Reply on RC1
Dirk Thielen et al.

1) Normalized precipitation indices such as the SPDI are particularly useful for drought monitoring as they measure the precipitation relative to what is expected climatologically for a specific location and season. However, it is not adequate for addressing the temporal variability of hazards associated with extreme precipitation. It is not the same to have an SPDI >2 during the rainy season, which could imply pluvial and fluvial flooding and debris flows, and during the dry season, in which the precipitation is unlikely to represent a similar hazard. It is important that the authors include the analysis of indices specific to extreme precipitation events (e.g. http://etccdi.pacificclimate.org/list_27_indices.shtml)

Response. We do agree with this important observation from Referee 1. We have generated important previous experience regarding the applicability of the SPDI in both, extreme wet or dry precipitation conditions (eg. Thielen et al. 2020, Thielen et al. 2021, among other works which are cited in the original version of the manuscript). From this experience, we realized that SPDI could be an appropriate analysis tool since El Niño generates in this region, rather than several isolated events, a prolonged and continuous extremely humid (SPDI >2) pulse encompassing, firstly the wet season and, later in a lesser degree, the dry season. Precipitations generated from a mega-Niño event are expected to occur in these conditions. SPDI, as in SPI, is designed to analyze accumulative processes rather than the effects of isolated extreme precipitation events. As shown by Thielen et al. 2020 and Thielen et al. 2021, as well as the present study, the main hazards, and affectations from the occurrence of an extreme El Niño event, occur during this prolonged wet pulse, and while SPDI >2. It is projected, as a second stage of the present study, to analyze with the assistance of other indexes such as the ones recommended by Referee 1, the precipitation dynamics on a daily bases during the prolonged wet pulses of the different mega-Niño events.

2) It is necessary that the authors include a validation of the CHIRPS satellite product using rain gauge data, at least for a few representative sites, particularly in arid regions where it might be less reliable, and for extreme events on a daily scale (e.g. https://doi.org/10.1016/j.pce.2022.103184).

Response. We completely agree with this important recommendation from Referee 1. Thus, as for section 2.2 Data, the entire text has been restated as follows in the new version of the manuscript:
“Precipitation data was obtained from the Climate Hazards Group Infrared Precipitation with Stations (CHIRPS V2.0, https://iridl.ldeo.columbia.edu/SOURCES/.UCSB/.CHIRPS/.v2p0/.monthly/.global/). CHIRPS V2.0 is a quasi-global gridded rainfall time series dataset, spanning 50°S-50°N, from 1981 to near-present, with 0.05° resolution satellite imagery with in situ station data, with great applications in monitoring precipitation extremes (Funk et al., 2015). Precipitation layers derived from interpolations of data from climate gauge networks have proven to have some limitations (Deblauwe et al., 2016). CHIRPS provides reliable precipitation observations with high accuracy and is particularly suitable for areas with few rainfall gauges (Paredes-Trejo et al., 2016; Beck et al., 2017), especially over montane (López-Bermeo et al. 2022) or arid regions (Paredes-Trejo et al. 2017; Ramoni-Perazzi et al. 2021) where extreme events may be rather common. According to Beck et al. (2017), in a global-scale evaluation of 23 precipitation datasets, CHIRPS V2.0 tends to perform the best in the hydrological modeling of tropical regions, specifically in Central and South America. As for Ecuador, Thielen et al. (2021a) successfully tested its applicability in the spatial/temporal analysis of hydroclimatological extreme events in one of the most important and extended basins of the Ecuadorian Pacific slope. For the present study, monthly data for the time series Jan-1981/Dec-2018 were obtained from 456 rasters. Monthly and annual mean, as well as some other basic precipitation parameters, were obtained through GIS applications.”

Now, these modifications in the text imply four new citations. Thus, they have been accordingly included in the REFERENCES section of the new version of the manuscript. These are as follows:


Regarding extreme events on a daily scale, it is projected that for next necessary step in this research is to analyze the dynamics of daily precipitations. Several authors state that CHIRPS may be also considered a reliable satellite-based rainfall data source for many geographical regions (eg. Valdés-Pineda et al. 2016; Baez-Villanueva et al. 2018).

3) The study by Kiefer and Karamperidou (2019; https://doi.org/10.1029/2018PA003423) is very relevant and the authors should compare the results to theirs in the manuscript.

Response. We completely agree with the recommendation of Referee 1 about comparing our results to those from Kiefer and Karamperidou (2019). In this regard, in the Discussion section, references have been made regarding the similarities in the results between both studies specific to the effects of different ENSO flavors on precipitation...
dynamics, as well as to the altimetric response of precipitation anomalies to EP and COA events.

The citation Kiefer and Karamperidou (2019) has been properly added to the REFERENCES section as: