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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Citizen observations contributing to flood modelling: opportunities and challenges" *by* Thaine Herman Assumpção et al.

Thaine Herman Assumpção et al.

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We thank the reviewer for taking the time to review this paper and for providing useful feedback. Your input is valuable in improving the scientific quality of the paper and its readability. Please find below our answer addressing your comments.

Comment #1: Dear editor, I went through the paper entitled "Citizen observations contributing to flood modelling: opportunities and challenges" by Assumpcao et al. Bringing people's idea and their involvement in science (citizen science) is becoming significant globally. This paper is exactly what lies behind the role of citizen science in combating the flooding by modelling. However, I find the paper is quite difficult to follow in its current form. This also has no such in-depth assessment of the role of citizen

science in mitigating climate-induced flood events/hazards.

Authors' response: We acknowledge that the assessment of the role of citizen science in mitigating climate-induced flood events/hazards is not addressed in the present article and that is because the focus of the paper is different, particularly it is to review the existing scientific literature regarding the actual and potential crowdsourced data for *flood modelling*. From that perspective, climate-induced flood events/hazards do not bring different challenges for citizens' data collection compared to "regular" flood events. Of course citizen science is much broader than only crowdsourcing of data, but such broad perspective is outside of the scope of this article. Regarding mitigation, in the article's Introduction (page 2), we are mentioning the review of Horita et al. (2013); and the studies of Dashti et al. (2014) and Oxendine et al. (2014). They are addressing disaster management and damage data collection, including the role of citizen science for mitigation of floods in general. In the present article the analysis is made for model improvement, but the model may have multiple purposes (e.g. flood risk or ecosystem conservation). The paper determines what are the benchmarking difficulties and benefits of collecting flood-related data by citizens and of integrating them into models, for the purposes of model set up, calibration, validation, simulation and forecasting.

Given your comment, we realise that an improved explanation of the aim of the review presented in the article is required in the Introduction section. The revised version of the manuscript will emphasize this aspect.

Comment #2: The synthesis/review would have been much useful and interesting if this were focused on one or two key objectives. For example, how citizen science would link to model building process based on crowdsourced data and how citizens themselves would be benefitted provided the feedbacks for the model improvement.

Authors' response: The approach taken was to group and analyse the studies in which crowdsourced data was integrated into each part of the flood modelling process.

We could not take a different approach because unfortunately the literature on specific parts is scarce (e.g. in Table 5, Page 16, we found just 6 studies on the model building process). Hence, the review could not be limited to few particular aspects. Similarly, although a paper on citizen's benefits from model improvement would be useful and interesting, this is a recent topic that has not been explored enough and there are not enough publications to date so that a review is required or can be made.

Some specific comments:

Page 2 Line 10-15:

Comment #3: what are the valuable contributions? elaborate

Authors' response: As suggested we will elaborate in the next version of the manuscript. For example, the CITI-SENSE project managed to simultaneously collect perception data and acoustic measurements in an approach that can be used to develop citizen empowerment initiatives in case of noise management (Aspuru et al., 2016).

Page 2 Line 22-26:

Comment #4: what are three projects? provide the summary

Authors' response: The manuscript will be changed to include such a summary.

Page 4 Line 19:

Comment #5: please define 'CAPTCHA plug in framework', not all readers would necessarily know about it

Authors' response: The following footnote will be added to the manuscript in order to

clarify the concept of a CAPTCHA plugin:

"CAPTCHA stands for 'Completely Automated Public Turing test to tell Computers and Humans Apart'. It is a test evaluating if the subject is human, which is used in websites to provide security. After the test is done the user can be asked to perform extra tasks, for example, tag images."

Page 10 Line 12-17

Comment #6: what level of citizens will get involved to generate data globally as many citizens are devoid of IT technology?

Authors' response: Iwao et al. (2006) did not provide any information on the profile of citizens, nor on engagement strategies, although the lack of data in certain regions was shortly addressed. However, as stated in the Citizen Science section of the manuscript (page 3), the review did not discuss the mechanisms of citizen engagement and participation, as this is a research topic on its own and we focus on data integration. To address this issue, also raised by a comment of a reader in the HESSD interactive discussion, the paper will be modified as follows (modifications are highlighted in bold text):

"The aim of the review presented in this current article is focused on the contribution towards flood modelling only, coming most prominently from the two lowest levels of engagement. **The review does not discuss topics related to engagement for the generation of (quantitative) data**."

Page 15, Fig. 6:

Comment #7: perhaps Fig. 6 holds the core concept of the paper, where the citizen science link to modelling and its application

Authors' response: Though the figure is a core concept of the paper, the paper struc-

ture is such that first the wider scope of the paper is defined, laying all the literature that has the potential to contribute to flood modelling in terms of flood-related data. This literature is characterized and analysed for advantages and disadvantages. Then, it is presented an in-depth analysis of the scientific contributions to each part of the modelling cycle. The existing literature is evaluated in terms of its information content and analysed to check how much it matches model requirements. Finally, opportunities and challenges are identified. Following this structure, Figure 6 is presented in a later section.

Page 18 Line 23:

Comment #8: please provide what consequences of uncertainty in data mining and how this is improved?

Authors' response: The consequence of uncertainties, including the ones of data mining, is low model performance. We consider that the higher the uncertainty, the lesser the quality of the data. Hence, because data obtained through data mining has, in general, more sources of uncertainty (from value, geotagging and timestamping), they can potentially be of lesser quality and result in models with low performance. As suggested by a reader, this will be further extended in the next version of the manuscript. To date, in modelling studies, there are only few studies that quantify the uncertainty from crowdsourced data, the impact on model performance or that consider methods for its reduction. To remain neutral, we did not include in the manuscript anything beyond what is in the literature, thus we do not include a discussion on how to improve the situation in modelling.