**Tsunami Hazard in Alaska**

Alaska has the greatest tsunami potential in the entire United States. Historic tsunamis generated by earthquakes on the Alaska-Aleutian subduction zone have resulted in widespread damage and loss of life along the Alaskan Pacific coast and other places located at exposed locations around the Pacific Ocean. Large seismic events occurring in the vicinity of the Alaska Peninsula, Aleutian Islands, and Gulf of Alaska have a very high potential for generating both local and Pacific-wide tsunamis. The 1964 Prince William Sound earthquake generated one of the most destructive tsunamis observed in Alaska and the west coast of the US and Canada. In addition to the major tectonic wave, there were about 20 local landslide-generated tsunamis that caused substantial damage in Kodiak, Seward, Valdez and other communities (Figure 1). On November 3, 1994 a landslide-generated tsunami in Skagway Harbor took one life and caused about $21 million of damage. Saving lives and property depends on how well a community is prepared, which makes it essential to estimate the potential flooding area of the coastal zones in case of a local or distant tsunami.

**Hazard Assessment**

To help mitigate the risk that tsunamis pose to Alaskan coastal communities, the Geophysical Institute of the University of Alaska Fairbanks and the Alaska Division of Geological and Geophysical Surveys participate in NOAA's National Tsunami Hazard Mitigation Program by evaluating and mapping potential inundation of selected parts of Alaska coastlines using numerical modeling of tsunami wave dynamics. The communities for inundation modeling are selected in coordination with the Alaska Division of the Emergency Services with consideration to location, infrastructure, availability of bathymetric and topographic data, and willingness for a community to incorporate the results in a comprehensive mitigation plan. Results of numerical modeling combined with historical observations can be very helpful in evacuation planning and public education for reducing risks from future tsunamis.

The production of tsunami evacuation maps consists of several stages:

- **hypothetical tsunami scenarios** are constructed based on the parameters of potential underwater earthquakes;
- **model simulations** are performed for each of the earthquake source scenarios;
- results are compared with any **observations from historical tsunamis** in the region, if such data exist;
- numerical results and historical observations are combined in order to develop a “**worst case scenario for a tectonically generated tsunami**” for every community on a map;
- the inundation line produced by the worst case scenario becomes a basis for local tsunami hazard planning and construction of **evacuation maps**.

Figure 1. This photo was taken at Seward at the north end of Resurrection Bay after the March 27, 1964 tsunami wave. Eleven persons lost their lives due to the tsunami waves at Seward. Photo Credit: U.S. Dept. of the Interior.
Kodiak Inundation Mapping

Kodiak Island was identified as a high-priority region for Alaska inundation mapping. It has a number of communities with relatively large populations and significant commercial resources. Kodiak’s vulnerability to tsunamis was demonstrated by the 27 March 1964 earthquake. In Kodiak City, the tsunami caused 6 fatalities and about $30 million in damage. We considered several hypothetical tsunami scenarios with a potential to generate tsunami waves that can affect communities in the Kodiak vicinity. Our results confirm that among the earthquake-generated tsunamis we modeled, the 1964 event can be considered a worst-case scenario for future planning (Figure 2). The results also show that the wave generated by the complex source model with detailed slip distribution produces the inundation zone closest to that observed in 1964. The one-fault model greatly underestimates the extent of flooding caused by the 1964 tsunami wave.

Supercomputer Support

We calculate the extent of inundation caused by tsunami waves using numerical modeling of tsunami wave runup. A high performance machine, the 32-processor CRAY SV1ex parallel vector supercomputer of the Arctic Regional Supercomputing Center, is used to simulate all three stages of tsunami evolution: generation by an earthquake, propagation in deep ocean, and inundation of dry land (Figure 3). The tsunami hazard maps, which are completed for the Kodiak area, represent the first step in the State of Alaska tsunami hazard evaluation and production of inundation maps for many Alaskan coastal communities. The work is under way for Homer, Seldovia, and possibly other communities along Kachemak Bay.