



## Heatwaves, Droughts, and Their Synergy in the Mediterranean

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Europe, particularly the Mediterranean region, faces an escalating threat from extreme weather events like heatwaves and droughts. These events are projected to worsen under climate change, impacting agriculture, water resources, and society.

This study delves into the individual and combined occurrences of heatwaves and droughts across Southern Europe. We investigate the interplay between soil moisture and atmospheric water vapor using high-resolution ERA5 climate data. We analyze trends in heatwave duration, intensity, and drought frequency. Additionally, we assess changes in soil moisture, average temperature, and precipitation. Furthermore, the study explores linkages between large-scale climate patterns like the North Atlantic Oscillation (NAO) and the occurrence of these extreme events.

Our results indicate an upward trend in both drought and heatwave intensity and duration. Soil moisture exhibits a concerning decline, with statistically significant negative trends across extensive regions. We also observe a rise in average temperatures alongside a slight decrease in average precipitation.

This research anticipates an increase in the frequency, duration, and intensity of combined heatwave and drought events. This trend is likely driven by climatic phenomena such as synoptic systems and preceding soil moisture conditions. Our findings aim to enhance the representation of these complex interactions within climate models, leading to improved projections of extreme events in the Mediterranean.

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