# A novel method for the extraction of local gravity wave parameters: description, validation and application

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Mesoscale gravity waves contribute to the vertical coupling in the middle atmosphere and require an adequate detection of wave packets. A novel method for the local diagnosis of wave properties is introduced. The method named "Unified Wave Diagnosis" (UWaDi) is based on the Hilbert transform and provides the wave amplitude and three-dimensional wave number at any grid point for gridded three-dimensional data. In comparison with other wave diagnosing methodologies UWaDi shows the best agreements for a synthetic test case.

To give an impression of the applicability of UWaDi, a minor sudden stratospheric warming on 30 January 2016 is analysed. We diagnose hydrostatic inertia-gravity waves in analyses of the European Centre for Medium-Range Weather Forecasts and find local inertia-gravity wave generation by spontaneous imbalance in the exit region of the stratospheric jet.

With this new method we will provide spatial and temporal gravity wave distributions by diagnosing the results from the gravity wave resolving Kühlungsborn Mechanistic general Circulation Model (KMCM). Thereby, we focus on secondary gravity waves generated at the altitude of the stratospheric jet due to breaking of primary gravity waves.

Key words: Hilbert Transform, sudden stratospheric warming, spontaneous imbalance, secondary gravity waves