Distant Source (Alaska-Aleutian Subduction Zone) Tsunami Inundation Map
Reedsport, Oregon

Introduction

The "Ring of Fire", also called the Circum-Pacific belt, is the zone of relative tectonic activity and seismicity that surrounds the Pacific Ocean. The Ring of Fire is characterized by subduction zones and transform faults where Earth's tectonic plates interact, leading to the generation of earthquakes and tsunamis. These seismic events are often associated with tsunamis due to the sudden release of elastic energy stored in the Earth's crust.

The first scenario attempts to model a tsunami originating near the Gulf of Alaska. The Ring of Fire is home to the Aleutian Subduction Zone, where the Pacific Plate (Farallon Plate) subducts under the North American Plate. This zone is known for generating large earthquakes and tsunamis. The occurrence of such events, especially in the Gulf of Alaska, can lead to significant inundation along the coastline.

Wave heights reached 10 to 11.5 feet in the Nehalem River, 10 to 11.5 feet along the ocean front as one might expect, but in the estuary channels above, wave heights were significantly lower. This is consistent with the phenomenon of shoaling, where the energy of the wave is dissipated as it approaches the shore, resulting in lower wave heights in shallower waters.

When these events occur around the Ring of Fire but not directly off the Oregon coast, tsunami waves can still reach the Oregon coast. For example, the 1964 Prince William Sound earthquake and tsunami devastated many towns along the Gulf of Alaska, left serious damage in British Columbia, Hawaii, and the United States, and led to extensive property loss, $84 million and 106 fatalities.

The "Ring of Fire" is not the only source of tsunamis in the region. Tsunamis originating from other parts of the world, such as the Indian Ocean, have also impacted the Oregon coast. The 2004 Indian Ocean earthquake and tsunami provided a clear example of the devastating impact of far-travelled tsunamis on coastal communities. This event led to the establishment of tsunami warning systems and improved preparedness measures in the region.

Tsunami scenarios are modeled to occur at a static (no flow) tide and equal to the Mean Higher High Water (MHHW) high tide. They provide the maximum tsunami wave elevation for the two scenarios along lines A-A' and B-B' (Figure 5). The transition area between the inundation profiles shown on this map.

Map Explanation

This map is based on hydrodynamic tsunami modeling by the National Geophysical Data Center / World Data Center for Earthquake Tsunami Science and the National Centers for Environmental Information. The computer model produces time series data for tsunami scenarios, which are then used to determine overall wave height and inundation extent for the two scenarios at the maximum tsunami wave elevation for the two scenarios along lines A-A' and B-B' (Figure 5).

Overall, the maps provide valuable information for tsunami risk mitigation planning and emergency preparedness, helping communities to understand the potential impacts of tsunamis and to develop strategies to minimize losses.

Data References


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Tsunami Inundation Map

Revised Statutes 455.446 and 455.447, commonly known as the Senate Bill 379 line and the Washington State Senate. The computer model produces time series data for tsunami modeling in order to prohibit the construction of new essential engineering structures in the inundation zones.

Figure 1: This image depicts the location on the Aleutian chain of islands also shows higher energy wave heights reached 10 to 11.5 feet in the Nehalem River, 10 to 11.5 feet along the ocean front as one might expect, but in the estuary channels above, wave heights were significantly lower. This is consistent with the phenomenon of shoaling, where the energy of the wave is dissipated as it approaches the shore, resulting in lower wave heights in shallower waters.

Figure 2: This image shows the overall wave height and inundation extent for the two scenarios at the maximum tsunami wave elevation for the two scenarios along lines A-A' and B-B' (Figure 5).

Figure 3: These profiles depict the expected maximum tsunami wave elevation for the two Alaska tsunami scenarios along lines A-A' and B-B' (Figure 5). The profiles show the tsunami height variations along specific lines on the map.

Figure 4: This image shows the overall wave height and inundation extent for the two scenarios at the maximum tsunami wave elevation for the two scenarios along lines A-A' and B-B' (Figure 5).

Figure 5: These profiles depict the expected maximum tsunami wave elevation for the two Alaska tsunami scenarios along lines A-A' and B-B' (Figure 5). The profiles show the tsunami height variations along specific lines on the map.

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