Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-701-RC3, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime observations of ultrafine particles and cloud condensation nuclei from the boundary layer to the free troposphere in the Arctic" *by* Julia Burkart et al.

Anonymous Referee #3

Received and published: 5 September 2016

As a description of a flight campaign this manuscript includes a lot of information and the authors should have credit for trying to limit what is probably much more than enough behind the scene. Just as using cloud probes as a tool to stratify cloudy or non-cloudy measurement I see no problem of using differences between instruments as indicators for NPF (despite any measurement problems). The absolute numbers are really not followed up in the work. Hence, I will not dwell on measurement details. What I am missing is a Reader's Digest for modelers. Much of what is presented was already observed during previous campaigns, but the wealth of data could be presented in a summary nicely arranged with pertinent chemical and thermodynamically properties.

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Discussion paper

These cases could then be tried and tested using models. The aim in the beginning of the manuscript states a focus on UFP and this is ok, but quantifying their potential impact on impact requires a model. The processes are very complex, and any changes in cloud base height for instance will over compensate any aerosol effect. Again, a model is needed. I'm not convinced the CCN chapter of the manuscript is required for the NPF focus. In my opinion, the papers stands well as a description of the campaign, but I would prefer that the paper takes the understanding further than that of Shaw, Atmospheric Environment Vol. 23, No. 12, pp. 284-2846, 1989. What extra knowledge stands out form these flights besides, low mixing, low surface area, high insolation? A summary of this specifically would be a nice contribution. I don't contest that it is in the manuscript, but it could be summarized in a nice form. Details: Orography is a source for concern at Svalbard, what about the conditions at the flight campaign? Strom et al. 2009 fig 11 Tellus would be nice to compare directly with the supplement figure 1. The fact that Aitken mode particles are not observed right at the surface could be an instrument detection issue I guess. Particles must grow to detectable size. On the source of particle near the surface, have a look at: Lampert et al., Inclined Lidar Observations of Boundary Layer Aerosol Particles above the Kongsfjord, Svalbard As an example of ocean source. Acta Geophysica 60(5), October 2012

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