Seismic whispers hint at future quakes

Finely tuned instruments picked up hints of quivering months before quake

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A cafe in Parkfield, Calif., advertises the city as the "Earthquake Capital of the World." A new study conducted following an earthquake in Parkfield in 2004 suggests that faint tremors along fault lines may help to predict future quakes.

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DiscoveryNews.

updated 8:49 a.m. PT, Fri., Sept . 4, 2009

In 2004, a magnitude 6.0 **earthquake** ripped through southern California on the San Andreas fault. It struck near the sparsely populated town of Parkfield. There were no injuries or fatalities.

During the three months before the main shock, finely tuned instruments lining the fault picked up hints of quivering. If a new study is right, these faint tremors could be a first crucial step toward predicting earthquakes.

In a new analysis of seismic data collected before and after the quake, David Shelley of the **United States Geological Survey** in Menlo Park, Calif., has found what he thinks is a precursor to the quake.

Shelley's analysis uncovered a swarm of tremors barely more than a whisper above normal seismic noise. They formed a pattern, moving steadily from north to south about 15.5 miles below Earth's surface.

At that depth, some six miles below where the main shock would later hit, faults become mysterious places. They can slip several feet without causing more than a seismic shimmy.

Since 2002, scientists have started finding tiny tremors linked up with these "slow slip events." Such events could transfer stress from the deep parts of a fault toward the surface, where rocks stay locked until rupturing violently.

Tremors have been detected in some of the world's most dangerous and well-studied faults: the San Andreas, the **massive Cascadia fault** in the **Pacific Northwest** and the Nankai Trough in southwestern Japan.

Shelley's work, due to be published in the journal Geophysical **Research** Letters, is a breakthrough, because it provides a tentative link between tremors, slow-slip events and a powerful earthquake.

"This is just one example; it's not clear enough that you could make a prediction based on this," Shelley cautioned. "But the implication is there are probably times of higher and lower likelihood of an earthquake happening, and that we could figure out when those are by looking at tremor activity."

Unfortunately, the only way to gain confidence about the connection — and to make the first steps toward prediction — is to wait until the next strong quakes strikes, then look for patterns in the tremor prior to the main event.

"Is there a connection between the tremors and the Parkfield main shock? I think there is, but that's just my opinion." Robert Nadeau of the University of California, Berkeley said. "We still have a lot to learn about how to look at these tremors. They're a very new phenomenon."