

RECONSTRUCTION OF INTERNAL GRAVITY WAVE PARAMETERS FROM RADIO OCCULTATION RETRIEVALS OF VERTICAL TEMPERATURE PROFILES IN THE EARTH ATMOSPHERE

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The new method for the reconstruction of internal gravity wave (IGW) parameters from a single vertical temperature profile measurement in the Earth atmosphere has been developed. This method does not require any additional information not contained in the profile and may be used for the analysis of profiles measured by various techniques. The criterion for the IGW identification has been formulated and argued. In the case when this criterion is satisfied, then analyzed temperature fluctuations can be considered as wave-induced. The method is based on the analysis of relative amplitude thresholds of the temperature wave field and on the linear IGW saturation theory in which amplitude thresholds are restricted by dynamical (shear) instability processes in the atmosphere. When the amplitude of an internal gravity wave reaches the shear instability limit, energy is assumed to be dissipated in such a way that the amplitude is maintained at the instability limit as the wave propagates upwards. In order to appraise the method we have used in situ data of simultaneous balloon high-resolution measurements of the temperature and wind velocity in the Earth stratosphere (France) where a long-period inertia-gravity wave has been detected. Using the temperature data only, we have reconstructed all the measured wave parameters with uncertainties not larger than 30%. An application of the method to the radio occultation data has given the possibility to identify the IGW in the Earth stratosphere and to determine the magnitudes of key wave parameters such as the intrinsic frequency, amplitudes of vertical and horizontal perturbations of the wind velocity, vertical and horizontal wavelengths, intrinsic vertical and horizontal phase (or group) speeds, kinetic and potential energy, vertical fluxes of the wave energy and horizontal momentum. The obtained results of internal wave studies in the Earth stratosphere deduced from the COSMIC, GRACE and CHAMP GPS occultation temperature profiles have been presented and discussed.