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California's earthquake warning system lags those in Europe, Japan

David Perlman, Chronicle Science Editor
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When earthquakes send their destructive seismic waves coursing through the ground, an early warning system could save countless lives, and California scientists are testing a promising one right now.

But even if the system works, the state would need far more seismic monitoring stations than it now has, and the statewide network of 250 to 300 instruments would need a major upgrade, a UC Berkeley geophysicist reported Monday.

Technology now being tested could provide seconds or even minutes of early notification that a dangerous quake has struck on any of the seismic faults that run through California's ground like stitching on a complex fabric, Richard Allen of UC's Seismological Laboratory said during a panel discussion by earthquake safety experts at the American Geophysical Union, which is in San Francisco for a weeklong conference at Moscone Center.

Even 10 seconds, which might not seem like much, would be enough warning to trigger "duck-and-cover" alarms seconds before the ground starts shaking violently. In major quakes, warning could prompt the doors of ambulance stations and firehouses to open automatically or alert utility operators to shut down power transmission lines or gas main networks.

Allen and his former graduate student, Erik Olson, developed the first computer-based formula two years ago. On Oct. 30, it detected the magnitude 5.4 temblor near San Jose and predicted its magnitude and ground-shaking capability quickly enough to have given San Francisco and Oakland early warning of peak seismic activity within 10 seconds, Allen said.

That system is one of three under test by California's Integrated Seismic Network, which links seismometer arrays - from California's northernmost regions, where the San Andreas Fault zone makes a right-angle turn beneath the Pacific, to the southernmost part of the state, where the quake danger crosses the border into Mexico.

The systems work by analyzing the very first pulse of seismic waves that jolt the ground at a quake's epicenter and instantly predicting the size and danger of the violent, high-energy seismic waves that follow more slowly.

The tests will continue until July 2009, but even if they demonstrate complete success, the state's network of seismic monitoring instruments is far from ready, Allen said. The network needs at least 650 new remotely operated seismometers able to transmit their warning signals automatically, he said. The cost for them, he said, would run up to $30 million.

And as for the 250 to 300 stations now deployed mostly around the Bay Area and the Los Angeles region for California's Integrated Seismic Network, every one would need to be upgraded - at a cost Allen couldn't estimate.

At the same session Monday, Paolo Gasparini of the University of Naples in Italy reported that scientists in 14 nations of the European Union have developed seismic early warning systems around three big cities that lie in seismically dangerous areas and where adequate networks of seismometers exist: Naples; Istanbul; and Bucharest, Romania.

Turkey has long experienced particularly devastating quakes, and a new warning system there provides an eight-second alert for the Istanbul gas company and the city's subway system, which runs through an underwater tunnel, Gasparini said.

In Bucharest, where quakes throughout the distant Vrancea mountain region in the Carpathians are commonly felt, the warning system has been developed to give a 35-second alert to operators of a critical nuclear science instrument in the city and is being extended to four other critical facilities, he said.

The system in Naples, Gasparini said, is linked to the Civil Defense Office and provides up to "several tens of seconds" of warning when large quakes hit the

neighboring Irpinia region of the Apennine Mountains, which form Italy's backbone and are noted for their severe quakes and volcanic eruptions.

Quake-ravaged Japan started a new seismic early warning system Oct. 1, and it is designed to catch the powerful first thrust of large quakes that so often strike the country both inland and offshore, said Osamu Kamigaichi of the country's quake-focused Metrological Agency.

Kamigaichi displayed vivid illustrated posters throughout the country that, in Japanese, announced "a new service that advises of strong tremors before they arrive," he said. The warnings alert schools, power companies, electric generating stations, railroads and many public buildings in "a few seconds to a few tens of seconds," according to Kamigaichi. The alerts are carried through Japan on radio and television and via the Internet.

Online resource

For more on earthquake early-warning systems, go to:

www.elarms.org

E-mail David Perlman at dperlman@sfchronicle.com.

http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/12/11/MN4OTRN8S.DTL

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