



## **Impact of model resolution on future soil moisture droughts over Europe**

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Climate models project an intensification of future soil moisture droughts over large parts of Europe. In this study, a 6-member ensemble of the EC-Earth global climate model for the present (2002-2006) and future (2094-2098) period was used at two model resolutions under RCP4.5 forcing. These simulations indicate that future projections of droughts are heavily influenced by the spatial resolution of climate models. High-resolution simulations ( $\sim 25$  km horizontal resolution) project about seven times more extreme drought months during the warm season (April-September) than standard-resolution simulations ( $\sim 112$  km), especially over central Europe.

Physical causes of these resolution-induced differences over central Europe are identified and include changes in the large-scale atmospheric circulation and local soil moisture feedbacks. In the high-resolution model, an anomalous high-pressure area near the UK in spring extends over central Europe promoting subsidence and decreasing convection, leading to less clouds and more surface solar radiation. The resulting warmer atmosphere promotes evaporation in the high-resolution model, drying the spring soil. Drier soil conditions at the start of summer limit the evaporative fraction. The warmer and drier boundary layer that subsequently develops during summer inhibits cloud formation and reduces precipitation leading to further soil drying.

High-resolution global climate models simulate physical processes in more detail making their future climate projections potentially trustworthier than simulations at standard model resolution. The robustness of these results will be tested with the multi-model ensemble of high-resolution global climate models participating in the PRIMAVERA project.