EGU21-12318
https://doi.org/10.5194/egusphere-egu21-12318
EGU General Assembly 2021

Volcanic aerosol heating in the tropical tropopause region and associated water vapour changes

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Large volcanic eruptions affect the distribution of atmospheric water vapour, for instance through cooling of the surface, warming of the lowermost stratosphere, and increasing the upwelling in the tropical tropopause region.

To better understand the volcanic impact on the tropical tropopause region and associated changes in the water vapour distribution in the stratosphere we employ a combination of short term convection-resolving global simulations with ICON and long term low resolution ensemble simulations with the MPI-ESM1.2-LR EVAens**,** both with prescribed volcanic forcing. With the EVAens a long term statistical analysis of the water vapour trends during the build-up and decay of a volcanic aerosol layer is made possible. The impact of the heating in the cold point regions is studied for five different eruption magnitudes. Stratospheric water vapour changes are analyzed in simulations with synthetic and observation based aerosol profiles showing that the distance of the aerosol profile from the cold point region can be more important for the water vapour entry into the stratosphere than the emitted amount of sulfur.

Whereas the EVAens is ideal to investigate the slow ascent of water vapour into the stratosphere the 10 km high resolution simulations with ICON allow insights into the convective changes after volcanic eruptions going beyond the limitations parameterizations usually impose on the model data.