

Mapping the wake of a pending quake

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Research into ancient earthquakes by scientists at USC and Caltech shows that within the next few decades another tsunami from another giant earthquake is likely to flood densely populated sections of western coastal Sumatra, south of those that devastated by the tsunami of Dec. 26, 2004.

The four researchers have modeled the process by which past quakes have flooded cities on that coast, hoping that a more detailed understanding of the future waves will speed preparations that could save lives. Their work will appear in the *Proceedings of the National Academy of Sciences* (PNAS) on December 4.

"The message of the 2004 tsunami has not been lost, at least in academia," said study participant Costas Synolakis, the director of the USC Viterbi School of Engineering Tsunami Research Center. "We are trying to be proactive and help prevent a similar disaster."

Fellow participant Kerry Sieh of Caltech explained, "When we tell people living along this 700-km section of the Sumatran coast that they will likely experience a big tsunami within the next 30 years, they ask for details. How much time after the earthquake will they have before the tsunami strikes" How big will the waves be" How far inland should they be prepared to run" What areas are likely to suffer tsunami damage" We can't answer these important questions without doing the work that we did for this paper."

The same big fault, or megathrust, that caused the tsunami of 2004

extends much farther southeastward, beneath the Indian ocean, just off the southwest coast of Sumatra. Rupture of this section of the megathrust, under the Mentawai islands, produced two great quakes and tsunamis in 1797 and 1833. Such events appear to recur on average every 230 years.

Samples of coral from the islands show how much these previous quakes lifted the sea floor. The patterns of uplift gave the scientists the information they needed to do computer simulations of the historical tsunamis. Synolakis says that the impact of the computed tsunamis is consistent with historical accounts.

The researchers say that this consistency gives them more confidence when they use the same model to evaluate worst-case scenarios from plausible future quakes. USC's Jose Borrero, the senior author of the study, says the results "confirm a substantial exposure of coastal Sumatran communities to tsunami surges." In particular, the coastal city of Bengkulu, with a population of 350,000, showed flooding in its river floodplain that extended up to several kilometers inland.

In the model, offshore islands appear to somewhat shield the larger city of Padang, but even then, the 1797 tsunami was reported to have carried a 200-ton English vessel into the town approximately a kilometer upstream, with smaller vessels carried yet further.

"The population of Padang in 1797 and 1833 was a few thousand," Sieh says. "Now it is about 800,000, and most of it is within a few meters of sea level. We hope that these initial results will help focus educational efforts, emergency preparedness activities, and changes in the basic infrastructure of cities and towns along the Sumatran coast."

Source: University of Southern California

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