Comment on hess-2022-107

Qin Zhang

Community comment on "Development of flexible double distribution quantile mapping for better bias correction in precipitation of GCMs" by Young Hoon Song et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-107-CC1, 2022

General comments:

This manuscript proposed two bias correction methods (F-DDQM and F-DGQM) based on DGQM for monthly precipitation. The results show that F-DDQM method performs best in correcting bias in precipitation compared with F-DGQM, DGQM and SGQM methods. Recently, our team conducted a similar work, which has been accepted at International Journal of Climatology (Paper title: Piecewise☐Quantile Mapping Improves Bias Correction of GCM Daily Precipitation towards Preserving Quantiles and Extremes; DOI: https://doi.org/10.1002/joc.7687).

In my opinions, there are some questions need to be explained and addressed for this manuscript.

- It is not really appropriate to use monthly precipitation to validate the proposed methods in correcting precipitation extremes from my perspective. For the precipitation extremes, the daily or sub-daily scale precipitation data is required.
- What is the relationship between F-DDQM and F-DGQM authors proposed? Since the F-DDQM performs best because of the consideration of diverse distribution function, what is the point of the F-DGQM's existence?
- Segmenting the precipitation series to two fragments by selecting an optimal threshold, is a good idea. But in my opinions, it is not optimal to use QM based on the theoretical distribution function approach for two different sequences. For the non-extreme series, the non-parametric transformation, i.e., interpolation method in Q-Q plot, is able to capture more precipitation information compared with parametric transformation method and theoretical distribution function method. For the extreme series, when the future precipitation extremes lie outside the domain of historical model data, the simple extrapolation algorithm, such as linear, cubic, and spline interpolation, might lead to great bias. So, in this situation, the theoretical distribution function can be applied due to its advantage of extending the data reasonably.
- For equation 3, the F_g corresponds the GCM outputs and the F_g^{-1} corresponds the observed data. I think this is wrong. Different letters subscript should be used.
- I don't know why the authors used the GEV to fit the corrected models data compared with observation. A direct comparison of the empirical distribution functions of the extreme value series seems more appropriate. Additionally, for the extreme series obtained by POT model, GP distribution is generally more appropriate, rather than GEV.