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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "The impact of cirrus clouds on tropical troposphere-to-stratosphere transport" *by* T. Corti et al.

**Anonymous Referee #1**

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The manuscript presents interesting new findings and gives a plausible explanation of troposphere-stratosphere exchange. As the authors conclude, more research needs to be done to corroborate the findings - nevertheless, the manuscript should basically be published as it is as it presents an interesting idea supported by quantitative calculations. I therefore suggest to publish the paper after consideration of the minor comments below.

Page 1733, line 10: I find it a bit surprising that ISCCP and LITE both provide the same fraction of cirrus with an optical depth below 1.27. ISCCP probably has a detection limit of 0.1 or higher optical thickness (typical for passive remote sensing) while LITE detects clouds with nearly two orders of magnitide less optical thickness. Therefore I

would expect a much larger fraction of thin clouds in the LITE data compared to the ISCCP data. Could the authors elaborate on that?

Page 1733, line 24: An effective diameter of 13 micron for ice particles appears to be very small - I would expect much larger particles. Could the authors elaborate on the sensitivity of their analysis to that assumption? I guess the thermal heating rate should depend strongly on the assumed particle size. The visible optical thickness (determined by LITE) is proportional to the particle area (second power of the size) while the IR absorption/emission depends on the volume (third power of the size). For a given visible optical thickness one might therefore get different infrared properties, depending on the size.

Page 1734, line 23: I don't understand the comment on gridding. For radiative transfer, the relevant coordinate is optical thickness, not geometrical altitude or potential temperature. If the regridding is done carefully, the difference should be zero. Or do I misunderstand something?

Page 1739, line 10: Replace "T. Cortiis" by "T. Corti is"

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1725, 2006.