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Comment

# ***Interactive comment on* “Seasonal variation of black carbon over the South China Sea and in various continental locations in South China” by D. Wu et al.**

**D. Wu et al.**

chjianyu@ust.hk

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Comments by Referee #1

Comments on “Seasonal variation of black carbon over the South China Sea and in various continental locations in South China” by Wu et al.

The manuscript by Wu et al. investigated the seasonal variations, spatial variations, and diurnal variations of BC at five continental sites in PRD region and a rural site over the South China Sea. While the BC concentrations at urban sites in PRD region were generally higher than those observed at other locations outside China, they were

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comparable at the rural sites. Pronounced seasonal variations of BC with higher concentration in the dry season were also observed at urban sites, yet not at the oceanic site. Because BC is an aerosol component playing important roles in Earth's climate system, the data of this study is scientifically important to the community of atmospheric science, and the results help us understand the BC behaviors in PRD region - a highly polluted area in China. The manuscript is overall well written, but some conclusions appear to be misinterpreted, which needs to be addressed before publication.

Response: We thank the reviewer for his/her constructive comments. Our point-by-point response to the review comments is listed below. The revised manuscript that has incorporated response to reviewer comments is submitted together with this response. Line numbers cited in our response refer to line numbers of the revised manuscript.

Major comments: 1. The authors claimed that the BC showed bi-peak diurnal patterns at all sites, and such patterns were most prominent at the urban sites. When I looked at the Fig. 5, I didn't see such bi-peak patterns except at the site of YX. In fact, the BC at most sites just showed pronounced diurnal cycles with higher concentrations at night although small morning peaks were also observed at some sites.

Response: We agree that the word "peak" was inaccurate in describing the observed diurnal variation pattern. The wording in the abstract is now revised to: "At urban/suburban PRD sites, BC was observed to have a diurnal pattern of higher concentrations at night and at the urban sites a small peak in the early morning rush hour."

Wording in the text is also revised accordingly.

2. Another conclusion the authors concluded is that BC was a regional pollutant based on the inter-site correlation analysis (pp 17390, line 15-16). It's well known that BC is mainly emitted from local sources (except the biomass burning events), e.g. diesel trucks at urban sites. The conclusion in this study appears to be inconsistent with the previous one because the inter-site correlation analysis might be biased by the consistent BC variations among different sites, i.e. high concentration at night and

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morning rush hours. Table 1 also showed that the BC among different urban sites was not consistently tightly correlated, for example, the pearson's  $r$  was 0.49 between NC and PY in dry season, which was much lower than ( $>0.70$ ) between NC and DG/XK. If the BC is a regional pollutant, I would expect similar correlations among different sites.

Response: We re-assessed the inter-site correlations and agree with the reviewer's suggestion. The statement "BC as a regional pollutant" is now deleted.

Specific comments: 1. P 17376, line 14: check the numbers, not consistent with those in the conclusions.

Response: Thanks. The numbers in the summary section has been corrected.

2. P17380, line 10: typo "is en route"

Response: Correction made.

3. P17384, line 5-6: The authors claimed that wet deposition was not a major cause of low BC in the rainy season, however in line 10-11, the authors listed it as a stronger removal of BC.

Response: We took another look of the data and it turns out that we did not pay close attention to differentiate during and after rain period. BC decreased during rain event and after rain BC could soon increase due to emissions. The text is revised to remove the inconsistency regarding wet removal of BC.

Lines 331-332 "The BC concentration decreased during rain event (Figure 2a), indicating that wet deposition was one cause for lower BC in the rainy season sampling period."

4. P17384, line 27: typo "NC and MFC"

Response: Correction made.

5. P7388, line 3-4: Again, I cannot see "The bi-mode peak pattern was more prominent

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in the rainy season” in the Fig. 5. In fact, in Fig.5, such bi-mode peak is more significant in the dry season. Also I would argue the bi-mode peaks of BC diurnal variations in this study.

Response: See response to comment #1. The text is revised.

Line 365-367 “A discernible diurnal pattern in BC was observed at the continental urban/suburban sites in that BC concentrations were higher at night and there was a small peak in the early morning.”

6. Fig. 3, please give the time that the trajectories were calculated.

Response: The trajectories in Figure 3 were calculated at 8:00 am local time for each day. This information has been added in the caption of Figure 3.

7. Fig. 5, explain the error bars, standard deviations or standard errors?

Response: The error bars in Figure 5 represent one standard deviation. This information has been added in the caption of Figure 5.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 17375, 2013.

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