

Interactive comment on “Observed microphysical changes in Arctic mixed-phase clouds when transitioning from sea ice to open ocean” by G. Young et al.

Anonymous Referee #2

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The manuscript reports detailed cloud microphysical studies of arctic mixed phase stratocumulus clouds probed during a single flight (B762) of the FAAM aircraft within the ACCACIA campaign in spring 2013. The authors present detailed cloud microphysical as well as aerosol and boundary layer dynamics of a transect that spans from sea ice covered arctic conditions to open ocean conditions. In contrast to earlier studies, special emphasis is put on the transition between these two regimes. As both cloud ice and aerosols have been probed, a comparison to primary ice nucleation parametrizations is made. The data presented are of high quality and rather comprehensive, they provide a clear picture of how the surface influences and sometimes dominates the cloud properties in both cases. The study enriches our understanding of arctic bound-

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ary layer clouds and provides valuable data for meteorological modelling. It remains open however, in how far the results can be transferred to different meteorological conditions or other seasons. From my perspective the manuscript is very well written and in most parts easy to comprehend. It may be published after considering the following single suggestion for improvement, which concerns the comparison to ice nucleation parametrisations. First I suggest that the authors include more recent ice nucleation parametrizations such as “deMott et al. ACP 15, 393, 2015” or “Tobo et al., JGR Atm. 118, 10,100, 2013” Secondly I am asking for a more detailed error analysis here. Two potential issues immediately come to mind: What is the sampling height distribution of the mineral dust?. Was it sampled only at the altitudes relevant for ice formation? Is ice predominantly nucleating at the cloud top? If not, why is the cloud top temperature taken into account? Thirdly, I feel that Figure 5 is somewhat overbusy. Especially ice number concentration from the parametrization is not well placed here. It is unclear, to what axis it belongs and to what measurement data points it should be compared.

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