



Relationship between the hydraulic conductivity and electric properties for investigating the alluvium aquifer

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In this study, to understand relationship between hydraulic conductivity and electrical properties in alluvial aquifer, some indoor experiments and field electrical surveys were conducted. Soil sampled from alluvial aquifer and various size of quartz sand particles were saturated in NaCl solution which had 100 ohm-m. Then their porosity, hydraulic conductivity, time domain induced polarization and spectral induced polarization were measured. As a result, hydraulic conductivity and resistivity of quartz sand had proportional relation but, chargeability and phase difference of it showed small value also, hydraulic conductivity did not show clear tendency. Through this experiment, it was possible to identify which quartz sand had almost no response from induced polarization survey. Moreover, for silty sand, hydraulic conductivity and resistivity had proportional relation, hydraulic conductivity and chargeability had inverse proportional relation and hydraulic conductivity and phase difference had proportional relation. Through this experiment, silty sand showed correlation between hydraulic conductivity and electrical property. When field resistivity survey was conducted at alluvial aquifer, it showed wider range of values than the values from indoor experiment. Therefore, it is difficult to estimate accurate hydraulic conductivity of alluvial aquifer by applying hydraulic conductivity-resistivity interaction formula from indoor experiment to field resistivity survey. However, through comparison between resistivity survey result and borehole data, it was acknowledged that parts with low resistivity were clayey stratum and parts with high resistivity were gravel stratum. Consequently, estimating relative hydraulic conductivity distribution was able to be determined. However, followed by result of time domain induced polarization survey, clayey sand stratum did not have high chargeability. Through this field induced polarization survey experiment, it looks difficult to estimate hydraulic conductivity distribution.