Atmos. Chem. Phys. Discuss., 3, S1507–S1508, 2003
www.atmos-chem-phys.org/acpd/3/S1507/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comment on evidence for surface-initiated homogenous nucleation" *by* J. E. Kay et al.

J. E. Kay et al.

Received and published: 12 September 2003

We thank AT for her second comment. To address her concerns, we have added a paragraph at the end of section 2.2 describing our views on the role of facets in nucleation theory:

Finally, we wish to comment on the theoretical discussion (Dijkaev et al., 2002) cited by Tabazadeh et al. (2002 a,b), that describes newly formed ice embryos as a tiny compact crystals having equilibrium crystal shape with two types of facets. This picture of the embryo is not consistent with current understanding of the ice initiation process. A critical nucleus is a strongly non-equilibrium object and at temperatures of homogeneous nucleation, consists of only tens of molecules. Recent molecular dynamic simulations (Matsumoto et al., 2002) have shown that a critical nucleus in water is a non-compact, chain-like object. Moreover, even if we assume that a nucleus is compact, its shape will have nothing in common with the equilibrium shape at correspond-

Full Screen / Esc
Print Version
Interactive Discussion
Discussion Paper

ing temperatures. The growth drive at the ice-water interface would rapidly destroy any emergent facets in a process called kinetic roughening.

For the record, we think that ACP/ACPD is an appropriate journal for discussion of the atmospheric relevance of surface-initiated nucleation. We appreciated (and learned from) the comments and suggestions from the three reviewers and from AT in this open discussion process.

References:

Dijkaev, Y. S., Tabazadeh, A., Hamill, P., and Reiss, H.: Thermodynamic conditions for the surface-stimulated crystallization of atmospheric droplets, J. Phys. Chem. A, 106: 10247–10253, 2002.

Matsumoto, M., Saito, S., and Ohmine, I.: Molecular dynamics simulation of the ice nucleation and growth process leading to water freezing, Nature, 416, 409-413, 2002.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3361, 2003.