Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-475-RC1, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Six Global Biomass Burning Emission Datasets: Inter-comparison and Application in one Global Aerosol Model" *by* Xiaohua Pan et al.

Anonymous Referee #1

Received and published: 16 August 2019

The authors have run the same atmospheric model with 6 different biomass burning (BB) inventories and analysed the differences using AOD and aeronet. These differences are often substantial and to some degree the authors have pointed to reasons why those differences exist. I feel the paper helps other modellers in understanding where some of the uncertainties in biomass burning emissions originate from but at the same time I feel the reader is left a bit wondering what the main messages are in the end. Ideally one would come up with recommendations about when and where to use a certain dataset, or when and where to avoid those. But given that the dataset to evaluate the results is also used to construct some this may be too much asked. Please find below a number of suggestions to further improve the paper

First sentence in introduction is spelled a bit awkward, please break up in two. Likewise for the second paragraph (L79).

159: Not sure why that small fire paper is cited in the GFED3 description

208: Kaiser et al. . ., -> Kaiser et al.,

The link on L213 does not work, at least not on my two computers

L282: I am a bit surprised that BB aerosols are injected near the surface. There is quite a bit of literature showing the importance of injection heights in for example the Boreal region

L297: So basically you use the same AOD data that was used to construct one of the BB inventories to evaluate a suite of models. That just doesn't feel right and requires careful explanation why this is done and what the consequences are

L305: I feel this is more useful and scientific sound; evaluate the various inventories with independent data

L393: But isn't April outside the main fire season in EQAS? In other words, if emissions are very low then a factor two difference (for example due to the detection of small fires in GFED4) is not that noteworthy I guess

L402: This is indeed a key question and I doubt we will make much progress as long as we keep using one single dataset to constrain emissions. Broadly speaking, the "gas community" (CO, NO2) has shown that the traditional inventories do reasonably well while the "aerosol community" has shown for over 10 years now that the emissions of those inventories are too low to reconstruct measured AOD. It would be very nice if someone would address why those two communities come to different conclusions.

L416 lights -> light

L419: GOES -> GEOS

L452: This is a bit confusing, I don't think emissions peaked in April but you found elevated AOD levels due to burning

L467: Given the very large interannual variability, especially in EQAS, this should be avoided. Please scale with active fire detections or so

L529: Now shown -> Not shown (I guess)

L624: This could be a place where this paper could make a difference. Given that the emission factors used in the various datasets are not wildly different, the variability stems from variability in dry matter fuel consumption. GFED has been tuned to match measured fuel consumption, how about FEER and QFAS? Are their levels of fuel consumption (per unit burned area that is) similar to literature-based values? I understand that the FRP approach aims to avoid burned area but these datasets are becoming better constrained and by dividing fuel consumption from FEER and QFED with burned area there could be a useful constraint. Right now we compare AOD with AOD-derived datasets and that just does not help us further I am afraid

L731: Actually most of the emission factors are from actual fires, not from lab-based measurements.

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