

## ***Interactive comment on “Differential effects of extreme drought on production and respiration: synthesis and modeling analysis” by Z. Shi et al.***

**Anonymous Referee #1**

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This is an exceedingly well-written piece of scholarship that I enjoyed reading. The study explores differential effects of various drought severities (with emphasis on extreme) on C fluxes using single model runs at 4 grassland sites and a literature review. Some minor comments are listed below. My main concern here is that only a single model was used. I've been involved in a few MIPs and can relate first-hand that drought response in models is not uniform. How can the authors substantiate that TECO is a good exemplar? I understand that a mini-MIP for a single manuscript is a huge burden but I feel that this question needs to be addressed in some form. Otherwise I have a few more technical issues contained in the minor comments below:

Just to be clear: You are focused on two types of drought: Seasonal drought with emphasis on rainforest and droughts in the context of interannual variation?

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I would prefer more treatments. Is not one aspect of your study to find some "tipping point" in drought response? Put another way, you are chasing a response surface and you have only 3 points (baseline and 2 variants of 33% reduction). I'm also curious why 33% was chosen? Is that value informed by some credible forecast of changes in precipitation in the study domain? Such forecasts are iffy at best, which reinforces the idea of a response surface. This might be a framing issue but I could not shake this question even after re-reading the paper.

P 16056: I do not follow your last sentence here, can you clarify?

Re: 4.4 Implications for future experimental studies Could you add something on capturing legacy effects in experimental studies. Especially in treed systems (trees may lay down wood with different hydraulic properties if the drought is severe enough) this lagged effect is highly relevant, and not well-incorporated in LSMs.

Table 2: Define monsoon R\_s.

Table 3: I think this is better placed in the SI, like the non-rainforest summary table.

Fig 1: This is a proof of concept figure that should allay reader reservation(s) that TECO can be used to explore ESR/REN. But I'm not sure I am comforted by this figure. Could you say a bit more about model skill in hindcast mode before moving to your treatments?

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