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Interactive comment on "Spatial variability in tropospheric peroxyacetyl nitrate in the tropics from infrared satellite observations in 2005 and 2006" *by* Vivienne H. Payne et al.

Anonymous Referee #2

Received and published: 19 January 2017

The authors present results from a recently developed and novel peroxyacetyl nitrate dataset from the TES instrument on Aura. The paper builds on previous work to demonstrate the ability of TES to measure PAN in enhanced conditions and presents an analysis of spatial and temporal variability of elevated PAN values in the tropics for 2005 and 2006. The method for producing the PAN data is discussed in a previously accepted paper in AMT. Data presented for 2006 are from an El Nino year and implications for PAN during increased fire activity periods are discussed. The paper presents comparison to model expectations during the same period and data between the observations and model are fairly consistent, at least qualitatively. The PAN data presented is currently unique for nadir viewing instruments and are of great value for testing the ability

of Earth system models to predict tropospheric ozone, for example. I have a few general comments and once these issues are addressed I am happy for the paper to be published in ACP.

General comments:

1) I would like more expansion of the model/measurement comparison (section 5). It is presented that absolute values of PAN are higher in the measurements than the model. Why does the model predict lower values? Where the measurements can help inform the model about where the formation mechanisms are lacking? I understand it is a data driven paper, but it is essential to discuss how these new datasets may be used to improve model predictions.

2) It is clear that PAN can only be measured in "elevated" concentrations and so it is not possible to look at regional averages etc. It would be useful to re-iterate what the detection limit is for this retrieval, without having to read through the original data paper. Does this limit vary from region-to-region based on thermal contrast, for example?

Specific comments and technical corrections:

1) Page 5, line 4: change to "GEOS-Chem (www.geos-chem.org) is"

2) Page 6, line 32: please add in which months peak biomass burning occurs either here or earlier in the text. It seems a little vague at the moment as the reader may not know which months are inferred.

3) Page 8, line 7: muddled sentence. I do not know what the authors are trying to say in this line, please rewrite.

4) Page 8, line 8: muddled sentence starting "The year-to-year. . .."

5) Page 9, line 26: muddled sentence "of the of fire", please adjust to make sentence clear.