

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-96

Anonymous Referee #2

Referee comment on "Satellite-based evaluation of AeroCom model bias in biomass burning regions" by Qirui Zhong et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-96-RC2>, 2022

Dear Authors,

Thank you for this exhaustive and well-described analysis of the factors governing uncertainty in simulation of atmospheric aerosols in regions affected by biomass burning. This is a problem of long-standing concern in the atmospheric composition community, and your study provides valuable information on the commonalities and differences of the atmospheric simulation models currently in use.

I have only minor recommendations for revisions. I encourage you to also attend closely to the revisions requested by the other reviewers.

Line 226 The Schutgens (2020) paper makes a number of interesting assertions about the potential effects of cloud contamination, but I do not see the suggestion there that southern hemisphere Africa during the burning season is subject to high cloud contamination. That is not consistent with other literature either. I would examine other explanations such as the extent of arid areas in southern Africa where satellite retrieval is more difficult.

Line 377: "For the aerosol lifetime and MEC which were mainly affected by other model aspects than emissions, there was no significant difference found among the three fire regions for the same model." Are you saying that the models used each had uniform MEC among the three regions? Are you saying that the models did not have varying lifetimes for the three regions? Either of these findings is quite significant, as they represent model assumptions and outcomes that can be compared to observations.

Line 118: "regarding to knowing issues for BBA models for more than ten years" I would

update this sentence and expand to clarify that BBA has been acknowledged as a large source of uncertainty in atmospheric aerosol for a very long time (e.g. AeroCom phase II paper from 2013: <https://acp.copernicus.org/articles/13/1853/2013/>, or before that this 2005 review by Kanakidou <https://acp.copernicus.org/articles/5/1053/2005/>, or before that this 1992 Science paper by Joyce Penner <https://www.science.org/doi/abs/10.1126/science.256.5062.1432>), and this study was undertaken to examine uncertainties and variation in current state-of-the-art modeling systems.

Line 135 "in multi" => "in multiple"

Line 191 "To avoid sampling issues" => "To mitigate sampling issues associated with varying coverage of the observational data sources"

Line 256: "impacts of different were" "impacts of verifying against different satellite data products were"

Line 270: "for the whole research" => "for the whole analysis."

Line 421: "positive correlation" is this actually a positive correlation? Your figure shows a positive correlation between precip and deposition load.

Line 520: "thoroughly" choose a different word—perhaps you mean "uniformly?"