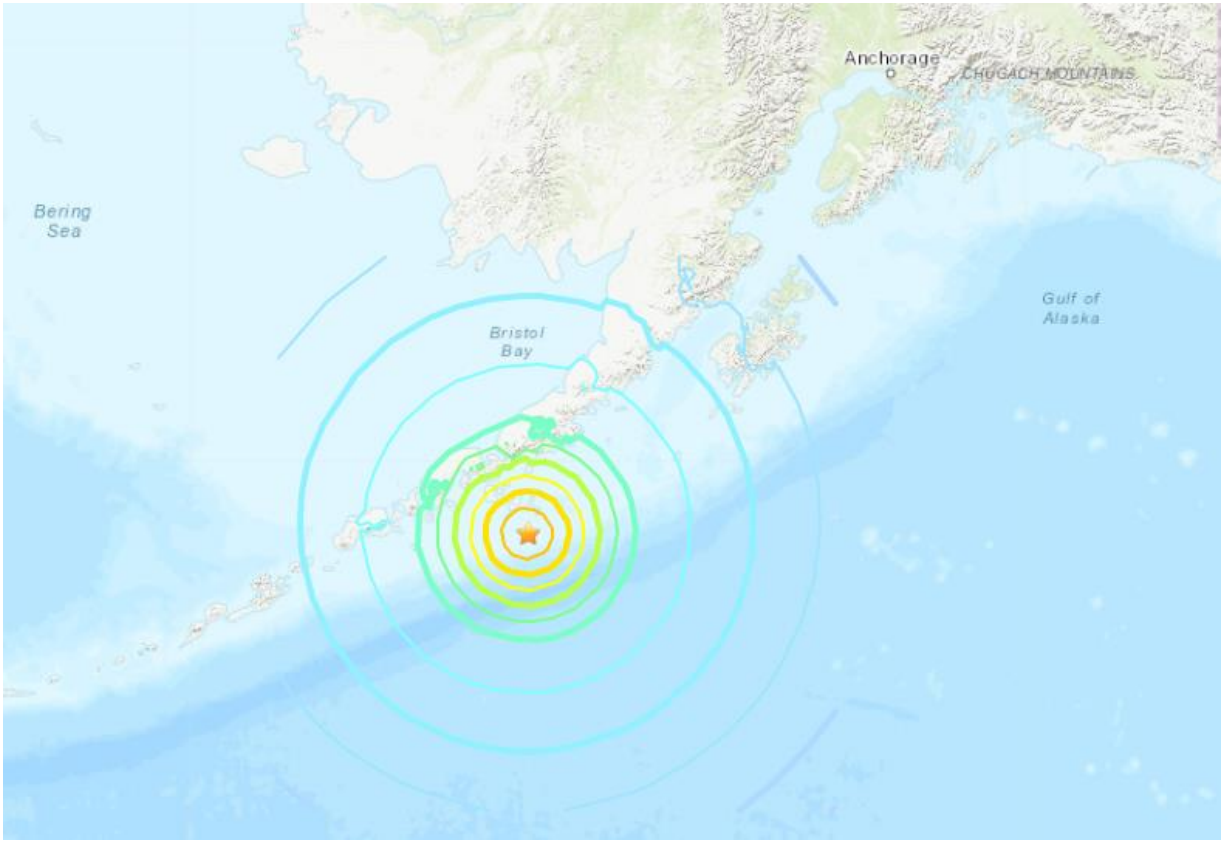
# Magnitude 7.5 ALASKA

## Monday, October 19, 2020 at 20:54:40 UTC

A magnitude 7.5 earthquake occurred Monday afternoon local time off the Alaska Peninsula at a depth of 40.1 km, triggering a tsunami warning in the region that has since been downgraded to an advisory. Some schools were evacuated. There were no immediate reports of damage.




While this earthquake did not generate a large tsunami, local landslide-generated tsunamis caused by earthquake ground shaking are a major hazard in Alaska. So evacuation to high ground is a proper response when ground shaking is felt.

This earthquake is an aftershock of the M 7.8 earthquake that occurred in July 2020.

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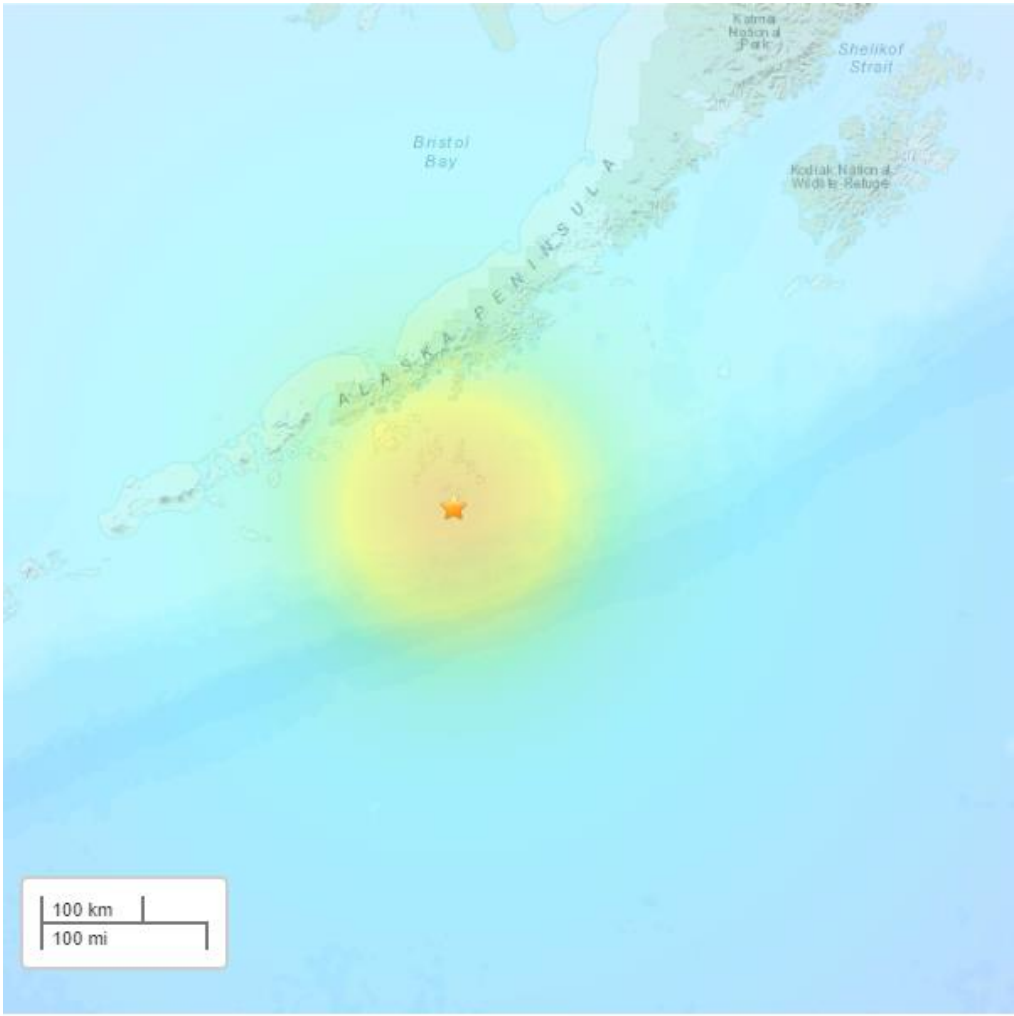
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking. Intensity is dependent on the magnitude, depth, bedrock, and location.

Strong shaking was felt from this earthquake.

| 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 7.5 Earthquake*

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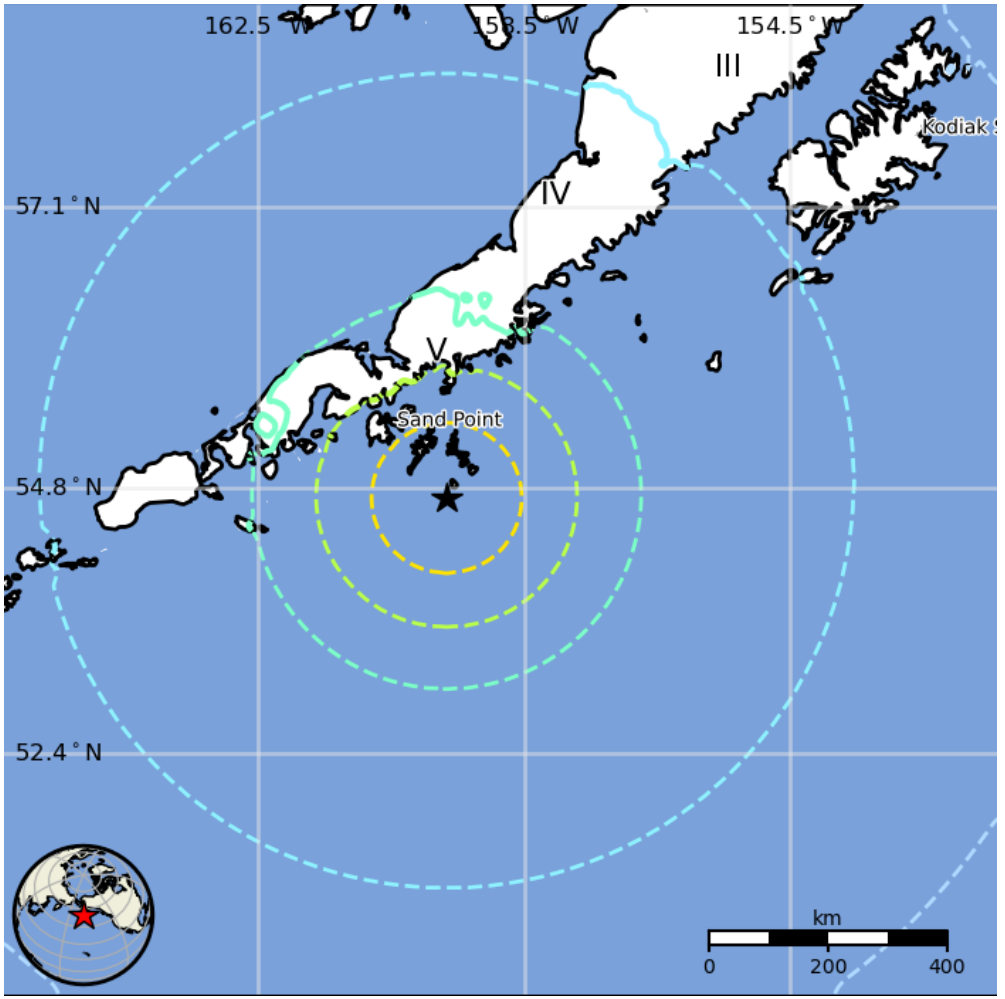
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that two thousand people felt strong shaking from this earthquake.

| | | |
|---|---|---|
| I | Not Felt | 0 k* |
| II-III | Weak | 16 k* |
| IV | Light | 1 k |
| V | Moderate | 0 k |
| VI | Strong | 2 k |
| VII | Very Strong | 0 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.

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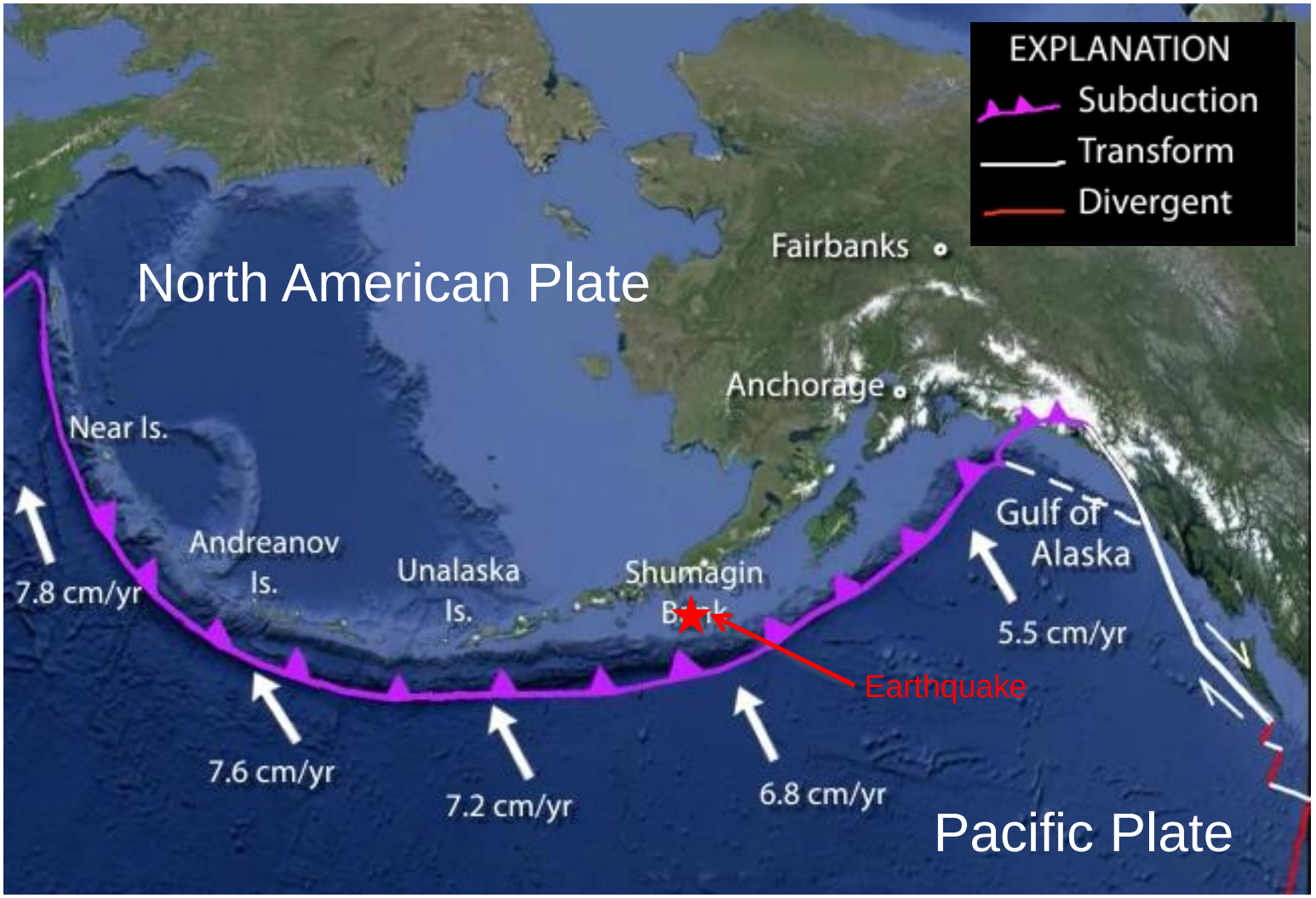


The Pacific Plate converges with, and subducts beneath the North American Plate and begins its decent into the mantle at the Alaska - Aleutian Trench just south of this earthquake. The rates of relative plate motion range from 5.5 cm/yr in the Gulf of Alaska to 7.8 cm/yr at the western end of the Aleutian Island chain. The rate of subduction at the location of this earthquake is about 6.8 cm/yr.

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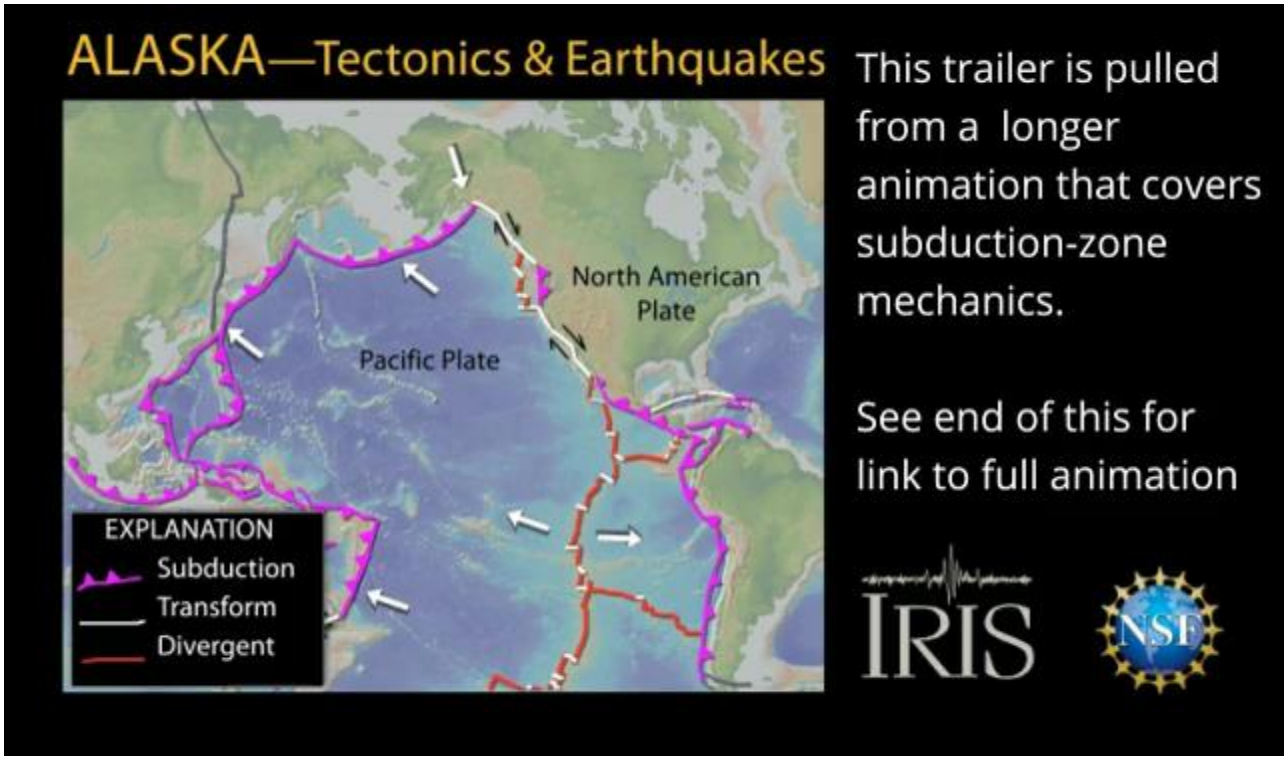
Large earthquakes are common in Alaska. Today's earthquake was on the subduction zone megathrust boundary between the Pacific and North American plates. Over the past 50 years, 12 magnitude 7 or greater earthquakes have occurred on the megathrust plate boundary between Kodiak Island and the Rat Islands toward the western end of the Aleutian Islands. In March of 1964, the magnitude 9.2 Great Alaska earthquake occurred on the subduction zone interface between the two plates beneath Prince William Sound.




Animation exploring plate tectonics and earthquakes of the Pacific – North American Plate boundary region.

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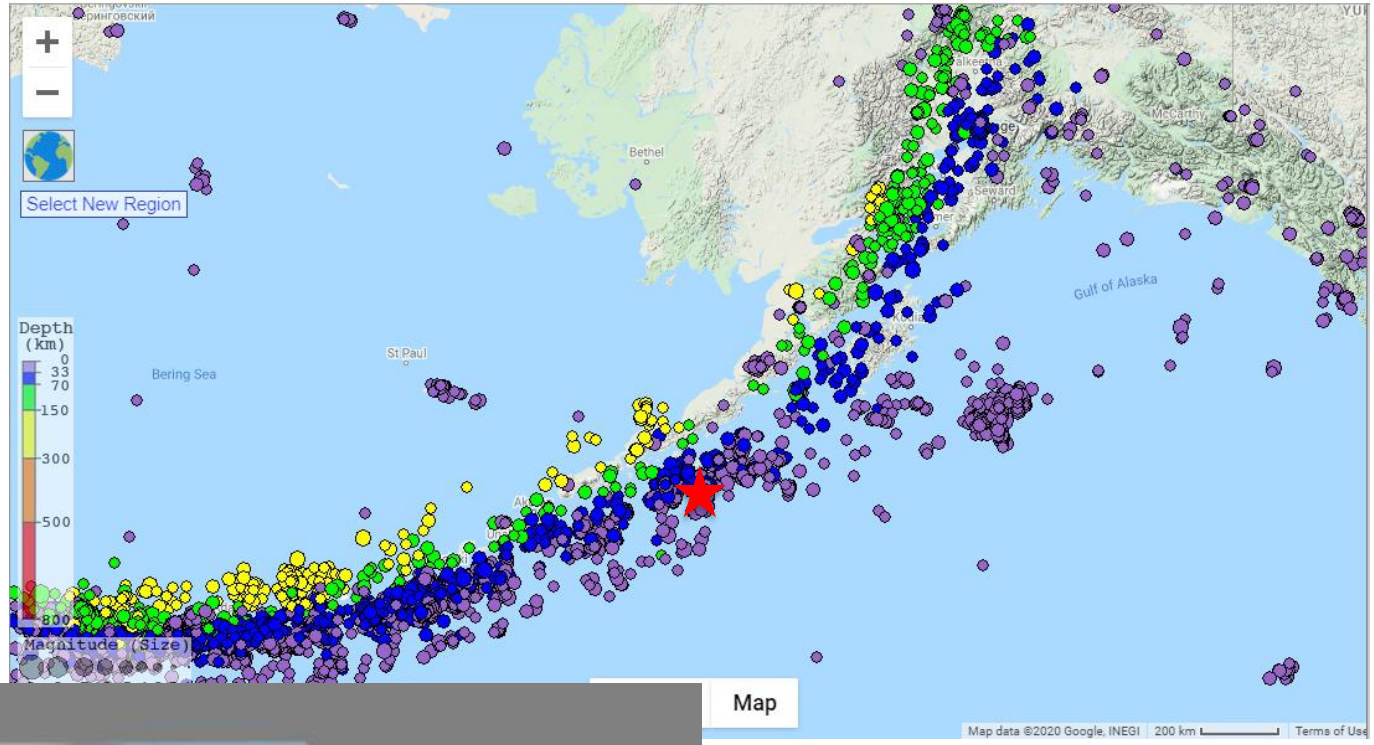
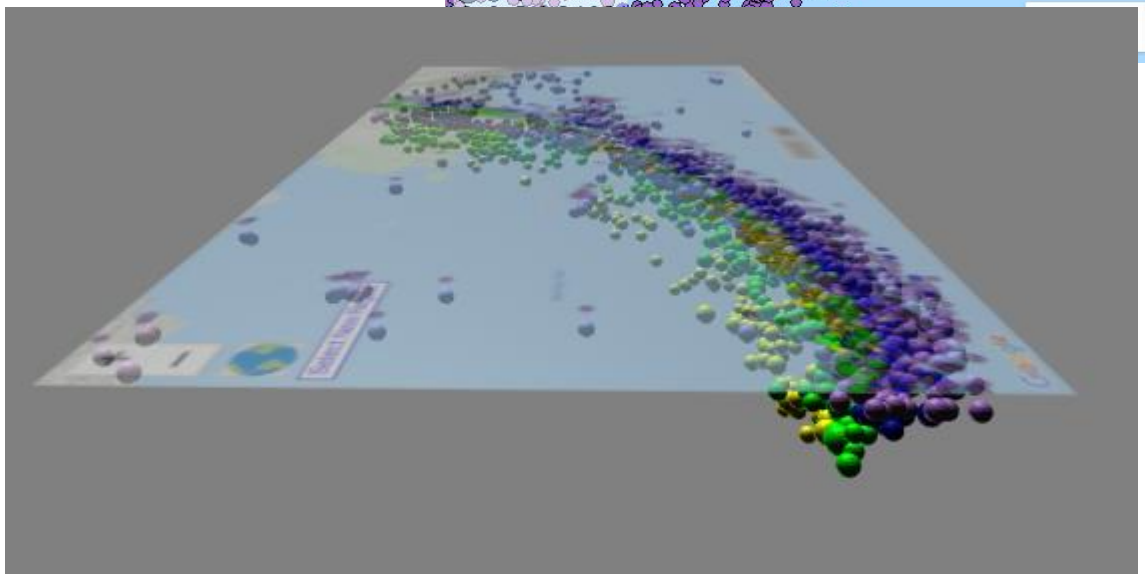
This earthquake plotted as a red star shown on a map of regional historic seismicity for the most recent 4000 earthquakes greater than magnitude 4.



This cross section, looking in 3D to the east, shows earthquakes as the Pacific Plate subducts beneath the North American Plate.

Maps created from IRIS Earthquake Browser (www.iris.edu/ieb)

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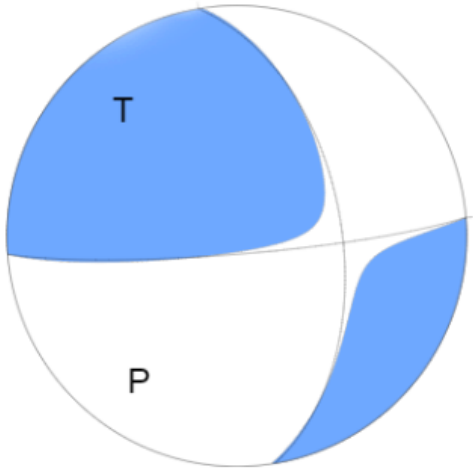
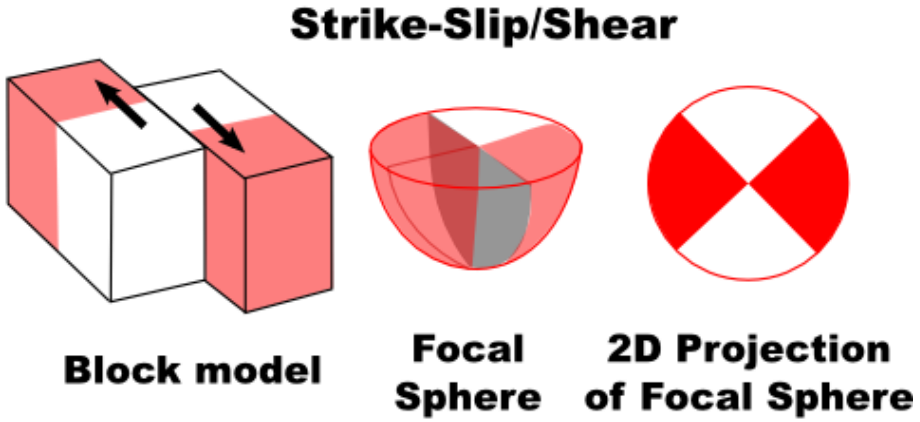
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation 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.

This preliminary focal mechanism solution indicates rupture occurred on either a moderately dipping right-lateral strike-slip fault striking towards the NNW or on a steeply dipping left-lateral strike-slip fault striking towards the east, and therefore that this earthquake was not a thrust event on the plate interface itself.



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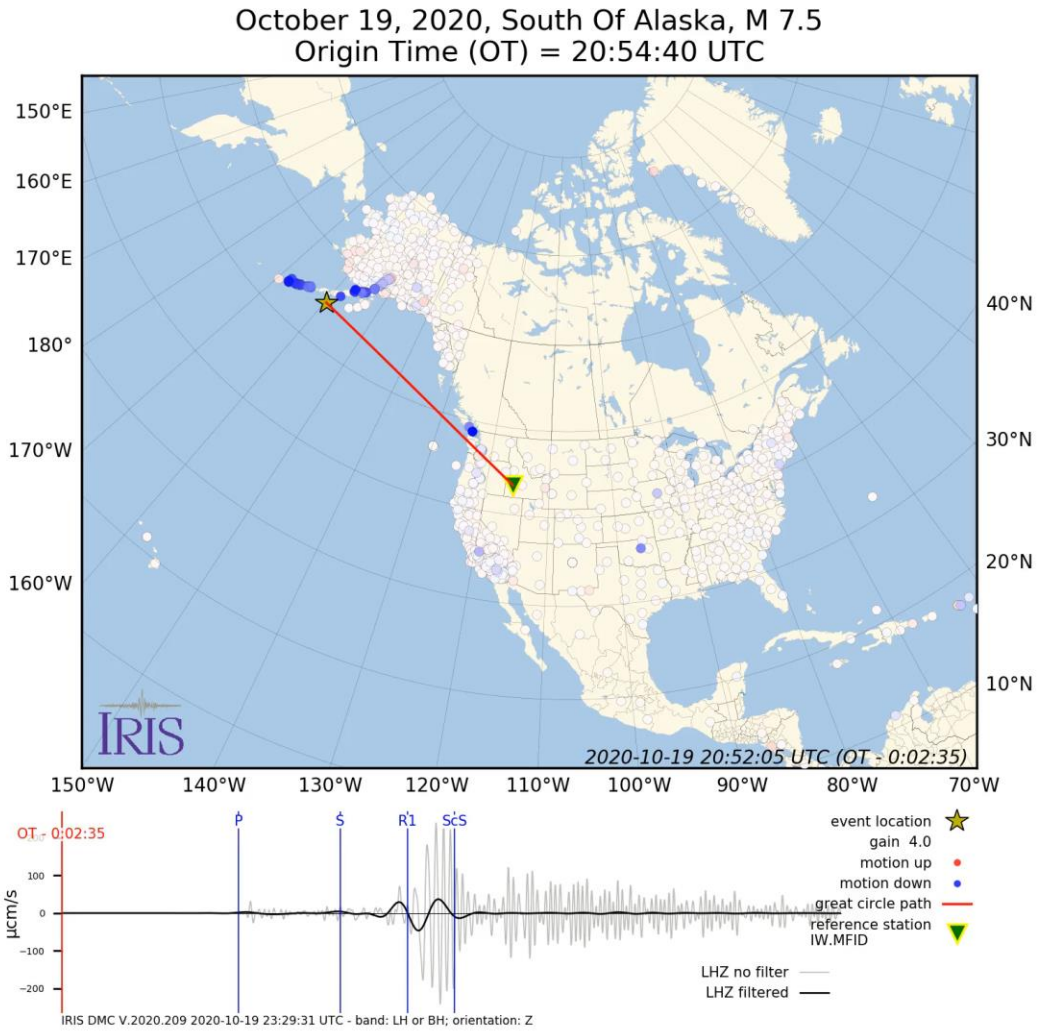
As earthquake waves travel along the surface of the Earth, they cause the ground to move. With the earthquake recording stations in EarthScope's Transportable Array, the ground motions can be captured and displayed as a movie, using the actual data recorded from the earthquake.

The circles in the movie represent earthquake recording stations and the color of each circle represents the amplitude, or height, of the earthquake wave detected by the station's seismometer.




Seismic waves crossing the US recorded by the USArray.

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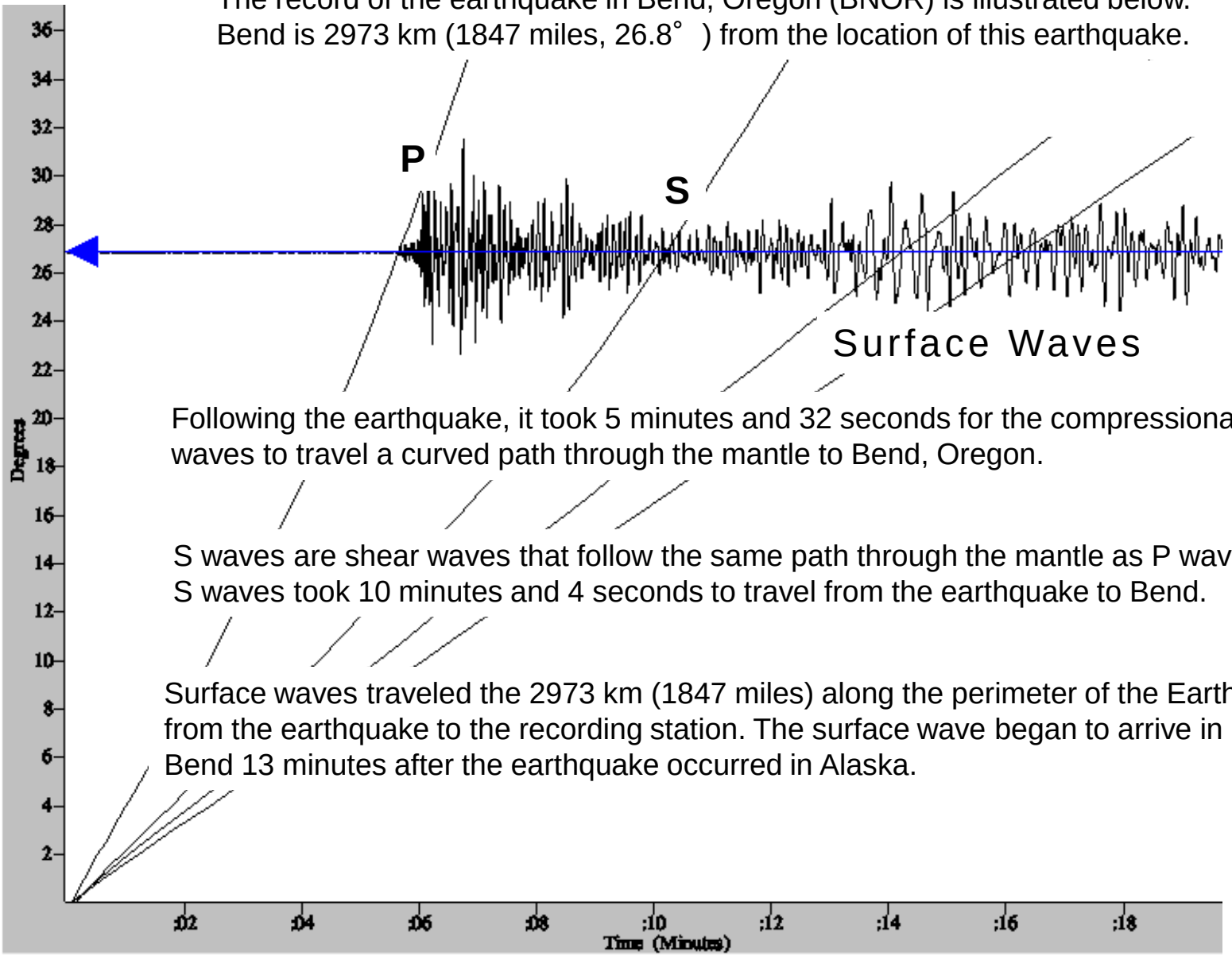
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 2973 km (1847 miles, 26.8˚ ) from the location of this earthquake.




Following the earthquake, it took 5 minutes and 32 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 10 minutes and 4 seconds to travel from the earthquake to Bend.

Surface waves traveled the 2973 km (1847 miles) along the perimeter of the Earth from the earthquake to the recording station. The surface wave began to arrive in Bend 13 minutes after the earthquake occurred in Alaska.

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