Utilizing Hierarchical Clustering to improve Efficiency of Self-Organizing Feature Map to Identify Hydrological Homogeneous Regions

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Hydrologic homogeneous group identification is considered both fundamental and applied research in hydrology. Clustering methods are among conventional methods to assess the hydrological homogeneous regions. Recently, Self-Organizing feature Map (SOM) method has been applied in some studies. However, the main problem of this method is the interpretation on the output map of this approach. Therefore, SOM is used as input to other clustering algorithms. The aim of this study is to apply a two-level Self-Organizing feature map and Ward hierarchical clustering method to determine the hydrologic homogenous regions in North and Razavi Khorasan provinces. At first by principal component analysis, we reduced SOM input matrix dimension, then the SOM was used to form a two-dimensional features map. To determine homogeneous regions for flood frequency analysis, SOM output nodes were used as input into the Ward method. Generally, the regions identified by the clustering algorithms are not statistically homogeneous. Consequently, they have to be adjusted to improve their homogeneity. After adjustment of the homogeneity regions by L-moment tests, five hydrologic homogeneous regions were identified. Finally, adjusted regions were created by a two-level SOM and then the best regional distribution function and associated parameters were selected by the L-moment approach. The results showed that the combination of self-organizing maps and Ward hierarchical clustering by principal components as input is more effective than the hierarchical method, by principal components or standardized inputs to achieve hydrologic homogeneous regions.