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Spatial differences in meteorological factors associated with hot days in EURO-CORDEX regional climate models

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The aim of the study is to evaluate the capability of regional climate models (RCMs) to simulate spatial patterns of links between atmospheric circulation, land–atmosphere interactions and hot days over Europe. We used 5 RCM simulations from the EURO-CORDEX project driven by global climate models. The reference data were taken from the ERA-Interim reanalysis. Hot days were defined based on an exceedance of the 90% quantile of daily maximum temperature distribution in summer over the 1979–2005 period. Their occurrence was linked to anomalies in 850 hPa u- and v-wind components, net shortwave radiation and evaporative fraction. In ERA-Interim, the links between temperature extremes and their driving mechanisms vary between geographical regions. Although southerly advection is increased during hot days nearly over the whole European domain, a decrease of zonal flow is observed only over the Atlantic coast and Eastern Europe. An increase of net shortwave radiation during hot days is most pronounced in Scandinavia and the British Isles, while links to evaporative fraction are not clear. The RCMs are generally able to reproduce an increment of southerly advection during hot days, however, simulation of spatial links between hot days and increased/decreased westerly flow varies between RCMs. The largest differences among RCMs are found in simulating land–atmosphere interactions, especially in terms of evaporative fraction. Changes in evaporative fraction during hot days are substantially variable among individual RCMs (in both magnitude and location). This RCMs' deficiency should be taken into account when assessing possible changes of summertime high temperature extremes in a future climate.