

Recharge-incorporated approximate solution to tracer experiments under pumping conditions

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Abstract

Tracer experiments under radially convergent flow (or pumping) conditions are conducted to obtain effective porosity and dispersivity required for detailed evaluation of groundwater resources and pollution problems at selected sites. However, interpretation of the tracer experiment is not readily available. Existing Laplace transform solutions often need to be numerically evaluated. This paper derives an approximate analytical solution which is able to account for a scenario of a vertical recharge. As special cases, the two commonly used approximate analytical solutions are obtained from this recharge-incorporated approximate solution. The approximate analytical solutions are applied to a tracer experiment conducted in a Karoo aquifer on the campus site at the University of the Orange Free State, Bloemfontein. All the computations can be performed on a spreadsheet. This approach proves to be powerful and user-friendly. The problems associated with the interpretation are also discussed.