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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Mesospheric winds measured by MF radar with Full Correlation Analysis: error properties and impacts on studies of wind variance" *by* Maude Gibbins and Andrew Kavanagh

Anonymous Referee #2

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Dear authors, Dear Editor,

The paper entitled "Mesospheric winds measured by MF radar with Full Correlation Analysis: error properties and impacts on studies of wind variance" by Gibbins and Kavanagh aims at study the impact of different parameters (solar illumination, geomagnetic activity) on the variance of the zonal thermospheric winds. The paper is really interesting in many aspects, and I see a clear link with the ionised atmospheric community. I suggest the authors to take into account for minor comments (below) which could be useful for a non-expert reader.

Sincerely yours

Figure 1 : Add Auroral zone and polar vortex extents locations approximation.

Line 96 : "An oscillating signal can be seen, most strongly in panel (b) then (c)" We can't see any oscillation on (c) picture due to missing data. I guess the authors wanted to mention (e). Additionally, to highlight the semi-diurnal oscillation mention, it could be interesting to add on the plot the estimated oscillation (sliding-median or least-square adjustment). It could be also interesting to have the meridional in the same plots (in red for example).

Fig 3 : is it based on the entire data set or only on the 5 days in April 2013. Can you explain the larger wind speed in Halley compare to Rothera.

Line 134-136 : "The data in fig. 3 are from all altitude ranges from the Rothera radar: the relationship between velocity and axial ratio appears to be independent of altitude for the range of heights that the radars measure." I don't understand this statement as fig 3 (nor fig 4) is dependent on the altitude. Could the authors explain a little bit more on this point ?

Line 146, 147, . . . : Replace H2 by 2.H or something similar instead of H2 which is confusing.

Figure 6 and associated discussion: What is the period of time taking into account to produce this plots (especially the black circles). Is it years, month or a typical day or hour ? I suppose that the variance at a certain altitude "varies" with time, seasons, ... If not, could you add a sentence on this for a non-expert.

L233 : "This is interpreted as a response to the changing levels of ionisation". In the ionosphere, we call it Weddell Sea Anomaly, which corresponds to a maximum of electron density at local midnight during summer season. This paper "Chang, L. C., Liu, H., Miyoshi, Y., Chen, C., Chang, F., Lin, C., Liu, J. and Sun, Y. (2015), Structure and origins of the Weddell Sea Anomaly from tidal and planetary wave signatures in

FORMOSATâĂŘ3/COSMIC observations and GAIA GCM simulations. J. Geophys. Res. Space Physics, 120: 1325– 1340. doi: 10.1002/2014JA020752." This could be interesting to discuss in the paper to make the link between neutral and ionised atmosphere. In theory is that the maximum electron density at local midnight is due to thermospheric winds.

Fig 8 and corresponding discussion: The solar Zenith Angle (SZA) stands generally for the angle between the zenith of the location considered and the sun angle with respect to this zenith. So 0° means at the Zenith, and +/-90° at the horizon. The authors should adapt the figure and the caption with respect to this rule as they mention that "the solar zenith angle (90 – solar elevation angle)" while from figure 7 top, the SZA should be in between 90-40=50° and 90-(-5)=95°. I suggest the author to SZA for zenith = 0° and below the horizon + or - 90° and + corresponding to the sunrise and sunset respectively. Figure 10: Do you observed the same patterns above Halley? It could be interesting to have both in case they behave in different ways.

AE comparison with zonal wind variance: this part is interesting in terms of climatology (seasonal correlations) but also in term of altitude impact. However, the correlations ranged between 0 and +/-0.2 which is really small. The authors should explain how we can be sure about the conclusions with small correlation coefficients.

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