NEW APPLICATIONS AND ADVANCES OF THE GPS RADIO OCCULTATION TECHNOLOGY AS RECOVERED BY ANALYSIS OF THE FORMOSAT-3 AND CHAMP DATABASE

A. G. Pavelyev*(1), Y. A. Liou (2), J. Wickert (3), T. Schmidt (3), A. A. Pavelyev (1), and V. N. Gubenko (1)

(1) Institute of Radio Engineering and Electronics, Russian Acad. of Sciences (IRE-RAS), Fryazino, Moscow region, Russia (2) Center for Space and Remote Sensing Research, National Central University, Chung-Li, Taiwan (3) GeoForschungsZentrum (GFZ) Potsdam, Potsdam, Germany

We show that the high-precision and stable signals emitted by Global Positioning navigational System (GPS) satellites create favorable conditions both for radio holographic monitoring of the atmosphere, ionosphere and terrestrial surface and for investigation of the radio wave propagation effects in the transionospheric satellite to satellite links. Comparative analysis of the phase and amplitude variations of the GPS radio-holograms allows one to separate influence of the layered and irregular structures. This analysis can be applied to study the spatial and seasonal distributions of the internal wave at different altitude in the atmosphere and ionosphere with a global coverage. A possibility exists to measure important parameters of the internal waves: the intrinsic phase speed, the horizontal wind perturbations and, under some assumptions, the intrinsic frequency as functions of height in the atmosphere. A new technique has been applied to measurements provided during CHAllenging Minisatellite Payload (CHAMP) and the Formosa Satellite-3 and Constellation Observing System for Meteorology, Ionosphere, and Climate (FORMOSAT-3/COSMIC) radio occultation (RO) missions. As an example of this approach, we establish the atmospheric origin of the amplitude and phase variations in RO signal at the altitudes 10 km. We observed in the first time in the RO practice examples of the internal wave breaking at the altitudes between 38 and 50 km. We obtained the geographical distributions and seasonal dependence of the atmospheric wave activity with global coverage for period 2001 - 2006 years and revealed an asymmetry in distribution of the wave activity at the 12 km level in the atmosphere. The maximal wave activity occurs in the summer polar region. At the 14 km level the wave activity is centered in the moderate latitudes both in the Northern and Southern Hemispheres. At 18 and 20 km levels, most of the internal wave activity is concentrated in the equatorial areas. The local seasonal dependences are clear for some regions, e.g. Siberia at the height of 14 km in the winter, with a low wave activity and a high wave activity in the summer.