Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2021-93-RC2, 2021

Comment on amt-2021-93

Anonymous Referee #2

Referee comment on "Using vertical phase differences to better resolve 3D gravity wave structure" by Corwin J. Wright et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-93-RC2, 2021

Review amt-2021-93 – "Using Vertical Phase Differences to Better Resolve 3D Gravity Wave Structure" by C. J. Wright et al.

Recommendation: Minor revisions

This paper describes a novel method to calculate GW parameters utilizingphase differences between individual horizontal cross sections of 3D temperature fluctuation data. Identifying vertical wavelength in data sets like the AIRS temperature fields poses a considerable challenge to traditional spectral techniques due to the fact that only few measurement points are available in the vertical. The authors show that the new 2D+1 S-Transform method results in a more detailed vertical wavelength retrieval especially for long vertical wavelengths (beyond the depth of the input field) than the previously presented 3DST. The methodology is well explained, the figures are clear and appealing. The analysis and discussion are comprehensive and carried out convincingly. As highlighted in the case studies, the analysis is especially useful in processing AIRS temperature observations, hence the discussion fits well into the scope of AMT.

Publication is recommended after the authors address the comments below.

General comment:

It is apparent from your discussion and figures, that the input to your method are

temperature fluctuation fields not temperature field. However, neither the Data section (section 2) nor the Data Preprocessing section (section 3.1) state how these temperature fluctuations are derived from the AIRS temperature retrieval output. Please add a section on the detrending for instance in either of the before mentioned sections.

Specific comments, typos, grammar:

p.3,l.55: hgh-resolution -> high-resolution

p.4,l.80: You mention here, that the method could be expanded to consider multiple overlapping waves in the signal. How would your current method deal with an overlapping wave signal? Can you elaborate on possible effects that a "less" monochromatic signal would have on your results?

p.6,l.136: I was wondering why it is "unwise to use adjacent vertical levels". What is the dependence between the levels? Could you clarify?

p.7,l.150: You state that your choice of vertical level selection is limiting the vertical wavelength you retrieve. What is the minimum vertical wavelength that you can retrieve? And how does this affect the wave spectra you are retrieving?

p.7,l.156: The abbreviation FWHM is used here before definition.

p.11,l.235: Maybe refer to the same wording in the headlines following as chosen here (or the other way around) for consistency.

p.11,l.241: …case is already … -> case, which is already ?

caption of Fig. 6:

"(a) and (h) show original data"… I assume these are temperature perturbations? Can you specify that?

“Data have been boxcar-smoothed by 3 voxels” -> The text states 5 voxel smoothing? Please make this consistent.

p.15,l.309: 500-100km -> 500-1000km

p.18,l.382: 3SDST -> 3DST

p.18,l.392: You are mentioning a hypothesis of „extremely-long” vertical wavelength here. Could you add a reference?

p.18,l.387: There is a loose) after Sweden