Interactive comment on "The Kerala flood of 2018: combined impact of extreme rainfall and reservoir storage" by Vimal Mishra et al.

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In the submitted manuscript authors made an attempt to analyze the rainfall and reservoir level in the monsoon months of prior August 2019. Apparently, many of the findings that authors have claimed are already available in public domain perhaps not in the same way the team has presented. I have included only some of the links below for reference.

1. https://www.firstpost.com/tech/news-analysis/what-caused-the-kerala-floods-4993041.html 2. https://indianexpress.com/article/research/year-1099-keralas-great-flood-of-1924-too-affected-same-areas-5317677/ 3. https://www.bloombergquint.com/kerala-floods/kerala-flood-of-2018-less-intense-than-deluge-of-1924-so-why-was-damage-as-great 4. https://timesofindia.indiatimes.com/india/in-just-20-days-kerala-gets-highest-aug-rains-in-87-yrs/articleshow/65480279.cms 5. https://www.indiatoday.in/india/story/why-kerala-fears-repeat-of-1924-havoc-in-2018-rainfall-1315884-2018-08-16 6. https://scroll.in/article/890593/monsoon-trends-for-many-in-kerala-this-years-rains-recalls-the-great-flood-of-99

Apparently, some of the articles appeared in print and electronic media made a more comprehensive and holistic overview of Kerala flooding, I assume, keeping the data analysis in the background. Please excuse me if I am being blunt or it reads harsh, as a reader of Hydrology and Earth System Science I would always seek a bit more scientific content with cutting edge hydrological analysis from a HESS article. The submitted manuscript is undeniably a good piece of work when I see it as a term project where grad students are asked to perform a quick analysis of rainfall pattern and reservoir levels to reason with the flooding, however, for a scientific paper it requires some more meat.

At its current form the submitted manuscript can be accepted in conference proceedings but for being considered as a potential HESS journal article it requires major re-vision with some additional analysis. To avoid overlap in comments made in 'Referee Comment 2' and 'Short Comment 1', I am not including the common queries here and only including those parts which I find missing or less emphasized in their observations.

Since, I am not the assigned referee of the paper authors are free to discard my comments, however, I would like to state few of my concerns that I would like to addressed by authors to make the manuscript more elaborate, scientific, and a good hydrology paper rather than being a mere data analysis.

Thanks for your comments. Both the reviewers and short-comment #1 suggest the importance of the work while they recommend more discussion on the certain aspects. The work available in the media does not provide in-depth discussion and scientific analysis.

Major comments:

Comment 1: The flood extent and inundation through hydrodynamic modeling approaches in the downstream of various reservoirs taken in the study will provide more insight into the problem. While doing so if authors can present a comparative analysis of flood extent between two scenarios as follows. Scenario 1: Flood extent with actual reservoir levels. Scenario 2: Flood extent if the reservoirs would have been regulated properly before the

heavy rainfall hit the catchment i.e., the best recommended practice. Though it will take some good amount of effort, it will add enormous value to manuscript.

We understand the importance of your suggestion. However, this is clearly beyond the scope of our manuscript. We aim to present the in-depth analysis on the extreme rainfall that caused flood in Kerala. However, entire hydraulic analysis and simulation of flood inundation need significant more work and data requirements. We do not have precise cross section information neither do we have reservoir release data. We only have rainfall and reservoir storage data to analyze the Kerala flood of 2018. Notwithstanding, the importance of the suggestions, we are unable to include all the aspects of the Kerala flood in this manuscript.

Comment 2: Did authors selected the specific IMD grid in which reservoir falls to analyze the rainfall or utilize the catchment average rainfall calculated for IMD gridded rainfall. Gridded data is prepared with the varying network of rain gages hence there could be inhomogeneity in the time series. Data constraint can be accepted while doing such analysis over India scale however, for small catchments only station data should be preferred. Since, this is a very localized study, it would be more appropriate if authors use station data instead of gridded rainfall data. Authors should include the rain gauge network from the reservoir catchment and utilize the rain gage data instead of gridded data.

We analyze two datasets: 1) standard 0.25 deg gridded rainfall data from IMD, and 2) precipitation data from global precipitation mission (GPM). These both the datasets are consistent. Getting daily rainfall data from individual stations is challenging and may not be error free. We will make efforts to obtain such data, if possible, and include that in the revised manuscript.

Comment 3: Reservoir catchment details have not been presented appropriately. A full section should be added in the manuscript explaining the reservoir details and their primary usage (i.e., flood regulation, hydro-power generation, irrigation purpose etc.). Besides, Figure S1 should be included in main document with more clarity.

Thanks. We have provided more details about the reservoir catchments in the revised manuscript.

Comment 4: It would be better to included more details of Kerala flooding and some of the satellite images (RADARSAT, MODIS etc.) to show flood extent, inundation depth, and time along with the incurred financial losses with lost human lives and livestock to show the severity of Kerala floods. In this way a wider audience from other part of the world which is not aware of this calamity would be able to relate it easily. As of now poor description makes it very difficult for people outside of India to comprehend the Kerala flood.

Thanks. We have included satellite imagery in the revised version to show the extent of flooding.

Minor comments

P2 - L-18: Does IMD already providing quarter degree rainfall data for year 2018? As per the norms the gridded data for year 2018 would be released next year. Please confirm this.

Yes, we have obtained the data from IMD.

P2 - L 19-20: IMD data has been prepared using 6000 rain gage data gives incomplete picture and a misleading statement as all these station never used to prepare the gridded

data simultaneously. Moreover, “substantial number of stations are located in Kerala” does not help much. Authors should rather provide the year wise number of functional stations that have been used in the preparation of gridded data for better understanding including the spatial distribution.

Thanks. In the revised manuscript, we have provided the stations that were used to obtain the gridded rainfall data from IMD.

P2 – L3 How many year of data was used to estimate the distribution parameters.

We used entire data (1901-2017) to estimate the parameters of the distribution.

P3 – L18 How does authors justify the usage of 117 years of data to obtain the long term average of rainfall for Kerala state. Is the long term rainfall is the true representation of average rainfall that Kerala receives owing to the changing climate. Is it the right approach to go for longest available time series for obtaining mean characteristics?

This is probably the best dataset any one can use. I am not aware of any other long-term data for the state of Kerala.

P7 – L1 Authors should present the number from rain gauge stations lying in the reservoir catchment instead of using grid based values. The station data can be easily obtained from IMD and would be much accurate as gridded data is often have smoothening effect due to interpolation.

Thanks, we have included this in the revised manuscript.