

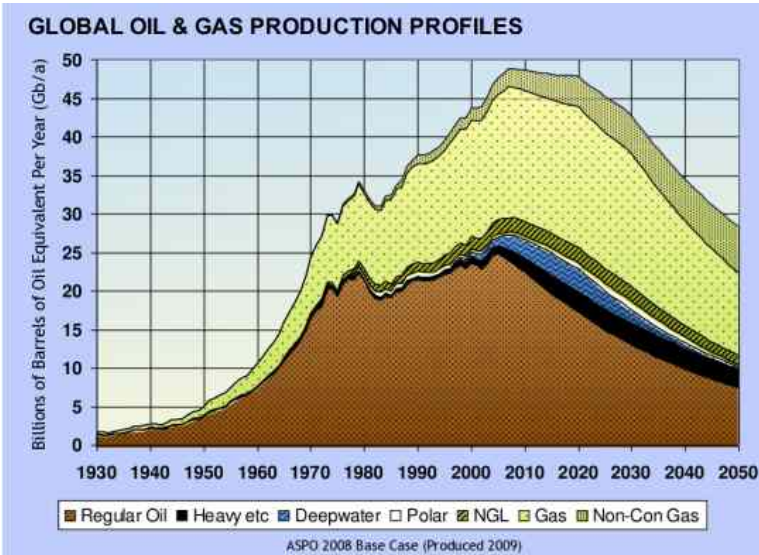
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## Abstract

A few papers have recently appeared dealing with the projections of future climate change, starting from emissions scenarios accounting for the ongoing exhaustion of fossil fuels. Here we show a new assessment of the future increase of the atmospheric CO<sub>2</sub> concentration, yielding a new estimate of the global temperature at the end of this century [1, 2]. The present projection is based on an evaluation of the possible future fossil energy availability and total energy production [3] and underpins the assumption that fossil fuels will be exploited at a rate controlled by economic and technological constraints only, even though limited by the geological availability.

## Methods

We developed an emissions scenario up to 2100 for the most important greenhouse gases (figure 1 and 2) and the SO<sub>2</sub> aerosols (figure 1) taking into account fossil fuels depletion. This scenario was used by the coupled gas-cycle/climate model MAGICC to draw a projection for the atmospheric CO<sub>2</sub> concentration and the related global temperature change of the 21st century.



## Results

Our results show that the CO<sub>2</sub> concentration will increase up to about 525 ppm by the end of the century (figure 3) and the temperature rise will be about 2.1 °C above the pre-industrial level (figure 4) [1, 2]. Both the temperature change and the CO<sub>2</sub> concentration will reach a peak after the date of 2100. The present result is in fair agreement with most of the previous forecasts based on fossil fuels depletion (figure 3 and 4) and shows lower projections values relative to the ones based on the IPCC SRES scenarios.

## Conclusions

However, we find that a level of dangerous anthropogenic interference with the climate system (CO<sub>2</sub> concentration of 450 ppm or, alternatively, +2 °C above the pre-industrial level) might be already experienced well before the end of the 21st century, despite the exhaustion of fossil fuels. Since any future improvement of fossil fuels recovery and new discoveries would lead to higher emissions, the present results should be considered as a lower bound to the projections of the future CO<sub>2</sub> concentration and the temperature change.

## References

- [1] Zecca A., Chiari L., Fossil-fuel constraints on global warming, *Energy Policy* **38**, 1-3 (2010).
- [2] Zecca A., Chiari L., Global warming projections under fossil fuels depletion, *under review*.
- [3] Nel W.P., Cooper C.J., Implications of fossil fuel constraints on economic growth and global warming, *Energy Policy* **37**, 166-180 (2009).

