

One year after the Japan tsunami, USC engineers help California's ports prepare

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On the one-year anniversary of the devastating Japanese tsunami, engineers from the USC Viterbi School of Engineering Tsunami Research Center are working with the State of California to better understand the damaging currents caused by tsunamis.

Funded by the California Geological Survey, the California [Emergency Management](#) Agency, and the [Federal Emergency Management Agency](#), USC researchers will use hydrodynamic computer modelling and historical tsunami data to evaluate the currents generated by tsunamis and their effect within California ports and harbors.

Results from the study will be used to determine safe depths for evacuation, to map zones that might be prone to higher or lower currents under tsunami conditions (to inform how ships and boats are moved and evacuated), and to create hazard maps for ports, harbors and marinas. Work will begin in the next few weeks and last through the end of 2012.

Currents caused by the Japanese tsunami of March 2011 caused millions of dollars of damage at 27 harbors along the [California coast](#), particularly in Santa Cruz and Crescent City. In Santa Barbara, swirling currents lasted for more than 24 hours, with the strongest surges taking place long after the original currents.

According to Associate Professor Patrick Lynett and Adjunct Research Professor Jose Borrero of the USC Sonny Astani Department of Civil and Environmental Engineering, who will conduct the study, these

tsunami-induced "phantom currents" are not well understood. Even in moderate sized tsunamis, currents can rip large boats from their moorings. During the Indian Ocean tsunami in 2004, at locations very far from the earthquake itself, large ships were ripped from their moorings and pushed around the harbor by surges occurring many hours after the tsunami first arrived.

A similar effect occurred in Crescent City in November 2006, when a magnitude 8.3 earthquake off of Russia's Kuril Island caused a moderate tsunami. The currents caused by the waves were strongest some three hours after tsunami arrival and caused \$20 million in damage to Crescent City harbor. Repairs from that event had not yet been completed when the Japan tsunami struck.

"Imagine an oil tanker or cargo ship torn loose and out of control in the Port of LA or San Francisco Bay," warns Dr. Lynett, USC's John and Dorothy Shea Early Career Chair in Civil Engineering. "The problem could escalate very quickly."

"California is being proactive in its effort to re-evaluate certain elements of its tsunami preparedness based on lessons learned from the Japan event," says Dr. Borrero. "During the Japan tsunami, even though we knew how big the waves were going to be, we severely underestimated the strength and duration of the currents."

"Fortunately, this is a hazard that can be dealt with," says Rick Wilson of the California Geological Survey. His agency and the Federal and State emergency management agencies are funding Drs. Lynett and Borrero to look at this issue as part of USC's ongoing initiative to provide [tsunami](#) expertise to the State.

Dr. Lynett and Borrero have been working together gathering data on this phenomenon and to applying advanced computer models to quantify

the extent and duration of these late arriving and potentially damaging surges. Said Lynett, "We have the tools available to understand this problem and make the right call in the future."

In an article published last week in the journal *Earth and Planetary Science Letters*, Lynett and Borrero describe observations of these currents at several locations both within California and internationally and describe their efforts to understand them. For more information about that paper, please visit:

<http://www.sciencedirect.com/science/article/pii/S0012821X12000696>

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