Geophysical Research Abstracts
Vol. 18, EGU2016-6316, 2016
EGU General Assembly 2016


# Characterizing and Modelling Preferential Flow Path in Fractured Rock Aquifer: A Case Study at Shuangliou Fractured Rock Hydrogeology Research Site

Shih-Meng Hsu (1), Chien-Chung Ke (2), Hung-Chieh Lo (2), Yen-Tsu Lin (3), and Chi-Chao Huang (3)

(1) Sinotech Engineering Consultants, Inc., Taiwan (shihmeng@sinotech.org.tw), (2) Sinotech Engineering Consultants, Inc., Taiwan , (3) Central Geological Survey, MOEA, Taipei, Taiwan

On the basis of a relatively sparse data set, fractured aquifers are difficult to be characterized and modelled. The three-dimensional configuration of transmissive fractures and fracture zones is needed to be understood flow heterogeneity in the aquifer. Innovative technologies for the improved interpretation are necessary to facilitate the development of accurate predictive models of ground-water flow and solute transport or to precisely estimate groundwater potential. To this end, this paper presents a procedure for characterizing and modelling preferential flow path in the fractured rock aquifer carried out at Fractured Rock Hydrogeology Research Site in Shuangliou Forest Recreation Area, Pingtung County, Southern Taiwan.

The Shuangliou well field is a 40 by 30-meter area consisting of 6 wells (one geological well, one pumping well and four hydrogeological testing wells). The bedrock at the site is mainly composed of slate and intercalated by meta-sandstone. The overburden consists of about 5.6 m of gravel deposits. Based on results of 100 m geological borehole with borehole televiewer logging, vertical flow logging and full-wave sonic logging, high transmissivity zones in the bedrock underlying the well field were identified. One of transmissivity zone (at the depths of 30∼32 m) and its fracture orientation(N56/54) selected for devising a multiple well system with 4 boreholes (borehole depths :45m, 35m, 35m and 25m, respectively), which were utilized to perform cross-borehole flow velocity data under the ambient flow and pumped flow conditions to identify preferential flow paths. Results from the cross-borehole test show the preferential flow pathways are corresponding to the predicted ones. Subsequently, a 3-D discrete fracture network model based on outcrop data was generated by the FracMan code. A validation between observed and simulated data has proved that the present model can accurately predict the hydrogeological properties (e.g., number of fractures and porosity) of the aquifer and precisely identify the locations of preferential flow path. Finally, the validated model was used for the estimation of groundwater storage based on simulated porosities of the Shuangliou well field. Taken together, this research provides insight into effective fractured rock aquifer characterization and modelling for dealing with heterogeneity at the site and for improving accuracy on groundwater storage computation.