

## Response to editor comments

### Reddington et al.

I find that the reviewers' concerns have been addressed adequately and that the manuscript is almost ready to be published. In some instances where the reviewers' comments would have required significant additional effort, e.g., Reviewer 2's request to address the issue of additional SOA formation from the BB volatiles, you chose to state that this is outside of the scope of the present paper. While this may be a missed opportunity to increase the scientific impact of your paper, I will accept your decision not to expand the scope of your work.

We thank the editor for this decision. We have responded to the comments below and have added discussion to our manuscript as suggested. New text in the manuscript is highlighted in yellow.

Reading the manuscript made me wonder if there might not be some compensating errors that explain some of the observed biases. For example, I noticed that you chose a very low OC-to-POM conversion factor (1.4). I think that for aged BB aerosols a factor of 2 would be more appropriate. On the other hand, sulfate in ZSR is assumed to behave like sulfuric acid, which is very unrealistic. In BB emissions, there is always enough ammonia to neutralize sulfuric acid, and ammonium to sulfate molar ratios are between 1 and 2. You are also using a fairly low  $\kappa$ -org (0.07). Our extensive measurements in the Amazon consistently give a value of 0.10. This then leads to the question: Would a  $\kappa$ -Koehler approach with more realistic values of OC/POM and  $\kappa$ -org result in a significantly reduced bias? If you don't want to change the paper, I would appreciate a response in the form of a comment.

These are good points. We have now added discussion on our OC-to-POM conversion factor and hygroscopic growth. We have added a comment pointing out that there is scope for compensating errors, particularly in calculation of AOD.

As suggested we now use a  $\kappa$  value of 0.1 as observed in the Amazon (Gunthe et al., 2009). We also show that simulated AOD is sensitive to our assumptions about  $\kappa$  and have added a Figure (new Figure 7) to highlight this.

We now emphasise that analysis against detailed aerosol chemical, microphysical and optical properties (Brito et al., 2014; Andreae et al., 2015) is now required to further understand any potential underestimates in biomass burning emissions.

A few minor and mostly technical issues still need to be addressed:

Thanks for pointing out these issues, which we have now addressed.

The labels and legends in several figures are much too small to readable in print. Please provide figures with larger font sizes. Reviewer 1 had requested this already for Figs. 4 and 7(old), but you did not make any changes in the figures he mentioned. The problem also extends to other figures, e.g., Fig. 1.

We have updated our figures with bigger labels and legends where possible. We will ensure that labels and legends are readable in the final typeset version of the paper.

Manuscript pages should be numbered.

Done.

According to SI recommendations, "year" in units should be abbreviated "a", not "yr".

Done.

## References

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