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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mean winds, temperatures and the 16- and 5-day planetary waves in the mesosphere and lower thermosphere over Bear Lake Observatory (42deg; N 111deg W)" *by* K. A. Day et al.

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Dear Referee 1,

Firstly, we would like to thank the referee for their suggestions about improving our paper. We have revised our paper in light of their helpful comments and comments. We feel that our paper is stronger as a result.

Resolution of the points detailed below line by line: P30382 L7 "at all observed heights" or "at all meteor ablation heights" – We agree and have changed.

P30382 L8 "speed" is a scalar quantity, and in this case cannot have a negative value (implying a negative distance or time going backwards!) – I think the authors repeatedly use "speed" when they mean "velocity" (northwards or eastwards positive) e.g. P30393 L27 and throughout the manuscript. We agree and have changed all to "velocity".

P30382 L17 "significant" are they significant, at what level of statistical significance, or do you mean "large"? We agree and have changed all to "large".

P30383 L3 are there really 32 occurrences used here? I count 16 green and 8 blue dots on Fig 10. See comment below on the presented values of AT and AW There were more occurrences that meet the burst criteria, but they did not all meet the next criteria of the Student T-test and so there are fewer points plotted on the figure. A sentence has been added to explain this.

P30384 L9 I am unaware of any studies that state the BD (or DB) circulation, driven by planetary wave breaking, drives the pole to pole circulation at meteor ablation altitudes other than through the selective filtering of upward propagating gravity waves. The authors should expand on this point (which is also repeated in the discussion) and support it with references. We agree and our original text was unclear. This has now been expanded on in the paper introduction and discussion. P4 L4-11 and P20 L10-11, respectively.

P30384 L24 what is a "significant meridional wind"? We agree and have changed all to "large".

P30385 L23 some references required as to previous use of these period ranges We agree and we have added the following references; Williams and Avery 1992; Luo et al. 2000; Luo et al. 2002a; Luo et al. 2002b; Lieberman et al. 2003; Riggin et al,2006; Belova et al.2008; Day and Mitchell 2010a; Day and Mitchell 2010b.

P30387 L17 typo, delete "they" We agree and have removed "they".

P30388 L7 typo, delete "on" We agree and have removed "on".

P30388 L26 and fig 1 I don't see the "two distinct episodes of maximum flow" on these plots, please explain this clearly This has been explained in more detail in the text.

P30388 L28 can you really say the lag is "two weeks" when you are using monthly mean winds and temperatures? This is one of your key results (stated in the abstract), but I don't see how you can "resolve" any differences smaller than one month? Please explain. We agree and a further statistical analysis of the data has been carried out. This is described in the paper. Briefly, a correlation analysis of the meridional wind and temperature time-series has been carried out using a 16-day smoothing to remove the effects planetary waves (if we did not use this smoothing we would get correlation caused by the coherent wind and temperature perturbations of any planetary waves). A full description is given in the text. This analysis shows that, at least in the composite-year, there is no lag and the coldest temperatures occur at the same time as the strongest equatorward winds. Abstract, Results, Discussion and Conclusion changed, P1 L9, P9 L22 to P10 L12, P20 L14 and P24 L4, respectively.

P30390 L18 typo "difference" We agree and have changed to "different".

P30392 L23 which solstice? This has been changed to explain that the 16-day wave is seen around both solstices.

P30393 L2 some references to the previous work are required here. We agree and we have added the following references; Williams and Avery 1992; Luo et al. 2000; Luo et al. 2002a; Luo et al. 2002b; Lieberman et al. 2003; Riggin et al,2006; Belova et al.2008; Day and Mitchell 2010a; Day and Mitchell 2010b.

P30393 L17 I would describe the summer peak here as a secondary maximum with minima around the equinoxes We agree and have changed to reflect this accordingly.

P30394 L3-7 why do all the values in this paragraph suddenly "appear to be" rather than "are"? We agree and have changed to "are".

P30394 L16 some references to PW damping during SSWs are required here. A figure

showing the major SSW events for the years observed has been added and the references of Alexander et al. 2010 and Day et al. 2011 added. P15 L20 to P16 L11 and a new figure, now figure 7.

P30394 L29 and P30395 L3 what are the statistical significance (if any) of the correlation coefficients presented here? The correlations coefficients are small but do suggest a connection between the winds and temperature fluctuations.

P30395 and fig 10 is there any statistical significance on the gradients of the (linear) fits presented here? This is another of your key results and needs an error analysis. In particular, have you forced the fits to pass through (0,0) and if so, why? The data has been forced through (0,0) as it is a reasonable assumption to link zero wind perturbation with zero temperature perturbation. The data has been analysed with this requirement removed and the results were calculated to be 0.22806 for the 16-day and 0.52627 for the 5-day wave (instead of 0.34069 and 0.61746, respectively when forced to pass through zero). These values are now mentioned in the paper. The statistical significance of the gradients added to the text. Note Figure 11 has been updated.

P30397 L8 and L15 are these agreements really "remarkable" or just "good"? We agree and all have been changed to "good".

P30397 L21 what "measurement biases"? Why are measurements made by Na lidars biased from those made by meteor radars? Also P30398 L4 discusses "measurement biases" what are these biases and how do they arise and how large are they? This text has been removed as it is beyond the scope of the current paper.

P30398 L13 typo, "nd" We agree and the text changed to "maxima and".

P30399 L19 typo "sites" We agree and the text has been changed to "site".

Thank you,

Kerry Day

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C14554/2012/acpd-11-C14554-2012-supplement.pdf

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