Magnitude 7.5 PERU

Sunday, November 28, 2021 at 10:52:13 UTC

A magnitude 7.5 earthquake occurred at 5:52 a.m. Sunday local time about 41 km (26 miles) NNW of the coastal city of Barranca, Peru, and about 160 km (100 miles) north of the capital of Lima, Peru at a depth of 112.5 km (70 miles). The earthquake was felt across Peru's northern border in Colombia and Ecuador.

Early reports indicate minor injuries, widespread damage to buildings, and several highways in the Amazonas and Cajamarca regions blocked by fallen stones.

Before and after photos of a collapsed 16th-century Catholic church tower.

JYB Devot

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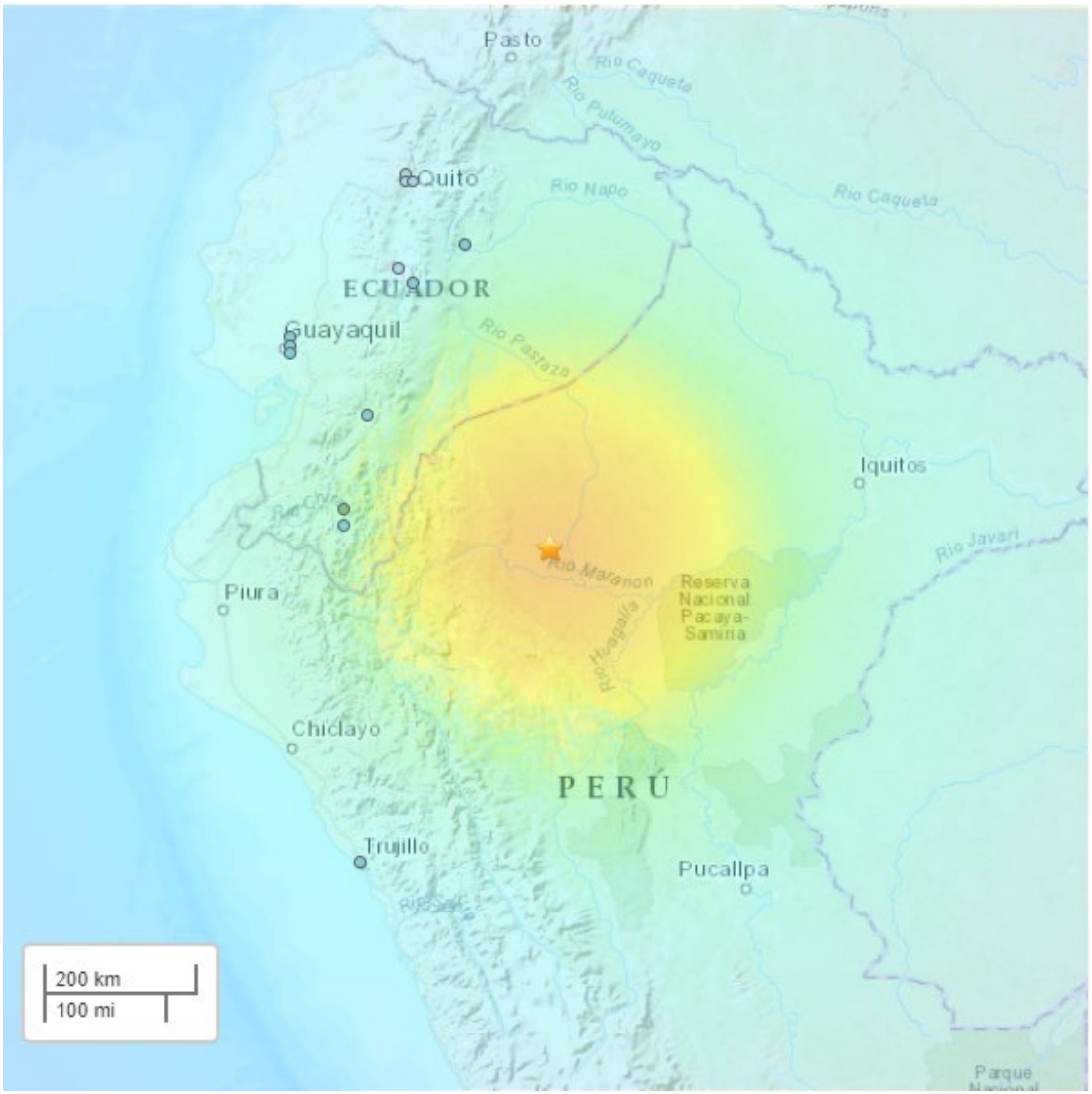
The Modified-Mercalli Intensity (MMI) scale is a ten-stage scale that indicates the severity of ground shaking. Intensity is dependent on the magnitude, depth, bedrock, and location.

The area near the epicenter experienced severe 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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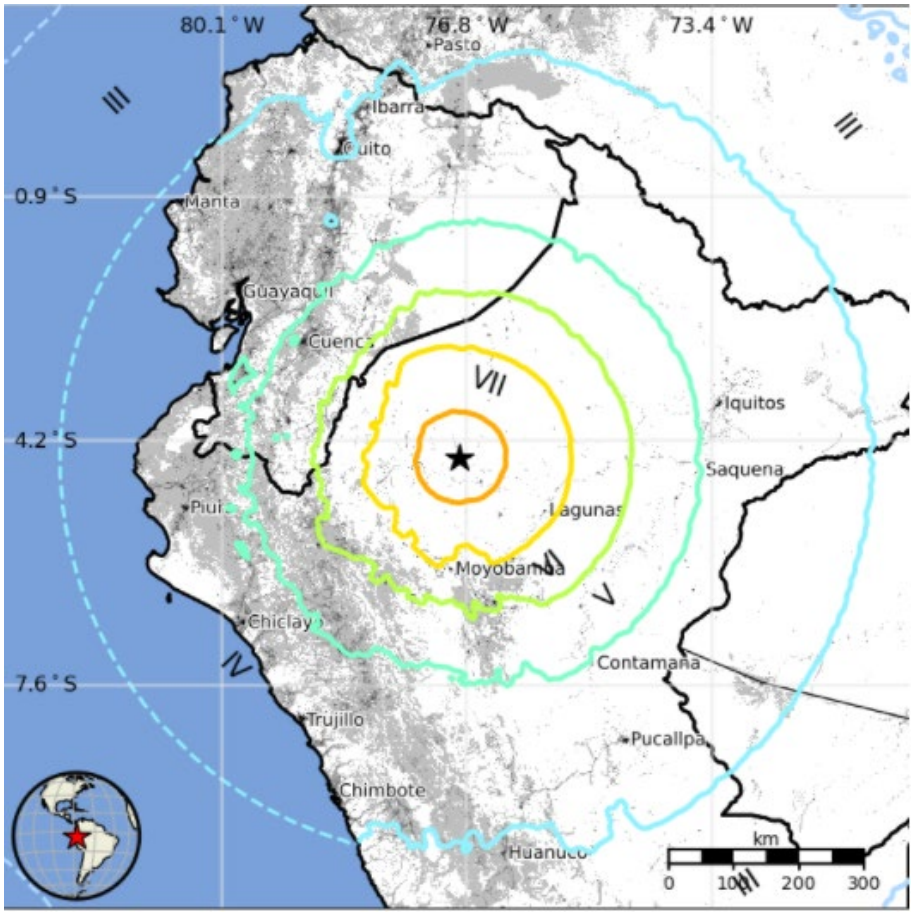
USGS PAGER
Population Exposed to Earthquake Shaking

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

27,000 people were exposed to severe shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	6,110 k*
IV	Light	20,418 k
V	Moderate	4,182 k
VI	Strong	1,084 k
VII	Very Strong	127 k
VIII	Severe	27 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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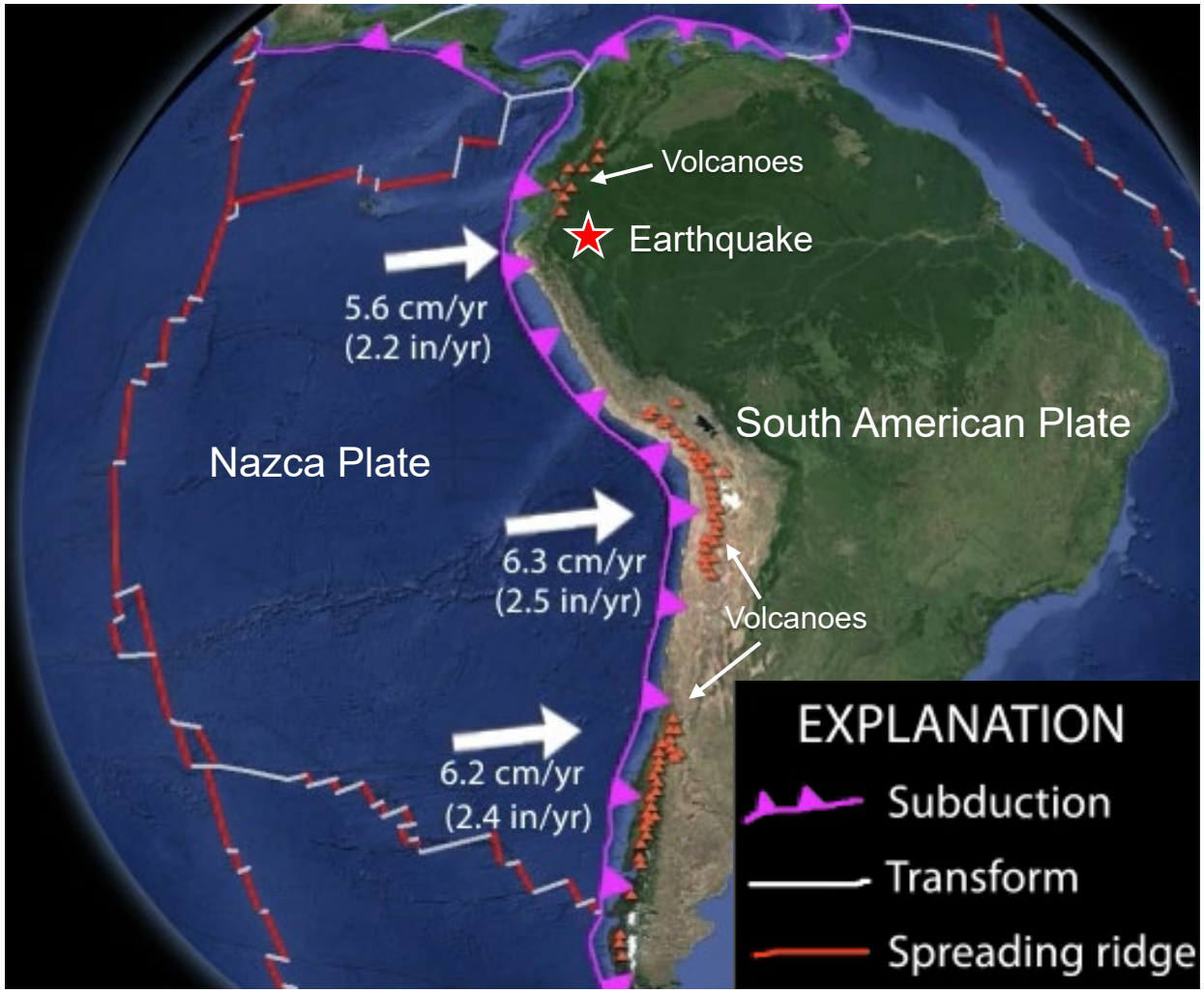
This illustration shows the rate and direction of motion of the Nazca Plate with respect to the South American Plate. Locations of active Andean volcanoes are shown by the orange triangles.

This earthquake is shown by the red star. At the location of this earthquake, the Nazca Plate subducts beneath the South America Plate at a velocity of about 56 mm/yr.



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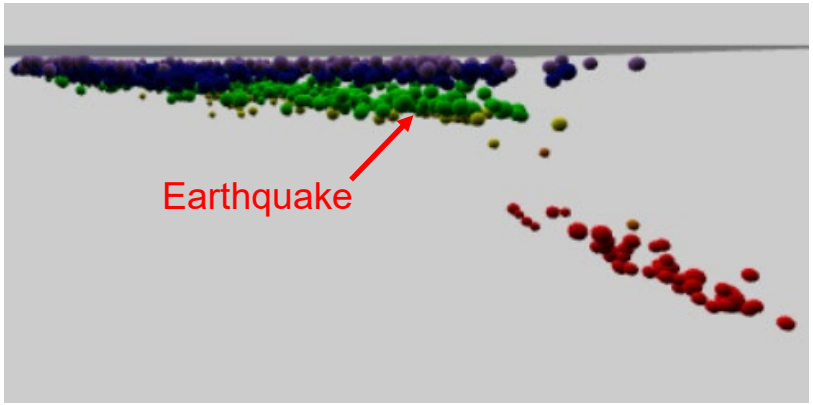
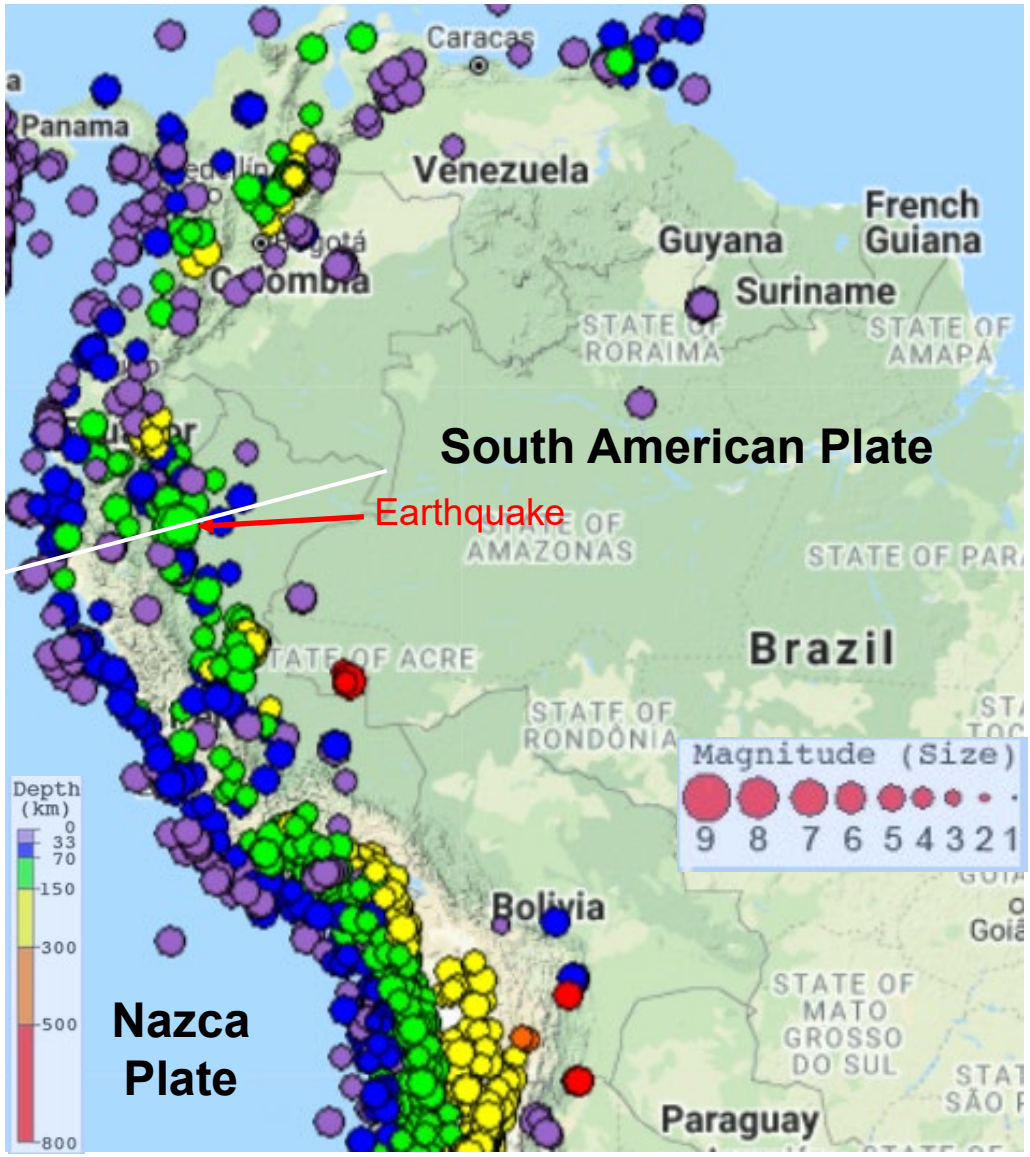
Epicenters are shown on a map of historic seismicity on the right. Earthquakes between the Nazca and South American Plates and within the Nazca Plate increase in depth from west to east.

A 3D view along the cross section oriented along the thin white line is shown below. This earthquake occurred within the top of the Nazca Plate as it bends to dive more steeply beneath the South American Plate.





Maps generated using IRIS Earthquake Browser

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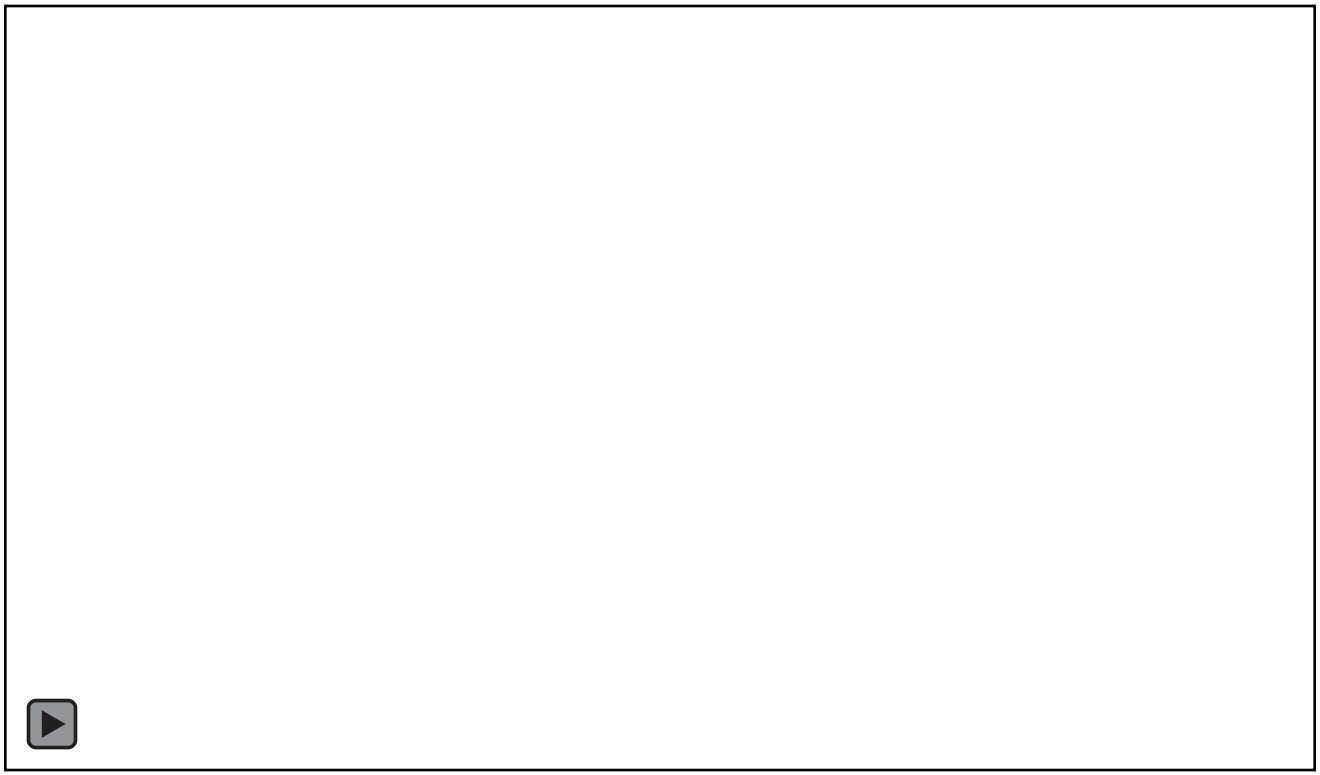
At the location of this earthquake, the oceanic Nazca Plate moves east relative to the South American Plate, subducting at the Peru-Chile Trench west of the Ecuadoran coast and sinking into the mantle beneath South America. This earthquake occurred at an intermediate-depth, where earthquakes occur within the subducting slab rather than at the shallow plate interface between subducting and overriding tectonic plates.



Animation exploring plate tectonics and earthquakes of the Nazca – South America plate boundary region.

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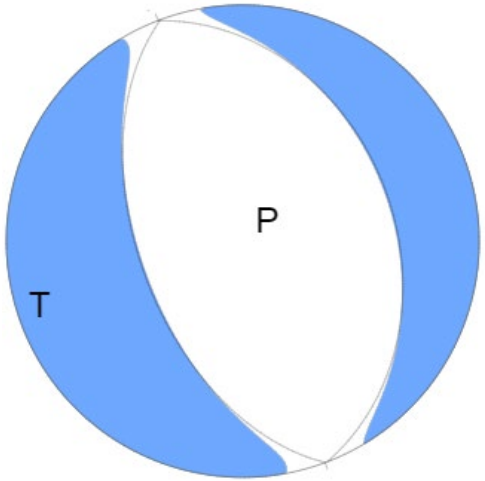
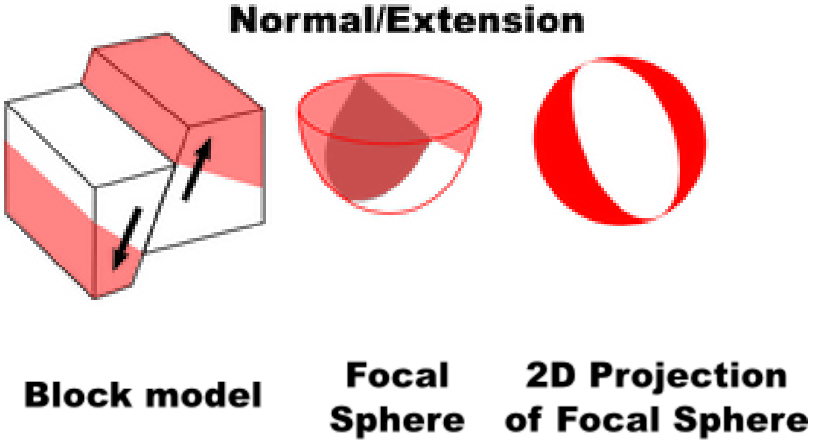
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation of these quadrants determined from recorded seismic waves 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 at a depth of 112.5 km, likely within the Nazca Plate which is subducting beneath the South America Plate.

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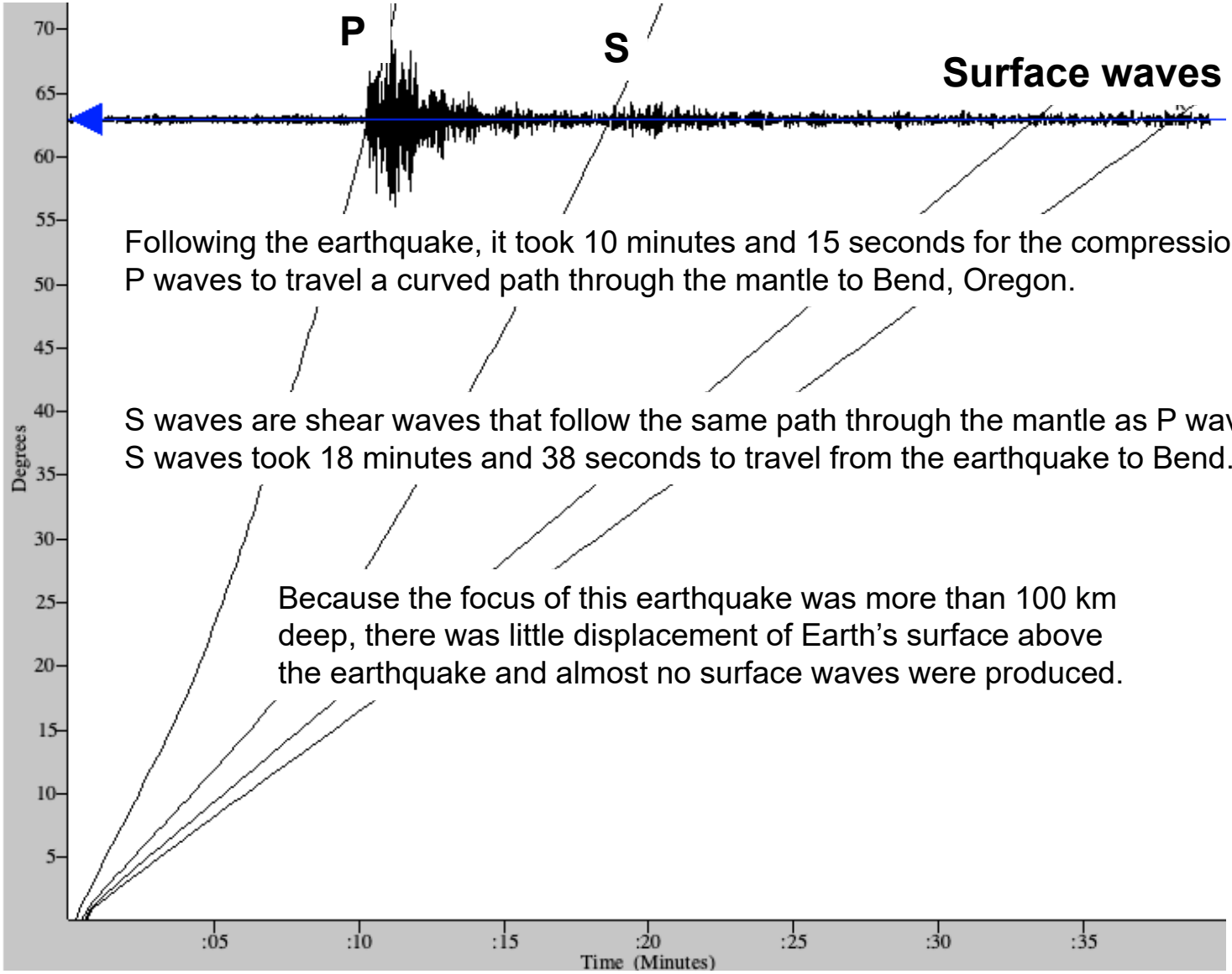
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 6984 km (4340 miles, 63.1°) from the location of this earthquake.



Following the earthquake, it took 10 minutes and 15 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 18 minutes and 38 seconds to travel from the earthquake to Bend.

Because the focus of this earthquake was more than 100 km deep, there was little displacement of Earth's surface above the earthquake and almost no surface waves were produced.

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