

## Magnitude 7.0 Earthquake Near Vanuatu

Saturday, Sept 3, 2011 at 22:55:36 UTC (Sept 4, 2011 09:55:36AM at epicenter)  
Epicenter: Latitude 20.585°S, 169.696°E Depth: 132.4 km

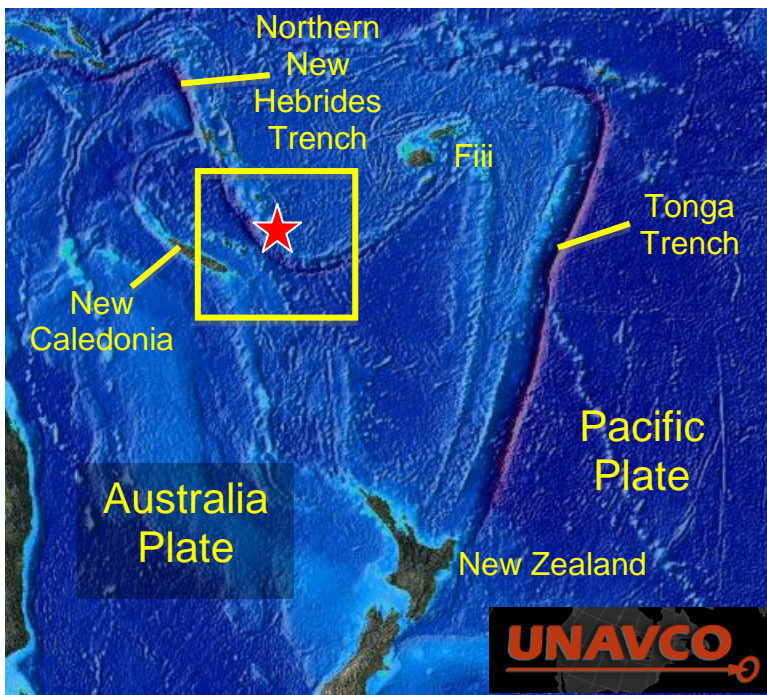
### Earthquake Summary:

As determined by the US Geological Survey National Earthquake Information Center (NEIC), a magnitude 7.0 earthquake occurred in the Northern New Hebrides Trench. This major earthquake was 122 km (75 miles) south-southeast of Isangel, Tanna, Vanuatu (Map B) where strong ground shaking was felt. Because this earthquake occurred at more than 100 km depth, a tsunami was not generated and no tsunami warnings were issued. There were no immediate reports of damage or injuries.

The September 3 earthquake occurred in the subduction zone where the northeastern corner of the Australia Plate subducts beneath the Pacific Plate (Map A below) at a rate of 90 mm/year (9 cm/yr). Earthquakes within the yellow square of Map A that occurred between 1990 are illustrated on Map B where the green star indicates the location of the M7.0 September 3 earthquake.

As illustrated on Map B, earthquake depths increase from southwest to northeast across this convergent boundary between the Australia Plate and the Pacific Plate. The Northern New Hebrides Trench has been the site of five major earthquakes within the past two years. Two earthquakes (M7.8 and M7.7) occurred within 15 minutes on October 7, 2009; a magnitude 7.2 earthquake occurred May 27, 2010; and two earthquakes (M7.1 and M7.0) occurred within a 90-minute interval on August 20, 2011.

### Map A



### Map B

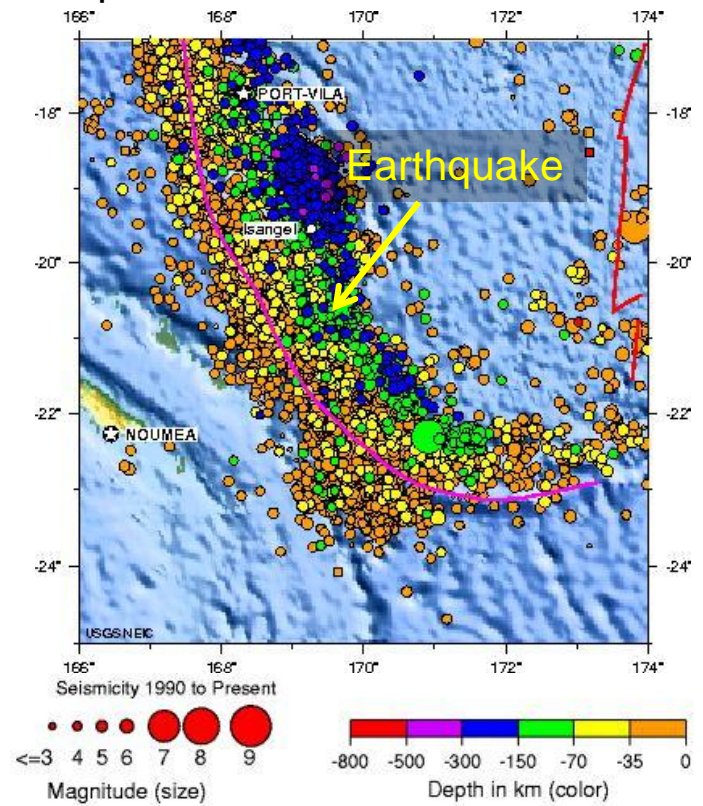
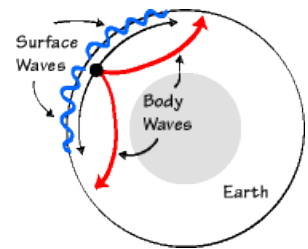


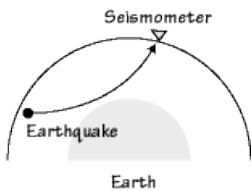
Image courtesy of the US Geological Survey

## Seismogram Description:

The record of the M7.0 Vanuatu earthquake on the University of Portland seismometer in Portland, Oregon is illustrated below. Portland is about 9976 km (89.88°, 6198 miles) from the location of this earthquake.

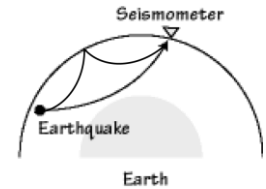


*Images adapted from Charles Ammon*



Following the earthquake, it took 12 minutes and 43 seconds (763 seconds) for the P waves to travel from the Vanuatu 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 17 seconds (977 seconds) after the earthquake.



The S waves started arriving 23 minutes and 25 seconds (1405 seconds) after the earthquake occurred. S waves are also body waves, but they travel as shear waves through the Earth's mantle. SS waves are S waves that bounce once off the Earth's surface between the epicenter and the recording seismometer. SS waves arrived 29 minutes and 26 seconds (1766 seconds) after the earthquake.

The surface waves traveled from the earthquake to Portland, Oregon 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 Vanuatu earthquake started arriving in Portland, Oregon about 38 minutes (2281 seconds) after the earthquake occurred.

