High Pressure Consolidation and Shear Behaviour of Mudrocks

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ABSTRACT

Friction angle and normalized undrained strength are found to vary considerably and consistently for mudrocks over the stress range 0.1 – 10 MPa. Models typically assume these properties to be independent of effective stress. This simplification has important consequences for wellbore stability analyses as well as our understanding of submarine slope failures. Mudrock strength and its variation with stress level can be estimated from liquid limit, an easily measured index property which indicates the quantity and type of clay minerals present in a mudrock. A simple model is also proposed which uses liquid limit to effectively predict mudrock permeability as a function of porosity.

CLICK ON IMAGE FOR LARGER VIEW

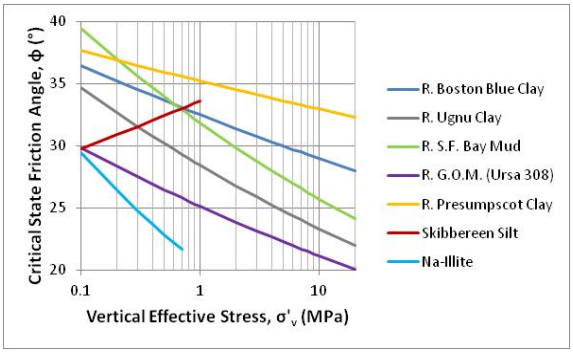


Fig. 1: Variation in friction angle with stress level for seven normally consolidated mudrocks. The actual data points used to produce the regression lines are omitted from the figure for clarity.

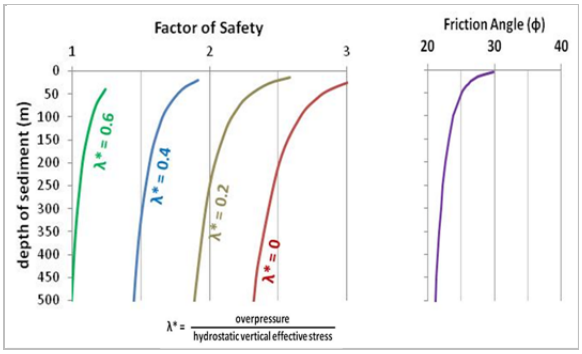
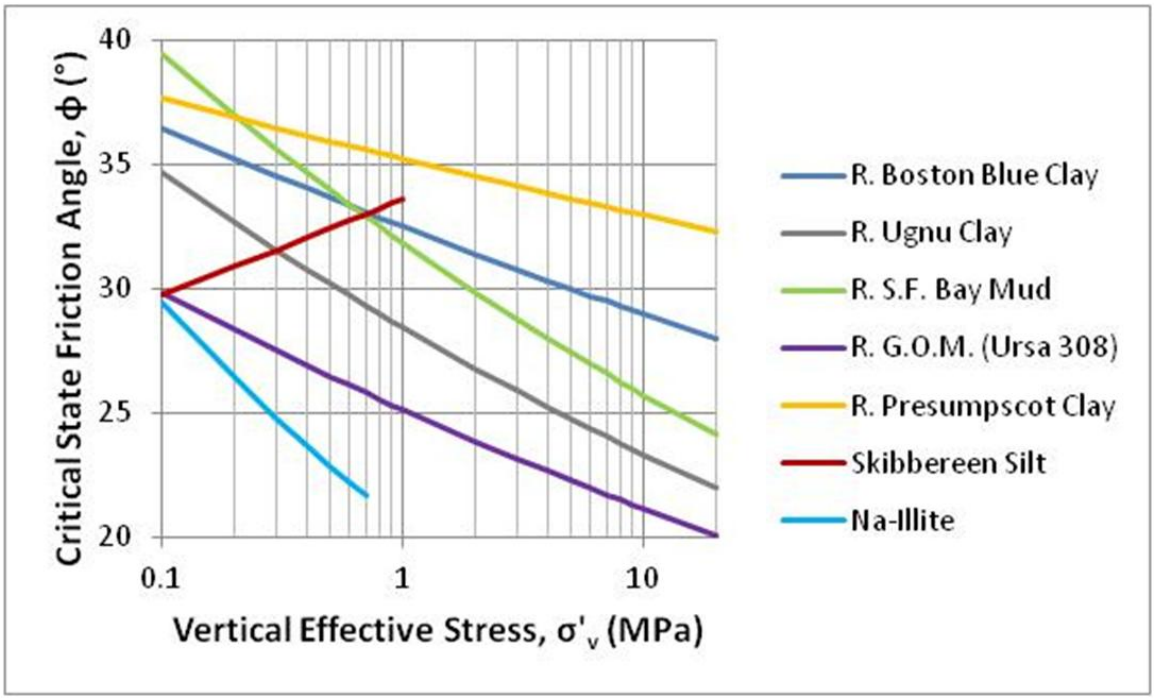


Fig. 2: Reduction in the factor of safety with depth for a slope of 10° in G.O.M. Ursa clay. An infinite submerged slope is assumed for analysis. As the sediment builds up, the effective stress at its base increases, leading to a reduction in strength (right plot) and a resulting reduction in factor of safety (left plot).



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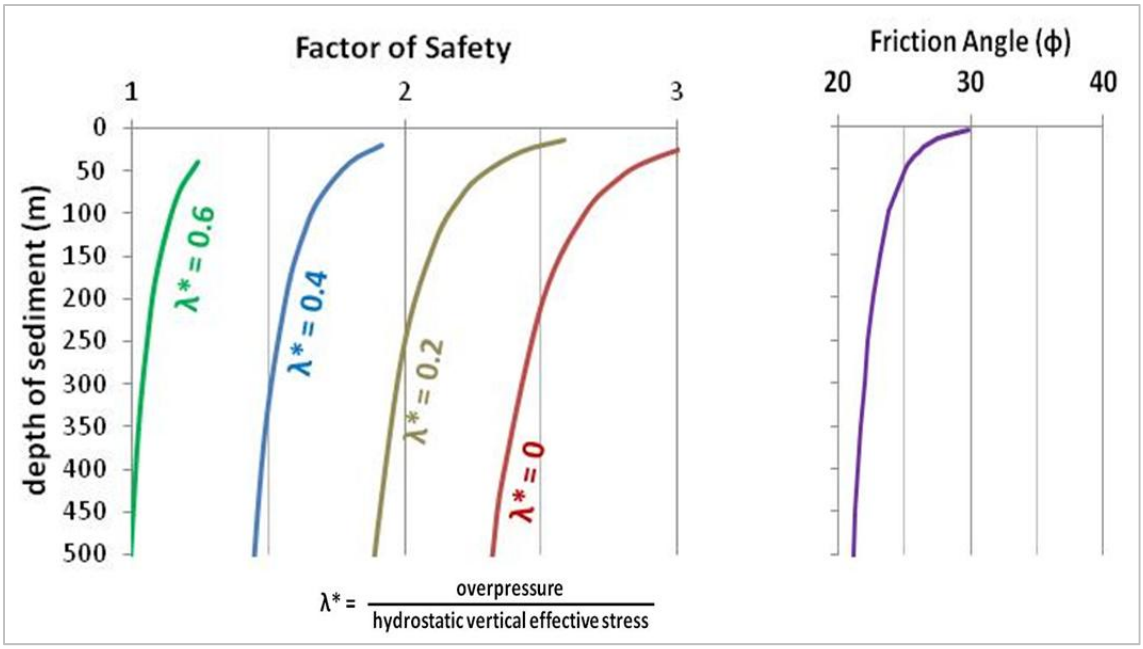

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