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Interactive comment on “Ozone production in the megacities of Tianjin and Shanghai, China: a comparative study” by L. Ran et al.

Anonymous Referee #1

Received and published: 7 June 2012

This paper reports summertime measurements of ozone and its precursors at a central urban site and a less-central site in two different megacities in China. A box model is used to explore the mechanisms responsible for ozone production in the two megacities, which are shown to have different limitations on ozone production. The reasons for this are briefly discussed in terms of precursor emissions, and implications for effective control strategies in each megacity are discussed. This is an interesting study, especially since there have so far been comparatively few studies of air quality in this region published in the international literature, and because of the large population affected. I recommend that the publication after some revisions have been made. The measurement methods are clearly stated. The Figures and Tables are generally clear. Figures 2 and 3 should be combined into one 4-panel figure. The standard of English is fair, and would benefit from careful and extensive editing by a native English speaker,

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if possible. The text is too long and should be condensed by about a quarter. Specific comments follow: All measurements were taken during the summer. The word ‘summer’ should be added to the title of the paper, and this seasonal limitation should be acknowledged in the Abstract. The conclusion that ozone pollution in Tianjin is a regional problem is rather strong, given the reliance on only one measurement site outside the urban core. This conclusion should be more strongly substantiated with supporting meteorological data, or it should be re-phrased to acknowledge the limitations of the data. Since the direction of the prevailing wind is so important for the type of sources influencing each site, it would be helpful to add a figure showing wind roses or sampling sectors for each sampling site/period. This would also be a good place to include captions with the sampling dates for each site. The term ‘suburban’ suggests a mainly residential landuse. This term is inappropriate for Jinshan, which is described as a well-vegetated and sparsely-populated industrial area. Another term should be used. (industrial/vegetated? extra-urban?) This reviewer found it a little confusing that two different names are used for each of the 4 main measurement sites, e.g. ‘urban Tianjin’ is used interchangeably with Tieta. It is very helpful that both names are used side-by-side (i.e. “Tieta, urban Tianjin”) in the legends for Figs 2 and 3, and in the header of Table 2. I suggest that the headers of Tables 1 and 3 be changed to follow this convention. In the text, it would be helpful to use the same type of name when several sites are being compared (e.g.. “110 ppbv is found in Wuqing, followed by about 95 ppbv in both Xujiahui and Jinshan”. It is not appropriate in the Discussion to refer to the Wuqing / Jinshan sites only in terms of “suburban Tianjin / Shanghai” because the regions surrounding the urban core of each megacity are large and probably not homogeneous in terms of influences on air quality. The measurements at the two sites, while interesting, should not be implied as representing the entire region. Pg 9163, line 26: Please add more recent references? Pg 9164 line 8: typo: it’s Haagen-Smit (not Hagggen-Smit) Pg 9167 line8-9: Do you mean: “Hourly averages were calculated for each hour with at least 75% valid data.”? Pg 9167 line 15-16: Please explain more clearly about your sampling duration, your sampling interval, and how each of these

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relate to the 2-hour sampling period. Pg 9169 line 7: Please give the name of the model. (It sounds as though it's the NCAR Master Mechanism, yes?). Please state version number and / or date of download, as appropriate. Pg 9710 line 19: "... monitoring sites should be needed..." Perhaps you mean "should be used" or "would be needed"? Pg 9710 line 26: please insert a reference to the relevant Figure. Pg 9171 lines 7-9: Isn't the ozone mixing ratio ALWAYS the result of a dynamic balance between production and destruction processes? What are you trying to say about this specific situation? Pg 9173: It would help the discussion if Fig 4 also showed the two different categories of Wuqing data (with error bars), as well as the average. Pg 9174 & Table 2: For what time of day is the VOC (OH) reactivity assessed? If it's a daily average, can you add an 'average' column to Figure 7, and refer to that here? Pg 9174 line 10: please add references. Pg 9174 lines 18 & 20: "could be" is ambiguous. Do you mean "might be" (tentative association) or "were able to be" (stronger association)? Pg 9175 lines 10 & 11: "except for VOC data that would be insufficient for analysis if only selected ones were considered." It is not clear what you mean. Please be more precise. Pg 9175 lines 17-18: "enough depletion of ozone". Enough for what? Pg 9175 line 21: Instead of "inconsiderable", try "low" or "negligible" (as appropriate). Pg 9175 line 24: "that brings in above ozone-rich air in the residual layer". Perhaps you mean "that brings in ozone-rich air from above the residual layer". Pg 9176 line 1: Instead of "speed fueling" try "initiate", "accelerate" (as appropriate) Pg 9176 line 8: In figure 5, ozone is >80 ppbv in Tianjin for 5 hours, not 6. Pg 9176 lines 9-12: Please reconcile the statements that Shanghai has no daytime ozone exceedances, but it does have some that last for 4 hours. Pg 9176 line 17: instead of "elevates", try "increases" Pg 9177 line 12: instead of "apparently", try "clearly", or omit. Pg 9178 lines 17-20. This sentence is not clear. Please re-phrase. Pg 9179 line 9: use "attributable" instead of "attributed" Pg 9179 line 26: do you mean daytime NOx concentrations are often below 25 ppbv? References: please add DOIs to all references. Figure 5: Please state in the caption which days were selected, or what criteria were used for the selection. Please show the standard deviations about the means. (This might require adding more panels to

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the Figure).

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