

Comments for: Improved Simulations of Biomass Burning Aerosol Optical Properties and Lifetimes in the NASA GEOS Model during the ORACLES-I Campaign by Sampa Das et al. (2023)

This work evaluated NASA GEOS model's ability to simulate biomass aerosol properties by comparing with observations from field campaign ORACLES-I. Sampa Das et al. implemented two adjustments in GEOS model to improve organic aerosol aging process and optics calculation. These two adjustments were further evaluated by AERONET and satellite observations. Radiative implication of these adjustments were discussed in the end. The content aligns well with the *ATMOS CHEM PHYS*'s scope and I recommend considering publication after major revisions.

Major comments:

- The abstract is almost identical with the first paragraph of conclusion. Abstract can be less detailed in methods, while the conclusion can provide more information about the adjustments implemented in the model.
- There are substantial text, figure and citation format issues in the draft. Details will be listed in the Minor comments section.
- For the first adjustment, are the 60% increased OA and 15% increased BC emission consistent with previous studies, or just to compensate the OA loss process introduced in this work? For the second adjustment about hygroscopic growth, it is not too clear and please add more descriptions about this adjustment.
- From the spatial distribution differences in figure 16 and 17, it is not clear whether the models with the implemented adjustments are more consistent with the observations or not. Please better quantify the differences by some metrics. Either regional mean differences or spatial correlation will work.

Minor comments:

For the improper text formats:

- Certain acronyms are repeated or mentioned more than once, such as AOD in line 175 and line 105, TOA in line 37, line 178 and line 598. Please check other acronyms throughout the papers.
- There should be spaces between the math operation symbols and the numbers, such as line 100: <40%, should be < 40%. Also the equal operations in line 629 and line 632. Please check this issue throughout the papers as well.

For the improper citation formats:

- Citations for data sets including links should be corrected: line 97 and line 253.
- Citations formats when abbreviations are included are wrong: line 119 for HSRL-2, line 156 for OMI.
- In-text citation formats are incorrect.
 - Line 108: Dubovik and King, (2000), no comma in the middle.
 - Line 214: Colarco et al., (2014), no comma in the middle.

For the improper figure formats:

- Figure title formats are inconsistent between the figures, neither the font nor the sizes. Please keep the title formats consistent of all the figures.
- The units in the axis caption should not be italic, such as Mm^{-1} in figure 4, should in $M m^{-1}$. Please check the unit formats in other figures and change properly.
- The titles of some subplots in the same figure are the same and unnecessary, such as figure 6(a)-(d), figure 9(b)-(c), figure 10(b)-(c), figure 11(a)-(b). You can either delete the title, or use other more informative texts.
- Subplots in figure 15 have the same legend captions. If the legends are the same for all the subplots, no need to show them in all subplots.
- The label notation (a)(b)(c)(d) is very inconsistent between the figures, sometimes outside the figure, such as figure 1, sometimes inside the figure, such as figure 4. Also, the labels sometimes are not clear if overlapping over other colors, such as figure 16. Please try to keep the position of these labels consistent among the figures and keep them clear.
- The names of the cases are inconsistent between the figures. For the OA loss adjustment cases, the notation is +OAlOSS_6days in figure 11, while it is GEOS + OAlOSS in figure 14 and GEOS OA-loss in figure 16. It is better to describe all the simulations in table 1. Create the cases names that are easier to put in the figures and be consistent among the figures.
- The legends in figure 13(b) are inconsistent with the text notations along the lines. Since they describe the same thing, you can delete either one.