

Did Earth give clues prior to Bay quake?

For residents of the San Francisco Bay area, last year's Loma Prieta earthquake hit without warning. But researchers reported last week that the Earth may have provided hints of the deadly jolt months and days before it actually struck — renewing the hope that scientists will someday accurately predict impending seismic shocks.

"It's a little strong to say that [Loma Prieta] has given us the key to earthquake prediction. But it certainly looks like this will really invigorate the field," says seismologist Paul G. Silver of the Carnegie Institution of Washington (D.C.), one of the researchers who discussed quake precursors at the American Geophysical Union meeting in San Francisco.

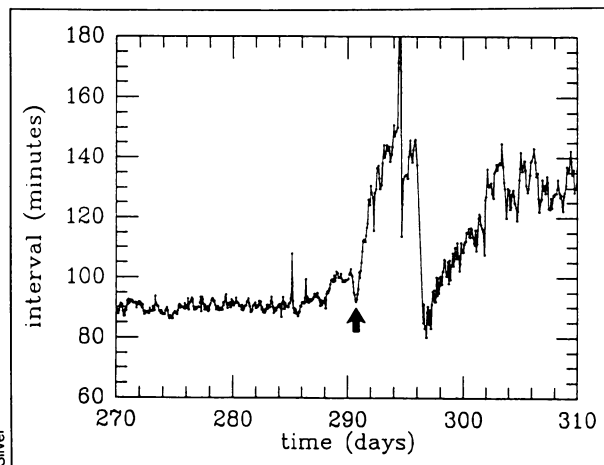
The strongest report of pre-quake clues comes from records of crustal warping near the San Andreas fault, studied by Malcolm J.S. Johnston of the U.S. Geological Survey (USGS) in Menlo Park, Calif., and Alan T. Linde of the Carnegie Institution. The researchers report that a strainmeter 35 kilometers south of the Loma Prieta epicenter began measuring a change in the rigidity of the fault zone in early 1989, long before the Oct. 17 quake.

The strainmeter is sensitive enough to detect extremely subtle deformations in the ground due to tidal forces. Normally the tides affect the crust in a regular manner, but in the months prior to the quake, the strainmeter measured a 10 percent increase in the effect of tides on the region. Johnston now speculates that microfracturing might have occurred along the fault during the months leading up to the earthquake, weakening the ground and amplifying tidal warping in the area. Japanese researchers have reported detecting similar effects before quakes in Japan, he says.

Johnston also found increased tidal deformation in records from a second type of strainmeter, located only a few kilometers away from the other one he studied. But Michael T. Gladwin from the University of Queensland in St. Lucia, Australia, did not detect any exaggerated tidal signal when he analyzed data from the second strainmeter. The two researchers met this week to discuss the discrepancy.

Although Gladwin did not see the changes in tidal warping, he and his colleagues report the second strainmeter detected another pre-quake change — a significant speedup in warping along the San Andreas fault. The acceleration occurred in August 1989, at about the time of a magnitude 5.2 quake that preceded the magnitude 7.1 Loma Prieta shock.

Gladwin and Johnston remain cautious about their findings because they have



A graph of the interval between eruptions shows that the Old Faithful geyser in Calistoga, Calif., behaved regularly in the weeks prior to the Oct. 17, 1989, quake (arrow). But 60 hours before the main shock, the eruption interval jumped from 90 minutes to more than 100 minutes. It increased even further after the quake.

information from only two instruments, which sit fairly distant from the earthquake's epicenter. Their observations could reflect instrument error or tectonic changes unrelated to the Loma Prieta quake, says James Savage of the USGS in Menlo Park.

The strainmeters did not detect any precursors immediately prior to the quake. But Silver and colleagues report that the Old Faithful geyser in Calistoga,

Calif., acted strangely days before the disaster. Just 60 hours in advance of the main shock, the geyser began erupting less frequently. Silver suggests pre-quake tectonic changes could have altered the plumbing system of the geyser, located 180 km from the epicenter. Though other researchers have observed earthquakes altering geyser behavior, this is the first report of geyser changes right before a quake, Silver says. — R. Monastersky

Meaty findings about colon cancer and diet

A large-scale, prospective study offers strong support for the long-standing suspicion that people who regularly eat red meat increase their risk of colon cancer. The study also turned up several new dietary influences — most notably that eating chicken and fish may reduce a person's risk of colon cancer, which ranks as the second leading cause of cancer deaths in the United States.

Through detailed questionnaires administered every two years since 1976, researchers at Brigham and Women's Hospital in Boston have been tracking the health of 121,700 female registered nurses in 11 states. In the colon cancer study, they focused on the nearly 89,000 participants who answered at least 85 percent of the food-consumption questions on the 1980 survey and had no history of colon-cancer-predisposing conditions. After following the women through three more surveys, they identified 150 who went on to develop the cancer.

The researchers, led by Walter C. Willett, looked for risk trends by analyzing the survey data on 61 different foods. Calorie consumption, dairy fats, vegetable fats, calcium, carotene and vitamins A, C, D and E had little or no effect on colon cancer risk, they found. But women who reported eating at least 1.4 ounces of animal fat daily showed a dose-dependent increase in colon cancer risk, the team reports in the Dec. 13 *NEW ENGLAND JOURNAL OF MEDICINE*.

Red meat appeared to account almost entirely for the increase. Women who daily ate a main dish containing beef,

pork or lamb faced 2.5 times the colon cancer risk of women who ate red meat less than once a month. Weekly servings of liver or processed meats such as bologna increased the risk by 50 to 100 percent compared with less frequent consumption. However, eating fish two to four times a week or eating skinless chicken daily reduced the risk by 25 and 50 percent, respectively. Red meat, chicken and fish differ in their ratios of unsaturated-to-saturated fat, notes Willett, who speculates that this may account for the observed risk differences.

Frequent consumption of fiber from fruits also appeared to lower colon cancer risk, the investigators found.

John Weisburger of the American Health Foundation in Valhalla, N.Y., says the risk posed by animal fats might have proved even greater if the Boston team had singled out cancers of the left colon. "Several key studies, including those we conducted, demonstrated very clearly that the right side of the colon is not sensitive to dietary fat," he says.

Peter Greenwald of the National Cancer Institute in Bethesda, Md., describes the new study as "good" but questions the researchers' simple recommendation that people substitute more chicken and fish for red meat. "My view is that you have to pay more attention to cooking methods," he says. Greenwald argues that small portions of broiled, lean red meat may pose no more risk — and perhaps even less — than regular servings of fish or skinless chicken deep-fried in fat.

— J. Raloff