

## **The association between preceding drought occurrence and heat waves in the Mediterranean**

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A large number of weather driven extreme events has occurred worldwide in the last decade, namely in Europe that has been struck by record breaking extreme events with unprecedented socio-economic impacts, including the mega-heatwaves of 2003 in Europe and 2010 in Russia, and the large droughts in southwestern Europe in 2005 and 2012. The last IPCC report on extreme events points that a changing climate can lead to changes in the frequency, intensity, spatial extent, duration, and timing of weather and climate extremes. These, combined with larger exposure, can result in unprecedented risk to humans and ecosystems. In this context it is becoming increasingly relevant to improve the early identification and predictability of such events, as they negatively affect several socio-economic activities. Moreover, recent diagnostic and modelling experiments have confirmed that hot extremes are often preceded by surface moisture deficits in some regions throughout the world.

In this study we analyze if the occurrence of hot extreme months is enhanced by the occurrence of preceding drought events throughout the Mediterranean area. In order to achieve this purpose, the number of hot days in the regions' hottest month will be associated with a drought indicator.

The evolution and characterization of drought was analyzed using both the Standardized Precipitation Evaporation Index (SPEI) and the Standardized Precipitation Index (SPI), as obtained from CRU TS3.23 database for the period 1950-2014. We have used both SPI and SPEI for different time scales between 3 and 9 months with a spatial resolution of 0.5°.

The number of hot days and nights per month (NHD and NHN) was determined using the ECAD-EOBS daily dataset for the same period and spatial resolution (dataset v14). The NHD and NHN were computed, respectively, as the number of days with a maximum or minimum temperature exceeding the 90th percentile.

Results show that the most frequent hottest months for the Mediterranean region occur in July and August. Moreover, the magnitude of correlations between detrended NHD/NHN and the preceding 6- and 9-month SPEI/SPI are usually dimmer than for the 3 month time-scale. Most regions exhibit significantly negative correlations, i.e. high (low) NHD/NHN following negative (positive) SPEI/SPI values, and thus a potential for NHD/NHN early warning. Finally, correlations between the NHD/NHN with SPI and SPEI differ, with SPEI characterized by slightly higher values observed mainly for the 3-months time-scale.

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