Response to reviewer (SC1)

We thank the reviewer for taking the time to provide us with helpful comments that we believe have substantially improved our paper.

・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. 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.

Reply: Many thanks for very important comments and information. We essentially agree with the reviewer's opinion. In the revised manuscript, sentences of the same meaning and references were added (Page 9 Line 15-21, Page 13 Line 9-14).

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?

Reply: In the revised manuscript, results of lidar ratios for Maxwell-Garnett

(MG) spheres and Core-Shell (CS) spheres were included (Figs 8-9). Approximately, lidar ratios for AST-A and -B particles were in between the results of MG and CS. The modeling and light scattering calculations for more compact soot aggregates than Type-B are possible. We think that the results will be similar to those of CS model. However, we did not carry out these calculations because the results of backscattering properties will show the same fluctuating feature as those of CS particles (Fig. 8-9), and because we have to implement many DDA/FDTD calculations to show general tendency.