

CLIMATE CHANGE 2001

The Scientific Basis



WMO

**Contribution of Working Group I to the Third Assessment
Report of the Intergovernmental Panel on Climate Change**



UNEP

Climate Change 2001: The Scientific Basis

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Contribution of Working Group I to the Third Assessment Report
of the Intergovernmental Panel on Climate Change

Published for the Intergovernmental Panel on Climate Change



CAMBRIDGE
UNIVERSITY PRESS

Contents

Foreword	vii
Preface	ix
Summary for Policymakers	1
Technical Summary	21
1 The Climate System: an Overview	85
2 Observed Climate Variability and Change	99
3 The Carbon Cycle and Atmospheric Carbon Dioxide	183
4 Atmospheric Chemistry and Greenhouse Gases	239
5 Aerosols, their Direct and Indirect Effects	289
6 Radiative Forcing of Climate Change	349
7 Physical Climate Processes and Feedbacks	417
8 Model Evaluation	471
9 Projections of Future Climate Change	525
10 Regional Climate Information – Evaluation and Projections	583
11 Changes in Sea Level	639
12 Detection of Climate Change and Attribution of Causes	695
13 Climate Scenario Development	739
14 Advancing Our Understanding	769
Appendix I Glossary	787
Appendix II SRES Tables	799
Appendix III Contributors to the IPCC WGI Third Assessment Report	827
Appendix IV Reviewers of the IPCC WGI Third Assessment Report	845
Appendix V Acronyms and Abbreviations	861
Appendix VI Units	869
Appendix VII Some Chemical Symbols used in this Report	871
Appendix VIII Index	873

Source Information: Summary for Policymakers

This appendix provides the cross-reference of the topics in the Summary for Policymakers (page and bullet point topic) to the sections of the chapters of the full report that contain expanded information about the topic.

An increasing body of observations gives a collective picture of a warming world and other changes in the climate system.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
2	<i>The global average surface temperature has increased over the 20th century by about 0.6°C.</i> ● Chapter 2.2.2 ● Chapter 2.2.2 ● Chapter 2.3 ● Chapter 2.2.2
4	<i>Temperatures have risen during the past four decades in the lowest 8 kilometres of the atmosphere.</i> ● Chapter 2.2.3 and 2.2.4 ● Chapter 2.2.3 and 2.2.4 ● Chapter 2.2.3, 2.2.4 and Chapter 12.3.2
4	<i>Snow cover and ice extent have decreased.</i> All three bullet points: Chapter 2.2.5 and 2.2.6
4	<i>Global average sea level has risen and ocean heat content has increased.</i> ● Chapter 11.3.2 ● Chapter 2.2.2 and Chapter 11.2.1
4 – 5	<i>Changes have also occurred in other important aspects of climate.</i> ● Chapter 2.5.2 ● Chapter 2.7.2 ● Chapter 2.2.2 and 2.5.5 ● Chapter 2.7.2 ● Chapter 2.6.2 and 2.6.3 ● Chapter 2.7.3 ● Chapter 2.7.3
5	<i>Some important aspects of climate appear not to have changed.</i> ● Chapter 2.2.2 ● Chapter 2.2.5 ● Chapter 2.7.3 ● Chapter 2.7.3

Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are expected to affect the climate system.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
5	Chapeau: “Changes in climate occur ...” Chapter 1, Chapter 3.1, Chapter 4.1, Chapter 5.1, Chapter 6.1, 6.2, 6.9, 6.11 and 6.13
7	<i>Concentrations of atmospheric greenhouse gases and their radiative forcing have continued to increase as a result of human activities.</i> Carbon dioxide: ● Chapter 3.3.1, 3.3.2, 3.3.3 and 3.5.1 ● Chapter 3.5.1 ● Chapter 3.2.2, 3.2.3, 3.5.1 and Table 3.1 ● Chapter 3.5.1 and 3.5.2 Methane: ● Chapter 4.2.1 Nitrous oxide: ● Chapter 4.2.1 Halocarbons: ● Chapter 4.2.2 Radiative forcing of well-mixed gases: ● Chapter 4.2.1 and Chapter 6.3 Stratospheric ozone: ● Chapter 4.2.2 and Chapter 6.4 Tropospheric ozone: ● Chapter 4.2.4 and Chapter 6.5
9	<i>Anthropogenic aerosols are short-lived and mostly produce negative radiative forcing.</i> ● Chapter 5.2 and 5.5.4 ● Chapter 5.1, 5.2 and Chapter 6.7 ● Chapter 5.3.2, 5.4.3 and Chapter 6.8
9	<i>Natural factors have made small contributions to radiative forcing over the past century.</i> ● Chapter 6.11 and 6.15.1 ● Chapter 6.9 and 6.15.1 ● Chapter 6.15.1

Confidence in the ability of models to project future climate has increased.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
9	Chapeau: “Complex physically-based ...” Chapter 8.3.2, 8.5.1, 8.6.1, 8.10.3 and Chapter 12.3.2
9	● Chapter 7.2.1, 7.5.2 and 7.6.1 ● Chapter 8.4.2 ● Chapter 8.6.3 and Chapter 12.3.2 ● Chapter 8.5.5, 8.7.1 and 8.7.5

There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
10	Chapeau: “The SAR concluded: The balance of evidence suggests ...” Chapter 12.1.2 and 12.6
10	● Chapter 12.2.2, 12.4.3 and 12.6 ● Chapter 12.4.1, 12.4.2, 12.4.3 and 12.6 ● Chapter 12.2.3, 12.4.1, 12.4.2, 12.4.3 and 12.6 ● Chapter 12.4.3 and 12.6. ● Chapter 12.6 ● Chapter 12.4.3 ● Chapter 12.4.3 and 12.6
10	“In the light of new evidence and taking into account the ...” Chapter 12.4 and 12.6
10	“Furthermore, it is very likely that the 20th century warming has ...” Chapter 11.4

Human influences will continue to change atmospheric composition throughout the 21st century.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
12	Chapeau: “Models have been used to make projections ...” Chapter 4.4.5 and Appendix II
12	<i>Greenhouse gases</i> ● Chapter 3.7.3 and Appendix II ● Chapter 3.7.1, 3.7.2, 3.7.3 and Appendix II ● Chapter 3.7.3 and Appendix II ● Chapter 3.2.2 and Appendix II ● Chapter 4.4.5, 4.5, 4.6 and Appendix II ● Chapter 3.7.3
12	<i>Aerosols</i> ● Chapter 5.5.2, 5.5.3 and Appendix II
12	<i>Radiative forcing over the 21st century</i> ● Chapter 6.15.2 and Appendix II

Global average temperature and sea level are projected to rise under all IPCC SRES scenarios.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
13	<i>Temperature</i> ● Chapter 9.3.3 ● Chapter 9.3.3 ● Chapter 2.2.2, 2.3.2 and 2.4 ● Chapter 9.3.3 and Chapter 10.3.2 ● Chapter 8.6.1, Chapter 12.4.3, Chapter 13.5.1 and 13.5.2 ● Chapter 10.3.2 and Box 10.1 ● Chapter 9.3.2
13	<i>Precipitation</i> ● Chapter 9.3.1, 9.3.6, Chapter 10.3.2 and Box 10.1
15	<i>Extreme events</i> Table 1: Chapter 2.1, 2.2, 2.5, 2.7.2, 2.7.3, Chapter 9.3.6 and Chapter 10.3.2 ● Chapter 2.7.3 and Chapter 9.3.6
16	<i>El Niño</i> ● Chapter 9.3.5 ● Chapter 9.3.5
16	<i>Monsoons</i> ● Chapter 9.3.5
16	<i>Thermohaline circulation</i> ● Chapter 9.3.4
16	<i>Snow and ice</i> ● Chapter 9.3.2 ● Chapter 11.5.1 ● Chapter 11.5.1 ● Chapter 11.5.4
16	<i>Sea level</i> ● Chapter 11.5.1

Anthropogenic climate change will persist for many centuries.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
17	● Chapter 3.2.3, Chapter 4.4 and Chapter 6.15 ● Chapter 9.3.3 and 9.3.4 ● Chapter 11.5.4 ● Chapter 11.5.4 ● Chapter 11.5.4

Further work is required to address remaining gaps in information and understanding.

SPM Page	Cross-Reference: SPM Topic – Chapter Section
17 – 18	All bullet points: Chapter 14, Executive Summary

Source Information: Technical Summary

This Appendix provides the cross-reference of the topics in the Technical Summary (page and section) to the sections of the chapters that contain expanded information about the topic.

Section A: Introduction

TS Page	Technical Summary Section and Topic – Chapter Section
22	<i>A.1 The IPCC and its Working Groups</i> Introduction to the Intergovernmental Panel on Climate Change (from the IPCC Secretariat, Geneva) or the IPCC web page at http://www.ipcc.ch
22 – 23	<i>A.2 The First and Second Assessment Reports of Working Group I</i> IPCC, 1990a: Climate Change: The IPCC Scientific Assessment. J.T. Houghton, G.J. Jenkins and J.J. Ephraums (eds.), Cambridge University Press, Cambridge, United Kingdom, 365 pp. IPCC, 1992: Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment. J.T. Houghton, B.A. Callander and S.K. Varney (eds.), Cambridge University Press, Cambridge, United Kingdom, 198 pp. IPCC, 1994: Climate Change 1994: Radiative Forcing of Climate Change and an Evaluation of the IPCC IS92 Emission Scenarios. J.T. Houghton, L.G. Meira Filho, J. Bruce, Hoesung Lee, B.A. Callander, E. Haites, N. Harris and K. Maskell (eds.), Cambridge University Press, Cambridge, United Kingdom, 339 pp. IPCC, 1996a: Climate Change 1995: The Science of Climate Change. Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change [Houghton, J.T., L.G. Meira Filho, B.A. Callander, N Harris, A. Kattenberg, and K. Maskell (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 572 pp.
23 – 24	<i>A.3 The Third Assessment Report: This Technical Summary</i> Background to these questions is in Chapter 1. Box 1: What drives changes in climate? – Chapter 1.

Section B: The Observed Changes in the Climate System

TS Page	Technical Summary Section and Topic – Chapter Section
26 – 29	<i>B.1 Observed Changes in Temperature</i> Temperatures in the instrumental record for land and oceans – Chapter 2.2.2 and 2.3. Temperatures above the surface layer from satellite and weather balloon records – Chapter 2.2.3 and 2.2.4. Surface temperatures during the pre-instrumental record from the proxy record Last 1,000 years – Chapter 2.3. Last glacial and deglaciation – Chapter 2.4.
30	<i>B.2 Observed Changes in Precipitation and Atmospheric Moisture</i> Annual land-surface precipitation – Chapter 2.5.2. Water vapour – Chapter 2.5.3. Cloud amounts – Chapter 2.5.5.
30	<i>B.3 Observed Changes in Snow Cover and Land- and Sea-Ice Extent</i> Snow cover and land-ice extent – Chapter 2.2.5. Sea-ice extent – Chapter 2.2.5. Arctic sea-ice thickness – Chapter 2.2.5.
31 – 32	<i>B.4 Observed Changes in Sea Level Changes During the Instrumental Record</i> Tide gauge data for the 20th century – Chapter 11.3.2. Box 2: What causes sea level to change? – Chapter 11.2. Changes during the pre-instrumental record – Chapter 11.3.1.
32 – 33	<i>B.5 Observed Changes in Atmospheric and Oceanic Circulation Patterns</i> El Niño-Southern Oscillation (ENSO) – Chapter 2.6.2 and 2.6.3. North Atlantic, Arctic, and Antarctic oscillations – Chapter 2.6.5 and 2.6.6.
33	<i>B.6 Observed Changes in Climate Variability and Extreme Weather and Climate Events</i> Heavy and extreme precipitation – Chapter 2.7.2. Tropical and extra-tropical storms – Chapter 2.7.3.
33	<i>B.7 The Collective Picture: A Warming World and Other Changes in the Climate System</i> A warming world – Chapter 2.8. Little or no change – Chapter 2.2.5 and 2.7.3.

Section C: The Forcing Agents That Cause Climate Change

TS Page	Technical Summary Section and Topic – Chapter Section
38 – 43	<i>C.1 Observed Changes in Globally Well-Mixed Greenhouse Gas Concentrations and Radiative Forcing.</i> Carbon dioxide – Chapter 3.2.2, 3.2.3, 3.3.1, 3.3.2, and 3.5, Chapter 6.13 Methane – Chapter 4.2.1, Chapter 6.13. Nitrous Oxide – Chapter 4.2, Chapter 6.13. Halocarbons and Related Compounds – Chapter 4.2.2, Chapter 6.13.
43 – 44	<i>C.2 Observed Changes in Other Radiatively Important Gases</i> Atmospheric ozone – Chapter 4.2.2 and 4.2.4, Chapter 6.13. Gases with only indirect radiative influence – Chapter 4.2.3, Chapter 6.13
44 – 45	<i>C.3 Observed and Modelled Changes in Aerosols</i> Observed and modelled changes in aerosols – Chapter 5.1, 5.2, 5.3 and 5.4, Chapter 6.7 and 6.8.
45	<i>C.4 Observed Changes in Other Anthropogenic Forcing Agents</i> Land-use (albedo) change – Chapter 6.13.
45 – 46	<i>C.5 Observed and Modelled Changes in Solar Activity</i> Observed and modelled changes in solar activity – Chapter 6.10.
46	<i>C.6 Global Warming Potentials</i> Global warming potentials - Chapter 6.12

Section D: The Simulation of the Climate System and Its Changes

TS Page	Technical Summary Section and Topic – Chapter Section
46 – 51	<i>D.1 Climate Processes and Feedbacks</i> Box 3: Climate Models: How are they built and how are they applied? – Chapter 8.3. Water vapour – Chapter 7.2.1. Clouds – Chapter 7.2.2 and 7.2.3, Chapter 8.5.1. Stratosphere – Chapter 7.2.4 and 7.2.5, Chapter 8.5.1. Ocean – Chapter 7.3, Chapter 8.5.2. Cryosphere – Chapter 7.5, Chapter 8.5.3. Land surface – Chapter 7.4, Chapter 8.5.4. Carbon cycle – Chapter 3.6.
51 – 53	<i>D.2 The Coupled Systems</i> Modes of natural variability – Chapter 7.6, Chapter 8.7. Box 4: The El Niño/Southern Oscillation (ENSO) – Chapter 7.6.5, Chapter 8.7.1 The thermohaline circulation – Chapter 7.3.7 and 7.7, Chapter 9.3.4. Non-linear events and rapid climate change – Chapter 7.7.
53 – 54	<i>D.3 Regionalisation Techniques</i> Categories of techniques – Chapter 10.1, 10.2, Chapter 13. Coarse resolution AOGCMs – Chapter 10.3, Chapter 13. High resolution RCMs – Chapter 10.5, Chapter 13.
54 – 55	<i>D.4 Overall Assessment of Abilities</i> Flux adjustment – Chapter 7.2, 7.3 and 7.6, Chapter 8.4 and 8.9. Climate of the 20th century – Chapter 8.6. Extreme events – Chapter 8.8. Interannual variability – Chapter 8.7. Model intercomparisons – Chapter 8.6.2 and 8.10.

Section E: The Identification of a Human Influence on Climate Change

TS Page	Technical Summary Section and Topic – Chapter Section
55 – 56	<i>E.1 The Meaning of Detection and Attribution</i> Detection/Attribution – Chapter 12.1.1 and 12.2.
56	<i>E.2 A Longer and More Closely Scrutinised Observational Record</i> Three of last five years – Chapter 12.2.1.
56	<i>E.3 New Model Estimates of Internal Variability</i> The warming over the past 100 years – Chapter 12.2.2.
57	<i>E.4 New Estimates of Responses to Natural Forcing</i> Natural forcing alone – Chapter 12.2.3.
57	<i>E.5 Sensitivity to Estimates of Climate Changes Signals</i> Responses to anthropogenic forcing – Chapter 12.2.3. Significant anthropogenic forcing contribution – Chapter 12.2.3.
57 – 59	<i>E.6 A Wider Range of Detection Techniques</i> Temperature – Chapter 12.3 and 12.4. Sea level – Chapter 11.4.
59 – 61	<i>E.7 Remaining Uncertainties in Detection and Attribution</i> Summary – Chapter 12.5.
61	<i>E.8 Synopsis</i> Most of the observed warming over the past 50 years – Chapter 12.6.

Section F: The Projections of the Earth's Future Climate

TS Page	Technical Summary Section and Topic – Chapter Section
62 – 63	<i>F.1 The IPCC Special Report on Emissions Scenarios (SRES)</i> SRES scenarios – Chapter 6.15.2, SRES Report. Box 5: The Emission Scenarios of the Special Report on Emission Scenarios (SRES) – Chapter 6.15.2, SRES Report, Appendix II.
63 – 66	<i>F.2 Projections of Future Changes in Greenhouse Gases and Aerosols</i> CO ₂ concentration trajectories – Chapter 3.3 and 3.7, Appendix II. Carbon storage in terrestrial ecosystems – Chapter 3.2 and 3.6. Abundance of the non-CO ₂ greenhouse gases – Chapter 4.3, Chapter 6.15, Appendix II. Emissions of indirect greenhouse gases and atmospheric chemistry – Chapter 4.4.4 and 4.4.5, Chapter 6.15. Emissions of indirect greenhouse gases and air quality – Chapter 4.4.5 Dependence of the abundance of aerosols on emissions – Chapter 5.5, Chapter 6.15, Appendix II. Projected aerosol emissions and the SRES scenarios – Chapter 5.5 Radiative forcing – Chapter 6.15, Appendix II.
67 – 71	<i>F.3 Projections of Future Changes in Temperature</i> AOGCM Results – Chapter 9.3 Simple Climate Model Results – Chapter 9.3
71 – 72	<i>F.4 Projections of Future Changes in Precipitation</i> Globally averaged precipitation and variability – Chapter 9.3.
72 – 73	<i>F.5 Projections of Future Changes in Extreme Events</i> Changes in extreme events – Chapter 9.3.6.
73	<i>F.6 Projections of Future Changes in Thermohaline Circulation</i> Weakening of Thermohaline Circulation – Chapter 9.3.4.

73	<i>F.7 Projections of Future Changes in Modes of Natural Variability</i> Changes in modes of natural variability – Chapter 9.3.5.
73 – 74	<i>F.8 Projections of Future Changes in Land Ice (Glaciers, Ice Caps and Ice Sheets), Sea Ice and Snow Cover</i> Glaciers, ice caps, and ice sheets – Chapter 11.5.4.
75	<i>F.9 Projections of Future Changes in Sea Level</i> Global average sea level change – Chapter 11.5.1. Regional sea level change – Chapter 11.5.2. Extremes of sea level – Chapter 11.5.3.
75 – 77	<i>F.10 Projections of Future Changes in Response to CO₂ Concentration Stabilisation Profiles</i> Greenhouse gases and aerosols – Chapter 3.7.3. Temperature – Chapter 9.3.3. Sea level – Chapter 11.5.4.

Section G: Advancing Understanding

TS Page	Technical Summary Section and Topic – Chapter Section
78	<i>G.1 Data</i> Decline of observational networks and the observing system – Chapter 14.2.1.
78	<i>G.2 Climate Processes and Modelling</i> Greenhouse gases and aerosols – Chapter 14.2.6. Processes – Chapter 14.2.3. Patterns of variability – Chapter 14.2.2. Ensembles of model results – Chapter 14.2.2. Hierarchy of models – Chapter 14.2.2
79	<i>G.3 Human Aspects</i> Physical system/human system – Chapter 14.3, Chapter 13.1
79	<i>G.4 International Framework</i> Co-ordination – Chapter 14.4.

1

The Climate System: an Overview

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Contents

1.1	Introduction to the Climate System	87	1.3	Human-induced Climate Variations	92
1.1.1	Climate	87	1.3.1	Human Influence on the Climate System	92
1.1.2	The Climate System	87	1.3.2	Modelling and Projection of Anthropogenic Climate Change	94
1.2	Natural Climate Variations	89	1.3.3	Observing Anthropogenic Climate Change	96
1.2.1	Natural Forcing of the Climate System	89	1.4	A 'Road-map' to this Report	97
1.2.2	Natural Variability of Climate	91			
1.2.3	Extreme Events	92			
				References	98

2

Observed Climate Variability and Change

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Contents

Executive Summary	101	2.5 How have Precipitation and Atmospheric Moisture Changed?	142
2.1 Introduction	105	2.5.1 Background	142
2.2 How Much is the World Warming?	105	2.5.2 Changes in Precipitation and Related Variables	142
2.2.1 Background	105	2.5.2.1 Land	142
2.2.2 Temperature in the Instrumental Record for Land and Oceans	105	2.5.2.2 Palaeo-drought	143
2.2.2.1 Land-surface air temperature	105	2.5.2.3 Ocean	145
2.2.2.2 Sea surface temperature and ocean air temperature	110	2.5.3 Water Vapour	146
2.2.2.3 Land and sea combined	112	2.5.3.1 Surface water vapour	146
2.2.2.4 Are the land and ocean surface temperature changes mutually consistent?	116	2.5.3.2 Lower-tropospheric water vapour	147
2.2.2.5 Sub-surface ocean temperatures and salinities	118	2.5.3.3 Upper-tropospheric and lower-stratospheric water vapour	147
2.2.3 Temperature of the Upper Air	119	2.5.4 Evaporation	148
2.2.4 How do Surface and Upper Air Temperature Variations Compare?	121	2.5.4.1 Land	148
2.2.5 Changes in the Cryosphere	123	2.5.5 Clouds	148
2.2.5.1 Snow cover, including snowfall	123	2.5.5.1 Land	149
2.2.5.2 Sea-ice extent and thickness	124	2.5.5.2 Ocean	149
2.2.5.3 Permafrost	127	2.5.5.3 Global	149
2.2.5.4 Mountain glaciers	127	2.5.6 Summary	149
2.2.5.5 Lake and river ice	129	2.6 Are the Atmospheric/Oceanic Circulations Changing?	150
2.2.6 Are the Retreat of Glaciers, Sea Ice, and Snow Cover Consistent with the Surface Temperature Trends?	129	2.6.1 Background	150
2.2.7 Summary	129	2.6.2 El Niño-Southern Oscillation and Tropical/Extra-tropical Interaction	150
2.3 Is the Recent Warming Unusual?	130	2.6.3 Decadal to Inter-decadal Pacific Oscillation, and the North Pacific Oscillation	151
2.3.1 Background	130	2.6.4 Monsoons	152
2.3.2 Temperature of the Past 1,000 Years	130	2.6.5 The Northern Hemisphere, excluding the North Pacific Ocean	152
2.3.2.1 Palaeoclimate proxy indicators	130	2.6.6 The Southern Hemisphere	153
2.3.2.2 Multi-proxy synthesis of recent temperature change	133	2.6.7 Summary	154
2.3.3 Was there a "Little Ice Age" and a "Medieval Warm Period"?	133	2.7 Has Climate Variability, or have Climate Extremes, Changed?	155
2.3.4 Volcanic and Solar Effects in the Recent Record	136	2.7.1 Background	155
2.3.5 Summary	136	2.7.2 Is There Evidence for Changes in Variability or Extremes?	155
2.4 How Rapidly did Climate Change in the Distant Past?	136	2.7.2.1 Temperature	156
2.4.1 Background	136	2.7.2.2 Precipitation	157
2.4.2 How Stable was the Holocene Climate?	138	2.7.3 Is There Evidence for Changes in Extreme Weather or Climate Events?	160
2.4.3 How Fast did Climate Change during the Glacial Period?	140	2.7.3.1 Tropical cyclones	160
2.4.4 How Stable was the Previous Inter-glacial?	141	2.7.3.2 Extra-tropical cyclones	160
2.4.5 Summary	142	2.7.3.3 Droughts and wet spells	162
		2.7.3.4 Tornadoes, hail and other severe local weather	163
		2.7.4 Summary	163
		2.8 Are the Observed Trends Internally Consistent?	163
		References	165

3

The Carbon Cycle and Atmospheric Carbon Dioxide

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Contents

Executive Summary	185		
3.1 Introduction	187		
3.2 Terrestrial and Ocean Biogeochemistry: Update on Processes	191		
3.2.1 Overview of the Carbon Cycle	191		
3.2.2 Terrestrial Carbon Processes	191		
3.2.2.1 Background	191		
3.2.2.2 Effects of changes in land use and land management	193		
3.2.2.3 Effects of climate	194		
3.2.2.4 Effects of increasing atmospheric CO ₂	195		
3.2.2.5 Effects of anthropogenic nitrogen deposition	196		
3.2.2.6 Additional impacts of changing atmospheric chemistry	197		
3.2.2.7 Additional constraints on terrestrial CO ₂ uptake	197		
3.2.3 Ocean Carbon Processes	197		
3.2.3.1 Background	197		
3.2.3.2 Uptake of anthropogenic CO ₂	199		
3.2.3.3 Future changes in ocean CO ₂ uptake	199		
3.3 Palaeo CO₂ and Natural Changes in the Carbon Cycle	201		
3.3.1 Geological History of Atmospheric CO ₂	201		
3.3.2 Variations in Atmospheric CO ₂ during Glacial/inter-glacial Cycles	202		
3.3.3 Variations in Atmospheric CO ₂ during the Past 11,000 Years	203		
3.3.4 Implications	203		
3.4 Anthropogenic Sources of CO₂	204		
3.4.1 Emissions from Fossil Fuel Burning and Cement Production	204		
3.4.2 Consequences of Land-use Change	204		
3.5 Observations, Trends and Budgets	205		
3.5.1 Atmospheric Measurements and Global CO ₂ Budgets	205		
		3.5.2 Interannual Variability in the Rate of Atmospheric CO ₂ Increase	208
		3.5.3 Inverse Modelling of Carbon Sources and Sinks	210
		3.5.4 Terrestrial Biomass Inventories	212
	3.6 Carbon Cycle Model Evaluation		213
	3.6.1 Terrestrial and Ocean Biogeochemistry Models		213
	3.6.2 Evaluation of Terrestrial Models		214
	3.6.2.1 Natural carbon cycling on land		214
	3.6.2.2 Uptake and release of anthropogenic CO ₂ by the land		215
	3.6.3 Evaluation of Ocean Models		216
	3.6.3.1 Natural carbon cycling in the ocean		216
	3.6.3.2 Uptake of anthropogenic CO ₂ by the ocean		216
	3.7 Projections of CO₂ Concentration and their Implications		219
	3.7.1 Terrestrial Carbon Model Responses to Scenarios of Change in CO ₂ and Climate		219
	3.7.2 Ocean Carbon Model Responses to Scenarios of Change in CO ₂ and Climate		219
	3.7.3 Coupled Model Responses and Implications for Future CO ₂ Concentrations		221
	3.7.3.1 Methods for assessing the response of atmospheric CO ₂ to different emissions pathways and model sensitivities		221
	3.7.3.2 Concentration projections based on IS92a, for comparison with previous studies		222
	3.7.3.3 SRES scenarios and their implications for future CO ₂ concentration		223
	3.7.3.4 Stabilisation scenarios and their implications for future CO ₂ emissions		224
	3.7.4 Conclusions		224
	References		225

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Contents

Executive Summary	241	4.3.2 Shifting Regional Emissions of NO _x , CO and VOC in 2100	267
4.1 Introduction	243	4.3.3 Projections of Natural Emissions in 2100	267
4.1.1 Sources of Greenhouse Gases	243	4.4 Projections of Atmospheric Composition for the 21st Century	267
4.1.2 Atmospheric Chemistry and Feedbacks	245	4.4.1 Introduction	267
4.1.3 Trace Gas Budgets and Trends	246	4.4.2 The OxComp Workshop	267
4.1.4 Atmospheric Lifetimes and Time-Scales	247	4.4.3 Testing CTM Simulation of the Current (Y2000) Atmosphere	268
4.2 Trace Gases: Current Observations, Trends and Budgets	248	4.4.4 Model Simulations of Perturbed and Y2100 Atmospheres	271
4.2.1 Non-CO ₂ Kyoto Gases	248	4.4.5 Atmospheric Composition for the IPCC Scenarios to 2100	274
4.2.1.1 Methane (CH ₄)	248	4.4.6 Gaps in These Projections - the Need for Coupled Models	275
4.2.1.2 Nitrous oxide (N ₂ O)	251	4.4.7 Sensitivity Analysis for Individual Sectors	275
4.2.1.3 Hydrofluorocarbons (HFCs)	253	4.5 Open Questions	277
4.2.1.4 Perfluorocarbons (PFCs) and sulphur hexafluoride (SF ₆)	254	4.5.1 Chemical Processes Important on the Global Scale	277
4.2.2 Montreal Protocol Gases and Stratospheric Ozone (O ₃)	255	4.5.1.1 Missing chemistry, representation of small scales, and changing emission patterns	277
4.2.3 Reactive Gases	256	4.5.1.2 Aerosol interactions with tropospheric O ₃ and OH	277
4.2.3.1 Carbon monoxide (CO) and hydrogen (H ₂)	256	4.5.1.3 Stratosphere-troposphere coupling	277
4.2.3.2 Volatile organic compounds (VOC)	257	4.5.1.4 Uncertainties in the tropospheric O ₃ budget	278
4.2.3.3 Nitrogen oxides (NO _x)	259	4.5.2 Impacts of Physical Climate Change on Atmospheric Chemistry	278
4.2.4 Tropospheric O ₃	260	4.5.3 Feedbacks through Natural Emissions	278
4.2.5 Stratospheric H ₂ O	263	4.6 Overall Impact of Global Atmospheric Chemistry Change	279
4.2.6 Tropospheric OH and Photochemical Modelling	263	References	280
4.2.6.1 Laboratory data and the OH lifetime of greenhouse gases	263		
4.2.6.2 Atmospheric measurements and modelling of photochemistry	264		
4.3 Projections of Future Emissions	266		
4.3.1 The Adjusted/Augmented IPCC/SRES Emission Scenarios	266		

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Contents

Executive Summary	291	5.4.1 Summary of Current Model Capabilities	313
5.1 Introduction	293	5.4.1.1 Comparison of large-scale sulphate models (COSAM)	313
5.1.1 Advances since the Second Assessment Report	293	5.4.1.2 The IPCC model comparison workshop: sulphate, organic carbon, black carbon, dust, and sea salt	314
5.1.2 Aerosol Properties Relevant to Radiative Forcing	293	5.4.1.3 Comparison of modelled and observed aerosol concentrations	314
5.2 Sources and Production Mechanisms of Atmospheric Aerosols	295	5.4.1.4 Comparison of modelled and satellite-derived aerosol optical depth	318
5.2.1 Introduction	295	5.4.2 Overall Uncertainty in Direct Forcing Estimates	322
5.2.2 Primary and Secondary Sources of Aerosols	296	5.4.3 Modelling the Indirect Effect of Aerosols on Global Climate Forcing	324
5.2.2.1 Soil dust	296	5.4.4 Model Validation of Indirect Effects	325
5.2.2.2 Sea salt	297	5.4.5 Assessment of the Uncertainty in Indirect Forcing of the First Kind	328
5.2.2.3 Industrial dust, primary anthropogenic aerosols	299	5.5 Aerosol Effects in Future Scenarios	330
5.2.2.4 Carbonaceous aerosols (organic and black carbon)	299	5.5.1 Introduction	330
5.2.2.5 Primary biogenic aerosols	300	5.5.2 Climate Change and Natural Aerosol Emissions	330
5.2.2.6 Sulphates	300	5.5.2.1 Projection of DMS emissions in 2100	331
5.2.2.7 Nitrates	303	5.5.2.2 Projection of VOC emissions in 2100	331
5.2.2.8 Volcanoes	303	5.5.2.3 Projection of dust emissions in 2100	331
5.2.3 Summary of Main Uncertainties Associated with Aerosol Sources and Properties	304	5.5.2.4 Projection of sea salt emissions in 2100	332
5.2.4 Global Observations and Field Campaigns	304	5.5.3 Simulation of Future Aerosol Concentrations	332
5.2.5 Trends in Aerosols	306	5.5.4 Linkage to Other Issues and Summary	334
5.3 Indirect Forcing Associated with Aerosols	307	5.6 Investigations Needed to Improve Confidence in Estimates of Aerosol Forcing and the Role of Aerosols in Climate Processes	334
5.3.1 Introduction	307	References	336
5.3.2 Observational Support for Indirect Forcing	307		
5.3.3 Factors Controlling Cloud Condensation Nuclei	308		
5.3.4 Determination of Cloud Droplet Number Concentration	309		
5.3.5 Aerosol Impact on Liquid-Water Content and Cloud Amount	310		
5.3.6 Ice Formation and Indirect Forcing	311		
5.4 Global Models and Calculation of Direct and Indirect Climate Forcing	313		

6

Radiative Forcing of Climate Change

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Contents

Executive Summary	351		
6.1 Radiative Forcing	353		
6.1.1 Definition	353		
6.1.2 Evolution of Knowledge on Forcing Agents	353		
6.2 Forcing-Response Relationship	353		
6.2.1 Characteristics	353		
6.2.2 Strengths and Limitations of the Forcing Concept	355		
6.3 Well-Mixed Greenhouse Gases	356		
6.3.1 Carbon Dioxide	356		
6.3.2 Methane and Nitrous Oxide	357		
6.3.3 Halocarbons	357		
6.3.4 Total Well-Mixed Greenhouse Gas Forcing Estimate	358		
6.3.5 Simplified Expressions	358		
6.4 Stratospheric Ozone	359		
6.4.1 Introduction	359		
6.4.2 Forcing Estimates	360		
6.5 Radiative Forcing By Tropospheric Ozone	361		
6.5.1 Introduction	361		
6.5.2 Estimates of Tropospheric Ozone Radiative Forcing since Pre-Industrial Times	362		
6.5.2.1 Ozone radiative forcing: process studies	362		
6.5.2.2 Model estimates	363		
6.5.3 Future Tropospheric Ozone Forcing	364		
6.6 Indirect Forcings due to Chemistry	365		
6.6.1 Effects of Stratospheric Ozone Changes on Radiatively Active Species	365		
6.6.2 Indirect Forcings of Methane, Carbon Monoxide and Non-Methane Hydrocarbons	365		
6.6.3 Indirect Forcing by NO _x Emissions	366		
6.6.4 Stratospheric Water Vapour	366		
6.7 The Direct Radiative Forcing of Tropospheric Aerosols	367		
6.7.1 Summary of IPCC WGI Second Assessment Report and Areas of Development	367		
6.7.2 Sulphate Aerosol	367		
6.7.3 Fossil Fuel Black Carbon Aerosol	369		
6.7.4 Fossil Fuel Organic Carbon Aerosol	370		
6.7.5 Biomass Burning Aerosol	372		
6.7.6 Mineral Dust Aerosol	372		
6.7.7 Nitrate Aerosol	373		
6.7.8 Discussion of Uncertainties	374		
6.8 The Indirect Radiative Forcing of Tropospheric Aerosols	375		
6.8.1 Introduction	375		
6.8.2 Indirect Radiative Forcing by Sulphate Aerosols	375		
6.8.2.1 Estimates of the first indirect effect	375		
6.8.2.2 Estimates of the second indirect effect and of the combined effect	375		
6.8.2.3 Further discussion of uncertainties	377		
6.8.3 Indirect Radiative Forcing by Other Species	377		
6.8.3.1 Carbonaceous aerosols	377		
6.8.3.2 Combination of sulphate and carbonaceous aerosols	378		
6.8.3.3 Mineral dust aerosols	378		
6.8.3.4 Effect of gas-phase nitric acid	378		
6.8.4 Indirect Methods for Estimating the Indirect Aerosol Effect	378		
6.8.4.1 The "missing" climate forcing	378		
6.8.4.2 Remote sensing of the indirect effect of aerosols	378		
6.8.5 Forcing Estimates for This Report	379		
6.8.6 Aerosol Indirect Effect on Ice Clouds	379		
6.8.6.1 Contrails and contrail-induced cloudiness	379		
6.8.6.2 Impact of anthropogenic aerosols on cirrus cloud microphysics	379		
6.9 Stratospheric Aerosols	379		
6.10 Land-use Change (Surface Albedo Effect)	380		
6.11 Solar Forcing of Climate	380		
6.11.1 Total Solar Irradiance	380		
6.11.1.1 The observational record	380		
6.11.1.2 Reconstructions of past variations of total solar irradiance	381		
6.11.2 Mechanisms for Amplification of Solar Forcing	382		
6.11.2.1 Solar ultraviolet variation	382		
6.11.2.2 Cosmic rays and clouds	384		
6.12 Global Warming Potentials	385		
6.12.1 Introduction	385		
6.12.2 Direct GWPs	386		
6.12.3 Indirect GWPs	387		
6.12.3.1 Methane	387		
6.12.3.2 Carbon monoxide	387		
6.12.3.3 Halocarbons	390		
6.12.3.4 NO _x and non-methane hydrocarbons	391		
6.13 Global Mean Radiative Forcings	391		
6.13.1 Estimates	391		
6.13.2 Limitations	396		
6.14 The Geographical Distribution of the Radiative Forcings	396		
6.14.1 Gaseous Species	397		
6.14.2 Aerosol Species	397		
6.14.3 Other Radiative Forcing Mechanisms	399		
6.15 Time Evolution of Radiative Forcings	400		
6.15.1 Past to Present	400		
6.15.2 SRES Scenarios	402		
6.15.2.1 Well-mixed greenhouse gases	402		
6.15.2.2 Tropospheric ozone	402		
6.15.2.3 Aerosol direct effect	402		
6.15.2.4 Aerosol indirect effect	404		
Appendix 6.1 Elements of Radiative Forcing Concept	405		
References	406		

7

Physical Climate Processes and Feedbacks

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Contents

Executive Summary	419	7.3 Oceanic Processes and Feedbacks	435
7.1 Introduction	421	7.3.1 Surface Mixed Layer	436
7.1.1 Issues of Continuing Interest	421	7.3.2 Convection	436
7.1.2 New Results since the SAR	422	7.3.3 Interior Ocean Mixing	437
7.1.3 Predictability of the Climate System	422	7.3.4 Mesoscale Eddies	437
7.2 Atmospheric Processes and Feedbacks	423	7.3.5 Flows over Sills and through Straits	438
7.2.1 Physics of the Water Vapour and Cloud Feedbacks	423	7.3.6 Horizontal Circulation and Boundary Currents	439
7.2.1.1 Water vapour feedback	425	7.3.7 Thermohaline Circulation and Ocean Reorganisations	439
7.2.1.2 Representation of water vapour in models	425	7.4 Land-Surface Processes and Feedbacks	440
7.2.1.3 Summary on water vapour feedbacks	426	7.4.1 Land-Surface Parametrization (LSP) Development	440
7.2.2 Cloud Processes and Feedbacks	427	7.4.2 Land-Surface Change	443
7.2.2.1 General design of cloud schemes within climate models	427	7.4.3 Land Hydrology, Runoff and Surface-Atmosphere Exchange	444
7.2.2.2 Convective processes	428	7.5 Cryosphere Processes and Feedbacks	444
7.2.2.3 Boundary-layer mixing and cloudiness	428	7.5.1 Snow Cover and Permafrost	444
7.2.2.4 Cloud-radiative feedback processes	429	7.5.2 Sea Ice	445
7.2.2.5 Representation of cloud processes in models	431	7.5.3 Land Ice	448
7.2.3 Precipitation	431	7.6 Processes, Feedbacks and Phenomena in the Coupled System	449
7.2.3.1 Precipitation processes	431	7.6.1 Surface Fluxes and Transport of Heat and Fresh Water	449
7.2.3.2 Precipitation modelling	431	7.6.2 Ocean-atmosphere Interactions	451
7.2.3.3 The temperature-moisture feedback and implications for precipitation and extremes	432	7.6.3 Monsoons and Teleconnections	451
7.2.4 Radiative Processes	432	7.6.4 North Atlantic Oscillation and Decadal Variability	452
7.2.4.1 Radiative processes in the troposphere	432	7.6.5 El Niño-Southern Oscillation (ENSO)	453
7.2.4.2 Radiative processes in the stratosphere	433	7.6.5.1 ENSO processes	454
7.2.5 Stratospheric Dynamics	434	7.6.5.2 ENSO and tropical storms	455
7.2.6 Atmospheric Circulation Regimes	435	7.7 Rapid Changes in the Climate System	455
7.2.7 Processes Involving Orography	435	References	457

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Contents

Executive Summary	473	8.6 20th Century Climate and Climate Variability	496
8.1 Summary of Second Assessment Report	474	8.6.1 20th Century Coupled Model Integrations Including Greenhouse Gases and Sulphate Aerosols	496
8.2 What is Meant by Evaluation?	474	8.6.2 Coupled Model Variability	499
8.2.1 The Approach: Mean State and Variability in Climate Models	474	8.6.2.1 Comparison with the instrumental record	499
8.2.2 The Basis	474	8.6.2.2 Comparison with palaeo-data	500
8.2.3 Figures of Merit	475	8.6.3 The Role of Volcanic and Solar Forcing and Changes in Land Use	500
8.3 Model Hierarchy	475	8.6.4 Climate of 20th Century: Summary	502
8.3.1 Why is a Hierarchy of Models Important?	475	8.6.5 Commentary on Land Cover Change	503
8.3.2 Three-dimensional Climate Models	475	8.7 Coupled Model: Phenomena	503
8.3.3 Simple Climate Models	475	8.7.1 El Niño-Southern Oscillation (ENSO)	503
8.3.4 Earth System Models of Intermediate Complexity	476	8.7.2 Pacific Decadal Oscillation (PDO)	504
8.4 Coupled Climate Models – Some Methodologies	476	8.7.3 Monsoons	505
8.4.1 Model Initialisation	476	8.7.4 Madden and Julian Oscillation (MJO)	505
8.4.2 Flux Adjustment and Energy Transports		8.7.5 The North Atlantic Oscillation (NAO) and the Arctic Oscillation (AO)	506
8.4.2.1 Does the use of flux adjustments in a model have a significant impact on climate change projections?	479	8.7.6 Pacific-North American (PNA) and Western Pacific (WP) Patterns	506
8.5 Coupled Climate Models – Means	479	8.7.7 Blocking	506
8.5.1 Atmospheric Component	479	8.7.8 Summary	506
8.5.1.1 Development since the SAR	479	8.8 Extreme Events	506
8.5.1.2 Tropospheric climate	479	8.8.1 Extreme Temperature	508
8.5.1.3 Stratospheric climate	484	8.8.2 Extreme Precipitation	508
8.5.1.4 Summary	486	8.8.3 Extra-tropical Storms	508
8.5.2 Ocean Component	486	8.8.4 Tropical Cyclones	508
8.5.2.1 Developments since the SAR	486	8.8.5 Summary and Discussion	509
8.5.2.2 Present climate	486	8.9 Coupled Models – Dependence on Resolution	509
8.5.2.3 Summary	489	8.9.1 Resolution in Atmospheric Models	510
8.5.3 Sea Ice Component	489	8.9.2 Resolution in Ocean Models	510
8.5.4 Land Surface Component (including the Terrestrial Cryosphere)	490	8.9.3 Summary	510
8.5.4.1 Introduction	490	8.10 Sources of Uncertainty and Levels of Confidence in Coupled Models	511
8.5.4.2 Developments since the SAR	491	8.10.1 Uncertainties in Evaluating Coupled Models	511
8.5.4.3 Does uncertainty in land surface models contribute to uncertainties in climate prediction?	492	8.10.2 Levels of Confidence	511
8.5.5 Past Climates	493	8.10.3 Assessment	511
8.5.5.1 Mid-Holocene	493	References	512
8.5.5.2 The last glacial maximum	495		
8.5.5.3 Summary	496		

9

Projections of Future Climate Change

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Contents

Executive Summary	527		
9.1 Introduction	530		
9.1.1 Background and Recap of Previous Reports	530		
9.1.2 New Types of Model Experiments since 1995	531		
9.2 Climate and Climate Change	532		
9.2.1 Climate Forcing and Climate Response	532		
9.2.2 Simulating Forced Climate Change	534		
9.2.2.1 Signal versus noise	534		
9.2.2.2 Ensembles and averaging	534		
9.2.2.3 Multi-model ensembles	535		
9.2.2.4 Uncertainty	536		
9.3 Projections of Climate Change	536		
9.3.1 Global Mean Response	536		
9.3.1.1 1%/yr CO ₂ increase (CMIP2) experiments	537		
9.3.1.2 Projections of future climate from forcing scenario experiments (IS92a)	541		
9.3.1.3 Marker scenario experiments (SRES)	541		
9.3.2 Patterns of Future Climate Change	543		
9.3.2.1 Summary	548		
9.3.3 Range of Temperature Response to SRES Emission Scenarios	554		
		9.3.3.1 Implications for temperature of stabilisation of greenhouse gases	557
		9.3.4 Factors that Contribute to the Response	559
		9.3.4.1 Climate sensitivity	559
		9.3.4.2 The role of climate sensitivity and ocean heat uptake	561
		9.3.4.3 Thermohaline circulation changes	562
		9.3.4.4 Time-scales of response	563
		9.3.5 Changes in Variability	565
		9.3.5.1 Intra-seasonal variability	566
		9.3.5.2 Interannual variability	567
		9.3.5.3 Decadal and longer time-scale variability	568
		9.3.5.4 Summary	570
		9.3.6 Changes of Extreme Events	570
		9.3.6.1 Temperature	570
		9.3.6.2 Precipitation and convection	572
		9.3.6.3 Extra-tropical storms	573
		9.3.6.4 Tropical cyclones	574
		9.3.6.5 Commentary on changes in extremes of weather and climate	574
		9.3.6.6 Conclusions	575
		9.4 General Summary	576
		Appendix 9.1: Tuning of a Simple Climate Model to AOGCM Results	577
		References	578

10

Regional Climate Information – Evaluation and Projections

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Contents

Executive Summary	585	10.5 Regional Climate Models	607
10.1 Introduction	587	10.5.1 Simulations of Current Climate	609
10.1.1 Summary of SAR	587	10.5.1.1 Mean climate: Simulations using analyses of observations	610
10.1.2 The Regional Climate Problem	588	10.5.1.2 Mean climate: Simulations using GCM boundary conditions	610
10.2 Deriving Regional Information: Principles, Objectives and Assumptions	588	10.5.1.3 Climate variability and extreme events	610
10.2.1 Coupled AOGCMs	589	10.5.2 Simulations of Climate Change	613
10.2.2 High Resolution and Variable Resolution AGCM Experiments	589	10.5.2.1 Mean climate	613
10.2.3 Regional Climate Models (RCMs)	590	10.5.2.2 Climate variability and extreme events	615
10.2.4 Empirical/Statistical and Statistical/Dynamical Downscaling	591	10.5.3 Summary and Recommendations	616
10.2.5 Sources of Uncertainty in the Generation of Regional Climate Change Information	591	10.6 Empirical/Statistical and Statistical/Dynamical Methods	616
10.3 Regional Attributes of AOGCMs	591	10.6.1 Introduction	616
10.3.1 Simulations of Current Climate	591	10.6.2 Methodological Options	617
10.3.1.1 Mean climate	591	10.6.2.1 Weather generators	617
10.3.1.2 Climate variability and extreme events	592	10.6.2.2 Transfer functions	617
10.3.2 Simulations of Climate Change	593	10.6.2.3 Weather typing	618
10.3.2.1 Mean climate	593	10.6.3 Issues in Statistical Downscaling	619
10.3.2.2 Climate variability and extreme events	602	10.6.3.1 Temporal variance	619
10.3.3 Summary and Recommendations	603	10.6.3.2 Evaluation	619
10.4 GCMs with Variable and Increased Horizontal Resolution	603	10.6.3.3 Choice of predictors	619
10.4.1 Simulations of Current Climate	603	10.6.4 Intercomparison of Statistical Downscaling Methodologies	620
10.4.1.1 Mean climate	604	10.6.5 Summary and Recommendations	620
10.4.1.2 Climate variability and extreme events	604	10.7 Intercomparison of Methods	621
10.4.2 Simulations of Climate Change	607	10.8 Summary Assessment	622
10.4.2.1 Mean climate	607	Appendix 10.1	624
10.4.2.2 Climate variability and extreme events	607	Appendix 10.2	625
10.4.3 Summary and Recommendations	607	Appendix 10.3	626
		Appendix 10.4	627
		References	629

11

Changes in Sea Level

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Contents

Executive Summary	641		
11.1 Introduction	643		
11.2 Factors Contributing to Sea Level Change	644		
11.2.1 Ocean Processes	644		
11.2.1.1 Observational estimates of ocean warming and ocean thermal expansion	644		
11.2.1.2 Models of thermal expansion	646		
11.2.2 Glaciers and Ice Caps	647		
11.2.2.1 Mass balance studies	647		
11.2.2.2 Sensitivity to temperature change	647		
11.2.2.3 Sensitivity to precipitation change	649		
11.2.2.4 Evolution of area	650		
11.2.3 Greenland and Antarctic Ice Sheets	650		
11.2.3.1 Mass balance studies	650		
11.2.3.2 Direct monitoring of surface elevation changes	652		
11.2.3.3 Numerical modelling	652		
11.2.3.4 Sensitivity to climatic change	653		
11.2.4 Interaction of Ice Sheets, Sea Level and the Solid Earth	654		
11.2.4.1 Eustasy, isostasy and glacial-interglacial cycles	654		
11.2.4.2 Earth rotation constraints on recent sea level rise	656		
11.2.5 Surface and Ground Water Storage and Permafrost	657		
11.2.6 Tectonic Land Movements	658		
11.2.7 Atmospheric Pressure	659		
11.3 Past Sea Level Changes	659		
11.3.1 Global Average Sea Level over the Last 6,000 Years	659		
11.3.2 Mean Sea Level Changes over the Past 100 to 200 Years	661		
11.3.2.1 Mean sea level trends	661		
11.3.2.2 Long-term mean sea level accelerations	663		
		11.3.2.3 Mean sea level change from satellite altimeter observations	663
		11.3.3 Changes in Extreme Sea Levels: Storm Surges and Waves	664
		11.4 Can 20th Century Sea Level Changes be Explained?	664
		11.5 Future Sea Level Changes	666
		11.5.1 Global Average Sea Level Change 1990 to 2100	666
		11.5.1.1 Projections for a single scenario based on a range of AOGCMs	666
		11.5.1.2 Projections for SRES scenarios	670
		11.5.2 Regional Sea Level Change	673
		11.5.3 Implications for Coastal Regions	674
		11.5.3.1 Mean sea level	674
		11.5.3.2 Extremes of sea level: storm-surges and waves	675
		11.5.4 Longer Term Changes	675
		11.5.4.1 Thermal expansion	675
		11.5.4.2 Glaciers and ice caps	677
		11.5.4.3 Greenland and Antarctic ice sheets	677
		11.6 Reducing the Uncertainties in Future Estimates of Sea Level Change	679
		11.6.1 Observations of Current Rates of Global-averaged and Regional Sea Level Change	679
		11.6.2 Ocean Processes	680
		11.6.3 Glaciers and Ice Caps	680
		11.6.4 Greenland and Antarctic Ice Sheets	680
		11.6.5 Surface and Ground Water Storage	680
		11.6.6 Summary	681
		Appendix 11.1: Methods for Projections of Global-average Sea Level Rise	682
		References	684

12

Detection of Climate Change and Attribution of Causes

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Contents

Executive Summary	697	12.4 Quantitative Comparison of Observed and Modelled Climate Change	716
12.1 Introduction	700	12.4.1 Simple Indices and Time-series Methods	716
12.1.1 The Meaning of Detection and Attribution	700	12.4.2 Pattern Correlation Methods	718
12.1.2 Summary of the First and Second Assessment Reports	701	12.4.2.1 Horizontal patterns	718
12.1.3 Developments since the Second Assessment Report	701	12.4.2.2 Vertical patterns	720
12.2 The Elements of Detection and Attribution	701	12.4.3 Optimal Fingerprint Methods	721
12.2.1 Observed Data	701	12.4.3.1 Single pattern studies	721
12.2.2 Internal Climate Variability	702	12.4.3.2 Optimal detection studies that use multiple fixed signal patterns	722
12.2.3 Climate Forcings and Responses	705	12.4.3.3 Space-time studies	723
12.2.3.1 Natural climate forcing	706	12.4.3.4 Summary of optimal fingerprinting studies	728
12.2.3.2 Climatic response to natural forcing	708	12.5 Remaining Uncertainties	729
12.2.3.3 Anthropogenic forcing	709	12.6 Concluding Remarks	730
12.2.3.4 Climatic response to anthropogenic forcing	711	Appendix 12.1: Optimal Detection is Regression	732
12.2.4 Some Important Statistical Considerations	712	Appendix 12.2: Three Approaches to Optimal Detection	733
12.3 Qualitative Comparison of Observed and Modelled Climate Change	713	Appendix 12.3: Pattern Correlation Methods	733
12.3.1 Introduction	713	Appendix 12.4: Dimension Reduction	734
12.3.2 Thermal Indicators	714	Appendix 12.5: Determining the Likelihood of Outcomes (p-values)	734
12.3.3 Hydrological Indicators	715	References	735
12.3.4 Circulation	715		
12.3.5 Combined Evidence	715		

13

Climate Scenario Development

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Contents

Executive Summary	741		
13.1 Introduction	743		
13.1.1 Definition and Nature of Scenarios	743		
13.1.2 Climate Scenario Needs of the Impacts Community	744		
13.2 Types of Scenarios of Future Climate	745		
13.2.1 Incremental Scenarios for Sensitivity Studies	746		
13.2.2 Analogue Scenarios	748		
13.2.2.1 Spatial analogues	748		
13.2.2.2 Temporal analogues	748		
13.2.3 Scenarios Based on Outputs from Climate Models	748		
13.2.3.1 Scenarios from General Circulation Models	748		
13.2.3.2 Scenarios from simple climate models	749		
13.2.4 Other Types of Scenarios	749		
13.3 Defining the Baseline	749		
13.3.1 The Choice of Baseline Period	749		
13.3.2 The Adequacy of Baseline Climatological Data	750		
13.3.3 Combining Baseline and Modelled Data	750		
13.4 Scenarios with Enhanced Spatial and Temporal Resolution	751		
13.4.1 Spatial Scale of Scenarios	751		
13.4.1.1 Regional modelling	751		
13.4.1.2 Statistical downscaling	752		
13.4.1.3 Applications of the methods to impacts	752		
13.4.2 Temporal Variability	752		
13.4.2.1 Incorporation of changes in variability: daily to interannual time-scales	752		
13.4.2.2 Other techniques for incorporating extremes into climate scenarios	754		
13.5 Representing Uncertainty in Climate Scenarios	755		
13.5.1 Key Uncertainties in Climate Scenarios	755		
13.5.1.1 Specifying alternative emissions futures	755		
13.5.1.2 Uncertainties in converting emissions to concentrations	755		
13.5.1.3 Uncertainties in converting concentrations to radiative forcing	755		
13.5.1.4 Uncertainties in modelling the climate response to a given forcing	755		
13.5.1.5 Uncertainties in converting model response into inputs for impact studies	756		
13.5.2 Approaches for Representing Uncertainties	756		
13.5.2.1 Scaling climate model response patterns	756		
13.5.2.2 Defining climate change signals	757		
13.5.2.3 Risk assessment approaches	759		
13.5.2.4 Annotation of climate scenarios	760		
13.6 Consistency of Scenario Components	760		
References	761		

14

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Contents

Executive Summary	771	14.2.4 The Global Carbon Cycle	777
14.1 Introduction	772	14.2.4.1 The marine carbon system	778
14.2 The Climate System	772	14.2.4.2 The terrestrial system	779
14.2.1 Overview	772	14.2.5 Precipitation, Soil Moisture, and River Flow: Elements of the Hydrological Cycle	779
14.2.2 Predictability in a Chaotic System	773	14.2.6 Trace Gases, Aerosols, and the Climate System	781
14.2.2.1 Initialisation and flux adjustments	773	14.3 The Human System	782
14.2.2.2 Balancing the need for finer scales and the need for ensembles	774	14.3.1 Overview	782
14.2.2.3 Extreme events	774	14.3.2 Humans: Drivers of Global Change: Recipients of Global Change	783
14.2.2.4 Organised variability	775	14.4 Outlook	784
14.2.3 Key Sub-systems and Phenomena in the Physical-Climate System	775	References	785
14.2.3.1 Clouds	775		
14.2.3.2 Thermohaline circulation	776		
14.2.3.3 Arctic sea ice	777		