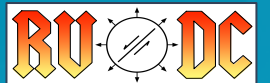


# 3-D joint P- and S-wave tomography of a fault zone in Rock Valley, Nevada, the Nevada National Security Site

Jennifer L. Harding, Leiph A. Preston, Miles A. Bodmer

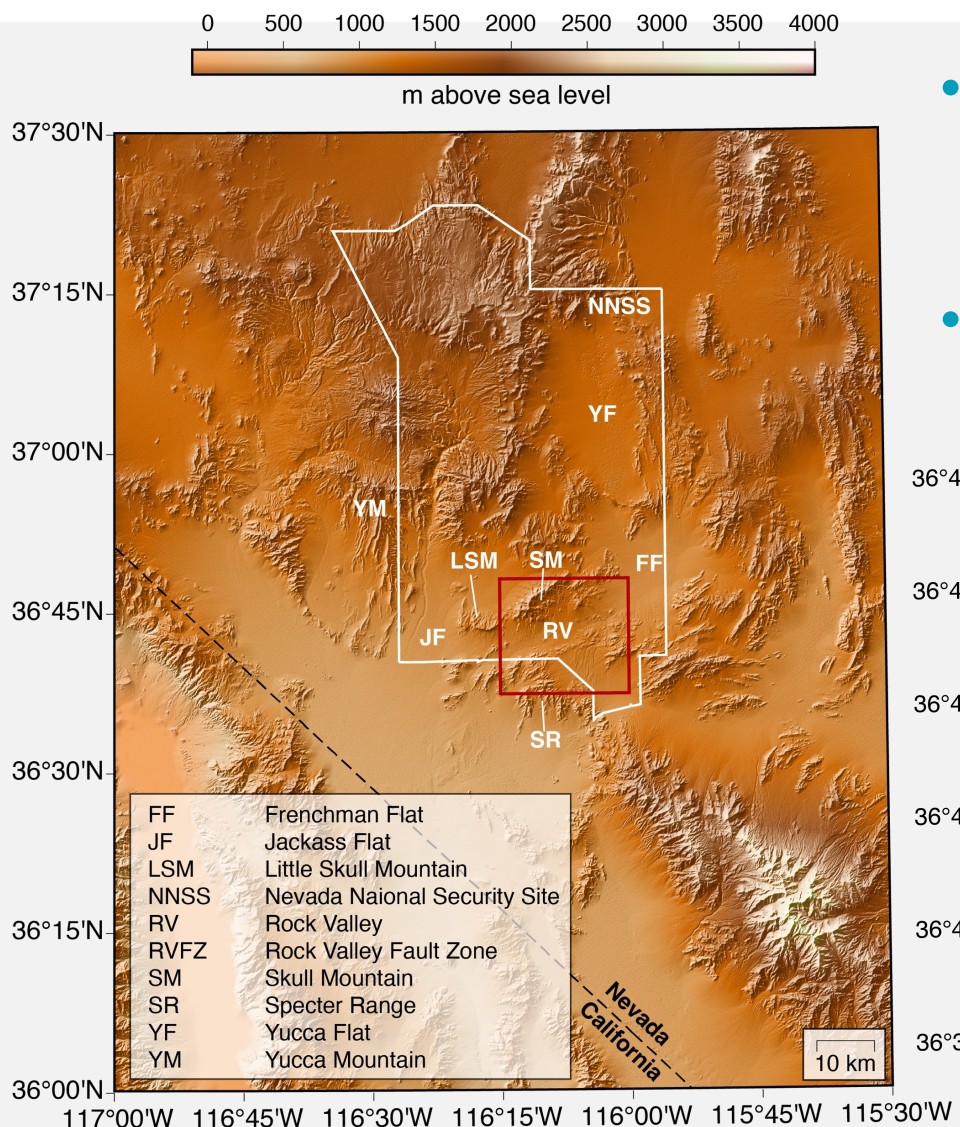
Sandia National Laboratories, Albuquerque, NM



S45C-02 | Thursday December 15

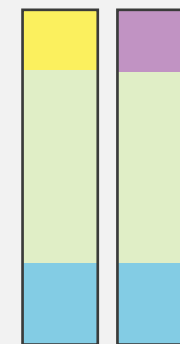


# Rock Valley, Nevada



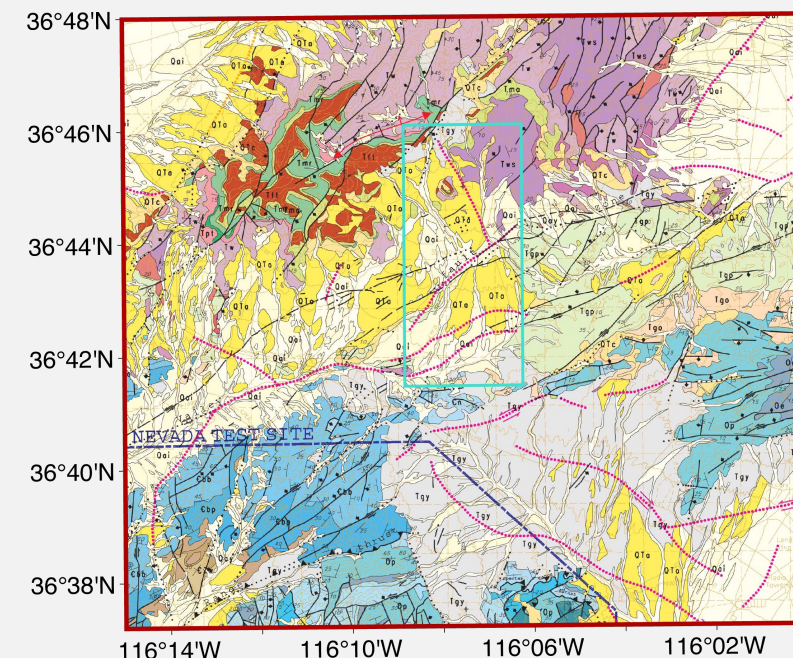
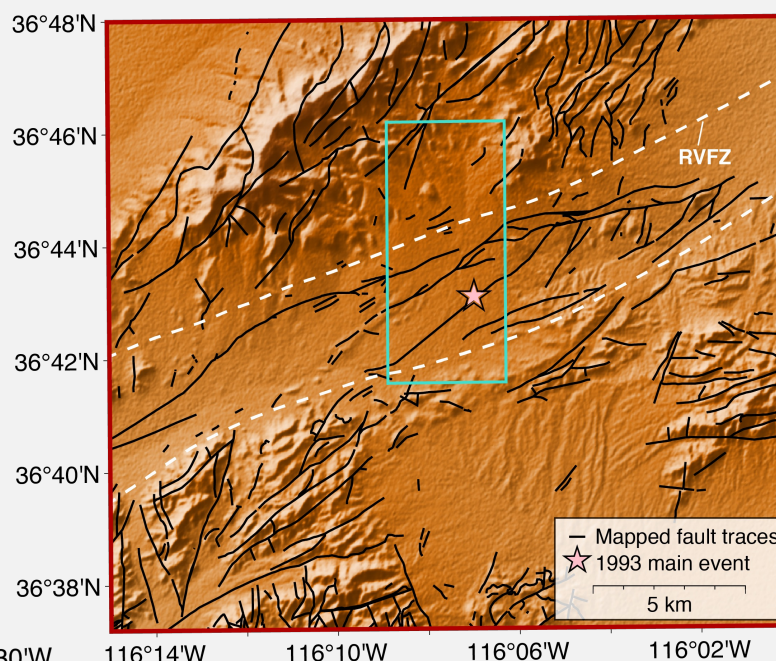
- Rock Valley hosts the left-lateral strike slip Rock Valley Fault Zone (RVFZ)
- Series of shallow (<3 km) earthquakes in 1993

Probable depth sequences



## Geologic Units

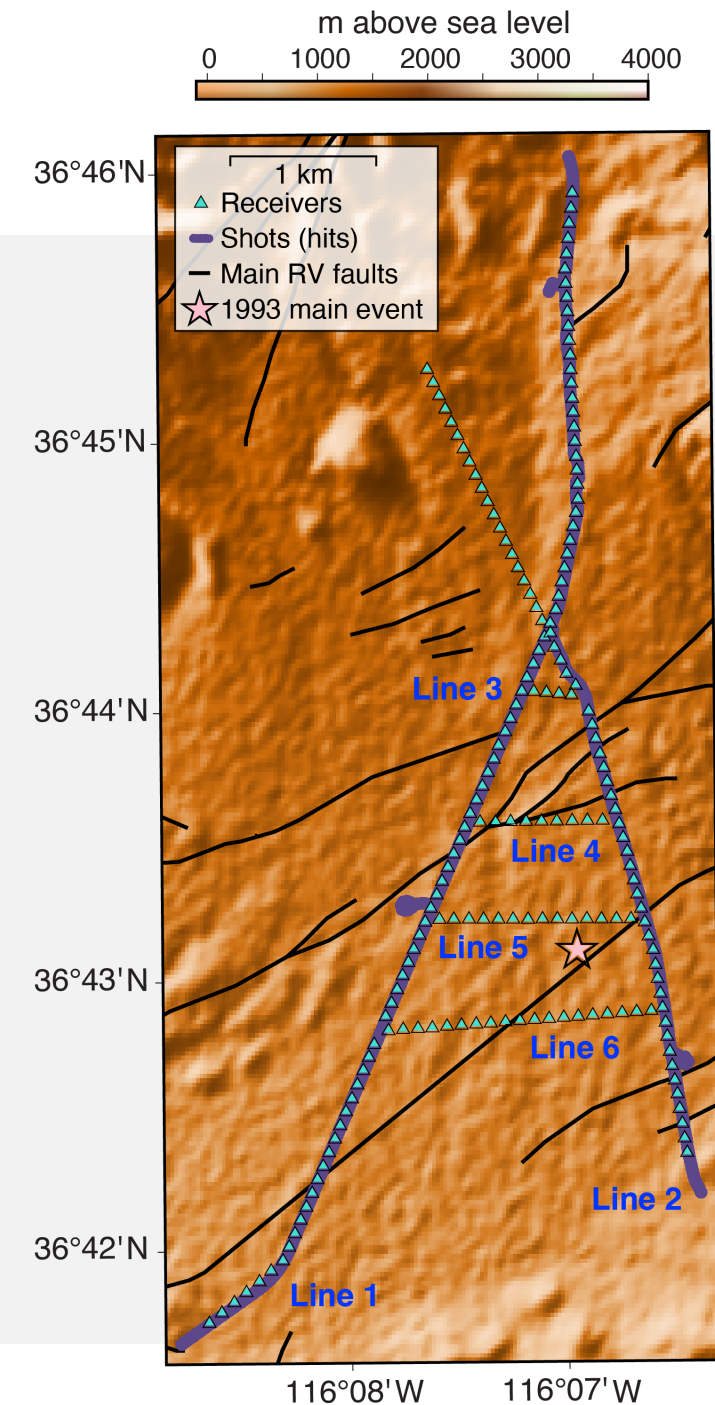
Qta	Tertiary-Quaternary alluvium
Qai	
Tgy	Tertiary basin-fill sediments
Tws	Tertiary volcanics
Tgp	Tertiary sedimentary rocks
C	Paleozoic carbonates





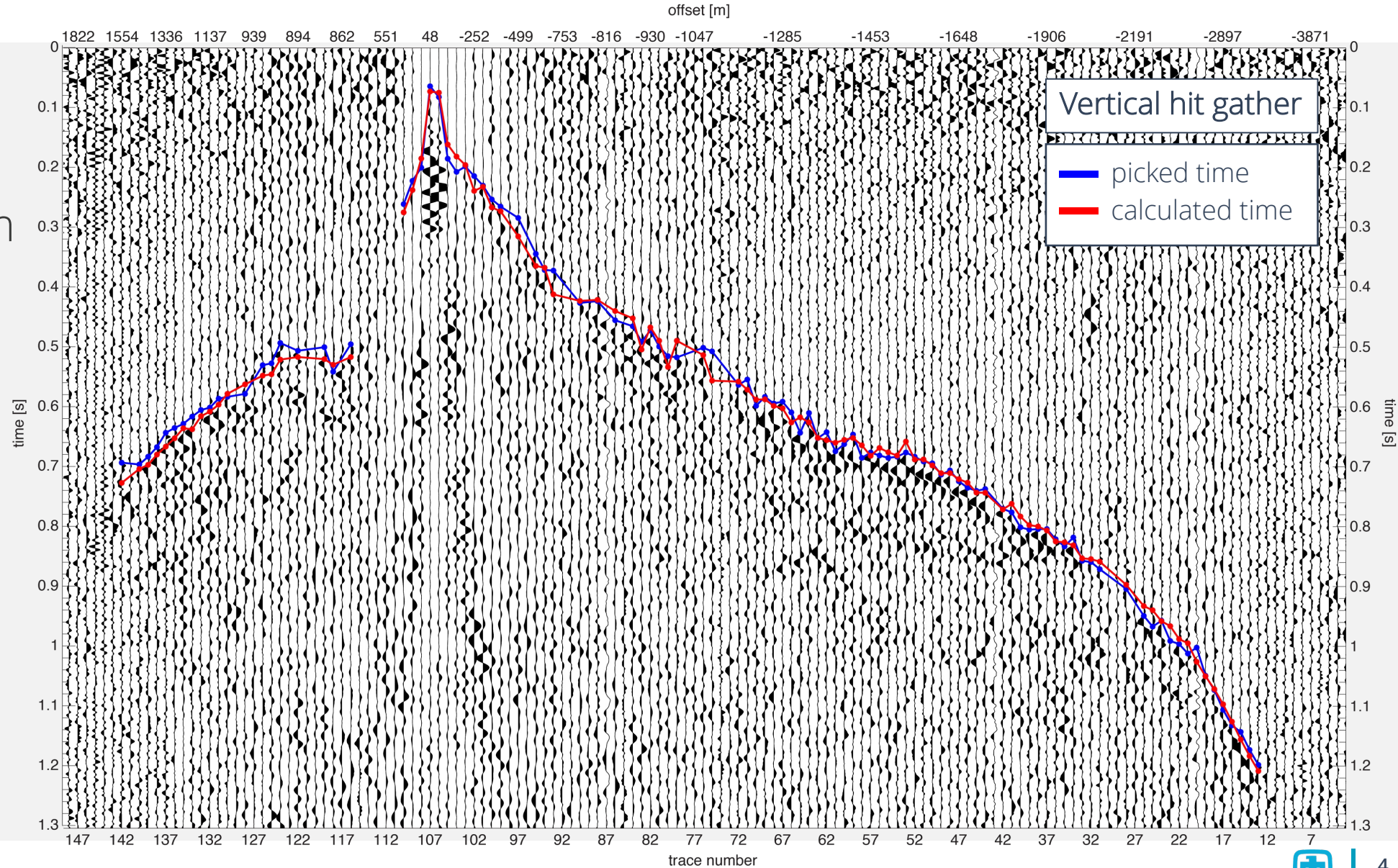
# Accelerated Weight Drop Data

- 188 3-C geophones at 100 m spacing
- AWD source every 25 m
  - 5 vertical hits for P waves
  - 10 side hits (5 in each opposing direction) for S waves
- Processed into gathers
  - Vertical hits were stacked, bandpass filtered, automatic gain control (agc)
  - Transverse components stacked, opposing side hits differenced, bandpass filtered, agc



# P- and S-wave travel time tomography

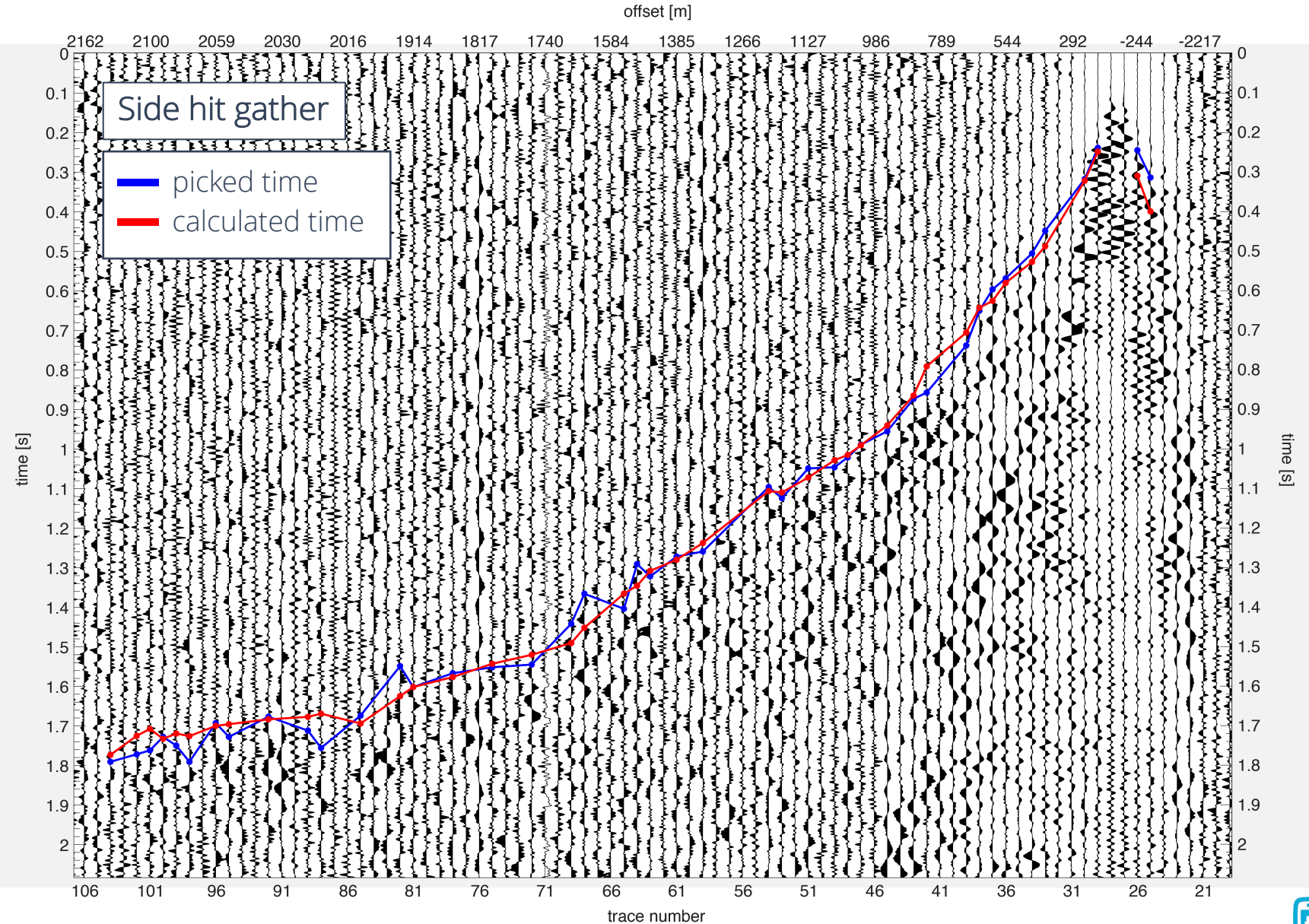
- ~17k P picks with maximum offset of ~3.5 km
- P pick root mean squared (RMS) misfit of 20 ms





# P- and S-wave travel time tomography

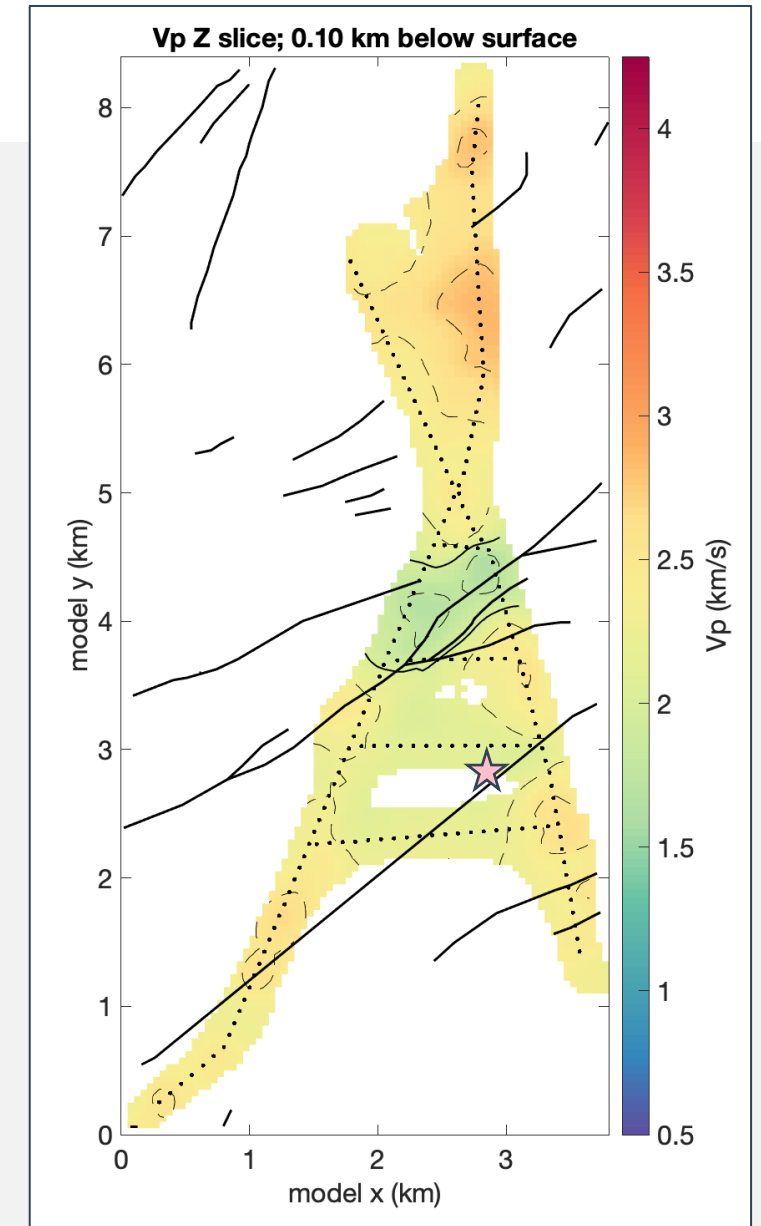
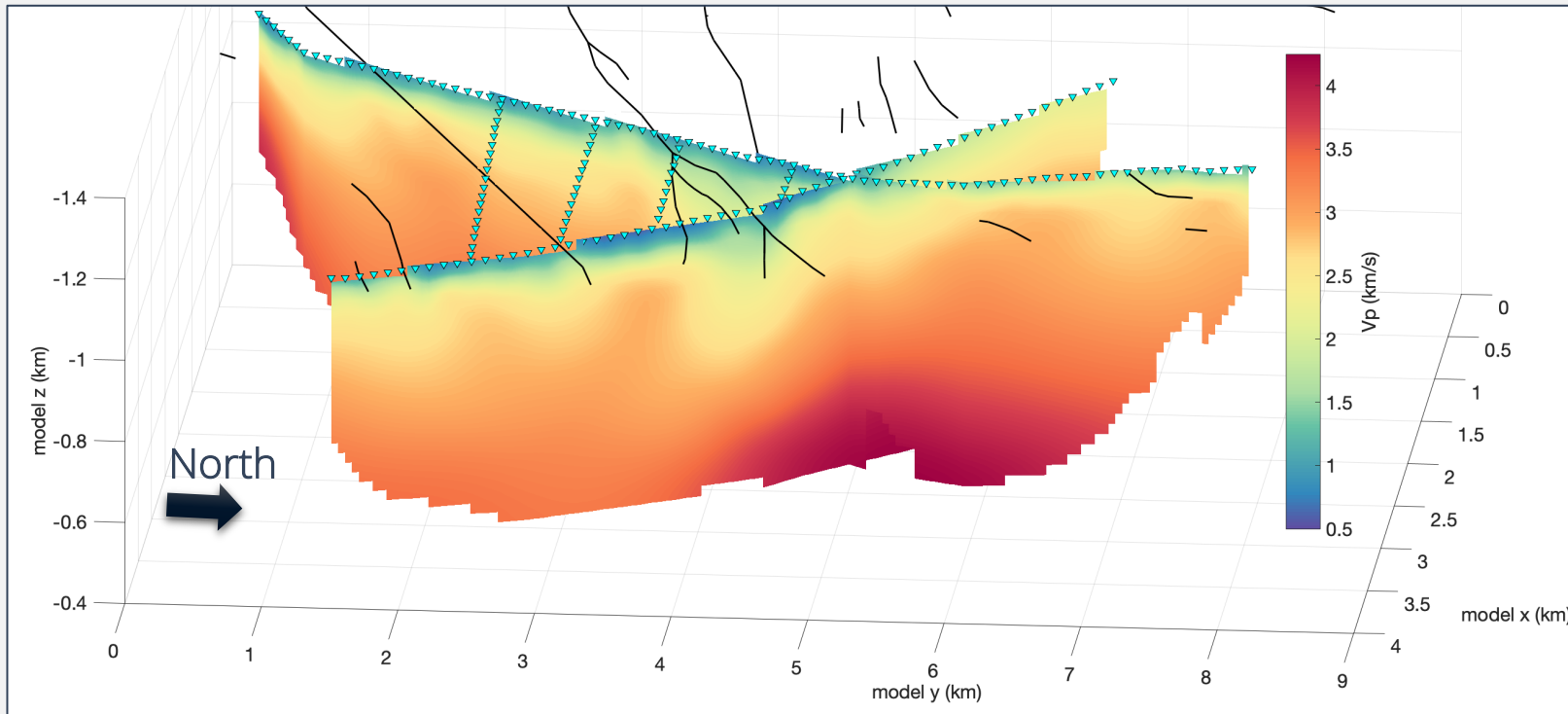
- ~15k S picks with maximum offset of ~3.5 km
- S pick RMS misfit of 60 ms



# Velocity Models

P-wave velocity ( $V_p$ )

- Prominent low  $V_p$  area beneath central faults and lower  $V_p$  beneath fault traces
- Consistent with shallow volcanic rocks in northern model area and ~20 m of alluvium central and southern model area

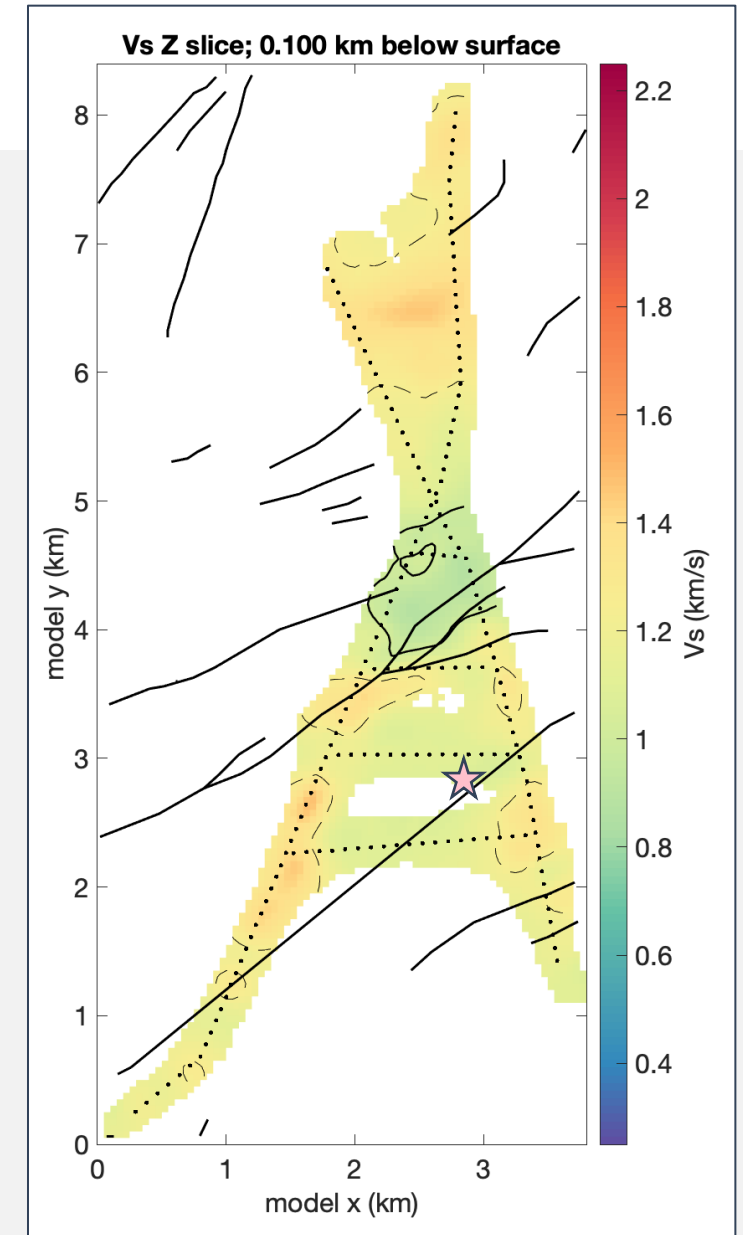
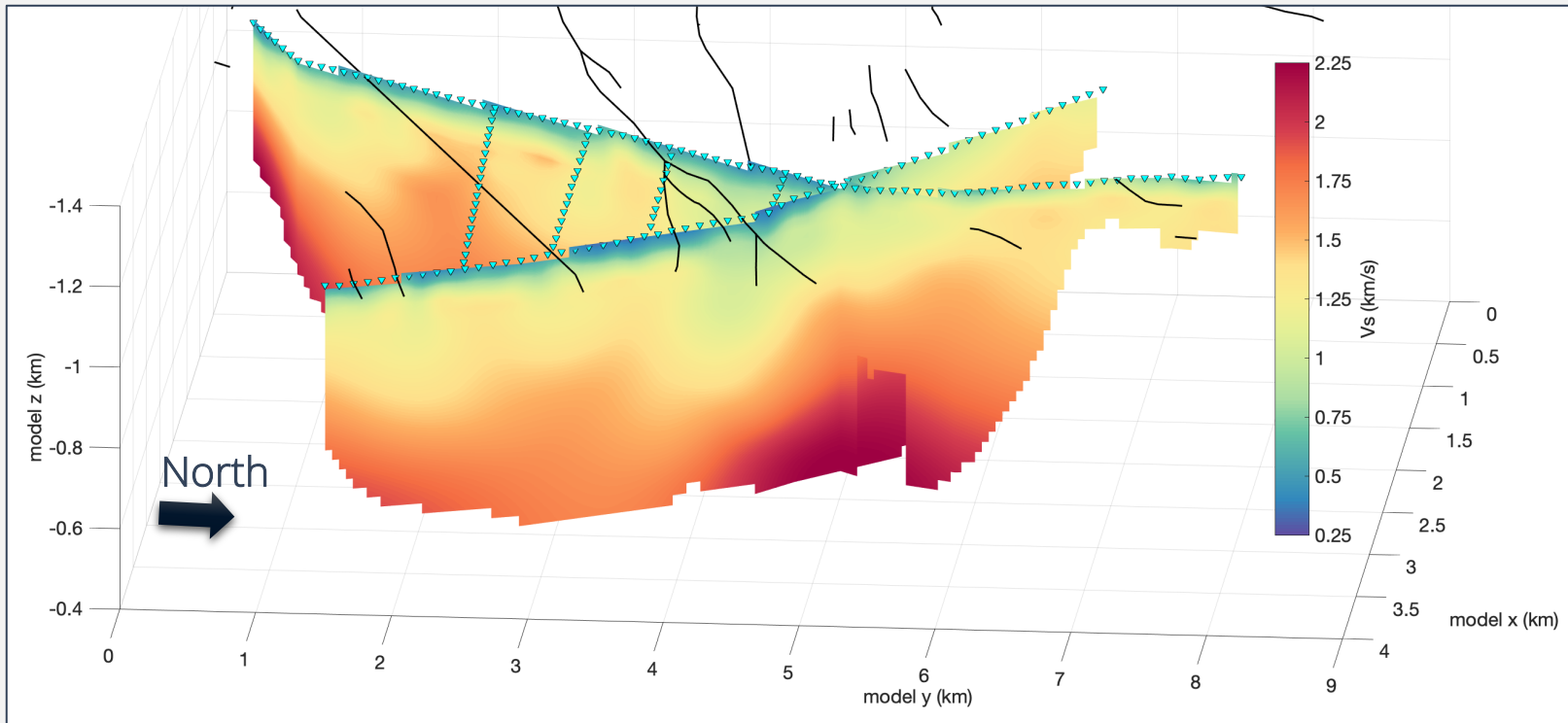




# Velocity Models

S-wave velocity ( $V_s$ )

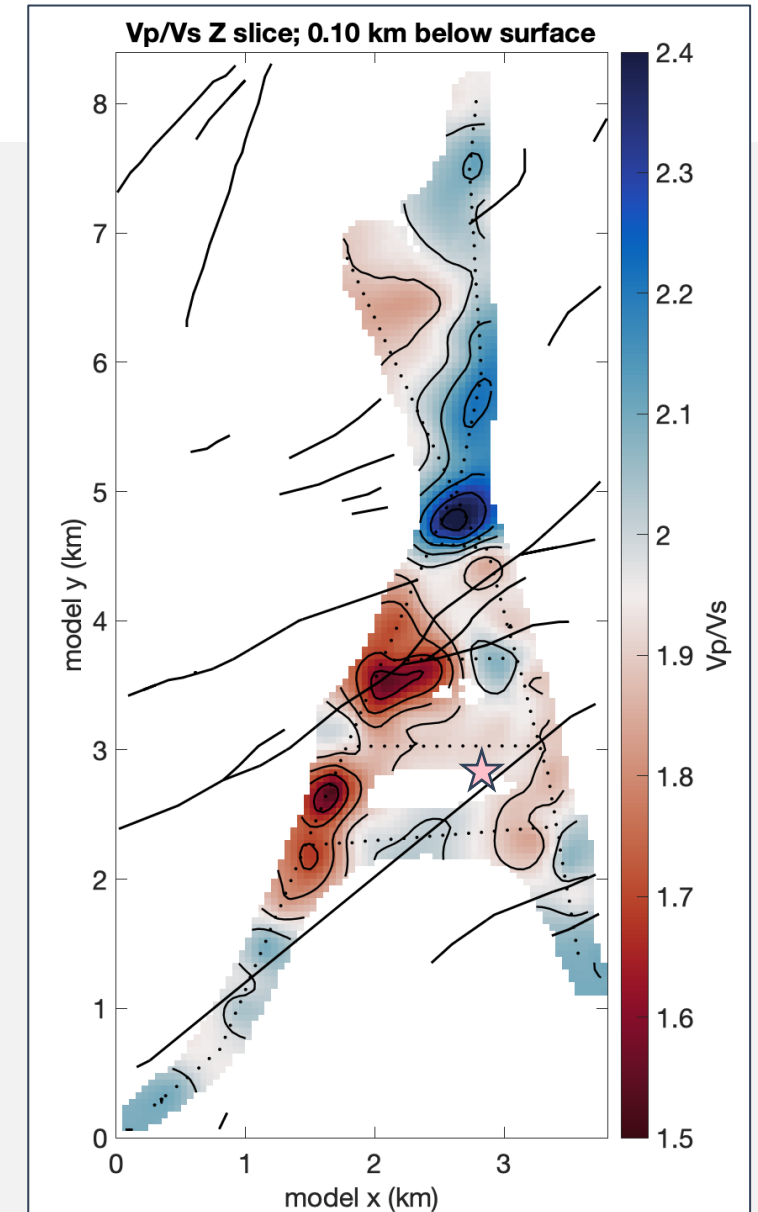
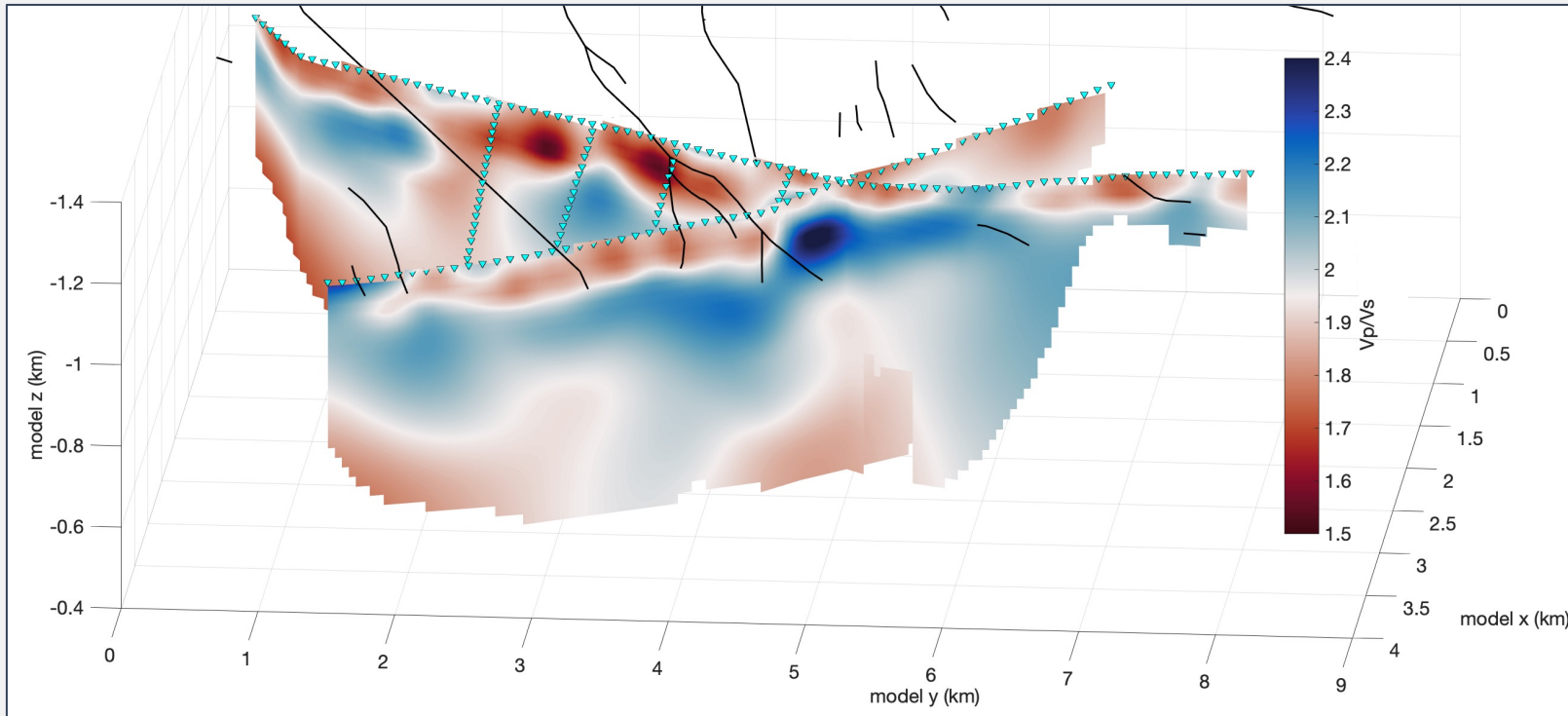
- Similar prominent low  $V_s$  area beneath central faults and lower  $V_s$  beneath fault traces
- May have imaged the top of the Paleozoic carbonate



# Velocity Models

Vp/Vs ratio

- Low Vp/Vs to the south of & high Vp/Vs to the north of central faults at 100 m depth
- High Vp/Vs area – fault damage or fluids?





# Summary and Next Steps

Vp, Vs, and Vp/Vs ratio images fault damage, likely from 1993 earthquake swarm and potential fluid-filled faults facilitating groundwater flow

## Next Steps

- Still working on Vp/Vs interpretations
- Complete error analysis
- Compare with gravity data
- Use to refine shallow earthquake locations
- Use to inform future source physics modeling

