# The self-potential method in groundwater exploration

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In recent years the self-potential method has attracted increasing interest in the detection and characterization of groundwater flow, since subsurface fluid flow generates self-potential anomalies or their changes on the ground surface through electrokinetic coupling. Revil et al. (2003) proposed methods to obtain the shape and range of possible depths of the water table from the self-potential distribution on the ground surface. Self-potential signals associated with pumping tests were also analyzed to obtain the changes in water table depth (Darnet et al., 2003; Rizzo et al., 2004).

During the last decade, the application of self-potential method to geothermal reservoir management was carried out, and a forward calculation technique has been developed to calculate time-dependent distributions of self-potential from changing underground conditions as computed by numerical unsteady multidimensional thermohydraulic reservoir/aquifer simulations (Ishido and Pritchett, 1999). This technique enables us to incorporate repeat and/or continuous self-potential measurement data into history-matching studies, which is especially useful for appraising the volumetric properties of any proposed mathematical reservoir model. Although the initial application was for monitoring geothermal reservoirs during fluid production and reinjection, this technique can be applied to various subsurface phenomena associated with groundwater. The application of this technique to self-potential data, which were obtained to infer regional hydrogeology and groundwater flow system, will be also discussed.