Geophysical Research Abstracts
Vol. 18, EGU2016-3968, 2016
EGU General Assembly 2016

Analytical Solution for Three-Dimensional Capture Zone of a Slanted Well

Yu-Hui Zhou (1) and Chia-Shyun Chen (2)

(1) National Central University, Taoyuan, Taiwan (square20184@gmail.com), (2) National Central University, Taoyuan, Taiwan (chiashyun@gmail.com)

It is rather impractical to install vertical wells inside a building for the sake of dealing with groundwater contamination under the building. Slant wells, however, provide an alternative because they can be drilled with a θ angle (with respect to the horizontal surface) from the edge of the building foundation to the target aquifer. Herein, a steady-state, analytical solution is developed for the three-dimensional (3D) capture zone created by a slant well pumping under the influence of a uniform regional flow field of a constant hydraulic gradient, i. The aquifer is assumed to be confined, homogeneous with a vertical anisotropy ratio, $\kappa\,(K_x/K_z \leq 1)$. The 3D capture zone is the largest when the slant well is in the same direction of +i, and the smallest when the slant well is in the direction at a right angle to +i; other conditions remain the same. Decreasingκ compresses the 3D capture zone in the vertical direction while elongates its horizontal extent. The stagnation point moves upward and closer to the slant well screen when i increases. Application of the linear superposition principle to this 3D analytical solution can yield information for various conditions that involve multiple slant wells with different orientation and θ angles, providing a useful understanding of how to employ slant wells to withdraw contaminated groundwater that cannot be done using the conventional vertical wells.