Geophysical Research Abstracts,
Vol. 11, EGU2009-6601, 2009
EGU General Assembly 2009

Phase acceleration: a new important parameter in GPS occultation monitoring of the atmospheric internal waves

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

(1) Kotelnikov' Institute of Radio Engineering RAS, Fryazino, Russian Federation (pvlv@ms.ire.rssi.ru), (2) Center for Space and Remote Sensing Research, National Central University, Chung-Li, Taiwan (yueian@csrsr.ncu.edu.tw), (3) GeoForschungsZentrum Potsdam (GFZ-Potsdam), Telegrafenberg, 14473 Potsdam Germany (wickert@gfz-potsdam.de)

After forty years of radio occultation (RO) experiments it is clear now that the phase acceleration of radio waves has the same importance as the Doppler frequency. This was shown by use of analysis of high-stability GPS RO signals. Phase acceleration technique allows one to convert the phase and Doppler frequency changes to the refraction attenuation variations. From the derived refraction attenuation one can estimate the integral absorption of radio waves by use of the amplitude data. This is important for measurement of water vapor and minor atmospheric gas constituents in future RO missions because of excluding the difficulty with removing the refraction attenuation effect from the amplitude data. Phase acceleration/intensity technique can be applied to separate the influence of layered structures from contributions of irregularities and turbulence in the atmosphere and ionosphere. Phase acceleration/intensity technique can be applied also for location and determination of the height and inclination of the layered structures in the atmosphere and ionosphere. In many cases the layered structures in the atmosphere indicate quasi-periodical altitude dependence that reveals their wave origin. The altitude profile of the vertical gradient of refractivity of the layered structures can be used to find the main characteristics of the internal wave activity with a global coverage. In general case, when the 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. In the case of the internal gravity waves (GW) one can measure important GW parameters by use of the vertical profile of the refractivity: the intrinsic phase speed, the horizontal wind perturbations and, under some assumptions, the intrinsic frequency as functions of height in the atmosphere. Advantages of the phase acceleration/intensity technique for GPS occultation mopnitoring of the atmospheric internal waves are validated by means of analysis of the Challenging Minisatellite Payload (CHAMP) and the FORMOSA Satellite Constellation Observing Systems for Meteorology, Ionosphere, and Climate mission (FORMOSAT-3/COSMIC) RO data.