EGU2020-20156
https://doi.org/10.5194/egusphere-egu2020-20156
EGU General Assembly 2020

Potentially catastrophic precipitation events and associated weather types in the western Mediterranean area

Damián Insua-Costa[1], Gonzalo Miguez-Macho[1], Marc Lemus-Canovas[2], and María Carmen Llasat[3]
[1]Nonlinear Physics Group, Universidade de Santiago de Compostela, Santiago de Compostela, Spain (damian.insua@usc.es)
[2]Climatology Group, Universitat de Barcelona, Barcelona, Spain (mlemus@ub.edu)
[3]Department of Applied Physics, Universitat de Barcelona, Barcelona, Spain (carmell@meteo.ub.edu)

The western Mediterranean region (WMR) often suffers from the devastating effects of flooding, caused by enormous rain accumulations that sometimes resemble the values produced by tropical systems. The ensuing socio-economic impact is so high that some of these extreme precipitation events are remembered and studied for decades. The main underlying reason for the high frequency of flooding in the WMR is that its precipitation regime presents a strong seasonality, with a maximum in late autumn associated with the development of strong convective situations that give rise to relatively short but intense periods of rain.

Here, we use the MESCAN precipitation analysis to detect daily heavy precipitation events in the WMR for the period 1980-2015. We consider a particular day as extreme if the precipitation for that day exceeds a threshold, which is based on normalized daily precipitation anomalies combined with a constant value. The selected events are ranked according to their magnitude, defined on the basis of the amount and intensity of rain as well as the total extent affected. We then associate a weather pattern to each detected event. The methodology used to classify extreme days by weather types is based on a principal component analysis (PCA) approach. Specifically, we apply a PCA to a temporal mode matrix of 500 hPa geopotential height and mean sea level pressure, both obtained from ERA-5 reanalysis data. Our results show that the atmospheric configurations leading to torrential rainfall in the WMR are very reduced and recurrent; only four weather types are present in most of the extreme days. One of the main novelties of this study is that we can distinguish between more and less intense cases, so we were able to ascertain that only two of these four weather types are responsible for the majority of the most severe cases.