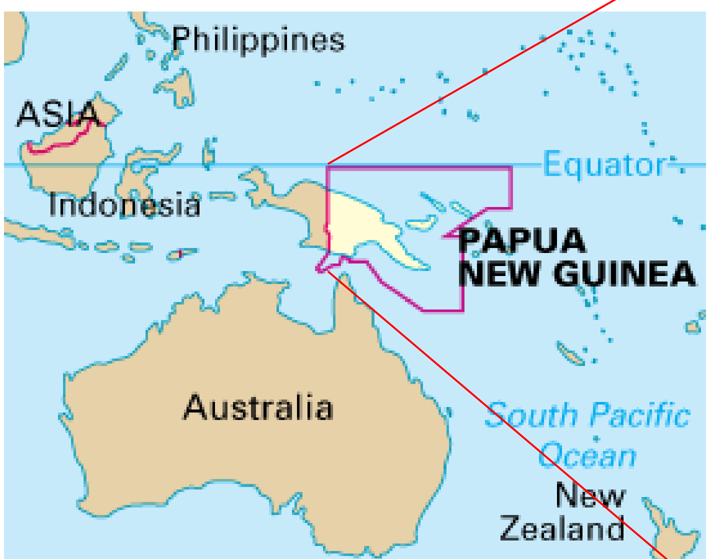
Magnitude 7.5 PAPUA NEW GUINEA
Tuesday, May 14, 2019 at 12:58:26 UTC

A magnitude 7.5 earthquake occurred 45km NE of Kokopo, Papua New Guinea at a depth of 10 km (6.2 miles).

There are no immediate reports of damage.



IRIS Teachable Moments

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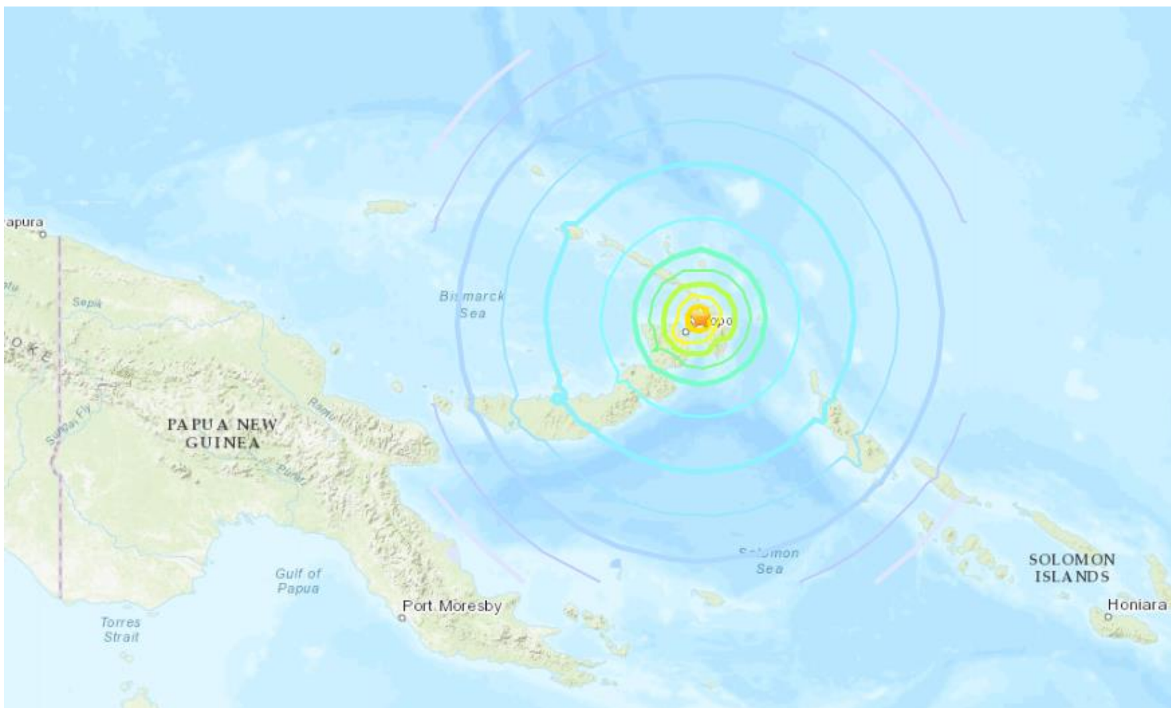
The Modified-Mercalli Intensity (MMI) scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking.

The area near the epicenter experienced very strong shaking from this earthquake.



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

USGS Estimated shaking Intensity from M 7.5 Earthquake

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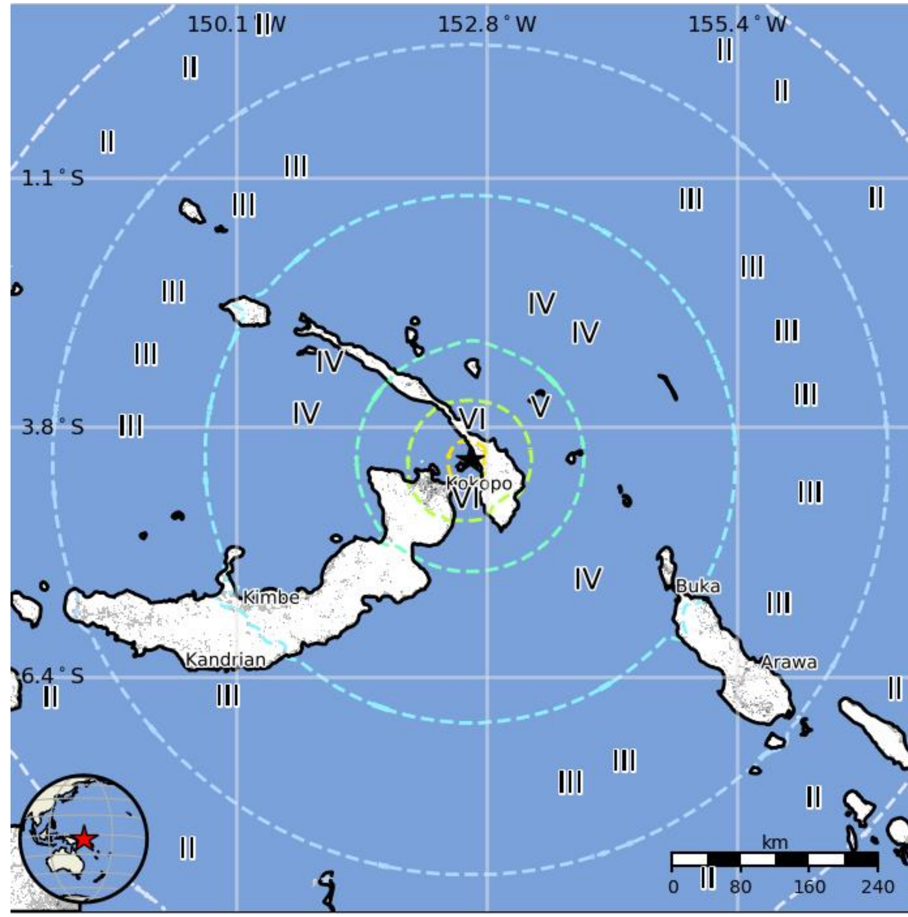
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

31,000 people were exposed to very strong shaking from this earthquake.

MMI	Shaking	Population
I	Not Felt	102 k*
II-III	Weak	369 k*
IV	Light	347 k
V	Moderate	49 k
VI	Strong	226 k
VII	Very Strong	31 k
VIII	Severe	0 k
IX	Violent	0 k
X	Extreme	0 k

USGS PAGER
Population Exposed to Earthquake Shaking



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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This animation of regional seismicity over last 6 weeks includes both a M7.2 that occurred May 6, 2019 and this M7.5 on May 14, 2019. While close in time, these earthquake are likely unrelated, both being in a seismically active region.

Animation created with the IRIS Earthquake Browser

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Arrows on the map below show motions relative to the Australian Plate. The red star shows the location of the May 14th earthquake. This earthquake occurred on a strike-slip fault between the North Bismarck and South Bismarck (micro)Plates.

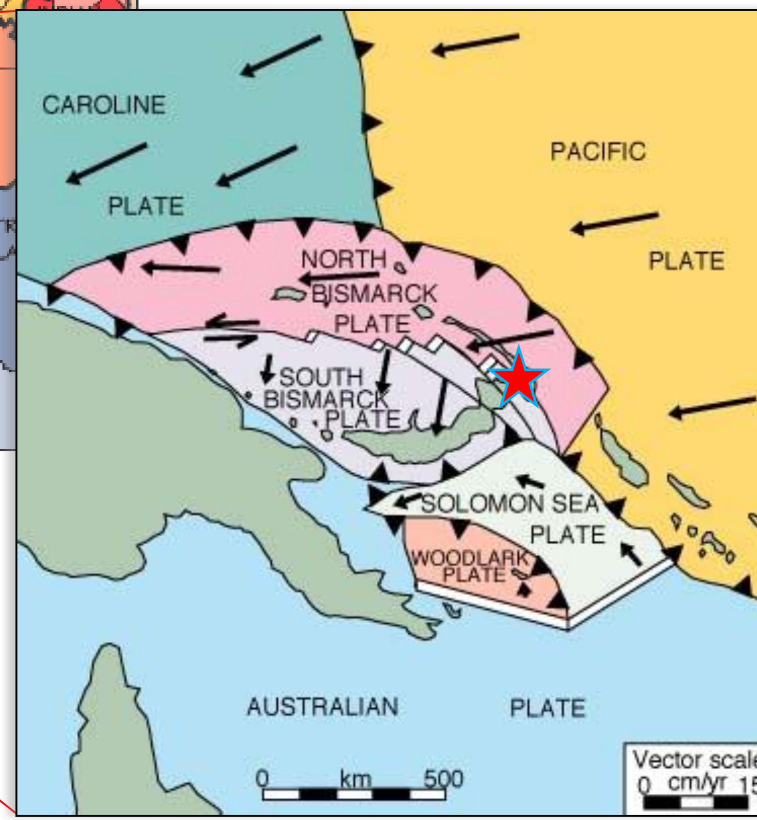

Image courtesy OSU; simplified from Hamilton (1979)

In the Solomon Sea region east of Papua New Guinea, the Pacific Plate converges with the Australian Plate at a rate of 9.5 cm/yr. The Australian Plate is broken into microplates that accommodate its convergence with and subduction beneath the Pacific Plate. Earthquakes in this region are generally associated with the large-scale convergence of these two major plates and with complex interactions of the associated microplates.

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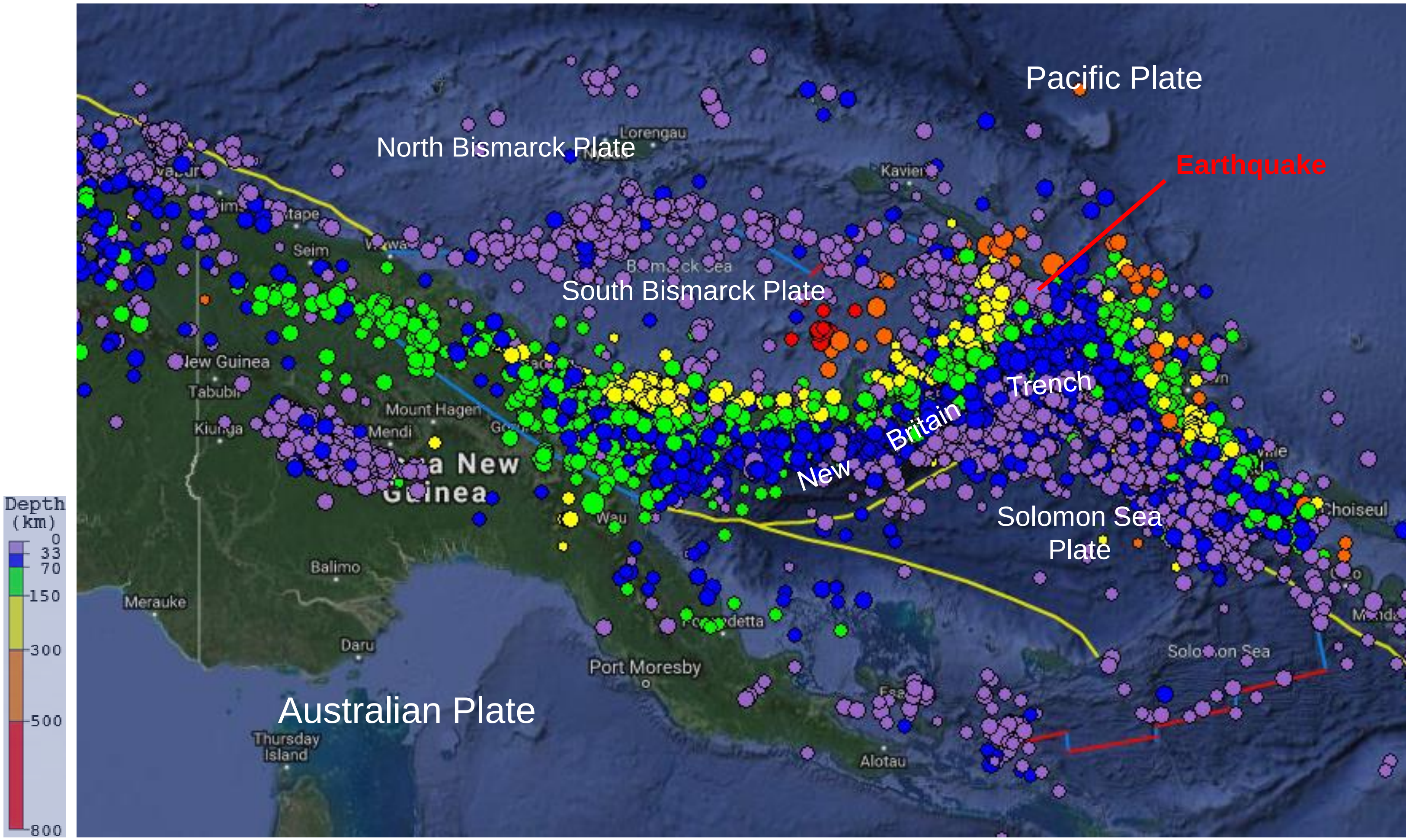

Map created with the IRIS Earthquake Browser

This seismicity map covers the same region as the microplate tectonic map of the previous slide. Locations of the 5000 most recent earthquakes are shown.

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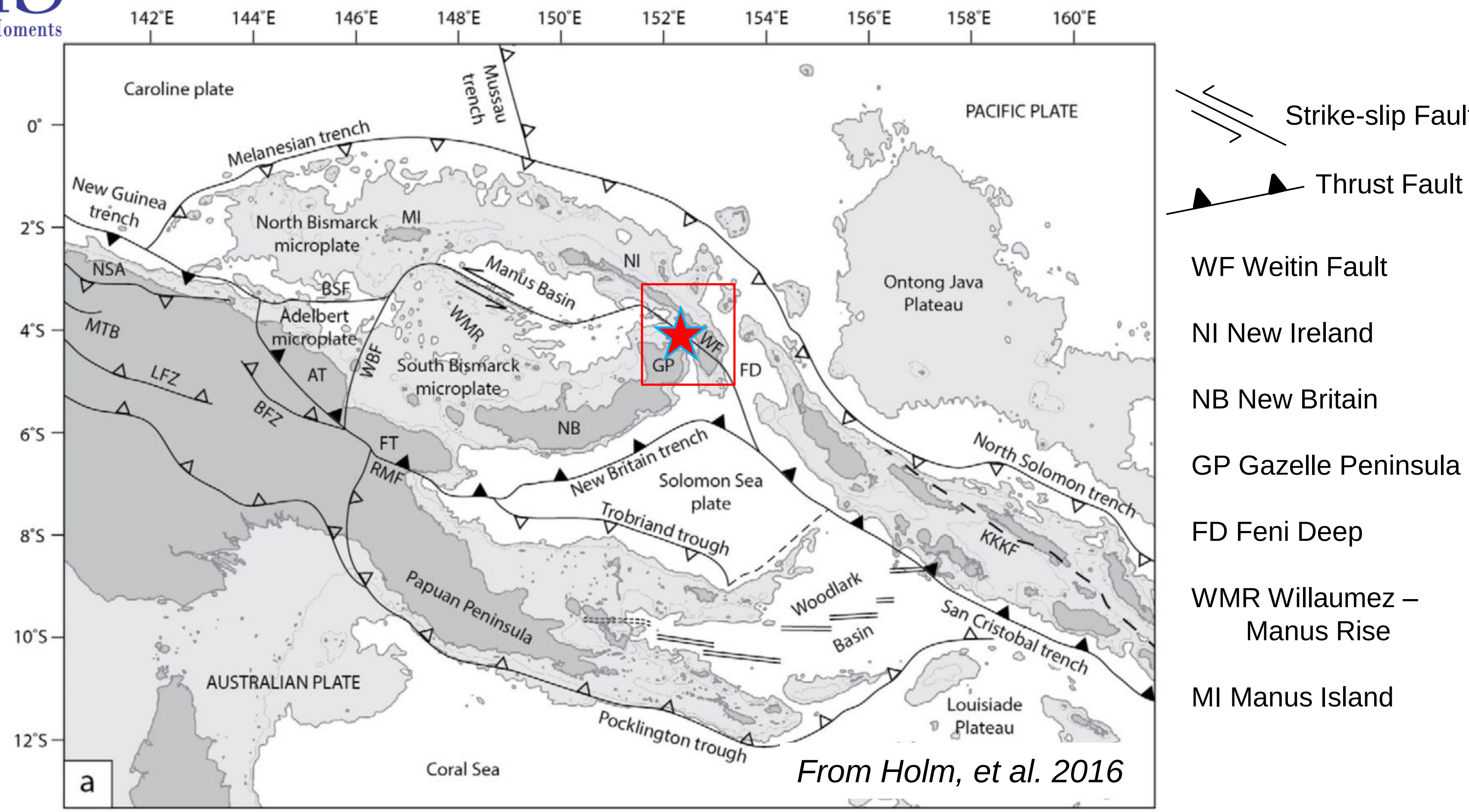

The map above shows microplates and structures in the Papua New Guinea - Solomon Sea region with the location of the May 14th earthquake indicated by the red star. The focal mechanism of the May 14th earthquake indicates that it was produced by either left-lateral strike-slip faulting on a northwest-southeast oriented fault or right-lateral strike-slip faulting on a northeast-southwest oriented fault. Its location on the Weitin Fault, a left-lateral strike-slip fault between the North Bismarck and South Bismarck (micro)plates, strongly argues that this earthquake was produced by left-lateral strike-slip faulting on that fault. The red box outlines the area of the maps on the next slide.

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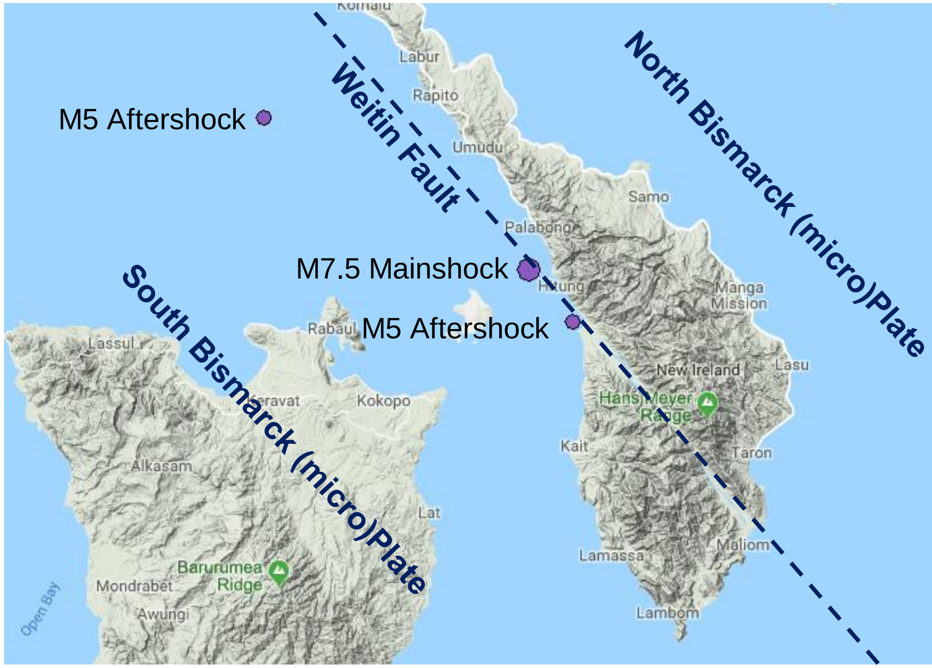
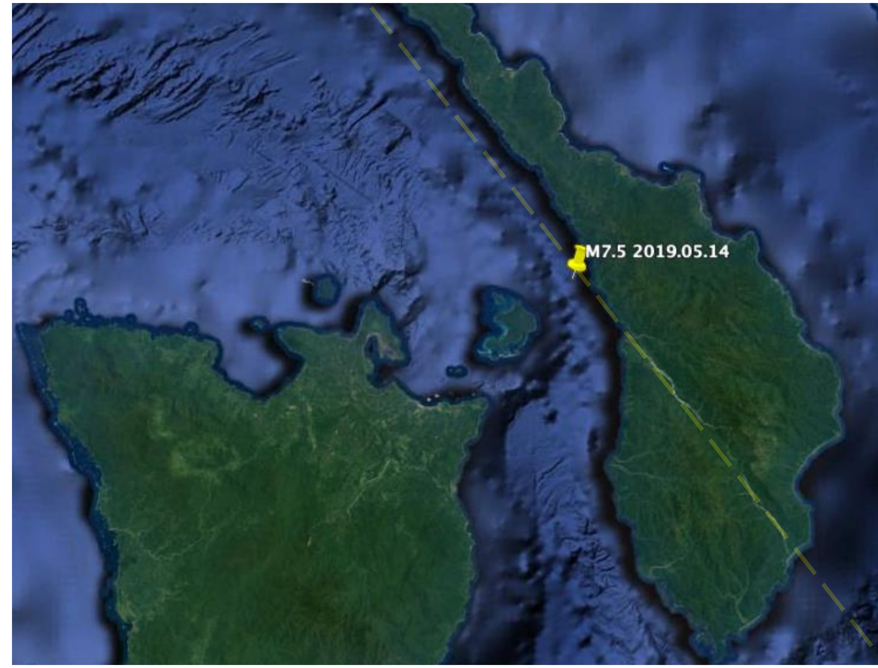


Map created with the IRIS Earthquake Browser



Google Earth image

The map above shows the May 14th M7.5 earthquake, the "mainshock", and two M5 aftershocks that occurred in the hours after the mainshock. Note that these three earthquakes are distributed in a northwest-southeast direction roughly parallel to the Weitin Fault that is shown by the dashed line. These observations and the focal mechanism indicate that the M7.5 mainshock was produced by left-lateral strike-slip faulting on the Weitin Fault that forms the boundary between the North Bismarck and South Bismarck (micro)Plates in this area.

The Google Earth image above shows the same area as the map on the left. The yellow pin locates the epicenter of the M7.5 May 14th mainshock. On this image, the light dashed yellow line shows the location of the Weitin Fault that cuts across the south end of New Ireland. It is interesting to note the valley containing stream deposits that coincides with the Weitlin Fault where it cuts across southern New Ireland. Active faults often produce topographic features, even in heavily vegetated tropical regions.

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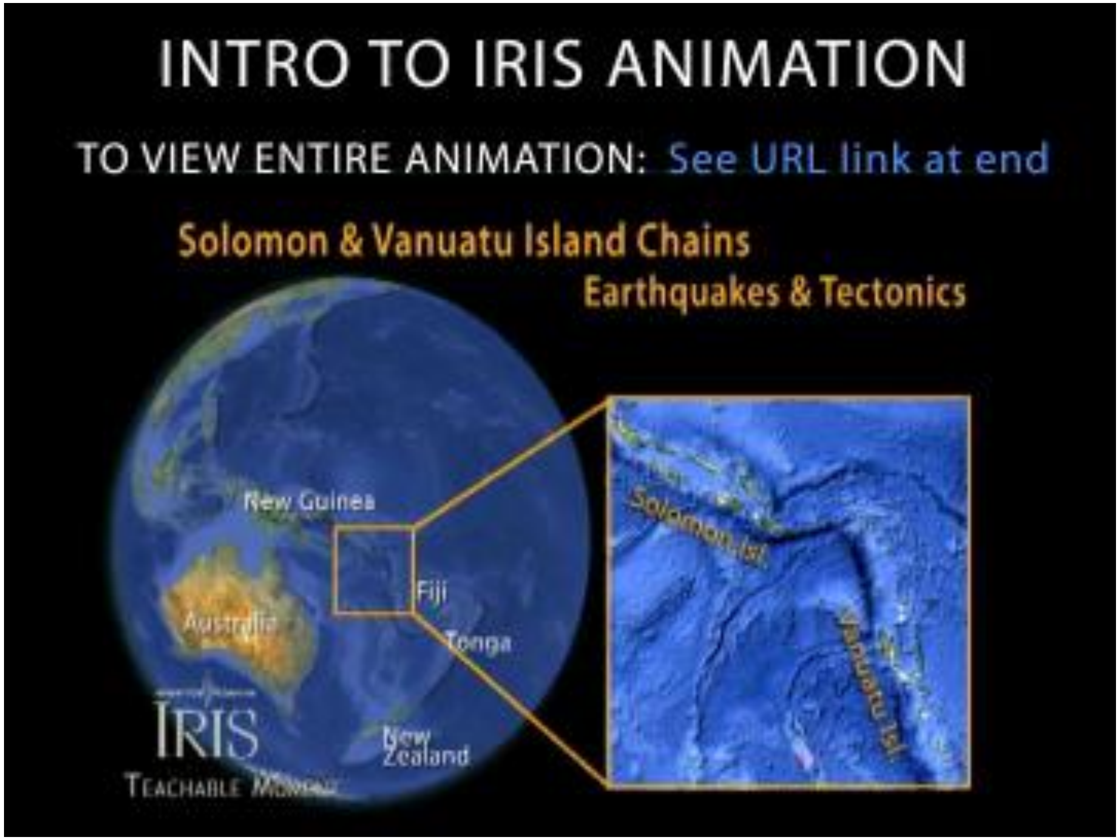
The Solomon and Vanuatu Islands are subduction-related features caused by the subduction of the Australian Plate beneath the greater Pacific Plate. It is a seismically active area of frequent large earthquakes. This animation addresses both the subduction earthquakes, as well as a strike-slip component between the island chains. Basically the earthquakes are caused by the northeasterly movement of the Australian Plate as it dives beneath the Pacific Plate, but there are variations along the plate boundary



Animation exploring plate tectonics and earthquakes of the Australian – Pacific Plate boundary region.

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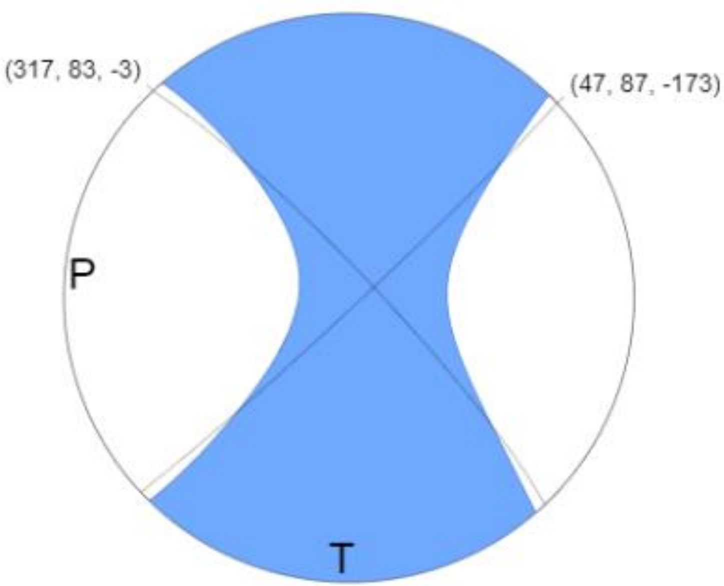
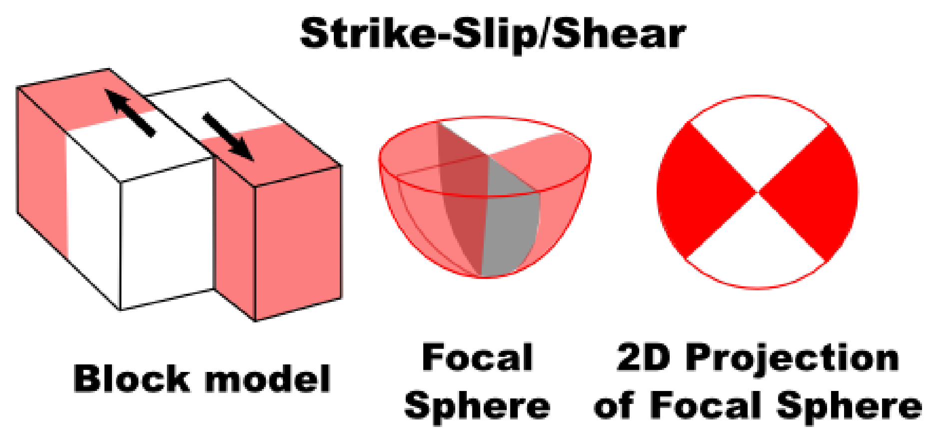
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation of these quadrants determined from recorded seismic waves identifies the type of fault that produced the earthquake.

This earthquake occurred as the result of shallow strike-slip faulting within the interior of the Pacific Plate.



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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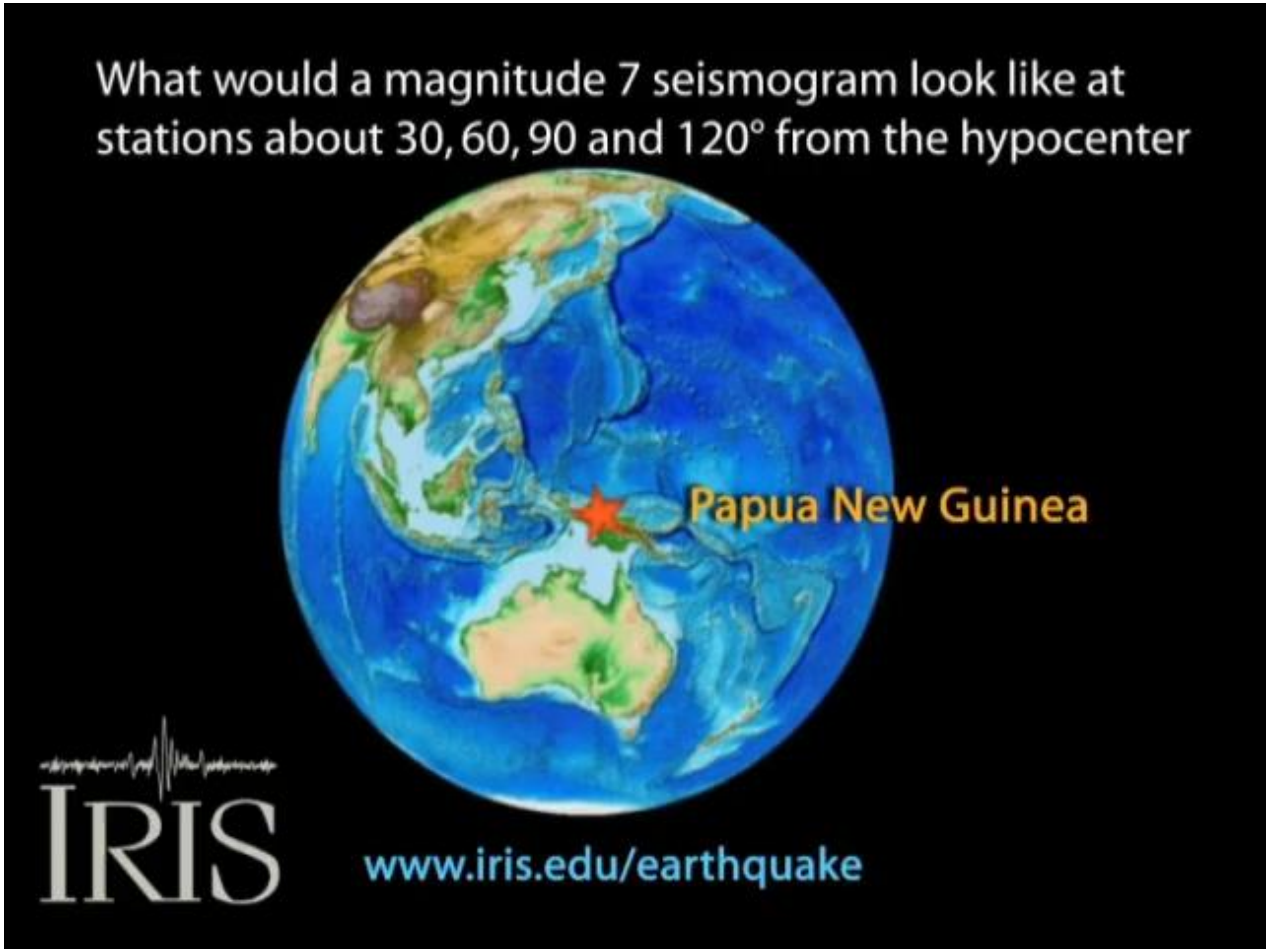
This animation explores how the earthquake created the seismogram seen in the next slide.

The seismic station BNOR was 90 degrees from this earthquake.



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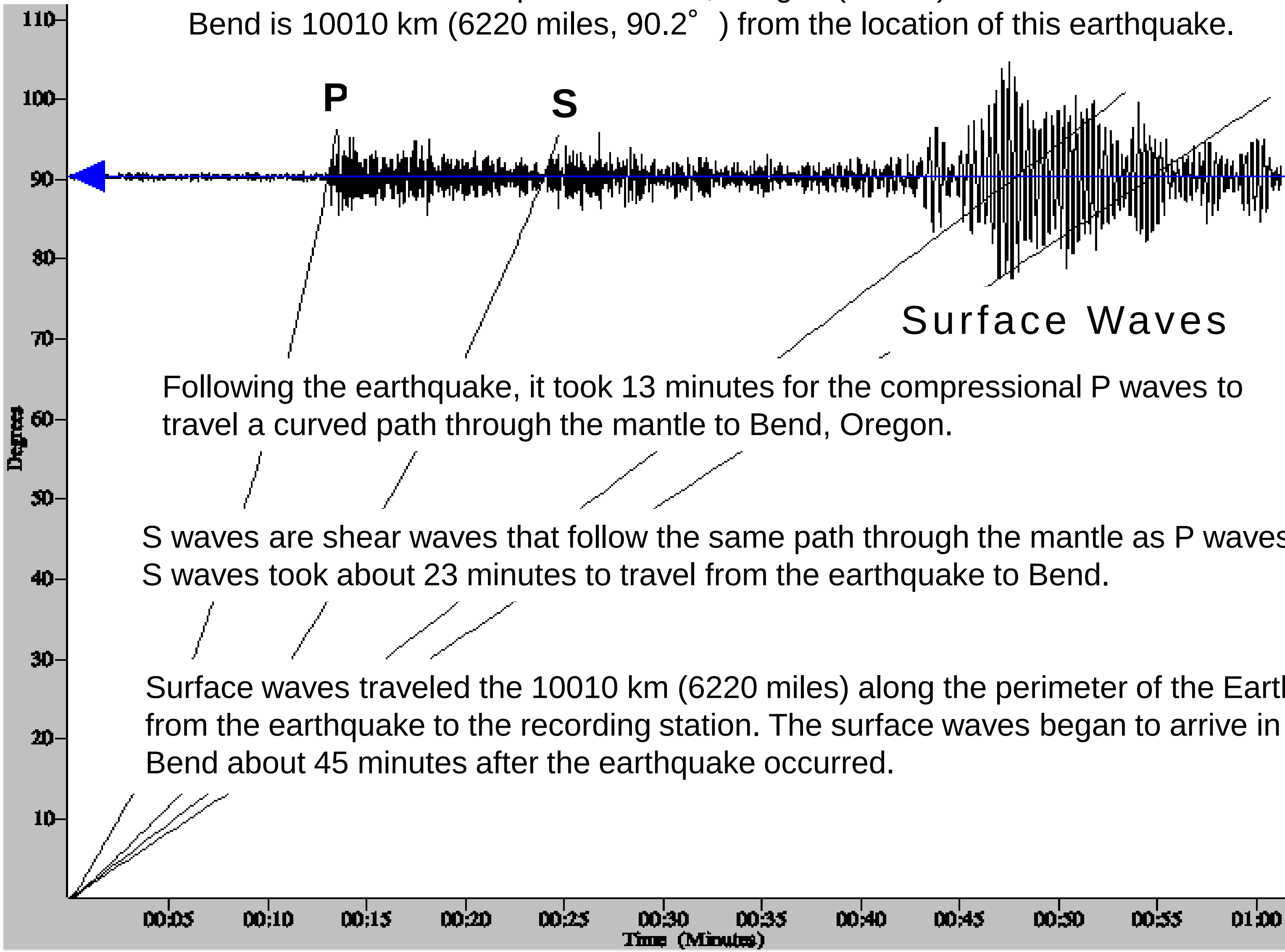
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 10010 km (6220 miles, 90.2°) from the location of this earthquake.



Following the earthquake, it took 13 minutes for the compressional P waves to travel a curved path through the mantle to Bend, Oregon.

S waves are shear waves that follow the same path through the mantle as P waves. S waves took about 23 minutes to travel from the earthquake to Bend.

Surface waves traveled the 10010 km (6220 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface waves began to arrive in Bend about 45 minutes after the earthquake occurred.

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