Review of "Enhanced ice nucleation efficiency of microcline immersed in dilute NH_3 and NH_4^+-containing solutions" by Kumar et al.

General Comment:

This manuscript reports the ice nucleating abilities of K-feldspar microcline particles in the immersion freezing mode with the help of a Differential Scanning Calorimeter (DSC). With the goal to improve the current understanding of the good ice nucleating abilities of feldspar particles, K-feldspar microcline suspensions with different inorganic solutes such as NH_3, $(NH_4)_2SO_4$, NH_4HSO_4, NH_4NO_3, NH_4Cl, Na_2SO_4, H_2SO_4, K_2SO_4 and KCl were prepared and studied. Besides the ice nucleating abilities of microcline particles, the authors were also able to test the water activity approach, the effect of solute concentration, the role of adsorbed NH_3, the influence of aging, and the reversibility of surface modifications on their ice nucleating abilities. The authors found i) the heterogeneous freezing onset temperatures deviate from the previously established water-activity-based approach, ii) The good ice nucleating abilities of microcline particles cannot be attributed to neither the native surface K+ ions nor their exchange with externally added cations, iii) Chemically adsorbed ammonia molecules on the particle surface seems to play an important role in the ice nucleating abilities of microcline, iv) Aging could play an important role in the ice nucleating abilities of microcline particles depending on the solute, pH, and, solute concentration, and v) There is a possibility for condensation freezing to occur at a warmer temperatures than immersion freezing in dilute ammonia containing microcline droplets.

This is a well written manuscript, with very well designed and carefully conducted experiments. The current study provides very important evidences of the ice nucleating abilities of feldspar and brings our understanding one step forward. Given the importance of feldspar particles in ice cloud formation on a regional and global scale, this is a great contribution to the ice nucleation community. The reviewer did not identify any major point on the manuscript. This can be basically accepted as is; however, below is a short list of minor comments that can be considered for the final version.

Minor comments:

Line 39: Remove “the” after “precipitation in”.

Line 40: Replace “remaining” with “existing”.

Line 42: “nucleation mechanisms at work” sounds a bit awkward.

Line 44: “supercooled” or “supersaturated”?

Line 52: Replace “at work” with “to take place”.

Line 72: Add a reference after “efficiency”.

Line 73: Define “cloud glaciation”. Why is this relevant for the manuscript?

Line 89: Replace “differential scanning calorimetry” with “DSC”.

Line 95: Replace “Nannochloris atomus and Thalassiosira pseudonana” with “*Nannochloris atomus* and *Thalassiosira pseudonana*”.

Line 96: Remove “dust” after “illite”.

Line 108: Replace “differential scanning calorimetry” with “DSC”.

Lines 125-126: “Evaluation” of what?

Lines 171-172: “The first signal observed at higher temperature is due to heterogeneous freezing triggered by microcline particles while the second freezing signal at lower temperature is due to homogeneous freezing.” This was already mentioned above.

Lines 376-377: “is to large extent reversible” sounds a bit awkward.

Line 401: “minor contributions” on what?

Line 403: Replace “superior” with something more appropriate.

Line 424: “atmospheric solution droplets by means of Fig. 9” sounds a bit awkward.

Line 438: Remove “temperature” after “lower”.

Line 444: Remove “the” before “nucleation”.

Line 464: Replace “ice nucleation” with “IN”.

Line 471: Replace “creation” with something more appropriate.

Line 483: Replace “ice nucleation” with “IN”.

Line 624: Correct the volume and page number.

Line 822: Use the short name of the journal for consistency.

Figure 5: The readability of this figure is very low. Could the authors add and insert with a zoom of the figure down to aw of .99 or .98 to better visualize the data? Or can the authors present the data of this figure in a Table in the Appendix?