

## ***Interactive comment on “Impacts of human activities and climate variability on green and blue water flows in the Heihe River Basin in Northwest China” by C. Zang et al.***

**Anonymous Referee #2**

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### General comments

The study aims to investigate the impact of human activity (irrigation expansion) and climate variability on actual evapotranspiration and runoff in the second largest inland river in China. The assessment is based on using SWAT model, which is running for four different scenarios. The results indicate that direct human activities did not significantly change the main water balance components. Land use change resulted in more increased runoff than evapotranspiration, while climate variability led to an increase of both evapotranspiration and runoff. The authors conclude that the results are helpful to benchmark the water resources in the context of global change in the

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inland rivers in China.

Overall, the manuscript is clearly written, however the novel scientific contribution is not clear. The methodology is based on a traditional model-based scenario approach, which is by no means novel. The dataset and selected model (SWAT) are also not unique. It is not clear to what extent the results reflect only the model parameter sensitivity and to what extent are the simulated causal relations 'real'. The paper reads like a case study, but I missed a closer look and deeper assessment of the coupled climate-human interaction which will bring some more understanding of the linkage between hydrologic and socio-economic processes and their controls.

### Specific comments

- 1) Abstract: Please consider to use mm instead of m3. Please indicate also the temporal dimension (yearly, daily, etc).
- 2) Introduction: "With global warming, extreme weather events are now occurring more frequently, ... (Vorosmarty et al., 2000, 2010, ...)". The sentence reads like the cited references confirming increased frequency of extreme events, which is likely not the case. Please consider to revise.
- 3) Introduction. The topic of human and climate impacts on water resources is really wide, resulting a huge number of publications. Please consider to present the context for your research in a closer way, in order to clearly show/distinguish, what is already published, what is missing and what is new and novel here. In the present state, the introduction is very general.
- 4) The SWAT model. Please be more specific in parts, which are relevant to the topic - evapotranspiration and runoff. How is the climate and human impacts parametrised and linked together? Is there some dynamical link between human and climate interactions on the water balance? How stable/sensitive are the parameters in time?
- 5) p.7, l. 25: Is the Nash-Sutcliffe efficiency based on daily values?

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6) Results, p.9, l.11-15: From Fig.4 and Table 2, it is not clear how much is the surface runoff accelerating and what categories (in Table 2) are taken as urban land use class. Please clarify and justify the interpretations made. For readers, which are not familiar with geographical and climate variability within the region, it is difficult to understand the differences and causing factors. Please consider to add some more detailed explanations about the causing processes.

7) Table 1: Please use values in mm.

8) Figure 8. Is it referred to annual means (mean annual precipitation and air temperature change)?

9) Green and blue water. The reason for this terminology is not clear. Why not evapotranspiration and runoff?

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