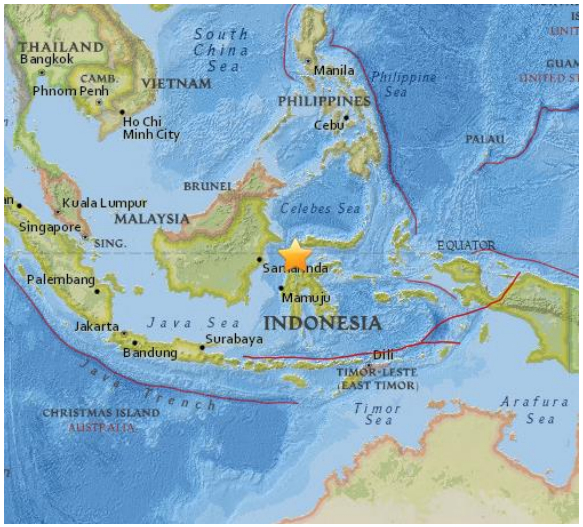
Magnitude 7.5 PALU, INDONESIA
Friday, September 28, 2018 at 10:02:43 UTC

A magnitude 7.5 earthquake occurred 80.8 km (50.2 mi) north of Palu, Indonesia at a depth of 10 km (6.2 miles). This earthquake triggered a tsunami with wave heights up to 2 m (6.6 ft) that an official said swept away houses in at least two cities.



The tsunami hit Palu, the capital of central Sulawesi province (population 282,000), Donggala, and several other coastal settlements.

Considerable damage is being reported, including many people reported missing. Communications and power have been disrupted.

Still image from a cell phone video of the tsunami wave inundating Palu, Indonesia compounding damage following the earthquake. Image courtesy BBC.

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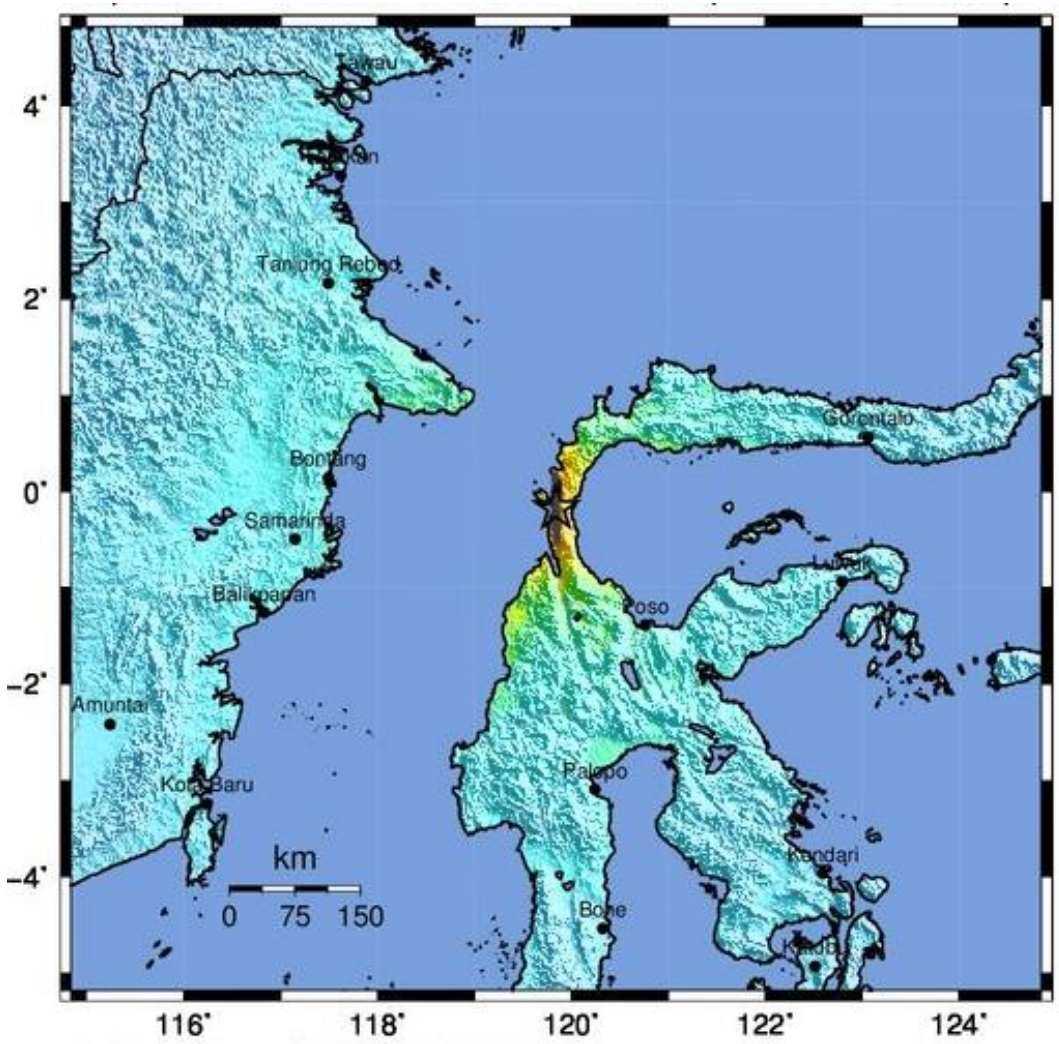
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking.

The area nearest the earthquake experienced violent 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 7.5 Earthquake

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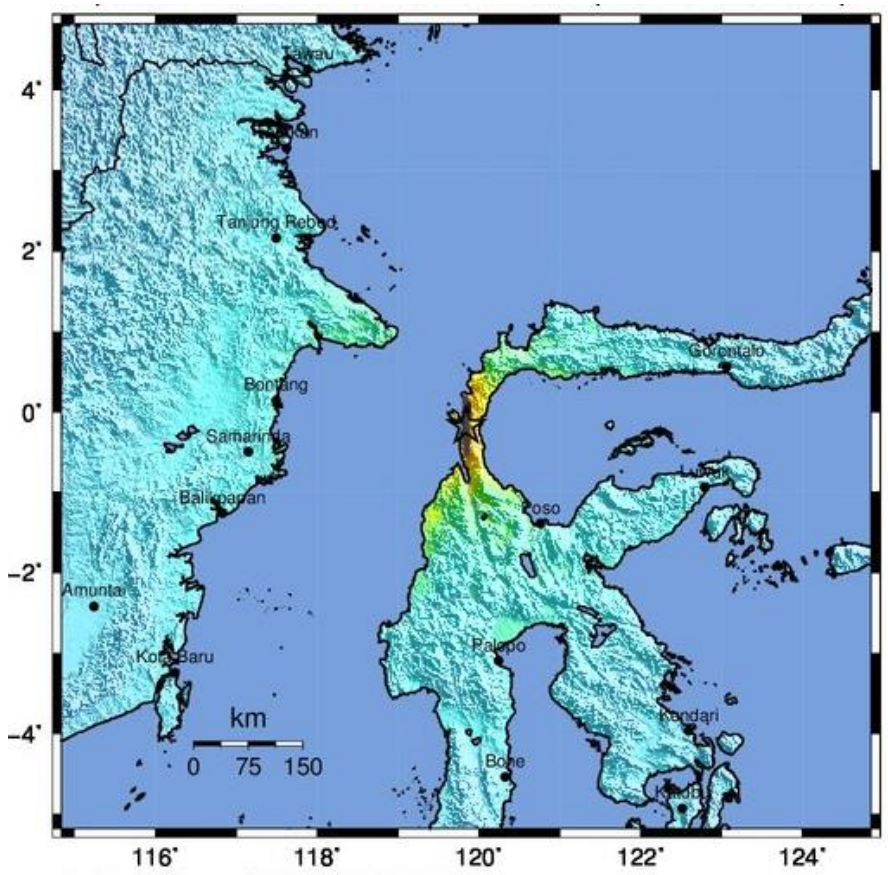
USGS PAGER
Population Exposed to Earthquake Shaking

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

The USGS estimates that approximately 10,000 people felt violent shaking from this earthquake.



MMI	Shaking	Pop.
I	Not Felt	--*
II-III	Weak	8,510 k*
IV	Light	12,785 k
V	Moderate	1,163 k
VI	Strong	737 k
VII	Very Strong	129 k
VIII	Severe	44 k
IX	Violent	10 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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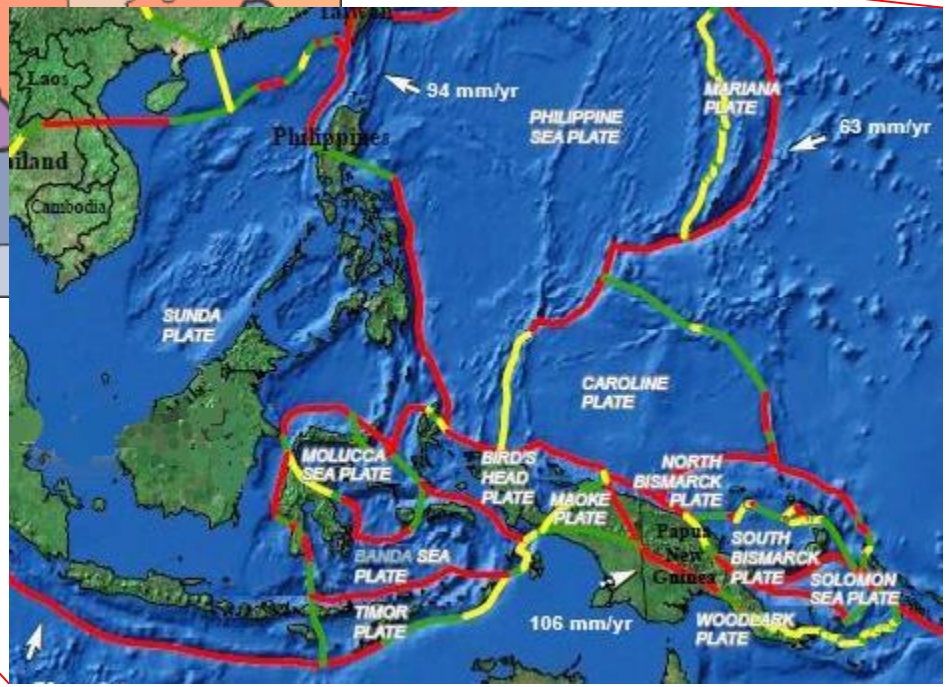
Image courtesy of the US Geological Survey

The Pacific, Philippine, Eurasian and Australian Plates meet in a complex arrangement of subduction zones in the western Pacific Ocean.

- Convergent plate boundary
- Divergent plate boundary
- Transform plate boundary



In detail, there are numerous microplates (fragments of larger plates) with convergent, divergent, and transform (strike-slip) boundaries between them.

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The Sunda Plate is the southeastern promontory of the Eurasian Plate. At the Sunda Trench and the Timor Trough, the Australia Plate subducts beneath the Sunda Plate.

Cross section D-D' illustrates subduction of oceanic lithosphere at the northern edge of the Australia Plate. As continental lithosphere of the Australia Plate approaches the Timor Trough, the Australia – Sunda convergent boundary is becoming a continental collision zone. Australia – Sunda plate convergence, along with convergence between the Sunda Plate and the Pacific and Philippine Plates, is causing internal deformation of the Sunda Plate.

This earthquake occurred on an intraplate strike-slip fault, possibly on the Palu Fault.

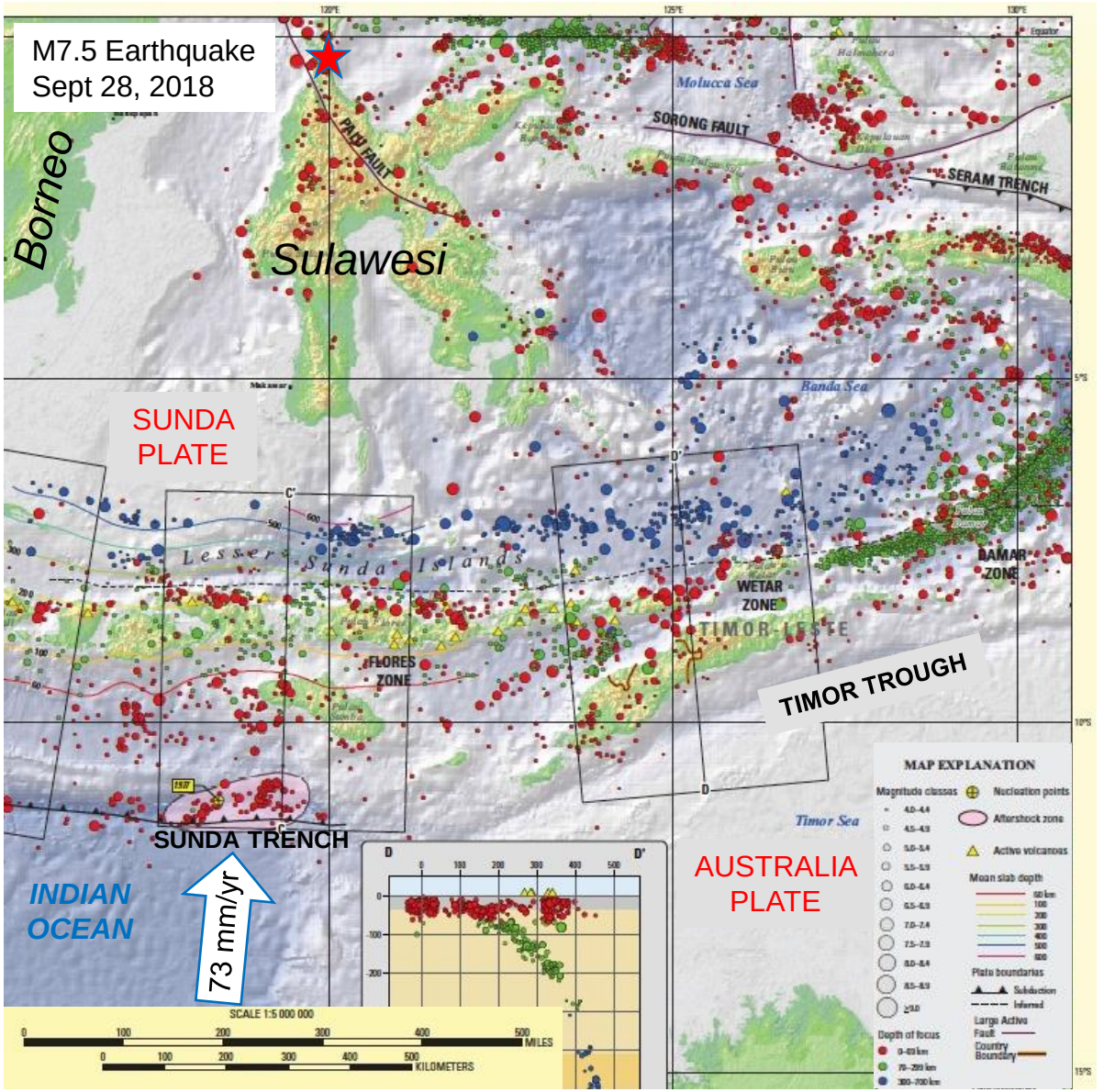

Image courtesy of the US Geological Survey

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Regional historic seismicity in this region is shown on the map with earthquakes color coded by depth.

The pattern of earthquake depths shows the complexity of the tectonic setting. The shallow to deep trend in earthquake depths in the NE portion of map is due to subduction of Philippine Plate beneath the Sunda Plate.

There have been 22 M7.5+ earthquakes recorded in the region since 1900 due to the arc-continent collision and the relative motions between the numerous local microplates.

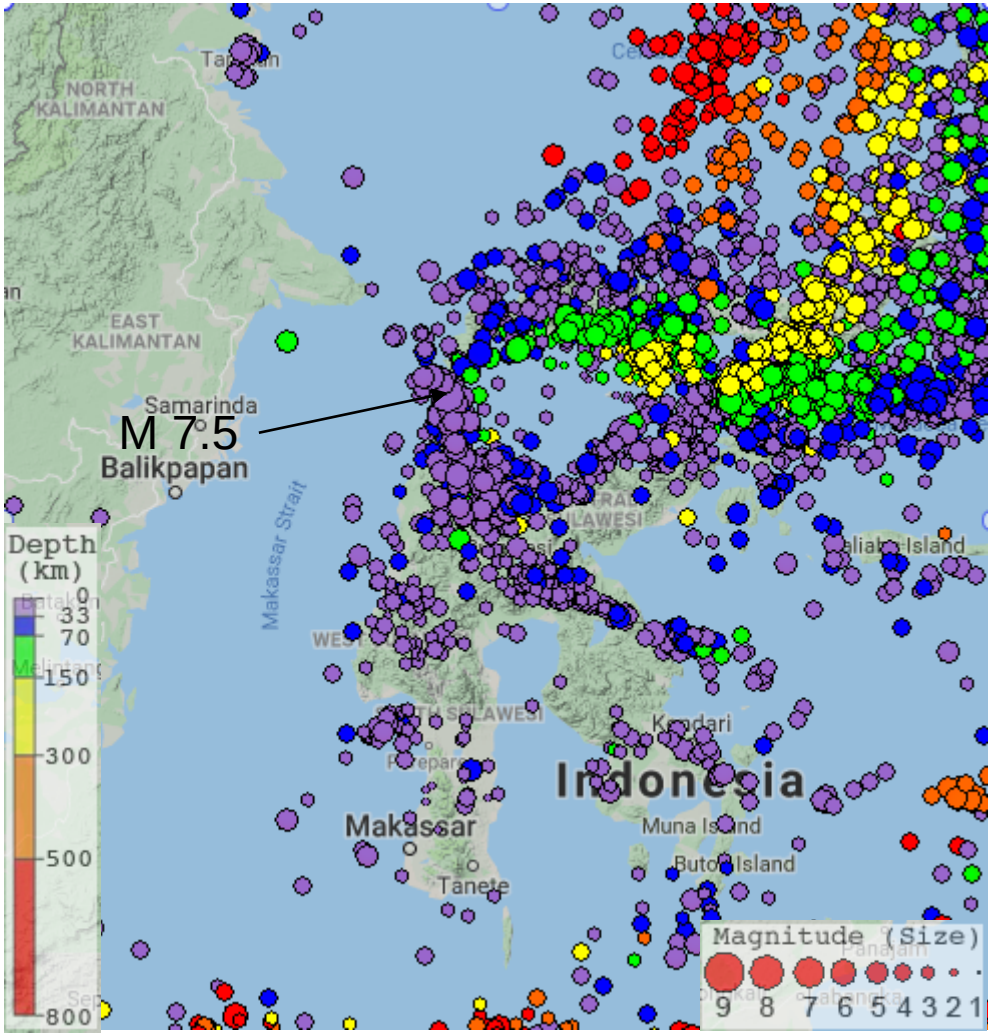

Image from IRIS Earthquake Browser http://www.iris.edu/ieb

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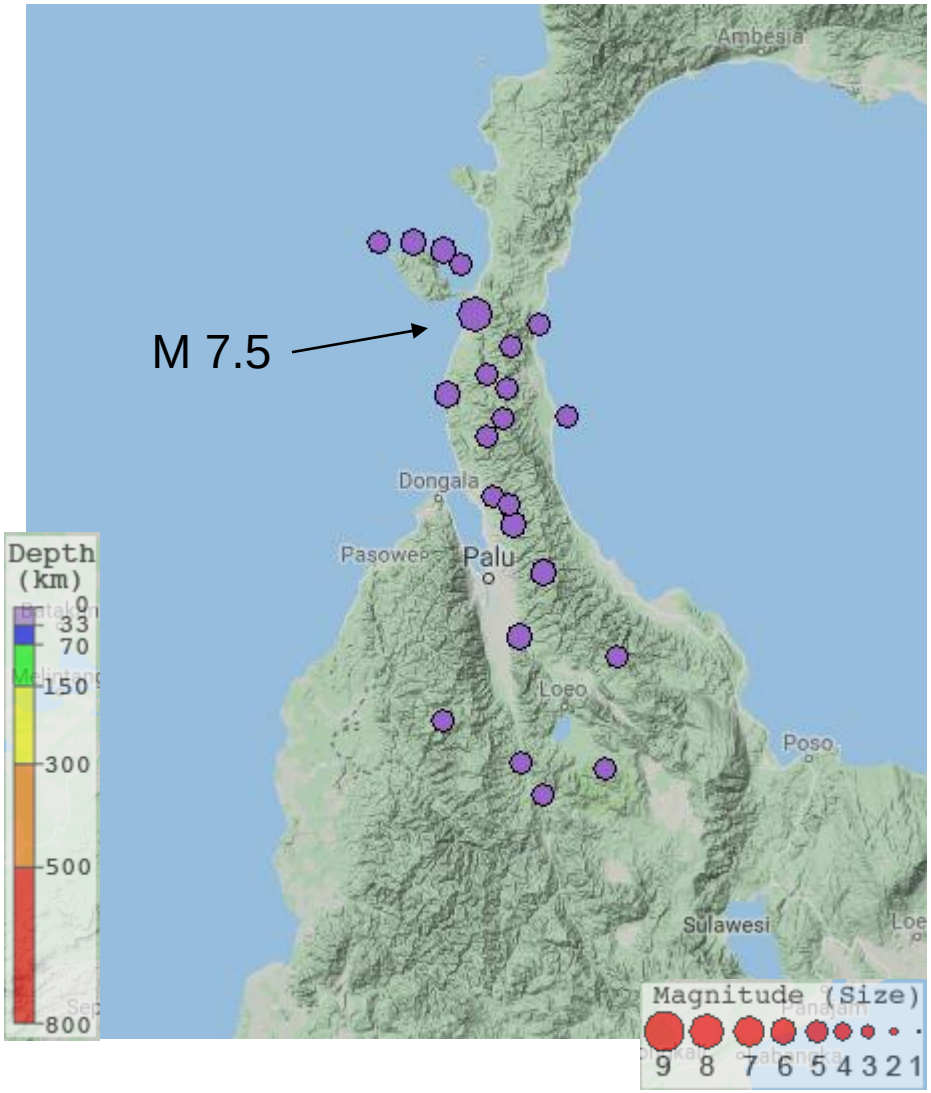
Earthquakes from September 28, 2018 are plotted to the right.

In the hours prior to this earthquake, there were a series of small-to-moderate sized earthquakes ranging from M 4.6 – M 6.1. The M 6.1 occurred three hours earlier and just to the south of the M 7.5 event.

In the three hours following this earthquake, there have been ten events of M 4.7 and larger. The largest aftershock was a M 5.8, about 12 minutes after the M 7.5 earthquake.

Explore these earthquakes at: https://bit.ly/2NP3SFY



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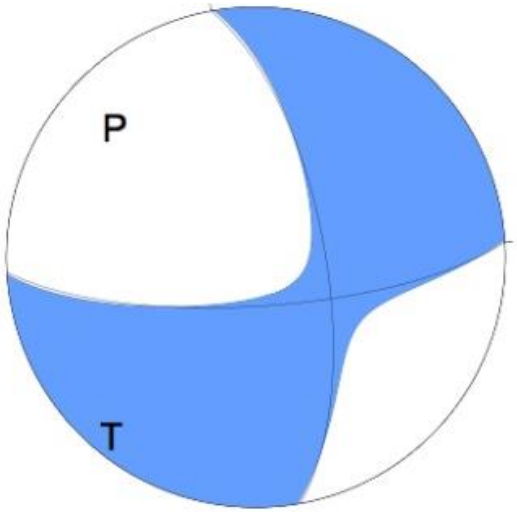
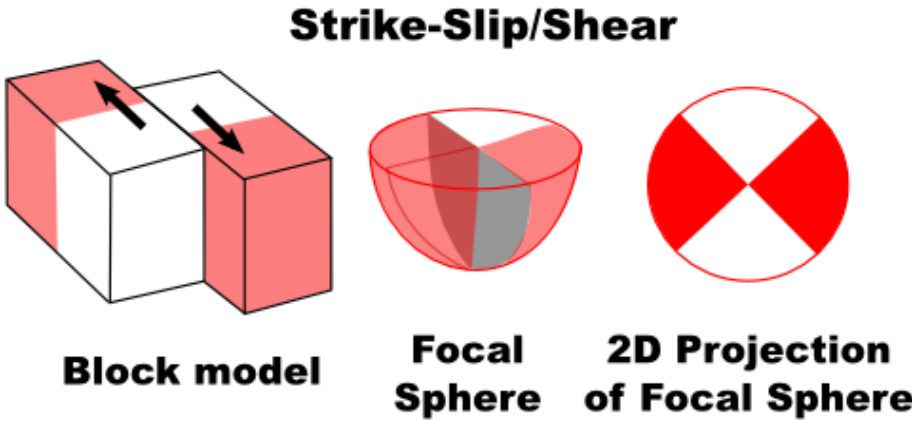
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation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

This earthquake occurred as the result of strike-slip faulting on a shallow crustal fault within the interior of the Sunda Plate.





USGS WPhase Centroid Moment Tensor Solution

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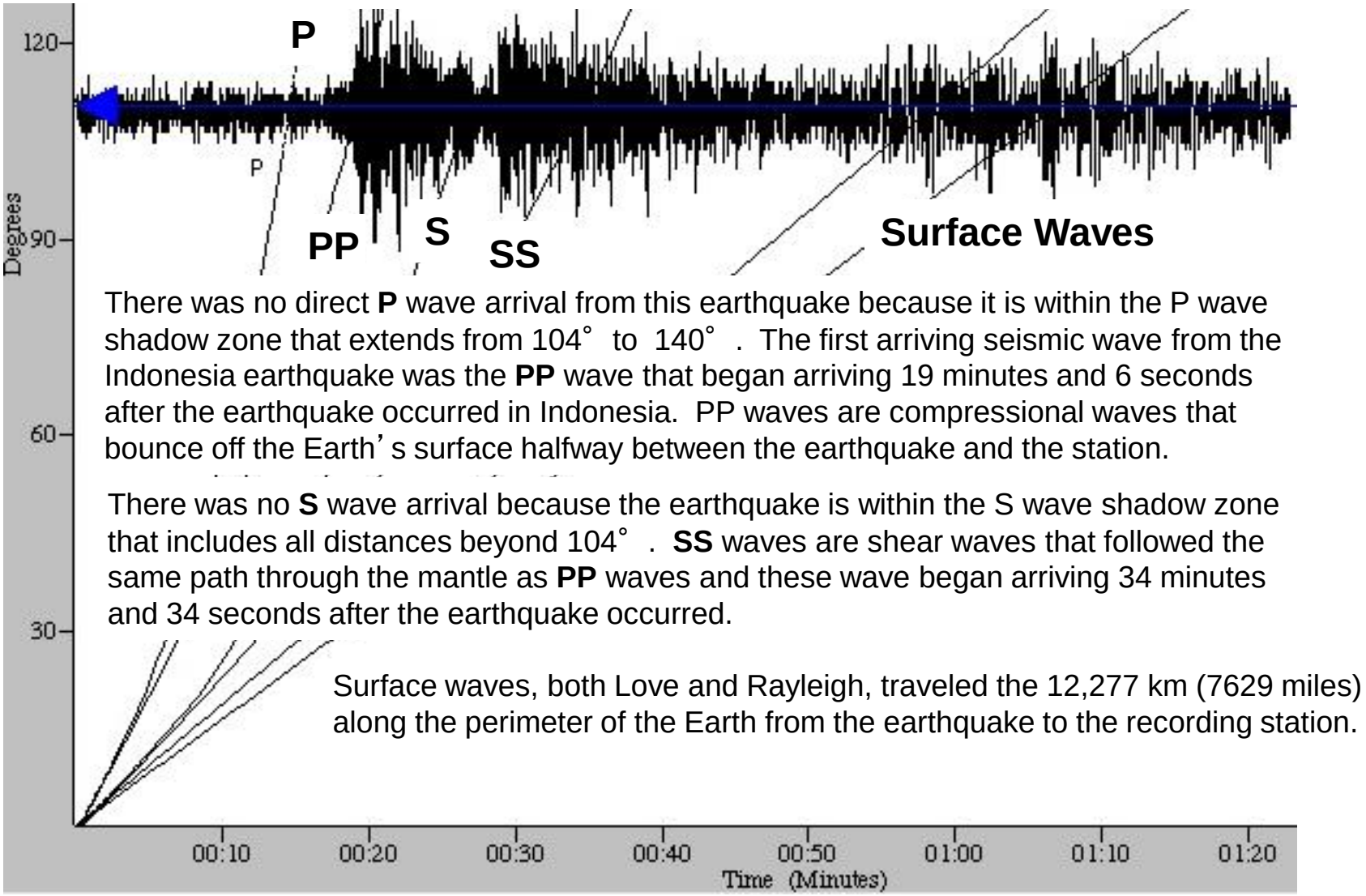
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 12,277 km (7629 miles, 110.6˚) from the location of this earthquake.



There was no direct **P** wave arrival from this earthquake because it is within the P wave shadow zone that extends from 104˚ to 140˚. The first arriving seismic wave from the Indonesia earthquake was the **PP** wave that began arriving 19 minutes and 6 seconds after the earthquake occurred in Indonesia. PP waves are compressional waves that bounce off the Earth's surface halfway between the earthquake and the station.

There was no **S** wave arrival because the earthquake is within the S wave shadow zone that includes all distances beyond 104˚. **SS** waves are shear waves that followed the same path through the mantle as **PP** waves and these wave began arriving 34 minutes and 34 seconds after the earthquake occurred.

Surface waves, both Love and Rayleigh, traveled the 12,277 km (7629 miles) along the perimeter of the Earth from the earthquake to the recording station.

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