Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., community comment CC2
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Reply on RC2

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Community comment on "Brief communication: Western Europe flood in 2021 – mapping agriculture flood exposure from synthetic aperture radar (SAR)" by Kang He et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-307-CC2, 2021

The brief communication "Western Europe flood in 2021: mapping agriculture flood exposure from SAR" is a very timely contribution for data on the exceptional flooding that took place this year. Particularly the associated data products are a valuable contribution to the knowledge base surrounding this event.Whilst I support publication of new primary data, particularly in such a timely manner, I do, however, believe there are a couple of things that need to be improved in the communication before full publication is warranted. My main points are on: 1) more detail on the approach used, 2) comparison with other (more local) sources, 3) visualization of the results. Next to these three points, I have some additional minor remarks at the end. Particularly regarding point 2, I am concerned that there may be some artifact in the methodology that heavily impacts the results (see point 2 below).

Respond: Thanks for your time and effort to review the paper. Your comments will help us improve the quality of the paper

- The methodology is very succinct, but maybe a bit too much so. It is not clear to me as the reader for instance HOW the delineation is done from reading the manuscript. Is it a direct delineation? Or is a comparison made with an image pre-flooding to determine what is flooded and what is normally covered by water. If so, what period is used for reference? This matters as the rivers in question have floodplains that are regularly flooded during winter. I'm also surprised that around line 50 where the inundation maps are described, there is no reference to the Shen and Yang papers which seem to form the basis for the delineation (judging from the references on the flood maps on AWS). This section really needs more detail for the reader to judge the results adequately.

Respond: We will add more details about the image acquired during the flood and the dates of the images used as dry reference in the methodology section. Since full details of the delineation method are provided in Shen et al. (2019a), we did not repeat this information in this manuscript. Specifically, Radar Produced Inundaiton Diary (RAPID) system first determine the optimal threshold of segmenting water from non-water pixels, initially segment the pixels, then form the water bodies. Secondly, it runs an improved changed detection algorithm at water-body level, which includes the comparison of the water bodies delineated at the flood time with the ones delineated at the dry time.; the

dry reference image will be introduced in the revised paper. The citations to the algorithm papers will be added at the section where inundation maps are described.

Shen, X., Anagnostou, E. N., Allen, G. H., Brakenridge, G. R. and Kettner, A. J., 2019a: Near Real-Time Nonobstructed Flood Inundation Mapping by Synthetic Aperture Radar. Remote Sensing of Environment, 221, 302-335, doi:10.1016/j.rse.2018.11.008.

- The study is done at a relatively large scale to be consistent, which I understand. However, I would really like to see at least some comparison with other estimates. For instance, do the precipitation totals estimated by the authors correspond to some other estimates? These could be from national met offices, or rainfall radars, or other satellite sources, etc. I also noticed that spatially, there is a hotspot of precipitation over the south of Luxembourg. However, the estimates from the Dutch fact finding mission (see below for reference) show this more to the north (northern Luxembourg and eastern Belgium, see Figure 2.2 in the Dutch report). This is based on E-OBS data and in line with the impacts observed in this region. Lastly but crucially, the communication mentions the main inundated area in the Netherlands to be in the north: in the regions of the Markermeer and Ijsselmeer. I know for sure that this is not the case (which is why I want to know more about the methodology) as the Markermeer/Ijsselmeer regions were not impacted at all during the floods. In the Netherlands the impact was way more upstream along the Meuse river (from Belgian border up to Roermond/Nijmegen). My knowledge is mainly on the Dutch situation, but I think it is imperative to check also the other areas for which claims are made. I was for instance surprised to learn about the flooding near the coast of Marseille and Montpellier. I did not find any news items on this (though I only looked briefly and don't speak French) and the wiki page also doesn't mention this. So I would urge the authors to check this to make sure it is not the result of an artefact in the method (as I presume the Markermeer/Ijsselmeer probably is), particularly as these are areas that seem to constitute a large portion of the overall results.

Respond:

We will check post-flood and pre-flood SAR images of the given location and determine whether a place is flooded by this comparison. We will also compare the inundation maps with other available results, for example, regional reports, inundation maps from other sources, e.g. International disaster charter.

- The visualization of the results can be improved considerably in the brief communication. Particularly Figure 2 should be improved. Right now no inundation can be seen and even the legend only refers to land-use classes (inundation is not even a class) and it seems more of a land-use map than a flood map. The maps on AWS on the other hand are very informative, so I would put some of those images in the communication. I would also pick different areas as the four focus areas. For the Netherlands/Belgium more downstream along the Meuse, for Germany along the Ahr (where most of the impacts where) and in France the communication mentions extensive flooding along the coast (Montpellier/Marseille) and along the Rhone. This would focus the panels on known heavily hit parts/key results. Next to Figure 2, I would propose to include a table with areas affected in the different countries. Now this is listed in text over a couple of paragraphs in the results, but by putting the numbers in a table it would be much easier to compare. Or when the authors feel Figure 4 is sufficient, I would only highlight the main findings from the figure, rather than listing all individual numbers.

Respond: Thanks for giving suggestions to better visualize the results. We will rework Figure 2 to make it clearer. We will add maps from images on AWS. For the focus areas, more representative areas will be selected, as suggested, to represent the regional

inundation information. In addition, we will enlarge the inundation extent maps for the four case areas while reducing the figure size of the overview map. We will follow the reviewer's suggestion to put the inundation results into a table next to table 2 and highlight the main findings in the text.

Minor remarks:

- The introduction heavily relies on newspaper sources on the event. Whilst these are of course the first ones to report on it, there have been more specific reports from the research community as well. In the Netherlands for instance a fact finding report has been published with an English summary (https://www.enwinfo.nl/publish/pages/183541/fact-finding-hoogwater-2021-versie-1-2.pdf)

Respond: Thanks for providing the flood report for Netherlands. We will cite this report. Besides the newspapers, we will look for more specific reports from the research community and cite them in the introduction section.

- Some more context can be given in the communication, particularly because it focusses on agricultural impacts. Most notably: the timing of theses summer floods was crucial as it occurred at the end of the growing season in NW Europe. As a result damage to agriculture can be expected to be relatively high. This is also very rare for NW Europe (Germany, Belgium, Netherlands) where flooding from the Meuse and Rhine rivers is usually during winter [I presume Rhone is similar, though I am less knowledgeable on that].

Respond: Thanks for the suggestion. We will provide more context on the extreme event in July 2021. The date of each inundation map will be provided as well.

- In the communication both precipitation and inundation products are presented. However, the communication seems to focus on the latter one. Some words on how these products are related would be good so the precipitation results don't feel isolated.

Respond: The inundation maps over western Europe are obtained from RAPID system which in triggered by IMERG precipitation data. We will put more text on the precipitation results and the linkages between precipitation and inundation results.

- The communication is good to follow, though there are a couple of slightly awkward sentences English-wise (for instance the use of the threshold as a verb in line 51, and permafrost should probably be glaciated in line 52)

Respond: We will improve the sentences throughout the paper in a more academic way.

- Bibliography is not in alphabetical order

Respond: We will reorganize the bibliography in the alphabetical order.