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Evaluation of Multivariate Statistical Methods for Characterizing Annual Streamflow Regimes in Turkey

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The multivariate statistical techniques are the appropriate tool for a meaningful data reduction and interpretation of hydrological measurements. An innovative approach for delineation of annual streamflow regions in Turkey is presented in this investigation. The approach considered is based on coupling Principal Component Analysis (PCA) and two different clustering methods called; Wards and K-means. These two multivariate clustering methods are tested on 31-year long data set according to the amount of cluster dispersion, silhouette plot and the cluster memberships. Our results suggested that the PCA dimension reduction did not cause much loss of streamflow information (variance) that determines the cluster membership. Furthermore a significant improvement in computational time was achieved; for example, 0,360 sec for 4 PCs, 0,343 sec for 3 PCs, and 0,438 sec for analysing the whole data set including 80 stations over Turkey. The K-means and Wards methods are both successful in defining homogenous regions. Hence, the use of first three principal components as an input to the clustering algorithms is recommended as an alternative to the identification of streamflow regions from the hydrological perspective.