Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-107-AC2, 2017

Hydrology and Earth System Sciences
Discussions
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Interactive comment on "Socio-hydrology from the bottom up: A template for agent-based modeling in irrigation systems" *by* Dimitrios Bouziotas and Maurits Ertsen

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Received and published: 11 June 2017

The reference of the reviewer to Epstein and Axtell is highly appreciated, as it is indeed a useful base for the type of work we do and the argument we would like to build. Similar to what we do, these authors discuss computational frameworks as laboratories for exploring micro-mechanisms that may or may not generate social phenomena. They show that simple local rules often are enough to create more complex patterns or overarching effects. Our IMG-ABM is also based on local rules, and results in emerging global patterns, shaped by simple agent action which depends on model settings. We are indeed aware of the considerable amount of literature on empirical agent-based or

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geo-simulation models in many fields. We could have included many more indeed and think that our current selection is rather well-balanced, as this study does not aim to provide an extensive literature review on ABM. Having said that, we will certainly profit from the reviewer suggestions and will use it for our revision, as stated in our general comments as well.

As this reviewer is also asking about how we study emergent phenomena, our response to reviewer 1 is also relevant here. The emerging (up-scaled) effects from our ABM are not so much found in responses from social institutions at this stage. We do observe emergent effects though, as we show that within the IMG-ABM the series of decisions that are made create patterns well-known in gravity irrigation in general and the IMG in particular. Upstream users generate more financial revenue and use more water, whereas downstream users generate less revenue, but generally more revenue per unit of water. We aim to clarify our position on and examples of the emerging effects seen in our work.

As explained in our paper, our model is based on the empirical case-study of the Irrigation Management Game. We compare the "game as played by humans" and "game-based model". An elaboration of the game results from humans and the reasons why the IMG would count as "real" have been published elsewhere, but we can include more details in (and make a comparison with) our current work.

What we aimed for was to discuss "essential elements of agent-based modelling in a simple socio-ecological context", in terms of agent properties, signal logic and relevant parameters that can be calibrated based on the real setting. It is clear, in line with the comments from other reviewers, that we need to clarify our modelling description and will, among other improvements, consider using the ODD system suggested. Reflecting our belief in scientific openness also seen through our submission in HESS, we planned to make the model publicly available (e.g. through OpenABM) when our paper would be published.

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