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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Statistical climatology of mid-latitude mesospheric summer echoes characterised by OSWIN radar observations" *by* Dimitry Pokhotelov et al.

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We are grateful to the Referee for the careful review. Below are point-by-point responses to the Specific comments. Referee's original comments are in [square brackets]. Attached is a revised version of the article, with changes highlighted in green.

[Page 1, line 3: "meridional wind transport"]

We replaced "meridional wind transport" with "meridional transport" throughout the manuscript.

[Page 1, line 3: "with THE OSWIN"]

Corrected.

[Page 1, line 12: "D-region (80-90 km)."]

Yes, the point was that MSEs occur at altitudes of 80-90 km within the D-region, though the D-region extends to lower altitudes. We modified the sentence to make it clear.

[Page 1, line 23: "during summer months with cold mesosphere"]

The referee is correct. We meant "cold upper mesosphere", the region where relevant meridional transport takes place. It has been corrected in the text.

[Page 2, line 8: "Similarly to PMSE, a dependence on global geomagnetic activity (Ap index) was found, as well as a weaker dependence on solar energy flux." This is not consistent with the results presented here, right? These differences should be openly discussed later in the manuscript. What are potential reasons for these discrepancies?]

Based on the suggestion of the other referee, we included the values of Pearson correlation coefficients between the occurrence of MSEs and meridional winds, F10.7, Kp and AE indices, and Vsw (the coefficients are now shown in Fig. 5 an 6). A weak correlation with global Kp index (R2 = 0.17) is also found in the current study. The main potential reason for the discrepancies between MSE and PMSE dependencies is that PMSEs at high latitudes are more directly linked to the geomagnetic activity than MSEs at mid-latitudes. We extended the discussion of the dependencies on geomagnetic activity in the Section 3.2.

[Page 2, line 11: "less than ONE 11-year solar cycle"]

Corrected.

[Page 2, line 15: "meridional wind transport" Page 2, line 20: "data from A specular .." Same line: "play A significant role .."]

All corrected.

[Page 3, line 4: “only for summer months (June-August).” Why wasn’t May analyzed? There may also be some MSE events in late May, right?]

Earlier work by Bremer et al., JASTP, 2006, doi:10.1016/j.jastp.2006.02.012 (see Fig. 1 in Bremer et al.) has shown extremely low MSE occurrence rates over Kuehlungsborn in late May, relative to summer months. To our knowledge, all subsequent studies of MSEs, at least over Kuehlungsborn, analysed summer months only. We do not expect that adding May periods would add anything substantial to this study.

[Page 3, line 7: I suggest replacing “In the analysis” by “In the current analysis” to make it clear that the statement refers to the work reported here.]

Replaced.

[Same line: “the maximum SNR value in a vertical column”. Is the entire altitude interval (50 – 120 km) used here, or only a narrower range around the expected MSE altitude?]

Only in a range of the expected MSE altitudes between 75 and 93 km. This has been is added in the text.

[Page 3, line 21: “a threshold of >= 5 MSE detections is used here.” In which time interval?]

A detection itself is defined as the detection in 1-hour interval. The threshold of 5 MSE detections is for the entire dataset of 12 years. These are very small counts.

[Figure 1: A general question about your MSE detection method: If the actual occurrence rate is 0%, would your technique be able to capture that or would you always obtain an occurrence rate of a few % ?]

If in a specific hour of UTC time (say 21-22 UTC) the amount of detected MSEs is zero, the occurrence rate would be 0%.

[Page 4, line 21: wrong cite command used for Bremer et al. (2016), i.e. entire citation should be in parentheses.]

Corrected.

[Page 4, line 27: “precipitation .. are” -> “precipitation .. is”]

Corrected.

[I would also replace “is shown by red bars” by “is shown (red bars)”, otherwise, the “as well as” may be interpreted to refer to “red bars”.]

Replaced.

[Page 4, line 1 and Figure 2: Please comment on the uncertainly on the winds shown (statistical and systematic errors).]

The statistical uncertainties in the horizontal winds range within 1-5 m/s, with the largest uncertainties at the upper (105 km) and lower (75 km) edges of the meteor layer. When averaged over 10 years, at the predominant MSE height of $\sim$85 km, these uncertainties should not exceed 1 m/s. We added a brief discussion in the text, with references to Stober et al. (2017; 2018). Systematic errors are difficult to assess due to the complexity and incomplete understanding of backscatter mechanisms from meteor trails. This discussion is well outside the scope of the current study.

[Page 6, line 12: “A more sensitive ..”]

Corrected.

[Page 6, line 22: “preferences .. is” -> “preference .. is” or “preferences .. are”]

Corrected.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2018-1027/acp-2018-1027-AC1-supplement.pdf

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