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California shakes most often in September

Seismologists have discovered a potential link between earthquakes and the weather—a connection that researchers had dismissed for decades.

A study of earthquakes in California and neighboring states indicates that fault activity in the last 5 years has followed a yearly pattern. The predominantly tiny quakes have occurred most frequently in September and least often in April, report Shang Xing Gao and Paul G. Silver of the Carnegie Institution of Washington (D.C.). After examining many potential causes of the cycle, Gao and Silver found that atmospheric pressure appears to be the controlling factor, they reported in San Francisco this week at a meeting of the American Geophysical Union.

When air pressure remains low, as it does during the warmth of summer, it lessens the weight of the atmosphere pressing on the ground, explains Gao. "This reduces the friction on rocks, so earthquakes can occur more easily," he says.

Some Californians have long asserted that earthquakes tend to follow certain weather patterns, but seismologists had been unable to find reliable connections, says Thomas V. McEvilly, a seismologist at the University of California, Berkeley.

Gao and Silver examined all earthquakes that occurred in more than a decade within 1,000 kilometers of Parkfield, Calif., a tiny town on the San Andreas fault. They found no obvious annual pattern in records before 1992. The yearly cycle first appeared in the data following June 28, 1992, when a magnitude 7.3 earthquake struck the Mojave Desert near Landers, Calif.

The Landers tremor may have sensitized certain faults across the western United States, enabling them to respond more readily to changes in atmospheric pressure, the researchers suggest.

"That makes sense," comments Don L. Anderson, a seismologist at the California Institute of Technology in Pasadena. The Landers earthquake, he notes, surprised seismologists by triggering aftershocks across a wide swath of the western United States, much farther than researchers had previously witnessed. Faults in northern California, Nevada, and even Yellowstone National Park in Wyoming awoke in the hours after the Landers quake.

Landers' far-flung aftershocks occurred mostly in volcanic regions, where magma and heated groundwater lie near Earth's surface. These may be weak areas of the crust that are unusually susceptible to changes in atmospheric stress, suggest Gao and Silver. If so, the sensitivity of these faults is waning; the seasonal variation in quake numbers has diminished over the last 5 years.

Other areas, such as the San Andreas fault, showed no heightened sensitivity following the Landers quake.

The researchers examined other potential causes of the seismic variations, such as changes in precipitation or seasonal variation in mining companies' blasting. The pattern of atmospheric pressure fluctuations best matched the rise and fall in quake numbers.

The new observations are important because they also offer new insight into the forces needed to generate aftershocks in the wake of a major quake. Seismologists have assumed that faults would not budge unless stresses jumped or dropped by more than 100 millibars, yet the variations in atmospheric pressure are only one-tenth that figure, say Gao and Silver.

—R. Monastersky