

Climate Change: 10 important facts, 10 possible elements of solution

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IPCC Vice-Chair from 2008 to 2015

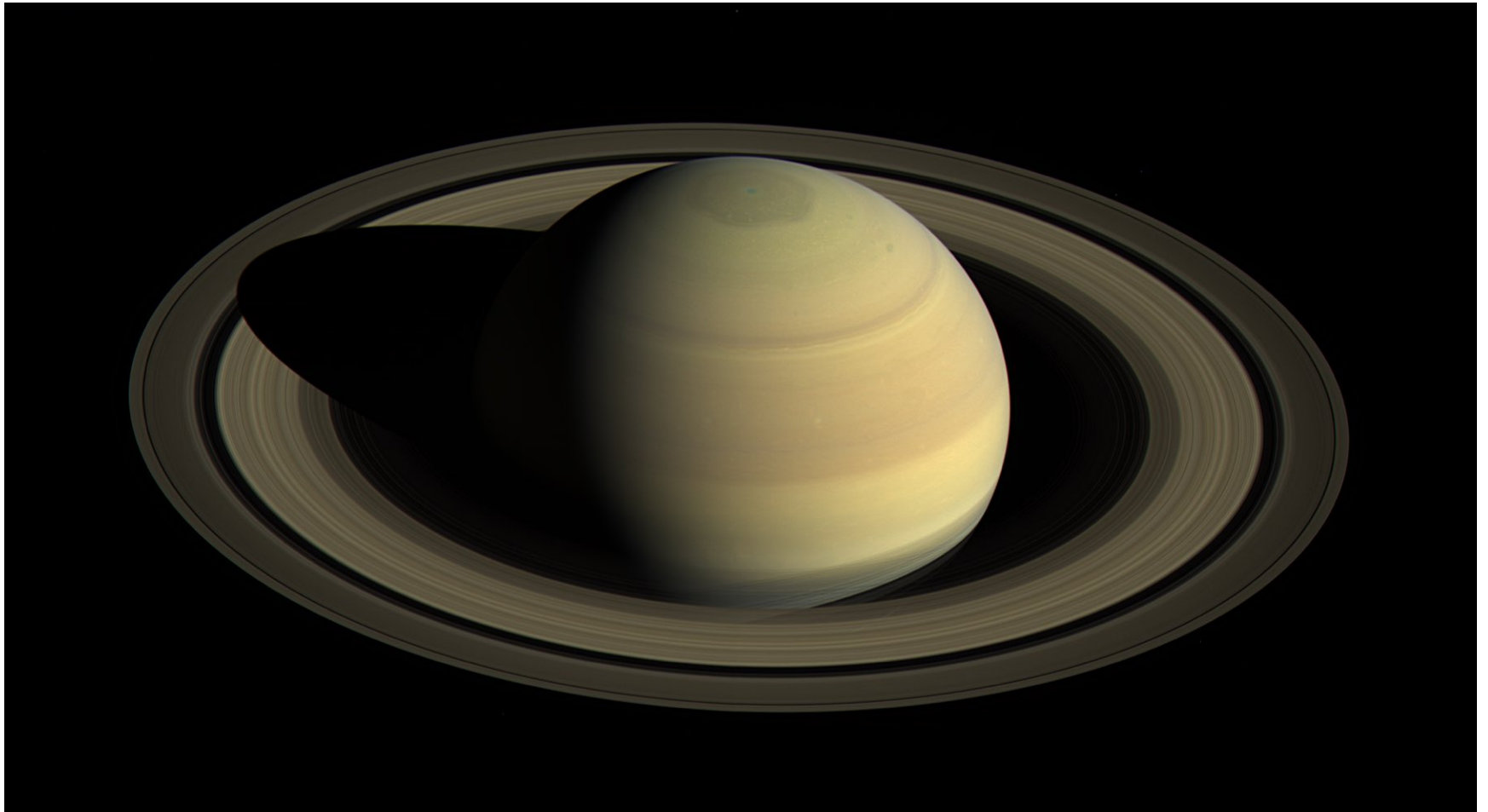
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**VIIth Environment Torres Conference, Universitat de Barcelona,
30 May 2018**

Thanks to the Walloon government for supporting www.pplateforme-wallonne-giec.be et my team at UCLouvain

Fact n^o 1: There is no planet B

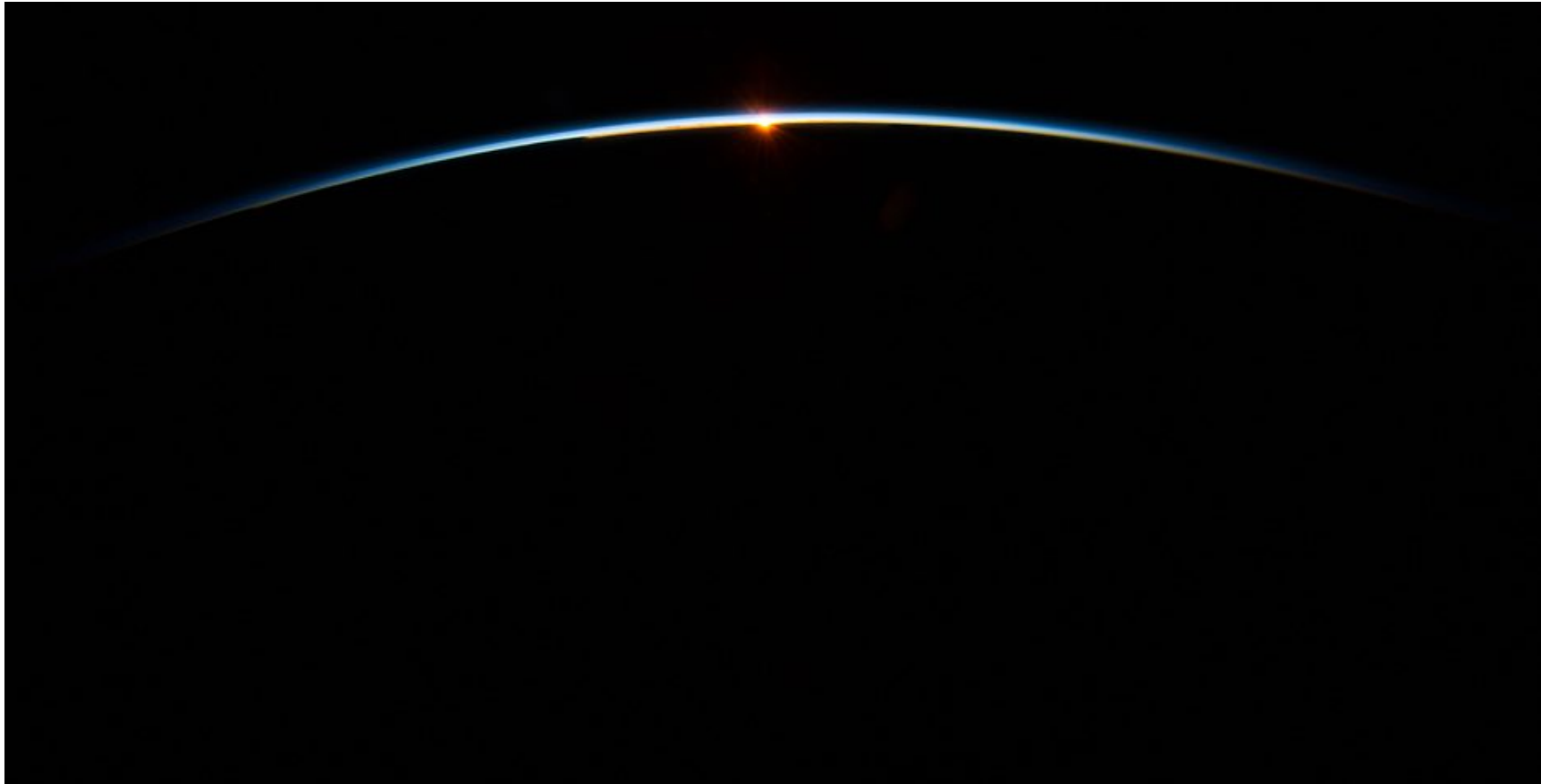
Saturn, as seen on 25-4-2016 from a 3 million km distance by the Cassini satellite launched in October 1997, 40 years after Sputnik



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



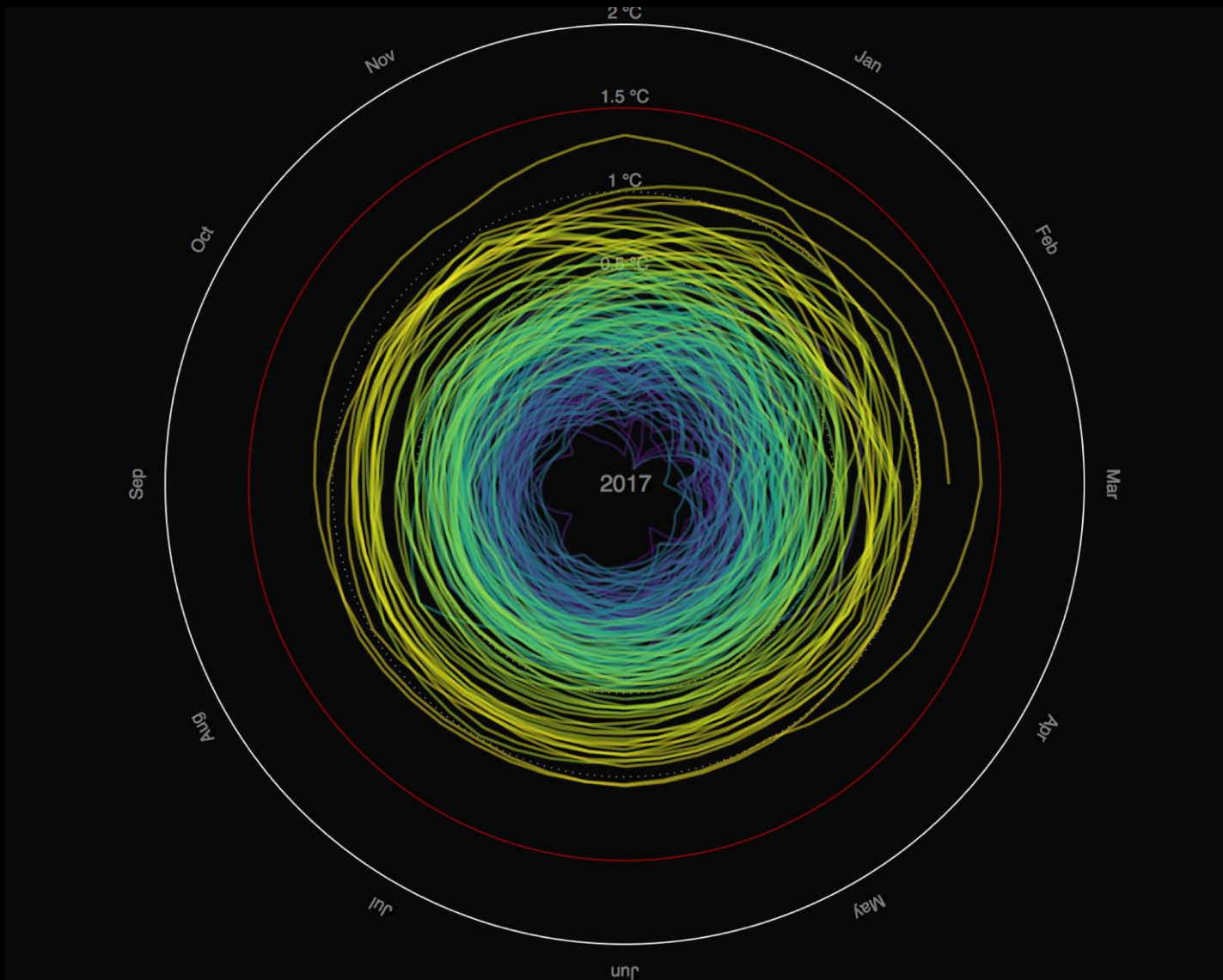
Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)



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

**Fact n° 2: We have changed the
composition of the atmosphere
and disturbed the climate
system**

Temperature spiral



Global Mean Temperature in °C relative to 1850 – 1900

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

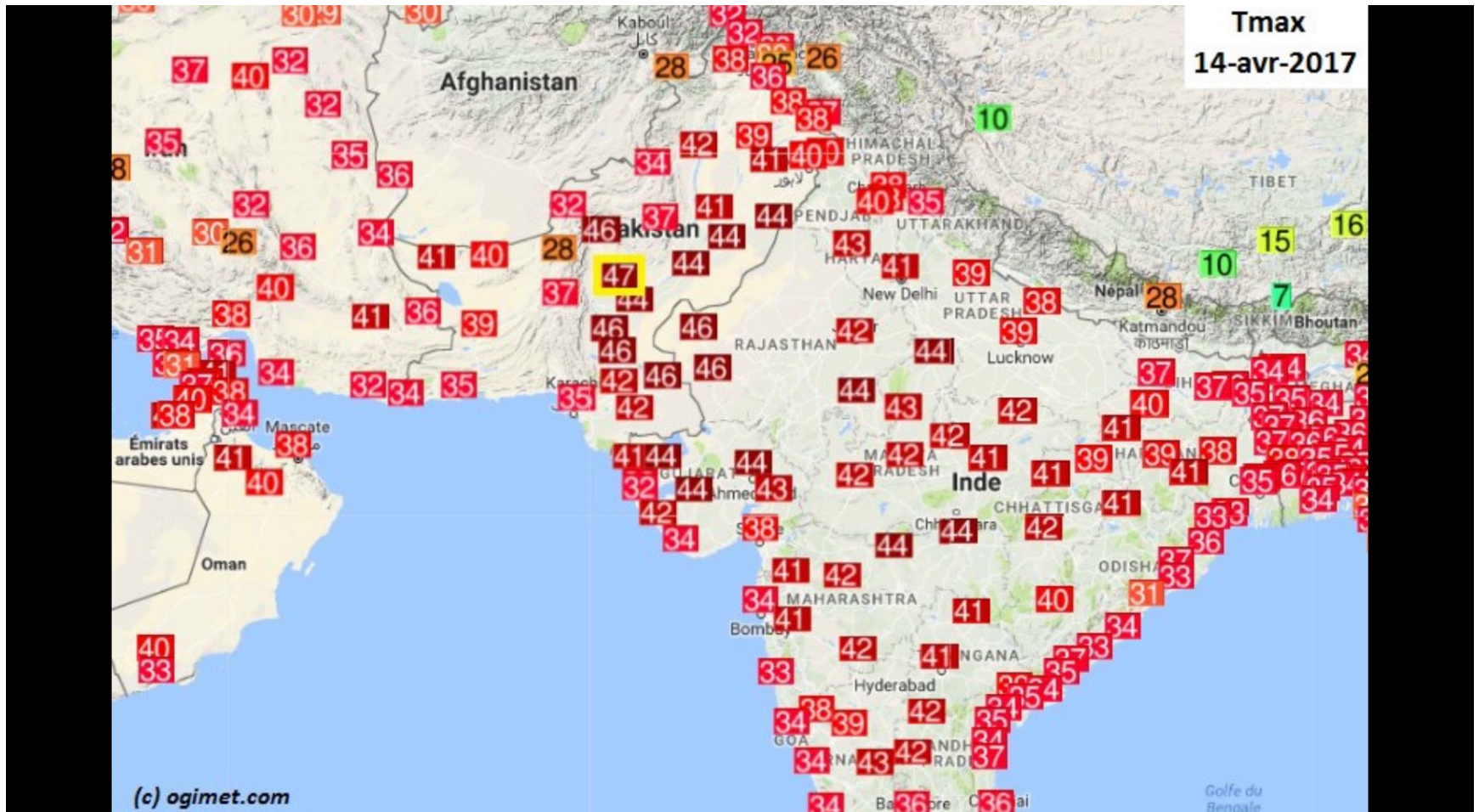
Animated version available on <http://openclimatedata.net/climate-spirals/temperature>

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

Heat waves kill



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

Fact n° 3: Because we use the atmosphere as a dustbin for our greenhouse gases, we thicken the insulation layer around the planet

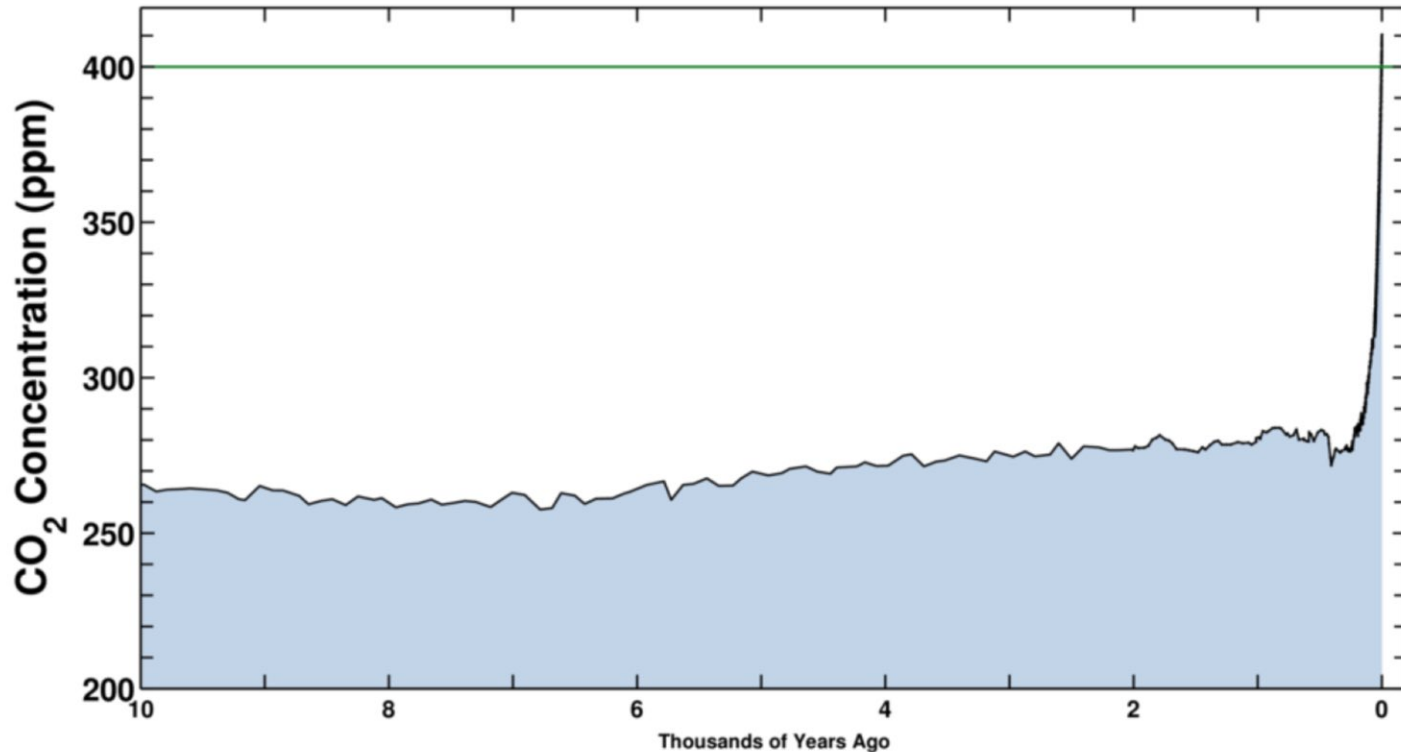
That is why we must cut emissions to ZERO as soon as possible

CO₂ Concentration, 28 May 2018 (Keeling curve)

Latest CO₂ reading
May 28, 2018

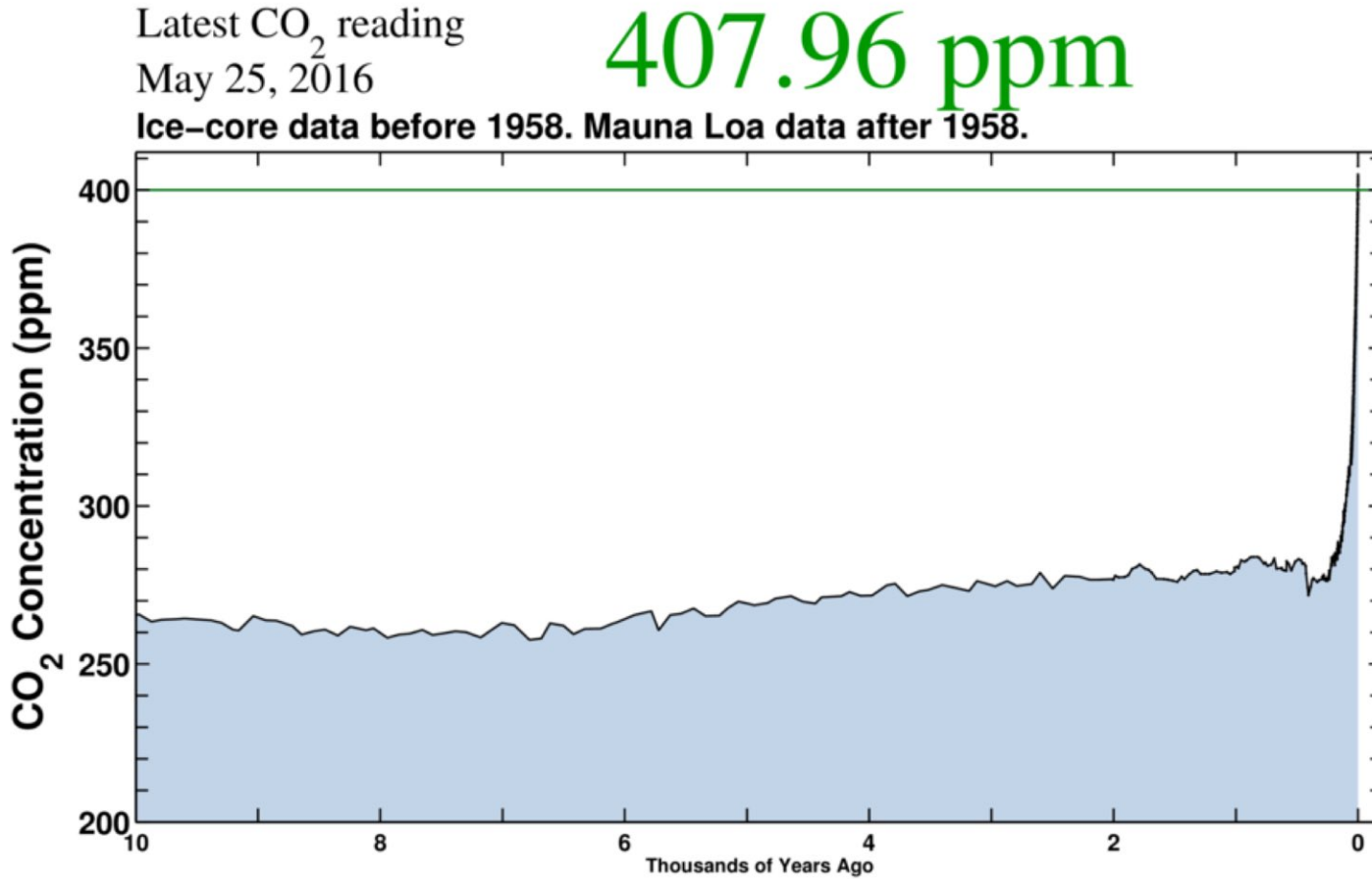
411.98 ppm

Ice-core data before 1958. Mauna Loa data after 1958.

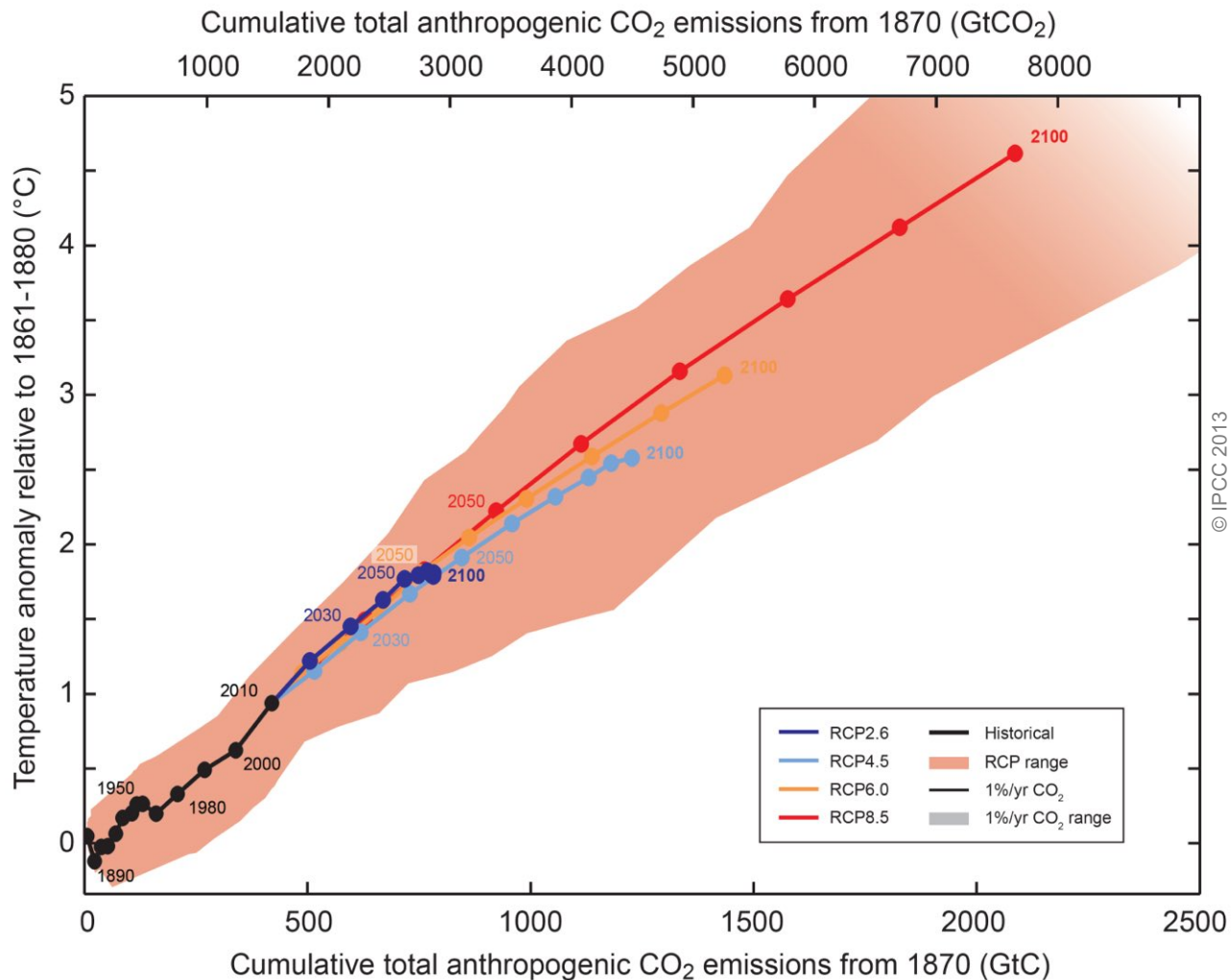


Source: scripps.ucsd.edu/programs/keelingcurve/

CO₂ Concentration, 25 May 2016 (Keeling curve)



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



© IPCC 2013

Fig. SPM.10

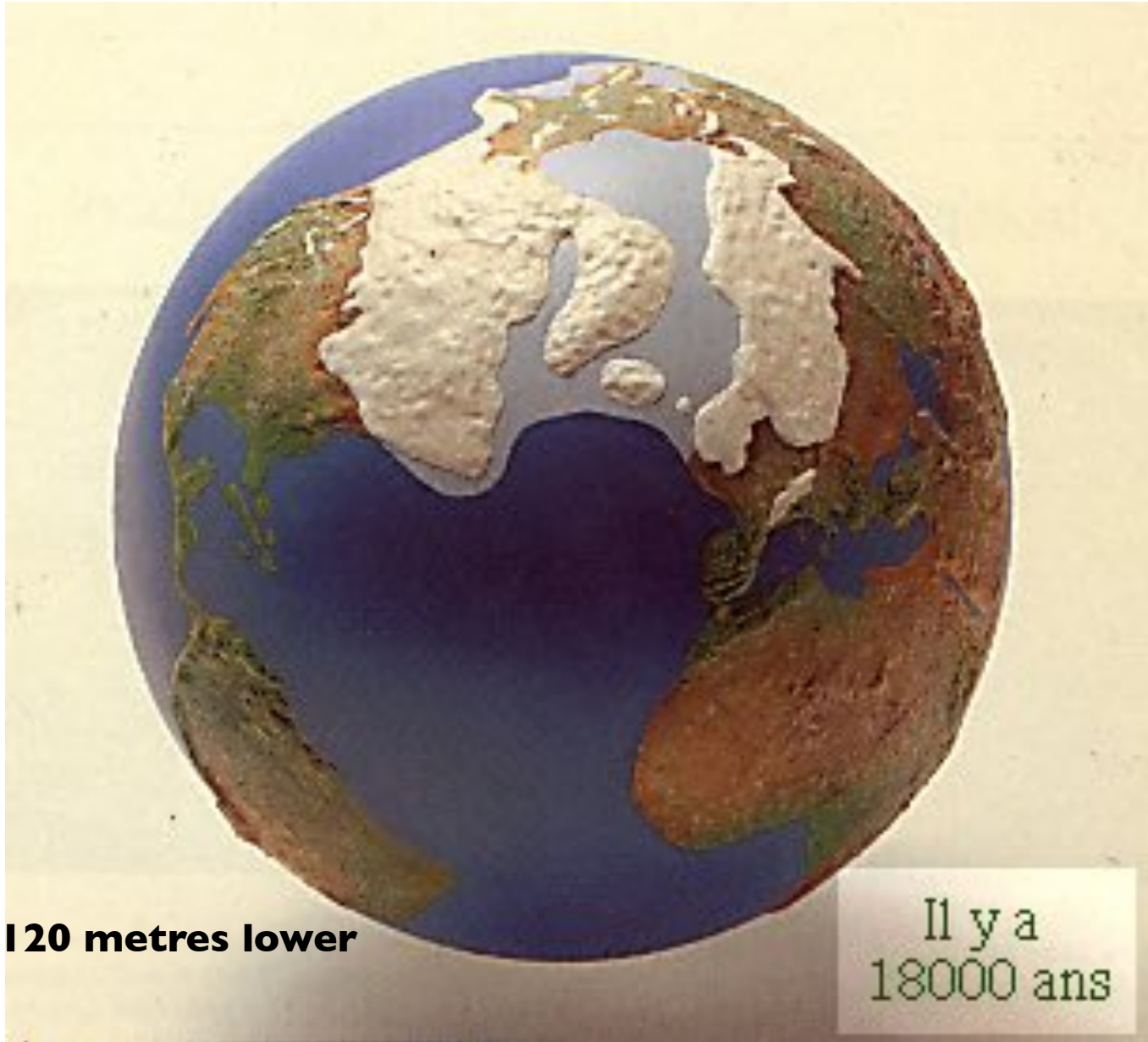
Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

Fact n° 4: Average temperature is probably on its way to exceed the « conservation temperature » for the Greenland and (some of the) Antarctic ice sheet

There is therefore a very high risk that average sea level would increase by several metres over the next century or two

18-20000 years ago (Last Glacial Maximum)

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

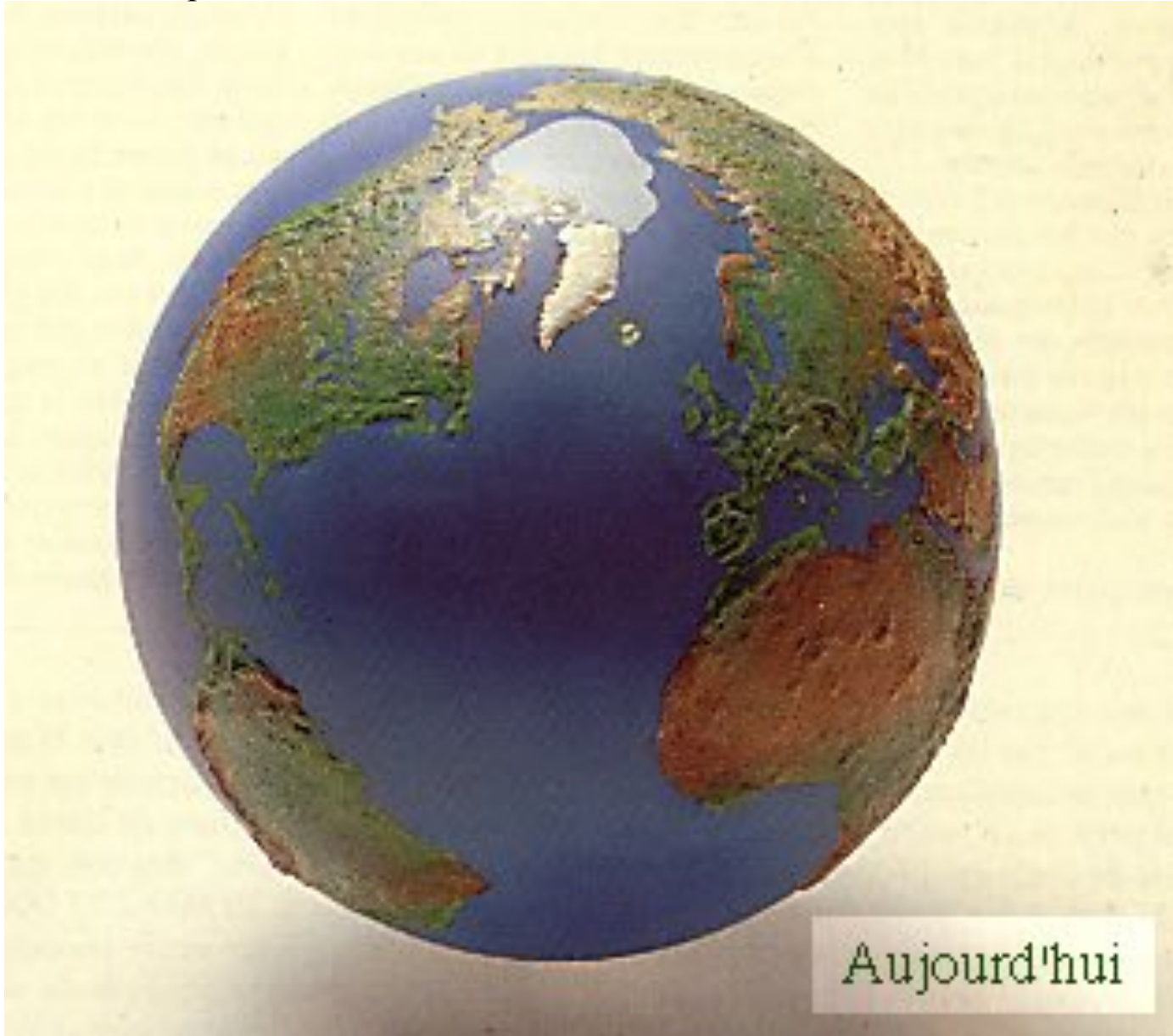


Sea level: 120 metres lower

Il y a
18000 ans

Today, with +4-5° C globally

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



Aujourd'hui

Fact n° 5: World Health Organization (2018): Air pollution kills 7 millions people per year (inc. 500 000 in Europe)

Sources of air pollution are broadly the same as those affecting climate: fossil fuels, wood and biomass combustion

Fine particulates from fossil fuel and wood burning kill



Photo: Jerzy Gorecki, Pixabay

Children are particularly sensitive to air pollution



Photo: Indiatoday.in, 6-12-2017

**Fact n° 6: Climate change
impacts poor people first, but we
are all on the same spaceship**

Belgian Prime Minister Charles Michel (RTBF,
4 May 2018): « when there is a geopolitical
instability, we pay the cost as well »

Risk = Hazard x Vulnerability x Exposure

(Victims of New Orleans floods after Katrina in 2005)



Effects on the Nile Delta, where more than 10 million people live less than 1 m above sea level



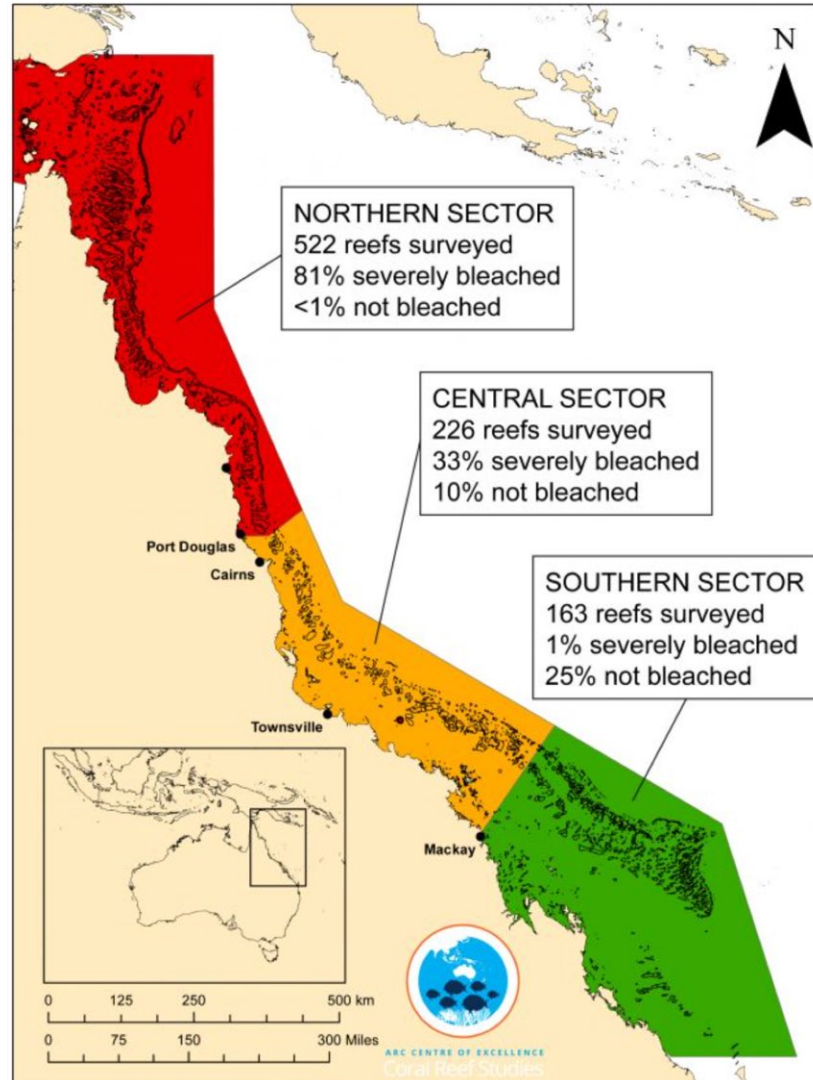
NB: + 1 m is possible
in the next 100 years...

(Time 2001)

Fact n° 7: Ecosystems suffer more and more, while our wellbeing depends on their good state

« Miners use canaries to warn them of deadly gases. It might not be a bad idea if we took the same warning from the dead birds in the countryside »
(Duke of Edinburgh at the Wildlife Fund dinner, quoted in « Silent Spring » (Rachel Carson, 1962))

2016: Only 7% of the Great Barrier Reef has avoided coral bleaching



**Fact n° 8: In the USA alone,
organizations which sow doubt
about climate change spend almost
a billion dollars/year! (Brulle 2014, average
numbers for 2003-2010)**

The European Union fares a little better, but many Brussels lobbyists try to dilute the EU environmental efforts (see the car industry...)

The « merchants of doubt » have evolved in their arguments:

- Existence of global warming
- Human responsibility in the warming
- Cost of decarbonization
- Drawbacks from alternatives

(recent example: so-called enormous needs of cobalt for electric mobility reported on CNN; see critical analysis on <https://www.desmogblog.com/2018/05/02/cnn-wrongly-blames-electric-cars-unethical-cobalt-mining>)

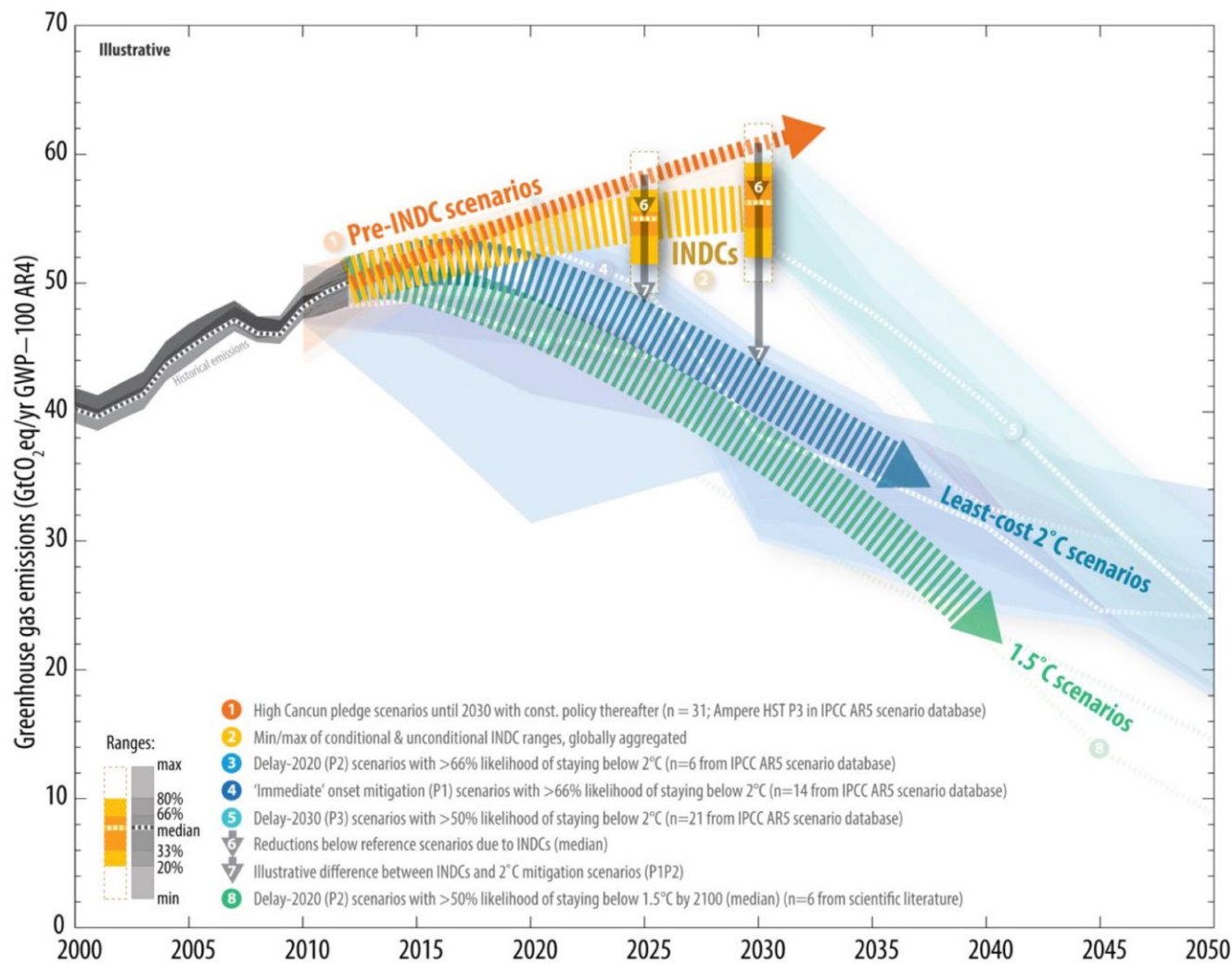
**Fact n° 9: European Union
spends at least 1 billion euros
per day simply to buy fossil fuels
outside its borders.**

True, decarbonizing the EU economy will cost, but not doing it could cost much more in impacts. Saving these 400 billions €/year could offer many opportunities

Fact n° 10: China is waking up to the climate and pollution challenge. It might become the world climate leader if the EU (5% of world population in 2050 ?) does not raise its ambition level in line with the Paris Agreement

The US economy will become less and less attractive, as it risks missing the decarbonizing trend. Hopefully, climate measures at the level of US cities and states can somewhat compensate federal actions

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>

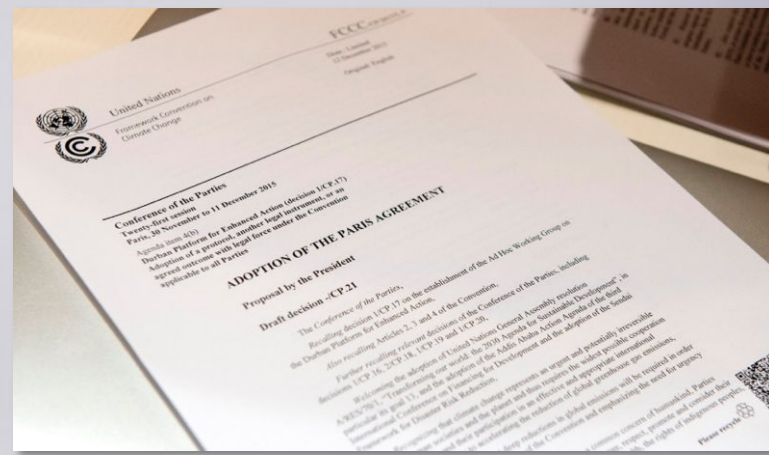
**(Element) of solution n° 1: The
survival of humanity and
ecosystems must become a
much higher political priority**

... as if we were at war, or all running for our life.

Sur les Changements Climatiques 2015

COP21/CMP11

Paris, France



Solution n° 2: Economic actors must be confronted much more clearly with their responsibilities

Degrowth of climate-unfriendly activities must be accepted, while growth of activities helping climate protection and poverty eradication must be encouraged

Solution n° 3: The best understood language is the price. Destroying the environment must become more and more expensive. Collected funds must be used to help the decarbonization, and avoid impacting the poor disproportionately

EU Emission Trading System, CO₂ taxes, fines, internal CO₂ price (firms do « as if » CO₂ emission was expensive). NB: Price must match the effect desired!

**Solution n° 4: Transition
towards a clean and sustainable
economy and energy system
must be « just »**

**Ex : The Polish energy system cannot
be transformed without facilitating
the coal miners reconversion**

Solution n° 5: Before looking at how to produce energy cleanly, much more attention must be given to reducing energy demand, in all sectors

All production and consumption patterns must be reconsidered, helped by energy audits, etc.

- **Substantial reductions in emissions to stay under 2° C 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**

Adaptation issues and prospects:

Water

1. Reducing non-climate stressors on water resources

Demand management and conservation are methods that target **efficiency**.

Conservation begins by **reducing high losses from water supply** distribution systems. Demand



management has gone largely unaddressed since most water utilities still focus on infrastructure development rather than on conservation.

<http://www.greenfacts.org/en/water-resources/l-3/6-sustainable-management.htm#2p0>

Solution n° 6: Building sector: offers many opportunities in energy saving, economic activity, improving wellbeing...

Trying to practice what I « preach »



Trying to practice what I « preach »



Solution n° 7: Mobility : much more space and priority to pedestrians, bicycles, and public transport; reduce priority given too long to individual transport in urban planning

Electrify remaining vehicles (with clean electricity). Fly less.

Solution n° 8: Food and agriculture. A possible change with big positive impact: eat less meat, of better quality! Eat more plant-based food (produced cleanly)

...It is good for health as well!

**Solution n° 9: Sun gives us in
two hours about as much
energy as the world uses in *one*
year, all forms of energy
considered**

The cost of solar kWh is crashing, wind power, heat and electricity storage, and smart grids are moving forward

Solution n° 10: Banks and the finance sector increasingly see the opportunities in climate-friendly and ethical investments promoting the 17 Sustainable Development Goals



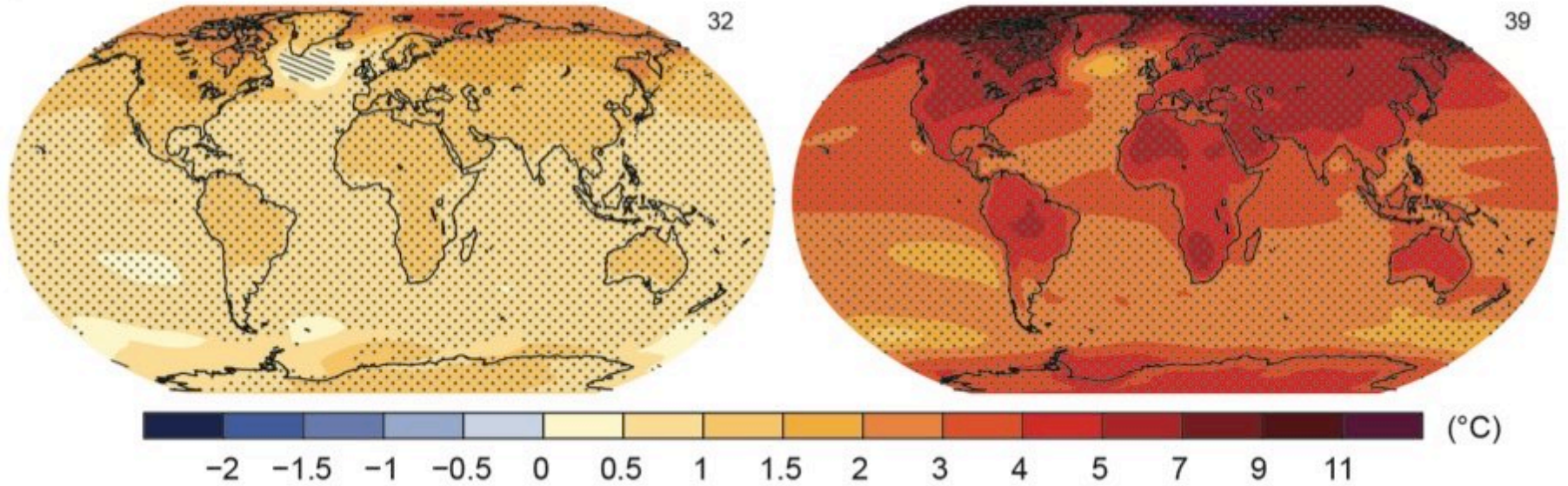
SUSTAINABLE DEVELOPMENT GOALS



RCP2.6

RCP8.5

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

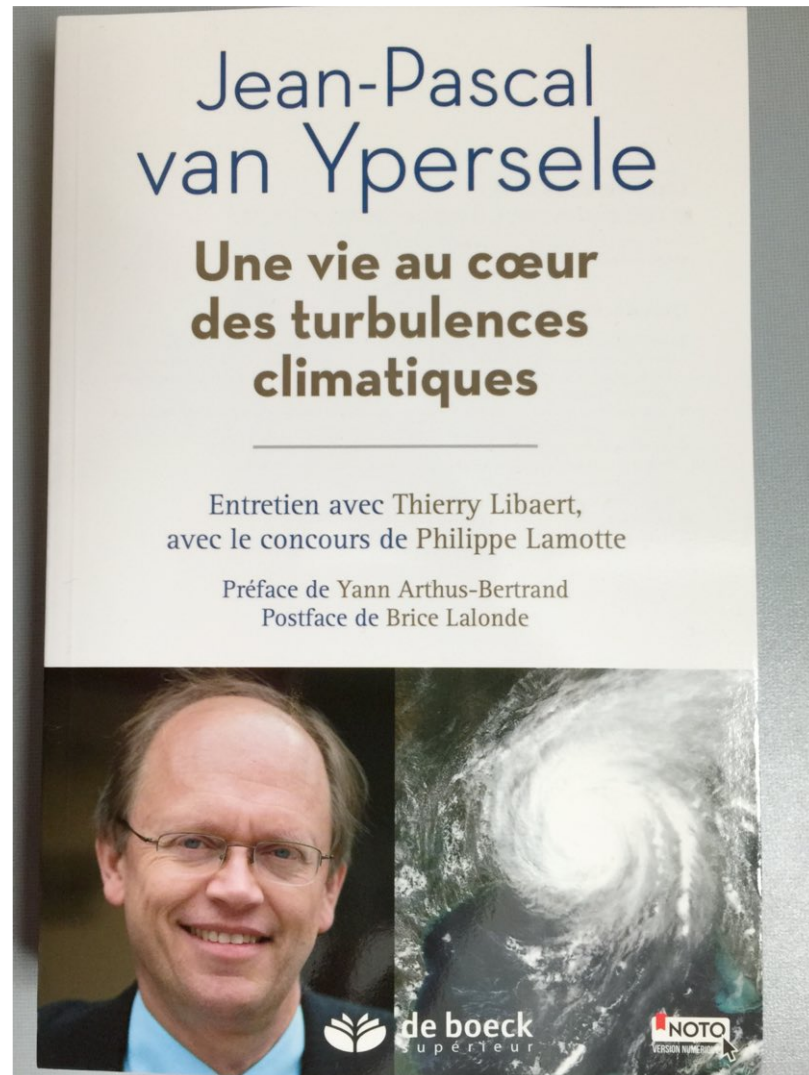


Humanity has the choice

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**Lisez mon livre, où
j'aborde tous ces sujets**

**Publié chez De Boeck
supérieur**



To go further :

- www.climate.be/vanyp : my slides (under « conferences)
- www.ipcc.ch : IPCC
- www.realclimate.org : answers to the merchants of doubt arguments
- www.skepticalscience.com : same
- **Twitter: @JPvanYpersele**
@IPCC_CH