

Review for Natural Hazards and Earth System Sciences (NHES)

Spatiotemporal clustering of flash floods in a changing climate (China, 1950-2015)

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This manuscript investigates the long-term flash floods persistency over China based on comprehensive catalogue data via Ripley's K-function and the Scan Statistics. They claim that the principal mechanism or triggering factor that controls the spatial and temporal distribution of flash flood is rainfall and rainfall characteristics. On the other hand, they claim that flash flood characteristics like duration, etc. are also controlled by rainfall with changing climate (ie. Climate change). This paper has strong data and rigorous analyses to investigate flash flood phenomena. However, there are some missing perspectives to explain the control mechanism of flash floods. Based on this I would be in favour of publication of the paper however, I have the following points to raise before a possible publication is granted:

- The basin morphometric characteristics are ignored in this study because precipitation is considered a major factor. However, many geomorphometric parameters have an important role in flash flood characteristics. For instance, the time of concentration is quite important for the flood, and the shape of the basin controls these parameters. When the water has reached to surface (basin), morphometric parameters control the way of water. On the other hand, flash floods are mentioned as hydro-geomorphological hazard almost in every sentence, but it is claimed that there is no any impact of "geo". How it can be a small impact than rainfall? It would be better explained in the paper.
- The impact of land-use on flash floods has ignored as well even if they claim that these parameters are not as important as rainfall. However, Yang and Tian (Abrupt change of runoff and its major driving factors in Haihe River Catchment) has written a manuscript on abrupt changes in runoff. They expressed that human activities have a strong impact on runoff changes rather than climatic changes because of Chinese land reform. Therefore, many studies like mentioned above showed that land-use changes have an important effect on surface water, infiltration, etc. For a very dynamic country like China, How can land-use be unimportant parameters? Of course each storm can cause flash flood but also land use changes have important impact by changing infiltration capacity. As a humble suggestion, I suggest that authors can match the important cluster dates with important land-use changes in China. If they still think that

land-use has no importance on flash floods in china they have to explain why. Otherwise, aspect of this study will be neglected.

- L105-115: The aim of this study should explain more clearly. What is the reason that study has done? What does this study bring new concept to flood studies etc.? What is the novelty of this study? I understand that this is first attempt to flood characteristic with such a kind comprehensive data. These kind of questions should explain more clearly.
- L158: I was wondering that how the past economic losses due to flash floods have converted current currency in the study. As far as I understand, this is one of the core of perception of this study in order to distinguish the impact of flash floods in China
- L218-224: How were these gaps between distances determined? There are some distances used for Ripley K function but there is no any explanation why this distances were used. Based on this K function, authors have determined the Rmax as well. Also, aggregation numbers seems similar like K function. Are they arbitrary numbers? Therefore, it would better to explain clearly.
- L341-343: "It results that flash floods detected clusters are mainly located in the southeastern most humid regions in every period. However, in the last two decades, clusters appear also in the north-western arid regions". It is not surprising to see the south areas precipitation are coinciding with important cluster dates. Because these areas correspond to the most important tropical and subtropical cyclone areas. I think authors are missing this perspective. Hu et al., has conducted research about flood mortality for the world (<https://doi.org/10.1016/j.scitotenv.2018.06.197>). They have explained the reason why tropical cyclones have an important impact on flood-induced mortality in those areas. Therefore, it is not surprising to see time patterns in Figure 7. Authors should also consider this perspective in their study. For instance, is there any relations between cyclone frequency and flash floods? Of course rainfall is an output of cyclonic storm but the cyclone itself is the mechanism of precipitation and flood formation.
- Authors have mentioned about storms but gave annual mean rainfall in Figure8. Does it make sense this kind of rainfall for flash-floods? On the other hand, this mean rainfall has obtained from sum of monthly rainfall. For flash floods, does it make sense as well? I would suggest to authors to use the long-term mean of 95 percentile of daily rainfall. May be, they can find more interesting results. ERA dataset also can be used for that comparison.

- L398-402: Sometimes it is easy to blame the climate change for some catastrophic disasters. However, it was not seen any analysis in this study for climatic changes, even extreme rainfalls. Therefore, I think that it would be valuable to investigate the rainfall characteristics in each spatial and time clusters. Therefore, I again suggest that, daily rainfall characteristics such as 95 percentiles, 5-day max rainfall can be investigated in each clusters. However, if there is no data to investigate this phenomena, I would suggest open access datasets.