THE INFLUENCE OF MINERALOGICAL COMPOSITION ON THE DAMPING CAPACITY OF COHESIVE SOILS

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SYNOPSIS

The damping capacity of soils, which at present is in a state of "confusion", is a multi-parameter, mathemetical representation of the energy absorption characteristic and inelastic behaviour. In this parametric study, the effect of mineralogical composition and plasticity index on the damping capacity of cohesive soils was investigated experimentally, to shed light on the choice of soils for aseismic design of earth structures.

RESULTS

It is has been shown that the mineralogical composition of clayey soils controle their microstructure, together with their pore fluid chemistry and past stress history. Clay structure, at microscale governs the mechanical behaviour in general and affects dynamic behaviour of clay, in the macroscale. However, the exact nature of these effects on the microscale is largely unknown and difficult to quantify. Nevertheless it may be reasonably assumed that damping properties of cohesive soils will be affected by their mineralogical composition.

Using the resonant column technique, under small strain conditions, the damping ratios of 10 saturated clayey soils with different mineralogical composition and plasticity index were determined experimentally. DTA and X-ray diffraction analysis were performed for the qualitative determinations of the minerals. Fig.1. illustrates and summarises the influence of mineralogical composition on damping. It is observed that at a constant relative consistency for all the soils, i.e. $I_c = 0.7$ the damping capacity increases with I_p, at a constant strain level. This indicates that, illitic and montmorillonitic soils have a greater tendency of energy absorbtion, when compared at the same stiffness, normalized by a constant relative consistency curve. The distances between the atomic planes in the microstructure as well as the inter-particle forces are governed to a large extend by the mineralogical composition and this is thus reflected in their energy absorbtion capacity.

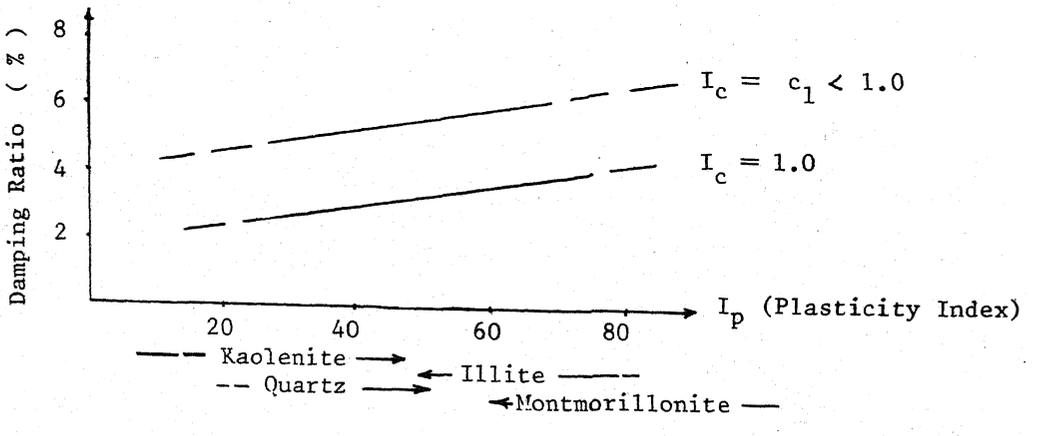

FIG 1. VARIATION OF DAMPING WITH I_p AND MINERALOGY AT A CONSTANT STRAIN

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