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Extreme heat waves in present climate and their projection in a warming Mediterranean region

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The extreme heat wave that occurred in Russia in the summer of 2010 was the strongest in the world recorded in the recent period. There is evidence that the anomalous 2010 heat, with serious impacts on humans and natural ecosystems, exceeded the amplitude and spatial extent of the previous hottest European summer in 2003.
There is strong evidence linking specific events, such as the abovementioned
heat waves or an increase in their frequency, to human influence on the climate
Here we present a new Heat Wave Magnitude Index (HWMI) based on the analysis of daily maximum temperature, in order to classify the strongest heat waves that occurred in the Mediterranean region during three study periods 1980-1990, 1991-2001 and 2002-2012. In addition results
of the multi-model ensemble from the Intercomparison Project Phase 5 (CMIP5), and from the COordinated Regional climate Downscaling EXperiment (CORDEX) are used to project future occurrence and severity of heat waves, under different emission scenarios, i.e. RCP2.6, RCP4.5 and RCP8.5. Understanding and quantifying on a unique scale
the present-day heat waves is a crucial basis for a reliable projection into the future. By analyzing observed and modelled daily maximum temperatures in current climates, we conclude that in the Mediterranean heat waves have been increasing in frequency and magnitude in the most recent
period 2002-2012 compared to the two earlier eleven-year periods. Moreover, model predictions suggest an increased probability of occurrence of severe heat waves in the coming 30-90 years: in particular, by the end of the century events of the same severity as the 2003 summer heat wave are projected to occur as often as every two years in the studied region.