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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Particle formation in the Arctic free troposphere during the ASTAR 2004 campaign: a case study on the influence of vertical motion on the binary homogeneous nucleation of H_2SO_4/H_2O" *by* F. Khosrawi et al.

Anonymous Referee #3

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The paper presented by Khosrawi et al. on "Particle formation in the Arctic free troposphere during the ASTAR 2004 campaign: a case study on the influence of vertical motion on the binary homogeneous nucleation of H2SO4/H2O" presents an analysis of flight data collected during an Arctic aircraft campaign. The paper presents three different periods of measurements to evaluate the influence of vertical motion on particle formation. In general the paper does not present anything novel, but it does provide an opportunity to examine various cases in which physical and dynamic processes along an air mass trajectory play a role in particle formation.

While there are no glaring errors or omissions, there do seem to be a few statements made with poor citations. In general, the introduction is somewhat poorly cited and perhaps a few more recent references are notably missing. Hegg and Baker (2009) provide a good overview.

A few minor comments:

- I believe the use of the expression "none nucleation" should be replaced with "non-nucleation"

- In section 2, the POLAR 2 aircraft is not described, while the POLAR 4 is.

- p21963, l10: change "extend" to "extent"

- p21964, l3: change "were a Condensation...", to "was a Condensation..."

- p21964, l12: remove respectively

- p21966, l6: provide references for the statement: "However, this should not affect our results..."

- p21968, l4: The use of the measurement data to initialize the model is not clear to me. Perhaps this could be clarified.

- p21973, section 4.1.3: Overall one of my largest concerns comes from the use of simple backward trajectories - which, to my knowledge do not adequately characterize the convective processes of the air parcell. The statement is made on p21973, l15: "Further, the paths of the air mass trajectories... have the same origin". I'm not convinced about this as no information is provided regarding the vertical motion of the trajectories.

Summary:

Overall the paper presents an analysis of in flight data using a box model to investigate the process of vertical lifting on particle formation. It is not written in a compelling

manner, nor in such a way that makes clear the goal (or conclusion) of the study. For instance, the conclusion has a sentence: "Due to the fact that the nucleation event occurred later than on the other days (thus closer to the time of the measurements) not all newly formed particles were removed due to coagulation until the measurements were preformed.", which essentially – as I read it – states that the two other days may have had similar results if the measurements were made at a different time. So, it thus hard to take anything away regarding the different 'cases' employed in the analysis.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 21959, 2009.