Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2017-59-RC2, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Towards assimilation of crowdsourced observations for different levels of citizen engagement: the flood event of 2013 in the Bacchiglione catchment" *by* Maurizio Mazzoleni et al.

Anonymous Referee #2

Received and published: 3 April 2017

This paper on the potential use of citizen science data for flood forecasting is interesting to the readers of HESS but I have several major and some minor comments and concerns.

Major comments

1) The paper describes the results for multiple experiments, for different river stretches, lead times and stations but the multitude of results are never integrated or discussed. In fact, there is almost no discussion of the results at all. The lack of integration of the different results leaves the reader at loss about what the main take home message

Printer-friendly version

Discussion paper

or contribution of this work is. This seriously harms the impact of this study and paper. Often the results for different stream sections or sub-catchments are described in detail and while these specific results (and the differences for the sections or sub-catchments) may be of interest for people working in this basin, it is unclear why the results are different and what was learned from these differences that can be used outside this particular basin. Due to this lack of synthesis and discussion, the paper reads a lot more like a report of a modeling study for an agency (or thesis) than a paper for an international journal. Overall, much more integration and discussion of the results are needed and to clearly state what new thing was learned from this study. The paper has 17 figures, many of which contain multiple subplots and look similar. It is hard for the reader to pin-point what the main or most important "take home" figures are. Is there not a way to merge some of the figures or to summarize the results in a more clever way so that it is clear what figure (and thus what result) the reader should remember from this manuscript? The different figures don't integrate and compare the results from the different experiments and therefore it is hard to compare the model simulation results for the different data types and thus to appreciate the value of the different data types.

2) P4L34: It is unclear how this paper is different from the four other papers by the authors on this topic. It would be good to specifically state here (or elsewhere) what is different between this paper and these previous papers and how this paper builds on the work of (and goes further than) these previous papers.

3) Methods: It is not fully clear what data that could come from citizen science observations was used. On P5L11, both water level and precipitation data are mentioned. From the methods (P5L25) it appears that only the water level data are used and the precipitation data are not used (except the precipitation from the standard measurement stations - not the simulated citizen science data) but then on P18L20-21, P29L4, 11 and P33L1 it is suggested that amateur weather observers will take more measurements. Why would amateur weather observers be particularly interested in water

Printer-friendly version

Discussion paper

levels? Weather stations don't regularly measure water levels. Or was the weather data used as well? Also, it is not clear when the water level data was converted to streamflow and when it was just used as water level. On P15L21-25 it is suggested that for this experiment the waterlevels were not converted. Were they only used in the hydraulic model or also in the hydrologic model? Or did that depend on the situation/experiment? If so, then it should be explained much better when water level and when streamflow (converted from the water level observations) was used. If sometimes water level and other times streamflow was used, it should be discussed how this hinders comparison of the results for the different experiments.

4) P11L27: In this study, the modeled streamflow was used to obtain the water level and streamflow data. However, when real citizen science water level data are used, a rating curve is needed for every potential measurement location to obtain information on the streamflow. How would you do that? This is crucial information that is needed when this approach would be used with actual citizen science data (rather than this hypothetical or virtual study). However, almost no guidance is given on how this rating curve information would be obtained for the real citizen science case or how the huge uncertainty in any assumed rating curve will affect the model results. This really needs to be addressed to make the proposed approach useful for real cases with citizen science data. On P15L19 it is suggested that cross sections can be derived from natural cross sections elsewhere but cross sections vary hugely. So this will significantly impact the results.

5) Table 2: How were these values chosen? What are they based on? No references or information is given and therefore it cannot be determined if these values are reasonable at all!! Give references to back up these values or describe how they were chosen and why they are considered reasonable.

6) Table 3: What are these alpha values based on? A reference should be given or the choice of these values should be discussed in detail! P13L7: do these values really suggest that if water levels can be measured from a staff gauge at 1 cm increments

that citizen scientists can estimate the distance between the bank and the water level without a staff gauge with a 2-5 cm accuracy? This latter value seems not reasonable to me at all (since already the surface level of the bank probably differs by a few cm).

7) P14L27: Does this indeed mean that for any given time step there is a 40% chance of getting 1 measurement? Even at night? That does not seem realistic. In the figure CEL values of >80% are used. This is certainly not likely. It would be better to at least also zoom in to the much lower and more realistic CEL values. On P25L20 it is mentioned that the results are highly sensitive to the CEL values. This makes it even more important to show only (or mainly) the results for reasonable CEL values!

8) P18L28-29: This is unclear and not logical. In the case that actual citizen science data are used, you don't know which measurement is most accurate and so you can't use this criteria. You would most likely use both measurements. Why was that not done here?

9) The results (e.g fig 5-6) show that the NSE values are low when the lead time is more than one hour. I miss a discussion on how useful these model simulations are for operational flood management. Is a model prediction with an NSE of 0.4 still useful? It seems unlikely to me that roads can be closed and people evacuated with a lead time that is much less than an hour. Currently there is no discussion about this at all – this really should be included. Also why was NSE used as a criteria and not peak water level or peak flow as well, as in the end that is what is most important in flood management.

10) Overall, the paper is not particularly well written. For many sentences, a more direct or less complicated sentence structure could be used. This would make the paper much easier to read. Some of the information is given twice (e.g. P3l25-28 = p4L14-15), other information is not really necessary (e.g. P2L25-28). Elsewhere lists with other studies are given without any information about them, thus also not the important aspects that are relevant for this study (e.g. P3L28-32). In other places, there

are sentences that may be remnants from moving text around or previous versions that don't fit with the content of the remainder of the paragraph at all (e.g. P4L15-19). I suggest that the authors critically read through the manuscript, include missing information but also remove sentences that do not fit (i.e. break the flow) or don't provide any information that is pertinent to this study.

Other specific comments:

* Title: The title doesn't really tell what the paper is about or what the main findings are. I suggest that you consider changing the title to make it much clearer that this is a hypothetical study that assumes that crowd-sourced data is available (using model results as observations).

* P2L13-15: Add references for each of these attempts.

* P2L21-29: Remove this text. This may be useful in a report but is not really necessary in a scientific publication.

* P3L7: Are 'heat flux sensor' data really that widely available and are they really that useful for flood prediction?

* P3L8: Add references!

* P3L25-29: I don't think that it is necessary to include this information. The paper is already very long.

* P3L29-32: Either take this list of references out or tell what these studies have looked at and how this is relevant for this study.

* P5L8: I thought that this was done by the civil protection. Make it clear that this is not an "average citizen".

* P5L12: Isn't the system already operational?

* P5L17: What are typical response times (and/or travel times of the flood wave) for this

catchment? Without any information on this, it is not possible to interpret the results for the different lead times.

* P5L24: Were these traffic disruptions indeed due to flooded streets (or due to landslides, etc)?

* P6L17: I would not use the word 'sensor' in this context. The text will be much clearer when 'observation' is used as no sensors are used in the DySc. This is particularly the case for wording such as on P26L9, 10, 13, where the number of observations is mentioned and not a particular sensor.

* P13L2: A reference is needed here. I don't think that technicians or hydrologists are necessarily better at estimating depths, volumes or flows than other people. In my experience when multiple hydrologists estimate the depth or flow in a river, their estimates still vary widely.

* Figure 4: Make it clearer in the caption that these are hypothetical curves and not based on previous studies. If not, please include the reference.

* Figures 4-5: Use different line styles so that the figure is also clear when printed in black and white.

* Figure 5a: For which lead time is this result? This is not clear from the caption.

* P21-L1-7: This should be part of the methods (not the results).

* P21: Only the mean simulation results are shown and discussed. The variability in the results should at least be mentioned (or shown with an error band in fig 6).

* P23L1-2: Why? This is an interesting result but not discussed. Just saying that results for A are better than for another catchment may be interesting for people working in this basin but not for the readers of HESS. For them it is much more interesting why these results are so different or what can be learned from these differences. Similar on L21-24 (and many other locations throughout the results) what is interesting about this

result for people outside this basin/what can be learned from this?

* P25L1-4: So here only the water level and not the derived streamflow data are used? But doesn't that make that the comparison between the static and dynamic sensor network results more difficult? This is unclear and needs to be discussed in more detail!

* P28L13-15: Don't overstretch your results. This study shows the model results for different chosen engagement levels but does not provide any information about the actual motivation.

* P29L10: Why is no bias assumed? Isn't it likely that when people estimate the distance between the water level and the stream bank, there is a bias in the resulting water depth information?

* P32L16-18: Add why this was the case.

* Conclusion: This is not a conclusion of the results or a summary of the main take home messages but rather a list of things that were done. That is much less useful than an actual conclusion.

* P33L14-16: Yes this is true but not a part of this study so don't include it in the conclusion.

Minor editorial suggestions:

* P1L18: remove 'for model performance' and insert 'for improving model performance' at the end of the sentence.

* P1L19: insert 'of inclusion of social sensor data'

* P1L29-30: try to rewrite this sentence to make is clearer and easier to understand.

* P2L2: do you mean 'maximum' engagement instead of 'minimum engagement'?

* P2L13: remove 'over'

* P2L17-18: replace ‘the benefits’ by ‘how citizen science data could have benefitted’ to make it much clearer that this is a hypothetical situation and actual citizen science data were not available for this event.

* P4L2: Rather than ‘minimize low’ you could say ‘maximize accuracies’

* P4L3-14: This part is about engagement and would fit much better at P5L4 (but this requires a sentence to link it to the previous sentence)

* P4L14-15: Double and not necessary – take out

* P4L16-18: Move to P4L2 where it fits much better.

* P5L29 (and elsewhere): replace ‘arrival time’ by ‘measurement interval’

* Table 1: replace ‘lecture’ by ‘reading’

* P21L4: “random uniform’ – this is confusing is it random and variable or uniform?

* P21L15: The caption needs to be improved because it doesn’t explain the figure (the figure is not clear for someone who only reads the caption).

* P32L28: Rewrite this sentence- it is unclear

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-59, 2017.

Printer-friendly version

Discussion paper