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## ***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 #3**

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#### Major comments:

In this paper the authors basically discuss interannual variability of PAN and diagnose usefulness of PAN as a proxy of photochemical ozone in conjunction with the detection of tropospheric ozone trend, particularly focusing on Asian emissions impacts. They showed year-to-year variability of PAN observed at Mt. Bachelor based on three-year dataset from 2008 to 2010, integrated other PAN measurements made in the Eastern Pacific region (though this attempt seems failed), discussed possible factors affecting interannual variability of PAN, and finally argued timescale of trend detection of PAN (and ozone) at Mt. Bachelor.

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I like the authors' idea and attempt. The idea to diagnose PAN as a proxy of photochemical ozone is not very original, but quantitative analysis and diagnosis associated with ozone trend is worth attempting, I believe. The data are quite new (2008-2010!) and their focus on the trend during the last decade is timely, since Asian emissions are rapidly increasing after 2000. The paper potentially has great contribution to the scientific community dealing with long-term trends of tropospheric ozone and/or stratosphere-vs.-troposphere arguments. On the other hand, overall impression of the paper is somewhat weak. I feel that the analysis presented in this paper could be more robust if they elaborate on interpretation of interannual variability of PAN (and ozone) or on diagnosis of trend detection at some more other sites, where data are available. For example, the authors suggested biomass burning, transport efficiency, and vertical transport as three major causes for PAN interannual variability. However, their analysis seems circumstantial evidence. It would be better if they could present some deeper analysis on this issue, for example, by using state-of art models, or anomalies in climate index and/or meteorological parameters. The interpretation could be improved if they discuss not only PAN but also ozone (or CO as a tracer) simultaneously. Since three years are obviously short, more effort to extend data period (2006 in Wolfe et al.) is highly appreciated.

## Minor comments:

The authors noted "ozone" in the paper title, but they did not discuss much about it. I would suggest "possible causes of variability" for the title, unless the authors analysis is going deeper.

Figure 1: Can you include ozone (and more, like CO and aerosol) here?

Figure 3: Data can be extended to 2010.

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

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