



Probing the UTLS from 65°S to 80°N with GLORIA

Hermann Oelhaf (1), Peter Preusse (1), Felix Friedl-Vallon (1), and the GLORIA-Team Team

(1) Institut für Meteorologie und Klimaforschung (IMK), Karlsruher Institut für Technologie (KIT), Karlsruhe, Germany , (2) Institut für Energie und Klimaforschung - Stratosphäre (IEK), Forschungszentrum Jülich (FZJ), Jülich, Germany

GLORIA (Gimballed Limb Observer for Radiance Imaging of the Atmosphere) is a newly developed unique instrument that bridges the gap from scanning to imaging in the Infrared spectral domain. This is realized by combining a classical Fourier transform spectrometer (FTS) with a 2-D detector array. Imaging allows the spatial sampling to be improved by up to an order of magnitude when compared to a limb scanning instrument. GLORIA is designed to operate on various high altitude research platforms. The instrument is a joint development of the Helmholtz Large Research Facilities Karlsruhe Institute of Technology (KIT) and Research Centre Jülich (FZJ). Atmospheric quantities to be measured are Temperature, H₂O, HDO, O₃, N₂O, CH₄, CFCs, HNO₃, ClONO₂ and some minor species indicating biomass burning and pollution, along with cloud distribution. A unique property of GLORIA measurements is the provision of well-resolved 2D-cross sections ('curtains') of atmospheric parameters along the flight path of the airplane or even 3D fields of trace species when dedicated flight patterns are carried out making use of tomographic approaches. These capabilities are a valuable added value to missions that are primarily equipped with in-situ instruments since it complements the vertical domain to the measurements taken by in-situ instruments on the flight level.

In August and September 2012 GLORIA was an integral part of the first large atmospheric research missions TACTS and ESMVAL with the German research aircraft HALO. The recorded data spanning latitudes from 80°N to 65°S form a unique treasure which allows to study a number of scientific questions, such as exchange of air between stratosphere and troposphere, outflow of biomass burning products from the African continent to the Sea, dehydration and hydration of Antarctic vortex air, and signals of pollution in air outflowing from Asia over the Arabian Sea. Processing and scientific analysis of data from more than 100 flight hours is in progress.

The paper will provide a brief overview of the instrument essentials and highlight some results addressing various issues of UTLS research based on data collected during the TACTS/ESMVAL campaigns.