

Interactive comment on “Factors controlling contrail cirrus optical depth” by B. Kärcher et al.

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Kärcher et al. (ACPD 9, 11,589–11,658, 2009) evaluated contrail cirrus probability distribution functions (PDFs) via homogeneous sampling across the contrail area, probing contrails filling a small volume as often as large contrails, therefore giving each contrail the same weight irrespective of its dimension (page 11,611, lines 23–28). This type of sampling was performed when analyzing the model results in Section 3 and making overall comparisons to available measurements (mostly averaged or mean values without information on representativity) in Section 4.

In Section 5 we offer a much more detailed comparison to one year of satellite observations. In these observations, the PDF of optical depth was obtained by sampling many contrails approximately weighted by their actual coverage, i.e., wider contrails are more
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frequently sampled than narrower ones. Therefore, the author team decided to repeat the model analysis in Section 5 and sample contrail cirrus in the CCSIM according to coverage, providing a more realistic comparison to the satellite data.

Sampling according to coverage is equivalent to sampling according to the width b in the model. This means that we now weigh the probabilities in the contrail cirrus PDFs at each sampling time t with the actual $b(t)$ instead of using a constant weight. The width statistic PDF(b) remains unchanged. A preliminary analysis of the new results shows that sampling in this way enhances the occurrence of contrail cirrus with small optical depths, roughly halving the mean optical depth and leading to correspondingly lower detection efficiencies. This supports our conjecture that “long-lived contrail cirrus may be optically thin due to high wind shear . . .” (page 11,629, lines 5–7).

The new results will be included in the final revised version of the manuscript to be submitted to ACP. We will include a brief description of sampling according to coverage in a new Section 2.2.3. In Section 5 we will update Figures 9 and 10 and the associated numerical values for detection efficiencies, and mean/median PDF values. Corresponding adjustments will be made in the abstract, main text, and conclusions.

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