The study of the interpretation of in-situ permeability test and grain size analysis in terms of the permeability model for soils

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A permeability of unconsolidated soils are obtained by lab-test, pumping test and in-situ permeability test in single borehole, however, estimation method from representative grain diameter ex.D_{20} and D_{10} is accepted in practical cases. Creager's equation is one the most usual equation in these equations. It defines the permeability range of each soil by D_{20} diameter. The estimated permeability from Creager's equation represents only at the depth where the soil samples are taken because soil is inhomogeneous medium. On the other hand, permeability obtained by in-situ permeability test represents average value of measurement interval, which is usually 50 cm long. Thus the permeability obtained by each method seems to be different from each other.

We collected 1000 in-situ permeability test and grain size analysis data obtained at same borehole and same geological formations. The permeability data estimated from Creager's equation are larger than permeability obtained by in-situ permeability test for gravel formation, and smaller for silt formation.

The difference between permeability from Creager's equation and in-situ test correlates with fine fraction content. The permeability obtained by in-situ test is larger than the permeability estimated from Creager's equation for large fine fraction content soils. The reason is that even if the soil are considered as fine grained soil by grain size analysis, there is a water pathway in the interval of in-situ permeability test, so the value obtained by in-situ test get larger than the value from Creager's equation. In contrast, fine grain particles filled in the pore space and it makes the permeability smaller for gravel formation.

We studied permeability model of the soils and shows an interpretation of the difference between the permeability value obtained by Creager's equation and in-situ permeability test in terms of the permeability model.