Geoscientific
Model Development
Discussions

Interactive comment on "Simulating Forest Fire Plume Dispersion, Chemistry, and Aerosol Formation Using SAM-ASP version 1.0" *by* Chantelle R. Lonsdale et al.

Anonymous Referee #1

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Major Comments:

1. Generally I think this paper needs more details. The main point of this journal is to describe the details of the model being used. In most cases the authors simply refereed the readers to another paper to get the specific details. I think most of the subsections is Section 2 Models, could and should be expanded upon. Specifically, it seems there should be more emphasis on the gas-phase chemistry as it seems like a main motivation in the introduction is ozone, yet this subsection is less than 5 sentences long.

2. According to this paper (Yokelson et al. 2013) , it is possible that the NEMR values

depending on the time and location (near the boundary layer vs. free troposphere) might distort the results / meaning of the values of the NEMR, specifically when looking at background CO2. Was this looked at or dealt with? How do the background values of CO2 vary? Also, I would consider mentioning this paper to caution people about the blind use of this technique.

3. It also may be a good idea to compare and contrast the differences between the new model and the box model you used before? This could help the readers further understand Figure 3.

4. For the NEMR technique, why was CO2 background concentrations used only for OA? It seems like there is only primary OA and no secondary OA being produced (in Fig. 4). I would assume the second bump in the measurements is from SOA? Would it be more appropriate to use the change in concentration of CO instead? Or was this looked at and the authors decided CO2 was more appropriate?

Minor comments:

On line 19-20 of p. 4 the authors mention that the hygroscopicity of the aerosol decreases with aging, but I thought the opposite was true, as the aerosol ages, it becomes more hygroscopic.

On the same line you mention this consistent with aerosols from the SAFARI-2000 studies, but isn't that study looking at savannah fires? I'm just wondering even though you aren't looking at these types of fires is still appropriate for your study?

On line 18 of p. 5 you discuss the BC mixing-rule options, I am more just looking for clarification, are all of these mixing states considered, or is just one chosen?

On line 1-3 of p. 6 This is perhaps a more specific example of the first major comment, but it doesn't seem all that helpful to explain that the coupling is similar to another coupling from another paper.

On line 10 of p. 6 The authors mention that the photolysis rates are calculated from a

look up table which are depending on the zenith angle and overheard ozone column but later on in the paper, the authors mention that the photolysis rates are constant. Is this the same thing? The values from the look up tables are all constant?

For Fig. 3 I know the authors explain that something isn't right with the ammonia but did you have any further details on it? That result seems very peculiar. Also for the caption in Fig 3, it would be helpful to the readers to explain the meaning of the horizontal and vertical error bars on the measurements like the authors do in the text.

Line 9 of p. 8, is this really supposed to say Fig. 3?

Pitfalls with the use of enhancement ratios or normalized excess mixing ratios measured in plumes to characterize pollution sources and aging R. J. Yokelson, M. O. Andreae , and S. K. Akagi (2013)