



Extreme future central European droughts in a high-resolution global climate model

Rein Haarsma, Eveline C. van der Linden, Frank Selten, and Gerard van der Schrier
Royal Netherlands Meteorological Institute, De Bilt, The Netherlands (linden@knmi.nl)

Future climate change is projected to induce strong central European summer drying. Using high resolution (~ 25 km) climate simulations we have investigated the occurrence of droughts at the end of the 21st century under a RCP4.5 emission scenario. Dynamic mechanisms and local feedbacks are responsible for a strong increase of extreme droughts in central Europe. This increase is much larger than for the standard (~ 150 km) resolution of the same model. The dynamical cause is a stronger anomalous high over the UK in late spring that induces enhanced subsidence with reduced precipitation. This reduces the soil moisture content, thereby pre-conditioning the occurrence of local feedbacks that enhance the drought conditions. These local feedbacks are a reduction of the evaporative fraction that induces an enhancement of surface temperature, increase of dry days and solar radiation. The pre-conditioning and enhancement by local feedbacks induce a clustering of extreme droughts and is a source of predictability. The extreme character of the droughts affects the ground water storage and the run-off in the following year. An additional effect of the increase of drought induced summer temperatures is that a larger fraction of the precipitation falls as heavy rain.