



Intercomparison of stratospheric gravity wave observations with AIRS and IASI

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Gravity waves are an important driver for the atmospheric circulation and have substantial impact on weather and climate. Satellite instruments offer excellent opportunities to study gravity waves on a global scale. This study focuses on observations from the Atmospheric Infrared Sounder (AIRS) onboard the National Aeronautics and Space Administration's Aqua satellite and the Infrared Atmospheric Sounding Interferometer (IASI) onboard the European MetOp satellites. The main aim of this study is an intercomparison of stratospheric gravity wave observations of both instruments. In particular, we analyzed AIRS and IASI $4.3 \mu\text{m}$ brightness temperature measurements, which directly relate to stratospheric temperature. Three case studies showed that AIRS and IASI provide a clear and consistent picture of the temporal development of individual gravity wave events. Statistical comparisons based on a five-year period of measurements (2008 – 2012) showed similar spatial and temporal patterns of gravity wave activity. However, the statistical comparisons also revealed systematic differences of variances between AIRS and IASI that we attribute to the different spatial measurement characteristics of both instruments. We also found differences between day- and nighttime data that are partly due to the local time variations of the gravity wave sources. While AIRS has been used successfully in many previous gravity wave studies, IASI data are applied here for the first time for that purpose. Our study shows that gravity wave observations from different hyperspectral infrared sounders such as AIRS and IASI can be directly related to each other, if instrument-specific characteristics such as different noise levels and spatial resolution and sampling are carefully considered. The ability to combine observations from different satellites provides an opportunity to create a long-term record, which is an exciting prospect for future climatological studies of stratospheric gravity wave activity.

Reference: Hoffmann, L., Alexander, M. J., Clerbaux, C., Grimsdell, A. W., Meyer, C. I., Rößler, T., and Tournier, B.: Intercomparison of stratospheric gravity wave observations with AIRS and IASI, *Atmos. Meas. Tech. Discuss.*, 7, 8415-8464, doi:10.5194/amtd-7-8415-2014, 2014.