



California
**Department of
Conservation**
California Geological Survey

The California Earthquake Clearinghouse

Ridgecrest Earthquakes, July 2019

***Improving Earthquake Resiliency
Through the Use of Post-Earthquake Clearinghouses***

***American Geosciences Institute
Geoscience Online Learning Initiative (GOLI) Webinar
November 14, 2019***

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After a major and/or damaging earthquake in California the California Geological Survey (CGS)

Is authorized to establish an earthquake clearinghouse

Works in partnership with its managing partners:

Earthquake Engineering Research Institute (EERI)

United States Geological Survey (USGS)

California Governor's Office of Emergency Services (Cal OES)

California Seismic Safety Commission (CSSC)

The clearinghouse provides for the timely sharing of information and data by researchers, engineers, and scientists conducting reconnaissance immediately after an earthquake.

The California Earthquake Clearinghouse can be activated when the following parameters are met:

- **An urban area is struck by a major and/or damaging earthquake**
or
 - **Upon recommendation of CGS, USGS, EERI, CSSC, and Cal OES when damage is significant**
or
 - **A less densely populated area, with an earthquake large enough to damage structures and lifelines.**

Physical EQ Clearinghouse

Location where scientists, engineers, and other professionals become part of a larger, temporary organization whose primary purpose is to collect and disseminate perishable field data



Provides a daily forum where geologists, engineers, researchers, and other practitioners can assemble to share and discuss observations and coordinate field investigations.

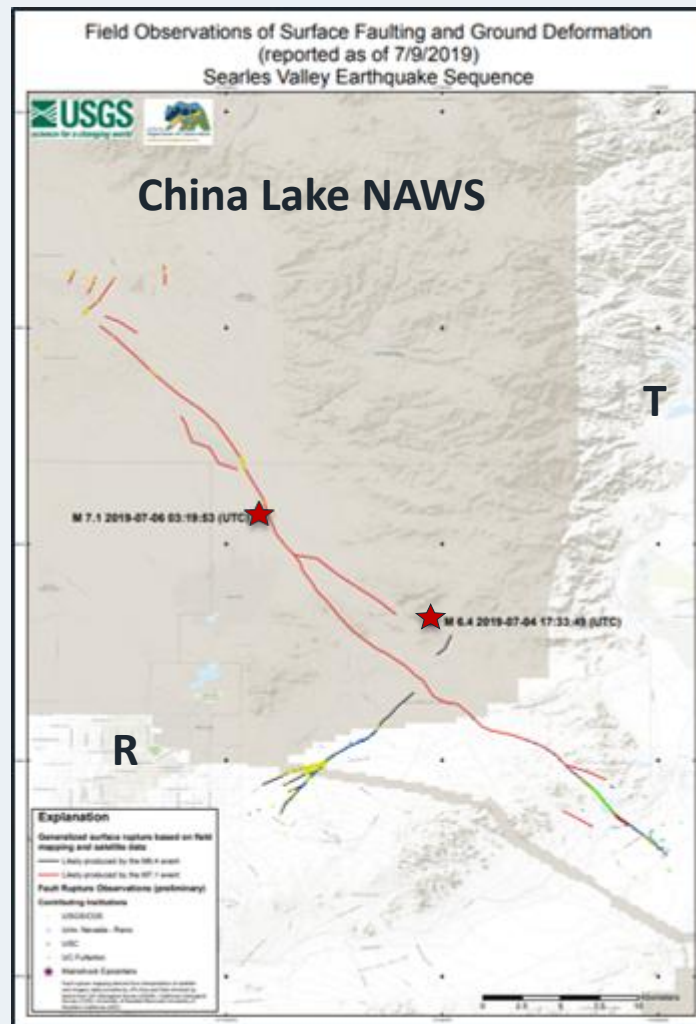
Ridgecrest Earthquakes Overview

On July 4, 2019, Southern California experienced a M6.4 earthquake followed by aftershocks.

Within minutes there were initial reports of some damage and fires.

~34 hours later, a M7.1 earthquake occurred, followed by an even more robust aftershock series.

Los Angeles is 114 miles to SW, felt both earthquakes



Explanation

Generalized surface rupture based on field mapping and satellite data

- Likely produced by the M6.4 event
- Likely produced by the M7.1 event

Fault Rupture Observations (preliminary)

Contributing Institutions

- USGS/CGS
- Univ. Nevada - Reno
- USC
- UC Fullerton

★ Mainshock Epicenters

JPL Fault rupture mapping derived from interpretation of satellite and imagery data provided by JPL/Aria and field checked by teams from US Geological Survey (USGS), California Geological Survey (CGS), University of Nevada-Reno and University of Southern California (USC).

CA EQ Clearinghouse Operations Support

EERI – operations, communication/briefings, virtual clearinghouse

CGS – operations, data collection/database management

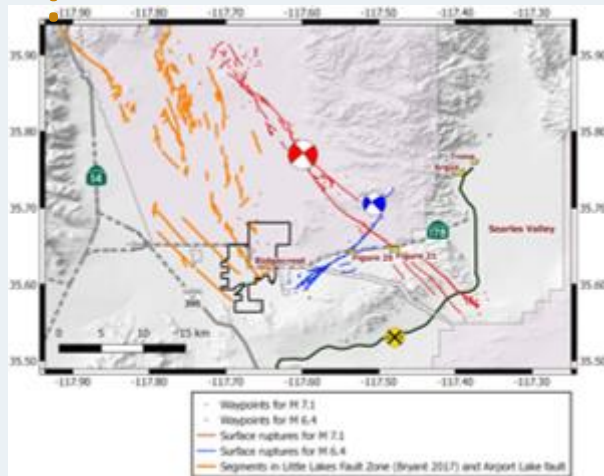
USGS – data collection/database management

CSSC - operations

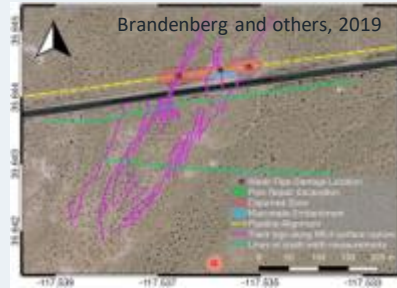
**Cal OES – securing a physical location, communications with CA State
Emergency Operations Center**



Clearinghouse Investigations included Defining and Documenting:



Hazards:
Surface rupture
Liquefaction
Lateral spread
Ground shaking



Effects on Built Environment and Community:

Lifeline: gas, power, communication, bridges, water, transportation

Structural: general building stock, hospital, commercial structures, single family homes, manufactured homes, fires, schools, ground motion/damage, building tagging



Brandenberg



PG&E, Bachhuber



Fred Turner / EERI photo archive



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Fred Turner / EERI photo archive



Ridgecrest Physical Clearinghouse Benefits

- **Provided rapid assessment of the geologic hazard and documentation of perishable scientific information – of use to the scientific and engineering community for improvement of building codes and engineering/scientific advances.**
- **Improved coordination of teams and individuals in the field**
- **Communication and coordination expanded access to restricted areas**
- **Linked the scientific and engineering communities with agencies and organizations responsible for emergency response (via evening briefings, virtual clearinghouse, and direct communication with the State Emergency Operations Center)**
- **Provided expertise important for potentially directing response resources (personnel, equipment, supplies) to impacted areas that may have been missed by standard response measures.**



Evening briefings provided a forum for mapping groups to report out their findings. These briefings included call-ins from other field personnel, other invited agencies, and representatives at the CA Emergency State Operations Center in Sacramento.

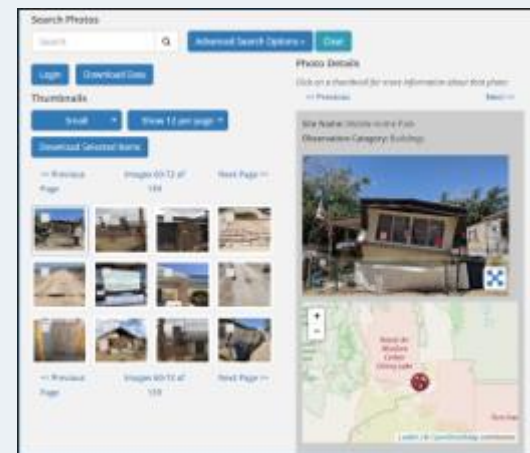
Data collection apps were used to facilitate systematic gathering, documentation, and dissemination of data, observations, and findings

Clearinghouse provided onsite support for accessing collection apps



Virtual Clearinghouse Benefits

- **Sharing of field data – *data from NAWS restricted until detailed internal review completed***
- **Access to upload and share photos and preliminary reports**
- **Hosted links to other data and imagery**
- **Posted preliminary reports and virtual reconnaissance reports**
- **Continued updates after physical clearinghouse closed**



Online information on how to share information and coordinate with others:

Fulcrum app – EERI members conducting reconnaissance

Collector app – CGS/USGS documenting ground failure

Upload photos

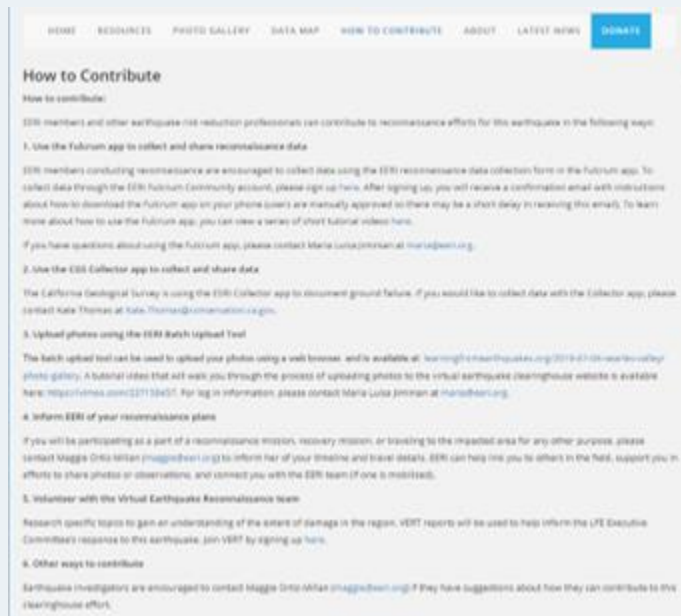
How to coordinate with Clearinghouse

Virtual EQ Reconnaissance Team



Ridgecrest Earthquake Sequence

M6.4 JULY 04, 2019 AT 17:33:49 UTC / M7.1 JULY 06, AT 03:19:53 (UTC)



HOME RESOURCES PHOTO GALLERY DATA MAP HOW TO CONTRIBUTE ABOUT LATEST NEWS UPDATE

How to Contribute

How to contribute:

EERI members and other earthquake risk reduction professionals can contribute to reconnaissance efforts for this earthquake in the following ways:

1. Use the Fulcrum app to collect and share reconnaissance data.

EERI members conducting reconnaissance are encouraged to collect data using the EERI reconnaissance data collection form or the Fulcrum app. To collect data through the EERI Fulcrum (continuity present), please sign up here. After signing up, you will receive a confirmation email with instructions about how to download the Fulcrum app on your phone (users are manually approved so there may be a short delay in receiving this email). To learn more about how to use the Fulcrum app, you can view a series of short tutorial videos here.

If you have questions about using the Fulcrum app, please contact Maria Luisa Jimenez at mjimenez@eeri.org.
2. Use the CGS Collector app to collect and share data.

The California Geological Survey is using the EERI Collector app to document ground failure. If you would like to collect data with the Collector app, please contact Kate Thomas at kate.thomas@conservation.ca.gov.
3. Upload photos using the EERI Batch Upload Tool.

The batch upload tool can be used to upload your photos using a web browser, and is available at: learningfromearthquakes.org/2019-07-04-searles-valley-photo-gallery. A tutorial video that will walk you through the process of uploading photos to the virtual earthquake clearinghouse website is available here: <https://vimeo.com/427138457>. For log in information, please contact Maria Luisa Jimenez at mjimenez@eeri.org.
4. Inform EERI of your reconnaissance plans.

If you will be participating as a part of a reconnaissance mission, recovery mission, or traveling to the impacted area for any other purpose, please contact Maggie Otero Wilson (maggie@eeri.org) to inform her of your timeline and travel details. EERI can help link you to others in the field, support you in efforts to share photos or observations, and connect you with the EERI team (if one is mobilized).
5. Volunteer with the Virtual Earthquake Reconnaissance Team.

Research specific topics to gain an understanding of the extent of damage in the region. VERT reports will be used to help inform the LFE Executive Committee's response to this earthquake, join VERT by signing up here.
6. Other ways to contribute.

Earthquake investigators are encouraged to contact Maggie Otero Wilson (maggie@eeri.org) if they have suggestions about how they can contribute to this clearinghouse effort.

<http://learningfromearthquakes.org/2019-07-04-searles-valley/how-to-contribute>

Clearinghouse Communications and Coordination with Emergency Management Officials

Direct communications with CGS and Cal OES management at the State Operations Center in Sacramento, CA

- Assisted with location for Physical Clearinghouse
- Arranged for helicopter flyover support for fault rupture mapping
- Communication with Regional, County, and City EOCs

The Clearinghouse evening briefings were broadcast to:

- Emergency management officials at the California State Operations Center in Sacramento, CA
- Included offsite representatives of EERI, USGS, CSSC, Cal OES, CGS, FEMA Region 9, Southern California Earthquake Center, JPL, and others



Clearinghouse members coordinated direct contacts with local officials:

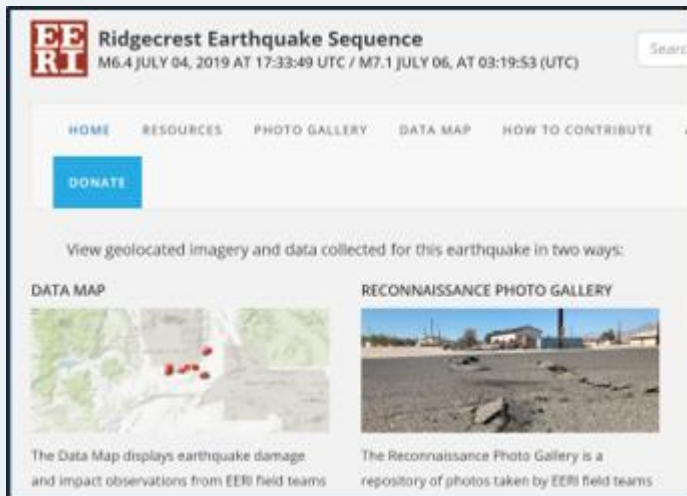
- **USGS and CGS lead scientists**
 - met with Navy to establish coordination between CGS, USGS and the NAWSCL Commanding Officer
 - met with City of Ridgecrest EOC and Mayor
- **CSSC Structural Engineers**
 - met with Ridgecrest Building Department

Ken Hudnut, USGS lead scientist, along with CalOES director and FEMA regional administrator, had the opportunity to brief Vice President Pence who was visiting CA



The Clearinghouse evening briefings provided the opportunity to update and inform Clearinghouse partners directly

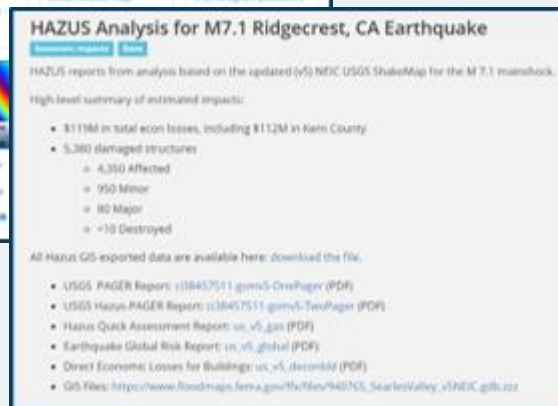
Emergency managers and public had access to virtual clearinghouse website which was updated daily



Date	Category	Featured	Title	Description
07-06-2019	Clearinghouse Updates		Physical Clearinghouse Location Closed	The California Clearinghouse has closed the physical clearinghouse location.
07-06-2019	Report		Rapid Assessment Situation Report	Summary of information gleaned from media reports collected by the California Seismic Safety Commission.
07-06-2019	Report		USGS shakemap over topographic map	Created by: wood. To view map pdf click here:
07-05-2019	Data		NASA Earth Science Disasters Program Event Page	Southern California Earthquakes July 2019 updates from the NASA Earth Science Disasters Program. Visit the article here.
07-05-2019	Data		DESIGNSAFE-CI 2019 Ridgecrest, CA Earthquake Sequence	2019 Ridgecrest, California Earthquake Sequence from DESIGNSAFE-CI (JHERI). To visit page click here.
07-05-2019	Seismology, Data		SCC Response Website - M6.4 Searles Valley, CA	M6.4 Searles Valley, California Response from Southern California Earthquake Center.
07-05-2019	Seismology, Report		Arthur G. Sylvester Report - China Lake Goodery	Arthur G. Sylvester's Survey of Two Geodetic Arrays on the Owens Valley Fault, Indian Wells Valley, California. To view document click here.
07-05-2019	Seismology, Data, Map		UNAVCO Event Page and Data Links	Data Event Response to the July 4, 2019 M6.4 and July 6, 2019 M7.1 Earthquakes Near Ridgecrest, California by UNAVCO. Data links for stations operated by UNAVCO and funded by the National Science Foundation are below.
07-05-2019	Seismology, Data		IRIS Event Page	Incorporated Research Institutions for Seismology (IRIS) Event page
07-10-2019	Media/news		News Articles	Here is a list of news articles containing information on the Searles Valley Earthquakes:
07-10-2019	Report	☆	Virtual Earthquake Reconnaissance Team (VERT) Phase 1 Response to M6.4 & M7.1 Searles Valley Earthquakes 0704 & 705/2019	By Mohammad Shafiqul Alam, Yisanda Alberto, Chrysi Aranha, Sahar Derakhshan, Wilfrid Djma, Erica Fischer, William Greenwood, Gabriela Hans, Wael Husain, Kenneth Hudson, Maney Hachamanehi, Alex Julius, Lucas Laughery, Xin Ma, Walker Maslowski, Hanzhi Mulchandani, Tansiah Rodriguez Niki, Yi Tyan Tsai, Mehmet Unal, Jenna Wong, David Yoo, Katerina Ziotopoulou. July 2019, Earthquake Engineering Research Institute. Virtual...

<http://learningfromearthquakes.org/>

Examples of available data resources posted on the clearinghouse website



Emergency Response:

FEMA – Declaration

FEMA – IA, PA

HAZUS runs

Remote Sensing:

NASA-JPL

UNAVCO

Virtual Reconnaissance:

Structural Recon –StEER

Virtual EQ Recon – VERT

Rapid Assessment –CSSC

<http://learningfromearthquakes.org/>

What lessons were learned during the implementation of the Ridgecrest EQ Clearinghouse?

Lessons learned from the Napa M6, 2014 earthquake, led a team of CGS geologists and GIS staff to develop a digital field data collection system for fault failure, landslide, and liquefaction

- 1. Need to strengthen communication with state level regional coordinators and local EOCs**
- 2. Maintain updated contact list for Clearinghouse activation notifications**
- 3. For long activations, additional staff/overlapping shifts**
- 4. Need for a release of a daily summary sheet & online dashboard summaries**
- 5. Continue to reach out to science/engineering/social science professionals to be involved**
- 6. Need to review & update CA EQ CH Operational Plan to build in scalability for large magnitude event within a multi city/county urban area.**



THANK YOU

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