An Investigation of Static and Dynamic Data using Multistage Triaxial Tests

Research Themes

This work is to develop an improved understanding of the relationship between static and dynamic data for a suite of four rock samples. “Static data” is the large strain (> 10^-3strain) measurement on unloading and reloading tri-axial stress path and “dynamic data” is the small strain (<10^-6) data acquired using standard acoustic velocity measurements techniques.

Recent Accomplishments

1. To our knowledge this is the first time a delineation of the separate mechanisms i.e. linear versus nonlinear effects in the static elastic moduli has been observed.

2. The unload-reload cycles are fit with a quadratic equation. M1(first order term) is equal to the modulus obtained from velocity data at small strains and M2 (hypermodulus, second order term) correlates with the total percent irrecoverable strains on both the unload and reload cycles.

3. A way forward has been proposed to predict irrecoverable strains using visual work (thin sections and micro-CT etc). Using these independent visual measurements and velocity data we can approximate the static data.

Issues

Static and dynamic data depend on very different mechanisms. Dynamic data depends mostly on contact modulus and follows Hertzian contact model. On the other hand the static data depends on cracks. With increasing axial load the dynamic modulus increases while static modulus decreases. Due to their very different behavior it is not trivial to get a standard correlation between them.

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