

Interactive comment on “Black carbon fractal morphology and short-wave radiative impact: a modelling study” by M. Kahnert and A. Devasthale

Anonymous Referee #1

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This study reports an importance of black carbon morphology regarding its optical and radiative properties. The result indicates that a spherical assumption for black carbon, which is commonly used in climate models, results in large error for the evaluation of the global climate. This study is well organized, includes important findings, and agrees with the scope and scientific significance of this journal. I have several comments that will help to improve this paper.

1. Fresh black carbon vs aged black carbon

This study mainly discusses fresh black carbon that has no coating. However, as authors mentioned (e.g., in abstract and conclusion), black carbon particles can have coatings and have different optical properties (e.g., Bond et al., 2006; Adachi et al., 2010). Although authors discuss the point in conclusion 3 as “a thin film of organic

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material”, more discussion will help readers to understand the limitation of this study. Especially, black carbon with “thick” coating, which could be dominant in polluted air, needs to be mentioned.

2. Modeled black carbon particle size

2-1. This study uses black carbon aggregate particles with 600 spherules with 25nm radius, which yield ~420 nm of volume equivalent diameter. This particle size seems to be large comparing to that observed in ambient air. For example, Kondo et al. (2011) reports mass median diameter of black carbon particles from Tokyo is approximately 150 nm.

2-2. Authors use a wide range of particle size (R_v) in Fig. 2. For smaller particle sizes, the sizes of black carbon spherules become much smaller than the original value (25 nm for radius).

3. Conclusion

Although it is a matter of taste, the conclusion of this study is relatively long and includes some discussion and repetition. I recommend having a discussion section or other section in this paper rather than such long conclusion section.

4. Technical comments

4-1. Table 1 & 3 and 2 & 4 can be combined. Otherwise, tables 3 and 4 should have more independent captions.

4-2. Page 23116 line 9. Typo “by by”.

References

Adachi, K., Chung, S. H. and Buseck P. R. (2010), Shapes of soot aerosol particles and implications for their effects on climate, *J. Geophys. Res.*, 115, D15206, doi:10.1029/2009JD012868.

Bond, T. C., Habib, G., and Bergstrom, R. W (2006), Limitations in the enhancement of visible light absorption due to mixing state, *J. Geophys. Res.*, 111, D20211, doi:10.1029/2006JD007315, 23123.

Kondo, Y. , Sahu, L. , Moteki, N. , Khan, F. , Takegawa, N. , Liu, X. , Koike, M. and Miyakawa, T. (2011), Consistency and Traceability of Black Carbon Measurements Made by Laser-Induced Incandescence, Thermal-Optical Transmittance, and Filter-Based Photo-Absorption Techniques', *Aerosol Science and Technology*, 45: 2, 295-312.

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