Manuscrip ID: hess-2022-257

Comments and suggestion for authors

General comments

This study identified the important characteristics of the local rain and ETref for estimating the diffuse recharge under semi-arid climate conditions. I consider that the evaluation of the synthesis methods for rain and ETref is a great contribution since these variables have great importance on GR models. My only concern is the assumption of a homogeneous soil and only two locations considered, but they bear in mind this situation. However, some corrections are needed to improve the quality of the manuscript.

1. The abstract is too popular and not scientific enough to reflect the conclusion of the manuscript. Some sentences should be rewritten and supported by data.
2. In the introduction, the necessity of this study must be stated more explicitly.
3. In conclusion, it is necessary to reflect what is the scientific novelty of the results of your research. On the other hand, which synthesis method performed better for both rainfall and ETref?
4. What is the importance of understanding rainfall and evapotranspiration characteristics on groundwater recharge?

Specific comments

In line 1, you should eliminate the word *climate* in order to be clearer, since only the factor rainfall is boarded.

In lines 37-38, this sentence should be added to the next paragraph. Since I understand that paragraph explains the Poison approach.

In lines 59-61, *"To 60 overcome this issue, several new methods, preserving different characteristics of the measured rainfall and ETref records, are applied"*, you must be more specific, which methods did you employ for rainfall and ETref?

In lines 156-158, *"the two- sample Kolmogorov-Smirnov test indicated that the synthesized and the measured distributions are statistically similar for the DS, ETDS, and ETWD methods"*, which is the value of the KS test for this affirmation?

In line 325, *"We find that there are high correlations between the annual rain and the annual GR for sandy…"*. Please specify which correlation criteria is used, it means which values correspond to high correlations. Also add these values to the sentences. Please, review this in the manuscript.

In line 361, *"Here, we considered five different methods for rain synthesis and seven methods for ETref synthesis"*. In total you applied 12 synthesis methods, however, in Table 1 only appear 11. Please correct this.

Technical corrections

In subsection 2.2 Generation of rain and ETref time series. Consider separate rain and ETref in two subsections (e.g., 2.2. and 2.3) to facilitate the reading.

In line 50, you employed ETref for potential evapotranspiration. However, in line 71 you refer for reference evapotranspiration. Take this into account and make the corresponding corrections throughout the manuscript.

In Figure 5, I suggest the use of letters (A,B,C,…) such as in Figure 8, to facilitate the reading and location of the graphic. For example, in lines 263-265 "Figure 5 top right panel" could be hard to follow.