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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical composition of ambient aerosol, ice residues and cloud droplet residues in mixed-phase clouds: single particle analysis during the Cloud and Aerosol Characterization Experiment (CLACE 6)" *by* M. Kamphus et al.

Anonymous Referee #2

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Overview

This paper, by Kamphus et al., is appropriate for publication in *Atmospheric Chemistry and Physics* if for no other reason than the dataset from Jungfraujoch, which is a valuable addition to the literature. I would not object to publishing the manuscript as-is. That said, I have a couple of comments and some minor points.

Comments

Comment: Implicitly, the freezing modes being considered in this paper are immersion and condensation, which brings up an interesting point, at least to me. The authors state that mineral dust with no associated soluble components (Class 1) are enriched in the ice residues. I find this a bit surprising for this type of cloud. For the relatively low maximum supersaturations I would expect in these clouds, I would have expected mineral dust with some soluble components to be favored since the soluble components would aid in the particles activation. By the time the droplet froze, it would be dilute enough for the freezing point depression to be negligible. On the other hand, mineral dust aerosol particles without soluble compounds associated would have higher critical supersaturations and might not activate. I am not disputing the finding presented here, it just seems curious to me. Do the authors know of any reason why pure mineral dust would be favored over mineral dust with (e.g.) sulfate as a freezing catalyst, especially if the cloud droplets from which the crystals froze were fairly large ($\sim$ 10 μm) and therefore fairly dilute?

Comment: It is odd that droplet residues were depleted in biomass burning components. I would not expect fresh biomass burning emissions to be good CCN necessarily, but it seems that they would be after aging in the atmosphere. (And there seems to be no indication that the clouds sampled here were influenced by fresh biomass burning emissions.)

Minor points

I may be in the minority here, but please consider a global search and replace for the following:

IR $\rightarrow$ "ice residue"

DR → ”droplet residue”

BG → ”background aerosol”

There’s no excess page fee is there? I find non-standard acronyms distracting and using them doesn’t cut the length that much. They don’t, in my opinion, improve the flow of the paper.

page 15390, line 25: reword “... ATOFMS was as well connected...” to “... ATOFMS was connected to the Ice-CVI inlet as well.”

page 15397, line 25: ”Predominatly" → ”Predominantly” (note second ”n”)

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 15375, 2009.