EMSP Project 70108: Effects of Fluid Distribution on Measured Geophysical Properties for Partially Saturated, Shallow Subsurface Conditions

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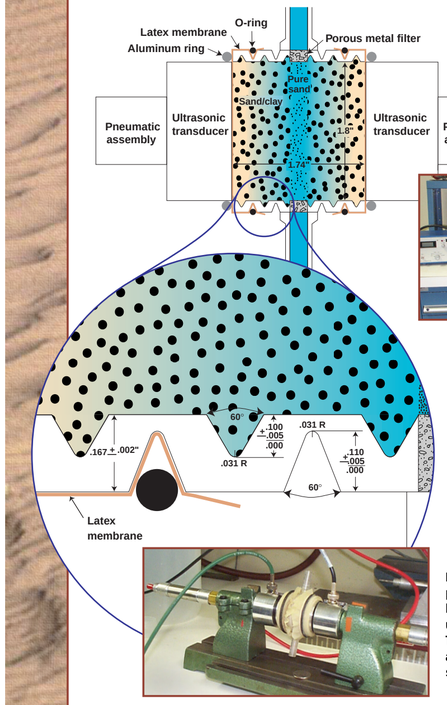
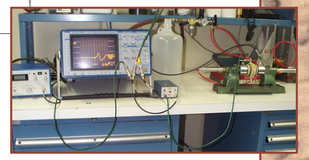
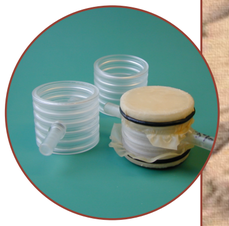


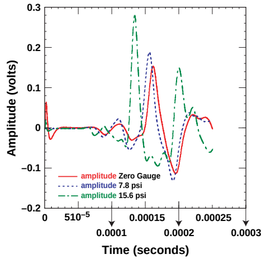
Conventional ultrasonic pulse transmission system (heavily damped commercial NDT transducers; 500 kHz, polarized for shear)





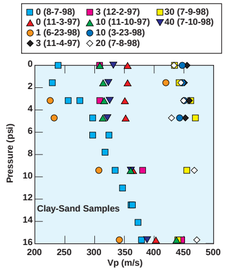
Plexiglass sample containers provide over 100 db insertion loss to control leakage of ultrasound past the sample. The long tortuous path increases attenuation and the minimal cross section acts as a high pass filter.

10% Na-Montmorillonite Clay with F-50 Ottawa Sand - Dry

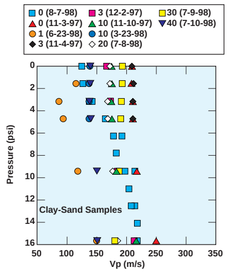


Waveforms change dramatically as load is increased, consistent with diminishing compressional and shear attenuation.

Vp Laboratory Data

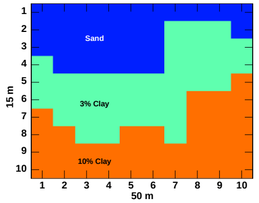


Vs Laboratory Data



Realistic Field Model of Sand-Clay Sediment Distributions

Model 1

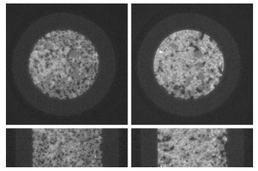


This shows the Model 1 area of study. This synthetic model is based on an actual field site at the Stetten Test Site landfill in Switzerland *(Green et al.,*

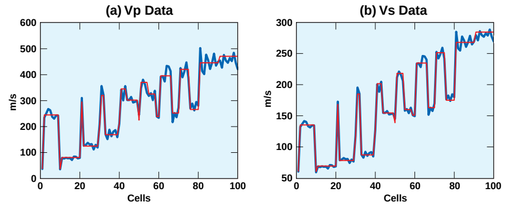
X-ray tomographic slices through partially-saturated sand sample

Multi-step outflow, 7 psi suction (~490 cm)

Drained 0.22 cc | Drained 0.16 cc

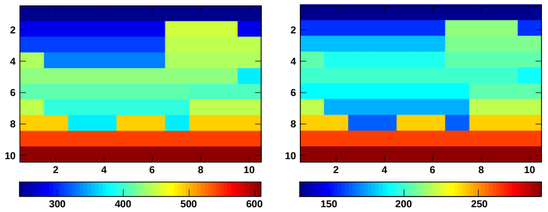


Vp Vs Synthetic Data with Noise for Model 1

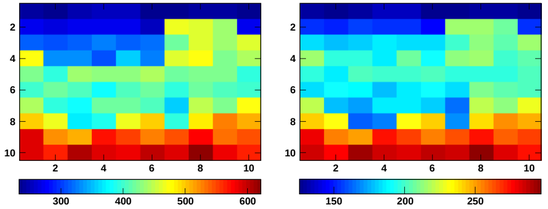


The polynomial fits to the lab data were used to generate the synthetic velocity model. 1-d representation of the Vp velocity distribution over the 100 cells in the grid. The thin red line indicates the true velocity distribution. The thick blue line indicates noisy synthetically-generated data to be used as the field velocity observations.

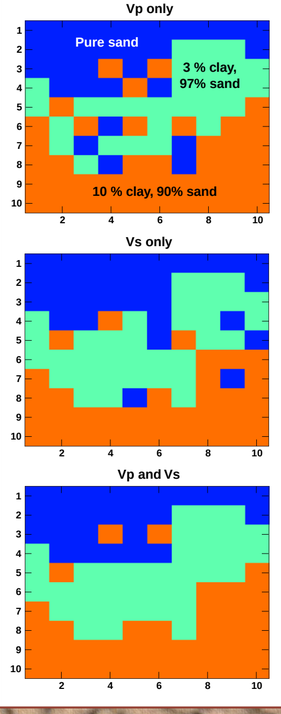
True velocities for Model 1



Synthetic Noisy Velocities for Model 1: "Field Data"



Model 1 Reconstruction Results



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