

Interactive comment on “Wintertime peroxyacetyl nitrate (PAN) in the megacity Beijing: the role of photochemical and meteorological processes” by H. Zhang et al.

Anonymous Referee #2

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Wintertime peroxyacetyl nitrate (PAN) in the megacity Beijing: the role of photochemical and meteorological processes (Zhang et al.)

This paper has improved since the first round of review. I am also happy to see that some analysis was expanded. However, there are still issues left which the authors need to address:

- Page 31872, line 9: what is meant by "average": arithmetic mean or median?
- Page 31872, lines 9-10: Why can a "small" diurnal cycle be a "significant" diurnal variation?

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- Page 31873, line 1: the ranges given for PA are obscure. Why are the lowest values 0 ppt, while Fig 14 also shows negative values? What are the uncertainties of these values, also given the fact the analyzer used by the authors did not measure NO₂ directly?

- Page 31876, line 24 and line 26: explain abbreviations HYSPLIT and GDAS

- Page 31877, line 2: explain abbreviation WRF

- Page 31877, lines 16-23: there is too much speculation about a trend in the PAN data. The time measurement period is too short to make this a conclusive point. The authors should remove this part.

- Page 31878, lines 16-17: what do the authors mean by "modern techniques"? This wording suggests that the previous PAN measurements were not reliable. Why then report those previous measurements?

- Page 31880, lines 16 etc.: the authors should also discuss the presence background O₃ in the Beijing area.

- Page 31881, line 3: remove "significant", as $r^2=0.4$ is not a significant number.

- Page 31881, lines 14-22: what are the levels of HNO₃ in Beijing? It could make a non-negligible contribution the NO₂ signal during the daytime.

- Page 31881, lines 19-20: the statement about the average concentration of NO₂ and PAN is not sufficient, as the NO₂/PAN ratio can change significantly during the day. The authors should rather estimate the worst case scenario, i.e. during daytime when the NO₂/PAN ratio tends to reach a minimum. What would be the contribution of PAN to the NO₂ signal?

- Page 31882, lines 13-22 (and associated Fig 6c): What is the added new information compared to Figures 6a and 6b? I would remove these parts.

- Page 31883, lines 9-19: this discussion can be shortened significantly, as it is obvious

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from Fig 7a and 8 that windspeed is the driving force in controlling the concentrations of most pollutants.

- Page 31884, lines 1-13: Fig 8 shows a combination of Fig 6 and 7. I would strongly recommend to shorten this lengthy and repetitive.
- Page 31884, lines 10-13: the authors should have Figure 8 split into day vs nighttime data to support their statement and not have speculations,
- Page 31887, lines 1-6: the authors should remove this paragraph as the subsequent paragraph discusses the same, but in a more elaborate way.
- Chapter 3.7: this chapter strongly needs an estimate about the uncertainty of the NO₂ measurements and its impact on the uncertainty in determination PA.
- Page 31889, line 16: what is the estimated contribution of physical processes to PA concentrations? According to Figure 14 it could be significant.
- Page 31890, line 2-3: Why?
- Page 31890, lines 9-11: units are missing.
- Page 31890, line 13: what do the authors mean by "significant"?
- Figure 1: Map of Beijing is way too tiny!
- Figure 6c: what is the additional value of this plot compared to 6a and 6b (see also comments above)
- Figure 7: what values are shown: arithmetic mean or median?
- Figure 8: units for windspeed are missing,
- Figure 11: would suggest to have the yellow background for the daytime period, not for the nighttime period. Is the data for temperature and relative humidity ever discussed in text? Would suggest to remove this plot?

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- Figure 12: would suggest to remove the contour lines to enhance clarity of the plot.
- Figure 14: this plot needs uncertainty bars rather than a moving average!
- Figure 15 is still too tiny

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 31871, 2012.

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