

***Interactive comment on* “Statistics on clouds and their relation to thermodynamic conditions at Ny-Ålesund using ground-based sensor synergy” by Tatiana Nomokonova et al.**

Anonymous Referee #1

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This paper presents a 14-month cloud property dataset collected at Ny-Alesund using a multi-instrument retrieval algorithm. The authors the presented some basic statistics to describe the cloud field including: cloud occurrence, column phase information and frequency, dependence on atmospheric state, and more. Generally, this is a well-written paper and I recommend acceptance after some minor items are addressed.

P1,L16: clouds do not conserve LW radiation; “emit” is a better word here P2,L3: mid-summer SW radiative cooling of the surface is not a general feature across the Arctic. You might indicate that clouds cool the surface the entire year at a site like Summit Greenland (Miller et al. 2018) P2,L33: sensors cannot “capture low level clouds” –

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“observe” is a better word P4,L29: “multi-variable” P6,L27: I am not sure what these double values (e.g., “+100% / -30%”) mean here. Please clarify P7,L3: “US National Weather Service’s” P10,L6: I found this minimum in July surprising. I suspect this is just a sampling error due to a relatively small dataset. I would encourage the authors to bring out this point more strongly here and in the conclusions of the paper P11,L20-25: Shupe et al. 2015 also had the same challenges in distributing liquid water vertically in mixed-phase clouds. Does the CloudNet algorithm use the same scaled-adiabatic method? Perhaps mention both the Shupe paper and address this question here. P13,L1: There were not 26 NWP models in the Klein et al. study. Most were very experimental cloud-resolving or LES models. P14,L7: “represented” is a better word than “reprocessed” P14,L10: What sort of radar reflectivity does this represent, given typical hydrometeor sizes? Perhaps a statement can be made here about the advantage of using an instrument simulator? P14,L23: you state “. . .these ice-related processes are longer in the real cloud than it is specified in ICON model.” Does this mean that you believe that the model has the processes act more rapidly than they do in nature? This sentence needs clarification P15,L19: “categorization” → “classification” P16,L33: These clouds with LWP values between 30 and 60 g/m² also have the largest radiative contribution to the surface energy budget (Bennartz et al. 2013) P18,L3: The L&C paper only talk about higher frequency microwave radiometer measurements. If you want to include the IR here (and you should), then please reference either Marke et al. 2016 or Turner 2007 P18,L6: how would the effective radius be determined? Fig 9, panels B and C: the most important clouds from a radiative point of view are the ones with smaller LWP and IWP. However, the linear x-axis sort of hides them. Would you consider plotting these data on a log₁₀ axis from 1 g/m² to 1000 g/m² for LWP? The bins should be equal-sized bins in log₁₀(LWP) space. Ditto for the IWP, but perhaps start the lower range at 0.1 g/m²? Fig11: I don’t see the labels for the individual panels (e.g., “a”, “b”, etc). Also, there seems to be some weird inset artifact on the lower left-hand panel. Fig12: I would emphasize that the ICON results are not “global”, but are from output over the Ny Alesund END

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