

***Interactive comment on* “On the origin of the mesospheric quasi-stationary planetary waves in the unusual Arctic winter 2015/16” by Vivien Matthias and Manfred Ern**

Anonymous Referee #2

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This paper on the origin of the mesospheric planetary waves in the Arctic winter of 2015/2016 is well written and organized. The scientific reasoning is sound and methods are appropriate. The only issue I have is that I am not convinced that the authors showed sufficient evidence that wavenumber 2 is generated by in situ gravity wave drag at the high latitudes. If the authors address this I think it should be published with the following minor revisions.

Page 1, line 15: change to “. . .show that all three mechanisms. . .”

Page 1, line 24: change to “In addition to these global anomalies. . .”

Page 3, line 8: change to “longitudinally variably” or “variably in longitude”

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Page 3, line 10: change the word order to "...how favorable the conditions are in the..."

Page 3, line 11: awkward word order, change to "... in situ generation of the quasi 2-day wave, for example."

Page 4, line 3-4: change "in all latitudes..." to "at all latitudes"

Page 4, line 14: should be "atmospheric parameters"?

Page 6, Figure 2: Yes the PNJ is much stronger than the 12-year mean, but is this surprising? Doesn't the NH PNJ move around a lot from year to year, so that the 12-year mean is of course a little washed out? It would make a stronger case that this PNJ is exceptional if the figure showed the spread of all 12 years instead of just the mean. So for example, a line plot of the zonal mean zonal wind averaged between 50 and 60 N and 40 and 60 km versus time for the entire Period I.

Page 7, line 17: change word order to "used here"

Page 7, line 21: change "shift in vertical" to "shift in the vertical" or "vertical shift"

Page 8, line 24 and 26: change to "in the vertical"

Page 10, section 5 heading: change to "Why does the SPW 2 dominate in Period II?"

Page 11, line 12: change to "...only possible in a weak zonal mean zonal wind."

Page 14, Figure 7 caption: The date range of the SABER data should be added to the caption. Is it the entire Period II? This was not clear in the text either.

Page 14, Figure 7: I'm not convinced that it makes sense to filter the GW drag for wavenumber 2. If wavenumber 2 is the dominant wavenumber in the zonal wind, and if the GW drag is the cause of this, then the unfiltered GWD should show that. It might be more interesting to see what the unfiltered GWD looks like, because the wind doesn't just feel the wavenumber 2 GWD. The numbers are also very small for the GWD. On the order of 0.5 to maybe 2 m/s/d it looks like, an order of magnitude smaller than those

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from Smith 2003 for example. Again, it might be more fair to show the GWD from all wavenumbers.

Page 15, line 18: change “primary” to “primarily”

Page 16, line 14: change to “raises the question”

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