



A new module designed to study seismic attenuation in large displacement experimental faults

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Here we present and document progress on a new physical properties module (PPM), specifically designed to study attenuation in large displacement experimental faults in SHIVA. The PPM measures (1) longitudinal and transverse wavespeeds at ultrasonic frequencies with piezoelectric transducers (PZT), (2) attenuation (Q^{-1}) in extensional mode, and (3) Young's modulus at seismic frequencies (0.1 – 100 Hz), with load oscillations generated by a piezoelectric motor. The elastic properties will be measured during simulations of the seismic cycle, with a focus on the effects of changing shear stress levels and simulated seismic events. Data will be compared with results from seismological and geophysical studies. In addition the piezoelectric motor (up to 50 kN of thrust and 30 μm in displacement) may be used to generate (from s to ms in duration) variations in the applied normal stress. Such stress excitation, combined with the applied shear stress, may induce frictional instabilities and will allow the investigation of the existence of a magnitude-frequency dependent stress threshold for triggering earthquakes.