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Interactive comment on "The role of organic aerosols in homogeneous ice formation" *by* B. Kärcher and T. Koop

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After learning of this work, I ran some similar cases using the cirrus cloud parcel model presented by Murphy (2003), except that freezing to cubic ice was not considered. The results agree with those presented in this paper. My model is different from that in this paper in several details, most notably that the temperatures are sine waves with superimposed fractal small scale variations rather than constant cooling rates.

In my model, hygroscopic growth before freezing is expressed as a growth factor between dry diameter and that at 80% relative humidity with respect to liquid water. I ran a case where half the particles had a growth factor of 1.7 and half had a growth factor of 1.2, with the same dry size distribution for each type. The great majority of the ice crystals came from the more hygroscopic mode, yet there was very little change

in the number or size distribution of the ice crystals when compared to a case where all of the particles had a growth factor of 1.7. This selection of hygroscopic particles as homogeneous nuclei was due to the increased water uptake leading to a larger size and consequently higher probability of freezing. In further case studies, the cloud properties changed significantly only when very few particles remained in the more hygroscopic mode. The control of the cloud properties by a few percent of more hygroscopic particles was similar to the way that only a few percent of heterogeneous nuclei can dominate ice formation.

Another set of case studies showed that only large changes in the accommodation coefficient of water onto the deliquesced particles could have noticeable impact on any part of the ice nucleation. In my model, this was because the smallest particles always remained near equilibrium and mass transport to the larger particles was diffusion limited unless the accommodation coefficient was much less than 0.1.

The studies I performed were less extensive than those in this paper, but they do show that the general results are not dependent on some of the details of the model. It is still not clear that differing water uptake can explain all of the observed differences in freezing behavior between organics and sulfate (Cziczo et al., 2004) but it is a viable hypothesis.

Cziczo, D. J., P. J. DeMott, S. D. Brooks, A. J. Prenni, D. S. Thomson, D. Baumgardner, J. C. Wilson, S. M. Kreidenweis, and D. M. Murphy,Observations of organic species and atmospheric ice formation, Geophys. Res. Lett., 31, L12116, doi:10.1029/2004GL019822, 2004.

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