Discussion of "A Global Economy-Climate Model with High Regional Resolution"

Krusell & Smith

Franck Portier

Hydra Conference, Majorqua
Oct 3, 2014

Very ambitious paper by modest authors

Per Krusell

22 septembre 2014 22:46

À : Franck Portier <franck.portier@tse-fr.eu>

Boîte de réception - Franck TSE

F,
I just looked at the Hydra-Majorca program and you were on the task of discussing my climate paper… if true, sorry! I'm attaching the most recent slides, will hopefully send more like a paper within soon. Feel free to ask any questions meanwhile.
P

crap.pdf

Road Map

1. Integrated Assessment Models
2. Baseline scenario
3. Some variations
4. Krusell & Smith

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2. Baseline scenario
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1. Integrated Assessment Models

- Pioneering work of Nordhaus (RICE, DICE)
- Main elements
  1. An economic model $\rightsquigarrow$ income per capita in one or more regions of the world
  2. A carbon cycle model that links CO_2 emissions and atmospheric concentration of carbon
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  4. A feedback to economics: damage function that links temperature to losses (TFP, preferences, ...)

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$$
\begin{aligned}
M_{AT}(t) &= 10 \times ET(t-1) + \phi_{11} M_{AT}(t-1) + \phi_{21} M_{UP}(t-1) \\
M_{UP}(t-1) &= \phi_{22} M_{UP}(t-1) + \phi_{12} M_{AT}(t-1) + \phi_{32} M_{LO}(t-1) \\
M_{LO}(t) &= \phi_{33}(t-1) + \phi_{23} M_{UP}(t-1)
\end{aligned}
$$

$$F(t) = \eta \left(\log \left(\frac{M_{AT}(t)}{M_{AT}^{PI}} \right) / \log(2) \right) + O(t)$$

$$\begin{aligned} T(t) &= T(t-1) + \sigma_1 (F(t) - \lambda T(t-1) \\ &\quad -\sigma_2 (T(t-1) - T_{LO}(t-1))) \\ T_{LO}(t) &= T_{LO}(t-1) + \sigma_3 (T(t-1) - T_{LO}(t-1)) \end{aligned}$$

1. Integrated Assessment Models

A quite ambitious task

- Assuming that the non-econ block is OK (...)
- Global warming is ... global $\rightsquigarrow$ the model is a model of the whole planet
- Global warming is not about emissions *per capita* but about total emissions $\rightsquigarrow$ need to model/forecast population
- Emissions per dollar of output is key $\rightsquigarrow$ need to forecast technology
- Model of the world economy $\rightsquigarrow$ need to forecast growth and speed of convergence.
- Long run phenomenon $\rightsquigarrow$ the horizon is at least one century
- This is for the positive side. On the normative side:
  - $\times$ Discounting the very long run
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2. Baseline scenario

- It is useful to have an idea of the baseline scenario
- It is computed using Boyer & Nordhaus (2000) assumptions

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Exogenous forces

- Growth rate of income per capita in the different geographical zones
- Growth rate of population in the different geographical zones
- (Negative) Growth of CO_2 emissions per dollar of output in the different geographical zones
- Start in 1995 (...)

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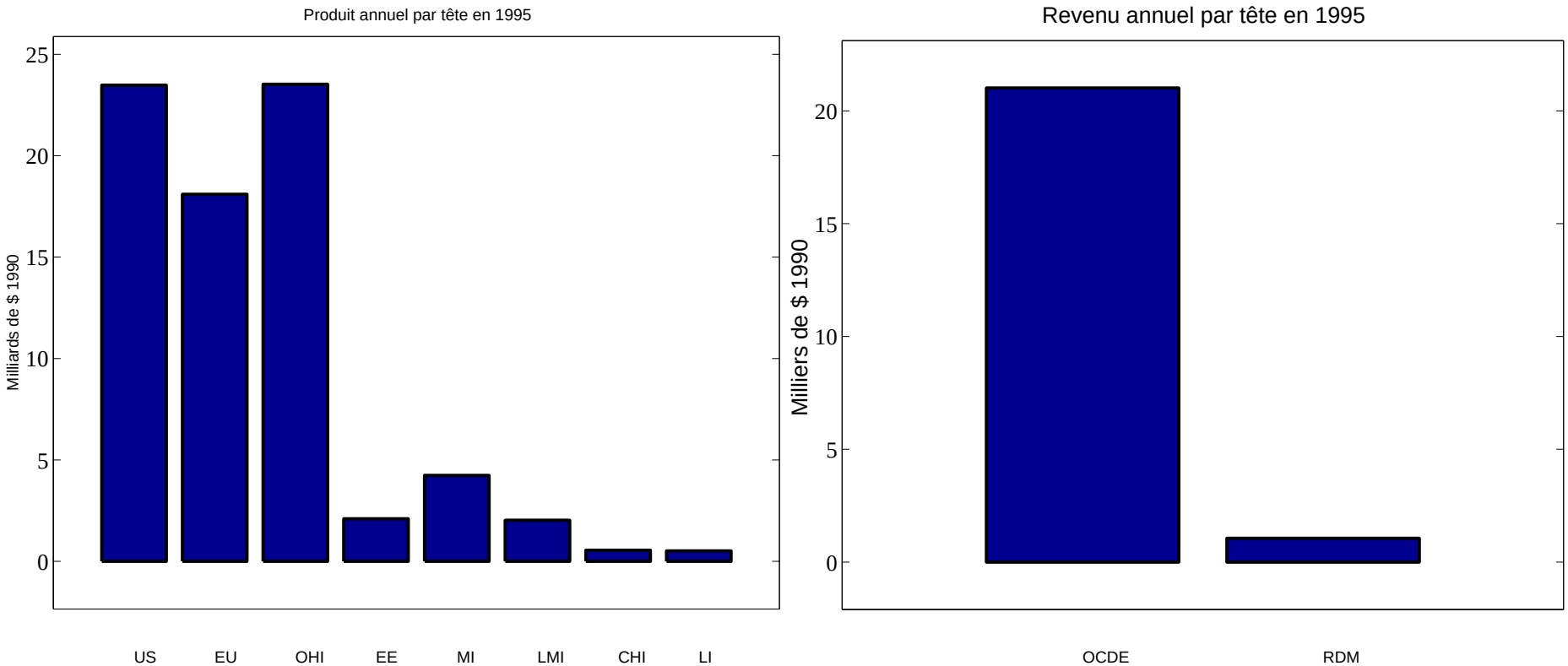
Figure 1: Output per capita: levels and trends



2. Baseline scenario

Figure 2: Output per capita: levels and trends

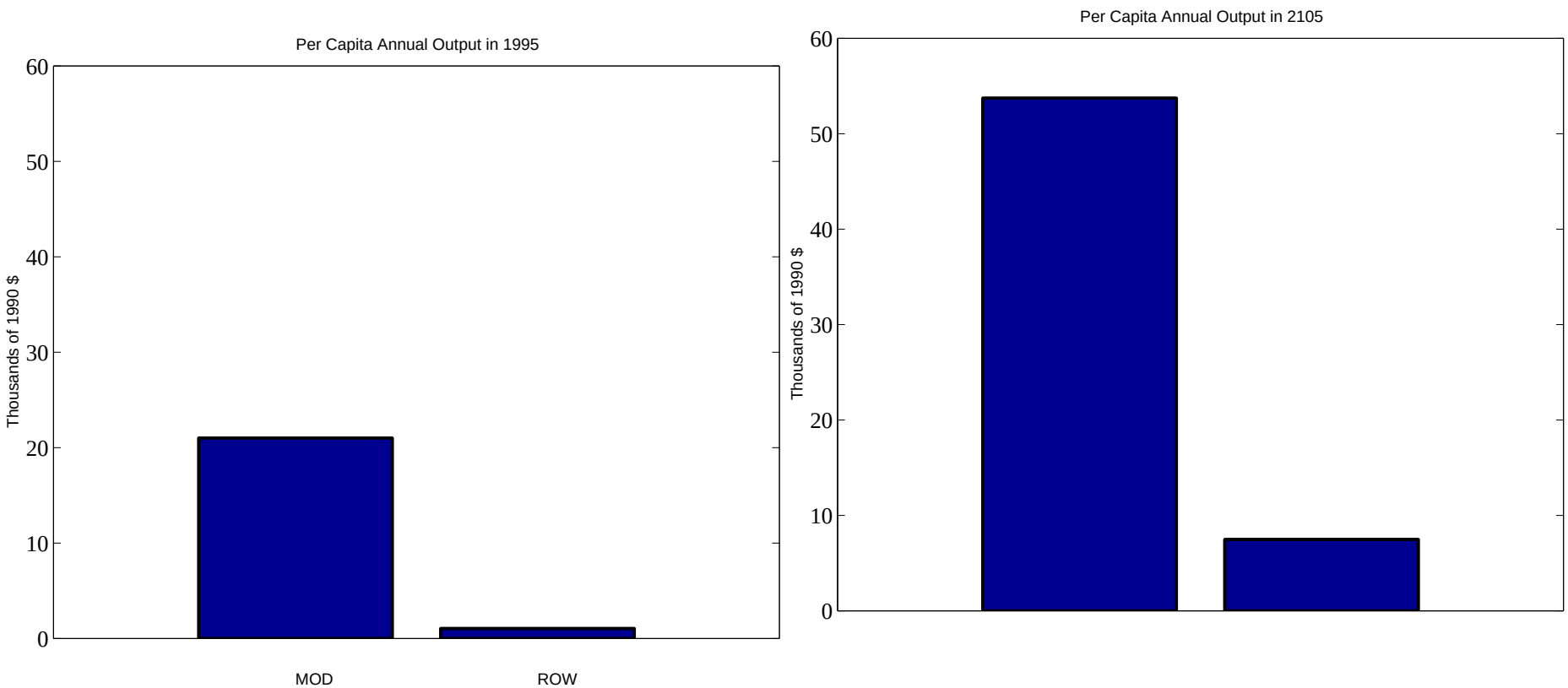


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Figure 3: Population: levels and trends

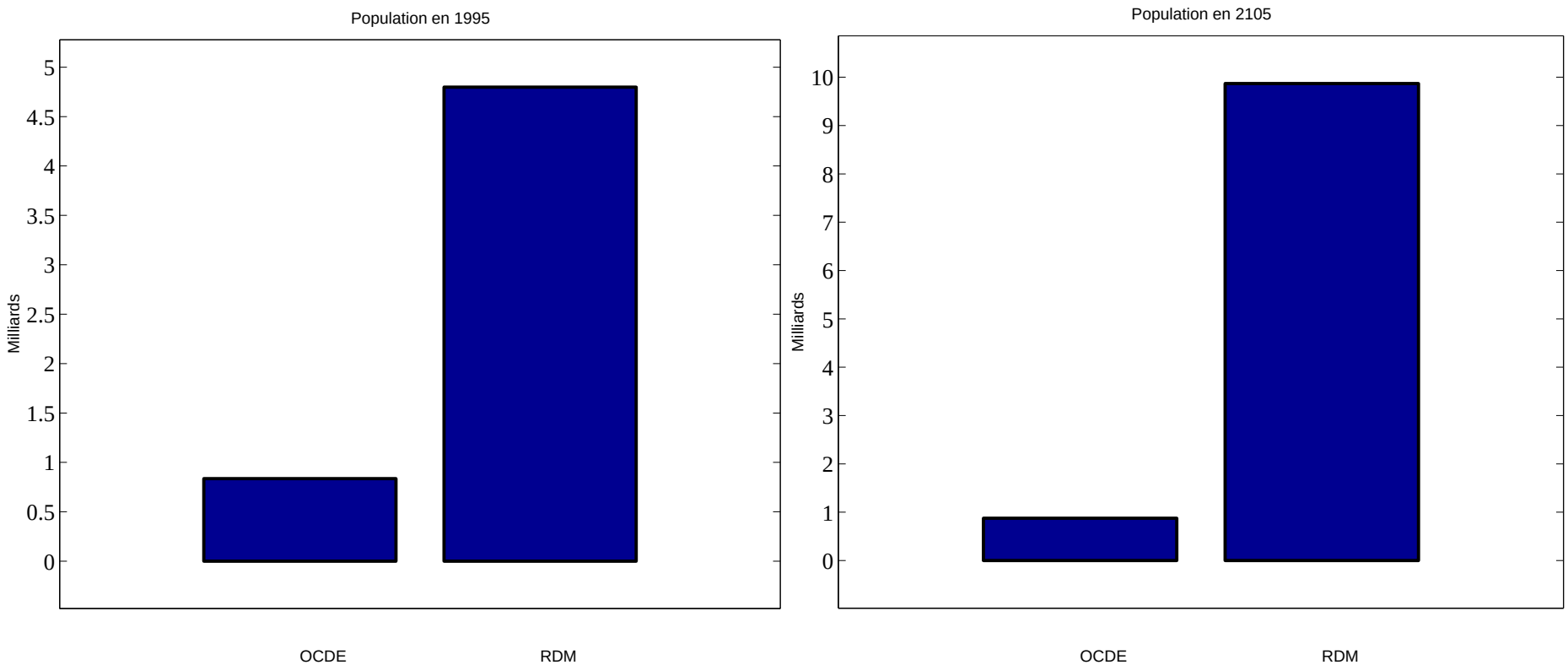

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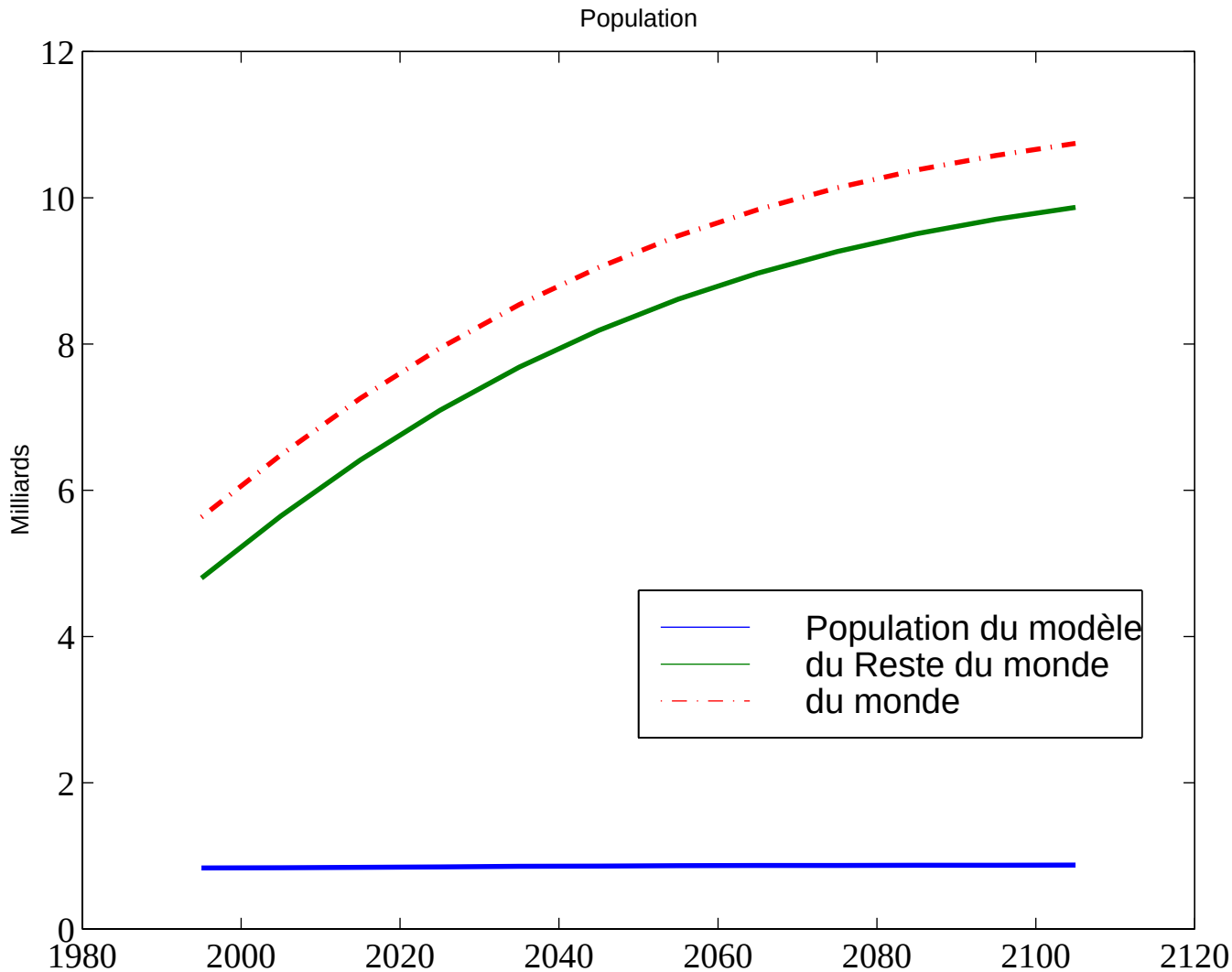
Figure 4: Population: levels and trends



2. Baseline scenario

Figure 5: Total output: levels and trends

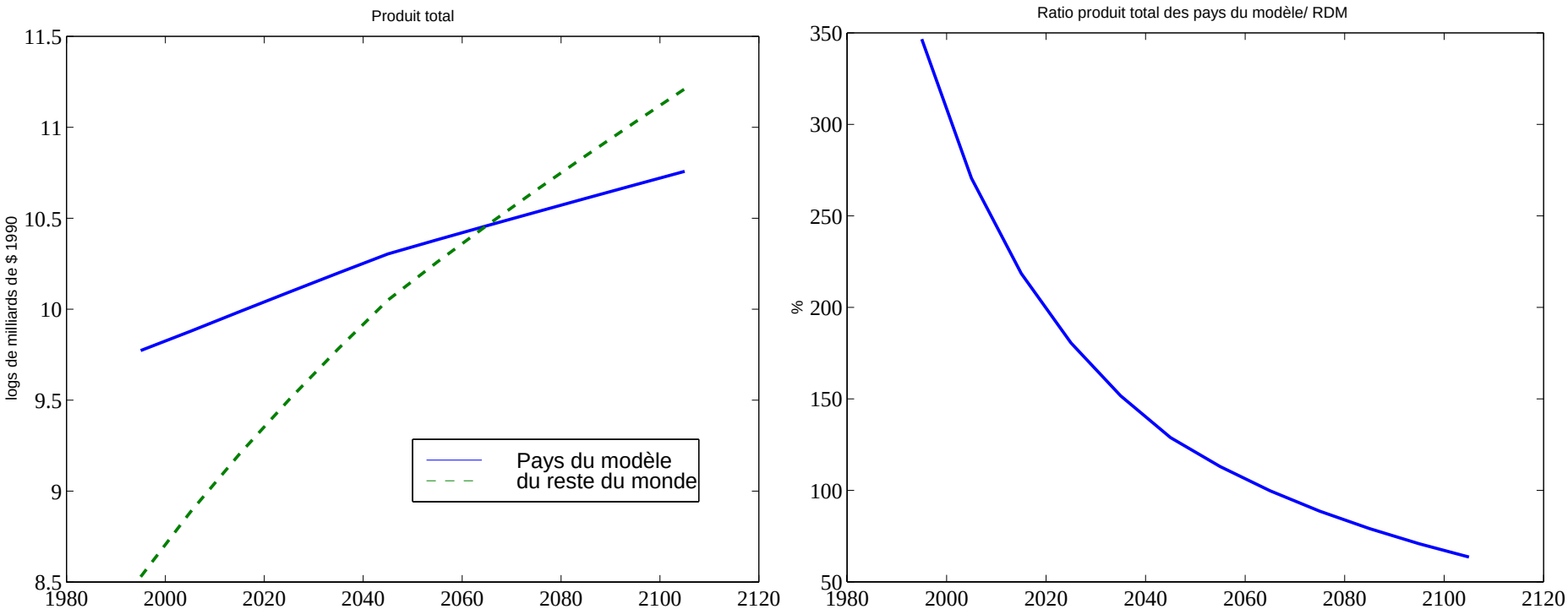


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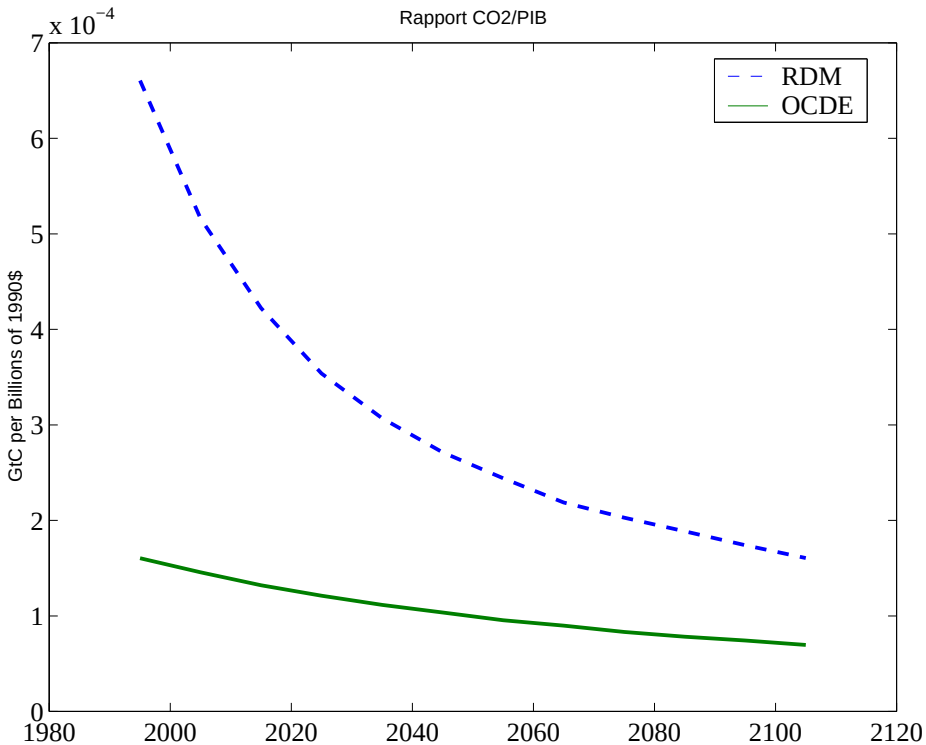
Figure 6: CO_2 emissions: levels and trends



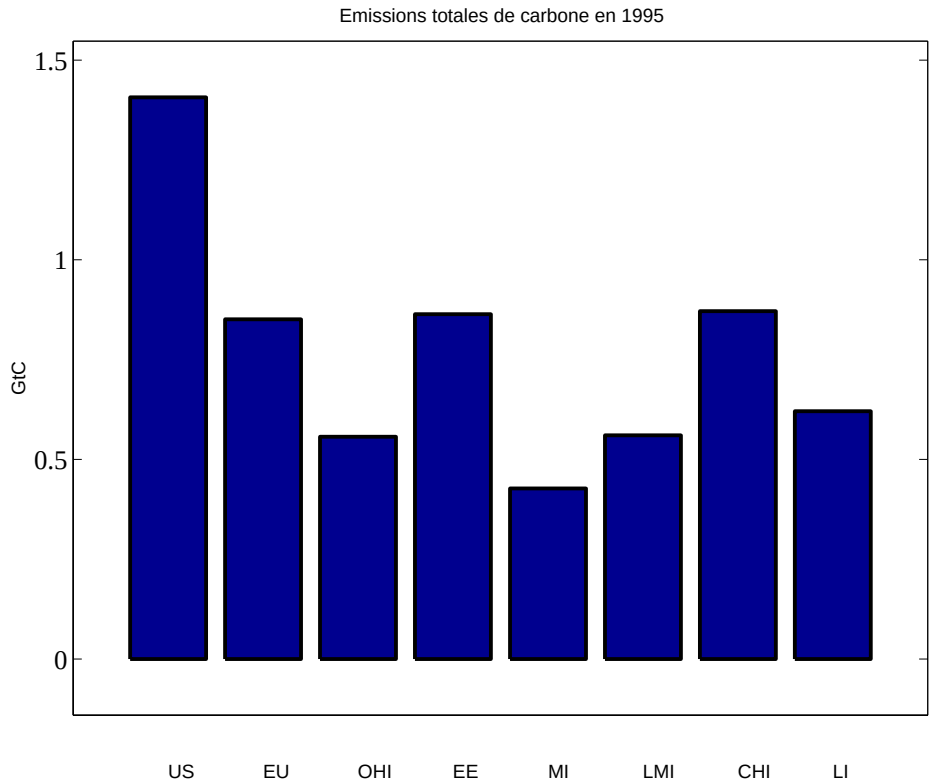


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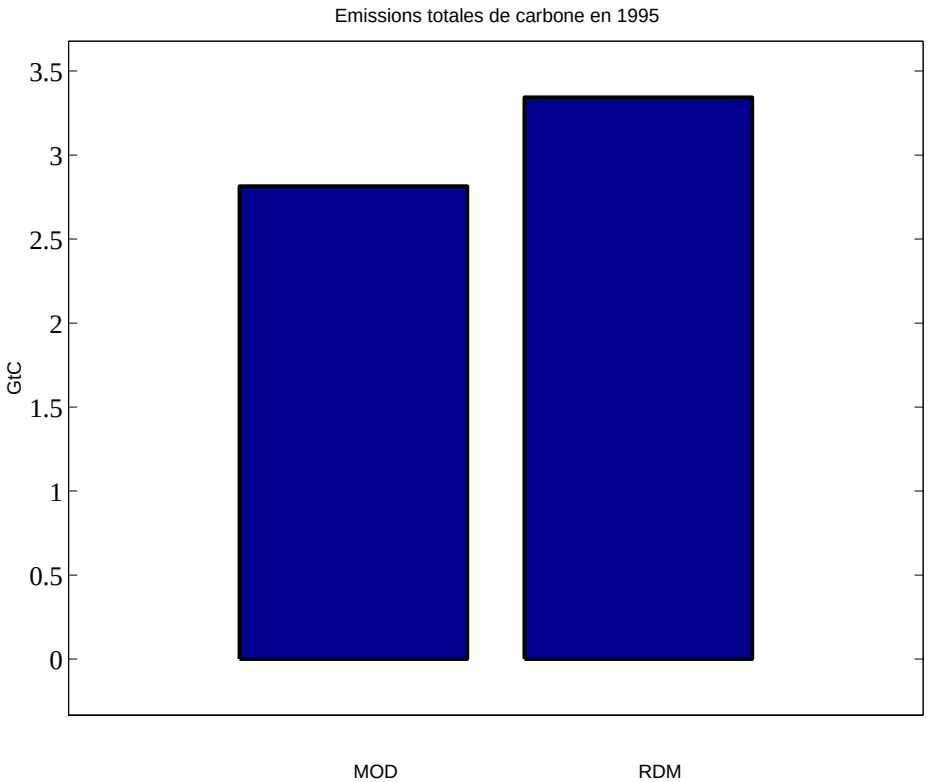
Figure 7: CO_2 emissions: levels and trends



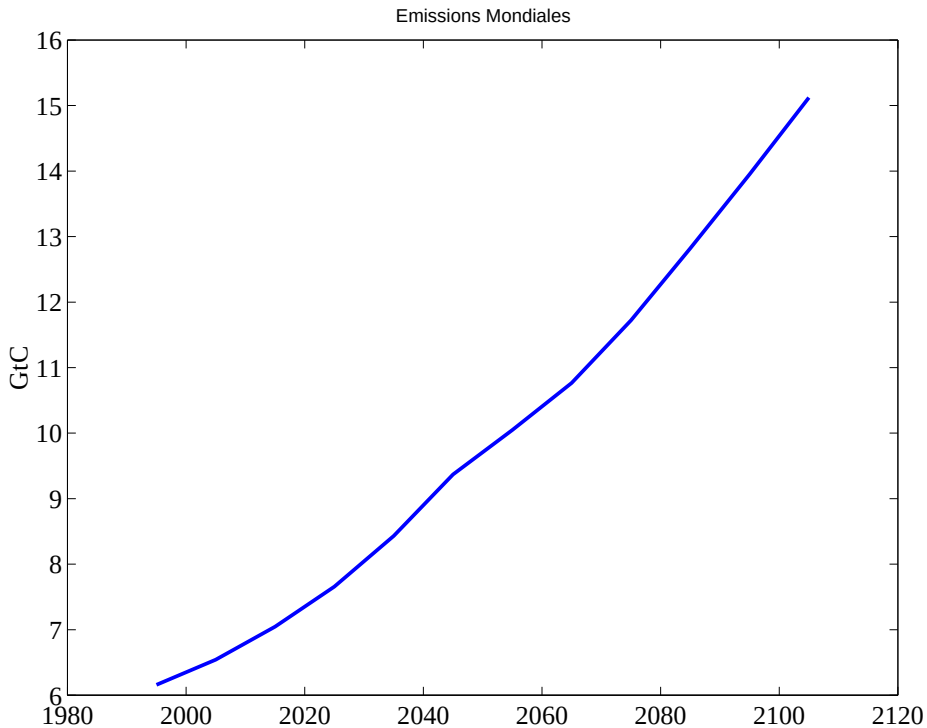


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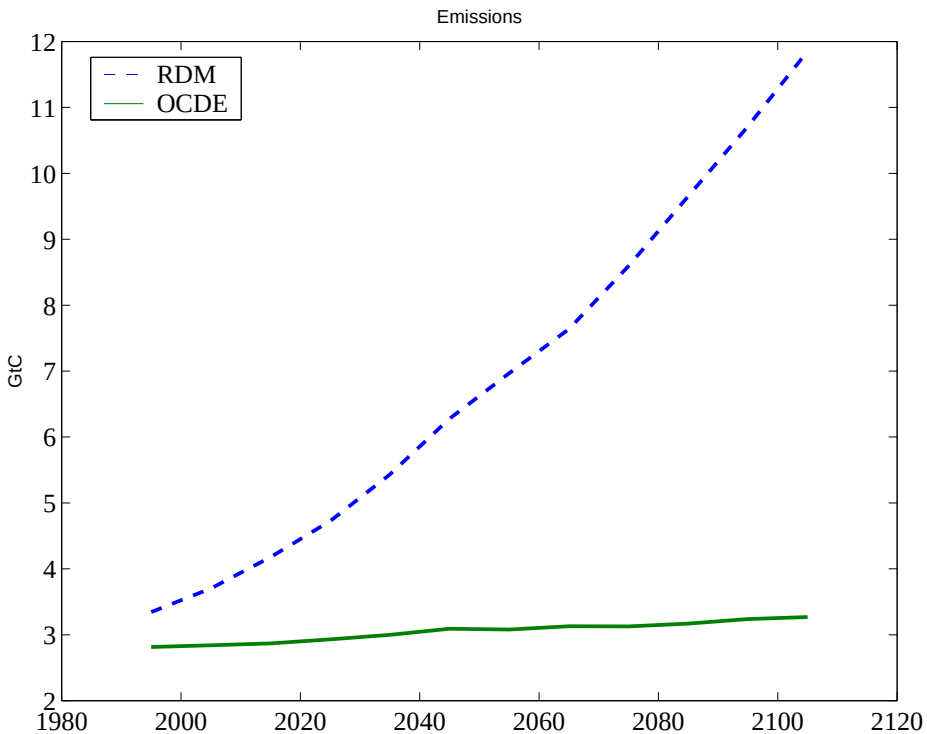
Figure 8: CO_2 emissions: levels and trends



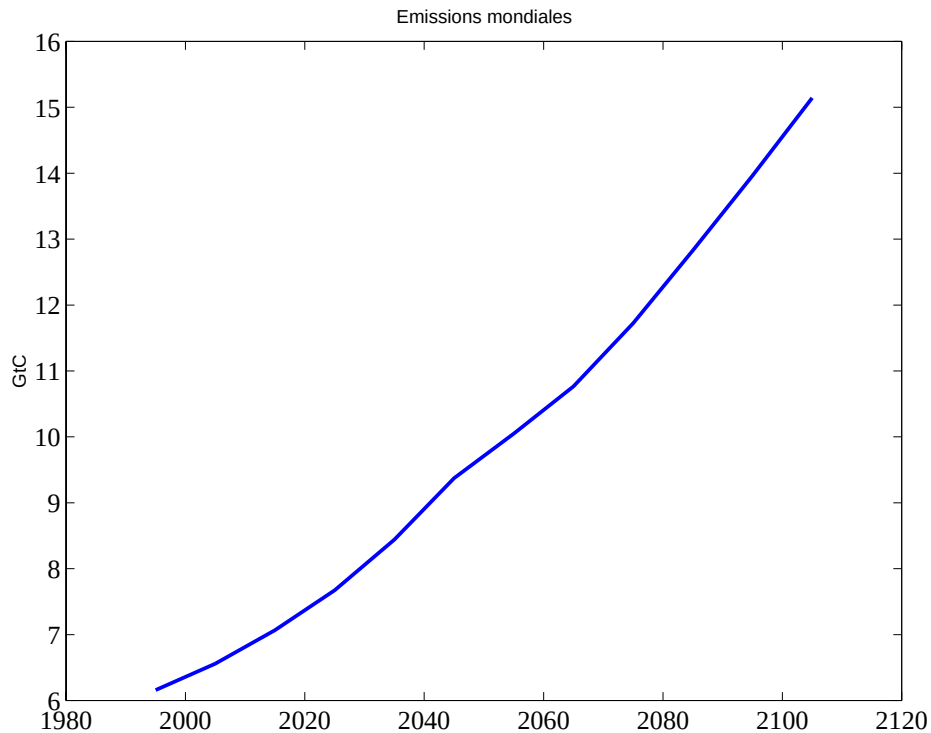


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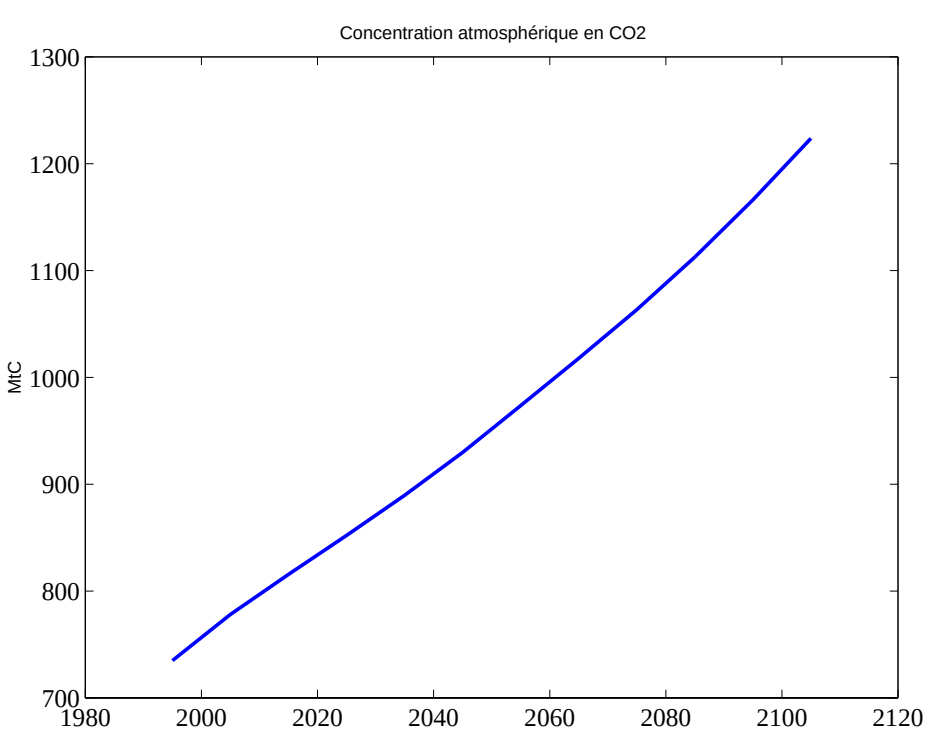
Figure 9: Carbon concentration, temperature et output losses



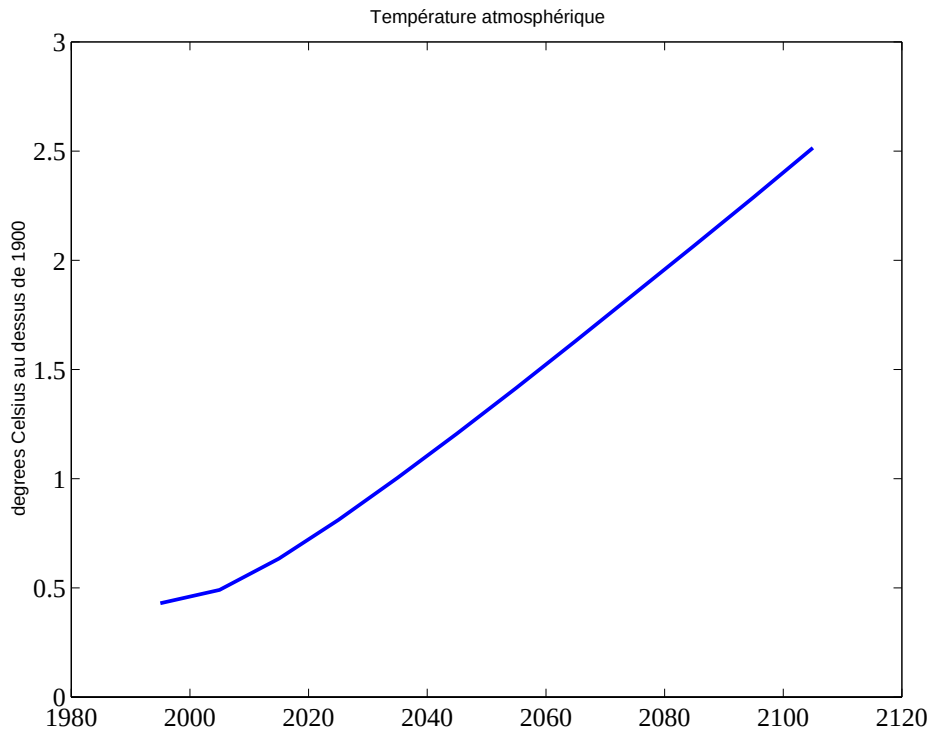


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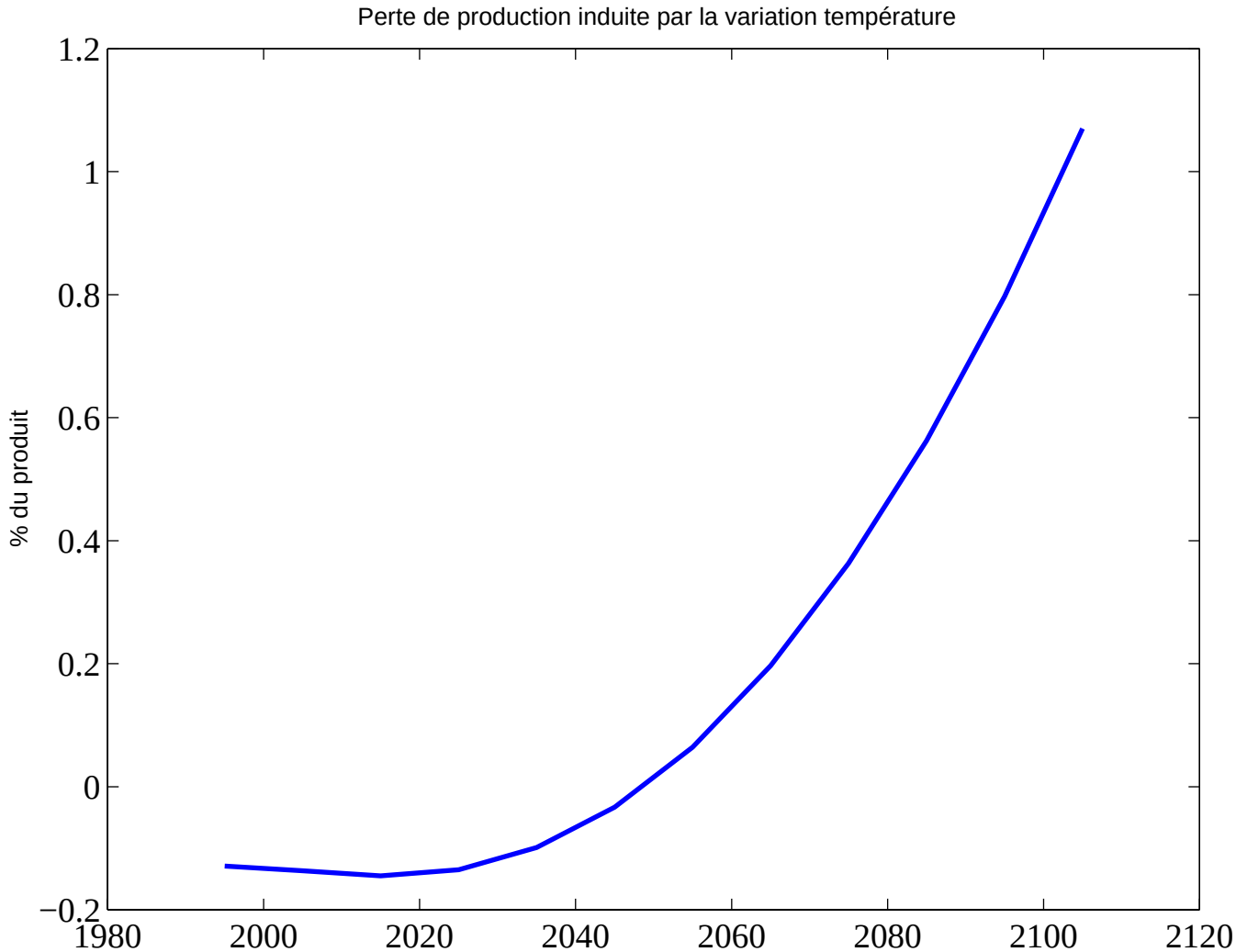
Figure 10: Carbon concentration, temperature et output losses



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- I study three alternative scenarios that show
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  - × The relative irrelevance of Oecd countries choices

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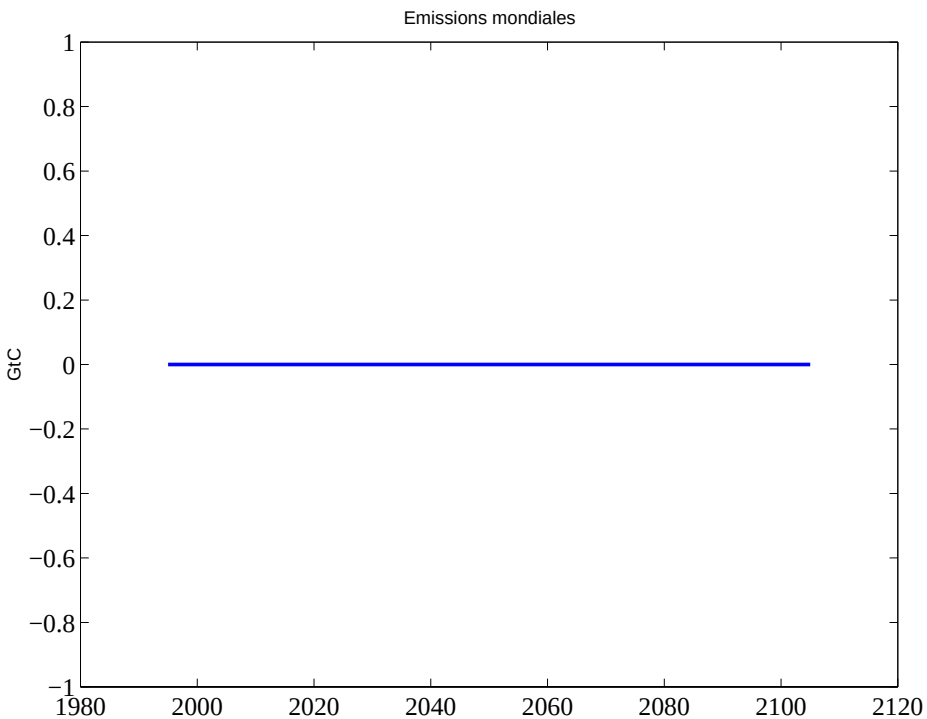
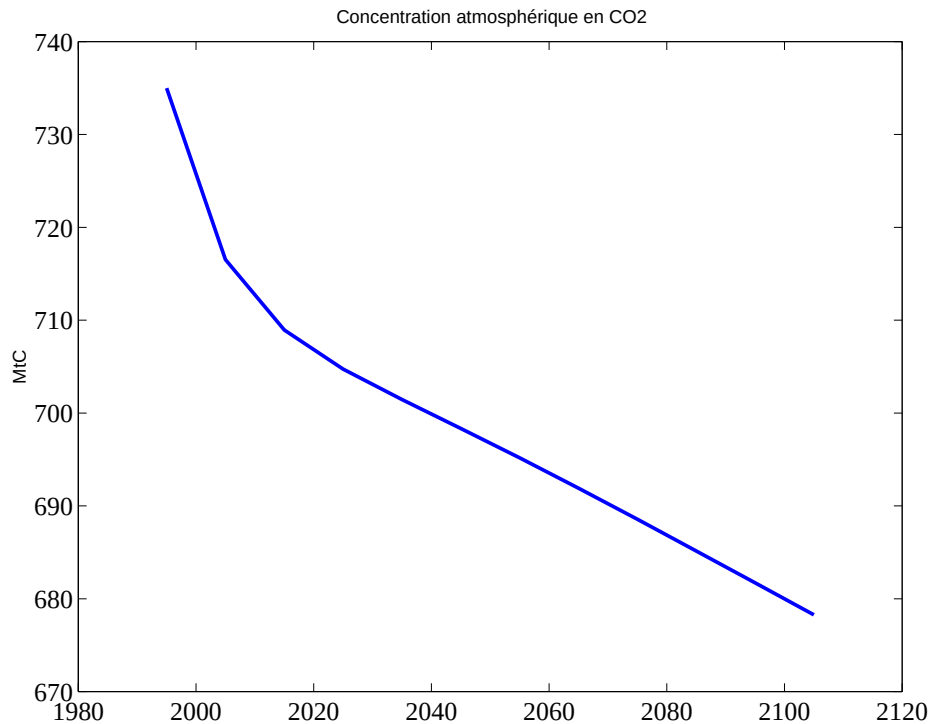
Zero emission scenario

Figure 11: Emissions and concentration

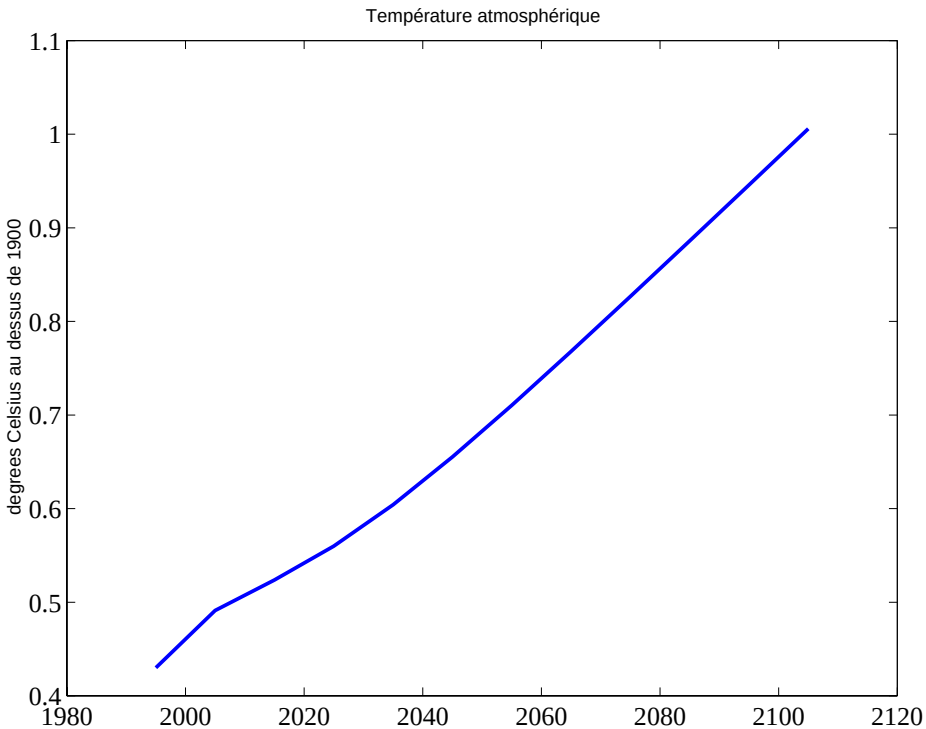




3. Some variations

Zero emission scenario

Figure 12: Temperature and losses



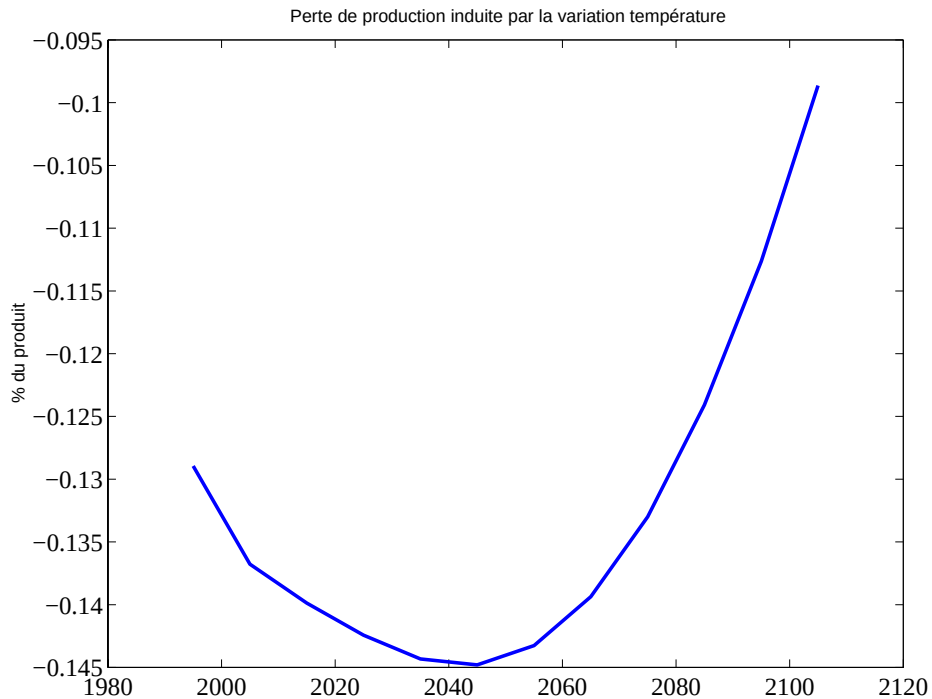


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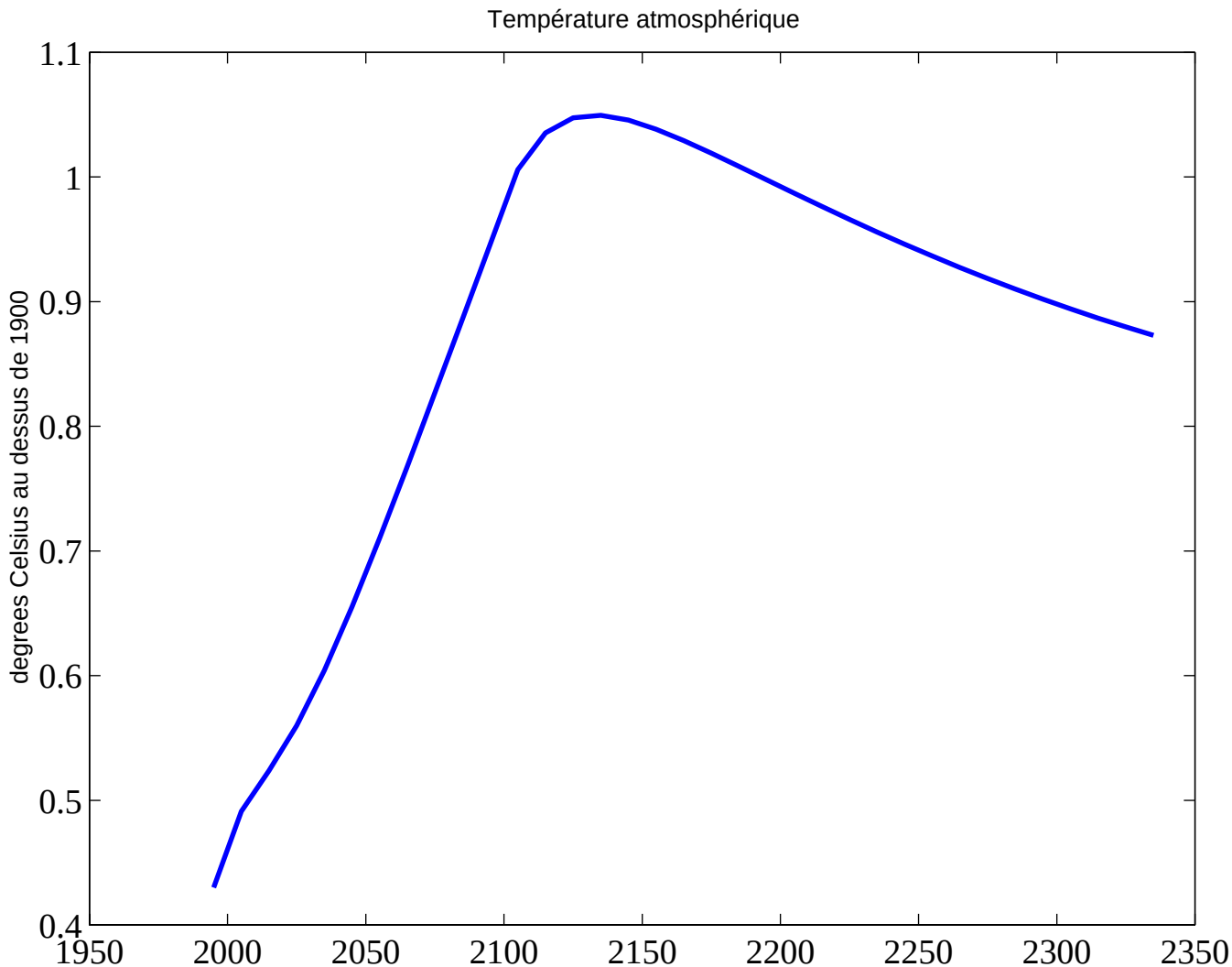
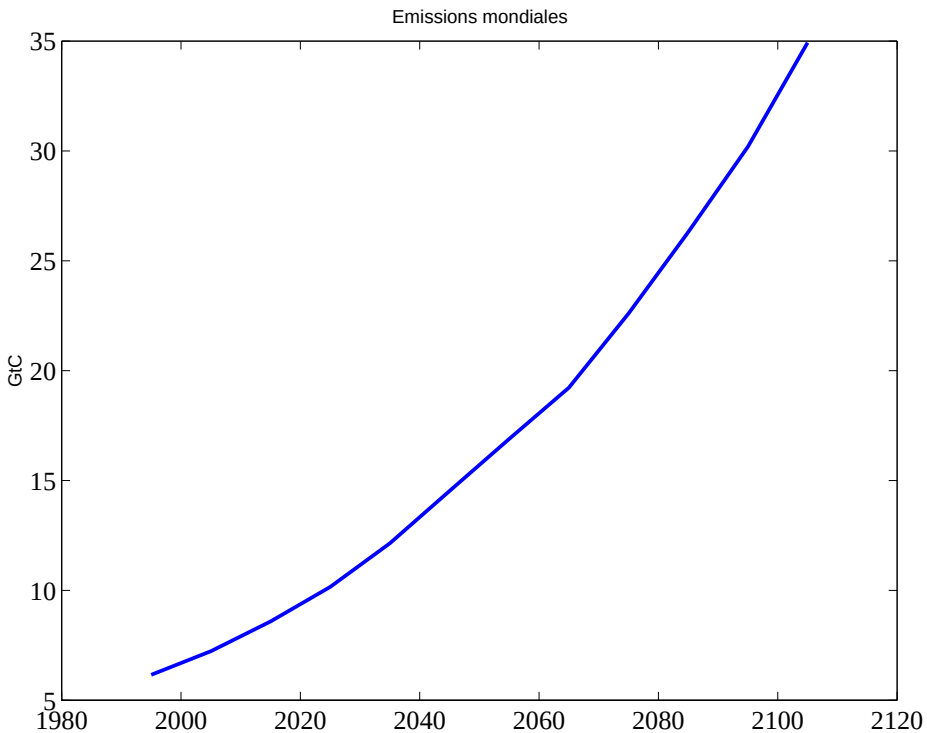
Figure 13: Temperature in the very long run



3. Some variations

CO_2/output ratio fixed at its 1995 level

Figure 14: Emissions and concentration



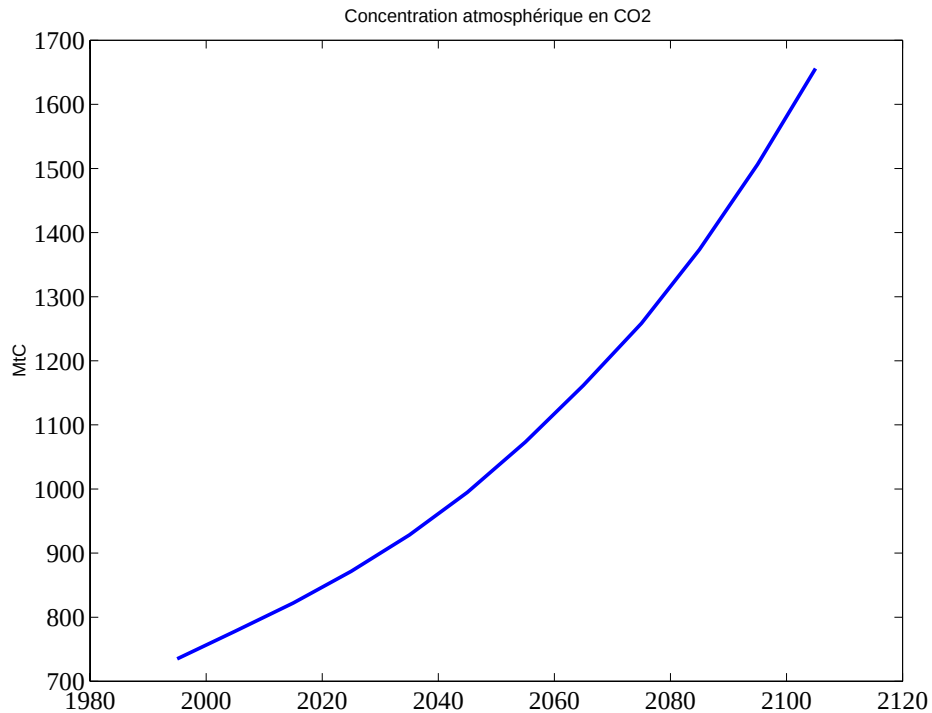


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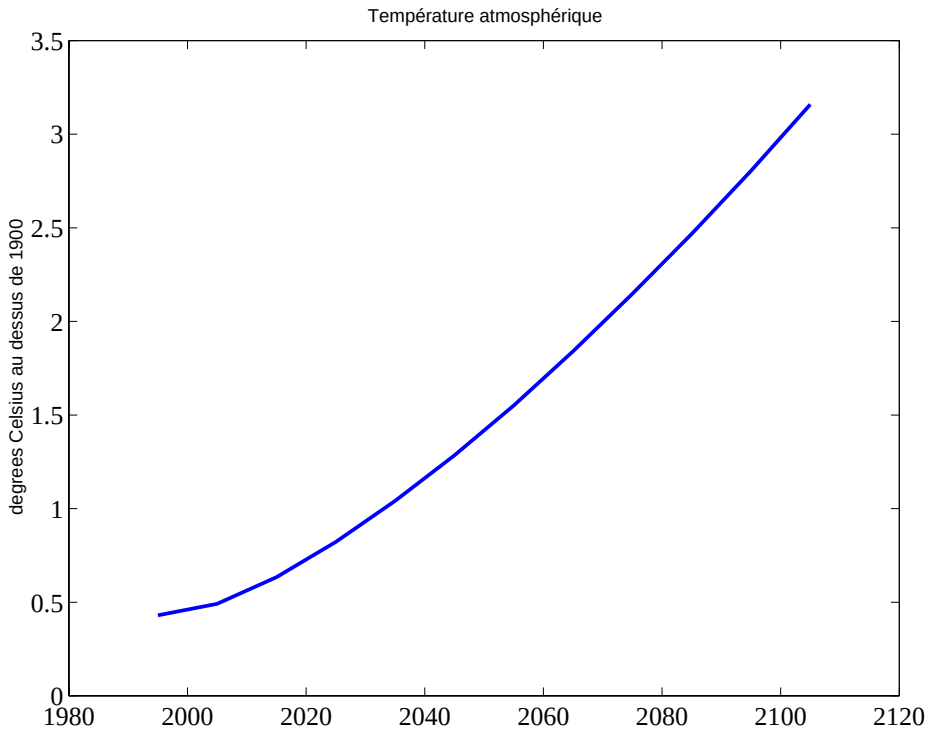
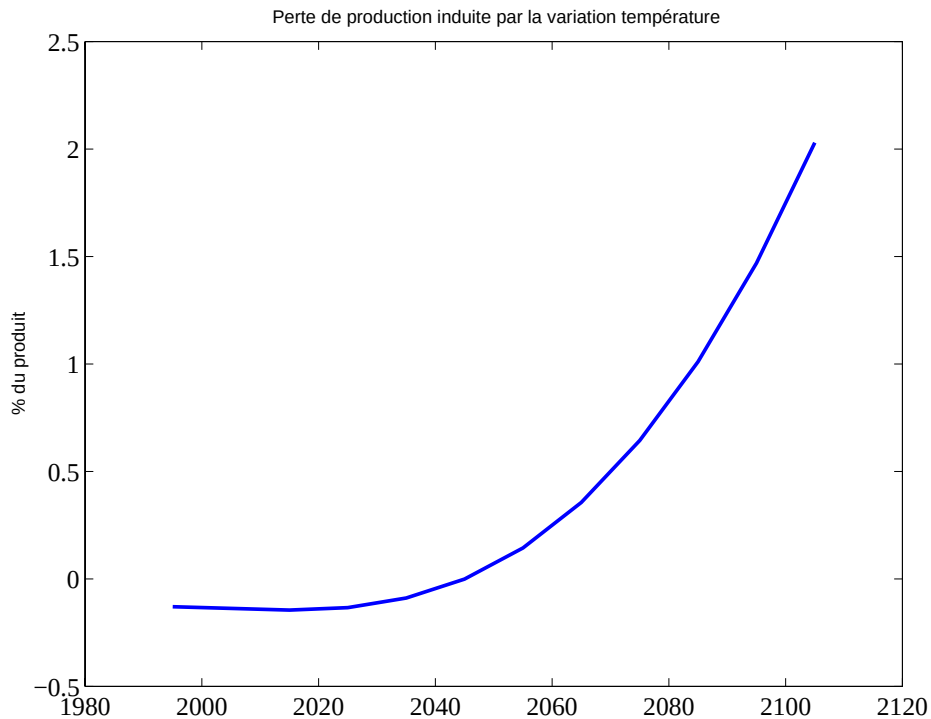
Figure 15: Temperature and losses





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Oecd emissions at their 1995 level

Figure 16: Emissions

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Figure 17: Emissions

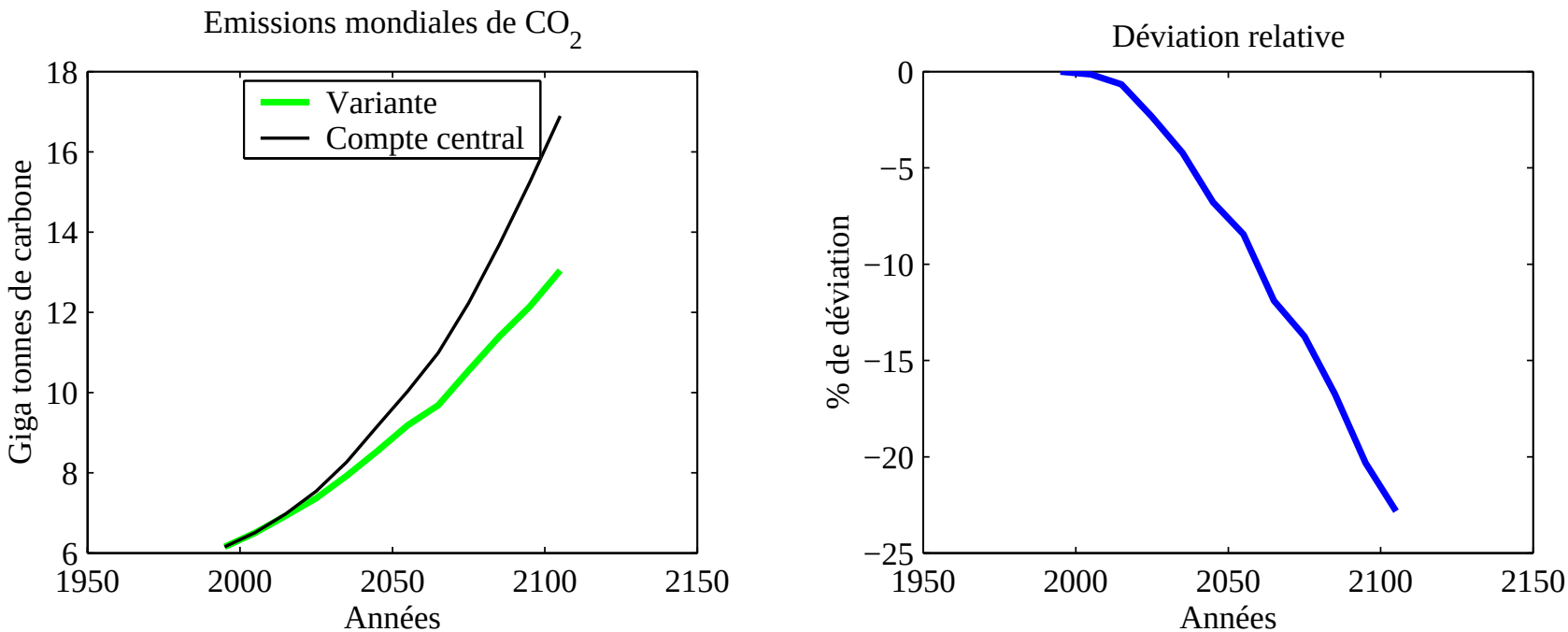

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Figure 18: Concentration

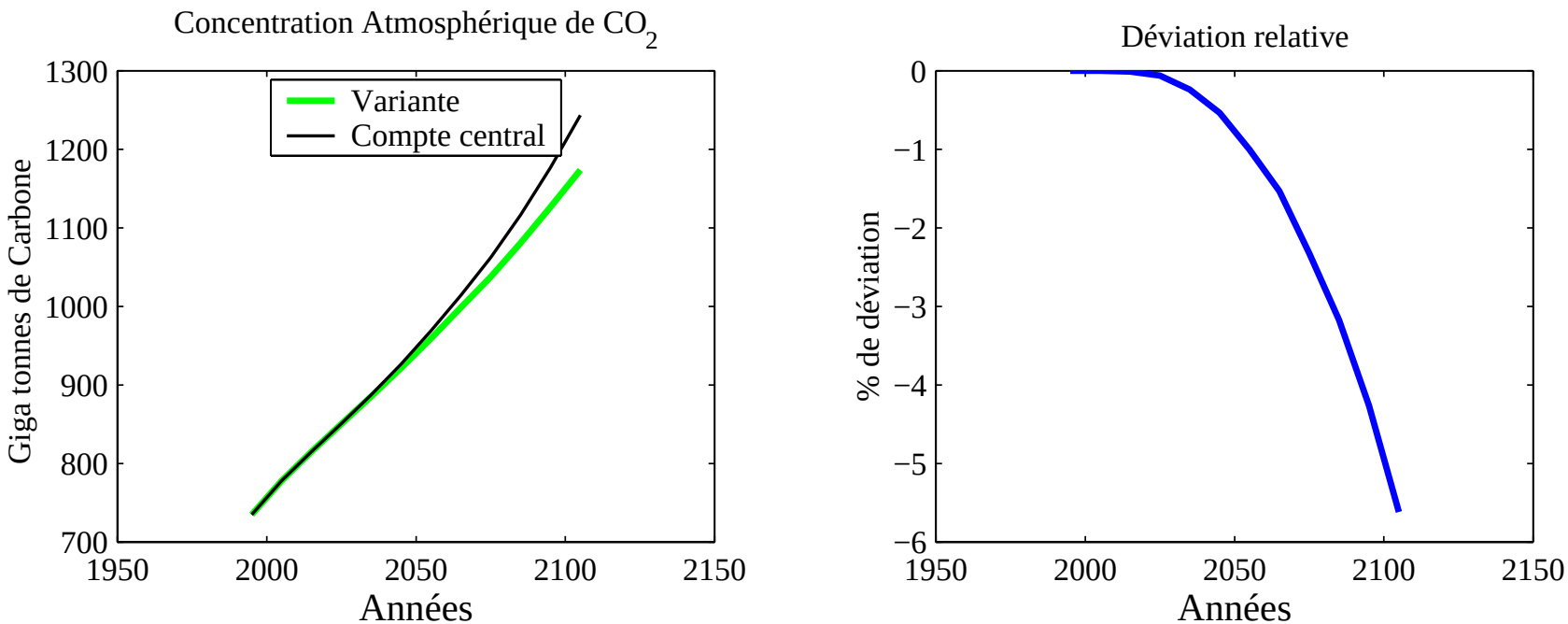

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Figure 19: Temperature

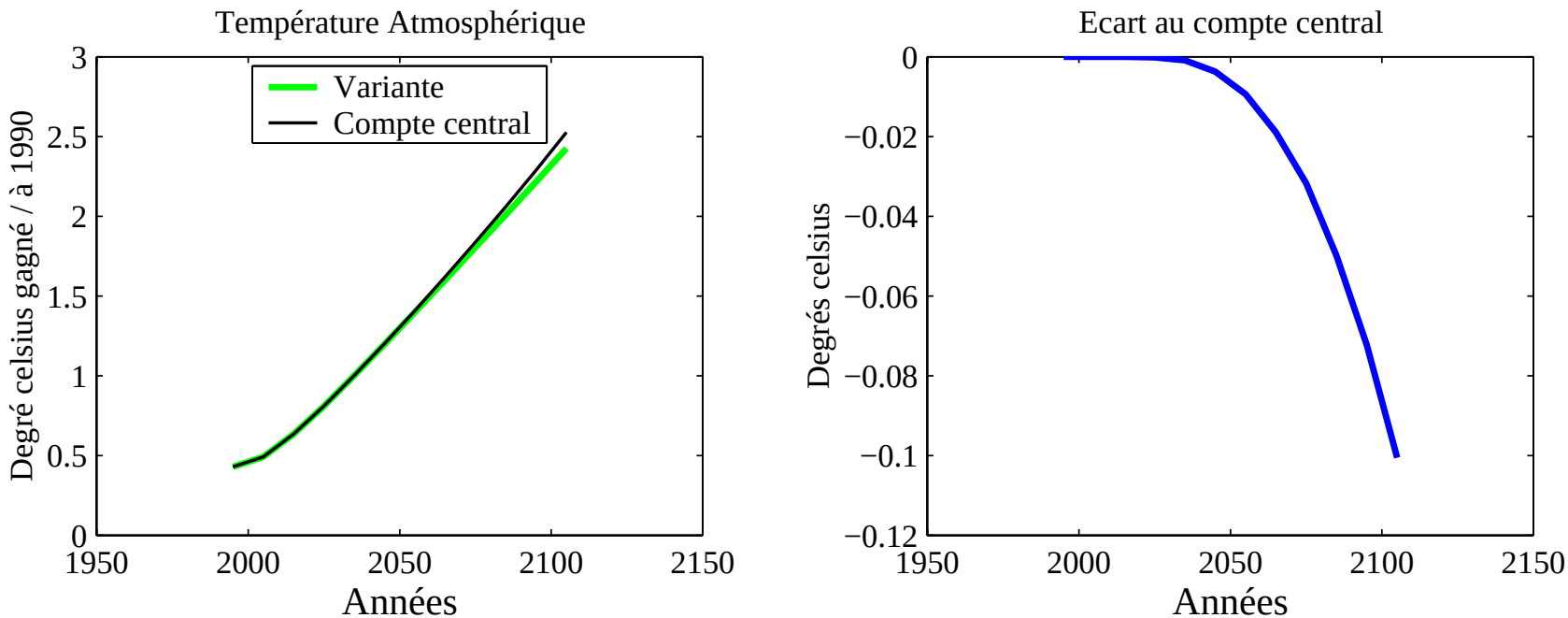

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Figure 20: Losses

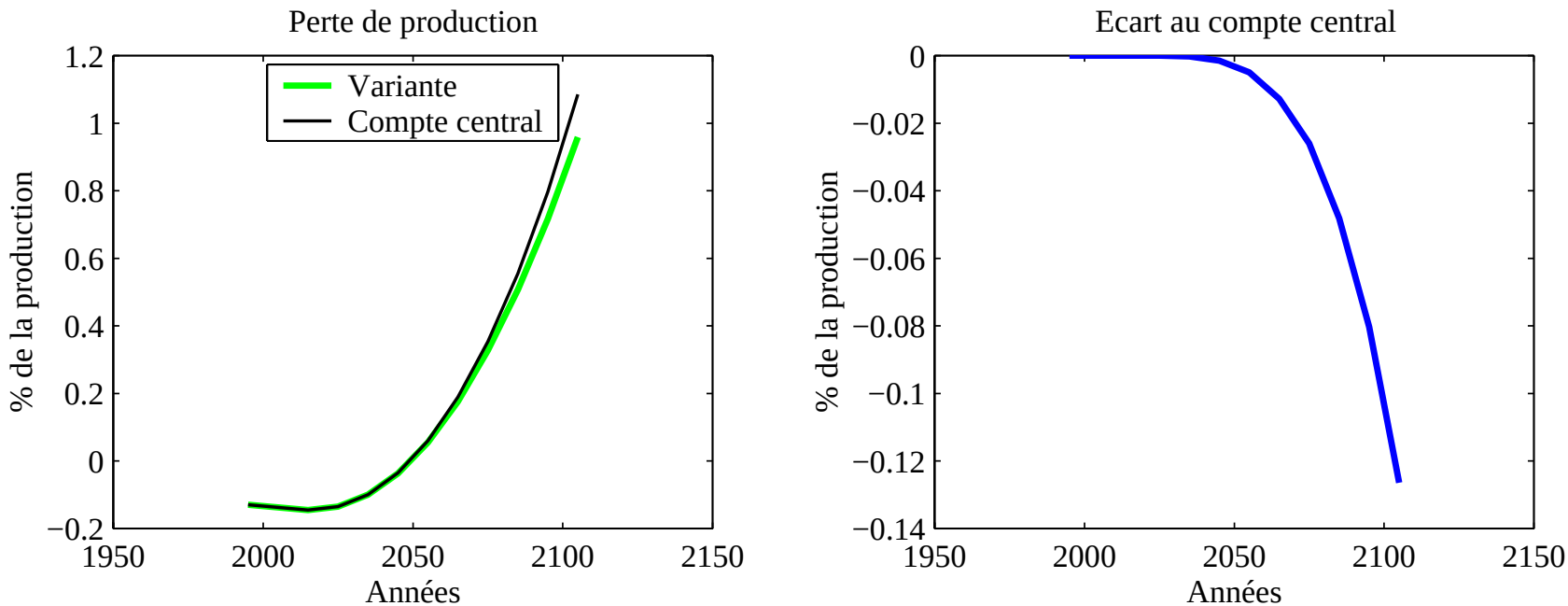

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Figure 21: Losers: Central Africa

Figure 22: Losers: Small islands

4. Krusell & Smith

Figure 23: Losers: Polar bears

Figure 24: Losers: Various places

4. Krusell & Smith

Figure 25: Losers: Coastal cities

4. Krusell & Smith

Figure 26: Winners: Siberia

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The Siberian Times

'I love Siberian women, they are incredible'
French actress Carole Bouquet, 2014

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Case study Opinion Profile

Norilsk breaks records for Arctic heat in a new sign of changing weather patterns

By The Siberian Times reporter
24 July 2013

Recent days have seen Siberia's nickel capital hotter than Nice and on a par with Naples.

Norilsk - above the Arctic Circle - is known as one of the world's coldest cites, and is built on permafrost. Sunbathing picture was taken around lake Baikal, The Siberian Times

Norilsk has hit 32C in recent days with some forecasts predicting a blistering 35C by the weekend as the Arctic competes with the Mediterranean. The tundra turned hot as the Kransnoyarsk region industrial city - where foreigners are restricted from visiting - smashed records for heat established in 1979.

News

State or emergency in Siberia's largest permafrost region - due to wildfires

People evacuated after thunderstorms-with-no-rain ignite foliage and forests.

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Dramatic floods hit Siberia with fears of worse to come

'Six die' as bridges swept away and 7,600 evacuated after heavy rains.

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State of emergency declared over wildfires in Irkutsk region

Hundreds - including dozens of children - evacuated safely as fires destroy and threaten homes.

Comments (0) | Add to My Stories

Booking.com

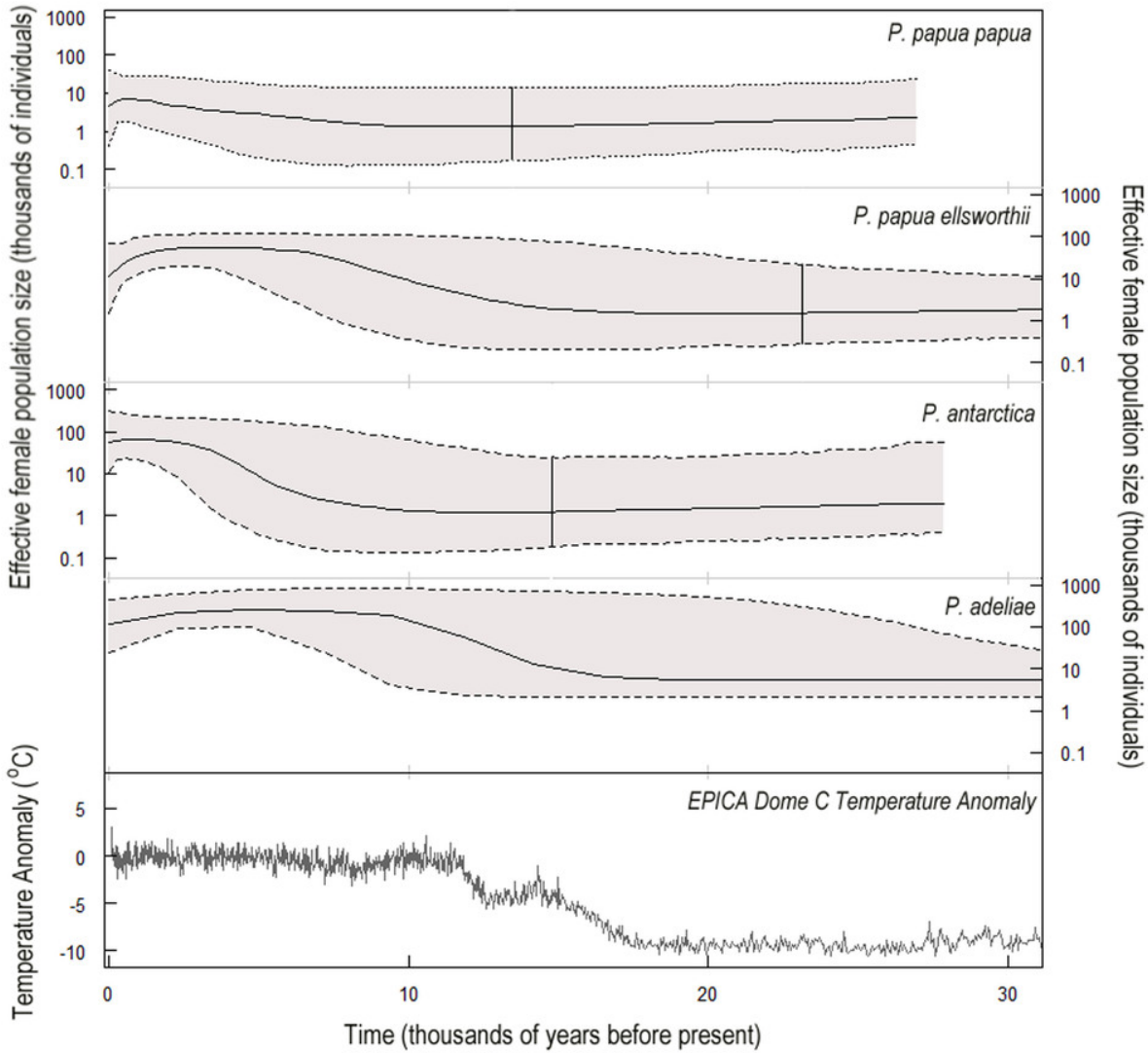
★★★★★ Budapest Hilton Budapest Hotel
★★★★★ Budapest Le Méridien Budapest
★★★★★ Budapest Hotel Central Basilica

4. Krusell & Smith

Figure 27: Winners: Some penguins (*Pygoscelis adeliae*)

4. Krusell & Smith

Figure 28: Bayesian skyline plots showing the change in effective female population size for each species and sub-species (*Nature (2014)*)



4. Krusell & Smith

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- Optimal policy (with a Social Welfare Function)
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