

# ***Interactive comment on “The Variability of Relationship between Black Carbon and Carbon Monoxide over the Eastern Coast of China: BC Aging during Transport” by Qingfeng Guo et al.***

## **Anonymous Referee #2**

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The authors conducted comprehensive measurements of ship cruise, island, and coastal receptor sites over the eastern coast of China. They analyzed the linear relationship between BC and CO and inferred very useful information about emission sources (e.g., fuel structures) as well as BC aging and removal in continental outflows. This study can improve our understanding on BC emissions, aging, and removal over the eastern coast of China. Before the manuscript can be considered for publication, I have a few comments for the authors to address.

1. Introduction Section: Since this study is focusing on BC aging during transport, there are not enough descriptions/discussions on BC aging process, such as defining BC aging and highlighting the importance of BC aging. For example, BC aging is

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commonly defined as the physical and chemical transformation of BC from hydrophobic to hydrophilic particles. BC aging significantly influences global BC distribution and budget (e.g., He et al., 2016; Huang et al., 2013) as well as BC optical properties (e.g., He et al., 2015; Bond et al., 2006), further affecting global BC radiative effects. It would be helpful if the authors could include these recent studies and add some discussions on this aspect.

#### References:

Bond, T. C., Habib, G., and Bergstrom, R.W.: Limitations in the enhancement of visible light absorption due to mixing state, *J. Geophys. Res.-Atmos.*, 111, D20211, doi:10.1029/2006jd007315, 2006.

He, C., Liou, K.-N., Takano, Y., Zhang, R., Levy Zamora, M., Yang, P., Li, Q., and Leung, L. R.: Variation of the radiative properties during black carbon aging: theoretical and experimental intercomparison, *Atmos. Chem. Phys.*, 15, 11967–11980, doi:10.5194/acp-15-11967-2015, 2015.

He, C., Li, Q., Liou, K.-N., Qi, L., Tao, S., and Schwarz, J. P.: Microphysics-based black carbon aging in a global CTM: constraints from HIPPO observations and implications for global black carbon budget, *Atmos. Chem. Phys.*, 16, 3077–3098, doi:10.5194/acp-16-3077-2016, 2016.

Huang, Y., Wu, S., Dubey, M. K., and French, N. H. F.: Impact of aging mechanism on model simulated carbonaceous aerosols, *Atmos. Chem. Phys.*, 13, 6329–6343, doi:10.5194/acp-13-6329-2013, 2013.

2. Measurement Section: In terms of cruise observations, how large is the impact of emissions from the cruise used for observations? Would the samples be contaminated by emissions of the cruise itself?

3. Page 4, Lines 20-21: Is there any way to verify that the delayed one day in peak time is approximately the transport time between island and Yellow Sea? A simple and

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quick way is to run the HYSPLIT model at the NOAA website to see if the air mass can be transported from island to the Yellow Sea during that specific day.

4. There are a number of English grammatical errors, e.g., Page 5, Line 4 (“much easier remove” should be “much more easily remove”); Page 5, Line 5 (“There are not outlier data” should be “There are no outlier data”); Page 5, Line 11 (“north China Plain that emit” should be “north China Plain that emits”). Here are just a few examples. Please double check the entire text.

5. Page 5, Line 6: It’s not accurate to state that “no outliers” indicates “negligible effects of precipitation”. This could simply be due to the offsetting effects of different atmospheric processes. So please re-write this sentence.

6. Page 6, Line 6: It’s not accurate to say “the BC/CO ratio is only associated with BC aging and removal”. I suggest using “dominantly” instead of “only”.

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