

Interactive comment on “Free tropospheric peroxyacetyl nitrate (PAN) and ozone at Mount Bachelor: causes of variability and timescale for trend detection” by E. V. Fischer et al.

Anonymous Referee #2

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General Comments:

This paper presents 3 successive years of measurement of spring time PANs at Mountain Bachelor Observatory (MBO) using Gas-Chromatography with Electron Capture Detector (GC/ECD), and then lists a few factors that might have impacts on the year to year variations, finally discusses the requirements to detect a trend within the range predicted in a previous model run. The data is valuable, and it is scientifically important to sort out the possible causes of observed variation and determine the requirement for trend detection. This paper shows a good effort of doing so, though the analysis is still coarse. I think it is publishable if the authors use some work to make the discussion

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deeper. For example, besides saying the listed factors can have an impact and 2009's observation might be able to be explained, it will be better to estimate the size of the effects, even an order of magnitude estimation will help. It is argued that 2008 has more fires (by how much? And how much variation in PAN?), and in 2009 the long range transportation spent more time at cold region thus thermal dissociation was reduced (again, by how much?), so in 2009 still more PAN was observed, but there is no detailed analysis. In fact, if the meteorology condition can suppress the "big" variation in the source (and how does this bio mass burning variation compare to the change in the anthropogenic inventory?), then the PAN trend story would be much more complicated and I believe it is.

The ozone measurement is mentioned in the title and there are 3 paragraphs in the introduction talking about O₃ concentration, but no O₃ data is shown in the paper. It would be nice to be included.

Some specific comments:

P4114 Line24-25: the campaign mean does not have much meaning here, given that if C-130 had couple more flights to chase plumes, the upper limits would be larger than 240pptv. It is not clear what these lower and upper limits are going to tell us.

P4115 Line18-22: Need some explanation on the inset map, why this region is chosen, is all the grid cell equally weighted in the fire counting? If so, is it a fair assumption?

P4116-P4115, section 4.1: How does the fire counts in figure 3 link with the observed PAN variation? There are more fires in 2008, but lower average PAN mixing ratio?

P4115 Line 2-3: Can not find MBO 2006 data in this paper.

P4116 Line 3-6: Again the southeast Asian impact is mentioned but no real analysis.

P4116 Line20-25: Authors firstly say “with such a small number of points the correlation coefficient is not significantly different from zero. ” Then they make assertion that 2010's transportation is stronger than 2008 and 2009. Though the exact numbers are

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not given here, it still makes readers wonder how reliable the conclusion is.

P4117 Line8-14: What kind of message should we take from this paragraph? So the trajectory study says MBO is under the influence of different air between 2009 and 2010, what does that mean to the PAN observation?

P4119 Line25-27: How much is the spring time variation of isoprene emission? For all the variability and even trend discussion, without some estimation, it is just hard to make sense out of it.

P4120 Line24-P4121 Line5: does Zhang's calculation include the variation in bio mass burning? If not, how would variation in the fires mentioned in section 4.1 impact the trend of PAN?

P4121 Line 6: a reference for this assertion?

P4125 Line 25: "By incorporating the multi-year dataset, we include both synoptic scale and interannual variability in the calculation" ... need more explanation here. I think this re-sampling is the core part that the authors acclaim the usage of the real data to determine the requirement for 4% trend detection. A single sentence like this is not very convincing, please list references.

Fig. 2 In Intex-B C130 and DC8 were sampling different air for most of the time; In fact, these two points can be any number depends on the flight plan, it is just confusing to put these points in the same figure without further filtering.

Fig. 4 $\log_{10}(\text{hours})$ is hard to understand, my guess it means "occurrence of trajectory went through the grid cell (in log scale)"

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 4105, 2011.