Magnitude 7.4 OAXACA, MEXICO

Tuesday, June 23, 2020 at 15:29:05 UTC

A magnitude 7.4 earthquake has occurred in Oaxaca, Mexico at a depth of 26.3 km (16 miles).

Shaking was felt hundreds of kilometers away in Mexico City.

Security tape alert people of a building damaged by an earthquake in Oaxaca, Mexico. The earthquake was centered near the resort of Huatulco, in the southern state of Oaxaca.

(AP Photo/Luis Alberto Cruz Hernandez)

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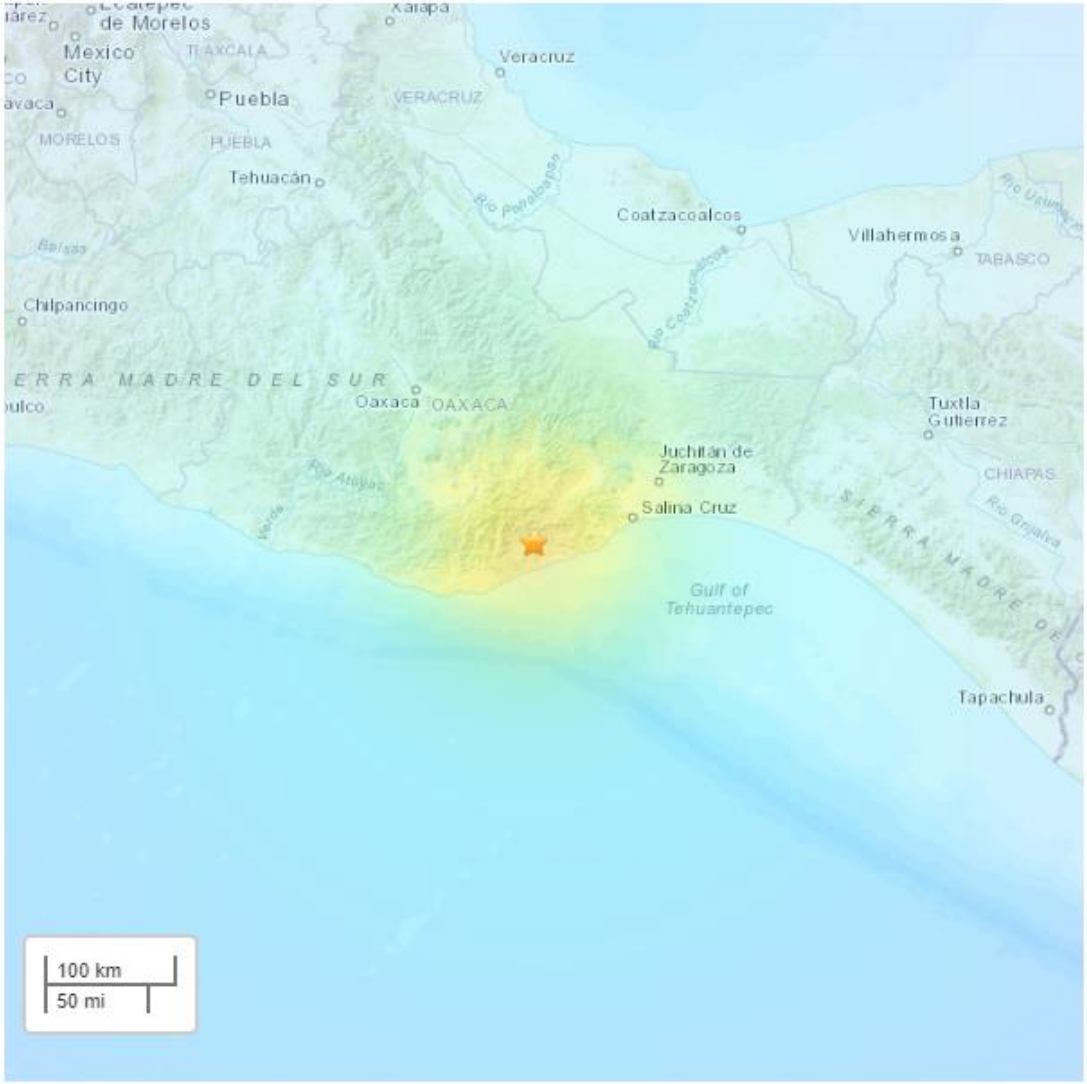
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking.

The area near the epicenter experienced very strong 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 7.4 Earthquake

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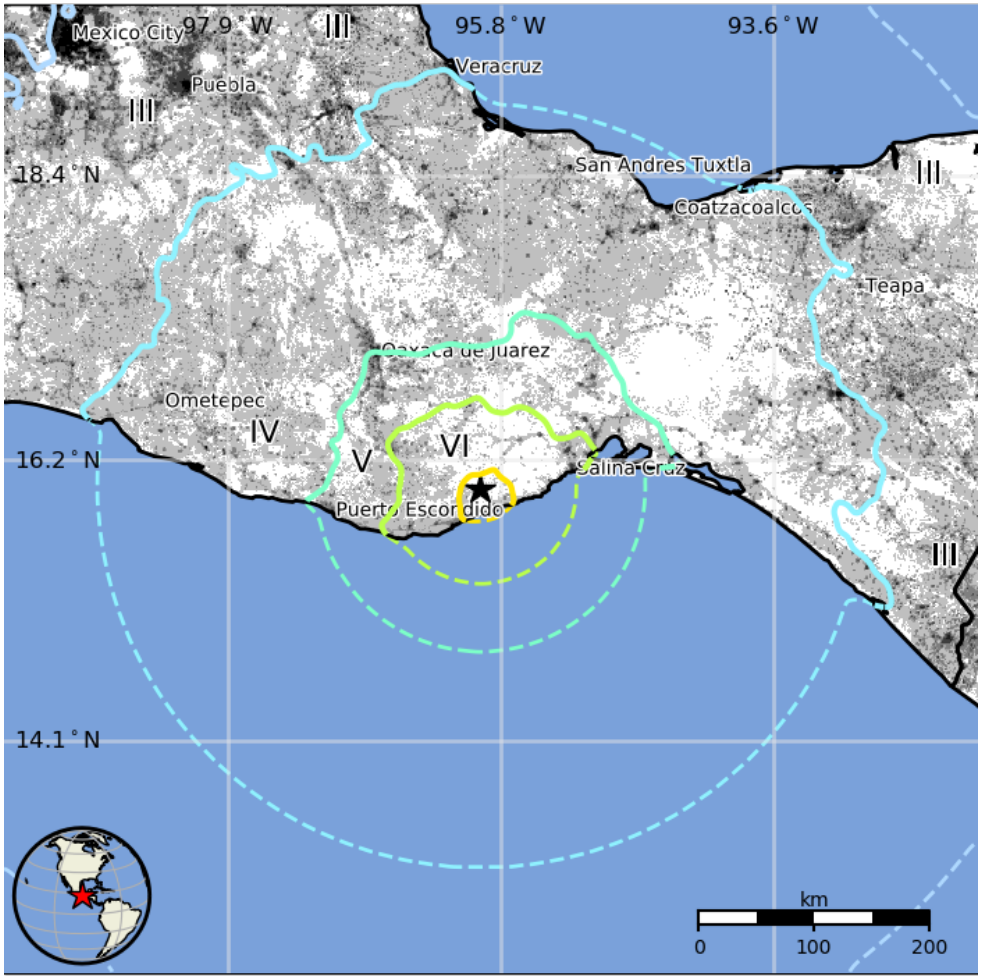
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels. From this earthquake, 26,000 people felt very strong shaking. Over 2 million people experienced moderate to strong shaking.

I	Not Felt	0 k*
II-III	Weak	39,632 k*
IV	Light	9,315 k
V	Moderate	1,504 k
VI	Strong	517 k
VII	Very Strong	26 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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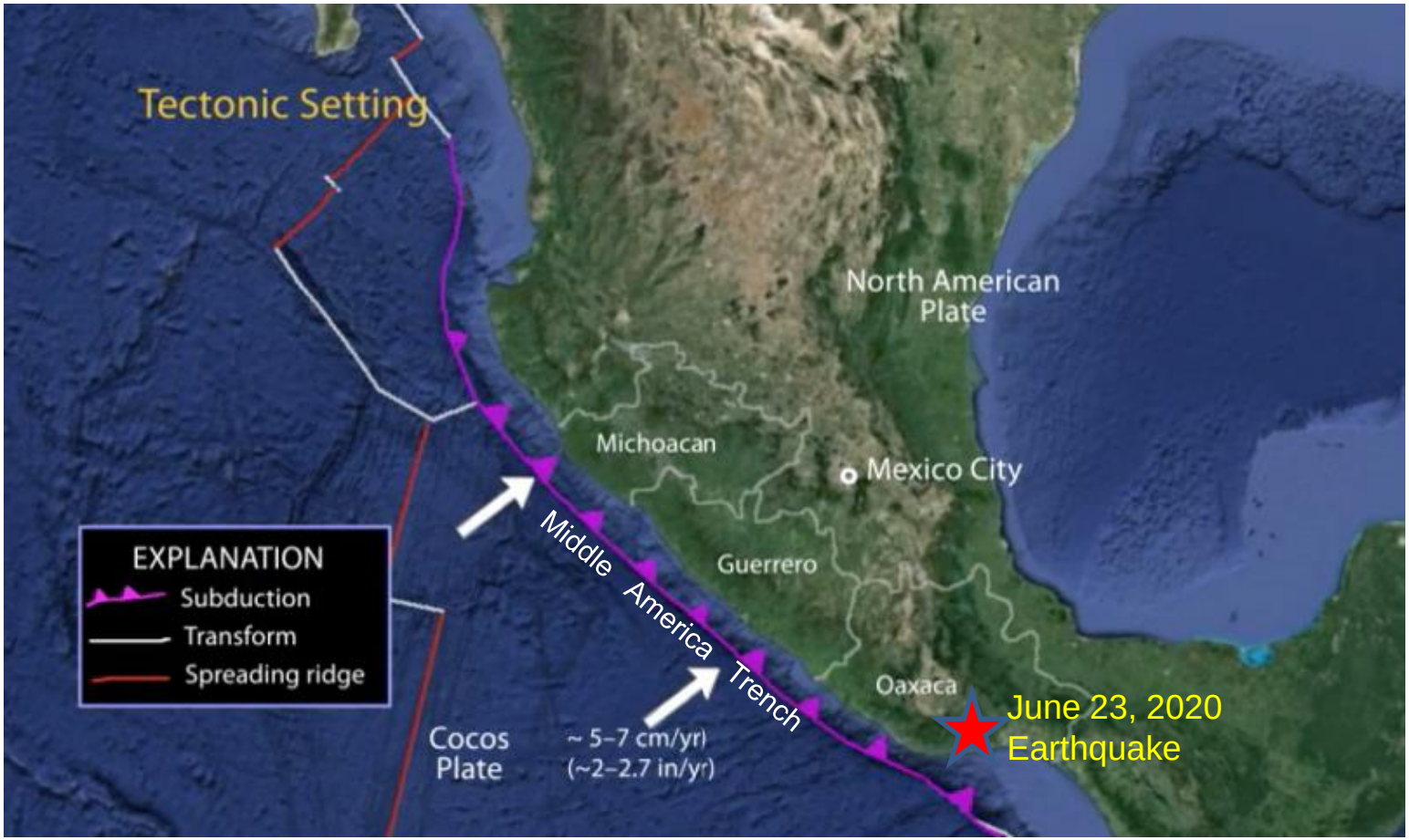

As part of the circum-Pacific “Ring of Fire”, Mexico is one of the most seismologically and volcanically active regions on Earth. Most of Mexico is on the North American Plate. Offshore of southern Mexico, the oceanic Cocos Plate subducts beneath the North American Plate at the Middle America Trench. In the area of this earthquake, the Cocos Plate subducts toward the northeast at a rate of approximately 6.5 cm/yr.

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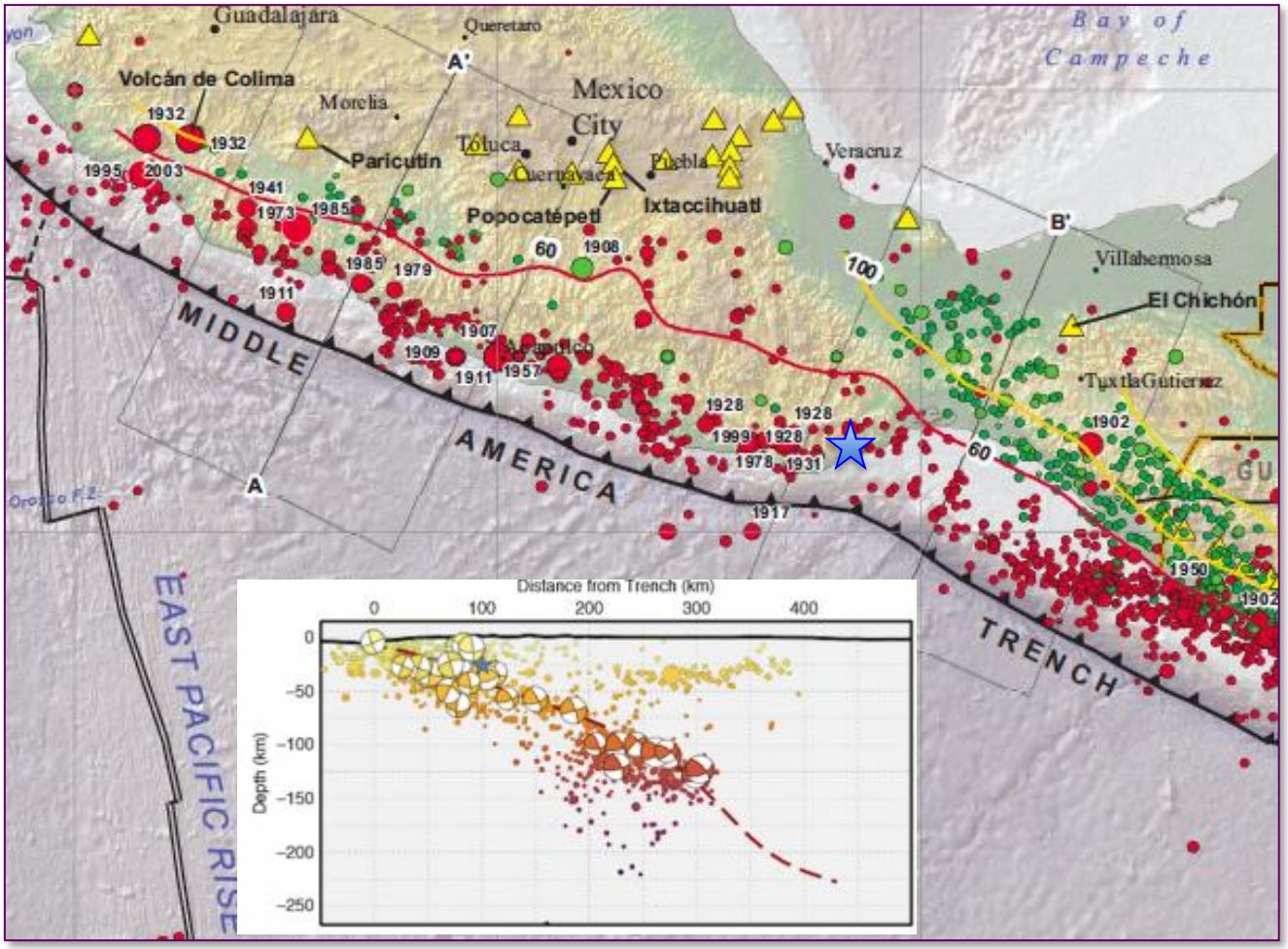
This epicenter of this earthquake is shown by the blue star on the map below. The Cocos Plate subducts towards the north-northeast beneath the North American Plate at the Middle America Trench. The depth of this earthquake fits the pattern of shallow and intermediate depth earthquakes that cluster along the megathrust plate boundary.



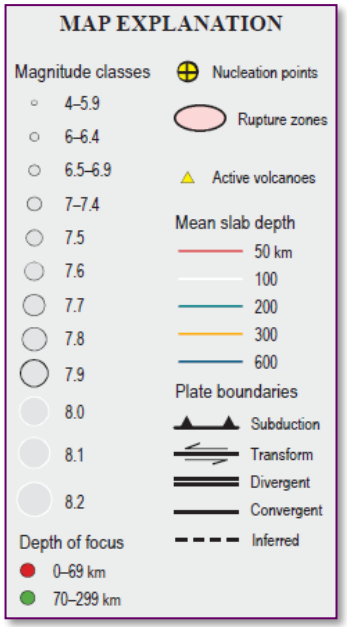


Image source:
U.S. Geological Survey Open-File Report 2010–1083-H

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Epicenters and rupture zones are shown below for magnitude ≥ 7.4 earthquakes in southern Oaxaca and Chiapas from 1965 to present. The June 23, 2020 is the largest earthquake in southern Oaxaca since 1999 but much smaller than the magnitude 8.2 great earthquake offshore of Chiapas in 2017.

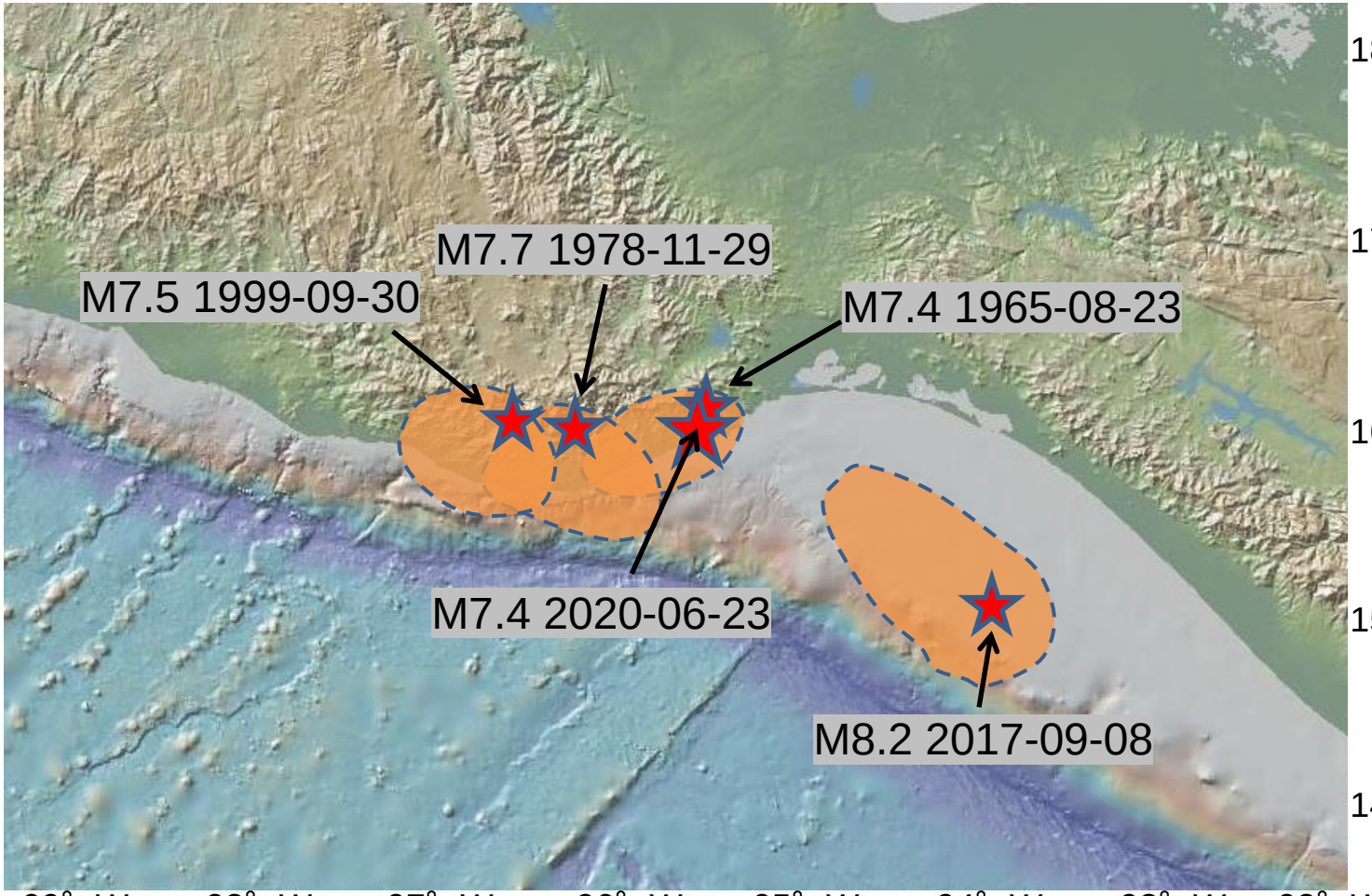

Image adapted from UC Berkeley Seismological Laboratory

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

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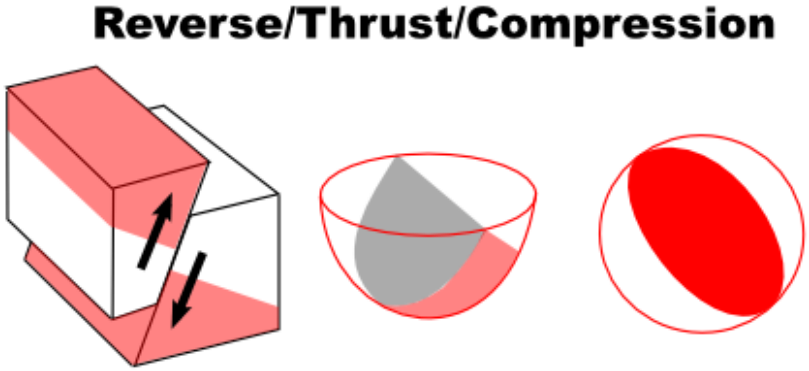
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Since an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants of compression (shaded) and extension (white). The orientation of these quadrants determined from recorded seismic waves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

The location, depth, and thrust-faulting mechanism of this earthquake suggest that it occurred on the interface between the Cocos and North American Plates.



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

USGS W-Phase Moment Tensor Solution

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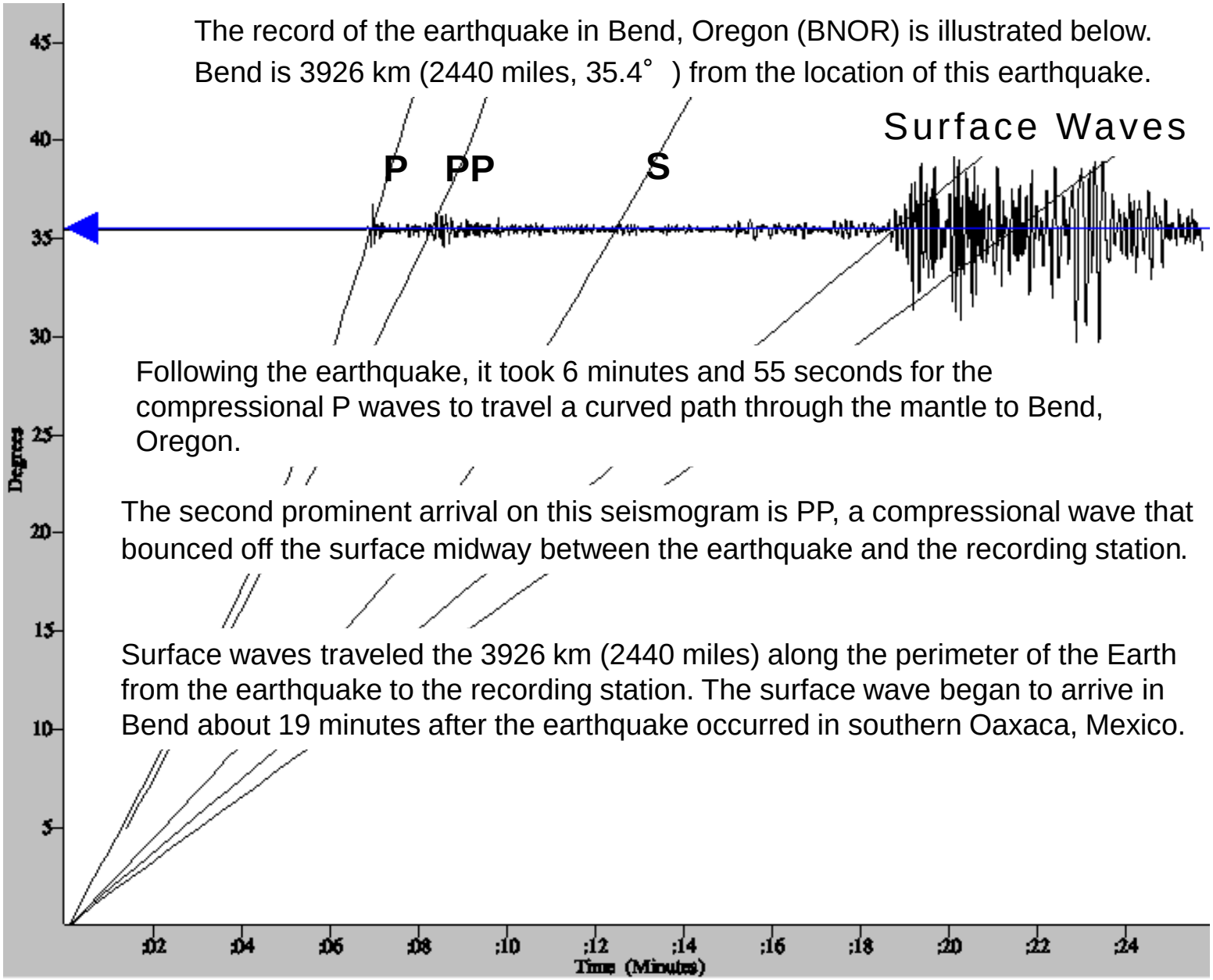
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 3926 km (2440 miles, 35.4˚) from the location of this earthquake.



Following the earthquake, it took 6 minutes and 55 seconds for the compressional P waves to travel a curved path through the mantle to Bend, Oregon.

The second prominent arrival on this seismogram is PP, a compressional wave that bounced off the surface midway between the earthquake and the recording station.

Surface waves traveled the 3926 km (2440 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Bend about 19 minutes after the earthquake occurred in southern Oaxaca, Mexico.

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