



## **GLORIA observations of de-/nitrification during the Arctic winter 2015/16 POLSTRACC campaign**

Marleen Braun (1), Wolfgang Woiwode (1), Michael Höpfner (1), Sören Johansson (1), Felix Friedl-Vallon (1), Hermann Oelhaf (1), Peter Preusse (2), Jörn Ungermann (2), Jens-Uwe Grooß (2), Tina Jurkat (3), Farahnaz Khosrawi (1), Ole Kirner (4), Andreas Marsing (3), Björn-Martin Sinnhuber (1), Christiane Voigt (3), Helmut Ziereis (3), Johannes Orphal (1), and the GLORIA Team

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

Denitrification, the condensation and sedimentation of  $\text{HNO}_3$ -containing particles in the winter stratosphere at high latitudes, is an important process affecting the deactivation of ozone-depleting halogen species. It modulates the vertical partitioning of chemically active  $\text{NO}_y$  and the vertical redistribution of  $\text{HNO}_3$  can affect low stratospheric altitudes under sufficiently cold conditions. The capability of associated nitrification to disturb the  $\text{NO}_y$  budget of the climate-relevant lowermost stratosphere (LMS) has hardly been investigated in detail and represents a challenge for model simulations. The Arctic winter 2015/16 was characterized by exceptionally cold stratospheric temperatures and widespread polar stratospheric clouds (PSCs) that were observed from mid-December 2015 until the end of February 2016 down to the LMS. Observations by the GLORIA (Gimballed Limb Observer for Radiance Imaging of the Atmosphere) spectrometer during the POLSTRACC (Polar Stratosphere in a Changing Climate) aircraft mission allow us to study the development of nitrification of the Arctic LMS during and after the 2015/16 PSC period with high vertical resolution. The vertical cross-sections of  $\text{HNO}_3$  distribution along the HALO (High Altitude and Long range research aircraft) flight tracks derived from GLORIA observations show the result of significant vertical redistribution of  $\text{NO}_y$  with strong nitrification of up to  $\sim 6$  ppbv in the LMS. We compare the results of the GLORIA observations with simulations by the state-of-the-art chemical-transport model CLaMS and the climate-chemistry model EMAC and discuss the capability of these models to reproduce nitrification of the Arctic LMS.