

Interactive comment on “The evolution of biomass-burning aerosol size distributions due to coagulation: dependence on fire and meteorological details and parameterization” by K. M. Sakamoto et al.

Anonymous Referee #2

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This paper investigates the influence of coagulation on the particle number size distribution, notably on the mean diameter (D_m) and geometric standard deviation (Σ) of a single particle mode, in biomass burning plumes. The work is based on a large number of sophisticated model simulations. The authors investigate how D_m and Σ evolve with time in biomass burning plumes, and how their evolution is related to several parameters associated with primary particle emissions, fire conditions and atmospheric conditions. The authors compare briefly the influence of coagulation to that caused by organic aerosol formation/loss in a plume. The authors finally parameterize their results to a form that is applicable in large-scale modeling frameworks.

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The is scientifically sound and original. The text is well organized and easy to read (with a couple of minor exceptions mentioned below). The authors are able to explain very well the numerous results obtained from model simulations. I have only a few minor suggestions for revisions.

Scientific comments:

I have a hard time of understanding Figure 3, even after reading the text on lines 210-213. I recommend that the authors work a bit more to make their message here clearer to readers.

Lines 254-255. The authors state that the initial mode mean diameter have little effect on D_m . I do not get this point when looking at Figures 4a and c: if D_m is initially large, it seems to typically lead to higher values of D_m at later plume times compared with cases when D_m is initially small. Could the authors specify what they mean here?

Line 390: Is this correct? Condensation of a non-volatile vapor into a single mode tend to narrow this mode, not widen it, as stated here.

The authors analyze shortly the influence OA production/loss on their results (section 3.5), and discuss also the potential effects of cloud processing (lines 463-469). This is clearly sufficient for these two processes in this paper. However, the authors do not mention at all new particle formation (NPF) that has been estimated to be a frequent process in biomass burning plumes. NPF might have notable effects on aerosol size distribution, and thereby on both D_m and Σ , in evolving biomass burning plume. The authors should spend at least a few lines on discussing the relevance of this process in biomass burning plumes and on the potential effects of NPF on their results.

Technical issues:

Line 265: Figure 5 shows Σ versus D_m rather than D_m versus Σ .

Line 382: "...OA has been..."

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