11.05: Vertical Velocity Measurements during Uniaxial Unloading of Mudrocks

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ABSTRACT

This talk presents results from the first experiments to characterize the changes in velocity as a function of unloading. Tests were performed on both resedimented Boston Blue Clay and Gulf of Mexico Clay. Vertical P and S wave velocities were measured during uniaxial compression in a rigid walled device.

The velocity during unloading is significantly higher than the normally consolidated value at any given stress level (Fig. 1). Both the P and S wave velocities have the same trends (Fig. 2). The unload/reload cycles are highly nonlinear and show significant hysteresis. The Bowers equation was used to represent the unloading results. For RGoM-EI, unloading to 25% of the maximum stress results in a U coefficient of 3 for both P and S waves. This is compared to 6 when unloading to 50%. RBBC has a lower plasticity and 50% larger U coefficients.

Velocity density cross plots showed a lower velocity during unloading at a given density, but the difference was less pronounced.

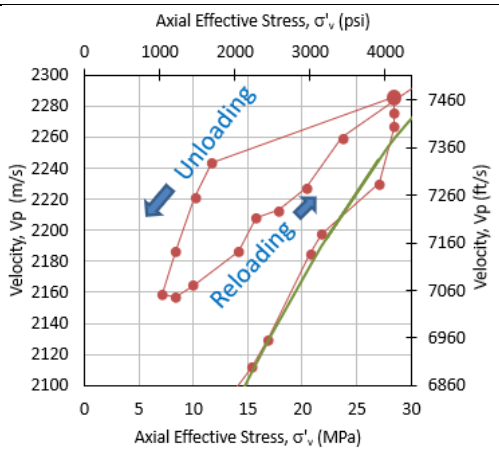

Fig 1: Variation of P-wave velocity during an unload/reload cycle on a GoM_EI specimen during uniaxial compression. The green line represents a fit of the virgin compression behavior.

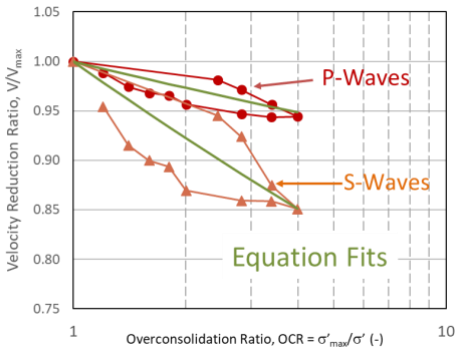

Fig 2: Unload/reload cycles from the same test showing data in normalized velocity vs overconsolidation ratio.

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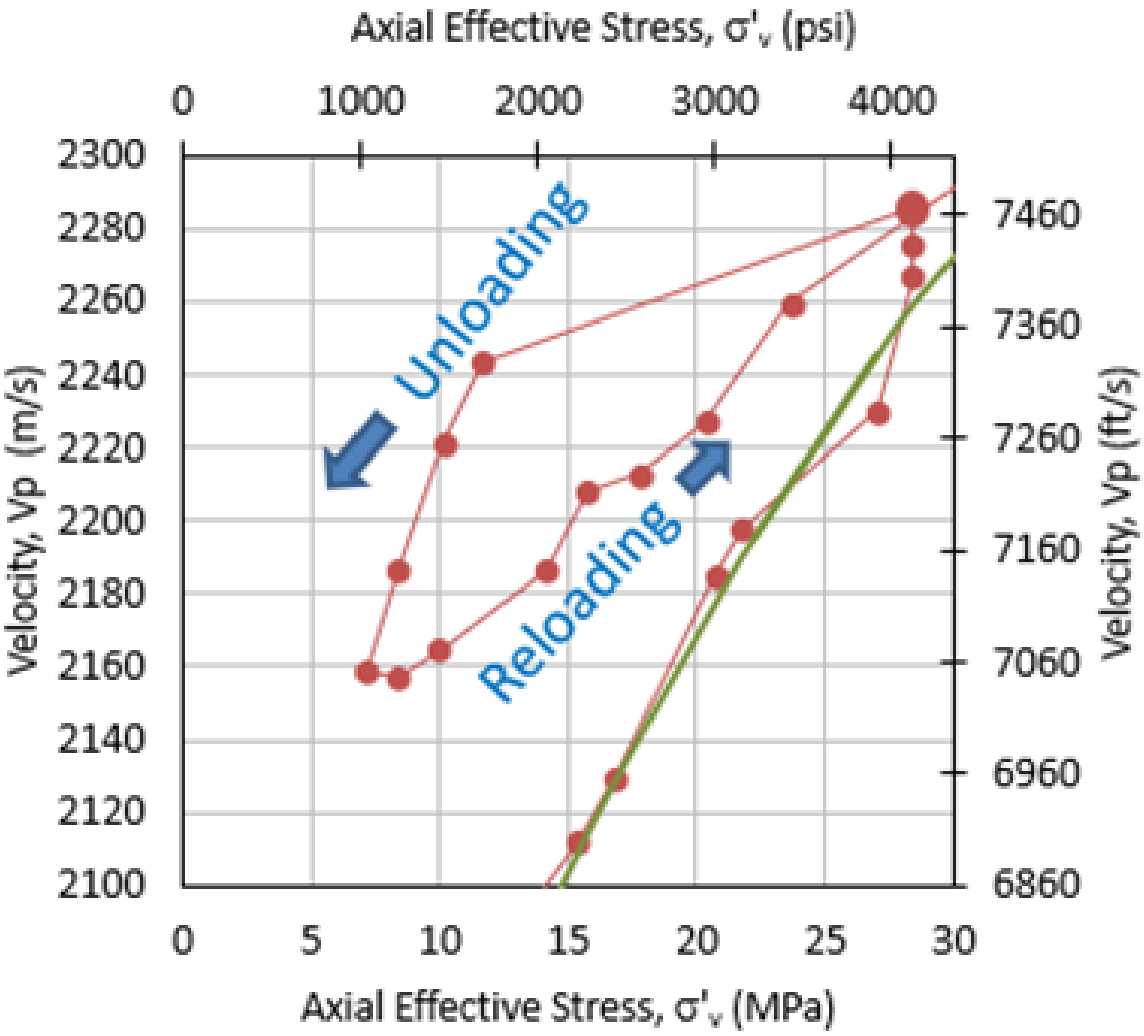

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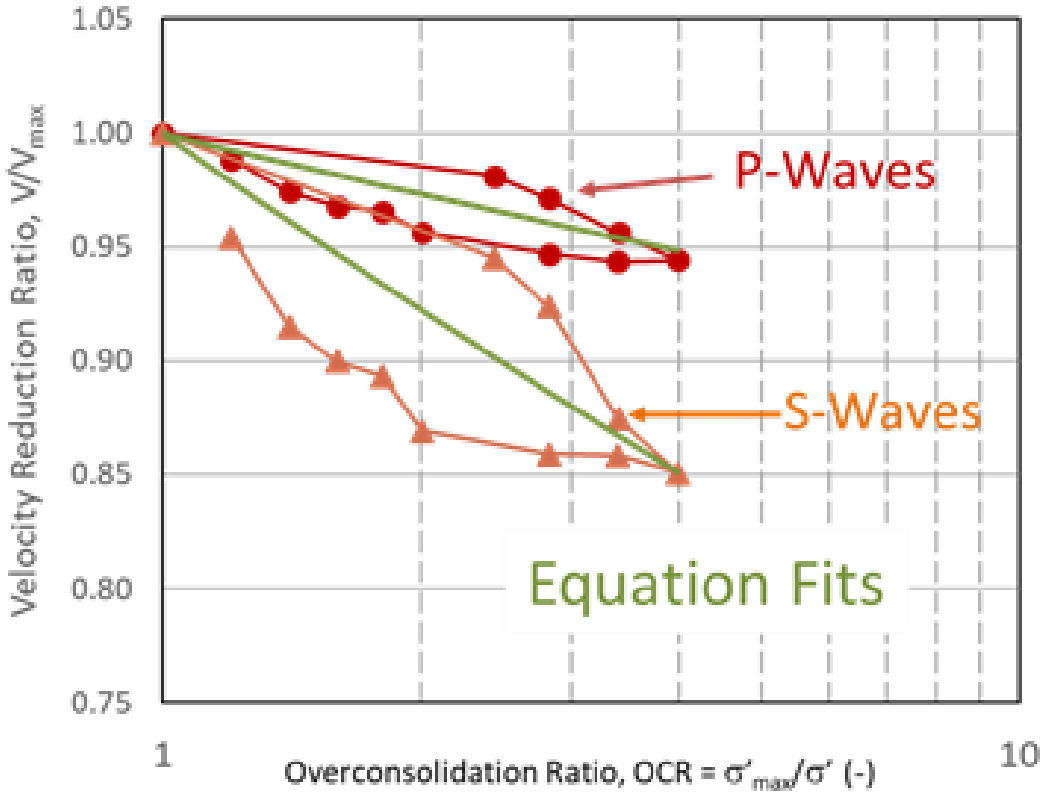

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