Changements climatiques: Quelques remarques sur Bastin-Cassiers (2013)

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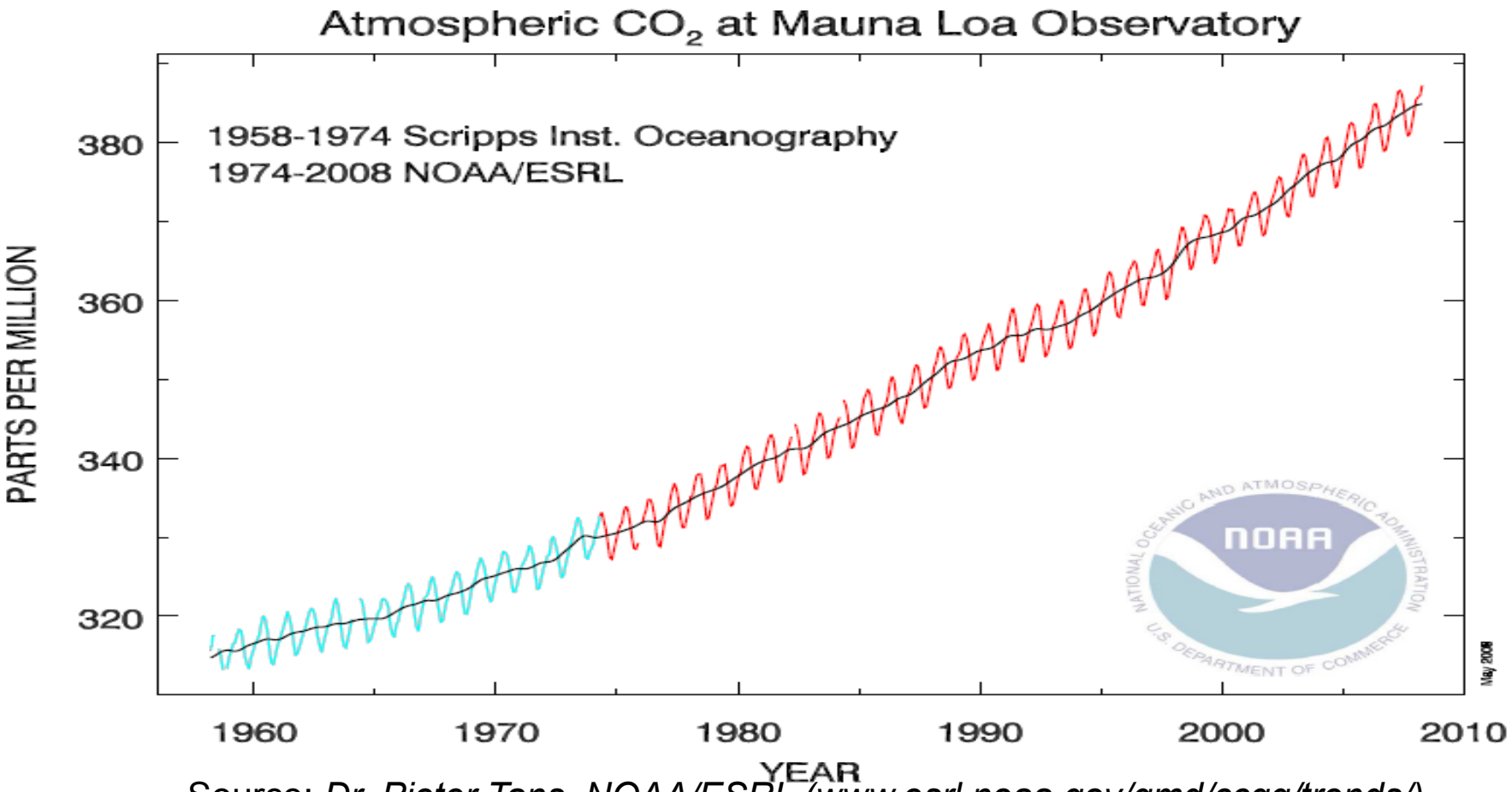
Journée de contact FNRS « Redéfinir la prospérité », ULB, (20130913)

CO_2 concentration measured at Mauna Loa (3400 m)



Source: *Dr. Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends/)*

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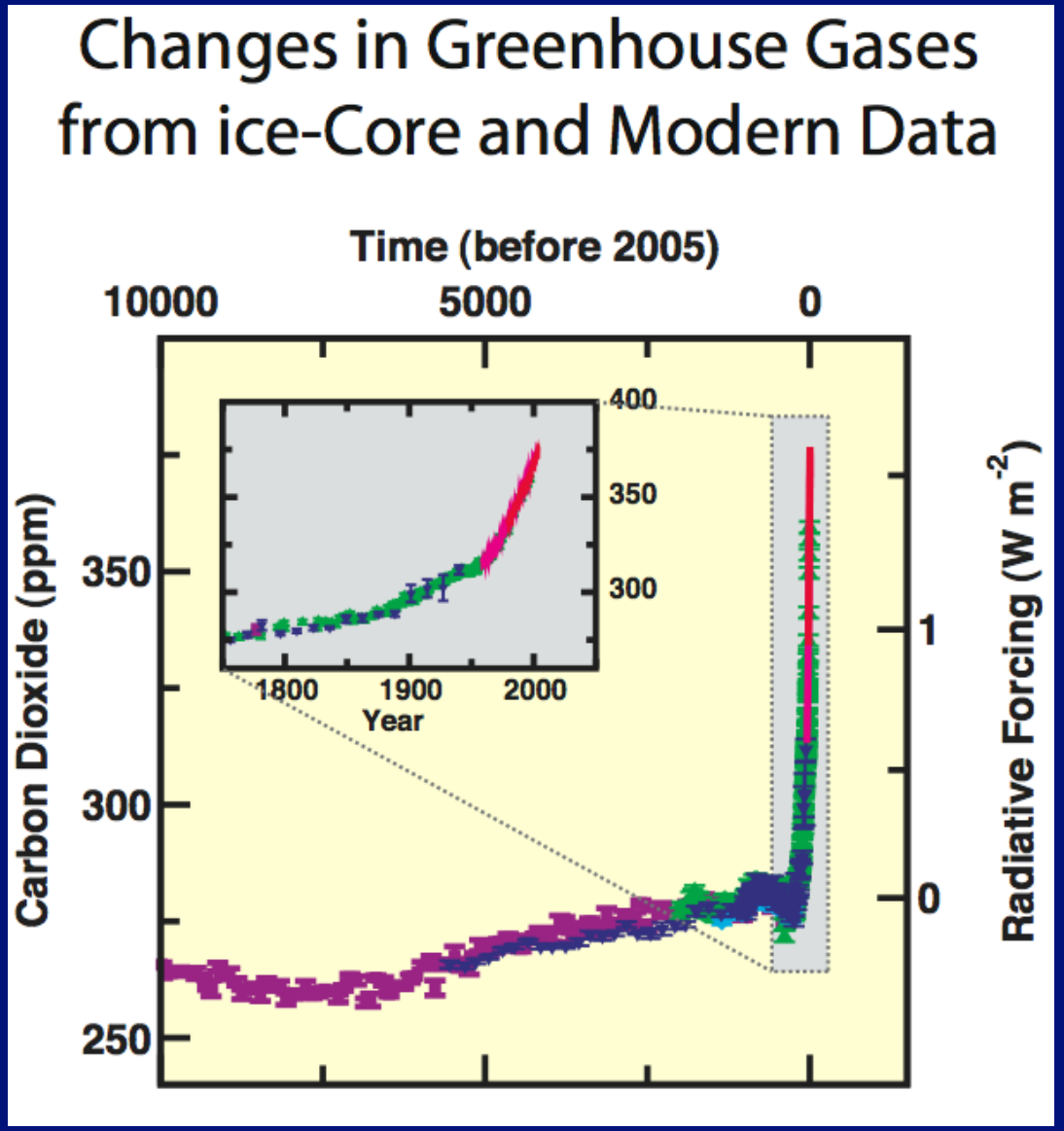
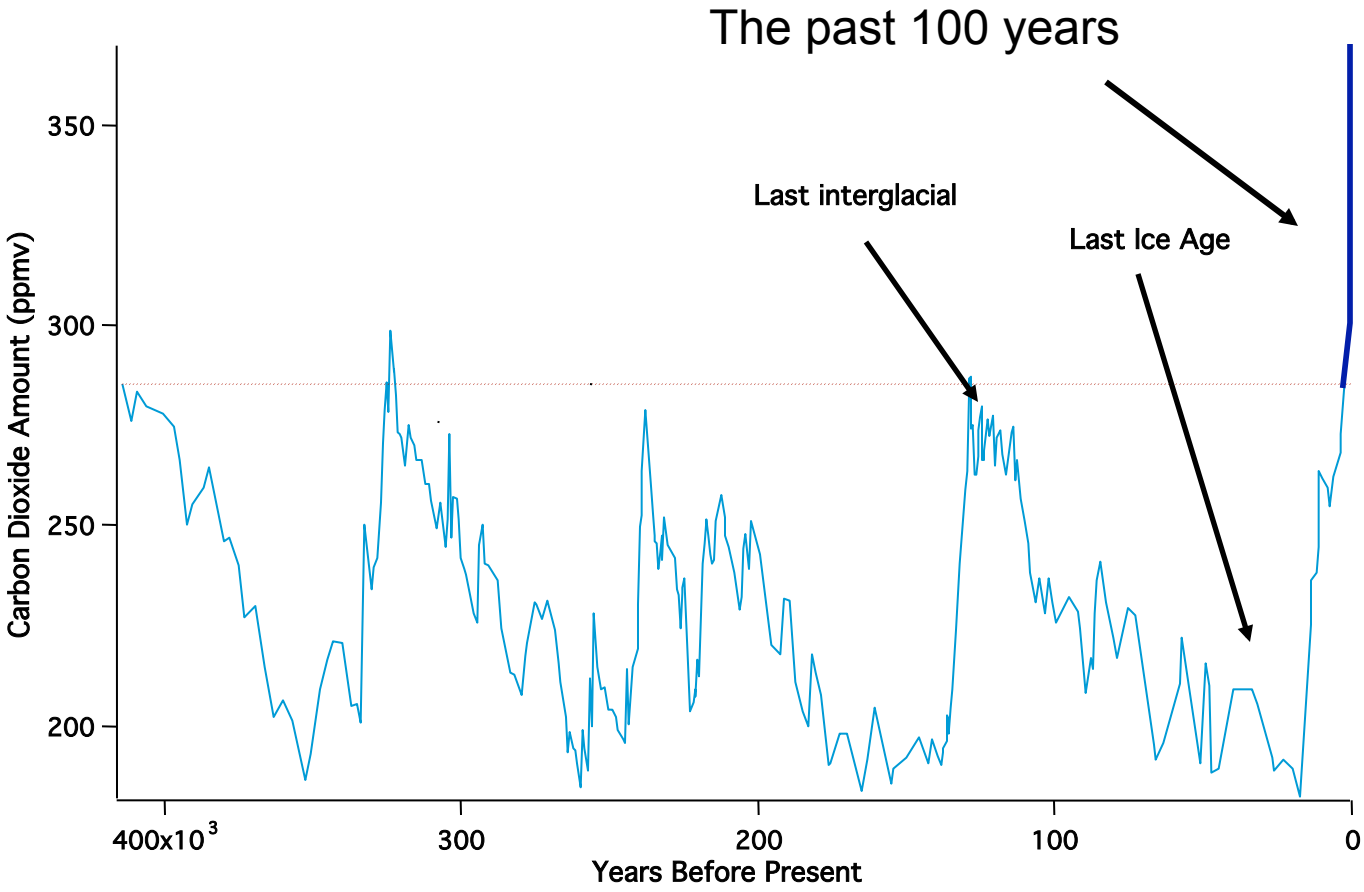
Human and Natural Drivers of Climate Change: Unprecedented

- Dramatic rise in the industrial era
- Largest growth rate of CO2 seen over the last ten years (1995-2005) than in any decade at least since direct measurements began (1960).



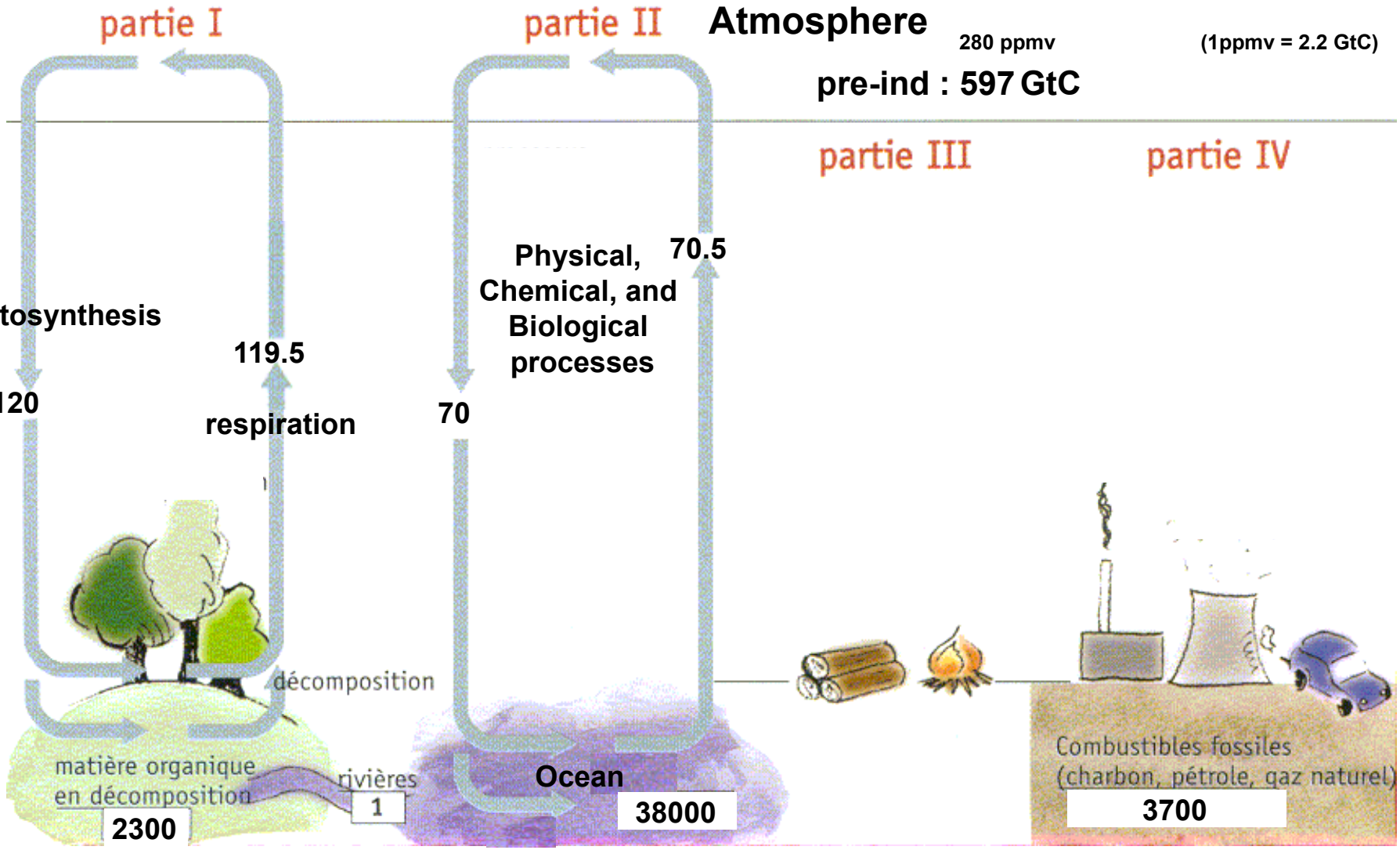
Some information about carbon dioxide changes through four past ice ages (from ice cores), and in the modern era (from global data)



Ice ages are 'forced' by earth's orbital clock….

It is well established that there is more carbon dioxide in the atmosphere today than there has been in at least 650,000 years. **(Figure by S. Solomon)**

Carbon cycle: unperturbed, balanced fluxes



Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get $GtCO_2$)

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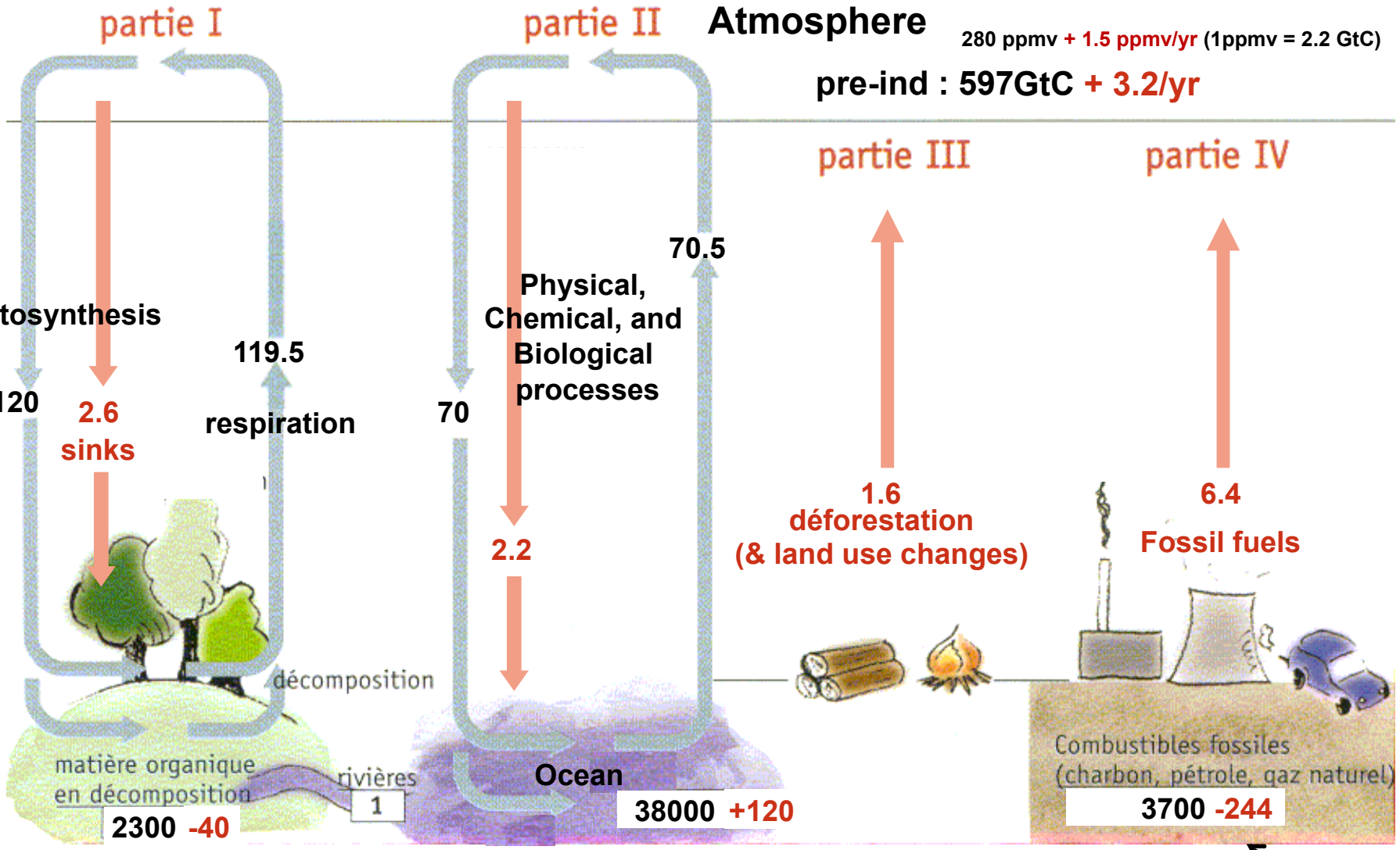
Carbon cycle: perturbed by human activities

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



Units: GtC (billions tons of carbon) or GtC/year

Stocks!

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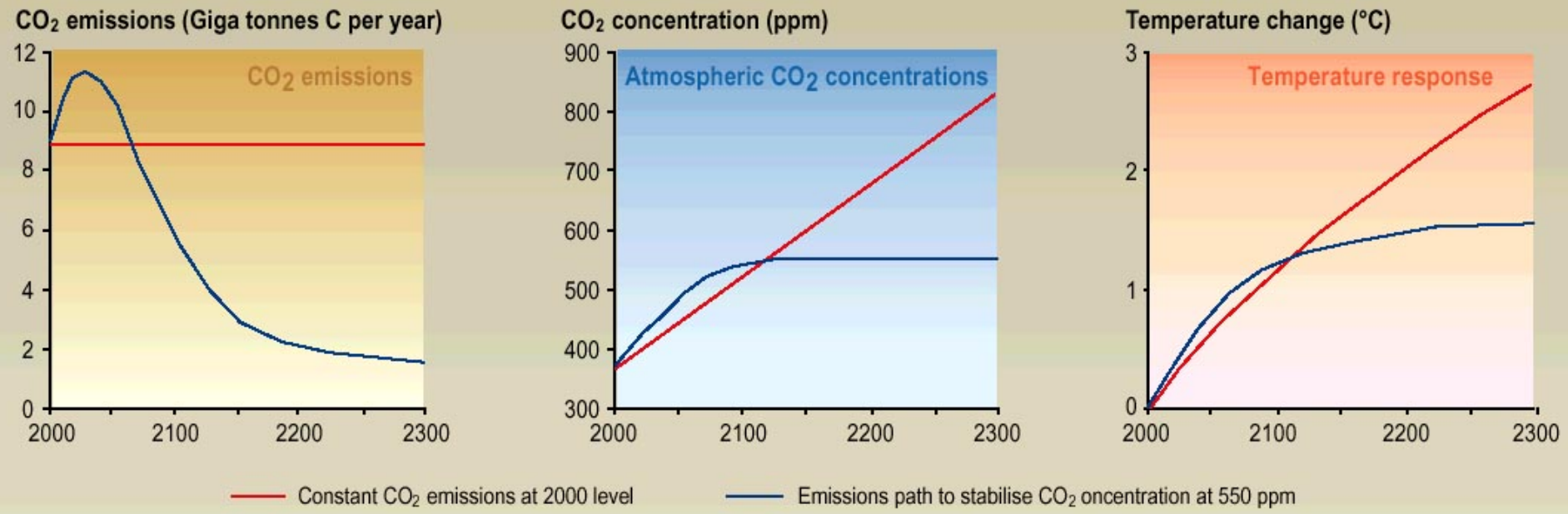
Impact of stabilising emissions versus stabilising concentrations of CO_2



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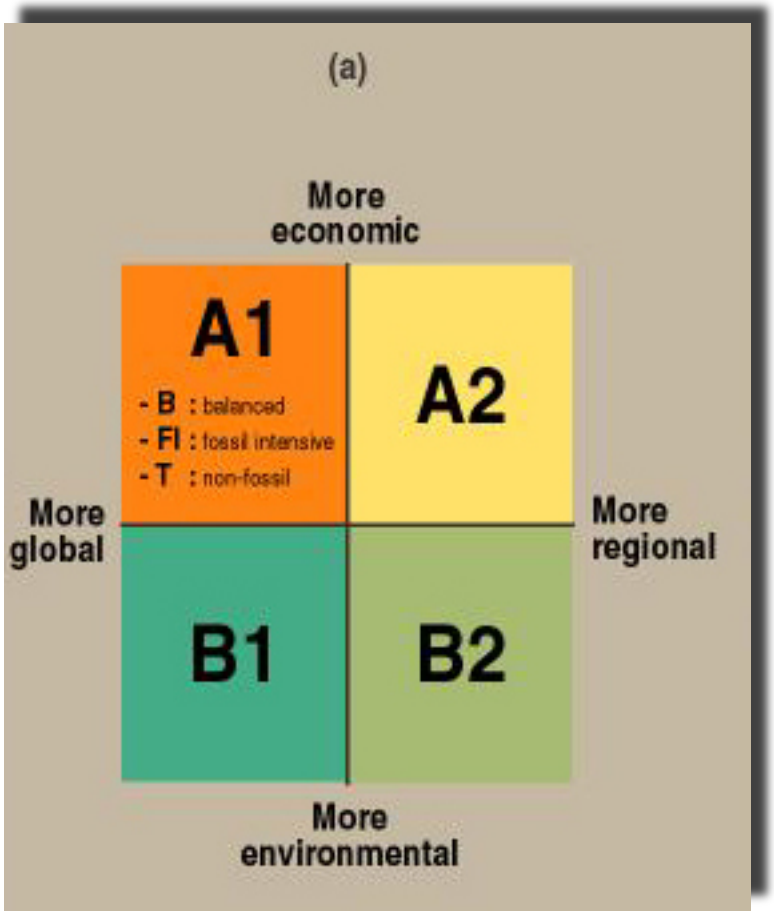
Scenarios SRES
(Special Report on Emission Scenarios, IPCC 2000)

A1: A world of rapid economic growth and rapid introductions of new and more efficient technologies

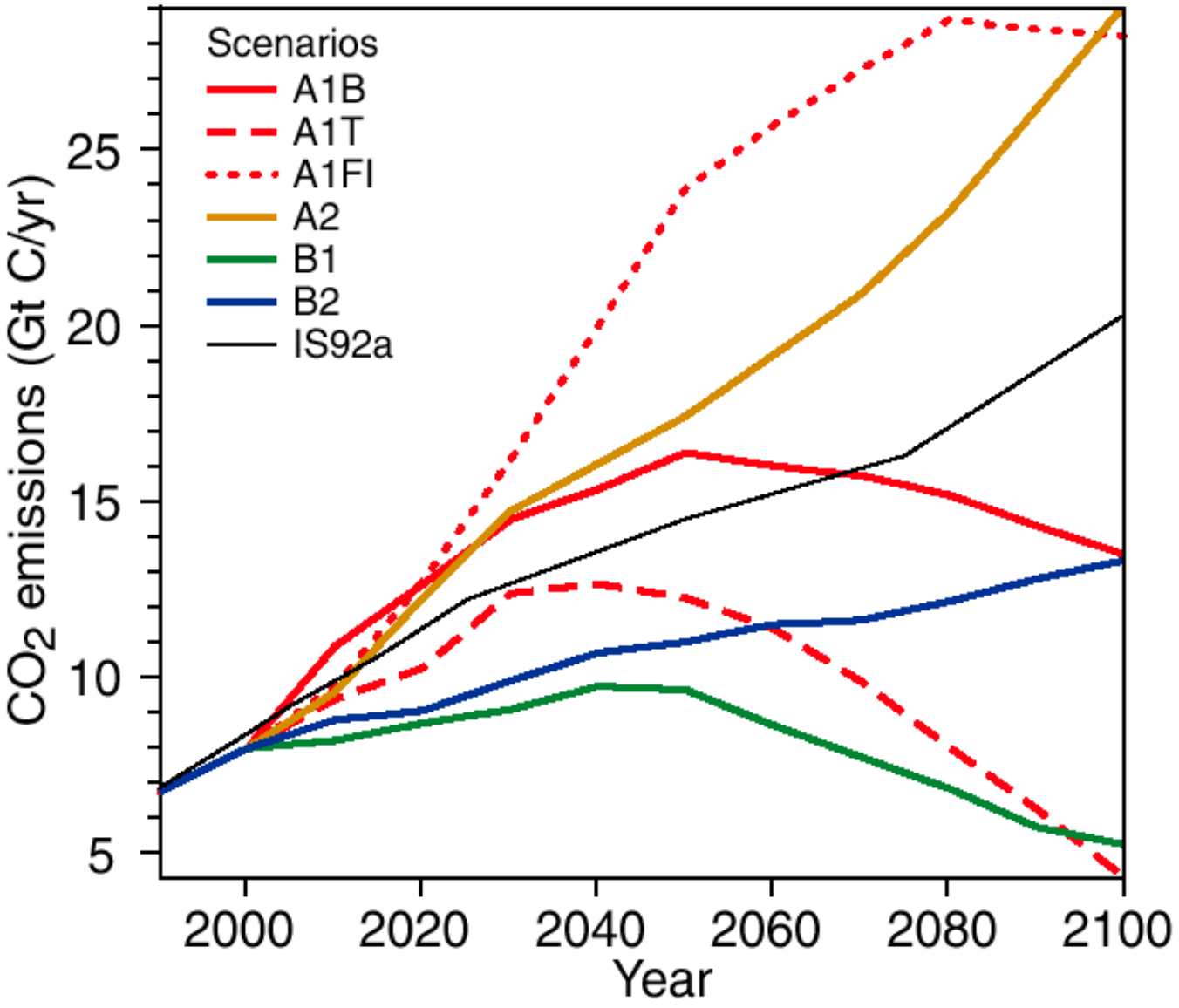
A2: A very heterogenous world with an emphasis on familiy values and local traditions

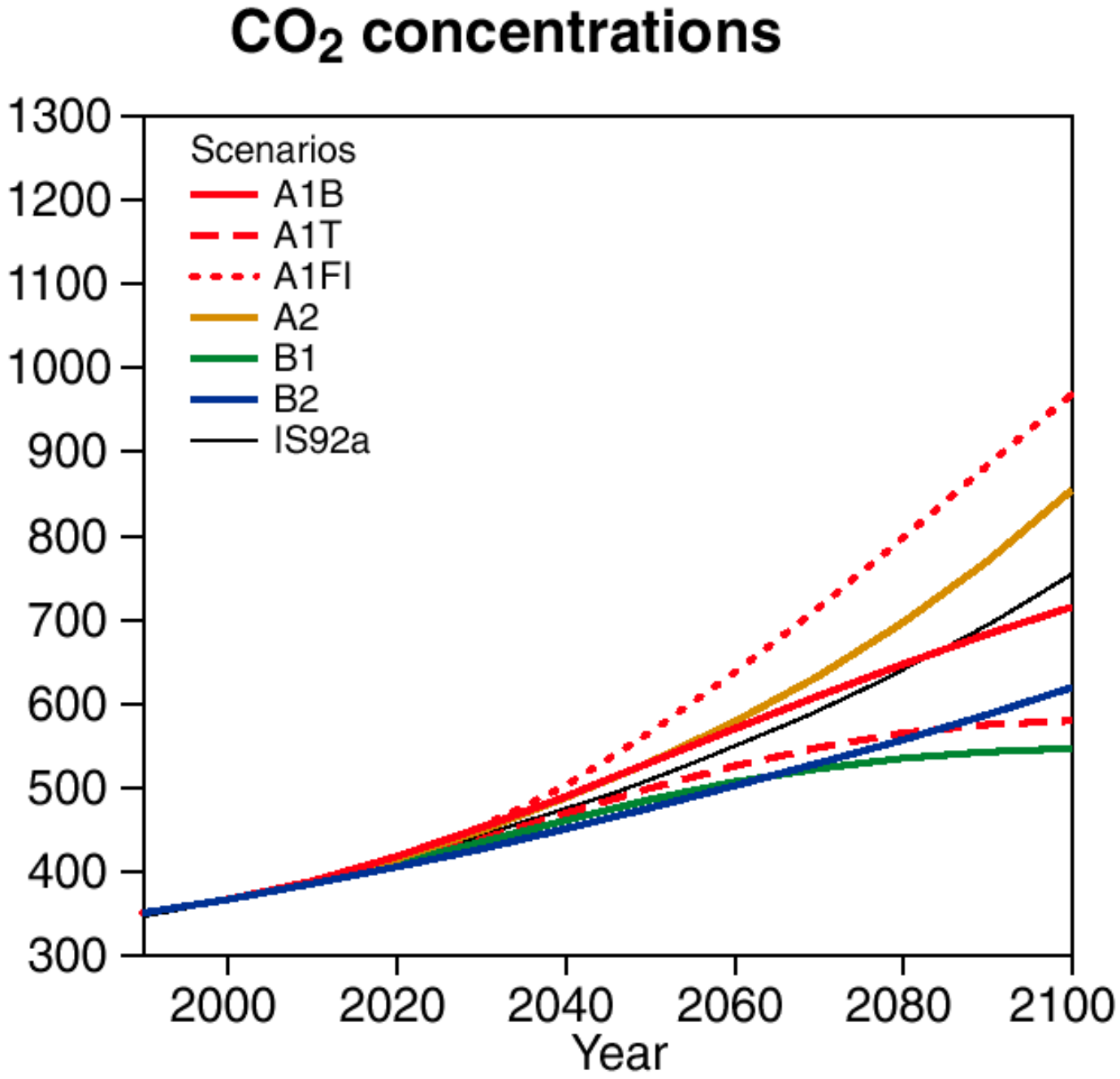
B1: A world of „dematerialization“ and introduction of clean technologies

B2: A world with an emphasis on local solutions to economic and environmental sustainability



CO_2 emissions




CO_2 concentrations
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a
1300
1200
1100
1000
900
800
700
600
500
400
300
2000
2020
2040
2060
2080
2100
Year

Augmentation de la température globale à l'équilibre en fonction de la concentration

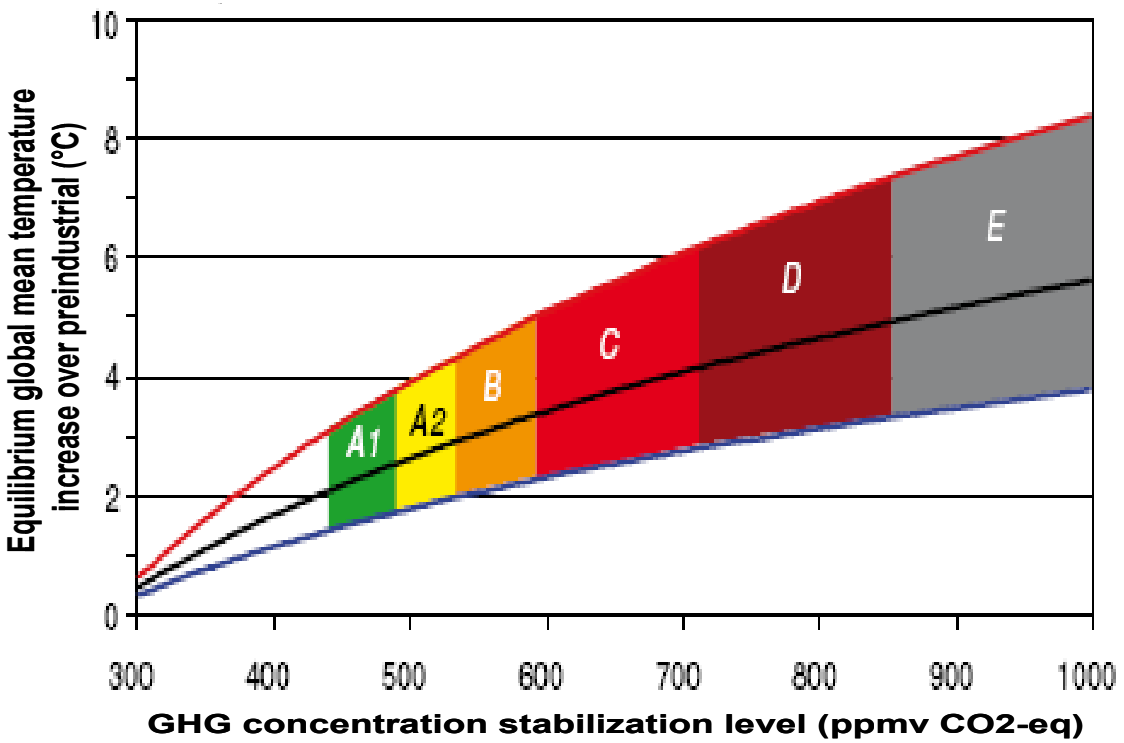
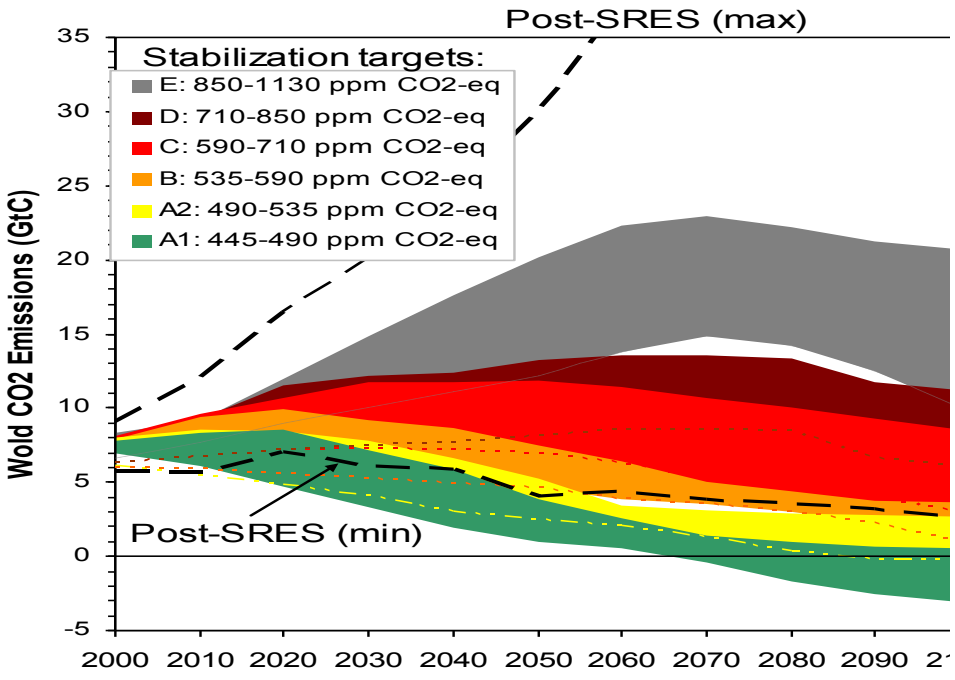
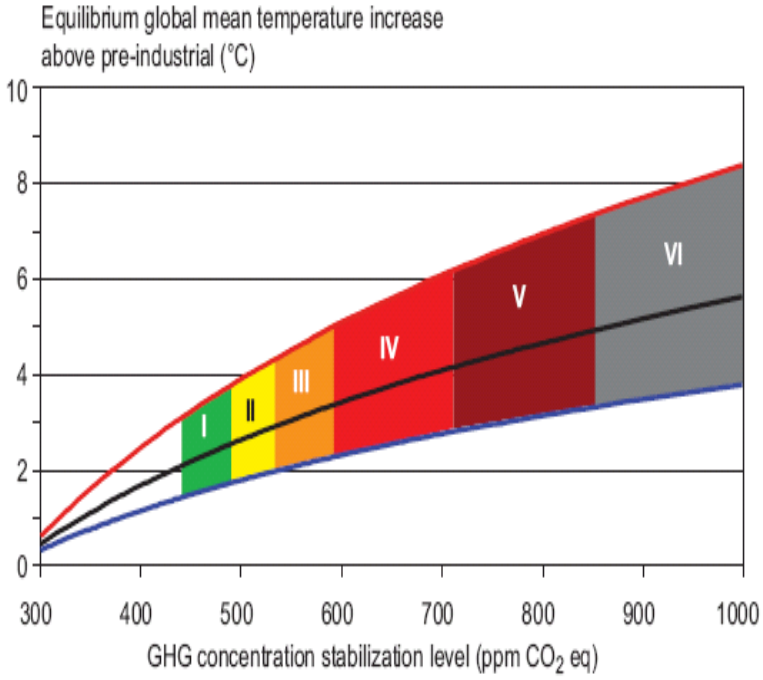


***Figure SPM 8**: Stabilization scenario categories as reported in Figure SPM.7 (coloured bands) and their relationship to equilibrium global mean temperature change above pre-industrial, using (i) "best estimate" climate sensitivity of 3°C (black line in middle of shaded area), (ii) upper bound of likely range of climate sensitivity of 4.5°C (red line at top of shaded area) (iii) lower bound of likely range of climate sensitivity of 2°C (blue line at bottom of shaded area). Coloured shading shows the concentration bands for stabilization of greenhouse gases in the atmosphere corresponding to the stabilization scenario categories. The data are drawn from AR4 WGI, Chapter 10.8.*

The lower the stabilisation level the earlier global emissions have to go down





Multigas and CO2 only studies combined

Long term mitigation (after 2030)

- The lower the stabilization level, the more quickly emissions would need to peak and to decline thereafter
- Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

Stab level (ppm CO2-eq)	Global Mean temp. increase at equilibrium (°C)	Year CO2 needs to peak	Reduction in 2050 compared to 200
445 – 490	2.0 – 2.4	2000 - 2015	-85 to -50
490 – 535	2.4 – 2.8	2000 - 2020	-60 to -30
535 – 590	2.8 – 3.2	2010 - 2030	-30 to +5
590 – 710	3.2 – 4.0	2020 - 2060	+10 to +60
710 – 855	4.0 – 4.9	2050 - 2080	+25 to +85
855 – 1130	4.9 – 6.1	2060 - 2090	+90 to +140

4. Carbon dioxide dynamics

As in [Nordhaus, 2008], we assume that CO_2 emissions are representative of total GHG emissions. The flux balance equation for atmospheric CO_2 is written:

$$\frac{d}{dt}\Delta_C = \kappa_0\Big(E_w - q(\Delta_C)\Big) \text{ with } \Delta_C = [CO_2] - [CO_2]_p, \tag{13}$$

where $[CO_2]$ is the average concentration of atmospheric CO_2, $[CO_2]_p$ is the natural pre-industrial atmospheric CO_2 concentration, E_w is the flow of CO_2 emissions into the atmosphere from world human economic activities, $q(\Delta_{CO_2})$ is a monotone increasing function representing the natural planet absorption rate of CO_2 and κ_0 is a constant coefficient.

Bastin & Cassiers (2013) Discussion Paper 2013-14, IRES, UCL.

Page 6, début de section 4, il est fait référence à Nordhaus 2008. Cela se rapporte à la phrase : "CO2 emissions are representative of total GHG emissions". Ce que Nordhaus fait, c'est qu'il ne simule que le CO2 et prend le reste de façon "exogène". Cette phrase ne dit rien de tel.

Plus ennuyeux: il n'y a aucune référence pour le "modèle du carbone" qui suit immédiatement cette phrase !!!
Le modèle du cycle du carbone au cœur de Bastin & Cassiers 2013 tient en fait en une seule équation, la (13). Cette équation vient sans doute de Nordhaus 1991, qui n'est pas cité en fin d'article. Nordhaus a cessé d'utiliser cette équation en 1999.

A key aspect that required improvement is the representation of the carbon cycle. The original version of DICE/RICE [Nordhaus, 1991] has been repeatedly criticized in this regard [Price, 1995, Joos et al., 1999], in particular because it involved an equation that assumes that a (fixed) fraction of the emited carbon is instantaneously absorbed and "disappears" and that all carbon would ultimately end up destroyed.

Marbaix & Gerard, 2008 (Climneg Paper, CORE, UCL)

This criticism was partly addressed in the subsequent versions of RICE [Nordhaus and Boyer, 1999b] which includes a "three reservoir" carbon representation that is still used in the current version [Nordhaus, 2007]. (...) However, even these updated models do not fully address the criticism presented in Joos et al. [1999]: the penetration of carbon in the ocean, which is a key process, is still represented by a linear system in spite of the highly non-linear effects that are taking place in the actual carbon cycle.

Marbaix & Gerard, 2008 (Climneg Paper, CORE, UCL)

Environmental Modeling and Assessment 4 (1999) 133–140

Correcting the carbon cycle representation: How important is it for the economics of climate change?

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Economic analyses of the greenhouse effect are typically carried out within the framework of computable general equilibrium models which represent the climate system by simple two box proxies based upon the pioneering work of Nordhaus. Since errors in predicting the carbon budget can imply high costs, there is some need to include more sophisticated climate models into the economics of global climate change. This paper presents a non-linear pulse representation of the process-based and data-validated Bern carbon model. Compared to the Nordhaus approach this leads to different results with respect to optimal climate policy and atmospheric carbon dioxide concentration. In particular, our results suggest that economic studies which use a Nordhaus representation of the climate system are biased towards high carbon emission and low abatement levels.

Bastin et Cassiers ont donc un cycle du carbone obsolète depuis plus de 15 ans, et complètement faux, comme on peut s'en apercevoir en regardant les résultats :
il est en effet totalement impossible de stabiliser les concentrations de CO2 à 450 ppm avec les émissions de la figure 12.

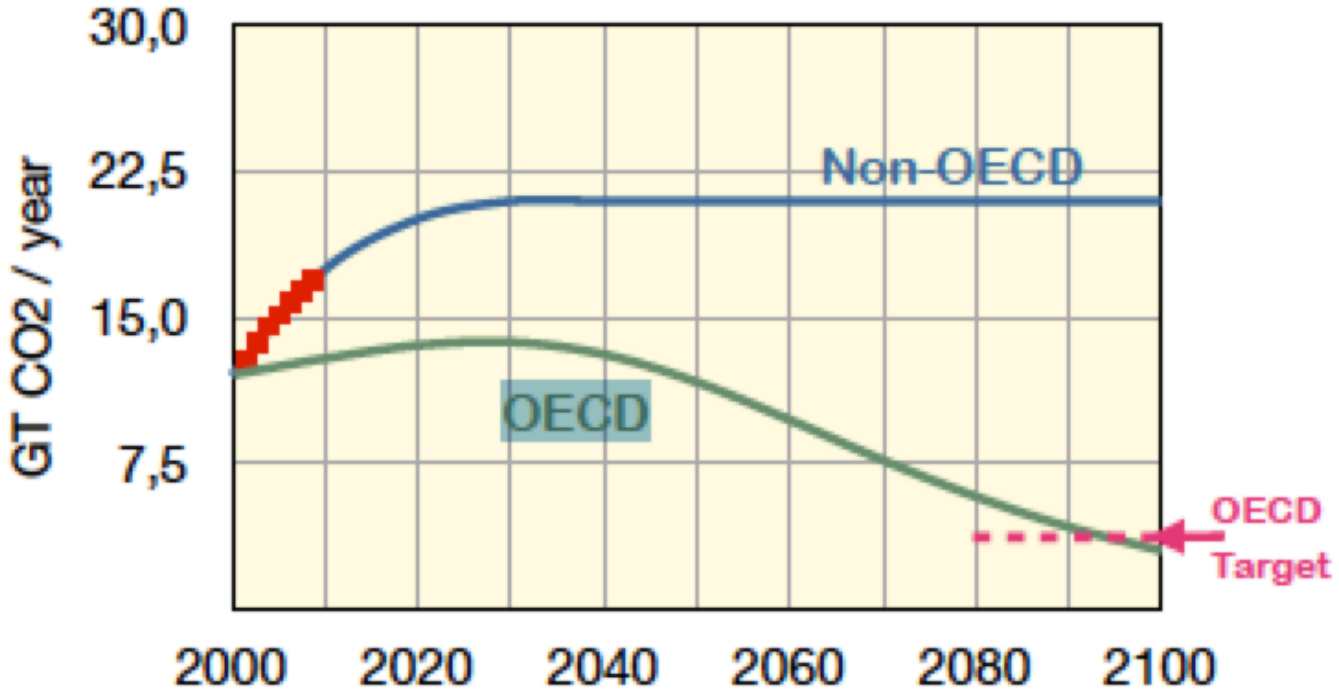

Fig.12: *CO_2 emissions for the period 2000-2100: simulation result for the OECD benchmark and highest admissible growth projection for non-OECD countries. The red dots are empirical data.*

Source: Bastin & Cassiers (2013) Discussion Paper 2013-14, IRES, UCL.

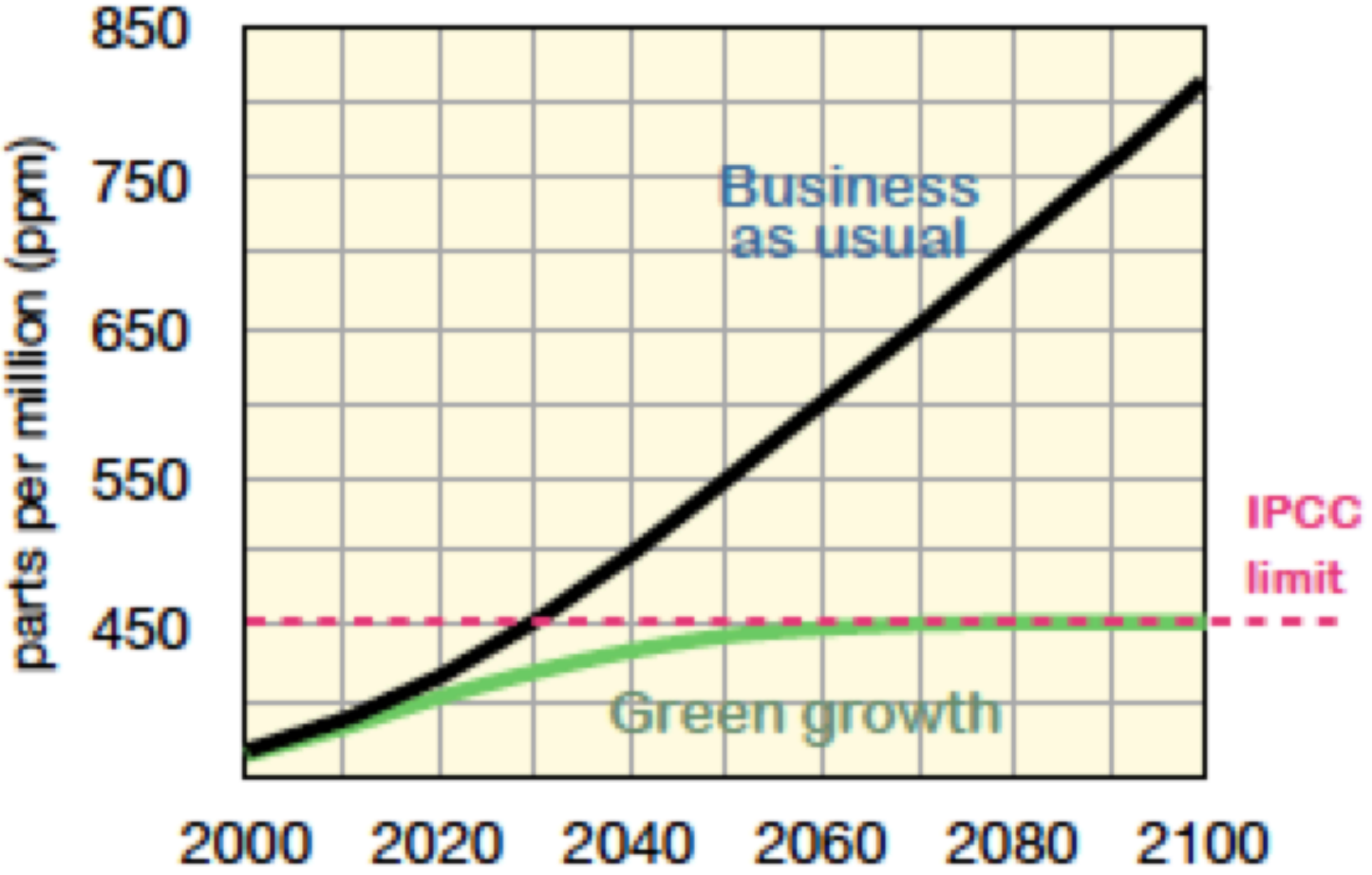

Fig.14: *Atmospheric CO_2 concentration*

Source: Bastin & Cassiers (2013) Discussion Paper 2013-14, IRES, UCL.

Autre bizarrerie dans ce papier: le fait de considérer que la « limite » de 450 ppm aurait été définie par le GIEC (introduction, figure 14).

Le mandat du GIEC est d'être « politiquement pertinent » (policy-relevant), sans être « prescriptif »

La Conférence de Copenhague (2009) a estimé que l'objectif devait être de ne pas dépasser une augmentation de la température globale de plus de 2°C (voire 1.5°C: à revisiter en 2015). Ce fut une décision polotique, prise au plus haut niveau, et non une décision du GIEC.

Commentaire sur: Bastin & Cassiers (2013) Discussion Paper 2013-14, IRES, UCL.

Pour en savoir plus…

- www.climate.be : UCL-TECLIM
- www.ipcc.ch : IPCC ou GIEC
- www.belspo.be (projet CLIMNEG)
- www.skepticalscience.com: answers to « skeptics »

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