Analysis of Well and Fault Modeling in Comparison to Seismic Data for Characterization of an Enhanced Geothermal System

Hayden Powers[1], Whitney J. Trainor-Guitton[1], Samir Jreij[1], Antoine Guitton[1], PoroTomo Team[2]
[1] Colorado School of Mines, Golden, CO
[2] www.geoscience.wisc.edu/geoscience/people/faculty/feigl/porotomo

Introduction

- The goal of this research is to analyze the correlation between well logs, fault densities, and seismic data to better understand the Brady's (Fernley, NV) geothermal system
- Specifically, this project aims to model the faulting and lithology to understand the water flow through the system.

Overview of the Faulting at the Geothermal System

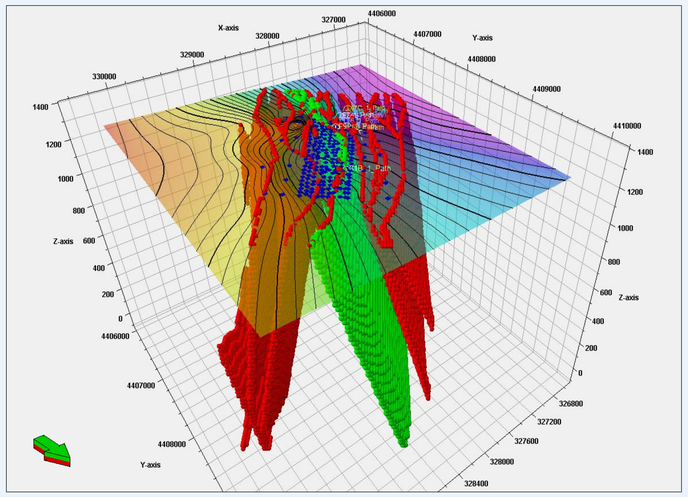

Figure 1: Shows the faulting planes in red and green. The green plane is one modeled in Figure 2. The geophone locations are show as the blue diamonds. The contour lines show elevation changes in 2.5m increments.

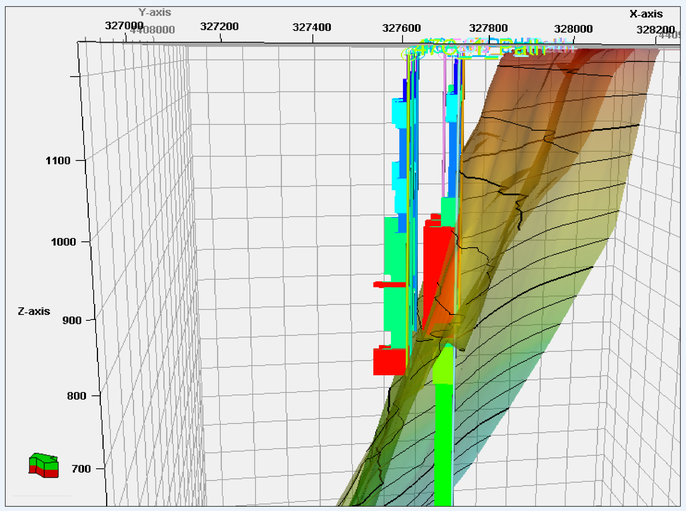

Figure 2: Shows an are of interest where the well logs are located. The faulting plane shown is created from the green faulting plane in Figure 1, and displays how the lithology changes.

Cross Section View of the Well Lithology

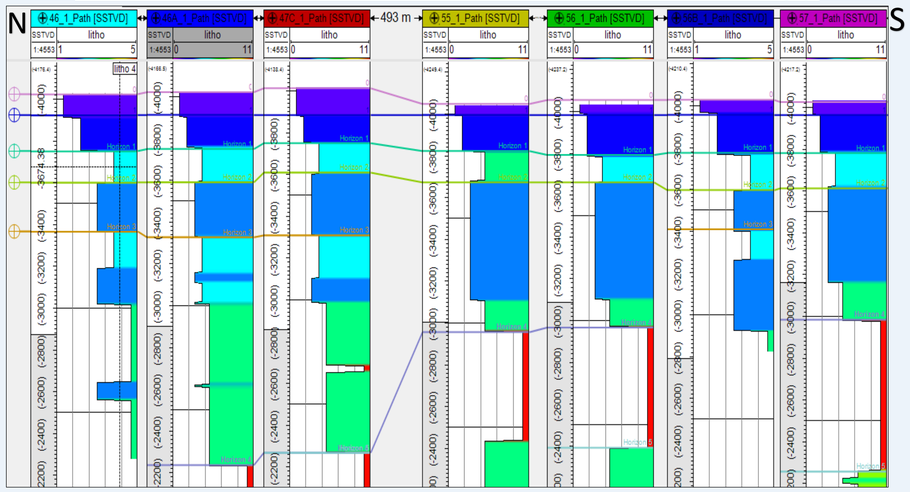

Figure 3: A cross section created from the well logs near the survey. This cross section lies North-South through the wells. Horizon 4 shows a faulting feature, supported by Figure 2.

Lithology	Description
Qfo	Old alluvial fan deposits, early to middle Pleistocene
Qfi	Intermediate age alluvial fan deposits, late Pleistocene
Qfw	Subaerial deposits of the Wyemaha alloformation, late Pleistocene
Qaytu	Young fan alluvium with massive lithoid tufa deposits
Qfy2	Young alluvial fan deposits, latest Pleistocene to early Holocene
Qfy1	Young alluvial fan deposits, middle to late Holocene
Qfy	Young alluvial fan deposits, undivided
Qa	Alluvial deposits of recently active washes, late Holocene
Qx	Disturbed areas, undivided
Qm	Mine waste

Table 1: This a legend for all of the geology shown in Figures 1-3.

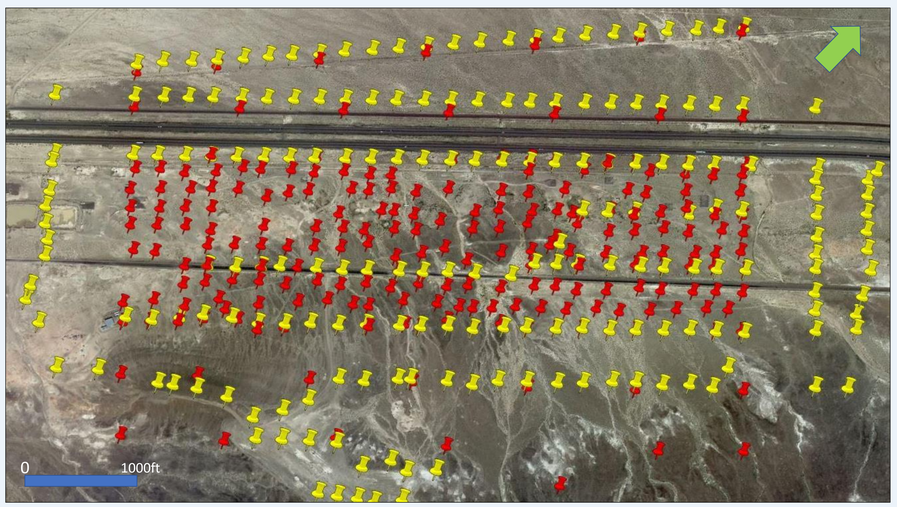

Figure 4: Shows all of the shot (Yellow) and receiver (Red) locations used to create the migrated volume shown in Figure 5. The spacing varies across the survey, and the shots are much more spread than the receivers.

Initial Migrated Volume Phase 3

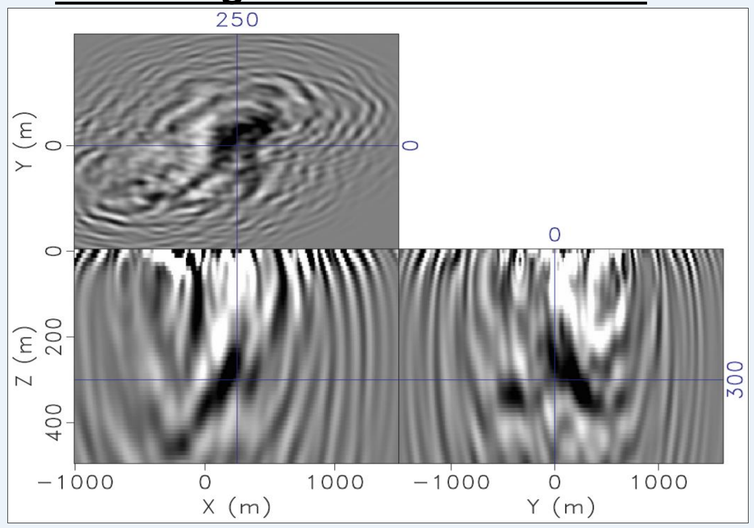

Figure 5: This is the preliminary migrated section of the geophone data. There is possible structure at 200-400m depth. This apparent feature dips at about 38deg, which is slightly shallower than the dips in the faulting features seen in the model which are around 45deg. This difference could be attributed to error in the simple velocity model used.

Conclusions

- The well logs correlated excellently with the faulting planes present in the geothermal system.
- The geology shows a distinct shift, shown in Figure 2, which contributes to the path the water flows along.
- The preliminary migrated volume made from the Phase 3 geophone data, shows a similar feature to the faulting in the model.
- Further work will be done to better image the area under the nodes, in order to image more of the faulting planes with greater accuracy.

Acknowledgements

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