

Interactive comment on “Influence of geomagnetic activity on mesopause temperature over Yakutia” by Galina Gavrilyeva and Petr Ammosov

Anonymous Referee #2

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The paper is based on a big data set of almost 2900 nights of data acquired over nearly 16 years. The results show higher monthly mean OH temperature with high A_p (>8) than with lower A_p (≤ 8) from October through January. The difference is about 10 K (i.e. $10.5\text{K} \pm 1.4\text{K}$, or $9.6\text{K} \pm 1.4\text{K}$, if Feb is included, according to what I have "measured" and calculated based on figure 4), but the text mentions 10 K only in the abstract and in the Conclusion (Page4, Line13), but not when figure 4 is explained. The difference approximately disappears in the remaining months of observation. This is the main finding.

[my "measurements" on figure 4 gave scale 50K/113mm, and oct: 20mm \rightarrow 8.9K, nov: 21mm \rightarrow 9.3K, dec: 21mm \rightarrow 9.3K, jan: 33mm \rightarrow 14.6K, feb: 13mm \rightarrow 5.8K]

I still find the treatment of the existing literature in the discussion section too long; it is

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nearly a review, although by no means complete (compared to the additional literature cited in the recent and somewhat related paper by Yi et al., 2017). I think that at least part of this literature overview should go to the introduction, while skipping some of the details of how the literature results were obtained. At any rate, some improvement in structure (like subtitles for the different sub-topics, temperature effect from decrease of ozone radiative cooling - stratospheric warming - direct particle precipitation effects on temperature) would also be helpful.

[my Yi reference is Yi, W., Reid, I.M., Xue, X., Younger, J.P., Murphy, D.J., Chen, T., and Dou, X. (2017), Response of neutral mesospheric density to geomagnetic forcing, Geophys. Res. Lett. 44, 8647-8655, doi:10.1002/2017GL074813. While the focus is on density (with temperature only an auxiliary parameter), it cites many papers about solar activity effects via Joule and particle heating, and about geomagnetic forcing on ozone (none of which are mentioned in the present paper), stating that the expected temperature and density impact has "never been found".]

Only after 30 lines of "review", the topic returns to the authors' original results related to figures 4, and turns to the comparison of the long-term behaviour of F10.7 and the Ap index in figure 5. The rest of the discussion is again about literature results.

The long literature discussion is not as closely focussed on the observed 10 K winter enhancement for high Ap conditions as would be desirable, and some reorganization and editing would help for easier reading.

Minor details: Page1, Line32: add after "activity", ", the" -> "...measure of geomagnetic activity, the widely available Ap index..." ["index Ap" sounds as if its name were not well-known]. Since "index" is latin, the plural "indices" should be used (same line).

Fig. 1: the overlap between the F10.7 and Ap curves makes it not easy to read. Shifting the zero point for F10.7 upwards would help.

Page2, Line31: Missing "The" before "first group"; (same issue next sentence).

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Line34: "approximately the similar" -> "approximately similar" (or "approximately the same"); change to read "geomagnetically active years" [an adverb, not an adjective].

Fig. 4: the ticks on the time axis seem to be the beginning of each month; to make this easier to see, the labels should be centered between these ticks. On the other hand, the temporal positions of the Aug, Sep, and May data points look as if there was something wrong (not centered near mid-month).

Page3, Line32: This reference to the result given in the previous section (temperature enhancement due to geomagnetic activity) should be formulated so that it does not sound like news, here. Also, the emission height of OH has been mentioned before. Here, only the height difference of 7 km matters, so that the previous sentence could continue "...limited to a height of 80 km, which is 7 km below the hydroxyl emission layer".

Line34: "has to be detected"? The argument is that stratwarm effects are known to propagate downward, so that the OH temperature effect should be expected to occur earlier than model results obtained for 80 km, and below.

L35, 36: -> "measurements", delete "also", or start sentence with "Also, most of...".

L40: it would be better to connect both sentences with ", because in order to separate...", because they are related.

Page4, Line13: missing "is" between "mesopause" and "approximately", missing space between "10" and "K".

L16: "onset of warming was noticed", better "the average onset of stratospheric warmings is observed (Seppälä et al., 2013)" to be more explicit, and avoid the impression that the timing of stratwarms was unknown, before 2013.

L37: missing "i" in "Gavrilyeva".

The occurrences of "Seppälä" (the 2 in P3L22, and the ones in P3L27, P4L7, P4L16)

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should be spelled correctly, as in P4L32, P5L10, P5L25, P5L27.

Page5, Line13: Mies title has "X dublett-Pi", and pages 150-188.

Line14,15: "III" is part of the family name, so -> "Russell III, J.M.". But, I ask myself (and the authors), wouldn't Randall, C.E., Harvey, V.L., Siskind, D.E., France, J., Bernath, P.F., Boone, C.D., and Walker, K.A.: NO_x descent in the Arctic middle atmosphere in early 2009, Geophys. Res. Lett. 36, L18811,doi:10.1029/2009GL039706, 2009. be more pertinent than the Randall et al. 2007 paper, although it's "only" about special conditions in early 2009. (The "x" in NO_x is subscript).

Line29: missing "." after "Kallenrode, M.-B".

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