Partial Support of Joint USGS-CALTECH Southern California Seismographic Network

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Robert W. Clayton
Egill Hauksson

Seismological Laboratory,
California Institute of Technology
Pasadena, CA 91125
hauksson@gps.caltech.edu
Tel: 626 395-6954
FAX: 626 564-0715
http://www-socal.wr.usgs.gov/scsn.html
http://www.trinet.org

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INVESTIGATIONS

This Cooperative Agreement provides partial support for the joint USGS-Caltech Southern California Seismographic Network. The purpose is to record and analyze data from more than 16,714 local earthquakes from October 2000 to September 2001 and generate a database of phase data and digital seismograms. The primary product derived from the database is a joint USGS-Caltech catalog of earthquakes in the southern California region. The upgrade of the network instrumentation from analog to digital also continues. We also provide rapid response to emergency services, the media, and public inquiries about earthquakes.

For more detailed information about data access, please contact:
Dr. Kate Hutton at (626) 395-6959
or with E-mail: kate@gps.caltech.edu.

RESULTS

Network Operation

Southern California Seismographic Network. The SCSN has 295 remote sites (with 1200 components) and gathers data from local, regional earthquakes and teleseisms. These data are used for earthquake hazards reduction as well as for basic scientific research. The earthquake hazards reduction effort has become more important as moderate-sized earthquakes continue to occur within densely populated areas in southern California. The largest earthquake to occur was the M_L5.1 on February 10, 2001, in the San Bernardino Mountains (Figure 1).

The average rate of 15 publications per year over the last 10 years using the network data illustrates the strength of the ongoing research activities that use the network data. Continued efforts to improve data quality and accessibility have created arguably the best regional earthquake database in the world. The ongoing upgrading of the quality of the waveforms recorded by the short-period network and the addition of low-gain seismometers and accelerometers provide numerous new avenues of research. Most important of these is analysis of on-scale waveforms to determine source, path, and site effects.

The USGS operates most of the remote short period stations in the SCSN. Jointly Caltech and USGS operate 145 broadband and strong motion and 30 strong motion TriNet stations (Figure 2). Caltech also maintains drum recorders and other equipment at the central site located in the Seismological Laboratory at Caltech.

All of the SCSN/TriNet data, including short-period, broadband, and strong motion, are recorded by two SUN server computers. The data processing is done on 15 SUN workstations and several PC's running UNIX. Caltech and USGS personnel share the operation of this equipment. To avoid duplication, software development is done in cooperation with the USGS in Menlo Park and other seismic networks.

A total of 16,714 earthquakes were entered into the southern California earthquake catalog for this reporting period. Approximately 10.0-12.0 Mbytes of phase data and 75-150 Gbytes of seismograms were archived. In addition to the data analysis we carry out software maintenance, hardware maintenance, and other tasks necessary to complete the catalog. Caltech and USGS maintain a data base that includes: 1) earthquake catalog (1932-present); 2) phase data (1932-present); 3) photographic paper seismograms (1930-1992); and 4) digital seismograms (1977-present). The earthquake catalog (1932-present) and phase data (1932-present) are available over the Internet. Other data are available upon request. This data base has been made available to the SCEDC and is the most voluminous part of the data stored in the SCEDC.

Near real-time reporting to USGS in Reston and the Governor's Office of Emergency Services and other response to any felt or damaging earthquake activity is provided by network personnel.

The Southern California Earthquake Data Center. This center has significantly increased the use of the data from SCSN/TriNet for scientific research. The mass-store system, which has been in operation for more than ten years, provides on-line storage for more than 1000 Gbytes of data. These data, including, 70 years of catalog, 70 years of phase data, and 20 years of digital seismograms are available through the internet in near real-time.

SEISMICITY SUMMARY FOR SOUTHERN CALIFORNIA
October 2000 - September 2001

Southern California seismic activity for the 12-month period from October 1, 2000 through September 30, 2001 was moderately above average in terms of the number of earthquakes. The total number of quakes detected and processed by the TriNet/Southern California Seismic Network was 16,714. This figure should be compared with a typical "quiet" year with a total of 10,000 to 12,000 detectable earthquakes. Of these, 222 were magnitude M3.0 and larger. In general, earthquakes must be in the range M2.5 to M3.0 or larger in order to be felt widely by the population.

The main contributors to the large earthquake totals were 1) the continuing aftershock sequence of the October 16, 1999 Hector Mines earthquake (Mw7.1), and 2) a Coso Junction (Rose Valley) swarm in July 2001.

In addition to these large contributors, seismicity in the usual locations, including the Northridge (January 17, 1994, Mw6.7) and Landers (June 28, 1992, Mw7.3) aftershock sequences, are visible on the seismicity map. As usual, the San Jacinto and Elsinore faults, the Imperial Valley, the southern Sierra Nevada and Tehachapi Mountains area, and various parts of the southern Owens Valley, clearly were active at the microearthquake level.

The largest earthquake of the year was a M_L5.1 on February 10, 2001, in the San Bernardino Mountains, 4 miles north-northwest of Big Bear Lake. It was felt over most of southern California, with Modified Mercalli intensity V logged in the epicentral area.

The second and third largest quakes in the region (Mw4.8 and Mw4.7, both on July 17, 2001) were members of the Coso Junction swarm. Coso Junction is just to the west of the Coso Range, which is a geothermal area and a prolific source of earthquake swarms. This year's swarm contained upwards of 6,000 earthquakes.

Probably the second most widely felt earthquake of the year was the ML4.2 that occurred on September 9, 2001 near the border between Beverly Hills and West Hollywood. This quake showed a strike-slip focal mechanism which was consistent with the Newport-Inglewood fault zone, even though there are no mapped strands of this fault system at the exact hypocenter. The quake was felt as far away as Gorman, Victorville, and Temecula. The peak Modified Mecalli intensity observed was VI.

The following table lists those quakes with magnitudes of M4.0 or larger:

Mag.	Local date time	Descriptive location
4.1	2000/12/02 00:28;07	8 km (4 mi) E of Big Bear City, CA
4.4	2000/12/23 17:04:21	10 km (6 mi) WSW of Grapevine, CA
4.0	2000/12/26 16:27:16	27 km (17 mi) ESE of San Clemente Is., CA
4.3	2001/01/13 18:26:14	3 km (2 mi) E of San Fernando, CA
4.0	2001/01/13 18:50:53	3 km (2 mi) E of San Fernando, CA
5.1	2001/02/10 13:05:05	6 km (4 mi) NNW of town of Big Bear Lake, CA
4.2	2001/02/10 16:39:15	6 km (4 mi) NNW of town of Big Bear Lake, CA
4.0	2001/05/17 14:53:45	29 km (18 mi) SSW of Coso Junction, CA
4.1	2001/05/17 15:56:45	29 km (18 mi) SSW of Coso Junction, CA
4.8	2001/07/17 05:07:26	9 km (5 mi) ESE of Coso Junction, CA
4.1	2001/07/17 05:25:18	7 km (4 mi) E of Coso Junction, CA
4.7	2001/07/17 05:59:59	7 km (4 mi) ESE of Coso Junction, CA
4.0	2001/07/20 05:53:07	8 km (5 mi) SE of Coso Junction, CA
4.4	2001/08/16 11:04:33	9 km (5 mi) SE of San Clemente Is.
4.2	2001/08/16 15:06:28	10 km (6 mi) S of San Clemente Is.
4.2	2001/09/09 16:59:18	2 km (1 mi) SE of Beverly Hills, CA

Processing of Backlog of SCSN Data

We made substantial progress in processing earlier backlogs, including 1950 to 1960 data and data from 1983, and from 1980 and 1981, which need to be picked and located. Data recorded on the CEDAR system (a previous real-time recording and post-processing system) are being translated into CUSP format and archived on the SCEC Data Center, for future review. Hand phase picks, previously entered into the computer, from the 1950's and the 1970's, are being used to relocate and reassign magnitudes to historical earthquakes in the region.

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Southern California

Seismicity October 2000 -- September 2001

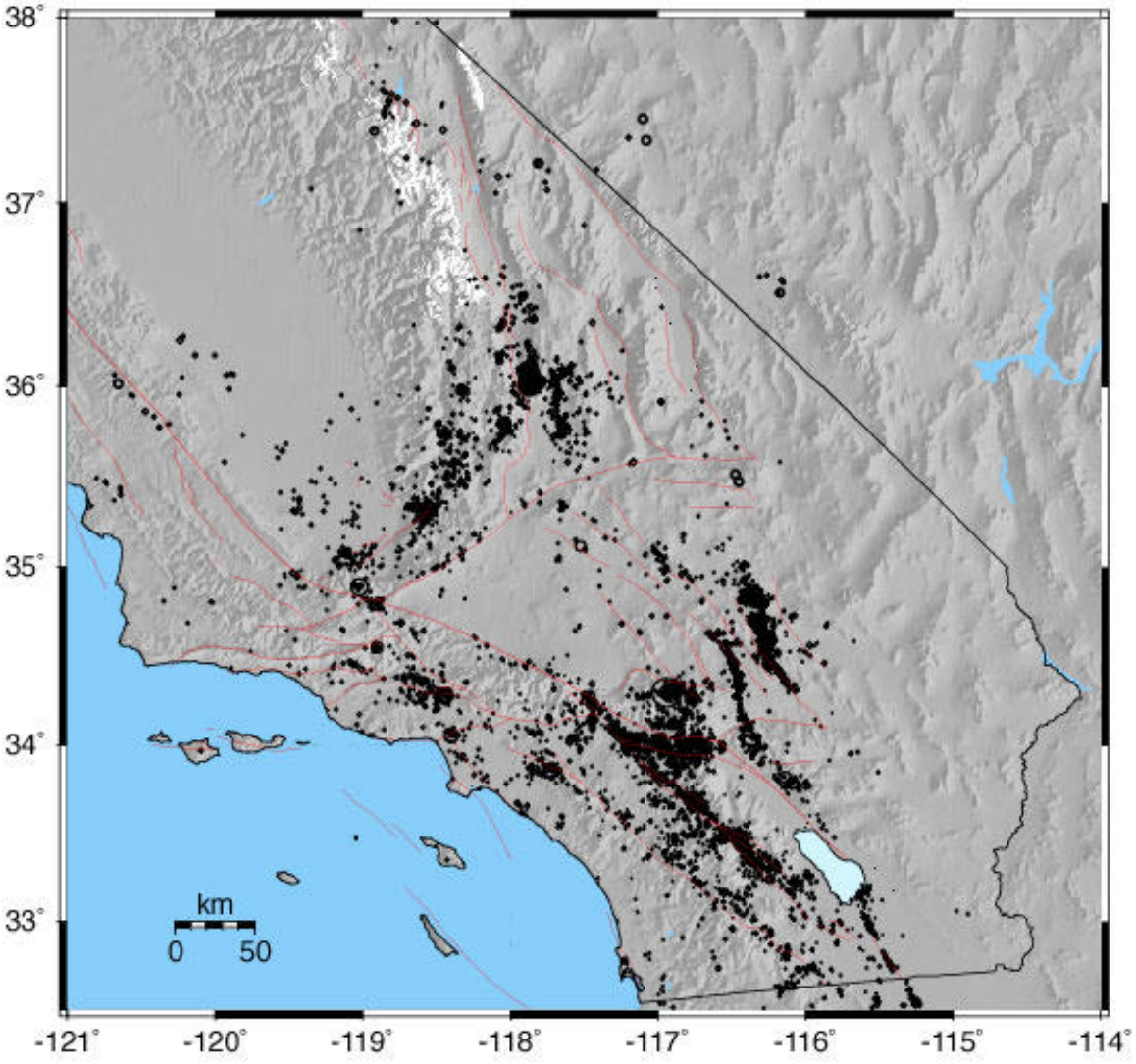

Figure 1. Earthquakes recorded by SCSN/TriNet.

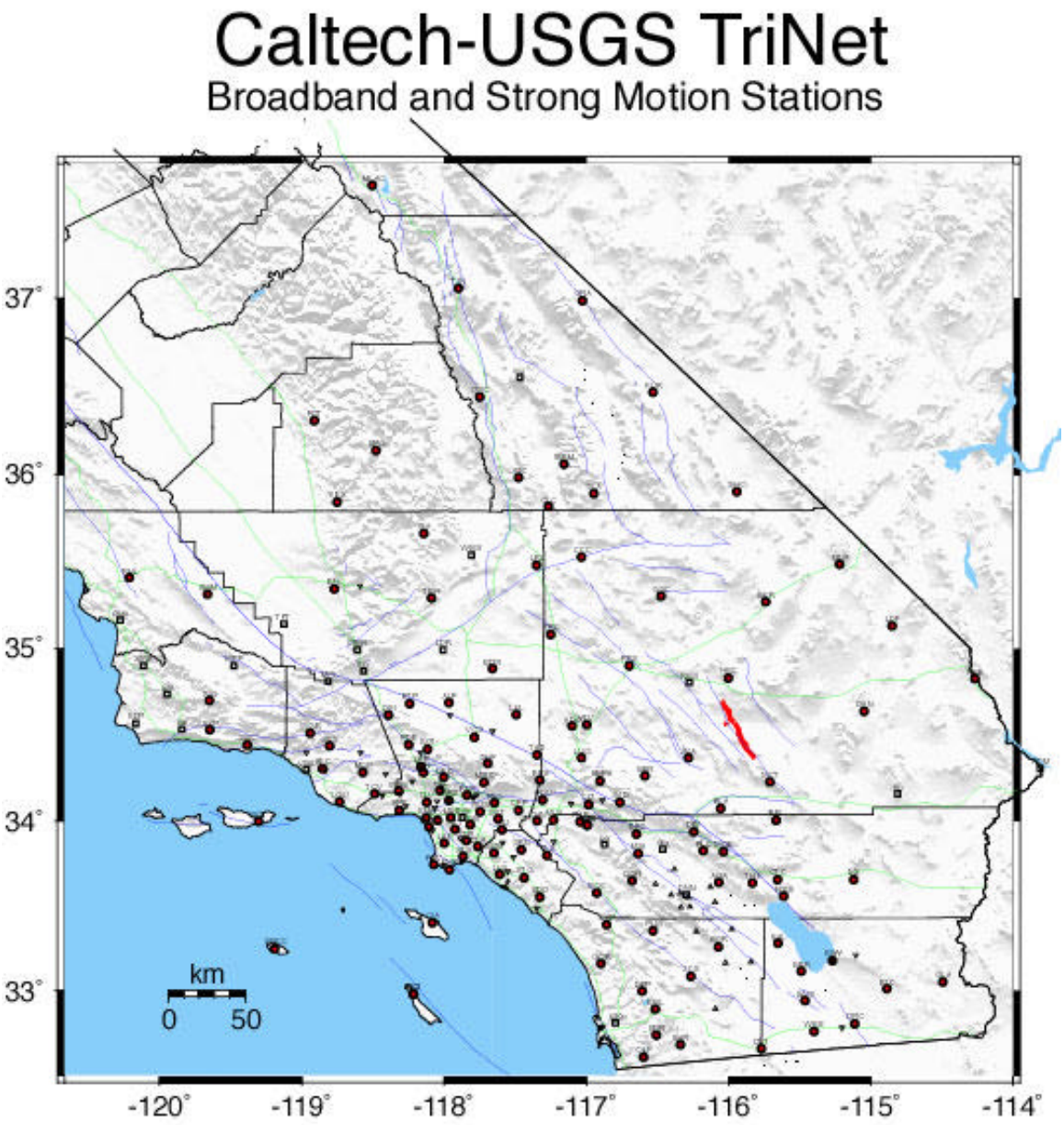

Figure 2. TriNet digital broadband and strong motion (circle) seismic stations strong motion stations (triangle), and planned stations (squares).

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NON-TECHNICAL SUMMARY