



Historical floods and climate forcing in the semi-arid catchments of south-eastern Iberian Peninsula

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Despite being one of the driest regions in Europe, the southeast of the Iberian Peninsula has been always affected by floods. Most settlements have a historical relation with flood damages, such as the 1973 event with 35 deaths or the 2012 extreme event with more than 1.500 million Euros in economic losses (official sources). Our study focus on Almanzora catchment, which have a significant number of population highly vulnerable to floods, especially flash floods. The aim of this study is to describe the flood data collected from historical documents and assess the occurrence of these historical flood-series in relation to climatic variability.

Flood events are identified from primary sources (municipal archives) and secondary sources (papers, old newspapers, pictures, etc.). Instrumental data is also used, but there are very few long-term data from this region. Flood descriptions found in municipal records are in some cases the only information available. The assessment flood data in relation to climatic variability improves the identification of the processes that naturally control the flood frequency. We used sea level pressure and geopotential at 500 hPa level from 20th Century V2 Reanalysis Project at 2.5° resolution. Multivariable analysis is applied to synoptic maps linked to flooding in this region, between 1871 and 2016, to determine the main synoptic patterns. The flood event was defined using a 7-day sequence: the flood occurrence date, retrieved in the historical records, plus the 6 days before, in order to analyze the previous conditions and to evaluate the stagnation of the synoptic configuration.

The results show the classification of flood events in four magnitudes, based on the damage caused by floods, according to with the available event descriptions. The largest flood occurred in the October 18th, 1973. It is worth mentioning that since 1900 the flooding frequency seems to increase, but we consider this is related to an increase of information, especially due to local newspapers.

A multivariate analysis was applied to a set of 42 floods defined by 7-day sequence, in order to generate a synoptic catalog related to major floods in the region. The prevailing synoptic conditions that favor heavy rainfall in the south-east of Iberian Peninsula have shown a good correspondence with the hydrological reconstruction. The flood magnitude is related to the south-east flux stagnation. In short, synoptic patterns are related to atmospheric convection caused by the presence of a trough oriented from north to south in middle levels of the troposphere, during the beginning of the 7-day sequence. When the trough passes, rainfall is related to easterly air masses associated with upper-level cut-off lows to the west of Gibraltar Strait, which carry upper-level Atlantic maritime air. At the surface, the low-pressure system usually located over northern Africa causes south-easterly warm and moist air to flows over the Spanish Mediterranean coastal areas.