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

Anonymous Referee #4

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Global distributions of overlapping gravity waves in HIRDLS data by Wright et al.

General comments

This study uses data from the HIRDLS instrument to investigate the distribution of gravity waves (GW) in terms of horizontal and vertical wavenumbers and its variability for different latitudes and heights. SABER data are also used to establish some comparisons. It is concluded that small-scale variability associated with particular geophysical phenomena arises due to variations in specific parts of the observed spectrum and that the Southern Andes and Antarctic Peninsula GW hotspot is made up of relatively few waves with high flux. The presentation is in general clear but there are some uncertain features. The applied methodology is correct but incomplete from my point of view, so

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it is not possible to assess the significance of the results at the present stage.

Specific Comments

-This study attempts to scrutinize a very broad range of the GW spectrum, which cannot be obtained just from one limb sounder. This ambitious undertaking should be at least supported with complementary nadir observations. See for example Figure 3 in Alexander, M. J., and C. Barnet (2007), Using satellite observations to constrain parameterizations of gravity wave effects for global models, *J. Atmos. Sci.*, 64, 1652–1665 or Figure 9 in Preusse, P., S. D. Eckermann, and M. Ern (2008), Transparency of the atmosphere to short horizontal wavelength gravity waves, *J. Geophys. Res.*, 113, D24104, and the corresponding discussions in both articles. The results are therefore incomplete or should be considered a dubious extrapolation in some ranges (mainly the short horizontal wavelengths). A more comprehensive study would lead to firmer conclusions on the GW of diverse horizontal and vertical scales, including those possibly generated by the monsoon, QBO or the Southern Andes hotspot.

-Paragraph below Eq. (2) and Section 4.7: The impact of using the mid-frequency approximation should be assessed on the results, as a significant portion of the analyzed spectrum stays out of that range. In particular, CRISTA and HIRDLS do not have identical observational filters.

-Last sentence before Section 3.1 and last 3 lines of the second paragraph of Section 6.1: Is there no way of assessing now the influence of this effect? It should at least be recalled in the last section to put the corresponding results in an adequate context.

-Section 6.1, third paragraph, last sentence: This argument is very weak. Are null winds more likely than other ones?

-Section 8.1, third paragraph, last sentence: You must give a reasonable explanation instead of making a loose statement.

-Section 8.2: Simply put, I could not understand how wpp was derived.

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-Section 9: You should be more specific about "...and explained why our results and methodology differ from previous studies."

Minor Comments

-The word "overlapping" is included in the title, so its meaning must be important in the context of the study. Some explanation should be devoted to it, may be in Section 3.

-Section 2.2: Why didn't you use V2.0 data?

-Are you using diverse notations for the perturbation temperature? See e.g. Eq. (2) and Section 8.1.

-Figures do not appear in the text according to increasing number (for example Figure 3 appears before Figure 2).

-The meaning of Figures 1 and 3 is clear. Can you please state what you conclude when comparing them?

-Section 8.1, second paragraph: Is momentum flux important for you in relation to weather and climate modelling or in relation to atmospheric dynamics in general? Can you cite specific applications that show its relevance for you or for the community?

-Figures 9 and 10: Time in days?

-Section 9, last paragraph: "demonstrate" is an overstatement according to your results, which seems to become then balanced by "appear". I suggest that you rewrite the sentence.

-Section 9, last paragraph: "reduction" as compared to what?

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

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