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# Investigation of mesoscale trace gas distributions across an Arctic tropopause fold affected by gravity wave activity

Wolfgang Woiwode (1), Hermann Oelhaf (1), Andreas Dörnbrack (2), Martina Bramberger (2), Christopher Diekmann (1), Felix Friedl-Vallon (1), Michael Höpfner (1), Peter Hoor (3), Sören Johansson (1), Jens Krause (3), Daniel Kunkel (3), Johannes Orphal (1), Peter Preusse (4), Roland Ruhnke (1), Romy Schlage (2), Jennifer Schröter (1), Björn-Martin Sinnhuber (1), Jörn Ungermann (4), Andreas Zahn (1), and the GLORIA Team

(1) Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Karlsruhe, Germany, (2) Deutsches Zentrum für Luft- und Raumfahrt, Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany, (3) Institute for Atmospheric Physics, University of Mainz, Mainz, Germany, (4) Forschungszentrum Jülich GmbH, IEK-7, Jülich, Germany

Tropopause folds are known of enabling efficient exchange of trace constituents between the stratosphere and troposphere. In particular, the modification of the vertical distributions of radiatively important $H_2O$ and other reactive trace gases associated with tropopause folds is relevant for accurate model simulations of the upper troposphere and lower stratosphere composition. During the POLSTRACC/GW-LCYCLE/SALSA flight on 12 January 2016, the HALO (High Altitude LOng range) aircraft crossed twice an extended tropopause fold in the vicinity of the Arctic polar vortex. At the same time, the ECMWF operational analysis shows that the meteorological scenario probed above Italy was accompanied by wide-spread gravity wave activity induced by north-westerly winds. Using high spectral resolution limb-observations by the GLORIA (Gimballed Limb Observer for Radiance Imaging of the Atmosphere) spectrometer aboard HALO and associated observations, we investigate the vertical distributions of $H_2O$, $O_3$, temperature, and associated parameters across the tropopause fold. In combination with a high-resolution simulation by the ICON-ART (ICOsahedral Nonhydrostatic- Aerosol and Reactive Trace gases) model, we search for indications for irreversible trace gas exchange between the stratosphere and troposphere and the potential influence of gravity waves.