

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-160

Anonymous Referee #2

Referee comment on "Seasonal variations in fire conditions are important drivers in the trend of aerosol optical properties over the south-eastern Atlantic" by Haochi Che et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-160-RC2>, 2022

Review of "Seasonal variations in fire conditions are important drivers to the trend of aerosol optical properties over the south-eastern Atlantic"

The authors analysed the seasonal variations in the optical properties of aerosols observed at Ascension island as well as the causes of these seasonal variations. One significant contribution is that they found the lower aerosol single scattering albedo during biomass burning season in Africa and suggested that the burning conditions are the major factor in the variation of aerosol optical properties. The paper is well written with comprehensive analysis and interesting findings, which should be published. However, I believe that some definitions and explanations need to be clearer and I therefore recommend that this paper be accepted with minor revision.

Specific comments

Line 24: change 'The absorption enhancement Eabs' to 'The absorption enhancement (Eabs)'

Line 23 to 25 and other places: Please be consistent with if there is a space needed between the symbol '~' and numbers.

Line 27: '(BC/ Δ CO)' looks like should be 'the enhanced ratio of BC to changes in CO (BC/ Δ CO)'.

Line 29: 'better capture' compared to what?

Line 34: Maybe specify 'these period' refers to which period. Probably also in line 18 specify the month-year period of the 17-month campaign.

Line 44 and other places: 'the savannah region' to 'the Savannah region'

Line 71: any explanations to why the simulation of absorption in this region is bad in climate models? Are the simulations in other regions, by any chance, better?

Line 72: maybe worth mention which months are the BB season here.

Line 88: 'MACBC' should be MAC_{BC}

Line 95: latitude and longitude should be in degree and indicating which hemisphere, e.g. 7.97 °N.

Line 101: either be '464nm, 529 nm, and 648 nm' or '464, 529, and 648 nm'.

Line 101 to 105 and hereafter: why switch to past tense in these sentences, while you used present tense in most other places.

Line 103: change $5 Mm^{-1}$ to $5 M m^{-1}$.

Line 107: 'represent' should be represents

Line 137 and Figure 3 caption: '9:43-9:49' refers to am or pm?

Figure 1. The 10th percentile for aerosol absorption in July 2017 is less than 0. Aerosol absorption should not be less than 0. The authors might need to double check.

Line 205. 'Taylor et al. (2020) found an averaged Eabs around 1.85..'. Is this average for

the whole campaign or is it an average at a certain height? Is it within a boundary layer?

Line 207: 'Zuidema et al. (2018) reported the July-September averaged MACBC measured in 2016 on the ASI as 15.1, 13.3, and 10.7 $\text{m}^2 \text{g}^{-1}$ at 464, 529 and 648 nm, which corresponds to Eabs as 1.70, 1.71, and 1.68 respectively". The authors state earlier that the errors in the Eabs for 464 and 648 nm are large (because of the uncertainty in the AAE), and only the Eabs for 529 nm are compared. Then why calculate and compare the Eabs at 464 and 648 nm from Zuidema' results?

Line 218. 'suggesting BrC have a minimal influence on the ASI'. Not sure I understand what does it mean here.

Line 235: 'consisting' should be consistent.

Line 261: Do the authors have data (or other literatures) from actual measurements of coating thickness to support their conclusions?

Line 276: 'curves fitting' should be curve fittings

Line 330: 'Our measured $\text{BC}/\Delta\text{CO}$ values are generally smaller than 0.012, suggesting this linear relation is applicable to our data'. For fresh plume, MEC and $\text{BC}/\Delta\text{CO}$ have a linear relationship when $\text{BC}/\Delta\text{CO}$ is less than 0.015. But the $\text{BC}/\Delta\text{CO}$ observed by the authors are for aged smoke, does the threshold of 0.015 still be applicable?

Line 347: 'with the relationship between BC/CO and SSA'. Do the authors mean $\text{BC}/\Delta\text{CO}$?

