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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The vapor pressure over nano-crystalline ice" *by* Mario Nachbar et al.

Anonymous Referee #1

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This manuscript (acp-2017-1101) reports temperature dependent measurements of the vapor pressure over nano-crystalline ice. The measurements were performed in two manners. In the first manner, the growth of seed nanoparticles in the MICE-TRAPS (molecular flow ice cell within the trapped reactive atmospheric particle spectrometer) exposed to a supersaturation of water vapor was used to infer the saturation vapor pressure over the ice sample surface in the cell. This approach allowed investigation of vapor pressures from 135 K to 160 K. The second approach to measure vapor pressure utilized a relative non-isothermal vapor pressure approach where ionization gauge pressure as a function of temperature gave the vapor pressure. This approach was applied from 166 K to 190 K. Combined, the authors found that at low temperatures (<160 K), where nano-crystalline ice is metastable for long time periods, saturation vapor pressures were 100% to 200% higher than for that of hexagonal ice, whereas at higher temperatures (>160 K) saturation vapor pressures were at most 18% higher

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Discussion paper

than that of hexagonal ice. The higher saturation vapor pressure at lower temperatures is described quantitatively by the Kelvin equation, assuming a nano-grain diameter of 7-19 nm.

This manuscript is clearly and concisely written with very clear figures. The experimental approach is novel and carefully performed. The results reported are significant, are very nicely put into the context of previous work on the subject, and will be very useful to the community. The subject of the manuscript is within the scope of Atmospheric Chemistry & Physics and should be published subject to addressing the minor comment below.

Comment:

In the revised manuscript, the authors should ensure that all abbreviations are defined. For example, in Appendix A, "k" in Eq. A2 is presumably the Boltzmann constant, though it is not defined. Similarly, "Tw" is not defined. On page 10, line 17, “NLC” presumably refers to noctilucent clouds but is not defined.

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