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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Regional variability in black carbon and carbon monoxide ratio from long-term observations over East Asia: Assessment of representativeness for BC and CO emission inventories" *by* Yongjoo Choi et al.

Anonymous Referee #2

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This manuscript attempts to estimate dBC/dCO ratios from long period observations in Asia and use them to evaluate the BC/CO ratio in emission inventory. The measurements are interesting to the community and valuable for improving the understanding of BC emission. However, several points need to be clarified before the manuscript is accepted for publication.

General comments: 1) As described in Section 2.3, dCO was calculated by subtracting the baseline level (determined as a 14-day moving 5th percentile) from the observed CO, dBC was calculated as BC concentration as the baseline was assumed to be

zero. These assumptions are important for all the analyses in this work, however, the authors did not provide any explanation for using them. Is there any studies/data that can support these assumptions?

2) A large part of this manuscript is using the dBC/dCO to validate REAS emission inventory. However, there is no introduction for REAS in the manuscript. The authors need to provide some key information for this inventory. e.g. What years does it cover? What is the resolution of this inventory? Is there any seasonal/diurnal variation included in the inventory? How is it compared with other inventories? Any studies have evaluated the inventory?

Specific comments: - Line 142 The statement of the updated MAC showed perfect correlation with COSMOS is not useful, since COSMOS also relies on assumed MAC. In addition, MAC could vary largely among different locations/periods. The key question here is whether MAAP measurements at these 2 sites are consistent with those measured by thermal optical method. Have the authors done any comparisons between MAAP and OC-EC analyzer BC?

- Line 159 The slope of 1.17 looks not small for this study. I would suggest the authors add a short discussion for the uncertainties of their all measurements, and discuss how those uncertainties may affect their results and conclusions.

- Section 3.3 As mentioned above, the authors need to give an introduction for the REAS v2.1 inventory. The key question is whether REAS covers the measurement period and reflects current emission inventory knowledge. If it is possible, I strongly suggest the authors to compare their measured dBC/dCO with more inventories (e.g. MIX). This may provide some insight for identifying the bias source of emission inventories.

- Have any of the measurements been affected by fires? Open biomass burning may change the BC/CO ratios substantially but is usually not well represented in emission inventories.

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