Geophysical Research Abstracts
Vol. 17, EGU2015-676, 2015
EGU General Assembly 2015

Arctic stratospheric ice nucleation and dehydration within CLaMS

Ines Tritscher, Jens-Uwe Grooß, and Rolf Müller
Forschungszentrum Jülich, IEK-7, Jülich, Germany (i.tritscher@fz-juelich.de)

Polar stratospheric clouds (PSCs) provide the surface for heterogeneous reactions enhancing concentrations of active, ozone destroying chlorine and thereby cause polar ozone loss in late winter and early spring. The understanding of PSC microphysics is therefore essential to simulate polar ozone accurately.
The Chemical Lagrangian Model of the Stratosphere (CLaMS) allows growth, evaporation, and gravitational settling of individual cloud particles to be calculated along their trajectories. Particles consisting of nitric acid trihydrate (NAT) were the focus of previous work and are known for their potential to denitrify the polar stratosphere by sedimentation. This study goes a step further and deals with the nucleation of ice particles and related dehydration, i.e. irreversible redistribution of water vapor. Homogeneous and heterogeneous nucleation of ice particles have been considered. Finally, we will also include NAT formation downwind of ice clouds.
To start with, we concentrate on the Arctic winter 2009/2010, which is already well characterized because of the RECONCILE campaign and connected work. Unusually low temperatures at stratospheric levels led to the formation of synoptic-scale ice PSCs for a week-long period. We present CLaMS results in comparison to PSC observations from the cloud-aerosol lidar CALIOP. Moreover, we juxtapose CLaMS simulations of water vapor with single balloon-borne measurements as well as with vortex-wide MLS observations. The hemispheric picture allows tracking dehydrated air masses around the vortex. Changes in the denitrification pattern, which might arise due to the implementation of ice particles, will be discussed.