



IPCC Fifth Assessment Report (AR5) now underway

Towards the Fifth Assessment Report (AR5) of the IPCC

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IPCC Vice-chair

SBSTA 38 Research Dialogue, Bonn, June 2013

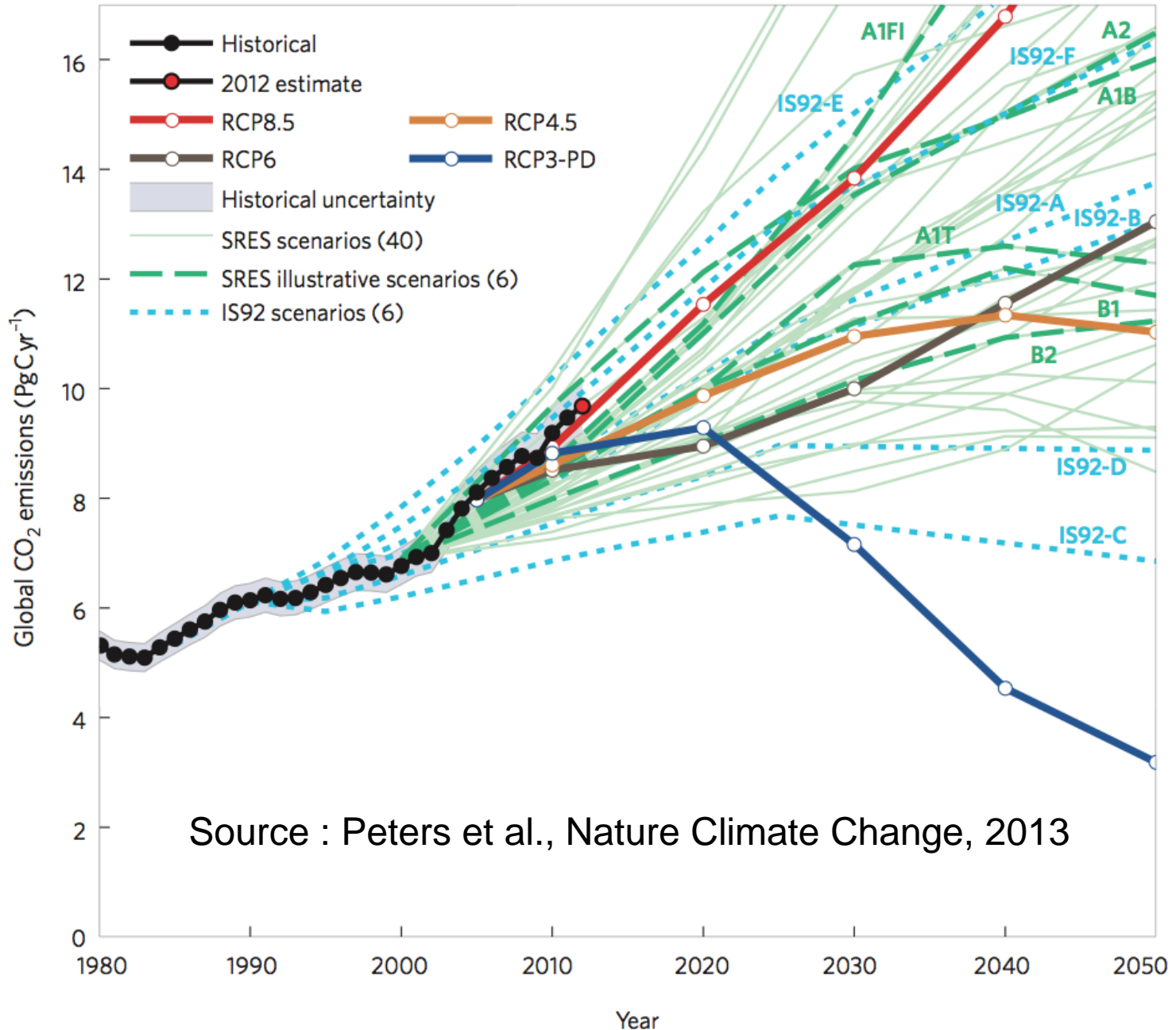
Thanks to the Belgian Federal Science Policy Office for its support



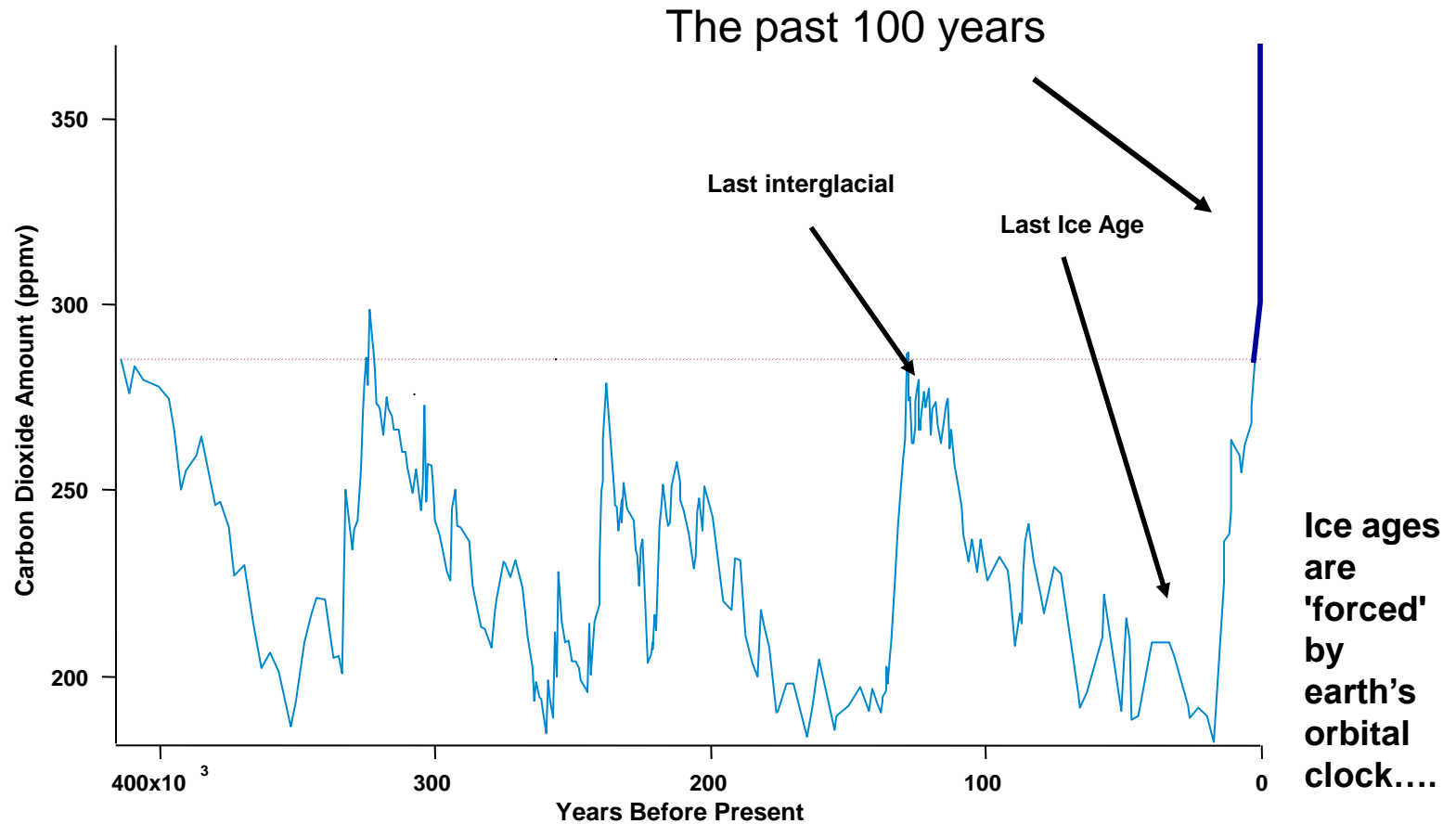
Key points

- Some recent news from the climate system
- CO₂ accumulates, warming continues, ice melts...
- Significant inertia exists
- 2° C, or even 1.5° C are possible, if...
- The options are there, but time matters
- IPCC is on track to deliver the AR5 (the best ever)
- NB: Anything dated after 2007, except for SRREN, is not material endorsed by IPCC. The next report (AR5) will assess this new information

Emissions are on the high side of past IPCC scenarios



Some information about carbon dioxide changes through four past ice ages (from ice cores), and in the modern era (from global data)



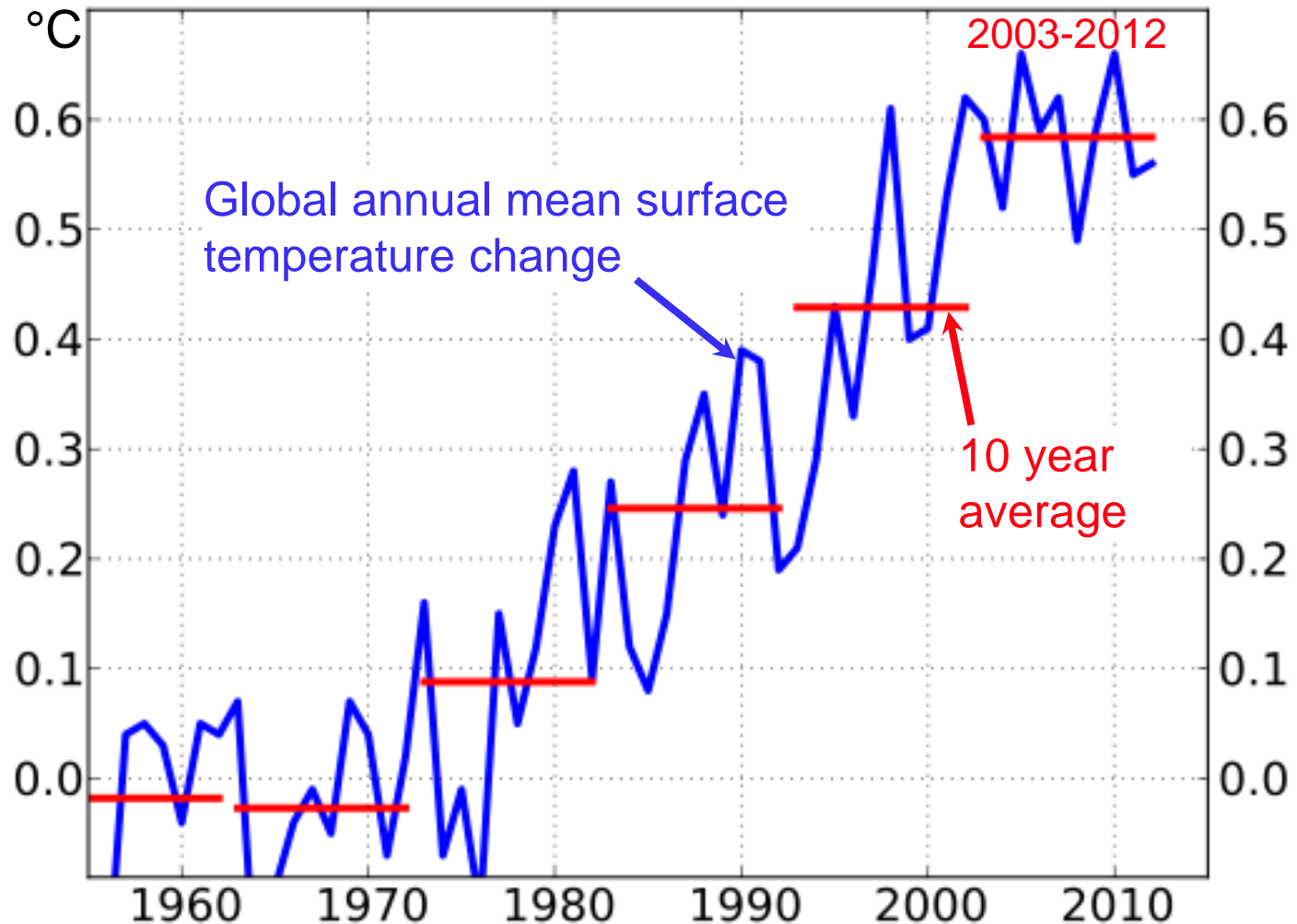
It is well established that there is more carbon dioxide in the atmosphere today than there has been in at least 650,000 years. (Figure by S. Solomon)

AR4: Sea-level rise due to thermal expansion only

Category	CO ₂ concentration at stabilisation (2005 = 379 ppm) ^a	CO ₂ -equivalent concentration at stabilisation including GHGs and aerosols (2005=375 ppm) ^b	Peaking year for CO ₂ emissions ^{a,c}	Change in global CO ₂ emissions in 2050 (percent of 2000 emissions) ^{a,c}	Global average temperature increase above pre-industrial at equilibrium, using 'best estimate' climate sensitivity ^{d,e}	Global average sea level rise above pre-industrial at equilibrium from thermal expansion only ^f
	ppm	ppm	year	percent	°C	metres
I	350 – 400	445 – 490	2000 – 2015	-85 to -50	2.0 – 2.4	0.4 – 1.4
II	400 – 440	490 – 535	2000 – 2020	-60 to -30	2.4 – 2.8	0.5 – 1.7
III	440 – 485	535 – 590	2010 – 2030	-30 to +5	2.8 – 3.2	0.6 – 1.9
IV	485 – 570	590 – 710	2020 – 2060	+10 to +60	3.2 – 4.0	0.6 – 2.4
V	570 – 660	710 – 855	2050 – 2080	+25 to +85	4.0 – 4.9	0.8 – 2.9
VI	660 – 790	855 – 1130	2060 – 2090	+90 to +140	4.9 – 6.1	1.0 – 3.7

AR4 SYR Table 5,1

Global mean surface temperature (last decades)



Plot: www.climate.be/pendules (2013) Reference period (0°C): 1951 - 1980

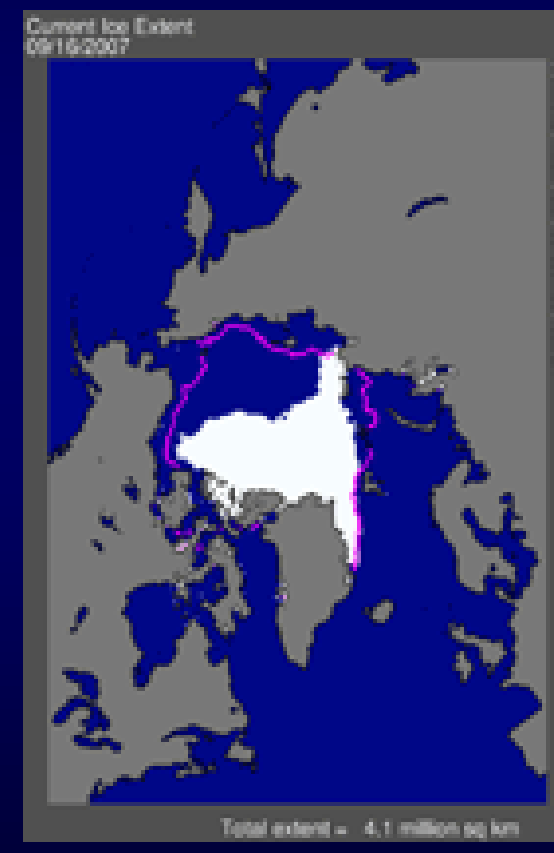
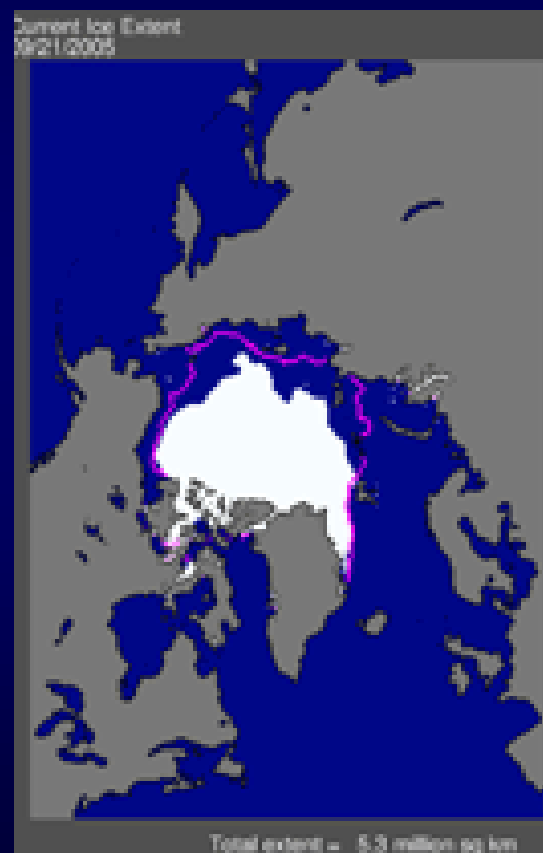
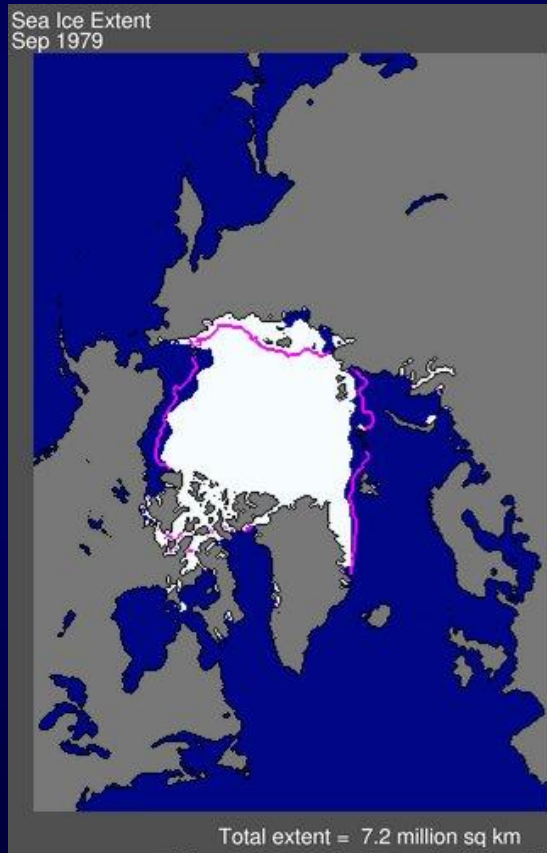
Data: NASA GISS, http://data.giss.nasa.gov/gistemp/graphs_v3, method in Hansen et al. PNAS 2006.

Extension of the Arctic ice cap

September 1979

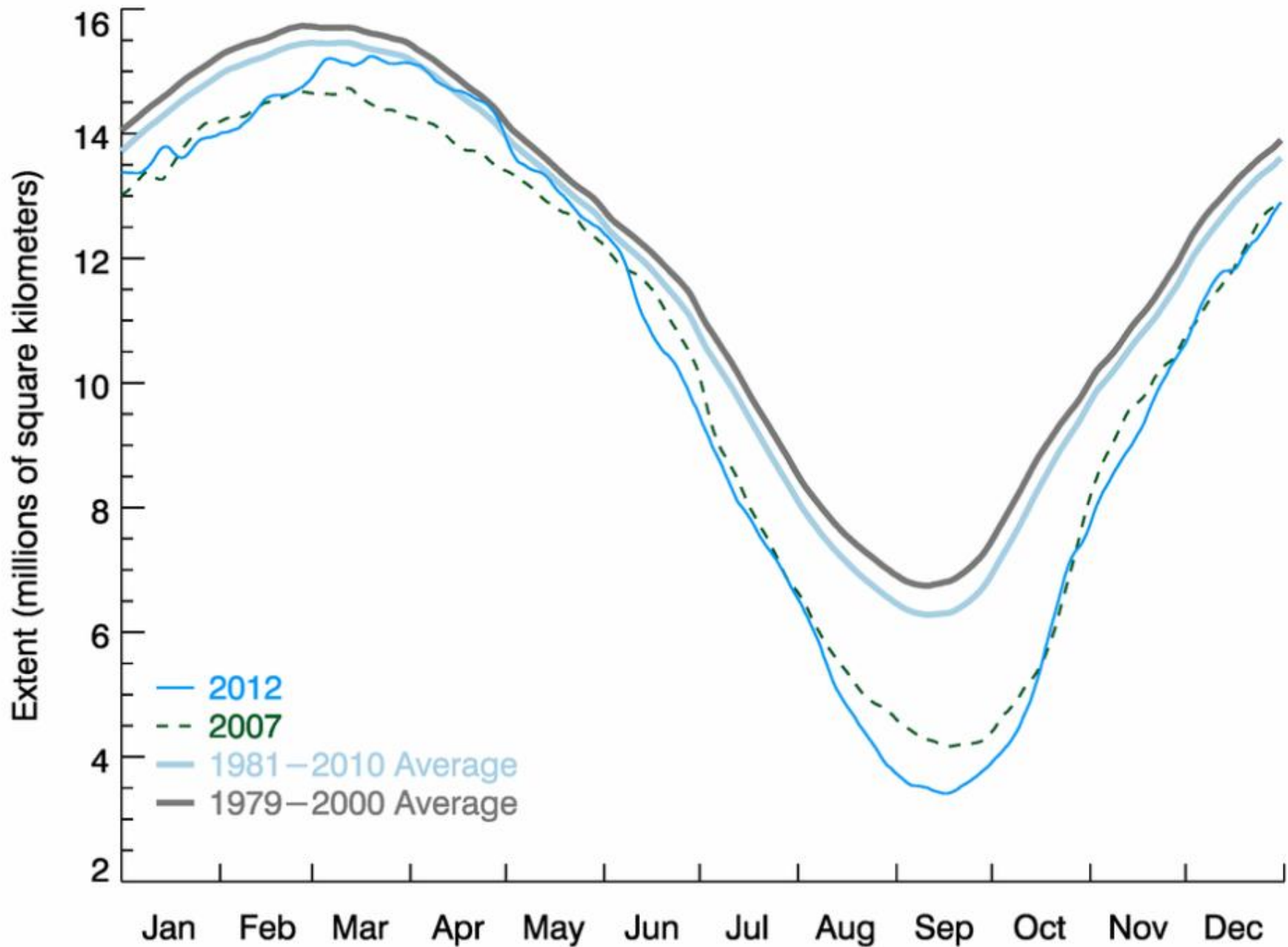
September 2005

September 2007



The pink line indicates the average ice cap extension since 1979

Arctic Sea Ice Extent (Area of ocean with at least 15% sea ice)



(The impacts of climate change, becoming more visible in many locations, will be discussed by Chris Field during the Expert Dialogue on June 5)

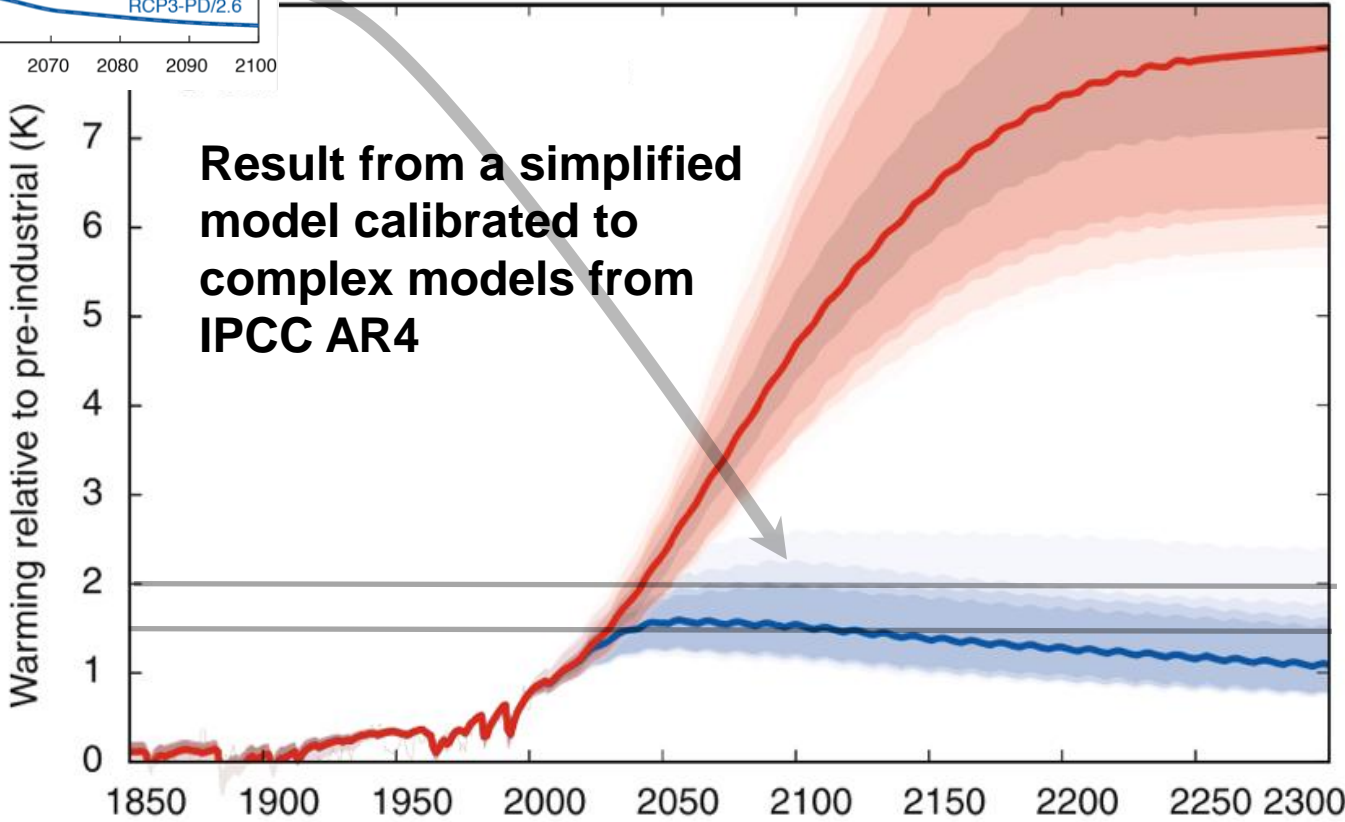
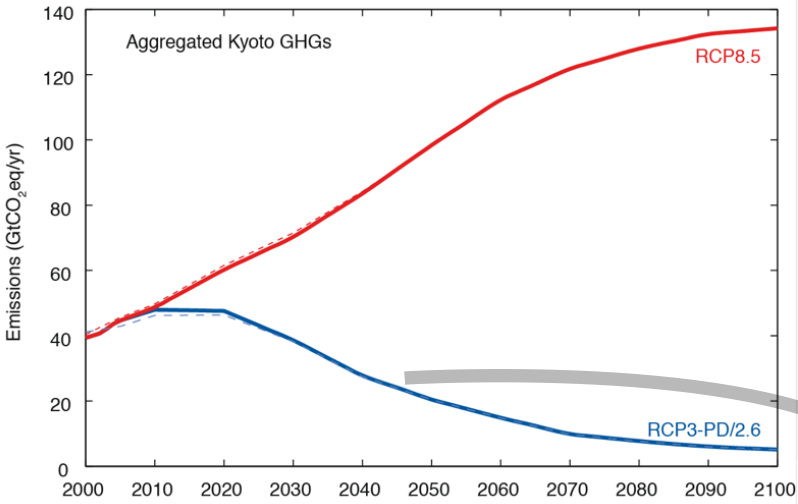
A general view shows the flooded center of Passau, southern Germany, on Monday, June 3, 2013



Photo by Matthais Schrader

Ongoing research - new «pathways»

- Emissions at the lower end of currently investigated pathways still avoid 2° C and may have about 50% chances of reaching 1.5° C by 2100, according to early analysis
- this means that global GHG emissions start to decline before ~2020



Source:
Meinshausen et al.,
Climatic Change, 2011

Why the IPCC ?

Established by WMO and UNEP in 1988

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

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



Completed IPCC Reports

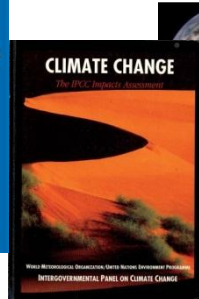
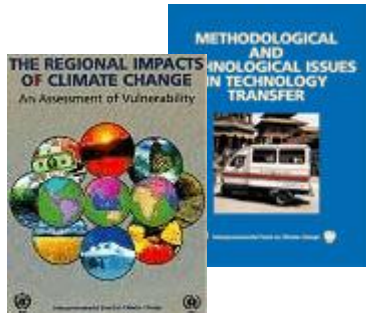
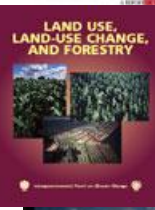
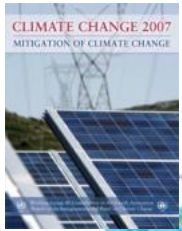
4 Assessment Reports (1990, 1995, 2001, 2007)

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)



Recent 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***
- ***All available on www.ipcc.ch***

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 **post-Durban 2015 agreement**

**AR5: we cannot speculate on content,
but...**

AR5 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**

The Working Group (WG) Reports and Synthesis Report will be completed in 2013/2014:

- **WG I: The Physical Science Basis**
23-26 September 2013
- **WG II: Impacts, Adaptation and Vulnerability**
25-29 March 2014
- **WG III: Mitigation of Climate Change**
7-11 April 2014
- **AR5 Synthesis Report (SYR)**
27-31 October 2014

Working Group I contribution to the IPCC AR5 2013: *The Physical Science Basis*

First Order Draft Review

21'400	Comments
659	Experts

Second Order Draft Review

31'422	Comments
800	Experts
26	Governments

Working Group II contribution to the IPCC AR5 2013: *Impacts, Adaptation and Vulnerability*

First Order Draft (FOD) review :
19598 comments

Working Group III contribution to the IPCC AR5 2013: *Mitigation of Climate Change*

Global Scientific Collaboration



For the first order draft review

Synthesis Report (ZOD)

- Topic 1: Observed Changes and their Causes
- Topic 2: Future climate changes, impacts and risks
- Topic 3: Transformations and Changes in Systems
- Topic 4: Adaptation and Mitigation Measures
- Box: Scientific information relevant to Article 2 of the UNFCCC

Some old IPCC information, still extremely relevant

- **CO₂ accumulates** in atmosphere as long as sources > sinks (and the sink fraction is decreasing) (it means historical responsibilities have a scientific basis)
- We are at CO₂ levels higher than at any period over at least the last million years
- Ocean **acidification** will increasingly be a problem
- Huge changes in habitability of our planet occurred when temperature increased by a few degrees in the past (ex: last glacial maximum)

Some old IPCC information, still extremely relevant (2)

- Adaptation is ***urgent*** but has limitations and costs, especially if mitigation is not strong
- Mitigation is essential, and because of the cumulative nature of the carbon cycle, is ***urgent*** if one wants to avoid more than 2°C warming
- Having a **price on emitted carbon** could realise significant mitigation potential in all sectors
- There are much **more fossil fuel reserves than needed** to keep the temperature increase below 2°C, and, a fortiori, 1.5°C

Some old IPCC information, still extremely relevant (2)

- There are many ***co-benefits*** to well-designed climate mitigation and adaptation (reduced air pollution, improved energy access and reduced dependence on non-renewable imported resources, sustainable development, ...)
- Greater ***cooperative efforts*** to reduce emissions will reduce global costs and improve environmental effectiveness
- Successful agreements incorporate distributional considerations and ***equity***

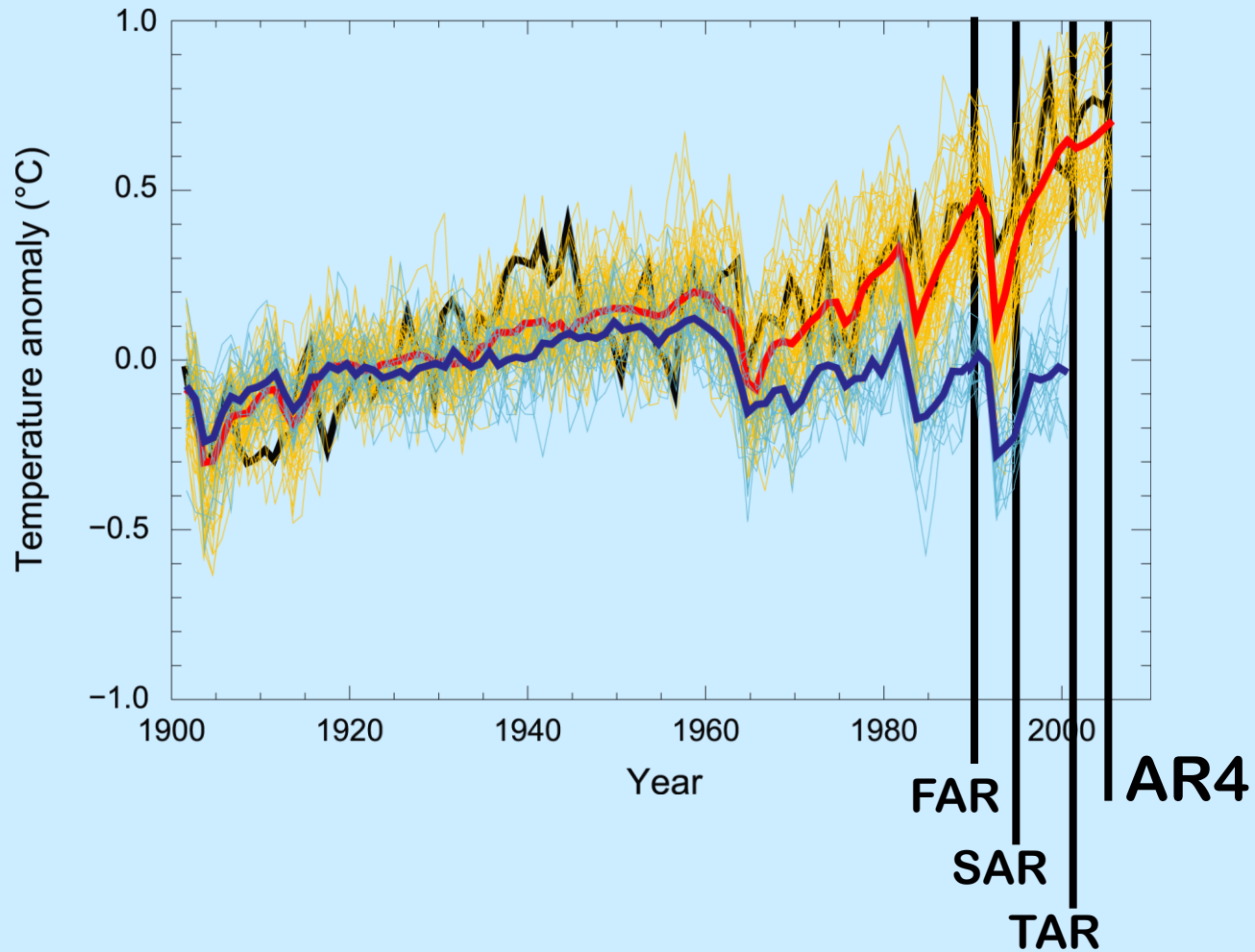
A Progression of Understanding: Greater and Greater Certainty in Attribution

FAR (1990):
“unequivocal detection
not likely for a decade”

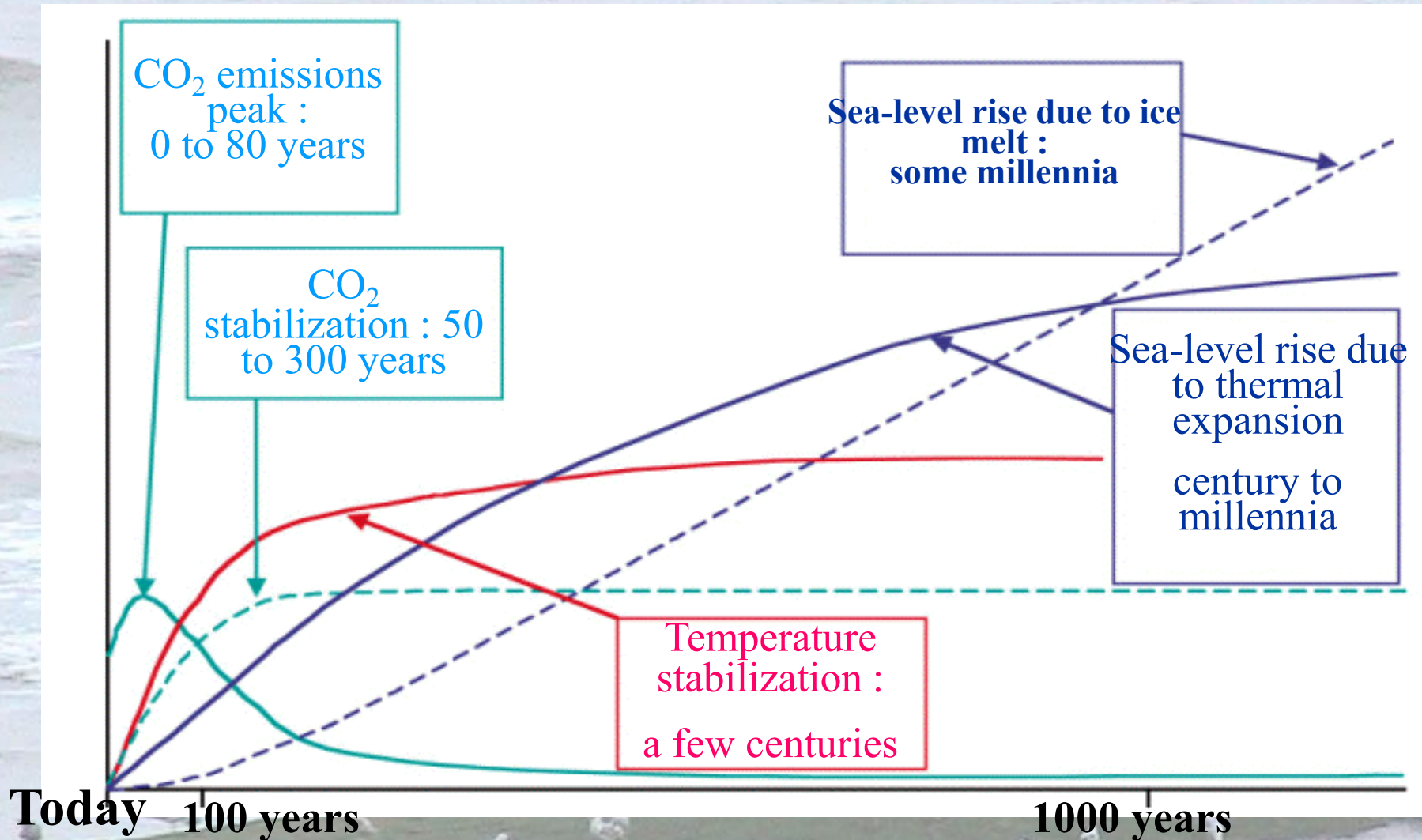
SAR (1995): “balance
of evidence suggests
discernible human
influence”

TAR (2001): “most of
the warming of the
past 50 years is likely
(odds 2 out of 3) due
to human activities”

AR4 (2007): “most of
the warming is very
likely (odds 9 out of 10)
due to greenhouse
gases”



Significant inertia exists in the climate system



AR4: Long-term sea level rise due to thermal expansion only

Long-term thermal expansion is projected to result in 0.2 to 0.6 m per degree Celsius of global average warming above pre-industrial.

(footnote f of Table 5, IPCC AR4 SYR)



WMO



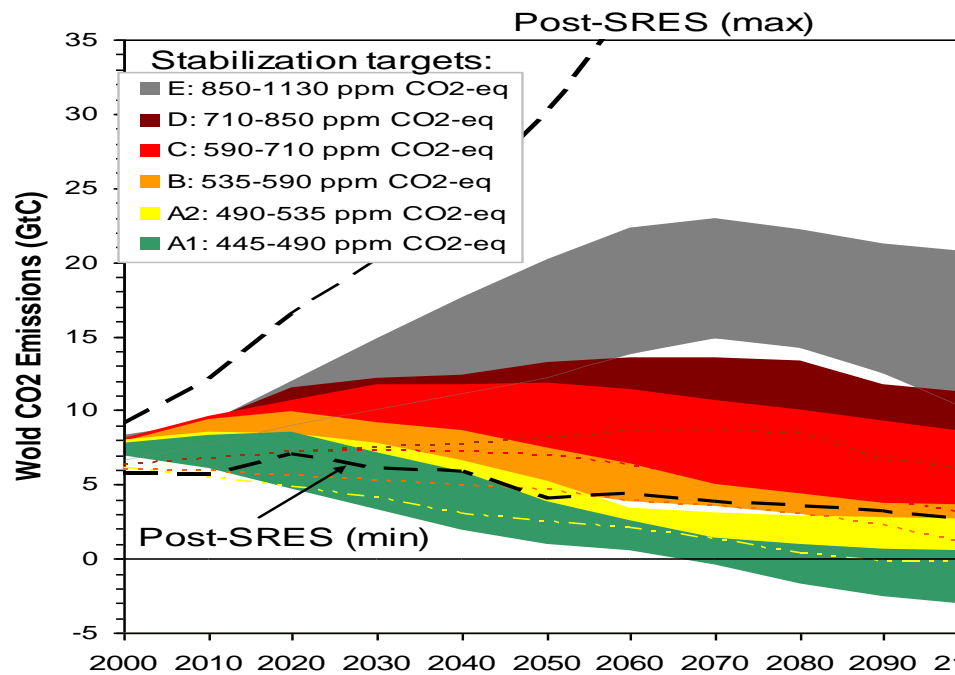
UNEP

AR4: Ice sheet melting

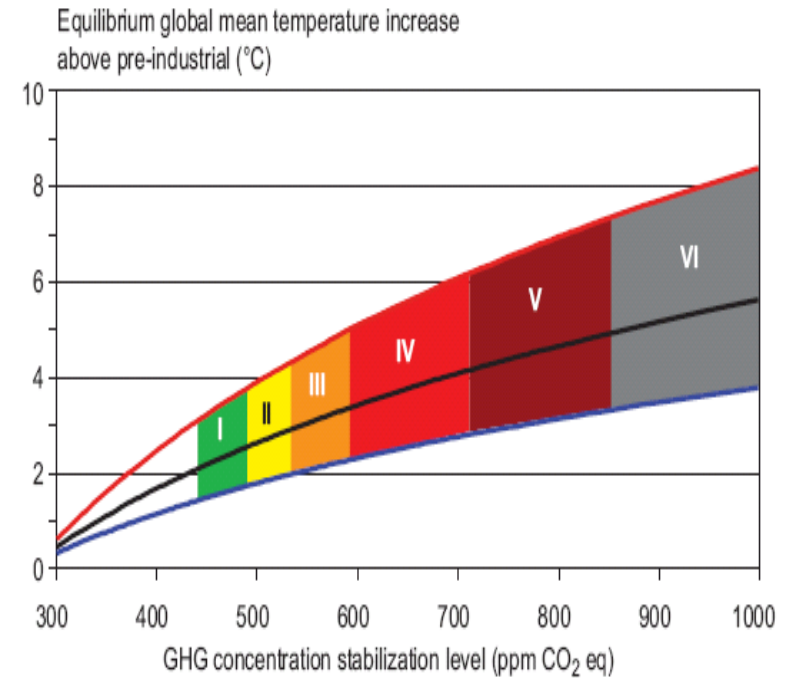
- The (Greenland) surface mass balance becomes negative (net ice loss) at a global average warming (relative to pre-industrial values) in excess of 1.9 to 4.6° C.
- If such a negative surface mass balance were sustained for millennia, that would lead to virtually complete elimination of the Greenland ice sheet and a resulting contribution to sea level rise of about 7m.



The lower the stabilisation level the earlier global emissions have to go down



Multigas and CO₂ only studies combined

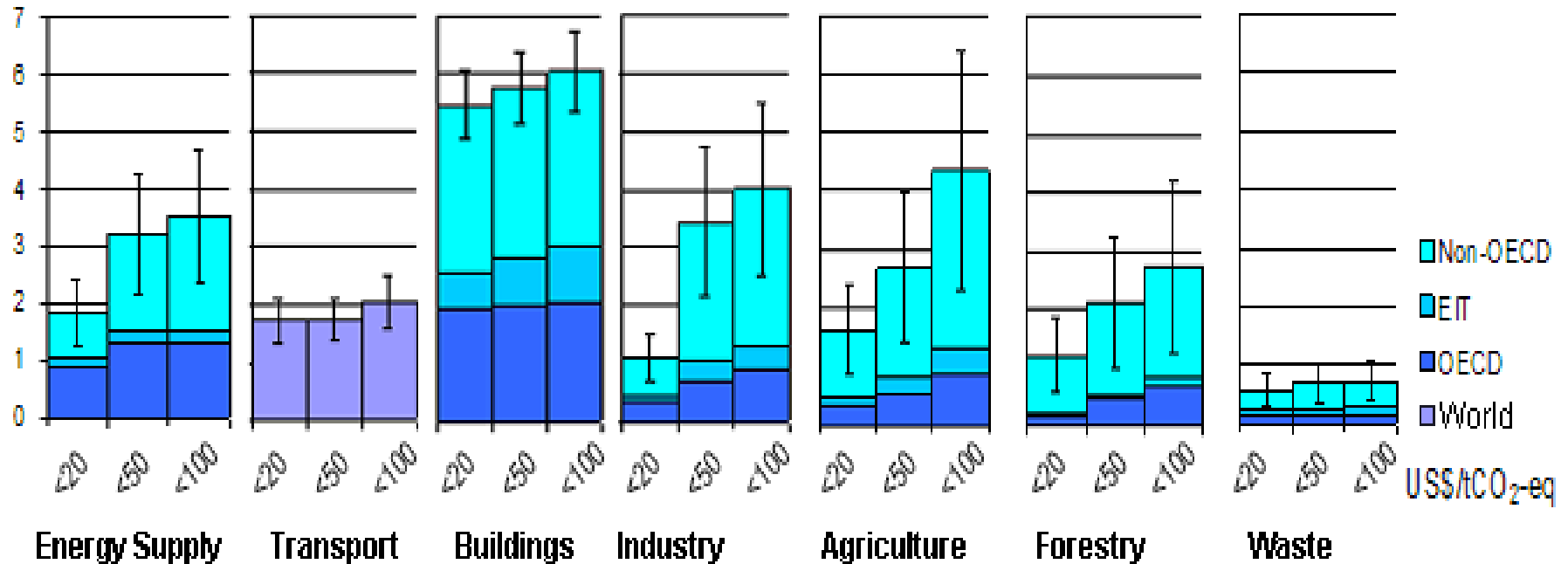


IPCC AR4 SYR (2007)

All sectors and regions have the potential to contribute by 2030

IPCC AR4 WG3 (2007)

GtCO₂eq / year (emission reduction potential)

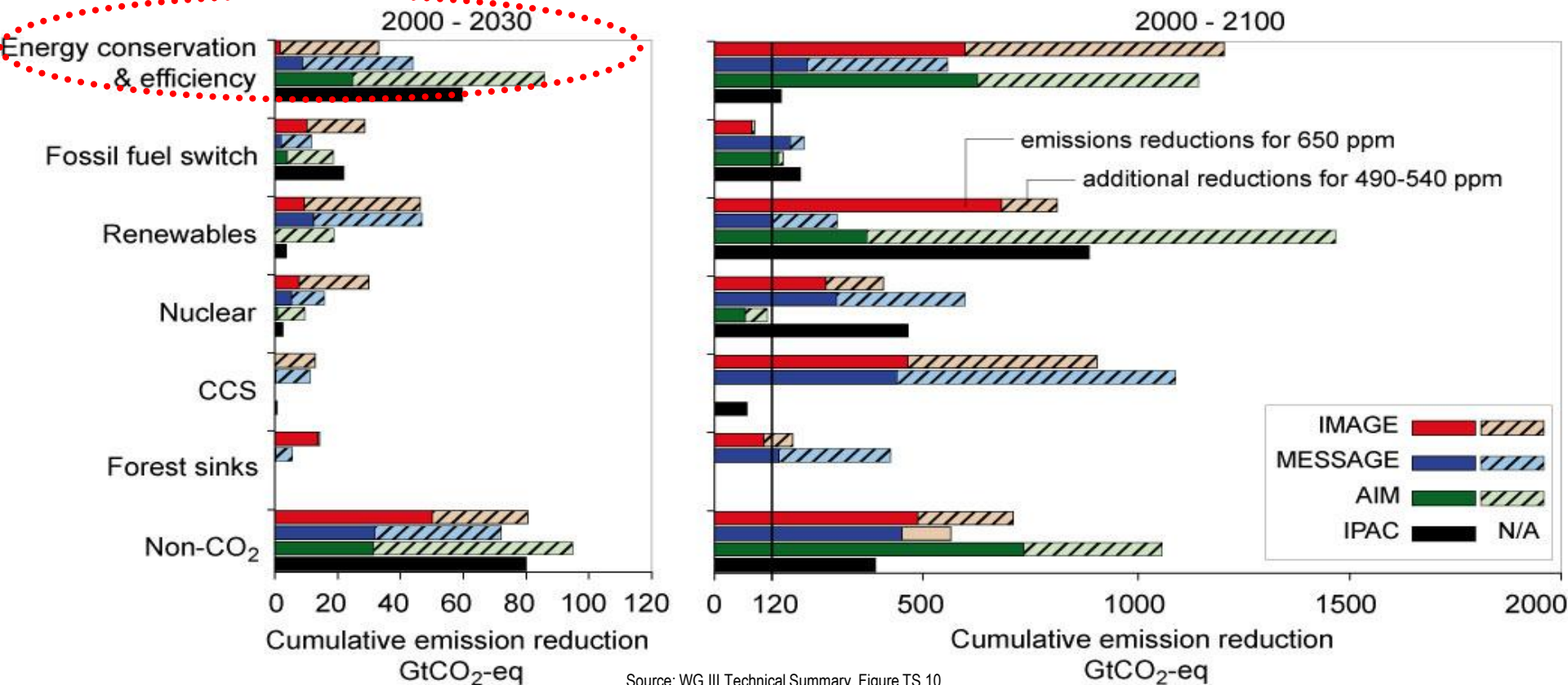


Note: estimates do not include non-technical options, such as lifestyle changes.

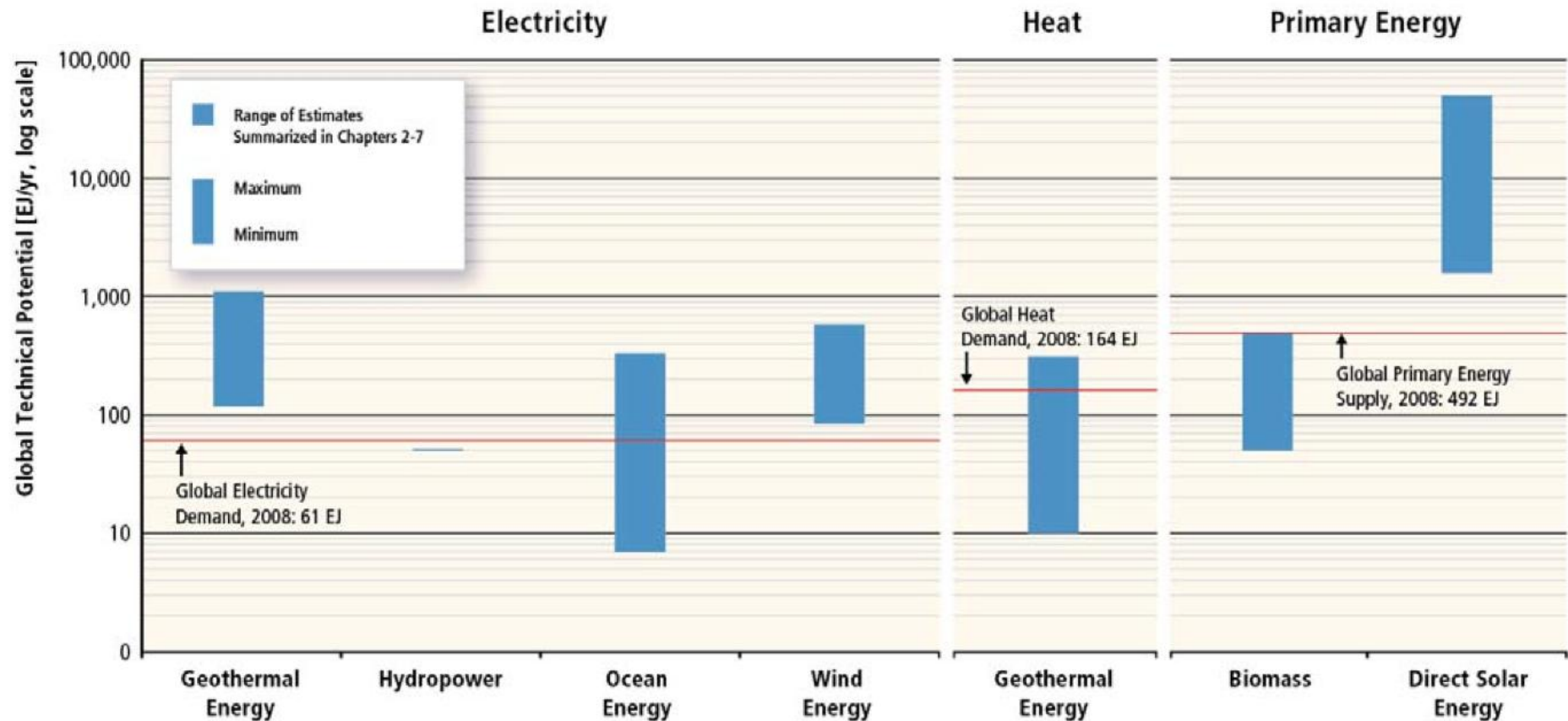
Cumulative emission reductions for alternative mitigation measures for 2000–2030 and for 2000–2100

- ❖ Different stabilization scenarios reflect different contribution of mitigation measures
- ❖ Scenarios concur that 60-80% of reductions should come from energy and industry

Illustrative scenarios from AIM, IMAGE, IPAC and MESSAGE aiming at the stabilization at 490–540 ppm CO₂-eq (light bars) and at 650 ppm CO₂-eq (dark bars)



The potential fo renewable energy technologies to supply energy services exceeds current demand

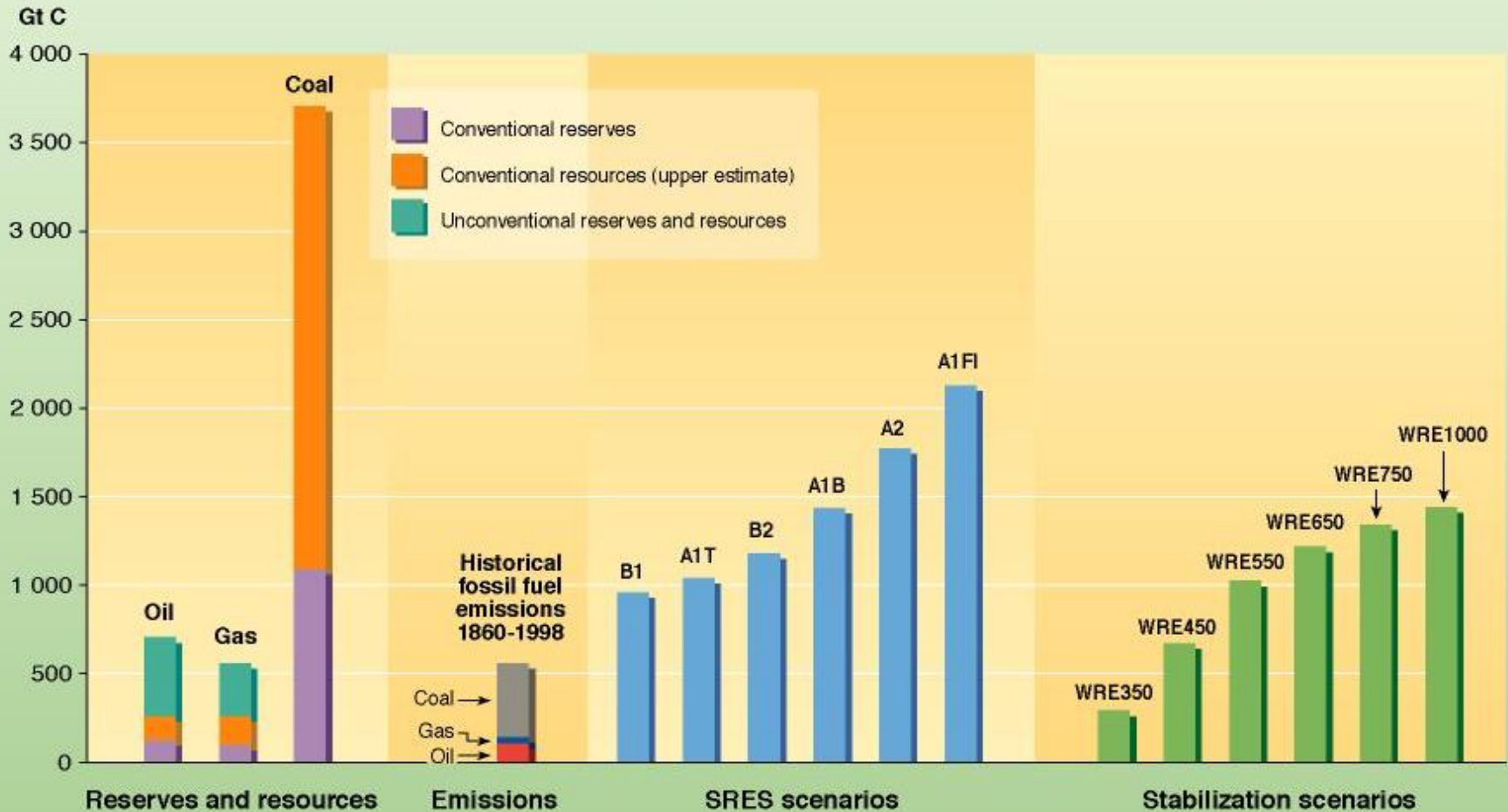


Range of Estimates of Global Technical Potentials

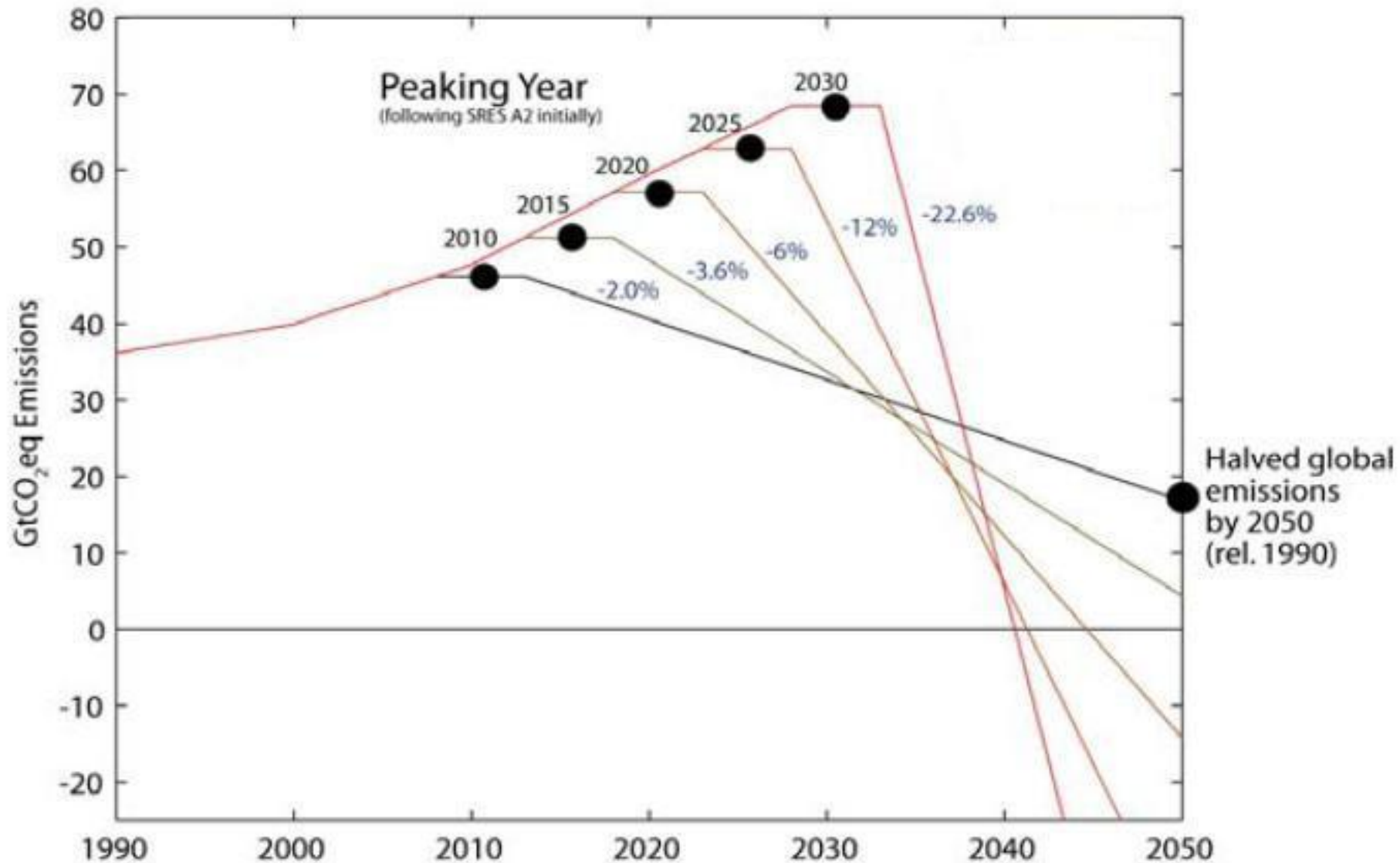
Max (in EJ/yr)	1109	52	331	580	312	500	49837
Min (in EJ/yr)	118	50	7	85	10	50	1575

There is more than enough fossil fuel to heat the climate above 2C, and a fortiori, 1.5C

Carbon in fossil fuel reserves and resources compared with historical fossil fuel carbon emissions, and with cumulative carbon emissions from a range of SRES scenario and TAR stabilization scenarios up until 2100



The more we wait, the more difficult it will be



Source: Meinshausen et al. - Nature, 30th April 2009

Conclusion (1):

Science has a lot to offer to understand better this un-named “Party” of UNFCCC, with whom one *cannot* negotiate:

The Climate System, governed by the laws of Nature

Conclusion (2):

**IPCC is eager to continue
serving the climate and
sustainable development
process, with policy relevance,
without being policy-
prescriptive**

www.ipcc.ch

Useful links:

- www.ipcc.ch : IPCC
- www.climate.be/vanyp : my slides and other documents
- Twitter: @JPvanYpersele

Thank you for your attention!