

Progresses in understanding summertime European heat and drought waves

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Several models predict a larger frequency of extreme weather events as human influence on climate increases. In particular, the risk of extreme heatwaves in Europe like the unprecedented one of summer 2003 is likely to increase in the future, calling for an increased understanding of these phenomena. Here we show that the 10 hottest European summers of the past 57 years are preceded by winter rainfall deficits over Southern Europe leading to droughts spreading throughout Europe in early summer. Thus, winter and early spring rainfall frequency in Mediterranean regions could be used as a useful predictor of summer temperatures. Observational analysis suggests that northward drought progression may result from atmospheric transport of anomalously warm and dry air from Southern Europe. An ensemble of regional model simulations, with different boundary and surface conditions, is analysed in detail in order to diagnose the meridional moisture flux and to understand the physical mechanism of the northward drought propagation.