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Abstract
Pumping test is the most common way to estimate hydro-geological parameters in the field experiment. The hydro-geological parameters of aquifer in the field are heterogeneous, but many people use the effective parameters which are anisotropic and homogeneous in heterogeneous aquifers to describe the parameters of heterogeneous aquifer. There are a lot of investigations to estimate hydraulic parameters of homogenous aquifer, but merely fewer researches focus on the hydro-geological characteristics of the anisotropic and heterogeneous aquifer. In this study, we use the groundwater level observed from pumping test to estimate the effective parameters of the anisotropic aquifer. At first, we use the numerical model, VSAFT2, to generate a heterogeneous study aquifer. And then, we proceed the pumping test on this study area. Finally, we use the four methods, Papadopulos analytical solution, weighting average, Darcy's law and spatial moment analysis, to indentify the anisotropic effective parameters and analyze the results.
Results show that the effective transmissivities identified by the Papadopulos analytical solution represent an averaged value of all transmissivities within the effective cone of depression. This value is strongly related to the hydro-geological parameters near the pumping well and observation well, and the hydro-geological heterogeneity within the effective cone of depression. The optimums of heterogeneous aquifer by the geometric weighted mean method are better than ones by the arithmetic weighted mean method. The hydro-geological parameters of anisotropic aquifer estimated by Darcy's law are very different to ones by Papadopulos analytical solutions. It is successful to apply spatial moment analysis to estimate the effective parameters, such as the effective transmissivity coefficient tensor or effective storage coefficient in any duration for any data from the curve of drawdown versus time.
Key words: anisotropic aquifer, effective parameter, VSAFT2, spatial moment analysis, transmissivity coefficient tensor.