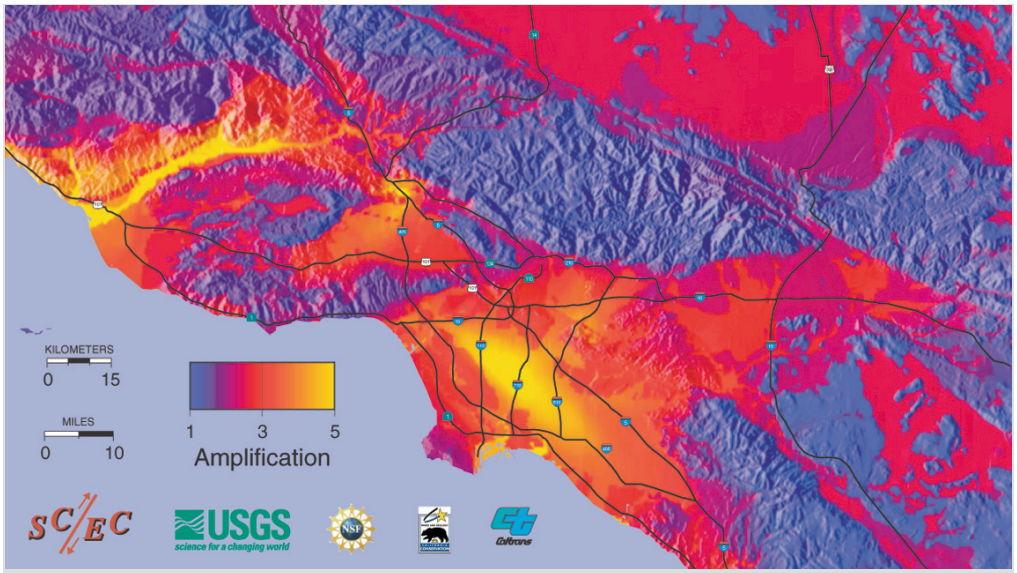
The Southern California Earthquake Center

A Multidisciplinary Research and Education Community

NSF USGS science for a changing world

SCEC's mission is 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. SCEC is supported by the National Science Foundation and the U.S. Geological Survey, and is headquartered at the University of Southern California. SCEC coordinates the efforts of over 55 institutions around the world and has produced a number of important reports on earthquake probabilities, ground-motion intensities, and other aspects of earthquake hazards since 1991. This information is communicated through SCEC's extensive Communication, Education and Outreach Program.



The SCEC "Phase III" Report (www.scec.org/phase3) quantified how local geologic conditions contribute to earthquake shaking. The study identified that shaking is amplified in softer rock or soil and that shaking is amplified where sediments are thicker. This map shows the average amplification caused by these site effects for all potential earthquakes; actual shaking amplification will vary depending on the location of the earthquake.

With many active faults along the rapidly moving Pacific-North American plate boundary, Southern California is a superb natural laboratory for understanding earthquakes. Few regions of the world are as intensely monitored and studied. SCEC was created to combine the results of research into a comprehensive and predictive understanding of earthquake behavior, essential information for improving earthquake risk management. This understanding can also be applied in other earthquake-prone areas.

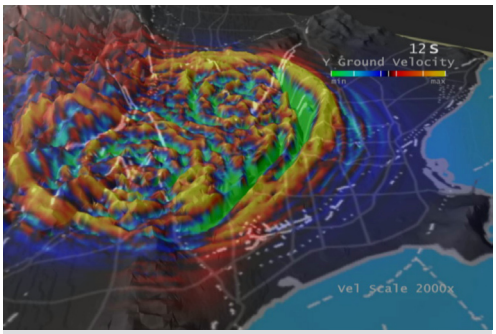
SCEC sustains disciplinary research through standing committees in seismology, geodesy, geology, and fault and rock mechanics. These committees also maintain and develop databases, instrument networks, and other resources needed for studying earthquakes.

Interdisciplinary research is organized into five focus groups: structural representation (location of faults and structure of the crust), fault systems (how faults behave individually and as a network), earthquake source physics (structures of fault zones and how faults move), ground motion (how earthquake waves travel through the earth and cause shaking at its surface), and seismic hazard analysis (when and where earthquakes are likely to occur and the shaking intensities they produce).

These groups are responsible for combining new results and existing understanding into "community models" that describe aspects of the Southern California fault system, such as the motion of crustal blocks, fault geometries, and variations in soil type and depth.

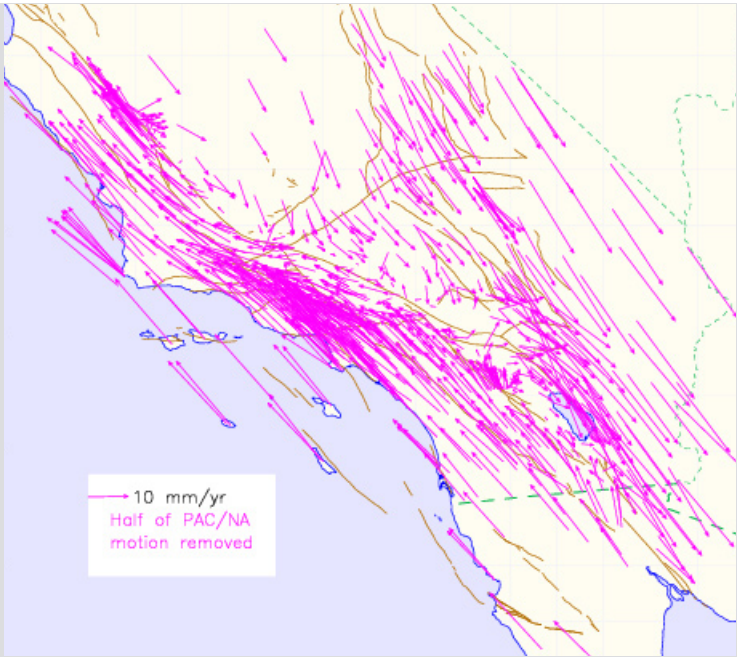
SCEC has organized major new facilities for earthquake research. For example, the 250-station Southern California Integrated GPS Network (SCIGN, www.scign.org) measures strain in the L.A. Basin and surrounding regions by monitoring the movement of permanent GPS receivers (similar to those used for navigation). Also, the Southern California Earthquake Data Center (SCEDC, www.data.scec.org) is the primary data repository and distribution center for seismic networks in the region.

SCEC has also developed substantial computational resources for earthquake science. Much of SCEC's research is being coordinated through an online "Community Modeling Environment"(CME)—a virtual co-laboratory for knowledge management, hypothesis formulation and testing, data conciliation and assimilation, and prediction (www.scec.org/cme). This system will allow scientists from many institutions to work together by sharing data and computer programs, testing theories, and communicating results. The advanced information technology needed for this manner of earthquake science is being developed through an extensive information technology partnership funded by the National Science Foundation.



Simulation of ground shaking during a 7.4 magnitude earthquake on the Puente Hills fault beneath the Los Angeles area. This image is from a movie created by a large team of SCEC scientists as part of the SCEC Community Modeling Environment project. Such an earthquake may cause up to $250 billion in losses and kill up to 18,000 people. More information, including the full movie for download, is at www.scec.org/puentehills.

Data from both permanent and mobile GPS receivers are used to monitor the motion along the Pacific-North American plate boundary in southern California. This map shows the motion over several years of hundreds of locations with half of the overall velocity subtracted from each point. By studying the small variations in how regions in Southern California are moving, stress and strain can be measured and may indicate where earthquakes are more likely to occur. This can lead to better planning and improved preparedness.



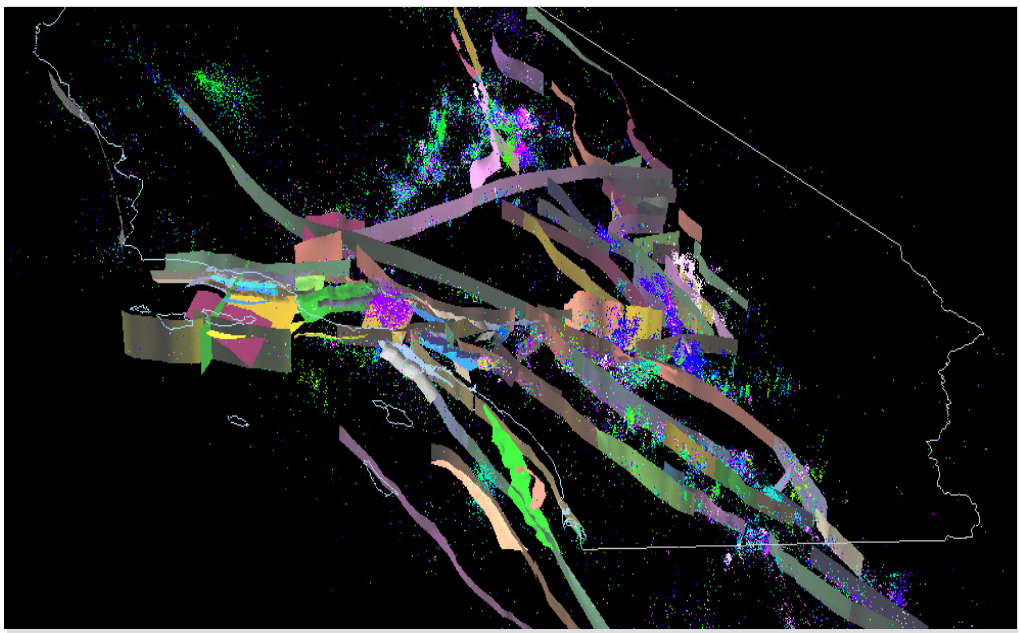
Over 150 students have participated in the SCEC Undergraduate Internship program since 1994. This picture shows the 2004 interns at the NSF San Andreas Fault Observatory At Depth (SAFOD) drill rig, less than two months before the long-awaited Parkfield earthquake finally happened.

An important benefit of SCEC has been a new community spirit for sharing data, instruments, expertise, and effort. For example, SCEC scientists developed online data archives for all available seismic records, geodetic data, and satellite radar images for Southern California, and established the first online database for strong-motion data. SCEC coordinated the field observations and science analysis following the 1992 Landers, 1994 Northridge, and 1999 Hector Mine earthquakes, and will continue in this role after future earthquakes. SCEC has demonstrated that an organized collaboration among disciplines is an effective way to make progress in understanding earthquakes.

To communicate information about earthquakes at many levels, SCEC manages an extensive Communication, Education and Outreach (CEO) program. This program has several objectives:

- Coordinate productive interactions among a diverse community of SCEC scientists and with partners in science, engineering, risk management, government, business, and education.
- Increase earthquake knowledge and science literacy at all educational levels.
- Improve earthquake hazard and risk assessments.
- Promote earthquake preparedness, mitigation, and planning for response and recovery.

To achieve these objectives, SCEC CEO provides student research experiences, web-based education tools and information, classroom curricula, informative brochures, media relations, technical workshops and a range of publications. Visit www.scec.org/education for more information.



SCEC researchers are developing improved representations of the 3-dimensional structure of faults in Southern California, and innovative new technologies for visualizing the results. This 3-D map shows the San Andreas, San Jacinto and other strike-slip faults as well as faults that dip into the earth at an angle and are usually very difficult to portray.

Southern California Earthquake Center
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