Compression Behavior of Carbonate Mudrocks

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ABSTRACT

Carbonate sediments obtained from the Florida Bay compact to 19% of their original volume at vertical effective stresses of ~19 MPa. We resedimented samples composed of high magnesium calcite and aragonite with 42% clay-sized particles to vertical effective stresses of ~100 kPa and then performed uniaxial consolidation to derive the compression behavior. The carbonate samples undergo extraordinary compaction at low stresses (0-100 kpa) but thereafter exhibit compression behavior similar to Nankai Trough sediment that has similar grain size properties. This study has the potential to improve our ability to model deposition and deformation in carbonate systems.

CLICK ON IMAGE FOR LARGER VIEW

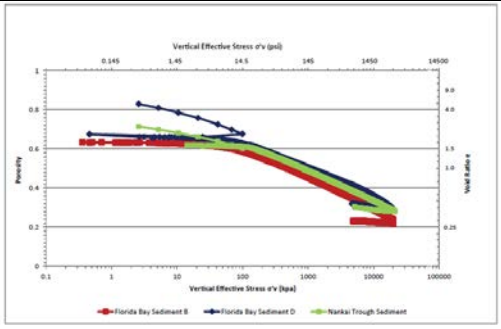

Fig. 1:
Compression curves for carbonate sediment from the Florida Bay and siliciclastic sediment from the Nankai Trough. Samples from the Florida Bay are composed of 57% silt-sized particles and 42% clay-sized particles Nankai Trough sediments consist of 56% clay-sized particles and 44% silt-sized particles.

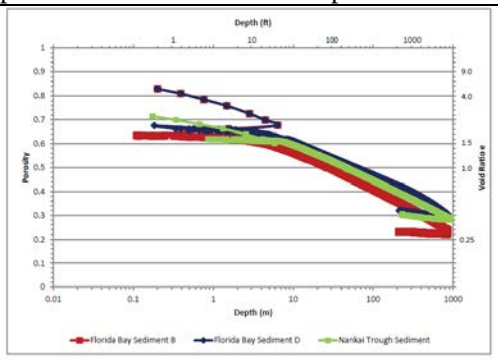

Fig. 2:
Porosity vs. Depth relationship for same materials as Figure 1.

Fig 3: Photomicrograph of carbonate sediment from the Florida Bay that was used in our compression tests.

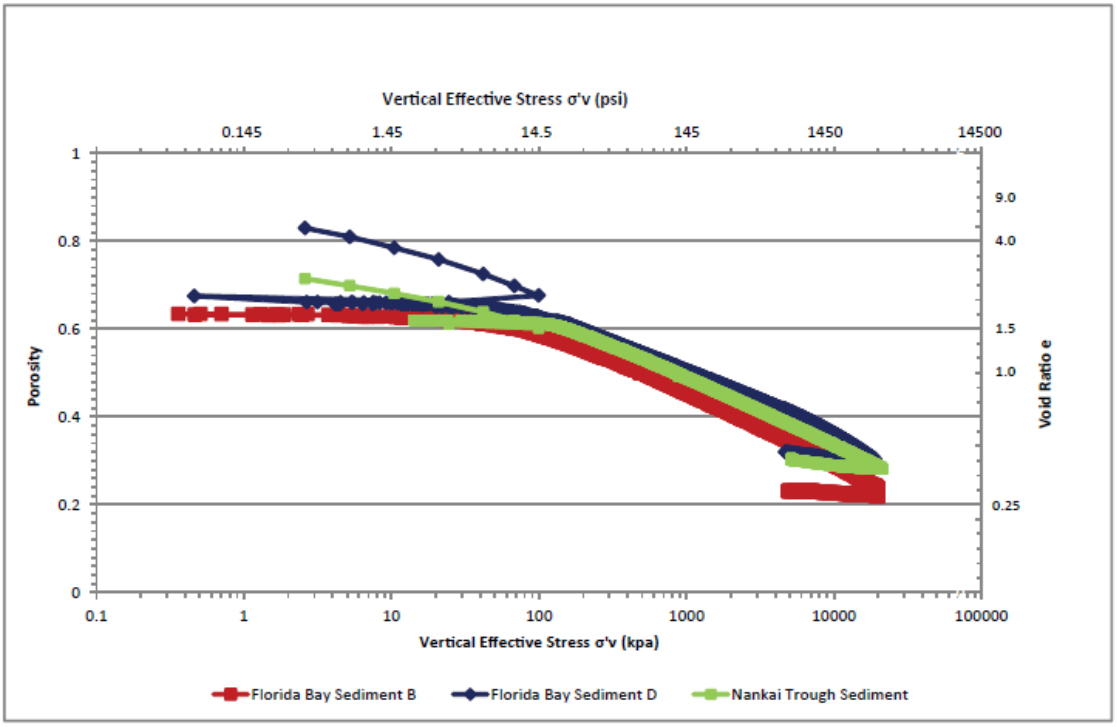

Fig. 1: Compression curves for carbonate mud from the Florida Bay and siliciclastic sediment from the Nankai Trough. Samples from the Florida Bay are composed of 57% silt-sized particles and 42% clay-sized particles. Nankai Trough sediments consist of 56% clay-sized particles and 44% silt-sized particles. Samples were reconstituted, pre-loaded to 100 kPa, and uniaxially consolidated to about 19 MPa. Dotted lines represent pre-loading during resedimentation. Solid Lines represent loading to high stresses during a constant rate of strain (CRS) test.

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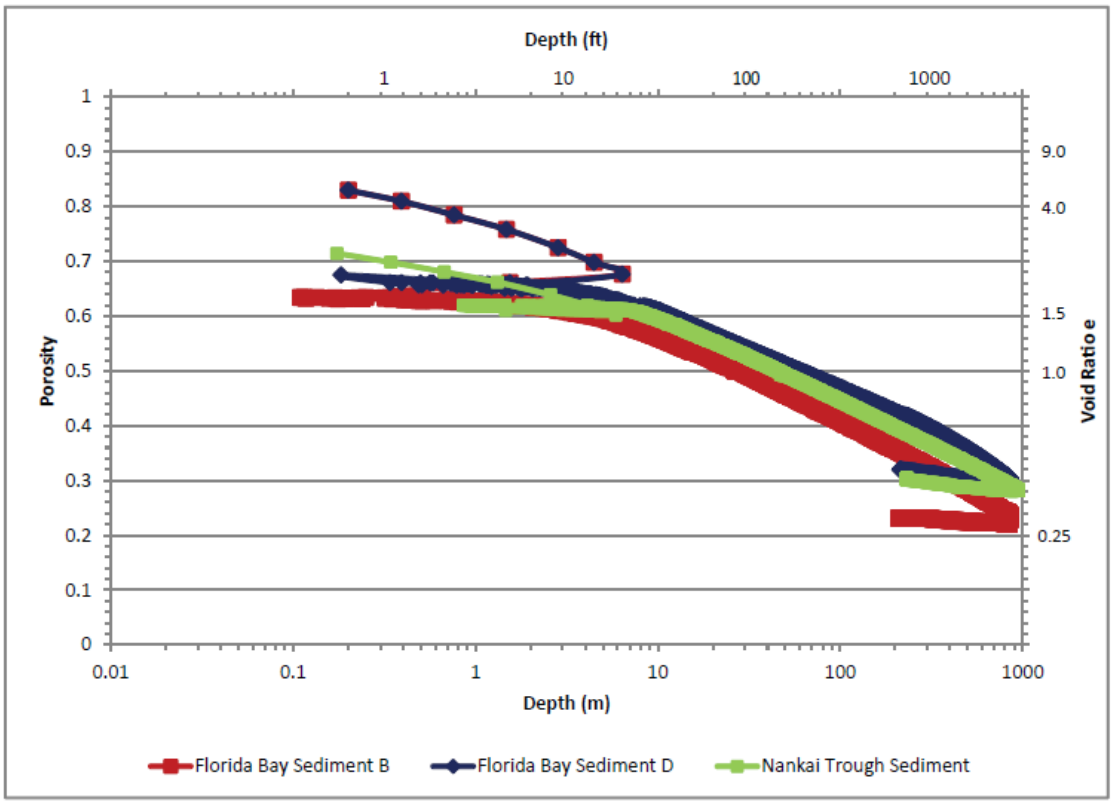

Fig. 2: Relationship between porosity and depth for carbonate mud from the Florida Bay and siliciclastic sediment from the Nankai Trough. Samples from the Florida Bay are composed of 57% silt-sized particles and 42% clay-sized particles. Nankai Trough sediments consist of 56% clay-sized particles and 44% silt-sized particles. Samples were reconstituted, pre-loaded to 100 kPa, and uniaxially consolidated to about 19 MPa. Dotted lines represent pre-loading during resedimentation. Solid Lines represent loading to high stresses during a constant rate of strain (CRS) test.

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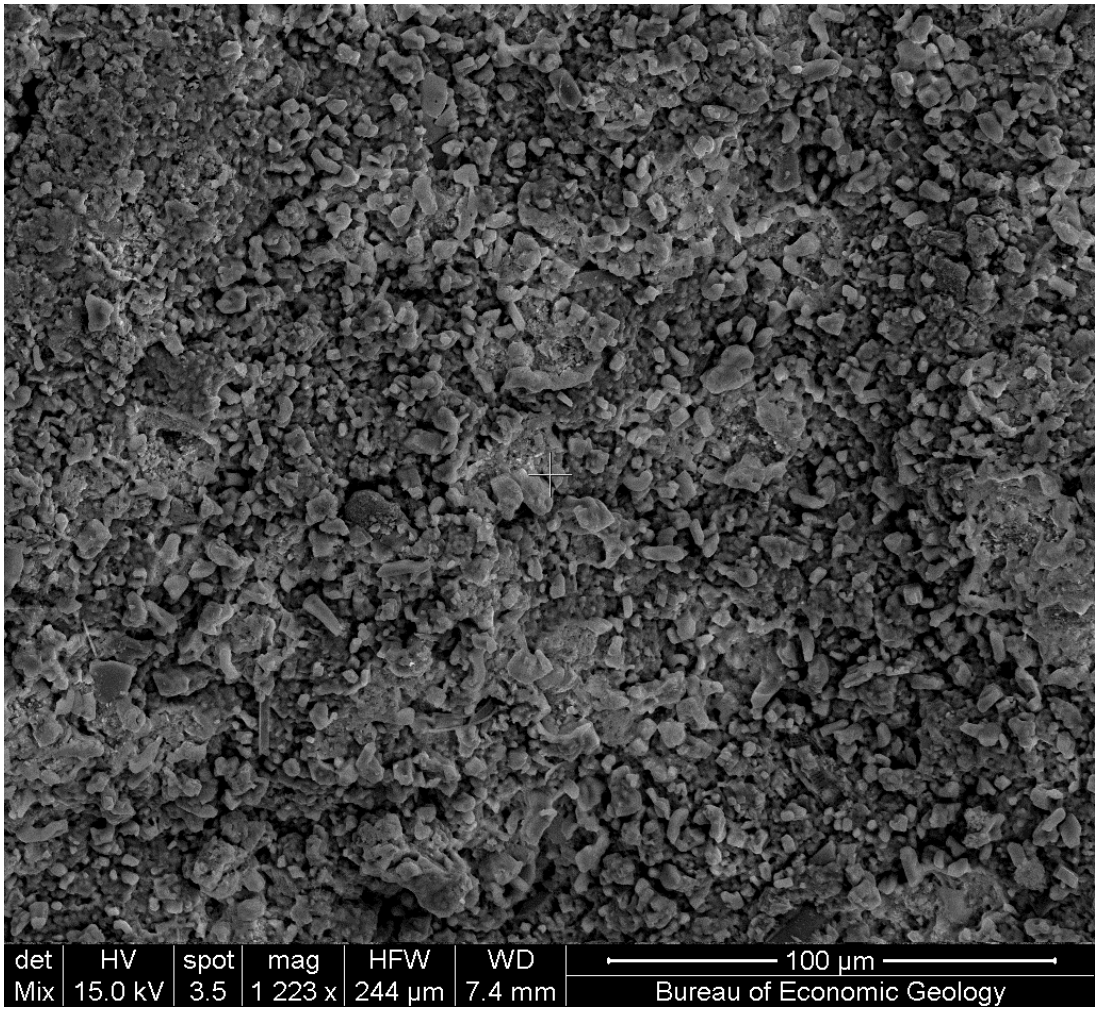

Fig. 3: Photomicrograph of sediment from the Florida Bay consisting of 57% silt-sized particles and 42% clay-sized particles. Sediment taken from the Florida Bay was wet seived using a #100 seive to pass particle sizes less 150 µm. This sediment was then used in the compression tests mentioned above.

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