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## Understanding changes in meteorological drought in regional UK Climate Projections (UKCP18)

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Extreme droughts can cause enormous ecological and economic damage, and are expected to become more severe in some regions due to climate change. For water managers, it is crucial to understand extreme droughts and how they are projected to change compared to previous droughts, in order to plan for resilience to these events.

Changes in water resources do not only result from changes in precipitation and periods of below normal precipitation (meteorological droughts), they are also shaped by changes in atmospheric moisture demand, characterized here by potential evaporation. Therefore we use two standardized indicators, the Standardized Precipitation Index (SPI) and the Standardized Precipitation-Evaporation Index (SPEI) to isolate the impact of projected changes in precipitation and potential evaporation. We consider the contribution of precipitation deficits and potential evaporation changes to projected changes in future drought duration, severity and frequency. We explore droughts and their development across different time scales, as their diversity – from flash droughts to creeping multi-year droughts – adds to the challenge.

We make use of the recently released 12-member 12-km horizontal resolution perturbed parameter ensemble of spatially coherent regional UKCP18 climate projections (with and without bias adjustment). This ensemble of projections was produced by the UK Met Office by dynamically downscaling a perturbed parameter ensemble of HadGEM3-GC3.05 simulations with a regional variant. The skill of the UKCP18 regional ensemble members for drought simulation is evaluated by comparison with observed drought metrics for the baseline period.

Projected changes in UK climate according to the UKCP18 projections include wetter winters, drier summers and generally stronger temperature increases in summer than in winter. We assess how these changes contribute to changes in drought characteristics using SPI and SPEI for each member of the ensemble.

While this work focusses on meteorological droughts, it will be followed by a future analysis of their propagation to hydrological droughts. This project aims to support adaptation to droughts in the region of East Anglia and is conducted in collaboration with the water company Anglian Water.