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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global contrail radiative forcing and the impact of diurnal variations of air traffic" *by* N. Stuber and P. Forster

N. Stuber and P. Forster

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We thank reviewer #1 for comments and suggestions which helped to clarify the text, and would like to make the following replies (numbering as in the original review):

1. We have changed the wording to clarify this point.

2. We have included references for our choice of contrail width and lifetime. Both contrail width and contrail lifetime affect the contrail cover. However, as we later scale our contrail cover to match mean contrail coverages obtained from satellite data, these choices are not critical for our results. Text has been added to explain this.

3. Thank you. We have corrected this typo.

4. Yes, we mean that while the column total of flights changes during the course of the year, the percentage distribution into individual layers/heights stays the same

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throughout the year. We have changed the wording to clarify this point. Ideally we would have liked to scale with the monthly air traffic at specific heights, rather than the total column amount. Unfortunately this was not possible: in a couple of layers which do have air traffic in, say, July, there is no air traffic in June. We have included a respective remark in the paper.

5. Yes, we scaled the data to match the observed value of annual mean, area-mean contrail cover in the Bakan area. This is quite a common procedure and generally referred to as a "calibration" (e.g., Ponater et al., 2002; Marquart et al., 2003). However, we have adopted the reviewer's language and have reworded the text accordingly.

6. We do not interpolate individual contrails, but rather a contrail cover, i.e., the percentage of the gridboxes that is covered with contrails. Maybe more precisely, we collect contrail cover (i.e., flights) from the high resolution, small gridboxes grid into the lower resolution, larger gridboxes grid. We have reworded the text for clarity.

7. We checked the text for clarity and think it is clear.

8. Thank you. We have corrected the text.

9. Thank you. We have corrected this typo.

10. Marquart (2003) gives mean contrail optical depths for different areas. From their Table 3.3 a global mean contrail optical depth of 0.1 can be inferred. Ponater et al. (2002) state that "On the global scale, mean contrail optical depth fluctuates around a value of 0.15 ..." This remark is actually only valid for the 250hPa level, as it is based on their Figure 6, which shows contrail optical depth for this height. Michael Ponater confirmed that the above statement is misleading, and that the mean contrail optical depth is closer to 0.1. We have included respective remarks in the paper.

11. We have changed the text.

12. see 10.

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13. For reasons of economy we did not increase the horizontal resolution. However, as the contrail coverage fractions are small, overlap is not a significant issue.

Marquart, 2003: Climate impact of contrails: Investigations by means of an atmospheric general circulation model. DLR Forschungsbericht 2003-16 (published in German), Cologne, Germany, 161pp.

Marquart, S., M. Ponater, F. Mager, and R. Sausen, 2003: Future development of contrail cover, optical depth, and radiative forcing: Impacts of increasing air traffic and climate change. J. Climate, 16, 2890-2904.

Ponater, M., S. Marquart, and R. Sausen, 2002: Contrails in a comprehensive climate model: Parameterization and radiative forcing results. J. Geophys. Res., 107, doi 10.1029/2001JD000429.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 9123, 2006.