Geophysical Research Abstracts
Vol. 21, EGU2019-17734, 2019
EGU General Assembly 2019

Evaluation of modelled polar stratospheric clouds by comparison with CALIPSO spaceborne lidar measurements

Michael Steiner, Andrea Stenke, Beiping Luo, and Thomas Peter
ETH Zürich, Institute for Atmospheric and Climate Science, Zürich, Switzerland (andrea.stenke@env.ethz.ch)

Polar stratospheric clouds (PSCs) provide surfaces for heterogeneous halogen activation, which is responsible for the severe ozone depletion occurring in polar regions each spring, mainly over Antarctica. The strength of halogen activation depends on the available surface area density and the composition of PSCs, which can consist of liquid ternary solutions (HNO_3–H2SO4–H_2O, STS), solid nitric acid trihydrate (NAT) and water ice, or mixtures thereof. Furthermore, by uptake of HNO_3 and sedimentation, PSCs can lead to a denitrification of the polar stratosphere, which impedes chlorine deactivation.
The formation of PSCs in state-of-the-art chemistry-climate models is parameterized in terms of temperature, available H_2O, HNO_3 and composition of liquid aerosols. An accurate representation of PSCs in chemistry-climate models is crucial for a correct representation of polar ozone chemistry and for reliable projections of future polar ozone. Since 2006 the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP) on CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) provides information of the temporal and spatial distribution of PSCs as well as of their composition.
Here we evaluate the PSCs from a simulation with the chemistry-climate model SOCOLv3 in specified dynamics mode with CALIOP backscatter measurements. We performed a set of sensitivity simulations to optimize a set of microphysical parameters in the simulation of PSCs, such as ice number density, NAT particle radius and maximum NAT number densities. In general, we find a good temporal and spatial agreement of PSC occurrence and classification (ice, NAT, STS), although the assumed fixed ice number density leads to an underestimation of wave ice occurrence over Antarctica in the model.

Key words: Polar Stratospheric Clouds, Climate modeling, Lidar measurements, CALIPSO.