The need for a transition path to no net carbon emissions

Jean-Pascal van Ypersele

(Université catholique de Louvain, Belgium)
Former IPCC Vice-Chair (2008--2015)

Twitter: @JPvanYpersele

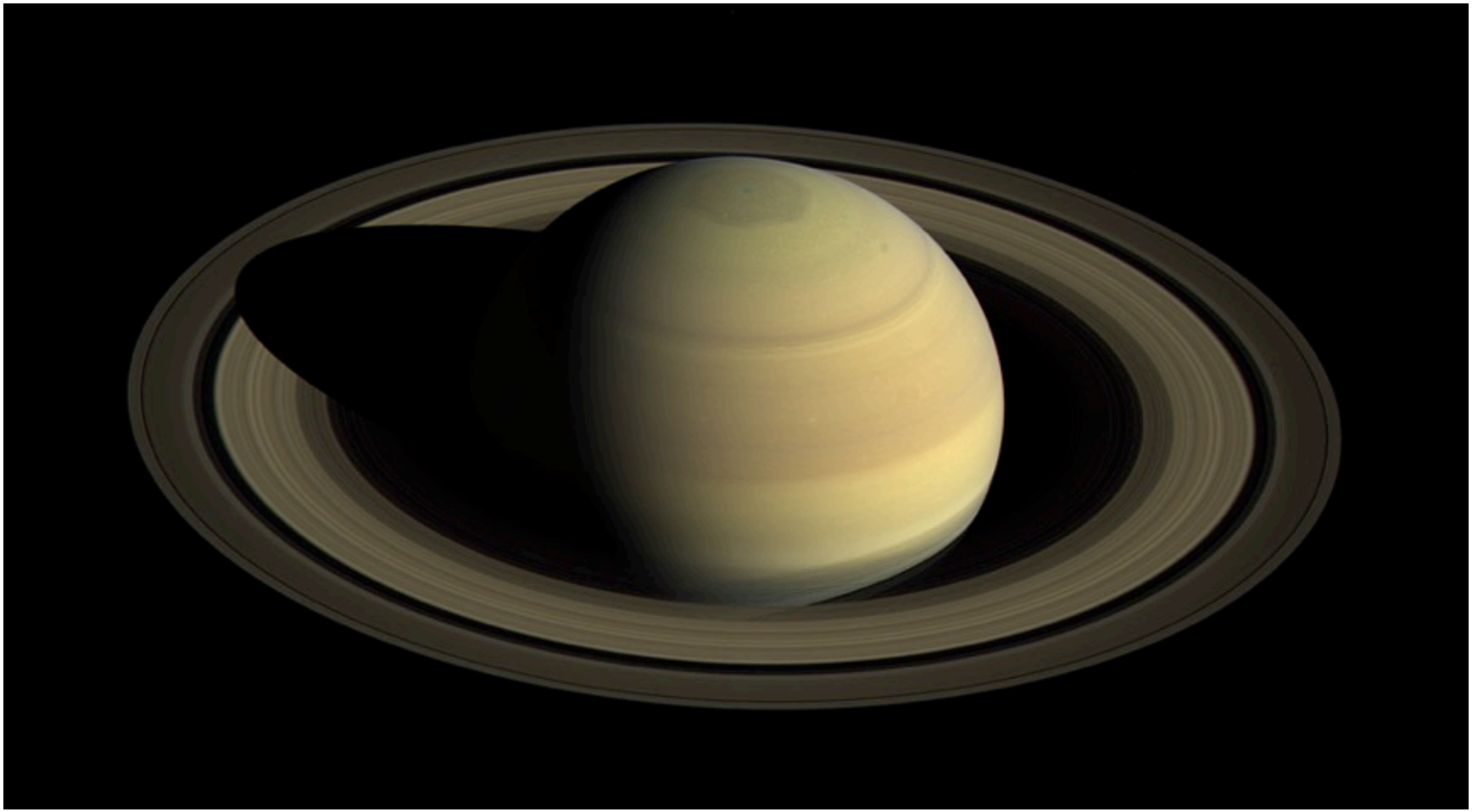
Accelerating EU leadership in sustainable finance,
Finance Watch conference, Brussels,

6 December 2017

Thanks to the Walloon Government (funding the Walloon Platform for IPCC) and to my team at the Université catholique de Louvain for their support

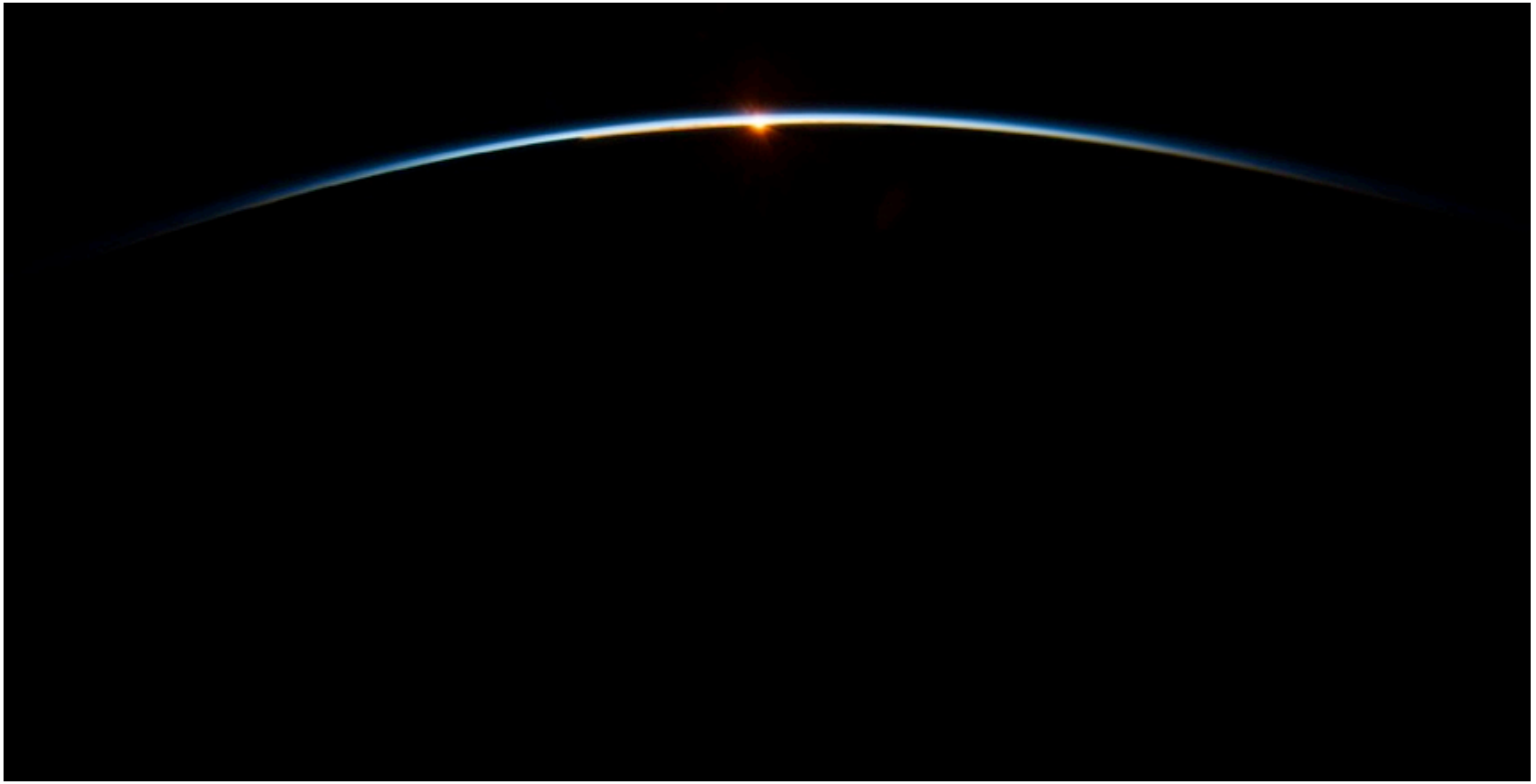
Felix Schaad (Tages Anzeiger, Switzerland)

Saturn, as seen on 25-4-2016 from a 3 million km distance by the Cassini satellite launched in October 1997, 40 years after Sputnik



That small blue dot is the Earth, a seen from Cassini, orbiting Saturn, 1.44 billion km from us, on 19-7-2013

Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)



Jean-Pascal van Ypersele
(vanyp@climate.be)

Key messages from IPCC AR5

- → **Human influence on the climate system is clear**
- → **Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems**
- → **While climate change is a threat to sustainable development, there are many opportunities to integrate mitigation, adaptation, and the pursuit of other societal objectives**
- → **Humanity *has* the means to limit climate change and build a more sustainable and resilient future**

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INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Why the IPCC ?

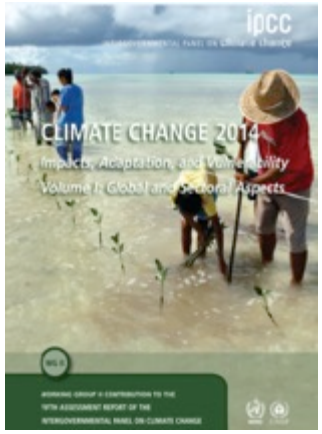
Established by WMO and UNEP in 1988

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

- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options (adaptation & mitigation).

WMO=World Meteorological Organizatior

UNEP= United Nations Environment Programme



What is happening in the climate system?

What are the risks?

What can be done?

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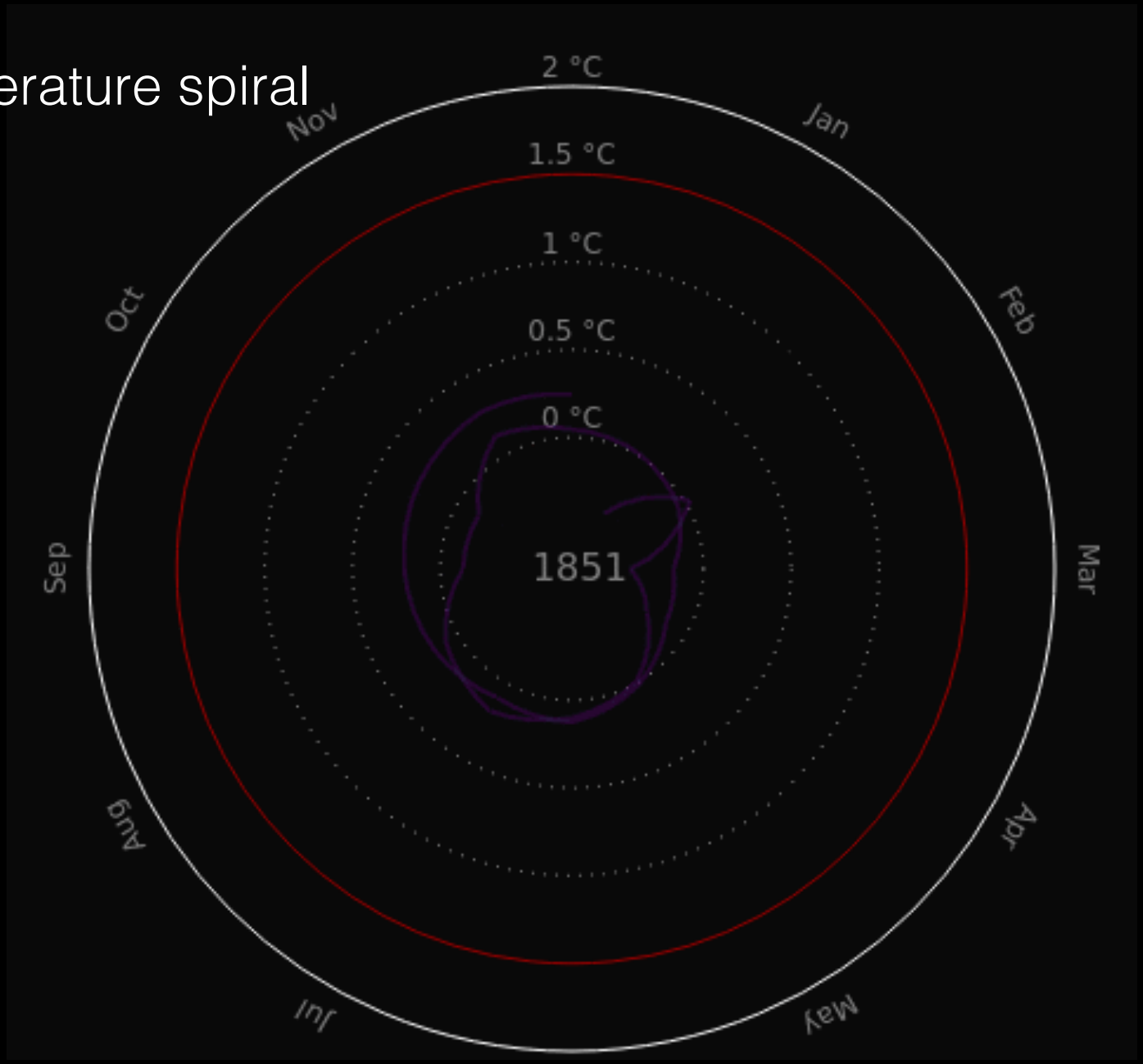
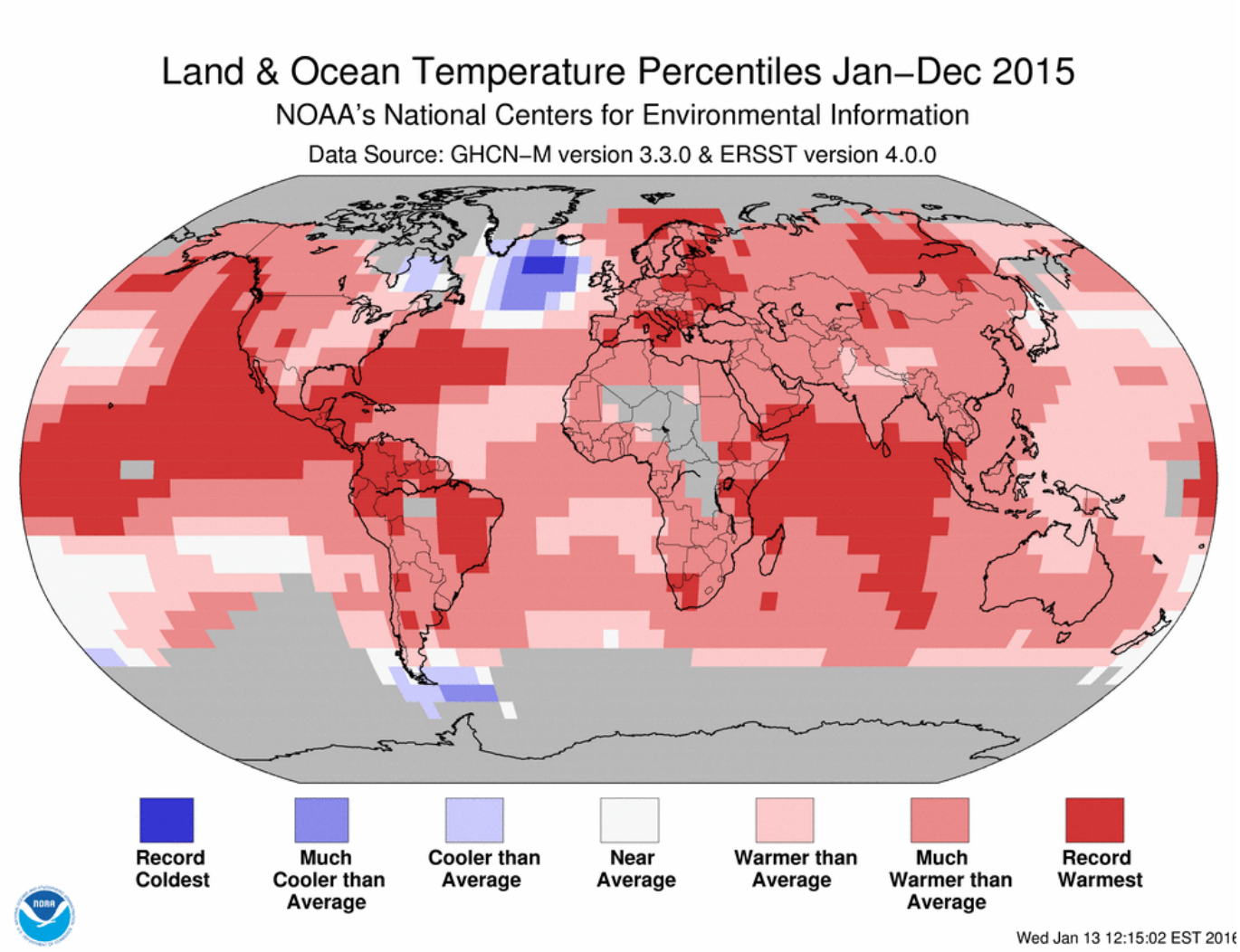
Temperature spiral



Global Mean Temperature in °C relative to 1850 – 1900
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset
Available on http://openclimatedata.net/climate-spirals/temperature

2014, 2015, 2016= warmest years since 1880



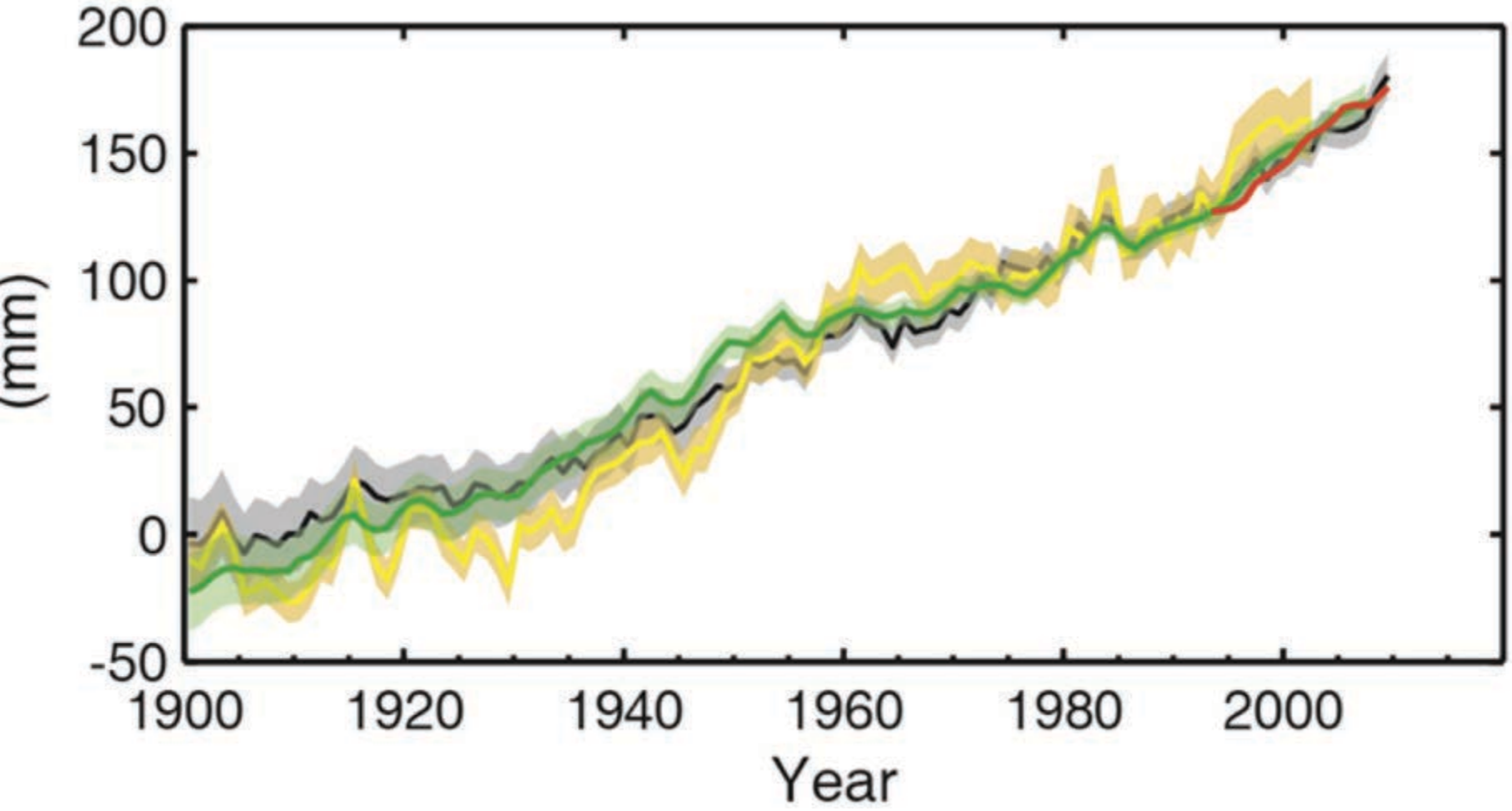
Plateau Glacier (1961)
(Alaska)

http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

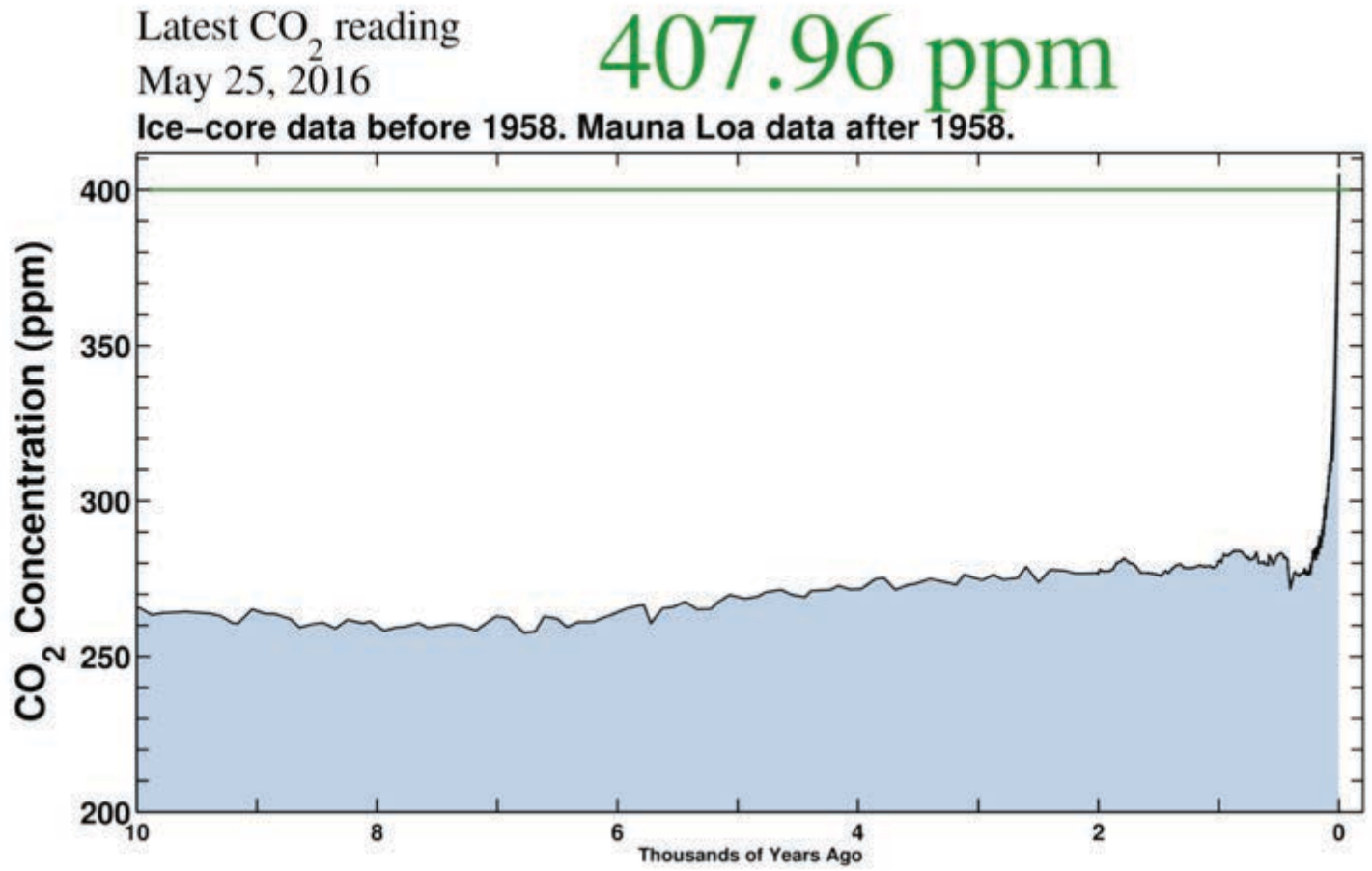
Plateau Glacier (2003)
(Alaska)

http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

Change in average sea-level change

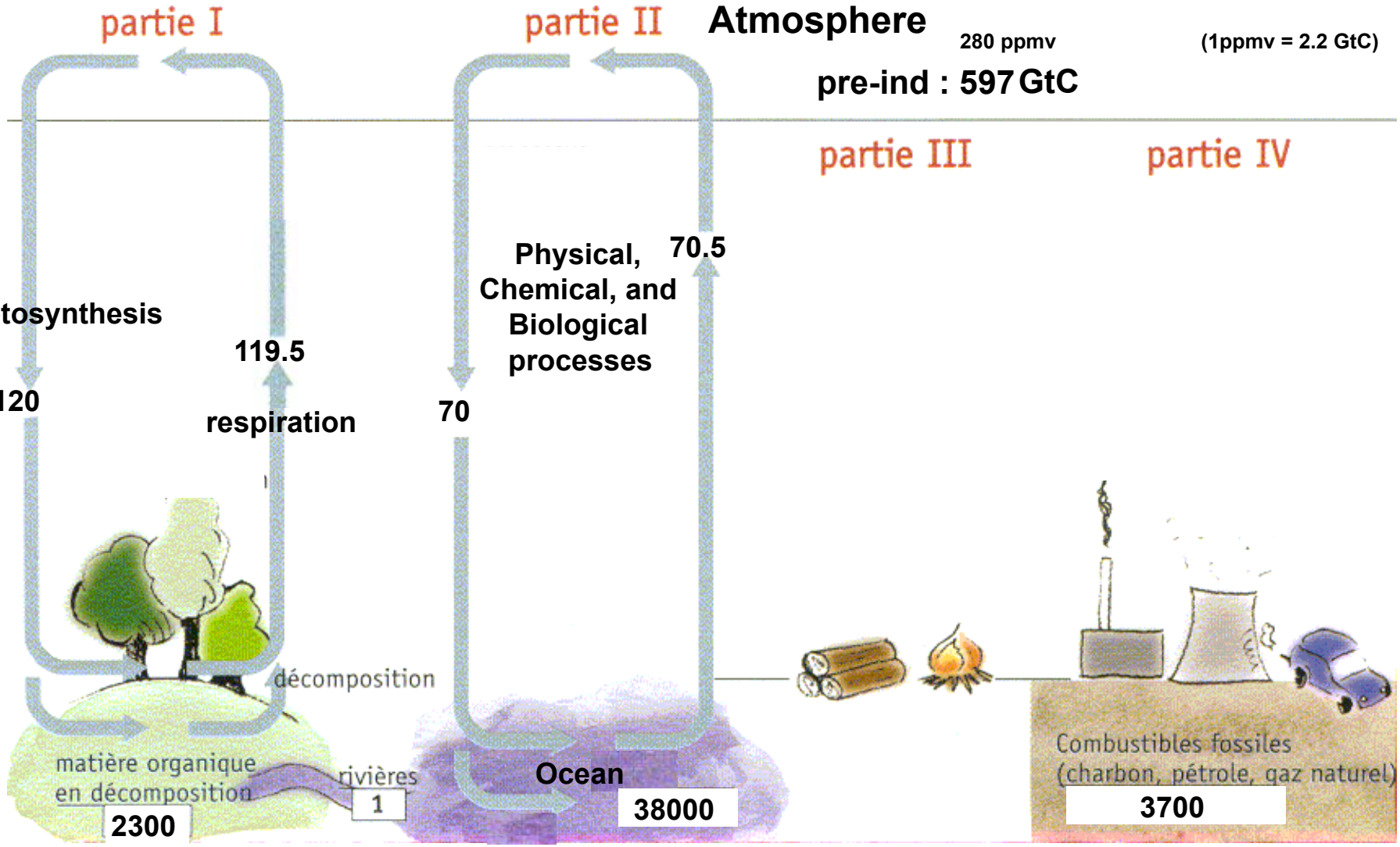


CO_2 Concentration, 25 May 2016 (Keeling curve)



Source: scripps.ucsd.edu/programs/keelingcurve/

Carbon cycle: unperturbed fluxes

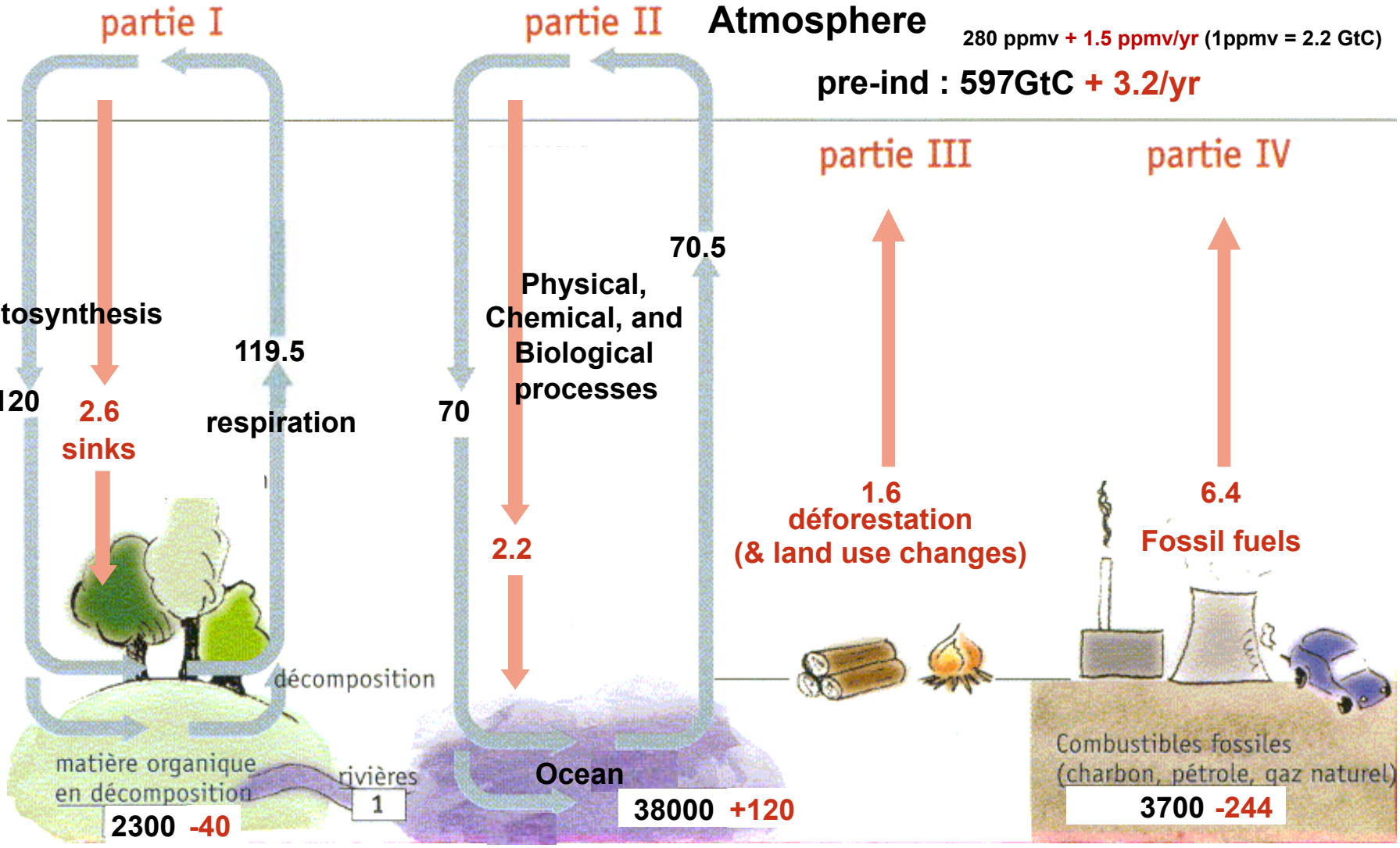


Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get $GtCO_2$)

vanyp@climate.be

Carbon cycle: perturbed by human activities

(numbers for the decade 1990-1999s, based on IPCC AR4)



Units: GtC (billions tons of carbon) or GtC/year

Stocks!

vanyp@climate.be

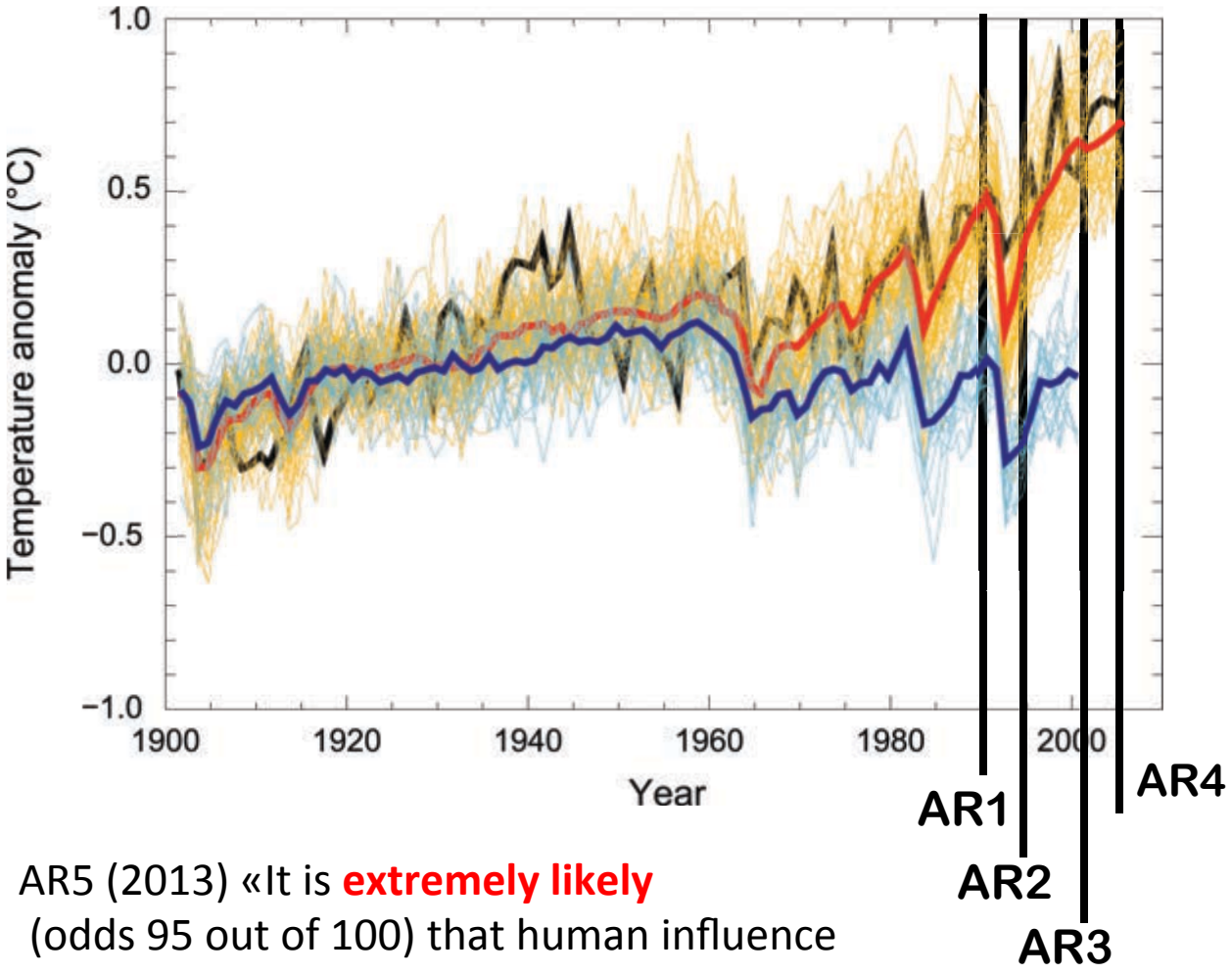
A Progression of Understanding: Greater and Greater Certainty in Attribution

AR1 (1990): "unequivocal detection not likely for a decade"

AR2 (1995): "balance of evidence suggests **discernible** human influence"

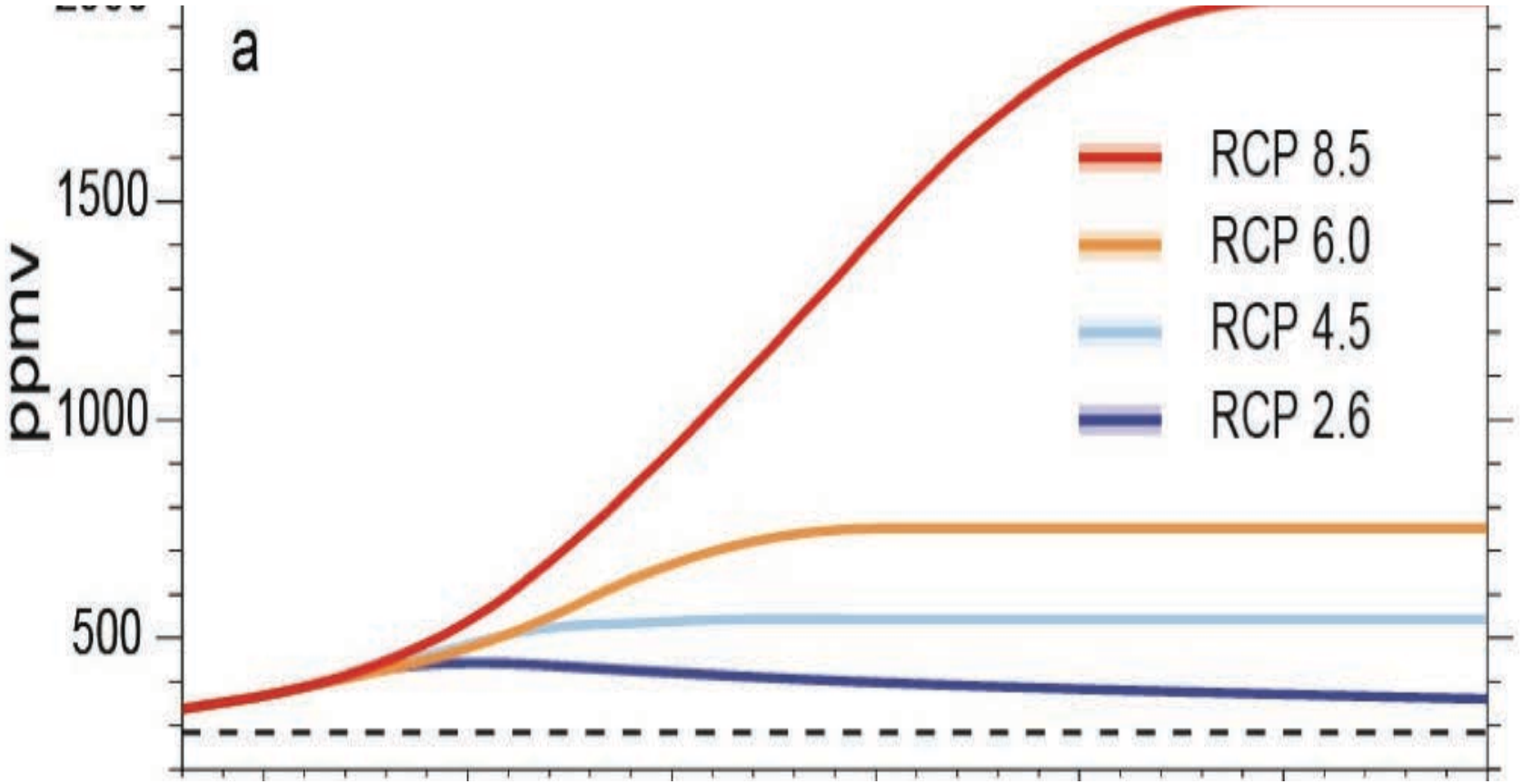
AR3 (2001): "most of the warming of the past 50 years is **likely** (odds 2 out of 3) due to human activities"

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



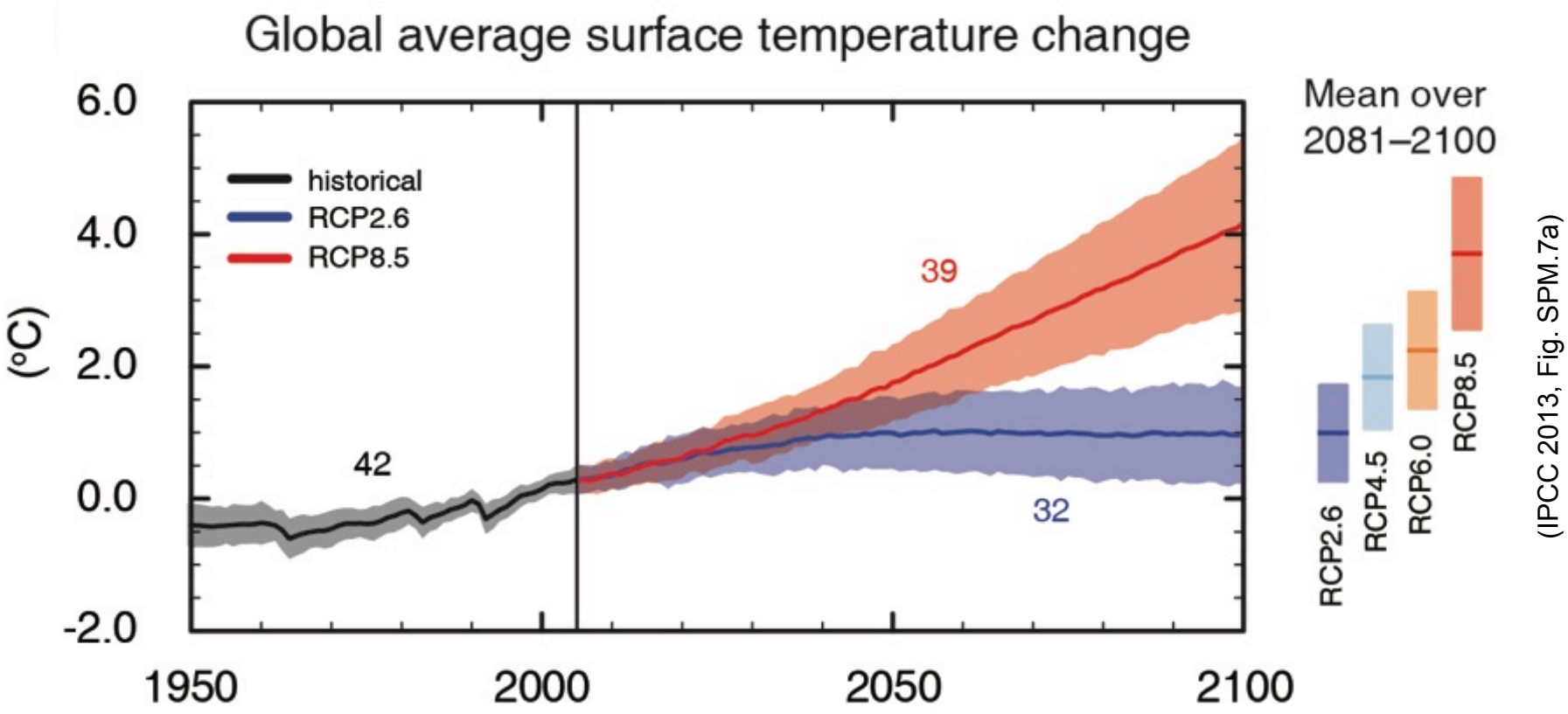
AR5 (2013) «It is **extremely likely** (odds 95 out of 100) that human influence has been the dominant cause… »

RCP Scenarios: Atmospheric CO_2 concentration



Three stabilisation scenarios: RCP 2.6 to 6
One Business-as-usual scenario: RCP 8.5

AR5, chapter 12. WGI- Adopted version / subject to final copyedit

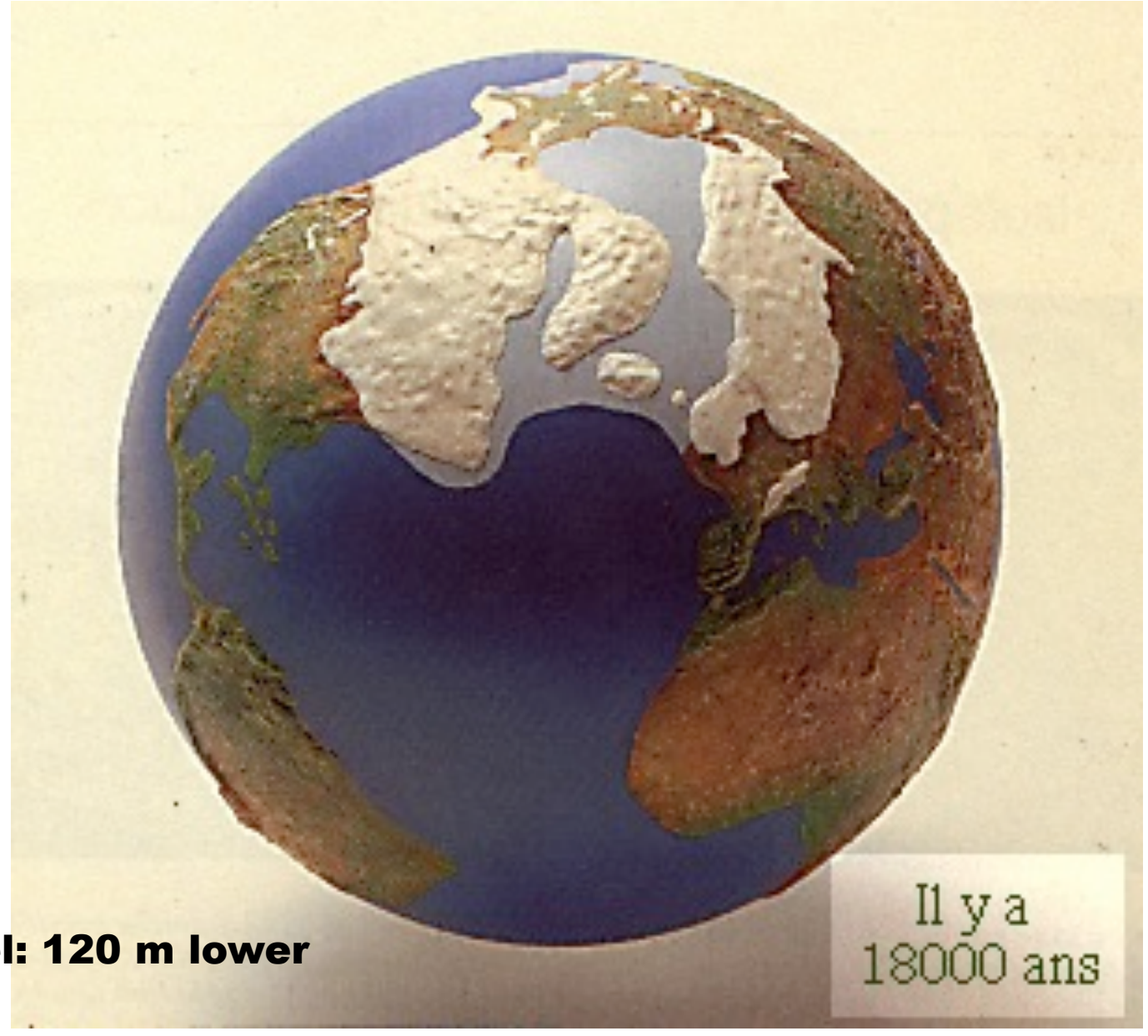


(IPCC 2013, Fig. SPM.7a)

Only the lowest (RCP2.6) scenario maintains the global surface temperature increase above the pre-industrial level to less than 2°C with at least 66% probability

18-20000 years ago (Last Glacial Maximum)

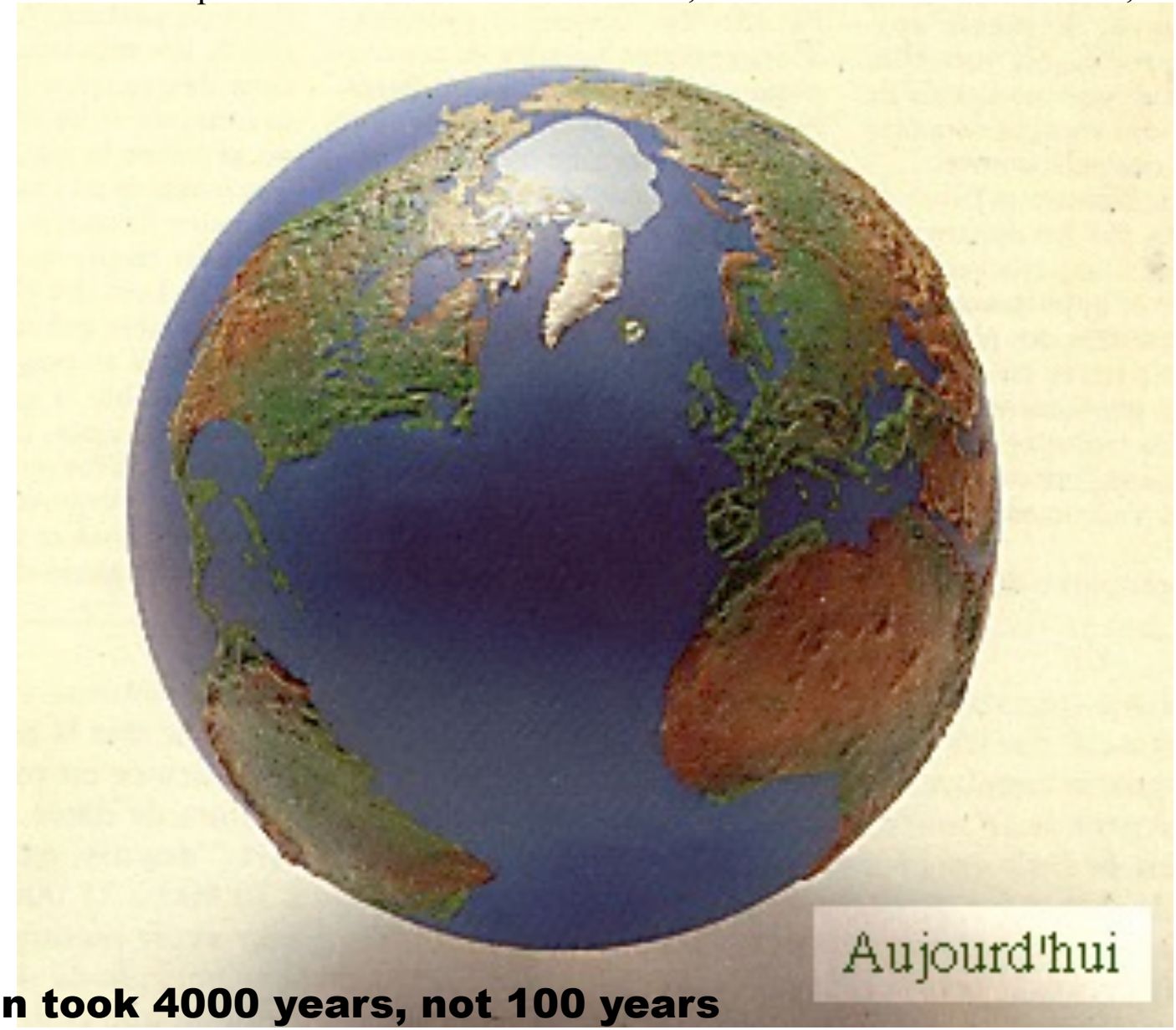
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



Sea level: 120 m lower

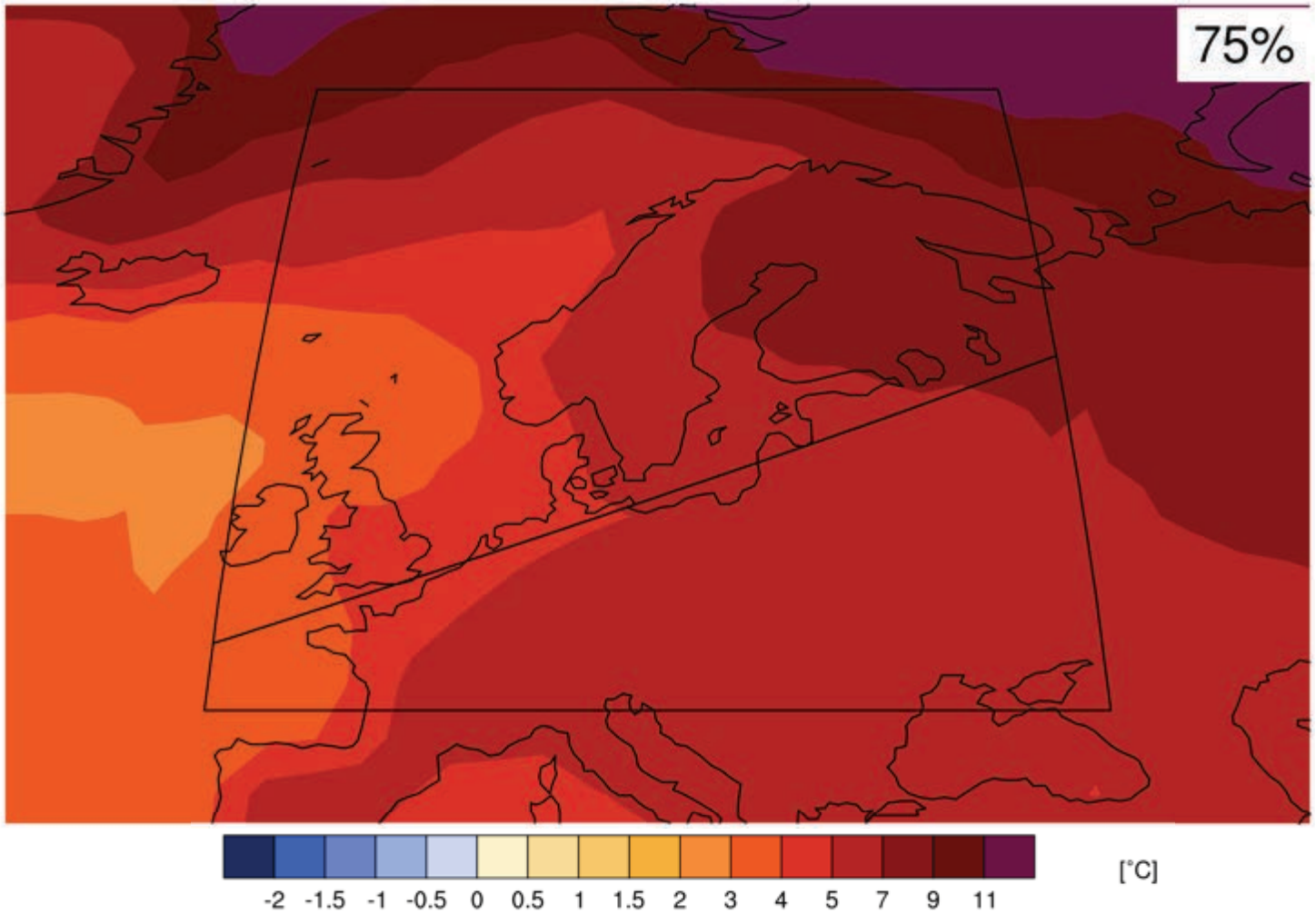
Today, with +4-5°C globally

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



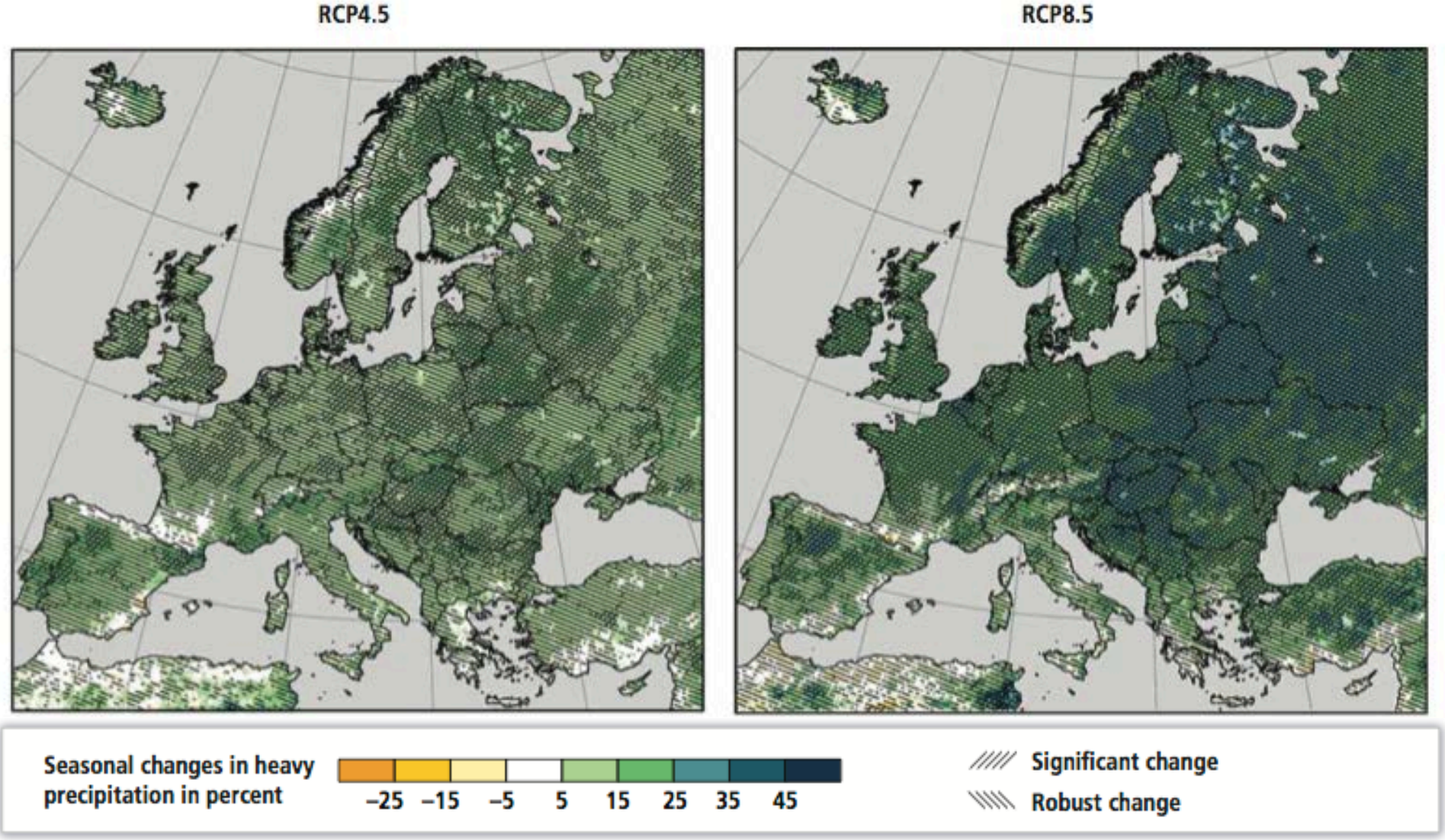
Transition took 4000 years, not 100 years

North Europe - Map of temperature changes: 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario (annual)



IPCC WG1 Fifth Assessment Report (Final Draft)

DJF seasonal changes in heavy precipitation (%), 2071-2100 compared to 1971-2000



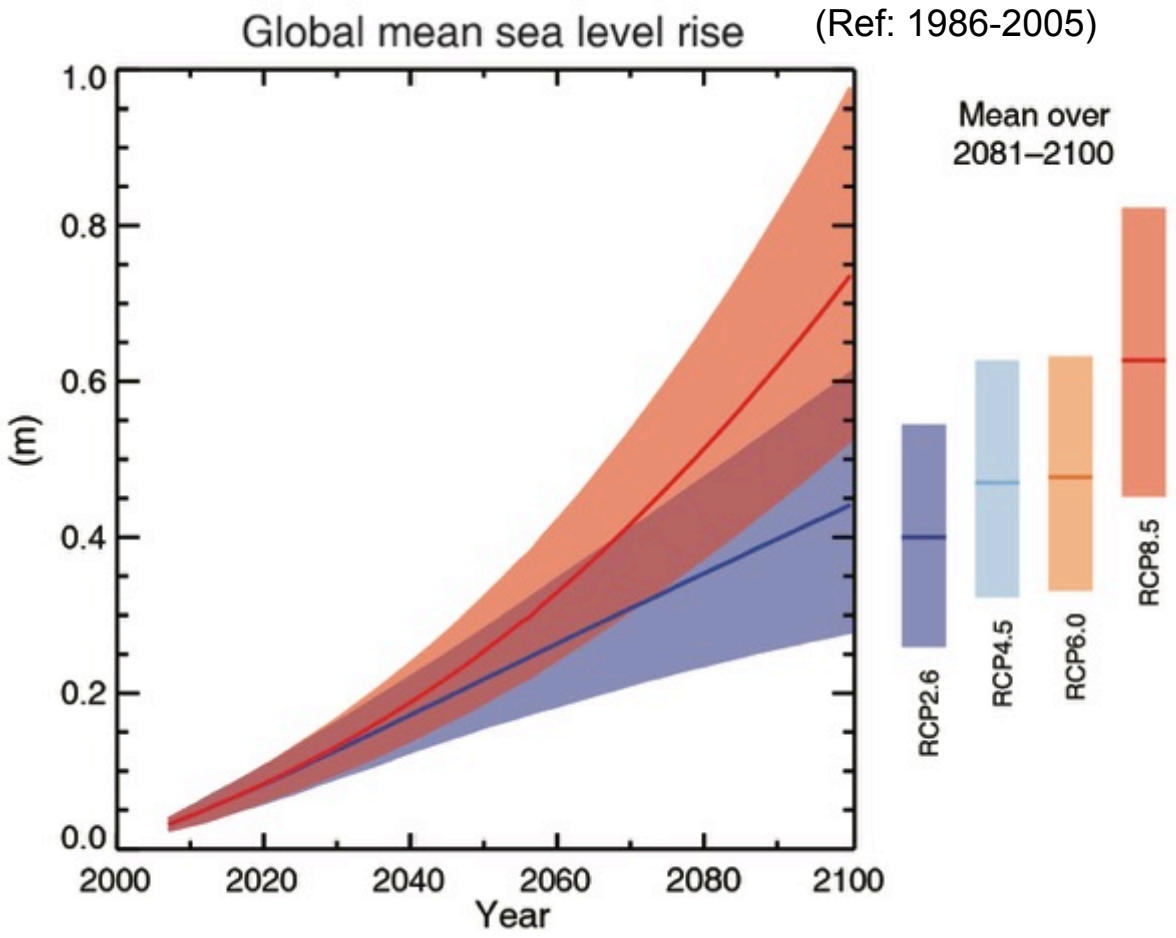
IPCC, AR5, WG II, Chap. 23, p. 1277

In Germany, many residents weren't prepared for the mass flooding as the rain pelted down (May 2016)

Matthias Schrader / AP

In Puerto Rico, Hurricane Maria created the worst humanitarian crisis in the US for decades

Source: FEMA, 24-9-2017



(IPCC 2013, Fig. SPM.9)

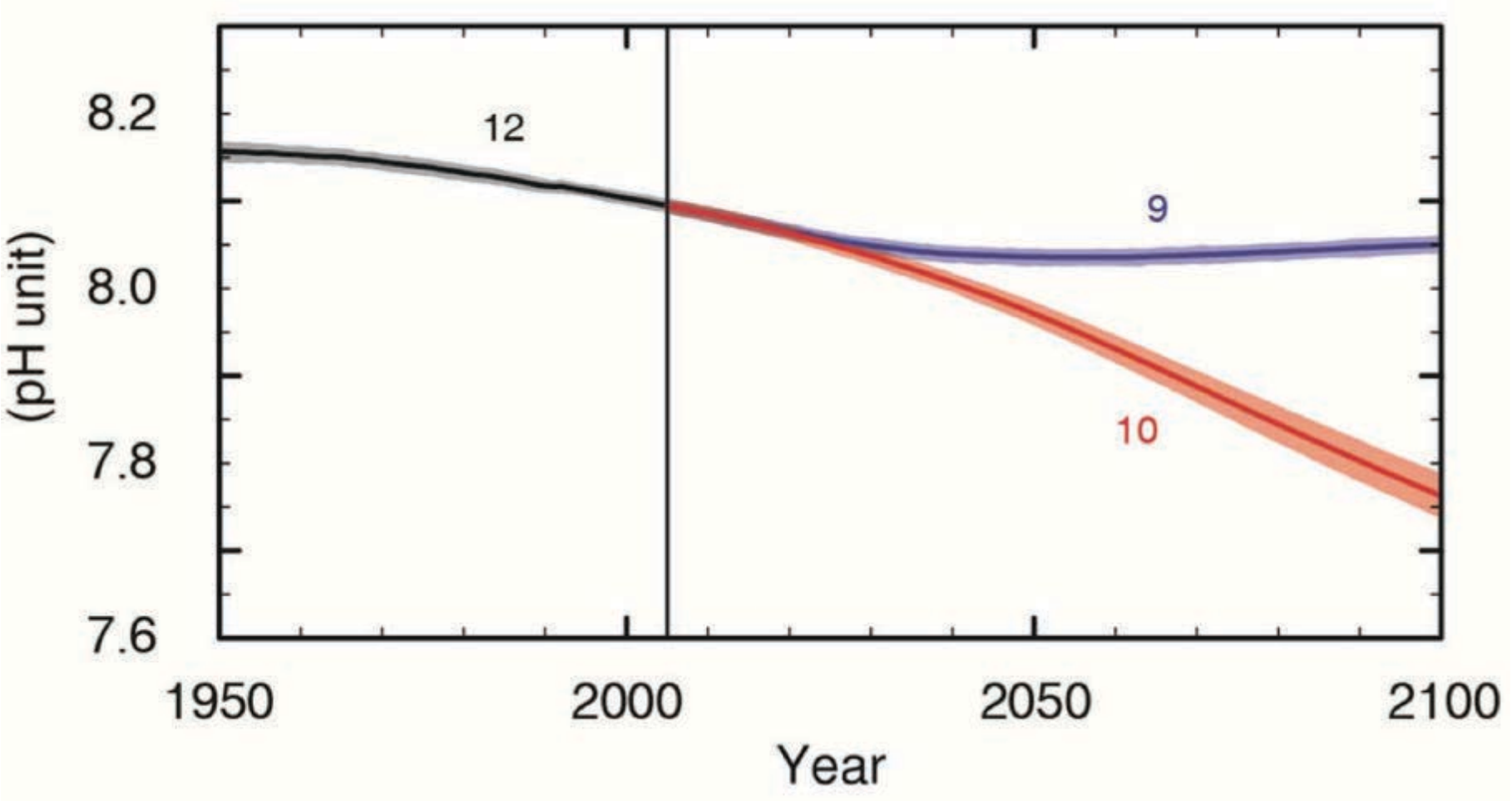
Sea level due to continue to increase

Nile Delta: more than 10 million people live in the red zone, which is less than 1 metre above sea level

(Time 2001)

Global ocean surface pH (projections)

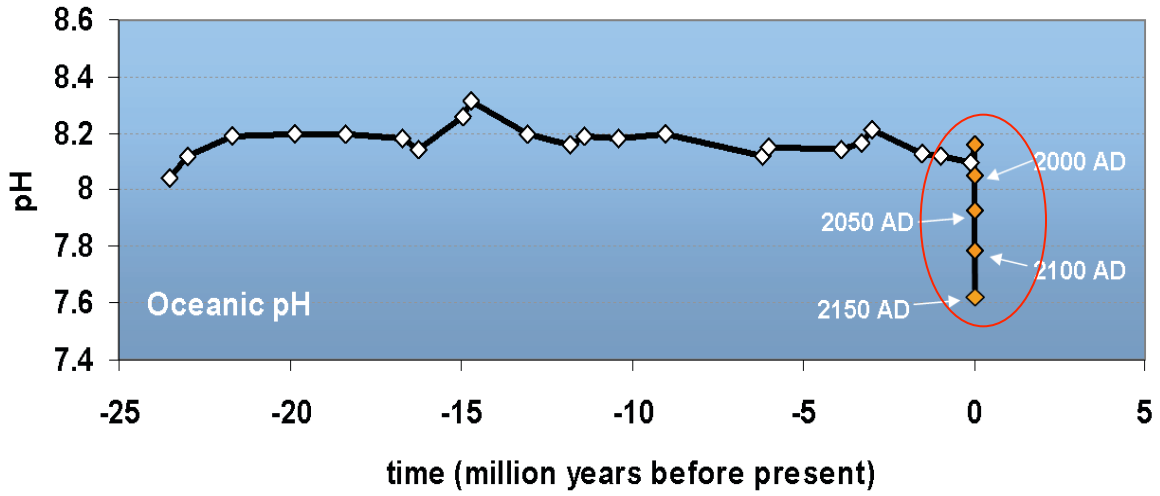
Ocean Acidification, for RCP 8.5 (orange) & RCP2.6 (blue)



IPCC AR5 WGI, Fig SPM 07

Oceans are Acidifying Fast ……..

Changes in pH over the last 25 million years



"Today is a rare event in the history of the World"

- **It is happening now, at a speed and to a level not experienced by marine organisms for about 60 million years**
- **Mass extinctions linked to previous ocean acidification events**
- **Takes 10,000's of years to recover**

Turley et al. 2006

Slide courtesy of Carol Turley, PML

Coral reefs are dying

American Samoa (from www.globalcoralbleaching.org)

Impacts are already underway

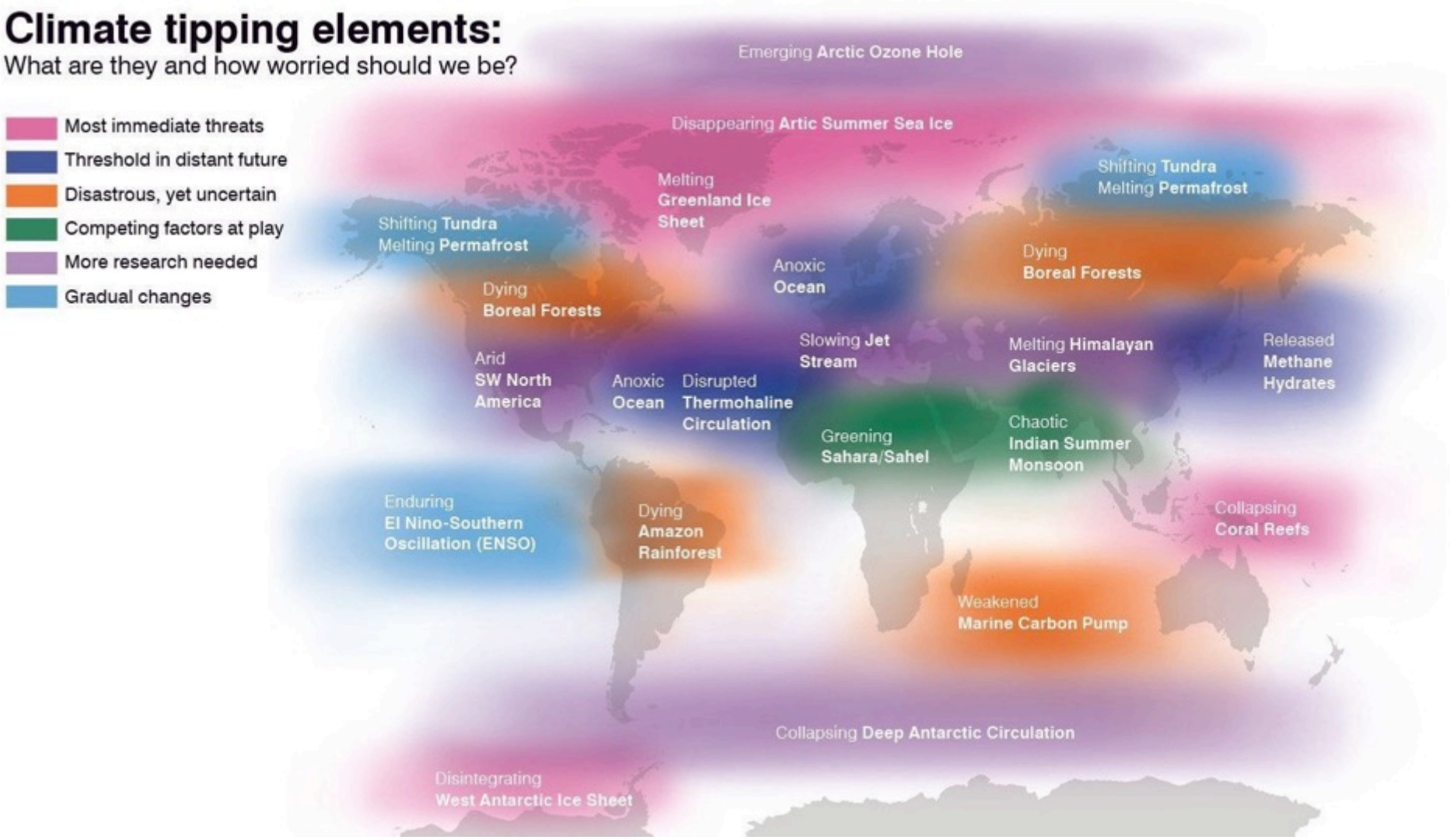
- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries (but the poor are more vulnerable everywhere)



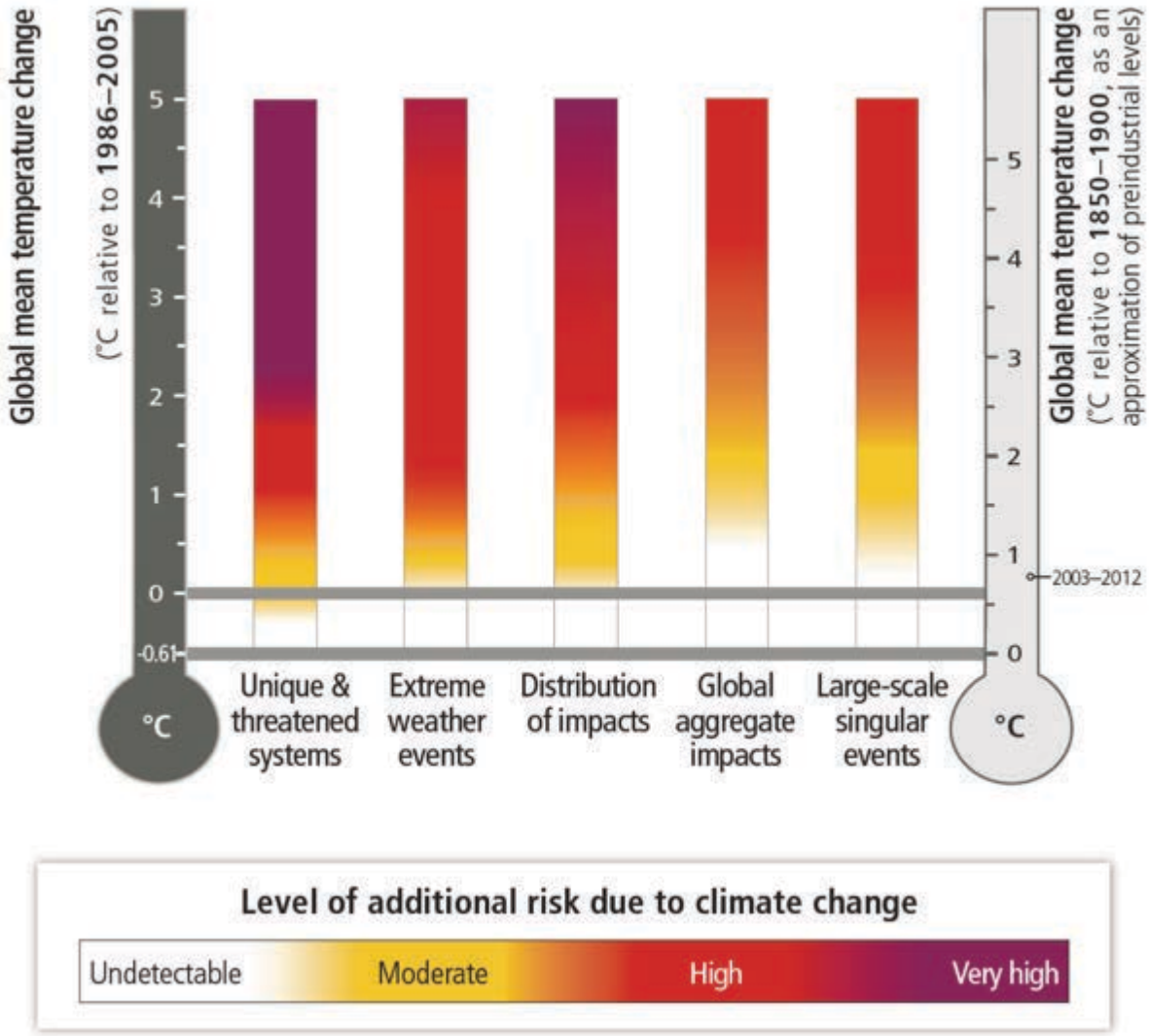

AR5 WGII SPM

Climate tipping elements:

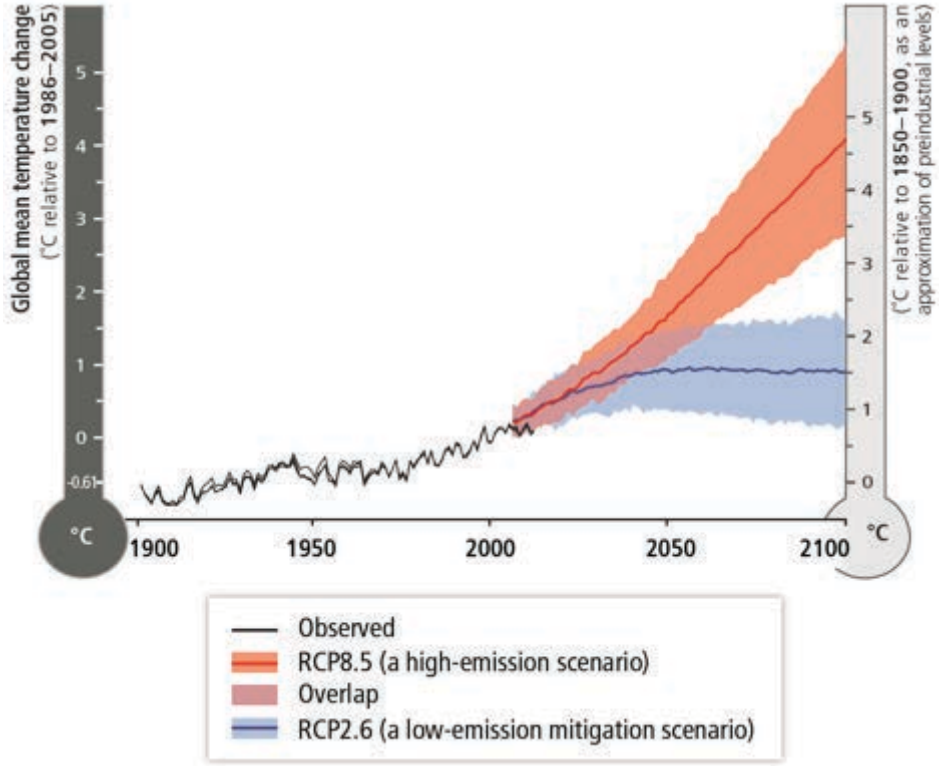
What are they and how worried should we be?

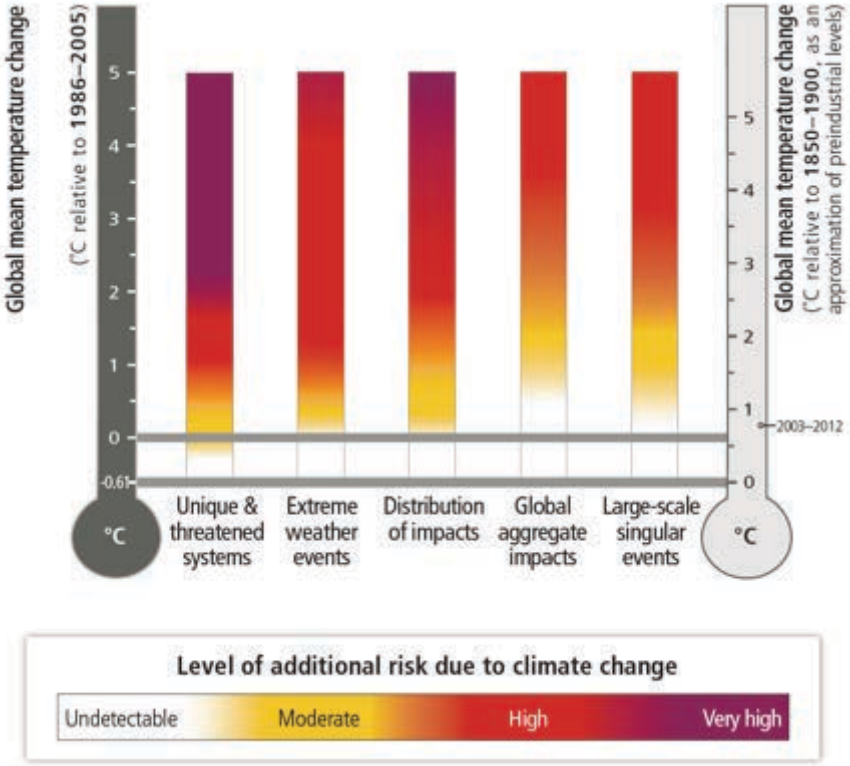


Environmental Defense Fund, 2017



AR5, WGII, Box SPM.1 Figure 1





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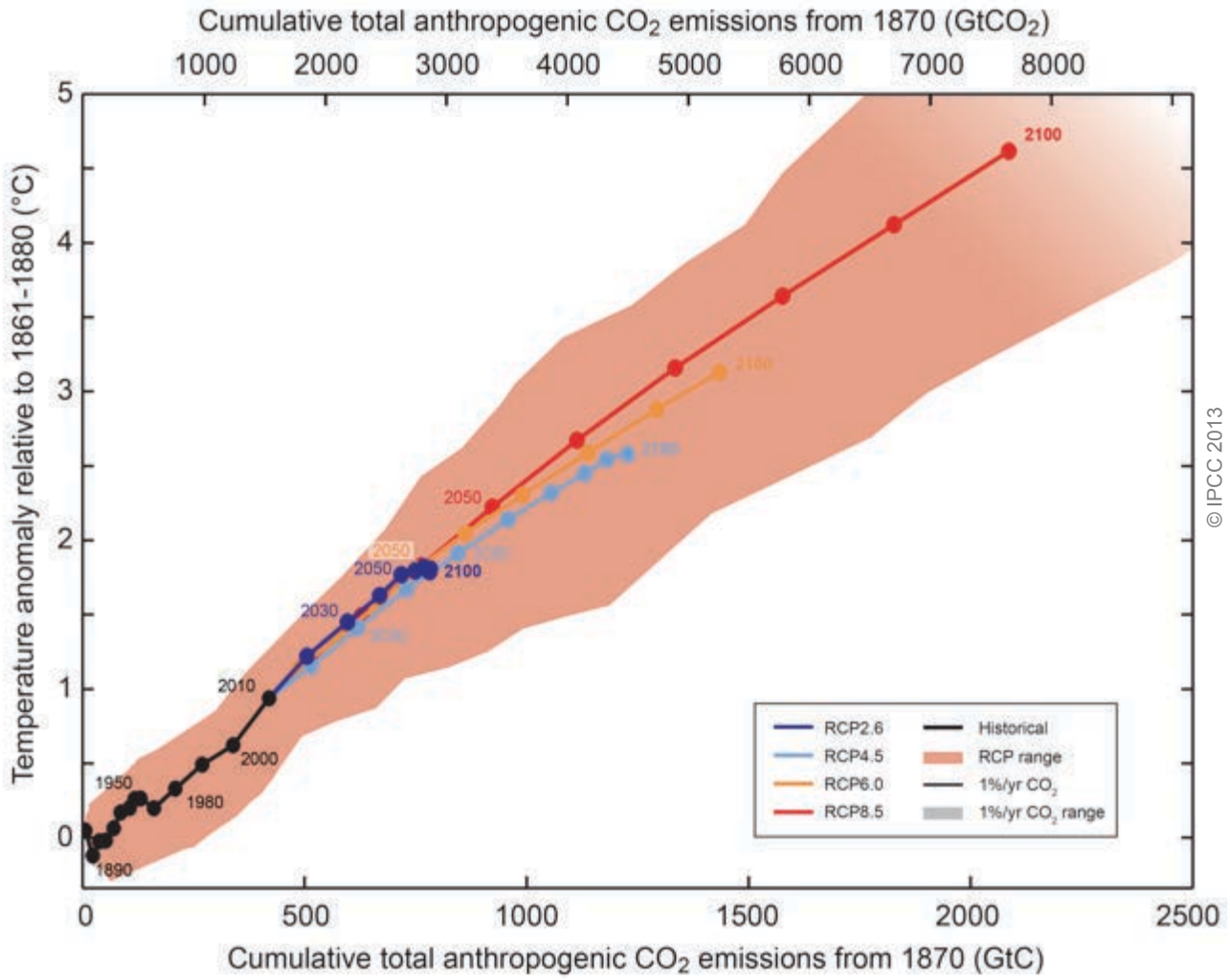
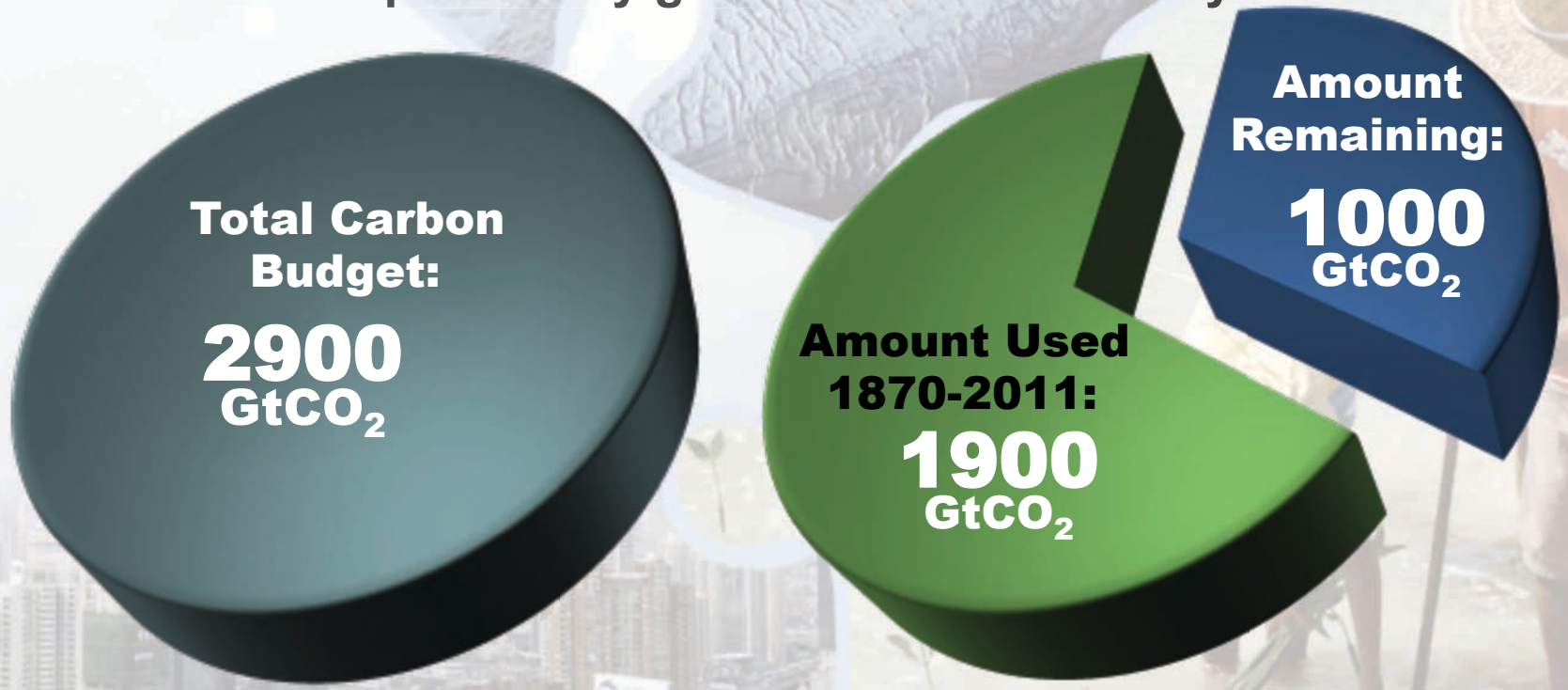


Fig. SPM.10

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

The window for action is rapidly closing

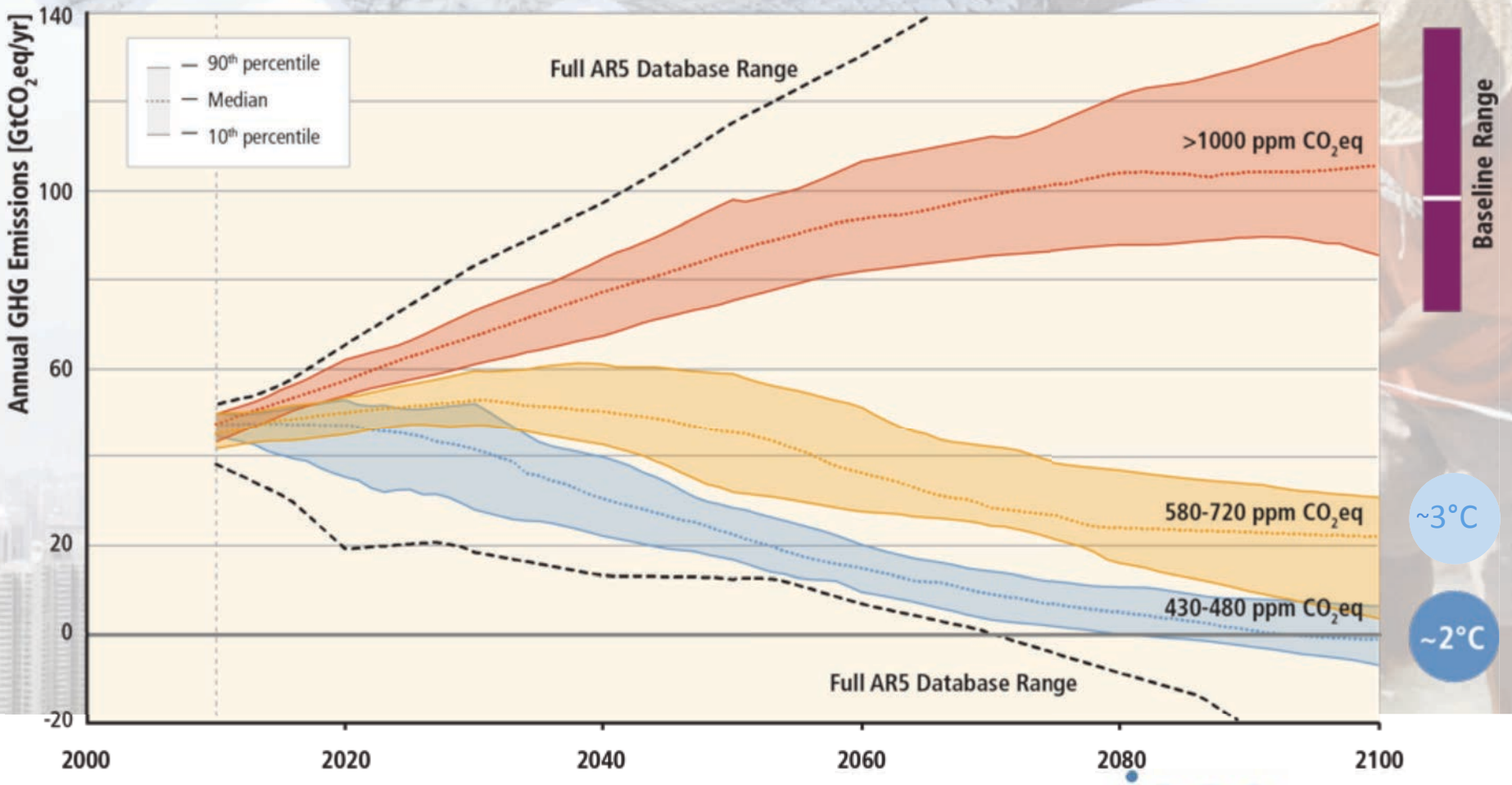
65% of the carbon budget compatible with a 2°C goal is already used
NB: this is with a probability greater than 66% to stay below 2°C



NB: Emissions in 2011: 38 GtCO2/yr

AR5 WGI SPM

Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.



Based on Figure 6.7

AR5 WGIII SPM

IPCC AR5 Synthesis Report

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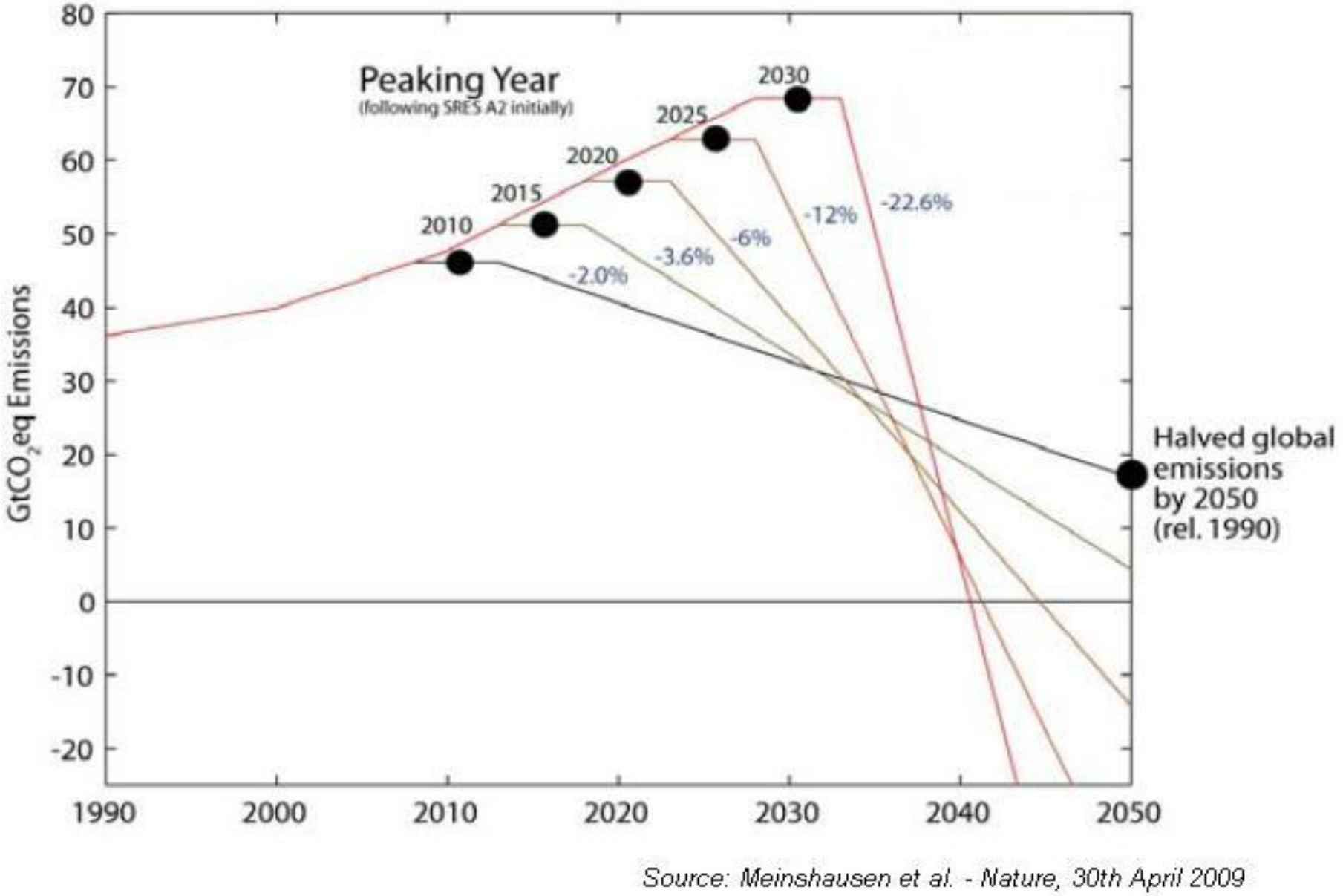
The more we wait, the more difficult it will be



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

Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today
- But worldwide investment in **research** in support of GHG mitigation is small…

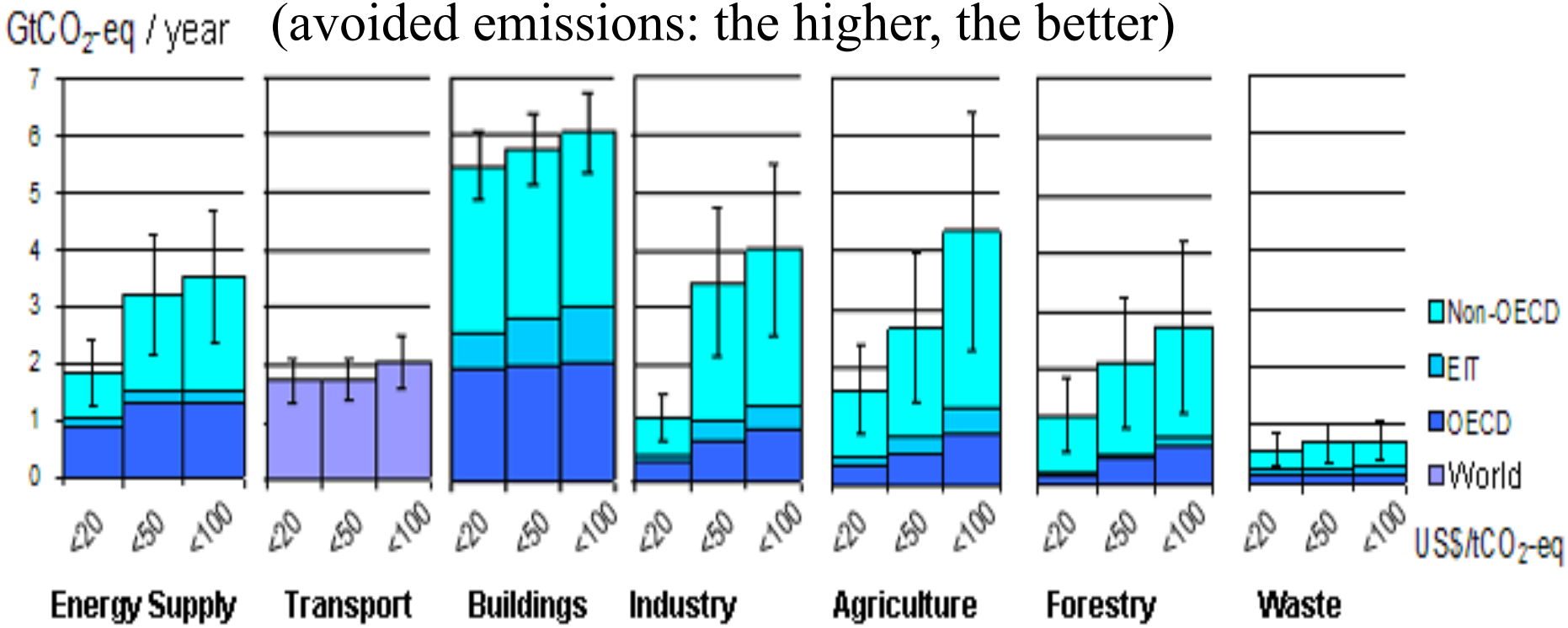
Improved carbon sinks

- **Reduced deforestation** and improved forest management and planting of new forests
- **Bio-energy with carbon capture and storage**

Lifestyle and behavioural changes

AR5 WGIII SPM

All sectors and regions have the potential to contribute by 2030

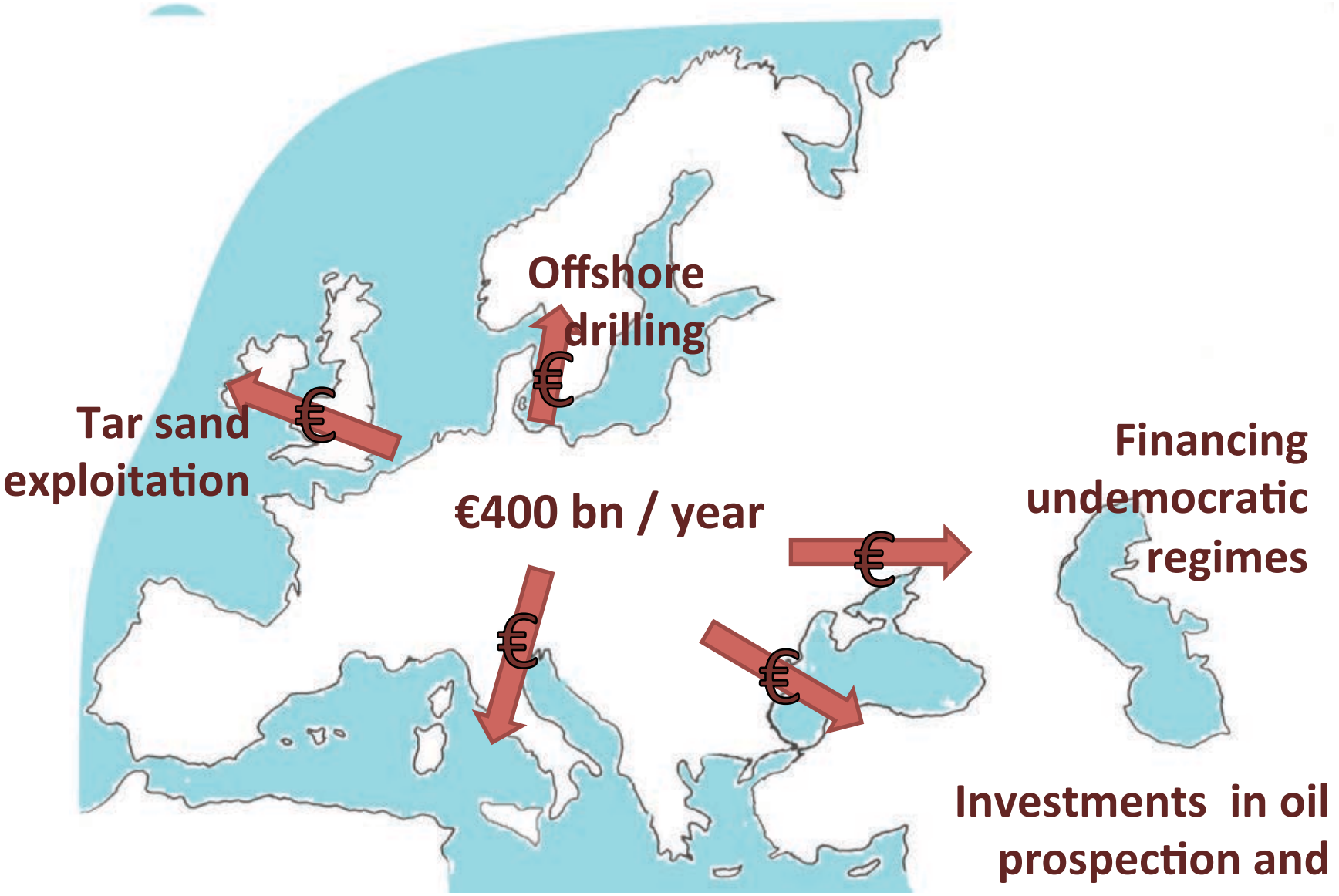


IPCC AR4 (2007)

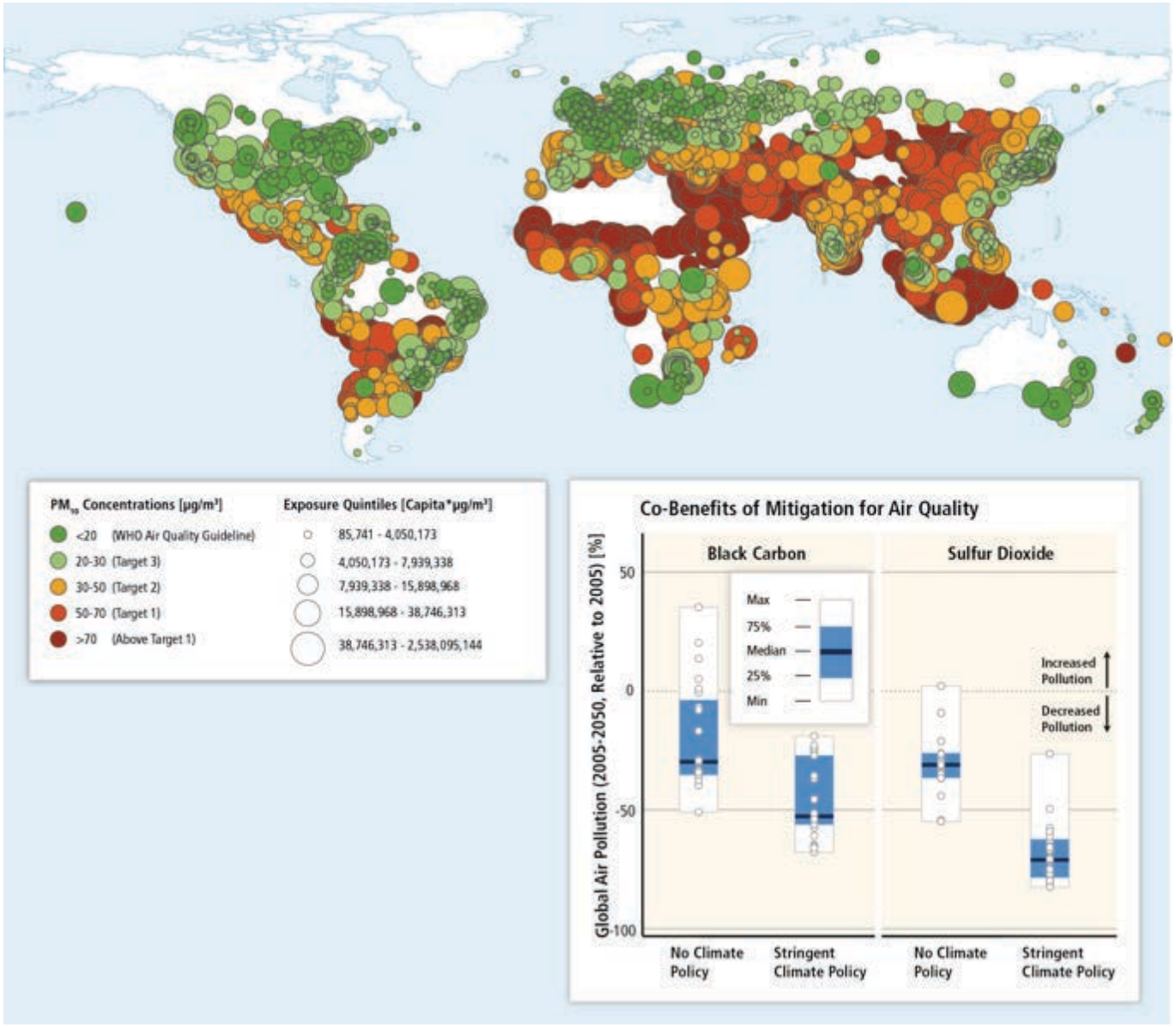
Note: estimates do not include non-technical options, such as lifestyle changes.

- **Substantial reductions in emissions would require large changes in investment patterns e.g., from 2010 to 2029, in billions US dollars/year:**
  (mean numbers rounded, IPCC AR5 WGIII Fig SPM 9)
- **energy efficiency: +330**
- **renewables: + 90**
- **power plants w/ CCS: + 40**
- **nuclear: + 40**
- **power plants w/o CCS: - 60**
- **fossil fuel extraction: - 120**

EU: annual cost of buying fossil fuels



Source: www.energycoalition.eu



Mitigation can result in large co-benefits for human health and other societal goals.

Joel Pett, USA Today

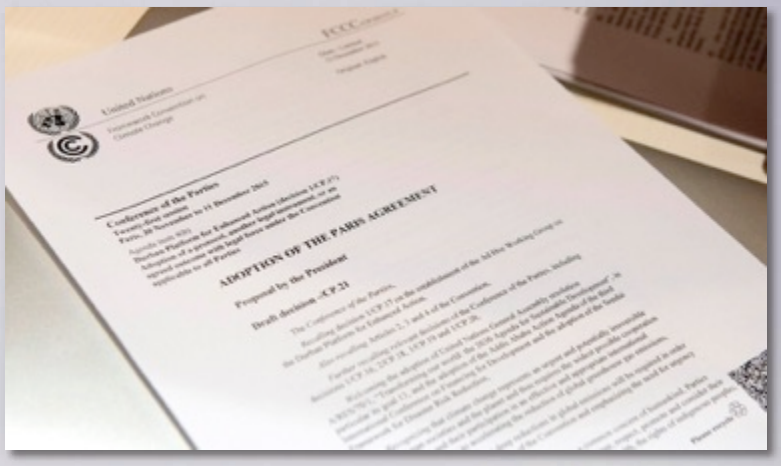
If well designed, measures to prevent climate change could offer so many opportunities:

- Co-benefits in reduced pollution, health improvement, employment, gender equality, food security, reduced poverty, energy independence…
- Opportunities to shift the tax burden away from labour and implement sustainable development
- Opportunities to integrate research results in a useful, policy-relevant way, accross disciplines (including social sciences)

ur les Changements Climatiques 2015

COP21/CMP11

Paris, France



Paris Agreement

- Article 2:
  - (…) to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:
    - Holding the increase in the global average temperature to **well below 2 °C** above pre-industrial levels and to **pursue efforts** to limit the temperature increase to **1.5 °C** above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
    - **Increasing the ability to adapt** (…) and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
    - Making **finance flows consistent** with a pathway towards low greenhouse gas emissions and climate-resilient development

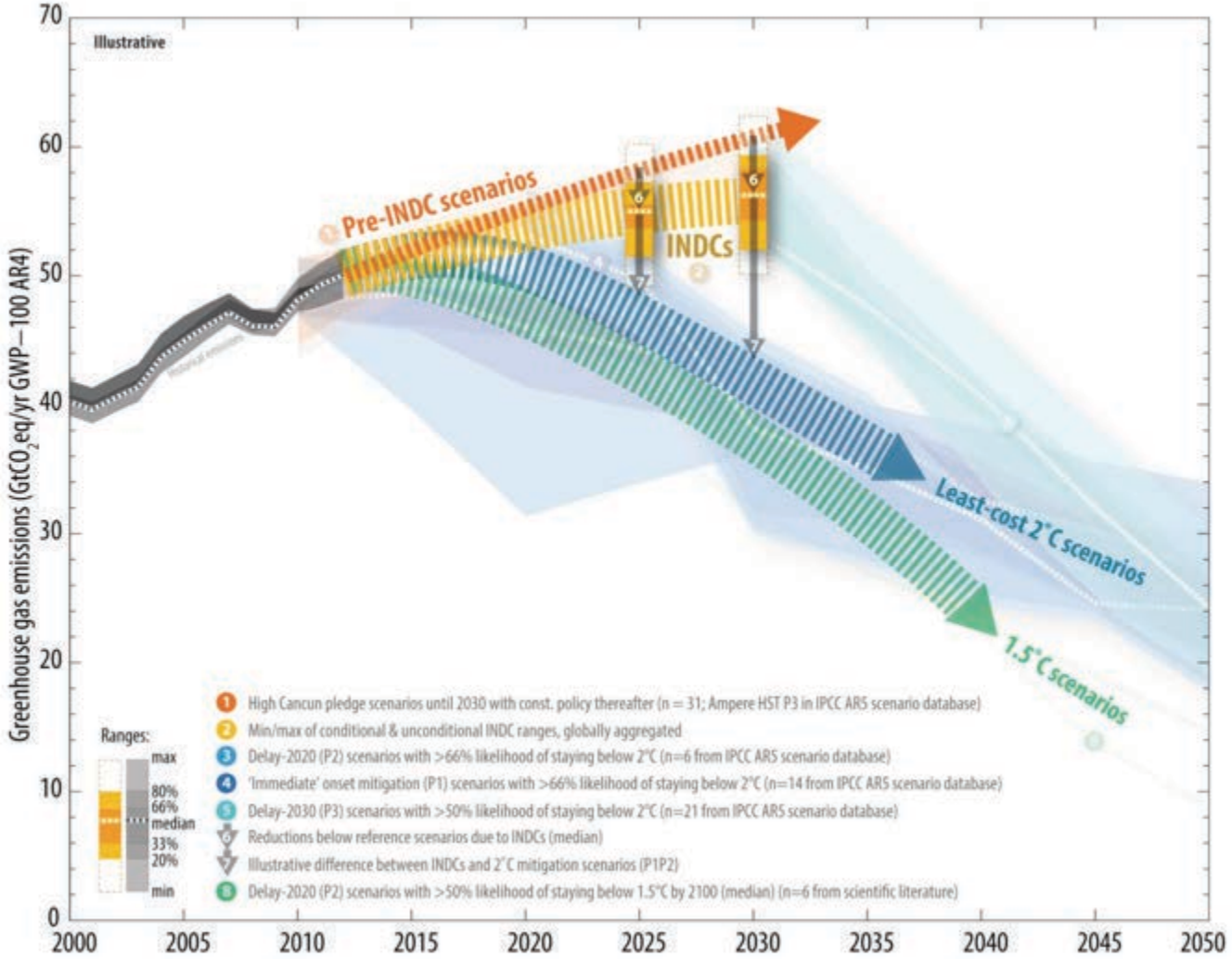
Paris Agreement

- Article 4:
  - 1. (…) Parties aim to reach **global peaking** of greenhouse gas emissions **as soon as possible**, recognizing that **peaking will take longer for developing country Parties**,
  - and to undertake **rapid reductions thereafter in accordance with best available science**,
  - so as to achieve a **balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century**, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty
  - 3. **Each Party's successive nationally determined contribution will represent a progression**(…)

"Getting 196 Countries To Agree On Climate Change Was The Easy Part. Now comes the real work."

(C. Figueres, World Economic Forum 2016, Davos)

Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions



UNFCCC, Aggregate effect of the intended nationally determined contributions: an update
http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf

SUSTAINABLE DEVELOPMENT GOALS

What did « The Economist » say in 1990 already?

- **“Being dirty has lots of costs: being greener than the competition may have many advantages”**

- **“For far-sighted companies, the environment may turn out to be the biggest opportunity for enterprise and invention the industrial world has seen.”**

(Frances Cairncross, The Economist, 8 September 1990)

Conclusions (1/2)

- The challenge is huge: transform the world in a few decades so that the whole world activities are decarbonized, while poverty and hunger are eliminated in a few decades

- It opens many economic opportunities, and opportunities to address in a synergistic manner other societal goals, such as the 17 Sustainable Development Goals.

Conclusions (2/2)

- **Last but not least, addressing this challenge, together, will allow us to look our children and grand children into their eyes when they will ask us how we contributed to avoiding the announced environmental collapse.**
- **The finance world has a key role to play!**

Yes, the planet got destroyed. But for a beautiful moment in time we created value for shareholders

"Yes, the planet got destroyed. But for a beautiful moment in time we created a lot of value for shareholders."

http://www.newyorker.com/humor/issuecartoons/2012/11/26/cartoons_20121119#slide=6

SEMINARIES OVER DE FINANCIERING VAN DE TRANSITIE :
MEER GELD VOOR MINDER KOOLSTOF

SEMINAIRES SUR LE FINANCEMENT DE LA TRANSITION :
PLUS D'ARGENT POUR MOINS DE CARBONE

(Belgian Federal Council for Sustainable Development)

18/01/2018 | 09h00 – 13h30 | BRUSSELS

01/02/2018 | 09h00 – 12h30 | BRUSSELS

www.cfdd.be
www.frdo.be

FRDO CFDD

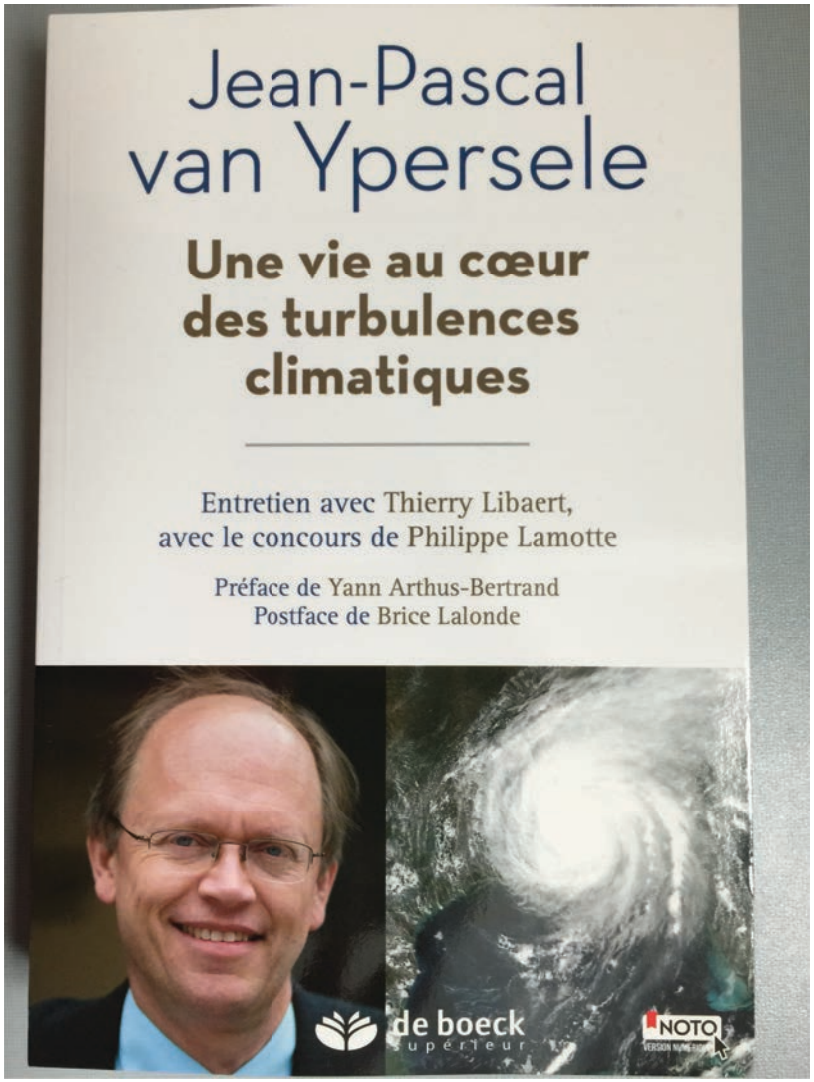
Please go and see the latest movie with Al Gore

An Inconvenient Sequel:

Truth to Power

Publié chez De Boeck supérieur,
octobre 2015

Straks (2017) in Nederlands bij EPO



Useful links:

- www.ipcc.ch : IPCC (reports and videos)
- www.climate.be/vanyp : my slides and other documents
- www.skepticalscience.com: excellent responses to contrarians arguments
- **On Twitter: @JPvanYpersele and @IPCC_CH**

Walking the talk…

- Energy audit of our home
- Strong external insulation (wood fibre)
- Ultra-efficient windows
- Airtightness inspecting + heat-recovery mechanical ventilation
- Oil furnace replaced by geothermal heat pump principally fed with PV pannels
- Non-tropical wood
- Small, used electric car
- Electric bicycles

Trying to be coherent (external insulation)

J’essaye d’être cohérent…