

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

**A. Stenke et al.**

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First of all we thank the reviewer for all comments which helped us to improve our manuscript. The reviewer raised some minor comments which we addressed as follows:

- *Systematic uncertainties in LW forcing:* As mentioned in our manuscript Marquart and Mayer (2002) compared the ECHAM4 radiation scheme with a sophisticated radiative transfer model with respect to the RF of contrails. Their analysis considered subsonic air traffic, but it included more than 4000 individual data points comprising a high variability of atmospheric conditions, contrail frequency and radiative forcing. Interestingly, the deviation in the LW forcing between both radiation schemes shows a linear behaviour, at least for typical tropospheric and also stratospheric conditions (their Fig. 2c). This indicates that the 25% correction to the LW forcing also holds for supersonic contrails. A detailed quantification

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- of this effect based on the results of Marquart and Mayer (2002) is not possible, but would require a further comparison of the ECHAM radiation scheme with a sophisticated radiation transfer model which is very time consuming.
- *Results of E39/ATTILA:* We added the numbers for the global mean contrail cover in the text. Further results from E39/ATTILA will be published in a separate paper.
  - *Numerical precision:* All our displayed changes in contrail coverage are statistically significant at the 95% level (we now mention this explicitly in the figure caption). The differences in the global mean radiative forcing values are statistically significant at least at the 90% level. As only 4% of the subsonic fleet are replaced by supersonics the differences between both scenarios are quite small. Unfortunately, a perturbation scenario with a substantially larger supersonic part was not considered within the SCENIC project. Rädcl and Shine (2007, submitted to JGR) recently analysed how the contrail RF depends on flight altitude. For this propose they increased the air traffic in several atmospheric layers individually and calculated the impact on the global RF. They found that the relation of flown kilometers to contrail cover and RF is linear up to a 200% increase, even for layers with high air traffic. Since the assumed air traffic density is still low at supersonic flight levels, we also guess that the contrail RF from supersonics should increase linearly with the number of supersonic aircraft, even up to a factor of 10.
  - *Results of IPCC 2007:* According to our knowledge the IPCC report 2007 provides contrail RF estimates for the years 2000 and 2005 which are mainly based on the work of Sausen et al. (2005), but not for the 2050 time slice or a supersonic (mixed) fleet. We added the estimates from the recent IPCC report into the introduction. Furthermore, on page 12941 we do not mention the contrail RF values for a subsonic fleet from IPCC (1999) anymore, but concentrate on the discussion of the RF estimates for a combined fleet.

Finally, we considered all technical comments of the reviewer. One of the papers listed

as a footnote (Stenke et al.) has been published in the meantime and we put the citation into the reference list. The second paper (Marizy et al., now cited as Rogers et al.) will hopefully be submitted to ACPD within a short time. Concerning the size of our figures we put the lower panel of Fig. 4 in a separate figure and we will take care that the figures are large enough in the final print version.

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

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