

Seismic Tomography in the Sacramento-San Joaquin Delta

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there are ~1,100 miles of levees in the Delta

the CALFED DRMS report grades most of the Delta levees as **highly vulnerable**

where an M6.5 earthquake that produces $\text{PGA} \geq 18\% g$ could cause failure that breaches the levee

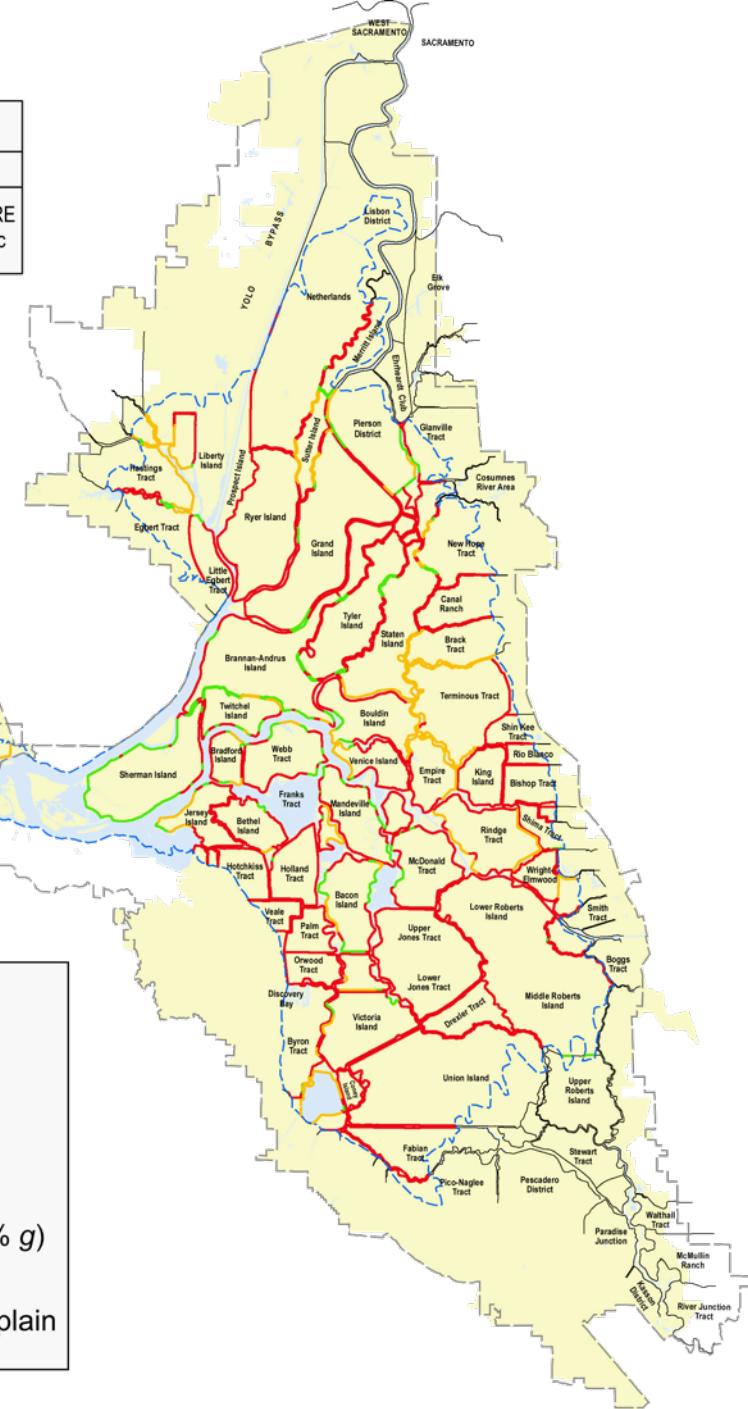
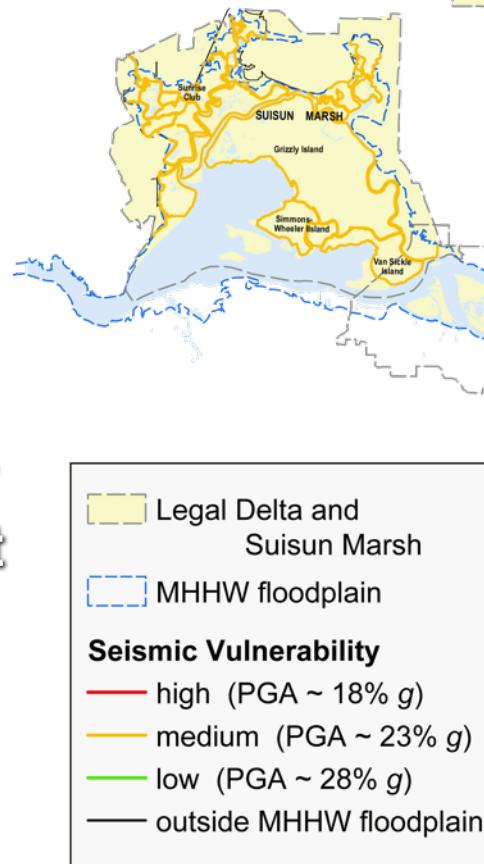
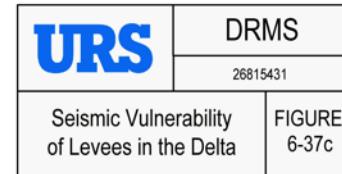
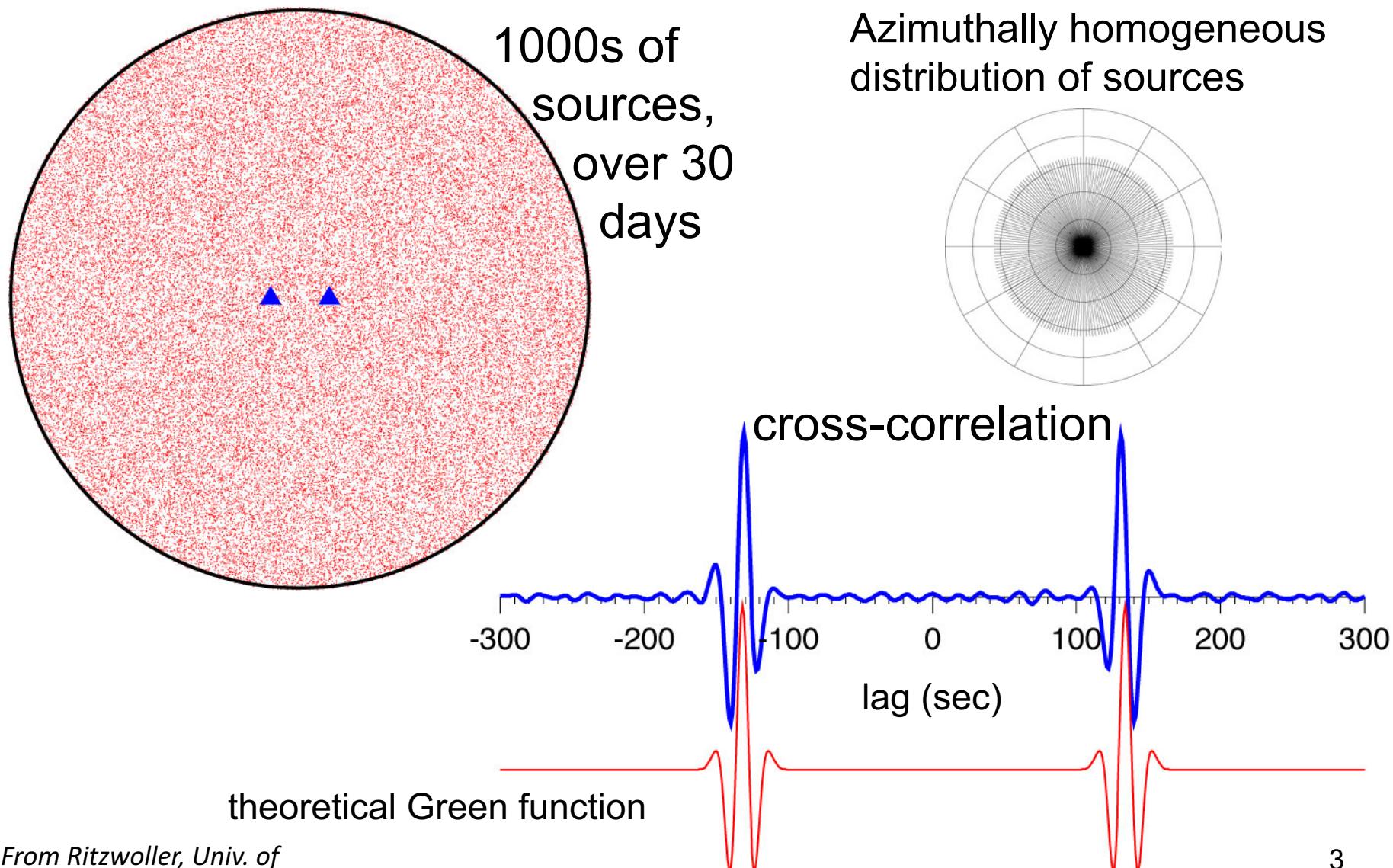
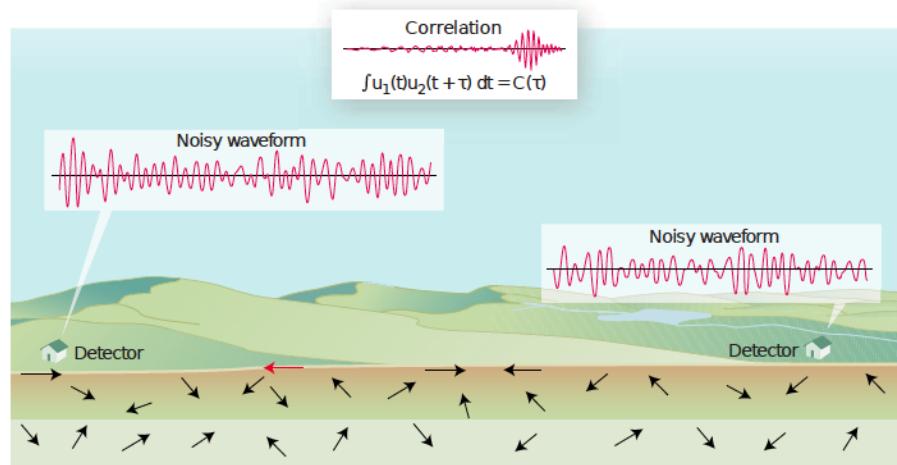


Figure 6-37c,
chapter 6 DRMS

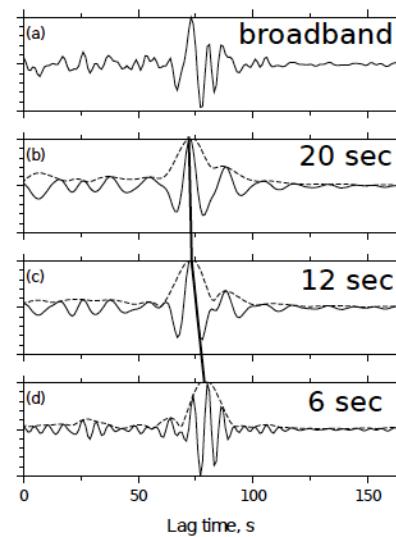
B. The Idea of the Method



1. Waveform cross correlation between all station pairs

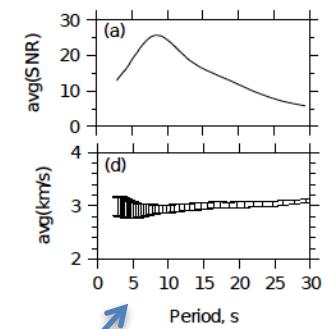


2. Frequency-time analysis



- Narrow band filter
- Time of envelope peak is travel time

$$Vg = X/tg$$

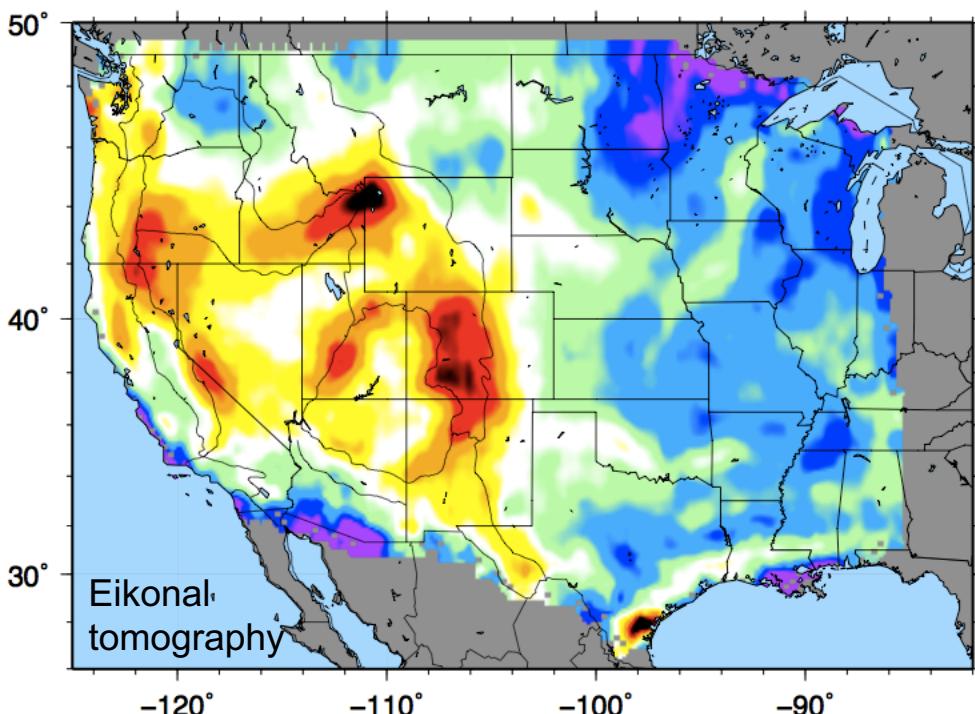


Dispersion curve

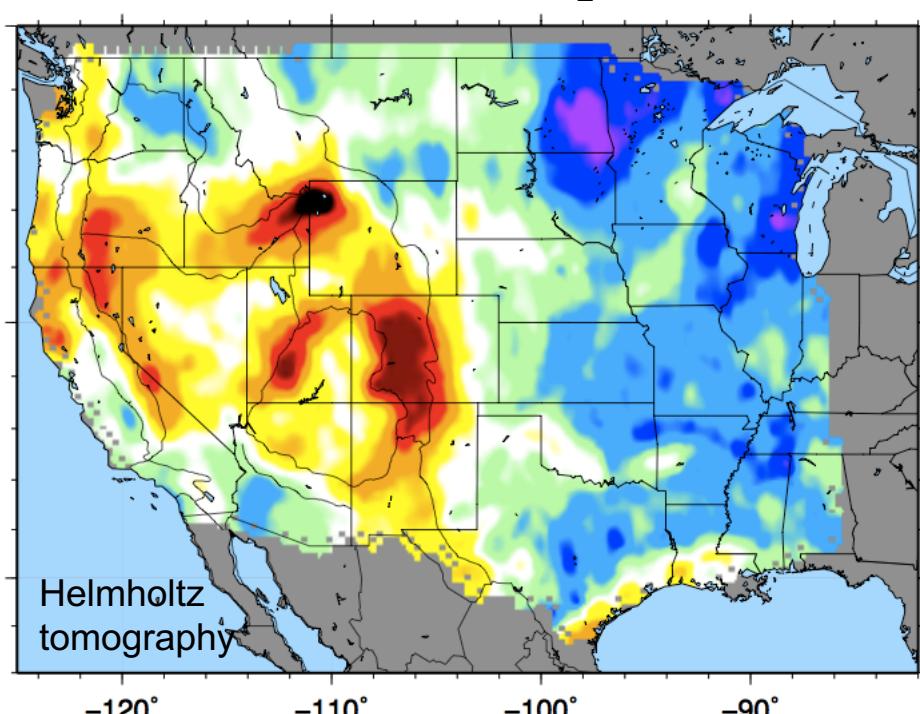
From isti.com

Comparison of Ambient Noise & Earthquake Tomography

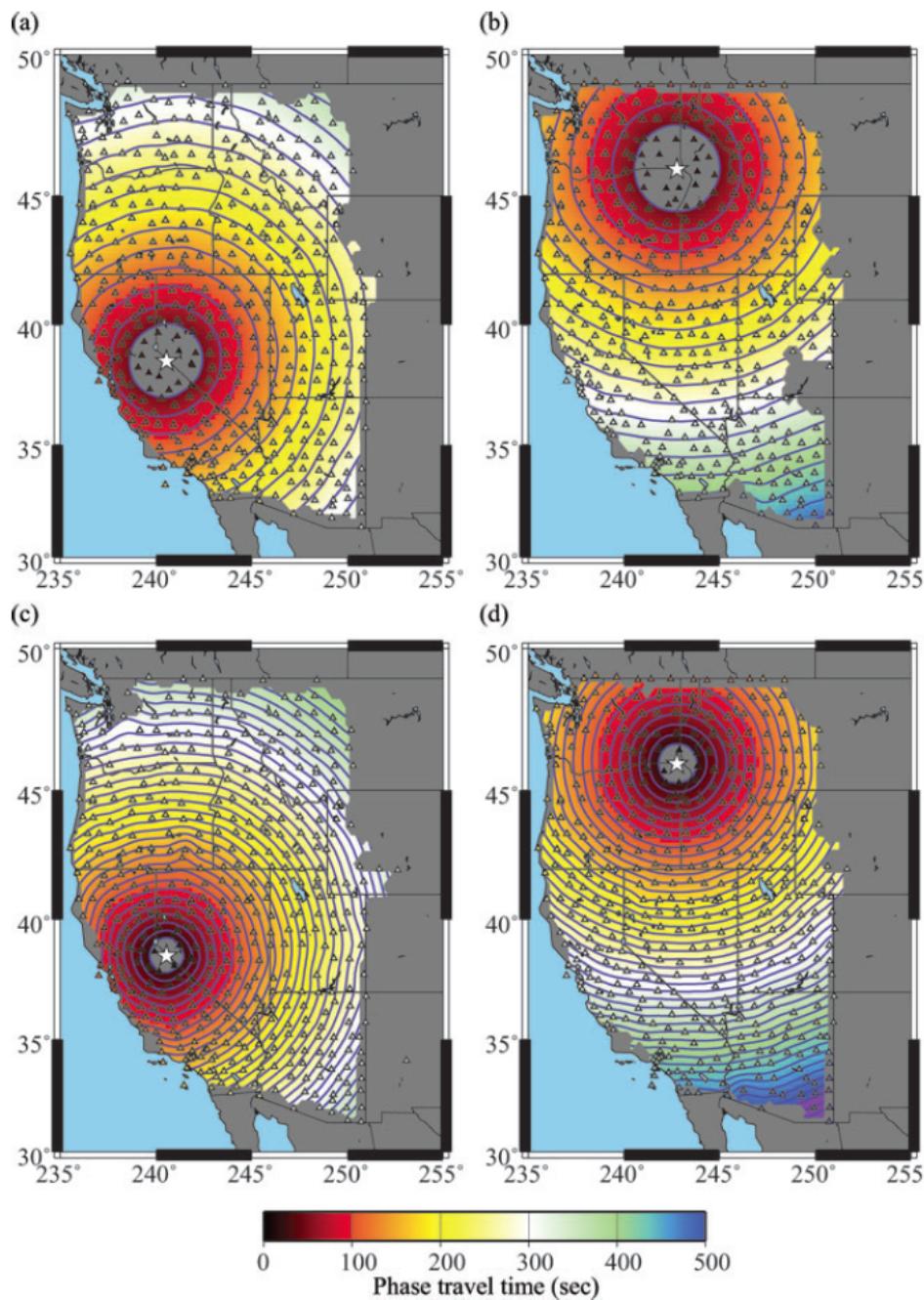
From ambient noise



From earthquakes



28 sec Rayleigh wave

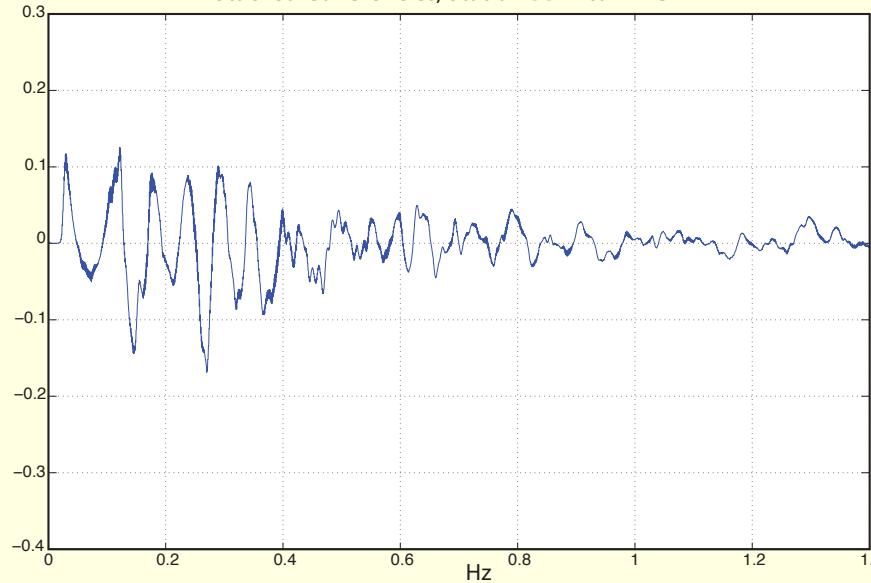


Wave fronts interpolated from ambient noise correlations. Change in slope of wave front related to slowness through eikonal equation.

from Fan-Chi Lin and others, 2009.

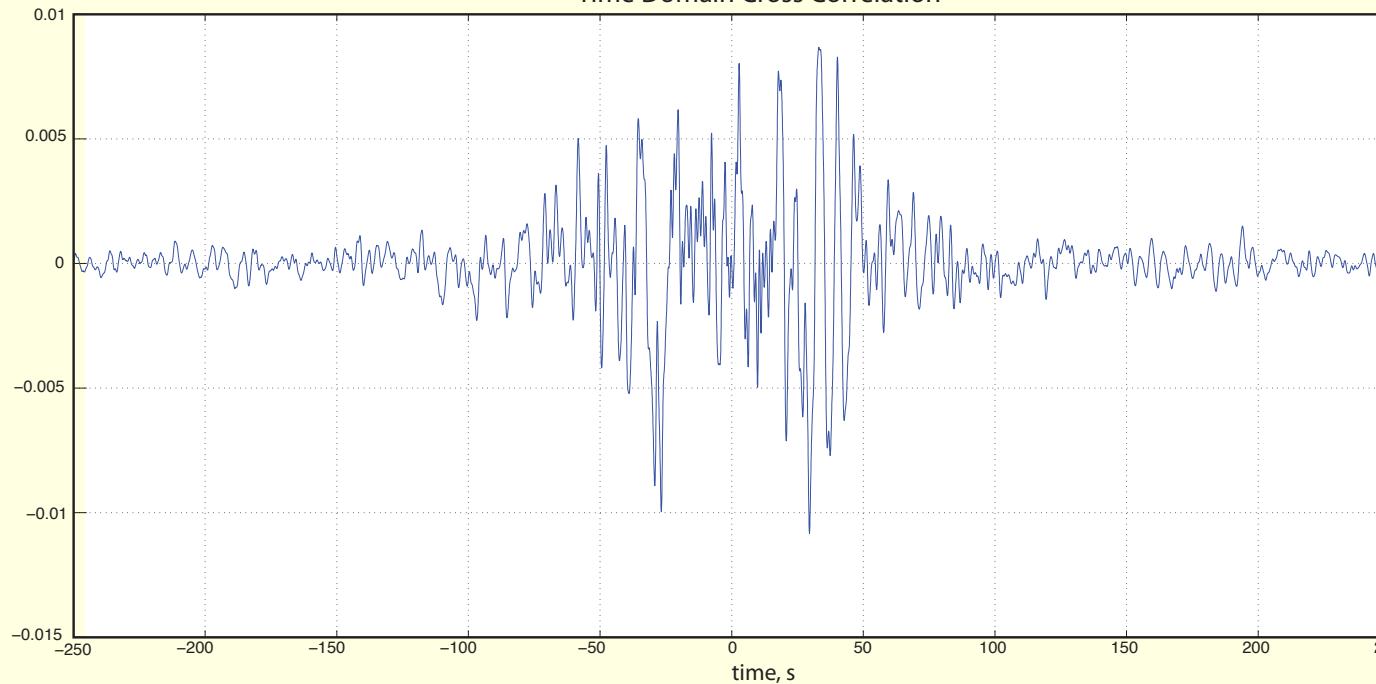
Stacked Coherencies, Station BDM to MHC

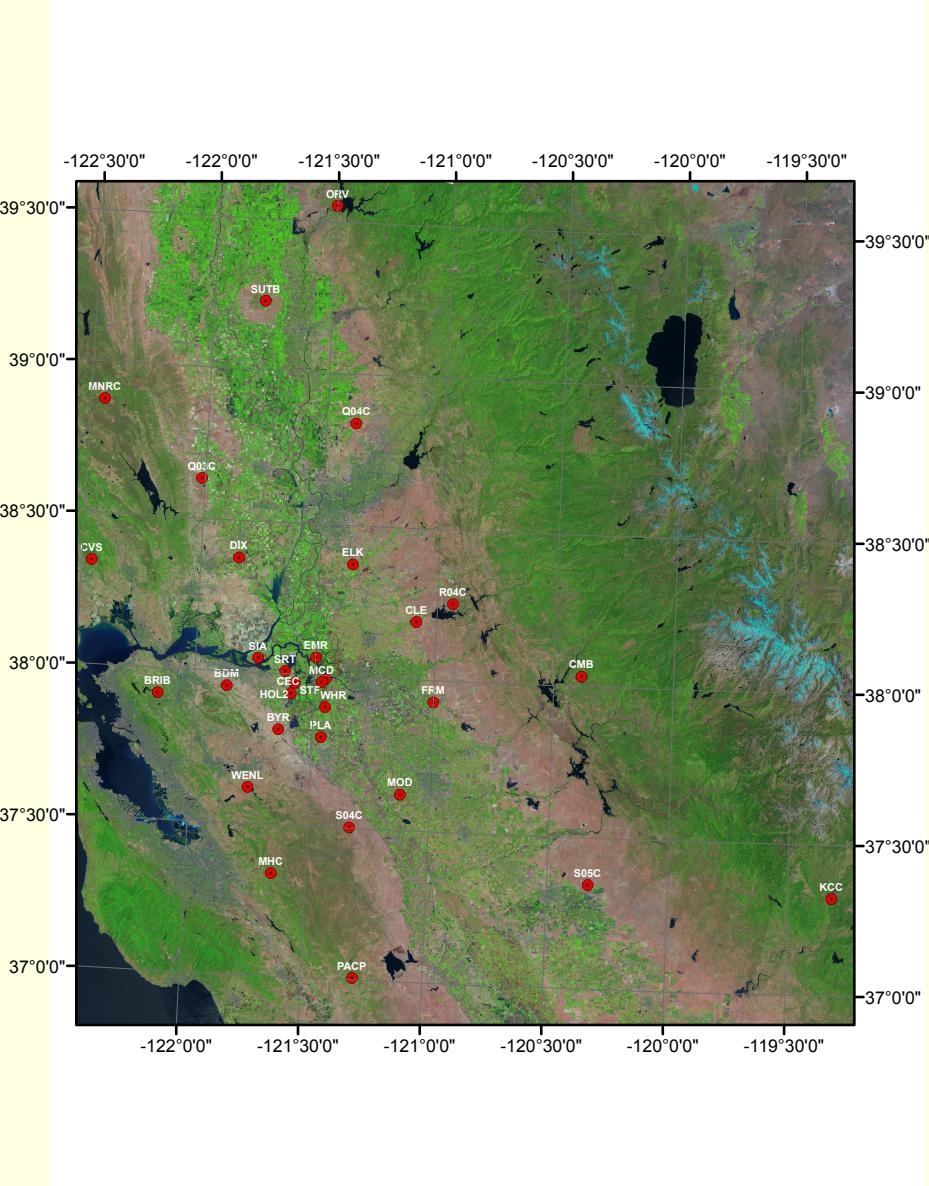
a)



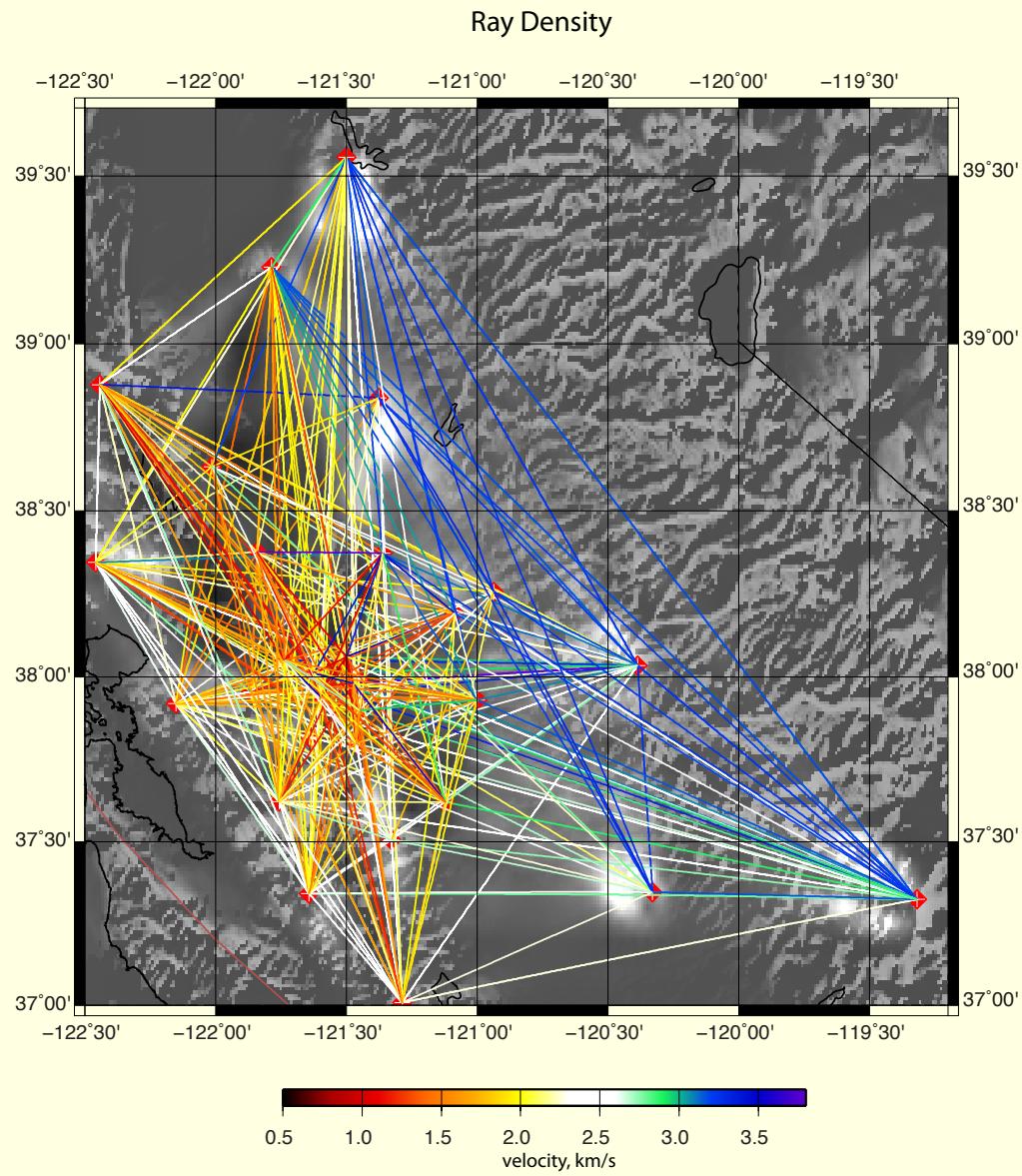
b)

Time Domain Cross Correlation

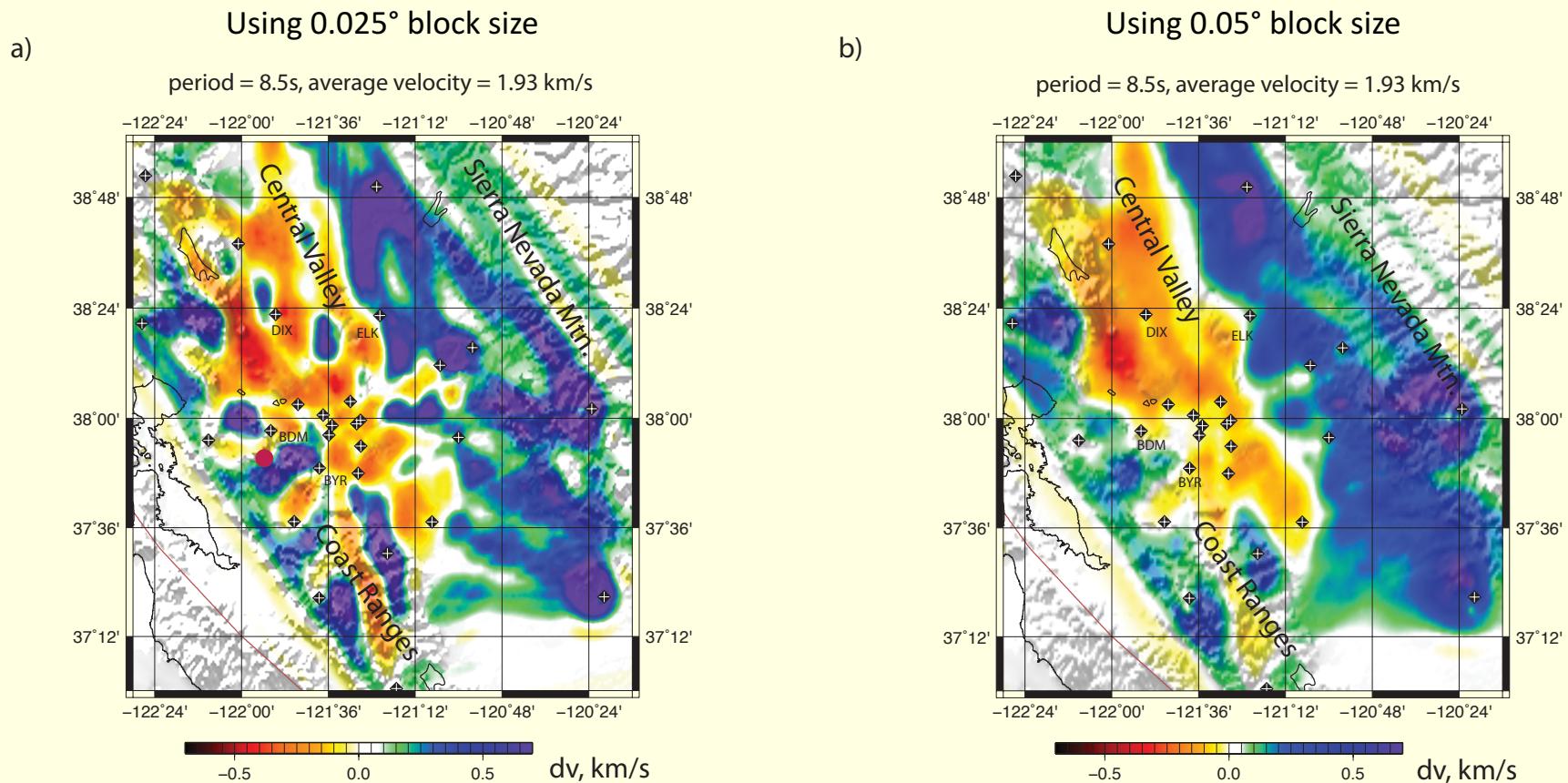




Map of stations in the Central Valley that have been used in creating tomographic model. Includes 15 stations deployed by the USGS, 11 UC Berkeley, and 5 stations that were part of the Earthscope Transportable Array in 2006 and 2007.



395 Rays in dsp file. This plot is rays used in slice for 8.5s.



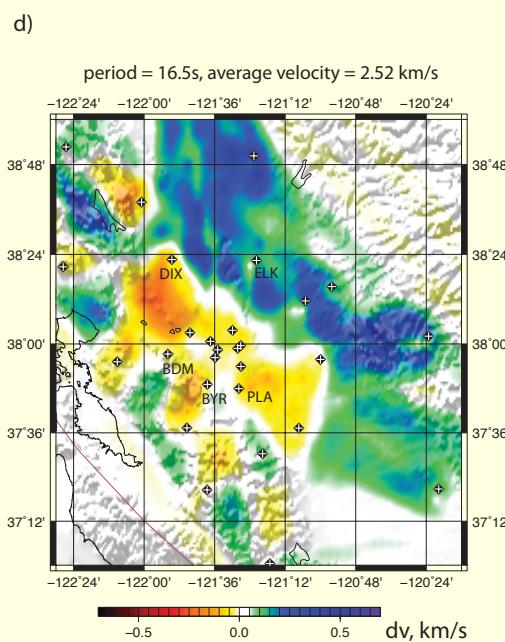
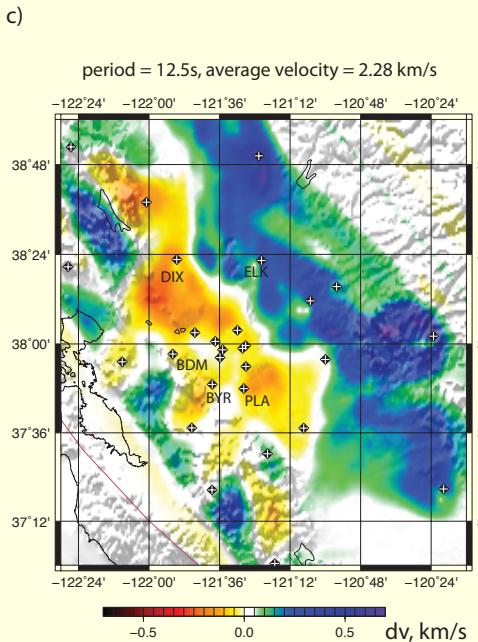
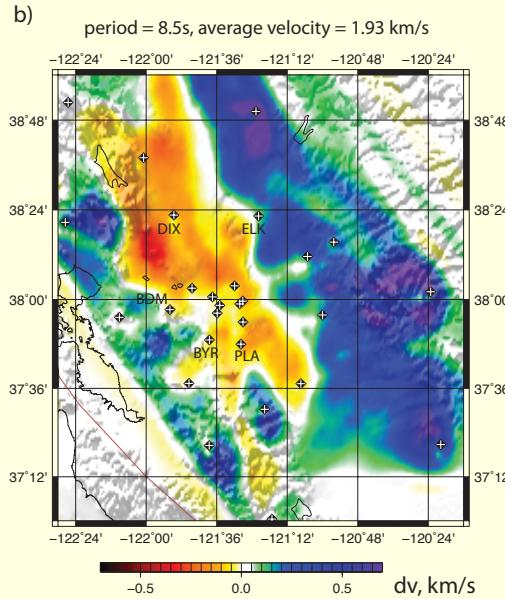
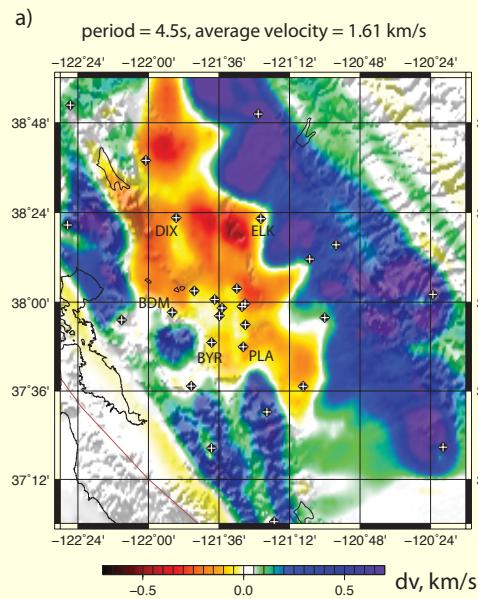
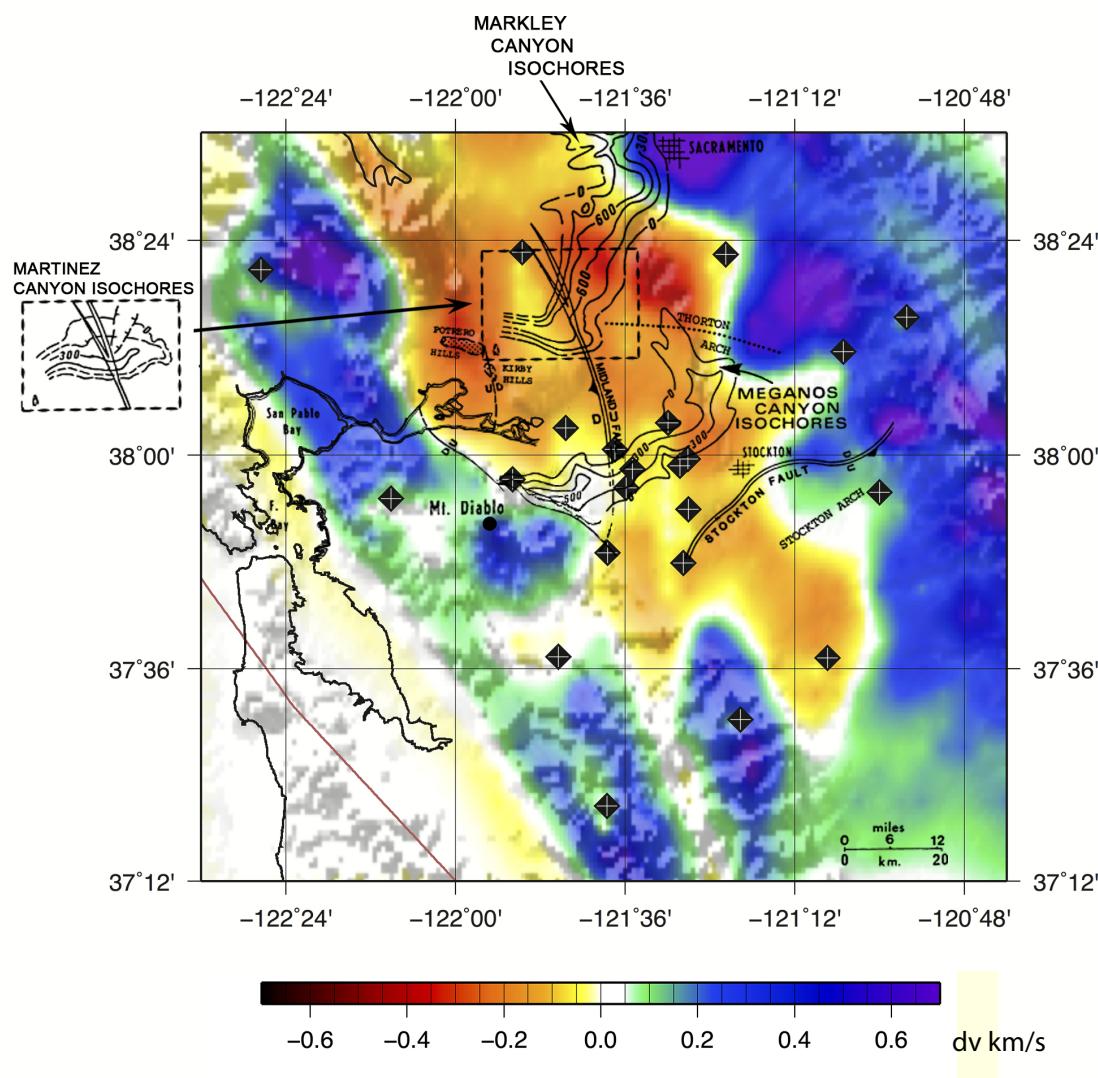


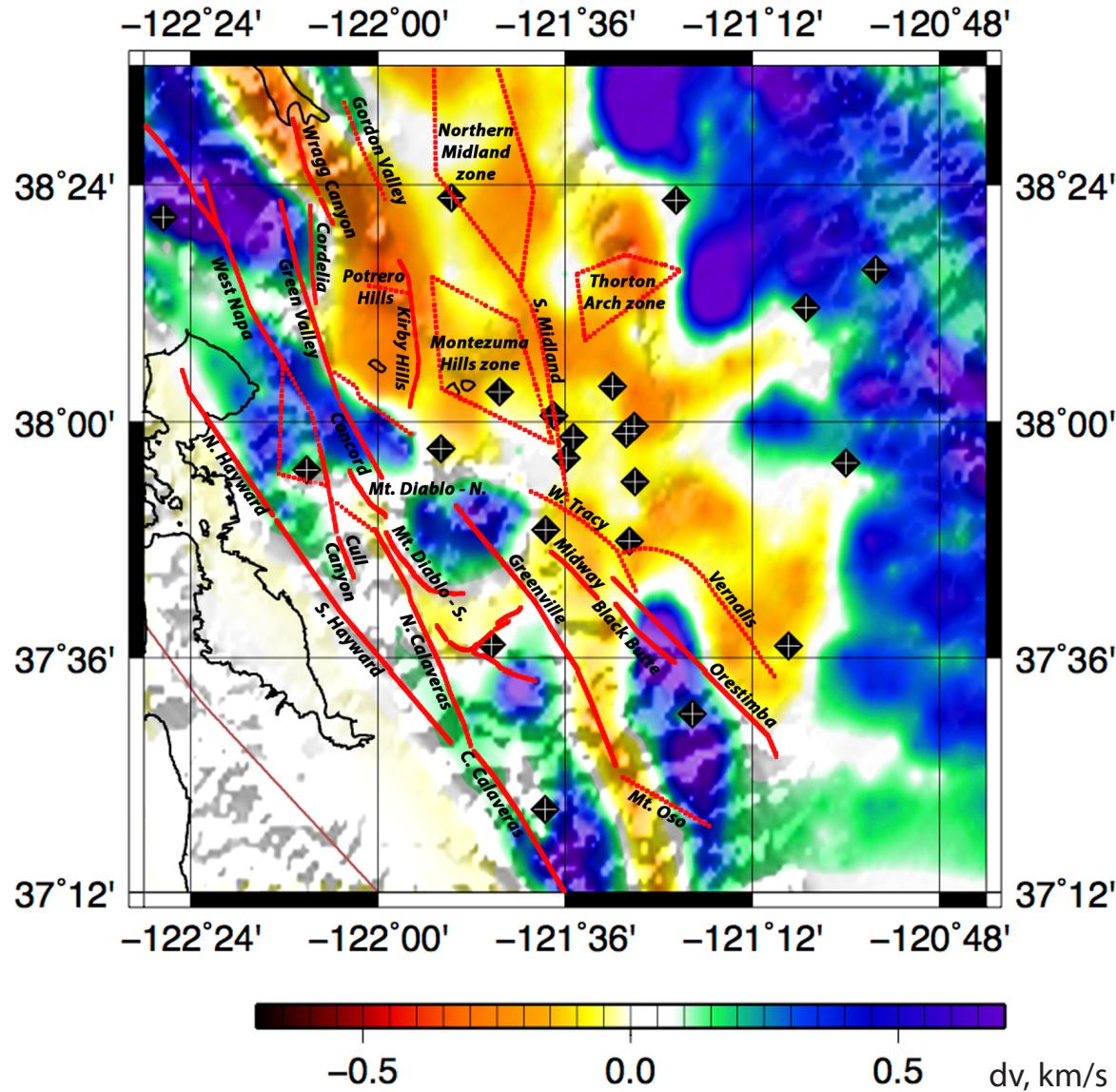
Figure 8

Submarine Canyons



Contours are from
Beyer, 1988

Important Faults in Central Valley, Coast Ranges

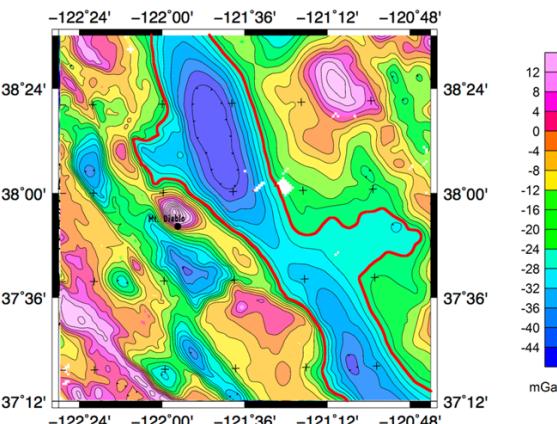


Note that the boundary between slow and fast velocities on west side of Central Valley seems to be controlled by local faults.

Correlation of Gravity Anomalies and Velocities

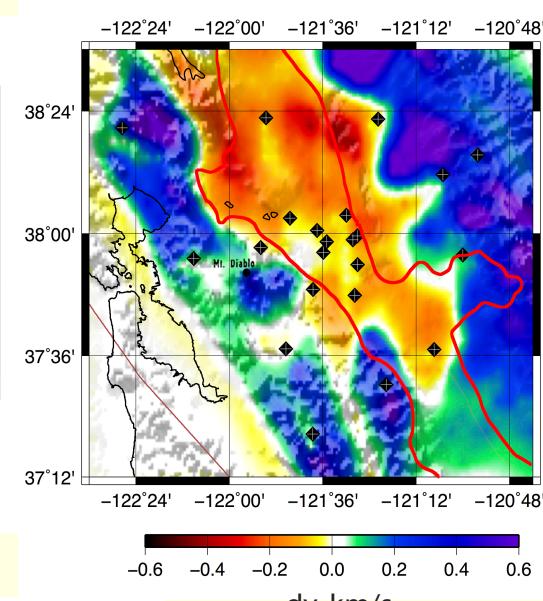
a)

Residual Gravity Anomalies



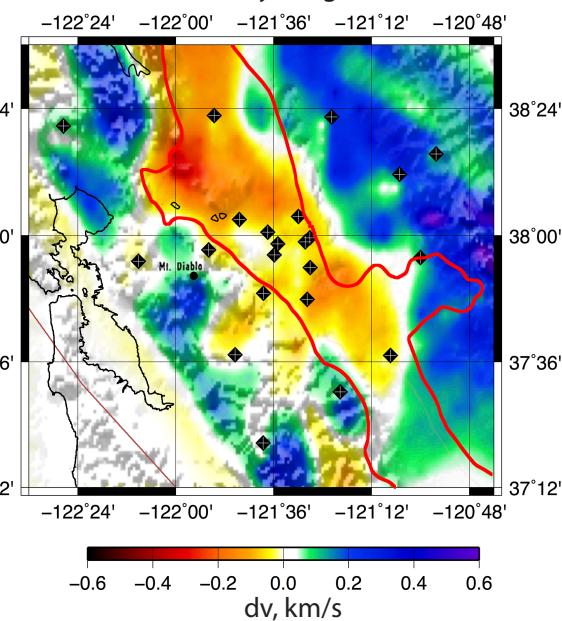
b)

Contours of Residual Gravity and Velocity Image at 5.5s



c)

Contour of Residual Gravity and Velocity Image at 10.5s



Gravity data contributed by Darcy McPhee

Figure 14



Average of 1 to 3 km of SH velocity model

