Atmos. Chem. Phys. Discuss., 5, S1698–S1700, 2005
www.atmos-chem-phys.org/acpd/5/S1698/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice nucleation by surrogates for atmospheric mineral dust and mineral dust/sulfate particles at cirrus temperatures" *by* C. M. Archuleta et al.

C. M. Archuleta et al.

Received and published: 23 July 2005

General comment:

We greatly appreciate the reviewer's positive comments on our paper and notes on typographical errors. We address below a few specific points of suggestion or contention.

Specific responses:

As a general point I would recommend to more clearly state that, for atmospheric mineral particles with irregular surface and inhomogeneous mineral composition, the het-

erogeneous freezing parameters may significantly differ from the parameters for the surrogate particles summarized in Table 6, at least one may expect some scatter.

We agree that this is a topic for further research and do not recommend specific parameterizations. We will add appropriate qualifying words. Nevertheless, we do provide the detailed values for those who would choose, with appropriate qualification, to parameterize such data.

(1) Mobility size selection with the DMA: There seem to be a strong size dependence of ice nucleation efficiency. Can the authors give an estimate of the number fraction of multiply charged larger particles contributing to the selected mobility size classes?

See comment to A. Vlasenko. We will add explicit values to the text.

(2) Ice crystal growth time and IN sensitive volume fraction of the CFDC: Do all ice crystals grow to d > 2μm, independent of their location to nucleate in the CFDC? Or do the authors expect all (or most) IN to activate in the upper section of the CFDC with enough time to grow to d > 2μm, even at the lowest T? Otherwise the IN efficiency may be underestimated. This could also affect the nucleation rate calculations.

This may a good point to elaborate on within the paper. We have run microphysical model calculations of ice crystal growth for the processing conditions used in the CFDC that suggest that for most temperatures, nucleation happening even half of the distance into the chamber will provide sufficient time for growth to the size of detection. We are not so concerned with IN efficiency, but it is clear that not all the residence time is available for ascertaining nucleation rate and that this may depend on temperature (due to ice growth rates). We will add this into an estimate of our certainty with regard to nucleation rates.

(3) Summary of ice nucleation results: Comparison to Heymsfield and Milosevich (1995) is somewhat speculative here because the CFDC results are limited to particles less than 2μm in diameter whereas the HM95 study tells, as far as I know, nothing

ACPD

5, S1698–S1700, 2005

about the aerosol properties. This may be mentioned here.

We will add this mention.

(4) The authors may add the line for homogeneous freezing to Figure 7.

We will consider this, but it may make the figure too busy and it is present in Figure 6.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 3391, 2005.