Geophysical Research Abstracts
Vol. 21, EGU2019-9696, 2019
EGU General Assembly 2019

Air-borne measurements and CLaMS modelling of organic and inorganic bromine and air mass ages around the extratropical tropopause

Meike Rotermund (1), Andreas Engel (2), Jens-Uwe Grooß (3), Tilman Hüneke (1), Flora Kluge (1), Ben Schreiner (1), Andreas Zahn (4), and Klaus Pfeilsticker (1)

(1) Institute of Environmental Physics, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany, (2) Institute for Atmospheric and Environmental Sciences, Goethe-University Frankfurt, Frankfurt, Germany, (3) Institute of Energy and Climate Research (IEK-7), Forschungszentrum Jülich GmbH, Jülich, Germany, (4) Institute of Meteorology and Climate Research (IMK-ASF), Karlsruhe Institute of Technology, Karlsruhe, Germany

Bromine plays a large role in influencing UT/LS ozone concentrations and in turn our climate. However the transport of bromine across the tropical tropopause layer and in particular across the extratropical tropopause is not well quantified. Air-borne measurements of atmospheric trace gases in particular of organic and inorganic bromine along the tropopause are studied during the WISE (Wave-driven ISentropic Exchange) research campaign over the northern Atlantic and western Europe from September 4 – October 24, 2017. BrO (O_3 and NO_2) is measured with the mini-DOAS (Differential Optical Absorption Spectroscopy) instrument, which is a remote sensing instrument mounted on the DLR – HALO (High Altitude and LOng range) aircraft. These measurements, using the novel scaling method (Hüneke et al., 2017), are assisted by in-situ O_3 measurements from the FAIRO instrument operated by Karlsruhe Institute of Technology as well as measurements of all relevant organic halogen species and air mass ages (SF_6, CO_2) by GhOST-MS operated by the University of Frankfurt. All these measurements are compared with CLaMS (Chemical Lagrangian Model of the Stratosphere) simulations, performed by the Forschungszentrum Jülich. The simulated curtains of the trace gases along the flight path allows for direct comparisons with the detected trace gases as well as to account for the partitioning of inorganic bromine. This information is used to construct a climatology of the organic and inorganic bromine and its partitioning as a function of the relative potential temperature with respect to the extratropical tropopause as well as the air mass ages. This data indicates the importance of bromine transport across the extratropical tropopause as well as potential losses of inorganic bromine by uptake onto and sedimentation of ice particles.