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Mountain-wave induced Polar Stratospheric Clouds in ICON-ART: Impact on Polar Ozone

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A significant process for small-scale ozone loss in polar regions are heterogeneous reactions on polar stratospheric clouds (PSCs) induced by mountain waves. Mountain waves can propagate vertically up to the stratosphere and have a horizontal wavelength in the order of 50 kilometres or lower. Therefore, they have to be parameterised in global chemistry models.

With the atmospheric chemistry model ICON-ART, we are able to bridge the gap between direct simulation of mountain waves and the representation of mountain-wave PSCs in the global simulation. For this, we use the possibility of local grid refinement with two-way interaction. It allows that variables calculated on the refined grid feed back to the global grid within the same simulation. We use a version of ICON-ART based on Weimer et al., GMD (2017) and Schröter et al., GMD (2018), including a comprehensive chemistry.

The PSC scheme in ICON-ART forms STS particles in thermodynamic equilibrium and ice PSCs using the microphysics of ICON. A size bin approach for non-equilibrium growth of NAT particles is applied. We evaluate the PSC scheme and the modelled chemical composition with satellite data and investigate the impact of mountain-wave induced PSCs on polar ozone with ICON-ART.