

## ***Interactive comment on “Spatiotemporal variations of air pollutants (O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub>, and VOCs) with land-use types” by J.-M. Yoo et al.***

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We appreciate the reviewers' comments for improving our manuscript. Our response to the comments is given below. All responses refer to the revised version. Response to Referee #2 Q1) Section 4, First paragraph: Authors refer to Figure 5 showing “annual” mean distributions with different land use. The discussion about seasonal changes (page 16999, lines 9-13) such as intense radiation during spring and monsoon effect in summer does not fit here. It should be either moved to some relevant section (e.g. section 3) or can be removed. The discussion here should be made in context of annual average distribution shown. A1) The two sentences were removed in the text (New version; Line 363).

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Q2) Page 16998, line 6-8: Please explain how intense solar radiation contributes to spring maxima in PM10. Also provide adequate references here.

A2) The phrase of ‘the more intense solar radiation and’ is unclear and removed (New version; Line 340).

Q3) Page 17002, lines 6-7, This is unclear. Do authors suggest that biogenic VOCs over Greenbelt lead to additional ozone production? What is the relative importance of less titration against lower NO<sub>x</sub> over Greenbelt (also see Figure 13 and discussion) as compared to the role of biogenic VOCs indicated here in exhibiting higher ozone over Greenbelt?

A3) The sentence that includes the two lines is removed because the paragraph is about weekly cycle of 5 pollutants without considering VOCs. Results about VOCs are discussed later. Please see New Version (Lines 437, 840-843).

Q4) Page 17003, lines 4-6. Other than comparison with a Chinese site, authors could also compare with similar secondary ozone peak in post-monsoon observed over a high altitude site in north India (Sarangi et al., 2014), similar to what is seen for Greenbelt.

A4) The reference of Sarangi et al. (2014) has been added to the text (New version; Lines 461-463, 1096-1099). The content is ‘The double peak patterns occurred at a regional background site in northern China in June and September, respectively (Meng et al., 2009), and at a high altitude site in north India in May and November, respectively (Sarangi et al., 2014).’

Q5) Page 17008, line 23-25; Three regions are defined (i) Seoul (ii) SMA except Seoul (iii) outside SMA. Then authors say “Seoul was defined as part of SMA”. This is slightly unclear. Please rewrite to clarify.

A5) The sentence has been revised to clarify (New version; Lines 624-625). The content is ‘The SMA is composed of i) Seoul and ii) SMA except for Seoul.’

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Q6) The VOC/NO<sub>2</sub> ratio in commerce (8.7) land use is not significantly less than threshold values (8-10). Can it be explicitly classified as VOC-limited?

A6) The criterion which originally determines either VOC-limited or NO<sub>x</sub>-limited is the ratio of the VOCs to NO<sub>x</sub> value. Since the NO<sub>x</sub> value is the summation of NO<sub>2</sub> and NO, the ratio of VOC/NO<sub>2</sub> used in this study is overestimated compared to that of VOC/NO<sub>x</sub>. Therefore, the VOC/NO<sub>2</sub> ratio in commerce (8.7) land use may be less than threshold values (8-10). Overall, the current value of ratio in commerce is neutral (i.e., between VOC-limited and NO<sub>x</sub>-limited). Please see Lines 749-753 of New Version.

Minor Comments: Q7) Table 5, please correct the units by removing yr<sup>-1</sup>. These are climatological mean mixing ratios (not trends)

A7) Corrected. Please see Table 5.

Q8) Page 16993, lines 20-25, This text is simply a repetition of the text given in Table 1. I suggest to the Table 1 for definitions instead of writing it at two places.

A8) The corresponding lines were deleted in the text (New Version; Line 199).

Q9) Figure 3: use different color/ symbol for commerce and Industry. Should be kept consistent with other figures of the paper for better comparison (e.g. Figure 2).

A9) Corrected. Please see Fig. 3.

Q10) Figure 6: Fonts of legends about land-use are very small. Instead of putting them in all 15 plots these could be given once in bigger fonts at the top of the figure.

A10) Corrected. Please see Fig. 6.

Q11) Figure 10, caption: red square – red circle

A11) Corrected (New Version; Fig. 10 caption).

Q12) Page 16998, line 27, unit of PM<sub>10</sub>: add microgram

A12) Corrected (New Version; Line 355).

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Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/15/C5664/2015/acpd-15-C5664-2015-supplement.zip>

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 16985, 2015.

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