Response to Reviewer 2

We would first like to thank all reviewers and the editor for taking the time to assess the manuscript. We will address each comment in the revised manuscript, as according to our responses below.

Referee comments are highlighted in bold with our response in normal font.

The study examines the influence of ENSO on the flood characteristics in the Amazon basin. While the article is packed with the statistical analyses, it fails to explore the large-scale physical mechanism associated with ENSO and flood characteristics, which plays a important role in the prediction and projections. Therefore, the article in the present form is not in the publication level of HESS and requires major modifications.

We disagree with the reviewer that this article in present form is not in the publication level of HESS due to the following reasons:

- The major criticism does not reflect on the research objective of this paper.
- Statistical analyses play a huge role in meteorological and hydrological research and are consistently published in many established journals including HESS.
- A multitude of highly cited papers use statistical analysis to identify relationships between hydrometeorological variables and climatic drivers without exploring the physical mechanisms directly. Examples include Ward et al. (2014) global analysis of discharge sensitivities to ENSO, Emerton et al. (2017) description on the complexities of ENSO driving flood hazard, and Nobre et al. (2017) analysis into how climate variability affects flood damage in Europe.
- The findings of this research can inform further studies that wish to characterise the large-scale physical mechanisms behind the conclusions.

Ward, P. J., Eisner, S., Flörke, M., Dettinger, M. D., & Kummu, M. (2014). Annual flood sensitivities to El Niño–Southern Oscillation at the global scale. *Hydrology and Earth System Sciences*, *18*(1), 47-66.

Emerton, R., Cloke, H. L., Stephens, E. M., Zsoter, E., Woolnough, S. J., & Pappenberger, F. (2017). Complex picture for likelihood of ENSO-driven flood hazard. *Nature communications*, *8*(1), 1-9.

Nobre, G. G., Jongman, B., Aerts, J. C. J. H., & Ward, P. J. (2017). The role of climate variability in extreme floods in Europe. *Environmental Research Letters*, *12*(8), 084012.

My comments/suggestion are:

1. **Authors should explore more towards explaining the physical mechanism associated with the relation they found in the present article.**

   While we understand the importance of research that tackles the physical mechanisms that lead to teleconnections, there is a wide body of literature that addresses the statistical link between climate variability and natural hazards that underpins both operational forecasting products (e.g., IRI forecasts; see https://iri.columbia.edu/our-expertise/climate/forecasts/iri-real-time-seasonal-climate-forecasts-and-models/) and decision-making on the ground (e.g., IASC, 2018). We believe that our research article falls within this bracket and provides important information on how climate variability impacts poorly researched flood characteristics (i.e., flood timing, and duration) in the Amazon basin.

IASC, 2018. Inter-Agency SOPs for Early Action to El Niño / La Niña Episodes, Inter-Agency Standing Committee. (https://interagencystandingcommittee.org/iasc-reference-group-risk-early-warning-and-preparedness/iasc-inter-agency-standard-operating).

2. **Zhang et al. (2017) found that Pacific Meridional Mode (PMM) also influences the precipitation over Amazon basin through a classical baroclinic Gill responses. It should be noted that PMM could also incite or trigger the ENSO (Larson and Kirtman, 2013). Considering these, it would be also necessary to analyse the association between PMM and flood characteristics over the basin.**

   We thank the reviewer for sharing the findings of these interesting papers. The Zhang et al. (2017) paper focuses on the effects of the Pacific Meridional Mode (PMM) on June-July-August rainfall which falls after most Amazon basin rivers have reached their peaks (see Fig. 1b of our manuscript). The effects on other seasons were stated to be much weaker (Zhang et al., 2017). Though interesting we believe this could be more beneficial to investigate the effect on drought predictability or possibly how this might affect the onset (ending) of the wet (dry) season. We intend to mention this link within the manuscript when describing which climate drivers, we choose to investigate (Sect. 2.4).

   Zhang, W., Villarini, G., & Vecchi, G. A. (2017). Impacts of the Pacific meridional mode on June–August precipitation in the Amazon River Basin. *Quarterly Journal of the Royal Meteorological Society*, *143*(705), 1936-1945.

3. **The manuscript needs some changes in the orientation. The author can move some of the figures to supplementary and just keep important ones in the main document, specifically Figures 2 to 10.**

   We have considered each figure in turn but believe they all have a role in the narrative of the paper that would not work in the supplementary material. We believe that including all of the figures within the main manuscript actually improves the readability of the manuscript. This is because all figures are referred to consistently throughout the results and discussion section and this prevents the reader from having to keep going back and forth through different files when interpreting the results. It also allows the paper to flow in a consistent manner with each flood characteristic section maintaining the same number of figures and in the same order (i.e., EN3.4, CP and EP, and then TNA/TSA).