Atmos. Chem. Phys. Discuss., 13, C673–C680, 2013
www.atmos-chem-phys-discuss.net/13/C673/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone and fine particle in the western Yangtze River Delta: an overview of 1-yr data at the SORPES station" *by* A. J. Ding et al.

Anonymous Referee #1

Received and published: 19 March 2013

General comments:

The manuscript shows a 1 year data series of trace gases and PM2.5 observations in the recently set up SORPES station in East China. The site is under influence of urban and biomass burning emissions, being an interesting location to study the interactions between surface emissions and pollution transport. The dataset is of good quality and the data analysis consistent. I recommend publication in ACP after minor revisions, according to the following comments.

Specific comments:

1. Section 2.1: You did not mention the construction works in the campus (Herman et

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

al., 2013). This could be a significant source or aerosols. Please discuss the potential impact on your results.

2. Page 2840, lines 11-13: It would be great to give the reader an idea of spatial distances, either by adding a length scale to Figure 1c, or by mentioning distances in the text.

3. Page 2840, line 19: what was the measurement height? 40 m above ground level? Or 40 m above the surrounding landscape?

4. Section 2.1: How about meteorological measurements? What equipment was used, and which variables were measured?

5. Section 2.1: Please mention the inlet lines length, material, and potential losses.

6. Page 2840, line 25: Was the SHARP-5030 aerosol mass analyzer operated under dry conditions? How did the RH vary inside the instrument along the year? This could have a great impact over aerosol mass, since the aerosols are quite hygroscopic in China (e.g., Eichler et al., 2008; Liu et al., 2011; Meier et al., 2009). Please discuss the potential impact of relative humidity on PM2.5 mass concentration.

7. Page 2841, line 15: Did you mean 3000 particles per cubic centimeter? Why did you assume this specific number? What was the release duration?

8. Page 2843, line 4: The observed O3 season behavior is quite similar to the one observed by Lin et al.(2009) near Beijing: peak in summer.

9. Page 2843, lines 12-16: Does solar radiation availability in summer could also contribute to the observed O3 summer peak?

10. Page 2843, lines 22-28: Increased vertical mixing in summer may also play a role on PM2.5 seasonal pattern.

11. Page 2844, line 3: How long does the winter break last?

ACPD

13, C673–C680, 2013

12. Page 2845, line 25: The positive correlation between PM2.5 and O3 under high temperatures does not seem “pronounced” to me, at least in the scale used on Figure 4d. Be careful with the use of adjectives in a scientific text.

13. Page 2845, line 27: On page 2843 (lines 19-28) you attribute PM2.5 variations to season emission and deposition patterns. You could also discuss the relationship between PM2.5 and NO there, or add a plot of the PM2.5-NO correlation to Figure 4.

14. Page 2845, line 29: The data you show do not characterize a statistically significant polynomial behavior. You should remove the polynomial fit from Figure 4d, unless you have a good reason for that.

15. Page 2846, line 1: The positive correlation between PM2.5 and O3 under high temperatures does not indicate a substantial formation of secondary aerosols by itself. Later in the same paragraph you point out a number of facts that support the hypothesis of secondary aerosol formation. Nevertheless, you don’t have a definite proof, so please be careful with the use of strong adjectives like “substantial”.

16. Page 2846, line 1 (again): According to Table 1, the highest RH levels are observed in the summer. If the RH inside the aerosol analyzer is also higher in summertime, water uptake by particles could produce a positive bias on aerosol mass concentration. Please discuss how this would affect your results.

17. Page 2846, line 8: Herrmann et al. (2013) do not clearly state that new particle formation occurred mostly under high O3 concentrations. Moreover, they only show data between Nov2011 and Mar2012, when O3 mixing ratios were smaller in comparison to summer (Figure 3a). What they say is that new particle formation is correlated with solar radiation, which, in its turn, may be correlated with O3 to a certain extent.

18. Page 2846, line 22-23: Please mention what is the AAQS-CN national standard for O3.

19. Page 2847, line 5: Are the diurnal cycles shown in Figure 5 average diurnal cycles?

ACPD
13, C673–C680, 2013

20. Page 2848, line 12: Maybe the “afternoon valley” during non-episode days is just not clearly seen in the y-axis scale used in Figure 6a.

21. Page 2848, line 15: Refer to comment #17.

22. Page 2852, lines 2-3: For a “strong evidence of secondary aerosol formation” you would need on line measurements of aerosol chemical composition. What you have are evidences of intense photochemical activity (high ozone mixing ratios) and SO2 concentrations high enough to partition to particulate sulfate.

23. Page 2852, line 18: Please define what you mean by “episode days” here: days in which O3 mixing ratios exceeded the national standard of XXX?

24. Page 2854, line 22: “. . . PM2.5-O3 correlations clearly demonstrated substantial formation of secondary aerosols. . .”. Refer to comments #12, 15, 17, 22.

25. Page 2854, line 24: Again, define what you mean by “episode days” here.

26. Table 1: By “statistics” you mean averages or medians? Does “Rainfall” refer to monthly accumulated precipitation?

27. Figure 3f: In this paper you show measurements between Aug-2011 and Jul-2012. How do you explain the discontinuity on NO concentrations between December and January? Median NO mixing ratios in December reached $\sim$18 ppb, while in January it suddenly dropped to $\sim$2ppb. Was the data coverage similar in all months?

28. Figure 4: a. What do the dashed lines mean on Fig 4b and 4c? b. The dependency shown in all of the four subplots is clearly non linear, considering all data points. Therefore, it is useless to fit trend lines. c. What does “R” mean on Fig 4b and “r” mean on Fig 4c? d. Remove polynomial fit (see comment #14)

Technical corrections:

1. Page 2836, line 6: remove “but with contrast patterns”, since the word “distinguished” has been used in the same sentence, with the same meaning.

ACPD

13, C673–C680, 2013

2. Page 2838, line 14: define the acronym GAW.

3. Page 2839, line 6: use “synthetic analysis” or just “synthesis”.

4. Page 2839, line 7: use “sources” instead of “causes”

5. Page 2840, line 17: “. . . measurements began in the summer of 2011”.

6. Page 2840, line 27: “. . . aerosol size distribution measurements were. . .”

7. Page 2841, line 6: “. . . less precipitation and low RH was observed. . .” instead of “appeared”

8. Page 2841, line 13: include the acronym and country NOAA-USA

9. Page 2841, line 15: remove “at”: “. . . with 3000 particles released 100 m a.g.l. over. . .”

10. Page 2841, line 20: “. . . of long-living species. . .”

11. Page 2842, line 12: “. . . from the Yellow Sea (NE) by clockwise . . .”

12. Page 2842, line 13: did you mean “. . . transported from Eastern China and adjacent oceans.”?

13. Page 2843, lines 24: Please be careful with the word “higher”. Maybe it would be more precise to say that in the winter the dry weather and strong winds contribute to increased particle suspension and advection.

14. Page 2844, line 1: I think you meant Section 3.3.

15. Page 2844, line 6: “. . . increased in the end of autumn. . .”

16. Page 2844, line 15: “. . . correlations between different species. . .”

17. Page 2844, line 24: “. . . in cold seasons and at nighttime.”

18. Page 2845, line 2: “. . . than the previous. . .”

ACPD

13, C673–C680, 2013

19. Page 2845, line 9: “clearly” sounds better than “obviously”

20. Page 2845, line 9: “. . .that high O3 levels are. . .”

21. Page 2845, line 20: please rephrase. Suggestion: “. . .that since XXX NOx control policies have been implemented in China. . .”

22. Page 2845, line 23: remove “the two most important pollutants”

23. Page 2846, lines 2-6: the sentence is too long. Please rephrase, for clearness.

24. Page 2846, lines 22-23: use “occurring” instead of “occurred”.

25. Page 2847, line 3: “As our measurements were conducted upwind from Nanjing. . .”

26. Page 2847, lines 21-22: for clearness, rephrase as: “Comparison of the diurnal patterns for episode and non-episode days. . .”

27. Page 2847, line 21: remove “etc”

28. Page 2849, line 6: “In the first day of the episode . . .”

29. Page 2849, lines 11-12: “. . . relatively fresh emissions from the YRD region (Fig. 7c), also produced O3 mixing ratios up to 90 ppbv.”

30. Page 2849, line 13: Be careful with the recurrent and unnecessary use of the adjective “high”.

31. Page 2849, line 22: “. . . an extremely high concentration PM2.5 episode . . .”

32. Page 2849, line 29: “. . . see the average retroplume . . .”

33. Page 2850, line 23-24: “Based on PM2.5 chemical composition, . . .”

34. Page 2850, line 29: “On 10-jun-2011 a low pressure was located. . .”

35. Page 2851, lines 5-8: Refer the reader to Figures 9c and 9e along the text.

36. Page 2851, line23: “on that day”: since you are analyzing several days, specify

ACPD

13, C673–C680, 2013

what day you are talking about, for clearness.

37. Page 2852, lines 5-6: the statement “SO2 was at relatively high levels” is misleading. “SO2 mixing ratios were relatively high, between XXX and XXX ppb” is more precise.

38. Page 2852, lines 14-18: The sentence is too long. Please rephrase, for clearness.

39. Page 2854, line 5: typing error “Summary”

40. Figure 3 (legend): did you mean “median values”?

41. Figure 3b: typographic error on y-axis title "ug". Use greek letter "mu" instead. The same on Figures 4d, 5b, 6a, 7a, 8a, 91, 10a, 12.

42. Figure 7: in the figure caption you could mention that the red circle shows the site location

43. Figure 8a: a. Superposition of PM2.5 and NOy y-axis labels. Same for Fig 9a. b. Use the same format on x-axis labels on Fig 7-10a c. There was no rain before 30 Nov?

44. Figure 9: There was no rain after 7 Jun on Fig 9a? I cannot see the red circle marking the site location on Fig 9f.

45. Figure 10a: Here you show the rain y-axis, but there seems to be no data points.

46. Figure 11: Please state what is the region delimited by dashed lines. Same for Fig 12.

References

Eichler, H., Cheng, Y. F., Birmili, W., Nowak, A., Wiedensohler, A., Brüggemann, E., Gnauk, T., et al. (2008). Hygroscopic properties and extinction of aerosol particles at ambient relative humidity in South-Eastern China. Atmospheric Environment, 42(25), 6321–6334. doi:10.1016/j.atmosenv.2008.05.007 Lin, W., Xu, X., Ge,

ACPD

13, C673–C680, 2013

B., & Zhang, X. (2009). Characteristics of gaseous pollutants at Gucheng , a rural site southwest of Beijing. Journal of Geophysical Research, 114(D00G14), 1–17. doi:10.1029/2008JD010339 Liu, P. F., Zhao, C. S., Gobel, T., Hallbauer, E., Nowak, A., Ran, L., Xu, W. Y., et al. (2011). Hygroscopic properties of aerosol particles at high relative humidity and their diurnal variations in the North China Plain. Atmospheric Chemistry and Physics, 3479–3494. doi:10.5194/acp-11-3479-2011 Meier, J., Wehner, B., Massling, A., Birmilli, W., Nowak, A., Gnauk, T., Bruggemann, E., et al. (2009). Hygroscopic growth of urban aerosol particles in Beijing (China) during wintertimeâĂŕ: a comparison of three experimental methods. Atmospheric Chemistry and Physics, 6865–6880.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 2835, 2013.