**Data for 5 case study catchments:**

Four are part of the UK Benchmark Network V2 (UKBN2; Harrigan et al. 2017). The Thames at Kingston is also included, but flow data have been naturalised so should OK for modelling – the Thames is not strictly a benchmark catchment but is well studied in the UK.

PRECIP (P, mm/d) = catchment average precipitation; PET (mm/d) = catchment average potential evapotranspiration; TEMP (T, DegC) = catchment average temperature; FLOW\_mmday = runoff (converted using: Mean Flow (m3s-1) x 86.4 / Catchment Area (km2)); FLOW\_cumecs (Q) = river flow (m3s-1).

P, PET, T is from 1961-2015, and Q where available over this period (at least 1961-2014 here).

Q and metadata were retrieved from the UK National River Flow Archive (NRFA; <https://nrfa.ceh.ac.uk/>). P was retrieved from the 1 km gridded CEH-GEAR dataset (Keller et al., 2015; Tanguy et al., 2016) between 1961 and 2015 for the UK. TEMP and PET according to Penman-Monteith for FAO-defined well-watered grass was retrieved from the 1 km gridded CHESS-PE dataset (Robinson et al., 2016, 2017) between 1961 and 2015.

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