Magnitude 7.6 MEXICO

Monday, September 19, 2022 at 18:05:06 UTC

Latitude 18.367° N
Longitude 103.252° W
Depth 15.1 km

A magnitude 7.6 earthquake struck southwestern Mexico on Monday, killing one person and prompting evacuations and causing buildings to sway in Mexico City. It occurred on the same day the country marks the anniversaries of two devastating quakes in 1985 and 2017 which killed thousands of people.

The earthquake was near La Placita de Morelos, in Michoacan state along the Pacific Coast, about 475 kilometers (295 miles) west of Mexico City. Hazardous tsunami waves were possible for coasts located within 300 kilometers of the epicenter, the Pacific Tsunami Warning Center said, asking people located in the threatened coastal areas to remain alert.

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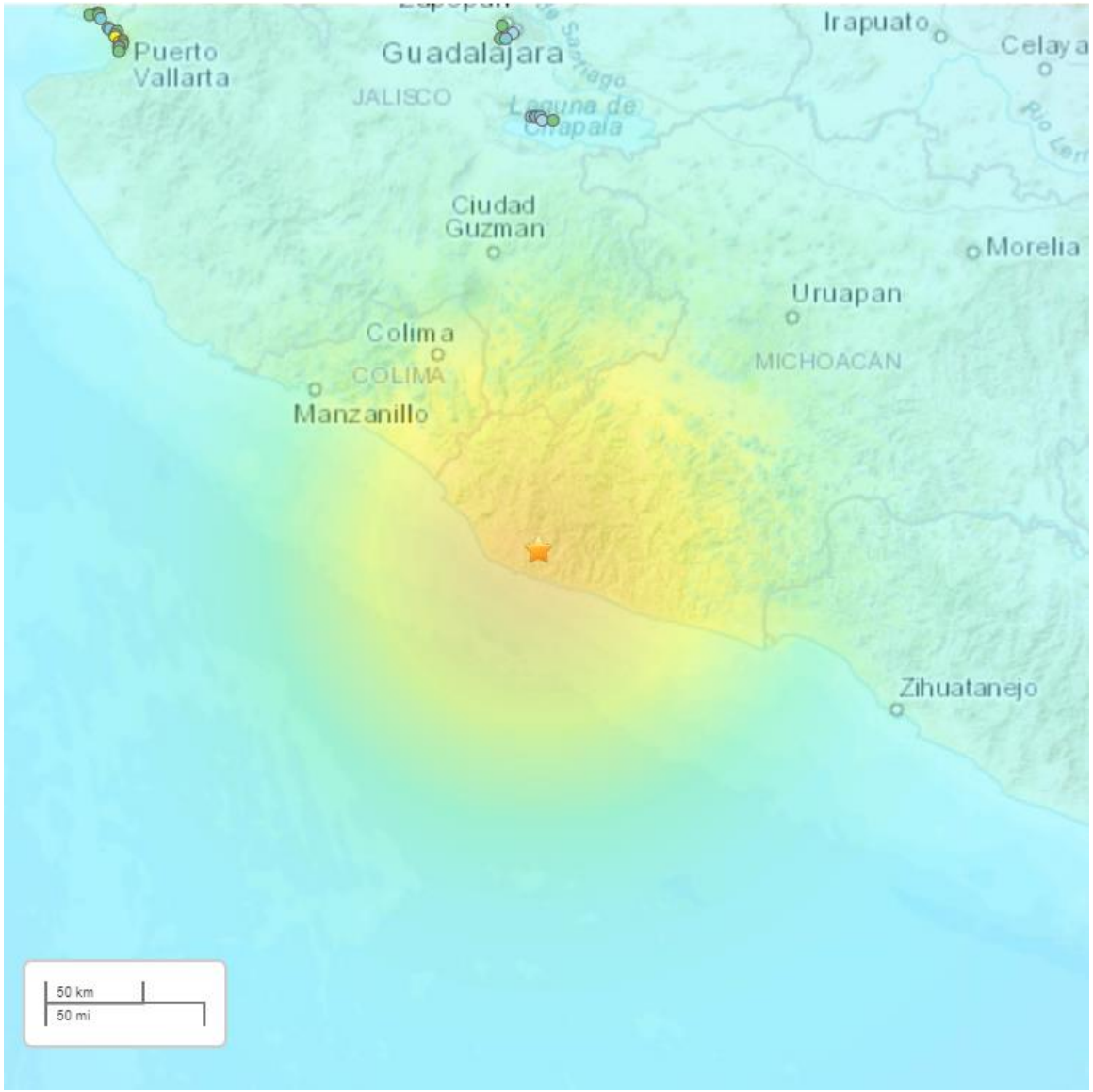
The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale, from I to X, that indicates the severity of ground shaking. Intensity is based on observed effects and is variable over the area affected by an earthquake. Intensity is dependent on earthquake size, depth, distance, and local conditions.

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 7.6 Earthquake

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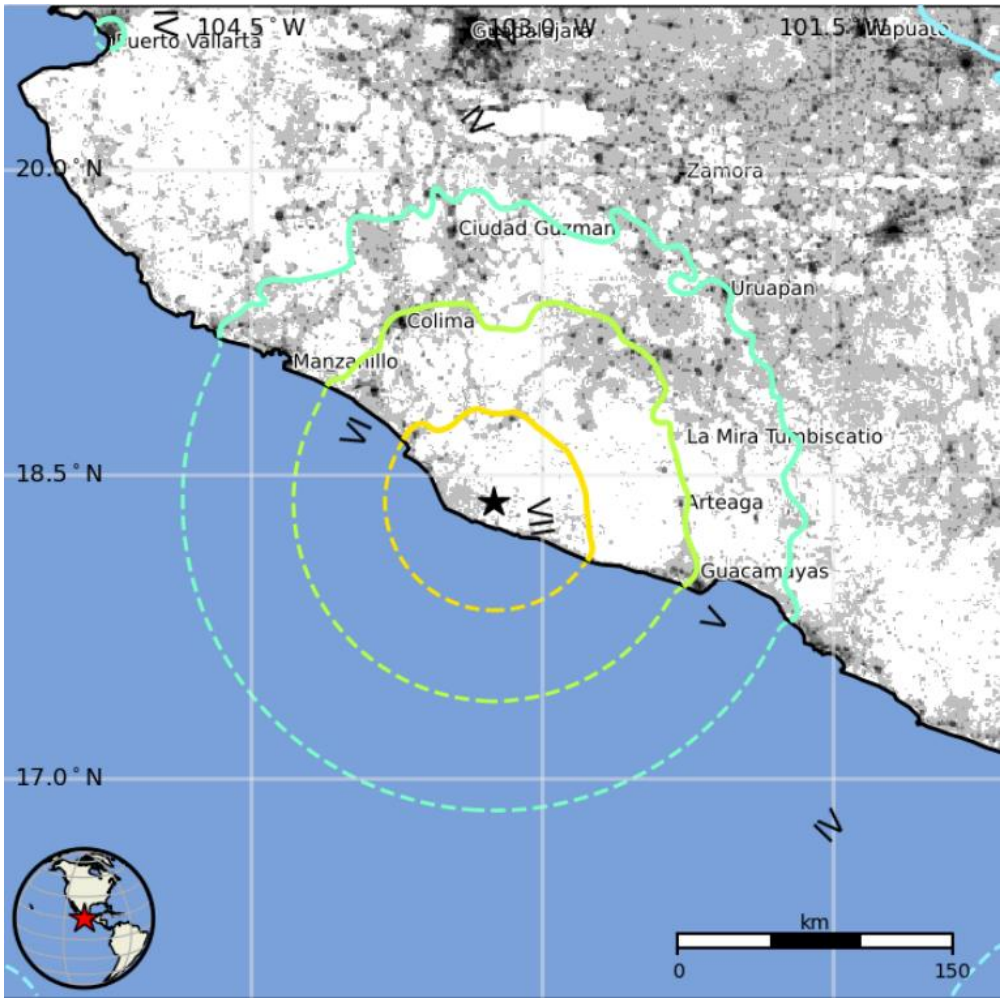
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that 66,000 people felt very strong shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	112 k*
IV	Light	13,566 k*
V	Moderate	1,996 k
VI	Strong	755 k
VII	Very Strong	66 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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As part of the circum-Pacific “Ring of Fire”, Mexico is one of the most seismologically and volcanically active regions on Earth. Most of Mexico is on the North American Plate. Offshore of southern Mexico, the oceanic Cocos Plate subducts beneath the North American Plate at the Middle America Trench. In the area of this earthquake, the Cocos Plate subducts toward the northeast at a rate of approximately 5.2 cm/yr.

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Animation of the regional tectonics and earthquake history of SW Mexico.

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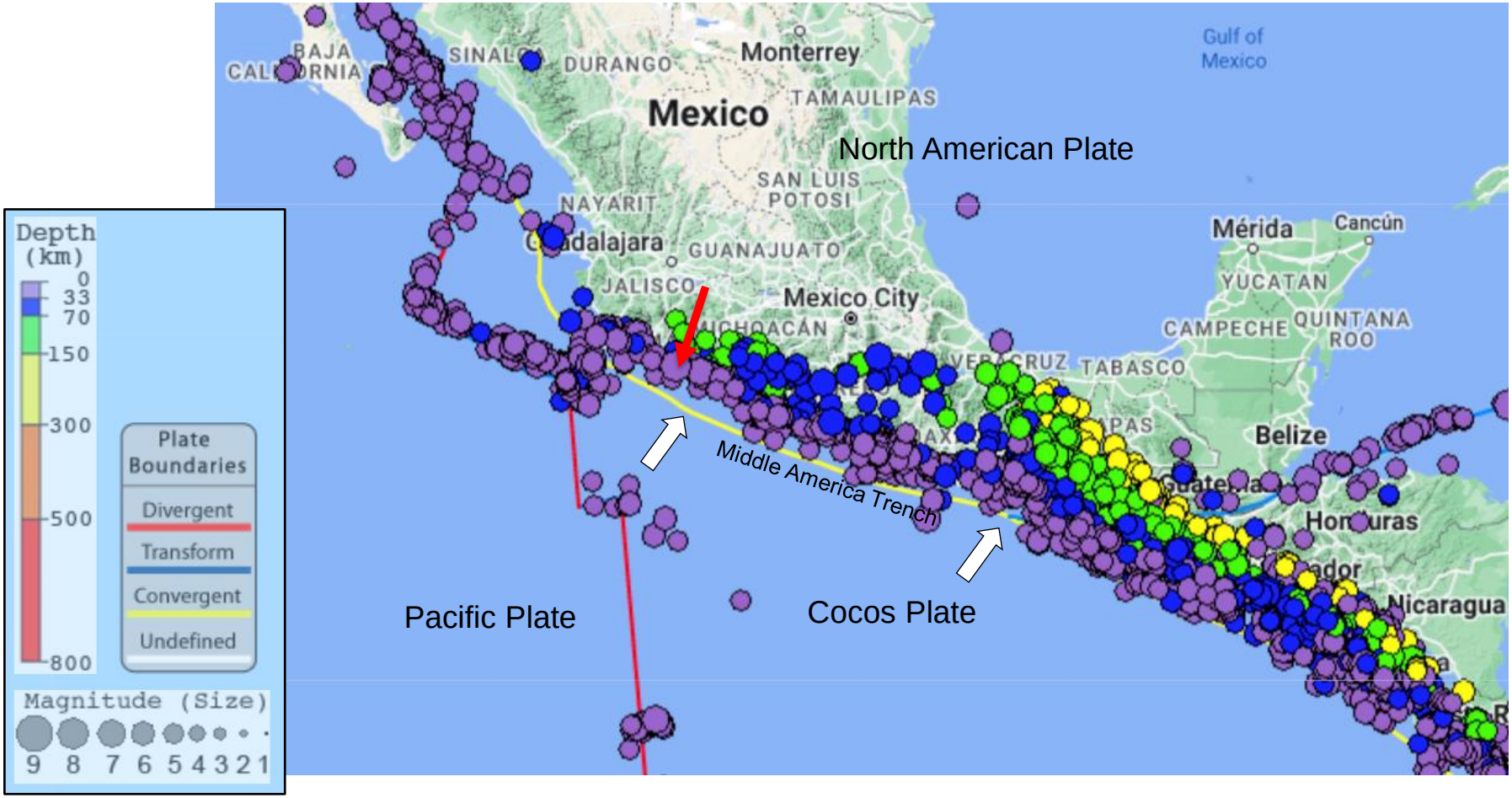
The map below shows magnitude 5 or larger earthquakes during the past 40 years. The red arrow points to the epicenter of the September 19 magnitude 7.6 earthquake. Earthquake depths increase from south to north across the subduction zone as the Cocos Plate dives beneath the North American Plate in southern Mexico. Given the location and thrust-faulting focal mechanism of the September 19 earthquake, this earthquake occurred on or near the subduction zone plate boundary.



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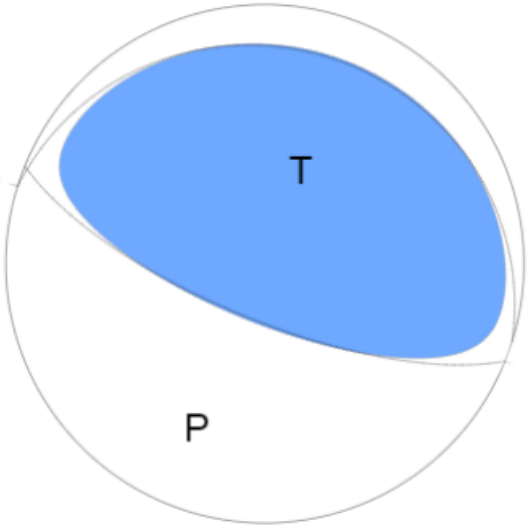
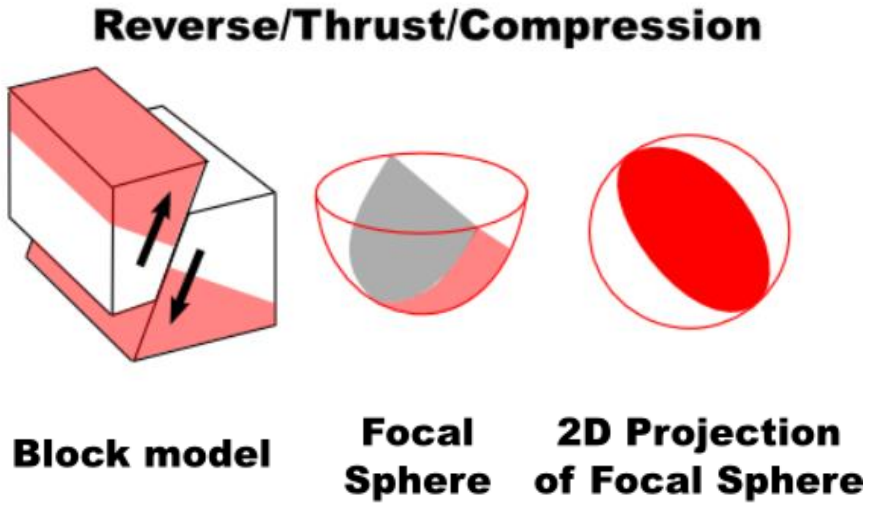
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation 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 shallow thrust faulting. The location, depth, and mechanism of the event are broadly consistent with slip on or near the boundary interface between the subducting Cocos Oceanic Plate and the North American Plate.



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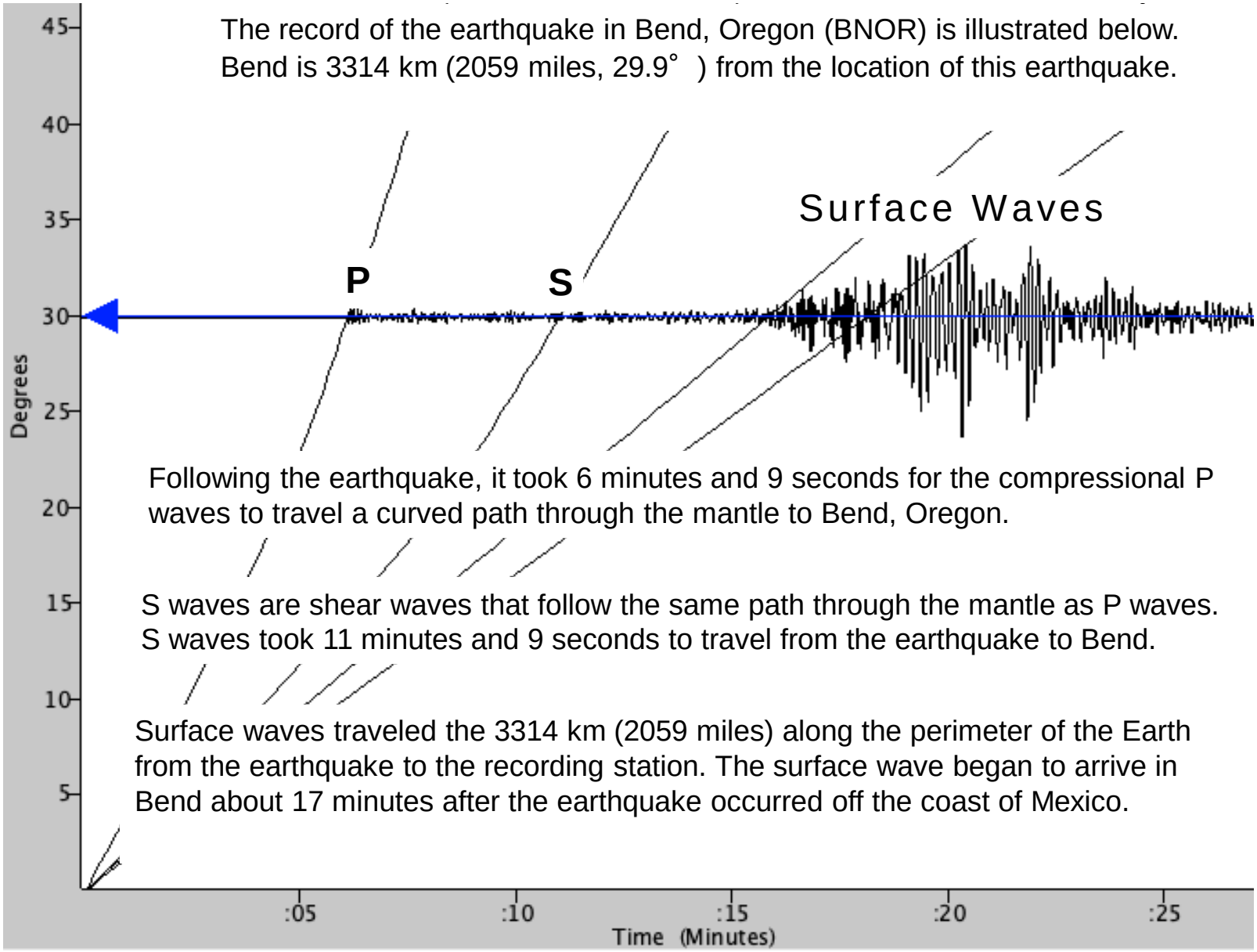
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 3314 km (2059 miles, 29.9˚) from the location of this earthquake.



Following the earthquake, it took 6 minutes and 9 seconds 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 11 minutes and 9 seconds to travel from the earthquake to Bend.

Surface waves traveled the 3314 km (2059 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Bend about 17 minutes after the earthquake occurred off the coast of Mexico.

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These resources have been developed as part of the SAGE facility operated by IRIS via support from the National Science Foundation.