Stress dependence of the yield surface on Gulf of Mexico Mudstone

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ABSTRACT

The yield surface is an important parameter for characterizing soil behavior and is incorporated in most material models of mudrocks. It is the contour that separates the stress state at which the mudrock is behaving elastically from where it is behaving plastically. Resedimented mudrock specimens will be K_o consolidated to 10MPa and then unloaded to a hydrostatic stress state (Path 1-2, Fig. 1). Drained triaxial tests along different stress paths will be used to probe out in different directions and characterize the shape of the yield surface. I will repeat this procedure at high confining stresses. I will then compare the interpreted yield surface to model formulations; such as MIT-E3 and MCC, and to previous research done at 1MPa. Previous GeoFluids research demonstrated that the undrained stress paths are strongly stress level dependent (Fig. 2). Linking the drained and undrained behavior will provide an important foundation for numerical models and provide insight into the state of stress in the subsurface.
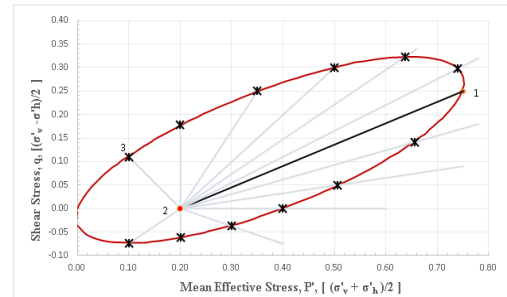
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Fig 1: Probing with drained triaxial tests to identify the yield surface.

1. Initially K_o Consolidate specimen to 10MPa.

2. Unload the specimen to a hydrostatic state of stress

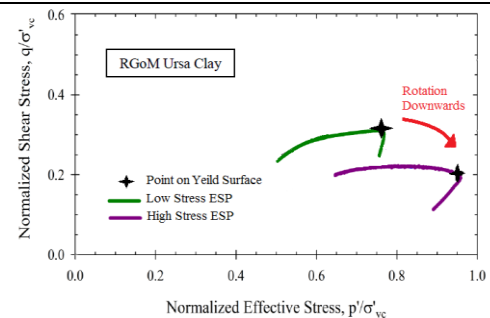3. Probe out in different directions to characterize the yield surface

Fig 2: Comparison of undrained stress paths for RGoM Ursa Clay following Ko compression at 1 and 10MPa.

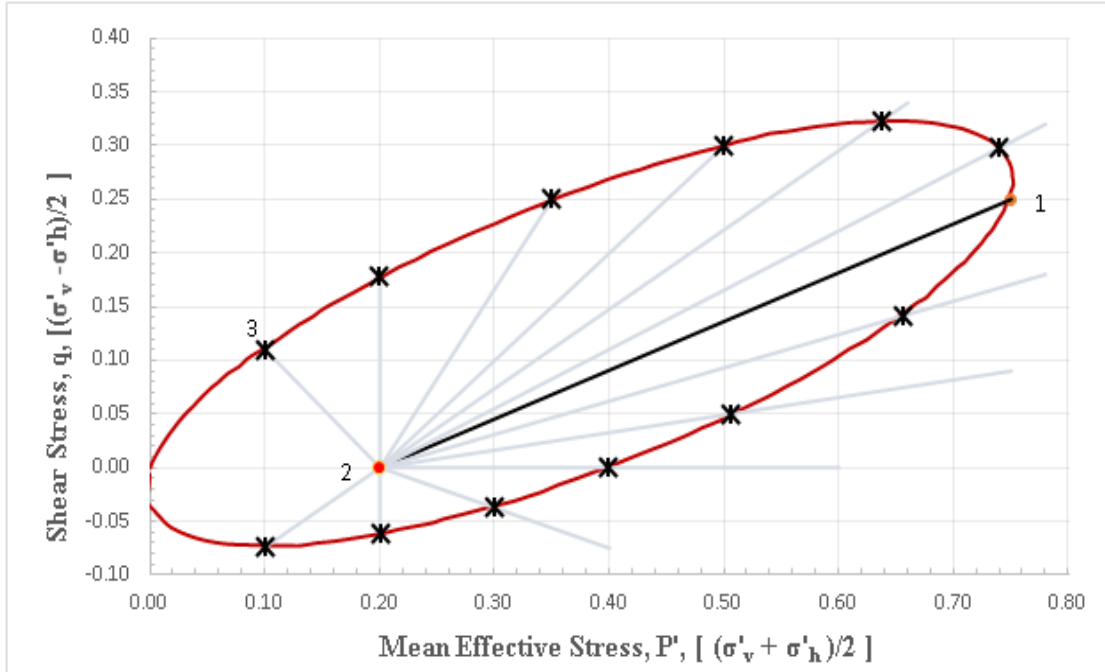These results imply that the yield surface is rotating downwardswith an increase in stress level. (Casey 2014)

Fig 1: Probing with 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
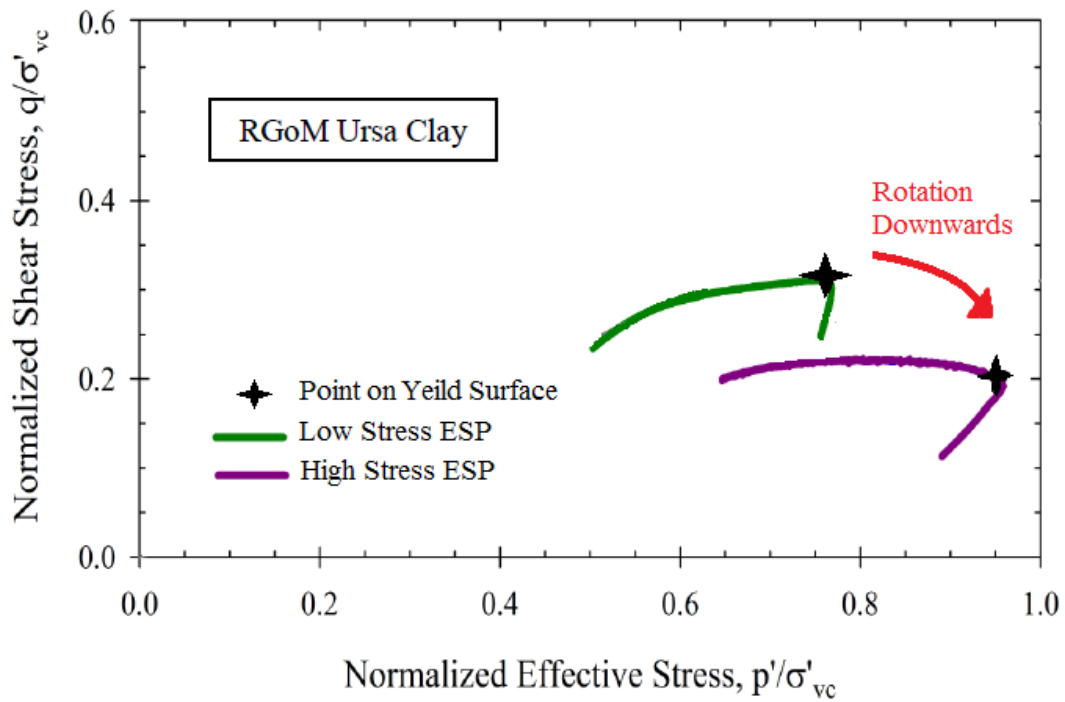

Fig 2: Comparison of undrained stress paths for RGoM Ursa Clay following Ko compression at 1 and 10MPa. These results imply that the yield surface is rotating downwardswith an increase in stress level. (Casey 2014)