

Underwater Landslides Threaten California Coast

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Tuesday, December 19, 2000

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URL: sfgate.com/article.cgi?file=/chronicle/archive/2000/12/19/MN156067.DTL



When more than 2,200 people died after a 1998 earthquake in Papua New Guinea, it wasn't the earthquake that killed them, but a massive undersea landslide -- triggered by the quake -- that within minutes sent 50-foot waves surging over the shoreline, drowning unwary victims and destroying their villages.

Similar submarine landslides down unstable coastal slopes threaten many California coastal communities, and the slides may not even require earthquakes to touch them off, scientists agreed yesterday at a briefing during the American Geophysical Union meeting in Moscone Center.

A global network of tsunami warning centers are designed to signal whenever major earthquakes occur anywhere around the Pacific's notorious "ring of fire," where the land and sea are marked by almost constant quakes and volcanic eruptions

But predicting the onset of the threatening underwater landslides when quakes are not involved is a science barely in its infancy, and experts are taking the first steps toward understanding the undersea origin of the waves.

A group of geologists and tsunami experts described how their high-tech maps of the offshore sea bottom along coastal areas of California are revealing potential hazards in areas where few have feared major dangers in the past.

Geologist H. Gary Greene of the Moss Landing Marine Laboratories, for example, used two remotely operated submersible vehicles from the Monterey Bay Aquarium Research Institute to map in detail the steep underwater slopes that dip down from the shore facing the Santa Barbara Channel.

He discovered clear evidence that at some unknown time in the past a truly monster slump occurred off Coal Oil Point near Goleta. It was more than six miles wide and nine miles long, and slid in three distinct segments, from a depth of 300 feet down to 2,000 feet.

Whether the slide was triggered by an ancient earthquake on one of the many faults in the region, or on the more distant San Andreas fault, is impossible to tell, Greene said. But his submersible craft recovered samples of chemicals and bacterial mats in the area that indicated the undersea slopes of earth and rock might well have been weakened enough to slide without any earthquake at all to trigger them, he said.

While major earthquakes on either side of the Pacific can cause tsunamis that cross the entire ocean within 12 to 24 hours, undersea landslides can also generate local tsunamis as the surface of the ocean first recedes and then surges forward to crash against the shore.

Such a slump along the Santa Barbara coast could batter the shore with waves as high as 50 feet if it were triggered by even a modest earthquake on one of the many known faults in the Santa Barbara Channel, according to Costas Synolakis, an environmental engineer at the University of Southern California.

Canadian geological engineer Jacques Locat created another scenario affecting the Palos Verdes Peninsula, which stands above the Los Angeles region with its scores of beaches and dense population, based on his calculation of what could happen if a 300-foot-thick rockfall were to slide down the peninsula's escarpment into the sea.

Plunging to a depth of more than 2,000 feet, the rockfall would generate a huge, surging wall of water -- a local tsunami that would batter the coast with a wave at least 100 feet high, Locat said, and give people on the shore at nearby Long Beach just 24 minutes to climb to safety.

What's needed, at least for California if not for all the world's coastal nations, the scientists agreed, is program to map the seabed wherever offshore slopes dip steeply enough to pose the threat of submarine landslides and the deadly tsunamis they are capable of generating.

EVIDENCE OF UNDERWATER LANDSLIDES

Using remotely operated submersible vehicles, geologists at the Monterey Bay Aquarium Research Institute have produced high-resolution maps of the sea floor off the coast of Santa Barbara. Their data have produced clear images showing evidence of a massive submarine landslide that occurred at some point in the past. Scientists can use these observations to help determine the causes of potential tsunami-producing landslides in California. . Source: Monterey Bay Aquarium Research Institute Chronicle Graphic

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