



Use of basin descriptors and distance measures in non-parametric flow duration curves estimation in ungauged catchments

D. Ganora (1), P. Claps (1), F. Laio (1)

(1) Dipartimento di Idraulica, Trasporti ed Infrastrutture Civili, Politecnico di Torino, Torino, Italy. (daniele.ganora@polito.it)

A non-parametric regional model has been developed here for the estimation of basins characteristic curves, such as the flow duration curves, in sites with no data or limited measurements. In the model the curve is interpreted as a single object rather than using one or more parameters as in a parametric approach. This involves the need to consider the (dis)similarity between selected pairs of curves, in order to find characteristic values that can be related to some basin descriptors, intended as geographic, geomorphologic and climatic parameters. Dissimilarity between curves is quantitatively computed using a predefined metric based on a linear norm and producing a distance matrix which is a square matrix with dimension equal to the number of curves considered. Analogous matrices are computed using the corresponding pairs of the descriptor values. Curve (dis)similarity measures are related with descriptors differences through linear and non linear regression models, identifying two-three descriptors that are able to explain the (dis)similarity between the curves. The final aim of the analysis is to obtain homogeneous “regions” in the descriptor’s space. To do that, a cluster analysis is applied and similar curves are grouped together; so that the curve in an ungauged basin can be estimated as the average curve of its corresponding cluster. In this work, the procedure has been applied to total flow duration curves of 37 river basins located in the North West of Italy. Estimation errors are computed by means of a cross-validation procedure and compare well with respect to the errors resulting from a “standard” parametric regional analysis based on a two-parameters log-normal model.