

IPCC WGI AR5 Final Government Distribution -- Comments on the Final Draft Summary for Policymakers

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
SPM-1	SPM	0	0	0	0	The SPM lacks consistency in the use of the term 'industrial era'. Can this be defined and used consistently throughout the SPM. In addition, clarity is required when observations are not available from pre-industrial times, or when, due to lag periods, change is only detectable in the 20th Century or later (i.e. observations of sea level rise and currently only reported since 1901 (pg 5, 51-56). [Government of Australia]
SPM-2	SPM	0	0	0	0	General comment: The SPM has improved considerable compared to the first order draft and Austria thanks the writing team for this effort. However, there is still some room for improvement. See the more specific comments below. [Government of Austria]
SPM-3	SPM	0	0	0	0	General comment: The revised structure is helpful and should be kept. However, some statements have been identified that may need to be relocated. [Government of Austria]
SPM-4	SPM	0	0	0	0	General comment: In the summary for policy makers, there is no single comment to find on the changes and uncertainties of the large scale atmospheric circulation (as well as on the potential shift of the polar front, the atlantic storm track or mid-latitude cyclone activity) despite there are several arguments to be found on this issues in the physical science basis !! We recommend to include some paragraphs on this important objects. [Government of Austria]
SPM-5	SPM	0	0	0	0	We appreciate the enormous work for producing the final draft of the SPM, which represents a very substantial improvement with respect to the SOD. A great deal of our comments were dealt with, some others were not considered and we will come back to those. [Government of Belgium]
SPM-6	SPM	0	0	0	0	We appreciate the efforts done to define the meaning of the acronyms. However, continued attention is required to reduce the use of acronyms to a minimum (examples : CMIP, RF...) [Government of Belgium]
SPM-7	SPM	0	0	0	0	We would like that the SPM better highlights the evolution with respect to previous reports. [Government of Belgium]
SPM-8	SPM	0	0	0	0	For some jargon there is a footnote and a reference to the glossary; for other not. The SPM should be readable without using a glossary. We suggest to avoid using jargon(e.g. outflow,...) as much as possible, and if it cannot be avoided, to define it clearly in the SPM. [Government of Belgium]
SPM-9	SPM	0	0	0	0	What is precisely meant by 'quantities' ? The word "quantities" is used several times in the SPM, and its meaning is not fully clear. Please consider replacing "quantities" by more specific wording. [Government of Belgium]
SPM-10	SPM	0	0	0	0	It is essential to explain the treatment of uncertainties in a very clear way, in particular because the SPM uses the term "extremely likely", which is only included in the guidance as a footnote and was rarely used to date. We suggest to include a box on this topic, with a table describing the uncertainty related terms. [Government of Belgium]
SPM-11	SPM	0	0	0	0	Overall, the sections on cryosphere and sea level appear coherent and appropriately summarising knowledge. [Government of Belgium]
SPM-12	SPM	0	0	0	0	In particular for those policymakers in charge of science policy, it would be very useful to have an indication on further research needs or gaps. A paragraph could be added at the end of the SPM. [Government of Belgium]
SPM-13	SPM	0	0	0	0	Please express all emissions primarily in the units most familiar to policymakers, i.e. tonnes of CO2 or CO2-equivalent, but not the obscure "PgC". A footnote is not sufficient. [Government of Belgium]
SPM-14	SPM	0	0	0	0	Adding numbering to the sections headlines would make cross referencing easier [Government of Belgium]
SPM-15	SPM	0	0	0	0	Underlying Report(FD) Chapter 2 Page 124: Figure 2.9 contains a world map with national borders. It is suggested to use a map without borders to avoid unnecessary disputes. [Government of China]
SPM-16	SPM	0	0	0	0	Underlying Report(FD) Chapter 2.SM Page 8: In Table 2.SM.2, the expressions of Taiwan and Hong Kong are incorrect. Please change "Hong Kong, surface" to "Hong Kong, China, surface" at the first column of Table 2.SM.2. Please change "Composite of 12 urban sites in the north of the country" to "Composite of 12 urban sites in the north of the region" at the second column of Table 2.SM.2. [Government of China]
SPM-17	SPM	0	0	0	0	Underlying Report(FD) Chapter 5 Page 123: Figure 5.11 contains a world map with national borders. It is suggested to use a map without borders to avoid unnecessary disputes. [Government of China]
SPM-18	SPM	0	0	0	0	Underlying Report(FD) Chapter 7 Page 130: Figure 7.13 contains a world map with national borders. It is suggested to use a map without borders to avoid unnecessary disputes. [Government of China]
SPM-19	SPM	0	0	0	0	General remark on the whole text. Authors operate by results of model calculations obtained on the basis of four scenarios: RCP2.6; RCP4.5; RCP6.0, and RCP8.5. Probability of realization of these scenarios themselves is not characterized in such terms as from "virtually certain" to "exceptionally unlikely". So, absence of characteristics of the scenarios can be understood as that they are equiprobable. In this context there is high probability of the fact that the generally accepted threshold of admissible rise of the global temperature (+2oC) will be reached by beginning of second half of 21st century (see tables SPM.2 and Fig. SPM.6). And, the authors reject the idea to use any

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						<p>geoengineering methods counteracting global temperature rise considering this as unacceptably dangerous way (see page 18, lines from 14 to 24). Thus, one can draw a conclusion that the climate crisis is inevitable if not in the middle but at the end of 21st century. We believe that the authors should propose to policy makers in this document some scientifically based ways of the climate problem solution. It should be clearly shown that at present time scientists in many countries (including the Russia) investigate possibilities to use geoengineering of climate to prevent negative consequences of possible climate crisis since a probability of its dawning is rather high. These investigations include also estimating of possible undesirable side effects. Decision makers should make their decision to use the climate geoengineering on the basis of comprehensive comparative analysis of benefits and losses of both situations, i.e. a case if admissible threshold of the warming will be exceeded or another one if the temperature growth will be stopped by a geoengineering method. And, it is evident that investigations in the field of the climate geoengineering should be continued.</p> <p>Thus, in connection with the above, we believe necessary to include into the conclusive part of the "Summary..." the following text: "Probability of onset of the climate crisis in the second half of the 21st century is rather high. Among other ways, possible solution of this problem can be found in using of geoengineering methods to stabilize current climate. These methods are already under development by scientists in some countries (including the Russia). These methods are aimed at prevention or mitigation of negative consequences of the climate crisis. And it is the IPCC experts' opinion that investigations in the field of the climate geoengineering should be continued. [Government of Russian Federation]</p>
SPM-20	SPM	0		31		<p>General comments: The report has provided valuable updated information for policy makers on global climate change. However, even this is a summary, it's still necessary to provide more information and details for each regions in the world, so policy makers can follow easier. [Government of Vietnam]</p>
SPM-21	SPM	0				<p>The text in the new draft SPM has been greatly improved since the last version and now uses clearer language and contains most of the key facts and figures. As a summary of the WGI report, it is broadly fine. However, as a summary for policy makers, it still lacks a coherent and concise narrative on the current understanding of the state of the climate. In its current form it looks too much like a collection of chapter key messages - very much what someone would expect to see in a technical summary. Policy makers will find it difficult to draw out the key messages as this requires the various strands of evidence to be linked. However, the evidence is spread out throughout the SPM and is not presented in a helpful structure (for policy makers). It would be more helpful to have a clear and succinct 'high-level summary section' that answers the following: (1) What is happening to the climate? (observations); (2) what is causing these changes? (drivers); (3) What can we expect in the future? (projections). Also, the text in the boxes could be further improved by using simpler, more accessible language. Some of the highlighted messages are also still quite vague and lack quantification. For example, p.10, p.23-24: "...human influence on climate caused more than half of the observed increase in global average surface temperature...". How much more than half? p. 15, l.33: "Global mean sea level will rise during the 21st century". By how much? P. 15, l.3-6 "...Arctic sea ice cover will continue to shrink and thin...". What's the key message on summer sea ice extent? How much will this change? [European Union]</p>
SPM-22	SPM	0				<p>There is still an issue regarding baselines in the SPM. The baseline and the method for converting to pre-industrial (where possible) needs to be included up front as it isn't always clear in the text. [European Union]</p>
SPM-23	SPM	0				<p>"We consider that the IPCC AR5 (WGI) is in general an excellent report that summarize in detail the results obtained by the scientific community the last years. Also, it introduces new results and conclusions." The same for the present SPM. [Government of Argentina]</p>
SPM-24	SPM	0				<p>The IPCC has a difficult challenge to communicate key findings in easily understood language, while maintaining traceability of text to underlying documents. It is difficult to find key policy relevant messages within the very technical language. For example, the SPM does not convey simply projected changes in global average temperature relative to the 2 degrees C goal, nor provide a clear message about either the timing or magnitude of needed emission reductions to keep within the 2 degrees temperature limit. Similarly, statements of uncertainty around observed changes and around projected changes are each based on different considerations, yet use the same calibrated language. This gives the impression that there is greater uncertainty regarding observed trends and their causes, than about future changes. Given the importance of these topics to policymakers (for example, the 2013-2015 Review being conducted under the UNFCCC), authors are encouraged to simplify these messages and/or work towards their clear presentation in the SYR. [Government of Canada]</p>
SPM-25	SPM	0				<p>There is inconsistency in the SPM (especially pages 12-17) in reporting on projections from the RCPs with results for all RCPs provided in some places and for select RCPs in others. To the extent possible, when results for selected RCPs are reported on, we would like to see RCP2.6 and RCP8.5 reported on to capture the range across scenarios. [Government of Canada]</p>
SPM-26	SPM	0				<p>There is insufficient information for policymakers about non-CO2 gases and other climate forcers and what role reductions in emissions of these substances can contribute to meeting the 2 degrees C target. We understand that there is overlap with IPCC WGIII on this topic, but when presenting the results about cumulative emissions of CO2 and global temperature, more attention should be given to explaining how emissions of other forcers will affect these results. [Government of Canada]</p>
SPM-27	SPM	0				<p>Comments by the Chinese Government on the Underlying Report and the Summary for Policymakers of 'Climate Change 2013: The Physical Science Basis' – the WG I Contribution to IPCC AR5</p> <p>The Chinese government appreciates Bureau members, lead authors and Technical Support Unit of 'Climate Change 2013: The Physical Science Basis' – a contribution by Working Group I to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) – for their contributions to the</p>

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						<p>preparation of the underlying report (FD) and the Summary for Policymakers (SPM). It would avail itself of this opportunity to review the AR5 WG I FD and SPM.</p> <p>Firstly, it is found in the underlying report (FD) that wrong name designations remain when referring to Taiwan Province of China and the Hong Kong Special Administrative Region of China. In addition, some maps in the report may raise concerns or disputes over national borders. The Chinese government specifically pointed out the above mistakes and concerns in its comments (submitted on 29 November 2012) on SOD of the WGI contribution to AR5, which include:</p> <p>--Figure 2.9 on page 124 of Chapter 2 of the underlying report (FD) contains a world map with national borders. It is suggested to use a map without borders to avoid unnecessary disputes. (The same point was made by the Chinese Government in its previous comment No.10 about figure 2.10 on page 151, chapter 2 of the underlying report (SOD)).</p> <p>--In Table 2.SM.2 on page 8, Chapter 2 of the underlying report (FD), incorrect name designations are used for Taiwan Province of China and the Hong Kong Special Administrative Region of China. Please change "Hong Kong, surface" to "Hong Kong, China, surface" at the first column of Table 2.SM.2. Please change "Composite of 12 urban sites in the north of the country" to "Composite of 12 urban sites in the north of the region" at the second column of Table 2.SM.2. (The same point was made by the Chinese Government in its previous comment No. 8 about Table 2.A.2 of page 116, Chapter 2 of the underlying report (SOD).)</p> <p>--Besides, Figure 5.11 on page 123 of Chapter 5 of the underlying report (FD) and the newly added Figure 7.13 on page 130 of Chapter 7 both contain a world map with national borders. It is suggested to use a map without borders to avoid unnecessary disputes.</p> <p>The Chinese government hereby reiterates its above comments and strongly requests the underlying report (FD) be modified accordingly.</p> <p>For the SPM of WG I reports, in order to better characterize the objectiveness, comprehensiveness and balance of an IPCC output, we have made the following comments in the hope that they can be adopted in the modification process.</p> <p>First, it is believed that major conclusions should be represented more rigorously in the SPM. For example, the assessment of the attribution of climate change, and the relationship between cumulative emissions and future warming will be considered most far-reaching conclusions in the WG I report, which therefore should be worded and explained more clearly.</p> <p>(1) Currently the attribution of climate change is expressed as: "It is extremely likely that human influence on climate caused more than half of the observed increase in global average surface temperature from 1951–2010." In our view, this would mislead policymakers into thinking that it is human activity since 1951 that has resulted in the observed increase in global average surface temperature. Therefore, the conclusion should clearly indicate that it is human activity since the Industrial Revolution (1750).</p> <p>(2) The relationship between cumulative emissions and warming is stated in the report as "The principal driver of long-term warming is total emissions of CO2 and the two quantities are approximately linearly related" (Line 21-22 Page 17). However, the process from the anthropogenic increased CO2 emissions to the changed global average surface temperature undergoes such stages as emission – concentration, concentration – radiative forcing, and radiative forcing – warming, each involving a complex biogeochemical cycle instead of a simple linear relationship. It can be seen from Figure SPM.9 as well that the historical cumulative CO2 emissions and warming are not linearly related in a simple way. The current formulation, which would be very puzzling to policymakers, should be clarified and modified as necessary in the SPM.</p> <p>(3) It is noted in Page 10 of SPM that according to TCRE, the warming caused by each 1000 PgC is likely to range from 0.8 to 2.5°C. In addition, it is seen from Figure SPM. 9 that if the temperature rise is controlled within 2°C, the cumulative CO2 emissions should be no more than 2500 PgC, which is in agreement with the previous estimate on page 10. However, it is indicated in Line 41-43 Page 17 SPM that "Based on the assessment of TCRE, cumulative CO2 emissions from all anthropogenic sources would need to be limited to about 1000 PgC since the beginning of the industrial era, if the warming caused by anthropogenic CO2 emissions alone is limited to be likely less than 2°C relative to pre-industrial". Therefore, the SPM should reconsider the possible range of cumulative CO2 emissions that limits temperature rise within 2°C and make corresponding modification.</p> <p>(4) Figure SPM.9, although very important and informative, may cause some misunderstanding due to its current presentation. The curves following the asterisk in the figure represent future global average surface temperatures projected by climate system models under different scenarios, such as Representative Concentration Pathways (RCPs). In our view, since a model-based future climate projection involves both the anthropogenic forcing and the internal variability of the climate system, the warming should result from the two contributing factors in combination as well. However, in Figure SPM.9, the horizontal axis represents only anthropogenic cumulative CO2 emissions, while the vertical axis the future warming compared to 1861-1880 which, we believe, is the combined effect of both natural variability and anthropogenic contribution. The current Figure SPM.9 strongly tends to make policymakers think that under the RCP, the future global average surface temperature anomaly as projected by climate system models result entirely from the cumulative emissions. To avoid misleading policymakers, the SPM should reinforce Figure SPM.9 with a clearer explanation and modification.</p>

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						<p>Second, some of the SPM conclusions are found inconsistent with the underlying report (FD), which calls for further verification, for example, the confidence level on the effect of radiative forcing of aerosols, data on changed sea ice coverage in Chapter 4, CH4 concentration/emission and total aerosol radiative forcing in Chapter 8, and sea surface temperature projection and spring snow cover projection in Chapter 12. The SPM will be read by policymakers. Its conclusions, which will be frequently cited, will be of high impact. Thus, it is suggested to carefully check and verify the numbers, data and confidence levels concluded in the SPM text to ensure consistency between the key conclusions and the underlying report (FD).</p> <p>Third, the SPM can be expanded with additional conclusions of interest to policymakers. Some important conclusions in the underlying report (FD) are essential to policymakers in their effort to have a general understanding of factual climate change and its potential evolution. Examples include urban heat island effect; changing ocean salinity; role of evaporation in water cycle; projected aerosols; projected ice sheets in the Antarctic and Greenland, and impact of climate change on extreme marine events, to name just a few. It is suggested that some conclusions of widespread concern (not limited to the above-mentioned ones) be reflected in the SPM to some extent.</p> <p>In addition, the SPM should be made linguistically accessible and friendly to non-professional readers.</p> <p>Specific comments by the Chinese government are contained in the attached table. [Government of China]</p>
SPM-28	SPM	0				<p>We thank the WG1 author team for a greatly improved text. The Final Draft presents complex issues and crucial findings in a clear manner, and also uncertainties are well treated. At this point we have some comments to further enhance the reader friendliness of the draft.</p> <p>In some sections the text is still hard to read (e.g. page 13, lines 33-35), but it is not easy to imagine ways to present results of different scenarios concisely in a different way. [Government of Finland]</p>
SPM-29	SPM	0				<p>In our previous review we have highlighted the importance of consistent reference levels: “Much of the information both in the text and the graphics on the change in climate parameters is given with regard to the reference level 1986-2005. The information needed by policy makers is however the change since pre-industrial conditions. This is one major flaw of this report. Under UNFCCC, countries have agreed to limit warming to below 2 degree C compared to the pre-industrial level. IPCC (across working groups) should respond to the clear policy need from UNFCCC and give information on the climate state for this reference level. This might not be possible for all variables, but we encourage the authors to provide information with regard to pre-industrial whenever possible. This statement applies to the entire report. Make sure the presentation of temperature changes is consistent with the presentation if the other Working groups so that references to impacts and mitigation scenarios can be made.” and “Please be consistent with AR4. In particular it should be possible to compare trends. This is difficult, if reference periods are not consistent as e.g. for sea level rise (AR4: 2090-2099 relative to 1980-1999. AR5: 2081 to 2100, compared to 1986 to 2005).”</p> <p>Unfortunately these comments have not been considered and the FGD still contains a wild mixture of reference levels (e.g., apparently there is still no definition of the time to be used for pre-industrial levels, the years 1750, 1850, 1860, and 1870 are mentioned in the SPM). While we understand that consistency is unfeasible for some observations and model simulations, an effort should be made to accommodate the requirement of the users of the report. [Government of Germany]</p>
SPM-30	SPM	0				<p>THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The SPM and the underlying report discuss a reduction in the surface warming trend during the last 15 years. We have several concerns with this matter (see also our specific comments on P 3 L 25-27, P 11 L 1-6):</p> <p>Reference to relatively small time spans like 10-15 years in the context of climate change could be misleading. As indicated in Chapter 9 (See Box 9.8), internal climate variability might account for most of the recent reduction in surface warming. Longer time spans and moving averages instead of consecutive averages of temperatures and temperature trends should be considered. This has also been the position of the authors in AR4, when they refused to show the 15-year trend of global mean temperature in Figure AR4-TS.6 with the argument that periods that short are dominated by short term variability and, hence, cannot be used for statements on climate change. According to the WMO, the classical period relevant for climate is 30 years (http://www.wmo.int/pages/prog/wcp/ccl/faqs.html).</p> <p>If discussing such a short time span, why are exactly the 15 years from 1998 to 2012 considered? This is not consistent with the SPM of TAR and AR4 in which the temperature change since the year 1995 was discussed.</p> <p>Furthermore, the information is missing that despite the decreased warming trend the decade of the 2000s has been the warmest in the instrumental record.</p> <p>In addition, the underlying report and the TS label the recent reduction in surface warming as “hiatus”. The web site http://thesaurus.com gives as definition of this expression “pause, interruption”, http://www.merriam-webster.com gives “1a: a break in or as if in a material object, 2a: an interruption in time or continuity; break; especially: a period when something (as a program or activity) is suspended or interrupted. All these definitions do not appropriately describe the recent temperature evolution as there is not a pause or interruption, but a decrease in the warming trend, and the first decade of this century has been the warmest since preindustrial times, see Figure SPM1. (a), lower figure. Hence, the expression “hiatus” is strongly misleading and should not be used throughout the report. [Government of Germany]</p>

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SPM-31	SPM	0				Our Government fully accepts the anthropogenic origin of the ongoing climate change, but we consider to leave less points to attack at for the "climate sceptics". At some points, therefore, we recommend to avoid trials to cover or decrease the unestablished (unexplained) elements of uncertainty. [Government of Hungary]
SPM-32	SPM	0				Coverage of the extreme events is very poor and needs to be strengthened given the large implications for economies. [Government of India]
SPM-33	SPM	0				Policy makers have agreed under UNFCCC on the <2° C stabilization. Policy makers would like to know which RCP is close to 2 degree C warming, when 2 degree C threshold would be crossed under BAU. It is surprising that the whole of SPM does not address the most important policy relevant 2 degree threshold at all. This must be included under various sections of the SPM. [Government of India]
SPM-34	SPM	0				There is very little coverage of regional or continental level climate projections in the SPM. [Government of India]
SPM-35	SPM	0				The whole SPM does not discuss the warming under the BAU or reference emissions scenario and policy makers are very keen on this. [Government of India]
SPM-36	SPM	0				All the abbreviations used for the first time in the report need be introduced in their full words. For example, for RCP, CMIP5, SREX, ... [Government of Islamic Republic of Iran]
SPM-37	SPM	0				Throughout SPM, both "surface air temperature" and "surface temperature" are used without clear distinction. Only "surface air temperature" should be used. [Government of Japan]
SPM-38	SPM	0				The structure of the AR5 WGI SPM is well presented but in some cases it is too concise and restrictive resulting in loss of relevant information from the underlying report. Too much use of the words some or most should be avoided as much as possible since it gives a terse tone to the scientific statement . It would be more useful for decision making if examples could be cited or if the authors could be more precise. [Government of Madagascar]
SPM-39	SPM	0				Zero-comments (please click on the cell to make this long comment entirely visible) This version is a considerable improvement compared to the previous version, which is a great achievement. There are remaining general issues that we list in this comment line. Highlight major changes compared to previous reports The SPM should highlight the changes compared to previous reports for the most important key items, AR4 (general) and SREX (climate extremes). A bullet-wise list at the start of the summary will greatly improve the outreach. The chapters pay considerable attention to these changes, which merit more attention in the SPM, but there is a broad wish, especially among policy makers for a concise and clear overview. Although the current SPM version does pay attention to these changes, they are not visible enough. The key items to list are the obvious items such as global warming (SPM-8, lines 2-3), climate sensitivity and heat content (SPM-4, lines 17-19, SPM-10, lines 5-7), sea level rise (SPM-6, lines 9-10, SPM-15, lines 33-35), climate extremes (Table SPM.1, a few highlights can be selected) and Arctic ice melt (SPM-9, 27-29). These highlights should also emphasize very poor understanding if this is the case. Highlights subject to intense controversy may be part of a separate box. See next comment. Separate major controversial highlights For some highlights which are subject to intense controversy, such as the hiatus, sea level rise upper end projections, and climate sensitivity, the SPM should supply a separate box with a concise explanation in simple language. Relevant conclusions in the SPM and FAQs can be copied, moved and rephrased if needed to improve readability. More transparent and consistent uncertainty formulation The SPM should include a clear distinction between process-based and model-based uncertainty formulation. Model uncertainty is not transparent enough. A full account of the uncertainty is often particularly difficult in paleo-climate studies because a model of the physical meaning of the observations is generally required. We further advice to check the SPM on inconsistencies in the use of likelihoods versus confidence. For example, it is not clear whether medium confidence may be applied with likelihoods. The uncertainty guidance leaves room for different interpretation. Special attention must be devoted to the section 'Detection and Attribution of Climate Change'. Often 'very likely' is stated, implying 'high confidence' (so no confidence qualification) while in the 'Evaluation of Climate models' medium or low confidence is given to the model ability to simulate a certain variable. Also, confidence may be low in observable. Use language suitable for the main target group The scientific language of the SPM is unreadable for the main target group. Ideally, the SPM should be rewritten. Practically, it would already greatly help if the SPM

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						<p>starts with a bullet-wise overview of the main key results and how they have changed compared to the previous report(s) as commented above. In terms of readability, most figures, including the captions are quite complicated. We challenge the author team to supply figures that can easily be understood by lay people. Figure 1 could be merged with Figure 2 (would be stronger to see the different variables together)</p> <p>Radiative forcing definitions should be applied in a consistent way Throughout the SPM the term CO2 concentrations is used, but the correct formulation is equivalent CO2 mixing ratios. It would be appropriate that the reader is aware of this fact by a short explanation in the SPM.</p> <p>For the first time in the SOD Effective Radiative Forcing is applied. The SPM is not fully adjusted to this change. Often terms such as 'total RF' are applied, while ERF should be applied. Critically check consistent use of the new terminology. Footnote 8 is too scientific. Below we give a suggestion: "Global warming can be seen as a perturbation of the climate systems' energy budget by greenhouse gases and aerosols, so called "drivers". This perturbation is expressed as Radiative Forcing (RF) in units Watts per square meter ($W m^{-2}$). Traditionally, RF was calculated keeping all surface and tropospheric conditions fixed, such as clouds, winds and rain. In this report, these conditions are allowed to vary in response to these perturbations. The very slow responding ocean and sea ice are still kept fixed. This change reflects the scientific progress from previous assessments and results in a better indication of the temperature response to changing greenhouse gases and aerosols on time scales of years."</p> <p>Since 'other drivers 'are not specified, the sentence: "For all other drivers, these adjustments are assumed to be small, and thus the traditional RF is taken as the best estimate of forcing." is meaningless for non-experts.</p> <p>Policy relevant key items missing in the SPM</p> <p>Greenhouse Warming Metrics Metrics are very policy relevant, but missing in the SPM. The attention given in the chapter merits at least one conclusion about metrics. Here we give a suggestion: "The Greenhouse Warming Potential is the commonly applied metric in climate negotiations. It calculates the total forcing in a 100-year time frame from greenhouse gases with CO2 as the reference gas. It includes climate-carbon feedbacks for CO2 but not for the non-CO2 gases. New concepts, including time dependencies, have been introduced and further explored since AR4 to improve the policy relevance of metrics. However, there is remaining controversial value-based judgment that warrants more studies and dialogues to assess the importance of consistent treatment of indirect effects/feedbacks. {8.7.1, 8.7.2}"</p> <p>Regional radiative forcing There is very little attention given to regional radiative forcing from short-lived greenhouse gases. There is a significant gap between the regional attention in WGII and WGI that will be reduced if the SPM includes a few bullets with the meaning and key findings of regional RF. The justification is also given by the fact that the RCPs contain air quality policies.</p> <p>[Government of Netherlands]</p>
SPM-40	SPM	0				The New Zealand Government thanks the WG1 authors and TSU for their hard work and congratulates them on the production of this draft. [Government of New Zealand]
SPM-41	SPM	0				There is no discussion on metrics in the summary for policy makers, despite a comprehensive discussion in chapter 8 of working group one. This is a very important issue for policy makers at present. Suggest something that summarises and captures the following would be useful: "To quantify and compare the climate impacts of various emissions, it is necessary to choose a climate parameter by which to measure the effects. Metrics are used to quantify the contributions to climate change of emissions of different substances and can thus act as 'exchange rates' in multi-component policies or comparisons of emissions from regions/countries or sources/sectors. Metrics that have been proposed include physical metrics as well as more comprehensive metrics that account for both physical and economic dimensions. Choices of time frames and climate impact are policy-related and cannot be based on science alone, but scientific studies can be used to analyse different approaches and policy choices. All metric choices contain implicit value judgements as well as large uncertainties. {8.7.1.1, 8.7.1.6, Box 8.4}" [Government of New Zealand]
SPM-42	SPM	0				Throughout the document temperature anomaly projections for specific future periods are given relative to 1986-2005. It would be helpful for these figures to be given versus pre-industrial levels, corresponding to the Cancun UNFCCC agreements. The use of two different reference periods (1986-2005 and pre-industrial) is unhelpful and risks misleading those who are used to thinking about the '2 degrees above pre-industrial' target and who do not read the document thoroughly. Appreciating that model projections are naturally made relative to a modern baseline, nevertheless it would be useful to add a column to Table SPM.1, and an extra axis scale to Figure SPM.6 to express these numbers relative to pre-industrial values. [Government of New Zealand]
SPM-43	SPM	0				It would be useful to have a statement about the relative confidence and agreement in projections of warming for the end of 21st Century versus peak warming. If justified by the underlying chapter, these could be related to levels of confidence and agreement on different measures of climate sensitivity (ECS, TCR, TCRE).

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						[Government of New Zealand]
SPM-44	SPM	0				The presentation of the SPM is greatly improved, including through the use of "highlighted" boxes and italic 'chapeau' comments at the beginning of each section. [Government of New Zealand]
SPM-45	SPM	0				We suggest that the highlighted shaded texts in the SPM follow a more harmonized structure and that they focus on the key findings in the report, e.g. by presenting main (quantitative) results including rate of change etc. while discription of process and methodology is moved to the body of the text under the key findings. [Government of Norway]
SPM-46	SPM	0				Is it possible to harmonize the reference years for many of the observations?. E.g. on page 3, line 21-25 there is a reference to temperature incereases relative to 1901-2012 and 1979-2012, while it is statet on page 10, line 9 that human activities have caused temperature change since the 1950s. Further, on page 17, line 33-37 the warming in 2300 is related to the timespan 1986-2005. Please go through the SPM and see if there is a possibility to harmonize the reference years for which temperature incereases, ice melting, sealevel rise etc. are referenced to. [Government of Norway]
SPM-47	SPM	0				Ocean acidification should recieve more focus in the SPM, due to its global occurrence, increased rates towards the poles, new knowledge and important implications for marine life and ecosystems and thus its importance for Working Group II. Consider moving the findings on acidification to highlighted parts of the SPM. [Government of Norway]
SPM-48	SPM	0				Please clarify the structure of the SPM, consider using A, B,... for example. [Government of Norway]
SPM-49	SPM	0				Please assess whether it is necessary for policymakers to have all those interval values in the SPM, or if average values are sufficient in some cases (for example radiative forcing). [Government of Norway]
SPM-50	SPM	0				To make the information more easily available, please consider using not only absolute values that are hard to grasp for the average reader, such as acidification and glacier and sea ice melting but more often use percentage or comparison with baseline levels. [Government of Norway]
SPM-51	SPM	0				The draft of the SPM focusses to a large extent on CO2 which is the most important green-house gas, however it is important to keep the balance with regard to the other green-house gasses. [Government of Norway]
SPM-52	SPM	0				Please consider the language in the SPM in order to make it as easy as possible to understand for policymakers. [Government of Norway]
SPM-53	SPM	0				Please consider harmonizing the reference period for the temperature reported in the SPM. Consider using pre-industrial temperatue as the reference temperature as most policy-makers know the 2 degrees target which is related to pre-industrial levels. [Government of Norway]
SPM-54	SPM	0				It is suggested an index with a table of contents [Government of Spain]
SPM-55	SPM	0				Throughout the SPM text there are mentions about different aspects and variations related to observed and projected changes, but often not detailed geographical distribution of these regional differences are stated(for example, page 4, lines 34-37; page 5 , line 43, page 14, lines 5-6 [Government of Spain]
SPM-56	SPM	0				The SPM has evolved well from the earlier draft, including indications in the text and table SPM 1, how the AR5 assessment relates to the AR4. However, there are still places where this relation (similarity with/difference from) is not elucidated. As AR5/WGI considers "new evidence" in relation to what was covered by AR4 it would be most useful and enlightening to link (each) bulleted point to a brief indication of the nature of the new evidence. In the current version, this is done for some of the points. For example, is it mainly related to new scientific knowledge or process understanding, more complete observational records or ones being longer or having higher precision, or is it due to better models, or more complete scenario ensembles, and so forth. Similarly, if there are (substantial) new scientific material that nevertheless do not change the conclusion in relation to AR4 (or strenghten the inconclusiveness), it would be equally relevant to indicate this. By providing this kind of brief information the gist of AR5 as an assessment of scientific evidence would clearly carry through to the SPM. [Government of Sweden]
SPM-57	SPM	0				It would be useful information if, whenever the uniqueness of some observation is commented on, and the reason for the choice of the period used in the comparison was commented on. For example, is "unprecedented on time scales of..." or for example "...of the last 1400 years", conditioned by the length of the period with relevant information or due to similar changes occurring up to the period considered. Perhaps a footnote could be provided on this in conjunction of first occurrence of such a comparison, or in the Introduction section on page SPM-2. [Government of Sweden]
SPM-58	SPM	0				The term "sea ice cover" used several time in the SPM, is scientifically not well defined. Suggested to be more specific and to use the terms "sea ice extent" and/or "sea ice thickness" when suitable. [Government of Sweden]
SPM-59	SPM	0				As usual, the reading of the SPM is difficult given its very technical presentation, but this is hardly avoidable al-though unfortunate because the IPCC does not make real efforts to present SPMs that are readable by its primary audience, i.e., policy makers, but rather meant for the scientific community. The SPM focuses on what is known. This is good and correct. But sometimes it is as equally important to know also what is not known, or not well understood. For certain areas, such statements have been added, but it would make the SPM much more valuable to the general reader if this was done more consistently throughout the SPM.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						<p>Apparently, it is impossible to avoid the use of a too technical jargon in the SPM. For example, the whole section on the radiative forcing is nearly impossible to understand without going to the underlying chapter and reading up on what is really meant with concentration versus emission-based RF, etc.</p> <p>This being said, this version of the SPM is in excellent shape. It is well balanced, highly informative, and carefully worded in general. The figures and tables are very well designed. The SPM covers important new issues compared to AR4, including ocean acidification. It highlights the long perturbation lifetime of CO2 in the atmosphere and links cumulative carbon emissions with warming. [Government of Switzerland]</p>
SPM-60	SPM	0				<p>The SPM provides an insufficient coverage of paleoclimate and what we have learned through the analysis of paleoclimate records since AR4. There are two discoveries from paleo research since 2007 that could be figured in either a time series figure or another graphic to emphasize these discoveries in the SPM, drawing on material already in Ch. 5: (1) One of the paleo chapter results is that Arctic temperature changes are nearly twice as large as other regions for many events. The past reveals the Arctic to be a sensitive place. Ch. 5 could be revised to draw out this conclusion in a way that could be reproduced in the SPM. A box could be created, titled "Arctic Temperature Sensitivity", and the box could refer to the multiple figures (5.1, 5.6, 5.12, 5.18) that provide evidence of high sensitivity. The most easily understandable evidence appears in the MCO-LIA temperature contrast (Fig. 5.12 lower right). If this bar graph data were reproduced in the box in table form, the 2x change in the Arctic would be obvious. A time series for the last millennium could be used to show the Arctic sensitivity, but the sensitivity is not easily compared from the Fig. 5.12 time series. (2) The other remarkable aspect of the paleo record is how high today's atmospheric carbon dioxide concentration is relative to the past. This is a main point of the paleo chapter and the SPM, but its not shown as a time series (it was in 2007, Fig. 6.3, and also in the 2007 SPM (Fig. SPM-1)). One way to illustrate this in the SPM is to plot the modern CO2 concentration as a green dot on Fig. 5.3. The problem with this is that the figure is not arranged well for this. An alternate suggestion would be to add an additional inset to Fig. 5.3, showing the CO2 record for the past 800,000 years with an exponential time axis as was done in the 2007 SPM. This figure would extend the 2007 result in two ways. It would extend the data back to 800,000 years (the 2007 data extended to 600,000 years BP), and it would extend the graph upwards to include the modern concentration of nearly 400 ppm. It's worth pointing out that even longer records of CO2 appear in Fig 5.2. These long records shown in Fig. 5.2 represent exciting cutting-edge and still-debated results that are not appropriate for the SPM. [Government of United States of America]</p>
SPM-61	SPM	0				<p>The authors should consider broadening the ranges for sea level rise. The discussion in Chapter 13 seems to lend itself to the possibility that such higher levels of sea level rise are plausible - we simply just do not yet understand all the physical processes, the timescales they will respond on, etc. This is particularly relevant to p. 16 and Fig SPM.8 [Government of United States of America]</p>
SPM-62	SPM	0				<p>Where possible, the authors should use a consistent reference period from which projections are made. It's understandable that different observational timeseries have different start times and, therefore, by necessity cannot have the same base year. But for projections, everything is against a 1986-2005 reference period - the reason for this choice is not clear to a scientific audience, much less to policymakers. Please explain why this choice was made and the appropriate extrapolations (i.e., values to be added) to various metrics to make a pre-industrial comparison, where possible. [Government of United States of America]</p>
SPM-63	SPM	0				<p>The SPM is not consistent with respect to which statements have evidence/likelihood/confidence/agreement qualifiers associated with them. A footnote early on in the SPM explaining why and when each certainty descriptor is used would minimize confusion to the reader. As just one example, p. 3, line 5 is a very likely statement with high confidence regarding the warmest 30-yr period in the past 800 years. Yet p. 3, lines 20-21 state that globally averaged surface temperatures have increased by ~0.9C over the past 100 years with no confidence or likelihood statement. While a range is given in brackets in this latter example (thereby implying a 90% uncertainty), the text could read more smoothly if likelihoods, agreement, confidence and evidence indicators were applied in a consistent manner. [Government of United States of America]</p>
SPM-64	SPM	0				<p>Broadly speaking, the SPM does not read like a narrative. It is a choppy collection of disparate facts. And while it is a hugely valuable to scientists who want a quick reference, its utility for policymakers can be questioned. Consideration should be given to how the text could be smoothed to read more fluidly. [Government of United States of America]</p>
SPM-65	SPM	0				<p>Noticeably absent from the SPM are any figures concerning observed or projected changes in extreme temperature or precipitation. Table SPM.1 does contain valuable assessments of the changes in a wide variety of extreme events but lacks the visual impact that Policymakers require. Furthermore, even though the SREX report did provide such figures in its SPM, the AR5 is a much more widely distributed document with an associated larger impact. We suggest that figures TFE9, Figure 1e and f from the technical summary be added to the SPM along with discussion about the projected RCP8.5 changes in rare one day temperature and precipitation events. [Government of United States of America]</p>
SPM-66	SPM	0				<p>The SPM has improved since the Second Order Draft. It is more readable, but still lacks narrative. The document as a whole still reads like a series of facts written by committee and in places is overly technical. In several places more breaking up with headings would make it more accessible. [Government of United Kingdom of Great Britain & Northern Ireland]</p>
SPM-67	SPM	0				<p>The treatment of SLR uncertainty still needs improving. [Government of United Kingdom of Great Britain & Northern Ireland]</p>
SPM-68	SPM	0				<p>Messaging might be improved and a stronger storyline achieved if observations and attribution sections are combined. [Government of United Kingdom of Great Britain & Northern Ireland]</p>

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						Britain & Northern Ireland]
SPM-69	SPM	0				The consistency in using RCPs throughout is much improved. It would be good if the RCP explanation could include temperature ranges for the forcings of the RCPs as well as cumulative emissions in CO2 equivalent. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-70	SPM	0				The uncertainty guidance should be prominently displayed as a box instead of being relegated to a footnote on page 2. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-71	SPM	0				It would be more informative to intersperse the contents of the evaluation of climate model section throughout the rest of the SPM where appropriate e.g. discuss model performance when simulating the cryosphere in the Cryosphere section (see comment below re. page 9). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-72	SPM	0				Some sections of the SPM have a lot of confidence statements, while some do not have any. This may lead to unclear messages on the confidence in some sections. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-73	SPM	0				The SPM as a whole requires more statements providing context to observations and projections, especially linking the different changes in the climate system to each other, e.g. changes in Arctic sea-ice are linked to rising Arctic surface air and sea temperatures as well as variations in ocean circulation. Policymakers may not necessarily have the background knowledge to be able to interpret how changes in, for example, the AMOC, will have an effect on the rest of the climate system. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-74	SPM	0				There is little discussion in the SPM of advances in regional modelling. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-75	SPM	1	1	31	14	The measurement section sometimes lacks context setting: why would the average policy maker like to know a certain measurement? [European Union]
SPM-76	SPM	1	1	31	14	suggest that throughout the report the word "mean" is replaced with the word "average", the latter being more common language [Government of Denmark]
SPM-77	SPM	1	1	31	60	The Authors should recall that this report is a summary for policy makers and reduce the overly scientific and technical tone of the report to ensure that information is clear and relevant for policy. [Government of Ireland]
SPM-78	SPM	1	1	31	60	Terms such as free-troposphere, cloud condensation nuclei should be avoided [Government of Ireland]
SPM-79	SPM	1	1	31	60	All references to temperature change should be relative to pre-industrial temperatures (This is the policy context) e.g. table SMP2 and figure SPM6 which use 1986-2005 as the reference period. [Government of Ireland]
SPM-80	SPM	1	1	31	60	General comment: short clear sentences aid communication [Government of Ireland]
SPM-81	SPM	1	1	31	60	Captions for figures and tables are very technical. These should help the reader to understand details in the SPM rather than just repeat such details from the TS and full report. This assumes that the audience will have a high level of technical/scientific knowledge which may not be the normal situation. [Government of Ireland]
SPM-82	SPM	1	3	1	4	The phrase "...considers evidence of past and projected future climate change ..." may be interpreted as a biased focus towards evidence for climate change as opposed to evidence for no climate change. [Government of Sweden]
SPM-83	SPM	1	6	1	15	It is unfortunate that out of 34 authors of the SPM, only 4 come from developing or emerging countries. A better balance would have been welcome. [Government of Belgium]
SPM-84	SPM	1		2		Footnotes page 1 and 2. - It is suggested to collect all explanations on the confidence levels and probabilities on a chart or table, as it is done in Table 1.2 (Chapter 1) and in box TS.1 [Government of Spain]
SPM-85	SPM	2	1	2	5	In this paragraph, there is need to define what a " climate system" is and its components so that the policy makers can understand and appreciate the components [Government of Kenya]
SPM-86	SPM	2	3	2	3	Please add "(AR5)" after "Report" [Government of Belgium]
SPM-87	SPM	2	3	2	4	Write "... new results compared to the AR4 of past and projected climate change ..." [Government of Switzerland]
SPM-88	SPM	2	4	2	6	"...ranging from..." requires a "...to..." later in the sentence. [Government of New Zealand]
SPM-89	SPM	2	4			Question the need for "future" after "projected". Suggest delete. [Government of New Zealand]
SPM-90	SPM	2	5	2	5	Replace 'archives' by 'records'. It is more accurate. Archives are a human construct. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-91	SPM	2	8	2	8	This paragraph can be deleted, the purpose of the shaded boxes is self-explaining. Instead, the information on uncertainty language should be extended. [Government

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						of Germany]
SPM-92	SPM	2	8	2	10	This text clarifying the purpose of the chapeaus and shaded boxes is useful as there is often confusion about the purpose of the bolded statements. This format should be repeated in the SPMs of the other WGs to ensure consistency in the AR5. [Government of Canada]
SPM-93	SPM	2	10	2	10	Non-English-speaking readers cannot understand the meaning of word 'chapeau'. A more common word should be used to replace 'chapeau'. [Government of Japan]
SPM-94	SPM	2	16	2	16	"...degree of agreement": agreement with what? It could be the author team, the literature, the lines of evidence. Please specify. [Government of Belgium]
SPM-95	SPM	2	16	2	16	In Footnote 1, 'unequivocal' is undefined though it is used in the SPM. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-96	SPM	2	16	2	17	In some cases, probabilistic estimates are based both on a statistical analyses AND expert judgment, e.g. when qualifying the ranges of model results within a 90% uncertainty interval (5 to 95% percentile) as likely, i.e. a chance of 66-100%, because of an expert judgment that the statistical calculation of the model spread is smaller than the real uncertainty. Please correct the statement. [Government of Germany]
SPM-97	SPM	2	16	2	17	Footnote 1 and 2 could very well be presented in a box or a figure/table. This would increase readability. Please consider to extract from Box TS1 and Box TS1 Fig1. [Government of Norway]
SPM-98	SPM	2	17	2	17	Footnote 2: We cannot imagine any case in which the use of additional terms to indicate uncertainty would be appropriate, in particular in the SPM. This strongly decreases the usefulness of the text, and we urge the authors to stick to the agreed uncertainty guidance for AR5. [Government of Germany]
SPM-99	SPM	2	17	2	19	We cannot imagine any case in which it would be appropriate to omit the uncertainty qualifier, in particular in the SPM: it is essential for decision maker to know the uncertainty of a finding. Please add this information wherever it is missing. [Government of Germany]
SPM-100	SPM	2	20	2	22	Please indicate the uncertainty of this statement. [Government of Germany]
SPM-101	SPM	2	20	2	22	Why do you introduce yet another time period here? Please provide the information on temperature increase with regard to reference periods that are relevant to policy makers, i.e. with regard to the pre-industrial level. This information is hidden in the note a) to Table SPM.2: "Based on the CMIP5 ensemble; anomalies calculated with respect to 1986–2005. Using HadCRUT4 and its uncertainty estimate (5–95% confidence interval), the observed warming to the reference period 1986–2005 ... is 0.61 [0.55 to 0.67] °C for 1850–1900, 0.30 [0.27 to 0.33] °C for 1961–1990, and 0.11 [0.09 to 0.13] °C for 1980–1999." [Government of Germany]
SPM-102	SPM	2	21	1	13	Text length can be reduced e.g. these lines repeats element of line 8 [Government of Ireland]
SPM-103	SPM	2	21	1	13	Add text to state AR5 builds on AR4 using 6 years of new research and analysis [Government of Ireland]
SPM-104	SPM	2	24	2	24	We consider it could be useful to summarise the drafting process, along the following line: "This reports has been compiled following the IPCC procedures, as can be found on the IPCC website". Perhaps we could even add something like: "The drafts of this report have been reviewed by any expert that wished to do so and by the governments of the members of IPCC, and comments were given due consideration by the author team under scrutiny of review editors especially appointed to guarantee that all views would be included". It would also be good to indicate: "All review comments and the responses to them of the author team are published on the IPCC-website. [Government of Netherlands]
SPM-105	SPM	2	24	2	27	Please indicate the uncertainty of this statement. [Government of Germany]
SPM-106	SPM	2	24			There is the need to incorporate a whole section about the explanation of the development of scenarios (RCPs). The information included in Box SPM.1 is very much brief and scientific. In addition, The modeling of the scenarios is incomplete and is not taking into account the most advanced and updated knowledge about this topic. There is the need to introduce in the analysis of the scenarios the relationship between solar cycles to the thermal trends. Finally in the analysis of the scenarios there is also need to consider social variables not as secondary but as principal ones, such as the impacts of poverty and political stability in the modeling of scenarios. Consequently, before moving forward the analysis of climate change there is the need to improve the construction of the scenarios related to climate change. [Government of Bolivia]
SPM-107	SPM	2	26	2	26	The terms "Climate System" are used many times in the SPM. They are defined in the IPCC Glossary and it would be useful to provide in the SPM their definition:"Climate system: The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, and human-induced forcings such as the changing composition of the atmosphere and land-use change." [Government of Switzerland]
SPM-108	SPM	2	26	4	38	The SPM should address the current pause in surface temperature more explicitly and explain how heat has been absorbed by the oceans over the past 10-15 years. The temperature trends for air and ocean are addressed in the SPM but the text never puts this into context by explaining the regular staircase pattern of warming over the 100 years linked to changes in IPO and deep ocean heat flux. As such the SPM inadvertently perpetuates the erroneous notion that global warming has slowed. [Government of Norway]

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SPM-109	SPM	2	26	6	46	For the section " Observed changes in the climate system", solar radiation changes or changes in extrem events (more in detail) should be mentioned and concerned in the report [Government of Vietnam]
SPM-110	SPM	2	26	7	11	There is the need to consider in the report the impacts of climate change on peoples and society. An analysis that takes away the people is incomplete, since there is a close relationship between climate change and the anthropogenic responses to it. One important aspect in the analysis of climate change should be related to poverty. This means that the biophysical analysis of climate change must be developed interlinked to the social analysis of climate change, whilst visibilizing its impacts on poverty. [Government of Bolivia]
SPM-111	SPM	2	26	7	11	It is important to highlight what is the contribution per region and country to the observed figures of climate change. This implies introducing global figures about countributions of developed and developing country Parties to climate change, since 1850. Also, the analysi must take into account the objective of the CBD, which is to allow Mother Earth to adapt naturally to climate change, and therefore the issue is about the incorporation of criteria regarding what is the capability of regeneration of Mother Earth/nature to climate change, in order to ensure the protection of the environmental integrit y of Mother Earth (according to the COP18 UNFCCC decision). [Government of Bolivia]
SPM-112	SPM	2	26			Observed Changes in the Climate System: This section doesn't give a good overall sense of which observations we are confident about and which we are not. Also, it would benefit from more context in terms of palaeoclimate records. An up-to-date reconstruction of temperatures, such as that of the PAGES-2K project, would be useful. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-113	SPM	2	28	1	30	Direct observations differ from paleo analysis this para can be restructured for clarity. [Government of Ireland]
SPM-114	SPM	2	28	2	33	There is some inconsistency between this chapeau and the reporting of trends in the subsequent section. Not all observations have trends going back to the mid-19th century(as is clear from Fig SPM.2). There is a focus in the following text on reporting changes since 1950 that is not addressed here in the chapeau. We suggest the following change to these lines: Add after the words "mid-19th century" "for some variables, later for others, with data for a comprehensive set of variables available for the period 1950 on. Paleoclimate reconstructions.....etc.". [Government of Canada]
SPM-115	SPM	2	28	2	33	Consider if it should be mentioned that som obesrvational data are more limited in some regions etc. Please also explain what physical and biogeochemical measurements are. E.g by placing temperature, precipitation etc. in brackets after "physical" etc. [Government of Norway]
SPM-116	SPM	2	28	2	33	It might be helpful to include here (or in each of the sub-sections) a summary of the coverage of observations (i.e. what climate indicators are well monitored in which regions and which are not), some sections do this more successfully than others - oceans and atmosphere in particular could benefit from a sentence or two on coverage or scarcity of observations. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-117	SPM	2	28	2	39	The FOD of the SPM has included a very important paragraph linking the results from AR4 with those from AR5 and made an excellent introduction to the following chapters. We recommend including this paragraph again: "AR4 concluded that warming of the climate system is unequivocal. New observation, longer data sets, and more paleoclimate information give further support for this conclusion. Confidence is stronger that many changes, that are observed consistently across components of the climate system, are significant, unusual or unprecedented on time scales of decades to many hundreds of thousands of years." [Government of Germany]
SPM-118	SPM	2	29	2	29	The text would be easier to read with a period after "satellites", and with a new sentence starting with "Information". [Government of Belgium]
SPM-119	SPM	2	29	2	29	Replace 'archives' by 'records'. Archives are repositories of human records - whereas here we are taking about the records in the physical world. We think this is misleading. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-120	SPM	2	32	2	33	Do the observations include the biogeochemical (C, N, etc) cycles as well? [Government of India]
SPM-121	SPM	2	32	2	33	in the atmosphere, the ocean, the cryosphere , and the land surface can be changed to in five components of climate system ie.,the atmosphere, the hydrosphere, the cryosphere, the lithosphere, and the biosphere. [Government of Islamic Republic of Iran]
SPM-122	SPM	2	33	2	33	We suggest inserting the notion that atmosphere, ocean, cryosphere and land surface are climate system components. The notion 'climate system components' is used on p8 line 50 to 51) [Government of Belgium]
SPM-123	SPM	2	33	2	33	Please add one sentence to the paragraph in order to explain why the Report shows different starting dates for the different climate variables: Global and regional trend analyses may start from the first complete year of the observations which are obviously different for one or the other climate variable. [Government of Hungary]
SPM-124	SPM	2	36	1	36	Explain why start with 1950? [Government of Ireland]
SPM-125	SPM	2	36	1	36	Is warming of the climate system unequivocal as stated in the AR4? Clarity on this is required [Government of Ireland]
SPM-126	SPM	2	36	2	36	This requires clarification: as it stands, it might be inferred that no change was found in the pre-1950 observations, as the paragraph immediately above explains that global observations began in the 19th century. The clarification might simply be that the amount, type, and quality of the data is too limited to make a statement for a longer period since the industrial revolution. [Government of Belgium]

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
SPM-127	SPM	2	36	2	39	This section could be part of a high-level summary section at the beginning of a the chapter. [European Union]
SPM-128	SPM	2	36	2	39	Concerning the text: "Since 1950, changes have been observed throughout the climate system: the atmosphere and ocean have warmed, the extent and volume of snow and ice have diminished, and sea level has risen (see Figures SPM.1 and SPM.2). Many of these observed changes are unusual or unprecedented on time scales of decades to millennia. {2.4, 3.2, 3.7, 4.2–4.7, 5.3, 5.5–5.7, 13.2}" , we like to point out that in Figure SPM.1, the change in temperature starts before 1950, as can be seen from the oscillation in the 1850-1910 decadal period and the significant increase in temperature of about 0.3 °C in the 1910-1950 decadal period. Also in the 2000 decade, the temperature trend was lower than before (see for example: C Schultz, Initialized decadal climate model projects reduced future warming, EOS, Transactions American Geophysical Union, 94 (6) 68, 5 February 2013, in particular the sentence in the Abstract: In the 2000s the Interdecadal Pacific Oscillation reversed, cooling the Pacific and stalling the rise of the global average temperature. So, please, modify the precise date of the "1950" year, to a previous decade. [Government of Argentina]
SPM-129	SPM	2	36	2	39	In this conclusion there is no mention of changes in Carbon and other biogeochemical quantities, which are later analyzed in this section and are related to the observed changes in the climate system [Government of Argentina]
SPM-130	SPM	2	36	2	39	Suggest that this finding may have more impact for a policy audience if the sentences were reversed (e.g., "Many changes have been observed throughout the climate system that are unusual or unprecedented on time scales of decades to millennia. Since 1950, the atmosphere and ocean have warmed, the extent and volume of snow and ice have diminished, and sea level has risen.") [Government of Canada]
SPM-131	SPM	2	36	2	39	The information contained in the WGI AR5 Report establishes that these changes have occurred, but the question is if there is evidence enough to state that they are "unusual or unprecedented on time scales of decades to millennia". [Government of Switzerland]
SPM-132	SPM	2	36	2	39	Suggest the box includes statements on changes in ocean pH and changes in atmospheric composition. This is the first major statement in the document, and should set a strong and clear summary narrative for this section. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-133	SPM	2	38	2	38	The climatic observations are provided for the last 60 years; whereas it has been compared with millennia. The rationale may be considered. [Government of India]
SPM-134	SPM	2	38	2	38	The word "many" or "most" seems to be vague in its meaning, compared with the detailed definiton of likelihood such as very likely (90-100%). How many is many? Define if it's possible. [Government of Republic of Korea]
SPM-135	SPM	2	38			Suggest deleting "unusual or" in this sentence. "Unusual" is a vague term for an SPM, particularly given the strong effort to precisely characterize uncertainty. "Unprecedented on the time scales of decades to millennia" would be more clear. [Government of Canada]
SPM-136	SPM	2	42	2	42	In footnote 1, the phrase "For a given evidence and agreement statement, different confidence levels can be assigned" seems contradictory to Fig. 1 from the Mastrandrea et al. 2010 IPCC Uncertainty guidance that has "agreement" on the y-axis and "evidence" on the x-axis, with "confidence" being the solution space. Therefore, it would be correct to say, "For a given confidence level, different agreement and confidence statements can be assigned", but as it is, the text reads as a confusing if not incorrect interpretation of Fig. 1 from the 2010 Uncertainty Guidance. [Government of United States of America]
SPM-137	SPM	3	1	3	49	Suggest adding information on recent hiatus in global mean air temperature trend from Section 11.3.6 and the referenced material from Chapter 9. [Government of United States of America]
SPM-138	SPM	3	1	4	6	Atmosphere: This section could be broken down further, with headings for observations of temperature changes, precipitation, etc. The section would benefit from a figure showing changes in precipitation patterns and indicating where coverage in precipitation observations is low. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-139	SPM	3	1	4	37	The recent slowing of the temperature trend is currently a key issue yet it has not been adequately addressed in the SPM. Much of the information is present but it requires a lot of effort on the part of the reader to piece it all together to gain an understanding of the situation. For example, p.3, l.3 addresses the point about the decadal trends but then information about other lines of evidence (e.g. ocean heat uptake, Arctic sea ice) are found elsewhere with little help given to relate them to one another. This is one example of an area in the SPM which would benefit from a clear narrative as discussed in the comment above. Just to note, Figure SPM.1(a) is very useful. [European Union]
SPM-140	SPM	3	1	4	37	Could atmosphere and oceans be put together to give a more coherent story? For example, it would be useful if lines 24-27 on p 3 could be followed by a statement about ocean warming, to give a fuller picture? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-141	SPM	3	1			Section Atmosphere:Why is there no statements on changes in Circulation and Modes of Variability in this section on Atmosphere ?What are the selection criteria? [Government of Madagascar]
SPM-142	SPM	3	1			SPM-3 SPM.1 The three surface temperature data sets should be referred to similarly. Right now the Hadley Center and NASA GISS are identified, but not NOAA/NCDC. This should be corrected. [Government of United States of America]
SPM-143	SPM	3	3	3	3	Insert 'Globally, near the Earth's surface,' before 'each of the last three decades.' [Government of United Kingdom of Great Britain & Northern Ireland]

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
SPM-144	SPM	3	3	3	3	The message of this sentence is not clear. It could be interpreted more than one way and does not make clear whether it is referring to global surface temperatures, atmospheric temperatures, the entire climate system, It is not clear exactly what time period the phrase 'the last three decades' is referring to; whether it is consecutive decades have each been warmer than the last, or that the last 3 decades before the current time were warmer than all previous decades? Assuming the former then it is still not clear whether the period is 1980 to 2009 or 1981 to 2010, as it is not possible to identify this for sure from Figure 1. This should be specified in the text. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-145	SPM	3	3	3	4	For the best understanding we suggest to change "...than all preceding decades..." to "...than any preceding decade...", and "...has been the warmest..." to "...has been the warmest of all..." [Government of Netherlands]
SPM-146	SPM	3	3	3	7	Statement should be clearer e.g. start "The 1st decade of this century is the warmest on record." [Government of Ireland]
SPM-147	SPM	3	3	3	7	Please consider if this can be written in a more understandable way, e.g. by starting with the most recent result in each sentence and including finding related to surface temperature from the bullets below. E.g.: "It is ... certain that the global mean surface temperature have increased and almost the entire globe has experienced surface warming since. The last decade has been the warmest since 1850 and each of the last three decades has been warmer than all preceding decades since 1850. In the Northern Hemisphere, the period 1983-2012 was very likely theof the last 1400 years, based on analyses of paleoclimate archives. (medium confidence), " Also is it possible to add confidence/likelihood to the first sentence? [Government of Norway]
SPM-148	SPM	3	4	3	7	replace 'and likely the warmest 30-year period of the last 1400 years' by 'and likely also an unusually warm 30-years relative to the period between 800 and 1400 years ago' [Government of Netherlands]
SPM-149	SPM	3	4	3	7	"Analyses of paleoclimate archives indicate that in the Northern Hemisphere, the period 1983-2012 was very likely the warmest 30-year period of the last 800 years (high confidence) and likely the warmest 30-year period of the last 1400 years (medium confidence). {2.4, 5.3}" Suggest that a more accurate statement would be, "Analyses of paleoclimate archives indicate that in the Northern Hemisphere, the period 1983-2012 was very likely the warmest 30-year period of the last 800 years (high confidence) and likely also an unusually warm 30-years relative to the period between 800 and 1400 years ago (medium confidence)." There are three reasons for the suggested change: 1. Establishing whether an interval is the warmest requires an analysis that permits comparing one interval against all possible 30 year intervals at once, an analysis that is generally accomplished using ensemble realizations. Although such a study was recently published for the Arctic over the last 600 years (Tingley, Martin P., and Peter Huybers. "Recent temperature extremes at high northern latitudes unprecedented in the past 600 years." Nature 496.7444 (2013): 201-205.), reference should be given if, indeed, there is a study conducted globally or extending back 1400 years. 2. Data availability becomes increasingly sparse prior to 600 years ago, making global inference more difficult. 3. The tree ring divergence problem remains unresolved, and tree ring chronologies provide the overwhelming majority of temperature indicators available during this interval over land. The National Academies report "Surface Temperature Reconstructions for the Last 2,000 Years" gives a good account of these issues. [Government of United States of America]
SPM-150	SPM	3	6	3	6	Paleoclimate archives have been analysed for the warmest trends in the Northern Hemisphere region have been provided. The word "likely" may not be of relevance. [Government of India]
SPM-151	SPM	3	7	3	7	The reference to 2.4 is not necessary. All information in the conclusion is in the 5.3 [Government of Netherlands]
SPM-152	SPM	3	10	3	17	Provide an explanation for the value of the temperature anomaly shown in Figure SPM.1 in the last 15 years that seems to show a less increasing trend than in the previous decades. [Government of Switzerland]
SPM-153	SPM	3	10	3	22	Figure 1 (a) shows Global Surface Temperature series from 1850-2012 and does not show the series for surface ocean temperature increase. The graph shows values for the period 1850- 2012 as anomaly relative to 1961-1990 whereas in the line 20 it is said that is over the period 1901-2012. There is no information if the increase refers to that anomaly relative to 1961-1990 or not. It is important to have the similar figure for 1 (a) for the Global Ocean Temperature (pg SPM-4 Line 30 says ocean warming dominates the change in energy stored in the climate system). [Government of Brazil]
SPM-154	SPM	3	11	3	14	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-155	SPM	3	12	3	12	All acronyms should be defined. In particular, please define MLOST, which is particularly unusual. [Government of Belgium]
SPM-156	SPM	3	12	3	12	HadCRUT4,MLOST and GISS are not defined anywhere for the reader to understand what they mean [Government of Kenya]
SPM-157	SPM	3	12	3	12	Figure caption SPM.1: HadCRUT, MLOST and GISS should be explained in the SPM. [Government of Switzerland]
SPM-158	SPM	3	12	3	12	Inconsistency: in the figure in Chapter 2 the 'MLOST' series is shown as 'NCDC MLOST'. [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-159	SPM	3	12			Figure SPM.1. This is a useful figure, but suggest "yellow" is changed to "orange" in the caption to match the colour that is used in the figure. [Government of New Zealand]
SPM-160	SPM	3	14	3	14	"change from 1901-2012" is ambiguous: it could be understood as a change wrt the mean of 1901-2012. Please use "change from 1901 to 2012" [Government of Belgium]
SPM-161	SPM	3	14	3	14	The word "2012derived" should be revised to "2012 derived". [Government of Japan]
SPM-162	SPM	3	14	3	14	Include space in "1901-2012derived" [Government of Netherlands]
SPM-163	SPM	3	14	3	15	Figure SPM.1, panel (b). The figure heading/legend refers to "change"/"trend over period". This may be confusing. Unless compelling reasons for using both terms, it might be clearer to opt for one of expressions. [Government of Sweden]
SPM-164	SPM	3	16			SPM3 SPM.1 Line 16 20% data availability needs more clarity. Does this mean 20% of all monthly, seasonal or annual values. What does this imply for ocean grid cells that are based on transient ship obs? [Government of United States of America]
SPM-165	SPM	3	20	3	20	Does "land and ocean surface temperature" mean "air temperature over land and ocean surface"? If so, at what height? If not, define it? [Government of United States of America]
SPM-166	SPM	3	20	3	21	In the footnote, the sentence "The upper endpoint of the uncertainty interval has a 95% likelihood of exceeding the value that is being estimated and the lower endpoint has a 95% likelihood of being less than that value" is awkward and may very easily be misinterpreted. The footnote aims at explaining the fundamental idea of a confidence interval which is commendable. However, using the specific example of the bulleted point (line 20-21), the "value that is being estimated" and "that value" is unclear and may very easily be interpreted as 0.89 [°C/decade]. And, of course, 1.08>0.89 with 100% likelihood, and 0.69<0.89 with 100% likelihood. It would be much clearer, and more in line with the statistical terminology to explain the concept in terms of the interval required around the best estimate required to reach 90 % likelihood to cover the real/true value of the variable that is being estimated (95% likelihood of no exceedance in either direction). [Government of Sweden]
SPM-167	SPM	3	20	3	21	Why is there no evidence/likelihood/confidence associated with this statement? [Government of United States of America]
SPM-168	SPM	3	20	3	22	One of the most important considerations for policymakers is how global surface temperatures are tracking towards the UNFCCC agreed 2 degree goal. This goal is based on temperature rise from pre-industrial temperatures, therefore this statement would benefit from an indication of temperature rise since pre-industrial times, with clarification on what time period 'pre-industrial' refers to. ie has the world warmed by .89C since pre-industrial or by .89+x? [Government of Australia]
SPM-169	SPM	3	20	3	22	We would like to see a statement added here about Arctic warming. Figure SPM.1 has most of the Arctic in white (no trend assessed because of data limitations). The SPM is missing an opportunity here to reinforce the message that the Arctic is warming about twice as fast as the rest of the world. [Government of Canada]
SPM-170	SPM	3	20	3	22	Indication of broad regional or continental trends will be useful [Government of India]
SPM-171	SPM	3	20	3	22	We suggest a small simplification for better readability: "The globally averaged combined land and ocean surface temperatures have increased by 0.89 [0.69 to 1.08] °C³ ...". We think the term "almost the entire globe" is raising questions, and we would like to replace it by: "Over this period, x% of the surface of the earth has experienced warming. [Government of Netherlands]
SPM-172	SPM	3	20	3	22	This paragraph starts with "globally averaged" and then states "almost the entire globe"...does this mean that an average was constructed leaving some parts of the globe out, or does it refer to the warming experienced by individual points in space/regions/areas? Please clarify/rephrase. [Government of United States of America]
SPM-173	SPM	3	20	3	27	Consider also whether this summary should reflect examples of areas where observed trends/rates in temperature are higher than average, for example in the Arctic. [Government of Norway]
SPM-174	SPM	3	20	3	27	It should mention which kind of trend is here, linear or what? [Government of Vietnam]
SPM-175	SPM	3	20	6	13	Users need more details on observed changes in regional scales [Government of Vietnam]
SPM-176	SPM	3	21	3	21	Footnote 3: Does this mean a likelihood of very likely (90-100% chance) that the result is within the given range? As footnote 3 applies to the full WGI contribution, the information should be added that for model results the ranges given are based on the 5-95 percentiles (90% range) of the results (model spread), but that the associated uncertainty is only 66-100% (i.e. a likely chance). Please add this information at an appropriate place in the SPM. [Government of Germany]
SPM-177	SPM	3	21	3	21	Footnote 3: The sentence on the meaning of the upper endpoint and the lower endpoint is twisted. Either upper and lower endpoint have to be swapped, or it should be 5% instead of 95 % at the two occurrences. [Government of Germany]
SPM-178	SPM	3	21	3	21	[0.69 to 1.08] The footnote explaining the range is easily overlooked. [Government of Netherlands]

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SPM-179	SPM	3	21	3	22	Why using 1901-2012? What is the particular significance of this period? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-180	SPM	3	22	3	22	Please consider adding the change from the pre-industrial to the reference period used in this report, as it is very policy relevant and would reduce the need for reading footnote 10 to find this important information. [Government of Belgium]
SPM-181	SPM	3	24	3	24	please write besides instead of despite. (There is no contradiction between the two statements.) [Government of Hungary]
SPM-182	SPM	3	24	3	24	Replace "despite the" by "in addition to". [Government of Switzerland]
SPM-183	SPM	3	24	3	25	Three timescales (trend, decadal, multidecadal) are mentioned in the first sentence. A policy maker would have a hard time following this idea. Perhaps, the following wording can be used: Global mean surface temperature trends coexist with decadal and multidecadal variability, e.g., see the multidecadal warming since 1901 in Figure SPM 1. [Government of United States of America]
SPM-184	SPM	3	24	3	27	Can this contain a forward reference to the section on the recent slowing of the temperature trend that interprets these measurements? For a policy maker it is important to provide some interpretation of this change in the rate of warming (see also comment above). [European Union]
SPM-185	SPM	3	24	3	27	Can you present the temperature trends during 2000 to 2010 or for the period beyond 2005, to highlight the observed slowing down of warming in the recent past. [Government of India]
SPM-186	SPM	3	24	3	27	Start para with "Robust multi decadal warming has been observed" remove "despite". [Government of Ireland]
SPM-187	SPM	3	24	3	27	The difference in trend between 1951-2012 and 1998-2012 is not clearly visible in the lower panel of figure SPM.1. This requires an explanation. And it is recommended to add trend-lines for these two time slices in the top panel of fig SPM.1 [Government of Netherlands]
SPM-188	SPM	3	24	3	27	It would help the reader if the recent warming trends were put into the context of trends over other decades. [Government of Switzerland]
SPM-189	SPM	3	24	3	27	These sentences need to be modified since they can be easily mis-interpreted. The authors could be observing just an inflection period in the natural cycle in recent years. Underlining the comparison of the two slopes (1998 to 2012) vs (1951-2012) is probably misleading, especially since a 15 year period does not really capture climate scale trends. When the number of years of observations is so short, the linear trend can be dependent on the values at the ends and the period selected. Also the ranges overlap so really, the two slopes are not even significantly different. That "smaller" has what level of confidence? [Government of United States of America]
SPM-190	SPM	3	25	3	25	between "SPM1)" and "The rate of" please write an additional sentence: Within this long-term warming, one can distinguish a rapidly warming period in ca. 1911-1940, a slightly cooling one in 1940-1970 and the even faster warming since ca. 1970. This sentence would improve the coincidence between the observed facts (Figure SPM1 a. and b.) and the written statements. [Government of Hungary]
SPM-191	SPM	3	25	3	26	The period of 1998-2012 is too short for climate assessment. These kinds of conclusion should be leaved from the SPM, because they are not reliable. [Government of Hungary]
SPM-192	SPM	3	25	3	26	"The rate of warming over the past 15 years (1998–2012; 25 0.05 [–0.05 to +0.15] °C per decade)" is qualitatively correct, the mean value of 0.5°C seems lower than what could be obtained from the value as shown from the data in line 19 of page 34 (section 2.4.3 WG 1AR5_SOD_Ch02_all_final.pdf. The upper range of 0.15°C does not appear to be compatible with that report. [Government of India]
SPM-193	SPM	3	25	3	26	Is there a specific reason for taking a 15-year average? [Government of Japan]
SPM-194	SPM	3	25	3	26	Replace "than the trend since 1951 (1951-2012) for: "than over the past 61 years (1951-2012)". [Government of Panama]
SPM-195	SPM	3	25	3	26	What is the difference between "rate" and "trend"? Do they have the same meaning? [Government of United States of America]
SPM-196	SPM	3	25	3	26	Does the sentence "The rate of warming over the past 15 years (1998-2012; 0.05 [–0.05 to +0.15] °C per decade) is smaller than the trend since 1951 (1951-2012; 0.12 [0.08 to 0.14] °C per decade)" is to hint to policy makers that there is a deceleration in the warming? If yes, just say so? If no, why not? This is an example of providing a bunch of numbers, then leave them up in the air without a concrete conclusion. As a summary for policy makers to readily and clearly understand each bottom line conclusion, authors need to spell out the conclusion clearly rather than throwing out some numbers and expect policy makers to figure it out without having all the caveats in those numbers. As the way it is written, it may set itself up for misleading conclusions. [Government of United States of America]
SPM-197	SPM	3	25	3	27	We object to the use of 1998, a particularly warm year for EL Nino reasons, as a starting date for any statistics. This kind of cherry-picking was not done in earlier IPCC reports. [Government of Belgium]
SPM-198	SPM	3	25	3	27	A 15 years period of observation is not sufficient to give a qualified analysis of the global mean surface temperature trend in an assessment of climate change. For a qualified analysis a 20-30 years period of global mean surface temperature would be necessary (30 years according to WMO's definition of climate). Therefore, this statement on the decreased warming trend of the last 15 years should be deleted.

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						If authors cannot agree, we urgently recommend putting the statement into context as in the TS P5 which states: "The rate of warming over the past 15 years..." standing alone, does not reflect the text of TS.2.2.1 p.5, stating "Despite the robust multi-decadal timescale warming, there exists substantial interannual to decadal variability in the rate of warming, with several periods exhibiting weaker trends. Although the trend uncertainty is large for short records, the rate of warming over the past 15 years (1998–2012; 0.05°C per decade [–0.05 to +0.15]) is smaller than the trend since 1951 (1951–2012; 0.12°C per decade [0.08 to 0.14])." The text highlighted in <i>italic</i> should be added to the statement, to clarify that the current temperature evolution is consistent with the general warming trend. [Government of Germany]
SPM-199	SPM	3	25			Picking a specific year for such a short trend is very precarious. For example, there is no observed trend since 2000. The recent trend short-term trend would be better described by framing the average trend over a span of starting years, and then providing some idea of the variability across those starting years. Something like, "over the short time period from 1998 through 2002 linear temperature trends vary from x to y degrees C per decade." [Government of United States of America]
SPM-200	SPM	3	27			Add ", although they agree well within the uncertainty ranges." [Government of Netherlands]
SPM-201	SPM	3	27			There is a curious mix-up here between the actual measured trend (which has uncertainty only from measurement errors) and the underlying trend for which the observed trend is an estimate. The central value refers to the first one, the range to the second one. [Government of Netherlands]
SPM-202	SPM	3	28	3	28	In view of the fact that the effects of urban heat island to global warming are of public concern, it is suggested that based on the underlying report (FD) (Chapter 2 – ES, Line 1-2 Para 5 Page 4), the following be added to the SPM (Line 28 Page 3): "It is unlikely that any uncorrected urban heat-island effects and land use change effects have raised the estimated centennial globally averaged LSAT trends by more than 10% of the reported trend." [Government of China]
SPM-203	SPM	3	29	3	29	Is "Continental-scale" meant to imply "land only"? Please clarify [Government of United States of America]
SPM-204	SPM	3	29	3	29	Insert 'from palaeoclimate data (for example, tree rings and)' after 'temperature reconstructions' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-205	SPM	3	29	3	30	It says: "Continental-scale surface temperature reconstructions show, with high confidence, multi-decadal intervals during the Medieval Climate Anomaly (950~1250) that were in some regions as warm as in the late 20th century." Contrast this SPM statement with this one from Ch 5 Exec Summary. Ch 5: page 5-5. "Continental-scale surface temperature reconstructions show, with high confidence, multidecadal intervals during the Medieval Climate Anomaly (950 to 1250) that were in some regions as warm as in the mid-20th century and in others as warm as in the late 20th century." These statements should be identical to avoid criticism. [Government of United States of America]
SPM-206	SPM	3	29	3	32	This finding could be removed from the SPM, since the information is not critical to the storyline for policymakers. [Government of Canada]
SPM-207	SPM	3	29	3	32	A short clear statement on the MCA and current warming is needed [Government of Ireland]
SPM-208	SPM	3	29	3	32	What caused multi-decadal intervals during the Medieval Climate Anomaly that were in some regions as warm as in the late 20th century could have significant implications for policy makers, because it might raise questions concerning whether there is any possibility of attributing the observed 20th century warming to the similar causes in a scientifically sound manner. To address above questions, the latest understanding on the cause for the occurrence of those warm decades should be given here. [Government of Japan]
SPM-209	SPM	3	29	3	32	There is no reference found of this statement in the main text. It is found in de executive summary of Chapter 5 and in the TS, but not in the refered chapter section. In contrast, the main text reads (page 5-25, section 5.3.5.1): "...published reconstructions and their uncertainty estimates indicate, with high confidence, that the mean NH temperature of the last 30 or 50 years very likely exceeded any previous 30- or 50-year mean during the past 800 years". This is actually the opposite conclusion than given here. [Government of Netherlands]
SPM-210	SPM	3	29	3	32	replace 'across seasons and regions' by 'across regions'. (Almost all observational evidence is from tree ring records but which only inform about temperature during the growing season.) [Government of Netherlands]
SPM-211	SPM	3	29	3	32	"Continental-scale surface temperature reconstructions show, with high confidence, multi-decadal intervals during the Medieval Climate Anomaly (950-1250) that were in some regions as warm as in the late 20th century. These intervals did not occur as coherently across seasons and regions as the warming in the late 20th century (high confidence). {5.3.5, 5.5.1}". Suggest removing "seasons and" from the above. The use of (high confidence) in this interval is also inconsistent with its use elsewhere in the SPM. 1. Almost all continental-scale reconstructions depend on tree rings records but which generally only inform about temperature during the summer growing season. 2. The models fail to reproduce the structure of the climate anomalies observed at this time when using estimated forcing, indicating that our theoretical basis for inferring changes in seasonality is also weak.

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						3. A full account of the uncertainty is often particularly difficult in paleoclimate studies because a model of the physical meaning of the observations is generally required. The following quote from the IPCC guidance provided by Mastandra et al. (2010) is particularly relevant when considering paleoclimate results: "Consider all plausible sources of uncertainty. Experts tend to underestimate structural uncertainty arising from incomplete understanding of or competing conceptual frameworks for relevant systems and processes. Consider previous estimates of ranges, distributions, or other measures of uncertainty, their evolution, and the extent to which they cover all plausible sources of uncertainty." [Government of United States of America]
SPM-212	SPM	3	29			Continental-scale surface temperature reconstructions unclear whether this is land-only or land and sea (note that Tglobal is dominated by sea) [Government of Netherlands]
SPM-213	SPM	3	30	3	30	Please consider to including "year" before 950-1250 in the brackets. [Government of Norway]
SPM-214	SPM	3	31	3	31	Please consider adding "but the same cannot be said for the global scale" after "...were in some regions as warm as in the late 20th century", to decrease the risk of misinterpretation. [Government of Belgium]
SPM-215	SPM	3	31	3	32	"as coherently" does not appear fully clear - please try another wording, e.g. "consistently" or "systematically". Clarify that the late 20th century not only had a "coherent climate change", but actually showed a consistent warming over almost all regions, which is less evident for the medieval warm period. In addition, please check the statement: do we have sufficient knowledge of the seasonality of changes during the medieval anomaly to affirm that it was "as coherent" across regions and seasons - paying attention to the reduced data availability before ~1200 (as compared to the LIA, for which regional/seasonal statements are possibly easier to provide) ? [Government of Belgium]
SPM-216	SPM	3	31	3	32	The content of this sentence may be very important for the understanding of the difference between warming in the medieval warm-period and the recent warming. However, the way it is written it may not be understood by non-climate-scientists, as the contrast to the current warming is not clear enough. We suggest starting the sentence with "In contrast to the recent observed warming, ..." [Government of Germany]
SPM-217	SPM	3	31	3	32	Does this mean that warming intervals during the medieval climate anomaly were shorter? Did they show shorter periods of increase? This needs to be explicit as it is currently unclear. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-218	SPM	3	32			The meaning of high confidence is very different across disciplines. For example, in discussing sea ice: "The average decrease in decadal mean extent of Arctic sea ice has been most rapid in summer and autumn (high confidence), but the extent has decreased in every season, and in every successive decade since 1979 (high confidence)." [Government of Netherlands]
SPM-219	SPM	3	34	3	34	Please specify the enddate for the warming and cooling mentioned. [Government of Belgium]
SPM-220	SPM	3	34	3	36	The second sentence here (about rate of change and the vertical structure of atmospheric warming in the troposphere and stratosphere) is a technical detail that is not necessary for policymakers to know about, especially given that the statements are given with medium and low confidence. Suggest that this sentence be deleted. Also, suggest instead that this space be used to explain to policymakers why the pattern of tropospheric warming and stratospheric cooling (sentence one) is consistent with expectations from an enhanced greenhouse effect. [Government of Canada]
SPM-221	SPM	3	34	3	36	Some additional information about the reasons and implications of the cooling stratosphere would be useful here. [Government of Canada]
SPM-222	SPM	3	34	3	36	Statement lacks meaning for policy makers: explain that temperature profile of the atmosphere is as expected from science. [Government of Ireland]
SPM-223	SPM	3	34	3	36	We guess that many readers will not know the terms troposphere and stratosphere. We think it would help to specify the height: "It is virtually certain that globally the troposphere (upto 18 km in the tropics and 6 km over the poles) has warmed and the overlying stratosphere has cooled since the mid-century. [Government of Netherlands]
SPM-224	SPM	3	34	3	36	The phrase "virtually certain" seems inconsistent with the "medium" and "low confidence" that is used in the same sentence. [Government of Netherlands]
SPM-225	SPM	3	34	3	36	The lower stratosphere has cooled due to ozone depletion, the role of GHGs is at most marginal. Suggestion:"and the upper stratosphere has (likely/very likely etc?) cooled due to increase in CO2" or leave out the stratospheric cooling at all [Government of Netherlands]
SPM-226	SPM	3	34	3	36	It is not clear what this paragraph tells the policy maker. It assumes background and technical knowledge and needs clarifying and expanding. It would benefit from an explanation of why these observations are considered important i.e. these temperature changes are considered evidence of global warming due to increased atmospheric greenhouse gas concentrations. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-227	SPM	3	35	3	35	Significance of 'vertical structure' may be included in the sentence for better appreciation [Government of India]
SPM-228	SPM	3	35	3	36	The sentence should be made easier to understand. Please explain the expression "extra-tropical troposphere". If the message is that the warming/cooling is virtually certain but there is medium confidence to the rates of the warming/cooling the whole paragraph could be more clear if this sentence starts with "However, the rates of

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						the warming and cooling.....". Furthermore the words "and their vertical structure" is confusing since the sign of the changes in troposphere and stratosphere is opposite. Probably the best way would be to delete "and their vertical structure". [Government of Norway]
SPM-229	SPM	3	35	3	36	Suggest authors re-word this sentence for clarity. First, it is not clear what "medium confidence in the rate of change" means. Second, regarding "its" vertical structure, it is not entirely clear what "its" is referring to. [Government of United States of America]
SPM-230	SPM	3	36	3	36	Is the 'low confidence' because of data limitations? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-231	SPM	3	38	2	40	What is meant by "mixed" referring to long-term precipitation trends? If some of the trends are statistically significant please so indicate. Perhaps the significant/non-significant trends can be identified for specific geographic regions? [Government of Canada]
SPM-232	SPM	3	38	3	38	Please specify the enddate for the precipitation change mentioned. [Government of Belgium]
SPM-233	SPM	3	38	3	38	Replace 'of data insufficiency' by 'data is sparse' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-234	SPM	3	38	3	39	The term "insufficiency" is misleading. Please present the current lack of data in a more neutral way as follows: "Based on the currently available data, confidence in precipitation change averaged over global land areas since 1901 is low prior to 1950 and medium afterwards. The available records show mixed and non-..." [Government of Germany]
SPM-235	SPM	3	38	3	39	The word "incomplete" would seem to be ill-chosen. All data series are more or less incomplete. Here, the qualifier of "data insufficiency" in the previous sentence would be a better choice of word. [Government of Sweden]
SPM-236	SPM	3	38	3	42	The section on oceans discusses evaporation. For consistency and comprehensiveness, this section could include consideration for atmospheric moisture, on the basis of FAQ 3.3. and the conclusion of section 2.5.5. [Government of Belgium]
SPM-237	SPM	3	38	3	42	Is global precipitation change a meaningful metric? Start with robust regional high confidence. [Government of Ireland]
SPM-238	SPM	3	38	3	42	The last sentence of this bullet stating medium/high confidence in NH ppt patterns could be read to be inconsistent with the first sentence stating that ppt trends have low/medium confidence globally. Thought might be given to starting this bullet with the latter sentence and then prefacing the global sentence with the fact that "Because of data insufficiency IN THE SOUTHERN HEMISPHERE,..." [Government of United States of America]
SPM-239	SPM	3	38	3	42	It would be really helpful to include a diagram showing global precipitation changes, with commentary on the main features. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-240	SPM	3	39	3	39	1901' should be '1900' according to the Chapter Executive Summary Text [Government of Argentina]
SPM-241	SPM	3	40	3	42	The term "precipitation" should be replaced by "mean annual precipitation" to be more precise. (or whatever season is meant therein) [Government of Austria]
SPM-242	SPM	3	40	3	42	It is not clear why only the NH midlatitudes are highlighted and not other regions. [Government of Netherlands]
SPM-243	SPM	3	44	3	44	What are "changes in ... events"? What is meant here: their nature? frequency? intensity? [Government of Belgium]
SPM-244	SPM	3	44	3	49	Because of the high interest and importance of extreme events like droughts and floods we recommend to add findings about these elements (as written in TS-15): For floods: "With high confidence, past floods larger than recorded since the 20th century occurred during the past five centuries in northern and central Europe, the western Mediterranean region, and eastern Asia." Please add a row providing information on floods in Table SPM.1. [Government of Germany]
SPM-245	SPM	3	44	3	49	Any linkage between GHG emissions and monsoon or rainfall extremes of the recent decades? [Government of India]
SPM-246	SPM	3	44	3	49	It should include definition of weather and climate extreme events, such as cold day, cold night, heat waves, drought...In fact, the definition of weather and climate extreme events are different across climatic regions [Government of Vietnam]
SPM-247	SPM	3	45	3	46	Suggest including a definition of "cold days/nights" (a footnote would be appropriate) in order for the SPM to be a stand alone document. Similarly "warm days/nights" should also be defined [Government of Canada]
SPM-248	SPM	3	45	3	46	Please consider defining/explaining what are "warm days" and "cold days" in a footnote as those terms likely mean different things depending on the climate in which the readers live. [Government of Norway]
SPM-249	SPM	3	45	3	48	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: On heat waves, the underlying text in Ch 2 S. P 5 is more specific: "There is only medium confidence that the length and frequency of warm spells, including heat waves, has increased since the middle of the 20th century mostly due to lack of data or studies in Africa and South America. However, it is likely that heat wave frequency has increased during this period in large parts of Europe, Asia and Australia. [2.6.1]" The current text in the SPM "In some regions, it is likely that the frequency of heat waves has increased." does not correctly reflect this finding when it only mentions "some

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						regions" without telling that there is a lack of data. We suggest the following text: "In regions with sufficient data that the frequency of heat waves has likely increased." [Government of Germany]
SPM-250	SPM	3	46	3	46	what about duration of heat waves ? [Government of Islamic Republic of Iran]
SPM-251	SPM	3	46	3	46	This line talks about the frequency of heat waves, but can anything be said about the (temporal) duration, (spatial) extent, intensity, etc.? [Government of United States of America]
SPM-252	SPM	3	46	3	47	Instead of "in some regions", please be more precise as in the TS-15 in the first paragraph: "in large parts of Europe, Asia, Australia" [Government of Germany]
SPM-253	SPM	3	46	3	48	In some regions, how useful is a statement like this? One could even omit this conclusion and refer to Table SPM.1. This also refers to other extreme event conclusions which already appear in the Table SPM.1. [Government of Netherlands]
SPM-254	SPM	3	46			Suggest specifying which regions are being referred to here. [Government of Canada]
SPM-255	SPM	3	47	3	49	1) There is no differentiation made between summer and winter half years when discussing "heavy precipitation", although heavy precipitation is very different between the seasons, not only in terms of magnitude but also in terms of the underlying processes and hence scales. 2) The term "heavy precipitation" is very unclear at this point. 3) There is no differentiation made between different types of heavy precipitation (like large scale or storm-related), although the level of confidence and uncertainty is very contrary between both. [Government of Austria]
SPM-256	SPM	3	47			SPM-3 line 47: It is not clear whether this refers to statistically significant increases or simply differences in the sign of the trend. [Government of United States of America]
SPM-257	SPM	3	48	3	48	confidence' and 'highest' should be in italics [Government of Argentina]
SPM-258	SPM	3	48	3	48	It is regarding regional trends whereas the reference is only made to North America. A comparison with others would be useful. [Government of India]
SPM-259	SPM	3	48	3	49	Would it be possible to add a mention of the regions where the trends towards heavier precipitation events were only "likely" (and not only "very likely", which only shows North America as mentioned here?) [Government of Belgium]
SPM-260	SPM	3	48	3	49	There is some inconsistency in referring to changes in heavy precipitation over North America. Here trends towards heavier precipitation events are considered very likely for North America, implying all/most of North America. In Table SPM.1, a similar statement is given but only for central North America (and it is not clear whether this includes southern Canada). In Ch. 2, FAQ 2.2 Fig 2, heavy precipitation is shown to have very likely increased for Eastern and Central North America, but the accompanying picture shows only southern North America with almost all of Canada excluded. This will be confusing for Canadian readers. Please try to clarify the region over which this statement is true. [Government of Canada]
SPM-261	SPM	3	48	3	49	The word 'highest' used in this sentence only shows a result of relative judgment and is not a word of the calibrated language (ref. footnote 1), but readers may misunderstand this word as one of the calibrated language. In addition, according to the Table 2.13 'very likely' increasing trend is found only in 'central North America', not in entire 'North America'. Calibrated language should be employed and the region name should be corrected. For example, 'Regional trends vary but the trend towards heavier precipitation events is found in central North America (very likely increase and high confidence).'
SPM-262	SPM	3	48	3	49	add a high (and low) latitude limit to regional trend in North America. Does it include Canada/Alaska? [Government of Netherlands]
SPM-263	SPM	3	48	3	49	It is stated that it is very likely that In North America the trends lean towards heavier precipitation. In the main text this applies to central North America and not North America. For the whole of North America the likelihood likely should be used. [Government of Netherlands]
SPM-264	SPM	3	48	3	49	How about other regions in addition to North America? Africa? Europe? [Government of United States of America]
SPM-265	SPM	3	49	3	49	On "very likely trends towards heavier precipitation events": Since the last sentence focuses on the frequency of events, it is not clear, whether this refers to the frequency of events or the intensity. Please write "very likely trends towards more intense and more frequent precipitation events." [Government of Germany]
SPM-266	SPM	3				Footnote 3: It would be clearer for the layman to write that the likelihood that the actual value is above the upper endpoint is 5%, while the likelihood that the actual value is below the lower endpoint is also 5%. Or use a similar formulation from the AR4. [Government of Belgium]
SPM-267	SPM	3				The SPM of WGI AR4 has provided information on emissions and resulting concentrations of greenhouse gases and aerosols in the context of drivers of climate change (see e.g. Figure SPM.1 of WGI AR4). While there is some quantification of emissions scattered across the SPM AR5, there is neither a systematic paragraph nor a figure stating that emissions and hence concentration are still increasing. At least the first paragraph in the section on atmospheric composition trends between 2005 and 2011 from the Executive Summary of Ch 2 P 3 starting with "It is certain that atmospheric burdens of the well-mixed greenhouse gases targeted by the

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						Kyoto Protocol increased..." should be added to the section on "Observed Changes in the Climate System" / "Atmosphere" on P 3 of the SPM of WGI AR5. [Government of Germany]
SPM-268	SPM	3				Missing statement on the (level of confidence in the) height dependence of the temperature trends in the troposphere and stratosphere, especially around the (tropical) tropopause which is most relevant for the global energy budget. [Government of Netherlands]
SPM-269	SPM	3				Missing statement on (lower) stratospheric ozone layer depletion and recovery affecting the general circulation in (upper) troposphere, mostly in the SH as confirmed to be important by e.g. comparing the CMIP3 and CMIP5 intercomparisons, (Son et al.) [Government of Netherlands]
SPM-270	SPM	3				Missing statement on unknown (regional) cirrus changes by lack of long-term observations, in combination with the established poor performance of CMIP-5 models for water vapour/cirrus around the (tropical) tropopause (Jiang et al., JGR, 2012). [likely in some part related to insufficient (vertical) resolution in most CMIP-5 models] [Government of Netherlands]
SPM-271	SPM	4	1	4	6	Table SPM 1: We would strongly recommend to split this Table into two. The first part is correct here with the past trends. The second part would contain the projections in the much later parts of the SPM. (It is also early to show the predictions of the extremes before showing those for the means. The table is very difficult to display in its present form, too.) [Government of Hungary]
SPM-272	SPM	4	1	4	9	Mass losses do not match those presented in the Review article by Hanna et al. 2013, Nature 498, p. 51-59. See their Figure 1. This is especially true for AIS. [Government of Netherlands]
SPM-273	SPM	4	1			Table SPM.1: Change "extreme high sea level" to "extremely high sea level". [Government of Netherlands]
SPM-274	SPM	4	2	4	6	The twenty-year future and reference periods are too short for drawing conclusions based on climate projections. Some explanation is supposed to be included in the text, on the one hand, to explain the reason for using them, and on the other hand, to give some information about its limitations. [Government of Hungary]
SPM-275	SPM	4	4	4	4	"SREX" and "AR4" should be fully spelled as they first appear to be followed by brackets showing these acronyms. [Government of Japan]
SPM-276	SPM	4	6	4	6	This is the first use of the acronym "RCP": please provide a reference to Box SPM.1 [Government of Belgium]
SPM-277	SPM	4	6	4	6	The phrase "(See Box SPM.1.)" should be added to indicate the reference for the explanation of RCP. [Government of Japan]
SPM-278	SPM	4	6			As the first mention in the SPM of RCP occurs in the caption to Table SPM.1, it need to be spelt out in full such that the text would read "...and use the new Representative Concentration Pathway (RCP) scenarios." [Government of New Zealand]
SPM-279	SPM	4	9	4	37	Please consider including a new point in this section about the deep water formation/thermohaline circulation from Chapter 3 if relevant. [Government of Norway]
SPM-280	SPM	4	9	4	37	Please consider including ocean acidification and oxygen depletion in the water column (oxygen free zones) in this section about observed changes in the ocean. This is an important observed change in the oceans and it is related to CO2 emissions. [Government of Norway]
SPM-281	SPM	4	9	4	38	There seems to be a certain disconnect if one goes from the expected changes to the observed changes. The Ocean section in "Future Global and regional Climate Change" on page 14 line 33 to 54 has two bullets out of three about AMOC, but there is no mention about the AMOC or and MOCs in the Observed Changes section (under Oceans). The Ocean Chapter 3 page 26-27 does mention that changes in SSH may indicate changes in major gyres and interior components of MOCs but does not give a level of confidence. It might be good to state in the SPM Ocean Observations that circulation changes (e.g. AMOC) are expected but the evidence record is not long enough to verify the expected change in circulation. [Government of United States of America]
SPM-282	SPM	4	9	4	38	This Ocean section in the Observed Changes focuses mostly on the surface, particularly warming. It might be just as important to note what is expected to change in terms of circulation but not observable yet (or indistinguishable from interannual variability due to the short record). There is no "smoking gun" yet to verify if the thermohaline circulation is slowing down or shifting, but once the signal can be distinguished from the noise, it will be difficult to do a quick fix. Policymakers need to be aware of this. [Government of United States of America]
SPM-283	SPM	4	9	5	36	Ocean: Suggest the bullets on carbon uptake and acidification from the 'Carbon and Other Biogeochemical Quantities' section (i.e. the last two) be incorporated into this section? This also seems like a good place to mention thermal expansion, which is also picked up later in the report. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-284	SPM	4	11	4	12	Please include quantitative results e.g. how large the warming has been. It seem from line 16 that it is approximately 0.5deg C since 1971 in the surface water. [Government of Norway]
SPM-285	SPM	4	11	4	13	This section could be part of a high-level summary section at the beginning of the chapter. Note, however, that this will require some careful drafting as a layperson/policy maker will probably not have a detailed understanding of the role of the deep ocean. Perhaps the famous analogy with a battery (capacity?) could be useful here? The statement starting at line 30 could be integrated into the higher level statement [European Union]

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SPM-286	SPM	4	11	4	13	The sentences needs to be relocated appropriately [Government of India]
SPM-287	SPM	4	11	4	13	A clearer statement of this may be possible. [Government of Ireland]
SPM-288	SPM	4	11	4	13	The notion that ocean heat content has been rising since 1870 is confusing, as it does not point at a human effect on ocean heat content. This statement needs additional explanation [Government of Netherlands]
SPM-289	SPM	4	11	4	13	The shaded statements are ment be overarching. However, The likelihood statements (likely) are not captured in the conclusions of this section [Government of Netherlands]
SPM-290	SPM	4	11	4	13	Please consider adding the changes related to acidification e.g. "The ocean has become more acid since the beginning of the industrial era". [Government of Norway]
SPM-291	SPM	4	11	4	37	An explanation of the difference between ocean warming and ocean heat content would be helpful, perhaps in a glossary, also there are other terms which also might helpfully be described. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-292	SPM	4	11			virtually certain' is not supported by the text in Chapter 3; this term does not occur in this Chapter (except in footnote 2) [Government of Netherlands]
SPM-293	SPM	4	12	4	13	The essence of this sentence comes towards the very end of sentence, please consider to rephrase to: "The deep ocean below 3000 m depth has likely warmed since the 1900s, when sufficient deep-ocean observations have become available. " [Government of Norway]
SPM-294	SPM	4	13	4	13	Given the importance of salinity to the observed climate system change, it is suggested that based on the underlying report (FD)(Chapter 3, Line 2-3 Para 4 Page 17), a conclusion on salinity be added to the SPM (Box on Ocean, Line 13 Page 4): "It is very likely that the salinity contrast between regions of high and low surface salinity has increased since the 1950s." [Government of China]
SPM-295	SPM	4	13			Why no statement on ocean between 700 and 3000m? [Government of Netherlands]
SPM-296	SPM	4	16	4	16	The word "largest" may be changed suitably [Government of India]
SPM-297	SPM	4	16	4	16	The upper 75 m of the ocean is referred to in the chapter as the upper 60 m (FAQ 3.1). [Government of Netherlands]
SPM-298	SPM	4	16	4	16	There should be uncertainty in brackets after the "0.1C per decade" [Government of United States of America]
SPM-299	SPM	4	16	4	21	Suggest that too much technical detail is being provided in this paragraph. Sentences 3, 4 and 5 could be deleted and replaced with one sentence that makes a simple statement about warming in the deeper ocean to convey to policymakers that as the ocean absorbs heat from the atmosphere, and as warm surface water is transported deeper into the ocean, we expect to see warming in deeper ocean levels as well, and observations confirm that this is occurring. The reasons for the different trends from 75 m - 2000m, from 2000-3000 m, and then below 3000m will not be understood by policymakers. [Government of Canada]
SPM-300	SPM	4	16	4	22	The last sentence starting on line 20 "Warming below 3000 m is largest near the source of deep and bottom water in the North Atlantic and the Southern Ocean" should be better drafted. [Government of Brazil]
SPM-301	SPM	4	16	4	22	Please indicate the uncertainty of these statements. [Government of Germany]
SPM-302	SPM	4	16	4	37	All those statements appear to apply to global averages. If this is only valid at the global scale, please add a word to say so. [Government of Belgium]
SPM-303	SPM	4	16			'The ocean warming is largest near the surface and exceeds 0.1C per decade'. No uncertainty quantifier here and in summary of Chapter 3, we think it is virtually certain judging from Chapter 3. So, 'It is virtually certain that the ocean warming is largest near the surface and very likely exceeds 0.1C per decade'. [Government of Netherlands]
SPM-304	SPM	4	17	4	19	Please consider removing this sentence from the SPM. Rationale: We assume that there are many areas where there previously have been large technical difficulties in observations, and which now have been improved. If this is particularly outstanding here, it could then be mentioned but then moved to the end of the bullet point list. [Government of Norway]
SPM-305	SPM	4	17	4	19	What are the consequences of this? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-306	SPM	4	18	4	18	please use corrected instead of mitigated which is a key term in climate change policy (even so often mixed with reduction of climate impacts) [Government of Hungary]
SPM-307	SPM	4	19	4	19	That warming extends down to 2000 m is inconsistent with the text on p4 13, where it is stated that warming below 3000 m is likely. Check consistency. [Government of Norway]
SPM-308	SPM	4	19	4	19	After 1980s, the authors should add "on a global average". [Government of United States of America]

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SPM-309	SPM	4	19	4	19	Why is 2005 the most recent date we have evidence for? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-310	SPM	4	19	4	20	The period of 1992-2005 is too short for climate assessment. These kinds of conclusion should be leaved from the SPM, because they are not reliable. [Government of Hungary]
SPM-311	SPM	4	19	4	20	In the chapter text the likelihood likely is applied in the same statement, which is omitted here. [Government of Netherlands]
SPM-312	SPM	4	20	4	21	Please provide the period for which the "warming below 3000 m" refers to. (1992-2005?) [Government of Sweden]
SPM-313	SPM	4	20	4	21	This sentence is unclear. It should be rewritten. [Government of United States of America]
SPM-314	SPM	4	20	4	22	It is not evident what "... the sources of deep and bottom water ..." are, we suggest to replace it with "... sinks of surface water ..." (which we think is meant) or "... upwelling of bottom water ..." (which is how we read the current phrasing, but consider unlikely to be correct). [Government of Netherlands]
SPM-315	SPM	4	21	4	21	It has been provided the deep oceans below 3000m refers to North Atlantic and South Ocean, whereas in line 13, a general observation (not region specific) has been provided. It needs to be clarified to avoid confusion [Government of India]
SPM-316	SPM	4	21	4	21	in the North Atlantic and the Southern Ocean changes to in the North Atlantic and the Southern Oceans. [Government of Islamic Republic of Iran]
SPM-317	SPM	4	21			The significance of "sources of deep and bottom water" is not clear. Suggest change to "sources of deep and bottom water (ie where surface water is carried into the deep ocean)" [Government of New Zealand]
SPM-318	SPM	4	24	4	27	We miss the deep ocean when summarizing heat content changes. Add: 'Between 2000 and 3000m there is no trend from 1992-2005 (low confidence) and the trend is greater than zero between 3000m and the ocean floor between 1992-2005 (low confidence)'. [Government of Netherlands]
SPM-319	SPM	4	24	4	28	Suggest that this paragraph about ocean heat content be shortened and merged with the one above about warming. The difference between ocean warming and ocean heat content may not be understood by many readers and it is not clear why there is a need to report on these separately, nor why the depths at which observations are reported differs for temperature vs. heat content. Details such as calculating the increase in heat content "from a linear trend" are probably best left to the TS. [Government of Canada]
SPM-320	SPM	4	24	4	28	Why is 1971 taken as starting point and not 1950 as is indicated in the figure (Figure SPM.2c)? This is explained in the TS, but not in the SPM. [Government of Netherlands]
SPM-321	SPM	4	24	4	28	Heat content expressed in 1022 J gives no information to the average policy maker. Please consider to add the percentage of the increase over the last 40 years which would be more understandable. [Government of Norway]
SPM-322	SPM	4	25	4	26	We had trouble finding this statistic (17 [15 to 19] 1022J) in the underlying chapter 3. It does not appear in the Executive Summary or section 3.2. Suggest this be reviewed. [Government of Canada]
SPM-323	SPM	4	25	4	26	Consider the possibility to insert a footnote similar to footnote 4. This additional footnote would provide some kind of correspondance of the 10exp22 J with another physical unit e.g. the average W/m2 over the period. [Government of France]
SPM-324	SPM	4	25	4	26	The units are inconsistent (W in main text and J in SPM). [Government of Netherlands]
SPM-325	SPM	4	25	4	26	Give an idea of what 10^22 J is equivalent to - otherwise this number is meaningless to a policymaker. [Government of United States of America]
SPM-326	SPM	4	25	4	27	Linear trend of heat content of 17 (15-19) 10^22 J is mentioned. We cannot find this number in the Chapter. Either present in Chapter or change SPM. The chapter mentions rate of increase of 137 [120-154] TW (10^12 Watts) in 40 years (and yes, that results in 17 10^22 J). [Government of Netherlands]
SPM-327	SPM	4	26	4	26	"According to some estimates" should be re-phrased as a confidence/likelihood/evidence. [Government of United States of America]
SPM-328	SPM	4	26	4	26	After '0-700m' indicate in parenthesis which coloured lines in Fig. SPM2c this refers to. Does this figure actually show 700-2000m ocean heat content? The diagram is impossible to follow. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-329	SPM	4	26	4	27	The wording needs improvement because the period 2003-2010 is not a decade. E.g. ... than over the period 1993 to 2002. [Government of Austria]
SPM-330	SPM	4	26	4	27	Clarify final sentence [Government of Ireland]
SPM-331	SPM	4	26	4	27	Also here there is implicit emphasis on the issue of temperature slow down during the last decennium. It may be good the collect the evidence for this issue separately and focus here on the major trend patterns for the whole period, which can be made with more confidence than for specific periods. For example, the section states that three out of five estimates see a slower increase in ocean heat content whereas two see an unabated increase. Section 3.2.3 states some convergence to agreement on this fact and specify the amount of pro and contra accounts. Stating that 'some estimates' show a slower increase seems inappropriate as five accounts

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						is not all that much and three out of five comes down to 60% and thus should be specified as about as likely as not according to the guidance note. [Government of Netherlands]
SPM-332	SPM	4	26	4	28	Please make clear why only the previous decade is explicitly mentioned in comparing the trends. It is not immediately clear for the reader that it implicitly refers to the slowing down of the temperature trends. On basis of figure SPM 3c, one could also note that the previous decade stands out to a certain degree, so that any comparison will be obscure. [Government of Netherlands]
SPM-333	SPM	4	26	4	28	There should be a confidence statement associated with this. It will be compared to the previous statement about the 1970-2010 trend, which does has a confidence statement. It says the deeper ocean (700-2000m) has continued to warm unabated - but it would be useful to see numbers for the rate and or total amount of warming. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-334	SPM	4	26			Suggest deleting the phrase "According to some estimates" and replace it with the appropriate likelihood / confidence statement. [Government of Canada]
SPM-335	SPM	4	27	4	27	This line speaks to an ocean heat uptake continuing unabated - but did that uptake vary in magnitude at all? Do we know? More clarity should be given. [Government of United States of America]
SPM-336	SPM	4	27	4	28	As Figure SPM.2c does not show the result for the 700-2000 m range, the reference to the figure should be moved earlier in the sentence, after "over the previous decade". [Government of Sweden]
SPM-337	SPM	4	27			mention that it has continued to rise since 2010. [Government of Netherlands]
SPM-338	SPM	4	30	4	30	Which change of energy? Please be more specific, e.g. if it is related to the radiative forcing or global warming. [Government of Norway]
SPM-339	SPM	4	30	4	31	Suggest considering including this information about ocean warming dominating the change in energy stored in the climate system in the shaded box at the start of this section. [Government of Canada]
SPM-340	SPM	4	30	4	31	'Warming of the ocean accounts for about 93% of this change...'. We miss a qualifier, given the impact of the deep ocean on this estimate we think there is low or medium confidence (see box 3.1 figure which shows about 30% contribution of the deep ocean which is very badly sampled, also surface fluxes cannot be used according to Chapter 3). [Government of Netherlands]
SPM-341	SPM	4	30	4	31	Does this statement mean that only 7% of the warming since 1971 has remained in the atmosphere (or been transferred to land or ice)? Please clarify. [Government of United States of America]
SPM-342	SPM	4	30	4	32	Please indicate the uncertainty of these statements. [Government of Germany]
SPM-343	SPM	4	30	4	32	This is key statement and should have a higher profile. Replace "the change" with "increase". SPM should show where other 7% energy has gone? [Government of Ireland]
SPM-344	SPM	4	30	4	32	The information that 93 % of the increase in energy content in the earth climate system is stored in the ocean is very important. This information is important to make the policy makers understand that the development of the atmospheric temperature is only one indicator for global warming. The description of this as an indicator could be added here, or further above under "Atmosphere" on page 3. [Government of Norway]
SPM-345	SPM	4	30	4	32	This bullet is somewhat out of place and would be best-positioned if it were moved to line 15, so it is the first bullet under the Oceans section (beneath the shaded box). [Government of United States of America]
SPM-346	SPM	4	31	4	31	There should be uncertainty in brackets after the "93%" [Government of United States of America]
SPM-347	SPM	4	32	4	32	For clarity, it would be good to avoid using different expressions for the same thing. Instead of "shallower than 700 m", one could here refer to the "upper ocean (0-700 m)". [Government of Sweden]
SPM-348	SPM	4	32			about 64% Please give a range or a less precise number ("about two thirds"?) [Government of Netherlands]
SPM-349	SPM	4	34	4	35	What is meant by an 'enhanced pattern' is unclear: could that be written more precisely? It would also be very useful to provide a clearer, policy-relevant message: this is indirect evidence for intensification of the water cycle. The message is clearer in FAQ 3.3: "Changes in the atmosphere's water vapour content provide strong evidence that the water cycle is already responding to a warming climate. Further evidence comes from changes in the distribution of ocean salinity (...)" [Government of Belgium]
SPM-350	SPM	4	34	4	35	The conclusion "the pattern of evaporation minus precipitation over the oceans has been enhanced" is vague. It could lead to more or less salinity, but it does not say anything about overall changes. It states that there is a interrelationship, but the statement enhanced does not give additional information about salinity. [Government of Netherlands]

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SPM-351	SPM	4	34	4	35	As this section is about the ocean, the order of the sentences should be reversed, so that the paragraph starts with the "it is very likely..." [Government of Sweden]
SPM-352	SPM	4	34	4	37	The use of the phrase 'evaporation minus precipitation' is very simplistic, this could be better described as 'the difference between evaporation and precipitation'. [Government of Australia]
SPM-353	SPM	4	34	4	37	Suggest that these sentences be written in plainer language. Suggest the following: "Areas of the ocean where evaporation dominates (E>P) tend to be highly saline (salty); those where precipitation dominates tend to be fresher. This pattern has been enhanced (medium confidence). It is very likely that regions of high salinity have become more saline while regions of low salinity have become fresher." [Government of Canada]
SPM-354	SPM	4	34	4	37	The sentence may be re-written in a simplified manner [Government of India]
SPM-355	SPM	4	34	4	37	There is high confidence in assessments of trends in ocean salinity, but medium confidence that E-P is enhanced. What does that mean? Be more clear about E and P? Since it also very likely that regions of high salinity become more saline this statement is about P. So better to split the E (related to salinity) and P: 'It is virtually certain that the salinity contrast between regions of high and low salinity has increased since the 1950s and there is low confidence on trends of precipitation over the oceans.' [Government of Netherlands]
SPM-356	SPM	4	34	4	37	Please consider starting this paragraph with the second sentence which gives the most interesting findings. [Government of Norway]
SPM-357	SPM	4	34	4	37	Change the sequence of the sentences: first write "It is very likely that regions of high salinity ...", then write "These regional trends..." [Government of Switzerland]
SPM-358	SPM	4	35	4	35	Check whether it would be appropriate to add the words "and rivers runoff" after the word "precipitation" [Government of France]
SPM-359	SPM	4	35	4	35	Re. 'pattern of ocean salinity have been enhanced since the 1950s' - what is the pattern? Also, it is not clear what is meant by 'enhanced'. Could these be indicated on a map perhaps? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-360	SPM	4	37	4	37	Check whether the word "fresher" could be replaced by "less saline" [Government of France]
SPM-361	SPM	4	37	4	37	Typo: there is a reference 3.21 stated, but there is no section 3.21 in the original text [Government of Netherlands]
SPM-362	SPM	4	37	4	37	We do not see the usefulness to add section 2.5 as a reference. [Government of Netherlands]
SPM-363	SPM	4	38			The reader will expect information on ocean acidification as the section's heading is "Ocean", but it is included on P 6 L 44-46 under the heading "Carbon and Other Biogeochemical Cycles". Please move this text from P 6 to the section on "Ocean" on P 4. [Government of Germany]
SPM-364	SPM	4	40	5	46	Cryosphere: This section should include a fuller explanation of trends in seasonal changes of Arctic sea-ice extent and also recent observations of Arctic sea-ice thickness. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-365	SPM	4	40	6	13	It would help the reader to have a small table showing, in mm/year, the importance of the different contributing factors to the observed SLR. This would nicely link the cryosphere and the sea-level sections [Government of Belgium]
SPM-366	SPM	4	42	4	42	The following wording is suggested to enhance clarity: There is stronger evidence compared to AR4 that ... [Government of Austria]
SPM-367	SPM	4	42	4	42	Suggest clarifying what the "stronger evidence" is relative to (e.g., AR4?). [Government of Canada]
SPM-368	SPM	4	42	4	42	It is unclear what 'stronger' refers to. Suggest amending to e.g. 'now stronger evidence since AR4...' [if that is the intended meaning] [Government of New Zealand]
SPM-369	SPM	4	42	4	42	"stronger evidence" does not make it clear whether that evidence is "medium" or "robust", terms [Government of Panama]
SPM-370	SPM	4	42	4	42	used in IPCC Fifth Assessment Report to describe the available evidence. [Government of Panama]
SPM-371	SPM	4	42	4	42	Write: "There is stronger evidence than in AR4...". [Government of Switzerland]
SPM-372	SPM	4	42	4	42	"stronger" compared to what? [Government of United States of America]
SPM-373	SPM	4	42	4	42	Recommend inserting 'There is stronger evidence than in the AR4 that the Arctic and Antarctic ice sheets....' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-374	SPM	4	42	4	43	This sentence creates confusion: since sea ice is different from land ice, it is suggested to write this as two sentences: 'There is stronger evidence that the ice sheets and glaciers worldwide are losing mass. Sea ice cover is decreasing in the Arctic, while the Antarctic sea ice cover shows a small increase.' [Government of Belgium]
SPM-375	SPM	4	42	4	43	Consider changing to "... stronger evidence since AR4 ..." ("stronger" needs a reference) [Government of Belgium]
SPM-376	SPM	4	42	4	43	This sentence is confusing. Please consider rephrasing: "There is stronger evidence since that the ice sheets and glaciers worldwide are losing mass. Sea ice

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						cover is decreasing in the Arctic, while it shows a small increase in the Antarctic." Also please consider to include the important result of the Greenland Ice Sheet mass loss from p. 5, l. 1-3 in this shaded text part. [Government of Norway]
SPM-377	SPM	4	42	4	43	Technical summary (TSM TS4.5, 34 page) describes Antarctic sea ice cover shows a small increase but the confidence for the estimate is still low. Summary paragraph (SPM page4, line 42-43) of SPM Cryosphere, however, just simply addresses that Antarctic sea ice shows a small increase. No argument for the low significance of that estimate is provided. Given the importance of Antarctic ice cover in climate change debate, this is a rather untuned information for policy makers, which can mislead them. [Government of Republic of Korea]
SPM-378	SPM	4	42	4	43	These statements need time periods - "glaciers worldwide are losing mass [over what time period]"?, "sea ice cover is decreasing in the Arctic [over what time period]"?, "Antarctic sea ice cover shows a small increase [over what time period]"? [Government of United States of America]
SPM-379	SPM	4	42	4	44	This box uses both "stronger evidence" and "more comprehensive" which are vague given the carefully crafted uncertainty language. These phrases should be converted to likelihood/confidence/evidence framings. [Government of United States of America]
SPM-380	SPM	4	42	4	45	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-381	SPM	4	42	4	45	Suggest this shaded box begin by telling the consistent story about declining extent and volume of almost all components of the cryosphere and then add a line at the end to convey that trends in Antarctic sea ice cover have been different. [Government of Canada]
SPM-382	SPM	4	42	4	45	Suggest clarifying the sentence "There is stronger evidence that the ice sheets and glaciers worldwide are losing mass and sea ice cover is decreasing in the Arctic..." Stronger than what/when? Also, why does this box not use the standardized uncertainty terminology that is used throughout the document and in other shaded boxes? [Government of Canada]
SPM-383	SPM	4	42	4	45	The expression "stronger evidence" suggests a comparison to e.g. AR4 or another previous report, but does not specify the reference. Please insert "Since the AR4, observations show that there has been a continued net loss of ice from the cryosphere" (Sentence taken from Ch 4 P 3). Otherwise it is not clear to the reader that there is a net loss. [Government of Germany]
SPM-384	SPM	4	42	4	45	End 1st sentence at Arctic. Antarctic issues should be considered separately (perhaps in a text box which combines the features discussed in the SPM where the ice shelf and sheets are considered as a whole) [Government of Ireland]
SPM-385	SPM	4	42	4	45	It is not clear to which time periods these statements apply to. [Government of Switzerland]
SPM-386	SPM	4	42			replace 'evidence' by 'evidence than in AR4' [Government of Netherlands]
SPM-387	SPM	4	43	4	43	Does the "Antarctic sea ice cover" refer to both the extent and thickness and does it refer to the entire Antarctic? Please specify. [Government of Sweden]
SPM-388	SPM	4	43	4	43	Re.: 'cover' - please change to 'extent' in this text box to clarify that the observed increases in the Antarctic are only in surface area and not in mass and to be consistent with extent used later (e.g. on page 5). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-389	SPM	4	43	4	44	Write:"... over longer time periods than in the AR4". [Government of Switzerland]
SPM-390	SPM	4	43	5	5	Page 4 (line 43) says "Antarctic sea ice cover shows a small increase" while page 5 (line5) states: "the Antarctic Ice Sheet has lost mass during the last two decades." While it is possible that the ice cover AREA (M0L2T0) increases and the MASS (M1L0T0) decreases, it may not be obvious for policy-makers that they have different dimensions. It could be very confusing if a reader thinks they have the same dimension but with conflicting results. So, it is desirable to make it clear that the "ice cover" is area and not the same as the latter mentioned "ice sheet", which is mass. [Government of Japan]
SPM-391	SPM	4	44	4	44	Does this second sentence mean more comprehensive observations since AR4 - if so, should say so. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-392	SPM	4	45	4	45	Is it more correct here to say permafrost is "warming" rather than "thawing"? This would potentially better reflect the evidence presented in chapter 4 which shows that warming of permafrost is occurring across the circumpolar north, but that thawing is not occurring over the entire region. [Government of Canada]
SPM-393	SPM	4	45	4	45	NH snowcover is decreasing AT WHAT RATE AND OVER WHAT TIME PERIOD? And permafrost is thawing AT WHAT RATE AND OVER WHAT TIME PERIOD? [Government of United States of America]
SPM-394	SPM	4	45	4	45	"...spring snow cover is decreasing and permafrost is thawing." Over what period(s) are these occurring? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-395	SPM	4	45			Should this be referring to "extent of spring snow cover" rather than just "snow cover"? [Government of Canada]
SPM-396	SPM	4	45			re: "permafrost is thawing", can the rate and its level of certainty be specified here? [Government of Denmark]

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SPM-397	SPM	4	45			spring snow cover is decreasing summer snow cover has decreased even more significantly. [Government of Netherlands]
SPM-398	SPM	4	48	4	48	What is meant by "continued to shrink"? Does this refer to a previous report, already reporting a shrinking or does this refer to a certain time period. Please clarify. [Government of Germany]
SPM-399	SPM	4	48	4	48	For consistency, change "world-wide" to "worldwide". [Government of Netherlands]
SPM-400	SPM	4	48	4	49	The term "shrink" would seem to include both a decrease in extent/length/coverage and a decrease in mass/volume. Therefore suggest the words "and lose mass" could be deleted. Also, suggest adding to the end of the first sentence, the words "with accelerated rates recently". This will lead in to the results provided in sentence 2. [Government of Canada]
SPM-401	SPM	4	48	4	51	Suggest it would be helpful if, in addition to presenting the average rate for 1971-2009, this data could be presented in a manner that is directly comparable to the bullet points discussing the Greenland and Antarctic ice sheets (time frames 1992-2001 and 2002-2011). [Government of Canada]
SPM-402	SPM	4	48	4	51	It is stated that "There is very high confidence that glaciers have continued to shrink and lose mass world-wide, with very few exceptions." It could be useful to explain the observed regional differences as this is of general interest. Cf. summary in Chapter 4: "During the last decade, most ice was lost from glaciers in Alaska, the Canadian Arctic, the periphery of the Greenland ice sheet, the Southern Andes and the Asian Mountains. Together these regions account for more than 80% of the total ice loss". [Government of Norway]
SPM-403	SPM	4	48	4	51	The very limited comment on mountain glacier changes is concerning. Some regionality is needed to provide depth to the bald global loss figure, for example for the Hindu Kush-Karakorum-Himalaya chain (considering it's importance to a large proportion of the world's population). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-404	SPM	4	48	5	9	To communicate more policy relevant information, mass loss should be given in percentages or compared to some baseline. [Government of Norway]
SPM-405	SPM	4	48	5	9	This section's bullets on changes in glaciers and ice sheets contain large numbers that are difficult to put in context. It would be useful to have these expressed as percentages. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-406	SPM	4	49	4	49	The reasons for "excluding glaciers on the periphery of the ice sheets" should be explained in a footnote. [Government of Brazil]
SPM-407	SPM	4	49	4	49	Can a % be used instead of term "very few"? [Government of Ireland]
SPM-408	SPM	4	49	4	49	In this contexte, it may be of interest to mention that there are studies that show that glaciers started to shrink as early as 1850: Oerlemanns, J. (2005) Science 308, 675-677. Oerlemanns, J., Björnsson, H., Kuhn, M., Obleitner, F., Palsson, F., Smeets, C. J. P. P., Vugts, H. F., and De Wolde, J. (1999) Boundary-Layer Meteorology 92, 3-26. Greuell, W. and Smeets, P. (2001) J. Geophysical Res. 106, 31717-31727. Marland, G., Boden, T. A., and Andres, R. J. (2007) Global, Regional, and National CO2 Emissions. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, TN, USA, http://cdiac.ornl.gov/trends/emis/tre_glob.htm [Government of Switzerland]
SPM-409	SPM	4	49	4	51	The sentence "The rate of mass loss, excluding glaciers on the periphery of the ice sheets, was very likely 226 [91 to 361] Gt yr-1 over the period 1971-2009, and very likely 275 [140 to 410] Gt yr-1 over the period 1993-2009" seems to hint to policy makers that there is an acceleration in glacier mass loss. If this is the case, just spell out the conclusion clearly. This is another example that authors just seem to make a hint and stay short of making the conclusion clearly. Why there is a reluctance to spell it out clearly for policy makers? [Government of United States of America]
SPM-410	SPM	4	49	4	51	How does mass loss relate to total mass and could the figures for mass loss be turned into a % loss, using gtyr-1 probably won't mean a great deal to policy makers. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-411	SPM	4	49			re: "very few", it would be helpful to quantify this in % of total area or % of total count. [Government of Denmark]
SPM-412	SPM	4	50	4	50	The sentence may be considered for simplification [Government of India]
SPM-413	SPM	4	50	4	50	Why not take the whole range from 1901 (Table 4.5) and leave out the specific periods? The uncertainty range does not allow a separation between periods with any significance. It is not sure if the reader understands why the periphery is excluded. Section 4.3.1 is referenced in the TS but not in the SPM. [Government of Netherlands]
SPM-414	SPM	4	51	4	51	Footnote 4: If "sea level equivalent" means "sea level rise or sea level decrease", we would for clarity prefer to write "sea level change" in this footnote. [Government of Norway]
SPM-415	SPM	4	52	4	5	On the footnote, we suggest a small simplification for better readability: "100 Gt yr-1 of ice loss is equivalent to about 0.28 mm of sea level rise. [Government of

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						Netherlands]
SPM-416	SPM	4	52	4	52	Footnote 4 is very valuable context, but it should be clarified as to whether this amount of SLR is from ice loss alone or whether it includes the thermal expansion from the warming that caused the ice to melt in the first place. [Government of United States of America]
SPM-417	SPM	4		4		Footnote 4: Consider changing to " ... of global mean sea level rise ..." to facilitate reading by non-experts [Government of Belgium]
SPM-418	SPM	4		4		Footnote 4: To avoid ambiguity, "0.28 mm yr-1 of sea level equivalent" should be replaced by "+0.28 mm yr-1 of sea level equivalent" or "0.28 mm yr-1 of sea level rise". [Government of Japan]
SPM-419	SPM	4				footnote: replace loss by mass change or equivalent by rise! [Government of Netherlands]
SPM-420	SPM	5	1	5	3	We think it is peculiar that the statement on the sign of the change of ice volume has been assigned very high confidence, while the quantitative statement is very likely. We would suggest either to make the first statement absolute (without a confidence statement) or to assign virtually certain. [Government of Netherlands]
SPM-421	SPM	5	1	5	3	This is more than a 6-fold increase in mass loss between the two periods (215/34 = 6.3)! Please consider stating this in the sentence, to make the change more obvious to readers. [Government of Norway]
SPM-422	SPM	5	1	5	7	If it is possible, a percentage figure here would help add clarity in these two bullets. E.g., "the average rate of mass loss increased by XX% from the period of 1992-2011 to the period of 2002-2011". [Government of Canada]
SPM-423	SPM	5	1	5	9	The two chapters that are cited mainly provide detailed treatises of measurements techniques and the resulting observational data. In relation to the response time to natural climate variability if the ice sheets (or relevant parts thereof) these records are short, and a formal attribution to specific causes (anthropogenic or otherwise) of the trends are not yet possible. However, this is not discussed in any detail in the main chapters (4.4.2 - 4.4.3). Improving the main text in this respect, and summarising the essence in SPM, would strengthen these two bulleted points (and possibly prevent some criticism). [Government of Sweden]
SPM-424	SPM	5	1	5	9	These statements about trends over two decades are very problematic, particularly if those are not embedded into a larger context, e.g. a 30 year period as usually used by IPCC and WCRP when speaking of long-term trends. Therefore, it would be appropriate to state here also what we do not know, i.e., how this trends compare to potential trends in other decades and centuries. In any case, the first and the last sentences seem to contradict each other (cf. icehttp://nsidc.org/data/seaice_index/). [Government of Switzerland]
SPM-425	SPM	5	1	5	9	The numbers in the sentence "The average rate of mass loss has very likely increased from 34 [-6 to 74] Gt yr-1 over the period 1992-2001 to 215 [157 to 274] Gt yr-1 over the period 2002-2011" suggest that there is an astounding acceleration of the mass loss of Greenland ice sheet by a factor of over 6 times after just one decade. Why not say it up front rather than let it be buried in the numbers? However, these numbers are given in Gt/yr, but they are inferred from figure 4.17 in Chapter 4, which are in Sea Level Equivalent (mm/yr) that is more directly relevant to other components contributing to sea level rise and easier for policy makers to compare the contribution of Greenland ice sheet versus other components in the overall sea level rise. Thus, Sea Level Equivalent in mm/yr should be used here, or at least together with Gt/yr. Switching between measurement units is another problem making it harder for policy makers to understand the issues. This issue also applies to the discussion of Antarctic ice sheet mass loss on p. 5, lines 5-9. [Government of United States of America]
SPM-426	SPM	5	1	5	9	Again, it would be informative to the policy maker to have these figures also as a % loss. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-427	SPM	5	2	5	2	Recommend inserting 'substantially' after 'increased' The change in the numbers is dramatic. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-428	SPM	5	5	5	9	see our comments on p.5 lines 1-3. [Government of Netherlands]
SPM-429	SPM	5	6	5	8	suggest to move "during the last interglacial period 7 (129,000 to 116,000 years ago)" to after first mention of "sea level" [Government of Denmark]
SPM-430	SPM	5	7			Why are ranges here 'likely', whereas for Greenland in SPM-5 line 2 it is 'very likely'? [Government of Netherlands]
SPM-431	SPM	5	13	5	14	re: "snow cover extent", month of June that has a more clear trend. See: Derksen, C., and R. Brown (2012), Spring snow cover extent reductions in the 2008–2012 period exceeding climate model projections, Geophys. Res. Lett., 39, L19504, doi:10.1029/2012GL053387. Showing spring snowcover is like showing spring sea ice. But summer sea ice is shown. [Government of Denmark]
SPM-432	SPM	5	14	5	14	Does the "upper ocean" refer to the topmost 0-700 m? If yes, please specify as done in the main text. [Government of Sweden]
SPM-433	SPM	5	14	5	15	Figure SPM.2, legend: the explanation of panel (c) and (d) refer to "normalized to 2006-2010, and relative to the mean of all datasets for 1971" and "relative to the 1900-1950... with all datasets aligned to have...", respectively. If similar kind of normalization and alignment are used (except of the periods of course), it would be more clear to have similar expressions in both cases rather than choose different words. [Government of Sweden]
SPM-434	SPM	5	17			"of satellite altimetry" instead of "of altimetry" [Government of Denmark]

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SPM-435	SPM	5	22	5	22	"The annual mean Arctic sea ice extent" should be "The annual Arctic sea ice extent", which is the description used in Executive Summary (p.4-3) in Chapter 4. According to the body text (p.4-10 of Chapter 4), "the range of 3.5 to 4.1% per decade" is derived from "the monthly anomaly data", so the current text may lead readers to misunderstanding that the annual mean sea ice extent decreased. [Government of Japan]
SPM-436	SPM	5	22	5	23	Suggest you give the estimated total reduction in extent over this period. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-437	SPM	5	22	5	29	This bullet point should include an estimate of the total reduction (Km2) in September Arctic sea-ice extent since 1979. The maximum change has happened in September which is a key feature of Arctic change. Also. the change in ice thickness/volume needs to be noted. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-438	SPM	5	22	5	31	Suggest deleting the words "In the range of", which are used on lines 23 and 31. This type of wording is not used elsewhere in the SPM and seems imprecise. [Government of Canada]
SPM-439	SPM	5	22	5	33	SPM-5 Lines 22-33: To contrast the size of the decrease of Arctic ice versus the increase in Antarctic ice, it would be very desirable to include the area change in sq km. [Government of United States of America]
SPM-440	SPM	5	22	5	34	Those two bullet points inform about the change in Arctic and Antarctic sea ice extent in percent. Would it be possible to add figures in square km to give an impression of the size of the changes. [Government of Norway]
SPM-441	SPM	5	22	5	34	It is mentioned that in the Antarctic there are 'some regions increasing in extent and some decreasing', while for the Arctic no information on regional trends is given. If in the Arctic there would be regions with increasing extent this should also be mentioned, if all regions show decreasing trends, it would be appropriate to mention this also. This is to avoid the impression to give information on regional differences only, if an observation seems not in line with warming. [Government of Switzerland]
SPM-442	SPM	5	23	5	23	For some policy-makers, the term "multi-year sea ice" (ice frozen for more than a year) is unfamiliar, and thus the difference between the first and the second sentence might be hard to understand. [Government of Japan]
SPM-443	SPM	5	23	5	23	Is it possible to refer to "summer ice" instead of "multi-year sea ice"? [Government of Norway]
SPM-444	SPM	5	23	5	24	"The extent of multi-year sea ice very likely decreased by over 11% per decade" does not agree with the conclusion in Para 4 Page 3 Chapter 4, which calls for verification. [Government of China]
SPM-445	SPM	5	23	5	24	"The extent of multi-year sea ice very likely decreased by over 11% per decade": Should report the range of the change as highlighted in Chapter 4 Executive Summary rather than just mentioning the lower limit. [Government of United States of America]
SPM-446	SPM	5	23	5	24	To be consistent (and provide the most useful information concisely), these rates (3.5-4.1%/decade and 11%/decade) should be listed as "mean [90% uncertainty range]". [Government of United States of America]
SPM-447	SPM	5	24	5	24	Please substitute "over 11%" by "13,5%" because this the correct and precise term regarded to the decadal retreat of multi-year sea ice as it is used in the [TS p.8 (2.5.3)]. [Government of Germany]
SPM-448	SPM	5	24	5	24	In the TS and the chapter text (4.2.2), about 13.5% and 14.7% decrease for the period 1979 to 2012 is mentioned for multi-year sea ice, which is different than "over 11%" stated in the SPM. The main text does mention 11.5, but for Perennial ice extent only. [Government of Netherlands]
SPM-449	SPM	5	24	5	25	It would be helpful for policy-makers to state the actual rate of decadal change in late summer minimum extent. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-450	SPM	5	24			suggest removing the unnecessary word "over" [Government of Denmark]
SPM-451	SPM	5	24			over 11%: no upper bound? [Government of Netherlands]
SPM-452	SPM	5	25	5	25	"summer and autumn", but Figure SPM.2b only say "summer". [Government of United States of America]
SPM-453	SPM	5	25			suggest to replace ", but the" with "Sea ice" [Government of Denmark]
SPM-454	SPM	5	26	5	28	This sentence could be phrased more simply: '...the decrease in summer sea-ice extent and increase in Arctic sea surface temperatures over the last three decades are larger than in at least the last 2,000 years.' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-455	SPM	5	28	5	28	Does 'are anomalous' mean they are significantly higher? In what way is it anomalous? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-456	SPM	5	28			On line 28, suggest indicating in what way the past three decades were anomalous. [Government of Canada]
SPM-457	SPM	5	28			suggest to remove the unnecessary "the perspective of" [Government of Denmark]

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SPM-458	SPM	5	29	5	29	It would be important to provide the policy maker/reader with a point of reference in this respect, i.e., when was the last time that the Arctic Ocean had seasonal ice only, i.e., ice-free during the summer. [Government of United States of America]
SPM-459	SPM	5	31	5	31	The phrase "the annual mean Antarctic sea ice extent" should be replaced with "the annual Antarctic sea ice extent", which is the description used in Executive Summary (p.4-3) of Chapter 4. According to the body text (p.4-16 of Chapter 4), "the range of 1.2 to 1.8% per decade" is derived from "the monthly anomalies", so the current text may lead readers misunderstanding that the annual mean sea ice extent increased. [Government of Japan]
SPM-460	SPM	5	31	5	31	Please delete "in the range of" or change to "ranging from". [Government of Netherlands]
SPM-461	SPM	5	31	5	32	Is the sea ice increasing due to increased discharge from the landmass or is it really increasing. Please clarify. [Government of Sweden]
SPM-462	SPM	5	31	5	32	To be consistent (and provide the most useful information concisely), this rate (1.2-1.8%/decade) should be listed as "mean [90% uncertainty range]". [Government of United States of America]
SPM-463	SPM	5	31	5	34	The wording of this paragraph needs improvement ("at a rate of in the range", and "with some regions increasing"). In addition, a policy relevant interpretation of these facts, should be provided. For example, the paragraph may end as: "... with sea-ice extent increasing in some regions and decreasing in others, resulting in a slightly increasing total extent that cannot be robustly attributed to a cause at present but could be due to changes in regional wind speed and patterns." [Government of Belgium]
SPM-464	SPM	5	32	5	33	"There is high confidence that there are strong regional differences in this annual rate, with some regions increasing in extent and some decreasing." - We think this is a very vague statement. We think in general there is high confidence that there are strong regional differences in the rate of change of ANY climatic variable. And which regions are we referring to with "some"? Moreover, the same is probably true for Arctic sea ice extent - why is it explicitly mentioned for the Antarctic, and not for the Arctic? [Government of Netherlands]
SPM-465	SPM	5	36	5	36	We suggest deleting the word "extent" in this sentence would be more clear, as "cover" already implies the statement is about area and not some other quality. [Government of Netherlands]
SPM-466	SPM	5	36	5	38	It is not clear to which statements in the main text the confidence and likelihood statement refer to. They cannot be traced in section 4.5.2, nor can the range be found in this section. [Government of Netherlands]
SPM-467	SPM	5	36	5	40	Why are changes in northern hemisphere snow cover extent reported for March and April (when changes are modest) rather than for May and June when reductions are more extensive? This is analogous to reporting on June sea ice extent changes instead of September. Suggest that the text be revised to say the following, consistent with Ch. 4 Exec Summary: "There is very high confidence that Northern Hemisphere snow cover extent has decreased since the mid-20th century, especially in spring (see Figure SPM.2a). Averaged March and April Northern Hemisphere snow cover extent decreased 1.6 [0.8 to 2.4] % per decade over the 1967–2012 period. Since AR4, the rate of reductions in June SCE – both absolute and relative - has surpassed the rate of reduction of March-April SCE, and exceeds the observed rate of September sea ice loss." [Government of Canada]
SPM-468	SPM	5	36	5	40	Given that since the late 1960s the month of June has a clearer declining signal, why show spring snow cover? See. Derksen, C., and R. Brown (2012), Spring snow cover extent reductions in the 2008–2012 period exceeding climate model projections, Geophys. Res. Lett., 39, L19504, doi:10.1029/2012GL053387. [Government of Denmark]
SPM-469	SPM	5	36	6	40	Please move the description of Figure SPM.2a (lines 36 to 40) before line 22 (where Figure SPM.2b is described) [Government of Belgium]
SPM-470	SPM	5	37	5	38	averaged March....period. No uncertainty indicator is given; is it likely or very likely? [Government of Netherlands]
SPM-471	SPM	5	38	5	38	"1.6 [0.8 to 2.4] %" should be "1.6 [0.9 to 2.3] %", if you round off "1.59% [0.86–2.33%]" described in body text of subsection 4.5.2 (p. 4-40) to one decimal place. [Government of Japan]
SPM-472	SPM	5	38	5	38	Typo: 1967-2012 in SPM, but 1922-2012 in TS. [Government of Netherlands]
SPM-473	SPM	5	38	5	38	"snow cover extent decreased 1.6 [0.8 to 2.4] % per decade over the 1967-2012 period" refers to 4.5.2, which presents those numbers but does not say where they come from. What are the references for those numbers? Or just single one reference if any? If this is the case, there is not much of "degree of agreement". [Government of United States of America]
SPM-474	SPM	5	39	5	40	Consider rephrasing "No months showed a significant increase during this period in the Northern Hemisphere". [Government of Norway]
SPM-475	SPM	5	39	5	40	Recommend that 'did not show a statistically significant increase' be reworded to say what it DID show, e.g. a decrease, or no statistically significant trend in either direction? [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-476	SPM	5	39			statistically significant': what is the related uncertainty indicator? [Government of Netherlands]
SPM-477	SPM	5	40			grammar: use "month" instead of "months" [Government of Denmark]
SPM-478	SPM	5	42	5	46	It is unlikely that policymakers will understand the significance of the statement about cold vs. warm permafrost and it is not intuitive that colder permafrost should warm more than warm permafrost. Suggest either deleting this sentence or explaining its significance. The last sentence in this paragraph singles out the Russian European North for reporting on changes in permafrost thickness. Is this the only region where trends were found or where data were available? Why only report on the trend up to 2005? This makes these data out of date compared to trends in other cryospheric indicators. [Government of Canada]
SPM-479	SPM	5	42	5	46	Is there any quantification possible in this bullet regarding the rate of or total temperature rise in permafrost? [Government of United States of America]
SPM-480	SPM	5	42	5	46	This bullet is for permafrost from materials in Chapter 4. A lot of references for permafrost in Chapter 4 are based on gray materials such as conference presentations. Why is there such "high confidence" or even "medium confidence" highlighted in the SPM? [Government of United States of America]
SPM-481	SPM	5	44	5	44	Suggest providing more concrete detail here about "a significant reduction" in permafrost. [Government of Canada]
SPM-482	SPM	5	44	5	44	Isn't it strange to couple 'significant' with only a medium confidence? [Government of Netherlands]
SPM-483	SPM	5	44	5	45	Please quantify this reduction in permafrost thickness. Without numbers it lacks impact for policy makers. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-484	SPM	5	44	5	46	This conclusion cannot be found in the TS. [Government of Netherlands]
SPM-485	SPM	5	44	5	46	Is the Russian European North the only region where sufficient observations are to make this statement OR is it the only place to have observed a reduction in permafrost thickness and areal extent? [Government of United States of America]
SPM-486	SPM	5	45	5	45	"Russian European North" Is this a formal region? Should this be 'Northern European Russia' or some other defined region? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-487	SPM	5	51	5	52	With respect to the text:"Global mean sea level has risen by 0.19 [0.17 to 0.21] m over the period 1901–2010 estimated from a linear trend", it is important, for comparison purpose, to present also the change in sea level for the last century period: 1901-2000. [Government of Argentina]
SPM-488	SPM	5	51	5	52	There needs to be some likelihood/confidence/agreement/evidence for this SLR statement. [Government of United States of America]
SPM-489	SPM	5	51	5	56	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-490	SPM	5	51	5	56	Key message is clear and global sea level has risen by 0.19m and the increase has accelerated rest of text does not improve clarity [Government of Ireland]
SPM-491	SPM	5	51	5	56	We suggest that you rephrase this key finding by deleting the explanation about the different types of observations. Consider rephrasing "Global mean sea level has risen by 0.19 [0.17 to 0.21] m over the period 1901-2010 based on observations. It is virtually certain that the rate of global...". Please consider adding an explanation of the cause of sea level rise from Chapter 13 "Ocean thermal expansion and glacier melting have been the dominant contributors to 20th century global mean sea level rise." [Government of Norway]
SPM-492	SPM	5	51	5	56	It seems that in this paragraph it would be worthwhile mentioning that some works refute this statement over the first millennium DC, cf. e.g. "Over the last 2000 years minimum sea level (-19 to -26 cm) occurred around 1730 AD, maximum sea level (12 to 21 cm) around 1150 AD." Grinsted, A., J. C. Moore, and S. Jevrejeva (2009), Reconstructing sea level from paleo and projected temperatures 200 to 2100AD, Clim. Dyn., doi:10.1007/s00382-008-0507-2. "Sea level was stable from at least BC 100 until AD 950. Sea level then increased for 400 y at a rate of 0.6 mm/y, followed by a further period of stable, or slightly falling, sea level that persisted until the late 19th century" Kemp, A. C., Horton, B. P., Donnelly, J. P., Mann, M. E., Vermeer, M., & Rahmstorf, S. (2011). Climate related sea-level variations over the past two millennia. Proceedings of the National Academy of Sciences, 108(27), 11017-11022. [Government of Switzerland]
SPM-493	SPM	5	51	6	13	Report stated that changes in global sea level rise are not geographically even, users may expect more details on sea level rise scenarios for each particular region [Government of Vietnam]
SPM-494	SPM	5	51			'Global mean level has risen by 0.19'.... Better: It is very likely that global mean sea level(see 3-37) [Government of Netherlands]
SPM-495	SPM	5	52	5	52	Remove space in "trend , based". [Government of Netherlands]
SPM-496	SPM	5	52	5	54	Replace 'it is virtually certain that the rate of global mean sea level rise has accelerated during the last two centuries.' by 'there is X confidence that the rate of global

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						mean sea level rise has increased over the last two centuries.' (Sea level not even globally observed prior to satellite era (e.g. the Southern Ocean) Terminology: Acceleration can imply increases or decreases in rate "during the last two centuries" permits for changes in rate at any time and any sequence Disparate use of uncertainty metrics [Government of Netherlands]
SPM-497	SPM	5	52	5	54	"Based on proxy and instrumental data, it is virtually certain that the rate of global mean sea level rise has accelerated during the last two centuries." Suggest the authors consider rephrasing to state, "Based on proxy and instrumental data, there is high confidence that the rate of global mean sea level rise has increased over the last two centuries." 1. Acceleration can imply increases or decreases in rate and the phrase, "during the last two centuries", permits for changes in rate at any time and in any sequence. 2. Sea level was not globally observed prior to the satellite era and variations in the Southern ocean are particularly sparse, making the use of "virtual certain" dubious. [Government of United States of America]
SPM-498	SPM	5	53	5	55	This statement refers to centennial scale rates of SLR, but one could argue the more relevant finding is what has happened most recently: that is, that within the past few decades the rates of SLR are 2-3x greater than they were earlier in the century. This section summary statement should be revised or supplemented to reflect this fact. Also, these centennial scale statements imply that we must have much greater than 200 years of SLR data. If that is the case, why does Fig SPM.2 only go back until 1900? Should this be decades and centuries rather than centuries and millennia? [Government of United States of America]
SPM-499	SPM	5	54	5	55	To avoid the ambiguous "unusually", suggest to restructure sentence like: "There is medium confidence that the current centennial rate of global mean sea level rise is high in the context of the last two millennia. [Government of Denmark]
SPM-500	SPM	5	54	5	56	The word "unusual" is not helpful in the phrase "... rate of global mean sea level rise is unusually high". Suggest including quantitative comparison instead. [Government of Canada]
SPM-501	SPM	5	54	5	56	To be neutral and informative, consider to add here "However, more rapid rates of sea level change occurred during past periods of rapid ice-sheet disintegration. Exceptional tectonic effects can drive very rapid local sea level changes, with local rates exceeding the current global rates of change." referring to the specific FAQ. [Government of Netherlands]
SPM-502	SPM	5	54			"accelerated" is ambiguous, since it can carry the implication of a constant acceleration term (ie that the data are well fitted by a quadratic curve). Suggest using "increased" instead. [Government of New Zealand]
SPM-503	SPM	5	55	5	55	Reference to last two millenia appears to be out of context as other analysis are provided for century or decadal. [Government of India]
SPM-504	SPM	5	55	5	55	Does this mean that sea level rise is significantly higher, rather than just 'unusually high'. Some numbers would be useful to quantify the signal to noise. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-505	SPM	6	1	6	1	The rate 1.7 [1.5 to 1.9] differs from the rate chosen at page 5 line 51. Why? [Government of Netherlands]
SPM-506	SPM	6	1	6	4	it would help to make a statement on whether sea level rise increased or not over the last century. The last two centuries as argued on page 5 is misleading and suggests this holds with the same confidence for the last century whereas in line 1-4 there are clear notions that there are periods with similar rates, so clarify this apparent inconsistency by making a statement on the acceleration over the last century [Government of Netherlands]
SPM-507	SPM	6	1	6	4	Here it is used change per year while other changes in the SPM are given in change per decade. This is confusing for the policy makers. Please use the same throughout the report e.g. decadal change. [Government of Norway]
SPM-508	SPM	6	1	6	13	Here, the reported mean rate (1901 to 2010) is followed by a higher rate (1993 to 2010). The latter is a rather short period and could be part of normal variability. It is noted that similar high rates were likely between 1920-1950. It should be clarified whether the recent increase in rate represents a sustained acceleration or is just multi-year variability. [Government of United States of America]
SPM-509	SPM	6	3	6	4	It is not clear if the rates occurred between 1920 and 1950 are similar to that ones occurred between 1993 and 2010. If so, the sentence " It is likely that similarly high rates occurred between 1920 and 1950." shoul be replaced by " It is likely that the rates occurred between 1920 and 1950 are similar to the rates occurred between 1993 and 2010 ." If not, the sentence should be " It is likely that high rates occurred also between 1920 and 1950". [Government of Brazil]
SPM-510	SPM	6	3	6	4	It is not clear, why information on rates between 1920 and 1950 is raised to the SPM level. It seems to be a more technical comment which one would expect in the TS. If it stays here, further information on its relevance would be needed. [Government of Germany]

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SPM-511	SPM	6	3	6	4	There is an inconsistency between SPM and TS regarding the period in which high rates of sea level rise occurred in the early 20th century. SPM says "high rates occurred between 1920 and 1950", while TS says they occurred "between 1930 and 1950" at the fourth line from the bottom in page 12. It should be necessary to check the cited reference and fix this inconsistency. [Government of Japan]
SPM-512	SPM	6	3	6	4	The statement "likely that similarly high rates occurred between 1920 and 1950. {3.7.2, 3.7.3}" is not mentioned in the section references. However, in section 3.7.4 is mentioned that "The trend in GMSL observed since 1993, however, is not significantly larger than the estimate of 18- year trends in previous decades (e.g., 1920-1950).", which is inconsistent with the SPM conclusion. Moreover, it is stated differently in the technical summary "It is very likely that the mean rate of sea level rise was 1.7 [1.5 to 1.9] mm/yr between 1901 and 2010. Between 1993 and 2010, the rate was very likely higher at 3.2 [2.8 to 3.6] mm/yr; similarly high rates likely occurred between 1930 and 1950." [Government of Netherlands]
SPM-513	SPM	6	3	6	4	The period 1920-1950 is not consistent with the information in TS 2.6 "between 1930 and 1950". Please correct this inconsistency. [Government of Norway]
SPM-514	SPM	6	4			Summary Ch 13 states: 1930-1950 rather than 1920-1950 which is stated in Ch 3. we assume this is a typo in Ch13, although 1920-1950 contains 1930-1950. [Government of Netherlands]
SPM-515	SPM	6	6	6	8	Replace 'There is very high confidence that the maximum global mean sea level was at least 5 m higher than present and high confidence that it did not exceed 10 m above present' by 'Limited evidence indicates that maximum global mean sea level was between 5-10 m above present' (Results are based on three studies, two by the same authors. As is typical for such a small body of literature, studies do not fully account for many uncertainties: systematic error and selection biases active tectonics most possible changes in Earth's geoid Picking the extreme from a time-series necessarily increases the size of the error bars.) [Government of Netherlands]
SPM-516	SPM	6	6	6	8	"There is very high confidence that the maximum global mean sea level was at least 5 m higher than present and high confidence that it did not exceed 10 m above present during The authors should consider rephrasing this to state, "Limited evidence indicates that maximum global mean sea level was between 5-10m above present during the last interglacial period (129,000 to 116,000 years ago)". 1. As discussed in WG1 Chapter 5, inferences of changes in sea level need to account for subsidence and uplift from glacial isostatic effects and other processes. Only three studies have accounted for glacial isostatic effects, two by the same group of authors, and these are the basis for this estimate (Kopp et al., 2009; Kopp et al., 2013; Dutton and Lambeck, 2012). 2. As is typical for such a small body of literature, the studies do not fully account for all relevant uncertainties, including systematic error and selection bias in the observations, active tectonics, and the range of possible changes in Earth's geoid. Furthermore, picking the extreme from a time-series necessarily increases the size of the error bars, but has not been included in the error estimates. 3. The recent study by Kopp et al. (2013) indicates that there is a 5% probability that sea level equalled or exceeded 10.9m above present during the last interglacial. References: Dutton, A., and K. Lambeck, 2012: Ice volume and sea level during the Last Interglacial. Science, 337, 216-219. Kopp, R. E., F. J. Simons, J. X. Mitrovica, A. C. Maloof, and M. Oppenheimer, 2009: Probabilistic assessment of sea level during the last interglacial stage. Nature, 462, 863-867. Kopp, R. E., F. J. Simons, J. X. Mitrovica, A. C. Maloof, and M. Oppenheimer, 2013: A probabilistic assessment of sea level variations within the last interglacial stage. Geophysical Journal International, 193, 711-716. [Government of United States of America]
SPM-517	SPM	6	6	6	9	It is noted in Line 6-9 Page 6 that "There is very high confidence that the maximum global mean sea level was at least 5 m higher than present and high confidence that it did not exceed 10 m above present during the last interglacial period (129,000 to 116,000 years ago), when the global mean surface temperature was, with medium confidence, not more than 2°C warmer than pre-industrial". This formulation tends to impress policymakers as such: If temperature is 2°C warmer than pre-industrial, the global sea level will rise by 5-10 m, which is a very compelling conclusion. But is it exactly what the SPM intends to mean here? If not, it is suggested to delete "when the global mean surface temperature was, with medium confidence, not more than 2°C warmer than pre-industrial". If it is imperative to include temperature here, it is suggested to indicate the global average temperature in the interglacial period. [Government of China]
SPM-518	SPM	6	6	6	9	Writing down high confidence fact that sea level was 5m to 10 m higher during the last interglacial period in parallel with medium confidence fact that air temperature was more than 2°C higher than pre-industrial could misinform SPM readers that rising temperature 2°C automatically brings 5m to 10m sea level rise. [Government of Japan]
SPM-519	SPM	6	6	6	9	Please consider to simplify the sentence, e.g. by saying "There is high confidence that the sea level was between 5 and 10m higher than present level during the last interglacial period...". In addition please explain what the "last interglacial period" is. For non-experts, it is easy to think that it means there was no ice at all left on Earth. Furthermore, if it is meant that 2deg C warming gave at least 5 m sea level rise in the last interglacial period may be this could be spelled out more clearly? [Government of Norway]
SPM-520	SPM	6	7	6	9	The confidence level medium confidence cannot be found in the chapter section 5.6.2. [Government of Netherlands]

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SPM-521	SPM	6	9	6	9	Please add what the temperature was in 1750 in brackets. [Government of Norway]
SPM-522	SPM	6	10	6	12	HOW does this imply an Antarctic ice sheet contribution? Is there evidence to support that this is the case? Could there be other sources and if not, why not? Essentially the sentence is poorly drafted and leaves the argument incomplete. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-523	SPM	6	10	6	13	Concerning the text: "During the last interglacial period, the Greenland ice sheet very likely contributed between 1.4 and 4.3 m sea level equivalent, implying with medium confidence a contribution from the Antarctic ice sheet to the global mean sea level. {5.3.4, 5.6.2}", please explain which will be the possible contribution from the Antarctic ice sheet. [Government of Argentina]
SPM-524	SPM	6	10	6	13	The statement "During the last interglacial period, the Greenland ice sheet very likely contributed between 1.4 and 4.3 m sea level equivalent, implying with medium confidence a contribution from the Antarctic ice sheet to the global mean sea level. {5.3.4, 5.6.2}" appears to overstate our ability to accurately define the range. The authors should clarify that the "1.4-4.3m" range is the range of model reconstructions, but that the uncertainties [almost certainly] do not allow for a statement down to the tenths of a meter. [Government of United States of America]
SPM-525	SPM	6	11	6	12	It is unclear and confusing why contributions from Greenland are on a "likelihood" scale, whereas those from Antarctica are on a "confidence" scale. Why the difference? The terms should either be in the same "units" or an explanation given. [Government of United States of America]
SPM-526	SPM	6	11	6	13	Please consider adding the total sea level rise in this sentence, for example "During the last interglacial period, the Greenland ice sheet very likely contributed between 1.4 and 4.3 m of the above-mentioned sea level rise, implying...". [Government of Norway]
SPM-527	SPM	6	11			The words 'sea level equivalent' may be a bit too technical [Government of Netherlands]
SPM-528	SPM	6	13	6	13	Please add the word "rise" after "sea level", to facilitate an unambiguous understanding of the sign of the contribution from the Antarctic ice sheet. [Government of Belgium]
SPM-529	SPM	6	16	6	16	Biogeochemical Quantities: define, as it seems that they are not defined in any IPCC Glossary. [Government of Switzerland]
SPM-530	SPM	6	16	6	48	It would be helpful for this section to include a paragraph on natural emissions of methane and an assessment of the observed evidence on whether they are increasing. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-531	SPM	6	16	7	7	Consider moving entire section "Carbon and Other Biogeochemical Quantities" to come before "Observed Changes in the Climate System" beginning page 2. The current order may follow the order of Chapter 2 but is not necessarily the most logical in terms of explaining the causal chain to policymakers. This section could also be re-named to Observed Changes in Carbon and Other Biogeochemical Quantities. [Government of United States of America]
SPM-532	SPM	6	18	6	18	Is the wording "more than 20%" an accurate description of the figure? [Government of Austria]
SPM-533	SPM	6	18	6	19	Suggest explaining here, in the shaded box, why 1750 is used to represent the pre-industrial period when reporting on GHG concentrations, but 1850 (or 1850-1900) is used for global temperature changes. The constantly changing reference periods in the SPM is a challenge for readers. [Government of Canada]
SPM-534	SPM	6	18	6	24	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-535	SPM	6	18	6	24	Given the recent widespread attention to the 400 ppm value crossed in Mauna Loa, it would be interesting to add a sentence comparing this level to similar levels in the history of the Earth: how long do we need to go back in the past to find values of the CO2 concentrations higher than 400 ppm? [Government of Belgium]
SPM-536	SPM	6	18	6	24	It would be very helpful not only to know the percentages of GHG concentration changes but also their absolute concentrations plus the concentrations in the CO2 eq. Please add the current values. [Government of Germany]
SPM-537	SPM	6	18	6	24	For a policymaker, it looks better to explain impact of non-CO2 greenhouse gases on global warming along with GWP(global warming potential) rather than to suggest their concentrations only. It is also desirable to mention their emission sources in order to provide a policymaker with an opportunity to devise a way to reduce the non-CO2 greenhouse gas emissions. [Government of Republic of Korea]
SPM-538	SPM	6	18	6	46	It is a bit disappointing to see that only the information about the time integrated CO2 budget is included here. This information was largely given already in AR4 and given a few years more of emissions and accumulation in land and ocean relative to the more than 150 years of emissions in the period before, makes the update rather irrelevant from a policy perspective. It seems that the recent evolution of the sources and sinks would have been much more policy relevant, e.g., that emissions have increased with a growth rate that is at the upper end of IPCC's SRES scenarios, that the total land and ocean sinks have been able to largely follow this increase, although with likely different proportions, etc.. Such statements are available in the summary from chapter 6 and should be lifted from there. [Government of Switzerland]
SPM-539	SPM	6	19	6	19	40% since 1750 to what year? (2012?) and it would be useful and helpful to explain why 1750 is chosen as a benchmark (i.e. because this has been adopted widely as the start of the industrial revolution). [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-540	SPM	6	19	6	20	It needs to be substantiated [Government of India]
SPM-541	SPM	6	19	6	21	Besides burning of fossil fuels, deforestation and cement production, other sources of anthropogenic emissions of CO2 exist including other uses of fossil fuels and carbonates (e.g. lime production, glass production, soda ash production, ceramics production). Moreover, as highlighted in paragraph beginning in line 31, contribution from use of fossil fuels have been twice the contribution from deforestation. The sentence should be changed to better describe the contributions. The suggestion is: "The increase is a result of human activity, with the primary source being the fossil fuel use, with land-use change providing another contribution in a lesser degree". [Government of Brazil]
SPM-542	SPM	6	19	6	21	It is not clear why only cement production has been identified in this statement while iron & steel production has comparatively larger contribution in the CO2 emissions among the industrial direct CO2 emissions (ref: http://www.iea.org/publications/freep) [Government of India]
SPM-543	SPM	6	20	6	20	Replace "deforestation" with "land use change", Other carbon pools are also significant [Government of Ireland]
SPM-544	SPM	6	21	6	21	A new sentence should be inserted in line 21 between "production" and "Present-day" to reflect pg SPM-6 Line 39 to Line 42. It would read " However the net effect of land-use change is very small due to accumulation of carbon in natural terrestrial ecosystems". [Government of Brazil]
SPM-545	SPM	6	21	6	21	Why is agriculture/land use omitted? Is the contribution from cement production larger than that from agriculture? Please explain and quantify if possible. [Government of Sweden]
SPM-546	SPM	6	21	7	22	Please indicate whether these increases in CH4 and N2O are a result of human activity. [Government of Norway]
SPM-547	SPM	6	22	6	22	Please consider rephrasing "exceed the range of concentrations during the past 800,000 years." [Government of Norway]
SPM-548	SPM	6	27	3	28	It is unclear when "very high confidence" is used and when "virtually certain"; We would suggest to use the latter for the increase in GHG concentrations since preindustrial [Government of Netherlands]
SPM-549	SPM	6	27	6	27	Please give the citation for the evidence of the increases in concentration of CH4 and N2O since 1750 [Government of Vietnam]
SPM-550	SPM	6	27	6	29	In the AR4 the figures for the trends of CO2, CH4 and N2O were included. These figures very often were used for illustrating the fact of rising GHG concentrations in the atmosphere. Please add also the graphs for CH4 and N2O in figure SPM.3. [Government of Germany]
SPM-551	SPM	6	27	6	42	We think the information in these statements would be absorbed better in the form of a flow diagram [Government of Netherlands]
SPM-552	SPM	6	27	6	42	It is suggested to show graphically all figures related to gas concentrations, emissions and removals, integrating them in Figure SPM.3 [Government of Spain]
SPM-553	SPM	6	27	6	46	As Prof. Jean-Pascal van Ypersele (Vice Chair of IPCC) mentioned in his presentation at the recent research dialogue of UNFCCC-SBSTA38 (http://unfccc4.meta-fusion.com/kongresse/sb38/pdf/1_IPCC_JP_van_YPERSELE_20130604.pdf), recently observed anthropogenic CO2 emissions are on the high side of past IPCC emission scenarios and the emission scenario causing RCP8.5 as reported by Peters et al. (2013). Such information, especially with a figure to plot CO2 concentration or CO2 emission over time (i.e. 1980-2050) against RCPs, has a substantial implication to policy-makers and worth mentioning somewhere. [Government of Japan]
SPM-554	SPM	6	29	6	29	Could this be illustrated with a diagram in the SPM? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-555	SPM	6	31	6	33	The following wording is suggested: By 2011, cumulative anthropogenic CO2 emissions from fossil fuel combustion and cement production ... [Government of Austria]
SPM-556	SPM	6	31	6	33	Does "by 2011" and "since 1750" apply to both of the statistics being described in this sentence. If so, suggest editing the wording to help clarify the timeframes for the reader. [Government of Canada]
SPM-557	SPM	6	31	6	33	Please delete "by" and insert "from 1750 to 2011". In addition, please delete "since 1750" at the end of line 33, otherwise it is unclear from which point in time onwards emissions were counted. [Government of Germany]
SPM-558	SPM	6	31	6	33	Instead of PgC, why not use GtC (billion tonnes) since policy makers are not familiar with this unit [Government of India]
SPM-559	SPM	6	31	6	33	To be consistent with the heading (page 6 lines 18-24) it would be preferable to split up the quantitative contributions of FF and cement production. [Government of Netherlands]
SPM-560	SPM	6	31	6	33	If possible, please split the four categories for better judgement of each ones contribution. [Government of Sweden]
SPM-561	SPM	6	31	6	37	Suggest these two small paragraphs be merged. As it is, the reader is left to 'do the math' at the end of the paragraph on lines 31-33, adding up 365 + 180. The first sentence of the next paragraph gives the result, so suggest adding this on to the end of line 33 by simply saying " for a total of 545 (460 to 630) PgC". The next sentence could start by saying " Less than half of emitted anthropogenic CO2 [240...etc.]". [Government of Canada]
SPM-562	SPM	6	31	6	42	Please express all emissions primarily in the units most familiar to policymakers, i.e. tonnes of CO2 or CO2-equivalent, but not the obscure "PgC". A footnote is not

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						sufficient. [Government of Belgium]
SPM-563	SPM	6	31	6	42	Please indicate the uncertainties of these statements. [Government of Germany]
SPM-564	SPM	6	31	6	42	Would it be possible to indicate the percentages of the carbon reservoirs (atmosphere, biosphere, ocean)? [Government of Germany]
SPM-565	SPM	6	31	6	42	These three bullets regarding CO2 emissions and uptake have no likelihood/confidence/evidence/agreement associated with them and they deserve to have these descriptors. [Government of United States of America]
SPM-566	SPM	6	31	6	45	It is common practice in this SPM to add the number of the footnote to the text. Please delete (see #) and just add the footnote where appropriate. [Government of Germany]
SPM-567	SPM	6	31		42	The statement starting at line 31 says, among others, that "deforestation and other land use change [...] have released 180 PgC". The statement starting at line 39 says that "natural terrestrial ecosystems not affected by land use change [...] have accumulated 150 PgC". While we do not doubt the correctness of these statements, we regard the way they are formulated a bit confusing. It took us three attempts to understand that the two statements are not a contradiction (ok, that may be our fault). What is said is that part of the terrestrial ecosystems release carbon, while others absorb it. Stating this explicitly would enhance the understanding of the text. [Government of Netherlands]
SPM-568	SPM	6	32	6	32	Chapter 6.3.1 makes reference to "land use change". The sentence "(...) while deforestation and other land use change are estimated to have (...)" should be replaced accordingly by "while land use change are estimated to have". [Government of Brazil]
SPM-569	SPM	6	32	6	32	The unit "Pg" is used here for the amount of C, whilst at page 4 and 5 "Gt" is used for the amount of ice. It should be considered to use the same units, preferably Gt as this unit is more known amongst policy makers. [Government of Norway]
SPM-570	SPM	6	32	6	32	Delete "(see)" and leave only the footnote. For conformity of the convention in the rest of the SPM. [Government of Sweden]
SPM-571	SPM	6	32	6	32	Reference not clear: [see 5] [Government of Switzerland]
SPM-572	SPM	6	32			For clarity, change "see5" to "see footnote 5" [Government of New Zealand]
SPM-573	SPM	6	33	6	33	Please consider including at the end of the sentence "for a total of 545 PgC" to make the link with the next point much clearer. [Government of Norway]
SPM-574	SPM	6	35	6	35	When you add up the limits of the 90% ranges for atmospheric+oceanic+terrestrial CO2 uptake you get a range of (230+125+60=) 415 PgC to (250+185+240=) 675 PgC. This differs from the range on line 35 (460-630 PgC). It's likely a matter of statistics, but it's worth clarifying to the policymaker who may be confused because of the inequality between these two approaches for total C in the system. [Government of United States of America]
SPM-575	SPM	6	35	6	36	The connection of CO2 emission and concentration is explained well in these sentences. But it is also urgently necessary to add the value for the CO2-equivalent emission, where all significant GHG gases are included. [Government of Germany]
SPM-576	SPM	6	35	6	37	For better understanding, we suggest to insert "only" before "240 [230 to 250] PgC...". [Government of Netherlands]
SPM-577	SPM	6	35	6	42	The carbon mass balance is not fully accounted for in these two bullets. 545 PgC in anthropogenic fossil emissions from 1750 to 2011 is found by a 240 PgC increase in the atmosphere, a 155 PgC increase in the global oceans, but 40 PgC are not mentioned. That is 545 -240 -155 = 40. A sentence should be added regarding the fate of the other 40 within the terrestrial biosphere. [Government of United States of America]
SPM-578	SPM	6	35			replace '240' by 'only 240' [Government of Netherlands]
SPM-579	SPM	6	36	6	36	Footnote 6: it could be useful to move the definition of ppb to page 14, since it is used only on that page. [Government of Belgium]
SPM-580	SPM	6	36	6	37	'atmospheric CO2 concentration' could be specified as being 'global annual average' in the text, for clarity. Also please update concentration to 2012. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-581	SPM	6	37	6	37	The range is missing for "390.5 ppm in 2011". [Government of Brazil]
SPM-582	SPM	6	37	6	37	Delete "(see)" and leave only the footnote. [Government of Sweden]
SPM-583	SPM	6	37	6	38	Please consider including a graphic illustration of the carbon cycle and numbers. [Government of Norway]
SPM-584	SPM	6	37			Update CO2 concentration for 2012 [Government of Denmark]
SPM-585	SPM	6	37			"especially in spring" must be "especially in summer". The formulation of this conclusion can be improved. Proposal: "There is very high confidence that Northern Hemisphere snow cover extent has decreased since the mid-20th century in spring and summer (see Figure SPM.2a). Autumn and winter snow cover extent do not

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						show significant trends. Averaged March and April Northern Hemisphere snow cover extent decreased 1.6 [0.8 to 2.4] % per decade over the 1967–2012 period." [Government of Netherlands]
SPM-586	SPM	6	37			For clarity, change "see6" to "see footnote 6" [Government of New Zealand]
SPM-587	SPM	6	37			The concentration of CO2 has recently reached 400 ppm, and this figure should be included in the SPM, updating the 390.5 ppm 2011 data [Government of Spain]
SPM-588	SPM	6	39	6	39	The amount of anthropogenic carbon taken up by the global ocean... should be changed to 'The total amount of anthropogenic carbon taken up by the global ocean since 1750...', for clarity. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-589	SPM	6	39			Spread of ocean uptake of anthropogenic Carbon given: 155 [125 – 185] Pg C in 2011. However, there is no uncertainty qualification. These are indirect measures with 2 independent methods (time transit distribution and C*), which results in significantly different spatial patterns (3-39), but the global numbers are within their uncertainty. Given that these are very indirect measures we suggest medium confidence. [Government of Netherlands]
SPM-590	SPM	6	40	6	40	Sentence provides information on terrestrial system. It may be dealt under the separate head. [Government of India]
SPM-591	SPM	6	40	6	40	"in 2011" should be "by 2011" [Government of India]
SPM-592	SPM	6	40	6	41	'.....during the period 1750-2011' rather than '...in 2011'. Could also start the following sentence: 'Over the same period, natural terrestrial...' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-593	SPM	6	40	6	42	Natural terrestrial ecosystems... Why is there no uncertainty qualification on the last issue? Very likely? (explanation: It is virtually certain that the ocean is taking up anthropogenic carbon dioxide from the atmosphere. There is very high confidence that the global ocean content of anthropogenic carbon increased from 1994 to 2010. Estimates range from 93–137 PgC in 1994 to 155 [125 to 185] PgC in 2010. {3.8.1, Figure 3.15, Figure 3.16} And also: There is very high confidence that oceanic uptake of anthropogenic CO2 has resulted in gradual acidification of seawater evidenced by a decreasing pH in surface waters at a rate of between 0.015 and 0.024 per decade since the early 1980s (see Figure SPM.2). {3.8.2, Table 3.2, Box 3.2, FAQ 3.2, Figure 3.17, Figure 3.18}) [Government of Netherlands]
SPM-594	SPM	6	41	6	42	The statement "which is an amount similar to the carbon released from deforestation and other land use change" could imply that deforestation and LUC are not significant or not a cause for concern. Suggest clarifying or contextualizing the statement if possible. [Government of Canada]
SPM-595	SPM	6	41	6	42	The sentence states that the accumulation of C by natural terrestrial ecosystems, 150 PgC is an amount similar to the carbon released from deforestation and other land use change. Does this indicate that increased accumulation in other land areas has almost out weighted the increase in C emissions from LULUCF and that net C uptake during the period has mainly been in the ocean ? In chapter 6.3.1 p.22 however the wording "close to neutral with an average loss of 30 Pg C" is used. Check the consistency between Chapter 6 and SPM [Government of Norway]
SPM-596	SPM	6	42	6	42	Please insert here from TS P 16 paragraph 5 the following: "The distribution of observed atmospheric CO2 increases with latitude clearly shows that the increases are driven by anthropogenic emissions which primarily occur in the industrialized countries north of the equator." (citation, please simplify sentence for the SPM) and "An independent line of evidence for the anthropogenic origin of the observed atmospheric CO2 increase comes from the observed consistent decrease in atmospheric O2 content and an decrease in stable isotopic ratio of CO2(13C/12C) in the atmosphere {2.2.1, 6.1.3}." These findings are very important and give a clear indication for the anthropogenic impact of observed climate change. These findings are also highly relevant for stakeholders and policymakers when designing an answer to the challenges caused by climate change. [Government of Germany]
SPM-597	SPM	6	43	6	46	lines 43-46 would fit better in the Ocean section on page 4 [Government of Spain]
SPM-598	SPM	6	44	6	44	We do not see why the "very likely" qualifyer is needed about a statement so solidly rooted in the laws of chemistry. Is there really any way oceanic uptake of anthropogenic CO2 could NOT result in acidification of the oceans? If the answer is negative, then please replace the sentence with "Oceanic uptake of anthropogenic CO2 results in acidification of the ocean". [Government of Belgium]
SPM-599	SPM	6	44	6	44	Why is it "very likely" and not "virtually certain" that ocean uptake of anthropogenic CO2 results in acidification? This is a general statement on the level of understanding in chemistry, and to our understanding there is no doubt that CO2 uptake leads to acidification. Or are there any publications which doubt this mechanism? [Government of Germany]
SPM-600	SPM	6	44	6	44	The assessment "very likely" for the ocean acidification by oceanic uptake of anthropogenic CO2 differs a little from the assessment "virtually certain" (see Page 16, Line 41) for the projection of future increase of ocean acidification on the same reason. Are these assessments consistent? Prerequisites for each of the likelihoods, such as time-frames, dependency on models etc. should be explained more explicitly. [Government of Japan]
SPM-601	SPM	6	44	6	44	It is surprising that this statement regarding the fact that ocean acidification results from oceanic uptake of anthropogenic CO2 is only stated with "very likely". The chemistry is pretty straightforward on this - can the likelihood term be strengthened? [Government of United States of America]

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SPM-602	SPM	6	44	6	45	The given numbers (0.1 and 26%) imply a precision inconsistent with measured pH trends, which contain considerable ranges (see section 3.8.2). [Government of Netherlands]
SPM-603	SPM	6	44	6	45	Presumably this is a global average figure? And it would be helpful to acknowledge regional differences. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-604	SPM	6	44	6	46	Ocean acidification: A reference to Figure SPM.3 is missing. [Government of Germany]
SPM-605	SPM	6	44	6	46	It would be helpful if the pH could be specified what it really means and i.e. in footnote 7 that it is a logarithmic scale [Government of Sweden]
SPM-606	SPM	6	44	6	46	Some historical context would be useful here. Is this unusual and why is it important? This is important for policy makers to understand. Should the current estimate of global ocean pH level also be stated, as well as the decrease since the beginning of the industrial era and associated increase in hydrogen ion concentration, to illustrate further the actual change that has occurred? Perhaps a footnote explaining that a pH of 7 is neutral, above 7 alkaline and below 7 acidic and that the average pH of ocean surface water has decreased from about 8.2 to 8.1 over the past two and a half centuries. It would also comfortably sit in the opening 'ocean' section and would possibly have more impact there. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-607	SPM	6	44	6	46	The author stated that the pH of seawater has decreased. Is this applied to all seawaters in the world or just some regions? And is it true the decrease of the pH due to the uptake of anthropogenic CO2 into the ocean? Or due to the undersea activities? [Government of Vietnam]
SPM-608	SPM	6	45	6	45	Delete "(see)" and leave only the footnote. [Government of Sweden]
SPM-609	SPM	6	45	6	45	Reference not clear: [see 7] [Government of Switzerland]
SPM-610	SPM	6	45	6	45	It ought to be mentioned that this value of 0.1 of pH change, ONLY applies to the open ocean and not to coastal areas or shelf waters, where processes not represented in the IPCC models tend to dominate pH variability. For more details see the recent landmark paper: Duarte et al. (2013). Estuaries and Coasts, 36:221-236 DOI 10.1007/s12237-013-9594-3. [Government of United States of America]
SPM-611	SPM	6	45			For clarity, change "see7" to "see footnote 7" [Government of New Zealand]
SPM-612	SPM	7	2	7	7	The caption to Figure SPM.3 is confusing, and it seems that clarity has been sacrificed for brevity. Suggest it be reworded as follows: Multiple observed indicators of a changing global carbon cycle. Measurements of atmospheric concentrations of carbon dioxide (CO2) from Mauna Loa and South Pole since 1958 are shown in panel (a). Measurements of partial pressure of CO2 at the ocean surface (blue lines) along with the measurement of in situ pH (green lines), are shown in panel (b) from three stations: two in the Atlantic Ocean (29°10'N, 15°30'W – dark blue/dark green; 31°40'N, 64°10'W – blue/green) and one in the Pacific Ocean (22°45'N, 158°00'W – light blue/light green). Full details of the datasets shown here are provided in the underlying report. {Figures 2.1 and 3.17; Figure TS.5} [Footnote: pH is a measure of the acidity and a smaller pH means greater acidity.] [Government of New Zealand]
SPM-613	SPM	7	3	9	4	"partial pressure": please replace by a wording that is more easy to understand by policymakers, or if absolutely needed, provide an explanation in the SPM and in the glossary. [Government of Belgium]
SPM-614	SPM	7	6	7	6	One could consider deleting "a measure of acidity of ocean water", as this is already explained in footnote 7, while keeping the text between the parentheses to facilitate reading ("smaller pH means greater acidity"). [Government of Belgium]
SPM-615	SPM	7	11	8	42	The whole analysis should be developed since 1850 (it is incorrect to develop a period of analysis starting on 1950). The global-scale observation from the instrumental era began in the mid-19th century and therefore the analysis must start also on the 1850s. [Government of Bolivia]
SPM-616	SPM	7	11	8	42	The document is incomplete. In relation to the analysis of the drivers of climate change there is the need to incorporate the analysis of the contributions of developed countries and developing countries to climate change since industrial times, which means 1850s. In addition, some figures are necessary in order to establish what is the carbon budget for developing and developing countries regarding different climate scenarios, taking into account different commitments of Parties for climate change reduction. [Government of Bolivia]
SPM-617	SPM	7	11	8	42	RF described in this section must be ERF (effective RF) described in body text. Even though extra explanation on the change of definition of the term is included in the footnote, it is still very confusing since only RF appears in SPM. As the body text, ERF should be used explicitly in SPM. [Government of Japan]
SPM-618	SPM	7	11	8	42	This section "Drivers of climate change" is of a very technical nature and is difficult to understand for a non-specialist. Furthermore, it is particularly confusing that the SPM refers to two types of RFs, i.e. emission- and concentration- based ones, and footnote 8 adds to this confusion. [Government of Switzerland]
SPM-619	SPM	7	11	8	42	Consider moving entire section "Drivers of Climate Change" so that the order of the SPM is: Introduction > Observed Changes in Carbon and Other Biogeochemical Quantities > Drivers of Climate Change > Observed Changes in the Climate System > Understanding the Climate System and its Recent Changes > etc. [Government of United States of America]

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SPM-620	SPM	7	11	8	44	Not clear on the added value of new RF format. There is a lack of comparability with previous report. The Figure provides a lot of detail including material on short life pollutants which is of limited value for the SPM. The added value of 3 time periods shown needs to be clear. Consider using AR4 format? [Government of Ireland]
SPM-621	SPM	7	13	7	13	Drivers of Climate Change: The first paragraph in this section needs an opening sentence that explains the concept of the Earth's energy budget and why it is important in terms of climate change. This section would perhaps benefit from a box explaining basic ideas such as the radiative forcing. Before the paragraph starting with line 13, suggest inserting: 'The climate of the Earth is determined by the balance of energy received from the sun and that outgoing to space which depends on the Earth's temperature'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-622	SPM	7	13	7	15	These two sentences are unclear (in particular because the use of the unusual word in the context of the IPCC: "imbalances") and can be replaced by sentences used in the AR4 WG I Report: "Changes in the atmospheric abundance of greenhouse gases and aerosols, in solar radiation and in land surface properties alter the energy balance of the climate system. These changes are expressed in terms of radiative forcing, which is used to compare how a range of human and natural factors drive warming or cooling influences on global climate." [Government of Switzerland]
SPM-623	SPM	7	13	7	20	As the RF of BC on snow and landuse change are included, earth surface refraction needs to be included in the factors that are used to calculate RF. [Government of Netherlands]
SPM-624	SPM	7	13	7	20	The reader would benefit to have some explanations in the SPM on how the contribution of each of the forcings contributes to the temperature's variability. This has been done mainly through modelling. The challenge is then to determine the most probable contribution of each forcing (e.g. CO2, solar, etc.). See e.g. Schneider, E.K., B.P. Kirtman and R.S. Lindzen (1999), Upper tropospheric water vapor and climate sensitivity. J. Atmos. Sci.,56, 1649-1658: "The positive feedback on the global mean surface temperature response to doubled CO2 from water vapor above 750 mb is about 2.6 times as large as that from water vapor below 750 mb. The feedback on global mean surface temperature due to water vapor in the extratropical free troposphere (above 750 mb) is about 50% larger than the feedback due to the lower-latitude free troposphere water vapor." See also: Lindzen, R.S., 2007, Taking greenhouse warming seriously, Energy & Environment, 18, 937-950. [Government of Switzerland]
SPM-625	SPM	7	13	7	20	Does the discussion of RF refer to RF at the top of the atmosphere or at some other layer? Please clarify. [Government of United States of America]
SPM-626	SPM	7	13	8	42	This material would be much more useful if the RFs were translated into global temperature effects with the usual caveats for translating W/m2 to global temps. Perhaps at the start of the section 1-2 sentences could be added explaining how to convert from RF to equilibrium temperature change. Of course, this would require stating a best estimate for equilibrium climate sensitivity... [Government of United States of America]
SPM-627	SPM	7	14	7	14	Previously, radiative forcing was "attached" to the tropopause level, now no level is mentioned: shouldn't this be explained? [Government of Belgium]
SPM-628	SPM	7	14	7	14	Insert 'net' between 'the' and 'change'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-629	SPM	7	15	7	15	For sake of clarity, consider the possibility to add the words "with respect to 1750" after the words "in these drivers" [Government of France]
SPM-630	SPM	7	16	7	16	"Positive RF leads to a warming, negative RF to a cooling." We find this imprecise and too general for the policy maker audience. Warming and cooling where? Surface warming and cooling yes but, for example, not in the stratosphere. What does a positive RF do to the climate system is the key question. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-631	SPM	7	16			It is curious that only numbers since pre-industrial are quoted in the SPM, some numbers for the last 10 years or so would be very useful to show that the build-up is continuing. [Government of Netherlands]
SPM-632	SPM	7	18	7	20	It would be appropriate if the RF values were based on both emissions and atmospheric concentration changes for purposes of comparison. [Government of Kenya]
SPM-633	SPM	7	19	7	19	The verb "based" in "RF values are based on emissions" seems odd. We suggest to use "related to" instead. [Government of Belgium]
SPM-634	SPM	7	19	7	20	It would be helpful if, at this point of the SPM, there could be a description of what is meant by "greenhouse gases emissions" since this phrase is used many times e.g. which gases and whether it includes removal by sinks. [Government of Norway]
SPM-635	SPM	7	19	7	24	The results presented on lines 23-24, and also on page 8, report RF for GHG concentrations, are in contradiction to the statement on line 19. This chapeau needs to be revised to be consistent with the text in this regard. [Government of Canada]
SPM-636	SPM	7	19	7	24	Suggest that the reasons for mainly reporting on emission-based RF values be expanded to include a statement explaining that this allows a better visualization and understanding of how emissions of one substance can affect the atmospheric concentration (and hence RF) of more than one substance. [Government of Canada]
SPM-637	SPM	7	19	7	24	It is recommended that the chapeau explicitly state whether or not total anthropogenic forcing estimates will be the same whether or not emissions-based or concentration-based RF estimates are used. This will help policymakers interpret the results on page 8 lines 1-5 comparing total anthropogenic forcing estimates between the AR4 and AR5. [Government of Canada]

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SPM-638	SPM	7	23	7	23	Instead of "net uptake", write "gain" because "uptake" suggests a sort of long-term storage. [Government of Switzerland]
SPM-639	SPM	7	23	7	23	Cf. our remark 3 above. [Government of Switzerland]
SPM-640	SPM	7	23	7	29	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-641	SPM	7	23	7	29	All seven findings in this box deserve an evidence/agreement/confidence/likelihood classification: (1) that anthropogenic RF is positive; (2) that it has led to a net uptake of energy by the system; (3) that CO2 has been the biggest contributor to this; (4) that CO2 has been the biggest anthropogenic forcer in every decades since the 1960s; (5) uncertainty of RF for clouds and aerosols remains large uncertainty; (6) total solar irradiance is a small contributor to RF; (7) volcanic activity is a small contributor to RF [Government of United States of America]
SPM-642	SPM	7	23			Box: Can we say anything about atmospheric residence times here, as otherwise CO2 emissions seem temporally on a par with aerosols and volcanic emissions. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-643	SPM	7	24	7	24	Please consider to relate this to emissions rather than concentrations, as described above when it is said that RF values are based on emissions. [Government of Norway]
SPM-644	SPM	7	24	7	29	Lines between 24 and 26 is read as "The increase in the atmospheric concentration of CO2 since 1750 makes the largest contribution to net radiative forcing, and has also made the largest contribution to the increased anthropogenic forcing in every decade since the 1960s". But between lines 28 and 29 it is stated that "Changes in total solar irradiance and volcanic forcing contribute only a small fraction to the net radiative forcing during the industrial era". Considering that the industrial era is defined as 1750 to 2011, it should be concluded that the atmospheric concentration of CO2 has made the largest contribution to the increased anthropogenic forcing in that period, and not only "in every decade since the 1960s". So, please delete "and has also made the largest contribution to the increased anthropogenic forcing in every decade since the 1960s" between lines 25 and 26. Alternatively, replace "every decade since the 1960s" by "industrial era". [Government of Brazil]
SPM-645	SPM	7	25	7	25	Recommend rewording '...also made the largest contribution to...' to '.....formed the largest component of....' or 'fraction of'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-646	SPM	7	26	7	27	Change to "... aerosols and precursor gases". [Government of Belgium]
SPM-647	SPM	7	26	7	29	Section 7.5 is referenced to support the statement that aerosols and clouds lead to the largest uncertainties in understanding the Earth's energy budget. While there is a lot of discussion of details in section 7.5, there is a better high level overview of this issue in section 7.1 and particularly 7.1.2 that goes through the rationale for this chapter. It would be good to reference 7.1 or 7.1.2 here. [Government of United States of America]
SPM-648	SPM	7	27	7	27	"largest" is a very strong statement, we think one of the largest would be appropriate in view of the many uncertainties on response of the energy budget to the full set of anthropogenic drivers [Government of Netherlands]
SPM-649	SPM	7	28			Solar irradiance and volcanic forcing changes may have contributed small fractions over the full period, but it should be noted this is not necessarily the case over short periods. Please see AR1 special report where predictions of global temp decreases related to Pinatubo were well borne out by the subsequent observations of significant decreases in global temps over a year or two. This is specifically mentioned in lines 34-37 on SPM-8, but it would be more powerful to also cite the validation of an IPCC prediction 20 years ago. [Government of United States of America]
SPM-650	SPM	7	32			Figure SPM.4: Below "Emitted Compound" change "Aerosols" to "Aerosols and Precursors". [Government of Netherlands]
SPM-651	SPM	7	32			Figure SPM.4: The RF contributions from individual components may depend on a combination of emissions of various species, in which case it is not obvious how to do the attribution. For instance, the nitrate RF does not only depend on the emissions of NOx, but also strongly depends on the availability of ammonium and thus on the emissions of ammonia (NH3) and sulphur dioxide (SO2). Also, CH4 and the short-lived gases indicated in the figure (CO, NMVOC, and NOx) may change the nitrate and sulphate RF by changing the hydroxyl (OH) concentrations (see, e.g., Shindell et al., Improved Attribution of Climate Forcing to Emissions, Science, 326, 716-718, 2009). These points should at least be acknowledged in the figure caption. [Government of Netherlands]
SPM-652	SPM	7	33	7	33	The x-axis label and the caption need clarification. Should it say 'additional radiative forcing in 2011 compared with 1750'? [Government of United Kingdom of Great Britain & Northern Ireland]

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						Britain & Northern Ireland]
SPM-653	SPM	7	34	7	34	It would be very helpful for the reader if the changes in RF values would be specified for each contribution into changes caused by the redefinition, changes by better insight in qualities of RF agents and changes by better insight in quantities of RF agents. This is done partially in the following statements on page 8, but we would prefer a small table. [Government of Netherlands]
SPM-654	SPM	7	34			For clarity, change "see8" to "see footnote 8" [Government of New Zealand]
SPM-655	SPM	7	37	7	38	Figure caption SPM4 says at these lines: "For halocarbons, confidence is H for ozone, and VH for CFCs and HCFCs". We believe ozone is not a halocarbon, therefore this sentence should be corrected. [Government of Argentina]
SPM-656	SPM	7	38	7	39	It is noted in Line 38-39 Page 7 that "For aerosols, confidence is H for total aerosols, and M for individual aerosol components". This conclusion does not agree with the statement on confidence in Line 28 Page 8: "The RF of the total aerosol effect is -0.9 [-1.9 to -0.1] $W\ m^{-2}$ (medium confidence)". The two formulations, which may puzzle policymakers, are suggested to be reconciled with each other. [Government of China]
SPM-657	SPM	7	43	7	45	Given the policy importance of contrails (related to aviation), and HFCs, PFCs and SF6 (all Kyoto Protocol gases), we definitely would like to see the values for those elements as well in the table, as was done in AR4 for some of these forcings. [Government of Belgium]
SPM-658	SPM	7	44	7	45	The phrase "Figures 8.16 and 8.18" needs to be corrected to "Figures 8.15 and 8.17". [Government of Japan]
SPM-659	SPM	7	47	7	47	In footnote 8, does this statement, "respond to perturbations with rapid adjustments" mean feedbacks? If so, include this term as it is commonly understood by policymakers. [Government of United States of America]
SPM-660	SPM	7		7		<p>One of the subjects where the AR5 provides a significant improvement when compared with the AR4 is the issue of metrics to compare and integrate the contribution of the different greenhouse gases to climate change. The recent development of the research, driven by a dialogue with the policy community allowed for a more comprehensive assessment of the options available, including implications, advantages and drawbacks.</p> <p>These results will be important to drive the mitigation choices under any basket of gases mitigation policy. Hence, the main results should be reflected in the SPM.</p> <p>A Box should be included in the Section "Drivers of Climate Change", including the main conclusions included in the TS3.8 chapter of the Technical Summary.</p> <p>[Government of Brazil]</p>
SPM-661	SPM	7		7		<p>(cont) Box content : "Different metrics can be used to quantify and communicate the relative and absolute contributions to climate change of emissions of different substances, and of emissions from regions/countries or sources/sectors. Up to AR4, the most common metric has been the Global Warming Potential (GWP) that integrates RF out to a particular time horizon. This metric thus accounts for the radiative efficiencies of the various substances, and their lifetimes in the atmosphere, and gives values relative to those for the reference gas CO₂. There is now increasing focus on the Global Temperature change Potential (GTP), which is based on the change in global mean surface temperature at a chosen point in time, again relative to that caused by the reference gas CO₂, and thus accounts for climate response along with radiative efficiencies and atmospheric lifetimes. Both the GWP and the GTP use a time horizon, the choice of which is subjective and context dependent. {8.7}</p> <p>In general, GWPs for near-term climate forcings are higher than GTPs due to the equal time weighting in the integrated forcing used in the GWP. Hence the choice of metric can greatly affect the relative importance of near-term climate forcings and WMGHGs, as can the choice of time horizon. {8.7}</p> <p>[Government of Brazil]</p>
SPM-662	SPM	7		7		<p>(cont.) A large number of other metrics may be defined down the driver-response-impact chain. No single metric can accurately compare all consequences (i.e., responses in climate parameters over time) of different emissions, and a metric that establishes equivalence with regard to one effect will not give equivalence with regard to other effects. The choice of metric therefore depends strongly on the particular consequence one wants to evaluate. It is important to note that the metrics do not define policies or goals, but facilitate analysis and implementation of multi-component policies to meet particular goals. All choices of metric contain implicit value-related judgments such as type of effect considered and weighting of effects over time. {8.7} [Government of Brazil]</p>
SPM-663	SPM	7		7		<p>(cont.) The GWP and GTP have limitations and suffer from inconsistencies related to the treatment of indirect effects and feedbacks, for instance if climate-carbon feedbacks are included for the reference gas CO₂ but not for the non-CO₂ gases. The uncertainty in the GWP increases with time horizon and for the 100-year GWP of WMGHGs the uncertainty can be as large as $\pm 40\%$. Several studies also point out that this metric is not well suited for policies with a maximum temperature target. Uncertainties in GTP also increase with time as they arise from the same factors contributing to GWP uncertainties along with additional contributions from it being further down the driver-response-impact chain and including climate response. The GTP metric is better suited to target-based policies, but is again not appropriate for every goal. Updated metric values accounting for changes in knowledge of lifetimes and radiative efficiencies and for climate-carbon feedbacks are now available. {8.7}"</p> <p>[Government of Brazil]</p>

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SPM-664	SPM	7				figure SPM.4 It is noted that figures TS.6 and TS.7 provide greater technical detail compared to figure SPM.4. It might be difficult for policy makers to understand the linkages between the figures/data provided in the Technical Summary and in the SPM. Therefore it is suggested to explain those linkages with the help of footnotes in figure SPM.4. In order not to overload the SPM another option might be to also include figure SPM.4 in the technical summary and to provide those linkages/explanations only in that additional figure for the interested reader. [Government of Austria]
SPM-665	SPM	7				footnote on pH can be removed information is already in caption fig 3 [Government of Netherlands]
SPM-666	SPM	8	0			Here it is particularly relevant to highlight all changes -- or not -- in relation to AR4; whether the numbers (best estimate and likely span) or their assessed likelihood according to the calibrated language, have changed or not. Currently this is done for a few items. [Government of Sweden]
SPM-667	SPM	8	1	8	1	In Chapter 8 of the WG1 Assessment Report a new concept is introduced, Effective Radiative Forcing (ERF), which differs from the RF concept which has been used in previous reports. In this summary the concept is explained but the name is changed, and both concepts are referred to as Radiative Forcings. This is confusing, please revise. [Government of Argentina]
SPM-668	SPM	8	1	8	1	There is a difference in Radiative Forcing between Anthropogenic and well mixed GHG. Reason may be given or explained in the context of other short lived climate forces [Government of India]
SPM-669	SPM	8	1	8	1	The value and the range are here given with only one decimal point (does this refer to the sum being less accurately determined compared to the components?), but the figure in question has two decimal places for the same total. Why? [Government of Sweden]
SPM-670	SPM	8	1	8	2	On future sea level rise, the CMIP5 estimates could be interpreted as very conservative [all below 1 m]. Various empirical, glaciological, and process studies have suggested a greater sea level rise is possible by 2100 AD, the high end of estimated ranges exceeds the ~1 m maximum in this graph. The SPM should discuss the circumstances that would facilitate higher SLR by 2100 and/or give a better justification for why these somewhat conservative numbers are stated (i.e., reasons for some model types being weighted more than others, etc.) [Government of United States of America]
SPM-671	SPM	8	1	8	5	Concerning the 44% growth (+0.63 W m-2) of total anthropogenic RF estimate for 2011 compared to the estimate reported in AR4 for the year 2005, the summary says 'about equal parts' to reductions in estimates of RF of aerosols and continued growth of GHGs concentrations. However, Table 8.6 shows that the RF change of aerosols is twice as large as that of well-mixed GHGs, which is only 0.20 W m-2 compared with RF reported in AR4. The text should be revised appropriately for fair assessment. [Government of Japan]
SPM-672	SPM	8	1	8	5	The Chapter 8 Executive Summary starts out with a strong statement: "It is unequivocal that anthropogenic increases in the well-mixed greenhouse gases (WMGHGs) have substantially enhanced the greenhouse effect, and the resulting forcing continues to increase." This is an extremely important statement at this time, and the authors should consider including it in the SPM here. [Government of United States of America]
SPM-673	SPM	8	1	8	5	This paragraph is confusing - reference needs to be made here to the start point, as in '1750-2011' and '1750-2005' respectively, else it seems to refer to individual years, 2005 and 2011. Also, '..... and it has increased more rapidly since 1970 than during prior decades' is too vague. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-674	SPM	8	1	8	42	Why is tropospheric O3 not discussed in this section? [European Union]
SPM-675	SPM	8	1	8	42	Please provide confidence levels for all statements. [Government of Germany]
SPM-676	SPM	8	1	8	42	Several of the detailed RF numbers in the nine bullet points are emission-based and refer to Figure SPM.4. Other RF numbers in the list are concentration-based, and thus not necessarily supported by Figure SPM.4. This section would benefit from a more clear distinction between the two different types of RF numbers, such that seeming disagreements between numbers in the text and Figure SPM.4 can be avoided. [Government of Sweden]
SPM-677	SPM	8	1			We notice inconsistent use of the term radiative forcing (RF). Compared to the FOD, the SOD introduced the term Effective Radiative Forcing. However, throughout the SPM this term is used in different ways and not always consistent with the definitions given in the underlying text. Although there is an explanation in a footnote, we recommend to use a box to explain what RF is applied in the SPM, especially for non experts. We further find this section somewhat out of balance. There is too much detail in greenhouse gas RF and we miss important policy relevant items, such as greenhouse warming metrics and spatial differences in RF. Concerning metrics, Chapter 8 pays considerable attention to metrics. In combination with the policy relevance of this issue, a separate conclusion in the SPM is justified. 'See also our zero comment for suggestions' [Government of Netherlands]
SPM-678	SPM	8	2	8	5	This sentence seems unclear and confusing by comparing the total anthropogenic RF for between 2011 from IPCC AR5 and 2005 from IPCC AR4. It would be better to emphasize that the total anthropogenic RF increased in 2011 since 2005 based on IPCC AR5 and then to compare any difference between IPCC AR4 and AR5 along with explanations on the improvement of IPCC AR5. [Government of Republic of Korea]

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SPM-679	SPM	8	2	8	42	All the RF values mentioned in this page are average of mean values of the RFs so please change "RF" to average of the RF mean values [Government of Vietnam]
SPM-680	SPM	8	3	8	3	Values of AR4 may also be given for easy reference [Government of India]
SPM-681	SPM	8	3	8	5	Check the sentence : the two parts "to reductions in estimates of the forcing resulting from aerosols" and "continued growth in most greenhouse gas concentrations" look like not homogeneous. Check whether the word "estimates of" is necessary here. Check whether it might be better to write "negative forcing" instead of "forcing". Consider adding the words "over the 2005-2011 time-span" could be added at the end of the sentence. [Government of France]
SPM-682	SPM	8	3			The precise claim of 44% is based on a shift in a range of values [0.6 – 2.4] to [1.1 – 3.3]. This is a question of interpretation. The lower border has increased with almost 90% and the upper border with 37%. The claim implies higher accuracy than in reality. [Government of Netherlands]
SPM-683	SPM	8	4	8	4	Please add the word "negative" before "forcing resulting from aerosols" for clarity. [Government of Belgium]
SPM-684	SPM	8	4	8	4	The phrase "reductions in estimates of the forcing resulting from aerosols" is too vague for communicating to policymakers. Recommend that the message here be that the overall (net) cooling from aerosols is less than previously estimated in the AR4. Suggest the following phrasing would work: "This is due in about equal parts to less cooling (lower negative total forcing) from aerosols and...." [Government of Canada]
SPM-685	SPM	8	4	8	5	unclear wording: "reductions in estimates of the forcing". Sentence could be rephrased as "This is due in about equal parts to continued growth in most greenhouse gas concentrations and improved estimates for the aerosol forcing that reduce their net cooling effects" [Government of Netherlands]
SPM-686	SPM	8	4	8	5	Please consider to put "negative" in front of "forcing results of aerosols" to make the sentence more clear. Please relate the change in RF to emisissions and not to concentrations. [Government of Norway]
SPM-687	SPM	8	4			The statement 'equal' does not contain an uncertainty qualifier. It is also not supported by the underlying chapter. The chapter states "this is caused by a combination of ". We agree there is sufficient evidence that both contribute significantly. However, 'equal' implies a higher accuracy than intended. [Government of Netherlands]
SPM-688	SPM	8	7	8	7	Value RF 2.83 is ERF in Table 8.6. [Government of Netherlands]
SPM-689	SPM	8	7	8	7	Consider using "due to" instead of "from" for clarity like in Table 8.6 [Government of Netherlands]
SPM-690	SPM	8	7	8	7	Please add "anthropogenic" in front of RF, and consider to write emisissions instead of concentrations. [Government of Norway]
SPM-691	SPM	8	7	8	8	Values of RF presented here correspond to ERF found in table 8.6 of the Report. Though the mean values of RF and ERF are the same, the deviations are different. The Executive Summary of Chapter 8 presents RF results while here ERF results are shown under RF name. Clarify [Government of Argentina]
SPM-692	SPM	8	7	8	8	While the figure of 2.83 used here corresponds to the RF noted in chapter 8 section 8.3.2, the range noted (2.26 to 3.40) actually corresponds to the ERF noted in chapter 8.5.1 (table 8.6). The range for the RF should be 2.54-3.12 to correspond with section 8.3.2, or the statement and reference should be changed. [Government of Canada]
SPM-693	SPM	8	7	8	8	Is it possible to give the relationship between radiative forcing and warming in terms of degree C? [Government of India]
SPM-694	SPM	8	7	8	8	The RF from WMGHG in the text here "2.83 [2.26 to 3.40]" is inconsistent with the mean and range stated in Fig. SPM.4: "2.90 [2.22 to 3.78]". Pleae reconcile this difference. [Government of United States of America]
SPM-695	SPM	8	7	8	18	Suggest considering whether these numbers need to be explicitly reported in the SPM or if they can we read from the figure. If they are included in the text, suggest that more explanation is needed about why this particular information is important/relevant. Given that space is precious in the SPM, there is not need to repeat numbers in text that can be read directly, or easily calculated, directly from the figure. If they are included in the text there is a need to explain why this information is being highlighted. [Government of Canada]
SPM-696	SPM	8	7	8	18	These paragraphs need to be clear on the time period they refer to - i.e. is it 1750 - 2013 for all of them? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-697	SPM	8	7			The range in this conclusion is inconsistent with that in Chapter 8, section 5.1 (which is 2.54 – 3.12). We wonder whether this bullet is really needed. See general remark for this section. [Government of Netherlands]
SPM-698	SPM	8	8			When the values in Figure SPM.4 are added up, one gets a combined greenhouse gas forcing of 3.0 not 2.83 W m-2. Please double-check and correct if needed. [Government of United States of America]
SPM-699	SPM	8	10	8	12	These chapter references are again difficult to verify - suggest that the authors review. [Government of Canada]

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SPM-700	SPM	8	10	8	12	There is a variety of ranges for CO2 alone and 'total' CO2, depending on the period chosen. Chapter 8 executive summary and TS.3.2 the contribution of 'CO2 alone' is given as 1.82 [1.63 – 2.01] for the industrial era. The same range is given in Chapter 8, section 3.2 (and in table 8.2) but for the period 1750 – 2011. None of them coincide with the ranges given in the SPM. It would help if periods are specified. We wonder whether this bullet is really needed. See general remark for this section. [Government of Netherlands]
SPM-701	SPM	8	10	8	12	The uncertainty levels and ranges are not consistent with the underlying sections and TS. Please check the numbers and make sure that they are consistent throughout the report and that can easily be traced. [Government of Netherlands]
SPM-702	SPM	8	10	8	12	It should be made clear whether the sentence is about net emissions of CO2 or not. What is "other carbon containing sources"? We suppose that it is not the content of the source itself that is important, but what comes out of the source. Does it refer to emissions of other gases containing carbon (e.g.. CO and methane)? [Government of Norway]
SPM-703	SPM	8	10	8	12	Somewhat unclear what the the latter RF (1.82) refers to? Emissions in terms of [C]? Or for CO2 atmospheric concentration? Is there overlap with the emissions of methane and CO? [Government of Sweden]
SPM-704	SPM	8	11	8	11	What do the observations of air pollutants, ozone and particles tell us? [European Union]
SPM-705	SPM	8	11	8	12	Clarify what are 'other carbon-containing sources (perhaps in brackets) and the mechanisms for contribution to CO2 from other carbon-contributing sources could usefully be specified here. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-706	SPM	8	12	8	12	The deviation limits (1.46 to 2.18) do not correspond with those found in the Report or technical summary [Government of Argentina]
SPM-707	SPM	8	12	8	12	Suggest: 'concentrations, the RF is 1.82...'. Also, is the 1.82 due to methane? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-708	SPM	8	14	8	14	The uncertainty definition of CH4 is unclear, it cannot be recalculated from the main report . [Government of Netherlands]
SPM-709	SPM	8	14	8	15	Please add "anthropogenic" in front of "emissions". In the first sentence an emission based estimate of RF is 0,97 [0.74 to 1.20]. The next sentence says that "This is very likely much larger than the concentration based estimate of 0.48 [0.38 to 0.58]" Since it is obvious that 0.97 is larger than 0.48 consider to put "very likely" in parenthesis at the end of the sentence. [Government of Norway]
SPM-710	SPM	8	14	8	15	Assumes background AND technical knowledge, SO needs clearer explanation for lay readers. The sentence 'This is very likely much larger than the concentration-based estimate of 0.48.' needs rewording because of course 0.97 is always larger than 0.48. The 'very likely' wording clearly relates to something other than the numbers, for example how the numbers are derived. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-711	SPM	8	14	8	18	This comment applies to CH4 RF but some considerations will apply also to other species. There is a basic inconsistency in the paragraph. The value of RF for methane includes the indirect effect of methane on ozone and water vapour and CO2. At the same time include the indirect effect of other emissions in the RF for methane. We understand that the atmosphere chemistry is a complex subject. Particularly with respect to the CH4 RF several issues are addressed in the different chapters of the report, including carbon oxidation, climate-carbon feedback, indirect effect on ozone and water vapour concentration, effects of CO , NMVOC, NOx emissions on methane. It is not always clear what are the phenomena that are included in each calculation throughout the AR5. Sometimes this information is not transparent and consistency cannot be assessed by the reader. [Government of Brazil]
SPM-712	SPM	8	14	8	18	(cont.)While all the phenomena have to be identified and quantified, the aggregation of the different components to each gas RF will be necessarily policy prescriptive. The approach can be misleading and inappropriate depending of the policy choices and methodologies for emissions estimations adopted (including methodologies that estimate CO2 from emission factors based on carbon content) and lead to duplication in calculations. This is particularly true for methane, for which emissions have to be differentiated between fossil and non-fossil, when looking at indirect effects on CO2. Hence, each component of the radiative forcing (direct or indirect) has to be individually presented with the assumptions behind the calculation. Totals should be presented with and without indirect effect. Particularly for methane aggregate values should differentiate fossil and non-fossil methane [Government of Brazil]
SPM-713	SPM	8	14			The range 0.48 [0.38 – 0.58] is not consistent with chapter 8, section 8.3.2 and with the TS.3.2, which states 0.48 (+/- 0.05) for the period 1750 – 2011. Again, no period is specified in this bullet. [Government of Netherlands]
SPM-714	SPM	8	14			The uncertainty qualifier very likely is not found in the underlying chapter, section 5.1, which states: 'For CH4 the contribution from emission is estimated to be almost twice as large as that from the CH4 concentration change, 0.97 W m–2 versus 0.48 W m–2, respectively'. It is not clear where this qualification is based on. Purely

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						based on the ranges, one could even qualify this conclusion as virtually certain. However, the range 0.74 – 1.20 is not found in chapter 8. The number 0.97 cannot be traced in the detailed outline within the relevant sections. Moreover, this number is entirely model based. Given the uncertainties a medium confidence would be more appropriate [Government of Netherlands]
SPM-715	SPM	8	15	8	15	"the concentration-based estimate of 0.48 [0.38 to 0.58]" does not agree with Chapter 8 Line 3 Para 5 Page 3 and Line 5 Para 6 Page 20. It is advisable to check relevant numbers therein. It is suggested to reformulate it as "the concentration-based estimate of 0.48 [0.43 to 0.53]" to be consistent with the underlying report (FD). [Government of China]
SPM-716	SPM	8	15	8	15	The uncertainty of RF 0,48 does not match [0,43 to 0,53] given by sources: 8-3, 8.3.2.2, Table 8.2 and TS-19. [Government of Netherlands]
SPM-717	SPM	8	15	8	15	How could the concentration based estimate of the RF of CH4 be unchanged from AR4? The concentration of CH4 has increased from 2005 to 2011. Please explain better. [Government of Norway]
SPM-718	SPM	8	15			We cannot reconcile the number of 0.48 with the corresponding row in Fig. SPM.4. The width of the orange (CH_4) bar is more like 0.6. [Government of Netherlands]
SPM-719	SPM	8	17	8	17	Change "other emissions" to "emissions of short-lived gases". [Government of Netherlands]
SPM-720	SPM	8	19	8	19	Please consider including a similar bullet point about RF from N2O for a more balanced content. [Government of Norway]
SPM-721	SPM	8	20	8	22	Please quantify the RF due to halocarbons as done for other species in this section. [Government of Germany]
SPM-722	SPM	8	20	8	22	This conclusion is based on primarily one study for the stratosphere (Stevenson et al. 2013). Hence, the confidence basis of the qualifier is not very solid. [Government of Netherlands]
SPM-723	SPM	8	20	8	22	Please add "stratospheric" in front of "ozone-depleting". Non-ozone depleting fluorinated gases (e.g. HFCs, PFCs and SF6) should also be mentioned here, or in a separate bullet point - even if the current RF might be small, these gasses are relevant for the Kyoto Protocol. [Government of Norway]
SPM-724	SPM	8	20	8	22	Why does this bullet point not include an estimate of the size of the radiative forcing, similar to the other bullets? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-725	SPM	8	24	8	24	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The current text states: "Emissions of short-lived gases contribute substantially to radiative forcing." This sentence is inconsistent with the information provided in Figure SPM.4. Please change statement to "Emissions of short-lived gases (CO, NMVOC, NOx) contributed approximately 10% of the forcing compared to the CO2-induced forcing (see Figure SPM.4)." [Government of Germany]
SPM-726	SPM	8	24	8	26	We consider a statement on short-lived RF agents very relevant. We would welcome any quantification. We would also like to see a sentence on the distribution, and on its relation to air quality, something like: "Due to their shortevity of hours to weeks, these agents are not well-mixed and the impacts are local to hemispheric. The emissions of these agents are increasingly subjected to air quality measures." [Government of Netherlands]
SPM-727	SPM	8	24	8	26	Please add the notion that the negative RF of NOx is due to the removal of CH4; this is not obvious from the text or figure SPM.4 [Government of Netherlands]
SPM-728	SPM	8	24	8	26	There is overconfidence in the statement 'contribute substantially to RF'. There is no justification given the total range in SPM-4, ranging from -0.34 to +0.30. One cannot simply add the different contributions due to non-linearity of the chemistry and interactions between the species. [Government of Netherlands]
SPM-729	SPM	8	24	8	26	Please add "anthropogenic" in front of "emissions". The sum of GHG (2.83 w/m2), aerosols (-0.9), volcanic (-0.1), solar (0.05) equals 1.88 w/m2. The total anthropogenic RF is 2.3 W/m2. Does this mean that the anthropogenic releases of short lived gases contibute net with 0.42 w/m2? Please make sure that all components contribute to the 2.3 w/m2 are quantified. Please also quantify the contribution to RF from emissions of black carbon. [Government of Norway]
SPM-730	SPM	8	24	8	26	Can we say anything in this bullet about residence times, e.g. what we mean by 'short-lived' - otherwise it is rather arbitrary. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-731	SPM	8	28	8	28	"The RF of the total aerosol effect is -0.9 [-1.9 to -0.1] W m-2 (medium confidence)" does not agree with the conclusion in Line 38-39 Page 7. It is suggested to check relevant conclusions. At the same time, it is suggested to add "including cloud adjustment due to aerosols" after "The RF of the total aerosol effect is -0.9 [-1.9 to -0.1] W m-2" to note that it includes not only the effect of aerosol radiation but also the interaction of aerosols with cloud (Page 28 Chapter 8). [Government of China]
SPM-732	SPM	8	28	8	28	We propose to add: "The RF of the total aerosol effect (excluding the effect of absorbing aerosol on snow and ice) is..." [Government of Germany]
SPM-733	SPM	8	28	8	28	Ch 7 P 4 "states: "The total effective radiative forcing due to aerosols (ERFari+aci, excluding the effect of absorbing aerosol on snow and ice) is assessed to be -0.9 (-1.9 to -0.1) W m-2 with medium confidence." The text in the SPM talks about RF, not ERF, which is correct? Please explain, what "total RF" means. [Government of Germany]

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SPM-734	SPM	8	28	8	28	Given the numbers in Figure SPM 4: '-0.9 [-1.9 to -0.1]' should be '-0.8 [-2.1 to +0.2]' [Government of Netherlands]
SPM-735	SPM	8	28	8	28	Adding up the numbers in Fig SPM.4 (-0.27+-0.55) gives -0.82. Where does -0.9 come from? Also the quoted uncertainty range doesn't seem to correspond to those in Fig. SPM.4. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-736	SPM	8	28	8	30	The explanation of the term 'RF from total aerosol effect' is not consistent with that in the executive summary of chapter 7. Chapter 7 uses the term 'total effective RF', specified as ERFari+aci, while the SPM states 'the total aerosol effect', similar as in the exec summary of chapter 8, although here the term ERF is used. The SPM should add "in the atmosphere". For experts this separation may be known, but for the target group of this SPM it should be made explicit. Moreover, nowhere in the underlying text there is an explicit specification of a BC component, while the SPM does. Chapter 7 states: "This range was obtained from expert judgement guided by climate models that include aerosol effects on mixed-phase and convective clouds in addition to liquid clouds, satellite studies, and models that allow cloud-scale responses". Experts know that the BC component is added in the terms, but the average reader might not. See also our zero comment on the issue of RF and ERF. [Government of Netherlands]
SPM-737	SPM	8	28	8	32	Suggest that the chapter references should also include 7.5.3. [Government of Canada]
SPM-738	SPM	8	28	8	32	The regional character of the RFs of the various aerosol components should be emphasized. [Government of Netherlands]
SPM-739	SPM	8	28	8	32	Please consider to make the effect of black carbon clearer, as it seems to be the third largest contributor to positive radiative forcing (from figure 4). [Government of Norway]
SPM-740	SPM	8	28	8	32	The figure (SPM.4) and text here should reconcile the ranges for the RF of direct and indirect aerosol effects. From SPM.4, it appears as though the total (i.e., direct+indirect) aerosol effect on RF is (-0.27 + -0.55 =) -0.82. Moreover, the range in the text does not include the possibility for a net (+) RF from the total aerosol effect, whereas Fig SPM.4 certainly indicates that such a (+) total aerosol effect is possible (i.e., if you add the highest values of the whiskers from the uncertainty ranges). [Government of United States of America]
SPM-741	SPM	8	28		29	We cannot reconcile the numbers given here with the "Aerosols" rows in Fig. SPM.4: They seem to apply to the "Cloud Adjustment due to Aerosols", but not to the balancing of reflecting and absorbing aerosols as stated in the text. [Government of Netherlands]
SPM-742	SPM	8	28			In chapters 7.5.3 and 8.3.4 another range is given with a likely qualifier: "Based on the above considerations, we assess ERFari+aci using expert judgement to be -0.9 W m ⁻² with a 5-95% uncertainty range of -1.9 to -0.1 W m ⁻² (medium confidence), and a likely range of -1.5 to -0.4 W m ⁻² ." The conclusions should add this section in their referencing. [Government of Netherlands]
SPM-743	SPM	8	28			Concerning the medium confidence, in Table 8.5 (section 8.5.1) RFari has a high confidence level and RFaci has two components with low confidence (aci and aci rapid adjustments). One can argue whether it is appropriate to mix these to Medium confidence in the SPM, especially with the notice that the dominant contribution comes from RFaci. [Government of Netherlands]
SPM-744	SPM	8	29	8	29	Please, include the following foot note related to the word "black carbon": "Bond et al. (2013) assessed the current understanding of BC effects and calculated GWP and GTP for BC that includes aerosol-radiation interaction, aerosol-cloud interactions and albedo. As shown in Table 8.A.6 the uncertainties are wide for both metrics (for 90% uncertainty range) reflecting the current challenges related to understanding and quantifying the various effects". The text comes from chapter 8, page 64. [Government of Brazil]
SPM-745	SPM	8	31	8	31	Please add "up to now" or "temporarily" in the phrase "the aerosols have offset" [Government of Belgium]
SPM-746	SPM	8	31	8	31	Need to quantify the portion of global forcing offset by aerosols. 'offset a substantial portion' is not clear enough. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-747	SPM	8	31	8	32	This is strongly implied by the figures 8.15 and 8.16, but it could not be found in the main text. The word substantial leaves room for different interpretations. The executive summary of chapter 8 does discuss the issue as such, but emphasizes the difference in confidence levels between decades. [Government of Netherlands]
SPM-748	SPM	8	34	8	35	The statement in the first line can be misinterpreted. According to chapter 8.4.2, Volcanic eruptions that inject substantial amounts of SO2 gas into the stratosphere are the dominant natural cause of externally-forced climate change on the annual and multi-decadal time scales, both because of the multi-decadal variability of eruptions and the time scale of the climate system response, and can explain much of the preindustrial climate change of the last millennium RF from volcanic aerosol. In this context, the first statement in this bullet is wrong. For the non specialists, the next statement is standing lose. There is no context why only the very recent years are mentioned. Make clear that it refers to the hiatus period. Perhaps this is an broader issue that could be highlighted separately in this SPM. Finally, The quantification "approximately double" is given by a range in the underlying text, but based on one reference only (Solomon et al., 2011). One could argue whether

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						statements from one study only should reach the SPM level. [Government of Netherlands]
SPM-749	SPM	8	34	8	35	"some years" in the main text is "two years", which is more specific, giving a better view of the situation. [Government of Netherlands]
SPM-750	SPM	8	34	8	35	Are these volcanic aerosols included in the Figure SPM.4 graphic? [Government of United States of America]
SPM-751	SPM	8	34	8	36	Suggest also including information about the difference in the number of eruptions between the 2008-2011 period and 1999-2002 to help contextualize this finding. [Government of Canada]
SPM-752	SPM	8	34	8	36	Please consider including information about the long term effect of volcanic aerosols. [Government of Norway]
SPM-753	SPM	8	34	8	43	Is it possible to link the information here about volcanic eruptions and the lower solar irradiance to the smaller trend in the rate of warming over the past 15 years? See page 3, line 25-27. [Government of Norway]
SPM-754	SPM	8	38	8	39	"the industrial era" is in this case not accurate: the period used is 1745 - 2008, according to 8.4.1.2. [Government of Netherlands]
SPM-755	SPM	8	38	8	42	The underlying chapter cites 1986 as the "minimum" year for the RF change of 0.04 (e.g., see Ch. 8, pg 5), rather than 1985 as noted here in the SPM. Suggest correcting. [Government of Canada]
SPM-756	SPM	8	38	8		This conclusion contains an overconfidence by the statement 'best estimate' without any explanation. It is an expert judgement based on a number of studies. The underlying text (section 8.4.1) states medium confidence, which has disappeared in the SPM. More general, we suggest to rephrase this conclusion by including the contribution to RF by volcanic aerosol over the whole industrial era. Non experts may not know why only specific short periods (i.e. hiatus period) are highlighted on a SPM level. [Government of Netherlands]
SPM-757	SPM	8	38			"the industrial era" should be clarified with a specific date range. [Government of New Zealand]
SPM-758	SPM	8	40	8	42	Please rewrite, as it is difficult to grasp on a first reading. [Government of Belgium]
SPM-759	SPM	8	40	8	42	The qualification 'likely' is not found in the main text, only in the executive summary. [Government of Netherlands]
SPM-760	SPM	8	40			The second conclusion applies likely as a uncertainty qualifier, which cannot be traced in the chapter 8.4.1. Moreover, formally it cannot be applied together with medium confidence. [Government of Netherlands]
SPM-761	SPM	8	41	8	41	Change "change" to "difference". [Government of Netherlands]
SPM-762	SPM	8	41	8	42	"1985 minimum" in the main text is "1986 minimum". [Government of Netherlands]
SPM-763	SPM	8	48	8	48	Feedback processes are important, but theoretical studies should not be reduced to their study. Please make the phrase more general. [Government of Belgium]
SPM-764	SPM	8	49	8	49	Please consider stating more clearly that not only are the observations more detailed than compared to AR4, but there exist also more observations both in space and time. Please consider rewriting the sentence so it reads: "Compared to AR4, more observations, and on a more detailed level, and improved...". [Government of Norway]
SPM-765	SPM	8				footnote not comprehensible for non-specialist rephrase [Government of Netherlands]
SPM-766	SPM	9	1	1	40	The analysis must be developed taking into account data since 1850s. Also there is the need to introduce references to the climate models, establishing their advantages and disadvantages for policy making and analysis. In addition, in the analysis of climate models must be considered those that incorporate linkages between solar cycles and thermal trends. [Government of Bolivia]
SPM-767	SPM	9	1	9	1	The technical summary report of the AR5 includes features of the new Coupled Model Intercomparison Project Phase 5 (CMIP5). However, in the summary for policy makers, there is no explanation for CMIPs. For the in-depth understanding of climate models, a brief explanation for CMIPs needs to be added, if appropriate, in the footnotes. [Government of Republic of Korea]
SPM-768	SPM	9	1	9	40	The revised text in this section on evaluation of climate models raises some concerns. In the previous version, this section focused largely on what models are able to do with relatively little mention of their limitations. Recognising that there needed to be some balance, this new text discusses model deficiencies but seems to have almost entirely focused on what they can't do. This is not balanced and does not give an accurate view of model capabilities. The statement in the grey box ("There is very high confidence that climate models reproduce the observed large-scale patterns and multi-decadal trends in surface temperature...") is not reflected in the bullet points, which do not provide any support and do not accurately convey the findings in of Chapter 9 (see the executive summary for that chapter). There are some sentences which are also badly worded, e.g. l. 12-13: "Models do not generally reproduce the observed reduction in surface warming trend over the past 10-15 years", l. 16-17: "... with possible contributions from ...too strong a response to increasing greenhouse-gas forcing". These sentences do not fully match the findings in Chapter 9 and can be easily misinterpreted. [European Union]

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SPM-769	SPM	9	1	9	40	Evaluation of Climate Models: Please include one bullet on model evaluation of climate phenomena, at least for monsoon and ENSO as their projections are assessed in the chapter 'Future Global and Regional Climate Change' (page SPM-14, lines 11-20). [Government of Japan]
SPM-770	SPM	9	1	9	40	Almost all the Earth System Models for CMIP5 also include either prescribed time evolution or interactive ozone, in contrast to CMIP3 where only few models included a prescribed time evolution or interactive ozone for the 20th century. This is very important for the simulation of Southern Hemisphere climate change in the second half of the 20th century [Government of Netherlands]
SPM-771	SPM	9	1	9	40	An 'evaluation' of climate models should also mention the most important and well-known 'shortcomings' of models (clouds, regional patterns, atmospheric circulation patterns). A paragraphs should be added, and a sentence in the leading box, mentioning these aspects and their evolution, as well as current efforts on these matters such as e.g. CMIP5, NCEP-NCAR, and ERA interim. [Government of Switzerland]
SPM-772	SPM	9	1	9	40	Evaluation of Climate Models: This section text is weakly written and lacks balance. It focuses more on the shortcomings of models than what they can do well and tell us. It would be more informative to intersperse the contents of this section throughout the rest of the SPM where appropriate e.g. discuss model performance when simulating the cryosphere in the Cryosphere section. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-773	SPM	9	1	10	54	The section of climate models does not address the height dependence of the temperature trend in the troposphere, nor the height dependence in the stratosphere, both which are very important aspects for evaluation of the radiation budget [Government of Netherlands]
SPM-774	SPM	9	3	9	3	we suggest to delete 'to be' and replace 'improved' by 'improve' [Government of Belgium]
SPM-775	SPM	9	3	9	3	Reduce tautological statements in report e.g. state "Climate models have improved since the AR4" [Government of Ireland]
SPM-776	SPM	9	3	9	3	Is it certain that the models have been 'improved'? A less judgmental verb might be preferable, e.g. 'extended' or possibly 'enhanced'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-777	SPM	9	3	9	8	What are the unknown factors that are not included in the models but could trigger warming? For example, ocean bed methane, arctic bed methane, methane from east Siberian sea, etc., which policy makers should be worried about and which are not currently addressed by the models. [Government of India]
SPM-778	SPM	9	3	9	8	We would welcome the reason why before the mid-20th century confidence in climate models is below very high. Are the models performing worse, or is the quality of the observations less? This is really important, because this will determine the trust in the quality of the models. [Government of Netherlands]
SPM-779	SPM	9	3	9	17	In the shaded box climate models are assessed with very high confidence to reproduce the observed large-scale patterns and multi-decadal trends in surface temperature, while in the succeeding paragraph there is a statement that models do not generally reproduce the recent reduction in surface warming trend. Some adjustments will be needed to reconcile these apparently conflicting statements. [Government of Japan]
SPM-780	SPM	9	4	9	6	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-781	SPM	9	5	9	5	Suggest using "continental and global scales" in place of "large-scale". [Government of Canada]
SPM-782	SPM	9	6	9	6	"confidence is lower"; to what extent? [Government of Netherlands]
SPM-783	SPM	9	6	9	6	'confidence is lower...' is not the right phrase. It would be better / more correct to say something like "These models are less successful on sub-continental and smaller spatial scales, where regional models with more accurate representation of topographical features are needed." [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-784	SPM	9	7	9	7	"as well as" is ambiguous as used [Government of Ireland]
SPM-785	SPM	9	7	9	8	The sentence "Precipitation and sea ice cover are not simulated as well as surface temperature" is not clear. As figure SPM.7 indicates, all the mentioned variables are simulated. To avoid misunderstanding, we suggest changing the sentence to ""Simulated precipitation and sea ice cover are less consistent with observations than simulated surface temperature." [Government of Germany]
SPM-786	SPM	9	7	9	8	"Precipitation and sea ice cover are not simulated as well as surface temperature, but improvements have occurred since the AR4." It may be worth clarifying what improvements have been made since AR4. [Government of United States of America]
SPM-787	SPM	9	11	9	11	Replace "more rapid" with "observed" [Government of Ireland]
SPM-788	SPM	9	11	9	14	This para appears to be repeated later (pg. 11 para 1-6). Can you say that models typically don't represent internal variability well? This would help to explain the statement about why models are not capturing the reduced rate of warming and, as well as giving some evidence for the explanation for the reduce rate of warming. For example, models not initialised with the last 10 - 15 years can't be expected to get recent internal variability right. [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-789	SPM	9	11	9	15	It is stated that "models do not generally reproduce the observed reduction in surface warming trend over the last 10-15 years". It is a very important information for users of climate projections to explain (as outlined in Box 9.2), that climate models are not intended to match the timing of internal climate variability and natural external forcing on that time scale, since climate models are not initialised with current conditions (as are e.g. weather models). [Government of Switzerland]
SPM-790	SPM	9	11	9	17	We are concerned that the sentence about "models that do not generally reproduce the observed reduction in surface warming" might be incorrectly interpreted. Most models used for climate projections do not have initial conditions to "reproduce" short term climate variability. Is the capacity to provide and use those initial conditions sufficiently mature to require models to reproduce a temporary slowdown at the right time ? If models are able to produce "hiatus" periods, but generally not at the appropriate point in time, this should be clarified. [Government of Belgium]
SPM-791	SPM	9	11	9	17	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: This paragraph provides explanations for the difference between models and observations for the recent reduction in the warming trend without putting it into context. It must be clearly highlighted that a single period of 15 years is too short to make any statements about climate change and the quality of climate models. In addition, in the current version, the sentence about the difference between models and observations is difficult to understand and suggests that models are wrong. Using information from the Box TS.3, we suggest the following change starting in L12 after the first sentence: "There is very high confidence that models reproduce the more rapid warming in the second half of the 20th century, and the cooling immediately following large volcanic eruptions, consistent with observations despite the disagreement over the last 10-15 years. Due to internal climate variability, in any given 15-year period, the observed temperature trend sometimes lies near one or the other end of a model ensemble, an effect that is pronounced for the last 10-15 years since global mean surface temperature was influenced by a very strong El Niño event in 1998." [Government of Germany]
SPM-792	SPM	9	11	9	17	It is not surprising that climate models are not able to reproduce the natural variability of the climate system. We cannot speak about predictability of the climate system in classical sense: the initialized climate model runs have only few-year predictability, and even this will be lost in 1-5 years. After that climate model results can be used only as statistical description of the climate. Therefore, it is suggested to remove the paragraph. [Government of Hungary]
SPM-793	SPM	9	11	9	17	This statement is the most important in the whole of the SPM. The fact that the reduced trend of the last 17 years is not reproduced by the models needs to be explained. We presume a major process that is not exceedingly well modelled is the heat exchange between surface, intermediate depths and deep ocean. If we know what is wrong, we need to be explicit here. [Government of Netherlands]
SPM-794	SPM	9	11	9	17	The second sentence does not build up on the first sentence. The first sentence states that the models reproduce the more rapid warming, and cooling effects from volcanoes. Then in second sentence it says that they generally do not reproduce reduction in surface warming trend. This seems somehow contradictory. Please look at the phrasing and consider changes. It is stated in line 13 that the main cause for the differences between models and observations the last 15 years are unpredictable climate variability. Please consider to rephrase as we are not talking about prediction but about historical observations and model results. What is said about solar and volcanic activity somehow weakens the quantitative results stated on page 8. [Government of Norway]
SPM-795	SPM	9	11	9	17	The leading theory for this phenomenon appears to be heat transfer to the deep ocean, which is neither observed nor modeled well. While this cause may be embedded in the term "unpredictable climate variability", that phrase will be confusing to policymakers. Consider explicitly mentioning the role of the deep ocean here. As is, the paragraph focuses far too much on radiative forcing, when one could argue the focus should be on the heat content in the system. Furthermore, the phrase "in some models, from too strong a response to increasing greenhouse-gas forcing" is puzzling. Since the observed warming for the period in question is essentially nil, would not ANY model response to increasing GHG be too strong? [Government of United States of America]
SPM-796	SPM	9	11	9	17	There are several contradictory statements. Making the paragraph confusing to lay readers. It would be useful to have some statement here about how well models reproduce ocean heat uptake. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-797	SPM	9	11	9	40	Please provide confidence levels for all statements. [Government of Germany]
SPM-798	SPM	9	11	9	40	This section seems overly 'techy' and is less robust in its language than other parts of the report. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-799	SPM	9	12	9	13	The statement beginning with "Models do not generally..." is a bit of an overstatement as various models that have different foci have had better skill at reproducing the recent trends. Indeed, the observed surface temperature anomaly trend is still within the uncertainty ranges of the multi-model ensemble. As it is, the text propagates the misunderstanding that climate simulations are predictions (as opposed to projections). Important to be clear that these simulations are not expected to reproduce the timing of internal variability. [Government of United States of America]
SPM-800	SPM	9	12	9	16	"Models do not generally reproduce the observed reduction in surface warming trend over the last 10–15 years." is followed by what appears to be speculation re: "unpredictable climate variability". Yet, what of the fact that ocean heat uptake is 9/10 of the heating signal, seems noteworthy that the reduced trend of the last 10-15 years may also be due to enhanced ocean heat uptake. [Government of Denmark]
SPM-801	SPM	9	12	9	17	The warming of oceans has played a part in slowing surface warming trend over the last 10-15 years. [Government of Republic of Korea]
SPM-802	SPM	9	12			Models cannot be expected to reproduce it if it is caused by natural variability. [Government of Netherlands]

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SPM-803	SPM	9	12			Why not specifically mention Pinatubo and the IPCC prediction in AR1 special report that closely predicted the impact on global temps? [Government of United States of America]
SPM-804	SPM	9	13	9	13	"reduction in surface " is not needed. [Government of Ireland]
SPM-805	SPM	9	13	9	17	<p>This sentence give room for confusion about the cause of the difference between model and observations in the hiatus period. First, the word "substantial" implies that the main cause is unpredictable climate variability. This is further strengthened by the word "possible" concerning the solar and volcanic and aerosol forcing. But Figure 8.19 shows that the downward contribution to the RF trend is mainly from "volcano and solar forcings, with the latter dominating" (section 8.5.2 and stated in SPM-11, lines 3-4). Hence, if both processes are the main contributors, this suggests that internal variability plays a minor role. Further noting low confidence in the models' ability to represent aerosol forcing and processes (section 9.4.1.4.1), these findings contradicts with with unpredictable climate variability as the main or "substantial" contributor.</p> <p>Secondly, the meaning of the phrase "too strong a response to increasing greenhouse forcing" is unclear and is subject to misinterpretation. Is this due to uncertain aerosol abundance or inadequate description of the forcing by aerosols and/or greenhouse gases? It could easily be interpreted as a lack of knowledge about the fundamentals of radiative forcing.</p> <p>Given the wide attention to this period, it is very important that the SPM includes a concise and simple explanation of the difference between model and observations of the hiatus period. We would even suggest to devote a separate box to this issue, where both conclusions SPM-9, 11-17 and SPM-11, 1-6 can be incorporated. See our general comment.</p> <p>[Government of Netherlands]</p>
SPM-806	SPM	9	13			This statement is inaccurate. Models cannot produce observed change if not given proper forcings. This blanket statement is not justified as CMIP 5 simulations did not include recent forcings of solar irradiance and volcanoes, which have been shown to be important. Furthermore, to the extent that recent lack of cooling is due to internal variability, then models SHOULD not reproduce it. The present text is unfair to the models. [Government of United States of America]
SPM-807	SPM	9	15	9	15	What is meant here? Unpredictable or unpredicted? Or unpredictable with current models? Need to clarify/re-word to avoid confusion in interpretation [European Union]
SPM-808	SPM	9	15	9	15	"unpredicatble" is not needed. Explain " inadequacies" [Government of Ireland]
SPM-809	SPM	9	15	9	15	"unpredictable climate variability" might mislead readers that the model performance would be doubtful. It should be revised to uncertainties in data for external forcing (solar input, aerosol emissions, etc.). [Government of Japan]
SPM-810	SPM	9	15	9	16	The contribution could be also coming from uncertainty in "land use change" in addition to solar and aerosol forcings used by the models [Government of India]
SPM-811	SPM	9	15	9	17inadequacies in the solar, volcanic, ozone, and aerosol forcings used by the models.... [Government of Netherlands]
SPM-812	SPM	9	16	9	16	"from too strong a response" should be rephrased: "from a too strong response" [Government of Austria]
SPM-813	SPM	9	16	9	16	Quantify "too strong" as used in context of some models [Government of Ireland]
SPM-814	SPM	9	16	9	17	The possibility that "too strong a response to increasing greenhouse-gas forcing in some models" could have grave implications in the context of credibility of future climate projections, and warrants more carefully calibrated and consistent statement. If this finding is robust and well-grounded, it should be clarified what impact it could have on future projection results presented in this assessment report. [Government of Japan]
SPM-815	SPM	9	19	9	19	Shouldn't revise "has" to "have" and "improvement" to "improvements"? [Government of Japan]
SPM-816	SPM	9	19	9	19	"improvement" should be changed to "improvements" [Government of Vietnam]
SPM-817	SPM	9	19	9	21	Please add what can be done to improve the uncertainty in observations. [Government of Norway]
SPM-818	SPM	9	19	9	21	It would be great if policy makers could get a quantification of these uncertainties. Would a policy maker figure out that large scale is of larger scale than regional scale? "the assessment remains difficult" is a bit loose and confusing...difficult to what? [Government of United States of America]
SPM-819	SPM	9	19			suggest replacing "large" with "hemispheric", "global" or "continental" [Government of Denmark]
SPM-820	SPM	9	19			It is unclear what the large-scale patterns are where the models have improved as opposed to the regional scales where they have not. [Government of Netherlands]

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SPM-821	SPM	9	21			suggest to insert "significant observational uncertainties." or "moderate to high observational uncertainties." instead of "observational uncertainties.". Otherwise, can a more precise statement not be made? [Government of Denmark]
SPM-822	SPM	9	23	9	25	Climate models now include more cloud, aerosol, and ozone processes, and their interactions,... [Government of Netherlands]
SPM-823	SPM	9	23	9	25	The meaning of this sentence is not clear because it is poorly written. [Government of Switzerland]
SPM-824	SPM	9	23	9	25	This sentence might be interpreted in that the inclusion of those processes led to negative results (low confidence). Somehow it would need to be highlighted that the inclusion of clouds, etc, has led to more realistic simulations (or reliable) than in the AR4. Is this correct? The authors should consider adding text that explains how the confidence in the predicted responses of clouds to increasing GHG is low. [Government of United States of America]
SPM-825	SPM	9	27	9	29	This statement about 'robust evidence...of better simulation of an observed trend' is not the main point of interest. Furthermore, 'one-quarter of models showing a trend as large or larger than the trend in observations' is not an obvious metric by which to judge the accuracy of the models. A more obvious metric would be the proportion of models predicting observations within a given margin of error. The main point of interest is that models of sea ice extent are still not very good at simulating observed trends. I suggest making this the first point, with a secondary point that the accuracy of these models is improving, as demonstrated by an increased proportion simulating observations within a given margin of error. [Government of New Zealand]
SPM-826	SPM	9	27	9	31	While the trend noted here is better captured, it's not necessarily because the sea ice processes are better modeled. Therefore the phrase that the "downward trend in Arctic summer sea ice extent since 1979 is now better simulated" could be made more precise. Suggest rewording to say "the downward trend is reproduced by more models than at the time of the AR4"...etc. [Government of Canada]
SPM-827	SPM	9	27	9	31	This can be stated more concisely/clearly [Government of Ireland]
SPM-828	SPM	9	27	9	31	Explain better and in more detail why models simulate a small decreasing trend in Antarctic sea ice extent in contrast to observations? Is it because of the limitation of models ? Any change in future for better simulation ? [Government of Vietnam]
SPM-829	SPM	9	30	9	30	the word "small" seems to be subjective here, especially if speaking about a contradiction. Please, use adequate numbers to convince the reader that the 1.2 - 1.8 % per decade (page 5, line 31-32) is really small comparing to sg. (the first appearance of this word "small" in this respect is in page 4 line 43, but there it is not so irritating than here.) [Government of Hungary]
SPM-830	SPM	9	30	9	31	Change "decreasing trend" to "downward trend" and "increasing trend" to "upward trend" [Government of Netherlands]
SPM-831	SPM	9	33	9	33	The word "many" or "most" seems to be vague in its meaning, compared with the detailed definition of likelihood such as very likely (90-100%). How many is many? Define if it's possible. [Government of Republic of Korea]
SPM-832	SPM	9	33	9	33	Here, reference is made to observed upper-ocean heat content from 1960 to present, which is a longer period than what was used in the observations-related assessment in the SPM for the same variable (see page 4, lines 24-25). Discrepancy? [Government of Sweden]
SPM-833	SPM	9	33	9	33	Should the actual depth range for 'upper-ocean heat content' be specified here as well, for clarity, rather than it being assumed? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-834	SPM	9	33	9	35	Reproduction of observed changes as described in the underlying chapter seems to range from 1960 to 2005, not 1960 to present as noted in this summary point. Suggest reviewing and clarifying as needed. [Government of Canada]
SPM-835	SPM	9	33	9	35	In the main text the same statement starts with "there is high confidence that". [Government of Netherlands]
SPM-836	SPM	9	33			"Many models" seems too vague a phrase. Could this be stated as a percentage of the available models? [Government of United States of America]
SPM-837	SPM	9	37	9	37	"the majority"; in the main text it is "two thirds", which is more specific. [Government of Netherlands]
SPM-838	SPM	9	37	9	37	The English is weak here. Shouldn't it read: "the sizes of the simulated global..." [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-839	SPM	9	37	9	38	Please add Figures 9.26 and 9.27 for the reference. [Government of Netherlands]
SPM-840	SPM	9	38	9	40	The underlying Ch 9.4.5 reports "... high confidence that CMIP5 ESMs can simulate the global-mean land and ocean carbon sinks within the range of observation-based estimates." However, two regions with model deficiencies in simulating the terrestrial carbon cycle when using inverse methods are mentioned, the northern mid latitudes and the tropics, see Ch 9 P 47: "With few exceptions, the CMIP5 ESMs also reproduce the large-scale pattern of ocean-atmosphere CO2 fluxes, with uptake in the Southern Ocean and northern mid-latitudes, and outgassing in the tropics. However, the geographical pattern of simulated land-atmosphere fluxes agrees much less well with inversion estimates, which suggest a larger sink in the northern mid-latitudes, and a net source rather than a sink in the tropics." It is not clear, why only one and especially one specific region has been raised (in an unprecise way, it's northern mid latitudes not the northern hemisphere) up to the SPM level. More information e.g. that this may be related to " the failure to correctly simulate nitrogen fertilization in the mid latitudes, and a rudimentary treatment of the net CO2

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						emissions arising from land-use change and forest regrowth" (Ch 9.4.5) would be needed. In addition, it is unclear, why "high confidence" is associated with the simulation of carbon sinks, given this disagreement. [Government of Germany]
SPM-841	SPM	9	38	9	40	Not all models, this is specific to the EMICs. [Government of Netherlands]
SPM-842	SPM	9	38	9	40	One could argue to include the tropics too for which strong conclusions are made in the main text, rather than just the Northern Hemisphere. If SPM conclusions become region specific, it should mention all relevant regions to be balanced, or it should make clear why certain regions stand out, or it should not mention regions at all. [Government of Netherlands]
SPM-843	SPM	9	39	9	39	A quantification of systematic underestimation should be provided [Government of Ireland]
SPM-844	SPM	9	39	9	39	By how much do models systematically underestimate the Northern Hemisphere land sink ? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-845	SPM	9	43	10	18	The current text is pretty clear and is supported by Austria. [Government of Austria]
SPM-846	SPM	9	43	10	18	The high uncertainty on cirrus, possible (regional) cirrus trends and other cirrus feedback mechanisms is completely neglected in this section. The inability of climate models to simulate (potential) cirrus (changes) and the subsequent uncertainties should be mentioned [Government of Netherlands]
SPM-847	SPM	9	45	9	45	Check writing. This sentence needs to be rewritten to make it understandable [Government of Switzerland]
SPM-848	SPM	9	45	9	47	This sentence is somewhat difficult to read; could you consider rephrasing to provide more clarity? [Government of Belgium]
SPM-849	SPM	9	45	9	47	Sentences may be simplified by redrafting [Government of India]
SPM-850	SPM	9	45	9	47	This sentence is too hard to understand, please consider rephrasing. [Government of Norway]
SPM-851	SPM	9	45	9	47	This statement contains too much jargon that will not be understood by the typical policy maker. [Government of United States of America]
SPM-852	SPM	9	45	9	48	This shaded, key finding box is too technical - it should be revised to focus on high-level overarching conclusions for policy-makers. Suggest this box be rewritten to start with an explanation of how climate forcers perturb the Earth's energy budget by altering the amount of energy coming in to the system or leaving, and then explain how estimating these changes in RF, as well as changes in heat content of the atmosphere and ocean, and resulting warming, can allow an estimation of the energy budget. The box could conclude with the existing last sentence that the budget can now be balanced. We do not recommend introducing the concept of equilibrium climate sensitivity (ECS) in this box. [Government of Canada]
SPM-853	SPM	9	45	9	48	A stronger statement is possible based on the subsequent material in this section [Government of Ireland]
SPM-854	SPM	9	45	9	48	This paragraph is too technical for the SPM. It has too much technical language and is unclear. What does it mean? (Observed warming and changes in radiative forcing are consistent with what we would expect if they were human caused?) [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-855	SPM	9	45	10	19	This section is not well written. A more general comment is that later in the SPM discussion of future projections sometimes is about RCPs, sometimes ECS or TCR, sometimes pgC and sometimes a particular level of atmospheric CO2 and it's not clear how the different quantities compare to each other, maybe a technical box, or expansion of box SPM1? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-856	SPM	9	46	9	47	"Is consistent with the assessed likely range of equilibrium climate sensitivity to within assessed uncertainties" This is incomprehensible and should be rewritten. [Government of Switzerland]
SPM-857	SPM	9	47	9	47	"... range of the equilibrium climate sensitivity to within assessed uncertainties" - this is technical jargon not accessible to policy makers and other lay readers. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-858	SPM	9	47	9	48	The qualifier of "high confidence" is not mentioned in Box 13.1 It is stated that there is strong evidence for our understanding of anthropogenic climate change. [Government of Netherlands]
SPM-859	SPM	9	52	9	52	"extremely likely". What is meant here? Shouldn't this be "virtually certain", i.e., 99 to 100% probability. [Government of Switzerland]
SPM-860	SPM	9	52	9	53	This finding seems inaccurate - or at least phrased in a confusing manner. The statement as written is incorrect. If you mean the entire collection of clouds state that "all cloud types combined". Perhaps the intent could be more clearly relayed through this phrasing: "The response from all types of clouds combined to a warmer world (i.e., one with more greenhouse gases in the atmosphere) would be a net positive RF. The reason for this is because more of the H2O in the atmosphere would be present as water vapor as opposed to cloud liquid water and, therefore, there would be less of a negative RF from all cloud types combined. Thus, the net radiative forcing from this cloud feedback - accounting for all cloud types - is likely to be positive." [Government of United States of America]
SPM-861	SPM	9	54	9	54	Please consider to rephrase "continuing uncertainty" as it is hard to understand what is meant [Government of Norway]

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SPM-862	SPM	9				particularly the section on evaluation of climate models requires a more balanced view on what we know and what we don't know [Government of Netherlands]
SPM-863	SPM	10	1	10	3	Clarify for policymakers what is meant by ECS. If TCR is "on a decadal to century timescale", over what order of magnitude of years are we talking when we define ECS as "the change in global mean surface temperature at equilibrium..." [Government of United States of America]
SPM-864	SPM	10	1	10	7	We note the revised lower boundary for ECS in the SPM of 1.5 degrees Celcius, from 2 degrees Celcius in the SOD, and that this revision reflects new science captured in Chapter 12, Box 12.2 (and Box 12.2 Figure 1). In the SOD SPM authors reported a best estimate of ECS of around 3 degrees C. We note that there is no best estimate reported in this final draft SPM, however it would be helpful if there were a revised best estimate of ECS in the final SPM which reflects the revised assessment. [Government of Australia]
SPM-865	SPM	10	1	10	7	On line 6, "reflecting the evidence from new studies" is unclear. "Evidence" suggests that there are new "facts". Please consider "reflecting the estimates from some new studies" - this seems to better reflect the current situation. In addition, if scientifically correct, we would suggest to add something like the following: " This does not mean that the assessment of climate sensitivity is lower than indicated in AR4, but that the uncertainty currently appears slightly larger, when taking into account the diversity of results in the literature." [Government of Belgium]
SPM-866	SPM	10	1	10	7	It is suggested to add "it is not a projection but is a measure of the climate system response to sustained radiative forcing" after "It is defined as change in global mean surface temperature at equilibrium that is caused by a doubling of the atmospheric CO2 concentration" to note that the temperature change calculated by ECS is not a result projected by climate system models in order to avoid confusing policymakers. [Government of China]
SPM-867	SPM	10	1	10	7	The description below *** is quite proper. This should be maintained. However, other WGs (2 and 3) draft reports are based on the probability distribution function of AR4 (Rogelj et al.) ECS when discuss whether 2 °C is likely or very likely etc even though best estimate issue has been removed from AR5.If AR5 does not bring up PDF, these 2°C descriptions should be consistent through all WGs or notes show that these are based on AR4 base. Also, some sort of statement would be helpful regarding why the best estimate is not mentioned explicitly in AR5. ***** The equilibrium climate sensitivity (ECS) quantifies the response of the climate system to constant radiative forcing. It is defined as change in global mean surface temperature at equilibrium that is caused by a doubling of the atmospheric CO2 concentration. ECS is likely in the range 1.5°C to 4.5°C (high confidence), extremely unlikely less than 1°C (high confidence), and very unlikely greater than 6°C (medium confidence). The lower limit of the assessed likely range is thus less than the 2°C in the AR4, reflecting the evidence from new studies of observed temperature change using the extended records in atmosphere and ocean. {Box 12.2} [Government of Japan]
SPM-868	SPM	10	1	10	7	This section requires a statement on whether the mean ECS changed or not [Government of Netherlands]
SPM-869	SPM	10	1	10	7	Is the AR4 "best estimate" (of "about 3deg") unchanged? If there is a best estimate, please provide here. [Government of Sweden]
SPM-870	SPM	10	1	10	7	The wording here seems to be putting undue emphasis on the AR5 lower limit being slightly less than the AR4 limit. The wording could be changed to something like: "The lower limit of the assessed likely range is thus slightly less than that in the AR4, but consistent with earlier Assessment Reports [FAR, SAR, TAR]..." This will de-emphasize this modest difference, and not confuse the message. Furthermore, the estimated central tendency - 3 deg C from the SOD - should be restored. [Government of United States of America]
SPM-871	SPM	10	1	10	7	ECS is a key issue of concern to policy. This para gives a significant change in the ECS which does not seem to be supported by the evidence given in other chapters (why has it changed since the earlier drafts?). The SPM should provide a far clearer picture of the evidence supporting this change (e.g. how many studies - vs. the rest of the evidence on 2 - 4.5), the robustness of this evidence, and importantly, the implications for policy (e.g. in terms of policy relevant factors such as the risk of exceeding 2 degree warming). It would benefit from an explanation of the different methods used to make estimates of the climate sensitivity. Also, why are best estimates of the climate sensitivity not included? Is undue weight being given to the more recent estimates of low climate sensitivity values based at least partly on short time series of observations? What policy-makers and others want to know is whether climate change is less of a threat than before and care should be taken not to give a misleading impression concerning risk reduction. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-872	SPM	10	1	10	13	The difference between equilibrium and transient simulations is probably interesting, but it should be explained why this important to a policy maker. Is it necessary to know that equilibrium is clearer about the model sensitivity? [European Union]
SPM-873	SPM	10	1	10	18	Please give best estimate values for ECS. These three bullet points describe very well the ECS, TCR and TCRE. However, it is not very clear why these three responses are important to quantify - what do they illustrate? What do these contribute to? Please consider to link the results to current emisisions and temperature respons. [Government of Norway]
SPM-874	SPM	10	1	10	18	In a previous draft of AR5, the climate sensitivity was unchanged from AR4. In this version of the SPM, the lower end of ECS and the higher end of TCR are adjusted downward. A recent assessment of climate sensitivity studies by the UK MetOffice question the recent studies using the extended temperature records, especially the

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						one by Otto et al in Nature Geoscience (2013) saying that the lower bound of ESC reported here seems at odds with the fundamental physics of climate sensitivity. Since AR4 a number of paleoclimate studies have concluded that ECS is between 2.2°C and 4.8°C (Rohling Nature 2012). It would be helpful for the governments if the authors at the working group session could explain the reasoning behind the given estimates of the ESC based on the up-to-date science. [Government of Norway]
SPM-875	SPM	10	1	10	18	In the discussion of ECS and TCR, it seems imprudent to weigh the instrumental record so heavily for ECS when it appears as though it receives little - if any - weight in the estimates of TCR. Looking at Box 12.2, Figures 1 and 2 (which these 3 bullets are based on) supports this concern. [Government of United States of America]
SPM-876	SPM	10	1			Mention which factors are held constant for the ECS calculation (ice sheets, vegetation, ...?). [Government of Netherlands]
SPM-877	SPM	10	2	10	2	Change "as change in" to "as the change in". [Government of Netherlands]
SPM-878	SPM	10	3	10	3	Suggest a slight revision to this text to convey that the doubled CO2 level is maintained over time to be consistent with lines 1-2, which say that ECS is a response to constant RF. [Government of Canada]
SPM-879	SPM	10	3	10	3	"doubling in the atmospheric CO2 concentrations", compared to when? Please indicate if it is pre-industrial. [Government of Norway]
SPM-880	SPM	10	3	10	4	The confidence assigned to these is inconsistent with the confidence stated in Box 12.2: here the range of 1.5-4.5C is stated with high confidence, but in Box 12.2, this range is given with medium confidence. Moreover, the extremely unlikely ECS of less than 1C is stated with high confidence in the SPM, but has no confidence with it in Box 12.2. These differences need to be reconciled. [Government of United States of America]
SPM-881	SPM	10	3	10	5	The phrase "extremely unlikely less than 1°C (high confidence)," suffers from cognitive dissonance. I suggest the following restructuring that reduces run-on sentences. "ECS is likely in the range 1.5°C to 4.5°C 3 (high confidence). There is high confidence that an ECS less than 1°C is extremely unlikely. There is medium confidence that the ECS is greater than 4 6°C. [Government of Denmark]
SPM-882	SPM	10	3	10	5	It is a bit strange that the certainty in ECS suddenly changes from extremely unlikely < 1 degrees to likely >1.5 degrees [Government of Netherlands]
SPM-883	SPM	10	3	10	5	To be consistent, the ECS should be stated as "mean [90% certainty range]". At the very least, there should be an explanation as to why a best estimate for ECS is not given - which is a break from previous practice in WG1 SPMs. [Government of United States of America]
SPM-884	SPM	10	3	10	7	<p>THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The FGD of WGI states "ECS is likely in the range 1.5°C to 4.5°C (high confidence), extremely unlikely less than 1°C (high confidence), and very unlikely greater than 6°C (medium confidence). The lower limit of the assessed likely range is thus less than the 2°C in the AR4, reflecting the evidence from new studies of observed temperature change using the extended records in atmosphere and ocean." The SOD made a different assessment: "Equilibrium climate sensitivity is likely in the range 2°C–4.5°C, and very likely above 1.5°C. The most likely value is near 3°C. Equilibrium climate sensitivity greater than about 6°C–7°C is very unlikely."</p> <p>We are surprised by these significant changes, and even more that they are in part associated with high confidence. The "new studies" mentioned in the second sentence of the FGD are based on extremely recent work, so that some papers could not be considered for the SOD as they have not been available at that time. While it is appreciated that the latest research is included in the IPCC assessment, the rapid modification of very important statements seems inappropriate (and did not undergo the mandatory review process) given the fact that at least one of the new studies referred to in Ch 12 (Otto, A., et al., 2013: Energy budget constraints on climate response. Nature Geoscience, published online:19 May 2013) mentions the preliminary nature of their work: "We note, too, that caution is required in interpreting notes that they are using very recent data, for which "which details of forcing and energy storage inventories are still relatively unsettled: both could make significant changes to the energy budget. The estimates of the effective radiative forcing by aerosols in particular vary strongly between model-based studies and satellite data. The satellite data are still subject to biases and provide only relatively weak constraints." In addition, TFE.6 in the TS P55 states: "Estimates based on AOGCMs and feedback analysis indicate a range of 2 to 4.5°C, with the CMIP5 model mean at 3.2°C, similar to CMIP3."</p> <p>Based on these reasons, the recent modification of the ECS does not seem appropriate and we request to return to the assessment of the SOD or alternatively to provide additional strong qualifiers in regard to the preliminary nature of the recent work. [Government of Germany]</p>
SPM-885	SPM	10	3	10	7	The range of equilibrium climate sensitivity in AR5 is revised from that in AR4. It is, therefore, recommended that AR5 includes some statements about what impact it could have on future projection results presented in this assessment report. Especially, it is important to add such statement on the new finding that the lower temperature of 'likely range' is decreased from 2 to 1.5 °C. [Government of Japan]
SPM-886	SPM	10	3	10	13	On equilibrium climate sensitivity, and to some extent, also transient climate response: the justification for lowering the lower bound of the ECS is not entirely clear. The new lower bound seems to be the result of a small number of very recent studies which are based on the instrumental records and therefore include the influence of the recent slowing in the temperature trend. However, other studies have indicated much higher climate sensitivities and some have discussed the problems associated with including the temperature trend over the past decade. How was it decided that the lower bound should be reduced? Also, a central estimate should be included as this is vital for future modelling work such as that included in WGIII. On this last point, isn't there now some inconsistency between the new range

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						given (1.5 to 4.5K) and the temperature response for the RCPs shown in the WGIII report? [European Union]
SPM-887	SPM	10	5	10	6	Suggest that the phrase stating "The lower limit of the assessed likely range is thus less than the 2°C in the AR4" be slightly revised to be more clear and explicit. Suggest "The lower limit of the assessed likely range is thus less than the lower limit of 2°C that was reported in the AR4. This reflects..." [Government of Canada]
SPM-888	SPM	10	5	10	7	Does this statement mean that it is based on observations over the past ~10 years? Or does it mean that paleo-records published over the past ~10 years? Or is it both? If it is, indeed, the former (purely on observations), it seems quite imprudent to redefine the range of ECS - which, by definition, is a metric based on far more than ~10 years of plateaued temperatures. "extended records" is ambiguous. It could mean (1) very long records; or (2) records that have been newly extended by the addition of new observations. It is ESSENTIAL that this be clarified, because interpretation #1 means that the change is NOT based on "the hiatus," whereas interpretation # 2 means the opposite. The authors should very clearly explain the basis for this change. [Government of United States of America]
SPM-889	SPM	10	6	10	33	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-890	SPM	10	6		7	If the sentence on lines 6-7 is meant to refer to paleoclimate records, suggest it would be clearer to say so, than refer to "extended records". Suggest the last line read: "...reflecting the evidence from newer studies of temperature fluctuations in the distant in both the atmosphere and ocean" (or something to that effect). [Government of Canada]
SPM-891	SPM	10	9	10	13	The added value for policymakers of this text is not clear. What are the message? [Government of Ireland]
SPM-892	SPM	10	9	10	13	It would be helpful to have a statement on what the change is with respect to AR4 [Government of Netherlands]
SPM-893	SPM	10	9	10	13	To be consistent, the TCR should be stated as "mean [90% certainty range]". At the very least, there should be an explanation as to why a best estimate for TCR is not given - which is a break from previous practice in WG1 SPMs. [Government of United States of America]
SPM-894	SPM	10	9	10	13	The definition of TCR is unclear. What is meant by 'on a decadal to century timescale' ? Re. 'concentration increasing at 1% per year': 1% of what? Also, no best estimate of the TCR is given. Please be clearer about the relevance of the TCR and how this differs from ECS - this is an issue of considerable confusion in the lay communities, for example, what is the significance of 1% per year and how long would this take to occur given current concentrations? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-895	SPM	10	9	10	18	These two paragraphs are overly technical for a policy audience. It is confusing to discuss both TCR and TCRE? Since TCR, as defined, is linked to an idealized situation, we would suggest focusing on TCRE and deleting text related to TCR. TCRE is a new concept from the AR4, and is essential information for policymakers, directly linking emissions to changes in global average temperature. [Government of Canada]
SPM-896	SPM	10	9	10	18	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The time scales related to the TCR and to the TCRE are very different. While TCR refers to the time of doubling of CO2, TCRE is not related to a specific time and applies for much longer time scales. Ch 12 P75 states: "This metric is useful to determine the allowed cumulative carbon emissions for stabilization at a specific global temperature." Please clarify this difference in time scales. To avoid confusion, it is suggested to omit the word transient for the TCRE and to call it simply "Climate Response to Emissions - CRE" throughout the report. [Government of Germany]
SPM-897	SPM	10	12	10	13	It is a bit strange that the certainty in TCR suddenly changes from extremely unlikely > 3 to likely <2.5 degrees [Government of Netherlands]
SPM-898	SPM	10	12	10	13	Shouldn't a comparison be made with the AR4 estimate of TCR, as has been done for ECS? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-899	SPM	10	15	10	15	It is essential to note that the definition of TCRE ignores non CO2 forcings, as explained at the end of BOX 12.2. The fact that the range of TCRE provided here is not applicable to scenarios including non-CO2 forcings is also visible (but not explained) on figure SPM.9, which shows that the full RCP range extends above the top of the TCRE range provided here, while the bottom of the range is much too low for scenarios that includes non-CO2 gasses. For clarity, it could also be explained that TCRE is a rough approximation, that might give an idea regarding temperatures up to a certain time horizon, but cannot replace a more detailed assessment of the consequences of a given emission scenario. [Government of Belgium]
SPM-900	SPM	10	15	10	18	Because the concept of TCRE is new and significantly affects mitigation policy discussion, uncertainties, such as airborne fraction and climate sensitivity, should be explicitly mentioned. In particular, a care should be given for consistency with models' systematic underestimate of the Northern Hemisphere land carbon sink (P9, L38), some models' over (strong) response to increasing greenhouse-gas forcing (P9, L16), and a possible deviation of multi-model results, shown in Figure SPM.9, from a relationship between observed temperature anomalies (P3, L20) and cumulative emissions estimate during 1850-2011 (Figure SPM.9). [Government of Japan]
SPM-901	SPM	10	15	10	18	Given that we've observed 0.9C warming with the cumulative 500Pg humanity has emitted to date, it seems needs be reconsidered and potentially re-stated. [Government of United States of America]
SPM-902	SPM	10	15	10	18	Using 'cumulative' and 'emitted' in the same sentence causes confusion. Suggest replacing 'emitted' by 'added'. [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-903	SPM	10	16	10	16	For a better understanding we propose adding the following sentence from Ch 12: "This metric is useful to determine the allowed cumulative carbon emissions for stabilization at a specific global temperature." [Government of Germany]
SPM-904	SPM	10	16	10	16	The range given for the TCRE is not entirely based on model simulations, as it is different from the 1%CO2 runs given in Figure SPM.9. Therefore, information on how the "TCRE assessment" mentioned in Figure SPM.9 has been obtained must be added in line 16. Please start the sentence as follows: "Based on multiple lines of evidence including climate model runs, TCRE is likely in the range of..." [Government of Germany]
SPM-905	SPM	10	16	10	17	Would it be possible to provide a bess guess? [Government of Germany]
SPM-906	SPM	10	16	10	18	The reference to figure SPM.9 appears before SPM.5. Please consider re-ordering. [Government of Belgium]
SPM-907	SPM	10	16	10	18	How is statement compatible with data on observed warming and estimated emissions since pre-industrail times (next sections) [Government of Ireland]
SPM-908	SPM	10	17	10	17	Please conform to the glossary definition of TRCE, which is "per unit cumulated CO2 emissions", since you also include the units in the next sentence (there is no need to have it twice). Could you also consider a caveat to clarify that this is an approximation, since global warming does not depends on CO2 emissions only, and some emissions have short life times that cannot be considered in TRCE ? [Government of Belgium]
SPM-909	SPM	10	18	10	18	This is jargon, not accessible to lay persons. What is meant by 'until the time temperatures peak'? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-910	SPM	10	21	11	54	The analysis must carried out taking into account data from 1850s to current times. The analysis must carried out taking into account data from 1850s to current times. The analysis taking the following wording: it is likely and it is very likely, low confidence and high confidence, is not appropriate for policy making. [Government of Bolivia]
SPM-911	SPM	10	21	11	54	In the whole chapter "Detection and Attribution of Climate Change" we miss a statement about the contribution of anthropogenic forcing to changes in extremes. But, obviously there has been progress in the last years, as we can read in 10.6.1.1.: "These new studies show that there is stronger evidence for anthropogenic forcing on changes in extreme temperatures than at the time of the SREX assessment. New evidence since SREX includes the separation of the influence of anthropogenic forcings from that of natural forcings on extreme daily temperatures at the global scale and to some extent at continental and sub-continental scales in some regions. These new results suggest more clearly the role of anthropogenic forcing on temperature extremes compared to results at the time of the SREX assessment. We assess that it is very likely that human influence has contributed to the observed changes in the frequency and intensity of daily temperature extremes on the global scale since the mid-20th century." We recommend putting at least the last sentence of this citation from 10.6.1.1. into the SPM. [Government of Germany]
SPM-912	SPM	10	21	11	54	Statements in the section "Detection and Attribution of Climate Change" are focused on whether or to what extent anthropogenic factors have contributed to observed changes in climate system components. What also matters and deserves mentioning in the context of attribution studies is whether or to what extent other possible factors could or could not explain those changes. [Government of Japan]
SPM-913	SPM	10	21	11	54	Compared to AR4 the agreement between modelled and observed SST in the early 20th century has much improved. Since in scientific and public debates the disagreement between obs and model in this time frame has received a lot of attention, a remark about the reason of the improvement of the agreement would be welcome in this section [Government of Netherlands]
SPM-914	SPM	10	21	11	54	Section Detection and Attribution of Climate Change: (1) No information about climate extremes is provided except in the summary paragraph mentioning "changed some climate extremes" in page 10 line 25. Given the importance of climate extremes in the context of climate change impact and adaptation, it needs to be considered to add a paragraph or two summarizing key detection and attribution findings on (at least) temperature and precipitation extremes with citation of Table SPM.1. (2) It would be suggested to highlight some important detection and attribution statements with pointing out new evidences or major improvement compared to conclusions of AR4 or SREX. [Government of Republic of Korea]
SPM-915	SPM	10	23	10	23	'caused more than half' is vague and weaker than in the AR4. What is the other half caused by? The numbers in lines 45-46 of the same page give an upper limit of 0.2°C for the effects of natural forcing plus internal variability leaving 0.4°C of the observed 0.6°C increase to human causes. This suggests that human influence caused at least 2/3 of the observed warming over this period. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-916	SPM	10	23	10	24	Can the words "more than half" be strengthened or made more precise? This text does not seem consistent with the graphs in Fig SPM.5 or the text on p.10 lines 45-46, which show the contribution of natural forcing alone as being much smaller. [Government of Canada]
SPM-917	SPM	10	23	10	24	In the formulation "It is extremely likely that human influence on climate caused more than half of the observed increase in global average surface temperature from 1951–2010.", "from 1951–2010" is put at the end, which fails to indicate that "human influence" refers to that since 1750. It is suggested to reformulate it as "More than half of the observed increase in global average surface temperature from 1951–2010 is extremely likely caused by human activities since 1750." [Government of China]
SPM-918	SPM	10	23	10	24	Please replace "from 1951-2010" by "since 1951". As it stands now, it is mistakable, the reader could believe that the influence has stopped. "Since 1951" is also used in table SPM.1 [Government of Germany]

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SPM-919	SPM	10	23	10	24	It looks rather unclear what "human influence on climate" in line 23 and "this" in line 24 represent respectively. Clearer wording would be suggested for both, for example, replacing "human influence on climate" by "human-induced increase in greenhouse gases" and "this" by "this human influence". [Government of Republic of Korea]
SPM-920	SPM	10	23	10	26	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-921	SPM	10	23	10	26	This statement implies that nearly half of the observed increase in average surface temperature (1951-2010), has been due to natural forcings. This seems to be contradictory to the point below (lines 41-48, although we note the different confidence levels), which highlights that greenhouse gases have contributed the most to the increase in warming. Instead of using 'more than half', would 'most' provide a clearer message? Refer to Chapter 10, pg 18, Section 10.3.1.1.3. [Government of Australia]
SPM-922	SPM	10	23	10	26	The two time periods – "1951-2010" and "the second half of the 20th century" – appearing in this paragraph do not agree with Figure SPM.5 where the time period for the attribution analysis is 1951-2005. To be strict in expression, it is suggested to reconcile temporal representations in the figure and the text. [Government of China]
SPM-923	SPM	10	23	10	26	<p>THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The SPM of WGI AR4 states: "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." The current draft of the WGI FGD reads: "It is extremely likely that human influence on climate caused more than half of the observed increase in global average surface temperature from 1951–2010." While the likelihood of the attribution statement has increased from AR4 to AR5, the attribution statement itself has also changed in an ambiguous way (most vs. more than half, and increase in anthropogenic GHG concentration vs. human influence).</p> <p>In particular, the expression "more than half" in AR5 vs. "most of" in AR4 is unclear, even more so when translated into other languages. "more than half" can mean anything between 50 and 100%, "most of" points to something larger than 66% to our understanding. If the authors mean that evidence is higher in AR5, a different expression should be used.</p> <p>The text on P10 L41-47 is much clearer: "The observed warming since 1951 can be attributed to the different natural and anthropogenic drivers and their contributions can now be quantified. Greenhouse gases contributed a global mean surface warming likely to be in the range of 0.5°C to 1.3 °C over the period 1951–2010, with the contributions from other anthropogenic forcings, including the cooling effect of aerosols, likely to be in the range of –0.6°C to 0.1 °C. The contributions from natural forcings are likely to be in the range of –0.1°C to 0.1 °C, and from internal variability likely to be in the range of –0.1°C to 0.1°C. Together these assessed contributions are consistent with the observed warming of approximately 0.6°C over this period." While the current formulation could create the wrong understanding of lay persons that up to half of the observed increase in temperatures is non-human induced, the actual facts point towards a much lower likely share of natural contributions compared to human influence.</p> <p>Based on the more explicit text on page 10, we suggest changing the statement as follows: "It is extremely likely that the net human influence on climate (including cooling influences) caused more than half of the observed increase in global average surface temperature from 1951–2010. It is likely that anthropogenic greenhouse gases alone would have induced almost all or up to approximately twice the observed warming over 1951-2010." [Government of Germany]</p>
SPM-924	SPM	10	23	10	26	The first sentence in the box says that human influence on climate caused warming from 1951-2010, while the second sentence refers to climate changes in the latter half of the 20th century. The discrepancy in the referred period between the two sentences needs to be explained. [Government of Japan]
SPM-925	SPM	10	23	10	26	Please consider to include to what extent human influence has changed ocean acidification in this key finding. [Government of Norway]
SPM-926	SPM	10	23	10	26	How does this assessment relate to/compare with the AR4's "most of the observed increase... very likely...". Stronger/similar/weaker? [Government of Sweden]
SPM-927	SPM	10	23	10	47	In lines 41-47 the case is made that virtually all of the warming since 1951 is attributed to greenhouse gases, but the statement on line 23 indicates only >50%. The two paragraphs are either incomplete or inconsistent. That is, one could make the case, although there is no evidence cited, that up to 50% of the warming since 1950 is due to natural variability or some other unknown factor. There is no discussion that natural variability could have caused up to 0.3C (up to 49%) warming since 1951. In fact, many natural mechanisms have been ruled out as contributors on this magnitude. [Government of United States of America]
SPM-928	SPM	10	24	10	24	It is not clear to what the word 'this' is referring to: is it human influence or is it the increase in global average surface temperature? Please clarify. [Government of Belgium]
SPM-929	SPM	10	24			suggest to be more explicit using "human activity" instead of "this" [Government of Denmark]
SPM-930	SPM	10	24			The connection made by "this has" is for us important but is rarely made in the underlying justification in chapter 10. [Government of Netherlands]
SPM-931	SPM	10	30	10	38	The reference periods for anomalies of temperature and ocean heat content are not indicated. [Government of Japan]
SPM-932	SPM	10	32	10	32	"ocean heat uptake" should be "ocean heat content". [Government of Netherlands]

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SPM-933	SPM	10	35	10	36	Figure SPM.5; there doesn't seem to be any dashed lines in the sea ice panels [Government of Sweden]
SPM-934	SPM	10	36	10	36	Figure caption SPM.5: CMIP5 is mentioned for the first time and needs to be explained. But take into account our previous remark 26. [Government of Switzerland]
SPM-935	SPM	10	37	10	37	The information given in footnote nr. 9 is too detailed for the SPM. It is sufficient if this kind of information is documented in the underlying chapter. [Government of Netherlands]
SPM-936	SPM	10	41	10	45	For consistency with other parts of the SPM, it would be useful to be able to put the results for 1951 onwards into a longer term context by including a statement about the contribution of human activities to warming over the 20th century, or since pre-industrial. Currently, the impression on readers is that there has only been a human influence from 1951 on. [Government of Canada]
SPM-937	SPM	10	41	10	45	The range of attributed warming from GHGs (0.5 degrees C to 1.3 degrees C) is larger than the range given for aerosols (-0.6 to 0.1 degrees C) which will suggest to readers that there is greater uncertainty about the contribution from GHGs. This contradicts messages in the SPM and in Fig SPM.4 that there is much higher confidence and lower uncertainty about RF from GHGs than aerosols. Suggest revising the text to avoid the misinterpretation that there is a lot of uncertainty about the contribution of GHGs to observed warming [Government of Canada]
SPM-938	SPM	10	41	10	45	Please split this sentence into two sentences for an increased comprehensibility. [Government of Germany]
SPM-939	SPM	10	41	10	47	This paragraph seems to be in contradiction to line 23-24, stating that "It is extremely likely that human influence caused more than half of the observed increase in global average surface temperature from 1951-2010". In line 42-45, the combined anthropogen forcing for 1951-2010 is estimated to 0,5 to 1,3 plus -0,6 to 0,1 = -0,1 to 1,4 grader C. While - 0,2 to + 0,2 grader C comes from natural forcings plus internal variability. This seemst to indicate that almost all increase in global surface temperature is coming from anthropogenic forcings. Please consider modifying the sentence highlighted on line 23. [Government of Norway]
SPM-940	SPM	10	41	10	47	To be consistent with the rest of the SPM (and relay the information most clearly), these warmings should be stated as "mean [90% certainty range]". [Government of United States of America]
SPM-941	SPM	10	41	10	47	Why aren't best estimates of warming contributions included? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-942	SPM	10	41	10	48	It is unclear if ozone depletion / CFC forcings are included in other anthropogenic forcings, in GHGs, or partly in both (i.e. CFCs warming in GHGs; stratospheric ozone in other forcings) [Government of Netherlands]
SPM-943	SPM	10	41	11	54	Please include a separate bullet point about the detection and attribution related to ocean acidification and if possible also oxygen depletion. Rationale: This is new findings in this report. Although ocean acidification and oxygen depletion are not part of the climate system per se, they are physical consequences of the anthropogenic increase of CO2 in the atmosphere, and these consequences will affect marine life and ecosystems severely. [Government of Norway]
SPM-944	SPM	10	42	10	42	Suggest inserting "Anthropogenic" before "greenhouse gases" for clarity. [Government of Canada]
SPM-945	SPM	10	42	10	42	Please add the word "anthropogenic" as greenhouse gases that contributed to the recent warming are human-made: "Anthropogenic greenhouse gases contributed a global mean ..." [Government of Germany]
SPM-946	SPM	10	42	10	42	It would be helpful if in the SPM could be indicated what is meant by "greenhouse gases" since this phrase is used many times e.g. which gases and whether it includes removal by sinks. Such a description could be given at page 7 line 13-20. [Government of Norway]
SPM-947	SPM	10	45	10	45	The text refers to an aerosol cooling effect, yet cites a range for that effect which at the upper end is actually a warming. Suggest that the text be rephrased to make the words consistent with the numbers (i.e., the upper end of range is positive because of potential warming effects of some aerosols - such as black carbon) [Government of United States of America]
SPM-948	SPM	10	45	10	46	Change sentence to "The contributions from natural forcings and internal variability are both likely in the range of -0.1 oC to 0.1 oC. [Government of Netherlands]
SPM-949	SPM	10	45	10	47	Please provide a range for the 0.6°C figure. [Government of Belgium]
SPM-950	SPM	10	46	10	46	What does "internal variability" mean here? As mentioned above, the meaning of "internal variability", seen in several places, is not always clear. [Government of India]
SPM-951	SPM	11	1	11	6	This appears to be the 3rd place in the SPM where the recent slowing of the temperature trend is discussed. We propose that all relevant discussions on this issue should be integrated into one section in order to make it easier for the policy maker to pick up the information. [European Union]
SPM-952	SPM	11	1	11	6	The underlying report (FD) (Figure 10.6 Chapter 10) shows that the decelerated warming since 1998 results from both the internal variability and external forcing of the climate system, while it has also been seen that since 1998, the external radiative forcing of volcanic activity has not been significant. Therefore, it is suggested that an explanation be given to the internal variability such as impacts from oceans (AMO, ENSO) rather than to the effect of external forcing alone. In addition, new studies show that the warming in deep oceans and the increased heat content may also be caused by factors leading to the slowdown in the rising global surface temperature

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						over the past decade. Therefore, it is suggested to give a more comprehensive explanation to the deceleration in warming since 1998. (Relevant references include: Balmaseda, M. A., K. E. Trenberth, and E. Källén (2013), Distinctive climate signals in reanalysis of global ocean heat content, <i>Geophys. Res. Lett.</i> , 40, 1754–1759, doi:10.1002/grl.50382. Watanabe, M., Y. Kamae, M. Yoshimori, A. Oka, M. Sato, M. Ishii, T. Mochizuki, and M. Kimoto (2013), Strengthening of ocean heat uptake efficiency associated with the recent climate hiatus, <i>Geophys. Res. Lett.</i> , 40, doi:10.1002/grl.50541. Song, Y. T., and F. Colberg (2011), Deep ocean warming assessed from altimeters, Gravity Recovery and Climate Experiment, in situ measurements, and a non-Boussinesq ocean general circulation model, <i>J. Geophys. Res.</i> , 116, C02020, doi:10.1029/2010JC006601.) [Government of China]
SPM-953	SPM	11	1	11	6	Given that ocean heat uptake is 9/10 of the heating signal, it seems noteworthy that the reduced trend of the last 10-15 years may also be due to enhanced ocean heat uptake. Is there no robust evidence for the important role of atmosphere-ocean net heat transfer in this apparently highly uncertain and important area of research? [Government of Denmark]
SPM-954	SPM	11	1	11	6	This paragraph provides explanations on the reduced warming trend without putting it into context. It must be clearly highlighted that the decade of the 2000s has been the warmest in the instrumental record, and that a period of 15 years is too short to make any statements about climate change: "The decade of the 2000s has been the warmest in the instrumental record of GMST, but observations show a reduction in the warming trend over the period 1998–2012 as compared to the period 1951–2012. Trends over periods as short as 10 to 15 years are of limited relevance for long-term climate change due to internal variability. The reduced warming trend is due in roughly equal measure to a cooling contribution from internal variability and a reduced trend in radiative forcing (medium confidence). The reduced trend in radiative forcing is primarily due to volcanic eruptions and the downward phase of the current solar cycle. However, there is low confidence in quantifying the role of changes in radiative forcing in causing this reduced warming trend. {Box 9.2; 10.3.1; Box 10.2}" These modifications are taken from the Box TS.3. [Government of Germany]
SPM-955	SPM	11	1	11	6	Are there regions where the warming trend is higher and is according to model projections? Are there regional variations in warming trends since 1998 to 2012 or during the period post-2005? [Government of India]
SPM-956	SPM	11	1	11	6	Seem to be a repeat of material in Page 9 11-17. is this needed? [Government of Ireland]
SPM-957	SPM	11	1	11	6	In this paragraph the observed reduction in warming is attributed partly to the reduced trend in radiative forcing. But this raises a natural question how the reduced trend in radiative forcing, if it remains still there and stays positive, could explain the reduction in warming. [Government of Japan]
SPM-958	SPM	11	1	11	6	In line 2, the authors should expand what "internal variability" means. Indeed, there is no mention at all of "oceans" in this bullet, when the leading hypothesis is that the reduction in the warming is due to an enhanced transfer of heat to the deep ocean, which is neither well observed nor well-modeled. This should be explicitly discussed here. [Government of United States of America]
SPM-959	SPM	11	1	11	6	Overall, this paragraph is weak. This seems to repeat most of the material from pg. 9 lines 11-14. Can something be said here about the ENSO role and ocean heat? Also, does the statement about the 'reduced trend in radiative forcing is primarily due to ... downward trend in solar cycle' contradict the statement on line 46 that 'solar irradiance does not contribute to global warming'? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-960	SPM	11	2	11	2	What does "internal "variability mean here? [Government of India]
SPM-961	SPM	11	2	11	2	Please describe what is meant by "cooling contribution from internal variability" or rephrase. [Government of Norway]
SPM-962	SPM	11	2	11	3	It is not clear where the evidence arises for attributing half of the warming hiatus to natural variability. The CMIP5 models have no real-world observations at this time. Please provide a basis for this statement. [Government of United States of America]
SPM-963	SPM	11	2			"Internal variability" is mainly variability of ocean heat uptake. This should be mentioned. [Government of Netherlands]
SPM-964	SPM	11	2			The statement about "cooling contribution from internal variability" will not be understood. Please clarify the wording. [Government of United States of America]
SPM-965	SPM	11	4	11	4	the word "However" is an undesirable disclaimer [Government of Netherlands]
SPM-966	SPM	11	8	11	8	We find it strange that the confidence in the antropogenic forcings to surface increase is LIKELY, while the contribution e.g. to global upper ocean is VERY LIKELY. Please explain. [Government of Norway]
SPM-967	SPM	11	8	11	11	A statement that "were observations are robust warming is likely due to antropogenic forcing" would be sufficient. [Government of Ireland]
SPM-968	SPM	11	8	11	11	Anthropogenic influence on the observed cooling in the stratosphere also deserves attribution statements in this paragraph. [Government of Japan]
SPM-969	SPM	11	8	11	44	Most of the statements on P 11 on the attribution of antropogenic influence on observations of climate change are too vague. Statements using expressions like "antropogenic influence", "antropogenic component" or "antropogenic contribution" can signify anything between 0 and 100 % human impact. Specifying uncertainties and / or likelihoods for these expressions does not make sense, as they themselves are vague. Wherever possible, the attribution statements should be

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						more specific and quantitative. At least they should clarify, if the human contribution is dominant or not in comparison to other factors. In the paragraphs on the temperature increase and on the upper ocean warming (L 8-15), the contribution is qualified as "substantial", but it is not clear if this means more or less than 50% of the causes of change. [Government of Germany]
SPM-970	SPM	11	9	11	11	warming should probably be made for specific: "surface warming". The uncertainty of the effect of ozone layer depletion on Antarctic climate should also be recognised [Government of Netherlands]
SPM-971	SPM	11	10			Need more specificity. Large spatial gaps in coverage? What observational uncertainties? Conflicting results? There is no discussion on this topic in Chapter 2 where changes in surface temperatures are presented. [Government of United States of America]
SPM-972	SPM	11	11			The reference of 2.4.1 is unnecessary. All the relevant information can be found in the the other paragraph 10.3.1. [Government of Netherlands]
SPM-973	SPM	11	13	11	14	Suggest moving "(above 700 m)" to immediately after "upper ocean", so it is clear that it is referring to "upper ocean" and not to "heat content". [Government of Canada]
SPM-974	SPM	11	13	11	49	This set of bullets in the attribution section is quite a lot of text. Suggest that the author consider whether there are ways to more effectively list this information, for example by cutting back or condensing some text or by communicating the information in a table. [Government of Canada]
SPM-975	SPM	11	14	11	15	The attribution of changes in regional upper ocean heat content is not mentioned in the technical summary, neither is it mentioned in the executive summary of the report. This is odd for a SPM conclusions. Moreover, less certain is too vague. We suggest to skip the last sentence of this conclusion [Government of Netherlands]
SPM-976	SPM	11	14	11	15	The text states that attribution of changes is "less certain", but to be consistent and most clearly relay this finding to the policymaker, it should be cast in "likelihood" terminology. Please revise accordingly. [Government of United States of America]
SPM-977	SPM	11	17	11	17	In what way has the global hydrological cycle been affected? Can a brief mention be made of regional snow and glacier loss? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-978	SPM	11	17	11	18	Regarding the statement, "It is likely that anthropogenic influences have affected the global water cycle and its patterns since 1960", authors should improve the clarity of the statement by adding modifiers, e.g., "It is likely that anthropogenic influences have had detectable effects on the global water cycle" ("detectable", "substantial", etc.). This is true for several other indicators, such as glacier loss, Arctic sea ice retreat, snow cover, though here at least there is a sign attached while ideally, we could put a percent contribution on these, at the moment, the way it is written, human activities could contribute to 1% of the trend and that would be sufficient to make this statement as written. [Government of United States of America]
SPM-979	SPM	11	17	11	21	This conclusion is too generalised and the likelihood is not appropriate. For example, for terrestrial precipitation the trends have low to medium confidence depending on the period (section 2.5.1.1). And this only concerns the trends and not the attribution to anthropogenic activity. Concerning surface salinity, section 3.3.2.1 states that the contrast between regions of low and high salinity has very likely increased, but nowhere the anthropogenic contribution has been discussed. Concerning atmospheric humidity, chapter 10 (executive summary and section 10.3.2.1) states that with medium confidence there is an anthropogenic contribution to specific humidity trends since 1973 (although section 10.3.2.1 does not specify a period, while the executive summary does). In summary, the likelihood likely is inappropriate, especially when attribution to anthropogenic activity is involved, but even without this attribution the trends for some quantities do not have the required high confidence level. [Government of Netherlands]
SPM-980	SPM	11	17	11	21	Where does the reference to 1960 as a baseline come from? Looking at the SPM, there does not appear to be any indication that 1960 represents some kind of reference point and no such reference is found in Chapter 7 either. Perhaps this is referenced in another chapter. Related to this point, the text in the referenced section 7.6.2, deals primarily with expectations of future change. The only reference to changes that have already occurred is the statement in section 7.6.2 that "there is some evidence that the sub-tropical dry zones are expanding (Section 7.2.5.2 and Section 2.7.5), both as a result of the tropical convergence zones narrowing (Neelin et al., 2006; Chou et al., 2009), and the storm tracks moving poleward (Allen et al., 2012) and strengthening (O’Gorman and Schneider, 2008)." [Government of United States of America]
SPM-981	SPM	11	17	11	21	Figure SPM.5: for clarity, change 'multi-model means and ensemble ranges' to 'multi-model-ensemble means and ranges' in the caption. [Government of United States of America]
SPM-982	SPM	11	17			This statement is confusing First, it does not specify what the changes were, which does not make it very useful. It also does not specify in which variables. As far as we know, there have been no attribution studies on precipitation, only detection of zonally mean precipitation, which do not describe all patterns. Even then, the trends in zonal mean land precipitation have only low confidence from 1901 and medium from 1950. Specific humidity increases are mainly due to temperature increase and not a sign of a change in the hydrological cycle, and salinity changes only a sign of a change over sea. [Government of Netherlands]
SPM-983	SPM	11	18	11	18	The "changes observed" and "detected" would seem to be a tautology. [Government of Sweden]

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SPM-984	SPM	11	19	11	19	For readability, remove 'and'. [Government of United States of America]
SPM-985	SPM	11	23	11	26	The statement that there is low confidence in the small observed increase in the Antarctic ice is not compatible with the lines 7-8, page 40, of the section 2.4.3 WG 1AR5_SOD_Ch02_all_final.pdf, which read as "By contrast, comparatively little change in Antarctic sea ice has been observed". [Government of India]
SPM-986	SPM	11	23	11	26	What is added value of this discussion, a separate discussion of Antarctica may be warranted elsewhere [Government of Ireland]
SPM-987	SPM	11	23	11	31	If the "low confidence in the scientific understanding" "low confidence in estimates" and "low level of scientific understanding" is caused by lack of observation and research in these areas it could be an advantage to say that more clearly. [Government of Norway]
SPM-988	SPM	11	28	11	28	Contributed to the retreat of *all* glaciers world-wide? The first full paragraph of Chapter 4, page 4, refers to the retreat of 'almost all' glaciers world-wide, which appears consistent with the high uncertainty for the Antarctic and Subantarctic region displayed in Table 4.4. Consider inserting 'almost all' before 'glaciers'. [Government of United States of America]
SPM-989	SPM	11	28	11	28	Why is the start point the 1960s? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-990	SPM	11	28	11	29	The discussion related to the Greenland ice sheet in the underlying text emphasises the uncertainty and discrepancies between different studies (observational and well as modelling). Because several of the studies cited in this section (4.3.3) suggest a rapid melting during the 1930ies it might still be premature to include the Greenland ice sheet melting as attributed to anthropogenic causes in this bulleted point. [Government of Sweden]
SPM-991	SPM	11	29			re: Greenland climate, "since 1994" is a safer statement than "since 1990" because critics could site that warming in this statement is measured from the 'bottom' of 1991-1993 Greenland cooling due to the Mt Pinatubo eruption. 1994 is clear of the Pinatubo cooling. [Government of Denmark]
SPM-992	SPM	11	30	11	31	The uncertainty of the effect of ozone layer depletion on Antarctic climate should also be recognised [Government of Netherlands]
SPM-993	SPM	11	33	11	33	Component is not immediately clear - could "contribution" or "influence" be used instead? [Government of Belgium]
SPM-994	SPM	11	33	11	34	It seems that anthropogenic signal in snow reduction is detectable in Northern "spring" season only as it can be seen from Figure SPM.2a. If so, will there be no need to specify this seasonality information? [Government of Republic of Korea]
SPM-995	SPM	11	36	11	37	Please consider to move the essence of the sentence to the front to increase readability so that it reads: "About 75% of the observed global mean sea level rise since the early 1970s can be explained by glacier mass loss and ocean thermal expansion from warming." [Government of Norway]
SPM-996	SPM	11	36	11	37	Please clarify what is "glacier mass loss", is it all glaciers (including Greenland and Antarctica), or only the other smaller glaciers (mountain glaciers)? Consider rephrasing: "About 75% of the observed global mean sea level rise since the early 1970s can be explained by glacier mass loss (excluding the Greenland and Antarctic ice sheets) and ocean thermal expansion from warming." [Government of Norway]
SPM-997	SPM	11	36	11	37	What is the evidence/agreement/confidence/likelihood of this statement? Please add the appropriate certainty descriptor. [Government of United States of America]
SPM-998	SPM	11	36	11	37	To be consistent and provide the information most clearly, the 75% in line 37 should be stated as "mean [90% certainty range]" [Government of United States of America]
SPM-999	SPM	11	36	11	39	This passage and Line 41-44 on this page, both of which discuss the attribution of sea level rise, are suggested to be reformulated and streamlined to be focused concise. [Government of China]
SPM-1000	SPM	11	36	11	39	It would be helpful to get an overview of all factors of the global sea level rise (input from Tab. 13.1), also as it was done in AR4. [Government of Germany]
SPM-1001	SPM	11	36	11	39	This bullet seems out of place because it does not have any anthropogenic link, whereas this section is devoted to attribution of changes to anthropogenic forces. It is an important bullet though; the authors should consider moving this to a more relevant section. [Government of United States of America]
SPM-1002	SPM	11	36	11	44	Bullets 8 (lines 36-39) and 9 (lines 41-44) could be combined into one bullet because they are closely related. [Government of Japan]
SPM-1003	SPM	11	36			Maybe refer to Ch 3 as well here, since Ch 13 refers back to Ch 3. [Government of Netherlands]
SPM-1004	SPM	11	37	11	37	Please insert: "...sea level rise (high confidence), with increasing contribution of the Greenland and Antarctic Ice Sheet since the early 1990s." [ES of Ch.13; p.13-3] to highlight the recently increasing contribution from the big ice-sheets to rising sea-level. [Government of Germany]
SPM-1005	SPM	11	37	11	37	What explains the other 25%? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1006	SPM	11	41	11	44	This sentence is hard to read. Please consider to rephrase, and split into two sentences. For instance: "It is very likely that there is a substantial anthropogenic contribution to the global mean sea rise since the 1970s. This is based on the high confidence in an anthropogenic influence on three of the main contributors to sea level; namely thermal expansion, loss of glacier mass and loss of Greenland ice sheet surface mass." [Government of Norway]

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
SPM-1007	SPM	11	43	11	43	How much is "substantial anthropogenic contribution"? And why is confidence not higher than "very likley?" [Government of United States of America]
SPM-1008	SPM	11	43			can the "substantial" contribution be quantified? Acknowledging that this is a difficult request, nevertheless we feel that vague unfalsifiable statements are not useful, and are open to criticism. [Government of New Zealand]
SPM-1009	SPM	11	46	11	48	The uncertainty in >spectral< solar irradiance changes and their potential impact on the large-scale circulation in the stratosphere should be recognised [Government of Netherlands]
SPM-1010	SPM	11	46	11	49	Both conclusions are not part of the executive summary of Chapter 10, which should be the case to be consistent with the SPM. They are found in Box 2. [Government of Netherlands]
SPM-1011	SPM	11	47			Why is the ending year 2008 when evidence in Annex II shows continued declines in solar radiation. Also, what "other" amplifying mechanisms? Why not just "amplifying mechanisms?" [Government of United States of America]
SPM-1012	SPM	11	48	11	49	"There is medium confidence that the 11-year cycle of solar variability influences decadal climate fluctuations in some regions through other amplifying mechanisms." Which mechanisms? A short description or listing would be useful ("... through other amplifying mechanisms like ...") [Government of Austria]
SPM-1013	SPM	11	48	11	49	Please clarify the meaning of "other". What does "other" refer to - what is the main amplifying mechanism, if these are "other amplifying mechanisms"? Could you also add some words on the type of "other" mechanisms involved? It would also be useful to explain to what extent these effects are substantial or minor, in the context of climate change. [Government of Belgium]
SPM-1014	SPM	11	48	11	49	Explain what amplification mechanisms? [Government of Ireland]
SPM-1015	SPM	11	49	11	49	Please clarify what 'other amplifying mechanisms' means. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1016	SPM	11	49			is "other" necessary? [Government of Denmark]
SPM-1017	SPM	11	51	11	54	This information about the effect of cosmic rays is quite technical and not of high relevance to policymakers. Suggest the information be simplified if possible or considering placing it in the technical summary. [Government of Canada]
SPM-1018	SPM	11	51	11	54	This statement is too technical for an SPM [Government of Ireland]
SPM-1019	SPM	11	51	11	54	The word "new" is redundant here, because "formation" already implicates that the particles are new. [Government of Netherlands]
SPM-1020	SPM	11	53	11	53	This statement is given with "medium evidence and high agreement" - can it not be translated into a confidence? [Government of United States of America]
SPM-1021	SPM	11	53	11	54	"No robust association between changes in cosmic rays..." This is one of the few places in the SPM where a statement has been added about the lack of a relationship etc.. This should be done more often in the SPM in order to provide a better context of the results. By the way, there is a very serious investigation based on a laboratory work related to the influence of galactic and cosmic rays on the formation of clouds. Cf. Kirby J. et al. 2011 Nature Vol. 476, Pages 429–433, and posterior works on these matters. [Government of Switzerland]
SPM-1022	SPM	11	53	11	54	"No robust association" should be cast in terms of agreement/evidence/confidence/likenhood. Please revise accordingly. [Government of United States of America]
SPM-1023	SPM	11	54	13	54	To be fully clear and consistent with the chapter, please consider this additional wording, taken from section 7.4.6.3 : No robust regional or global association... [Government of Belgium]
SPM-1024	SPM	12	1	12	1	This section of the SPM should have a link to emissions. We propose to move the bullet point on page 17, line 6-12 up here. [Government of Norway]
SPM-1025	SPM	12	1	12	1	For the entire section on future global and regional climate change: a statement of the sort on how the changes scale with the RCP scenarios would be very helpful, i.e., higher emission scenarios imply larger changes in temperature etc., with a relatively linear scaling to global emissions over the next decades (or if it is not linear, than add a statement how it increases/decreases with emissions). Furthermore, a table summarizing the impacts for each scenario would be very helpful. [Government of Switzerland]
SPM-1026	SPM	12	1	18	24	The analysis of the future global and regional climate change must not be focus only on the understanding of biophysical data but is needed analysis on socioeconomic date. The analysis, therefore, must include the integration of the three pillars of sustainable development, which is social, economic and ecological, and not only biophysical. This imply having a comprehension about the relationship between the biophysics of climate change and its impact on poverty and economic development of countries. Also, an analysis of the commitments of developed countries with respect to climate change is needed in order to establish a criteria with respect to what be expected about climate change regarding the political will of countries. [Government of Bolivia]
SPM-1027	SPM	12	1			In the section "Future and Global and Regional Climate Change", please, consider ways of making clear the baseline period: "relative to 1986-2005 unless otherwise stated". Mentioning this in text on page 12, lines 10 to 11 may not be sufficient. [Government of Finland]

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
SPM-1028	SPM	12	2	12	11	Please consider to include information about which green-house gases are included in the RCPs and to what extent removal by sinks are included since this will help to understand the phrase "Greenhouse gas emissions..." in this whole section. [Government of Norway]
SPM-1029	SPM	12	3	12	3	For a non-scientist reader it would be interesting to know if these models cover a range of values of solar, volcanoes, galactic and cosmic rays, etc. forcings. [Government of Switzerland]
SPM-1030	SPM	12	8	12	10	The number and names of each of the different models that participated in the CMIP5 to give projections in this AR5 need to be provided [Government of Kenya]
SPM-1031	SPM	12	8	12	11	It is necessary to explain, what this means in comparison to pre-industrial level in the SPM, as this is the reference that is relevant for climate policy. Add sentence: "To get to the temperature change with regard to preindustrial, add approximately 0.61 °C (see footnote 10)." [Government of Germany]
SPM-1032	SPM	12	9	12	9	Please explain CMIP5 [Government of Norway]
SPM-1033	SPM	12	10	12	10	The chosen reference period is not useful for the SPM. The information should be referenced to pre-industrial temperatures [Government of Ireland]
SPM-1034	SPM	12	10	12	10	We appreciate the explicit mention that all projections are against a 1986-2005 reference period, but it's worth explaining *why* this was chosen. As we mentioned repeatedly in our comments on the previous draft, policymakers are familiar with projections and observations pegged to a pre-industrial base period. So this framing will be confusing to them. Moreover, footnote 10 states that the change in temperature from 1850-1900 to 1986-2005 is 0.61C, but on p. 3, line 20 it is stated that temperature has risen 0.89C from 1901 to 2012. While the specific time frames understandable make a difference, this almost 0.3C (50%) difference seems significant, particularly from a policymaker's perspective that is used to "2C above pre-industrial"... Please try clarifying this seeming discrepancy. [Government of United States of America]
SPM-1035	SPM	12	10	12	10	"...climate system projections reviewed here." - would read better. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1036	SPM	12	10	12	11	It is important that projections be clearly communicated to policy-makers relative to pre-industrial so that projections can be evaluated relative to the 2 degrees warming (from pre-industrial) target. The footnote provided (footnote 10) is not adequate for this purpose and also not worded clearly. Many readers will be unable to correctly combine footnote 10 and Figure SPM.6a to obtain an assessment of when and for which RCPs, the 2-degree threshold (relative to preindustrial) will be surpassed. Suggest that the authors reconsider whether all three different time periods in the footnote are required in the SPM. [Government of Canada]
SPM-1037	SPM	12	10	12	11	Why the climate projections are relative to 1986-2005? Whereas AR4 had a baseline period of 1980-1999. It is very confusing for policy makers if the baseline periods are changed without providing the rationale or why not give for 1980-1999 and if needed 1986-2005. [Government of India]
SPM-1038	SPM	12	10	12	11	The distinction between temperature projections relative to 1986-2005, and relative to pre-industrial, is too important to be presented only in a footnote. [Government of New Zealand]
SPM-1039	SPM	12	10	12	11	We assume that there are valid justifications for using 1986-2005 as reference periode for future changes. However, most Policy Makers are more familiar with estimating changes relative to pre-industrial level, ref the global, politically agreed objective of limiting temperature increase to 2 degree C. If you estimate future changes relative to 1986-2005 in this SPM, it will not be possible to compared to the 2 degrees increase since pre-industrial time. It will therefore be important that you also indicates the changes relative to pre-industrial times, in addition to relating changes to 1986-2005. Please also clarify if the 1986-2005 reference is used only for temperature (as the footnote indicate) or also for other projections. [Government of Norway]
SPM-1040	SPM	12	11	12	11	Footnote 10: Add corresponding values for preindustrial (which is used as reference for the 2°C target and therefore very important), otherwise the results presented in SPM cannot be related to the 2° warming limit, which relates to preindustrial. Values for preindustrial could be derived from reconstructions, since direct measurements are missing. [Government of Switzerland]
SPM-1041	SPM	12	11	12	11	Footnote 10 could be expressed better, it's very dense. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1042	SPM	12	14	12	14	Please consider if the word "will" could be used, instead of "would". [Government of Norway]
SPM-1043	SPM	12	14	12	14	Write: "Continous emissions of greenhouse gases at current or increased levels will cause further warming." and add a statement on confidence. [Government of Switzerland]
SPM-1044	SPM	12	14	12	14	'Will' better expresses the current situation. The line states "continued emissions of GHGs would cause further warming" - of course, if we stopped emissions we would also see further warming. So this statement could be misleading. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1045	SPM	12	14	12	15	The first two statements of this shaded box could/should have certainty descriptors associated with them. Both would appear to be "virtually certain". Please consider revising the text accordingly. [Government of United States of America]
SPM-1046	SPM	12	14	12	19	This section could be part of a high-level summary section at the beginning of the chapter. It is a key message but needs to be strengthened and it is currently inconsistent with the message on p.17, l.23-24. It is recommended that "would" is replaced with "will" - this is the basic physics of the greenhouse effect. Also, ocean

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						acidification is not the result of climate change, but the result of an increase in carbon dioxide emissions so it is recommended that this is mentioned at the start of the box as a separate issue. Perhaps something like "Continued emissions of greenhouse gases will cause further warming and increases in carbon dioxide specifically will continue to increase ocean acidification" and "Limiting climate change and ocean acidification will require substantial and sustained reductions of CO2 emissions". [European Union]
SPM-1047	SPM	12	14	12	19	Suggest replacing the word "would" with "will" throughout this paragraph. It could be made more clear that these findings are based on future projections/scenarios if there is concern about strengthening the verb tense. [Government of Canada]
SPM-1048	SPM	12	14	12	19	This can be shortened for clarity [Government of Ireland]
SPM-1049	SPM	12	14	12	19	What is the reason to write "would"? Is it a chance that e.g. continued GHG emissions not will lead to warming? [Government of Norway]
SPM-1050	SPM	12	17	12	17	"Changes in land and ocean" is rather unspecific. Perhaps changes in mean surface and ocean temperatures are meant? [Government of Germany]
SPM-1051	SPM	12	17			The use of the word "some" is very interesting as the observed section on extremes indicates "many extreme weather and climate events have already changed. The term "a variety" might be more descriptive and consistent with the observed section as to "some". Variety would represent projected changes in temperature and precipitation extremes, not to mention other types of extremes such as storm surges on top of elevated sea level and more intense hurricanes and typhoons. [Government of United States of America]
SPM-1052	SPM	12	18	12	19	Consider to indicate whether it is meant "net CO2 emissions". [Government of Norway]
SPM-1053	SPM	12	19	12	19	Write: "... will require substantial and sustained reductions..." and add a statement on confidence. Furthermore, it is necessary to specify the reference case, i.e., the SPM needs to say relative to what scenario the emissions have to be cut. This is one of the most important policy-relevant statements of the SPM, and therefore should be given special consideration. [Government of Switzerland]
SPM-1054	SPM	12	19	12	19	Are you sure that this is JUST CO2 emissions? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1055	SPM	12	19	12	19	replace 'would' by 'will'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1056	SPM	12	22	12	22	The word 'quantities' is too vague. What are you talking about? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1057	SPM	12	22	12	23	This statement is not compatible with Chapter 11 text (Box 11.2) particularly for precipitation and even for temperature at regional/subcontinental scales [Government of Argentina]
SPM-1058	SPM	12	22	12	23	This statement is too general. It is widely assumed that in the Southern Hemisphere ozone recovery will counteract some regional effects of GHG concentration increases, while ozone depletion in GHGs worked together in the 20th century (Son et al.). So regional patterns might well change in SH for the next few decades [Government of Netherlands]
SPM-1059	SPM	12	22	12	24	Suggest specifying the "quantities" or being more clear about the meaning of this term. [Government of Canada]
SPM-1060	SPM	12	22	12	24	The use of the word "quantities" is not clear in these two sentences. [Government of Switzerland]
SPM-1061	SPM	12	22	12	27	This bullet point is vague and abstract and needs to include more detail about which quantities are being referred to. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1062	SPM	12	22		23	This statement seems a bit too strong. Patterns of simulated future change are similar to patterns of simulated past change. The latter, however, are similar to observed patterns only on very large spatial scales. This can be seen from Fig. 1 in Box 11.2. While patterns on very large scales, like high vs. low latitudes or land vs. sea, are correctly simulated, the patterns differ on continental scales, especially for precipitation. [Government of Netherlands]
SPM-1063	SPM	12	22			This is not in agreement with the chapter text. In Box 11.2 it is mentioned that the observed patterns are not compatible with the simulated ones over the last 60 years, which are indeed similar to the projected ones. [Government of Netherlands]
SPM-1064	SPM	12	23	12	23	Suggest changing "They" to "Observed changes" for clarity. [Government of United States of America]
SPM-1065	SPM	12	23			The subject "they" is not clear. Suggest using "These projections". [Government of New Zealand]
SPM-1066	SPM	12	24	12	24	After "For some quantities", please insert, "(e.g., ...)" and list some examples. [Government of United States of America]
SPM-1067	SPM	12	24	12	25	It is suggested to also point to the strong internal climate variability. The wording might read as follows: For some quantities, natural variability continues to be larger than the forced changes, particularly at the regional scale and for short time periods. [Government of Austria]

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SPM-1068	SPM	12	24	12	26	Re. the sentence beginning "for some quantities" - the text seems to imply that natural variability will still be greater than forced changes at the end of the 21st century (e.g. given the content of the previous sentence). Doubt that this is the case, so consider rewording. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1069	SPM	12	25	12	25	Instead of "By" wording "From" or "After" would be more unequivocal pointing at the fact that the longer the time period, the stronger the effect of a mitigation-oriented global climate policy can be. [Government of Hungary]
SPM-1070	SPM	12	30	12	31	The box on RCPs is too dense and needs to be made more relevant to policymakers. It should include a discussion of how to relate the RCPs to emissions. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1071	SPM	12	34	12	34	In page 9 some models are assessed to be overly sensitive to greenhouse-gas forcing. In page 10 the likely range of equilibrium climate sensitivity is revised to extend downward compared to the range in AR4. These findings make it unlikely that the RCP-based AR5 projections can still be similar to AR4 after accounting only for scenario differences. [Government of Japan]
SPM-1072	SPM	12	34	12	34	AR4 used SRES scenarios but AR5 uses RCPs to project future climate. AR5 briefly mentions comparability of SRES scenarios and RCPs. However, there is no explanation why AR5 introduces RCPs instead of SRES scenarios. It would be better to add explanation and scientific (or political) implications for the adoption of RCPs in AR5. [Government of Republic of Korea]
SPM-1073	SPM	12	34	12	34	Is this really true for all aspects of climate change? It seems to be adequate for temperature, but e.g. not for sea level rise. The range given in AR4 is 0.18 - 0.59 m, while it is 0.26 - 0.81 m in AR5. Given that with regard to resulting CO2 concentration SRES B1 seems to correspond approximately to RCP4.5, that RCP8.5 has somewhat lower concentrations than A1FI, that AR5 uses a later reference period in the beginning (1986-2005 vs. 1981-1999) and an earlier reference period at the end than AR4 (2081-2100 instead of 2090-2099), the upper end of the range is considerably higher in AR4 than in AR5 (about 40%; similar to the lower bound), which cannot be considered 'similar'. [Government of Switzerland]
SPM-1074	SPM	12	34	12	39	The close similarity to AR4 is a very important statement. A full explanation of the reasons for the apparent differences needs to be provided: - the results of the emission-driven simulations should be included in table SPM.2, to document the carbon cycle uncertainty - the difference between RCP8.5 and SRES A1FI (included in the AR4 range), needs to be explained here: RCP 8.5 has a ESM-simulated radiative forcing equal to roughly 8 W/m ² in 2100, and is close to SRES A2, while A1FI had a radiative forcing roughly 1 W/m ² above A2 in AR4. This is one of the scenario differences between AR4 and AR5, and it needs to be indicated clearly so as to avoid misinterpretations. - the change in the methods for assessment of climate uncertainty also plays a role in explaining the different uncertainty range in AR5 versus AR4 (lower upper bound). A key factor is that in AR5, a Gaussian distribution is used. This forces the range to be symmetrical around the mean, while the uncertainty can be expected to be larger for higher values (for ECS, low values are more easy to exclude than high values). [Government of Belgium]
SPM-1075	SPM	12	34	12	39	Policy makers would like to know which RCP is closest to BAU emission scenario or for the emissions for the period 2000-2012. [Government of India]
SPM-1076	SPM	12	34	12	39	This paragraph is too technical and is inaccessible to policy makers? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1077	SPM	12	35	12	38	Does the "Consideration of carbon cycle uncertainties" really explain the reason why the overall spread of projections for the high RCPs in AR5 is narrower than that in AR4? As AR5's RCPs are defined as concentration pathways, the official CMIP3 experiments for AR4 have also been driven by concentration scenarios, not emission; for example, the often-cited AR4 spread of 1.1 - 6.4 °C (Table SPM.3 of AR4) is based on concentration driven experiments. It is true that the emission-driven experiments conducted under C4MIP provided important findings to AR4, but they were treated as a kind of supplementary information in AR4. [Government of Japan]
SPM-1078	SPM	12	38	12	38	Please explain CMIP3. [Government of Germany]
SPM-1079	SPM	12	38	12	39	Please consider removing this sentence about CMIP3 and CMIP5, as it is not very relevant for policy-makers. CMIP3 is hardly mentioned in other places. [Government of Norway]
SPM-1080	SPM	12	39	12	39	In general, suggest the use of acronyms/abbreviations like "CMIP5" and "CMIP3" be avoided in the SPM. The approach taken on pg. SPM-9 (e.g. line 28) would be preferable here, referring to "models at the time of the AR4" rather than "CMIP3 models". [Government of Canada]
SPM-1081	SPM	12	39	12	39	CMIP5 has been correctly defined previously in the SPM, but not CMIP3. It would be even better to stress that most results from AR4 concerning Future Global and Regional Climate Change were based on CMIP3. This would improve the document's readability for those not familiar with CMIPs. [Government of France]
SPM-1082	SPM	12	42	12	52	The horizontal black dashed line in Figure SPM.6 is not explained, but should refer to the explanation in Figure 12.30: "The horizontal line corresponds to a nearly ice-free Arctic Ocean in September. [Government of Netherlands]
SPM-1083	SPM	12	42			Figure SPM.6: In panel c, the y-axis label "(pH)" should be removed, because pH is not a unit. (in panels 6a and 6b the y-axis labels are units) [Government of Netherlands]
SPM-1084	SPM	12	44	12	44	Footnote 10 rather than 9. [Government of Belgium]

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SPM-1085	SPM	12	44	12	44	The reference to the footnote is incorrect. It should be footnote 10. [Government of Canada]
SPM-1086	SPM	12	44	12	44	Please check the footnote-number. Should be 10? Excellent, by the way, to provide the comparability to different reference periods! [Government of Sweden]
SPM-1087	SPM	12	46	12	46	From statistical point of view, Range is defined as Max-Min difference. So, there is no need to have minimum-maximum in front of Range. [Government of Islamic Republic of Iran]
SPM-1088	SPM	12	46			"minimum-maximum range" is suddenly used without any explanation. The ranges look similar by eye to the 5%-95% ranges. Why not use these as everywhere else? The tables are also based on these ranges, not the min-max ones. [Government of Netherlands]
SPM-1089	SPM	12	48	12	48	[Legend of Figure SPM.6]: The shaded region shows the inter-model spread (min--max), which is not a proper measure of uncertainty. Thus, it would be more appropriate to rephrase this to "... and the shaded region shows the minimum-maximum range (which gives an indication of the uncertainty)" or some similar wording. [Government of Sweden]
SPM-1090	SPM	12	49	12	49	replace 'is' by 'are' [Government of Belgium]
SPM-1091	SPM	12	50	12	50	From statistical point of view, Range is defined as Max-Min difference. So, there is no need to have minimum-maximum in front of Range. [Government of Islamic Republic of Iran]
SPM-1092	SPM	12	53	12	53	Footnote 10: It would be more effective to avoid the first period (1850-1900) from this comparison, since no recent comparison have used it as reference period. The latter two are important and often used. Another argument is that the 0,61 K warming is a new numerical data which is different fro the 0.89 K for the overall warming, which may confuse the reader and lead to misinterpretations. [Government of Hungary]
SPM-1093	SPM	12		13		Table SPM.2 and Figures SPM.6 and SPM.8: The definition of likely range in Table SPM.2 and Figures SPM.6 and SPM.8 is different from that in Table SPM.3 and Figure SPM.5 of AR4. While these estimates are assessed from a hierarchy of models that encompass a simple climate model, several Earth System Models of Intermediate Complexity and a large number of Atmosphere-Ocean General Circulation Models (AOGCMs) in AR4, these estimates are based on the CMIP5 ensemble only in AR5. A footnote describing these differences should be needed. [Government of Japan]
SPM-1094	SPM	13	1	13	12	Why RCP 4.5 is not included in the Figure? [Government of India]
SPM-1095	SPM	13	2	13	12	Figure SPM.7, panel (c): What does the parenthesized numbers at the upper right of the maps show ("(3)" and "(5)")? [Government of Sweden]
SPM-1096	SPM	13	2	13	12	The description of Fig. SPM 7 includes references to the Representative Concentration Pathways scenarios (RCPs). These are relatively new concepts and it is likely that most readers will be unfamiliar with them, so it would be helpful to reference the box in the SPM page 19 as well as other places. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1097	SPM	13	2	13	12	The description of figure SPM 7 uses technical language that makes it difficult for non-technical readers. It would be helpful if definitions of terms such as "standard deviation of internal variability" were explained in simpler terms in footnotes. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1098	SPM	13	6	13	7	Change "multi model" to "multi-model" (2x). [Government of Netherlands]
SPM-1099	SPM	13	20	13	20	It would be helpful to add here the numbers for both global and land only. [Government of Switzerland]
SPM-1100	SPM	13	20	13	47	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1101	SPM	13	22	13	22	Please indicate if it is meant "The total future anthropogenic emissions". [Government of Norway]
SPM-1102	SPM	13	22	13	22	The use of the word "total" is not clear here: is it meant what finally the atmosphere "sees" from the anthropogenic greenhouse gas emssions after sinks have removed from the atmosphere part of these "total" emissions, or is it meant really the total of anthropogenic greenhouse gas emissions without sinks' remouvals? [Government of Switzerland]
SPM-1103	SPM	13	22	13	22	The first statement of the shaded box could/should have a certainty descriptor associated with it. Please revise the text accordingly. [Government of United States of America]
SPM-1104	SPM	13	22		23	Suggest that future tense be used here rather than present tense (e.g., change "determines" to "will determine") to be consistent with following sentences. Alternately, to maintain present tense, it could be clarified that this finding is based on projections (e.g., add to beginning of sentence "According to projections, ...") [Government of Canada]
SPM-1105	SPM	13	23	13	25	This sentence states with very high confidence that warming over land will be greater than over the oceans. Although it is mentioned in the executive summary, it is not found in the refered sections 12.3 or 12.4. [Government of Netherlands]

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SPM-1106	SPM	13	23	13	25	The Arctic region is largely ocean, though - so it might clarify the sentence if the Arctic phrase were moved ahead of the land vs ocean phrase. [Government of United States of America]
SPM-1107	SPM	13	26	13	26	We feel that the bullet points in this section give much important information but are difficult for the policymakers to relate to the relevant question they have. Therefore we suggest one additional bullet point about the following three questions. What kind of emission pathway is needed to follow if the temperature should stabilize long-term at 2 degrees above preindustrial level? What would be the temperature relative to preindustrial if there is no additional emission reduction policy applied? What would be the unavoidable temperature increase relative to preindustrial, e.g. if all emissions are stopped today? [Government of Norway]
SPM-1108	SPM	13	28	12	35	We assume that there are valid justifications for using 1986-2005 as reference period for future changes. However, most Policy Makers are more familiar with estimating changes relative to pre-industrial level, ref the global, politically agreed objective of limiting temperature increase to 2 degree C. If you estimate future changes relative to 1986-2005 in this SPM, it will not be possible to compare to the 2 degrees increase since pre-industrial time. It will therefore be important that you also indicate the changes relative to pre-industrial times, in addition to relating changes to 1986-2005. [Government of Norway]
SPM-1109	SPM	13	28	13	28	Please insert "as compared to 1986-2005" after "2016-2035". [Government of Germany]
SPM-1110	SPM	13	28	13	29	Wording, but important to prevent suggestion of predictive capability, the sentence should e.g. read: "Based on the set of RCPs and conditionally for natural decadal climate variability and incidental forcings such as e.g. a large tropical volcanic eruption, the global mean surface..." [Government of Netherlands]
SPM-1111	SPM	13	28	13	30	Suggest this paragraph should start by saying that it is about near-term temperature change in order to clearly contrast this paragraph with the next one. Suggest revising the sentence to read: "Near-term change in global average temperature for the period 2016-2035...etc." [Government of Canada]
SPM-1112	SPM	13	28	13	30	Suggest it would be helpful to explain why results are not distinguished by RCP for these near-term results. [Government of Canada]
SPM-1113	SPM	13	28	13	30	Although it was stated in the chapeau at the beginning of this section, suggest it would be useful to refresh the reader again about the baseline period for these findings. There is too much separation between these findings and the chapeau on page 12 for readers to recall what the default baseline is. Citing the baseline will also help to avoid the misinterpretation as the change being *over* the period of 2016 to 2035. [Government of Canada]
SPM-1114	SPM	13	28	13	30	In order to allow comparison with the overall goal of staying below +2°C above pre-industrial temperature level, the given change of surface temperature for 2016-2035 should be translated into a change compared to pre-industrial. [Government of Germany]
SPM-1115	SPM	13	28	13	30	Please provide a comparative graph of temperature projections for RCP scenarios and SRES (A1, A2, B1 and B2) scenarios which would help the policy makers to compare AR4 and AR5 projections. [Government of India]
SPM-1116	SPM	13	28	13	30	Rephrase the conclusion, since it can be interpreted as temperature rise over this period only. [Government of Netherlands]
SPM-1117	SPM	13	28	13	30	Please explain if the temperature change is projected to take place from 2016 to 2035, or whether the average temperature for the period 2016-2035 is projected to increase by 0,3 to 0,7 degrees compared with the year 2000. Please also indicate the temperature change in 2016-2035 since preindustrial conditions. [Government of Norway]
SPM-1118	SPM	13	28	13	30	The wording of this sentence does not make it very clear that the stated temperature change is the projected increase between the 1986 - 2005 'baseline' and 2016 - 2035 period; it could be mis-interpreted as meaning over the period 2016 to 2035, if the reader does not refer to the introductory paragraph on page 12 (lines 10 - 11). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1119	SPM	13	28	13	35	There is no mention of the reference period for the stated increases. The same happens in different SPM paragraphs relative to projected changes [Government of Spain]
SPM-1120	SPM	13	28	13	35	Suggest you also give the mean or median figures for the projected temperature increases. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1121	SPM	13	28	13	42	Medians of each RCP scenario's temperature rise should be described here. [Government of Japan]
SPM-1122	SPM	13	28	13	42	Do the temperature projections in these three paras take into account the most recent change in the range of ECS? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1123	SPM	13	28	13	47	In this section, the base period (i.e. 1985-2005) should be re-introduced to avoid confusion. Otherwise it may be misquoted and be confusing for policy makers. Also in this section, it would be useful to confirm any changes since AR4. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1124	SPM	13	29	13	29	Temperature increase relative to pre-industrial values should be given [Government of Ireland]
SPM-1125	SPM	13	29	13	29	Presumably this temperature increase is relative to 1986-2005? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1126	SPM	13	29	13	30	The sentence "This is based on an assessment of observationally-constrained projections and predictions initialized with observations" is quite technical for a policy

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						audience. Suggest simplifying, e.g., "This is based on model-based projections and predictions." [Government of Canada]
SPM-1127	SPM	13	30	13	30	It is suggested to include the following sentence at the end of the paragraph: "It is possible that the real world might follow a path outside (above or below) the range projected by the CMIP5 models." The sentence is verbatim from chapter 11.3.6 that also provides some explanation. The inclusion is suggested because otherwise people might blame the IPCC later on that the real world delivered a different trend in temperature and that the models used by the IPCC are wrong (biased). [Government of Austria]
SPM-1128	SPM	13	30			"and predictions initialized with observations" This disagrees with the chapter text and ES. Please state the actual information used as listed in 11.3.6 (observations up to 2012, observationally constrained ensembles, ensembles with more aerosols). [Government of Netherlands]
SPM-1129	SPM	13	30			The text should read initialized with "the observed climate as of [INSERT DATE]" [Government of United States of America]
SPM-1130	SPM	13	32	13	32	The words: "for the CO2 concentration driven RCPs" should probably read: "for the greenhouse gas concentration driven RCPs". [Government of Switzerland]
SPM-1131	SPM	13	32	13	34	The reference years (as indicated 1986-2005 in the legend) are not indicated in the text. [Government of Japan]
SPM-1132	SPM	13	32	13	35	Suggest that these lines be deleted. It is confusing to have two consecutive paragraphs (this one and the one following it) about long-term climate change. One is sufficient and the emphasis should be on change since pre-industrial. If these lines are not deleted then revisions are required to make clearer that these results are about long-term change in contrast with the information about near-term climate change on lines 28-30. [Government of Canada]
SPM-1133	SPM	13	32	13	35	Please insert "as compared to 1986-2005" after "2081-2100". [Government of Germany]
SPM-1134	SPM	13	32	13	35	Temperature increase relative to pre-industrial values should be given [Government of Ireland]
SPM-1135	SPM	13	32	13	35	This sentence should be rephrased. It is misleading to write "the CO2 concentration driven RCPs". The CO2 concentrations are part of the RCPs and have been used to drive the CMIP5 climate models, not the RCPs. Furthermore, it cannot be concluded that the increase of global mean surface temperatures "is projected to likely be in the ranges derived from the CMIP5 climate models". This statement is by definition true because it follows directly from the way the ranges are estimated. [Government of Netherlands]
SPM-1136	SPM	13	32	13	35	Similarly (re. the previous comment above), the wording here could also be misconstrued, in relation to the temperature increase for the period 2081 - 2100. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1137	SPM	13	34	13	38	It is better to specifically mention the important parameters for which the spread is narrower in the AR5 as compared to AR4. The regional variations, if any, also need to be mentioned at least briefly if necessary. [Government of India]
SPM-1138	SPM	13	35	13	35	It is strongly recommended to repeat here the information with regard to comparison to AR4. Comparison to AR4 is absolutely crucial for users to understand the evolution of science. E.g. 'projected temperature change is very similar to AR4 when accounting for scenario differences'. It is not sufficient to mention such important information only once in the SPM, since numbers, paragraphs, tables etc. are often used individually and without caveats or information given somewhere else in the SPM. [Government of Switzerland]
SPM-1139	SPM	13	35	13	35	Suggest adding following statement: "Thus, it is [likely ?] that global mean surface warming over the 21st century will be greater than the observed 20th century warming under all new RCP scenarios, with the possible exception of the RCP2.6 scenario." [Government of United States of America]
SPM-1140	SPM	13	37	13	37	This new text on the temperature change projections for the RCPs is welcome and now reflects better the literature on the likelihood of reaching 2degC under the different RCPs, in particular RCP2.6. [European Union]
SPM-1141	SPM	13	37	13	37	Please insert "global SURFACE temperatures" [Government of United States of America]
SPM-1142	SPM	13	37	13	39	Since confidence levels are the same in the sentence 'global temperatures averaged in the period 2081-2100 are projected to likely exceed 1.5°C above preindustrial for RCP4.5, RCP6.0 and RCP8.5 (high confidence) and are likely to exceed 2°C above preindustrial for RCP6.0 and RCP8.5 (high confidence)', rephrasing might be needed: 'global temperatures averaged in the period 2081-2100 are projected to likely exceed 1.5°C above preindustrial for RCP4.5 (high confidence) and are likely to exceed 2°C above preindustrial for RCP6.0 and RCP8.5 (high confidence)' [Government of France]
SPM-1143	SPM	13	37	13	40	The text states that, for RCP6.0 and RCP8.5, the global average temperature for (by) 2081 - 2100 is likely to exceed 1.5, and also likely to exceed 2.0, degrees C above pre-industrial. Is the same level of likelihood for both temperature increases consistent and expected? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1144	SPM	13	37	13	42	This statement is key to the SPM but still difficult to read for policymakers. What policymakers would like to know is how likely it is to stay below given thresholds - 1.5°C, 2°C, more. Saying that RCP 8.5 is "likely" to exceed 2°C is trivial but misleading, as this is not just likely but also "virtually certain". [Government of Belgium]
SPM-1145	SPM	13	37	13	42	This bullet is important but the information here cannot be linked to that in Table SPM.2. We recommend adding the values for projected changes in global mean

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						temperature, relative to preindustrial, directly to Table SPM.2 9. IT is also difficult to reconcile the statement on line 40 (that temp change above 2 degrees C under RCP2.6 is unlikely) with the projected range in global temperature increase for RCP2.6 using the given range relative to 1986-2005 from Table SPM.2 and adding 0.61 degrees to obtain values relative to pre-industrial. The new likely range would be 0.9 - 2.3 for RCP2.6. This seems inconsistent with the statement on line 40, and an explanation for the determination that exceeding 2 degrees C is unlikely is required. [Government of Canada]
SPM-1146	SPM	13	37	13	42	Difficult to read perhaps put in a table [Government of Ireland]
SPM-1147	SPM	13	37	13	42	In this paragraph results of projections following RCP scenarios are stated with "high confidence". Giving "high confidence" is questionable if those results came only from model calculations without any theoretical considerations based on physical laws or empirical evidences from paleoclimatic data. If so, it is better not to use the word "confidence" but just to note "high agreement in model projections." [Government of Japan]
SPM-1148	SPM	13	37	13	42	An obvious omission from this paragraph is 'how likely temperatures are to exceed 2 degrees under RCP 4.5' [Government of New Zealand]
SPM-1149	SPM	13	37	13	42	The average policy maker would read this section and assume that all RCPs are as likely as one another and therefore 'choose' to believe that the 2.6 is on the table as a plausible future. What is not captured is the dramatic change in societal energy use policies required to achieve the RCP 2.6 future. While perhaps not appropriately addressed here, Box SPM.1 provides the perfect platform to address this issue. [Government of United States of America]
SPM-1150	SPM	13	37	13	42	Suggest adding information on near-term projection (2016-2035) relative to pre-industrial control with material from 11.3.6 on page 11-53 and Ch. 11 executive summary on page 11-3. [Government of United States of America]
SPM-1151	SPM	13	37	13	42	This is a really confusing message for policy-makers who are really trying to work out what are the likely changes in temperature and by when? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1152	SPM	13	40	13	40	It needs to be confirmed whether the term "unlikely", which is associated with temperature change above 2 °C under RCP2.6 with respect to the preindustrial era, is consistent with the projected likely range of 0.3°C to 1.7°C relative to 1986-2005 mentioned in the previous paragraph. [Government of Japan]
SPM-1153	SPM	13	40	13	40	Please indicate if this includes long-term temperature changes or only this century. [Government of Norway]
SPM-1154	SPM	13	40	13	42	Although it has been stated on page 12 that all figures are given relative to 1956-2005 unless otherwise stated, the change of reference period within this paragraph is confusing. Either keep pre-industrial as reference for the two last sentence or specify 1986-2005 (we would strongly prefer to keep the pre-industrial reference, and include consideration for the emission-driven simulations for RCP 8.5). [Government of Belgium]
SPM-1155	SPM	13	41	13	42	This is confusingly complex language. In plain English you seem to be saying 'we think there is a 50:50 chance of exceeding 4 degrees for the RCP8.5 scenario'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1156	SPM	13	41	17	42	Please check the statement that 4°C is "as likely as not" for RCP 8.5: we have doubts regarding this because table 12.3 states that the probability is 62%. Moreover, this table is based on gaussian distribution, while the distribution of climate sensitivity (and transient response) is not symmetrical: higher sensitivities are more probable than a symmetrical distribution would suggest. Thus it appears that the probability is "somewhat larger than 62%", which makes it "likely". The qualifier "as likely as not" may underestimate the risk. Note that starting from "likely", the likelihood statements means "probability > x%", but this is not true for "as likely as not", which means between 33 and 66%. In other words, this statement is valid only if you are convinced that the likelihood is < 66 %. [Government of Belgium]
SPM-1157	SPM	13	44	3	47	This is important information from the policy maker's point of view. Is it possible to provide some examples of regions (e.g. those for which high confidence exists for such a statement) that will experience these changes in order to be less generic ? (this info may be included in Table SPM.1 for example). [European Union]
SPM-1158	SPM	13	44	13	44	"in most places" is somewhat vague. Suggest being more precise about what is meant here if possible. [Government of Canada]
SPM-1159	SPM	13	44	13	44	What is not included "in most places"? [Government of United States of America]
SPM-1160	SPM	13	44	13	47	A statement about precipitation extremes in the near term should be added, following the Executive Summary in Chapter 11 (page 11-4). [Government of United States of America]
SPM-1161	SPM	13	44	13	47	This doesn't say WHY occasional cold winter extremes will continue to occur - the first question readers will ask. Is it because of shorter-term changes in regional weather patterns or more about the tail of a pdf? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1162	SPM	13	44			What does "in most places" mean and what does it mean to say we are "virtually certain" about something which only occurs "in most places"? [Government of Netherlands]
SPM-1163	SPM	13	45	13	47	Can anything be said about the extent and intensity of heat waves (In addition to their frequency and duration)? [Government of United States of America]
SPM-1164	SPM	13	50	13	50	Since this section deals with the elements of atmospheric circulation like monsoon and ENSO, it is suggested to re-entitle "Water Cycle" as "Atmosphere Circulation and Water Cycle". [Government of China]

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SPM-1165	SPM	13	50	13	50	The title says water cycle but the section discusses only precipitation. Why not call it precipitation, which is easy for policy makers to understand. [Government of India]
SPM-1166	SPM	13	52	13	52	Please substitute: "...contrast of seasonal mean..." by "...contrast of annual mean...", as it is used in the TS P 52 and the ES of Ch 12 P 4 [TS-52; ES 12-4]. [Government of Germany]
SPM-1167	SPM	13	52	13	55	It is not clear what "contrast" means in these two sentences. We believe that these findings were better phrased in the FOD of SPM. Please consider rephrasing. [Government of Norway]
SPM-1168	SPM	13	52	13	56	These statements on seasonal precipitation are very important and new comparing to main messages by AR4. Please insert an additional figure indicating the seasonal changes (or DEC-FEB and JUNE-AUG, at least). Please do not join these figures with the present Figure 7b (annual changes), but with present day (simulated or observed) precipitation. Such figures would surely help to understand and accept this message by the targeted policy makers. [Government of Hungary]
SPM-1169	SPM	13	52	13	56	It is concluded here with high confidence that two kinds of contrasts will increase in water cycle; the contrast of seasonal mean precipitation between dry and wet regions, and the contrast between wet and dry seasons. The change in water cycle is very important for agriculture, people's life and Policymakers and significantly dependent on seasons as described in the text. However, only a map for change in average precipitation is shown in this Figure SPM.7. This is not enough even for SPM. At least, maps for projected changes in seasonal precipitation for JJA (June-July-August) and DJF (December-January-February) should be added to Figure SPM.7 or somewhere in SPM. [Government of Japan]
SPM-1170	SPM	13	52	13	56	Note that both conclusions about precipitation are not found in the executive summary of chapter 12. Moreover, nowhere in chapter 12 the Equatorial Pacific Ocean is linked to precipitation. Consequently, the connection with the likelihood statement very likely is not appropriate. [Government of Netherlands]
SPM-1171	SPM	13	52	13	56	Can you say something about ENSO in this box and about a warmer atmosphere being expected to hold more water overall? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1172	SPM	13	55	13	56	"very likely" seems too much for Antarctica, also in view of medium confidence for increased snowfall on Antarctica elsewhere (SPM-16 I.24) [Government of Netherlands]
SPM-1173	SPM	13		14		It's strange that ocean acidification is considered to be an 'indicator' of climate change here when it is a separate issue and is a result of CO2 emissions and not climate change. [European Union]
SPM-1174	SPM	14	1	14	2	The statement: "... similar large-scale pattern to those toward the end of the century ..." does not provide clarity on the century referred to. And where are these pattern described? [Government of Switzerland]
SPM-1175	SPM	14	1	14	3	Suggest add specifics with likelihood and confidence qualifiers. From the Ch 11 exec summary (page 11-3): Zonal mean precipitation will very likely increase in high and some of the mid-latitudes and will more than likely decrease in the subtropics. Increases in specific humidity over land are very likely. (11.3.2) [Government of United States of America]
SPM-1176	SPM	14	1	14	3	This paragraph might be better at the end of this sub-section. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1177	SPM	14	1	14	4	Ozone recovery effects are neglected: "In the next few decades ...internal variability, and in the Southern Hemisphere by ozone recovery." [Government of Netherlands]
SPM-1178	SPM	14	2	14	3	For the last sentence the following wording is suggested: "Projected changes at the regional-scale and for short time periods (e.g. the next few decades) will be strongly influenced by internal variability." The explanation is that such statement is not only true for the next decades but in general (and a similar statement can be found already onj page SPM-12) [Government of Austria]
SPM-1179	SPM	14	2	14	3	Suggest clarifying what is meant by "projected changes at the regional-scale will be strongly influenced by internal variability." This wording may not be clear for a policy audience. [Government of Canada]
SPM-1180	SPM	14	2	14	3	This statement is redundant, since internal variability is always important at regional scale independent of the period. Moreover, it mentions changes only without specification. [Government of Netherlands]
SPM-1181	SPM	14	3	14	3	What is meant by "Internal variability" should be explained. [Government of Norway]
SPM-1182	SPM	14	5	14	5	Again, given that this report is intended for a non-technical audience, it would be useful to provide an explanation for the definition of "subtropical dry regions" as these include geographical areas and countries that might surprise lay readers. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1183	SPM	14	5	14	7	Figure SPM.7 does not make clear where the wet en dry regions are. It shows changes in precipitation, but it does not highlight the mentioned regions. [Government

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						of Netherlands]
SPM-1184	SPM	14	5	14	9	Here, one should provide - as done for temperature on the previous page - also results based on the other RCPs, not only for the RCP8.5. [Government of Sweden]
SPM-1185	SPM	14	5	14	9	Why is only the RCP8.5 scenario mentioned here? Does this imply that no significant changes are predicted to occur in the other scenarios? If this is the case, than it needs to be stated. [Government of Switzerland]
SPM-1186	SPM	14	5	14	9	The specific focus on mid-latitudes is not obvious in the referenced sections in 7.6. Rather, there is an emphasis of dry regions getting drier, and wet regions getting wetter more generally. Perhaps the language is spelled out more clearly in Chapter 12 and can be drawn forward to the SPM. [Government of United States of America]
SPM-1187	SPM	14	6	14	7	Results here are illustrated for RCP8.5 only. Are projections under other scenarios inconclusive? If so, this should be stated (with appropriate certainty descriptors). [Government of United States of America]
SPM-1188	SPM	14	6	14	7	Does this mean that this is not the case for the other scenarios? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1189	SPM	14	8	14	9	Can anything be said about the extent and duration of extreme precipitation events (in addition to their intensity and frequency)? [Government of United States of America]
SPM-1190	SPM	14	10	14	10	Given the role of humidity and evaporation in the water cycle, it is suggested that based on Chapter 11 – ES (Line 1-2 Para 8 Page 3), "Increases in near-surface specific humidity over land are very likely. Increases in evaporation over land are likely in many regions." be added to the SPM (Line 10 Page 14). [Government of China]
SPM-1191	SPM	14	11	14	11	Which monsoon? Overall, this paragraph on monsoons reads inconsistently. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1192	SPM	14	11	14	14	Line 12 in this paragraph states that "monsoon precipitation is likely to intensify". But Chapter 14 – ES (Page 3) notes that "the global monsoon, aggregated over all monsoon systems, is likely to strengthen in the 21st century with increases in its area and intensity, while the monsoon circulation weakens. Monsoon onset dates are likely to become earlier or not to change much and monsoon retreat dates are very likely to delay, resulting in lengthening of the monsoon season". The ES gives no conclusion on the changing global monsoon system precipitation. Moreover, Page 3 also notes that "There is low confidence in projections of changes in precipitation amounts for the North American and South American monsoons". Further verification is suggested to ensure the rigorousness of the conclusion reached here in the SPM that "monsoon precipitation is likely to intensify". [Government of China]
SPM-1193	SPM	14	12	14	12	".while monsoon circulation is likely to weaken, monsoon precipitation is likely to intensify" will be counter-intuitive to non-technical readers. Does it, by the way, imply that the weakened circulation is insignificant, and rise in the rainfall is solely due to rise in temperature? If so, the information on the "weakening monsoon circulation" should be qualified by some probabilistic measure. Further, are teh probabilities/confidence levels for increase in monsoon rainfall similar every monsoonal region? Monsoons cover highly populated regions, and therefore, if possible, adding some regional information may be useful, but only along with sufficient information on probabilities. [Government of India]
SPM-1194	SPM	14	12	14	12	A short explanation, if any, on why monsoon precipitation intensifies under reduced monsoon circulation would be informative. [Government of Japan]
SPM-1195	SPM	14	12	14	12	What is meant by monsoon 'circulation' in the context of its weakening? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1196	SPM	14	12			"monsoon precipitation is likely to intensify" only refers to globally averaged monsoon precipitation. To avoid potential over-confidence about regional changes: "global monsoon precipitation is likely to intensify, but with variations between different monsoon regions" [Government of Netherlands]
SPM-1197	SPM	14	13	14	14	It's unclear what the justification is for the statement that monsoon retreat date is "very likely" to be delayed. Importantly, there does not appear to be any evidence cited for a detectable trend toward a later monsoon end date in the WG1 report. In addition, it seems that the likelihood level has gotten inflated along the way from the full text section to the SPM. In fact, looking back to the original chapter, this "inflation of likelihood" seems to occur going from main text to the executive summary of Ch. 14. See for example the section 14.2.5. Assessment Summary "There is high confidence that global monsoon precipitation is likely to strengthen in the 21st century with increase in its area and intensity while the monsoon circulation weakens. Precipitation extremes including precipitation intensity and consecutive dry days are likely to increase at higher rates than those of mean precipitation. Overall, CMIP5 models project that the monsoon onset will be earlier or not change much and the monsoon retreat dates will delay, resulting in a lengthening of the monsoon season. Such features are likely to occur in most of Asian-Australian Monsoon regions." This discussion clearly does not indicate a "very likely" delay in the monsoon retreat date. Further, the duration projection form global monsoon in Fig. 14.1 has error bars for RCP8.5 that include zero. East Asia and South Asia regions have projected duration increases where the error bars do not include zero, but this is not a sufficient basis for a "very likely" projection. For other regions results are even less compelling. In short the high likelihood level (very likely) seems not justified by the findings in the report. [Government of United States of America]

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SPM-1198	SPM	14	14			monsoon onset and retreat dates: high confidence? What does the model evaluation chapter say about the verisimilitude of onset and retreat dates of GCMs? [Government of Netherlands]
SPM-1199	SPM	14	18	14	20	The following wording is suggested in order to enhance clarity: "Natural modulations of the variance and spatial pattern of ENSO are large and thus confidence in any projected change for the 21st century for a specific region remains low." [Government of Austria]
SPM-1200	SPM	14	20	14	20	Please revise to "...projected change in ENSO-related regional phenomena for the...." or otherwise appropriate. "Any specific change" is too wide a concept. [Government of Sweden]
SPM-1201	SPM	14	23	14	23	This section is missing a statement on aerosol (PM) air quality- even if they are uncertain. [European Union]
SPM-1202	SPM	14	23	14	30	This section describes ozone only, i.e., a part of "Air Quality". If the "Air Quality" section remains, future projection of aerosols, especially sulfate and black carbon, which are significant climate forcing agents should be added. [Government of Japan]
SPM-1203	SPM	14	23	14	30	We miss explicit information about particulate matter and other short lived climate forcers in this section. Please consider to elaborate on the last sentence with results from e.g Ch11 and 6 in the main report. [Government of Norway]
SPM-1204	SPM	14	23	14	30	The section misses a "shaded" box. Given that there only is one bullet, such a box could be omitted. However, the information derives from the full report and a heading could be motivated. Suggest that the last sentence (starting "All else being equal...") is made into a "shaded box". [Government of Sweden]
SPM-1205	SPM	14	25	14	25	The section on Air Quality needs to be extended. It should address the response of both surface ozone and particulate matter (PM). Preferably this section should address the main conclusions regarding the effects of both climate change and changes in emissions of ozone and aerosol precursors. For ozone it is mentioned that the background levels increase with rising methane. However, this cannot be isolated from the effects of changes in the other ozone precursor gases. The corresponding uncertainties should be discussed in the same way as for the other components of the climate system. [Government of Netherlands]
SPM-1206	SPM	14	25	14	25	Another effect that can be mentioned in relation to surface ozone is the acceleration of the meridional circulation in the stratosphere and the resulting increase in the net downward transport of ozone from the stratosphere, which are both simulated in models. It should be mentioned if this has any importance for surface ozone. [Government of Netherlands]
SPM-1207	SPM	14	25	14	27	"surface ozone" is up to what height (boundary layer, free troposphere, both...)? [Government of United States of America]
SPM-1208	SPM	14	25	14	28	The current wording lacks clarity. The following is suggested: "Background levels of surface ozone (O3) on continental scales are projected to decrease over most regions as rising temperatures enhance global O3 destruction (high confidence). However, tropospheric ozone increases with rising methane (high confidence). Thus, by 2100, surface ozone increases by about 8 ppb globally in the double-methane scenario (RCP8.5) relative to the stable-methane pathways." [Government of Austria]
SPM-1209	SPM	14	25	14	28	It is not readily obvious whether the net effect under the RCPs (2.6, 4.5, 6.0) is one of decrease or increase. Or are all these "stable-methane"? [Government of Sweden]
SPM-1210	SPM	14	25	14	30	Sentences needs to be simplified for better understanding [Government of India]
SPM-1211	SPM	14	25	14	30	The removal of aerosols might also be enhanced, e.g. by enhanced precipitation, this effect is neglected in the current summary on Air Quality [Government of Netherlands]
SPM-1212	SPM	14	25	14	30	It will be useful to have a note that ozone in the air that people breath (vs ozone in the stratosphere that reduces radiation) is an oxidant and considered as a pollutant. [Government of United States of America]
SPM-1213	SPM	14	25	14	30	We strongly encourage the authors to significantly re-write this entire paragraph for improved clarity (e.g., the situation in polluted vs. less polluted regions) and relevance for policymakers regarding ozone, and to say something about aerosols and PM2.5. (The corresponding paragraph in chapter 11, page 4 should likewise be re-written along the lines suggested here). Our suggested re-write borrows almost entirely from existing text in section 11.3.5: The range in near-term projections of air quality is driven primarily by emissions (including CH4) rather than by climate change (medium confidence). Globally, warming decreases [DELETE: baseline, INSERT: background] [DELETE: surface, INSERT: tropospheric] O3 almost everywhere due to an increase in the destruction of O3 by water vapor [INSERT: because increases in water vapor facilitates O3 destruction], but increases O3 in some polluted regions and seasons. Higher methane levels such as in RCP8.5 can offset this climate-driven decrease in background O3 (by 2100 background O3 levels are 8 ppb higher than under RCP4.5 or RCP6.0). Observational and modelling evidence indicate that, all else being equal, a warming climate is expected to increase [DELETE: surface, INSERT: tropospheric] O3 in polluted regions (medium confidence). Natural aerosols may increase with temperature, particularly carbonaceous aerosol from wildfires, mineral dust, and biogenic secondary organic aerosol. However, there is low confidence in the overall impact of climate change on PM2.5 distributions. Higher temperatures in polluted environments will trigger regional feedbacks during air stagnation episodes that will increase peak pollution (medium confidence). [Government of United States of America]

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SPM-1214	SPM	14	25	15	27	What is the net effect on the O3 concentration from these two contrasting trends? [Government of Germany]
SPM-1215	SPM	14	25		30	This para is very hard to follow. It contains three statements: (i) The net effect of ozone destruction due to higher temperatures and production due to higher CH ₄ is a decrease; (ii) There is more O ₃ if there is more CH ₄ , and (iii) there is a positive feedback between T and chemistry. To enhance the readability of this para, each of these three statements should have their own bullet. [Government of Netherlands]
SPM-1216	SPM	14	26	14	29	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1217	SPM	14	27	14	27	Please let the reader know how the projected 8 ppm increase relates to the present global average e.g. in percentage. [Government of Hungary]
SPM-1218	SPM	14	27	14	27	Surface ozone increases by about 8 ppb compared with what? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1219	SPM	14	27	14	28	The projected 8 ppb increase in ozone is not consistent with the TS: "For O ₃ , continental-scale changes across the RCPs range from -4 to +5 ppb by 2030 and -14 to +5 ppb by 2100." [Government of Netherlands]
SPM-1220	SPM	14	28	14	28	Suggest explaining which pathways have stable methane - is it all the other RCPs other than RCP8.5? Also, it's not clear if surface ozone decreases or not in these RCPs. [Government of Canada]
SPM-1221	SPM	14	28	14	30	This statement is not clear enough. Please let the reader know what the IPCC means under "All else being equal". Also please indicate what kinds of pollution will further enhance dou to the mentioned positive feedbacks. (Not all kinds of pollution, we are sure.) [Government of Hungary]
SPM-1222	SPM	14	30	14	30	Enhancing pollution levels: which are the 'pollutants'? Is it only O ₃ as discussed in the begining of the paragraph? Also the last sentence (lines 28-30) seems to contradict the first 2 lines of this paragraph. Maybe it is simply an issue of re-phrasing. [European Union]
SPM-1223	SPM	14	30	14	30	"Enhancing pollution levels" may not be clear to all, as it may possibly be understood as "improving" the pollution level, which means decreasing pollution. We suggest to use a wording that clearly means "increasing pollution" to all readers. [Government of Belgium]
SPM-1224	SPM	14	32	14	32	Insert a new section on Climate phenomena Move P14,L11,P14,L20 to this new section. Add as the 3rd bullet of the section, Chap.14,P4, the first paragraph in bold letters under Tropical Phenomena on Indian Ocean Dipole Add as 4th bullet of the section, Chap.14, P4, the sentences in bold letters of the first paragraph under Cyclones [Government of Madagascar]
SPM-1225	SPM	14	35	14	35	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-1226	SPM	14	37	14	37	The reference {12.4} could be replaced by {12.4.7}, because the latter contains all the information. [Government of Netherlands]
SPM-1227	SPM	14	40	14	41	How can tropical & subtropical oceans warm the most if there is polar amplification going on, with greatest warming expected [occurring] in the Arctic? This needs clarification [Government of United States of America]
SPM-1228	SPM	14	40	14	43	This bullet needs agreement/evidence/confidence/likelihood descriptors. [Government of United States of America]
SPM-1229	SPM	14	40	14	48	In all scenarios, there is no explanation for the differences in degree of increase in sea surface temperature at different regions. [Government of Vietnam]
SPM-1230	SPM	14	40	14	54	There seems to be little impact expected in the ocean in this section on Future Global and Regional Climate change. There are two expectations listed about AMOC but nothing globally. Why is that? Isn't the thermohaline circulation expected to slow down? Will the ocean bottom layer become isolated from the surface and oxygenation be reduced, possibly increasing vulnerability to hypoxia? Will the melting ice create a layer of fresher water that will increase stratification? The whole future section seems to be very carbon and temperature-centric, and there is very little concern about the ocean where all the heat (and energy) is trapped. The residence time of carbon in the atmosphere and in terrestrial systems is much shorter than in the ocean. The policymaker would benefit from a more representative discussion of the ocean in this light. [Government of United States of America]
SPM-1231	SPM	14	40			This is the first place the term "warming signal" is used. Is this necessary? For consistency and ease of understanding, suggest deleting the word signal and just describe the warming. [Government of Canada]
SPM-1232	SPM	14	41	14	43	"According to underlying report (FD) 12.4.7.1, ocean warming in surface water ranged from about 1°C to more than 3°C, rather than 0.5°C to 2.5°C in SPM. Furthermore ocean warming between 0.5°C and 1.5°C will reach a depth of 1 km rather than 0.3°C and 0.7°C by the end of the century in SPM." It is suggested to verify relevant numbers in this passage to ensure the consistency with the underlying report (FD). [Government of China]
SPM-1233	SPM	14	41	14	43	The warming rates cannot be traced in section 12.4.7. [Government of Netherlands]
SPM-1234	SPM	14	42	14	43	Recommend rewording to make clearer: "...to 2.5oC (RCP8.5) and at a depth of about 1km, 0.3oC (RCP2.6) to 0.7oC (RCP8.5) by the end of the century."

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						[Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1235	SPM	14	42		42	The corresponding statement in Chap. 12 (page 12-59, l 4/5) is: "Depending on the emission scenario, global ocean warming between 0.5°C (RCP2.6) and 1.5°C (RCP8.5) will reach a depth of about 1 km by the end of the century." This is not really the statement given here in the SPM. [Government of Netherlands]
SPM-1236	SPM	14	45	14	45	Providing what the AMOC acronym stands for is probably not enough for policymakers. A footnote would be probably useful, explaining for example that the AMOC conveys heat from the tropics to higher latitudes, and that it is partly responsible for regional climate variability in the Atlantic. [Government of France]
SPM-1237	SPM	14	45	14	45	Please add to "Atlantic Meridional Overturning Circulation" the name mostly used and understood by policy-makers "Thermohaline circulation". [Government of Norway]
SPM-1238	SPM	14	45	14	48	Why is RCP4.5 used for the lower bound? For other similar places (e.g., the bullet just above, bullets on page 15), RCP2.6 is always used for defining the lower bound. [Government of Japan]
SPM-1239	SPM	14	45	14	48	The corresponding text in Chapter 12 does not say the same thing. This corresponding text is as follows: "it is very likely that the AMOC will weaken over the 21st century. The best estimate decrease in 2100 is about 20–30% for the RCP4.5 scenario and 36–44% for the RCP8.5 scenario" 12-59/60 [Government of Netherlands]
SPM-1240	SPM	14	45	14	48	The finding that AMOC weakening is "very likely" for RCP8.5 late 21st century may be overstating the likelihood. Importantly, no observational evidence is cited in the IPCC report for a declining trend in the AMOC to date. Secondly, relatively few CMIP5 models were even included in the analysis. Consequently, the current statement is possibly overstating the likelihood. The authors should reconsider whether a likelihood level of "very likely" is warranted, particularly as there is no observational evidence to date for a decline in the AMOC. Also the statement (p. SPM-14, lines 45-48) reads as if the weakening will very likely be in the range of 20 to 30% in the RCP4.5 scenario. However, in the main chapter, we see that 20 to 30% is the best estimate, not a 5-95% confidence range. Therefore in the SPM, the text should be clarified to read: "It is [likely?] that the Atlantic Meridional Circulation (AMOC) will weaken over the 21st century with a best estimate of about -20 to -30% in the RCP4.5 scenario, and about -36 to -44% in the RCP8.5 scenario..." In other words, there appears to be more specificity that can be justified. A 90+% likelihood that the weakening will be between 36 and 44%? This may be the model range, but it is highly suspect that an expert elicitation would produce a range that small. In general, the projections in this section seem to be almost entirely model-driven, and while it makes sense for models to be prominently featured, it would be useful to also place the model projections in context of broader scientific judgments (this is done well for the sea level rise section, for example). [Government of United States of America]
SPM-1241	SPM	14	45	14	48	It would be useful to relate the potential weakening of the AMOC to changes in the rest of the climate system. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1242	SPM	14	45	14	53	Suggest condensing these two bullets into one bullet and beginning with a brief explanation of the relevance of understanding changes in the AMOC. By its technical term, the AMOC won't be understood by many readers. Suggest that plainer language required here. [Government of Canada]
SPM-1243	SPM	14	46	14	46	Why are results about changes to the AMOC presented for only RCP4.5. and 8.5? If results for only two scenarios are to be presented, should not RCP2.6 and RCP8.5 be used to be consistent with presentation of other results in other parts of this section? [Government of Canada]
SPM-1244	SPM	14	46	14	48	Please clarify that the cause for AMOC increase during some decades is natural variability. In addition, the current sentence may suggest that you are certain that decades with increasing AMOC will occur. The main report states that this is "to be expected" (chapter 11). Please clarify whether the uncertainty statement also applies to the second part of the sentence. Will there also be decades where it is certain that the AMOC will decrease, so that what is "certain" is that there is variability, and what is likely is that there will be a net downward trend ? [Government of Belgium]
SPM-1245	SPM	14	46	14	48	In the statement 'but there will be some decades when the AMOC increases', indicative values for 'some' should be provided. [Government of India]
SPM-1246	SPM	14	46			"about 36 to 44%". Round to nearest 5%. [Government of Netherlands]
SPM-1247	SPM	14	47	14	48	"It is likely that there will be some decline in the AMOC by 2050, but there will be some decades when the AMOC increases." This is quite unclear. Are these decades with increases in the AMOC apparent in all simulations, do the models agree? What are possible drivers for the increase? [Government of Austria]
SPM-1248	SPM	14	47	14	48	The implication of "there will be some decades when the AMOC increases" is not readily clear. Will the AMOC be larger than at present or larger than what would be expected from the successive impact on the AMOC of the 21st Century trend? [Government of Sweden]
SPM-1249	SPM	14	47	14	48	"...but there will be some decades when the AMOC increases." Why is this and why is it important? Without some explanation, it is likely that this will confuse policy makers. Also, you need to repeat the confidence language in the second point made in this sentence - i.e. 'but there will likely be some decades when the AMOC increases.' otherwise this could be quoted out of context. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1250	SPM	14	48	14	48	"AMOC increases" should be "AMOC can be expected to increase." [Government of United States of America]

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SPM-1251	SPM	14	50	14	53	You need to be cautious with language here - modelling may show that an AMOC collapse is unlikely in the 21st century but most models are weak when it comes to modelling non-linear feedbacks, so this could be as much about confidence as likelihood. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1252	SPM	14	50			"It is very unlikely that the AMOC will undergo an abrupt transition or collapse" implies high confidence, is that warranted? [Government of Netherlands]
SPM-1253	SPM	14	51	14	52	This statement cannot be traced in section 12.5.5. [Government of Netherlands]
SPM-1254	SPM	14	52	14	53	Suggest inserting "However," before "A collapse", so sentence reads, "However, a collapse..." [Government of Canada]
SPM-1255	SPM	14	52	14	53	Skip the last sentence. It is redundant, it cannot be found in the section, and it contains an alarming note [Government of Netherlands]
SPM-1256	SPM	14	52	14	53	Please consider to describe the potential consequences of a collapse of AMOC? [Government of Norway]
SPM-1257	SPM	14	53	14	53	Add confidence level to this statement about the collapse of the AMOC. [Government of Switzerland]
SPM-1258	SPM	14	53			The corresponding statement in Chap. 12 (2nd to last para of 12.5.5.2) reads: "It remains very unlikely that the AMOC will undergo an abrupt transition or collapse in the 21st century. No model exhibits an abrupt shutdown of the AMOC after 2100 under any RCP simulation. Only one of the CMIP5 models revealed an eventual slowdown of the AMOC to an off state. But this did not occur abruptly." We would not conclude from this statement that a collapse cannot be excluded. [Government of Netherlands]
SPM-1259	SPM	15	1	15	28	(See earlier comments) the cryosphere section excludes any regionality in respect of ice and snow cover (e.g. in the Himalaya, which affects a third of humanity). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1260	SPM	15	3	15	4	Northern Hemisphere snow cover should actually be spring snow cover, according to the model projections described in section 12.4.6.2 and to be consistent with the conclusion at SPM-15, lines 24-25. Moreover, the confidence of these model projections is given as medium and not as very likely (which would even imply high confidence). According to section 12.4.6.2 this is due to considerable scatter and simplified snow processes in models. Note that the conclusions related to snow cover in section 12.4.6.2 are also inconsistent with those in the executive summary of the same chapter and in the TS. [Government of Netherlands]
SPM-1261	SPM	15	3	15	6	This section could be part of a high-level summary section at the beginning of the chapter although it could perhaps also contain a sentence on summer Arctic sea-ice extent. [European Union]
SPM-1262	SPM	15	3	15	6	A summary statement on Greenland and Antarctica is required followed by a bullet point in this section there is no content on the ice sheet at all?? [Government of Netherlands]
SPM-1263	SPM	15	3	15	29	Please provide information on projected future developments of the Greenland ice sheet. [Government of Germany]
SPM-1264	SPM	15	4	15	4	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1265	SPM	15	4	15	4	Please insert, "snow cover will CONTINUE TO decrease during..." Also, it's not clear why further reductions in snow and ice cover are not "virtually certain." [Government of United States of America]
SPM-1266	SPM	15	4	15	5	Suggest replacing the phrase "near-surface permafrost extent" with "the thickness of seasonally thawed ground". The original formulation could easily be misinterpreted as indicating that there will be a complete loss of permafrost, when in fact the modeling studies that are the basis of this statement only consider the upper 2-3 m of the ground. Similar changes should be made to the statement on lines 27-28 of this page. This will help to avoid the risk of misinterpreting that the decrease of 37-81% is an estimate in the change in spatial extent. [Government of Canada]
SPM-1267	SPM	15	4	15	5	This conclusion states permafrost decrease at high northern latitudes specifically while the chapters do not specify the Northern Hemisphere. Unless there are important permafrost regions outside the Northern Hemisphere, it should be deleted. [Government of Netherlands]
SPM-1268	SPM	15	5	15	5	Include 'global' before 'glacier volume'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1269	SPM	15	5	15	6	It is not clear if the decrease in glacier volume only refers to high northern latitudes only or not. Anyhow this comment should also include "high mountains in mid latitudes" and include permafrost as well. [Government of Austria]
SPM-1270	SPM	15	5	15	6	This statement needs agreement/evidence/confidence/likelihood descriptors. [Government of United States of America]
SPM-1271	SPM	15	6	15	6	Add reference to section 11.3.4 which provides the mid-century projection. [Government of United States of America]
SPM-1272	SPM	15	8	15	16	The first bullet here is based on the full set of models, whereas the second bullet is based on a subset of models that do better at reproducing observed historical changes. The authors should make this point more explicit, so an inconsistency in the findings between these two bullets is not implied (the second one says the Arctic

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						is likely to be ice-free by mid-century under RCP8.5, whereas the first bullet says the Arctic sea ice extent will recede 94% by 2100 under RCP8.5). Moreover, these two bullets should be combined and their implications assessed. [Government of United States of America]
SPM-1273	SPM	15	8	15	16	These two paragraphs seem to be giving different estimates of Arctic sea-ice loss. The second gives a higher loss. Also, in line 8 'reductions in Arctic sea ice...' should specify that it is extent that is being considered to avoid confusion. Suggest merging these paragraphs and giving a best estimate range for summer ice loss. Also, the figures for September seem a little low. Elsewhere sea-ice extent is estimated to be zero by 2070. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1274	SPM	15	9	15	9	Fig SPM.7 suggests removal of September sea ice in RCP8.5 to be 100%, not 94%. [Government of Netherlands]
SPM-1275	SPM	15	9			"43% for RCP2.6 to 94% for RCP8.5 in September and from 8% to 34% in February" No model uncertainty included in these statements? [Government of Netherlands]
SPM-1276	SPM	15	10	15	10	The phrase "from 8% to 34%" is too brief for readers to understand which RCP scenario corresponds to "8%" and "34%". So, "from 8% to 34%" should be "from 8% for RCP2.6 to 34% for RCP8.5", which is described in Executive Summary (p.12-5) of Chapter 12. [Government of Japan]
SPM-1277	SPM	15	13	15	16	Most of the projections reported on in the SPM on pages 12-17 include results for all RCPs or at least both the lowest (RCP2.6) and the highest (RCP8.5). Why are only the results for RCP8.5. provided here for Arctic sea ice projections? If it can be said that in general, all the RCPs point toward a nearly-ice free Arctic ocean by mid-century, then suggest stating so. [Government of Canada]
SPM-1278	SPM	15	13	15	16	Why is scenario RCP8.5 singled out for future Arctic sea ice? Is it because it projects serious environmental conditions, ie no September sea ice [presumably]? But this is inconsistent with some other sections which give results from several RCP scenarios, What are the other scenario projections and their confidence for sea ice? They are quite different according to SPM-Fig 6b. [Government of United States of America]
SPM-1279	SPM	15	13			The subset is surprisingly small. Mention the size of the subset. [Government of Netherlands]
SPM-1280	SPM	15	14	15	14	A 'nearly' ice-free Arctic Ocean is used in the text but the footnote defines 'ice-free' as <1 million km squared. Better specifically to define what you mean by a 'nearly ice-free Arctic Ocean' or use 'ice-free Arctic' on line 14, to match your current definition. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1281	SPM	15	14	15	15	Please consider starting the paragraph with "The arctic Ocean is likely to be nearly ice-free in September..." [Government of Norway]
SPM-1282	SPM	15	15	15	15	Only RCP8.5 is used, unlike elsewhere in the SPM where numbers for other RCPs are included. What about other RCPs? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1283	SPM	15	18	15	18	Why low confidence? What evidence is this confidence estimate based on? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1284	SPM	15	18	15	19	Suggest providing an explanation of the opposite direction in observed trends vs. projections for Antarctic sea ice. [Government of Canada]
SPM-1285	SPM	15	18	15	19	The large impact of ozone recovery for Antarctica in 21st century is neglected. Add:for the end of the 21st century as GHG concentrations increase and the ozone layer has recovered from the anthropogenic forcing by CFCs [Government of Netherlands]
SPM-1286	SPM	15	18	15	19	This conclusion can be misinterpreted and should be rephrased to make it straightforward: "Due to global warming, models project a decrease in Antarctic sea ice extent at 2100, but with low confidence (optionally reflected by a large spread in the model results or so)." [Government of Netherlands]
SPM-1287	SPM	15	21	15	21	is eliminated' should be toned down, especially since this result has no higher degree of certainty than the other entries between lines 8 and 28. Replace with 'is projected to be eliminated' or 'According to state-of-the-art projections, by 2100...' [Government of France]
SPM-1288	SPM	15	21	15	21	Please consider using "lost" instead of "eliminated", which has a too active meaning here. [Government of Norway]
SPM-1289	SPM	15	21	15	21	"present" is undefined - what are the date(s) exactly? Also, replace 'eliminated' by 'lost'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1290	SPM	15	21	15	22	This sentence structure is inconsistent with what has been presented so far. Suggest revising as: "By 2100, it is projected that 15 to 55% of the present glacier volume will be eliminated..." [Government of Canada]
SPM-1291	SPM	15	21	15	22	Suggest considering using the phrase "volume of mountain glaciers and icecaps" rather than "glacier volume" to make clear that this does not include the Greenland and Antarctic ice sheets. Note that the term is also used on line 5 of this same page. [Government of Canada]
SPM-1292	SPM	15	21	15	22	In view of the importance of the Antarctic and Greenland ice sheets to the overall mass of glaciers, it is suggested that based on the underlying report (FD) (Chapter 13 – ES, Line 1-2 Para 5 Page 3), the following projection on the Antarctic and Greenland ice sheets be given at the end of the paragraph: "There is high confidence in projections of thermal expansion, high confidence in projections of Greenland surface mass balance, and medium confidence in projections of Antarctic surface mass balance and glacier mass loss." [Government of China]

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SPM-1293	SPM	15	21	15	22	Define what is included in "glacier volume" [Government of Denmark]
SPM-1294	SPM	15	21	15	22	after 'volume', add 'globally'. Replace 'eliminated' with 'lost'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1295	SPM	15	21			Please mention that "glaciers" here exclude the icesheets in Greenland and Antarctica. [Government of India]
SPM-1296	SPM	15	24	15	24	Is this by 2100? If so, say so. So, suggest adding 'By 2100' at the start of the sentence to clarify, and add 'from XXXX-YYYY' (the defined 'present date') at the end. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1297	SPM	15	24	15	25	Please, in the text: "The area of Northern Hemisphere spring snow cover is projected to decrease by 7% for RCP2.6 and by 25% in RCP8.5. {12.4.6}", specify the corresponding year when the 7% and 25% decrease will happen. [Government of Argentina]
SPM-1298	SPM	15	24	15	25	By 2100, the area of Northern Hemisphere spring snow cover is projected to decrease by 7%% for RCP2.6 and by 25% in RCP8.5 (medium confidence) [Government of Austria]
SPM-1299	SPM	15	24	15	25	What is the confidence level, and can a likelihood statement be provided ? [Government of Belgium]
SPM-1300	SPM	15	24	15	25	For what time period are these reductions in snow cover applicable? Suggest clarifying. [Government of Canada]
SPM-1301	SPM	15	24	15	25	The number of 25% corresponds with Chapter 12 – ES (Line 5 Para 4 Page 5), but not with 12.4.6.2 of the underlying report (FD), the original text of which (Chapter 12, Line 12 Para 3 Page 57) reads: "SCE decreases of about 13 ± 4% are simulated for RCP4.5, 15 ± 5% for RCP6.0, and 24 ± 7% for RCP8.5". It is suggested to verify the data to change 25% to 24% under RCP 8.5, or to give a temporal attributive - "the last two decades of the 21st century" – for the sake of accuracy. [Government of China]
SPM-1302	SPM	15	24	15	25	In the section of cryosphere, only this sentence does not describe a time frame. The phrase "By the end of the 21st century," should be added at the beginning of the sentence as in Executive Summary (p.12-5) of Chapter 12. [Government of Japan]
SPM-1303	SPM	15	24	15	25	This statement must apply to the 21st century, as is clear from its context, but this fact will get lost when it will be copied elsewhere. [Government of Netherlands]
SPM-1304	SPM	15	24	15	25	A time period is missing. In addition, there should be an uncertainty qualification. The executive summary of chapter 12 labels the confidence of this statement as "fairly coherent", based on the model results, which is not a clear uncertainty formulation. But in the underlying text in section 12.4.6.2 the model projections are labeled as medium confidence (see also comments for SPM-15, lines 3-4). A minor remark: snow cover changes for RCP8.5 are given as 24% +/- 7% in section 12.4.6.2, while in the SPM (and executive summary and TS) is it given as 25%. [Government of Netherlands]
SPM-1305	SPM	15	24	15	25	In contrast to all other bullets in this list, a statement on confidence is missing. [Government of Sweden]
SPM-1306	SPM	15	24	15	25	These projections are substantially less than the reduction already observed. Since 1971 with half a degree of warming the snow cover extent has decreased by 12% based on data contained in Chapter 2. Yet the warming in RCP 8.5 is 5 to 8 times greater and in RCP 2.6 it is as much as three times greater than observed, but the decreases in snow cover is only 25% and 7% respectively. This deserves explanation, if true. [Government of United States of America]
SPM-1307	SPM	15	24	15	25	By what end period - 2100? [Government of United States of America]
SPM-1308	SPM	15	24		25	What is the confidence level of this statement? [Government of Netherlands]
SPM-1309	SPM	15	24			Add model uncertainty in these statements. [Government of Netherlands]
SPM-1310	SPM	15	27	15	27	It is suggested to delete the word "diagnosed" as the sentence refers to the projected near-surface permafrost area. [Government of Austria]
SPM-1311	SPM	15	27	15	27	What does 'diagnosed' mean here? Suggest clarifying. [Government of Canada]
SPM-1312	SPM	15	27	15	27	It is unclear what "diagnosed" means in this context. Please explain better. [Government of Norway]
SPM-1313	SPM	15	27	15	27	"diagnosed" can be deleted. [Government of United States of America]
SPM-1314	SPM	15	27	15	27	What does 'diagnosed' mean here? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1315	SPM	15	27	15	28	"near-surface permafrost extent" is not a well-defined term that is used by the climate modelling community, but is not commonly used by permafrost scientists. The term may be misleading to readers as it implies that there will be a complete loss of permafrost. Rather, the models on which these statements are based are considering thawing in the upper 2-3m of the ground and are therefore considering increases in thaw depth rather than decrease in lateral permafrost extent. reduction in the lateral extent of permafrost, but rather it is referring to a decrease in vertical extent (i.e. permafrost is getting thinner as thawing progresses deeper in

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						the ground). Suggest avoiding the use of this term and more clearly describing the changes in permafrost in terms of change in lateral or vertical extent/thaw depth. [Government of Canada]
SPM-1316	SPM	15	27	15	28	It's worth adding to this bullet what the implications of these various thawings on C release would be. [Government of United States of America]
SPM-1317	SPM	15	27			Add model uncertainty in these statements. [Government of Netherlands]
SPM-1318	SPM	15	31	15	31	This section does not adequately address the implications of the loss of arctic sea ice cover for release of methane and its implications for warming. [Government of India]
SPM-1319	SPM	15	31	16	33	It is very unfortunate that this section is essentially silent about sea-level rise beyond 2100, when such information would be so policy-relevant. Please consider improving this. [Government of Belgium]
SPM-1320	SPM	15	33	15	33	The first statement deserves a likelihood descriptor - virtually certain? [Government of United States of America]
SPM-1321	SPM	15	33	15	36	These conclusions contradict those given in Hanna et al. 2013, Table 1. More recent data show a gap between observed and the sum of all contributions, while this is not the case for the period 1992-2011. Therefore, the sentence 'Confidence in projections has increased' is not logical. [Government of Netherlands]
SPM-1322	SPM	15	33	15	36	Please consider to move this second sentence to a bullet point in the body text. Rationale: the highlighted text should be about future climate changes according to the heading of this part of the SPM. The highlighted text here could be supplemented with the finding in body text so that it reads: "Global mean sea level will rise during the 21st century due to increased ocean warming and loss of mass of glaciers and ice sheets." [Government of Norway]
SPM-1323	SPM	15	35	15	36	The phrase "ice-sheet rapid dynamical changes" is unclear. Please clarify for the policymakers. [Government of United States of America]
SPM-1324	SPM	15	36	15	36	It should be mentioned that the projections of sea level rise are higher than in AR4 (e.g. mainly due to the inclusion of ice-sheet rapid dynamical changes). The range given in AR4 is 0.18 - 0.59 m, while it is 0.26 - 0.81 m in AR5. As mentioned in the underlying report (chapter 13, page 54, line 3ff), for scenario SRES A1B, which was assessed in the AR4, the likely range on the basis of science assessed in the AR5 is (...) 0.57 [0.40–0.75] m by 2090–2099 relative to 1990, compared with the AR4 projection of 0.21–0.48 m for the same scenario and period. An explanation (based on the same paragraph in the main report) might be added to the second bullet point of the section, page 16, line 6. [Government of Switzerland]
SPM-1325	SPM	15	39	15	41	The rate of rise from 1970-2010 is not reported in the SPM and therefore there is no reference rate of rise to compare with. This statement would be much more useful if it was in relation to sea level rise from 1993-2010 (3.2mm/year) as reported at pg 6, line 1-4. [Government of Australia]
SPM-1326	SPM	15	39	15	41	Provide the 1971-2010 rate, as it has not been stated in this SPM. [Government of Belgium]
SPM-1327	SPM	15	40	15	41	"loss of glacier and ice sheet mass" instead of "loss of mass of glaciers and ice sheets" [Government of Denmark]
SPM-1328	SPM	15	45	15	52	[Legend Figure SPM.8]: Using calibrated language for explaining the shaded likelihood interval (i.e. confidence interval of some sort) is not correct. According to the definition (SPM, page1, footnote 1) of the calibrated word "likely" corresponds to 66-100% likelihood. But such a span does not make sense in relation to the shaded regions in the figure. It is reasonable to interpret the shaded region to cover the 66% likelihood band, but to cover the 100% likelihood band the shaded region must be much wider. [Government of Sweden]
SPM-1329	SPM	15	46	15	46	Change "RCP2.6, and RCP8.5" to "RCP2.6 and RCP8.5". [Government of Netherlands]
SPM-1330	SPM	15	49			It is not entirely clear what "marine-based" sectors of ice sheets are, and there could be confusion with sea ice. Suggest the text is changed to read "...marine-based sectors (i.e. where the ice sheet bed lies below sea level) of the Antarctic ice sheet...." [Government of New Zealand]
SPM-1331	SPM	15	51	15	51	replace would by will [Government of Netherlands]
SPM-1332	SPM	15				Footnote 11: Please provide the current extent of sea ice as a reference to clarify the context. [Government of Belgium]
SPM-1333	SPM	16	1	16	2	This sentence should be rephrased to make it more clear that the mentioned sea level rises are relative to the standard reference period. In the way it is phrased now it could also mean a sea level rise from 2081 to 2100. [Government of Netherlands]
SPM-1334	SPM	16	1	16	2	This has been assessed as 'likely' (i.e.>66% probability) given the quantitative evidence. But it has been assessed as medium confidence. This is because there is less confidence in the validity of the findings - presumably due to the high end tail of the distribution (i.e. that there is a smaller chance that it is significantly higher). This should be made clear, as it currently could be read as if there isn't good evidence for the mid-range, or that the range could be lower. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1335	SPM	16	1	16	6	This paragraph lacks clarity because it does not include a reference to the base period (1986-2005). The wording might read as follows: Global mean sea level rise

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						for 2081-2100 relative to 1986-2005 will likely be in the ranges [Government of Austria]
SPM-1336	SPM	16	1	16	6	Suggest stating here that these increases in sea level are relative to 1986-2005. [Government of Canada]
SPM-1337	SPM	16	1	16	6	The last sentence in this bullet is confusing because it is the only place where the projected SLR range in the year 2100 is given (all other reported projections are for 2081-2100) . Why is this the case? This issue is further complicated by the fact that the last sentence begins by reporting on a rate of SLR for 2081-2100 and then concludes by reporting on a range in absolute SLR by the year 2100. If the purpose is to communicate to policy-makers an upper end to projected SLR by the very end of the century, then including a projection for the year 2100 may be appropriate. However, this should be stated more clearly and simply, for example, by saying stating "the upper end of additional SLR projected by 2100, relative to 1986-2005, is just under 1 metre". [Government of Canada]
SPM-1338	SPM	16	1	16	6	It is important that the figures presented in this bullet agree with the Tables and Figures presented in Chapter 13. However, Table 13.5 (upon which these values are based) does not agree with the amounts shown in Figure 13.11. In particular, the Antarctic SMB contribution should be negative, according to Table 13.5, but is plotted as a positive contribution in Figure 13.11. Suggest reviewing and clarifying. [Government of Canada]
SPM-1339	SPM	16	1	16	6	Are the given figures for sea level rise relative to 1986-2005 reference period or are the figures only the rise occurring during 2081-2100 in addition to sea level rise occurring before 2081? If the latter is true, the figures relative to pre-industrial sea level should be given. [Government of Germany]
SPM-1340	SPM	16	1	16	6	Please compare the AR5 sea level rise projections with AR4 SRES scenarios' projections [Government of India]
SPM-1341	SPM	16	1	16	6	It is confusing in this bullet point to jump between rates of sea level rise and the range of total sea level rise by 2100. Could these projected values be placed in separate bullet points? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1342	SPM	16	1	16	6	There is an apparent mis-match to Fig. SPM8. The maximum of the likely range for RCP8.5 for example is quoted on line 2 as 0.81. However, the caption for SPM8 is unclear as it says (page 30 line 6) that the likely range is shown in the "shaded band" (with a maximum close to 1.0m). The caption doesn't clearly explain the difference. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1343	SPM	16	1	16	14	The text (lines 10-12) indicate that the main upside potential for SLR is Antarctica, not Greenland. The low-ish SLR projections seem instead to result from the authors' faith that process-based models correctly represent the future behavior of Greenland. Please clarify and justify this in the text. [Government of United States of America]
SPM-1344	SPM	16	1	16	33	The section fails to make a clear comparison with statements made in AR4 [Government of Netherlands]
SPM-1345	SPM	16	2			We had the impression that giving a likely range was formally not allowed if combined with "medium confidence", but we may be wrong here. [Government of Netherlands]
SPM-1346	SPM	16	4	16	6	The ranges need likelihood qualifiers. [Government of Belgium]
SPM-1347	SPM	16	5	16	5	Suggest to change "the range in year 2100 is 0.53 to 0.97 m" to "the range in sea level rise by year 2100 is 0.53 to 0.97 m" for clarity. [Government of India]
SPM-1348	SPM	16	5	16	5	Here it is used change per year while other changes in the SPM are given in change per decade. This is confusing for the policy makers. Please use the same throughout the report e.g. decadal change. [Government of Norway]
SPM-1349	SPM	16	5	16	5	If the 0.53 to 0.97" is the "likely" range, please specify explicitly. [Government of Sweden]
SPM-1350	SPM	16	6	16	6	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: While it is appreciated that uncertainty and lack of evidence is clearly indicated, the relevance of the matter for decision making, in particular for long term infrastructure planning, requires more detailed information on the upper bounds of sea level rise; a likely range including only 66% of the probability range is of very limited applicability for coastal planning. Ch 13, Sec 13.5.3 on "Confidence in Likely Ranges and Bounds" contains on P 53 estimates of an upper bound from recent literature providing values between 1.15 m and 2.4 m. We suggest lifting this important information to the SPM by adding the sentence "Sea level rise is very likely not to exceed 2.4m by 2100." or at least "The maximum global mean sea level rise reported in the scientific literature does not exceed 2.4 m." [Government of Germany]
SPM-1351	SPM	16	8	16	10	Sentence unclear, please rewrite it. [Government of Switzerland]
SPM-1352	SPM	16	8	16	14	Suggest that the statement "However, there is medium confidence that this additional contribution would not exceed several tenths of a meter of sea level rise during the 21st century" be revised to provide a more concrete upper limit if possible. Given that the upper-bound on West Antarctic MISI estimates of sea-level rise are 69.3, 49, 78.5, and 61.5 cm (Chapter 13-40, 3rd paragraph from bottom), is it possible to amend the statement to read "However, there is medium confidence that this additional contribution would comprise several tenths of a meter of sea level rise during the 21st century and would not exceed 70 cm"? This phrasing has more practical relevance for planners and policymakers. [Government of Canada]

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SPM-1353	SPM	16	8	16	14	There is a large overlap with the caption of fig 8 [Government of Netherlands]
SPM-1354	SPM	16	8	16	14	What about potential collapse of the Greenland Ice Sheet? Is that ruled out for the 21st century? Also, suggest that you include more of the range of estimates (including upper tails) here. And they should mention the possible long-term (up to 2300) projections of sea level rise. Finally, the last sentence is too vague: 'several 10ths of a meter'. The projected range should be included. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1355	SPM	16	8	16	27	The text in this section refers to possible effects of the Antarctic ice sheet on global sea level rise but does not make it clear enough that any contribution would essentially be from collapse/loss of ice shelves, rather than surface melt (since net change in surface mass balance -snowfall minus surface melt - is projected to be positive). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1356	SPM	16	9	16	9	Is it "insufficient evidence" or "insufficient model simulations"? [Government of India]
SPM-1357	SPM	16	10	16	11	Please define "marine-based sectors". For example "parts of the ice sheets grounded below sea-level". [Government of Norway]
SPM-1358	SPM	16	10	16	11	'marine-based sectors' could be more simply described as 'ice shelves'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1359	SPM	16	12	16	14	The use of the off-hand estimate of "several tenths of a meter" should probably not be used in the SPM as it is left for the reader to define and interpret how many tenths is several tenths? Is there a range of values that can be used? [Government of United States of America]
SPM-1360	SPM	16	13	16	13	Consider rephrasing "'would not exceed several tenths of a meter" E.g. by "would be under 1 m", if that is what is meant. [Government of Norway]
SPM-1361	SPM	16	16	16	17	The wording "semi-empirical model" and "process-based model" need explanation by footnotes or likewise. Otherwise, the sentence is too difficult for policy-makers to understand. [Government of Japan]
SPM-1362	SPM	16	16	16	18	This bullet on semi-empirical model projections is too technical for an SPM; suggest that they be deleted as they are better suited to the Technical Summary. The conclusion of these lines also already seems to be captured by the paragraph above. [Government of Canada]
SPM-1363	SPM	16	16	16	18	This statement is phrased differently in the underlying text in section 13.5.3, either by questioning the reliability of the model projections or the reliability of the models. It is important to distinguish this more clearly, because no reliability in the models is much stronger than no reliability in the projections. More general, this statement is very strong and it could be argued whether a generalized statement about model uncertainty is more appropriate, rather than focusing on a particular set of models. Also more detailed coupled models contain severe uncertainties that would too justify a separate conclusion. An SPM should be balanced. [Government of Netherlands]
SPM-1364	SPM	16	16	16	18	This statement is helpful. [Government of New Zealand]
SPM-1365	SPM	16	16	16	18	would it be possible to give an approximate size of the higher rate of the semi-empirical projections? [Government of Sweden]
SPM-1366	SPM	16	16	16	18	Please explain the difference (even in a footnote) between semi-empirical projections and process-based projections. This is critical for understanding the different projections and is something that will not be intuitive to a policymaker. Perhaps an even more important discussion is needed as to why the authors have put their faith in the process-based models and discounted the empirical models. [Government of United States of America]
SPM-1367	SPM	16	16	16	18	This summary statement does not capture the appropriate context of the discussion in Chapter 13 regarding the semi-empirical model (SEM) projections. From the discussion in 13-4, a suggested inserted second sentence should be "In nearly every case, the semi-empirical model 95-percentile is higher than the process-based likely range". Although the authors dismiss these models due to lack of agreement and consensus on their reliability, it is important to recognize that they do all project higher ranges. That in itself is an important consistency that shouldn't be so easily diminished or dismissed. Based on the discussion in Ch 13, it does not appear as though there is an understanding as to why SEMs are higher than process-based models. So if there is not an understanding of this difference, how can we be so dismissive of one group of models? (see p. 52 of Ch 13 for good explanatory text) [Government of United States of America]
SPM-1368	SPM	16	16	16	18	This short paragraph begs the question: so what? Suggest removing this paragraph - it doesn't mean much to the policy maker. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1369	SPM	16	20	16	21	To facilitate reading by non-scientists, please clarify that "glaciers" mean "outside Greenland and Antarctica". Can a percentage be provided for glaciers (and possibly other contributions) ? [Government of Belgium]
SPM-1370	SPM	16	20	16	21	This statement is problematic: "In all RCP scenarios, thermal expansion is the largest contribution to future global mean sea level rise, accounting for 30 to 55% of the total," The literature suggests that ice will contribute more than thermal expansion in the future [maybe ice is contributing more to modern SL rise [see Table 13.1]. Is the reason why thermal expansion is the largest contributor (i.e., a plurality) because the SLR due to the increase in ocean mass is divided into two terms (i.e., glaciers and ice sheets)? If there were only two contributors, (i.e., steric and mass), then the steric would NOT be the largest in all cases. The authors should clarify this in the text. [Government of United States of America]

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SPM-1371	SPM	16	20	16	27	Because of limitation in simulations and studies of ice melting, there may be low confidence in the contribution of ice melting on sea level changes. [Government of Vietnam]
SPM-1372	SPM	16	23	16	23	Suggest to change "positive contribution from changes" to "positive contribution to sea level rise from changes" [Government of India]
SPM-1373	SPM	16	24	16	24	Compare medium confidence on increased snowfall with "very likely" more precipitation at SPM-13 I.55. Suggest a more restrictive formulation at SPM-13 I.55 and no change here [Government of Netherlands]
SPM-1374	SPM	16	24			TODO: check "medium confidence that snowfall on the Antarctic ice sheet will increase" [Government of Netherlands]
SPM-1375	SPM	16	26	16	26	Please explain the meaning of "outflow" [Government of Belgium]
SPM-1376	SPM	16	26	16	27	The authors should consider adding a qualifier here using text from 13-47 and table 13.5. Suggested re-write for clarity could be " Rapid changes in outflow from both ice sheets combined will likely make a contribution in the range of 0.03 to 0.20m by 2081 - 2100 for RCP8.5 and 0.03 - 0.19m by 2081-2100 for all other RCP's." [Government of United States of America]
SPM-1377	SPM	16	26	16	27	Please clarify if whether these ice sheet contributions are embedded in the estimates stated earlier on the page OR if they are additional to the numbers stated earlier. [Government of United States of America]
SPM-1378	SPM	16	29	16	33	Indicative areas and numbers should accomany percentages used here. [Government of Ireland]
SPM-1379	SPM	16	29	16	33	We think it would be more accurate to state that: "... it is very likely that sea level will have risen in more than about 95% of the ocean area." [Government of Netherlands]
SPM-1380	SPM	16	29	16	33	Why is the self-gravitation effect not included in the list of processes? It has received a lot of attention since AR4 [Government of Netherlands]
SPM-1381	SPM	16	29	16	33	The section requires an introduction section explicitly stating that sea level rise is not uniform [Government of Netherlands]
SPM-1382	SPM	16	29	16	33	clarify the statement by adding after "are" beside climate effects also important etc [Government of Netherlands]
SPM-1383	SPM	16	29	16	33	It would be valuable to give an explicit mention of how large the regional variability in SLR is projected to be - if we have that information. [Government of United States of America]
SPM-1384	SPM	16	30	16	31	Why was 20 % above average chosen as a relevant number? [European Union]
SPM-1385	SPM	16	30	16	31	For non-scientist readers, it might be useful to start by stating that there are regional differences in sea-level rise (and maybe add words about the causes - gravity is not cited here, is this appropriate ?) [Government of Belgium]
SPM-1386	SPM	16	30	16	31	Please write "differing from the global mean sea level change by maximum 20 %" instead of "within 20% of the global mean sea level change". [Government of Hungary]
SPM-1387	SPM	16	30	16	31	The expression: "... to experience sea level change within 20% of the global mean sea level change." is misleading and the phrase should be "... to experience sea level change within 20% discrepancy from the global mean sea level change". [Government of Japan]
SPM-1388	SPM	16	30	16	31	We suggest that the range in meters in addition to 20% of the global mean sea level change is stated. 20% can eventually be placed in brackets. [Government of Norway]
SPM-1389	SPM	16	30	16	31	This doesn't mean much without giving the global mean change or other central estimate of change in SLR. i.e. within 20% of what number? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1390	SPM	16	31	16	31	Add "±" before '20%' for clarity, otherwise one could understand that 70% of the coastlines will only experience a sea level rise of an amount of 20% of GMSLC. [Government of Switzerland]
SPM-1391	SPM	16	31	16	33	This statement contains processes that are difficult to trace in the chapter. The section references do not cover all processes in this statement. Moreover, for some processes it is not clear what is ment. For example, "local anthropogenic processes" can be interpreted differently. In section 13.2.2.2 it is labeled as "Land subsidence due to natural and anthropogenic processes, such as the extraction of ground water or hydrocarbons, is common in many coastal regions, in particular in large river deltas". But such description could also be interpreted as "coastal processes". However, tectonic movements and coastal processes are not within the scope of chapter 13 (see section 13.1.3). Note that both sections (13.1.3 and 13.2.2.2) are not in the reference of this conclusion. Since this conclusion is important for local sea level changes, we advise to be more clear in the formulation and the referencing. [Government of Netherlands]
SPM-1392	SPM	16	31			The sentence 'In some coastal ...' is confusing because it is true for all SLR measures relative to land. Suggest to leave it out

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						[Government of Netherlands]
SPM-1393	SPM	16	33	16	33	What about the role of changes in ocean dynamics, i.e., ocean circulation? Does it not also have the potential to lead to substantial local changes in sea-level? [Government of Switzerland]
SPM-1394	SPM	16	35	16	35	In view of the impact by extreme marine events like storm surge, it is suggested that based on the underlying report (FD) (Chapter 13 – ES, Page 5 Para 3-4), the following passage on the impact by a future sea level rise to extreme marine events be given here: "It is very likely that there will be a significant increase in the occurrence of future sea level extremes by 2050 and 2100. It is likely (medium confidence) that annual mean significant wave heights will increase in the Southern Ocean as a result of enhanced wind speeds." [Government of China]
SPM-1395	SPM	16	35			We suggest adding text from the Executive Summary of Ch 13 P4: "It is virtually certain that global mean sea level rise will continue beyond 2100, with sea level rise due to thermal expansion to continue for many centuries. Longer term sea level rise depends on future emissions. Sea level rise of 1–3 m per degree of warming is expected if the warming is sustained for several millennia (low confidence)." [Government of Germany]
SPM-1396	SPM	16	36	16	36	We do not see that other biogeochemical cycles than the C-cycle are discussed. Please consider to include results for the N-cycle [Government of Norway]
SPM-1397	SPM	16	36	16	36	Cf. our remark 17 above. Define "Biogeochemical Cycles". [Government of Switzerland]
SPM-1398	SPM	16	36	17	16	is a comparison between observed and projected CO2 emissions (from AR4 or before) available? If so, this would be valuable to add to this SPM [Government of Netherlands]
SPM-1399	SPM	16	38	16	39	Please indicate whether it is meant "cumulative anthropogenic net emissions". [Government of Norway]
SPM-1400	SPM	16	38	16	42	This section could be part of a high-level summary section at the beginning of the chapter. [European Union]
SPM-1401	SPM	16	38	16	42	The sentences on uptake by the ocean, and especially the one about land, are almost obvious. Could something more informative be provided, e.g. something about the rate of carbon uptake on land - will it decrease ? (it is quite evident that it is model and scenario dependent, but to what extent?). [Government of Belgium]
SPM-1402	SPM	16	38	16	42	The sentence "Future CO2 uptake by the land is model and scemario dependent" makes little sense. Is it the estimations of future uptake that are model and scenario dependent? Because the uptake will happen regardless of models and scenarios. Consider to rephrase and/or move this sentence to the body of the text below. [Government of Norway]
SPM-1403	SPM	16	40	16	41	"Future CO2 uptake by the land is model and scenario dependent". In real world, why should the uptake care about a model? The sentence could be changed to "Future CO2 uptake by the land is much more uncertain" [Government of India]
SPM-1404	SPM	16	41			"virtually certain" implies a remaining possibility that it may not lead to acidification. It is completely certain based on well established chemical and biological processes. [Government of Netherlands]
SPM-1405	SPM	16	45	16	46	"higher uptake" by ocean can be misleading policymakers to consider the ocean carbon pool absorbs most of extra CO2 emissions after the present. It seems better to replace "higher" with a ratio of ocean carbon uptake to the total anthropogenic CO2 emissions. [Government of Republic of Korea]
SPM-1406	SPM	16	47	16	47	The future evolution of the land cabon uptake is much more uncertain. The uncertainty should be specified. For example, section 6.4.2.1 states medium and low agreement, referring to figure 6.21, and sections 6.4.2.3.2 and 6.4.3.3 state low confidence in the projections. [Government of Netherlands]
SPM-1407	SPM	16	48	16	49	Is this a finding under all RCPs? Or just RCP8.5? Please clarify the text accordingly. [Government of United States of America]
SPM-1408	SPM	16	51	16	52	What does the word climate mean in the phrase that the feedback between climate and the carbon cycle is positive? If the intent is to capture changes in a variety of elements of the climate system, suggest stating instead that "the feedback between changes in climate and the carbon cycle are positive"? [Government of Canada]
SPM-1409	SPM	16	51	16	52	The phrase "partially offset" is too vague. Suggest stating "climate change will weaken land and ocean carbon sinks". [Government of Canada]
SPM-1410	SPM	16	51	16	55	It might be useful to provide the range of the climate-carbon feedback (figures) [European Union]
SPM-1411	SPM	16	51	16	55	This paragraph seems important but it is not very clearly written for policymakers. In particular, we suggest a clarification of the wording "the climate change will partly offset land and ocean carbon sinks". [Government of Belgium]
SPM-1412	SPM	16	51	16	55	Wording is very general on feedback between climate and carbon cycle while the high confidence is likely to be limited to the known positive feedback of atmospheric CO2 to temperature increases. The ESMs do not include forzen carbon feedbacks and are very limited in Arctic greening and fire modelling, which casts doubts on the high confidence for the full carbon cycle and suggest are more limited statement is needed. [Government of Netherlands]
SPM-1413	SPM	16	51	16	55	It is not clear whether the phrase "... leaving more of the CO2 in the atmosphere..." relates to the proportion or absolute amount of CO2. The first part of this point

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						(highlighting a positive feedback) suggests the former, but the actual wording "... leaving more ..." suggests the latter. [Government of Sweden]
SPM-1414	SPM	16	51	16	55	Should say which processes are involved in the climate-carbon cycle feedback; for example, melting of permafrost. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1415	SPM	16	53	16	55	This statement deserves an agreement/evidence/confidence/likelihood descriptor. [Government of United States of America]
SPM-1416	SPM	16	54	16	54	Is this feedback included in the projections? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1417	SPM	17	1	17	1	This should explicitly exclude the coastal ocean as none of the IPCC simulations includes biological and chemical process that do affect the ocean's acidity in these areas. Duarte et al (2013) highlights this issue very clearly and comprehensively. [Government of United States of America]
SPM-1418	SPM	17	1	17	4	It is suggested to include the reference period chosen. [Government of Austria]
SPM-1419	SPM	17	1	17	4	Please consider to state what the current pH is in the ocean is, at least somewhere in the SPM. [Government of Norway]
SPM-1420	SPM	17	1	17	4	Why is only the change in pH mentioned here? The change in saturation state is much more important for corals, for example than the change in pH. In addition, it would be very worthwhile pointing out that the magnitude of these changes in the surface ocean linearly depend on the atmospheric CO2 concentration. [Government of Switzerland]
SPM-1421	SPM	17	2	17	2	"corresponding decrease in surface ocean pH by the end of 21st century is": it might be useful to note that this pH decrease is on a logarithmic scale, and give as an example that 0.3 pH units is a doubling of hydrogen ions, and maybe compare that to estimates of historical pH changes like the PETM (e.g. Ridgwell & Schmidt)? Maybe even note that the problem isn't the absolute acidity, but rather the rate of change and related aragonite saturation changes? [Government of United States of America]
SPM-1422	SPM	17	3	17	3	"0.203" after "RCP4.5," is 0.205? For other RCPs, the representative values are the average of the bounding values. [Government of Japan]
SPM-1423	SPM	17	6	17	12	This paragraph about cumulative fossil fuel emissions is important, but is confusing as written. We suggest that the authors consider illustrating these data with a new Figure or a Table (Figure SPM.9 is not adequate because it is difficult to link the numbers in the text with this Figure). It would be helpful to combine information in one place about projected changes in global average temperature relative to pre-industrial for the RCPs and the estimated cumulative fossil fuel emissions associated with each scenario. [Government of Canada]
SPM-1424	SPM	17	6	17	12	How are land use emissions and sinks being considered in this analysis? [Government of Ireland]
SPM-1425	SPM	17	6	17	12	Perhaps include in a table which also uses material from lines 41-47. include figure 6.2.5 in SPM for clarity [Government of Ireland]
SPM-1426	SPM	17	6	17	12	Again, model ranges, no assessed ranges. No confidence statement. [Government of Netherlands]
SPM-1427	SPM	17	6	17	12	This paragraph is very important. Please consider taking the essence also in the key findings at the beginning of the section. Furthermore this paragraph seems to only deal with fossil fuel emissions, we believe that removal by sink also should be described or included in the discussion related to CO2. [Government of Norway]
SPM-1428	SPM	17	6	17	12	Several comments on this bullet: (1) Please include a footnote showing the conversion from PgC to Gt CO2. (2) Please explain to the reader that PgC includes emissions of CO2 and CH4 (which comprise ~x% of GHG emissions), but does not include other non-C based GHGs, such as N2O, O3 (and halocarbons?). (3) Please add a sentence to the end of this bullet stating that "The world currently emits x Gt C/yr" to provide the reader with important context for understanding this paragraph. [Government of United States of America]
SPM-1429	SPM	17	6	17	12	Why is the forcing here given in PgC? Couldn't it be given in CO2 equivalent? In BOX SPM1 it's given in ppm CO2. Why have these different measures been used? Could CO2 equivalent be used instead in all sections? Could the RCP's associated temperature ranges be included here? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1430	SPM	17	6	17	47	Suggest that the three paragraphs on lines 6-11, 14-16 and 41-47 be treated as a set because they are closely linked but with different messages, each of which is important to policymakers. Understanding these as a set is made difficult by the separation of lines 6-16 from 41-47 by the shaded box. The first message is that going forward, cumulative carbon emissions have to be within a certain range. The second message is that the emissions pathway needs to come down to close to zero or negative to limit global warming to levels consistent with RCP2.6. The third message is that the situation is even more pessimistic if we account for additional carbon emissions such as those that might come from thawing permafrost (one example) and if we account for emissions from non-CO2 gases. The final message is somewhat different and relates to how risk averse governments are (i.e., do we want to achieve the global warming limit with a high or medium probability?). Recommend reviewing and revising this text to make these messages clearer. [Government of Canada]
SPM-1431	SPM	17	9	17	9	Range of 14-96% reduction seems very wide and should be linked with analysis on future pathways [Government of Ireland]

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SPM-1432	SPM	17	9	17	10	To facilitate a comparison, it is not desirable to give emission reductions by 2050 under RCP 2.6 only . It is suggested to give them under other three scenarios (RCP 4.5, 6.0 and 8.5) at the same time. And explanations should be given on how the value of 50% is derived from the scenario RCP 2.6 which offers a wide range of emission reduction options. [Government of China]
SPM-1433	SPM	17	9	17	10	"For RCP2.6, an average emission reduction of 50% (range 14% to 96%) is required by 2050 relative to 1990 levels." Required for what? The goal is not specified. [Government of Netherlands]
SPM-1434	SPM	17	9	17	10	This sentence on its own needs further information - such as 'to achieve...'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1435	SPM	17	9	17	12	Recommend that these lines be split from lines 6-9 then and form a new paragraph because they shift the discussion to one about emissions pathways. [Government of Canada]
SPM-1436	SPM	17	9	17	12	Does this statement (avg emission reduction of 50% (range 14-96%)) pertain only to fossil fuel emissions (as in lines 6-9) or to all anthropogenic emissions? Suggest clarifying. [Government of Canada]
SPM-1437	SPM	17	9	17	12	The 14 - 96% range is quite large and could be interpreted as meaning that the uncertainty about needed emission reductions by 2050 is so large that little useful guidance can be offered. Suggest considering to include a statement indicating that, given the cumulative fossil fuel emission limits specified in lines 6-9, lower emission reductions in the first half of the century will require deeper emission cuts later in the century. [Government of Canada]
SPM-1438	SPM	17	10	17	12	The statement that is it about as likely as not that sustained globally negative CO2 emissions are required to be compatible with the RCP2.6 scenario may be misleading and does not convey the important message that in those models not projecting negative emissions, emissions still need to be reduced to close to zero levels. Recommend this sentence be reworded to better express the size of the required emission reductions in all model projections using RCP2.6. [Government of Canada]
SPM-1439	SPM	17	10	17	12	This sentence containing "as likely as not" should be explained better, the interpretation of the statement seems to be rather complicated. We recommend to give clearer information. [Government of Germany]
SPM-1440	SPM	17	10	17	12	Negative emissions seem to be likely if data in figure 6.2.5. are used? [Government of Ireland]
SPM-1441	SPM	17	10	17	12	"to achieve the reductions": to achieve which reductions? [Government of Netherlands]
SPM-1442	SPM	17	10	17	12	Prevent the unphysical/incongruent term "net negative emissions", why not use "net carbon uptake", i.e. that sustained net carbon uptake will be required.... [Government of Netherlands]
SPM-1443	SPM	17	10	17	12	Suggest adding "Based on physical climate modeling alone" to introduce the sentence "It is about as likely as not..." to be very clear there that this is not reflecting any economic analysis. [Government of United States of America]
SPM-1444	SPM	17	10	17	12	The need for negative emissions - is this something WG1 should be talking about? Isn't this more for WG3? If keeping this in, then it would perhaps be best to put it in BOX SPM1? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1445	SPM	17	10			"globally" needs to come before "sustained" such that the sentence reads: "It is about as likely as not that globally sustained net negative CO2 emissions..." [Government of New Zealand]
SPM-1446	SPM	17	14	17	16	Suggest rewriting the sentence to clearly begin with the main message for policymakers (e.g. "There may be additional emissions from thawing permafrost but there is low confidence in this." [Government of Canada]
SPM-1447	SPM	17	14	17	16	Why are results only for RCP8.5 reported in this paragraph? To be consistent, suggest that results for the suite of RCPs or for RCP2.6 and 8.5 should be reported. [Government of Canada]
SPM-1448	SPM	17	14	17	16	Please delete in line 15 "for 2100" and insert after 250 PgC "between 2000 and 2100", see TS P 57 L 1-2. [Government of Germany]
SPM-1449	SPM	17	14	17	16	Is there low confidence in the release of C from permafrost altogether, or only in its magnitude? Please clarify. [Government of Germany]
SPM-1450	SPM	17	14	17	16	change wording and make more general than only thawing permafrost: There is low confidence in projections of the magnitude of the net carbon flux (CO2 or CH4) to the atmosphere from biophysical changes in the high northern latitudes including permafrost melting, changes in fires, and high-latitude greening. [Government of Netherlands]
SPM-1451	SPM	17	15	17	16	It seems unclear what you mean with this sentence. Please express it more clearly. [Government of Norway]
SPM-1452	SPM	17	15	17	16	Can anything be said about potential polar C emissions for the other RCP scenarios? What about methane clathrates/hydrates? [Government of United States of America]

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SPM-1453	SPM	17	16	17	16	Please indicate explicitly whether those PgC should be understood as PgC of equivalent carbon dioxide. The same precisions should be given in the quoted section 6.4.3. [Government of France]
SPM-1454	SPM	17	16	17	16	Please add one sentence to the paragraph: The stronger and faster the warming in the permafrost regions, the larger this additional emission will be. [Government of Hungary]
SPM-1455	SPM	17	16	17	16	Can you say how much additional temperature rise this might cause - this would be of more interest to the policy maker. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1456	SPM	17	19	17	19	<p>Although the word "stabilization" appears in the title, the subsequent sentences do not explain it specifically. A number of factors below seem to indicate that "stabilization" has changed. It is crucial to clarify here or somewhere in this WG1 Report, what "stabilization" means, and if implication is indeed broadened since AR4, this report must state clearly how and why it is changed so. Otherwise credibility and integrity of IPCC science could be at risk.</p> <p>*****</p> <p>Until AR4 the word "stabilization" is taken to mean "stabilization of GHG concentrations," without doubt, reflecting Article 2 of the UNFCCC. The "concentration (radiative forcing) stabilization" has been discussed in the past WG1 reports as the key in keeping the global mean temperature below a specified threshold. As a result, up to the AR4, the mitigation strategy treated in WG3 is limited to the concentration stabilization as shown in Table SPM 5 of WG3 AR4 (Table SPM 6, in AR4 SYR).</p> <p>However, in this AR5, "Climate Stabilization" refers to a more general class of concentration pathways such as peak-and-decline types treated by Allen(2009) and Matthews et al.(2009), as discussed in the relation between peak warming and cumulative total emissions.</p> <p>Also in WG3 AR5 SOD (6.3.2, page 19 L12-16), it is stated that "concentration stabilization scenarios are only one type of scenarios. Other mitigation scenarios include scenarios focused on specific policy formulations (e.g. the G8 target of 50% emission reduction in 2050), temperature goals, and cost benefit analysis (see Box 6.1). "This statement in conjunction with Table 6.1 caused a serious concern and confusion among draft reviewers, because Table 6.1 is very similar to but slightly different from the above mentioned Table SPM 5 of WG3 AR4 (Table SPM 6, in AR4 SYR), which has played crucial roles in mitigation policy arguments since 2007.</p> <p>Any change of "stabilization" should be stated clearly with reasoning.</p> <p>[Government of Japan]</p>
SPM-1457	SPM	17	19	17	25	<p>The word "commitment" appears in the title and on the line 25, but there is no description what the word means within SPM. Though explanations are made in the full text in Chapter 12, the special meaning (or usage) of the word particular to the climate change science cannot be understood in this SPM alone. Since it appears not necessary to use this word here in SPM, simply delete "Climate Change Commitment" from the section title and replace "commitment" on Line 25 by "persistent climate change".</p> <p>Generally the use of "commitment" is not appropriate in the IPCC reports because what it means is not clear by itself. Its meanings as described in Chapter 12 of WG1 report are now spread by inclusion of many kinds of commitments. The word was first used by physical climate change scientists regarding the situation of constant CO2 concentration, which was supposed to continue naturally as a result of "stabilization". It was a result of naïve consideration by physical climate change scientists in the 1980's, without paying attention to carbon cycle, another aspect of climate change science. Under this limited scope "committed warming" was a proper expression for the implied situation intuitively. Now surroundings of climate change science have changed entirely and the use of commitment has lost its sound background as a scientific terminology as well as its merits. Use of "commitment" should be avoided.</p> <p>[Government of Japan]</p>
SPM-1458	SPM	17	19	18	12	Values of SLR until 2300 and possibly further should be discussed in this section [Government of Belgium]
SPM-1459	SPM	17	21	17	21	If it is meant "net emissions" and/or "antropogenic emissions" we suggest that this is said. Since it is important to know if you intend to include removal/release by sinks in this finding and if it is related to human activities. [Government of Norway]

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SPM-1460	SPM	17	21	17	21	Same remark as remark 42 above on the use of the word "total". Furthermore, in line 52 below the notion of "net" emissions is used. [Government of Switzerland]
SPM-1461	SPM	17	21	17	21	It takes quite some time to realize what is meant by "the two quantities" (since grammatically this would relate to 'principal driver' and 'emissions of CO2', which makes no sense. Better replace "the two quantities" by "warming and CO2 emissions" (which seems to be meant actually), to be clear. [Government of Switzerland]
SPM-1462	SPM	17	21	17	22	With respect to the text:"The principal driver of long-term warming is total emissions of CO2 and the two quantities are approximately linearly related (see Figure SPM.9).", long-term warming is not an atmospheric variable, is a qualification of the state of the atmosphere. In Figure SPM.9 the temperature is represented as function of CO2 emission. So, consider to change the last sentence, by (for example) the following one: "The principal driver of long-term warming is total emissions of CO2 and this mass emission and temperature are approximately linearly related (see Figure SPM.9)." [Government of Argentina]
SPM-1463	SPM	17	21	17	22	Please clarify the wording "long term warming": does this paragraph relate to the 21st century or beyond ? (note that figure SPM 9 apparently relates to the 21st century, but depending on the feasibility of net negative emissions, an increased concentration may remain well beyond the 21st century) [Government of Belgium]
SPM-1464	SPM	17	21	17	22	The process from the anthropogenic increased CO2 emission to the changed global average surface temperature undergoes such stages as emission – concentration, concentration – radiative forcing, and radiative forcing – warming, each involving a complex biogeochemical cycle instead of a simple linear relationship. It can be seen from Figure SPM.9 as well that the historical cumulative CO2 emission and warming are not linearly related in a simple way. Therefore, the formulation in Line 21-22 Page 17 that "The principal driver of long-term warming is total emissions of CO2 and the two quantities are approximately linearly related" would be very puzzling to policymakers Hence it is suggested to replace "approximately linearly related" with "positively related". [Government of China]
SPM-1465	SPM	17	21	17	23	The assumed linearity between CO2 emissions and global temperature increase is inconsistent with the notion that long term persistence plays a role here, as frozen CO2 emissions are associated to a range of subsequent temperatures [Government of Netherlands]
SPM-1466	SPM	17	21	17	24	The explanation may not appear immediately to policymakers. Could something be added to make clear that CO2 accumulates in the atmosphere, and/or that part of the concentration increase remains for centuries (or more) ? In addition, the possibility of net negative emissions in the long term might be added - this would need a link with WGIII. [Government of Belgium]
SPM-1467	SPM	17	21	17	25	This section could be part of a high-level summary section at the beginning of the chapter. For policy makers, the CO2 budget analysis on p. 17, line 41 is important and as such should be presented in the box (lines 21-25). [European Union]
SPM-1468	SPM	17	21	17	25	Sea level should really be added explicitly in this summary paragraph [Government of Belgium]
SPM-1469	SPM	17	21	17	25	But does this also not depend on the choice of the conversion index (i.e. GTP vs. GWP) to compute the Carbondioxide- equivalent of short lived gases? [Government of India]
SPM-1470	SPM	17	21	17	25	As to the former half regarding the relation between transient warming and the total emissions, the present sentences are too much simplified for policymakers to understand its significance. Since this is the first time to mention the point, it may be better to explain what are new findings and what implications they have concerning mitigation strategy, more carefully. Besides, it is better to polish the sentence "Therefore, for any given warming ----" to cover more realistic cases. An example is as follows: "Therefore, for a given temperature rise limit, it is possible to allocate more emissions to earlier decades at the expense of lower emissions later." By this statement it is possible to explain why the new pathways shown in the WG3 Table 6.1 of AR5 allow more emissions by 2100 compared with some stringent pathways having the same temperature limit in the WG3 Table SPM5 of AR4, which were designed following concentration stabilization. Directly this is a matter of WG3, but the scientific basis should be in WG1 report. [Government of Japan]
SPM-1471	SPM	17	21	17	25	Wording: (i) Is long-term warming a quantity? (ii) "emissions of GHGs are stopped". The latter is unprecise. What is meant is that anthropogenic emissions are stopped, i.e. mankind would cease to exist. This does not seem to us a useful remark. [Government of Netherlands]
SPM-1472	SPM	17	22	17	23	Suggest replacing 'target' with 'level' and replace 'imply' with 'would necessitate'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1473	SPM	17	23	17	25	This is very important findings and it is also important to be precise. Maybe it should be said that also other greenhouse gases than CO2 contribute to long-term warming and also consider if it is meant only emissions of CO2 in the last sentence or if it includes also emissions of other greenhouse gases. [Government of Norway]
SPM-1474	SPM	17	24	17	24	The term "Many centuries" is vague. If possible, it is recommended to clarify more specific period. [Government of Republic of Korea]
SPM-1475	SPM	17	28	17	39	Figure SPM.9: it would be good to add SLR info to this figure, as it is so policy-relevant [Government of Belgium]
SPM-1476	SPM	17	29	17	46	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1477	SPM	17	33			suggest "areas illustrate" instead of "plume illustrates" [Government of Denmark]
SPM-1478	SPM	17	35			suggest "area" instead of "wedge" [Government of Denmark]

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SPM-1479	SPM	17	36	17	36	Change "All values" to "All temperature anomaly values". [Government of Netherlands]
SPM-1480	SPM	17	36			suggest delete "given" [Government of Denmark]
SPM-1481	SPM	17	36			The base period for Fig. SPM.9 is 1861-1880, while for Fig. SPM.6 is 1986-2005. Therefore, they cannot be easily compared. For instance, the dark blue diamond in Fig. SPM.9 corresponds to a warming of more than 1.5 K, while the corresponding warming at the end of the 21st century in Fig. SPM6a is only 1 K. While both these numbers are correct given the different base periods, they may lead to confusion by some readers. Figure SPM.9 should be replotted with the standard base period of 1986-2005. [Government of Netherlands]
SPM-1482	SPM	17	41	17	41	Please spell out TCRE. [Government of Germany]
SPM-1483	SPM	17	41	17	41	It would be useful to have an explicit statement about which RCP scenarios are consistent with cumulative anthropogenic emissions < 1000 PgC (i.e. Only RCP 2.6) [Government of New Zealand]
SPM-1484	SPM	17	41	17	41	Would the word "cumulated" not be more appropriate here? [Government of Switzerland]
SPM-1485	SPM	17	41	17	43	The first sentence in this bullet is very difficult to understand and should be revised. Specifically: (1) It would be difficult for the average reader to recall the earlier definition of TCRE, which occurred much earlier in the SPM; and (2) if we are interpreting the sentence as intended, the probability assessment here (and use of the term likely) is not the same as the likely TCRE range (of 0.8 degrees C to 2.5 degrees C per 1000pgC). We think this sentence may be trying to convey the results of a probability assessment of exceeding the 2 degrees target if we want to keep to below this target with a 66% or higher probability. Therefore the reader would be wrong to try to link this statement to the likely TCRE range of 0.8 - 2.5 degrees C. Suggest revising to avoid misinterpretation. [Government of Canada]
SPM-1486	SPM	17	41	17	43	This sentence contains a very informative finding but difficult to read. Consider to rephrase or delete the part about what it is based on to the last part of the sentence. Furthermore in the figure text to Figure SPM 9 above it is said that that TCRE represents this reports assessment. Hence it would be better to say "based on assessments in the WGI report" if that is what is meant? [Government of Norway]
SPM-1487	SPM	17	41	17	46	The "warming caused by CO2 alone" is a strange concept for policymakers - it appears purely theoretical. The sentence "accounting for non-CO2 ... would imply a substantially lower budget" will be difficult to understand, and maybe forgotten by many. There should be an explanation immediately after (or within) the first sentence of the paragraph. An alternative would be to provide a *rough* estimate of the cumulated emissions that would likely limit temperature to 2°C, taking all emissions into account (this could only be a rough estimate because of additional unknowns related to the non-CO2 emissions). [Government of Belgium]
SPM-1488	SPM	17	41	17	47	It is unclear whether 'emissions from all anthropogenic sources need to be limited to about 1000 PgC ... less than 2 C' refers to transient warming or equilibrium warming. If the former is intended (as seems most likely) there should be some explanation of how this paragraph relates to page 17 lines 6-12. [Government of Australia]
SPM-1489	SPM	17	41	17	47	How are numbers lined to those cited in 6-12? Can estimates of other anthropogenic GHGs be provided? [Government of Ireland]
SPM-1490	SPM	17	41	17	47	Can "strongly negative" be quantified? [Government of Ireland]
SPM-1491	SPM	17	41	17	47	Suggest replacing 'imply' with 'necessitate'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1492	SPM	17	41			This is the first mention of TCRE, except for the caption text for Figure SPM.9. [Government of New Zealand]
SPM-1493	SPM	17	41			The abbreviation TCRE should be spelled out. [Government of United States of America]
SPM-1494	SPM	17	42	17	42	Please express all accumulated emissions primarily in the units most familiar to policymakers, i.e. tonnes of CO2 or CO2-equivalent, but not the obscure "PgC". A footnote is not sufficient. [Government of Belgium]
SPM-1495	SPM	17	42	17	42	It is noted in Page 10 of SPM that according to TCRE, the warming caused by each 1000 PgC is likely to range from 0.8 to 2.5°C. In addition, it is seen from Figure SPM. 9 that if the temperature rise is controlled within 2°C, the cumulative CO2 emissions should be no more than 2500 PgC, which is in agreement with the previous estimate on page 10. However, it is indicated in Line 41-43 Page 17 SPM that "Based on the assessment of TCRE, cumulative CO2 emissions from all anthropogenic sources would need to be limited to about 1000 PgC since the beginning of the industrial era, if the warming caused by anthropogenic CO2 emissions alone is limited to be likely less than 2°C relative to pre-industrial". Therefore, the SPM should reconsider the possible range of cumulative CO2 emissions that limits temperature rise within 2°C and make corresponding modification. [Government of China]
SPM-1496	SPM	17	42	17	42	The wording "limited to about 1000 PgC" should be modified as "limited up to about 1000 PgC." With the original wording (without "up"), the sentence may seem inconsistent with the third bullet on page 10, which says the likely range of temperature rise is 0.8 - 2.5°C for 1000 PgC emission indicating that going beyond 2.0°C is more or less normal. [Government of Japan]
SPM-1497	SPM	17	45	17	46	the example including permafrost and methane hydrates is pure speculation and should be removed or replaced by a more general remark on reasons to be on the

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						safe side [Government of Netherlands]
SPM-1498	SPM	17	46	17	46	Please add ", or a lower stabilisation target, such as 1.5°C, " at end of line. [Government of Belgium]
SPM-1499	SPM	17	46	17	46	The words "or requiring a higher likelihood of temperatures remaining below 2°C" is difficult to understand and should be revised. It also does not seem to fit well in the list in this sentence: the other points are about atmospheric and earth system processes and feedbacks, whereas this point seems to be about decision making. Suggest clarifying. [Government of Canada]
SPM-1500	SPM	17	49	17	50	It is our understanding that emissions of CO2 described here do not include temporal biogenic emissions from forestry and other land-use that cause temporal carbon fluxes. Maybe this should be more clear. According to the LULUCF accounting rules, all accounting shall be on the basis of instantaneous oxidation. Such biogenic emissions are temporal, and will generally be reabsorbed in re-growth by photosynthesis within the timeframe of the crops rotation. Hence such emissions should not contribute to increase the long-term stabilized CO2 concentration in the atmosphere, as stated in article 2 in the convention, or to "cumulative emissions of CO2 over time" as explained in WG1, Ch 12.5.4.3, on page 76. [Government of Norway]
SPM-1501	SPM	17	49	17	51	This statement is potentially misleading as constant warming could be interpreted as an ongoing increase in temperature (thus usual definition of 'warming'). Suggest rephrasing as "CO2 induced temperature change is approximately constant..." or later to state "Following a complete cessation of CO2 emissions, (elevated) temperature is projected to remain approximately constant for many centuries." [Government of Canada]
SPM-1502	SPM	17	49	17	53	suggest specifying the year that half of the CO2 remains atmospheric instead of 20% which seems a small number. [Government of Denmark]
SPM-1503	SPM	17	49	17	53	1000 years is a time scale equivalent with the age of several major global cities such as Beijing, China; Kyotom Japan; Hamburg, Germany and many others. Thus, 1000 years hence is a relevant human timescale [Government of Denmark]
SPM-1504	SPM	17	49	17	53	The references to Box 6.2 and Ch 12.5.5 do not make sense, please check. [Government of Germany]
SPM-1505	SPM	17	49	17	53	Add level of confidence to these statements. [Government of Switzerland]
SPM-1506	SPM	17	50	17	51	"CO2 induced warming is projected to remain approximately constant for many centuries following a complete cessation of emissions". This is only true after the committed warming has been realized. [Government of Netherlands]
SPM-1507	SPM	17	50	17	51	For clarity, should the wording 'CO2 induced warming is projected to remain approximately constant for many centuries following a complete cessation of emissions.' be amended to 'CO2 induced warming is projected to continue and remain approximately constant for many centuries.....'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1508	SPM	17	51	26	52	"a large fraction" is vague. It should be clarified in order to be helpful to policymakers - could it be "most of climate change"? [Government of Belgium]
SPM-1509	SPM	17	52	17	52	"human time scale" is confusing and innacurate. Use numbers. [Government of United States of America]
SPM-1510	SPM	17	52	17	53	Human timescales could be interpreted differently by different readers. It depends on whether one interprets this with reference to one human lifespan, or many generations. Recommend clarifying the timescale. [Government of Canada]
SPM-1511	SPM	17	52	17	53	Discussion of possible negative emissions and the associated risks could better be included in the box discussing RCPs. If not, then suggest: 'over a sustained period through the use of, for example, Negative Emissions Technologies.' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1512	SPM	17	53	17	53	An additional information concerning the statement on negative net anthropogenic GHG emissions is needed. Please add: "However, no such option is available, and research on options to remove GHG from the atmosphere and on the associated risks is in its infancy." [Government of Germany]
SPM-1513	SPM	17	53	17	53	Box 6.2 is not the correct reference, it should be Box 6.1 [Government of Netherlands]
SPM-1514	SPM	17	53			Suggest clarifying what is meant by "strongly negative". [Government of Canada]
SPM-1515	SPM	18	1	18	5	It is suggested to include the reference period chosen, in particular for the sea level rise in 2300 of 1m as well as for the 1 to 3m sea level rise.. [Government of Austria]
SPM-1516	SPM	18	1	18	5	How would this relate to the RCPs? [Government of Germany]
SPM-1517	SPM	18	1	18	5	The wording is very unclear, especially as the second sentence is too long. Make it clear that there are few model results that go out to 2300, not just that there are few model results in total for sea level rise. Also, is it the case that if either or both emissions peak and decline below 500ppm at any time, SLR will stay below 1m? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1518	SPM	18	1	18	5	Can this section on projections beyond 2100 be related in some way to the RCPs and also likely temperature changes? [Government of United Kingdom of Great

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						Britain & Northern Ireland]
SPM-1519	SPM	18	1	18	5	Do these long term sea level rise projections include the contribution from ice sheets? Could they be linked more closely with the statements in the following paragraph? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1520	SPM	18	1	18	12	Suggest that these two paragraphs should go in the sea level rise section. They should also be merged as they are dealing with the same topic. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1521	SPM	18	2	18	5	It is unclear is a CO2 concentration much larger than 700 ppm would also lead to the stated maximum of 3m [Government of Netherlands]
SPM-1522	SPM	18	4	18	4	Please consider to be more specific if possible. When does the CO2 emissions peak and decline? [Government of Norway]
SPM-1523	SPM	18	4	18	5	We suggest rephrasing, for example to " concentrations that peak and decline while remaining below 500 ppm, but 1 to 3 m for radiative forcings that corresponds to CO2 concentrations above 700 ppm " [Government of Belgium]
SPM-1524	SPM	18	4	18	5	This is the only place in the report where projections are expressed in ppm. This makes the meaning of the numbers hard to immediately grasp. Expressing these projections in Radiative Forcing or cumulative emissions terms would make it easier to understand. [Government of New Zealand]
SPM-1525	SPM	18	4	18	5	Is sea level rise by 2300 really limited to 3 meters for any CO2 concentration above 700 ppm (i.e. also for e.g. 1200 ppm)? Is 1 to 3 meters the rise induced by thermal expansion only or by all factors (see comment to next bullet point below)? [Government of Switzerland]
SPM-1526	SPM	18	5	18	5	How high above 700ppm - 710 or 1000? Please clarify / express more accurately. [Government of United States of America]
SPM-1527	SPM	18	7	18	7	It is unclear what 'larger sea level rise' refers to, i.e. Larger than what?. This needs to be clarified. [Government of New Zealand]
SPM-1528	SPM	18	7	18	7	It is unclear what 'sustained' refers to. Is this a time period on the order of years, decades, centuries or millenia? [Government of New Zealand]
SPM-1529	SPM	18	7	18	7	"Larger sea level rise": larger than what? Than the 1 to 3 meters mentioned in the bullet point before (then it should be explained in the bullet point before to what factors these 1 to 3 meters refer)? [Government of Switzerland]
SPM-1530	SPM	18	7	18	8	"and some part of the mass loss might be irreversible" This is very vague, can it be specified which part would not be irreversible and it should be specified by a timescale? [Government of Sweden]
SPM-1531	SPM	18	8	18	9	What is the level of "a certain threshold"? It might be best to explicitly state that this is unknown [Government of United States of America]
SPM-1532	SPM	18	8	18	12	Suggest this would read better: 'The available evidence indicates that sustained warming greater than 1 degree but less than 4 degrees above pre-industrial levels would lead to the near-complete loss of the Greenland Ice Sheet over a millennium or more, causing a global mean sea level rise of up to 7m (low confidence).' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1533	SPM	18	9	18	9	insert "eventually" after "would lead" [Government of Netherlands]
SPM-1534	SPM	18	13	18	13	Please include a bullet point about ocean acidification in relation to climate stabilization. This should also describe that acidification is only related to net CO2 emissions and not to other greenhouse gases. [Government of Norway]
SPM-1535	SPM	18	14	18	14	The first sentence describing the term geo-engineering is not adequate. As written, it could include mitigation and adaptation techniques and actions. Many are looking to the IPCC to provide a suitable definition, if possible, for geo-engineering. This sentence risks taking the whole debate on the definition backwards. [European Union]
SPM-1536	SPM	18	14	18	14	Given that the definition for geoengineering continues to evolve, the IPCC's wording of the definition of this term will carry a lot of weight. The definition used in this sentence in the SPM is could be made more precise to be in line with the definition in the glossary of this report. Suggest that the first part of the sentence be changed to "Methods that aim to deliberately alter the climate system to counter climate change...". Suggest also adding the second sentence from the Glossary definition to this paragraph (or as a footnote) in order to provide policymakers with the necessary context to understand CDR and SRM ("Most, but not all, methods seek to either (a) reduce the amount of absorbed solar energy in the climate system (Solar Radiation Management) or (b) increase net carbon sinks from the atmosphere at a scale sufficiently large to alter climate (Carbon Dioxide Removal)."). [Government of Canada]
SPM-1537	SPM	18	14	18	14	"Methods...have been proposed" is quite vague. Suggest being more precise about wording around the current status of geoengineering proposals or speak only about geoengineering in terms of defining the concept. [Government of Canada]
SPM-1538	SPM	18	14	18	14	By whom have 'geoengineering techniques have been proposed' ? It reads as if policymakers have proposed them, or at least could be read this way. Suggest replacing 'have been proposed' with 'have been suggested'. [Government of United Kingdom of Great Britain & Northern Ireland]

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SPM-1539	SPM	18	14	18	15	Suggest: 'Carbon dioxide removal from the atmosphere' in the second sentence. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1540	SPM	18	14	18	23	There is very limited coverage of CDR and SRM. Either expand the coverage of these issues or delete this paragraph. This is a very important issue and policy makers would like to know more about this. [Government of India]
SPM-1541	SPM	18	14	18	24	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The information on geoengineering options is too optimistic as it does not appropriately reflect the current lack of knowledge or the high risks associated with such methods. We therefore suggest the following changes: a. Please shift the sentence of L 21-23 (including slight modifications and an additional statement on risks) right after the first sentence in L14: "However, all these methods carry unintended side effects and long-term consequences on a global scale. Limited evidence precludes the assessment of any option and its impact on the climate system, including side effects and risks." (Note that we have deleted the word "quantitative" in the last sentence, because limited evidence does not only preclude a quantitative assessment of geoengineering but any assessment of SRM and CDR, including qualitative assessments of effectiveness and efficiency, or side effects.) b. The information that CDR cannot rapidly reduce atmospheric CO2-concentration must be provided. Please add after "global scale" in L 16: "CDR would need to be deployed at large-scale and over at least one century to be able to significantly reduce CO2 concentrations." [TS P62 Box TS.7, 2. para] c. The statement in L 17 starting with "Modelling shows..." is an overoptimistic generalisation, and it should be mentioned that SRM is not yet available. We suggest the following: "SRM (solar radiation management) remains unimplemented and untested. If realizable, a limited number of modelling studies shows" [TS S62 Box TS 7] [Government of Germany]
SPM-1542	SPM	18	14	18	24	We believe that text on geoengineering rather belongs in WG III than in WG I and we suggest it is removed from here. If you still want it to stay, we suggest replacing the present first sentence with the presently last sentence and thus start the bullet point with "Limited evidence... impact on the climate system." [Government of Sweden]
SPM-1543	SPM	18	15	18	15	Explain which are the limitations to these methods. [Government of Switzerland]
SPM-1544	SPM	18	15	18	15	Please insert, "and technological AND ECONOMIC limitations to their potential" [Government of United States of America]
SPM-1545	SPM	18	17	18	17	Prevent the use of the unphysical/incongruent term "negative emissions". Replace by net enhanced carbon uptake [Government of Netherlands]
SPM-1546	SPM	18	17	18	18	Suggest rewording to: 'methods to reduce the amount of solar radiation reaching the Earth's atmosphere' (solar radiation management)'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1547	SPM	18	18	18	18	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1548	SPM	18	18	18	19	Evidence/agreement/confidence/likelihood descriptors are needed for all three parts of this sentence: SRM can offset temp rise [agreement/confidence/evidence/likelihood]; but also modify global water cycle [agreement/confidence/evidence/likelihood]; and would not compensate for OA [agreement/evidence/confidence/likelihood]. [Government of United States of America]
SPM-1549	SPM	18	19	18	19	Suggest that 'compensate for' should be changed to 'reduce' or even better to 'prevent'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1550	SPM	18	19	18	20	Wording: If implemented SRM were to be terminated after some time again for any reason, there is [Government of Netherlands]
SPM-1551	SPM	18	20			high confidence' not in text Chapter 7. [Government of Netherlands]
SPM-1552	SPM	18	21	18	21	What is meant by 'rapid'? It would be better (if possible) to quantify. [European Union]
SPM-1553	SPM	18	21	18	22	The sentence "CDR and SRM methods carry unintended side effects and long-term consequences on a global scale." should probably read as "CDR and SRM methods may...". [Government of India]
SPM-1554	SPM	18	21	18	22	The authors should consider revising this statement as - in a literal sense - it overstates our certainty about unintended consequences. CDR and SRM methods MAY carry unintended side effect and have long-term consequences on a global scale. We do not know enough yet to make this assertion with the certitude that this statement has. Perhaps the statement could be given a very high degree of confidence, though not complete certainty. [Government of United States of America]
SPM-1555	SPM	18	21	18	23	The second-to-last sentence in this paragraph reads as a statement of fact, which seems at odds with the following sentence, which is much softer and describes the limited evidence available. Suggest revising as "CDR and SRM may have unintended side effects and long term consequences on a global scale". Also, suggest clarifying for policymakers what is meant by unintended (e.g., are the consequences unpredictable?). [Government of Canada]
SPM-1556	SPM	18	21	18	23	The broad conclusions in these two sentences are important and correct for SRM but only for some CDR-options due to how broad geoengineering/CDR is defined in the WGI draft Glossary. This illustrates the difficulty with the current draft definition in the Glossary to this report (which seems to include several terrestrial stationary biomass related options). All mitigation options have uncertainty also main stream options like renewables (e.g. assessment of the impact on the climate system by large scale wind energy development). Hence here we think it is important to mention the geoengineerings options where the limitations and uncertainties are

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						significantly larger compared to already applied mitigation options. However since the definition of geoengineering in this report also includes mitigation options already in place and where to a large extent guidelines for GHG inventories and implementation guidelines/safeguards are developed or under development it is not possible to treat all geoengineering options in the same way as done in these sentences. Please also note that the definition of Geoengineering/CDR in the WGI draft is different from the definition used in other WGs draft reports. See Glossary. With regard to the two aspects mentioned here (unintended impacts and assessment of the impact on the climate system) it is a significant difference between on one side options like forestry (where actions and possible unintended impacts is mostly confined to given geographical areas and therefore much related to how projects are developed and the uptake are related to species which can be assessed and monitored) and on the other side for other CDR options like ocean fertilization and SRM where you might have unintended impacts in many countries or in the ocean and in some cases far away from the initial "project" and it is also more difficult to assess and monitor the impact on the climate system because many other factors may influence such broad activities. We suggest that the best solution might be to change the definition to not include afforestation/reforestation and Bio-CCS/BECs for this report. Another way is to be more precise in these sentences about which SRM/CDR have these unintended side effects and for which options assessment of impacts on the climate system is more difficult than other main stream mitigation options. [Government of Norway]
SPM-1557	SPM	18	22	18	23	if possible, please briefly mention which side effects are expected under CDR and SRM methods. [Government of Republic of Korea]
SPM-1558	SPM	19	1	19	29	Box SPM.1 is welcome but it needs to include more information. What do the RCPs mean/represent? What kind of assumptions do they include and what are the underlying assumptions (e.g. relating to population, future emissions reductions - include a reference to WGIII)? How do they compare with the SRES? How do they relate to business-as-usual and mitigation scenarios? All these issues help policy makers to understand what RCPs stand for. [European Union]
SPM-1559	SPM	19	1	19	29	Please provide a cross-reference to the report, for more explanations about the scenario process and literature references. [Government of Belgium]
SPM-1560	SPM	19	1	19	29	Box SPM.1 Suggest that the first paragraph of this Box explain further why a different suite of scenarios being used, in what ways are they different from SRES, whether the findings of research using SRES scenarios be directly compared to research using RCPs, and what the direct implications are for policymaking. For example, the sentence on lines 11-14 stating "The RCPs can contain 21st century climate policies" and thus differ from the SRES scenarios, should be included in the introduction of this box. [Government of Canada]
SPM-1561	SPM	19	1	19	29	It would be make it much easier to understand the Box SPM.1, if it would be accompanied with a graph showing the time evolution of radiative forcing and atmospheric CO2 equivalent of RCPs. [Government of Finland]
SPM-1562	SPM	19	1	19	29	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The explanation on the RCPs in Box SPM.1 is highly appreciated, but should be improved: Please 1) use common language rather than scientific jargon, 2) provide examples for the parameters of the "different scenarios of human activity, which are not assessed in this report" (e.g. population, GDP, etc.), because otherwise non-experts will not understand, 3) mention the purpose of the three RCPs to be used across the three WGs in order to provide consistent information, 4) state how the RCPs relate to the SRES-scenarios (RCPs include mitigation scenarios!). Information and text might be taken from Ch 1 P 22-23. [Government of Germany]
SPM-1563	SPM	19	1	19	29	It is very important to provide to the readers some comparison of the SRES and RCP scenarios (e.g. related to the resulting CO2 concentration. It could be emphasized, e.g., that the lowest RCP scenario has no equivalent in SRES (since the latter had not included policy measures), that RCP4.6 roughly can be compared to SRES B1, that RCP 6.0 can be compared to SRES B2 (with regard to the resulting warming; Rogelj et al. 2012 (DOI: 10.1038/NCLIMATE1385), or SRES A1B (with regard to resulting CO2 concentrations by 2100; http://www.ipcc-data.org/observ/ddc_co2.html) and RCP 8.5 is comparable to SRES A1FI. [Government of Switzerland]
SPM-1564	SPM	19	1	19	29	Box SPM.1 does make it clear that a given RCP represents a set of specific assumptions that lead to a given trajectory of fossil fuel use and level(s) of other future forcings. The summary box also clearly states that the RCPs do not represent a full range of plausible scenarios. The SPM should, however, include some statement about the trajectory that best represents where we end up if global society does nothing to curb fossil fuel emissions or to reduce their accumulation in the atmosphere. It should also be very honest about how realistic it is (or is not) for RCP 2.6 assumptions to represent a logical future condition. [Government of United States of America]
SPM-1565	SPM	19	1	19	29	It would be very useful if Box SPM.1 provided either a table or list of bullets that contained basic information about each RCP, as was done for SRES in previous SPMs. This could take the place of some sentences. For each RCP suggest listing total forcing by 2100, whether that forcing peaks by 2100 or not, and expected CO2 concentrations by the 2050 and 2100 timeframes. [Government of United States of America]
SPM-1566	SPM	19	1	19	29	Box SPM1 could usefully give a bit more of a summary of each of the RCPs and say a bit more about the assumptions underpinning each of them (including both policy assumptions and scientific assumptions like climate feedbacks). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1567	SPM	19	1			Box SPM.1: In general, we would recommend including a comprehensive illustration of the RCPs showing emissions and concentrations for GHGs and aerosols, RF etc. If not in this WGI SPM, then in the SYR. [Government of Canada]
SPM-1568	SPM	19	3	19	4	make ozone depleting substances explicit in view of their role in climate as GHGs and the role of ozone layer changes for climate on the Southern Hemisphere: ...greenhouse gases, aerosols and other anthropogenic drivers including the prescribed time evolution of ozone or ozone depleting substances [Government of

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						Netherlands]
SPM-1569	SPM	19	3	19	6	Consider to explain the difference between the old scenarios and the new RCPs. [Government of Norway]
SPM-1570	SPM	19	3	19	29	Concerning the use of RCPs, conditional dependencies (e.g. on RCPs and spread per RCP) could be better stated in some of the projections. The use of RCPs lead to a different representation of the range of model results compared to model result based on SRES. This must be clearly explained to avoid misinterpretation. Mention clearly that the RCPs make use of Air Quality Policy, which is fundamentally different compared to SRES scenarios. [Government of Netherlands]
SPM-1571	SPM	19	6	19	7	Please consider to explain to what extent the exclusion of solar or volcanic forcings introduces uncertainties. [Government of Norway]
SPM-1572	SPM	19	9			Insert "the" before "IPCC" [Government of New Zealand]
SPM-1573	SPM	19	10	19	10	Change "Representative Concentration Pathways (RCP)" to "Representative Concentration Pathways (RCPs)". [Government of Netherlands]
SPM-1574	SPM	19	10	19	11	They are identified by their year 2100 total radiative forcing'. Consider the possibility to add the words "with respect to 1750" [Government of France]
SPM-1575	SPM	19	10	19	11	Box SPM.1 RCPs: To enhance the understanding of size of the radiative forcings (RF) for the the different RCP's, it could be helpful to compare with the total anthropogenic radiative forcing in 2011 since 1750; 2.3 W/m2, referring to figure SPM.4. We suggest to add the sentence in line 11; "For comparison the total anthropogenic radiative forcing in 2011 since 1750 is estimated to 2.3 W/m2 (see Figure SPM.4)". [Government of Norway]
SPM-1576	SPM	19	11	19	11	Are these RCPs identified by their year 2100 total radiative forcing AGAINST A 1750 BASE PERIOD? Please clarify. [Government of United States of America]
SPM-1577	SPM	19	11	19	11	It's worth inserting a statement here from the Fig. SPM.4 that current anthropogenic RF is 2.3 W/m2 [Government of United States of America]
SPM-1578	SPM	19	11	19	12	Box SPM.1: This is a good description of the RCPs. It says that "...The RCPs can contain 21st century climate policies and thus are framed differently compared to" It would have been useful for Policy Makers if these policies are also explained. [Government of Norway]
SPM-1579	SPM	19	11	19	14	Box SPM.1: The "can" in the statement indicating "The RCPs can contain 21st century climate policies and thus are framed differently compared to no-climate policy scenarios used in previous reports." is confusing and ambiguous. Suggest revising. [Government of Canada]
SPM-1580	SPM	19	11			Box SPM.1: Suggest each of the 4 RCPs be identified here rather than just RCP2.6 and 8.5. 2. Recommend moving the sentence on lines 15-16 (While the RCPs...aerosols) to the end of this paragraph so it follows the information on lines 16-19 about what information are contained within each RCP dataset [Government of Canada]
SPM-1581	SPM	19	12	19	24	In ths Box SPM.1, some explanation on how the prescribed CO2 concentrations for the RCPs were agreed upon is necessary [Government of Kenya]
SPM-1582	SPM	19	13	19	13	Suggest inserting: "These new scenarios are not intended to be interpreted as forecasts nor as policy recommendations." [Government of United States of America]
SPM-1583	SPM	19	13	19	14	Consider the possibility to replace "by year 2100" by "between 2013 and 2100" or by "before 2100". [Government of France]
SPM-1584	SPM	19	15	19	15	Suggest adding "and thus a wide range of climate outcomes" after "total forcing values". [Government of United States of America]
SPM-1585	SPM	19	15	19	16	Please clarify how this compares to the SRES used in AR4: it is important to mention that the highest RCP is lower than the SRES A1FI by ~1 W/m2. [Government of Belgium]
SPM-1586	SPM	19	15	19	19	Box SPM.1: Recommend moving the sentence on lines 15-16 (While the RCPs...aerosols) to the end of this paragraph so it follows the information on lines 16-19 about what information are contained within each RCP dataset. Lines 15-16 talk about emissions for aerosols before telling the reader that aerosol emissions are part of the dataset. [Government of Canada]
SPM-1587	SPM	19	16	19	16	Change "particularly for aerosols" to "particularly for short-lived gases and aerosols". [Government of Netherlands]
SPM-1588	SPM	19	16	19	19	Some RCP scenarios such RCP2.6 and RCP4.5 have assumed implementation of carbon dioxide removal (CDR) geoengineering methods in the future. This could be mentioned as well. [Government of India]
SPM-1589	SPM	19	21	19	21	The word "many" or "most" seems to be vague in its meaning, compared with the detailed definiton of likelihood such as very likely (90-100%). How many is many? Define if it's possible. [Government of Republic of Korea]
SPM-1590	SPM	19	21	19	24	Box SPM.1: Suggest it would be helpful to explain here how the simulations with prescribed CO2 allow estimation of cumulative fossil fuel emissions in order to link this box better with text on page 12 lines 34-39 [Government of Canada]
SPM-1591	SPM	19	21	19	26	It should be indicated whether the values of CO2-concentrations in the text are expressed in real concentration values or in CO2-equivalents. [Government of

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						Hungary]
SPM-1592	SPM	19	21	19	26	The 421 ppm concentration of RCP2.6 scenario is more optimistic than the earlier SRES B1 (exceeding 500 ppm) by 2100. Some hints should be given whether the RCP2.6 scenario has any practical relevance or not. [Government of Hungary]
SPM-1593	SPM	19	21	19	26	The 936 ppm concentration of RCP8.5 scenario is lower than the value of (the most pessimistic) SRES A1FI by 2100. Some comparison is suggested to be included in the text about this aspect. [Government of Hungary]
SPM-1594	SPM	19	21	19	26	Box SPM.1. It would be useful to more clearly explain that only CO2 concentrations and emissions are used as the driver or which are the assumptions/scenarios for other LLGHG etc, as appropriate. Alternatively, if only CO2 is used, how one may relate the forcings (and thus results) to CO2-equivalents. [Government of Sweden]
SPM-1595	SPM	19	24	19	26	It might be useful for policymakers to explain that in the last type of simulations, the carbon cycle is simulated in the ESMs (while it is not in the other runs), and thus the associated uncertainties can be explored. It may also appear surprising that, in spite of the existence of these emission-driven runs, page 12 line 35+ explains that "The overall spread of projections for the high RCPs is narrower than for comparable scenarios used in AR4 because in contrast to the SRES emission scenarios used in AR4, the RCPs used in AR5 are defined as concentration pathways...". [Government of Belgium]
SPM-1596	SPM	19	25	19	25	Box SPM.1: Suggest explaining to readers what 'integrated assessment models' are. [Government of Canada]
SPM-1597	SPM	19	25	19	25	"...by the integrated assessment models". This is the first mention of IAMs and they are not explained (or referenced to elsewhere in the WGI chapters). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1598	SPM	19	26	19	26	After "related to carbon cycle feedbacks," add "in an intuitive manner.": It should be possible to explore uncertainties of carbon cycle feedback only with concentration-driven comparison experiments, by performing "coupled" and "uncoupled" runs using concentration scenarios. [Government of Japan]
SPM-1599	SPM	19	28	19	29	Suggest re-writing the last sentence for clarity, to read: "The forcing label associated with the 2100 forcing value of each RCP should be understood as indicative, as there are a number of different emission pathways that would produce that same forcing by 2100." Furthermore this sentence should be moved to come before the paragraph describing CMIP5 modeling. This box needs a statement relaying to policymakers that these RCPs are pathway-independent; that is, emissions pathways are non-unique and various temporal evolutions of global, regional and national emissions pathways could get you to the same endpoint. [Government of United States of America]
SPM-1600	SPM	19	28	19	29	Assume that this is true but it appears to cast doubt on what the RCPs actually represent. Can this be rephrased? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1601	SPM	19	30	19	30	The report should include recommendations on how policy makers can use climate change projection information [Government of Vietnam]
SPM-1602	SPM	19	30			Box SPM.1: Suggest adding to the end of this Box a sentence to explain that while the RCPs were generated with a particular set of conditions (the original RCP scenario), other emission pathways could be compatible with the RCP pathways and that this will be assessed by IPCC WGIII. [Government of Canada]
SPM-1603	SPM	19		19		We appreciate the addition of BOX SPM.1, which provides a lucid explanation of RCPs. However, despite its implications that concentrations will continue to be stabilized beyond 2100 in RCP4.5, emission trends beyond 2100 should be discussed in the text for explicit understanding. We request that emission trends beyond 2100 are also described using explanatory figures. [Government of Japan]
SPM-1604	SPM	19		19		Box SPM.1 is very important as it introduces to Policy Makers a new basic concept, omnipresent throughout the SPM, as it is RCPs. This is one of the very few places within SPM where there are some figures (quantitative information) that link RCPs with GHGs concentrations, but only for CO2 concentrations and not for others GHGs as CH4. It might be useful to further explain here quantitative relationships between RCPs - GHGs Emissions - GHGs Concentrations as inputs to CMIP5 multi-model simulated time series and their outputs : global average temperature, etc. It might be also useful to show this relationships in figures and charts as it is done in WGI Fifth Assessment Report Chapter 1 Box 1.1 and its figures. It is suggested to add at this stage "WGI Fifth Assessment Report Chapter 1 Box 1.1, Figure 3: (a) Equivalent CO2 concentration and (b) CO2 emissions (except land use emissions) for the four RCPs and their ECPs as well as some SRES scenarios." that can be found in IPCC WGI Fifth Assessment Report Chapter 1, page 60. This would give Policy Makers a powerful visual information relating RCPs with all GHGs concentrations (CO2 eq ppm), and CO2 Emissions; Alternatively, it might be even better to make a compound of all or some of the figures attached to Box 1.1 from WGI Fifth Assessment Report Chapter 1 ("WGI Fifth Assessment Report Chapter 1 Box 1.1, Figures") , pages 58 to 61, that is figures 1, 2, 3, and 4 with a brief explanation on how these numeric relations between RCPs, GHGs concentrations and GHGs emissions have been settled. It might also be of use to relate comprehensively with an all inclusive picture, to compound some of the above mentioned figures with "SMP Figure SPM.6, page SMP-28", then there would be an immediate visual quantitative information on the relationships on the whole conceptual architecture core of Climate Change Science, that is: RCPs - GHGs Emissions - GHGs Concentrations as inputs to CMIP5 multi-model simulated time series and their outputs : global average temperature, ice extent change and ocean Ph change.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						[Government of Spain]
SPM-1605	SPM	19				BOX SPM.1: Which of these scenarios corresponds roughly to 'business as usual'? Do the total RFs at 2100 include carbon cycle feedbacks? Is it possible to relate these to the SRES scenarios, approximately, in a table? A diagram showing these scenarios might be helpful. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1606	SPM	20	3	20	6	Table SPM.1, caption: Please replace "Bold indicates where the AR5 (black) provides a revised* global-scale assessment from the SREX (blue) or AR4 (red). Projections for early 21st century were not provided in previous assessment reports." by "The global-scale assessment of the likelihood of the statements as assessed in AR (black), in the SREX (blue) and in AR4 (red) are provided. Bold indicates where the AR5 provides a revised* assessment. In column 4, the "--" indicates missing projections for early 21st century that were not provided in previous assessment reports." If the numbers in brackets indicate the reference to the underlying report, the brackets should not be squared but curly as elsewhere in the SPM. [Government of Germany]
SPM-1607	SPM	20	7	20	7	The phrase "in many (but not all) regions", which appears in row 4, column 2 of Table SPM.1 in italic type, should be instead typed in normal, because it is neither a level of confidence nor likelihood. [Government of Japan]
SPM-1608	SPM	20	7	20	7	The phrase "not formally assessed", which appears in row 4, column 3 of Table SPM.1 in italic type, should be instead typed in normal, because it is neither a level of confidence nor likelihood. [Government of Japan]
SPM-1609	SPM	20	7	20	7	The phrase "Very likely in central North America", which appears in row 5, column 2 of Table SPM.1 in italic type, should be instead typed in bold, because it is a revised assessment from SREX and AR4. [Government of Japan]
SPM-1610	SPM	20	7	20	7	The phrase "over most land areas", which appears in row 5, column 5 of the table SPM.1 in italic type, should be instead typed in normal, because it is neither a level of confidence nor likelihood. [Government of Japan]
SPM-1611	SPM	20	7	20	7	There is some inconsistency with the Table text and the text in the chapter sections. In the Table in box column 3 row 5 low confidence is stated for droughts and for SREX it is stated as medium confidence. In section 2.6.1 however it is concluded that consistent with SREX there is low confidence. In addition, the same section it is mentioned that the AR4 conclusions should be tempered, while in the Table the AR4 refers to "more likely than not", which is already tempered. In Table in column 4, row 2 and 3 the likelihood "likely" is given. However, this is untracable in the main text of the section 11.3.2. In Table column 4, row 5: this conclusion is not so clearly stated in the referred section. In Table column 5 row 5: this conclusion cannot be found the referred section. [Government of Netherlands]
SPM-1612	SPM	20	7	20	7	It is better to add information on trends of monsoon activities. [Government of Vietnam]
SPM-1613	SPM	20	7			SPM.1 Table ---- The descriptor "Very likely increases in Central North America" for precipitation extremes should read "Eastern and Central North America." Please see the many published papers by Kunkel (2013), Groisman et al., and the US National Climate Assessment 2009 (or the draft 2013) which provides ample evidence for statistically significant strong increases in extreme precip in the eastern two-thirds of the USA especially the NE USA. [Government of United States of America]
SPM-1614	SPM	20		20		The likelihood of increases in intense tropical cyclone activity in the late 21st century has been changed from "likely" in AR4 to "more likely than not" in AR5. Because this likelihood may have great impact on adaptation assessment, background clarification on that change since AR4 would be helpful. [Government of Japan]
SPM-1615	SPM	20		21		Table SPM.1: The likelihood statements need clarification in terms of whether they apply generally across all scenarios, unless otherwise specified (in a footnote). [Government of Canada]
SPM-1616	SPM	20		21		Table SPM.1: Please clarify if the phrase Central North America is considered to include southern Canada or not. [Government of Canada]
SPM-1617	SPM	20		21		Table SPM.1: Please add a footnote describing the effect of different RCPs on extreme events, which should differ by the end of the century. [Government of Germany]
SPM-1618	SPM	20				Table SPM.1: It would be very much appreciated to include in the SPM, e.g. a footnote, explaining the concrete reason for the difference in the assessment, compared to previous assessments. Furthermore it would be informative for the reader to learn about the difference in assessment without the need to consult earlier reports. [Government of Austria]
SPM-1619	SPM	20				Table SPM.1: Headline of Column 3: should specify over which period the assessment is made [Government of Belgium]
SPM-1620	SPM	20				It is suggested to outline reasons for elements "Not assessed" in the table using labels or marks. [Government of China]
SPM-1621	SPM	20				Table SPM1: Increase in intense tropical cyclone activity: Likelihood of further changes in Late 21st century, clarify or give precision for some basins [Government of Madagascar]
SPM-1622	SPM	20				Table SPM-1: This is a very informative table. Please also consider to include a row about ocean acidification where the findings are new and seem to be more

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
						confident in this report than in the previous report. [Government of Norway]
SPM-1623	SPM	20				Table SPM-1: Caption: please consider using the same wording in the caption as in the table headings. [Government of Norway]
SPM-1624	SPM	20				For clarity, in Table SPM.1: the sentence on likelihood of late 21st century changes in tropical cyclone activity should read '... in some ocean basins'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1625	SPM	21	8	21	8	This is not concluded in section 11.3.2, but only in the executive summary. [Government of Netherlands]
SPM-1626	SPM	21	17			Footnote (j) in Table SPM.1 on extreme sea level events projections from SREX needs clarification. Also the authors should consider whether the projection of increased extreme sea level events is: i) very likely or ii) very likely but only in the limited context of considering the impact of sea level rise with other factors (i.e., storm characteristics) assumed constant. SREX was concluding more along the lines of (ii) in its statements. From SREX's Table SPM.1: "It is very likely that mean sea level rise will contribute to upward trends in extreme coastal high water levels in the future. There is high confidence that locations currently experiencing adverse impacts such as coastal erosion and inundation will continue to do so in the future due to increasing sea levels, all other contributing factors being equal. The very likely contribution of mean sea level rise to increased extreme coastal high water levels, coupled with the likely increase in tropical cyclone maximum wind speed, is a specific issue for tropical small island states." [NOTE: There is no mention of a likely increase in frequency or intensity of storm surge events per se. Just that this is a "specific issue" for island states.] From Table SPM.1 from SREX: "While changes in storminess may contribute to changes in extreme coastal high water levels, the limited geographical coverage of studies to date and the uncertainties associated with storminess changes overall mean that a general assessment of the effects of storminess changes on storm surge is not possible at this time." [NOTE: While SREX was confident on how one factor (sea level rise) was going to contribute to future extreme sea levels, it was not expressing any confidence in how storm changes would contribute. This distinction needs to be included in the footnote (j).] [Government of United States of America]
SPM-1627	SPM	22	1	22	9	This table provides projections for the period 2081-2100, whereas AR4 provided projections for 2090-2099. Why not give projections for the same period as that of AR4, as this would enable policy makers to make a comparative assessment of projections over [Government of India]
SPM-1628	SPM	22	1	22	9	"Anomalies calculated with respect to 1986-2005" should be moved from footnote (a) to the title of the table. Also, the authors should add a sentence stating how much needs to be added to both temp and SLR to make these projections against pre-industrial, since that is what policymakers are most accustomed to - and indeed, what the UNFCCC goal is against. [Government of United States of America]
SPM-1629	SPM	22	1	22	32	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: Table SPM.2 provides information on temperature increase with regard to the period from 1986-2005, the footnote gives ranges and best guesses for observed warming up to this period. It is essential that IPCC provides guidance on how to use this information and it is strongly suggested to simplify footnote (a) from "Using HadCRUT4 and its uncertainty estimate (5-95% confidence interval), the observed warming to the reference period 1986-2005 used for projections is 0.61 [0.55 to 0.67]" to "In order to relate the above temperature changes to pre-industrial levels, add approximately 0.6 °C. This is based on the HadCRUT4 dataset which shows an observed warming from the period 1850-1900 to the period 1986-2005 of 0.61 [0.55 to 0.67] °C." Information on other reference periods is not needed in a SPM, and can be found in the underlying report. Furthermore, in order to guarantee consistent use of scenario information based on the RCPs across the WGs of AR5 the provision of information on cumulative emissions, CO2-equivalent emissions, CO2-concentrations, CO2-equivalent concentrations (similar to Table 6.1. of the SOD of AR5-WGIII, but with results from WGI) is needed. All these data is available somewhere in the report, but they are not easily accessible in the SPM of WGI. Table SPM.2 should be extended for this purpose and give this information for each RCP and time period. The current CO2-concentrations, CO2-equivalent concentrations should be provided in a footnote. In addition, a footnote providing information on previous sea level rise since pre-industrial levels should be added. [Government of Germany]
SPM-1630	SPM	22	1	22	34	Table SPM2: Similar to the Global Mean Surface Temperature Change figures, the table would benefit from the inclusion of the observed sea level rise up to the reference period 1986-2005, to enable comparisons between projected sea level rise and observations from a consistent baseline. At the moment we have observed SLR from 1901 - 2010, but then projections start at the 1986-2005 baseline. [Government of Australia]
SPM-1631	SPM	22	1		2	Table SPM.2: Suggest adding the baseline to the table title/caption in lines 1-2 [Government of Canada]
SPM-1632	SPM	22	2	22	2	Table SPM.2: '...late 21st century relative to the 1986-2005 average.' Suggest you also say that in the table title and not just in the notes. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1633	SPM	22	2	22	4	Table SPM.2 should include future projections for other periods such as (2020-2045) and (2066-2080), this information is useful for policy makers in their applications [Government of Vietnam]
SPM-1634	SPM	22	3	22	3	The differences between RCP4.5 and RCP6.0 are very small, particularly in the shorter term compared to the differences with RCP 2.6 and RCP 8.5 respectively. This is not self-evident and we would appreciate some explanation in an additional note. [Government of Netherlands]

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SPM-1635	SPM	22	3	22	4	In this table, projections given under the various scenarios are for 2046-2065 and also 2081-2100. This certainly is far future while policy makers would also like to know projections for near future e.g. 2015-2030. Can something be given for this period since it may determine resource allocation to address immediate climate change concerns by the policy makers? [Government of Kenya]
SPM-1636	SPM	22	3	22	33	Add a note or statement that temperature ranges are based on the new RCP scenarios which differ from the SRES scenarios in AR4. Consider a comparison (maybe figure) between the two set of scenarios [Government of Denmark]
SPM-1637	SPM	22	6	22	9	Table SPM.2, caption: All differences between AR4 and AR5 should be pointed out to avoid confusing the readers, e.g. line 6: "anomalies calculated for 2081-2100 (AR4: 2090-2099) with respect to 1986-2005 (AR4: 1980-1999); add in line 9 information like: the additional warming to the reference period 2081-2100 compared to the period 2090-2099 used in AR4 is about 0°C for RCP2.6 up to about 0.25°C for RCP5.8 (or even better the correct numbers with uncertainty ranges from model results). RCP8.5 gives about 0.1°C less warming around 2100 compared to SRES A1FI due to somewhat lower CO2 concentrations. A highest 'scenario' comparable to the one given in AR4 Table SPM.3 would be probably somewhat like a mean of 4.2 and a range of 3.0 to 5.3 (compared to 2.4-6.4 in AR4). [Government of Switzerland]
SPM-1638	SPM	22	6		9	Table SPM.2: Suggest considering whether footnote (a) really needs to have all these data about changes in global mean temperature relative to the reference period for three different time periods? Suggest it may be sufficient to only give the value relative to pre-industrial. [Government of Canada]
SPM-1639	SPM	22	11	22	19	Table SPM.2, caption: Information about how to compare these values to AR4 Table SPM.3 should be provided, i.e. the influence of changing the reference periods (1986-2005 instead of 1980-1999; 2081-2100 instead of 2090-2099) and scenarios. All changes lower the highest values in table SPM.2 in AR5 'artificially' compared to the highest values in AR4 table SPM.3. Corrections might be in the range of +1.5cm for the later reference period in the beginning, about +6, +4 and +8cm for the mean, lower and upper likely range values, respectively, and maybe 1-2 cm for the scenario. A highest 'scenario' comparable to AR4 might therefore be something like a mean of 0.71 and a likely range of 0.52 to 0.92 m. Even if comparison might be difficult, some comparison of that kind is very important. At least present the comparison provided in the main report (chapter 13, page 54, line 3ff) for scenario SRES A1B, which was assessed in the AR4, with the likely range on the basis of science assessed in the AR5 is 0.57 [0.40–0.75] m by 2090–2099 relative to 1990, compared with the AR4 projection of 0.21–0.48 m for the same scenario and period. [Government of Switzerland]
SPM-1640	SPM	22	12	22	12	The abbreviation AOGCM has not been defined. [Government of Netherlands]
SPM-1641	SPM	22	21	22	21	Table SPM.2. Is this (...are then assessed...) an "expert assessment"? If yes, please specify. [Government of Sweden]
SPM-1642	SPM	22	21	22	24	The likely ranges of temperature increases are based on the ranges derived from the CMIP5 models. Because this procedure is different from that in AR4, where other simplified models are also used with some judgment, it would be informative to describe the validity of CMIP5-only ranges. [Government of Japan]
SPM-1643	SPM	22	22	22	24	The lower confidence level associated with projections for the mid-21st century is attributed in this paragraph to the larger uncertainty arising from radiative forcing and initial conditions. This could be better explained as attributable to natural climate variability that could sometimes obscure the signals from radiative forcing that will be less dominant in the mid-21st century than in the late 21st century. [Government of Japan]
SPM-1644	SPM	22	22	22	24	The text suggests that the confidence level for projections of global mean surface temperature change in 2081-2100 is high, but this is not mentioned. [Government of Netherlands]
SPM-1645	SPM	22	23	22	24	"contributions of radiative forcing and initial conditions to the temperature response uncertainty" There are no contributions of initial condition on temperature more than 10 years out. These are also never discussed. [Government of Netherlands]
SPM-1646	SPM	22	24	22	24	To avoid ambiguity, the term "surface temperature", instead of mere "temperature", should be consistently used. [Government of Japan]
SPM-1647	SPM	22	29	22	29	Table SPM.2. Is this (...are then assessed...) an "expert assessment"? If yes, please specify. [Government of Sweden]
SPM-1648	SPM	22				Table SPM.2 It is very unfortunate that this Table is silent about sea-level rise beyond 2100, when such information would be so policy-relevant. Please consider improving this. [Government of Belgium]
SPM-1649	SPM	22				Table SPM.2 : This table should provide all the information useful for comparison to AR4 and understanding of the uncertainties: - please add lines for the emission-driven RCP8.5, to document the carbon cycle uncertainty - if possible, keep the same type of statistical analysis; if not, document the change in the caption and provide a link to its justification. Indeed, the AR4 range was +60 / -40% around the mean. Here, the distribution is symmetric. However, the results are affected by the uncertainty in climate sensitivity, whose distribution is tail-heavy (see first paragraph on page SPM-10). It would be surprising that this distribution transform into a symmetric one here. Results by Rogelj et al. (2012) presented in Figure 12.8, which are based on a careful Bayesian analysis of CMIP5 results taking into account the whole spectrum of climate sensitivity and potential model flaws seems to indicate that the statistical approach of AR4 (mean -40% +60%) is a better indicator of uncertainty than the symmetric approach chosen here. Even without strictly following the method from the AR4, it seems very important to use a method that takes the skewed nature of the distribution into account. This also applies to Figure SPM.6.

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						- note that the range of forcing covered by the scenarios is not the same as in AR4 (RCP2.6 is below all SRES, RCP 8.5 is ~1 W/m2 below SRES A1FI in 2100) [Government of Belgium]
SPM-1650	SPM	22				Table SPM.2: Please add a line for the emission-driven RCP 8.5. This line is needed to provide the full information regarding uncertainties as well as facilitate the comparison to AR4. [Government of Belgium]
SPM-1651	SPM	22				Table SPM.2 : Footnote (c) : Could add that this is the 1.64 standard deviation, assuming a normal distribution. [Government of Belgium]
SPM-1652	SPM	22				Table SPM.2: Suggest adding projected changes relative to pre-industrial directly to the table so that the readers aren't left to do the math and figure out how the projections relate to the 2 degrees warming target. Values relative to pre-industrial for SLR also recommended. [Government of Canada]
SPM-1653	SPM	22				Table SPM.2: Policy-makers would appreciate information on changes relative to the pre-industrial level (at least for the temperature). [Government of Finland]
SPM-1654	SPM	22				Table SPM.2 It would be useful to include in this table the corresponding ppm ranges from Box SPM.1 and the corresponding cumulative total anthropogenic emissions (currently I have to infer these from graph SPM.9) [Government of New Zealand]
SPM-1655	SPM	22				Table SPM.2 Caption, paragraph b), line 19. "several tenths of a metre" is the same as the entire range of sea level projections. Can this statement be made more specific? [Government of New Zealand]
SPM-1656	SPM	22				Table SPM.2: Estimates of changes related to pre-industrial level should also be included in a separate column. We see that Note (a) partially explains this, but it is difficult to understand what the ranges in Note (a) is related to. [Government of Norway]
SPM-1657	SPM	23	0			In Figure SPM.1, panel a, the black colour of the HadCRUT4 line is (much) more distinctive compared to the colours of the alternative data sets. Purely perceptually, this leads the eye to interpret the HadCRUT4 as the 'best' or otherwise reference datasets. If this is not intentional, redraw with more 'equal' colours. [Government of Sweden]
SPM-1658	SPM	23	1	23	11	Suggest authors consider relabeling temperature datasets Fig SPM.1 from HadCRUT4 to "Hadley HadCRUT4", from MLOST to "NOAA MLOST" and from GISS to "NASA GISS". The reason being these suggested labels are more immediately familiar to policymakers. [Government of United States of America]
SPM-1659	SPM	23	2	23	2	The lower panel of figure 1(a) seems to "hide the decline" that is evident from the upper panel. We are worried this may be seen as a cover-up, which we think needs to be avoided. [Government of Netherlands]
SPM-1660	SPM	23	2	23	2	Figure SPM.1: Both panel (a) and panel (b) are called "Global surface temperature", but panel (b) excludes polar regions. This seems to suggest that panel (a) also excludes polar regions. If this is not the case, then explicitly say that panel (a) is for global temperature INCLUDING polar regions. [Government of United States of America]
SPM-1661	SPM	23	3	23	5	Figure SPM.1-map- b- may be better perceived if an additional color, with the necessary tones, would be added to clearly differentiate the regions below and above the average observed temperature change from 1901-2012. [Government of Spain]
SPM-1662	SPM	23	5	23	6	Figure SPM1. Please, explain the Model names HadCRUT4, MLOST and GISS, in the text: "Figure SPM.1: (a) Observed global mean combined land and ocean temperature anomalies from three surface temperature data sets (black – HadCRUT4, yellow – MLOST, blue – GISS)." Also, it will be of importance to introduce in this Figure caption, the absolute temperature value (in °C), at the time period chosen as reference for temperature anomaly, i.e., the 0 °C value), in order to have a better understanding of this variable. [Government of Argentina]
SPM-1663	SPM	23	5	23	11	Figure SPM.1. Add sentence on the observed cooling trend in the North Atlantic either in the caption or in the text. [Government of Denmark]
SPM-1664	SPM	23	8	23	8	insert space after "2012" [Government of Netherlands]
SPM-1665	SPM	23	9	23	9	Is it 'trends' or just 'differences'? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1666	SPM	23	11	23	11	replace "significant" by "significantly different from zero" [Government of Netherlands]
SPM-1667	SPM	23		24		Use of different reference periods could cause confusion. In Fig. 1a, the reference period is 1961-1990, in 2c it is 1971 and in 2d it is 1900-1905. In Table 1 and in Fig. 6, 7 and 8, projections in AR5 are relative to 1986-2005. [Government of India]
SPM-1668	SPM	23				Figure SPM.1: the end point of the period should be given in the title of the plot and the caption [Government of Belgium]
SPM-1669	SPM	23				Figure SPM.1 Is it normal that no black line (HadCRUT4) is visible on the last two decades? [Government of Belgium]
SPM-1670	SPM	23				Figure SPM.1: To facilitate understanding, we suggest a formulation closer to the caption of Figure 2.21: "a trend of zero lies outside the 90% confidence interval" or a simplified version thereof: "Grid boxes where the likelihood that there is a trend is higher than 90% are indicated by a + sign". [Government of Belgium]

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SPM-1671	SPM	23				It is suggested to note the white parts in Figure SPM.1 (b), eg as an indication of incomplete or missing observations. [Government of China]
SPM-1672	SPM	23				Title for Fig SPM1 panel a) should be changed from "Global surface..." to "Global mean surface..." [Government of India]
SPM-1673	SPM	23				Figure SPM-1 (a). Please consider showing the absolute temperature instead of the relative temperature or in the figure text line 8 "to the mean of 1961-1990 which was...". [Government of Norway]
SPM-1674	SPM	23				Please consider changing the figure caption so that it reads "Annual average compared to 1961-1990" and "Decadal average compared to 1961-1990". [Government of Norway]
SPM-1675	SPM	23				Fig. SPM.1.a): explain what are HadCRUT4, MLOST & GISS - perhaps in a footnote. Also, see comment for page 3 line 12. Fig. SPM.1. yellow line is NCDC MLOST (see figures in Chapter 2). [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1676	SPM	23				Fig. SPM.1. a): poorly defined lines in graphic (a) means that, especially for the last two decades, the three lines overlap and e.g. HadCRUT4 lines are invisible. Suggest that the figure is enlarged to show all relevant lines clearly. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1677	SPM	23				Fig. SPM.1.b): it would be more useful to show the temperature difference between 1901 and 2012, rather than trends. Also, as noted earlier, why are you using 1901 to 2012? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1678	SPM	24	1	24	2	In Figure 2B, What is the source of sea ice going back to 1900?. Satellites only go to 1979, in the SPM Technical summary Figure TS12 sea ice record only plotted back to about 1960. The reliability of the pre-1979 instrumental record of sea ice could easily be drawn into question. Conversely there is little discussion or paleo-sea ice reconstructions which are extremely important as they show large variability including summer-sea ice free conditions in the Arctic at several times. Please crosscheck all sea ice sections across AR5. [Government of United States of America]
SPM-1679	SPM	24	1	24	10	Figure SPM 2 global average sea starts at 1900. The AR4 figure started in 1870. Why? [Government of Ireland]
SPM-1680	SPM	24	1	25	2	Figure SPM.2. This is a useful figure, but these graphs would benefit from having a key denoting what the different coloured lines represent. This is stated in text in the explanation below each figure but it would make the graphs clearer and increase their visual impact if this were drawn out into a key, as in the case of Figure 1 on Page 23. [Government of New Zealand]
SPM-1681	SPM	24	4	24	10	Figure SPM.2: The colors in the graphs are not explained. Please add an explanation in the caption. The vertical axes of Figures a and b should be decreased. [Government of Germany]
SPM-1682	SPM	24	5	24	6	In the caption of Figure SPM.2, add the depth range to clarify what the upper ocean means, as in the text (line 11 of page 4) : upper ocean --> upper ocean (0-700m) [Government of Republic of Korea]
SPM-1683	SPM	24	6	24	6	the normalization to 2006-2010 AND relative to the mean of all datasets sounds like 2 normalizations. Unclear how this is defined. [Government of Netherlands]
SPM-1684	SPM	24	6	24	6	Caption of Figure SPM.2: What does "normalized to 2006-2010" mean? Consider changing to "relative to a 2006-2010 mean". [Government of United States of America]
SPM-1685	SPM	24		24		Figure SPM.2 (a): It would be very helpful to insert a horizontal line, e.g. the average 1920-1960 or so, since otherwise it is not easy for the reader to recognize the decrease of snow cover extent mentioned in the text (SPM-5, lines 36 to 40). [Government of Germany]
SPM-1686	SPM	24		25		Why not have identical timescales on Figures SPM2 and SPM3? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1687	SPM	24				Figure SPM.2, Panel (a): Why does the panel show March-April snow cover change and not May-June which represents the period of minimum snow cover and is therefore more comparable to showing July-Sept sea ice extent? [Government of Canada]
SPM-1688	SPM	24				Figure SPM.2, Panel (b): Are the coloured lines all separate data sets? If so, suggest adding a note to that effect in the Figure caption. [Government of Canada]
SPM-1689	SPM	24				Figure SPM.2: The grey shaded areas relating to uncertainties are very difficult to read and interpret. While the uncertainties in panel a are decipherable, with multiple lines (as in panel b, c, d), uncertainties with different shades of grey are virtually impossible to interpret. Suggest revising the figure to make this more clear. [Government of Canada]
SPM-1690	SPM	24				The legend to Figure SPM.2 is not clear enough. The illustration of Figure SPM.2 (a) and (b) and the caption of Figure SPM.2 are inconsistent, with the former using the seasonal expression like spring and summer, while the latter the monthly expression. It is suggested to apply the monthly expression to the illustration as well. [Government of China]
SPM-1691	SPM	24				Figure SPM2 caption for c): Please mention the depth of upper ocean. Further, it should be "global upper ocean heat content", there shouldn't be the word "mean". [Government of India]

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SPM-1692	SPM	24				Figure SPM2 caption: Add rise after sea level [Government of Madagascar]
SPM-1693	SPM	24				Figure SPM-2 (b). What are the different colors? For someone reading only the SPM, this is confusing. Please add (black) in the caption when you talk about the mean of all datasets. [Government of Norway]
SPM-1694	SPM	25	0			The units of Fig SPM.3 panel b) y-axis label now reads "uatm". This should be "µatm" (greek letter mu). And the relation (compatibility) between ppm and µatm should be detailed in the legend or in a footnote. [Government of Sweden]
SPM-1695	SPM	25	1	25	2	On Fig. SPM.3(b), the primary y-axis of pCO ₂ is an unusual unit. Can this be converted to concentration? [Government of United States of America]
SPM-1696	SPM	25	1	25	2	On Fig. SPM.3(b), the secondary y-axis shows pH since ~1990, but on p. 6, line 44-46, it states that oceanic pH has decreased by ~0.1 pH units since pre-industrial. Therefore, can the dataserie in this figure be extended back? [Government of United States of America]
SPM-1697	SPM	25	1	25	10	Figure SPM 3 GHG record could be extended back to period covered by AR4 at least (other GHGs could be included) [Government of Ireland]
SPM-1698	SPM	25	3			Figure SPM.3: Why are the CH ₄ and N ₂ O graphics not included? [Government of United States of America]
SPM-1699	SPM	25	4	25	4	Figure SPM3. Please, include an introductory general statement in the Figure caption and then separates the rest in a) and b), as was done, for example, in Figure SPM2. Also, consider to explain in the Figure caption, the meaning of the unit "uatm" introduced in the vertical axis variable in Figure SPM3.b. [Government of Argentina]
SPM-1700	SPM	25	4	25	4	Fig. SPM.3: insert 'Panel (a)' before ' measurements' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1701	SPM	25	4	25	8	A suggestion for wording: "Measurements of partial pressure of CO ₂ and in situ pH are shown from three stations: [Government of Panama]
SPM-1702	SPM	25	4	25	8	From the Atlantic...." [Government of Panama]
SPM-1703	SPM	25	4	25	9	Figure SPM.3: It would be useful to add the measured decreasing levels of O ₂ , which are a relatively new set of measurements, helping to show the atmospheric CO ₂ increase is related to combustion of carbon [Government of Belgium]
SPM-1704	SPM	25	4	25	9	Figure SPM.3: This figure does not correspond to Figure 3.17. It is actually Figure 3.18. More importantly, it shows the seasonally detrended data, and also only the partial record. I find the deseasonalization of the data highly problematic, as it is important to realize that the changes in surface ocean pCO ₂ and pH occur in a background of natural (seasonal) variability. The seasonal cycle is actually included in the atm. CO ₂ record, but then omitted in the surface records, which makes the figure also internally inconsistent. Finally, the BATS/Station "S" record starts in 1983 and not in 1988 as shown. [Government of Switzerland]
SPM-1705	SPM	25	4		9	The caption for Figure SPM.3 needs to be clear what aspects refer to part a of the figure and what aspects refer to part b. [Government of Canada]
SPM-1706	SPM	25	5	25	5	Fig. SPM.3: Insert 'Panel (b)' before ' measurements' [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1707	SPM	25	6	25	8	Figure SPM.3: The description of the colors is confusing: green colors are for acidity and not for partial pressure. Therefore, please shift the whole line 8 after "surface" in line 6. In addition, light and dark lines cannot be distinguished, please use different colors (e.g. red/orange and blue/cyan). [Government of Germany]
SPM-1708	SPM	25	6	25	9	Fig. SPM.3: this is written in a confusing way. Blue curves are CO ₂ partial pressure and green curves are ocean pH. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1709	SPM	25	8	25	8	PH is a measure of acidity of water, the lower the pH, the higher the acidity. [Government of Panama]
SPM-1710	SPM	25				figure SPM.3 (b): the unit for the partial pressure of CO ₂ should read (µatm) [Government of Austria]
SPM-1711	SPM	25				Figure SPM.3 : In Figure (a) please also add measurements of N ₂ O and CH ₄ to this graph, taken from Figure TS.5. N ₂ O and CO ₂ could share the same axis, whereas for CH ₄ an additional axis can be added on the right side. [Government of Belgium]
SPM-1712	SPM	25				Figure SPM.3, Panel (a): Suggest briefly explaining in the caption the seasonal variability responsible for the regular increase/decrease of these lines as they trend steadily upwards. [Government of Canada]
SPM-1713	SPM	25				It is suggested to change u to µ for the unit of partial pressure of CO ₂ in Figure SPM.3. Moreover, the caption should be marked with (a) and (b). [Government of China]
SPM-1714	SPM	25				Figure 3b needs a legend explaining the colors of the lines what is black?? [Government of Netherlands]
SPM-1715	SPM	25				Figure SPM3 (a): Consider adding to the heading to this figure "Atmospheric CO ₂ concentration" [Government of Norway]

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SPM-1716	SPM	25				Figure SPM3 (b): Consider adding to the heading to this figure "Surface Ocean uptake of CO2". Also consider to print the captions with the same colors as the lines, e.g. pCO2 in blue and pH in green. [Government of Norway]
SPM-1717	SPM	25				Figure SPM.3: Please consider rephrasing so it reads: "Measurements of partial pressure of CO2 at the ocean surface (blue colors) are shown along with the measurement of in situ pH (green colors), a measure of the acidity of ocean water (smaller pH means greater acidity) for three stations from the Atlantic...". [Government of Norway]
SPM-1718	SPM	26	1	26	1	Please, include the following foot note related to the word "black carbon" in the figure SPM.4: "Bond et al. (2013) assessed the current understanding of BC effects and calculated GWP and GTP for BC that includes aerosol-radiation interaction, aerosol-cloud interactions and albedo. As shown in Table 8.A.6 the uncertainties are wide for both metrics (for 90% uncertainty range) reflecting the current challenges related to understanding and quantifying the various effects". The text comes from chapter 8, page 64. [Government of Brazil]
SPM-1719	SPM	26	1	26	1	Please, include separate uncertainty bars in one of each substances in the figure SPM.4. CH4: separate uncertainties related to each CO2, H2O, O3, CH4; Halo-carbons: separate uncertainties related to each O3, CFCs and HCFCs; CO: separate uncertainties related to each CO2, CH4 and O3; NOx: separate uncertainties related to each Nitrate CH4 and O3; Aerosols: separate uncertainties related to each Mineral dust, sulphate, Nitrate, Organic carbon, black carbon. [Government of Brazil]
SPM-1720	SPM	26	1	26	1	The same idea, expressed in comments related to page 8 (lines 14-18) above, applies to Fig. SPM 4. [Government of Brazil]
SPM-1721	SPM	26	1	26	1	Figure SPM.4: Suggest the line at the zero mark be made slightly bolder so figure is easier to read. [Government of Canada]
SPM-1722	SPM	26	1	26	2	On Fig. SPM.4, it would be useful to compare these results to those from AR4. One way of doing this, for example, would be to have the mean [90% certainty range] from AR4 stated below the mean [90% certainty range] from AR5 on the right-hand side of this plot. [Government of United States of America]
SPM-1723	SPM	26	1	26	10	Figure SPM 4 RF figure is very complex and not comparable to earlier values. Some key emerging gases are not included. Use of the AR4 standard should be considered [Government of Ireland]
SPM-1724	SPM	26	1			The yellow text in the figure is not easily visible. Another color choice would be helpful. [Government of United States of America]
SPM-1725	SPM	26	4	26	4	Figure SPM4. Making a detailed sum of the positive contributions to Radiative Forcings (including: Well-Mixed GHG and Short Lived gases, except NOx), I obtain: 3.33 Wm-2 and doing a similar sum of the negative RF contributions (Short Lived gas NOx, Aerosols and Albedo Change due to Land Use), I obtain: 1.12 Wm-2. So, the Net RF = RFpositive - RFnegative = (3.33 - 1.12) Wm-2 = 2.21 Wm-2. However, in this Figure SPM4 the: Total Anthropogenic Radiative Forcing since 1750, for the year 2011 = 2.29 Wm-2, which is different to the value of 2.21 Wm-2 described above. Please, verify if the difference of 0.08 Wm-2 between these last two quantities comes from: a) other contributions (so, include this explanation in the Figure caption, for example in lines 14 and 15, add to the sentence: "Small forcings due to contrails, volcanoes, HFCs, PFCs and SF6 are not shown", the following: "and contribute by 0.08 Wm-2"); b) one or several of the RF values that are not correctly introduced in this Figure, or c) an error in the difference operation. [Government of Argentina]
SPM-1726	SPM	26	4	26	4	Description of H2Ostr and NMVOC are missing. [Government of Netherlands]
SPM-1727	SPM	26	4	26	4	Which values are ERF and which are RF? This is unclear from the figure. [Government of Netherlands]
SPM-1728	SPM	26	4	26	4	After 'estimates' insert 'in 2011'. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1729	SPM	26	4	26	16	The detailed data for aerosols might be misleading, especially regarding black carbon, and raise questions in relation to the apparent change from AR4. To facilitate understanding, the caption should note the radiative forcing from BC is partly offset by the co-emission of organic carbon. For biomass burning, the net radiative forcing from these aerosols is close to zero, while it is positive for the fossil fuels. [Government of Belgium]
SPM-1730	SPM	26	4	26	16	How are errors added? [Government of Netherlands]
SPM-1731	SPM	26	6	26	6	If the present version of Figure SPM.4 is still kept in SPM, the phrase "in a combination of drivers" should be replaced by "in a combination of drivers and responses" to ensure consistency with Figure SPM.4. [Government of Japan]
SPM-1732	SPM	26	9	26	9	Figure SPM.4: The sentence "For aerosols, confidence is H for total aerosols..." could read "For aerosols, confidence is H for the radiative effects...", as this is most probably not the total radiative + cloud adjustment that is referred to. You may also consider reducing the confidence levels to M for total and L for individual components? [Government of Belgium]

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SPM-1733	SPM	26	9	26	14	Figure SPM.4. Suggest that a legend is needed to explain the abbreviations for the gases (CFC, HCFC, NMVOC, HFC, PFC, SF6 etc.). [Government of Canada]
SPM-1734	SPM	26	10	26	12	Figure SPM.4, Lines 10-12: These statements about various components of aerosol forcing are quite confusing and technical to read. Suggest considering whether different versions of this Figure may be appropriate for the SPM versus the technical summary/chapter and simplify these lines as appropriate. We would suggest that policy-makers need to understand mainly that the net aerosol forcing is a cooling effect, which is even larger once aerosol-cloud interactions are accounted for, and that this has offset the warming from GHGs. They also need to understand that BC is unusual among aerosols in causing direct warming effects and that the larger positive forcing from BC is a or the primary reason for the larger (more positive) net anthropogenic forcing estimate in the AR5 versus the AR4. [Government of Canada]
SPM-1735	SPM	26	10	26	12	sentence starting with aerosol unclear [Government of Netherlands]
SPM-1736	SPM	26	10	26	14	Figure SPM.4: Does the upper part of the figure indicate data for 2011? Then this should be mentioned in the caption. [Government of Germany]
SPM-1737	SPM	26	10	26	14	Figure SPM.4, caption: The first part of the sentence "Aerosol forcing other than cloud adjustments..." is confusing. A possibility to change it would be: "Aerosol forcing other than cloud adjustments amounts to -0,27 W/m2 (including +0,04 W/m2 due to black carbon on snow) as shown in the bar above and to 0,04 W/m2 from the nitrate response to NOx emissions. The radiative forcing due to aerosol radiation interactions (without black carbon on snow) is assessed to be -0,35 W/m2. The cloud adjustment term includes a response of -0,1 Wm2 due to aerosol-radiation interactions which is attributable to black carbon and -0,45 W/m2 that has not been attributed to individual components." [Government of Germany]
SPM-1738	SPM	26	11	26	12	'and the -0.04 W/m ² from the nitrate response to NOX emissions (which is equal to the -0.35 W/m ² due to aerosol radiation interactions plus +0.04 W/m ² due to black carbon on snow)'. Don't seem to be equal - don't understand this. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1739	SPM	26	14	26	15	We suggest to include additional "small forcings" in the figure because 1) some were included in the AR4, 2) they are not always smaller than some of the forcings that are show here, e.g. contrails are of a magnitude comparable to that of changes in solar irradiance, and 3) All Kyoto gasses should be included. For policy relevance and consistency, it is important to find a way to show that without degrading the readability of the figure. [Government of Belgium]
SPM-1740	SPM	26	16	26	16	Figure SPM.4: Chemical abbreviations used in the figure (H2Ostr, CH4, O3, N2O etc.) should be explained in the caption. [Government of Switzerland]
SPM-1741	SPM	26		26		<p>Figures of SPM should be easily understandable without detailed explanation for readers and authors should avoid risks of any misunderstanding, because the figures will be widely cited, solely in many cases, after the publication. However it is difficult to understand the meanings of Figure SPM.4, especially, the relationship between 'Emitted compound' and 'Resulting Drivers and Responses', and the reason why the RF based on emitted compounds is represented by the sum of RFs of resulting drivers and responses. In addition, the values of RF in the figure are not identical to those in the text (ex. RF of total aerosol effect in p8 L28-32, RF of well-mixed GHGs in p8 L7-8) and this difference would cause confusion for readers.</p> <p>RF based on emitted compounds has larger uncertainty than that based on concentrations, because the former is estimated with various assumptions while the latter is mainly based on the observation. The figure shows much larger contribution of the methane than that based on concentrations, and therefore there is concern that the figure may convey a policy-prescriptive message. Besides, lack of continuity from AR4 may also bring confusion to readers.</p> <p>As for the merit of using RF based on emitted compounds, the body text says 'Policy decisions are better informed by analysis of forcing attributable to emissions' (Chapter 8 p12 L6-7). However, it is unclear 'what' is better informed specifically by using RF based on emitted compounds in Figure SPM.4. Then, it is unlikely that showing RF based on emitted compounds in Figure SPM.4 has an advantage over showing RF based on concentrations. The important thing in SPM is to show clearly and easily to policy-makers, using a figure of RF based on concentrations, how RF changes from AR4 to AR5 due to changes in GHG concentrations and advances of scientific understanding on aerosols.</p> <p>In conclusion, it is highly recommended to replace Figure SPM.4 with the figure of RF based on concentrations such as Figure 8.15, which is updated version of Figure SPM.2 in AR4, to ensure the consistency from AR4 to AR5.</p> <p>If this proposal is not accepted and the present version of Figure SPM.4 is still kept in SPM, it is requested to also show a figure of RF based on emitted compounds such as Figure 8.15 and to explain in an easily understood manner the following points in SPM: (1) the relationship between 'Emitted compound' and 'Resulting Drivers and Responses, (2) the difference between RF based on emitted compounds and RF based on concentrations for well-mixed greenhouse gases and aerosols, and (3) the merit of using RF based on emitted compounds for policy decisions.</p>

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						[Government of Japan]
SPM-1742	SPM	26		26		The reader has difficulty in understanding Figure SPM.4 for some reasons. For example, in the row for CH ₄ , CO ₂ , H ₂ O, O ₃ , and CH ₄ are provided in the second column without any explicit explanation for listing them or for the aggregation in the next column. Presented differently from that in AR4, the figure required more explanation. In addition, considering the fact that aerosols, including black carbon, are a subject of high concern, we propose that the figure be revised to follow the structure of Figure TS.7, which is easier to understand. [Government of Japan]
SPM-1743	SPM	26		26		Base period: Base year for radiative forcing (and GHGs) is set to year 1750 (Figure SPM.4), while that for climate stabilization is year 1850 (Figure SPM.9). Explanation is needed on RF change between 1750 and 1850. [Government of Japan]
SPM-1744	SPM	26				Figure SPM.4 : Add "... and precursor gases" to the "emitted compound" cell for Aersols [Government of Belgium]
SPM-1745	SPM	26				Figure SPM.4 : We suggest to add a sentence such as: "Most anthropogenic sources emit compounds in several of the categories listed above; therefore, to address their net effect, a careful analysis taking into account the co-emission of compounds with opposite RFs and different lifetimes in the atmosphere needs to be performed." This is important for the link with mitigation. [Government of Belgium]
SPM-1746	SPM	26				Figure SPM.4: This graph is quite technical and may be difficult for readers to grasp. While it does convey a lot of important information, we would recommend a companion figure that is much simpler, to convey the overarching messages about cooling from aerosols has offset some of the warming from GHGs (like that of the lower panel in Figure TS.6.). Such a figure, in combination with the lower part of Figure SPM.4 showing the increasing total anthropogenic forcing over time, will provide the essential take home messages for most readers. [Government of Canada]
SPM-1747	SPM	26				Figure SPM.4: Suggest clarifying whether the positive forcing from BC in the graph includes the effect of albedo forcing or is this atmospheric forcing only. [Government of Canada]
SPM-1748	SPM	26				It is suggested to note the uncertainties on the rightmost column of Figure SPM.4. For example, how the uncertainty of a multi-component RF is derived; why the uncertainty of RF of each aerosol component is "medium", while the uncertainty of the total aerosol RF is "high"; etc. [Government of China]
SPM-1749	SPM	26				Fig. 4 caption: Might be better to define or expand the short lived gas "NMVOC" [Government of India]
SPM-1750	SPM	26				Figure SPM-4: We think that this is a key figure in the report, and it is important that this is understood correctly by policymakers. The values on radiative forcing are described as "Raditative forcing since 1750" which could be understood as accumulative radiative forcing. However we feel that it is more the "radiative forcing relative to 1750". Please consider to rephrase this title and the title of the last row since they can be easily misunderstood. Please consider dividing the table into "anthropogenic" and "natural" forcing (like in AR4) and adding the years of emissions. Also, on the second column from the left: please explain better what are the "resulting atmospheric drivers and responses". Please also consider to indicate the difference between long-lived and short-lived e.g. aerosols are also short-lived and it can be misunderstood is only mentionned in the "short-lived gases". [Government of Norway]
SPM-1751	SPM	26				Figure SPM-4: Please consider including the effect of volcanoes or exaplaining in the figure caption why it is not included. [Government of Norway]
SPM-1752	SPM	26				Figure SPM.4: it would be informative to add a column to this figure showing concentration changes (in %) of the different atmospheric constituents. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1753	SPM	26				Figure SPM.4: is it necessary to include the Total RF from 1950 and 1980? It would be more informative to have a separate plot showing historical changes in radiative forcing. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1754	SPM	26				Figure SPM.4: the title of this figure is 'Emission based radiative forcing...' but it includes estimates of albedo and land use change forcings. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1755	SPM	27	1	27	1	Figure SPM.5: Suggest including more detail in the legend to explain the lines better. (e.g., dashed vs. solid, clarify what the three shaded lines beside "observations" mean, etc). [Government of Canada]
SPM-1756	SPM	27	1	27	1	Figure SPM.5: The legend is incomplete: "Models using both natural and anthropogenic forcings" [Government of Germany]
SPM-1757	SPM	27	1	27	1	The red and blue lines on these graphs should be added into the key [Government of New Zealand]
SPM-1758	SPM	27	1	27	1	Figure SPM.5: While all regions of the world have plots showing the thermal condition change (either by temperature or by heat content), there is a peculiar omission of such plots for the Arctic where only sea ice extent is shown. This can be misleading since the decrease of sea ice extent is partially caused by thermal effects (heating) while dynamic loss caused by sea ice tranported out of the Arctic by wind and current forcings can be important. There are temperature data for air and

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						ocean over the Arctic from sources such as the Arctic buoy systems over several decades. Why not show the temperature results for the Arctic? It is quite odd that there are temperature and heat content plots for Antarctic while there is none for the Arctic where data are available. [Government of United States of America]
SPM-1759	SPM	27	1	27	1	There is a confusing finding in Figure SPM.5 which shows that the increase in heat content is more pronounced over the North Atlantic compared to that of South Atlantic, while Figure SPM.1 shows cooling over North Atlantic and warming over South Atlantic. A clarification on this difference will be useful for policy makers. Are there seasonal differences at play, as well? [Government of United States of America]
SPM-1760	SPM	27	1	27	2	In this figure SPM.5, there is a panel referring to the " southern Ocean". Which ocean is being referred to in this context? It should be stated clearly [Government of Kenya]
SPM-1761	SPM	27	1	27	2	Because the changes in climate in Asia area are much different from region to region, it suggests to have assessment for sub-regions, such as North-Asia, South-Asia, West-Asia, and East-Asia. [Government of Vietnam]
SPM-1762	SPM	27	1	27	12	Re: models using only natural forcings, is it clarified somewhere in the main report or could it be mentioned in this figure caption why the largest simulated reduction in Arctic sea ice extent and increase in northern hemisphere continental temperature, e.g. Europe, Asia, North America occurs in the most recent decade? [Government of Denmark]
SPM-1763	SPM	27	1			Figure SPM.5: The baseline reference period for temperature changes also needs to be defined. [Government of United States of America]
SPM-1764	SPM	27	4	27	5	Figure SPM5. Concerning the text: "Comparison of observed and simulated climate change based on time-series of three large-scale indicators in the atmosphere, the cryosphere and the ocean: continental land surface air temperatures (yellow panels)," the background color of these figures is not yellow. Please, verify. [Government of Argentina]
SPM-1765	SPM	27	4	27	12	Figure SPM.5. Suggest spelling out in the legend or caption what the acronym "OHC" stands for. [Government of Canada]
SPM-1766	SPM	27	4	27	12	Figure 5. Right below the figures (or the top of the notes of figures), there are three lines under the observation (black, grey and light-grey colored lines). However, there is no explanation what these three different lines imply. [Government of Republic of Korea]
SPM-1767	SPM	27	4			Figure SPM5. We understand that, possibly, it will be difficult to remake the different figures, but for non scientists (policymakers and even for specialists of different disciplines) the horizontal time scale is very complicated. For example, it is difficult to determine the beginning of the present century. Please try to change the scale, introducing numbers separated by, for example, 20 years: 1900, 1920, ..., 2000, 2020. [Government of Argentina]
SPM-1768	SPM	27	6	27	6	The preposition "and" is missing in the sentence...sea ice (white panels) "and" ocean heat uptake.... [Government of Panama]
SPM-1769	SPM	27	7	27	10	Figure SPM.5, caption: Please expand the caption and explain the different meaning of the lines, before giving exceptions (dashed lines). The sentence in L 7 starting with "For temperature panel..." should be replaced by "Observations based on data of good coverage and quality are indicated by black or gray solid lines, model results by blue/red lines for simulations without/including anthropogenic forcings. Dashed lines are used if data coverage is less good: for temperature panels the spatial coverage of areas being examined is below 50% and for ocean heat content and sea ice panels data coverage is only adequate, and thus, uncertainty is larger." [Government of Germany]
SPM-1770	SPM	27	8			The dashed lines referred to in the caption to Figure SPM.5 are extremely difficult to see in the small graphs. Suggest the small graphs are enlarged, and the appeal of using a map as a backdrop may need to be sacrificed for a different presentation. [Government of New Zealand]
SPM-1771	SPM	27	10	27	11	Figure SPM.5: for clarity, change 'multi-model means and ensemble ranges' to 'multi-model-ensemble means and ranges' in the caption. [Government of United States of America]
SPM-1772	SPM	27	12	27	12	Figure SPM.5: Some reader may want to know the exact definition of target regions specified by longitudes and latitudes. Definitions should be explicitly defined in the main part of underlying report and should be cited here. [Government of Japan]
SPM-1773	SPM	27	13	27	13	In this figure there are more models with natural+anthropogenic forcing than there are models with only natural forcing. There is a risk that part of the difference is due to drift in the models for which there are no comparable runs with no forcing. This should be addressed in a comment here. [Government of Sweden]
SPM-1774	SPM	27				Figure SPM.5: it is interesting to see the land-only average temperature, as it where most people are living. The values for the last decade (2000-2010? Please specify in caption) could be given as well in the text. It would be interesting to have the same values (land average) for the projections as well. [Government of Belgium]
SPM-1775	SPM	27				Figure SPM.5 : In the figure the phrasing "ocean heat content" is used, while the caption refers to "ocean heat uptake": please make this consistent. [Government of Belgium]
SPM-1776	SPM	27				Figure SPM.5: why are there shades of grey for the observation lines? Please clarify. [Government of Belgium]

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SPM-1777	SPM	27				SPM.5 does not reflect the change of global SST. It is suggested to add one figure of global Ocean Surface Temperature change by referring to figure 10.21 in chapter 10 of underlying report (FD) and figure TS.12 of Technical Summary. At the same time, specific explanation should be given on the colored curves in the figure so that policy makers and non-professionals can easily understand the information conveyed by the figure. [Government of China]
SPM-1778	SPM	27				Fig. 5 caption: Should mention the reference period for the anomalies. Further, panels for land are supposed to be in yellow but they are not. [Government of India]
SPM-1779	SPM	27				Figure SPM.5. Difficult to see the observations that are grey rather than black. It gives the impression the black lines are most important. A black and grey background map of the world might be less distracting from the graphs. [Government of New Zealand]
SPM-1780	SPM	27				Figure SPM-5, figure caption: what are the grey lines "observations"? [Government of Norway]
SPM-1781	SPM	28	1	28	10	Figure SPM 6 average temperature increas for all RCPs could be included in (a) and referenced to pre-industrial tempertures. [Government of Ireland]
SPM-1782	SPM	28	1			Fig. 6b: The number in brackets is not defined but appears to be the total number of models used to generate the "uncertainty" shading. [Government of Netherlands]
SPM-1783	SPM	28	1			Panel b what is dotted line? [Government of Netherlands]
SPM-1784	SPM	28	1			Panel c explain quick stabilisation [Government of Netherlands]
SPM-1785	SPM	28	4	28	13	Fig. SPM.6: it is not clear from the caption what the bracketed numbers in (b) relate to. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1786	SPM	28	5	28	5	There is a mistake, "footnote 9" should be replaced by "footnote 10". [Government of Norway]
SPM-1787	SPM	28	10	28	10	What are the numbers in parenthesis? [Government of Norway]
SPM-1788	SPM	28	10	28	10	The numbers of CMIP5 models used to calculate the multi-model mean is indicated. However, the number in the blanket such as 39 (5), and 29 (5) are not clearly indicated in the figure caption. This can make policymakers be confused. [Government of Republic of Korea]
SPM-1789	SPM	28		28		Figure SPM.6: on the middle panel, it can be inferred that the figures between brackets represent a subset of models, but this should be more explicitly stated in the legend. [Government of France]
SPM-1790	SPM	28		28		Figure 6: Please indicate that the uncertainty intervals correspond to the 2081-2100 (not to 2100 one could think, too), similarly to the way as it is written in Fig 8 on Page 30. Please, do not forget to eliminate the small numbers from the upper right parts of each elementary figure! [Government of Hungary]
SPM-1791	SPM	28		28		Figure SPM.6: Definition of each scenario shown below should be written in the caption of Figure SPM6. Otherwise policy makers could misunderstand RCP2.6 is the right path compared to RCP 8.6 but actually both scenarios are two extremes among scenarios on the table. RCP 2.6: An average emission reduction of 50%(range 14% to 96%) is required by 2050 relative to 1990 level. (As described in SPM chapter "Carbon and Other Biogeochemical Cycles") [Government of Japan]
SPM-1792	SPM	28		28		In Figure SPM.6, it is better to show projected temperature changes for scenarios together with emission scenarios (or changes in time) as shown in Figure SPM.5 of AR4 (SYR). Otherwise, it is unclear that emission needs to be near the 1850 level before 2100 in order to achieve RCP2.6. Without figure comparison or at least additional explanation, RCP2.6 may look easily achievable. [Government of Japan]
SPM-1793	SPM	28		29		Fig. 6b: What is the number in the parathesis? This could be explained in the caption. Similar issue in Fig. 7c [Government of India]
SPM-1794	SPM	28				Figure SPM.6: It would be interesting to see the land-only average temperature projections as well, as it is where most people are living. This is done in Figure SPM.5, and would be very good here as well. [Government of Belgium]
SPM-1795	SPM	28				Figure SPM.6 : Please add information on the emissions. The top panel of figure TS.19 could possibly be appropriate. [Government of Belgium]
SPM-1796	SPM	28				Figure SPM.6 : Please clarify the meaning of the figures in brackets in plot (b). [Government of Belgium]
SPM-1797	SPM	28				Figure SPM.6: Please add the mean and range for the emission driven RCP 8.5 over 2081–2100. [Government of Belgium]
SPM-1798	SPM	28				Figure SPM.6: 1. Panel (a) and Lines 4-5: As per comments on other figures, here again the reader needs to "do the math" to figure out the projected changes relative to pre-industrial by searching for the information in an earlier footnote. Suggest this info needs to be explicit given its relevance to the global 2deg goal. [Government of Canada]
SPM-1799	SPM	28				Figure SPM.6, Panel (b) and Lines 10-12: Suggest clarifying if the subset of models that most closely reproduce sea ice trends is the number given in brackets in panel (b) and also whether these results are the dashed or solid lines. 2. [Government of Canada]

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SPM-1800	SPM	28				Figure SPM.6, Panel (b): We cannot distinguish the uncertainty range for the whole model set vs. the subset of models since the same colour is used in both cases. Consider revising. [Government of Canada]
SPM-1801	SPM	28				Figure SPM.6, Panel (b): Suggest reconsidering whether both sets of results should be shown - is one intended to be a more reliable projection than the other? [Government of Canada]
SPM-1802	SPM	28				Figure SPM.6, Panel (b): What is the black dashed line in the bottom part of the panel? Is this the nominal ice free limit of 1 million km ² of ice? Please clarify. [Government of Canada]
SPM-1803	SPM	28				Figure SPM.6, Panel (a): Suggest that the legend in the top left corner would be better placed elsewhere (e.g., to the right of the panels) since it does not apply to what is actually inside the panel box. [Government of Canada]
SPM-1804	SPM	28				The bracketed numbers of 29 (3), 37 (5) and 39 (5) in Figure b should be noted. [Government of China]
SPM-1805	SPM	28				Figure SPM.6: It is not reader-friendly to advise "see Table SPM2 and footnote 9 for other reference periods". [Government of Finland]
SPM-1806	SPM	28				Figure SPM.6: If the reference period is the same for temperature and sea level change, why not say it in the table caption and not in the notes. [Government of Finland]
SPM-1807	SPM	28				Figure SPM6: Please consider adding the years for each subfigure here. [Government of Norway]
SPM-1808	SPM	28				Figure SPM.6: Please consider to also provide illustrations of changes compared to pre-industrial levels. [Government of Norway]
SPM-1809	SPM	29	1	29	1	Figure SPM7c is hard to read. Could be improved. [European Union]
SPM-1810	SPM	29	1	29	1	the choice of grey colors for both the land mass and the subset ice mask is very unclear. Can the land mask be plotted with a different color (black for instance)? [Government of Netherlands]
SPM-1811	SPM	29	1	29	2	Similar panels for SLR are warranted to show the regional variability. Please strongly consider including. [Government of United States of America]
SPM-1812	SPM	29	1	29	3	Figure SPM.7 (c) on sea ice should be improved, so that the basic message becomes clear from a glance. It is suggested to use either all CMIP5 or only the subset of best models, but not both as this dilutes the core message. Please move the legend from the figure to the caption and extend the caption. The white and grey lines differ in both of the graphs, due to unclear reasons. We recommend using one line resulting from observed data of ice cover extent. [Government of Germany]
SPM-1813	SPM	29	1			panel c difference between small open rectangle and large open rectangle not clear from figure [Government of Netherlands]
SPM-1814	SPM	29	4	29	4	Maps of CMIP5 models used to calculate the multi-model mean is indicated. However, the number in the blanket such as 29 (3), and 37 (5) are not clearly indicated in the figure caption. This can make policymakers be confused. [Government of Republic of Korea]
SPM-1815	SPM	29	4	29	5	Please specify in the caption that this is ANNUAL surface temperature change and percent change in mean ANNUAL precipitation. [Government of United States of America]
SPM-1816	SPM	29	7			Figure SPM.7 caption: "...number of CMIP5 models [used] to calculate ...". The "used" needs to be inserted in the sentence. [Government of Canada]
SPM-1817	SPM	29	8	29	9	Please explain what mean "less than one standard variation" and "two standard variations". Which one is the most reliable? [Government of Norway]
SPM-1818	SPM	29	9	29	9	Please consider using "dotted" instead of "stippling" which is hard to understand. [Government of Norway]
SPM-1819	SPM	29		29		Figure 7: These figures will be widely used in the dissemination of the messages of AR5. Please help it by repeating the two scenarios (RCP2.6 and RCP8.5) near each pair of elementary figures. Please, do not forget to eliminate the small numbers from the upper right parts of each elementary figure! [Government of Hungary]
SPM-1820	SPM	29		29		The future change in the Northern Hemisphere sea ice extent is one of the most significant issues remarked by many Policymakers. However, in Figure SPM.7, for the CMIP5 subset, light gray indicating sea ice and dark gray for land are not distinguishably perceived. Other colors should be used to improve that point instead of gray colors. [Government of Japan]
SPM-1821	SPM	29				Figure SPM.7: panel c) is relevant but it should be simplified, it is far too difficult to identify the different areas in the current version. If the model subset is clearly more appropriate because it exclude models that are most probably irrelevant here, consider showing only the model subset, and then use a different shading or colour to show the past conditions (and consider shading the sea-ice cover reduction between past and future, rather than plotting a single line for the past - this might be clearer for an SPM) [Government of Belgium]
SPM-1822	SPM	29				Figure SPM.7 : Instead of a yearly average precipitation (b), plots for JJA and DJF averages would be more interesting (see Figure12.22). [Government of Belgium]

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SPM-1823	SPM	29				It should be noted that Figure (a) and (b) are “annual”, eg the annual average surface temperature; the annual average precipitation. [Government of China]
SPM-1824	SPM	29				Figure SPM.7 Panel (c) on sea ice extent uses dark grey as the land colour and grey to indicate the trend of Arctic sea ice cover. The impact of the information presented is lost because the colours are too similar - suggest a different colour entirely is used for the land. [Government of New Zealand]
SPM-1825	SPM	29				Fig. SPM.7: these plots are too small, especially plot c) showing the Arctic. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1826	SPM	30	1	30	2	Fig. SPM.8: should have some indication of fuller range of possible SLR by end of the century. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1827	SPM	30	1			vertical bars need to be outside frame like for figure 6 [Government of Netherlands]
SPM-1828	SPM	30	4	30	11	Why is there no mention of the impact Greenland would have on these projections? It might be worthwhile to superimpose on Fig. SPM.8 the additive effects if Greenland and/or Antarctica were to melt considerably over the 21st century, if indeed, this is a possibility (on this timescale)... which seems to be the case at least for Greenland. Why is so much faith placed in process-based models that project relatively little melting of Greenland. There does seem to be some possibility of higher-than expected [from process-based models] melting of Greenland, and that this should be conveyed somehow. The approach taken at present, which is to present results from the process-based models, discount the empirical models, and not mention the possibility of larger than expected melting, is unacceptable. The problem is, of course, that it's difficult/impossible to estimate likelihood of this outcome. Even so, it is important to mention it as a possibility. [Government of United States of America]
SPM-1829	SPM	30	6	30	6	See comment above concerning page 16, line 1 to line 6. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1830	SPM	30	7			Figure SPM.8: Please consider to move the two sentences starting with "Based on current understanding..." and "However, there is medium..." in a bullet point in the relevant text on page 15 or 16. [Government of Norway]
SPM-1831	SPM	30	8	30	8	Figure SPM.8: The caption states "only the collapse of marine-based sectors of the Antarctic ice sheet, if initiated, could cause..". It is not clear, if the word "only" means "already" or "the only reason". [Government of Germany]
SPM-1832	SPM	30	8	30	8	Please explain what is "marine-based sectors", for example "parts of the ice sheets grounded below sea level". [Government of Norway]
SPM-1833	SPM	30	31	4	31	The composite of this figure is very policy relevant and should be incorporated in the SPM. We suggest to add observations in this graph which would make it much more informative and convincing. [Government of Netherlands]
SPM-1834	SPM	30				Figure SPM.8: Values of SLR until 2300 and possibly further should be shown as well [Government of Belgium]
SPM-1835	SPM	30				It is suggested to note the specific number of models in the caption. [Government of China]
SPM-1836	SPM	30				Figure SPM.8 This figure would benefit from including past observations in black/grey, similar to Figure SPM.6 [Government of New Zealand]
SPM-1837	SPM	30				Figure SPM-8: The expression in line 51 "would not exceed several tenths of a meter" seems a bit strange. Could it be replaced by a likely interval eg 0,2 -0,6 meter or whatever would be more correct? [Government of Norway]
SPM-1838	SPM	30				Fig. SPM.8: suggest adding a diagram covering the longer term? [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1839	SPM	30				Fig. SPM.8: it would be useful to somehow include projections of change beyond 2100. [Government of United Kingdom of Great Britain & Northern Ireland]
SPM-1840	SPM	31	1	31	1	Suggest adding "until 2100" to the x-axis title. I.e., "...from 1850 to 2011 (PgC)". [Government of Canada]
SPM-1841	SPM	31	1	31	2	The authors should add a secondary x-axis that also lists the Gt CO2 (rather than PgC),m since Gt CO2 is the much more familiar unit for policymakers. [Government of United States of America]
SPM-1842	SPM	31	1	31	14	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY: The statements on the relation of cumulative emissions and global temperature increase including Figure SPM.9 are very useful. However, the figure is quite complex and we suggest the following improvements: a. It is very important that a table is inserted with the key numbers of this graph, i.e. for the percentiles of CMIP5 climate model runs remaining below certain temperatures (1.5C, 2C, 3C) and their corresponding cumulative emission budgets as shown in the graph on the basis of the multi-gas RCP scenarios (shown currently in colors). b. The brown bar is situated at negative temperature anomalies; this is misleading. The bar should be placed below the figure, the uncertainty should not be indicated by just a line but with whiskers as is common practice in IPCC. c. Please indicate the TCRE range. d. The two columns of the legend should be reordered: In the right column lines, ranges and symbols for CO2-only should be explained, while in the left column lines and ranges for the historical data and RCPs should be given. The legend contains twice the label for “1% CO2 runs”, please add “range” to the one referring to the dark gray wedge. The star, square and diamond in the label should not be filled with gray color, this can be misunderstood to be related with the gray shading of 1%

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						CO2 runs. e. The figure mentions the "TCRE assessment" without explanations what this means and why it is different from the 1%CO2 runs. This information should be added to the paragraph on the TCRE in the text (see our comment on P 10, Line 16) or in the caption of Figure SPM.9. f. In the caption, please add the information that the temperature change in the RCP runs is caused by all drivers, in order to avoid misunderstanding that only CO2-emissions (shown in the x-axis) would have been considered. g. In the caption, L 11, please delete "from CO2 only", as this is obvious due to the definition of the TCRE. [Government of Germany]
SPM-1843	SPM	31	4	31	1	Figure SPM.9: It would be useful to explain, in a clearer way, that this figure contains scenarios that includes non-CO2 forcings (RCPs, history) as well as cases that do not include non-CO2 - the +1% runs and the TCRE range. This is potentially confusing. [Government of Belgium]
SPM-1844	SPM	31	4	31	4	It is our understanding that emissions of CO2 described here are net CO2 emissions according to IPCC greenhouse gas inventory guidelines and includes uptake of CO2 by afforestation and reforestation but not temporal biogenic emissions from bioenergy and forestry and other land-use that cause temporal carbon fluxes. If so it would be helpful to clarify this. [Government of Norway]
SPM-1845	SPM	31	4	31	14	It is hard to understand the figure caption clearly. If possible, please paraphrase more easily. [Government of Republic of Korea]
SPM-1846	SPM	31		31		It seems that Figure SPM.9 is intended to help readers understand paragraphs in SPM, but there is no mention of the relationship among RCP/ 1% CO2 run /TCRE. Because the point of adding Figure SPM.9 is unclear and we do not have enough clues how we can interpret the comparisons of "1% CO2 run" and RCP scenarios in the figure, it would confuse and even mislead policy-makers. We suggest adding reasons for this comparison and how it could be useful for policy-makers; otherwise the figure should be deleted. [Government of Japan]
SPM-1847	SPM	31		31		Base period: Base year for radiative forcing (and GHGs) is set to year 1750 (Figure SPM.4), while that for climate stabilization is year 1850 (Figure SPM.9). Explanation is needed on RF change between 1750 and 1850. [Government of Japan]
SPM-1848	SPM	31				Figure SPM.9: A figure on the issue of cumulative total anthropogenic CO2 emissions for different increases in global mean temperature is crucial for the SPM. However, this figure is quite complex and difficult to understand. It also does not include information about emissions pathways, which will require visualization as well. Suggest that this figure either needs to be revised to make the main messages more clear and include emissions pathways or needs to be replaced with an alternate figure. We recommend an alternate Figure and suggest Figure TS.19 is a suitable alternative if a new Figure cannot be created. [Government of Canada]
SPM-1849	SPM	31				Figure SPM.9: The RCP scenarios are fundamentally different than the TCRE experiments and putting these results on the same graph is potentially misleading. It is a risk that readers will look over from the 2 degrees temperature point on the y-axis and see that it passes through the grey shading all the way out to 2500 PgC and will therefore think a large range of emissions is compatible with 2 degrees warming. Since the RCP diagnosed emissions are for fossil fuel CO2 only and already take into account the forcing from land use changes and from all the non-CO2 GHGs (and aerosol forcing), it is misleading to put the TCRE results on the same graph as the RCP results. [Government of Canada]
SPM-1850	SPM	31				Figure SPM.9: Why is 1861-1880 used in this Figure to represent pre-industrial period and not 1850-1900 as elsewhere (e.g. footnote 10 and note (a) to Table SPM.2)? [Government of Canada]
SPM-1851	SPM	31				Figure SPM.9, although very important and informative, may cause some misunderstanding due to its current presentation. The curves following the asterisk in the figure represent future global average surface temperatures projected by climate system models under different scenarios, such as Representative Concentration Pathways (RCPs). In our view, since a model-based future climate projection involves both the anthropogenic forcing and the internal variability of the climate system, the warming should result from the two contributing factors in combination as well. However, in Figure SPM.9, the horizontal axis represents only anthropogenic cumulative CO2 emissions, while the vertical axis the future warming compared to 1861-1880 which, we believe, is the combined effect of both natural variability and anthropogenic contribution. The current Figure SPM.9 strongly tends to make policymakers think that under the RCP, the future global average surface temperature anomaly as projected by climate system models result entirely from the cumulative emissions. To avoid misleading policymakers, the SPM should reinforce Figure SPM.9 with a clearer explanation and modification. At the same time, the first sentence of the caption of SPM.9 should be modified into "the relationship of global mean temperature increase and cumulative total global CO2 emissions from various lines of evidence." [Government of China]
SPM-1852	SPM	31				THIS IS A COMMENT ON THE TECHNICAL SUMMARY: Last paragraph in the TFE-3-box on SLR: The text refers to 1990, but the TFE.3, Figure 1 shows data since 1950. This seems to be an error in the text. [Government of Germany]
SPM-1853	SPM	31				Figure SPM.9 The presentation of Cumulative emissions estimate 1850-2011 as a horizontal brown bar and solid black line is strange. Does the brown bar represent data or is it just a 'text box'?. If the latter then I suggest moving this text to the key and changing the solid black line to a different colour to distinguish it from the 1 % line. It should also be made clear that this is a range by adding vertical lines at either end. It should also be made clear that there is no temperature anomaly data plotted in this line. [Government of New Zealand]
SPM-1854	SPM	31				Figure SPM.9. This figure is complex with a lot of information, and difficult to understand. Unsure of the purpose of including this figure in the SPM. [Government of New Zealand]

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SPM-1855	SPM	31				Fig. SPM.9: are the 1% CO2 run results necessary? They have little or no relevance to policy makers. [Government of United Kingdom of Great Britain & Northern Ireland]