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# Investigating atmospheric transport processes of trace gases with ICON-ART on different scales

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We have extended the global ICON [1] (ICOsahedral Nonhydrostatic) modelling framework by introducing ICON-ART [2]. ICON is jointly developed by the German Weather Service (DWD) and Max-Planck-Institute for Meteorology (MPI-M), and is used for numerical weather prediction as well as for future climate predictions.
ICON-ART is developed at the KIT with the goal to simulate interactions between trace substances and the state of the atmosphere. For the dynamics (transport and diffusion) of gaseous tracers, the original ICON tracer framework is used. A process splitting approach separates the physical processes.

In this study, we present results of the ICON-ART extension, including the full gas-phase chemistry module. This module uses the kpp formalism [3] to generate chemistry modules and the photolysis module is based on Cloud-J7.3 [4]. Photolysis rates are calculated online based on the meteorological state of the atmosphere, as well as on the actual ozone profile and cloud optical parameters.
Two simulations are performed with ICON-ART. The first one with physics parameterisations for the numerical weather prediction (NWP) and the second one with that for climate simulation in order to investigate the dynamical influence on the distribution of long-lived as well as of short-lived species by comparing both simulations. The results are evaluated with other model results and with observation.
In addition to that, we use aircraft campaign data to validate the results on the regional scale for short term simulations by using the NWP physics.

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