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Interactive comment on "GRACILE: A comprehensive climatology of atmospheric gravity wave parameters based on satellite limb soundings" *by* Manfred Ern et al.

Anonymous Referee #2

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Review comments for "GRACILE: a comprehensive climatology of atmospheric gravity wave parameters based on satellite limb soundings" by Ern et al.

This paper thoroughly describes an atmospheric gravity wave (GW) dataset that consists with two satellite instrument measurements: SABER and HIRDLS. This is a Level-3 dataset that has already been gridded and monthly-averaged. Both instruments have similar viewing geometry so their observed GW parameters are highly consistent with each other. This dataset provides a valuable quantitative estimations of stratospheric GW parameters for users to compare with their measurements or model outputs.

This dataset was made possible from the authors' group's many years of scientific

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exploration of studying GW characteristics using SABER and HIRDLS, so the quality is very trustworthy. As an Algorithm Theoretical Basis Document (ATBD) type of manuscript, the descriptions of the methodology, advantage and disadvantage of each derived variables are very clear. I suggest publication after some minor revision (typos, image edit, etc.)

(1) One major concern is about how to grid the data. Gridding highly intermittent features such as the atmospheric gravity wave requires the denominator to be the number of pass-by observations during a month. For example, monthly mean GWMF in the gridbox [5W,5S, 5E,5N] equals total of all retrieved GWMF values within this gridbox divided by all pass-by samples fall into this gridbox during the month. So when you use paired obs. for calculation and if they fall into two grid boxes, which one do you assign it? I'm not saying you are wrong, it's just not very clear to me in the description of gridding methodology.

(2) Another concern is that, from Fig. 15 (c) I can see two stripes of enhancement of momentum flux samples around 50S and 50N. I suspect that's partly caused by the fact that GWs there are strong during wintertime, so you have greater chance to find pairs to complete your GWMF calculation. But I don't see such hints in HIRDLS map in Fig. 15 (f). Why that's the case? If my interpretation was wrong, then what causes the enhancements at 50S and 50N in Fig. 15 (c)?

Minor points: Page 3, Line 13: please considering adding one more recent reference that has validated the theoretical value proposed by van Zandt, 1985 from an observation or multiple different observations.

Page 5, Line 34: how do you read the new "observational filter" in de le Torre et al. (2018)? In their paper, they sort of suggests that SABER's observational window is very narrow.

de la Torre, A., Alexander, P., Schmidt, T., Llamedo, P., and Hierro, R.: On the distortions in calculated GW parameters during slanted atmospheric soundings, Atmos.

Meas. Tech. Discuss., https://doi.org/10.5194/amt-2017-192, in review, 2017.

Page 6, Line 4: please consider also including Gong et al., 2015 in the reference Gong, J., J. Yue, and D. L. Wu (2015), Global survey of concentric gravity waves in AIRS images and ECMWF analysis. J. Geophys. Res. Atmos., 120, 2210–2228. doi: 10.1002/2014JD022527.

Page 13, Line 21: I didn't read Gill et al., 2011, so can't comment further, but arbitrarily divide every number by two seems dangerous to me. Can you provide a rough picture like how many observed samples are $\frac{1}{2}$ of theoretical value and what is the standard deviation?

Page 15, Line 29: you may want to add "except inside the jet streams".

Page 20, paragraph 1: so GRACILE only starts from z=30 km, correct? If that's the case, I strongly suggest you change Fig. 15 (I'll mention my suggestion when comes to that point).

Page 20, Line 13: that's where my major concern #2 comes from. If you can draw a lat-lon map you can discover whether the enhancement of sample size is source-related. Also, it would be helpful to add a bit discussion here if that's the case. Since stronger source gives you larger chance to "see" them because it's easier to find pairs.

Page 20, Line 31: do you provide a quality flag for each value in each grid box? So user can easily make their own plots according to their needs.

Page 22, Line 14: GLIGLOSS -> GRACILE?

Fig. 10: please consider use horizontal wavelength as the colorbar so the unit and physical meaning would be consistent with Fig. 9 (or the other way around).

Fig. 15: Since the sample size is not height dependent, I strongly suggest you make only line plot so you only need two plots (one for SABER with three lines as a function of latitude, and one for HIRDLS) to explain the sample size matter. The only exception is

at $\sim$ 20 km for HIRDLS tropics. But since you don't provide data below 30 km because of potential cloud contamination, no need to show and discuss about that anyway.

Fig. 18: Instead of using dashed lines to show the natural variability, I think you can use semi-transparent grey/color areas to enclose the natural variability.

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