Magnitude 6.9 TAIWAN

Sunday, September 18, 2022 at 06:44:14 UTC

Latitude 23.159° N
Longitude 121.316° E
Depth 10 km

A 6.9-magnitude earthquake hit the Chishang township in rural southeastern Taiwan on Sunday at a depth of 10 km, causing buildings to collapse. Four people were rescued after being trapped under the rubble of one building, and about 20 passengers were evacuated after a train derailed in the area. At this time one death is being reported.

This photo shows a collapsed residential building following an earthquake in Yuli township in Hualien County, eastern Taiwan. A 7-11 convenience store was at the first floor of the collapsed building. Two people were trapped inside.

(Hualien County Fire Department via AP)

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The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale, from I to X, that indicates the severity of ground shaking. Intensity is based on observed effects and is variable over the area affected by an earthquake. Intensity is dependent on earthquake size, depth, distance, and local conditions.

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 6.9 Earthquake

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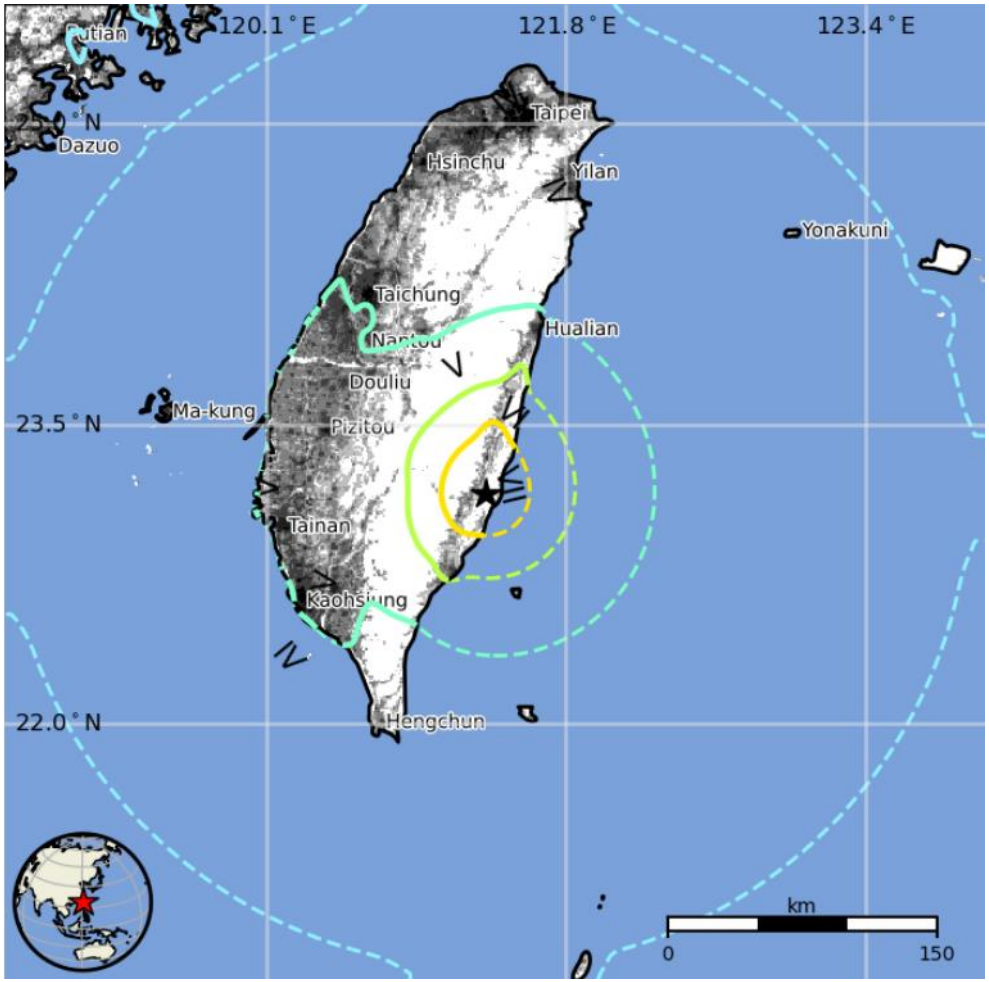
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.
The USGS estimates that 15,000 people felt severe shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	2,730 k*
IV	Light	15,367 k
V	Moderate	9,564 k
VI	Strong	531 k
VII	Very Strong	101 k
VIII	Severe	15 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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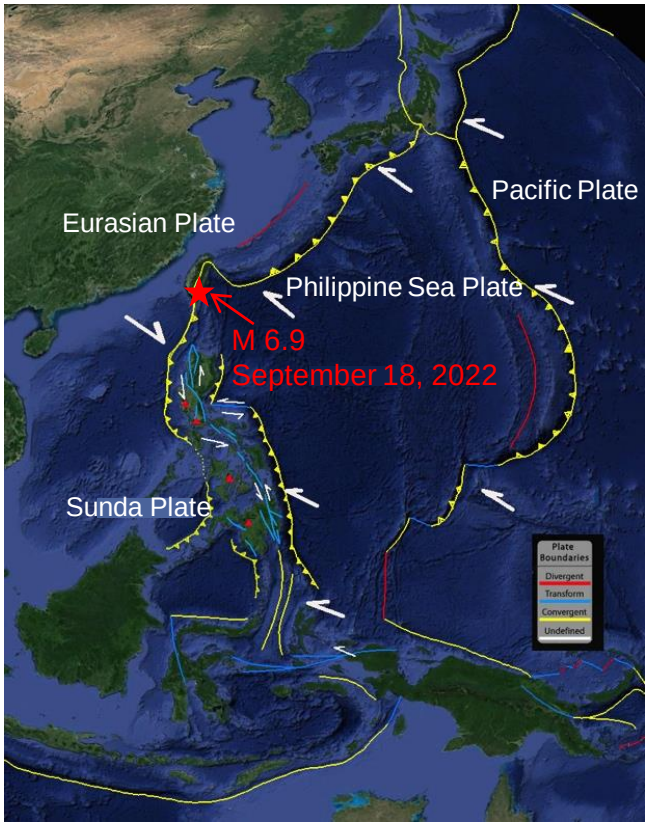
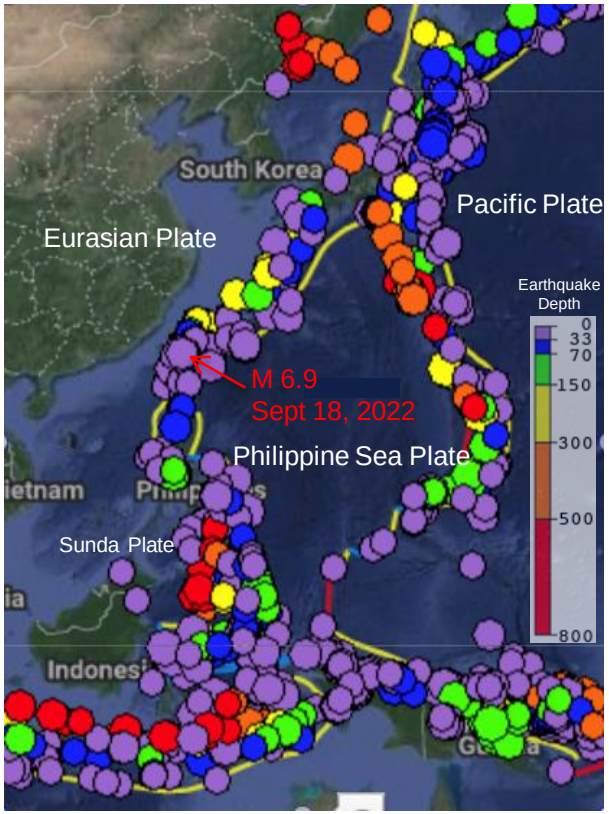
Along its northwestern margin, the Philippine Sea Plate converges with and subducts beneath the Eurasian Plate. Earthquakes increase in depth from southeast to northwest across this subduction zone. The September 18 magnitude 6.9 earthquake (indicated by the red star) occurred at the southwestern end of this convergent plate boundary.



Simplified tectonic boundaries



Magnitude ≥ 6 earthquakes 2000-present

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A **foreshock** is a smaller magnitude earthquake that precedes the mainshock.

There are no special characteristics of a foreshock that let us know it is a foreshock until the mainshock occurs.

A **mainshock** is largest magnitude earthquake during an earthquake sequence.

Aftershocks are smaller earthquakes occurring after a large earthquake as the fault adjusts to the new state of stress.

The graph shows how the number of aftershocks and the magnitude of aftershocks decay with increasing time since the main shock. The number of aftershocks also decreases with distance from the main shock.

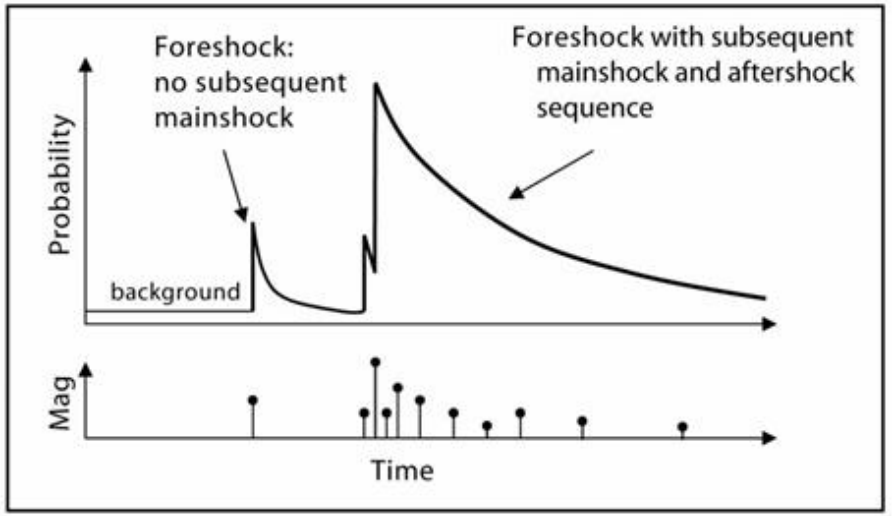

Image courtesy of the US Geological Survey

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This map shows details along the northwestern margin of the Philippine Sea Plate. At the Ryukyu Trench, the Philippine Sea Plate subducts beneath the Eurasian Plate and earthquakes reach up to 300 km depth. Across Taiwan, very few earthquakes are deeper than 100 km because this area is a collision zone between the Philippine island arc and the Eurasian continental margin. Note the right-lateral strike-slip fault along the plate boundary near the September 18 earthquake (red star). The strike-slip focal mechanism of this earthquake might be related to this structure.

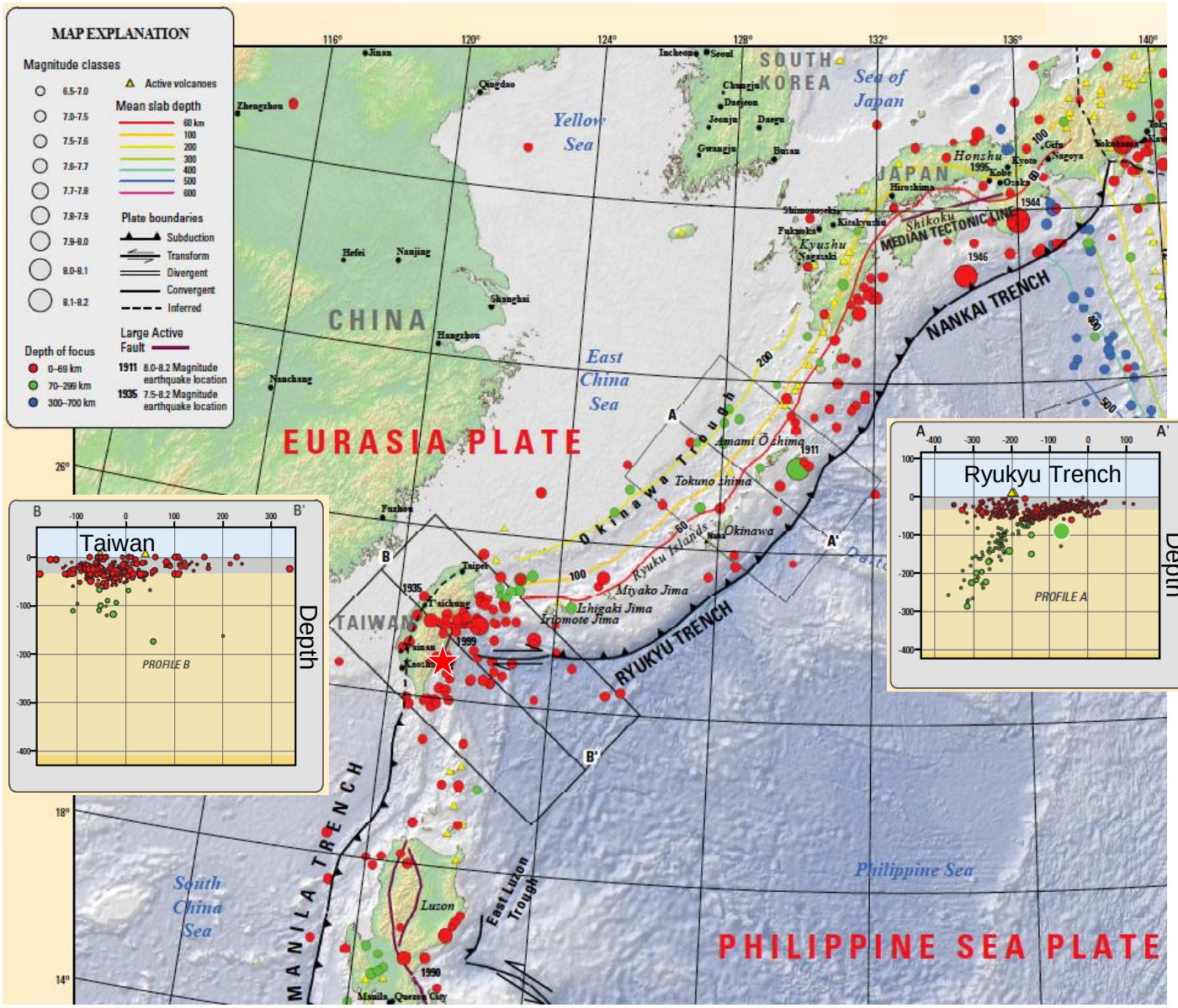

Image courtesy of US Geological Survey

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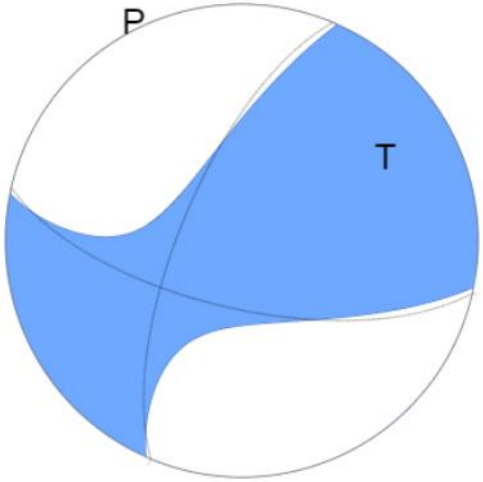
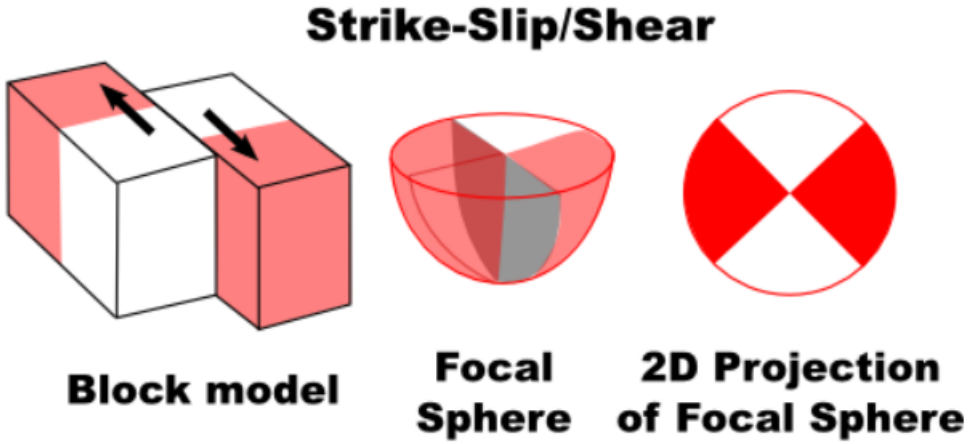
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation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



USGS 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.

In this case, the earthquake occurred as the result of strike-slip faulting at a shallow depth, near the plate boundary between the Philippine Sea and Eurasian Plates at the southeast coast of Taiwan.



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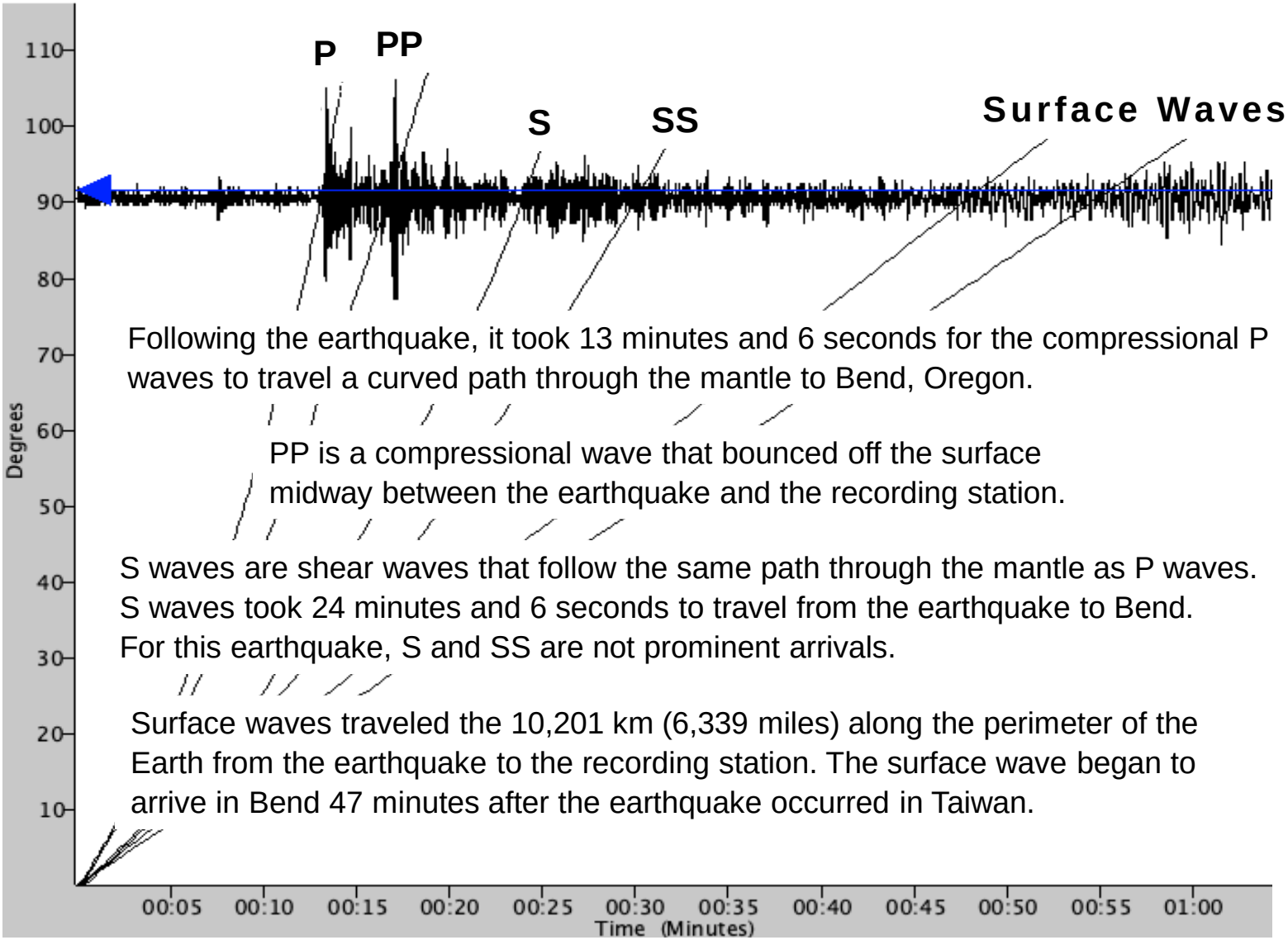
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 10,201 km (6,339 miles, 91.5˚) from the location of this earthquake.



Following the earthquake, it took 13 minutes and 6 seconds for the compressional P waves to travel a curved path through the mantle to Bend, Oregon.

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 24 minutes and 6 seconds to travel from the earthquake to Bend. For this earthquake, S and SS are not prominent arrivals.

Surface waves traveled the 10,201 km (6,339 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Bend 47 minutes after the earthquake occurred in Taiwan.

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