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Geographical Distribution of Potential and Kinetic Energy of Internal Waves in the Atmosphere found from CHAMP and FORMOSAT3 Radio Occultation Data

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The radio occultation (RO) method, which employs the high-precision global positioning system (GPS) signals, allows one to determine the vertical gradients of refractivity and monitoring wave structures in the atmosphere on a global scale in the altitude range from 10 to 40 km. The results of analysis of data corresponding to Challenging Minisatellite Payload (CHAMP) and FORMOSAT3 RO events are presented. We introduce a new technique based on simultaneous analysis of the phase and amplitude variations of RO signal. This technique allows one to reveal contribution of the layered structures corresponding to internal atmospheric waves and separate it from the turbulence effect on the phase and amplitude variations in the RO signal. We found wave clusters in the amplitude and phase variations of RO signal with interior vertical periods from 0.8 to 4 km in the tropopause and lower stratosphere at the heights from 15-40 km (low latitudes) to 10-25 km (moderate latitudes). We demonstrate that the amplitude and phase variations of RO signal can be considered as a radio-holographic image of wave structures in the atmosphere. For internal gravity waves (GW). We show that the GW dispersion and polarization relationships allow one to estimate the vertical profile of the horizontal wind perturbations, its gradient and the GW intrinsic phase speed. Then the geographical distribution of the potential and kinetic energy of IGW has been obtained with a global coverage. In general case, when the origin and

type of internal waves are not known, the height dependence of the vertical gradient of refractivity can be applied for monitoring the seasonal and geographical distributions of wave activity at different levels in the atmosphere.