Geophysical Research Abstracts
Vol. 21, EGU2019-11493, 2019
EGU General Assembly 2019

Impact of heavy precipitation events and floods in the East of Spain: present and future scenarios

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The communication presents the main results of the Spanish Project HOPE (CGL2014-52571-R). It treats flooding from a holistic perspective that integrates bottom-up and top-down approaches to improve the estimates of the present and future impacts of floods in the Eastern of the Iberian Peninsula and for designing proposals to improve the resilience and adaptation strategies. In a first phase, the project has systematically collected all the state of the art about legislation, procedures and criteria related with floods in France, Italy and Spain, as well as in the sub-national regions, which has been completed with scientific literature about flood risk impacts and flood risk trend. The study shows explicitly the problems associated to different criteria and definitions. Hydrometeorological and socioeconomic information associated to floods recorded between 1981 and 2015 in Catalonia, Valencia and Balearic Islands has been collected. This part has been developed in collaboration with the HYMEX program. Results show 258, 112, 47 flood events for these three regions respectively. Some of these events have affected more than one region, which means a total of 373 different flood and heavy rainfall events. Trend analysis has showed an increase of extraordinary flood events but not an increase in daily extremes of precipitation. On the contrary, the work with sub-daily data has showed a pattern characterised by an increase of convective precipitation in some coastal areas. The identification of precipitation and flow thresholds associated to different types of flood events and weather types has been done. Scenarios do not provide a good estimation of sub-daily precipitation, which forces us to work with daily data. Attending the fact that the greatest part of flood events is flash-floods produced by local and short but heavy precipitations, floods can be produced even if daily precipitation isn't high. Then, we have looked for the 30-min and 24-h precipitation for each event and we have reached the conclusion that more than 40 mm/day can have a potential flood risk in little basins. Weather types show a major contribution from situations associated to cyclones in surface.

To analyse flood impacts, data from the re-insurance company of the Spanish State have been used to model the potential correlation between rainfall and damages. Data from discharge are not usually available since these are often non-gauged catchments. Results show a good correlation between 30-min maximum rainfall intensity in each event and damages. This has been used to stablish a logistic model relating rainfall and damages. The same methodology has been applied to maximum daily rainfall. Future scenarios from EURO-CORDEX have been applied to estimate future impacts.

A last part consists in the holistic analysis of specific events like those floods produced in September 1962, November 1982, June 2013 and October 2016. Rainfall data produced by SAFRAN reanalysis, radar and lightning data and proxy-data to estimate discharge have been used. Results from the HOPE project have constituted the starting point of the National project CTM2017-83655-C2-2-R, M-CostAdapt, where adaptation strategies to climate change and risks in coastal Mediterranean Areas are analysed.