Novel observations of currents and drag generated by a tsunami

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Tsunamis cause damage even after they have traveled thousands of kilometers from their sources, and much of the damage is through generation of local strong currents. Even though wave heights of tsunamis that have traveled long distances are no greater than those of local tides or waves, tsunamis modify currents, resulting in unusually strong pulses of mixing, transport, and seiching (standing waves in enclosed water bodies). Seiching is common and is the most destructive hazard, particularly along narrow bays and harbors.

In a new description of currents and sediment transport associated with a tsunami, Lacy et al. studied water height, currents, and suspended sediment concentrations in the Monterey Bay, California, where a tsunami set off by a magnitude 8.8 earthquake off the coast of Chile on 27 February 2010 arrived approximately 14 hours later, causing strong seiching. Studying vertical velocity profiles of the tsunami waves reaching the inner shelf at Monterey Bay, the authors show that the friction from the shelf bed vastly affected the tsunami currents, and the bed drag coefficient varied with time. The observation is contrary to assumptions behind the common practice of using depth-averaged models to simulate tsunamis in the near-shore region.

The authors find that in the 10-meter (32.8-foot) deep study sites in the Monterey Bay area, the largest tsunami wave vastly increased sediment transport toward the shore. On the other hand, the strong currents that lasted for several days following the seiche enhanced sediment transport along the shore. The tsunami generated shear stress strong enough to

entrain the sandy seafloor of the study site. Such in- depth understanding of the vertical structure of tsunami currents, and their interaction with the seafloor, is critical for improving the prediction of the passage of tsunamis across the inner shelf.

More information: Currents, drag, and sediment transport induced by a tsunami thawing, *Journal of Geophysical Research-Oceans*, doi:10.1029/2012JC007954 , 2012