

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

### **Anonymous Referee #2**

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This paper describes images of ice particle shapes and sizes measured during the CR-AVE experiment sampling subvisible cirrus clouds near San Jose, Costa Rica during Jan-Feb. 2006. Comparisons are made with ice particle replicator images collected in the tropical tropopause layer in 1973.

Perhaps the most significant of their findings is that the large crystals imply large supersaturations in those clouds—i. e., that the large supersaturations that have been inferred from other measurements are supported by the microphysical evidence.

Additional concerns and comments aside from those of reviewer #3:

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- 1) How is SVC defined here? The definition is confusing since in one place the authors say that CPI data were used to identify SVC but later they say 2D-S particle concentrations  $> 5 \text{ L}^{-1}$  defines SVC. What criterion was used here to define SVC?
- 2) Sample CPI images are shown in Fig. 6 but how were these chosen - sequentially on one flight leg or at random or ?
- 3) The authors report that the crystal habits appear different from those seen on the 1973 flights and muse that the differences might be due to differences in atmospheric moisture and chemistry that may have changed over the past 30 years. This reviewer suggests that natural variability in crystal shape has not been ruled out. Perhaps the larger crystal images could be grouped into sets of sequential images to estimate the size variability. Also perhaps the point is not that the cloud changed since 1973, but simply that the earlier instrumentation missed these particles.
- 4) Comparison with the Heymsfield (1986) images may be questionable - were the published crystal images typical of the region? Often what ends up in print is an image of the unusual or symmetric crystal rather than the typical crystal due to human bias for symmetric and “interesting” crystal shapes.
- 5) The images of spherical glass beads in Fig. 7 do not appear spherical but are instead about 20% prolate. Does this bias the crystal habit comparison shown in Fig. 8 and the aspect-ratios reported here?
- 6) The authors compare CR-AVE and RICO images of spherical particles but the fact the size spectrum is similar seems irrelevant since they formed under different conditions. Why is this match a good test of their Korolev algorithm?
- 7) Only 35 particles greater than 100  $\mu\text{m}$  were observed but did others shatter on the probe inlet? The authors state that the fact that the observed particles were less than 165  $\mu\text{m}$  demonstrates that particle shattering on the probe inlet was not a problem. But previous researchers have found that at these aircraft speeds the breakup of 100+  $\mu\text{m}$

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particles cannot be ruled out (e.g. see Hallett (1976) and Field (2003)).

8) Perhaps with 8000+ total images the authors could look for clustering of larger particles due to short regions of high-RH.

9) Figure 1 (bottom) and figure 2 seem to be irrelevant to the discussion here. Figure A1 could be labeled “Magnified view” rather than “Exploded view”.

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

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