

Impact of Unloading on Mudrock Velocities

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ABSTRACT

The velocity behavior during the unloading portion for Resedimented Boston Blue Clay (RBBC) and Resedimented Gulf of Mexico (RGOM) was shown to vary to different degrees. Both compressional (P) and shear (S) wave velocities were measured concurrently through RBBC and RGOM in the vertical direction (C_{33} and C_{55} , respectively). The P-wave velocity, as seen in **Fig. 1**, decreases when the vertical effective stress (σ'_v) is decreased. The degree to which it decreases differs in the RBBC and RGOM results, implying that plasticity plays a role in the rebounding effect of the velocity. When the results are plotted in porosity-modulus space (**Fig. 2**), which takes into account the density behavior of the material, we observe that the unloading portion of the RGOM is virtually indistinguishable from the loading portion of the curve. The unloading RBBC results, however, are much more clearly interpretable.

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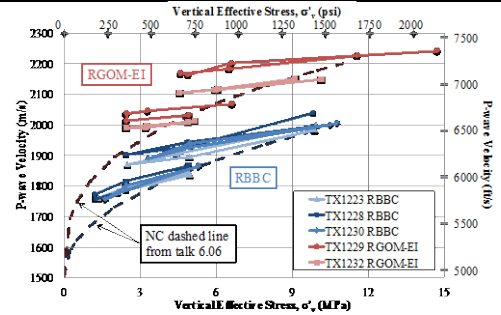


Fig. 1: The loading and unloading curves for RBBC and RGOM show the P-wave velocity through RGOM is higher than RBBC. Furthermore, unloading the stress seems to have a more pronounced effect on the P-wave velocity for RBBC (which has lower plasticity) than for RGOM.

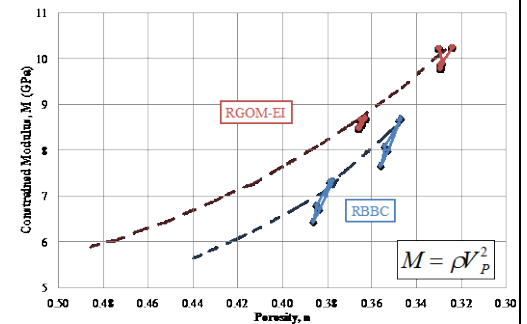


Fig. 2: The Constrained Modulus (also C_{33}) plot against the porosity for the loading/unloading behavior of RBBC and RGOM shows that the unloading portion for RGOM is indistinguishable from the loading portion. The unloading portion is indicated with solid dots and lines, while the NC portion is a dashed line. The RBBC unloading portions are clearly seen to follow a different pathway.

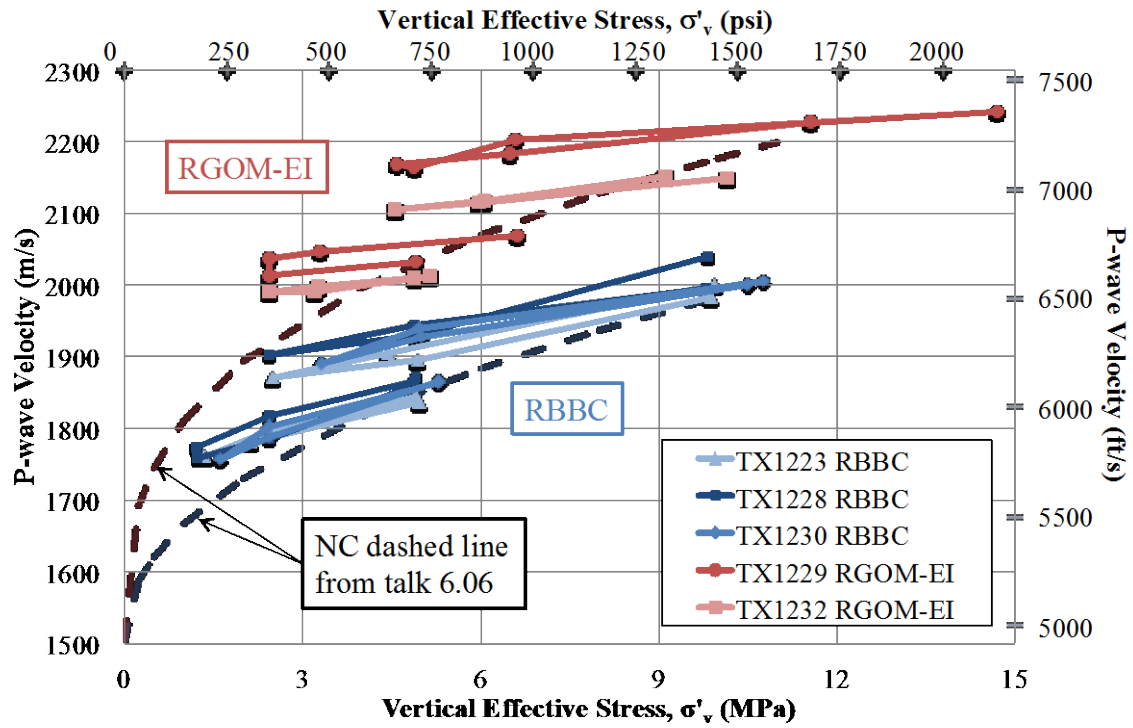


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[Back](#)

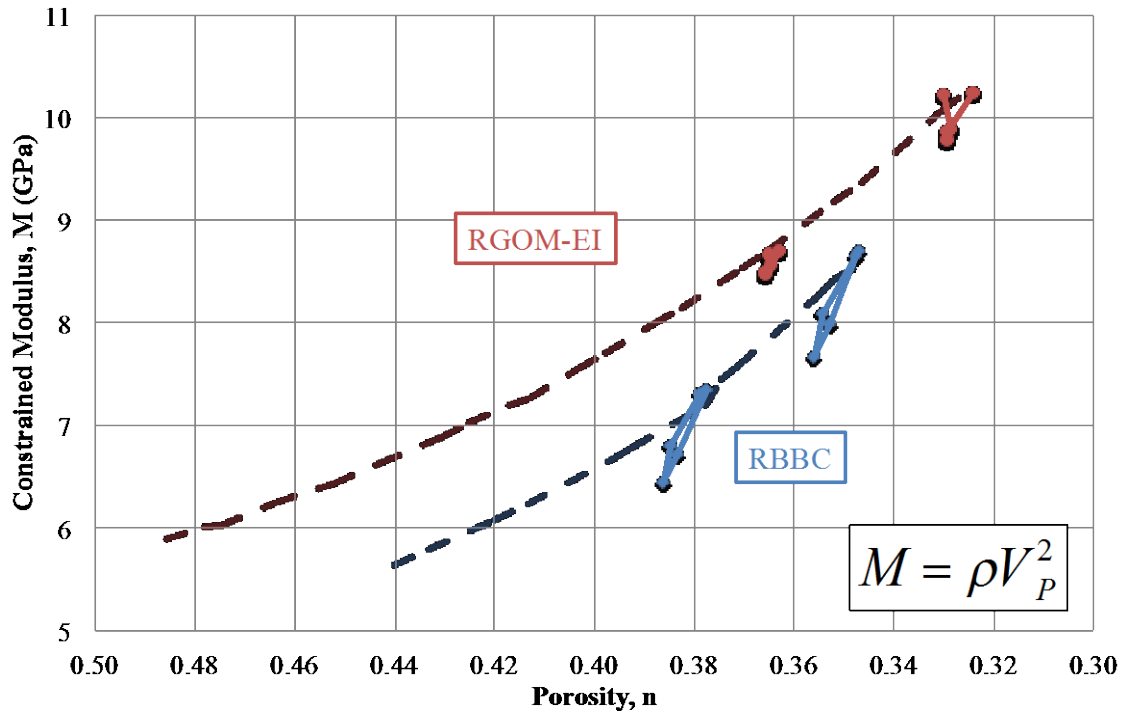


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[Back](#)