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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Prediction of extreme floods based on CMIP5 climate models: a case study in the Beijiang River basin, South China" *by* C. H. Wu et al.

Anonymous Referee #2

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1 Summary

This paper runs through a projection of floods for a basin in China, using downscaled GCM data to force a hydrologic model. The paper would be strengthened by increasing the details in some areas, noted below, and by expanding on the results. As the results section reads now, the contribution of this paper is that there is a lot of variability between the models. Is there is some way to take information between the models to have a more robust understanding of how floods are going to change? Or is the overarching conclusion is that these models are not in enough agreement to say anything?

2 Major points:

- It is unclear how the model calibration and validation was done (Figure 2). How do they have observed runoff? Is it discharge divided by basin area? How was the model routed? No mention of a routing model is made in the text.
- I found the text vague about the GCM downscaling methodology. The introduction laid out several different possibilities. I believe what was done was a simple interpolation of monthly values followed by bias correction through quantile mapping and then stochastic weather generation. If this is not the case, please modify the text. If it is the case, include some more details on the methodology so that the paper stands on its own. Also, if this is the case, I do not understand Section 3.3 saying it was driving the VIC model through historical resampling. The validation should be of the historical GCM runs downscaled identically to how the future runs are. I'm unsure if the problem here is due to the writing or the methodology.
- There's nothing about the flood regime of this basin as is... is it seasonal, etc.? It's hard to know what these changes mean and how much to care about this basin
- Fitting 30 years of data to a 500-year return period (and 200-year) is not scientifically sound, and conclusions should not be made on these statistics. Adding just 5 more years of data to fitting the time series could dramatically alter their results; they are not robust.

3 Minor points:

- The labels on some of the figures should be larger to be legible.

HESSD
11, C5135–C5138, 2014

- Did they interpolate the station data to 0.25 resolution? Clarify the methodology (line 5, p9649).
- What was the DEM data used for? River network extraction? VIC snowbands?
- p. 9649, line 18: Unless Wang et al. (2012) rewrote the physics of the VIC model, this reference is not appropriate.
- P9649, line 28: Wu et al 2013a citation is not appropriate here unless this reference documented something new about its method and/or its application to hydrometeorological time series.
- Figure 4: Showing all trends are misleading, as you could be ending up with a bunch of very minor positive Z statistics for the Mann-Kendall. If you do want to show all trends, somehow incorporating their values, so that the reader knows how larger or small they are, would be useful.
- Comment on how good or bad the GCM precipitation was prior to quantile mapping.
- Figure 3 – specify in the legend that these are the downscaled precipitation. Could also make it clear in the text with language: it is only the first half of the first sentence (Section 3.2) that states this.
- Why were max 1 day Q and max 7 day volumes used? Are they representative of flooding in this basin?
- P 9645, Lines 4-6: Unclear what is being said here. The impacts will exceed economic damage? Isn't economic damage one of the impacts of flooding?
- The discussion spends a significant amount of time discussing the possibility that the humidity trends are affecting the runoff and could be a source of uncertainty.

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11, C5135–C5138, 2014

This can be tested by feeding the model synthetic data. The alternative hypothesis would be that none of that matters for extreme floods driven by extreme precipitation.

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