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TITULO DE LA PONENCIA

Modelling of the water table in the Quaternary Aquifer of Central Boyacá (Colombia) using Random Forests Regression Kriging

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Categoría del resumen

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Resumen

PALABRAS CLAVE

Groundwater, Piezometric head, Random Forest, Kriging

CONTENIDO DEL RESUMEN

Central Boyacá is an area with approximately 350000 inhabitants where most of the economic activities are related to industry, agriculture and mining. There is a growing need for water to fulfill the requirements of these activities that cannot be solved with surface water. Groundwater has emerged as a viable option for water supply in this area, specially during summer season and drought periods associated with ENSO. The growing demand and exigency for groundwater resources in the study area requires the creation of maps of piezometric heads for a first preview of flow directions in the aquifers and to calibrate numerical flow models. However, these maps are commonly created using only measurements taken at wells and in

some cases the use of a single secondary variable such as elevation in the case of geostatistical techniques (regression kriging, kriging with external drift or cokriging). In this work, models of the spatial distribution of the shallow water table in the Quaternary aquifer in Central Boyacá are defined with Random Forest Regression Kriging (RFRK) using piezometric heads measured at 130 handdug wells and several secondary variables. The secondary variables include the real and detrended elevation, slope, aspect, TRI, terrain roughness and flow direction. The results indicate that the correlation coefficient between the predicted heads with the Random Forest and the measured heads is equal to corr=0.98 showing deviations of about 30 m for high altitudes (elevation > 2580 masl). From the results of the Random Forest, the elevation and the residual of the elevation are the most influential variables for the prediction of the piezometric levels in this aquifer. The head residuals show a clear spatial correlation described by an spherical semivariogram with a range of influence of 2400 m and a variance of 40 m2 (sill). The obtained models of the spatial distribution of piezometric heads of the Quaternary Aquifers reproduce the expected flow directions (regional flow with a SW-NE trend) and the location of the outlet point when compared to the conventional methods. The proposed approach is an alternative tool for the hydrogeologists to build models of the spatial distribution of piezometric heads in an aquifer using nonlinear dependences with secondary information with Machine Learning Methods.