Comparison of rotated and unrotated principal components of Turkish streamflow

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Abstract. We recently defined systematic modes of spatial and temporal variation in a 372-month record of streamflow using the principal components analysis (PCA). The unrotated and orthogonally rotated (varimax) components were previously calculated from a matrix of monthly streamflow records of 78 stations in Turkey for the period 1964-1994. As a result, the basic anomaly patterns by the unrotated components and the hydrologically homogeneous regions by the rotated components were successfully documented for Turkish streamflow data. As a complementary study, we herein intended to compare the two different sets of principal components (i.e., unrotated and rotated) to test their overall performance with regard to the following five criteria. First, we compared the two sets in terms of temporal variations in the monthly PC scores by plotting the time series of the first five components. A tendency to wet or dry season within the study period was noted for each component's plot. Second, we compared the first unrotated and rotated PCs of annual streamflow to the aggregate precipitation series (precipitation records of 96 stations with a period 1964-1994 were all averaged to obtain the aggregate series). Although correlation was a little better for the unrotated PC, their performance were almost the same. Third, we applied the same procedure as in the second case except for the aggregate streamflow series. The unrotated PC showed better harmony with the aggregate streamflow series than its counterpart. Fourth, we compared the first unrotated and rotated PCs of annual streamflow in terms of how well they are correlated with NAO index. Fifth, we compared the fifth unrotated and rotated PCs of annual streamflow in terms of how well they are correlated with SO index. The performance of the two types of PC for the last two comparisons seemed to be similar, but the unrotated resulted in enhanced relation with the atmospheric circulation indices.

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