

## ***Interactive comment on* “Characterization of atmospheric trace gases and particle matters in Hangzhou, China” by Gen Zhang et al.**

### **Anonymous Referee #1**

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This manuscript reports one-year continuous measurements of trace gases and particulate matters at a National Reference Climatological Station in Hangzhou, southern Yangtze River Delta region. The data were analyzed in terms of seasonal variations, interspecies correlations, and potential contributions from local emissions and regional transport. The measurement data of the present study are much valuable, and the analysis and interpretation of the data are fairly well. Thus, it is recommended that this manuscript can be considered for publication after the following comments being addressed.

#### Specific Comments:

1. Overall, the interpretation and analyses of the measurement results are fairly well, but there is lack of comparison with the other studies and importance or implications

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of the present study. To date there have been many measurement studies in the YRD region, such as at Lin'an, Shanghai and Nanjing. The authors should point to the new findings or difference between this new piece of work and the previous studies.

2. The first paragraph of the Introduction section contains a lot of very basic information on the individual trace gases. I presume that the readership of the Journal should be expertise of this field, and suggest the authors to remove (or shorten) such general description and just focus on the key knowledge gaps and motivation of the study in the Introduction part.

3. Page 2, Line 52: intermediates/products

4. Page 2, Line 55: and/or

5. Page 3, Lines 80-81: it is not clear what the “large knowledge gap and discrepancy” means. Please elaborate more about the knowledge gap.

6. Line 3, Line 89: Experiment and meteorological conditions

7. Line 3, Line 93: please provide the standard deviations for the average temperature, RH and rainfall.

8. Section 2.1: the authors need clearly state the type (e.g., urban, suburban or rural) of the study site. What are the major emission sources surrounding the site?

9. Section 2.2, on the measurements of NO<sub>2</sub> and CO: what kind of converter was used for the conversion from NO<sub>2</sub> to NO? Is there auto-zero or auto-reference function for the CO analyzer, and what is the time frequency for the auto-zeroing during the campaign?

10. Page 5, Line 132: change “showed” to “found”

11. Page 6, Lines 165-166: it would be better to use daily maximum 8-hour average ozone concentration for estimating the ozone exceedance days.

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12. Page 6, Line 172: change “between” to “among”

13. Page 6, Lines 180-182: higher NO<sub>y</sub> levels cannot indicate more photochemical oxidation of NO<sub>x</sub>, as NO<sub>y</sub> is the total nitrogen oxides including both NO<sub>x</sub> and its oxidation products (NO<sub>z</sub>). More NO<sub>y</sub> suggests the more abundance of nitrogen oxides in Hangzhou.

14. Page 7, Lines 188-191: some studies have also investigated the seasonal variations of O<sub>3</sub> in Hong Kong and North China, and the authors should acknowledge these earlier studies.

Xue, L. K., Wang T., Louie P. K. K., Luk, C. W. Y., Blake D. R., Xu Z.: Increasing external effects negate local efforts to control ozone air pollution: a case study of Hong Kong and implications for other Chinese cities, *Environ. Sci. Tech.*, 48(18), 10769-10775, 2014.

Sun L., Xue L. K., Wang T., Gao J., Ding A. J., Cooper O. R., Lin M. Y., Xu P. J., Wang Z., Wang X. F., Wen L., Zhu Y. H., Chen T. S., Yang L. X., Wang Y., Chen J. M., Wang W. X.: Significant increase of summertime ozone at Mount Tai in Central Eastern China, *Atmos. Chem. Phys.*, 16, 10637-10650, 2016.

15. Page 7, Line 192: Xianlin?

16. Page 8, Lines 227-228: revise this sentence

17. Page 9, Line 257: color-coded

18. Page 9, Line 258: led to

19. Page 9, Line 275: change “in addition to” to “in view of”

20. Page 10, Line 297: pay attention to

21. Page 11, Lines 329-330: why the air masses coming from open seas contained higher concentrations of NO<sub>x</sub> and O<sub>3</sub>? The authors need elaborate more about the

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reason for this interesting result.

22. Page 12, Line 359: long distance transport

23. Figures 3-7: it would be better to combine these figures into one figure.

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