

Partial Support of Joint USGS-CALTECH Southern California Seismographic Network

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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 10,937 local earthquakes from October 2001 to September 2002 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.

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RESULTS

Network Operation

Southern California Seismographic Network. The SCSN records data from about 325 remote sites (with 1600 high sample rate 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 that occurred during this reporting period was a M5.7 quake on February 22, 2002 was located south of the U.S./Mexico border (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.

Jointly Caltech and USGS operate 160 broadband and strong motion and 30 strong motion TriNet stations. In addition, the USGS operates the remote short period stations in the SCSN (Figure 2). Caltech and USGS also maintain data acquisition equipment and other facilities at the central site located in the Seismological Laboratory at Caltech and the USGS Office 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 10,937 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 4000 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 2001 - September 2002

Southern California seismic activity for the 12-month period from October 1, 2001 through September 30, 2002 was fairly low. The total number of earthquakes detected and processed by the TriNet/Southern California Seismic Network was as follows:

All quakes:	10,937
Quakes 3.0 & larger:	212
Quakes 4.0 & larger:	21
Quakes 5.0 & larger:	3

In general, earthquakes must be in the range M2.5 to M3.0 or larger in order to be widely felt by the public.

The "average" quiet year for earthquakes in the region includes a total of about 10,000 to 12,000 events. The decrease from last year's 16,714 was due to the lack of any large mainshock-aftershock sequences. Late aftershocks of the Northridge (1994, Mw6.7), the Landers earthquake (1992, Mw7.3), and the Hector Mines (1999, Mw7.1) sequences were included in this year's 10,937. However, the numbers were considerably smaller due to the amount of time elapsed since these mainshocks.

The largest earthquake during this reporting period was a M5.7 quake on February 22, 2002. This quake actually occurred south of the U.S./Mexico border (26 miles south-southeast of Calexico), but it was felt in California, including in the Imperial Valley, San Diego, and by a few people as far away as Palmdale. The peak intensity in the U.S., in the northern Imperial Valley, was Modified Mercalli V.

There were two ML5.1 quakes. One of these was also in Mexico, quite far south, near the northern end of the Gulf of California. Nevertheless, it was felt widely in the Imperial Valley, San Diego, and in the Yuma, Arizona region.

The other ML5.1 quake occurred on October 30, 2001, in the Anza-Borrego area. It was widely felt from the U.S./Mexico border to Victorville and Orange County. For this quake, the peak intensity was also Modified Mercalli V.

An earthquake of perhaps greater public interest (in other words, felt more strongly in urban areas) was a ML4.8 in Yorba Linda on September 14, 2002, for which we received over 7,700 "felt reports" from the public. It was felt throughout the Inland Empire, Los Angeles Basin, San Fernando Valley, and as far south as the San Diego area, with a peak intensity of Modified Mercalli V. It may have occurred either on the Whittier Fault, or a subsidiary fault branching off the Whittier Fault.

A ML4.1 on or near the San Andreas fault northwest of the Salton Sea also caught seismologists' attention. This quake occurred as part of a small swarm on November 13, 2001. Earthquakes on or near this part of the San Andreas fault are relatively rare, and the segment is thought to have been "locked" and accumulating strain for a period of time measured in centuries.

The following table lists the earthquakes with magnitudes of M4.0 or larger:

4.0	2001/10/28 08:27:45	6 km (4 mi) NW of Compton, CA
5.1	2001/10/30 23:56:16	15 km (10 mi) ESE of Anza, CA
4.1	2001/11/13 12:43:14	5 km (3 mi) SE of Bombay Beach, CA
5.1	2001/12/08 15:36:10	86 km (53 mi) SSW of Yuma, AZ
4.9	2001/12/08 17:42:26	85 km (53 mi) SSW of Yuma, AZ
4.0	2001/12/14 04:01:35	8 km (5 mi) SE of Diamond Bar, CA
4.2	2002/01/02 04:11:28	15 km (9 mi) NNW of Borrego Springs, CA
4.2	2002/01/19 15:44:29	180 km (112 mi) S of Calexico, CA
4.2	2002/01/28 21:53:28	9 km (6 mi) WSW of Valencia, CA
5.7	2002/02/22 11:32:41	42 km (26 mi) SSE of Calexico, CA
4.1	2002/02/22 12:33:49	43 km (27 mi) SSE of Calexico, CA
4.0	2002/02/24 17:29:11	42 km (26 mi) SSE of Calexico, CA
4.6	2002/03/16 13:33:23	33 km (20 mi) NW of Santa Barbara Is., CA
4.4	2002/04/05 00:02:56	43 km (27 mi) N of Joshua Tree, CA
4.1	2002/04/29 05:24:41	78 km (49 mi) SSW of Yuma, AZ

4.0 2002/05/22 17:52:50 95 km (59 mi) SSW of Calexico, CA
 4.9 2002/06/14 05:40:46 53 km (33 mi) ENE of Furnace Creek, CA
 4.8 2002/09/03 00:08:51 5 km (3 mi) NE of Yorba Linda, CA
 4.3 2002/09/21 14:26:16 9 km (6 mi) N of Ocotillo Wells, CA
 4.1 2002/09/28 03:34:47 21 km (13 mi) NNE of Trona, CA
 4.0 2002/09/28 11:11:29 21 km (13 mi) NNE of Trona, CA

Processing of Backlog of SCSN Data

We have made more progress in processing earlier backlogs. Events from 1932 through 1934 and from 1950 through 1976 now have computerized locations and magnitudes consistent with our current calibrations. All data from 1981 onward has been written to the data center Oracle data base, although some time periods in 1983 and 1981 have not been completely processed. All of the CEDAR system data (1977 through 1980) that are readable from the tapes of that period have been translated from CEDAR format to CUSP & are ready to be converted into the Oracle data base.

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Southern California

Seismicity October 2001 -- September 2002

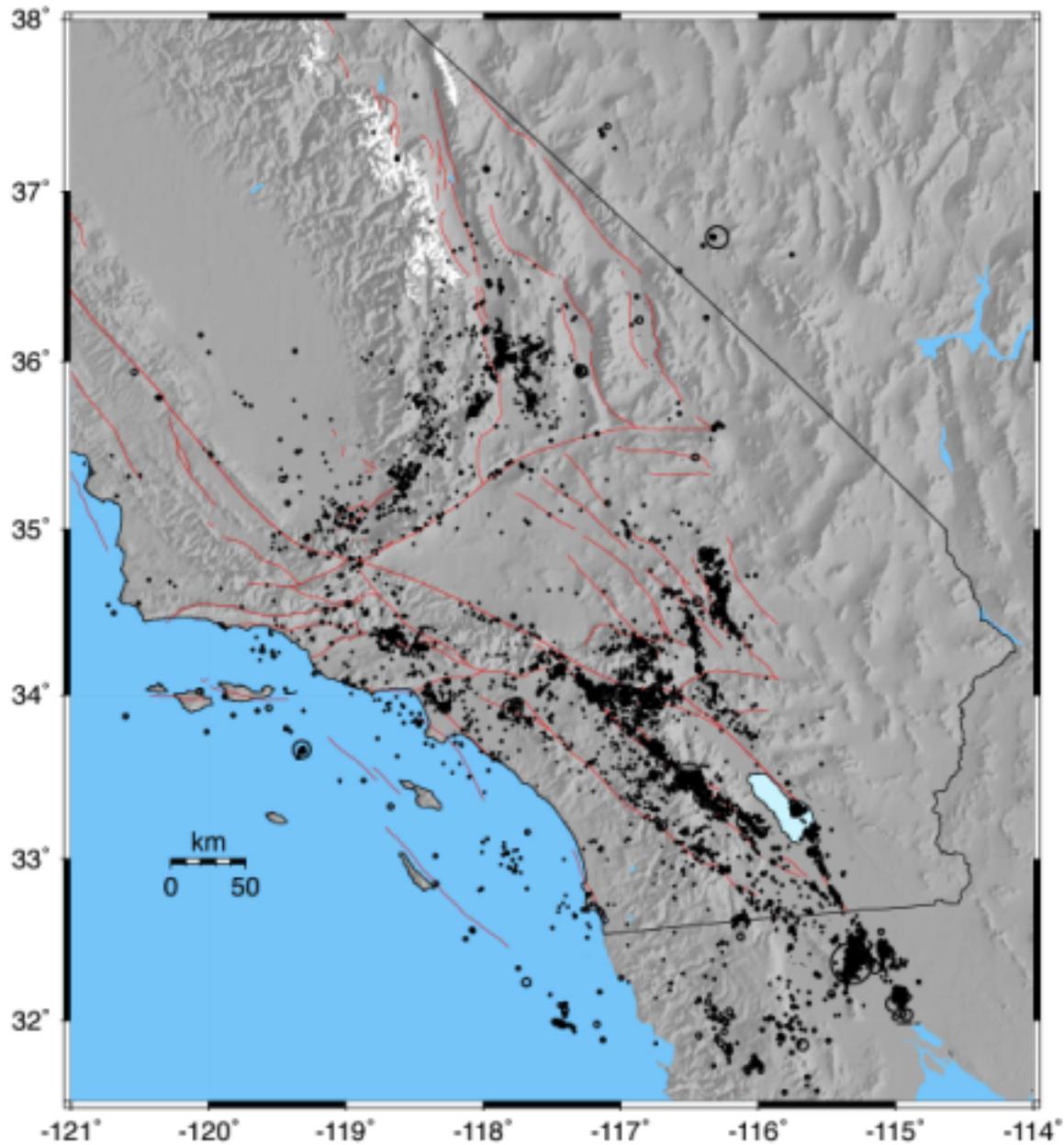


Figure 1. Earthquakes recorded by SCSN/TriNet, <http://www.trinet.org>

Caltech-USGS TriNet

Current Configuration 2002

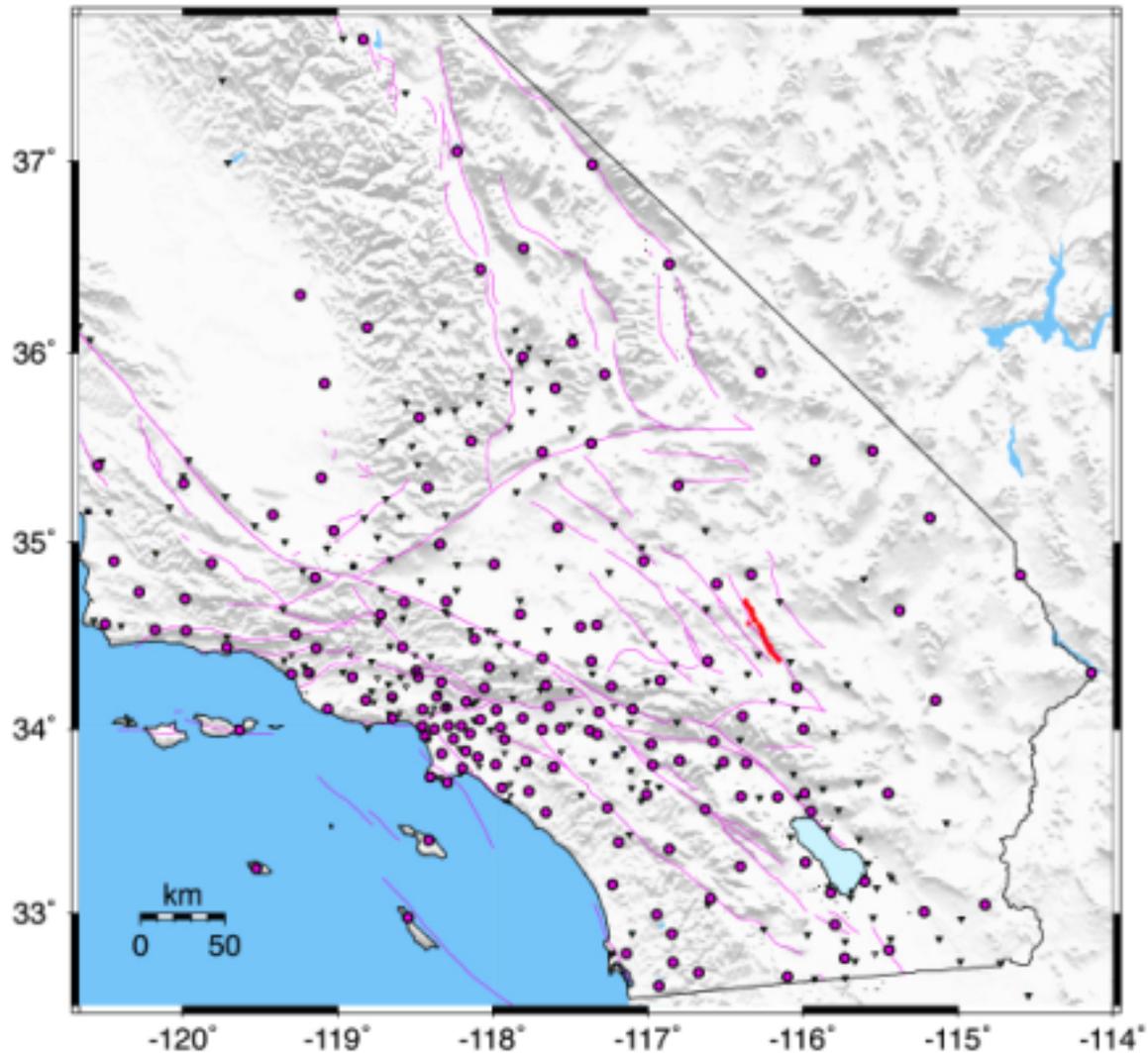


Fig. 2. TriNet digital broadband and strong motion (circles) seismic stations, strong motion (triangles), planned (squares), short period stations (inverted triangles).

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NON-TECHNICAL SUMMARY