

USGS Science Helps Build Safer Communities

Tsunami Hazards—A National Threat



This map shows seven earthquake-generated tsunami events in the United States from the years 900 to 1964. The earthquakes that caused these tsunamis are: Prince William Sound, Alaska, 1964, magnitude 9.2; Chile, 1960, magnitude 9.5; Alaska, 1946, magnitude 7.3; Puerto Rico/Mona Rift, 1918, magnitude 7.3 to 7.5; Virgin Islands, 1867, magnitude undetermined; Cascadia, 1700, magnitude 9; and Puget Sound, 900, magnitude 7.5. Map not to scale. Sources: National Geophysical Data Center, NOAA, USGS

A Real Risk for the United States

In December 2004, when a tsunami killed more than 200,000 people in 11 countries around the Indian Ocean, the United States was reminded of its own tsunami risks.

In fact, devastating tsunamis have struck North America before and are sure to strike again.

Especially vulnerable are the five Pacific States—Hawaii, Alaska, Washington, Oregon, and California—and the U.S. Caribbean islands.

In the wake of the Indian Ocean disaster, the United States is redoubling its efforts to assess the Nation's tsunami hazards, provide tsunami education, and improve its system for tsunami warning.

The U.S. Geological Survey (USGS) is helping to meet these needs, in partnership with the National Oceanic and Atmospheric Administration (NOAA) and with coastal States and counties.

Tsunami Impacts	USGS Science Priorities
<ul style="list-style-type: none"> The 2004 Indian Ocean tsunami reached heights of 65 to 100 feet in Sumatra, caused more than 200,000 deaths from Indonesia to East Africa, and registered on tide gauges throughout the world. The 1964 Alaska tsunami led to 110 deaths, some as far away as Crescent City, Calif. In 1918, an earthquake and tsunami killed 118 people in Puerto Rico. Several such events have struck this region in historic times A tsunami that originated along the Washington, Oregon, and California coasts in 1700 overran Native American fishing camps and caused damage in Japan. 	<ul style="list-style-type: none"> Identify and quantify tsunami sources, such as earthquake faults, volcanoes, and landslides Assess tsunami sources and hazards and model tsunami generation Improve understanding of how tsunamis are generated and incorporate this information into probabilities of tsunami hazards in different areas Assess tsunami inundation hazards by interpreting tsunamis



Crescent City, Calif., is heavily damaged following a tsunami generated in Alaska on March 28, 1964. (University of California-EERC photo)

Tsunami Warnings

In 2005, the President's tsunami-warning initiative directed \$37.5 million to the USGS and NOAA to improve the Nation's domestic tsunami detection and warning system.

As part of that commitment, the USGS has received \$13.5 million to strengthen its ability to detect global earthquakes both through 24-7 analysis of earthquake events and through improvements in the Global Seismographic Network, a partnership with the National Science Foundation (NSF) and the Incorporated Research Institutions for Seismology.

These changes are enabling the USGS to provide NOAA's tsunami-warning centers with faster, more accurate estimates of earthquake location and size.

Domestic Tsunami Hazards

The USGS assesses tsunami hazards in the United States by investigating past tsunamis, identifying potential tsunami sources, mapping tsunami-prone coasts, and creating simulations of tsunami inundation. Emergency managers use this information in hazard planning and mitigation.

The USGS played major roles in documenting the tsunamis generated by the magnitude 9.2 Alaska earthquake in 1964

and in discovering previously unknown tsunami hazards in Washington, Oregon, and California. These findings were a key impetus for the National Tsunami Hazard Mitigation Program.

International Efforts

The USGS has teamed up with NOAA, the U.S. Agency for International Development, and other Federal agencies and scientific organizations to provide scientific information and support of relief efforts around the Indian Ocean.

This work builds on a rapid response in early 2005, when USGS geologists investigated tsunami effects in Sri Lanka, Indonesia, and the Republic of Maldives, and provided field training to scientists from Indonesia and India.

These activities are coordinated through the Intergovernmental Oceanographic Commission, a branch of the United Nations Educational, Scientific, and Cultural Organization. The USGS is particularly active in working groups that address seismic monitoring and hazard assessment.

The United States is also a member of the Group on Earth Observations. This group is committed to the development of a worldwide, all-hazards warning system as part of the integrated Global Earth Observation System of Systems.

Through such efforts at home and abroad, the USGS helps the public, policymakers, and emergency managers make informed decisions on how to reduce losses from future tsunamis.



An automobile, carried by surging water during the December 26, 2005, Indian Ocean tsunami, lies crumpled in a building in Banda Aceh, Indonesia. (USGS photo/Guy Gelfenbaum)



Following the December 26, 2005, Indian Ocean tsunami, debris and standing water are the only things left in parts of Banda Aceh, Indonesia. (USGS photo/Guy Gelfenbaum)

Tsunami Facts

- Tsunamis are triggered by earthquakes, volcanic eruptions, submarine landslides, and by onshore landslides in which large volumes of debris fall into the water. All of these triggers can occur in the United States.
- If a tsunami-causing disturbance occurs close to the coastline, a resulting tsunami can reach coastal communities within minutes.
- Although many people think of a tsunami as a single, breaking wave, it typically consists of multiple waves that rush ashore like a fast-rising tide with powerful currents. Tsunamis can travel much farther inland than normal waves.

For More Information

<http://walrus.wr.usgs.gov/tsunami/>—USGS tsunami research

<http://woodshole.er.usgs.gov/project-pages/caribbean/>—USGS research into tsunami hazards in the Caribbean

<http://www.usgs.gov/>