

Interactive comment on “A global simulation of brown carbon: implications for photochemistry and direct radiative effect” by D. S. Jo et al.

Anonymous Referee #3

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This study applies a global model to study the change in direct radiative effect of including BrC as a special source of OC in the model. The treatment is reasonable, though comparisons with observations are not as good as with other models.

Page 27808, lines 20 -26: you should also summarize results from Lin et al. 2014 (JGR, v. 119, doi:10.1002/2013JD021186) who found absorption from BrC ranging from 0.22 to 0.57 W/m², though the net TOA forcing for the aerosols containing BrC was negative. This study did not assume a constant ratio of BrC to OC. The fraction depended on the type of OC and the specific emission source.

Page 27812, lines 4,5: Since BrC absorption is variable, with variable sources, it is of interest to know how much your results would change if you used the MAE for SOC based on the WSOC measurements and the MAE observed by Alexander et al.

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27813, line 6,7: some SOCs become whiter when photolyzed (Sareen et al. 2013 Wu et al 2013]

27813, line 24-25: the BrC MAE is 5.3 m²/g for primary and 1.5 m²/g for secondary BrC at 365nm. But “primary” is 1.0 at 550nm. For clarity, please specify the wavelength dependent MAE for both types: perhaps a figure would help.

27816, line 7-9: “Model slightly underestimates”: how is this comparison made (difficult to see on scatter plots). Perhaps you could fit a line to these points?

27816, line 9-11: here you quote annual mean concentrations, but the scatter plot shows values at different locations. How is the annual mean (for the US I assume) computed? i.e. if you use grid box values, do all grid boxes within the US have measurements?

27821, line 6-9; Lin et al 2014, also find little bias compared to these simulations. What is your total biomass emissions? How do these compare with other estimates such as used in Lin et al. 2014 (JGR)?

27824, lines 6-10: seems odd to say you use McMeeking, and then you decrease these values. Need to revise so it does not sound as if you are using 2 values, or clarify that you use 2 values.

27851 Figure 8 caption: What exactly is panel c? BrC is assumed to be OC and purely scattering minus the normal BrC calculation? Need to rephrase. I understand these positive values must be from a calculation including BrC with absorption minus a calculation assuming all BrC is purely scattering.

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