



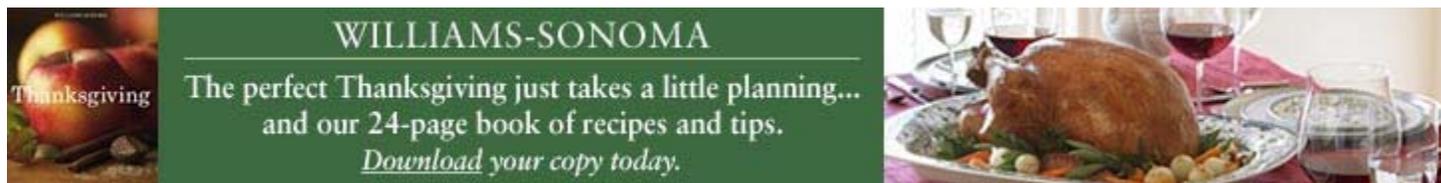
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Posted on Wed, Nov. 09, 2005

Study says quake warning systems could save lives

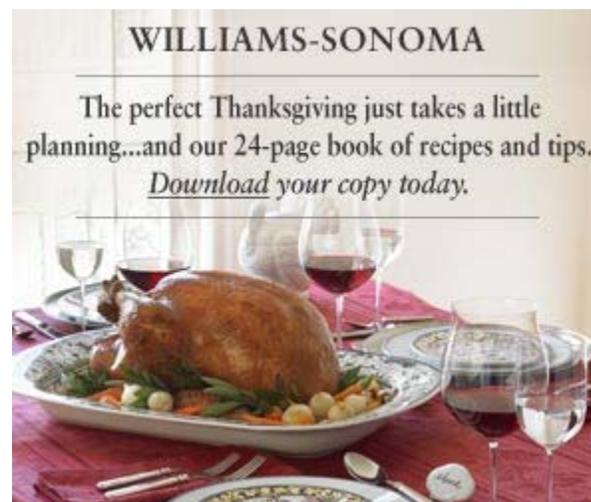
BY ERIC HAND
St. Louis Post-Dispatch

ST. LOUIS - What would you do if you had one minute until the Big One hit?

Supporters of earthquake early warning systems say you could do a lot, even in 10 seconds: Trains could stop, firehouse garages could open, schoolchildren could crawl under desks, surgeons could pull back their scalpels.

The systems, which detect the onset of earthquakes and broadcast warnings faster than the shockwaves, will be bolstered by a study that appears Thursday in the journal Nature.

The study shows that the first moments of an earthquake indicate how big it will get, contradicting a popular



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"cascade" theory of rupture where even big earthquakes could start small.

Some geologists say the news could finally motivate the United States to develop a warning system as has been done in Japan, Taiwan and Mexico.

"I think that we've been waiting for the necessary science in order to do this," said Richard Allen, a University of California at Berkeley seismologist and study co-author.

Other geologists, however, say that liability and logistical issues would doom a system to false alarms and failure. They point out that in Indiana 10 minutes of warning for a tornado last Sunday didn't help much. In New Orleans, days of warning for Hurricane Katrina still left many vulnerable.

Earthquakes can't be predicted. But the idea for earthquake early warning systems has existed for decades. An earthquake's first shock waves, P waves, are mild and travel almost twice as fast as the powerful S waves that do the damage.

Instruments can detect the P waves and estimate how big the quake will get. Allen's study improves that estimation. Since electrical and radio signals move faster than shockwaves, warnings can be broadcast ahead of the rolling shockwave front.

In Japan, P wave detectors are used to stop high-speed "bullet" trains at the first sign of an earthquake. Japan last week announced plans for a more advanced system that would eventually notify citizens, perhaps with sirens, computers or even cell phones in a "reverse 911" process.

All of it - the detection, the processing, the broadcast - has to happen in a few seconds. Close to an earthquake's epicenter where shaking is greatest, the S waves are right behind the P waves.

"The people who are most affected aren't going to get a warning. That will be perceived as a failure," said David Wald, a U.S. Geological Survey seismologist.

Based on his study of 71 historic earthquakes, Allen says that most of the time, it takes only two seconds to estimate the quake's total magnitude. That means that even those at the epicenter of the 1994 Northridge earthquake in California could have had a one- or two-second warning, he said.

"There's always this issue about there being a blind spot at the epicenter. We've minimized the size of that blind spot," he said.

But Wald said the uncertainties in the earthquake size estimation - about 0.5 magnitude units on the Richter scale - would mean big differences in how widely an earthquake would be felt, and therefore tough questions over who would be warned.

There are also liability issues as to who gets the warnings, and who is liable for false warnings. California would not provide warnings just to select groups, said Eric Lamoureux, a spokesman for the governor's Office of Emergency Services.

"It's a product that has to be available to everyone," he said.

The systems are most useful in places like Mexico City, where the threatened area lies some distance away from the originating fault zone.

An early warning system would need a dense network of seismic stations, each of which cost \$10,000 and another \$10,000 to install.

The U.S. Geological Survey is hoping to get the millions of dollars it needs for 3,000 seismic stations, said William Leith, Advanced National Seismic System coordinator.

Wald says a warning system wouldn't be a panacea for earthquake damage:

"You could only save so many lives. Putting all your money in early warning isn't going to keep your building from collapsing."

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