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Dynamics of future European warm extremes: a multi-model analysis from IPCC AR4

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As illustrated by the recent spate of warm extreme events over Europe (summer 2003, fall 2006), changes in regional climatic extremes should cause more damages to socio-economic or environmental systems than changes in mean global climate. Since mechanisms triggering climatic extremes are not well established, their response in amplitude and frequency to an enhanced radiative forcing as expected for the 21st century still remains misunderstood. In this study we focus on identifying the dynamics of future seasonal warm extremes over Europe, as simulated by the IPCC-AR4 models ensemble. Our dataset covers the present period 1961-2000 and both future periods 2046-2065 and 2081-2100 and contains about 15 different models, which gives us a wide spread and variety of hot extremes. From the sea-level pressure field, we characterize atmospheric circulation patterns associated with exceptionally high anomalies of 2-meter temperature, for each season. These dynamical patterns are then compared to those observed for recent extremes, from both re-analyses and present runs of IPCC models. This analysis helps in better predicting the development of future warm seasons in order to consider adptation or mitigation strategies to reduce their impacts.