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Relative roles of different types of PSC to Antarctic ozone depletion in polar spring caused by chlorine activation, denitrification and dehydration

O. Kirner (1), R. Müller (2), F. Khosrawi (3), and R. Ruhnke (3)

(1) Karlsruhe Institute of Technology, Steinbuch Centre for Computing (SCC), Germany (ole.kirner@kit.edu), (2) Research Centre Jülich, Institute of Energy and Climate Research – Stratosphere (IEK-7), Germany, (3) Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research (IMK), Germany

Heterogeneous reactions on the surfaces of PSC particles and denitrification of the stratosphere are the cause for Antarctic ozone depletion in polar spring, but the relative roles of different types of PSCs is an open question. We use multi-year simulations of the chemistry-climate model ECHAM5/MESSy Atmospheric chemistry (EMAC) to investigate the impact that various types of PSCs have on Antarctic ozone loss.

Different EMAC simulations (nudged with ERA-Interim) have been performed to evaluate the contribution of liquid, NAT and ice particles to ozone depletion in Antarctic winter and spring due to chlorine activation by heterogeneous chemistry on their surfaces, and due to denitrification and also dehydration. In several sensitivity simulations, we changed the heterogeneous chemistry on PSC particles by switching on and off the chemistry on liquid, NAT and ice particles. The influence of denitrification and dehydration is evaluated by switching on and off the sedimentation of NAT and ice particles in the model.

With the help of the EMAC simulations we show the significance of liquid, NAT and ice particles to Antarctic ozone depletion caused by chlorine activation, denitrification and dehydration.