

We would like to thank Referee #3 for appreciating our efforts and for the very helpful comments and suggestions that will definitely improve the manuscript!

Please find below our point-by-point reply to the reviewer concerns. Comments by Reviewer #3 are given in red, our reply is given in black, and changes in the manuscript are indicated in blue.

Reply to the Minor Comments by Reviewer # 3:

(Minor Comment 1:) Convective waves: The paper mentions quite thoroughly the limitations of the satellite dataset, notably in terms of spectral characteristics of the waves that can be observed. I would appreciate though a further discussion regarding gravity waves generated by convective systems in the tropics. Like convection, the activity of those waves likely presents a strong diurnal cycle (cf. e.g., Corcos et al., 2021, reference already cited). I wonder how the HIRDLS/SABER observation characteristics (e.g., local time of passage) might alter the retrieval of the intermittency. My impression is that undersampling the diurnal cycle would probably lower the observed intermittency... I also wonder whether this might be one possible reason for the higher intermittencies reported in SABER observations around lines 515 onward.

Of course, the local time coverage could have some effect on the intermittency and could explain the minor differences between HIRDLS and SABER intermittency in the tropics. While HIRDLS observes at two fixed local times, the SABER local time varies during one month. However, based on satellite data, local time variations of gravity waves in the tropics have not been investigated so far. One of the reasons is that the situation is even more complicated by the differences in the viewing geometry between both satellite instruments on the one hand, and the different viewing direction during the ascending and descending orbit legs on the other hand. Addressing these effects is very difficult and beyond our current study.

This means that these effects should be considered as remaining uncertainty and potential systematic error.

In the revised manuscript we will mention that such effects can lead to systematic errors and contribute to the remaining uncertainty of our results. In the revised manuscript we have added another paragraph after former l. 519.

“One effect that may play a role are the different line of sight orientations of the HIRDLS and SABER instruments (see, for example, Trinh et al., 2015). These differences will lead to different sensitivities of observing gravity waves of a given orientation. In addition, the lines of sight are different for ascending and descending satellite orbits, which may lead to systematic differences between gravity wave amplitudes and momentum fluxes detected during ascending and descending orbits, respectively. These differences are probably one of the reasons why the diurnal cycle of convectively generated gravity waves in the tropics has not been investigated so far using satellite data. Of course, this diurnal cycle will also contribute to the level of intermittency in the monthly values shown in our study. However, the above mentioned effects are difficult to quantify and should be considered as one of the remaining uncertainties.”

(Minor Comment 2) PDF Normalization process: I agree with the justification of PDF normalization... but I am still unsure how the normalization is actually applied. Actually, this is explained in only one sentence (l 239-240), which is repeated in line 247-248. I would appreciate some further details. In particular, my current understanding is that, in every geographical box used to obtain gravity-wave momentum flux PDFs (and for every calendar month), one normalization factor is computed: this would explain

that the authors refers to the "global distribution median values", which are used as normalization factors. What I feel confusing is the application of this process that is made in Figure 6 (namely Figure 6a =, 6b). A natural choice (at least for me!) would have to use a single normalization factor per year for the whole 65S-50S region. But this seems at odds with several of your results/remarks, so I have inferred that this is not what was applied.

This point is related to Reviewer # 1, Main Comments 2 and 3, and Additional Comment (8), as well as Reviewer # 2, Minor Comment (10).

As recommended, we have added a detailed description of the normalization procedure in the revised manuscript after former I.240.

Applying a single normalization factor for a given year and a region as large as the whole 65S-50S region would not be sufficient because horizontal gradients of the global distribution of gravity wave potential energies or momentum fluxes can introduce spurious intermittency. The problem is that by forming a PDF (or quantifying intermittency in another way) one assumes that all data points considered follow the same distribution with the same mean and the same standard deviation. This, however, is clearly not the case if there are spatial gradients caused by variations of the overall global distribution within an area considered. These variations are compensated for by normalizing values by the temporally and spatially varying global distribution of medians.

This reasoning is also given in the revised manuscript after former I.240.

Further, in the revised manuscript, the importance of spatially and temporally varying normalization is now demonstrated in an Appendix where global distributions of Gini coefficients are shown that are calculated for SABER gravity wave absolute momentum fluxes without normalization. In these distributions spurious enhancements of intermittency can be seen that are introduced by strong horizontal gradients of the global distribution of momentum fluxes, particularly at mid to high southern latitudes during austral winter. These enhancements are evident, even though the lon/lat bins used for gridding these global distributions are much smaller than the regions used for creating the PDFs (e.g., the whole 65S-50S region).

Reply to the Technical Remarks by Reviewer # 3:

(Remark 1) **I 122: remove "for about 60 days"**

done

(Remark 2) **I 153: flying northward rather than "southward", right?**

Thank you very much for finding this mistake!

corrected!

(Remark 3) **I 184: discarded rather than "neglected"?**

corrected!

(Remark 4) **Figures 17 and 18: I would recommend putting the highest altitudes at the top of the figures and the lowest altitudes at the bottom.**

As recommended, Figs. 17 and 18 were rearranged.