Annales
Geophysicae
Discussions

ANGEOD

Interactive
comment

Interactive comment on "Statistical variations of lower atmospheric turbulence and roles of inertial gravity waves at a middle latitude radiosonde site" *by* Jian Zhang et al.

Anonymous Referee #2

Received and published: 14 March 2019

This paper describes analyses of high vertical resolution radiosonde data from the Miramar NAS in San Diego CA USA. Time-height climatologies are constructed of both (what appear to be) gravity waves and energy dissipation rate (epsilon) using the Thorpe method to extract the turbulence. Their results appear to be consistent with epsilon values derived from other studies in the US from MST radars. They also show high correlations between the constructed gravity wave fields and the derived epsilon fields, which is a new result but of limited use since it based on only one station. Unfortunately, this paper is very poorly written, and therefore difficult to understand in places, but beyond that, there is not much new here (some important references are missing) and since the results are given for only one station, it is difficult to evaluate

the representativeness of the results. I have to therefore recommend rejection of the article as submitted.

Major comments 1. The gravity wave analysis using nigh vertical resolution radiosonde data is not new. The authors are apparently not aware of the work of Marv Geller's group (e.g., Wang and Geller, JGR, 2003, Geller and Gong JGR 2010, Gong and Geller JGR 2010). These references are much more complete in that they used many stations and is also more rigorous in the analysis techniques used.

2. The derivation of epsilon from the Thorpe method is also not new, and in the fact the same authors have a paper under review for JGR that again is more complete in that it involves more stations, and is more rigorous after the incorporation of reviewer comments.

3. I realize the authors are at a disadvantage in writing these results since English is not their native language. However this leads to some statements that are either incorrect or not understandable. I cannot list all of these here, but some of the more egregious ones are a. Lines 123-126. "We utilize the site located at Miramar Nas (32.8° N, 117.1° W), that is, the site closest to the MST radar at White Sands Missile Range, California (34.46° N, 120.33° W), which was adopted by Nastrom and Eaton (1997; 2005). Thus, the radiosonde and radar results can be roughly compared.". First the lat,lon given for White Sands Missile Range (WSMR) , California cannot be right, that must be Vandenberg, and WSMR is in New Mexixo, not California. The same mistake is made on line 306. Second, Nastrom and Eaton (1995) was for WSMR while Nastrom and Eaton (2005) was for Vandenberg. Third, Miramar is fairly far in distance from either WSMR or Vandenberg, and have distinctly different climatological environments. So meaningful comparisons could be challenging. b. It's not clear to me how the technique of using time differences to identify gravity waves also filters out large-scale time variations. This needs discussion. c. Lines 353-357. "In the absence of energy dissipation and energy transport, E should keep a constant altitude value under the assumption that the main energy of waves transports from bottom to top." I

don't understand this statement, but I think it is based on the Eliassen-Palm theorem. E can and does vary with height as their Fig. 7 shows. Wave trapping effects will certainly invalidate this statement. So this statement needs more justification. d. In the gravity waves and conclusions discussion there is reference to the waves as being inertial waves. Why are gravity waves being discounted? Also there is reference to propagating gravity waves, but there could be trapped waves as well. The analyses presented cannot make that distinction.

Minor comments 1. In equation (5) the $\frac{1}{2}$ multiplying the PE term is not correct and should be removed. 2. In equation (7) the denominator should be 2 deltaz, not 2z. 3. The English is rough in places. For example, there are several instances where the word "argument" is used when I think "agreement" is meant. 4. Some of the figures are mislabeled, e.g., Fig. 8.

Interactive comment on Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2018-114, 2018.