Characterization of the Yield Surface for Fine Grained Sediments

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ABSTRACT

The yield surface is an important parameter for determining soil behavior in geotechnical practice. It is a contour that separates the stress state at which the soil is behaving elastically from where it is behaving plastically. I will use the strain energy method to characterize the yield surface for resedimented mudrocks. Resedemented mudrock specimens will be K_o consolidated to a known stress level and then unloaded to a hydrostatic stress state (Path 1-2, Fig. 1). Drained and un-drained triaxial tests will be carried out using different shearing techniques. Through these techniques, I will probe out in different directions (Blue paths, Fig. 1) to characterize the shape of the yield surface. I will then repeat this procedure at high confining stresses. It has long been believed that the yield surface is independent of stress level. However, GeoFluids research demonstrates that the yield surface is not stress independent (Fig. 2). Understanding this behavior will provide important a better foundation for numerical models and provide insight into the state of stress in the subsurface.

CLICK ON IMAGE FOR LARGER VIEW

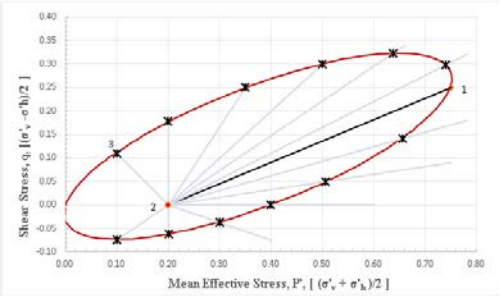


Fig 1: Probing with both drained and un-drained triaxial tests to identify the yield surface.

1. Initially K_o Consolidate specimen to a known stress level
2. Unload the specimen to a hydrostatic state of stress
3. Probe out in different directions to characterize the yield surface

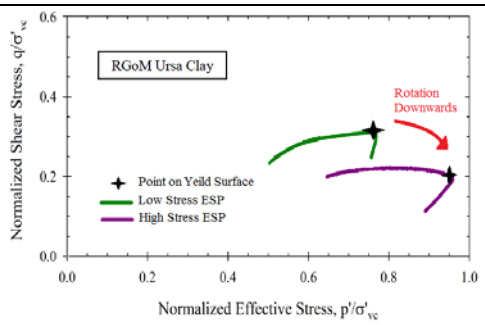
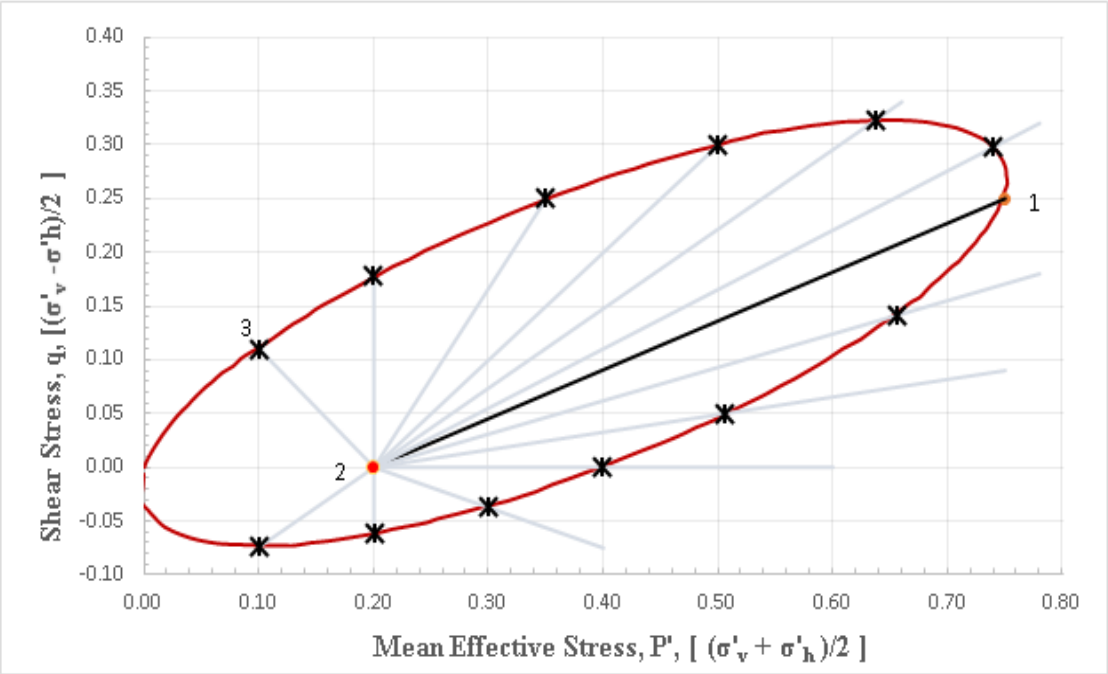


Fig 2: Shift in Yield Surface for Resedimented Gulf of Mexico Clay.

A test procedure carried out at high is stress is compared to one carried out at low stress. The point on the yield surface has moved significantly. It appears that the yield surface is rotating downwards with increase in stress level.



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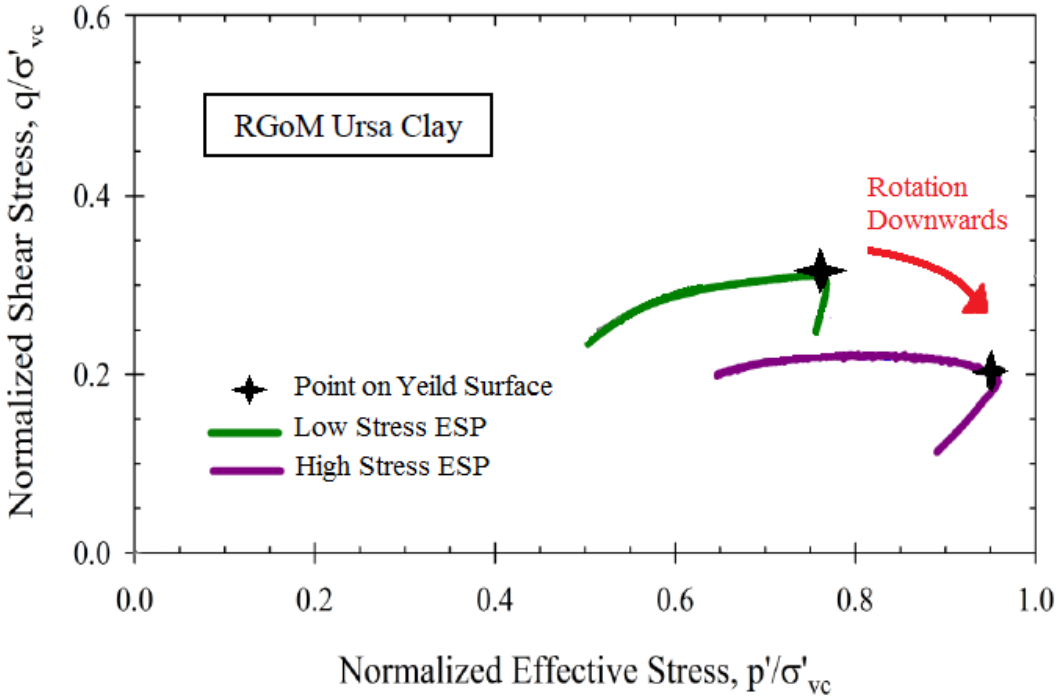

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