

# De klimaatverandering uitdaging en opportuniteiten

**Prof. Jean-Pascal van Ypersele**

**Voormalig IPCC Vice-chair (2008-2015)**

**UCL-ELI**

**(Université catholique de Louvain,  
Earth & Life Institute)**

**Web: [www.climate.be](http://www.climate.be)**

**E-mail: [vanyp@climate.be](mailto:vanyp@climate.be)**

**Twitter: [@JPvanYpersele](https://twitter.com/JPvanYpersele)**

**Humanistisch-Vrijzinnige Vereniging,**

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**NB: Merci au Gouvernement wallon pour son soutien à la  
<http://plateforme-wallonne-giec.be>.**

# 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 Organization

UNEP= United Nations Environment Programme

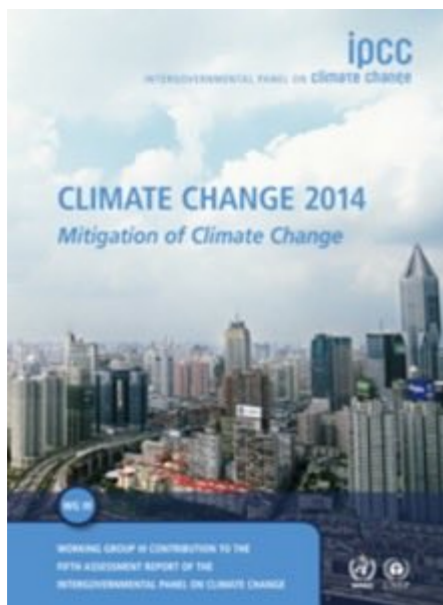




**What is happening in the climate system?**



**What are the risks?**



**What can be done?**

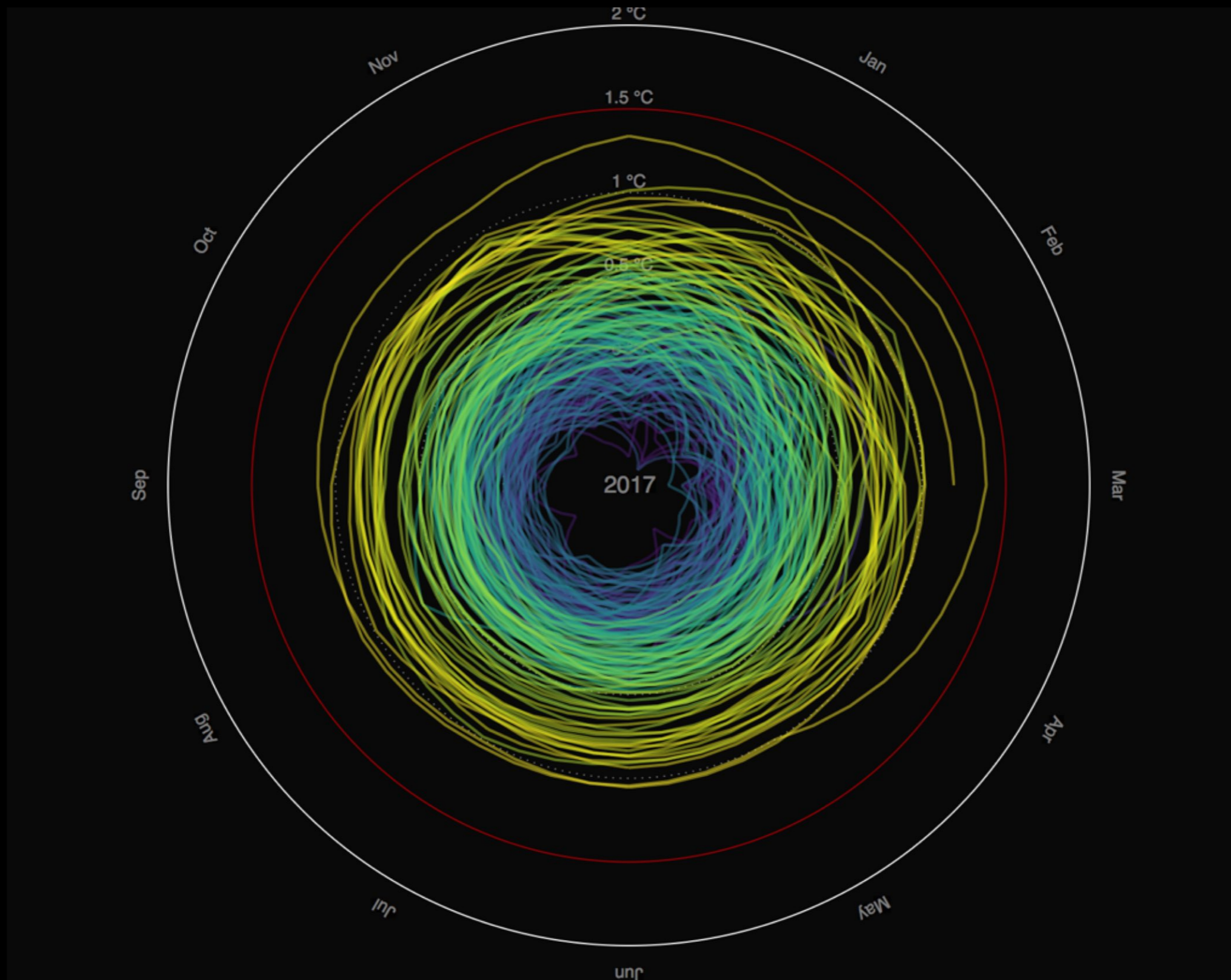
# Key messages from IPCC AR5

- **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**

# Knelpunten

- **Klimaat veranderd inderdaad**
- **Meestal onder de invloed van menselijke activiteiten (meestal CO<sub>2</sub>)**
- **Zonder mitigatie, gevolgen zullen kostbaar zijn, ook voor België**
- **Adaptatie is belangrijk, maar kan niet alles doen**
- **Grote emissie reducties zijn nodig om de opwarming te limiteren**
- **Er zijn veel mogelijkheden om dat te doen,**
- **Het kost niet zoveel als de gevolgen, en er zijn ook “co-benefits” en opportuniteiten**

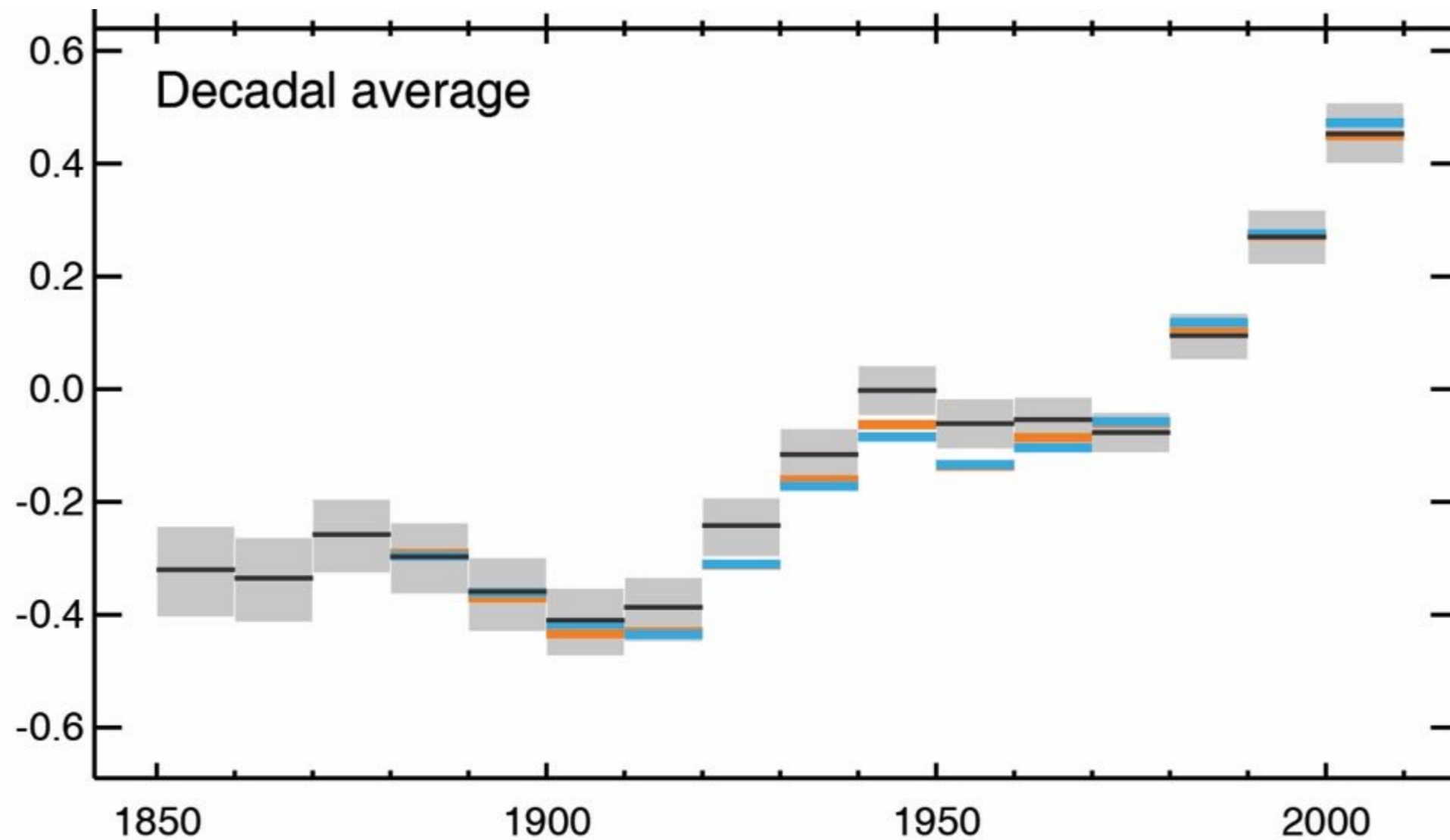
# Temperature spiral



Global Mean Temperature in °C relative to 1850 – 1900

Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset

Animated version available on <http://openclimatedata.net/climate-spirals/temperature>



(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*).**

Since 1950, extreme hot days and heavy precipitation have become more common



There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes



# 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](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)

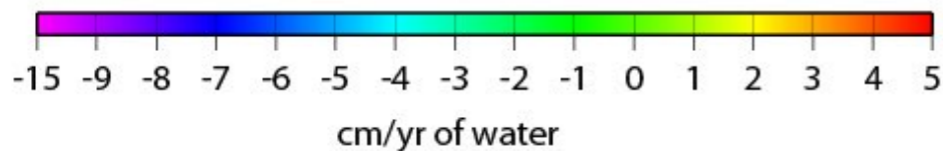
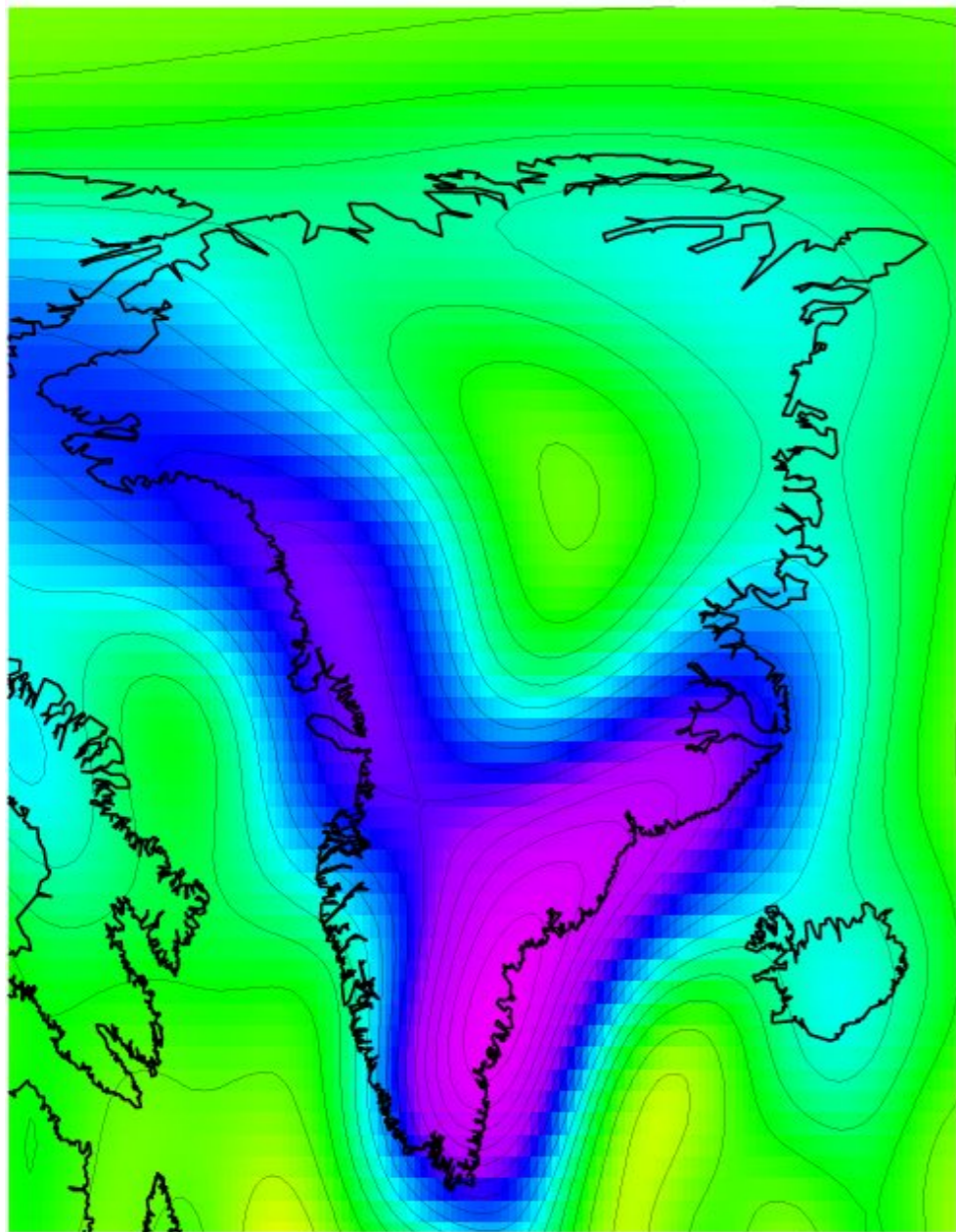


[http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes-20131125?cm\\_ven=Email&cm\\_cat=ENVIRONMENT\\_us\\_share](http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share)

# Greenland Ice Mass Loss 2002-2009

## Derived From NASA GRACE Gravity Mission

### Greenland

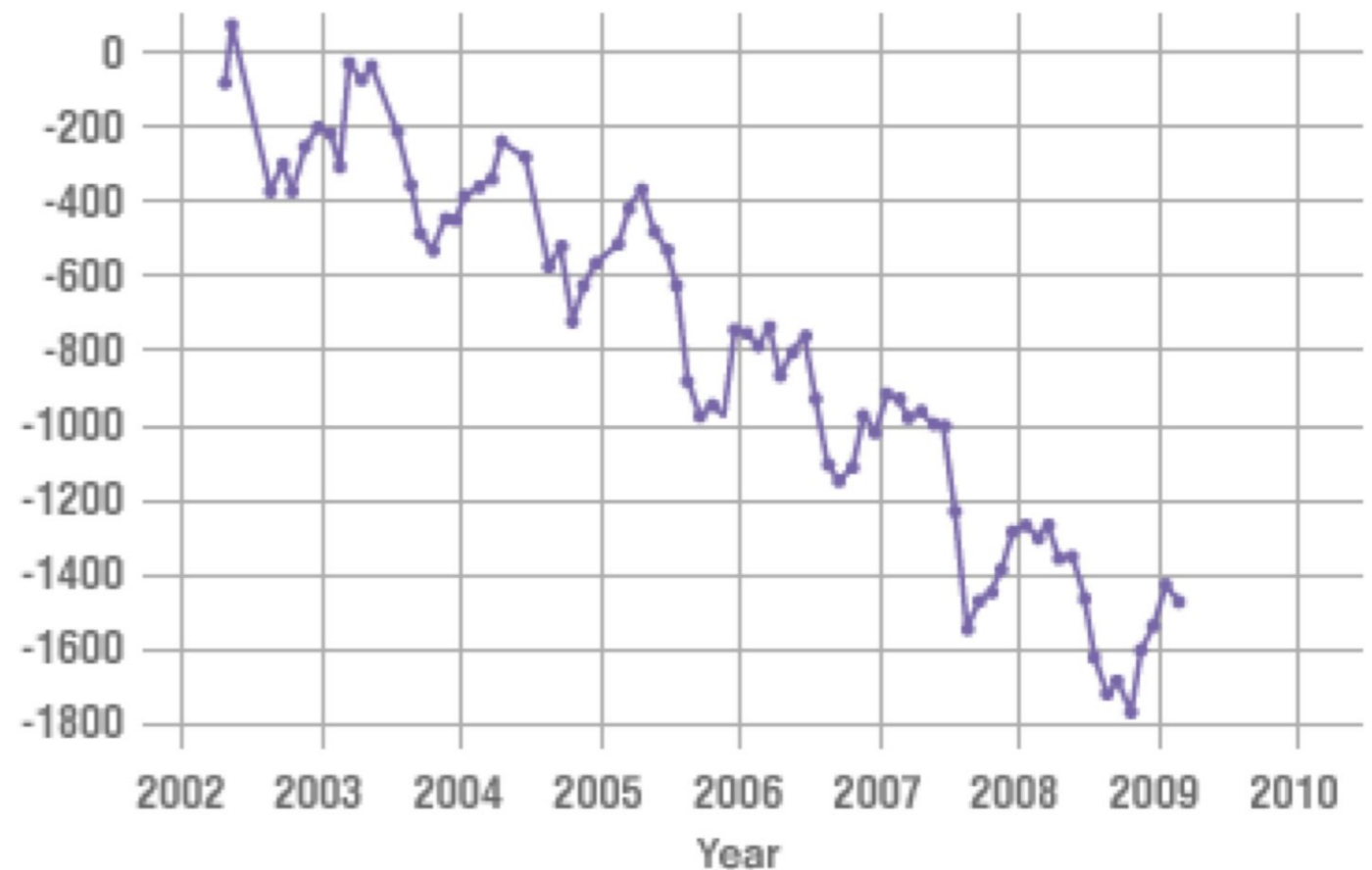


J. Wahr, U. Colorado

### GREENLAND MASS VARIATION SINCE 2002

Data source: Ice mass measurement by NASA's Grace satellites.

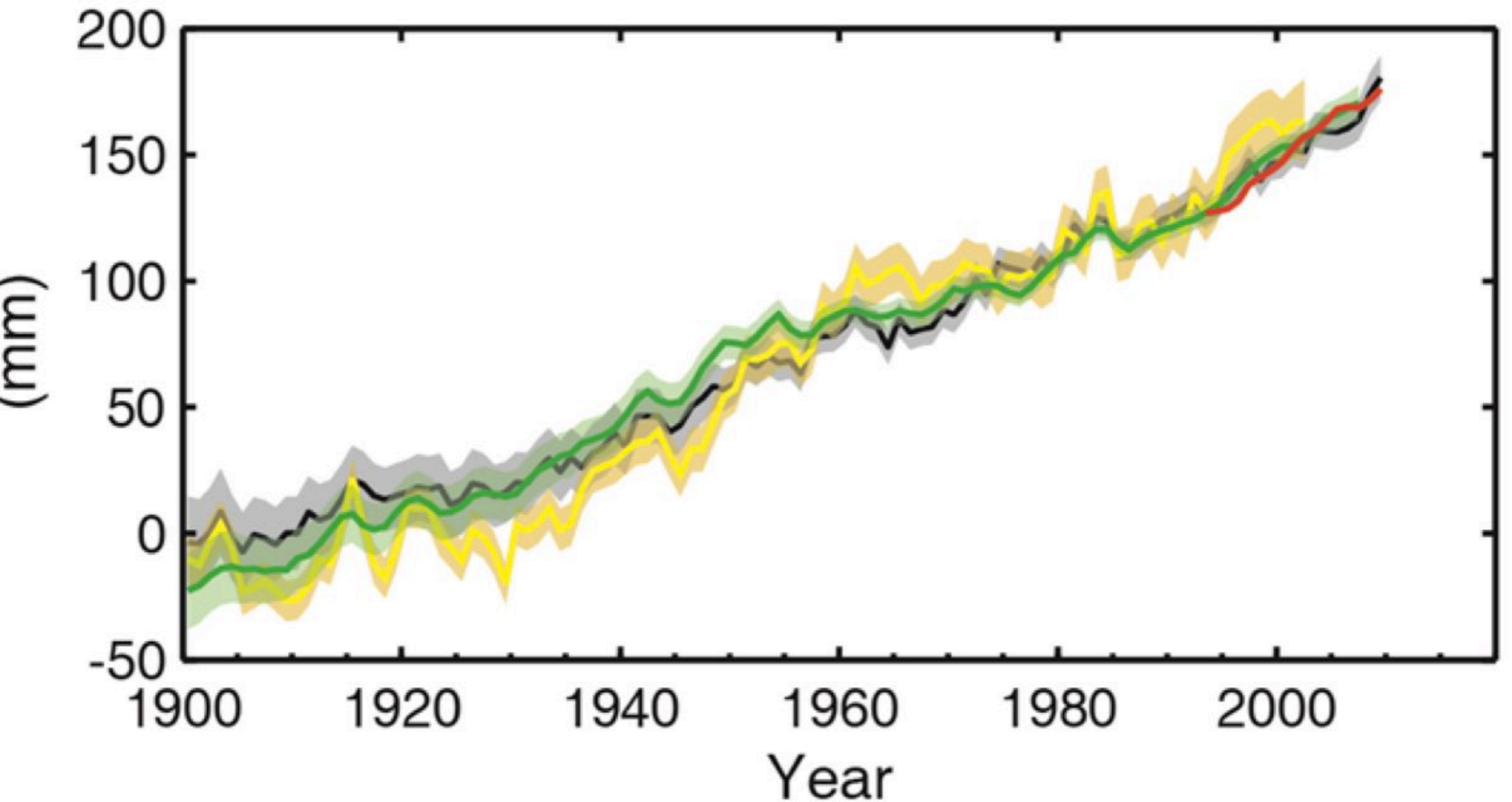
Change in Ice Mass Loss Gigatons



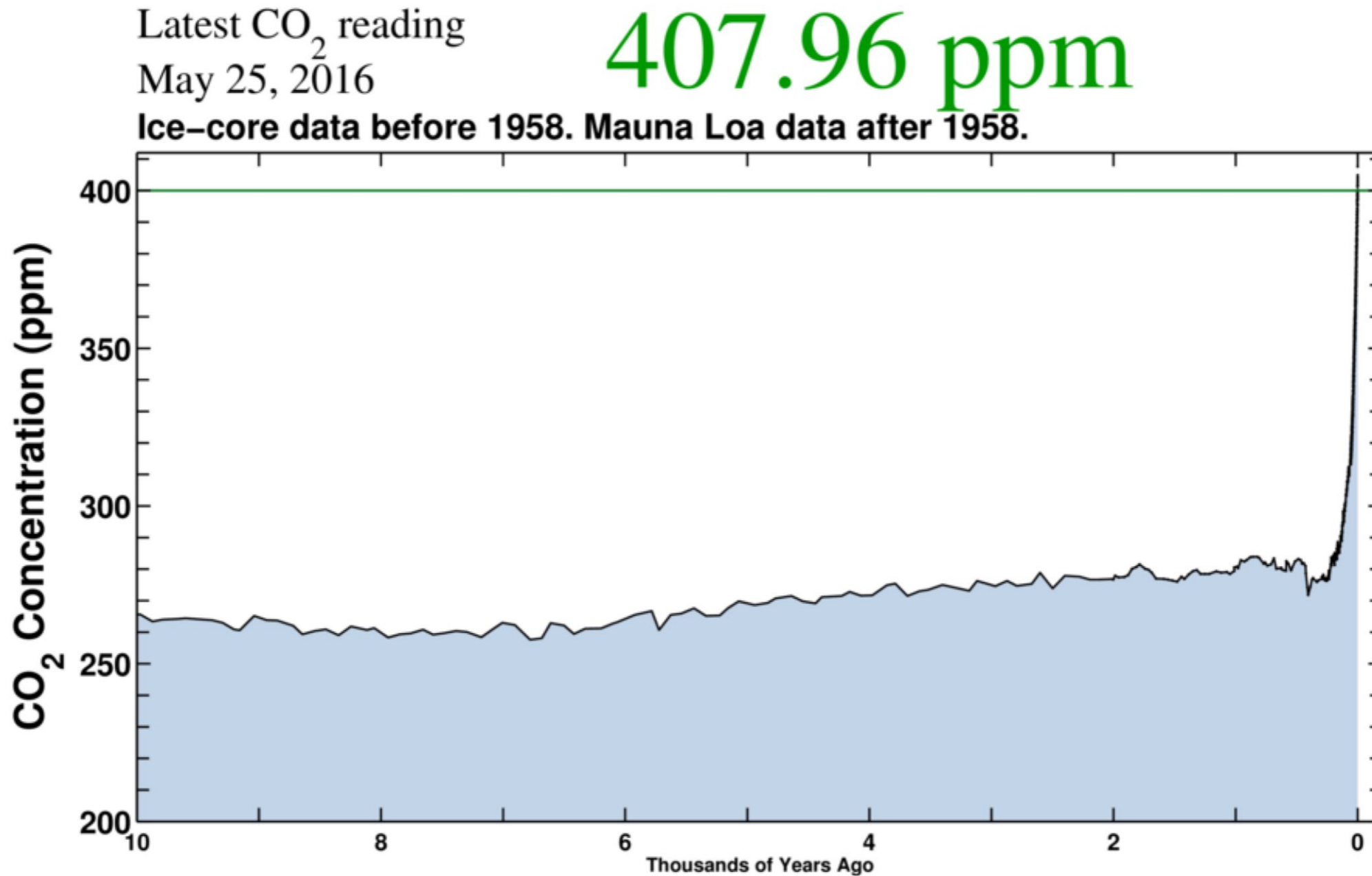
Velicogna, Geophysical Research Letters, 2009

•Contributes to sea level rise

# Change in average sea-level change



# CO<sub>2</sub> Concentration, 25 May 2016 (Keeling curve)



Source: [scripps.ucsd.edu/programs/keelingcurve/](http://scripps.ucsd.edu/programs/keelingcurve/)

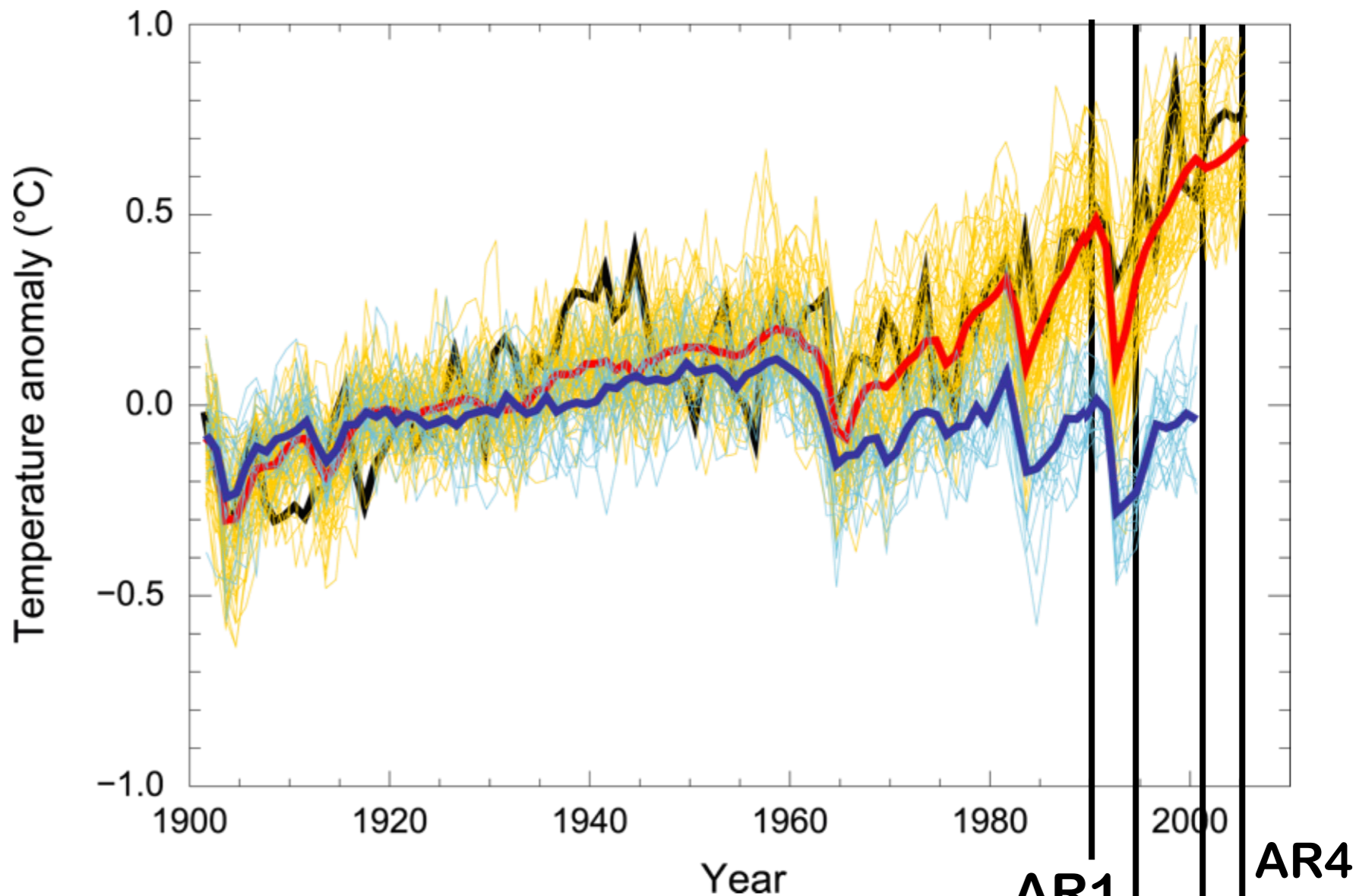
# A Progression of Understanding: Greater and Greater Certainty in Attribution

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

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

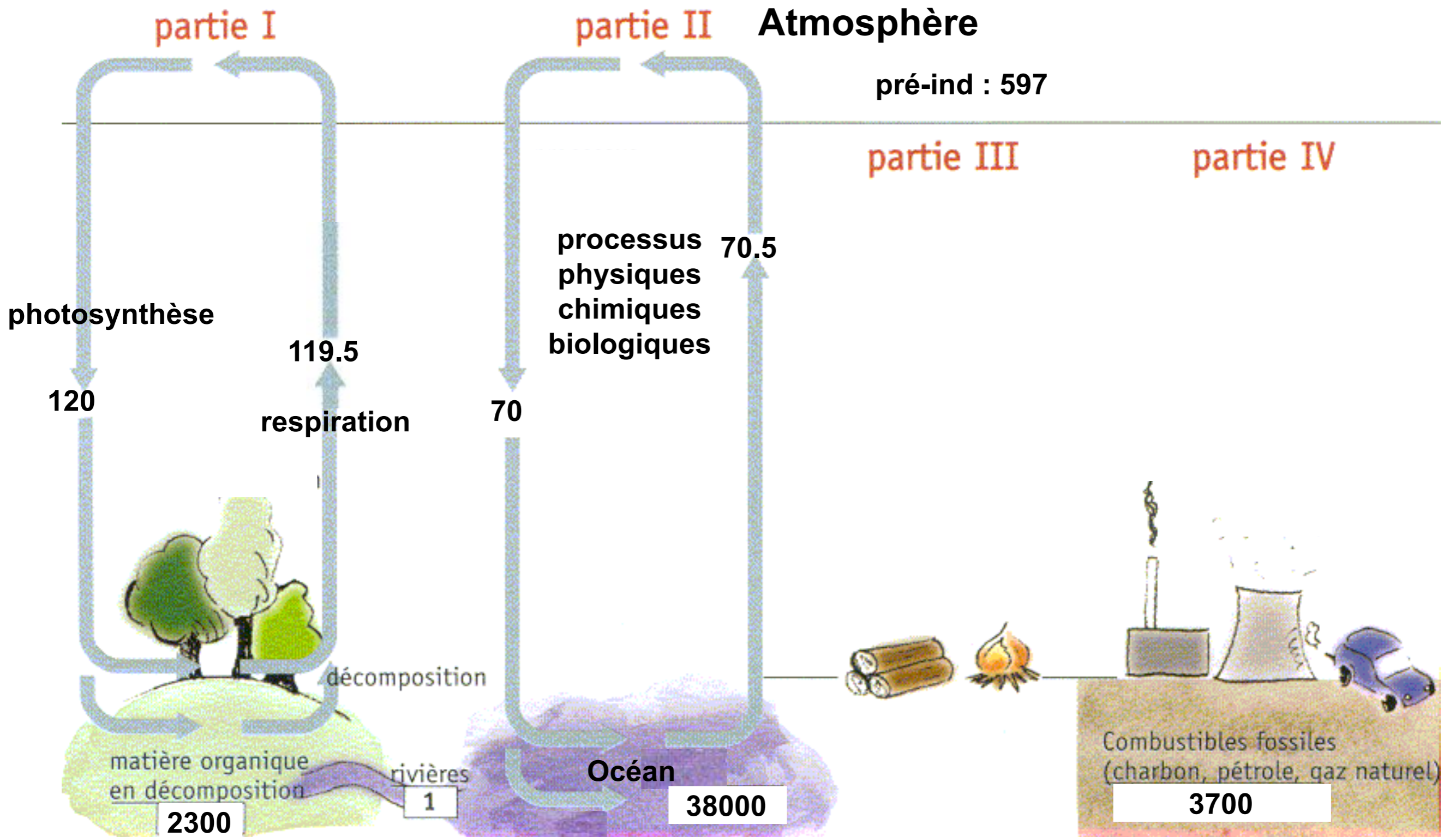
AR3 (2001): “most of  
the warming of the  
past 50 years is **likely**  
(odds 2 out of 3) due  
to human activities”

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



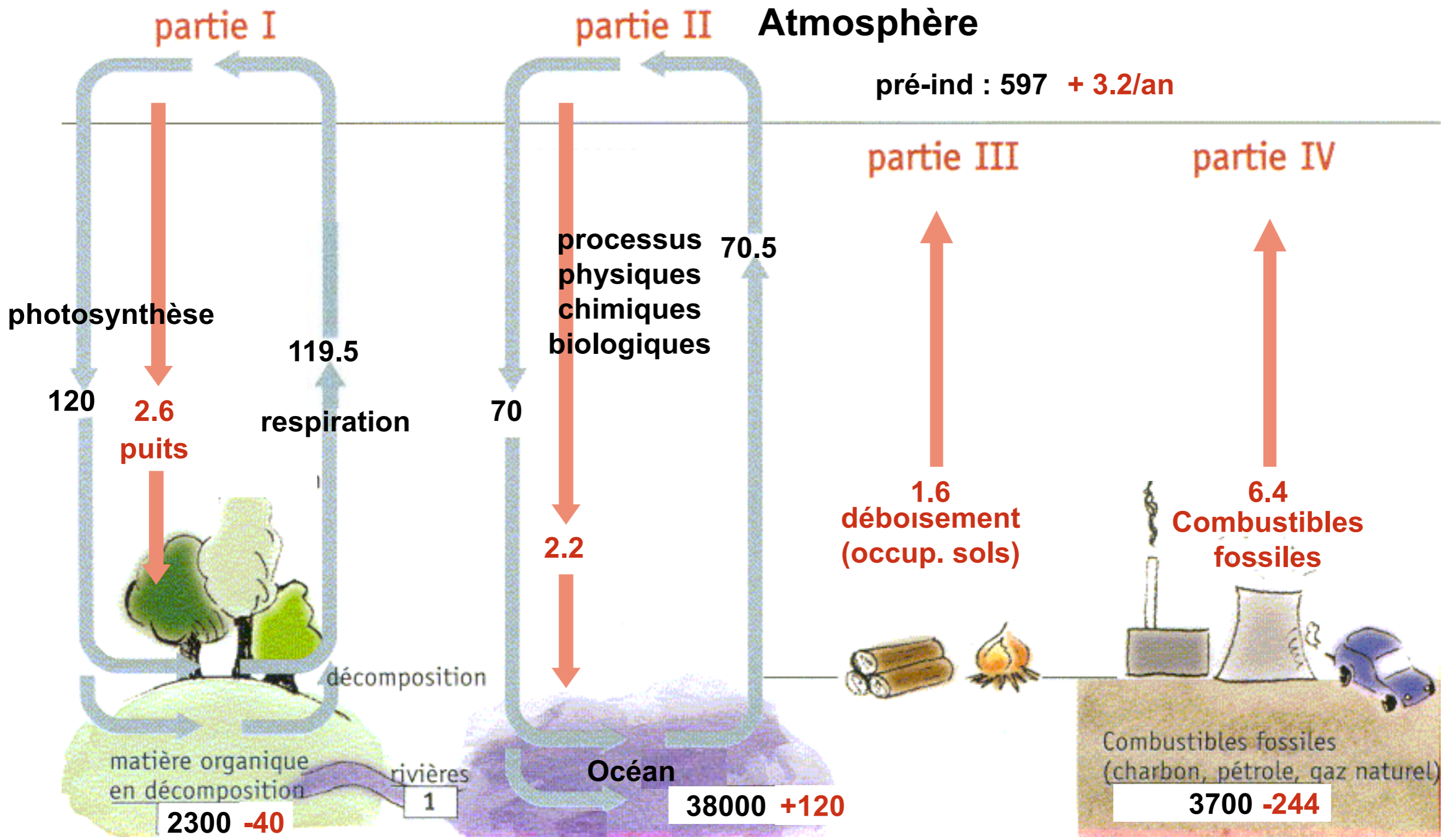
AR5 (2013) «It is **extremely likely**  
(odds 95 out of 100) that human influence  
has been the dominant cause... »

# Cycle du carbone



Unités: GtC (milliards de tonnes de carbone) ou GtC/an

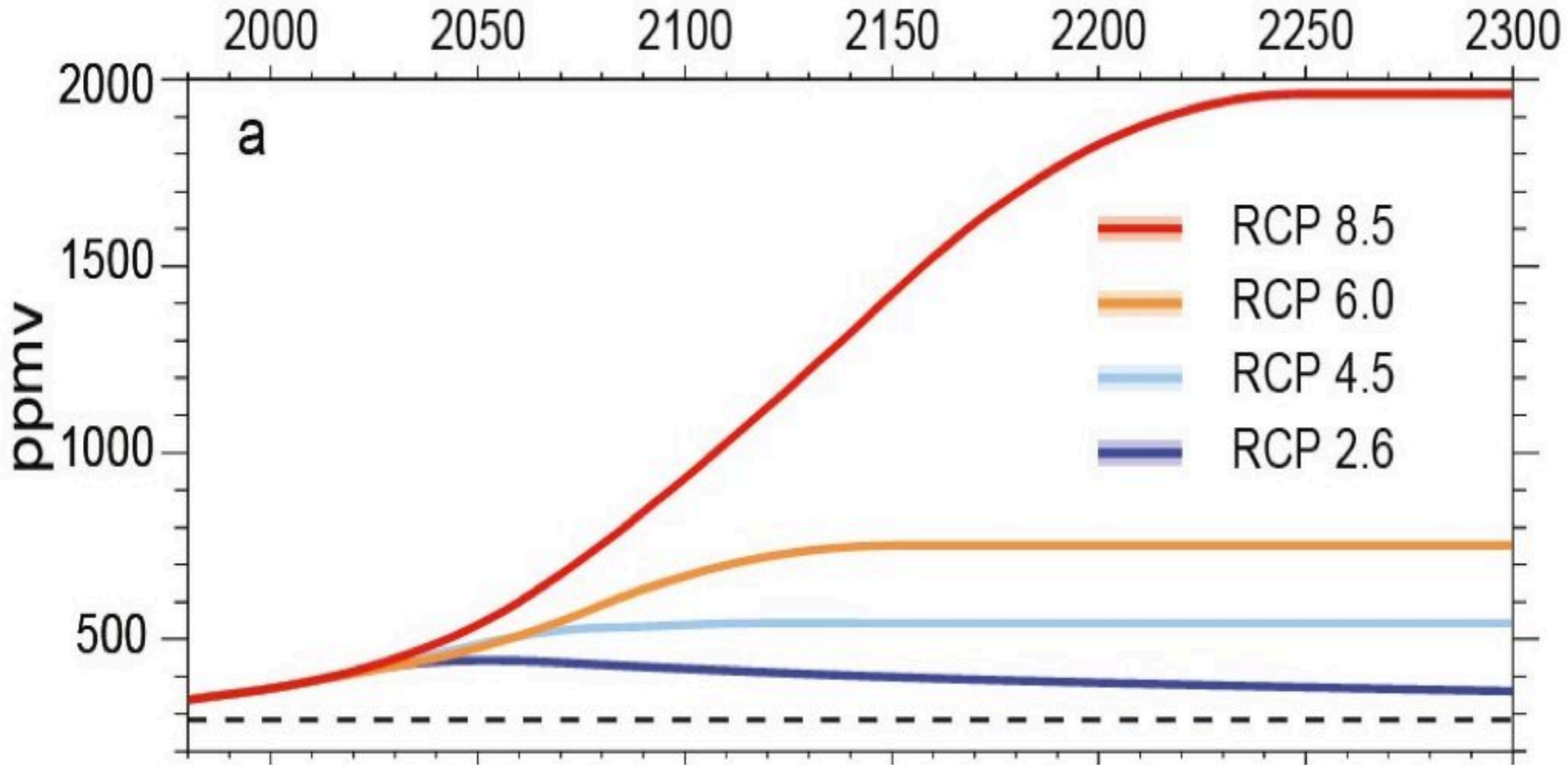
# Cycle du carbone



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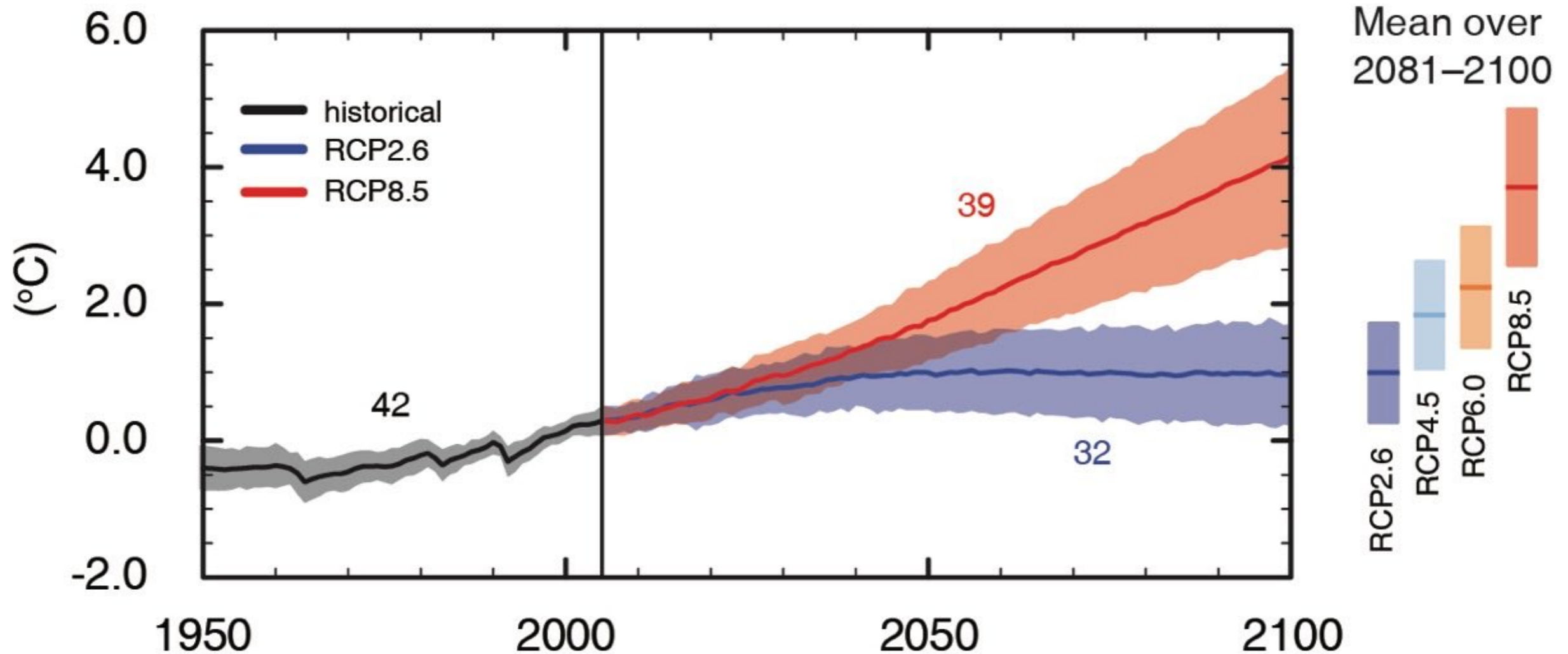


# RCP Scenarios: Atmospheric CO<sub>2</sub> concentration



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

## Global average surface temperature change

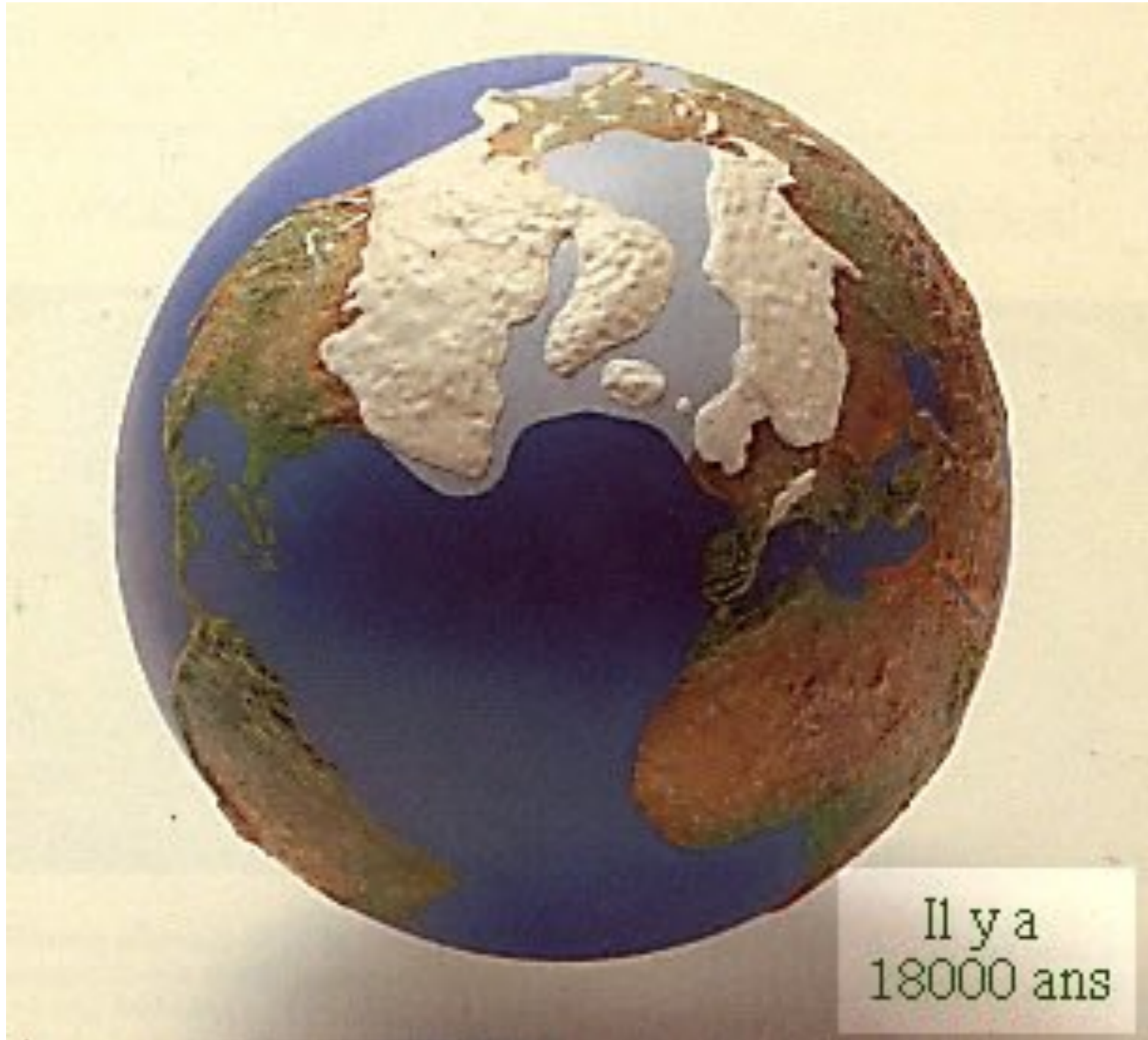


(IPCC 2013, Fig. SPM.7a)

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

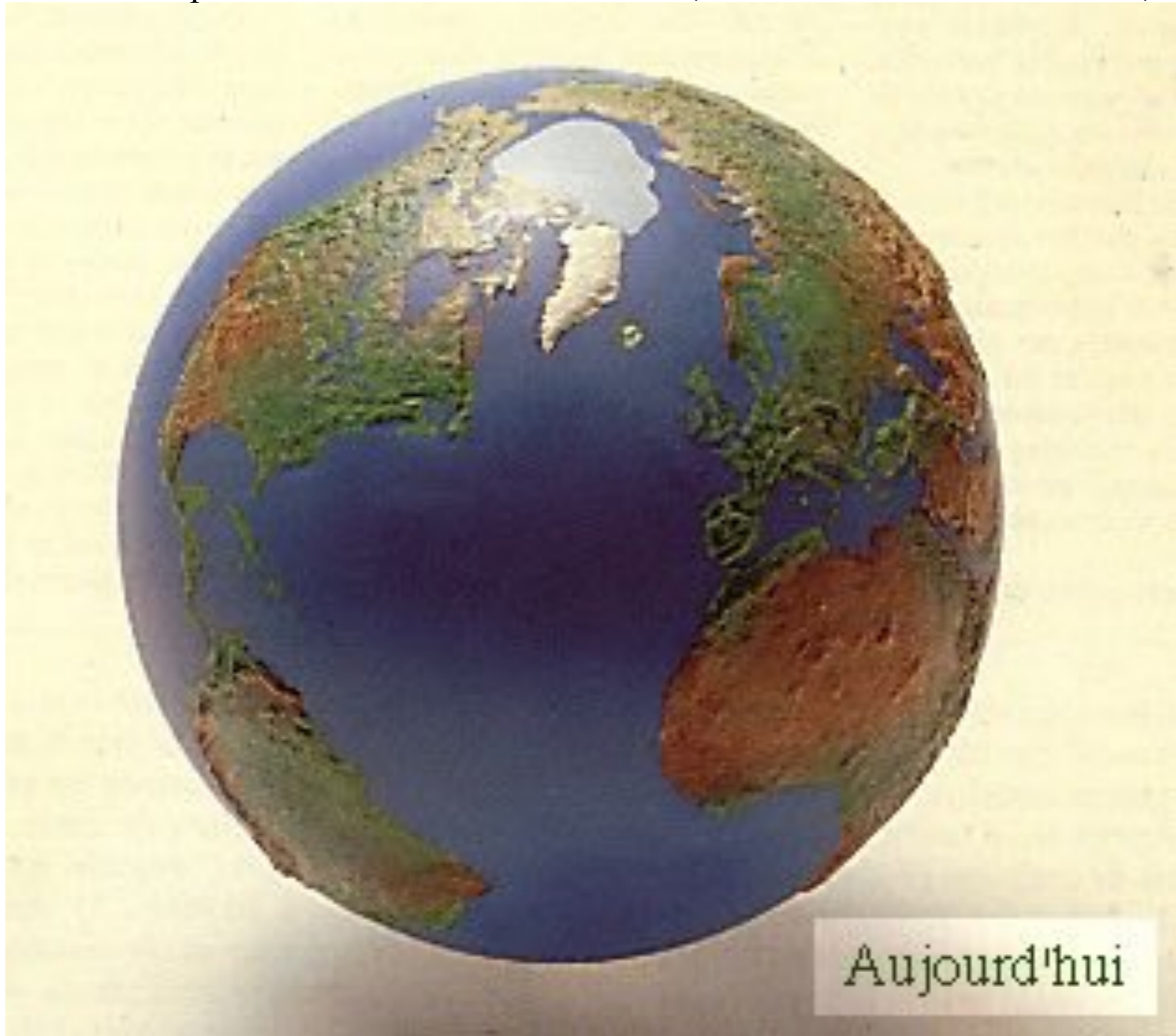
# 18-20000 years ago (Last Glacial Maximum)

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



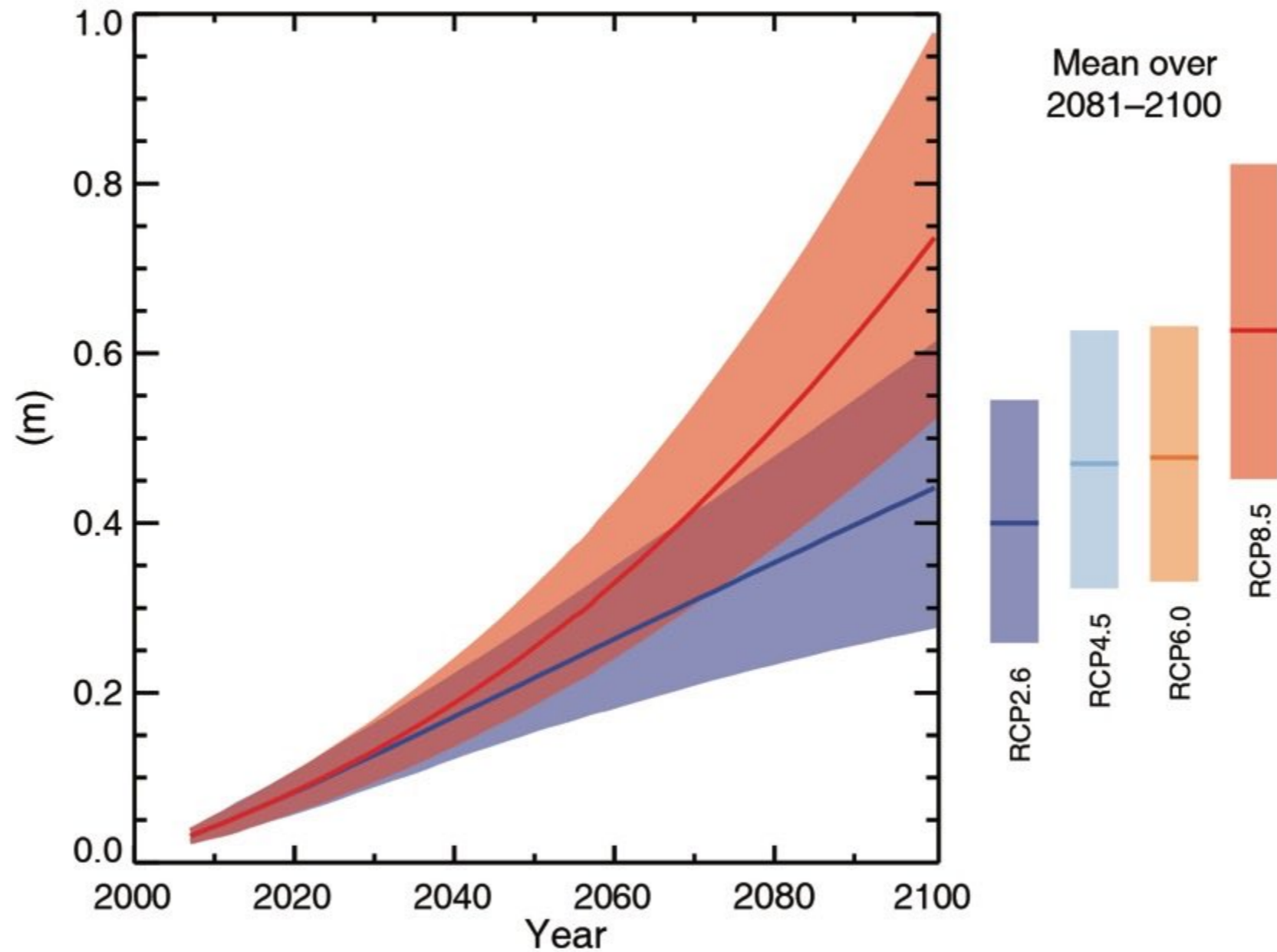
# Today, with +4-5° C globally

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



Aujourd'hui

Global mean sea level rise (Ref: 1986-2005)



(IPCC 2013, Fig. SPM.9)

Sea level due to continue to increase

**With 1 metre sea-level rise: 63000 ha below sea-level in Belgium (likely in 22nd century, not impossible in 21st century)  
(NB: flooded area depends on protection)**



**Source: N. Dendoncker (Dépt de Géographie, UCL), J.P. van Ypersele et P. Marbaix (Dépt de Physique, UCL) ([www.climate.be/impact](http://www.climate.be/impact))**

**With 8 metre sea-level rise: 3700 km<sup>2</sup> below sea-level in Belgium (very possible in year 3000)  
(NB: flooded area depends on protection)**

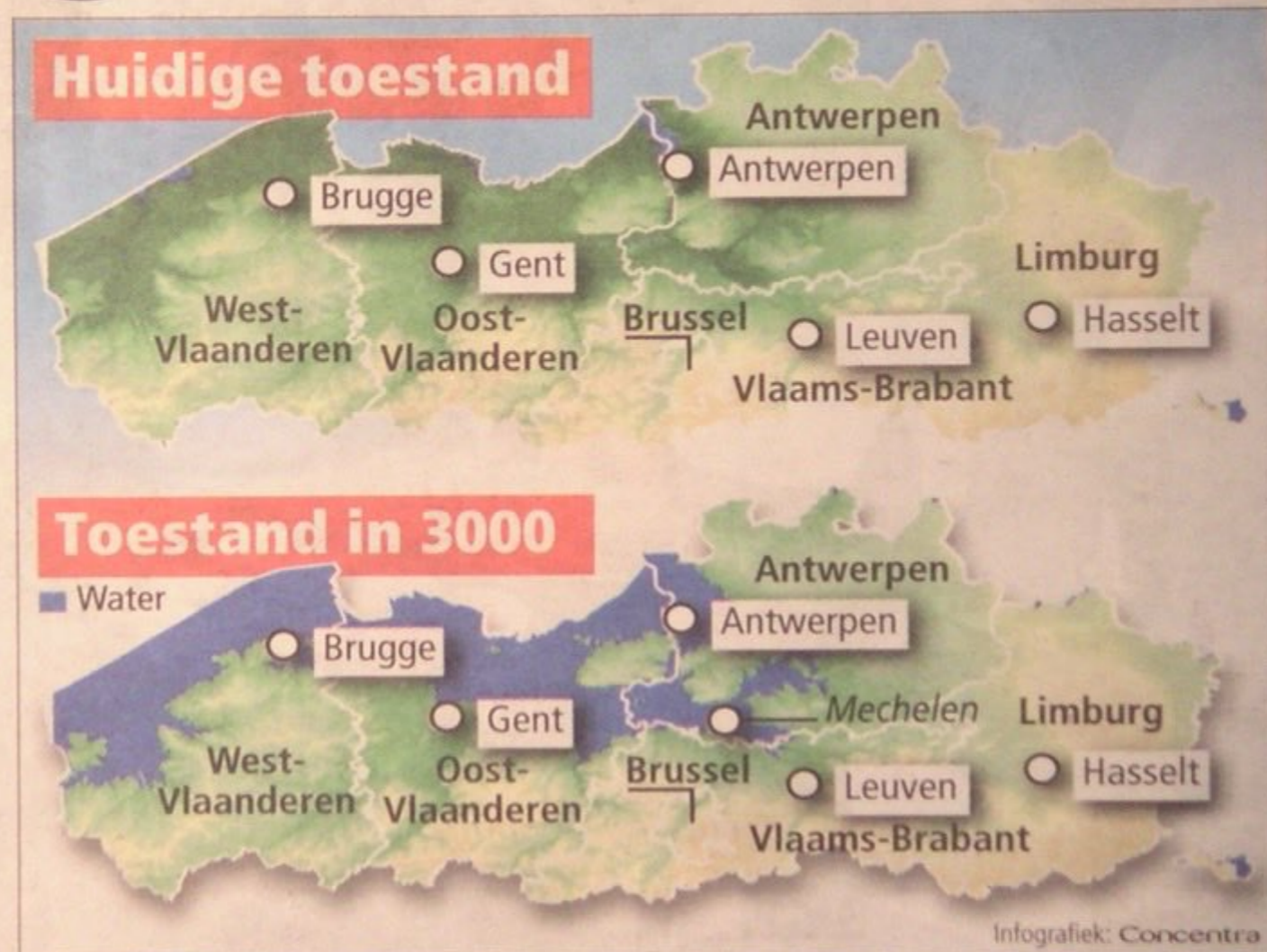


**Source: N. Dendoncker (Dépt de Géographie, UCL), J.P. van Ypersele et P. Marbaix (Dépt de Physique, UCL) ([www.climate.be/impact](http://www.climate.be/impact))**

# Gent koningin der badsteden?

Zonder maatregelen voor milieu is Antwerpen overspoeld in 3000

BRUSSEL - Zonder nieuwe maatregelen zal ons klimaat verder opwarmen. Dan komt tegen 3000 tien procent van België onder water te staan. Daaronder uiteraard alle kuststeden, maar ook Brugge, Antwerpen en zelfs Mechelen. Gent komt aan zee te liggen. Dat blijkt uit een studie van professoren van de UCL in opdracht van Greenpeace.



Gerard Govers, professor geografie aan de Katholieke Universiteit Leuven, tekende gisteren op onze vraag het nieuwe kaartje van Vlaanderen anno 3000 uit. Een land waarin de zeespiegel volgens het rapport van Greenpeace mogelijk 8 meter gestegen is. "In dat geval zou het grootste gedeelte

Govers. "Gent zou nog net boven water blijven, ze mogen daar al appartementjes beginnen bouwen." Gent als koningin der badsteden? Het is een grapje, volgens professor Govers is het moeilijk om nu al voorspellingen voor het volgende millennium te maken. "Dat lijkt me

meetbaar te worden en er bestaan al voorspellingen voor het jaar 2050, zelfs 2100. Maar verder hangt veel af van wat op Antarctica gaat gebeuren en dat is moeilijk te zeggen. Afwachten dus." Het rapport van Greenpeace werd gisteren overhandigd aan Bruno Tobback en Kri



# Effects of a 1 m Sea-Level Rise in the Nile Delta (>10 million people live at less than 1 m a.s.l.)



(Time 2001)

# Potential Impacts of Climate Change



Food and water shortages



Increased displacement of people

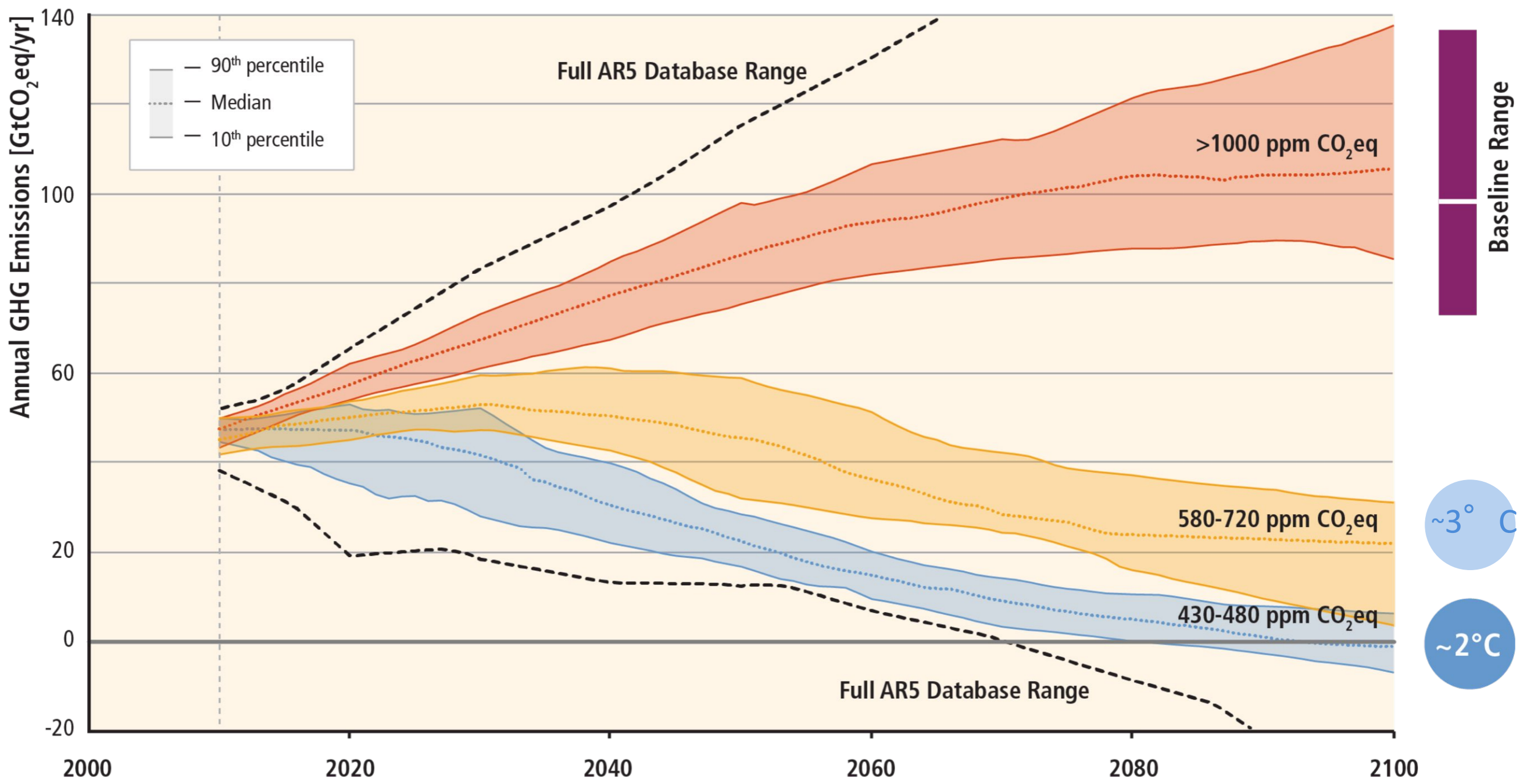


Increased poverty



Coastal flooding

AR5 WGII SPM



Based on Figure 6.7

AR5 WGIII SPM

- **Many scenario studies confirm that it is technically and economically feasible to keep the warming below 2° C, with more than 66% probability (“likely chance”).** This would imply limiting atmospheric concentrations to 450 ppm CO<sub>2</sub>-eq by 2100.
- **Such scenarios for an above 66% chance of staying below 2° C imply reducing by 40 to 70% global GHG emissions compared to 2010 by mid-century, and reach **Zero** or negative emissions by 2100.**

# 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**

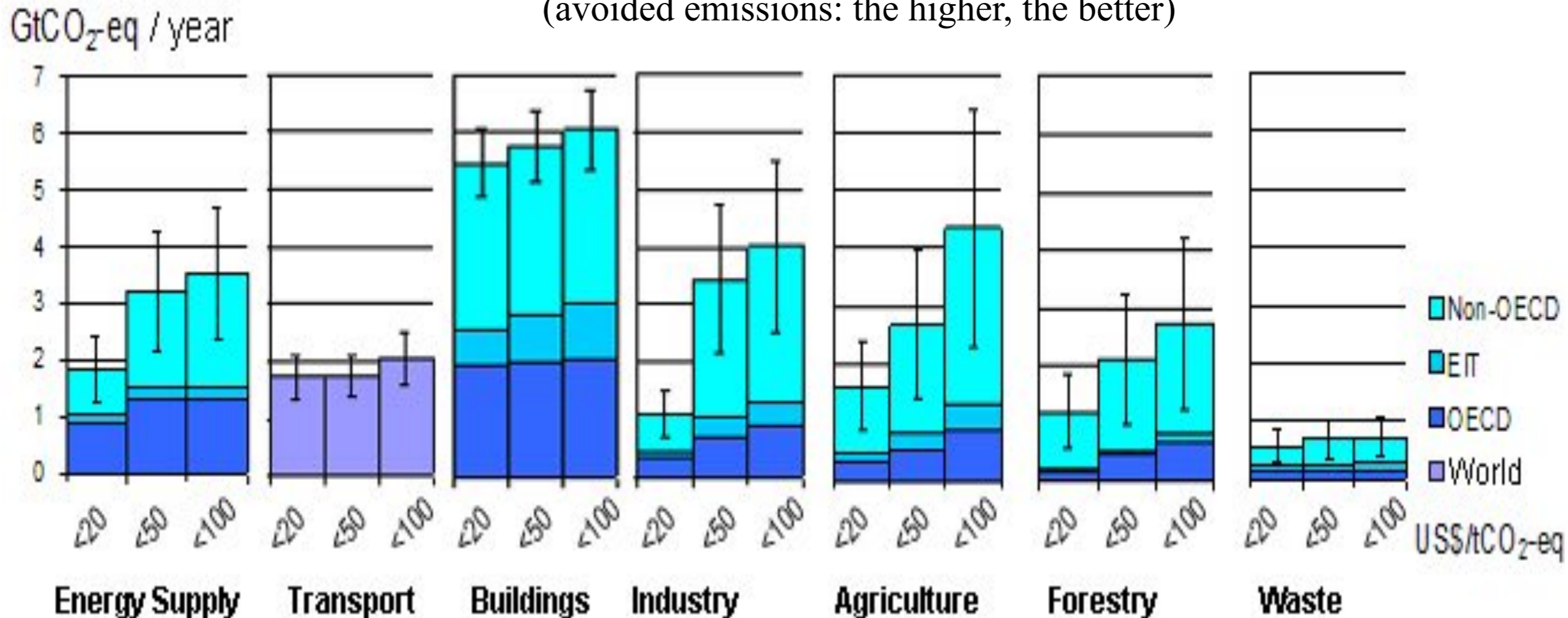


**Lifestyle and behavioural changes**

AR5 WGIII SPM

# All sectors and regions have the potential to contribute by 2030

(avoided emissions: the higher, the better)



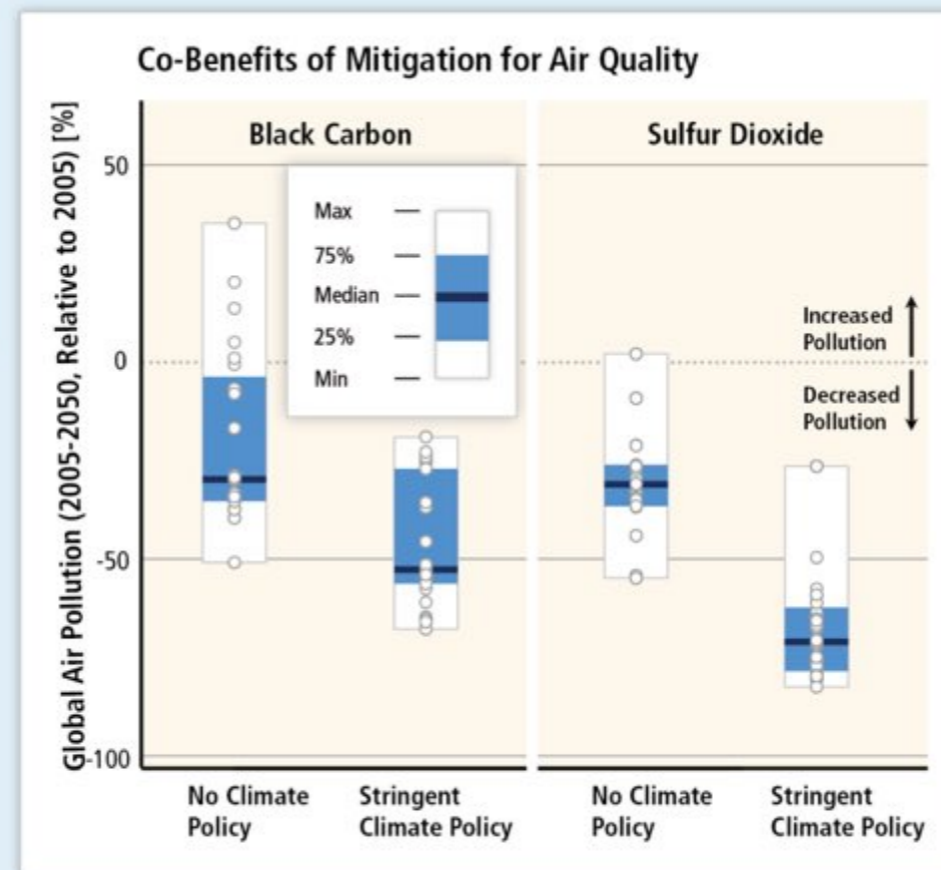
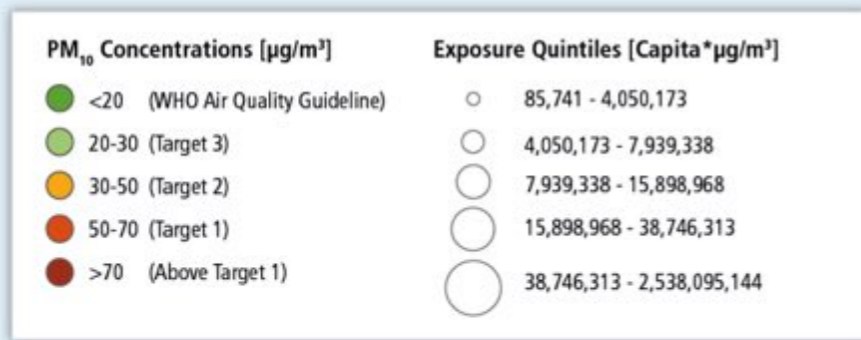
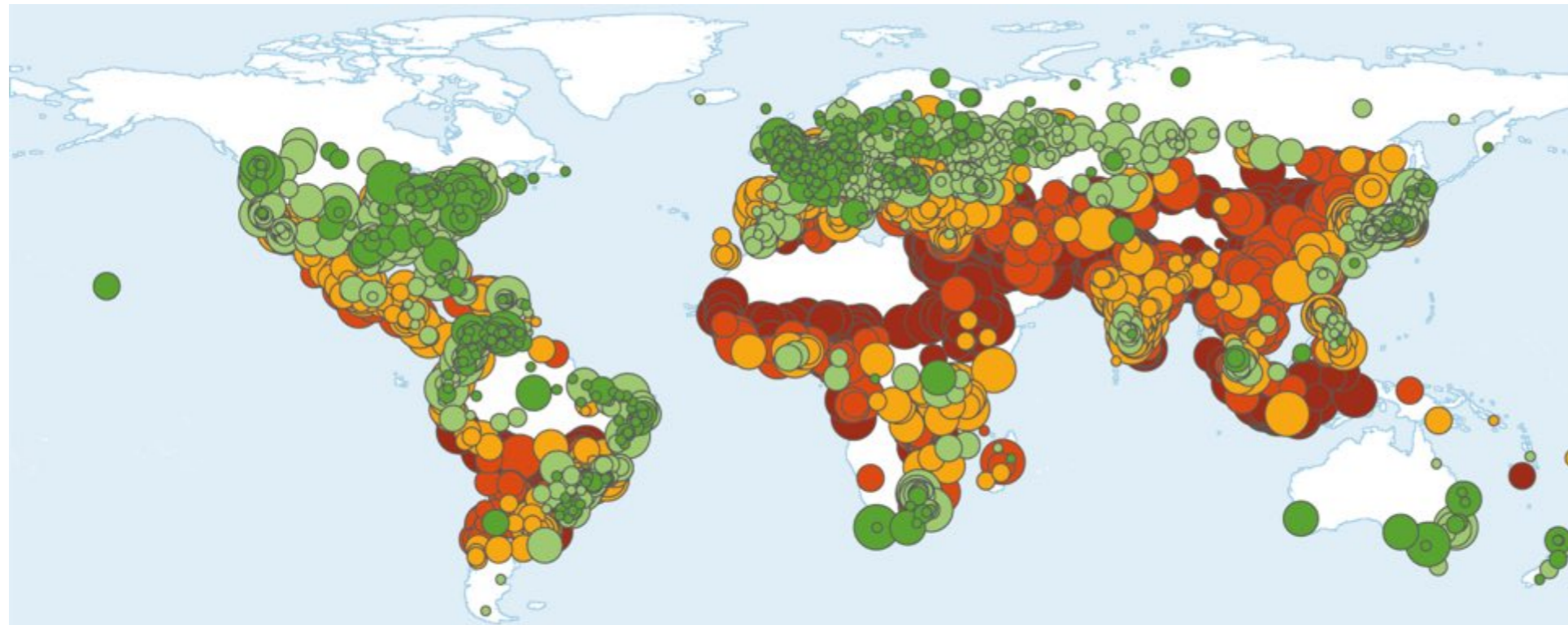
IPCC AR4 (2007)

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**



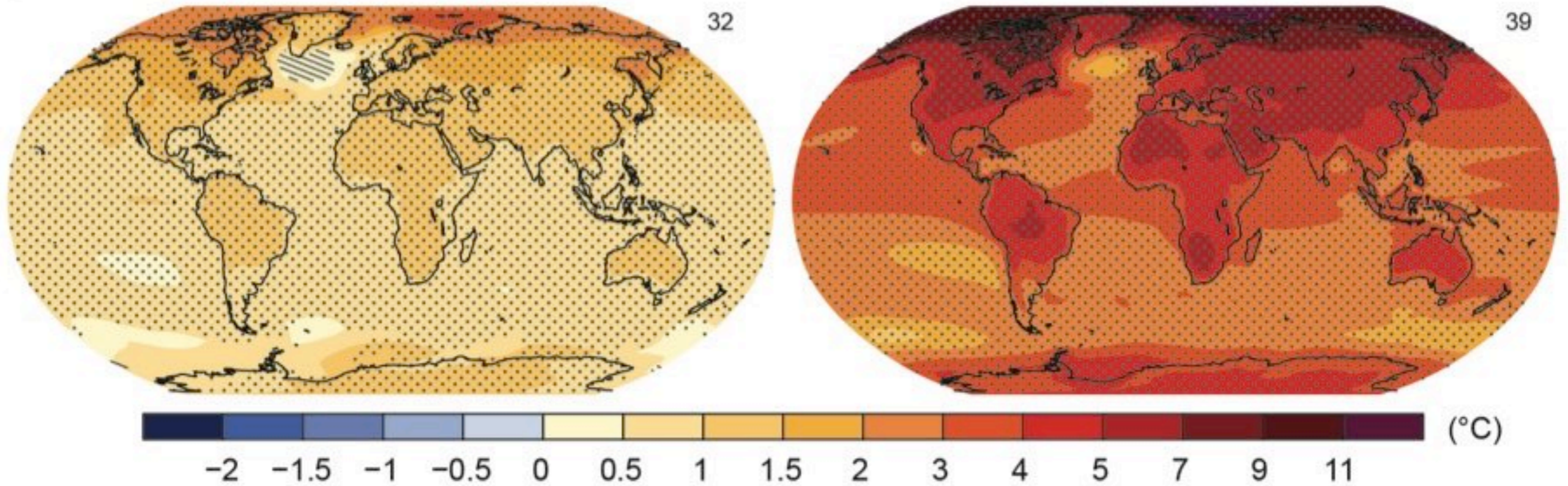
**Mitigation can result in large co-benefits for human health and other societal goals.**



# RCP2.6

# RCP8.5

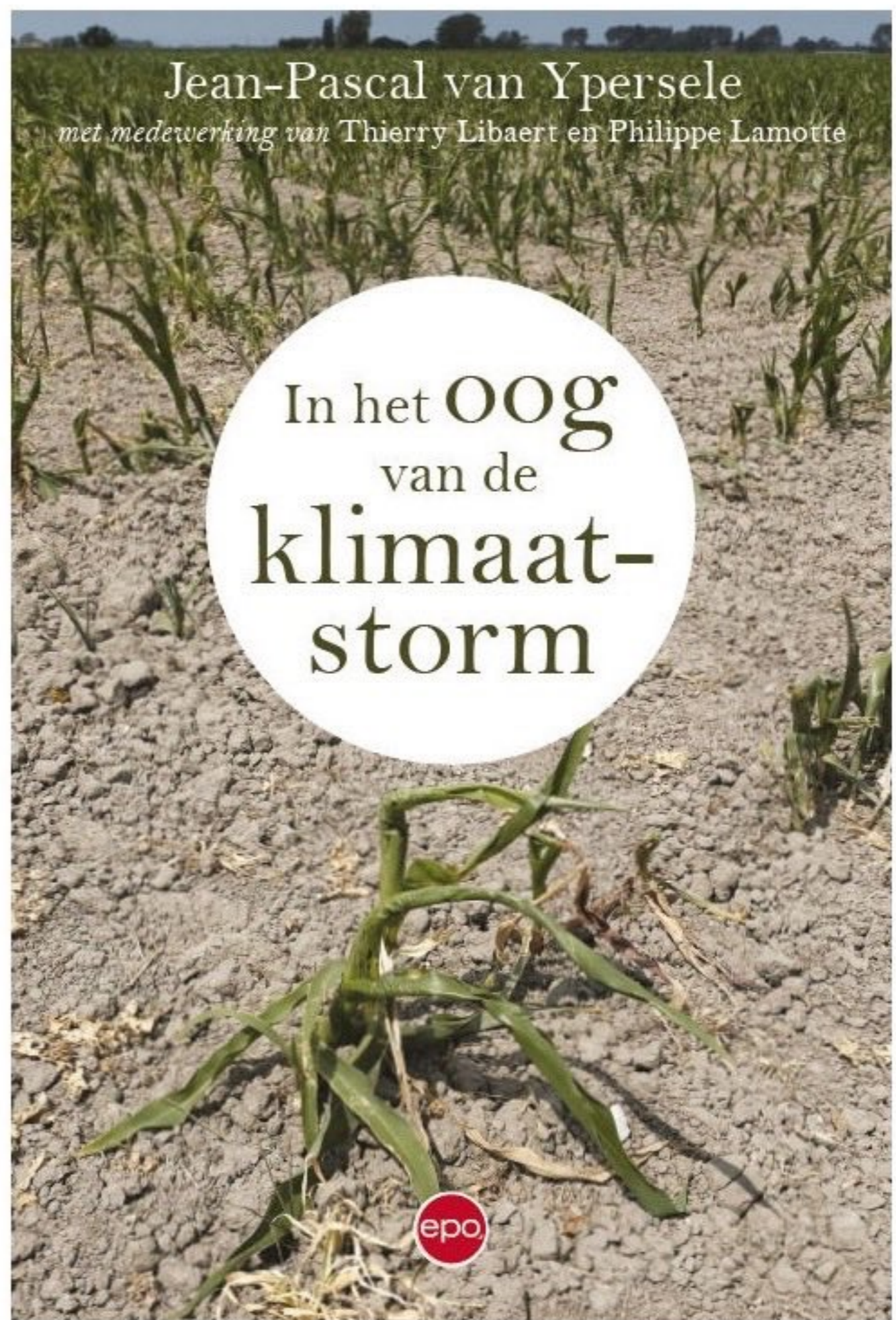
Change in average surface temperature (1986–2005 to 2081–2100)



Humanity has the choice

**Bij EPO  
(februari 2018)**

**Voorwoord:  
Jill Peeters**



## **In het oog van de klimaatstorm**

(Voorwoord van Jill Peeters, en mijn portret)

- 1: De pioniers**
- 2: Opwarming: waar ligt het probleem?**
- 3: Het IPCC, van oprichting tot erkenning**
- 4: Het IPCC, de klimaatboot op kruissnelheid**
- 5: Kopenhagen, de zeemeermin was te aantrekkelijk**
- 6: Het akkoord van Parijs, een mooi resultaat ?**
- 7: Het IPCC in een onweerszone**
- 8: Oog in oog met de « klimaatsceptici »**
- 9: De economie, medeoorzaak en slachtoffer**
- 10: De transitie versnellen**

(Nawoord door Brice Lalonde)

# Useful links:

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