

Interactive comment on “Widespread and Persistent Ozone Pollution in Eastern China” by Guohui Li et al.

Anonymous Referee #2

Received and published: 5 November 2016

The manuscript presents observed distribution of surface O₃ in April - Sep 2015 in East China. To interpret the causes of high O₃ events, a modified version of WRFChem is used to simulated O₃ distribution in 22-28 May 2015 and subsequent sensitivity experiments are conducted by turning off difference sources of emissions in the model. It is concluded that O₃ pollution in Eastern China is widespread and persistent, and the most important cause for this is industrial emissions. The emission from transportation also has significant contribution to high O₃ event, but the effect from residential emissions appears to be small.

The manuscript overall is sound, although it is questionable how representative the modeling analysis is. The title of this manuscript is not specific enough for describing what this paper is about. At the minimum, the title should add "observation and source attribution". It is a well known problem that pollution in China is widespread and

C1

persistent, and there are many studies that have looked at this problem.

The manuscript needs a major revision before it can be considered for publication.

1. The title. suggesting to make changes to reflect the fact that the paper only looked the O₃ in non-summer season and model simulation is done for only one case studies.
2. L50. 'photo' should be 'photon'.
3. L66-83. Are there any past modeling study if O₃ in east China? If so, acknowledge it here.
4. section 2.1. how emission is set up for the model for both anthropogenic and biogenic sources? spatial resolution? boundary conditions? etc. is model spin up of 28 hours too short? need some description for the table 1.
5. Line 156. suggest to start a new paragraph, begin with "There are several".
6. Line 162. Suggest to add the following references that showed statistically, the meteorology has a significant impact on pollution.

Calkins, C., C. Ge, J. Wang, M. Anderson, K. Yang, 2016. Effects of meteorological conditions on sulfur dioxide air pollution in the North China Plain during winters of 2006-2015, *Atmospheric Environment*, 296-309.

7. Line. 156-160. If it is VOC limited, then decreasing of NO_x will lead to increase of O₃.
8. Section 3.2. Subtropic high pressure system is mentioned several times. Yet , all the figures show the surface wind only. Suggest to add either 500 hpa or 700 hpa geopotential heights into the map. see reference above.
9. section 3.3. how well the biogenic emission is represented, especially in high temperature conditions? suggest to add the following reference into the introduction and discussion. The agricultural section may contribute significant emission of NO_x.

C2

Oikawa P.Y. , C. Ge, J. Wang, J.R. Eberwein, L.L. Liang, L.A. Allsman, D.A. Grantz, and G.D. Jenerette, 2015. Unusually high soil nitrogen oxide emissions influence air quality in a high-temperature agricultural region, *Nature Communications*, 6, 8753.

10. Line 127-132. In equation for IOA, there is no $P^{\{\bar{}}\}$. Average of the prediction in what time/space?

11. Line 240-244. While for specific cases, perhaps this argument has some ground. However, on weekly to monthly basis, sea breeze should be well captured in the model. See breeze is added into the day to day wind vectors. Suggest to add the following reference in the discussion.

Wang, J., C. Ge, Z. Yang, E. J. Hyer, J. S. Reid, B.-N. Chew, M. Mahmud, Y. Zhang, and M. Zhang, 2013. Mesoscale modeling of smoke transport over the Southeast Asian Maritime Continent: interplay of sea breeze, trade wind, typhoon, and topography, *Atmospheric Research* , 122, 486-503.

12. Suggest to put Fig 2 - Fig. 5 into one figure, and note the difference in scale. Why use the maximum not second maximum 1-hr O₃?

13. Figure 6 and other figures. there should be a legend for wind speed.

14. Fig. 7. There are places where observed peak O₃ is well captured, well overestimated and well underestimated. I suggest short all the panels according to how well the peak O₃ concentration is simulated by the model. Do you have any commonality where the peak O₃ amount is not simulated well?

15. The only difference between captions for Fig. 9 and Fig. 10 is that caption 10 has a 'alone' after 'industry'. The caption should be clear about what we mean by 'alone' and not having word 'alone'. It is understood the O₃ production is nonlinear.

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