

## ***Interactive comment on “Investigating the response of LAI to droughts in southern African vegetation using observations and model-simulations” by Shakirudeen Lawal et al.***

### **Anonymous Referee #1**

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#### General comments:

This study investigates the vegetation response to drought by looking at the correlation between LAI and SPEI and compares the responses between the observed and modeled world. Overall, this study is very interesting, and the manuscript is well organized and reads relatively clearly. I do think the authors could explore deeper in discussing the differences of the observed and simulated vegetation response to drought and highlight the possible implications on model development in terms of better capturing the vegetation response to drought. Please see my specific comments below:

#### Specific comments:

C1

1. Line 154-156: Is there a specific reason of choosing the period of 1982-2011 for this study? Why not extending to 2019?
2. Line 84: please check the reference, it seems that the paper is published in 2010 instead of 2005. Besides, is it possible to update the reference to recent advance reflecting the statement of “southern Africa may lose about one-third of its current vegetation due to increasing exacerbation of drought in the region”?
3. Line 264-265: Do you also deseasonalize the simulated LAI before the correlation analysis?
4. Line 273-275: Is there a major difference between the CRU and CRUJRA datasets in terms of the precipitation and temperature fields? If so, what are the differences?
5. Line 277-282: The description is a bit confusing. Do you calculate the correlation for each month separately using the 30 years data and then calculate the seasonal mean of the correlation? Please refine the description.
6. Section 3.1: How about the correlation between the simulated and observed monthly LAI time series? Figure 2 has indicated that the spatial pattern between the simulated and observed LAI matches relatively well, but I wonder how they compare to each other in terms of seasonal and interannual variation? I guess this might be helpful when explaining the difference between the vegetation response to drought in the observed and modeled space?
7. Figure S5: It is interesting that for Mediterranean and Tropical forest, models almost fail to simulate the second peak around September. Any possible explanations?
8. Line 328: While the first sentence mentioned that “This section compares the seasonal cycle of observation (CRU) and reanalysis (CRUJRA) climate variables. . .”, I only see one set of climate variables in Figure 3. Are they from CRU or CRUJRA? And there is no discussion with respect to the comparison between the two. Please consider add on the corresponding figures/analyses.

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9. Line 375: “The severity of drought intensity is similar for all SPEI” – which character in Figure 4 do the authors refer to?

10. Section 3.4 & 4.4: This finding is very interesting. I think it’s worth to populate the discussion regarding possible reasons why models tend to overestimate the magnitude and time scale of vegetation response to drought and advice on future scopes of model developments.

11. Section 3.5: Why stratify the analyses based on latitude instead of the vegetation biome types?

12. Figure 6: is the red line represent “ensemble median” or “ensemble mean”? I noticed that sometimes “ensemble mean” is used and sometimes “ensemble median” is used. Please check and clarify across the text/figures.

13. Figure 7: While models overestimate the drought time scale for most of the vegetation biomes, it seems that they tend to underestimate the time scale for Dry savanna. Any ideas on what might be causing this difference?

14. Table 1: It seems that CLM performs the worst among others. Could the authors explore a bit on why this is the case?

15. Section 3.8: Could the authors elaborate on how the impact of extreme events are evaluated and the rationale behind? For instance, how the correlation of a wet year of 2000 is calculated? I have trouble understand how the response for a single year is projected onto the response for a longer time span.

Technical corrections:

16. Line 220: A period is missing after “. . .understanding drought impacts through 2011”. 17. Line 244: Please correct for the typo – “Penman-Monteith”. 18. Line 275: A period is missing in the end. 19. Line 419: Typo: “magnitude” 20. Line 589-590: Should be “Fig. S6”?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-528>, 2020.

C4