Gravity Wave Observations using the GRIPS Spectrometers: A Case Study

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Gravity waves play a prominent role in our understanding of atmospheric dynamics through carrying energy and momentum. There are numerous sources in the upper and lower atmosphere generating gravity waves. The waves often propagate vertically through the atmosphere and can affect the OH* emission layer in the mesopause region (around 87 km). Measurements of the OH*-airglow are therefore well suited to study gravity waves. Two case studies illustrating the potential of the GRIPS (Ground-based Infrared P-branch Spectrometer) system to quantify gravity wave parameters are presented.

Observations of the GRIPS 1 instrument located at the Meteorological Observatory Hohenpeissenberg, Germany (48°N/11°E) and the GRIPS 3 instrument at the German Environmental Research Station Schneefernerhaus, Zugspitze (47.4°N/11°E) are used to study gravity waves in the alpine region. A case study estimating the gravity wave parameters is presented.

The mobile spectrometer GRIPS 4 recorded a gravity wave event in the Bay of Biscay during the night of 15/16 October 2005 on its trip with the German research vessel 'Polarstern' during the expedition ANTXXIII/1 from Bremerhaven (54°N/9°E) to Cape Town (34°S/19°E). At the same time period AVHRR composites indicate gravity wave structures in the water vapour in the troposphere. Additionally, vertical profiles of temperature, wind and ozone derived by radio- and ozonesondes during the 'Polarstern' cruise show similar wave signals. A convective cloud cluster centred south-western of Iceland could be identified as the most likely source of these waves.