Shear Strength Behavior of Resedimented Mudrocks

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ABSTRACT

Friction angles and undrained strength ratios of mudrocks decline significantly as effective stresses increase from 0.1 – 10 MPa (Figure 1). These properties are commonly assumed to be independent of effective stress. We show that decreasing normalized strength with effective stress results in greater wellbore instability at depth (Figure 2) as well as higher lateral stresses with depth than is predicted if strength properties are assumed to remain constant (I thought we agreed you were going to make this plot?). The friction angles and undrained strength ratios of mudrocks can be effectively estimated from their liquid limit, an easily measured material property which is related to the quantity and type of clay minerals present in a mudrock.

CLICK ON IMAGE FOR LARGER VIEW

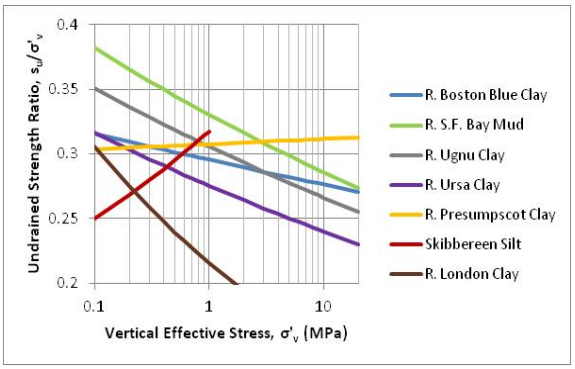


Fig. 1: Variation in undrained strength ratio with stress level for seven normally consolidated mudrocks. The actual data points used to produce the regression lines are omitted from the figure for clarity.

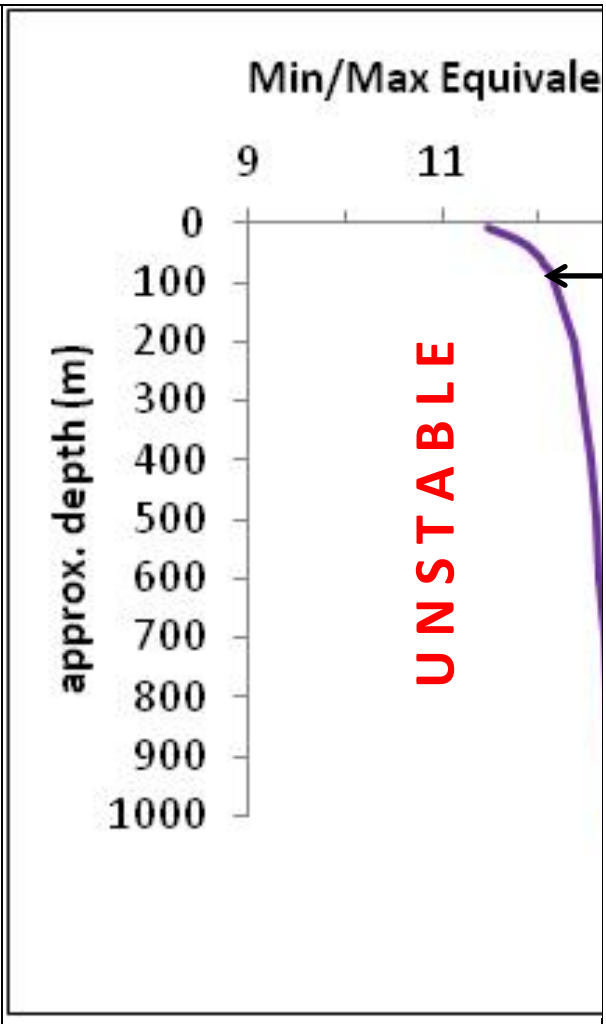
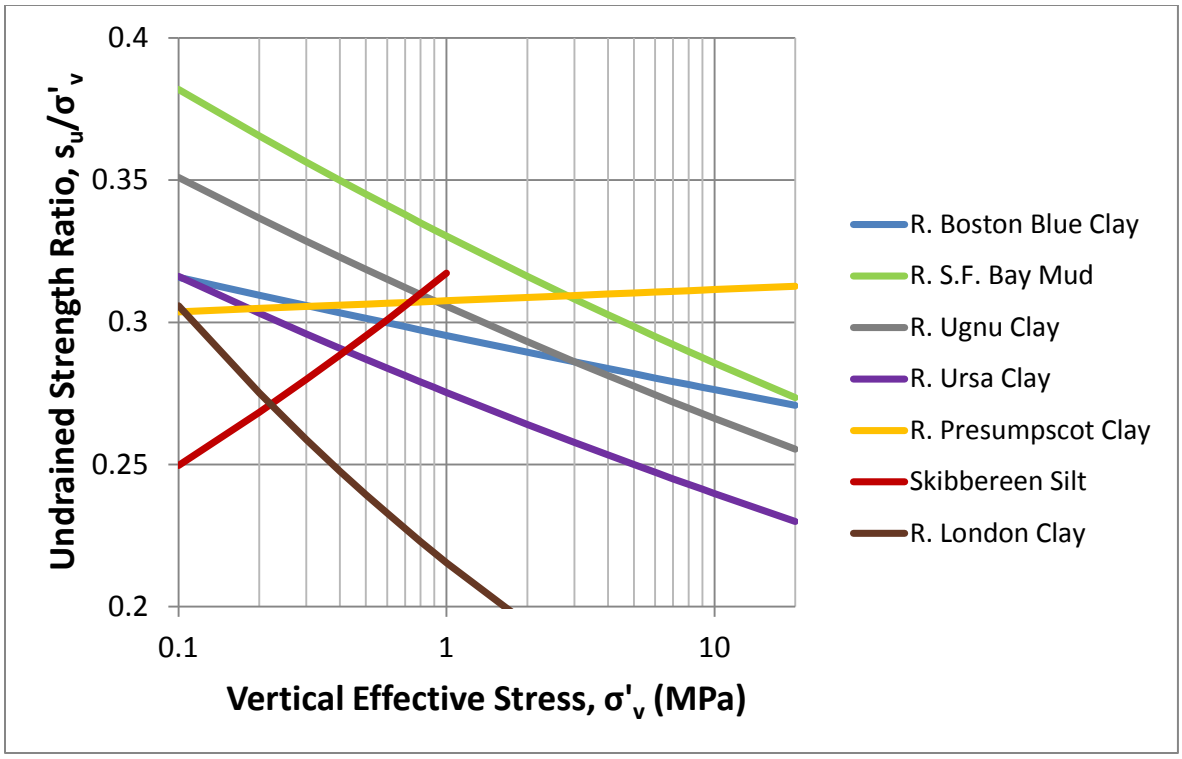


Fig. 2: The effect of the decrease in the undrained strength ratio of Gulf of Mexico Ursa Clay on the size of the safe drilling window for this mudrock. The minimum and maximum well pressures (in pounds per gallon) are calculated assuming a vertical well, hydrostatic water pressures and an impermeable borehole wall.



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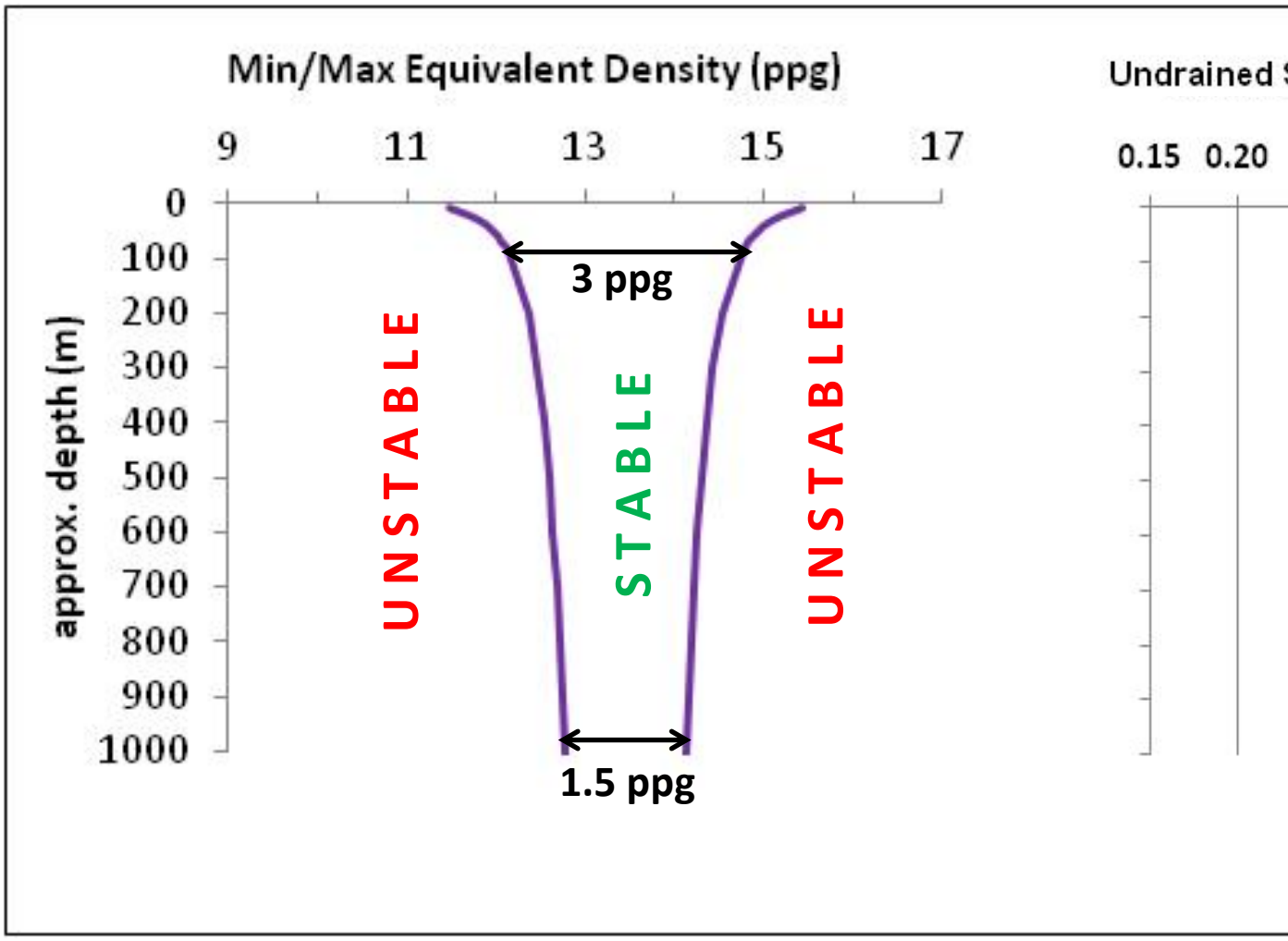

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