**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Modelling the optical and radiative properties of freshly emitted light absorbing carbon within an atmospheric chemical transport model" *by* M. Kahnert

Dr Kahnert

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Response to anonymous reviewer 3:

I thank the reviewer for his helpful comments. Below follows my response, along with a description of the changes I intend to make to the revised manuscript.

1. *Some discussion is necessary with respect to the number of monomers that form an aggregate and the consequences for the AOPs.*

   I agree that this discussion needs to be added to the revised version of the paper,

   which will be prepared after the discussion has been closed. The main point to note here is the following (see also my response to the comments by M. Kocifaj). If we keep the mass constant and decrease the monomer radius a, then the number of monomers N_s will increase. It has been noted by Bond and Bergstrom (2006) that MAC is completely insensitive to a variation in a for monomer radii smaller than 40 nm (diameters smaller than 80 nm). So I do not anticipate MAC to change appreciably by decreasing a while increasing N_s. At the same time, such a variation is likely to change the scattering cross section. However, the single scattering albedo I obtain with my model lies right in the middle of the measured values reviewed by Bond and Bergstrom (2006) — see Table 7 in their review. Thus I would expect that choosing a different values of a and a correspondingly different range of N_s will only deteriorate my results. However, I do think that it will be worth checking this in a follow-up study, since some of the earlier studies of the sensitivity of MAC often were based on using approximate methods .

2. *P. 25451, line 4 to 18: This paragraph could be shortened, since the effect of oscillation of Mie results with size parameter for non absorbing particles is well known by the readers of such an article. I think that the high absorption of LAC is not "The other reason (for simpler averaging over particle size)" (line 28), but the main reason. This is clearly to be seen in Fig. 5, which therefore should not be omitted, even though it is not necessary for the paper.*

   I completely agree with the reviewer that I may be running in open doors with this discussion. This paragraph was mainly included for didactic reasons with a readership of chemical transport modellers in mind. I will substantially shorten this discussion and limit it to the discussion about the quenching of internal resonances for highly absorbing particles.

3. *P. 25455, line 3: Add the information "..at λ=440 nm".*

   This information will be added in the revised manuscript.