



EGUsphere, referee comment RC1
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Comment on egusphere-2022-664

Anonymous Referee #1

Referee comment on "GEB v0.1: a large-scale agent-based socio-hydrological model – simulating 10 million individual farming households in a fully distributed hydrological model" by Jens A. de Bruijn et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-664-RC1>, 2022

The study by Bruijn et al. with the title of "*A large-scale agent-based socio-hydrological model – simulating 10 million individual farming households in a fully distributed hydrological model*" is intended to provide a coupled agent-based and hydrological model to simulate farmers' behavior. At the current stage, the paper does not present a proper understanding of agent-based modeling and socio-hydrological model. While the study implies that agent-based modeling benefits this work, I am quite concerned and surprised about the materials of the paper regarding agent-based modeling:

- What is the difference between your current model and the high-resolution water management model? The authors named some components as agents (i.e., reservoir operators, a government, and an NGO) though they act as the same as a traditional water management model. For example, there is a so-called NGO agent, but when we read the information about its action in Section 3.5, there are like "scenarios"! the same example can be seen for the government agent. Thus, another concern can arise regarding the wrong definition of agents in this study.
- The agent-based model is well-known for stochastic processes, learning and adaptive procedure, and complex interactions among agents. How do you benefit from each or some of these features in your model structure and equations? Please explain each feature, if there is any, according to your equations.

Besides these comments, I also have other major comments:

- The paper lacks a literature review on socio-hydrological models.

- The socio-hydrology is mainly about the coevolutionary behavior between the hydrological and human systems. Please clarify the bidirectional feedback between a hydrological and social system in a figure. The current figures do not satisfy this need. Please also note that scenarios cannot show the “co-evolutions” between the systems.
- Another point of socio-hydrology is to involve social factors. In lines 131-134, I am very surprised that the authors just mentioned they will work on it in their future work. Then, what are the social components in this study?
- I wonder if Figure 2 shows the complete picture of the current paper?! The authors mentioned some components (e.g., characteristics and experience) will be in their future work (lines 131-134)! Also, there should be a meaningful connection between Figure 2 and the equations. You should completely clarify each component of the figure and refer to the corresponding equation.
- It seems that Equations 1-4 represent all agents’ equations in the model. Once again, I wonder how this work benefits from the concept of an agent-based approach. what is the difference between this model and a traditional water management? It seems that the only advantage of this water management work is to provide a high-resolution model.
- I am very surprised by the conclusion section. Around 75% of the conclusion is about future work! what is the take-home message of this study? What are the implications?

Some minor comments:

Line 55: very confusing. Are you talking about approaches of modeling human systems? what is the traditional hydrological component as an approach? here I suggest you write about approaches of simulating water-human systems (including SD and AB).

Line 63: The other approach to consider/model what?

Lines 64-65: Is it an example of coupling the agent-based modeling and a hydrological model? what is the agent-based modeling part about? Please explain more.

Line 66: What does it exactly simulate?

Lines 63-70: this paragraph just provides a list of references and confuses readers. what is the main idea of this paragraph? if you want to mention the advantage of coupling agent-based modeling and hydrological model, explain the agent-based modeling and hydrological part in each study. what was the benefit of agent-based modeling for each study?

Line 71: what are the "these methods"?

Lines 230 and 240: what is section 0?

Line 330: this section should change to scenario analysis

Lines 331-347: what is the argument behind choosing these numbers like 30% probability of switching crops? Do you have any references for them? If not, there is a need to do a sensitivity analysis.

Lines 401-404: "for the first time"?