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Non-linear Resonant Wave-wave Interaction (Triad): Case Studies Based on Rocket and Satellite Data

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It is well known, that gravity waves have significant influence on circulation and thermal structure of the atmosphere by transporting energy and momentum. Knowledge about their sources, energy dissipation rates or the amount of energy which is transferred via nonlinear wave-wave interaction is essential.

Using ozone data derived from GOME, regions of high variability (so called hotspots) were identified and are supposed to generate gravity waves. In this context, knowledge about occurrence of nonlinear resonant 3-wave interaction (triad) is important. A case study of a triad of data with a high spatial resolution which were derived during DYANA campaign is presented. The improved methods of the case study are applied to GOMOS data of a hotspot.

During DYANA campaign four foil chaff and three falling sphere rockets were flown at Biscarrosse (44˚N, 1˚E) on 20^{th} February 1990. By using cubic splines the wind data are detrended and gravity wave signals of wavelength from ca. 0.4 km to 2.6 km are obtained as residuals.

Maximum entropy method (MEM) in combination with former wavelet analysis shows nearly the same five wavelengths in all four flights in a height interval of 4 to 6 km. The problem of determining the right order of MEM is solved by an experimental criterion. By means of bispectral and hodograph analysis indication for nonlinear resonant 3-wave interactions is found. Energy dissipation rates are derived by using falling sphere experiments. Furthermore hints for an atmospheric wave guide are found. In a first case study parts of the improved methods are applied to GOMOS ozone measurements also revealing nonlinear processes.