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# *Interactive comment on* "Exploring the Long-Term Reanalysis of Precipitation and the Contribution of Bias Correction to the Reduction of Uncertainty over South Korea: A Composite Gamma-Pareto Distribution Approach to the Bias Correction" *by* Dong-Ik Kim et al.

**Anonymous Referee #1**

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This is an interesting article investigating and bias-correcting the long-term reanalysis of precipitation over South Korea. Different combination of transfer function and wet frequency adjustment methods are applied to correct the precipitation time series. Explicit analysis was down and detailed results were shown. The manuscript is well presented, however, there are still spaces to improve.

Genreal comments: 1. QM based methods are fundamental tool for bias correction of



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Discussion paper

climate variables. However, Many similar studies have been done. It is also quite normal to take the combination fo different transfer functions to describe CDF for different quantiles. Thus, the contribution of this paper to the scientific progress is low. Also, the title of this manuscript highlights the"Contribution of Bias Correction to the Reduction of Uncertainty", but it is not well explored in this paper.

2. Unlike the temperature, bias correction of precipitation is more challenging due to the fact of spatial/temporal heterogeneity and zero inflation. The bias correction should take care of all the four cases: (0,0), (0,1), (1,0) and (1,1), where 0 denotes a dry day and 1 indicates a wet day. It is not clear how the authors did for there four different cases.

3. The authors proposed a new framework for bias correction in un-gauged area by using the IM-PCM method to interpolate the parameter of transfer functions. To my opinions, the contour mapping technique could bring large uncertainties and biases. Even the the results are validated, but it is based on the average of all the 48 stations. The study of spatial impacts of this technique on the bias correction is still missing.

4. It is not clear that how the authors set the calibration and validation period. It seems the complete study period is used for both calibration and validation.

Specific comments: Page 4, Line 5: "but not bias correction issues" -> "but not bias correction technique issues" Page 4, Line 11: In addition to linear scaling, local intensity, power transformation, and quantile mapping, there are also there sophisticated method for bias correction, e.g. copula-based technique. Page 5, Line 9: "Comparatively little attention has been given to the bias correction of the reanalysis data" is not correct. There is no clear clue for this. Page 10, Line 20: "(TH4). The frequency" -> "(TH4), the frequency" Page 16, Line 9: It is not clear if all the TH are tested together with gQM or not? Page 17, Line 13: "TH4 performs the best with 0.755 for NSE". It is a bit confuse to me, as the TH only affects the wet frequency of the time series. How it affects the extreme correction? This needs to be explained in more detail. Page 17,

Line 20: It is not clear if the TH4 is take for gpQM tests.

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