

Interactive comment on “Lagrangian Gravity Wave spectra in the lower stratosphere of current (re)analyses” by Aurélien Podglajen et al.

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The authors use data from long-duration quasi-Lagrangian super-pressure balloons (SPBs) to assess the accuracy of the GW spectrum simulated in the ERA-Interim, ERA5, and MERRA-2 reanalyses.

They use data from three campaigns, one of which was assimilated into the reanalyses, with pressure and temperature measured directly by SPB instrumentation and wind speed inferred from GPS position data. The particular advantage of using these SPB data is that, unlike ground- or space-based measurements, they record data in a Lagrangian frame of reference.

Time sampling of these data may be a factor in their results, but this is taken into ap-

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appropriate consideration throughout the paper. In addition, the authors describe a wide range of other possible error sources - the discussion of these is often slightly briefer than I would prefer, but demonstrates that they have been taken into consideration.

The reanalyses are shown to reproduce important features of the wave spectrum, including the PW-GW spectral gap and a peak near the inertial frequency at high latitudes. The authors conclude that the reanalyses do a good job of reproducing GW features in the observed data, particularly at low frequency, but that the high-frequency performance is sufficiently deficient that GW parameterisations will still be required in the medium to long term. They also note that the assimilation of the balloons for one campaign had a positive impact on model quality.

The paper is very clearly written, in particular with a very high standard of written scientific English, and I see no critical scientific deficiencies. I have listed a few minor issues below, but none of these are critical, and I would support publication with at most minor changes.

1. The authors mention JRA-55 a couple of times early on, but then rapidly remove it from consideration due to time-sampling issues. However, I don't think they actually use these data anywhere significant in the paper. For clarity I think it would be best to just remove JRA-55 and mentions thereof from the paper completely. This is particularly a problem for the abstract, as it is potentially misleading for someone looking for an assessment of this model specifically.
2. Figure 2b makes the pressure-level differences look bigger than they actually are, so might be worth mentioning that the y-scale is over a narrow range (roughly 0.5km max deviation - for ERA5, which is the highest vertical resolution of those considered, this is only ~ 2 -3 model levels at these heights)
3. Figures 3 and 7: the panels on the right-hand side are labelled "PreConcordiasi" but those on the left do not say "VorCore", but "pole" instead. I would suggest labelling the left panels as Vorcore to make it immediately clear.

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4. Figure 3: it is quite hard to see the relationship between the values in right-hand panels due to the thickness of the black line and how much it jumps around on top of the red and blue lines. I would suggest replotting it somehow so that the reader can actually see the coloured lines - maybe make the black lines thinner and reduce the heaviness of the gridlines to compensate visually?

5. P12L31: is this specifically zonal momentum flux?

6. Figure 5 uses a jet colour table. This is hard for colourblind readers to read, and also suggests semantic meaning at sharp colour transitions where none is implied by the data. I would strongly suggest changing the colour table used for this figure. Also, some of the maximal regions are out of band on the colour table and plotted in white - it may be useful to truncate the data at these points to avoid this issue.

Typos/Grammar:

P06L11 non-grammatical: Missing "which"?

P12L15 non-grammatical: "provide information on"?

P14L13 non-grammatical: "since Concordiasi only ran/flew for one year", maybe?

P15L21 non-grammatical: "has a non-spectral grid"?

P15L24 non-grammatical: "more prevalent the lower the"

P16L01 typo : "wavenumber"

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