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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Universal power law of the gravity wave manifestation in the AIM CIPS polar mesospheric cloud images" *by* Pingping Rong et al.

Anonymous Referee #3

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General Comments:

This paper presents an analysis of data from the Cloud Imaging and Particle Size (CIPS) instrument on the Aeronomy of Ice in the Mesosphere (AIM) satellite that focuses on the potential to extract gravity wave information from the CIPS measurements. CIPS measures backscattered radiance at 265 nm, which provides information about the background atmosphere (excluding PMCs) at approximately 50 km altitude. An algorithm is presented to identify gravity waves with horizontal scales between ∼20-60 km. Power spectra of the identified waves are determined, as well as the importance of the background albedo brightness.

The approach to identifying and characterizing gravity waves presented in this paper is successful in some situations. However, the ability to distinguish waves (and thus study their morphology) is clearly dependent on the background albedo intensity. The presence of multiple waves in any scene, with different scale lengths and orientations, is also a challenge for classification. One suggestion would be to investigate the use of image processing algorithms to sharpen the contrast of any wave-like features before applying the detection algorithm.

It is puzzling that the recent paper on CIPS gravity wave observations by Randall et al. [2017] (Geophys. Res. Lett. 44, 7044-7052) is not addressed in this manuscript. Four of the co-authors on this manuscript are also authors on the Randall et al. paper. Since the Rayleigh Albedo Anomaly (RAA) data used in the Randall et al. paper are also available at the AIM web site, I think it is essential that this manuscript discusses how their approach compares with the RAA method.

Some additional specific comments are listed below.

Specific Comments:

1. p. 4, lines 21-22: It would be helpful to note that the Y-axis scale for the red curve in Figure 1(a) is a factor of 3 larger than the scale for the individual series.

2. p. 4, line 31: If the individual component time series each have a maximum amplitude of ±1 unit, how can the reconstructed time series shown in Figure 1(b) have an amplitude greater than -7 at grid = 55?

3. p. 5, line 13: What is the angular step used to select "all radial directions"?

4. p. 5, lines 31-33: You can't call concentric waves "characteristic" in the first sentence and "extremely rare" in the next sentence. These terms have very different meanings.

5. p. 6, lines 23-25: Are the straight wave patterns present in the lower right quadrant of Figure 2(d)? It would be good to see more examples of straight waves, which are presumably much more common.

6. p. 7, lines 17-19: This exponential behavior is also seen in g-distribution plots of PMC brightness and ice water content (e.g. DeLand and Thomas [2015]).

7. p. 7, lines 21-23: Interannual variability of the g-distribution slope of SBUV PMC ice water content is discussed by DeLand and Thomas [2015].

8. p. 7, lines 29-31: What is the term “laminated” intended to mean here?

9. p. 9, line 1: Why is a different analytic form needed?

10. p. 10, lines 8-10: The fits for the different power categories seem to have almost identical slopes in the left-hand panel (log scale), despite the changes in quoted slope value. Is everything correct here?

11. p. 11, lines 11-13: This is another instance where straight waves seem to be more common, which raises the question as to why there is so much initial emphasis placed on concentric waves.

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