Changements climatiques et santé: Le contexte climatique

Jean-Pascal van Ypersele (UCL)

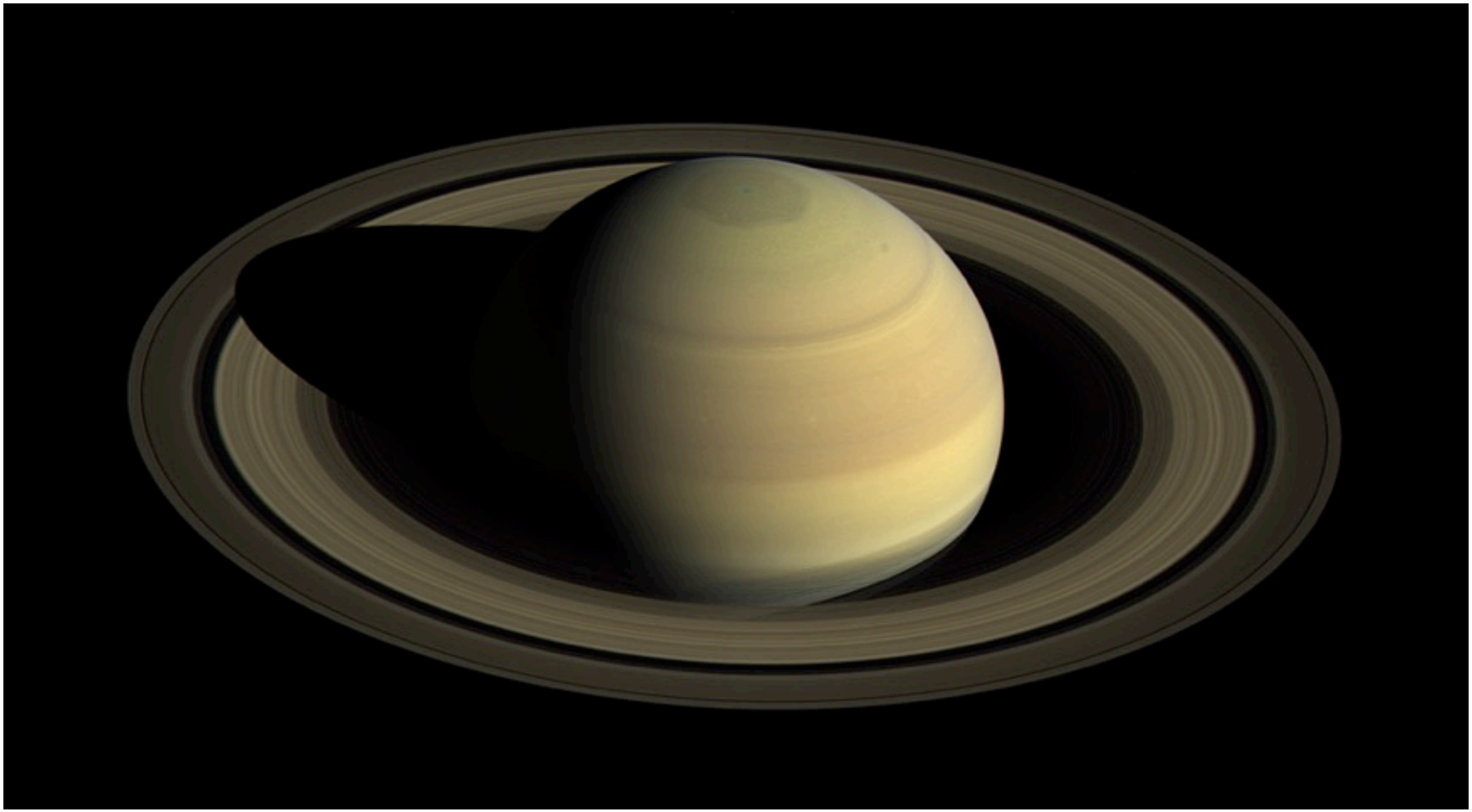
Vice-président du GIEC de 2008 à 2015

Twitter: @JPvanYpersele

Conférence « changements climatiques et santé », CFDD, Sénat, Bruxelles, 26-10-2017

Merci au Gouvernement wallon pour son soutien à la www.plateforme-wallonne-giec.be et à mon équipe à l'Université catholique de Louvain pour son soutien

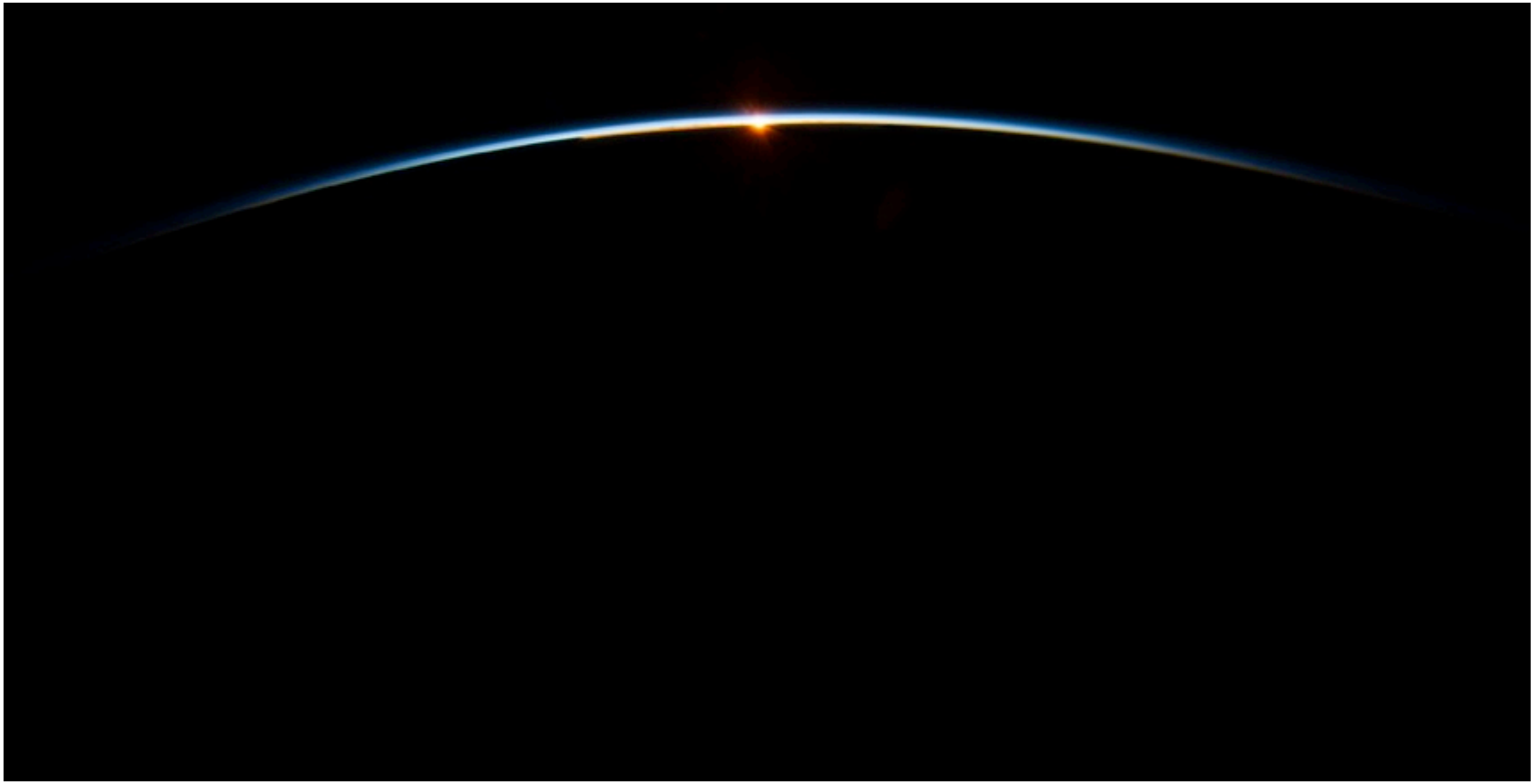
Saturn, as seen on 25-4-2016 from a 3 million km distance by the Cassini satellite launched in October 1997, 40 years after Sputnik



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

Apollo 17,
7 Dec. 1972

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



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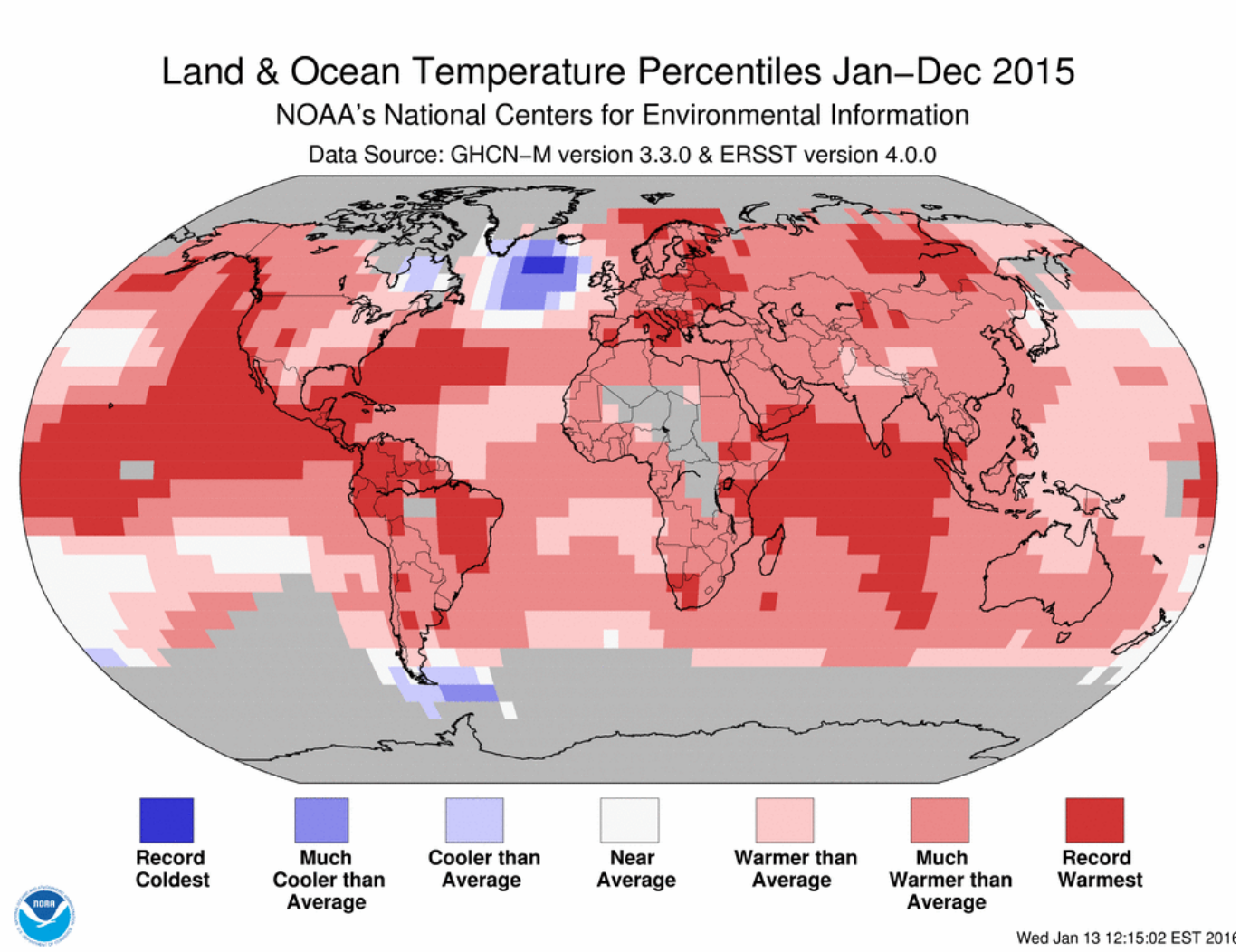
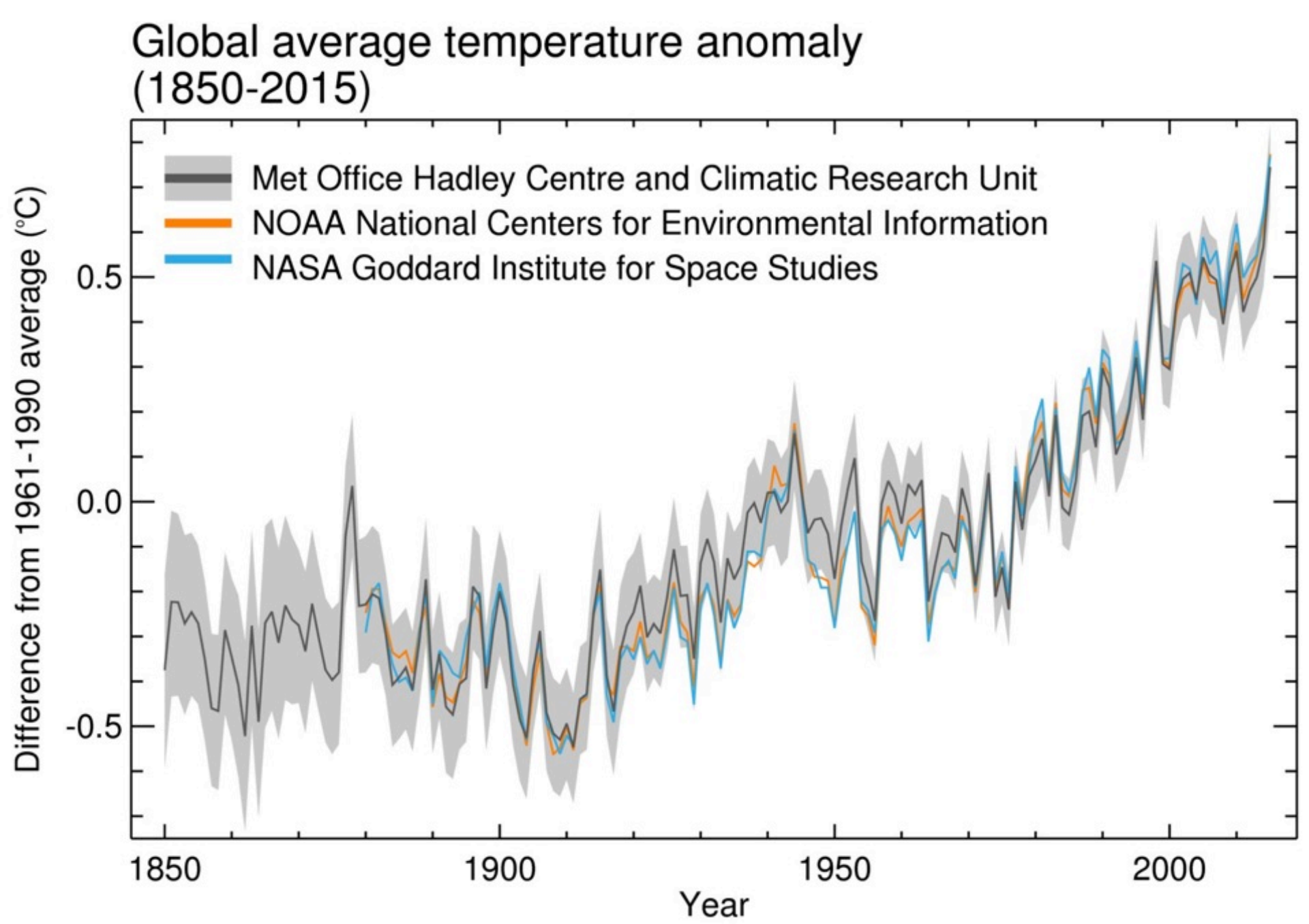
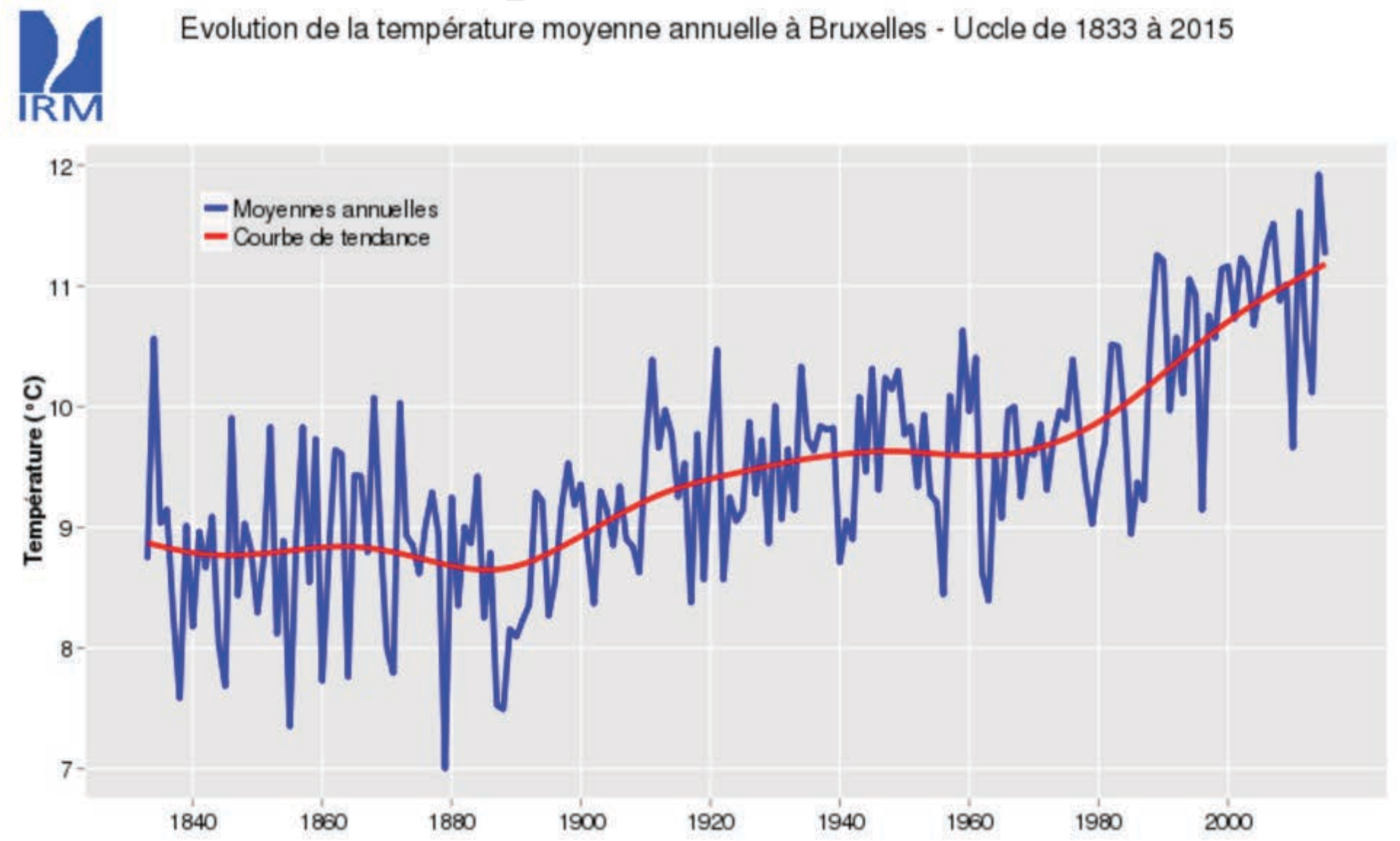
2014, 2015, 2016= warmest years since 1880





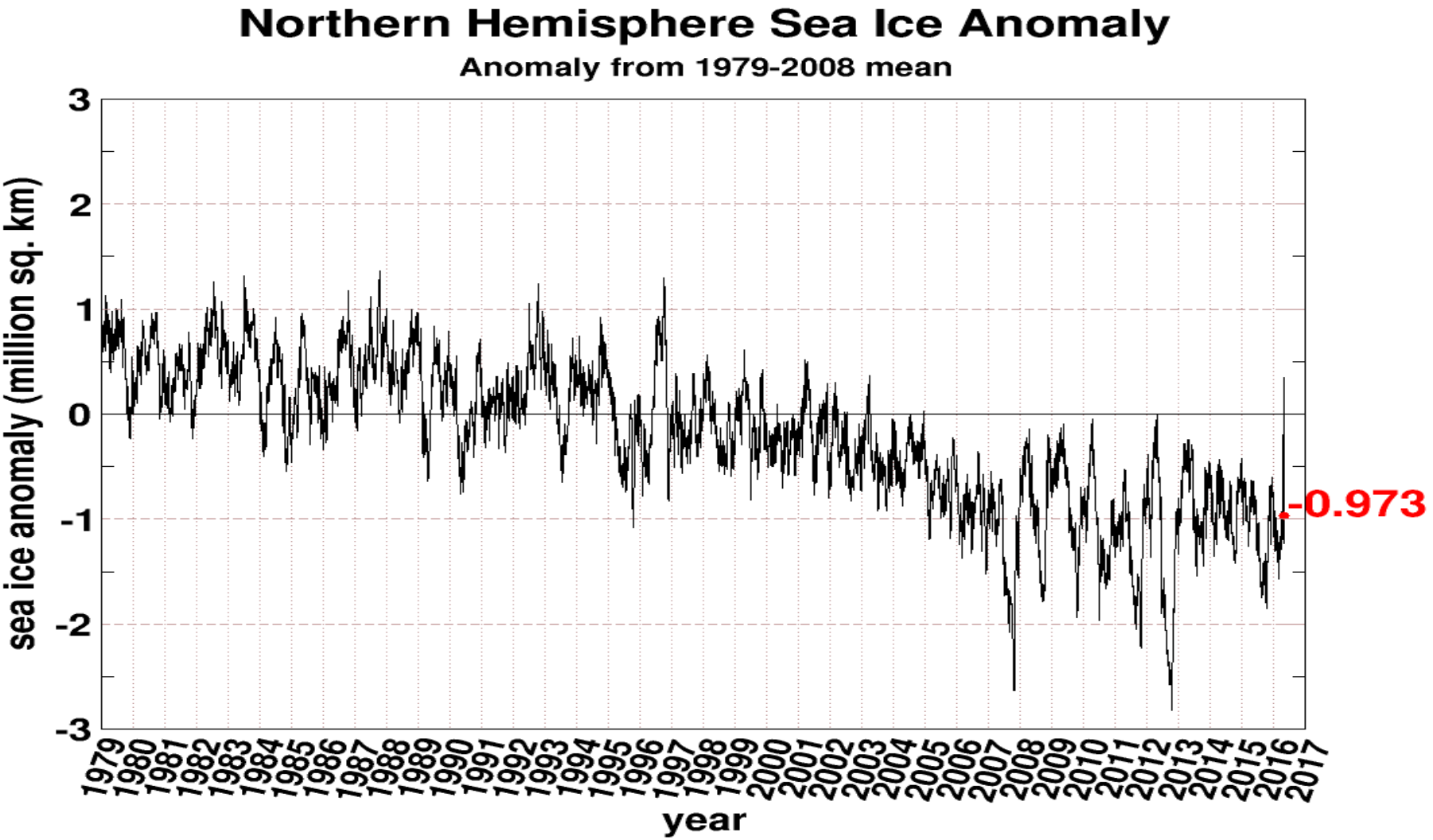
Source: NASA GISS

Uccle n'est pas en reste:

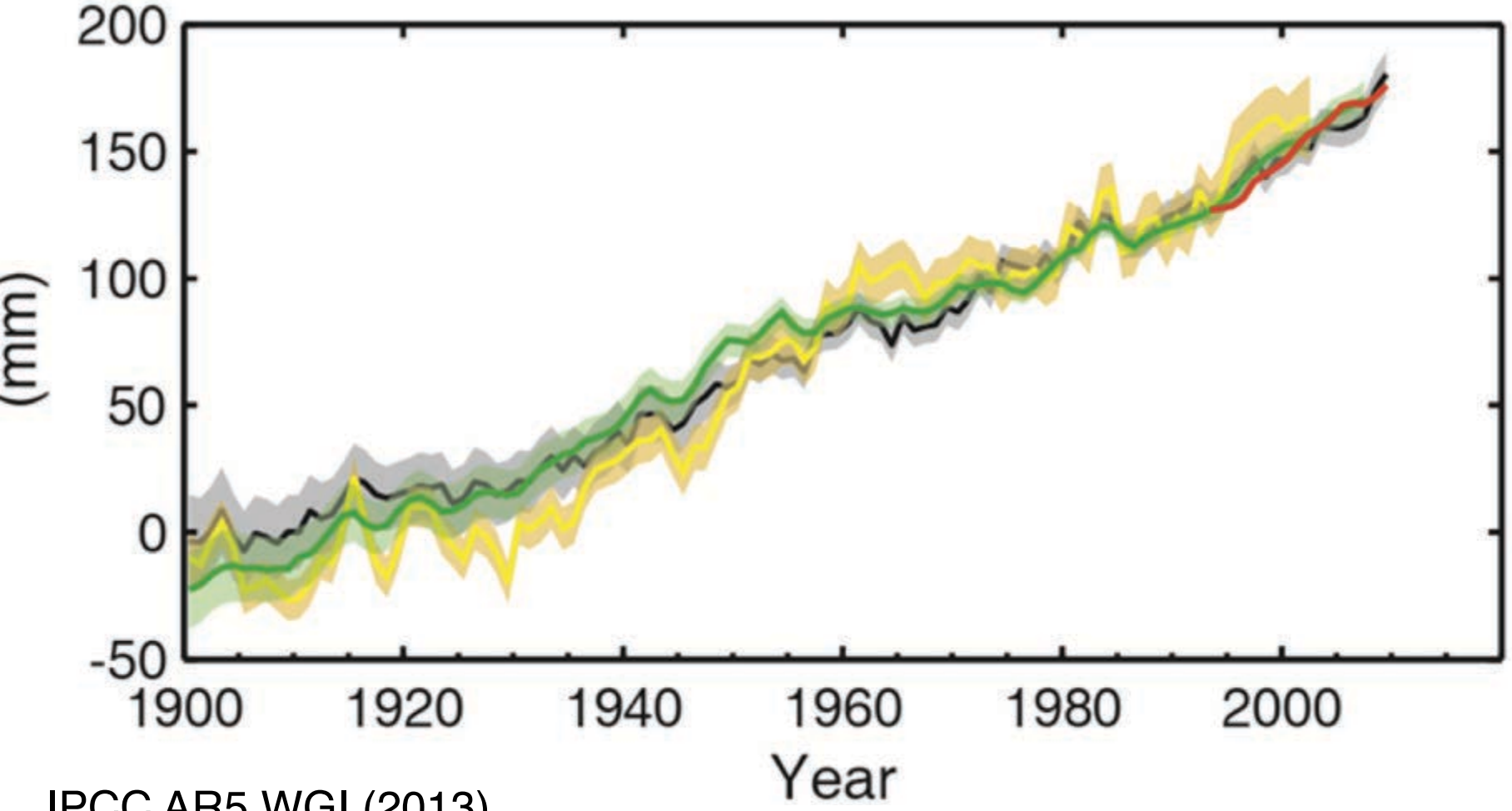


http://www.meteo.be/meteo/view/fr/66940-Articles.html?view=25246729

Surface de la glace de mer arctique (écart par rapport à la moyenne)



Change in average sea-level change



IPCC AR5 WGI (2013)

Les récifs coralliens meurent

American Samoa (from www.globalcoralbleaching.org)

Qori Kalis Glacier (Pérou): juillet 1978

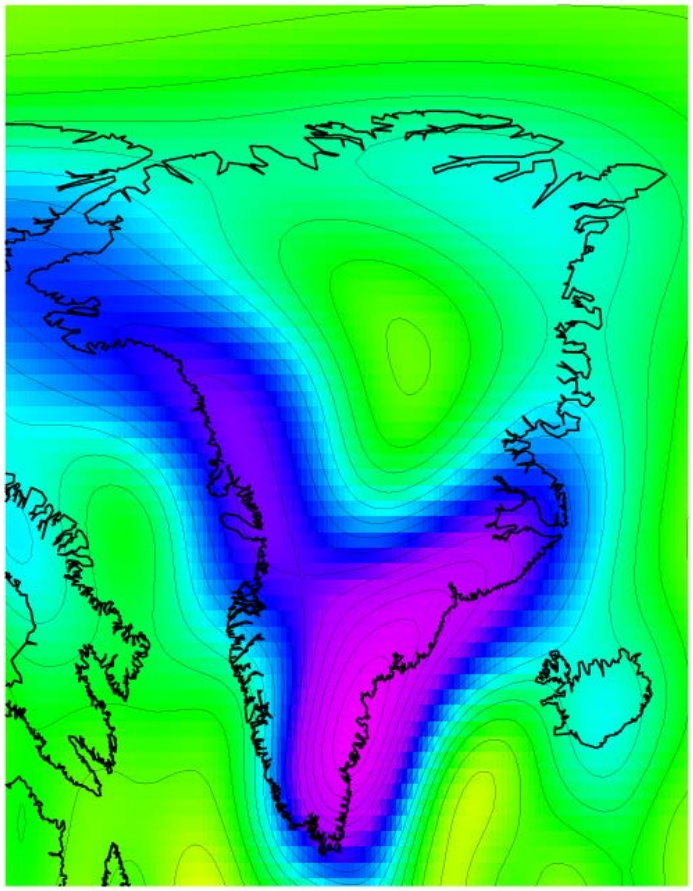
Source: Dr. Lonnie Thompson (OSU),
via http://climate.nasa.gov/images-of-change#543-melting-qori-kalis-glacier-peru

Qori Kalis Glacier (Pérou): juillet 2011

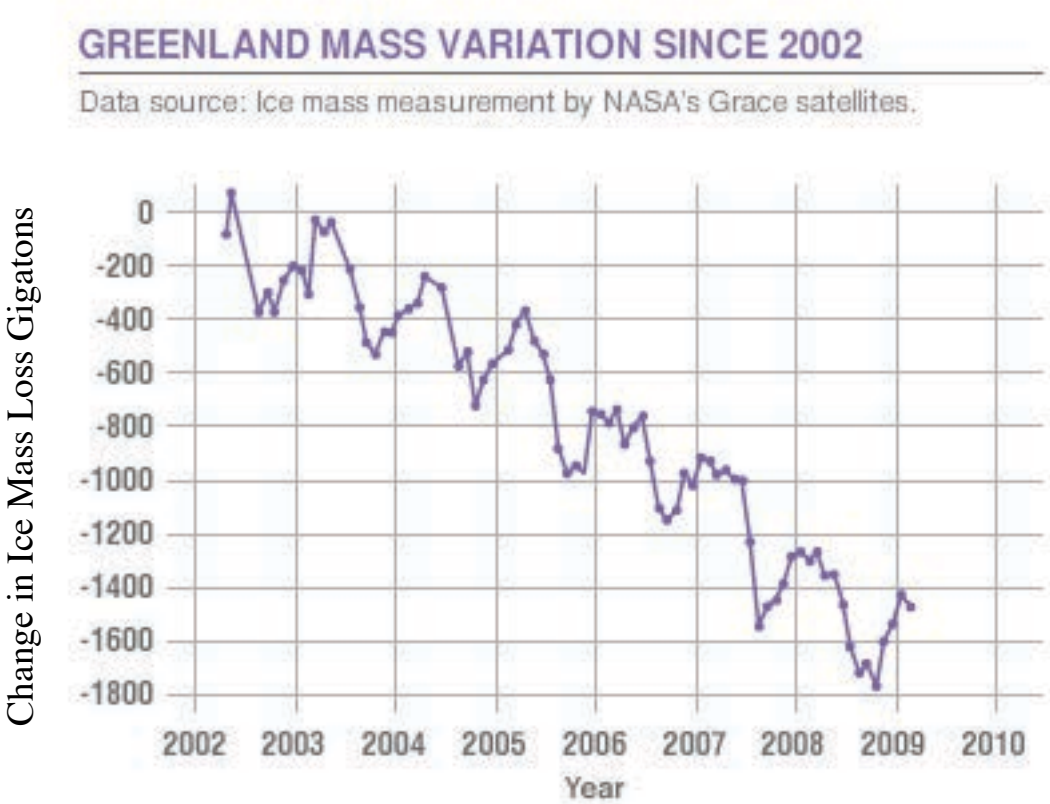
Source: Dr. Lonnie Thompson (OSU),
via http://climate.nasa.gov/images-of-change#543-melting-qori-kalis-glacier-peru

Greenland Ice Mass Loss 2002-2009 Derived From NASA GRACE Gravity Mission

Greenland



J. Wahr, U. Colorado

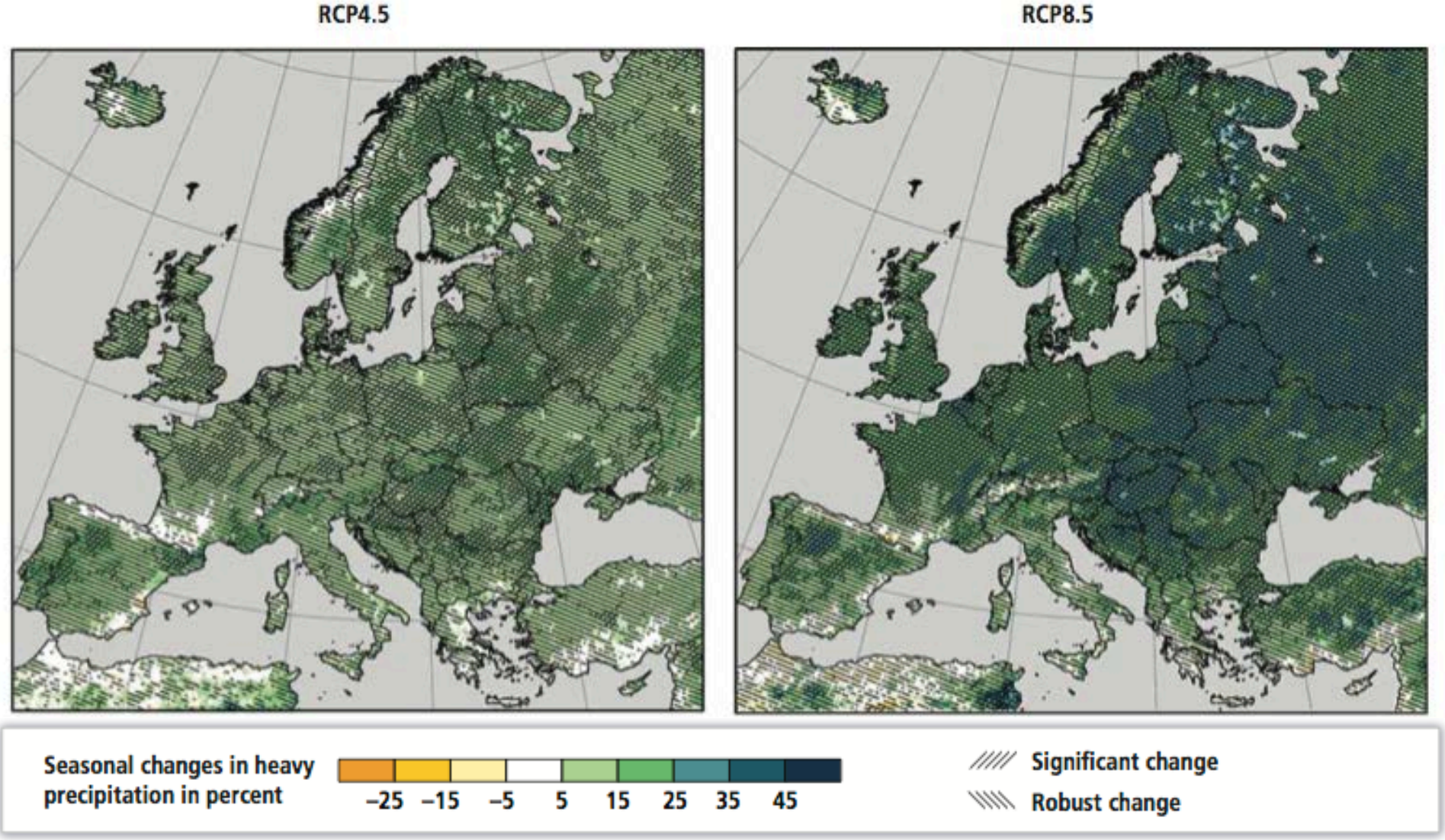


Velicogna, Geophysical Research Letters, 2009

•Contributes to sea level rise

B. Holt - JPL

Winter (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

Matthias Schrader / AP

In Puerto Rico, Hurricane Maria created in 2017 the worst humanitarian crisis in the US for decades

Source: FEMA, 24-9-2017

Pourquoi le GIEC (Groupe d'experts Intergouvernemental sur l'Evolution du Climat) ?

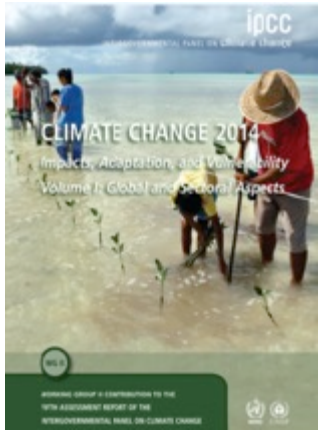
Etabli par l'OMM et le PNUE en 1988

Mandat: fournir aux décideurs une source objective d'information à propos:

- des causes des changements climatiques
- des scénarios possibles d'évolution
- des conséquences observées ou futures pour l'environnement et les activités humaines
- les options de réponse possibles (adaptation & atténuation = réduction des émissions).

OMM = Organisation Météorologique Mondiale

PNUE = Programme des Nations Unies pour l'Environnement



Que se passe-t-il dans le système climatique ?

Quels sont les risques ?

Que peut-on faire ?

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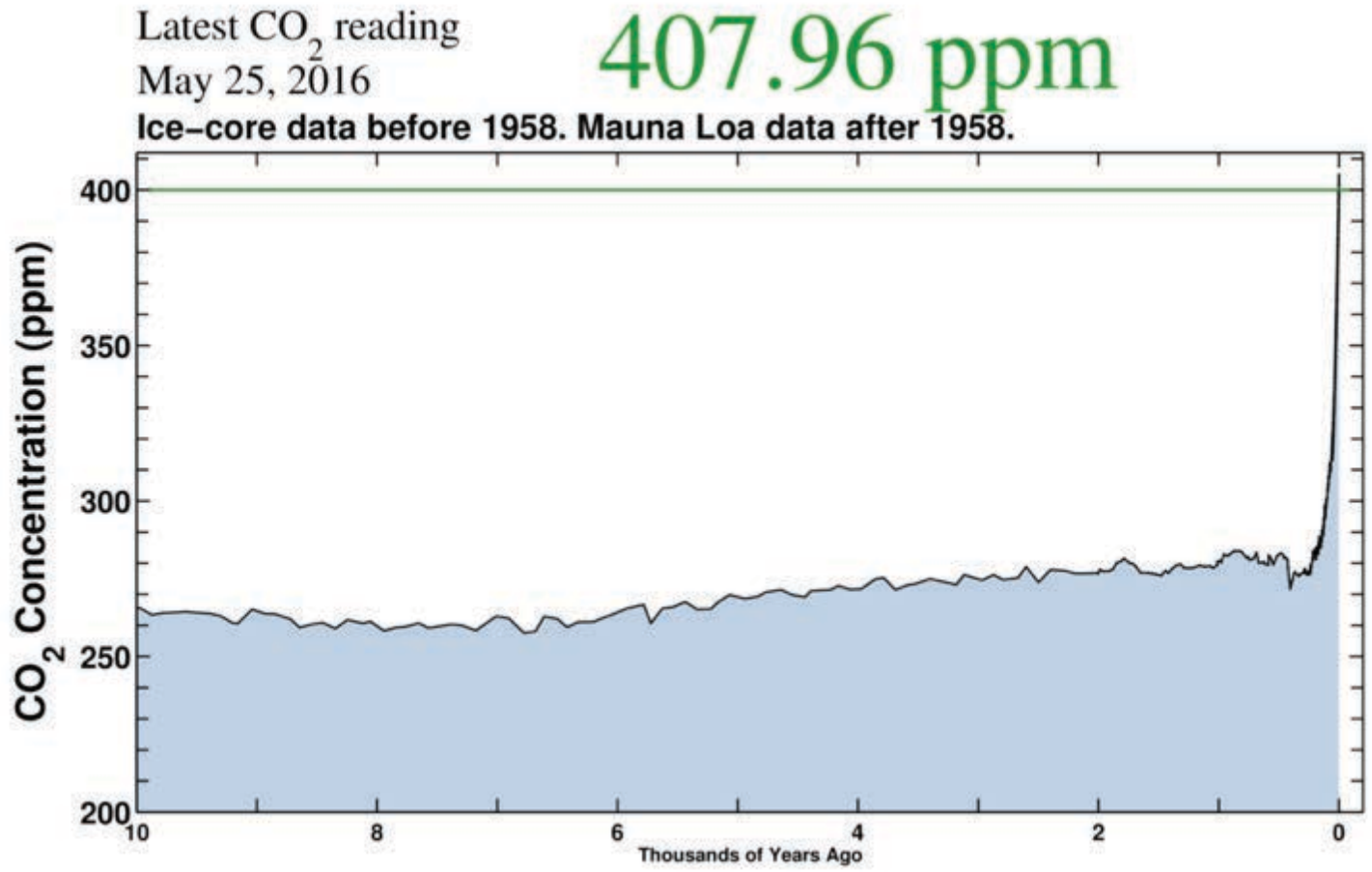
Messages clés

- **L'influence humaine sur le système climatique est claire**
- **La poursuite des émissions de gaz à effet de serre augmentera le risque d'impacts graves, répandus et irréversibles pour les populations et les écosystèmes**
- **Alors que les changements climatiques représentent une menace pour le développement durable, il existe de nombreuses opportunités pour intégrer l'atténuation, l'adaptation, et la poursuite d'autres objectifs sociétaux**
- **L'Humanité a les moyens de limiter les changements climatiques et de construire un avenir plus durable et plus résilient**

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM

CO_2 Concentration, May 2016 (Keeling curve)



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

Atmospheric concentrations of CO_2

(Lüthi et al.,2008, NOAA)

The concentrations of CO_2 have increased to levels unprecedented in at least the last 800,000 years.

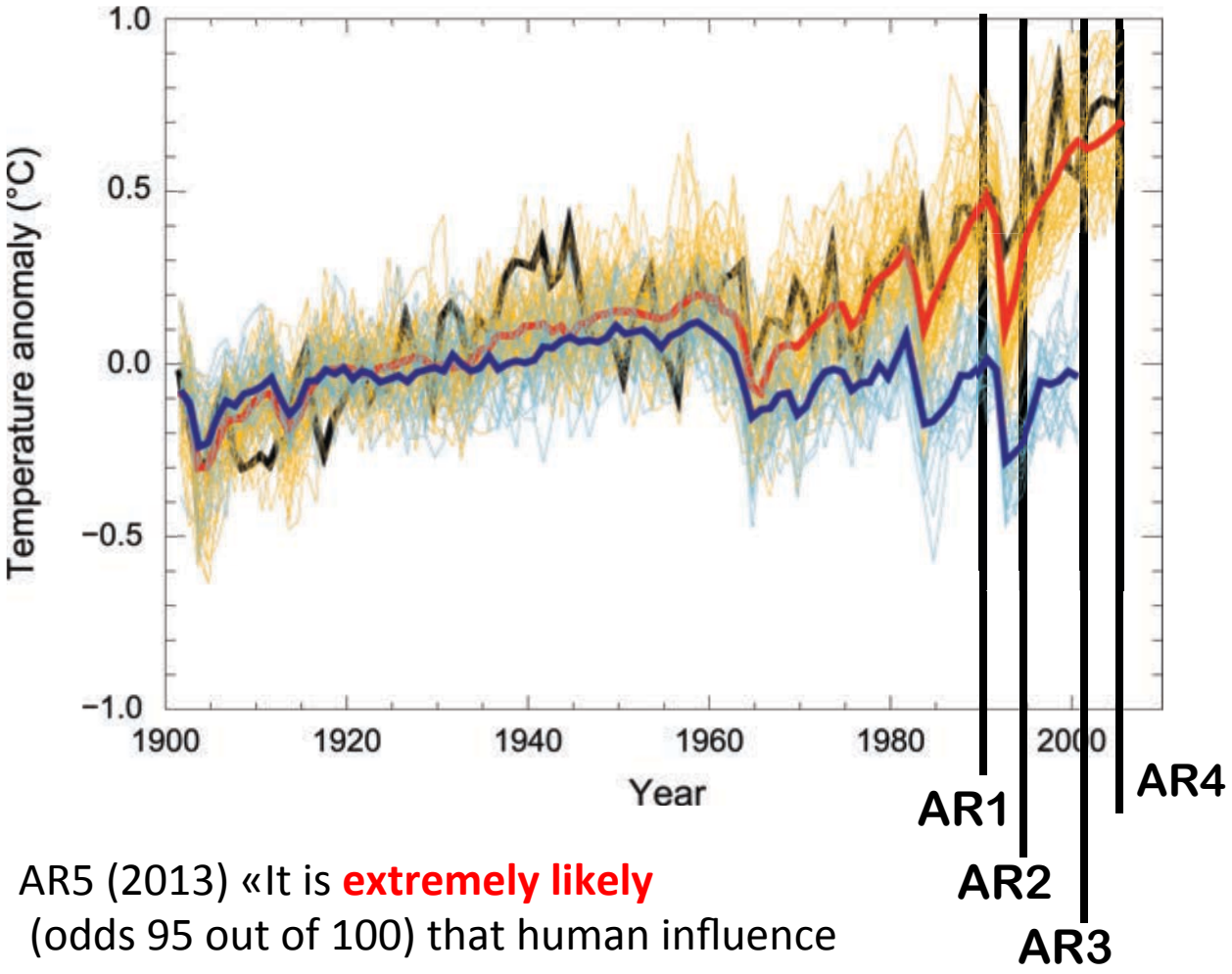
A Progression of Understanding: Greater and Greater Certainty in Attribution

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

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

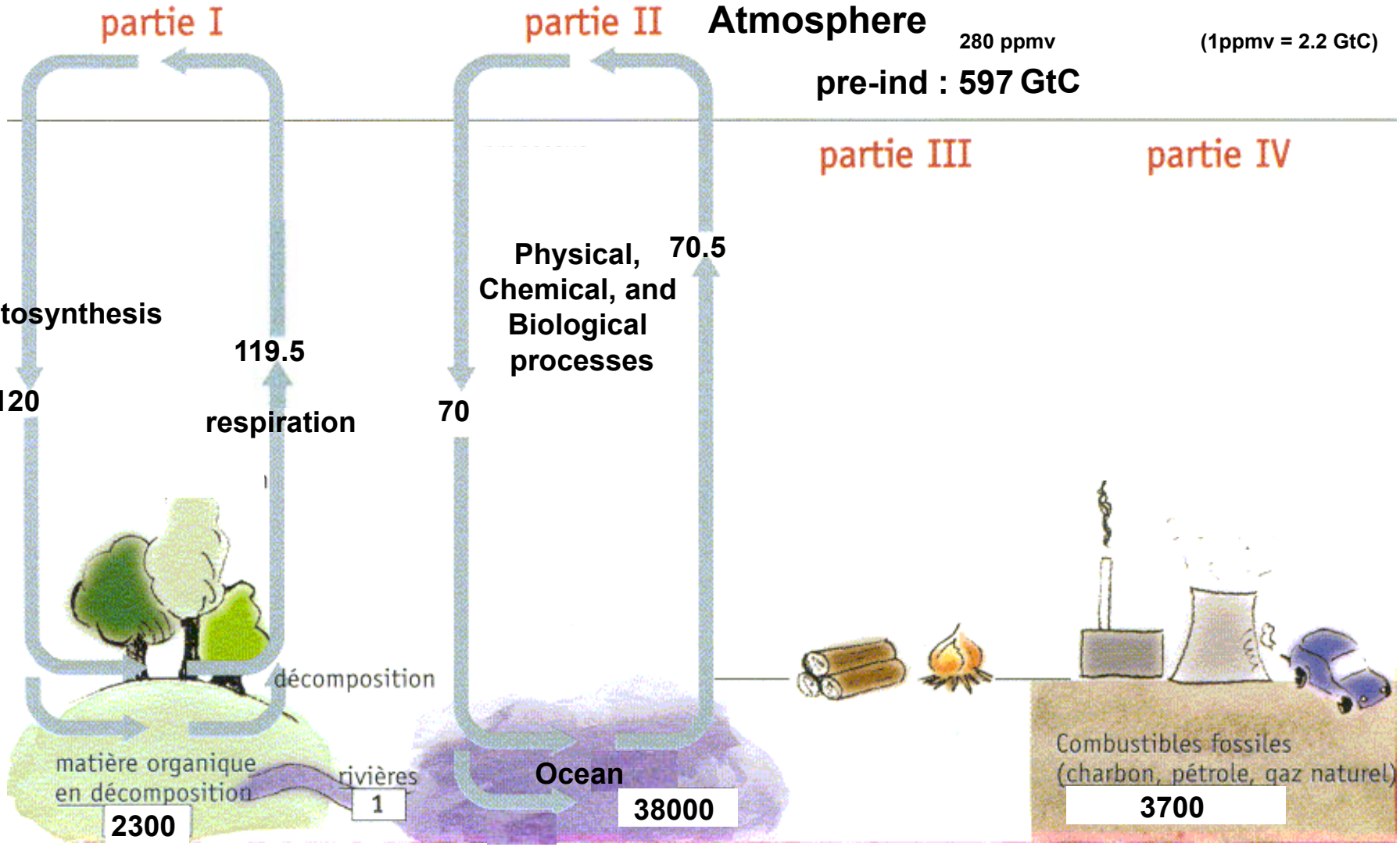
AR3 (2001): "most of the warming of the past 50 years is **likely** (odds 2 out of 3) due to human activities"

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… »

Carbon cycle: unperturbed fluxes

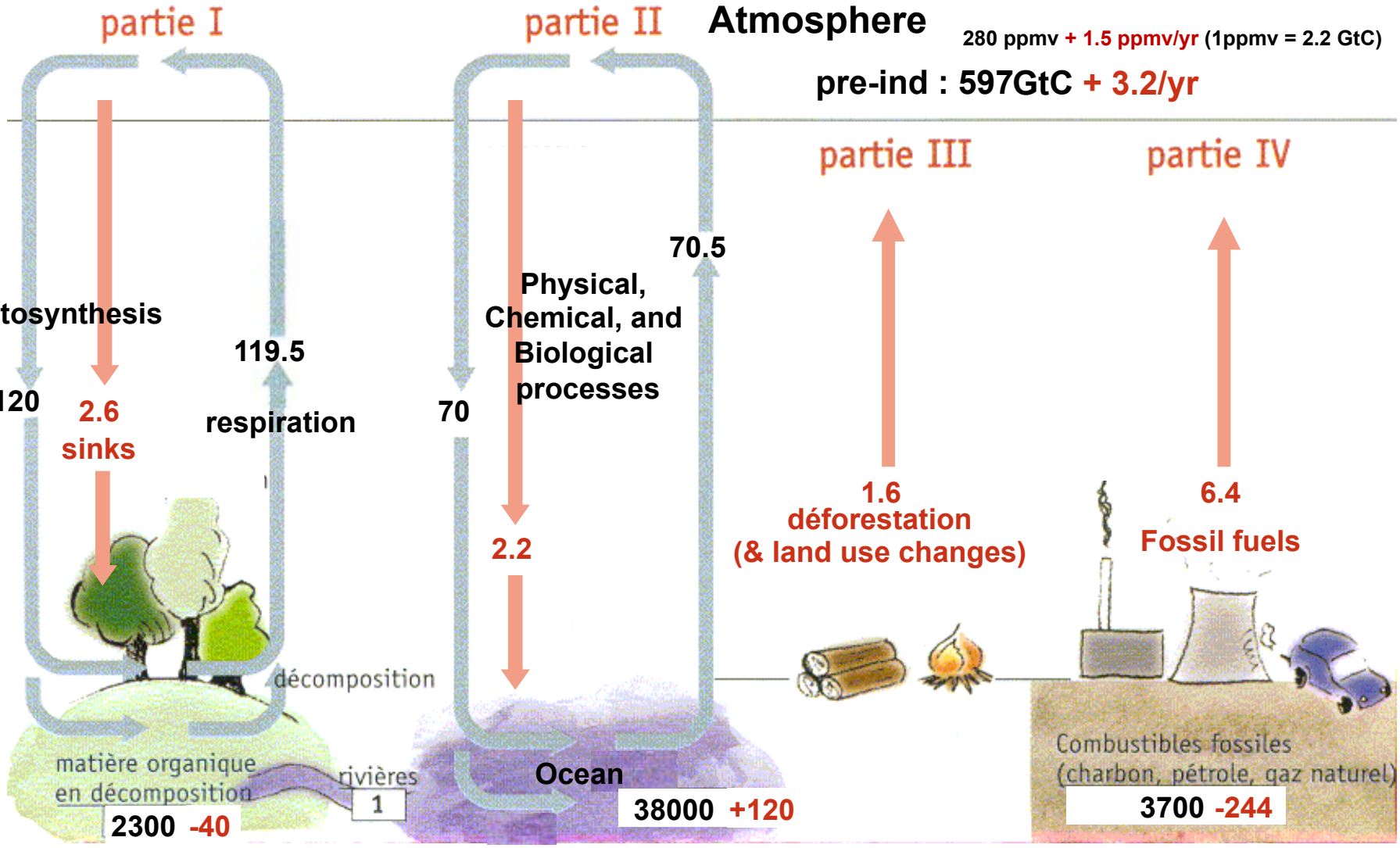


Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get $GtCO_2$)

vanyp@climate.be

Carbon cycle: perturbed by human activities

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

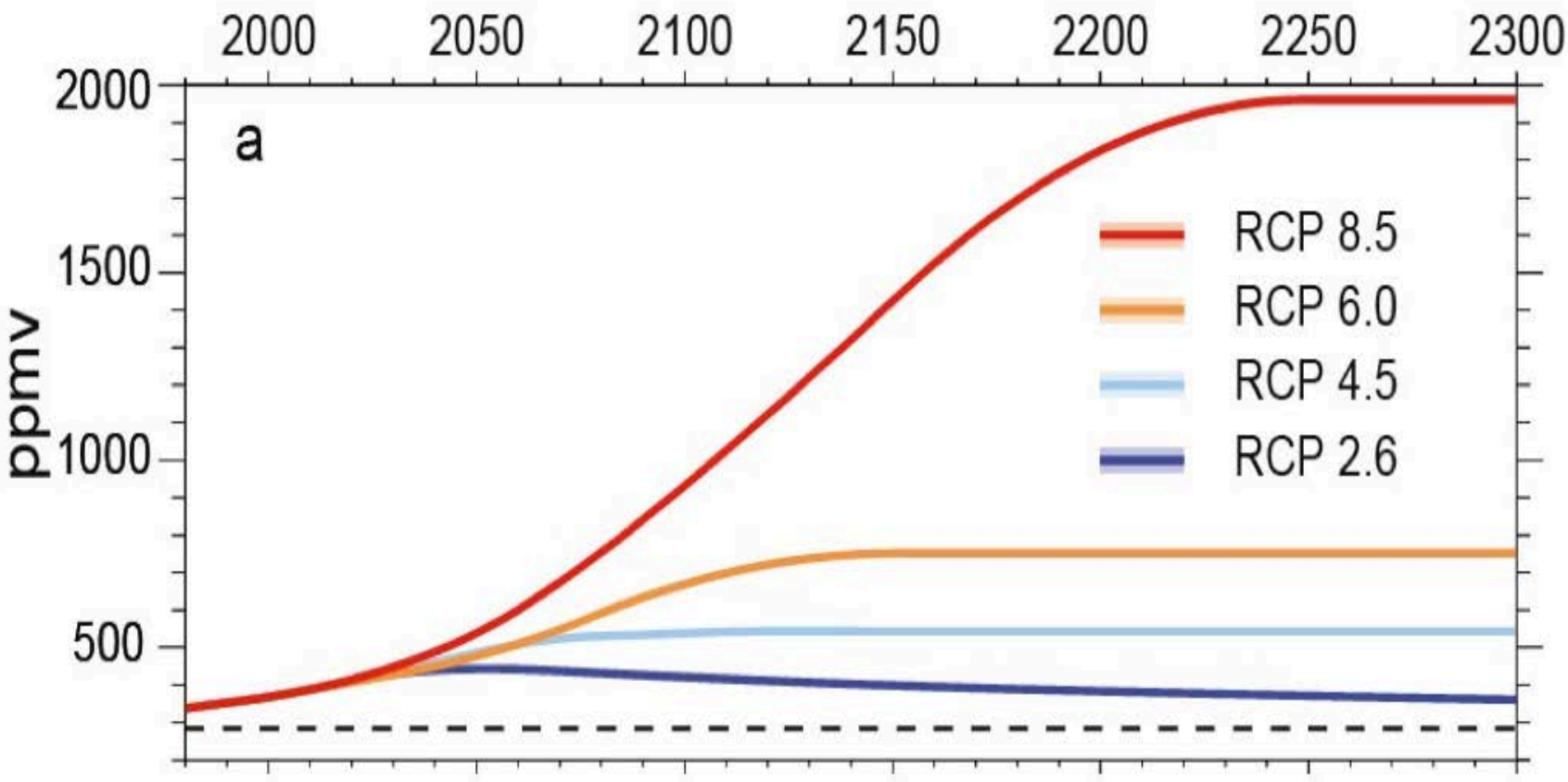


Units: GtC (billions tons of carbon) or GtC/year

Stocks!

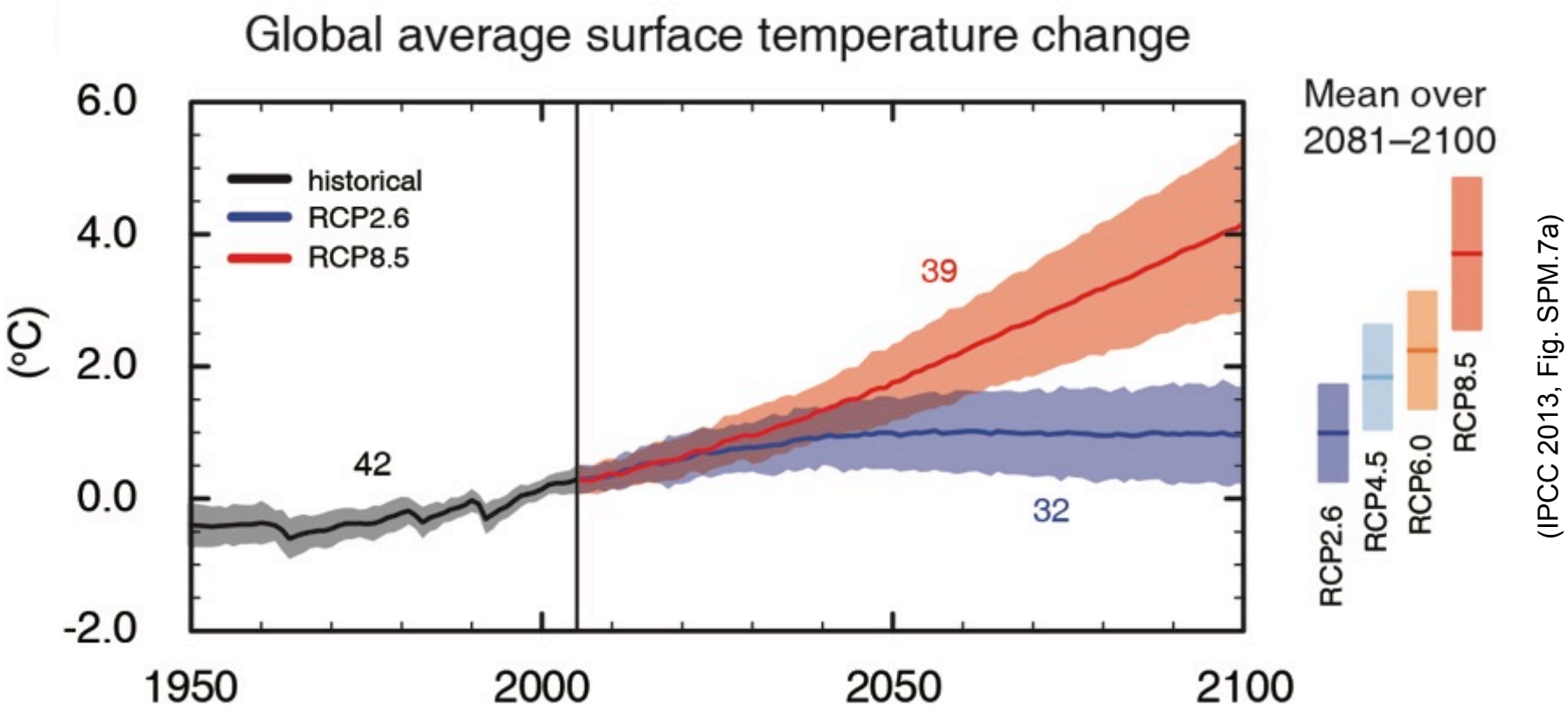
vanyp@climate.be

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)

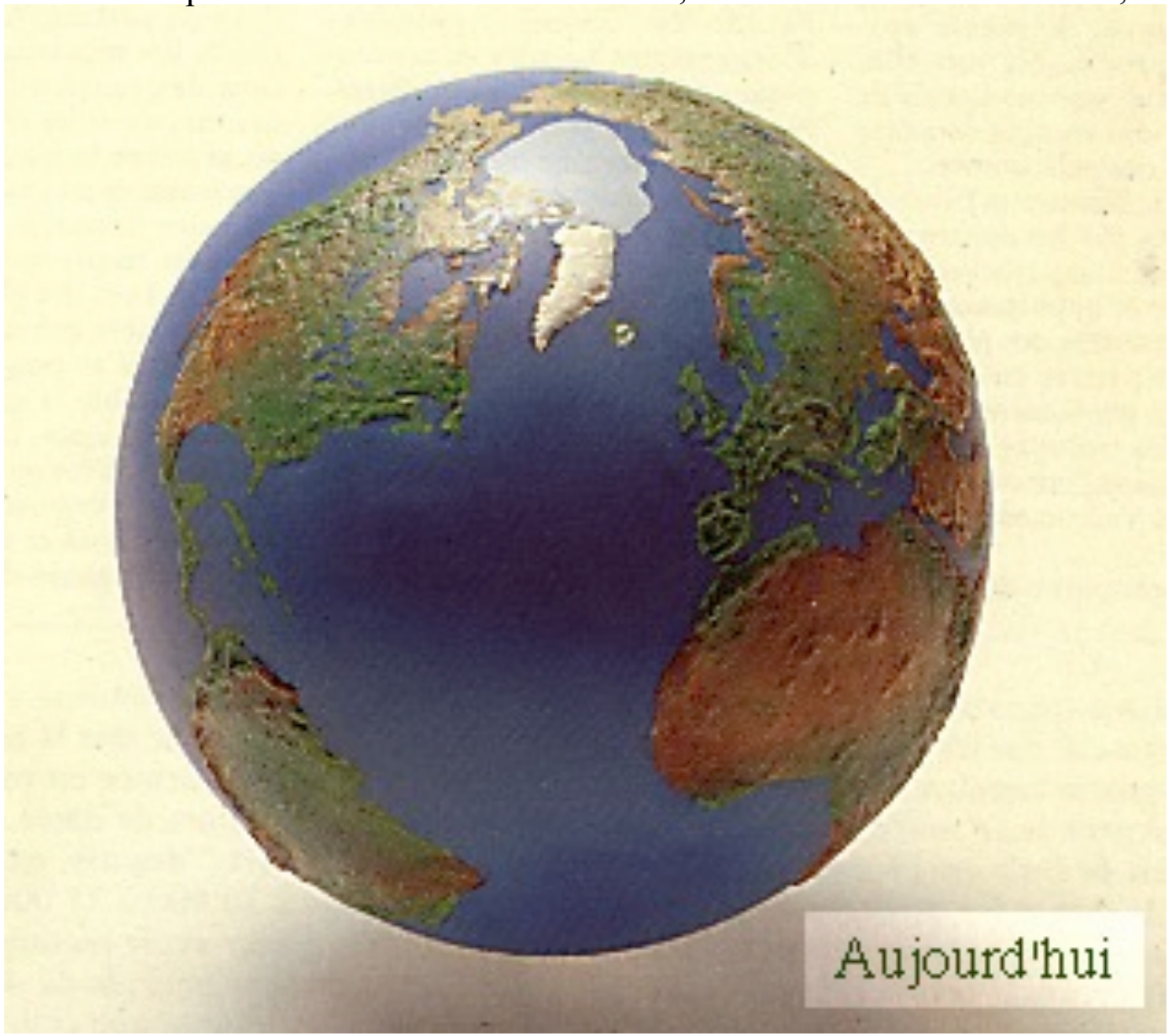
Only the lowest (RCP2.6) scenario maintains the global surface temperature increase above the pre-industrial level to less than 2°C with at least 66% probability

18-20000 years ago (Last Glacial Maximum)

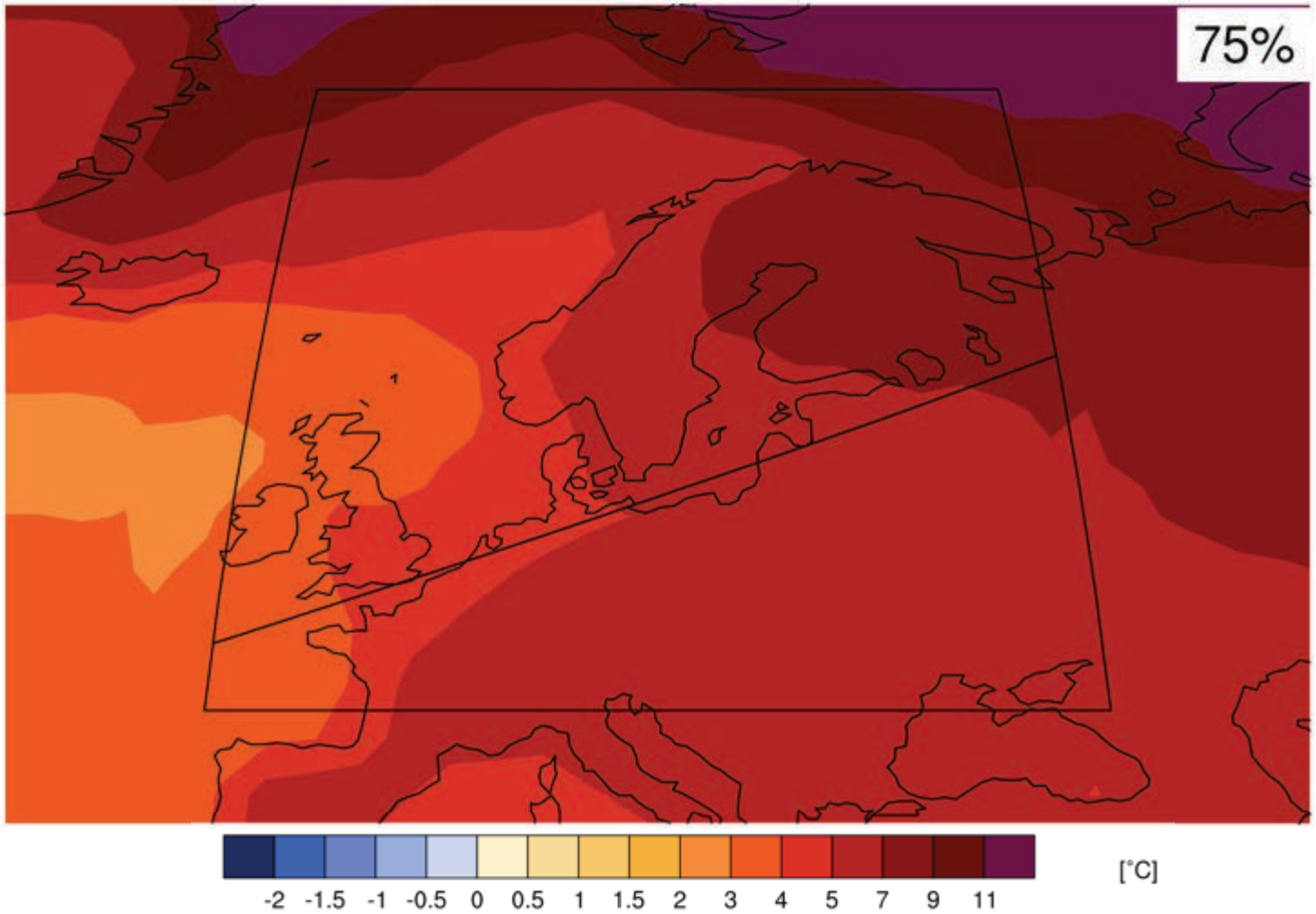
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.

Today, with +4-5°C globally

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

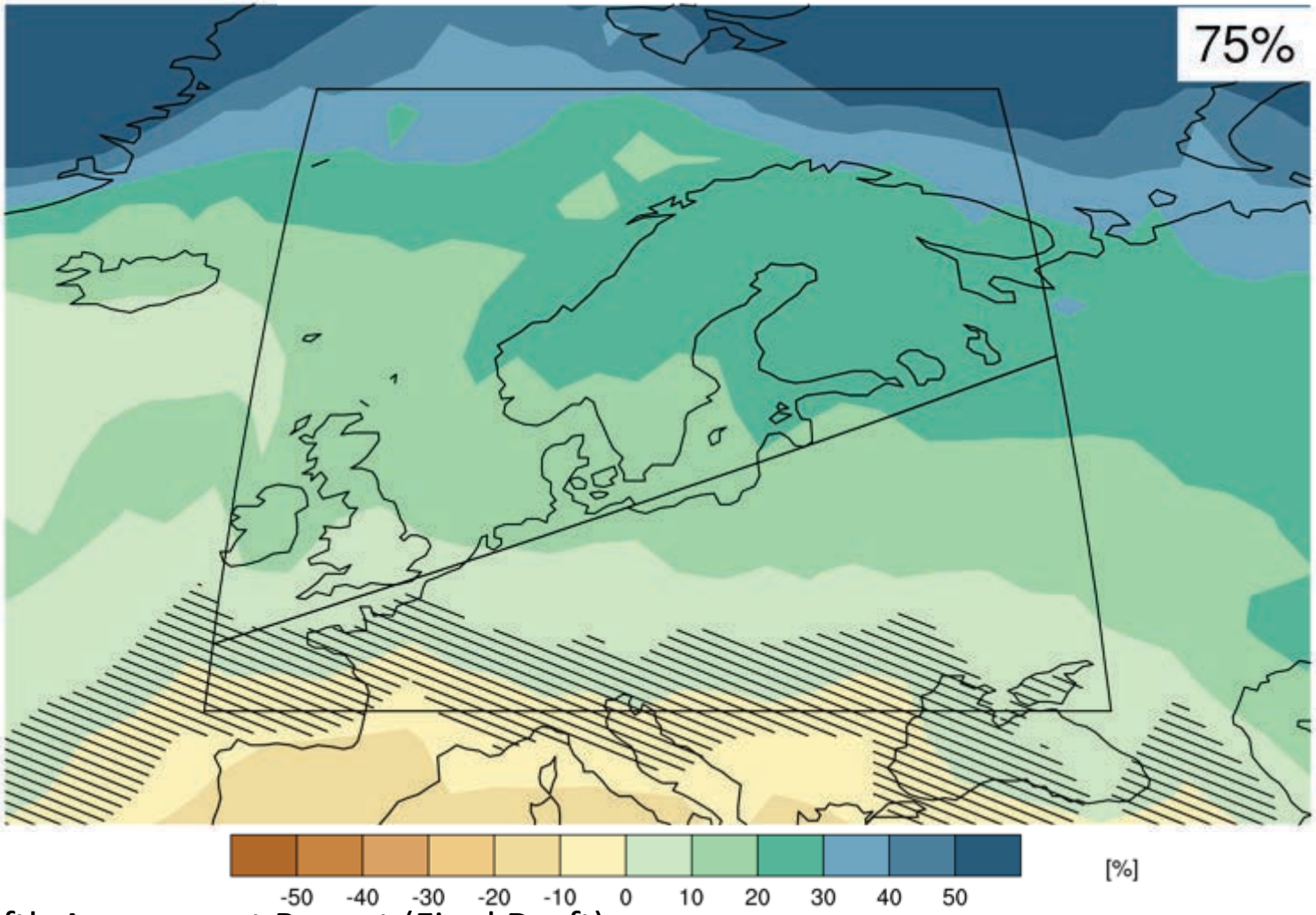


North Europe - Map of temperature changes: 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario (annual)

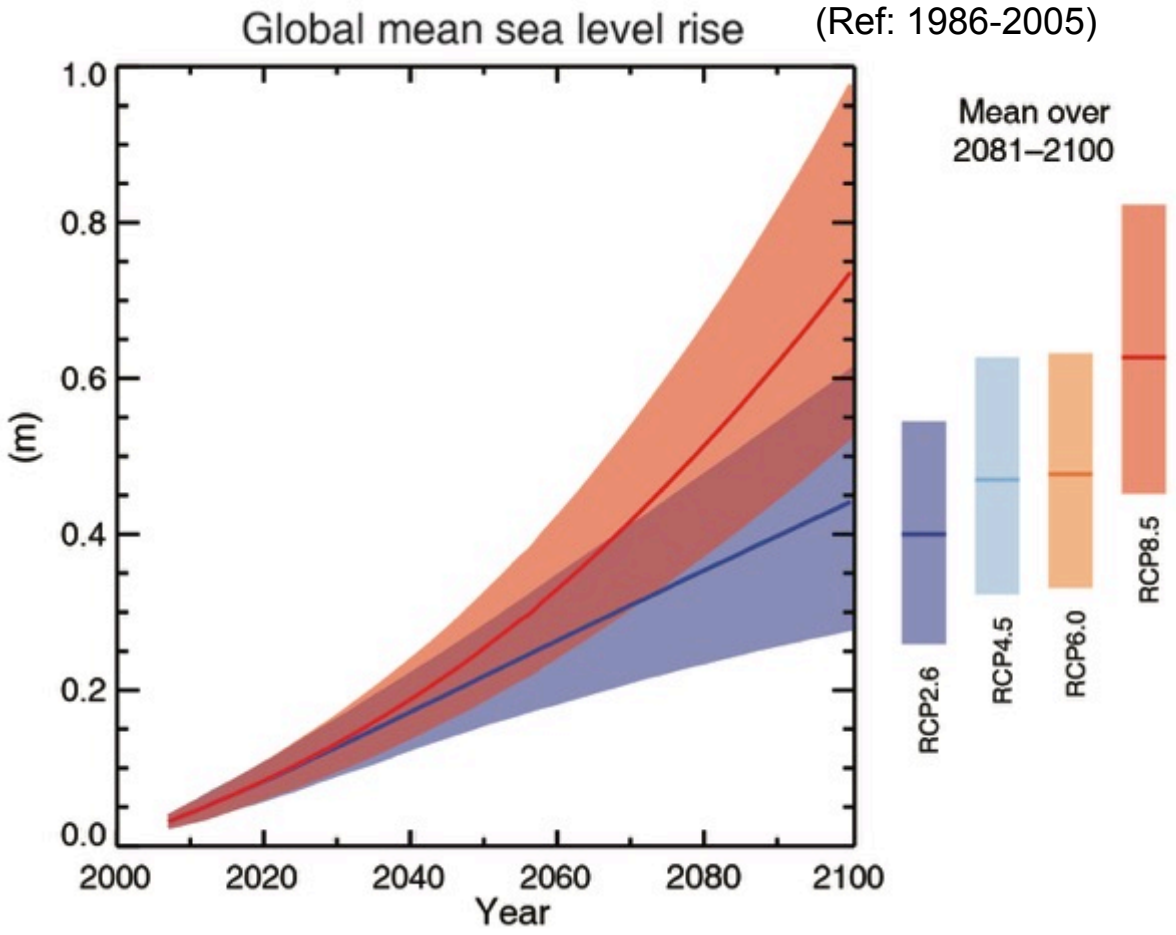


IPCC WG1 Fifth Assessment Report (Final Draft)

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



IPCC WG1 Fifth Assessment Report (Final Draft)



(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: J.P. van Ypersele et P. Marbaix (2004) See www.climate.be/impacts

Effets sur le Delta du Nil, où vivent plus de 10 millions de personnes à moins d'1 m d'altitude

(Time 2001)

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)

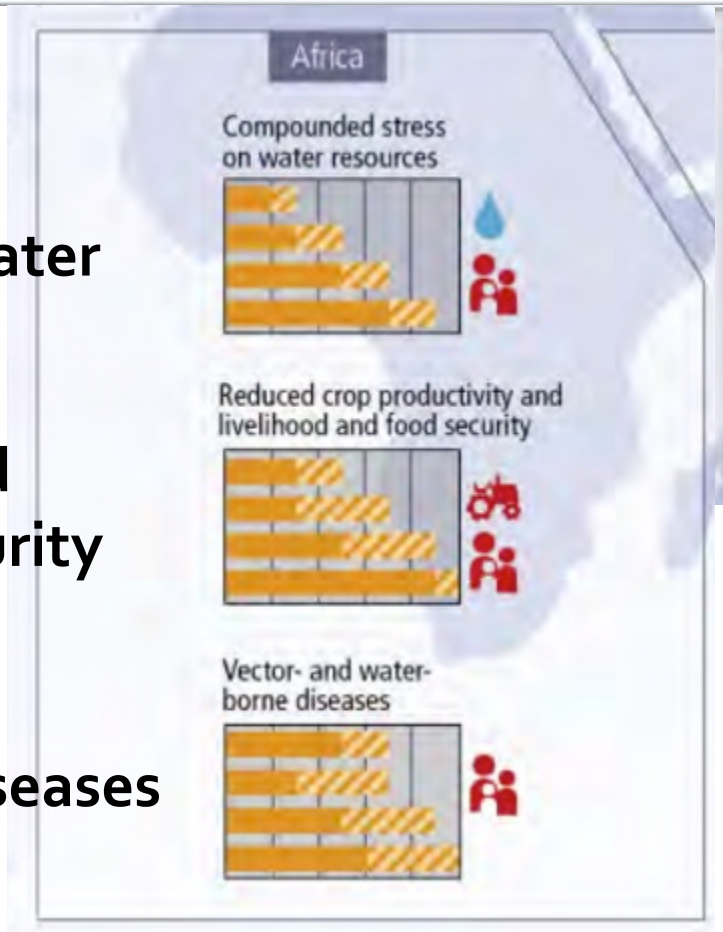



AR5 WGII SPM

Risk = Hazard x Vulnerability x Exposure (Katrina flood victim)

AP Photo - Lisa Krantz (http://lisakrantz.com/hurricane-katrina/zspbn1k4cn17phidupe4f9x5t1mzdr)

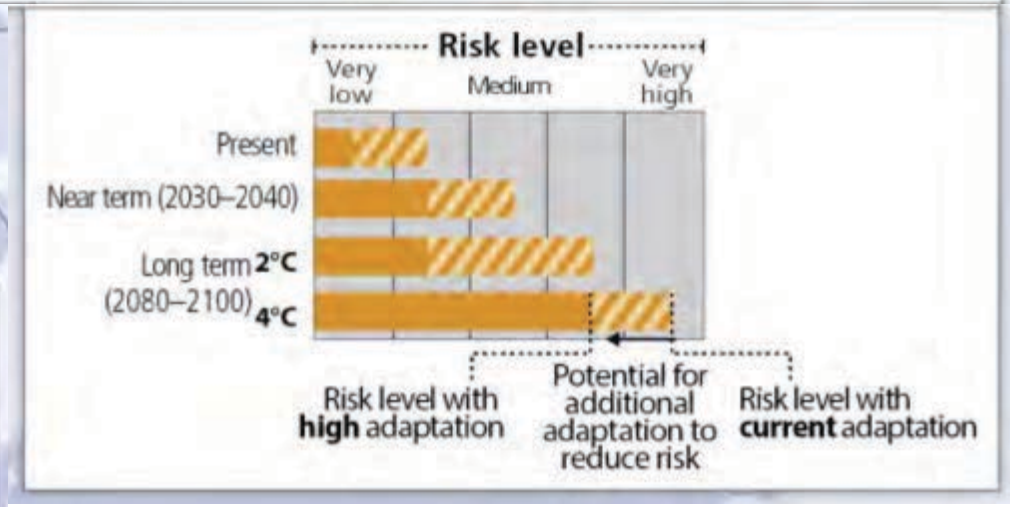
Regional key risks and risk reduction through adaptation



Water

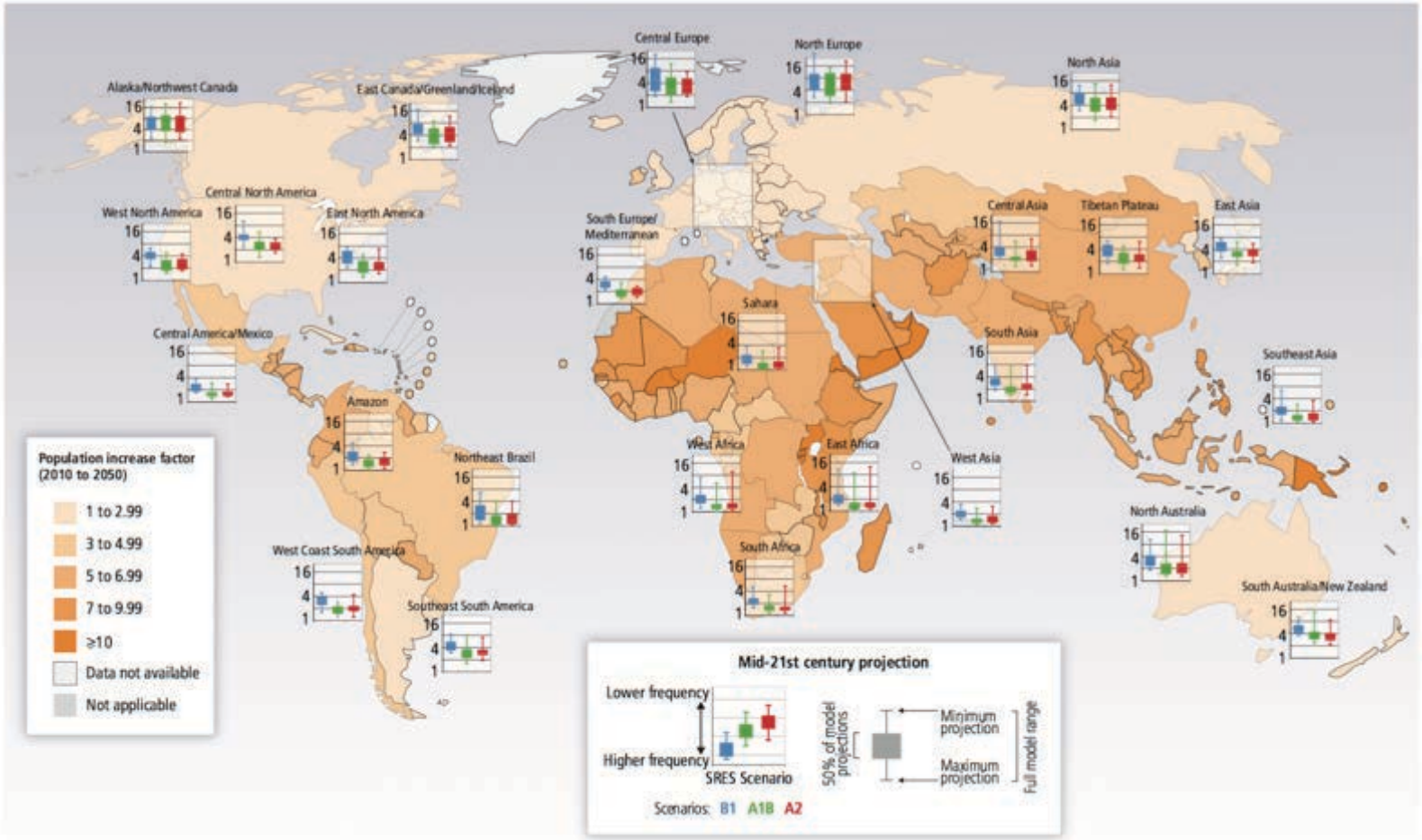
Food security

Diseases



IPCC, AR5, SPM, Figure SPM.8

Increasingly frequent heat extremes will combine with rapidly growing numbers of older people living in cities



IPCC, AR5, WGII, chap.11, Figure 11-2

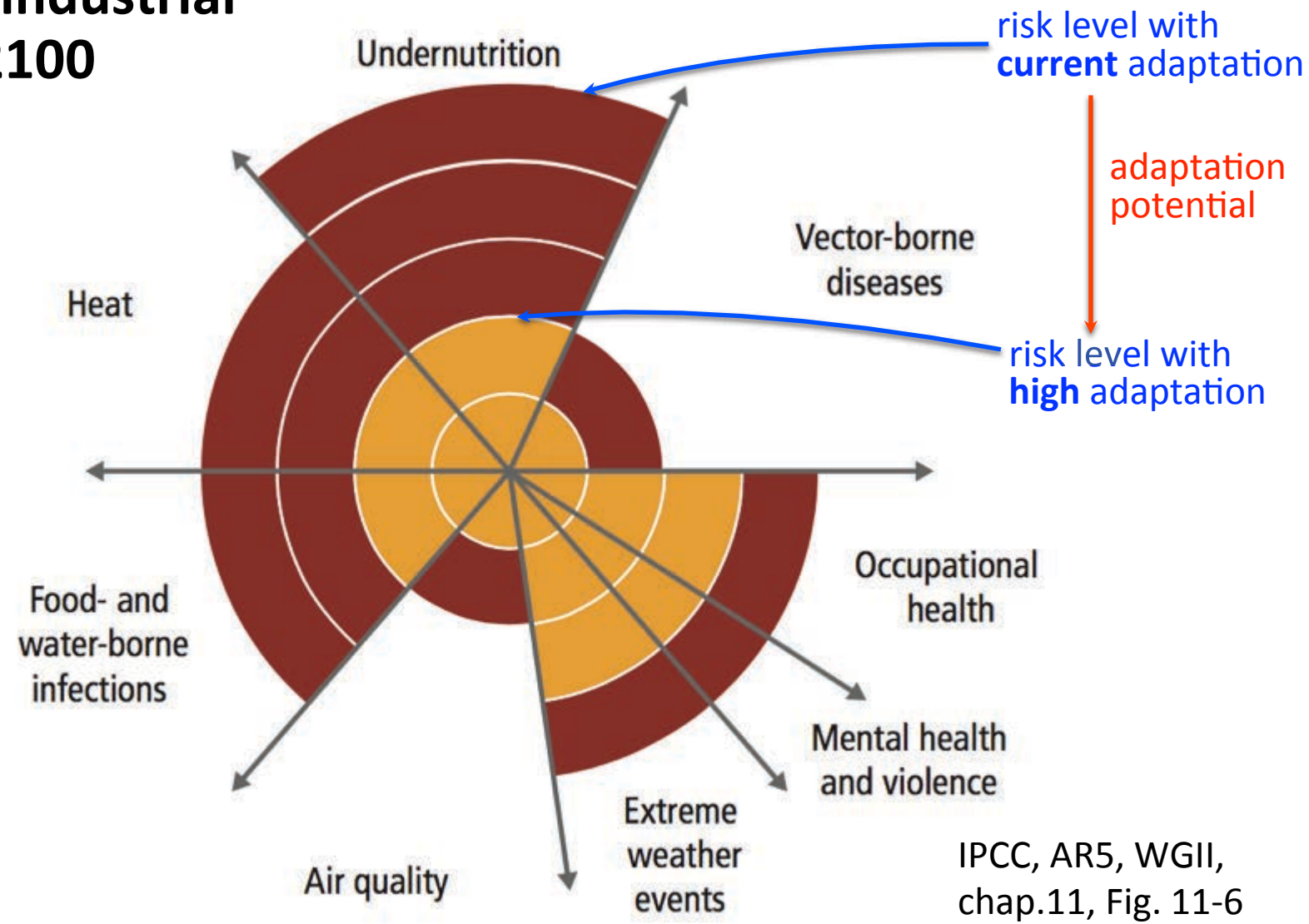
Association between different climatic drivers and the global prevalence and geographic distribution of selected vector-borne diseases observed over the period 2008-2012

Disease	Area	Cases per year	Climate sensitivity and confidence in climate effect	Key references
Mosquito-borne diseases				
Malaria	Mainly Africa, SE Asia	About 220 million		WHO (2008); Kelly-Hope et al. (2009); Alonso et al. (2011); Omumbo et al. (2011)
Dengue	100 countries, esp. Asia Pacific	About 50 million		Beebe (2009); Pham et al. (2011); Astrom et al. (2012); Earnest et al. (2012); Descloux (2012)
Tick-borne diseases				
Tick-borne encephalitis	Europe, Russian Fed., Mongolia, China	About 10,000		Tokarevich et al. (2011)
Lyme	Temperate areas of Europe, Asia, North America	About 20,000 in USA		Bennet (2006); Ogden et al. (2008)
Other vector-borne diseases				
Hemorrhagic fever with renal syndrome (HFRS)	Global	0.15–0.2 million		Fang et al. (2010)
Plague	Endemic in many locations worldwide	About 40,000		Stenseth et al. (2006); Ari et al. (2010); Xu et al. (2011)

IPCC, AR5, WGII, chap.11, Table 11-1

Health impacts and potential for adaptation

As it could be with +4°C/pre-industrial by 2080-2100



IPCC, AR5, WGII, chap.11, Fig. 11-6

Human Health: Impacts, Adaptation, and Co-Benefits (1)

- The health of human populations is sensitive to shifts in weather patterns and other aspects of climate change (*very high confidence*).
- Until mid-century climate change will act mainly by exacerbating health problems that already exist (*very high confidence*).

IPCC, AR5, WGII, chap.11, Executive Summary, p. 713

Human Health: Impacts, Adaptation, and Co-Benefits (2)

- In recent decades, climate change has contributed to levels of ill health (*likely*) though the present worldwide burden of ill health from climate change is relatively small compared with other stressors on health and is not well quantified

IPCC, AR5, WGII, chap.11, Executive Summary, p. 713

Human Health: Impacts, Adaptation, and Co-Benefits (3)

- Impacts on health will be reduced, but not eliminated, in populations that benefit from rapid social and economic development (high confidence), particularly among the poorest and least healthy groups (very high confidence).
- In addition to their implications for climate change, essentially all the important climate-altering pollutants (CAPs) other than carbon dioxide (CO_2) have near-term health implications (*very high confidence*)

IPCC, AR5, WGII, chap.11, Executive Summary, p. 713

Human Health: Impacts, Adaptation, and Co-Benefits (4)

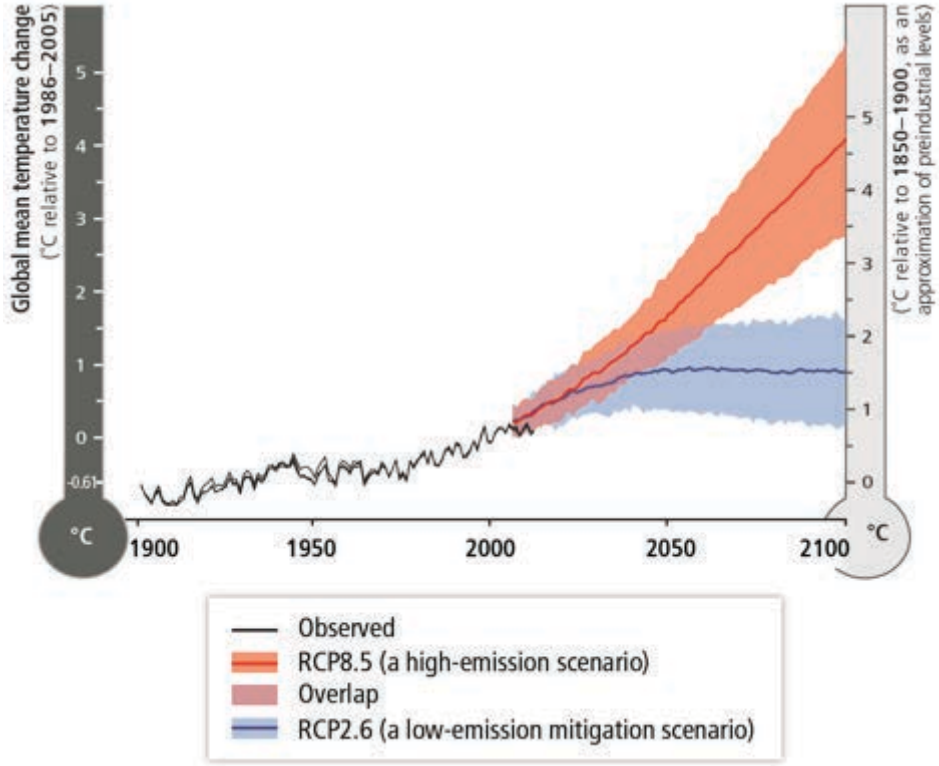
- Some parts of the world already exceed the international standard for safe work activity during the hottest months of the year.
- The most effective measures to reduce vulnerability in the near term are programs that implement and improve basic public health measures such as provision of clean water and sanitation, secure essential health care including vaccination and child health services, increase capacity for disaster preparedness and response, and alleviate poverty (*very high confidence*).

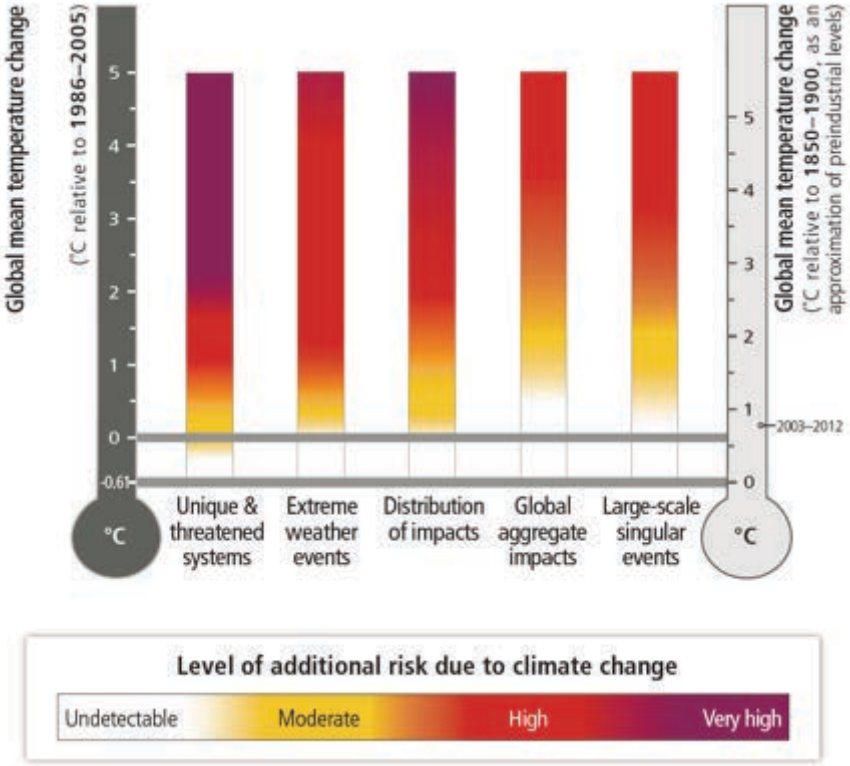
IPCC, AR5, WGII, chap.11, Executive Summary, p. 713-714

Climate Change Poses Risks and Opportunities Related to Health

- The 2015 *Lancet Commission on Climate Change and Health* report stated: "The effects of climate change are being felt today, and future projections represent an unacceptably high and potentially catastrophic risk to human health."

- BUT it also underscored that **Tackling climate change could be the greatest global health opportunity of the 21st century.**





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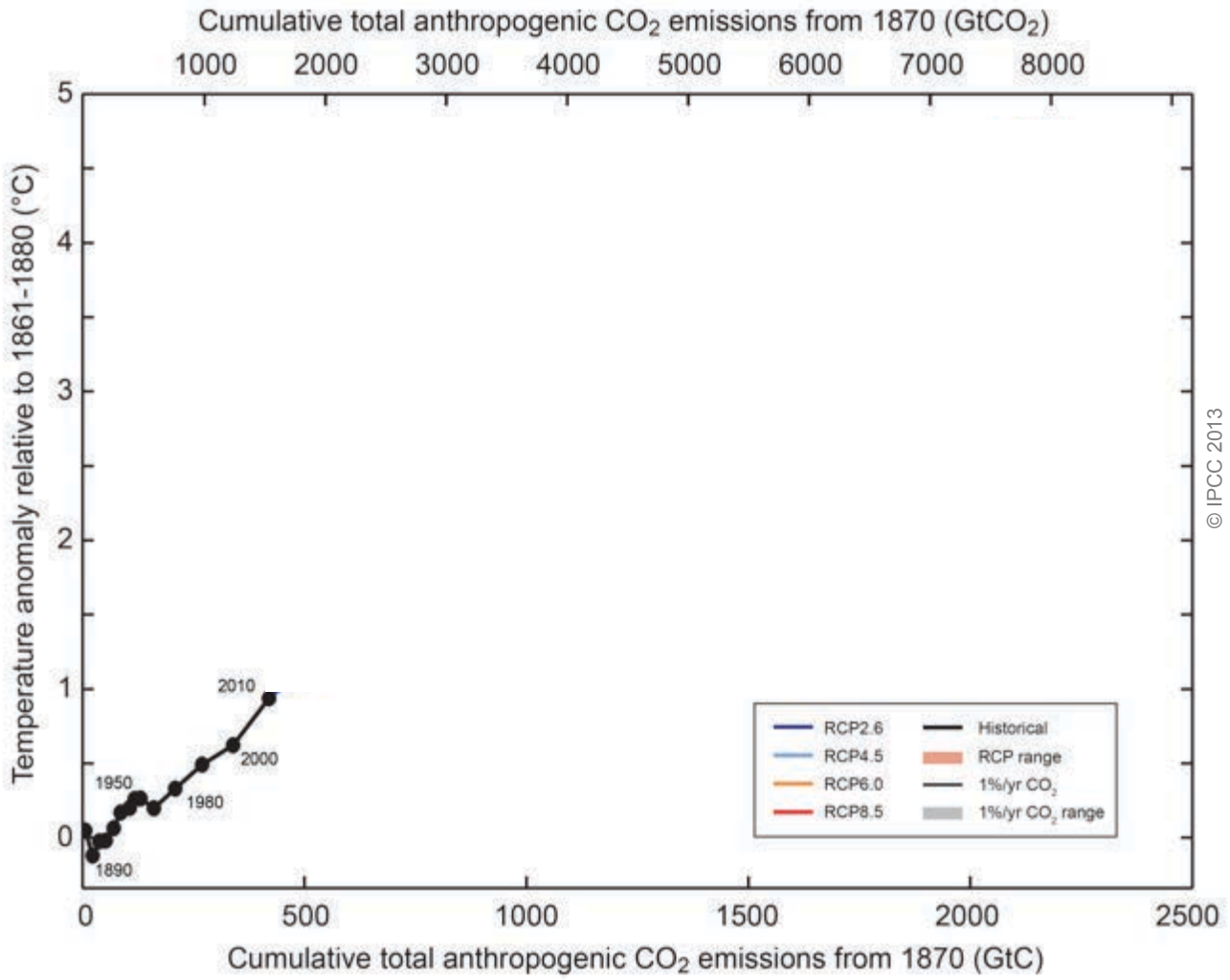


Fig. SPM.10

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond.

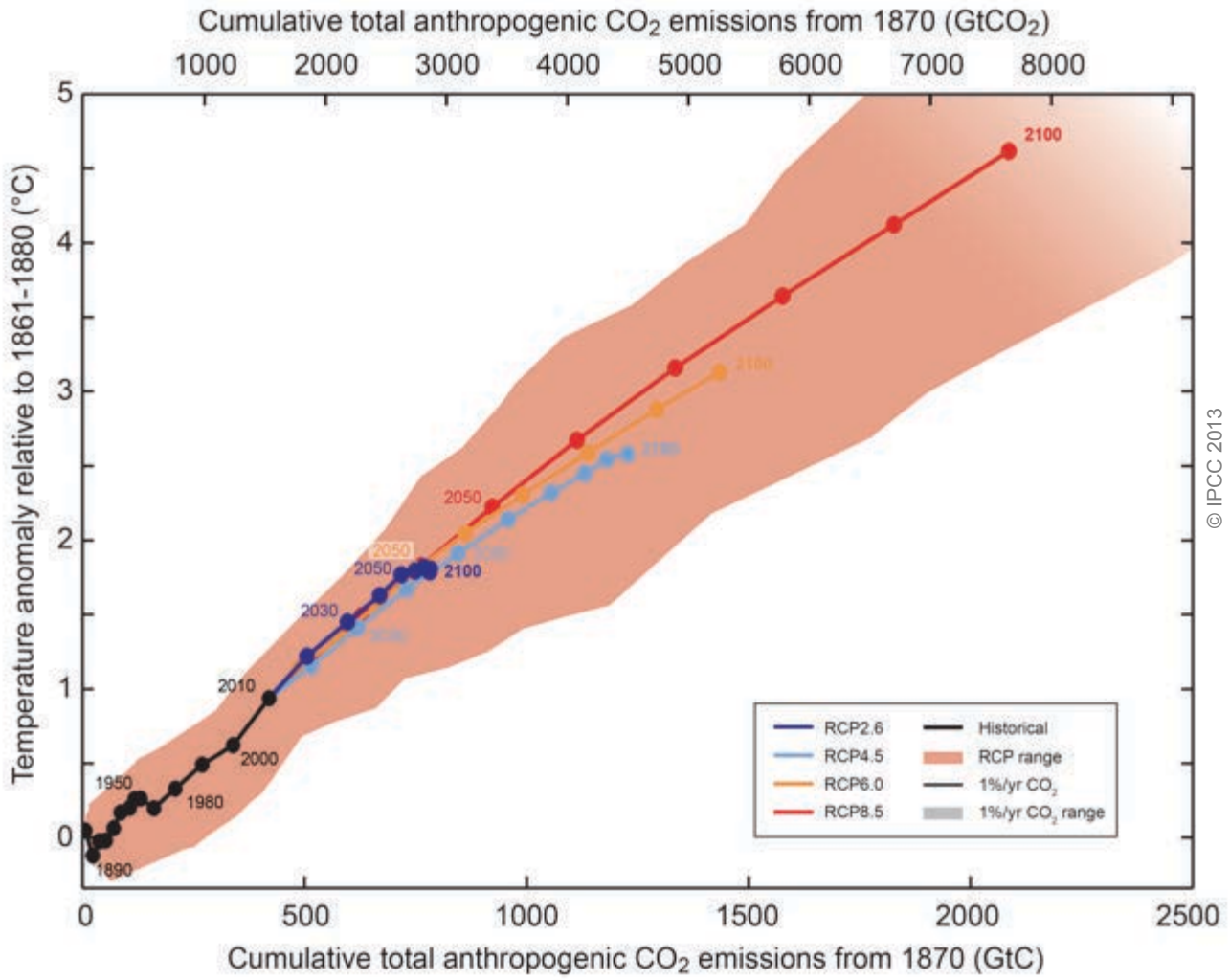
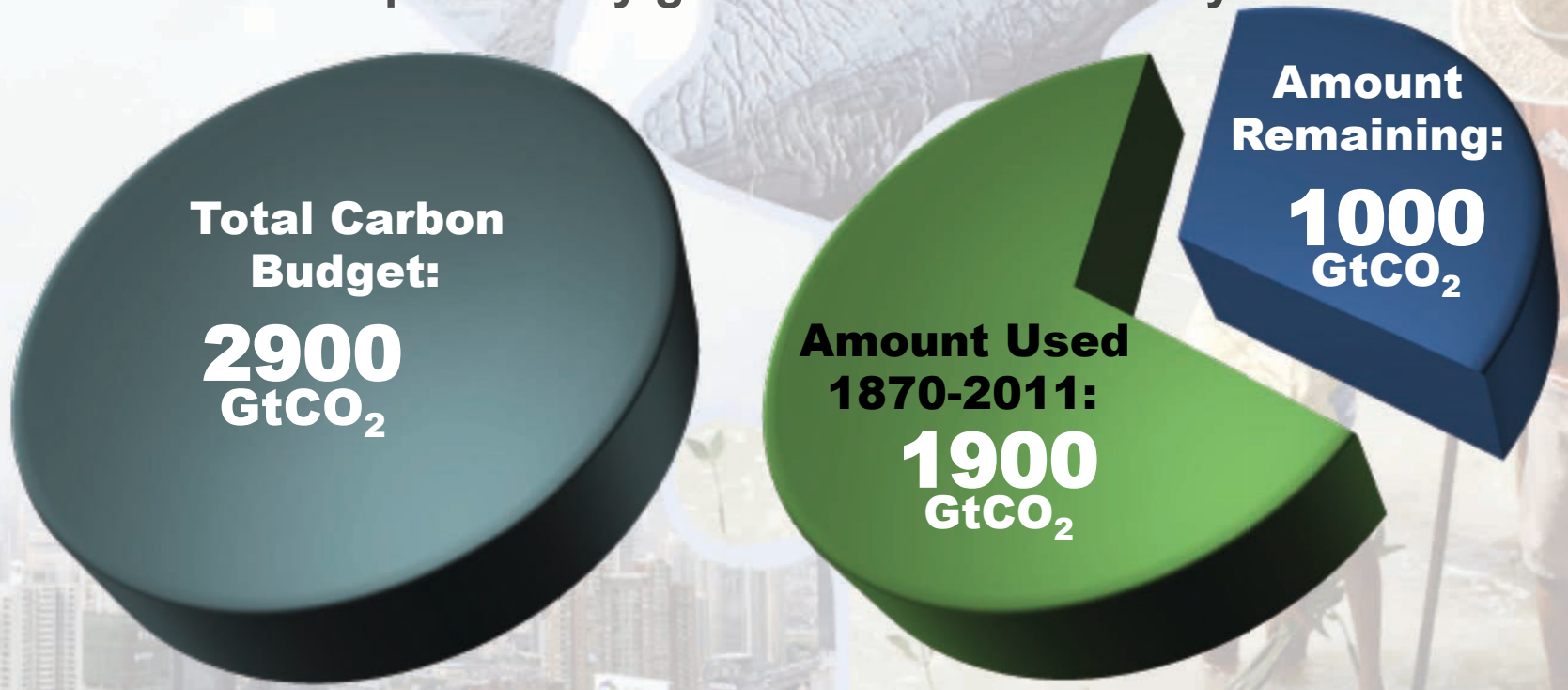


Fig. SPM.10

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

The window for action is rapidly closing

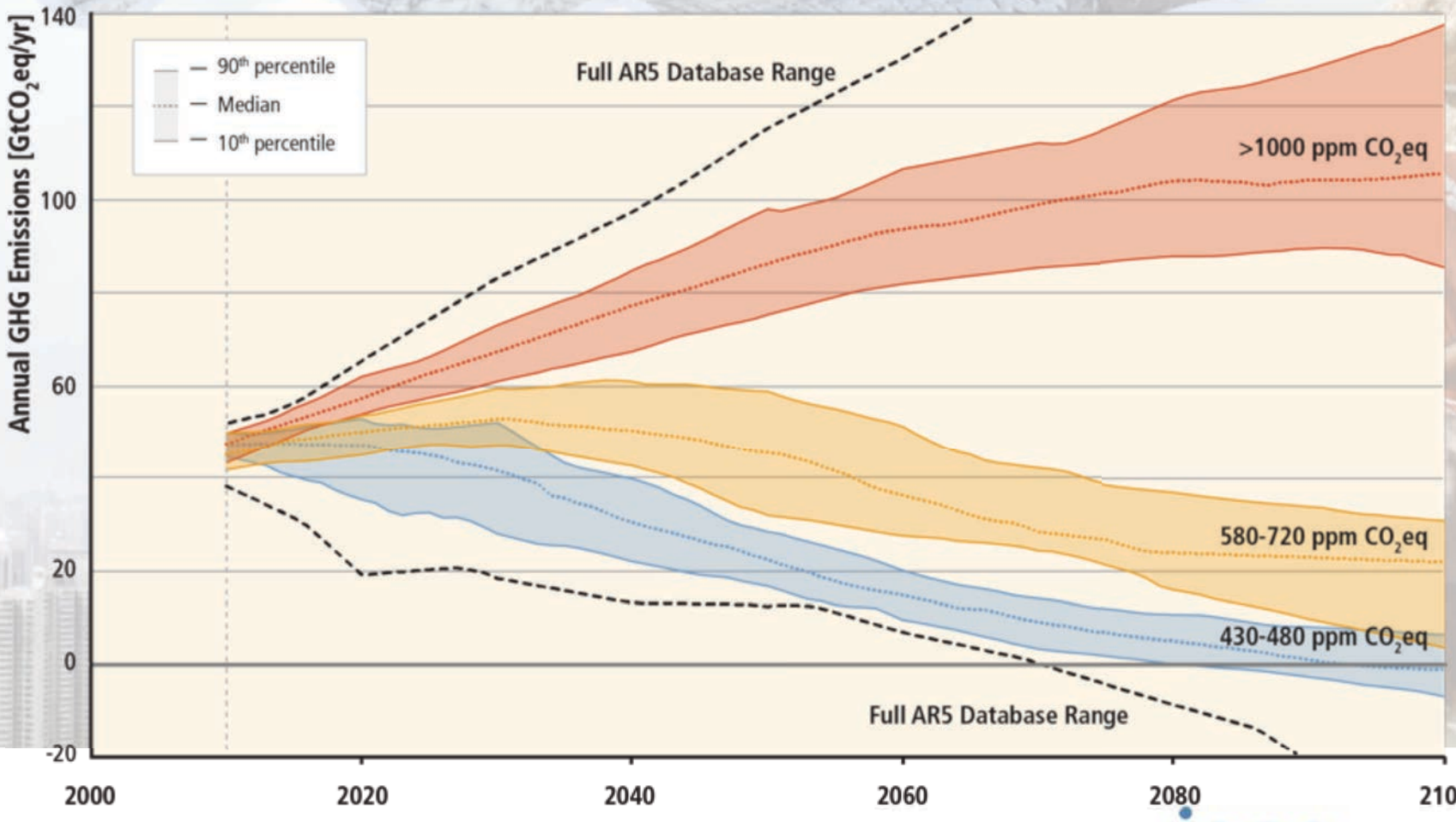
65% of the carbon budget compatible with a 2°C goal is already used
NB: this is with a probability greater than 66% to stay below 2°C



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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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**

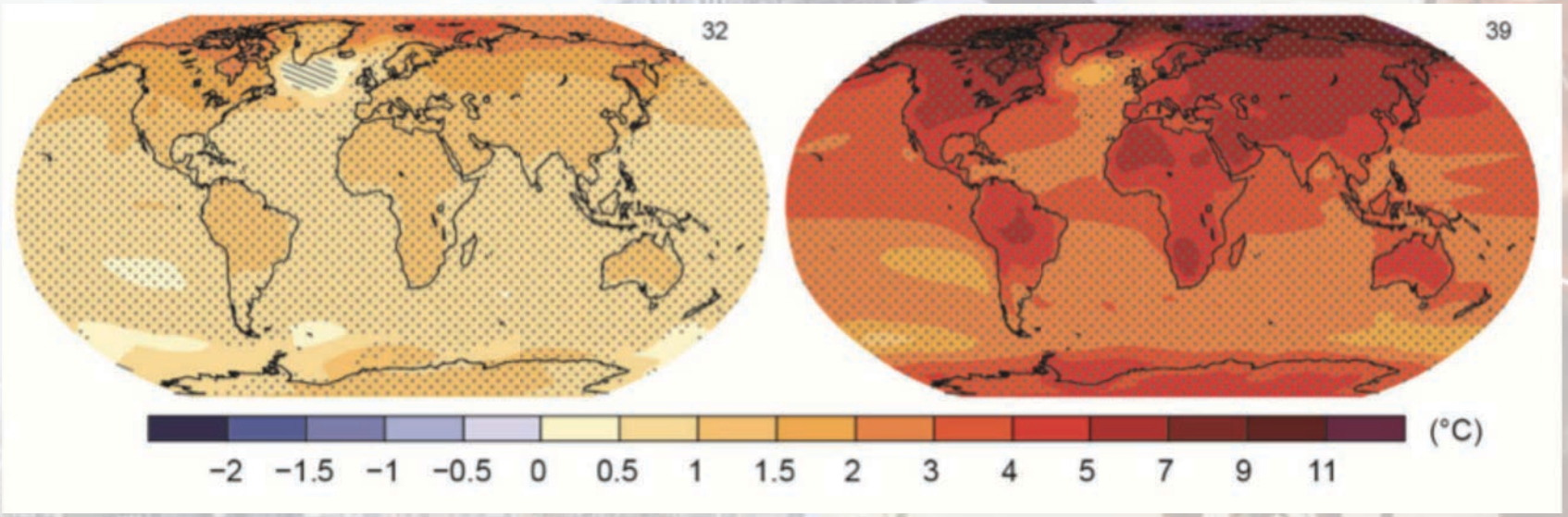
Lifestyle and behavioural changes

AR5 WGIII SPM

The Choices Humanity Makes Will Create Different Outcomes (and affect prospects for effective adaptation)

With substantial mitigation

Without additional mitigation



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

AR5 WGI SPM

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ACP Recommendations

- A global effort is required to reduce anthropogenic greenhouse emissions and address the health impact of climate change. The United States must commit to taking both a leadership and collaborative role in developing, implementing and ensuring the success of such a global effort and in reducing its own contributions to greenhouse emissions. Climate change adaptation strategies must be established and mitigation measures must be adopted.

Adaptation: Limiting the Damage Done by a Changing World

Adaptation is "adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects." (1)

Problem	Adaptation Strategy (1)
• Drought in Africa	• Reducing non-climate stressors on water rec., sustainable urban devel., strengthen institutional capacities for demand mgmt.
• Extreme Heat Events in Europe	• Warning systems, reduced emissions to improve air qual., residence, workplace modifications
• Urban flooding in North America	• Use of pervious surfaces, rooftop gardens; wetland conservation, planting of mangroves, coast-protecting vegetation.

Climate Change Mitigation: The Key to Stopping Further Climate Change

- Climate change mitigation is the **goal of "implementing policies to reduce greenhouse gas emissions and enhance sinks**,"(1) including
  - more efficient use of energy
  - expanded use of carbon neutral or low-carbon energy
  - reductions in deforestation and increases in reforestation
  - lifestyle and behavioral changes (such as energy conservation and reduced energy demand).

Mitigation could have major health benefits

Action	*Outcome*
▪ Increasing safe active transport and use of lower-emission vehicles	▪ Reduce heart disease, cerebrovascular disease, dementia, depression(1)
▪ Increase use of clean-burning stoves	▪ Reduce indoor air pollution exposure, respiratory illness(1)
▪ Reduction in use of coal-generated electricity	▪ Lower air pollution, better respiratory health

Addressing Climate Change is a Win-Win Situation

- Fossil fuel combustion creates dirty energy, endangering respiratory health
  - Switching to clean energy or reducing consumption can improve the air breathed by children, elderly, people with chronic illness
- Agriculture industry emits massive amounts of methane and other greenhouse gases
  - Reducing meat consumption in favor of more fruits and vegetables may contribute to a more healthy, balanced diet
- Healthy buildings – recycled construction materials, encourage use of stairs over elevators, use of natural lighting
  - Less construction-related pollution, improved physical activity from stair use, better mental health from day-lighting.(1)

ACP Recommendation

- **The health care sector, within the United States and globally, must implement environmentally sustainable and energy-efficient practices and prepare for the impacts of climate change to ensure continued operations during periods of elevated patient demand.**

The Health Care Industry is One of the Largest Consumers of Energy

- The health care sector is ranked second in energy use after the food industry
- It spends about $9 billion annually on energy costs
- Power plant emissions are connected to premature deaths, chronic bronchitis, asthma attacks, emergency room visits and more.(1)
- Hospitals in the United States produce a massive amount of garbage/waste (>2.3 million tons per year)

More Resources

- Intergovernmental Panel on Climate Change (IPCC) - http://www.ipcc.ch/
- U.S. Global Change Research Program - http://www.globalchange.gov/
- Health Care without Harm (U.S./Canada) - https://noharm-uscanada.org/
- My Green Doctor - http://www.mygreendoctor.org/
- Climate for Health - http://climateforhealth.org/

Please go and see the latest movie with Al Gore (2017):

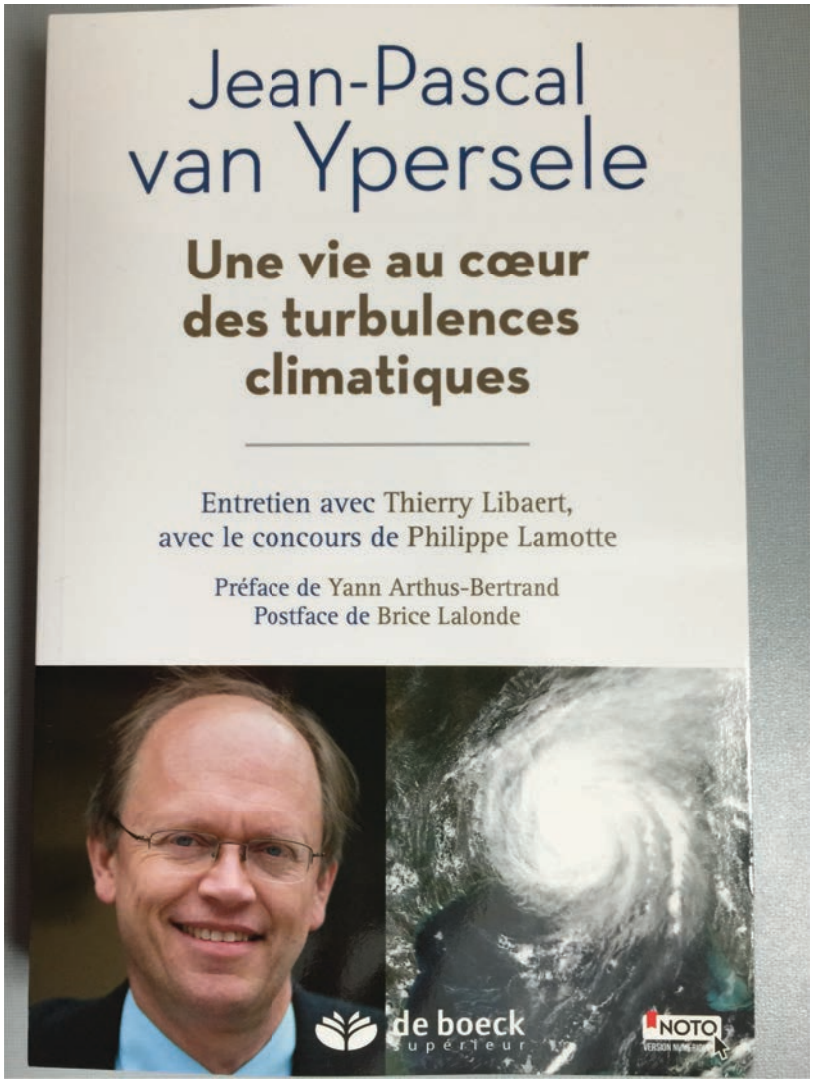
An Inconvenient Sequel:

Truth to Power

Pour en savoir plus:

Publié chez De Boeck supérieur,
octobre 2015
Broché: 16 euros
E-book: 13 euros

Straks in het Nederlands (eind 2017), bij EPO



Pour en savoir plus :

- www.ipcc.ch : GIEC ou IPCC
- www.climate.be/vanyp : beaucoup de mes dias
- www.plateforme-wallonne-giec.be : Plateforme wallonne pour le GIEC (e.a., Lettre d'information)
- www.my2050.be : calculateur de scénarios
- www.realclimate.org : réponses aux semeurs de doute
- www.skepticalscience.com : idem
- **Sur Twitter: @JPvanYpersele**

  @IPCC_CH

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