

M6.0 South Napa Earthquake

USGS Real-Time Products

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Earthquake Monitoring Project, NCEDC
ShakeMap, PAGER, ShakeCast, and EHP Web teams



September 4, 2014

Use of USGS Real-Time Products

David Wald's view of the earthquake from the airport in Frankfurt, Germany

Origin time: 3:20am PDT

4:13am PDT

Vodafone.de 3G 1:13 PM
blogs.kqed.org

6.0 Quake Rolls Through Bay Area; Damage Reported in Napa

Dan Brekke | August 24, 2014

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U.S. Geological Survey map of 6.0 earthquake.

4:22am PDT

Vodafone.de 3G 1:22 PM
news.kron4.com

Breaking News: Earthquake Rattles Bay Area

By Anne Price
Published 5:01:33 am, August 24, 2014

U.S. Geological Survey map of 6.0 earthquake.

4:45am PDT

Vodafone.de 3G 1:45 PM
sanfrancisco.cbslocal.com

Strong 6.0 Earthquake Rocks San Francisco Bay Area, Epicenter In Napa County's American Canyon

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U.S. Geological Survey map of 6.0 earthquake. (USGS)

4:47am PDT

Vodafone.de 3G 1:47 PM
google.org

6.0 Earthquake, 8th MN of American Canyon, California

1 hour, 28 minutes ago
Location: 8 miles SW of American Canyon, California

Watch 30 minutes ago - U.S. Geological Survey

U.S. Geological Survey map of 6.0 earthquake.

USGS Real-Time Products

PAGER Prompt Assessment of Global Earthquakes for Response

ShakeCast

United States Department of Veterans Affairs **ShakeCast Report**

M 6.0 6.7 km (4.2 mi) NW of American Canyon, CA
 Depth: 11 km (6.8 mi)
 Origin Time: 2014-08-24 10:20:44 GMT
 Latitude: 38.2142 Longitude: -122.3192
 Version: 1
 Created: 2014-08-24 10:33:59 GMT
 Depth: 10.75 km

These results are from an automated system and users should consider the preliminary nature of this information when making decisions regarding public safety. ShakeCast results are often updated as additional or more accurate earthquake information is reported or derived.



USGS Earthquake Shaking **Orange Alert** USAID PAGER Version 2

M 6.0 6.7 km (4.2 mi) NW of American Canyon, CA
 Latitude: 38.2142 Longitude: -122.3192
 Depth: 10.75 km

Estimate of fatalities

Estimate of economic losses

Estimate of Population Exposed to Earthquake Shaking

Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very Light	Light	Moderate	Substantial	Heavy	Very Heavy

USGS Community Internet Intensity Map
 NORTHERN CALIFORNIA
 Aug 24 2014 03:20:44 AM local 38.2202N 122.3128W M 6.0 Depth: 11 km ID:nc72282711

38739 responses in 990 blocks (Max C01 - VIII)

INTEGRITY	I	II-III	IV	V	VI	VII	VIII	IX	X
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy

Processed: Mon Aug 26 16:36:37 2014

CISN ShakeMap : 6.7 km (4.2 mi) NW of American Canyon, CA
 Aug 24, 2014 10:20:44 AM UTC M 6.0 N36.21 W122.32 Depth: 10.8km ID:72282711

Map Version 2 Processed 2014-08-24 10:37:18 AM UTC

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
PEAK ACCEL (g)	<0.1	0.2	0.4	0.7	1.3	2.4	4.4	8.0	>16.0
PEAK VEL (cm/s)	<0.07	0.4	1.0	2.0	3.5	6.0	10	18	>35
PEAK DISP (cm)	<0.01	0.05	0.1	0.2	0.4	0.7	1.2	2.0	>4.0

City Exposure

City	Population
San Francisco	776,000
San Jose	1,000,000
San Diego	1,114,000
Los Angeles	3,890,000
Phoenix	1,000,000
Chicago	2,890,000
San Antonio	1,500,000
San Diego	1,114,000
San Jose	1,000,000
San Francisco	776,000
San Antonio	1,500,000
San Diego	1,114,000
San Jose	1,000,000
San Francisco	776,000

Processed: Mon Aug 26 16:36:37 2014

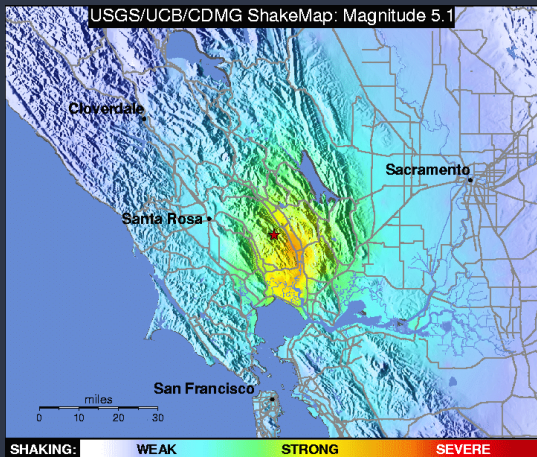
"Did You Feel It?"

ShakeMap



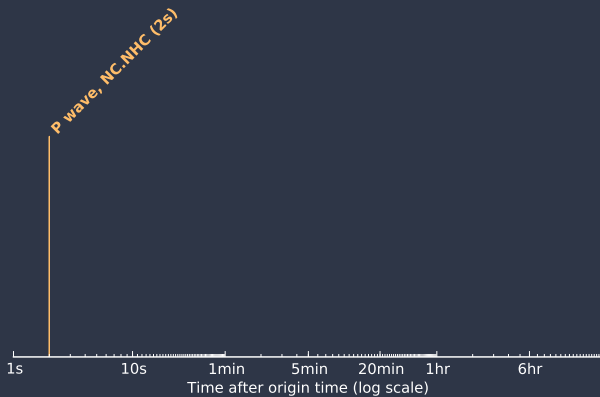
South Napa Earthquake Timeline: Seismicity

- 1898 M 6.3 earthquake near Mare Island
- 2000-09-03 M5.1 Yountville earthquake

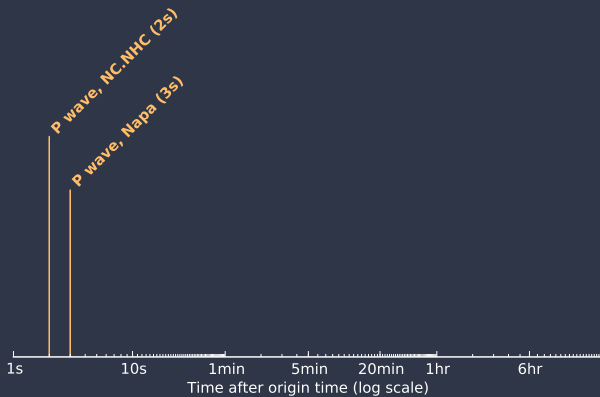


- 2014-08-05, M3.0 earthquake, 5kw SW of Napa

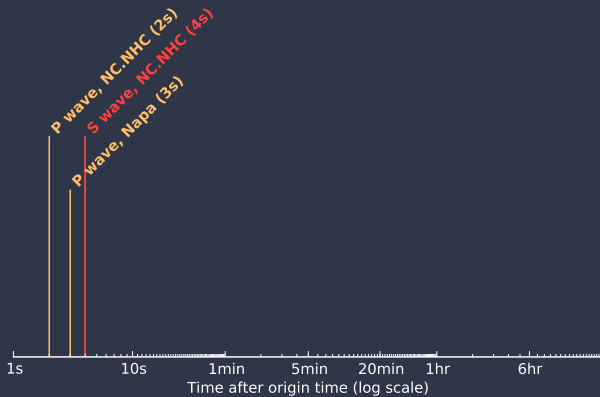
South Napa Earthquake Timeline



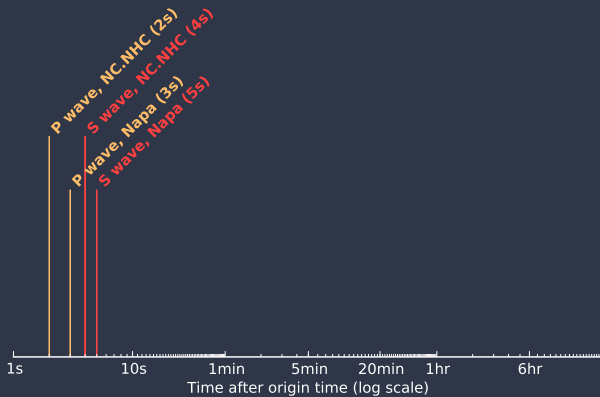
South Napa Earthquake Timeline



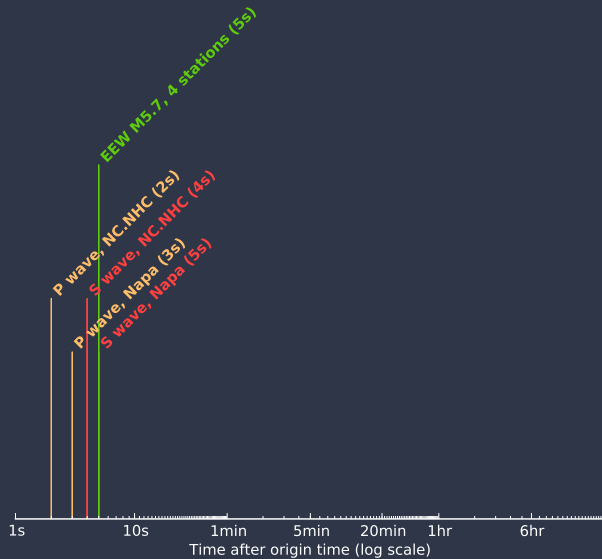
South Napa Earthquake Timeline



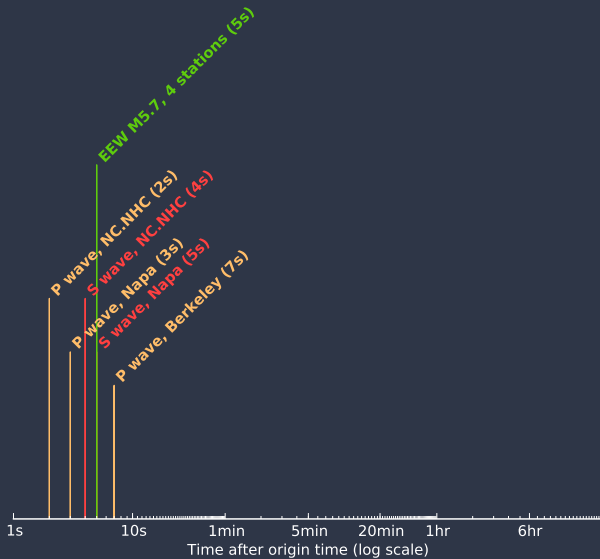
South Napa Earthquake Timeline



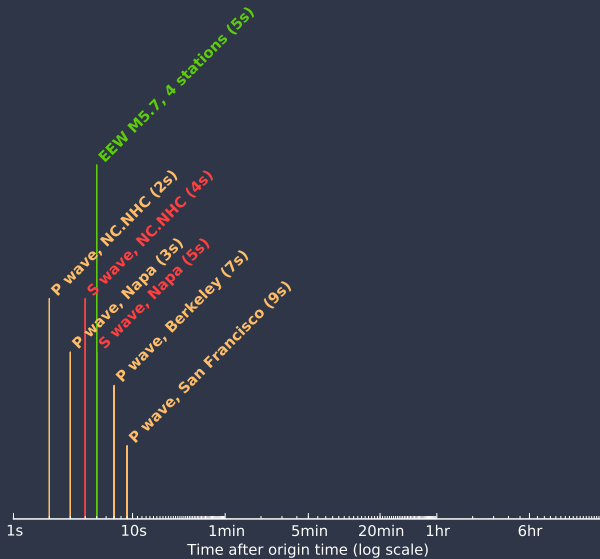
South Napa Earthquake Timeline



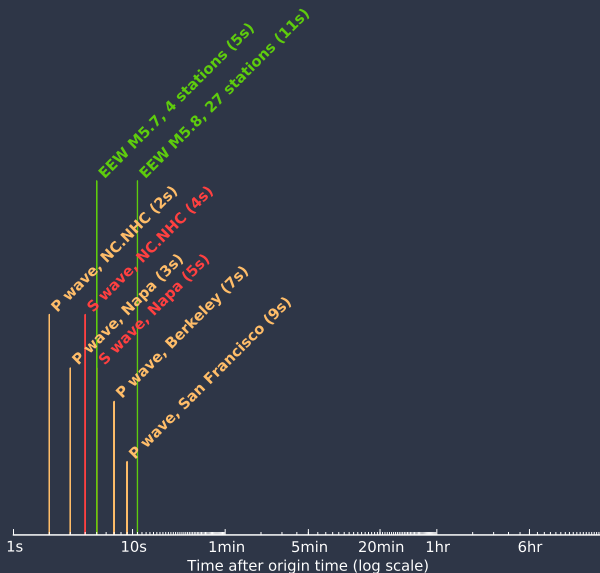
South Napa Earthquake Timeline



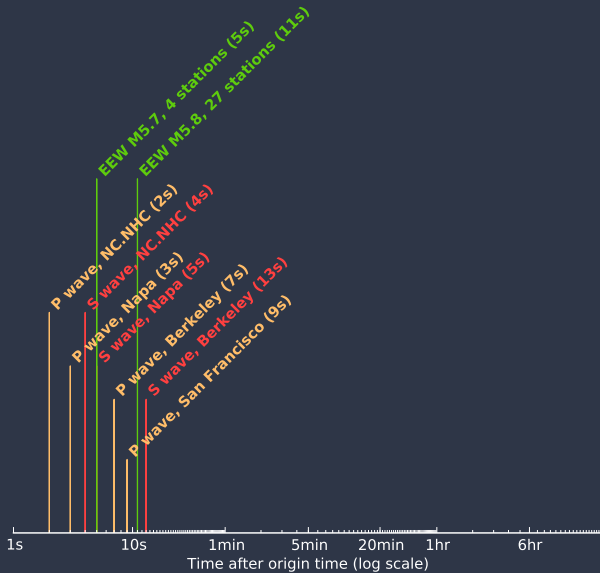
South Napa Earthquake Timeline



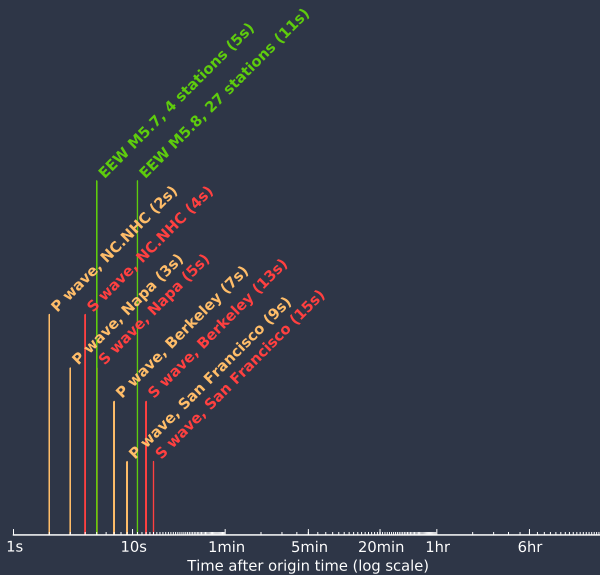
South Napa Earthquake Timeline



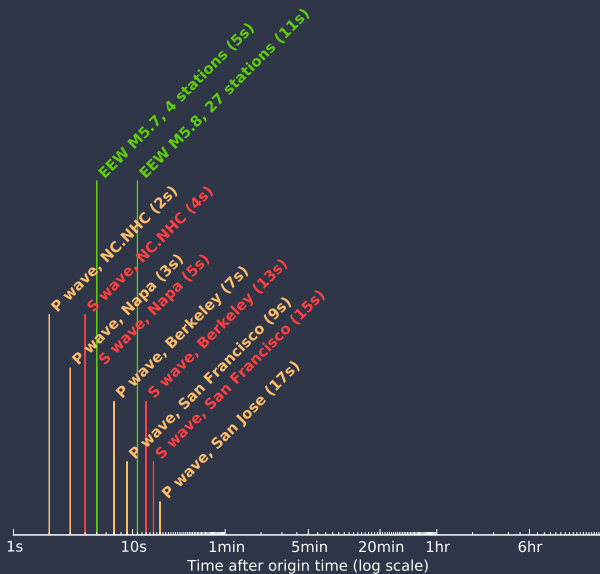
South Napa Earthquake Timeline



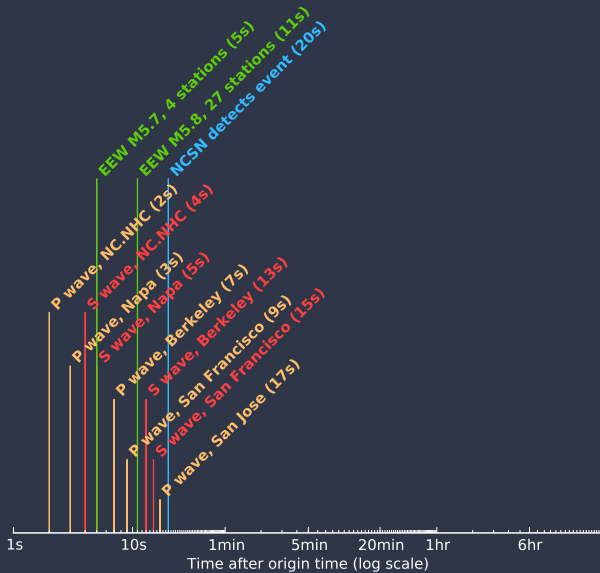
South Napa Earthquake Timeline



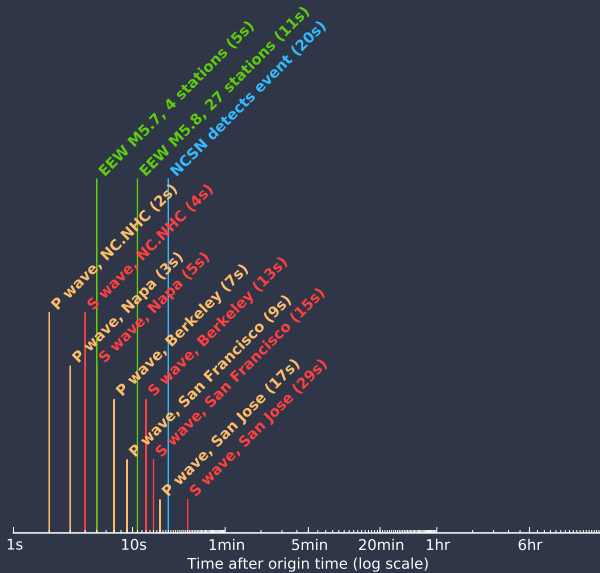
South Napa Earthquake Timeline



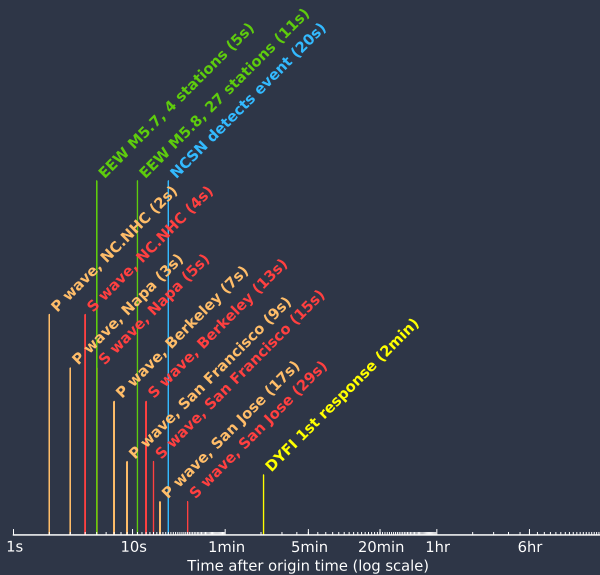
South Napa Earthquake Timeline



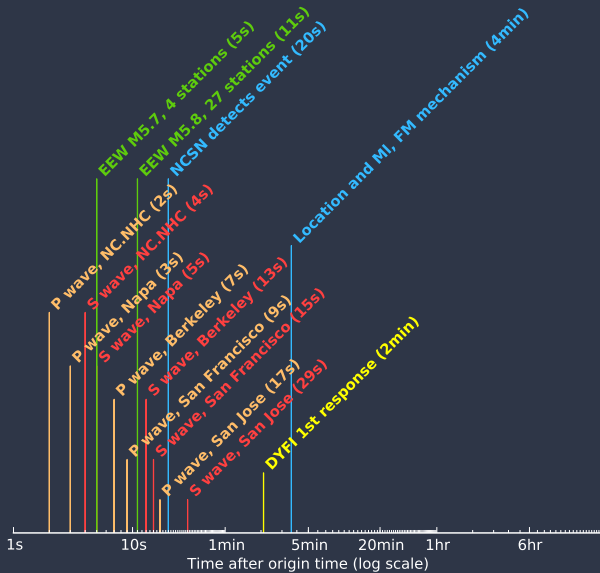
South Napa Earthquake Timeline



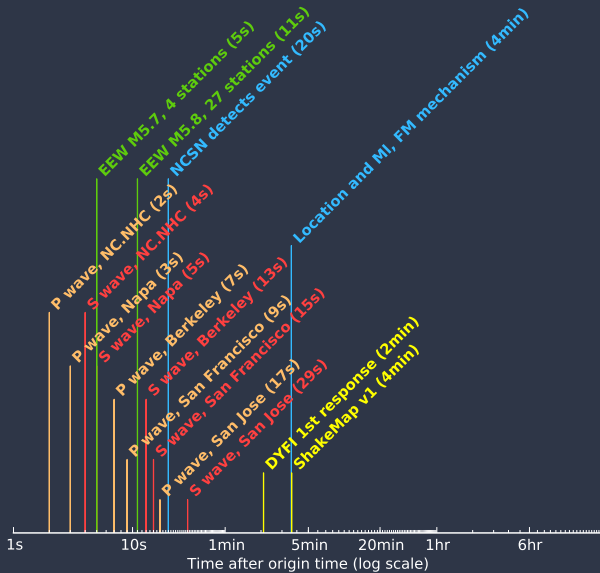
South Napa Earthquake Timeline



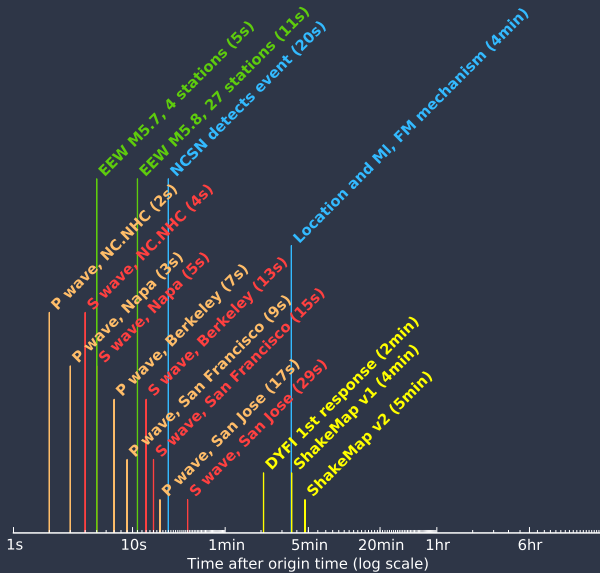
South Napa Earthquake Timeline



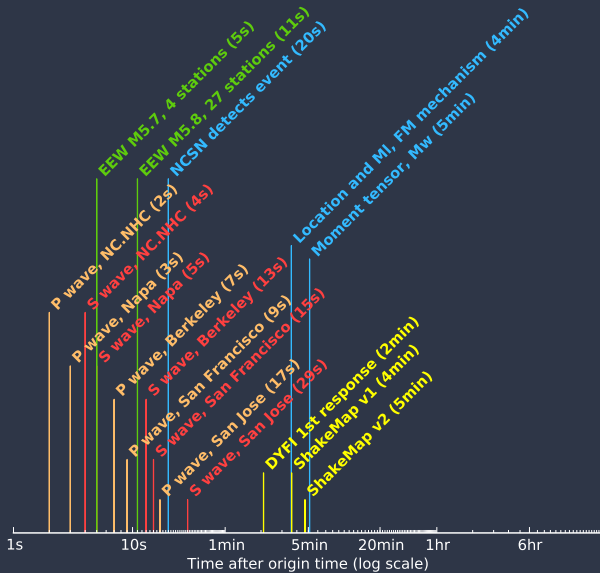
South Napa Earthquake Timeline



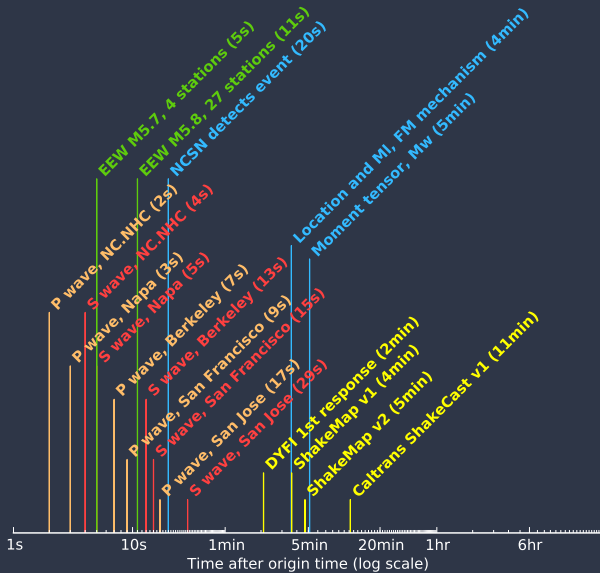
South Napa Earthquake Timeline



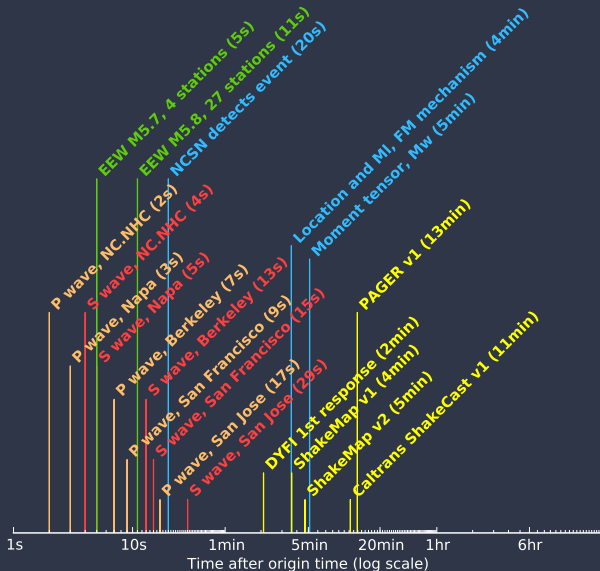
South Napa Earthquake Timeline



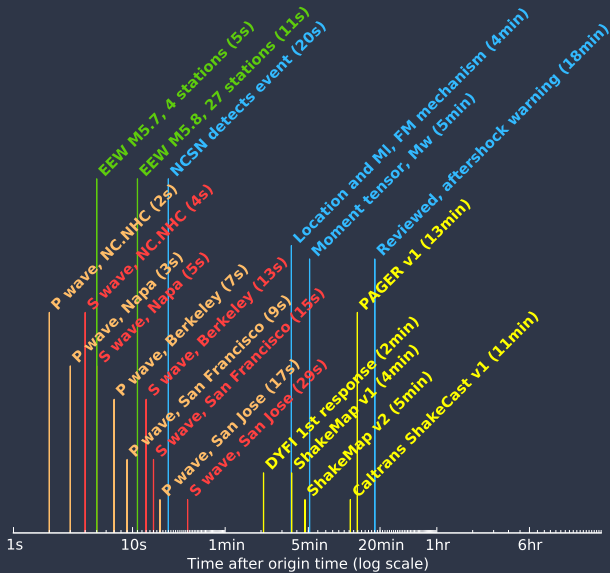
South Napa Earthquake Timeline



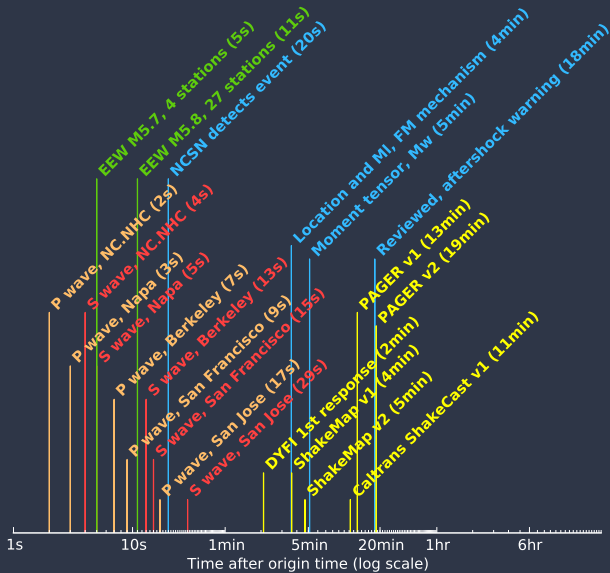
South Napa Earthquake Timeline



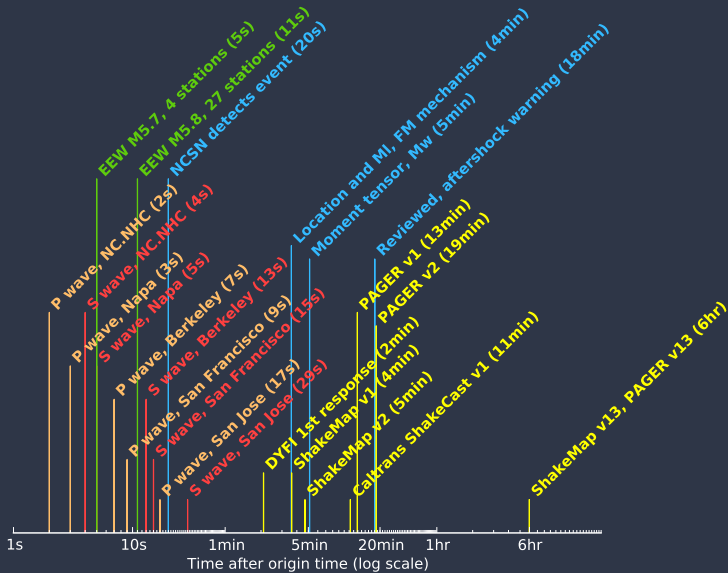
South Napa Earthquake Timeline



South Napa Earthquake Timeline



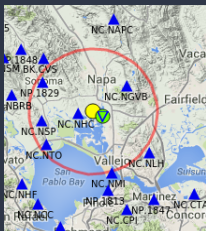
South Napa Earthquake Timeline



CISN ShakeAlert

Prototype earthquake early warning system

- Notification available 5.1 s after origin time: M5.7



Berkeley 5s warning before S wave arrival
San Francisco 8s warning
San Jose 12s warning

- Error in hypocenter location: less than a few km
- Error in magnitude: less than 0.2 within 11s of origin time

NCSS Mechanisms

First Motion Mechanism



Strike 345

Dip 85 (east)

Rake 180

Moment Tensor (TMTS)



Strike 155

Dip 82 (west)

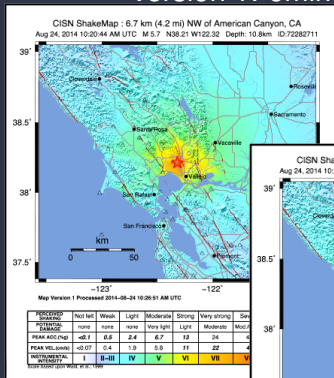
Rake 172

ShakeMap

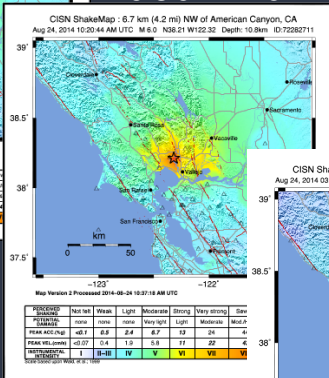
Version 1 provides good indication of shaking

Version 1: 6min

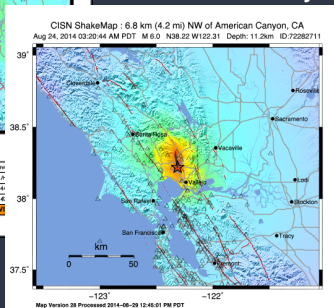
0.63g, 55 cm/s near epicenter
0.99g at 20km



Version 2: 15min



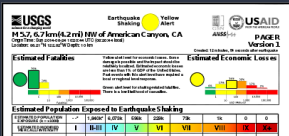
Version 28: 5 days



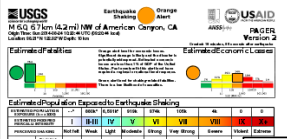
PAGER

ShakeMap updates refine estimates of economic losses

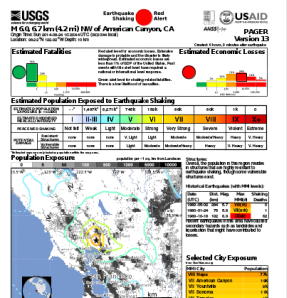
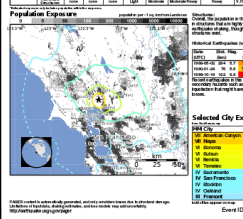
Version 1: 12min



Version 2: 18min

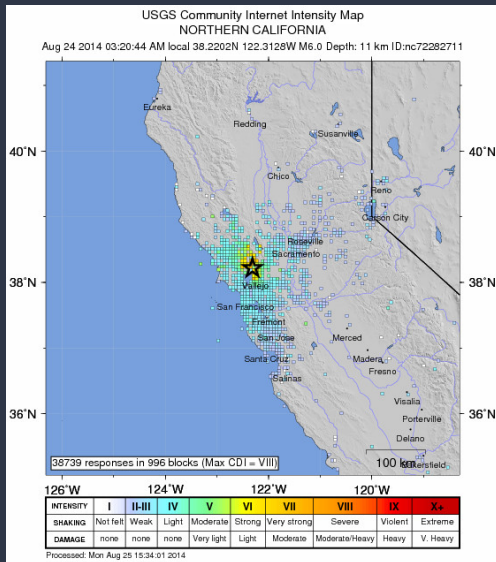


Version 13: 6hr



Geocoded Did You Feel It?

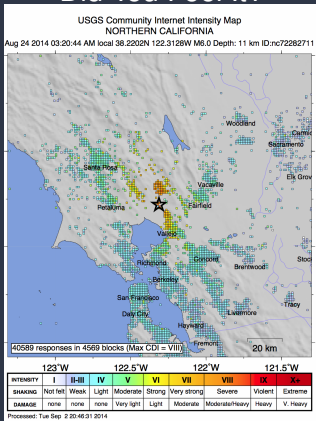
Earthquake was widely felt across central California



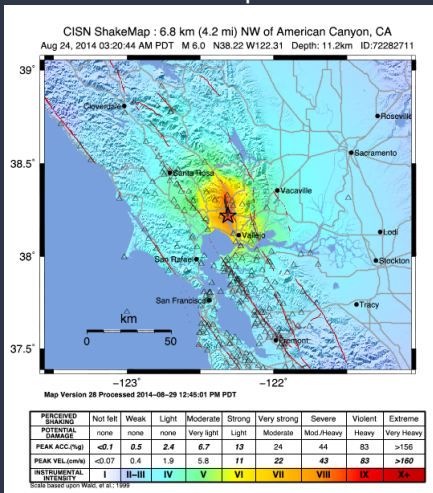
ShakeMap and Geocoded DYFI

Consistent, independent views of the ground shaking

Did You Feel It?



ShakeMap v28



Aftershock Probabilities

Updated every 6 hrs over first few days, then daily

Example: Monday 3:20am PDT (24hr after origin time), v5

- **STRONG AFTERSHOCKS (Magnitude 5 and larger)** - At this time (one day after the mainshock) the probability of a strong and possibly damaging aftershock **IN THE NEXT 7 DAYS is approximately 16 PERCENT**
- **EARTHQUAKES LARGER THAN THE MAINSHOCK** - Most likely, the recent mainshock will be the largest in the sequence. However, there is a small chance (APPROXIMATELY **5 TO 10 PERCENT**) of an earthquake **equal to or larger than this mainshock in the next 7 days.**
- **WEAK AFTERSHOCKS (Magnitude 3 to 5)** - In addition, approximately **2 to 15 SMALL AFTERSHOCKS are expected in the same 7-DAY PERIOD** and may be felt locally.