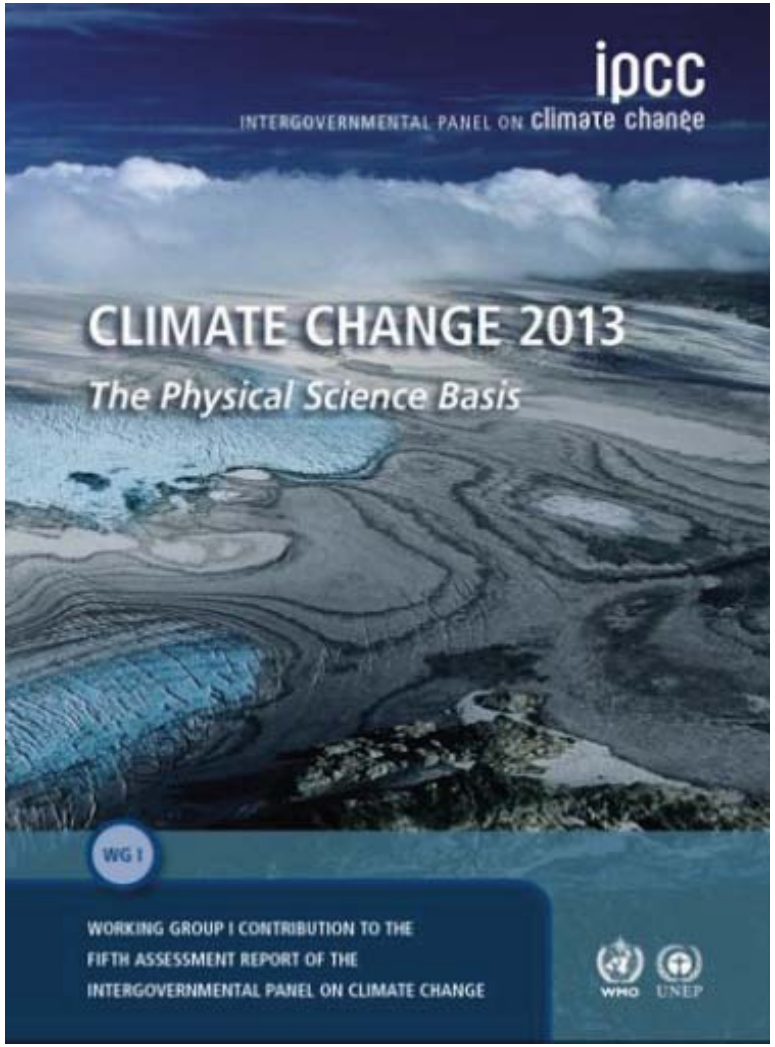
The IPCC process of Working Group 1 and scientific improvements of Paleoscience from AR1 to AR5



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Outline of the talk

- What is the **Intergovernmental Panel on Climate Change (IPCC)**?
  - The principals governing the IPCC process
  - The structure and the 3 different working groups (WG)
  - The process of WG 1
  - Tasks of Authors
  - Characteristics, facts and elements of the WGI contribution to IPCC AR5
  - Impressions from the Summary for Policy negotiations in Stockholm September 2013

- The questions of **Governments** to Science
  - Role of the Governments in the IPCC process
  - Use of the answers from science in policy processes

- **Paleoscience from IPCC FAR to AR 5**; progress at continental to hemispheric scales since 1990

What is the IPCC?

- The **Intergovernmental Panel on Climate Change (IPCC)** is the international body for **assessing the science related to climate change**.
- The IPCC was set up in 1988 by the WMO and UNEP **to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.**

- **IPCC assessments provide a scientific basis for governments at all levels to develop climate-related policies**, and they underlie **negotiations at the UN Climate conference** – the United Nations Framework Convention on Climate Change.
- The assessments are **policy-relevant but not policy-prescriptive**: they may present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, **but they do not tell policymakers what actions to take**

Principles Governing IPCC work

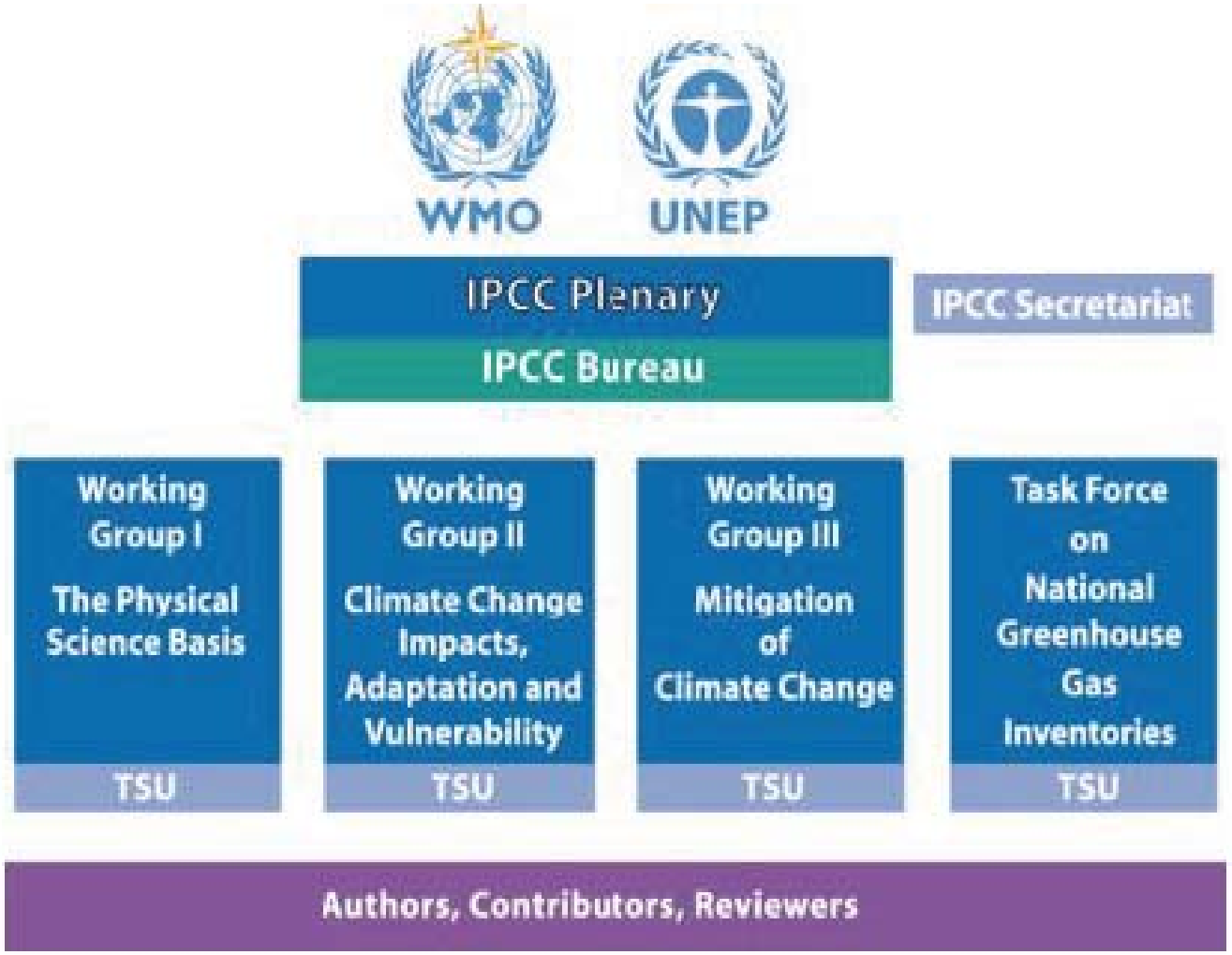
[...]

2. The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. IPCC reports should be neutral with respect to policy, although they may need to deal objectively with scientific, technical and socio-economic factors relevant to the application of particular policies.

3. Review is an essential part of the IPCC process. Since the IPCC is an intergovernmental body, review of IPCC documents should involve both peer review by experts and review by governments.

[...]

The structure of the IPCC?



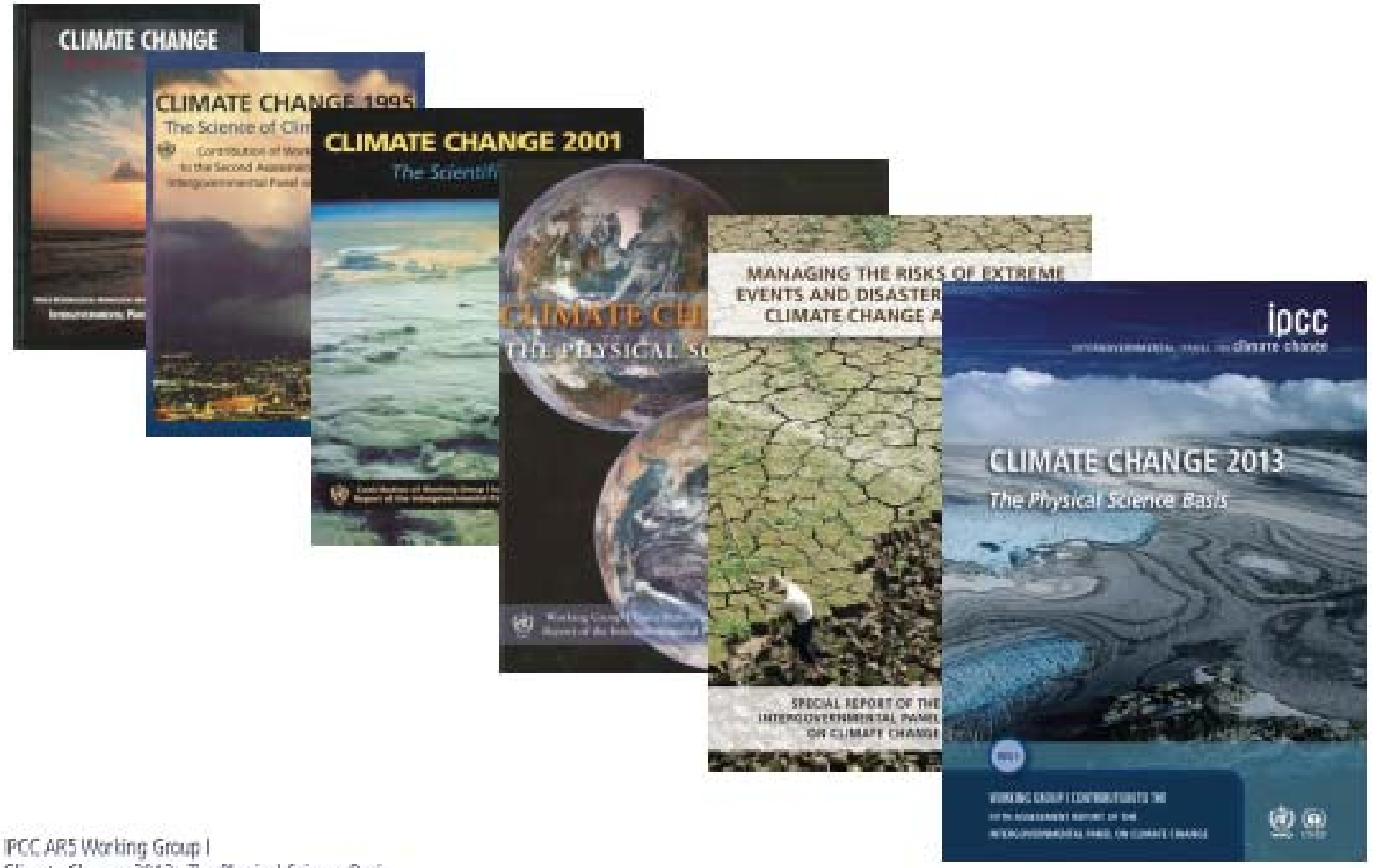
The 3 IPCC Working Groups (WGs)

- **WG I** assesses the ***physical science basis*** of the climate system and natural and anthropogenic climate change **(Release 27 September 2013, Final Report 30 September)**

- **WG II** assesses the ***vulnerability*** of socio-economic and natural systems to climate change, negative and positive ***impacts*** of climate change, and options for ***adapting*** to it **(Release 31 March 2014)**

- **WG III** assesses options for ***mitigating climate change*** through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere **(Release 12 April 2014)**

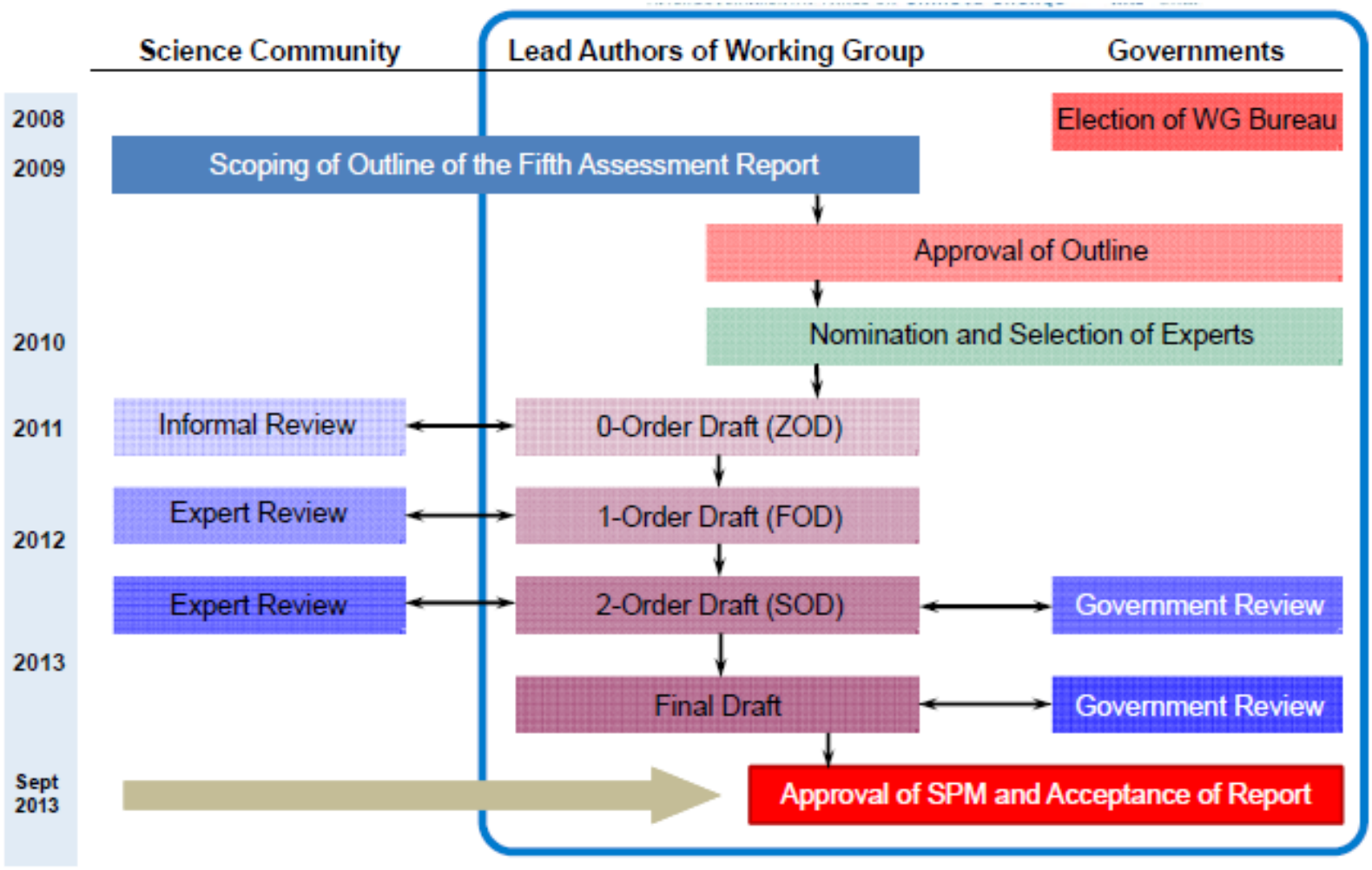
The 5 IPCC reports so far (1990-2013)



IPCC AR5 Working Group I
Climate Change 2013: The Physical Science Basis

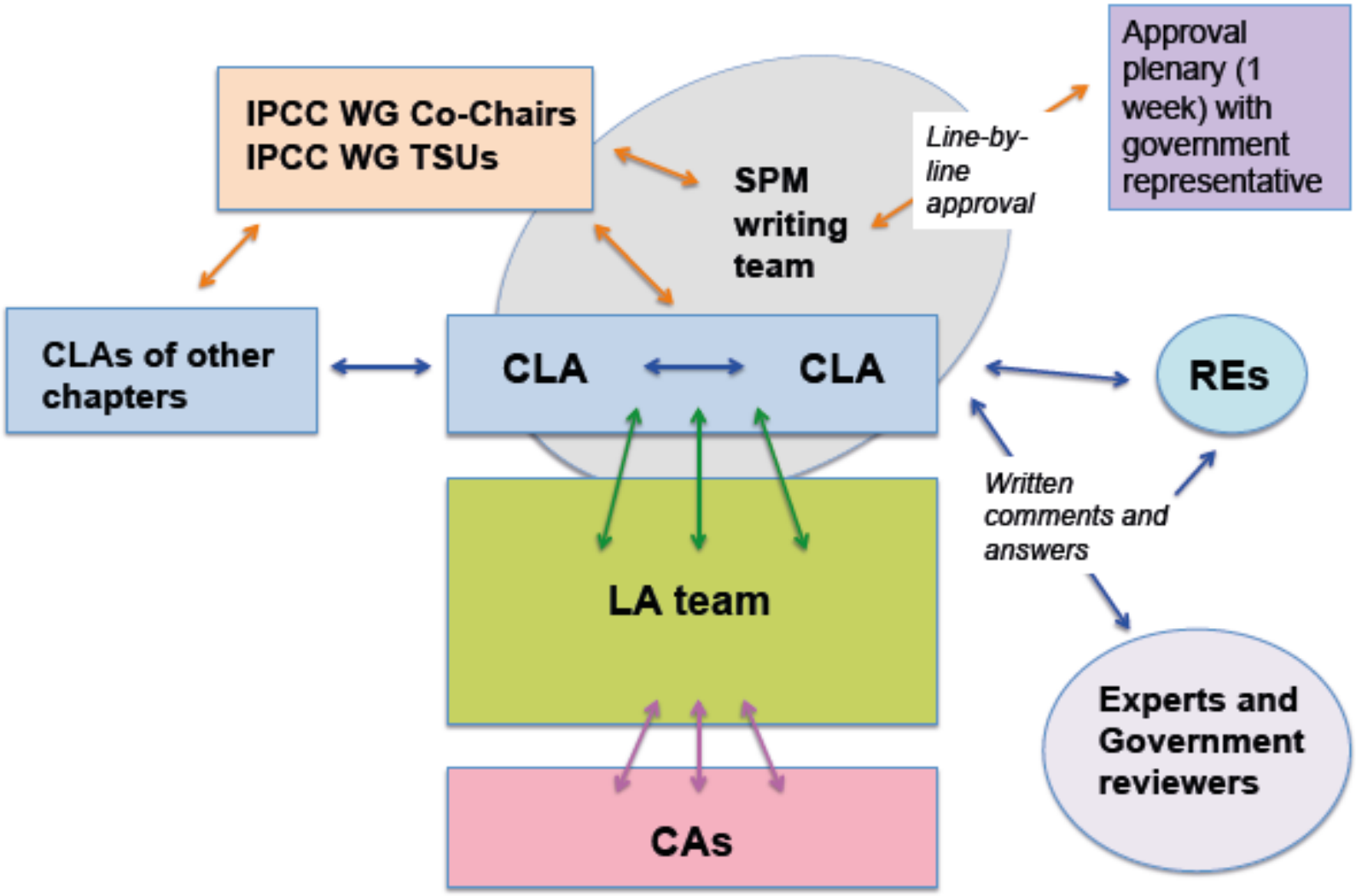
http://www.climatechange2013?org/

IPCC process (WG1)



http://www.climatechange2013.org/

Tasks of IPCC Authors



http://www.climatechange2013.org/

Characteristics of the IPCC Report

- **Authors nominated by governments**, observer organisations
- Selection of chapter teams **based on expertise**
- Attention to **regional and gender balance**
- Drafts are developed with **multiple rounds of review**
- **Line-by-line approval** of Summary for Policymakers by governments
- Presence of authors at approval ensures **scientific accuracy**

Facts about the WGI contribution to IPCC AR5

- **209 Lead Authors** and 50 Review Editors from 39 countries
- Over **600 Contributing Authors**
- More than **2 million gigabytes** of numerical data from climate models
- Over **9200 scientific publications** cited
- **1089 expert reviewers** from 55 countries and 38 governments
- **54,677 review comments**
- **Was** approved by almost **200 countries** in September 2013

The Elements of the 5th Assessment Report, WG 1

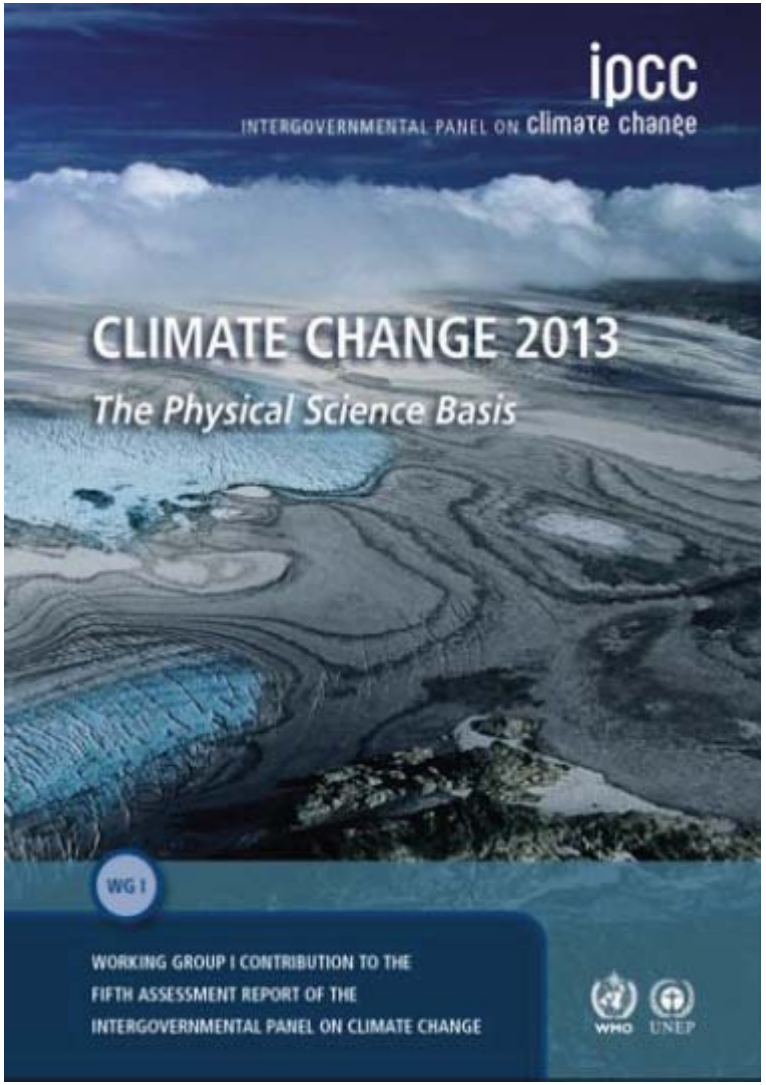
14 Chapters
1'140'000 words, ca. 2000 pages
1250 Figures and Tables

Atlas: Regional Projections
Maps from 17 Regions of the World,
Digital form, 2 Mio G Bytes

Technical Summary
55'000 words, ca. 90 pages

Summary for Policy Makers
14'000 words, 22 pages, 10 figures

Synthesis Report
all WGs contribute (target 30 pages)



Arrival of delegates and researchers in Stockholm, September 2013, Monday

T. Osborn, pers. com.

Wednesday evening, 20% of the words were approved but 70% of the time had elapsed, sessions extended to 2.30am

T. Osborn, pers. com.

Delegates thinning out, authors still doing email at 2.30am (except those with their heads in their hands)…

T. Osborn, pers. com.

Moving towards approval of final paragraphs at 5am Friday morning, then some applause breaks out as it becomes evident that everything is approved …

T. Osborn, pers. com.

Friday, 27 September 10 am, about to release the SPM…

T. Osborn, pers. com.

Friday, 27 September 10 am, release of the SPM, first page

Summary for Policymakers

Drafting Authors: Lisa Alexander (Australia), Simon Allen (Switzerland/New Zealand), Nathaniel L. Bindoff (Australia), François-Marie Bréon (France), John Church (Australia), Ulrich Cubasch (Germany), Seita Emori (Japan), Piers Forster (UK), Pierre Friedlingstein (UK/Belgium), Nathan Gillett (Canada), Jonathan Gregory (UK), Dennis Hartmann (USA), Eystein Jansen (Norway), Ben Kirtman (USA), Reto Knutti (Switzerland), Krishna Kumar Kanikicharla (India), Peter Lemke (Germany), Jochem Marotzke (Germany), Valérie Masson-Delmotte (France), Gerald Meehl (USA), Igor Mokhov (Russia), Shilong Piao (China), Gian-Kasper Plattner (Switzerland), Qin Dahe (China), Venkatachalam Ramaswamy (USA), David Randall (USA), Monika Rhein (Germany), Maisa Rojas (Chile), Christopher Sabine (USA), Drew Shindell (USA), Thomas F. Stocker (Switzerland), Lynne Talley (USA), David Vaughan (UK), Shang-Ping Xie (USA)

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The questions of Governments to Science (example Switzerland)

- What is known about the influence of anthropogenic greenhouse gas emissions (GHG) on the global climate system?
- What are / may be the long-term changes of the climate system?
- What are / may be the impacts of climate change on ecosystems, economic activities, human health, etc.?
- What are the options for adapting to these changes?
- What can be done to mitigate climate change?
- Which methodologies do allow to estimate anthropogenic GHG emissions?

Getting the answers from science: (example Switzerland)

• What is known about the influence of anthropogenic greenhouse gas emissions (GHG) on the global climate system? • What are / may be the long-term changes of the climate system?	IPCC Working Group I Assess: current knowledge of the physical climate system; the factors that drive climate change; past climate and projections of future climate change; detection and attribution of human influences on recent climate
• What are / may be the impacts of climate change on ecosystems, economic activities, human health, etc.? • What are the options for adapting to these changes?	IPCC Working Group II Assess: the sensitivity, adaptive capacity, and vulnerability of natural and human systems to climate change; potential impacts; adaptation options at regional and global scales
• What can be done to mitigate climate change?	IPCC Working Group III Assess: technological and biological options to mitigate climate change; costs and ancillary benefits of these options and the barriers to their implementation; policies, measures and instruments to overcome these barriers
• Which methodologies do allow to estimate anthropogenic GHG emissions?	IPCC The Task Force on National Greenhouse Gas Inventories Elaborates: methodologies for the national GHG inventories (sources and sinks)

J. Romero, Federal Dept. of Environ. Switzerland

Role of the Governments in the IPCC process

- Decisions on the organisation of the IPCC and its processes
- Provision of funding
- Nomination of experts for the management of the process (e.g. IPCC Chair, Co-chairs of the Working Groups, other members of the Bureau, etc.)
- Nomination of experts for the elaboration of the IPCC works
- Review of the draft documents (assessment reports and methodologies)
- Approval of the works (assessment reports and methodologies)
- Use of the findings and of the methodologies of the IPCC at national and international level (e.g. in the UNFCCC process)

Getting the answers from science: (example Switzerland)

Some details

- Decisions on all aspects of the IPCC are adopted in frequent (1 or 2 times per year) IPCC Plenaries with participation open to all Governments and observer organisations
- The average annual budget of the IPCC is around CHF 6 million
- Once nominated and elected, IPCC officers are independent of their Governments
- The IPCC works are elaborated according to highest scientific standards and in full independence from the Governments

J. Romero, Federal Dept. of Environ. Switzerland

Getting the answers from science: (example Switzerland)

Some details (cont.)

- The review of the draft documents (assessment reports and methodologies) by the Governments does not mean that the Governments influence the scientific content of the IPCC works
- The "Approval" of IPCC Summaries for Policymakers (SPM) signifies that the material has been subject to detailed, line by line discussion and agreement between Governments and IPCC experts
- The words in the approved SPM may differ from those initially proposed by the IPCC experts, but the scientific content and the message are fully respected

J. Romero, Federal Dept. of Environ. Switzerland

Getting the answers from science: (example Switzerland)

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J. Romero, Federal Dept. of Environ. Switzerland

Use of the answers from science in policy processes (1)

Practically, how do the IPCC works help policymakers (national and international level)?

- **Raising awareness on the risks posed by climate change**

  Fosters climate policies (e.g. the Swiss CO2 Law and the adaptation strategy); changes public and business behaviour

- **Underlying the global nature of climate change**

  Fosters international cooperation on climate change issues: adoption of the UNFCCC and the Kyoto Protocol; financing (GEF); technology transfer; etc.

- **Providing quantified estimates of the emissions reductions to reduce risks**

  E.g. the 2 degrees target to be reviewed (COP 17 decision)

Use of the answers from science in policy processes (2)

(cont.)

- **Identifying reduction potentials (mitigation) in sectors**
  E.g. reduction potential in the energy sector; in forests (REDD+), etc.
- **Identifying climate-friendly technologies**
  E.g. the recent publication of the Special Report on renewable energies (SREX)
- **Evaluating vulnerabilities and adaptation possibilities**
  E.g. approaches for avoiding "maladaptation"
- **Estimating the costs (policies, measures and technologies)**
  E.g. cost of measures with and without the carbon market certificates
- **Providing methodologies for estimating GHG emissions**
  E.g. for news gases (NF3); wetlands; wood products

J. Romero, Federal Dept. of Environ. Switzerland

Further Information

AR 5, WG1, Chapter 5: Information from Paleoclimate Archives, Authors

Chapter 5: Information from Paleoclimate Archives

Coordinating Lead Authors: Valérie Masson-Delmotte (France), Michael Schulz (Germany)

Lead Authors: Ayako Abe-Ouchi (Japan), Jürg Beer (Switzerland), Andrey Ganopolski (Germany), Jesus Fidel González Rouco (Spain), Eystein Jansen (Norway), Kurt Lambeck (Australia), Jürg Luterbacher (Germany), Tim Naish (New Zealand), Timothy Osborn (UK), Bette Otto-Bliesner (USA), Terrence Quinn (USA), Rengaswamy Ramesh (India), Maisa Rojas (Chile), XueMei Shao (China), Axel Timmermann (USA)

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Review Editors: Anil K. Gupta (India), Fatemeh Rahimzadeh (Iran), Dominique Raynaud (France), Heinz Wanner (Switzerland)

Date of Draft: 7 June 2013

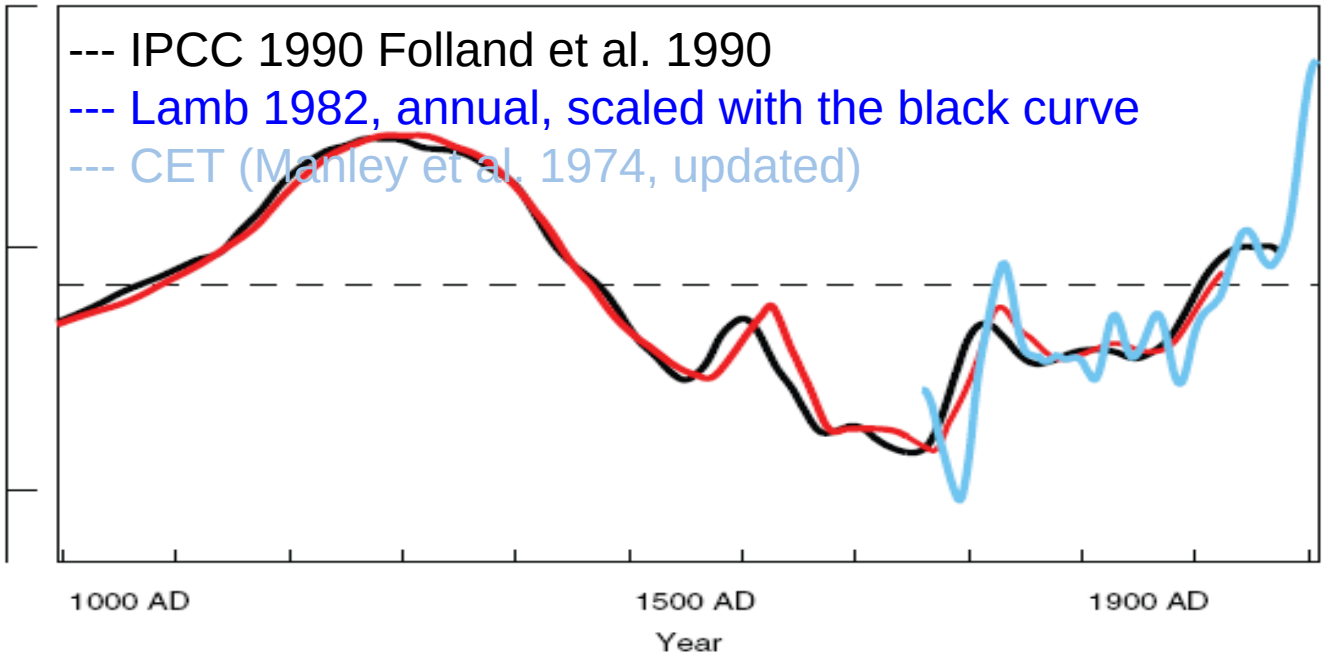
http://www.climatechange2013.org/

AR 5, WG1, Chapter 5: Information from Paleoclimate Archives, Content

Table of Contents

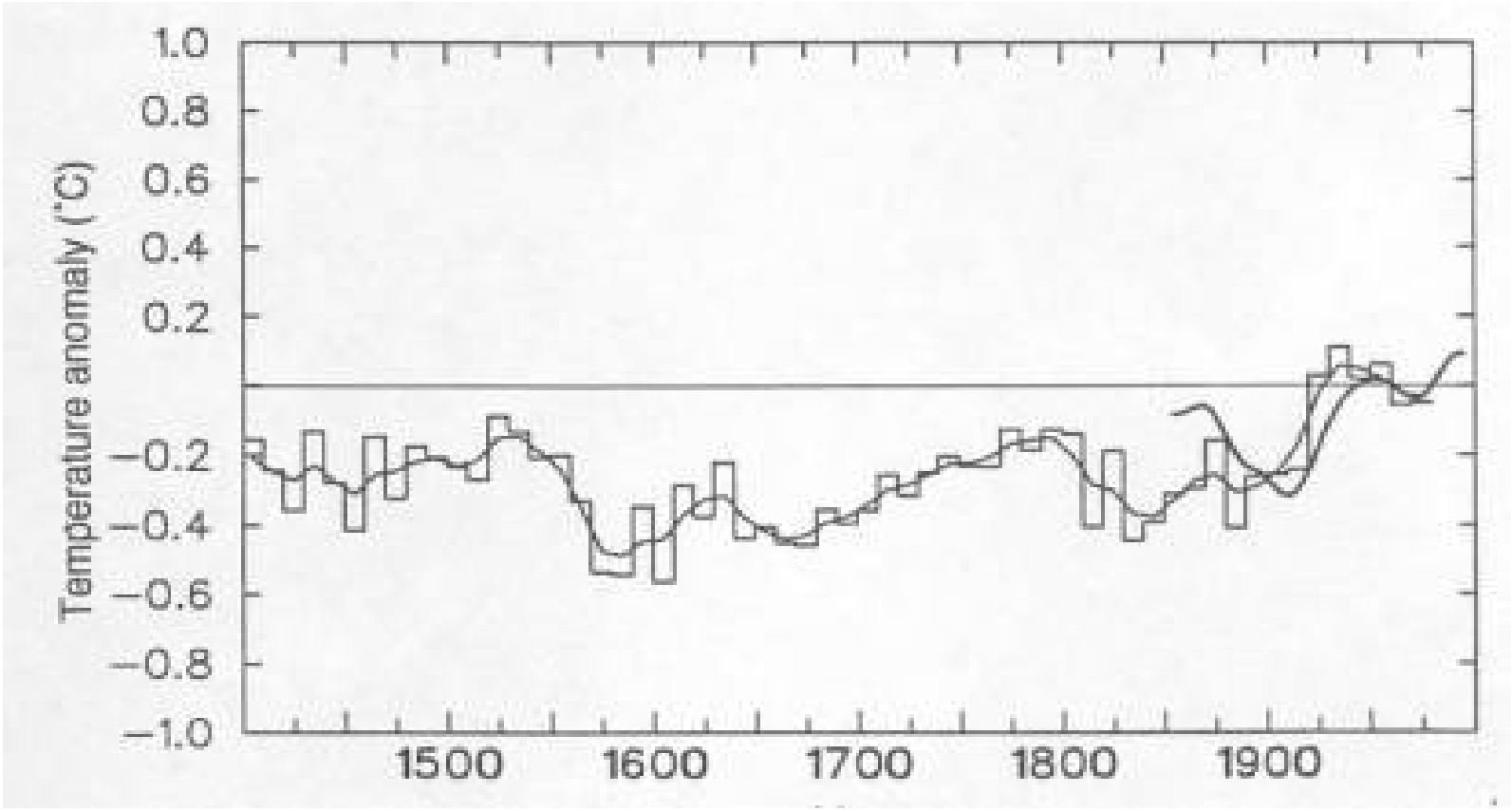
Paleoscience from IPCC FAR to AR 5; progress at continental to hemispheric scales since 1990

First IPCC 1990: Schematic diagram of ‘global’ temperature variations for the last thousand years (Fig. 7.1c)



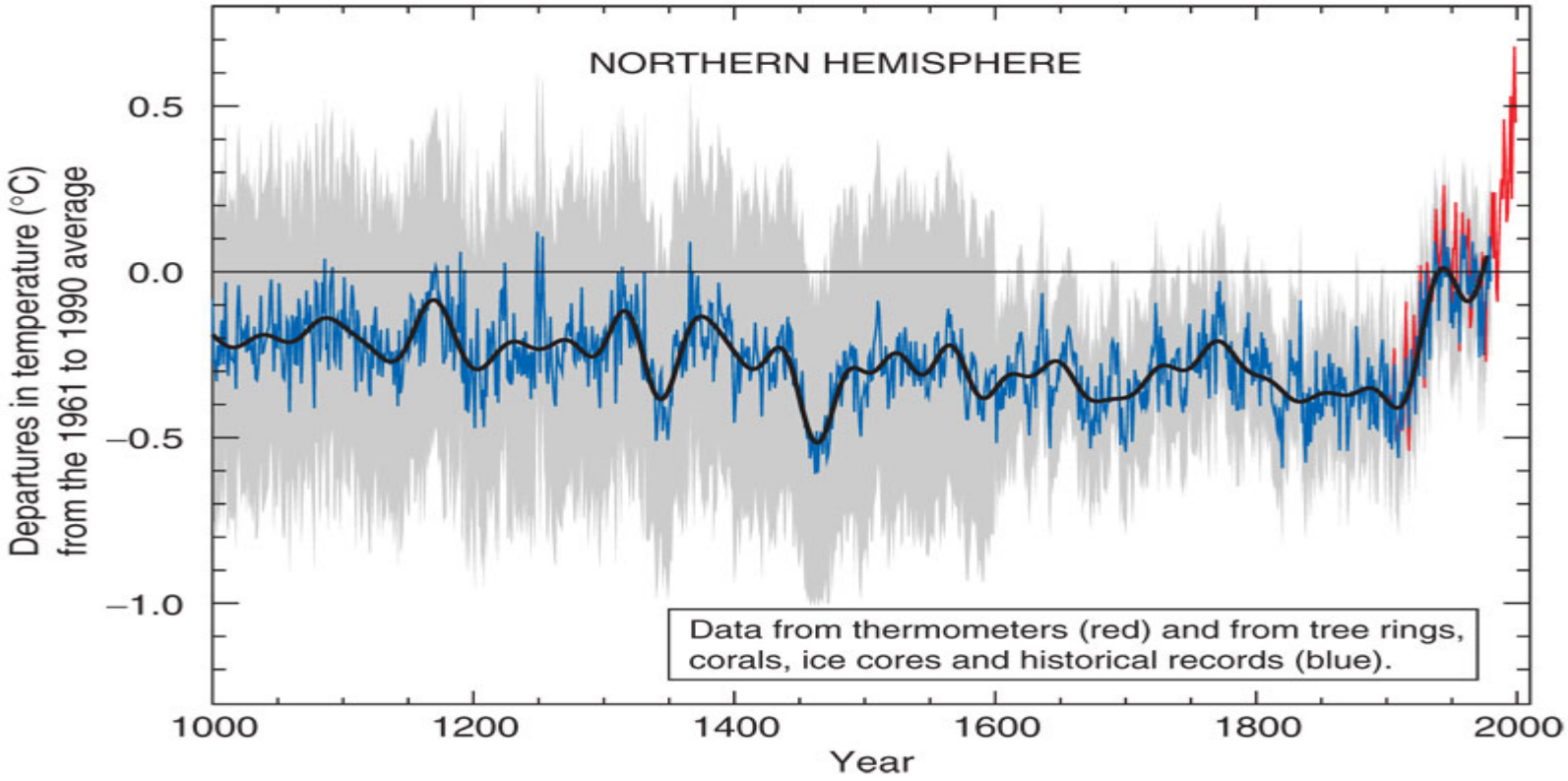
- no explicit calibration against instrumental data
- based on Lambs work in the 1960s and 1970s
- not a ‚global‘ curve, representative for Central England

SAR IPCC 1995: Northern Hemisphere summer temperature variations back to 1400



- based on Bradley and Jones 1993 (Holocene)
- based on 16 proxy records (tree rings, ice cores, documentary records
- data sources: North America, Europe and East Asia
- calibration with instrumental data

TAR IPCC 2001: Northern Hemisphere temperature variations back to 1000



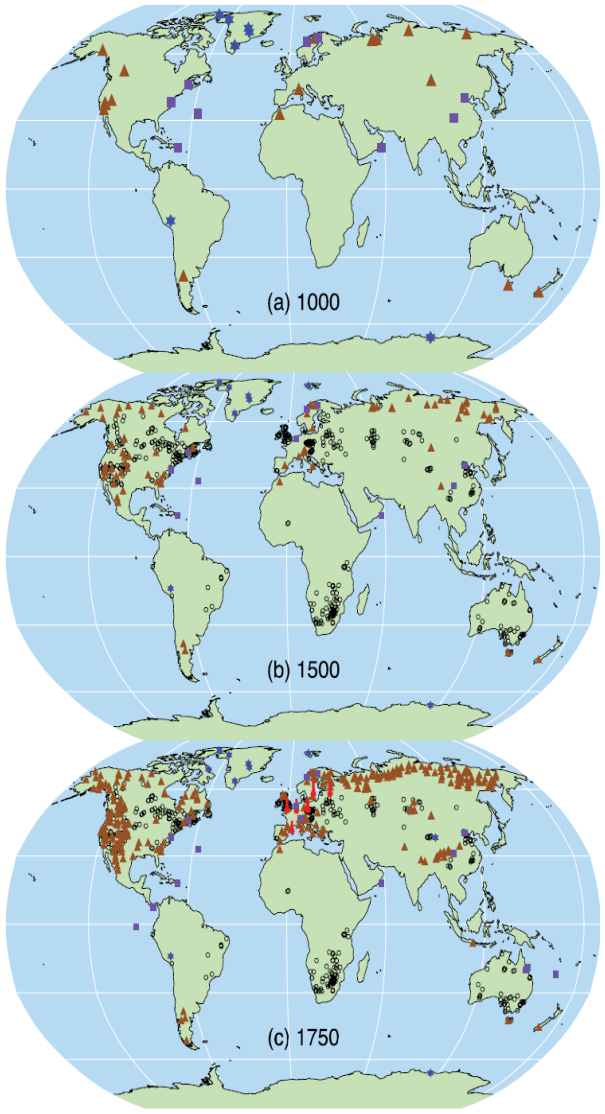
- different reconstructions were presented in the Scientific Basis, only Mann et al. (1998, 1999) was used for Summary for Policy makers (the only reconstruction with uncertainties)
- multiproxy reconstruction
- truncated Principal Component analysis & inverse multiple regression

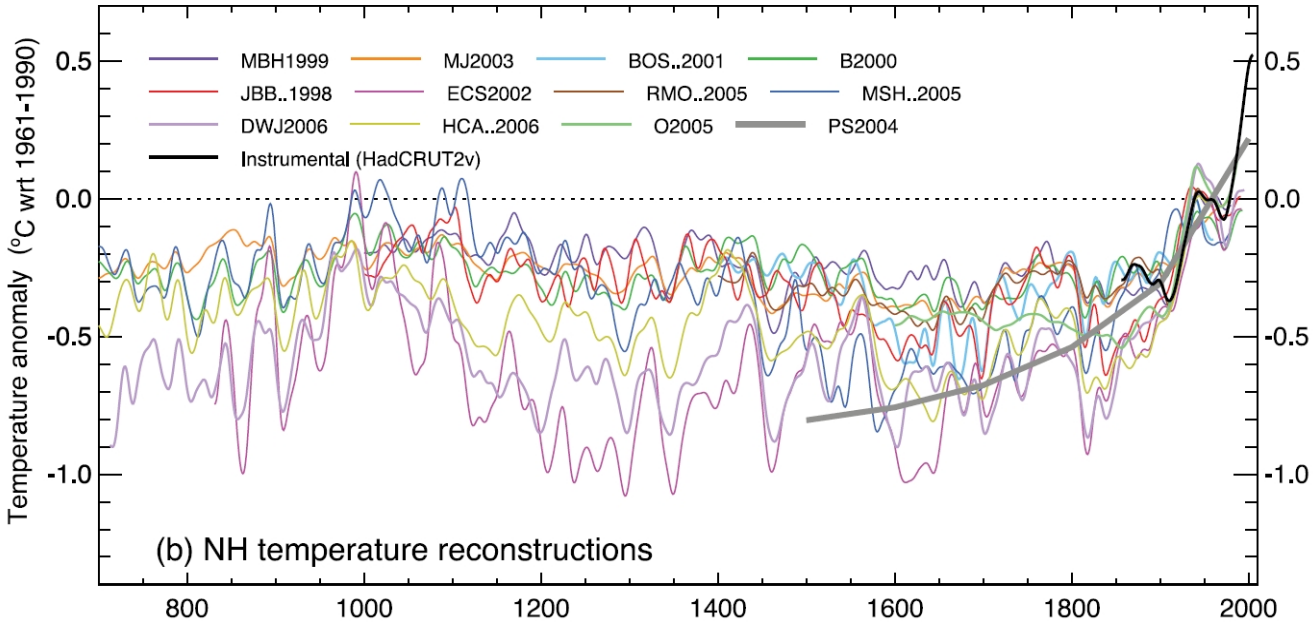
Summary for Policy Makers TAR for the last millennium NH

New analyses of proxy data for the Northern Hemisphere indicate that the increase in temperature in the 20th century is likely to have been the largest of any century during the past 1,000 years.

It is also likely that, in the Northern Hemisphere, the 1990s was the warmest decade and 1998 the warmest year. Because less data are available, less is known about annual averages prior to 1,000 years before present and for conditions prevailing in most of the Southern Hemisphere prior to 1861.

AR4 IPCC 2007: Northern Hemisphere temperature variations back to AD 700



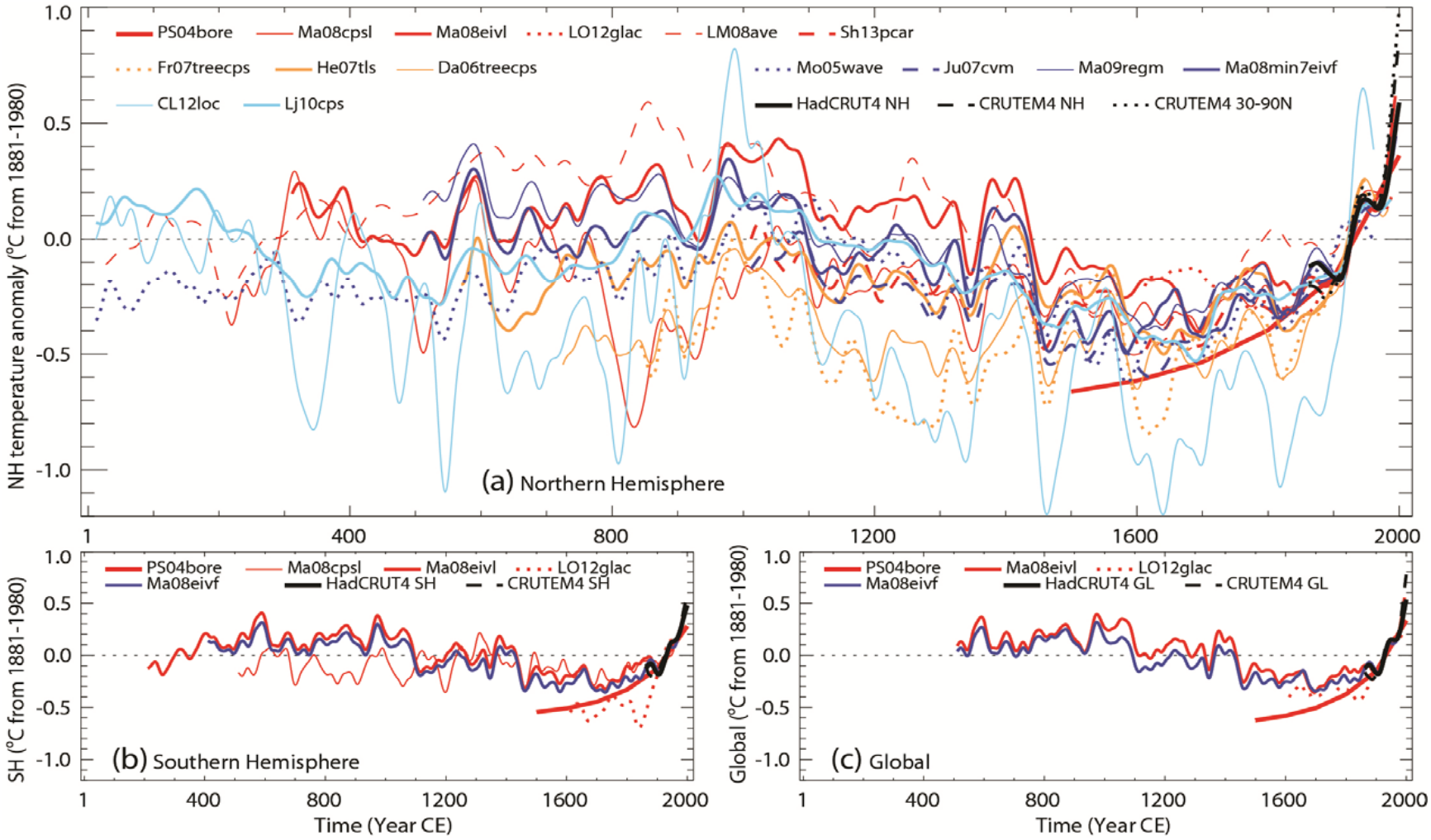


- Networks deteriorate back in time
- Differences in data network
- Dendroclimatic data dominate most reconstructions
- Different statistical approaches - empirical/physical
- Differences in spatial representativeness and methods
- Different target season (seasonal versus annual)
- Different calibration periods

Summary for Policy Makers AR 4 for the last millennium NH

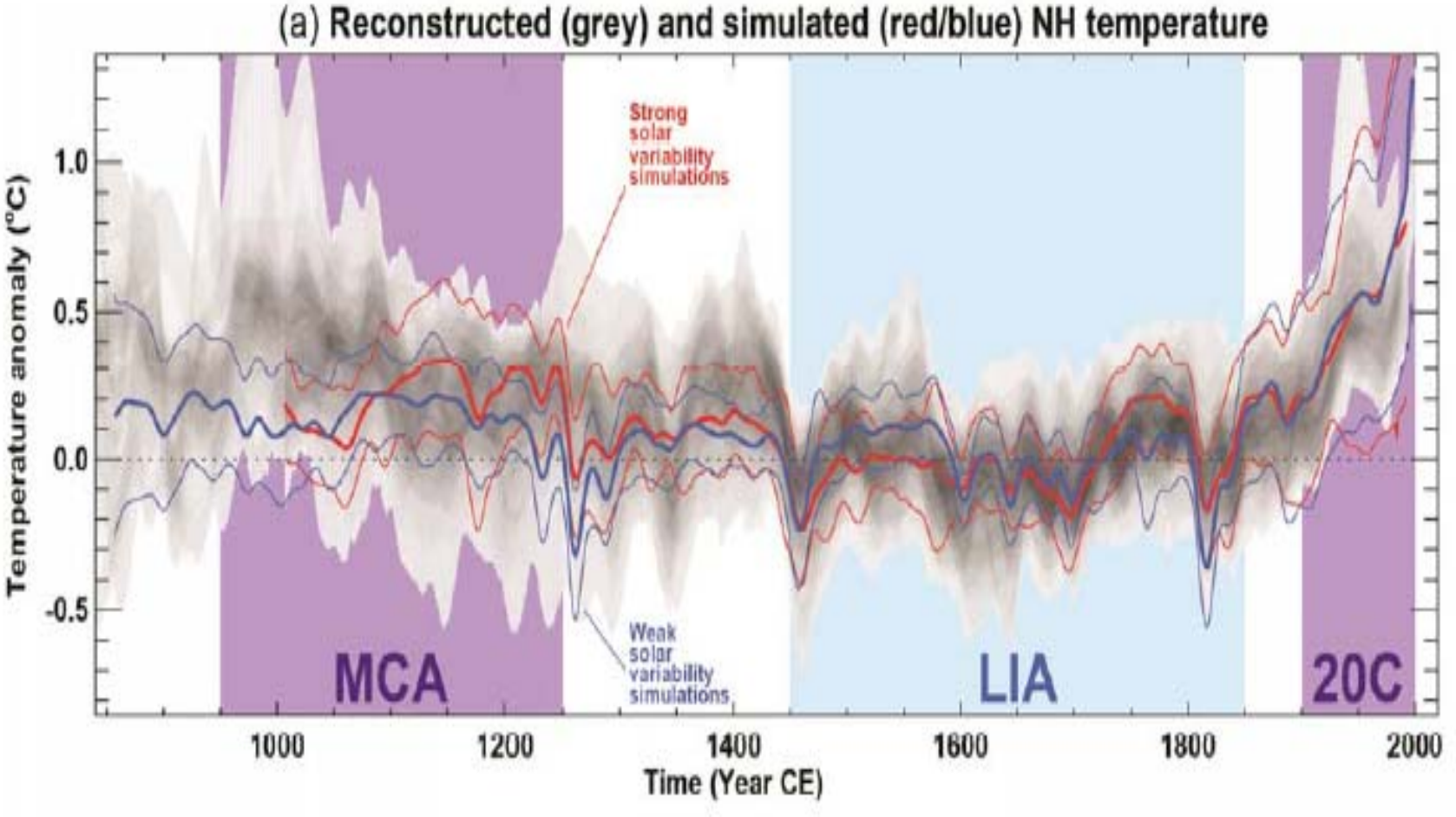
Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years

AR 5 IPCC 2013: Reconstructed Northern, Southern Hemisphere and global annual temperatures during the last 2000 years



IPCC AR5, chapter 5, 2013

AR 5 IPCC 2013: Comparisons of simulated and reconstructed NH temperature changes



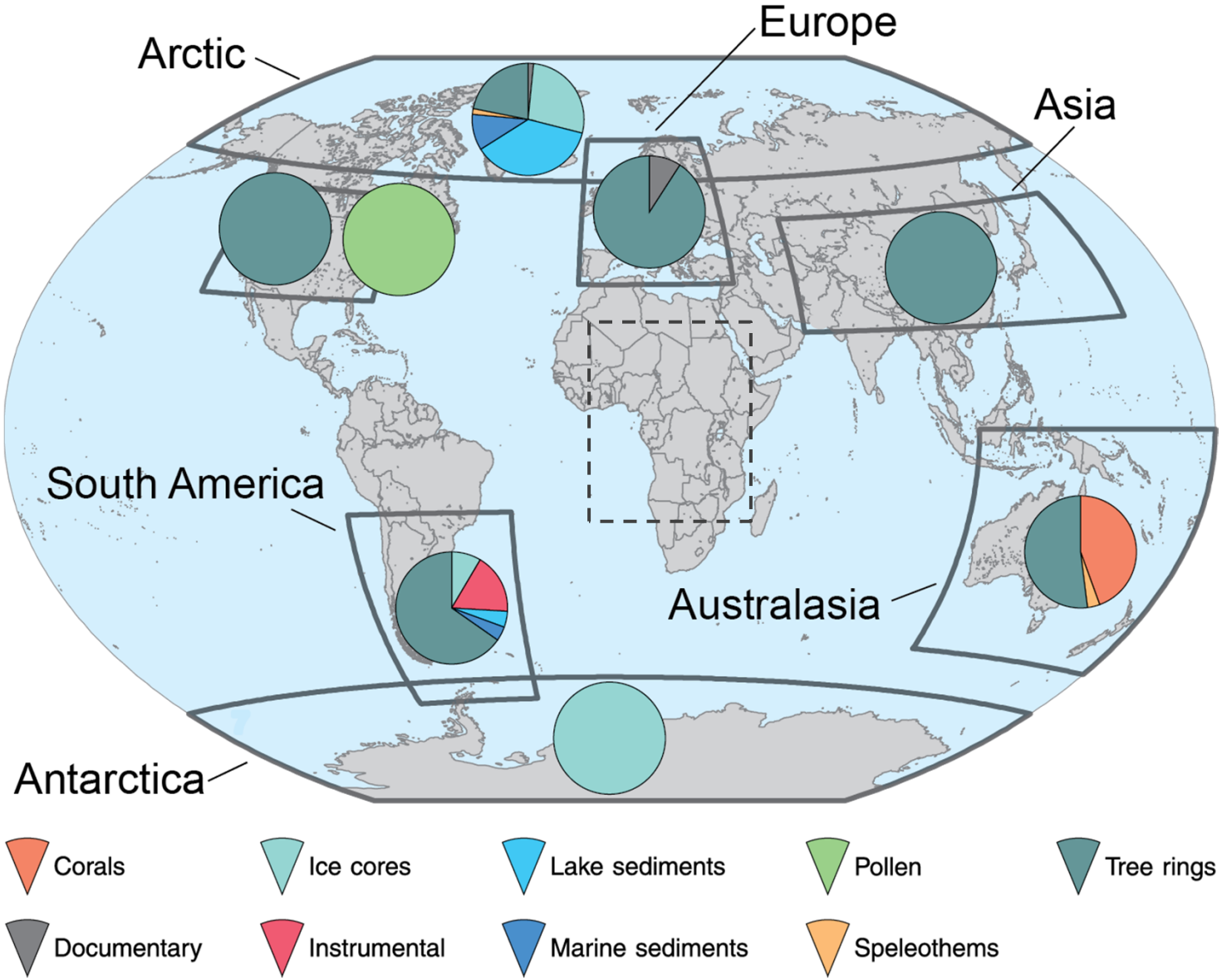
IPCC AR5, chapter 5, 2013

Executive Summary AR 5 for the last millennium NH

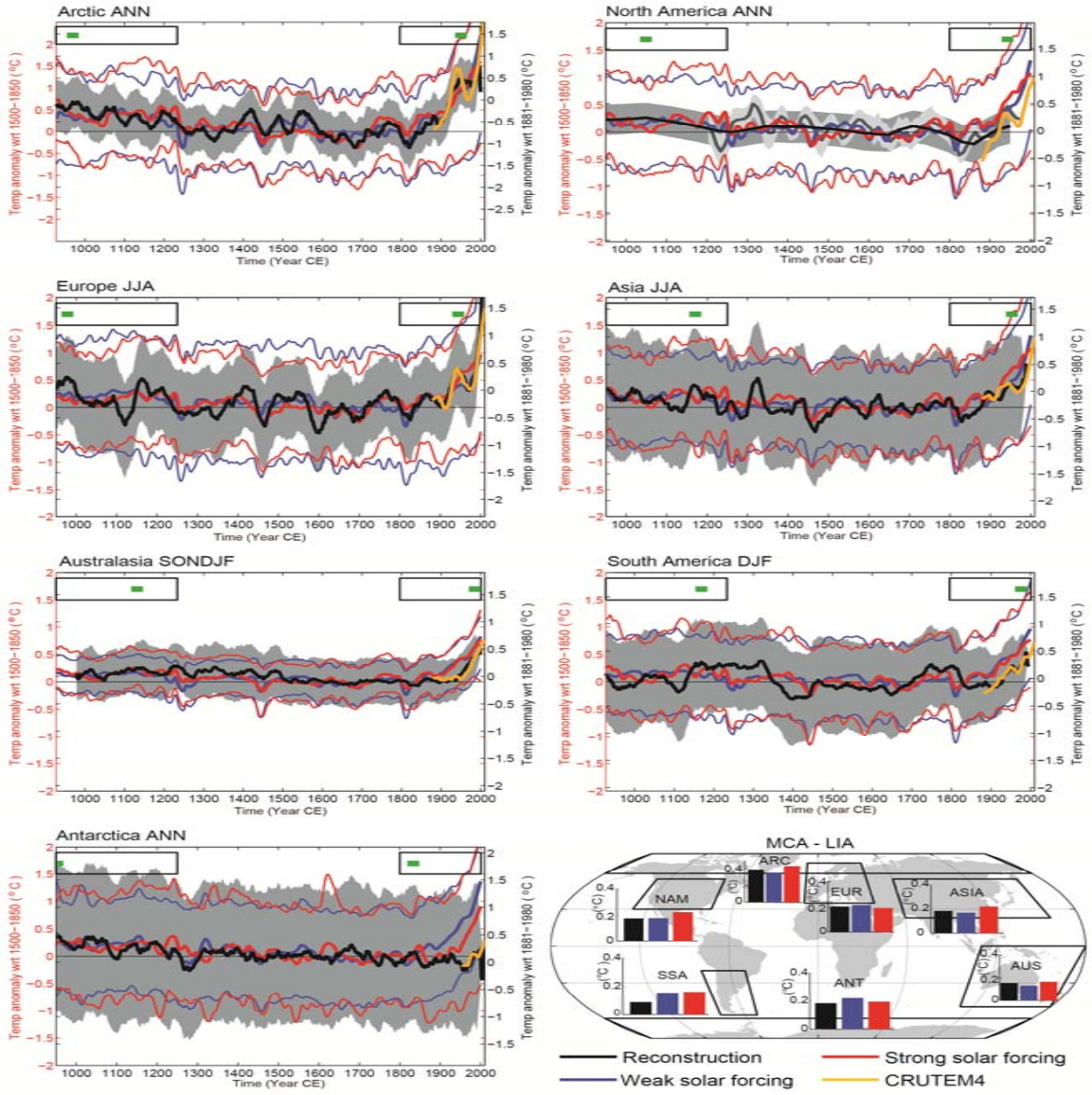
For average annual Northern Hemisphere temperatures, the period 1983–2012 was very likely the warmest 30-year period of the last 800 years (high confidence) and likely the warmest 30-year period of the last 1400 years (medium confidence). This is supported by comparison of instrumental temperatures with multiple reconstructions from a variety of proxy data and statistical methods, and is consistent with AR4. …

PAGES Initiative, 2000 years high resolution continental climate reconstructions

PAGES 2k — Continental-scale regions



Continental temperature reconstructions and paleo model simulations



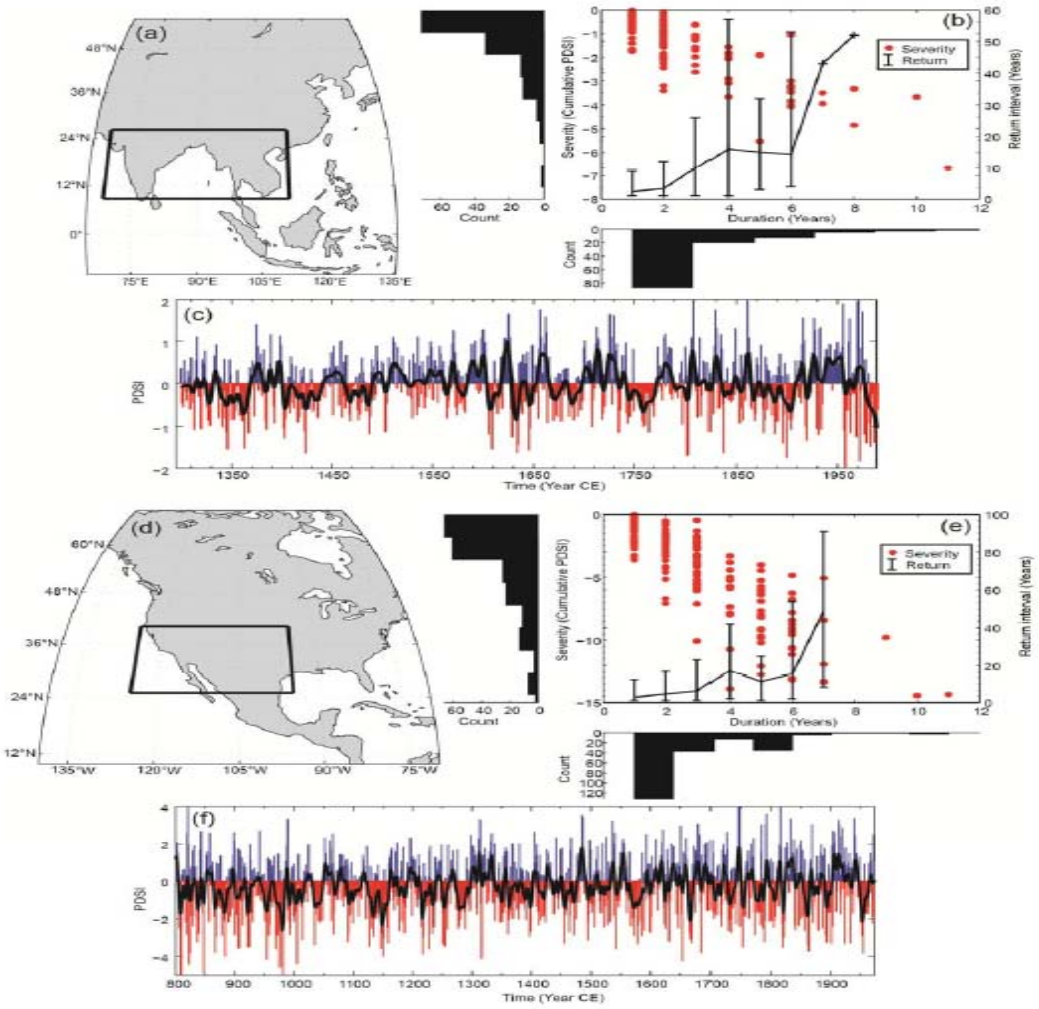
PAGES 2k Consortium 2013;
IPCC AR5, chapter 5, 2013

Executive summary AR 5
Paleo temperature last 2000 years

Continental-scale surface temperature reconstructions show, with *high confidence*, multidecadal intervals during the Medieval Climate Anomaly (950 to 1250) that were in some regions as warm as in the mid-20th century and in others as warm as in the late 20th century.

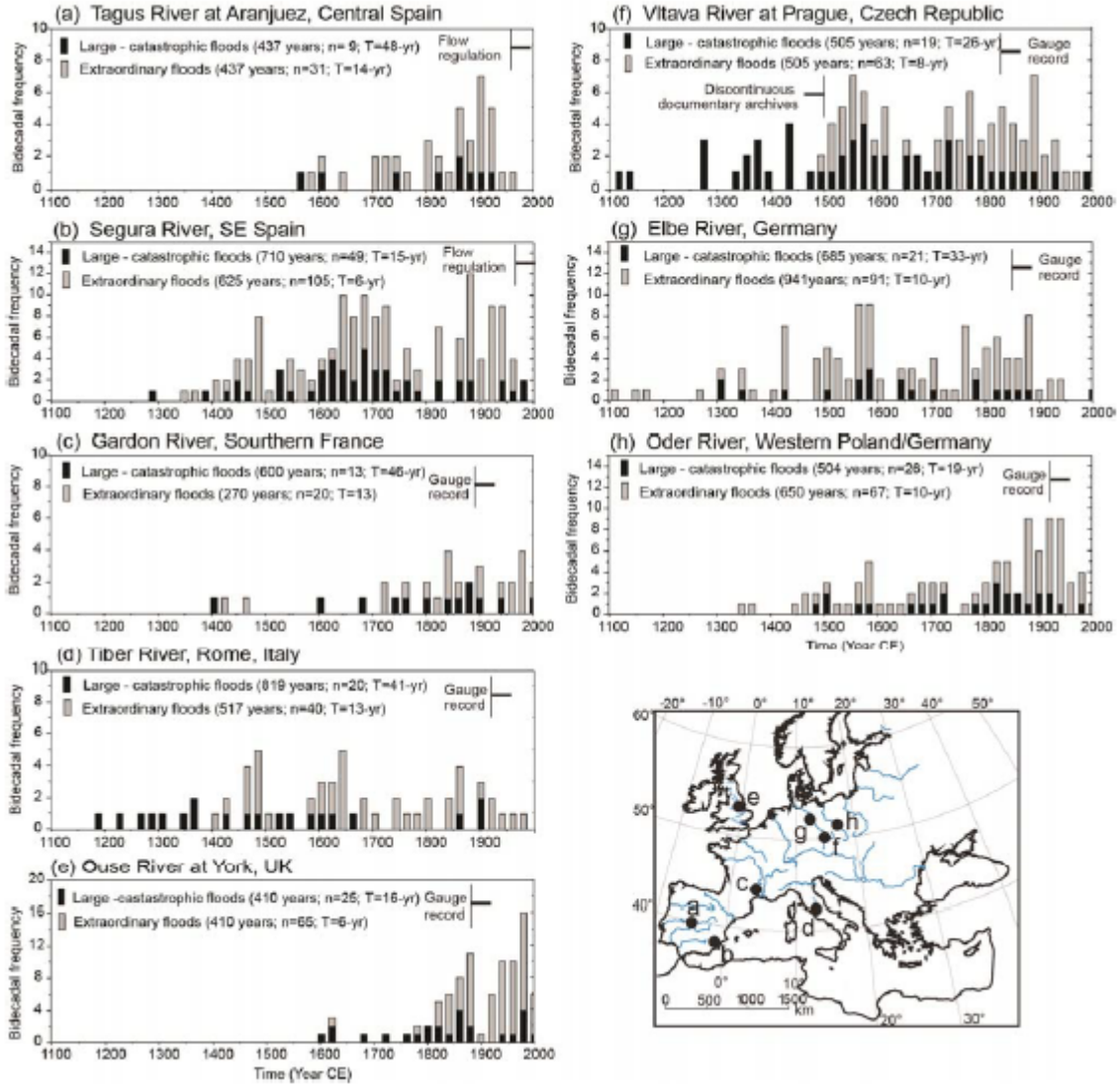
With *high confidence*, these intervals were not as synchronous across seasons and regions as the warming since the mid-20th century. Based on the comparison between reconstructions and simulations, there is *high confidence* that not only external orbital, solar and volcanic forcing, but also internal variability, contributed to the spatial pattern and timing of surface-temperature changes between the Medieval Climate Anomaly and the Little Ice Age (1450 to 1850).

Severity, duration, and frequency of droughts in the Monsoon Asia and North American



IPCC AR5, chapter 5, 2013

Flood frequency from paleofloods, historical & instrumental records in selected European rivers



IPCC AR5, chapter 5, 2013

Executive summary AR 5 last
Paleo Droughts and Floods

There is *high confidence* for droughts during the last millennium of greater magnitude and longer duration than those observed since the beginning of the 20th century in many regions. There is *medium confidence* that more megadroughts occurred in monsoon Asia and wetter conditions prevailed in arid Central Asia and the South American monsoon region during the Little Ice Age (1450 to 1850) compared to the Medieval Climate Anomaly (950 to 1250).

With *high confidence*, floods larger than those recorded since 1900 occurred during the past five centuries in northern and central Europe, western Mediterranean region, and eastern Asia. There is *medium confidence* that modern large floods are comparable to or surpass historical floods in magnitude and/or frequency in the Near East, India, and central North America.


Thank you very much for
your attention!