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Contribution of different PSC types to Arctic ozone depletion caused by chlorine activation and denitrification

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Heterogeneous reactions on the surfaces of PSC particles and denitrification of the stratosphere are the cause for polar ozone depletion in spring. In a former study we investigated the impact of different types of PSCs on Antarctic ozone depletion with the help of the chemistry-climate model ECHAM5/MESSy Atmospheric chemistry (EMAC). In this study, we investigate the impact of PSCs on Arctic ozone loss.

One standard and four sensitivity EMAC simulations (nudged with ERA-Interim) have been performed to evaluate the contribution of liquid, NAT and ice particles to ozone depletion in the Arctic winters 2010/2011 and 2015/2016 due to chlorine activation by heterogeneous chemistry on their surfaces and due to denitrification of the stratosphere.

In the first three sensitivity simulations, we changed the heterogeneous chemistry on PSC particles by switching on and off the chemistry on liquid, NAT and ice particles. One further sensitivity simulation without NAT formation (only liquid and ice particles) was performed to evaluate the contribution of NAT to Arctic ozone depletion due to denitrification of the stratosphere.

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