

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-398

Anonymous Referee #1

Referee comment on "Process-based flood damage modelling relying on expert knowledge: a methodological contribution applied to the agricultural sector" by Pauline Brémond et al., Nat. Hazards Earth Syst. Sci. Discuss.,
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The manuscript deals with the modelling of flood damage to agriculture, one of the (relatively) less investigated sector among the exposed assets. Although this makes the paper a potentially interesting contribution for NHES, it actually suffers from several criticalities that, in my opinion, prevent its publication in its current version. Then, I would suggest the Authors to reconsider the way they presented their work, by better emphasizing the modelling aspects related to the proposed tool (floodam.agri), rather than presenting a 'philosophical' paper, with limited usefulness.

Indeed, the actual structure of the manuscript makes it very confusing, with repetitions, and does not give the right emphasis on the model itself and on its innovation, which should be the main core of the paper. I would therefore re-arrange the structure of the manuscript by first presenting the model (with more details on it) and then explaining why it should be considered a "good" model and what are its current limitations. On the contrary, the Authors just presented a description of the "archetype of a model" and then they try to explain (with limited success) why their proposed model should be considered as "the" model. In particular, the first part of the manuscript is very general, since the definition of the methodological framework for the development of a process-based flood damage model (Table 1) is not "new", given that the listed questions are typically taken into account in the development phase of any process-based model.

More importantly, the way the Authors presented their model is also not very convincing. Indeed, unfortunately, when presenting floodam.agri, they failed in properly addressing some of the questions raised by themselves. I especially refer to the ones labelled as "Axis 1: explicit assumptions", i.e. model and data transparency, which (I agree with them) should be regarded as one of the most important features of a model. I just mention hereafter some examples related to the lack of details on modelling assumptions within the model. (i) biophysical process taken into account to develop crop susceptibility functions: if you heavily claim for explicitness, the only Table 4 cannot be considered enough, but I would expect a thorough description on how the crop susceptibility functions were developed from a methodological point of view (e.g. by also considering a few crops

as example and explaining how the different processes impact on the produced functions: i.e. how the plots reported in Figure 1 have been derived? (why I observe abrupt changes in damage at certain water depths and duration thresholds? Which are the driving mechanisms for these specific patterns?). I think this would be very interesting to know from a modeler's perspective and this could be a real added value to the manuscript. (ii) interviews with experts: no detailed information is provided within the manuscript on how the Authors actually took advantage of experts' knowledge for developing floodam.agri. Again, I would suggest you to better describe the following aspects: how the questionnaires were structured (templates may also be included as supplementary material), how the collected data were analyzed and, in particular, whether you found uncertainty in the collected data and you handled this uncertainty in developing the model. Moreover, (if I understood correctly) the same experts were involved both in the development as well as in the "validation" (I would suggest not using this word) stage of the model: doesn't this introduce a bias in the results of model "validation"? (iii) farmers' decisions: I would find interesting to know if you could report more (quantitative) details on the driving factors for farmers' behaviors. (iv) the description of damage to soil should be better explained: it is not clear how dtilling and dcleaning are assessed, as I would expect these to be highly influenced (minimum) by the hazard parameters, soil and crop type. The modelling of damage to the equipment needs to be better clarified as well. (v): could you provide details on how the flood impact to the quality of the crops is modelled in floodam.agri?

The Authors may reply to my comments raised above that it would be impossible to provide full details of a (complex) model within a Journal paper, with limited available space. This is true, but, at the same time, you cannot claim a full lack of transparency (as you are experiencing also with your paper) of other models in the literature, by also mentioning this as the reason from writing the present article. So, the Authors' comment on this point (P8-L186-189) appears to me a bit subjective (and not fair), given that the cited Agride-c is a well documented, explicit model, which seems to be originated by the same need for model transparency claimed by the Authors.

Another aspect that would deserve more attention is the actual applicability of the model. The Authors mentioned that floodam.agri has been already applied in France in several projects. It would be then very valuable if you could give more details on these experiences, e.g. which were the main difficulties for application, necessary adaptations and/or assumptions in the input data (for both hydraulic and vulnerability / exposure data). Indeed, floodam.agri, as any micro-scale process-based model, requires very detailed input data, with some of them usually not know/difficult to know or with high local variability, then necessarily requesting some kind of averaging or simplification process in order to make the model actually applicable at the river basin/ reach scale. For instance (but you can include additional examples): how the problem of crop rotations was handled for identifying crop type in each plot? In which month of the year the flood was supposed to occur in the damage calculations (did they consider the month with the highest probability of flood occurrence / or did they calculate a weighted average damage, with the weights represented by the probabilities of flood occurrence in each specific month ?)

I finally do not agree with the statement at P27.L615-616 (as well as the one in the abstract, P1.L5-8), or I may did not interpret well the Authors' point, which I then ask to be better clarified. According to me, the model framework must be certainly general, but,

especially when modelling damage to agriculture, it is strictly necessary to be context-specific, in order to capture the typical features of the region where the model is applied, otherwise we are oversimplifying reality, which can be an acceptable solution (a "full adaptation" may be a huge effort, since while some components can be easily adapted (e.g. yields and price values), there are others that highly change from a context to another (e.g. the cultivation practices and operations)), but that we must be aware of it

Minor comment: although the sense is always clear and English usage is almost correct, the paper needs to be proofread as there many typos (e.g. "litterature", "diven", "developped", just to cite some) and few weird sentences (e.g. P2.L24, P2.L41).