

## Imaging techniques of near surface permeability using geophysical exploration

# Koichi Suzuki[1]

[1] CRIEPI

<http://criepi.denken.or.jp/index-j.html>

Geophysical exploration has developed with computer techniques. We can interpret an outline of geological structure from the cross sections obtained by the geophysical exploration, however, it is difficult to estimate hydro-geological and dynamic strength structure objectively from the cross section alone at engineering sites. In order to derive hydraulic conductivity from electrical resistivity of layers, it is necessary to consider tortuosity of pore space and eliminate surface conductivity effects due to charged fine particles. We have reviewed empirical equations relating electrical resistivity with hydraulic conductivity based on two idealized electrical conduction models; one for porous media and the other for fractured rock mass. We proposed techniques to calculate hydraulic conductivity from several geophysical logging data; electrical, natural gamma, and neutron logging. This technique has been applied to a well where soft sedimentary rocks are distributed. The calculated hydraulic conductivity of fine sandstone, mudstone, and tuff were consistent with those of several core samples at the well. Secondly, the technique for fractured rock mass tested at a site where the rock mass consisted mainly of granite. Estimated hydraulic conductivity from well logging data was consistent with several spikes of higher hydraulic conductivity by temperature logs. In the future, in order to estimate the cross sections of hydraulic conductivity and dynamic strength from resistivity and seismic velocity profiles, we should reveal the relationship between geophysical data and hydraulic conductivity by laboratory tests using core samples obtained from various layers.