

## ***Interactive comment on “A journey of a thousand miles begins with one small step – human agency, hydrological processes and time in socio-hydrology” by M. W. Ertsen et al.***

**Anonymous Referee #2**

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This paper explores three temporal views relating to historic irrigation systems in Arizona – long-term climatic reconstruction; middle term canal construction and short-term canal management. It is argued by the authors that to understand the management of the irrigation systems there is a need for agent-based modelling at a fine temporal resolution. Additionally, the longer-term studies are required to provide the context for such modelling.

While this paper does contain some interesting material, I have a number of reservations. In particular, Section 3 is poorly written, with the methodology and rationale unclear. Also, for a paper on socio-hydrology, I would have expected to see some de-

C7240

scription of what is known of societies in this region and how they could be mapped to the proposed agent-based modelling. The interpretation of the canal management scenarios (Section 5) would benefit from this information.

Some more detailed comments are provided below.

### **1. View 1: Climatic Reconstruction (Section 3)**

I found this section confusing. I would have thought that the objective here would have been to create a 1000 yr temperature / rainfall record for the irrigated (lowland) region using the upland tree-ring dataset (i.e. from p. 14274, line 9). For temperature, firstly it appears that the mean of an upland observational record is subtracted from each value in the annual tree-ring data series. Then, randomly selected data from an observational lowland site are added to the modified tree-ring data series to derive a monthly record. If this is a correct interpretation, I do not understand the rationale.

It may have been more useful if the authors had related the long-term variations in climate to developments in the irrigation system. However, it is acknowledged this information may not be available.

The graphs for the rainfall series validation are missing from Figure 3.

### **2. View 2: Canal System (Section 4)**

This section could be considerably shortened. In particular, I am not sure that Fig. 6 adds much in the context of a hydrological journal.

P. 14281, line 23: Should read Fig 4a.

### **3. View 3: Canal operation (Section 5)**

A hydraulic model is setup to simulate a number of water control scenarios in an irrigation system, representing an archaeological site. The results focus on the time of arrival at the most downstream field. How / what historical data were used to construct the scenarios is not clear. How this could be modelled in an agent-based model should

C7241

be discussed.

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C7242