

Interactive comment on “Quasi 12 h inertia-gravity waves in the lower mesosphere observed by the PANSY radar at Syowa Station (39.6 °E, 69.0 °S)” by Ryosuke Shibuya et al.

Anonymous Referee #3

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This study reports observation of quasi-12 hour disturbances in the polar mesosphere from a period of PANSY radar observations. The authors argue that these are inertia-gravity waves, and deduce the wave characteristics from the observations and hodograph method. To further investigate the source(s) of the observed waves, the authors perform high-resolution NICAM simulations with MERRA initialization and show that the simulated wave features are similar to the observations. By analyzing the simulation results, they confirm that the quasi-12 hour disturbances are indeed inertia-gravity waves, rather than semi-diurnal tides. The inertia-gravity waves are likely generated from mid-latitude upper tropospheric jet and/or from the polar night jet. Both observational and numerical analyses are presented clearly, and the numerical results com-

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plement the observations by providing a rather plausible interpretation of the observed disturbances. The work also cautions previous interpretations of quasi-12 hour signals as semi-diurnal tides.

The following are specific comments on the paper:

1. It appears that both observations and simulations presented suggest wave period between 11-12 hours. The consistency is certainly satisfying, but it is not clear from the analysis (especially the analysis of simulation results) why this period range is "preferred"(vs a broader spectrum). Is this more related to the wave source, or the wind system at the time of the observation?
2. The authors cite spontaneous radiation from a balanced polar night jet (page 20) as a possible source of wave package (i). This part of the discussion appears to be rather speculative, and I wonder if they could be more specific and quantitative. For example, if they think quasi-resonance mechanism is responsible, is it possible to examine the flow and see if some quasi-resonance condition is satisfied?
3. The observation was made from 16 to 24 of March 2015. This is the time when the polar night jet is forming in the Southern hemisphere, and one may expect that the jet to be not very steady. I wonder if this is the case for the observational period, and if it has any implications for the wave generation.
4. Questions with regard to PANSY (page 6): Is the time resolution in the mesosphere also 1 minute? Although it is stated that the height range of PANSY is 1.5-500km, the figures suggest there is an observation gap between 30-60km. Please explain.
5. Page 8 lines 12-13: According to the formula given, glevel-8 corresponds to a resolution of 28km, not glevel-7.
6. Page 10 lines 13-14 and Figure 2a: It is stated that the PMWEs are likely associated with solar flares on March 17, but the peak echoes are found on 21st. Is such a delay of 4 days expected?

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7. Page 12-13: Is it possible to quantify the uncertainty in k_h estimation?

8. Page 13 line 23: "vertical wavelength of less than 1km", but 2km was given from earlier discussion.

Page 4 line 10: change to ", present in most climate models in the polar..."

Page 6 line 22: change to "with the complete system..."

Page 17 line 10: change to "at the height of 70km"

Page 17 line 12: remove "spatial"

Page 22 line 23: "examined the energy density[?]. "by dividing [the total energy density?]"

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