Atmos. Chem. Phys. Discuss., 12, C3908–C3910, 2012
www.atmos-chem-phys-discuss.net/12/C3908/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of business-as-usual anthropogenic emissions on air quality" *by* A. Pozzer et al.

A. Pozzer et al.

apozzer@ictp.it

Received and published: 21 June 2012

We thank Dr. Cameron-Smith for the positive review. Here we reply to the recommendations/concerns raised in the review, while all the minor suggestions have been included in the manuscript.

- **I recommend that the name [PCMPI] be renamed 'population weighted multi-pollution index (PWMPI)'**.

  We agree with the referee that the name is not exactly representing what is calculated. Hence, as nicely suggested, we will change PCMPI (Per Capita Multi Pollutant Index) to PWMPI (Population Weighted Multi Pollutant Index).

- **I was surprised to see such a large discrepancy between the CO predicted by the model and the CO measured in urban areas. [...] What I would like to see in the paper is a brief comment about the implication for the validation of the other species, and whether this has any implication for the results and conclusions of the paper.**.

  We completely understand the referee's concern, as we were also surprised by the strong discrepancies, as all the previous model evaluations including CO showed a good agreement between model results and (background) observations.

  Regarding the discrepancy between the model results and observations in urban areas of other pollutants, we refer (cited also in the manuscript) to the nice work of Qian et al. (2010). Thanks to model results on different resolution, Qian et al. (2010) quantified the sub-grid variability (SGV) of trace gases and aerosols, showing that "Mostly inert and long-lived trace gases and aerosols, such as CO and BC, are more likely to have broad and skewed distributions (i.e. larger SGV) over polluted regions", while "secondary trace gases and aerosols, such as O_3, sulfate, ammonium, and nitrate, are more likely to have a relatively uniform probability distribution (i.e. smaller SGV)". This implies that O_x generally presents smaller SGV than CO, and that the comparison of model results with the observations is rather robust. In the case of PM2.5, this is a combination of bulk and secondary aerosol and hence it is difficult to estimate the real influence of SVG on the comparison.

  As consequence of SVG of different pollutants and the inability of the model to reproduce local sources (but rather an average over large areas), the MPI should be considered as a lower limit because a high SVG would imply higher local values of pollutants (and hence MPI).

- **Although the emission scenario assumes that there is no change in air pollution technology, the scenario does assume that energy efficiency in-**

creases [...].

The BaU scenario responds to a strongly increasing energy demand, with a strong increase in fuel consumption. The technologies of 2050 are assumed to be advanced systems of the technology present in the year 2005, that are more energy efficient than the current average.

- **There are some places in the manuscript where the words sound as if the predictions for the scenario are facts rather than model predictions.**

  We completely agree with the referee, and, as mentioned, this is done with the intention "to write a clear paper that is not burdened by repetitious caveats". We will modify the text to make it clearer that we refer to model simulations and not "reality".

References

Qian, Y., Gustafson Jr., W. I., and Fast, J. D.: An investigation of the sub-grid variability of trace gases and aerosols for global climate modeling, Atmos. Chem. Phys., 10, 6917–6946, doi:10.5194/acp-10-6917-2010, 2010.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 8617, 2012.