Antelope Contributed Software Development Status for Detectors, Focal Mechanisms, Moment Tensors, Locations

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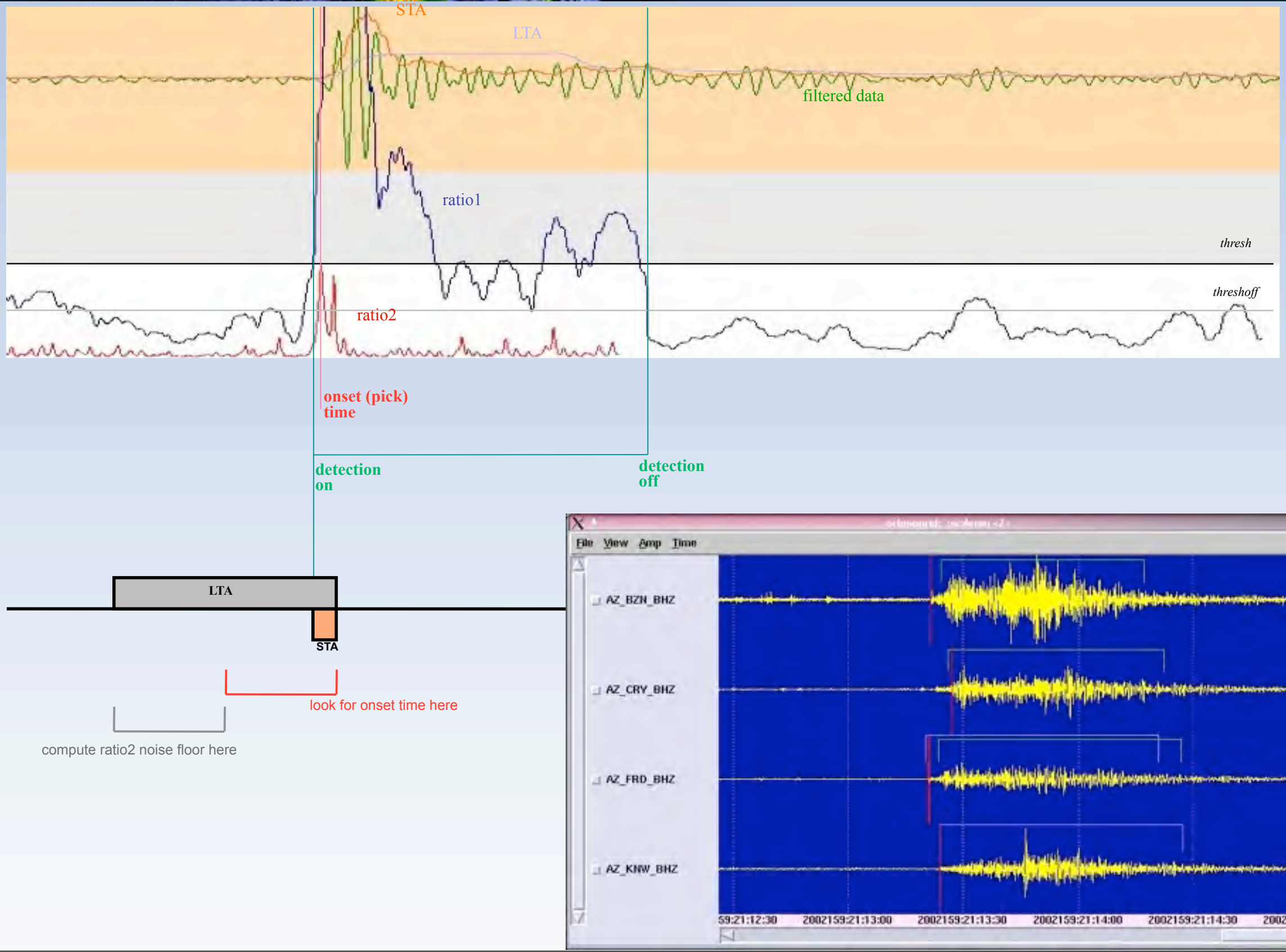
Topics

Current developments

- SVD Detectors
  - 3 person-months uninterrupted
- Focal Mechanisms without GUI
  - 2 person-months uninterrupted
- Moment Tensors
  - 3 person-months uninterrupted
- 3d Velocity Locations
  - 6 person-months uninterrupted

Detectors

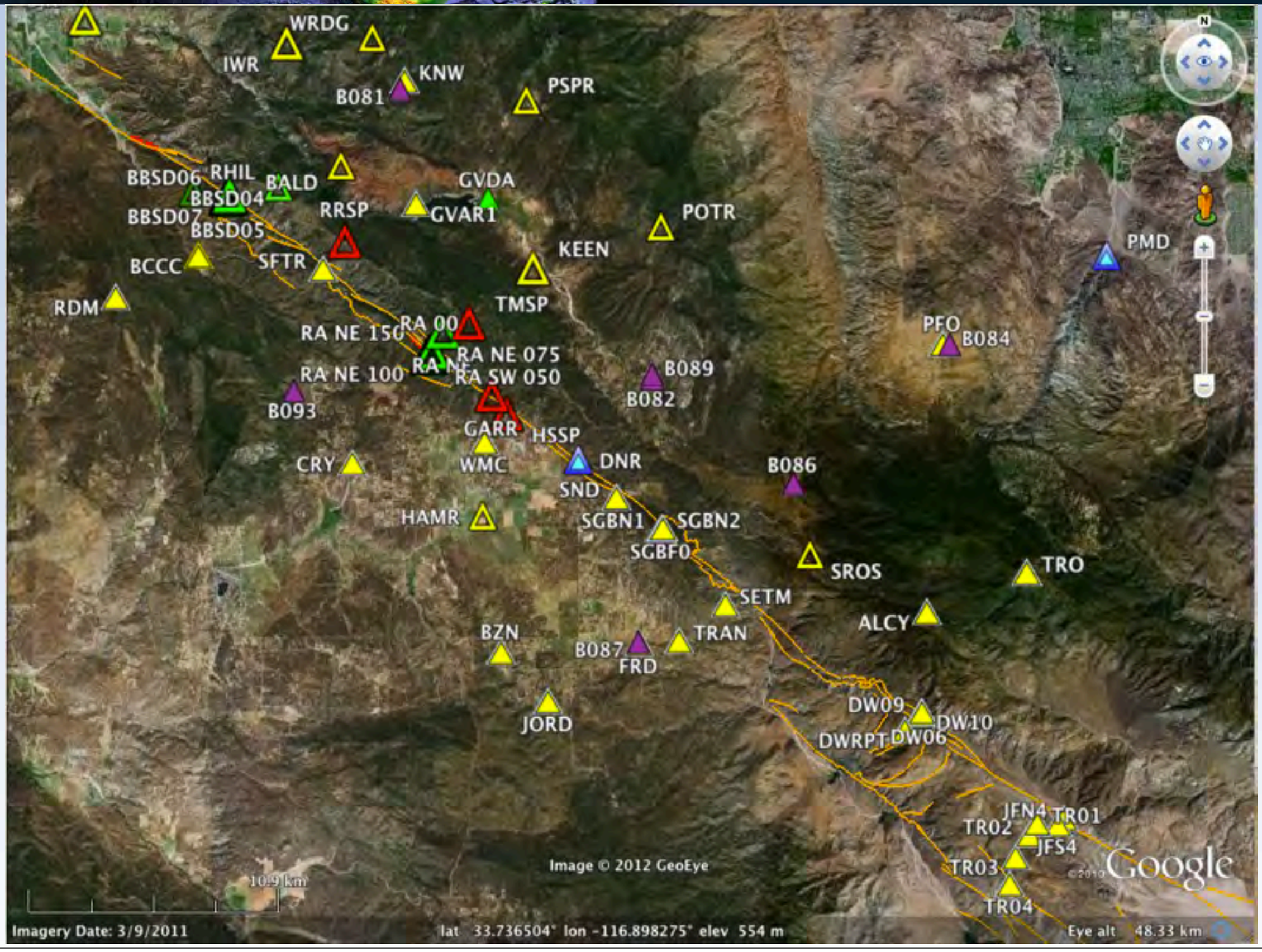

STA
LTA
filtered data
ratio1
thresh
threshoff
ratio2
onset (pick) time
detection on
detection off
LTA
STA
look for onset time here
compute ratio2 noise floor here

File View Amp Time
AZ_BZN_BHZ
AZ_CRY_BHZ
AZ_FRD_BHZ
AZ_KNW_BHZ
59:21:12:30
2002159:21:13:00
2002159:21:13:30
2002159:21:14:00
2002159:21:14:30
2002159:21:15:0

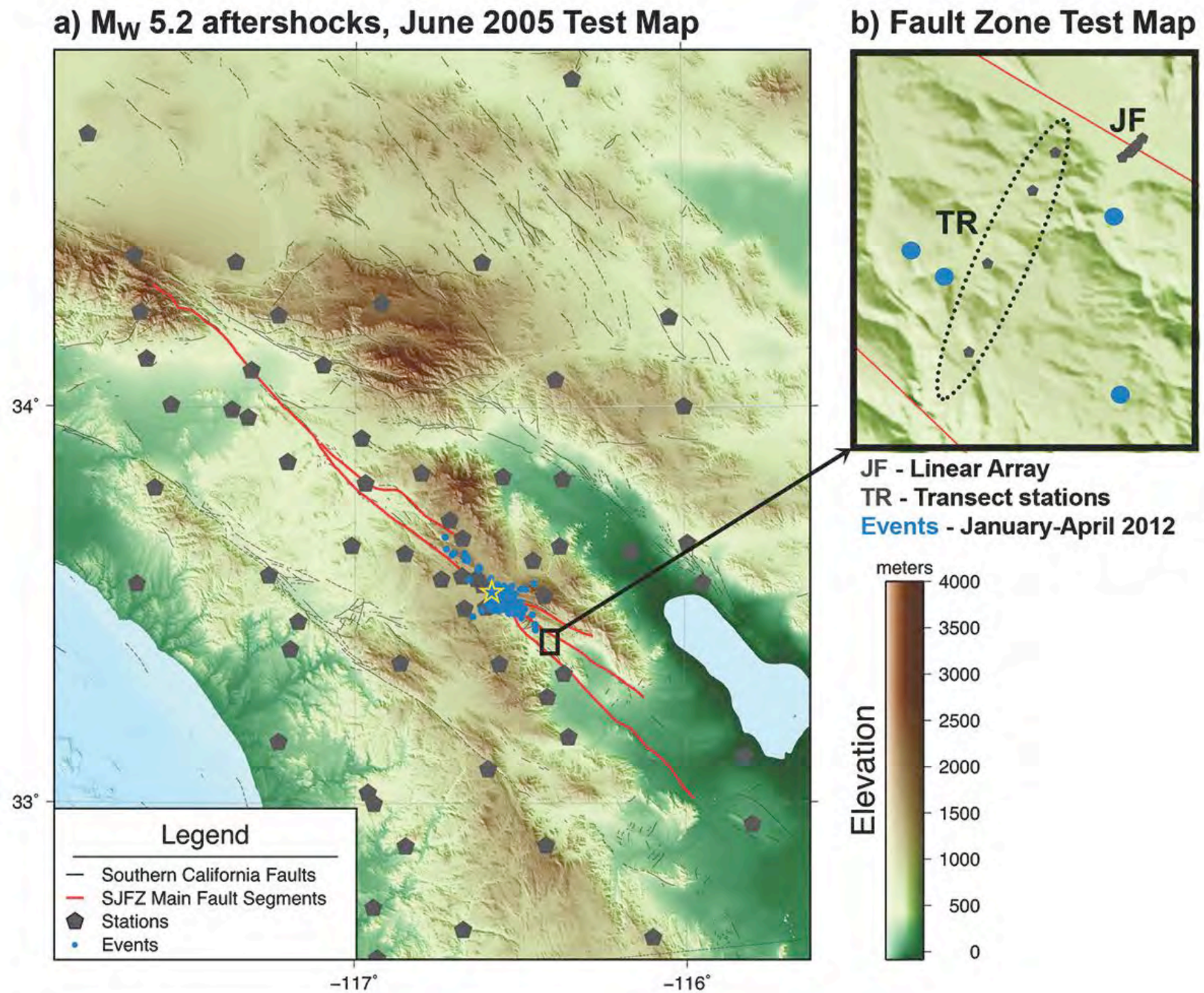
Detectors

- P wave detection
  - works extremely well
- S wave detection issues
  - P wave coda
  - N or E component?
  - S-P times may be too short
- Particle motion analysis
  - recursive singular value decomposition
  - distinguish P and S seismic phases
  - stream of three-component data
  - sample-to-sample resolution
  - Rosenberger, Bulletin of the Seismological Society of America, Vol. 100, No. 3, pp. 1252–1262, June 2010, doi: 10.1785/0120090265

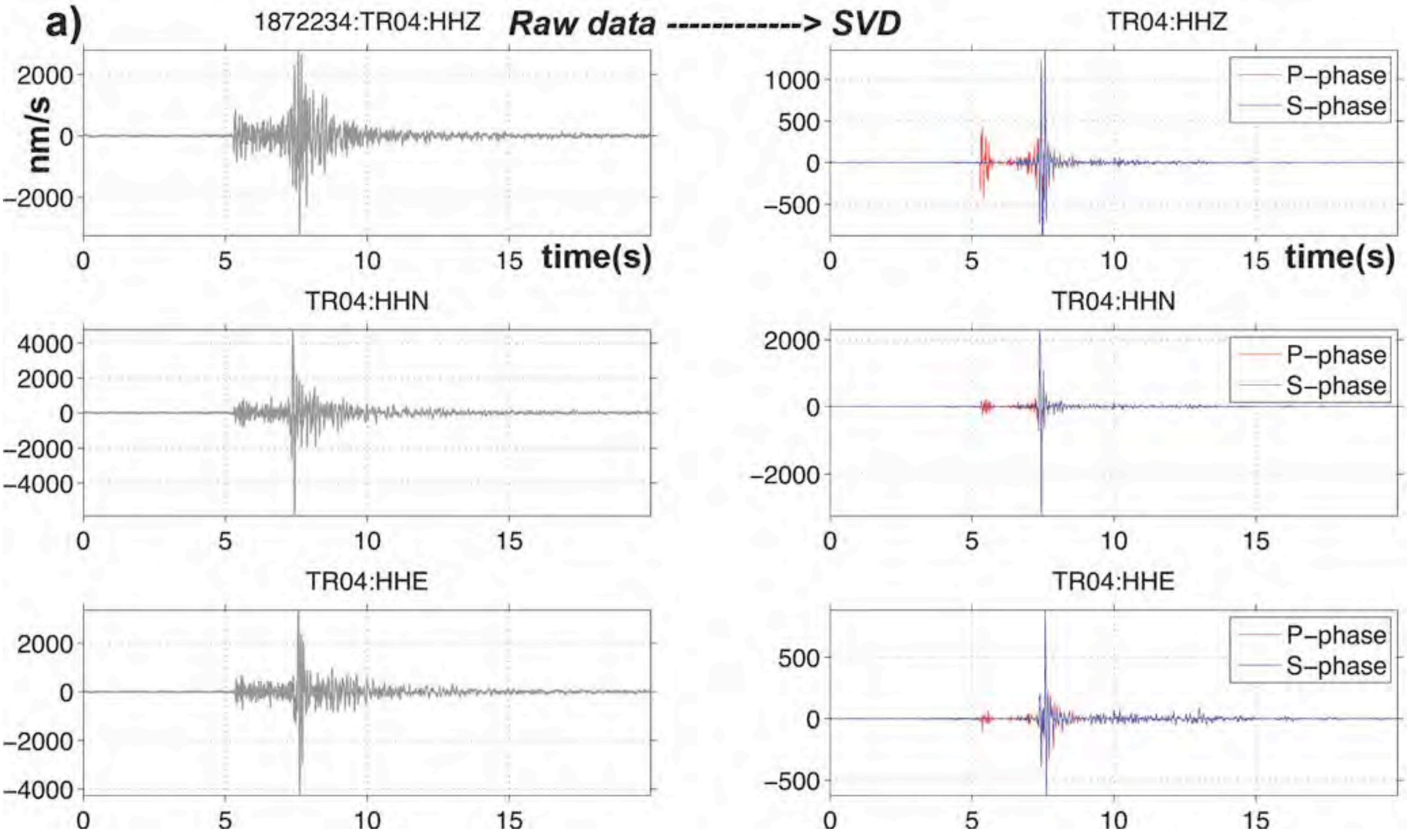
San Jacinto Fault Zone Experiment



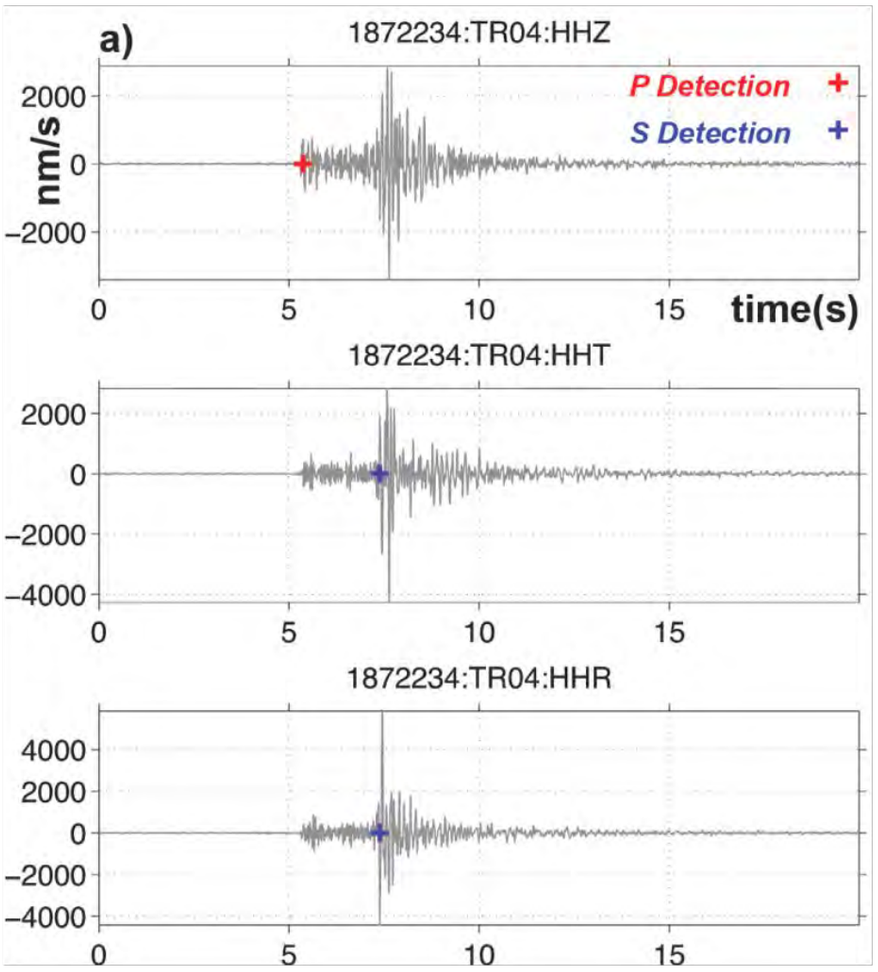
SVD Dataset

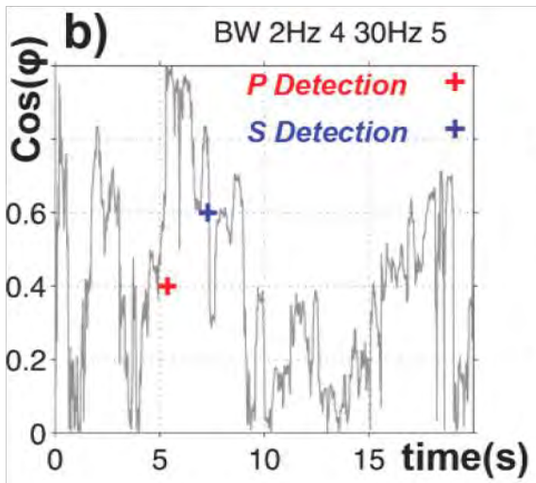

a) M_W 5.2 aftershocks, June 2005 Test Map
b) Fault Zone Test Map
JF
TR
JF - Linear Array
TR - Transect stations
Events - January-April 2012
meters
4000
3500
3000
2500
2000
1500
1000
500
0
Elevation
34°
33°
−117°
−116°
Legend
Southern California Faults
SJFZ Main Fault Segments
Stations
Events

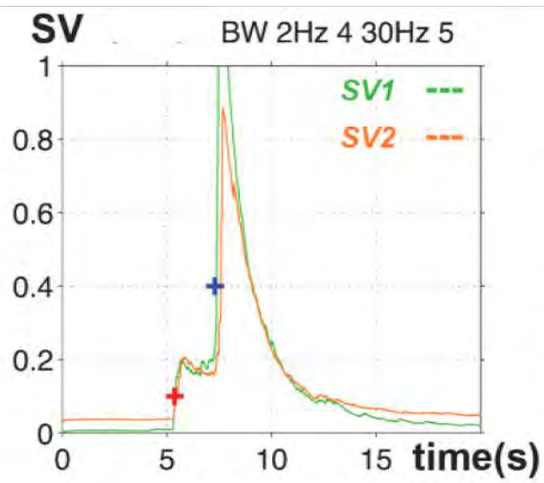
SVD Waveforms

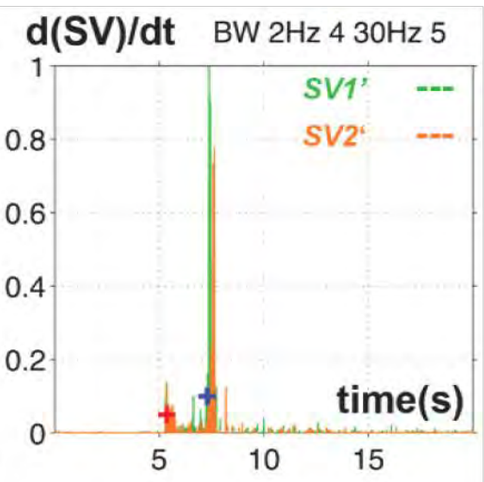


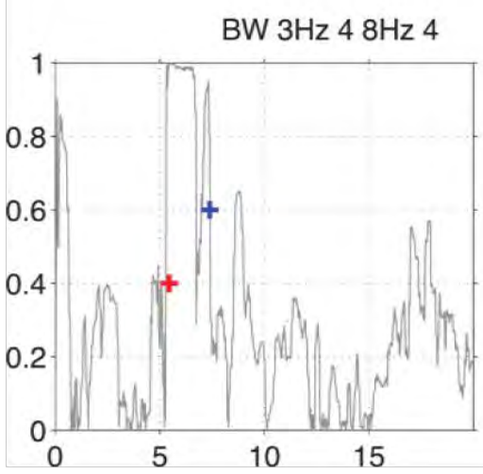
SVD Detector

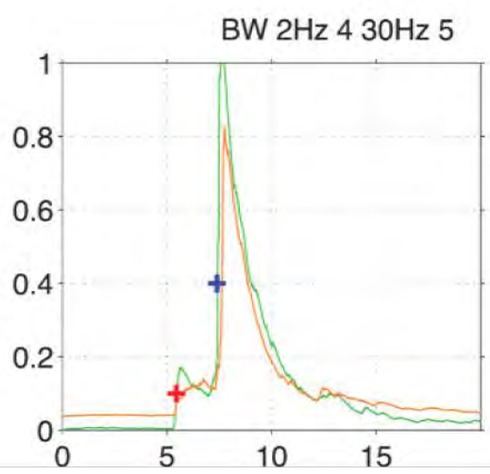


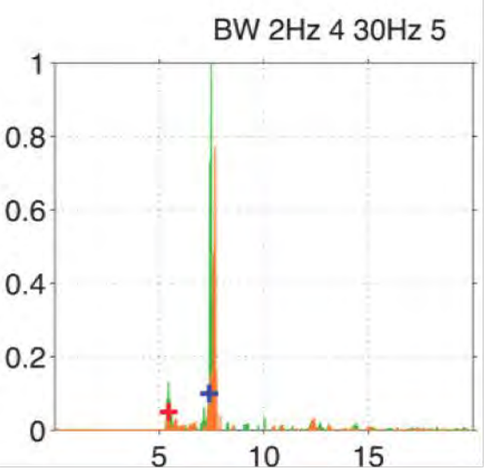




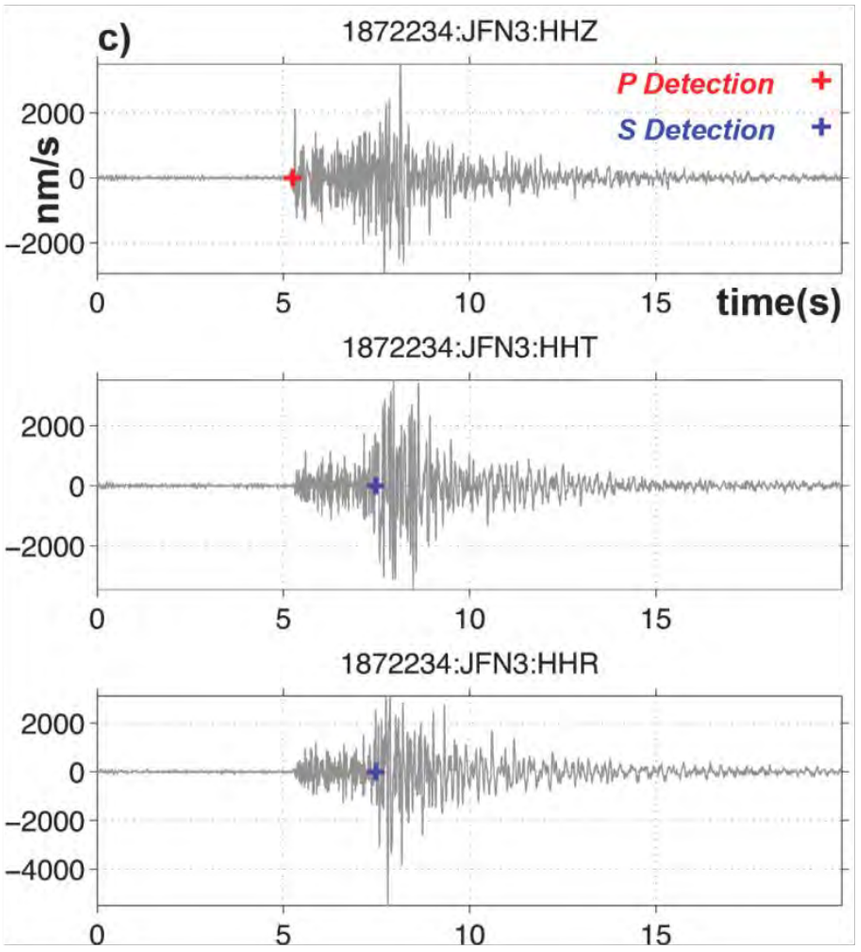


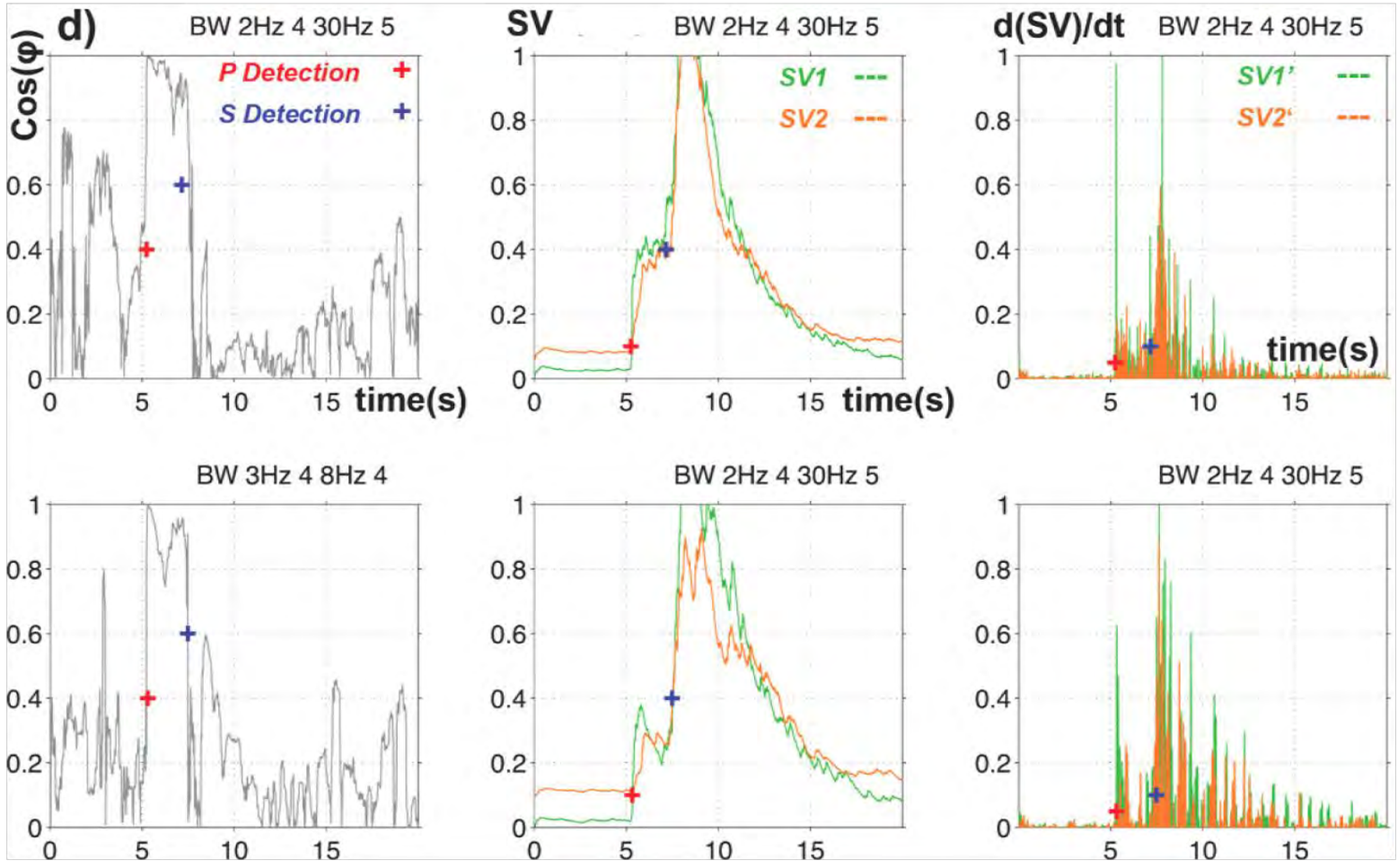




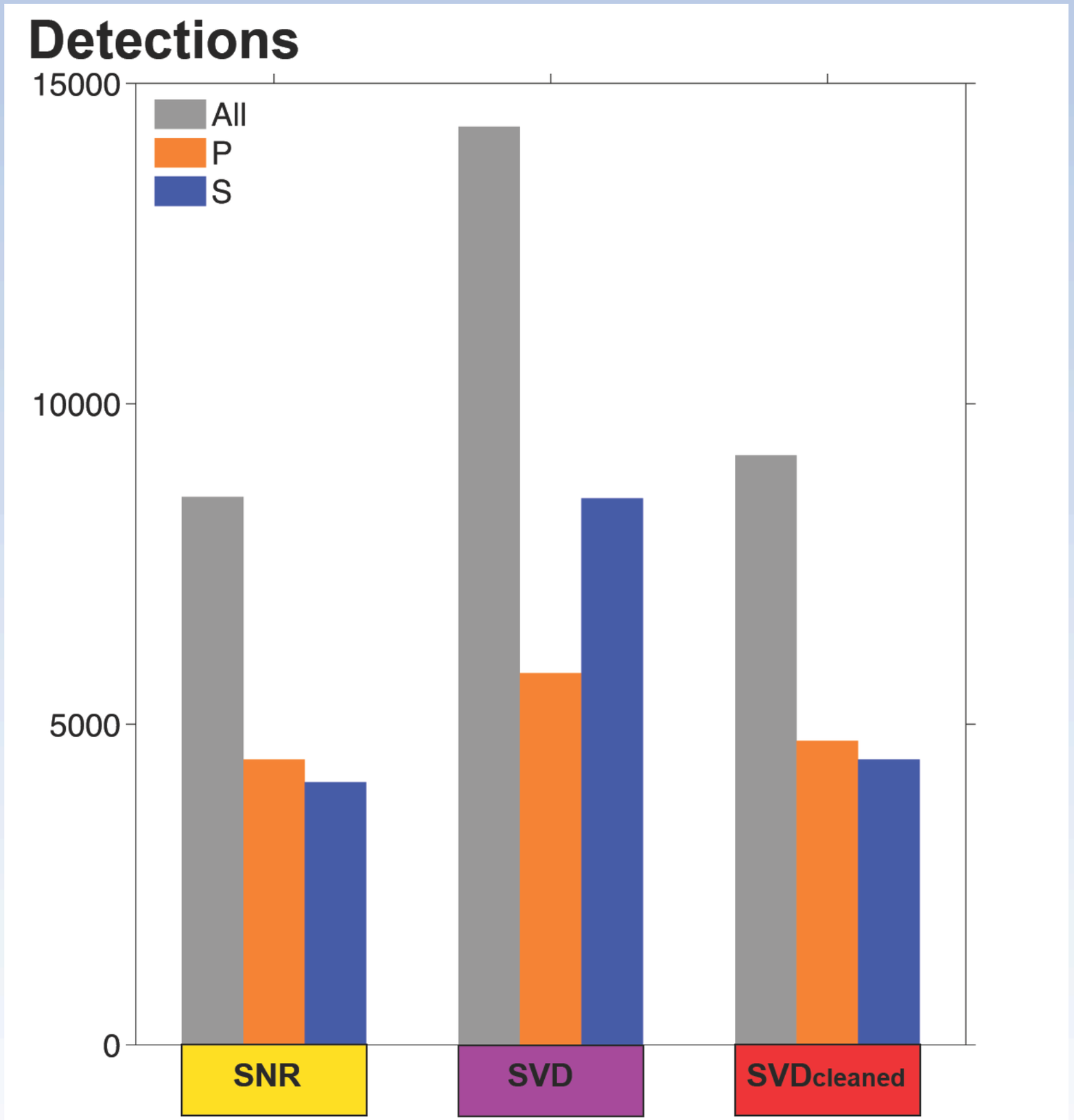


SVD Detector

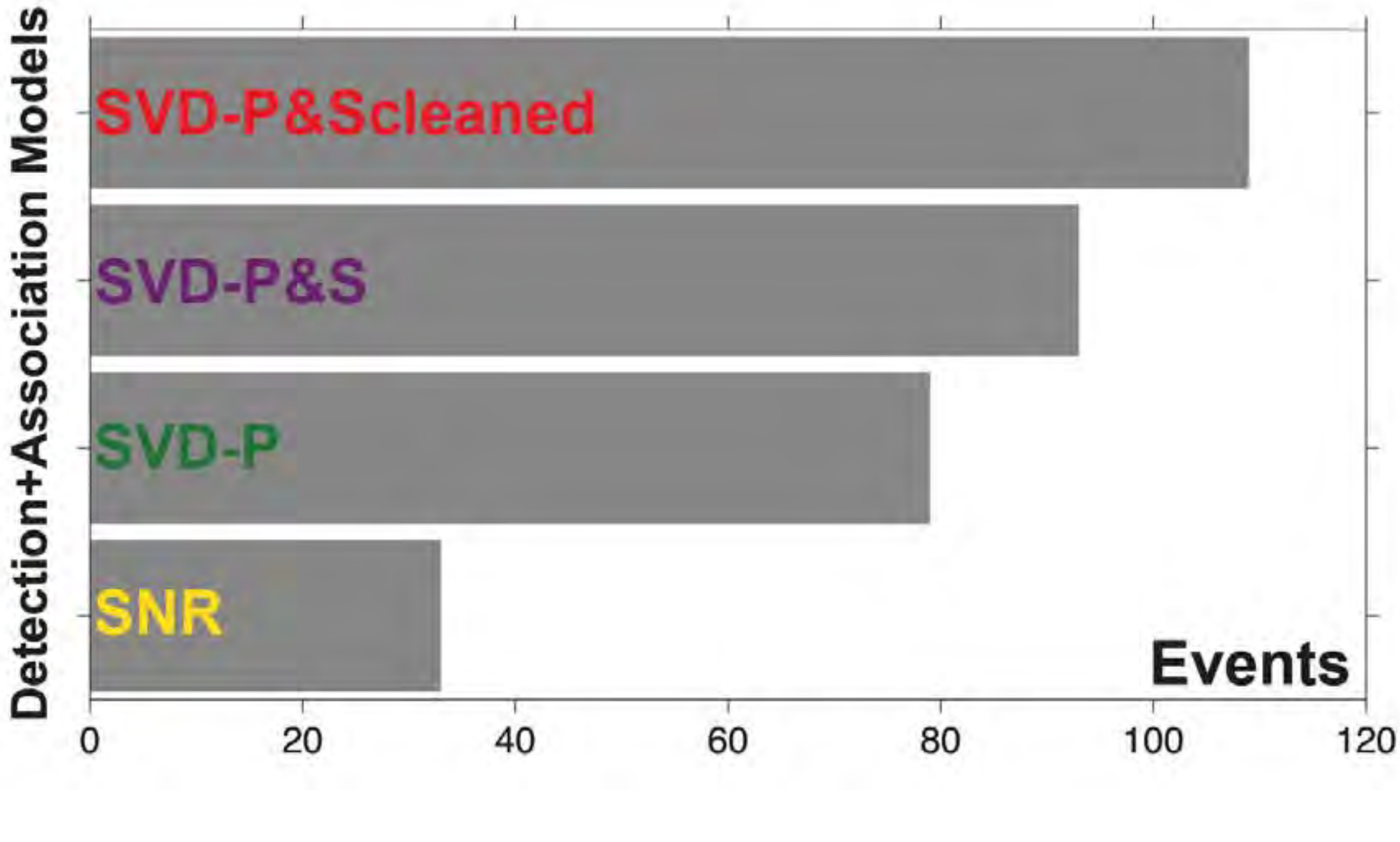




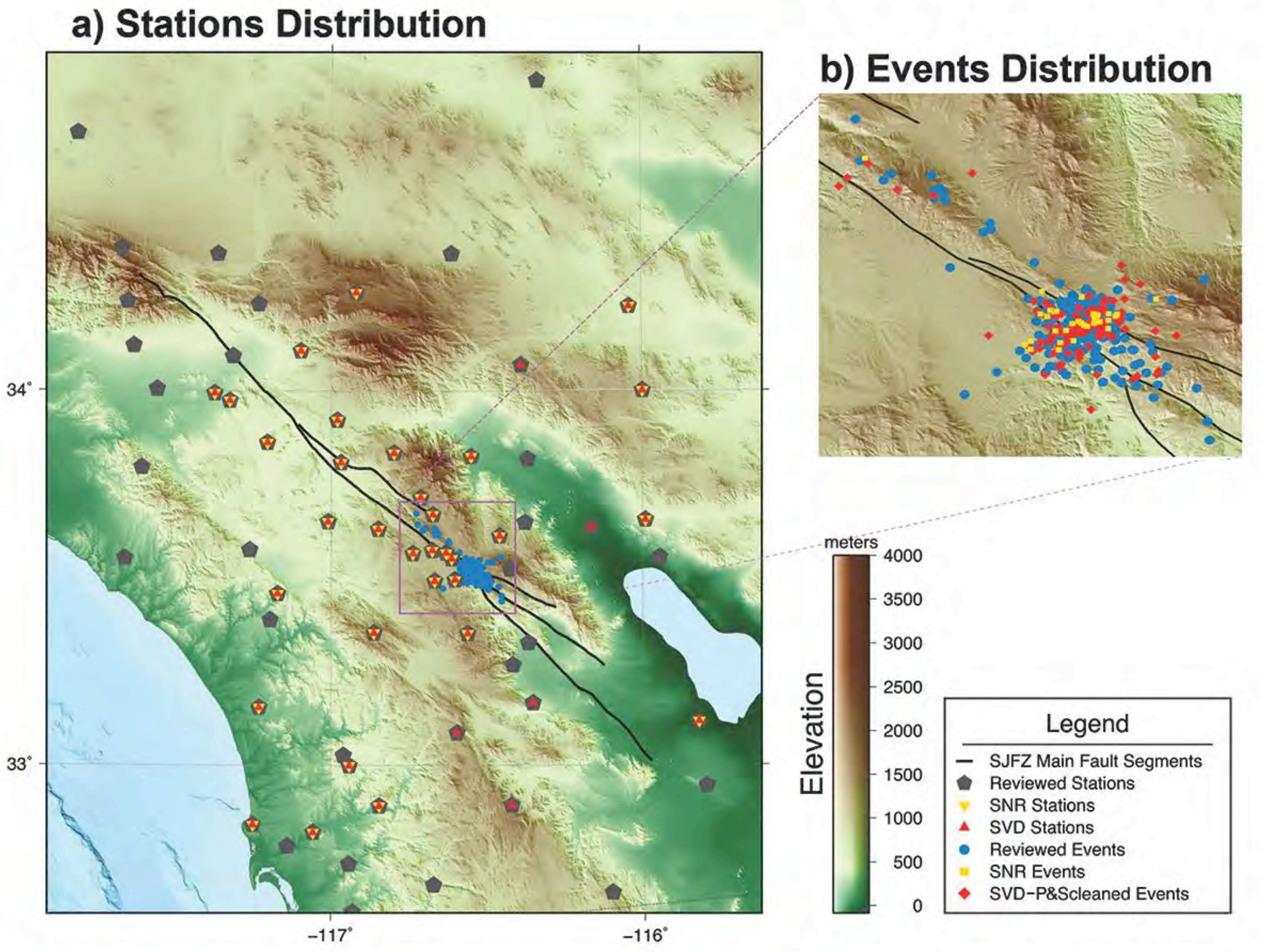
SVD detections



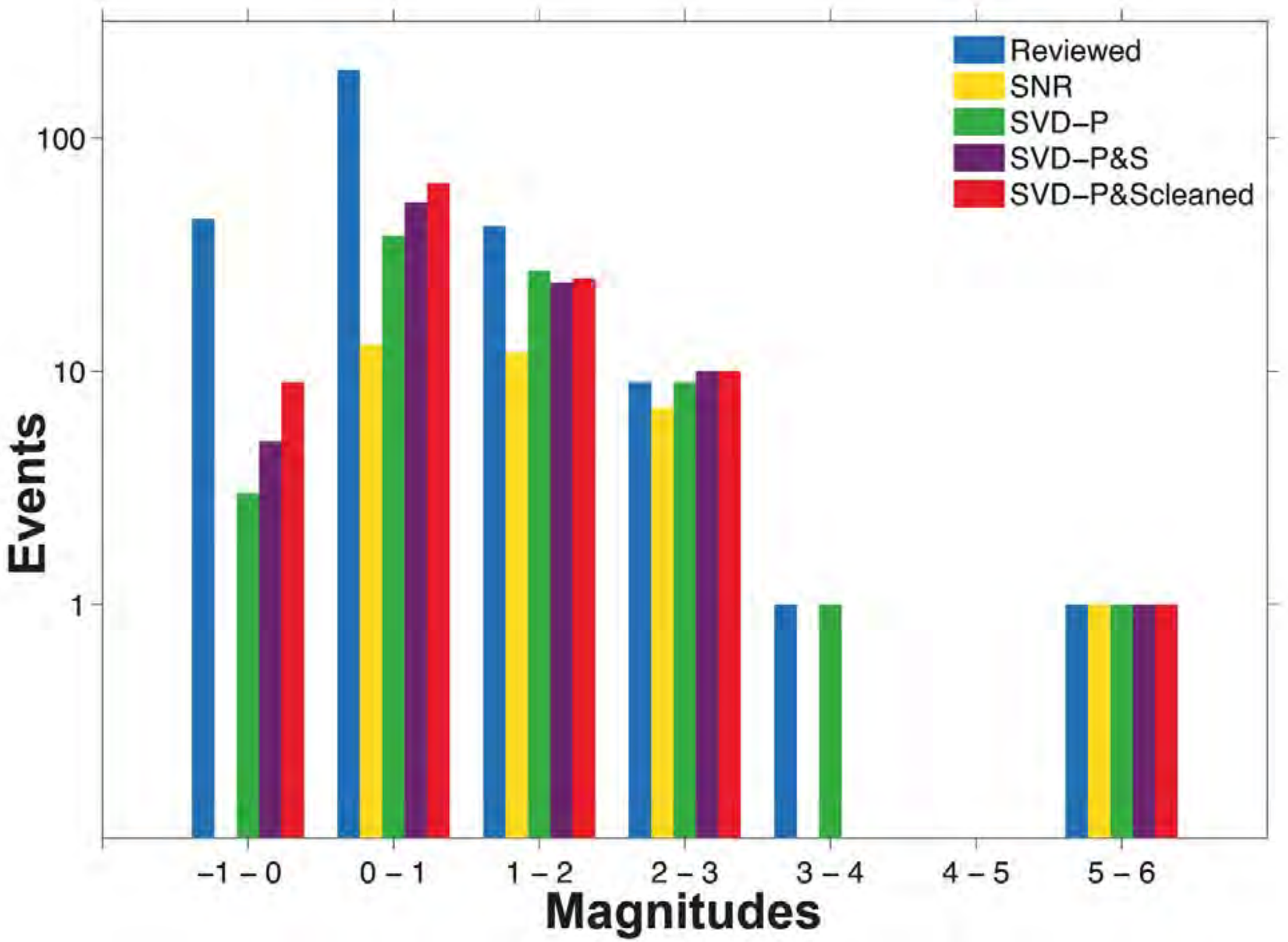
SVD events


Detection+Association Models
SVD-P&Scleaned
SVD-P&S
SVD-P
SNR
Events
0
20
40
60
80
100
120

SVD Results


a) Stations Distribution
b) Events Distribution
34°
33°
−117°
−116°
meters
4000
3500
3000
2500
2000
1500
1000
500
0
Elevation
Legend
SJFZ Main Fault Segments
Reviewed Stations
SNR Stations
SVD Stations
Reviewed Events
SNR Events
SVD−P&Scleaned Events

SVD Magnitudes



Current Status

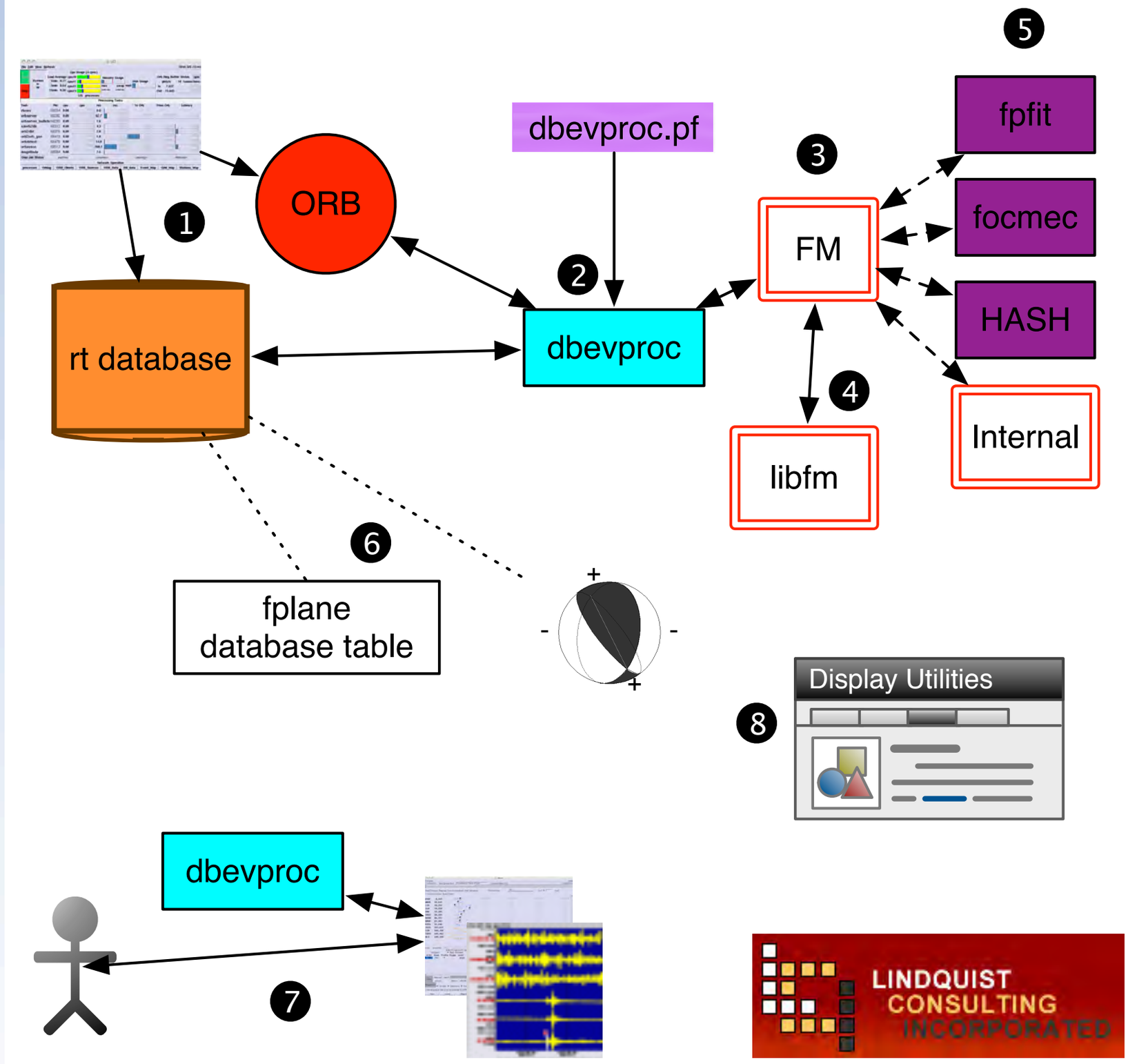
- Testing configuration parameters
- Needs orbwfproc implementation
- Not ready for operations

Focal Mechanism

- Several programs exist at various institutions
- No standard implementation in Antelope or Contrib
- No community accepted standard
  - fpfit
  - focmec
  - hash
  - ....

Focal Mechanism

Concept of Operations



Current Status

- Lindquist consulting completed
  - example parameter file
  - input database
  - command line that uses the new HASH driver for dbevproc
  - code is submitted to contrib
  - not ready for operations
- Lindquist consulting no longer available
- Future needs
  - testing, testing, testing
  - apply to many earthquakes
  - Fmhash.pm code may need to be tweaked and made more sophisticated.
  - implement fpfit and focmec algorithms
  - add DSP to produce the first motion measurements as input.

Preliminary Results of the Moment Tensor Code in Antelope

Moment Tensor and Focal Mechanism Code

So Far

- Get origins from Datascope tables.
- Subset stations in quadrants.
- Get Green's Functions from Datascope based on distance and depth of event.
- Extract, rotate and filter data from stations.
- Reject stations with bad cross-correlation.
- Invert the MT and extract the eigen values/ vectors.
- Update Datascope with results.

Current Status

- Need to resolve problem in filtering waveforms

- testing, testing, testing

- Implement other moment inversion modules

- Not ready for operations

Locations - 3d Velocity

- Desire of many networks and experiments
- Design plan
  - Travel times created using Steve Roecker's or Malcolm Sambridge's spherical eikonal solver code
  - Build ttgrid file
  - Use with orbassoc or dbgrassoc
  - Incorporate in genloc grid search
  - Interpolate to refine location
- Needs
  - 3d velocity structure on regular grid
  - grid spacing at highest level of resolution required
  - site table

Other developments?

Are there any other data products being developed in the community?