14.19: Sample reconstitution and mechanical behavior of sandy silt from the Green Canyon 955 of the Gulf of Mexico

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ABSTRACT

I investigated the stress–strain–time-strength characteristics of sandy-silt reconstituted specimens from Green Canyon Block 955 hydrate reservoir (deep-water Gulf of Mexico) using K_0-consolidated triaxial drained shear and oedometer tests (with stress holds). Uniaxial strain testing under drained conditions revealed that the ratio of horizontal to vertical effective stress (K_0) is 0.51. Furthermore, the lateral stress (hence, K_0) did not change during axial stress holds. Holding the axial stress constant illustrated ongoing creep in the axial direction. Both the compressibility and the creep rate increase with stress. However, the normalized creep rate is constant (~0.028) with axial stress (Fig. 1). During triaxial drained shear tests (Fig. 2), I measured the critical state friction angle of 33° (M = 1.33). Overall, my measurements help better understand reservoir behavior, including initial stress state (lateral stress ratio), porosity decline during reservoir compaction (compression behavior), and borehole stability (friction angle).

CLICK ON IMAGE FOR LARGER VIEW

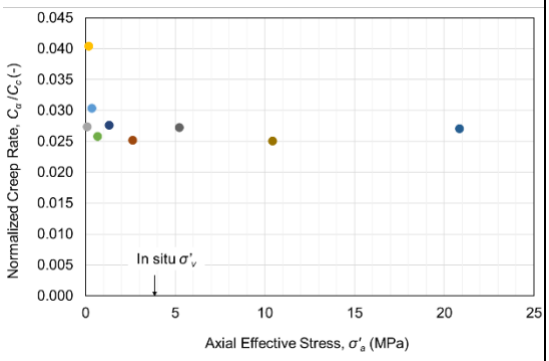


Fig 1: Measurements from oedometer test illustrating that normalized creep rate is constant with axial effective stress.

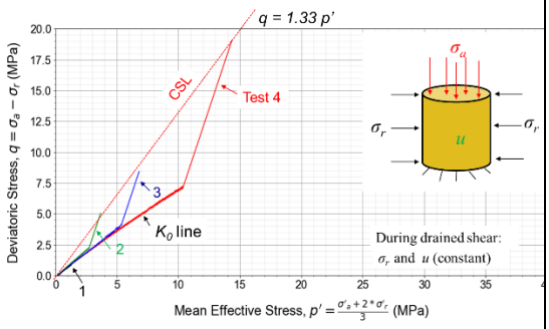
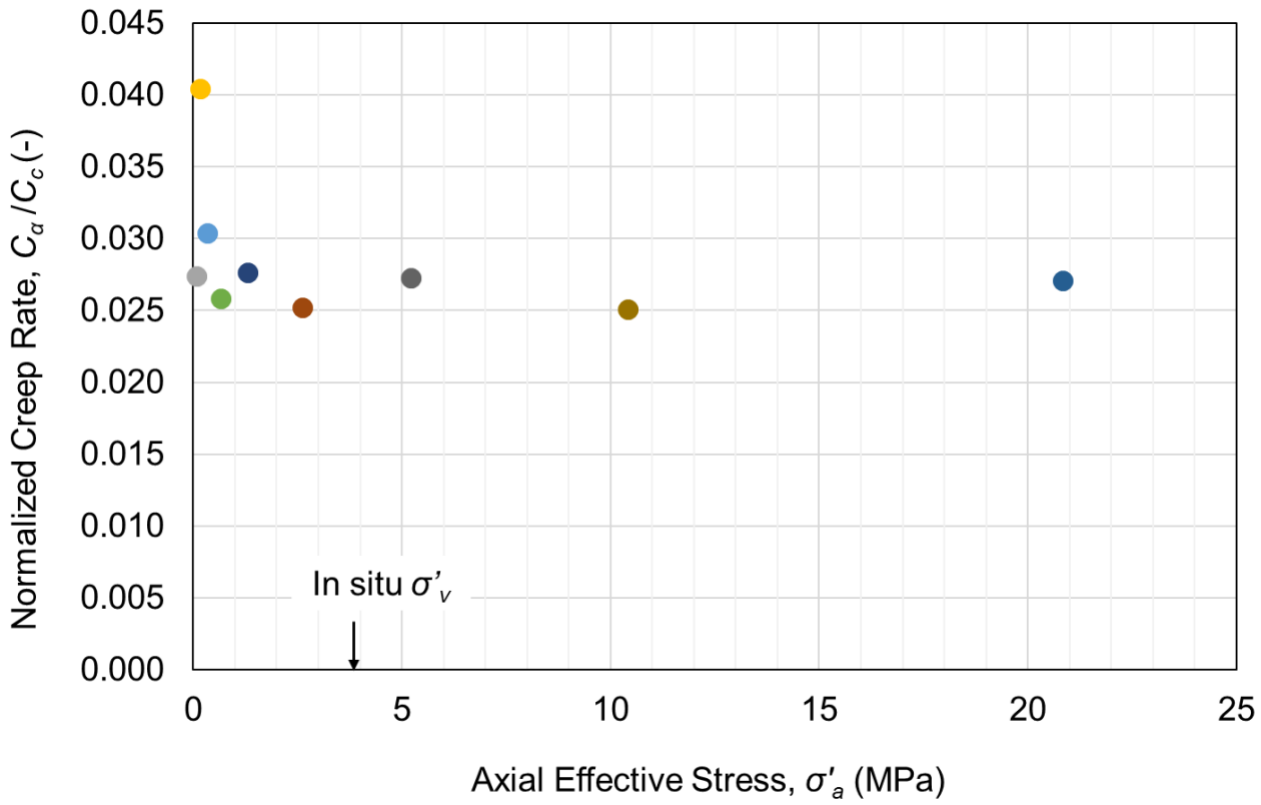


Fig 2: K_0 (thick red line) and drained shear (triaxial compression) stress paths (green, blue, and red lines). The material friction angle is 33°, measured from the slope of the critical state line (dotted red line).



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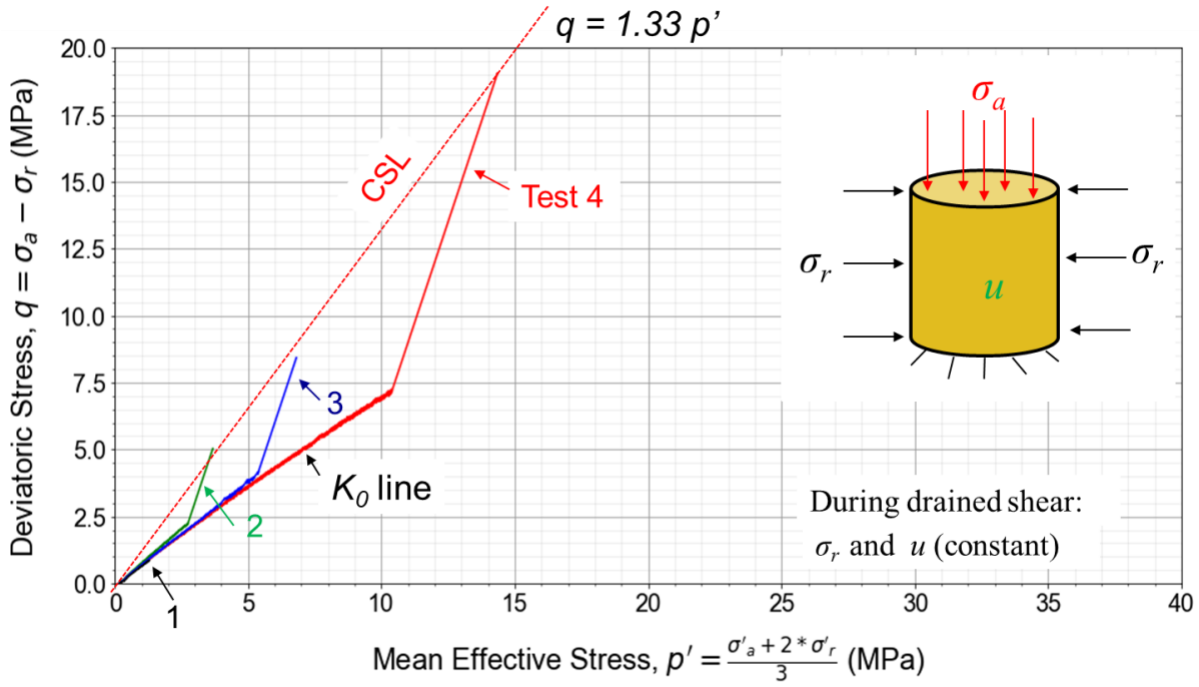

Fig. 2: K_0 (thick red line) and drained shear (triaxial compression) stress paths (green, blue, and red lines). The material friction angle is 33°, measured from the slope of the critical state line (dotted red line). CSL = critical state line

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