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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The manuscript ‘The Kerala flood of 2018: combined impact of extreme rainfall and reservoir storage’ by Mishra and others includes very interesting argument on recent flood in the Kerala. The topic is very interesting and of great interest to the scientific communities working in the field of climatology and hydrology as well. However, certain portion of the manuscript needs substantial reworking before it can be referred in HEES. The research purpose, significance and objectives are clearly stated but not well organized. More detailed and accurate descriptions are required. I suggest some parts of abstract would fit better into the introduction. Moreover, authors should begin the abstract directly with results/findings, and/or state that the area received several anomalous rainfall storms throughout the past and recently experienced 53% above normal rainfall (Monsoon season 2018).

Thanks for your positive remarks and suggestions. We have carefully revised the manuscript and incorporated the comments.

The rainfall in the Kerala is predominately controlled by the South-west and North-east monsoons. The area has witnessed heavy losses to life and property by floods in almost all rivers of Kerala due to several rainstorms in the past as well. Despite the fact such information is missing in the text and fails to convey a clear and convincing introduction. I suggest that keep one paragraph in introduction about the history of floods in Kerala and discuss the conditions about reservoir operations during such rainfall events. The contents of this paper are valuable, but the authors should pay close attention to the data sets and results. Authors have used rigorous statistical methods to compare peak monsoon rainfall patterns during two time periods. The team looked specifically at rainfall during the month of August, which is the peak of the monsoon. Further, explain the percent (%) of rainfall over Kerala during June, July and 1st to 19 th of August, above selected normal. Catchment area of each sub-basin is believed to be calculated and should be included in the text, and therefore comparison of rainfall depths observed in different sub-basins and rest of the Kerala during event will be computed.

Thanks. We have included a paragraph on the historical floods in Kerala and their deriving factors such as the role of reservoirs. We have provided a table with catchment areas and rainfall depth in the revised manuscript.

Rainfall received during the summer monsoon season contributes about 70–90% of annual rainfall over India. The intensity and magnitude of these floods are the manifestation of year to year variability of monsoon over India. Also, it has been recognized that such variability of ISM has a good teleconnective relation with El Nino Southern Oscillation (ENSO), North Atlantic Oscillation and climate extreme indices available. Therefore, team should look at the effects of teleconnection patterns (TPs) on the extremes of precipitation over Kerala. Whether, the patterns of extreme wet and dry spells during the monsoon season have changed in recent decades (1901-2018). An understanding of the teleconnection patterns associated with these events could benefit many people and policy makers in the state. It is essential to re-evaluate the operating criteria, guidelines that govern the storage and release functions of a reservoir in such extreme conditions. You would need to have much more discussion highlighting how

your results are relevant for climate change adaptation and disaster risk reduction in the region. This has not really been demonstrated in discussion or conclusions.

Thanks. We have added a new section on the sea surface conditions in the Indian and Pacific Oceans to highlight the potential role of large-scale climate drivers. Moreover, we have included discussion on the reservoir rule curves in the revised manuscript. Since the reservoir release data is not in the public domain and almost impossible to get due to regulations, we limit our discussion on the available datasets and develop insights from them.

Can you expand on this? “Reservoir operations need to be improved using a skillful forecast of extreme rainfall at the longer lead time (4-7 days)”. Your result shows that, if the reservoir had been below FRL, the flooding conditions would have not changed much due to the severe storm continued for 3-4 days. It would have been necessary to release from the reservoirs after 1st day of the extreme rainfall. Therefore, improved forecast of extreme rainfall from onset of the monsoon along with reservoir conditions (Inflow and outflow) must be reviewed and design accordingly. The probable maximum flood (PMF) is frequently revised as the required inflow design flood (IDF) until all the necessary safety conditions will be satisfied.

Thanks. We have provided a detailed discussion on the role of improved extreme precipitation forecast on reservoir operations. We have cited the studies that used such information in other countries, which highlight the need of an improved forecast.

Results and conclusions are almost similar. Findings you infer from your data should be worked out more thoroughly in discussion section. Try to be more stringent when presenting your data and avoid repletion of similar sentences. Pleas find more details in the attached file.

Thanks. As mentioned above, we have provided in-depth discussion and included a new section on the large-scale climatic factors in the revised manuscript.

The manuscript needs to substantially improve in English. I think manuscript need thorough revision for it to get to the standard that it deserves. I strongly encourage authors to read these comments without any pre-conceived notion because I think this should be published once revised appropriately.

Thanks. We have checked the revised version for English and Grammar.