Atmos. Chem. Phys. Discuss., 15, C10010–C10013, 2015
www.atmos-chem-phys-discuss.net/15/C10010/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime ozone formation in Xi'an and surrounding areas, China" *by* T. Feng et al.

Anonymous Referee #2

Received and published: 2 December 2015

Major Comments:

1) This study provides a WRF-CHEM analysis of ozone and PM2.5 pollution in Xi'an, China over a short time period of 3-days. If this type of urban study focusing on just 3 days were conducted for an urban area in the US or Europe it would not have a level of significance that would warrant publication in ACP. But because this study focuses on China, the fastest growing emissions region on the planet with enormous implications for tropospheric chemistry and trace gas budgets, the study is appropriate for ACP. Therefore my main recommendation to the authors is to devote less space to describing the details of the model/measurement comparison, and spend more time discussing or emphasizing the results that have implications for future atmospheric chemistry research: comparison of Xi'an ozone and PM2.5 to other region in China,

the difficulties of controlling PM2.5 which then boosts ozone production, describing the full seasonal cycle of ozone at Xi'an. Specifically, the abstract and conclusions are quite long and can be shortened by reducing the model/measurement comparison which is adequately covered in the main text.

2) Greater context of the Xi'an region and ozone observations needs to be given in relation to China, the US and Europe. Please expand Figure 1 by showing a map of all China and the location of Xi'an so the reader can understand that this city is far from the urban areas of Beijing and Shanghai. It would also be very helpful if you can show the seasonal cycle of ozone in Xi'an by plotting the monthly median, 5th percentile and 95th percentile for daytime observations. Then the reader can understand how the ozone observations in this study fall in relation to typical conditions. For example, in the North China Plain ozone peaks in June and then decreases in July and August due to the southerly monsoon flow. Does the same pattern occur at Xi'an? Are the high ozone values in August in Xi'an less than the values in June? Also the reader will then be able to compare Xi'an to the regionally representative sites in northern China, the USA and Europe as shown in the recent review paper:

Cooper et al. (2014), Global distribution and trends of tropospheric ozone: An observation-based review, Elementa: Science of the Anthropocene, 2, 000029, doi: 10.12952/journal.elementa.000029

See their Figure 10 http://www.elementascience.org/articles/29

3) No description is provided of the methods used to make the observations of ozone, NO2 and PM2.5. Instruments? Institutions? Were the data checked for quality and reliability?

4) According to the ACP data policy, the underlying chemical observations used in the analysis should be publicly available, as described here:

Statement on the availability of underlying data: http://www.atmospheric-chemistry-

and-physics.net/about/data_policy.html#data_availability “Authors are required to provide a statement on how their underlying research data can be accessed. This must be placed as the section "Data availability" at the end of the manuscript before the acknowledgements.”

This paper contains no data availability statement and the authors need to provide one. I am bringing this up because there is great interest within the atmospheric chemistry community regarding the quantity of ozone produced in East Asia as well as the ozone produced by East Asian emissions once the pollutants have been exported from the continent. With ozone pollution decreasing in North America and Europe, East Asia is the main driving force behind any increase in tropospheric ozone. By having access to the ozone and ozone precursor observations described in this paper the scientific community can further its understanding of the global tropospheric ozone budget. It would be a great service to the community if the authors of this paper can make available the ozone and precursor data for at least a full year, rather than just the 3 days described in the paper. The authors can provide a further valuable service to the research community by uploading the hourly ozone observations to the database of IGAC’s Tropospheric Ozone Assessment Report (TOAR): http://www.igacproject.org/TOAR One of the goals of TOAR is to calculate ozone metrics at thousands of surface sites around the world relevant for research on ozone’s impact on human health, vegetation and climate change. With so little data publicly available from East Asia, the data in this paper would be of great benefit to TOAR.

5) The standard of English in the manuscript needs to be greatly improved. The paper has too many grammatical and word-choice errors for me to correct and I recommend that the authors either find a colleague with excellent English skills to edit the grammar line-by-line, or employ the assistance of an ACP journal copy-editor.

Minor Comments:

Abstract, page 30564 line 27 I’m not sure what you mean by “manifest changes of the

emission inventory”. Manifest means obvious, is that what you mean to say? Also, is it the inventory of the emissions that has changed, or the actual emissions that have changed? The inventory is the documentation of the emissions, and from what I can infer from your paper, the inventory is out of date because the actual emissions have changed faster than the inventory can be updated. I think what you mean to say is Further studies need to be performed for O3 control strategies considering the rapid changes in emissions that are not reflected in the available emission inventories, and uncertainties of meteorological ïňĄeld simulations.

Page 30582, lines 9-11 I don’t understand what this sentence is trying to convey due to poor sentence structure. I think the word “whether” is used incorrectly. “The industry emissions contribute the most to the O3 concentrations in Xi’an and surrounding areas, but whether individual anthropogenic emissions or bio-genic emissions do not play a dominant role in the O3 formation. “

Page 30583 lines 11-13 Please provide a reference for the claim that O3 is now the major summertime pollutant in the Beijing region.

Table 2 What are the sources of the ozone and PM2.5 data from all of these cities?

Figure 6 and 7 and 10 The squares indicating observed values are too small and need to be larger

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 30563, 2015.