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## Quake Warning System May Buy Precious Time

**It could sound the alarm up to 40 seconds before the ground moves, according to new research, but some wonder if it's really feasible.**

**By Kathleen Doheny**  
*HealthScoutNews Reporter*

THURSDAY, May 1  
(HealthScoutNews) -- Earthquakes are nature's scary surprises. By the time you realize you're experiencing a temblor, the shaking is often half over, leaving you to wonder if another one will follow quickly.



Long-time residents of earthquake country swear that their animals sometimes alert them by acting strangely, while others warn that it's "earthquake weather" when the mercury rises.

Soon there may be a more scientific warning for residents of southern California.

In the May 2 issue of *Science*, researchers describe an early-warning system for the region that could give as much as 40 seconds' notice before a strong ground motion was due. Once in place, the system could help stem disaster by giving people enough time to take shelter, evacuate buildings, stop trains, and divert aircraft.

The amount of warning time will depend on how far a person is from the epicenter, says Richard M. Allen, a professor of geology and geophysics at the University of Wisconsin-Madison and the lead author of the paper. "If you are at the epicenter, we're talking about zero, one, maybe two seconds. If you are 60 kilometers [37 miles] away, we are talking about 20 seconds of warning."

The proposed new early warning system, called ElarmS, uses a network of 155 seismic stations already in place in

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southern California, called TriNet, now part of the California Integrated Seismic Network.

"TriNet has two rapid reporting systems," Allen says. "CUBE is a paging system and it gives the magnitude and location of the earthquake. The other is the Shake Map -- it shows the distribution of the ground motion across southern California. They're available within minutes."

TriNet stations record ground motion, including P waves, the first seismic arrival from an earthquake, and the usually larger amplitude S waves, which are responsible for most of the damage to buildings during a quake.

"We are using the P waves to locate and determine the magnitude of the earthquake and, based on that, issue a warning," Allen says.

To test the concept of ElarmS, Allen and his co-author, Hiroo Kanamori of the California Institute of Technology in Pasadena, gathered waveform data from 53 recent California earthquakes and estimated the magnitude from the P waves and other data.

Early-warning systems are already in place in other locations, Allen says. Mexico City, for instance, has an early warning system based on measurements of ground motion along the coast, where the quakes tend to occur, and can transmit alerts to the city before the ground motion arrives.

Southern Californians live above many active faults, some of which are directly below densely populated metropolitan areas. So measuring the P waves, rather than waiting for the S waves or waiting until the ground motion reaches a particular threshold, as other systems do, is a better idea, Allen says.

The next step, Allen says, is to test the new system in the "real time system that Trinet already runs" to see how accurate the magnitude estimates based on P waves are.

Other experts praise the paper's scientific value but question whether the early warning system will be logistically feasible.

"The paper is excellent work," says Bill Spencer, a professor of civil engineering at the University of Illinois at Urbana-Champaign. The system might work best, he adds, in conjunction with buildings equipped with shock absorber-like systems that cause the building to adapt to the magnitude of the quake to sustain the least damage. "These are already inside some large buildings," he says.

"Scientifically it's a very good paper," agrees David Wald, a seismologist with the United States Geological Survey in Golden, Colo., who helped develop the Shake Map. "But I

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have reservations about implementation of an early -warning system." Putting the system into practice, he says, would involve complicated logistics.

"You could stop elevators at a certain floor [if the warning was issued]. You could install electronic freeway signs, saying 'Don't go over this overpass.' But a lot of things rely on human response." And that might not be so predictable, he says.

"The amount of [warning] time this system would provide is very little for the people closest," he says. "People who would need the most warning would get the least."

Yet, Allen counters that any warning is better than none. After the Northridge quake of 1994, he says, "buildings were red-tagged up to 60 kilometers from the epicenter." In the 1989 Loma Prieta quake, highways and buildings 50 miles from the epicenter collapsed.

### More information

For details on how earthquakes occur, visit the [Institute for Crustal Studies](#). Learn more facts about tremors from the [U.S. Geological Survey](#).

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