

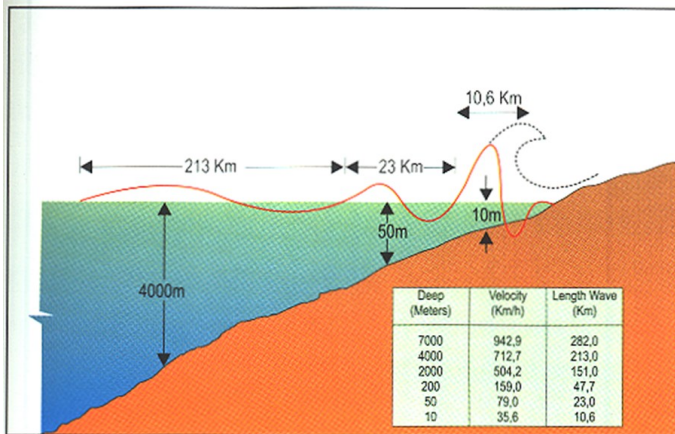


# Tsunami



Juneau

**What is a Tsunami?** A tsunami is a series of traveling waves in water that are generated by violent vertical displacement of the water surface. Tsunamis travel up to 500 mph across deep water away from their generation zone. Over the deep ocean, there may be very little displacement of the water surface; but since



the wave encompasses the depth of the water column, wave amplitude will increase dramatically as it encounters shallow coastal waters. In many cases, a tsunami wave appears like an endlessly onrushing tide which forces its way around through any obstacle.

The image on the left illustrates how the amplitude of a tsunami wave increases as it moves from the deep ocean water to the shallow coast. Over deep water, the wave length is long, and the wave velocity is very fast. By the time the wave reaches the coast, wave length decreases quickly and wave speed slows dramatically. As this takes place, wave height builds up as it prepares to inundate the shore.

## Why do Tsunamis occur in Alaska?

Subduction-zone mega-thrust earthquakes, the most powerful earthquakes in the world, can produce tsunamis through fault boundary rupture, deformation of an overlying plate, and landslides induced by the earthquake (IRIS, 2016). Megathrust earthquakes occur along subduction zones, such as those found along the ring of fire (see image to the right). The ring of fire extends northward along the coast of western North America, then arcs westward along the southern side of the Aleutians, before curving southwest along the coast of Asia. Powerful earthquakes along this zone displace water, generating tsunami waves that radiate outward. These waves can be generated close to Alaska, or far away in places such as coastal Japan.



Destructive tsunami waves can also be generated through above water landslides. On July 9, 1958, a strong earthquake triggered a mountain slide over Lituya Bay (see image to the right). 40 million cubic yards of rock slid into the bay, which caused a tremendous displacement of water that generated a wave that destroyed vegetation 1,722 feet above the height of the bay. The complex unstable topography of Alaskan waterways makes this particular type of tsunami a threat that is bound to repeat again in the future.





# NOAA Tsunami Warning, Advisory, and Watch Program



**Monitor NOAA weather radio, NWS websites, or other media outlets for evolving tsunami threats.**

## **Tsunami Warning:**

- Issued when a potentially tsunami-producing earthquake over 7.0 in magnitude has occurred.
- The initial warning is typically based solely on seismic information.
- Warnings are issued when the earthquake information or tsunami forecasts indicate that a wave over 1 meter in amplitude is expected, possible, or ongoing.

## **Tsunami Advisory:**

- Indicates that a tsunami which may produce strong currents and is dangerous to those in or very near the water is expected.
- Large water inundation is not expected in areas under advisory status.
- Advisories will be cancelled, extended, or upgraded to a warning depending on the event severity.
- Advisories are issued when the tsunami forecast is in the range of 0.3 to 1 meter, or an observed tsunami is in the range of 0.5 to 1.0 meters.

## **Tsunami Watch:**

- A tsunami watch is an early alert issued to areas which may later be impacted by a tsunami.
- Tsunami impact is normally at least three hours away for regions within a tsunami watch.
- The watch will either be upgraded to a warning or advisory in subsequent messages, or cancelled depending on the severity of the tsunami.
- People within a watch area should stay alert for further information regarding the tsunami threat.

## **Notable Tsunamis in Alaska**

<b>Year</b>	<b>Location</b>	<b>Cause</b>	<b>Wave Height</b>	<b>Casualties</b>
July 9, 1958	Lituya Bay	Mountain Slide	Damage 1720 feet above the bay	5
March 27, 1964	Southern Alaska	Megathrust Earthquake	220 feet	106
April 1, 1946	Aleutian Islands	Megathrust Earthquake	100 feet	5
March 9, 1957	Aleutian Islands	Megathrust Earthquake	75 feet	0