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Interactive comment on "A study of the dynamical characteristics of inertia–gravity waves in the Antarctic mesosphere combining the PANSY radar and a non-hydrostatic general circulation model" *by* Ryosuke Shibuya and Kaoru Sato

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Reviewer #1,

The authors greatly appreciate the reviewer's critical reading of our manuscript and constructive comments. We have revised the manuscript as much as possible following the reviewer's comments. Responses to each comment are described in the following. The pdf version is also attached as the supplement pdf.

Response to comments: 1) It is not clear to me how bar(u'w') and similar quantities

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Discussion paper

were computed. What is the temporal resolution of the model output? Was a Fourier transformation performed? Related to this, in equation 4, if tilde(w) is the Fourier transform of w, then what does the average bar(tile(w)) mean? Please define your averages, e.g., over a wavelength und over a wave period? And please explain what averages over Fourier-transformed variables mean.

The interval of the output by NICAM is one hour (P12. L21), and a Fourier transformation is not performed to an original output. The definition of the prime is described at the beginning of Section 4.1. The equation (4) is not Fourier-transformed, so I must use w', not w ÌČ. Thank you very much for your pointing out, and the equation has been revised. In addition, we have used the 5-day average in the segment of the simulation. This is because it is difficult to detect each wave packet, although my previous case study (Shibuya et al., 2017, ACP) tried to do that by using an extended Hilbert transform method. The definition of the average has been added in Section 4.1 (P19, L2-3).

2) Gravity waves with frequencies 2pi/30h are discussed, but the inertial frequency is 2pi/12.7h. Omega must be greater than f, as the authors write themselves. So how is this consistent? Is it because of Doppler shifting? If so, this should be calculated and justified. To avoid confusion, omega could be called the ground based frequency in the figure captions where omega < 2pi/12.7h is shown.

In this study, the analysis is based on the ground-based frequency, not the intrinsic frequency. Thus, the frequency spectra of gravity waves do not range from f to N due to the Doppler shift; ω ÌĆ=ω- U âČŮ·k âČŮ. The discussion of the effect of the Doppler shift has been revised in Section 5 (P30, L3-23). In addition, the sentences and figure captions have been revised to denote ω as the ground-based frequency.

3) Each section looks at different months. The gravity wave analysis uses JJA, Figures 5 and 6 use May, Figure 4 April and May, Figure 3 April, Figure 2 May. It may be good to say at the beginning that different months are chosen for different comparisons and

give the reason for it.

We have selected April and May for the comparison of the model simulation to the observation (Fig. 4), since large amounts of the PANSY radar observation data are available. The case studies of the time-height section (Figs. 2, 3 and 5) are performed for the short time-periods in April or May. However, the statistical comparison in Fig. 6 is only performed for May, not for April. Following the suggestion, the comparison to the MERRA reanalysis data has been performed using April and May for the consistency. We have added some sentences to explain the reasons for the choices (P15, L16-18), and Figure 6 have been revised.

4) Every now and then semi-diurnal non-migrating tides with s=1 are mentioned. What is s?

s denotes a zonal wave number of tides, which is commonly used in the previous studies (e.g., Murphy et al., 2006, JGR). The definition has been added to the main text (P22, L1).

Typos: Figure 2: duplicate (a) Page 10 line 9: which -> which is Page 11 line 22: cumulous -> cumulus

The sentences have been revised. We apologize for such careless mistakes.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2018-1023/acp-2018-1023-AC1-supplement.pdf

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