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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Scanning electron microscopy and molecular dynamics of surfaces of growing and ablating hexagonal ice crystals" *by* W. C. Pfalzgraff et al.

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In view of the nearness of the closing date for the open discussion of this manuscript, only a few comments on the views expressed by Referee #3 will be possible here.

First, we would like to express our gratitude to the reviewer for her/his detailed examination of the manuscript. In general, we would say that the question of relevance of our observations to real cirrus clouds is an important one, and the reviewer raises good points. Taking these in succession,

1. We believe there is some suggestion of transprismatic strands in optical images of in situ crystals. An example is figure 1 of Yang et al, J. Appl. Met. and Clim., 2008,

which shows an image of ice at South Pole Station, at -54°C. In that image, it is not clear whether the corrugations occur on the inside or outside of a hollow hexagon, but the symmetry and spacing of the corrugations roughly matches what we have called transprismatic strands.

2. The pressure of the VP-SEM chamber is certainly much lower than conditions experienced by real cirrus clouds, as the reviewer points out. Nevertheless, the crystal habits we observe are still hexagonal prisms, as (sometimes) observed in real clouds. While we acknowledge that mesoscopic features such as transprismatic strands might be an artifact of low pressure, it is not clear that ruling out their existence on the surfaces of real cirrus clouds is entirely warranted. Scarcity of observations is not 100% convincing (see point 1), and we would point out that other evidence for surface roughness exists, in the form of lower-than-expected asymmetry parameters of ice cloud particles.

3. Regarding supersaturations, we were evidently not sufficiently clear in the manuscript: the transprismatic growth strands we observed are most prominent as conditions near the ablation point – i.e., at low supersaturations; they are even more pronounced as one moves into ablation conditions. Real cirrus clouds also undergo such transitions.

4. We did not intend to convey the idea that hexagonal prisms constitute a majority of crystals in cirrus clouds.

5. The reviewer's concerns about the relationship between the conditions pertaining to our molecular dynamics simulations (in which a quasiliquid layer forms) and those of the SEM results are valid; we ought to have made that more clear.

In summary, the paper was intended (paraphrasing the reviewer) to address observations of ice growth under VP-SEM conditions with possible inferences to real cirrus ice. We think that the connection is stronger than perceived by the reviewer. Regardless of the strengths (or suspicions) of that connection, however, we do think the images will

be of interest to readers of ACP.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20739, 2009.