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Numerical Modeling of the Effect of Groundwater Pumping on Local Scaled Saltwater Intrusion at Volcanic Island in KOREA

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Jeju is a volcanic island dependent mainly on the groundwater supply. Overexploitation of groundwater is becoming a concern in the area resulting in saltwater intrusion. Eastern area of the island was selected as a field-scale study site to simulate the saltwater intrusion phenomenon. Prior to the saltwater intrusion modeling work, a regional groundwater flow models were employed to evaluate the water balance and hydrogeological characteristics by taking the advantage of a long time, 18 years, recorded groundwater level data. Hydraulic conductivity was one of the major parameters to be calibrated with inverse modeling using pilot point technique. The groundwater recharge was estimated using SWAT(Arnold et al., 1998). Using the field measurements and outputs of the regional scale model the saltwater intrusion at the local scale was simulated using SEAWAT(Langevin et al., 2007) which combines MODFLOW and MT3DMS in a single code. Several scenarios were created to test the effect of groundwater pumping by varying the current pumping rates, distribution of pumping wells, and the location of well screens. The results show that the amount of current groundwater pumping at the coastal region induced saltwater intrusion and the increase in pumping rate would have an impact on further saltwater intrusion. The location of the well screen affects the profile of the saltwater wedge. In addition, the distribution of the wells in the model creates significant change both in the prevention and in the enhancement of the intrusion. From this study, it is evident that cautiously designed well location and pumping schedules are possible management alternatives.

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