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Tsunami inundation mapping for Alaska coastal communities

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Seismic events that occur within the Alaska-Aleutian subduction zone have a high potential for generating both local and Pacific-wide tsunamis. To help mitigate the large risk they pose to Alaskan coastal population, the Alaska Tsunami Modeling Team participates in the US National Tsunami Hazard Mitigation Program by evaluating and mapping potential tsunami inundation of coastal communities in Alaska. We address the problem of predicting runup of tsunami waves by solving nonlinear shallow-water equations with a finite-difference method. Embedded grids of different resolution are employed to increase spatial resolution in the shelf area. Numerical simulations yield runup heights, extent of maximum inundation for chosen tsunami scenarios, depths of inundation on dry land, and maximum velocity current distribution in inundation zones.

The communities are selected for inundation modeling in coordination with the Division of Homeland Security and Emergency Management. Inundation maps have been produced for three communities on Kodiak Island, and for 2 communities in Kachemak Bay. The work is under way for Seward, a community in the Prince William Sound area. It suffered an extensive damage and 12 fatalities during the 1964 tsunami. The 1964 Good Friday earthquake induced submarine landsliding in deltaic sediments underlying Seward. Local tsunami waves as much as 10 m high devastated Seward minutes later. Using high resolution bathymetric imagery we identified and mapped the extent of submarine landslides which originated near Seward, as well as multiple submarine landslides from other deltas around upper Resurrection Bay. Three distinct slides occurred at Seward, but only the largest slide produced subaerial failures in the delta fan, affecting 1250 m of the Seward waterfront. We consider several tsunami scenarios for Seward inundation mapping that include both tectonic and landslide sources.