

Interactive comment on “The effect of Three Gorges Dam and rainfall on summer flow risk over Yangtze River Basin” by Zhenkuan Su et al.

Anonymous Referee #1

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The authors use canonical correlation analysis to develop linear model between streamflow and rainfall during pre-dam period (1960-2003), and the model is then used to predict streamflow during post-dam period (2003-2014). The difference between the prediction and the observation during the post-dam period is simply addressed to the dam effect. The method used by the authors is questionable, and the conclusions are not rigorous. I suggest to reject this paper for publication. The major deficiencies of this paper are:

1. The rainfall measurements across the whole Yangtze River basin were used to develop the regression models for five discharge stations, which is questionable. Since different discharge stations have different controlled upstream areas, it's more reasonable to use these rainfall stations located in the corresponding upstream area of each discharge station for the analysis. For instance, the authors presented in Lines 142-

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144, “However, the rainfall in Subbasin Xiangjiang located at downstream of the dam has negative correlation with the streamflow, indicating that different climate events occurred over northwestern and southeastern part of Yangtze River Basin”, I think the negative correlation is related to the fact that the rainfall in the downstream has not any contribution to the streamflow upstream.

2. The authors also divide the whole Yangtze River basin into 21 subbasins, while only data from 5 discharge stations are collected, which is far not enough for the analysis. I suggest to collect all the streamflow data from most discharge stations (at least stations represent the 21 subbasins) currently operated in the Yangtze River basin for the analysis.

3. The authors attribute the differences noted between the predicted and the measured streamflow during the post-dam period (e.g. Figure 6) to the dam effect, which is not rigorous. As seen from Figure 3, the correlation coefficients between the rainfall and streamflow are generally less than 0.7, indicating that only the rainfall cannot fully explain the measured streamflow dynamics. Figure 5 also shows that large uncertainties exist in the model performance. As such, simply attributing the difference to the dam effect is not correct without analyzing the impact of model uncertainties. In addition, the authors also note the lake effect, how will this affect the model development and prediction? The time lag between the rainfall and streamflow is also not considered in this study, how will this affect the analysis?

4. It's interesting to see from Figure 8 that the models predict totally different results for all the stations in comparison to the measurements for the year 2008, e.g. measured low flow vs. predicted flood, what's the reason for this? Is it related to the model deficiency? 5. The authors conclude in the abstract around Lines 28-30, “The comparison of risk type changes between observations and predictions during the post-dam period showed the dam effectively relieved the risk of upstream while not always played a positive role in risk mitigation of downstream”, which sounds strange to me. It's surprise to see that the dam has minor effect on the downstream but affect the upstream area.

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What's the reason for this? Is this conclusion still true if more discharge stations in the upstream area are included for the analysis?

Minor Comments: 1. Line 20: Is it correct to replace “each station” with “each sub-basin”?

2. Please add reference to the sentence “4 970 000 houses were flattened in the flood of year 1998 and agricultural disaster area was 33 900 km² over upstream in the drought of year 2006” around Line 44.

3. Please rephrase the sentence “unclear parameter uncertainty and inaccurate physical process” around Line 61, it's not clear for “unclear parameter uncertainty”, and what do you mean by “inaccurate physical process”?

4. Please rephrase the sentence “the uneven distribution of rainfall stations” around Line 62, I don't think this will “make it difficult for a single model to accurately characterize streamflow across the whole basin”.

5. Please rephrase the sentence “But the use of highly correlated rainfall records among the adjacent gauges in a single model is problematic” around Line 75, it's not clear.

6. Please also add the rainfall data to Figure 2.

7. Please rephrase the sentence “which are linearly interpolated using data from the closest two stations” around Line 110, it's not clear.

8. Can you add a table to introduce the name of each subbasin, it will be helpful to understand the text, for instance, presented around Lines 140-142, “the most significantly correlated subbasins are Jinshajiangupper, Yalongjiang and Jialingjiang”.

9. Please rephrase the sentence “To solve this problem” around Line 156, what's the “problem” do you mean?

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