

## ***Interactive comment on “Evolution of the human–water relationships in Heihe River basin in the past 2000 years” by Z. Lu et al.***

### **Anonymous Referee #2**

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This study has attempted a reconstruction of different hydrological elements of the water balance equation over the past 2000 years in Heihe river basin. This reconstruction then permitted the authors to estimate how human water consumption within this basin evolved over such a long period, and characterise this evolution into four different developmental stages of human-water interaction. The subject matter is indeed very interesting and fits well within the remit of HESS. I recommend publication of this paper once my following comments have been addressed:

1) How the past 2000 years were divided into several different periods is not entirely clear. First, Table 1 provides vague timelines for the different dynasties; it would be much better if the authors provided start and end years to these periods. It would also help the reader understand whether these were successive contiguous periods.

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Second, it is mentioned in Section 2.3.1 that the authors used “precipitation in each historical period reconstructed by Ren et al. (2010)”. Are Ren et al. (2010)’s historical periods the same as the seven dynastic periods chosen in this study? If not, how different are Ren et al.’s divisions of the historical period?

2) In Section 2.3.3, three land use types are considered: cultivated oases, natural oases, and unused land. Equation 4 provides how the P (water supply) in the first two land use types was estimated, to be used in equations 2 and 3. However, for the unused land, was precipitation the only water supply considered? If yes, please state it explicitly; if not, please explain how water supply was calculated for unused land.

3) Sticking with Section 2.3.3, in equation 4, the groundwater irrigation I is kept constant at 500 mm throughout the entire historical period. This assumes that the types of crops cultivated in this basin did not change over 2000 years, and does not take into account the evolution in agricultural technology. Moreover, it directly contradicts the statements made in Section 3.6, such as “In the middle of the Qing Dynasty, the Hexi corridor was politically stable and free from wars and innovative farming and engineering methods were introduced, such as better seeds, new crops, and the steel farm implements”.

4) I think Section 4 of the paper needs to include a paragraph or two on the limitations/assumptions/caveats of the methods used. Historical reconstruction of annual water fluxes over such a long period will most definitely involve huge uncertainties and assumptions (one example pointed out in my point 3 above). These need to be mentioned and discussed in this section.

5) What is k in Figure 6? I did not find any explanation in the article text.

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