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## Heat waves and climate change: an application to Sicily (Italy)

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Nowadays, the effects of global warming are becoming increasingly evident and dangerous at every latitude of the planet. In such a context, the Mediterranean basin turns out to be a "hotspot". Reductions in precipitation, especially in the summer season, and increases in the intensity and frequency of extreme events, such as droughts and heat waves, have been observed in regions bordering the Mediterranean Sea in recent decades. In particular, heat waves may have numerous negative impacts on human health, environment, agriculture, and the energy sectors. Indeed, consecutive days with extremely high temperatures, combined with high humidity, poses a high health risk to the population. Moreover, in combination with other extreme events such as drought, they can also promote the occurrence of forest fires causing further damage to ecosystems.

The goal of this work is to analyze the characteristics of heat waves that have occurred in Sicily over the last two decades, from 2002 to 2021, to assess the existence of any trend over the period under consideration. For the identification and characterization of the heat waves, hourly data of air temperature and relative humidity have been collected from 101 stations of the Sicilian Agrometeorological Information Service (*Servizio Informativo Agrometeorologico Siciliano* - SIAS) network. Heat waves have been defined on the base of three variables at the daily scale: maximum air temperature, minimum air temperature, and daily maximum values of the Heat Index, which puts together temperature and relative humidity. A heat wave is detected when the daily maximum/minimum air temperature and the maximum daily Heat Index value exceed for at least two consecutive days the value of a threshold usually calculated as a function of the 90<sup>th</sup> percentile of the distribution of daily maximum/minimum temperatures and daily Heat Index. For each year, the number of events, number of days of heat waves, duration of the longest event, magnitude of the season (i.e., the number of days between the first day of the first heat wave and the last day of the last heat wave), and intensity (i.e., the average of the differences for each event between the mean temperature value and the threshold to define the occurrence of the heat waves) have been assessed. A trend analysis has been carried out by means of a simple linear regression on all the above-mentioned variables. Results reveal increasing trends for most of the Sicilian gauges, although not for all the above-mentioned variables, showing that in the last 20 years the frequencies of occurrence and magnitude of heat waves have increased, most likely as a climate change effect, and confirming what other studies have found out for other Mediterranean regions in the last years.