UK Hydrological Outlook using Historic Weather Analogues

Wilson Chan[1], Katie A. Facer-Childs[1], Maliko Tanguy[1,2], Eugene Magee[1], Burak Bulut[1], Nicky Stringer[3], Jeff Knight[3], Jamie Hannaford[1,4]

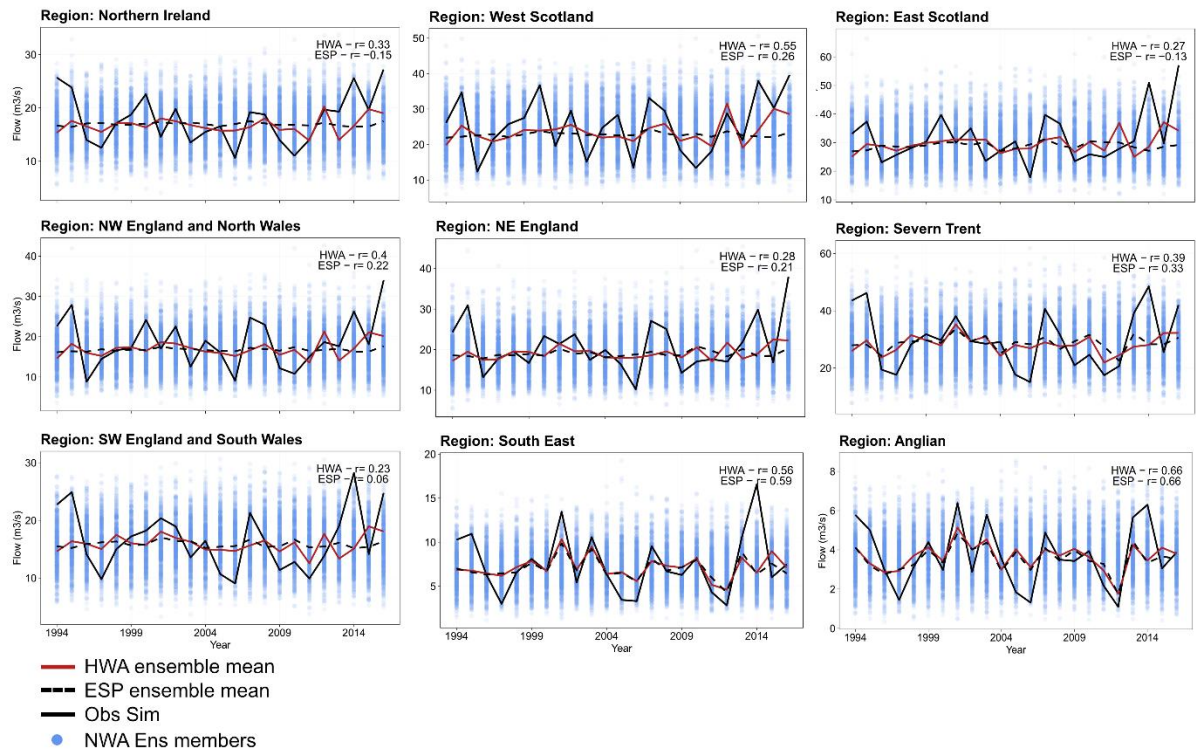[1]UK Centre for Ecology & Hydrology, Wallingford, OX10 8BB, England
[2]European Centre for Medium-Range Weather Forecasts, Reading, RG2 9AX, England
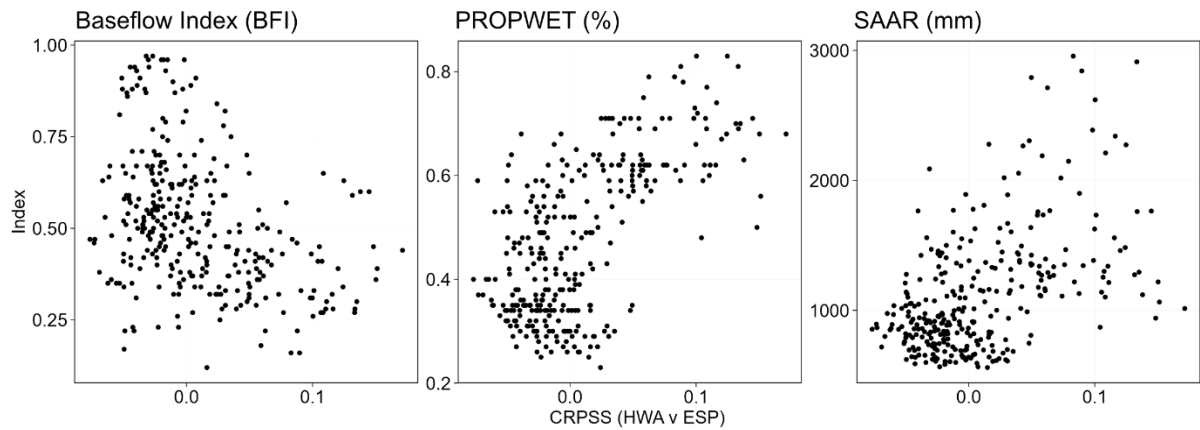[3]Met Office, Exeter, EX1 3PB, England
[4]Irish Climate Analysis and Research UnitS (ICARUS), Maynooth University, Maynooth, Co. Kildare, Ireland

Figure S1 CRPSS values assessed against benchmark climatology averaged across different hydroclimate regions and across the four seasons for the standard ESP (left) and HWA (right) methods.

Figure S2 December-January-February (DJF) simulated flows aggregated across catchments in each hydroclimate regions. Blue dots show the individual ensemble members from the historic weather analogues approach, the red line shows the HWA ensemble mean, the dotted black line shows the standard ESP ensemble mean and the solid black line shows the simulated observed river flows. The correlation coefficient for the ensemble mean of HWA and ESP compared to the observed simulated is shown on each plot. .
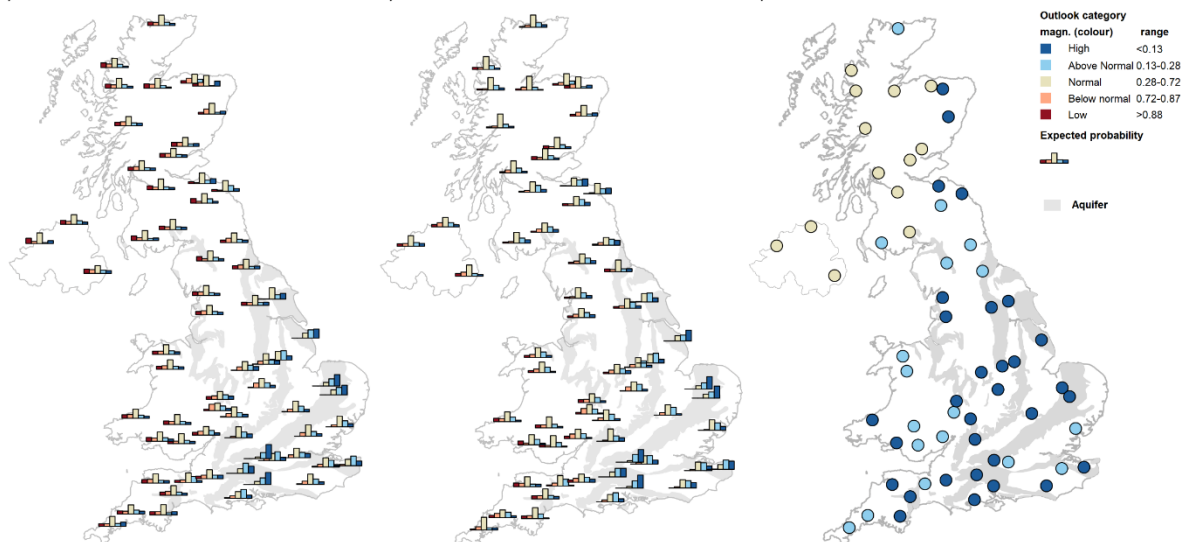

Figure S3 Relationship between CRPSS by comparing HWA the standard ESP for each catchment and the Baseflow Index (BFI), catchment wetness index taken as the proportion of time that catchment soils are wet (PROPWET) and Standardised Annual Average Rainfall 1961-1990 (SAAR).

Figure S4 ESP (a) and HWA (b) 3-month forecasts issued operationally for December 2023 by the UK Hydrological Outlook. Panel (c) shows the river flow category for each catchment over winter 2023/24 computed from simulated observed river flows.

Table S1 River flow percentiles used within the UKHO based on the distribution of historical simulated observed river flows at each catchment

Outlook category	Range (percentiles)
High	<0.13
Above normal	0.13-0.28
Normal	0.28-0.72
Below normal	0.72-0.87
Low	>0.88