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Persistent summer extremes: The role of atmospheric dynamics and soil moisture feedback

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Some types of extreme weather like heatwaves and heavy rainfall are becoming more frequent with global warming. There is also some evidence that weather persistence in the northern hemisphere summers is lengthening. Although the persistence of such extreme events can strongly jeopardise agriculture, human health, and society, the drivers and physical mechanisms behind prolonged weather extremes are still debated. In order to disentangle the influence from atmospheric dynamics and soil moisture feedback on extreme events, the ExtremeX experiments were designed consisting of four sets of simulations: (1) free interactive atmosphere and soil as reference run (AISI), (2) nudged atmosphere and free interactive soil (AFSI) run, and (3) prescribing soil moisture with (AFSF) or (4) without (AISF) nudging the atmosphere. The study period ranges from January 1979 to December 2016. We present new EC-Earth runs of the ExtremeX protocol. Based on those, the hypothesis can be tested on whether atmospheric dynamics plays an important role in promoting persistent summer extremes and to what extend soil moisture feedbacks act as drivers. European heat waves in 2003 and Russia heat waves in 2010, which were known resonance summers, will serve as case studies for EC-Earth simulations analysis.