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Using the CAMELS-GB large-sample dataset to investigate controls on baseflow (BFI)

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Over the last decade or so many studies of the hydrologic characteristics of basins have been driven by the desire to develop models that enable prediction of particular signatures, such as baseflow and Base Flow Index (BFI), in ungauged basins (PUB). These studies typically focus on understanding how readily available mapped or remotely sensed data can be used to infer hydrologic signals. However, in the specific case of baseflow, there is a recognition that we still have a poor understanding of the relative influences of underlying hydrological processes at appropriate scales, particularly in anthropogenically impacted catchments. New opportunities are being offered to better understand relationships between BFI and various controls on baseflow through the production of large sample catchment datasets. Here we present the results of an analysis of one such large-sample dataset, CAMELS-GB, investigating the relative importance of different hydrogeological controls on baseflow, including factors such as: climatology; hydrogeology; geophysical catchment characteristics, e.g. soil characteristics and land cover; and, anthropogenic influences, e.g. discharge from reservoirs and from sewage treatment works (STWs), abstraction, and mains leakage.

CAMELS-GB consists of daily hydrometerorological time series for the period 1970-2015 and landscape, catchment and hydrogeological attributes for 671 catchments in Great Britain. Machine learning approaches, including random forest algorithms, are used to investigate the influence of catchment characteristics on BFI and to inform the selection of hydrologically reasonable parameters to quantify relationships using linear regression models. We describe how the regression models can be used to investigate and characterise the sensitivity of estimates of BFI to: i.) the underlying hydrogeological mapping; ii.) the spatial support scale of the analysis; and iii.) anthropogenic influences.