



Estimation of an index flood using data transfer in the UK

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An important part of the statistical procedure for flood frequency analysis in the UK outlined in the Flood Estimation Handbook (FEH) is concerned with estimation of an index flood at an ungauged site. This is carried out through application of a multivariate regression model linking the index flood, defined as the median annual maximum flood, to a set of catchment descriptors. The parameters of the regression model were estimated using a generalised least square (GLS) technique. The FEH then emphasises the importance of data transfer from nearby gauged (donor) sites or from catchments considered to be hydrologically similar but located anywhere in the UK (analogue sites).

Generic expressions of prediction uncertainty are developed for cases when the index flood is estimated at an ungauged site with and without the use of donor sites. The results clearly show that the benefit of data transfer, quantified in terms of RMSE, is closely linked to the adopted description of the regression error residuals (as opposed to the sampling error residuals) in the GLS framework. A modified transfer scheme is also investigated. The results show that the use of donor sites in the FEH scheme can lead to worsening predictive accuracy of the regression estimates but adopting the modified transfer scheme provides a potential solution to this particular problem.

The correlation between the regression residuals in the FEH model is described purely as a function of geographical distance between catchment centroids. A case study of a single hydrometric region in the English Midlands indicate that some improvements in the description of the correlation structure may be achieved through consideration of the relative location of pairs of gauging stations on the river network.