

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-233

Anonymous Referee #1

Referee comment on "Acceleration of the southern African easterly jet driven by the radiative effect of biomass burning aerosols and its impact on transport during AEROCLO-sA" by Jean-Pierre Chaboureau et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-233-RC1>, 2022

Summary comments:

In this manuscript, the authors use two convection-permitting simulations one taking into account the BBA radiative effect and the other not to address the direct and semi-direct effects of BBA over southern Africa and the southeast Atlantic during the AEROCLO-sA field campaign in September 2017.

Both simulations are examined against satellite, airborne and ground-based observations and ECMWF analyses. Efforts are made to understand the acceleration of the southern components of the African Easterly Jet.

There is no doubt that such a comparison adds value to understanding the overall dynamic of AEJ-S and heat low, which are linked to the direct radiative effect over Angola and Namibia. However, there are numerous (sometimes major) concerns with the analysis and approach. Therefore, I encourage the authors to significantly revise the paper.

Abstract:

The readability of the Abstract may be improved by using scientifically relevant terms such as "baroclinicity" and highlighting key mechanisms in general terms rather than discussing specific simulations issues.

Introduction :

The introduction is quite good and correctly motivates the study. But there are less relevant sentences and less citations. I strongly recommend looking at the introduction in a direct and succinct way to properly motivate the questions you hope to answer.

Data:

It is not clear why only September 2017 was used in the study. Please explain why.

Results section:

The dynamic and corresponding mathematical framework (e.g., Radiative heating, temperature gradient etc.) used in this study is unclear and makes it very difficult to understand the attributions/mechanisms for the differences in the AEJ-S intensity. Improvements are necessary here.

The authors need to clarify the method used to define the AEJ-S core to produce Figure 3. Also, clarification should be provided on why 8 m/s was used to identify AEJ-S.

Refine the colour bar in Figure. 1 so that all colours are used.

Clarify by explicitly writing the equation/formula used to create Figure5.

Section 3 was essentially descriptive and was correct. Section 4 deals with the direct effects of the BBA on the atmosphere - radiation distribution and circulation and have a better-developed process approach. I like your analyses. The main concern I have is about the perspective of coupling within the atmosphere (radiation, transport, rain and convection), in that the acceleration of the AEJ-S is associated with radiative heating and increases the temperature through the intensity of the thermal heat low and gradient in temperature. So there must be some relationship and consistency among the sections 3 and 4 analyses.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2022-233/acp-2022-233-RC1-supplement.pdf>