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Impact of acetone on ozone in the upper troposphere: simulations with ICON-ART

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We present results of an extension to the ICOsahedral Non-hydrostatic modelling framework (ICON). ICON is a joint project of the German Weather Service and the Max-Planck-Institute for Meteorology.

We use the Aerosols and Reactive Trace gases (ART) extension for ICON which currently is under development. Here, a new interface for including emissions from external data sources has been implemented and exploited.

Our test cases are the emissions of volatile organic compounds (VOCs), in particular that of acetone. We test the sensitivity of the VOC concentrations in the upper troposphere and lower stratosphere (UTLS) to the prescribed emission inventory. Because VOCs are influencing the HO_x equilibrium the annual cycle of VOCs matter for UTLS ozone concentrations.

In the UTLS region, the HO_x production due to photooxidation of the VOC acetone gets in the same order as that due to photolysis of ozone. Therefore, acetone is one of the main regulators of HO_x and ozone in this region. We compare our simulations of acetone concentrations with airborne measurements of the Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrument Container (CARIBIC) and the ECHAM/MESSy Atmospheric Chemistry model (EMAC) for different emission inventories and different parametrisations of the acetone lifetime.