Response to RC1

We appreciate the reviewer's comments and suggestions that helped to improve the manuscript. Our responses are presented below, including the original comments from the reviewer, which are presented with gray background.

REVIEWER

The paper investigates the occurrence and optical properties of black and brown carbon during a five-year period based on ground-based observations at the ATTO site in the Amazon forest. In particular, the impact of different airmass dynamics and El Nino conditions on the optical properties and relative contribution of black and brown species is investigated. I find the paper well structured and clearly written, and the data presented of great value. In my opinion the paper deserve publication only after minor revisions. Main comments are detailed in the following.

The introduction is quite long and introduces to many concepts. I do not know if it would be better to split it in sub-paragraphs giving a theoretical background on the topic. Anyhow, it is a good state-of-the art of black and brown carbon studies.

AUTHORS

We would like to thank the reviewer for the comments related to the introduction and the article in general. We have improved the introduction in order to make it more concise. Please see the revised version of the manuscript.

REVIEWER

Page 14, line 362 : what do you mean with characteristic size distribution ? the average size ? Please be more precise.

AUTHORS

We have included number and size distribution plots in the supplementary material to clarify the statements written in the manuscript.

REVIEWER

Section 3.1, page 19, line 482 : you state that dry and wet periods are related to different aerosols influences (biomass burning and dust/sea salt respectively). However different signatures are not present in the temporal absorption angstrom exponent (Fig. 3, panel e). Can you comment on this point ?

AUTHORS

The average of hourly mean $å_{abs}$ values measured at the ATTO site during this study was slightly higher during the dry season compared to the wet season, as stated in the original manuscript: “0.94 ± 0.16 compared to a wet season average of 0.91 ± 0.19.” We hypothesized a more pronounced seasonality due to the larger occurrence of fires in the dry season bringing BrC-rich aerosol. However, we have found that these conditions occurred episodically rather than seasonally, with increased $å_{abs}$ only when ATTO was under strong influence of likely close-by biomass burning.

The following comment was added to section 3.1 of the revised manuscript:

> “It was found that the $å_{abs}$ only increased significantly during episodes of hours or days, typically caused by nearby burning during the dry season”.

Regarding the mineral dust effect on $å_{abs}$, no influence was found during the dust periods, as stated in the manuscript: “no effect on $å_{abs}$ was observed due to the presence of dust, most likely due to a size effect, given that absorption coefficients were measured only for sub-micron aerosol particles after May 2014”.

REVIEWER

Line 492-526 : probably this part can be moved in a single paragraph focusing on the MAC

AUTHORS

Point taken; in the new version of the manuscript the MAC discussion is included in a new section.

REVIEWER

Line 529-530 : many time the authors state, but do not prove, that the dry season is affected by BB particles. Is this assumption made based on previous studies at the site? The same for the dust influence during the wet season. I think this point should be better addressed in the paper before analyzing in more detail the optical properties of the different aerosol types in different periods. This was the only part that I found not clear at all in the paper.

AUTHORS

Point taken. The influences of biomass burning and mineral dust over the Amazon rain forest are indeed well documented in the literature, therefore we have included the following references in the introduction of the revised manuscript:

Biomass burning influence during the dry season:
(Andreae et al., 1988; Artaxo et al., 2002; Fuzzi et al., 2007; Guyon et al., 2003; Roberts et al., 2003)

Saharan dust influence during the wet season:
(Formenti et al., 2001; Guyon et al., 2004; Moran-Zuloaga et al., 2017; Prospero et al., 1981; Talbot et al., 1990; Wang et al., 2016), already mentioned in the original manuscript.

REVIEWER

Line 565 : you state that is the contribution of sulfate that increases scattering. Why not the mixing with other compounds or species ?

AUTHORS

We agree with the reviewer and have modified the manuscript accordingly.

Original version:

> "In terms of the single scattering albedo (ω_0, Fig. 4c), its increase towards the end of the dry season confirms that the aerosol particles during this time are scattering more radiation, not only due to higher BrC presence but also due to an increased sulfate concentration".

Revised version:

> “The increase of the single scattering albedo (ω_0, Fig. 4c) towards the end of the dry season confirms that the aerosol particles during this time are scattering more radiation, not only due to higher BrC presence but also due to other light-scattering aerosol particles”.

REVIEWER

Lines 568-570 : how do you select and eliminate from the dataset the BB and mineral dust events, and what "extreme event" means (AOD higher than a threshold ?). Please be more precise.

AUTHORS

These extreme events were removed from the data used in section 3.4 by using only data within the 90% confidence interval. A comment has been added to the revised version of the manuscript.

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