

Interactive comment on “The Impact of CCN Concentrations on the Thermodynamic and Turbulent State of Arctic Mixed-Phase Clouds” by Jan Chylik et al.

Anonymous Referee #2

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The topic of the presented study is highly interesting and the title is quite intriguing. However, when reading and trying to understand the study and the results, I am not impressed. The manuscript is in quite a bad state with lots of repetition, spelling errors, poor quality figures, missing figure etc. This is a misuse of the time of a reviewer. In the current state, it is not possible to review the science and I therefore recommend rejection of this manuscript. I hope the authors take the time to do a thorough rewrite, I am happy to review it again provided it is presented with the details and explanations that is needed to assess the quality and validity of the work performed. Below I illustrate my decision with some examples, they are far from exhaustive though.

C1

The title contains Arctic Mixed-Phase Clouds which in my view leads to the long-lived persistent clouds that are found in the Arctic. The simulation, however, are based on observations that are classified as cold-air outbreak days. Although the clouds in cold-air outbreaks also can be of mixed-phase, which is common in Cu clouds, the title is still a bit misleading.

The presentation of the cases that the study is based on does not give enough information to be convincingly chosen. The background information is scattered and not coherent. Figure 1 claims to present the “mesoscale weather situation” and shows MODIS Aqua views and the flight tracks. It is not even clear what clouds we are looking at and how this relates to the design of the experiments.

Figure 2, where are the observations taken?

Figure 3, there is a mixture of statistical methods in this figure, using medians and interquartile ranges are used if data is non-gaussian. Why then plot standard deviations, if that is what is meant by “standard 1.5 range”?

The explanation and motivation for the demi-Lagrangian method cannot be understood. A statement like “has been widely used outside the Arctic” must be followed by references.

On Page 10, you write that you are referring to DS01 and DS08 but in the Figure it says DS01 and DS07.

The alterations that are done for RF05 are huge and still the comparison with the DS01 is way off although you write “generally agree”. Where is the comparison of the vertical profiles? What stratification, winds, and RH do you have? Are we even close to reality? Do we have any idea if the turbulence in the LES is generated by the correct processes to be able to compare with reality and thus analyse any sensitivity?

Table 1 consists of coefficients that you do not explain at all what they are used for. Are they all unitless?

C2

Figure 5 and others, do you really think that it is appropriate to provide four significant numbers for the cloud liquid water content?

Figure 13, caption explains panels e and f. The figure only contain a-d.

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