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The role of spring precipitation deficits on European and North American summer heat wave activity

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Heat waves are relatively short-term climate phenomena with potentially severe societal impacts, particularly on health, agriculture and the natural environment. In water-limited regions, increased heat wave activity over intra-decadal periods is often associated with protracted droughts, as observed over North America's Central and Southern Great Plains in the 1930s and 1950s, highlighting the importance of land surface-atmosphere feedbacks. Here we present an analysis of the covariability of spring precipitation deficit and summer heat waves for North America and Europe, the latter having experienced an increase in summer heat wave frequency since the 1950s (Perkins et al. 2012). Over the Great Plains summer heat waves are significantly earlier, longer and hotter if following dry rather than wet springs, with the mega-heat waves of the 1930s Dust Bowl decade an extreme example (e.g. Cowan et al. 2017). Similar relationships can be found in some parts of Europe for heat wave frequency and duration, namely Southern and Eastern Europe, although the heat wave timing and amplitude (i.e. the hottest events) appear less sensitive to spring drying. Climate model results investigating the relationship between heat waves and precipitation deficit in regions in Europe and North America will also be presented. It is necessary to pinpoint the causes of large decadal variations in heat wave metrics, as seen in the 1930s over North America and more recently across Central Europe, for event attribution purposes and to improve near-decadal prediction. The tight link between spring drought and summer heat waves will also be important for understanding the impacts of these climatic events and supports the development of compound event analysis techniques.

References:

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