

Interactive comment on “Microphysical sensitivity of coupled springtime Arctic stratocumulus to modelled primary ice over the ice pack, marginal ice, and ocean” by Gillian Young et al.

Anonymous Referee #1

Received and published: 15 November 2016

Review of “Microphysical sensitivity of coupled springtime Arctic stratocumulus to modelled primary ice over the ice pack, marginal ice and ocean” by Young et al.

This paper uses LES simulations of mixed phase Arctic clouds in order to determine the sensitivity of the microphysical structure and lifetime of single-layer mixed phase stratocumulus clouds in the Arctic to three different ice nucleation parameterizations. Overall, I think this is an excellent paper that would be a great fit for ACP, and honestly all I think the authors need to do is to improve the presentation in some of the figures. The uncertainties in the model simulations and data are very thoroughly discussed, the procedures they used are well documented, and I think that it is interesting to find that small uncertainties in Nice can lead to drastically different simulations, which further

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adds to our need to better characterize the microphysical observations of mixed phase stratocumulus.

I have some minor comments that would improve the paper. In general, I do think Figures 5,6, and 8 do need to be more readable, as many of the sub panels are quite small and can be difficult to read at points.

I also think that Figures 7a,b,c are not needed as the conclusions reached by those figures could be misleading since you are comparing modeled Nice to observed Nice >100 , which are not the same quantity since they cover different size ranges of particles. Particles with sizes less than 100 microns can vastly outnumber those at larger sizes, so it is crucial to make sure that the number concentrations being compared cover the same size range.

Secondary ice production processes also occur in Arctic mixed phase stratocumulus, such as in Rangno and Hobbs 2001. I think it would be a benefit to mention them in the introduction when you introduce primary nucleation. You can then mention that the focus of your study is on primary nucleation rather than secondary production.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-898, 2016.

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