Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-586-RC2, 2016

Atmospheric Chemistry and Physics Discussions
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Interactive comment

Interactive comment on "Modeling investigation of light absorbing aerosols in the central Amazon during the wet season" *by* Qiaoqiao Wang et al.

Anonymous Referee #2

Received and published: 14 September 2016

The manuscript "Modeling investigation of light absorbing aerosols in the central Amazon during the wet season" focuses on the modelling tool GEOS-Chem to assess the variability and nature of aerosol particles in the Central Amazon (CA) during the wet season of 2014, with particular emphasis on the light absorbing aerosols (LAA). To evaluate and support the model results in respect to the main remote sources of aerosol particles found in CA during the wet season, i.e. Sahara (dust) and sub-Saharan biomass burning regions (smoke), the authors used observational data from ground-based (AERONET) and orbital (MODIS, CALIOP) remote sensing platforms. These data are also used to discuss and assess the model performance as regard to the transatlantic transport of aerosols (dust/smoke) toward CA during the analysed period (Jan-Apr 2014). Considering the modelling of LAA in CA, observational data used to evaluate model simulations and support the manuscript conclusions are measure-

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ments performed at the ATTO site of aerosol light absorption, mass concentrations of refractory Black carbon (rBC), total aerosol and coarse mode.

The manuscript is well written, the scientific goal is of significant relevance and consistently addressed. Therefore, I recommend its publication after minor revisions. Comments: I would suggest more caution regarding the spatial representativity of the conclusions derived combining model results with observations at ATTO. While conclusions in the context of the region defined in the manuscript title (i.e., Central Amazon) are ok, often in the manuscript the conclusions are provided interchanging Amazon basin (ex. Page 7, Line 01) and Central Amazon. Certainly, even during the wet season, other regions inside the Amazon basin, for example the southern/southwest portions, are likely to present aerosols properties characteristics distinct from those found in CA based on measurements at ATTO. As done for the North of Africa, it would be elucidative to see the evaluation of the model performance against AERONET and MODIS over north and northeast of South America as regard to the AOD time and spatial variability. Along with ATTO data, I think it would reinforce the model capability to simulate aerosol particles loading across Amazon basin and borders, in special given the role of regional open fire contribution to the aerosols in CA.

Since the manuscript analyses a specific wet season, conclusions must be carefully contextualized. I would suggest caution when general conclusions are made (Ex. subtopic 4.1: the discussion concerning the main Saharan source area of the dust deposited in CA). In this context, the meteorological scenarios have to be taken in to account: was the 2014 wet season meteorological scenario consistent with climatological features? That may have important impact on the Saharan origin of dust deposited in CA. The role of meteorological processes on the resultant aerosol optical properties observed at ATTO and CA are barely discussed, in particular, precipitation (wet removal) and wind circulation fields.

Page 05: Line 01: I would think better about the sentence “We use the region NSA to represent the Amazon Basin”. Along Amazon basin, NSA include several other

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regions with characteristics, in many aspects, distinct from Amazon basin. Therefore, rigorously, I would not indicate NSA as representative of Amazon basin.

The aerosol loading distribution (as seen in AOD) nearby remote emission sources (Sahara and Sub-Saharan biomass burning region) predicted by the model presented significant differences when compared with MODIS. One can see that in the amount of dust/smoke leaving the west coast of Africa. I wonder how good is the MODIS retrieval compared with AERONET across Sahara and sub-Saharan region? Model seems to compare better with AERONET (Figure 2) than with MODIS. Nevertheless, there are two large AOD spots (in Serra Leoa and in Congo) in the model that appear in the MODIS field with much lower values. At least, the one in Serra Leoa seems to have important impact on the plume transported toward South America. This is not quite discussed in the manuscript.

The combination of the lack of emission in the Bodélé region with the overestimation of AOD downwind of Bodélé in the model is still not clear to me. In the manuscript it is suggested that the model tendency to overestimate AOD downwind of Bodélé is mainly driven by differences in the optical properties. How about the role of removal processes? Also one would wonder about the impact once the emission in Bodélé region is properly simulated.

Minor technical corrections: Page 06: It seems that references for MODIS and AERONET products have been missed.

Page 2, Line 02: Replace "…as strong absorber…" to "…as strong absorbers…"

Page 4, Line 03: Replace "…is calculated online…" to "…are calculated online…"

Page 4, Line 20: Replace "…OA…" to "…organic aerosol (OA)…". The term "OA" appears in the text before its definition, which is done afterward (Page 4, Line 29).

Page 4, Line 24: It seems that where is "…refractive index and the AAE at 550 nm..." it should be "…refractive index and the MAE at 550 nm..."

Page 7, Line 10: Replace "...February 2104..." to "...February 2014...".

Page 13, Line 14: "Figure 14 shows... ...AAOD at 550 nm..." in the Figure 14 legend (Page 40) its mentioned "...AAOD at 500 nm...", which is correct?

Page 36, Legend: Replace "...BC-CO analysis in Fig. 12..." to "...BC-CO analysis in Fig. 11...".

Page 41, Legend: The wavelengths correspondent to the calculated AAE?

Special attention to the figures captions, some of them, to be fully understood, required text revision. They should be self-sufficient. I think there is need to improve the description provided by some captions (ex. From Figure 14).

Captions: It would help if the author identify the AERONET site used in Figure 3 in the map presented in Figure 2.

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