Biogeosciences Discuss., 11, C3412–C3414, 2014
www.biogeosciences-discuss.net/11/C3412/2014/

Biogeosciences
Discussions
Open Access

Interactive comment on "Continental-scale impacts of intra-seasonal rainfall variability on simulated ecosystem responses in Africa" *by* K. Guan et al.

Anonymous Referee #2

Received and published: 11 July 2014

The manuscript presents results from a modelling exercise to study how the delivery of annual rainfall impacts ecosystems. The Authors used scenarios of given annual rainfall amounts occurring at different rates (and thus different amounts per event) and with different durations of the rainy season; the scenarios are applied to Africa, focusing on biomass productivity (GPP) and soil moisture, which, as I understood, is interpreted to be the key driver of GPP. Even though the manuscript addresses a topic that is likely of interest to the audience of Biogeosciences, it is not well written; there are several grammatical errors and some parts (especially the methods) were not very clear.

I have listed below specific comments as they appeared in the text.

- Page 7577, Line 11: it is not clear what the Author meant with 'second-order climate statistics'.

- P7580, L10-15: the Authors mention here that MAP is given by the product of 3 rainfall characteristics, but in reality they define MAP as a product of 4 parameters, λ, α, T_w, and f_w. I do not think that the term 'normalized' used in the context of 'f_w' is correct here. I think it should also be said here that the rainfall statistics in the wet and dry season are not different (now, this is said at P7592). This part should be better explained.

- P7580, L19: this line repeats exactly what said 3 lines before.

- P7581, L12: what is the rooting depth adopted in the model. Did it vary spatially?

- P7581, L17: the Authors mention here that 'other environmental conditions' affect Lai and so NPP. What are these other conditions? The Authors focus on soil moisture, which is considered the main variable and it is used to interpret the data. However, I think it would be better to report also other variables and explain why their role is not as important as soil moisture.

- P7582, L3-5: please, re-phrase this part.

- P5782, L11: how were 30 years used to drive the 2000-year warm-up period?

- P7583: daily rainfall is generated using a marked Poisson process with frequency of daily rainfall and daily rainfall depths exponentially distributed. According to Fig. 1, it seems that this approximation is not realistic. I think the Authors should justify this assumption.

- P7584, L28: from P7583 L6-7 and L14, it looks like T_w is a stochastic variable; how was the fix value defined in Exp 1 simulations? Specifically, in sections 3.2 and 3.3 the Authors refer to values of T_w (not its statistics) and comment on the large impact that this parameter has on the results. This is an important point and it needs to be clear how this parameter was determined in order to understand the results.

- P7586, L6-7: rainfall intensity is defined as 1 mm, which is a depth. It should be 1 mm day^{-1} or it should be referred to as rainfall depth per event.

- P7587, L13-16: this phrase was not clear to me. Please, re-phrase.

- P7588, L3: how is s* defined?

- P7591, L24: I do not think that the term 'understand' is correct here. Considering the limitations of the model, the model is used for interpretation more than understanding.

- P7592, L11-12: I would erase the word 'still' ('. . .in reality they have seasonal variations').

- P7593, L12: a rainfall frequency of 0.35 day^{-1} is not very low.

- P7594, L15-16: I thought λ and α also described the dry season. This is confusing.

- Fig. 1: panel b: rainfall intensity should be depth. Panels e-h do not look like histograms; how were they normalized?

- Fig. 2: I would remove this figure.

- Fig. 3: this figure is not very useful. The linearized model and s^* are not used here. Also, I believe that this is not a water stress factor as defined in Porporato et al. (2001), but is more a reduction function for transpiration. The water stress is lower at high soil moisture and increases as soil moisture decreases.

- Fig. 6: it would be nice to have more explanation in the text on how this figure is generated.

Interactive comment on Biogeosciences Discuss., 11, 7575, 2014.