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Atmospheric Measurement Techniques Discussions

Interactive comment on "Removing spurious inertial instability signals from gravity wave temperature perturbations using spectral filtering methods" *by* Cornelia Strube et al.

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Dear Dr. Šácha,

thank you very much for your valuable comments on our article. We have corrected our mistake in citation and addressed your specific questions in more detail below.

Yours sincerely,

Cornelia Strube

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Discussion paper

- *[...]I just noticed that on P3L63 you reference Šácha et al. (2016), but it should be either Šácha et al. (2015) or Šácha et al. (2014), which are observational studies.[...]*

  Sorry for the wrong citation, we meant to refer to Šácha et al. (2014) here. We have adjusted this and added the second citation as well.

- *1) When using some simple form of vertical background separation (e.g. polynomial fit) is it possible to identify the potential presence of the inertial instability signal in the data from analysis of the vertical wavenumber power spectrum density of disturbances? I.e.as long as the spectrum slope follows the theoretical saturated GW spectrum, then weare on the safe side?*

  The critical vertical wavenumber separating the saturated and unsaturated part of the vertical wavenumber spectrum is rather short in the stratosphere, corresponding to about 3 km vertical wavelength (Smith et al., 1987; Dewan et al., 1984; Thomas et al., 1992; Warner and McIntyre, 2001). Inside this range, inertial instabilities would also become convectively instable with the same threshold. This would not allow for a safe separation. In addition, for conveying momentum in the middle atmosphere we are also interested in GWs of longer vertical wavelengths not yet saturated. Therefore one would rather have to search for additional different criteria.

- *2) As you acknowledge in the paper, all GW types are highly sensitive to the background winds during their lifecycle, can you exclude the possibility that a portion of GW activity can be filtered out using the horizontal filtering? How do you expect GWs to interact with the inertial instability region?*

  Horizontal filtering is likely to remove some very long horizontal wavelength GWs. However, since GWMF is inversely proportional to the horizontal wavelength the meso- and short-scale GWs are of larger importance for many analyses. In addition, wind modulation implies stronger effects on the vertical wavelengths than

the horizontal wavelengths. Thus, for the purpose of following the same wave through different altitudes, horizontal filtering should be preferred to vertical filtering, as it will usually not shift waves in and out of an observational filter depending on the altitude.

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