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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Impacts of spatial resolutions on projected changes in precipitation extremes: from site- to grid-scales" *by* Jianfeng Li et al.

Anonymous Referee #2

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The manuscript described the potential impact of model spatial resolution on the projected future changes in precipitation extremes using daily rainfall observation and simulation over China. The authors argued that even though the precipitation related extreme indices are sensitive to spatial resolution of analyzed data, the impact on future projection is relatively small. The authors also used three different approaches to compared and evaluated the model gridded mean output with mismatched point observation. The result suggests that by applying statistical downscaling method to model simulation to derived the precipitation extremes to the observed location outperformed the direct comparison of model simulated gridded output and station observation with and without scaling the station and model data to a common grid size. They also

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highlighted the similarity between the simulation and observation and implied that the difference in the data spatial resolution does not matter in the comparison.

While there is certainly some interests on the topic the authors tried to address, the presentation and discussions in the paper are either already known in previous literature or missed the real important issues in such study. In particular, the authors totally neglect the potential mixed influence from the model bias (or spread) and model spatial resolution. The necessity to exclude the spatial mismatch of the data is the basis for fair comparison. One should not argue if in practice the result are similar (due to various reasons), then one don't have to make the comparison in right way. The more detailed comments are listed below. I can't really find anything new reported in the paper. Further, the discussions are often misleading. Therefore, I would recommend the rejection of paper.

Originality: Fair Technical quality: Fair Clarity of presentation: Fair Significance: Poor

General comments:

1. The impact of spatial resolution on rainfall extremes (or even more detailed rainfall intensity–duration–frequency relationship) from point measurement to large area average are well known in the previous hydrological study. Due to such impact, one should only compared (or validate) the rainfall extremes at the same resolution. Therefore, the three approaches used by the authors can only be considered as how incorrect the comparison can be, especially the model simulations run at various resolutions and different from point measurement from station. Nevertheless, the authors tends to emphasize the relatively small impact from such spatial scale differences for both model evaluation and future projection. But that is very misleading in term of basic principle.

2. The most important issue related to the mismatched spatial resolution of daily data in calculating precipitation-related extreme indices from CMIP5 models is whether the spread of model projected future change is truly due to model difference, not the model resolution. This is often overlooked. For example, even the papers cited in the IPCC

AR5 report regarding the projected future change of rainfall extremes (Skillmann et al. 2013a,b, JGR Atmos., DOI: 10.1002/jgrd.50203, DOI:10.1002/jgrd.50188) did not take into account the model resolution difference when all of climate extreme indices are calculated from model daily output at original model resolution. Indeed, the range of model projected change might not be that different from the result based on upscaled or downscaled data due to mixed impact from model bias and model spatial resolution. However, one should carefully clarify such mixed impact into detailed. In that regard, the authors did not provide any useful insight to the issue.

3. There is no surprise for the authors to find that using statistical downscaling method to transfer the model output to the station location. perform better since the quantile mapping procedure correct the model bias. What is the point for the authors to compare with other approaches that with only simple interpolation and upscaling or even without upscaling the station measurements.

4. In addition, the authors often show only model ensemble mean projected change, but as point out earlier the model ensemble mean might be affected differently by model tuning at higher and lower spatial resolution. Further, it is also expected to have minimum impacts from different approaches on the future projected percentage change since the impact largely canceled out when the same operators are applied to both denominator and numerator.

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