

Interactive comment on “Aircraft measurements of gravity waves in the upper troposphere and lower stratosphere during the START08 Field Experiment” by F. Zhang et al.

Anonymous Referee #4

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The paper describes aircraft measurements that have been collected in the upper troposphere and lower stratosphere over the continental United States, and analyzes the gravity waves present in these measurements. One research flight of the START08 campaign was dedicated to gravity waves in the Upper Troposphere and Lower Stratosphere. This is, a priori, the first aircraft research flight dedicated to this theme. It is of interest to describe and document it. The paper shows: - that multiple events of gravity waves occurred along the flight track, - both orographic and non-orographic waves are captured, - the analysis using wavelets allows to identify wave packets, but there are difficulties; part of the high frequency signal corresponds to measurement noise.

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Overall, the paper leaves the impression that the analysis, even with a wealth of high-resolution measurements, is difficult. Although much analysis is discussed with care, the paper leaves the reader somewhat unsatisfied. The description of the flights and the results of the spectral analysis of the measurements are valuable and of interest. Perhaps the paper in its present form contains too much information, in particular in the figures, and the reader may have difficulty in clearly singling out essential messages. I recommend publication after some revision to improve the focus of the study.

Major points

1. Many of the figures are difficult to read because they cover too much information. As an example, figure 4 contains 25 panels, each containing 6 curves... This needs to be reduced if information is to be retained from this figure. For instance, is it necessary to distinguish along and across-track spectra? They seem very similar, and unless one fears that the measurements are introducing a bias, I do not see any physical reason not to combine these into a wind speed and plot spectra for the wind speed. Whereas spectra of u_h , w , and potential temperature are common, I do not know of expectations for the spectra of static pressure. I believe one could do without this row of plots. Finally, do all the five legs of the flight really need to be plotted separately, or could some be combined or omitted?

Similarly: - figure 2 could contain less maps (e.g. 1800, 1950, 2210 and 0020UTC) - figure 5 could contain less panels (e.g. c, d, e) - figures 6 and 7 could contain less panels (e.g. horizontal velocity, w , θ for figure 6) - in each of the four figures 8, 9, 10 and 11: several curves are repeated many times, to display phase relationships (e.g. w is plotted 6 times among 9 panels!). This is excessive, there are other ways to present such information (e.g. profiles in a single plot, displaced in the vertical so as not to overlap, and with vertical lines indicating extrema (or zeros) of one reference signal...

2. While the figures provide too much information, it is sometimes difficult to find certain

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quantitative informations on the gravity waves. For example on p4733, line 27 onward: what are the largest amplitudes mentionned in the text? p4745: line 18: similarly, what are the amplitudes?

3. WRF simulations are used in Figure 2 to exhibit the flow configuration, but the comparison between the simulated GW and the observed ones is hardly discussed.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 4725, 2015.