

Interactive comment on “The thermodynamic structure of summer Arctic stratocumulus and the dynamic coupling to the surface” by G. Sotiropoulou et al.

Anonymous Referee #1

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This paper analyses observations from the ASCOS (Arctic Summer Cloud Ocean Study) campaign. The study relies heavily on the observed thermodynamic structures by radio sondes. In combination with cloud radar and microwave observations, the structures are interpreted in terms of clouds and stability in order to understand the role of turbulence in the cloud layers.

The paper is very interesting, well written and well worth publishing. The authors made a serious effort to go beyond the classification of structures and to give a description of the physics of the processes. This is important in view of the role of clouds in Arctic amplification and the uncertainty of the cloud representation in atmospheric models.

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The paper is also welcome as it analyses a unique data set from an area that is hardly observed.

There is one issue that I would like the authors to discuss a little more. It is about the observation that the stable clouds are water clouds and optically thin. The stable stratification is consistent with optically thin clouds, because the clouds are too thin to experience destabilization from cloud top cooling. But how are these water clouds maintained; why do they not glaciate? In the thick radiatively destabilized clouds, there is often a liquid layer at the top that is maintained by the continuous supply of liquid water from condensation in the cloudy updraughts. Such a mechanism does not exist for optically thin stable clouds. So how are these water clouds maintained. I would expect them to glaciate rather quickly without a turbulent regeneration mechanism. The authors could perhaps discuss this in the paper.

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