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Investigating the Interplay Between Mediterranean Wildfires and Compound Extreme Events Over Land and Adjacent Oceans

Raquel Santos[1], Ana Russo[2], and **Célia Gouveia**[1,2]
[1]Instituto Português do Mar e da Atmosfera, Núcleo de Observação da Terra, Portugal (raquel.santos@ipma.pt)
[2]Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Portugal

Climate change has emerged as a global concern in the current century, marked by an increase in the frequency, duration, and intensity of extreme events. Heatwaves have been rising in recent decades in the Mediterranean region, with notable impacts on ecosystems, human health, and essential resources, affecting both atmospheric and marine environments. These warmer conditions, often coupled with extended periods of dryness, have particularly impacted southern European Mediterranean countries, which are highly vulnerable to climate change.

This work aims to investigate the interplay between atmospheric heatwaves and drought conditions in Southern Europe and marine heatwaves in the East Atlantic and Mediterranean Sea, from 2001 to 2022. The study also examines how individual and combined dry and hot conditions are linked to wildfire occurrence and extent.

Positive correlations between air and sea temperatures and negative correlations between air temperature and precipitation values were identified. The analysis also reveals that severe wildfires are mostly associated with reduced precipitation and/or elevated air temperatures during the summer season, revealing a close relationship with intensified sea surface temperatures. Moreover, marine heatwaves are more common in months when burned areas do not exceed the 80th percentile, while drier conditions over land predominate when burned areas are above this threshold. Months with increased fire coverage are strongly associated with extreme climatic conditions, indicating a prevalent occurrence of compound extreme events.

This study demonstrates the potential of considering both land-based atmospheric and marine conditions when exploring compound extremes, which might be crucial to ensure effective preparedness and mitigate the risks of climatic disasters that keep threatening the ecosystem stability, particularly wildfires.

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