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Landslides, asteroids pose tsunami hazard

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BY CAROLYN LUCAS-ZENK | WEST HAWAII TODAY

Considerable evidence indicates Hawaiian Islands landslides and Pacific Ocean asteroid impacts could generate 100 meter or greater tsunamis, capable of destroying many coastal cities, said Charles Mader, of Honolulu-based Mader Consulting Co.

Such a tsunami could inundate much of the islands. Most of Oahu would be flooded to elevations of 150 meters with local inundations of more than 300 meters, particularly on the leeward side.

The majority of the Big Island and Maui would be flooded to more than 100 meters while most of Kauai, Lanai and Molokai would be inundated at elevations below 100 to 150 meters, he said.

Mader was one of nine speakers at the "Tsunami Science, Research and Response" session Wednesday at the OCEANS '11 Kona conference. Scientists and others presented their latest research, ideas and developments in oceanic engineering and marine technology at this four-day forum that ends today, at the Hilton Waikoloa Village.

Surveys after the 2004 Indian Ocean tsunami found the "death zone" was any area lower than 10 meters and less than 1 kilometer from shore, as well as all areas below 5 meters above sea level and within 3 miles of the shoreline.

"The current Hawaii evacuation zones leave tens of thousands of people at risk from a tsunami similar to the 2004 Indian Ocean tsunami;" Hilo is the only Hawaii evacuation zone adequate for such an event, he said.

Mader said two- and three-dimensional compressible hydrodynamic modeling has been done to study tsunami generation, propagation and flooding. These tools can also determine tsunami characteristics in relation to an asteroid's size, energy and impact angle.

His model showed how an asteroid and the ocean target instantly vaporizes upon impact and excavation continues. Seven seconds later, a "rooster tail" carries most of the projectile's horizontal momentum. After 40 seconds, the rooster tail is gone. The debris curtain is the leading edge of material forced out, falling back to Earth on ballistic trajectories. After 2 minutes, the debris current lays down a blanket of material forced out and a central uplift begins to form.

Eddie Bernard, scientist emeritus for the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory, detailed how Deep-Ocean Detection and Reporting of Tsunami, or DART, systems evolved over the past 20 years and are playing a critical role in tsunami forecasting. He said this technology, as well as its 80 percent accurate data, has helped save the cost and credibility of three unnecessary evacuations.

"By 2010, over 40 tsunamis had been measured using DART technology and the third generation DART system was part of the operational global array," he said. "The future looks bright as the new generation of DART systems are more affordable and do not require large ships to deploy and maintain the operation arrays. These new developments hold promise for a global network of DART stations paving the way for a standardized global tsunami warning system."

George Curtis, tsunami research specialist at the University of Hawaii at Manoa, gave a brief history of the state's tsunami mitigation strategies and the Pacific Tsunami Warning System.

"(The system) has never missed an event and has benefited from numerous improvements, which have greatly reduced the false alarm rate and provided faster analyses of the threat," he said. "Satellite data links, more gauges, more staff and modeling have contributed to this improvement."

clucas-zenk@westhawaiitoday.com