



Local diagnosis of gravity wave propagation during different background wind conditions

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A new method to diagnose gravity wave properties of a 3-dimensional data set is introduced. Based on the Hilbert transform the amplitude and 3-dimensional wave number is provided on every grid point with the possibility to analyze wave propagation locally.

As an exemplary case study two situations with different wind conditions in early 2016 are chosen from ECMWF reanalysis data. These situations are analyzed for vertical gravity wave propagation. During a minor sudden stratospheric warming event gravity waves propagate from the tropopause into the lower stratosphere up to the wind reversal. There the gravity wave becomes shallower and it is absorbed. During strong westerly wind conditions gravity wave action indicates wave propagation to higher altitudes and damping by the model sponge layer leading to no gravity wave signals above about 50 km. Local and zonally averaged results show that consideration of the wave energy may mislead the interpretation of gravity wave behavior due to its dependence on density and background wind. The wave action is highlighted as a better measure for gravity wave propagation.