Fuzzy logic regression analysis for groundwater quality characteristics

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ABSTRACT

Fuzzy logic is applied in many problems that contain uncertainty. Specifically, fuzzy regression analysis can supply useful information about the validity of measured quantities. This article examines the variation of certain quality characteristics of groundwater in boreholes using fuzzy methodology. Traditionally, classical correlation analysis was used to depict the relation between the dependent variable and the independent variables. Classical regression is considered to be probabilistic and has many uses but can be problematic: (a) if the data set is small, (b) if the error distribution is not normal, (c) if there is uncertainty between dependent and independent variables or if linearity acceptance is not proper. For the previous reasons fuzzy regression analysis is preferable. Water was sampled from these boreholes by Institute of Geology and Mineral Exploration from 2005 to 2008 and the concentration spread of Ca, K and Mg ions was examined. Using fuzzy regression, the range of these concentrations was calculated during the period under consideration with inclusion equations and results are presented in graphic form. All the measured values were taken into account in order to obtain an estimation of future measurement accuracy with a confidence level according to historical values and similar regional conditions.

Keywords: Fuzzy regression; Groundwater quality; Measurement uncertainty; Concentration

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