Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
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Comment on hess-2021-204

Anonymous Referee #3

Referee comment on "Ecosystem adaptation to climate change: the sensitivity of hydrological predictions to time-dynamic model parameters" by Laurène J. E. Bouaziz et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-204-RC3, 2021

Review on "The importance of ecosystem adaptation on hydrological model predictions in response to climate change" by L. Bouaziz et al.

This is a very interesting study on the possible implications of ecosystem root-zone storage capacity changes induced by vegetation adaptation to climate change. The authors use a top-down approach based on the Budyko model. I believe that the study is novel and the insight provided by the study is valuable. The methods are innovative and useful for the Hydrology and earth system science community. However, there are several aspects in the methodology that need to be further explained/clarified to improve the quality of this contribution.

Detailed moderate/minor comments linked to the manuscript:

- Lines 144-145 refers to a monthly bias-correction factor applied to improve the consistency between the "E-OBS dataset in the center of the basin when compared to an operational dataset" which is "based on local precipitation data provided by the Service Public de Wallonie for the period 2005-2017". Though there are some additional details in the supplement this comment is very vague here, so it would be good to add some further clarification on the rationale for the use of the bias- correction factor, and why it "improves consistency".

- Lines 227-228 state: "The water-balance method requires daily time series of precipitation, potential evaporation and a long-term runoff coefficient to estimate transpiration, as it depletes the root-zone storage during dry spells." Dry spells can be interpreted as interannual periods (a dry spell could potentially last more than one year in certain regions), but here you are only considering seasonal dry periods… so please clarify.

- Lines 231-235: The explanation on the use of equation (4) and the estimation of the associated variables is not clear. The problem might be that at this stage in the manuscript, the model used for the estimation of the hydrologic variables has not been presented yet (it is later presented in section 4.2 and schematized in Figure 3). It is then difficult for the reader to understand how is P_E estimated based on the other variables in this equation (as E_I and S_I are not available from observations). It is therefore important to explain how E_I and S_I are estimated (here and not later, perhaps linking to the use of the model here, mentioning that the details will be described later). Please also explain if there is an implied iterative process. That is, in order to estimate E_I and S_I from the model (shown also in Figure 3), the value of Sr, max needs to be set, right? But it is obtained after using equation 4 (which uses the results of the model). I find the explanation of the methodology in this aspect unclear, so this needs to be further clarified.

- Line 249: I think it should be "By fitting the extreme value distribution of Gumbel to the series of annual maximum storage deficits"

- Lines 249: Why Gumbel?

- Line 271. What do you mean by "native" simulated … ?

- Figure 5 a is not clear (difficult to visualize). Perhaps a change on the colour scheme used for the lines (more contrasting colours) could help.

- Line 421 states: "The ensemble of parameter sets retained as feasible after calibration mimics the observed hydrograph…". I think that you are trying to say: The simulated values of Q obtained using "the ensemble of parameter sets retained as feasible after

calibration mimics the observed hydrograph…”.