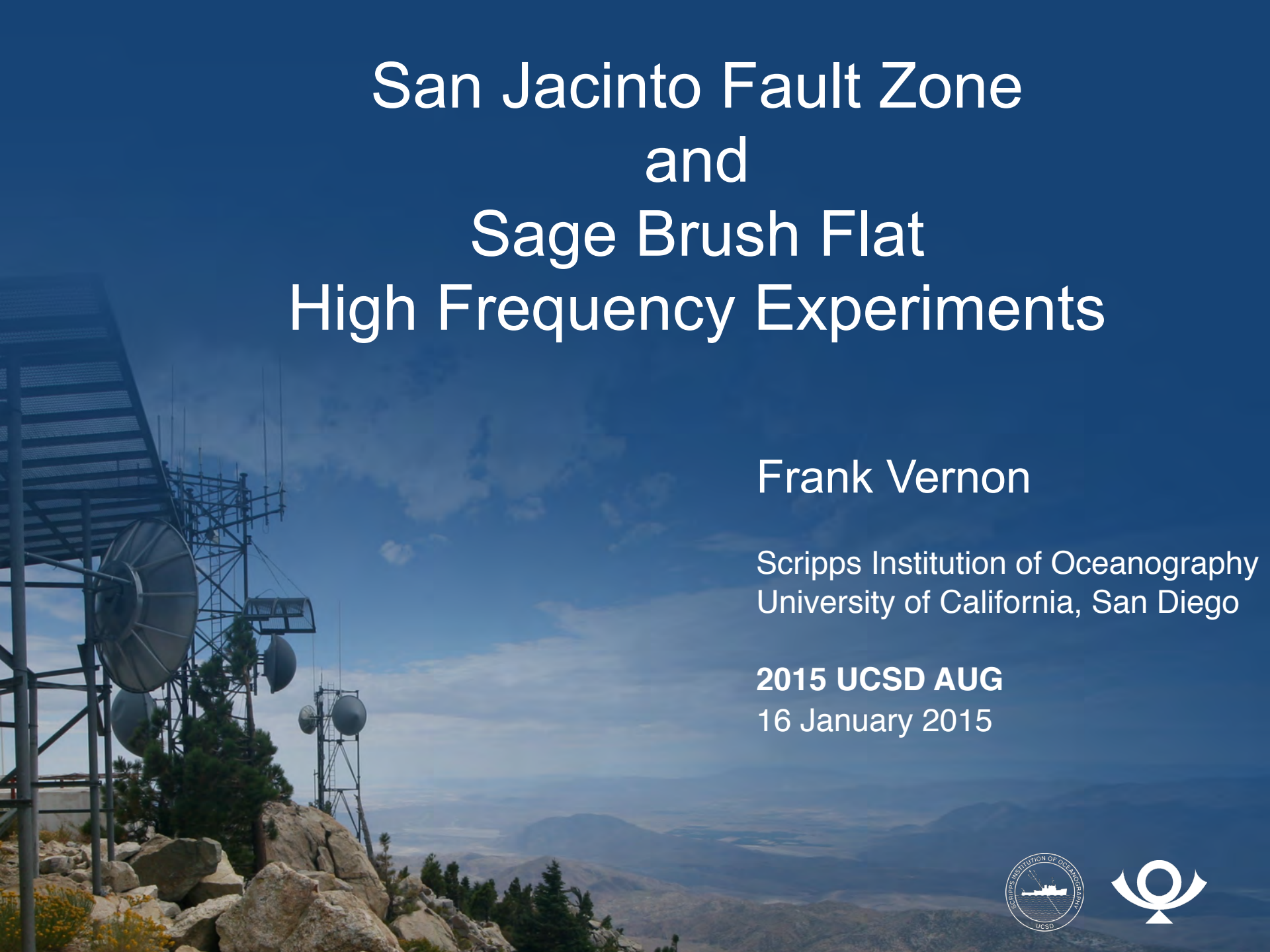
San Jacinto Fault Zone and Sage Brush Flat High Frequency Experiments



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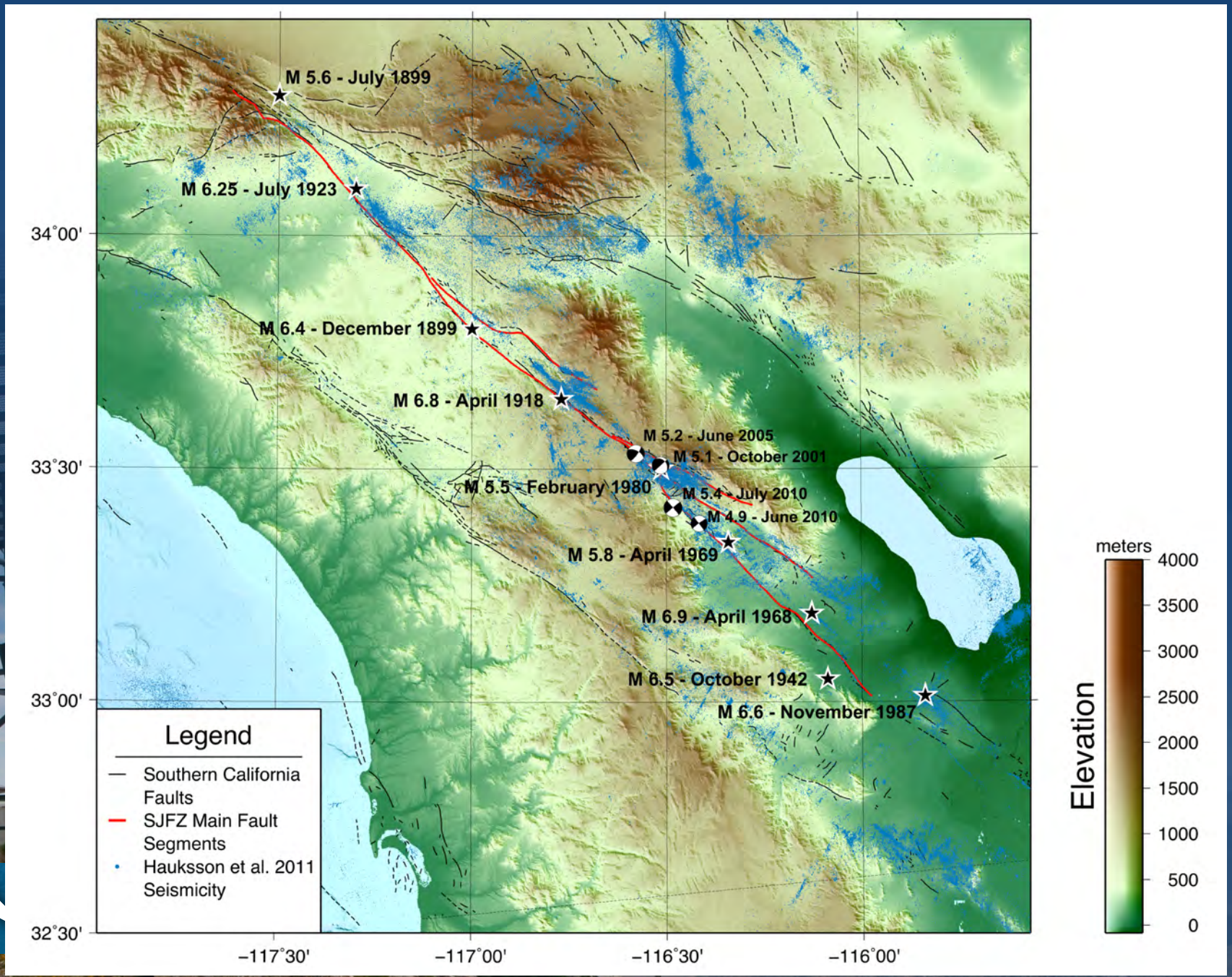
Scripps Institution of Oceanography
University of California, San Diego

2015 UCSD AUG
16 January 2015

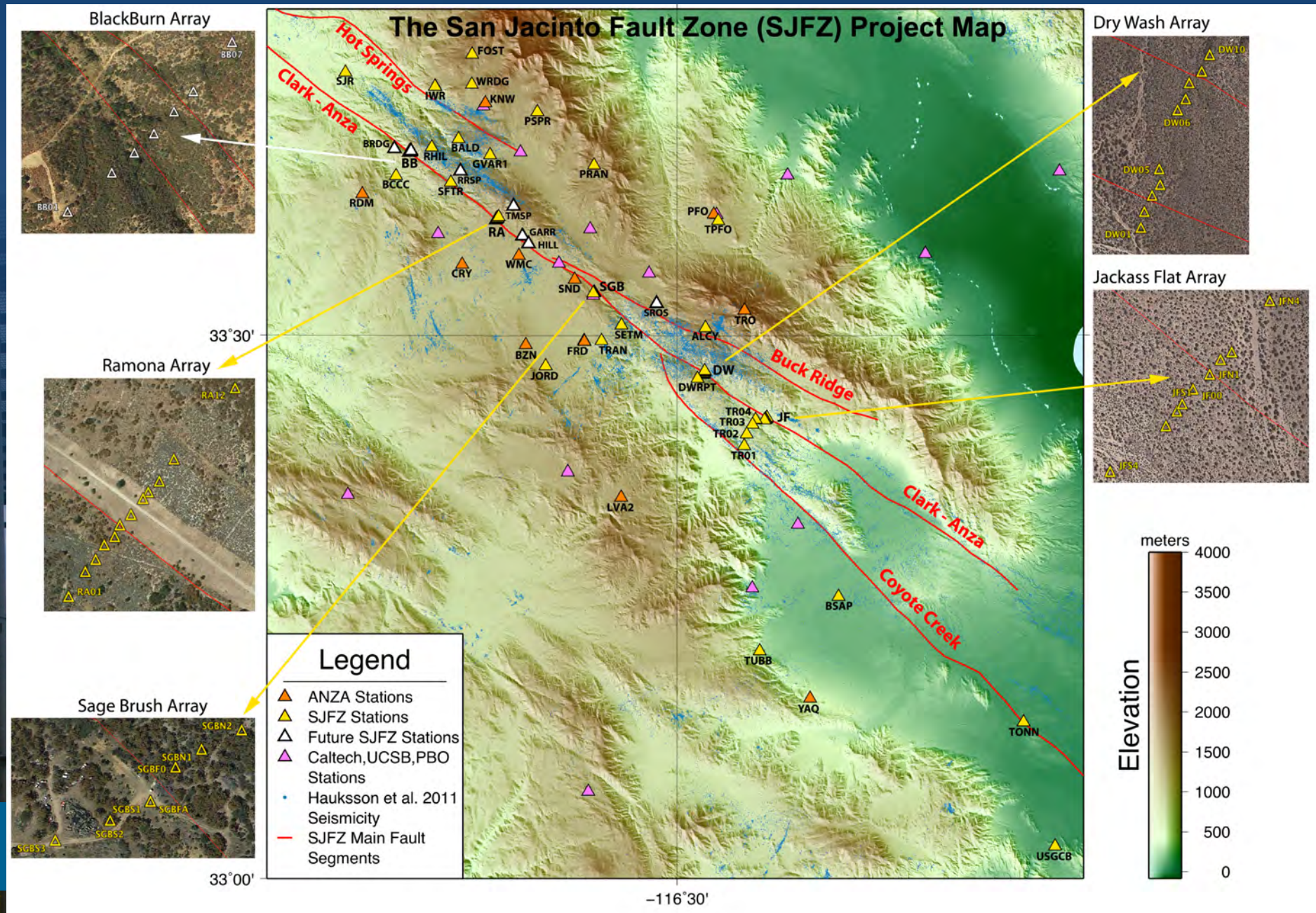
San Jacinto Fault Zone



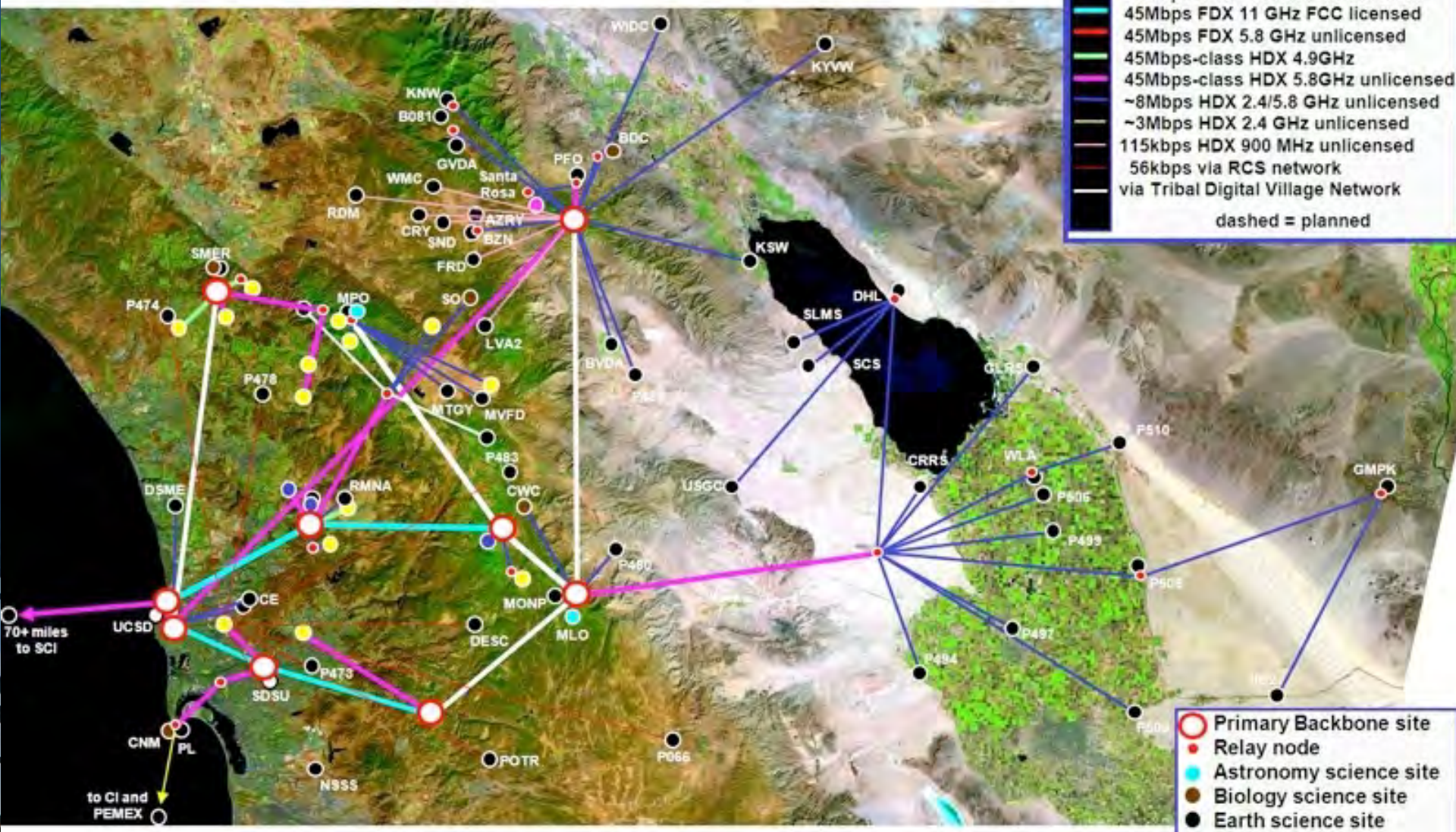
San Jacinto Fault Zone
Realtime Virtual Observing Network

- ANZA Seismic Network (24)
- Plate Boundary Observatory (8)
- Southern California Seismic Network (~30)
- UC Santa Barbara (3)
- PASSCAL
  - 5 Linear Fault Crossing Arrays
    - *45 total elements*
  - 20 stand alone stations
- 8 Borehole Strainmeters
- 12 Permanent GPS

The SJFZ Project Deployment Map

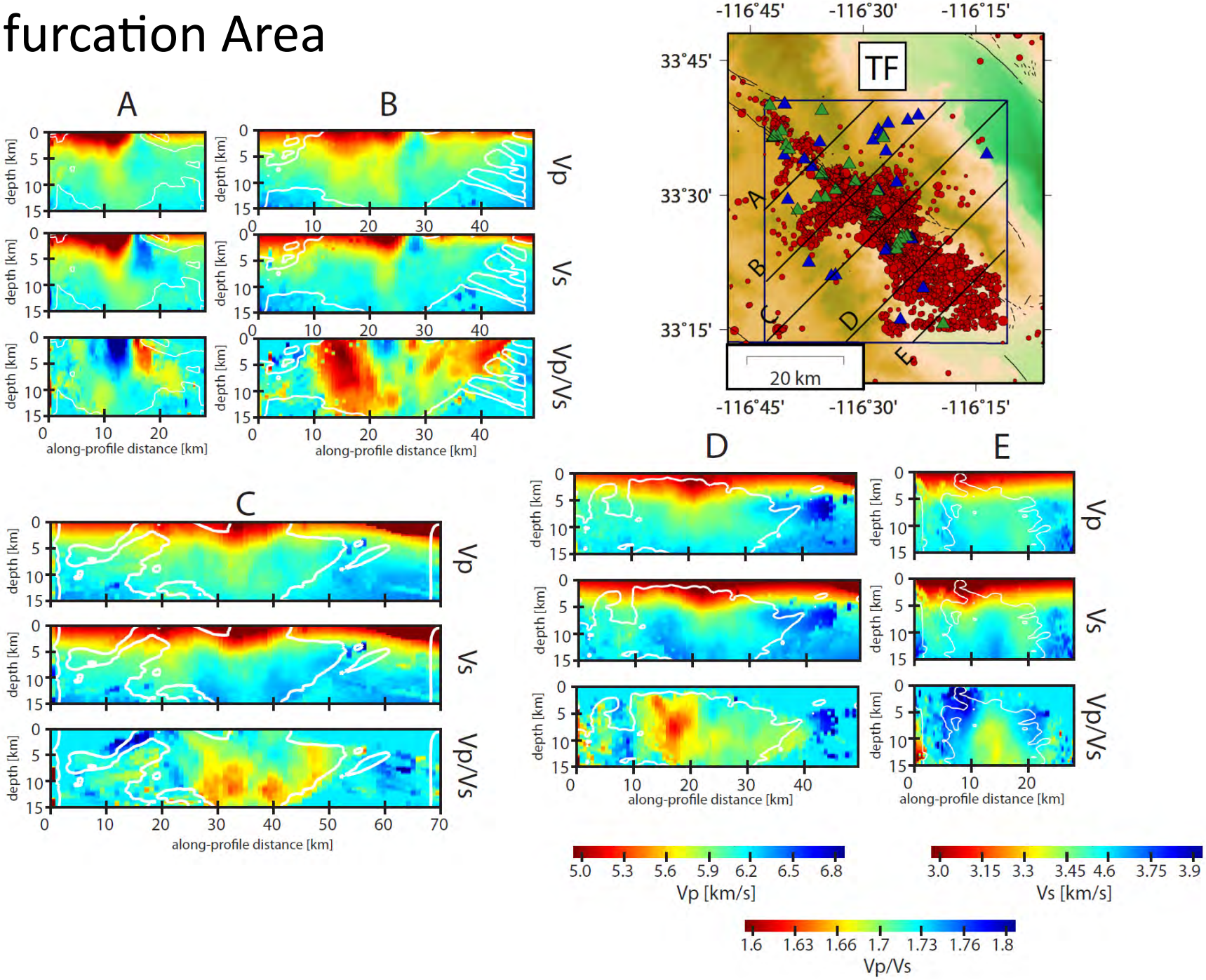


HPWREN topology – January 2012



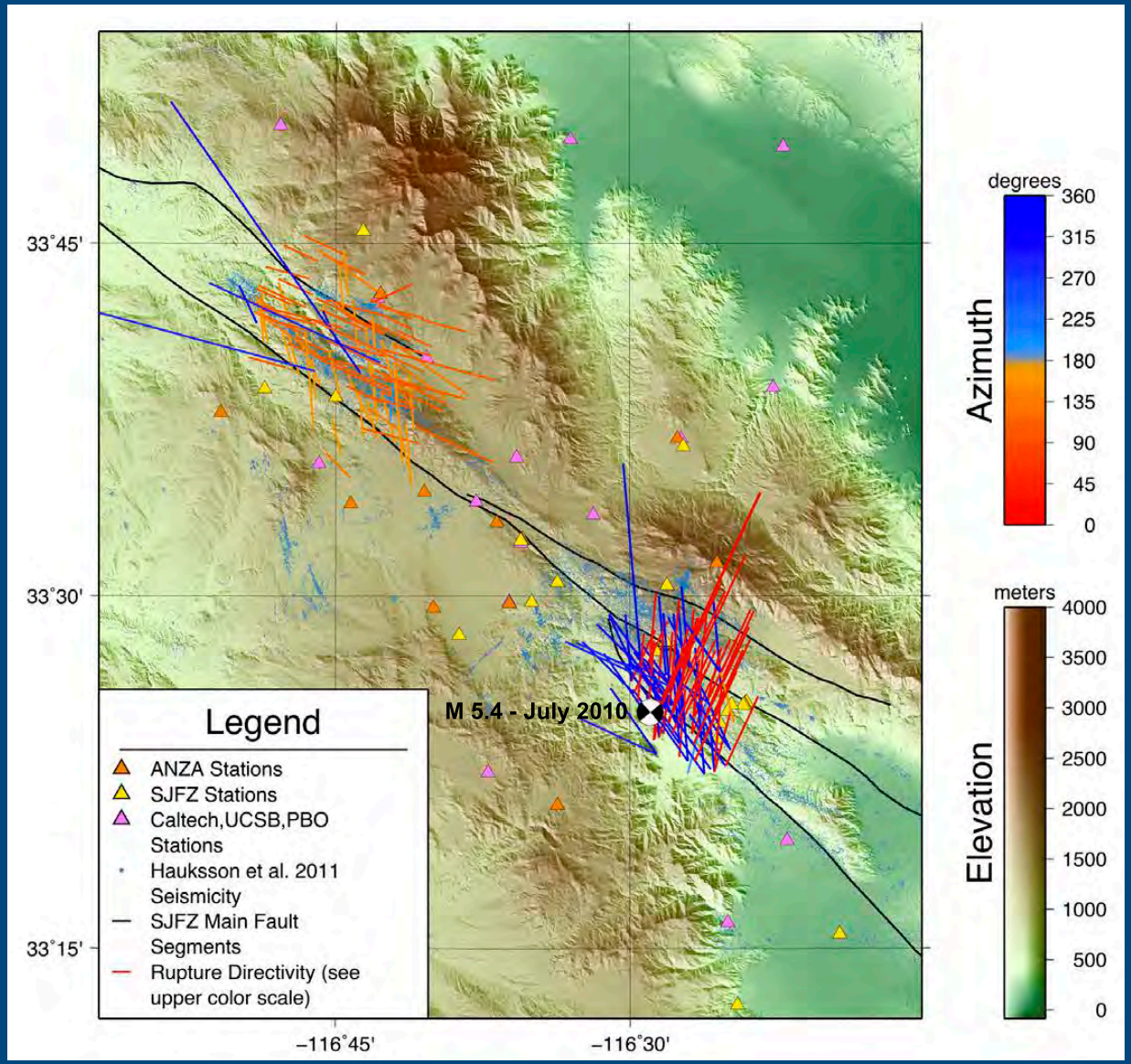
Applied Network Research http://anr.ucsd.edu

Trifurcation Area



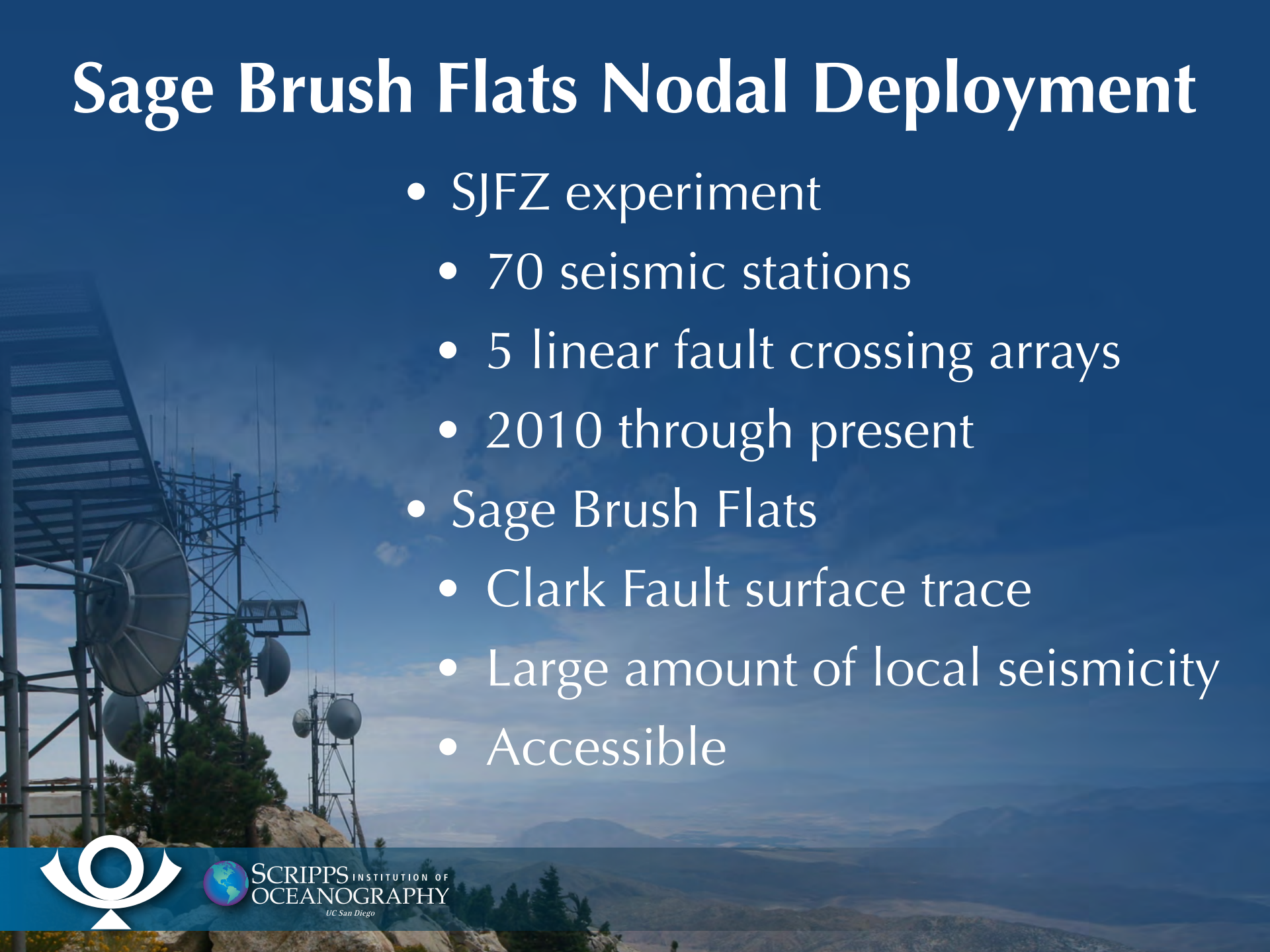
Directivity Observations

- M_l 5.9 July 2010 aftershocks
- Hot Springs Cluster December 2011
- Kurzon et al. submitted

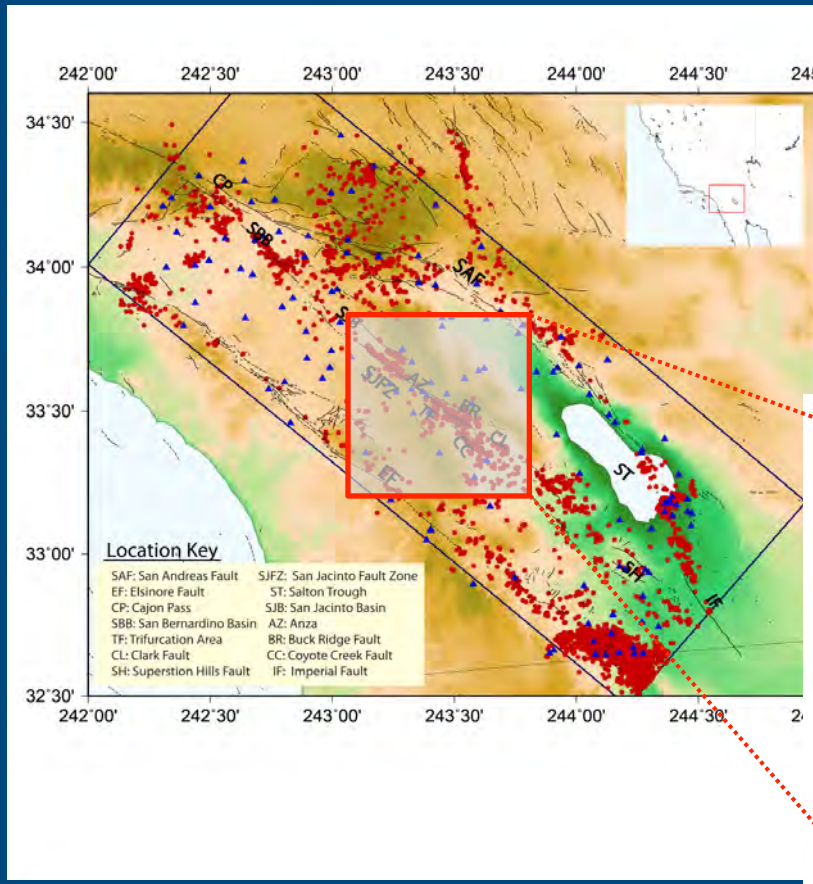


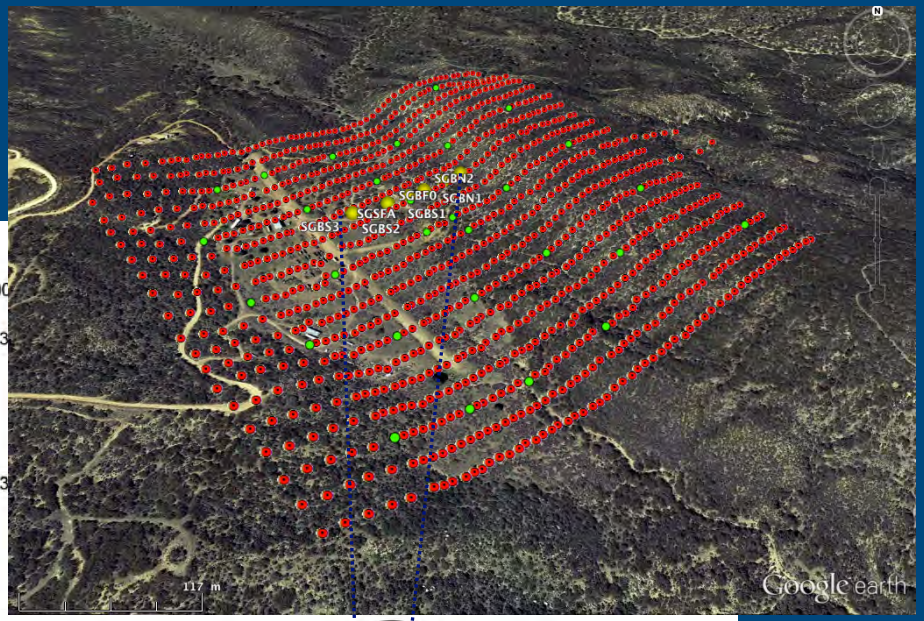
Sage Brush Flats Nodal Deployment

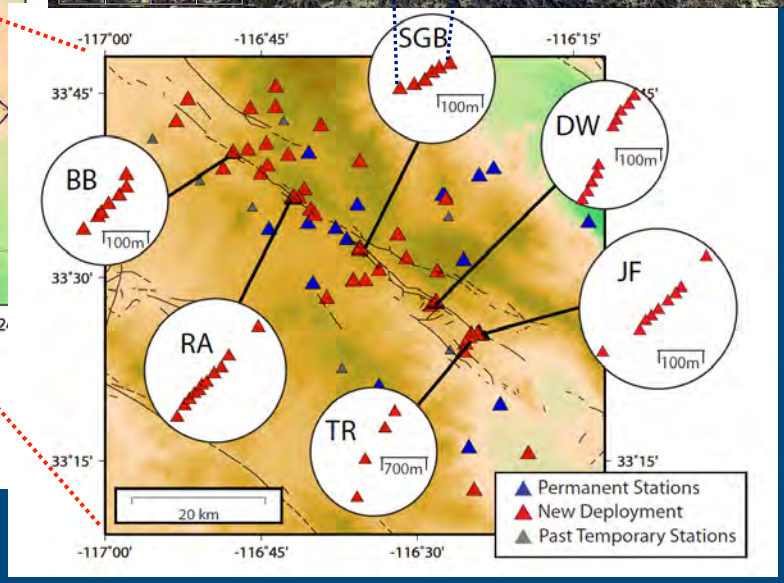
- SJFZ experiment
  - 70 seismic stations
  - 5 linear fault crossing arrays
  - 2010 through present
- Sage Brush Flats
  - Clark Fault surface trace
  - Large amount of local seismicity
  - Accessible



San Jacinto Fault Zone Dense Array



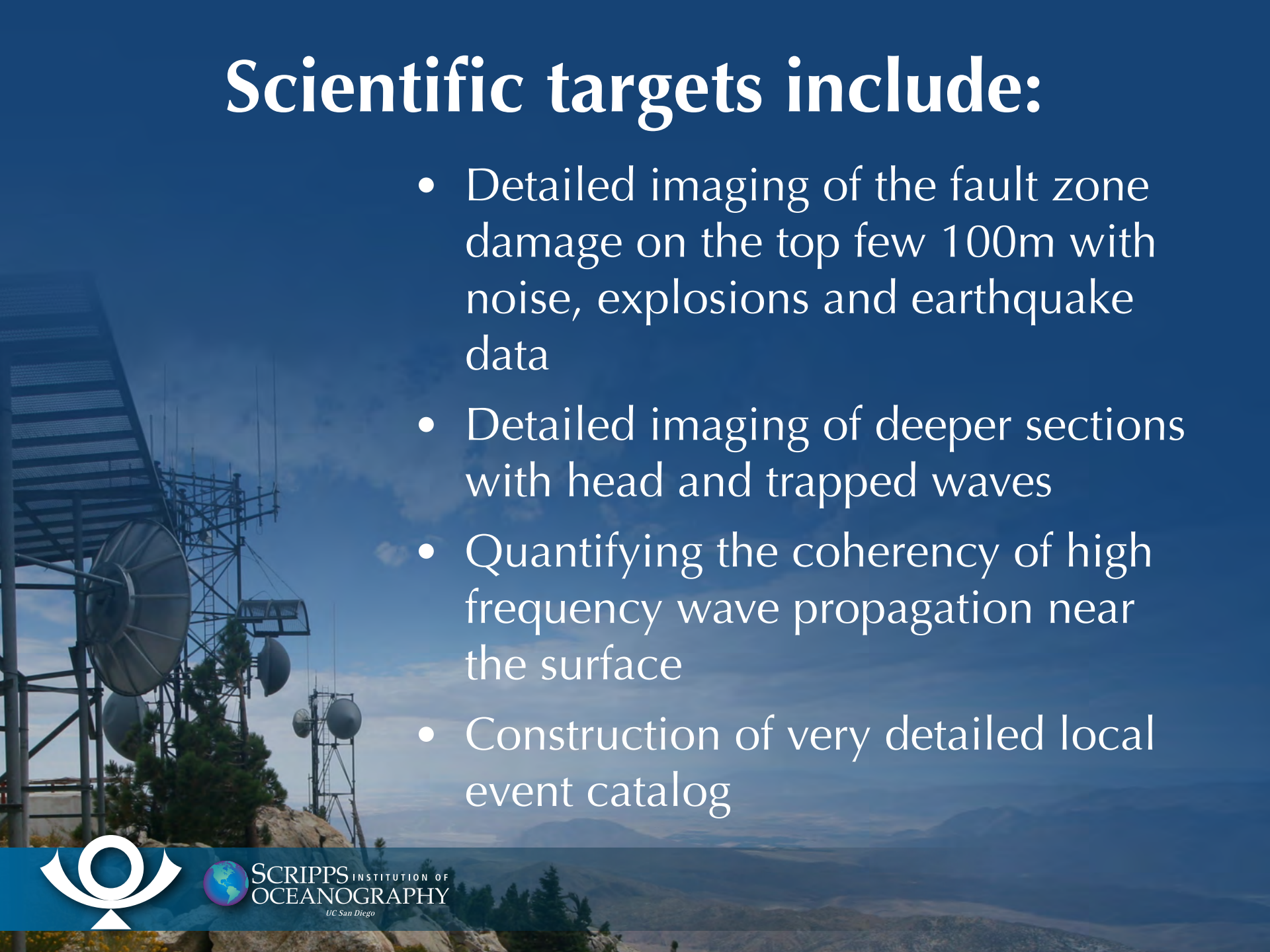




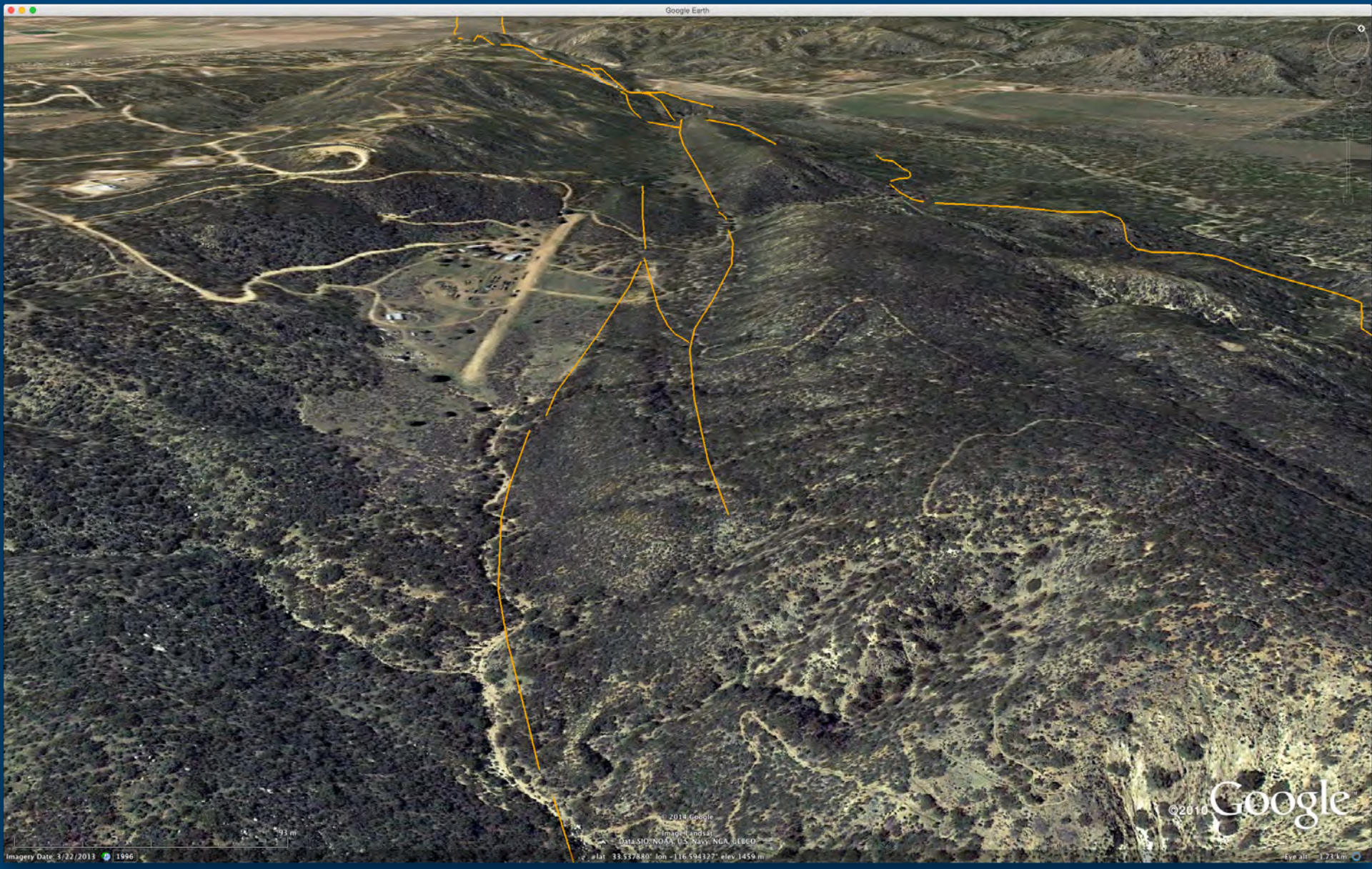
(Left) Regional seismic stations (blue triangles) and seismicity (red circles) of plate-boundary region in southern California. (Bottom right) Over 70 additional (red triangles) instruments and dense linear arrays across and around the SJFZ. (Top right) Highly-dense rectangular array with 1108 vertical-component nodes. The green dots are locations of "Betsy" gun shots.

Scientific targets include:

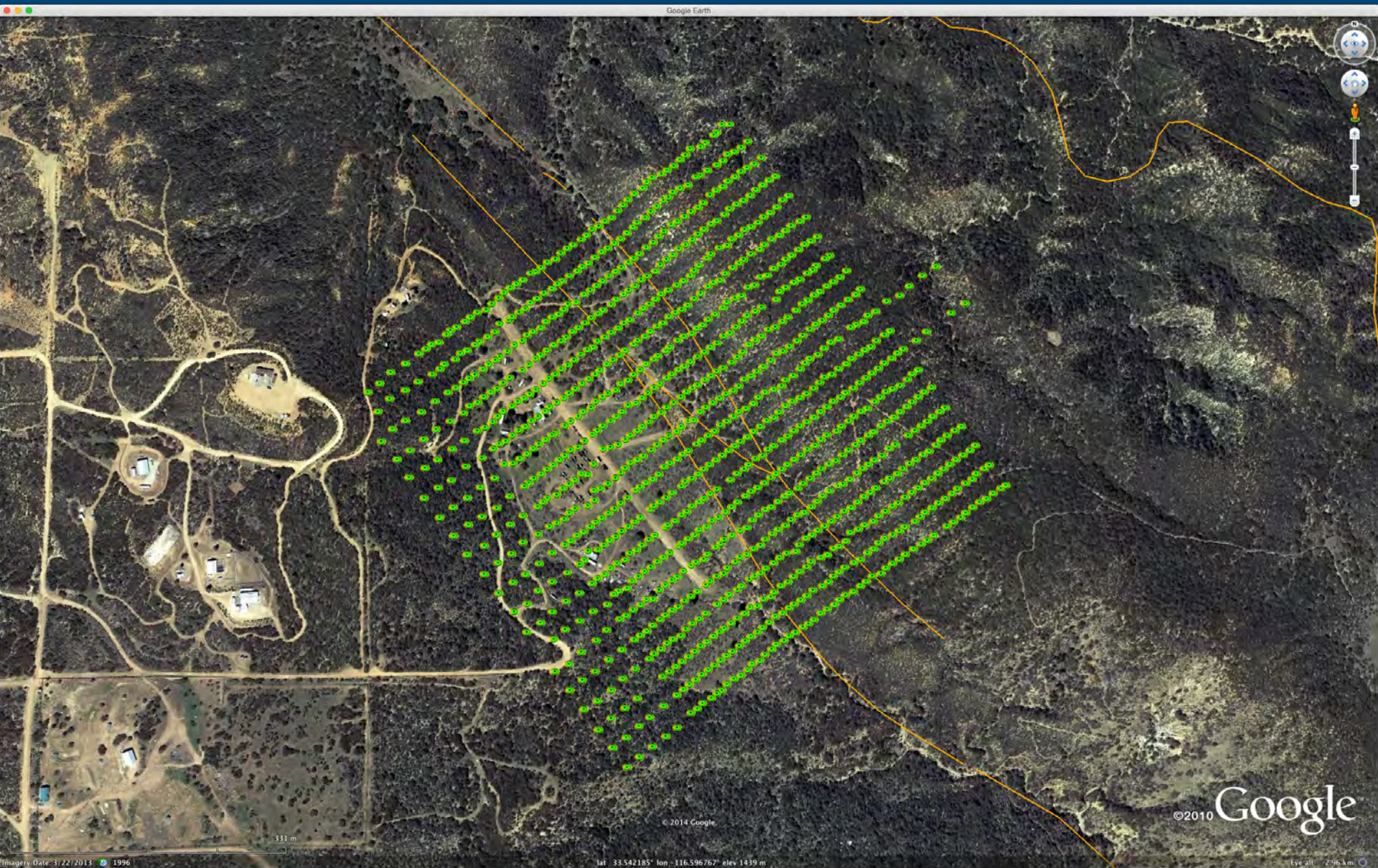
- Detailed imaging of the fault zone damage on the top few 100m with noise, explosions and earthquake data
- Detailed imaging of deeper sections with head and trapped waves
- Quantifying the coherency of high frequency wave propagation near the surface
- Construction of very detailed local event catalog



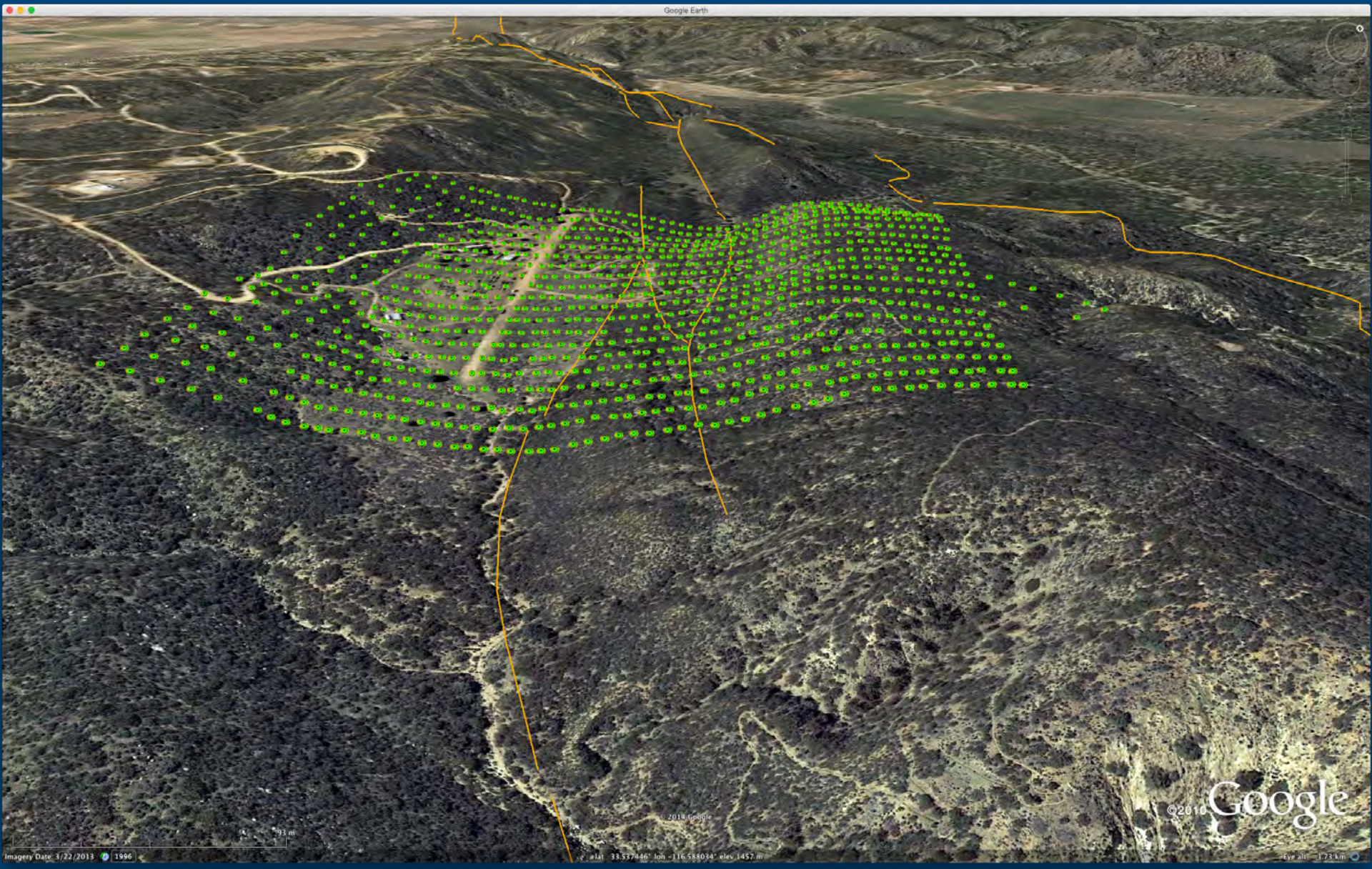
Sage Brush Flats - Clark Fault

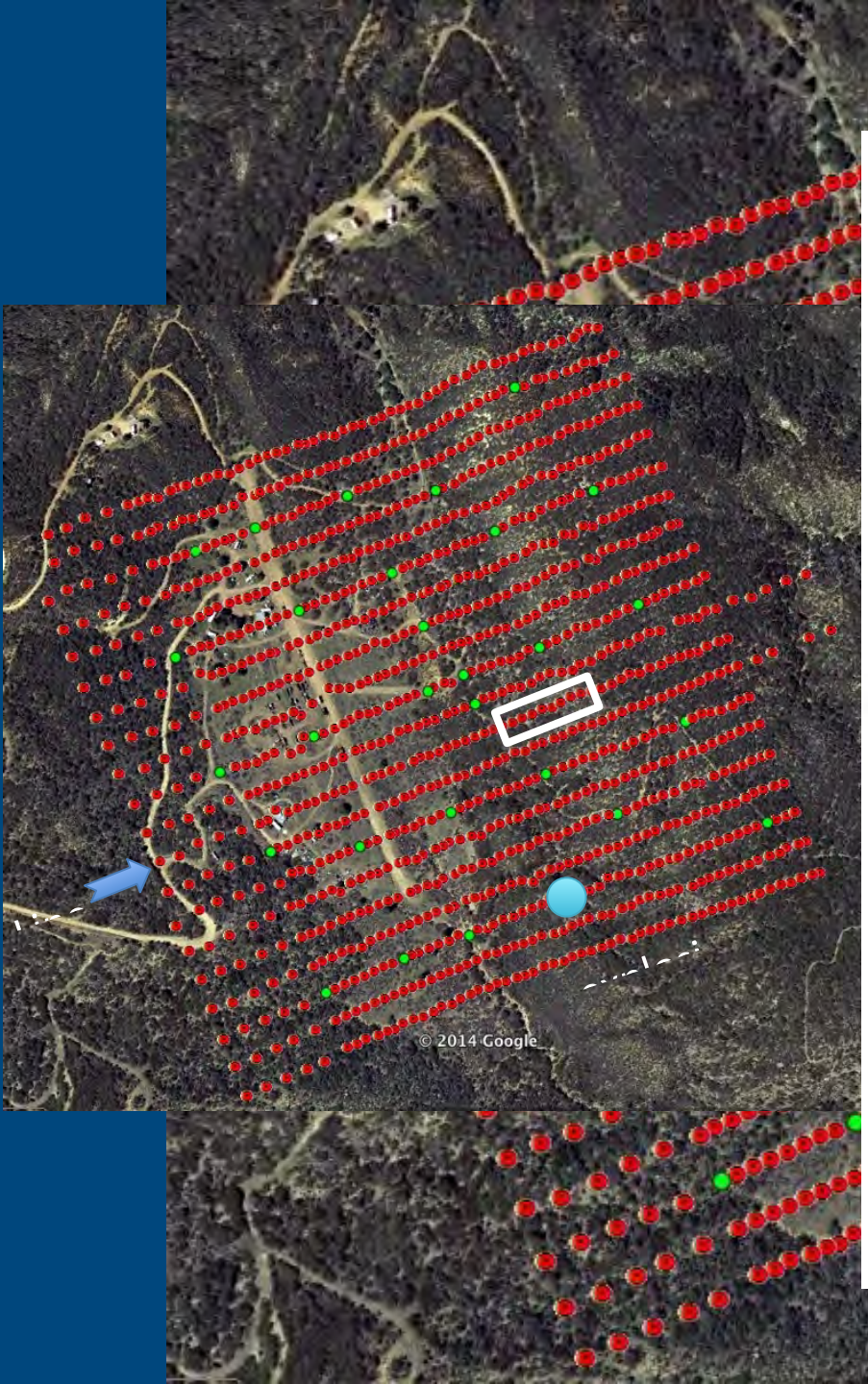


Sage Brush Flats - Nodal Array

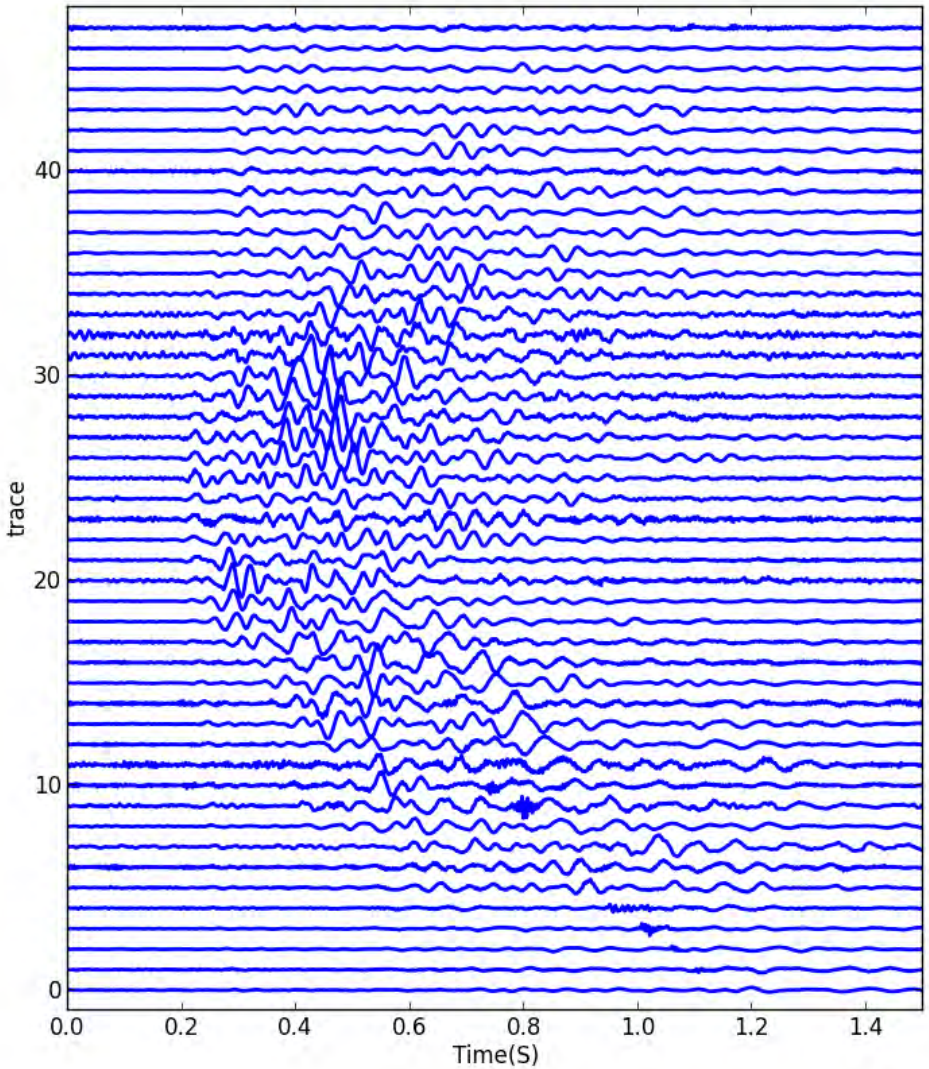


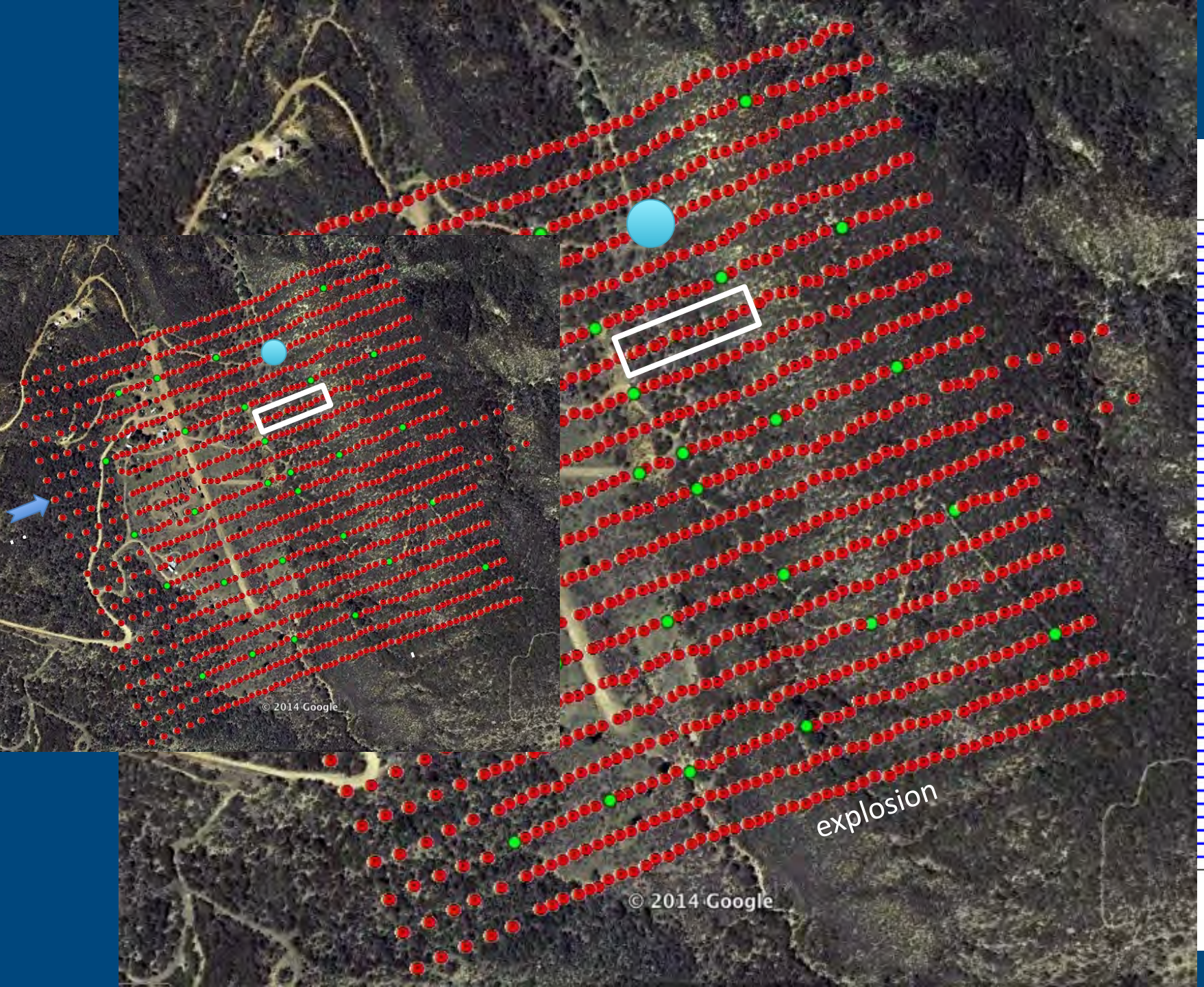
Sage Brush Flats - Oblique View

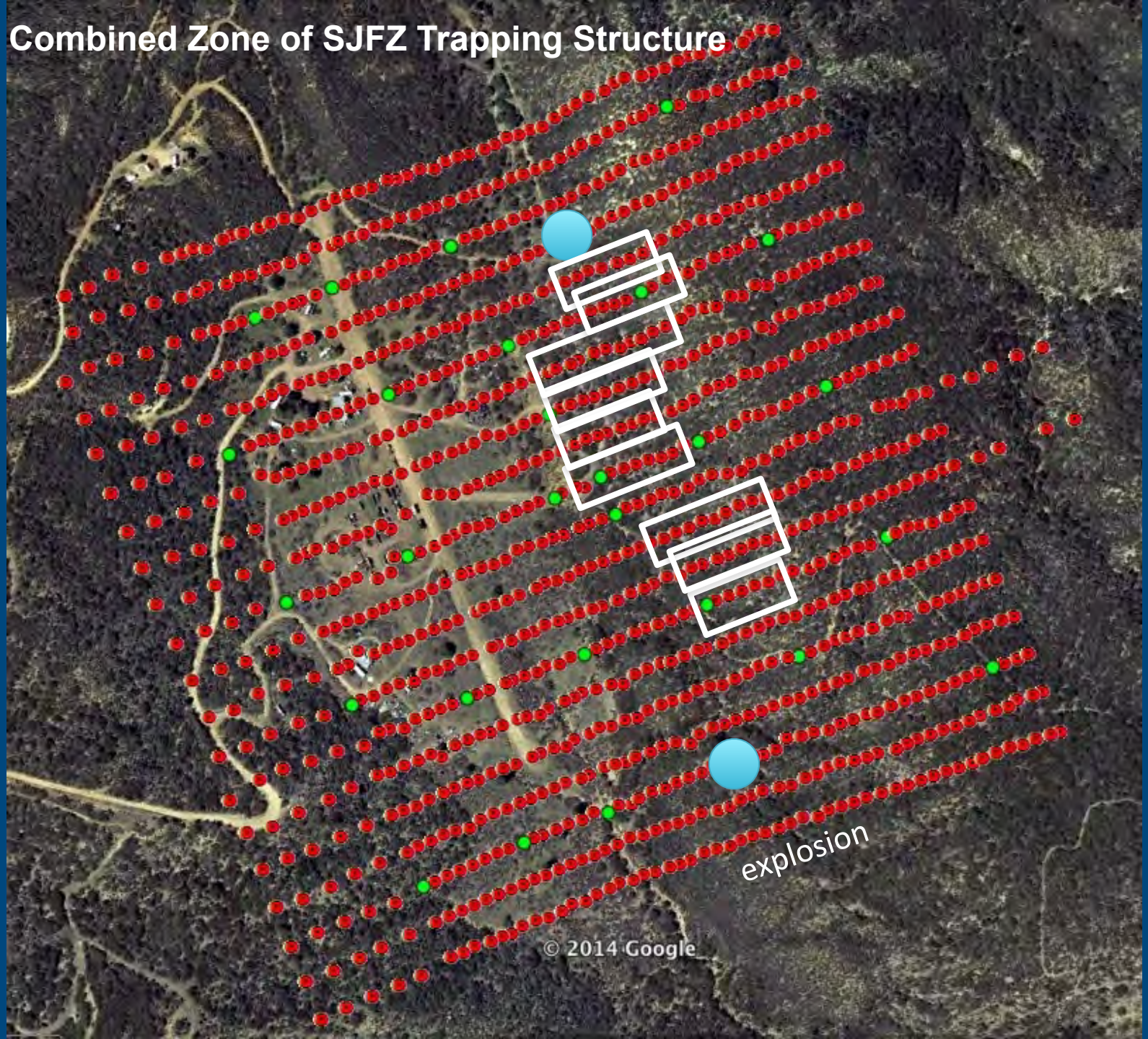




Potential trapped waves




explosion
© 2014 Google
© 2014 Google
1.4


Combined Zone of SJFZ Trapping Structure
explosion
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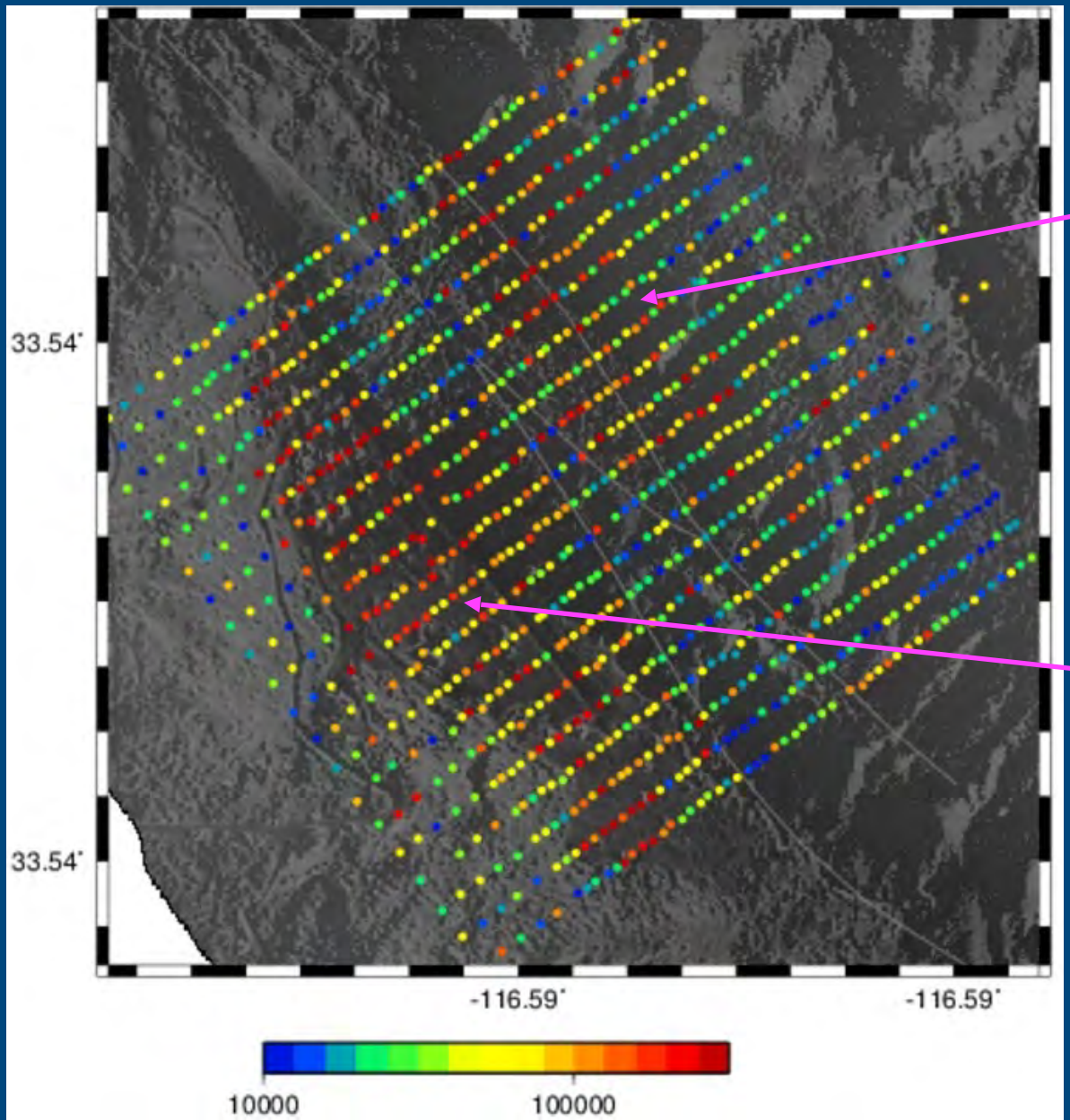
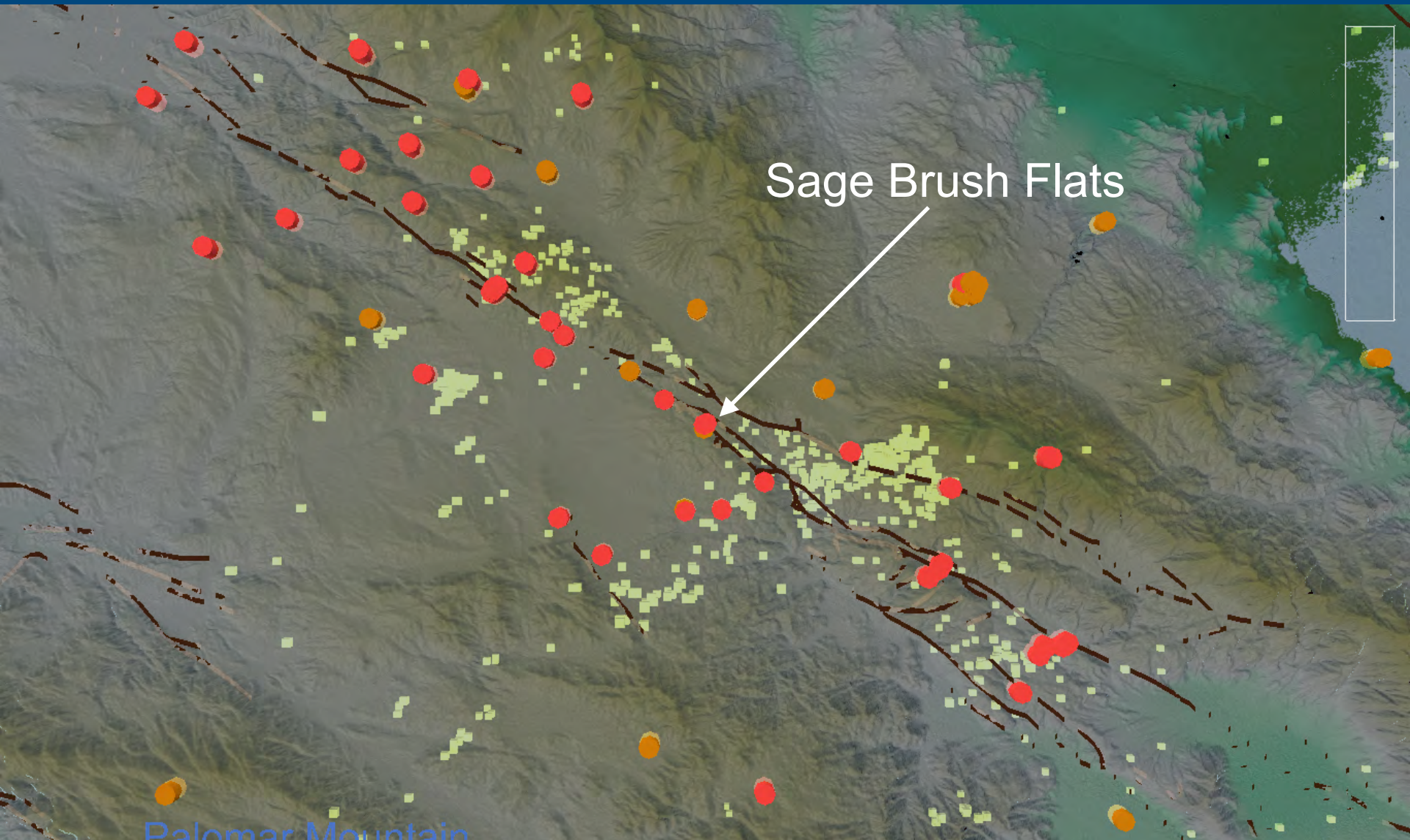
Median power (amplitude squared) recorded for duration of experiment



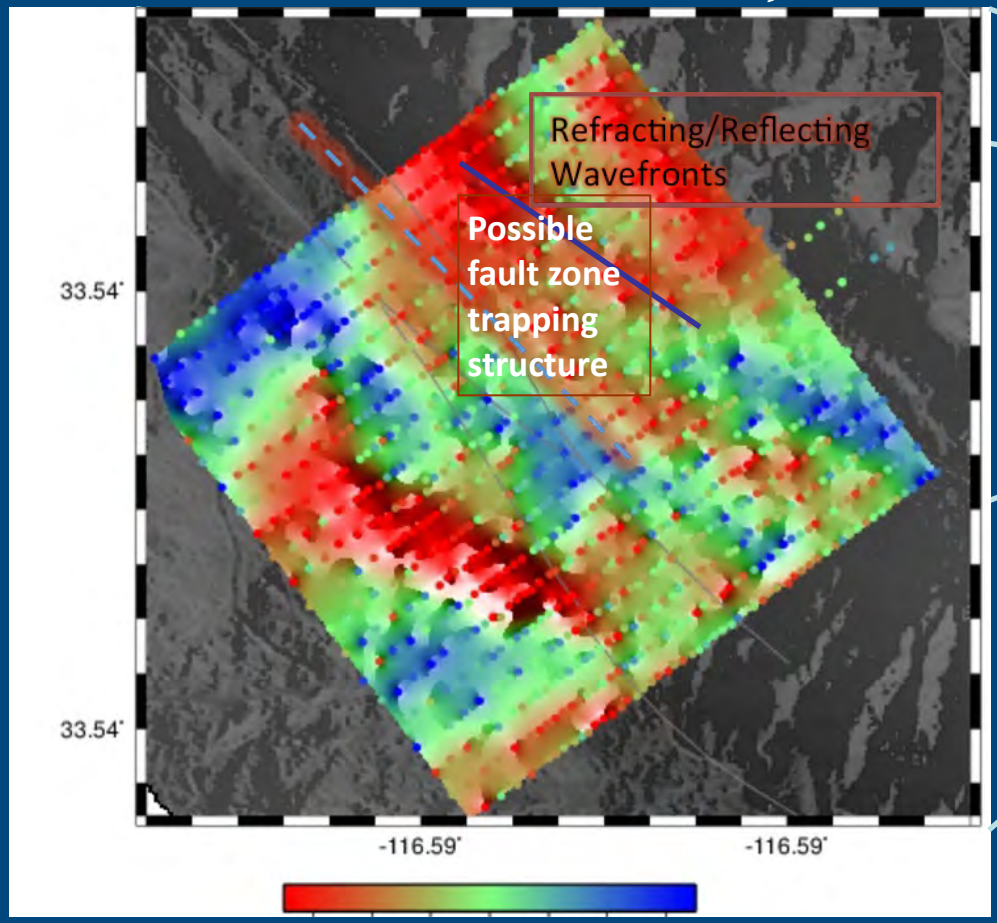
This zone of amplified motion is associated with possible trapping structure (see next slides)

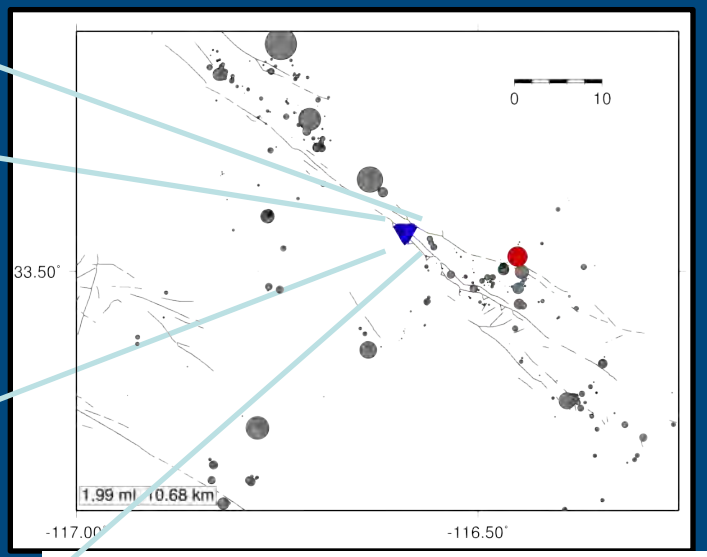
This zone is associated with landowners home and machines (cultural noise), plus possible small sedimentary basin

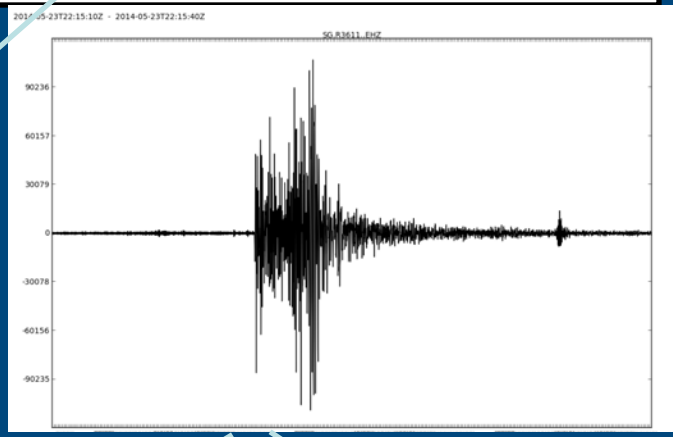
Seismicity during Nodal Experiment

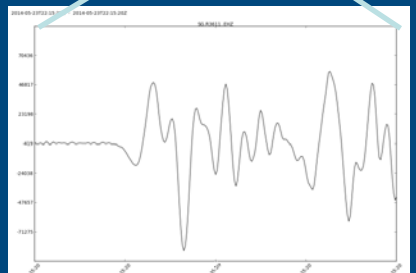


M2 Event, Distance:10.68 km

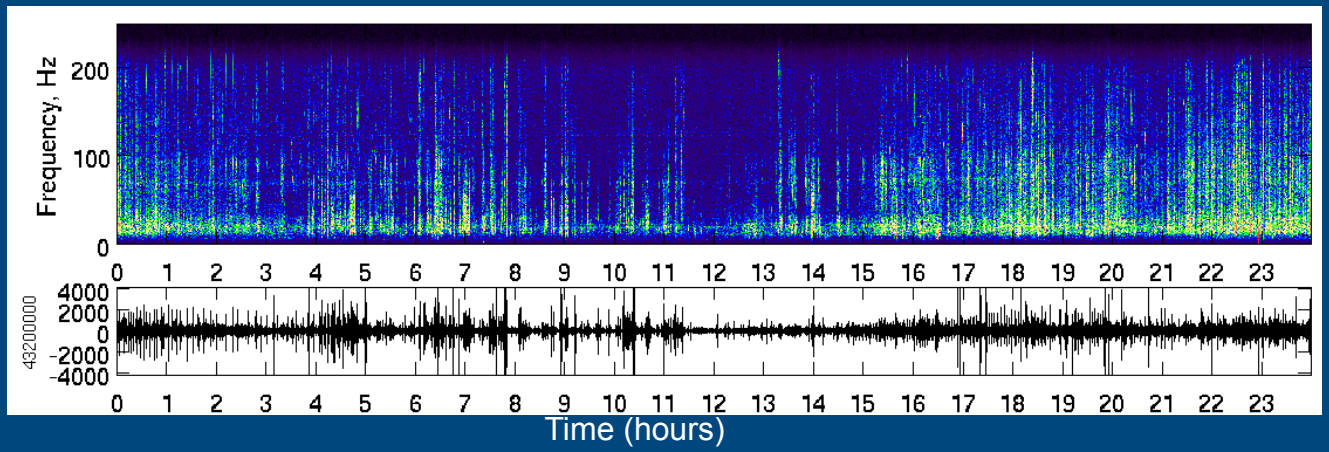








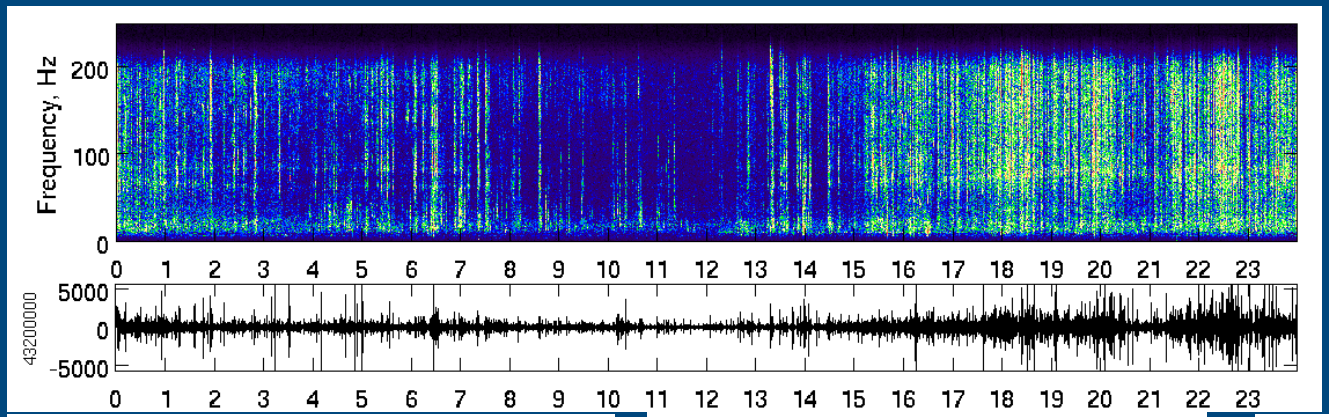
Example data and correlations from the dense deployment



Station R3413

Spectrogram for day 145

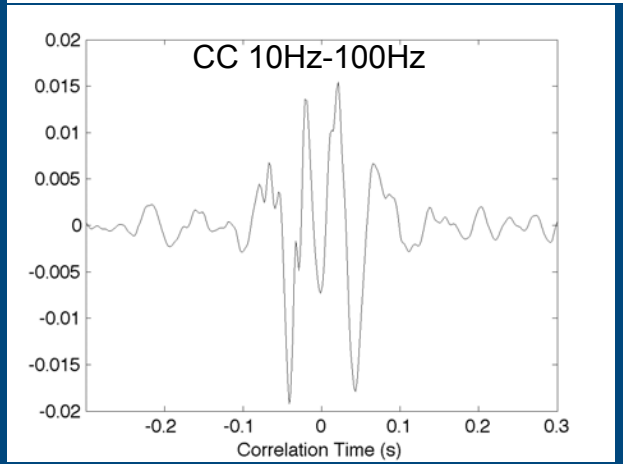
24h data for day 145

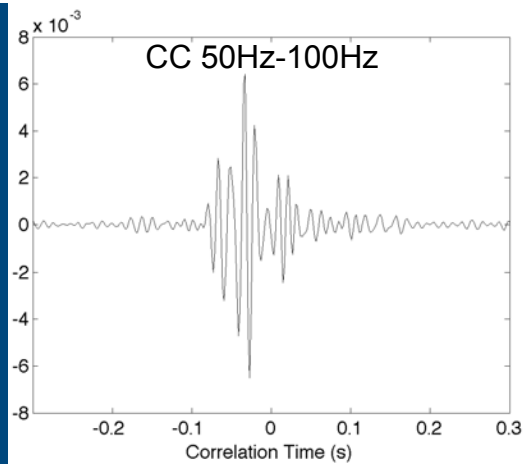


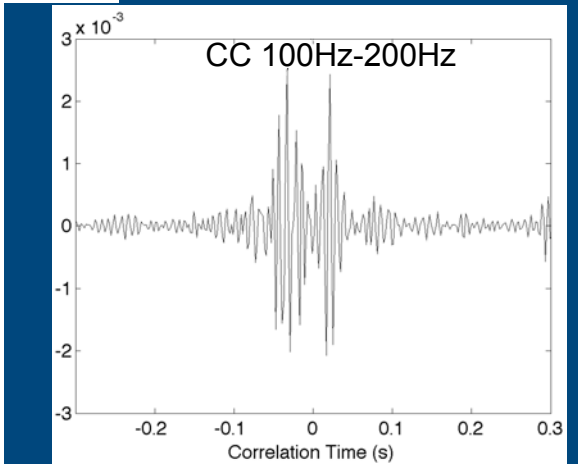
Station R3513

Spectrogram for day 145

24h data for day 145

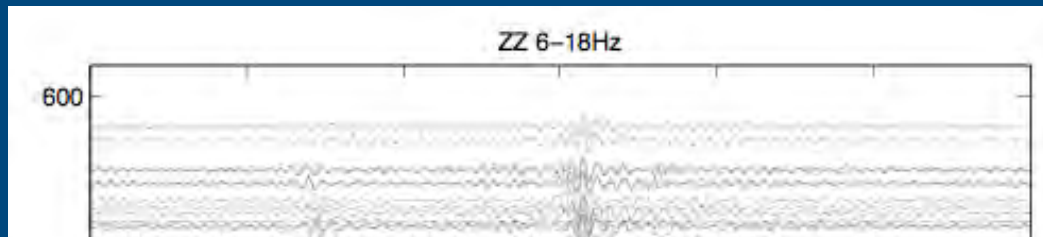


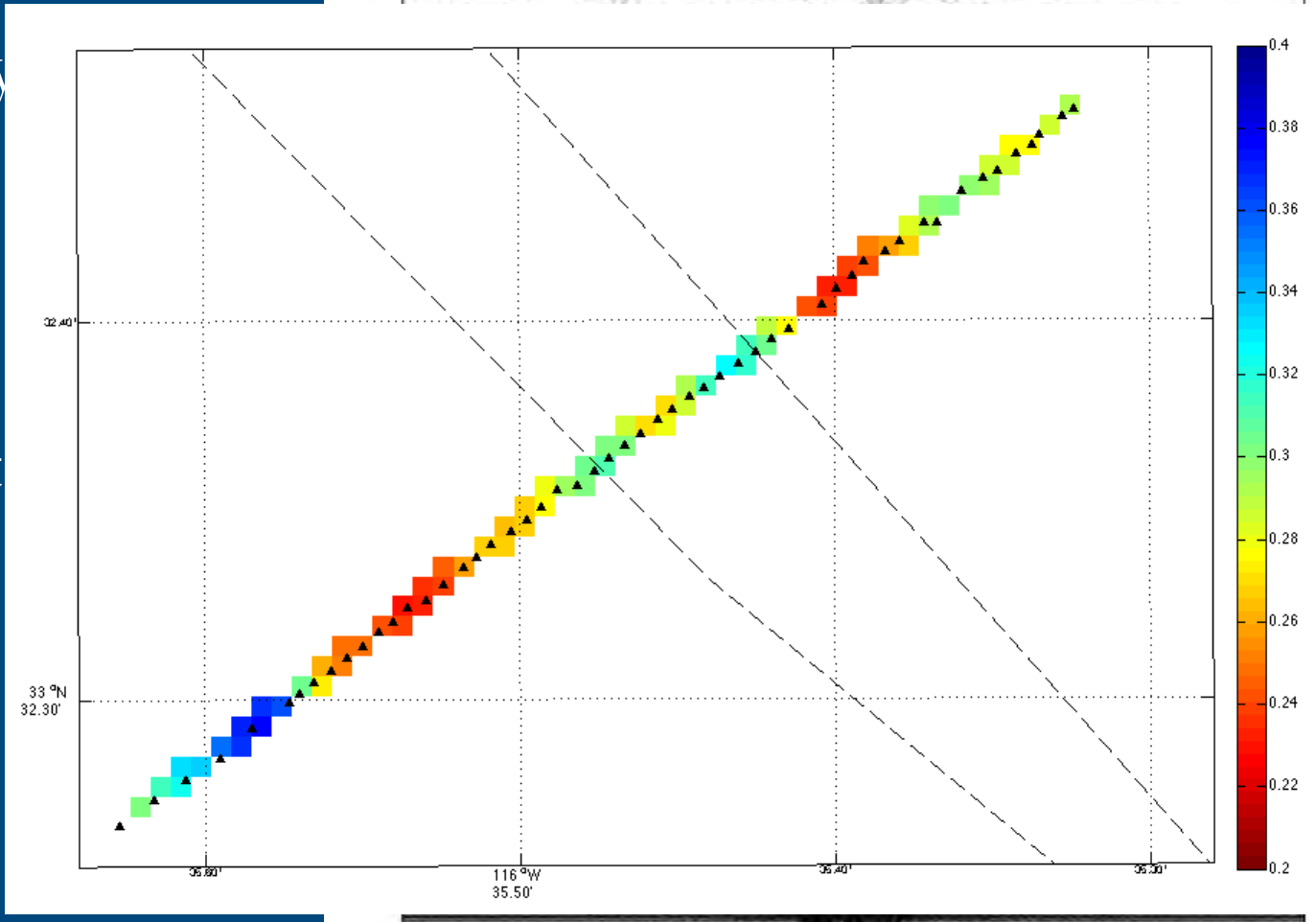




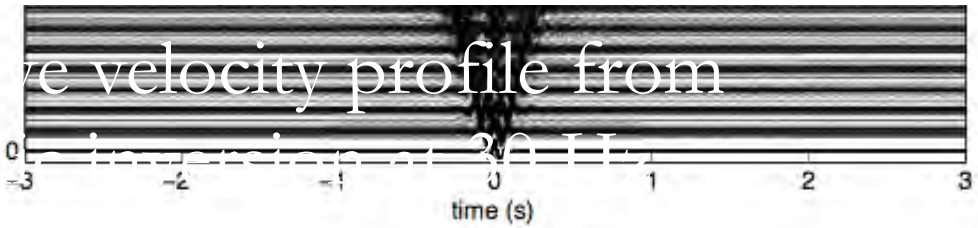
Ambient Noise Cross-correlation

- Preliminary
- Line 13
- 600 meters
- 55 element
- 6-18 Hz

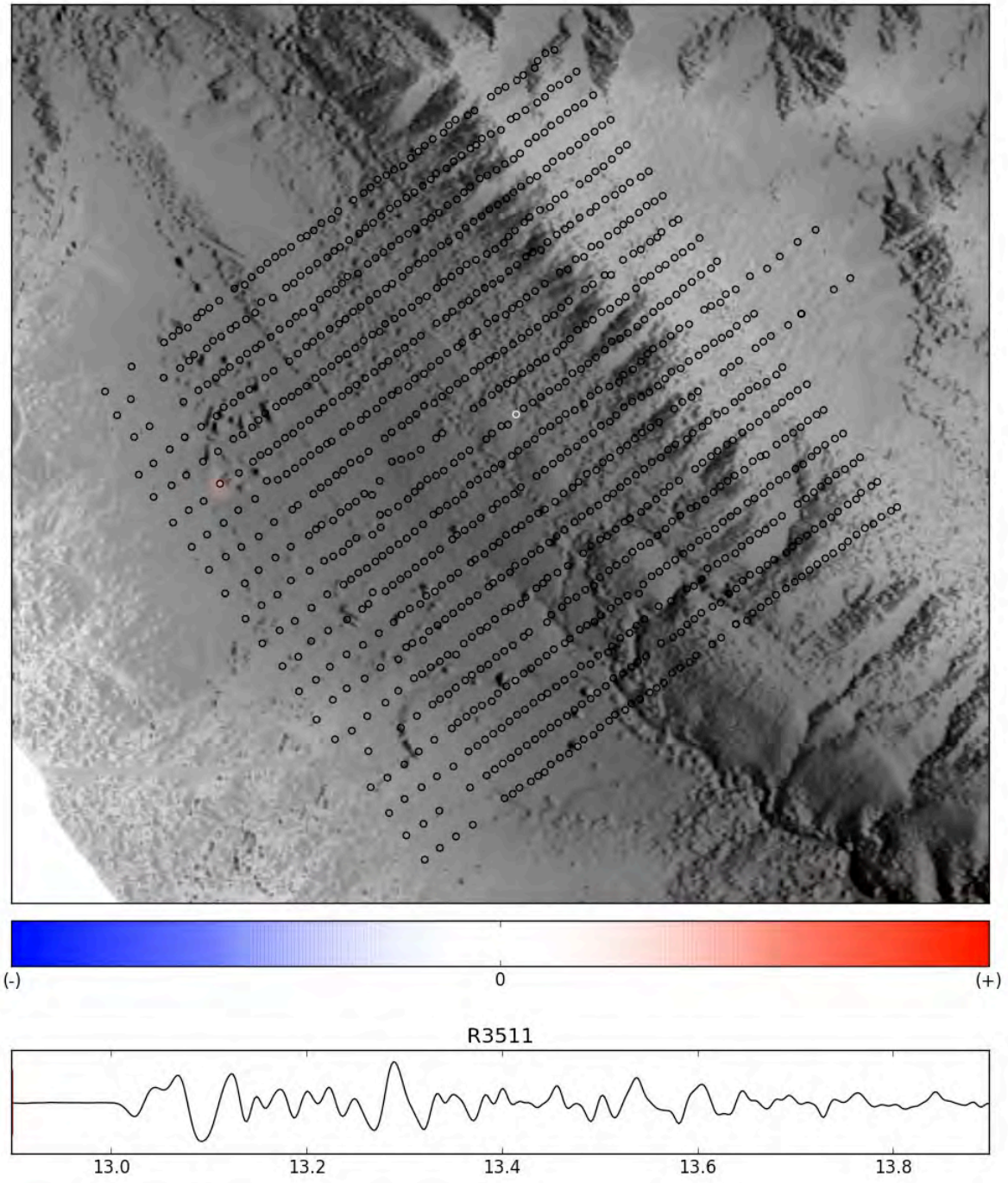




Surface v e velocity profile from tomograp in region at 20 Hz



- P wave
- M_L 1.5
- Epicentral distance 11.3 km
- Azimuth 120°



- P wave
- M_L 2.3
- Epicentral distance 7 km
- Azimuth 329°