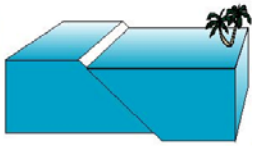
Magnitude 7.0 Earthquake Near Loyalty Islands
Thursday, January 13, 2011 at 16:16:41 UTC (8:16:41 AM PST)
Friday, January 14, 2011 at 3:16:41 AM at Epicenter
Epicenter: Latitude 20.617 °S, Longitude 168.489 °E Depth: 5 km

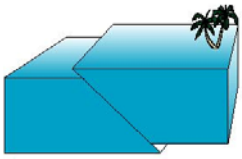
Earthquake Summary:

As determined by the US Geological Survey National Earthquake Information Center (NEIC), a magnitude 7.0 earthquake occurred in the Northern New Hebrides Trench on Thursday January 13, 2011 at 16:16:41 Coordinated Universal Time (UTC). At this trench, the northeastern corner of the Australian Plate subducts beneath the Pacific Plate at a rate of about 9 cm/yr (Map A on left). The 1990-to-present earthquake history within the yellow square of Map A is shown on Map B. The gold star on Map B shows the location of the M7.0 January 13 earthquake. This major earthquake occurred about 118 km north-northeast of Tadine, Loyalty Islands, New Caledonia (Map B). The Northern New Hebrides Trench has been the site of several major earthquakes recently. Two M7.3 events have occurred on this convergent plate boundary within the last six months; one on August 10 and the other on Christmas day.

The mechanism of this earthquake was normal faulting indicating that it was caused by extensional forces in the upper part of the Australian Plate. Earthquakes that occur on the interface between converging plates at subduction zones are dominated by thrust (compressional) faulting. However, the descending oceanic plate at a subduction zone must first bend before it can dive into the trench. That bending produces extensional forces in the upper part of the subducting plate and those forces produce earthquakes with normal faulting mechanisms. Because the magnitude of the January 13 earthquake was smaller than those that produce significant tsunamis, no tsunami warning was issued and there have been no reports of significant tsunami arrivals.

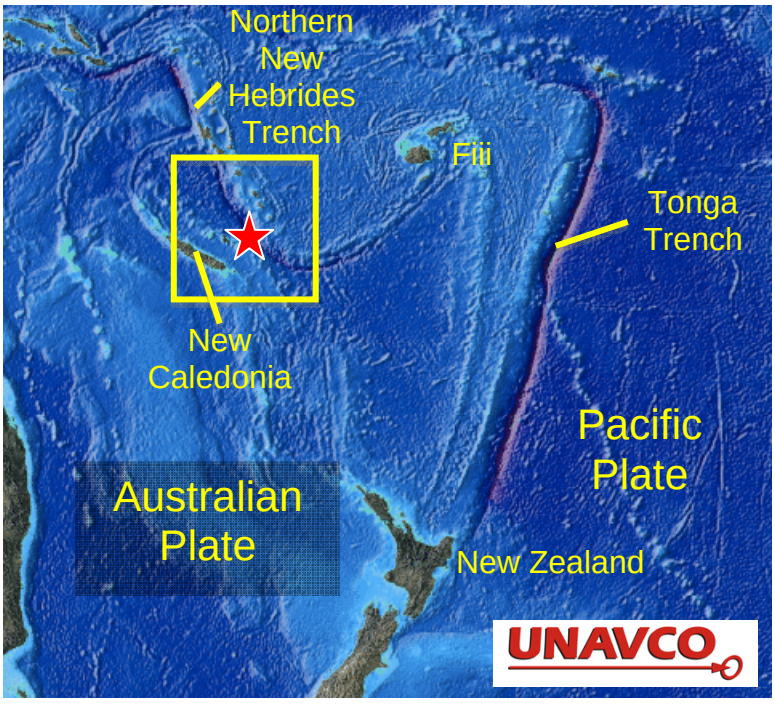


Generalized Normal Fault - USGS

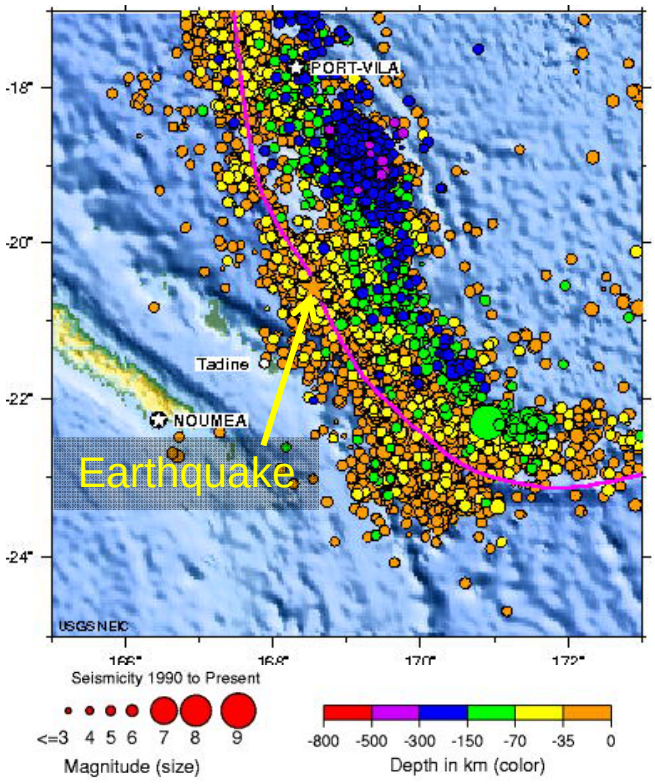


Generalized Thrust Fault - USGS

Map A



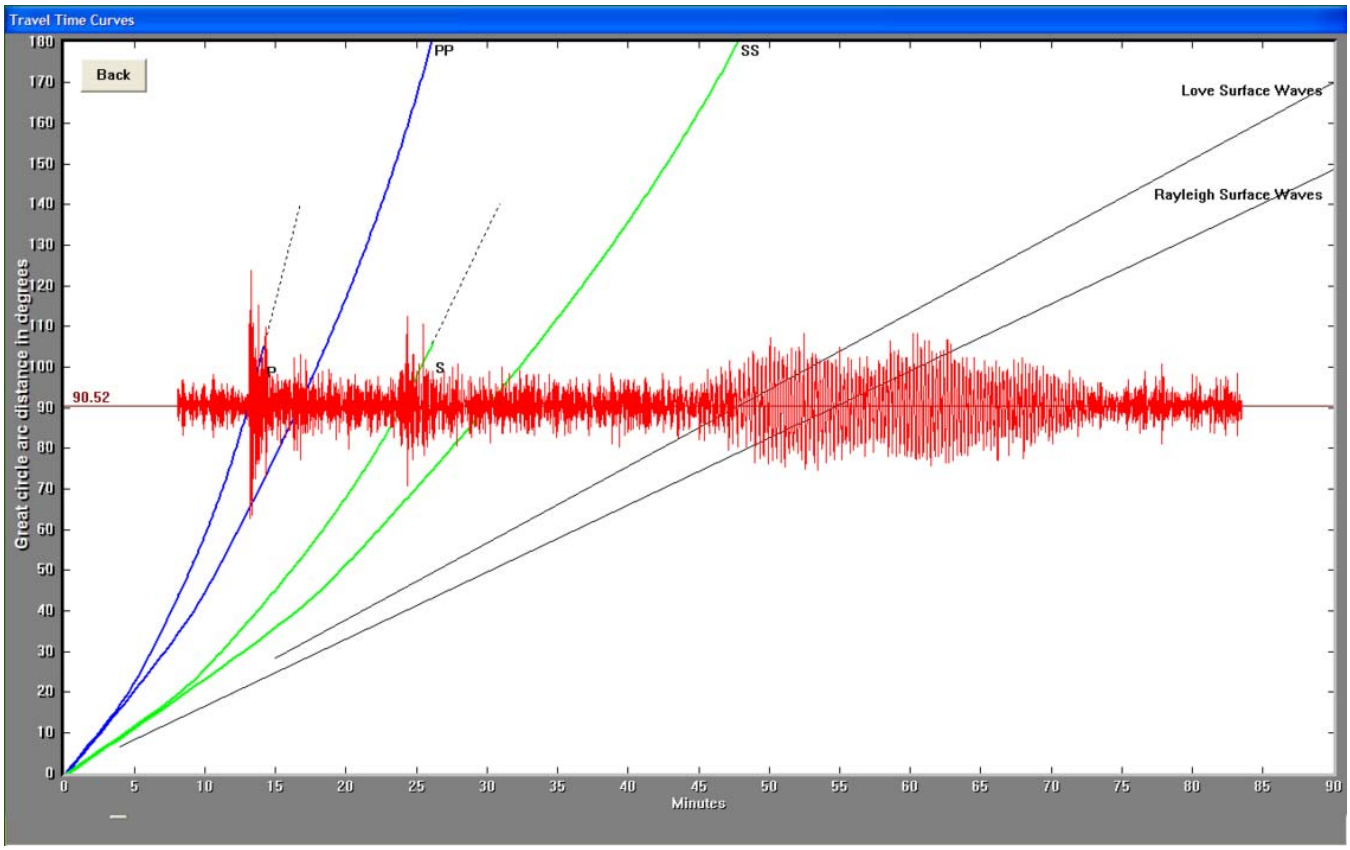
Map B



Images courtesy of the US Geological Survey

Seismogram Description:

The record of the M7.0 Loyalty Islands earthquake on the University of Portland seismometer in Portland, Oregon is illustrated below. Portland is about 10,062 km (90.65°) from the location of this earthquake. Following the earthquake, it took 13 minutes and 3 seconds for the P waves to travel from the earthquake to Portland, Oregon. P waves are body waves, compressional waves that travel through the Earth's mantle. PP waves are P waves that bounce once off the Earth's surface between the epicenter and the recording seismometer. PP waves arrived 16 minutes and 38 seconds after the earthquake. The S waves arrived 24 minutes after the earthquake occurred. S waves are also body waves, but they travel as shear waves through the Earth's mantle. The surface waves traveled from the earthquake to Portland around the perimeter of the Earth. Because the distance around the perimeter is longer than the distance through Earth's mantle and the speed of surface waves is slower than body waves, it takes surface waves much longer than body waves to travel from an earthquake to a distant seismic station. In this case, the first surface waves from the Loyalty Islands earthquake started arriving in Portland, Oregon about 38 minutes after the earthquake occurred.



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