Klimaat: Perspectief, Urgentie en Hoop

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Leuven 2030 – Road to 2050 conferentie,
Leuven, 28 maart 2019

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

Perspectief

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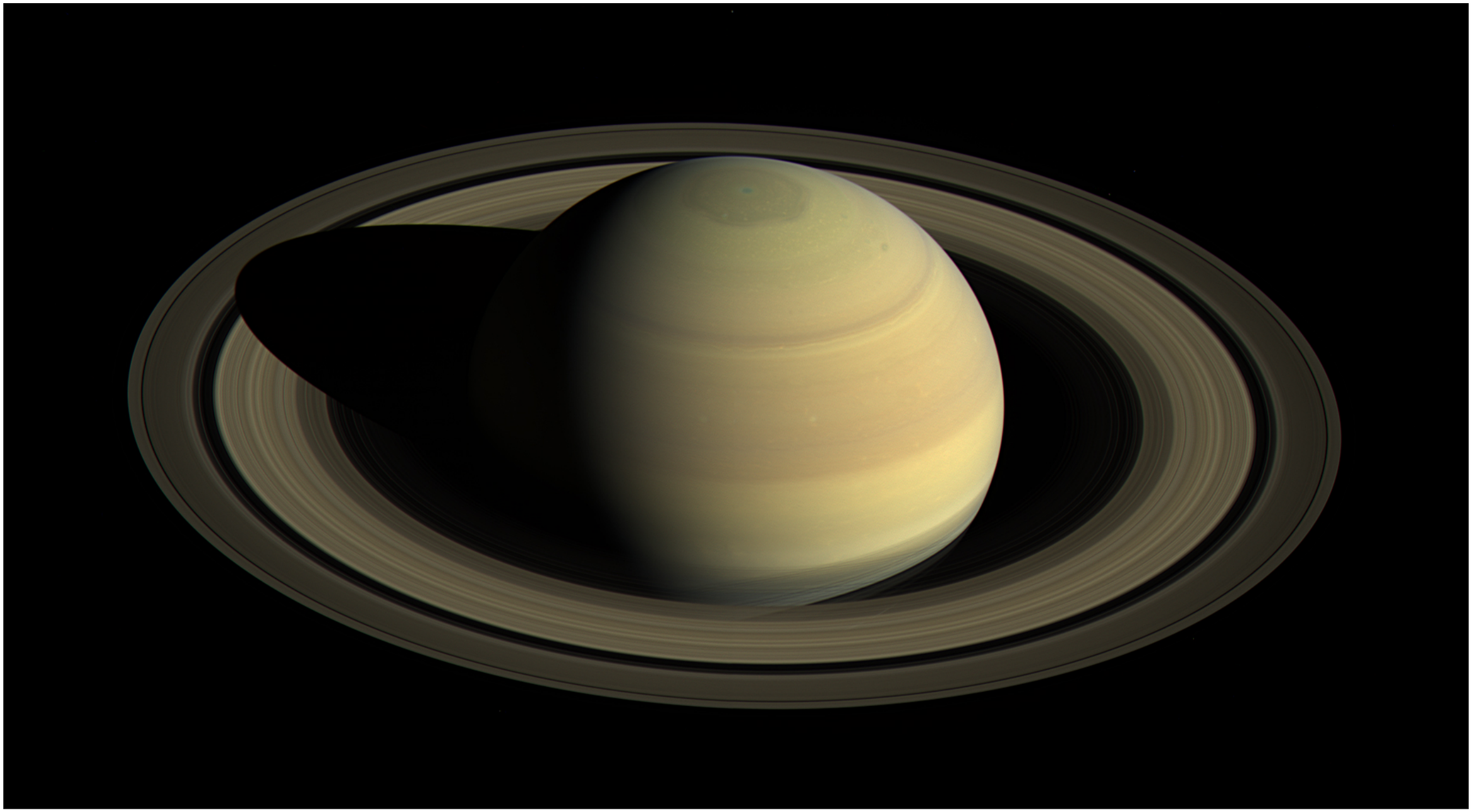
Saturn, as seen on 25-4-2016 from a 3 million km distance by the Cassini satellite launched in October 1997, 40 years after Sputnik



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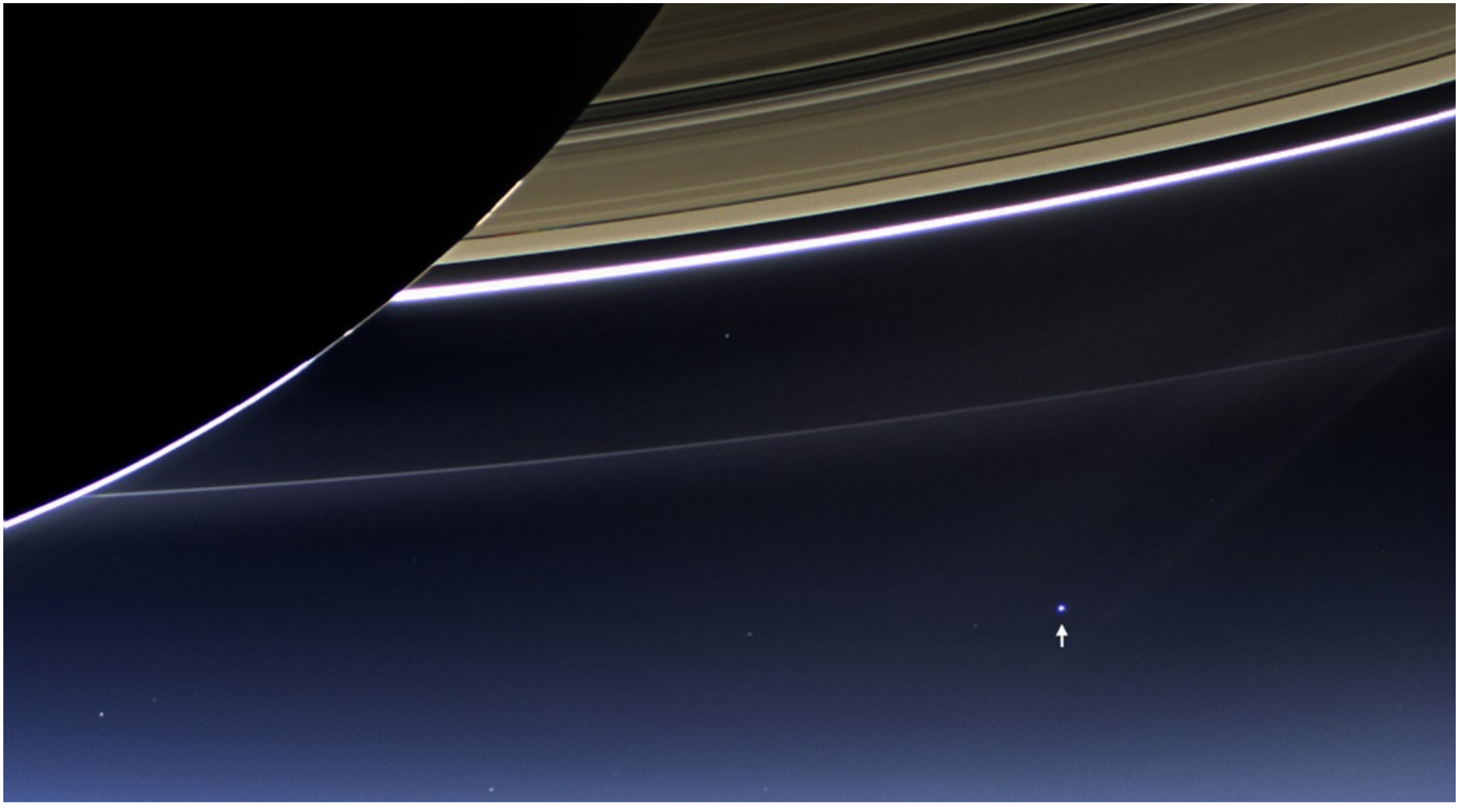
That small blue dot is the Earth, a seen from Cassini, orbiting Saturn, 1.44 billion km from us, on 19-7-2013



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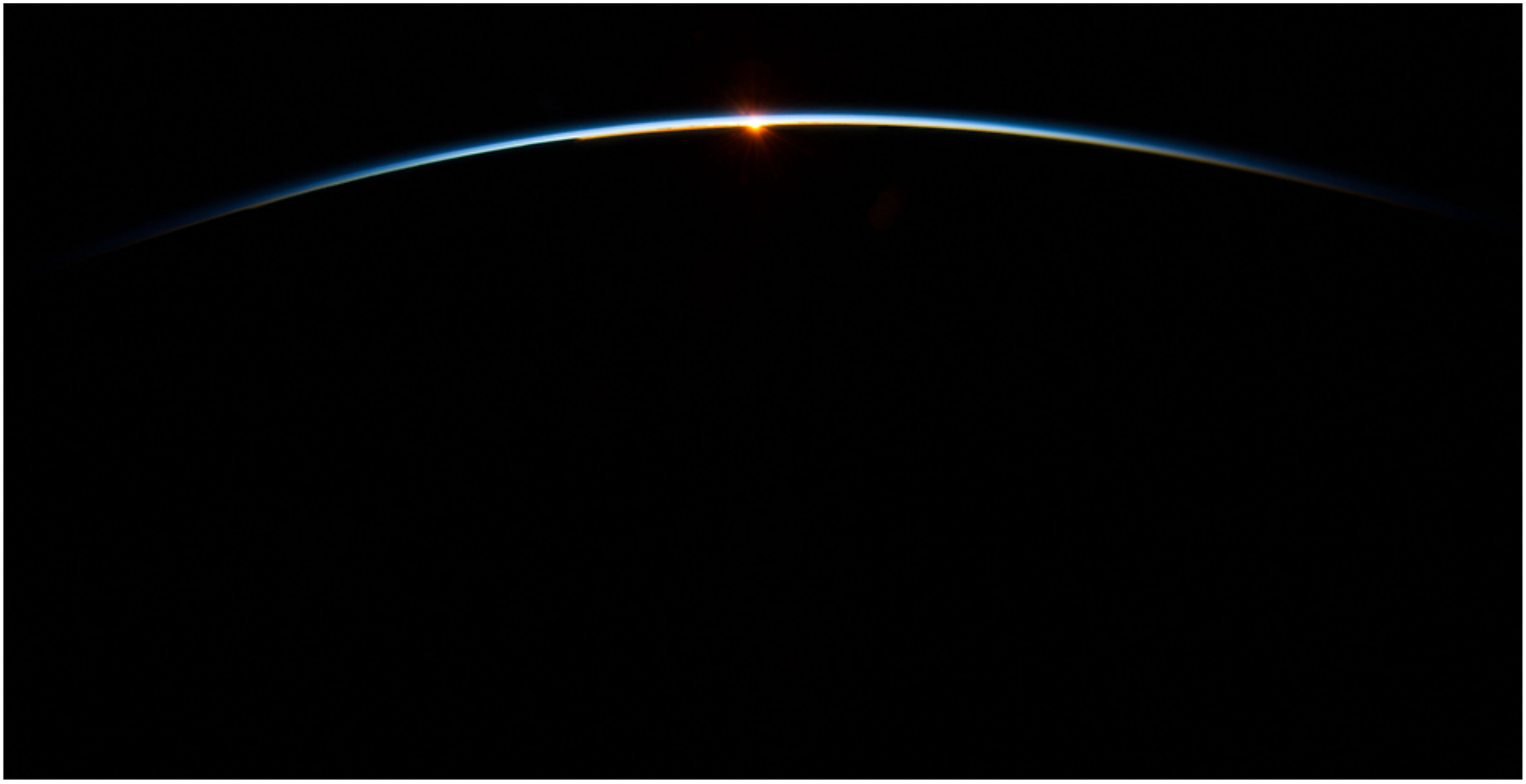
Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)



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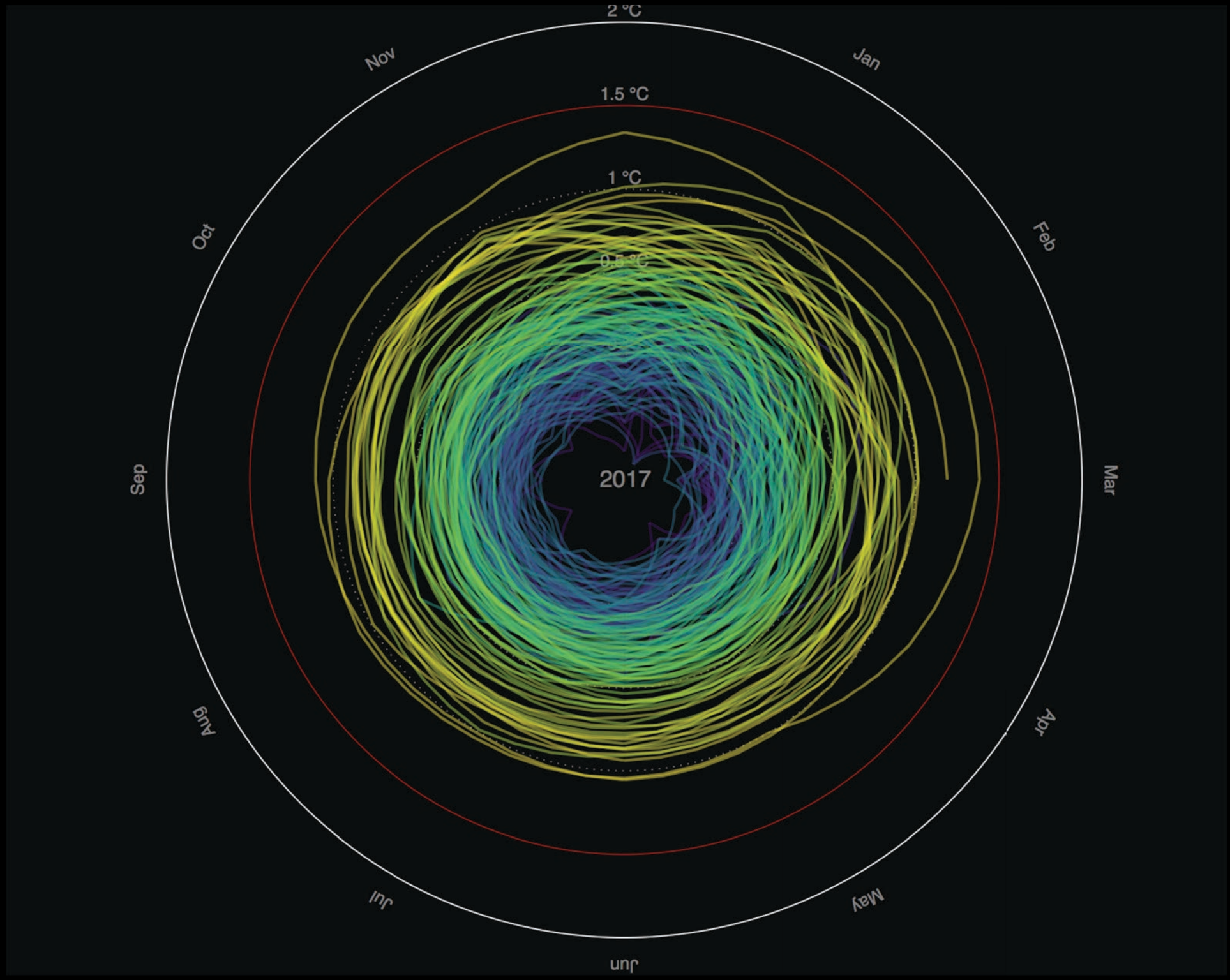
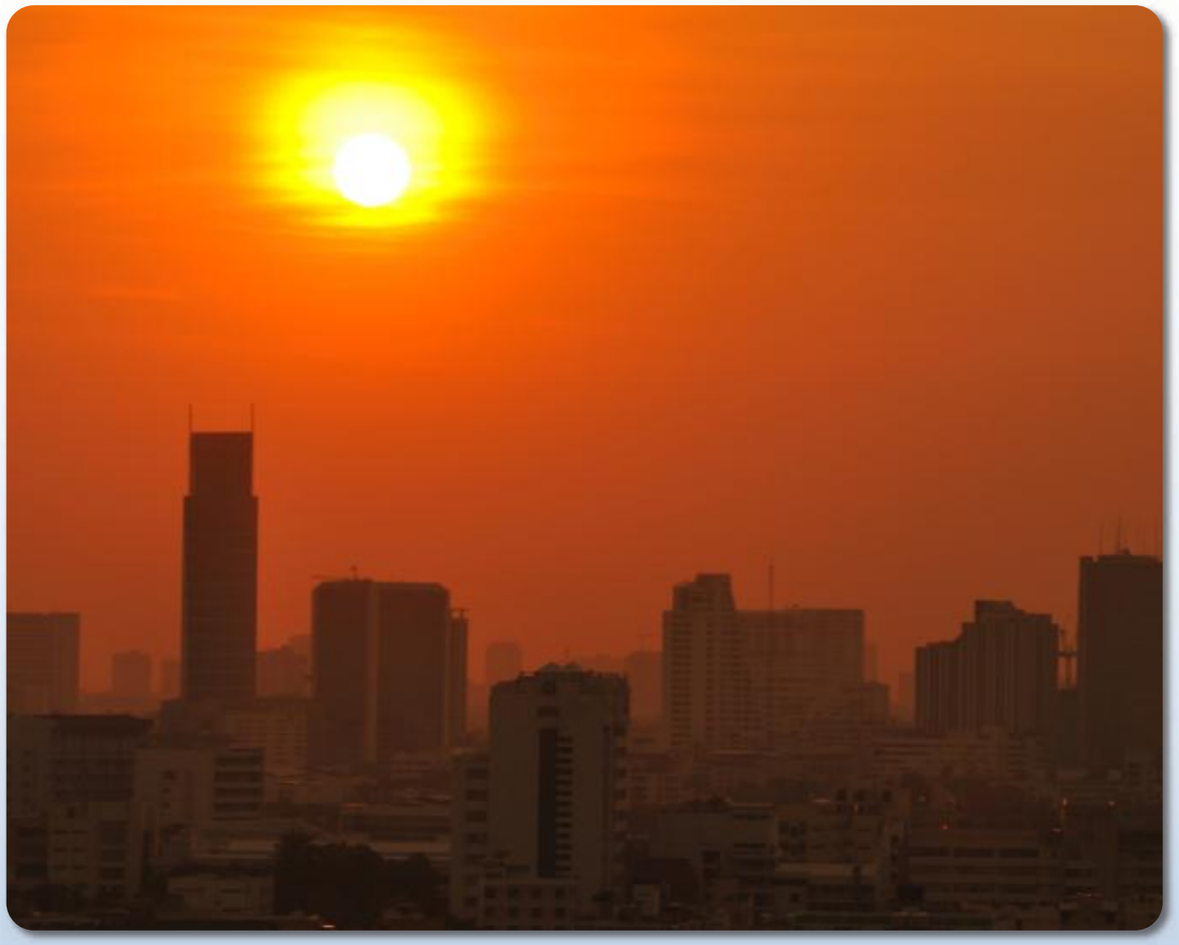
Temperature spiral



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

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

Qori Kalis Glacier (Peru): July 1978

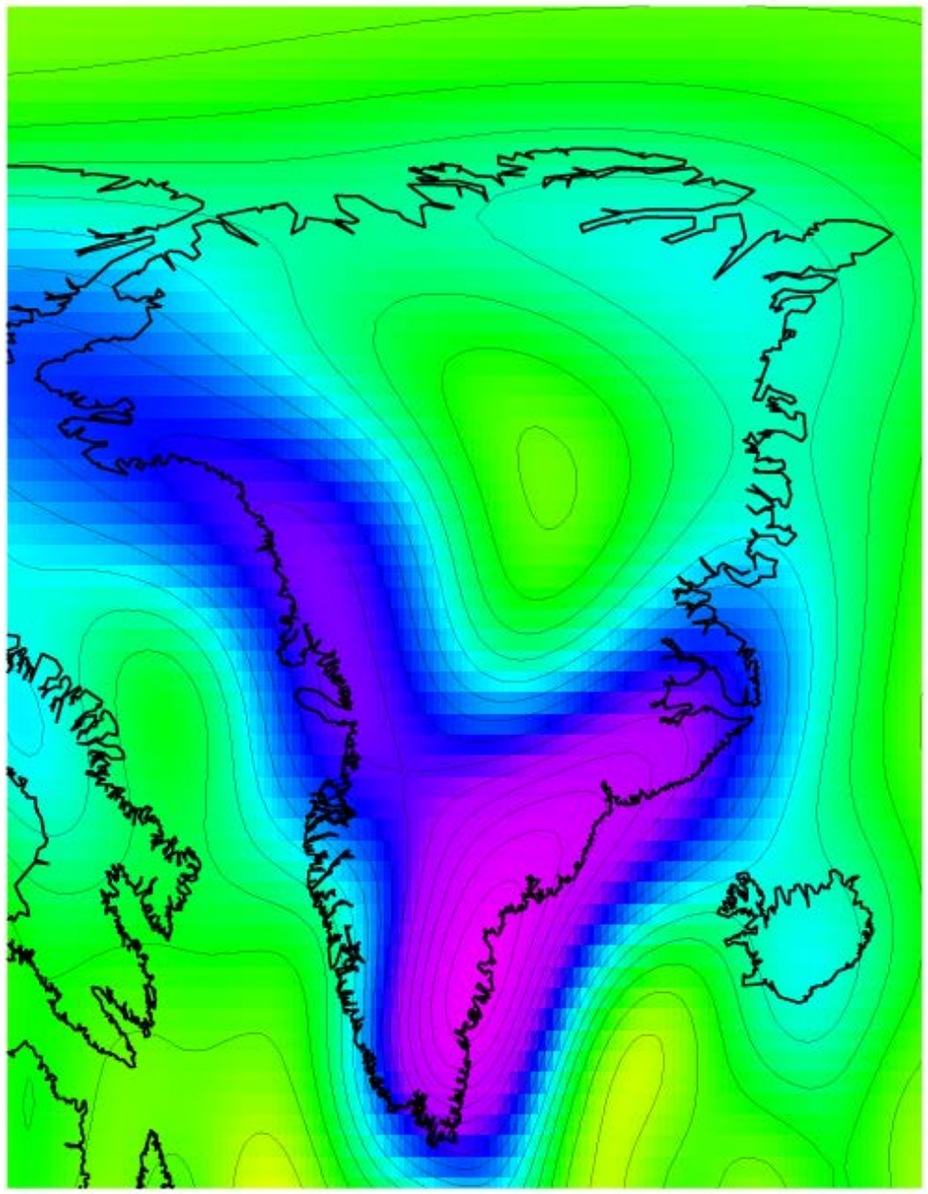
Source: Dr. Lonnie Thompson (OSU),
via http://climate.nasa.gov/images-of-change#543-melting-qori-kalis-glacier-peru

Qori Kalis Glacier (Peru): July 2011

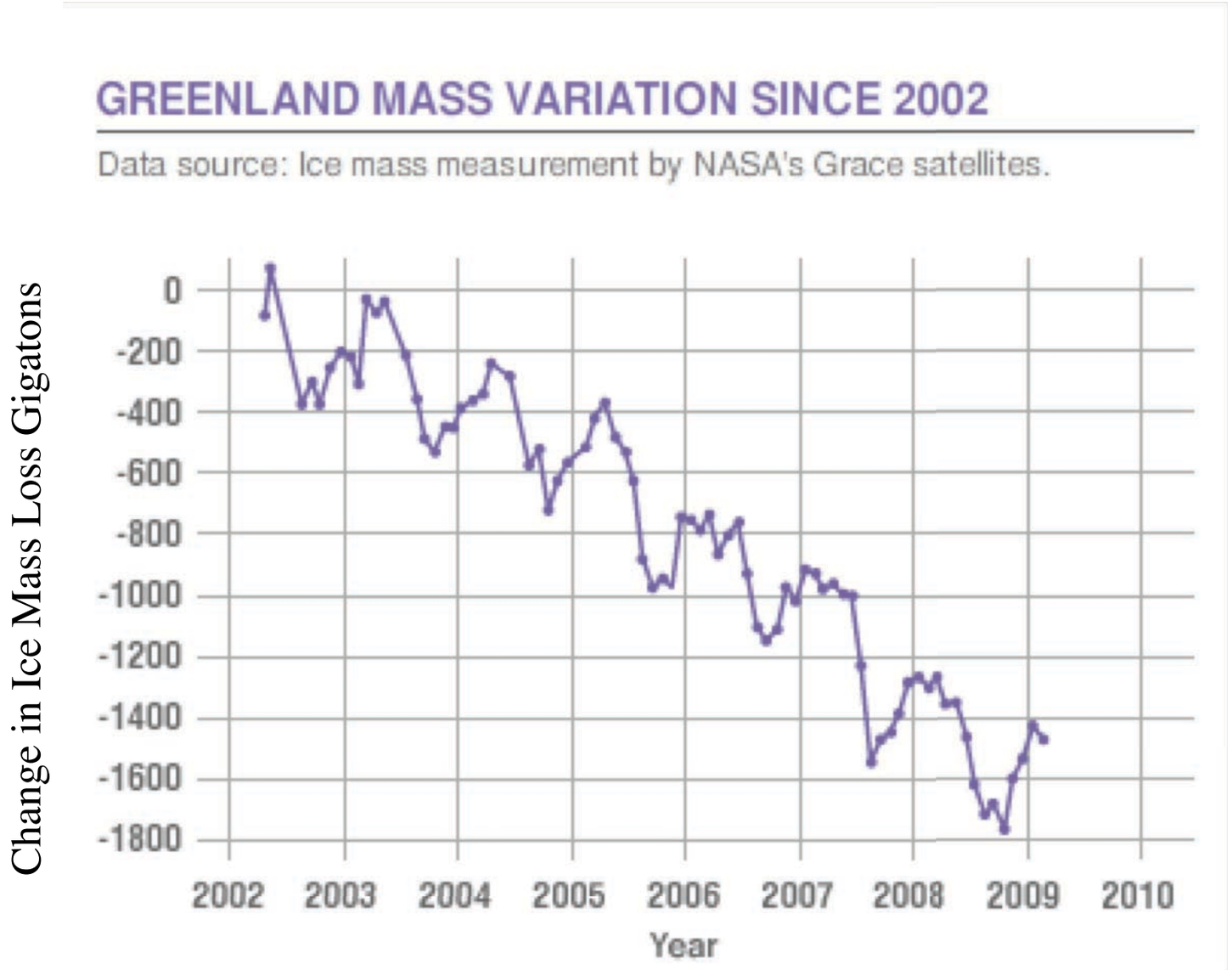
Source: Dr. Lonnie Thompson (OSU),
via http://climate.nasa.gov/images-of-change#543-melting-qori-kalis-glacier-peru

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

Greenland



J. Wahr, U. Colorado

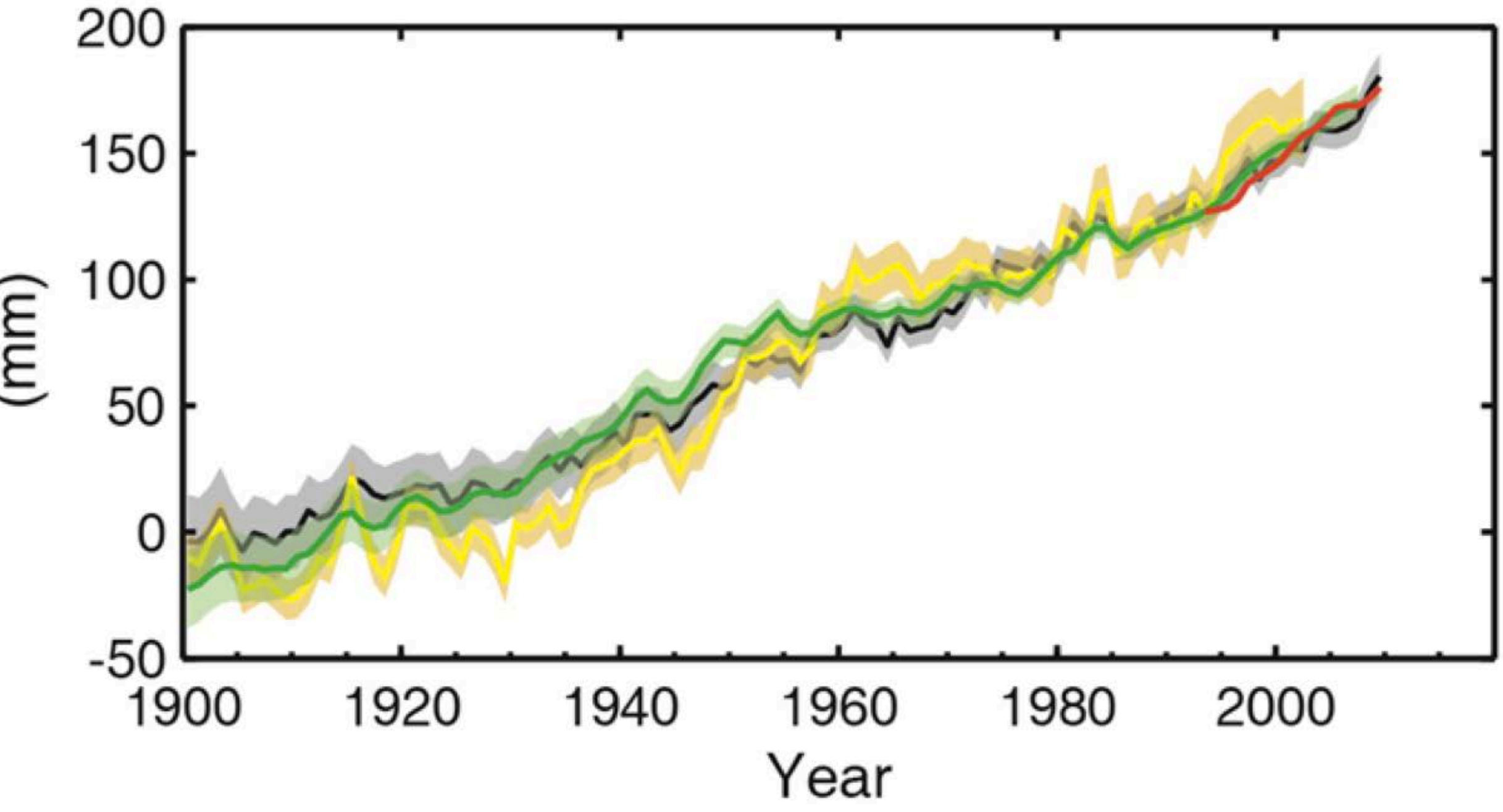


Velicogna, Geophysical Research Letters, 2009

•Contributes to sea level rise

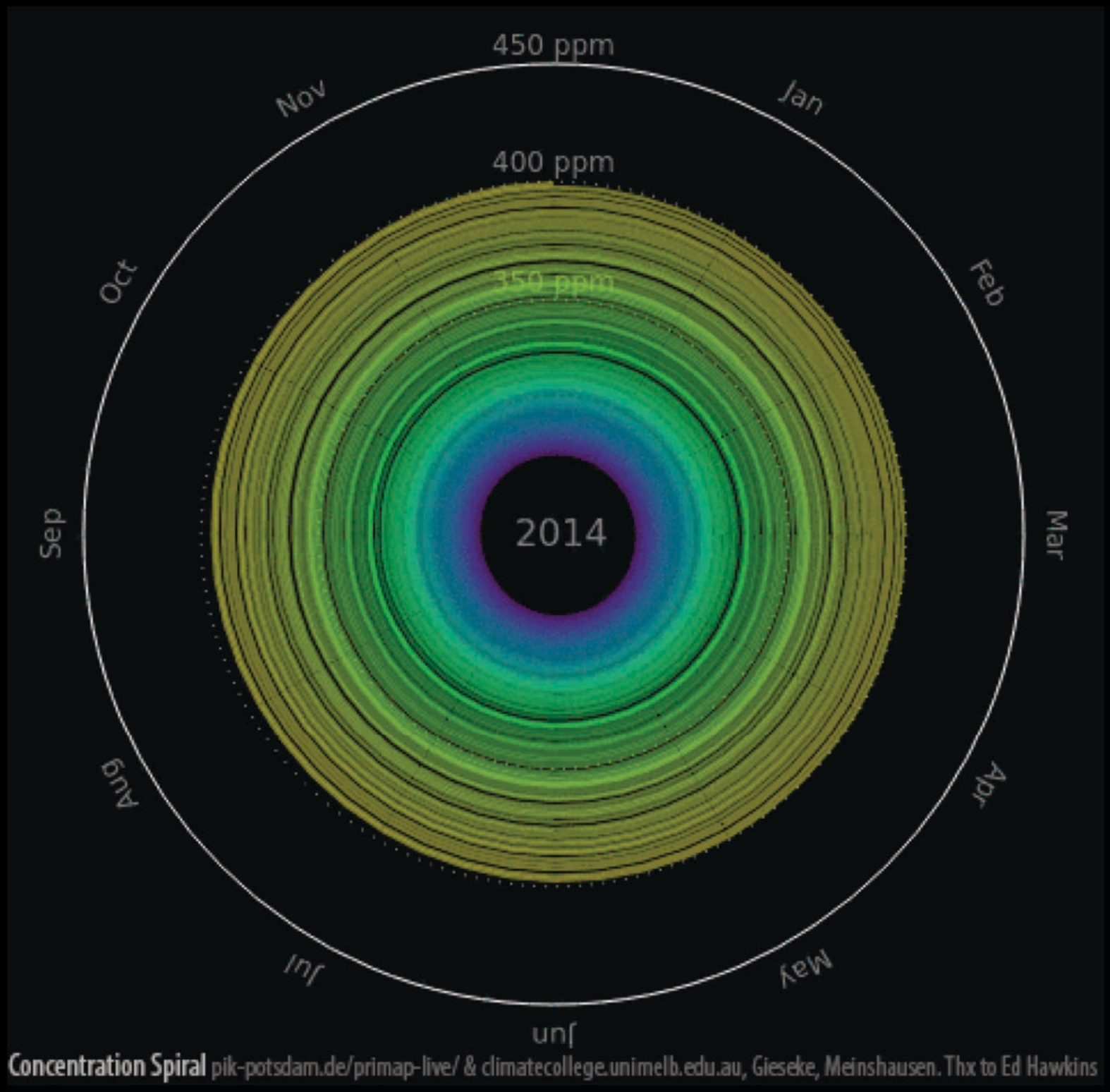
B. Holt - JPL

Change in average sea-level change



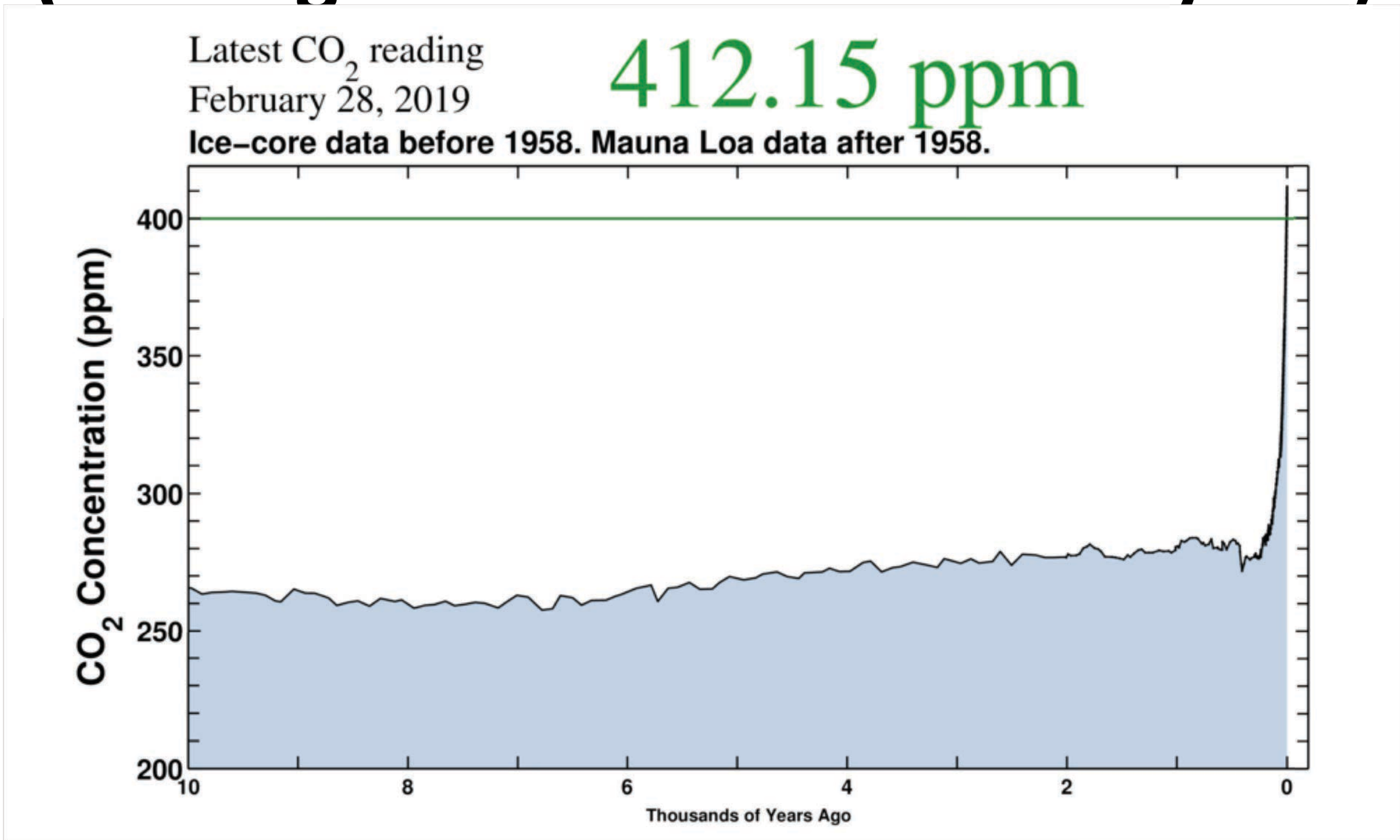
AR5 WGI SPM - Approved version / subject to final copyedit

CO_2 concentration spiral: the insulation thickens!



CO_2 concentration spiral 1851-2014 (ppm), by Gieseke & Meinshausen,
Available on http://pik-potsdam.de/primap-live

CO_2 Concentration, 28 February 2019 (Keeling curve over last 10000 years)



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

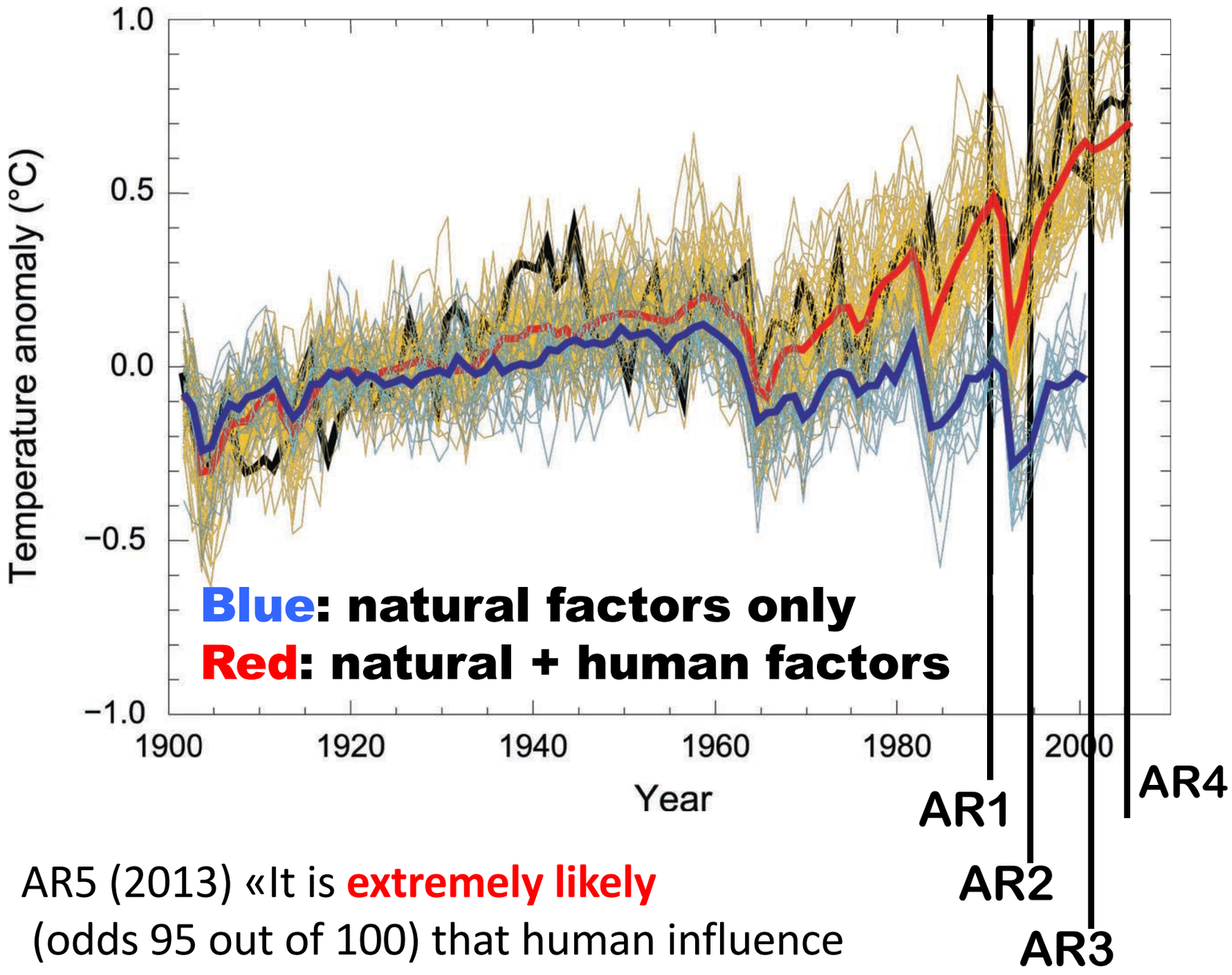
A Progression of Understanding: Greater and Greater Certainty in Attribution

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

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

AR3 (2001): "most of the warming since 1950 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… »

Because we use the atmosphere as a dustbin for our greenhouse gases, we thicken the insulation layer around the planet

That is why we must cut emissions to (net) ZERO as soon as possible

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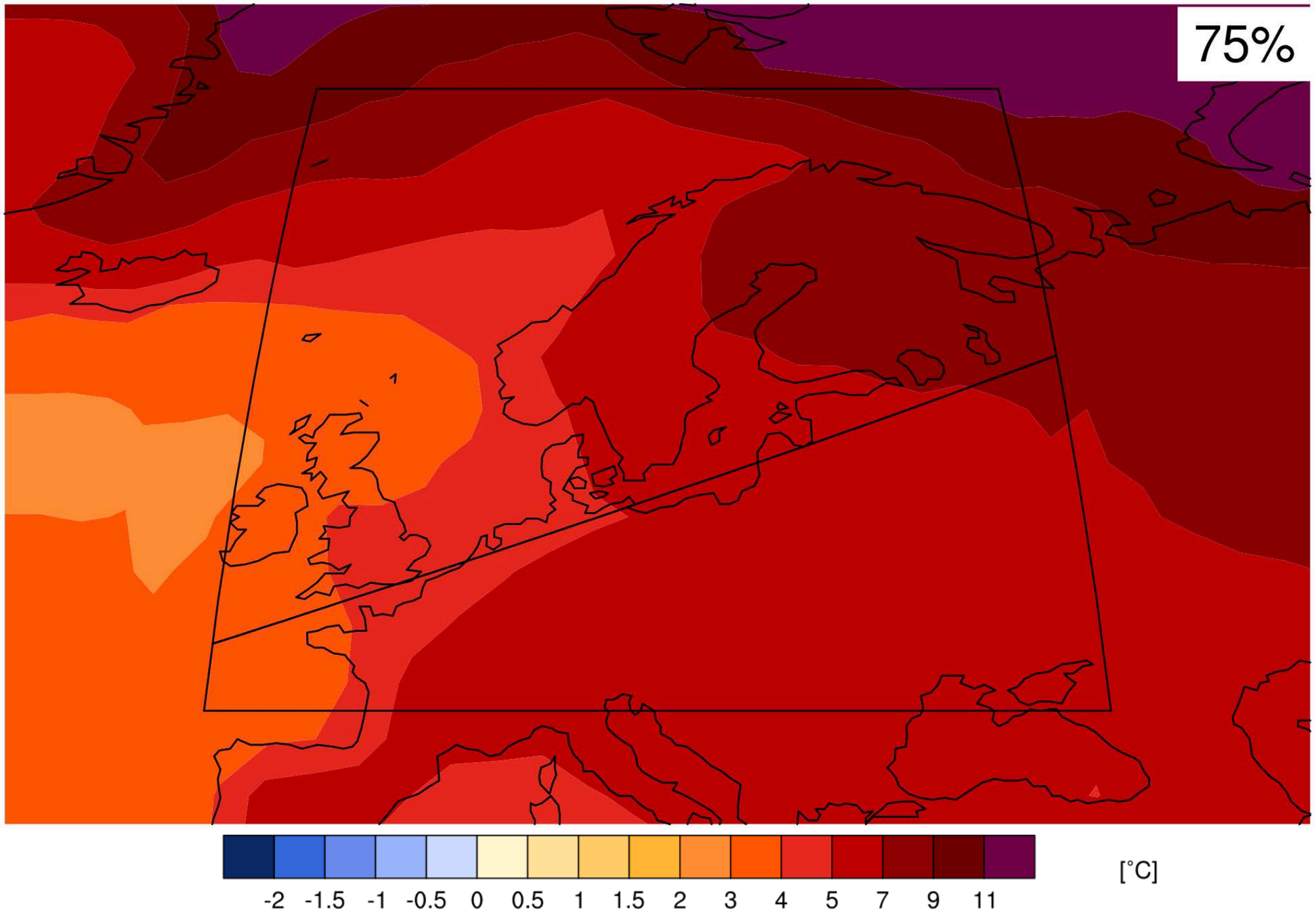
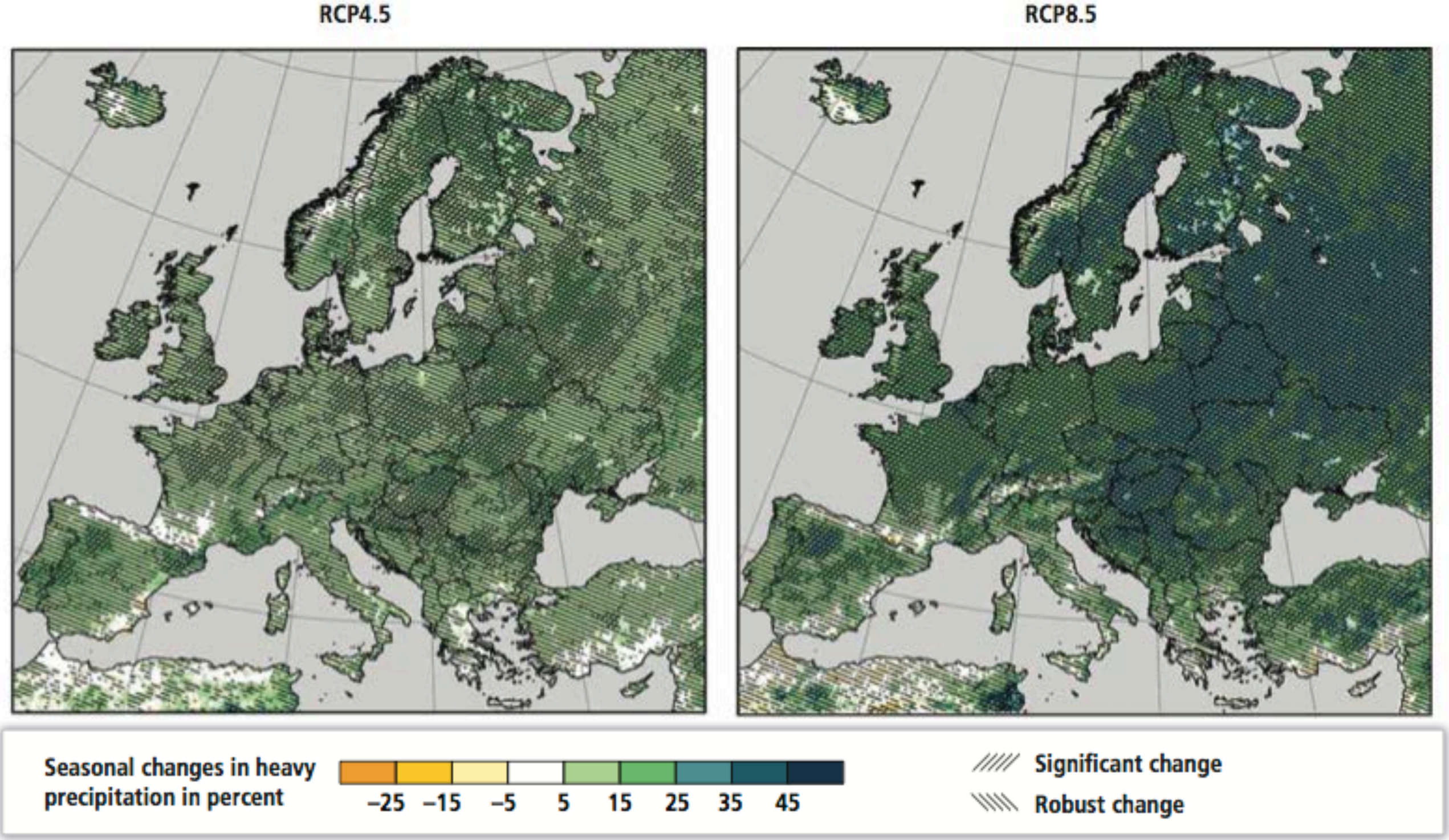
North Europe - Map of temperature changes: 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario (annual)



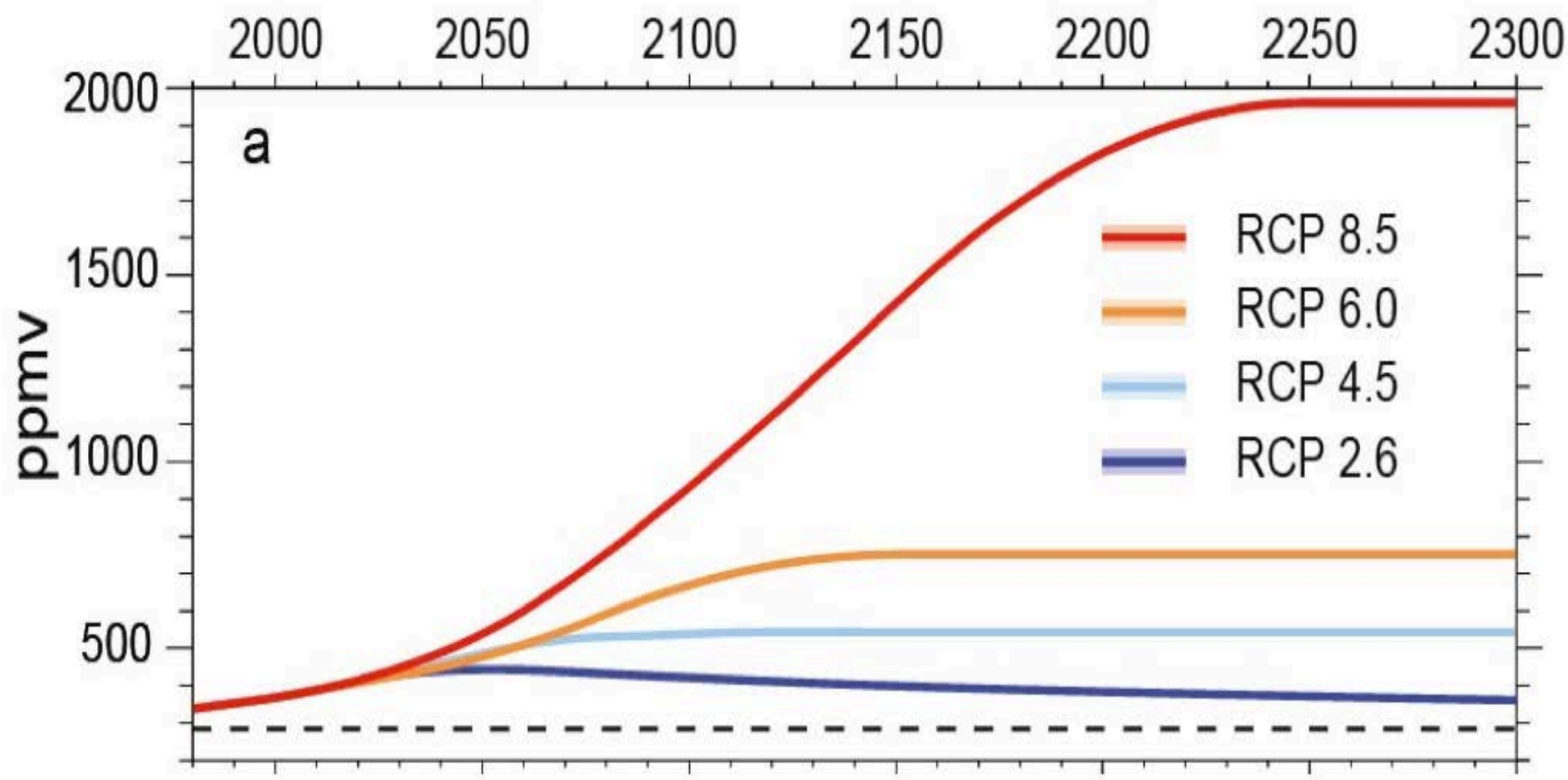
IPCC WG1 Fifth Assessment Report (Final Draft)

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



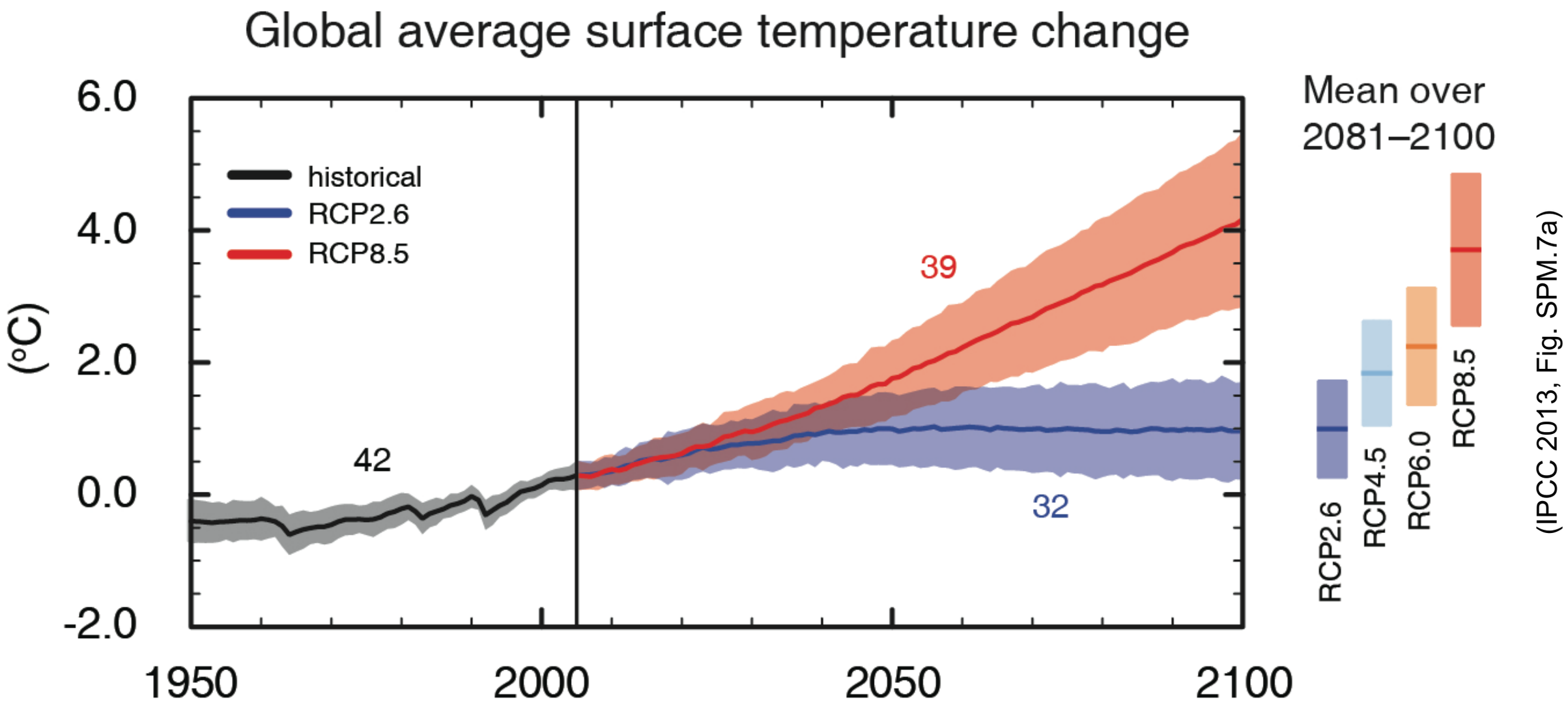
IPCC AR5 WG II

RCP Scenarios: Atmospheric CO_2 concentration



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

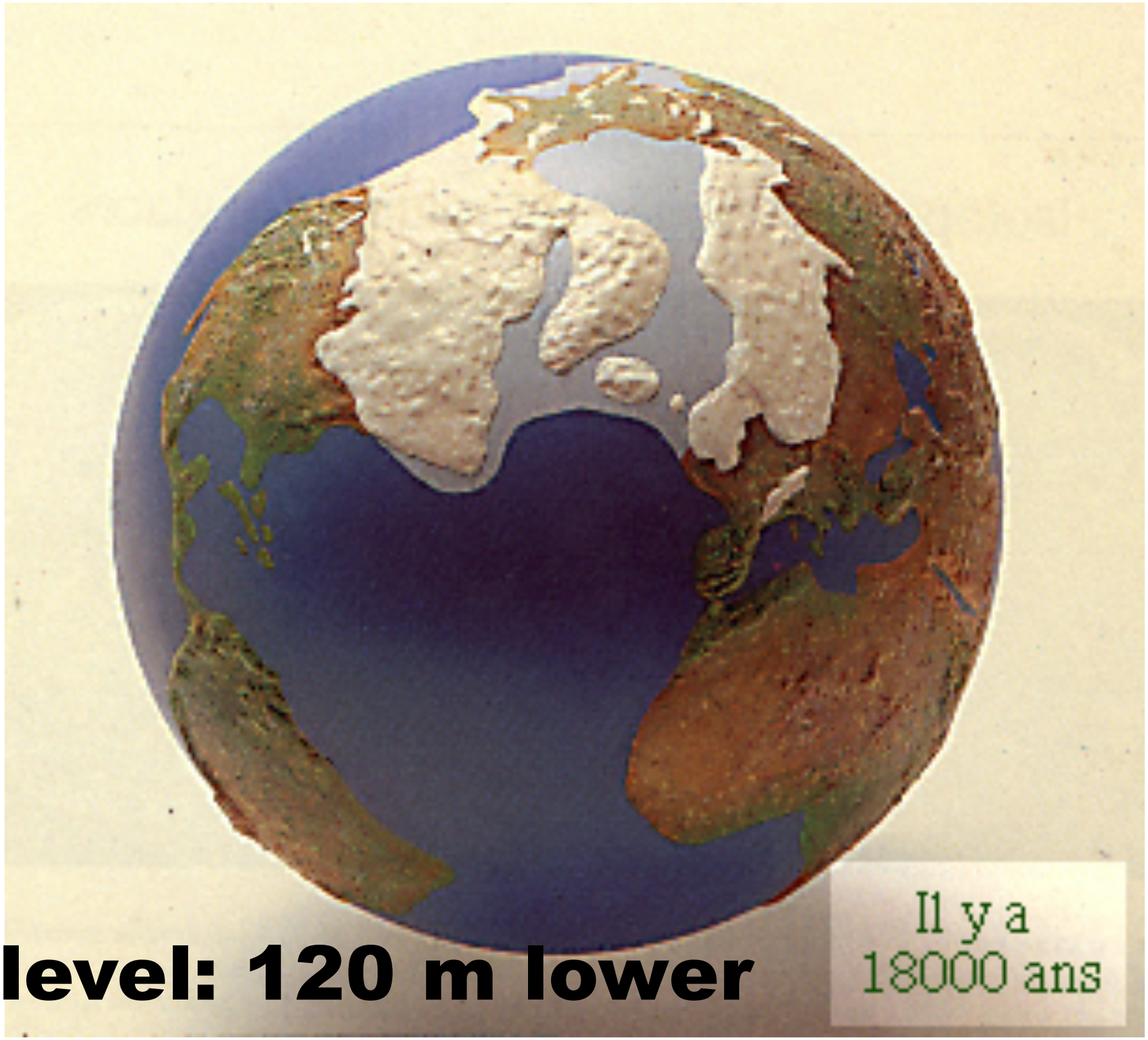
AR5, chapter 12. WGI



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)

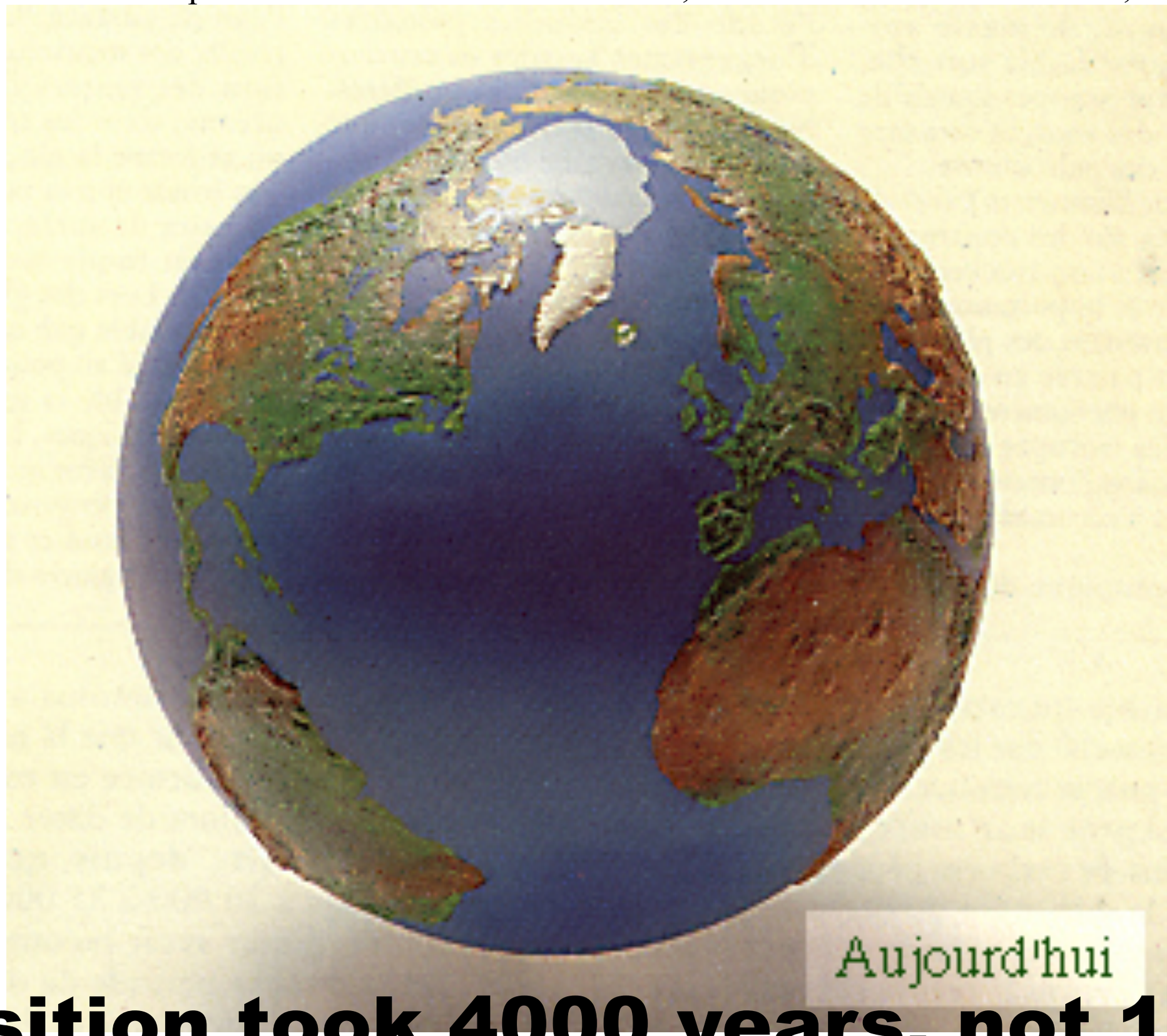
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



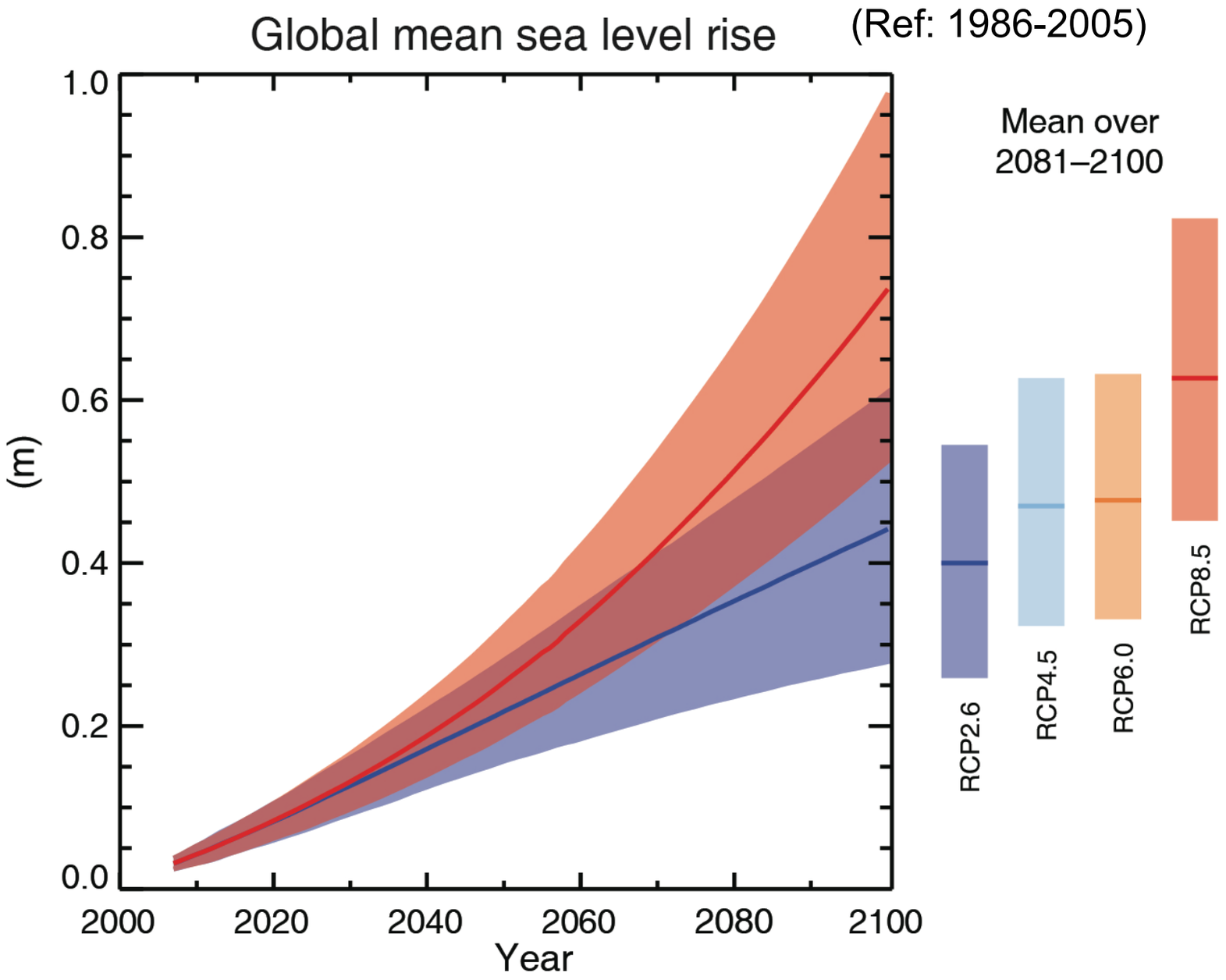
Sea level: 120 m lower

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 ye



(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)

With 8 metre sea-level rise: 3700 km² 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)

Urgentie

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Potential Impacts of Climate Change

Food and water shortages

Increased displacement of people

Increased poverty

Coastal flooding

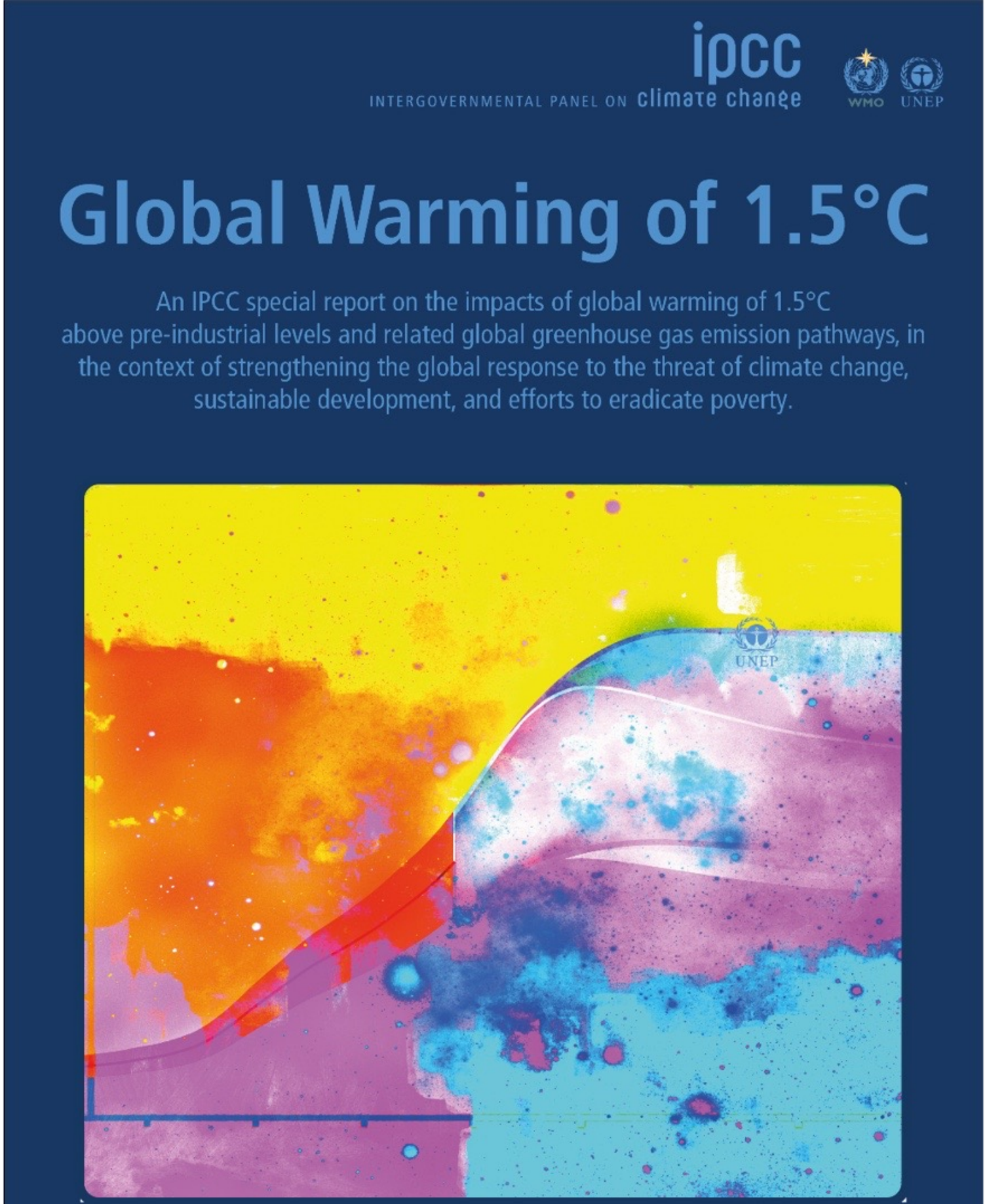
AR5 WGII SPM

IPCC AR5 Synthesis Report

INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

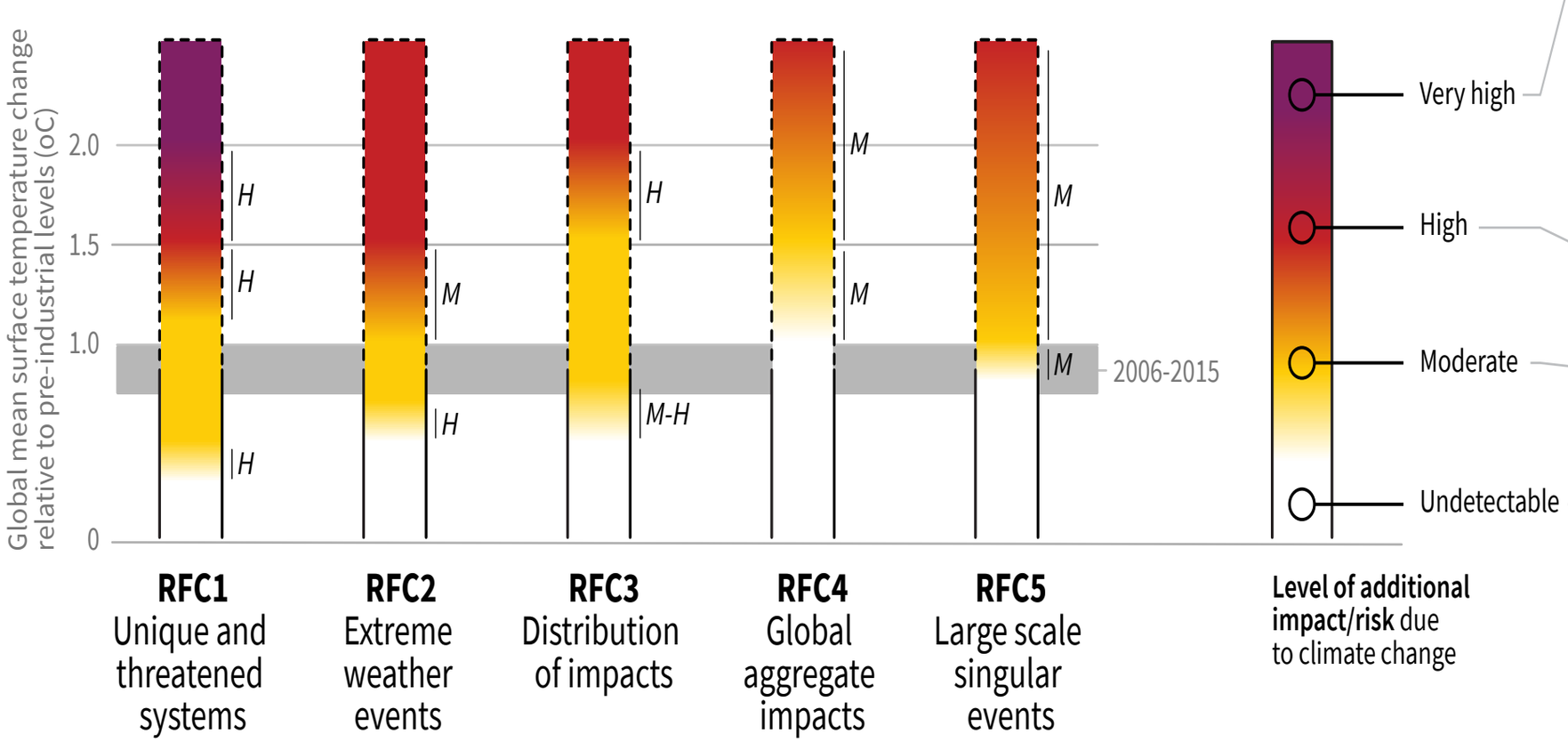
The SR15


ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO
UNEP
Global Warming of 1.5°C
An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.
UNEP

How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)



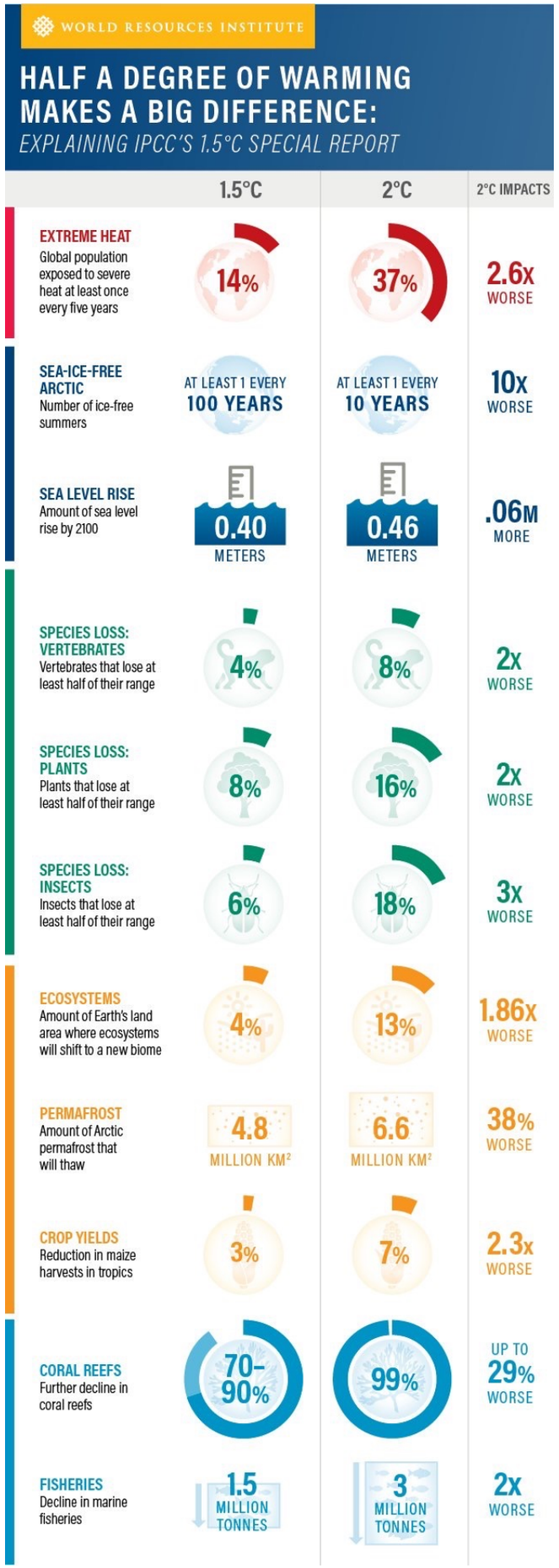
Purple indicates very high risks of severe impacts/risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.

Red indicates severe and widespread impacts/risks.

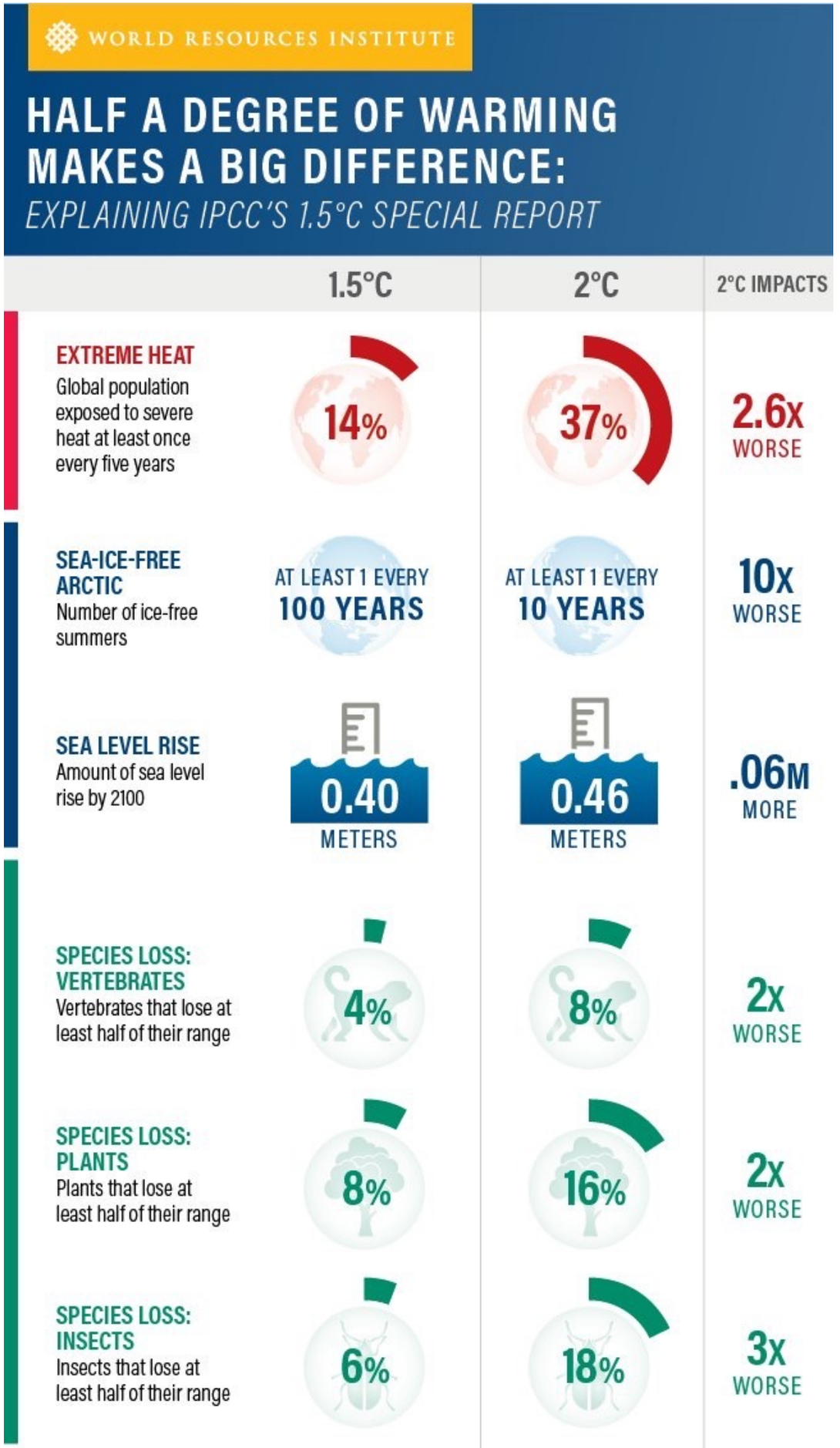
Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.

White indicates that no impacts are detectable and attributable to climate change.

Responsibility for content: WRI



Responsibility for content: WRI



Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO_2, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM3B.

Global total net CO_2 emissions

Billion tonnes of CO_2/yr

In pathways limiting global warming to 1.5°C with **no or limited overshoot** as well as in pathways with a **high overshoot**, CO_2 emissions are reduced to net zero globally around 2050.

Four illustrative model pathways

P1
P2
P3
P4

Net ZERO:

2050

Non-CO_2 emissions relative to 2010

Emissions of non-CO_2 forcers are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

Methane emissions

Black carbon emissions

Nitrous oxide emissions

Timing of net zero CO_2
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios

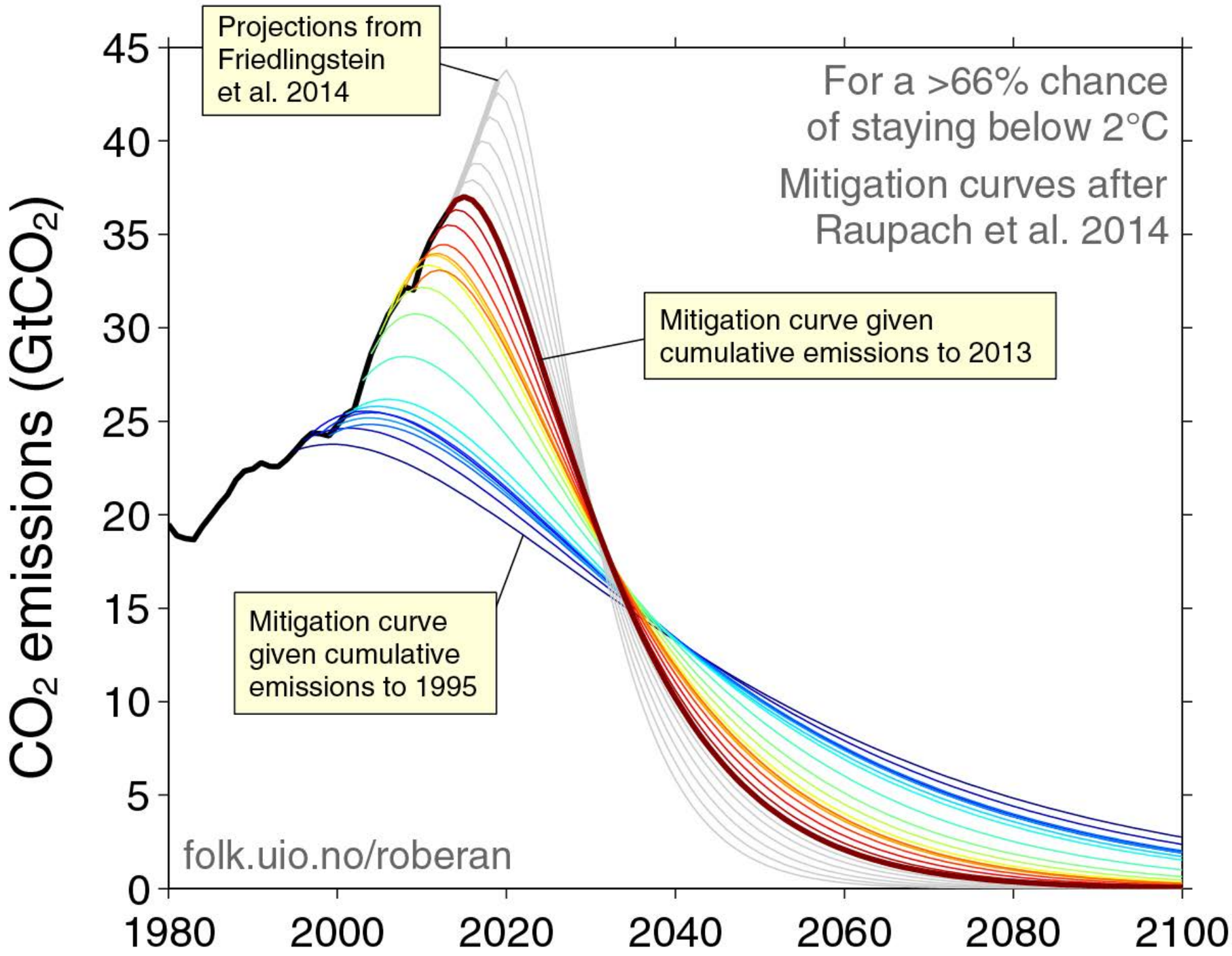
Pathways limiting global warming to 1.5°C with **no or low** overshoot

Pathways with **high overshoot**

Pathways limiting global warming below 2°C (Not shown above)

Source: IPCC Special Report on Global Warming of 1.5°C

Limiting warming becomes much more difficult when the peak happens later



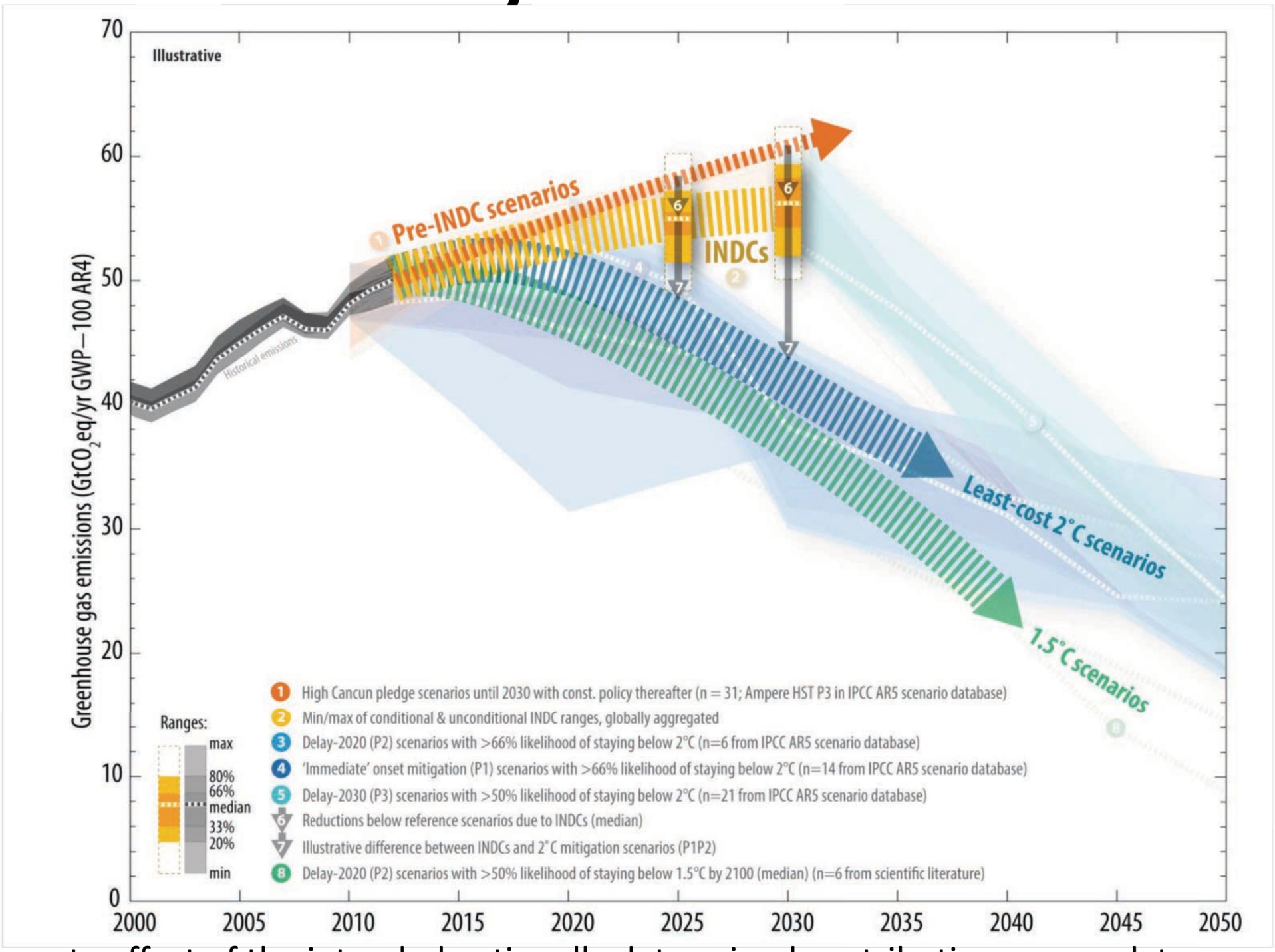
Source and details:

http://folk.uio.no/roberan/t/global_mitigation_curves.shtml

Greenhouse gas emissions pathways

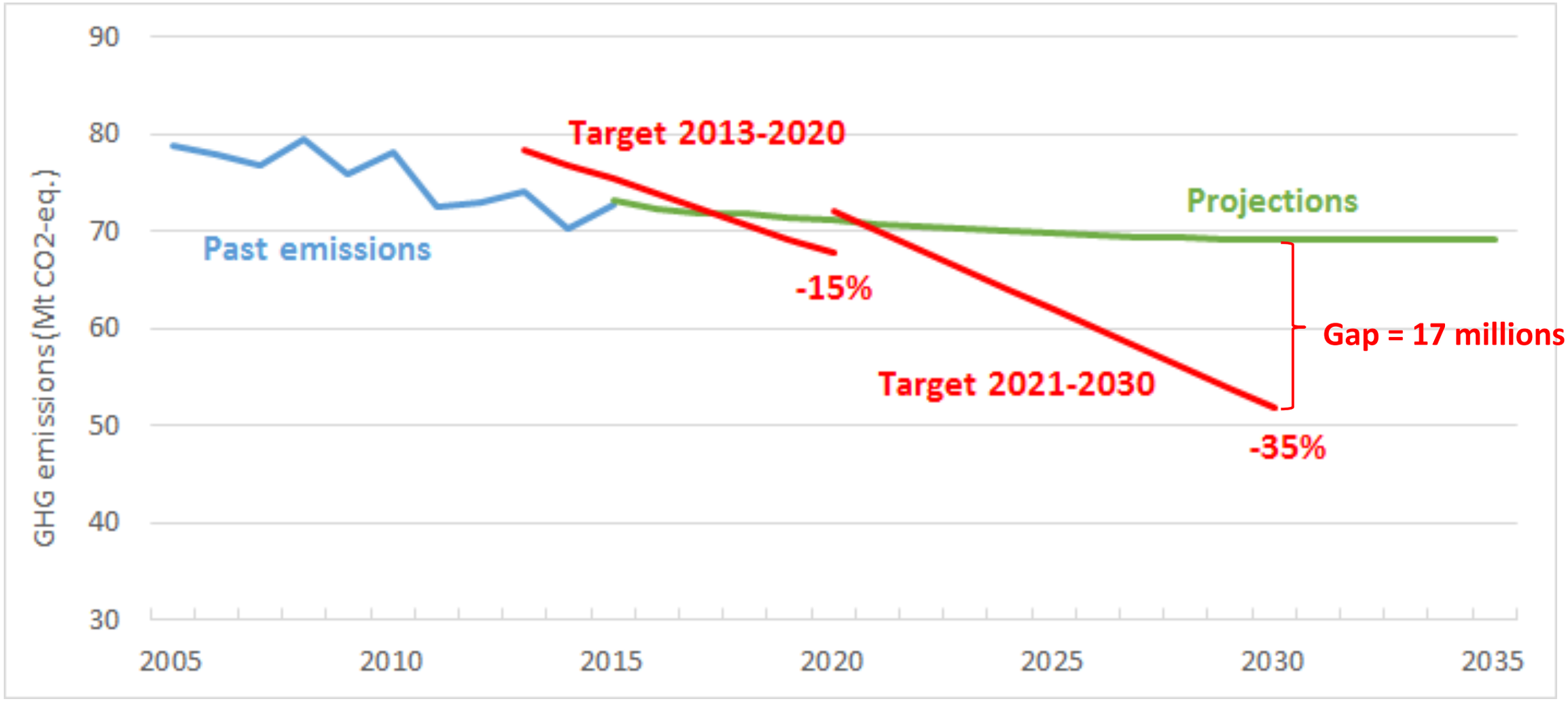
- To limit warming to 1.5° C, CO_2 emissions fall by about 45% by 2030 (from 2010 levels)
    - Compared to 20% for 2° C
- To limit warming to 1.5° C, CO_2 emissions would need to reach ‘net zero’ around 2050
    - Compared to around 2075 for 2° C
- Reducing non-CO_2 emissions would have direct and immediate health benefits

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

OBJECTIFS DE LA BELGIQUE DANS LE CADRE EUROPÉEN



Evolution des émissions en Belgique et objectifs de réduction (secteurs non-ETS)

(2005-2015: émissions réelles; 2015-2035: projections)

Source: Commission Nationale Climat (2017)

Hoop

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I want you to panic… and act

- **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_2-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…

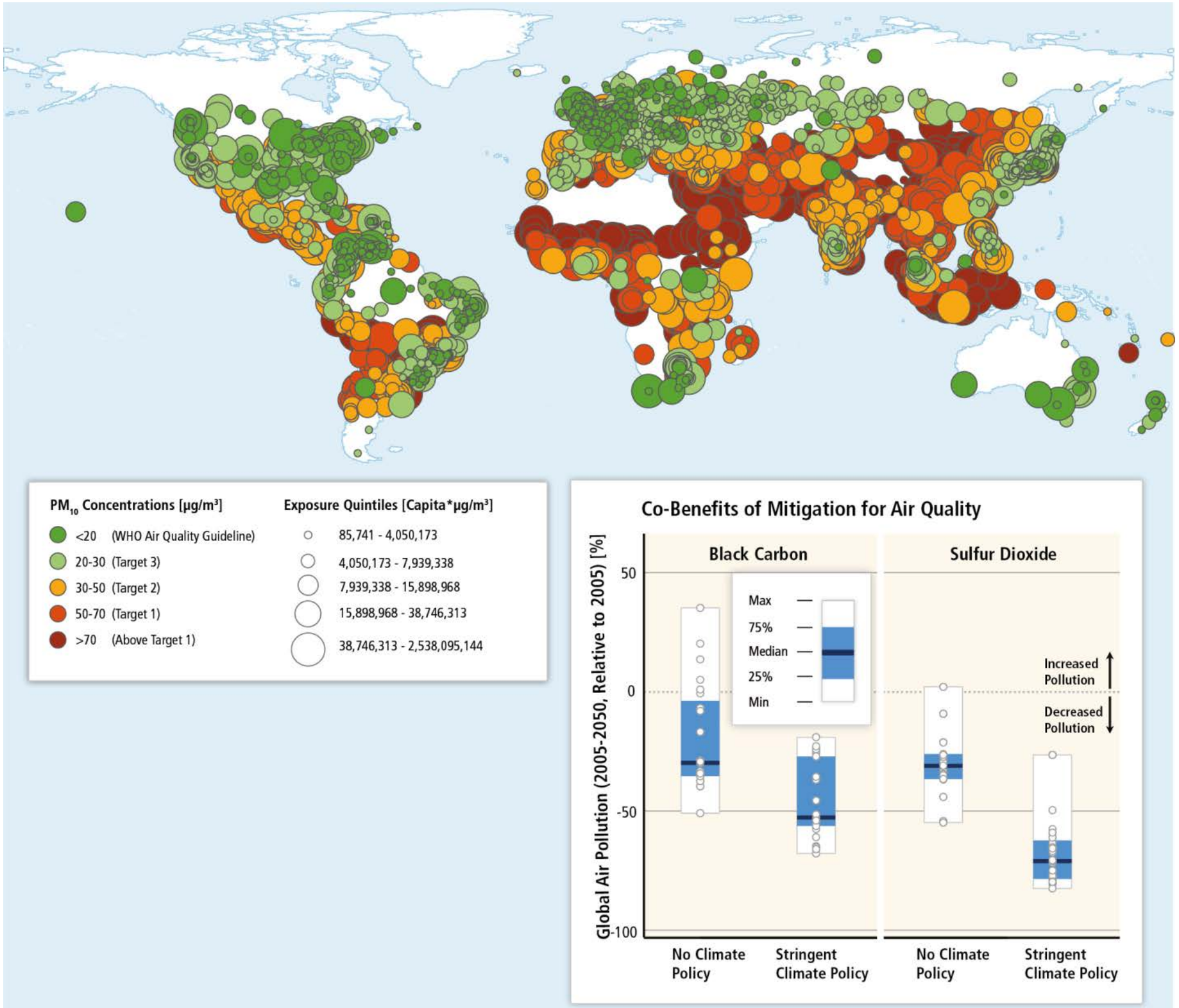
Improved carbon sinks

- **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

- **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.

SUSTAINABLE DEVELOPMENT GOALS

IPCC SR15
Fig SPM 4

Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)

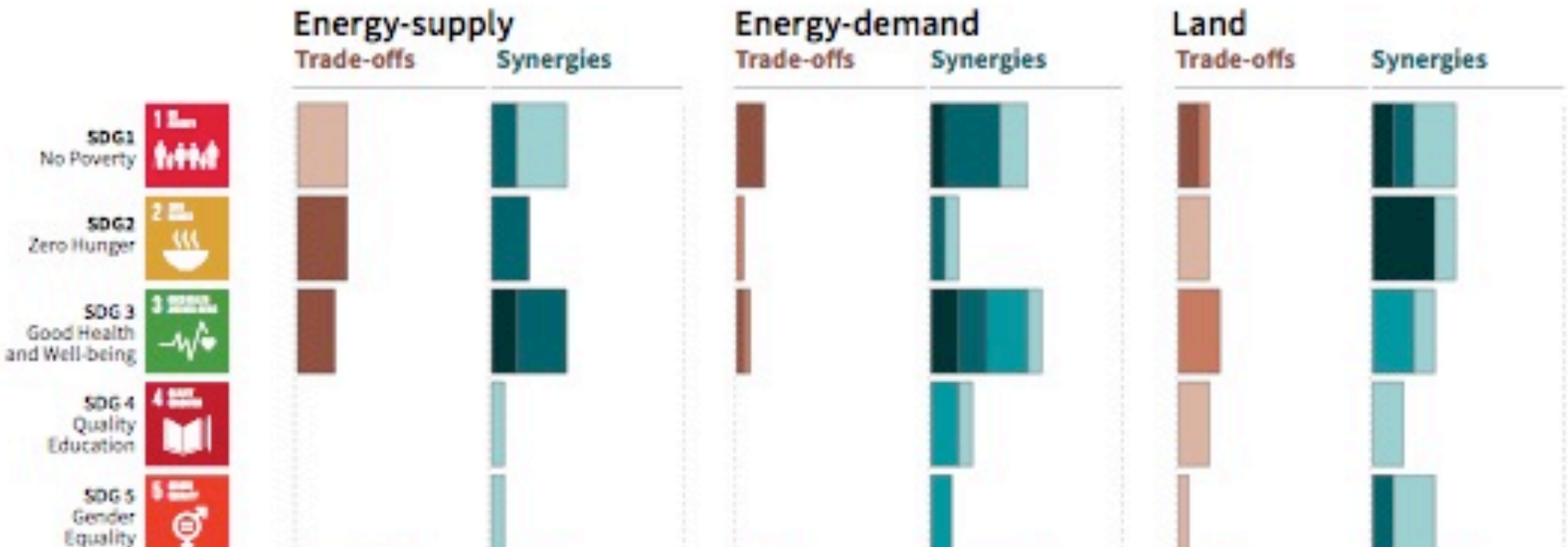
Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.

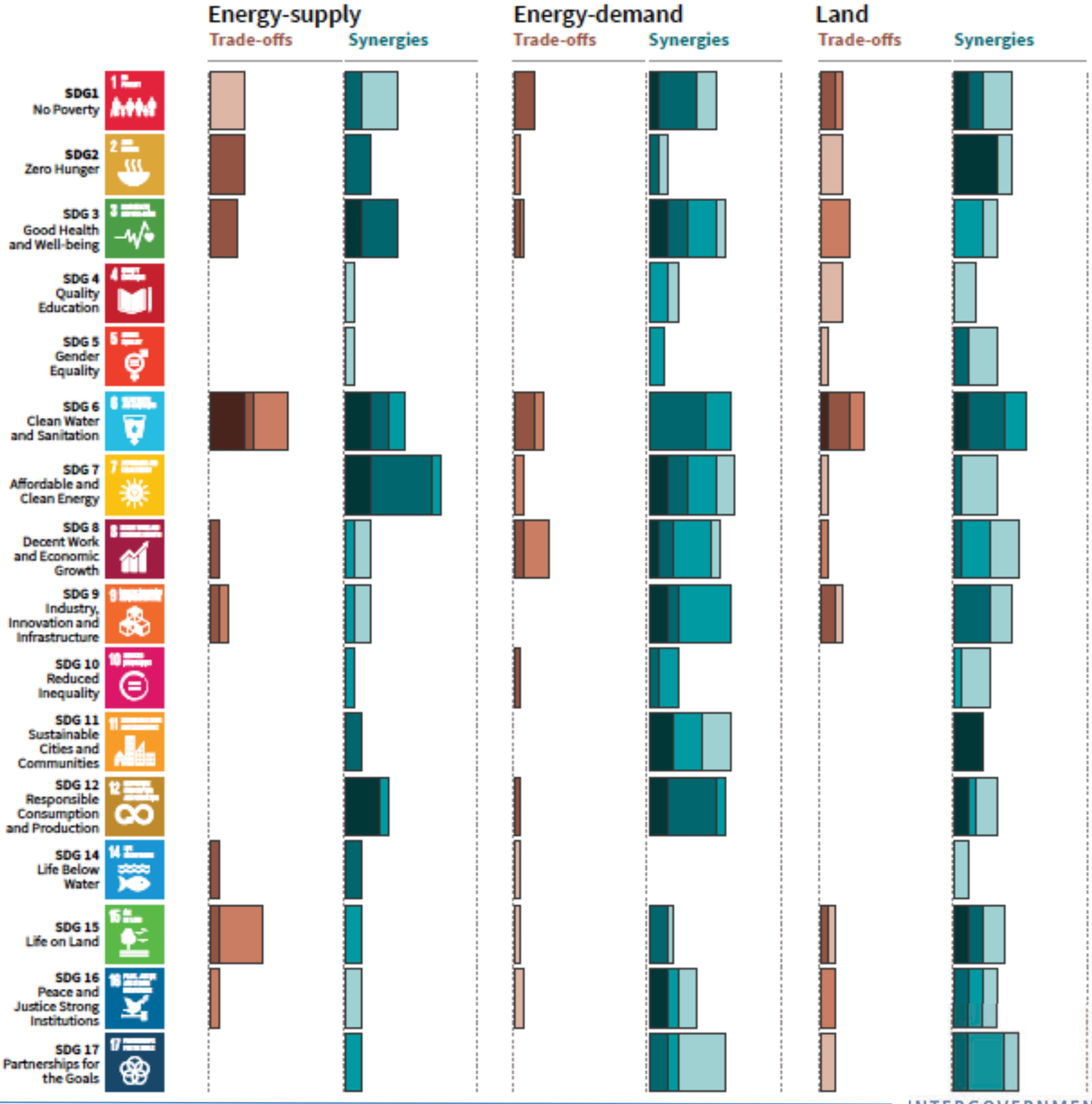
Length shows strength of connection

The overall **size of the coloured bars** depict **the relative** for synergies and trade-offs between the sectoral mitigation options and the SDGs.

Shades show level of confidence

The shades depict **the level of confidence** of the assessed potential for **Trade-offs/Synergies**.





Length shows strength of connection

The overall **size of the coloured bars** depict **the relative** for synergies and trade-offs between the sectoral mitigation options and the SDGs.

Shades show level of confidence

The shades depict **the level of confidence** of the assessed potential for **Trade-offs/Synergies.**

Very High *Low*

Indicative linkages between mitigation options and SDGs

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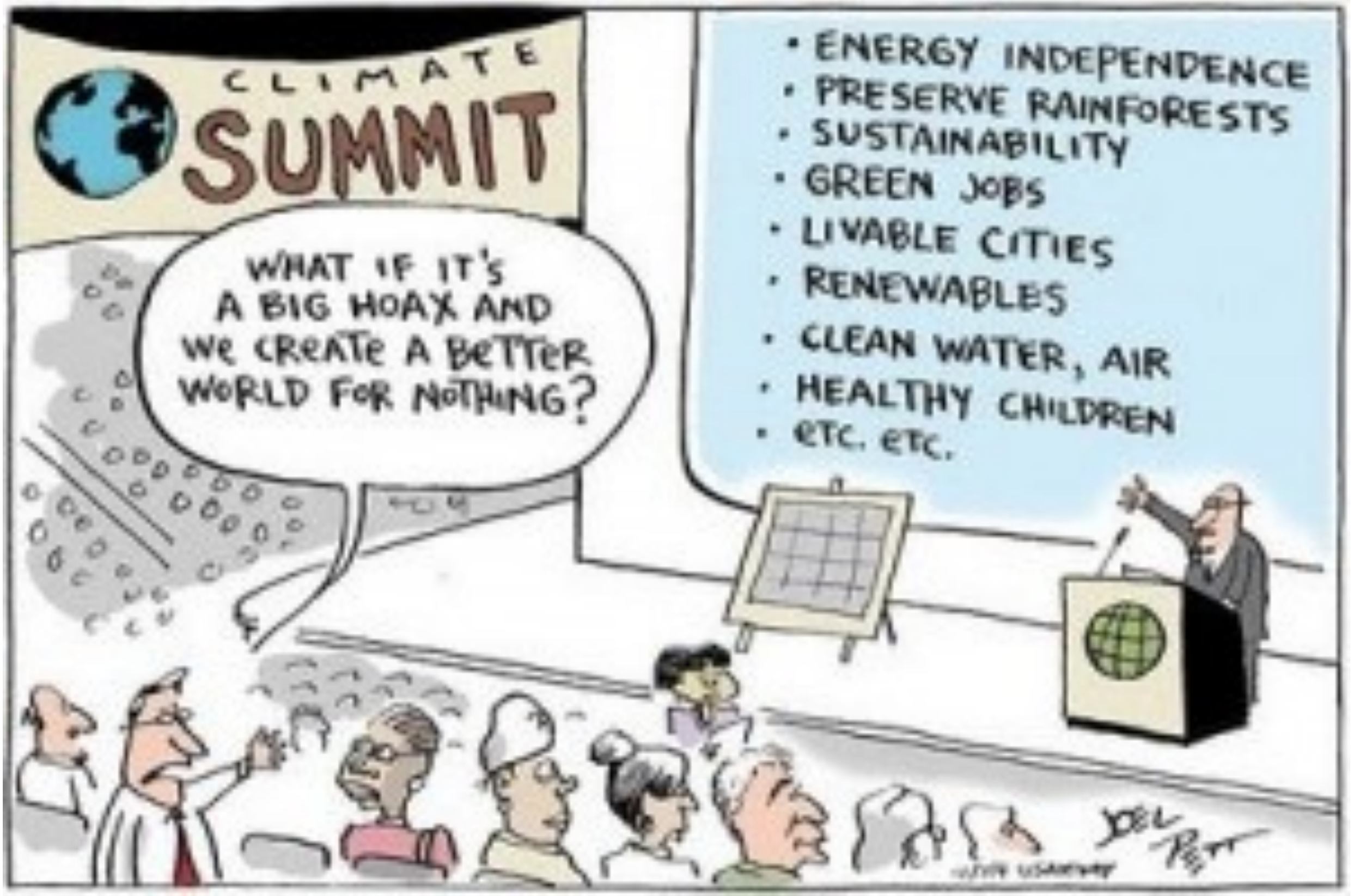
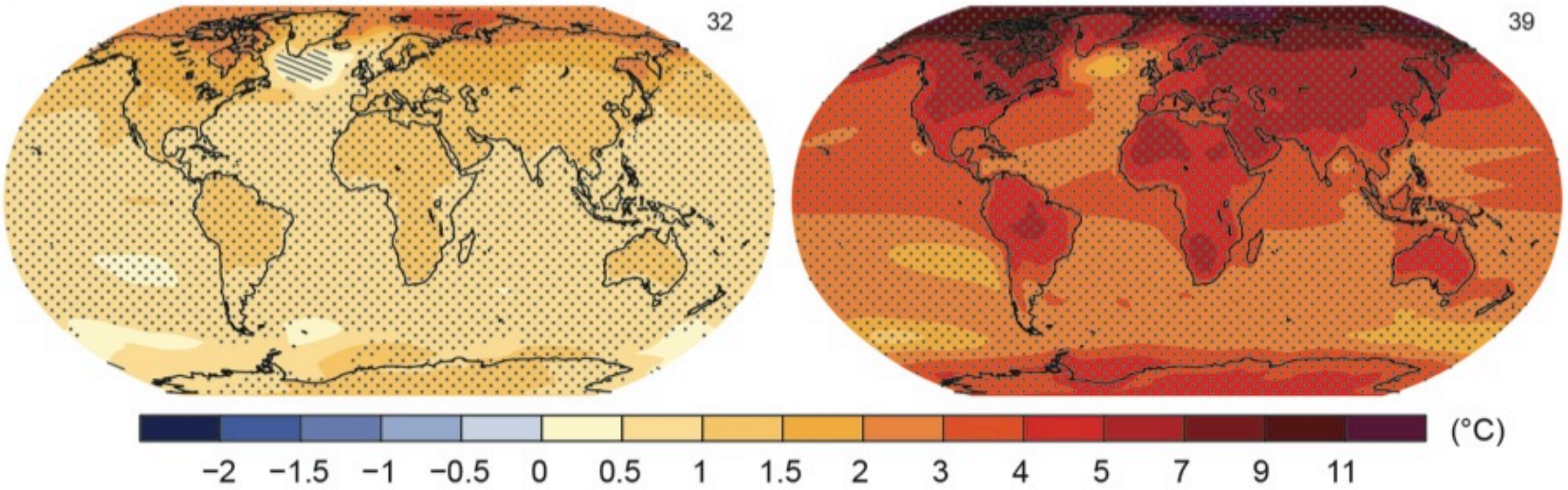


Joel Pett, USA Today

RCP2.6

RCP8.5

Fig. SPM.8



Humanity has the choice

Redenen voor hoop :

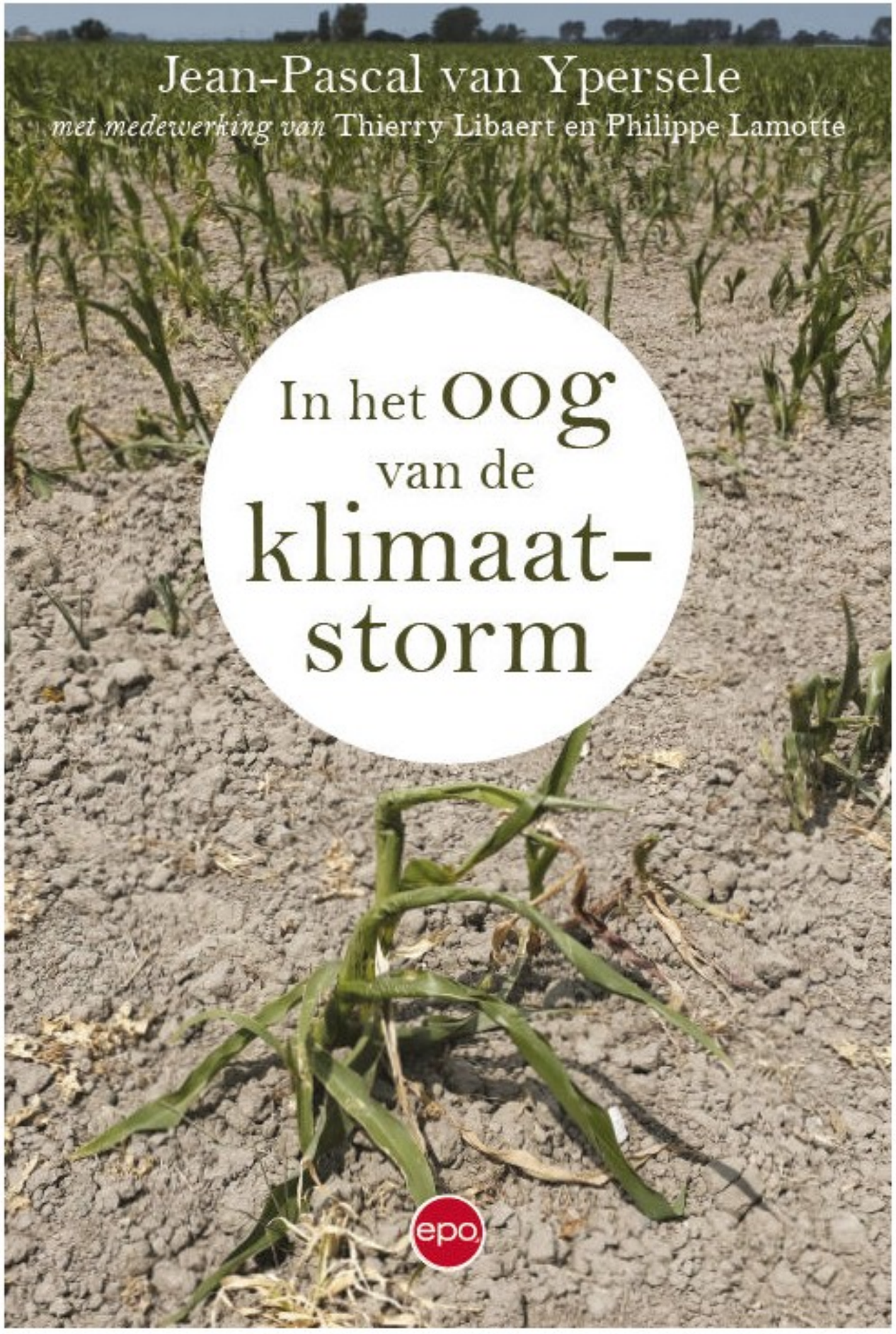
Greta, Anuna, Kyra, Adélaïde…

#YouthForClimate

Met @GretaThunberg op COP24

Bij EPO
(februari 2018)

Voorwoord:
Jill Peeters



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**

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