**Referee #2, Vladimir Gubenko**

**Aswers to the comments of Dr. Vladimir Gubenko**

**This paper presents an attempt to overcome the inconsistency of hodograph method when retrieving the internal wave parameters from radiosonde measurements. It seems to me that the description of scientific methods and theoretical expressions used for calculations of wave characteristics and their uncertainties needs to be strongly improved. For this reason, I would advice MAJOR REVISION as the Anonymous referee #1, also. The paper may become suitable for publication in ACP following implementation of the following points.**

**Major Comments:**

1. **Page 3, line 75. The values v' and u', in your Eq. 1, are not the meridional and zonal wind fluctuations, respectively. The values u' and v' are the complex perturbations for parallel and perpendicular components of wave-induced horizontal wind speed to the wave propagation direction [see for details, for example, Gubenko et al. (2008, JGR, p. 2); Gubenko et al. (2011, AMT, p. 2155); Gubenko et al. (2012, Cosm. Res., p. 22)]. Hu et al. (2002, GRL, p. 1) designate u' as the in-phase wind along the wave propagation direction, and v' as quadrature-phase wind perpendicular to the wave propagation direction.**

**1A.** We have followed the age old method of hodographic analysis. 'u' and 'v' are the profiles of zonal and meridional winds. Height variations of u and v are the profiles of zonal (E – W) and meridional (N – S) velocities only. Please refer to Tsuda et al 1994, (JGR, pg. 10508). "Gravity wave components were extracted…contour plots". Hodographs are plotted with these filtered eastward (zonal wind) and northward (meridional wind) components which are u' and v'. In page 10509, " The lengths of major and minor axes of an ellipse u' - v' correspond to the amplitude of wind velocity fluctuations due to gravity wave", and the formulae follows. Please check the above mentioned paper. The gravity wave fluctuations are normally computed in this manner from measure wind profiles. I am giving you two examples Dutta et al., 2008, JGR and Dutta et al., 2009, JGR. We followed the same procedure to extract gravity wave components.

2. **Page 3, line 77. Your Eq. 2 is wrong. The valid expression for the calculation of the inertial frequency f is following (Gubenko et al., 2008, JGR, p. 1). $f = 2\Omega \sin \phi$, where $\Omega = 7.292 \times 10\text{-}5$ rad/s is the Earth's rotation rate, and $\phi$ is latitude.**

**2A.** Earth's rotation rate ($\Omega$) can be calculated as

$$\Omega = \frac{1}{T} cycles / \sec$$

where 'T' is time period of Earth's rotation (=1day).

According to equation (3) of our paper,

$$f = \frac{\sin\varphi}{\frac{1}{2}day}$$

$$f = \frac{2\sin\varphi}{1day}$$

$$f = \frac{2\sin\varphi}{T}$$

$$f = 2\Omega\sin\varphi \qquad (\because {}^{1}\!/_{T} = \Omega)$$

which is the same equation that you have mentioned.

3. **Page 3, line 79. Your Eq. 3 is wrong. In the work of Gubenko et al. (2012, Cosm. Res., p. 23), the dispersion equation in the interval of intermediate intrinsic frequencies ($f^2 << \omega^2 << N^2$) is given: $|k| = \omega |m| / N$. If we use this expression to calculate the value |k|, then calculated values of horizontal wave number |k| will be systematically overestimated by factor $(1 - f^2/\omega^2)^{1/2}$. This is connected with fact that the appropriate dispersion equation that is valid for internal waves with both low and intermediate intrinsic frequencies ($f^2 < \omega^2 << N^2$) has form (Gubenko et al. 2012, Cosm. Res., p. 23): $|k| = (1 - f^2/\omega^2)^{1/2} \times \omega |m| / N$. For this reason, the obtained results about horizontal wavelengths and wave numbers must be recalculated.**

**3A.** We thank Dr. Gubenko for pointing out this small mistake and giving his important reference paper. We have incorporated the correction factor which improved the quality of the paper.

4. **Page 3, lines 86–87. You state that the final direction of wave propagation was calculated by using hodographs u' – v' and u' – t' (Hu et al., 2002). I don't understand your method, because Hu et al. (2002, GRL, p. 1) use for that the hodographs of the zonal wind versus meridional wind, and the in-phase wind versus temperature.**

**4A.** Yes we have done with in-phase wind and temperature. But there is no clarification given in the paper. So now we have incorporated this clarification.

**<u>Minor Comments:</u>**

1. **Page 2, line 71. For zonal and meridional perturbations it is necessary to introduce another symbols, for example, $u_{we}$' and $u_{sn}$'**

**1A.** u' and v' are zonal (E – W) and meridional (N – S) wind fluctuations for us. We use in-phase wind and temperature perturbations in the other hodographs (Figure 7). It is not necessary to introduce the new symbols.

**References:**


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