European heat waves: observational characterization attending to climatic zones and modelled sensitivity to spring precipitation deficit.

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In a changing climate an increase in frequency, intensity, and duration of heat extremes in Europe is predicted, accompanied by a decrease in mean precipitation, soil moisture and evapotranspiration. Over the last century, an increase in the duration of the heat waves and the number of hot days and warm nights was observed in Europe. One of the main “hot-spot” in this intensification of weather extremes is the Mediterranean due to the strong decrease in mean precipitation and increase in mean temperature. In the last two decades Europe has been frequently affected by extreme heat waves with record-breaking temperatures and large impacts on the natural, social system or on human health. During such heat-wave periods the daily mortality rate reached anomalies of about +70 %, causing for example additional 70,000 heat-related deaths in Europe in summer 2003. European cities are highly vulnerable to such events due to the urban heat effect.

Despite the significant impact of heat waves on society and the projected increase in the frequency and intensity of these phenomena in Europe, the local-to-regional characteristics and the physical processes that contribute to their occurrence are not yet sufficiently understood.

In this study, we investigate two relevant aspects of this extreme phenomena, (a) the evolution observed from the 1950-to-present in three different climatic zones in Europe, the Iberian Peninsula, France, and Central Europe, and (b) the sensitivity to preceding winter-spring precipitation and particularly spring soil moisture conditions.

Despite a general positive tendency towards higher number and intensity of heat waves in all climatic zones, relevant differences were also found. Wet winter seasons are correlated to a decrease in the number of heat days and heat wave events during summer periods. Furthermore, extreme dry/wet spring soil moisture conditions over the Iberian Peninsula contribute up to 30% to changes in summer temperature in central Europe. In this presentation, the above mentioned and additional key results will be further discussed in detail.