

Magnitude 7.6 Earthquake in Kermadec Islands
Wednesday, July 6, 2011 at 19:03:16 UTC
(7:03:16 AM July 7, 2011 at epicenter)
Latitude 29.312°S, 176.204°W Depth: 20 km



Earthquake Summary:

A major earthquake occurred Wednesday near the Tonga – Kermadec Trench about 1185 km (736 miles) northeast of Auckland, New Zealand. As shown on the map on the left below, this earthquake occurred where the Pacific Plate bends into the trench to subduct below the eastern edge of the Australia Plate. The rate of convergence at the location of Wednesday’s earthquake is about 60 mm/yr (6 cm/yr).

The map below on the right shows earthquakes recorded from 1990 to present in this region with the July 7, 2011 earthquake shown as an orange star. The mechanism of this earthquake was normal faulting indicating that it was caused by extensional forces in the upper part of the Pacific Plate. Earthquakes that occur on the interface between converging plates at subduction zones are usually caused 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.

A regional tsunami warning was issued but no tsunami was observed and the warning was soon cancelled.

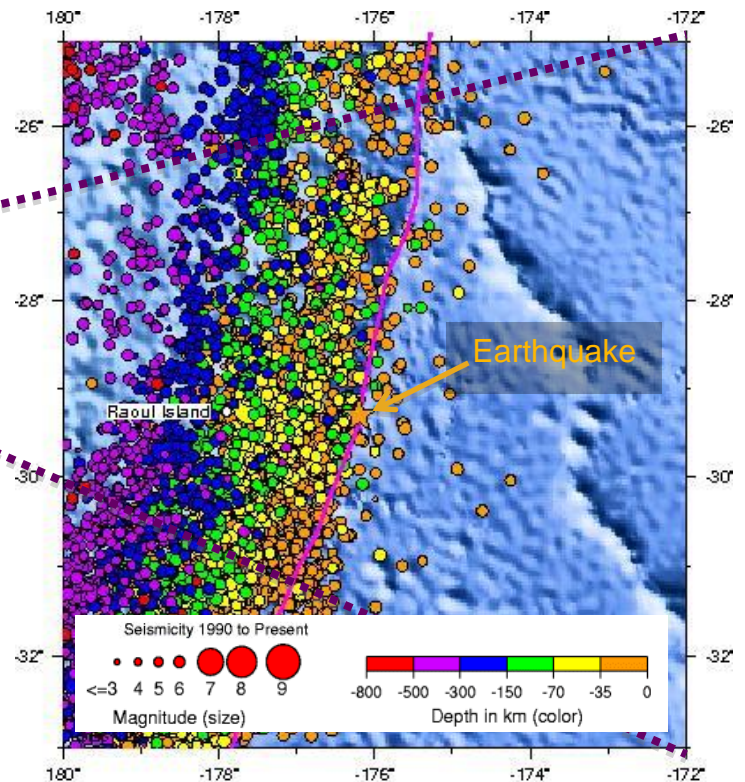
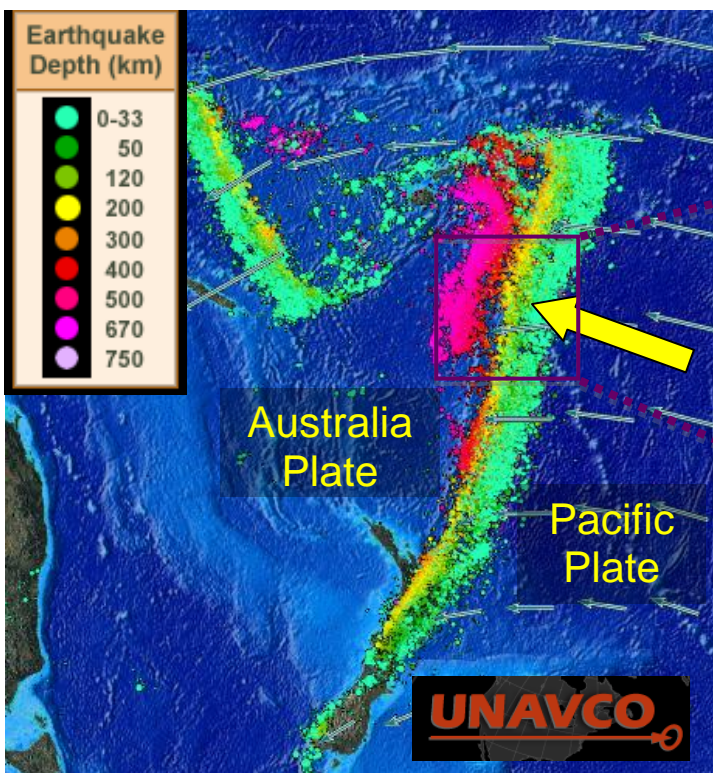
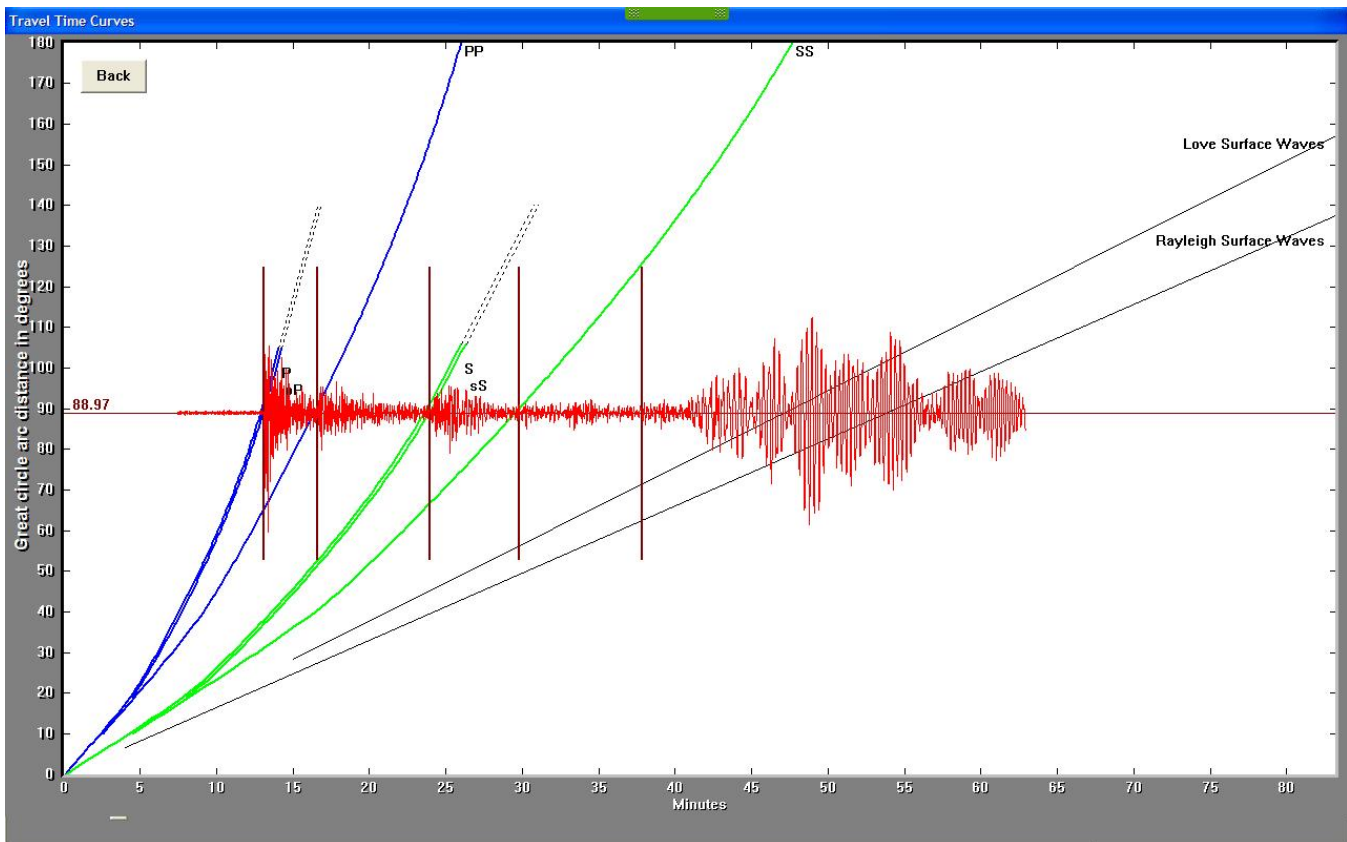


Image courtesy of the US Geological Survey

Seismogram Description:

The record of the Kermadec earthquake on the University of Portland seismometer is illustrated below. Portland is about 9873 km (6134 miles, 88.95 degrees) from the location of this earthquake. The waves labeled P, PP, S, and SS are “body” waves that traveled through the Earth’s mantle from the earthquake to Portland. P waves are compressional waves while S waves are shear waves. It took about 12 minutes and 53 seconds (773 seconds) for the P waves to travel from the earthquake to Portland while the slower S waves took about 23 minutes and 40 seconds (1420 seconds). The seismic wave labeled PP is a compressional wave that bounced once off the Earth’s surface midway between the earthquake and Portland. The SS wave is a shear wave that bounced at the midpoint between the earthquake and Portland. It took about 16 minutes and 22 seconds (982 seconds) for the PP waves to travel from the earthquake to Portland while the SS waves took about 29 minutes and 34 seconds (1774 seconds). 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 took about 37 minutes for the first surface waves to travel from the earthquake to Portland.



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