Atmos. Chem. Phys. Discuss., 7, S8259–S8262, 2008
www.atmos-chem-phys-discuss.net/7/S8259/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Do supersonic aircraft avoid contrails?" *by* A. Stenke et al.

A. Stenke et al.

Received and published: 9 January 2008

We thank reviewer 1 for the comments on the manuscript which helped us to improve our paper.

In her/his general comment the reviewer mentioned that it is uncertain whether a supersonic fleet will be developed at all. Current market forecasts see a 60% chance of any launch of a supersonic business jet program in the next 8 years, and an 85% chance by 2020. Since this topic might be of general interest, we added a short paragraph on this issue in the introduction. Further changes in our manuscript are listed below:

- 1, 3, 22, 26: We asked some native speakers at our institute and they told us that the plural of aircraft is "aircraft" and not "aircrafts". Maybe there is a differ-

ence between American and British English, but we decided to keep the current spelling.

- 2: We added a short discussion on the cirrus contrails in the introduction and included the given reference.
- 4, 5, 6, 7: We corrected the text according to the recommendations of the reviewer.
- 8: We calculated the change in fuel consumption between S4 and S5 for the tropics, the North Atlantic and the North Pacific, and included the numbers in the text, both in Tg/yr and %.
- 9: Text corrected.
- 10: We agree with the reviewer that the sentence is misleading. At supersonic cruise levels, i.e. about 70 hPa, the northern extratropics are only in winter cold enough for the formation of contrails. At lower levels, i.e. around the tropopause, contrails can also form in summer. We revised our text in order to clarify this point, also in the abstract.
- 11, 12: We corrected the text according to the recommendations of the reviewer.
- 13: In this case “overall” means the sum of subvisible and visible contrails, “total” means vertical summation. We revised our text in order to clarify this point.
- 14: Text corrected.
- 15: We agree that the differences between S4 and S5 are very small for certain regions. However, the analysis of the change in contrail cover for the northern extratropics (polwards of 30°N) shows a decrease in visible contrails and a nearly constant amount of subvisible contrails between S4 and S5. In Table 2 we listed only a subset of regions. We revised our text to clarify this point.

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- 16: In our model simulations we considered the increase in atmospheric greenhouse gas concentrations according to the SRES scenario A2p and the change in sea-surface temperatures. This is described in Sect. 2.1. We also added a short comment on page 12939.
- 17: Text corrected.
- 18: We added a short comment on the assumptions made in IPCC (1999) concerning the contrail RF of supersonic aircraft in the conclusions.
- 19-23: We corrected the text according to the recommendations of the reviewer.
- 24: Now we comment on the regional differences listed in Table 2 also in the text.
- 25: Text corrected.
- 27: We included the values for the USA in Table 2 and discussed them in the text. We did not include the regional values from IPCC (based on Gierens et al., 1999), since they used different regions. Therefore, the values are not directly comparable.
- 28: We provided the results of Marquart et al. (2003) in Table 3 since both studies rely on the same model and contrail parameterization, i.e. they are more or less directly comparable. Therefore we did not include the IPCC values in Table 3. In the text we now concentrate on discussing the IPCC (1999) estimates for a combined fleet.
- 29: Thanks for the hint concerning the wrong tropopause in Fig. 4. We corrected this figure. In the lower panel of Fig. 4 only the statistically significant (99%) changes have been displayed. In this case the contrails in northern extratropics at supersonic cruise levels vanish. This may be confusing, since the upper panel of Fig. 4 shows small contrail formation in this region for the S5 scenario. In the

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current version we show differences that are significant at the 95% level. Since Fig. 4 is very small in the current format, we put the lower panel of Fig. 4 in a separate figure.

- 30: Supersonic aircraft might be a mitigation option to reduce contrail formation and RF, if supersonic routes would be restricted to mid-latitudes. In the SCENIC database a significant part of supersonic routes is located in tropical regions, and therefore the global mean contrail cover is not affected by the replacement of subsonics with supersonics. But contrails are only one aspect in terms of aviation-induced climate impact. We think it is important to consider all aspects of supersonic air traffic which is done in a companion paper by Grewe et al. (2007). We extended this discussion in the conclusions a little further.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 12927, 2007.