Direct-Push Crosshole (DPCH) Testing for High-Resolution Vp and Vs Subsurface Profiling

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Longhorns

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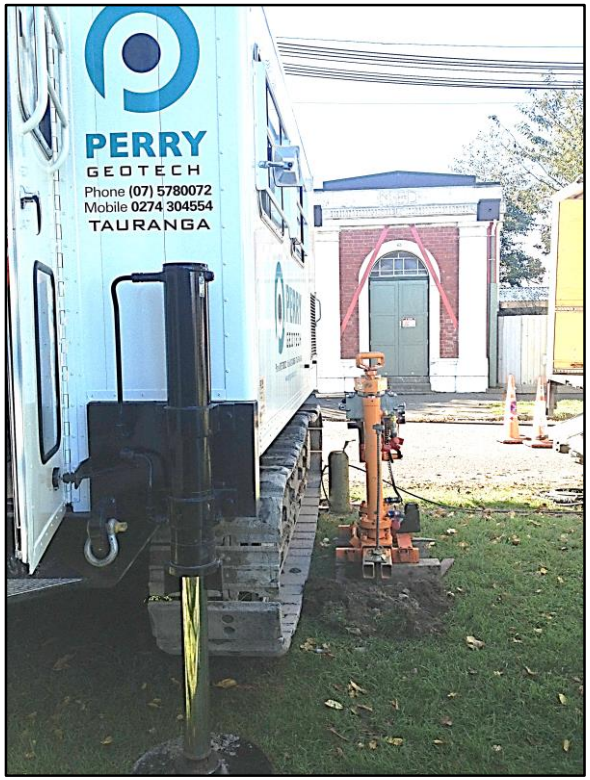
Direct-Push Crosshole Overview

- Push two seismic cones ~ 0.75 – 2.0 m apart
- Propagate compression (P) and shear (S) waves between the cones
- Measurements at 20 – 50 cm depth intervals
- High-resolution measurements of Vp and Vs down to at least 20 m depth
- Vp measurements used to find depth to 100% saturation (Vp > 1500 m/s)
- Can test native soil and improved ground

Direct-push Crosshole Equipment



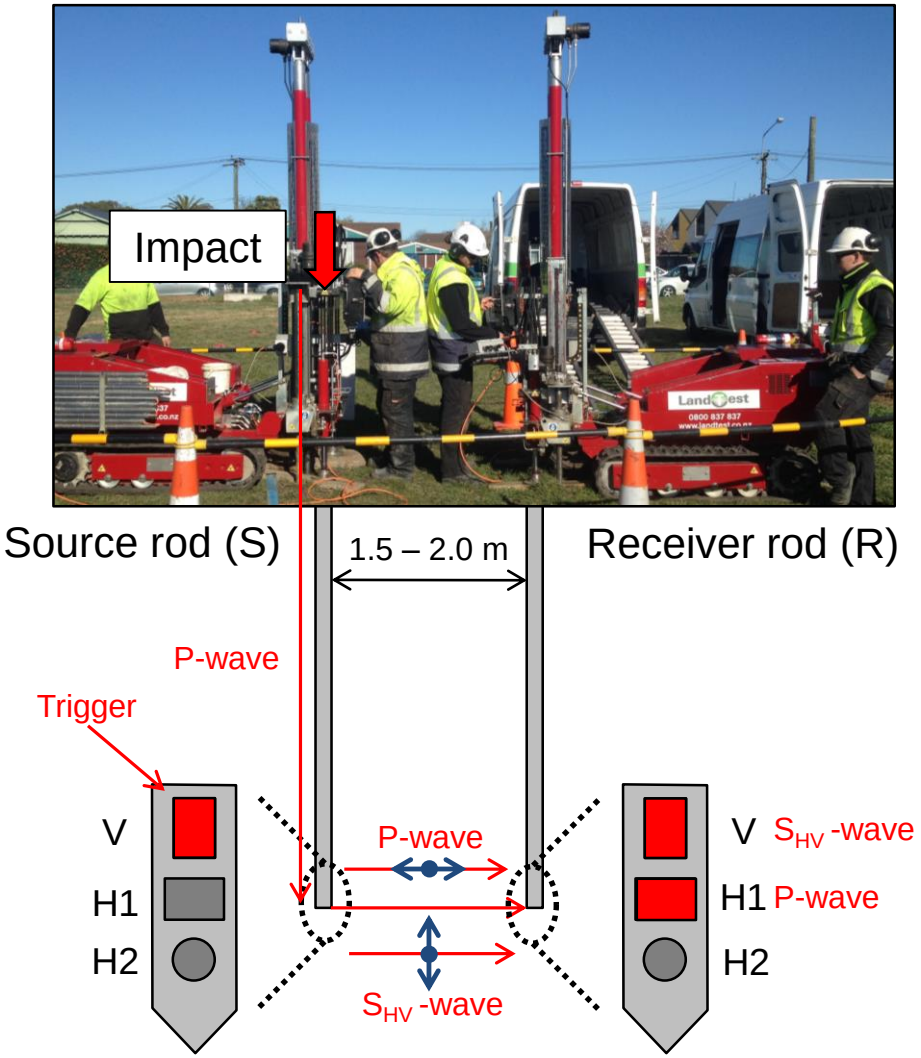
Full-sized track-mounted CPT rig and portable CPT actuator

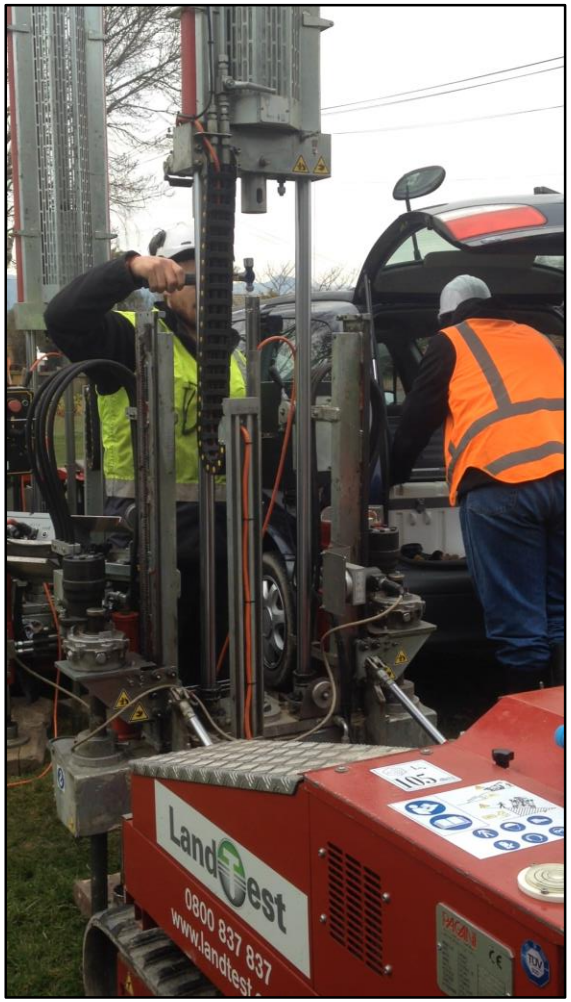
Standard Seismic CPT Cone

Pagani track-mounted CPT rigs

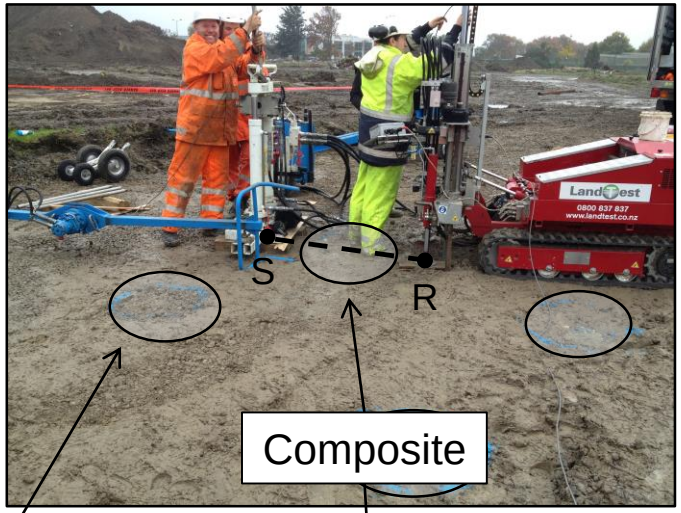
Custom Built Cones:
3 x orthogonal geophones
1 x triaxial MEMS accelerometer

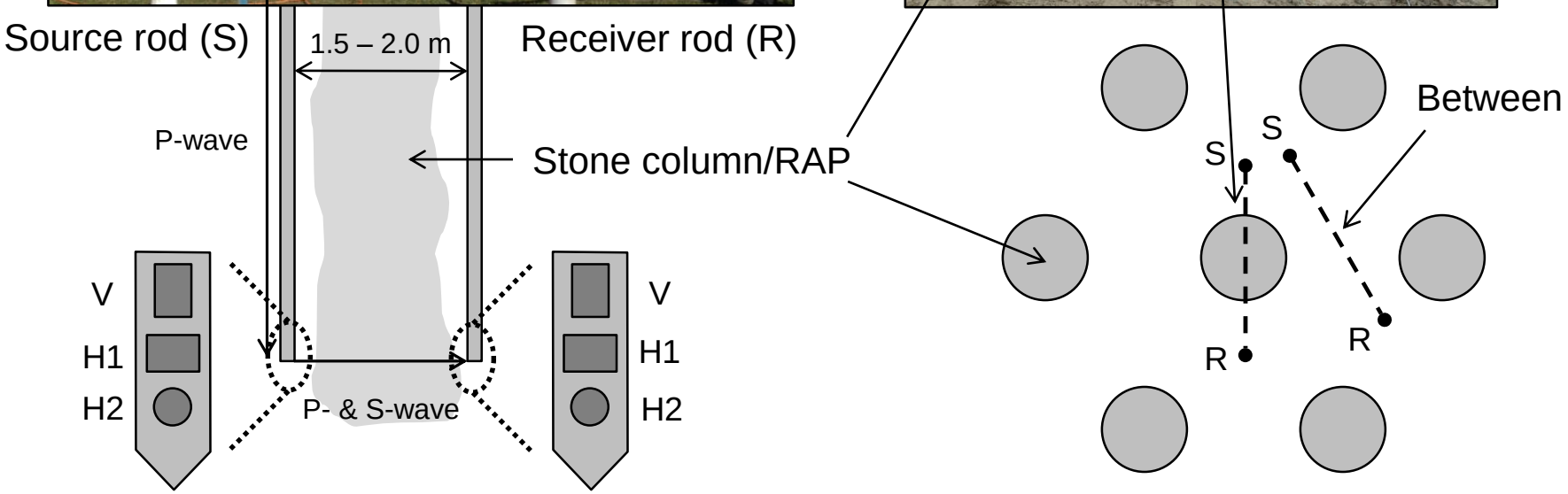
Direct-push Crosshole (DPCH) Setup



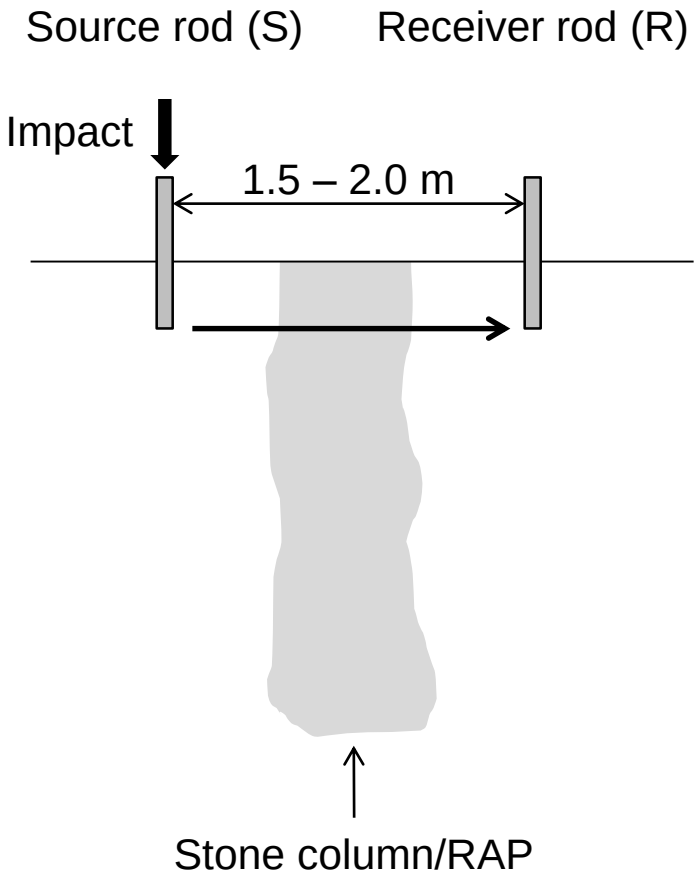


DPCH for Ground Improvement

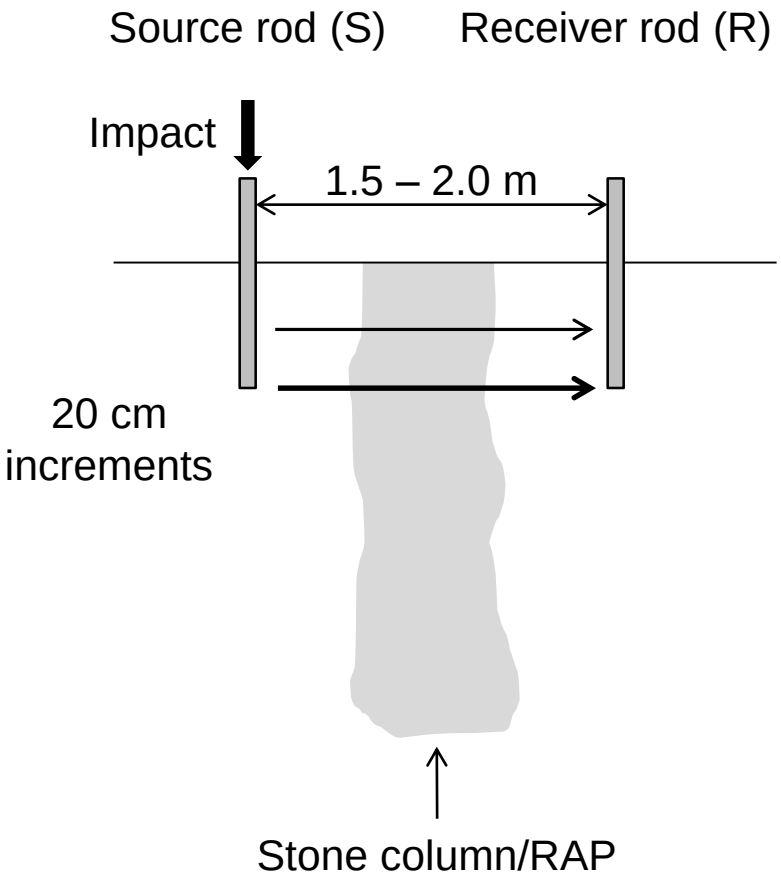




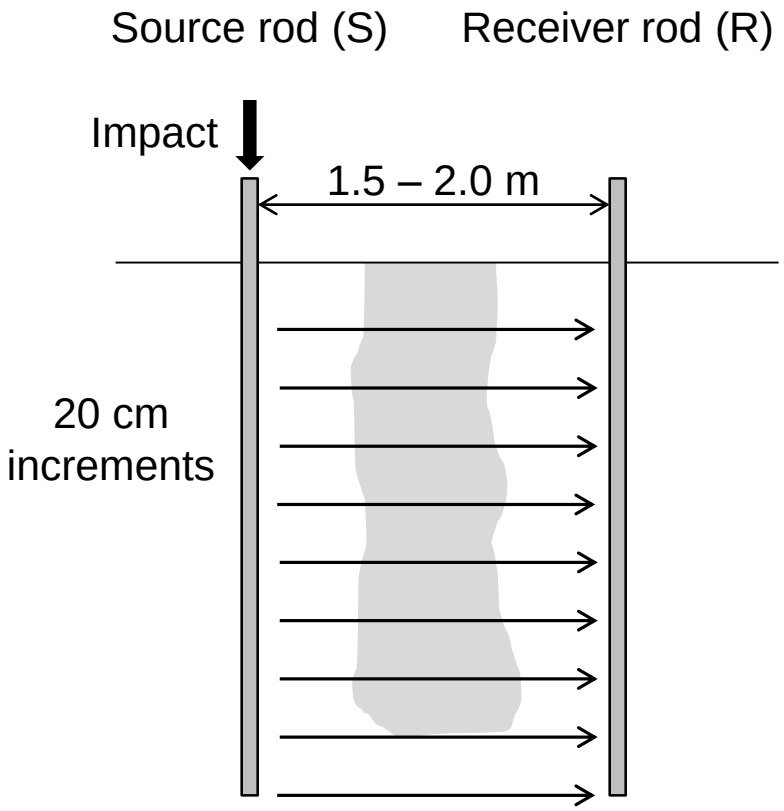
DPCH for Ground Improvement cont…



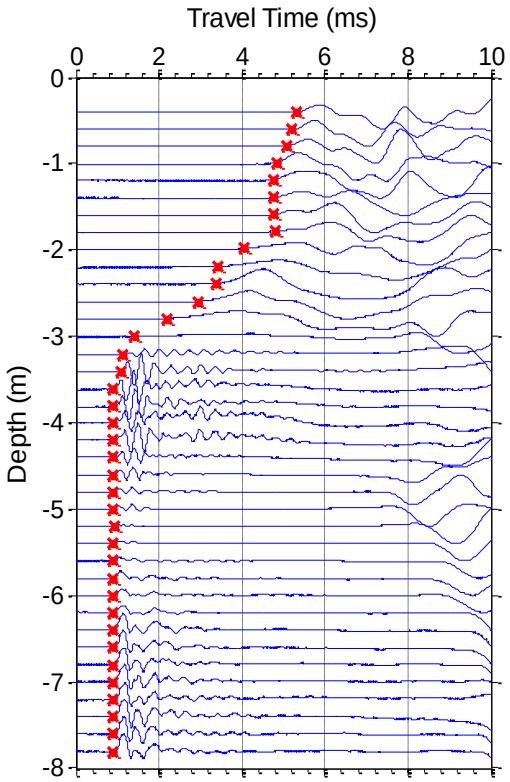
DPCH for Ground Improvement cont…



DPCH for Vp and Vs

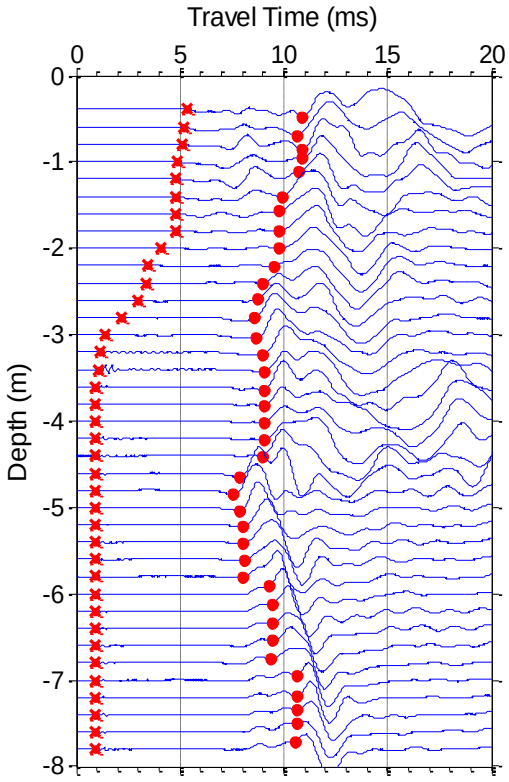


P–wave Arrivals



In-line horizontal geophone

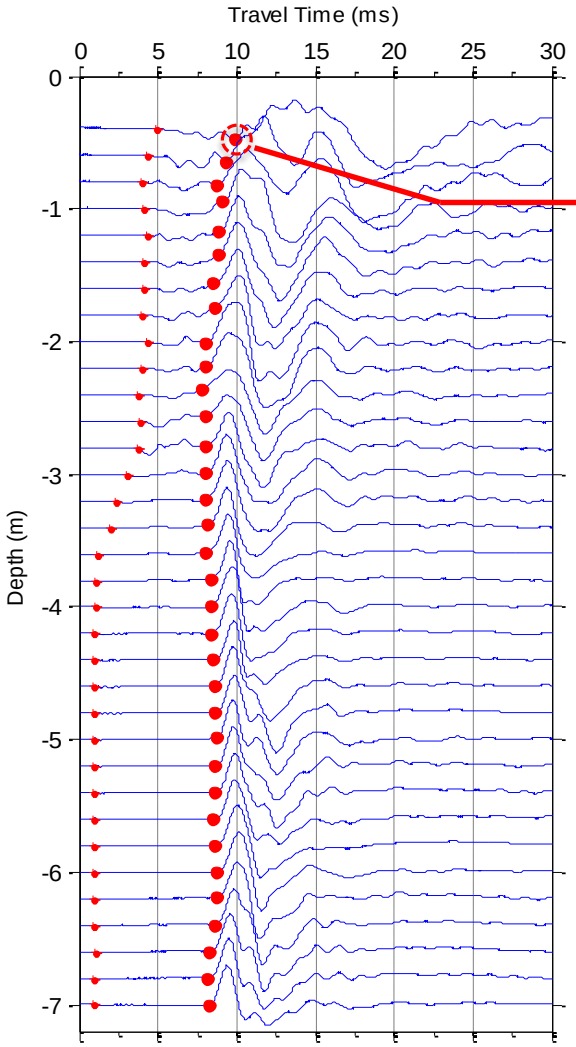
S_{HV} –wave Arrivals



Vertical geophone

S_{HV} –wave arrivals complicated by refracted waves or non-direct travel paths

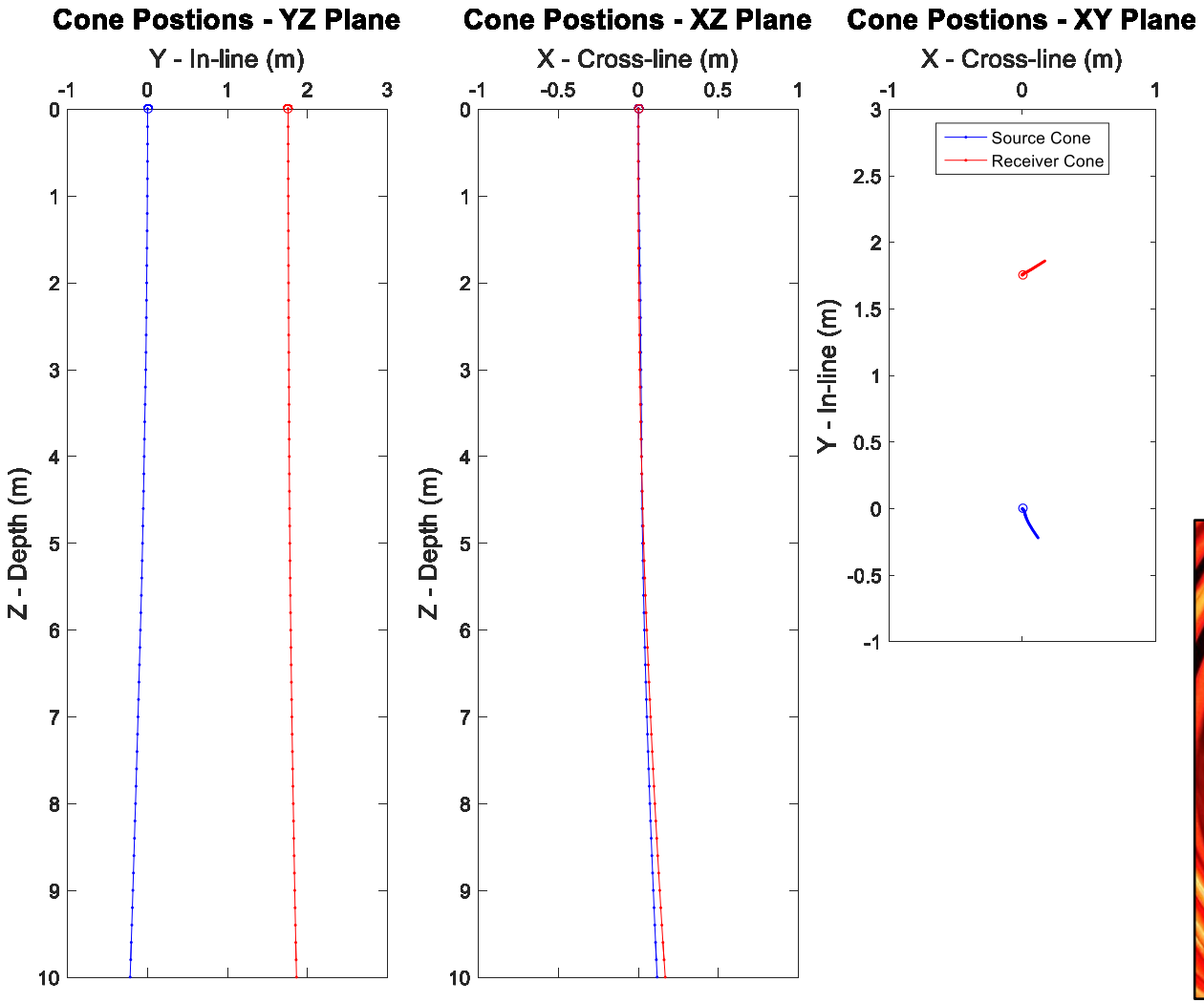
DPCH Trigger Calibration



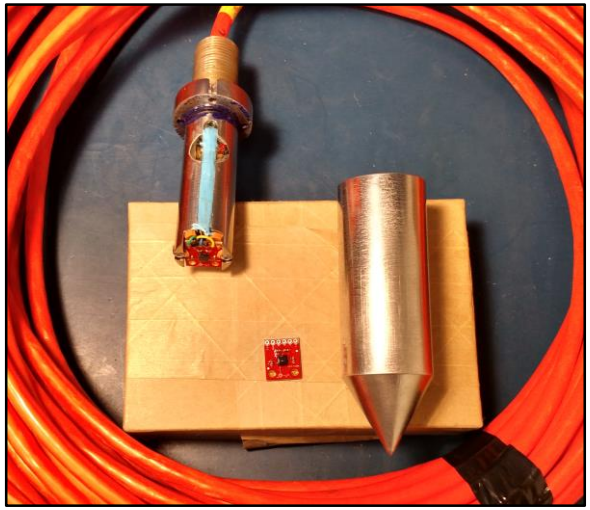
$$t_C = t_{Raw} + t_T$$

$$V = Dist. / t_C$$

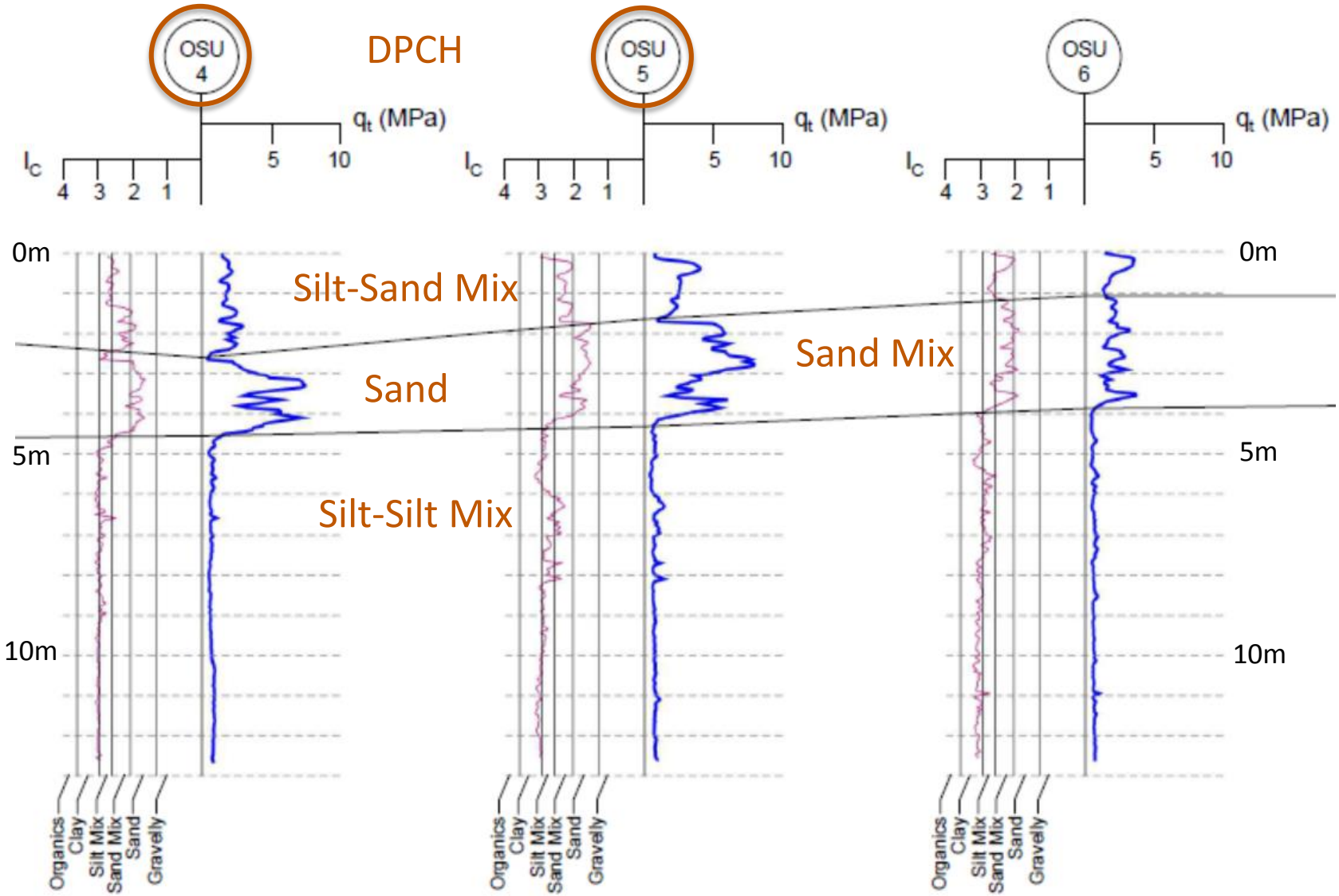
DPCH Distance Calculation



Triaxial MEMS accelerometer for tilt and position calculations

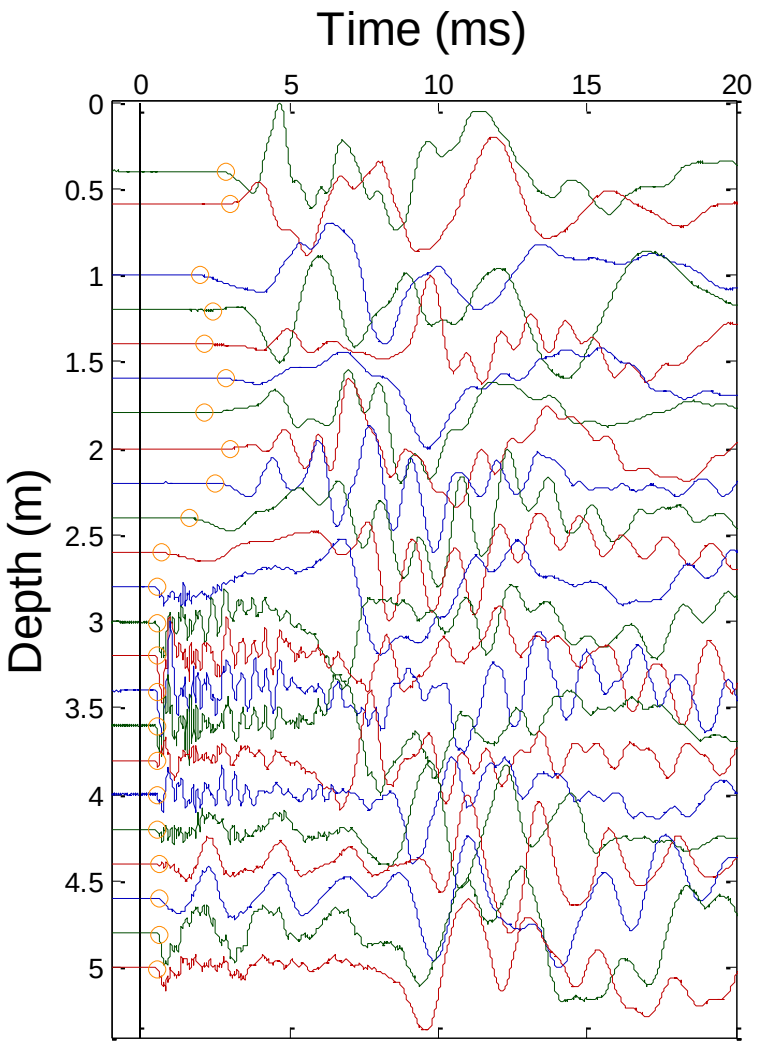


DPCH at Port of Longview

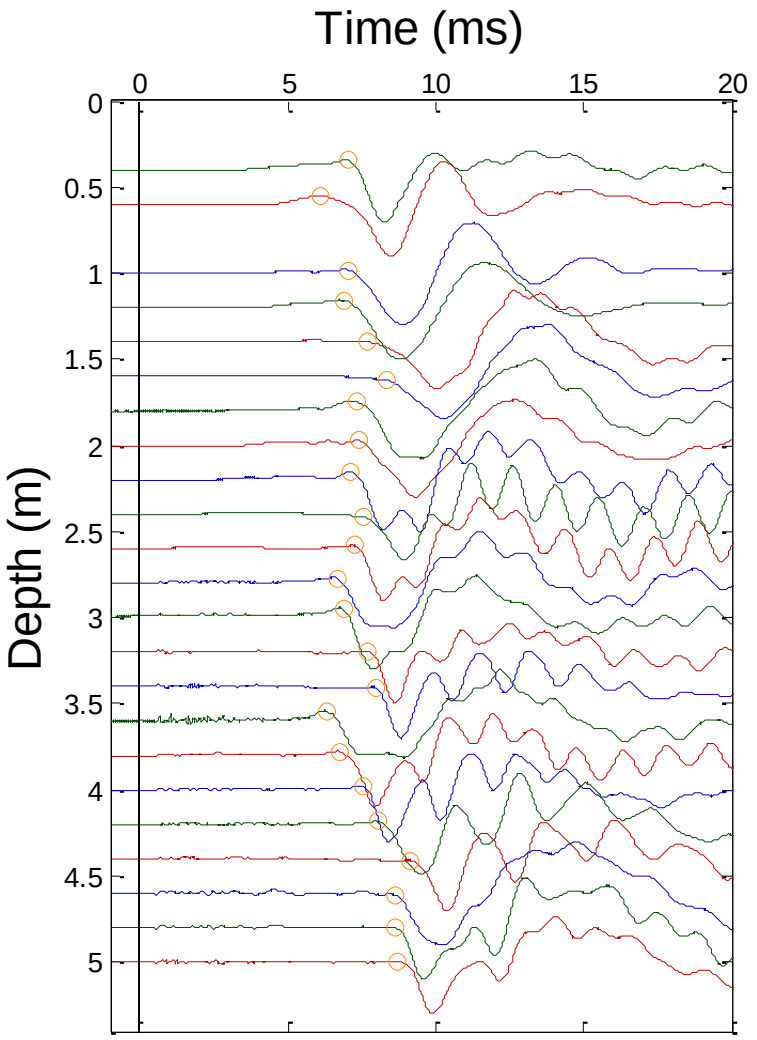


DPCH Waveforms: OSU-5

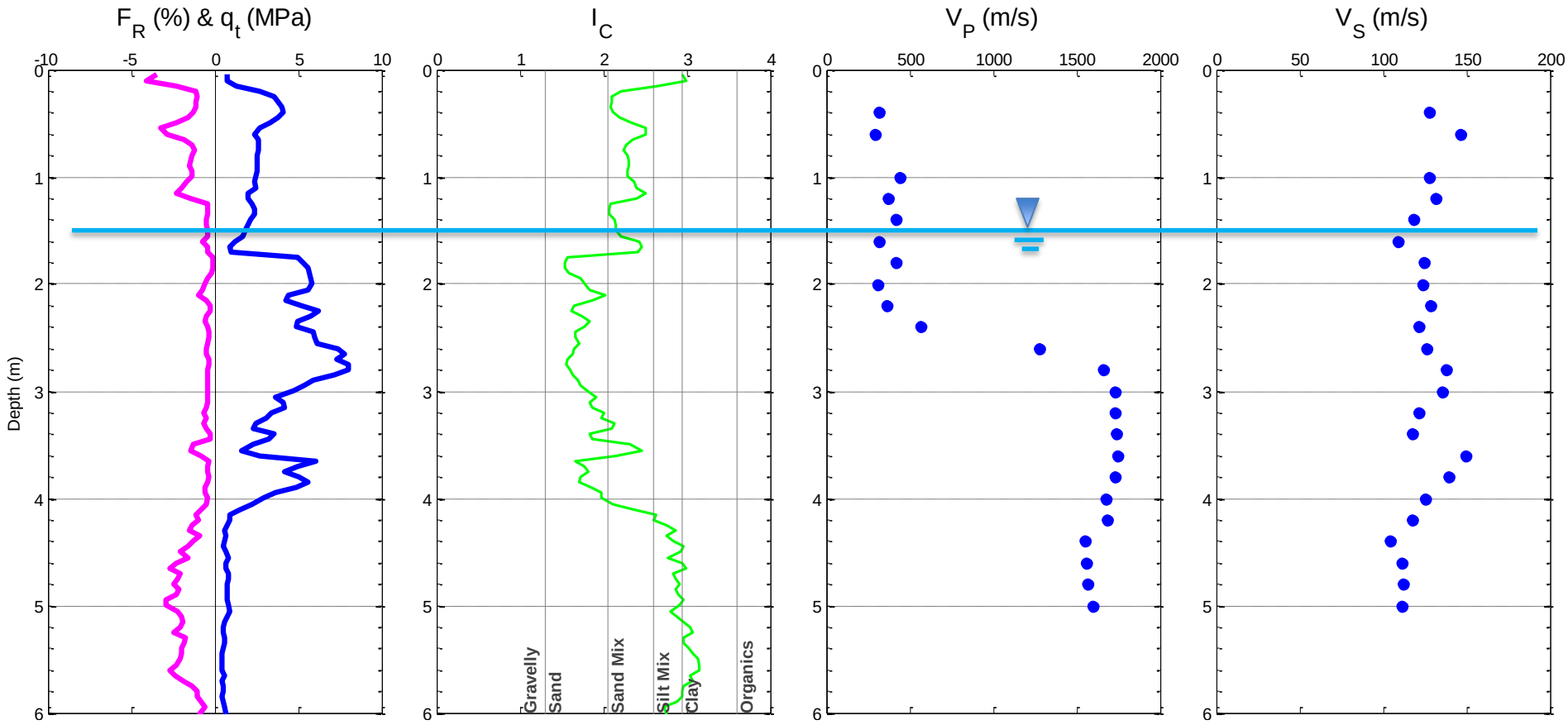
XH P-Wave - Receiver Cone



XH S-Wave - Receiver Cone



DPCH Results: OSU-5



Questions?