



Predicting Base Flow Index of ungaged catchments using Self Organizing Maps to derive similarity

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Knowledge on river low-flow characteristics such as base flow is needed for water resources management and quality assessment as low-flow is generally associated with catchment storage. Base Flow Index (BFI), the long-term ratio of baseflow to total streamflow, is widely used to provide information on quick- and low-flow components of a catchment. In ungaged sites, where stream flow data is not available, BFI can be predicted either by geostatistical means (i.e. by using the data from surrounding gaged catchments) or by equations, often linear, relating BFI to a number of catchment properties including topography, climate, soil and subsoil materials. However, in areas that are too large or where there is a strong heterogeneity of landscapes, climate features etc. (e.g. France), comparison between measured and modeled BFI has shown that simple linear relationships were not sufficient. Many authors have suggested previously splitting the studied catchment set into different homogenous groups and then applying for each group a specific regression relationship. Results have shown in the latter case improvements of BFI prediction but then depend on the method for group/regions delimitation (i.e. based on their spatial proximity or/and physical similarity). In this present study, information on soil, parent material, geomorphology, and land cover/use of over 800 French catchments were gathered. We used the Self Organizing Maps (SOM) to determine pools of 'similar' catchments. Whereas SOM is mainly considered as an unsupervised tool for classification, it may be used as supervised classifier, which was also tested in this study. The methodology follows the jackknife procedure: each catchment in turn was considered as ungaged and data from all other gaged catchments were used to perform classification thanks to SOM. Then, after identification of the ungaged catchment's group, BFI value was determined through linear regression equation specific to its group. A number of combinations of catchment properties were tested for making the SOM classifier and regression equation, making it possible to assess the relative relevance of the catchment properties used in this study.