First Steps in Atmospheric Particle Formation: Nucleation of the Smallest Ice Snowflake

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Republic, Molecular and Cluster Dynamics Team — The study of at-
mospheric aerosols attracts considerable attention because of its influence on atmo-
ospheric chemistry and climate. Perhaps the most famous example is the ozone hole 
where the polar stratospheric clouds play a key role in the ozone depletion process. 
The atmospheric cloud generation starts with the growing of small ice nanopar-
ticles via uptake of molecules on water clusters. Therefore the cross-sections for 
uptake have been investigated. The measured cross sections of ice particles can be 
more than twice larger than the geometrical cross sections of these particles. 
2. This 
can have significant consequences in modelling of growth ice nanoparticles. Subse-
sequently, we have investigated the size-dependence of the measured cross-sections for 
water clusters. Here, the cross sections of water clusters depart from the theoret-
ically predicted dependence and are considerably larger starting from the clusters 
of approximately 300 water molecules. We interpret this increase of cross section 
by the occurrence of highly irregular water cluster shapes, e.g. formation of the 
“nanosnowflakes”. 

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