



Understanding drought propagation in the UK in the context of climatology and catchment properties

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Droughts are a complex natural phenomena that are challenging to plan and prepare for. The propagation of droughts through the hydrological cycle is one of many factors which contribute to this complexity, and a thorough understanding of drought propagation is crucial for informed drought management, particularly in terms of water resources management in both the short and long term.

Previous studies have found that both climatological and catchment factors cause lags in drought propagation from meteorological to hydrological and hydrogeological droughts. There are strong gradients in both climatology and catchment properties across the UK. Catchments in the north and west of the UK are relatively impermeable, upland catchments with thin soils and receive the highest annual precipitation with relatively low mean annual temperatures. Conversely, in the south and east of the UK, characterised by higher mean temperatures and lower annual precipitation, catchments are underlain by a number of major aquifers (e.g. Chalk, limestone) and are typically associated with high baseflow rivers. Here we explore the effects of these gradients in climatology and catchments on the propagation of droughts.

Using standardised drought indices (the Standardised Precipitation Index; the Standardised Streamflow Index; and the Standardised Groundwater Index) we analyse drought propagation characteristics for selected catchment-borehole pairs across the UK using reconstructed time series back to the 19th century. We investigate how the timing, nature and predictability of drought propagation changes across the UK, given gradients in climatology and catchment characteristics. We use probability of detection methods, usually used for forecast verification, to investigate how well precipitation and streamflow deficits predict deficits in streamflow and groundwater levels and how this varies across the UK.