

Changement climatique

- ✓ *Etat des lieux*
- ✓ *Prochains rapports du GIEC*

Valérie Masson-Delmotte

Statut de ratification de l'Accord de Paris

61 Parties have ratified
of 197 Parties to the Convention



Accounting for 47.79%
of global GHG emissions



Entry into force

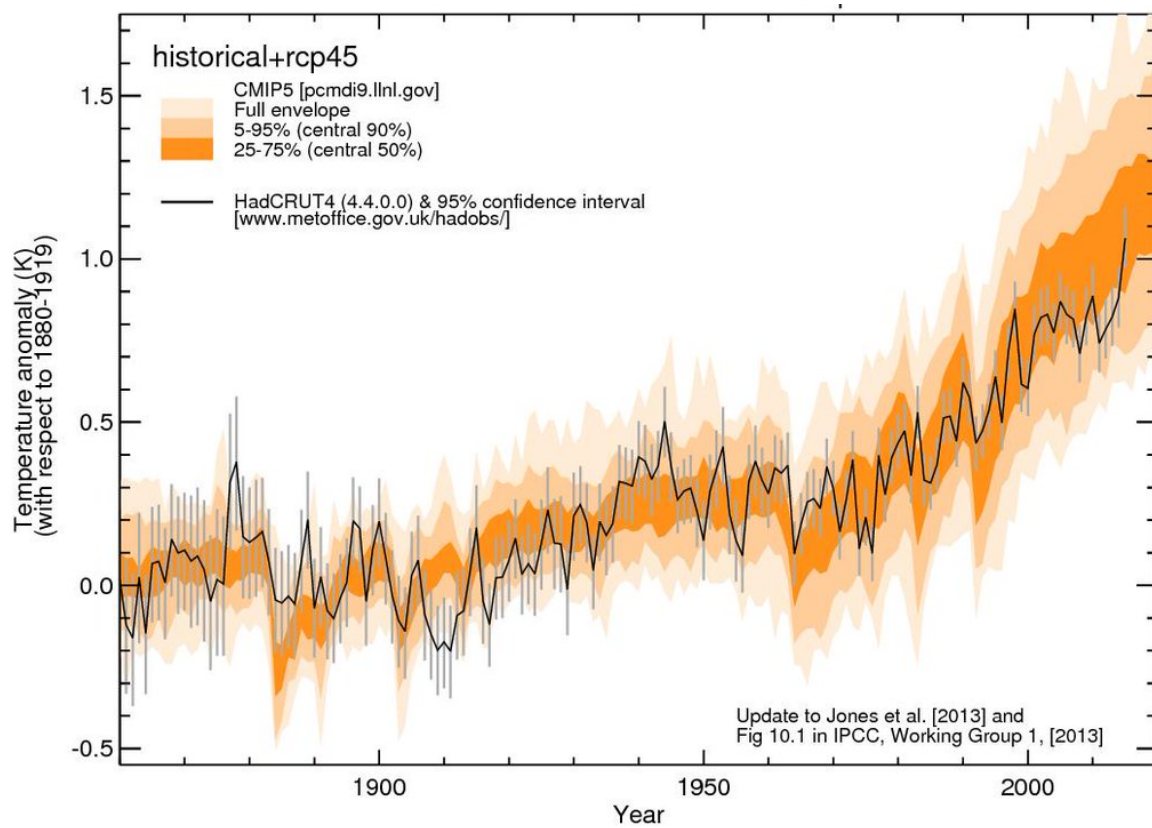


United Nations
Framework Convention on
Climate Change

Etat des lieux

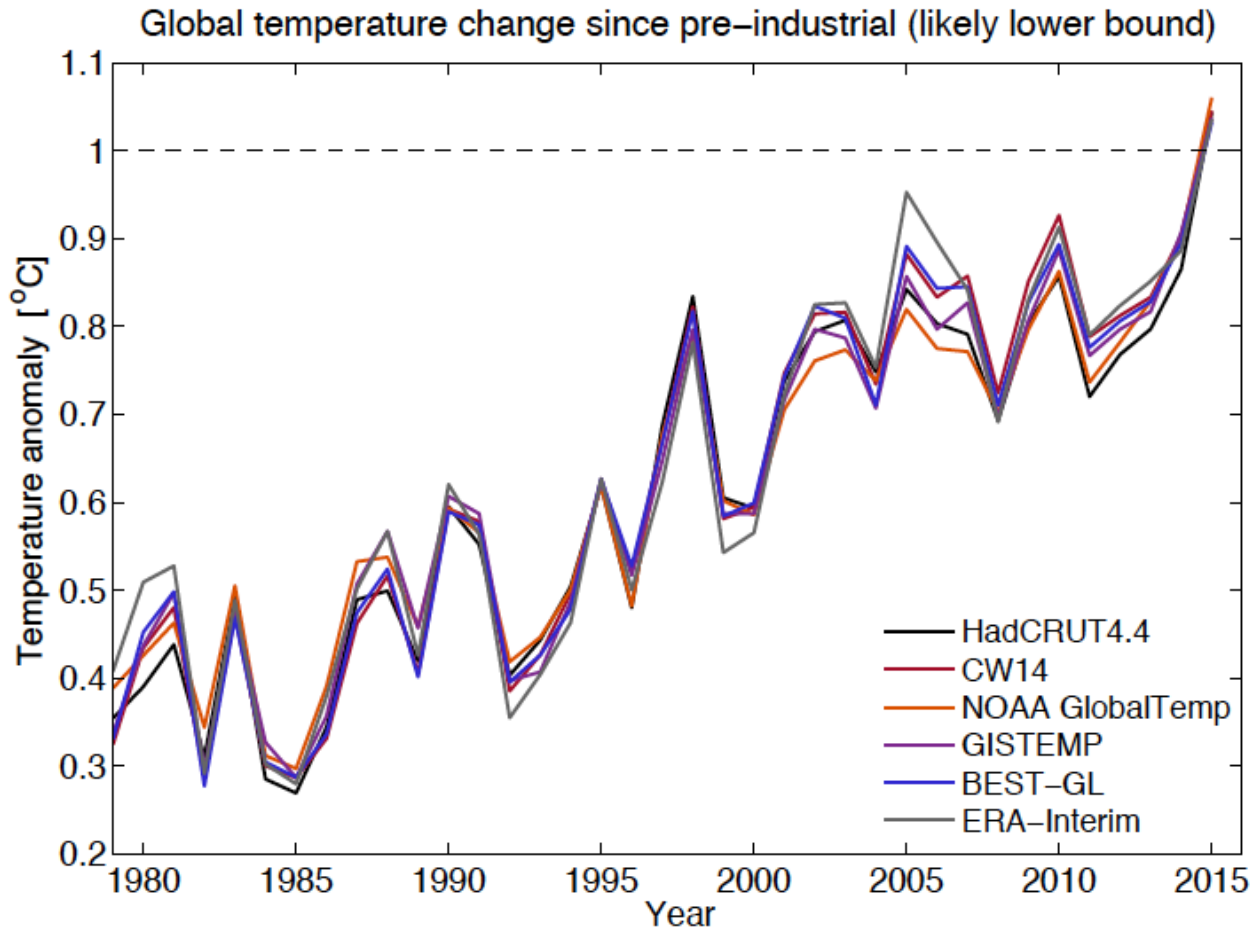
- ✓ *Evolution de la température moyenne à la surface de la Terre*
- ✓ *Evolution du niveau moyen des mers*
- ✓ *Evolution de la composition atmosphérique*
- ✓ *Evaluation de l'influence humaine*
- ✓ *Projections*

Changement de température moyenne à la surface de la terre



Jones, pers. comm., update from IPCC AR5

Zoom depuis 1980



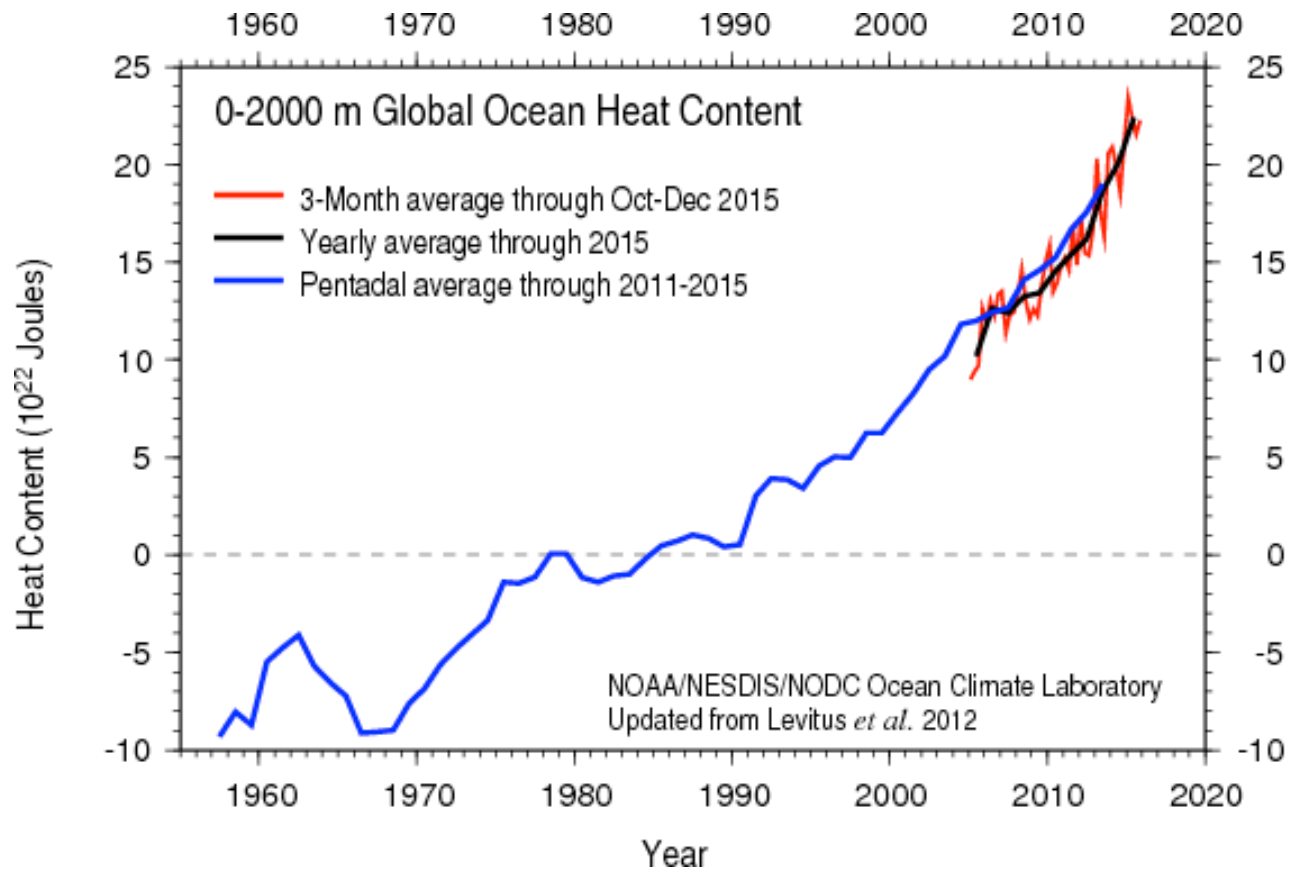
✓ 2015 is $>1^{\circ}\text{C}$ above pre-industrial level (1720-1800)

✓ Trend since 1900: $\sim 0.9-1^{\circ}\text{C}$

✓ Trend since 1970 : $0.17-0.18^{\circ}\text{C}$ per decade

✓ Decadal prediction + Interdecadal Pacific Osc. larger rates 2013-2022

Changement de contenu de chaleur des océans

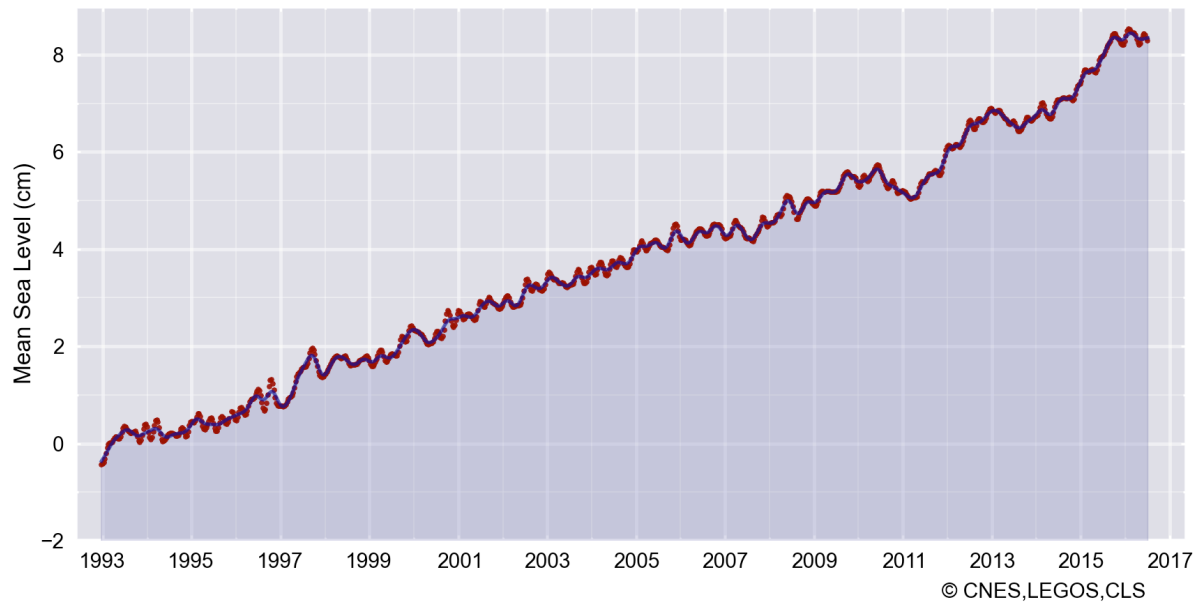


Niveau des mers

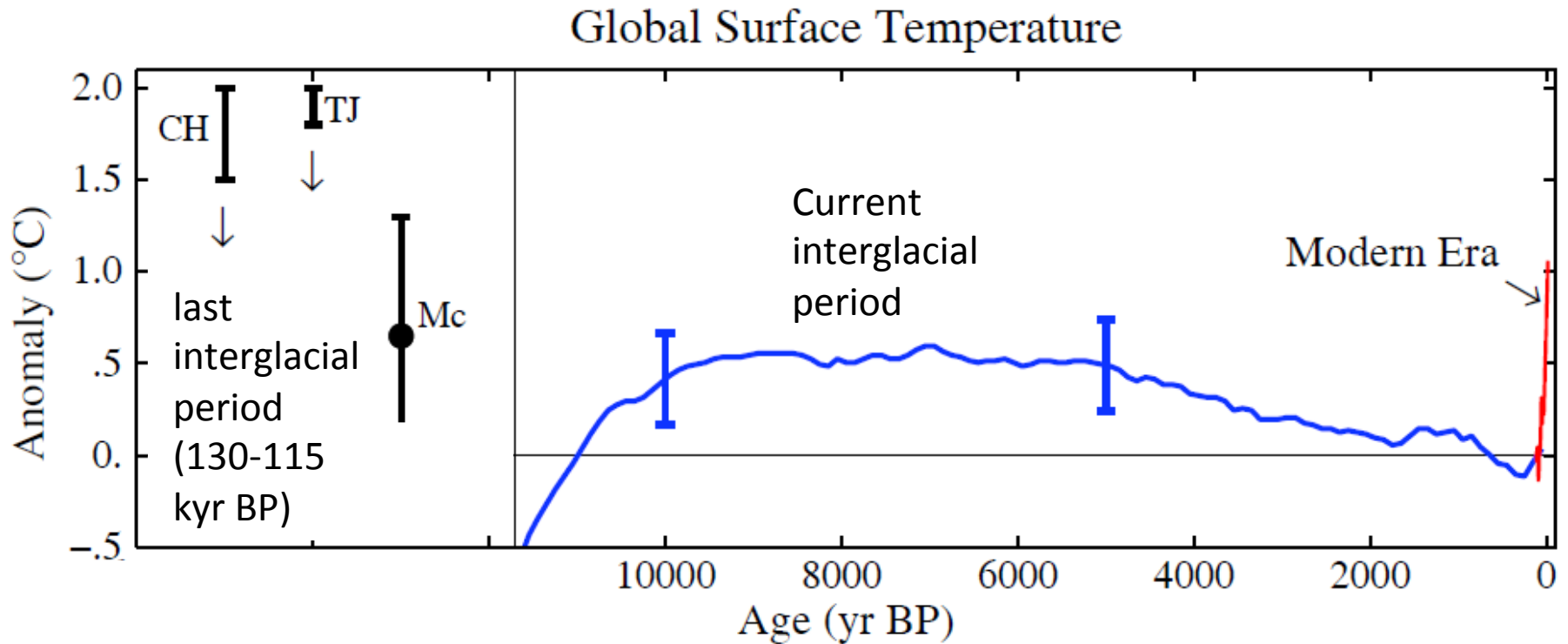
Latest MSL Measurement
20 July, 2016

+3.41 mm/yr

Reference GMSL - corrected for GIA

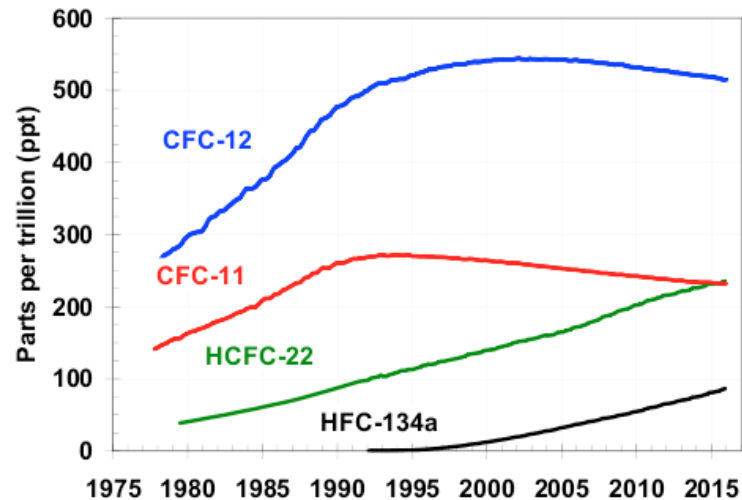
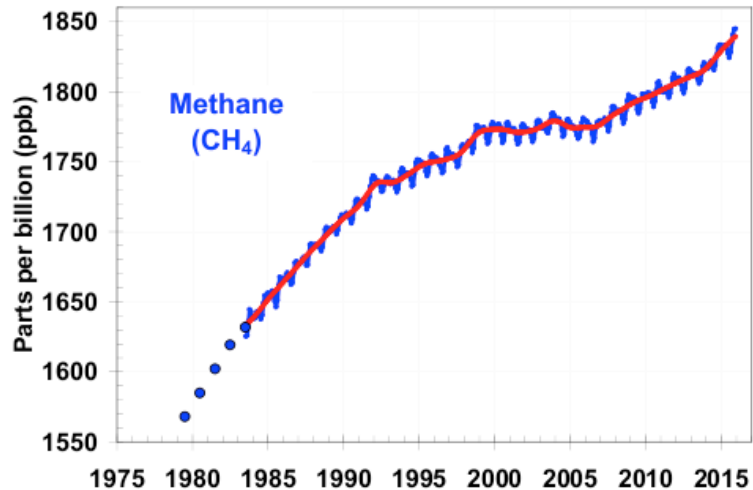
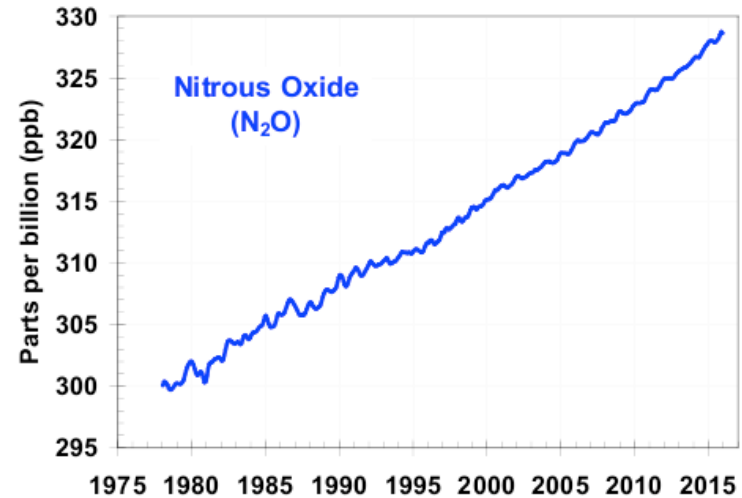
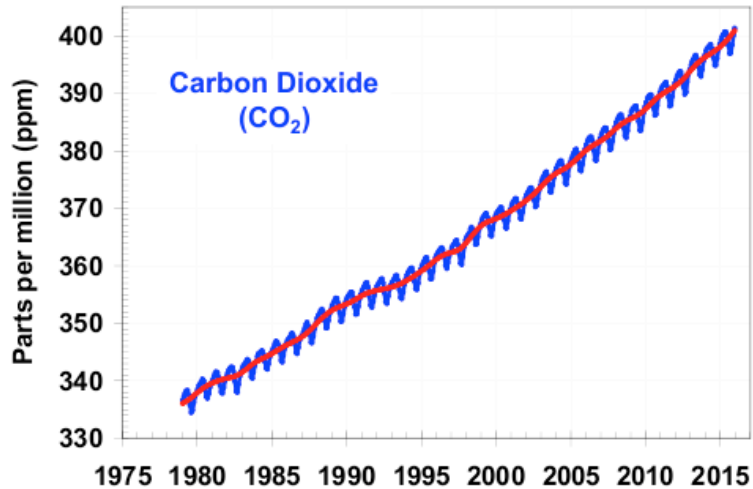


Contexte paléoclimatique

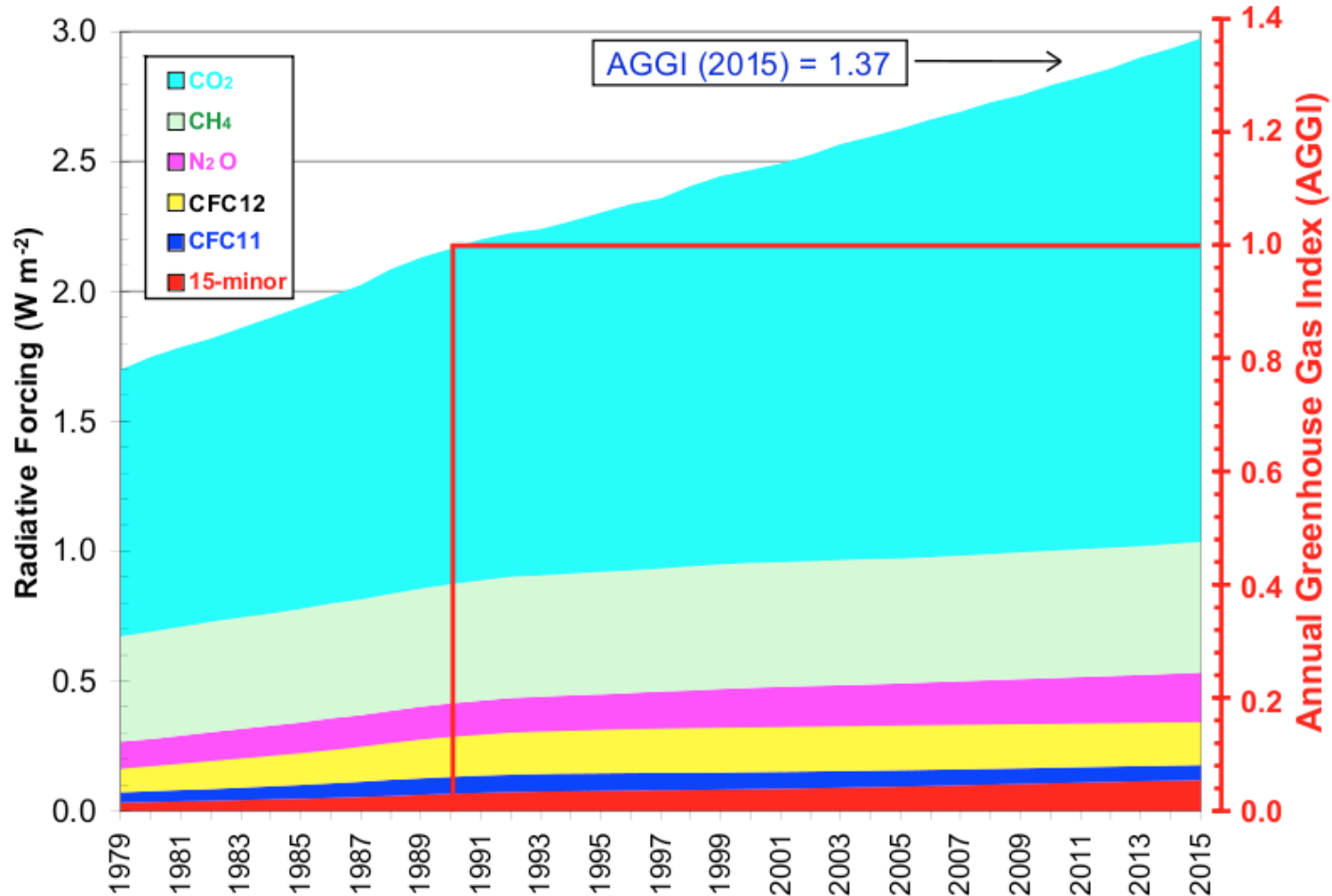


Marcott et al, Science, 2013; Turney and Jones, JQSR, 2010 ; Clark and Huybers, Nature, 2009; McKay et al, GRL, 2011; Hansen et al, in prep

Composition atmosphérique

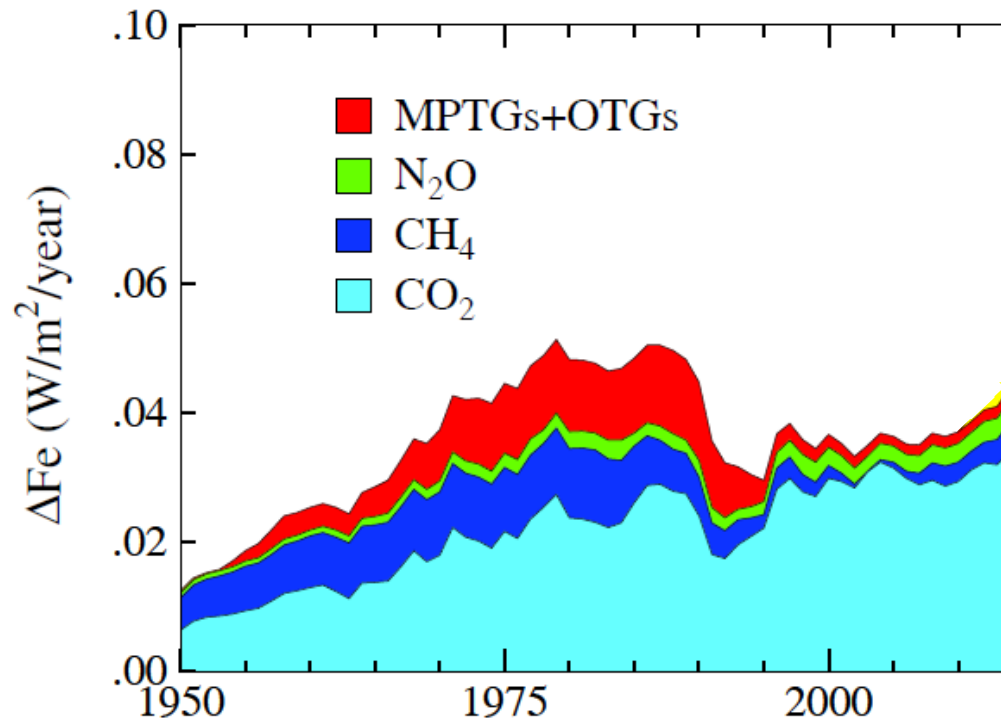


Effet sur le climat : forçage radiatif



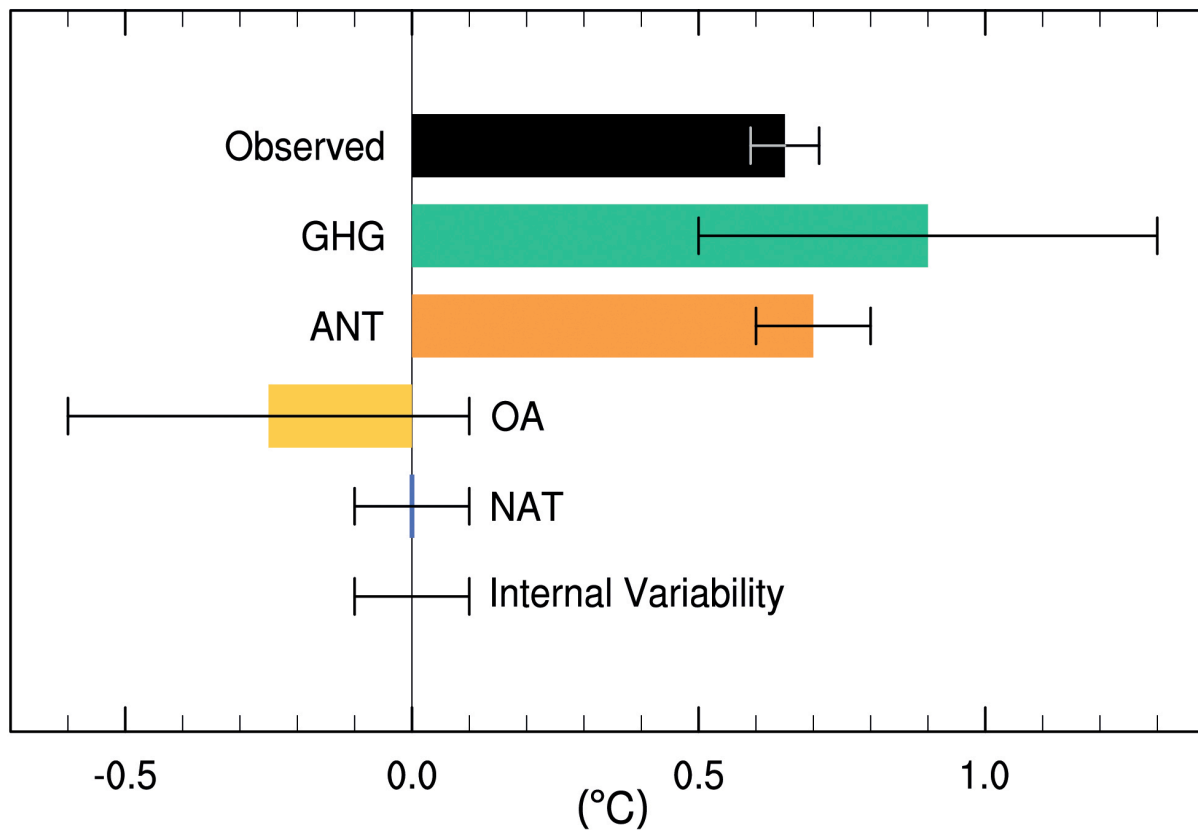
Taux de croissance du forçage radiatif anthropique

Greenhouse gas effective radiative forcing growth rate ($\text{W}/\text{m}^2/\text{yr}$)

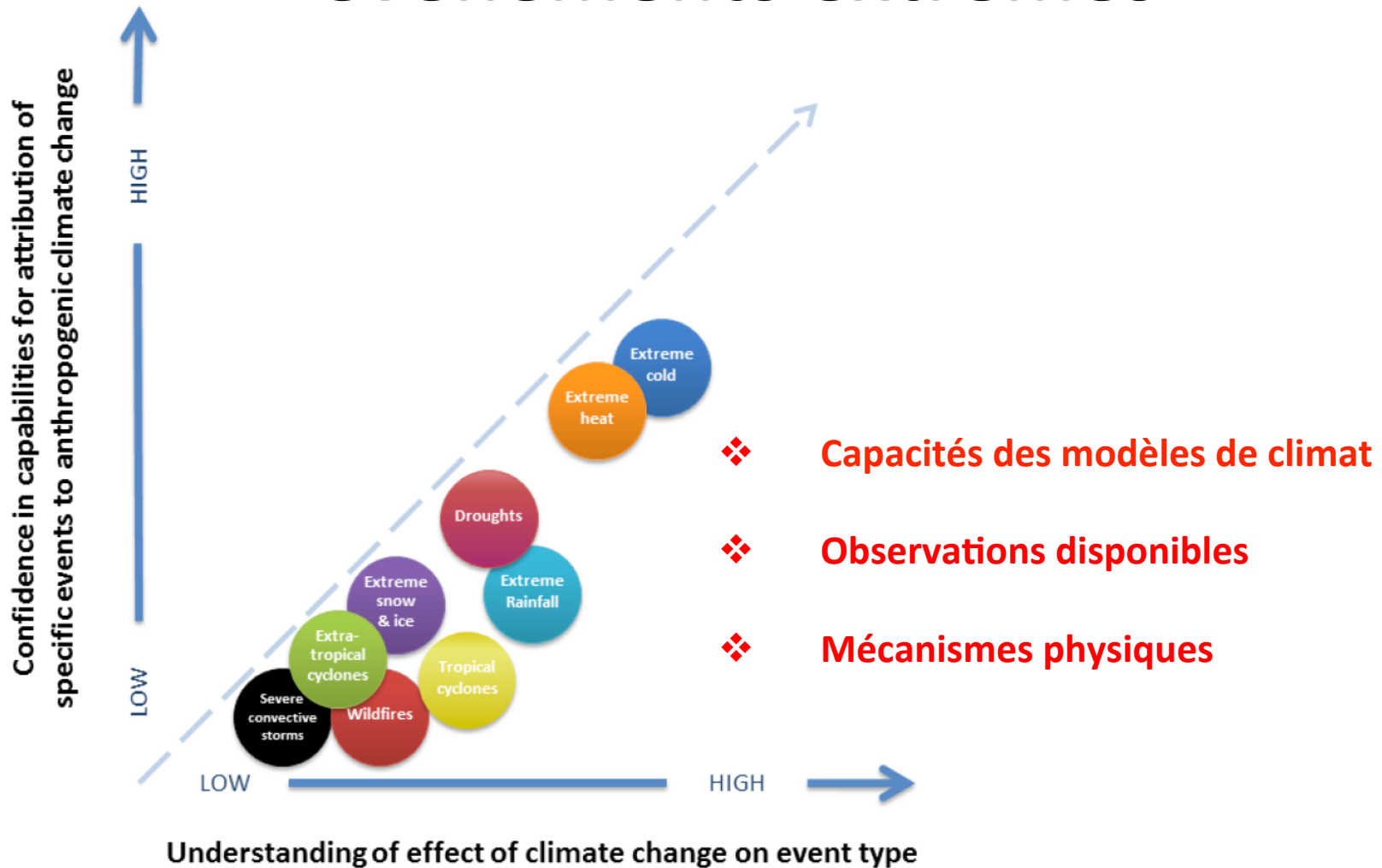


Influence humaine : tendance de température

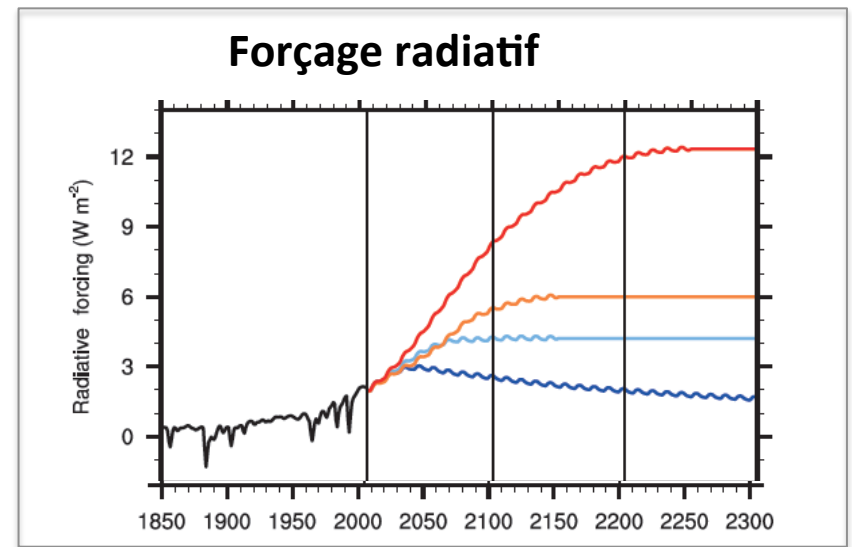
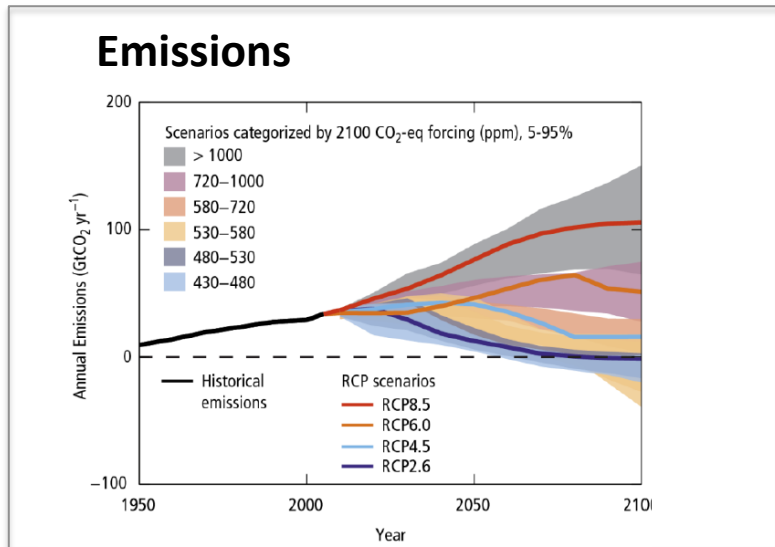
Attribution of 1950-2010 warming trend to drivers



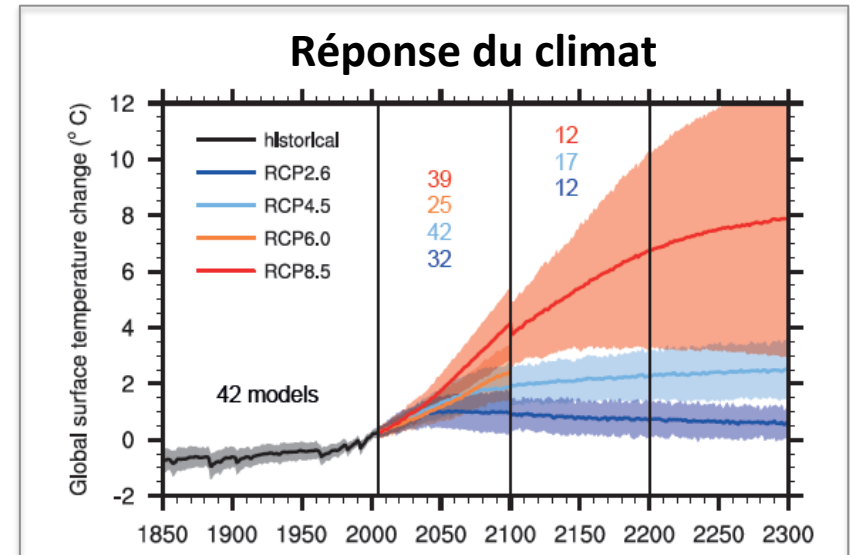
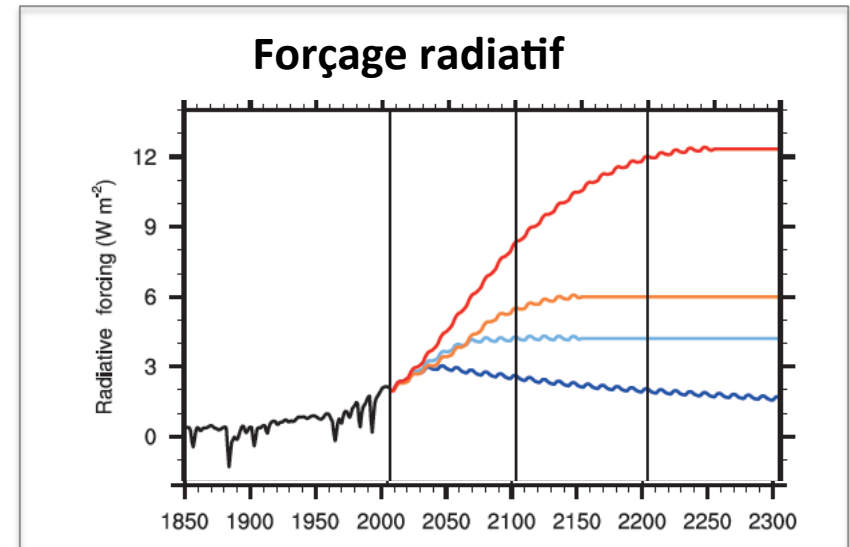
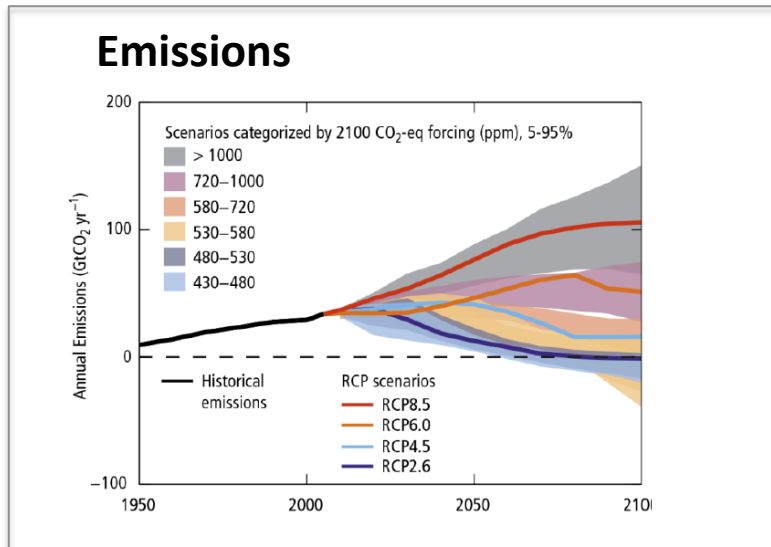
Influence humaine : évènements extrêmes



Trajectoires



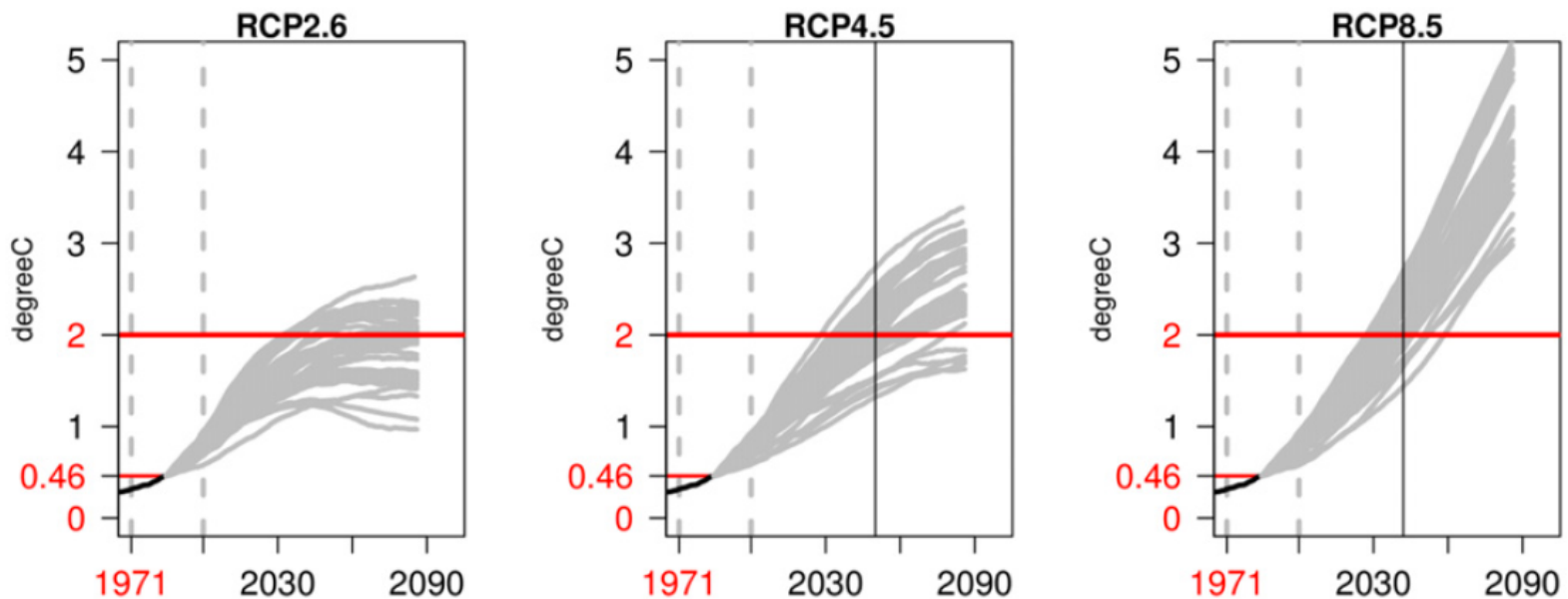
Trajectoires, réponses du climat



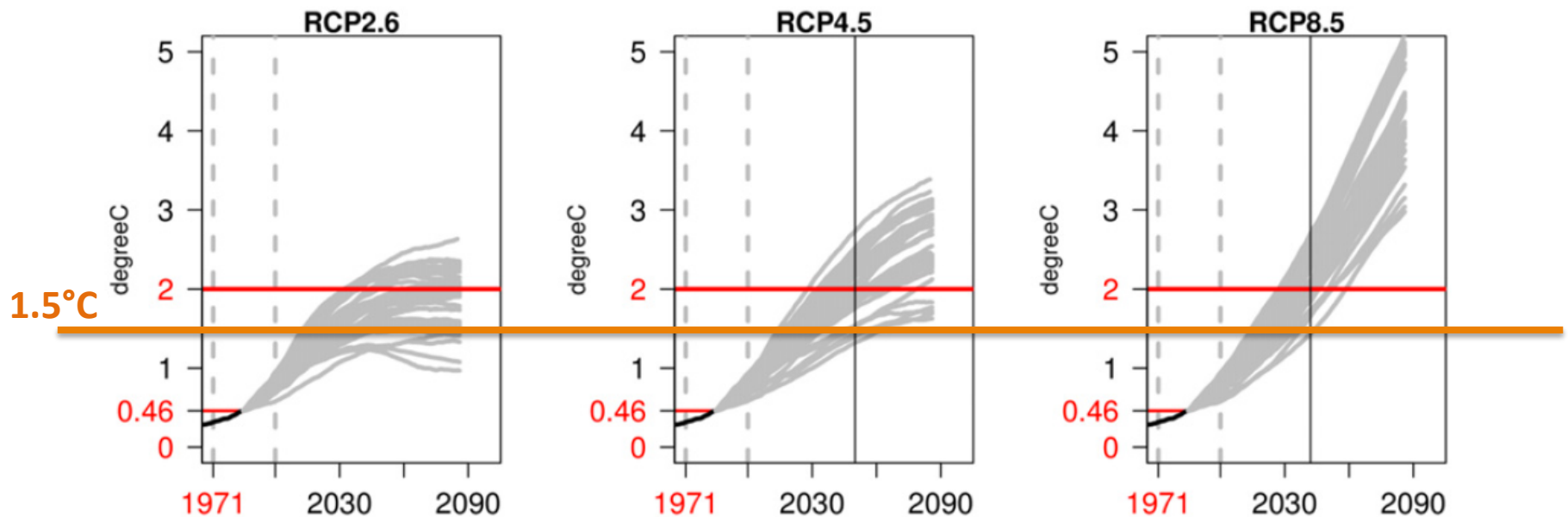
- ✓ Prise en compte des forçages (e.g. aerosols)
- ✓ Rétroactions, réponse transitoire, sensibilité du climat (e.g. nuages)
- ✓ Rétroactions climat – cycle du carbone

Objectifs de long terme et simulations CMIP5

Moyennes glissantes sur 30 ans

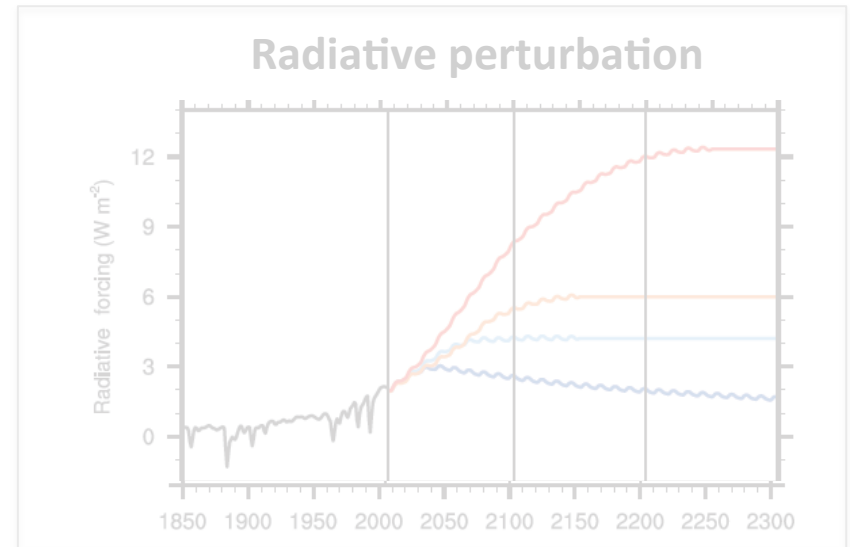
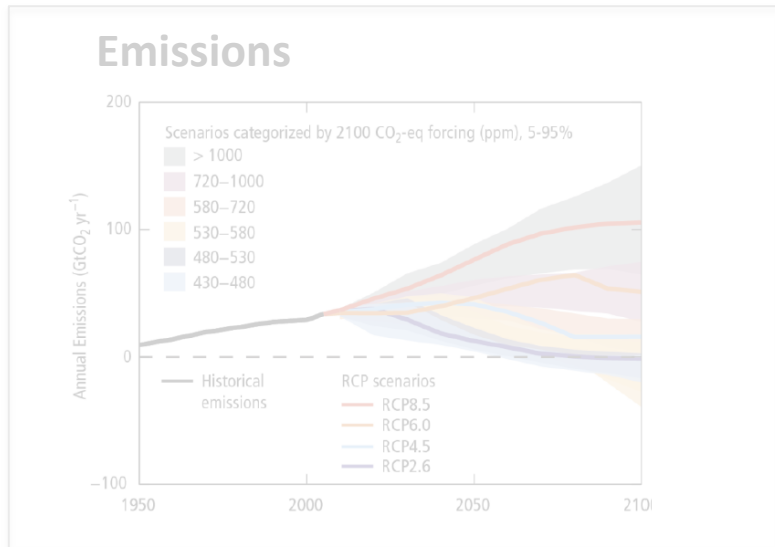


Objectifs de long terme et simulations CMIP5

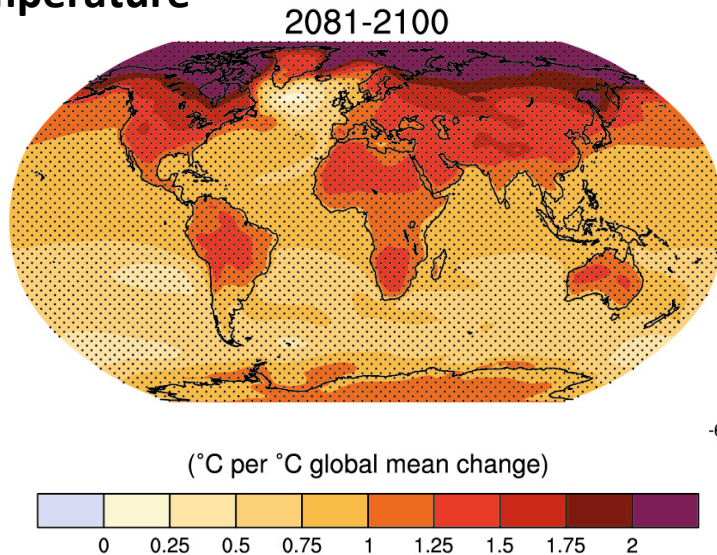


- ✓ *Nécessité d'avoir davantage de simulations (ensembles)*
- ✓ *Réponse transitoire du climat*
- ✓ *Développement de nouveaux scénarios (SSP)*
- ✓ *Importance des scénarios pour les conséquences régionales (aérosols ; usage des terres)*

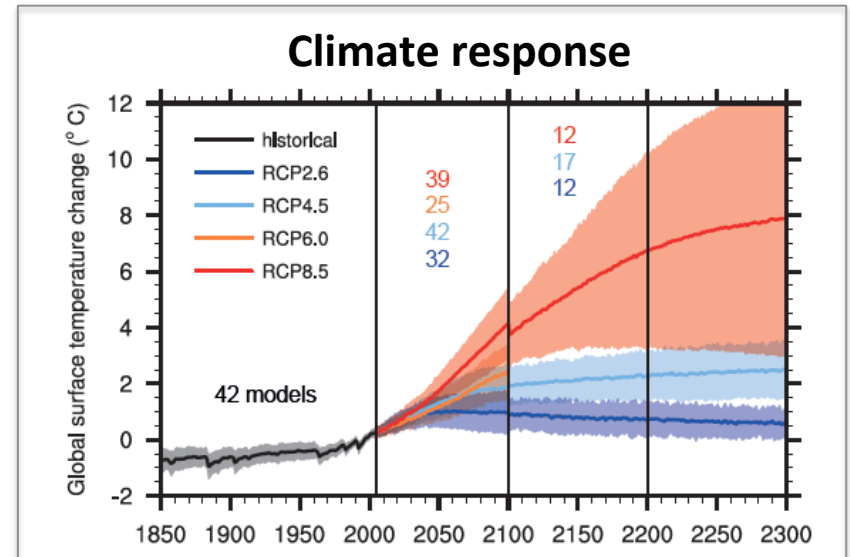
Réponse du climat



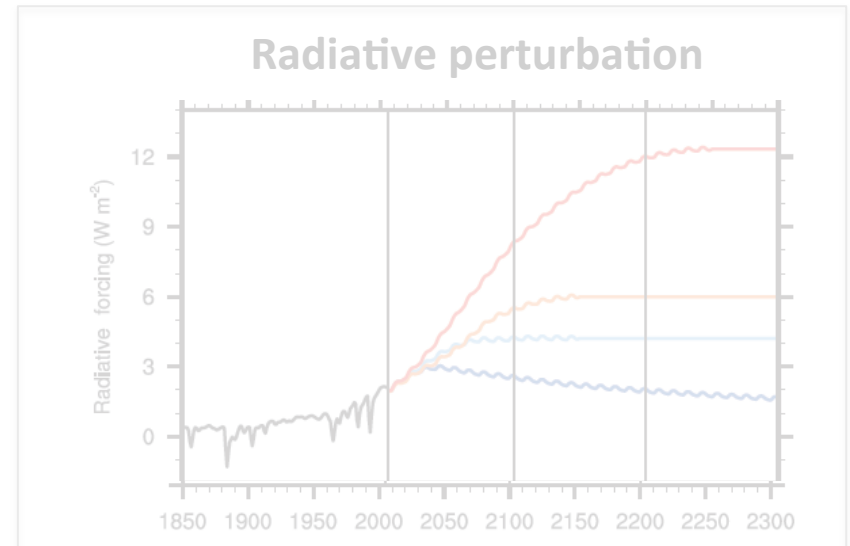
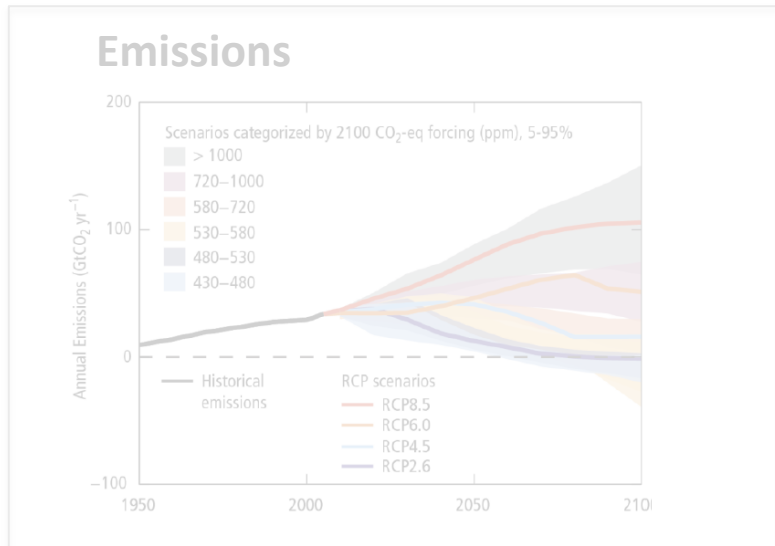
Temperature



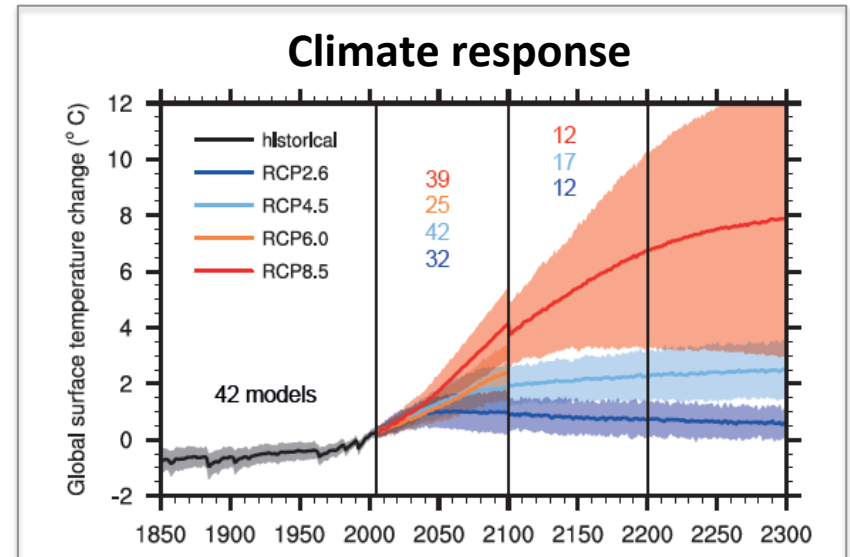
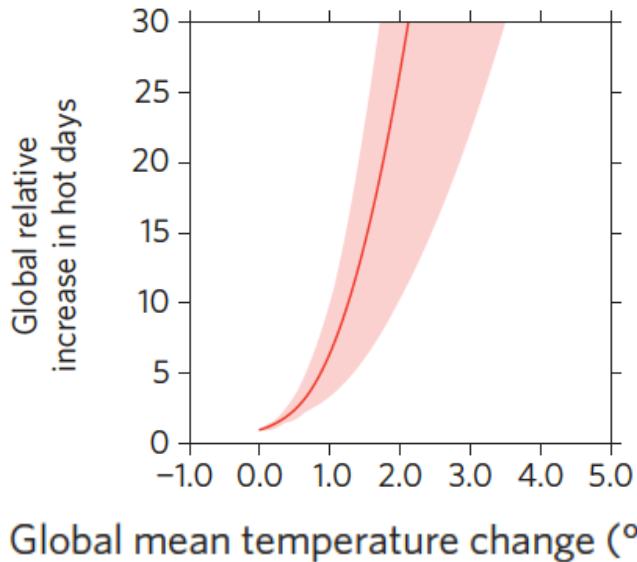
-6



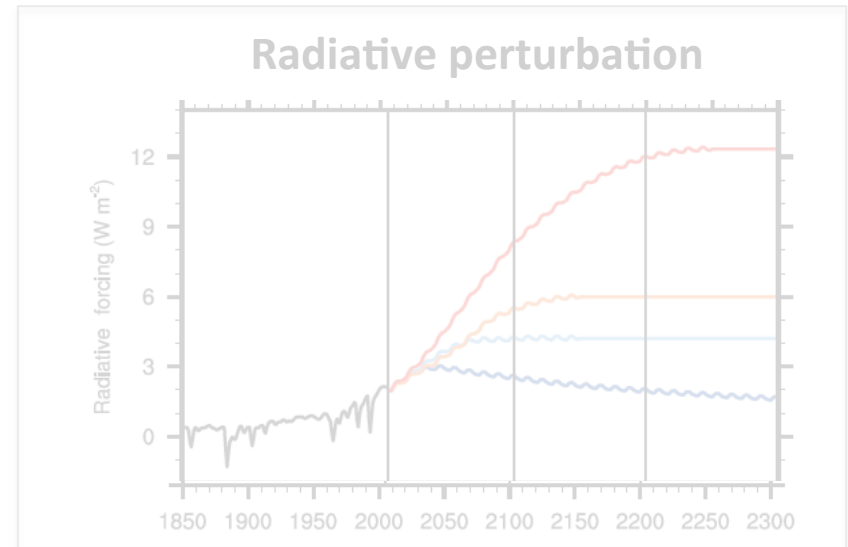
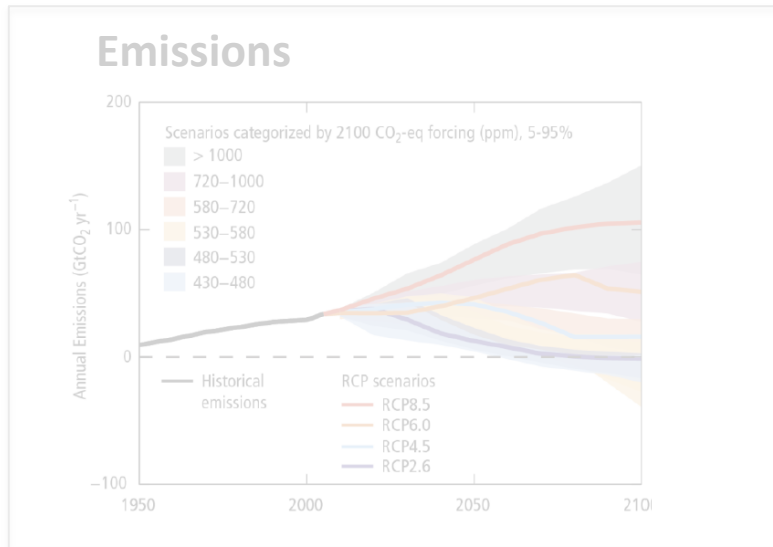
Réponse du climat



Extrêmes chauds (Knutti et al, NCC, 2016)

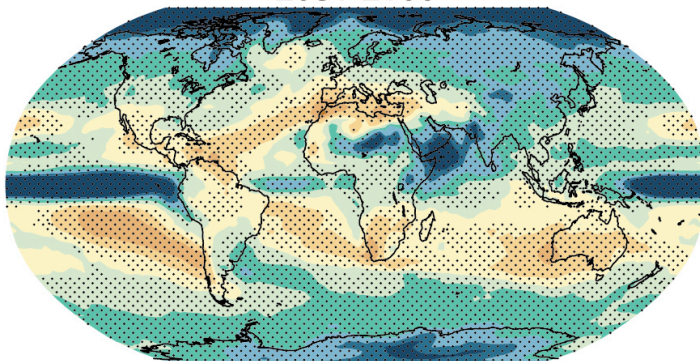


AR5 : climate response

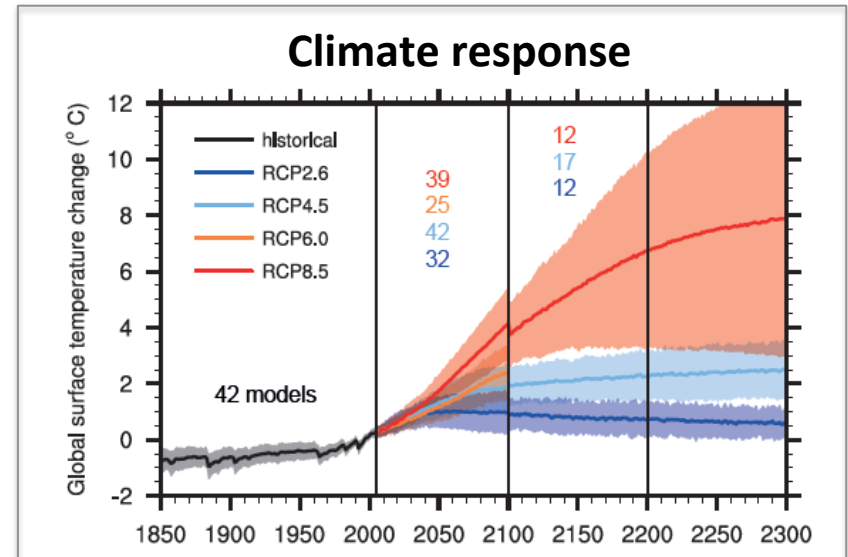
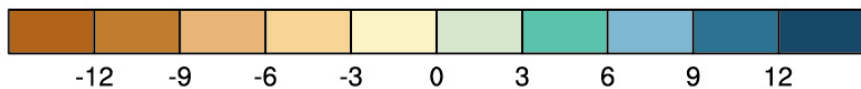


Precipitation

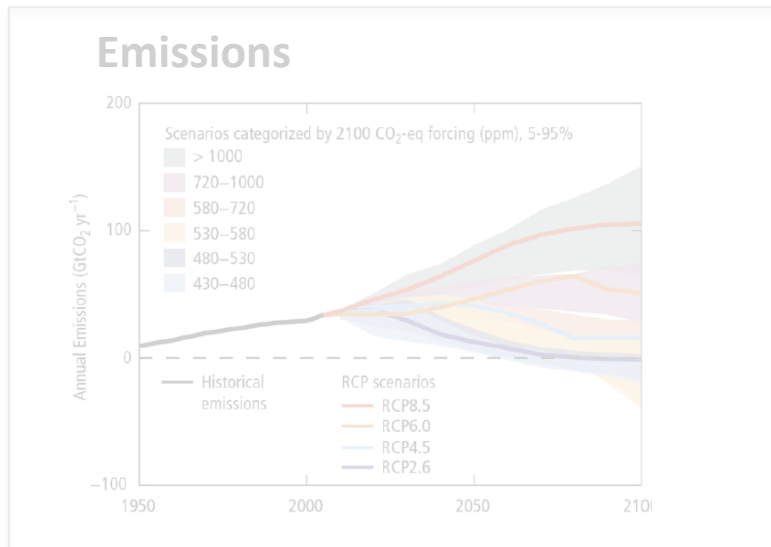
2081-2100



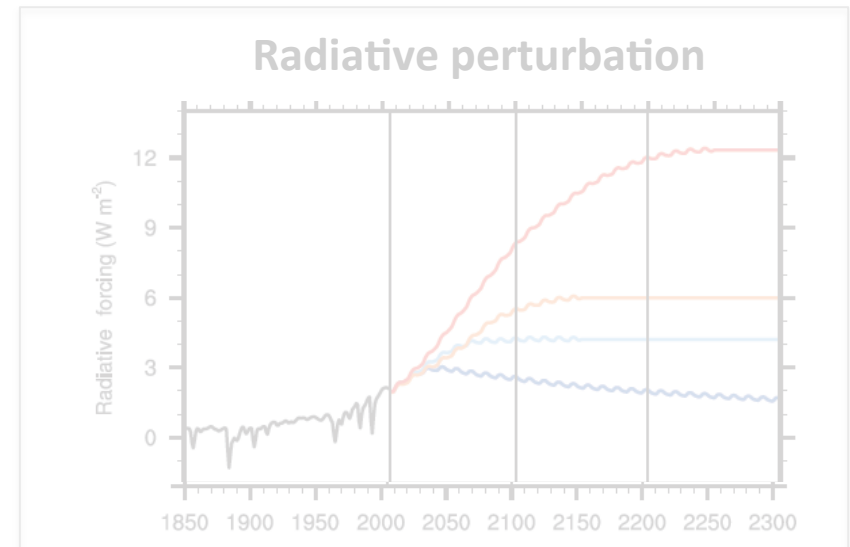
(% per $^{\circ}\text{C}$ global mean change)



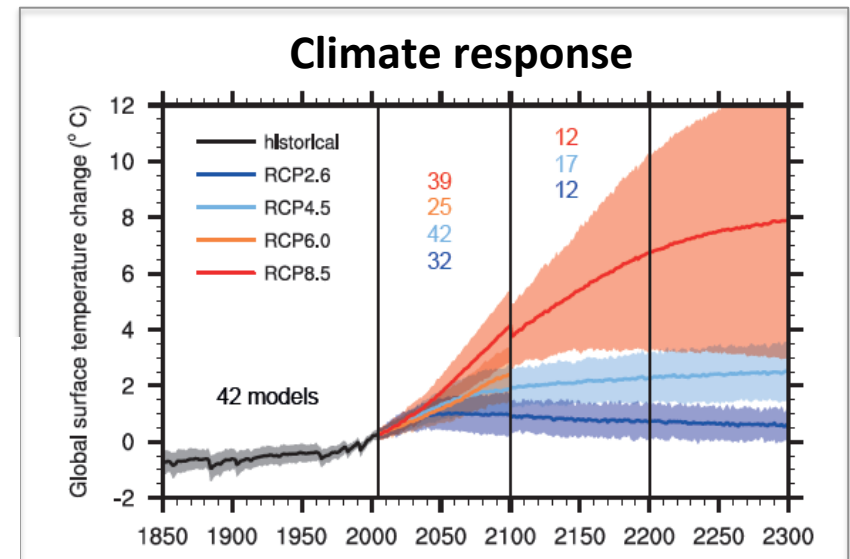
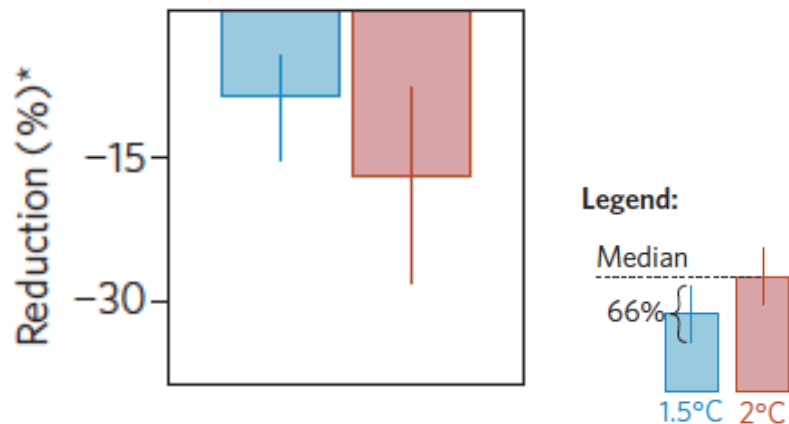
AR5 : climate response



(Schleussner et al, NCC, 2016)

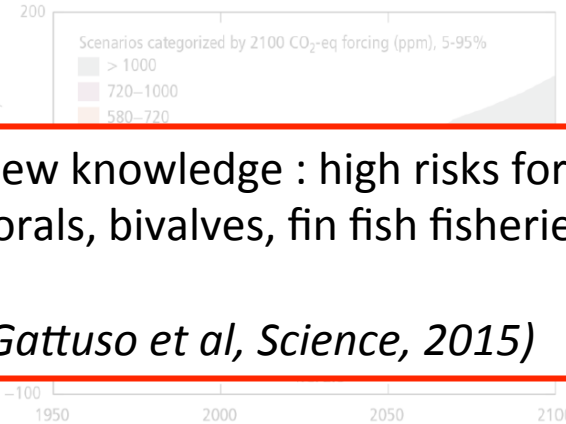


c Mediterranean water availability

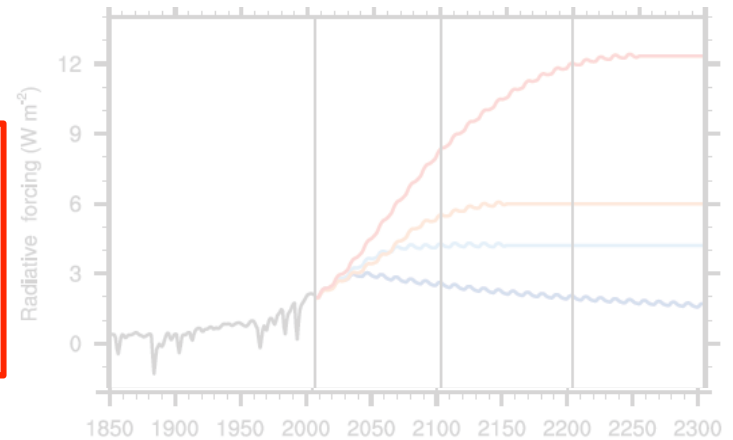


AR5 : climate response

Emissions



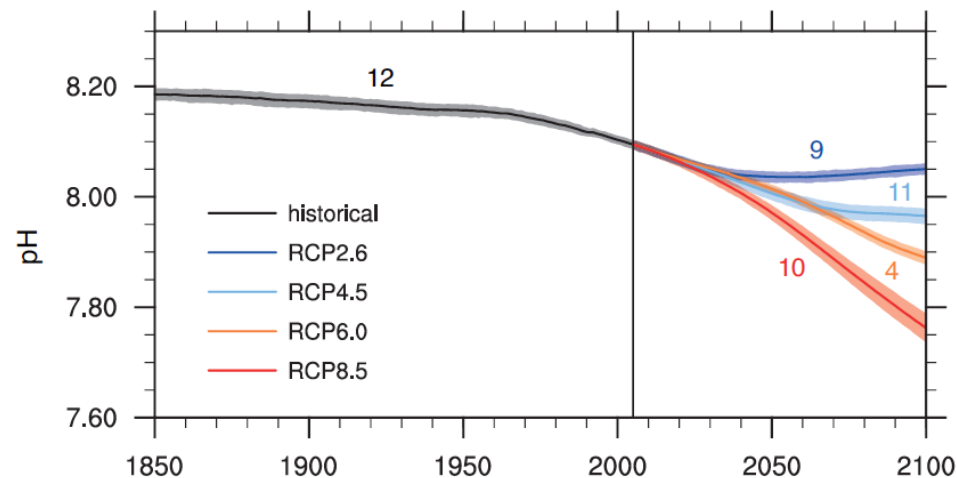
Radiative perturbation



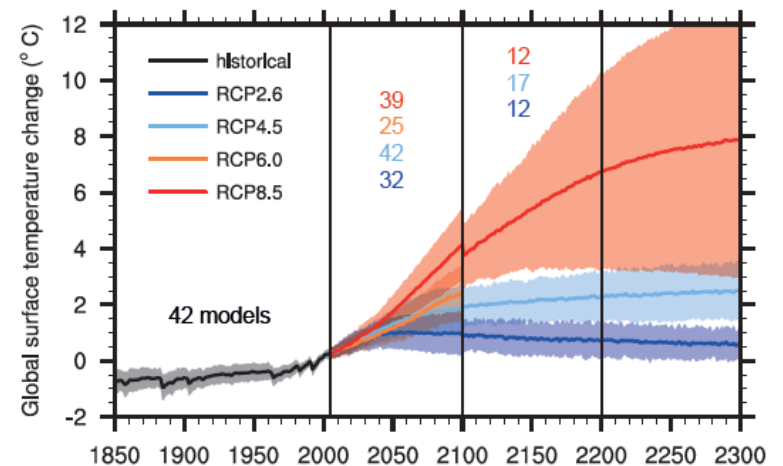
New knowledge : high risks for warm water corals, bivalves, fin fish fisheries... for <2°C

(Gattuso et al, Science, 2015)

Ocean acidification

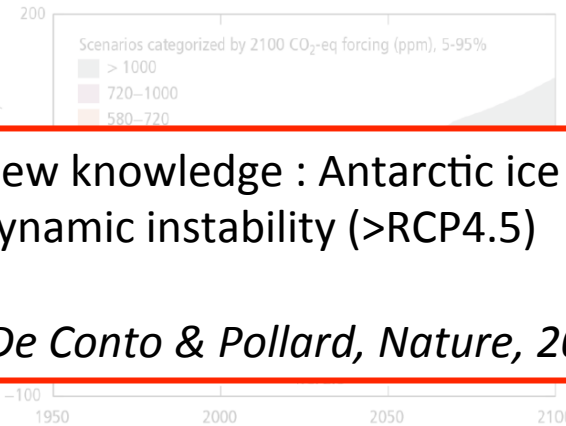


Climate response



AR5 : climate response

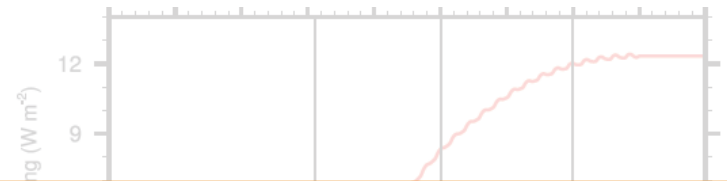
Emissions



New knowledge : Antarctic ice sheet dynamic instability (>RCP4.5)

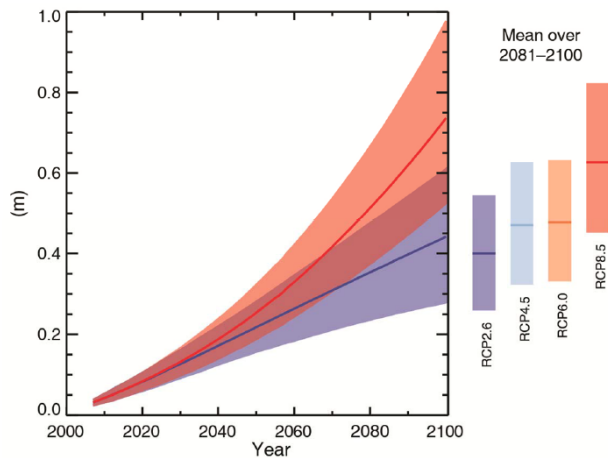
(De Conto & Pollard, Nature, 2016)

Radiative perturbation

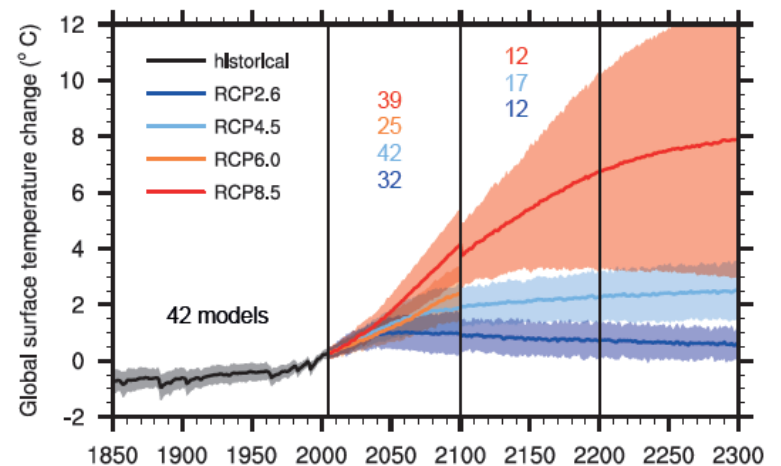


- ✓ *Glaciers at 1.5 or 2°C?*
- ✓ *Arctic / Antarctic sea ice?*
- ✓ *Permafrost carbon feedbacks?*
- ✓ *Cyclones?*

Sea level until 2100

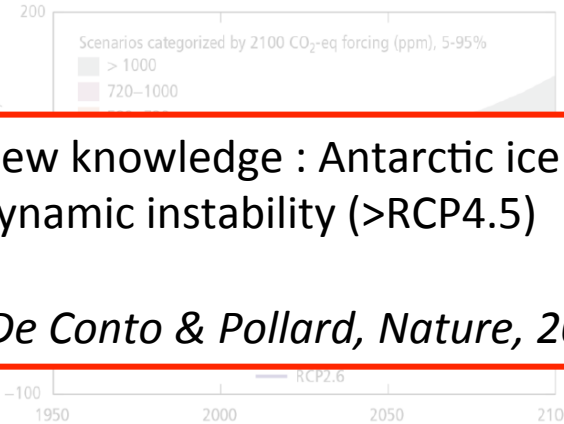


Climate response



AR5 : climate response

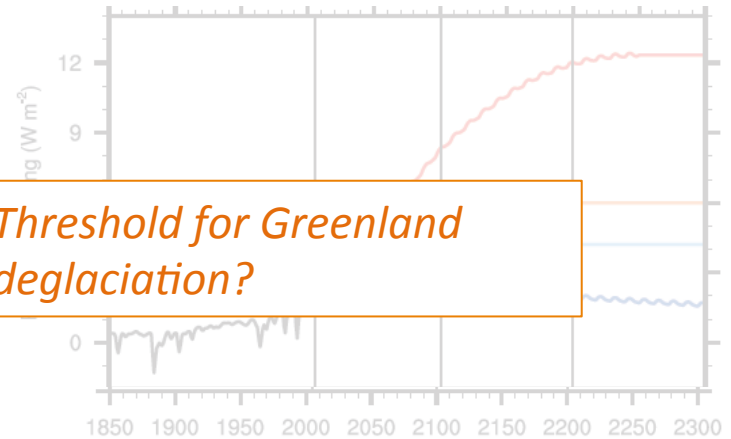
Emissions



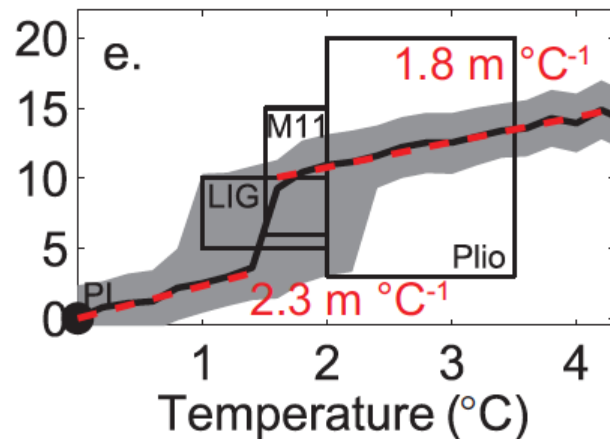
New knowledge : Antarctic ice sheet dynamic instability (>RCP4.5)

(De Conto & Pollard, Nature, 2016)

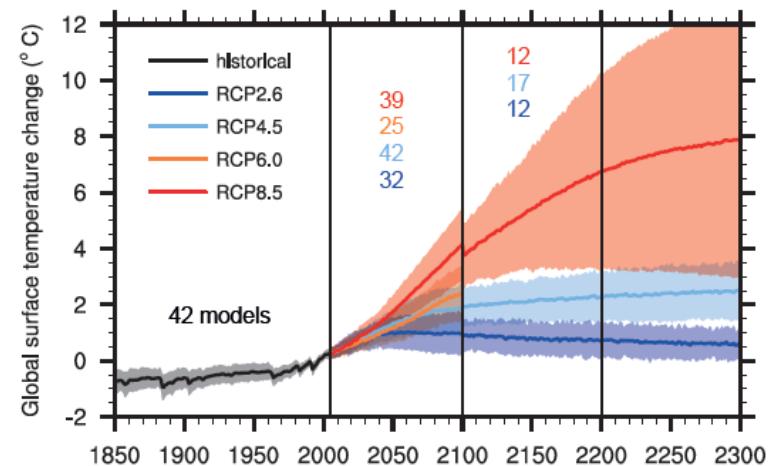
Radiative perturbation



Multi-millennial sea level commitment (m)

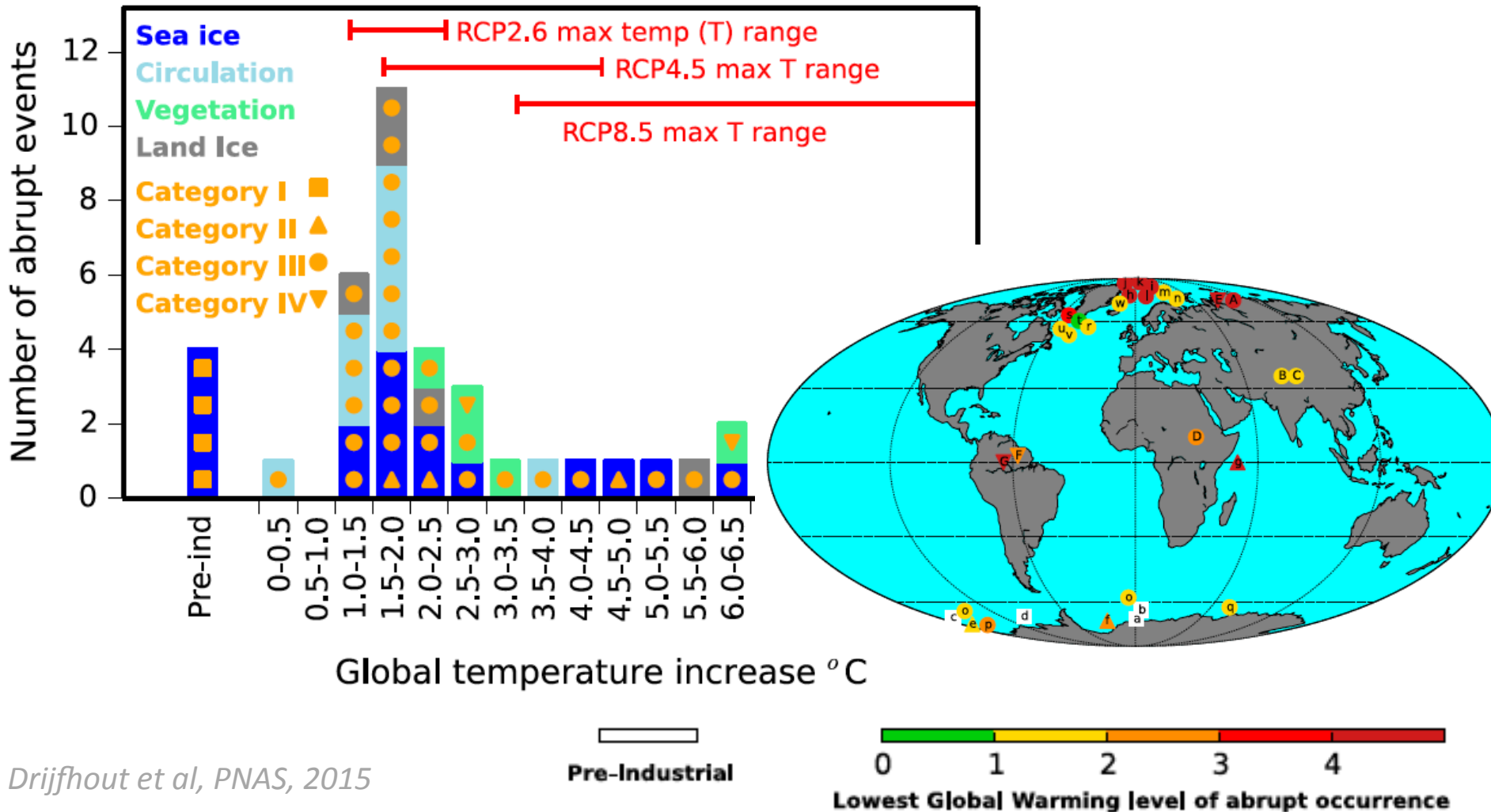


Climate response



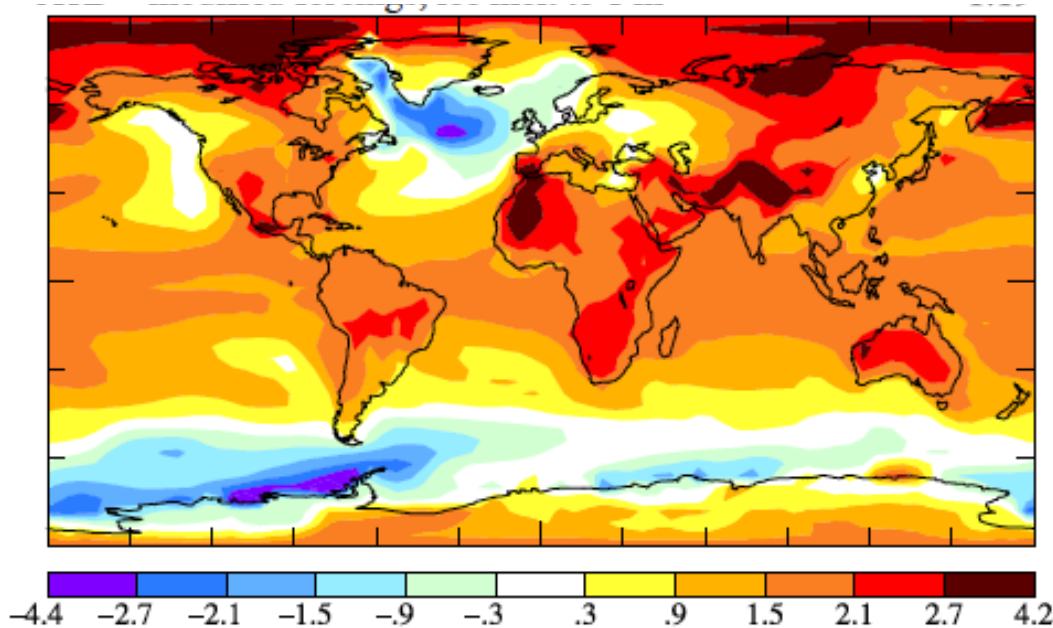
Risques d'évènements abrupts : analyse des simulations CMIP5

Catalogue of abrupt shifts in CMIP5 climate model projections



Quels conséquences en cas d'accélération de la fonte de calottes de glace polaires

Changement de température simulé



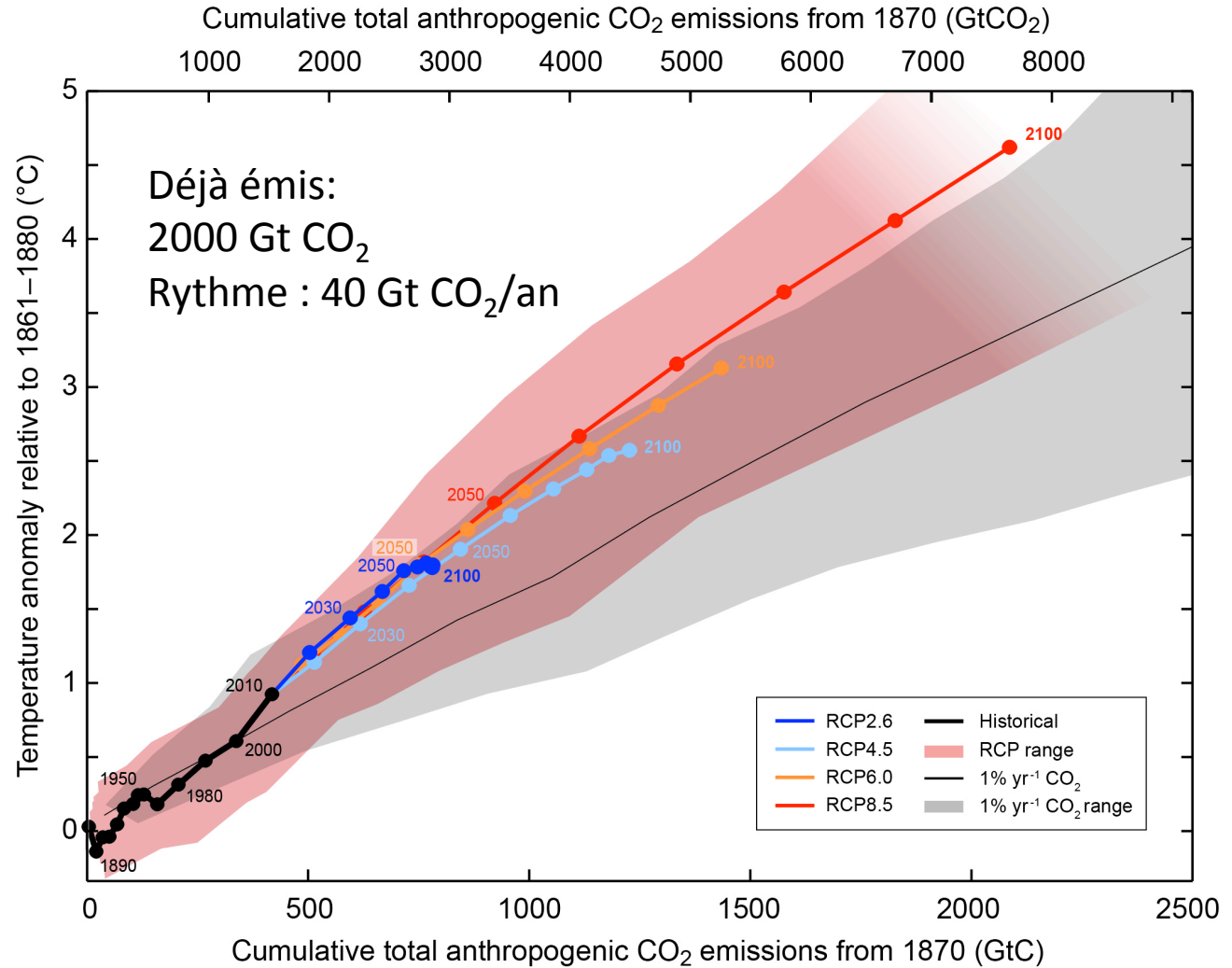
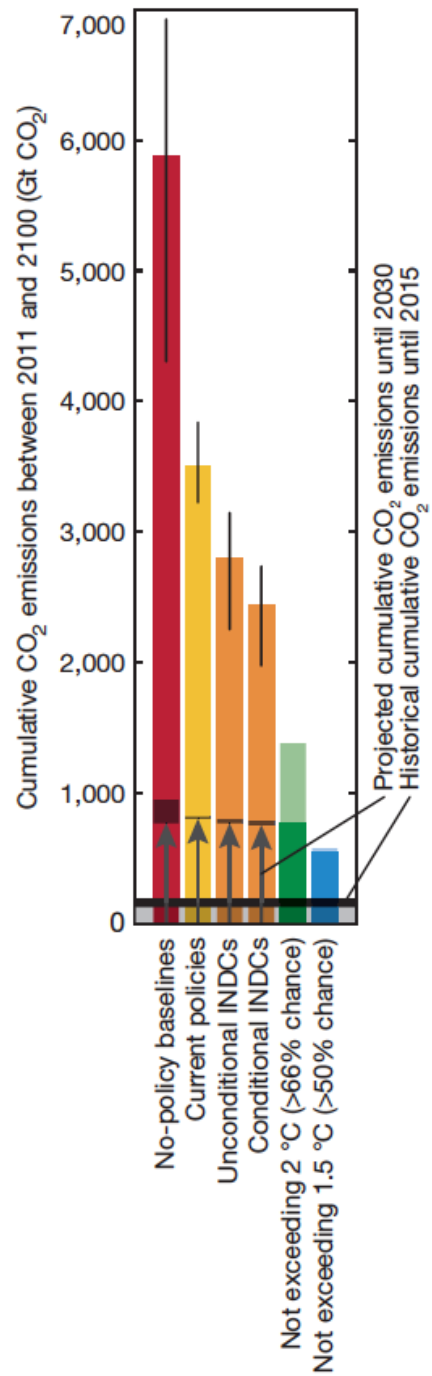
Ralentissement circulation thermohaline

Modification de la température à la surface des océans

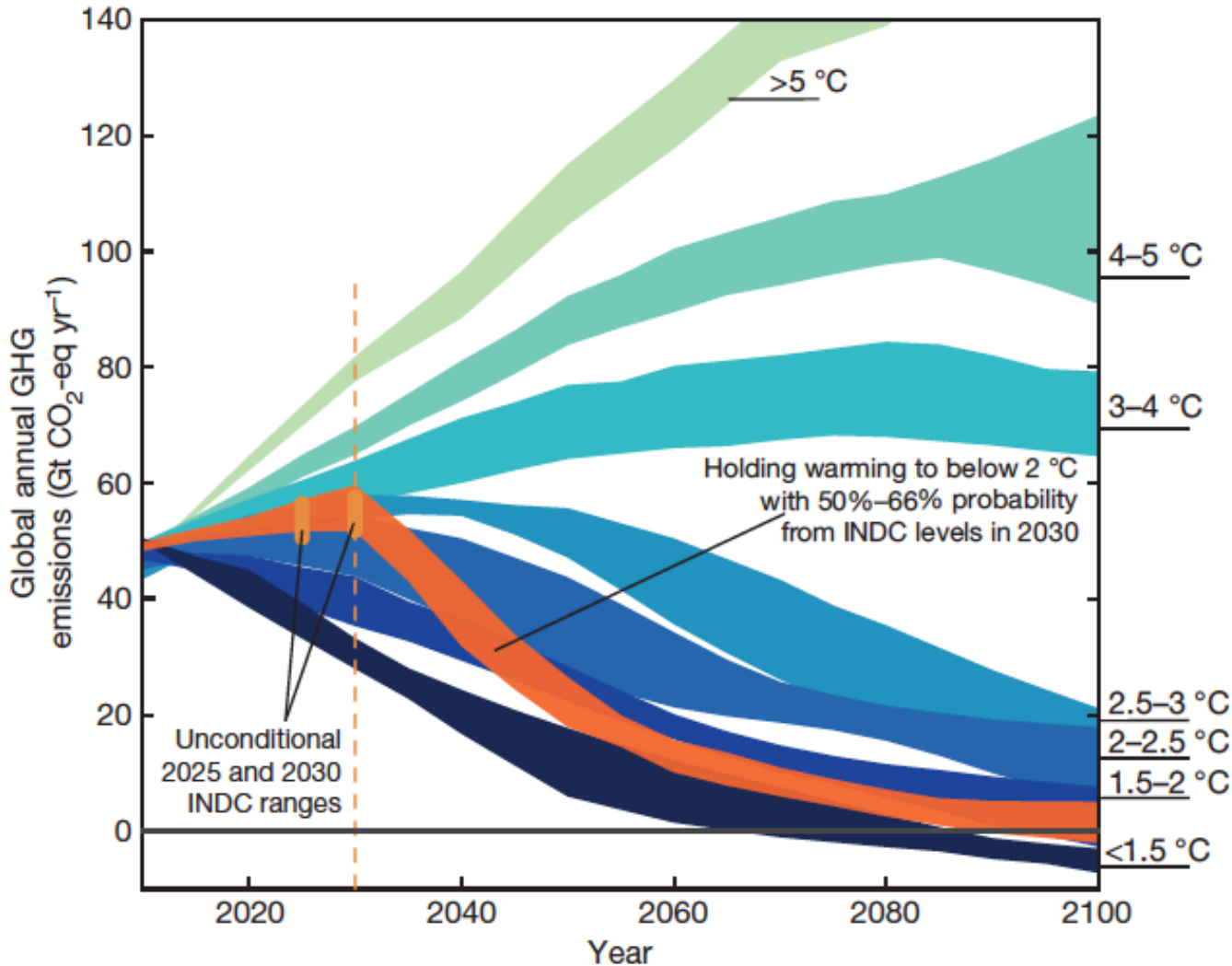
Impacts sur formation tempêtes

Réchauffement de subsurface près de l'Antarctique et impacts sur la fonte des plateformes de glace

Notion de « budget carbone »



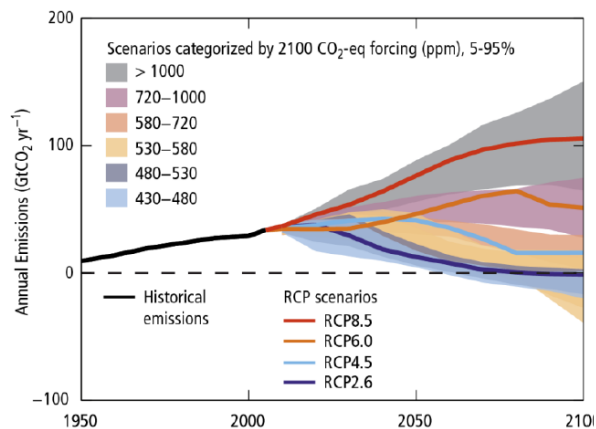
Quelles sont les trajectoires de mitigation compatibles avec un réchauffement <2°C?



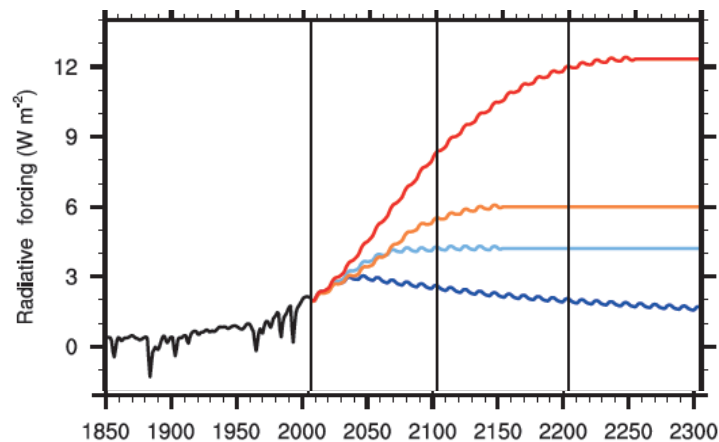
- ✓ How would overshoots affect Earth system responses?
- ✓ What are the biophysical implications and limits of negative emission options?

Trajectoires, réponses du climat, impacts

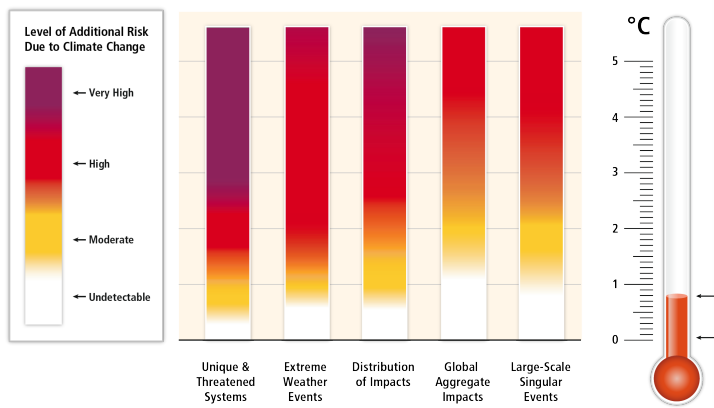
Global greenhouse gas emissions



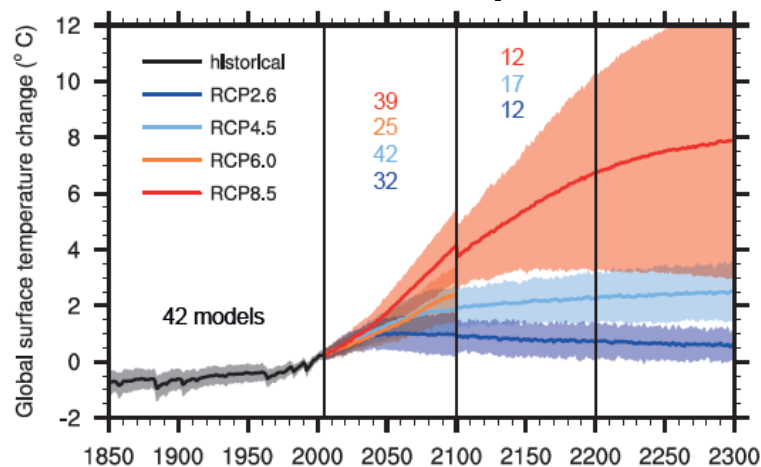
Radiative perturbation



Impacts as a function of global warming

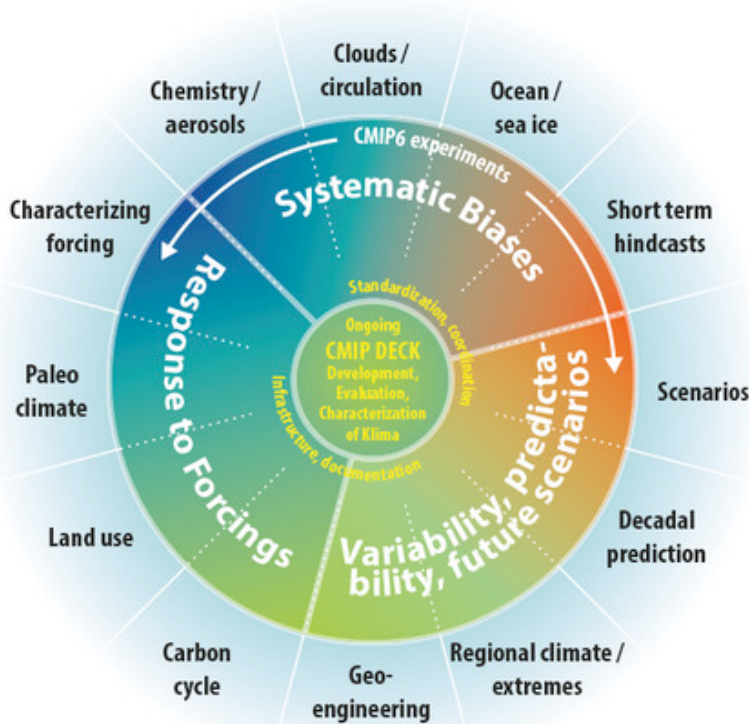
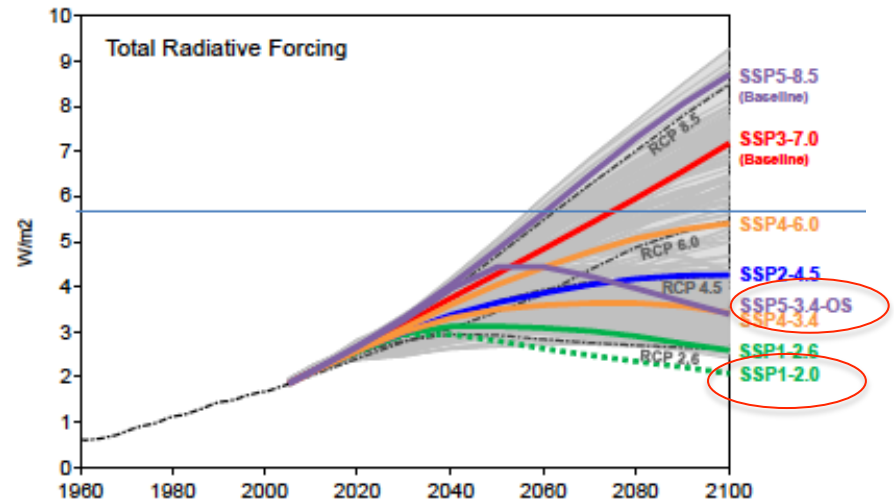


Climate response

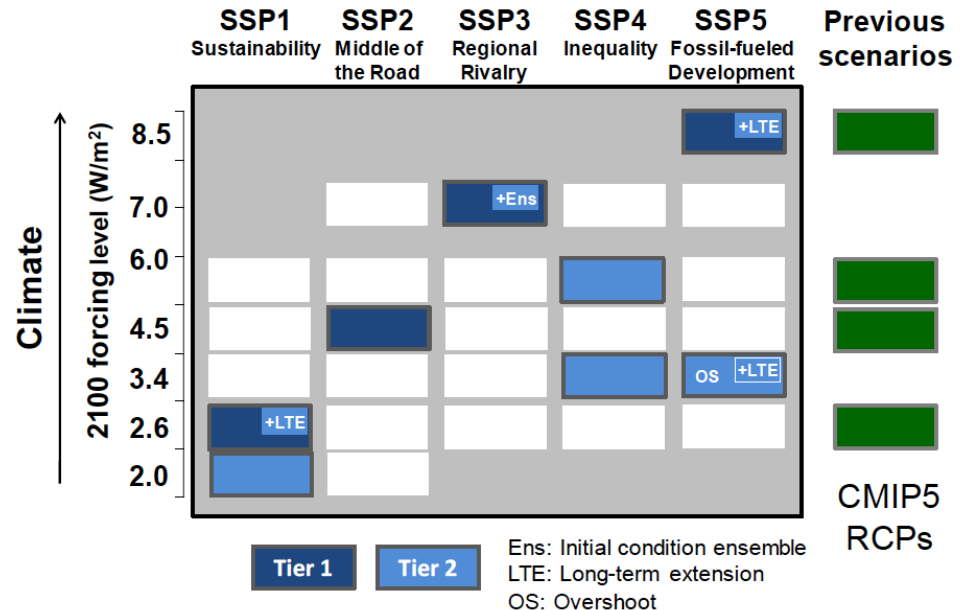


Développements en cours

ScenarioMIP for CMIP6, O'Neil et al, GMD Discussion 2016



Shared Socioeconomic Pathways



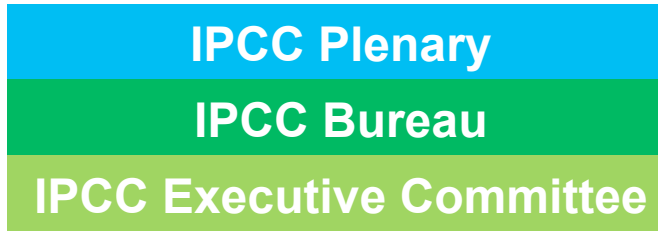
Prochains rapports du GIEC

- ✓ *Structure*
- ✓ *Rapports spéciaux 2018-2019*
- ✓ *Rapport complet 2021-2022*

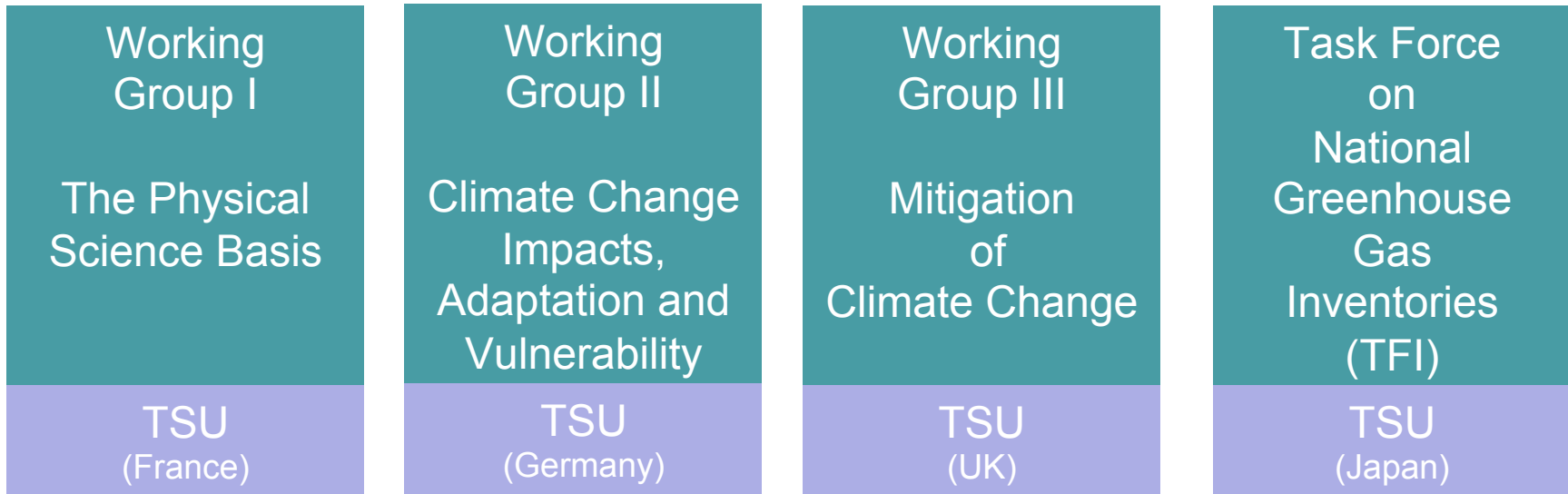


IPCC Structure

- UN body
- Intergovernmental Panel
(195 member States)



IPCC Secretariat
(in Geneva,
Switzerland)



Authors, Contributors, Reviewers

- International scientific, technical and socio-economic expertise

Trois rapports spéciaux



impacts of global warming of **1.5 °C** above pre-industrial levels and related global greenhouse gas emission pathways *in the context of sustainable development and eradication of poverty* **(SR1.5)**

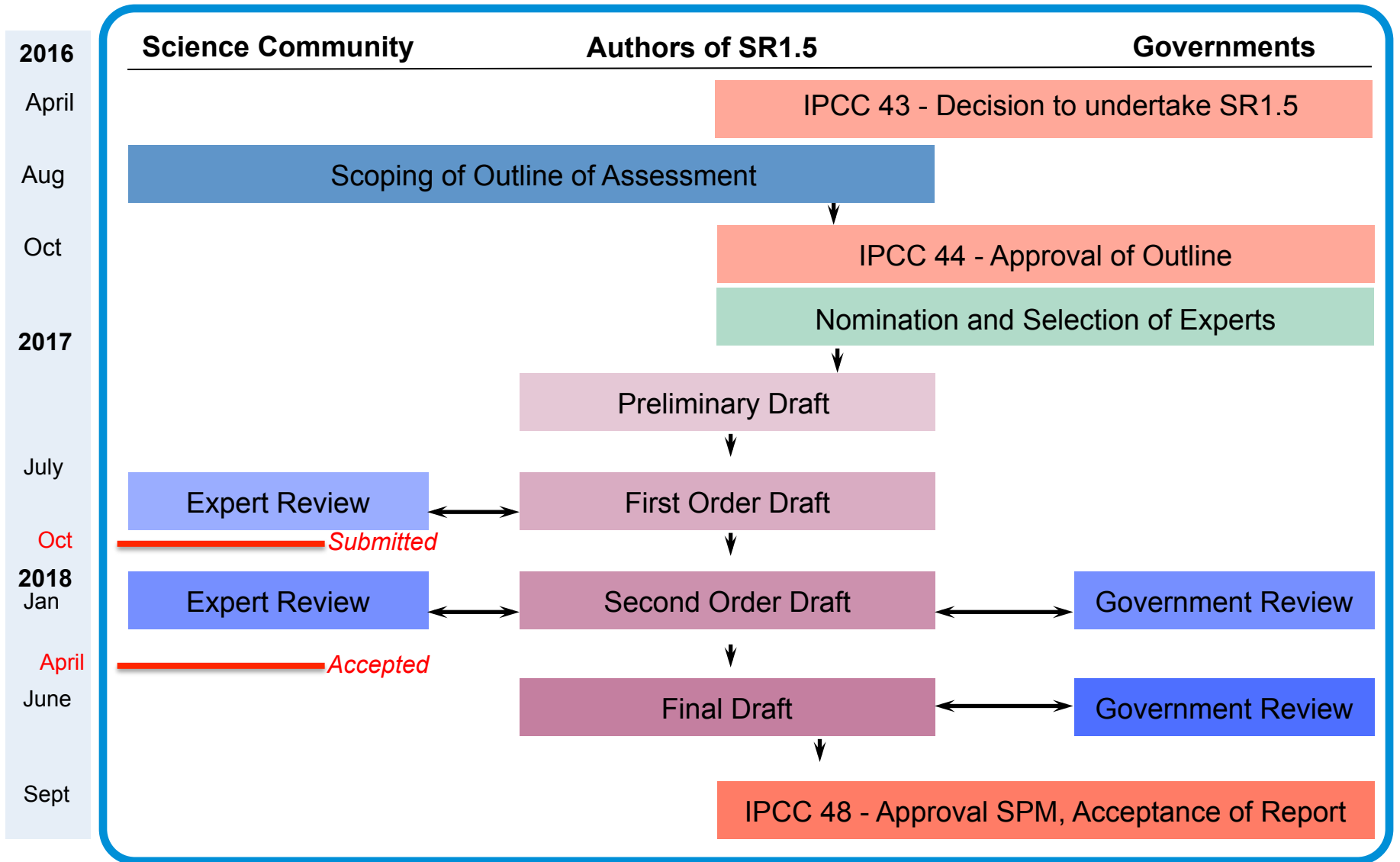


Climate change and **oceans** and the **cryosphere** **(SROCC)**



Climate change, **desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems** **(SR2)**

SR1.5: timeline



Literature to be assessed: submitted by **October 2017** to be included in the Second Order Draft for review, and accepted by **April 2018** to be included in the Final Draft review.

SR1.5 - Outline from Scoping Meeting

Noted at 52nd Session the IPCC Bureau;

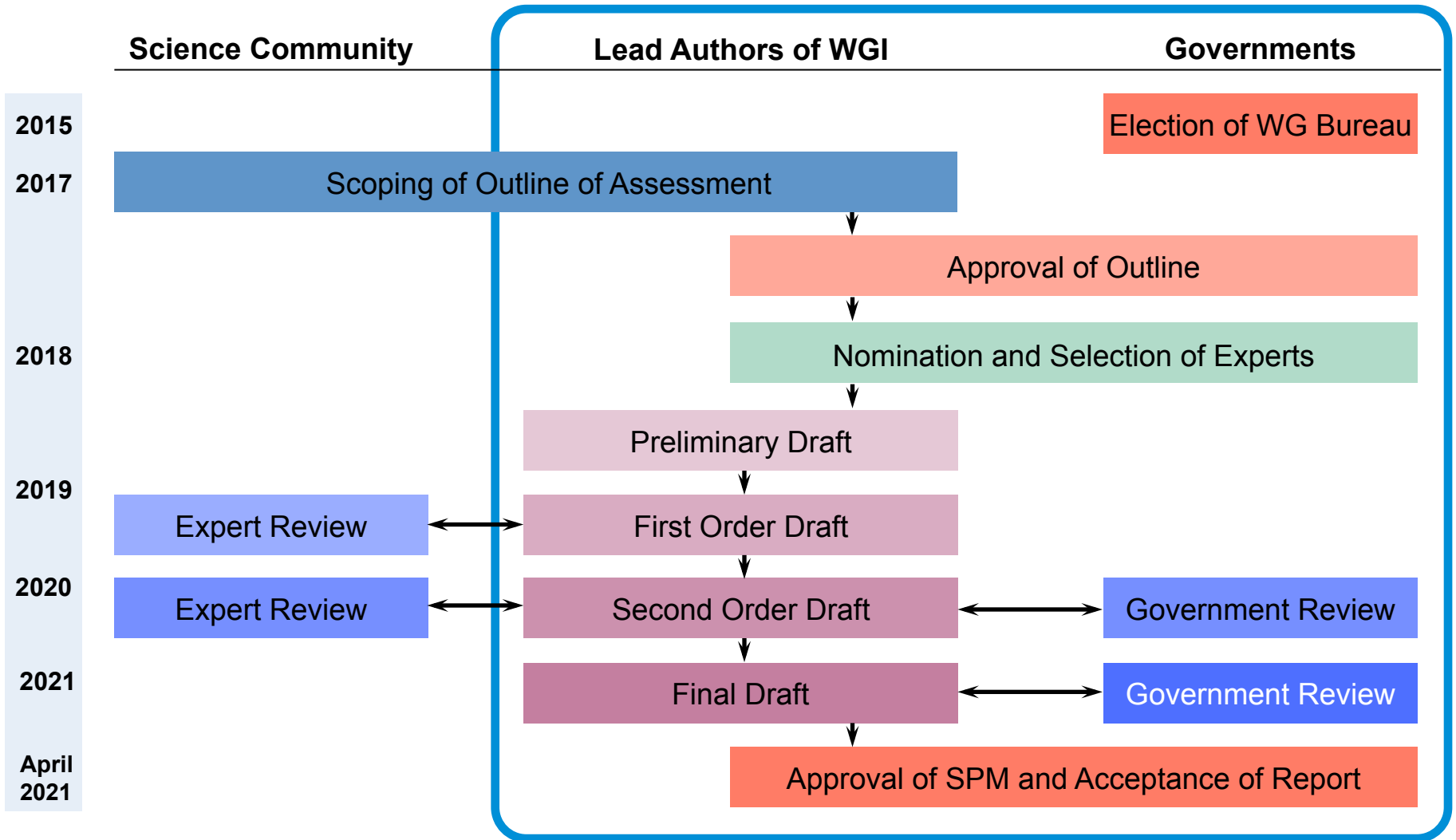
Submitted for consideration to the 44th Session of the IPCC, 17-20 October 2016

Front Matter	(2 pages)
Summary for Policy Makers	(15-20 pages)
1. Framing and context	(15 pages)
2. Mitigation pathways compatible with 1.5°C in the context of sustainable development	(40 pages)
3. Impacts of 1.5 °C global warming on natural and human systems	(60 pages)
4. Strengthening the global response to the threat of climate change	(40 pages)
5. Approaches to implementing a strengthened global response to the threat of climate change	(20 pages)
6. Sustainable development, poverty eradication and reducing inequalities	(40 pages)
Up to 10 boxes integrated case studies/regional and cross-cutting themes	(20 pages)
FAQs	(10 pages)
TOTAL: (247/267 pages)	

Outline of AR5, WGI

Introduction	Chapter 1
Observations and paleoclimate Information	Chapters 2, 3, 4, 5
Process understanding : <i>carbon and BGC, clouds and aerosols</i>	Chapters 6, 7
From forcing to attribution of climate change : <i>forcings, model evaluation, D&A</i>	Chapters 8, 9, 10
Future climate change and predictability	Chapters 11, 12
Integration : sea level, climate phenomena	Chapters 13, 14
<i>Atlas of global and regional climate projections</i>	
<i>WGII Part B (regional aspects)</i>	

Préparation du rapport complet



Considerations for the AR6, WGI

- From global to regional aspects, strengthen regional assessment (extreme events incl. attribution)
- Focus on process-based understanding (WCRP grand challenges)
- Involve social scientists (perception, indigenous knowledge, history of climate research)
- Inform adaptation strategies including internal variability and response to natural and anthropogenic forcings (e.g. major volcanic eruptions)
- Consider stake-holder and end-user needs in scoping
- More authors from DC and EIT
- Grow capacity and develop communication skills of authors

Perturbation du cycle du carbone

