

# Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis

## Summary for Policy Makers

### Technical Summary

#### Chapter 1: Introduction

##### Executive Summary

- Rationale and key concepts of the WG1 contribution
- Treatment of uncertainty
- Climate change projections since FAR

##### Frequently Asked Questions

#### Chapter 2: Observations: Atmosphere and Surface

##### Executive Summary

- Changes in surface temperature and soil temperature
- Changes in temperature, humidity and clouds
- Changes in atmospheric composition
- Changes in radiation fields and energy budget
- Changes in hydrology, runoff, precipitation and drought
- Changes in atmospheric circulation, including wind
- Spatial and temporal patterns of climate variability
- Changes in extreme events, including tropical and extratropical storms

##### Frequently Asked Questions

#### Chapter 3: Observations: Ocean

##### Executive Summary

- Changes in ocean temperature and heat content
- Ocean salinity change and freshwater fluxes
- Sea level change, ocean waves and storm surges
- Ocean biogeochemical changes, including ocean acidification
- Changes in ocean surface processes
- Changes in ocean circulation
- Spatial and temporal patterns of ocean variability

##### Frequently Asked Questions

#### Chapter 4: Observations: Cryosphere

##### Executive Summary

- Changes in ice sheets, including mass balance
- Changes in ice shelves
- Changes in glaciers and ice caps
- Sea ice variability and trends
- Snow and ice cover variability and trends
- Changes in frozen ground
- Dynamics of ice sheets, ice shelves, ice caps, glaciers and sea ice

##### Frequently Asked Questions

## **Chapter 5: Information from Paleoclimate Archives**

### Executive Summary

- Characteristics of early instrumental, documentary and natural climate archives
- Reconstruction of radiative forcing and climate response
- Reconstruction of regional variability and extremes
- Abrupt climate changes and their regional expression
- Sea level and ice sheets: patterns, amplitudes and rates of change
- Paleoclimate perspective on irreversibility in the climate system
- Paleodata-model intercomparisons

### Frequently Asked Questions

## **Chapter 6: Carbon and Other Biogeochemical Cycles**

### Executive Summary

- Past changes in CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and biogeochemical cycles
- Recent trends in global and regional sources, sinks and inventories, including land use change
- Processes and understanding of changes, including ocean acidification
- Interactions between the carbon and other biogeochemical cycles, including the nitrogen cycle
- Projections of changes in carbon and other biogeochemical cycles
- Greenhouse gas stabilisation
- Carbon cycle – climate feedbacks and irreversibility
- Geoengineering involving the carbon cycle

### Frequently Asked Questions

## **Chapter 7: Clouds and Aerosols**

### Executive Summary

- Observations of clouds and their representation in models
- Coupling of clouds, water vapour, precipitation and the large-scale circulation
- Cloud and water vapour feedbacks and their effects on climate sensitivity
- Observations of aerosols and their representation in models
- Aerosol types including black carbon: chemistry, sources, sinks and distribution
- Direct and indirect aerosol forcing and effects, including contrails and cosmic rays
- Aerosol-cloud-precipitation interactions
- Geoengineering involving clouds and aerosols

### Frequently Asked Questions

## **Chapter 8: Anthropogenic and Natural Radiative Forcing**

### Executive Summary

- Natural radiative forcing changes: solar and volcanic
- Anthropogenic radiative forcing, including effects from land surface changes
- Effects of atmospheric chemistry and composition
- Spatial and temporal expression of radiative forcing
- Greenhouse gas and other metrics, including Global Warming Potential (GWP) and Global Temperature Change Potential (GTP)

### Frequently Asked Questions

## **Chapter 9: Evaluation of Climate Models**

### Executive Summary

- The hierarchy of climate models: from global to regional
- Downscaling methods
- Assessing model performance, including quantitative measures and their use
- New model components and couplings
- Representation of processes and feedbacks in climate models
- Simulation of recent and longer term records
- Simulation of regional patterns, variability and extremes

### Frequently Asked Questions

## **Chapter 10: Detection and Attribution of Climate Change: from Global to Regional**

### Executive Summary

- Evaluation of methodologies
- Atmospheric and surface changes
- Changes in ocean properties
- Cryosphere changes
- Extreme events
- Pre-instrumental perspective
- Implications of attribution for projections

### Frequently Asked Questions

## **Chapter 11: Near-term Climate Change: Projections and Predictability**

### Executive Summary

- Predictability of interannual to decadal climate variations and change
- Projections for the next few decades
- Regional climate change, variability and extremes
- Atmospheric composition and air quality
- Possible effects of geoengineering
- Quantification of the range of climate change projections

### Frequently Asked Questions

## **Chapter 12: Long-term Climate Change: Projections, Commitments and Irreversibility**

### Executive Summary

- Scenario description
- Projections for the 21<sup>st</sup> century
- Projections beyond the 21<sup>st</sup> century
- Regional climate change, variability and extremes
- Forcing, response and climate sensitivity
- Climate change commitment and inertia
- Potential for abrupt change and irreversibility in the climate system
- Quantification of the range of climate change projections

### Frequently Asked Questions

## **Chapter 13: Sea Level Change**

### Executive Summary

- Synthesis of past sea level change and its components
- Models for sea level change
- Projections of globally averaged sea level rise
- Projections of the regional distribution of sea level change
- Extreme sea level events
- Potential ice sheet instability and its implications
- Multi-century projections

### Frequently Asked Questions

## **Chapter 14: Climate Phenomena and their Relevance for Future Regional Climate Change**

Executive Summary

- Patterns of variability: observations, understanding and projections
- Monsoon systems: observations, understanding and projections
- Extremes: observations, understanding and projections
- Interconnections among phenomena

Frequently Asked Questions

## **Annex I: Atlas of Global and Regional Climate Projections**

**Annex II: Glossary**

**Annex III: Acronyms and Regional Abbreviations**

**Annex IV: List of Authors**

**Annex V: List of Reviewers**

**Index**