Atmos. Chem. Phys. Discuss., 7, S1771–S1773, 2007
www.atmos-chem-phys-discuss.net/7/S1771/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aircraft pollution: a futuristic view" *by* O. A. Søvde et al.

O. A. Søvde et al.

Received and published: 14 May 2007

Thank you very much for your helpful comments.

First of all, I must say - as I did in my author comment - that I'm very sorry for the mix-up of the figures. I somehow managed to get Figures 3 to 11 to become Figures 2 to 10, so that in the paper the Figures 10 and 11 are the same, and Figure 2 is missing.

1. The previous 2050 study was an unpublished calculation with the same boundary conditions as for the present study. It was used as initialization to reduce the required time to spin up the year 2050 atmosphere in the present study. The boundary conditions in both studies were based on [World Meteorological Organization(2003)], and methane and N2O were set to 2549ppbv and 372ppbv, respectively, at the surface. The emissions are described in the text, and the model was then run for 7 years, as spin-up. After this spin-up aircraft emissions were included and the model was run for another six years.

2. As meteorology we have chosen year 2000 to ensure stable steady-state results. We agree that it would be interesting to look at other years in order to assess the impact of meteorology on the results. For CPU time limitations we did not include this in the present paper, but this will certainly be subject for future studies. The presented analysis is based on the last year of simulations. After six years of simulations, the perturbations were in steady state, as can be seen on the figures presenting the last two years of dobson units.

3. 1 x 1 resolution means 1x1 degrees horizontal resolution. The vertical model resolution in the UTLS is between 0.8 and 1.2km, depending on latitude and season. At altitudes above 100hPa the vertical spacing is 20hPa, corresponding to $\sim$2km at 18km altitude.

4. Thanks for this comment, it is clear that the feedback from CO2 cannot be calculated with a CTM. This will affect the calculation of production and loss for both background O3 and the impact of aircraft emissions. A colder stratosphere may enhance heterogeneous chemistry, both increasing the NOx conversion to HNO3 (reducing ozone loss due to NOx) and increasing the ozone loss due to halogens.

As stated by referee #2, there was a cold bias in the tropopause region for the year 2000. In that respect the UTLS could be more similar to year 2050 conditions. However, it must be said that the climate of the year 2050 is very uncertain and we therefore chose to keep this a pure CTM study to focus only on the chemical issues.

5. Please see the note at the top of this letter about the figures.

6. Please see the note at the top of this letter about the figures.

7. The percentage values are the span in variation in the change of O3 due to aircraft emissions (I have given the values in ppbv and percent).

8. Please see the note at the top of this letter about the figures.

9. The change in the column is less than 1%, but must seen in context with the vertical

ACPD

7, S1771–S1773, 2007

distribution of the change. Although the change in the column is not very large, there are large changes in the vertical distribution. Ozone is reduced at high altitudes, and produced at lower altitudes.

10. Please see the note at the top of this letter about the figures.

11. Please see the note at the top of this letter about the figures.

12. Please see the note at the top of this letter about the figures.

13. Please see the note at the top of this letter about the figures. Shows the effect in ppbv.

14. Figure 13 shows the effect of aerosols on O3 given in ppbv.

15. Figure 11 and 12 are for the two last years. See answer to question 13 for figure 10.

References

[World Meteorological Organization(2003)] World Meteorological Organization: Scientific assessment of ozone depletion: 2002., World Meteorological Organization: Global ozone research and monitoring project – Report 47, 498pp, Geneva, Switzerland, 2003.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 2531, 2007.