

3D tomographic measurements of gravity waves with the IR limb imager GLORIA during GW-LCYCLE

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Gravity waves (GWs) are one of the most important coupling mechanisms in the atmosphere. They couple different compartments of the atmosphere. The GW-LCYCLE (Gravity Wave Life Cycle) project aims on studying the excitation, propagation, and dissipation of gravity waves. An aircraft campaign has been performed in winter 2015/2016, during which the first 3D tomographic measurements of GWs were performed with the infrared limb imager GLORIA (Gimballed Limb Observer for Radiance Imaging of the Atmosphere).

GLORIA is a joint development of the Helmholtz Research Centers Karlsruher Institut für Technologie (KIT) and Forschungszentrum Jülich (FZJ) and combines a classical Fourier Transform Spectrometer with a 2D detector array. The capability to image the atmosphere and thereby take several thousand spectra simultaneously improves the spatial sampling compared to conventional limb sounders by an order of magnitude. Furthermore GLORIA is able to pan the horizontal viewing direction and therefore measure the same volume of air under different angles. Due to these properties tomographic methods can be used to derive 3D temperature and tracer fields with spatial resolutions of better than 30km x 30km x 300m from measurements taken during circular flight patterns.

Temperature distributions measured during the GW-LCYCLE campaign will be presented and analyzed for gravity waves. The full three dimensional wave vector and amplitude will be determined. Gravity wave momentum flux and its horizontal direction will be calculated from the measurements. The gravity wave events will be discussed in terms of sources and upward propagation into the middle stratosphere. Furthermore the measurements will be compared to ECMWF analysis data.

Key words: gravity waves, remote sensing, aircraft campaign, ray-tracing, tomography