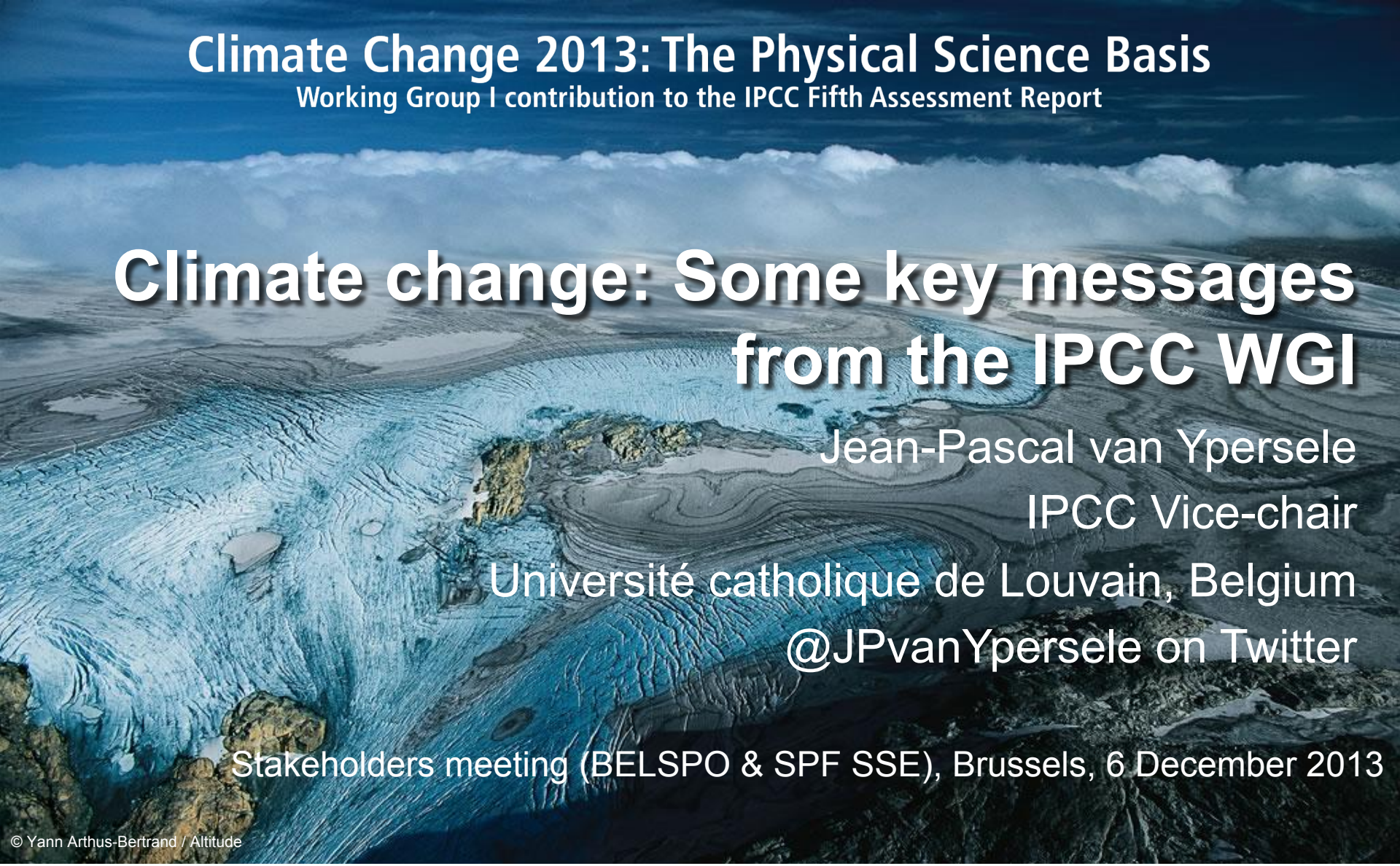


Climate Change 2013: The Physical Science Basis

Working Group I contribution to the IPCC Fifth Assessment Report

Climate change: Some key messages from the IPCC WGI

Jean-Pascal van Ypersele

IPCC Vice-chair

Université catholique de Louvain, Belgium

@JPvanYpersele on Twitter

Stakeholders meeting (BELSPO & SPF SSE), Brussels, 6 December 2013

Thanks to the Belgian Federal Science Policy Office for their support,
to IPCC WGI for some of the slides, and to Dr Philippe Marbaix & Dr Bruna Gaino for their help

Why the IPCC ?

Established by WMO and UNEP in 1988

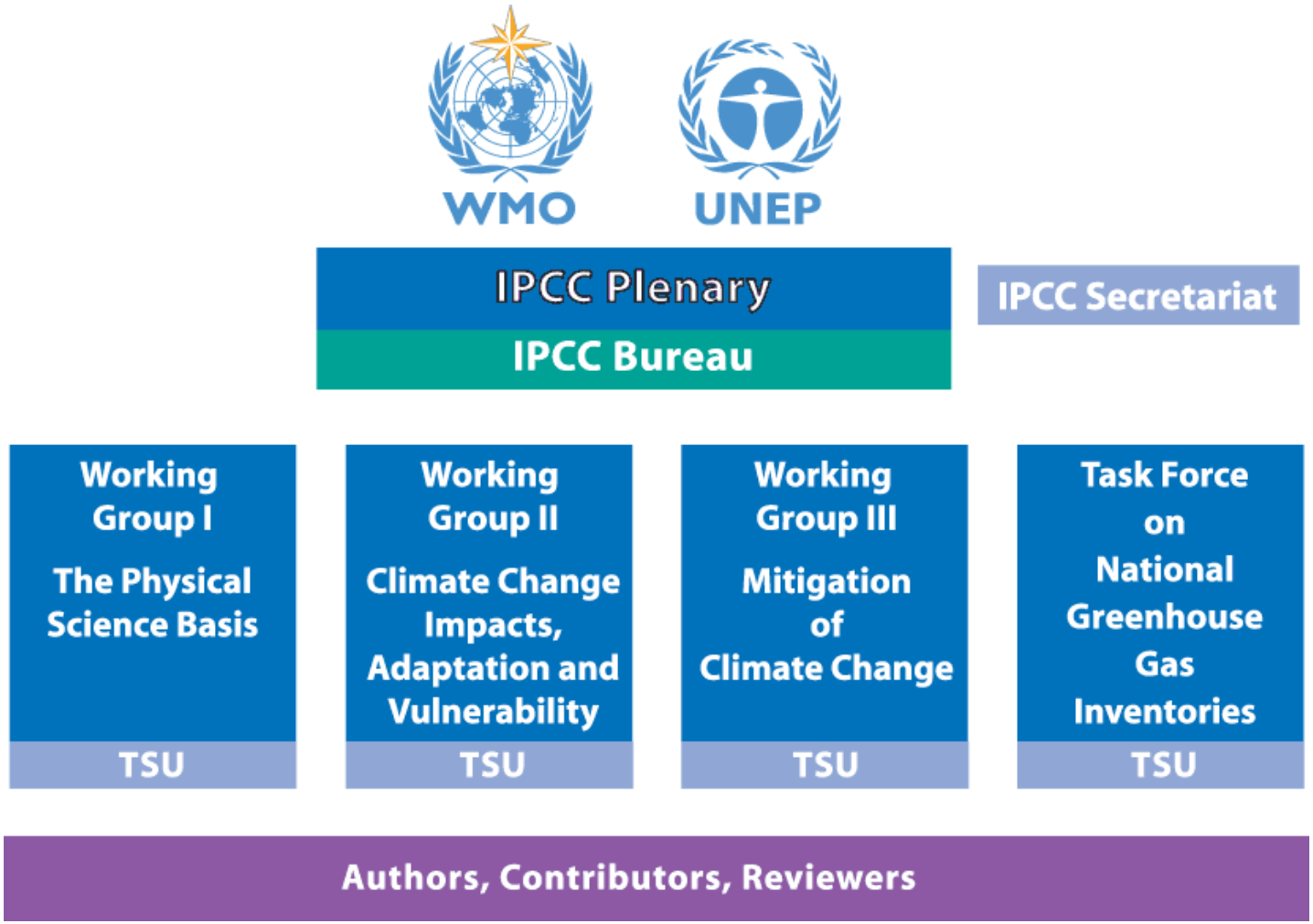
to provide policy-makers with an objective source of information about

- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options.

WMO=World Meteorological Organization

UNEP= United Nations Environment Programme

Structure of the Intergovernmental Panel on Climate Change



IPCC writing cycle (4 years, 831 Lead authors)

- **Plenary decides table of content of reports**
- **Bureau appoints world-class scientists as authors, based on publication record**
- **Authors assess all scientific literature**
- ***Draft* – Expert review (+ Review editors)**
- ***Draft 2 (+ Draft 1 Summary for Policy Makers (SPM)* – Combined expert/government review**
- ***Draft 3 (+ Draft 2 SPM)*– Government review of SPM**
- **Approval Plenary (interaction authors – governments) – *SPM and full report***
- ***NB: the scientists have the last word!***

Jean-Pascal van Ypersele
(vanypersele@astr.ucl.ac.be)

Completed IPCC Reports

4 Assessment Reports *(1990,1995, 2001, 2007)*

1992 Supplementary Report and 1994 Special Report

8 Special Reports *(1997,1999, 2000, 2005, 2011)*

Guidelines for National GHG Inventories, Good Practice Guidance *(1995-2006)*

6 Technical Papers *(1996-2008)*

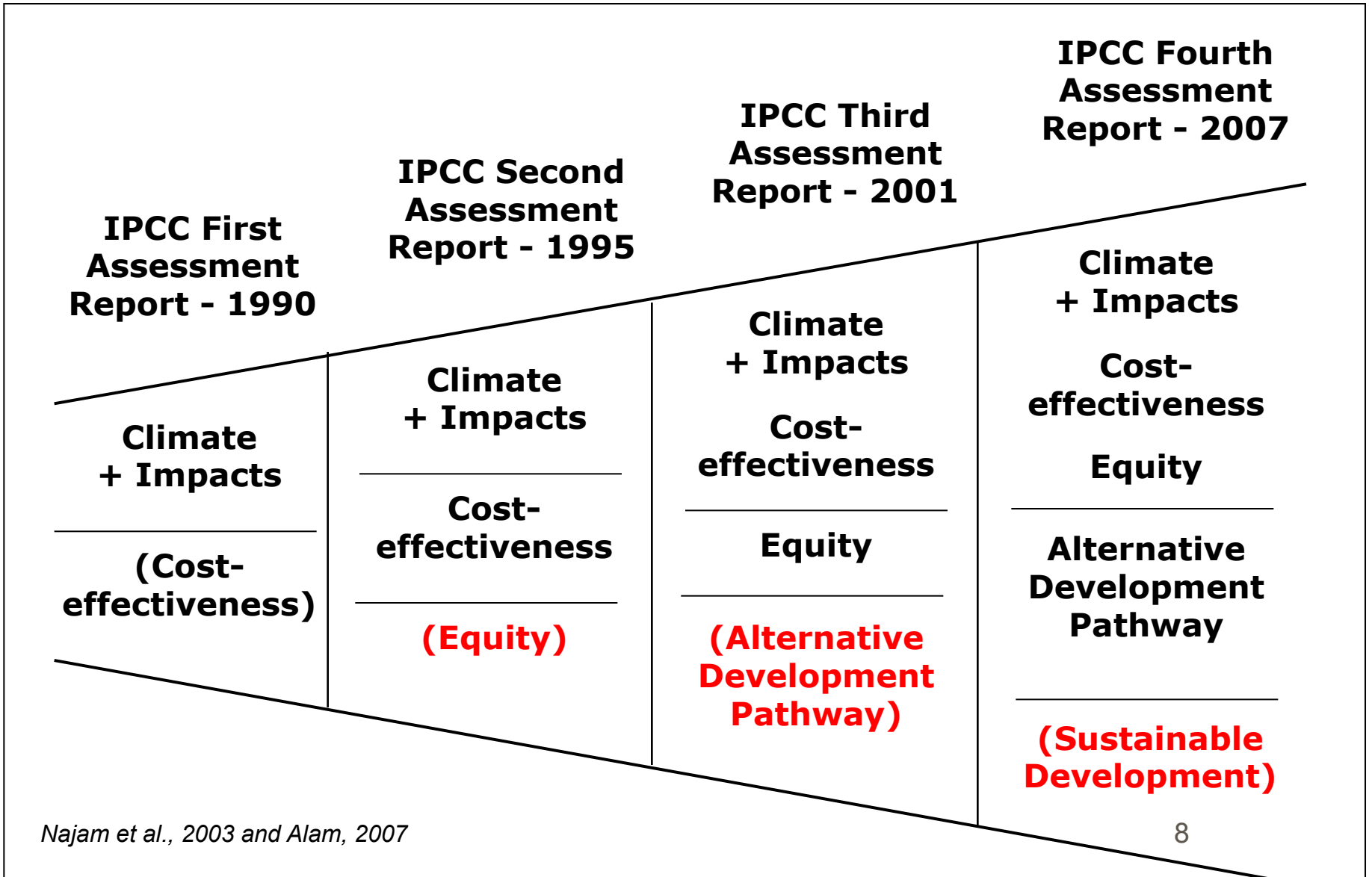
The IPCC assessments have influenced global action on an unprecedented scale

1. The First Assessment Report (FAR, 1990) had a major impact in defining the content of the UNFCCC
2. The Second Assessment Report (SAR, 1996) was largely influential in defining the provisions of the Kyoto Protocol
3. The Third Assessment Report (TAR, 2001) focused attention on the impacts of climate change and the need for adaptation
4. The Fourth Assessment Report (AR4, 2007) informed the decision on the ultimate objective (2°C) and is creating a strong basis for a post Kyoto Protocol agreement
5. The Fifth Assessment Report (AR5, 2013-14) will inform the review of the 2°C objective, and be the context for preparing the Paris 2015 agreement

Recent/Coming IPCC Products

- ***2011: Special report on Renewable Energy Sources and Climate Change Mitigation***
- ***2011: Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation***
- ***2013: AR5 WGI report (physical science)***
- ***2014: AR5 WGII (Impacts & Adaptation); WGIII (Mitigation), Synthesis Report***
- ***All available on www.ipcc.ch***

Background



Najam et al., 2003 and Alam, 2007

AR5 is/will be the best ever

- Better integration of Mitigation and Adaptation
- Improved risk-management approach
- Evolving away from the non-mitigation SRES scenarios (SRES= Special Report on Emission Scenarios, 2000)
- Special effort to provide regional information when available
- Sustainable development & equity aspects
- More comprehensive treatment of economic aspects, and of cross-cutting issues
- Emerging issues handled (geo-engineering, …)
- Better handling & communication of uncertainties

Key SPM Messages

19 Headlines

on less than 2 Pages

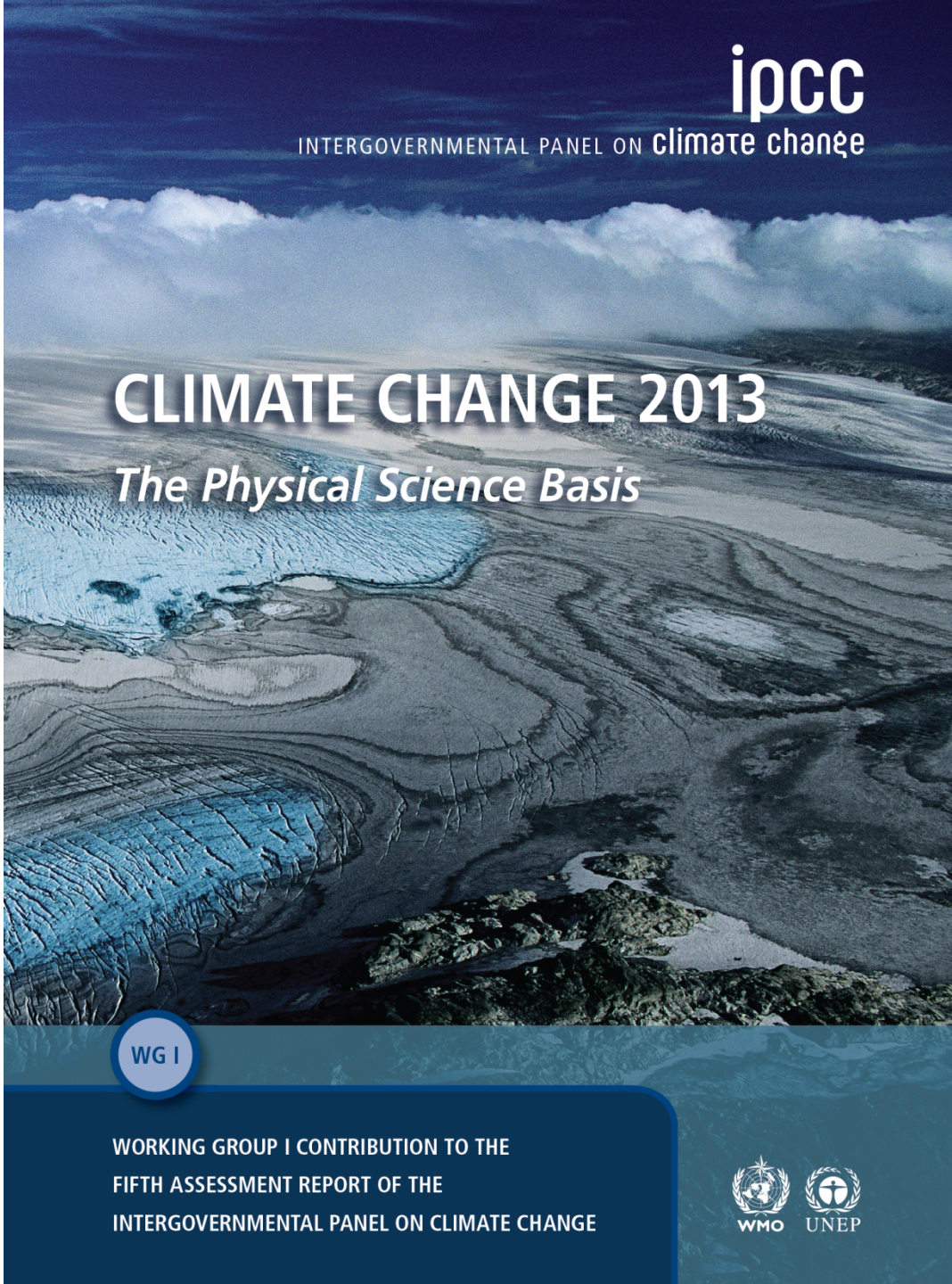
Summary for Policymakers
~14,000 Words

14 Chapters
Atlas of Regional Projections

54,677 Review Comments
by 1089 Experts

2010: 259 Scientists Selected

2009: WGI Outline Approved



Key messages from the IPCC WG1 Report (1)

- **Certain:**
  - Emissions resulting from **human activities are substantially increasing** the atmospheric concentrations of the **greenhouse gases**: CO2, CH4, CFC, and N2O
- Calculated **with confidence**:
  - Under the business as usual scenario, **temperature will increase by about 3°C by 2100** (uncertainty range: **2 to 5°C**), and **sea level will increase by 60 cm** (uncertainty range: **30 to 100 cm**)

Jean-Pascal van Ypersele
(vanypersele@astr.ucl.ac.be)

Key messages from the IPCC WG1 Report (2)

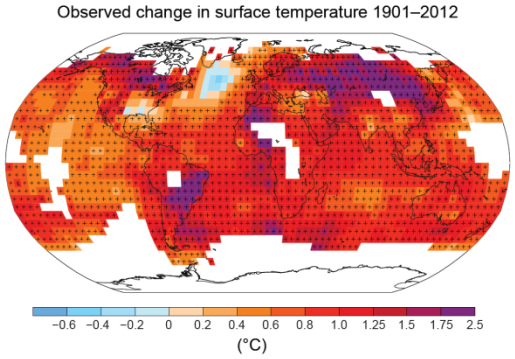
- With an increase in the mean temperature, **episodes of high temperature** will most likely become **more frequent**
- Rapid changes in climate will change the composition of ecosystems; **some species** will be unable to adapt fast enough and **will become extinct**.
- Long-lived gases (**CO2**, N2O and CFCs) **would require immediate reduction** in emissions from human activities **of over 60% to stabilise their concentration at today's levels**.

Jean-Pascal van Ypersele
(vanypersele@astr.ucl.ac.be)

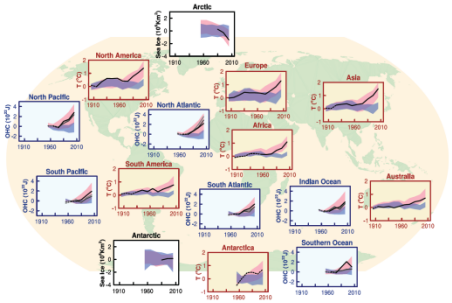
Oops…

- … this was from the IPCC **first** assessment report, published 20 years ago (1990)

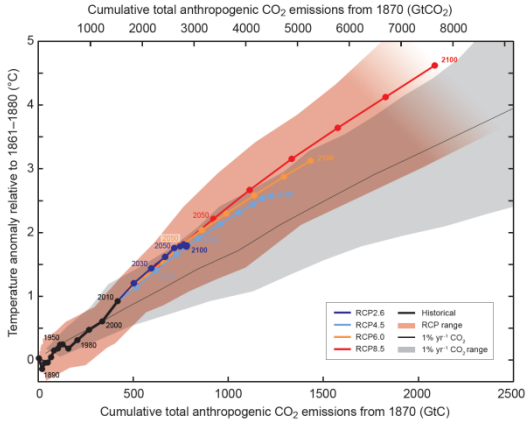
- Was anybody really listening?



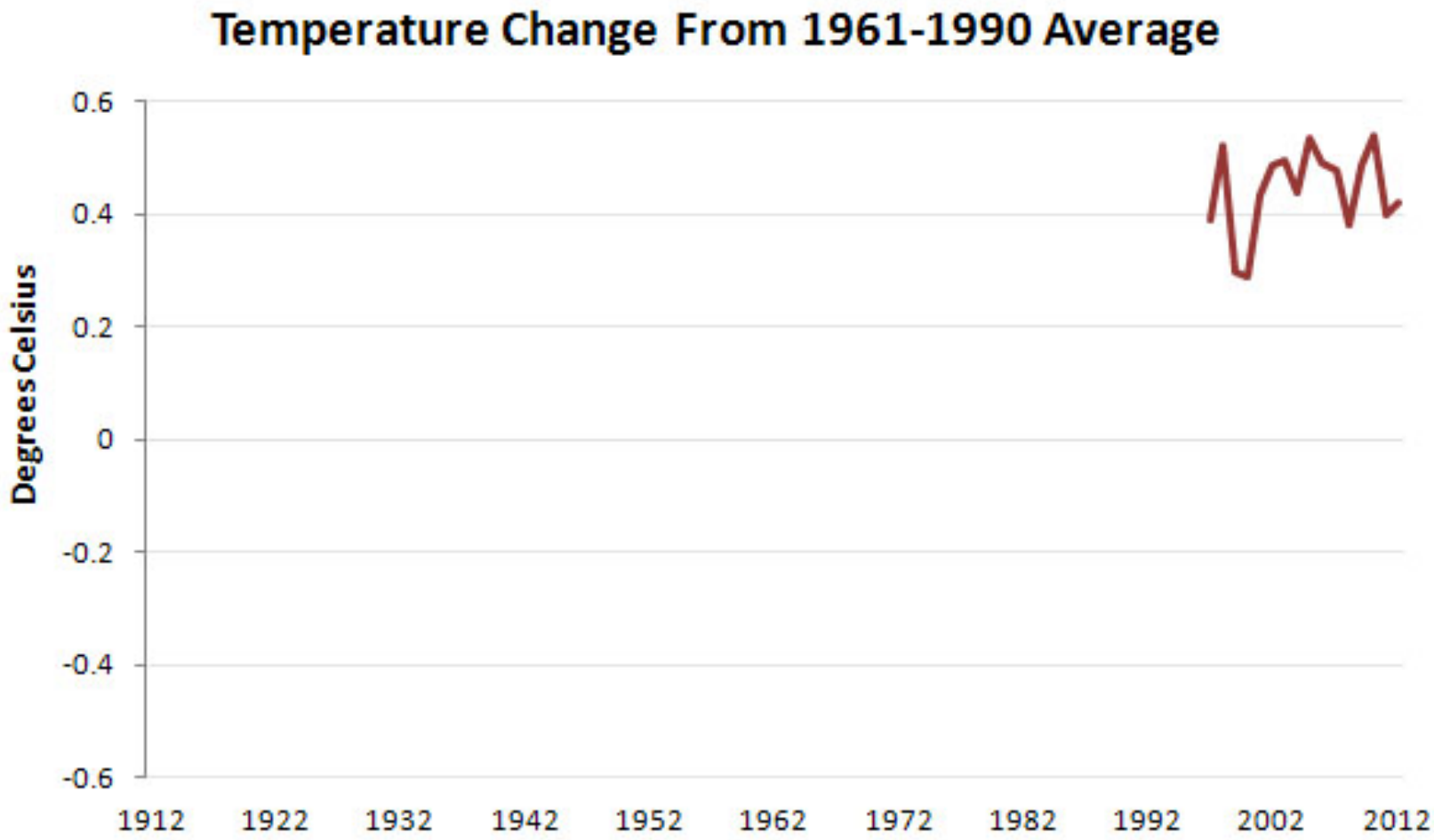
Warming of the climate system is unequivocal, [...]



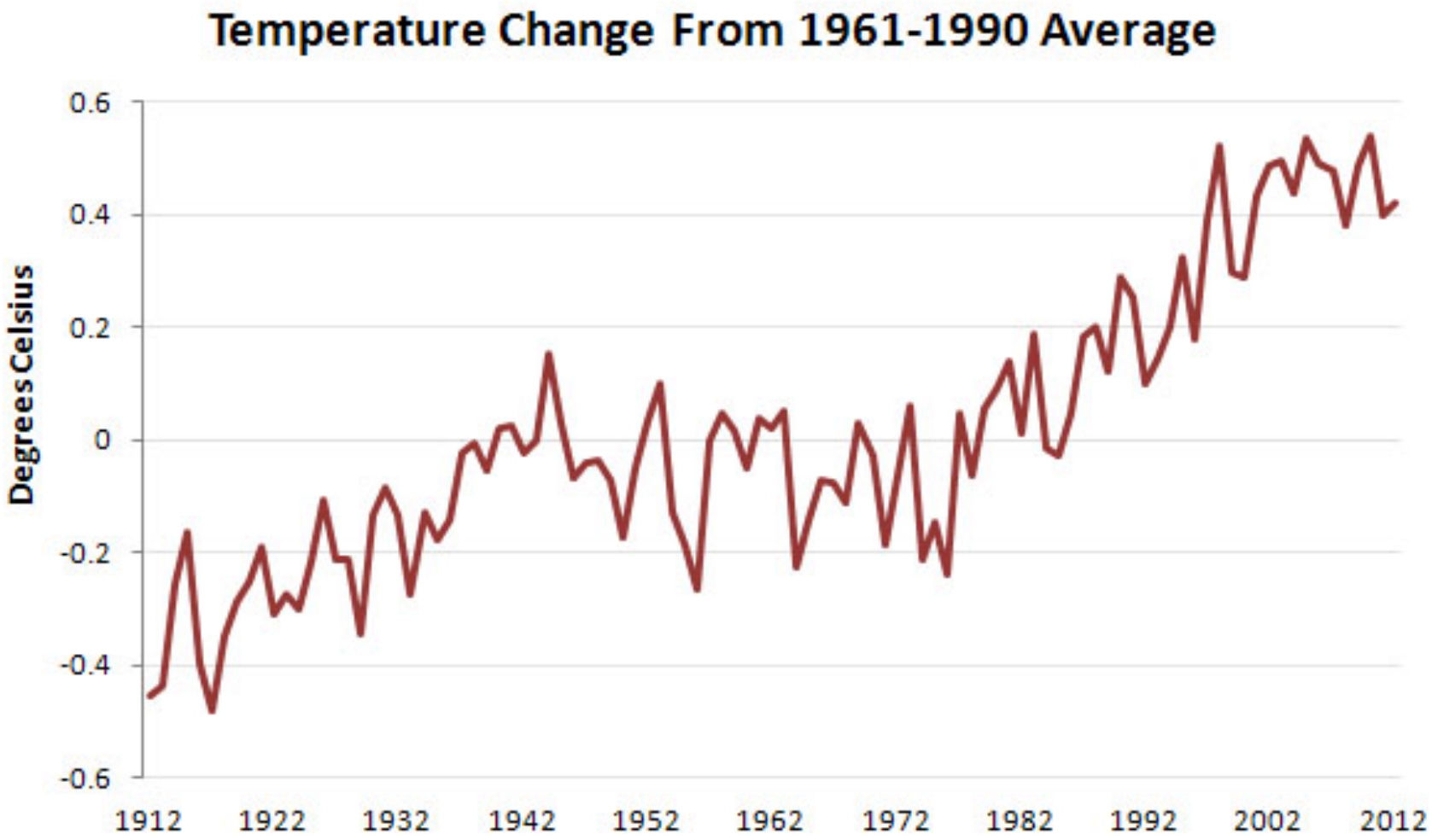
Human influence on the climate system is clear.



Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

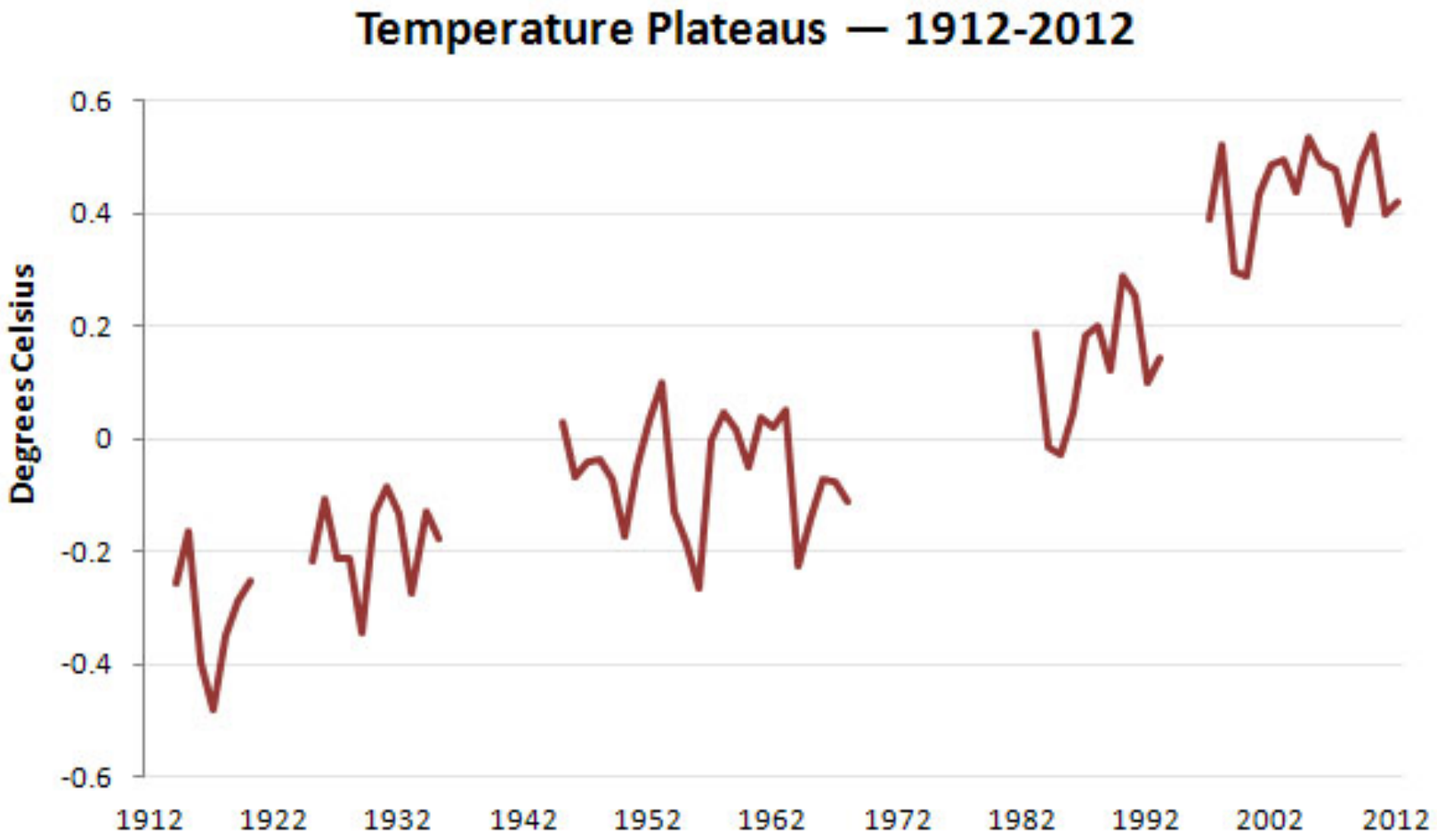


http://www.motherjones.com/kevin-drum/2012/10/lying-statistics-global-warming-edition

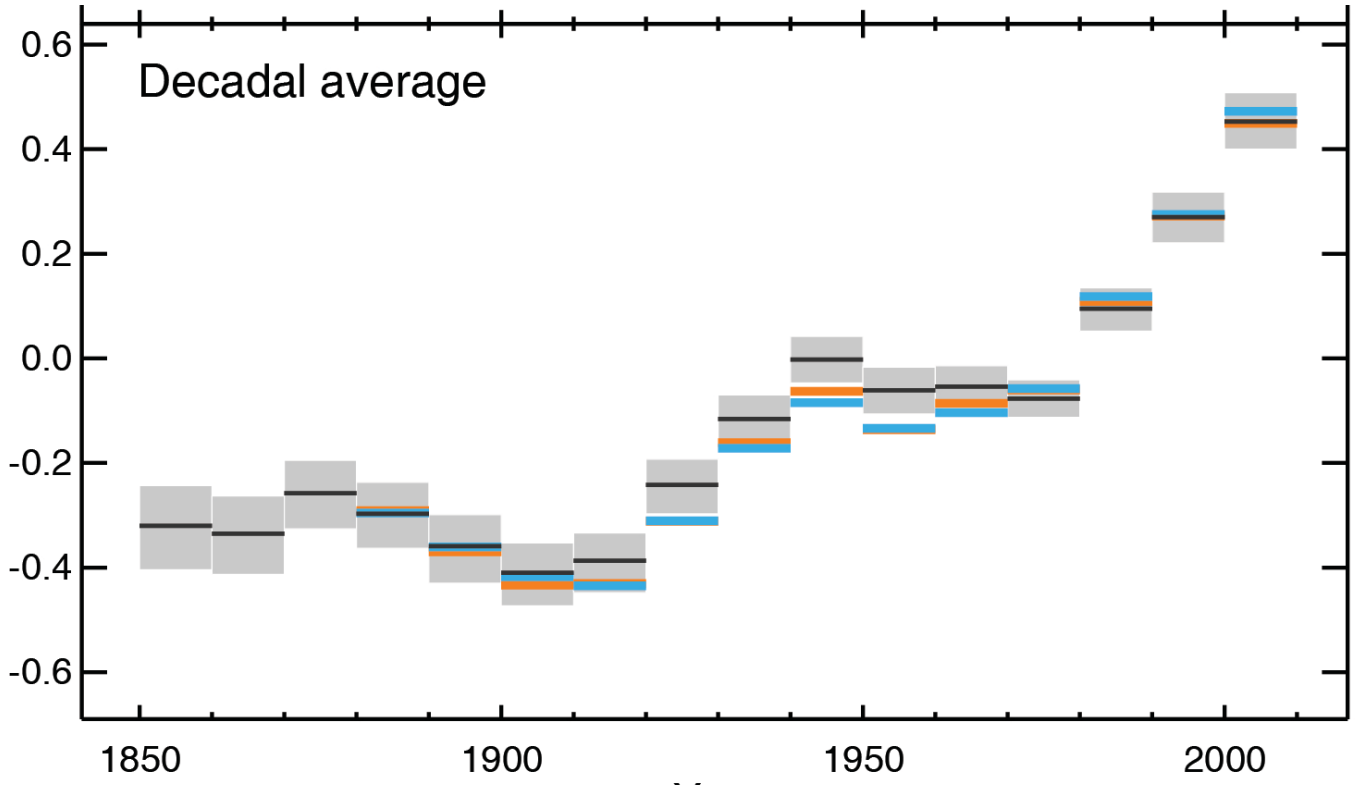


http://www.motherjones.com/kevin-drum/2012/10/lying-statistics-global-warming-edition

Lying With Statistics, Global Warming Edition



http://www.motherjones.com/kevin-drum/2012/10/lying-statistics-global-warming-edition



(IPCC 2013, Fig. SPM.1a)

Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850.

In the Northern Hemisphere, 1983–2012 was *likely* the warmest 30-year period of the last 1400 years (*medium confidence*).

Que dit le GIEC sur le « ralentissement du réchauffement »

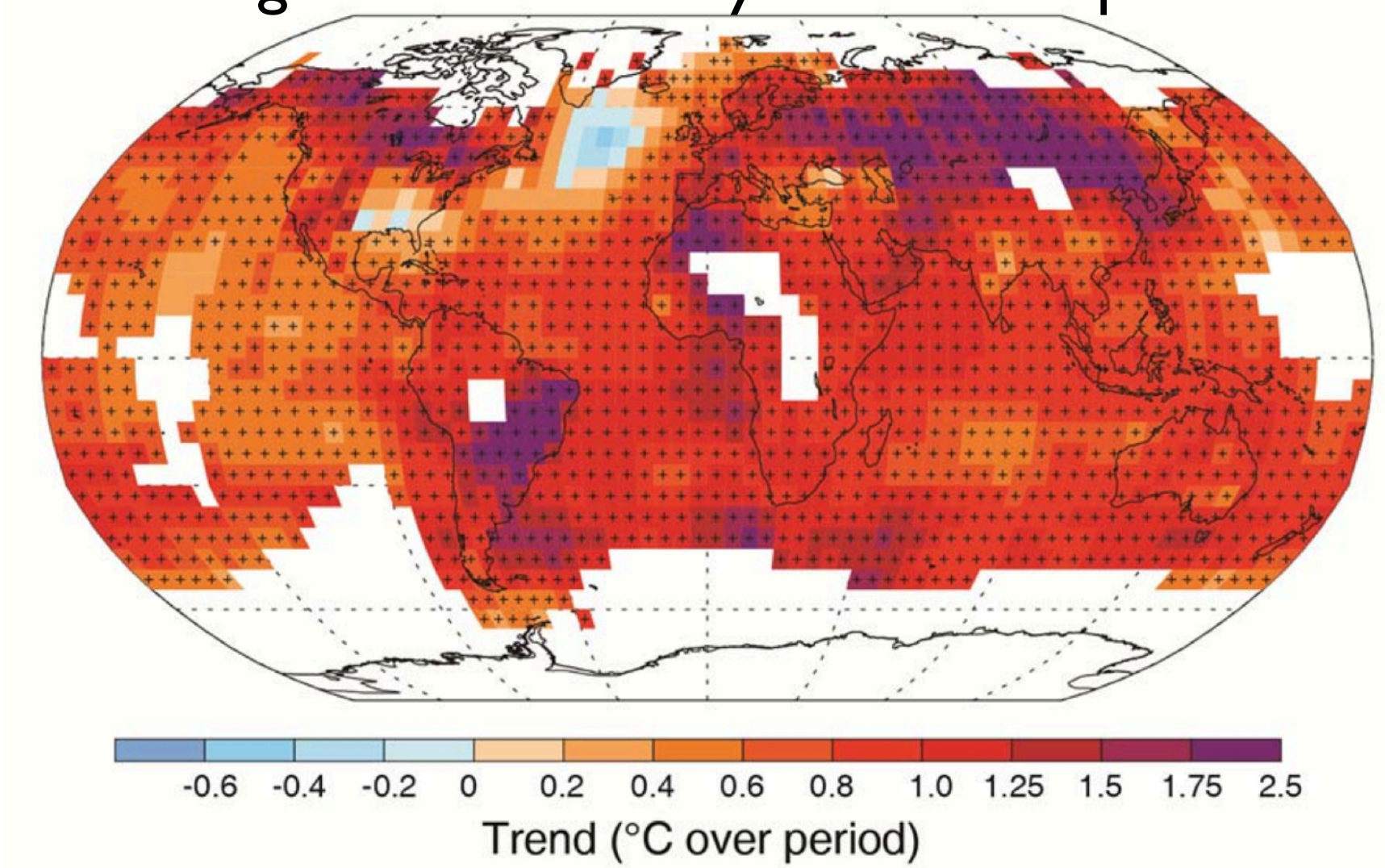
- En raison de la variabilité naturelle, les tendances calculées sur des séries courtes sont **très sensibles à la date de début et de fin de la période** considérée, et ne reflètent généralement pas les tendances climatiques
- Le taux de réchauffement calculé sur la période **1998-2012 est de +0.05°C/décennie** (début lors d'un fort événement El Niño), alors que celui calculé sur la période **1996-2010 est de +0.14°C**; la tendance calculée sur **1951-2012 étant de 0.12°C**/ décennie

Que dit le GIEC sur le « ralentissement du réchauffement »

- La réduction observée de la tendance 1998-2012 par rapport à celle de 1951-2012 est **due à parts à peu près égales à :**
    - une **réduction du forçage radiatif** (principalement due à des éruptions volcaniques et à la phase descendante du cycle solaire) (degré de confiance faible)
    - Une contribution de la **variabilité interne**, dont une possible **redistribution de la chaleur au sein de l'océan** (degré de confiance moyen)

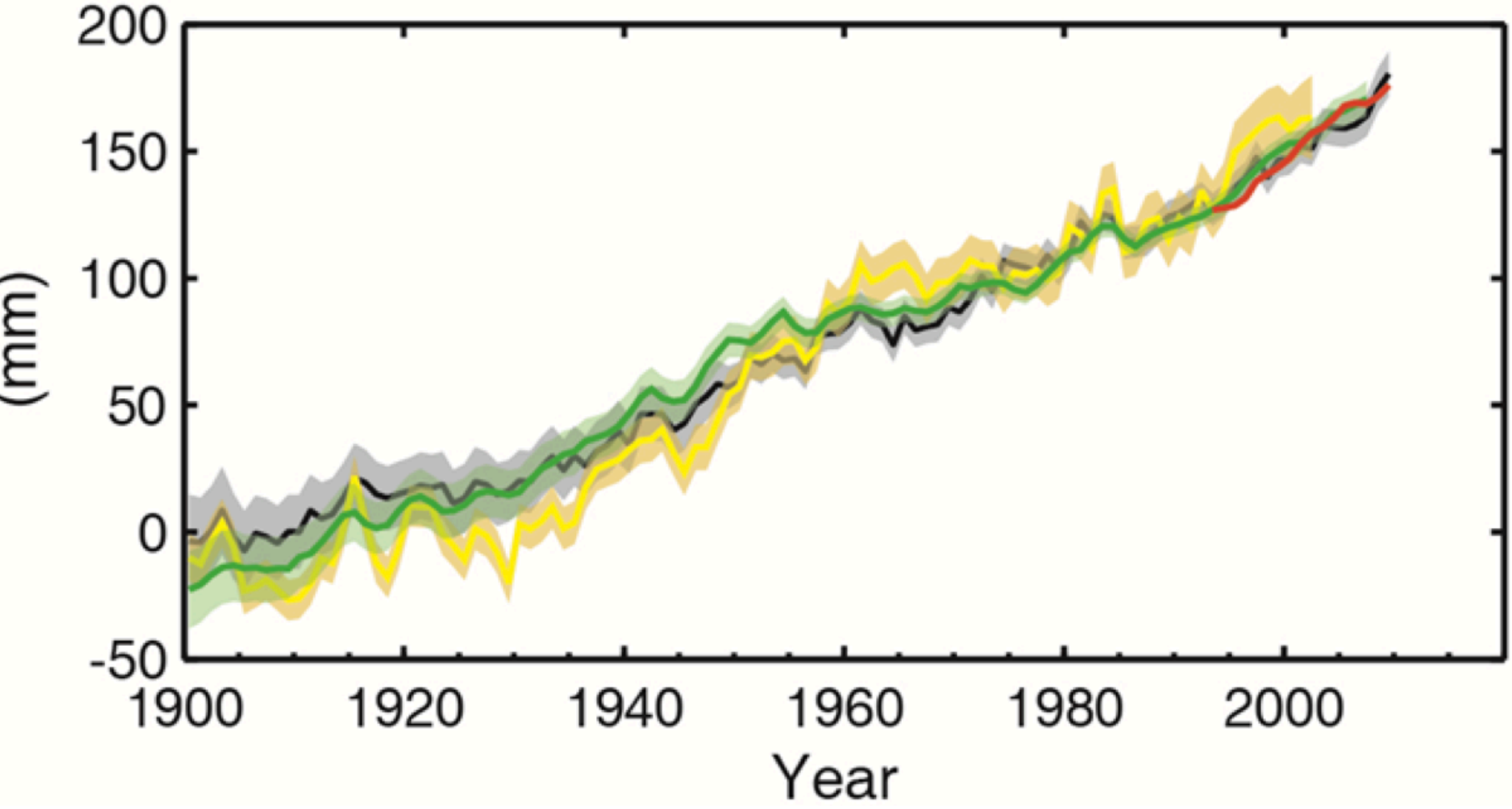
Change in average surface temperature 1901-2012

Warming in the climate system is unequivocal

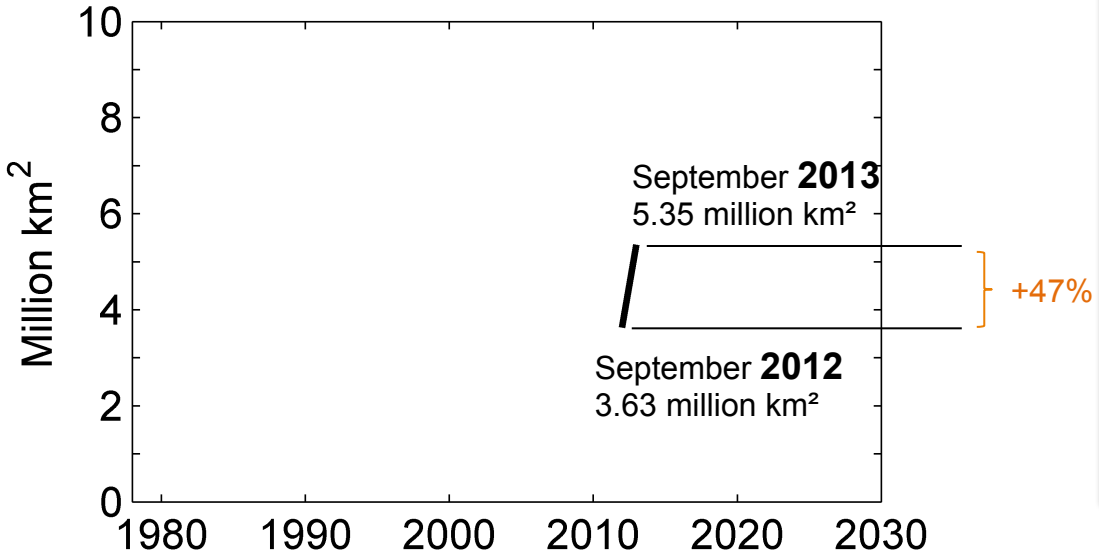


AR5 WGI SPM - Approved version / subject to final copyedit

Change in average sea-level change

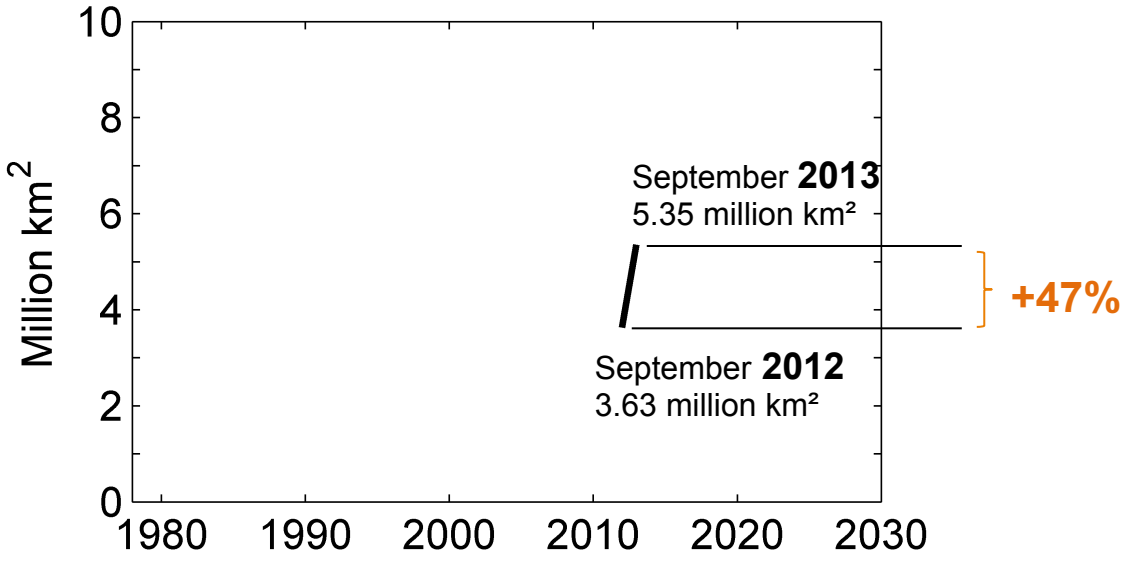


Observed Arctic September sea ice extent



Credit: F. Massonnet, UCL, 2013
Sea ice extent data: www.nsidc.org

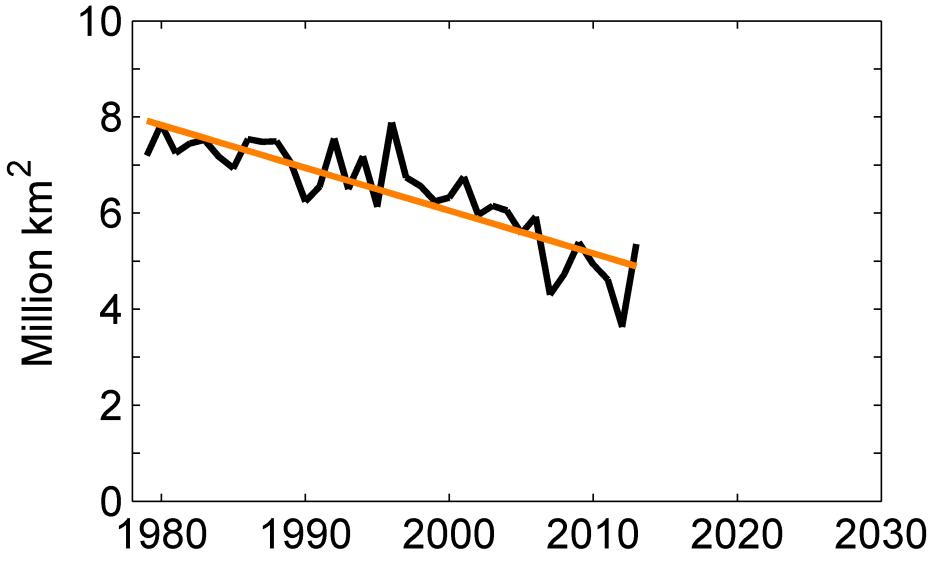
Observed Arctic September sea ice extent



Cherry-picking analysis

-« **Arctic sea ice cover is rebounding** »

-« **Climate is cooling** »



Scientific approach: the full view

-**Variability of September sea ice extent at the interannual time scale is important**

-**Significant negative trend over record period (1979-2013): −0.89 million km²/ decade**

-**September 2013 sea ice extent is 6th lowest on record and 16.5% below 1979-2013 average**

Credit: F. Massonnet, UCL, 2013
Sea ice extent data: www.nsidc.org