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Atmospheric Measurement Techniques Discussions

Interactive comment on "Analysis of internal gravity waves with GPS RO density profiles" *by* P. Šácha et al.

Anonymous Referee #2

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Reply to paper Analysis of Internal Gravity Waves with GPS RO density profiles

By P. Šácha, U. Foelsche, P. Pišoft

I. General impression. The manuscript applied an original separation method for analysis of the GPS radio occultation (RO) data based on the theoretical approach introduced previously for description density response of neutral atmospheric layers to internal gravity wave (IGW) perturbations (Gardner, C.S. and Shelton, J.D., 1985). The Authors introduce various approximations for background and then considered a small remaining part as an IGW contribution in the density variations. The Authors used a main parameter – similar to Brunt-Vaissala or buoyancy frequency – determined in equations (3)-(5) and (13). The Authors obtain from GPS RO data vertical density

profiles, a mean vertical wave-number power spectrum and other parameters of IGW without hydrostatic approximation. Various background density and temperature vertical profiles choices are discussed and their correspondence is examined in analytical forms for density perturbations. The mean vertical wave-number power spectra are found for a sample of sixty profiles and further compared with the theoretical shape of saturated spectrum. In the 8 km – 40 km altitude interval results of the continuous wavelet transform of the vertical density profiles perturbations are presented and discussed. The Authors concluded that analysis of IGWs with the GPS RO density profiles is not restricted to hydrostatic waves, this is a main advantage of the new approach over the old complex methods of revealing the IGW parameters from dry temperature profiles. Therefore the manuscript contains important new information appropriate for publication after minor corrections.

II. Remarks and suggestions 1. Page 8319 Lines 5-7. The Authors stated (Page 8319 Lines 5-7): "The dry temperature profile of this event is depicted in Fig. 2, note the inversion layer around 10 km altitude and the significantly perturbed tropopause. . ." and then (Page 8323 Lines 15-20). . ."Taking into account the temperature profile shown in Fig. 2, we can see in Fig. 1b that the tropopause (around 18 km) does not cause enhancement of the gravity wave activity unlike the inversion layer around 10 km altitude (which causes serious problems to our method)"... These sentences contain some contradiction. It is not clear is the inversion layer only a part of IGW or this layer is a background meteorological phenomenon separating two air masses with different characteristics. 2. Page 8316 Line 4; Page 8317 Line 2 Printed: (Gardner, 1989) Should be: (Gardner et al., 1989) 3. Page 8329 Lines 25-28 Printed: Gardner, C. S.: Rayleigh and sodium lidar techniques for measuring middle atmosphere density, temperature and wind perturbations and their spectra, University of Illinois, Urbana-Champaign, 1989. Should be: Gardner, C. S., Senft, D.C., Beatty, T.J., Bills, R.E., and Hostetler, C.A.: Rayleigh and sodium lidar techniques for measuring middle atmosphere density, temperature and wind perturbations and their spectra, in: World Ionosphere/Thermosphere Study. Volume 2. Edited by C.H. Liu. Chapter 6. Pp.

148-187. University of Illinois, 1406 W. Green St., Urbana, Illinois 61801. December 1989. 4. Pages 8330-8331 Lines 32,33; 1,2. Printed: Pavelyev, A. G., Liou, Y. A., Wickert, J., Gubenko, V. N., Pavelyev, A. A., and Matyugov, S. S.:New applications and advances of the GPS radio occultation technology as recovered by analysis of the FORMOSAT-3/COSMIC and CHAMP data-base, Springer, Berlin Heidelberg,165–178, 2009. Should be: Pavelyev, A. G., Liou, Y. A., Wickert, J., Gubenko, V. N., Pavelyev, A. A., and Matyugov, S. S.: New Applications and Advances of the GPS Radio Occultation Technology as Recovered by Analysis of the FORMOSAT-3/COSMIC and CHAMP Data-Base, in New Horizons in Occultation Research. Studies in Atmosphere and Climate. Editors: Andrea Steiner âĂć Barbara Pirscher âĂćUlrich Foelsche âĂć Gottfried Kirchengast. Berlin Heidelberg. p. 165-178. 2009.

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/7/C2536/2014/amtd-7-C2536-2014-supplement.pdf

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 8311, 2014.