

Response to Editor

Why is the model simulation limited to only four days? This seems rather short to provide robust statistics, especially since the adaptive mesh setup does not appear prohibitively expensive. Alternatively, if the period between 21 and 25 November is particularly crucial, would it not be preferable to examine several ensemble simulations instead?

In summary, the short simulation period raises concerns about the statistical significance of the results. The number of MCS categories appears too low to fully support the manuscript's conclusions. This is to me the key caveat of the study, and should be commented in the manuscript text.

Re: We thank the editor for the very helpful comment. We acknowledge the caveat raised regarding this study. The short simulation period and the limited number of MCS cases—particularly MCCs—represent key caveats of our work, although we have conducted sensitivity tests for the analyzed period. In these tests, random perturbations were added to the 1000-hPa potential temperature field following a Gaussian distribution with a standard deviation of 0.6 K, as in Núñez Ocasio et al. (2024). Because the results from the sensitivity tests closely resemble those of the unperturbed simulation, only the latter is presented in the manuscript. Nevertheless, this caveat should be noted: while the results appear robust for the short analyzed period, other MCS events or longer simulation periods may exhibit different behaviors. As a follow-up to this study, we plan to examine additional MCS cases over a much longer simulation period and perform multiple ensemble simulations using initial conditions from the Global Ensemble Forecast System (GEFS). We have added relevant discussions in the revised manuscript, copied below:

Lines 523-534: “One caveat of this study is the relatively short simulation period and the limited number of MCS categories, particularly MCCs, which are represented by only two cases. We focus on the period from 21–25 November in 2023 because of the extreme runoff anomalies observed over the Congo Basin during this time. Although the ensemble simulations are not shown here, we performed additional experiments to ensure that our conclusions are not affected by model stochasticity (Section 2.2). Because the results from the sensitivity tests closely resemble those of the unperturbed simulation, only the latter is presented in this study. Nevertheless, this caveat should be noted: while the results appear robust for the short analyzed period, the results from other MCS events or longer simulation periods may behave differently. As a follow-up of this study, we will examine additional MCS cases over a much longer simulation period and perform multiple ensemble simulations using initial conditions from the Global Ensemble Forecast System (GEFS).”