

## ***Interactive comment on “Long term dynamics of OH temperatures over Middle Europe: Trends and solar correlations” by C. Kalicinsky et al.***

### **Anonymous Referee #1**

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This paper opens a new view on trends in mesopause temperatures. Since it is controversial in comparison with other results, possible open questions or weaknesses of the paper should be carefully revised. Therefore I recommend major revision but, on the other hand, I expect final publication of the paper even though my personal point of view in its area differs.

#### Comments:

You assume that dependence of temperature on solar proxies is the same over the whole period of measurements. Some recent results indicate that it need not be true. Try to calculate solar proxy dependence separately for 1988-2005 and 2006-2015, even though the second period is rather short for significant result.

It is natural that eq. (9) with three terms provides better fit than eq. (8) with two terms.

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Try to add to eq. (8) trend term as the third term and compare it with results of eq. (9).

I do not agree with your conclusion (5) as it is written. The result that if you assume only one trend over the whole period than the trend depends on the length of period is trivial and well known but it does not mean that linear trend approach is wrong. Since long-term changes of some trend drivers (ozone, geomagnetic activity etc.) are temporally and spatially variable, trends can (and some must) change with time (see e.g. review paper Lastovicka et al. (2012)). For this reason a piecewise linear trend model with trend break(s) has been introduced, which you also apply. So either reformulate your conclusion (5) or delete it. Lastovicka, J., S.C. Solomon, L. Qian: Trends in the Neutral and Ionized Upper Atmosphere. Space Science Reviews, 168, 113-145, doi: 10.1007/s11214-011-9799-3, 2012.

Page 7: The trend break near 1997 is not well supported by data in Fig. 8; it appears to be rather questionable.

Figure 3: Have you some explanation for WUO-HPB difference in 2008-2010?

Figures 8 and 9: Eye inspection of data points in these Figures calls for trend break rather in 2003 than in 2006, even though both are possible.

You should also take into account results of some other authors:

C.M. Hall et al.: Temperature trends at 90 km over Svalbard, Norway (78 N, 16 E), seen in one decade of meteor radar observations. J. Geophys. Res., 117, D08104, doi: 10.1029/2011JD017028, 2012: No change of 90 km temperature trend over Svalbard around 2006. Meteor radar temperatures.

I.A. Mokhov, A.I. Semenov: Joint analysis of the long-term behavior of temperature in the mesopause and on the Earth's surface during the period of about 60 years. 6th NDMC Meeting, Grainau, 2014 (your co-author D. Offermann attended): 1960-2012 data from Zvenigorod near Moscow. OH mesopause temperatures. Drop in the second half of the 1970s, than negative trend till the mid-1990s and essentially no trend

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afterwards. No change reported around 2006.

C.-Y. She, D.A. Krueger, T. Yuan: Long-term midlatitude mesopause region temperature trends deduced from quarter century (1990-2014) Na lidar observations. *Ann. Geophysicae*, 33, 363-369, doi: 10.5194/angeocom-33-363-2015, 2015. Fort Collins/Logan, USA. 85-90 km temperature trend 1990-2014 is negative, after the mid-1990s weaker than before. No change of trend reported around 2006.

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