REGIONAL CLIMATE MODELLING OF EUROPEAN SUMMER HEATWAVES

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A record-breaking heatwave affected the European continent in summer 2003. With summer temperatures (June, July and August) exceeding the 1961–90 mean by about 3°C *(1)* it was very likely the hottest European summer over the past 500 years *(2)*. Estimations by the World Health Organization (WHO) indicate an excess mortality due to the heatwave of 15000 persons *(3)* and the financial loss due to crop shortfall over Europe is estimated to 12.3 billion US$ by the reinsurance Swiss RE *(1)*.

During droughts the net balance of solar and infrared radiation has been shown to be almost entirely balanced by local heating, while evapotranspiration is suppressed owing to the lack of soil moisture *(4)*. This process may be further amplified by a positive feedback between soil moisture and precipitation *(1, 5, 6)*.

In this study we use the regional climate model CHRM (Climate High-Resolution Model) *(7, 8)* to simulate the summer 2003 over Europe in order to identify the key processes of an evolving heatwave. The CHRM is a climate version of the former mesoscale weather forecasting model known as the HRM (High Resolution Model) or formerly EM (Europa-Modell). The CHRM has been validated regarding its ability to represent natural variability on different timescales *(9)*. We conduct simulations driven by assimilated lateral boundary conditions and sea surface temperatures from the ECMWF operational analysis. Independent observational and reanalysis data is used for validation.

We perform sensitivity experiments for the summer 2003 by manipulating different variables in order to determine their influence on the formation of a heatwave. We emphasize on the role of the evapotranspiration and the related feedback processes by conducting experiments with varying initial soil moisture. The results are compared to an unforced control run.

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