



## Deep vertical propagation of mountain waves above Scandinavia

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The project "Investigation of the life cycle of gravity waves (GW-LCYCLE) is part of the German research initiative ROMIC (Role of the Middle atmosphere In Climate) funded by the ministry of research. In close cooperation with Scandinavian partners as the Stockholm University and the Finnish Meteorological Institute a first field phase was conducted in November/December 2013. The field program combined ground-based observations of tropospheric and lower stratospheric flow and stratospheric and mesospheric temperature by lidars and radars at Alomar (N) and at ESRANGE (S) with airborne and balloonborne observations. Northern Scandinavia was chosen since the westerly flow across the mountains is often aligned with the polar night jet permitting gravity waves (GWs) to propagate into the middle atmosphere.

From 2 until 14 December 2013, 24 hours of the DLR Falcon flown in four intensive observing periods (IOPs) provided in-situ and remote-sensing observations of atmospheric wind, temperature, water vapour and other trace gases (e.g. CO, N<sub>2</sub>O, O<sub>3</sub>) in the vicinity of the tropopause. During three IOPs, the airborne observations were supported by 3 hourly simultaneous radiosonde launches from Andøya (N), ESRANGE (S) and Sodankylä (FIN). Additionally, 1.5 hourly high-frequency radiosonde launches were conducted from the Arena Arctica at Kiruna airport with two systems (Väisälä and GRAW) and different balloon fillings to obtain different ascent rates.

During GW-LCYCLE, the atmospheric flow above the Scandinavian mountains was observed under distinct meteorological conditions enabling or attenuating the deep vertical propagation of mountain-induced gravity waves. The presentation juxtaposes two different cases and analyses the associated meteorological conditions. The unique combination of airborne tropospheric wind lidar measurements, flight level data, high-frequency radiosonde profiles and the ground-based lidar observations allow a comprehensive study of deeply propagating gravity waves from the Earth's surface to the mesosphere.