



Geotechnical property characterization of deep sea sediments from Puntarenas, Costa Rica

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Using an oedometer cell instrumented to measure the evolution of electromagnetic properties, small strain stiffness, and volume, we conducted consolidation tests on sediments recovered during 334 IODP drilling project in Puntarenas, Costa Rica. The tested specimens include six undisturbed specimens (as recovered from the original core liner) from different depths. The compression index values vary from 0.3 to 1.4, showing decreasing trend with depth. Electrical conductivity ranges from 0.5 to 3 siemen/meter when measured mega frequency ranges. Dielectric permittivity of specimens ranges from 20 to 40 in micro-wave frequency ranges. Microwave frequency range can capture orientational polarization, so the dielectric permittivity of water, water-organic fluid mixtures, or water-organic fluid-soil mixtures represent orientation polarization of water molecules. Shear wave velocity ranges from 100 meter/sec to 350 meter/sec. The shear wave velocity increases as the applied stress increases due to increased contact stiffness. , where σ' is the mean stress in the polarization plane, α is the velocity of the medium subjected to 1 kPa confinement, and β is an experimentally determined coefficient. Experimentally determined β is around 0.3, similar to that of silty clay. Test results demonstrate the extent to which the electromagnetic and mechanical properties of sediments are governed by the vertical effective stress, stress history, porosity, fabric, ionic concentration of the pore fluid.