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

Anonymous Referee #3

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The authors present a detailed analysis which is clearly explained and has patently been approached carefully and thoroughly with a view to understanding the limitations of the data while attempting to exploit it in a novel manner. Where I believe that the manuscript could usefully be improved is in the finishing touches of the presentation to clarify the relevance of the work to support its stated aim of improving the modelling of gravity wave phenomena.

The key barrier to unlock, as an open question, is what the modelling community should be taking from the primary measure presented, that is relative occurrence of gravity wave packets as a function of both horizontal and vertical wavenumber.

For instance, if it is proposed as a tool for model validation, the implication is that

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models would need to produce some form of comparable output diagnostic. This may well be non-trivial because spectral information tends to be embedded in model parametrizations for subgrid non-orographic gravity waves in the form of momentum flux PDFs against wavenumber/phase speed Hence any insight that the authors can offer as to how to translate between these two different facets would be useful.

Alternatively, the authors throw out a link to geophysical phenomena which suggests they might be considering shedding welcome illumination on the vexed question of representing gravity wave sources but then leave it as unsupported speculation. Stating that a summer peak in Fig10.q might in some way associate with the monsoon is of course plausible but it would be much 'tighter' to move just one step further and quantify it by showing an appropriate timeseries measure (based on reanalysis?) that can be compared with the time evolution of the HIRDLS derived wave packet numbers. There are serious unanswered questions as to what exactly needs to be going on in a volume of atmosphere to generate appreciable numbers of such wave packets and whether relationships derived from experiments at specific locations will necessarily translate elsewhere: even a relatively simple illustration using the zones presented in the manuscript could provide modellers with serious food for thought.

Minor/ technical comments:

P4336-4337: Although I can appreciate the authors' desire to come clean about issues and raise reader awareness about the general pitfalls of working with real data, I am not sure that precise detailing of the technical issues for HIRDLS are required for understanding the present analysis and indeed they are in danger of distracting from the message of what capabilities HIRDLS data has today. Please consider if you can delete [Shortly after ... data.] ... [This would have been possible ...such research] ... [Due to the optical blockage] ... [Data above 60km were ... blockage] ... [when a failure ... collection]. The later reference to Kapton on p4349 can be condensed to '9deg resonance is known technical issue' because you cite Gille et al.(2008) for details anyway.

P4337: 'collocated'.

P4338: not sure what 'but we include this information to provide some coverage for the analysis' is meant to convey. Are you padding out data gaps?

P4339, I21: 'each quantised value,' singular? And I23 I think you can delete 'base-10-' as it is fairly obvious from your specification of range in powers of 10.

P4340, I6: double 'the'

P4340, 3.1: You appear to have reorganised your Figure references and now have '1 and 3' before 2. Is it journal policy to number Figures 'in order of appearance'?

P4340, I23: 'to one equivalent to' reads rather awkwardly, would say 'in line with' be better?

P4353, I4 and again I10: If you start a sentence 'Since ...' it seems repetitious to then have ', ... hence'.

P4358: 'implies a significant change' sounds like something you could easily check 'Yes' or 'No'!

P4363, I11: 'both' three times in one sentence reads like overkill, could you lose two?

P4371: Note (a) states that 'the asterisked number ...' but cannot spot asterisk!

p4372: On Fig 1 (and 3): I find the brown line hard to differentiate from the red and this is a bad combination for certain colour blind sufferers also. Could you consider another colour (deep grey?) or add a change in linestyle to help here?

p4376: Fig 5a does not show up very clearly (maybe it is my printer?) as the shading graduations are a shade fine. Either a slightly darker endpoint, fewer shade bands or even adding a few contours to help highlight the regions of maximum values might all help? Note, for some reason, the plots on Fig6-7 work better, so I do not have a problem with them.

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