Geophysical Research Abstracts, Vol. 7, 00660, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00660

1 Characteristics of the internal gravity waves in the middle atmosphere obtained from analysis of the GPS occultation data

A.G. Pavelyev[1,2], Y.A. Liou[2], J. Wickert[3], V.N. Gubenko[1]

[1]Institute of Radio Engineering and Electronics of Russian Academy of Sciences, (IRE RAS), Fryazino, Vvedenskogo sq. 1, 141190 Moscow region, Russia. E-mail *pvlv@ms.ire.rssi.ru*
Fax: +7 095 203 8414
[2]Center for Space and Remote Sensing Research, National Central University, Chung-Li 320, Taiwan.
E-mail: *yueian@csrsr.ncu.edu.tw*. Tel: (03) 4227151 ext 7631. Fax: (03) 4254908.
[3]GeoForschungsZentrum Potsdam (GFZ-Potsdam), Telegrafenberg, 14473 Potsdam Germany.
E-mail: *wickert@gfz-potsdam.de* Phone: +49- 331-288-1168; Fax: +49-331-288-1169

Internal gravity waves (GW) play a decisive role in affecting the atmospheric circulation and temperature. For theoretical studies of the GW phenomena it is important to have the experimental data showing the phase and amplitude dependence of the GW on height with global coverage. This raises the problem of insufficient data for establishing wave climatology, despite the good results from many of the ground-based and space-borne instruments.

The Global Positioning System (GPS) signals registered during the radio occultation (RO) experiments are important source of information for studying the wave processes in the atmosphere and mesosphere. The amplitude variations in the GPS signals can be considered as the 1-D radio holographic image of the waves in the 5-80 km height interval. The current theory of the internal gravity waves (GW) is considered with the goal to be applied for the RO data analysis. It follows, that the GW polarization relationships can be used for the RO data analysis if the frequency of GW is far above the inertial frequency and far below the Brunt-Vaisala frequency. A new polarization relationship is found which connects the relative variations of the refraction index with horizontal wind perturbations caused by GW propagation. The GW polarization and dispersion relationships and the Hilbert transform are used to find the 1-D GW radio images in the atmosphere by analysing the amplitude radio holograms of the RO signals. The radio image, also called the GW portrait, consists of the phase and amplitude of the GW as functions of height. Analysis of the GW radio images has shown the possibility to reveal locations of GW breaking regions in the stratosphere. The GW activity is non-uniformly distributed with the main contribution associated with the upper troposphere and lower stratosphere in the 8-40 km interval. The height dependence of the GW vertical wavelength was inferred through the differentiation of the GW phase. Analysis of this dependence using the GW dispersion relationship gives estimation of the GW intrinsic phase speed. Comparison of the horizontal wind perturbations obtained from the amplitude data analysis with radiosondes data revealed good correspondence. It follows that the GPS signals can be used as a high-precision tool for establishing wave climatology in the middle atmosphere with global coverage.