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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aircraft measurements of microphysical properties of subvisible cirrus in the tropical tropopause layer" *by* R. P. Lawson et al.

Anonymous Referee #1

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This paper describes observations of subvisible cirrus (SVC) clouds with the NASA WB-57F aircraft during the Costa Rica Aura Validation Experiment (CR-AVE) in 2006. SVC clouds were encountered and characterised with state-of-the-art optical array imageing probes in extended areas of the tropical tropopause layer with temperatures as low as $-90°$C. Nearly spherical crystal shapes were measured for ice crystals smaller than about 65 μm and a minor fraction of surprisingly large ice crystals was detected with a maximum dimension of up to 160 μm. The new findings were compared to ice crystal images collected in 1973 with the same aircraft flying in the tropical tropopause region.

It can be questioned whether both the older and newer measurements are representative of SVC cloud characteristics in the tropical tropopause layer and whether conclusions can be drawn from obvious differences between both data sets. On the other hand, together with the companion paper by Jensen et al., this work not only provides new insights into the climatically relevant characteristics of SVC clouds (ice particle number, size, and shape), but also adds new and interesting aspects to the ongoing discussion about the observation of high supersaturations in cirrus clouds and their possible explanation. The paper is well in the focus of the ACP journal and I recommend its publication after some minor points specified below have been considered and answered by the authors.

Specific comments:

p.6259, l.10-12: I do not understand why and how a smaller sample volume of the CPI should affect the representation of size distributions. The authors should be more specific here. For example, the measured size distribution may be affected by the limited size range of detected particles, out-of-focus images, a poorly defined size of the detection volume and other artefacts that influence the accuracy of CPI measurements.

p.6261, l.12: '. . . for 5-km or greater . . . ': I guess you mean '. . . for a flight path longer than 5 km . . . '. As I understand this is how the authors define the presence of SVCs, based on the ice particle concentration measured with the 2D-S. On the other hand, on page 6260, line 24, it is stated the the CPI data was used to identify SVC regions. This needs to be explained and corrected.

p.6263, l.17-20: The statement that different environmental conditions like moisture or chemistry can possibly explain the difference between the present and the 1973 observations is rather speculative in my view. Of course this can still be true but I think that instrumental artefacts can not be completely ruled out here. Furthermore it is not clear that both sets of data are representative for the characteristics of SVC at the tropical tropopause in 1973 and 2006.

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I agree to the other referees that the lower panel of Fig. 1 and Fig. 2 can be removed. The text body contains only a short reference to both figures and no further discussion of what is shown on the fotografs.

Minor comments and typos:

p.6257, l.8: It is sufficient to state '. . . with base above 15 km . . . '.

p.6258, l.4: Missing dot behind '(FSSP)'.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6255, 2007.