

# **Some of the reasons for climate urgency, and for keeping hope**

**Jean-Pascal van Ypersele**

**(Université catholique de Louvain, Belgium)**

**IPCC Vice-Chair from 2008 to 2015**

**Twitter: @JPvanYpersele**

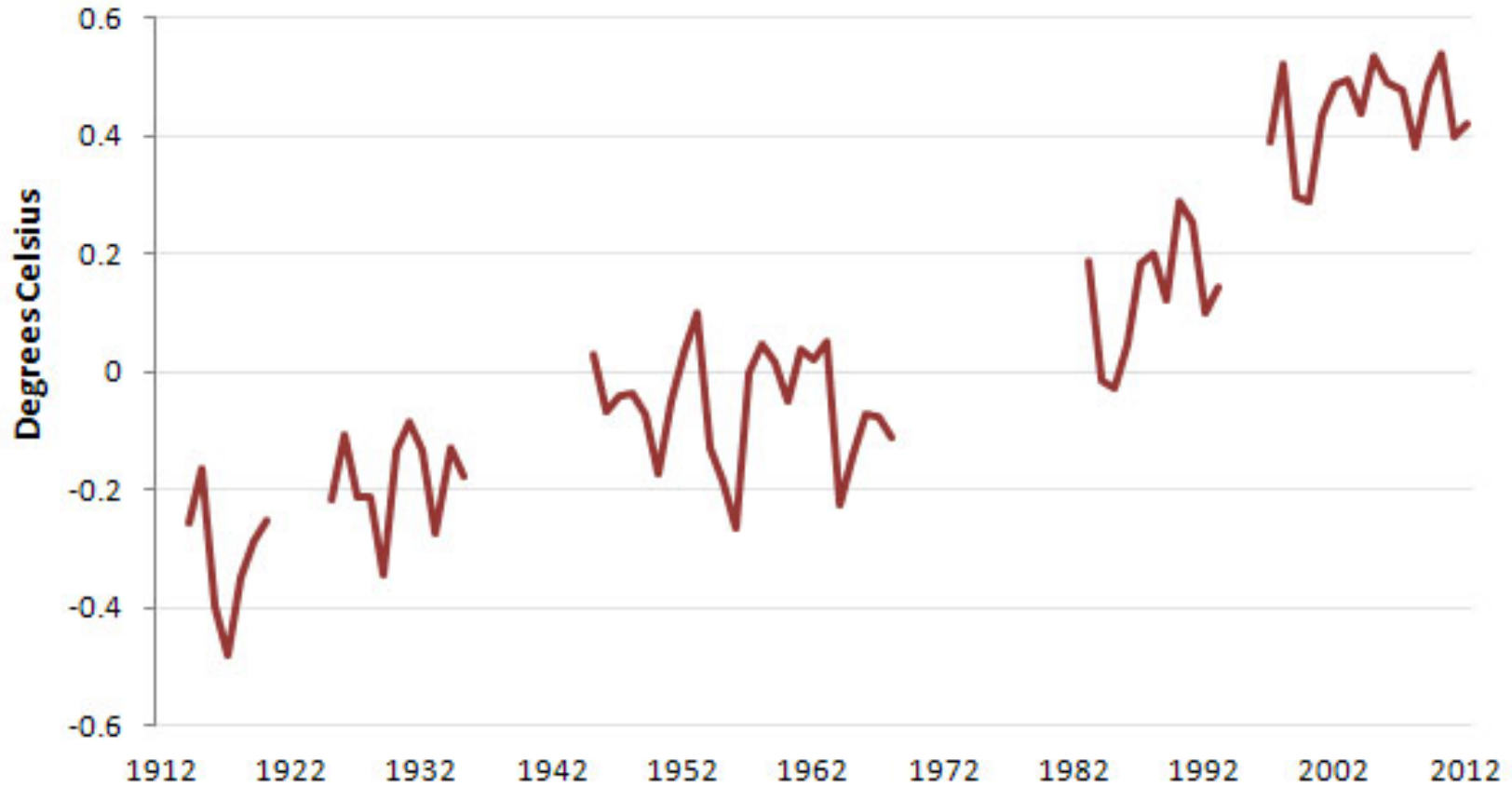
**SMILE for the Future, Lausanne, 8 August 2019**

## Temperature Change From 1961-1990 Average



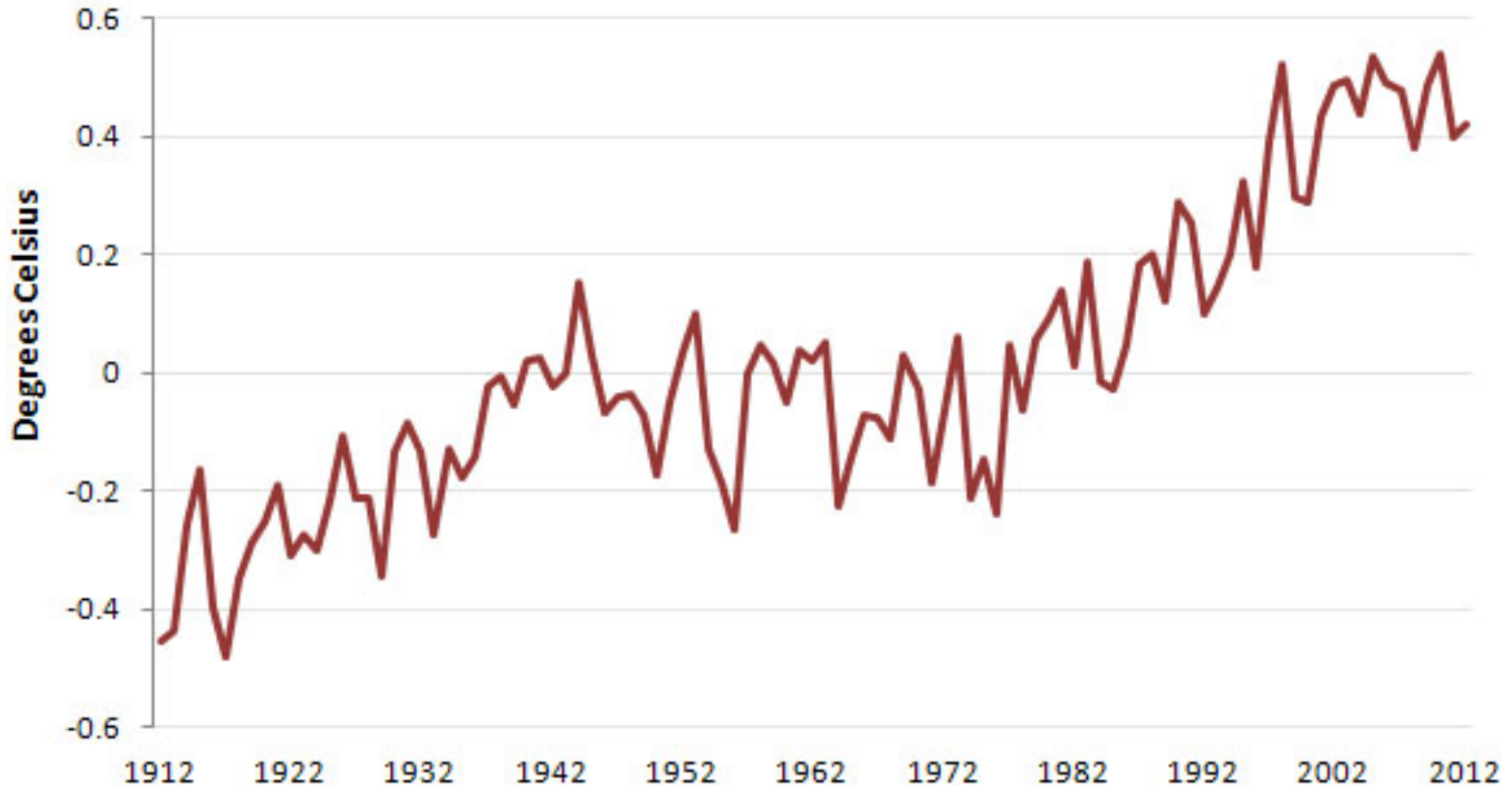
# Lying With Statistics, Global Warming Edition

## Temperature Plateaus — 1912-2012



# Lying With Statistics, Global Warming Edition

## Temperature Change From 1961-1990 Average



# 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

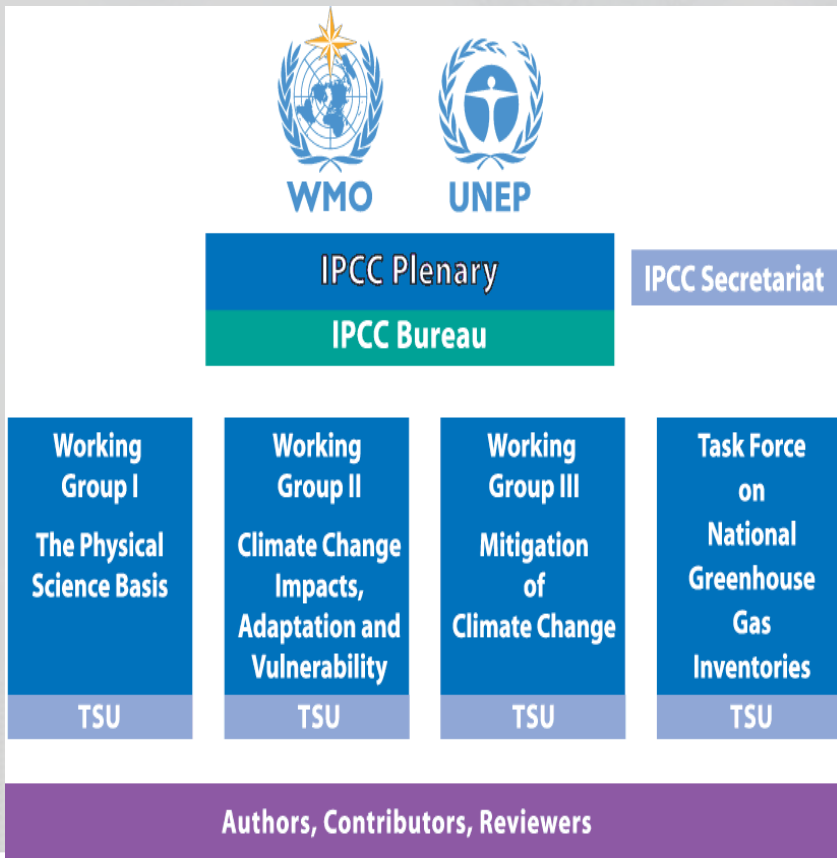




IPCC Reports are  
policy-relevant,  
**NOT**  
policy-prescriptive

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

# Inter-governmental Panel on Climate Change (IPCC): Organization Structure



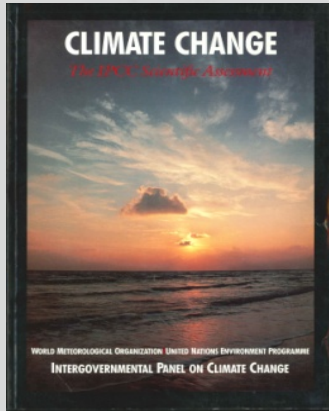
- IPCC plenary comprises of all countries in the world
- IPCC Bureau comprises of 34 elected members; IPCC elects its Bureau every 6-7 years
- 3 Working Groups & a Task Force on National Greenhouse Gas Inventories
- Authors, Contributors, Reviewers, Review Editors

# IPCC writing cycle (4 years, 831 Lead authors)

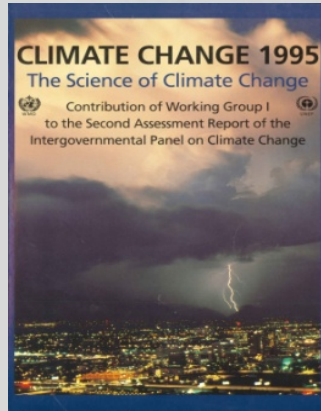
- Plenary decides table of content of reports
- Bureau appoints world-class scientists as authors, based on publication record
- Authors assess all scientific literature
- *Draft* – Expert review (+ Review editors)
- *Draft 2 (+ Draft 1 Summary for Policy Makers (SPM))* – Combined expert/government review
- *Draft 3 (+ Draft 2 SPM)* – Government review of SPM
- Approval Plenary (interaction authors – governments) – *SPM and full report*
- ***NB: the scientists have the last word!***



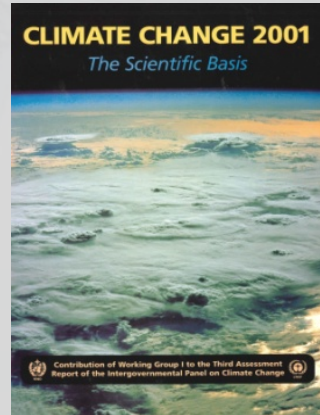
# IPCC Assessment Reports



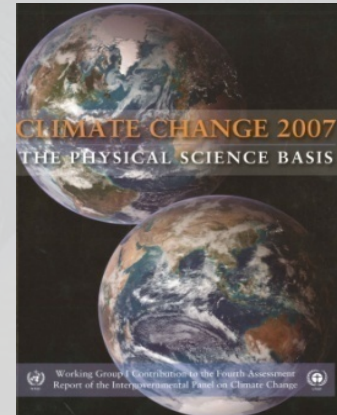
FAR 1990



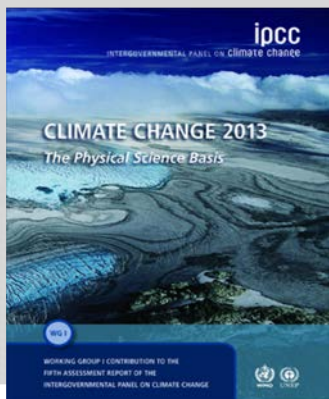
SAR 1995



TAR 2001



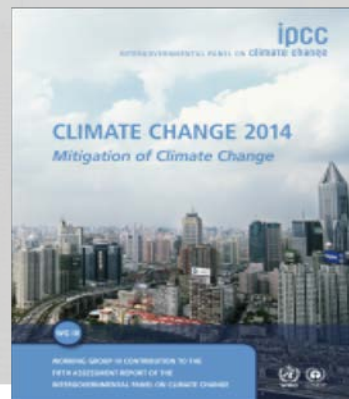
AR4 2007



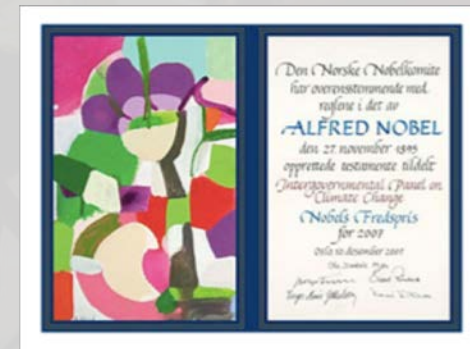
AR5 WGI 2013



AR5 WGII 2014



AR5 WGIII 2014



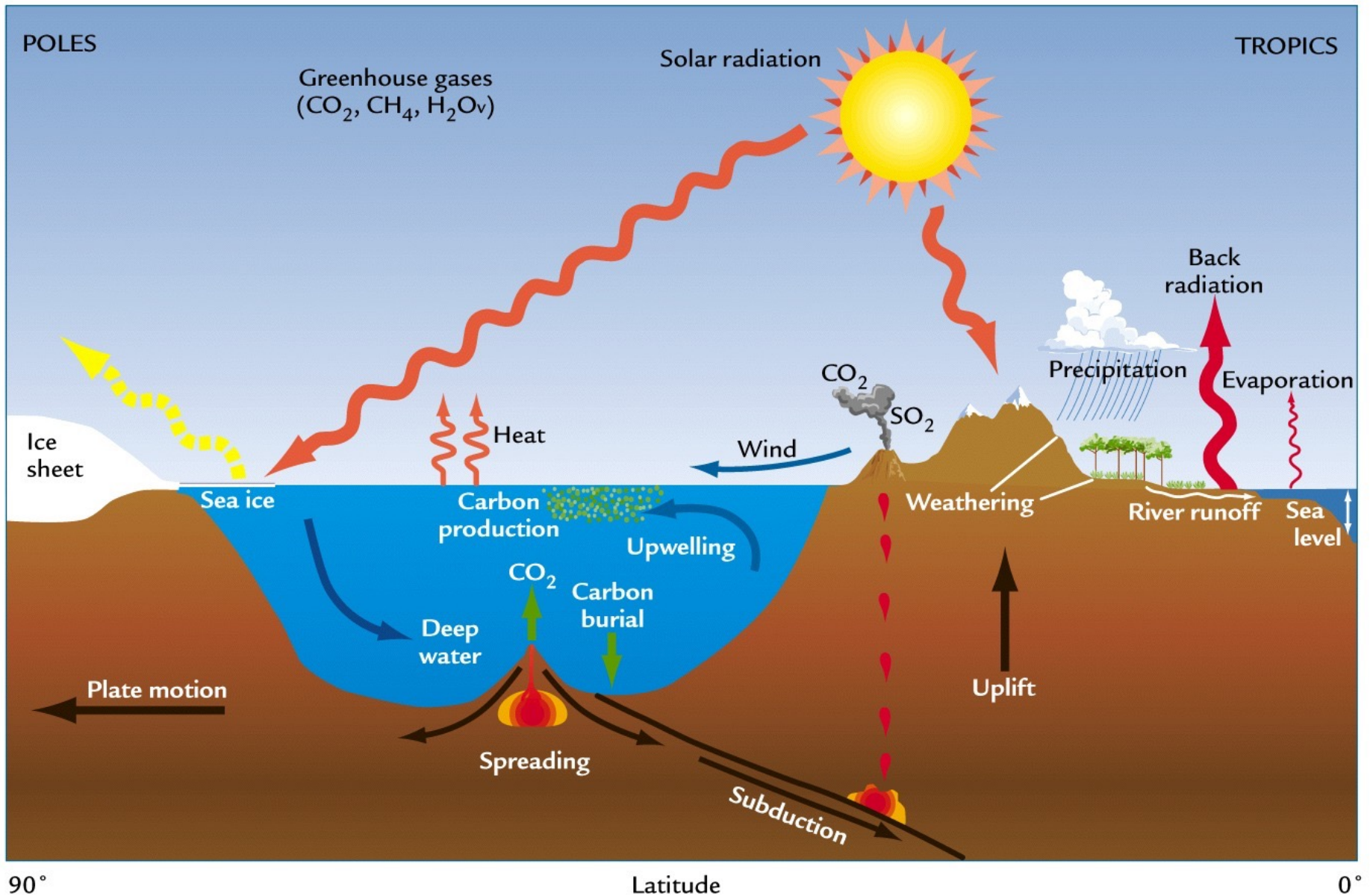
# The IPCC assessments have influenced global action on an unprecedented scale

1. The First Assessment Report (FAR, 1990) had a major impact in defining the content of the **UNFCCC**
2. The Second Assessment Report (SAR, 1996) was largely influential in defining the provisions of the **Kyoto Protocol**
3. The Third Assessment Report (TAR, 2001) focused attention on the **impacts** of climate change and the need for **adaptation**
4. The Fourth Assessment Report (AR4, 2007) informed the decision on the ultimate objective (**2° C**) and is creating a strong basis for a **post Kyoto Protocol** agreement
5. The Fifth Assessment Report (AR5, 2013-14) has informed the **review of the 2° C objective**, and the **preparation of the Paris 2015 agreement**

Reminder: There is no planet B

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



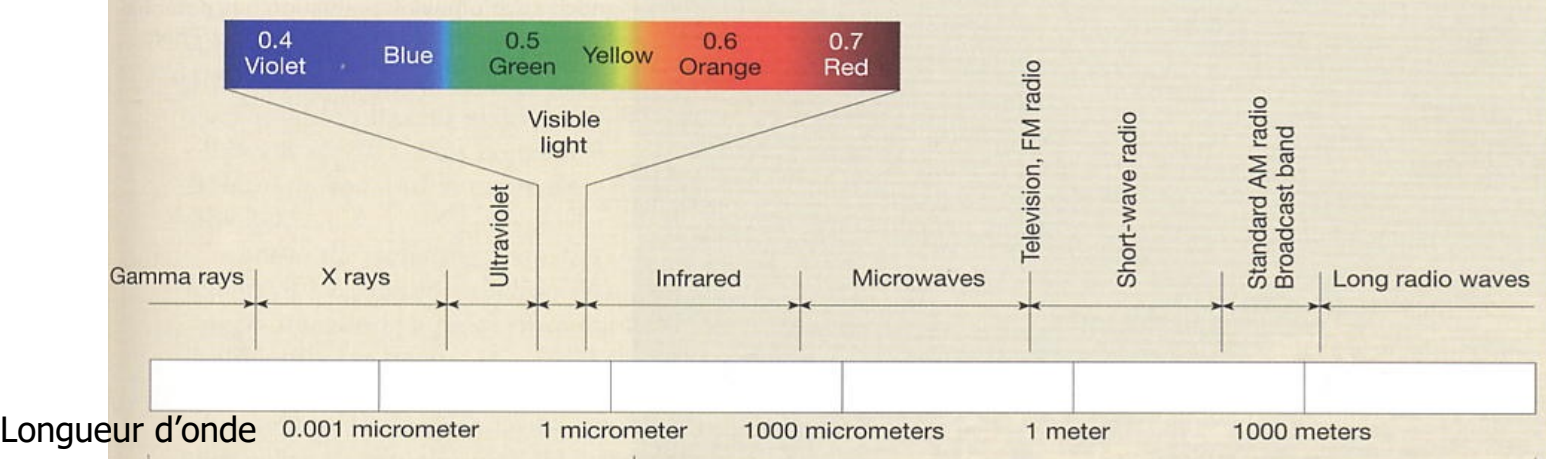


**Fact n° 1: Because we use the atmosphere as a dustbin for our greenhouse gases, we thicken the insulation layer around the planet**

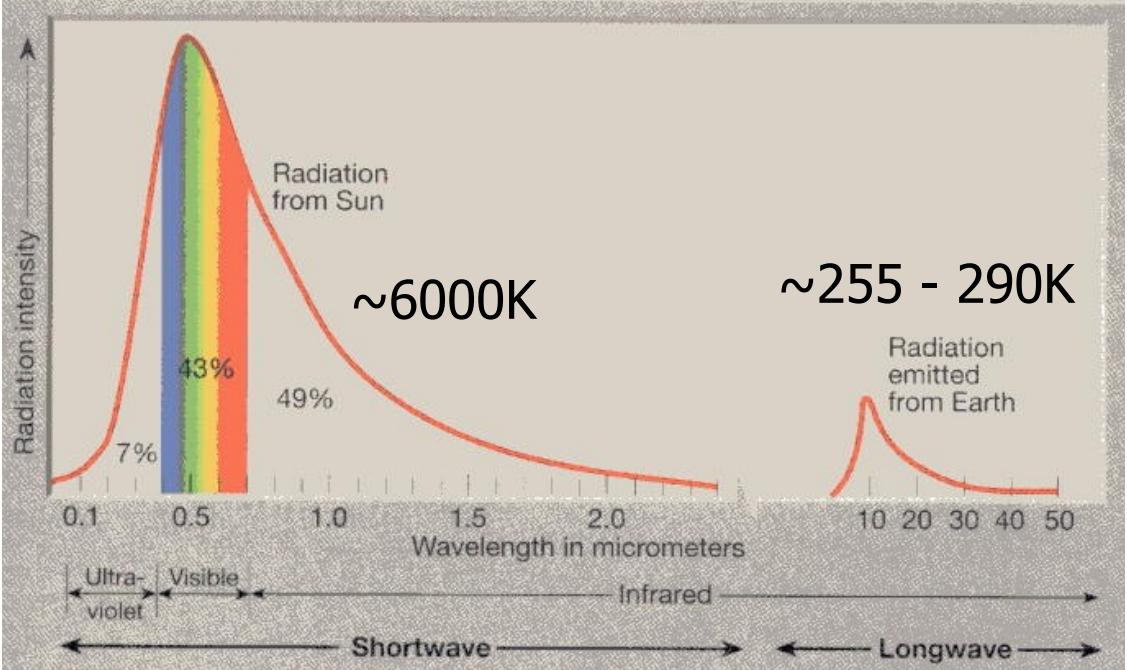
**That is why we must cut emissions to ZERO as soon as possible**



# Spectre du rayonnement électromagnétique



# Spectres des rayonnements solaire et terrestre

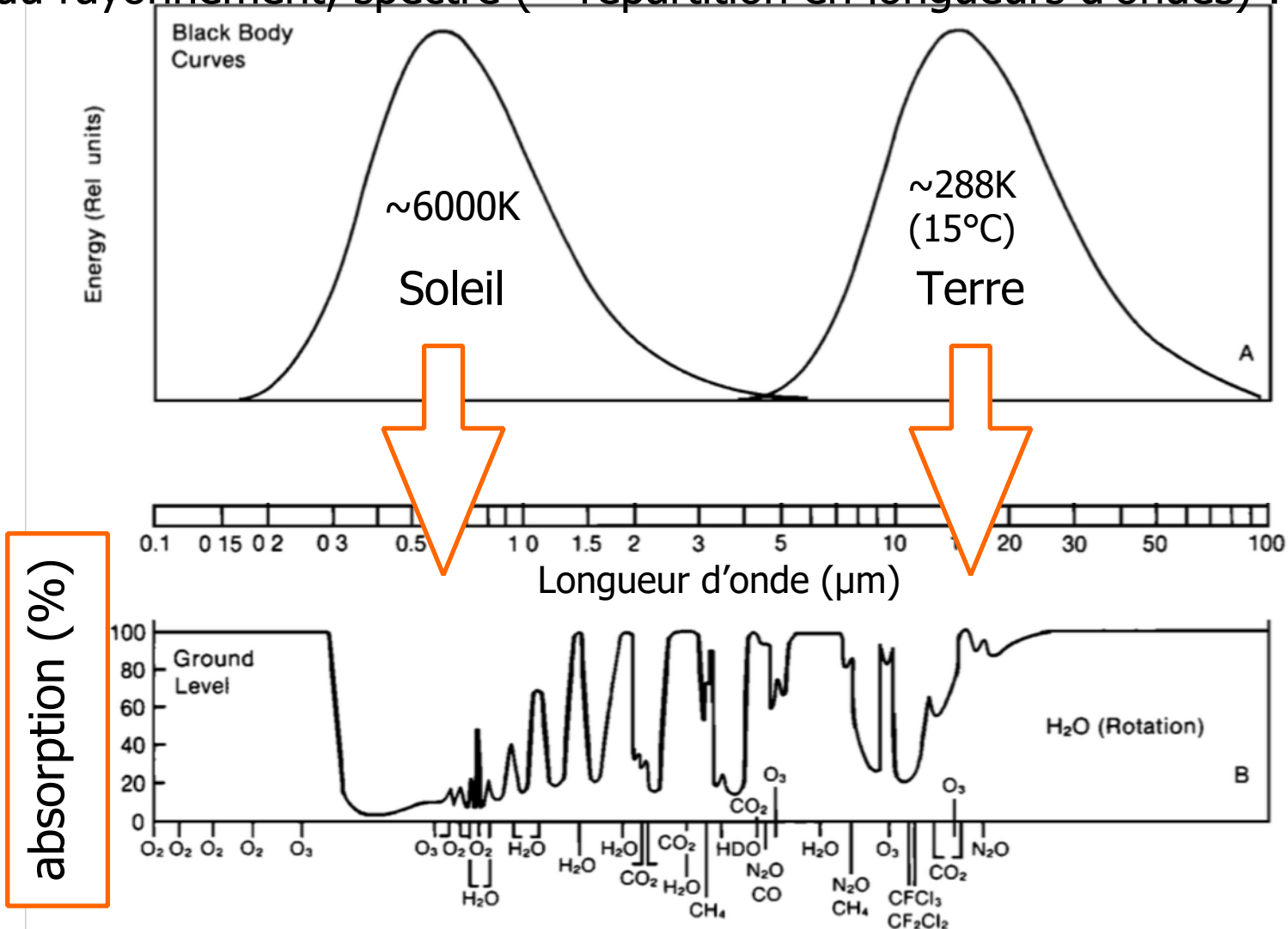


(0°C = +273K)

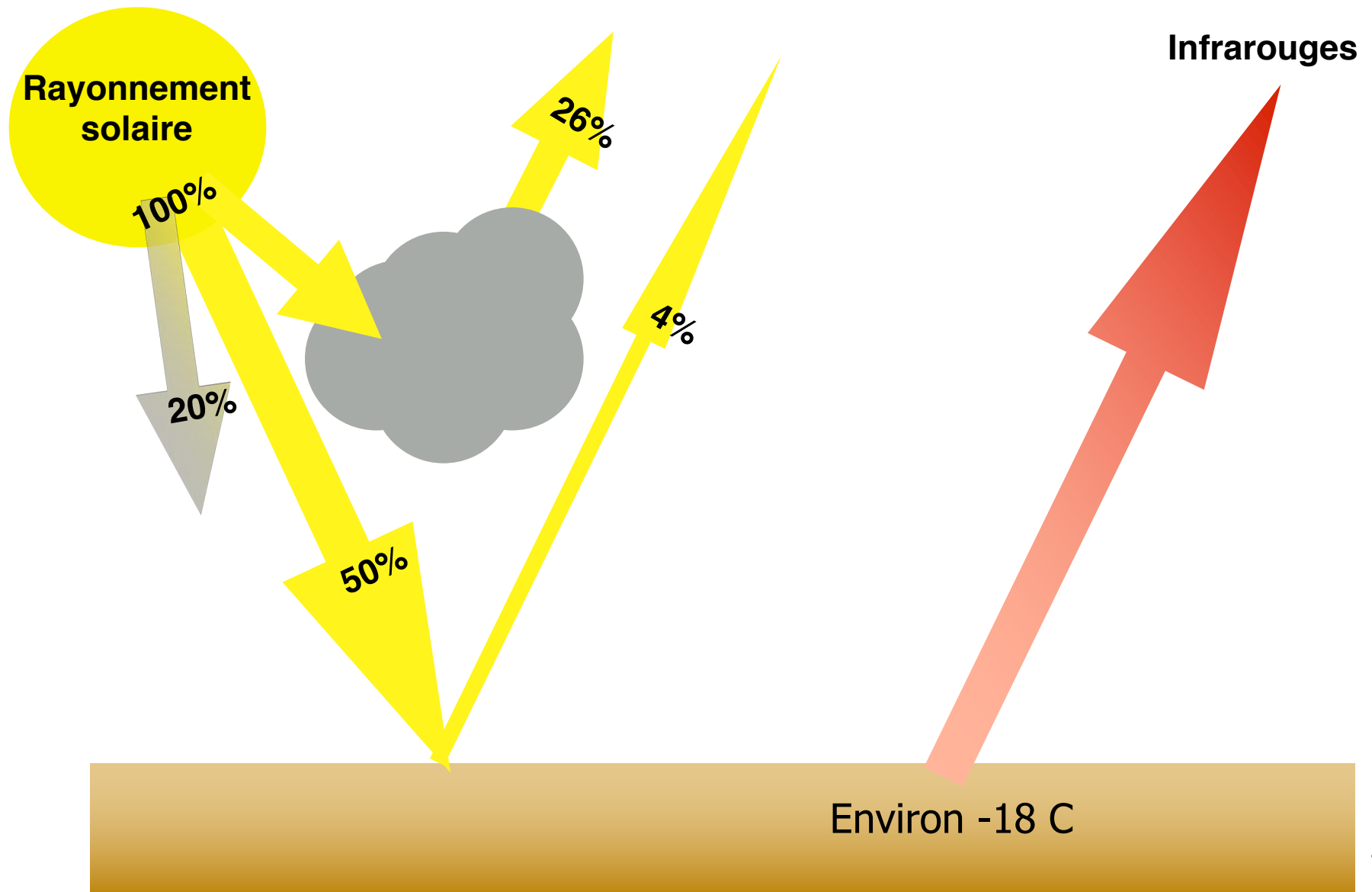


Le rayonnement solaire passe largement l'atmosphère, mais l'infrarouge est largement absorbé

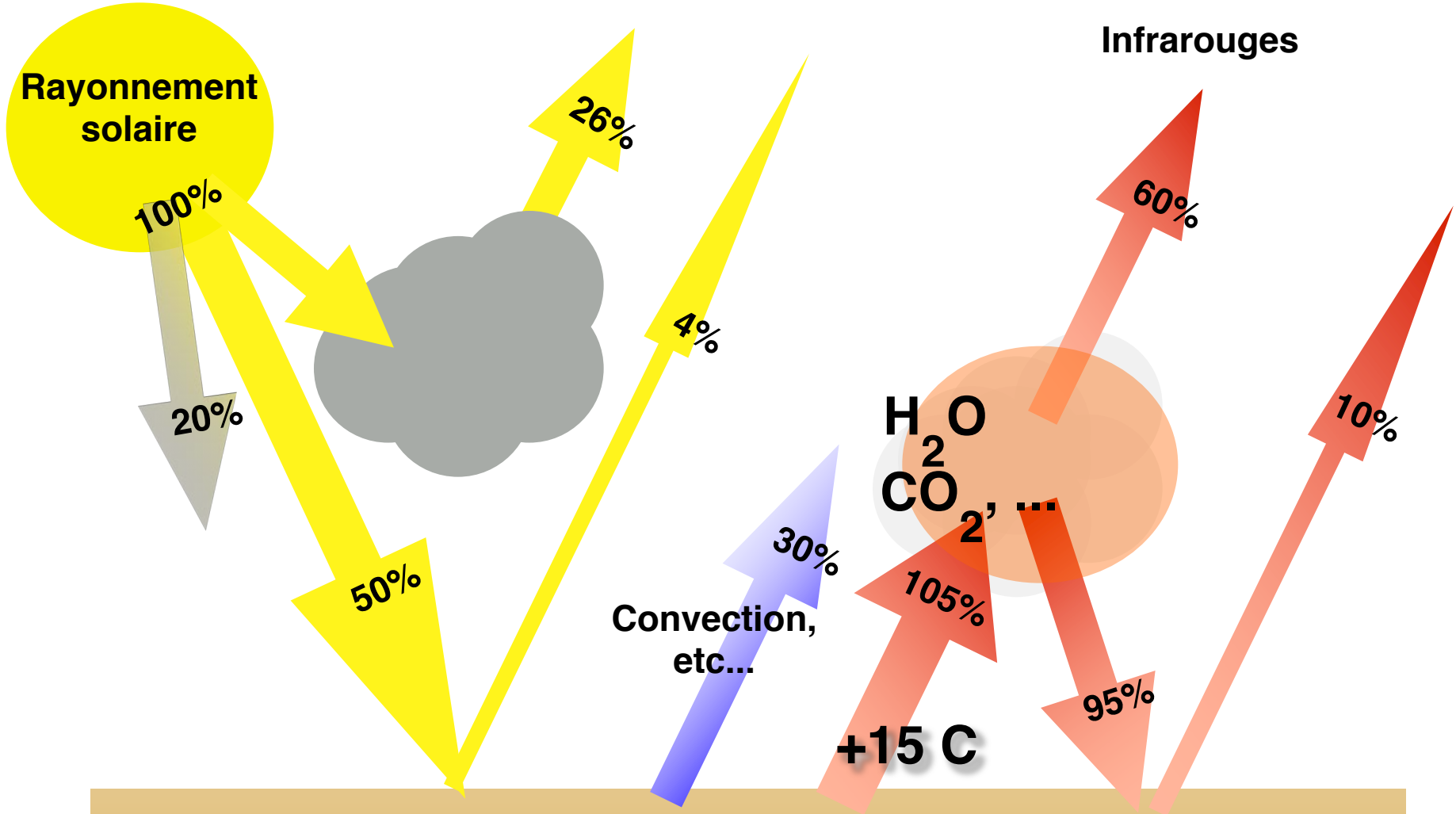
Source du rayonnement, spectre (= répartition en longueurs d'ondes) :



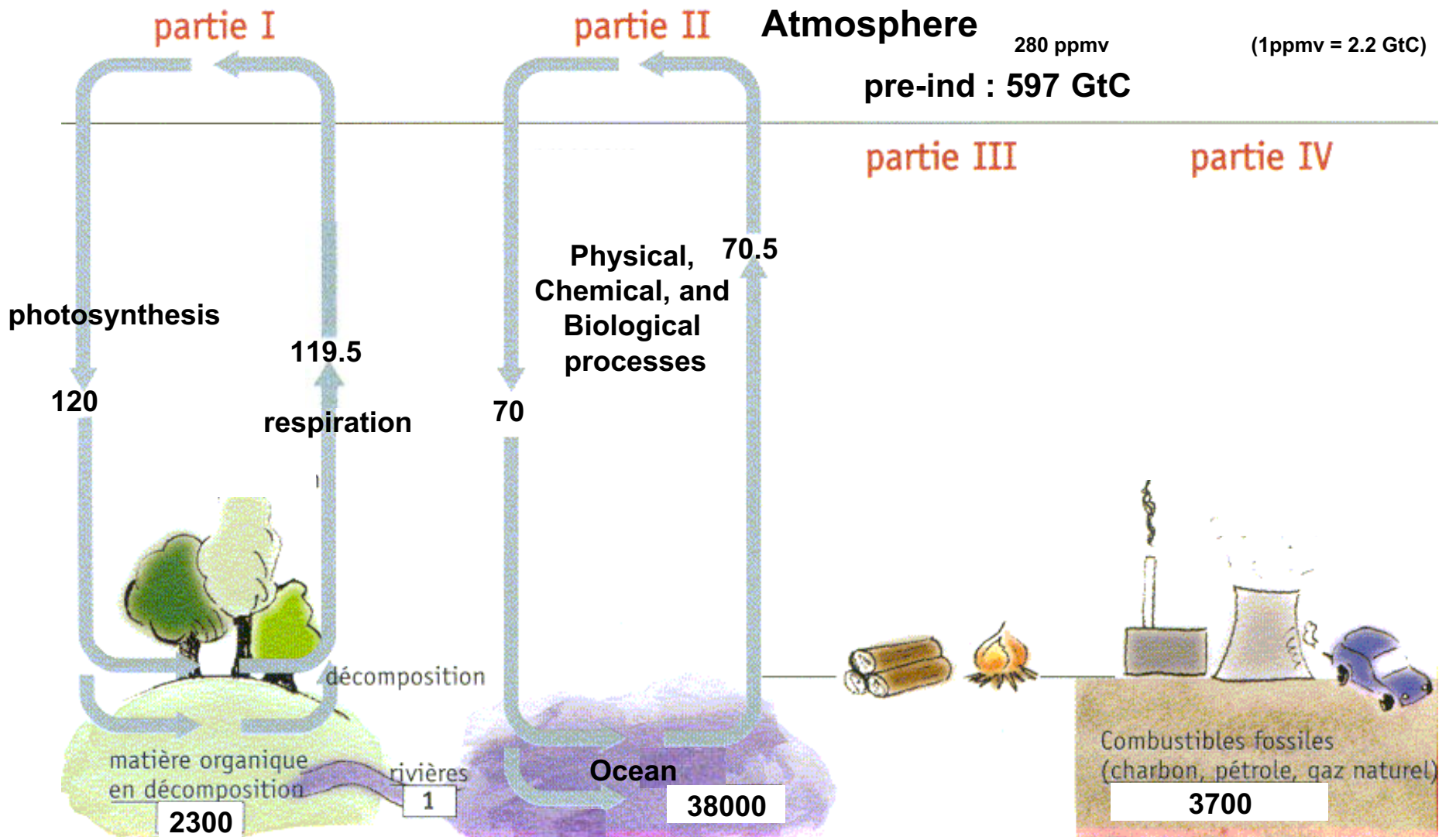
# Energie et effet de serre



# Energie et effet de serre



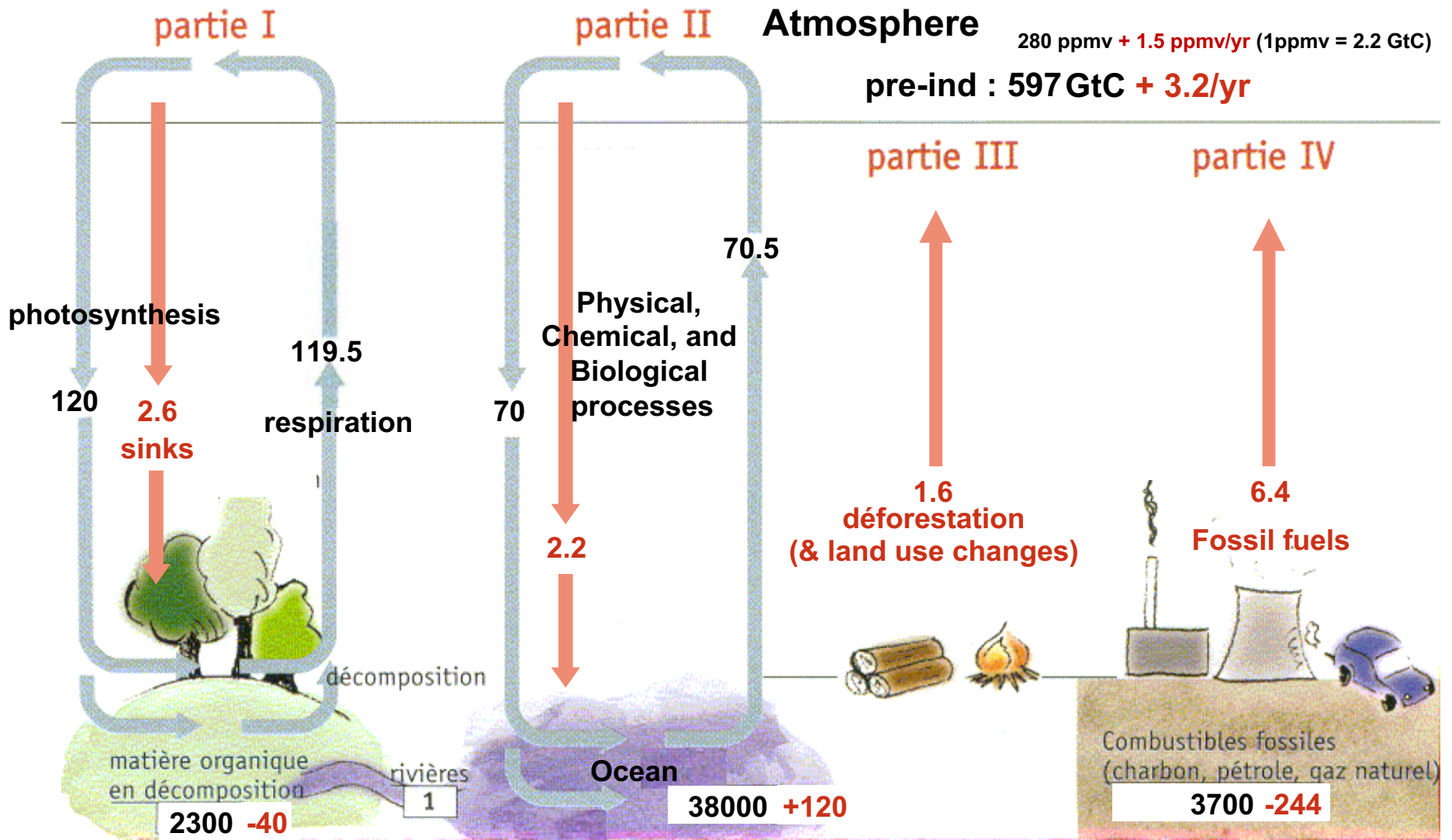
# Carbon cycle: unperturbed fluxes



Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get GtCO<sub>2</sub>)

# Carbon cycle: perturbed by human activities

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



Stocks!

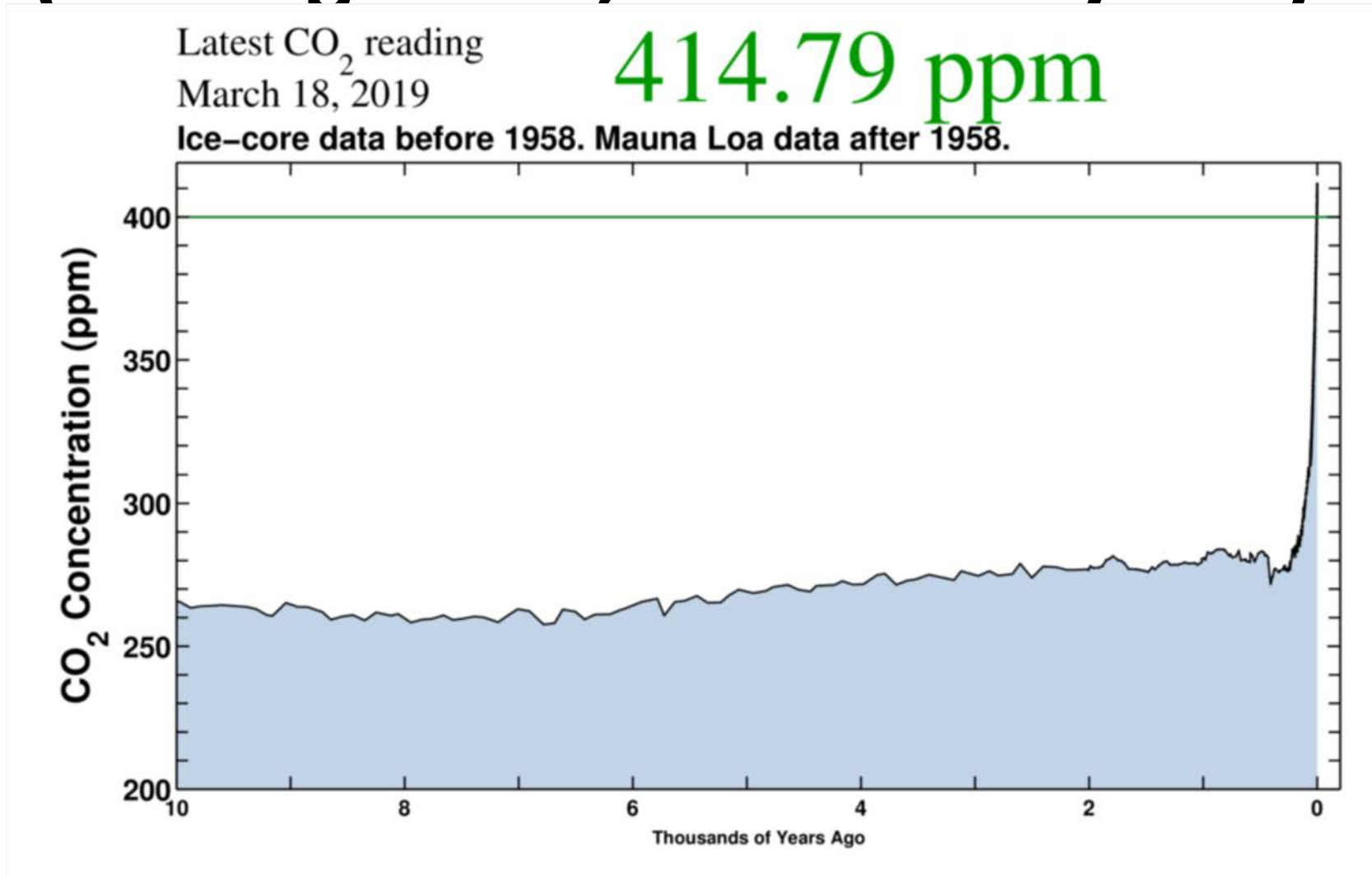
# Climatic Change: Are We on the Brink of a Pronounced Global Warming? (Broecker, 1975)

Table 1. Reconstruction and prediction of atmospheric CO<sub>2</sub> contents based on fuel consumption data.

Year	Chemical fuel CO <sub>2</sub> ( $\times 10^{16}$ g)	Excess atmospheric CO <sub>2</sub> * ( $\times 10^{16}$ g)	Excess atmospheric CO <sub>2</sub> (%)	Excess atmospheric CO <sub>2</sub> (ppm)	CO <sub>2</sub> content of the atmosphere† (ppm)	Global temperature increase‡ (°C)
1900	3.8	1.9	0.9	2	295	0.02
1910	6.3	3.1	1.4	4	297	.04
1920	9.7	4.8	2.2	6	299	.07
1930	13.6	6.8	3.1	9	302	.09
1940	17.9	8.9	4.1	12	305	.11
1950	23.3	11.6	5.3	16	309	.15
1960	31.2	15.6	7.2	21	314§	.21
1970	44.0	22.0	10.2	29	322§	.29
1980	63	31	14	42	335	.42
1990	88	44	20	58	351	.58
2000	121	60	28	80	373	.80
2010	167	83	38	110	403	1.10

\*On the assumption that 50 percent of the CO<sub>2</sub> produced by the burning of fuel remains in the atmosphere.  
 †The preindustrial atmospheric partial pressure of CO<sub>2</sub> is assumed to be 293 ppm. ‡Assumes a 0.3°C global temperature increase for each 10 percent rise in the atmospheric CO<sub>2</sub> content. §Value observed on Hawaii for 1960, 314 ppm; value for 1970, 322 ppm (8). ||Post-1972 growth rate taken to be 3 percent per year.

# CO<sub>2</sub> Concentration, 18 March 2019 (Keeling curve, last 10000 years)

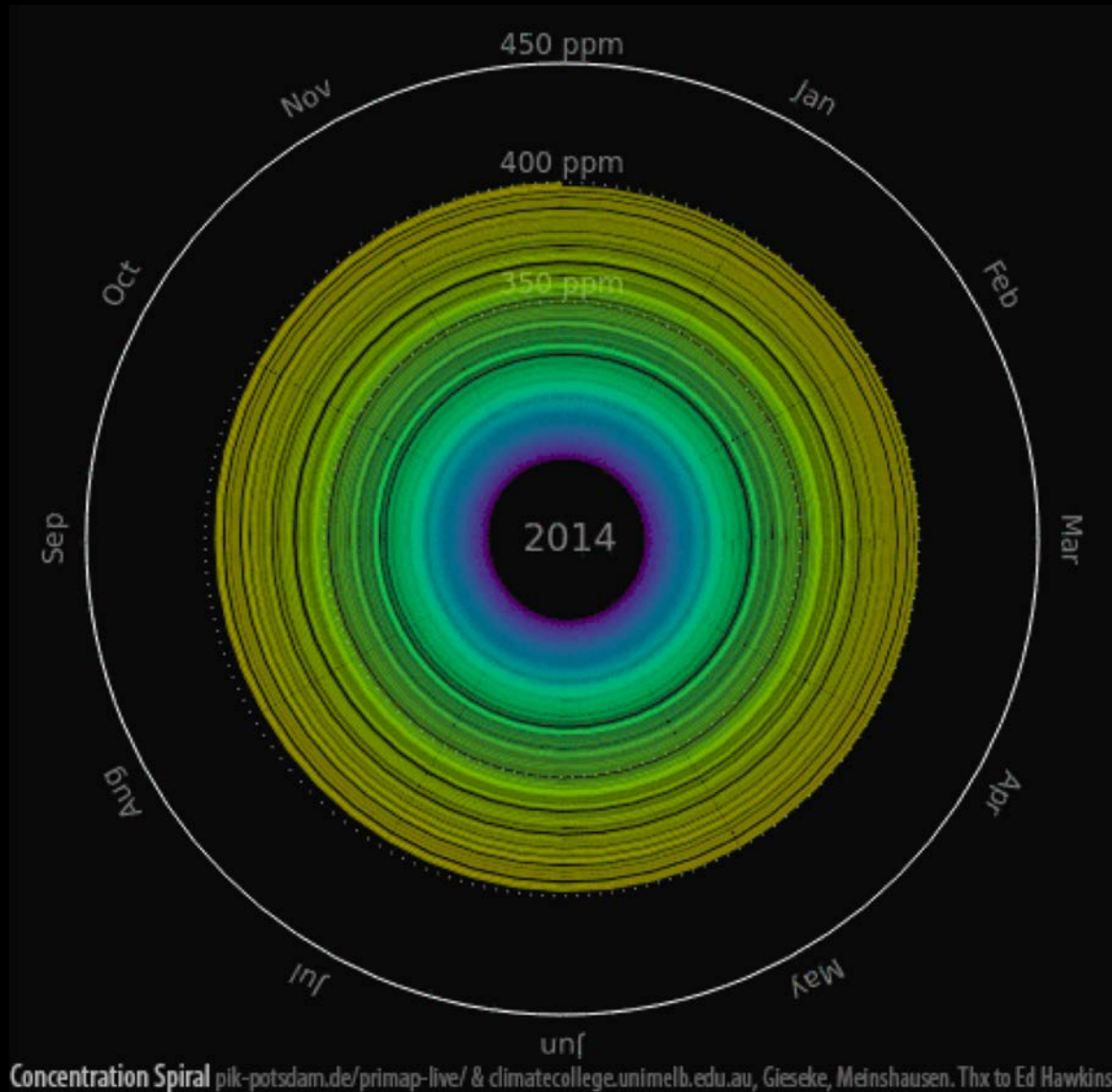


**Source:** [scripps.ucsd.edu/programs/keelingcurve/](https://scripps.ucsd.edu/programs/keelingcurve/)

**Fact n° 2: Because we have  
changed the composition of the  
atmosphere, the climate system  
is disturbed**

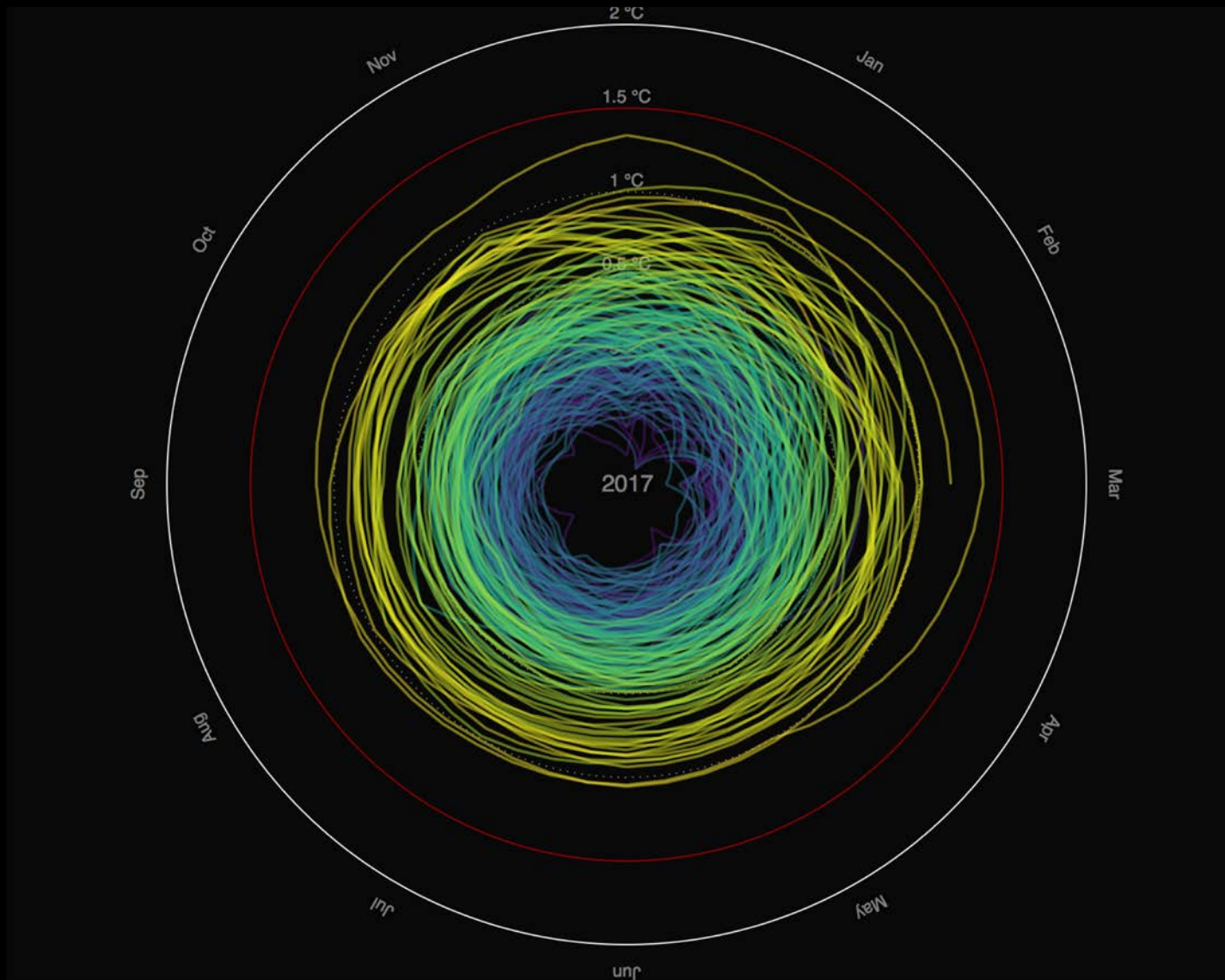


# CO<sub>2</sub> concentration spiral: the insulation thickens!



CO<sub>2</sub> concentration spiral 1851-2014 (ppm), by Gieseke & Meinshausen,  
Available on <http://pik-potsdam.de/primap-live>

# 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



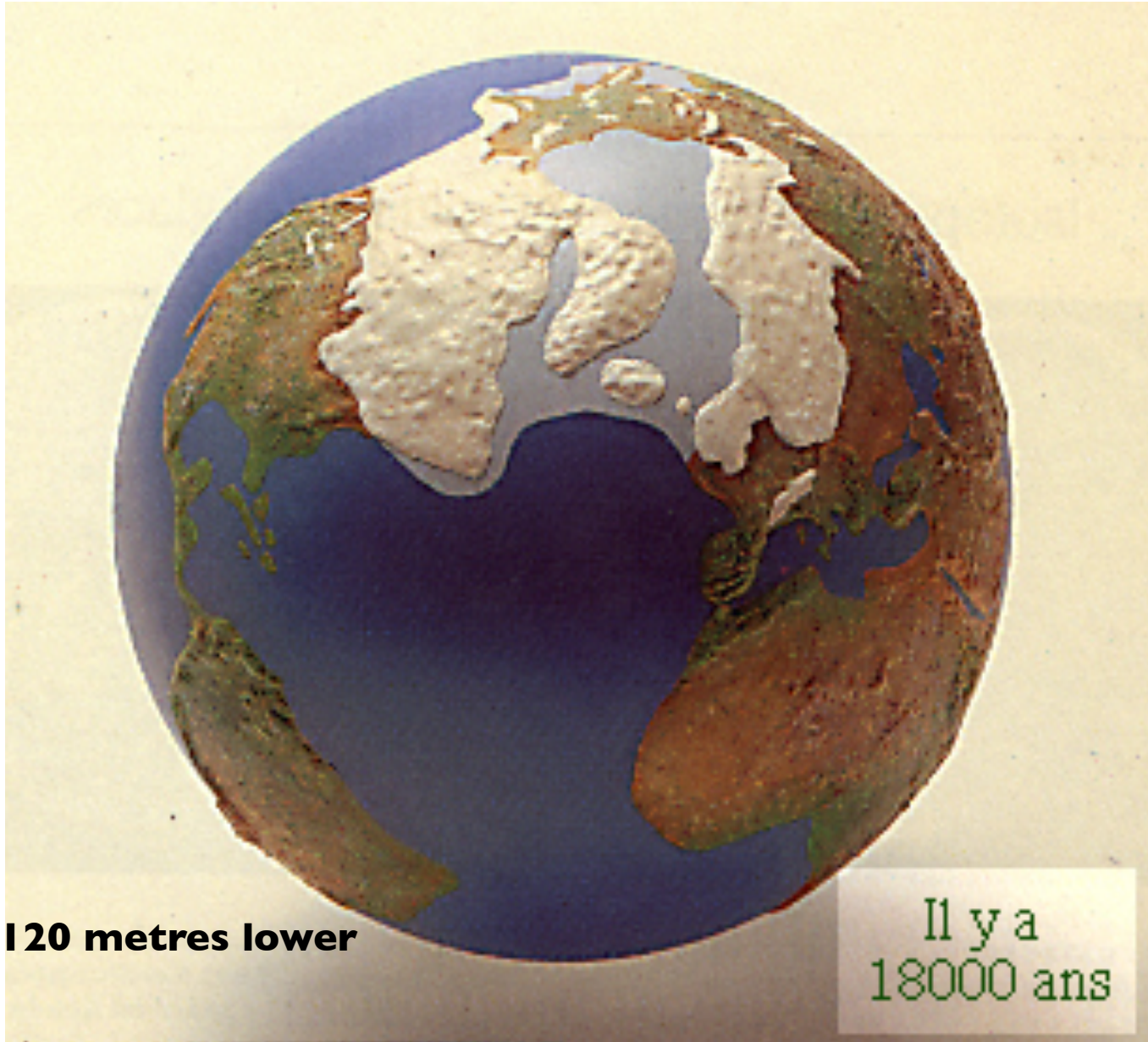
There is evidence that anthropogenic influences, including increasing atmospheric **greenhouse gas concentrations**, have changed these extremes

**Fact n° 3: 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. Joussaume, 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.



**Fact n° 4: World Health Organization (2018): Air pollution kills 7 million 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

# 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

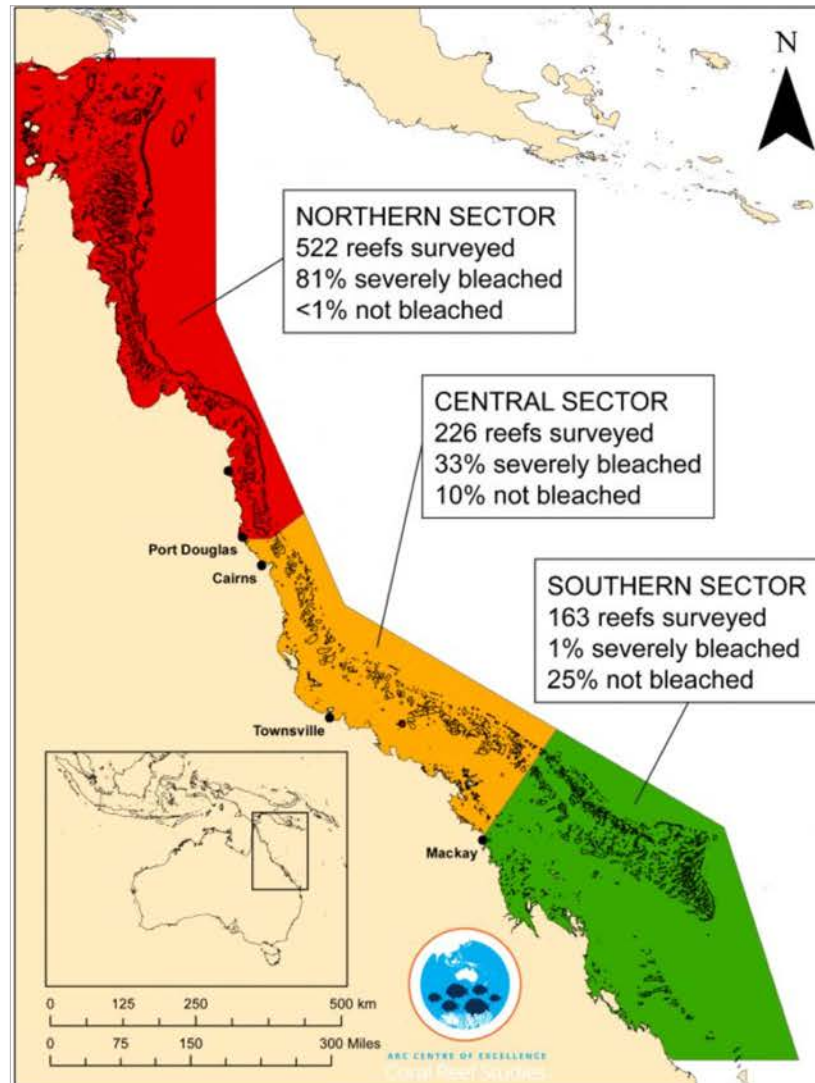
(Victims of New Orleans floods after Katrina in 2005)



# **Fact n° 6: Ecosystems suffer more and more, while our wellbeing depends on their good state**













The « Sixth Extinction » has started, and climate change is one of the causing factors

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



# HALF A DEGREE OF WARMING MAKES A BIG DIFFERENCE:

EXPLAINING IPCC'S 1.5°C SPECIAL REPORT

	1.5°C	2°C	2°C IMPACTS
<b>EXTREME HEAT</b> Global population exposed to severe heat at least once every five years	 <p>14%</p>	 <p>37%</p>	<b>2.6x</b> WORSE
<b>SEA-ICE-FREE ARCTIC</b> Number of ice-free summers	 <p>AT LEAST 1 EVERY 100 YEARS</p>	 <p>AT LEAST 1 EVERY 10 YEARS</p>	<b>10x</b> WORSE
<b>SEA LEVEL RISE</b> Amount of sea level rise by 2100	 <p>0.40 METERS</p>	 <p>0.46 METERS</p>	<b>.06M</b> MORE
<b>SPECIES LOSS: VERTEBRATES</b> Vertebrates that lose at least half of their range	 <p>4%</p>	 <p>8%</p>	<b>2x</b> WORSE
<b>SPECIES LOSS: PLANTS</b> Plants that lose at least half of their range	 <p>8%</p>	 <p>16%</p>	<b>2x</b> WORSE
<b>SPECIES LOSS: INSECTS</b> Insects that lose at least half of their range	 <p>6%</p>	 <p>18%</p>	<b>3x</b> WORSE

Responsibility for content: WRI

**Fact n° 7: 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° 8: 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: The present national plans (NDCs) introduced ahead of the Paris Agreement are far from what is needed to respect the 1.5° C objective, and even to stay below 2° C warming**

Please note that the Paris Agreement speaks about 1.5° C and « *well below* 2° C » warming, not 2° C

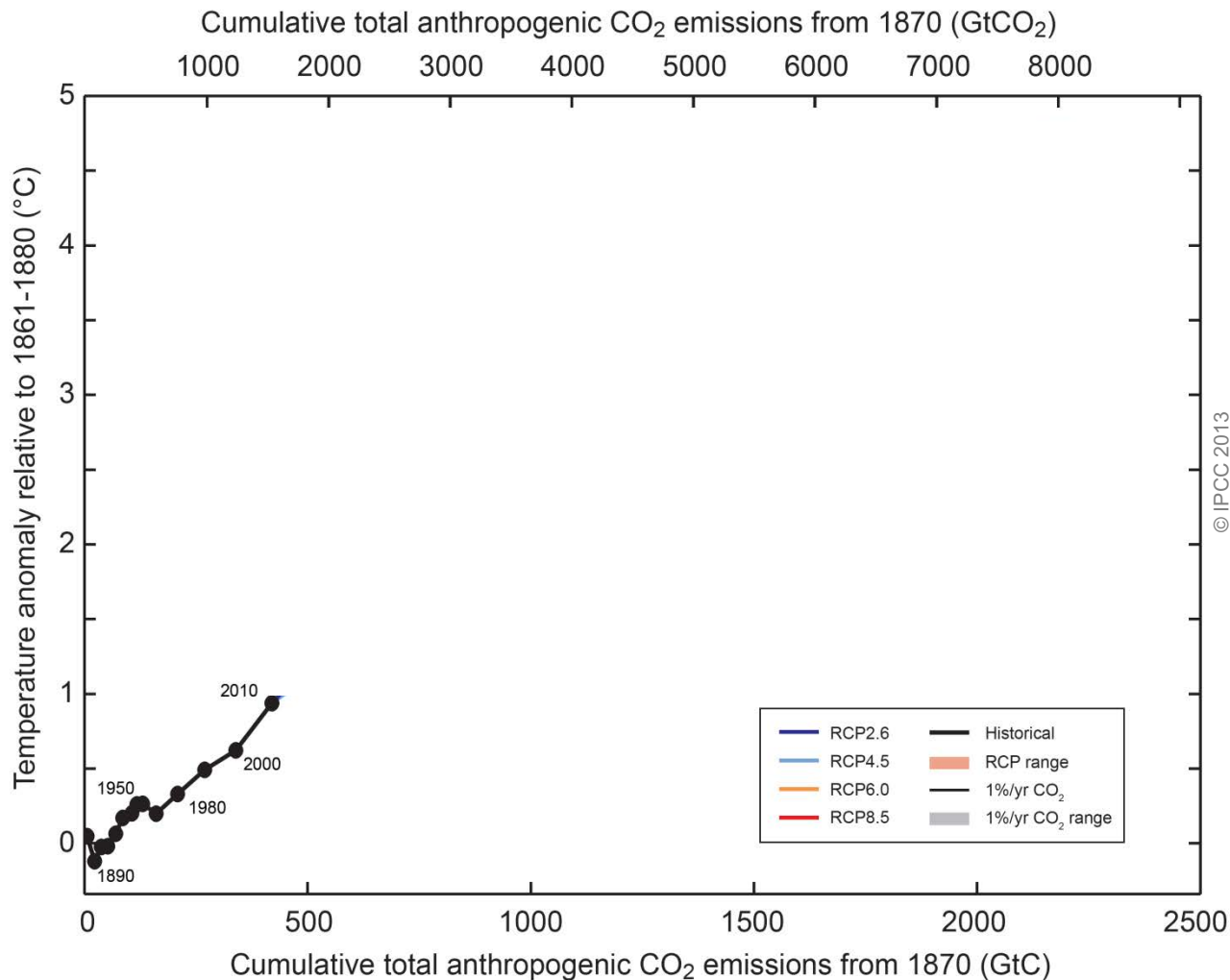
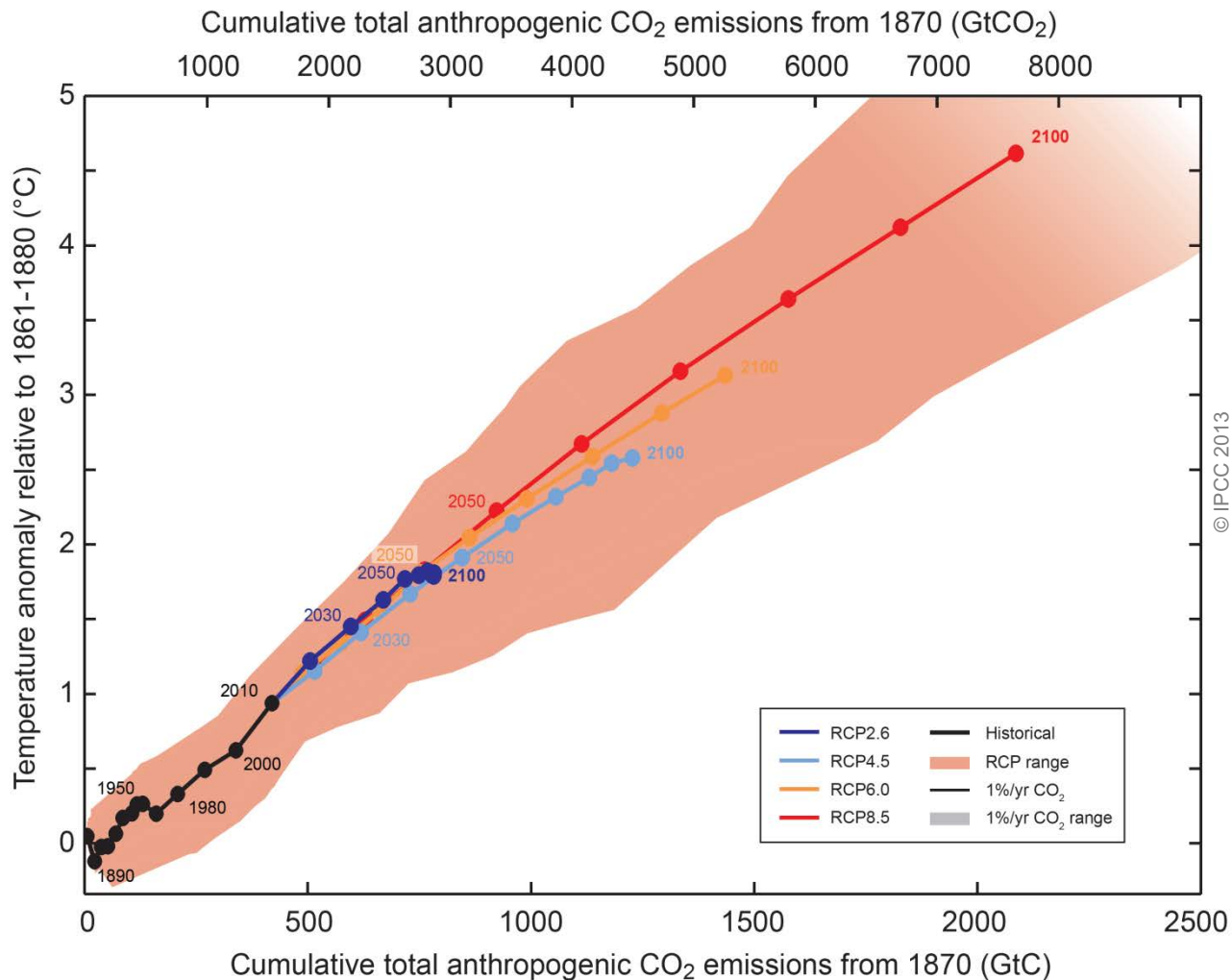


Fig. SPM.10

Cumulative emissions of CO<sub>2</sub> largely determine global mean surface warming by the late 21st century and beyond.



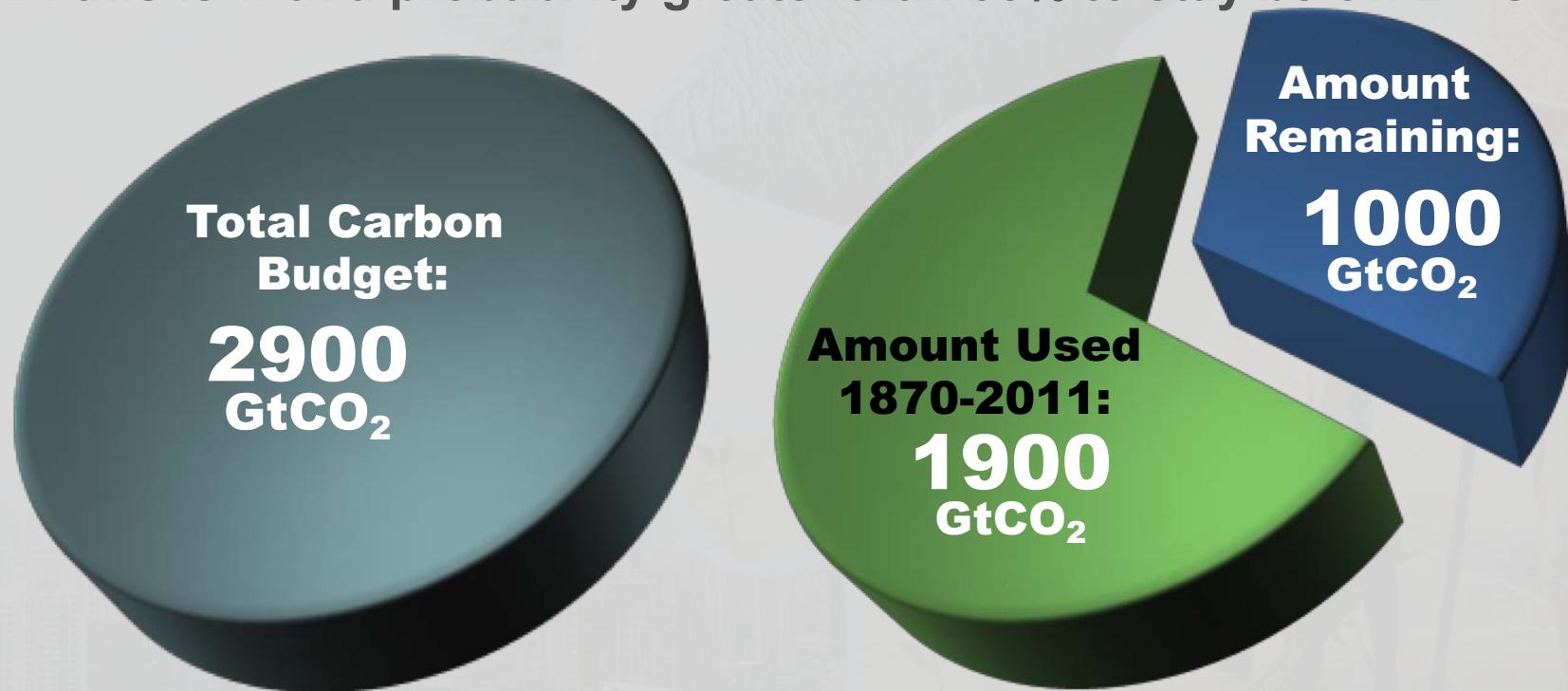
© IPCC 2013

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



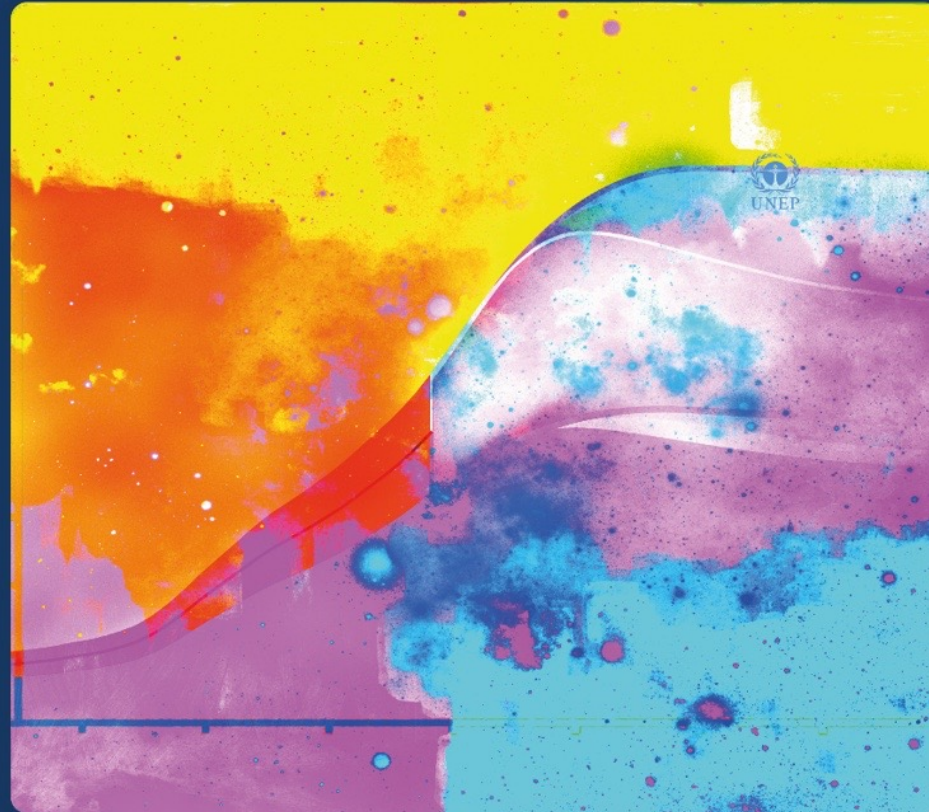
**NB: Emissions in 2011: 38 GtCO<sub>2</sub>/yr**

AR5 WGI SPM

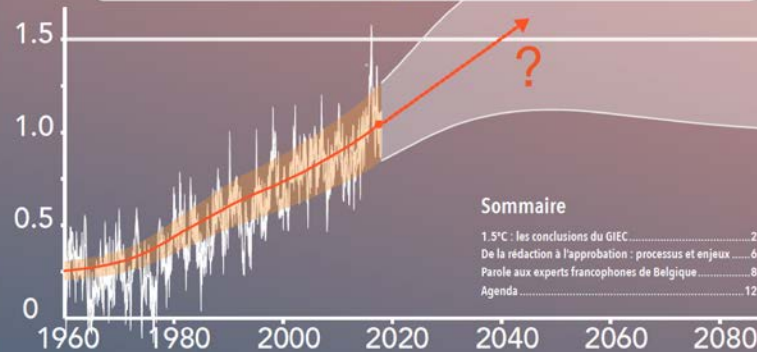
# The SR15

# 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.



## Le rapport spécial du GIEC Réchauffement planétaire de 1.5°C



### Sommaire

1.5°C : les conclusions du GIEC .....	2
De la rédaction à l'approbation : processus et enjeux .....	6
Parole aux experts francophones de Belgique .....	8
Agenda .....	12

**P**our de nombreuses populations et écosystèmes, il est essentiel de limiter le réchauffement à 1.5°C ou de ne dépasser ce niveau que temporairement. Et c'est potentiellement encore réalisable. Le 6 octobre 2018, l'Assemblée Plénière du GIEC a adopté le Rapport Spécial sur un « Réchauffement planétaire de 1.5°C », qui fait le point au sujet des impacts et scénarios correspondant à ce niveau de réchauffement.

Ce rapport conclut que pour limiter le réchauffement climatique à 1.5°C, il faut des transformations radicales et rapides dans tous les domaines de notre société. Il précise que ces changements sont sans précédent en termes d'échelle, mais pas nécessairement en termes de rapidité.

L'origine du rapport est une demande formelle au GIEC de la part des Parties à la Convention cadre des Nations Unies sur les changements climatiques (CNUCC) lors de l'adoption de l'Accord de Paris, en 2015 (21<sup>e</sup> Conférence des Parties, COP21). La COP21 avait aussi indiqué que le rapport du GIEC devrait identifier le niveau auquel les émissions mondiales devraient être ramenées en 2030 pour contenir l'élévation de température en-dessous de 1.5°C.

Le rapport a été adopté à l'issue d'une semaine de discussions intenses au sujet de la formulation du Résumé à l'intention des décideurs, sur la base des chapitres et du projet de résumé rédigés par les scientifiques - qui ont toujours le dernier mot en ce qui concerne le contenu. Il forme une base scientifique essentielle pour les prochaines négociations internationales dans le cadre de la CNUCC, qui auront lieu à Katowice (Pologne) en décembre 2018 (COP24).

Dans cette Lettre, nous donnons d'abord un aperçu des conclusions du rapport, ensuite un aperçu du processus d'approbation et des enjeux associés. Pour ouvrir le débat et fournir un ensemble de points de vue, nous avons ensuite donné la parole aux experts francophones de Belgique, qui nous ont aimablement fait part des commentaires que vous trouverez en troisième partie. L'agenda indique les prochaines périodes de relecture de rapports du GIEC et annonce deux événements à venir en Belgique.

Nous vous en souhaitons une bonne lecture,  
Jean-Pascal van Ypersele, Bruna Gaino et Philippe Marbaix

Image de fond : extrait adapté de la figure SPM1 du Rapport spécial

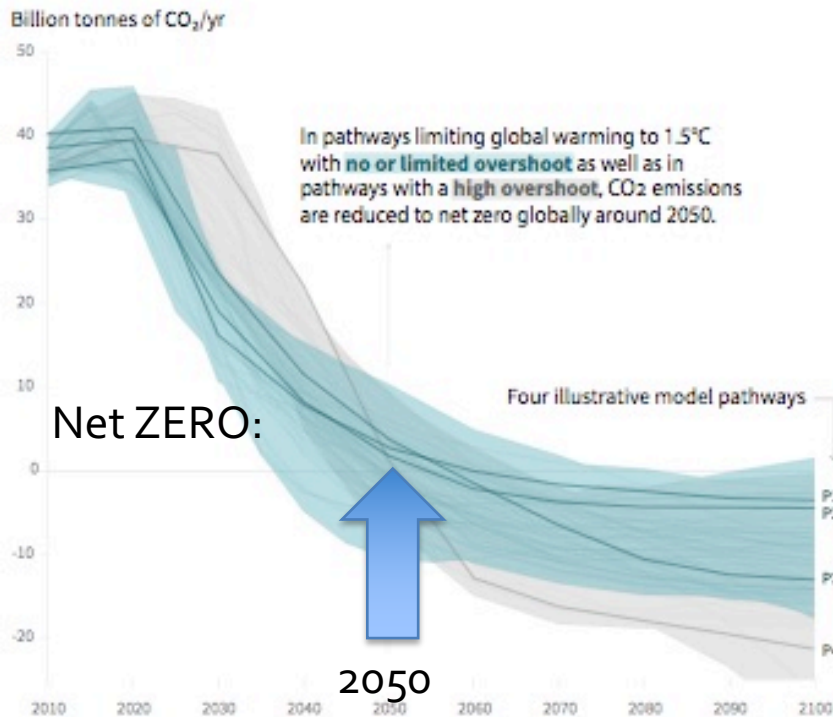


Disponible gratuitement, 6X/an: [www.plateforme-wallonne-giec.be](http://www.plateforme-wallonne-giec.be)

## Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO<sub>2</sub>, 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<sub>2</sub> emissions



#### Timing of net zero CO<sub>2</sub>

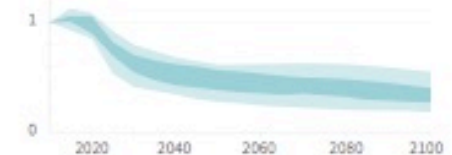
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios



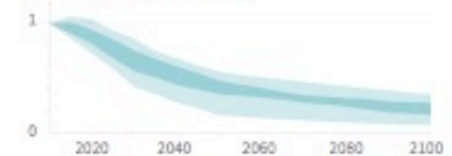
### Non-CO<sub>2</sub> emissions relative to 2010

Emissions of non-CO<sub>2</sub> 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.

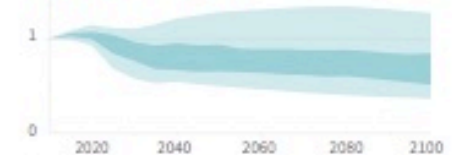
#### Methane emissions



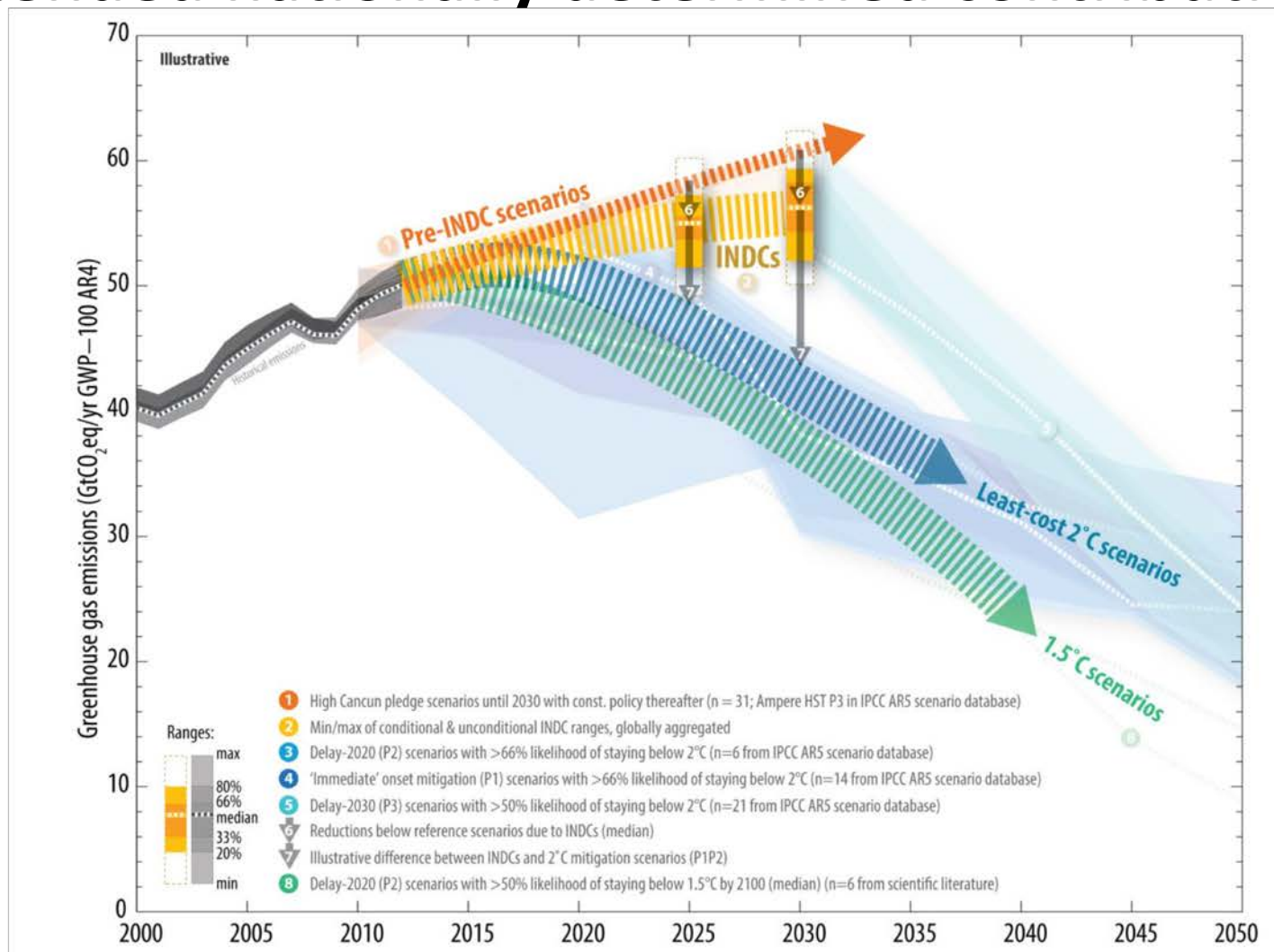
#### Black carbon emissions



#### Nitrous oxide emissions



# 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 all running for our life.

# **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

**100 fossil-fuel related  
companies were responsible for  
71 % of world industrial CO<sub>2</sub>  
emissions between 1988 and  
2017**

Of course, their products are bought by billions  
of people, but they have a particular  
responsibility

Source: The Carbon Majors Database, CDP Carbon Majors Report 2017, CDP, 2017, [www.cdp.net](http://www.cdp.net)

@JPvanYpersele

**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, CO<sub>2</sub> taxes, fines, internal CO<sub>2</sub> price (firms do « as if » CO<sub>2</sub> 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 », and other synergies with  
the SDGs must be sought**

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



# SUSTAINABLE DEVELOPMENT GOALS



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

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

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



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, only if essential.

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

**...It is good for health as well!**

(\*) See « Beyond-Meat », page 14 of De Tijd, page 13 of L'Écho, 23 November 2018

@JPvanYpersele

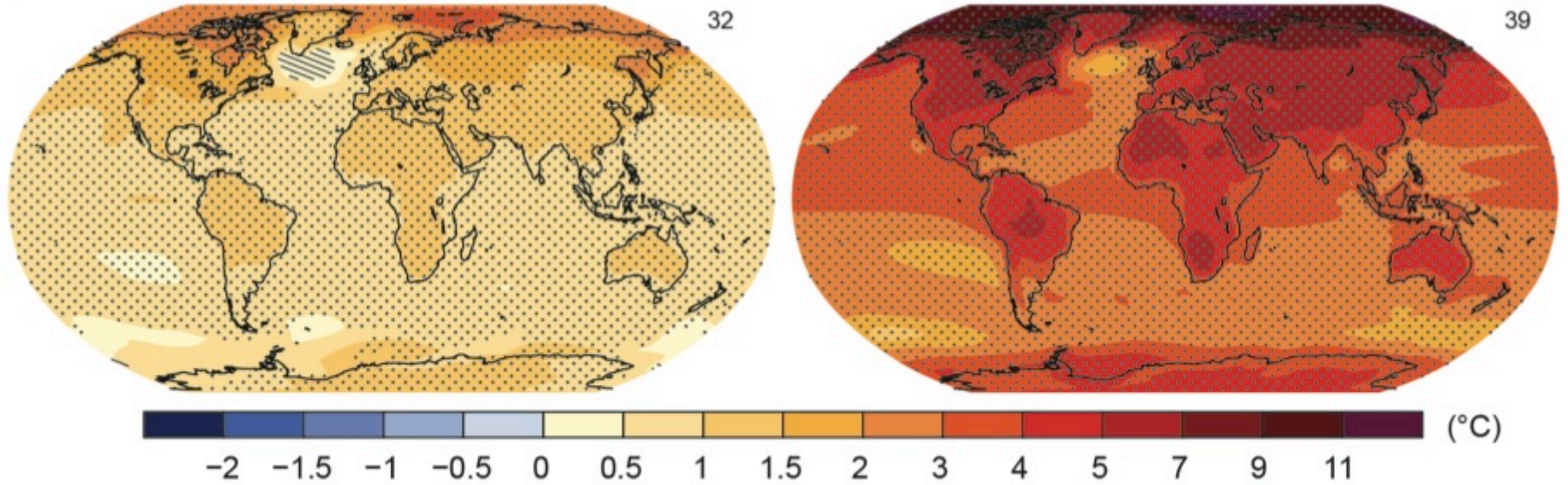
**Solution n° 9: The Sun gives us  
in two hours about as much  
energy as the world uses in *one*  
*year*, all forms of energy  
considered**

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

# RCP2.6

# RCP8.5

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



Humanity has the choice

This gives me  
hope:

Well-  
informed  
young people  
speaking  
truth to  
power



With @GretaThunberg at COP24

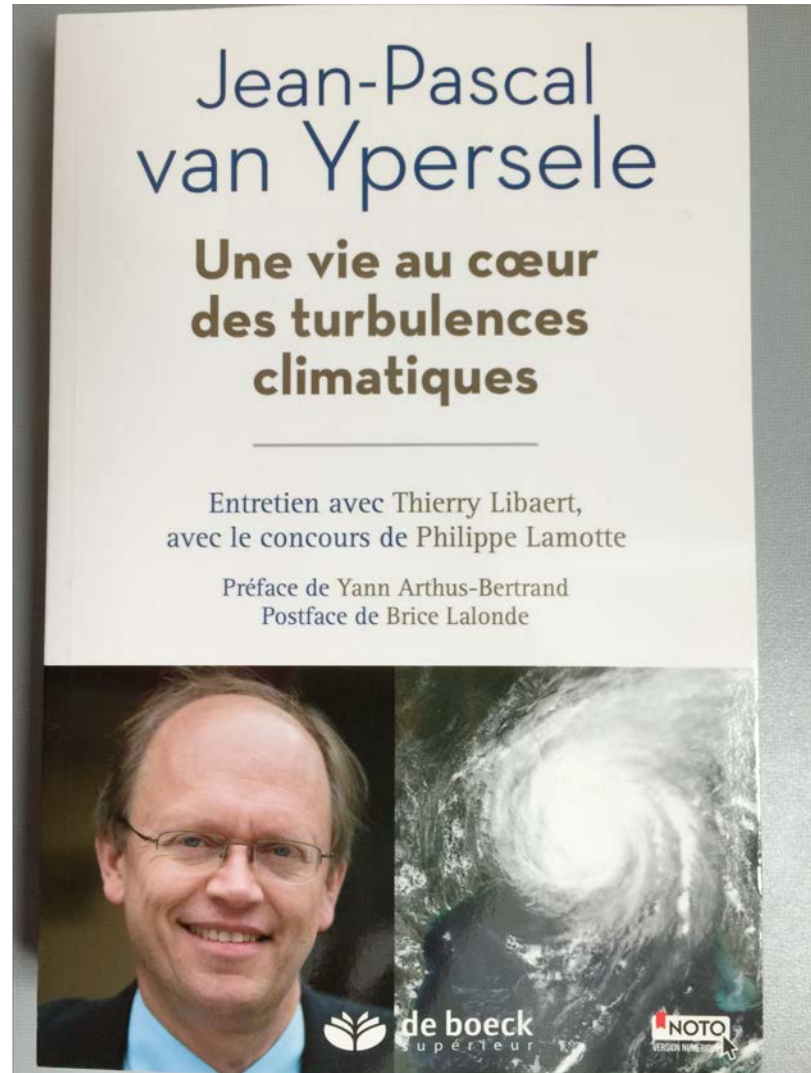
**Pour en savoir plus:**

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

**Publié chez De Boeck  
supérieur**

**Préface: Yann Arthus-  
Bertrand**

**Postface: Brice Lalonde**



**Om meer te weten:**

**Bij EPO (2018)**

**Voorwoord:  
Jill Peeters**





# 'Sauver le climat' : les bases

Écrit pour les jeunes (et moins jeunes), avec des liens vers des ressources utiles



*Suite à l'intense mobilisation des jeunes, les changements climatiques ont fait l'objet de beaucoup d'attention au cours des derniers mois. Éléves du secondaire, étudiants, professeurs, parents et grand-parents sont descendus dans la rue pour montrer leur désarroi face à la lenteur de l'action vis-à-vis des changements climatiques.*

*Nous nous réjouissons de cette mobilisation, car notre rôle nous met encore plus fréquemment que l'ensemble de la population en position de témoin des risques que font courir les changements climatiques, ainsi que de l'ampleur des efforts nécessaires pour mettre en œuvre les objectifs qui se sont fixés les membres des Nations Unies à Paris en 2015 (COP21).*

*Une démarche essentielle en faveur de ces jeunes est de les aider à se former, à appréhender les principaux éléments de la problématique du climat, et plus largement, de l'influence de nos activités sur notre environnement et sur le futur de l'humanité. L'éducation est un des instruments essentiels pour évoluer vers une société plus durable et plus juste.*

*Pour y contribuer, nous présentons ici une brève synthèse de la problématique et une sélection de références commentées. Nous espérons que cette Lettre aidera enseignants et élèves à disposer d'une base d'information solide et ainsi à prendre leur part dans la solution à ce problème planétaire : agir à leur niveau et favoriser l'action dans leur entourage et au niveau sociétal.*

*Plusieurs témoignages d'élèves ou de professeurs sont également présentés.*

*Nous vous souhaitons une bonne lecture !*

Jean-Pascal van Ypersele, Philippe Marbaix et Bruna Gaino

## Sommaire

ABC des changements climatiques .....	2
Ressources pour l'enseignement .....	10
Témoignages .....	14
Agenda .....	16

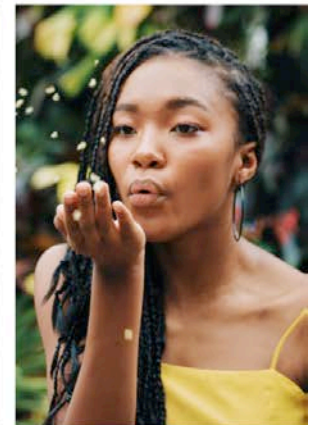


**Excellente ressource  
(7 mai 2018) :**

**Disponible sur :  
[www.naacp.org](http://www.naacp.org)**

# **YOUTH & COLLEGE ORGANIZING TOOLKIT**

**FOR  
Environmental & Climate Justice**



**NAACP**

Environmental and Climate Justice Program

# To go further :

- [www.climate.be/vanyp](http://www.climate.be/vanyp) : my slides (under « conferences)
- [www.ipcc.ch](http://www.ipcc.ch) : IPCC
- [www.realclimate.org](http://www.realclimate.org) : answers to the merchants of doubt arguments
- [www.skepticalscience.com](http://www.skepticalscience.com) : same
- [www.plateforme-wallonne-giec.be](http://www.plateforme-wallonne-giec.be) : IPCC-related in French, Newsletter, e.g. on SR15
- **Twitter: @JPvanYpersele & @IPCC\_CH**