

## Response to Reviewers' Comments

Dear editor:

The authors express their appreciation to the reviewers of the paper. Their careful review has resulted in a greatly improved paper.

According to the editorial opinion, the introductory part has been extensively revised, and many other details have been revised one by one.

### *Reviewer #1 (R1):*

#### **1. Justification of correlating reanalysis variables that were derived from the same reanalysis system (see R1 specific comment)**

- 1) We used the reanalysis data from the website below <http://hydrology.princeton.edu/data.lsm.php>. It has been renamed as “Global Land Surface Model Data”, and now requires registration to obtain the data set.
- 2) Reanalysis data is obtained based on observation data and has been used widely as a supplementary data to observation data, especially in ungagged area. A very important example is the widely used Statistic Downscaling Tool, SDSM, which use NCEP reanalysis data as the ground truth to do regression with a large set of Metrologic parameters.
- 3) The investigation in this study did not present a stable strong correlation with all the metrological parameters; a large variation has been shown in the study.

#### **2. Justification of using the two reanalysis datasets that were chosen for the study (both reviewers commented on this). Please explain why these two datasets were chosen over others and if they are better than others over China. Please see the specific comment from R1.**

The two-sets reanalysis data were not randomly picked up. First of all, NCEP reanalysis data as said before, has been widely accepted (e.g. being used in SDSM as the ground truth observation) and has been well studied; it is however, with coarse resolution. While GLADS dataset might be less investigated in the past, it however is with high resolution of  $0.5^{\circ} \times 0.5^{\circ}$ . The two dataset are both from US and may share a similar observational data source and the structure of calibration. It is then might be easier to compare the discrepancy induced by different resolution. Error exists everywhere. By comparing the results from two dataset, it is a way to reduce the error.

In addition, the GLDAS has also been used previously to study the climate change in the world, e.g. Gomez (2018), Jon Gottschalck (2005) et al. and in China, e.g. Y Y Liu (2012); we then choose the two datasets for further investigation in our study.

**2. Three issues with respect to references throughout the manuscript. See specific comment from R1.**

The detailed mistakes about references have been fully corrected in the manuscript using redline edit. Also, some minor spelling and grammatical errors have been corrected, and we have masked out the area outside of China in each figure.

***Reviewer #2 (R2):***

**1. Explanation of why the three major China sub-division zones were selected and whether there is another potential approach for this.**

The partition of sub-division zones in China was based on a 50-year study since 1950's funded by Ministry of China Water Resources. It was published in a book entitled "Torrential Rainfall in China" by Jiaqi Wang in 2002. It now became the national guideline for design and planning.

**2. Inclusion of potential evapotranspiration (ET) and actual ET in the correlation analysis, if possible.**

The calculation of PET for grid data involves a lot of computation. It can be another study. It is then very hard to be included in the current study. So does actual ET.

**3. Simple surface point validation of reanalysis datasets for random selected points.**

The validation by randomly selected ground meteorological station data was included in the revised manuscripts. The source of data was added in P7L12-16 and Figure 1, the correlation analysis was added in P15L1-7 and Table 2, the Mann-Kendall analysis was added in P17L7-10, and P21L1-6 as well Table 3. The validation based on the ground station indicates the similar trend and correlation with the results from the two reanalysis data sets.

**4. Illustrate the history of land use/land cover in China instead of just one snapshot so that the agriculture development trend can be compared with the precipitation trend, and potential ET/actual ET if possible.**

We have tried a lot of efforts to search for the land use maps. The land use map over entire China is not free of charge; the cost of obtaining these maps is substantial.

Additionally, evaluating the history of land use change in China and comparing with the precipitation trend and PET/Actual ET could be a good research topic and a good paper itself, while it would involve a lot of efforts. Thanks for the idea and we may apply some additional funding for this research in the near future, it however could not be done in this paper. It seems to be too much to be integrated into one paper.