Integration of T-Rex Vibrator and PASSCAL Texan Recorders for Seismic Profiling of Shallow and Deep Crustal Targets
Sedimentary Basin Vibroseis Data

- Surprise Valley/Warner Range
  - east-dipping, high-angle normal fault
  - young (<5 Ma), large offset (~2 km)
  - Holocene slip, geothermal exp., mud volcanoes

- 60,000 lb tri-axial (Trex) vibrator provided by the Network for Earthquake Engineering Simulation (NEES)
Surprise Valley reflection profiling (cont.)

Shaded relief map of Surprise Valley
Surprise Valley reflection profiling (cont.)

Views along “High-Resolution” phase of experiment: Fortynine Lane

Photo: S.L. Klemperer
Surprise Valley reflection profiling (cont.)

T-Rex baseplate and mass

Photo: S.L. Klemperer
Surprise Valley reflection profiling (cont.)

Teeth marks from baseplate

Photo: S.L. Klemperer
Surprise Valley reflection profiling (cont.)

T-Rex with plywood pad on baseplate to protect asphalt
Surprise Valley reflection profiling (cont.)

1 60,000 lb vibrator
8 hours/day
= 90 gallons of diesel/day
Surprise Valley reflection profiling results
Surprise Valley reflection profiling results

Processing software: ProMAX
Deep crustal refraction/reflection profiling

NEES “T-Rex” vibrator in the northern Black Rock Range

Photo: S.L. Klemperer
Deep crustal refraction/reflection profiling

Best source gather from crustal profile. Coherent arrivals visible to offsets of ~20 km, with discontinuous energy visible to ~50 km. Wide gray line represents Moho travel time calculated from the Lerch et al. (2007) wide-angle velocity model. Gather produced by stacking ten coincident sweeps, applying a bandpass filter (4-6-36-42 Hz), and performing a predictive deconvolution.
Conclusions

- T-Rex offers a viable source for upper crustal imaging and velocity modeling.
- Mid-to-lower-crustal targets may be out of reach for T-Rex in single-vibrator work.
- In addition to standard P-wave velocity modeling, the S-wave capability of the T-Rex vibrator may have applications for those interested in shallow targets such as constraining the $V_s$ structure of basins for earthquake hazard assessment.
END