REFINEMENT IN PARAMETER ESTIMATION BY JOINT INVERSION OF ISOTHERMAL AND NON-ISOTHERMAL GROUNDWATER FLOW MODELS FOR YUCCA MOUNTAIN, NEVADA

ARMSTRONG, AMIT and PAINTER, SCOTT L., CNWRA/Southwest Research Institute, San Antonio, Texas, USA

Yucca Mountain, located in the Basin and Range Physiographic Province of western United States, is being evaluated as a potential site for a high-level nuclear waste repository. The groundwater flow system is located in a regional anomaly of relatively low heat flux and shows a greater range of water table elevations and enhanced vertical flow promoting circulation to greater depths than the surrounding areas. The limited amount of hydraulic head data and measured hydraulic conductivity data is not sufficient to adequately calibrate a site-scale isothermal flow model. A joint inversion of an isothermal and a non-isothermal model was performed using MULTIFLO simulator. The hydrostratigraphic framework was represented by a non-uniform logically rectangular grid. Fault zones were explicitly incorporated into the unstructured grid so that specific hydrologic properties can be assigned to these zones. Heat transfer from the water table to the land surface, with variable thickness of the unsaturated zone, was assumed to occur by conduction. Predicted hydraulic heads and water table temperatures, for the non-isothermal case, closely matched the measured values at well locations. A joint inversion of hydraulic and thermal data provided improved estimations of saturated hydraulic conductivity. Simulation results also provided estimates for upward vertical flow from a deeper carbonate aquifer. Numerous cases of high permeability along the faults and low-permeability across the faults were also analyzed.This work is performed by the CNWRA under contract NRC-02-97-009. It is an independent product and does not reflect the regulatory position of the NRC.