**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Acyl peroxy nitrate measurements during the photochemical smog season in Beijing, China" by Z. Xu et al.

Anonymous Referee #2

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The paper by Xu et al describes PAN, PPN, and MPAN measurements in Beijing, for a one week period, in the summer of 2007. This would be the first report of PAN measurements in Beijing, and, given that and the rather high concentrations of PAN in this highly populated megacity, the data, if published, are useful. However, the paper is largely descriptive, and focuses on reporting the statistics of the observations, with standard regressions between PAN species, and with O3. By themselves, such statistics do not bring this to the level of a publishable paper, without providing some new information or understanding of atmospheric PAN chemistry. I find Figure 14 quite intriguing (perhaps I am missing something), and counterintuitive, in that I would expect that PANs would typically increase with increasing humidity, since OH production rates increase with humidity (from O3 photolysis). Thus, this figure implies the possibility of RH-dependent uptake on aerosols? If this issue can be explored further, this obser-

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vation might bring this data set to a publishable form. But just reporting the numbers should not, in my opinion, make it publishable in ACP. I encourage the authors to work on this, since the data are useful. I have a number of minor criticisms, listed below in the approximate order they arose in the paper.

1. Page 10267, line 5 - the NOx transport issue should refer to Singh and Hanst, GRL, 1981.

2. Figure 1 is not a useful map. What would be useful is a map on a more regional scale, say 100km, showing the measurements site within the greater Beijing area.

3. Page 10269, line 9 - are these response ratios by peak area?

4. Page 10269, line 20 - you cannot get "actual NO2" by subtracting NO and PANs, since the NOx analyzer also responds to HNO3 and RONO2 species.

5. Table 1 should be deleted.

6. The first three sentences of paragraph 2 under section 3.1 are confusing and should be rewritten.

7. Top of page 10271 - as far as one can tell from Figures 2 and 4, the timing for the O3 and PAN peaks are not different. The sentence starting with "The daytime maxima..." on line 21 does not make sense. In general, the paper should be brief with the presentation of the statistical information, because it is not very interesting or informative, at least as presented.

8. Page 10272, line 16 - change to 400 micrograms/m3, not mg/m3! Line 23 - PAN is correlated with peroxy radicals, as they are produced in parallel. PAN itself is not necessarily making much RO2.

9. Page 10273, line 17 - isn't PAN/MPAN a better indicator of the impact of AHCs?

10. The paragraph about ratios at the top of page 10274 makes little sense to me. How exactly are HC emission inventories connected to the PAN/NOx ratio?

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11. Page 10274, line 11 - in several places, here as an example, too many significant figures are used in the numbers reported.

12. Page 10274, lines 12 and 13 - I think these are backwards.

13. Mid page 10275 - explain why this regression equation to predict PAN is useful. Can you imagine a situation in which someone has PPN and MPAN data, but not PAN data?

14. Explain how you derived equations 1-4.

15. Section 3.4 should be deleted, as nothing significant is concluded from it.

16. Page 10277, line 21 - what does "an appropriate range for heterogeneous reactions" mean? Can you provide a reference, or a calculation?

17. Page 10278 - The section related to Figure 14 should cite Roberts et al., JGR, 1996.

18. The Conclusions section should discuss what we have learned that we didn't know previously. The possibility for heterogeneous reactions would be most of this, and should be explored further, if it can be done in a scientifically defensible way.

19. The O3 vs MPAN regression in Figure 6, for very low O3, implies to me the possibility that there is an overlapping interference at the MPAN retention time.

20. I am not able to determine what the green data in Figure 9 are.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10265, 2011.

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