Humboldt State researchers discover remnants of historic tsunamis

National study seeks to prepare West Coast for future disasters

Will Houston, Eureka Times-Standard, 5-25-14

A group of Humboldt State University researchers and graduate students aided in the discovery of the first tactile evidence of a historic tsunami at Half Moon Bay as part of a national study aimed at increasing the state's understanding and defenses against the aqueous natural disaster.

HSU Geology Department research associate and principal investigator Eileen Hemphill-Haley, along with research associate Harvey Kelsey and a team of students, took part in the study that searched for traces of past tsunamis in the sediment at 20 coastal sites stretching from Crescent City to the Tijuana River.

Hemphill-Haley said the sites were chosen based off a computer model created by the study's other contributors: the U.S. Geological Survey's Science Application for Risk Reduction team, the California Geological Survey, the California Governor's Office of Emergency Service and the National Oceanic and Atmospheric Administration.

"We started by looking at the results of the modeling to see that if there was a large earthquake in the Aleutian Islands, where would high water heights be along the California coast," she said. "If you look along the whole coast, it didn't have a consistent water height level, which is based on the consistency of the shore. We focused in on the places where the model said had the highest water levels."

Of the sites examined, only two yielded any evidence, which Hemphill-Haley said is indicative of the mixed composition of the coastline.

"If the tsunami came and hit a rocky coastline, over time you wouldn't find the evidence of it," she said. "We looked for areas where there would be low lying wetlands and marshes along the coast. You need the right type of depositional setting to preserve a tsunami deposit on our coast. We just didn't find a smoking gun anywhere else."

In the northern portion of Half Moon Bay, the research crew discovered the first evidence of the 1946 tsunami that killed one person walking on the beach and wrecked fishing boats. The tsunami resulted from a magnitude 8.1 earthquake on the Aleutian Islands that occurred on April 1, 1946, killing 159 people and caused $26 million in property damage in Hilo, Hawaii, according to the U.S. Geological Survey.

As to how they could tell the sediment was from that particular tsunami, the researchers used a variety of techniques including carbon dating, researching historic records and reconnaissance work.

HSU Geology Department graduate student Casey Loofbourrow was one the students who participated in the field studies.

"We'd go around and poke holes in the ground with this device, which goes down 2 meters," he said. "Then, we'd clean off the core and describe the sedimentary layers. When we find a good core, we package it up, and we do all kinds of stuff to it."

The sediment's location was also an indicator of potential tsunami debris.

"The type of material a tsunami would pick up is the same stuff a big storm would," she said. "What happens with a tsunami is that sediment would be transported farther inland. You look for more of a single, sheet-like deposit that you can trace a continuous distance inland. You have to have a very big tsunami to have it go that far."

For the Half Moon Bay event, Hemphill-Haley said the deposit they found stretched back about 1,000 feet.

"That place has been hit by a lot of storms, but you don't see a lot of those that far back," she said.

The researchers also found further evidence of the deadly 1964 Crescent City tsunami that killed over a dozen people. With a limited record of state tsunamis stretching back to the late 1700s, Hemphill-Haley said new data on distance sourced tsunamis — originating from far-away earthquakes — is necessary.

"The goal was to really get more baseline data to improve our understanding of tsunami hazards for the entire state and the types of earthquakes that could create these hazards," Hemphill-Haley said. "If there is a tsunami big enough to leave traces of a tsunami there before, you can think that same thing can happen again. The computer modeling can show what might be possible and whether there is a pattern of tsunamis at certain areas of the coast. All these bits of information start filling in some blank spots we didn't know before."

National Weather Service warning coordination meteorologist Troy Nicolini said that knowing where a tsunami are likely to hit based on where its earthquake originates gives coastal communities a better understanding of what they will be dealing with before the waves reach the shore.

"We don't want to evacuate a significantly large part of the population for every distance sourced earthquake," he said. "If we can increase our knowledge of how the earthquake in the Aleutians will impact us, we can help emergency managers do so for any given scenario. For quakes along the Cascadia Subduction Zone, we worry about taking action immediately. From far away, we have much more time — about four hours for Aleutian Island quakes."

Nicolini said the data gathered from this study is exactly what is needed to "refine" emergency responses along the state's coast.