Atmos. Chem. Phys. Discuss., 15, C389–C390, 2015
www.atmos-chem-phys-discuss.net/15/C389/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Microphysical processing of aerosol particles in orographic clouds" *by* S. Pousse-Nottelmann et al.

A. Bogdan

anatoli.bogdan@uibk.ac.at

Received and published: 25 February 2015

In the atmosphere, as in general on the Earth, water does not exist in pure state but as aqueous aerosol drops of sub/micrometer size. Cloud ice particles are formed by freezing of such drops. Since ice is highly intolerant to impurities, the freezing of sub/micrometer drops results in the formation of not pure ice but mixed-phase spherical particles: an ice core enveloped with a freeze-concentrated solution (FCS). How such coated ice cloud particles are formed and impact water vapor uptake we described in papers: Bogdan, A. and Molina, M. J. 2010,"Aqueous Aerosol May Build up an Elevated Upper Tropospheric Ice Supersaturation and Form Mixed-Phase Particles after Freezing." J. Phys. Chem. A, 114, 2821-2829; Bogdan, A. and Molina, M. J. 2009,

"Why does large relative humidity with respect to ice persist in cirrus ice clouds?" J. Phys. Chem. A, 113, 14123-14130; Bogdan, A., M. J. Molina, K. Sassen, and M. Kulmala, 2006, "Formation of low-temperature cirrus from H2SO4/H2O aerosol droplets." J. Phys. Chem. A, 110, 12541-12542. Further, soon after freezing, the FCS coating around spherical ice particles will surely impact the Wegener-Bergeron-Findeisen process within mixed-phase clouds. The coated ice particles will also impact the riming process. It would be a good thing if the authors will mention the phase separation during the freezing of atmospheric aqueous drops and its impact on microphysics and development of clouds. The freeze-induced phase separation is real and the authors can find pictures and videos of this process in papers: Bogdan, A., Molina,M. J., Kulmala, M., Tenhu, H. & Loerting, T. 2013, Solution coating around ice particles of incipient cirrus clouds. Proc. Natl. Acad. Sci. USA, 11, E2439, and A. Bogdan, M. J.Molina, H. Tenhu, E. Bertel, N, Bogdan, T. Loerting, 2014, Visualization of Freezing Process in situ upon Cooling and Warming of Aqueous Solutions." Scientific reports 4: 7414 | DOI: 10.1038/srep07414.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 2405, 2015.