Final Author Comments to Anonymous Referee #1 comments 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.**

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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 polarization 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.

In this paper we did not attempt to compare derived internal gravity wave parameters for four GPS profiles with an example from a high-resolution balloon flight in France. These simultaneous temperature and wind velocity measurements obtained in a high-resolution balloon experiment (Cot and Barat, 1986) were used by us for the experimental ***verification*** *and* ***validation of*** *our IGW parameters reconstruction* ***technique*** *(see text on p.1401, 1411 and 1412, and Table 1). Cot and Barat (1986) identified an inertia-gravity wave propagating upwards using a wind velocity hodograph analysis. For the determination of IGW parameters from the basic dispersion and polarization relations they utilized not only the wind velocity data but temperature data also. Using the temperature data only, we independently identified the same wave and reconstructed the IGW parameters determined by Cot and Barat (1986) with relative deviations not larger than 31% (see Table 1). We suppose that the simultaneous high-resolution radiosonde wind velocity and temperature data are most appropriate for the further examinations of the technique's validity.*

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.

In accordance with your remark the text in Section 2 and 3 will be removed. In a re-worked, very shortened section the needed key equations will be summarized in a couple of paragraphs, and the new equations will be kept.

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.

Radiosonde soundings consist of point measurements while RO soundings represent averages over finite volumes of the atmosphere and hence there are significant interpretation difficulties when the two types of soundings are compared. Moreover, the validation studies (Kitchen, 1989; Sofieva et al., 2008) indicate that separations of less than a few tens of kilometers and 1 or 2 hours are necessary for useful comparisons between point measurement instruments. This implies that profiles should be almost exactly collocated in time and space for validation of high-resolution profiles. It is quite hardly to get from the CDAAC website the radiosonde data collocated in time and space with RO data where an IGW is clearly visible. Note also that at the tropical latitudes our IGW parameters reconstruction technique is not valid because the f-plane approximation does not take place here. We suggest that the determination of the IGW parameters, including wave energies and fluxes (see Table 2), from individual vertical temperature profiles is an important point, and we decided to leave the paper as is on this matter.

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.

Thank you for the interesting and useful papers by McDonald et al. (2010), and Wang and Alexander (2010). They will be discussed in a re-worked paper and will be included in the references.

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.

OK

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

OK

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

OK

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

OK

References:

Cot, C., and J. Barat (1986), Wave-turbulence interaction in the stratosphere: A case study, J. Geophys. Res., 91, D2, 2749–2756.

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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/FORMOSAT-3 and Rayleigh lidar observations, J. Geophys. Res., 115, D19128, doi:10.1029/2009JD013658.

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