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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurements of the relation between aerosol properties and microphysics and chemistry of low clouds in northern Finland" *by* H. Lihavainen et al.

Anonymous Referee #1

Received and published: 23 August 2008

The paper of Lihavainen et al. presents results from the cloud and aerosol interaction experiment (PaCE) performed in Finland in 2004. This paper complement the previous study published by Komppula et al. (2005) and brings new information on the influence of different air masses, aerosol number size distribution and chemistry on the activation of aerosol particles in cloud.

I think that the paper is suitable for publication after answering to the following points:

- p. 14108: My major concern is about the description of the inlet. The authors should bring more information on the separation between the interstitial phase and the cloud hydrometeors. In the present description, the authors are giving detailed description

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on the length of the inlet, the flow rate but there is a lack of information on the main interest of the sampling line, which is the removal of the cloud phase. The authors mention a size cut of 7um but without giving any information on the size of the droplet population. Cloud droplets may have sizes smaller than 7um and can thus enter the system and thus contaminate the interstitial phase. The result would be a sampling of the bulk aerosol and not the interstitial phase, which would modify all the analysis.

- p. 14110: Ionic composition is measured in 2 size classes at the below-cloud site but they are compared to PM7 at the in-cloud site. How was the comparison made and what are the uncertainties?

- p. 14110: What was the interest of sampling with the SDI? Why mentioning it if no data are presented?

- p. 14111: The inlet at the below-cloud station is not heated. What is the influence of contamination by ice crystals breaking in the inlet?

- p. 14112: How often did you get negative activated fraction? And what was the magnitude? Were the size distribution spectrums negative? If yes these values cannot be removed since they balance the average concentration. This brings some question on the use of two sites, so far in distance from each other, to determine the activated fraction, as well as the influence of hydrometeors in the interstitial sampling at the in-cloud station. Please clarify.

- p. 14112: Indicate the detection limit for the measured ions and carbon fractions.

- p. 14118, line 13: Why is Reff decreasing with decreasing concentration?? Figure 6 is showing the opposite, as expected, please clarify.

- p. 14119: Why mentioning MSA and Oxalate since it is not used anywhere? I would suggest removing this sentence since it does not bring any additional information.

- Table 3: How can Ca2+ be higher for the fine mode than for the coarse mode?

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- Table 3 and 4: I would suggest indicating in the caption at which sites the data were collected.

- Table 4: Replace ionic components by nomenclature, Cl-, NO3- and others.

- Figure 1: I would suggest using colors for the graph.

- Figure 4: I would suggest just explaining the results of Figure 4 and not showing it as a separate graph since Figure 4 and 5 are quite similar.

- Figure 7: What are the error bars on this graph? Percentiles and errors are different. Please clarify.

- Figure 8: Use color in addition to the patterns. The figure is not clear as it is.

- Figure 9: What are the uncertainties on these measurements particularly for the fog samples considering the huge variability between aerosol and in-cloud samples?

Technical corrections:

- Replace "Air craft" by "Aircraft" throughout the manuscript.

- p. 14107: Change "in Northern from" by "in Northern Finland from".

- p. 14108: Change "by Finnish Meteorological Institute"; with "by the Finnish Meteorological Institute".

- p. 14113: Change "DMSP" by "DMPS".

- p. 14115: Change "the overall activated fraction was was quite high" by "the overall activated fraction was quite high".

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14105, 2008.

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