08.18: 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. It is a contour that separates the stress state at which the soil is behaving elastically from where it is behaving plastically. I used the strain energy method to characterize the yield surface for resedimented mudrocks. Resedemented mudrock specimens were K_0 consolidated to 1MPa and then unloaded to an OCR of 2 (Fig.1). I carried out drained triaxial tests under varying loading conditions; to probe different directions (e.g. orange path, Fig. 1) and characterize the shape of the yield surface. I compared the cap of the interpreted yield surface to the undrained compression effective stress path. I then compared the interpreted yield surface to model formulations; such as MIT-E3 and MCC (Fig. 2). MIT-E3 captures the yield envelop rotation caused by the material anisotropy. The experimental results show large volumetric strain in lateral loading as compared to the MCC model.

Understanding this behavior provides an important foundation for numerical models and provides insight into the state of stress in the subsurface.

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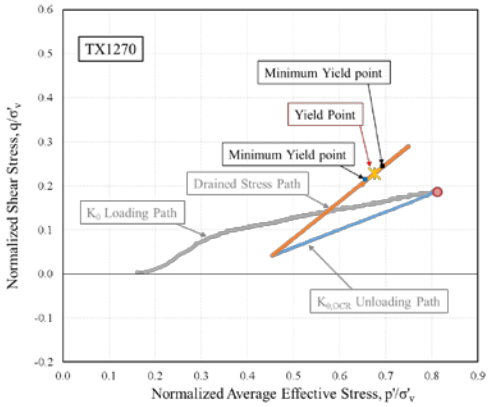


Fig 1: Typical K_0 consolidation, unloading and drained shear path.

1. Initially K_o Consolidate specimen to 1MPa (grey path)
2. Unload the specimen to a OCR of 2 (blue path)
3. Probe in different directions to characterize the yielding. (orange path)

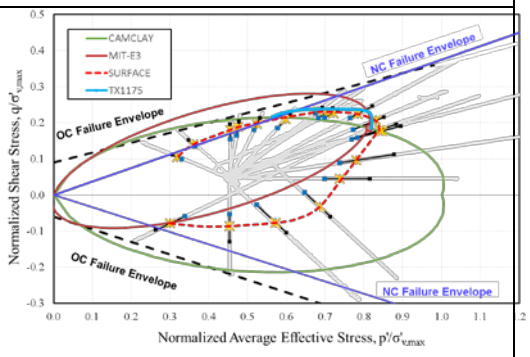
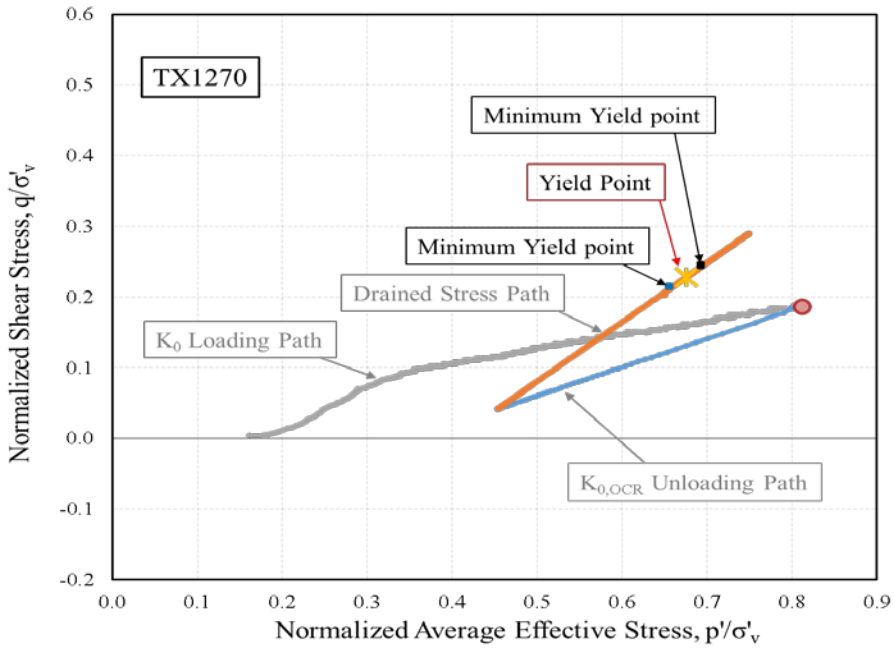


Fig 2: Interpreted RGOM-EI yield surface compared to model formulations.

1. Undrained stress path traces the cap of the yield surface
2. MCC is not accurately predicting the yield surface as it is not incorporating the effects of anisotropy
3. MIT-E3 is over predicting yielding on the compression side



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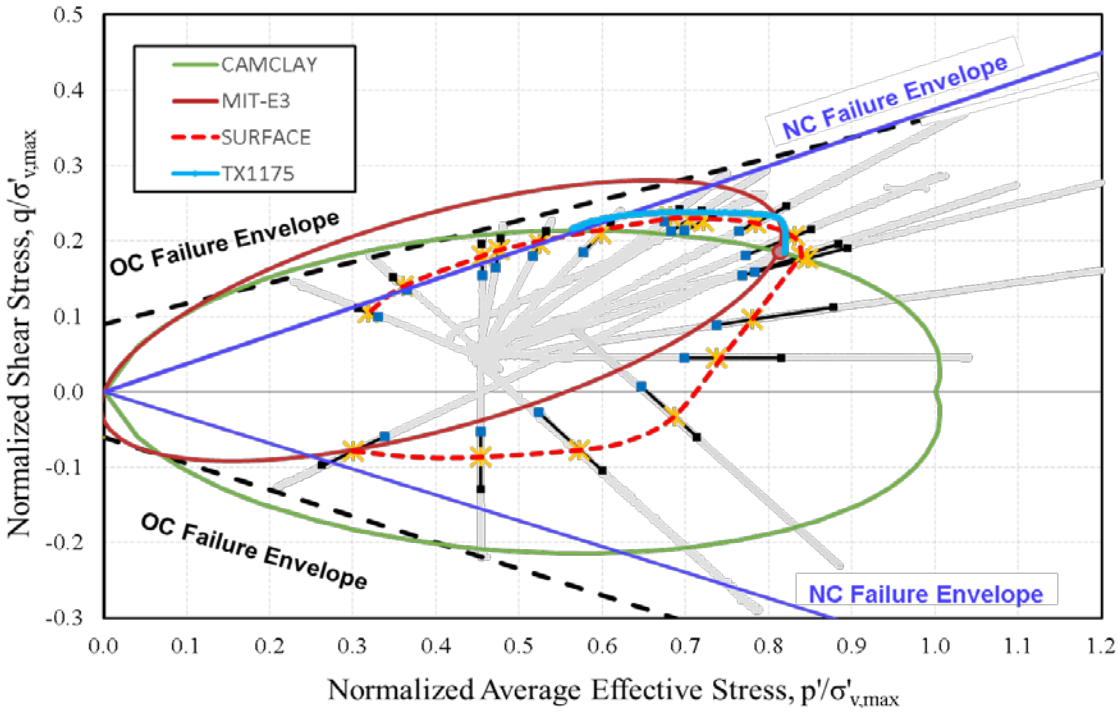

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