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Mediterranean Marine heatwaves: On the comparison of the physical drivers behind the 2003 and 2015 events

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Over the last decade, an intensification of extreme warm temperature events, termed as marine heatwaves (MHWs), has been reported in the Mediterranean Sea, itself a "Hot Spot" region for climate change. In the summer of 2003, a major MHW occurred in the Mediterranean with abnormal surface temperature anomalies of 2-3 C° persisting for over a month. In 2015, an undocumented but more intense summer MHW affected almost the entire Mediterranean Sea with regional temperatures anomalies reaching 4-5 C°. Here, we apply a MHW detection algorithm for long-lasting and large-scale summer events, on the hindcast output of a fully-coupled regional climate model (RCSM). We first examine the spatial variability and temporal evolution of both the 2003 and 2015 events. Then a basin-scale analysis of the mixed layer heat budget during each MHW is performed. The ocean and atmospheric components' contribution is investigated separately during the onset, peak, and decay phases of both events, in order to disentangle the dominant physical processes behind each event. On the large-scale, our results indicate a key role of the wind forcing and the air-sea heat fluxes, while advection processes become more important at local scales. This study provides a comparison of the underlying mechanisms behind the two most intense MHW detected in the Mediterranean Sea during the last decade, constituting key information for the marine ecosystems of the region.

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