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Memo: Contact Glenda Chui at gchui@sjmercury.com or (408) 920-5453.

UNDERSEA LANDSLIDES POSE TSUNAMI THREAT EXTENT OF RISK TO CALIFORNIA COAST UNKNOWN, SCIENTISTS SAY

GLENNDA CHUI, Mercury News

The biggest tsunami threat along the California coast may be from giant undersea landslides that send walls of water crashing to shore, researchers said Monday.

But the extent of the threat is poorly known, they added. Scientists are just beginning to make detailed maps of underwater canyons and cliffs whose sudden slumping, triggered by an earthquake or by a rush of water, could set off what is popularly known as a tidal wave.

"We have really changed our focus," Costas **Synolakis**, a tsunami expert from the University of Southern California, said at a San Francisco meeting of the American Geophysical Union. "We now believe that landslide tsunamis are much more common than we had thought."

Quakes still a threat

Until a few years ago, most tsunami research focused on giant waves triggered by earthquakes in the ocean floor. They roll across vast stretches of open ocean toward shore, allowing disaster officials in frequently hit places such as Hawaii and Japan to warn people hours in advance.

But in July 1998, a calamity in Papua-New Guinea caught scientists by surprise. Shortly after a magnitude 7 earthquake rocked the ocean bottom, a tsunami more than 40 feet high swept over the island, destroying three villages and killing 2,200 people. It was about three times bigger than the tsunami expected from a quake that size.

An investigation revealed that the earthquake had triggered a giant submarine landslide that, in turn, set off the tsunami.

Researchers have known for a long time that there are landslide-prone areas off the California coast. Many had been mapped by the U.S. Geological Survey in the 1980s. But the disaster in New Guinea inspired them to take a new look, this time with high-tech tools that paint a much more detailed picture of the ocean floor.

The Monterey Bay Aquarium Research Institute in Moss Landing surveyed the sea floor of the Santa Barbara basin, where a landslide had earlier been identified. It mapped the slump, off Coal Oil Point near Goleta, and found it's nine miles wide and more than six miles long.

"This slide evidently moved in three different events," said H. Gary Greene, a geologist at the institute. Each time, he said, it moved enough mud to generate a tsunami -- provided that the movement took place all at once.

The institute has been using robotic submersibles to sample the landslides, he said, but has not been able to determine when they happened or what triggered them.

Another team has been studying the sea floor off the Palos Verdes peninsula between Long

Beach and Redondo Beach in Southern California. There, on a gentle slope at the edge of the continental shelf, a landslide has sent debris tumbling five to six miles out onto the bottom, said Jacques Locat of Laval University in Quebec, Canada.

He concluded that the slide must have been sudden, triggered by an earthquake. If so, it would have generated a huge tsunami -- from 30 to 150 feet high.

Southern California is considered especially vulnerable to undersea landslides because of its numerous earthquake faults and unstable slopes offshore. But the area between San Francisco and Point Sur is also potentially hazardous, Greene said, along with places with submarine canyons such as Monterey Bay and the mouth of the Eel River.

Tsunami warning system

The federal government has a tsunami warning system, based on a network of buoys that detect waves coming across the ocean.

Philip Watts, president of Applied Fluids Engineering Inc. in Long Beach, said a similar network is needed to warn people along the coast about tsunamis that start nearby.

If, for instance, a giant undersea slide off Palos Verdes triggered a tidal wave, people on the beach would have 24 minutes to clamber up the cliffs to safety before it struck the shore.

Computer models of such an event show a 50-foot wave slamming into the peninsula -- where, fortunately, the cliffs are also 50 feet high. But just to the south, Long Beach harbor could expect a wave height of six to 10 feet.

Until a warning system is in place, Watts said, people on the shore should be alert to signs of a possible tsunami: ground shaking, a receding sea, the mighty sound of a crashing wave and, finally, the wave itself.

Illustration:Diagram

DIAGRAM: MERCURY NEWS
UNDERWATER LANDSLIDES

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