EGU22-6187
https://doi.org/10.5194/egusphere-egu22-6187
EGU General Assembly 2022

An update on polar stratospheric clouds within CLaMS

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Polar ozone loss in late winter and early spring is caused by enhanced concentrations of active chlorine. The surface necessary for heterogeneous reactions activating chlorine species is provided by cold stratospheric aerosols and by polar stratospheric clouds (PSCs). Moreover, sedimentation of PSC particles changes the chemical composition of the lower stratosphere and alters the ozone depleting process by irreversible redistribution of nitric acid and water vapor.

Over the past few years, the Chemical Lagrangian Model of the Stratosphere (CLaMS) has been further developed by the implementation of a microphysical PSC scheme. Within the sedimentation module of CLaMS, nitric acid trihydrate (NAT) and ice particles nucleate, grow, sediment, and evaporate along individual trajectories. Results from different Arctic and Antarctic winters have been compared to measurements from the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS), and the Microwave Limb Sounder (MLS). For this study, we focus on characteristics of different PSC formation routes: Are there typical meteorological conditions which promote certain nucleation pathways? Are there general hemispheric differences? Do different nucleation pathways contribute differently to the total PSC volume? Vice versa, is it possible to conclude from observations which kind of nucleation mechanism took place?