Dear Prof. Haynes and Reviewers,

We would like to thank all three reviewers for their contributions and comments, which helped to improve the manuscript.

One remaining suggestion by Reviewer #3 was that effects of the part of the GW spectrum not seen by limb sounders should be discussed referring to the work by Geller et al. (2013).

Regarding this comment of Reviewer #3, we took the opportunity of the recent SPARC meeting on GWs to discuss this issue with Joan Alexander, who was chief in drafting the relevant sentences in the Geller et al. (2013) paper. The statement was meant to point out, in general, that observations cannot confine the whole spectrum of waves. However, if something specific was in the authors' mind, it was really the horizontal scale. Shorter horizontal scales have a higher threshold of saturated GWMF. Thus, if source processes generate such shorter scales, the according waves may break at higher levels in the atmosphere and result in a less steep vertical gradient of momentum flux. Given that we see a pronounced maximum, our study indicates the presence of GWs from mesoscale convective complexes with several hundred kilometer wavelengths. However, we also know from observations that much shorter temporal and horizontal scales such as represented as by MF1 also excite GWs. These exist in parallel, must be taken into account in parameterizations, but cannot be confined by limb sounder observations. Following the request of the Reviewer #3 and the editor we add the following paragraph after line 444:

The results presented in this section show good general agreement between modeled and observed GWMF and potential drag (i.e. vertical gradient of absolute GWMF). This raises confidence in studies investigating the momentum balance of global scale wind fields such as the QBO (Ern et al., 2014) or SAO (Ern et al., 2015) where scales are concerned that limb sounders can observe. However, the systematic survey of spectra shows that there are source scales which cannot be addressed by limb sounders, for instance the parameter choice associated with MF1. These shorter scales have the potential to carry larger momentum flux at a higher saturation threshold, as the saturation threshold is proportional to the horizontal wavenumber of the waves. This and a potentially different phase speed distribution in such unconfined scales might allow to convey GWMF to higher altitudes and hence contribute to explain differences in the vertical gradient of GWMF between limb-sounding observations and parametrizations employed in GCM (Geller et al., 2013).

A detailed reply to some other remaining technical comments by Reviewer #3 is given below. Reviewer comments are quoted in bold text style, replies are given in normal text style, and changes made are indicated in italic.

Sincerely,

Thai Trinh

Reply on technical comments of Reviewer #3

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(Line 94) "Until recently"

Modified as suggested

(Line 98) Please explain what a "hot-spot region" is.

The sentence is rewritten as follows:

There are a few studies which compare distributions in the hot spot regions of convective GWs in the summertime subtropics (Choi et al., 2009, 2012).

(line 101) "spectral information of global observations"

Modified as suggested

(line 102) Presumably you mean the following, "The spatial distributions are then used as an additional test: we estimate the relative importance of"

The suggestion of the Reviewer is not what we meant, so we keep the sentence as it is.

(Line 141) Capitalize theta.

Modified as suggested

(line 206) "Although Eq. 3 is based on a monochromatic wave assumption"

Modified as suggested

(line 210) not sure what is meant by larger distortions in the present context.

The sentence is rewritten as follows:

We thus expect, that no larger biases will be introduced by the chosen approach.

(line 261) "and b) to validate"

Modified as suggested

(line 301) "likely due to the QBO"

Modified as suggested

(line 421) "similarly strong"

Modified as suggested

(line 636) presumably the "one hemisphere" referred to is the Northern Hemisphere?

"one hemisphere" → "the Northern Hemisphere".

References

Choi, H.-J., Chun, H.-Y., Gong, J., and Wu, D. L. (2012). Comparison of gravity wave temperature variances from ray-based spectral parameterization of convective gravity wave drag with AIRS observations. *J. Geophys. Res.*, 117.

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