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Discussions
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Interactive comment on "Frequency and magnitude variability of Yalu River flooding: Numerical analyses for the last 1000 years" *by* Hui Sheng et al.

Anonymous Referee #1

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The paper coupled HYDROTREND with the ECHO-G model to reconstruct and investigate the impacts of climate change and human activity on the flooding frequency and magnitude for the Yalu River over the past 1000 years. The results indicated that the frequency trends of flooding were dominated (increased) by climate variability, i.e., intensity and frequency of rainfall events. The also found that deforestation increased the magnitude of floods by 19.2∼20.3%, while the construction of cascade reservoirs significantly reduced their magnitude by 36.7∼41.7%. In general, the paper presents some useful analyses and can potentially make a useful contribution to the field. However, there are some critical issues need to be addressed. All the major and minor issues I found are included in the detailed review below.

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Discussion paper

Major comments:

(1) According to section 3.2, the climate model ECHOG was used to simulate monthly precipitation and temperature of Yalu River over last millennium. How to calibrate by meteorological station data? The accuracy of the simulated precipitation and temperature would have an important impact on flood simulation by HYDROTREND model. If there are large biases in ECHOG simulation, a bias correction is necessary before coupled with HYDROTREND model. But there is no relevant information in the paper. On the other hand, the HYDROTREND model was run at the daily scale (as shown in Figures 3d and 4d), whereas the precipitation and temperature of ECHOG are simulated at the monthly scale. How the authors downscaled monthly-scale climate data to daily scale. The authors should provide relevant information in detail.

(2) The authors used the GEV distribution to calculate the return interval flood values. How to estimate the parameters of the GEV when fitting the data of peak flows? There is no any information about it. In addition, I am not sure if the GEV is the best distribution for the study basin, which raises another key question: why not use other distribution functions such as P-3, since the P-3 is widely used for the frequency analysis of floods in Chinese basins. Or, why not use multiple probability distributions and find the optimal distribution to analyze flood frequency? The authors need to carefully clarify this.

(3) The flooding frequency analysis is based on the hydrological model coupled with the climate model. In my opinion, there would be large uncertainties throughout the process of modeling and frequency function analysis as well as the data used, especially for such long-term (1000 years) hydrological simulations. The authors should make a discussion to emphasize this point.

Specific comments:

Line 15: what' s the meaning of "AD"? Please give it full name.

Line 21: what' s the meaning of "larger floods"? please clarify it.

Lines 228-230: Please provide information about the spatial resolution of the ECHO-G model.

Lin 250: How to identify wet years, average years and dry years? please clarify it.

Line 255: Why use 14 years as the period of wet and dry years for the Yalu River basin?

Table 1: Which basin's error results are summarized in Table 1? Ai River or Yalu River? please clarify it.

Figure 3: the performance of model seems not well for daily peak flows in the Ai River, how would this affect the flood frequency analysis?

Figures 3 and 4: I suggest the x-axis of (e), (f), (g) in Figures 3 and 4 be marked with the actual year.

Section 4.3: wavelet analysis is conducted based on continuous (flood) data over a certain period. How to compute the long-term (1000-2012) series of the designed floods with different return intervals? As I know, for a specific timeseries there is only one value for a certain return period fitted by the GEV distribution. How to generate a long-term data of the designed floods used for wavelet analysis? please clarify it.

Table 3: how to calculate the frequency of flood occurrence for different recurrence intervals? More explanations are needed.

Line 458: decreased » increased

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