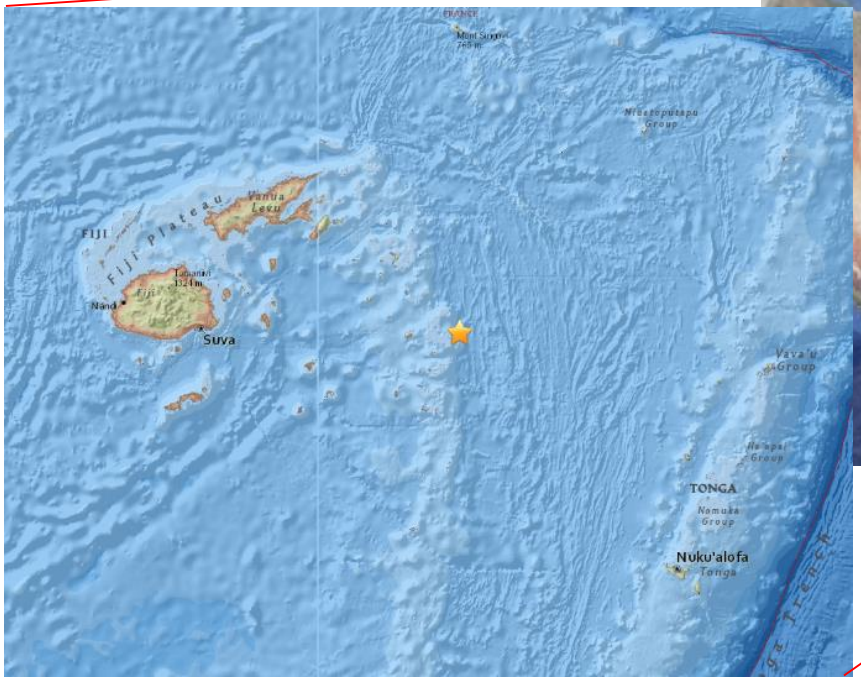
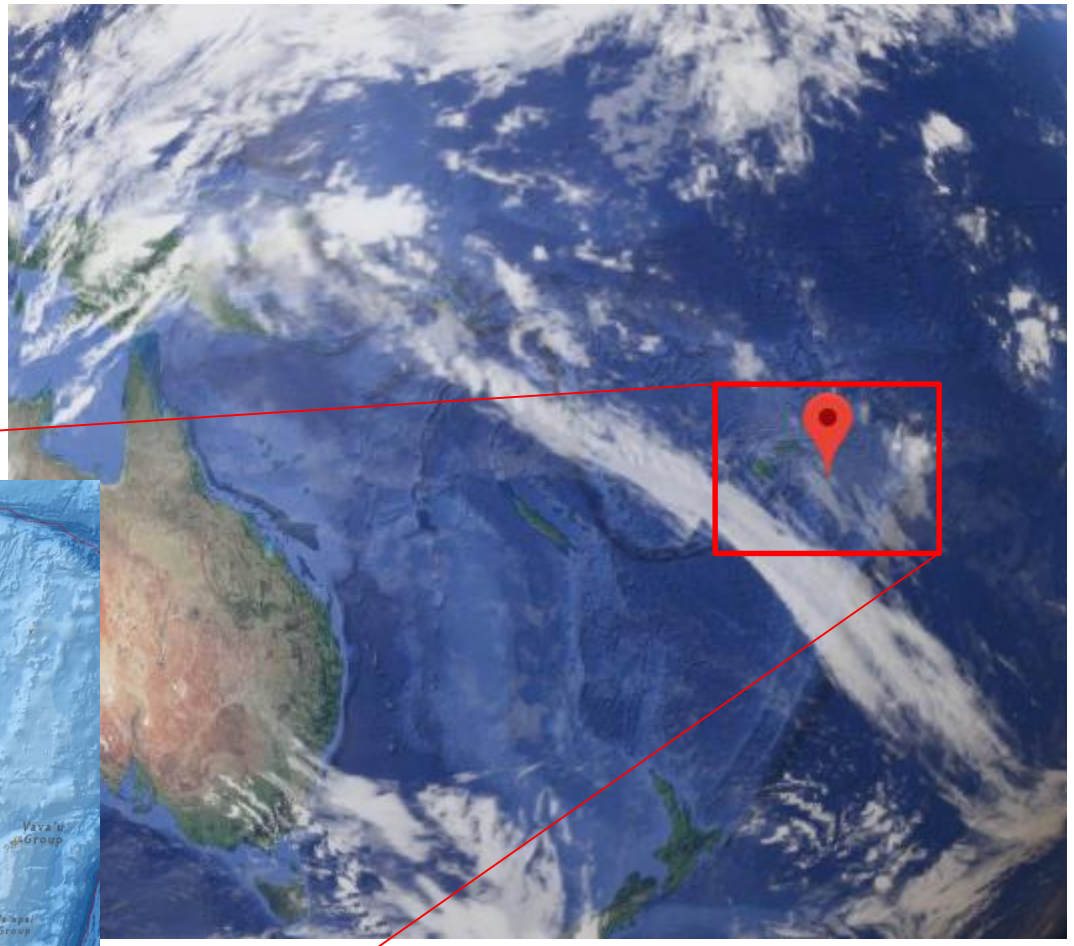
Magnitude 8.2 FIJI
Sunday, August 19, 2018 at 00:19:37 UTC

A magnitude 8.2 earthquake occurred 364.8 km (226.7 mi) E of Suva, Fiji at a depth of 563.4 km (350 miles).

There is no risk of a tsunami from an earthquake at this depth.





Images courtesy of Google

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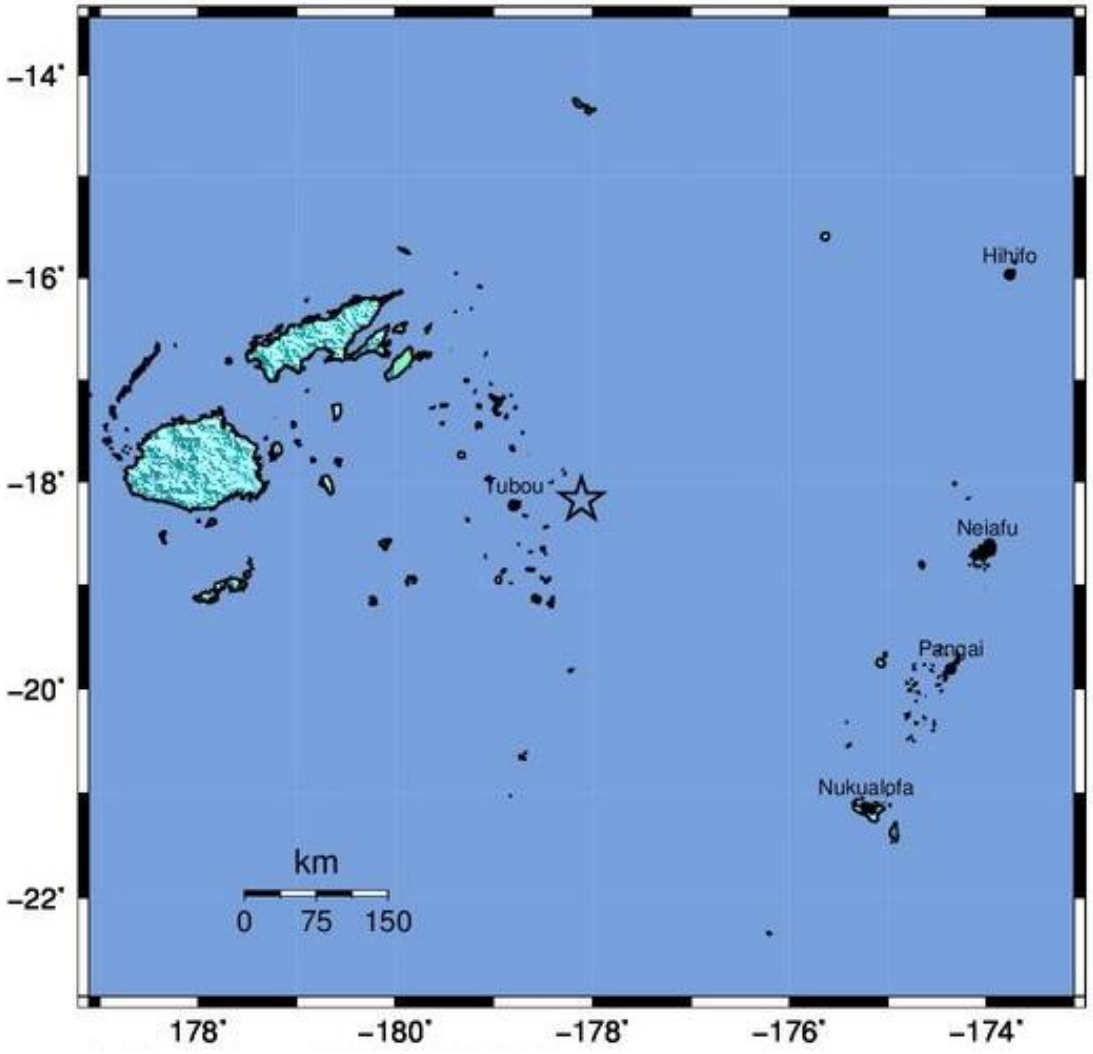
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking.

Due to the depth of 563.4 km (350 miles), the area nearest the earthquake experienced only light shaking.

Modified Mercalli Intensity	Perceived Shaking
X	Extreme
IX	Violent
VIII	Severe
VII	Very Strong
VI	Strong
V	Moderate
IV	Light
II-III	Weak
I	Not Felt

Image courtesy of the US Geological Survey



USGS Estimated shaking Intensity from M 8.2 Earthquake

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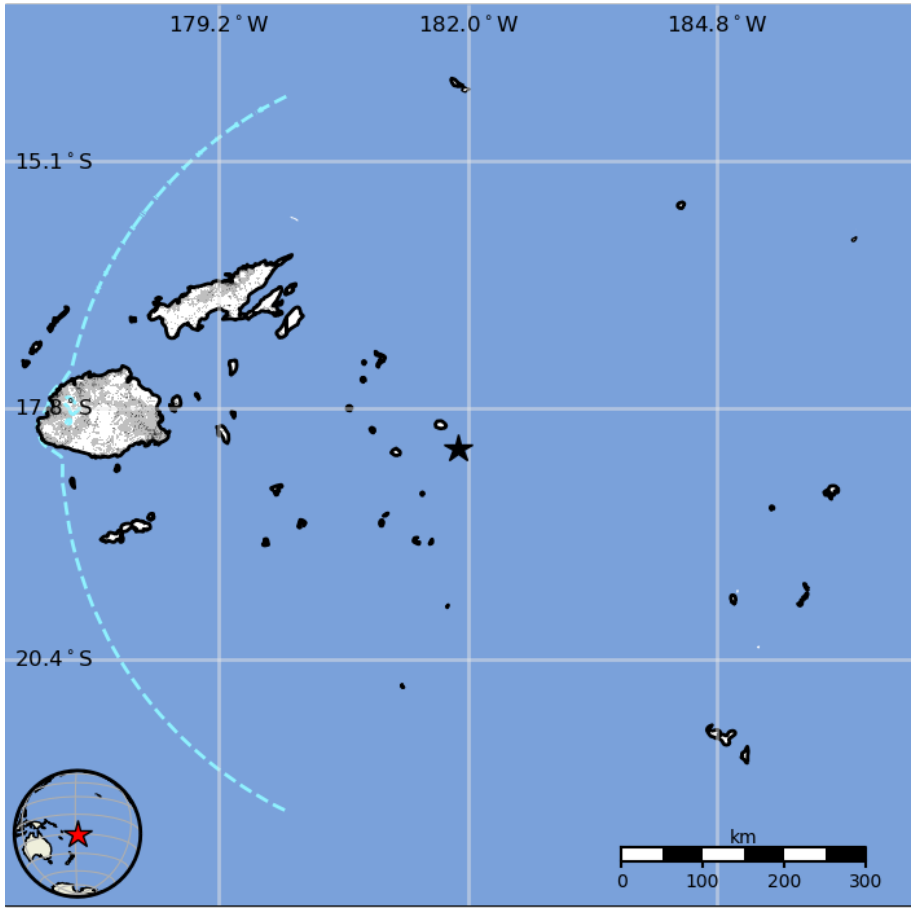
USGS PAGER
Population Exposed to Earthquake Shaking

The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that over 1 million people felt light shaking from this earthquake.

MMI	Shaking	Pop.
I	Not Felt	--*
II-III	Weak	20 k*
IV	Light	1,011 k
V	Moderate	2 k
VI	Strong	0 k
VII	Very Strong	0 k
VIII	Severe	0 k
IX	Violent	0 k
X	Extreme	0 k



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.

Image courtesy of the US Geological Survey

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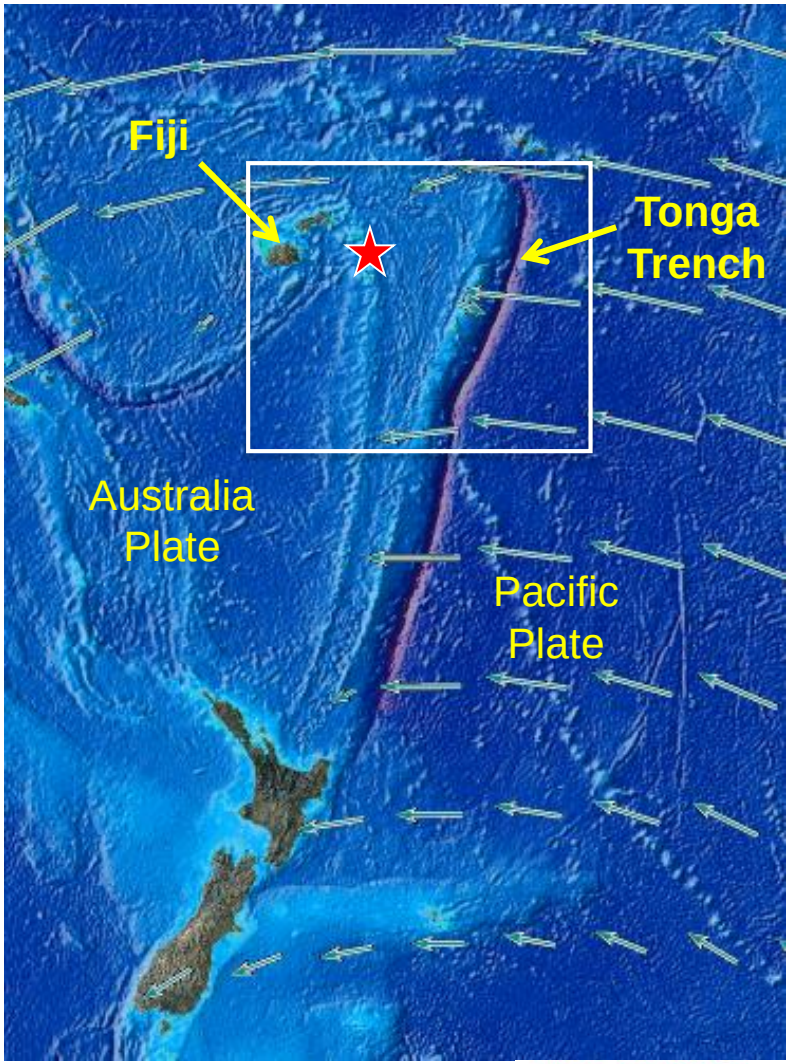
The blue arrows show the motion of the Pacific Plate with respect to the Australia Plate. The epicenter of the earthquake is shown by the red star while the white square outlines the area of historic seismicity shown on the next slide.

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 80 mm/yr (8 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.



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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.

See a 3-D view on the next slide.

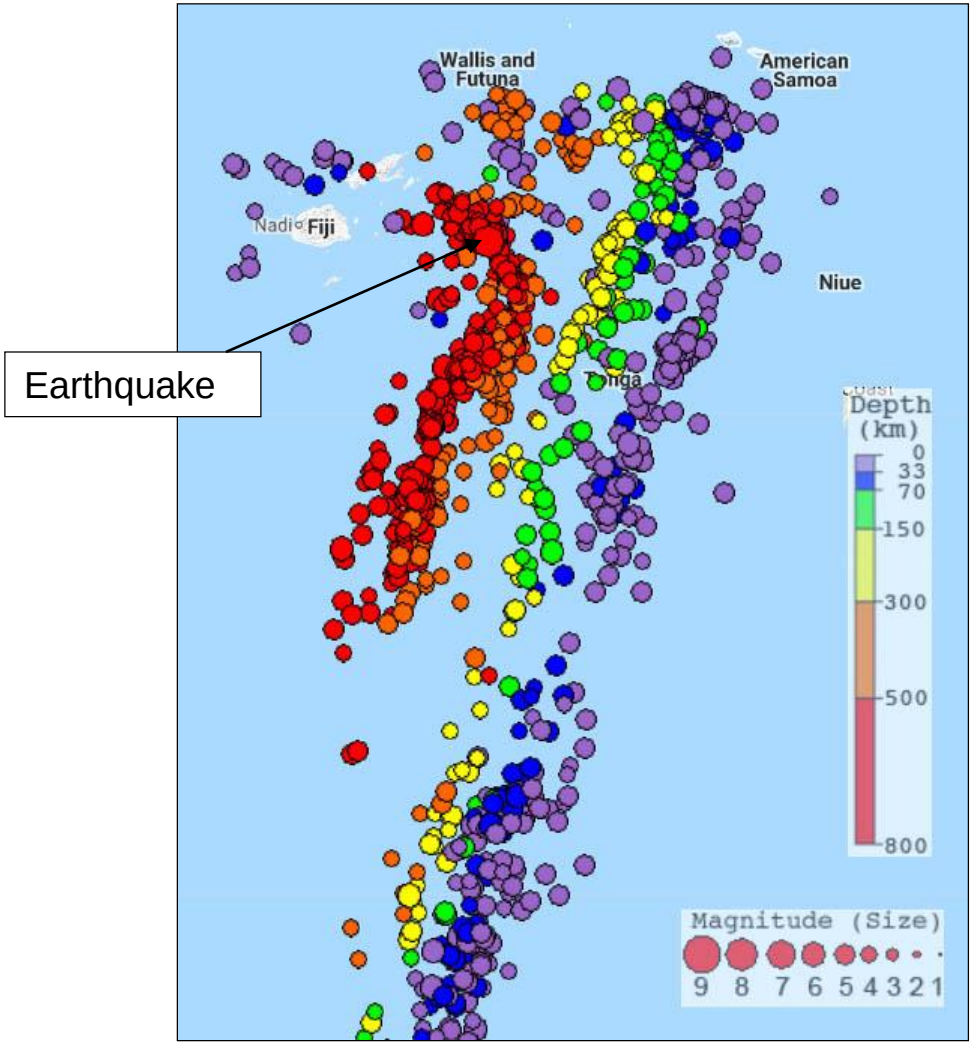

Image from IRIS Earthquake Browser http://www.iris.edu/ieb

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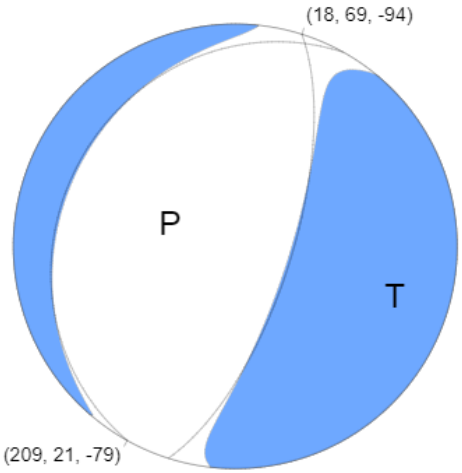
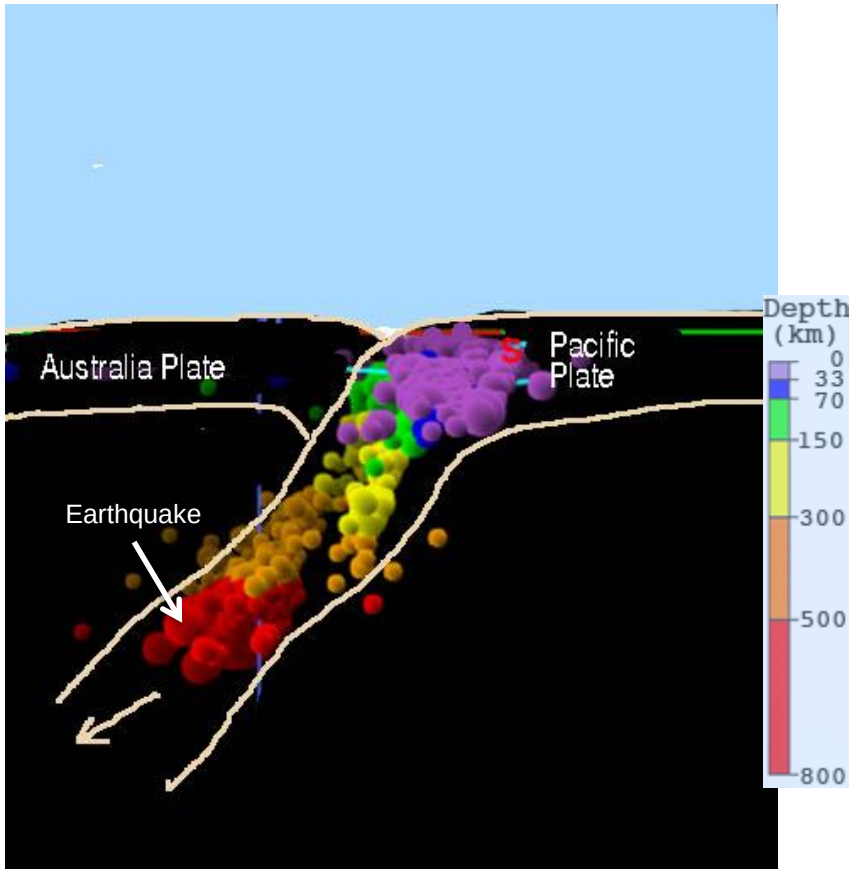
A deep-focus earthquake has a hypocenter depth exceeding 300 km. Deep earthquakes occur exclusively within subducting oceanic lithosphere, especially within old oceanic lithosphere that is subducting rapidly.

The physical mechanism of rupture of deep focus earthquakes is different than earthquakes that occur at a shallow depth. This earthquake occurred within the subducting Pacific Plate.



USGS Centroid Moment Tensor Solution



This modified screen capture from the 3-D feature of IRIS' Earthquake Browser shows a cross sectional view from the earthquakes on the previous slide.

Image from IRIS Earthquake Browser http://www.iris.edu/ieb

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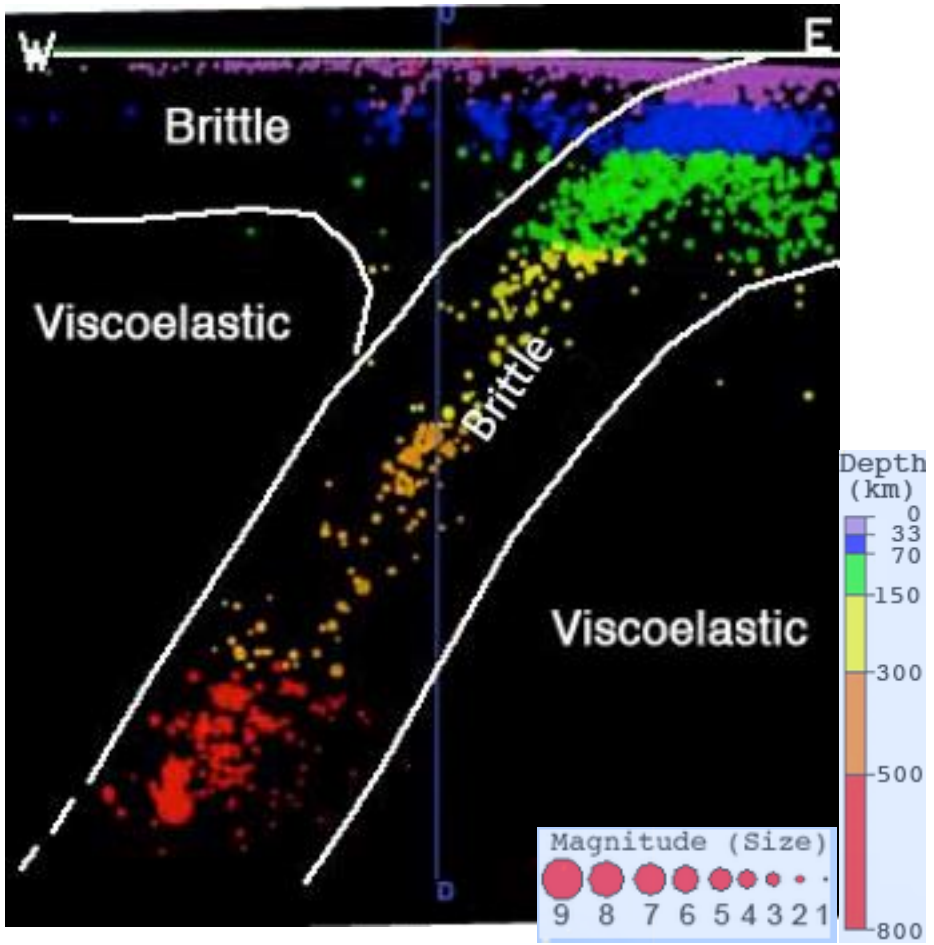
To produce earthquakes, rocks must be brittle. Brittle rock accumulates elastic energy as they bend then rapidly releases that energy during earthquake rupture.

With the exception of subducting oceanic plates, rock in Earth's mantle below about 100 km depth is viscoelastic and cannot rupture to produce earthquakes. Rocks are brittle at low temperatures but become viscoelastic when they reach temperatures of about 600° C.

Rapidly subducting cool oceanic plates, however, can remain brittle up to about 700 km in the hot mantle. The deepest earthquakes are thought to be due to phase changes of minerals in the high pressure and temperature conditions at those depths.



Exploring a three-dimensional view from the IRIS Earthquake Browser.

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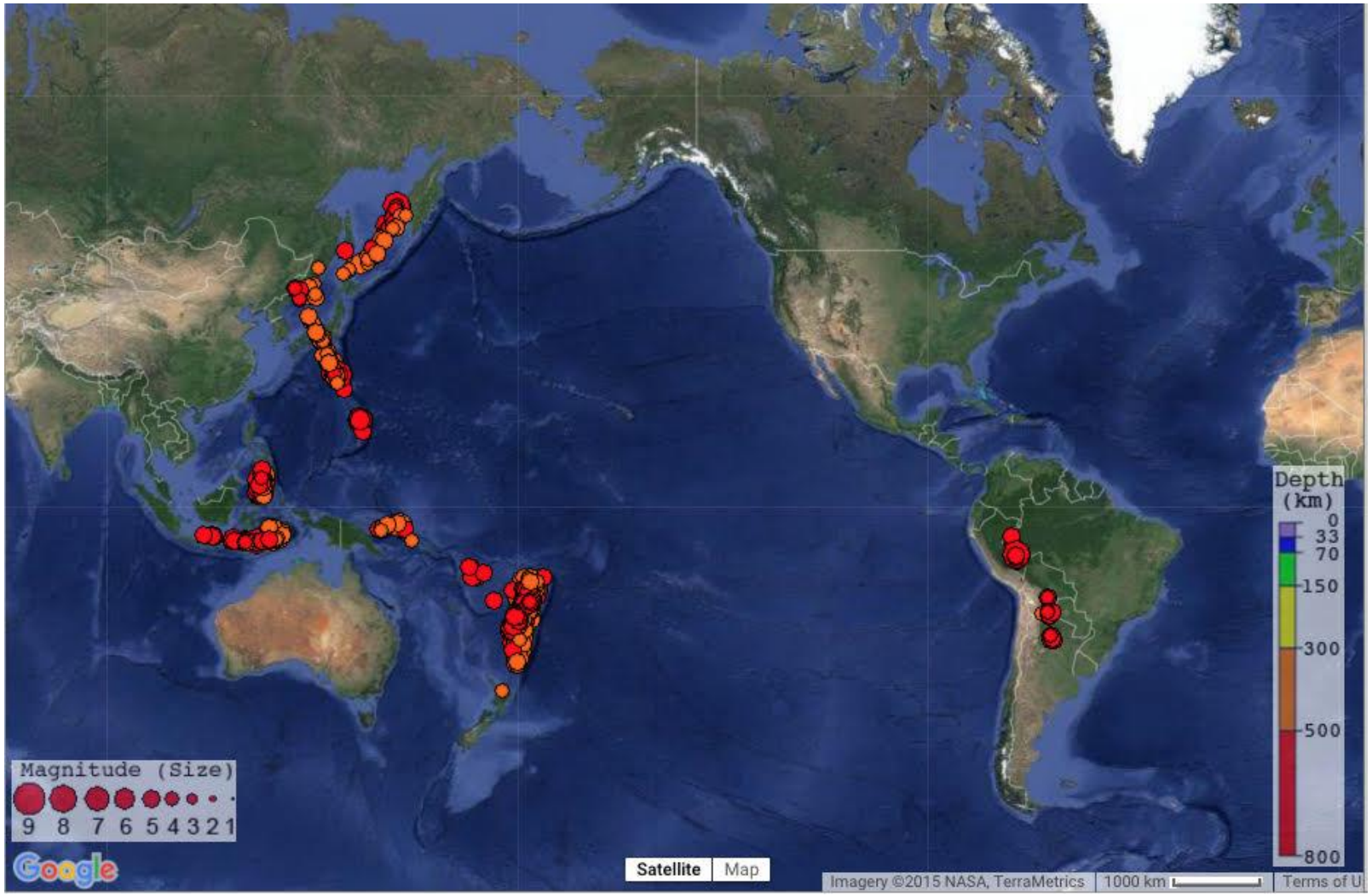
Locations where these deep large earthquake occur.



Map created using the IRIS Earthquake Browser: *www.iris.edu/ieb*

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Worldwide Earthquakes >M5 Located by the NEIC Since 1990

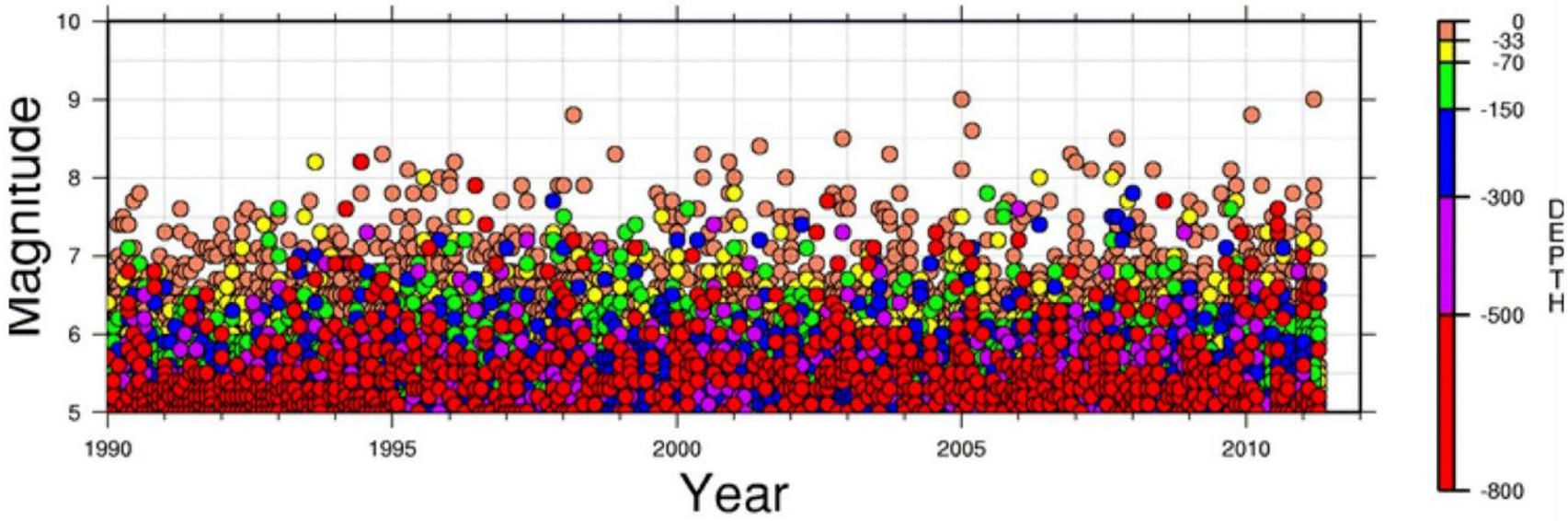

Image courtesy of the US Geological Survey

- 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.

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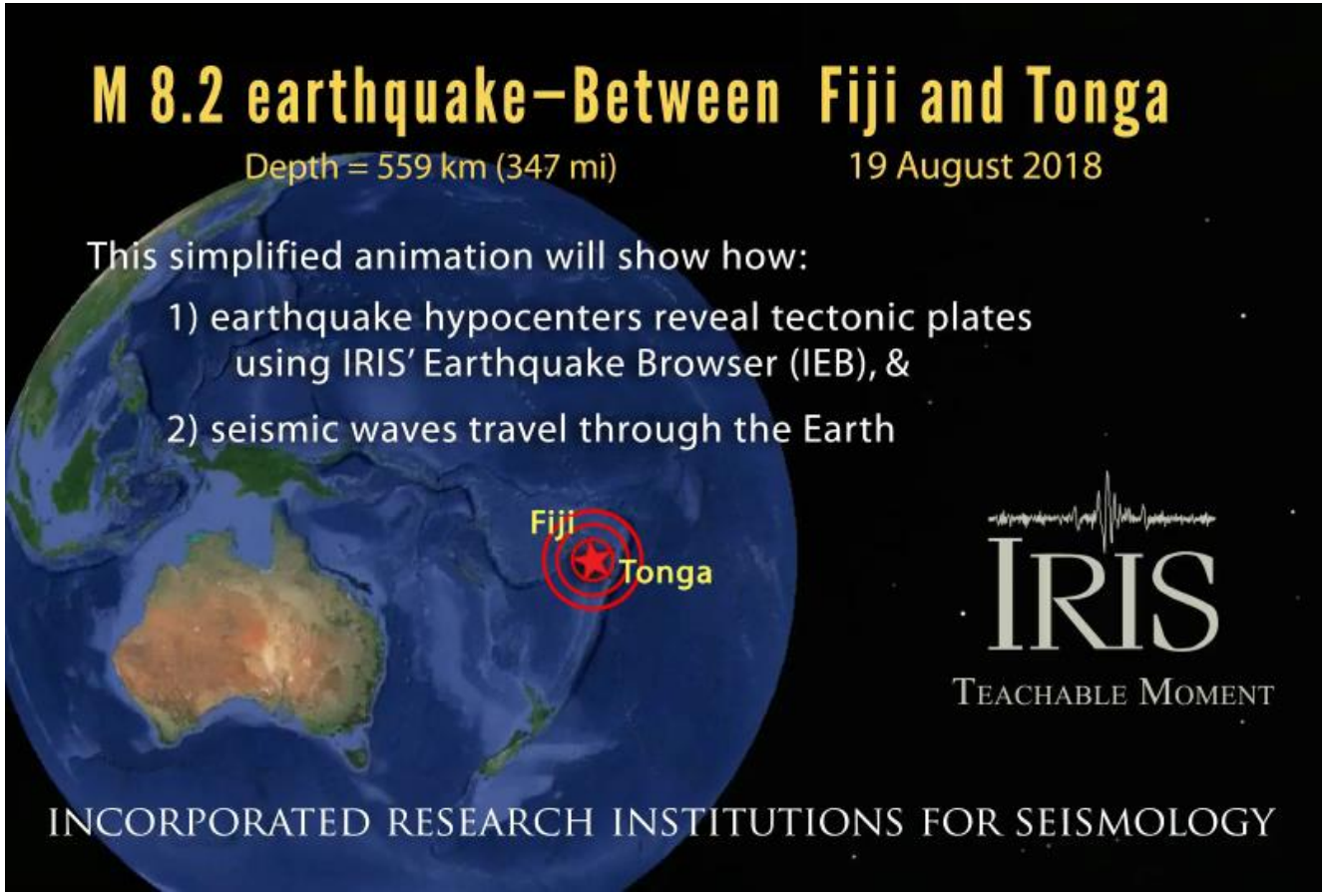
Regional tectonics of this earthquake (click for animation).



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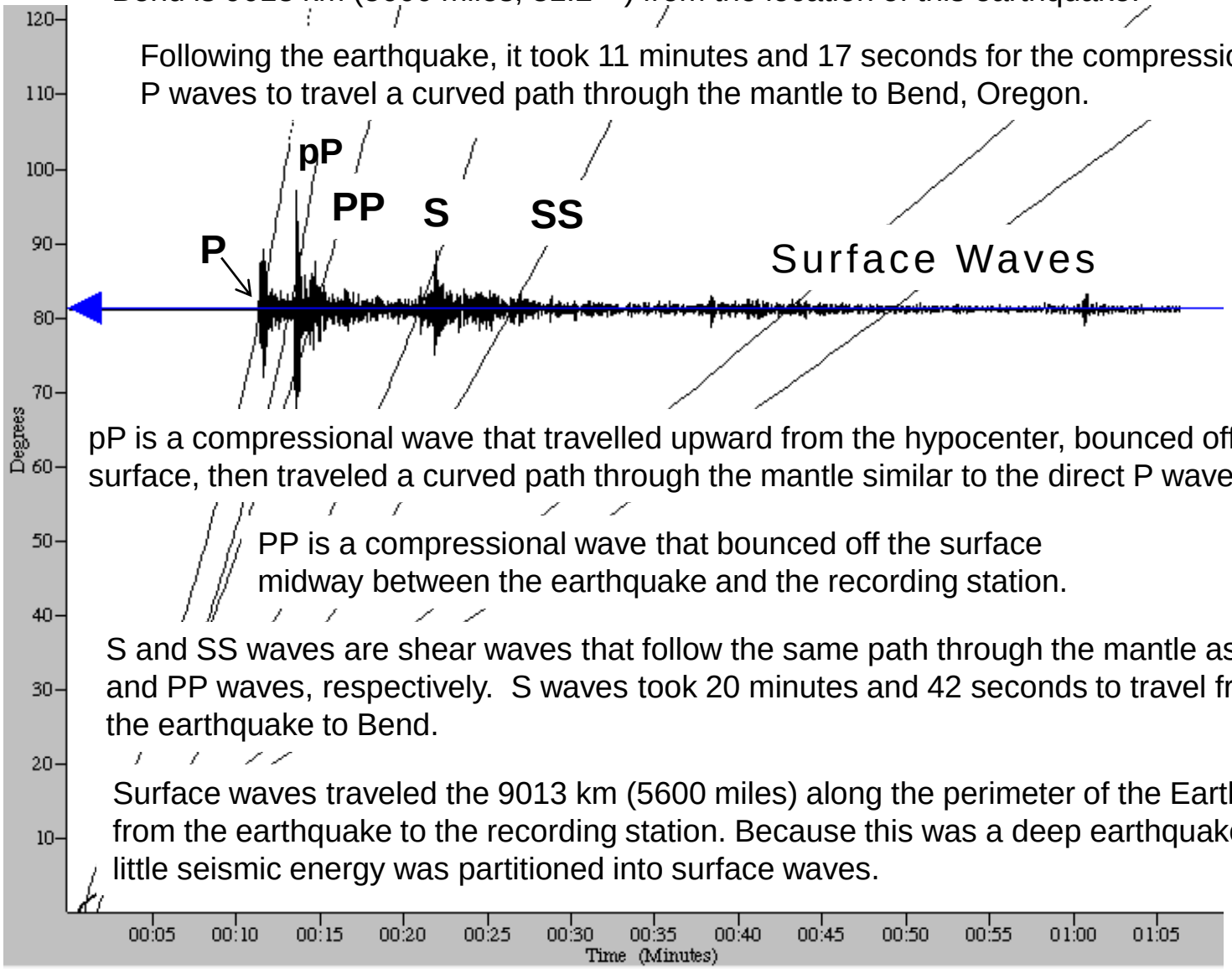
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 9013 km (5600 miles, 81.2˚) from the location of this earthquake.

Following the earthquake, it took 11 minutes and 17 seconds for the compressional P waves to travel a curved path through the mantle to Bend, Oregon.



pP is a compressional wave that travelled upward from the hypocenter, bounced off the surface, then traveled a curved path through the mantle similar to the direct P wave.

PP is a compressional wave that bounced off the surface midway between the earthquake and the recording station.

S and SS waves are shear waves that follow the same path through the mantle as P and PP waves, respectively. S waves took 20 minutes and 42 seconds to travel from the earthquake to Bend.

Surface waves traveled the 9013 km (5600 miles) along the perimeter of the Earth from the earthquake to the recording station. Because this was a deep earthquake, little seismic energy was partitioned into surface waves.

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