

## ***Interactive comment on “Size-selected black carbon mass distributions and mixing state in polluted and clean environments of northern India” by Tomi Raatikainen et al.***

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I have three short comments:

1. Page 1, Line 20: “. . ., but this also depends on the structure of the particle.” Here, the authors missed several more recent studies on the morphological effects on BC optical properties. For example, He et al. (2015, 2016) showed that different structures for both fresh and coated BC particles can lead to substantial variations in BC absorption and scattering. I suggest including these two studies as references here.

References:

He, C., Liou, K.-N., Takano, Y., Zhang, R., Levy Zamora, M., Yang, P., Li, Q., and C1

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., Takano, Y., Liou, K.-N., Yang, P., Li, Q., and Mackowski, D. W.: Intercomparison of the GOS approach, superposition T-matrix method, and laboratory measurements for black carbon optical properties during aging, *J. Quant. Spectrosc. Radiat. Transfer*, in press, 2016.

2. Page 2, Line 17: “. . ., anthropogenic emissions such as biomass burning . . .” Typically, biomass burning is referred to wildfire emission, which is not included in the anthropogenic (i.e. fossil fuel and biofuel burning) emissions. Here, are you referring to agricultural burning? Please clarify.

3. Page 9, Lines 12–25: as stated in my first comment, recent studies (He et al., 2015, 2016) have shown that nonspherical/fractal structures of both fresh and coated BC particles can significantly affect BC optical properties and hence optical size during measurement. This could introduce large uncertainty into the optical method. The authors also showed results suggesting highly fractal BC aggregates in the measurement. In addition, the authors assumed the core-shell structure to quantify BC mixing state, which could also bring some uncertainty to their results due to the irregular coating structures in the real atmosphere. Thus, I suggest adding some discussions on how fractal aggregating structures could possibly increase the uncertainty in measurements and analysis.

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