Catchment classification based on characterisation of streamflow and precipitation time-series, Part I: Classification of streamflow signatures

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The identification of groups of hydrologically similar catchments is a fundamental issue in both operational and research hydrology: it is essential to ensure the transferability of information when applying regionalization methods, but can also provide valuable indications to improve the understanding of the dominant physical phenomena in the different groups.

For assessing catchment similarity, a variety of hydrological information may be considered; in this work, gauged sites are characterised by a set of streamflow signatures that include a representation, albeit simplified, of the properties of fine time-scale flow series and in particular of the dynamic components of the data, in order to keep into account the sequential order and the stochastic nature of the streamflow process.

In the first part of the study, the streamflow signatures are provided in input to a clustering algorithm based on unsupervised SOM neural networks, recently proposed for catchment classification, but so far never utilised for classifying attributes based on time-series properties.

The results highlight that such approach provides an overall reasonable grouping of catchments on the basis of their hydrological response. This is shown also by the spatial distribution of the members of the classes. In fact, even if no geographical nor elevation information is provided in input to the SOM network, the clusters seem able to distinguish, at least approximately, among parts of the study region coherent as far as climatic and geomorphological characteristics are concerned.

The companion presentation (Part II) shows the final step of the study, that is the assignment of ungauged catchments to the classes obtained from the similarity of the river flow time series.