



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



California Department of Conservation | conservation.ca.gov



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

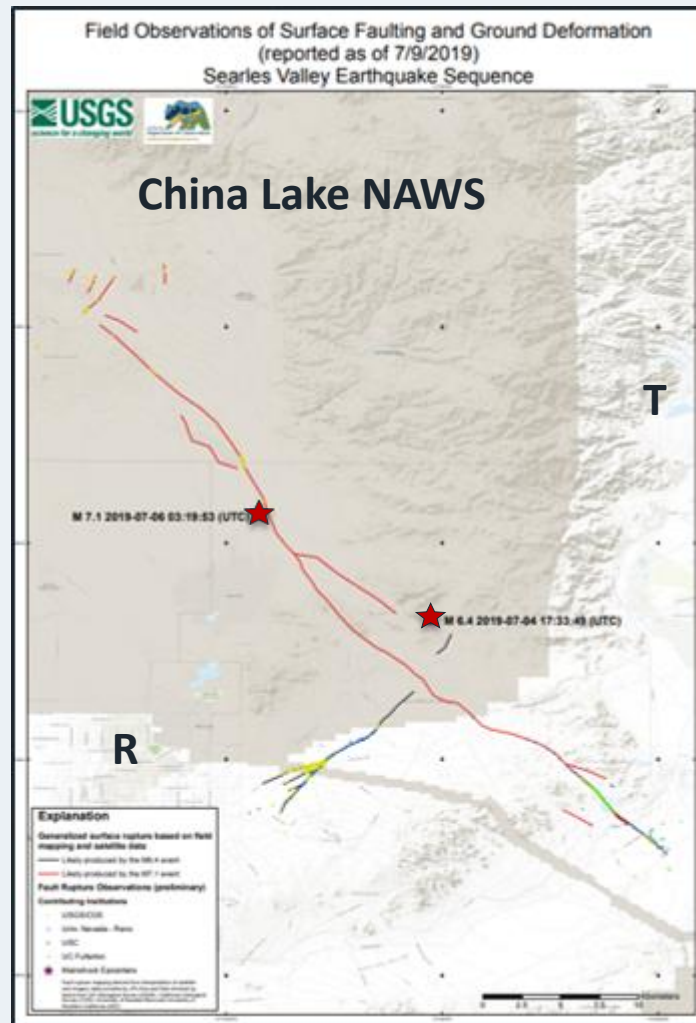
Ridgecrest Earthquakes Overview

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



CA EQ Clearinghouse Operations Support

EERI – operations, communication/briefings, virtual clearinghouse

CGS – operations, data collection/database management

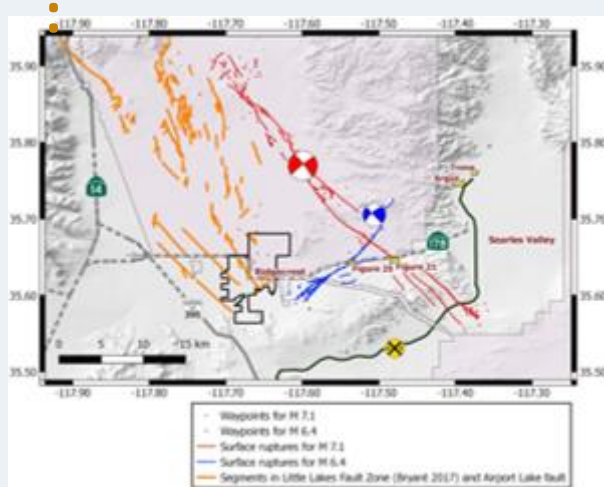
USGS – data collection/database management

CSSC - operations

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

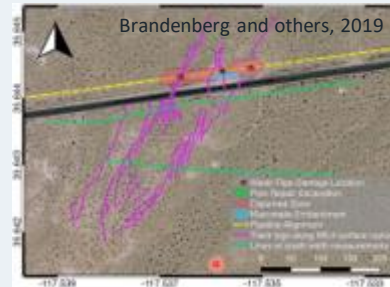


Clearinghouse Investigations included Defining and Documenting:



Hazards:

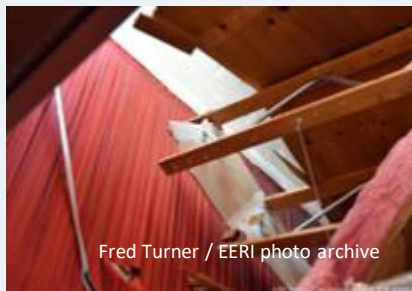
Surface rupture
Liquefaction
Lateral spread
Ground shaking



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



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.

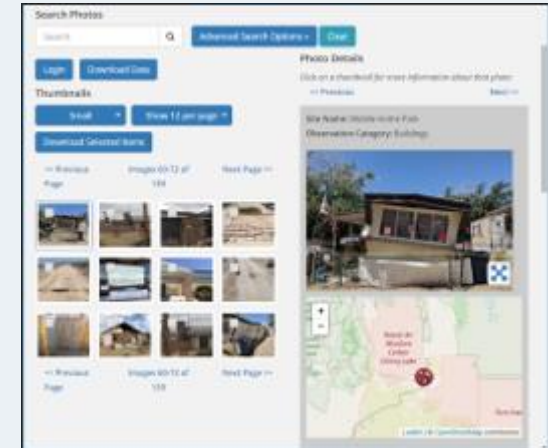
Data collection apps were used to facilitate systematic gathering, documentation, and dissemination of data, observations, and findings

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:

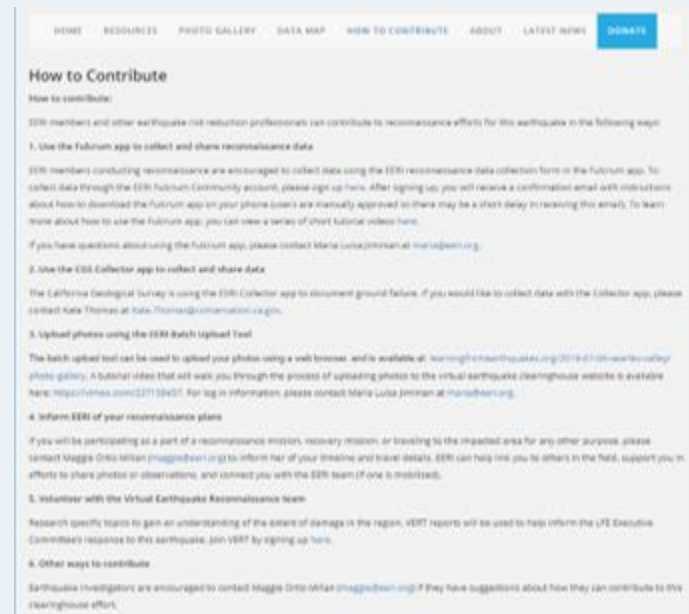
Fulcrum app – EERI members conducting reconnaissance

Collector app – CGS/USGS documenting ground failure

Upload photos

How to coordinate with Clearinghouse

Virtual EQ Reconnaissance Team



<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:

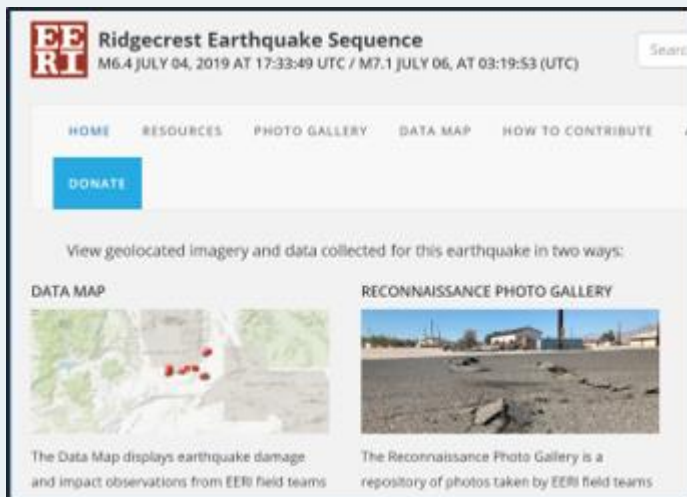
- **USGS and CGS lead scientists**
 - met with Navy to establish coordination between CGS, USGS and the NAWSCL Commanding Officer
 - met with City of Ridgecrest EOC and Mayor
- **CSSC Structural Engineers**
 - met with Ridgecrest Building Department

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

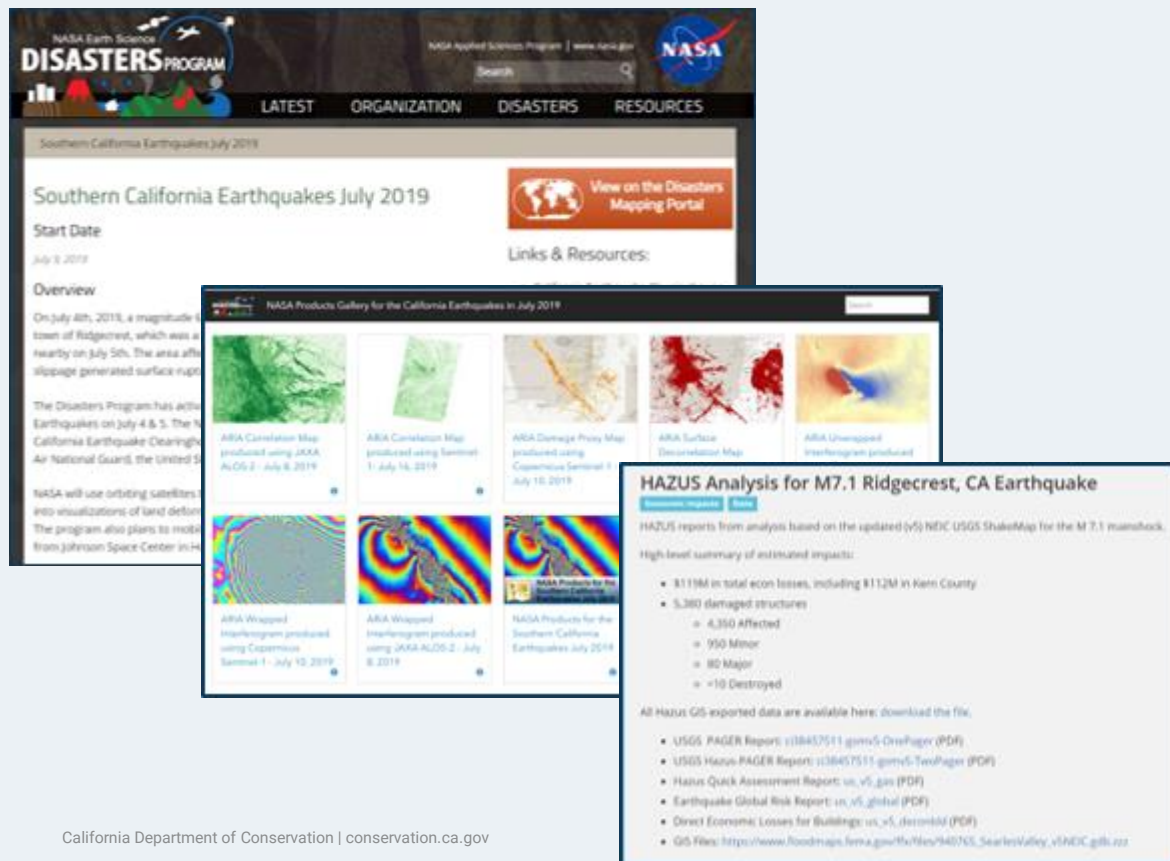
Emergency managers and public had access to virtual clearinghouse website which was updated daily



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:
07-06-2019	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.
07-06-2019	Data		DESIGNSAFE-CI 2019 Ridgecrest, CA Earthquake Sequence	2019 Ridgecrest, California Earthquake Sequence from DESIGNSAFE-CI (JHER). To visit page click here.
07-06-2019	Seismology, Data		SCSC Response Website - M6.4 Searles Valley, CA	M6.4 Searles Valley, California Response from Southern California Earthquake Center.
07-06-2019	Seismology, Report		Arthur G. Sylvester Report - China Lake Geodetic	Arthur G. Sylvester's Survey of Two Geodetic Arrays on the Owens Valley Fault, Indian Wells Valley, California. To view document click here.
07-06-2019	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.
07-06-2019	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 & 0706/2019	By Mohammad Shafiqul Alam, Yolanda Alberto, Chrysi Aranha, Sahar Derakhshani, Wilfrid Djima, Erica Fischer, William Greenwood, Gabriela Hays, Wael Hunsan, Kenneth Hultson, Manley Kahanavanshi, Alex Julluk, Lucas Laughery, Xin Ma, Walker Madhwalizi, Hanih Mulchandani, Tonatiah Rodriguez Niki, Yi Tyan Tsai, Mehmet Unal, Jenna Wong, David Yon, Katerina Ziotopoulou. July 2019, Earthquake Engineering Research Institute Virtual...

<http://learningfromearthquakes.org/>

Examples of available data resources posted on the clearinghouse website



NASA Earth Science DISASTERS PROGRAM

NASA Applied Sciences Program | www.nasa.gov

Search

LATEST ORGANIZATION DISASTERS RESOURCES

Southern California Earthquakes July 2019

Start Date
July 5, 2019

Overview

On July 4th, 2019, a magnitude 7.1 earthquake struck near Ridgecrest, which was a nearby on July 5th. The area after the earthquake generated surface ruptures.

The Disasters Program has active Earthquakes on July 4 & 5. The California Earthquake Clearinghouse, Air National Guard, the United States Geological Survey, and NASA will use orbiting satellites into visualizations of land deformation. The program also plans to receive from Johnson Space Center in Houston.

View on the Disasters Mapping Portal

Links & Resources:

NASA Products Gallery for the California Earthquakes in July 2019

ARIA Correlation Map produced using ARIA-ALOS-2 - July 6, 2019

ARIA Correlation Map produced using Sentinel-1 - July 14, 2019

ARIA Damage Proxy Map produced using Copernicus Sentinel-1 - July 10, 2019

ARIA Surface Displacement Map

ARIA Unwrapped Interferogram produced

ARIA Unwrapped Interferogram produced using Copernicus Sentinel-1 - July 10, 2019

ARIA Unwrapped Interferogram produced using ARIA-ALOS-2 - July 6, 2019

NASA Products for the Southern California Earthquakes July 2019

HAZUS Analysis for M7.1 Ridgecrest, CA Earthquake

HAZUS reports from analysis based on the updated (v5) USGS ShakeMap for the M 7.1 mainshock.

High-level summary of estimated impacts:

- \$1.19M in total economic losses, including \$112M in Kern County
- 5,380 damaged structures
 - 4,350 Affected
 - 950 Minor
 - 80 Major
 - 10 Destroyed

All HAZUS GIS-exported data are available here: download the file.

- USGS PAGER Report: v18457511.gmrv5-OverPage (PDF)
- USGS HAZUS-PAGER Report: v18457511.gmrv5-TestPage (PDF)
- HAZUS Quick Assessment Report: us_v5.gis (PDF)
- Earthquake Global Risk Report: us_v5_global (PDF)
- Direct Economic Losses for Buildings: us_v5_direct (PDF)
- GIS Files: http://www.floodmaps.fema.gov/files/940763_SearchedValley_v1NEIC.gdb.zip

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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