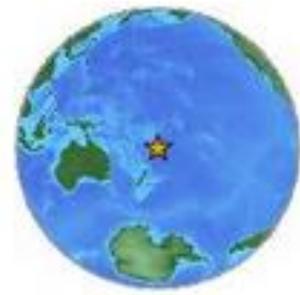


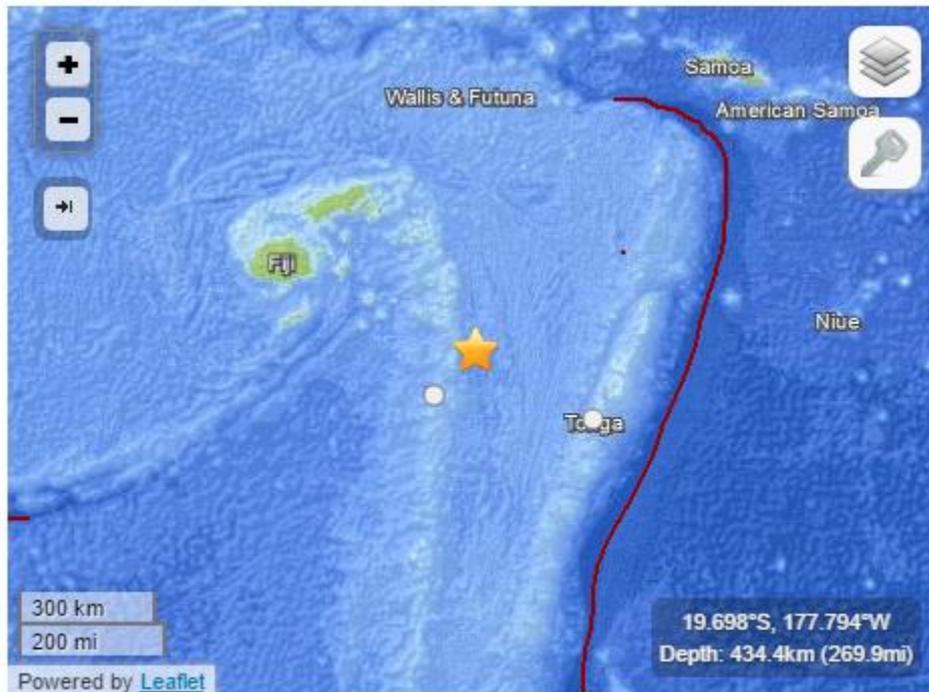
Magnitude 7.1 FIJI

Saturday, November 1, 2014 at 18:57:22 UTC



A magnitude 7.1 earthquake struck 141 km (88 miles) northeast of Ndoi Island, Fiji, and 313 km (194 mi) west-northwest of Nuku'alofa, Tonga according to the US Geological Survey, but there were no reports of damage.

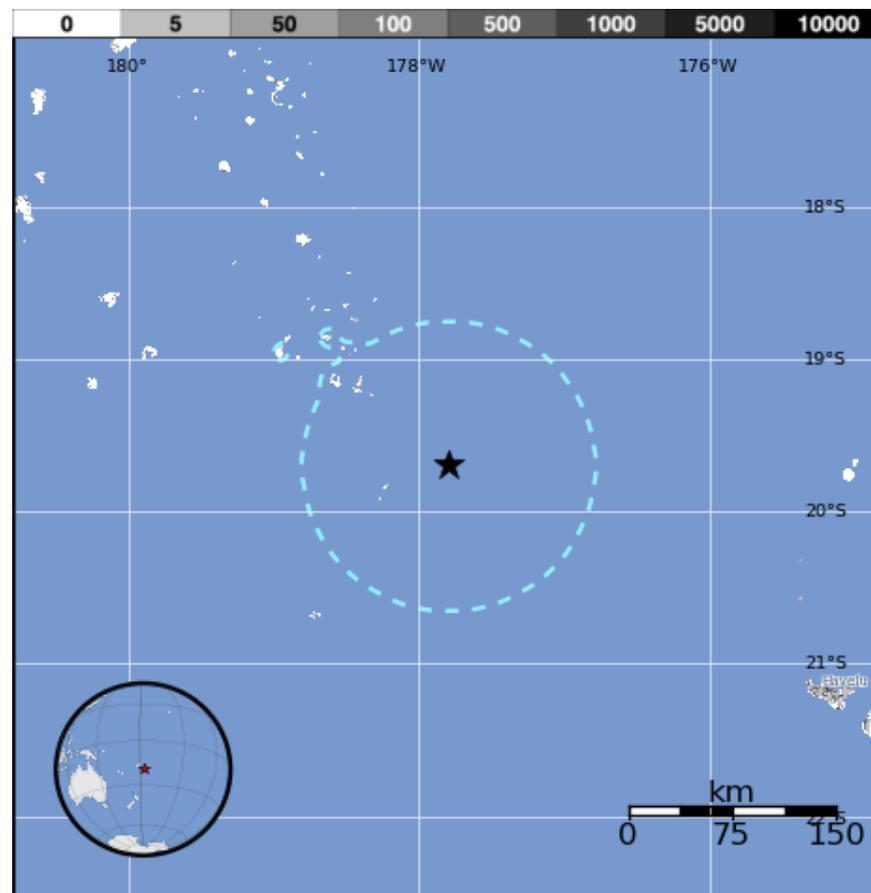
The earthquake hit at 11:57 am local time at a depth of 434.4 km (269.9 mi). Because of the quake's depth, no tsunami was expected.



The USGS estimates that 32,000 experienced light shaking from this earthquake.

The color coded contour lines outline regions of MMI intensity. The total population exposure to a given MMI value is obtained by summing the population between the contour lines. The estimated population exposure to each MMI Intensity is shown in the table below.

Image courtesy of the US Geological Survey

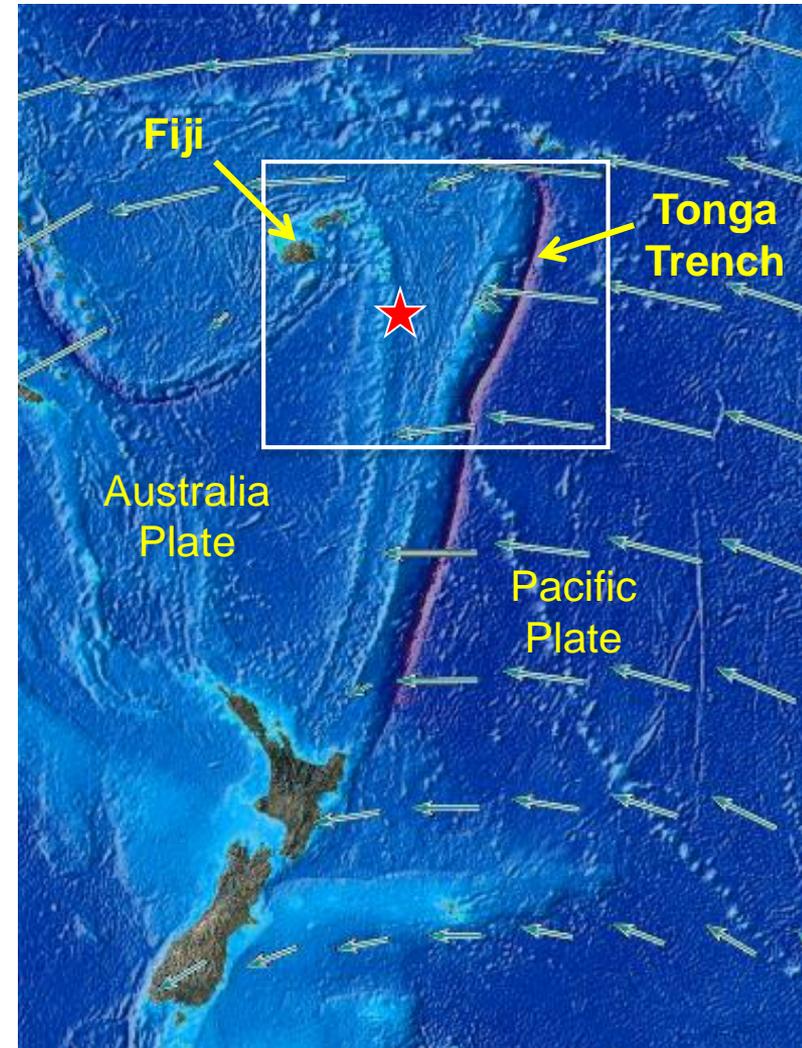


Estimated Modified Mercalli Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X
Est. Population Exposure	–*	72k*	32k	0k	0k	0k	0k	0k	0k
Perceived Shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme

The blue arrows show the motion of the Pacific Plate with respect to the Australia Plate. The epicenter of the earthquake is shown by the red star while the white square outlines the area of historic seismicity shown on the next slide.

This earthquake occurred within the Pacific Plate where it subducts beneath the Australia Plate at this ocean – ocean convergent plate boundary.

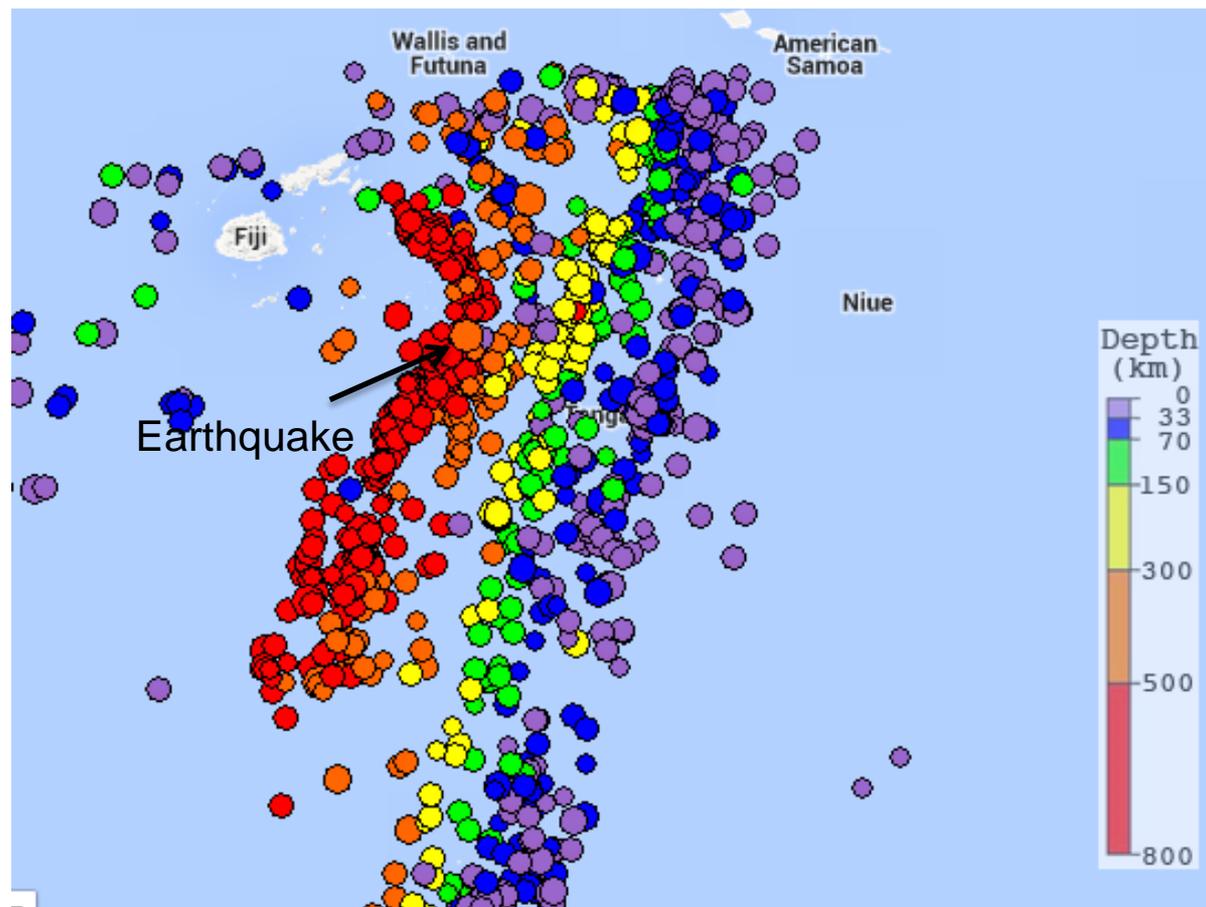
The rate of convergence at the location of this earthquake is about 70 mm/yr (7 cm/yr). Notice that the rate and direction of motion of the Pacific Plate change with distance north from New Zealand. These changes remind us that lithospheric plate motions are actually relative rotations of spherical shells along Earth's surface rather than linear motions of flat plates.



Regional historical seismicity in the northern Tonga Trench is shown on the map below with earthquakes color coded by depth.

Notice that earthquakes are shallow near the Tonga Trench on the east side of the map area. As the Pacific Plate subducts towards the west beneath the Australian Plate, earthquakes within the Pacific Plate increase in depth from east to west.

This earthquake occurred within the subducting Pacific plate and fits this general depth pattern.



Worldwide Earthquakes >M5 Located by the NEIC Since 1990

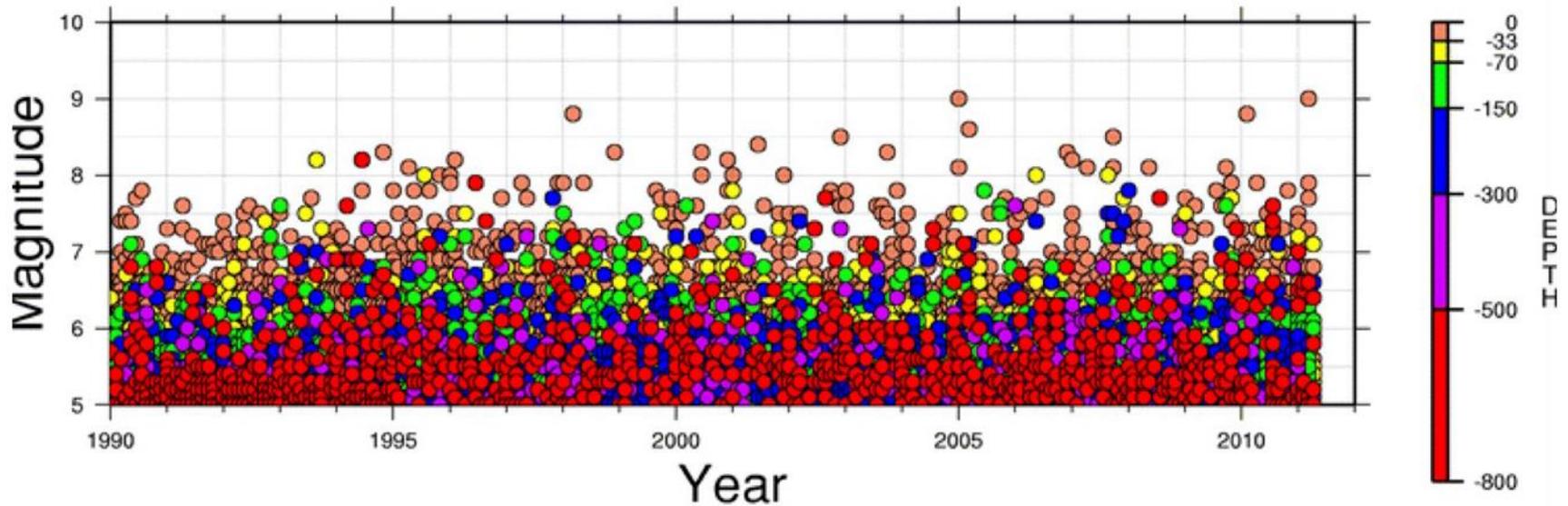


Image courtesy of the US Geological Survey

- Most magnitude 8 and 9 earthquakes are shallow subduction zone earthquakes (for example: Japan 2011 or Sumatra 2004 megathrust earthquakes)
- The majority of earthquakes deeper than 70 km depth are magnitude 5 and 6 events.
- Deep earthquakes occur within cold subducting oceanic plates. Eventually subducting oceanic plates warm as they penetrate deeper into Earth's mantle. As the plates warm, they become viscoelastic and are no longer brittle enough to produce earthquakes. So with greater depth, a smaller portion of a subducting plate is cold enough to be brittle and capable of producing deep earthquakes. This smaller volume of brittle rock accounts for the general observation that deeper earthquakes are generally smaller magnitude events. However, magnitude 7 and 8 deep earthquakes do exist and present challenges to understanding the geodynamics of subducting oceanic plates.

Magnitude 7.1 FIJI

Saturday, November 1, 2014 at 18:57:22 UTC

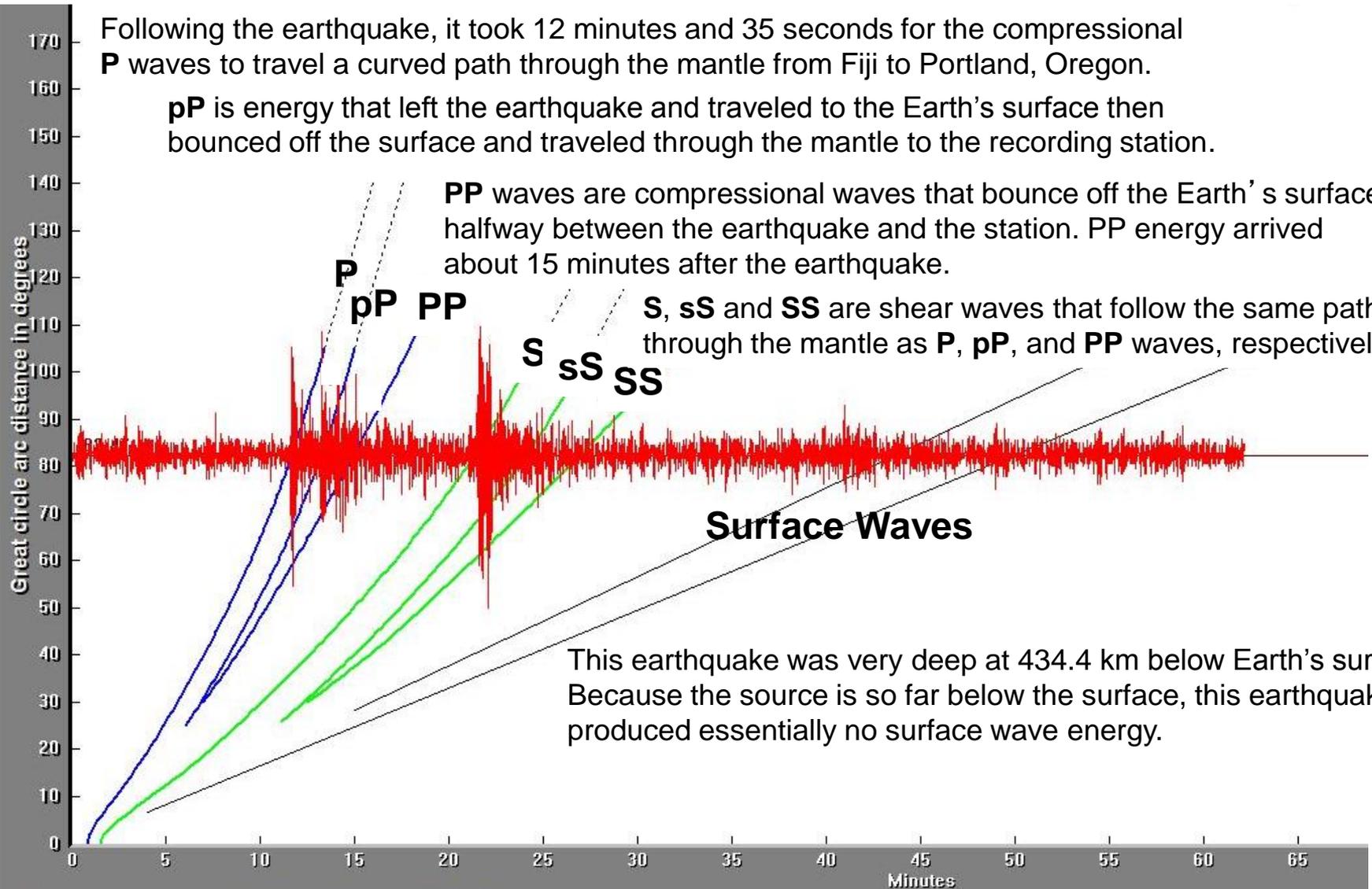
The record of the earthquake on the University of Portland seismometer (UPOR) is illustrated below. Portland is 9392 km (5835 miles, 84.62°) from the location of this earthquake.

Following the earthquake, it took 12 minutes and 35 seconds for the compressional **P** waves to travel a curved path through the mantle from Fiji to Portland, Oregon.

pP is energy that left the earthquake and traveled to the Earth's surface then bounced off the surface and traveled through the mantle to the recording station.

PP waves are compressional waves that bounce off the Earth's surface halfway between the earthquake and the station. PP energy arrived about 15 minutes after the earthquake.

S, **sS** and **SS** are shear waves that follow the same paths through the mantle as **P**, **pP**, and **PP** waves, respectively.



This earthquake was very deep at 434.4 km below Earth's surface. Because the source is so far below the surface, this earthquake produced essentially no surface wave energy.

Teachable Moments are a service of

IRIS Education & Public Outreach
and
The University of Portland

