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Counting Waves to Sense Quakes

Even seconds' notice before the deadly strike of an earthquake, like the one that hit southeast Turkey yesterday, could help minimize death and destruction. Advance warning systems are already in place in Mexico City, Taiwan, and Japan, but they have yet to be extensively tested. Researchers have struggled to devise a system for earthquake-prone Southern California, where the number of faults makes such calculations difficult. A new method described in the 2 May issue of *Science* gets around this problem and could detect a big earthquake more quickly than any existing method.



Without warning. Future earthquake detection systems might help avert tragedies like this crumpled school dormitory in southeastern Turkey.

CREDIT: DIMITRI MESSINIS/AP

waves, which arrive first and cause less damage. The lower the frequency of the first P waves, the bigger the quake that's coming. ElarmS' advantage over past systems in Southern California is that it uses a network of seismic stations across

Earthquakes consist of two types of waves, S waves and P waves. The existing early warning systems track S waves, which create the most damaging ground motion. The proposed Southern California early warning system, called ElarmS, follows P

the region, rather than motion sensors tied to a few specific faults. This broader setup would detect shaking from unknown faults, like the one that caused the 1994 Northridge earthquake.

ElarmS' developers, Richard Allen of the University of Wisconsin, Madison, and Hiroo Kanamori of the California Institute of Technology in Pasadena, tested the system on seismic data from more than 50 earthquakes in Southern California. For those greater than magnitude 4, the researchers could provide a rough estimate of magnitude within 1 second of the arrival of the first P wave--or as much as tens of seconds before damaging S waves showed up. That's enough time to secure computer systems and nuclear facilities or even warn people to get away from structures that might fall--if the system were hooked up to an efficient communication network. "The big test is to actually get [ElarmS] running with real data streams," Allen says.

"I think their approach is very clever," says John Evans, a seismologist at the U.S. Geological Survey in Menlo Park, California. He likens it to judging whether an elephant or a squirrel is bearing down on you, by listening to the pitch of the animal's war cry. A high-pitched squeak is nothing to worry about, but a low rumble means trouble.

--NAOMI LUBICK

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[Richard Allen's site on ElarmS](#)

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