Atmos. Chem. Phys. Discuss., 15, C5583–C5585, 2015
www.atmos-chem-phys-discuss.net/15/C5583/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Enhanced internal gravity wave activity and breaking over the Northeastern Pacific/Eastern Asian region" *by* P. Sacha et al.

Anonymous Referee #2

Received and published: 4 August 2015

General comments:

This manuscript by Sasha et al. reports enhanced internal gravity wave activity and breaking over the Northeastern Pacific/Eastern Asian region using the density profiles obtained from GPS-RO observations made from 2007 to 2010. This topic the authors tackle is important in a sense that gravity-wave properties have not been well constrained through observations and gravity wave activities have so far been reported as being low in the East Asian region. However, reviewer thinks that this manuscript requires substantial revision or additional computation to be published as a regular article in the journal, Atmospheric Chemistry and Physics, for reasons described below:

First, authors need to justify that the observed density perturbations are gravity-wave (GW) perturbations. Since authors are discussing GW potential energiy (Ep) and GW breaking simultaneously, it is not easy for this reviewer to clearly understand whether the Ep presented is indeed due to gravity waves or due to turbulent motions. It seems necessary to separate stably stratified cases and convectively (or dynamically) unstable cases from the GPS-RO basic-state profiles and then to re-compute Ep using the density perturbations that are believed to be GW perturbations in a stably stratified (or dynamically stable) environment.

Second, authors claim that using non-linear color scaling in their plots is a key to find out the unprecedented GW activity in the East Asian region, but it is hard to believe. Authors need to show comparison between their original plots and some results plotted with linearly scaled colors after appropriately separating GW perturbations from the GPS-RO density profiles as mentioned above.

Third, authors claim that mountain waves are primary waves in the unprecedented GW activities revealed through the GPS-RO observations in the Eastern Asia. However, it is unclear to reviewer that mountain waves are able to extend far eastward to regions where there is no strong horizontal wind. Note that mean horizontal wind is not so strong in the "region of interest" as authors have shown in their manuscript.

Finally, in terms of possible source mechanisms, reviewer recommends that authors should discuss more the possibility of spontaneous adjustment process. References mentioned about the spontaneous wave generation are too out-dated. There are some active scientists such as Fuqing Zhang and Riwal Plougonven who have researched for a long time on the spontaneous generation of gravity waves around the tropospheric jet axis. As long as mountain waves are not easy to be believed to be major gravity waves, spontaneous generation mechanism is certainly worth being described.

Specific comments:

At line 19, page 18287: Author need to clearly show the region of interest in their plot

ACPD

15, C5583–C5585, 2015

rather than vaguely mentioning like "a tilted ellipse".

At line 13, page 18288: There has been a number of -> There have been a number of

At line 25, page 18288: Kuroshiro -> Kuroshio

From line 27, page 18292: Authors justifies the use of density profiles instead of using temperature mentioning density profile includes non-hydrostatic waves. However, in page 18293, authors claim that their wave modes may possibly have vertical wavelengths of 2-5 km. Discussion about non-hydrostatic waves seem unnecessary and confusing.

At line 7, page 18294: VanZandt (1985) did not mention about a theory about the partitioning of kinetic and potential energy of gravity waves. The partitioning is quite empirical rather than theoretical.

At line 1, page 18296: Description about the maximum growth rate of Rayleigh-Taylor convective instability is confusing. How gravity waves drive the fluid to be overturning when the value of sigma is real? In fact, authors described instability due to gravity waves using negative values of the sigma in their figure 7.

From line 1, page 18301: Description about figure 7 is pretty confusing. There is no secondary maxima shown in figure 7, but authors are explaining a lot about the secondary maxima without describing anything about 8-th or 12-th maxima shown in figure 7.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 18285, 2015.