Atmos. Chem. Phys. Discuss., 9, C910–C911, 2009
www.atmos-chem-phys-discuss.net/9/C910/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Physical properties of High Arctic tropospheric particles during winter" *by* L. Bourdages et al.

Anonymous Referee #1

Received and published: 18 May 2009

The authors present a winter climatology of four particle types at 80N, 86W (Eureka): aerosols, mixed-phase clouds, ice clouds and boundary-layer ice clouds. My recommendation of rejection is based on their apparent lack of an objective classification for the 4 particle types considered. We are given a one-day example in section 3, from which the manuscript immediately moves into the results of a 3 or 4 year climatology. This is particularly troublesome because one of the main interesting findings is that small ice particles depolarize more than large ice particles - a counterintuitive finding. Yet we have little if any quantitative information on how the authors differentiate between large and small ice particles. I suggest the authors rescrutinize their classification scheme, describe it to the readers, describe the sensitivity to mis-classification, and evaluate it with data from other sites (SHEBA had a depolarization lidar, has the AHSRL being elsewhere? Can data from other instruments be used to assess

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the AHSRL/MMCR-only clasificaitons, such as a microwave radiometer for the mixed-phase classification, and the sun photometer for the aerosol classification?) before they resubmit this manuscript.

minor comments:

- would recommend using winds from the radiosondes to assess how well boundary-layer ice clouds correspond to blowing snow. - the reflectivity of ice particles is actually a function of the 4th power of the ice particle size, rather than the 6th power, because of a density decrease with particle size increase (i.e. the Brown-Francis relationship, see also Matrosov et al. 2003 for further explanation). -the color ratio is not wholly independent of the number density as the particle size number distribution is still contained in the mean cross-sections. -why the coarse vertical (1km) and time (1hr) resolution? - does the study cover 3 or 4 years? 2005 to 2008 implies 4 years but 351 days total implies less.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7781, 2009.