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Interactive comment on “Global distributions of overlapping gravity waves in HIRDLS data” by C. J. Wright et al.

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Specific Comments

[spectral range] A full-spectral study of the wave spectrum from multiple instruments including nadir sounders would indeed be a useful addition to the literature, and the lead author (CJW) is currently working on such a project in the specific context of the Andes, with expected submission to a journal within the next couple of months and intended extrapolation to global work thereafter. However, we feel that such work is very significantly beyond the scope of the article currently under review.

[midfrequency approximation] We only use the midfrequency approximation for those

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small sections of the article relating to momentum flux. Nevertheless, we have investigated this assumption, illustrated by the figure below. What this figure shows is the computed intrinsic wave frequency $\hat{\omega}$ for the spectral region under consideration (colour bar and contours are $\hat{\omega}$, x-axis is k_h , y-axis is k_z , all values are logged). Regions where $\hat{\omega} < 0.75N$ have been marked in red and those where $\hat{\omega} > 1.5f$ have been marked in blue, i.e. the white region indicates a moderately conservative interpretation of the midfrequency spectral region.

The spectral region of our actual observations is indicated by the black box at centre. We see that, at high latitudes, portions of our region do indeed fall outside the midfrequency, specifically those at small horizontal wavenumbers. Note that our observations extend only to 60S in the southern hemisphere and 80N in the northern hemisphere, i.e. the worst-case figure (rightmost) is never reached. An appropriate caveat has been added to the text.

[horizontal duplication] A caveat in this regard has been added to the Discussion/Conclusions section.

[weak argument] The sentence has been removed.

[loose statement] The statement has been weakened and caveated.

[wpp] The waves-per-profile value is the number of distinct wavelike signals measured in the profile after removing signals below our noise floor. See lines 13-16, page 4339 and Wright and Gille (2013, GRL, doi:10.1002/grl.50378).

[section 9] “by allowing for the detection of multiple overlapping wavelike signals in a profile” has been added to this sentence.

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[overlapping] The following sentence has been added to section 3: “Since multiple above-noise spectral peaks may exist in a profile at a given height, this method allows for the detection of overlapping wavelike signals, in contrast to many previous studies.”.

[v2] Simply put, we used the monthly-combined level 2 temperature-ozone files provided on the SABER website, and at time of analysis the temporal coverage required was only available in v1.07 in this format. This has subsequently changed.

[inconsistent notation] Section 8.1 has been corrected to use the same notation as equation 2.

[figure ordering] The ordering of figures 1, 2 and 3 is a moderately tricky choice. As the reviewer notes, the text in section 3 refers to “figures 1 and 3” well before the introduction of figure 2 in section 5.1.1. However, the full discussion of these figures takes place within section 5, and the order is internally consistent here (i.e. it follows the order 1,2,3). Consequently, on balance we have left the figures in their original order. We’re not fundamentally committed to this choice though (both choices seem equally valid to us for different reasons), and are thus happy to change it or for it be changed by the journal if the reviewer(s) or editor feel especially strongly about it!

[figure 1 vs figure 3] Figures 1 and 3 are not directly compared because one shows vertical and one shows horizontal wavelength. They are implicitly analysed as covarying variables by the remainder of the paper (section 6 onwards).

[momentum flux] Momentum flux is important in both the real and model worlds, both as a real-world mechanism which teleconnects sections of the atmosphere without mass transfer and in the model-world as a property which when parameterised at the subgrid level helps to correct for momentum and energy biases arising due to the lack of simulation of small-scale waves and related processes. Momentum flux parameterisations are currently vital to weather and (especially) climate modelling. See e.g. Fritts

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and Alexander (2003, Rev. Geophys, doi:10.1029/2001RG000106). This has been added to the text.

[time] The units are indeed days. This has been added to the caption and to the figure.

[demonstrate] The word ‘demonstrate’ has been replaced with ‘suggest’ and the sentence reworded accordingly.

[reduction] “relative to the annual mean” has been added to the sentence.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 4333, 2015.

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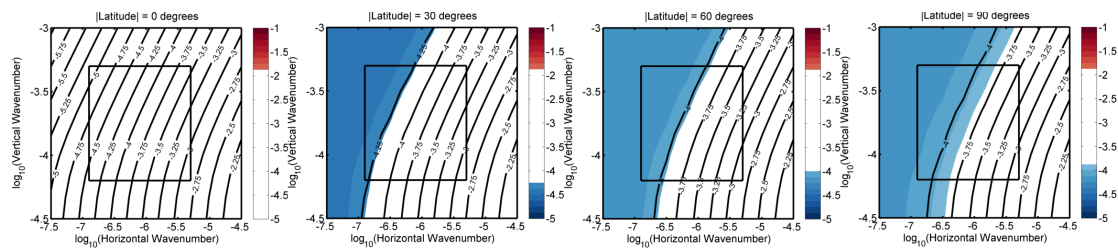


Fig. 1.

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