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Interactive comment on “Observation and a numerical study of gravity waves during tropical cyclone Ivan (2008)” by F. Chane Ming et al.

Anonymous Referee #2

Received and published: 14 June 2013

The paper studies GWs above a specific typhoon case in two model data sets and GPS-RO measurements. However, I agree with the first reviewer that the specific scientific questions are drowned in a flood of detail information. What exactly do the authors want to investigate? Some examples for science questions could be: Which waves are typically forced by a typhoon? How does the wave spectrum change in the different stages of the typhoon (e.g. before/after landfall)? What is the actual process generating the waves? How do the waves feedback onto the typhoon? Of course there are more. However, neither from the body of the paper nor from the summary it became clear to me which question is to be addressed and how the shown data contribute to it. This question is essential in order to judge whether the means applied can answer these questions. The paper will therefore need substantial rewriting before

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it can be published in ACP. In the major comments detailed below there are some important limitations to the data and the analysis which need to be set more clearly in the text. These need to be taken into account for identifying and answering the scientific question still to be defined.

Major Comments:

1. ERA-Interim data show wave structures with wavelengths of approx. 400km or longer. There are a number of questions concerned: First, one could use the method of Skamarock to find the true horizontal resolution. Second, are at least those GWs which are resolved realistic? Considering global maps one finds that the propagation direction is unnaturally alligned in the zonal direction. It maybe worth to compare, for instance, with high resolution ECMWF data or mesoscale modeling.

2. The way of analysising data emphasizes the short vertical wavelengths. In particular, many of the spectra shown (e.g. Figures 6 and 7) display a peak at the first resolved wavenumber. This could point to longer wavelengths actually beeing dominant but removed together with the background. In addition, the spectral resolution is very low. The true wavelength remains uncertain. That is problematic for calculations of e.g. phase speeds based on thes values, too.

3. Model data provide regularly gridded 4D (3D+time) data fields of u,v,w and T. Maybe more information could be gained, if this full potential would be used applying 2D or 3D data analysis techniques (cf. e.g. phase speed spectra calculated by Kim et al., JGR, 2009).

Specific comments:

P10762 L11 Please give also SI units (m/s; e.g. in brackets) for knots

Line graphics should not be converted to jpg

P10764 L8 There is now a quite large number of papers: quote also the first one (Tsuda et al., 2000) and use e.g.

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P10768 L15 How much of this is observational filtering by the removal of the background in combination with the use of FFT which generates a fixed grid? The vertical wavelength (and thus the intrinsic phase speed) is limited by the observation interval. If by some mechanism the horizontal wavelength is similar than larger background wind speeds would likely imply lower ground based frequencies.

Fig 8d: strange values for the ticks at y (wavelength) axis

P10770 L9 dissipating: How do you know that the wave dissipates? In one snapshot it could also be just the state of a temporal evolution. The wave could lose energy also to higher altitudes ...

P10770 L19 are observed only at latitudes ...

P10770 L22 (cf. wind reversal in Fig 5c)

P10770 L27 where are the horizontal wavelengths of the observed waves discussed?

P10771 L10 phase relations

P10771 L15 a paper needs to be self explaining: equations used need to be included!

FFT and CWT transforms: the T abbreviates transform

P10771 L27 ??? observations are consistent with previous studies on GWs triggered by convective turrets ??? Studies of Dewan, Piani or Lane focus on the short period and short horizontal wavelength GWs forced by the mechanical oscillator

P10772 L3 "favored by the westward background wind in the UT and LS." The only winds you discussed so far are the radiosondes and the show eastward winds in the UT.

P10772 L11 Why do you use a polynomial fit to determine the background. The model provides full 3D fields. Why not make use also of the horizontal information? This should retain longer vertical wavelengths, too.

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L10775 L26 Define high frequency. Though the result is plausible, I cannot follow this argument from 12a. Indeed you have discussed in 11d that some short horizontal wavelength GWs are found both south and north of the typhoon.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 10757, 2013.

ACPD

13, C3641–C3644, 2013

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