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Appraisal on Applicable Condition for Vertical Dipole Flow Tracer Test in Determining the Longitudinal Dispersion Coefficient

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Vertical dipole flow test with a tracer (DFTT) have been proposed as an in-situ method to determine the longitudinal dispersivity from analysis of the breakthrough curves (BTCs) in the extracted screened interval by assuming that only the longitudinal dispersion has an effect on the BTCs. However, the tracer must undergo transverse dispersion before it enters the extracted screened interval and will certainly influence BTCs in the extracted screened interval. Previous study has demonstrated that the transverse dispersion exerts significant effects on the BTCs in the extracted screened interval in an aquifer with a large hydraulic conductivity anisotropy ratio and a large longitudinal dispersivity for a specific case. In this study we execute a series of simulations for investigating how operational factors such as locations of the extracted and injected screened interval, lengths of the extracted and injected screened interval and distance between the two intervals affects transverse dispersion on the BTCs in the screened interval. The selection of the appropriate locations, lengths of the screened interval and interval distance may slightly influence on BTCs in the DFTT, but does not significantly promote the applying conditions of the DFTT for determining the longitudinal dispersivity. In engineering practices, the DFTT is suffered to an aquifer hydrogeological setting where the longitudinal dispersivity or the hydraulic conductivity anisotropy ratio is large.