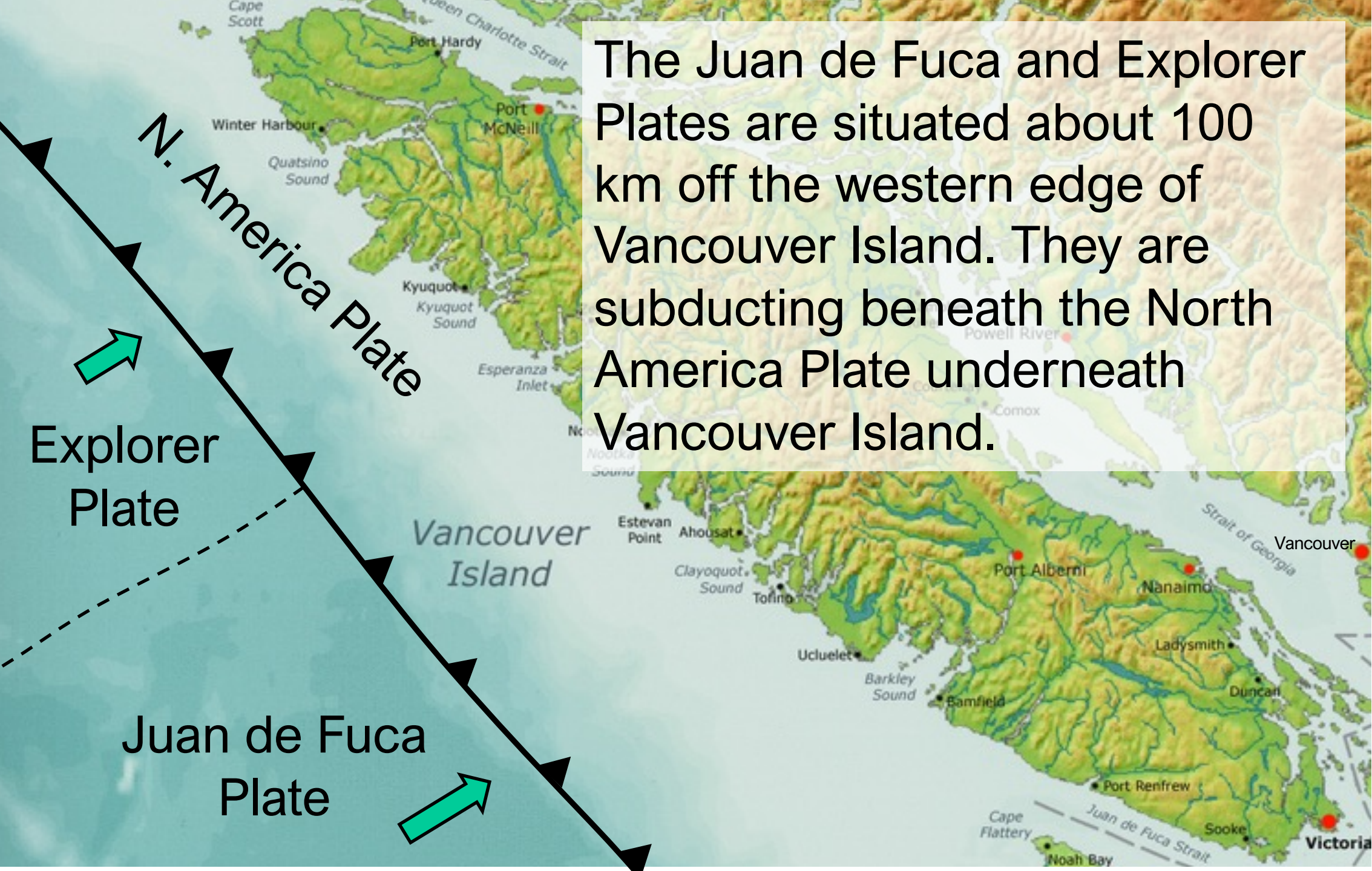
A topographic map of the Pacific Northwest coast of North America, showing the coastline from Cape Scott in the north to Victoria in the south. The map features various geographical labels such as Cape Scott, Port Hardy, Winter Harbour, Quatsino Sound, Bowen River, Nanaimo, Ladysmith, Duncan, Port Renfrew, Sooke, and Victoria. The terrain is depicted with green and brown shading to indicate elevation and topography.

# The great Cascadia Earthquake and Tsunami of January 26<sup>th</sup>, 1700

**This video has no soundtrack.**



The Juan de Fuca and Explorer Plates are situated about 100 km off the western edge of Vancouver Island. They are subducting beneath the North America Plate underneath Vancouver Island.

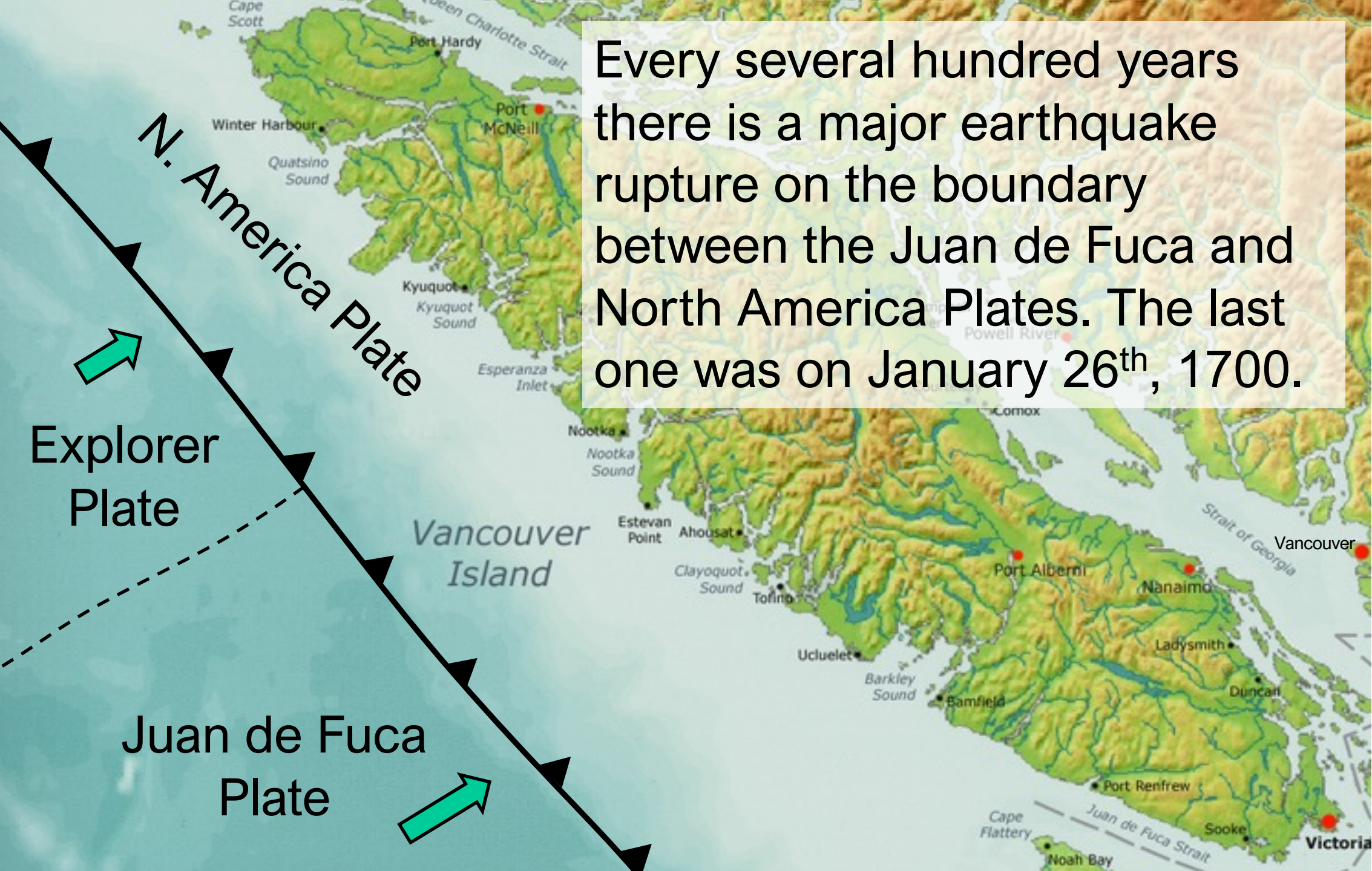
N. America Plate

Explorer Plate

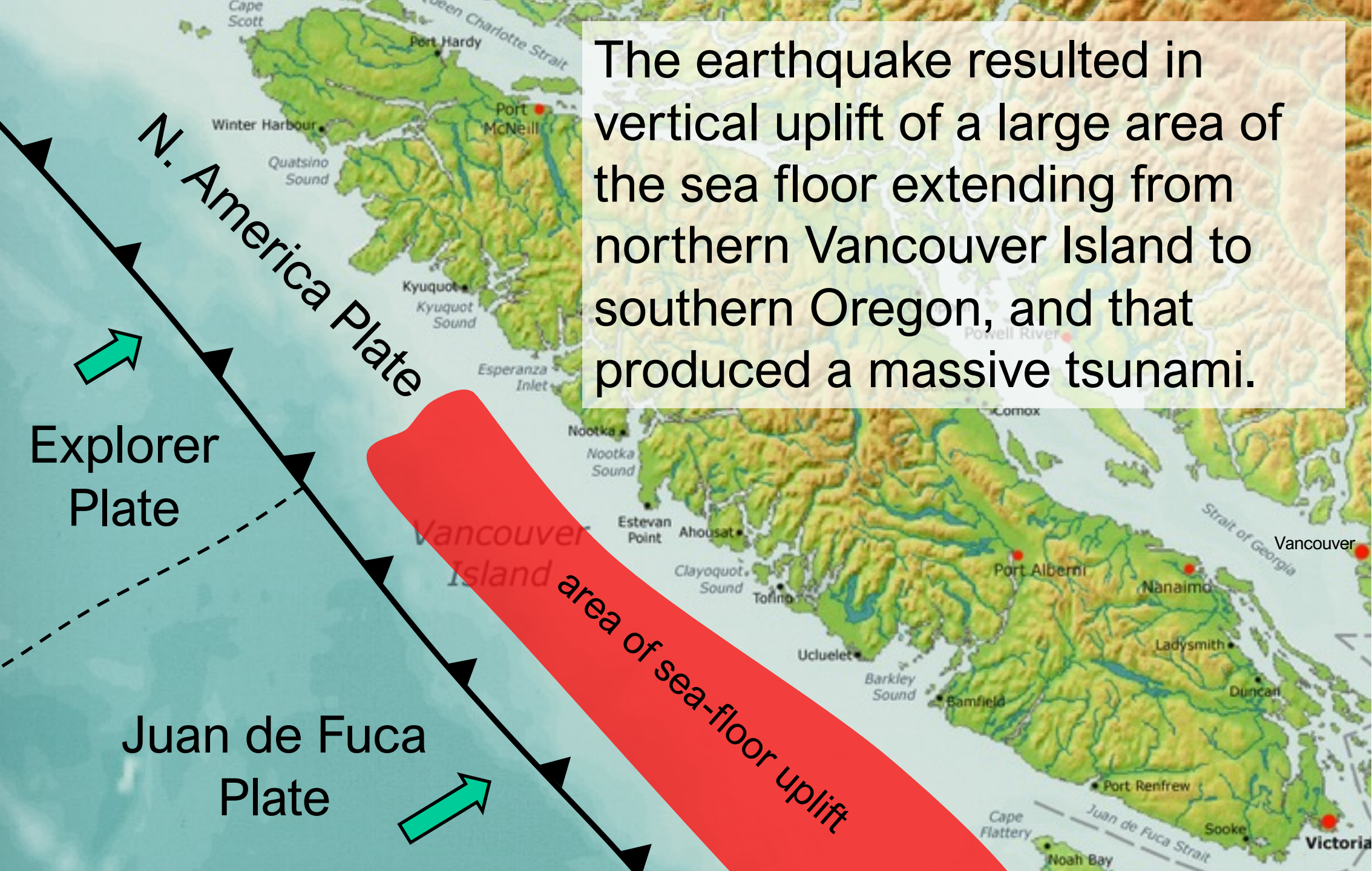
Juan de Fuca Plate

Vancouver Island

Every several hundred years there is a major earthquake rupture on the boundary between the Juan de Fuca and North America Plates. The last one was on January 26<sup>th</sup>, 1700.



The earthquake resulted in vertical uplift of a large area of the sea floor extending from northern Vancouver Island to southern Oregon, and that produced a massive tsunami.



N. America Plate

Explorer Plate

Juan de Fuca Plate

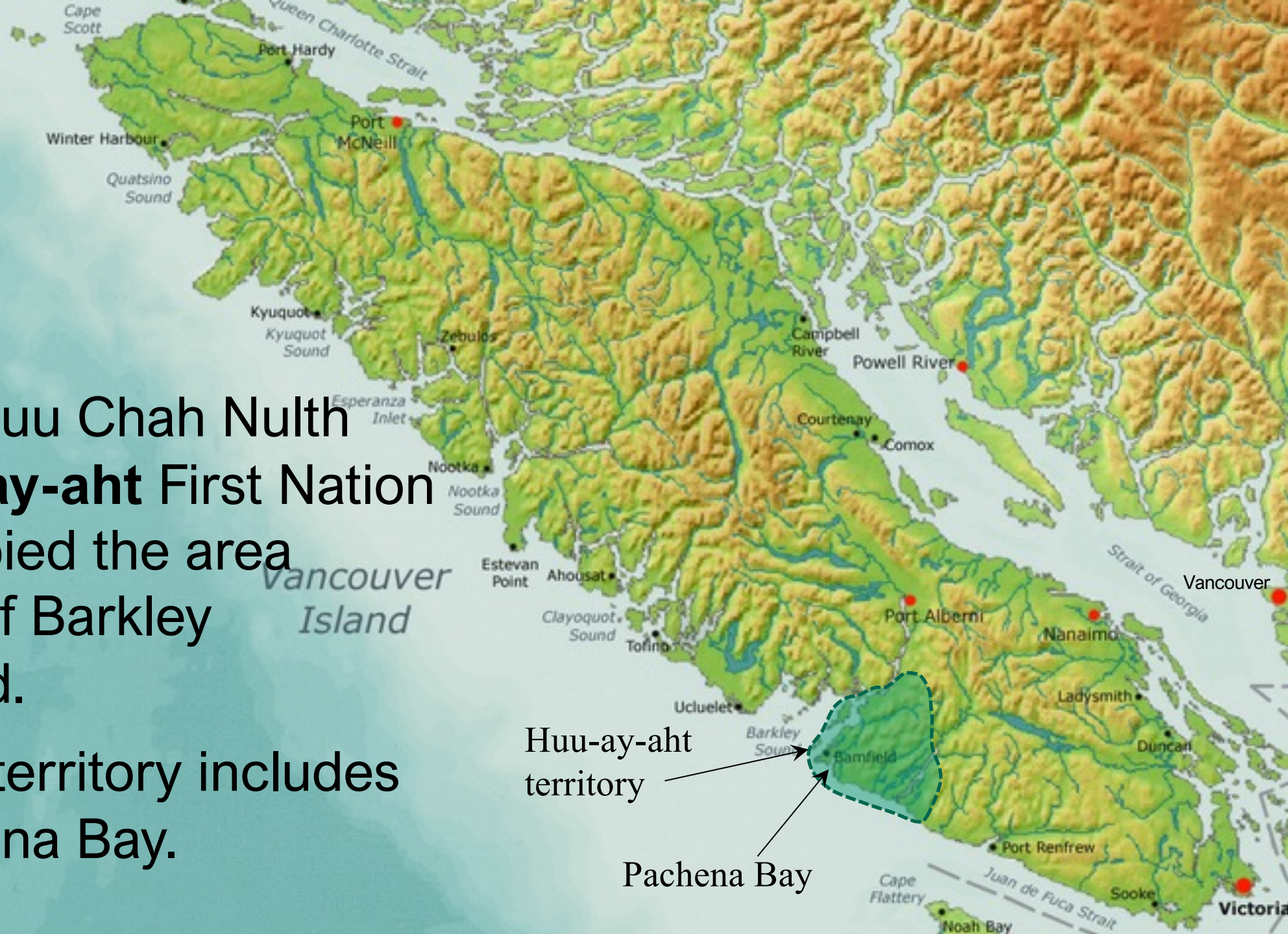
Vancouver Island area of sea-floor uplift

In 1700 the  
Nuu Cha Nulth  
people lived in this region.  
There were no Europeans on  
this part of the Pacific Coast.



The Nuu Chah Nulth  
**Huu-ay-aht** First Nation  
occupied the area  
east of Barkley  
Sound.

Their territory includes  
Pachena Bay.



Huu-ay-aht  
territory

Pachena Bay

Pachena Bay extends about 4 km in from the open ocean.

The current Huu-ay-aht village of Anacla is behind the trees on the right

In 1964 Hu-ay-aht Chief Louis Clamhouse spoke to anthropologist Eugene Arima, and told what he considered to be the most important story of the Huu-ay-aht people:





“This story is about the first Anaqt or Pachena Bay people. I think they numbered over a hundred persons.

They were members of the Pachena Bay tribe. There is now no one left alive due to what this land does at times.



They had practically no way or time to try to save themselves. I think it was at nighttime that the land shook...  
they simply had no time to get hold of canoes,  
no time to get awake.  
They sank at once, were all drowned; not one survived.



It is said no one ever knew what happened. I think a big wave smashed into the beach. The Pachena Bay people were lost. Their food was whale meat. That is why they were living there. Nothing was known about what happened and what became of them.”

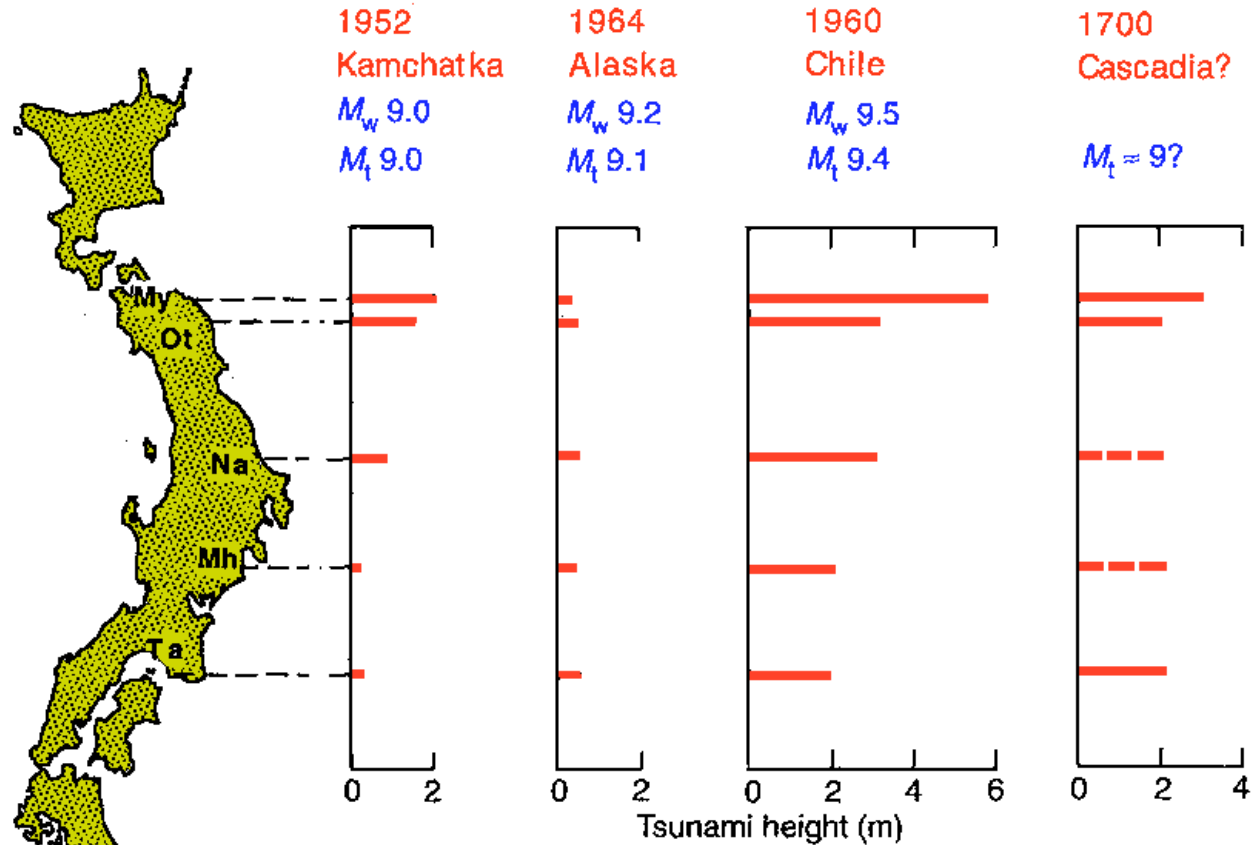
from: E.Y. Arima, Louis Clamhouse, Joshua Edgar, Charles Jones, and John Thomas, Barkley Sound Southeast, 1989, *Between Ports Alberni and Renfrew: Notes on West Coast Peoples*, Canadian Museum of Civilization.



There is no written record of a large earthquake happening anywhere around the Pacific in the year 1700, but a large tsunami wave was recorded in Japan on January 27<sup>th</sup>, 1700, and it could have been generated by an earthquake on the Pacific Northwest Coast at around 9 pm on January 26<sup>th</sup>. This is consistent with Chief Louis' observation: "I think it was at nighttime".



Based on the size of the waves that hit Japan in 1700 it is estimated that the earthquake magnitude was around 9



Japanese Tsunami Records

Chief Louis also said: "...they simply had no time to get hold of canoes, no time to get awake."

This is consistent with models that show that, following the shaking, which likely lasted for several minutes, the tsunami wave would have reached Pachena Bay in just over 30 minutes, leaving them no time to get away from shore, even if they had known that was what they needed to do.

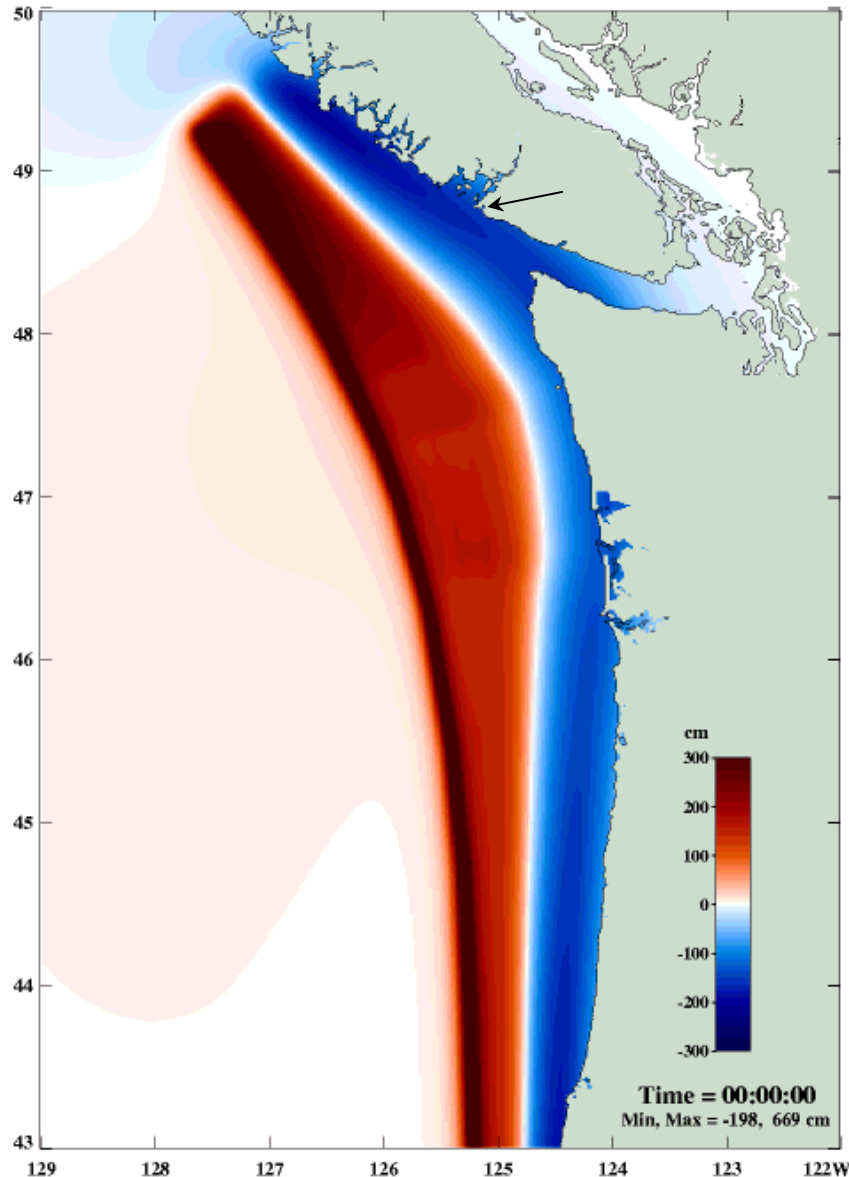


The following slides show the tsunami wave model for the 1700 earthquake in 5 minute increments, up to 45 minutes after the earthquake.

The figures are from: Cherniawsky, J.Y., Titov, V.V., Wang, K., and Li, J.Y. (2007), Numerical simulations of tsunami waves and currents for southern Vancouver Island from a Cascadia megathrust earthquake, *Pure Appl. Geophys.* **164** (2-3), p. 465-492.

In 2007 these figures were displayed on a Government of Canada, Fisheries and Oceans Canada, Institute of Ocean Sciences website.

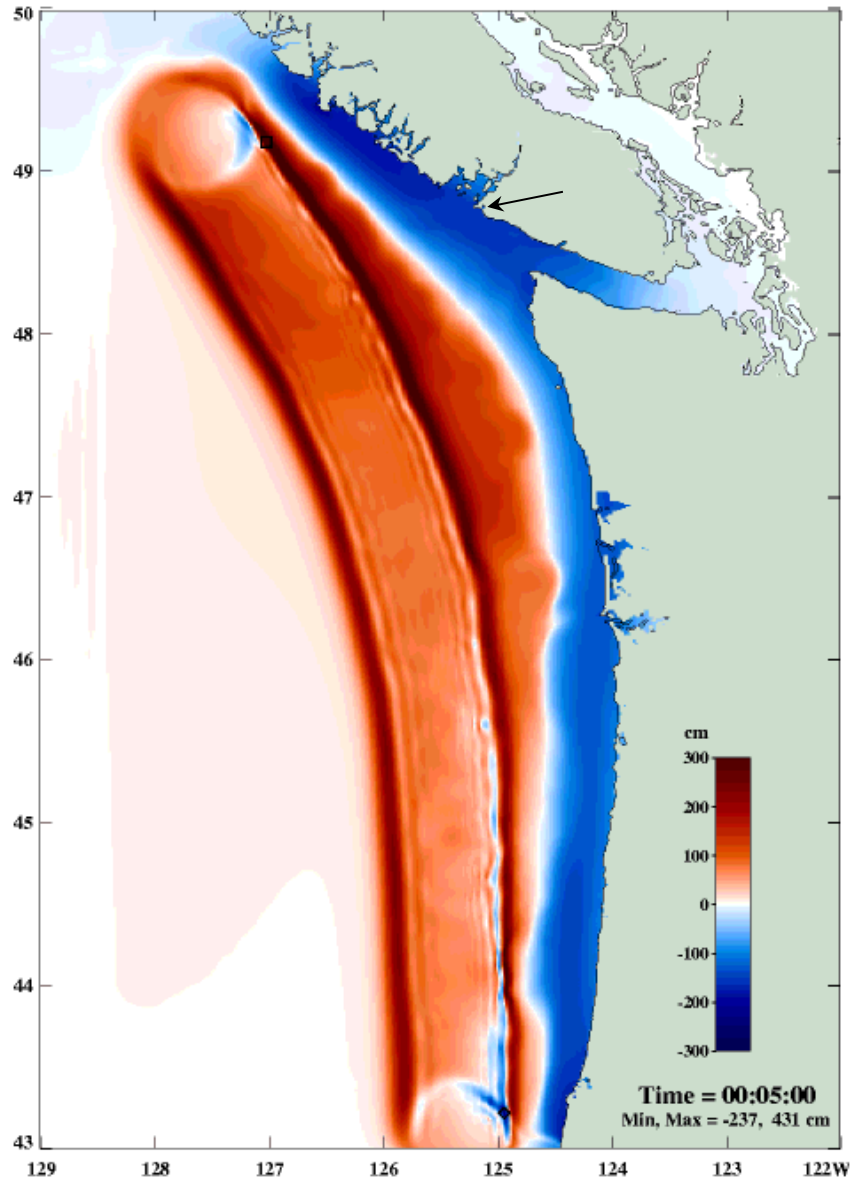




Red denotes areas of elevated sea surface (here up to about 3 m above normal) while blue indicates areas where the sea surface was lower than normal.

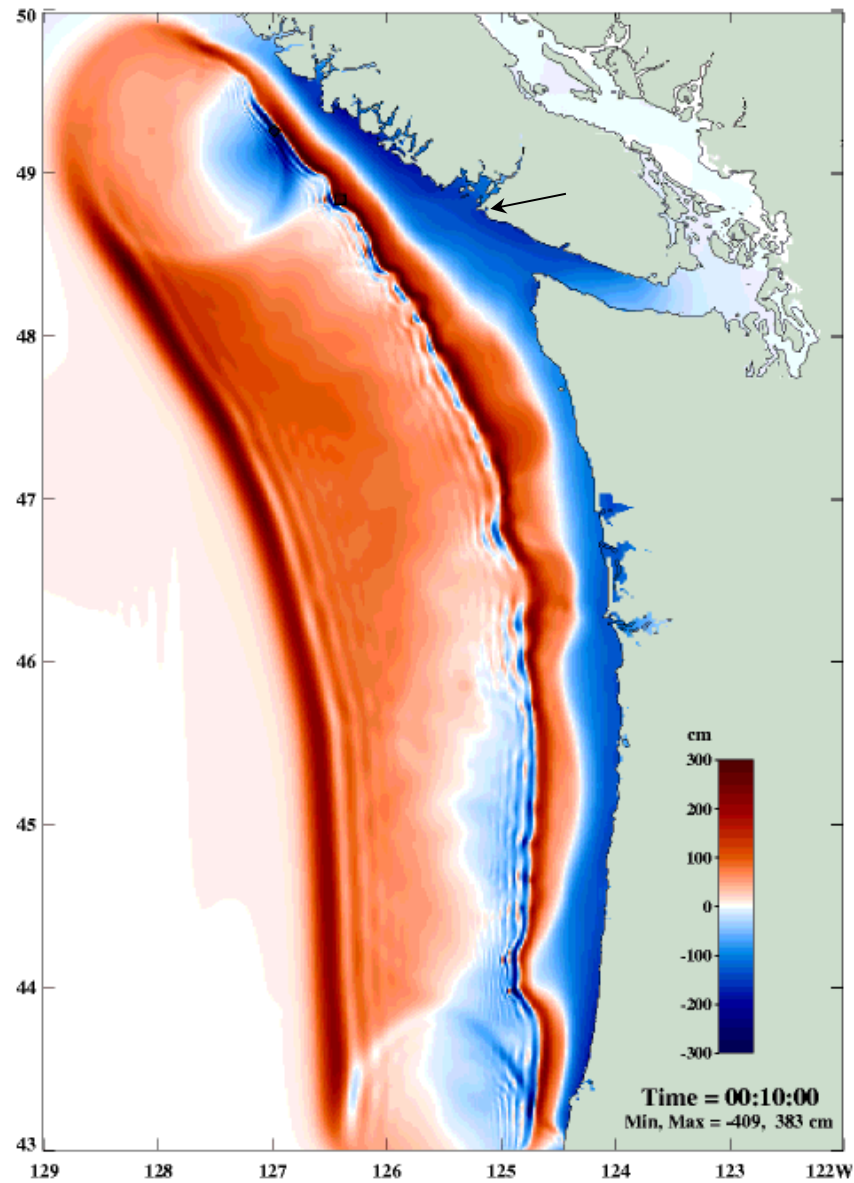
In this image the red area coincides with the part of the sea floor where seismic uplift is assumed to have taken place.



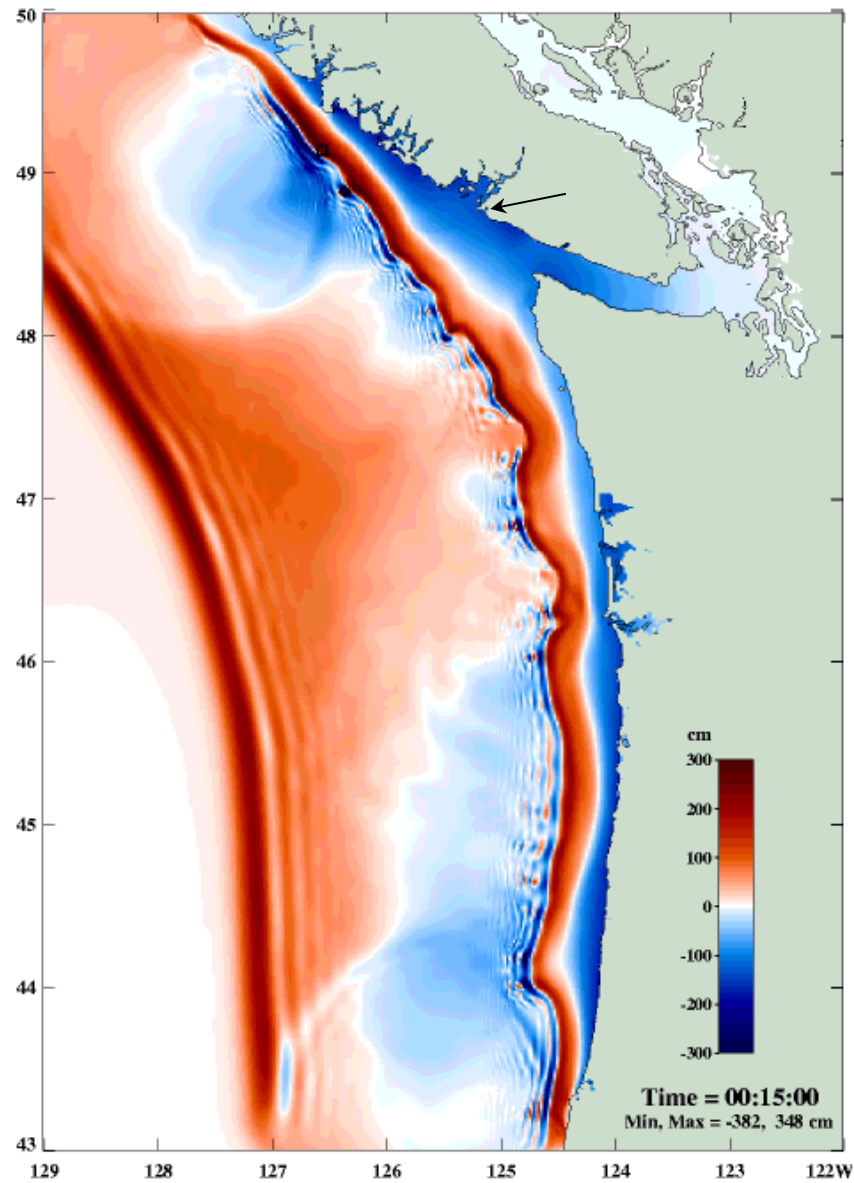


5 minutes

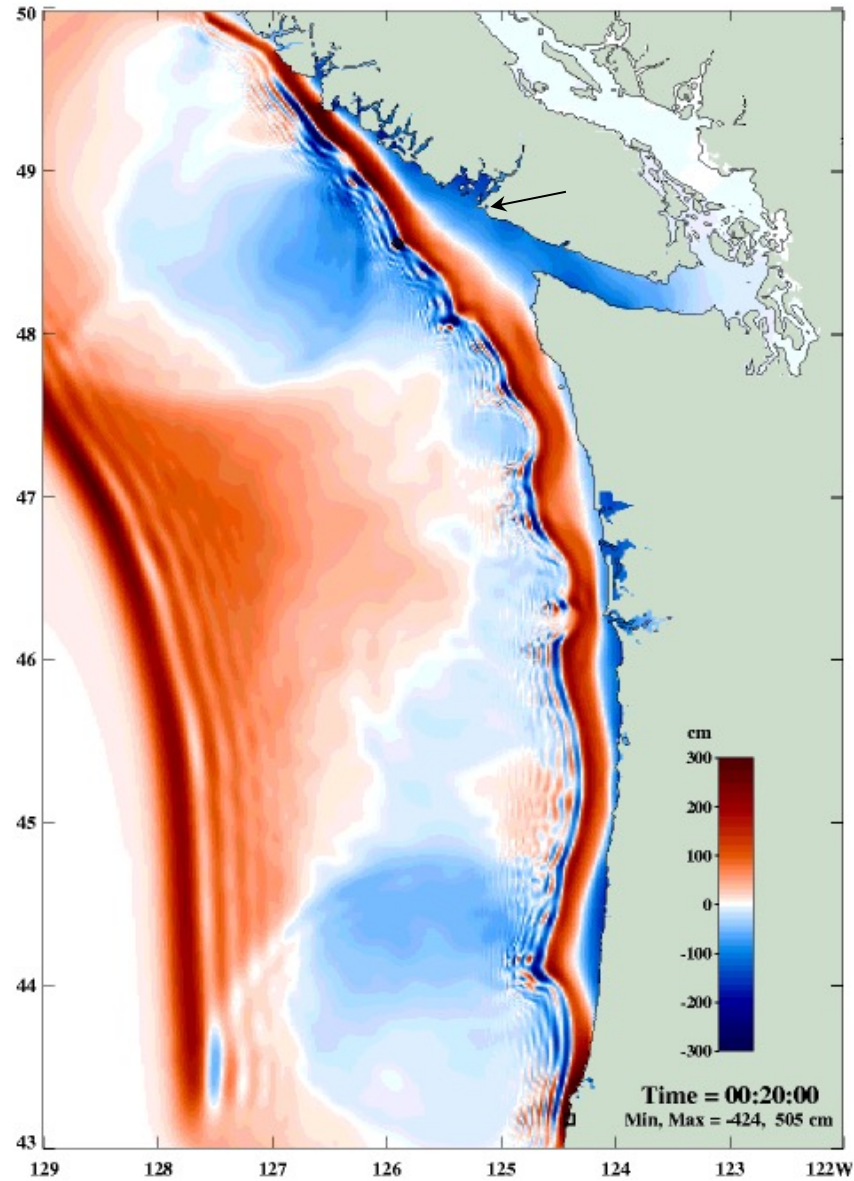
The black arrow points to Pachena Bay.



10 minutes

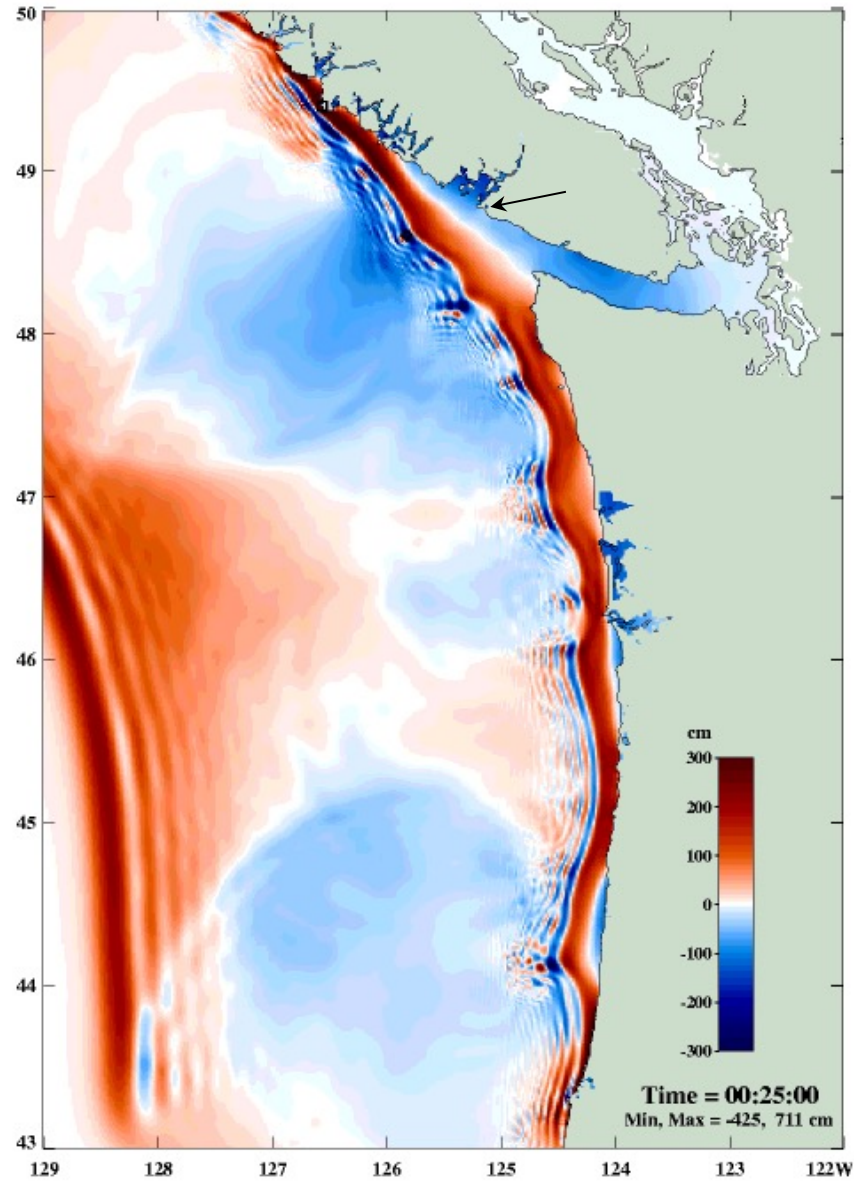


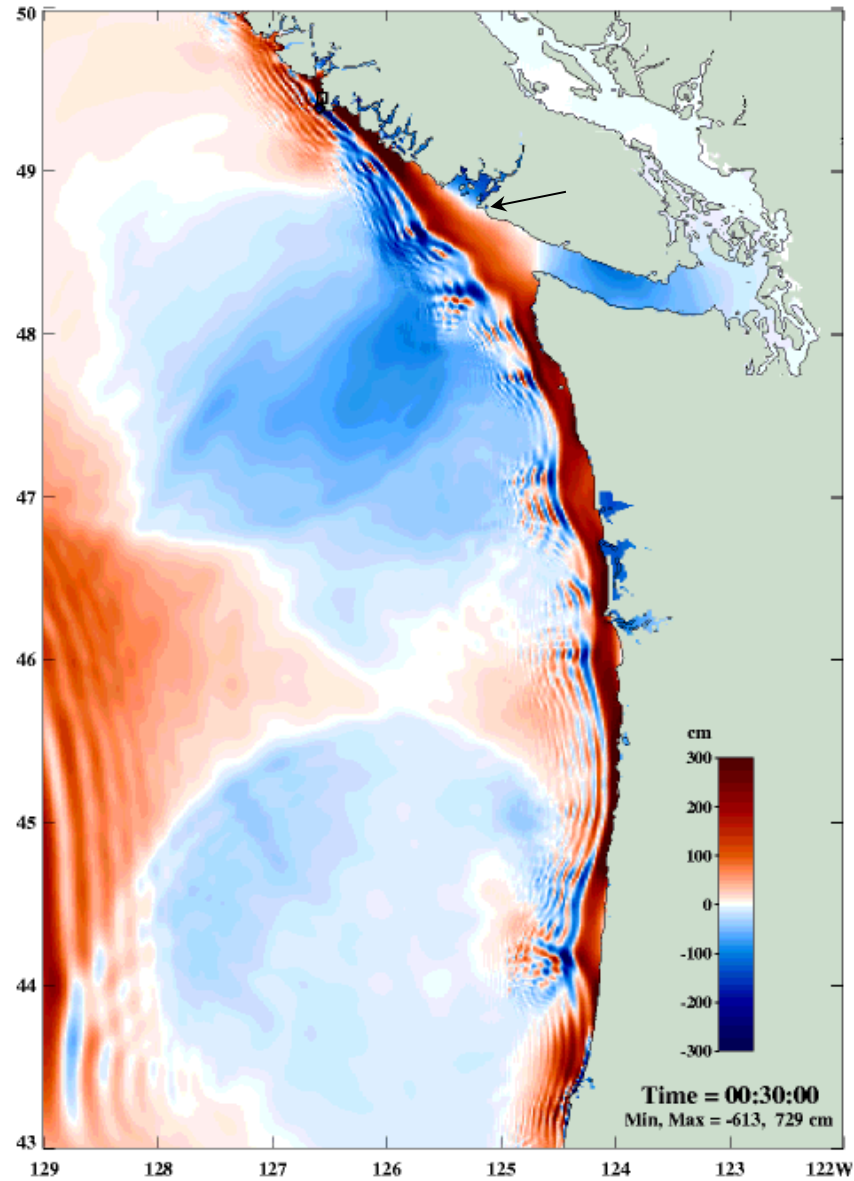
15 minutes



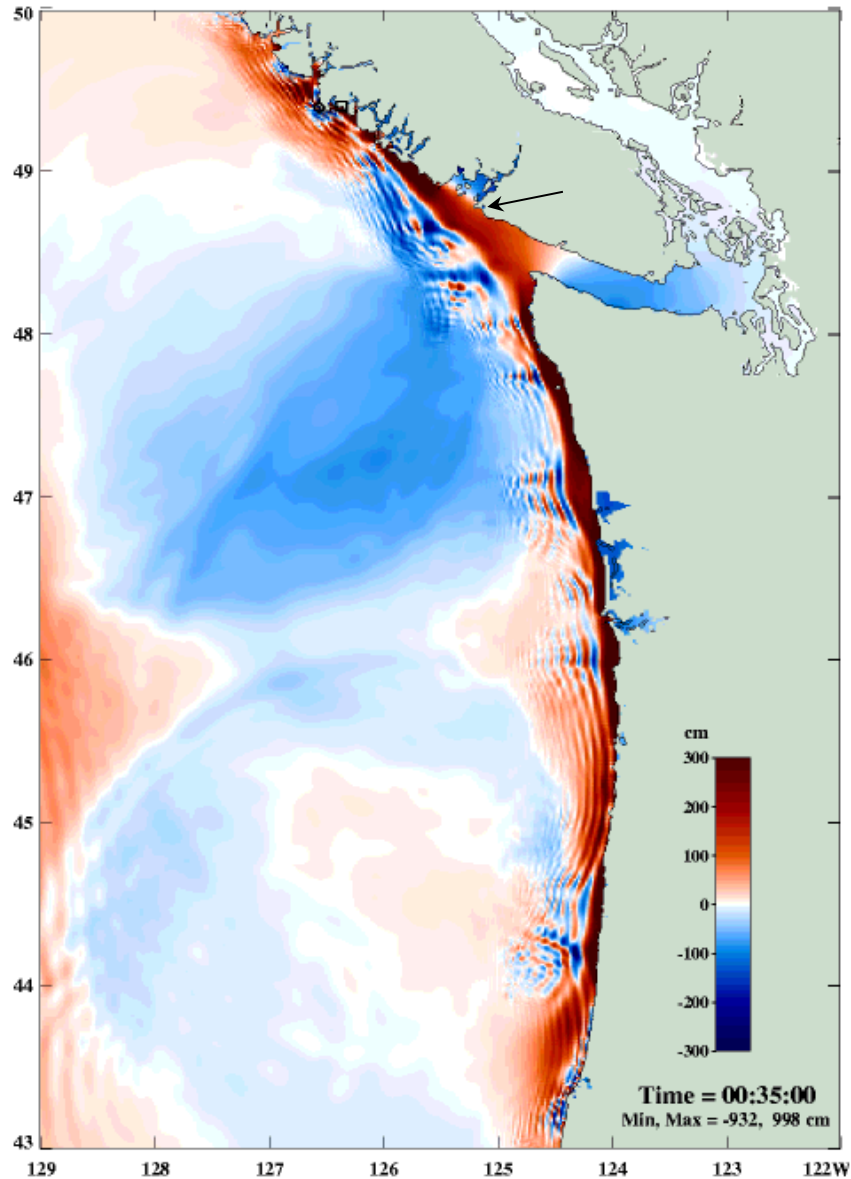
20 minutes

25 minutes



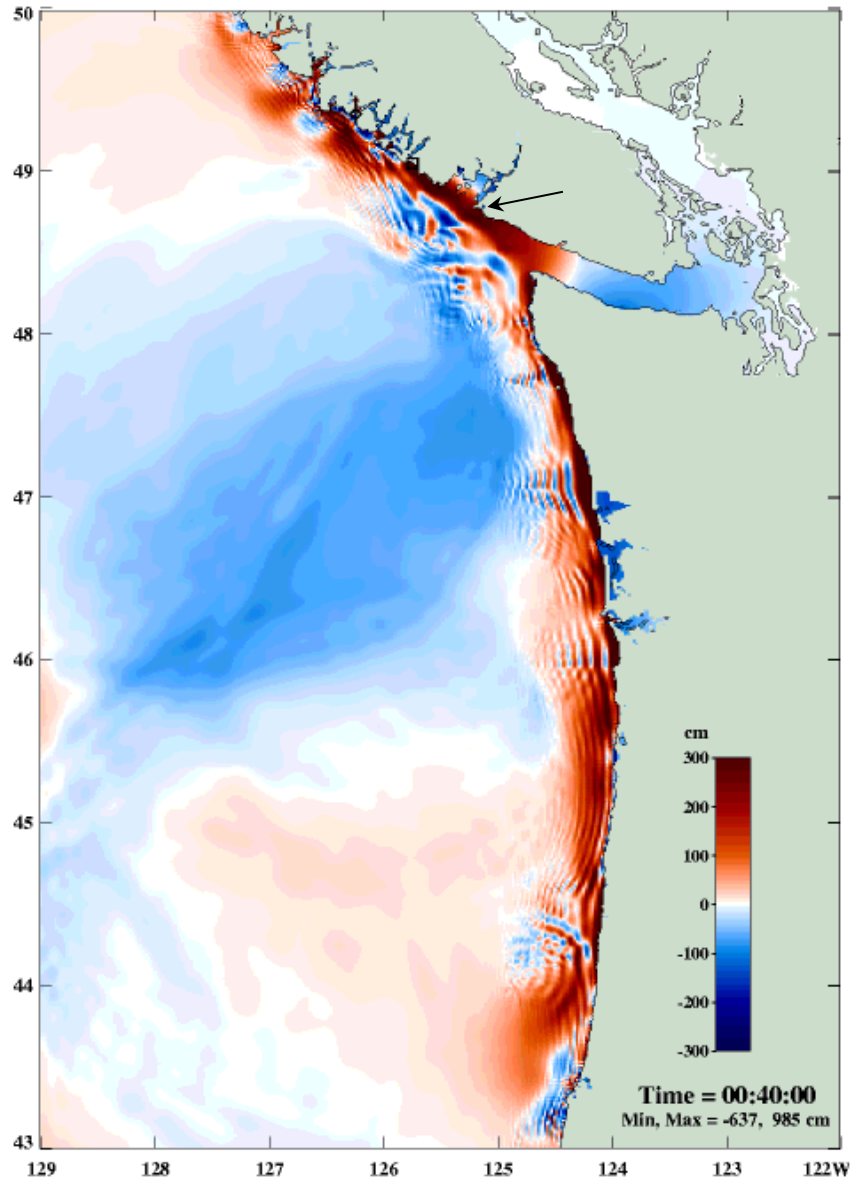


30 minutes



35 minutes

The tsunami wave reaches  
Pachena Bay

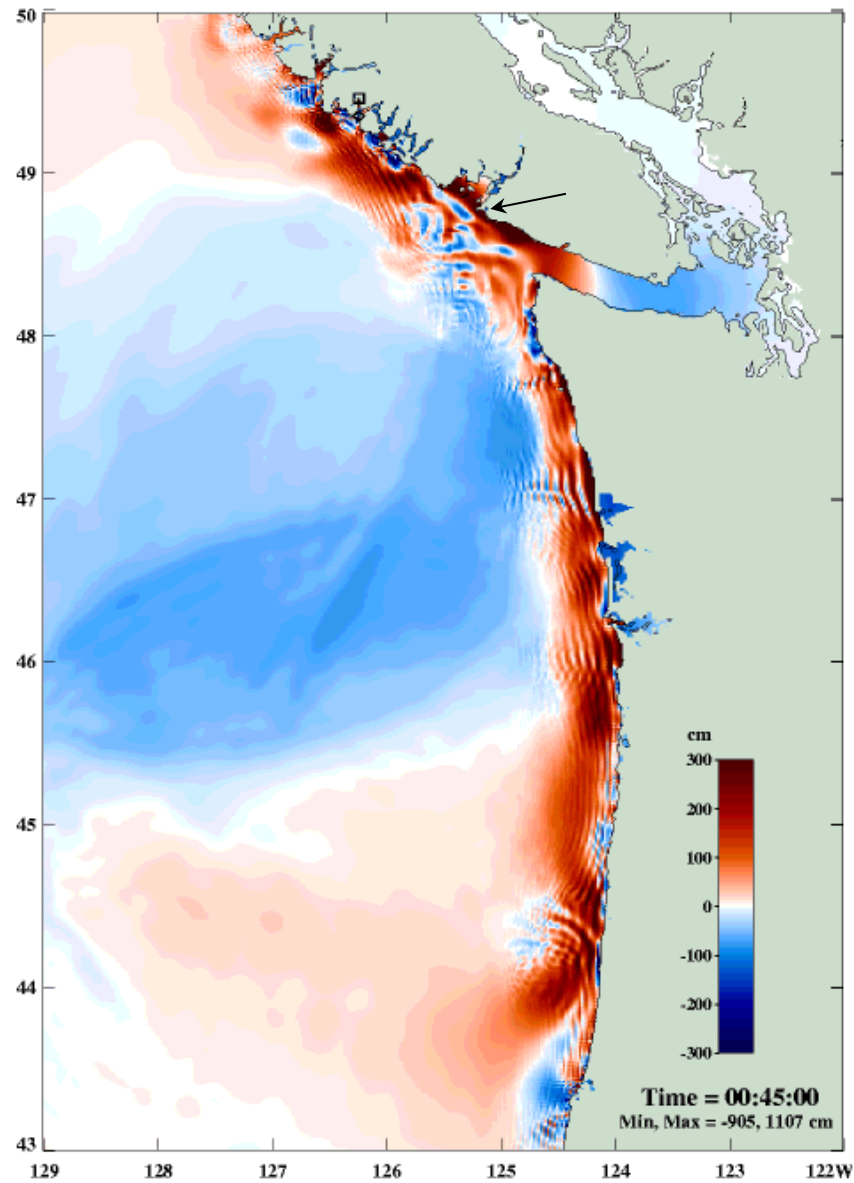


40 minutes

At this time the model shows a maximum wave height of 9.85 metres, in the area near to Pachena Bay.



45 minutes



The tsunami wave model presented above is from: Cherniawsky, J, et al. (2007), Numerical simulations of tsunami waves and currents for southern Vancouver Island from a Cascadia megathrust earthquake, Pure Appl. Geophys. **164** (2-3), p. 465-492.

It was displayed in 2007 on a Government of Canada, Fisheries and Oceans Canada, Institute of Ocean Sciences website, and is presented here under the proviso that the information in crown publications may be reproduced, in part or in whole and by any means, without charge or further permission provided that due diligence is exercised in ensuring the accuracy of the information reproduced, and that the material is not being reproduced for commercial purposes.



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## Tsunamis and Tsunami Research

This web page outlines the research on the observation and modelling of tsunamis being conducted at IOS. Research includes tsunamis formed by mega-thrust earthquakes of order of magnitude of 9.0 and by submarine and sub aerial landslides in coastal waters and in steep continental slope regions. The page will eventually include simulations of mega-earthquake tsunamis generated of the west coast of Canada including coastal waters and fjords.

**== NEW ==** [Indian Ocean Tsunami December 26,2004](#)

In the first part, you could find the [basic physics of tsunamis](#), big historical [tsunami events](#), the local tsunami source - [Cascadia subduction zone](#) - in coastal British Columbia and some [useful links](#) to additional information on Tsunamis including how to protect yourself from tsunamis.

## **Text summary for: Pachena Bay Tsunami video**

This video starts with a summary of the plate tectonic situation off the west coast of Vancouver Island, and how large earthquakes take place here every several hundred years. The last such quake was in January 1700, and at that time only the Nuu Cha Nulth people were living along the western edge of Vancouver Island, including the Huu-ay-aht First Nation that occupied the area around Pachena Bay.

In 1964 Huu-ay-aht Chief Louis Clamhouse retold the story of the 1700 earthquake and how the village of Anacla was destroyed because the people there had no time to get away from the shore. They were killed by the Tsunami wave that struck Pachena Bay.

The video also includes a series of maps showing how the 1700 earthquake created tsunami waves that propagated across the Pacific Ocean, but also headed towards the coast of Vancouver Island, reaching the Pachena Bay area about 35 minutes after the earthquake.