

## ***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.***

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Received and published: 10 June 2005

The paper of Archuleta et al. is among the first experimental studies of ice nucleation on surrogates of atmospheric mineral dust. It is an excellent combination of laboratory and modeling work. Perhaps due to the already large amount of material presented in this paper, several details related to the characterization of the particles generated from a suspension of asian dust have been omitted. Since aerosol size distributions are not given as a figure, a couple of questions arise, which might be of importance in assessing the significance of the experiments with the authentic dust particles.

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1. Was a neutralizer installed in front of the DMA? Fig.1 does not show it explicitly. If the aerosol is not neutralized, I would expect a significant number of multiply charged, larger particles of the same mobility at a given DMA voltage setting. Therefore, a significant number of also larger particles would have entered the CFDC along with those of the pretended size. The TSI atomizer is known to produce highly-charged aerosol (Forsyth et al., 1998).

2. Asian dust aerosol is typically poorly water soluble (Maxwell-Meier et al., 2004; Mori et al., 2002). The authors used an aqueous suspension of the dust to generate the aerosol. After evaporation of the droplets leaving the atomizer one would expect a bi-modal size distribution (similar to the dispersion of PSL suspensions). The first mode is expected to be somewhere below 100 nm particle diameter due to particles composed of the soluble material from the dust ( $\text{CaCO}_3+\text{CaSO}_4$  internal mixture). The second mode is expected to represent particles consisting of a non-soluble core of one or two dust particles partially covered with  $\text{CaCO}_3+\text{CaSO}_4$ . The size of this mode is rather hard to predict because it depends on the properties of the dry dust powder and the properties of the suspension (degree of disaggregation etc.). Therefore, the way the aerosol has been produced induces further changes to the size dependent chemical composition. First, this could explain the observed hygroscopic growth factors of 1.155, 1.125 and 1.05 for 50, 100 and 200nm particles, respectively (p.3402, 10). Smaller particles contain water soluble material and grow under increasing RH conditions whereas larger particles are basically insoluble and grow very little. Second, the question arises to what degree the ratio of soluble material to mineral oxides, which might affect the IN properties, has been ‘authentic’ in these experiments. So it would be useful to provide more details about the aerosol generation and characterization, if available, or caution the conclusions in view these aspects.

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Maxwell-Meier, K., Weber, R., Song, C., Orsini, D., Ma, Y., Carmichael, G.R., and

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