



Resources from the Southern California Earthquake Center

Robert de Groot

**Director for Education, Experiential Learning, and Career Advancement
Southern California Earthquake Center (SCEC)**

Native Science Educators Workshop

1 – 3 August 2015 – Cass Lake, MN

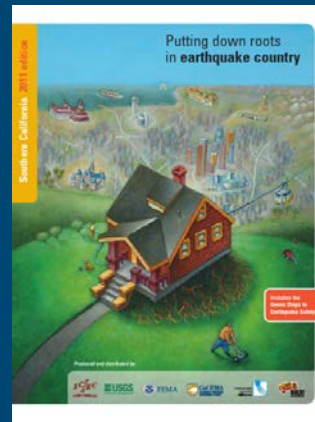
degroot@usc.edu

What is the Southern California Earthquake Center (SCEC)?

- A Multidisciplinary Research and Education Community
- Supported by the National Science Foundation and the U.S. Geological Survey
- Coordinates the efforts of over 60 institutions (e.g. USC, Columbia, Caltech, MIT, Harvard, Univ of New Hampshire, ASU, Cornell, Penn State)

Mission: To gather new information about earthquakes in Southern California, combine knowledge into a comprehensive understanding of earthquake phenomena, and communicate this understanding to increase earthquake awareness, reduce economic losses, and save lives.

www.scec.org



Experiential Learning and Career Advancement

"What you do not see,
do not hear,
do not experience
you will never really know."

"Esghallghilnguq
Nagaqullghilnguq,
Nalluksaghqag"

- St. Lawrence Island Yupik
Anchorage Museum, AK
Aug 2014



Earthquake Country Alliance

The CA ECA is a public-private partnership of people, organizations, and regional alliances, founded in 2003 in Southern California and expanded in 2009.

Each regional alliance conducts its own activities and collaborates with the others

Statewide committees determine long-range plans, sector-based needs, and develop resources

The screenshot shows the Great Alaska ShakeOut website. At the top is a navigation bar with links: Home, Other ShakeOuts, Other Languages, Contact Us, Search, and Login. Below this is a banner image of a snowy mountain range with the text 'The Great Alaska ShakeOut'. A secondary navigation bar contains links: Register Here!, Why Participate?, Who is Participating?, How to Participate, Resources, News & Events, Partners & Sponsors.

The main content area is divided into several sections:

- GET READY TO SHAKEOUT!**: Contains text about the 2014 Great Alaska ShakeOut, registration information, and a link to 'Start here'.
- LEARN THE LATEST**: Includes links for 'Share your ShakeOut', '50th Anniversary', 'How to Participate', 'Who is Participating?', 'ShakeOut Resources', 'ShakeOut Participant Updates', and 'Frequently Asked Questions'.
- PLAN YOUR DRILL**: Features a 'How to plan your drill & get prepared...' section with a dropdown menu for 'Select your category', a 'ShakeOut Shop' logo, and links to 'Countdown to ShakeOut for Organizations (PDF)', 'Recommended Earthquake Safety Actions (PDF | RTF)', and 'Earthquake Guide for People with Disabilities (PDF | RTF)'.
- CHECK THE STATS**: Displays a map of Alaska with the text '0 participants and counting! (Over 6.7 million worldwide)' and a link to 'Click the map for detail Mar. 2014 Total: Over 100,000 about each area'.
- PLAY AND SHARE**: Includes a 'PLAY BEAT THE QUAKE' section with a 'Quake Quiz' logo and a 'Download the FREE app today!' link for the 'Earthquake by the American Red Cross' app.

At the bottom, there is a status bar showing '0 participants registered', '10:16 a.m. on October 16, 2014', and '171 days until the 2014 Alaska ShakeOut'. The footer contains logos for the Alaska Department of Transportation, the Alaska Science & Safety Commission, and the Alaska Science & Safety Commission, along with a navigation bar for 'Login | Why? | Who? | How? | Resources | News & Events | Share the ShakeOut | Partners & Contact Us | Privacy | Plugins | Other ShakeOuts'.

Shake
Out

Shake
Out™



Great ShakeOut
Earthquake Drills

October 15, 2015 @ 10:15 am



Register today at ShakeOut.org

The Great
Central U.S.

Shake
Out™



What is the ShakeOut?

The Great ShakeOut is the
annual earthquake drill
on the third Thursday of October

Millions of people practice...



Register today at ShakeOut.org!



ShakeOut.org/resources

Get Ready to Shake Out.

10.20.11
Register Now at
www.shakeout.org

The Great California
Shake Out



The Great California ShakeOut
Annual Statewide Earthquake Drill

Individuals and Families
Get Ready to ShakeOut

Register today at ShakeOut.org

At 10:15 a.m. on October 16, 2011, millions of Californians will "Drop, Cover, and Hold On" to The Great California ShakeOut, the largest earthquake drill ever. Everyone is encouraged to participate in the drill whenever they are at 10:15 a.m. on 10/16.

Major earthquakes may happen anywhere you work, live, or travel in California. The ShakeOut is our chance to practice how to protect ourselves and for everyone to become prepared. The goal is to prevent disaster from becoming catastrophe.

Why is a "Drop, Cover, and Hold On" drill important? As with anything, to act quickly you must practice often. You may only have seconds to protect yourself in an earthquake before strong shaking knocks you down, or something falls on you.

Nearly 6.5 million Southern Californians participated in the 2010 ShakeOut. New statistics will be held on the third Thursday of October each year.

Businesses can participate! Individuals, families, businesses, schools, government agencies and organizations are all invited to register.

As a registered ShakeOut participant you will:

- Learn what you can do to get prepared
- Receive free access to the resources in the largest earthquake drill ever
- Be an example that motivates others to participate

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The Great California ShakeOut
Annual Statewide Earthquake Drill

Businesses
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The Great California ShakeOut
Are You Ready to ShakeOut?

We're all in this together...

- On the third Thursday of October each year, you can join the millions of Californians who will "Drop, Cover, and Hold On" to The Great California ShakeOut, the largest earthquake drill ever.
- As described below, major earthquakes may happen where you work, live, or travel in California. The ShakeOut is our chance to practice how to protect ourselves, and for everyone to become prepared. The goal is to prevent disaster from becoming catastrophe.
- Why is a "Drop, Cover, and Hold On" drill important? As with anything, to act quickly you must practice often. You may only have seconds to protect yourself in an earthquake before strong shaking knocks you down, or something falls on you.
- Other preparedness information is on the back of this flyer and is online at www.shakeout.org.
- Everyone can participate! Individuals, families, businesses, schools, government agencies, community groups, and other organizations are all invited to register.
- Register now at www.ShakeOut.org

California is earthquake country!

- California experiences earthquakes as large as the 1800 Northridge or 1906 San Francisco earthquakes on average.
- All areas of California have experienced earthquakes in the past and will do so again in the future. There are hundreds of faults throughout the state that can have large earthquakes.
- There is a 50% chance of a magnitude 7.5 or greater earthquake somewhere in California in the next 30 years (www.usgs.gov).
- While some areas and certain faults have a higher chance of earthquake than others, the risk anywhere in California is high when compared to most areas of the country.

This section of the San Andreas Fault in central California is one of the most active faults. But many faults do not and the shaking, as well as the risk anywhere in California is high when compared to most areas of the country.

The amount of ground motion is a function of the distance and is not necessarily proportional to the size of the fault. The amount of ground motion is a function of the distance and is not necessarily proportional to the size of the fault.

CALIFORNIA'S ANNUAL EARTHQUAKE DRILL
Shake Out
www.ShakeOut.org

Shake Out. October 20, 2011
Don't Freak Out.
The Great California
Shake Out
www.shakeout.org

Official Participant

Join Us
for the Largest
Earthquake Drill
in U.S. History.

DROP! COVER! HOLD ON!

October 20, 10:20 a.m.

Register at www.ShakeOut.org

Shake Out "Countdown to ShakeOut" for Businesses

Use the following countdown to ensure everyone in your business takes part in The Great California ShakeOut Drill on October 20, 2011, to prepare for the next big earthquake. All businesses are invited to participate at work, and at home!

- Register your business as an official participant in the 2011 ShakeOut Drill at www.ShakeOut.org.
 - Register the number of people participating business-wide
 - Encourage employees to also participate if at home and register as an individual or as a family; invite friends and neighbors to register as individuals or organizations
- Meet with department heads to review plan and obtain their buy-in, if necessary, and determine what level of drill your business will conduct and who will participate. Consider drilling at a higher level to engage staff to be more effective during a disaster. (Drill manuals are available at www.ShakeOut.org/resources/index.html#manuals)
 - Level 1 – Simple: Drop, Cover and Hold On
 - Level 2 – Basic: Life Safety Drill
 - Level 3 – Intermediate: Decision-Making Drill
 - Level 4 – Advanced: Business Operations Simulation Drill
- Create a drill/exercise plan that includes overview of what your drill will consist of (even if just Drop, Cover and Hold On), what you expect to happen during the drill, and a feedback session after the drill to identify strengths and weaknesses
 - Inform employees/staff participants of date and time of drill, your expectations for their participation, and the benefits of the drill
- Encourage suppliers, vendors, contractors, partnering businesses, and others in your business network to participate – as a means of protecting your business – and share ShakeOut resources with them. (Consider other tasks that can protect your business, such as having Service Level Agreements in place to ensure that the services or products you rely on will be available after disaster.)
- Create employee awareness campaigns:
 - Hang ShakeOut banners and signs throughout your business to encourage and remind employees, vendors, and customer to participate
 - Initiate an email campaign to employees, staff, and customers with information and tips on how to prepare at home and work. (See http://www.shakeout.org/resources/for_examples)
 - Encourage employees to post a ShakeOut-related safety message on outgoing email messages, such as "Participate in the 2011 Great California ShakeOut on 10/20 at 10:20am!"
- Review and use ShakeOut resources for drills at www.ShakeOut.org/resources/index.html
 - Drill manuals; Drill broadcast; banners, signs, triangle of life rebuttal; PowerPoint presentations; 7 Steps to an Earthquake Resilient Business booklet; ShakeOut Shop, etc.
- Hold your drill at 10:20 a.m. on October 20th (or an alternative time, if necessary)
 - Hold post-drill discussions to hear what people learned and plan next steps

Earthquake Country Alliance



Earthquake Education and Public Information Center (EPIcenter) Network

- **EPIcenters** include a variety of public venues such as museums, science centers, libraries, aquaria, park visitor centers, and universities
- Share a commitment to demonstrating and encouraging earthquake and tsunami preparedness
- Help coordinate activities in their region (including the ShakeOut), lead presentations or organize events in their communities, or in other ways demonstrate leadership in earthquake and tsunami education and risk reduction.



www.earthquakecountry.org/EPIcenter

**Shake
Out**

“Native California is Earthquake Country!” Project

- Partnership with Sherman Indian High School (Riverside, CA)
- Turtle Tale Video: Earthquake story of Gabrielino-Tongva Tribe (filmed by SCEC)
- <http://www.earthquakecountry.org/EPIcenter/turtletale.html>
- Two posters: one with tribal languages of students at the school (national), one for distribution throughout California (only California languages)



!NATIVE CALIFORNIA IS EARTHQUAKE COUNTRY!

**BE PREPARED
KNOW THE DRILL
IN YOUR
NATIVE LANGUAGE**




English	Spanish	Chinese	Japanese
Drop!	¡Cae!	地震	地震
Cover!	¡Cubre!	地震	地震
Hold On!	¡Sostén!	地震	地震
Drop!	¡Cae!	地震	地震
Cover!	¡Cubre!	地震	地震
Hold On!	¡Sostén!	地震	地震

These translations have been provided exclusively for use on this poster. To request permission for use please contact Sherman Indian High School or www.earthquakecountry.org

**Shake
Out**

SCEC Plate Tectonics Puzzle Map

- Large, two-sided version of the USGS *This Dynamic Planet* poster map along with an accompanying lesson plan with a map legend, instructions, most commonly lost plates template, and suggested discussion questions.
- Back is printed with plate outlines to guide cutting
- Provides educators with a tool to teach students about Earth science topics through interaction and visualization.
- Map includes volcanoes, mountains, earthquakes, and meteorite impacts as well as vector arrows that show direction and speed of plate movement.
- Email degroot@usc.edu for ordering information (\$15)



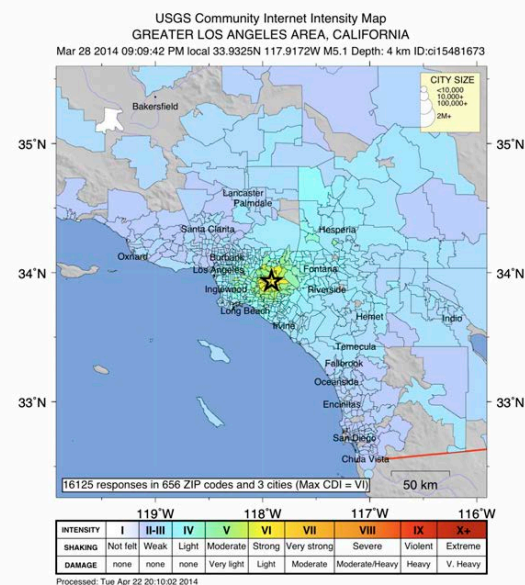
Citizen Scientist!

Quake Catcher Network: Increase the density of seismic observations to better detect earthquakes and mitigate hazard:

- New sensor technology
- Distributed sensing techniques
- Community participation

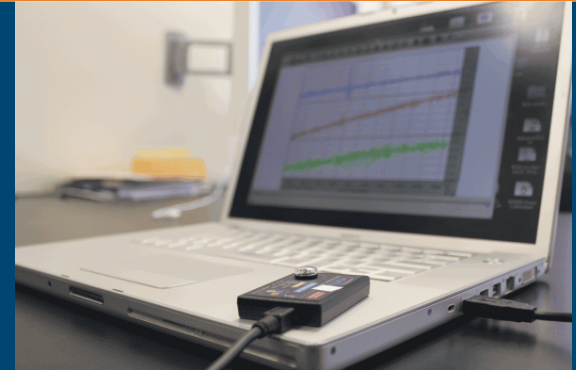
Did You Feel It?

Tap the abundant information available about earthquakes from the people who actually experience them.



Quake Catcher Network (QCN)

- Largest, low-cost strong motion seismic network utilizes sensors in and attached to Internet-connected computers.
- Collaborative initiative of IRIS, SCEC, USGS, and Caltech
- Provides educational software that uses the sensors to teach about earthquakes and their hazards
- QCN and the SCEC/ECA EPIcenter Network are initiating a campaign to bring sensors and educational programming to free-choice learning environments. Partners include SCEC, NEES, IRIS, USGS, CA Geological Survey, UNAVCO, and EarthScope
- The QCN-EPIcenter Team has over 120 sensors installed in locations in AK, AR, CA, ME, MO, MS, OR, TN, and WA



<http://qcn.caltech.edu>



Shake
Out

THE BBC COMES TO MARQUEZ!

DURING SPRING BREAK, THANKS TO AKIKO AREVALO ELIZABETH COCHRAN, GEOPHYSICIST, AND THE BBC CAME TO 4TH GR. SCIENCE AT MARQUEZ TO TALK ABOUT EARTHQUAKES.



WHAT HAPPENS WHEN THERE'S AN EARTHQUAKE?

MOST EARTHQUAKES OCCUR ON FAULT LINES.



TECTONIC PLATES GRIND TOGETHER.

1, 2, 3 JUMP!
SIMULATING SEISMIC ACTIVITY.



READING THE SEISMIC ACTIVITY RECORDED ON THE QUAKE CAPTURING NETWORK (QCN) CONNECTED IN THE UPPER GRADE SCIENCE LAB.

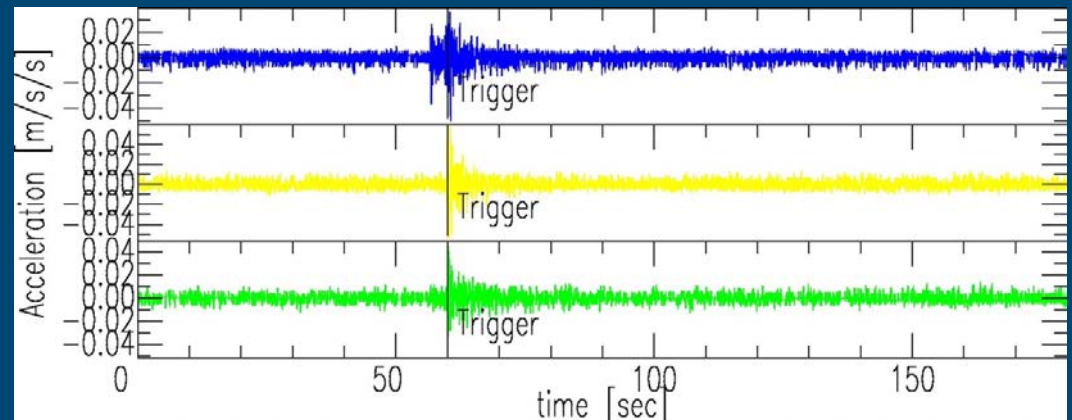


WHOA!

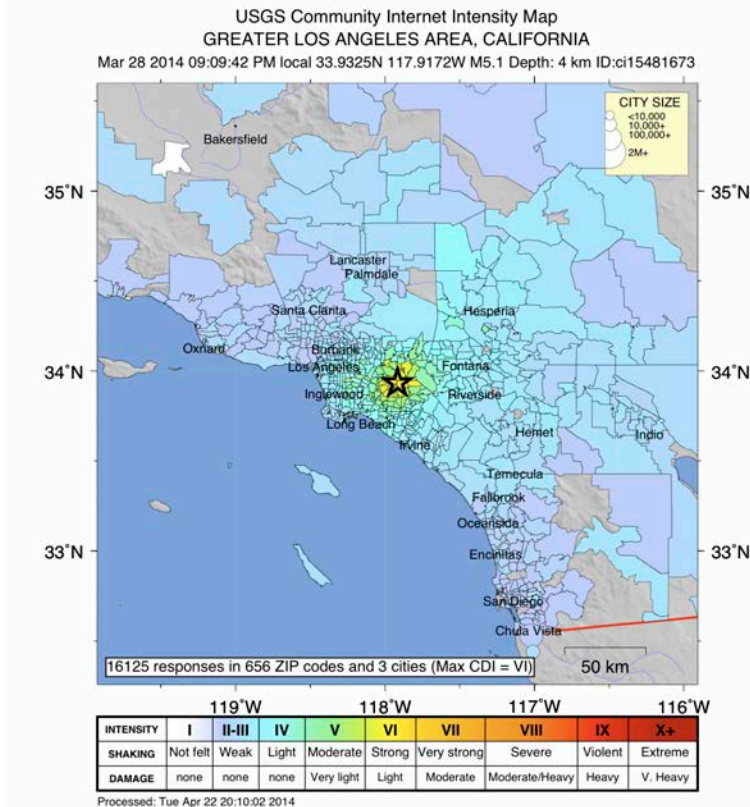
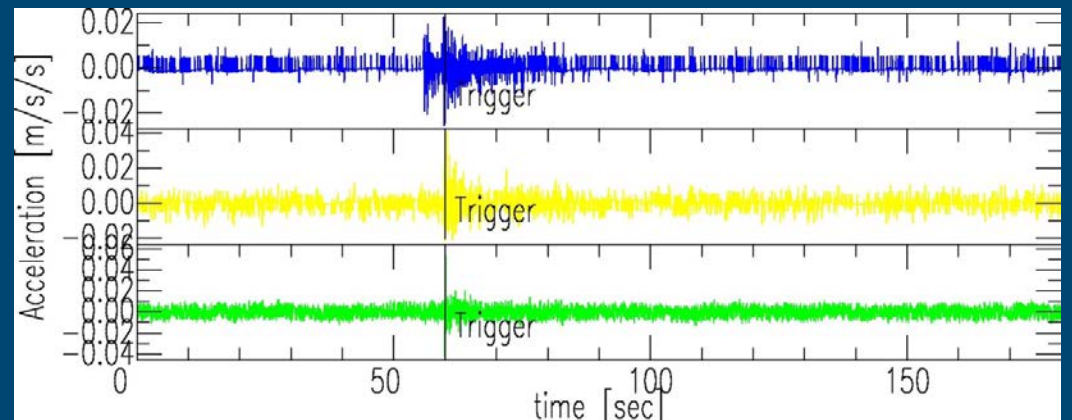
In April 2013, the BBC came to Marquez Charter School (Pacific Palisades) to see QCN in action!

M 5.1 La Habra Earthquake 3/28/14

Recorded at Montclair High School



Recorded at Colony High School

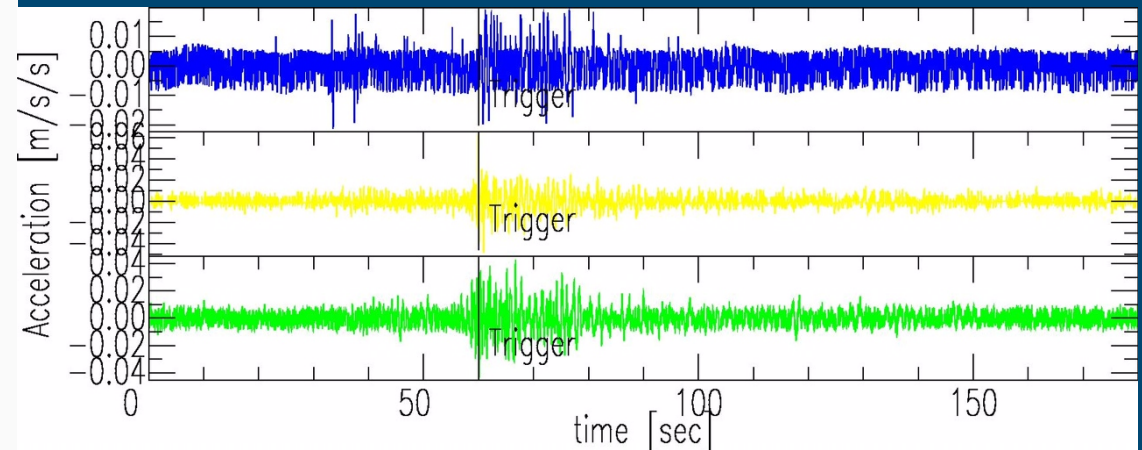


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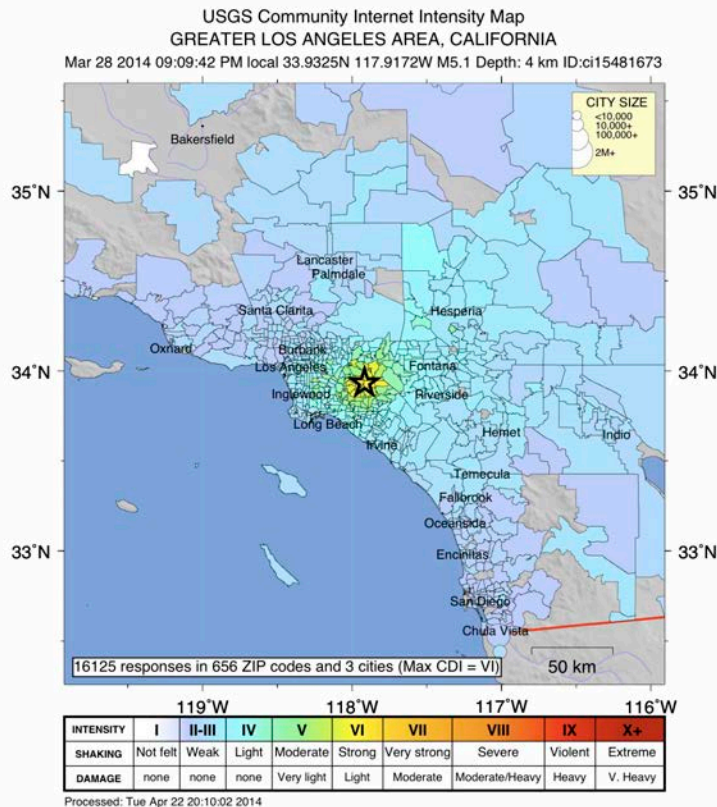
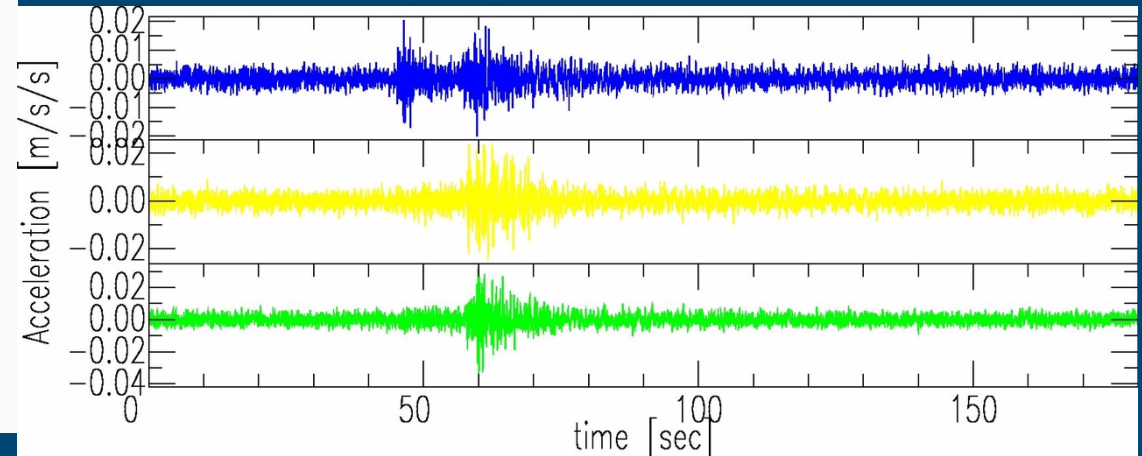
Shake
Out

M 5.1 La Habra Earthquake 3/28/14

Recorded at Salton Sea SRA – Visitor Center



Recorded at Morongo Reservation School



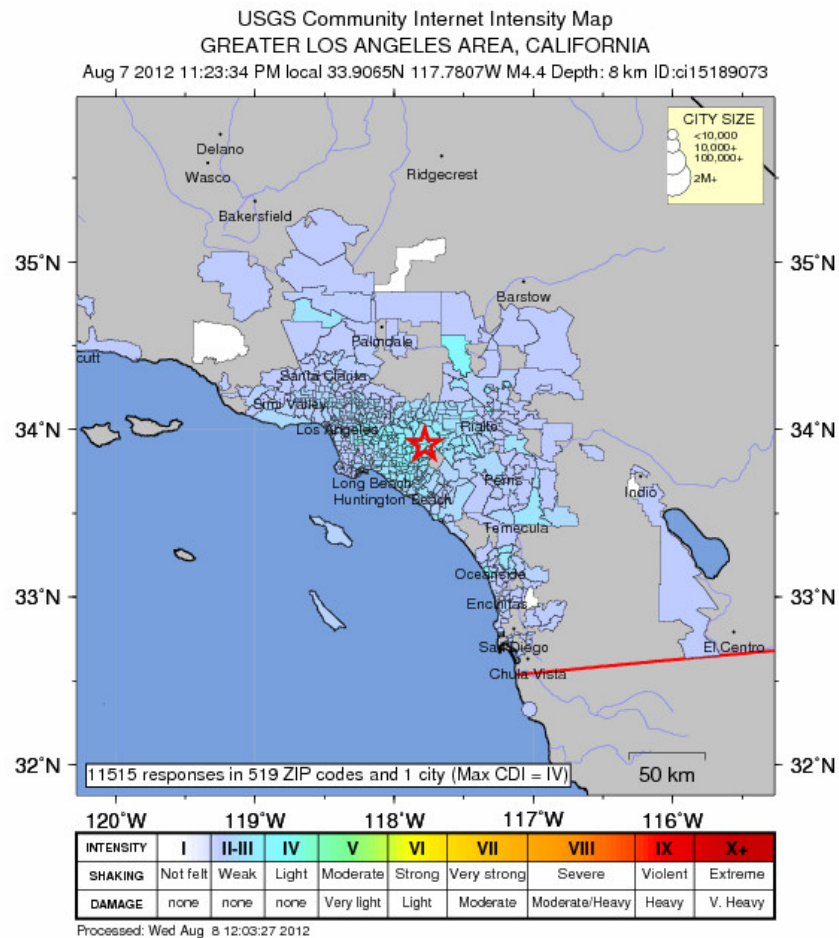


As people become take part in seismic monitoring, they feel more safe and educated about SFIP operations

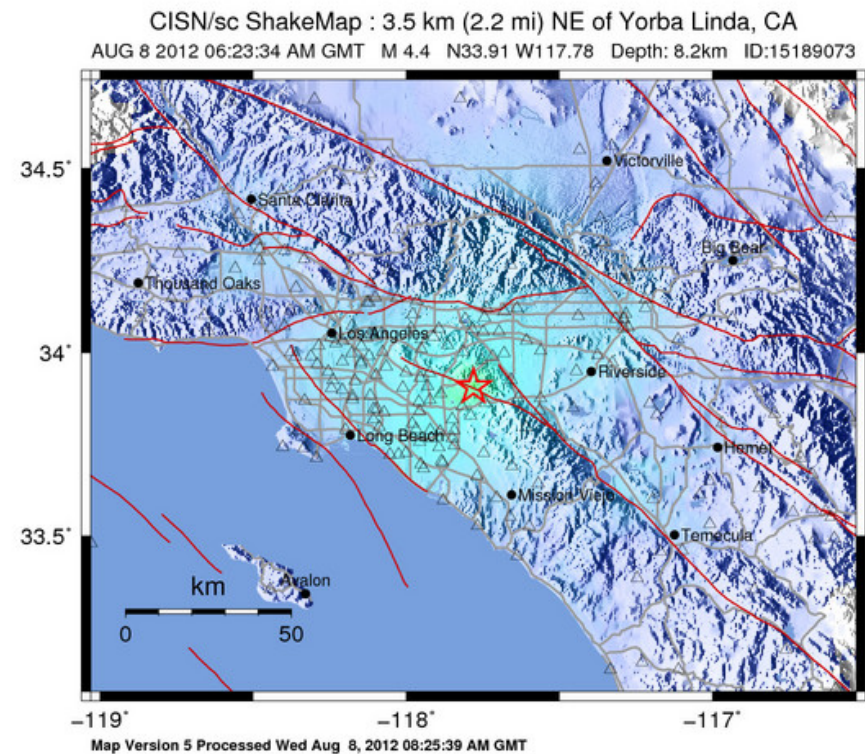


Intensity & Magnitude

ShakeMap



Did You Feel It?



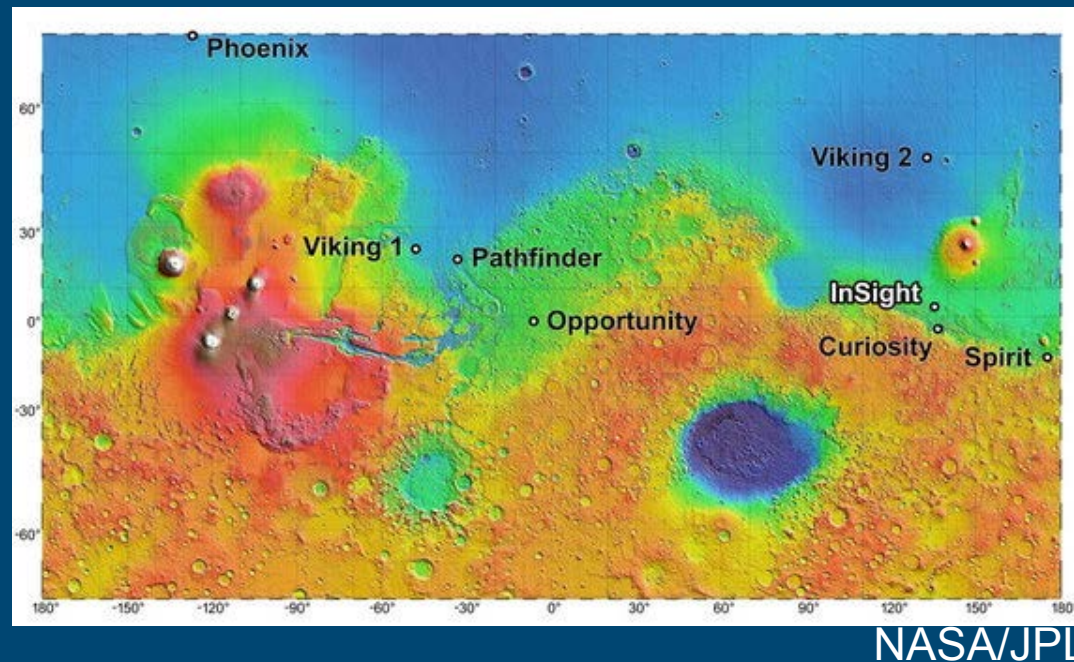
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2011)

NASA InSight



Interior Exploration using
Seismic Investigations,
Geodesy and Heat
Transport



Shake
Out

InSight 2015 Activities

In 2015, twelve *Vital Signs of the Planet*

Educator Fellows:

- Were immersed in the science of
- Caltech, JPL, QCN, USGS, and SCEC
- Conducted 5 days of survey-mode GPS research
- Developed and will test teach 4 lessons and kits
- Install a QCN seismometer at their school
- Hosted SCEC Annual Meeting workshop
- Participate in 2015 Great ShakeOut



California Science Center Live Earthquake Program

- Developed by SCEC SURE interns and Science Center staff
- 15-minute program performed on the Creative World *Tech Review* Stage at the California Science Center in Los Angeles
- Debuted in 2012 as a *Science Spectacular!™* Program and is offered weekly to school groups, families, and other visitors
- Program will be shared with and performed by other members of the EPIcenter Network
- Covers earthquake science and preparedness basics



<http://www.earthquakecountry.org/EPIcenter/eqshow.html>

Shake
Out



Thank You!

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 Director for Education, Experiential Learning, and Career Advancement
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Earthquake Country **Alliance**
We're all in this together.