

# Magnitude 7.3 Earthquake Near Vanuatu

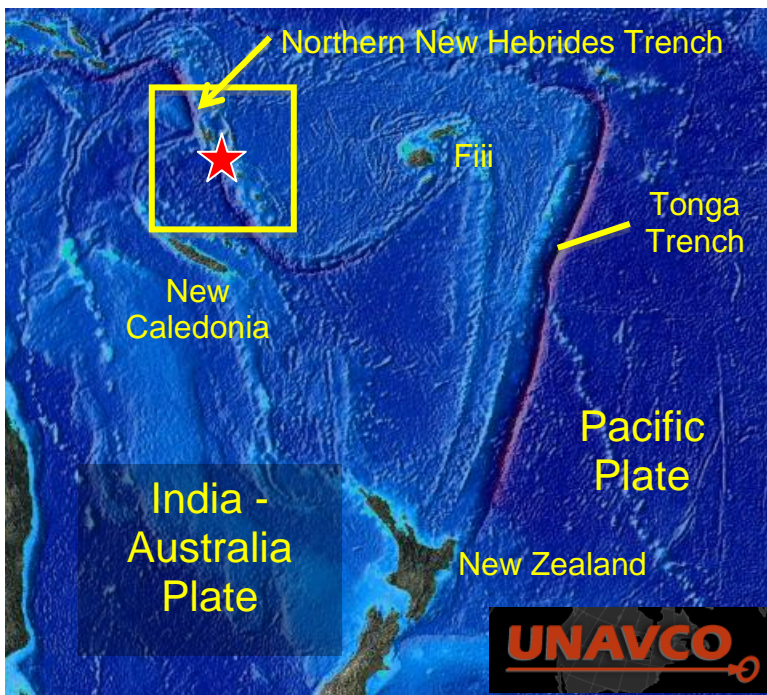
Tuesday, August 10, 2010 at 05:23:46 UTC  
Monday, August 9, 2010 at 10:23:46 PDT

Epicenter: Latitude 17.561°S, 168.028°E

Depth: 35 kilometers

As determined by the US Geological Survey National Earthquake Information Center (NEIC), a magnitude 7.3 earthquake occurred late Monday evening Portland time in the Northern New Hebrides Trench. At this trench, the northeastern corner of the India-Australia Plate subducts beneath the Pacific Plate (Map A on left). The 1990-to-present earthquake history within the yellow square of Map A is shown on Map B where the yellow star indicates the location of the M7.3 August 10 earthquake. This earthquake occurred just 35 km west-northwest of Port-Vila, Efaté, Vanuatu (Map B). The location and thrust-fault mechanism of the August 10 earthquake are consistent with this earthquake occurring on the plate boundary where the India-Australia Plate dives to the east-northeast beneath the Pacific Plate. This convergent plate boundary has been quite active during the past year with major earthquakes and volcanic eruptions. On October 7 2009, a sequence of three major earthquakes of magnitudes 7.6, 7.8, and 7.4 occurred within a 70-minute interval. Those events were about 500 km north-northwest along the Northern New Hebrides Trench from the M7.3 August 10 earthquake. As described on page 3 of this earthquake notice, this subduction zone is the site of recent and ongoing volcanic activity.

Map A



Map B

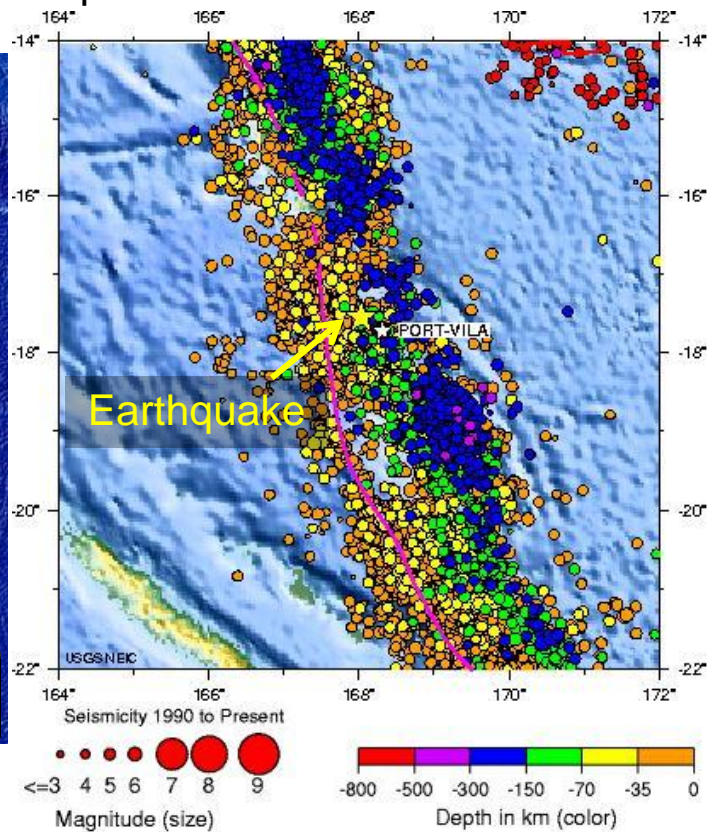
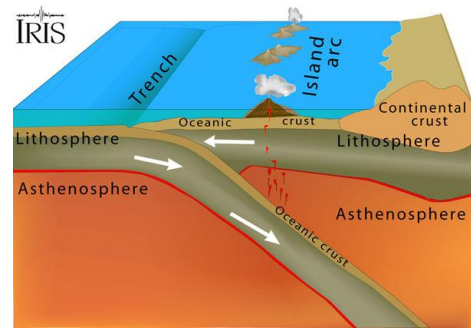


Image courtesy of the US Geological Survey

## Volcanoes of the Vanuatu Region

When one oceanic plate dives beneath another, an island arc is formed by the construction of overlying volcanoes parallel to the subduction zone (trench). The island chain of Vanuatu, with a half dozen active volcanoes, and submarine volcanoes typifies this process.

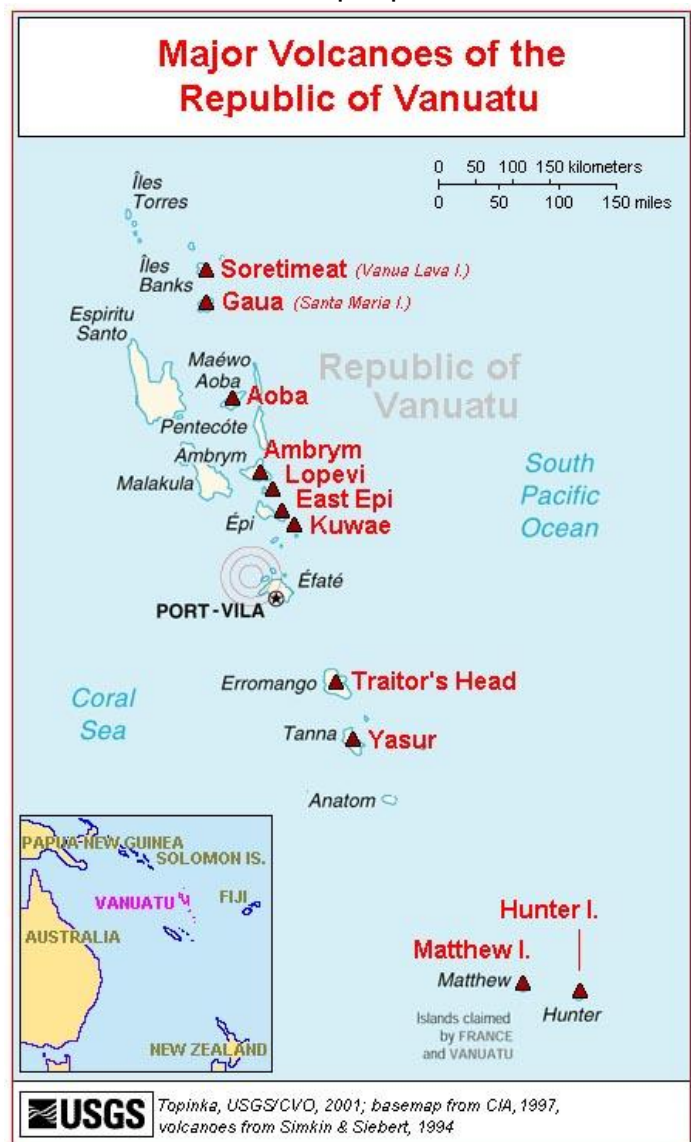


Subduction zones are particularly hazardous regions because of violent volcanoes and large earthquakes that sometimes produce tsunamis. The volcanoes produce fertile soils and scenic landscapes that attract large populations to their slopes. This combination of people, earthquakes, tsunamis, and volcanoes presents a major challenge for geologic hazards mitigation.

The 7.5M earthquake of August 10, 2010 occurred along the subduction zone northwest of Efaté, the most populous island in Vanuatu. The volcano on Efaté has not had historic eruptions, though any volcano that sits above a subduction zone should be considered potentially active.

Over the past few decades, seismologists, chiefly from New Zealand, have been monitoring Vanuatu for volcanic earthquakes. These earthquakes are of different character than the tectonic earthquakes that occur due to plate interaction. Volcanic earthquakes occur prior to an eruption and reflect the migration of magma from depth into a “plumbing system” beneath the volcano, cracking rock along the way.

- Kuwae, closest to the August 10, 2010 epicenter, was first observed in eruption during 1897, and last erupted in 1974.
- Epi erupted in 2004.
- Lopevi erupted in 2003.
- Aoba had steam and ash eruptions in 2005.
- Yasur, to the south, has had high levels of activity since the beginning of 2010. It erupted ash in early June and continued erupting into July.



The Global Volcanism Program is a collaboration between Smithsonian National Museum of Natural History and USGS. See: <http://www.volcano.si.edu/world/region.cfm?num=0507>

The record of the M7.3 Vanuatu earthquake on the University of Portland seismometer in Portland, Oregon is illustrated below. Portland is about 9850 km (88.69°) from the location of this earthquake. Following the earthquake, it took 12 minutes and 50 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 are expected to arrive 16 minutes and 18 seconds after the earthquake. The S waves started arriving 23 minutes 34 seconds 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, 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 at the in Portland, Oregon about 41 minutes after the earthquake occurred.

