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Interactive comment

Interactive comment on "A shape model of internally mixed soot particles derived from artificial surface tension" *by* H. Ishimoto et al.

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Ishimoto et al. presented a very interesting shape model of coated soot particles. This comment is mainly referring to the high depolarisation ratios obtained with the presented shape model.

For larger aggregates with a high amount of coating the calculated depolarisation ratios for both 355 and 532 nm exceed 0.3, which appears to be too high for soot particles. Some of the modelled particles even give depolarisation ratios, which are higher than 0.5, which is higher than what would be expected of any type of atmospheric aerosol. When considering aerosol size distributions for remote sensing applications these high values pose the risk of overestimating the depolarisation ratios with your shape model.

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Discussion paper

A similar effect has been reported by Kahnert, 2017. A possible explanation was that the coated soot particles were too non-spherical. Your results point into a similar direction, as some of the soot aggregates with Vr=20 have a smaller depolarisation ratios than the same aggregates with Vr=10. In Kanngießer and Kahnert, 2018 we showed that the speed of transition from film coating to spherical growth is a morphological parameter which has a strong impact on the depolarisation ratio. Having a faster transition to spherical growth resulted in more spherical paticles which had a smaller depolarisation ratio. Does your model allow for a more spherical shape for coatings of larger aggregates with e.g. Vr=10?

The lab experiments conducted by Pei et al., 2018 suggest that with the application of coating material the soot aggregates become compacted before there will be a growth in particle size. Could the different particle types (AST-A and AST-B) represent such compaction?

Kahnert, M., "Optical properties of black carbon aerosols encapsulated in a shell of sulfate: comparison of the closed cell model with a coated aggregate model," Opt. Express, 25, 24579-24593, https://doi.org/10.1364/OE.25.024579, 2017

Kanngießer, F., Kahnert, M., Calculation of optical properties of light-absorbing carbon with weakly absorbing coating: A model with tunable transition from film-coating to spherical-shell coating, J. Quant. Spectrosc. Radiat. Transfer, Volume 216, Pages 17-36, https://doi.org/10.1016/j.jqsrt.2018.05.014, 2018

Pei, X., Hallquist, M., Eriksson, A. C., Pagels, J., Donahue, N. M., Mentel, T., Svenningsson, B., Brune, W., and Pathak, R. K.: Morphological transformation of soot: investigation of microphysical processes during the condensation of sulfuric acid and limonene ozonolysis product vapors, Atmos. Chem. Phys., 18, 9845-9860, https://doi.org/10.5194/acp-18-9845-2018, 2018.

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