

Dear Editor,

In the new version, we have taken into account all the points listed below.

The manuscript is in a good shape but needs some technical corrections found by Reviewer 1. Also, please do the following technical corrections:

- Change from "Mallet Marc" to "Marc Mallet" in the author list

***This is changed.***

- line 41: "thought be" => "thought to be"

***This is modified.***

- line 154: use the super script for the degree symbols in "1.875o x 1.25o"

***This is now changed.***

- line 157: "Large Eddy" => "large eddy"

***This is changed.***

- line 228: "decrease (of about -10 W.m<sup>-2</sup>)" => "decrease (of about 10 W m<sup>-2</sup>)" I found that two mistakes in English and style throughout the text and this is a good example. Use magnitude after "decrease of", "reduction of", "decreased by", "reduced by", and "the order of". For these expressions only magnitude is used, e.g., decrease of 10. You don't have to use "+" with expressions like "increase of". Remove "." between unit symbols and use a space, e.g., m s<sup>-1</sup>. Please fix these typos throughout the text.

***All those points have been modified in the text.***

- line 266: "3D" => "three-dimensional (3D)"

***This is changed.***

- line 267: What is the RegCM model? I don't see any description of the model.

***This regional model is effectively not used in the study but serves for some comparisons. We have now included in the text the recent reference of Giorgi et al. (2023) that describes this regional climate model. The sentence has been changed as follows : « ...CNRM-CM simulations is consistent with the results obtained by Solmon et al. (2021) who used the RegCM model (Giorgi et al., 2023), but smaller in magnitude.»***

***Giorgi, F., Coppola, E., Giuliani, G., Ciarlo, J. M., Pichelli, E., Nogherotto, R., et al., The fifth generation regional climate modeling system, RegCM5: Description and illustrative examples at parameterized convection and convection-permitting resolutions. Journal of Geophysical Research, 128(6). <https://doi.org/10.1029/2022JD038199>, 2023.***

- line 297: Define "GG"

***This refers to Gulf of Guinea. This is now clearly indicated.***

- line 298: Define "O-A"

***This refers to Ocean-Atmosphere. This is now indicated.***

- line 344: "layer). for" => "layer) for" (Remove ".")

***This is changed.***

- line 409: "kg.kg.s<sup>-1</sup>" => "kg kg<sup>-1</sup> s<sup>-1</sup>"

***This is modified.***

General comments:

This is a second review of 'Impact of Biomass Burning Aerosols (BBA) on the tropical African climate in an ocean-atmosphere-aerosols coupled climate model' after authors revised in response to the first round of referee comments, and comments largely focus on the new or altered content. The authors' additional comments and especially new simulations provided addition context to help disentangle effects of the dynamic SST and the aerosol radiative effects on cloud properties and ERFs, improving the quality of the analyses against the first version. I recommend acceptance after minor revisions.

**We would like to thank the reviewer for his comments. In the new version, we have taken them into account.**

Specific comments:

Minor:

The simulations to separate the impacts from BBA radiative dynamical effects vs. surface SST effects on cloud properties are very useful. As these are the dominant proposed mechanisms at play here, the differentiated models for BBA and SST effects should be mentioned in more places as appropriate through the work to justify claims of whether one effect or the other is dominant. For example:

- 346: Doesn't figure A6a) show that the BBA effect is strongly tied to the increased LCF over the Gabon/Angola coast? Is the increased moisture advection tied to BBA radiative impacts then?

***This is right and we have now clarified this point and changed the sentence as follows : « As shown in Figure A6, the response of the low-level clouds simulated in the coastal areas of Gabon and Angola is not sensitive to the coupling between the ocean and the atmosphere and is probably more related to the increase in moisture advection over this region due to the BBA radiative effect(Figure A7 and A8) that favors north-westerly anomalies over the ocean south of the Equator (see Part 3.3). This contributes to enhance the low cloud fraction.»***

- 475: The BBA effect being weaker isn't simply 'more likely', it is explicitly backed up by figure A6. I recommend mild reorganization to move the claim and the evidence (~line 487) closer together.

***We have now changed the sentence by removing « more likely » and linked the result to the contribution of SST and BBA radiative effects: «As shown in Figures 9a,b,c and A8, this dimming is largely due to the increase of the low-level CF, LWP and COD (mainly controlled by the persistent SST cooling, see the following paragraph), while the BBA direct effect more likely plays a smaller role in this season.»***

513: I read this sentence as claiming that the SST decrease is the dominant effect on changing cloud patterns, but figure A6 seems to show the opposite-- the BBA effect is at least as strong in JJA, if not stronger, over a wider ocean area and is the dominant influence near Gabon.

***This is effectively right and the sentence has been changed as follows: «This positive impact is found to be mainly due to BBA radiative effect (especially the lower tropospheric heating) associated to a lesser extent to the SST decrease (which is in response to the surface BBA radiative forcing ~-5 to -15 W.m<sup>-2</sup> and the cloud changes), ~~associated to lower tropospheric heating,~~. These both contribute to (i) increasing the LTS and (ii) to limiting the intrusion of dry air at the cloud top.»***

Technical corrections:

23: feedback should be 'effect' on precipitation

***This is done.***

142: missing left parenthesis for Druge 2019

***This is now changed.***

149: Biomass Burning shouldn't be capitalized

***This is changed.***

181: should read "the present configuration allows us to focus on solely the..." with no comma

***This is now changed.***

206: favoring should be 'favor'

***This is modified.***

276: 'strongest' should probably be 'stronger'

***This is changed.***

304: define 'GG' and 'O-A' coupling

***These two terms are now defined.***

314: 'with an impact of up to 15W' as a phrase doesn't make sense. '...with an impact of up to [magnitude] at 15W', or perhaps 'with an impact out to 15W' as possible alterations.

**Thank you for the suggestion. We have now used : « with an impact out to 15W ».**

Section 3.3: should read 'dynamics', not 'dynamic'

**This is modified.**

Figure A8 shouldn't have underscores in the title

**This is now changed in the Figure.**

400: Clarify the direction of the model bias with '...biased towards underestimating low-level cloud cover', as long as that is what's intended

**This is changed.**

420: figure reference should be A7

**Thank you, this is changed.**

461: should read 'do not allow us to disentangle...'

**This is modified.**

474: Figure reference should probably be A9, not A8

**Thank you, this is changed.**

487: remove 'the' before 'Figure A6'.

**This is done.**

489: I believe the reference to figure A7 should probably be A6 for SON cloud anomalies

**This is right and now modified.**

498: Clarify to say there are no major changes over the African continent. South America shows significant differences in precipitation.

**These two points are now indicated.**

559: either write 'using different GCMs' or, less favored because it's redundant with the acronym (global circulation model models), 'using different GCM models'

**This is modified.**

508: indicate should be 'indicates'

**This is changed.**

513: Suggest a rephrase to clarify and organize, the original sentence is confusing about what is cause and what is effect(s). One suggestion: This positive impact is found to be mainly due to the SST decrease, which is in response to the surface BBA radiative forcing ( $\sim -5$  to  $-15$  W.m<sup>-2</sup>) and the cloud changes associated with lower tropospheric heating. These both contribute to (i) increasing the LTS and (ii) to limiting the intrusion of dry air at the cloud top.

**Thank you for the suggestion. This is now changed.**