

## ***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 #1**

Received and published: 23 February 2015

This paper reconstructed water balance in the mid- and downstream area of Heihe River Basin during the past 2000 years. Four stages of the human-water systems are identified. The interaction of cultivated area and streamflow into the terminal lake is then discussed. This study adds a valuable case study for comparative socio-hydrologic studies across different human–water systems. I have some comments for the consideration of revision by the authors.

The estimation of  $E$  is not clear to me. Is  $E$  estimated by equation (2) or (3) for the basin or for cultivated oases and natural oases separately? Is  $w=3.5$  for all the historical periods? Should the value of  $w$  be different between cultivated oases and natural oases? Should  $w$  even change with time depending on the type and intensity of crops?

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Water supply is computed as the summation of local precipitation and irrigation (or groundwater ET). Is irrigation water pumped from groundwater or surface water with-drawal?

Is a portion of local precipitation recharged to the groundwater? If not, the groundwater is fully replenished by the precipitation recharge at the upstream (mountain).

Line 15 page 1061: change to “, e.g., water”

Lines 1-3 page 1062: There are some recently published papers which are for ex-planatory and predictive purpose, e.g., “A prototype framework for models of socio-hydrology: identification of key feedback loops and parameterisation approach” by Elshafei et al. (2014 HESS)

Lines 24-25 page 1062: some information is repeated at lines 4-9.

Line 15 page 1064: “Budyko and Miller, 1974;” Double check this.

Line 20 page 1064: change to “respectively;” Similar changes are applicable for other locations.

Line 16 page 1066: correct “Fu (1981) fFor details,”

Line 24 page 1066: change “PET” to “E0” or define PET.

Lines 24 page 1066 – line 1 page 1067: E0 is assumed to be the same between the historical period and the instrumental period. This assumption needs to be justified or the uncertainty on estimated E due to this assumption needs to be discussed.

Line 15 page 1067: since “I” has been used for irrigation in Equation (5), you can use “J” to replace “I” in equation (5).

Line 2 page 1074: “m3/year”? Check the unit in Table 2 too.

Lines 10-11 page 1076: The period from 2000-2010 is short. I am not sure whether it has already reached a new equilibrium stage. Natural oasis may continue to increase

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from Figure 5.

Line 13 page 1077: Are predictions of its possible future dynamics discussed? How to predict future dynamics?

Lines 15-18 page 1077: I think the claim is over stated. The manuscript can be shortened, but the “transition theory” needs more description and discussion.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 1059, 2015.

**HESSD**

12, C275–C277, 2015

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