

## ***Interactive comment on “Modelling the optical properties of fresh biomass burning aerosol produced in a smoke chamber: results from the EFEU campaign” by K. Hungershöfer et al.***

**Anonymous Referee #3**

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The article presents and discusses optical properties of fresh smoke from the burning of two fuels, as observed in flaming-dominated combustion experiments in a smoke chamber. Mass scattering and absorption efficiencies were derived. By using these in combination with measured particle size distributions and Mie calculations, effective refractive indices were obtained. The mass efficiencies and effective refractive indices differ substantially from literature data for similar flaming-dominated burning conditions and the authors elaborate extensively on the possible reasons. Overall, the arguments given in this elaboration are quite sensible. Future research on the subject should certainly benefit from the explanations and suggestions given. However, as indicated in detail below, the article is on a number of occasions unclear and/or some essential

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information is missing. Revision is therefore needed.

Specific comments:

1. The scientific name for musasa (*Brachystegia spiciformis*) should also be given. Furthermore, it should be indicated that the tree is also named msasa.
2. Page 12658, lines 14-15, and Page 12671, lines 12-13: Reference is made here to changes in particle size. However, nowhere in the article is it indicated how the particle size distribution changes in the course of the burning experiment. Only average size distributions are presented (i.e., in Fig. 1).
3. Page 12664, lines 8-9: The presumptions made here are clearly not justified. Later in the paper, the authors invoke changes in chemical composition in the course of the experiment to explain some of their results. Furthermore, it appears from the authors' reference linuma et al. (2007) that the average chemical composition (average over the course of the experiment), as deduced from the 5-stage Berner impactor samples, is not the same for the 5 size bins. Some clarification and explanation is needed here.
4. Page 12665, lines 10-14: The size distribution data from the smoke chamber experiments are compared here with those from the SMOCC campaign. The latter campaign took place in the Amazon basin and the biomass burnt there is quite different from that in the African savanna or in the authors' smoke chamber experiments. Are there no better (and also more complete) size distribution data sets available for comparison?
5. Page 12666, line 7: It is unclear what size range is meant by "bulk fine". I would think that the mass data were obtained from the TEOM and that this instrument collected the total aerosol, as no inlet is specified in section 2.1.1.
6. Page 12666, lines 21-22 and line 27: Presumably, the mean mass scattering and absorption efficiencies and the associated standard deviations of the mean were obtained from the about 30 data points displayed in Figs. 2b, 2c, 3b, and 3c. This should be made clearer, i.e., the number of data points used ( $N$ ) should be indicated.

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7. Page 12670, lines 20-21: If I understand it correctly, the authors seem to imply that the semi-volatile (condensed) organics have a larger mass scattering efficiency than the primary organics of the biomass burning smoke. Is there any evidence (e.g., a literature reference) to substantiate this?

8. Page 12670, lines 27-29, continuing on page 12671, lines 1-2: Since the aerosol produced from the EFEU lab experiments is substantially different from that in biomass burning field experiments, the refractive index of the EFEU experiments will also differ from that in the field. Stating that the current study gives insights in "the refractive index of biomass burning aerosol" seems too general.

9. Technical corrections:

p. 12674, l. 4: replace "using a capillary" by "using capillary".

p. 12684, Figs. 2b and 2c, and p. 12685, Figs. 3b and 3c: "coefficient" in the ordinate should be replaced by "efficiency".

p. 12685, Fig. 3d: "SSA" should be replaced by "Single scattering albedo". Incidentally, the acronym SSA is not defined in the text and there is no need to do so as it is not used there.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 12657, 2007.

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