CLIMATE-SMART Agriculture 2015

Global Science Conference

March 16-18, 2015
Le Corum, Montpellier France

Climate Change: From Global Alert to Local Studies

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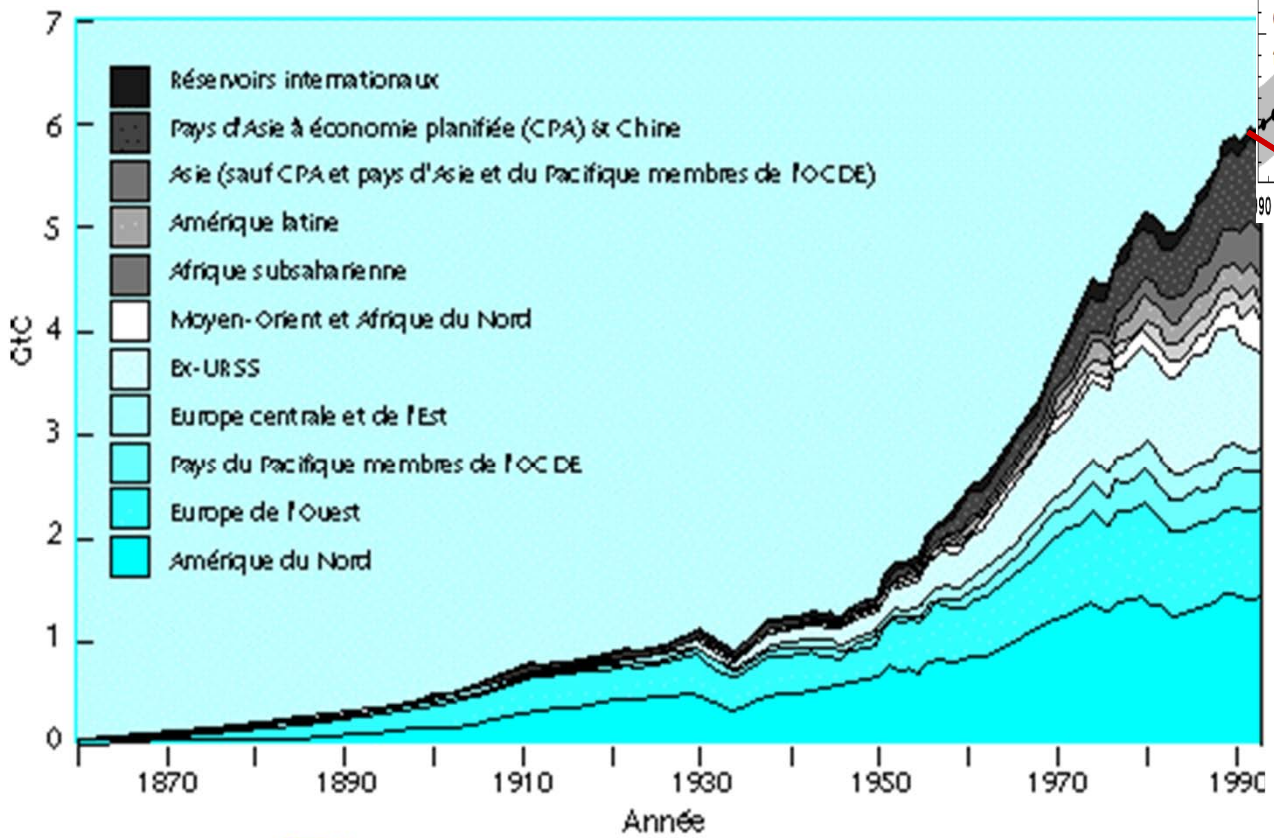
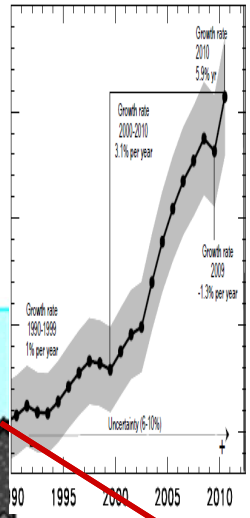
Montpellier

March 16-18, 2015

Greenhouse Gas emissions do not slow down: the example of CO2 (in Gt C per year – Gigatons of Carbon per year) (International Energy Agency)

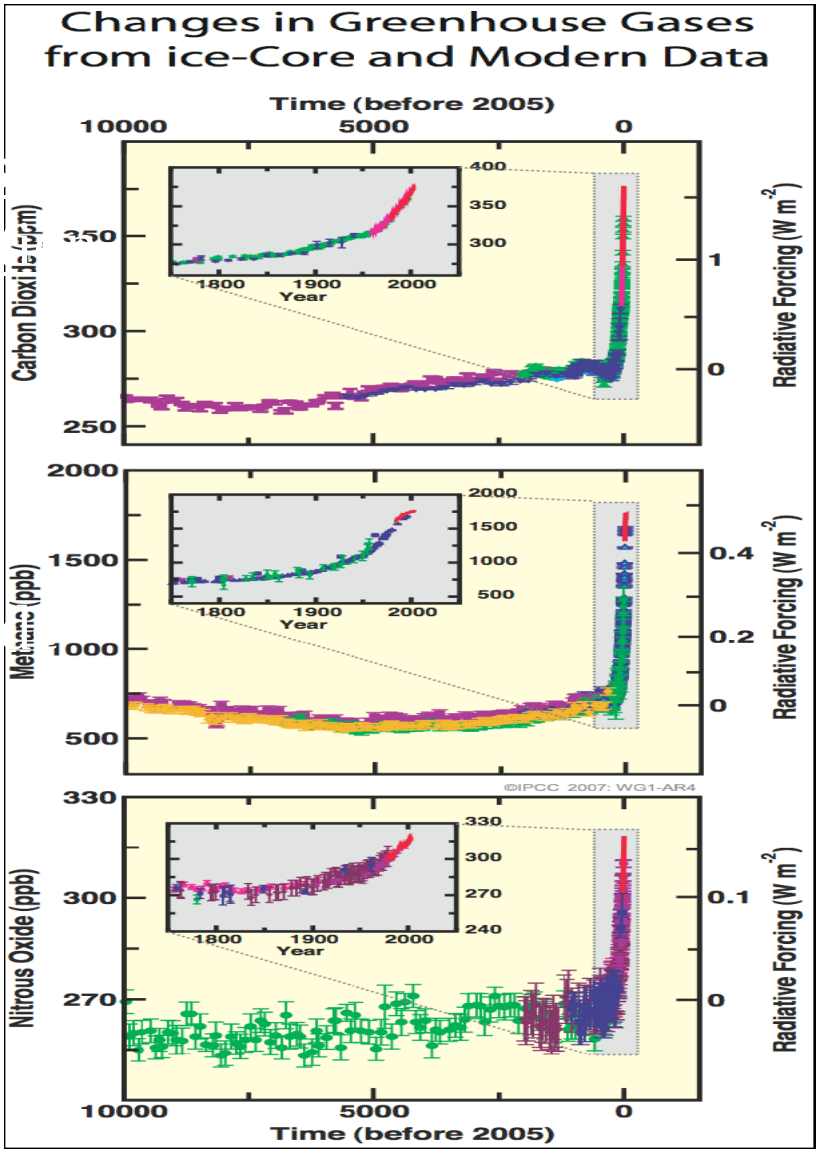




Earth Summit
Rio 1992

Agriculture 2015

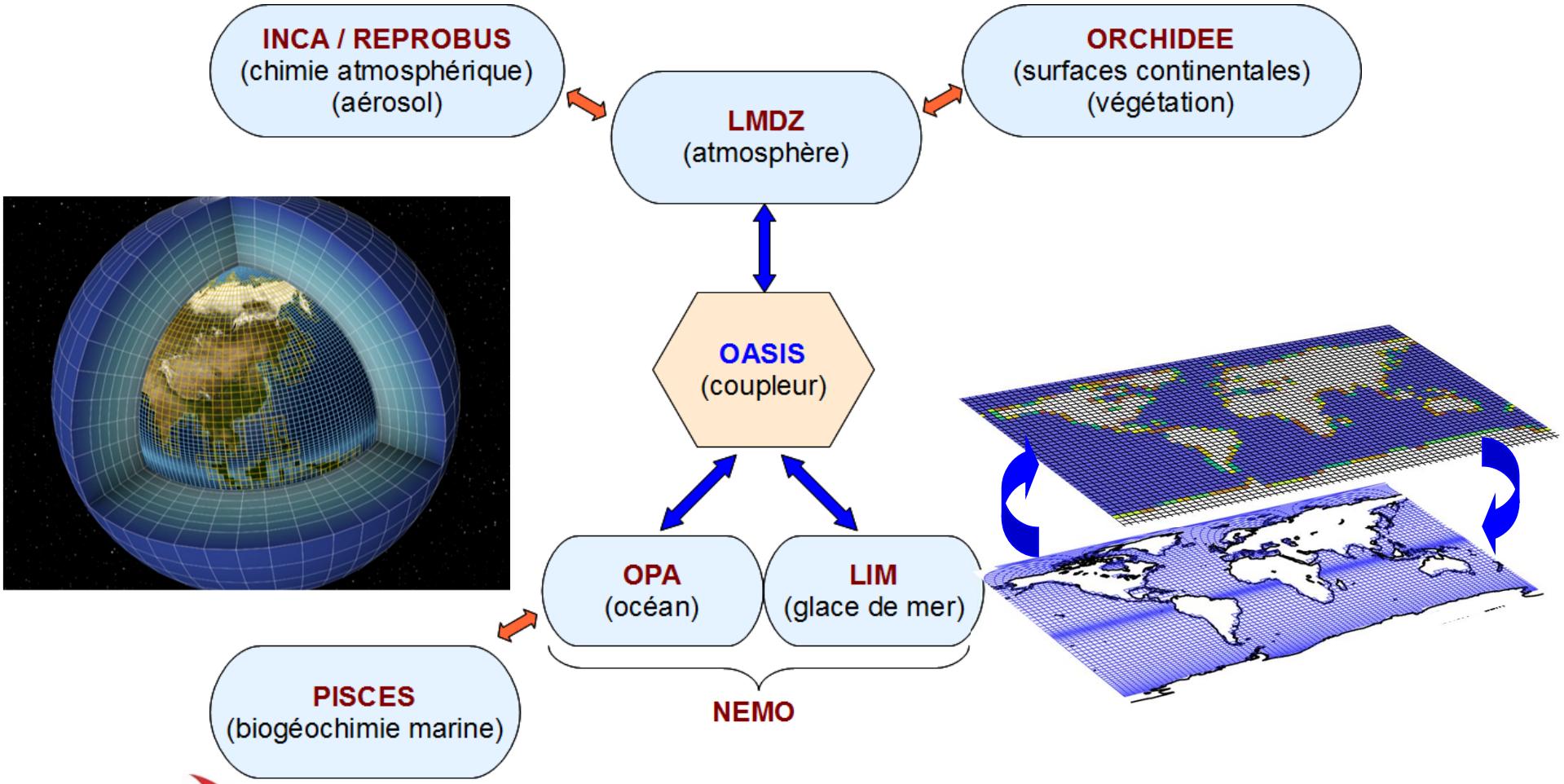
Abrupt modification of a millenia-old balance:



GIEC/IPCC
2007

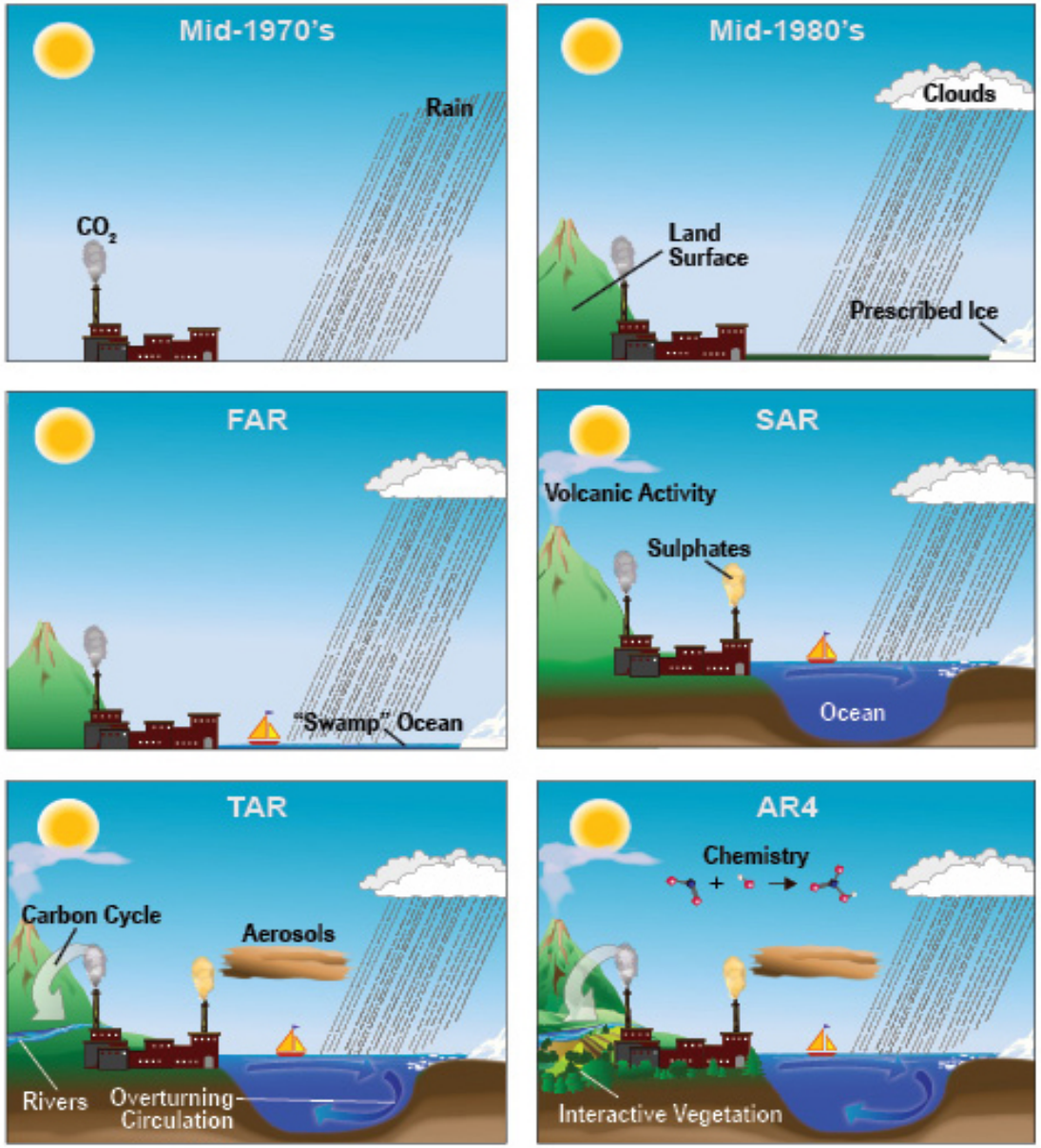
CLIMATE-SMART
Agriculture
2015

The IPSL « Earth System Model » : a numerical world



Source: J.-L. Dufresne

The World in Global Climate Models



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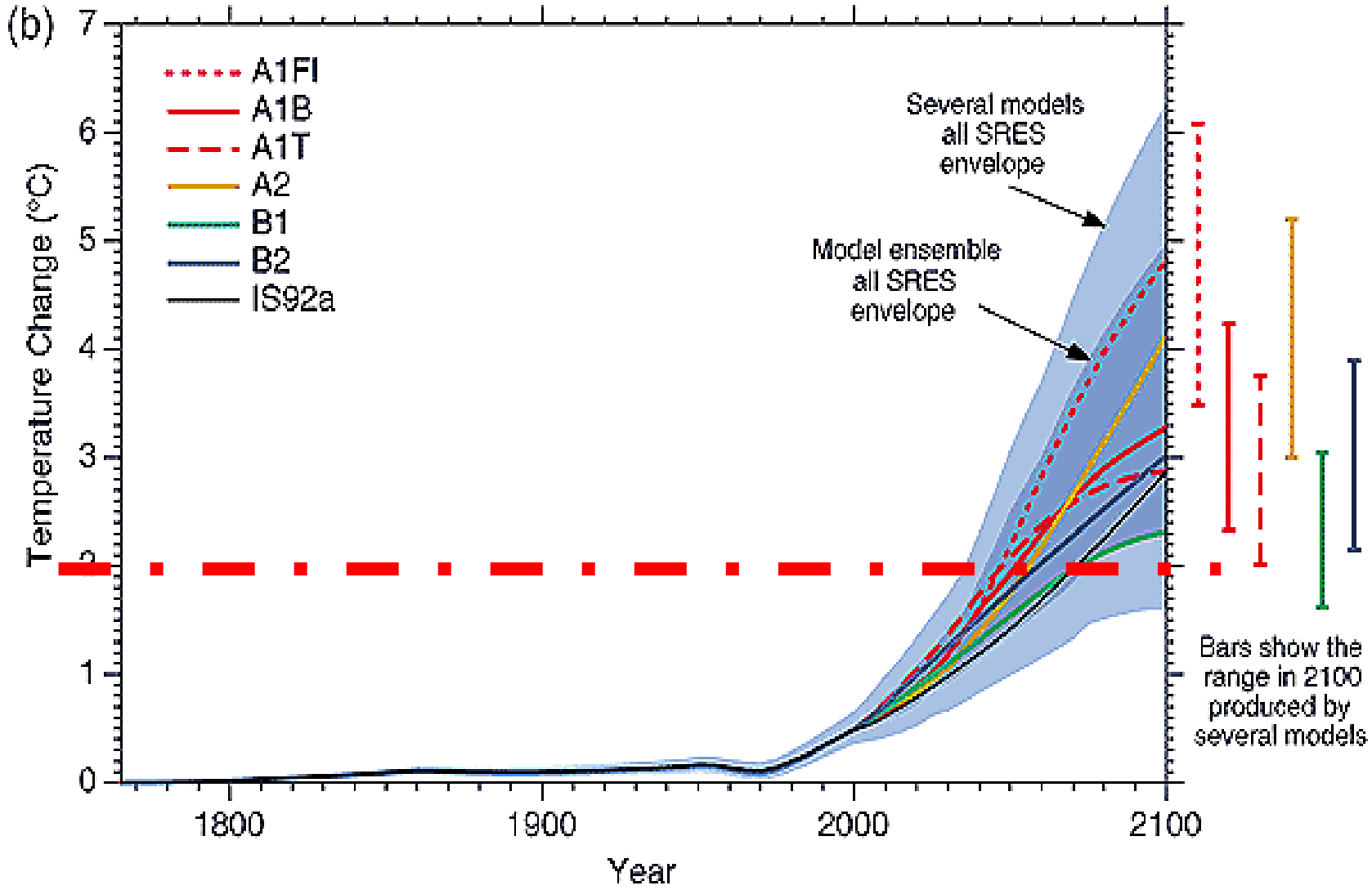
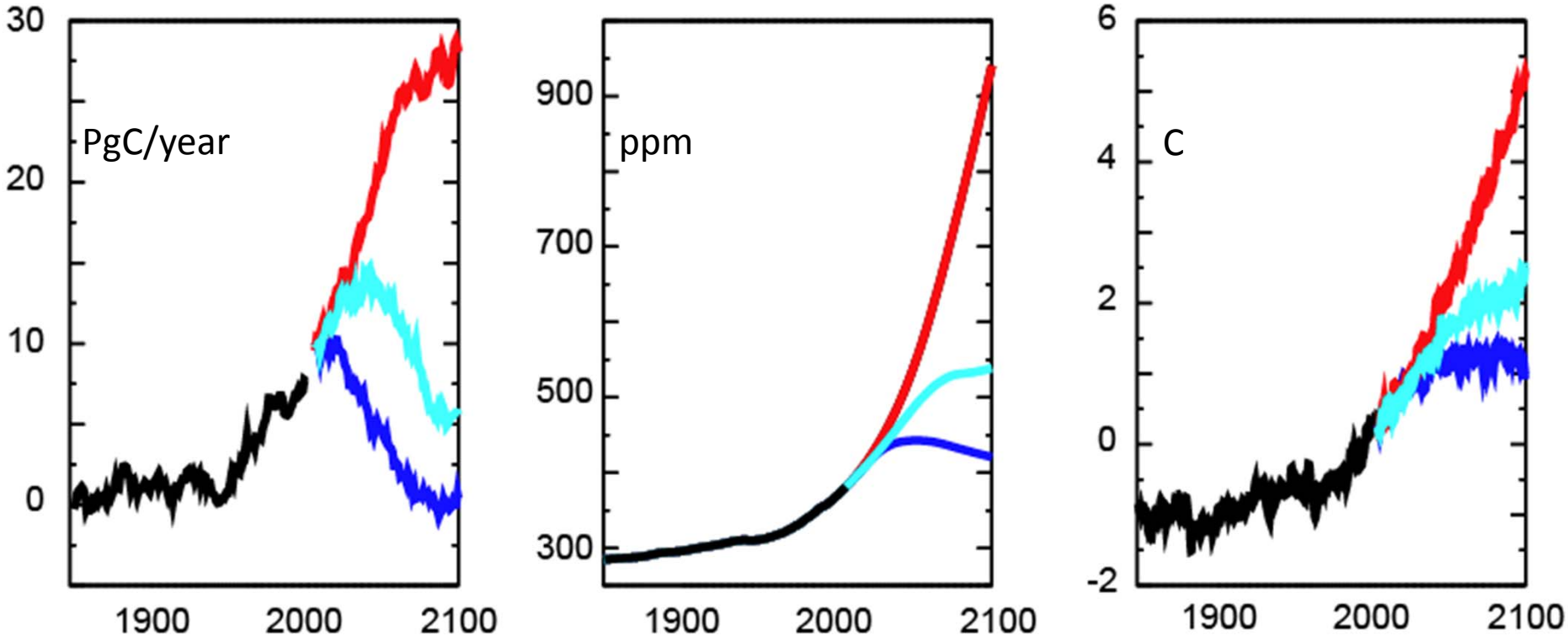
Two sets of emission scenarios : (1) « policy-free » (IPCC /SRES, used here in tIPCChe IPCC report of 2001)



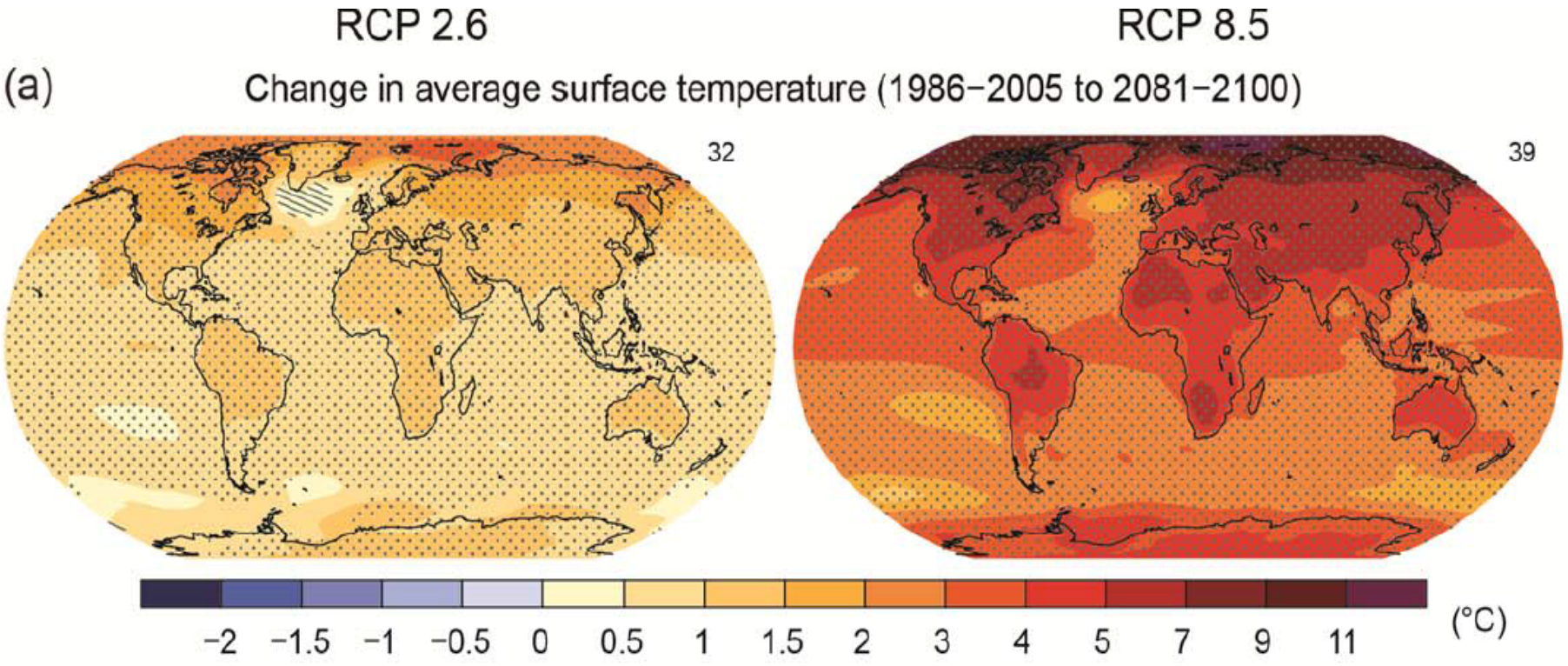
(2) Scenarios defined by objectives:

the « RCP » simulations for CMIP5 and the AR5 IPCC report. Illustrated here by IPSL results

CO_2 emissions ← CO_2 concentration ← Temperature



A world 2°C warmer and a world 4/5°C warmer: warmer everywhere



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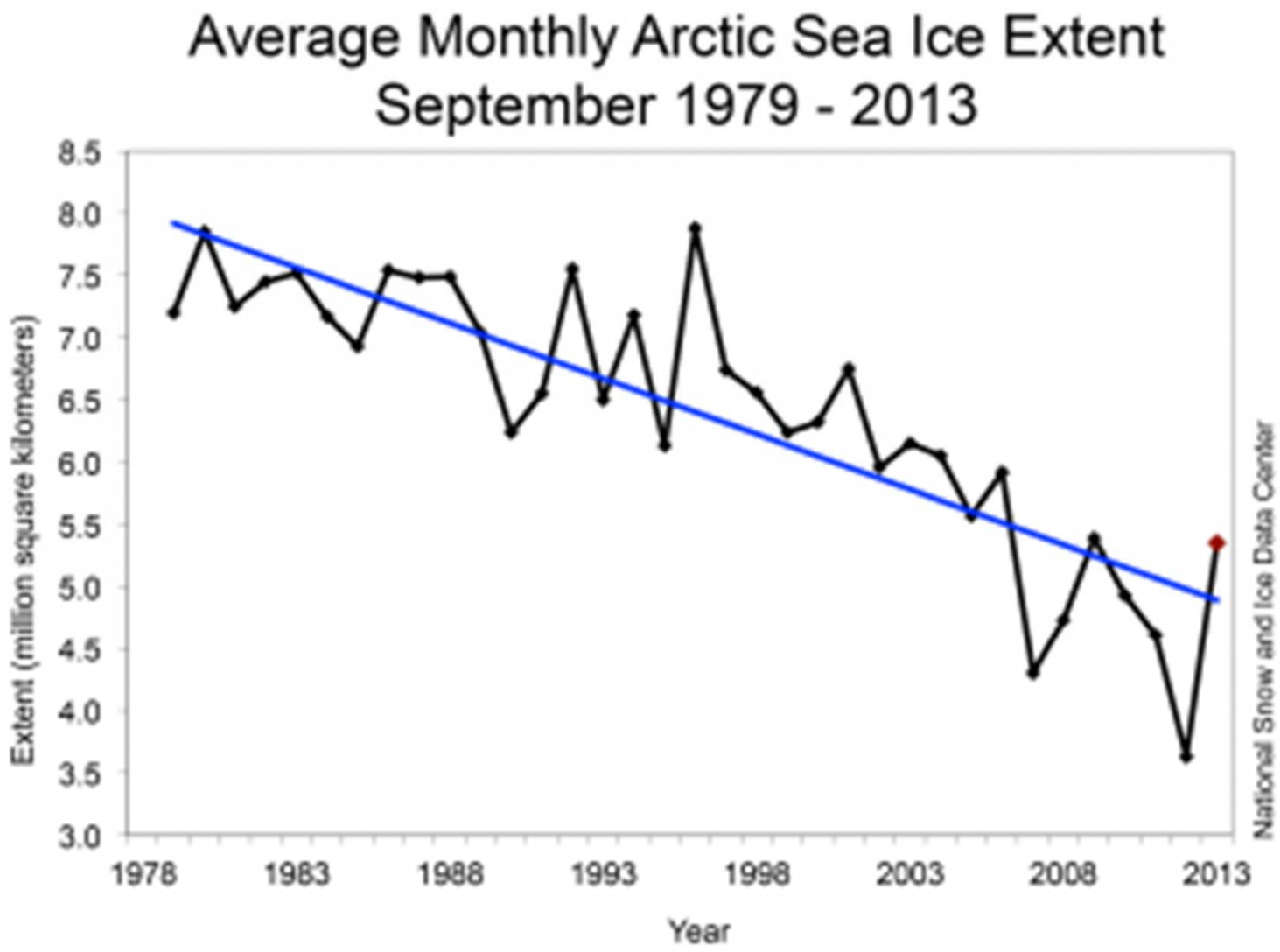

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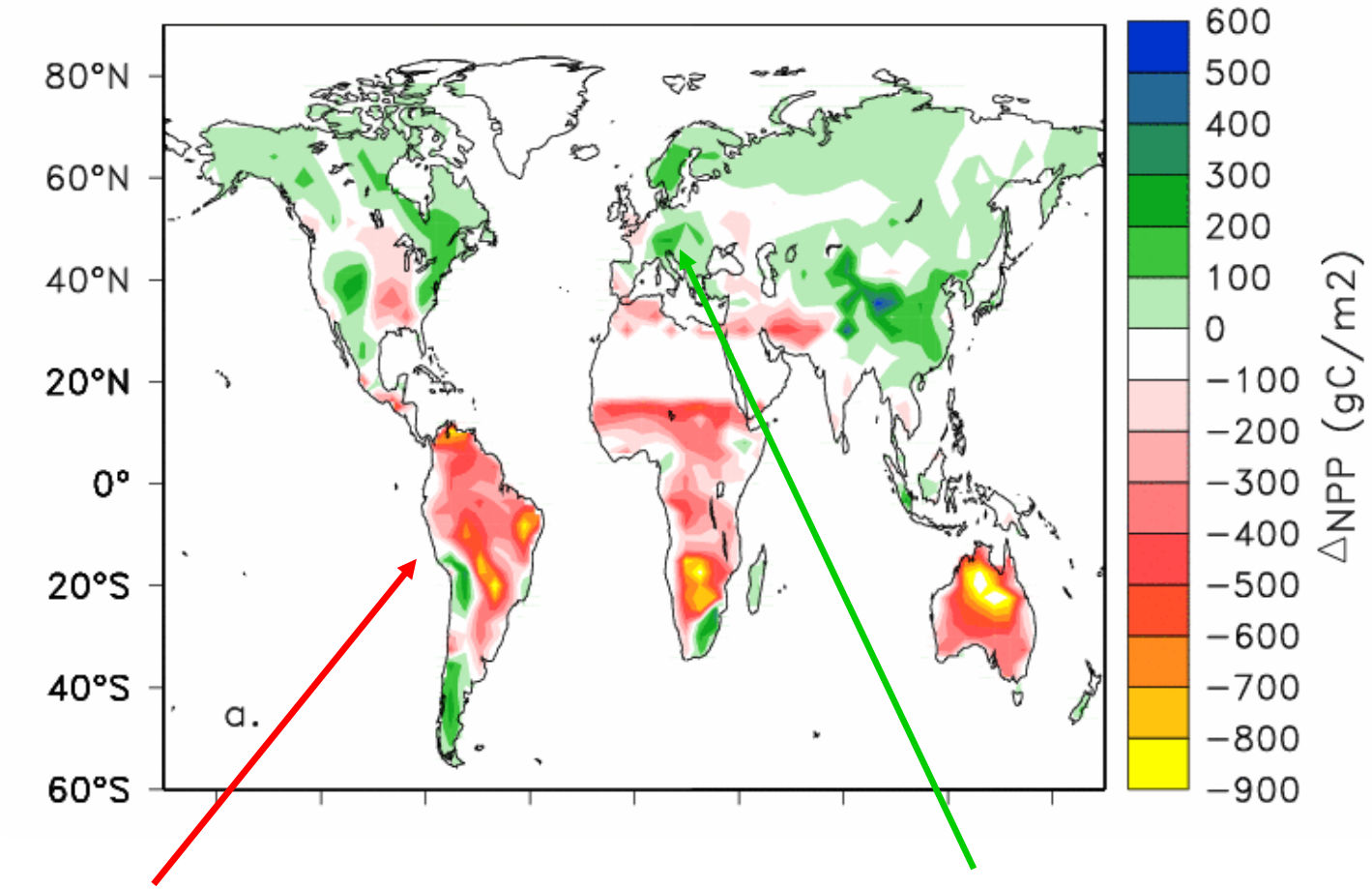
Change in net primary production
a direct consequence of temperature change



Increase in soil aridity

Extension of the growing season

Berthelot et al., 2002

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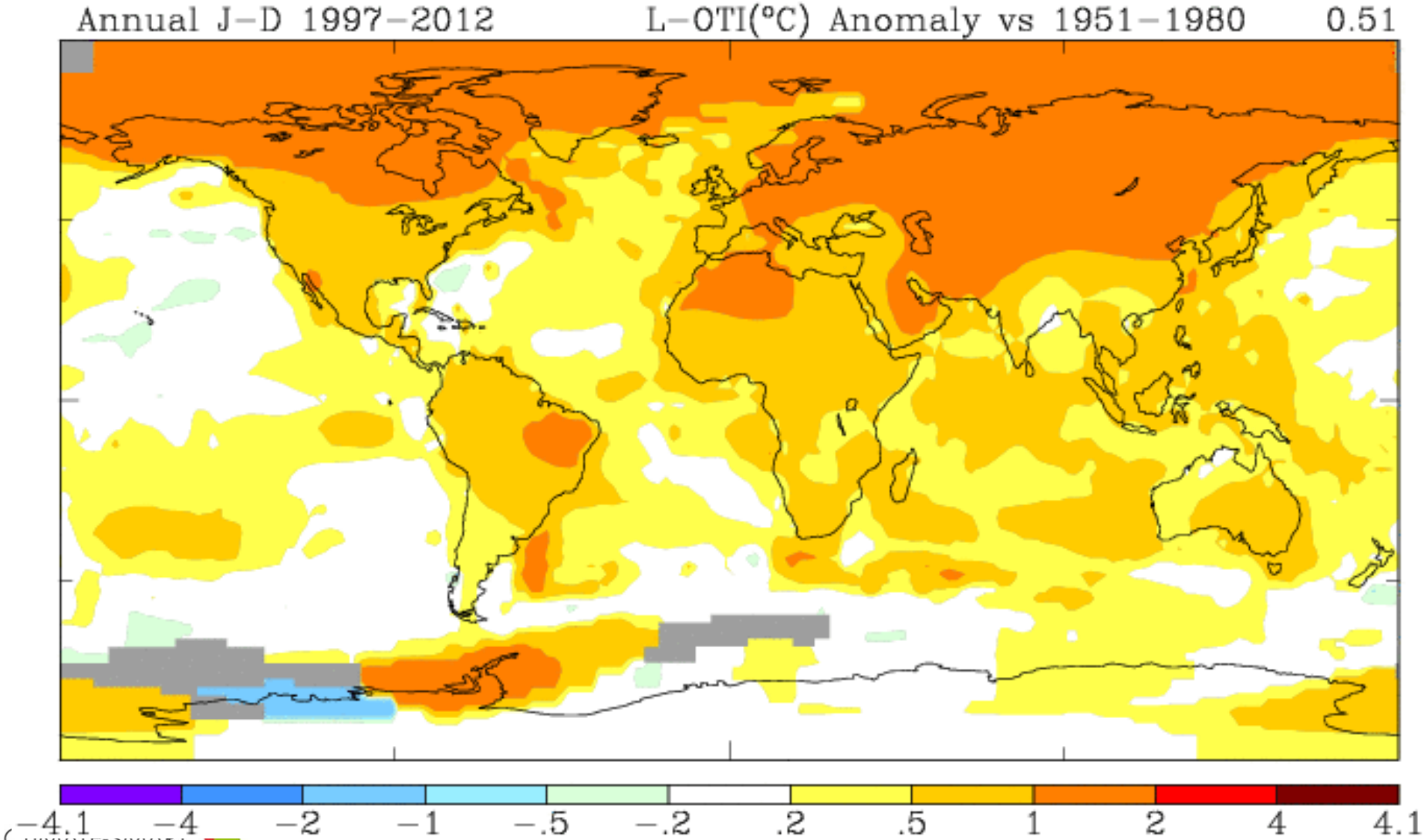

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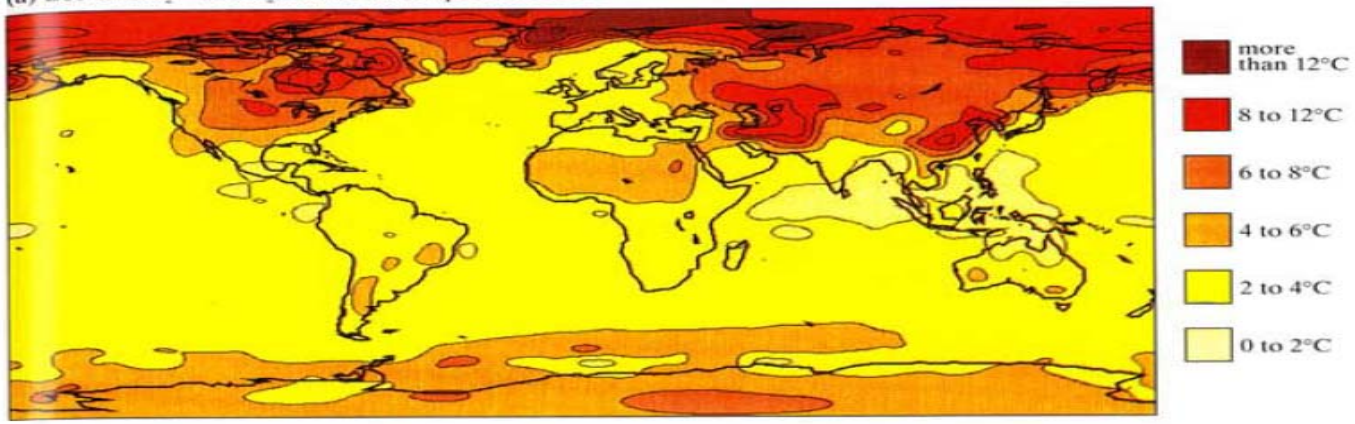
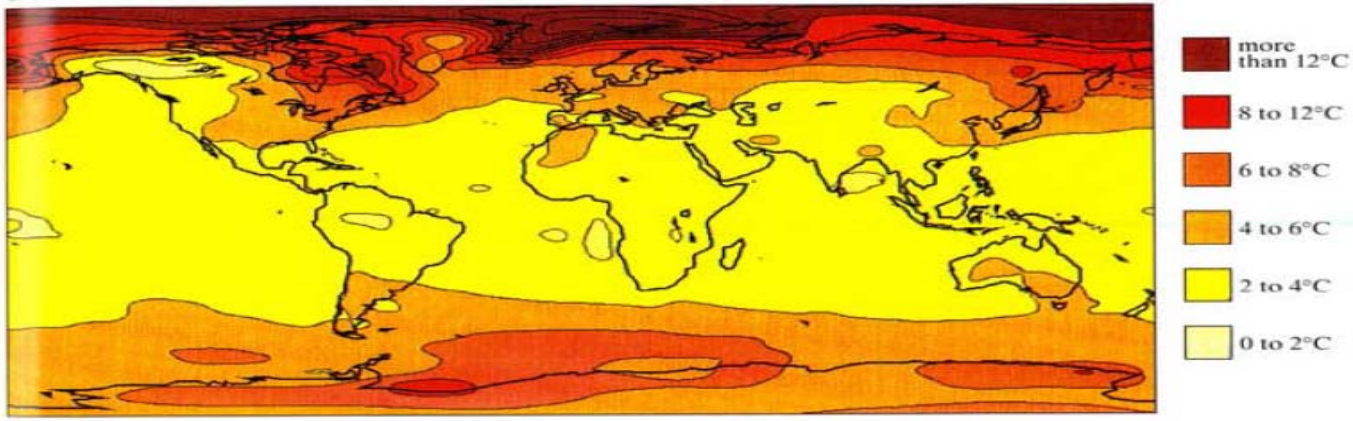
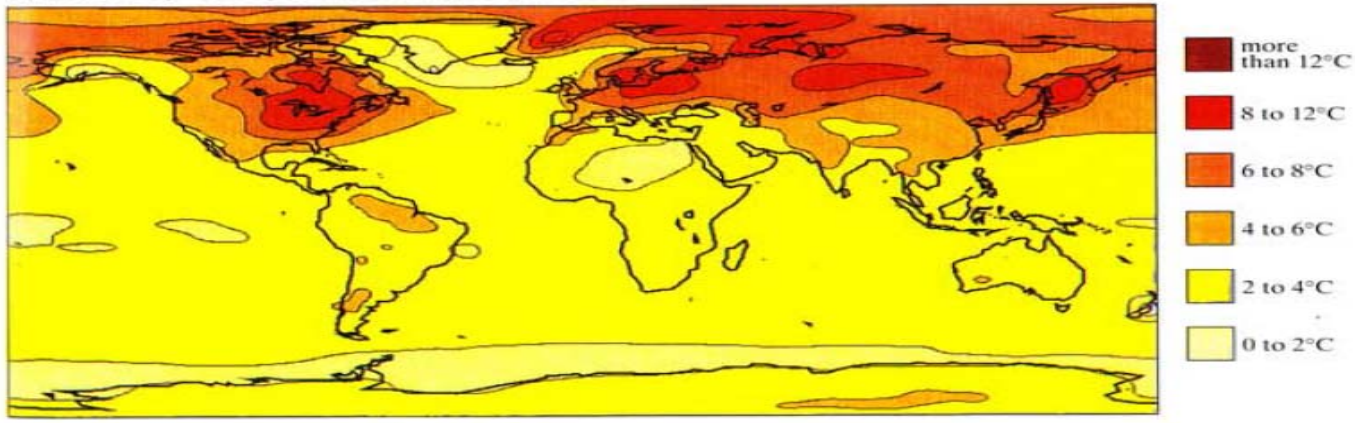
(a) DJF $2\times CO_2 - 1\times CO_2$ surface air temperature: CCC



(b) DJF $2\times CO_2 - 1\times CO_2$ surface air temperature: GFHI

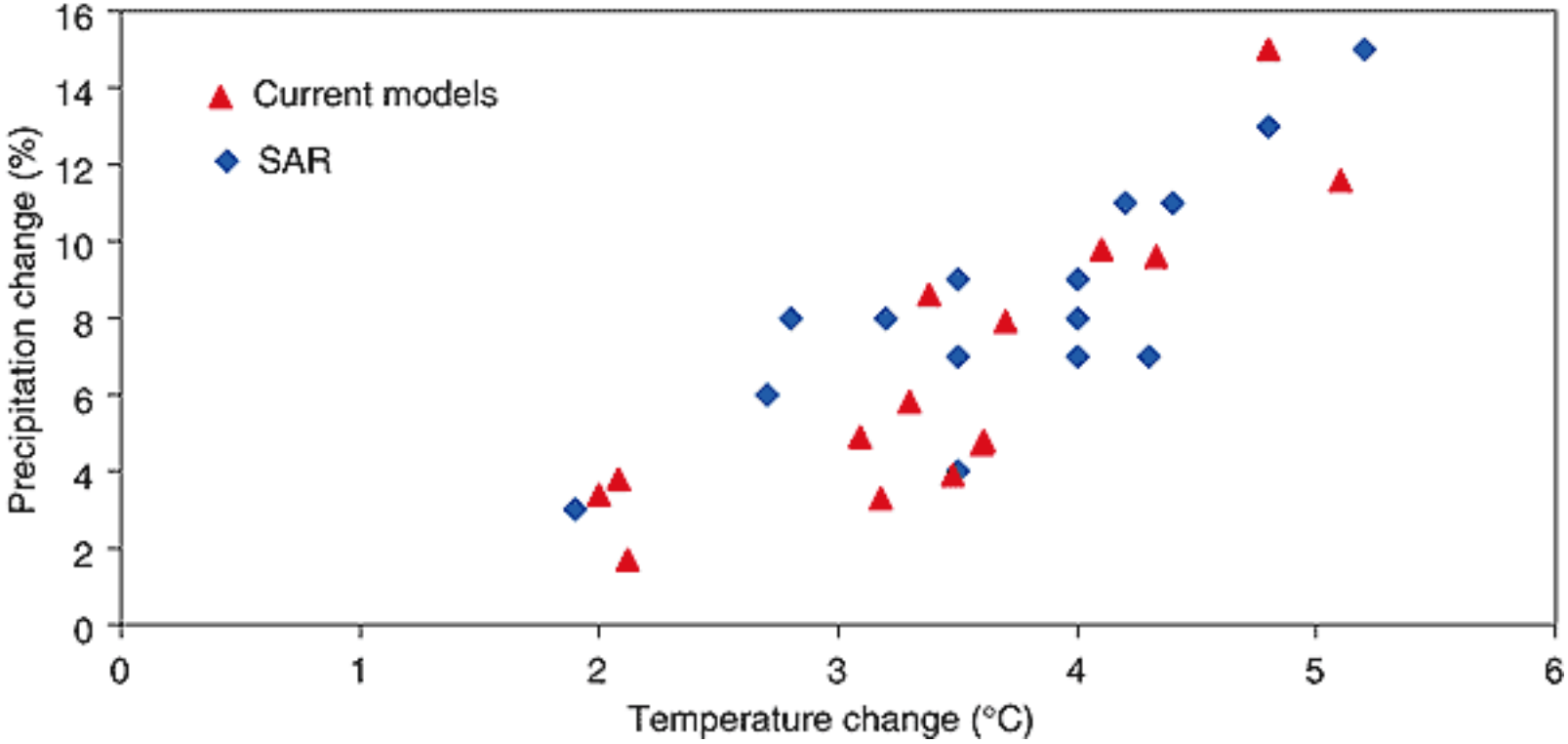


(c) DJF $2\times CO_2 - 1\times CO_2$ surface air temperature: UKHI

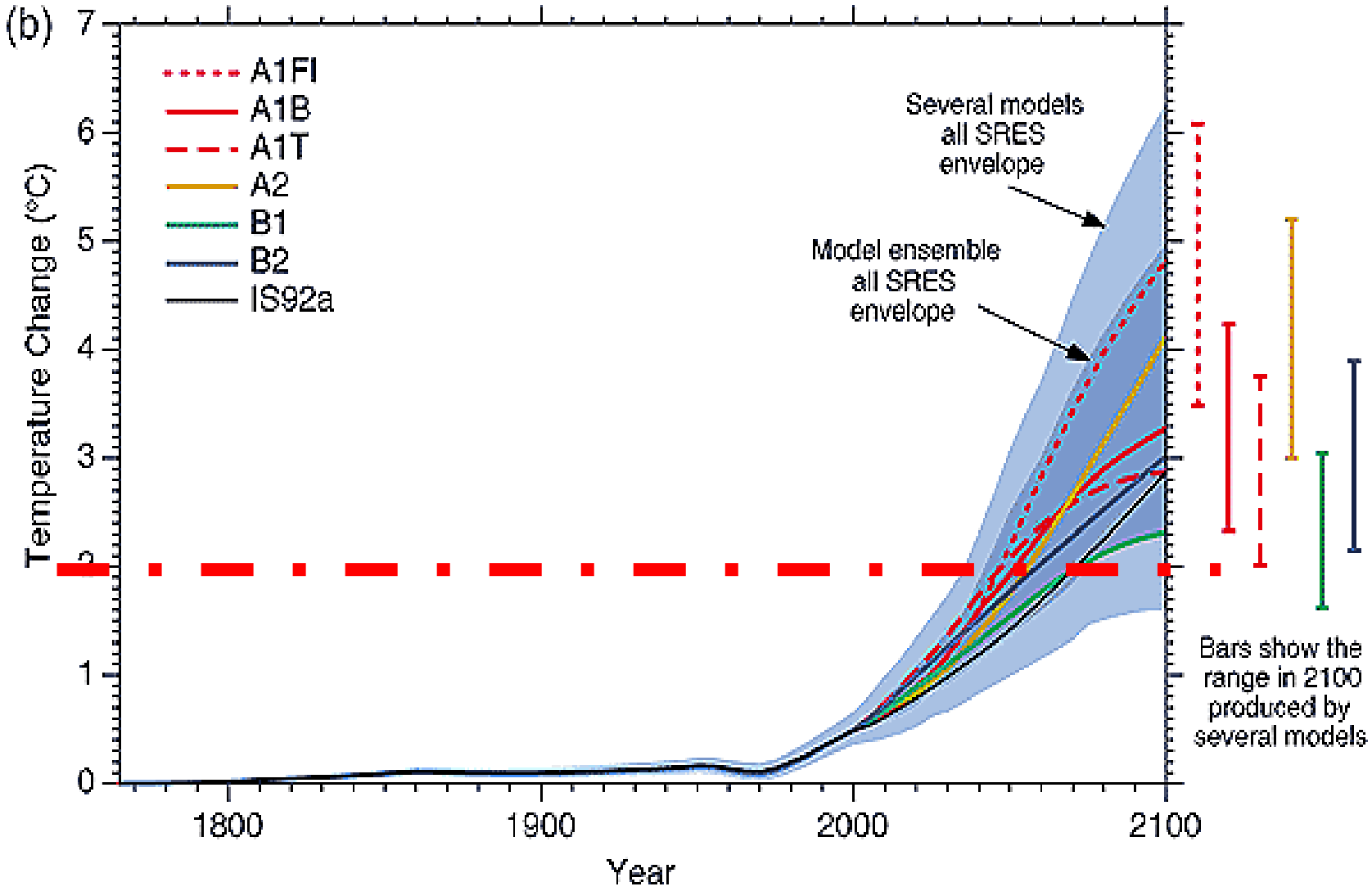


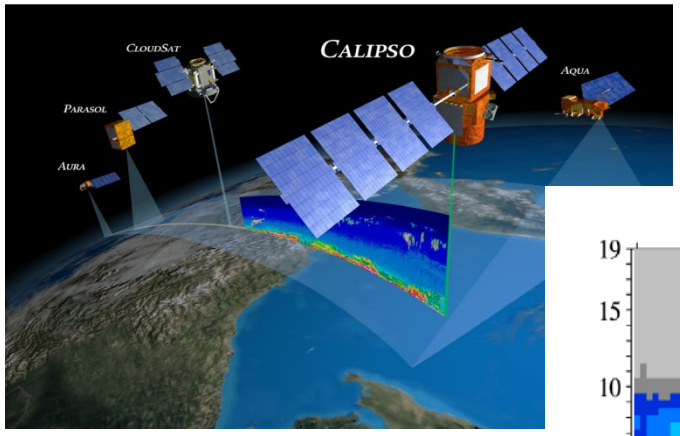
Uncertainties about climate change amplitude: still there but some hope to reduce them

Sensibilité climatique = réponse des températures (et précipitations) globales de la planète pour un doublement du CO_2 atmosphérique.

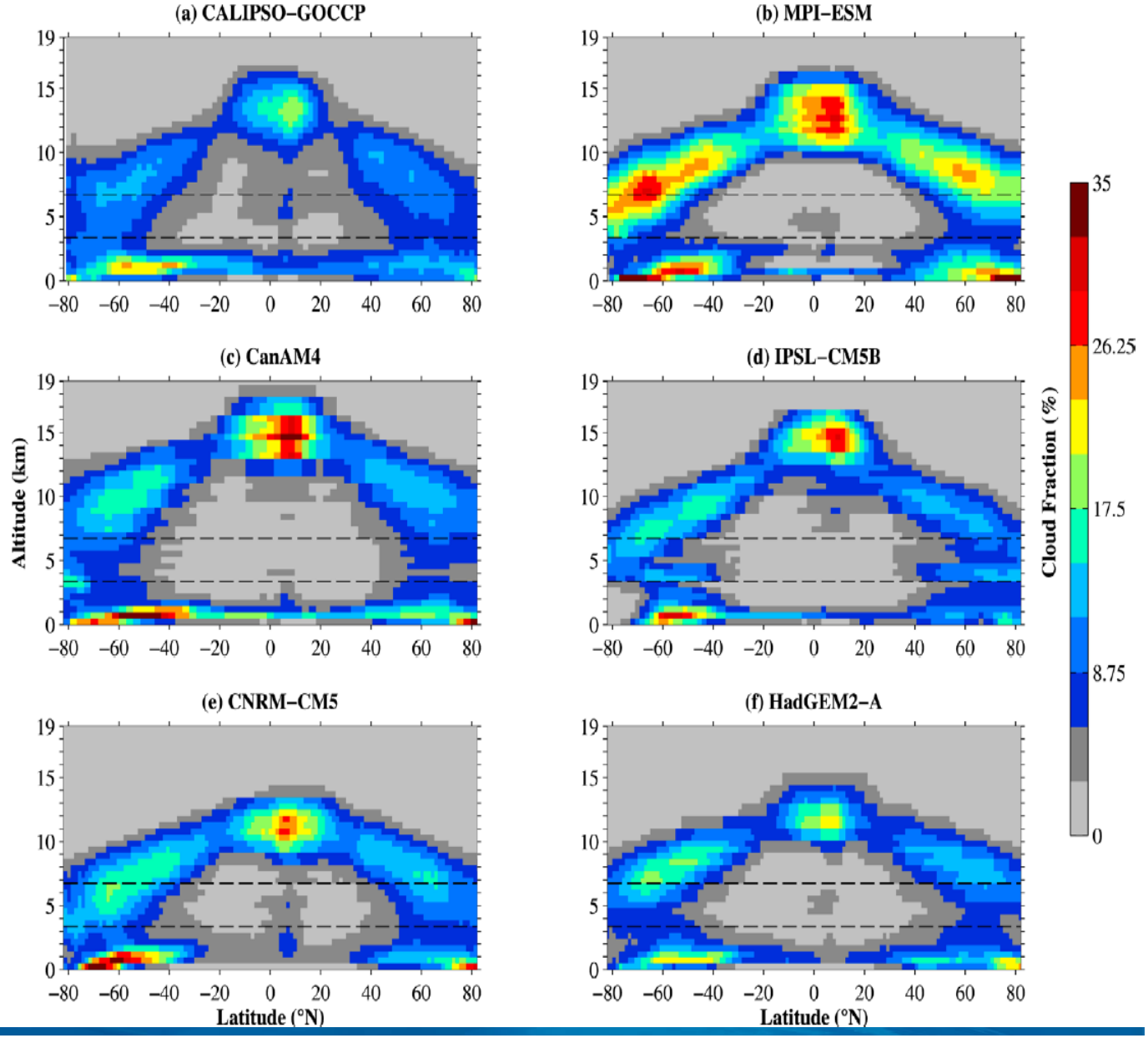


Rapports 1995 (SAR) et 2001 du GIEC


(b)
A1FI
A1B
A1T
A2
B1
B2
IS92a
Several models
all SRES
envelope
Model ensemble
all SRES
envelope
Bars show the
range in 2100
produced by
several models
Temperature Change (°C)
Year
0
1
2
3
4
5
6
7
1800
1900
2000
2100



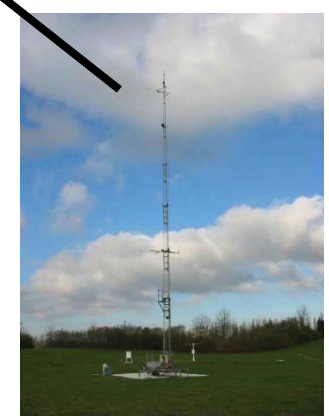
Cloud model evaluation using a satellite simulator



Zonal mean of the vertical cloud fraction observed with Calipso and simulated by models + the COSP simulator

[Cesana & Chepfer, 2012]

SIRTA observatory
a node for national and internationa networks



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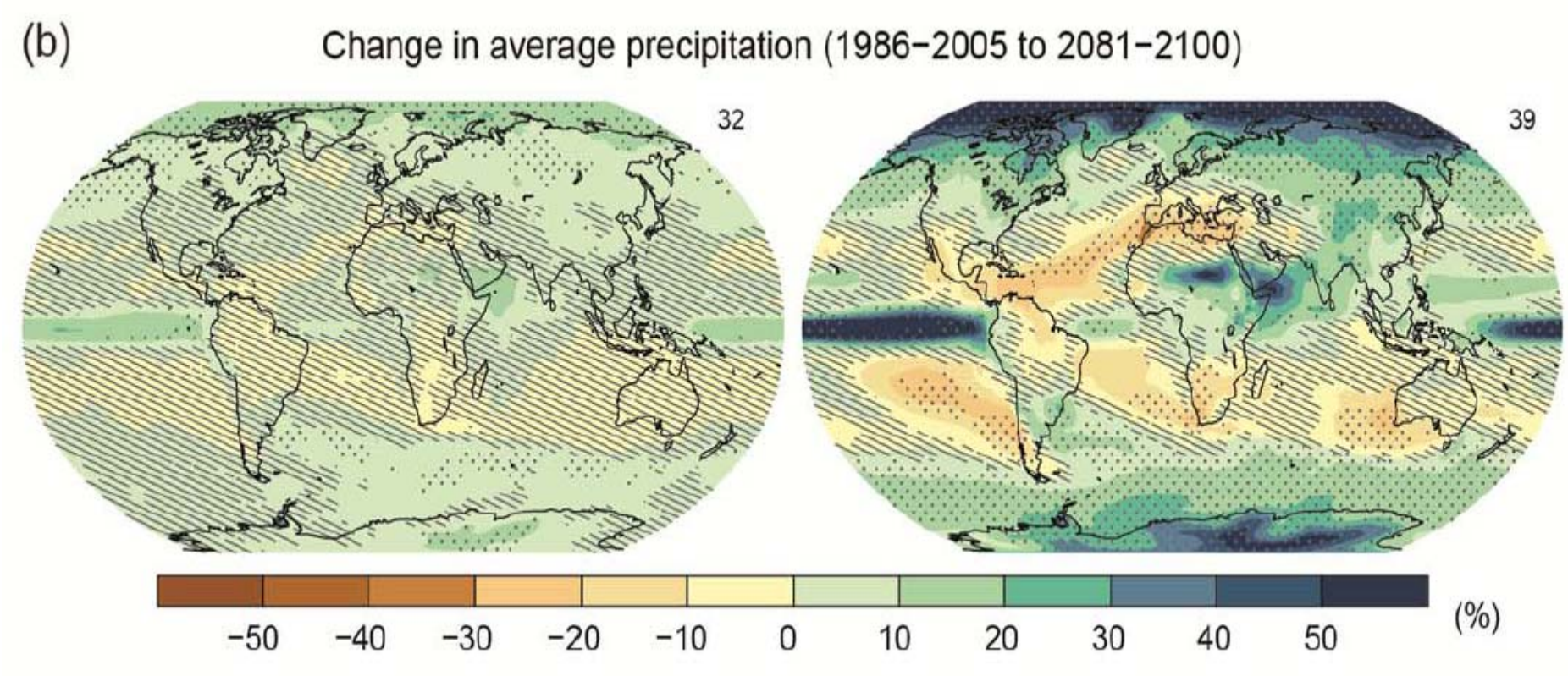
A world 2°C warmer and a world 4/5°C warmer: uncertain mean annual precipitation changes (IPCC, 2013)



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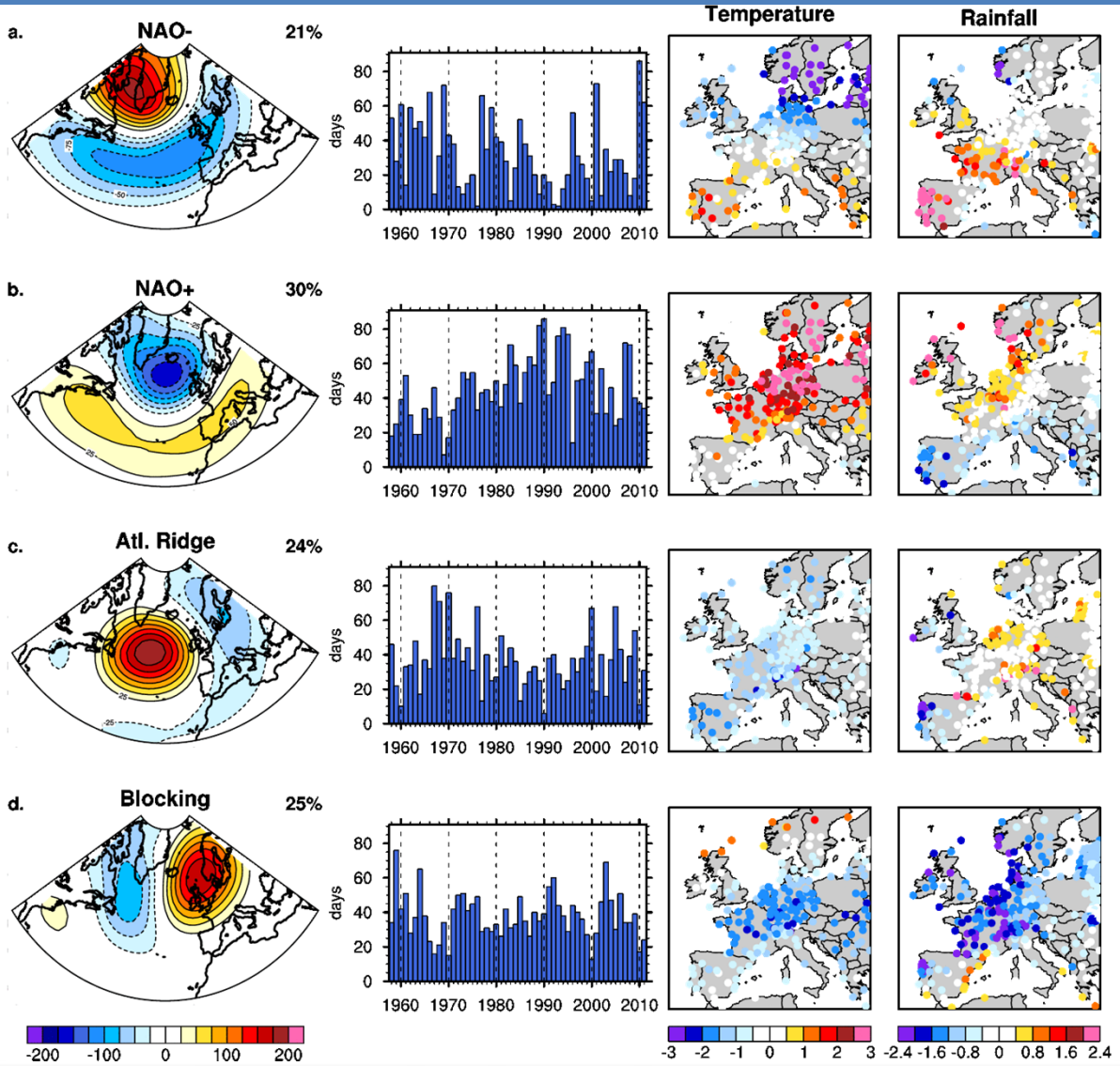
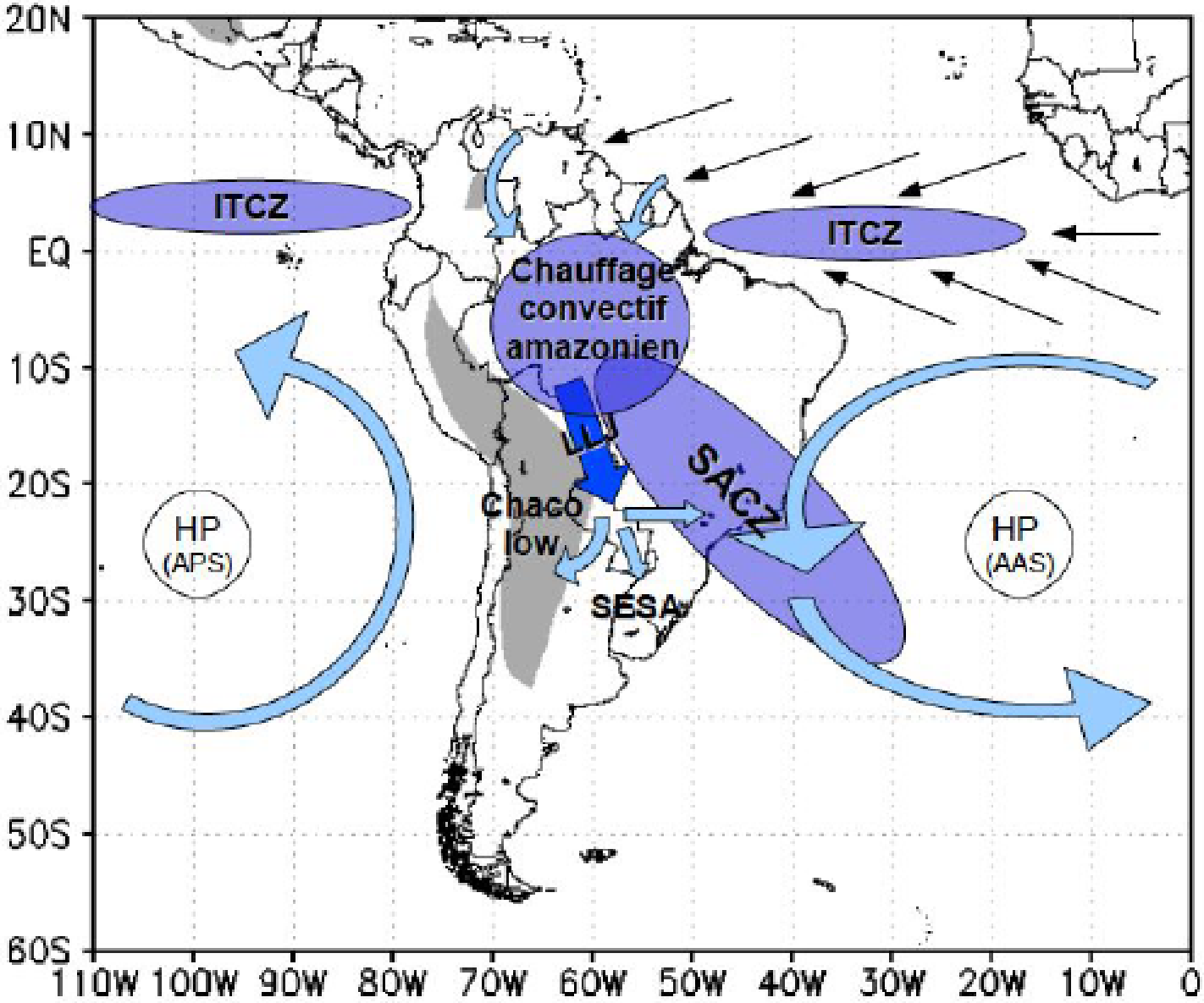
Going from global to local:
The weather regimes over the North-Atlantic aera



Another example: the South-East South American region



Using key manifestations of the natural variability, as a way to sort out what are the most reliable models

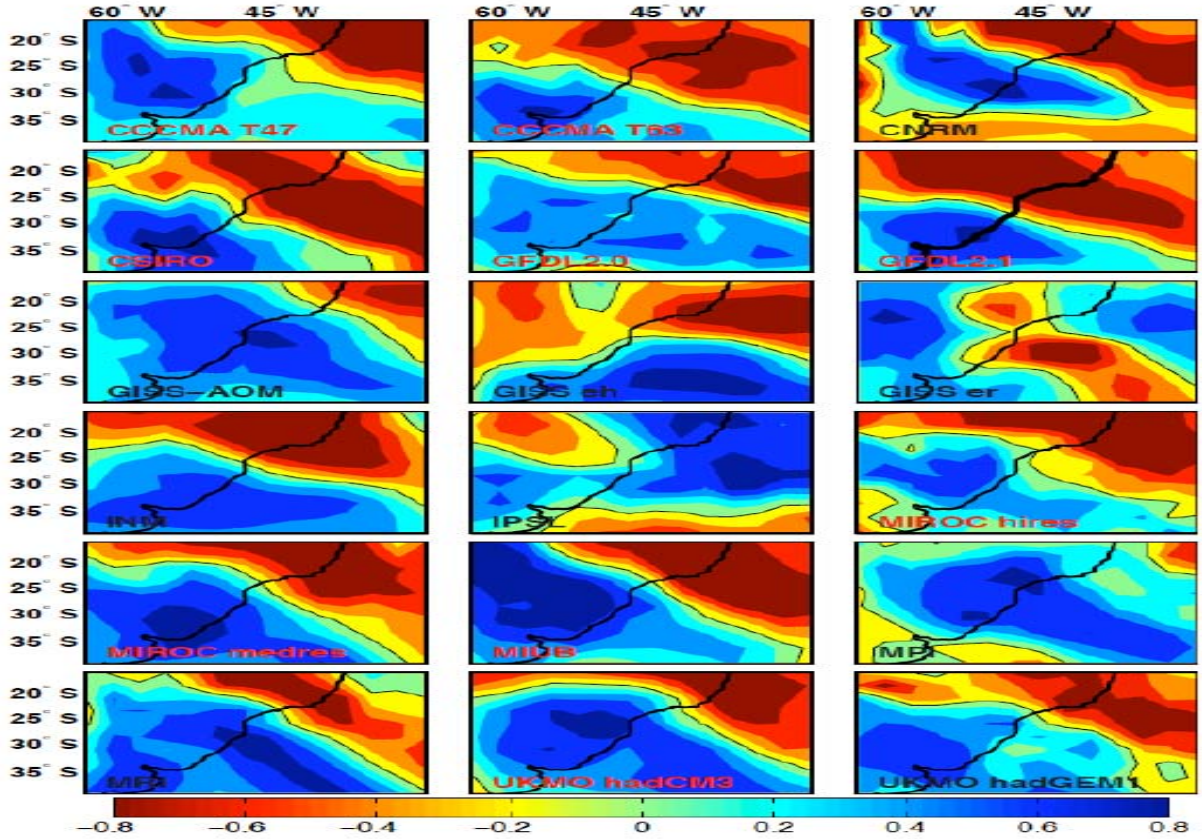


FIGURE 3.11 – EOF1 of DJF rainfall for the 1979-1999 period, from the 18 WCRP/CMIP3 models (see the list in Table 3.1). Color scale interval is 0.2 non-dimensional units. Black contour indicates the 0 level. The 9 models identified in Section 3b are marked in red.

Teleconnections: a (non linear ?) process coupling climate sensitivity in different parts of the world

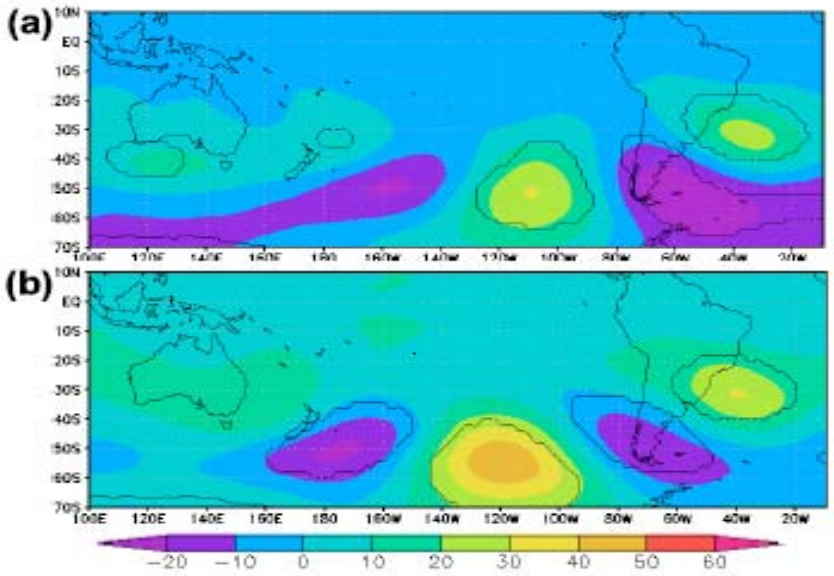
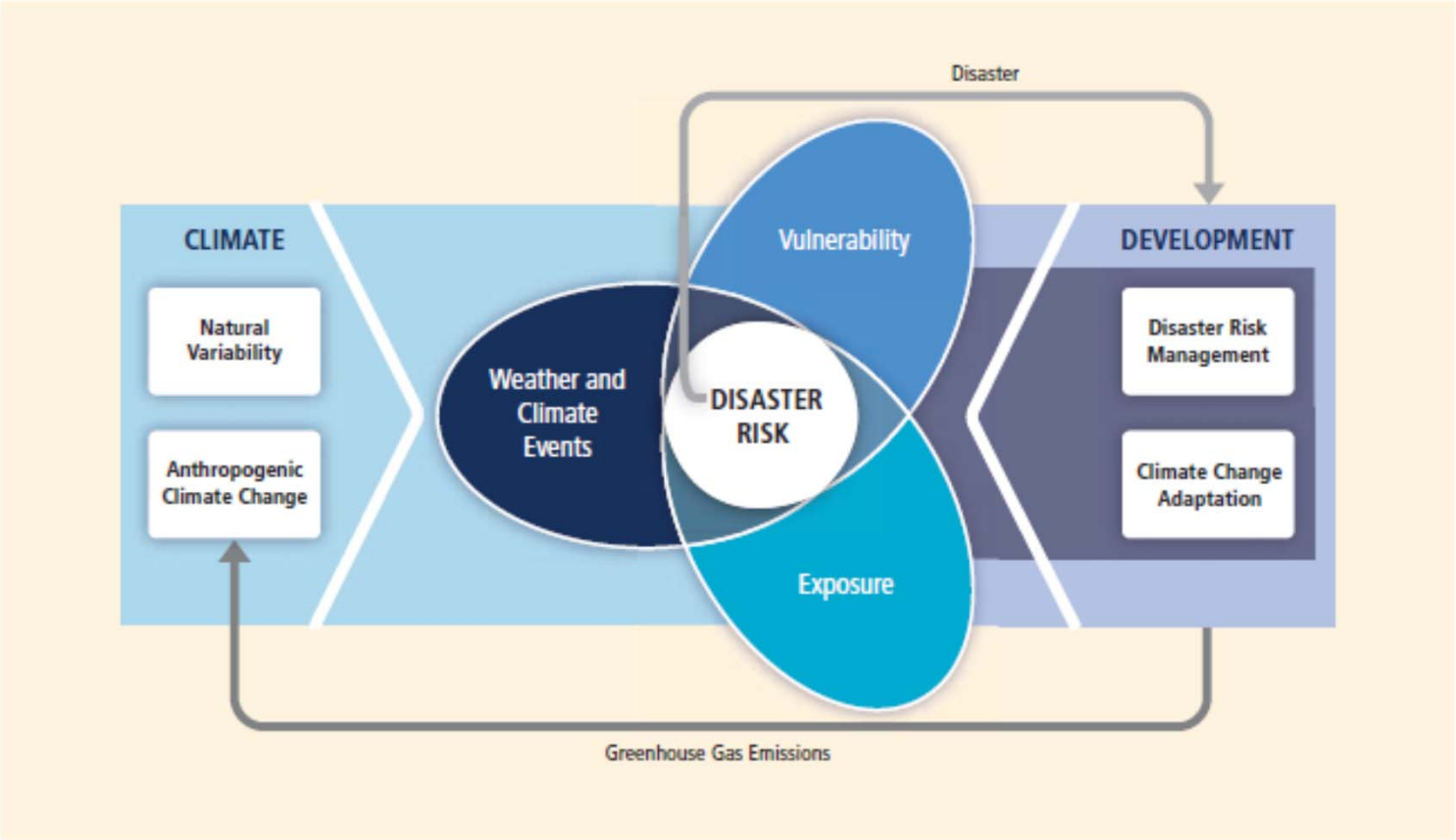


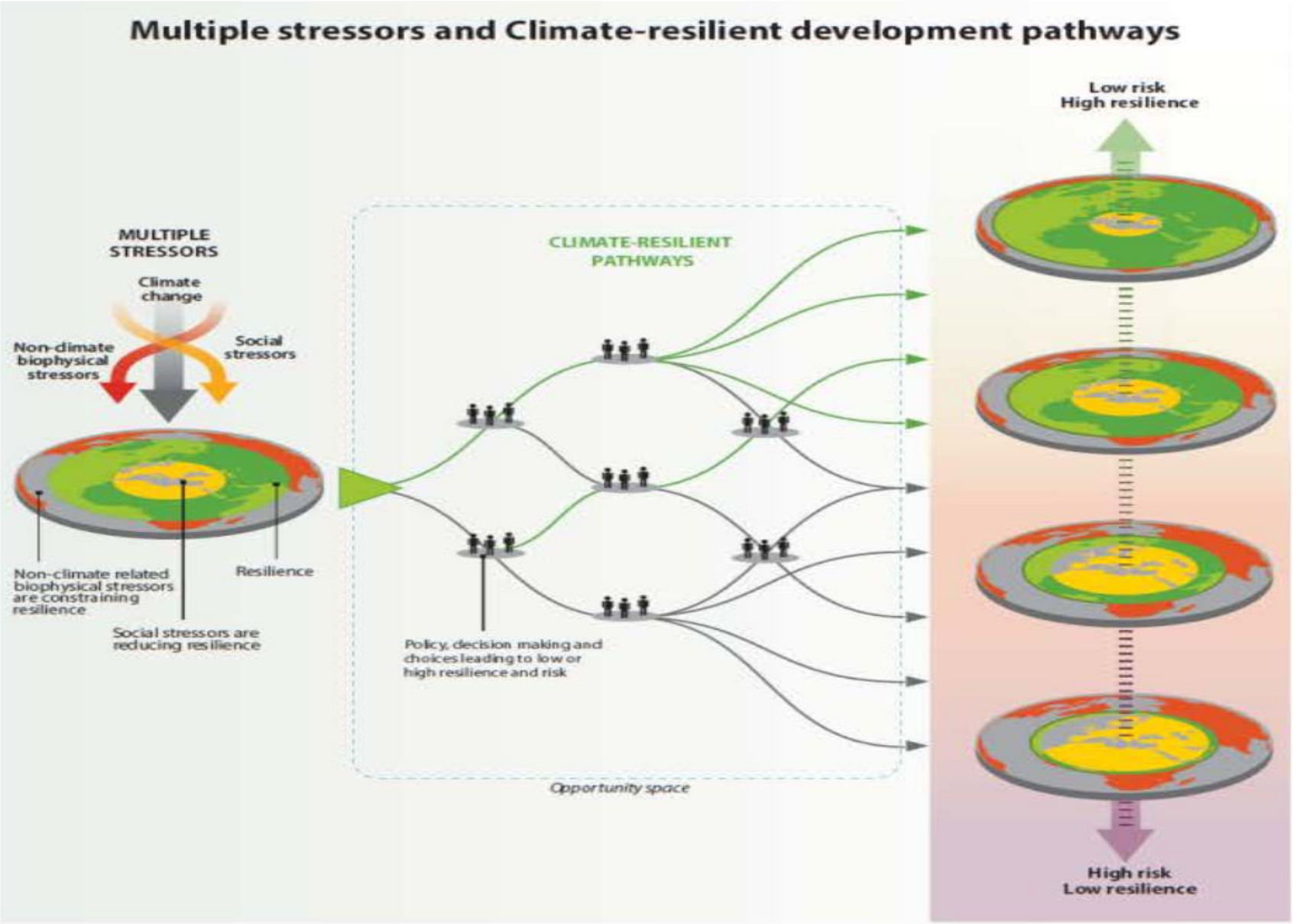
FIGURE 3.21 – Composite differences of DJF geopotential height anomalies at 500 hPa between positive and negative EOF1 events for **a** (2001-2049), and **b** (2050-2098) periods, computed from the 8-model ensemble mean. Color scale and contour interval is 10 m. Areas where values are statistically significant at the 90% of the Student's t-test are inside a black contour

Looking to the future: the notion of climate risk (Figure from the IPCC/SREX report on extreme events):

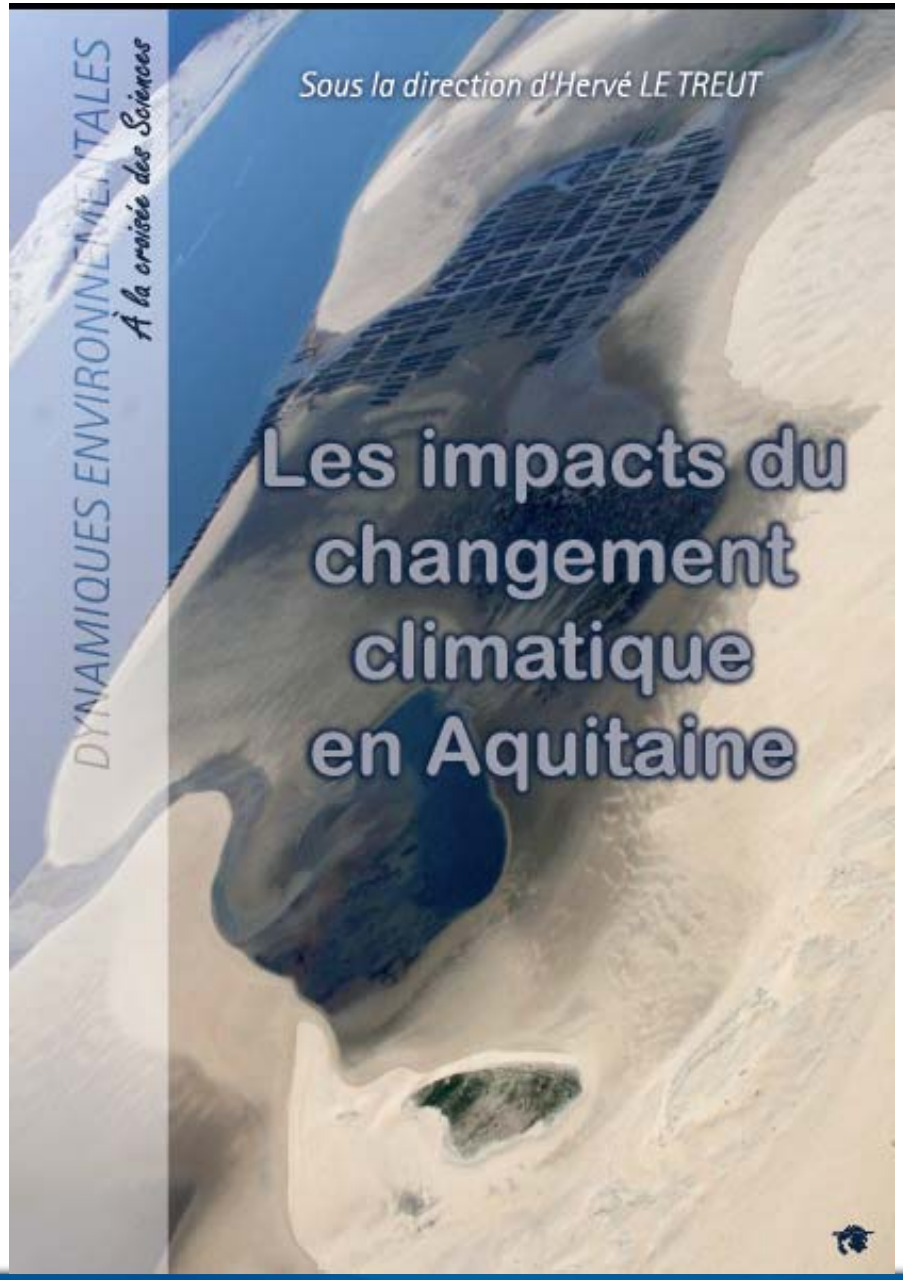
C

SREX SPM Graphics




Multiple stressors and Climate-resilient development pathways
MULTIPLE STRESSORS
Climate change
Non-climate biophysical stressors
Social stressors
Non-climate related biophysical stressors are constraining resilience
Resilience
Social stressors are reducing resilience
CLIMATE-RESILIENT PATHWAYS
Policy, decision making and choices leading to low or high resilience and risk
Opportunity space
Low risk
High resilience
High risk
Low resilience

IPCC, 2014


DYNAMIQUES ENVIRONNEMENTALES
À la croisée des Sciences
Sous la direction d'Hervé LE TREUT
Les impacts du changement climatique en Aquitaine

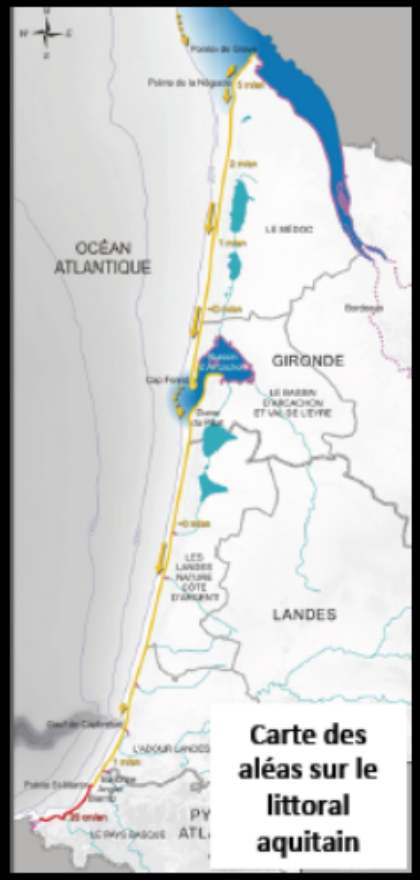
A collective work:
F. Grousset, A. Kremer, D. Salles, E. Villenave, E. Bourdenx

Les auteurs

(cf. p. 363)

S. Abadie, G. Abril, D. Amouroux, X. Arnauld De Sartre, I. Auby, L. Augusto, G. Bachelet, I. Baldi, V. Banos, A. Bardonnet, J. Baron, M. Baudrimont, M.L. Begout, Y. Bérard, V. Bernard, C. Bernard, M. Berroneau, P. Bertran, G. Biais, G. Blanc, P. Boet, P. Bonneton, A. Borja, C. Boschet, C. Bouisset, D. Breysse, N. Brisson†, Y. Brunet, H. Budzinski, N. Caill-Milly, C. Cassou, I. Castège, B. Castelle, A. Chaalali, G. Chust, S. Clarimont, B. Clavé-Papion, A. Colin, D. Compagnon, E. Corcket, B. Coupry, G. Coureau, A. Coynel, F.X. Cuende, F. D'Amico, J. D'Elbée, J.C. Dauvin, V. David, B. De Grissac, X. De Montaudouin, M.N. De Casamajor, J. Dehez, Y. Del Amo, S. Delzon, B. Denoyes, M.L. Desprez-Loustau, P. Deuffic, M.H. Devier, L. Doyen, J.C. Duplessy, A. Dupuy, H. Etcheber, J. Favennec, I. Garcia de Cortazar-Atauri, E. Garnier, G. Gault, D. Genty, E. George-Marcepoil, O. Girardclos, N. Goñi, P. Gonzalez, J.P. Goutouly, P.Y. Guernion, F. Grousset, V. Hanquiez, F. Hissel, F. Huneau, D. Idier, G. Irichabeau, H. Jactel, M. Jarry, R. Kantin, M. Kleinhentz, A. Kremer, V. Laborie, E. Lamaud, G. Largier, M. Launay, S. Lavaud, S. Lavorel, Y. Le Bagousse Pinguet, G. Le Cozannet, H. Le Treut, M. Leandri, N. Lenôtre, M. Lepage, T. Leurent, F. Levrault, M. Lissardy, L. Londeix, D. Loustau, C. Lucas, J.P. Maalouf, J.J. Malfait, C. Mallet, D. Malvy, P. Marchet, P. Maron, J.C. Martin, S. Mathoulin-Pelissier, J. Maugein, D. Maurer, N. Mazella, P. Mazellier, C. Meredieu, R. Michalet, O. Mora, G. Morandeau, V. Moreaux, S. Morin, T. Oblet, N. Ollat, J.-C. Péreau, E. Perraudin, P. Pieri, D. Piou, S. Planton, P. Point, P. Prouzet, J.C. Quéro, C. Raherison, T. Rambonilaza, J.P. Rebillard, P. Régnacq, M. Regolini, T. Renault, A. Ribes, E. Rochard, N. Rocle, P. Rolland, R. Salamon, D. Salles, F. Sanchez, M.F. Sanchez-Goñi, E. Sauquet, B. Sautour, J. Schäfer, B. Seguin, G Simonet, A. Sota, A. Sottolichio, J.P. Tastet, J.P. Terreaux, B. Touzard, P. Trichet, J.P. Urcun, C. Van Leeuwen, S. Vaucelle, F. Verdin, E. Villenave, V. Vles, S. Zaragosi.

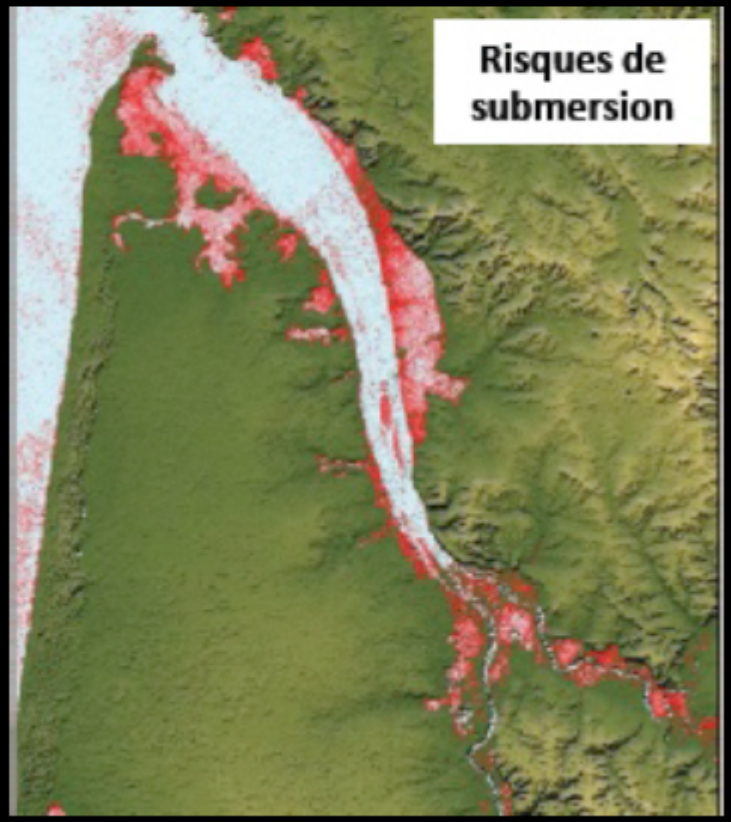
Le littoral : érosion



Carte des aléas sur le littoral aquitain


Le littoral : érosion

Le littoral : submersion



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1. *What the scientific community says or does not say is key to many decisions (Climate Services)*

2. *Pre-COP21 conference « Our common future under climate change », UNESCO, July 7-10, 2015.*

3. Regional or « Territorial » approaches are necessary to close the gap between climate and other environmental problems and also reconciliate citizens with