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Atmospheric Measurement Techniques Discussions

Interactive comment on "Reconstruction of internal gravity wave parameters from radio occultation retrievals of vertical temperature profiles in the Earth atmosphere" *by* V. N. Gubenko et al.

Anonymous Referee #1

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Review of 'Reconstruction of internal gravity wave parameters from radio occultation retrievals of vertical temperature profiles in the Earth atmosphere' by Gubenko et al., submitted to AMTD.

This paper presents a novel technique for determining parameters of internal gravity waves using only temperature profiles obtained from GPS radio occultations (RO). The method is derived from the basic dispersion and polarisation relations. The authors compare their derived internal gravity wave parameters with an example from a high-resolution balloon flight in France, as well as deriving parameters for four GPS profiles.

The paper may become suitable for publication in AMT following implementation of the following points.

Major Comments:

1) The text in Section 2 ("Theoretical relationships") and Section 3 ("Identification of IGWs and determination of wave parameters", down to Equation 22) appears to be copied verbatim from Gubenko et al. (JGR 2008). I do not think it appropriate that this full derivation be republished in another journal and I strongly suggest removal of these sections. In the current AMTD manuscript, the authors could summarise in a couple of paragraphs the key equations needed subsequently in this AMTD manuscript and then refer the reader to Gubenko et al. (JGR 2008) for the full derivation. The equations from Equation 23 onward are new, so could be kept in a re-worked, very much shortened section.

2) Comparisons with parameters derived from GPS-RO needs to be improved. Probably the best way to do this is to compare the results from GPS-RO with nearby radiosonde results. In Figures 1 – 4, the authors have chosen four GPS profiles in the middle or high latitudes and provided the IGW parameters in Table 1. I suggest that the authors remove these figures and this table, and instead provide three examples of GPS profiles, one in the polar latitudes, one in the middle latitudes and one in the tropical latitudes. In each case, the authors should compare their derived parameters with those derived by radiosondes which also measure the winds, i.e. choose GPS profiles to be close in space and time to radiosonde results where an IGW is clearly visible in the radiosonde data. Doing this comparison at the polar, mid- and tropical latitudes would significantly strengthen the results of the paper and demonstrate the technique's validity across a wide range of latitudes.

3) Page 1400, line 6. The authors may find the papers by McDonald et al. (JGR 2009) and Wang and Alexander (JGR 2010) useful because these papers discuss the horizontal wavelengths and spatial separations of COSMIC GPS-RO. Wang & Alexander

derive COSMIC GPS-RO momentum fluxes and horizontal propagation directions.

Grammar, spelling:

1) Throughout the paper (and in the title), please change from ‘Earth atmosphere’ and ‘Earth stratosphere’ to ‘Earth’s atmosphere’ or ‘Earth’s stratosphere’ – the apostrophe is required.

2) Page 1398, line 2: ‘A new method for. . .’

3) Page 1405, line 19: ‘in the lower stratosphere’

4) Page 1409, line 11 ‘With the determined wave parameters which were considered. . .’

References:

Gubenko, V. N., A. G. Pavelyev, and V. E. Andreev (2008), Determination of the intrinsic frequency and other wave parameters from a single vertical temperature or density profile measurement, J. Geophys. Res., 113, D08109, doi:10.1029/2007JD008920.

Wang, L., and M. J. Alexander (2010), Global estimates of gravity wave parameters from GPS radio occultation temperature data, J. Geophys. Res., 115, D21122, doi:10.1029/2010JD013860

McDonald, A. J., B. Tan, and X. Chu (2010), Role of gravity waves in the spatial and temporal variability of stratospheric temperature measured by COSMIC/FORMOSATâĂŘ3 and Rayleigh lidar observations, J. Geophys. Res., 115, D19128, doi:10.1029/2009JD013658

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 1397, 2011.