

Project 2 Hydrogeophysics in Volcanic Environments:

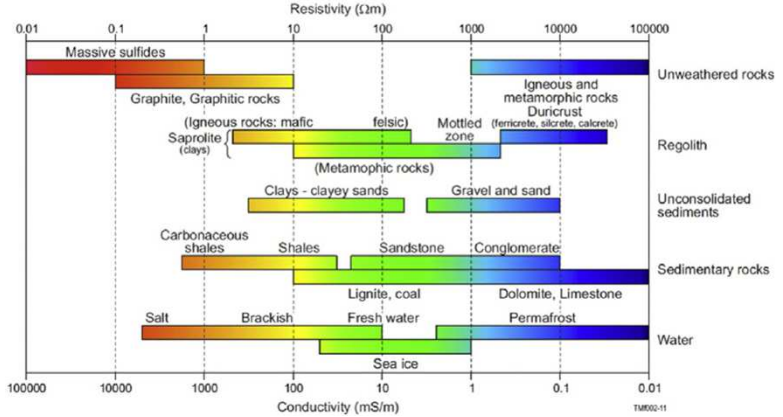
A multi-geophysical study of an old stream valley at Kaiwi Coast (O'ahu, Hawai'i), using **ambient noise surface wave tomography, Electrical Resistivity Tomography(coupled with induced polarization)** and **self-potential data**



Integrating geophysics

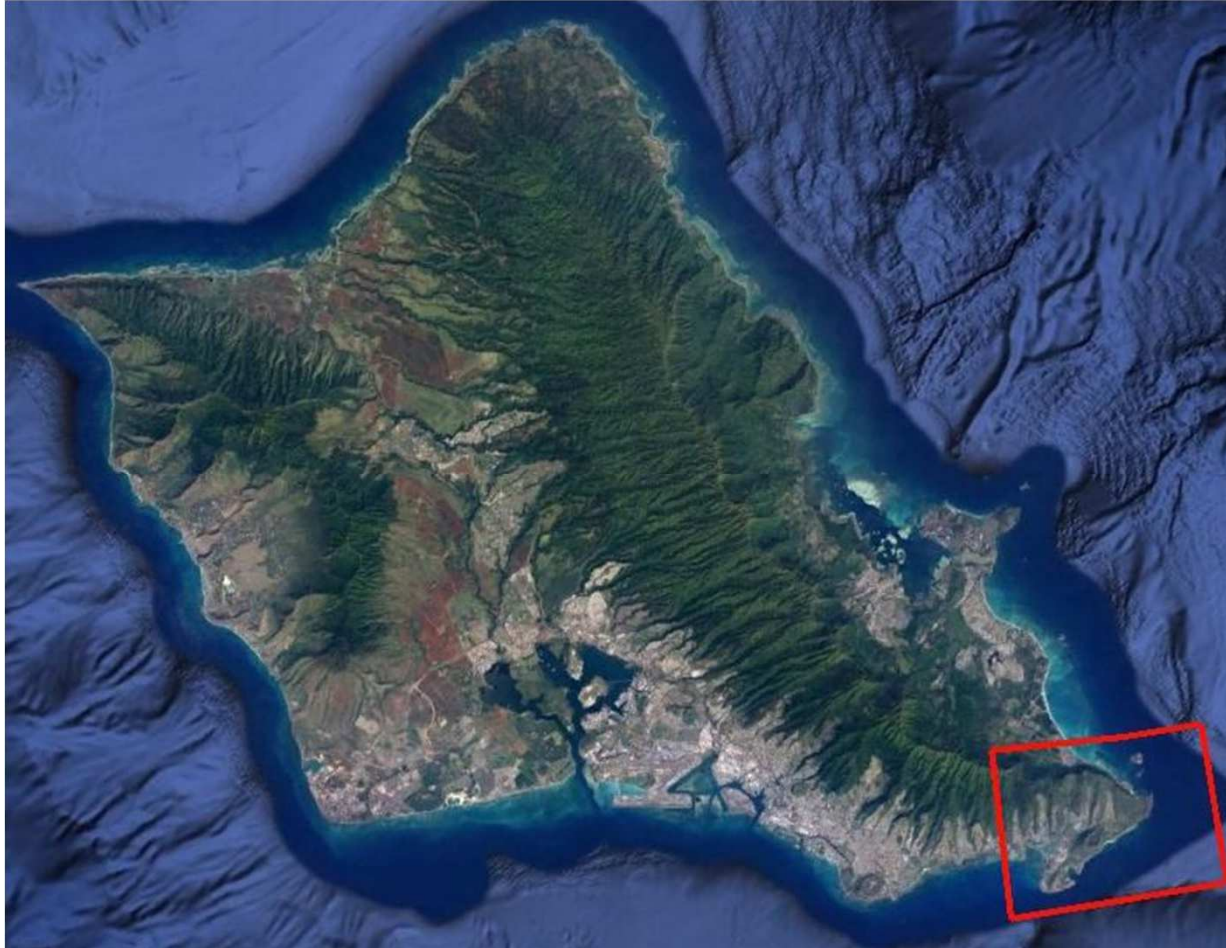
- SP surveys → electrical potential anomalies → relative wet/dry areas
- ERT/IP surveys → resistivity & conductivity distribution → type of medium
- Seismic surveys → velocity structure → geology

Three methods can help us constrain what type of rock and what the water levels are beneath the subsurface we can use this information to constrain the parameter we are inverting for, such as conductivity zones in this example.



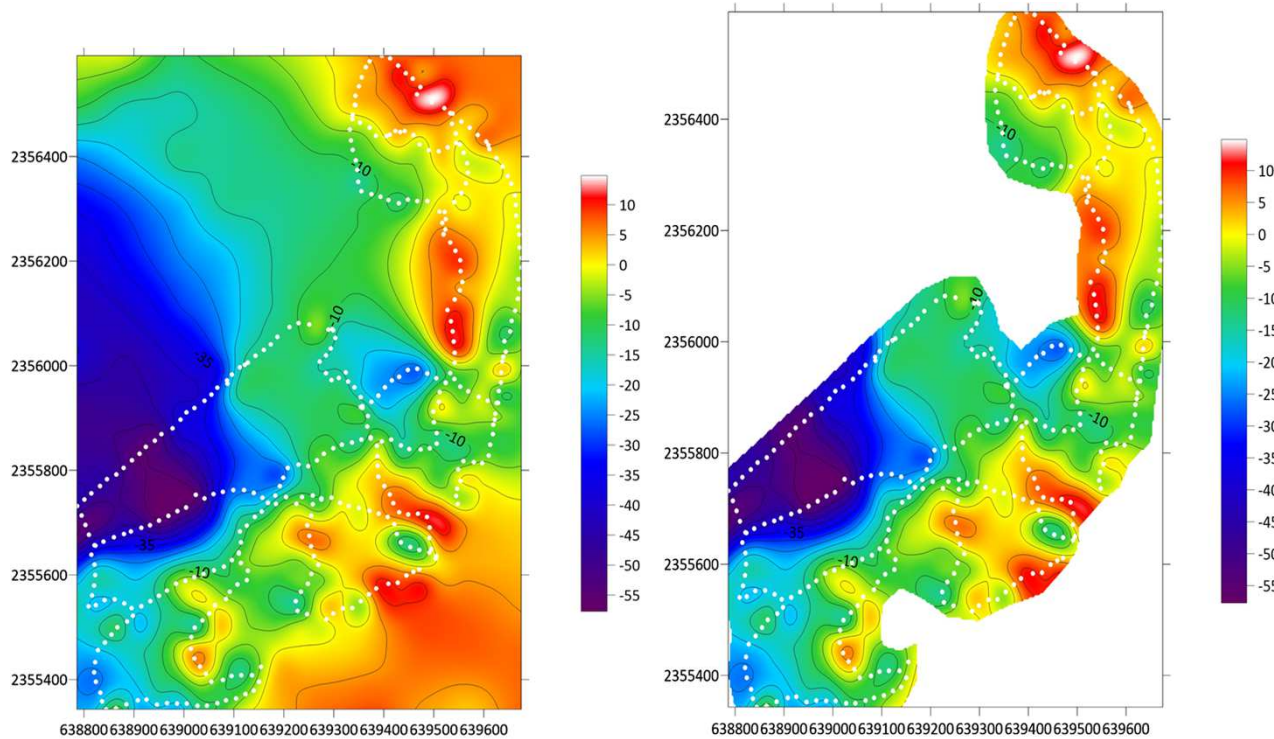
University of British Columbia Geophysics foundations

Field Site: Kaiwi Coast



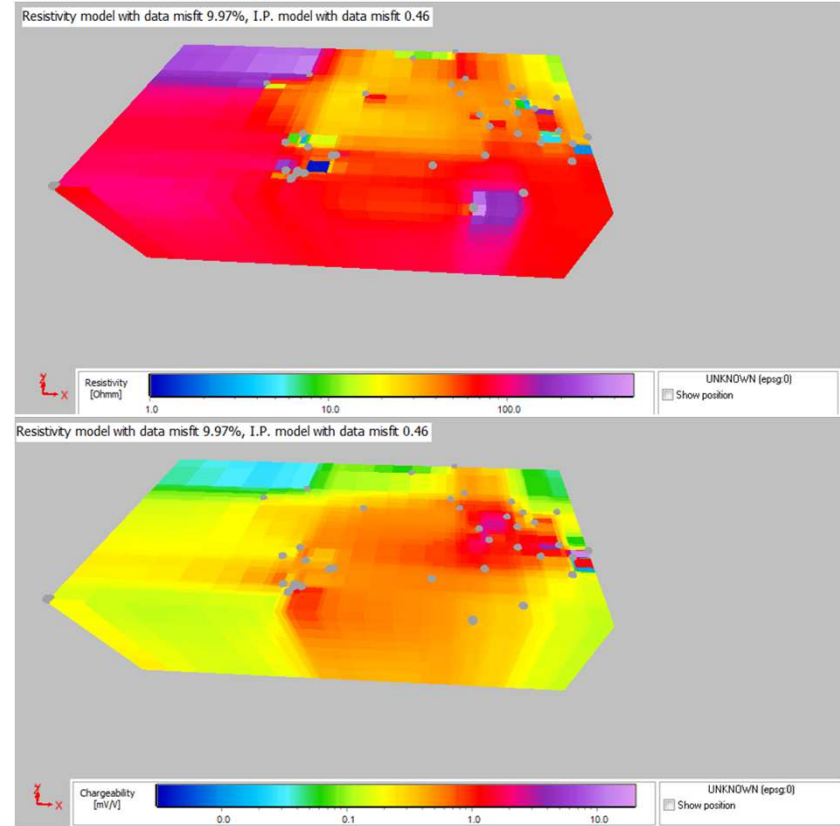
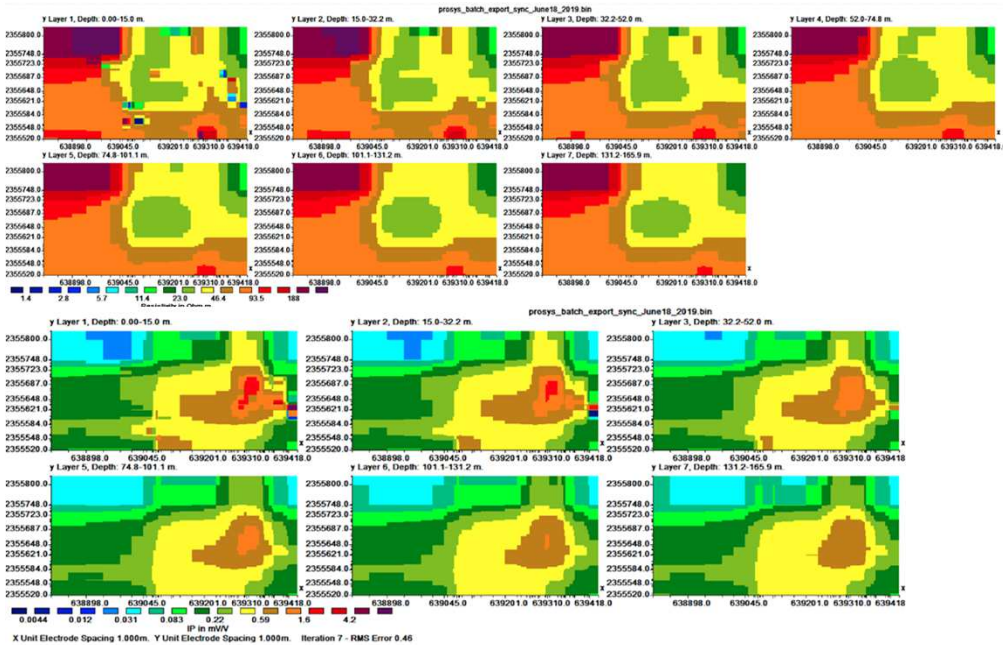
- SouthEast of Oahu island

Self-Potential Data



- Values are in millivolts with ocean as reference of 0 mV.
- Positive and negative signs do not have physical meaning but the contrast between the values means the flow path but no indication on direction.
- Need more evidence, such as geological setting, topography to find relative wet/dry areas.

ERT/IP Results

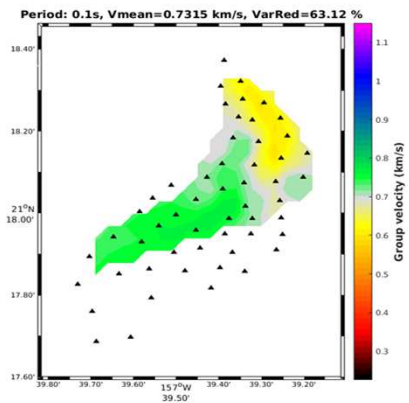


- Depth slice on left; inversion 3-D cube on right.
- low-resistivity feature in the center, possibly clay rich zone.
- Upper left region corresponds to streambed we observed in the field site, and central region contains saltier groundwater.

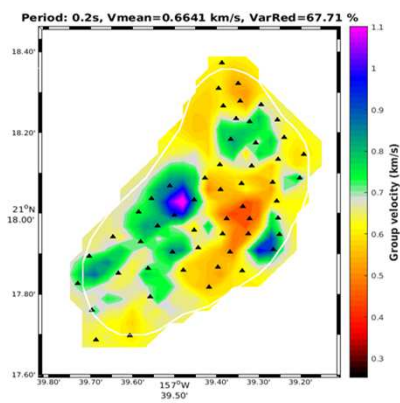


Seismic Results

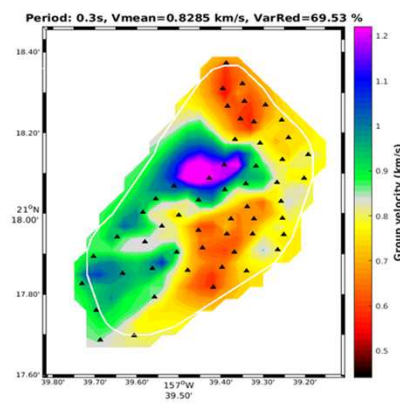
- 29 1-D (vertical measurement)
- 25 3-D (3 direction measurement)
- Total stations:54



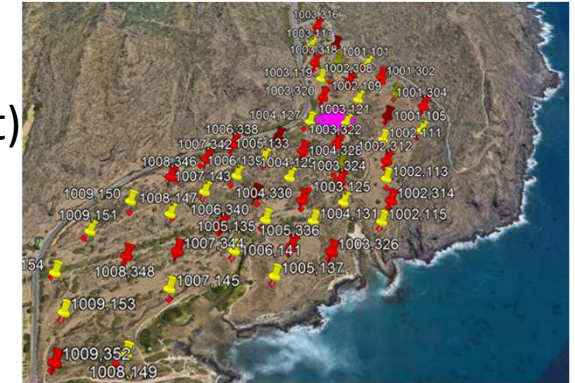
$\cong 24.4$ m



$\cong 44.3$ m

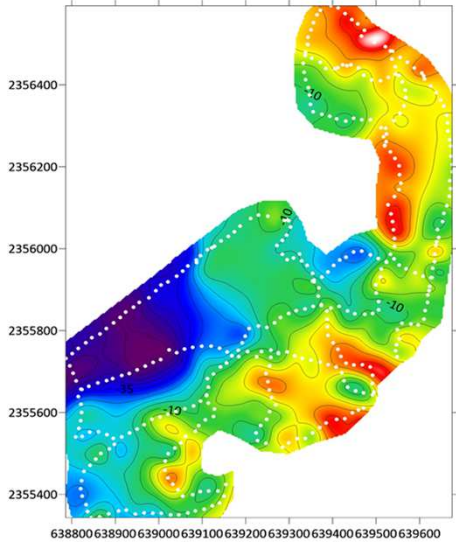


$\cong 82.9$ m

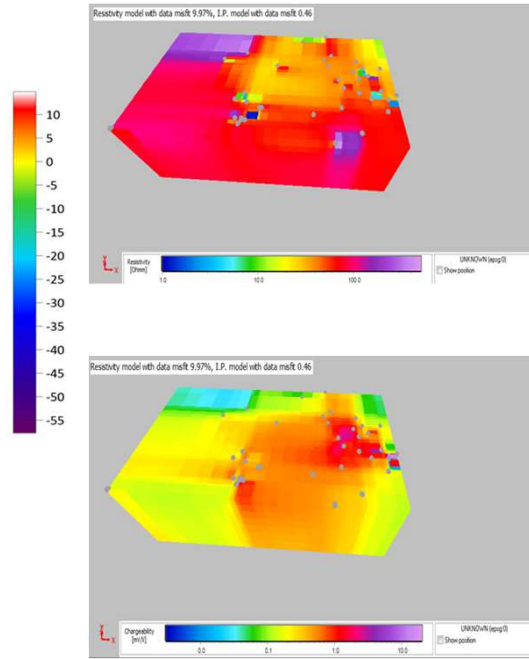


- High velocity is shown in purple and blue
- The faster the group velocity indicates the older the rock is.
- Lower velocity groups can be interpreted as unconsolidated new material or high fluid content.

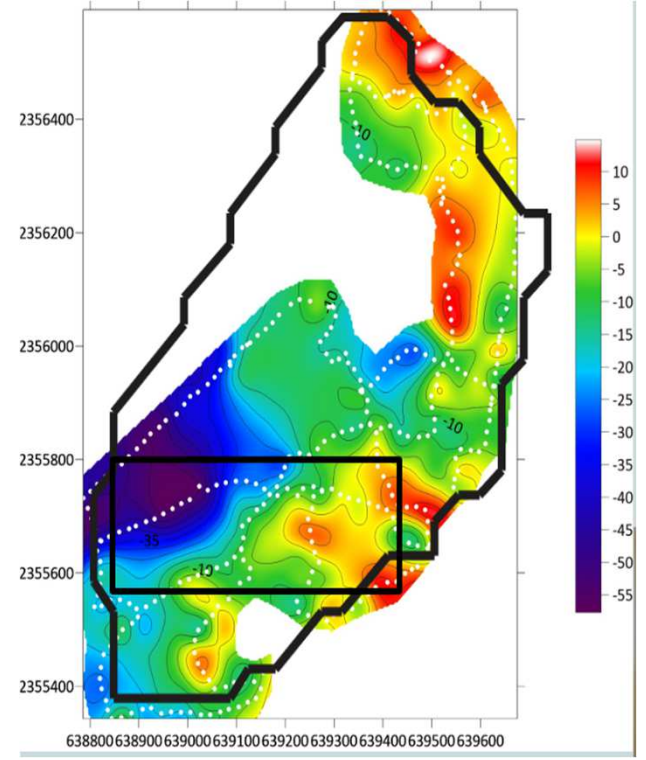
SP



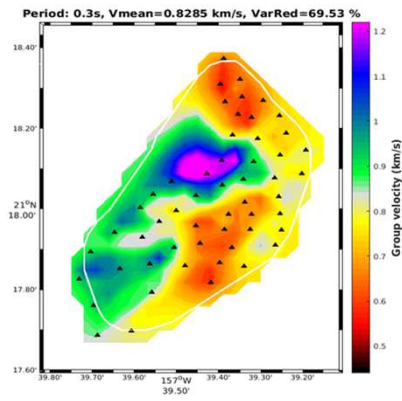
ERT/IP



Integrated Results



Seismic



Green to purple is high group velocity such as basalt and yellow to red is low group velocity which shows less consolidated, newer sediment i.e sand or clay. This does not totally fit with our interpretation from the ERT SP and IP but we do see similar relative high and low structures