

## CEE 595F – Geotechnical Engineering Seminar

---

Friday, October 5, 2018 | 11:00 AM, Newmark Lab 3310

### *Ultrasonic Monitoring of Near Surface Hydraulic Fractures*

**Gabriel Mishaan**

M.S. Student, Geotechnical Engineering  
CEE at UIUC



#### **Abstract**

Ultrasonic wave measurements are a powerful tool in monitoring and understanding the physics of hydraulic fractures in rock and they can be used at both laboratory and field scales. Hydraulic fracturing experiments are carried out in granite blocks of different sizes that are loaded equally in two directions with no load applied along the third direction. The injection of glycerin-water mixture is performed at one-third specimen depth and geometrical asymmetry of the problem causes the hydraulic fractures to propagate in a curving manner towards the free surface of the block. Throughout the experiments, the fracture is monitored with time lapsed ultrasonic measurements with active sources from both compressional (P-wave) and shear wave (S-wave) transducers. As the hydraulic fracture propagates, it attenuates, reflects, and deflects the ultrasonic waves, and studying these interactions allows characterization of the fracture geometry. The results of ultrasonic measurements are compared to displacement measurements on the free surface of the blocks and to the analytical solution from a model that describes the geometry of penny-shaped hydraulic fractures and are shown to be in reasonable agreement.