

A trial for estimating groundwater salinity by geophysical exploration

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Currently, analyzing method is often used in order to estimate groundwater salinity from sampled water on the surface and in the boreholes. However, it is necessary to obtain amount of data to estimate its detailed 3-dimensional distribution, because these array data originally come from sampled point. In the meantime, geophysical method is able to explore underground property and also able to obtain physical property values by nondestructive extensively. Resistivity, which is one of the available property values by geophysical exploration, is well known as affected by the rock properties containing clay and underground water.

Authors introduce a trial to estimating 3-dimensional distribution of groundwater salinity using such a resistivity character from field data by electric and electromagnetic exploration in Horonobe Hokkaido. This paper describes the correlation among resistivity by electromagnetic method, host rock itself and pore water by electrical logging using equivalent parallel circuit model. Porosity, clay mineral content, mineral consisting rate and resistivity of the pore water data are usually obtained by drilling investigation. We apply these field parameter to the parallel circuit model to calculate resistivity of clay minerals, cementation factor and tortuosity. Then an experimental equation of the model is introduced by the correlation among the values. We apply this equation to the electrical logging data to estimate pore water salinity from porewater resistivity. The estimated salinity by this trial is relatively equivalent to data from minerals contamination analysis (NaCl) sampled in the borehole.