

Review of “Evaluation of middle atmosphere temperature and wind measurements and their disturbance characteristics by meteorological rockets” by He et al. submitted to *Atmospheric Measurement Techniques*

General comments:

This study obtained middle atmosphere temperature and wind measurements from 20-60 km in northwest China by two meteorological rockets. The detection results are compared with satellite, empirical model and reanalysis data, and the error analysis theory is carried out in combination with the of the drop sounding and atmospheric disturbance characteristics. The observations in the manuscript provide valuable results for understanding the atmospheric environment in the near space. Moreover, the authors, in combination with ERA5 data, have captured typical cases of gravity wave, which is a very interesting result. Although the authors’ dataset and observation could be of high scientific value, the study in its present form suffers from several flaws and I recommend publication with suitable revisions.

Specific comments:

1. The theoretical background introduced in the introduction is not complete enough. Since a considerable part of the manuscript is about the analysis of atmospheric disturbance characteristics, the author needs to emphasize in the introduction the significance of atmospheric fluctuations in detection, or why the rocket detection results should be used to analyze the characteristics of gravity activities?

2. Effective height interval for analysis is from 20~60 km.

Does the rocket stop receiving data when it actually reaches a height of 20 kilometers (during the descent phase)? Why is only the data over 20 kilometers mentioned here? If the author analyzes the data from 0 to 20 kilometers together, more valuable results will be highlighted. Also, the maximum detection altitude of the rocket exceeds 70 kilometers (Figure 3).

3. The specific calculation process of atmospheric parameters shown in Figure 2 doesn't seem to correspond to the previous statement. For instance, shouldn't base pressure measurement be conducted independently? In the picture, it seems to be obtained after temperature correction. Similarly, it is recommended that the calculation formulas for air pressure and density be further clarified in the main text.

4. Errors and deviations in the result comparison.

Since authors evaluate the accuracy of the rocket detection results, a deviation analysis is conducted by comparing with the reference data, and at the same time, the error results are obtained through iterative calculation of the parameters during the detection process. The author should distinguish the differences between the two results in the text, and what are the respective functions of the given deviation results and error results?

5. Temperature correction.

Temperature correction is the key to ensuring the accuracy of temperature measurement. Judging from the results in the figure, the author's temperature correction results are reliable. However, the main text and supplementary materials lack further descriptions of the instrument's performance parameters, which makes it unclear to readers who focus on the measuring instrument itself the extent to which the instrument parameters affect the measurement. Similarly, the author provided the results of each temperature correction sub-term in the supplementary materials, which are very valuable measurement results. It is suggested that the author further explore and analyze the internal information.

6. Regarding the extraction of gravity waves, the author should provide the original profile of the rocket detection, the fitted background profile, and the disturbance profile, etc., to visually demonstrate whether the extracted waves are reasonable.

7. Regarding the slope of the gravity wave spectrum. The extraction of the slope of the gravity wave spectrum largely depends on the fitting interval. Due to the significant fluctuations of the power spectrum throughout the wavenumber range, different fitting intervals may cause obvious slope differences.

8. Based on the parameters obtained by the stokes parameter method, the author points out that the gravity waves of HJ-2 have a consistent propagation process. However, there is a significant change in the horizontal propagation direction (from 215° to -36°). The results in Figure 12 can demonstrate that within the 40-50km range, the propagation characteristics reflected by HJ-1 and HJ-2 through the stokes parameter method are consistent with the wave characteristics of ERA5. However, it cannot be determined whether the wave propagation characteristics at the entire altitude of the same rocket exploration are consistent (whether the wave in 40-50km and the wave in 20-50km are from the same source).

Minor comments:

L24: momentum deposited → momentum deposition

L91: The captions and the main text should be separated.

16. L59: The falling spheres can obtain the atmospheric density profile of 30-100 km, and then calculate the wind field, temperature and pressure, the thermistor measurement can obtain the atmospheric temperature from 20 to 60 km, and then calculate the density, pressure, and wind field → The falling spheres can obtain the atmospheric density profile of 30-100 km, and then calculate the wind field, temperature and pressure. The thermistor measurement can obtain the atmospheric temperature from 20 to 60 km, and then calculate the density, pressure, and wind field

L64: Atmospheric density are measured using GPS data on a rigid falling ball and found that the deviation from → Atmospheric density is measured using GPS data on a rigid

falling ball and the measured deviation from

L70: to obtain near space meteorological detection data from 20 to 60 km → to obtain meteorological detection data from 20 to 60 km

L91: One space is missing

L112: form → from

L389: are → is

Unfortunately, neither my abilities nor my time allow me to find all the grammatical problems throughout the manuscript. Therefore, I sincerely ask the authors to check the full text by themselves, and preferably seek advice from a native speaker.