Hydrometric data: the long view – CEH, 22nd October 2013

Joint (synergistic) applications of the NRFA (daily mean flows) with other UK datasets (rainfall and water quality): selected case studies from the 1990s

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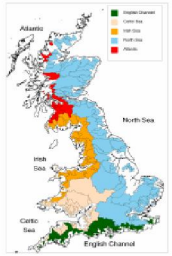
The NRFA, used primarily to assist with strategic UK water resources (quantity) monitoring/assessment, has facilitated and stimulated other hydrological research covering the UK – the poster outlines two examples

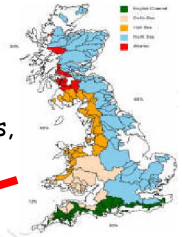
River mass load estimation

NRFA
daily mean flows

Harmonised Monitoring Scheme (**HMS**)
river water quality concentrations

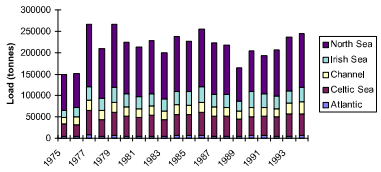


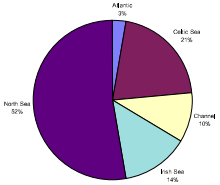
catchments above gauging stations/sampling sites, by coastal zones



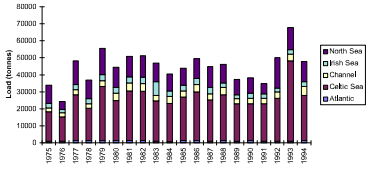
e.g.

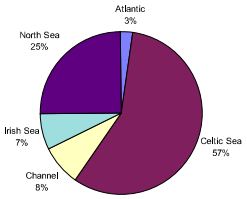
Great Britain: Nitrate-N annual load estimates





Great Britain: Total phosphorus annual load estimates





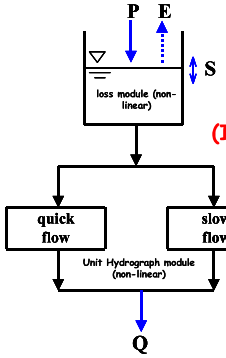
Littlewood, I.G. Watts, C.D., Green, S., Marsh, T.J. and Leeks, G.J.L. (1997). *Aggregated river mass loads for Harmonised Monitoring Scheme catchments grouped by PARCOM coastal zones around Great Britain.* Institute of Hydrology commissioned report to the Department of the Environment, 91pp + Appendices.

Littlewood, I.G., Watts, C.D. and Custance, J.M. (1998). Systematic application of United Kingdom river flow and quality databases for estimating annual river mass loads. *The Science of the Total Environment*, 210/211, 21-40.

Littlewood, I.G. and Marsh, T.J. (2005). Annual freshwater river mass loads from Great Britain, 1975 to 1994: estimation algorithm, database and monitoring network issues. *Journal of Hydrology*, 304, 221-237.

Rainfall–streamflow (RS) model parameter regionalisation

In the UK and elsewhere spatially lumped conceptual RS models, e.g. IHACRES, have been applied to national river flow and rainfall **daily** datasets, seeking relationships between model dynamic response characteristics (DRCs) and physical catchment descriptors (PCDs) – e.g. to assist with estimating hydrographs for ungauged catchments and for climate change impact studies.



c – depth of a conceptual catchment wetness store [L]
τ_w – catchment drying time constant [T]
f – temperature modulation factor ($^oC^{-1}$)

(IHACRES DRCs)

$\tau^{(q)}$ – quick flow response decay time constant [T]
$\tau^{(s)}$ – slow flow response decay time constant [T]
SFI – slow flow index [-]

daily data for 60 UK (NRFA) basins ….

Sefton, C.E.M. and Boorman, D.B. (1997). *A regional investigation of climate change impacts on UK streamflow, J. Hydrol.*, 195, 26-44.

Sefton, C.E.M. and Howarth. (1998). Relationships between dynamic response characteristics and physical descriptors of catchments in England and Wales. *J. Hydrol.*, 211, 1-16.

Recent work indicates that the typical large uncertainty in statistical relationships between DRCs (any model) and PCDs might be reduced, e.g. by using **sub-daily** data for flashy gauged catchments.

Littlewood, I.G. and Croke, B.F.W. (2013). Effects of data time-step on the accuracy of calibrated rainfall-streamflow model parameters: practical aspects of uncertainty reduction. *Hydrology Research*. 44(3), 430-440. doi:10.2166/nh.2012.099.

also

Littlewood (in press). Regionalisation of rainfall–streamflow models for estimating flows in ungauged basins: towards reducing uncertainty. In (eds) Pomeroy, Spence and Whitfield, *Putting PUB into Practice.*