12.13: Variation in Velocity During Unloading and Creep under Uniaxial Conditions

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ABSTRACT

This talk presents results from uniaxial laboratory tests performed on resedimented Gulf of Mexico mudrock. Vertically propagating compressional and shear wave velocities are evaluated during both unload/reload stress cycles and creep stages. Results are provided for 10 and 30 MPa.

The velocity during unload/reload cycles is both nonlinear and hysteretic (Fig 1). The trends are very similar for both P and S waves as well as stress levels. The nonlinearity equates to a variation in the Bower's unloading coefficient (U) which decreases from about 5 to 2.5 with increased unloading. The unloading coefficient for the shear velocity is similar to that for the compressional velocity.

Velocity increases nearly linearly when plotted against the log of time during secondary compression. The rate is about 4% per log cycle of time. Velocity density cross plots show a remarkable consistency for both the creep and unload/reload behavior (Fig.2). Velocity (S and P) is linearly related to density but the slope is steeper than for normally compressed mudrock.

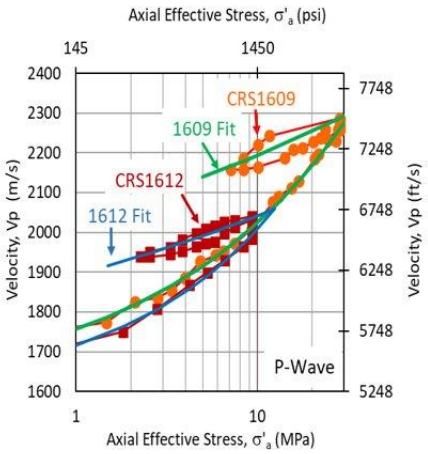


Fig 1: Variation of P-wave velocity during an unload/reload cycle on a GoM_EI specimen during uniaxial compression. The green and blue lines represent a fit to the Bower's equation.

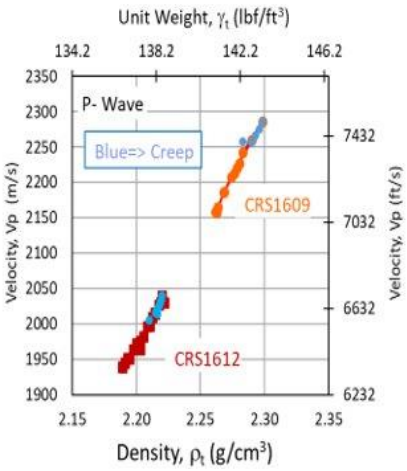
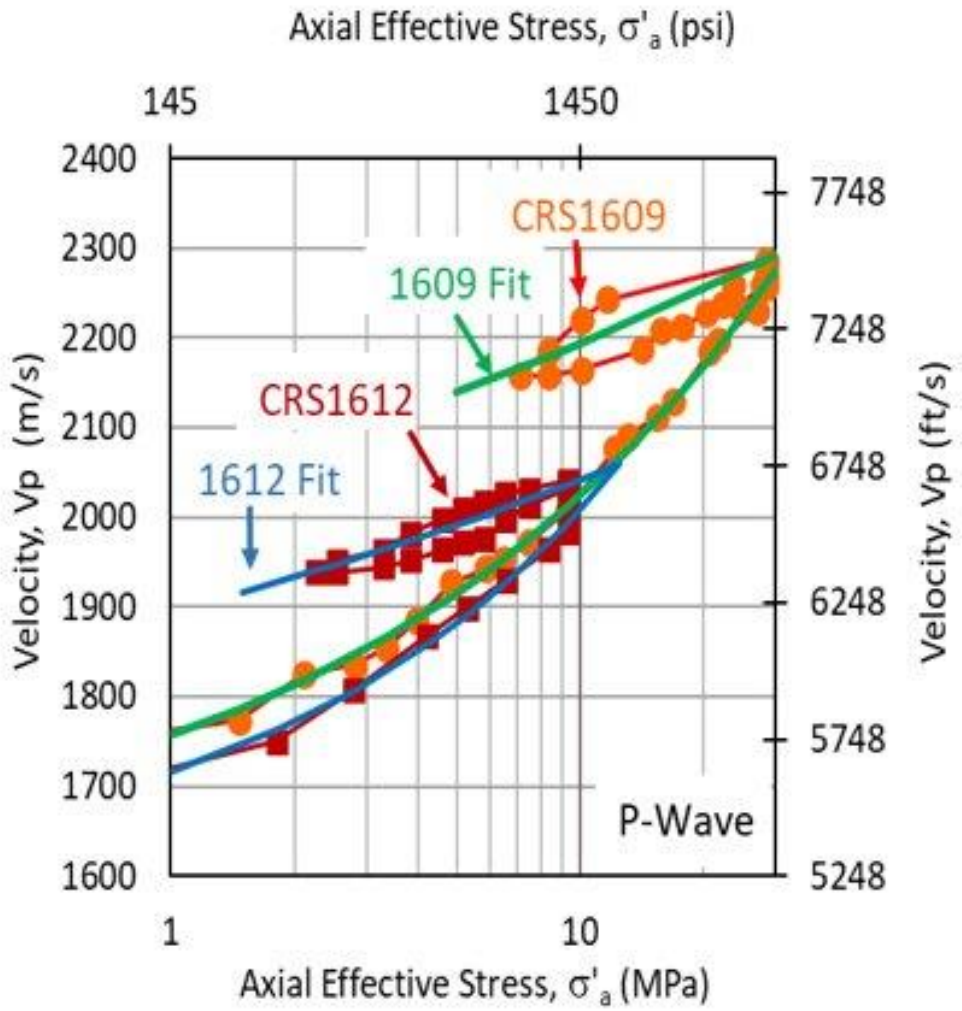


Fig 2: CRS results of intact and resedimented GoG as well as intact void ratio measurements



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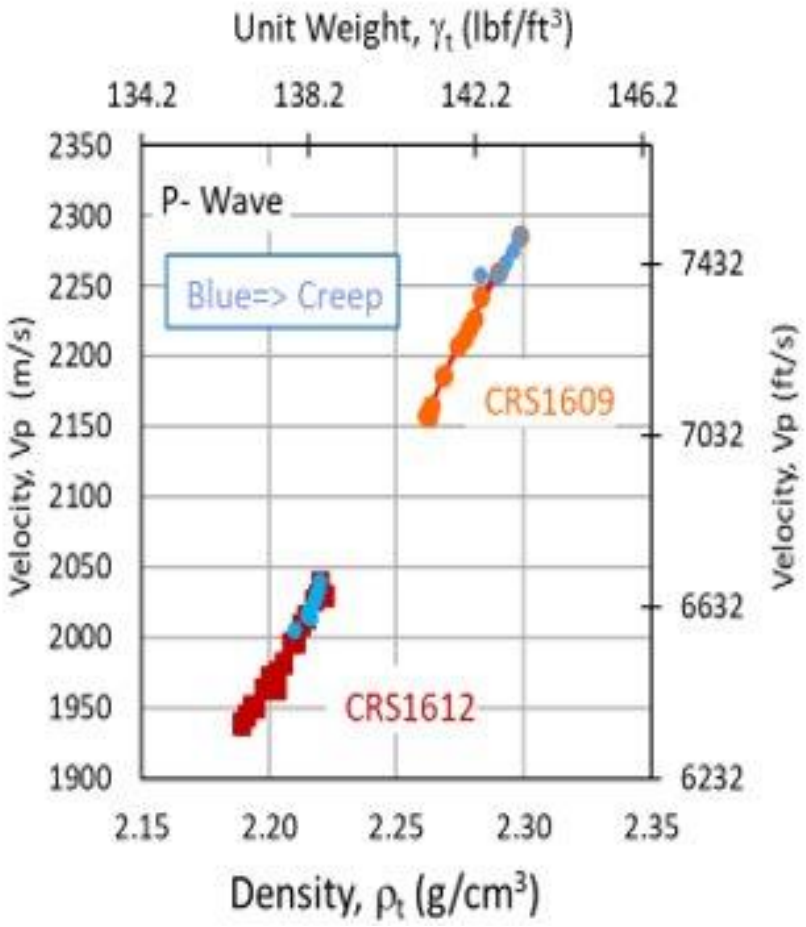

Fig. 2: **Velocity density cross plot for P wave velocity during two unload/reload cycles and creep stages.**

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