Variation of P & S-wave velocity in RBBC and RGOM up to 10MPa

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ABSTRACT

Compressional (V_P) and shear (V_S) wave velocities were measured on Resedimented Boston Blue Clay (RBBC), Resedimented Gulf of Mexico (RGOM), and Presumpscot Clay over a stress range from 0.6 to 10MPa (**Fig. 1**) in a modified triaxial apparatus. Piezoelectric elements were used to transmit and receive compressional (P) and shear (S) wave signals through the specimens while they were being consolidated up to 10MPa. The P-wave velocity results are seen in **Fig.1**. The results show quite repeatable experiments, and that RBBC has a considerably slower P-wave velocity than RGOM. The Poisson's ratio (ν) can be calculated based on the P and S-wave measurements (see **Fig. 2** for equation). Poisson's ratio is close to 0.5 at low stresses and decreases with increasing vertical effective stress (σ'_v). The velocity-derived ν increases as a function of plasticity (**Fig. 2**, inset).

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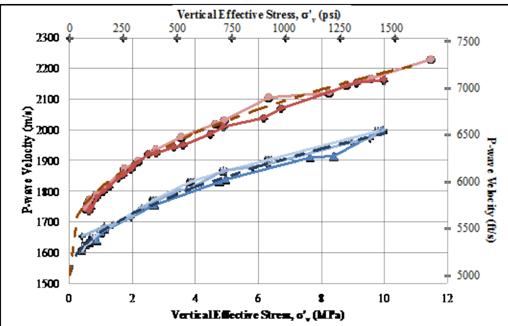


Fig. 1: The compressional wave velocities for RBBC are consistently showing an increase of as a function of vertical effective stress. The higher plasticity clay (RGOM) has higher velocities than the low plasticity clay (RBBC). Furthermore, fits based on the Bowers (1994) paper are seen on the graph, using an equation of the form $V_p = C + A\sigma_v'^B$. The A, B and C parameters used are as follows, respectively: RBBC=(33.7, 0.52, 5029), RGOM=(129.2, 0.384, 5021).

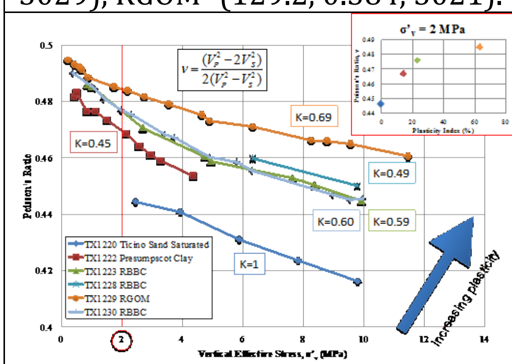
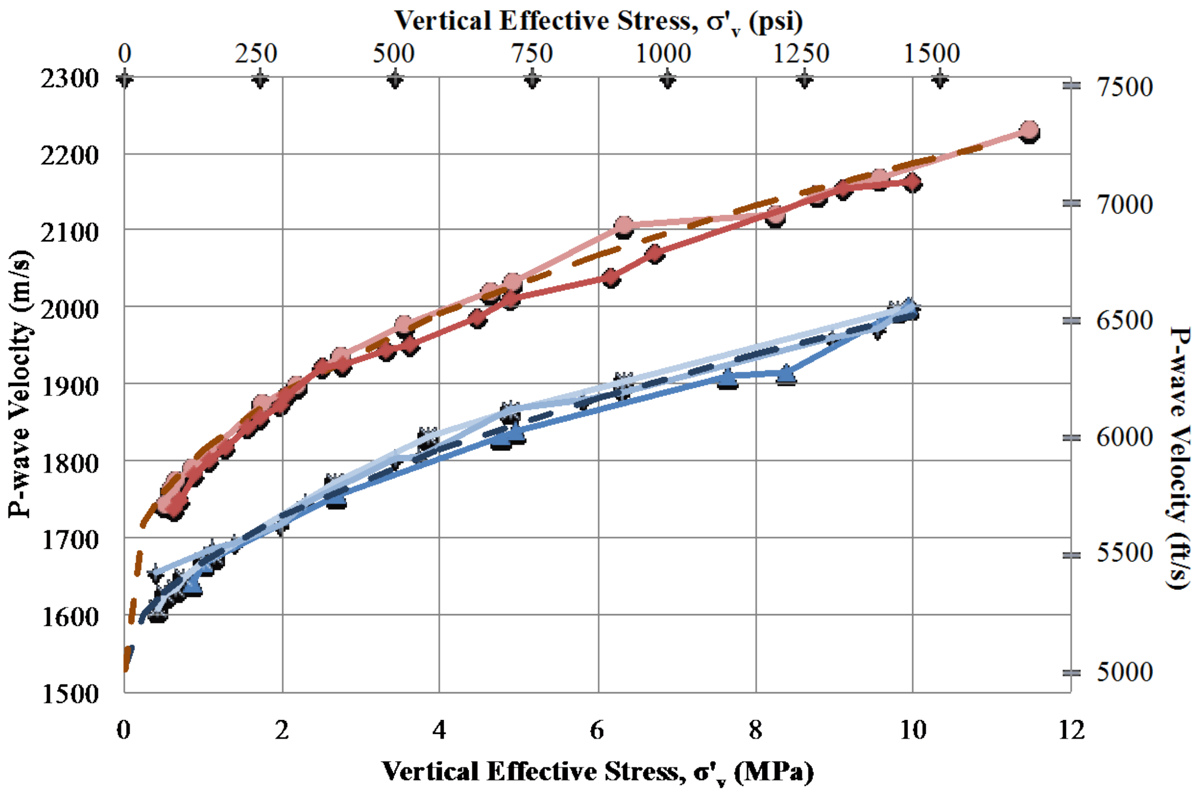


Fig. 2: The Poisson's ratio obtained from the relationship $\nu = (V_p^2 - 2V_s^2)/(2(V_p^2 - V_s^2))$ can be seen in the figure above. It exemplifies how the Poisson's ratios for clays begin very close to the upper limit of 0.5 and decrease linearly as a function of stress. There is a trend of increasing Poisson's ratio with increasing plasticity.



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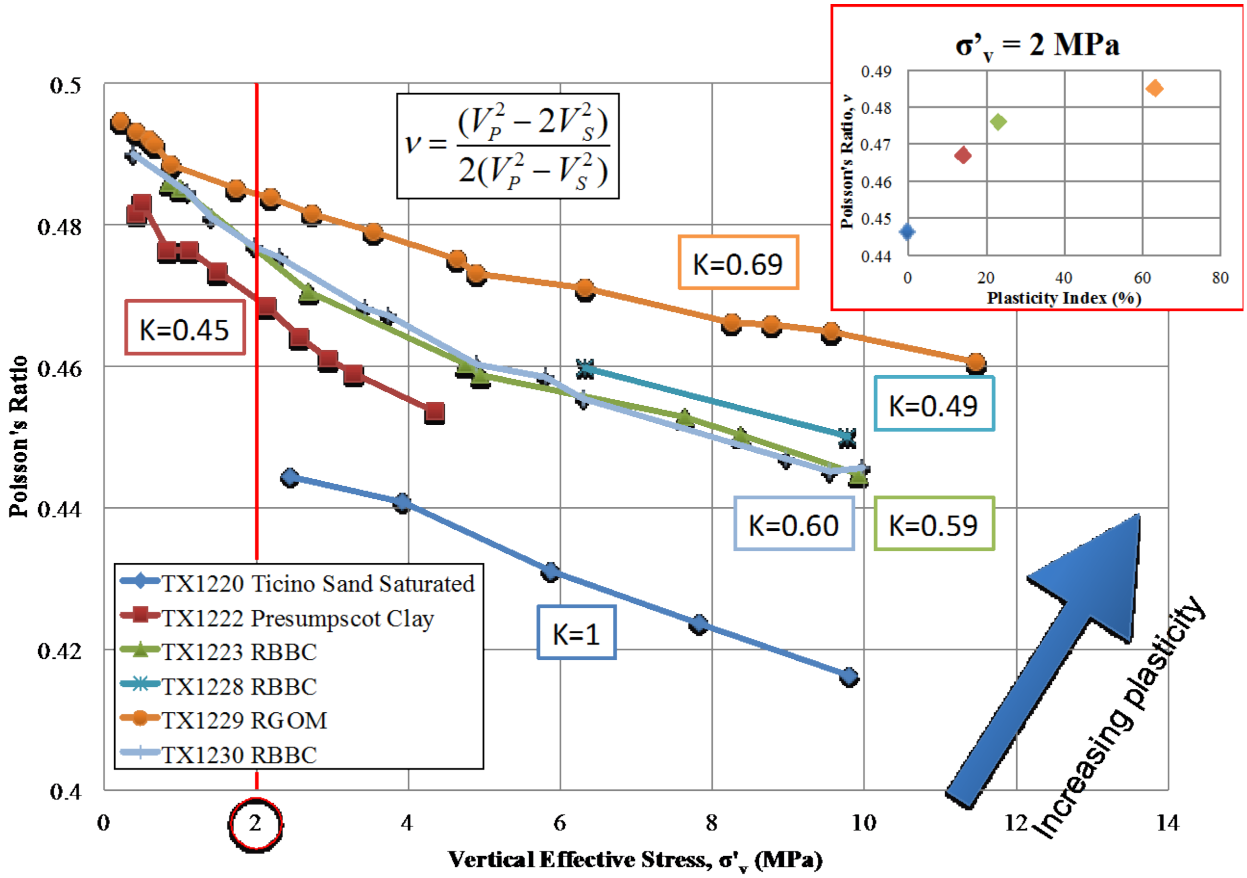

Fig. 2: The Poisson's ratio obtained from the relationship $\nu = \frac{V_P^2 - 2V_S^2}{2\left(V_P^2 - V_S^2\right)}$ can be seen in the figure above. It exemplifies how the Poisson's ratios for clays begin very close to the upper limit of 0.5 and decrease linearly as a function of stress up to a vertical effective stress of approximately 10MPa. There is a trend of increasing Poisson's ratio with increasing plasticity.

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