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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Composition of cirrus-forming aerosols at the tropical tropopause" *by* K. D. Froyd et al.

Anonymous Referee #1

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Froyd et al. present chemical composition measurements of ice residual particles from subvisible cirrus in the tropical tropopause region. Furthermore, the composition of interstitial aerosol particles in the same clouds and from ambient aerosol particles measured near the clouds is studied. Interestingly, the composition of the residuals is indistinguishable from the composition of the ambient and interstitial aerosol, strongly dominated by internal mixtures of sulfates and organics, and also not distinguishable by the size distribution of the activated nuclei. Hardly any ice residual composition data from the tropical tropopause region is currently available and therefore the data is quite valuable. The findings presented here are clearly limited as the data mainly stems from a single case study (2 Feb 2006) and altogether only 126 ice residuals were analysed in total of which 120 were classified as sulphate-organic. Nevertheless, this is an important first snap shot and the results are rather surprising as no signifi-

cant difference is found between the typical composition of the unfrozen and the frozen aerosol particles. The authors also do a good job in discussing the issues of potential inlet contamination that have hampered similar measurements in the past. By plating the CVI inlet surfaces with gold a clever solution has been found.

The paper is concise and well-written, the length is appropriate. The paper is recommended for publication in ACP after consideration of the following major point and a few minor comments:

Major point:

Have sufficient in-flight tests been conducted to confirm that the CVI strictly suppresses ambient and interstitial aerosol from entering the sampling line? With the much higher abundance of ambient aerosol particles (200-500 times higher abundance is stated p. 20356, l. 19) even a small fraction of $\sim$0.1% of these particles entering the CVI inadvertently would influence the cirrus residue measurements significantly. Because the composition differences between the unfrozen aerosol and the ice residual particles are small, it is even more difficult to exclude this possibility. Interpretation of the data and the hypothesis of a "non-conventional" freezing mechanism (p. 20358, l. 5) hinges on the highly reliable performance and perfect selectivity of the CVI.

Minor points:

1) how did the authors conclude that the SVC clouds were not associated with recent convective systems and that they can be assumed to have formed in situ (e.g., p. 20353, l. 13)? Was this only based on the observed crystal sizes or has an analysis similar to Froyd et al., 2009, been performed?

2) p. 20350, l. 13-22: how did the authors realize the switching between the measurements with and without a CVI counter flow? Was the start of the CVI counter flow triggered by other measurements (e.g. the 2-DS signal) indicating the presence of the SVC or did you just switch automatically between the two measurement modes? How

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frequently did you switch and how long did you wait after switching to be sure that all particles from the previous mode have been cleared from the sampling line?

3) Fig. 3: Can you give errors for the CAPS and CPI IWC measurements. Do CAPS and CPI agree with each other within the error bars?

4) Figure 5 is very small.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20347, 2009.