

Magnitude 7.5 PERU-ECUADOR BORDER REGION

Friday, February 22, 2019 at 10:17:22 UTC

A magnitude 7.5 earthquake struck on Friday near the border of Ecuador and Peru, 115km ESE of Palora, Ecuador. Shaking was felt as far away as the Ecuadorean capital of Quito and the coastal city of Guayaquil, Ecuador.

The earthquake occurred at a depth of 132.4 km. There were no immediate reports of casualties or damage.



Puente Sobre Río Pastaza, Palora, Ecuador



Magnitude 7.5 PERU-ECUADOR BORDER REGION

Friday, February 22, 2019 at 10:17:22 UTC

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 very strong shaking from this earthquake.

Modified Mercalli Intensity



Perceived Shaking

Extreme

Violent

Severe

Very Strong

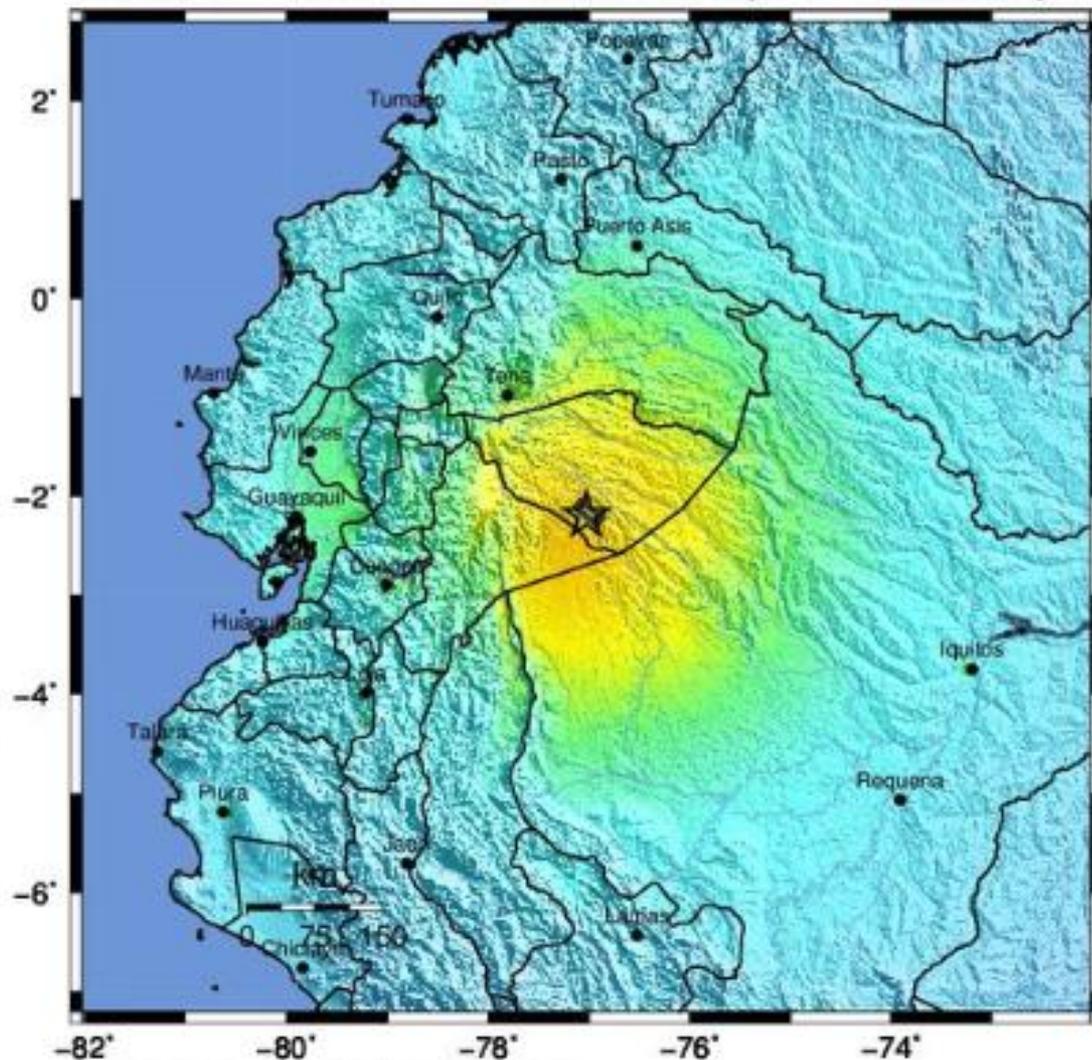
Strong

Moderate

Light

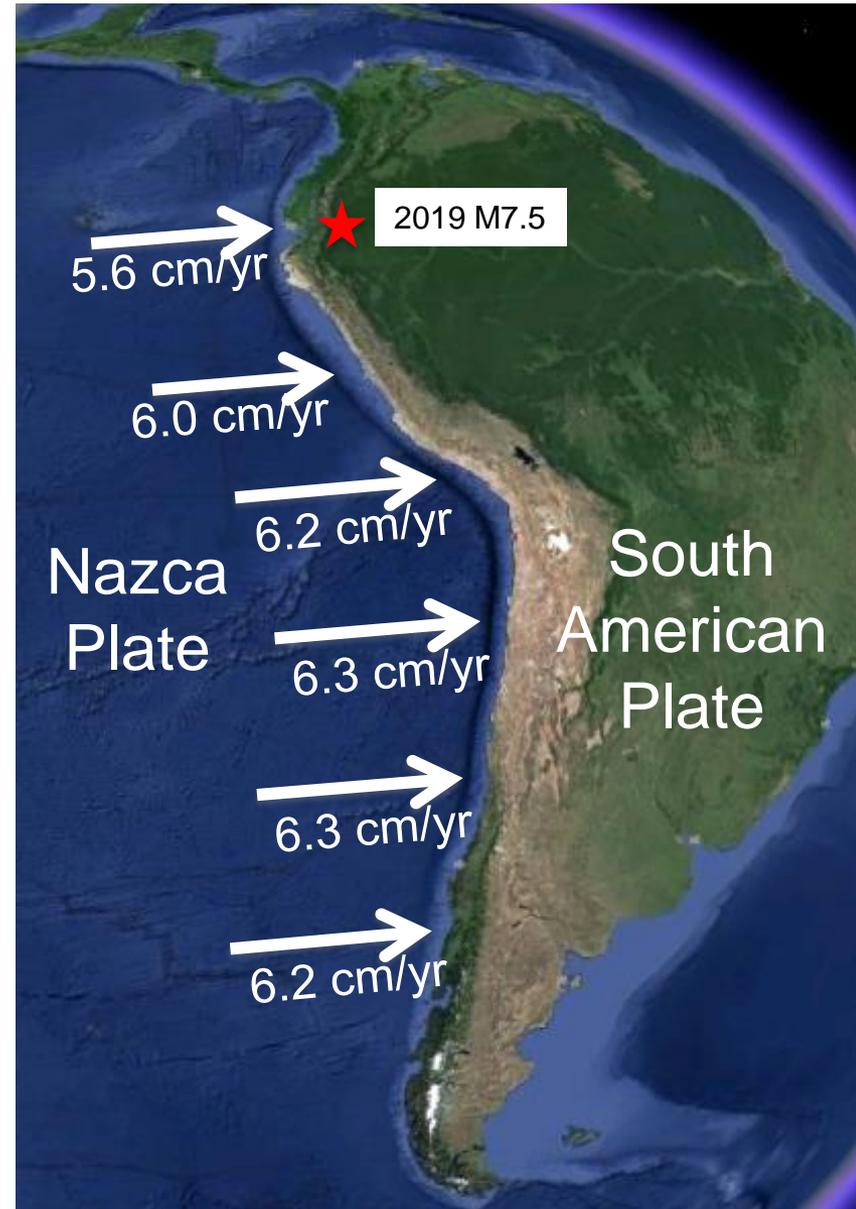
Weak

Not Felt



Lithospheric plates are actually spherical shells on Earth's surface so relative plate motions are best described as relative plate rotations. This means that rates of relative plate motion change with location on a long plate boundary such as the Nazca – South American Plate boundary. The map on the right illustrates how the convergence rate of the Nazca Plate toward the South American Plate ranges from 5.6 cm/yr to 6.3 cm/yr.

These rates have recently been updated using Global Positioning System (GPS) observations from islands on the Nazca Plate and numerous GPS stations in South America. At the location of this earthquake, the rate of convergence is about 5.6 cm/yr.

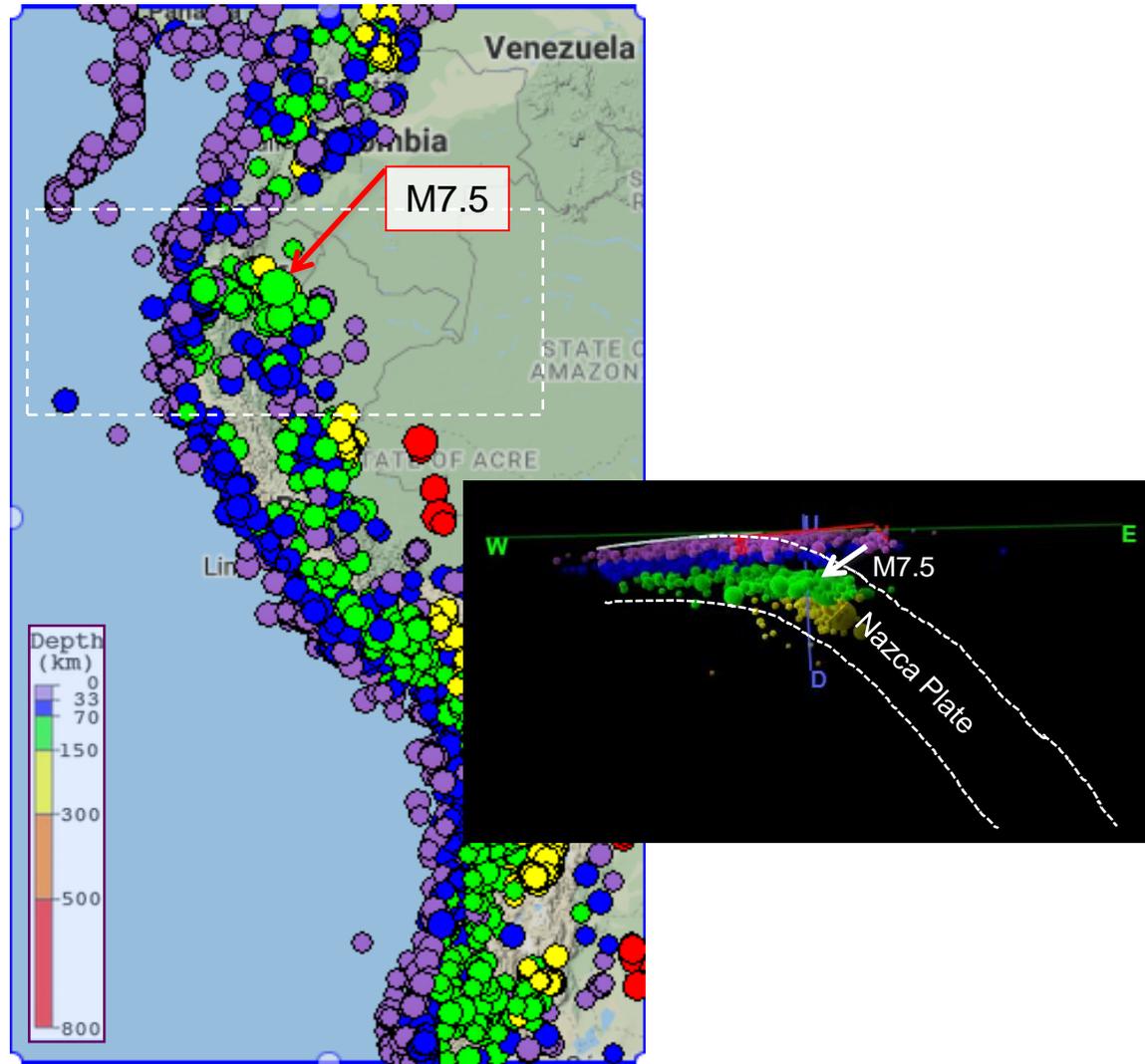


Magnitude 7.5 PERU-ECUADOR BORDER REGION

Friday, February 22, 2019 at 10:17:22 UTC

This map shows the 3000 most recent earthquakes along the west coast of northern South America. The epicenter of the February 22 earthquake is labeled. Earthquakes are color-coded by depth as shown by the legend in the lower left corner.

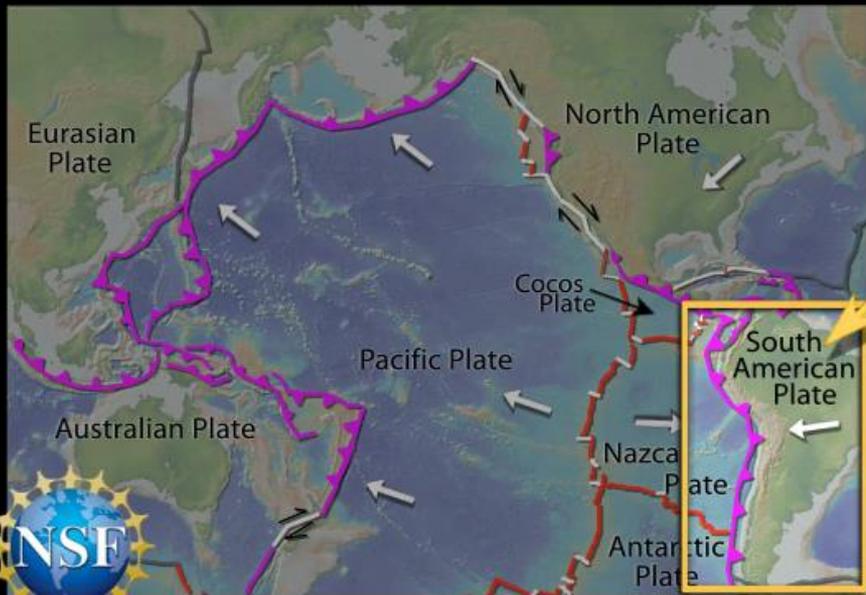
A cross section of earthquakes within the dashed rectangle on the map is shown in the right. The outline of the Nazca Plate is shown in light dashed lines on the cross section. Depths of earthquakes increase from west to east across the Nazca – South America subduction zone. Earthquakes deeper than 100 km occur within the subducting Nazca Plate.



Map created using the IRIS Earthquake Browser (IEB).

At the location of the February 22nd 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 deformation occurs within the subducting slab rather than at the shallow plate interface between subducting and overriding tectonic plates.

South America—Earthquakes & Tectonics



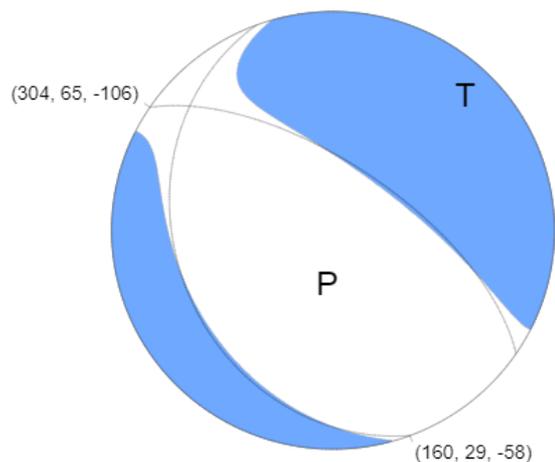
What is going on geologically in this seismically active subduction zone?

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

Magnitude 7.5 PERU-ECUADOR BORDER REGION

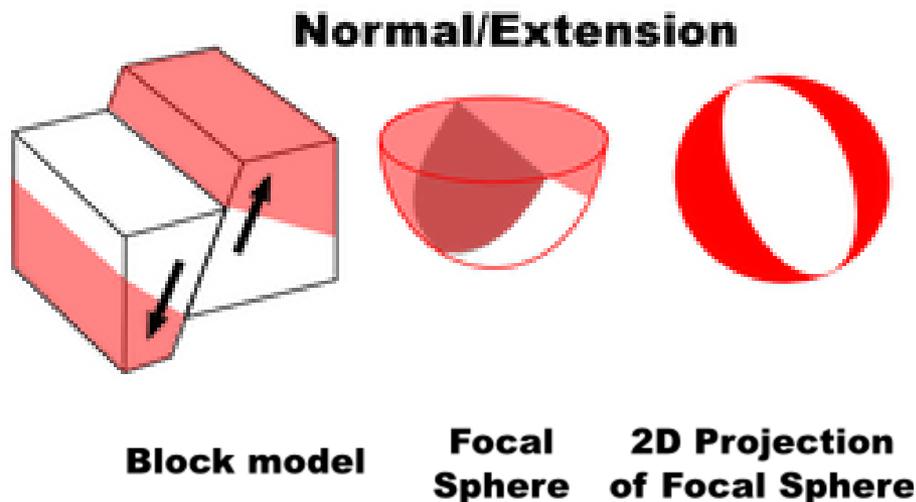
Friday, February 22, 2019 at 10:17:22 UTC

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.

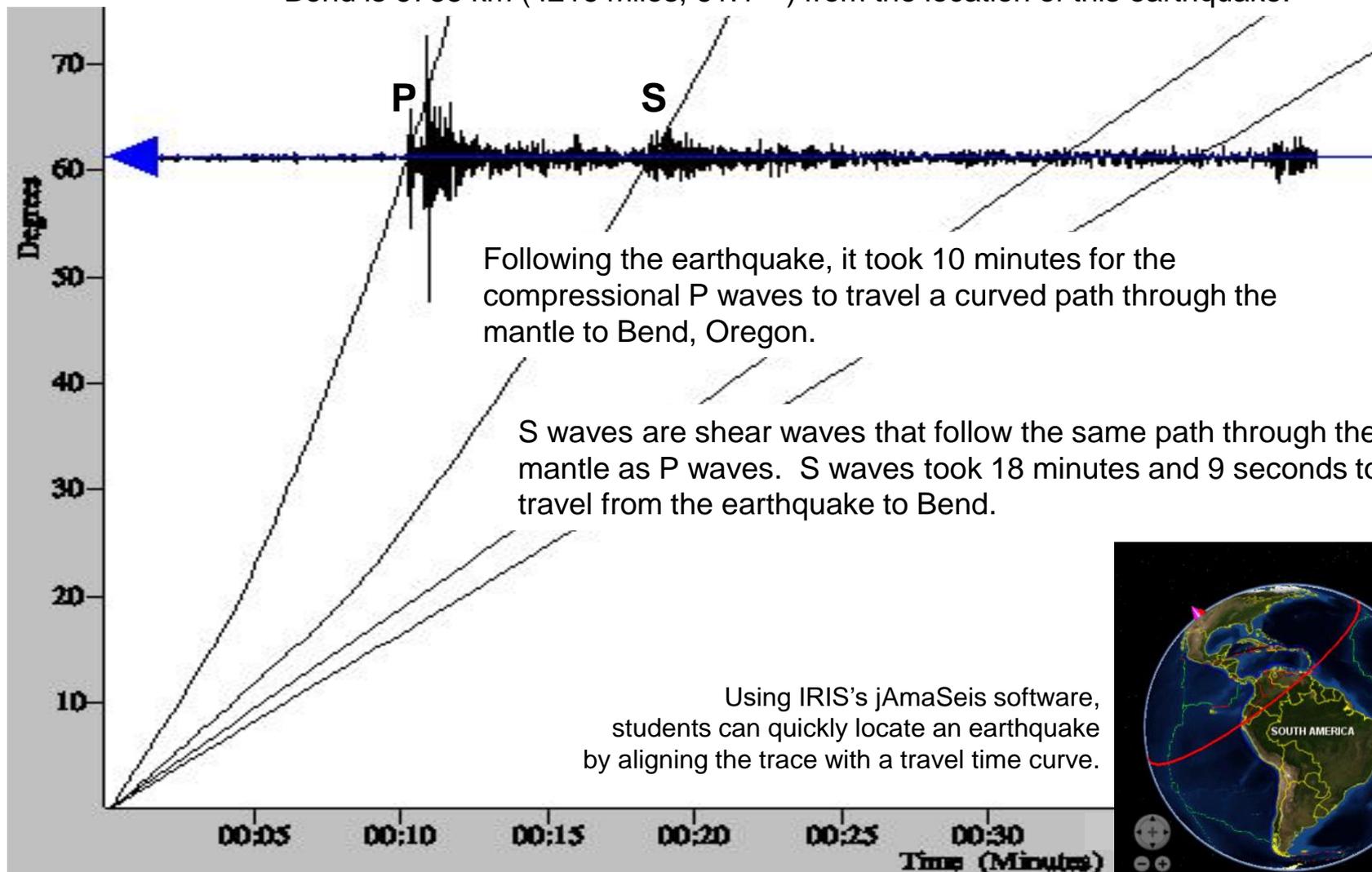


In this case, the focal mechanism indicates this earthquake occurred as the result of normal faulting beneath western Ecuador within the lithosphere of the subducted Nazca Plate.

Magnitude 7.5 PERU-ECUADOR BORDER REGION

Friday, February 22, 2019 at 10:17:22 UTC

The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 6785 km (4216 miles, 61.1°) from the location of this earthquake.



Teachable Moments are a service of

The Incorporated Research Institutions for Seismology
Education & Public Outreach
and
The University of Portland

Please send feedback to tkb@iris.edu

To receive automatic notifications of new Teachable Moments
subscribe at www.iris.edu/hq/retm

