Hydrol. Earth Syst. Sci. Discuss., 10, C7789–C7792, 2014
www.hydrol-earth-syst-sci-discuss.net/10/C7789/2014/

Hydrology and Earth System Sciences
Discussions

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.

M. W. Ertsen et al.

m.w.ertsen@tudelft.nl

Received and published: 7 February 2014

We would like to express our thanks to the two reviewers, who both welcome our discussion on the importance of the temporal scale in modeling coupled human-water systems.

General response to Reviewer 1, point 1i, 1ii, 3 and 5; Reviewer 2, Intro and point 2

Both reviewers suggest that we open up the discussion a little more to the non-specialists on Hohokam society and geo-archaeology. This includes providing some background on what is known of (pre-) Hohokam societies in this region. We will do so,

and will focus our attention to providing this information in the section on canal management scenarios (Section 5), as this offers the clearest link to do so. It will also allow improving the section as suggested by the reviewers (see below).

In terms of the wordiness of sections 1 and 2, and length of and use of technical terms in section 3, we will go through the text again and carefully check our language. It is to be expected, however, that in a paper like ours – and a field like sociohydrology in general – that readers do encounter terms and types of writing that may not be immediately obvious to the HESS readership.

The majority of the detailed suggestions made by the reviewers focus on section 3 and 5, the water related paragraphs. Obviously, we apologize for the errors and/or confusions in text, equations and Fig. 3. We will correct these in a new version, if we are invited to submit one. We will include all the more general comments to improve the overall quality of the Manuscript, including the figures, references and other errors.

Response to Reviewer 1, point 1iii, and Reviewer 2, point 1

Indeed, our approach – expressed in the equations in section 3 – is calculating the monthly temperature/precipitation in our (lowland) study area, using the monthly observed data in the lowland and the difference/ratio between yearly reconstructed tree-ring data and yearly observed data in the upland. The assumption is based on the fact that climate variability is highly correlated between upland and lowland. We will include a clearer discussion on the method and its rationale. This will also be the case for the issue of additional steps and assumptions, especially the assumption that climatic variability has not changed over time. Indeed, the CF method demands that climatic variability has not changed over time. In term of the one thousand year of tree-ring series, there is no evidence indicating climate changes in the uplands. Because most CF methods are used for forecasting climatic variables, it typically calculates the additive and multiplicative change factors between a baseline and a future scenario. But for our case, it is for the past, and thus we modified the equations. The additive and multi-

plicative change factors are between reconstructed tree-ring data and upland observed data.

Response to Reviewer 1, point 2, and Reviewer 2, point 1

We have considered including more discussion on trends in long-term climate in relation to short- to medium-term changes in irrigation and human agency in the region. However, this paper discusses the type of data needed to properly do so (focusing on hydrology, geomorphology and water management) and does not focus on the actual analysis yet. We are working on that, and would like to reserve the results for another paper.

Response to Reviewer 1, point 4, and Reviewer 2, point 3

In terms of the suggestions made by the reviewers to improve section 5, on the hydraulic model of a small-scale irrigation management system, we will include more discussion and information on what we did and how that is relevant to Hohokam water management.

Response to Reviewer 1, point 4i

On the archaeological evidence supporting our assumption that control structures were used to manipulate flows in such irrigation systems, we actually wanted to know whether such features would have been used in the first place. Typically, one would expect that structures of mud and wood will have been used, and these materials leave few archaeological traces.. Today, only a few partially preserved control gates have been encountered in the Hohokam world and their systematic use has not yet been proven. We can include more discussion on evidence for control features.

The same remark would go for the reviewer's questions on social organization. This issue is actually germane to our point: although evidence is available on the general Hohokam society, the details of its water management are unknown, and we hope to apprehend it better by understanding the constraints of the physical system, which is

what we are modeling. Our modeling is obviously based on archaeological evidence, but also points out the need to find for other types of archaeological evidence (including control structures).

Response to Reviewer 1, point 4ii

We believe that we did include at the bottom of page 14284 how much time reduction was resulting from applying controls, but we will emphasize it more.

Response to Reviewer 1, point 4iii

Obviously, our simulation of 28 fields is a simplification of an example with more than 1,000 fields. The results for these fields clearly show lower delivery times and greater stability under certain control scenarios. We are not certain that these differences in irrigation delivery times between scenarios would have translated into markedly different societal/individual benefits in our specific case, as we have not done the analysis yet (using all the data sets we discussed in the paper), but comparing our findings with irrigation systems in general suggests that it is beneficial to have stability and lower demands in terms of coordinating actions.

Response to Reviewer 1, point 4iv

We will clarify the results in terms of total delivery times and volumes of water needed to fill up all the fields and canals. Indeed, some irrigators could not fill their fields in certain scenarios when inflow was scarce.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14265, 2013.