



**IPCC Synthesis Report
Fourth Assessment Report**

Formal Government and Expert Review of First Order Draft

EXPERT and GOVERNMENT COMMENTS – TOPIC 1

All Batches (July 27, 2007)

Review Editors:

Bubu Pateh Yallow, The Gambia
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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-1	E-1-1	A	0				message is clear. It is fine with the draft (Hisayoshi Morisugi, Japan Research Institute)	Noted.
1-2	E-1-2	A	0				It seems, that coastal changes are not very well addressed. Changes along the coastline due to climate change need some more attention (Klaus Schwarzer, Institute of Geosciences, Coastal and Shelf Research)	Added WGII SPM statement on coasts.
1-3	E-1-3	A	0				I agree with the content of topic 1 and have no other specific comments. (Michael Brady, Natural Resources Canada - Canadian Forest Service)	Noted.
1-4	G-1-1	A	0				Highlighting the findings is ok, but SYR should also summarize which deficiencies in observations and data with regards to spatial and/or temporal resolution and/or variables have been identified. This would facilitate specific measures to be taken. (Government of Germany)	Rejected because of lack of space.
1-5	G-1-2	A	0				General comment. It would be better not to combine into one topic the issues on climate change and its effects (Government of Russian Federation)	Topic titles set by IPCC Panel.
1-6	E-1-1	B	0				In general, the topic 1 is well written and well presented (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Noted
1-7	E-1-4	A	1	1	1	1	The title should be Observed changes in climate and their effects (changes is plural) (Archie McCulloch, University of Bristol)	Topic titles set by IPCC Panel.
1-8	E-1-5	A	1	1	1	1	"its" should be replaced by 'their' (Jon Egill Kristjansson, University of Oslo)	Topic titles set by IPCC Panel.
1-9	E-1-6	A	1	5	4	28	This section should also refer to Figure 1.2 which gives a much more comprehensive picture of the change in global temperatures that have occurred than is given by Figure 1.1, which should still be retained. It demonstrates an important aspect of the global warming that is hardly commented upon. This is the asymmetry of the warming with the greatest warming occurring in the Arctic and the least in the Antarctic. This is important for 2 reasons. One is that as shown in Topic 3 this mimics what the models predict, which provides a powerful argument for in favour of anthropogenic causes for the global change in temperature - ie it is not just that the average global temperature is rising as predicted by the models, but it is following a geographic pattern that is also predicted by the models. Secondly it explains to some extent why currently climate change is viewed as more significant by northern hemisphere countries, and for instance why many ordinary Australians have become rather sceptical of many of the claims, because although the Australian climate has shown change, to date it can all be explained by natural climate variability. Recognising the asymmetry of the changes will be important in convincing many ordinary Australians, particularly the older generations who have experienced several cycles of droughts and flooding rains, that while the changes may be less apparent now in Australia, they will still be	Added figure callout.

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							very significant in the longer time periods, and mainly negative due to a forecast increase in aridity in an already dry country. (George Walker, Aon Re Asia Pacific)	
1-10	G-1-3	A	1	5			Section 1.1: There is a general lack of uncertainty language in this section (see further comments below). (Government of Australia)	Uncertainty language added where appropriate.
1-11	E-1-7	A	1	7	1	11	suggest shortening paragraph to" Progress since the Third Assessment Report has have confirmed that the climate system is warming and provided evidence of other, more regional climate changes including precipitation trends oversome large regions. (Hugo Beltrami, St. Francis Xavier University)	Text changed to remove duplication. See E-1-10.
1-12	E-1-8	A	1	7	1	11	Perhaps it is convenient here to add that there is physical consistency between those changes identified in different variables (i.e., temperature and air humidity), as well as the spatial consistency of changes in climate variables. (Germán Poveda, Universidad Nacional de Colombia)	Too detailed for SYR.
1-13	E-1-9	A	1	7	1	11	I would like to see someplace under Topic 1, and the end of this first paragraph seems an appropriate place, a statement along the lines of: "The datasets remain imperfect, but they constitute the best evidence available and we present here our consensus interpretation of them." (Claire Parkinson, NASA Goddard Space Flight Center)	Rejected. Applies to all topics.
1-14	G-1-4	A	1	7	1	11	This introductory text is a mixture of background information and results. Please be consistent with the format used. (Government of Canada)	Text changed. See E-1-10.
1-15	G-1-6	A	1	9	1	9	Insert "global" between "the" and "climate" (Government of Republic of Benin)	Agreed. Inserted.
1-16	E-1-10	A	1	9	1	26	I suggest to avoid redundancy. It reads in line 9 that ... "have confirmed that the climate system is warming", which is repeated in line 24. The text below the heading 1.1 should only say facts about the increase of scientific knowledge, and it should be stated that this increased knowledge is the basis for the summary conclusions in the SR that is printed in bold. (Zoltán Somogyi, Hungarian Forest Research Institute)	Text changed. Uses exact WGI SPM language and deletes results.
1-17	G-1-5	A	1	9	1	26	Redundancy could be avoided: it reads in line 9 that ... "have confirmed that the climate system is warming", which is repeated in line 24; the text below the heading 1.1 should only say facts about the increase of scientific knowledge, and it should be stated that this increased knowledge is the basis for the summary conclusions in the SR that is printed in bold. (Government of Hungary)	See E-1-10.

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1-18	E-1-11	A	1	10	1	10	include "changes in" before "precipitation" (Zoltán Somogyi, Hungarian Forest Research Institute)	Text removed. See E-1-10.
1-19	E-1-12	A	1	10	1	10	I would write "including changes of precipitation trends" rather than "including precipitation trends". (Marco Mazzotti, ETH Zurich)	Text removed. See E-1-10.
1-20	G-1-7	A	1	10	1	10	include "changes in" before "precipitation" (Government of Hungary)	Text removed. See E-1-10.
1-21	E-1-13	A	1	11	1	11	WGI SPM is not defined in text. I may be defined elsewhere, but this might be confusing for reader with just this document. (Michael Brady, Natural Resources Canada - Canadian Forest Service)	This will be clarified in foreword to the entire report.
1-22	G-1-10	A	1	13	1	13	BOX1.1 refers to Climate Change Definition. So the term "Definition" is missing in the title of this box. (Government of Republic of Benin)	Changed title.
1-23	E-1-14	A	1	13	1	22	The definition should come before current heading 1.1 as the first section, and not as a box. (Zoltán Somogyi, Hungarian Forest Research Institute)	Box highlights definitions.
1-24	E-1-15	A	1	13	1	22	I understand there is difference of definition of "climate change" among IPCC and UNFCCC. However, I point out that there is also large difference between WG1&WG2 and WG3. In WG3, main target of mitigation is same as UNFCCC. Therefore, I recommend more appropriate description of difference of definition of "climate change" among IPCC and UNFCCC. (Koki Maruyama, Central Research Institute of Electric Power Industry (CRIEPI))	IPCC uses one definition (see Glossary).
1-25	G-1-9	A	1	13	1	22	The definition should come before current heading 1.1 as the first section, and not as a box. (Government of Hungary)	Box highlights definitions.
1-26	G-1-8	A	1	13			The prominent placement in Box 1.1 of the definition of climate change and its distinction from the anthropogenically-based definition should help ward off erroneous comparisons with assessments and opinions from other groups. (Government of United States)	Noted.
1-27	E-1-2	B	1	13			Write Change (capital "C") (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-28	E-1-3	B	1	13			Change header to clearly state that this is the IPCC's definition of climate change (Kevin Grandia, DeSmogBlog)	Box also includes UNFCCC definition.
1-29	G-1-11	A	1	15	1	17	This sentence defining climate change in IPCC usage is a new construction that does not appear in the WG reports or the TAR. In addition it is unclear if this sentence adequately	Rejected. Definition has been used by IPCC since its

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							captures extreme weather events and variability as a component of climate change, which the IPCC addresses. The authors should consider the need for the inclusion of this first sentence. (Government of Australia)	inception.
1-30	E-1-4	B	1	15			Write Change (capital "C") (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial
1-31	E-1-17	A	1	16	1	16	I suggest to incorporate to the sentence about "mean and/or variability" the term seasonality. For instance, with the same annual precipitation changes in intensity or produced in different moths could produce impacts on agriculture, tourism or other economical aspects. In my opinion is relevant to inform to polycimakers about these specific questions; if not, they can think only about changes in quantity in a variable (temperature, amount of precipitation) as the unique important question, producing a wrong interpretation of the question (Ricardo Anadón, Universidad de Oviedo)	IPCC definition (see Glossary).
1-32	E-1-18	A	1	16	1	16	Could omit the "(e.g. using statistical tests)". (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	IPCC definition (see Glossary).
1-33	G-1-12	A	1	16	1	16	To avoid confusion in what is a relatively long and complex sentence for the lay reader, please replace 'its' with 'climate' thus: "... the variability of climate properties ..." (Government of New Zealand)	IPCC definition (see Glossary).
1-34	E-1-16	A	1	16			Replace statistical tests with statistical methods (Andreas Matzarakis, Meteorological Institute, University of Freiburg)	IPCC definition (see Glossary).
1-35	E-1-19	A	1	17	1	17	Please consider revising statement to read "...persists for an extended period of time,..." (or "time period") as opposed to "persistsfor an extended period,...." (Veronica Brieno Rankin, GeoSeq International LLC)	IPCC definition (see Glossary).
1-36	E-1-20	A	1	18			Suggest changing "natural variability" to "natural processes" (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	UNFCCC definition (see Glossary).
1-37	E-1-21	A	1	19	1	19	Insert the wellknown acronym (UNFCCC) in Box 1.1 (Ulf Molau, Göteborg University)	Accepted.
1-38	E-1-22	A	1	21	1	21	"that alters the composition of the global atmosphere" - I would delete this - it is unnecessary, and also not quite complete - a change in surface albedo could cause anthropogenic climate change, without altering the composition of the atmosphere (Keith Shine, University of Reading)	UNFCCC definition (see Glossary).
1-39	E-1-23	A	1	22			Suggest changing "variability" to "change" (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	UNFCCC definition (see Glossary).

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1-40	E-1-24	A	1	24	1	24	Delete 'unequivocal', revising the sentence to: "Warming of the climate system is now evident from ..." (Claire Parkinson, NASA Goddard Space Flight Center)	Exact WGI SPM approved language.
1-41	E-1-25	A	1	25	1	25	Please add ground in sentence: "in global average air, ground and ocean temperatures" (Hugo Beltrami, St. Francis Xavier University)	Exact WGI SPM approved language.
1-42	E-1-26	A	1	26	1	26	replace WGI 4.2 (chapter on snow only) by WGI 4.8 (synthesis on the entire snow, ice, and frozen ground chapter). (Georg Kaser, Geography)	Callout changed.
1-43	E-1-27	A	1	26	1	26	Ocean temperatures are the subject of WG1, Section 5.2. The curly braces should include reference to section 5.2 for complete accuracy. (Nathaniel Bindoff, CSIRO MAR and University of Tasmania)	Callout changed.
1-44	G-1-13	A	1	26	1	32	Consistent with the approved WG1 SPM (p. 5) for which the first full paragraph after the box on lines 13-22 is apparently derived, change on line 26 the words "and rising global mean sea level" to "and rising global average sea level," and on line 32 the words "linear rate of warming over the last 50 years" to "linear warming trend over the last 50 years". (Government of United States)	Changed "mean" to "average". Text changed to reflect WGI SPM language on warming..
1-45	E-1-31	A	1	28	1	28	Eleven of the last twelve years rank among the "twelve" most ... – should be: ... rank among the eleven warmest years ..., or: ... rank among the warmest years ... (Marcos Gomes, Pontifical Catholic University of Rio de Janeiro)	Current text is WGI SPM approved text.
1-46	E-1-28	A	1	28	1	29	This sentence is gobbledygook. Either "Eleven of the past twelve years to 2006 rank among the warmest on record" or "The past twelve years to 2006 rank among the warmest twelve year period on record". see also SPM 1/12 (Archie McCulloch, University of Bristol)	Current text is WGI SPM approved text.
1-47	E-1-29	A	1	28	1	29	Please clarify whether global surface temperature refers to the whole globe including oceans. (Dieter Gerten, Potsdam Institute for Climate Impact Research)	Defined in Glossary.
1-48	G-1-14	A	1	28	1	29	Should this read: "Eleven of the last twelve years...rank among the twelve warmest years in the instrumental record of global average surface temperature...?" (Government of Australia)	Defined in glossary. Exact WGI SPM language.
1-49	E-1-30	A	1	28	1	34	from polar paleo records one can say that in the north the last 30 years have been the warmest in 2000 years (David Fisher, NRCan)	Too detailed for SYR.
1-50	E-1-32	A	1	28	1	34	As in the first comment on SPM [TSU note: See Comment E-SPM-92-A], I'm confused by statements of linear trends and then a description of a non linear component of the trend (trend over the last 50 years is twice that of the last 100).	Text changed.

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							(John Nyboer, Simon Fraser University)	
1-51	G-1-15	A	1	28	1	34	A short table may provide a useful summary of this and perhaps other linked information (Government of Ireland)	Insufficient space.
1-52	G-1-17	A	1	29	1	29	replace "Global mean surface temperature has increased with a linear trend of 0.74 [0.56 to 0.92]°C ¹ over the last 100 years" with: "Global mean surface temperature has increased. Calculation of the linear trend gives 0.74 [0.56 to 0.92]°C over the last century." (Government of Netherlands)	Text has been changed.
1-53	E-1-33	A	1	29	1	31	The sentence spanning these lines could be reworded, as it reads as if global surface temperature has increased linearly, which is not the case. Two alternatives, the first more general than the second, are "Global mean surface temperatures in the first few years of the 21st century are almost 1 deg C higher than they were a hundred years ago" and "A linear fit to the global mean surface temperature record gives a trend of 0.74[0.56 to 0.92] deg C over the last hundred years (1906-2005)". Same comment has been made on SPM. (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Text has been changed.
1-54	G-1-16	A	1	29	1	32	The difference in 100-year trends for the two data periods is the result of linear regression sensitivity to end points (at both the start and end of the records) and is not important to highlight here. Pick one or the other trend as a summary statement. When stating a linear trend of 0.74 [0.56 to 0.92]°C, a time frame needs to be added (100 years)? Or to be consistent with what is just below 0.074 per decade. Delete "with a linear trend of." (Government of United States)	Comparison with 1901-2000 has been deleted, and 100-year time frame added.
1-55	E-1-34	A	1	29	1	33	If you look at the chart of temperature since 1850 (CRU), it is clear that the greatest rate of change per decade is conveniently 1906 to 2006. The only reason it is greater than the TAR is because of cherrypicking the data. To be honest, the full data set should always be used, even if the answer is not so supportive of the apparent agenda. An unbiased assessment would have pointed out that the temperature rise was from perhaps the coldest period in 8,000 years (as measured in the Greenland ice cores) and may not be much greater than around 1100 or so. This section is one of the low points of IPCC 2007 and needlessly damages IPCC's credibility in order to gain headlines, or so it seems. I was embarrassed to see this "decadal" discussion on the front page of the Washington Post, where it was clearly developed to enhance the alarmist agenda. It has no place in a scientific document! (John Everett, Ocean Associates, Inc.)	Text has been changed. Comparison with TAR deleted.
1-56	E-1-35	A	1	29	1	34	Although the first sentence here describes the temperature trend as linear, the rest of the paragraph and the figure to which it refers show that the rate is increasing. It seems that what is meant by the first sentence is that the temperature increase, averaged over the last 100 years was 0.74 degC per century. see also SPM 1/11	Text has changed.

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							(Archie McCulloch, University of Bristol)	
1-57	E-1-38	A	1	30	1	30	Need to state clearly that the 0.74 trend is 0.74 degrees per century (James Crampton, GNS Science)	Text changed.
1-58	E-1-39	A	1	30	1	30	linear trend - the actual trend has been far from linear (Andy Morse, University of Liverpool)	Text changed.
1-59	E-1-41	A	1	30	1	30	Footnote 1 is largely redundant and can be removed, but the example (5% likelihood ...) should be moved to the description in Box I.1. (Dieter Gerten, Potsdam Institute for Climate Impact Research)	Footnote is required to explain square brackets throughout SYR.
1-60	E-1-42	A	1	30	1	30	Don't mix rate units in this paragraph. Stick with °C per decade. '...temperature has increased with a linear trend of 0.074 [0.056 to 0.092]°C1 per decade over the last 100 years...' (Steven Clemens, Brown University)	Rejected. Changed text now makes the different units clear.
1-61	E-1-43	A	1	30	1	30	... has increased with a linear trend of 0,74 [0.56 to 0.92] oC over the last 100 years (1906-2005) ... - Comment 1 - figure 1.1 indicates that the trend for the temperature increase over 1906-2005 may hardly be interpolated by a linear relationship between "Temperature difference and Year". The data in the figure demonstrates that the temperature has increased faster in the last years, a conclusion which has been addressed at the end of the paragraph. Comment 2 – let's assume a linear trend may represent the relationship between "Temperature difference and Year" over 1906-2005 – the sentence above could be written as: ... has increased "by" 0,74 [0.56 to 0.92] oC with an approximate linear trend over the last 100 years (1906-2005) ... (Marcos Gomes, Pontifical Catholic University of Rio de Janeiro)	Text changed.
1-62	G-1-1	C	1	30	1	30	" The word 'trend' implies a change over a unit time interval (e.g., per year, per decade...).The expression 'linear trend' suggest that the temperature increase has been linear over the last 100 years, should rather say 'linearalised trend', and explain that the real increase is not linear." (Government of Belgium)	Text changed.
1-63	E-1-37	A	1	30	1	31	There has been no linear trend in temperature over the previous century. This criticism was also given for similar statements in the SPM WGI. Please rephrase. (Bram Bregman, Netherlands Organisation of Applied Research)	Text changed.
1-64	E-1-44	A	1	30	1	31	"temperature has increased with a linear trend of" is difficult to understand. Suggest to replace it to something like "curent mean temperature is by 0.74 [0.56 to 0.92]°C higher than the average temperature between 1850-1900". Also, however this sentence is formulated, it is not consistent with Figure 1.1, which uses averages for the period 1961-1990. The reference (i.e., zero value) should be the average of 1850-1900 for graph (a), and the beginning of the	Text changed. 1961-90 is standard reference period.

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							measurement period for the other graphs. Only by this way gets the reader quickly, and without the need of calculations, the magnitude of observed changes. (Zoltán Somogyi, Hungarian Forest Research Institute)	
1-65	G-1-18	A	1	30	1	31	There has been no linear trend in temperature over the previous century. This criticism was also given for similar statements in the SPM WGI. Please rephrase. (Government of Netherlands)	Text changed.
1-66	G-1-19	A	1	30	1	31	Replace "Over the last 100 years (1906-2005)" by "Over the last 100 year period of 1906-2005". (Government of Republic of Benin)	Text changed.
1-67	G-1-20	A	1	30	1	31	add warming relative to pre-industrial levels (0.76 degree C), as this is very relevant for policymakers (Government of Germany)	Not in WGI SPM.
1-68	G-1-21	A	1	30	1	31	"temperature has increased with a linear trend of" is difficult to understand. It is suggested to replace it to something like "curent mean temperature is by 0.74 [0.56 to 0.92]°C higher than the average temperature between 1850-1900". Also, however this sentence is formulated, it is not consistent with Figure 1.1, which uses averages for the period 1961-1990. The reference (i.e., zero value) should be the average of 1850-1900 for graph (a), and the beginning of the measurement period for the other graphs. Only by this way gets the reader quickly, and without the need of calculations, the magnitude of observed changes. (Government of Hungary)	Text changed. 1961-90 is standard reference period.
1-69	E-1-36	A	1	30			when you say with a linear trend of 0.74 [0.56 to 0.92]°C1 should you not add per 100 years? Or to be consistent with what is just below 0.074 per decade. You need to define time unit over which trend term applies. (Bruce McCarl, Texas A&M Univesity)	Agreed. Text changed.
1-70	E-1-40	A	1	30			Footnote1: Because 'Assessed uncertainty intervals are not always symmetric about the corresponding best estimates' we cannot assert that '...there is an estimated 5% likelihood that the value could be above the range given in square brackets and 5% likelihood that the value could be below that range'. May be better: '...there is an estimated 10% likelihood that the real value could be above or below the range given in square brackets...'. (Roman Corobov, Modern institute for humanities)	Values in square brackets are calculated to provide 5% estimates.
1-71	E-1-46	A	1	31	1	31	I pointed out in my previous review that this "larger than" is just plain misleading. The main reason why the 1906-2005 warming is greater than the 1901-2000 warming is because of the cooling between 1901 and 1906. The century scale warming will continue to increase until about 2010, even if the climate gets no warmer, as there is a quite strong cooling minimum in 1910.	Comparison deleted.

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							(Keith Shine, University of Reading)	
1-72	E-1-47	A	1	31	1	31	... larger than the corresponding trend for 1901-2000 ... - In accordance with the previous comment, I suggest the sentence to be modified to: ... larger than the corresponding "temperature difference" of 0,6 [0.4 to 0.8] oC, given in the TAR, for 1901-2000 ... (Marcos Gomes, Pontifical Catholic University of Rio de Janeiro)	Text changed.
1-73	E-1-45	A	1	31	1	32	The sentence included in the SPM and in topic 6 seems more appropriate: "It is very likely that the second half of the 20th century was the warmest 50-year period for the Northern Hemisphere in the past 500 years". (Serge Planton, Météo-France)	Statement is in paleo paragraph (page 3).
1-74	E-1-48	A	1	32	1	32	Third Assessment Report of 0.06 [0.04 to 0.08] °C per decade. The linear rate of warming over the last 50 (Steven Clemens, Brown University)	Text changed.
1-75	E-1-49	A	1	32	1	33	surely this statement contradicts comment on 100 year linear trend above (Andy Morse, University of Liverpool)	Confusion due to units. Text improved to reduce confusion.
1-76	E-1-51	A	1	33	1	33	A key point of the observed temperature change is that it is NOT linear and it is not appropriate to characterize the record with a linear trend. Please add from the WG I SPM the wording "The total temperature increase from 1850-1899 to 2001-2005 is 0.76C [0.57 to 0.95C]" (Kevin Trenberth, NCAR)	Adding this sentence does not overcome problem with linear terminology.
1-77	E-1-50	A	1	33	1	34	I suggest to incorporate the true interpretation of the commentad fact: Is nearly twice that for the last 100 years {WGI 3.2}, indicative of warming as and acelerated phenomena. (Ricardo Anadón, Universidad de Oviedo)	WGI does not indicate that this is an acceleration.
1-78	E-1-56	A	1	36	1	36	Insert at the end of this line: "Arctic temperatures have high decadal variability. A slightly longer warm period, almost as warm as the present, was also observed from the late 1920s to the early 1950s." This is a direct quote from the Executive Summary of WG I, Chapter 3. As currently worded, the statement about warming implies that the warming of the higher northern latitudes is unusual. However, as WG I points out, it may just be an example of natural climate variability. It is difficult to argue that warming of the Arctic is evidence of anthropogenic climate change if a similar period of warming occurred less than a century ago, after the beginning of the industrial revolution, but at a time when anthropogenic emissions were much lower. (Robert Siveter, IPIECA)	Too detailed.
1-79	G-1-23	A	1	36	1	36	This is the first point in the SYR where the descriptor of higher latitudes is used. For the broad range of readers who will use the SYR the authors should consider providing an explanation of the latitudes that can be described as "high" or "low", as a footnote. (Government of Australia)	Standard terminology.

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1-80	G-1-24	A	1	36	1	36	Please replace "a maximum" with "greatest" thus: "The warming ... is greatest at higher northern latitudes.". The word 'maximum' refers to a specific quantitative point value and while it is likely the location of this point is in the high northern latitudes there is no evidence we are aware of that shows this beyond doubt. (Government of New Zealand)	Text changed to "greater".
1-81	G-1-26	A	1	36	1	36	For clarity for the broader range of policy readers replace "a maximum" with "largest". (Government of Australia)	Text changed to "greater".
1-82	G-1-2	C	1	36	1	36	" Could state that the 'Average arctic temperatures increased at almost twice the global average rate in the past 100 years.' (from SPM WGI) " (Government of Belgium)	Too regionally detailed.
1-83	E-1-54	A	1	36	1	37	The term "warming" is used here twice but must be changed to "temperature increase". Elsewhere, in the section on radiative forcing, the term warming has units of Watts per meter squared and refers effectively to heating. Here it does NOT mean this and it should be explicit and limit the terminology to be "temperature increase" which is only one facet of warming. (Kevin Trenberth, NCAR)	Text changed as suggested.
1-84	E-1-53	A	1	36	1	44	This chapter discusses the observed changes in climate and effects based on the studies conducted observations. The latitudinal distribution of global warming and the differences are brought clearly. The precipitation change and its variability has also been brought out nicely. (Ramachandran Srikanthan, Physical Research Laboratory)	Noted.
1-85	G-1-22	A	1	36	1	44	Two comments on this paragraph: 1) It would help the readers if after the first sentence, which notes that the oceans are warming more slowly than the land, it was explained WHY this is so. Otherwise, it is potentially confusing to read a couple of sentences later that the ocean is taking up over 80% of the added heat to the system, because a reader might wonder why the oceans aren't warming more quickly then....(need to just mention the huge heat capacity of the ocean), 2) With regard to line 40, it needs to be clarified that the ocean has been warming for longer than just the 1963-2003 period based on available data; this period is the period of warming to depth (down to 3000 m according to the Technical Summary of WGI. (Government of Canada)	Topic 1 focuses on observed changes not causes. Statement about ocean heat changed to exact WGI SPM language.
1-86	G-1-25	A	1	36	1	44	Note lack of confidence levels around these findings. (Government of Australia)	No confidence levels given in WGI SPM.
1-87	E-1-52	A	1	36			warming is equally as warm as the northern maximum in the southern hemisphere in the region of the Antarctic Peninsula (Peter Convey, British Antarctic Survey)	Text has been changed to avoid "maximum".

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1-88	E-1-55	A	1	36			maybe 'and is maximum at higher...'? (Michel Rixen, NATO Undersea Research Center)	Text changed.
1-89	E-1-57	A	1	36			in sentence I find "a maximum to be misleading and not really possible" The warming is widespread over the globe, and is a maximum at higher northern latitudes. Why not say "largest" (Bruce McCarl, Texas A&M Univesity)	Text changed.
1-90	E-1-5	B	1	36			Many layman and media disregard the scientific community's concern over the rise in global average temperature -- they see .25 centigrade as minimal. Would it be possible to include some localalized average means temperatures over the same period to point out that while an average of .25 C globally does not seem like much it translates into XX C temperature rise in the Northern Hemisphere. (Kevin Grandia, DeSmogBlog)	See Figure 1.2.
1-91	E-1-58	A	1	37	1	37	"Warming has occurred in both land and sea domains, although" is redundant with later text and should be deleted (Zoltán Somogyi, Hungarian Forest Research Institute)	First clause deleted to avoid redundancy.
1-92	G-1-28	A	1	37	1	37	"Warming has occurred in both land and sea domains, although" is redundant with later text and should be deleted (Government of Hungary)	First clause deleted to avoid redundancy.
1-93	G-1-29	A	1	37	1	37	"-" is needed : during the 25 year period ⇒ during the 25-year period (Government of Republic of Korea)	Comment out of place.
1-94	G-1-27	A	1	37	1	38	Add the detailed time period, such as "from the 1970s". (Government of China)	Text changed. Remaining text does indicate time period.
1-95	E-1-59	A	1	38	1	38	The value 0.25C is incorrect: in SPM WG I it is 0.27C. (Kevin Trenberth, NCAR)	Changed.
1-96	E-1-61	A	1	38	1	38	I suggest replacing "Land temperatures have warmed.." with "Land regions have warmed..". (Annarita Mariotti, ENEA)	Agreed. Text changed.
1-97	G-1-30	A	1	38	1	38	Instead of "Land temperatures" state "Surface air temperatures over land" (Government of United States)	Agreed. Text changed.
1-98	E-1-60	A	1	38	1	39	replace lie 37 with : "All climate subsystems (atmosphere, continental surface, cryosphere, and oceans have gain heat over 1961-2003. The ocean however takes up over 80% of the heat added to the climate system (Hugo Beltrami, St. Francis Xavier University)	Not in WGI SPM.
1-99	G-1-32	A	1	39	1	40	This is the first point in the SYR where a year is provided as the point of comparison for an observed change, without explanation being provided as to why it was chosen. The	Used "in the past two decades"

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							authors should explain the relevance of 1979. This applies for the 1961-2003 period referred to in line 40 as well. (Government of Australia)	from WGI TS, instead of 1979.
1-100	G-1-33	A	1	39	1	40	For accuracy and comprehensiveness insert "at depths of at least 3,000 metres" after "heat content". (Government of Australia)	Agreed. Text added.
1-101	G-1-31	A	1	39	1	41	This statement may be incorrectly interpreted to the effect that the ocean would permanently take up 80% of the heat added to the climate system. In order to be consistent with the headline statement of WG 1 TS.3.3.1, the text should be changed to "and the ocean has been taking up more than 80% of the heat being added to the climate system over this period". (Government of European Community)	Agreed. Text changed.
1-102	E-1-62	A	1	39			Would be explicit that the world ocean has, since 1957, accumulated twenty two times the amount of heat as had the atmosphere (Levitus et al. 200, recalculated in 2005). (Paul Epstein, Harvard Medical School)	Too detailed.
1-103	E-1-63	A	1	40	1	41	The concepts of "ocean heat content" and of "heat being added to the climate system" are obscure to me. (Marco Mazzotti, ETH Zurich)	Standard terminology.
1-104	E-1-65	A	1	41	1	41	After "... added to the climate system.", insert: "Since 2003 there has been some cooling." This statement is almost a direct quote from the Executive Summary of WG I, Chapter 5. There is an effort in Topic 1 to present an unambiguous picture of warming. However, this is not the actual situation. The cooling of the oceans has to be acknowledged as one of the counter-indications to global warming. (Robert Siveter, IPIECA)	Published work since WGI approval indicates this cooling is artificial.
1-105	G-1-36	A	1	41	1	41	Chapter 5 of WG1 4AR notes some cooling in the 2003-2005 period. After "... added to the climate system.", insert: "Since 2003 there has been some cooling." This statement is a direct quote from the Executive Summary of WG1 Chapter 5. (Government of United States)	Published work since WGI approval indicates this cooling is artificial.
1-106	E-1-64	A	1	41	1	44	Anything remarkable on temperature trends in the high troposphere-low stratosphere? (Germán Poveda, Universidad Nacional de Colombia)	Too detailed. Not in WGI SPM.
1-107	G-1-35	A	1	41	1	44	Re: "New analysis of balloon-borne and satellite measurements of lower-and mid tropospheric temperature show warming rates similar to the surface temperature, largely reconciling a discrepancy noted in previous assessments." Raises following questions: What has not yet been reconciled?; What about upper-tropospheric temperatures?; How does this additional data and similarity with surface temperature and lower, mid, (upper)	Deleted "largely reconciling...assessments".

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							tropospheric temperatures contribute certainty parameters of chapeau? (Government of Australia)	
1-108	G-1-37	A	1	41	1	44	Add the detailed time period, such as "from the 1970s". (Government of China)	Difficult because more than one time period (satellites, balloons).
1-109	G-1-34	A	1	41			Some data on changes in ocean temperature would be useful here (Government of Ireland)	Not added because ocean heat content is included – sufficient detail.
1-110	G-1-38	A	1	42	1	42	To make the rate of warming in the troposphere clearer insert "those of" after "similar to" (Government of Australia)	Agreed. Text changed.
1-111	E-1-66	A	1	42	1	43	Change "warming rates similar to the surface temperature" to "warming rates similar to those observed in surface temperature" (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Agreed. Text changed.
1-112	G-1-39	A	1				Topic 1, Box 1.1: Climate Change: It is important to state what the IPCC considers natural climate variability to be. (Government of Colombia)	See glossary (climate variability)
1-113	E-1-69	A	2	1	2	1	Change to: "Observed decreases in snow and ice in the Northern Hemisphere ..." All of the data presented in the paragraph refers to the Northern Hemisphere. At least one significant aspect of Southern Hemisphere snow and ice, Antarctic sea ice, has not been observed to change (Topic 1, Pg. 7, lines 4-5). (Robert Siveter, IPIECA)	Antarctic sea ice is discussed in 1.4. Southern Hemisphere data are included in this paragraph.
1-114	G-1-40	A	2	1	2	1	Change to "Observed decreases in snow and ice in the Northern Hemisphere ..." All of the data presented in the paragraph refers to the Northern Hemisphere. At least one significant aspect of Southern Hemisphere snow and ice, Antarctic sea ice, has not been observed to change (Topic 1, p. 7, lines 4-5). (Government of United States)	Antarctic sea ice is discussed in 1.4. Southern Hemisphere data are included in this paragraph.
1-115	E-1-67	A	2	1	2	5	These statements should include dates. (Serge Planton, Météo-France)	Start date for data varies widely with region. Lack of space precludes including all this detail. Declines have been observed from whenever data commences.
1-116	E-1-68	A	2	1	2	10	note that in eastern arctic the mass balance was stable from 1960 until 1985 after which it headed strongly to the negative (David Fisher, NRCan)	Too detailed.

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1-117	G-1-42	A	2	2	2	2	Is that compared to 1978? Add time frame. (Government of United States)	Start date for data varies widely with region. Lack of space precludes including all this detail. Declines have been observed from whenever data commences.
1-118	G-1-43	A	2	2	2	2	For clarity insert "extent" after "snow and ice". (Government of Australia)	Agreed. Text changed.
1-119	E-1-70	A	2	2	2	10	May want to differentiat between what is happening in Arctic versus what is known to be occurring (or not known to be occurring) in Antarctic since many assume the 2 regions respond identically. In the next paragraph you deal with the issue of ice cap melting in both regions. There is also additional info on page 7 line 4-10 (Ian Church, Yukon Government)	Antarctica discussed in 1.4.
1-120	G-1-41	A	2	2	2	10	Should also note decreases in the thickness of sea ice [WG1 3.9]. (Government of United States)	Not in WGI SPM – rejected because of space limitations.
1-121	E-1-71	A	2	2			"Observed decreases in snow and ice are consistent with warming (Figure 1.1)." Figure 1-1C the snow cover could not indicate the snow cover declined. The change of snow cover for March-April only can indicate the snow melt become earlier. (Xiuqi Fang, Beijing Normal University)	The earlier snow melt is consistent with warming.
1-122	G-1-44	A	2	3	2	3	The authors should explain the relevance of 1978. (Government of Australia)	Comprehensive satellite data available since 1978 – clearly implied in text.
1-123	G-1-45	A	2	5	2	5	The expression "on average" should come before "have declined" thus: " ... and snow cover on average have declined in both hemispheres." (Government of New Zealand)	Agreed. Text changed.
1-124	E-1-72	A	2	5	2	7	Rewrite sentence to say that "The maximum areal extent of seasonally frozen ground has decreased..." (Frozen ground does not cover an area, it underlies the land surface) (Sharon Smith, Geological Survey of Canada)	Agreed. Text changed.
1-125	E-1-73	A	2	5	2	7	Regarding the decrease in extent of seasonally frozen ground in spring - Would it not be better to indicate that the duration of seasonally frozen ground is decreasing or that it is thawing earlier? This would get at the implications of this 15% decrease in the spring - i.e. that the period of frozen conditions is becoming shorter (might be more appropriate for a synthesis document and have more impact?) (Sharon Smith, Geological Survey of Canada)	Partly covered in 1.2.
1-126	E-1-74	A	2	5	2	7	It may also be useful to provide information about the decrease (in %?) in the extent of permafrost (and not only in the extent of seasonally frozen ground) because the melting of	Topic 1 does not focus on carbon cycle issues.

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							permafrost will result in the release of organic carbon "trapped" in frozen grounds (in frozen peat beds, for example). This may have some effects on the carbon content of high-latitude seas and freshwater bodies, possibly affecting atmospheric CO2 uptake by these water bodies. (Arnaud Hequette, Université du Littoral Côte d'Opale)	
1-127	G-1-46	A	2	7	2	7	Since multiple occurrences are being referred to, the decreases are plural, thus: " ... with decreases in spring of up to 15%." (Government of New Zealand)	Agreed.
1-128	E-1-75	A	2	7	2	8	Is it Arctic "air" temperatures that have increased? It is not clear as there is also discussion following this statement about permafrost temperatures. If the sentence does refer to Arctic air temperatures then it is a bit out of place here and should come earlier especially since there are statements earlier in the paragraph that indicate changes in the Arctic cryosphere are consistent with warming. (Sharon Smith, Geological Survey of Canada)	This statement is located in similar position in WGI SPM, rather than with air temperature discussions.
1-129	E-1-76	A	2	9	2	9	Remove brackets around 'by up to 3°C' (David White, ASIT Consulting)	Agreed. Brackets removed.
1-130	E-1-77	A	2	9	2	10	add WGI 4.5 (Georg Kaser, Geography)	Agreed. Added.
1-131	G-1-47	A	2	12	2	12	The "are" comes before the "also", thus: "Increases in sea level are also consistent with warming (Figure 1.1)." (Government of New Zealand)	Agreed. Text changed.
1-132	E-1-80	A	2	12	2	14	I miss the conclusion for the whole previous century. It is somewhat odd to start the conclusions over a relatively small period. If trend statements are being made, try to be consistent among the different variables (e.g. temperature). (Bram Bregman, Netherlands Organisation of Applied Research)	Long-term trend is shown in Figure 1.1 Text focuses on more recent period because of lower uncertainty.
1-133	E-1-78	A	2	12	2	18	This discussion is very uneven. The key number that should be quoted is the 1.2 mm/yr contribution to sea level rise since 1993 as the total from all ice melting (e.g. this is featured in WG I FAQ 4.1 on changes in snow and ice.) The paragraph needs rewriting. (Kevin Trenberth, NCAR)	Paragraph has been rewritten, based on WGI SPM text.
1-134	E-1-79	A	2	12	2	18	This analysis of sea level rise is interesting for what it does not say. If the sea level has been rising at a rate of 3.1 mm/yr from 1993-2003, this gives a rise over this period of 34.1 mm. For the period 1961-2003, the rate of rise is estimated at 1.8 mm/yr or a total of 77.4 mm. Subtracting off the later rise, means a rise of 1.4 mm/yr from 1961-92 and then 3.1 from 1993-2003, which suggests a large and very clear acceleration. This should be mentioned. [It also would have been nice to have the report include the results of the models over this time to see if they show anything like this degree of acceleration--it was really a serious omission that the	WGI SPM states clearly that we cannot be certain that it is an acceleration.

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							models simulations of sea level rise from 1850 to 2100 were not separately shown and compared during the 20th century in a manner similar to the detection and attribution studies done for the temperature record.] (Michael MacCracken, Climate Institute)	
1-135	E-1-81	A	2	12	2	18	check SPM (Bram Bregman, Netherlands Organisation of Applied Research)	Done. Text made more consistent.
1-136	G-1-48	A	2	12	2	18	Re: "Increases in sea level rise are also consistent with warming. Global average sea level rise rose at an average rate of 1.8mm per year over 1961-2003 and at an average rate of about 3.1mm per year from 1993-2003. Since 1993 thermal expansion of the oceans has contributed over half of the of the observed sea level rise, with decreases in glaciers and ice-caps contributing about a quarter." Raises following questions: Warming over what period has resulted in thermal expansion sea level rise observed today?; If thermal expansion has contributed over ½ of observed sea level rise and decreases in glaciers and ice-caps contribute about ¼, what is causing the other ¼ of the sea level rise? This data should be complete (ie add up to 1). (Government of Australia)	Text has been changed and clarified.
1-137	G-1-3	C	2	12			" What about the other quarter of sea level rise (could be put in a footnote) " (Government of Belgium)	See G-1-48.
1-138	E-1-6	B	2	13			Quantify the overall sea level rise, i.e. "average sea level rose at an average rate of 1.8mm per year" -- overall this is equal to a XX mm rise between 1961 abd 2003. (Kevin Grandia, DeSmogBlog)	Current text is consistent with Plenary decision on WGI SPM.
1-139	E-1-82	A	2	14	2	14	Insert: "Whether this faster rate for 1993 to 2003 reflects decadal variation or an increase in the longer term trend is unclear." Given the high level of concern about the potential impacts of sea level rise, inclusion of this caveat, which is a direct quote from Pg. 5 of WG I's approved SPM, is critical. (Robert Siveter, IPIECA)	Agreed. Text changed.
1-140	E-1-83	A	2	14	2	14	If average rate of sea level rise for 1993 to 2003 is 3.1 mm pa, what is the best guestimate for the next decade (>>3.1 mm pa)?? (David White, ASIT Consulting)	Topic 1 is only about observed changes.
1-141	G-1-50	A	2	14	2	14	Insert "Whether this faster rate for 1993 to 2003 reflects decadal variation or an increase in the longer term trend is unclear." Given the high level of concern about the potential impacts of sea-level rise, inclusion of this caveat—which is a direct quote from p. 5 of the WG1 SPM—is critical. (Government of United States)	Agreed. Text changed.

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1-142	G-1-49	A	2	14	2	16	This adds up to only three-quarters. What accounts for the other quarter? (Government of United States)	Text rewritten and clarified.
1-143	E-1-85	A	2	16	2	16	glaciers and ice-caps contributing about a quarter ... each? (James Crampton, GNS Science)	Text rewritten and clarified.
1-144	G-1-51	A	2	16	2	16	Insert "Melting of" before "(t)he Greenland and Antarctic ice sheets each have made a similar contribution." (Government of United States)	Text has been revised. Says "Losses...". Losses could be due to melting and ablation.
1-145	E-1-84	A	2	16			you say "The Greenland and Antarctic ice sheets each have made a similar contribution" should not you start this with "Melting" of or something similar (Bruce McCarl, Texas A&M Univesity)	Text has been revised. Says "Losses...". Losses could be due to melting and ablation.
1-146	E-1-87	A	2	17	2	17	Change "relatively" to "much." WG I Table SPM.1 lists the contribution of the Greenland ice sheet to sea level rise since 1993 as 0.21 +/- 0.07 mm. per year. It lists the contribution of the Antarctic ice sheet to sea level rise since 1993 as 0.21 +/- 0.35 mm. per year. The difference in uncertainty is much larger than indicated by the word relatively. The uncertainty range for Antarctica includes the potential of a negative contribution to sea level rise. (Robert Siveter, IPIECA)	Text revised and statement has been deleted and replaced.
1-147	E-1-88	A	2	17	2	17	"contribution of 0,2 mm per year" (John Church, CSIRO)	Text has been revised. Number has been removed.
1-148	G-1-52	A	2	17	2	17	Change "relatively" to "much". WG1 Table SPM.1 lists the contribution of the Greenland ice sheet to sea-level rise since 1993 as 0.21 ± 0.07 mm yr-1. It lists the contribution of the Antarctic ice sheet to sea-level rise since 1993 as 0.21 ± 0.35 mm yr-1. The difference in uncertainty is much larger than indicated by the word relatively. The uncertainty range for Antarctica includes the potential of a negative contribution to sea-level rise. (Government of United States)	Text revised and statement has been deleted and replaced.
1-149	E-1-86	A	2	17			replace "but there is a" with the word "this" the but does not work (Bruce McCarl, Texas A&M Univesity)	Text revised and statement has been deleted and replaced.
1-150	E-1-89	A	2	17			"about 0.2 mm per year" would be better than "0.21mm per year" as none of the other figures in this paragraph are quoted to a second decimal point. (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Text revised and statement has been deleted and replaced.
1-151	E-1-90	A	2	18	2	18	I suggest we add the short sentence at the end. "The sum of the climate related sea-level terms is 2.8 [2.1 to 3.5] explaining to within uncertainty the observed sea-level rate for the 1993 to 2003." (Nathaniel Bindoff, CSIRO MAR and University of Tasmania)	Agreed. Text replaced.

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1-152	E-1-91	A	3	1	3	2	"likely contributed more than 4m" Is this on the basis of modelling or paleo results ? How confident can one be of this 4m number ? (David Fisher, NRCan)	Too detailed for SYR. Details in WGI chapter.
1-153	E-1-7	B	3	1			Could you include the definitions of "likely" "very likely" etc. While it is defined in the intro, the IPCC definitions of likelihood/certainty should be easily accessible to the reader. Even just bracketing the numerical definition of a certainty/likelihood statement would be helpful. For example: "Very high confidence (9 out of 10)" (Kevin Grandia, DeSmogBlog)	Defined in Intro.
1-154	E-1-92	A	3	10	3	16	Differences in the earth's orbit and why discounted as the present cause for sea level rise and temperature increases should be given in the text if not already done so since such changes occurred in the past. (Robert Molinari, University of Miami)	Topic 1 does not discuss causes of modern changes.
1-155	G-1-53	A	3	10	4	2	This paragraph is informative but it is not clear why the reader is told what the climate was like 125,000 years ago. Is this to support the fact that climate has not always been stable, or to make evident the fact that previous changes in climate took place over hundreds of thousands of years? Why is this piece of information important in this paragraph? Please explain. (Government of United States)	Text changed to refer to last 1,300 years only.
1-156	E-1-94	A	3	12	3	12	paleoclimate: should say paleontological as it refers to something much wider than climate evidence (Stephan Halloy, Conservation International)	Text deleted, as this is also covered in topic 3.
1-157	G-1-55	A	3	12	3	12	The sentence beginning "In earlier times..." reads awkwardly. This phrase is not necessary, in any case, so suggest deleting and simply beginning the sentence with "Paleoclimatic evidence indicates that....". (Government of Canada)	Text deleted, as this is also covered in topic 3.
1-158	G-1-57	A	3	12	3	12	Move "In earlier times" to before the words "global average sea level" for clarity. (Government of United States)	Text deleted, as this is also covered in topic 3.
1-159	G-1-56	A	3	12	3	14	Re: "In earlier times, paleoclimate evidence indicates that global average sea level in the last interglacial period...was likely 4-6m higher than during the 20th century, mainly due to retreat of polar ice caps... The Greenland ice sheet and other Arctic ice fields likely contributed no more than 4m of the inferred sea level rise. There may also have been contribution from Antarctica." Raises following questions: What caused the extra 0-2m rise in this period?; Was it from Antarctica?; What is the confidence level of Antarctic contribution to sea level rise during this period (Government of Australia)	Text deleted, as this is also covered in topic 3.

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1-160	G-1-4	C	3	12	3	14	" Could also state that 'The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 m of sea level rise.' (SPM WG I) " (Government of Belgium)	Text deleted, as this is also covered in topic 3.
1-161	E-1-93	A	3	12	3	16	This text on paleoclimate seems out of place. If it is intended to provide context related to prior text, then an explicit statement establishing the intended link is required. Otherwise it can be deleted. If it is retained, then line 16 should read '...because of systematic changes in the Earth's orbit. The Greenland ice sheet and other Arctic ice fields...' (Steven Clemens, Brown University)	Text deleted, as this is also covered in topic 3.
1-162	E-1-95	A	3	12	4	2	Discussion on the changes on sea level should be deleted as it mixes the issue of climate change and ocean issues, and hinders understanding of changes in temperature. (Zoltán Somogyi, Hungarian Forest Research Institute)	Text deleted, as this is also covered in topic 3.
1-163	G-1-54	A	3	12	4	2	These sentences are out of place with respect to the first part of the paragraph. Add "By comparison" before "in earlier times". (Government of United States)	Text deleted, as this is also covered in topic 3.
1-164	G-1-58	A	3	12	4	2	Discussion on the changes on sea level should be deleted as it mixes the issue of climate change and ocean issues, and hinders understanding of changes in temperature. (Government of Hungary)	Text deleted, as this is also covered in topic 3.
1-165	E-1-96	A	3	12			"In earlier times," could be deleted. (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Text deleted, as this is also covered in topic 3.
1-166	G-1-59	A	3	14	3	16	Wording suggests that the ice-core data indicate there were difference in the Earth's orbit... suggest re-draft: "Ice core data indicate that average polar temperatures at that time were 3-5o C higher than present. This is (confidence level eg likely/ highly likely) because of differences in the Earth's orbit." (Government of Australia)	Text deleted, as this is also covered in topic 3.
1-167	G-1-60	A	3	16	3	16	Suggest re-draft: "The melting of the Greenland ice sheet and Antarctic ice fields contributing to sea level rise..." (Government of Australia)	Text deleted, as this is also covered in topic 3.
1-168	E-1-97	A	3	16	4	1	This sentence ("The Greenland ice sheet and other Arctic ice fields likely contributed no more than 4 m of the inferred sea level rise") should be revised to indicate which 'inferred sea level rise' is referred to. As written, it can easily be interpreted as the sea level rise that occurred in the bringing about of the last interglacial period about 125,000 years ago, yet that sea level rise probably included well over 4 m from Arctic ice retreat. I'm guessing that it instead refers only to the 4-6 m sea level difference between the 20th century and 125,000 years ago; but that is certainly not clearly stated. Alternatively, perhaps 'Arctic' is defined very narrowly, in	Text deleted, as this is also covered in topic 3.

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							which case that should be stated. In any event, the sentence should be revised to clarify it.. (Claire Parkinson, NASA Goddard Space Flight Center)	
1-169	E-1-98	A	3	16			Are effects in differences in earth's orbit included in models? Policy makers have to be convinced this is minor compared to anthropogenic warming (Michel Rixen, NATO Undersea Research Center)	Text deleted, as this is also covered in topic 3.
1-170	E-1-99	A	3				Text above the figure should be deleted. (Zoltán Somogyi, Hungarian Forest Research Institute)	TSU format decision to have figure titles.
1-171	E-1-100	A	3				Figure SPM-1: Suggest drawing 'zero' line in each panel to aid the reader. Also change caption text to: 'All changes are relative to corresponding averages for the period 1961-1990 (left-hand axes). Absolute values of temperature and snow cover are shown on right-hand axes. (David Fahey, NOAA Earth Science Research Laboratory)	Figure, legend and caption approved in WGI plenary.
1-172	E-1-101	A	3				Figure 1.1:I suggest to replace the y axes with each other. When you read the graph, you start from left to right, which should be the beginning level of temperature, and arrive at the right end to see the change over the period shown. (Zoltán Somogyi, Hungarian Forest Research Institute)	Figure, legend and caption approved in WGI plenary.
1-173	E-1-102	A	3				Figure 1.1: The global average sea level displays the ternd that starts from negative values, making it unclear if the observed seal level rise has positive consequences (providing it to return to its original state) or it is a result of natural fluctuations. Propose to provide more detailed explanation of the sea level trend observed. (Michael Gytarsky, Institute of Global Climate and Ecology)	Too detailed for SYR. See sea level chapter in WGI.
1-174	E-1-103	A	3				Figure 1.1. There is not uniformity in the legend to a right y-axis: for temperature - the parameter and dimension are given; for snow cover - the dimension only. (Roman Corobov, Modern institute for humanities)	Figure, legend and caption approved in WGI plenary.
1-175	E-1-104	A	3				Fig 1.1 Specify what the uncertainty intervals refer to (?the ten year running mean?) . Clarify why the intervals "end early" in panel (b). If it is a centered decadal average: clarify how it can run to the end of the dataset? If not clarify what it is. (Leonard Allen Smith, London School of Economics)	Uncertainty intervals described in caption.
1-176	E-1-105	A	3				delete Figure 1.1 , I do tnot think it adds much since the changes illustrated have been stated in the previous pages. It takes too much space. (Hugo Beltrami, St. Francis Xavier University)	Rejected. Figure shows time-series of data, ie adds to text.
1-177	G-1-61	A	3				Text above the figure should be deleted. (Government of Hungary)	TSU format decision to have figure titles.
1-178	G-1-62	A	3				Figure 1.1:I suggest to replace the y axes with each other. When you read the graph, you start from left to right, which should be the beginning level of temperature, and arrive at	Figure, legend and caption approved in WGI plenary.

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							the right end to see the change over the period shown. (Government of Hungary)	
1-179	G-1-63	A	3				Figure 1.1 comment: The label on the vertical axis ("Difference from 1961-1990") is not clear - particularly for a lay reader (and we note this figure is also used in the SPM, and the figures might as well be the same). We do not have a good solution but suggest that "Change since 1961-1990" is at least a bit clearer. (Government of New Zealand)	Figure, legend and caption approved in WGI plenary.
1-180	G-1-64	A	3				Figure 1.1 comment: Please remove the temperature and area scales from the right hand vertical axes. Given that the title, caption, and vertical label of this figure all refer only to CHANGES in the parameters, it is not appropriate to include the absolute values as well. (Government of New Zealand)	Figure, legend and caption approved in WGI plenary.
1-181	G-1-65	A	3				Figure 1.1 and related text: Why are we not provided with figures/ or reasons for not including global and/ or Southern Hemisphere snow cover? (Government of Australia)	Figure, legend and caption approved in WGI plenary.
1-182	E-1-8	B	3				I suggest you returning figure 1.1 on page 2 after line 2 (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial/layout issue
1-183	G-1-66	A	4	1	4	1	The phrasing for this sentence was better in the WGI Technical Summary (page TS-32). Suggest using that phrasing (i.e. "...inferred sea level rise IMPLYING THAT THERE MAY ALSO have been....."). The connection between the two sentences is thus made clear to the reader. (Government of Canada)	Text deleted, as this is also covered in topic 3.
1-184	E-1-107	A	4	4	4	5	It is a bit strange to mention long term trends for one century only, especially after the previous bullet about changes on paleo time scales. I advise to simply mention trends. One century is certainly not long and summaries like these should avoid any confusion in this respect. (Bram Bregman, Netherlands Organisation of Applied Research)	Deleted "long term" from first two sentences. This is potentially misleading because of placement of paleoclimate paragraph in SYR, relative to WGI SPM.
1-185	G-1-68	A	4	4	4	5	It is a bit strange to mention trends for one century only, especially after the previous bullet about changes on paleo time scales. I advise to simply mention trends. One century is certainly not long and summaries like these should avoid any confusion in this respect. (Government of Netherlands)	See E-1-107.
1-186	E-1-106	A	4	4	4	11	this para lacks information on uncertainties, which is crucial to credibility. Suggest to include such information here. (Zoltán Somogyi, Hungarian Forest Research Institute)	Included "significantly" (from WGI SPM text) into second sentence. Uncertainties for other statements not available in WGI SPM. But

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								only statistically significant trends are noted in this paragraph.
1-187	G-1-67	A	4	4	4	11	this para lacks information on uncertainties, which is crucial to credibility. Suggest to include such information here. (Government of Hungary)	Included "significantly" (from WGI SPM text) into second sentence. Uncertainties for other statements not available in WGI SPM. But only statistically significant precipitation trends are noted in this paragraph.
1-188	E-1-108	A	4	4	4	15	In my opinion the chapter 1 should add some more remarks about heat waves/droughts. A suggestion is the sentence given in {see WGI 3 page 238}. "In Australia and Europe, direct links to global warming have been inferred through the extreme nature of high temperatures and heat waves accompanying recent droughts." (Christof Appenzeller, Federal Office of Meteorology and Climatology MeteoSwiss)	Heat waves in bullet in next paragraph. Droughts noted in paragraph on precipitation.
1-189	G-1-5	C	4	4			" Should state that there is no clear trend observable in the other regions " (Government of Belgium)	Current text implies this.
1-190	G-1-69	A	4	5	4	9	This sentence is too long. We suggest re-writing as: "Long-term trends from 1900 to 2005 have been observed in precipitation amount in many large regions. Over this period there has been increased precipitation in eastern parts of North and South America, northern Europe and northern and central Asia whereas precipitation declined in the Sahel, the Mediterranean, southern Africa and parts of southern Asia." (Government of New Zealand)	Agreed. Text replaced.
1-191	E-1-110	A	4	9	4	11	More intense and longer droughts have not been observed in northern high latitude regions since 1970s. (Guoyu Ren, National Climate Center)	Replaced drought statement with statement from Table SPM2.
1-192	E-1-109	A	4	9			Should "More intense" be replaced by "More-intense"? Have droughts been observed to become more intense, or have intense droughts become greater in number? Current wording is unclear. (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Replaced drought statement with statement from Table SPM2.
1-193	E-1-111	A	4	10	4	10	replace "drying" with "evapotranspiration" (Michel J. Rossi, Ecole Polytechnique Fédérale de Lausanne)	Statement deleted.
1-194	E-1-112	A	4	10	4	11	Any role from actual and potential evapotranspiration? (Germán Poveda, Universidad Nacional de Colombia)	Statement deleted.
1-195	G-1-70	A	4	10	4	11	What is the confidence attached to this statement? Eg: Increased drying due to higher temperature as well as decreased precipitation has (likely??) contributed to this change.	Sentence commencing "Increased drying..." has been

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
							(Government of Australia)	deleted.
1-196	E-1-114	A	4	13	4	13	The "or" here should be changed to "and" or "and/or". (Kevin Trenberth, NCAR)	"or" can be read as inclusive in this context.
1-197	G-1-71	A	4	13	4	22	This list misses one important finding from WG 1 Table SPM.2 on droughts. The following bullet point could be added:"The area affected by drought has likely increased in many regions." (Government of European Community)	Replace current drought statement in precipitation paragraph with this statement (which includes uncertainty).
1-198	G-1-72	A	4	13	4	22	It should be clarified whether the changes in extreme weather events listed here are common to all regions or if some are region-specific. (Government of United States)	Regions now indicated where available in WGI.
1-199	G-1-73	A	4	13	4	22	Consideration should be given to WG1 SPM Table 2 replacing these prose. (Government of Australia)	Table too complex. Prose listing more effective.
1-200	E-1-113	A	4	13	4	28	There are many climatic variables that did not show a long-term change, and also there are many that show a change somehow positive for human and ecosystems. The authors may need to explain why they only choose these rather than those? (Guoyu Ren, National Climate Center)	Decrease in frosts is presumably positive and has been included. The variable listed come from the WGI SPM.
1-201	G-1-75	A	4	14	4	12	In this usage, 'frosts' is better plural, thus: "It is very likely that cold days, cold nights and frosts have become less frequent, ...". (Government of New Zealand)	Agreed. Text changed.
1-202	E-1-116	A	4	14	4	15	Replace "...cold days, cold nights and frost have became less frequent, while hot days, hot nights ..." by "...cool days, cool nights and frost have became less frequent, while warm days, warm nights ..." (Serhat Sensoy, Turkish State Meteorological Service)	"Cold" and "hot" used in WGI SPM.
1-203	E-1-117	A	4	14	4	15	Is this a global / terrestrial / northern hemisphere trend? Please specify (Markus Erhard, European Environment Agency)	"over most land areas" (from WGI SPM Table SPM2) now included.
1-204	E-1-118	A	4	14	4	15	Delete "and heat waves." Table SPM.2 of WG I's approved SPM states that it is "likely" that heat waves have become more frequent, not "very likely." If a statement is made about heat waves, it should be in a separate bullet point. (Robert Siveter, IPIECA)	Agreed. Heat waves deleted.
1-205	G-1-74	A	4	14	4	15	Table SPM.2 of WG1's approved SPM states that it is "likely" that heat waves have become more frequent, not "very likely." If a statement is made about heat waves, it should be in a separate bullet point. (Government of United States)	Heat waves deleted.

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1-206	E-1-119	A	4	14	4	22	as in Chapter 1.2 you may use the same type of sentences of extreme events: It is very likely ..., It is likely ... (Markus Erhard, European Environment Agency)	Agreed. Sentences rewritten.
1-207	E-1-115	A	4	14			where you say "The incidence of extreme high sea level likely has increased at a broad range of sites" I would work in the word tides or something to convey that you are not thinking about changes in overall sea level in terms of the extreme but rather the extreme variation given the upward shift in levels (Bruce McCarl, Texas A&M Univesity)	Too detailed.
1-208	E-1-120	A	4	14			"The frequency of heavy precipitation events likely has increased {WGI 3.8, 3.9}" I would be helpful to add some information on where on the globe the number of heavy precipitation events have increased {see WGI 3. fig 3.39 page 303} . (Christof Appenzeller, Federal Office of Meteorology and Climatology MeteoSwiss)	Agreed. Location now included.
1-209	E-1-9	B	4	15			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-210	G-1-76	A	4	16	4	16	When a statement does not contain an uncertainty descriptor (such as "Mid-latitude westerly winds have strengthened in both hemispheres since the 1960s"), are we to assume that this is virtually certain (probability >99 %)? The El Niño bullet doesn't have a certainty level either. (Government of United States)	No confidence statement in WGI SPM. El Nino bullet deleted – no confidence statement available and not in WGI SPM. Statement deleted.
1-449	G-1-1	D	4	16	4	16	A probability assessment as in lines 14-15 and 18-19 should be mentioned in reference to this line. (Government of Argentina)	No confidence statement in WGI SPM. Statement deleted.
1-211	E-1-121	A	4	16	4	17	It is essential to mention at what level (vertically) the strengthening of the mid-latitude westerlies has taken place. (Jon Egill Kristjansson, University of Oslo)	Too detailed.
1-212	E-1-122	A	4	16	4	17	In eastern Asia the strengthening of westerly wind has not been found. (Guoyu Ren, National Climate Center)	Too detailed.
1-213	E-1-10	B	4	17			Write ...} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-214	E-1-123	A	4	18	4	18	Sentence is awkwardly worded. A better sentence would be: "It is likely that the incidence of heavy precipitation events has increased" (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	Agreed. Text changed.
1-215	E-1-124	A	4	18	4	18	Please add the vital information about where and why and how this links to warming: namely "over most areas in association with increased water vapor in the atmosphere". That increase is important as it changes the character of precipitation and also enhances the greenhouse	Too complex for SYR. "over most land areas" added from WGI Table SPM2.

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							effect. Here the information is lost. (Kevin Trenberth, NCAR)	
1-216	E-1-125	A	4	18	4	18	Is this a global / terrestrial / northern hemisphere trend? Please specify (Markus Erhard, European Environment Agency)	“over most land areas” added from WGI Table SPM2.
1-450	G-1-2	D	4	18	4	18	Variations in the hydrological regimes of some rivers, especially those in the River Plate basin, might generate flood peaks greater and more frequent than the ones registered without the climate change. These peaks may diminish the security at the dams due to insufficient capacity of the spillways. Weather forecasts predicting severe conditions should be improved in order to prevent intolerable situations at some hydro electric production sites. Source: Sors S.A. B-7, Energy Infrastructure and System Vulnerability, August 2005, Buenos Aires. (Government of Argentina)	Too detailed for SYR.
1-217	E-1-126	A	4	18	4	19	"likely has" is poor English. Better: 'has likely' (Jon Egill Kristjansson, University of Oslo)	Sentence construction changed.
1-218	G-1-77	A	4	18	4	19	Change "likely has" to "has likely" for grammatical correctness. (Government of Australia)	Sentence construction changed.
1-219	E-1-127	A	4	19	4	19	Sentence is awkwardly worded. A better sentence would be: "It is likely that the incidence of extreme high sea level has increased at a broad range of sites worldwide since 1975" (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	Sentence construction changed.
1-220	E-1-128	A	4	19	4	19	Insert: "(excluding tsunamis)" after "high sea level." This is consistent with the wording in WG I Table SPM.2. Since concern about climate change driven sea level rise has been so well publicized, there is some confusion about the difference between this phenomenon and tsunamis. Adding this phrase would make it clear that tsunamis are not a climate phenomenon. (Robert Siveter, IPIECA)	Agreed. Text included.
1-221	G-1-78	A	4	19	4	19	Insert "(excluding tsunamis)" after "high sea level". This is consistent with the wording in WG1 Table SPM.2. Since concern about climate change driven sea-level rise has been so well publicized, there is some confusion about the difference between this phenomenon and tsunamis. Adding this phrase would make it clear that tsunamis are not a climate phenomenon. (Government of United States)	Agreed. Text included.
1-222	G-1-79	A	4	19	4	19	Define "extreme high sea level" as done in footnote g in WG1 Table SPM.2. (Government of United States)	Too detailed for SYR. See WGI SPM.
1-223	E-1-11	B	4	20			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.

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1-224	E-1-130	A	4	21	4	21	please add likelihood of attribution of these events to climate change (Markus Erhard, European Environment Agency)	Attribution is Topic 2.
1-225	E-1-131	A	4	21	4	22	I still think that the evidence for a recent observed shift in ENSO frequency is not well established; and note that section WGI 3.6 concludes that more research is needed into whether there is a link with global climate change (Janice Lough, Australian Institute of Marine Science)	Bullet deleted.
1-226	E-1-132	A	4	21	4	22	I find this to be too vague to be useful. How did the shift affect many areas? (Keith Shine, University of Reading)	Bullet deleted.
1-227	E-1-133	A	4	21	4	22	A mistake in the years here? (Elizabeth L Malone, Pacific Northwest National Laboratory)	Bullet deleted.
1-228	E-1-134	A	4	21	4	22	"A 1976-1977 climate shift ..." is poorly worded. What does it mean? A climate shift that took place precisely in that 2-year time period? I assume what is meant is that El Nino events have been more frequent after 1976-1977 than before that. In that case, this should be stated. (Jon Egill Kristjansson, University of Oslo)	Bullet deleted.
1-229	G-1-80	A	4	21	4	22	The WG1 SPM did not highlight any information on the connections between climate change and ENSO behavior, although this was covered in the TAR SPM. AR4 WGI Chapter 3, at the end of section 3.6.2 states, "Thus whether observed changes in ENSO behavior is physically linked to global climate change is a research question of great importance." Thus speaking about "A 1976-1977 climate shift toward more El Niño events affected many areas," when it is not even clear that we have seen a shift to more El Nino Southern Oscillation events, including La Nina, seems to be going beyond what the AR4 assessment can support. (Government of United States)	Bullet deleted.
1-230	G-1-81	A	4	21	4	22	El Niño is not an extreme weather event. Delete the bullet. (Government of United States)	Agreed. Bullet deleted.
1-231	G-1-82	A	4	21	4	22	Does the word 'area' in this context refer to a geographical area? Common usage and the underlying text in WG1 3.6 would suggest so. If so, the example of 'tropical monsoons' is not appropriate. If not, please use 'atmospheric phenomena' or similar. (Government of New Zealand)	Bullet deleted.
1-451	G-1-3	D	4	21	4	22	A probability assessment as in lines 14-15 and 18-19 should be mentioned in reference to this line. (Government of Argentina)	Bullet deleted.
1-232	E-1-129	A	4	21			when you say "A 1976-1977 climate shift toward more El Niño events affected many areas, including" I have difficulty with the precision and wording" I would say since 1976-7 plus we have and more la Nina's as well and I would say toward more El Nino, Southern Oscillation	Bullet deleted.

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							events (Bruce McCarl, Texas A&M Univesity)	
1-233	E-1-12	B	4	22			Write {.....}. (ponctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-234	G-1-85	A	4	24	4	26	It is unclear whether “an increase of intense tropical cyclone activity” refers to the frequency or magnitude of cyclones. It should be made clear that there is evidence that the intensity, not frequency, is increasing. (Government of United States)	Approved language from WGI SPM.
1-235	E-1-135	A	4	24	4	28	This conclusion is not fully consistent with the SPM (page 8, lines 28-31) (Bram Bregman, Netherlands Organisation of Applied Research)	Text is from WGI SPM.
1-236	E-1-136	A	4	24	4	28	please add likelihood of attribution of these events to climate change (Markus Erhard, European Environment Agency)	Attribution is in Topic 2.
1-237	G-1-83	A	4	24	4	28	This finding should be the same as in WG1 SPM: "There is 'observational' evidence for an increase in intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures. There are also suggestions of increased intense tropical cyclone activity in some other regions where concerns over data quality are greater." Should also include certainty language indicating likelihood of correlation between sea surface temperatures and cyclone activity. (Government of Australia)	Rejected because of space considerations. Current language is from WGI SPM.
1-238	G-1-84	A	4	24	4	28	Should note poleward migration of storm tracks as a key finding [WGI 3.6, 10.3, SPM]. (Government of United States)	Not included because of space limits.
1-239	E-1-140	A	4	25	4	25	Add: "...increased intense tropical cyclone activiy and CYCLONE INTENSITY in some other..." (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	Current text is from WGI SPM.
1-240	G-1-86	A	4	25	4	25	Since we talk about the North Atlantic it should be made clear that tropical cyclones here include hurricanes and typhoons. (Government of Norway)	Changed “North Atlantic” to “Atlantic north of the equator”.
1-241	E-1-138	A	4	25	4	26	This is not clear: "... and suggestions of increased intense tropical cyclone activity in some other 26 regions where concerns over data quality are greater." Does this mean that data are suspect? (John Everett, Ocean Associates, Inc.)	Approved WGI SPM language.
1-242	E-1-139	A	4	25	4	26	The comment concerns the statement "... and suggestions of increased intense tropical cyclone activity in some other regions where concerns over data quality are greater." This is	Approved WGI SPM language.

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							quite uninformative (which regions are affected? what is the level of uncertainty?) and, given its speculative nature, appears out of place in this section. (Annarita Mariotti, ENEA)	
1-243	E-1-137	A	4	25	4	28	This paragraph has lost a lot of useful information from WG I, and it must keep the connection of increased intensity of hurricanes in the North Atlantic with the statement "in association with higher sea surface temperatures in the tropical Atlantic", see WG I SPM. (Kevin Trenberth, NCAR)	Too detailed for SYR.
1-244	E-1-142	A	4	26	4	26	greater than what? Should perhaps read: greater than in the north Atlantic"? (Michel J. Rossi, Ecole Polytechnique Fédérale de Lausanne)	Current text is OK.
1-245	E-1-141	A	4	26	4	28	Something went wrong in this sentence. (Marco Mazzotti, ETH Zurich)	Approved WGI SPM text.
1-246	E-1-143	A	4	27	4	27	To add "started" before "in about 1970" and put comas before and after this explanation (Antoaneta Yotova, National Institute of Meteorology and Hydrology)	Approved WGI SPM text.
1-247	E-1-144	A	4	27			in about 1970': maybe 'around 1970'? (Michel Rixen, NATO Undersea Research Center)	Approved WGI SPM text.
1-248	E-1-145	A	4	28			Remove 'tropical cyclone'. Better - in their ... (Roman Corobov, Modern institute for humanities)	Approved WGI SPM text.
1-249	E-1-146	A	4	30	5	40	Observational evidence also shows that many managed systems are being affected by regional climate changes, particularly drought cropping agriculture. However, it is not mentioned in this topic! (Guangsheng Zhou, Institute of Botany, The Chinese Academy of Sciences)	This is mentioned later in section.
1-250	G-1-87	A	4	30			Section 1.2: This section does not mention important observed impacts on coastal regions. The following sentence from the WG 2 TS.B could be added: "Sea-level rise is contributing to losses of coastal wetlands and mangroves, and increased damage from coastal flooding in many areas, although human modification of coasts such as increased construction in vulnerable zones plays an important role too." (Government of European Community)	Agreed. WGII statement added.
1-251	E-1-147	A	4	32	4	32	Why does it only cover the period since 1970? It is because that is the relevant period when the human signal is significantly above the noise of natural variability, or because data are not available before then, or what? (Kevin Trenberth, NCAR)	Both reasons.
1-252	E-1-148	A	4	32	4	40	delete these lines (Hugo Beltrami, St. Francis Xavier University)	Statement provides important context.

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1-253	E-1-149	A	4	35	4	35	Move the sentence that appears on Topic 1, Pg. 7, lines 24-25: "There is, however, a notable lack of geographic balance in data and literature on observed changes, with marked scarcity in developing countries." to the end of line 35. In WG II's SPM it was the last sentence of the paragraph quoted on lines 32-25, and it makes no sense to separate it from the rest of the paragraph. For completeness, and because policymakers in developing nations want to know whether the statements in the Synthesis Report apply to their countries, the final sentence from the WG II paragraph must be added. (Robert Siveter, IPIECA)	Agreed. Sentence moved.
1-254	G-1-88	A	4	35	4	35	Move the sentence that appears on Topic 1, p. 7, lines 24-25 "There is, however, a notable lack of geographic balance in data and literature on observed changes, with marked scarcity in developing countries." to the end of line 35. In WG2's SPM, it was the last sentence of the paragraph quoted on lines 32-25, and it makes no sense to separate it from the rest of the paragraph. Because policymakers in developing nations want to know whether the statements in the Synthesis Report apply to their countries, the final sentence from the WG2 SPM paragraph must be added. (Government of United States)	Agreed. Sentence moved.
1-255	G-1-89	A	4	37	4	38	These lines are important to keep given the lack of a confidence statement for the AR4 conclusion in the bolded text below. (Government of Canada)	Agreed. Lines kept.
1-256	E-1-150	A	4	38	4	39	To remove a second 'Assesment';Better:...in the Third Assessment, which concluded.... (Roman Corobov, Modern institute for humanities)	Approved WGII SPM text.
1-257	G-1-91	A	4	46	4	47	Permafrost is not a part of frozen ground. So better to say «related to show, ice, frozen ground and permafrost (Government of Russian Federation)	Approved WGII SPM text.
1-258	E-1-151	A	4	46	5	2	Shouldn't Ch 4 in WG1 be referred to as it gives a more complete discussion of observed changes in the cryosphere (also Ch 15 of WG2 - Polar Chapter) - Since this is meant to be a synthesis information from both working groups should be brought together as well as information found in different chapters. (Sharon Smith, Geological Survey of Canada)	Callout to WGII is sufficient, because this section is on effects.
1-259	G-1-90	A	4	46	5	4	Restructure these bullets as paragraph text (as in SPM and to match the format of the subsequent sections). (Government of Canada)	Structure follows WGII SPM.
1-260	E-1-152	A	4	47	4	48	delete "Examples are:" in line 47. Delete line 48 (Hugo Beltrami, St. Francis Xavier University)	Reject. Reviewer provides no rationale.

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1-261	E-1-13	B	4	48			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-262	E-1-153	A	5	1	5	4	Fast retreat of most (all) tropical glaciers in the high Andes (Germán Poveda, Universidad Nacional de Colombia)	See section 1.1.
1-263	E-1-154	A	5	1	5	4	delete these lines. (Hugo Beltrami, St. Francis Xavier University)	Reject. Reviewer provides no rationale.
1-264	E-1-14	B	5	2			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-265	E-1-155	A	5	3	5	3	changes' is too vague a term to be meaningful' be more specific (David White, ASIT Consulting)	Too much detail for SYR – space limitations.
1-266	E-1-156	A	5	3	5	3	changes in some Arctic, Antarctic and mountain flora and fauna (Stephan Halloy, Conservation International)	Approved WGII SPM text. Mountains noted later.
1-267	E-1-157	A	5	4	5	4	exchange "high in the food chain" with "at high levels of the food web". Food chain is an outdated concept that does not reflect the actual complexity of the feeding relationships in an ecosystem. (Dagmar Schröter, Umweltbundesamt GmbH)	Agreed. Text changed.
1-268	E-1-15	B	5	4			Write {.....} . (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial..
1-269	G-1-92	A	5	6	5	6	To align with the following paragraphs this finding on hydrological systems should include the finding in the WG2 report that this is based on "growing evidence". (Government of Australia)	Agreed. Text added.
1-270	E-1-158	A	5	6	5	9	Add a mention of actual and potential evapotranspiration. Also to evidences of greater variance (variability of river flows), if so. (Germán Poveda, Universidad Nacional de Colombia)	Insufficient confidence to include in SYR.
1-271	G-1-93	A	5	8	5	9	The authors should consider if an explanation of the implications of changes in thermal structure should be included to provided readers with an understanding of why it is an important effect of climate change. (Government of Australia)	Too detailed for SYR.
1-272	E-1-159	A	5	9	5	9	Add: "... structure and water quality, CHANGES IN PRECIPITATION PATTERNS{WGII 1.3, 15.2} (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	Precipitation covered in section 1.1.
1-273	G-1-94	A	5	11	5	17	What is meant by "recent warming"? What is meant by "strongly" affecting terrestrial biological systems (line 13)? Definitions needed.	"Recent warming" refers back to first statement in Section 1.2.

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							(Government of Australia)	Strong effects described in second part of sentence.
1-274	G-1-95	A	5	11	5	17	This paragraph misses an important finding. The following sentence from WG 2 TS.B could be added: "Changes in abundance of certain species, including limited evidence of a few local disappearances, and changes in community composition over the last few decades have been attributed to climate change." (Government of European Community)	Not in WGII SPM because of multiple causal factors.
1-275	G-1-96	A	5	11			I would attenuate a bit this assertion (i.e. use "high confidence" instead) as there are important papers in ecology suggesting that in spite of individual effects that may look quite strong, the integration of more complex systems in higher levels of organization may not show significant or apparent changes with warming. See for example the paper by Enquist et al. (Global Change Biology, 2007, 13 pg 591). (Government of Brazil)	New paper since WGII cut-off. Agreed WGII SPM text.
1-276	G-1-97	A	5	13	5	16	Are 'leaf-unfolding' and 'greening' essentially the same thing in this context? If so, the text is repetitive and should be cut by removing the second sentence in its entirety. (Government of New Zealand)	Reject. Different things: Site versus large-area evidence.
1-452	G-1-4	D	5	13			Instead of leaf-unfolding it is suggested bud-sprouting, which is a more general phenomenon because it includes also flowering. (Government of Argentina)	Reject. Leaf-unfolding is correct term for the observed change, selected by chapter ecologists.
1-277	E-1-160	A	5	16	5	17	Is earlier 'greening' due to longer thermal growing season, or short winter periods (early start of spring)? . This sentence need to be made clearer (Richard Anyah, Rutgers University)	Earlier start to spring. SPM text.
1-278	E-1-161	A	5	16			Delete ...'in the spring' as a commonplace. (Roman Corobov, Modern institute for humanities)	Approved SPM language.
1-279	E-1-162	A	5	17			Delete ...'recent'. (Roman Corobov, Modern institute for humanities)	Approved SPM language.
1-280	E-1-164	A	5	19	5	21	In the SPM page 4, lines 11-15 and the topic 1 page 7, lines 3-10, we stated that the global-scale meridional overturning circulation of the ocean has not yet been determined whether it has changed. However, there is no statement about the regional or single-basin scale overturning of the ocean, part of which has already determined to had been changed (e.g., overturning circulation of North Pacific Ocean, WGI chapt.5). This somewhat jug-handed description may lead the readers to an implicit impression that ALL the oceanic overturn has not yet changed. In the present sentence, association of the changes in marine biological systems with the climate-related changes in "circulation" is stated. Although I was a reviewer of WGI and I had not read WGII full report, I can speculate that this word actually mean "regional circulation."	"Circulation" here does not imply MOC and/or global scale.

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
							However, I feel a risk that some readers may be confused with this word, when he has already impressed by the above sentence that ALL the oceanic overturn should have not yet been changed. I therefore, recommend to add the word "regional" before the word "circulation" in this sentence. (Tsuneo Ono, Hokkaido National Fisheries Research Institute, Fisheries Research Agency)	
1-281	E-1-163	A	5	19	5	24	There is high confidence, based on substantial new evidence, that observed changes in marine and freshwater biological systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. These include: shifts in and freshwater biological systems are associated with rising water temperatures, as well as ranges and changes in algal, plankton and fish abundance in high-latitude oceans; increases in algal and zooplankton abundance in high-latitude and high-altitude lakes; and range changes and earlier fish migrations in rivers. {WGII 1.3} AND CORAL REEFS BLEACHING EPISODES (1.3.4; Box 4.5 and Box 6.1) (Avelino G. Suarez Rodriguez, Ecology and Systematic)	Agreed. WGII Ch 1 text added.
1-282	E-1-165	A	5	19	5	24	I think that "increased frequency of mass coral bleaching events" should be added here. (Janice Lough, Australian Institute of Marine Science)	Agreed. WGII Ch 1 text added.
1-283	E-1-166	A	5	21	5	24	Are there evidences from coral reef bleaching or the like? (Germán Poveda, Universidad Nacional de Colombia)	Agreed. WGII Ch 1 text added.
1-284	E-1-167	A	5	21			add 'ocean acidity' after 'salinity' (M. James C. Crabbe, University of Bedfordshire)	Acidity is discussed in paragraph below.
1-285	E-1-168	A	5	22	5	22	Add: "... and fish abundance in high latitudes abundance; CORAL REEF BLEACHING AROUND THE WORLD; increases in algal and zooplankton..." (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	Agreed. WGII Ch 1 text added.
1-286	G-1-98	A	5	26	5	26	the term human environment is not clear: are the infrastructure systems meant? Please clarify! (Government of Germany)	The term is approved WGII SPM text.
1-287	E-1-170	A	5	26	5	37	I have some difficulties with the assumptions behind these conclusions. The SPM WGI shows hardly any significant differences in temperature trends with natural variability for North America and Europe (Figure SPM-4), and page 10, lines 17-24 of this SPM clearly states the difficulties in determining trends once regions are being analysed. However, the statements here concerning the Northern hemisphere and in particular Europe assume clear temperature trends. This is confusing. This implies that the main conclusion (lines 26-28) should also include the difficulties due to natural variability once regions are analysed and not only adaptation and non-climatic drivers, in particular for the northern hemisphere (Arctic excluded). (Bram Bregman, Netherlands Organisation of Applied Research)	Despite variability, terrestrial systems in Europe are responding to observed temperature trends as documented in thousands of data series.

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-288	E-1-169	A	5	26	5	39	There should be balance here. Except for earlier planting, only negative items are reported. This is foundation material and should note the positive items as well, such as warmer homes in winter, less damaging frosts in summer, and the satellite data showing a greener earth since the 1970s. (John Everett, Ocean Associates, Inc.)	There is little documented evidence for examples cited by expert reviewer. Satellite data on greening are included.
1-289	E-1-171	A	5	27	5	28	non-climatic CONFOUNDING drivers (Germán Poveda, Universidad Nacional de Colombia)	Approved text. Proposed addition does not improve text.
1-290	E-1-172	A	5	28	5	28	"non-climatic drivers" you may use "non-climatic co-drivers" or "co-forcing" instead to avoid misunderstanding: climate change is also but not only driving these processes/changes (Markus Erhard, European Environment Agency)	Approved text. Proposed addition does not improve text.
1-291	E-1-174	A	5	30	5	31	I would argue that we have high (or very high) confidence in the arctic/alpine and boreal effects listed (F. Stuart Chapin, III, University of Alaska Fairbanks)	These impacts are noted earlier in section.
1-292	G-1-100	A	5	30	5	31	Add "managed and human " before "systems". (Government of European Community)	Agreed. Text added.
1-293	E-1-173	A	5	30	5	39	Northern hemisphere bias very evident here, despite Africa and Australia being deemed particularly vulnerable to future climate change (David White, ASIT Consulting)	Examples reflect published literature.
1-294	G-1-99	A	5	30	5	39	effects of temperature rise on infrastructure/human environment should be added. Description of impacts of climate change on infrastructure is missing throughout the text of this chapter. A para on this issue should be added especially as at page 12 lines 23-26 changes of impacts on infrastructure are envisaged and in topic 4 table 4.1 adaption measure for several infrastructure sectors are mentioned (Government of Germany)	Reject. There is little literature describing documented observed impacts on infrastructure.
1-295	E-1-175	A	5	32			Delete...'Effects on..' (Roman Corobov, Modern institute for humanities)	Agreed. Text deleted.
1-296	E-1-176	A	5	32			Delete "Effects on" (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Agreed. Text deleted.
1-297	E-1-177	A	5	33	5	33	What does "alterations in disturbance regimes of forests " mean? (Michel J. Rossi, Ecole Polytechnique Fédérale de Lausanne)	Deleted "regime". Meaning now clear.
1-298	G-1-101	A	5	33	5	33	The authors of the SYR should try to avoid the use of jargon, such as "disturbance regimes". (Government of Australia)	Deleted "regime". Meaning now clear.

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1-299	E-1-16	B	5	34			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-300	E-1-179	A	5	35	5	37	"heat related mortality" has been observed not only in Europe, but also in Asia and North America. So, these regions should be added. (Hisashi Ogawa, World Health Organization Regional Office for the Western Pacific)	Literature documenting this is unavailable.
1-301	G-1-102	A	5	35	5	37	This bullet point does not mention the direction of observed changes. Change sentence to "such as INCREASED heat-related mortality in Europe, CHANGES in infectious disease vectors in some regions, and EARLIER ONSET AND STRENGTHENING OF THE allergenic pollen season..." (Government of European Community)	Agreed. Text changed.
1-302	E-1-178	A	5	35	5	39	What are the impacts here? Longer and/or worse pollen seasons? Disappearance of snow and ice travel and sport? (Elizabeth L Malone, Pacific Northwest National Laboratory)	Agreed. Text changed.
1-303	G-1-103	A	5	36	5	36	It would be of assistance to readers if the authors could provide the areas where infectious disease vectors have changed due to climate change. (Government of Australia)	Agreed. Included "parts of Europe"
1-304	G-1-104	A	5	36	5	36	"in some areas" is too vague. Either give details or don't include this point. (Government of United States)	Agreed. Included "parts of Europe"
1-305	E-1-180	A	5	36	5	37	To change "in Northern Hemisphere high and mid-latitudes" with "in high and mid-latitudes of the Northern Hemisphere" (Antoaneta Yotova, National Institute of Meteorology and Hydrology)	SPM language retained.
1-306	E-1-17	B	5	37			Write {.....} ; (punctuation) (Ibouraïma Yabi, LECREDE/DGAT/FLASH/UAC)	Editorial.
1-307	G-1-105	A	5	38	5	38	The examples provided to illustrate this point seem trivial. (Government of Australia)	Examples are documented in literature.
1-308	G-1-106	A	5	38	5	39	Add "limitations in" before "mountain sports". (Government of European Community)	Agreed. Text added.
1-309	E-1-181	A	5	40	5	40	Include a new bullet: " YEARLY HEAT WAVES IN EUROPE AND OTHER WORLD REGIONS" (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	In second bullet already.
1-310	E-1-182	A	5	41	5	41	replace "a warming world" with "warming" (Zoltán Somogyi, Hungarian Forest Research Institute)	Agreed. Text replaced.

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-311	G-1-107	A	5	41	5	41	replace "a warming world" with "warming" (Government of Hungary)	Agreed. Text replaced.
1-312	E-1-185	A	5	43	5	43	Need to make it clear what "sea ice" parameter we are talking about - concentration or extent. And it really just applies to the Arctic. I would prefer to be explicit and change first part of the sentence to: "...with observed decreases in snow cover and Northern Hemisphere sea ice concentration and extent, thinner global sea ice, shorter freezing seasons..." (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	Added Northern Hemisphere, and extent.
1-313	E-1-186	A	5	43	5	43	For 'Changes in the ocean and on land' I suggest to write 'Changes of the temperature in the ocean and on the land' (Nováky Béla, Szent István University, Gödöllő, Hungary)	Changed "with" to "including" to clarify meaning.
1-314	G-1-108	A	5	43	5	43	Please include the word 'extent' after the first occurrence of 'sea ice', thus: " ... with observed decreases in snow cover and sea ice extent, thinner sea ice, ..." (Government of New Zealand)	Agreed.
1-315	G-1-109	A	5	43	5	43	For clarity, suggest that "with" is replaced with "such as". (Government of Australia)	See E-1-186
1-316	E-1-184	A	5	43	5	45	retreat of tropical high mountain glaciers (Germán Poveda, Universidad Nacional de Colombia)	Not included because this point might be controversial.
1-317	E-1-183	A	5	43	5	46	To shorten this paragraph to: 'All above demonstrated changes strongly support the view that the world is warming'. (Roman Corobov, Modern institute for humanities)	Examples are included here because they are first noted some distance from this point in the text. Text is confusing without the list.
1-318	E-1-187	A	5	43	5	46	add: and NASA satellite data showing a greener earth since the 1970s, likely due to warmth, increased precip and CO2 fertilization (http://www.nasa.gov/centers/goddard/news/topstory/2003/0530earthgreen.html) (John Everett, Ocean Associates, Inc.)	Example already in 1.2.
1-319	E-1-188	A	5	43	6	3	89% of studies show warming trends but what do the remaining 11% show? Assume chapter 1.4 is referring to this 11%. If yes this should be clearly communicated of no it needs short explanation in chapter 1.3 (Markus Erhard, European Environment Agency)	Meaning of current text is clear. Remaining 11% show significant change not consistent with warming.
1-320	E-1-189	A	5	45	5	45	Shouldn't Ch 4 in WG1 also be referenced to as it discusses observed changes in the cryosphere. (Sharon Smith, Geological Survey of Canada)	WGI 3.9 discusses consistency, the topic of this section.
1-321	E-1-190	A	5	45	5	45	Add: "...and borehole temperature profiles, INCREASES IN OCEAN AND SEA WATER TEMPERATURES, and sea level rise...." (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	See E-1-186.

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-322	E-1-191	A	5	45	5	45	"Increase in deep ground temperatures" would be better term to use than "increases in borehole temperature profiles" (clearer?). Regarding the link between soil and deep ground temperatures and climate warming - changes in soil temperature and deep ground temperatures indicate that changes have occurred in ground surface temperatures that may be linked to changes in climate - the link from deep ground temperatures to air temperature is not direct and may not necessarily indicate a warming climate. For example the changes in ground temperature could be due to changes in snow cover (which may or may not reflect a warming world), changes in surface cover, vegetation that could result from a number of causes. A change in ground temperature does not necessarily provide strong support that the world is warming. (some reference to the role of snow cover was provided in the underlying WG chapter) (Sharon Smith, Geological Survey of Canada)	WGI Ch3 text.
1-323	G-1-110	A	5	46	5	46	What is meant by ... "all 'strongly' support the view that the world is warming"? This statement should have certainty language around it eg: "It is (likely/ highly likely) / there is high, medium confidence that changes in the ocean and on land (etc)... support the view that it is (virtually certain/ extremely likely – see first comment) that the world is warming." (Government of Australia)	The warming is "unequivocal" (and this is stated earlier in the Topic. This statement reiterates the bolded statement at the start of 1.1.
1-324	G-1-111	A	5	46			Replace "strongly support the view" with "providing additional evidence". Stating the world is warming is a "view" suggests that there are scientifically defensible views that it is not warming. Keep the language simple and clear. (Government of Canada)	Agreed. Inclusion clarifies statement.
1-325	E-1-192	A	6	1	6	1	Remove footnote (redundant). (Dieter Gerten, Potsdam Institute for Climate Impact Research)	Agreed. Footnote removed.
1-326	E-1-194	A	6	1	6	1	Footnote 2: I find criterion 3 a bit troubling - if most of the 51,000 studies found no change, then shouldn't we be told this? (Keith Shine, University of Reading)	Observations that were not significant were not included in order to base the assessment on a statistically defined, unbiased data set of changes either consistent or not consistent with warming. Approved WGII SPM figure and caption. Also text added to Fig. 1.2 caption: "Regions without dots have no time-series that meet the criteria: in these regions physical and biological systems may or may not be changing but are not documented."

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1-327	E-1-195	A	6	1	6	1	Could leave out the footnote (2) as it repeats what is given in the Figure 1.2 caption, lines 8-12. (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	Agreed. Footnote removed.
1-328	G-1-112	A	6	1	6	2	What about studies that do not show a statistically significant change? This appears in the caption of Figure 1.2 and in a footnote, but it is significant that 64% of studies appear to show no statistically significant change or do not meet the same criteria as the 75 studies. Please clarify. (Government of United States)	Observations that were not significant were not included in order to base the assessment on a statistically defined, unbiased data set of changes either consistent or not consistent with warming. Approved WGII SPM figure and caption. Also text added to Fig. 1.2 caption: "Regions without dots have no time-series that meet the criteria: in these regions physical and biological systems may or may not be changing but are not documented."
1-329	E-1-196	A	6	1	6	3	A statement should be added to indicate that the distribution of observations is not uniform and there are large areas (eg. southern hemisphere) where there are no indications of significant change. The authors should also clarify whether the fact that there are large areas in Figure 1.2 which do not have any dots means there are no studies done in these areas or that studies have been done but they don't indicate a significant change. This information is required to interpret the spatial patterns of observed change. (see earlier comment on SPM [TSU note: See Comment E-SPM-214-A]) (Sharon Smith, Geological Survey of Canada)	Text added to Fig. 1.2 caption: "Regions without dots have no time-series that meet the criteria: in these regions physical and biological systems may or may not be changing but are not documented." Also, caveat about sparse literature moved to head of section 1.2.
1-330	E-1-193	A	6	1			Footnote2 as well as the words 'from 75 studies' repeat entirely Figure 1.2's legend and can be removed. (Roman Corobov, Modern institute for humanities)	Footnote removed.
1-331	E-1-197	A	6	4	6	5	It remains unclear what "coastal processes" are. (Klaus Schwarzer, Institute of Geosciences, Coastal and Shelf Research)	Text is sufficiently clear.
1-332	E-1-198	A	6	5			Figure 1.2.has green shading in it but a green color is not in the legend, what is this (Bruce McCarl, Texas A&M Univesity)	Green colour is in legend.
1-333	G-1-114	A	6	6	6	6	"Locations of significant changes in observations ... " should read "Locations of observations of significant changes ..." (Government of New Zealand)	Approved text.

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1-334	G-1-113	A	6	6			<p>Somewhere it should be mentioned that tropical environments (where most of biodiversity and the highest ecosystem productivity and carbon stocks are) are very poorly studied in relation to others. This suggests that more effort should be made to study such regions as the lack of knowledge increases the levels of uncertainty for forecasts. Also, this is very important for policy makers, as they will know where human resources and financing for science should be invested. I suggest that the following text might be added to the item 1.3 pg 6, line 4: "Although a relevant proportion of biodiversity, primary ecological productivity and carbon stocks are in the tropical biomes in the Amazon, Tropical African and Asia, these regions have been poorly studied to date. This denotes an imbalance between the uncertainties related to the temperate (Northern) and the tropical regions of the world. Therefore, a focus on studies on these regions should be favored in order to correct this informational imbalance and decrease uncertainty of forecasts for the whole biosphere system" . Note that a phrase about the lack of data was added to pg 7 lines 24 and 25.</p> <p>(Government of Brazil)</p>	Caveat on lack of data and studies moved to start of 1.2.
1-335	G-1-115	A	6	8	1	11	<p>these lines are duplicated in the following footnote. Some footnotes that have corresponding explanation in main text could be removed, just like the redundant descriptions pointed out in the general comments.</p> <p>(Government of Japan)</p>	Footnote removed.
1-336	E-1-199	A	6	8	6	11	<p>The sentences within these lines are exactly repeated in the under-line note 2 on the same page which can be deleted</p> <p>(Antoaneta Yotova, National Institute of Meteorology and Hydrology)</p>	Footnote deleted.
1-337	E-1-200	A	6	8	6	11	<p>Repeats note at bottom of the page</p> <p>(Michel Rixen, NATO Undersea Research Center)</p>	Footnote deleted.
1-338	E-1-201	A	6	10	6	10	<p>"spanning a period of at least 20 years" is simply not adequate in this context. It is not possible, regionally, to distinguish global warming from natural fluctuations without using much longer time series. Case in point: Arctic warm period of the 1930s and 1940s.</p> <p>(Jon Egill Kristjansson, University of Oslo)</p>	20 years is minimum. Many studies much longer. See WGII Chapter 1 Supplementary Material.
1-339	E-1-202	A	6	11	6	13	<p>To refrain from repetition in the legend (e.g. 29,000; line 8), this sentence is better to restate, e.g. as: "The selected subset is from about 75 studies (of which ~70 are new since the Third Assessment); about 28,000 data series are from European studies'.</p> <p>(Roman Corobov, Modern institute for humanities)</p>	Figure caption shortened.
1-340	E-1-203	A	6	17			<p>delete double parenthesis before "MFW"</p> <p>(Hartmut Grassl, Max Planck Institute for Meteorology)</p>	Abbreviation has been deleted and is now written out in Table 1.1
1-341	E-1-204	A	6	19	6	19	<p>The reference to "WGI Figure 3.9b" is not totally appropriate and neither matches the figure here. The global temperature analyses are different (here: HadCRUT3 and WGI/Fig3.9b:</p>	Callout changed to {WGII Figure SPM1}.

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							NCDC), as are the considered time periods. This leads to some differences in local temperature changes as well as areas of sufficient/insufficient data. (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	
1-342	E-1-205	A	6	19	6	19	Instead of MFR, use MFW. (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	Abbreviation has been deleted and is now written out in Table 1.1
1-343	E-1-206	A	6				The footnote is redundant as it is already included in the legend of figure1.2 (María Isabel Travasso, Instituto Nacional de Tecnología Agropecuaria)	Footnote deleted.
1-344	E-1-207	A	6				Playing devil's advocate: is there a possible bias caused by higher number of studies focusing on warming only? (Michel Rixen, NATO Undersea Research Center)	Bias eliminated through assessment protocol.
1-345	E-1-208	A	6				Figure 1.2: Regarding the caption: A description of the 2x2 boxes in the body of the caption, specifying the meaning of the left-hand and right-hand columns, would be useful (I did not find the text box in the legend useful at a first glance). Concerning the 2x2 boxes: why are some numbers given with 3 decimal digits (EUR,TER,GLO) while others with 0 decimal digits? could the figure be simplified in this respect? Regarding the figure: would it be possible to display the various regions on the map? (Annarita Mariotti, ENEA)	Boxes removed and global-scale data for TER and MFW put in Table 1.1, with columns headings written out.
1-346	E-1-209	A	6				Figure 1.2: numbers in 2x2 boxes too small. (Michel Rixen, NATO Undersea Research Center)	Boxes removed and global-scale data for TER and MFW put in Table 1.1, with columns headings written out.
1-347	E-1-210	A	6				Figure 1.2: boxes in the middle of the figure should be larger to allow for large numbers to include (there is still much space for that). This would increase readability. Also the map itself should be larger for easier readability. The legend should be above the series of boxes. (Zoltán Somogyi, Hungarian Forest Research Institute)	Boxes removed and global-scale data for TER and MFW put in Table 1.1, with columns headings written out. Map is now easier to read.
1-348	E-1-211	A	6				Figure 1.2: I recommend that in the 2X2 boxes for EUR, TER and GLO all the numbers are put into the box. It does not matter if the boxes become rectangles instead of squares, but I do not like that arrows are used, because one associates to arrows a meaning that in this case they do not have. I believe this change would greatly improve the readability of the figure (which is quite complex!). (Marco Mazzotti, ETH Zurich)	Boxes removed and global-scale data for TER and MFW put in Table 1.1, with all numbers in table cells and columns headings written out.
1-349	E-1-212	A	6				Figure 1.2. I think it is misleading to lump the Arctic and Antarctic together when the changes, both observed and predicted, in each are so dramatically different, and also when probably almost all the observations reported are for the Arctic. (George Walker, Aon Re Asia Pacific)	Map shows different distribution of datasets in the Arctic and Antarctic.

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-350	E-1-213	A	6				FIGURE 1.2. - Comment: Perhaps some explanation for the odd results of Australia-New Zealand would be appropriate. (Maria Rosa Paiva , Universidade Nova de Lisboa [New University of Lisbon])	Too detailed for SYR.
1-351	E-1-214	A	6				Figure 1.2, next to last line in box: “ at sites and large areas...” (Michel J. Rossi, Ecole Polytechnique Fédérale de Lausanne)	Text corrected.
1-352	E-1-215	A	6				Fig. 1.2, lines 6-7: Rephrase "hydrology; and coastal processes" to "inland waters; and coasts". Line 12: delete for reasons of redundancy "and contain about 29,000 data series". (Dieter Gerten, Potsdam Institute for Climate Impact Research)	SPM approved text, so cannot rephrase categories. Redundancy eliminated.
1-353	E-1-216	A	6				delete Figure 1.2 . Very large. Give reference to original (s). (Hugo Beltrami, St. Francis Xavier University)	Important synthesis figure. Cannot delete. Boxes removed to make figure more effective. Information for TER and MFW put in separate table.
1-354	G-1-116	A	6				This figure is very difficult to interpret. Part of the problem is that the dots obscure the underlying map over the western U.S. and Europe. Furthermore, the dots have little meaning. Why not have a dot represent the ratio of warming consistent observations to the total? The regional boxes should also have a category of significant results which are inconsistent with warming. The text needs to be larger. The footnote is redundant since information about the data set is in the Figure 1.2 caption. (Government of United States)	Footnote deleted. Figure approved by WGII plenary so cannot change. Final figure more readable because boxes have been removed, with information for TER and MFW put in separate table. Dots show data-series with significant changes in physical and biological systems.
1-355	G-1-117	A	6				Reproduce Figure 1.2 exactly as it appears in the WG2 SPM with particular attention to color schemes and treatment of the symbols indicating observations. Include the title for this figure from the WG2 SPM and use the figure caption verbatim. Even with revisions incorporated into the final WG2 SPM version of this figure, it remains confusing and difficult to understand. Consider listing the information contained in the 2x2 boxes in a traditional table with the names of regions in full; the 2x2 boxes are confusing and difficult to read. Full names of regions in a traditional table will alleviate the need to define abbreviations in the caption. (Government of United States)	Map is exactly as in WGII SPM. Title included. Boxes removed and MFW and TER information put in separate table as suggested, with category names written out. Caption for the map is the same, with text added to Fig. 1.2 caption: “Regions without dots have no time-series that meet the criteria: in these regions physical and biological systems may or may not be changing but are not documented.”

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
1-356	G-1-118	A	6				<p>Figure SPM-2 is still rather hard to understand and did not benefit from any discussion at the WGII Plenary about how to improve the visual presentation of this Figure (such a discussion was deferred until the scientific content of this Figure was agreed upon, at which point there was no time left for discussion of presentation aspects of the material). Therefore, we resubmit many of our original recommendations for improving the presentation aspects of this Figure.</p> <p>1) Delete the box explaining the different size dots for Europe. Instead, include in the Figure caption lines 30-31 from page 58 of the Technical Summary which reads “dots represent about 75 studies which have >29,000 data series, of which about 27,800 are from European phenological studies.” If this were done, then all the dots could be made one size and the box about the dots removed from the graphic itself. As it is, it is impossible for the reader to ascertain which of the dots on the map correspond to which size. The main message is that most of the studies come from Europe and this message is provided with the suggested text change for the caption. 2) Clarify what the blank spaces on the map are - are they regions where no studies have been done, or regions where studies have been done and changes observed, but these were not significant? 3) The gradations for the change in temperature between 1970 and 2004 are inconsistent. This requires explanation. Alternatively, qualitative descriptors of temp change could be used (i.e. warming/significant warming or temp decrease/increase) 4) provide an improved map which shows the polar regions better - it is unclear in the present map whether observations in the Canadian high arctic are marine or terrestrial, 5) choose colours for the dots that differ significantly from the colours used to depict areas where observed temperature has decreased.</p> <p>(Government of Canada)</p>	<p>Noted. 1) Boxes have been eliminated and MFW and TER information put in separate table. 2) Added statement in caption: Regions without dots have no time-series that meet the criteria; in these regions physical and biological may or may not be changing but are not documented. 3) Noted, but need to use WGII SPM approved figure as much as possible so can't change temperature legend. 4) Noted, but need to use map projection approved in WGII SPM Plenary. 5) Noted, but need to use approved dots.</p>
1-357	G-1-119	A	6				<p>Figure 1.2: boxes in the middle of the figure should be larger to allow for large numbers to include (there is still much space for that). This would increase readability. Also the map itself should be larger for easier readability. The legend should be above the series of boxes.</p> <p>(Government of Hungary)</p>	<p>Boxes removed from Figure 1.2 and MFW and TERR information moved to Table.</p>
1-358	G-1-120	A	6				<p>Figure 1.2 shows the association of observed changes in physical systems and biological systems with the increase in temperature by region. The locations of observed physical/biological change are, of course, distributed unevenly throughout the globe. The problem is that the figure does not show locations where observations indicate no significant change in the systems. In other words, there is no control group of locations. Do we interpret from the figure that observations of systems, for example, in the Amazon River basin showed no significant change? Or, should we assume that we really don't know if the systems there changed significantly because no documented observations exist? The statement on p. 4 lines 22-23 suggests the latter, but this should be made</p>	<p>Data and literature lacking in many regions. Added statement in caption: 'Regions without dots have no time-series that meet the criteria; in these regions physical and biological may or may not be changing but are not documented.'</p>

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Running number	Topic - Comment	Batch	Page	Line	To Page	To Line	Comment	Considerations by the writing team
							clear in the caption. (Government of United States)	
1-359	G-1-121	A	6				Figure 1.2 comment: We question whether this figure conveys sufficient new and important information to be worth including it in the SYR. The figure itself is complex and difficult to interpret, while the relevant information is already clearly set out in the preceding three lines:"Of the more than 29,000 observational data series ... more than 89% are consistent with ... warming {WGII 1.4}". The figure adds only the geographical information, which probably shows where research groups are working, rather than where changes are and are not occurring. (The differentiation between physical and biological observations is hard to see and not likely to be picked up by readers of the SYR.) The figure does not show where or how many studies have been done that do NOT show significant changes. (Government of New Zealand)	Figure is important synthesis figure. Figure has been made more readable with removal of boxes, with TER and MFW information put in table.
1-360	G-1-122	A	6				Figure 1.2 comment: Interpretation of the sub-box labelled "Europe*** " is not straightforward. Does that scale of circle sizes apply only to Europe (and if so, why - does a different scale apply elsewhere)? If not, then omitting the label 'Europe*** ' would also allow to omit the explanation at the bottom of the figure. The circles on the map of Europe are difficult to distinguish - but there do not appear to be any of the '1201-7500' size on the map, although we believe there should be. (Government of New Zealand)	Legend is sufficiently clear. There are dots of every size.
1-361	G-1-123	A	6				Figure 1.2 and related text: This figure and in particular its caption need to be more carefully explained for the broader SYR readership. Currently it is quite difficult to use, because it is "busy" and hard to read (especially in B&W), and also because the explanation of the Figure is overly technical and poorly explained. The authors need to make it more plain for policy readers. (Government of Australia)	Second paragraph of section 1.3 explains this in simpler way. Figure simplified by removing boxes and statement added to caption to clarify: 'Regions without dots have no time-series that meet the criteria; in these regions physical and biological may or may not be changing but are not documented.'
1-362	G-1-124	A	6				Define what a "significant change" is on line 1 and in the footnote. (Government of United States)	Added "statistically".
1-363	G-1-6	C	6				" There is the same information about the three criteria of selection of the 29,000 datasets in footnote and caption of figure 1.2. This could be put only once in the footnote. " (Government of Belgium)	Footnote deleted.

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1-453	G-1-5	D	6				The footnote is redundant as it is already included in the legend of figure 1.2 (Government of Argentina)	Footnote deleted.
1-364	E-1-218	A	7	1	7	1	The header "Aspects of climate and effects not observed to have changed" would be misleading to the lay reader, as most of what is discussed are things we either don't have a long enough record for (eg sea ice) or that we have difficulty measuring, rather than factors we can categorically say have not changed. This heading probably should be changed to something like: "Changes in some aspects of the climate system are unclear" (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	This is very similar to text in WGI SPM.
1-365	G-1-125	A	7	1	7	1	This sentence reads very awkwardly. I would suggest not trying to lump climate and effects into one sentence. In any case, with respect to the managed systems, it seems it is not so much that they haven't changed, but that the causes of the change are hard to discern. Suggest changing this bolded result to read: "Some aspects of climate have not been observed to change. Changes in human and managed systems have been observed but are difficult to attribute to any one cause." (Government of Canada)	Agreed. Title changed.
1-366	E-1-220	A	7	1	7	7	Antarctic temperatures on the peninsula and in west antarctica are going up while in the rest of the continent they are going down. This is typical of paleo records also. So it makes no sense to make averages of antarctic wide temperatures (David Fisher, NRCan)	No obvious change needed to text.
1-367	E-1-217	A	7	1			The title of this section is very hard to understand. Only reading the first sentence of the section I better understood the intent of this section. An effort should be made to reformulate the title in simpler terms. As a more general comment, I find that trying to describe together aspects of the climate which appear not to have changed with those which cannot be described because of data inadequacies is not a good idea. It implicitly conveys the idea that changes have not been observed because of data inadequacies. It would be preferable if these aspects could be treated separately. (Annarita Mariotti, ENEA)	Title changed. Second paragraph of section deleted.
1-368	E-1-219	A	7	1			One could consider adding a statement on that some (many?) of those aspects of climate that do not appear to have changed are neither expected to change to any discernible amount for the size of climate change so far. The annual number of tropical cyclones could do as an example. (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	This would imply attribution – not Topic 1 province.
1-369	E-1-222	A	7	3	7	4	"we cannot determine if they are changing because of data inadequacies" could be changed to "data inadequacies prevent us from determining whether they are changing" (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Agreed. Text changed.

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1-370	G-1-127	A	7	3	7	4	A stylistic point but the authors should avoid using the personal term "we". Suggest instead the following text: "Some aspects of climate appear not to have changed, and for some other aspects it cannot be determined if changes have occurred because of data inadequacies." (Government of Canada)	Agreed. Text changed.
1-371	E-1-221	A	7	3	7	10	Any reference to observed (or lack thereof) of trends in precipitation. For example, in Colombia there is a mixed signal of precipitation trends. (Germán Poveda, Universidad Nacional de Colombia)	Too detailed.
1-372	G-1-126	A	7	3	7	10	There is a lack of certainty language. Suggest following as example of kind of information useful to policy makers: "It is (virtually certain/ highly likely/ likely)/ there is (high/ medium/ low confidence) that some aspects of climate have not changed. For other aspects we cannot determine change because of lack of data inadequacies." Suggest these are outlined in a table that makes the information more accessible to policy makers. (Government of Australia)	The intention of the paragraph is to say that it is uncertain. No space for table.
1-373	E-1-223	A	7	4	7	7	In this discussion of change over Antarctica, it should be mentioned that the depletion in stratospheric ozone is thought to have had a cooling influence, so the reason that one might not be seeing a GHG-induced warming and sea ice meltback is the offsetting cooling influence of stratospheric ozone depletion. Failing to indicate that there is a quite plausible explanation gives the (mis)impression that climate change might not be manifest there, when it may simply be being offset. (Michael MacCracken, Climate Institute)	Attribution inappropriate in Topic 1.
1-374	E-1-227	A	7	4	7	7	As noted for comment 1 above, Antarctic sea ice extent has only been observed over the relatively short satellite era, and hence a) statistical significance has little meaning, and b) decadal like variability may well mask any longer term trend. Furthermore, at least one proxy study has suggested large changes (ice edge retreat) occurred in the 30 years or so prior to the satellite era (Curran et al, (2003), Science). Also, it would seem odd to relate temperature changes over the continent with those over the sea, as i)the sea ice edge is sometimes hundreds of kilometres away from the continent, and ii)most of the continent is above 3500 metres in elevation (ie, over 3 kilometres above the height of the sea). If i have misinterpreted the meaning of this part of the sentence, then it will clearly be misinterpreted by others. A better sentence could be: "For instance, Antarctic sea ice extent observed over the short satellite era (1978-present) shows localised changes, but the large inter-annual and longer term variability means that the time series remains too short to show any clear average trend." (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	Too detailed for this purpose.
1-375	E-1-224	A	7	4	7	10	In the list of aspects of climate that appear not changed, a significant miscommunication is possible. In a number of the things listed here, the available estimates suggest little detectable change should be anticipated at this time. The paragraph as written gives the	Text avoids such expectations.

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							impression that these are things we would have expected to detect but didn't. (J. David Neelin, UCLA)	
1-376	E-1-225	A	7	4	7	10	delete everything after " For instance in line 4. (Hugo Beltrami, St. Francis Xavier University)	Examples are relevant.
1-377	E-1-226	A	7	4			Could the undersampling of Antarctic compensate for the warming observed elsewhere? (Michel Rixen, NATO Undersea Research Center)	No. Antarctica is quite a small area relative to rest of globe.
1-378	G-1-128	A	7	5	7	5	Either clarify or delete the word "average". (Government of United States)	Meaning is clear.
1-379	G-1-129	A	7	6	7	6	"lack of warming" in the Antarctic need some explanation? It often raises questions from people when making presentations. (Government of Sweden)	Attribution is not part of Topic 1.
1-380	E-1-228	A	7	6			Change "lack of warming reflected in atmospheric temperatures" to "lack of rise in near-surface atmospheric temperatures". There is some evidence of warming away from the surface over Antarctica. (Adrian Simmons, European Centre for Medium-Range Weather Forecasts)	Agreed. Text changed.
1-381	E-1-229	A	7	7	7	10	There are many climatic variables that did not show a long-term change, and also there are many that show a change somehow positive for human and ecosystems. The authors may need to explain why they only choose these rather than those? In addition, dust storm in northern China and central Asia decreases in frequency during the past half a century. (Guoyu Ren, National Climate Center)	No room for many examples. Examples included do not neglect possible positive changes.
1-382	E-1-230	A	7	7			Add 'or data' after 'evidence' (Javier Martin-Vide, Group of Climatology)	Evidence includes data.
1-383	E-1-232	A	7	8	7	8	Although there is no evidence for change in meridional overturning circulation of the global ocean, weakening circulation in the Atlantic has been reported. This fact should not be discarded. (Motoyoshi Ikeda, Hokkaido University)	Too much regional detail – lack of space.
1-384	E-1-231	A	7	8			Since physical oceanographers are just now trying to determine how to measure the MOC, it is obvious that we can't determine trends in this feature (i.e., select another example) (Robert Molinari, University of Miami)	Still an important example.
1-385	E-1-233	A	7	9	7	9	The sentence referring to tropical cyclones does not make it clear what region or strength we are talking about, as regionally there have been some changes in strong tropical cyclones. Would be better to say: "There is no clear global trend in the total number of tropical cyclones." (Andrew Watkins, National Climate Centre, Australian Bureau of Meteorology)	Approved WGI SPM text.

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1-386	G-1-131	A	7	9	7	9	The authors should consider whether anything can be said about trends in fire activity. We would expect this to rise with global warming, but fire suppression efforts and arsonists may confound observed trends. (Government of Australia)	Fire included in section 1.2.
1-387	E-1-234	A	7	9	7	10	recent work documents a clear increase in the number of high category (intense) storms. E.g. Trenberth, K. E., 2007: Warmer oceans, stronger hurricanes. Scientific American, 297: 26-33. (Stephan Halloy, Conservation International)	Intensity of tropical cyclones discussed in section 1.1.
1-388	G-1-130	A	7	9	7	10	This sentence can be confusing since there is an increase in the intensity but not in the total number of tropical cyclones. The sentence can also be understood as related only to tropical areas, but in many cases hurricanes is included in the numbers. We suggest that the phrase "total global annual number" is used instead of "annual number" and that number is put in italics. Furthermore it could be made clear whether or not tropical cyclones here include hurricanes and typhoons (Government of Norway)	Approved WGI SPM text.
1-389	E-1-235	A	7	10	7	10	Insert after cyclones ", even though there is evidence of an increase of intense tropical cyclone activity in the North Atlantic since 1970." (John Church, CSIRO)	Intensity of tropical cyclones discussed in section 1.1.
1-390	E-1-236	A	7	10	7	10	Add: "... the annual number of tropical cyclones, BUT IS AFFIRMATIVE THE INCREMENT IN INTENSITY. " (Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	Intensity of tropical cyclones discussed in section 1.1.
1-391	G-1-132	A	7	10	7	10	Insert "globally" after "tropical cyclones" so that there is no implication of inconsistency between this section and the section 1.1 discussion of tropical cyclones in the North Atlantic. (Government of Australia)	Approved WGI SPM text.
1-392	G-1-133	A	7	12	7	13	The authors need to review this sentence, as at present there seems to be an internal inconsistency in the logic of the sentence. Currently it notes that the presence of adaptation causes a difficulty for the detection of a climate change response - adaptation can itself, however, be a response to climate change. Suggest that at the minimum "autonomous" is inserted before "adaptation". (Government of Australia)	Second paragraph of section deleted.
1-393	E-1-237	A	7	12	7	22	This paragraph does not belong under the bold heading of "Aspects of climate and effect not observed to change". Indeed all of the examples provided do address observed change, but it's the issue cause of this change that is unclear. Text would be more appropriate as part of section 1.2, perhaps after p. 5, l. 40. It is important that this text be retained somewhere. (Donald Lemmen, Natural Resources Canada)	Second paragraph of section deleted.

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1-394	E-1-238	A	7	12	7	22	Further, it is particularly difficult to get a clear picture of impacts because positive impacts are not newsworthy and are often less frequently reported and studied. These include improved crop yields, fewer deaths among homeless street people in winter, less winter mortalities of fish in streams, and reduced heating costs. The underlying reports are somewhat deficient in dealing with these aspects, but it is not too late to raise awareness. (John Everett, Ocean Associates, Inc.)	Second paragraph of section deleted.
1-395	G-1-134	A	7	13	7	22	This paragraph is bias. We simply know more about humans and because of that only, we tend to think that complexity is higher when the issue is related to humans. We are only one species and complexity is thought to increase as integration between species increase. Thus, ecosystems and communities are more complex than humans and their social networks. In the text in lines 12 and 13, the idea is that it is more difficult to draw conclusions due to complexity. This is not true, as the level of complexity was gauged by the amount of knowledge about a subject. What will happen when an enormous amount of information about the tropical systems will be added to the already know data? This is not an irrelevant question as the tropical biomes are important carbon sinks and water releasers which may influence the climate with different strenghts. See the ideas of Joseph Stiglitz (noble prize in economy 2001) about the importance of asymmetric information in economy. (Government of Brazil)	Second paragraph of section deleted.
1-396	G-1-135	A	7	13	7	22	These sentences providing examples of non-climatic factors that increase vulnerability to climate change need to be restructured. The authors should consider using bullet points to break-up the paragraph and more clearly illustrate the impacts of each of the non-climate drivers provided. (Government of Australia)	Second paragraph of section deleted.
1-397	E-1-239	A	7	15	7	16	you say "Changes in river systems related to water supply make it more difficult to determine how streamflow may be changing" but this is misleading I think the changes are because of "water supply and consumption" not just supply (Bruce McCarl, Texas A&M Univesity)	Second paragraph of section deleted.
1-398	G-1-136	A	7	15	7	16	Add "and consumption" after "supply" (Government of United States)	Second paragraph of section deleted.
1-399	E-1-240	A	7	18	7	18	After 'water consumption' add 'including groundwater extraction' ... which is in part an indirect but very important consequence of climate change (also affected by technology, population etc) (David White, ASIT Consulting)	Second paragraph of section deleted.
1-400	E-1-241	A	7	18	7	18	Add: "... such as land - use and land - cover changes, OVER EXPLOITATION, and changes in rates of...."	Second paragraph of section deleted.

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							(Cristobal Felix Diaz Morejon, Ministry of Science, Technology and the Environment)	
1-401	E-1-242	A	7	19	7	20	human [insert 'and livestock'] diseases (David White, ASIT Consulting)	Second paragraph of section deleted.
1-402	G-1-137	A	7	19	7	22	The meaning of the term "first" is not clear in this context. The word should be deleted as it does not seem justified. (Government of European Community)	Second paragraph of section deleted.
1-403	E-1-243	A	7	24	7	25	It is very correct to indicate the notable lack of geographic balance in data and literature on observed changes. But why do not the IPCC authors make efforts to use as many as possible the non-English publications. There are a lot of Chinese papers on observed change in climate, for example. (Guoyu Ren, National Climate Center)	Noted.
1-404	E-1-244	A	7	24	7	25	Does the statement mean there have been no studies in these regions or that there just aren't very many that indicate observed changes. (see earlier comment on SPM [TSU note: See Comment E-SPM-214-A]) (Sharon Smith, Geological Survey of Canada)	Lack of data and lack of studies.
1-405	E-1-245	A	7	24	7	25	delete these lines. No room (Hugo Beltrami, St. Francis Xavier University)	Moved to earlier section.
1-406	G-1-138	A	7	24	7	25	Suggest moving the sentence to page 4, line 35. (Government of United States)	Agreed. Text moved.
1-407	E-1-246	A	7	25			maybe 'in developing countries and some remote areas' (Michel Rixen, NATO Undersea Research Center)	Rejected. Major lack is in developing countries.
1-408	G-1-140	A	7	27	7	27	A more appropriate caption would be: "Observations of non-climate effects of increases in atmospheric carbon dioxide concentration". The use of the word 'direct' does not seem necessary, particularly since impacts on the marine biosphere through acidification do not seem greatly more direct than effects on, say, the terrestrial biosphere through warming. (Government of New Zealand)	Section deleted.
1-409	E-1-247	A	7	27	7	39	this section does not fit here and should be deleted. There are many other effects of air pollution (in this section, CO2 is treated as one form of air pollution) which are rightly not dealt with in a report on climate change. (Zoltán Somogyi, Hungarian Forest Research Institute)	Section deleted.
1-410	E-1-248	A	7	27	7	39	Given the tremendous amount of information from manipulative experiments involving CO2, I was surprised to see the only mention of direct effects of CO2 on terrestrial ecosystems condensed to three brief sentences about plant growth and C uptake. Nothing is said about	Section deleted.

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							shifts in plant species or biodiversity. Considering the importance of native and semi-natural ecosystems to agriculture and the societies they support, and the abundant literature that very clearly indicates differential species sensitivities to CO ₂ , I would have expected a comment that rising CO ₂ has likely already resulted in species shifts in native and semi-natural plant communities, and will likely invoke future shifts and evolution of Earth's plant life in the future. Although we are a long way from predicting the particulars of such species responses, the evidence that they are likely underway seems compelling. I believe this is likely one of the most important implicates of rising CO ₂ on terrestrial ecosystems. (Jack Morgan, Crops Research Lab)	
1-411	E-1-249	A	7	27	7	39	delete complete section 1.5 (Hugo Beltrami, St. Francis Xavier University)	Section deleted.
1-412	G-1-139	A	7	27	7	39	this section does not fit here and should be deleted. There are many other effects of air pollution (in this section, CO ₂ is treated as one form of air pollution) which are rightly not dealt with in a report on climate change. (Government of Hungary)	Section deleted.
1-413	E-1-252	A	7	29	7	29	It would be useful to add a few words describing the link between increased CO ₂ concentrations and ocean acidification, as done later on in Topic 3 (page 6 line 36). (Annarita Mariotti, ENEA)	Section deleted.
1-414	E-1-254	A	7	29	7	29	Exchange "although" with "and". (Dagmar Schröter, Umweltbundesamt GmbH)	Sentence deleted.
1-415	E-1-256	A	7	29	7	29	although the [insert 'extent of the'] impacts (David White, ASIT Consulting)	Sentence deleted.
1-416	E-1-257	A	7	29	7	29	add "marine calcifying organsims such as" before "corals" (Janice Lough, Australian Institute of Marine Science)	Sentence deleted.
1-417	E-1-255	A	7	29	7	30	effects of ocean acidification are 'as yet uncertain' yet in Topic 3 (page 6, lines 38-39) the text states that ocean acidification with medium confidence will have negative impact on corals (Thomas Spencer, University of Cambridge)	Projection versus observation.
1-418	E-1-250	A	7	29	7	33	Suggest a shorter formulation here that also reduces repetition: "Ocean acidification is occurring. There is evidence that the average pH of surface seawater has fallen by 0.1 units in the last 200 years. The impacts, for example on corals and the marine biosphere are as yet undocumented and uncertain." (Markku Rummukainen, Swedish Meteorological and Hydrological Institute (SMHI))	Agreed. Have shortened text.
1-419	E-1-251	A	7	29	7	33	Ocean acidification is not only a gradual phenomenon but might also be particularly sensitive to critical thresholds. Maybe this aspect is worth mentioning in the context of this paragraph. (Gian-Reto Walther, University of Bayreuth)	Too detailed for SYR.

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1-420	E-1-253	A	7	29	7	33	I thought there were observations of changes in the compensation depth that should be mentioned as an impact that is occurring--it might also be said that we may not be seeing an effect because we have just started looking and that there are other factors having a detrimental influence (e.g., on coral reefs). (Michael MacCracken, Climate Institute)	Too detailed. Statement on multiple stresses now added in earlier section.
1-421	G-1-141	A	7	29	7	39	Where possible, add consistent certainty language. (Government of Australia)	Not available.
1-422	E-1-259	A	7	30	7	30	If you accept the change in line 29 then change 'are as yet uncertain' to 'is as yet uncertain'. (David White, ASIT Consulting)	Sentence deleted.
1-423	E-1-260	A	7	30	7	30	"pH of near surface" (John Church, CSIRO)	Agreed.
1-424	G-1-142	A	7	30	7	30	The construction "there is evidence" that average pH has fallen is weaker than the finding provided in the WG1 SPM on this issue. The WG1 finding states definitively that there has been "a decrease of 0.1 units since pre-industrial times", this should be repeated here. (Government of Australia)	Agreed. WGI SPM text adopted.
1-425	G-1-144	A	7	30	7	30	It is unclear why the SYR authors have changed the finding contained in the WG2 SPM, by stating that the impacts of ocean acidification are "uncertain" rather than "undocumented". Unless the authors have a sound scientific reason for making this change the WG2 finding of "undocumented" should be repeated here. (Government of Australia)	Sentence deleted.
1-426	E-1-258	A	7	30	7	31	The text almost, but doesn't quite, say that the change in pH is due to CO ₂ - readers might assume it is due to sulphur deposition or something, so I would be explicit here. (Keith Shine, University of Reading)	Agreed. Added explanatory text from WGI SPM.
1-427	G-1-143	A	7	30	7	32	Please add to this line the statement, "AS A RESULT OF ENHANCED UPTAKE OF CARBON FROM THE ATMOSPHERE". This linkage may seem obvious to some readers, but to others, the linkage between the changing atmospheric CO ₂ and increasing acidity in the ocean may need to be made clear. (Government of Canada)	Agreed. Added explanatory text from WGI SPM.
1-428	E-1-261	A	7	31	7	31	Please check the '30%' value; it should actually be '26%'. (Perhaps it is close enough). (Henry Janzen, Agriculture and Agri-Food Canada)	Figure taken from WGI 5.4.
1-429	G-1-145	A	7	32	7	32	The term 'surface oceans' is not clear. Is 'ocean surface' intended? The earlier part of the sentence uses the term 'surface seawater' - why not continue to use the same term, if it is accurate?	Agreed. Text changed.

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							(Government of New Zealand)	
1-430	E-1-262	A	7	32	7	33	Need to clarify that observed effects not found, as yet, in the natural biosphere, although modelling and experimental studies indicate that one outcome will be reduced ability of marine calcifying organisms to build their skeletons and shells. (Janice Lough, Australian Institute of Marine Science)	Topic does not cite modeled or experimental effects.
1-431	G-1-146	A	7	32	7	33	Delete last sentence as it is repetitious. (Government of Australia)	Deleted first sentence of paragraph to avoid repetition.
1-432	E-1-263	A	7	33	7	33	This is biased towards the negative. E.g., NOAA Paleo data indicate corals were much more broadly distributed during the mid-cretaceous when the temp was much higher than forecast and CO2 levels were 2-4X higher (http://www.ncdc.noaa.gov/paleo/globalwarming/cretaceous.html) Add at end: Further, there is no evidence from the rapidly expanding and globally distributed molluscan aquaculture industry of any difficulty in shell formation. (John Everett, Ocean Associates, Inc.)	No value judgement included in statement.
1-433	E-1-264	A	7	33	7	33	Replace "undocumented" by "scantily documented" (there are actually several studies out there, e.g. Orr et al, 2005 or Feely et al, 2004). Cited reference(s): Orr, J. C., V. J. Fabry, O. Aumont, L. Bopp, S. C. Doney, R. A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R. M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R. G. Najjar, G. K. Plattner, K. B. Rodgers, C. L. Sabine, J. L. Sarmiento, R. Schlitzer, R. D. Slater, I. J. Totterdell, M. F. Weirig, Y. Yamanaka & A. Yool, 2005. "Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms." Nature (London), 437(7059): 681-686. http://dx.doi.org/10.1038/nature04095 ; Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleypas, V. J. Fabry & F. J. Millero, 2004. "Impact of anthropogenic CO2 on the CaCO3 system in the oceans." Science, 305(5682): 362-366. http://dx.doi.org/10.1126/science.1097329 (Andreas Fischlin, Integrative Biology - Systems Ecology)	Literature does not document observed impact. Topic does not include modeled or experimental effects.
1-434	E-1-265	A	7	33	7	33	Change 'as yet undocumented' to 'little documented' (David White, ASIT Consulting)	Literature does not document observed impact. Topic does not include modeled or experimental effects.
1-435	E-1-266	A	7	33			At end of paragraph add 'There is evidence that increases in ocean acidity will decrease coral reef growth.' (M. James C. Crabbe, University of Bedfordshire)	Projection – not Topic 1 province.
1-436	G-1-148	A	7	35	7	35	The authors should make it clear that the statement refers to current uptake of carbon by the terrestrial system. As currently drafted it could be confused with future projections of terrestrial carbon uptake.	Clearly about observations not projections.

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							(Government of Australia)	
1-437	E-1-267	A	7	35	7	36	Role of tropical forests as a Carbon sink? (Germán Poveda, Universidad Nacional de Colombia)	Section deleted.
1-438	E-1-268	A	7	35	7	39	Insert "are limited in scale and thus difficult to generalize" after "most experiments and studies ". Replace "show" by "have shown". Delete "water". Last sentence should then read: "However, most experiments and studies are limited in scale and thus difficult to generalize and have shown that such responses appear to be strongly coupled to other effects such as availability of nutrients." (Andreas Fischlin, Integrative Biology - Systems Ecology)	Section deleted
1-439	G-1-147	A	7	35	7	39	There are thousands of papers on the effect of high CO2 on plant photosynthesis and plant growth. Most of them are related to temperate plant species, but there is a strong tendency for higher photosynthetic rates and biomass increase under high CO2. A lower effect is expected on flower and fruit production and this suggests a lower impact on crops which yield fruits and seeds whereas there will be a high positive impact on crops that don't rely on reproduction for productivity such as sugarcane (my data, unpublished). The effect of temperature is relatively less studied, but is thought to be additive to the effects of CO2 for a long period until the optimal temperatures for biochemical processes such as photosynthesis and respiration are passed by. If this is true, we can expect an increase in food production which will be followed by a decrease. A big problem here is that people will not believe that the climatic changes are happening if the climatic situation apparently is getting better. So, this possibility of a large decrease in productivity after a high, should be very clear. Regarding the natural biomes, the increase in biomass may have an impact on the food chains as the availability of food might increase, at least for a certain period. In places where relatively less water will be available such as the Northern US, Oriental Amazon, Africa and Australia, where C4 plants may take places where before there were C3, the increase in biomass might have an impact on big animals (e.g), favoring reproduction and increasing their populations. But the effect would be similar to the one described above for crops. (Government of Brazil)	Section deleted
1-440	G-1-7	C	7	36	7	37	" Should mention negative impacts of temperature increases and precipitation changes on crops " (Government of Belgium)	Section deleted
1-441	E-1-269	A	7	37	7	39	The effect of nutrient deposition mentioned on the line 37 obviously depends on nutrients, therefore I recommend to replace the words on the line 39, "such as availability of water and nutrients" with the words "such as availability of water" to avoid the tautology. (Georgii Alexandrov, National Institute for Environmental Studies)	Section deleted

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1-442	G-1-149	A	7	37	7	39	Nutrient availability is not an "effect" but a "factor". (Government of European Community)	Section deleted
1-443	G-1-150	A	7	38	7	38	The authors should define "most experiments" and "strongly" coupled. (Government of Australia)	Section deleted
1-444	E-1-270	A	7	38	7	39	In the context of what is called 'other effects' in the last sentence of this paragraph, the important aspect the magnitude and direction of the response of plants to elevated CO2 is highly species-specific is here lacking! (Gian-Reto Walther, University of Bayreuth)	Section deleted
1-445	E-1-271	A	7	38	7	39	"Strongly" coupled? Maybe this is true for some species but not for all. (María Isabel Travasso, Instituto Nacional de Tecnología Agropecuaria)	Section deleted
1-454	G-1-6	D	7	38	7	39	The concept of "strongly" coupled" might be true for some species but not for all. (Government of Argentina)	Section deleted
1-446	E-1-272	A	7	39	7	39	Same as above. [TSU note: See Comment E-SPM-365-A] (Knute Nadelhoffer, University of Michigan)	Section deleted
1-447	E-1-273	A	7				Very well done! (Paul Epstein, Harvard Medical School)	Noted.
1-448	E-1-274	A	8	8	9	16	Add some comments about the concept of good governance (including transparent and non-corrupt democratic institutions and processes) (Leila Devia , National industrial technology)	Not part of Topic 1.