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CHARACTERIZING LONG-TERM WATER QUALITY VARIATION WITH MULTIVARIATE STATISTICAL METHODS: A CASE STUDY IN THE TWO TRIBUTARIES OF YELLOW RIVER, CHINA

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Abstract

Spatial and temporal variation of water quality in two main tributaries of Yellow River was characterized with statistical methods including Discriminant Analysis (DA), Principal Component Analysis (PCA) and Factor Analysis (FA). The DA analysis determined the most significant parameters for spatial discrimination in the rivers: biological oxygen demand (BOD₅) and total phosphorous (TP) for Luohe River and BOD₅, total nitrogen (TN) and TP for Yihe River. The temporal discrimination of the water quality in the rivers mainly depended on the variables influenced by natural environmental process including, water temperature (WT), dissolved oxygen (DO) and pH. The variance factors obtained from the PCA/FA analysis suggested that the parameters associated with organic pollution and nutrient pollution accounted for water quality variations mostly. The FCA results showed that the water quality of the two rivers was higher than the water quality requirement in the water functional zones and got better in recent years. The temporal trend of the water quality in the two rivers showed that all the environmental actions implemented by the local government in the last years are contributive to the water quality upgrade in the region and should be kept or implemented more stringently in the future.

Keywords: discriminant analysis, fuzzy comprehensive assessment, principal component analysis, water quality

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