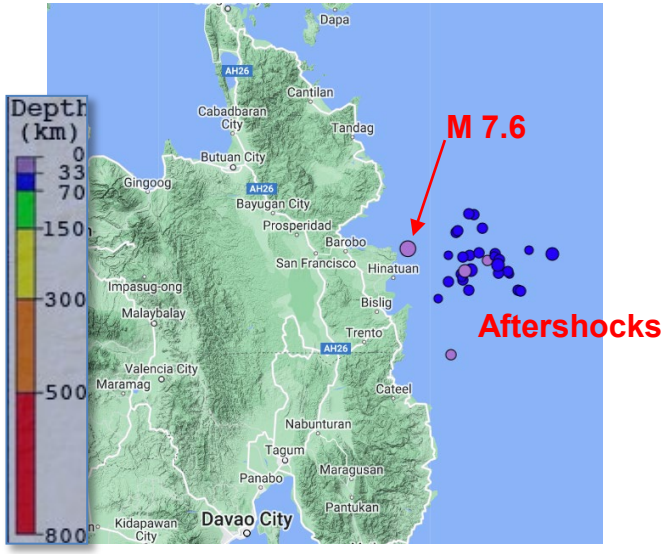
Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 UTC

Latitude 8.527° N
Longitude 126.449° E
Depth 32.8 km

A magnitude 7.6 earthquake occurred Saturday off the coast of the southern Philippines island of Mindanao. The earthquake occurred at 10:37 p.m. at a depth of 32 kilometers (20 miles). There are no immediate reports of damage or casualties. The area has experienced over 30 aftershocks, the largest measuring magnitude 6.9.

The Pacific Tsunami Warning Center said based on the magnitude and location, hazardous tsunami waves are possible for coasts located within 1000 km (621 miles) of the earthquake epicenter, including the southern Philippines and parts of Indonesia, Palau and Malaysia.

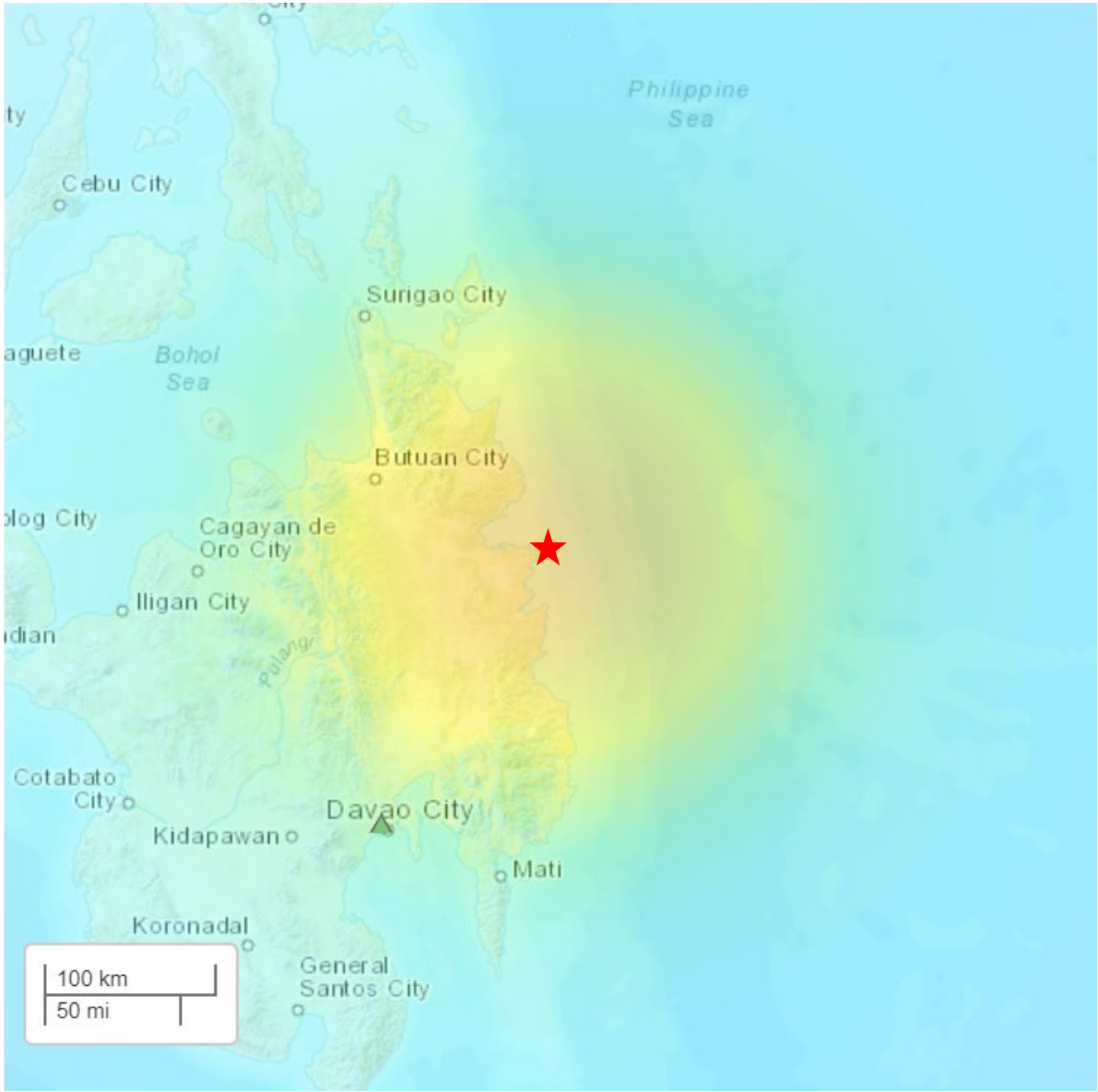


Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 UTC

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



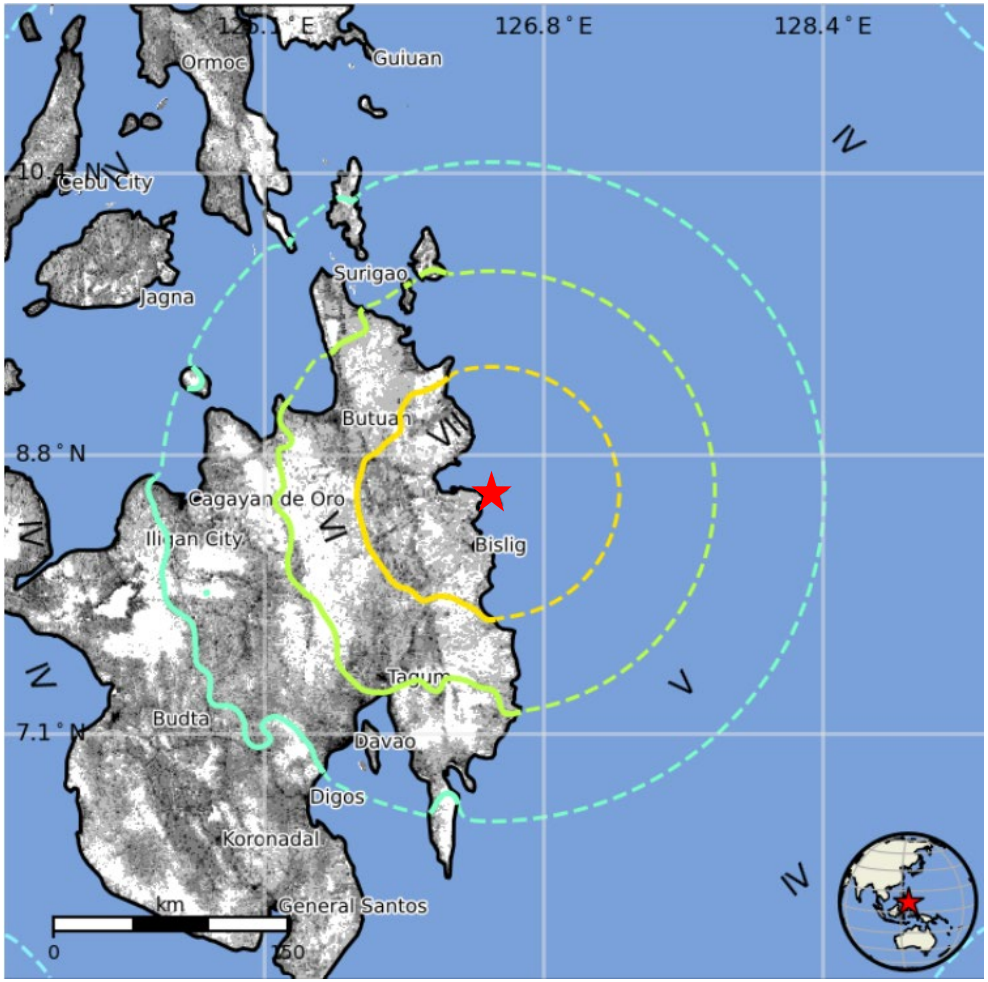
USGS estimated shaking intensity from M 7.6 Earthquake

Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 UTC

The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels. The USGS estimates that 1.2 million people felt very strong shaking from this earthquake.

MMI	Shaking	Population
I	Not Felt	0 k*
II-III	Weak	0 k*
IV	Light	19,276 k*
V	Moderate	7,028 k
VI	Strong	2,865 k
VII	Very Strong	1,240 k
VIII	Severe	0 k
IX	Violent	0 k
X	Extreme	0 k



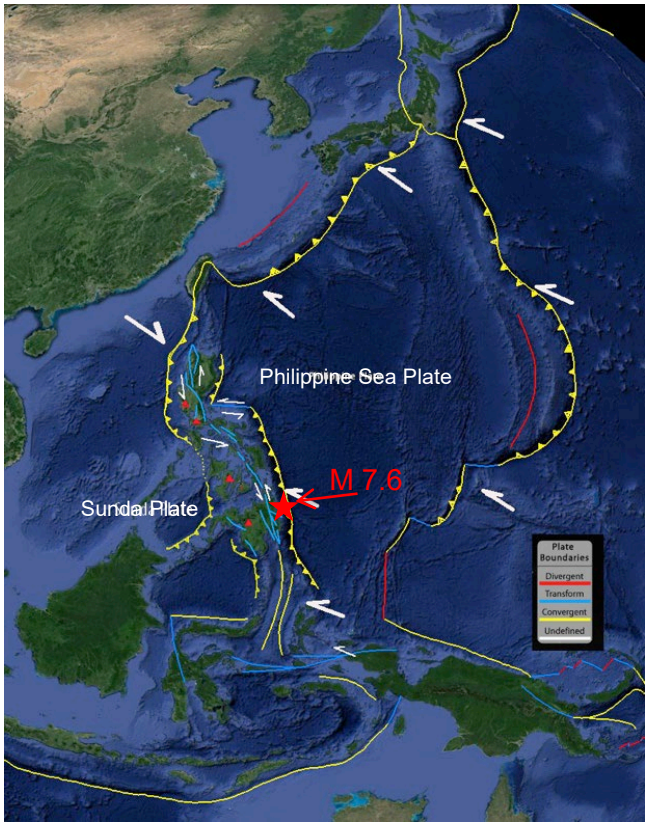
The color-coded contour lines outline regions of MMI intensity. The total population exposure to a given MMI value is obtained by summing the population between the contour lines. The estimated population exposure to each MMI Intensity is shown in the table.

Image courtesy of the US Geological Survey

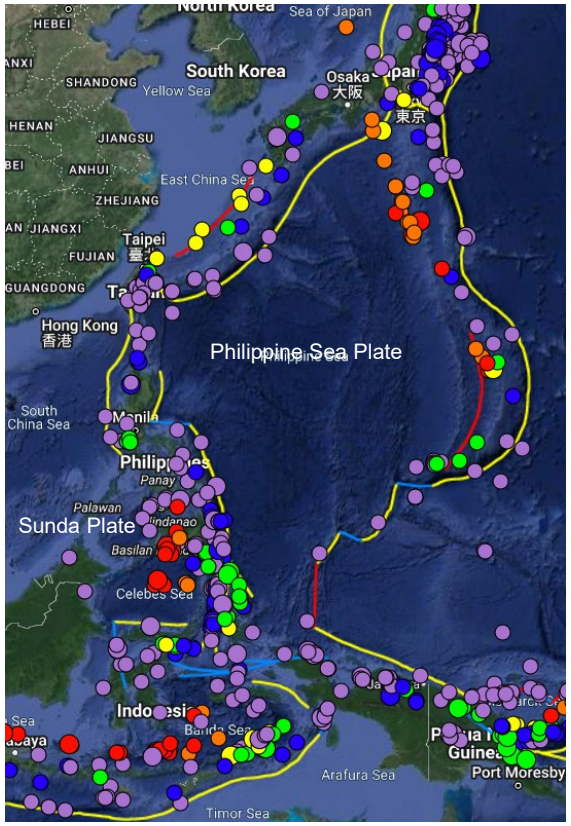
Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 UTC

Along its western margin, the Philippine Sea Plate converges with and subducts beneath the Sunda Plate, the southeastern promontory of the Eurasian Plate. The Philippines Archipelago has oceanic plates subducting beneath both its east and west sides. These islands contain active volcanoes (red triangles), as well as high earthquake activity.



Simplified tectonic boundaries



Magnitude 6–8 earthquakes 2000-2023

Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 UTC

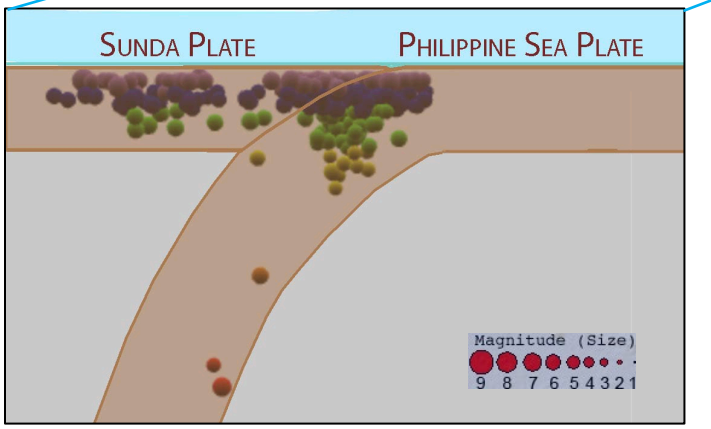
The Philippines is an earthquake-prone region as revealed in maps of increasing magnitude.

Map A shows 1 year of earthquakes greater than M4.

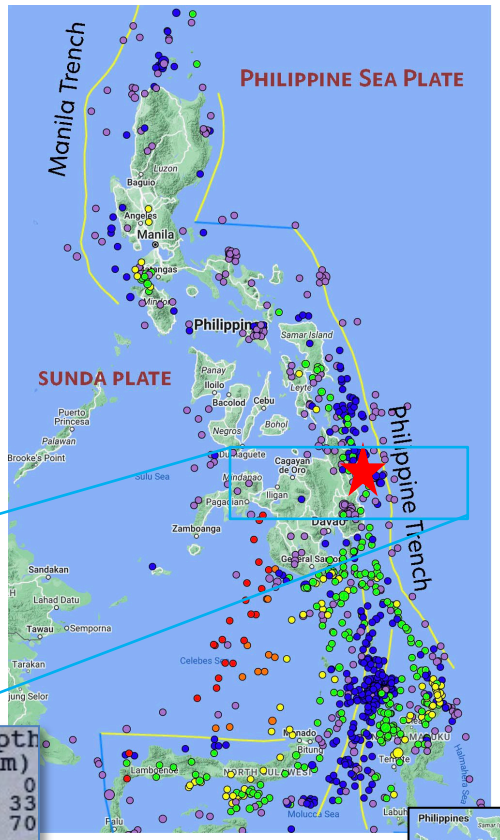
Map B shows 20 years of earthquakes greater than M5.

Map C shows 20 years of earthquakes greater than M7.

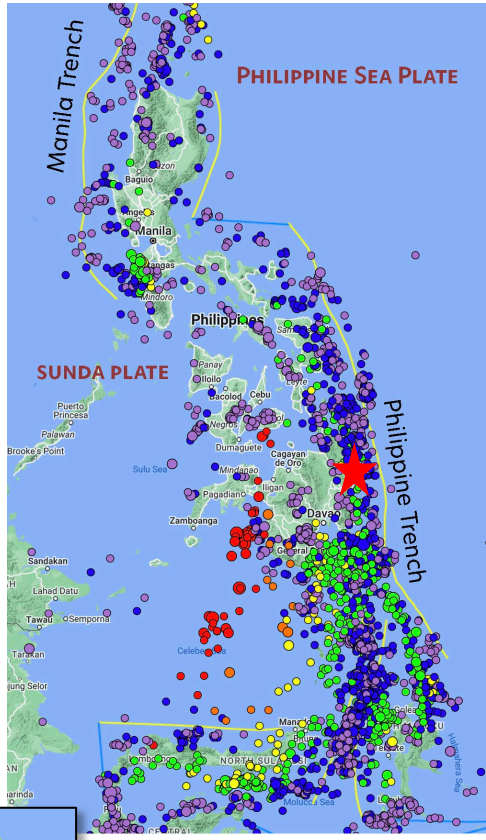
The red star indicates the location of the M7.6 that occurred today.

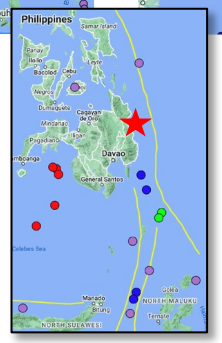


Map A: 1,080 >M4 in 1 year



Map B: 2,620 >M5 in 20 years





Map C:
19 earthquakes >M7
in 20 years

Maps created with the Interactive Earthquake Browser

Magnitude 7.6 PHILIPPINES
Saturday, December 2, 2023 at 14:37:03 UTC

This earthquake is shown by the red star in this map of historical earthquakes (1900-2016).

In the region of this earthquake, the Philippine Sea Plate moves west-northwest with respect to the Sunda Plate at a rate of ~10 cm/yr.

Given the epicentral location, thrust-faulting mechanism (next slide) and 32 km depth, we can conclude that this earthquake occurred on the subduction zone plate boundary where the Philippine Sea Plate subducts beneath the Philippine Islands located on the eastern side of the Sunda Plate.

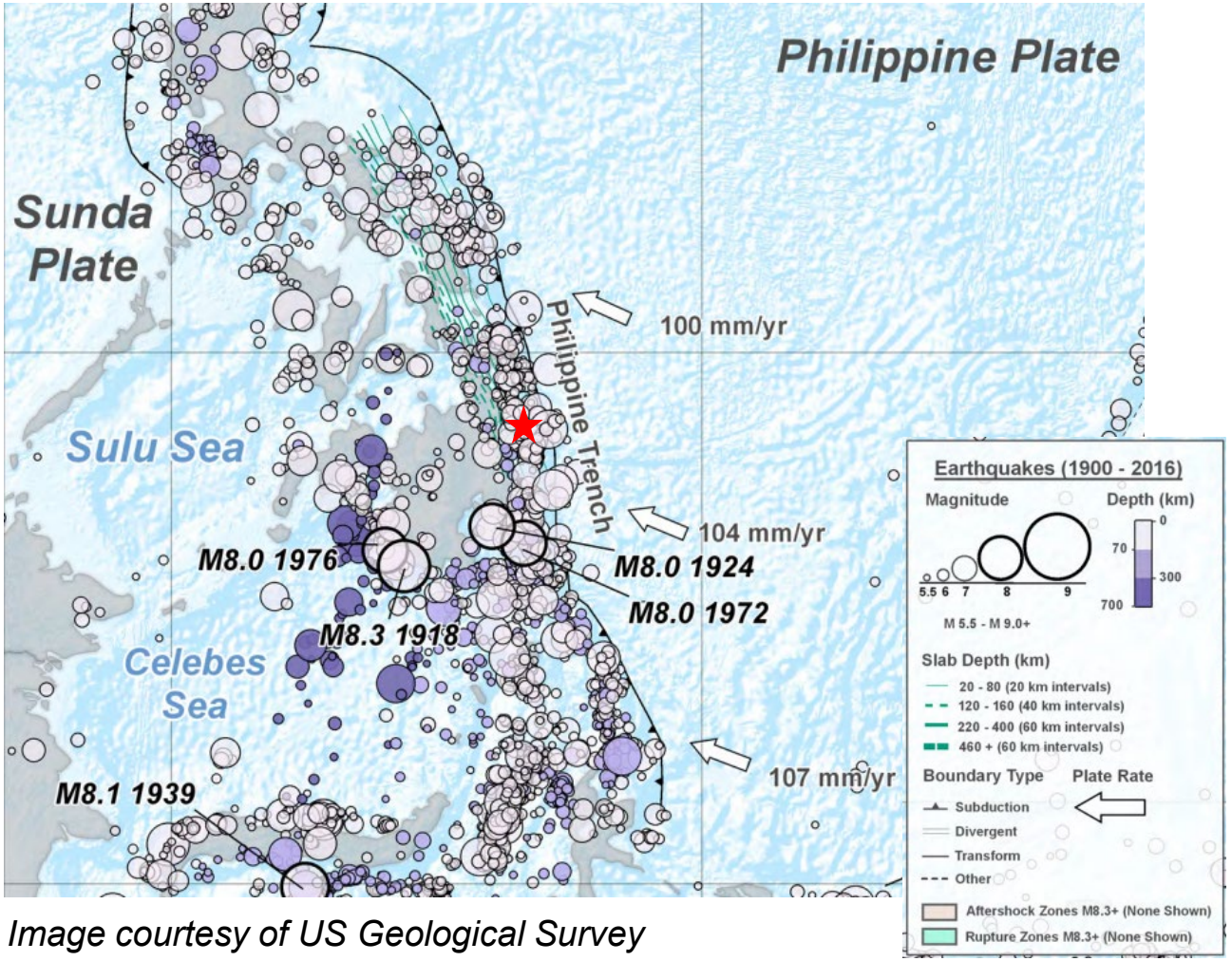
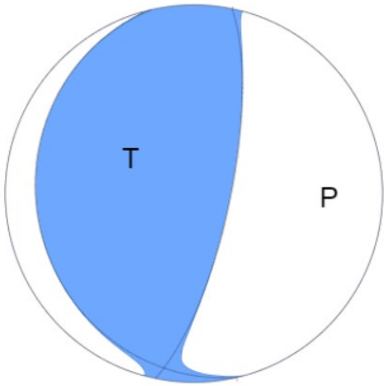


Image courtesy of US Geological Survey

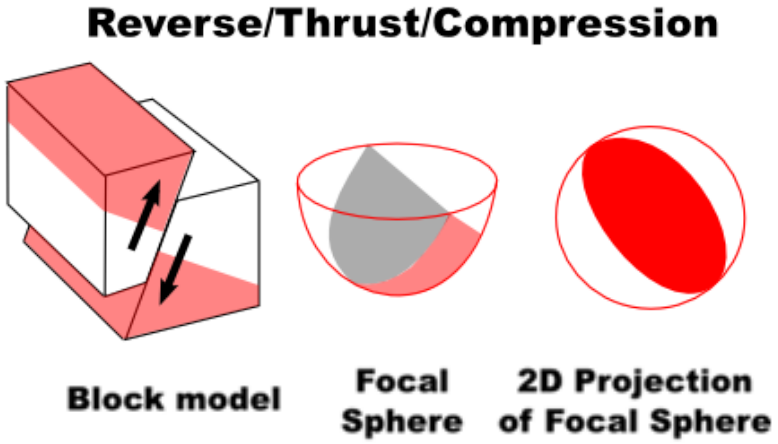
Magnitude 7.6 PHILIPPINES

Saturday, December 2, 2023 at 14:37:03 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.



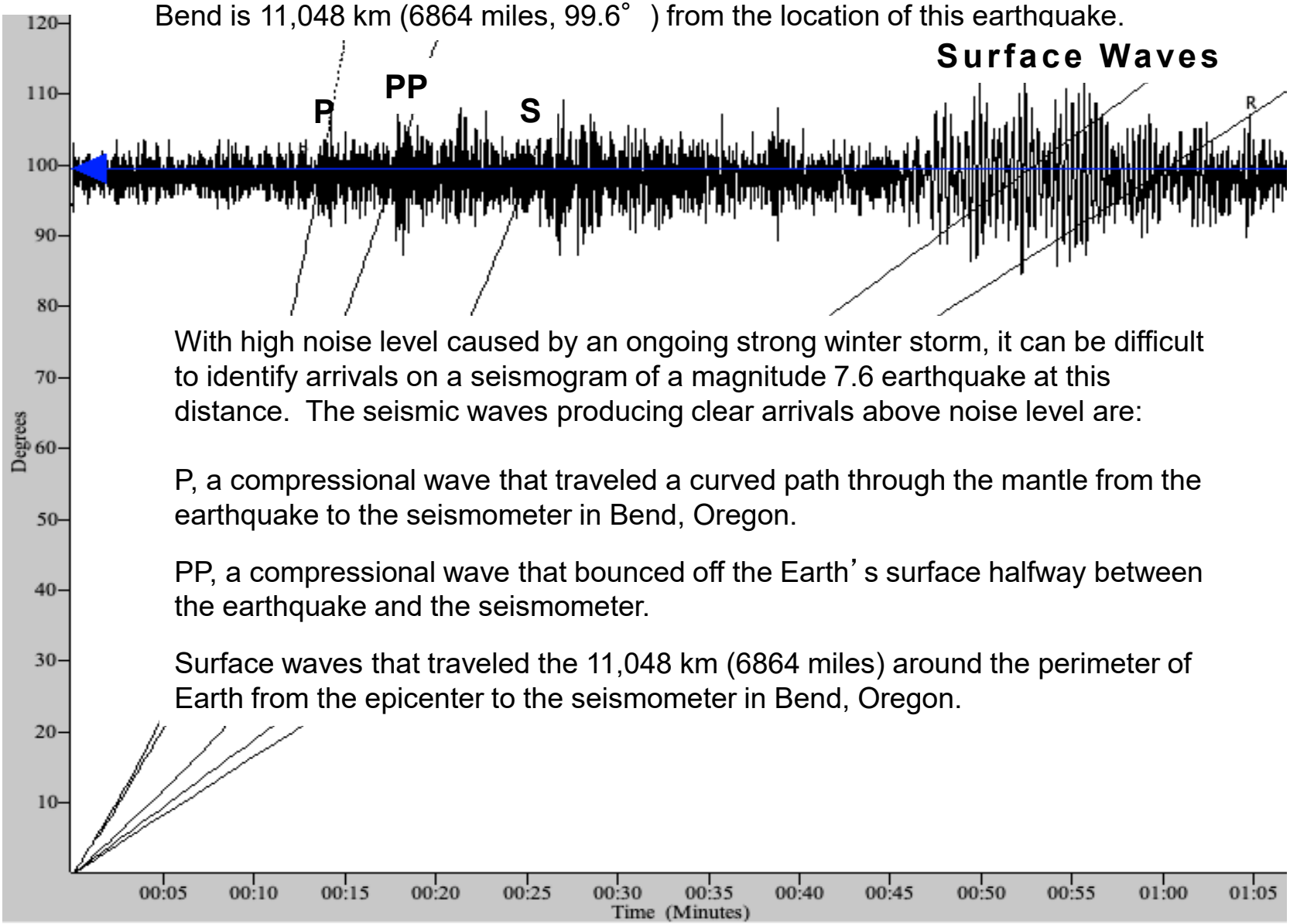
USGS W-phase Moment Tensor Solution



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

Magnitude 7.6 PHILIPPINES
Saturday, December 2, 2023 at 14:37:03 UTC

The record of this earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 11,048 km (6864 miles, 99.6°) from the location of this earthquake.



With high noise level caused by an ongoing strong winter storm, it can be difficult to identify arrivals on a seismogram of a magnitude 7.6 earthquake at this distance. The seismic waves producing clear arrivals above noise level are:

P, a compressional wave that traveled a curved path through the mantle from the earthquake to the seismometer in Bend, Oregon.

PP, a compressional wave that bounced off the Earth's surface halfway between the earthquake and the seismometer.

Surface waves that traveled the 11,048 km (6864 miles) around the perimeter of Earth from the epicenter to the seismometer in Bend, Oregon.

Teachable Moments are a service of

The EarthScope Consortium
and
The University of Portland

Please send feedback to tammy.bravo@earthscope.org

To receive automatic notifications of new Teachable Moments
send a blank email to earthquakes+subscribe@earthscope.org

GAGE
SAGE
Operated by

EarthScope
Consortium

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