Interactive comment on “Cloud chamber experiments on the origin of ice crystal complexity in cirrus clouds” by M. Schnaiter et al.

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Dear Authors,

Thank you very much for citing our papers in your work. That was indeed a very nice surprise because our works are usually being ignored by atmospheric scientists dealing with the formation and modeling of cirrus and PSCs. A reason for this could be that they are not able to comprehend a well-known-for-decades fact that ice is highly intolerant to impurities and, consequently, during ice nucleation and subsequent freezing of aqueous solutions a phase separation occurs into pure ice and a freeze-concentrated solution (FCS).

Below I give you a short list of our papers in which you will find pictures and videos
(3, 5-7 in a list below) which demonstrate the freezing process in situ and show that indeed there is a freeze-induced phase separation (FIPS) into pure ice and FCS both in aqueous bulk solutions/formulations relevant for biotechnology and small aqueous drops of size and composition relevant for UT and polar stratosphere. After you have read our papers, I hope you will rewrite these sentences of yours and also add a couple of sentences into introduction about the FIPS in the atmosphere.

These are your sentences: “A possible explanation for this observation could be the formation of concentrated H2SO4/H2O residuals on the ice crystal surface, which affects the regular crystal growth. Such a separation into solid ice and unfrozen residual solution was observed by calorimetric measurements on aqueous H2SO4 droplets in the cirrus temperature range 190K < T < 230K (Bogdan et al., 2006; Bogdan, 2006). Although emphasized by the authors, the formation of a complete H2SO4/H2O coating of the crystal surface was not unambiguously proven by these studies. Further studies with homogeneously nucleated ice particles are necessary to investigate the impact of unfrozen H2SO4/H2O residuals on the ice crystal complexity.”

Note, that freezing aqueous drops do produce spherical ice particles. This is easily observed in situ during freezing experiments on micrometer-scaled drops. The FCS-coating is very thin and, consequently, can exist around young cirrus ice particles (see papers 1,2 from the list below).

This is a short list of our papers:


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