

Review of “**The importance of Aitken mode aerosol particles for cloud sustenance in the summertime high Arctic: A simulation study supported by observational data**” by Bulatovic et al.

General comment

The authors have substantially improved the manuscript and have included the reviewers’ suggestions. The discussion has been expanded and now better embeds the study in the existing literature. Similarly, the introduction has been restructured and additional relevant studies are cited. All figures have been improved according to the suggestions. I still have a few minor comments which should be addressed prior to final publication, which are listed below.

Specific comments

Line 46: “cloud liquid growth” should rather be “cloud liquid water increase”

Line 47, line 50: “water vapor” instead of “vapor”

Line 274: How are IWP and LWP defined (i.e. including or excluding precipitation)?

Line 293: consider changing “is better” with “performs better”

Line 300: RAMS also produces vertical bands of increased rain throughout the cloud, e.g. at hours 8 and 9. Can you explain those? Again, is the autoconversion similar for both models? Or is the autoconversion rate especially high in RAMS? You show the condensational growth of raindrops, but (if available) it could be interesting to have a look at the conversion rate from cloud droplets to rain drops.

Figure 3: Thanks very much for including the cloud top and base height. However, how did you calculate cloud top and base height? Please add this information.

Line 367: “the cloud base altitude changes...”

Line 411: “when no accumulation mode particles **are** present”

Line 439: “vary” instead of “very”

Line 452: “in the two models”

Line 456 ff: I appreciate the additional discussion of the radiative budget in the simulations. Did you also analyze the impact of SW radiation at the surface (as done in Figure 10 for LW radiation)? I would assume that especially (and most likely only) in summer there might also be an impact. Or did you only investigate SW radiation at the model top, as written in line 461?

Also, did you look at the **net** surface LW and SW radiation? Overall it would be interesting to see, how the **net** surface energy balance changes for the inclusion of Aitken mode particles and how these results could be extrapolated to the summertime high Arctic radiative budget.

Line 681: Apart from the choice of prescribed/prognostic ICNC/INPs, secondary ice formation may also play a relevant role in determining the cloud evolution, especially in summertime Arctic MPCs (Sotiropoulou et al., 2020; doi: 10.5194/acp-20-1301-2020) and at the temperatures shown in Figure 1. However, this is not mentioned at all. Are secondary ice processes omitted (in the first version of the manuscript I read they are)? Does this also introduce additional uncertainties or effects (i.e. a

potentially higher ice fraction and a decreased influence of Aitken mode particles)? This could also be mentioned in e.g. Section 5.2.