Magnitude 7.9 BOUGAINVILLE REGION, PAPUA NEW GUINEA

Sunday, January 22, 2017 at 04:30:23 UTC

A magnitude 7.9 earthquake occurred 40 kilometers (24 miles) west of the town of Panguna, at an intermediate depth (136 km, 84.5 miles) beneath the island of Bougainville, Papua New Guinea.

In early reports there are no casualties, but there was damage in parts of central Bougainville and the major town of Arawa.

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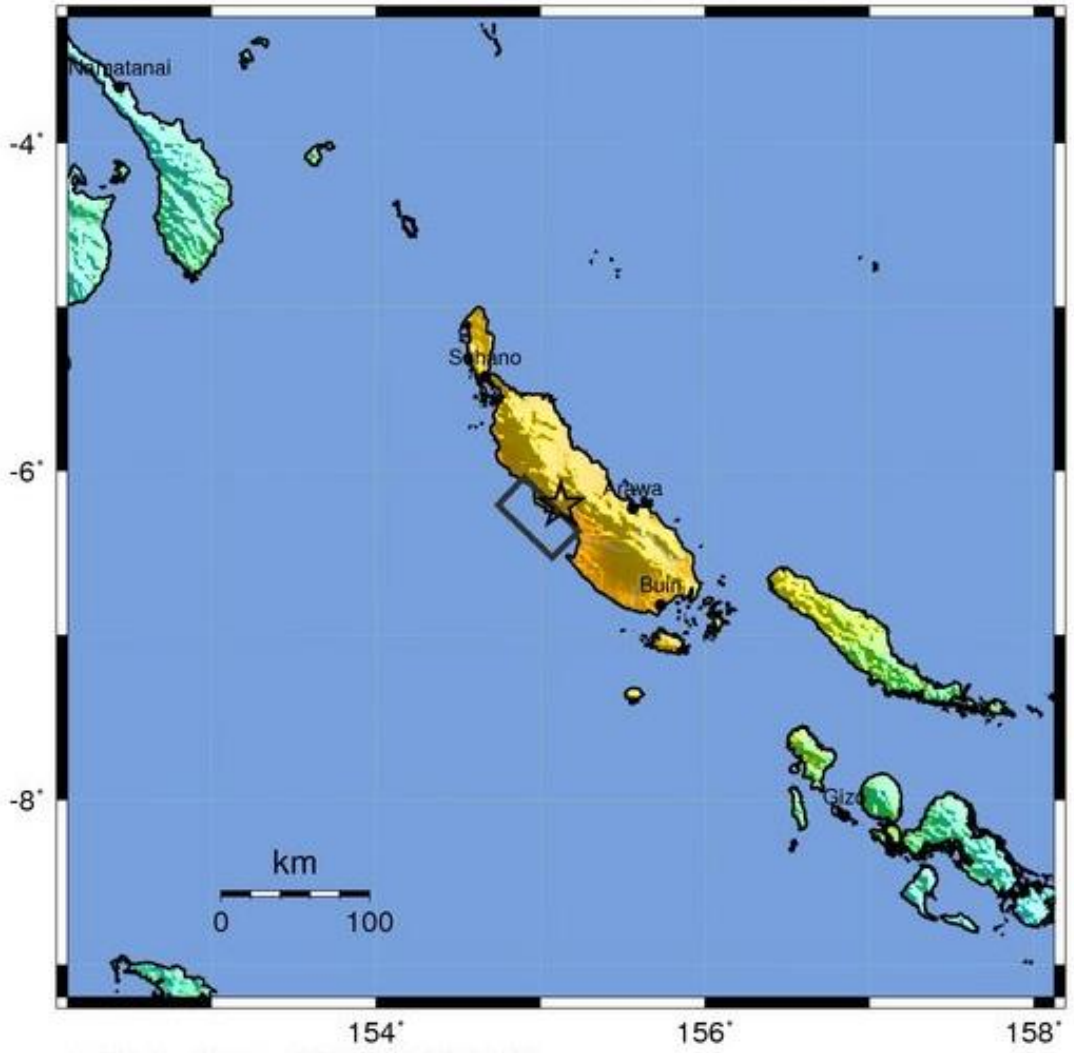
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking.

The nearest islands experienced moderate to very strong shaking from this earthquake.

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 7.9 Earthquake

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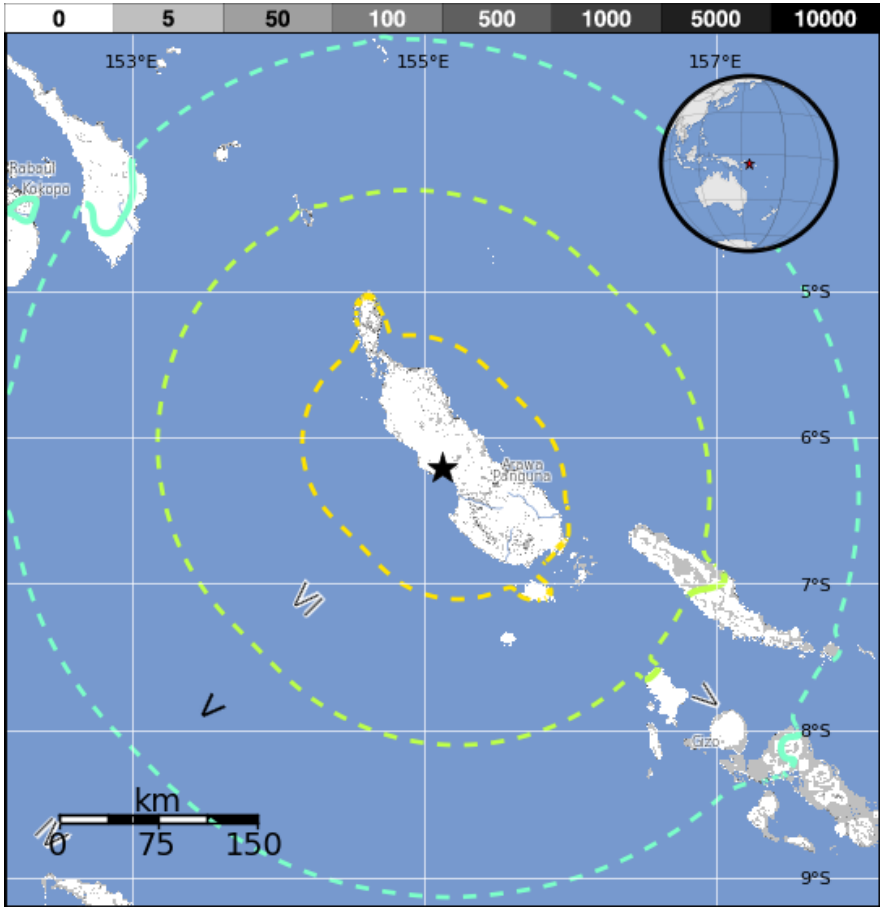
USGS PAGER

Population Exposed to Earthquake Shaking

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

2,000 people were exposed to severe shaking while 210,000 experienced very strong shaking from this earthquake.

MMI	Shaking	Pop.
I	Not Felt	--*
II-III	Weak	--*
IV	Light	192 k*
V	Moderate	118 k
VI	Strong	42 k
VII	Very Strong	210 k
VIII	Severe	2 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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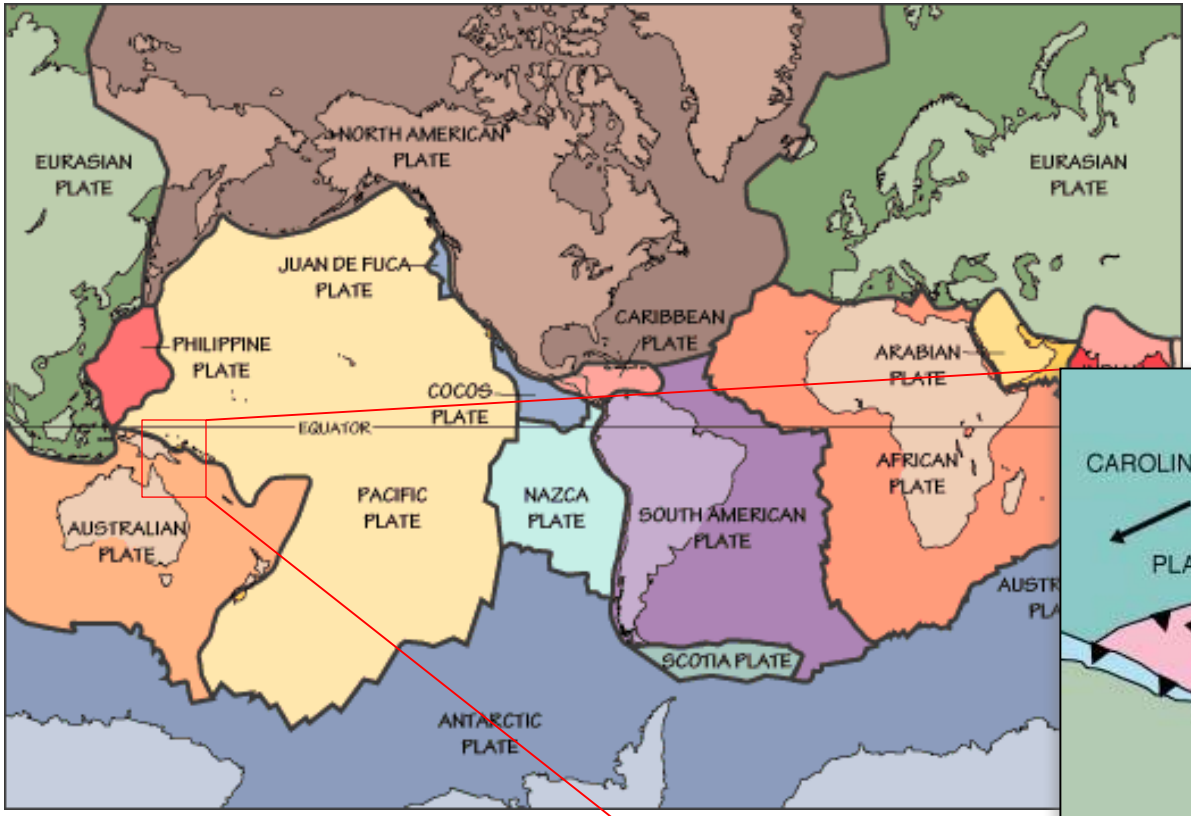
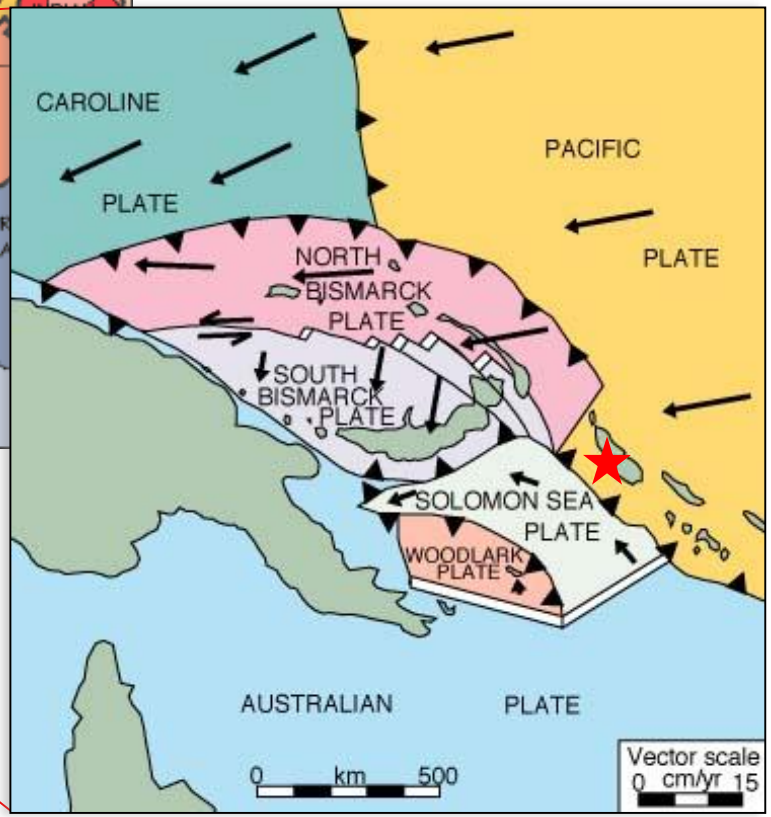
IRIS Teachable Moments



The NE part of the Australian Plate is broken into microplates that accommodate its convergence with the Pacific Plate. Arrows on the map below show net motions relative to the Australian Plate. The red star shows the location of the January 22, 2017 M7.9 earthquake.



Seafloor spreading between the Solomon Sea microplate and the Australian Plate rotates the Solomon Sea microplate slowly counterclockwise. The Pacific Plate moves rapidly westward toward the Australian Plate. Resulting convergence between the Solomon Sea microplate and Pacific Plate produces the subduction zone where the Solomon Sea microplate dives beneath the Pacific Plate. This earthquake occurred within the subducting Solomon Sea microplate at a depth of 136 km (84 miles).

Image courtesy OSU; simplified from Hamilton (1979)

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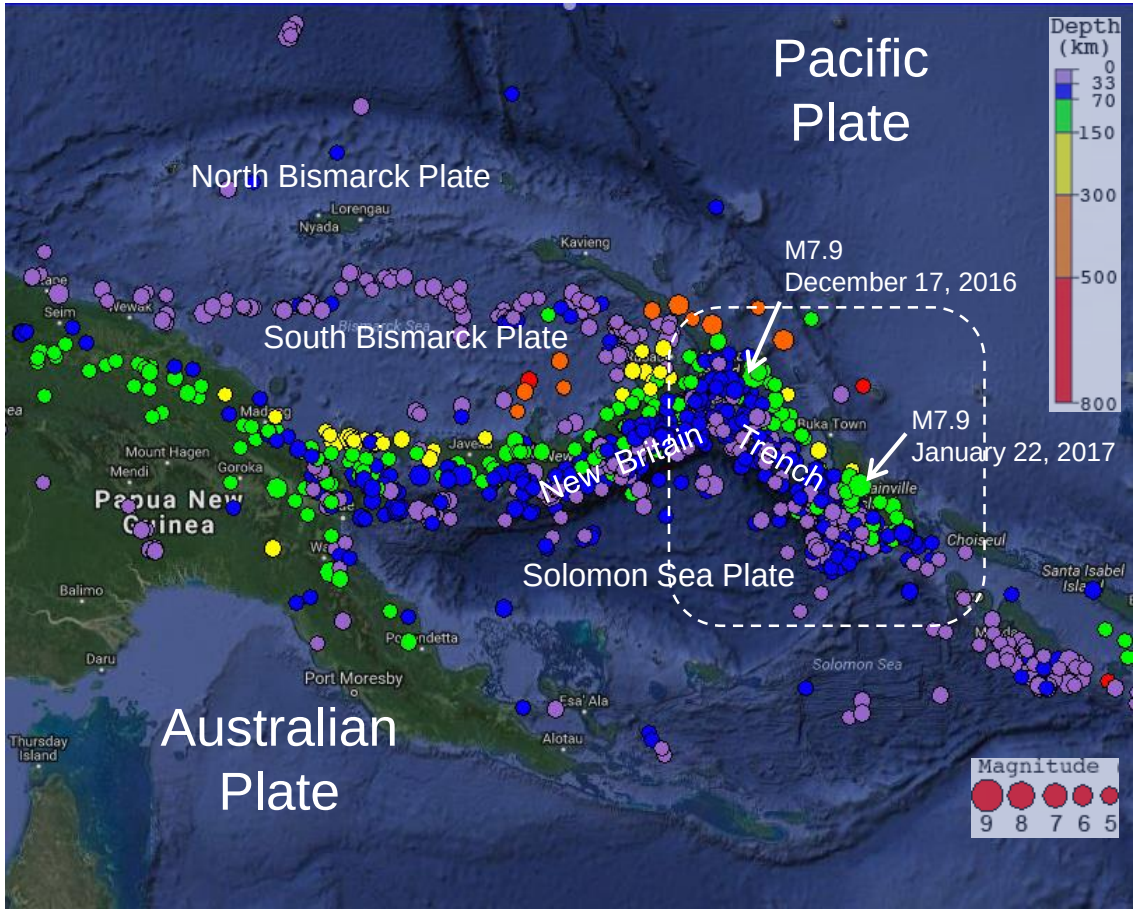
This seismicity map covers the same region as the microplate tectonic map of the previous slide. Locations of the most recent 1000 earthquakes of magnitude (M) ≥ 5 are shown.

Locations of two M7.9 earthquakes that occurred on December 17, 2016 and on January 22, 2017 are labeled. Earthquake depths increase from southwest to northeast across the New Britain Trench where the Solomon Sea microplate subducts beneath the much larger Pacific Plate.

A cross section of seismicity within the area outlined by the dashed square is shown on the next slide.



Map created with the IRIS Earthquake Browser

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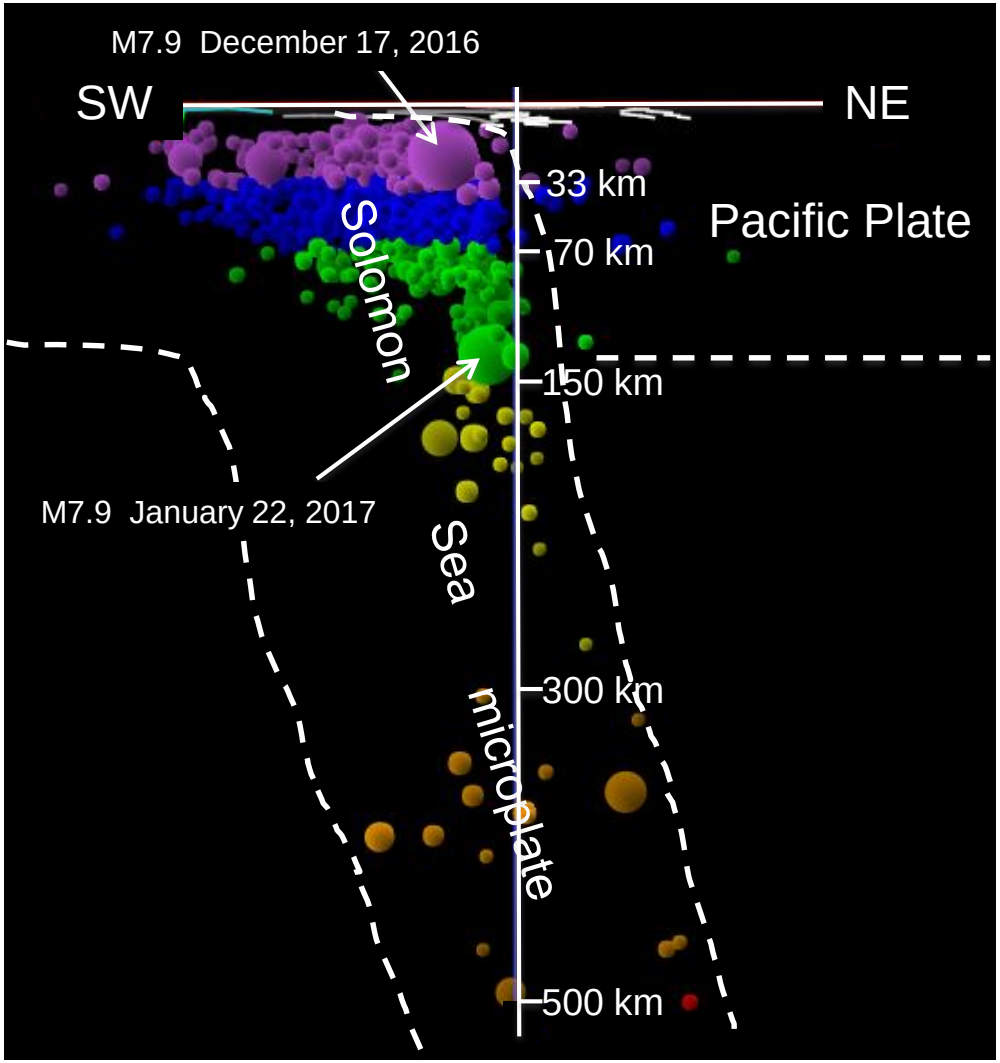
The cross section on the right is oriented from southwest to northeast approximately perpendicular to the orientation of the subduction zone between the Solomon Sea microplate and the Pacific Plate.

Locations of two M7.9 earthquakes that occurred on December 17, 2016 and on January 22, 2017 are labeled. The approximate outlines of the Solomon Sea microplate and the Pacific Plate are indicated by dashed lines.

Earthquakes down to 500 km depth occur within the subducting Solomon Sea microplate. With a depth of 136 km and a thrust fault mechanism, the M7.9 January 22, 2017 earthquake most likely occurred within the upper portion of the Solomon Sea microplate rather than along the subduction zone plate boundary.



Cross section created using the IRIS Earthquake Browser

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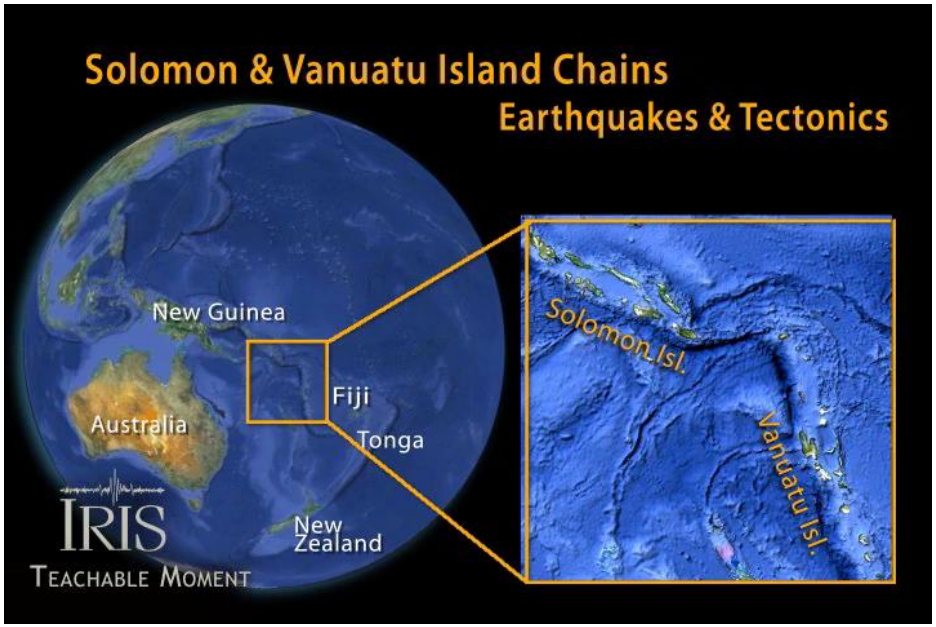
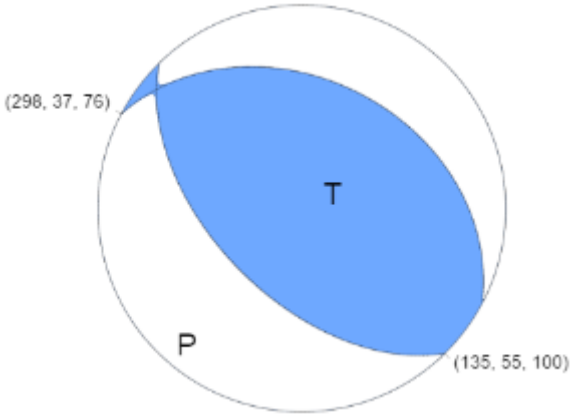
According to the USGS, the location, depth and focal mechanism solution all indicate the earthquake occurred as a result of intraplate faulting within the subducting lithosphere of the Australia plate (Solomon Sea microplate), rather than on the overlying plate interface.

At the location of the earthquake, the Australia plate is converging with and subducting beneath the Pacific Plate in an east-northeast direction at a rate of approximately 103 mm/yr.



Regional tectonic complexities involving the convergence of the Australian and Pacific Plates (click for animation)



W-phase Moment Tensor Solution

The tension axis (T) reflects the minimum compressive stress direction. The pressure axis (P) reflects the maximum compressive stress direction.

Images courtesy of the U.S. Geological Survey

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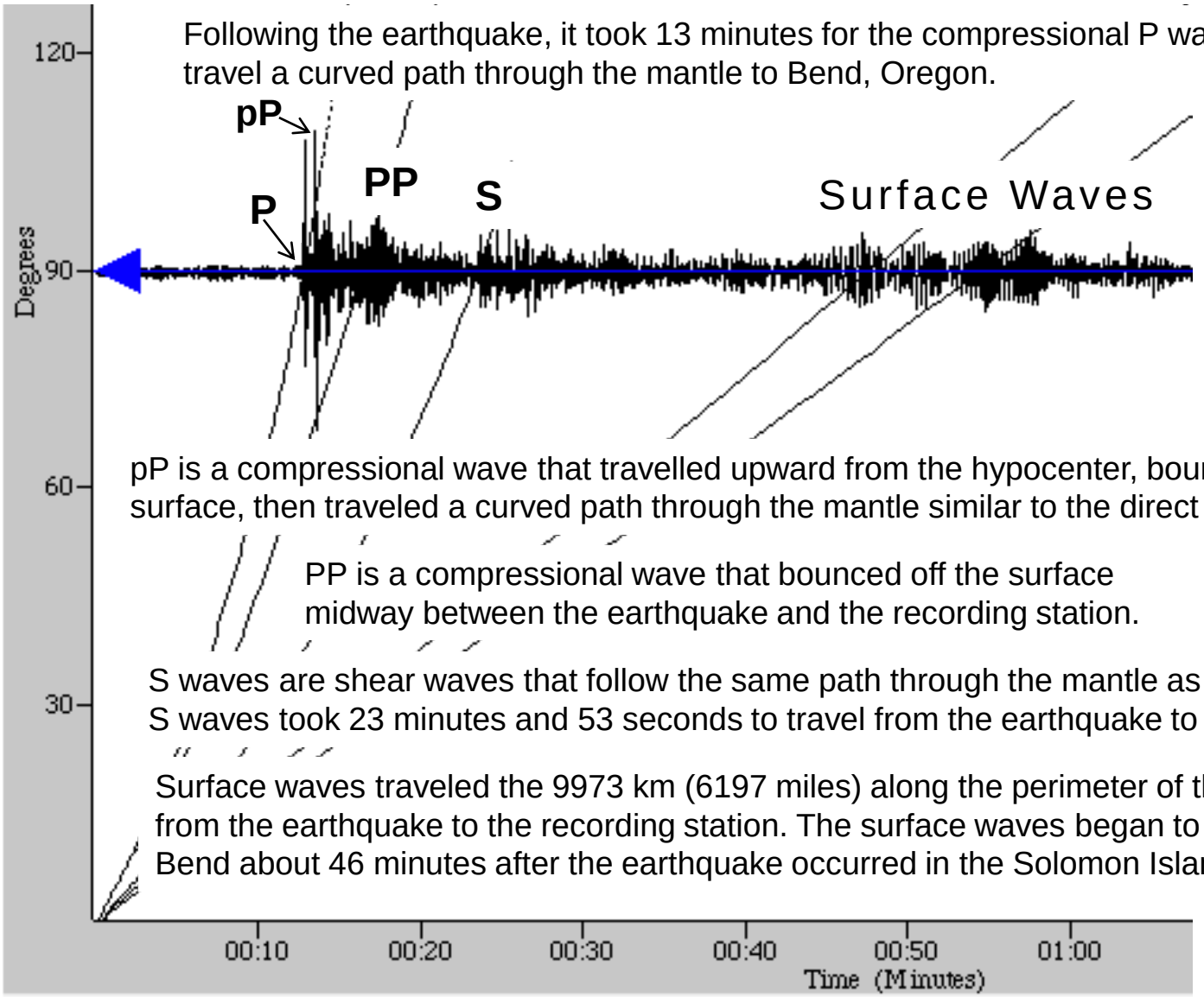
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 9973 km (6197 miles, 89.8˚) from the location of this earthquake.

Following the earthquake, it took 13 minutes 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 waves are shear waves that follow the same path through the mantle as P waves. S waves took 23 minutes and 53 seconds to travel from the earthquake to Bend.

Surface waves traveled the 9973 km (6197 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface waves began to arrive in Bend about 46 minutes after the earthquake occurred in the Solomon Islands.

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