

Interactive comment on “Mesoscopic surface roughness of ice crystals pervasive across a wide range of ice crystal conditions” by N. B. Magee et al.

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The authors provide evidence from ESEM studies that the prism and basal facets of hexagonal ice show significant roughening. The authors show that these features are nearly ubiquitous, with prismatic roughening being more symmetric than roughening of the basal facet. Though the roughening occurs on most crystals, cycling the supersaturation can lead to crystal facets that effectively cease growing despite the roughened surfaces. I think this result is important, as it indicates that the features affecting growth may be different (though related) to the rough features. Moreover, sublimation leads to a distinctly different surface structure of ice. These results deserve to be published

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because they bear on not only the issue of scattering by roughened particles, but also on how the growth and sublimation of ice particles is ultimately quantified.

Minor comments:

(1) You may want to define mesoscopic. (2) I did not find SEM or VPSEM defined before being used. (3) Enough information is provided for me to understand how the ESEM substrate measurements were conducted, but little information is provide on how the diffusion chamber studies were done. Was the chamber similar in design to Bailey and Hallett? How were the grown crystals from the chamber transferred into the containment cell? It also was not clear to me how long the containment cell was exposed to ambient conditions (and what those conditions were) prior to being transferred to the ESEM cold stage. (4) I think the discussion regarding ice-lc and ice-lh in relation to the presented results is a little confusing. First, you may wish to define what ice-lh and ice-lc are for readers. Most of your readers will (or should) know, but some will not. You may need to provide a couple sentences on the combined existence ice-lc and lh, and why that could lead to stacking faults and hence roughening features. I think you need that to then make a connection to the steady-state and inhibited growth you observe. (Are you suggesting that in your case it was annealing towards lh that caused the inhibited growth? This wasn't clear, at least to me, from what is written.) (5) With respect to the inhibited growth: Is it possible that competition for vapor was important here? (6) Hallett is missing a "t" on page 8405 at Line 19. (7) I think it is very interesting that sublimation leads to scalloping, and that this seems to start at the roughness locations. Is it possible to provide more information here on how the scallops develop over time? Do the scallops originate at the tips of ridges and corners, or in the crevasse regions? How do they propagate? (8) Theoretically, faceted growth requires a constant vapor flux over the facet. Could you perhaps comment on this in relation to the roughening shown by your observations?