

## ***Interactive comment on “Assessing the impact of rainfall seasonality anomalies on catchment-scale water balance components” by Paolo Nasta et al.***

### **Anonymous Referee #1**

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#### General comments:

In the submitted paper, authors investigate the impact of the rainfall seasonality anomalies on the catchment water balance components. For this purpose, a catchment in the southern Italy is selected and SWAT model is applied in order to carry out the investigation. Two different approaches are used in order to define rainfall scenarios. First approach is based on the standardized precipitation index and second one is based on the duration of the wet season as proposed by Feng et al. (2013). The topic is potentially interesting for the society and HESS readers. However, two main shortcomings of the paper from my perspective that should be improved are:

Firstly, the main focus of the paper is to investigate what is the impact of different rainfall scenarios on the water yield, actual evapotranspiration and groundwater recharge.

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Thus, for different scenarios changes in these variables are analyzed with respect to reference case. Model calibration is just briefly described and reference to more detailed description is given (Nasta et al., 2017). It seems that model was calibrated using monthly data (?). However, P6, L124 states that daily time step of the SWAT model was used. I think that model should also be calibrated using daily data if authors want to use this time step. Otherwise, I would suggest to aggregate daily rainfall data into monthly and re-run the model with monthly time step (if this is possible or perhaps use a different model). An alternative is, to calibrate the model using daily data if there is a discharge gauging station available near the catchment outlet.

Secondly, when using different scenarios, authors only modified rainfall characteristics, what about air temperature? It is true that in some cases the dependence between these two variables can be low or even none existing. However, in some other cases, some dependence could exist. For example, higher average annual temperature could lead to lower annual rainfall and vice-versa. Or higher daily temperature in summer could cause higher rainfall amounts due to more extreme thunderstorm. Did authors check the relationship for this specific catchment? Moreover, I think that air temperature variability should be included in this kind of investigations. Even if there is no clear relationship with rainfall.

#### Specific comments:

I would suggest to add a figure showing the location of the catchment with stations used.

P6, L130: Please better explain what is meant by the term boundary forcings.

P7, L142-144: Why did you use only 3 years for simulation and why 2-years warm-up period? How does this selection impact on the results? Moreover, does initial state of the catchment also have impact on the results (i.e. using different initial values of model variables)?

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P7, L146-149: The data from other station will be used for analyses at monthly time scale but the model will run with daily time step and daily reference evapotranspiration will be calculated? Perhaps you could rephrase this sentence.

P7, L149: Here reference evapotranspiration is mentioned but in next sections, you only mention potential and actual evapotranspiration. Why was reference evapotranspiration used?

P9, section 4.3: If I understand correctly exponential distribution was selected only based on the graphical comparison shown in Figure 2 and Figure 3? If this is the case, I would suggest to additionally apply a suitable statistical test.

P10, L230-231: I do not understand this sentence, if you split the data, how can you then have a drying trend? Only for the second 45 years?

P13, L285 and L294: A statistical test is mentioned here but no information about null and alternative hypothesis is given. Moreover, authors should rephrase these sentences. In statistical hypothesis testing the null hypothesis can be either rejected in favor of the alternative hypothesis or cannot be rejected (with the chosen significance level). Moreover, all the methods used should probably be mentioned and described in the methodology section (and not results and discussion).

Sections 5.3 and 5.4 and conclusions: The main results of the paper are somehow expected: dry scenario leads to less runoff, groundwater recharge and also less actual evapotranspiration (compared to reference scenario). On other hand, wet scenario leads to more runoff, groundwater recharge and actual evapotranspiration (compared to reference scenario). Moreover, different rainfall simulation methods yield different results. The actual relationship among variables mostly depends on the rainfall characteristics, especially if variability in air temperature is not considered. Can the authors perhaps somehow enhance the take home message of this paper?

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