Comment on egusphere-2022-919
Anonymous Referee #2

Referee comment on "Local and remote climate impacts of future African aerosol emissions" by Christopher D. Wells et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-919-RC2, 2022

General comments:

The authors use a single coupled climate model to estimate climate impacts from African aerosol perturbations. This is certainly an important topic that has not been given much attention, as the manuscript points out. Though the manuscript has some interesting results, I found several of the figures and conclusions to be fairly confusing at this stage. I would like to see the authors clarify these points in the specific comments before recommending publication.

Though this is a global modeling study, the results are mostly focused over Africa. Yet there are no African authors. I note that the authors here tease a future paper on air quality impacts. I highly suggest they begin collaborating with African scholars and experts to avoid perpetuating colonialism in science.
Specific comments:

Line 39-40: provide some citations for the statements about aerosols impact on precipitation. Also, "scattering aerosols tend to decrease precipitation..." I suppose a more accurate statement would be "Increases in scattering aerosols tend to decrease precipitation". Likewise for the black carbon statement in the following sentences.

Line 57-58. I’m not following the how the first sentence “The tropics cover half...” implies the second sentence, that they will have substantial effect on remote climates.

Line 60: What’s a direct human health impact?

Line 79-85: There needs to be a little more effort dedicated on this model evaluation. I can understand not wanting to perform a model evaluation for this paper since it has already been done in other papers, but we at least need to know some quantitative values rather than just statements like representation is “reasonable”.

Line 101: suggest using the more common “Formaldehyde” for HCHO
Line 100-127: Suggest putting all of this in a table, or otherwise nicely organizing it. Right now it is confusing.

Line 112: Need to explain how the ensemble members are different

Figure 1 and accompanying text: It is very confusing. I think you need to label things as either “AerAll” or “AerBB” rather than just “perturbation”. What is “All 2xBB” row showing? Hard to make much sense out of this figure.

Line 166: and reducing variability by averaging over ensemble members, right?

Line 180-185 and Figure 2. The figure here makes more sense than Figure 1. However, I’m having trouble following the description. AerNonBB means that fossil fuel and biofuel aerosol and reactive gas emissions follow SSP3-7.0 in Africa, but everything else follows SSP1-1.9. So there’s more surface warming with AerNonBB? Is this because of Black Carbon? According to Table 1, the local effect over Africa is a cooling, so where is that warming coming from relative to the control?

Figure 2: I was looking for the results of AerAll, is it on this plot at all? Perhaps it is and the bright yellow doesn’t show up well.
Line 200: Ok, here is some explanation regarding the previous results in Fig 2 and Table 1. Suggest moving this up. Still not seeing why is there so much warming in remote areas in AerNonBB and AerAll?

Fig 3 and 4 (and all figures really): recommend having labeled panels a,b,c,d,e, ... etc. Will clear things up when you can refer to a specific panel

Line 234: But we haven’t actually seen the radiative forcing patterns yet in this paper, have we? And shouldn’t the forcings be pretty close to the emissions changes, which are all in the tropics?

Figure 4: is there supposed to be stippling to indicate significance on the 850 hPa omega plots? I see it on the zonal plots.

Line 256: I’m not following how the more norther position of the ITCZ in JJA prevents the perturbations from inducing a strong interhemispheric forcing asymmetry.

Line 274: is there something unique about these regions that warrants further focus, or is it just because they were “hotspots”
Line 334: Unless I’m missing something, the reactive gases aren’t really ever mentioned much in the results. So what is this statement based on?