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A conceptual model for climatic teleconnection signal control on groundwater variability in the UK and Europe

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Abstract

The ability to predict future variability of groundwater resources in time and space is of critical importance to drought management. Periodic control on groundwater levels from oscillatory climatic systems (such as the North Atlantic Oscillation) offers a potentially valuable source of longer term forecasting capability. While some studies have found evidence of the influence of such climatic oscillations within groundwater records, there is little information on how periodic signals propagate between a climatic system and a groundwater resource. This paper develops a conceptual model of this relationship for groundwater resources in the UK and Europe, based on a review of current research. The studies reviewed here reveal key spatial and temporal signal modulations between climatic oscillations, precipitation, groundwater recharge and groundwater discharge. Generally positive correlations are found between the NAO (as a dominant influence) and precipitation in northern Europe indicating a strong control on water available for groundwater recharge. These periodic signals in precipitation are transformed by the unsaturated and saturated zones, such that signals are damped and lagged. This modulation has been identified to varying degrees, and is

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