Hydrology and Earth System Sciences Discussions

Interactive comment on "A new method of rainfall temporal downscaling: a case study on sanmenxia station in the Yellow River Basin" *by* G. F. Chen et al.

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Dear sir, thank you for your comments and suggestions for our manuscript, they are really useful to improve the quality of our manuscript. We agree to take into account your comments/suggestions in the revised manuscript submission. Please find our reply to your comments step by step.

AC: First of all, the manuscript should be checked and edited by a native English speaker before re-submission. I have read the paper with difficulties because of the English writing and frequently I have had to guess the meaning of sentences. In its

present form, almost every sentence has one or more grammar errors and/or inappropriate usage of words.

Author reply: Thank you for your suggestion, and we are sorry for our low English level. We will invite some native English speakers to check our manuscript in the following days, and the revised manuscript will be improved in English writing.

AC: Authors only use one or two stations as a case study, which may not be appropriate for two reasons: a) it does not take account into the spatial variation of rainfall over the Yellow River Basin; 2) one method performs well in one station, but could totally unsuitable for another station.

Author reply: The middle reach of the Yellow River Basin is a typical area of PUB areas, and the Sanmenxia Station is the only station with long enough single rainfall events observation data we can get in this area. So in order to check the new method, two station in the upper reach of the Yellow River Basin, Anningdu Station and Tangnaihai Station are mentioned in this study. Because the data series contain different rainfall types of the middle reach of the Yellow River Basin, the Sanmenxia Station can represent the middle reach of the Yellow River Basin which is an important area of flood source of the Yellow River Basin, although it cannot represent the whole river basin. We will adjust the study area to the middle reach of the Yellow River Basin if it is necessary.

AC: The main concerns I have is that the conclusion is not fully supported by the evidences. A few figures show that this new method is "better" than several existing methods, such as random distribution method, normal distribution, proportional method, or sinusoidal distribution. Each of these existing methods has its own advantages and caveats, and could be used for different purposes. Clearly, authors have not investigated these methods in detail, and claimed their method was "better".

Author reply: By comparing the simulation curves of different existing methods and the outsourcing curve of all single rainfall process lines of the Sanmenxia Station, we can see the simulation results of existing methods can not meet the outsourcing curve

at the high intensity part, and improved methods of the existing method cannot simulate the low intensity part of the outsourcing curve, so these methods cannot meet the actual situation of the middle reach of the Yellow River Basin. The comparison is also taken between the simulation process line and the outsourcing curve of all single rainfall process lines. They can meet quite well in both high intensity part and low intensity part. So two series are selected to validate the new method and simulation of the two series by the normal distribution method and the new method are compared, as shown in Fig.8 and Fig.9. But we are very sad to find that titles of these two Figures are wrong. The title for Fig.8 should be "Comparison between the simulation hyetograph of proportional distribution method(above) and normal distribution method (below) to the actual hyetograph of the first calibration time series", and the title of Fig.9 should be "Comparison between the simulation hyetograph of proportional distribution method(above) and normal distribution method (below) to the actual hyetograph of the second calibration time series". In Fig.9, we can see clearly, the simulation values of the normal distribution method are far lower than the actual ones while the simulation values by proportional method can meet the actual values quite well except one event with intensity larger than 40mm/h, .

AC: Another relevant issue is the event chosen for this study. It is not clear for me how the authors chose this event. Is it a long-term "typical" rainfall event for the study region? What is probability? I guess we can have hundreds – if not thousands – different rainfall-process events. The fact that new method simulates this event well could not justify its validation for different scenarios.

Author reply: The new method is validated with two time series. One contains all single rainfall events from June 1st to July 30th of 1970, and the other contains all single rainfall events from Jun. 5th to July 30th of 1996. It was our fault that we did not express clearly in our manuscript and it will be improved in the revised manuscript. The first time series contain a rainfall event with middle large amount and long duration and some rainfall events with small amounts. The second time series contain some rainfall

events with large amounts and short duration which lead to high rainfall intensity. So the two time series selected contain almost all types of rainfall events in the middle reach of the Yellow River Basin.

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