

We thank both referees for their kind words and their help with this manuscript.

Referee 1:

Line 186: It should be “wavelengths” instead of “wavenumbers”.

Fixed

Referee 2:

During the revision, methodological corrections have been made. The updated results are now more reasonable and consistent with the literature, which satisfactorily resolves my previous main comment #1. Importantly, the correction did not diminish the advantage of the newly proposed “neighbourhood method”. The other comments from my earlier review have also been addressed appropriately.

Upon reading the revised manuscript with the updated results, a couple of comments have arisen (listed below). Addressing these may require only minor revision. I therefore recommend publication of this paper after minor revision.

[Specific comments]

L130. “non-smoothed”: The mask obtained using the non-smoothed data is finally applied to the smoothed field (L151). What is the reason that the mask should be obtained using non-smoothed data (rather than simply using the smoothed data in the first place)?

This method works on the basis that there are regions with continuous wavenumbers amongst regions with discontinuous wavenumbers, which you can only access if you apply the ST to the non-smoothed data. Smoothing the data aims to reduce the thermal noise, which, after applying the ST, results in a (generally) continuous wavenumber field across the whole granule. We have tested this, and the outputs were unphysical due to large spatial waves.

Sect. 4.3: The motivation of using the ratio k/m in this analysis has not been given. In L328-329, it is stated that “larger values would mean the GWs have unreasonably sized wavelengths.” Does this refer to the errors mentioned in L240?

This was added in response to reviewer 3, and we have added our motivation for this in the text. The stated line does not refer to these errors.

[Technical comments]

L11: “, and ... observed” → “and ... observed by the latter method” (or even entirely removable, as this does not add much to what was already mentioned: “lower than is visible”)

We have removed this

L92: “cross-track resolution”

Fixed

L97: “to be GWs and noises”

Fixed

L105. “through localisation in the frequency domain”: It does not seem correct. Do you mean something like “with frequency localisation achieved by the spatially sinusoidal modulation” ?

We agree with the reviewer that we are saying the same thing with different terminology. The S-transform uses a scalable Gaussian window to achieve spatial localisation of the Fourier spectrum. We use this nomenclature for consistency with Stockwell (1996) and subsequent publications.

L136. “Pair of”: Please check if this phrase is necessary.

We have checked this, and have decided to keep it, as we want to present our method accurately.

L150. “... regions are slightly smoothed”: This is unclear. Do you mean “stretched” rather than “smoothed”? If so, how much are they stretched ?

We smoothed them using a 5 x 5 window to soften the effect of the mask in regions where waves were falling on either side of the detection threshold.

L167: For completeness, please consider specifying how the BG is set: e.g., to be a constant or the 4th-order polynomial fit (Sect. 3.1).

We have added that our BG is set from the 4th-order polynomial fit.

L169. “all of the GWs’ intrinsic frequencies lie within mid-frequency approximation”: For this to be correct, it requires modification (e.g., “all ... observed from AIRS”). Also, please note that the cited study (Wright et al., 2010) justified the approximation through the scale analysis for HIRDLS GWs.

We have fixed this, and have changed the citation to be applicable to AIRS.

L178-179. “the mean amplitude ... is lower than ...”: This sentence may cause misunderstanding, as a reader could initially find it higher in the figure. Indeed, the paragraph works well without this sentence, so I suggest removing it, or rephrase.

We have removed this sentence.

L186. “rotate”: What does this mean?

We have removed references to “rotate”

L186. “wavenumbers” → “wavelengths”

Fixed

Fig. 2 caption: Please specify the months for the local winter in each hemisphere.

Fixed

L212: If this statement indeed refers to the “peaks”, it is incorrect (see Fig. 4a-i, ii). The peaks seem to be close between the two methods, while the histogram for the new method shows a large proportion at low amplitudes. Please revise the statement.

We have revised this to be more accurate to what is seen in the figure.

L236. However, this fraction is much smaller than that from the cutoff method. Noting this may help readers’ interpretation.

We have added this.

L240: Please provide a reference regarding this error source.

We have added the reference “Hindley 2019”

L275. “exhibits a similar morphology”: The result over N. Africa exhibits a semiannual cycle whereas that over Rocky Mountains is dominated by the annual cycle.

We have fixed this in the text to reflect this

L297. “Whereas those ...”: Please rewrite this.

We have rewritten this

L313-315; L316-321: I suggest switching the order of these two paragraphs. L303-306 introduce the winds and expected wave directions over Rocky Mountains and New Zealand/Tasmania in

the extratropical winter, followed by the results over Rocky Mountains in the next paragraph. For consistency, it would be clearer to present the results over New Zealand/Tasmania next rather than those over N. Africa.

We agree with this, and the paragraphs have been swapped.

Fig. 8 caption: (1) “zonal wavenumber/vertical wavenumber” → “ratio of ...”
(2) Panels c and d do not exist in the figure.

Fixed

L347. “over the same area”: from summer to winter hemisphere?

Fixed

L326. “a similar number of ... waves”: Does this mean a similar “fraction”? Absolute counts have not been informed.

Fixed