Seismic recordings of rockfall a step toward early-warning system in Yosemite

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Hardly anyone noticed the ruckus when Yosemite Valley's largest rockfall in two decades thundered down near Half Dome before sunrise one March morning -- but scientists will hear all about it soon.

A graduate student from the University of California at Berkeley rigged the valley with seismic instruments months before the rocks tumbled. The instruments captured the first detailed record of such a big rockfall, from start to finish.

The measurements are an important first step, experts say, toward producing an early-warning system to protect people from tons of falling granite.

The recording also may spur more funding of rockfall research, which has not attracted as much attention as other natural calamities, such as earthquakes, hurricanes and tornadoes.

Two people died in Yosemite Valley during episodes of falling rock in the 1990s, and three others perished in a 1980 rockfall. Last year, a rockfall at Curry Village occurred while schoolchildren were in the area, but no one was hurt.

More than 3 million people each year pass through this glacial landscape, where there always is some degree of rockfall risk. Scientists say the majestic cliffs have regularly sent tons of granite crashing to the valley floor for at least the last 17,000 years.

Yosemite officials said no one was out walking in the area when March's rockfall occurred, but the impact was obvious afterward. It flattened hundreds of pine trees and shook the ground with a magnitude 2.4 earthquake.

The seismic recordings of the event -- a series of peaks compiled by six instrument stations around the valley -- now must be studied closely, said Nicholas Sitar, a UC Berkeley geologic engineering professor.

"We recorded the actual initiation of the rockfall," he said. "Most people assumed that it was not possible to see the initiation of a rockfall in the data. But we believe we see the impact and the source before the impact."

Scientists need to understand the way this rockfall began, he said. Did the granite simply slide off the cliff? Did it topple off at a high point? And were there sounds in the cliff or vibrations before it happened? The answers to those questions would guide future research.

Sitar's graduate student, Valerie Zimmer, is analyzing the seismic recording. She said she wasn't actually in Yosemite National Park when the rockfall occurred, but her instruments picked up everything.

Zimmer said she set up the instruments last fall to monitor rockfall in another part of the valley. She left them for the winter, basically allowing them to listen continuously for sounds in the ancient granite cliffs.

In March, about 115,000 tons of granite -- which would fill more than 8,000 dump trucks -- rumbled down from Ahwiyah Point, which is near the edge of Tenaya Canyon where it connects to Yosemite Valley.

Rocks fell roughly 1,800 feet, burying the southern section of the Mirror

Lake Loop Trail. That part of the trail remains closed under rock and debris.

Zimmer said the recorded seismic waves may indicate there was movement in the cliff before the rockfall happened.

"I'm trying to figure out what the various spikes mean," she said. "Can we figure out what had to happen to make these wave forms? That's a very interesting question."

The rockfall is quite visible as a white streak down the cliff face, said park geologist Greg Stock. He said he and many others around the valley did not feel the quake when the rock came down about 5:30 a.m. March 28.

"If it had been light outside, you would have been able to watch it pretty easily from Half Dome or Mirror Lake," he said. "The public can see it pretty well now. I think it helps illustrate to people that this is a dynamic landscape and rockfalls are common in Yosemite."

But the rockfall was not nearly as dramatic as the 1987 rockfall from a soaring valley cliff face called Middle Brother _ that was 10 times larger.

The National Park Service suspected it was coming when a series of boulders came rolling down many hours before the rockfall happened.

Officials closed part of the valley's main road, Northside Drive, as a precaution and perhaps saved many lives.

A Happy Isles rockfall in 1996 killed one person and injured others. Tons of unbroken rock fell at more than 100 mph and struck the ground with such force that the granite was pulverized. A gray pall hung in the

air like fog.

Rockfall triggers are sometimes debated because they can be started by various forces -- earthquakes, large storms or freezing and thawing of water in granite joints. One scientist suspects water releases from a waste-water facility at Glacier Point are connected to a fatal rockfall in that area.

No one knows yet what triggered the March 28 rockfall. Like other rockfall analysis, the discussion takes place after the damage has been done.

Many scientists would prefer to study ways of predicting them. Sitar of UC Berkeley says research dollars need to be invested in prediction.

"We're doing this work on a shoestring right now," he said. "When we look for support, we are told we need to prove that we can find a way to predict rockfall. If you can prove that it's going to work before you do the research, how is that research?"

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