

Multivariate Classification Method in Groundwater Monitoring

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In this paper problem of the classification of groundwater observations is discussed. That is a general problem, common to the fields of sciences, as well hydrogeology, engineering geology and the environment. This paper presents the results of development and application a multivariate statistical technique for detection of population's groupings in data arrays.

The classification procedure referred to as the G-mode is based on a new Z^2 criterion. This method allows an automatic classification in terms of homogenous taxonomic units, without any "a priori" knowledge of the taxonomic structure of the natural observations; it provides information on the different levels of classifications present in the data set under study, on the level of information residing in each variable, on the level of similarity among homogenous classes. G-mode has been translated in computer programs; it is a part of GIS-geomonitoring.

Results obtained analyzing urban aquatic environment are discussed. The G-mode was used to map and investigate the natural and urban effects on groundwater chemistry, regime and circulation with Novocherkassk geomonitoring data. The groundwater chemistry is a complex and dynamic system that is spatially and temporally very heterogeneous. An analysis of the water classification results and the corresponding hydrogeochemical map indicated that geomorphology, relief, intensity of water circulation and anthropogenic activities are the primary factors controlling the groundwater chemical composition. The classification has shown that three main hydrogeochemical zones could be isolated. Waters of A zone have more high water salinity decreases as the water level increases.

The practical application of the classification G-method has demonstrated its potentially extensive capabilities in the groundwater numerical simulation and data processing.