



The Application of the ACE Algorithm to Interpret Karst Aquifer Monitoring Data

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The authors introduces the alternating conditional expectation (ACE) algorithm to interpret different karst aquifer monitoring data measured in the Bukk Mountains, Hungary. The proposed nonparametric approach can be applied easily for estimating the optimal transformations of different hydrogeological data to obtain maximum correlation between observed variables. By using nonparametric regression, the need to assume a specific form of an investigated model is avoided, and a clearer vision of the relationships between water resource parameters can be revealed.

The monitoring data are deriving from a complex karst aquifer in Miskolc, Hungary. Miskolc is the third largest city (population is around 170000) in Hungary with a famous Cave-bath based on the thermal groundwater coming from the deep section of the karstic Bukk Mountains. On the other hand, this huge karst reservoir is the main water resource for the city water supply in Miskolc. A complex and versatile monitoring system involving many wells and karst springs have been working for nearly twenty years. The monitoring system operated by the University of Miskolc provides useful information for the local water works. Although the relations were assumed earlier between the cold and thermal karst water systems, the traditional multiple regression analysis did not provided satisfactory accuracy in earlier predictions. Now, the authors would like to demonstrate that the application of the ACE algorithm has improved the reliability and accuracy of the complex regression analysis to achieve better water management strategy in the monitored region.

The detailed field study examples using the different monitoring data proved that the

application of the ACE algorithm can be advantageous over the traditional multiple regression approach not only in groundwater science but in different Earth Science related problems. Based on our knowledge, this is the first application of the ACE algorithm to analyze and interpret successfully such a huge amount of karst aquifer monitoring data. It has also been demonstrated for the experts that the ACE algorithm is an easy-to-use tool.

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