Magnitude 7.8 ALASKA
Wednesday, July 22, 2020 at 06:12:44 UTC

A magnitude 7.8 earthquake occurred in Alaska near Simeonof Island at a depth of 28 km. There are no immediate reports of damage or fatalities.

A tsunami warning initially was issued for south Alaska and the Alaska Peninsula, but was canceled by early Wednesday.

Strong shaking was reported on the peninsula. Light to weak shaking was reported around Kodiak, about 300 miles northeast of the earthquake, and in Anchorage, about 530 miles northeast of the earthquake.

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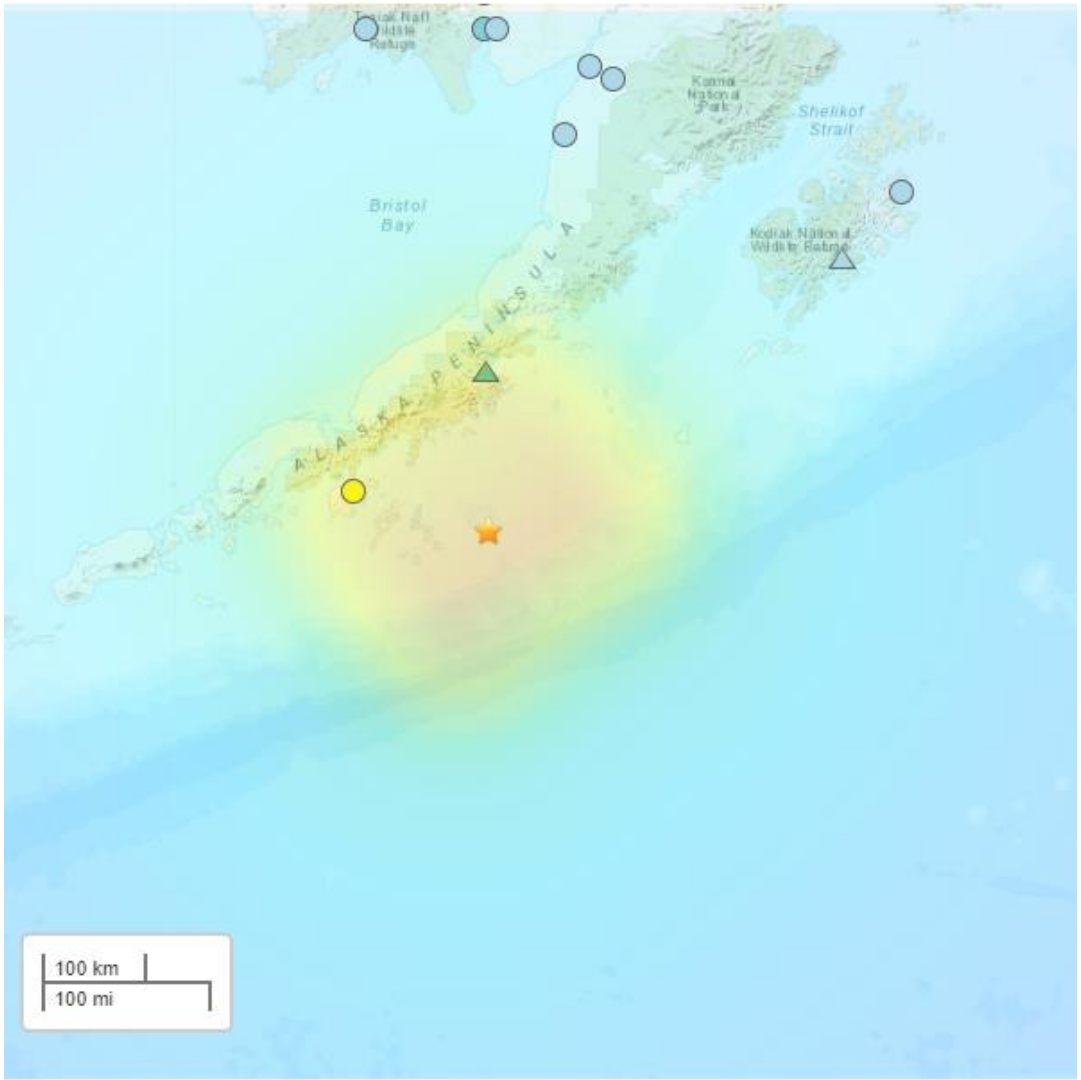
The Modified-Mercalli Intensity scale is a twelve-stage scale, from I to XII, that indicates the severity of ground shaking. Intensity is dependent on the magnitude, depth, bedrock, and location.

Moderate 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 7.8 Earthquake

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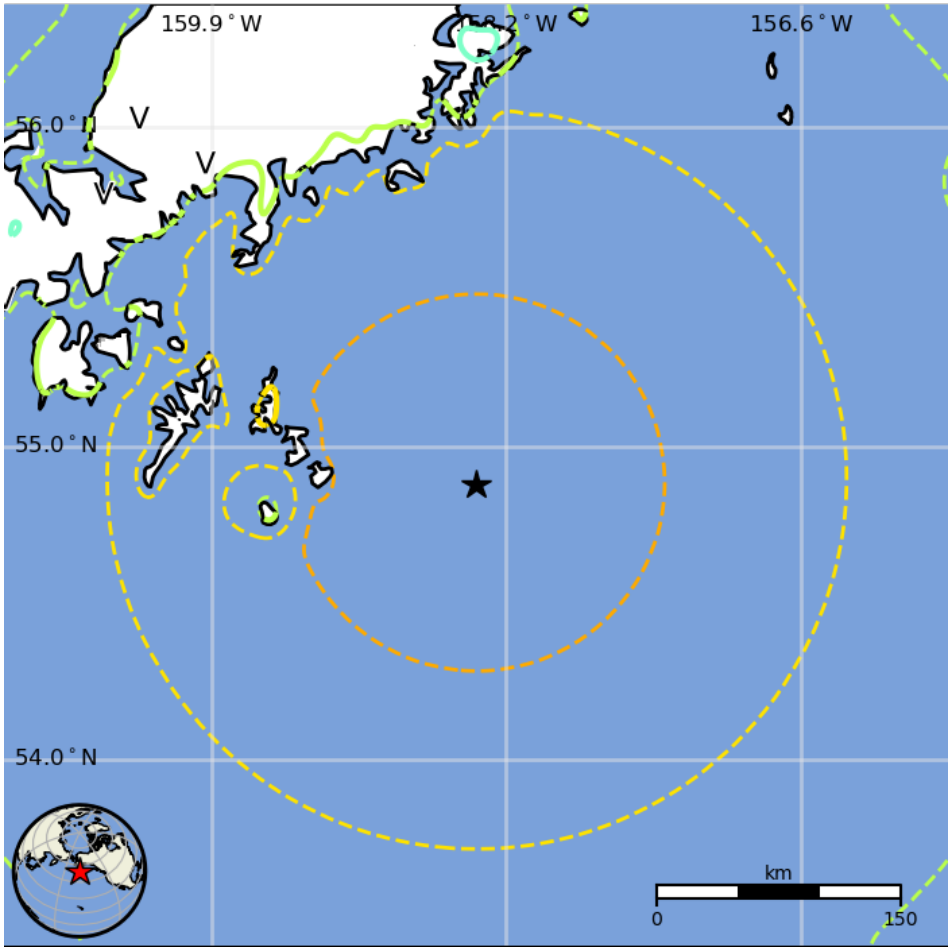
The USGS PAGER map shows the population exposed to different Modified Mercalli Intensity (MMI) levels.

The USGS estimates that one thousand people felt moderate shaking from this earthquake.

I	Not Felt	0 k*
II-III	Weak	0 k*
IV	Light	1 k*
V	Moderate	1 k*
VI	Strong	0 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.

Image courtesy of the US Geological Survey

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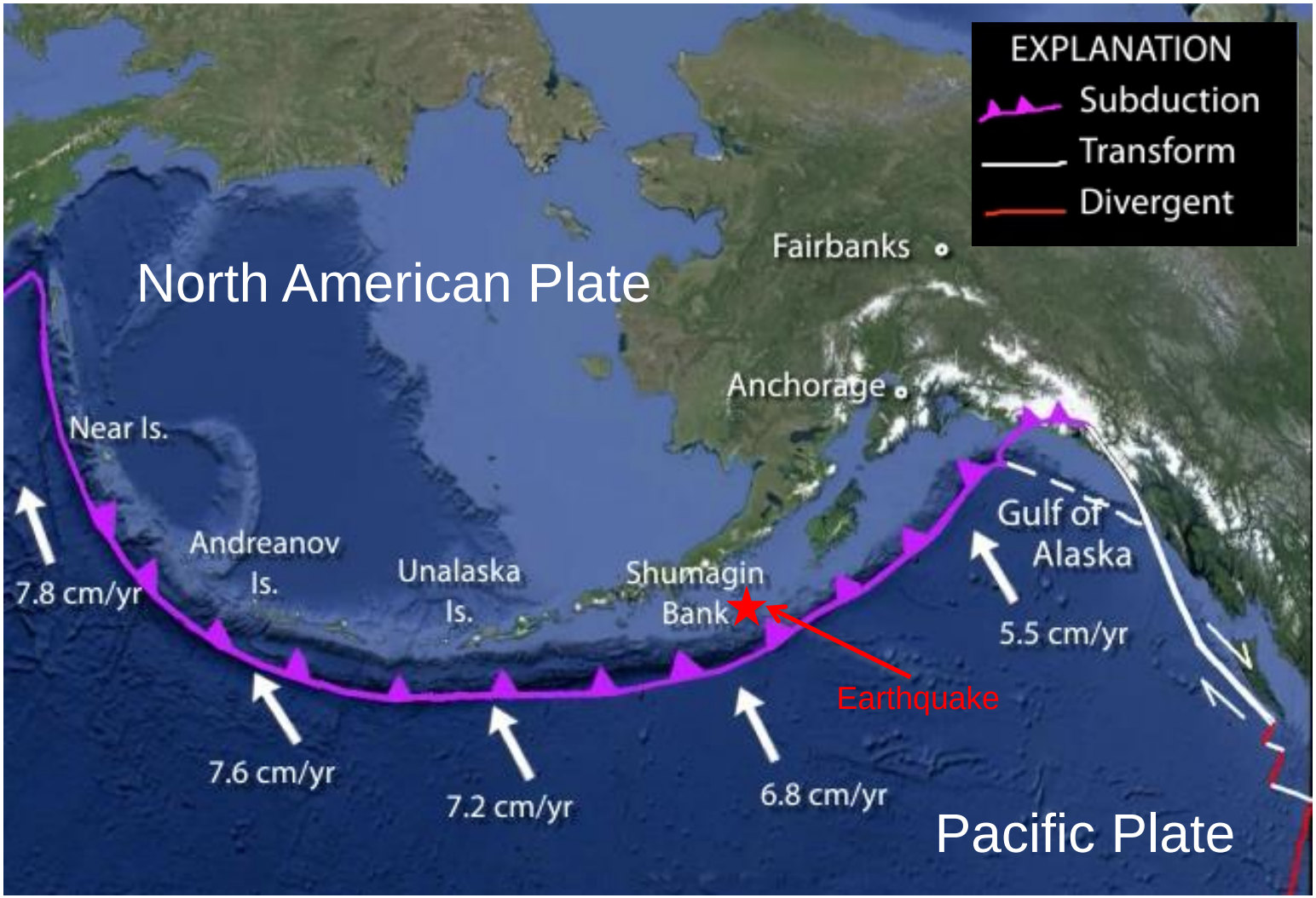

The Pacific Plate converges with, and subducts beneath the North American Plate and begins its decent into the mantle at the Alaska - Aleutian Trench just south of this earthquake. The rates of relative plate motion range from 5.5 cm/yr in the Gulf of Alaska to 7.8 cm/yr at the western end of the Aleutian Island chain. The rate of subduction in the location of this earthquake is about 6.5 cm/yr.

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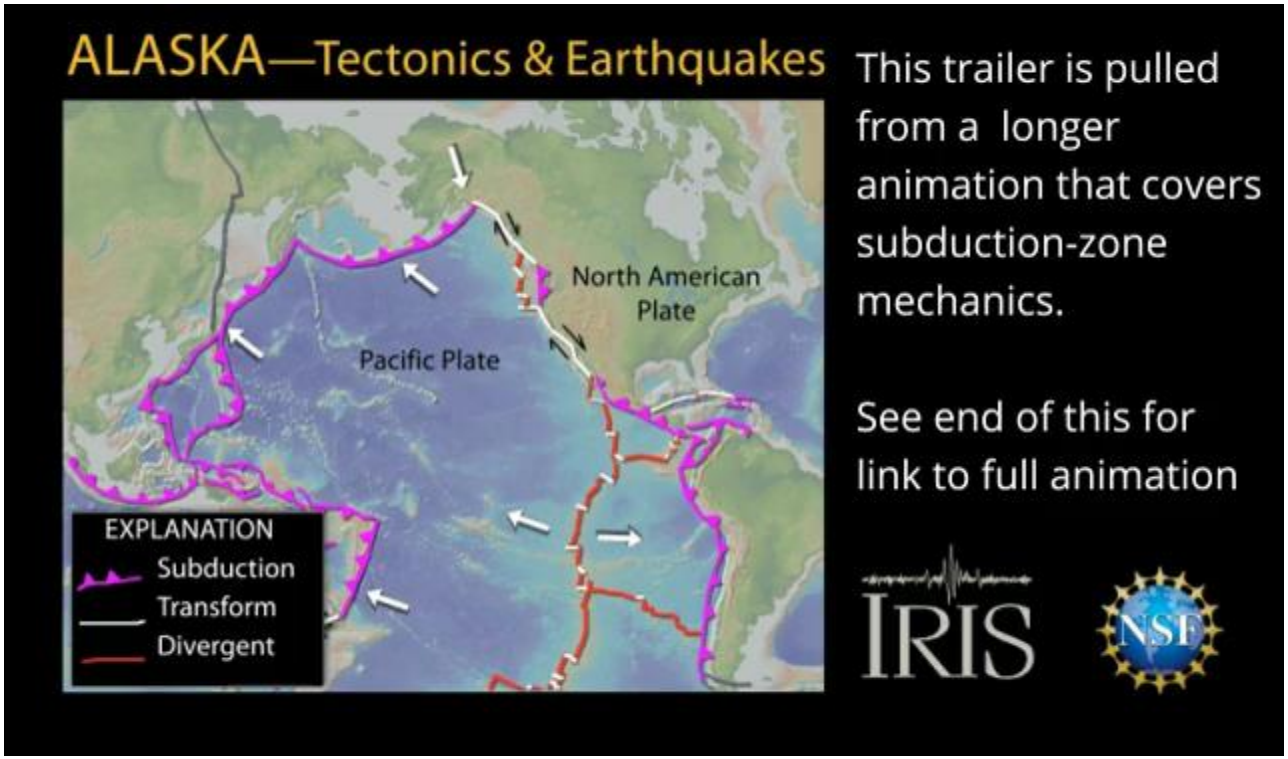
Large earthquakes are common in Alaska. Today's earthquake was on the subduction zone megathrust boundary between the Pacific and North American plates. Over the past 50 years, 11 magnitude 7 or greater earthquakes have occurred on the megathrust plate boundary between Kodiak Island and the Rat Islands 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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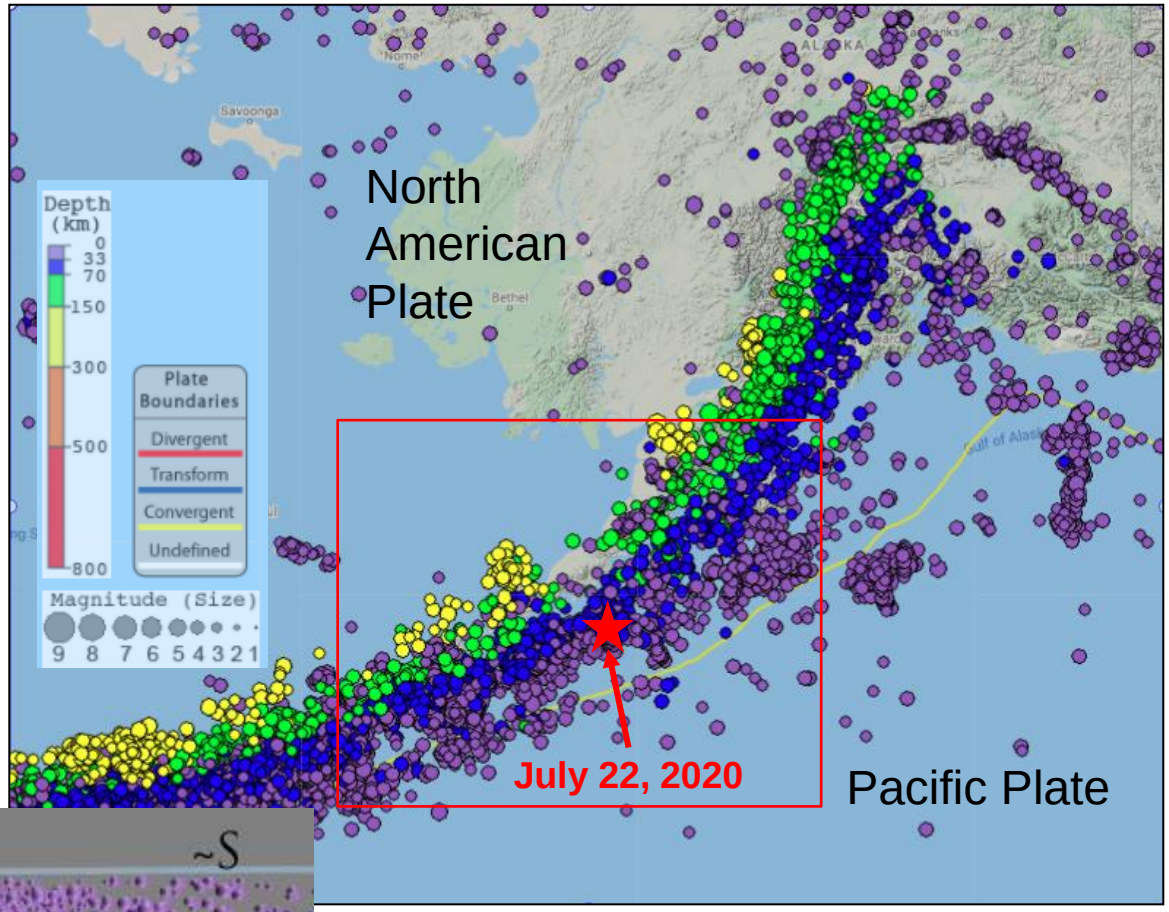
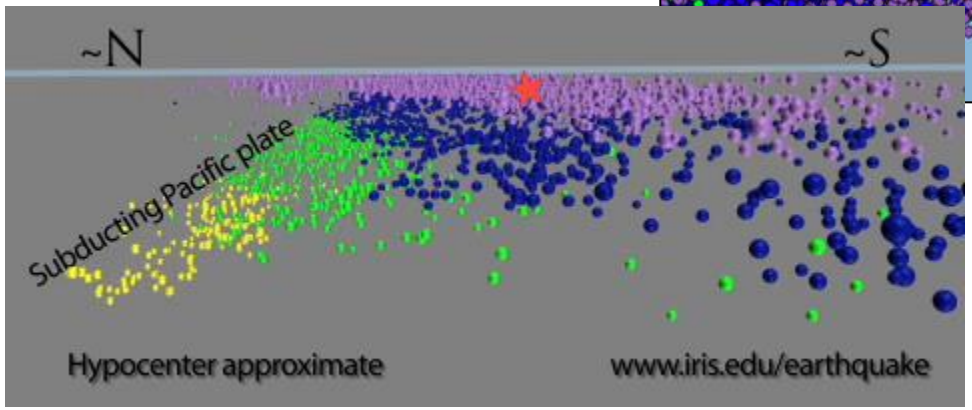
Epicenters of earthquakes of magnitude 4 or greater are shown on this map of regional seismicity. There have been 10,188 M ≥ 4 earthquakes in this area since 1980.

The cross section below, taken from the 3D function of IRIS' Interactive Earthquake Browser, is from the area outlined in red surrounding this earthquake.



Past 50 years of seismicity (1980-2020)



Map and animation created from IRIS Earthquake Browser (www.iris.edu/ieb)

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This map shows rupture zones from earthquakes along the Aleutian megathrust from 1938-1996. The “Shumagin Gap” is a section of the plate boundary that has not ruptured in a major or great earthquake during this time range. The July 22 earthquake initiated on the eastern edge of the Shumagin Gap and a USGS fault model indicates that faulting progressed into a small portion of the gap. According to the Alaska Earthquake Center, aftershocks shown in next slide also suggest this earthquake may have ruptured westward into the Shumagin Gap.

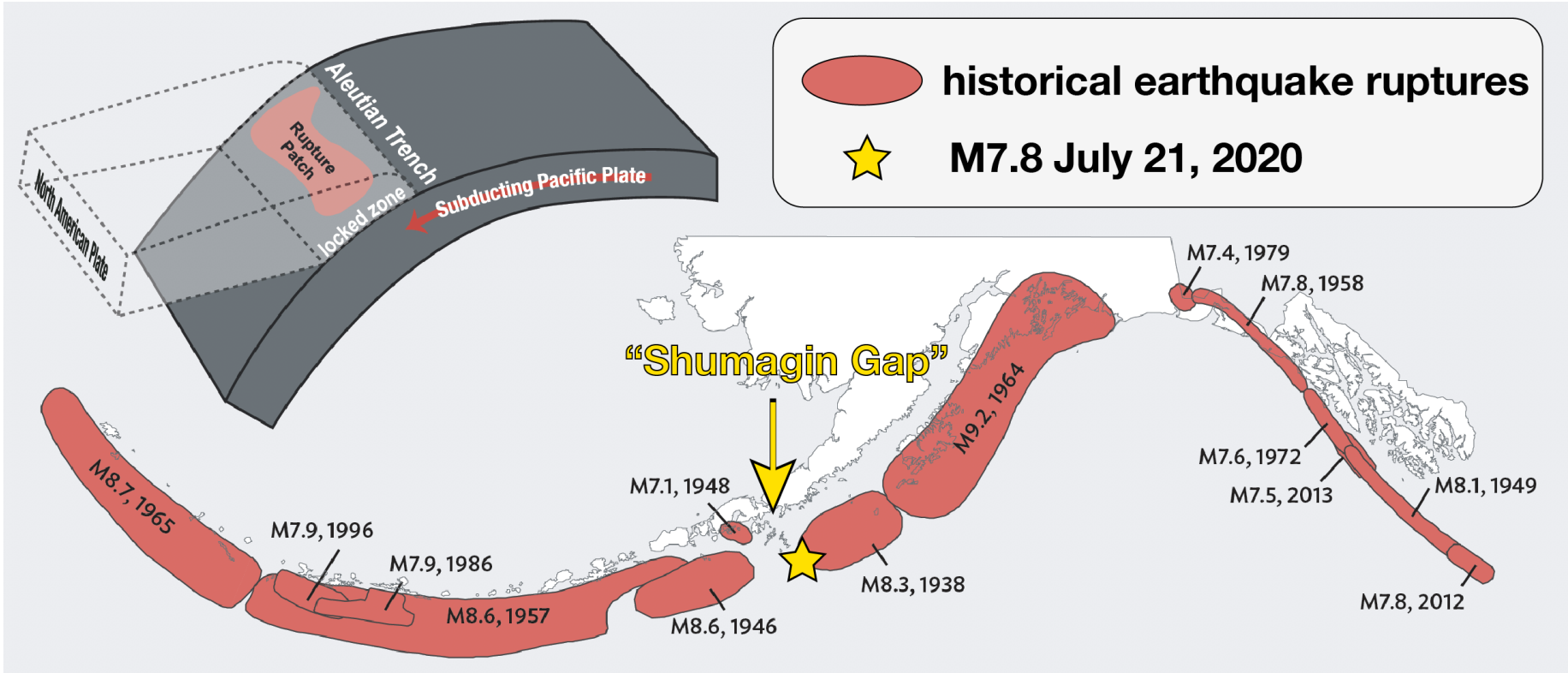

Image courtesy of the Alaska Earthquake Center

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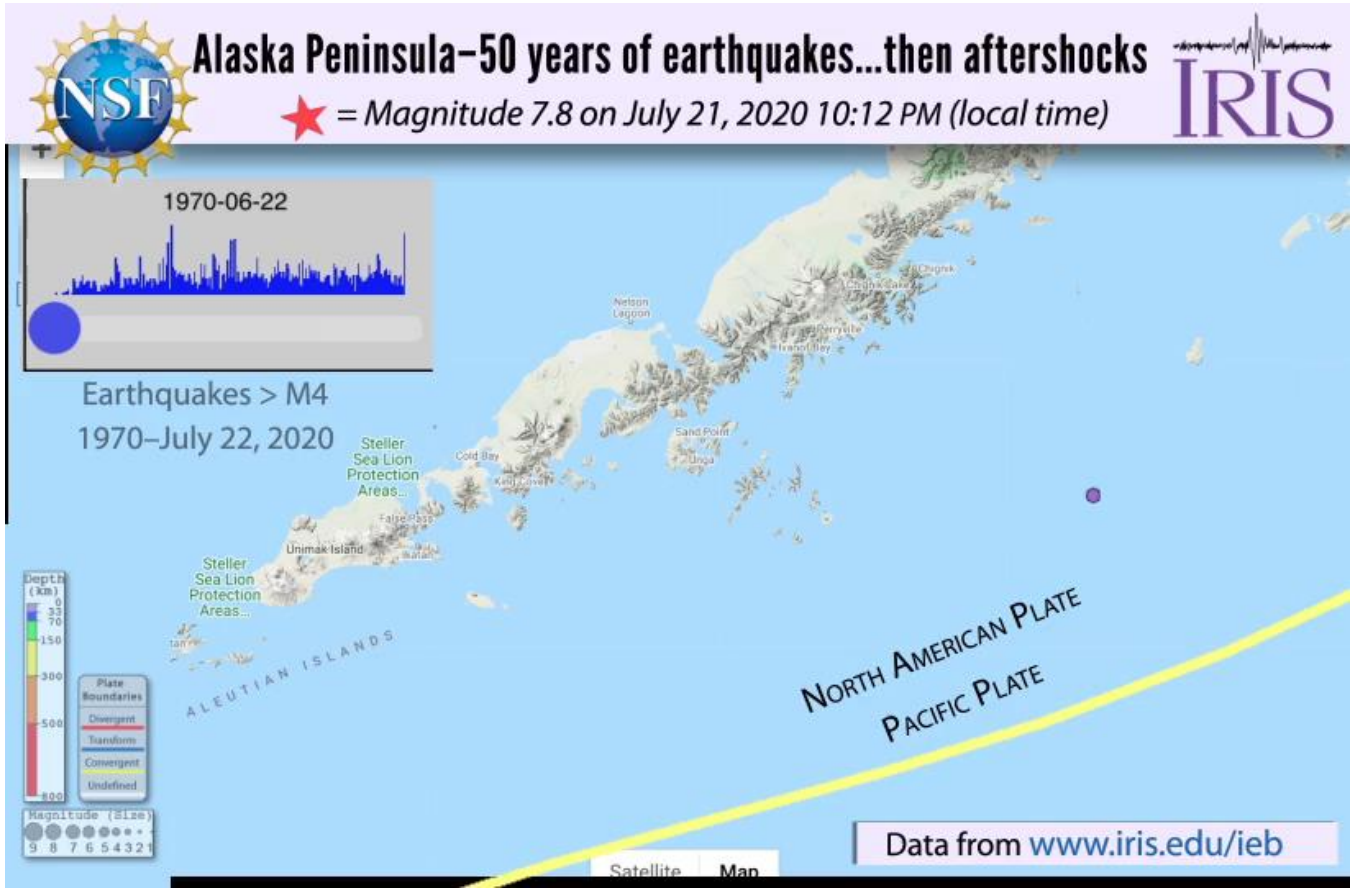
This animation from IRIS's Earthquake Browser begins with 50 years of earthquakes in the region, then shows aftershocks in the first hours after this earthquake.

In the hours following the magnitude 7.8, there have been over 30 aftershocks including:

No.	Magnitude
1	M 6.1
3	M 5.0–5.8
12	M 4.0-4.9
15	M 3.0–3.9



Data from IRIS's Earthquake Browser (www.iris.edu/ieb)

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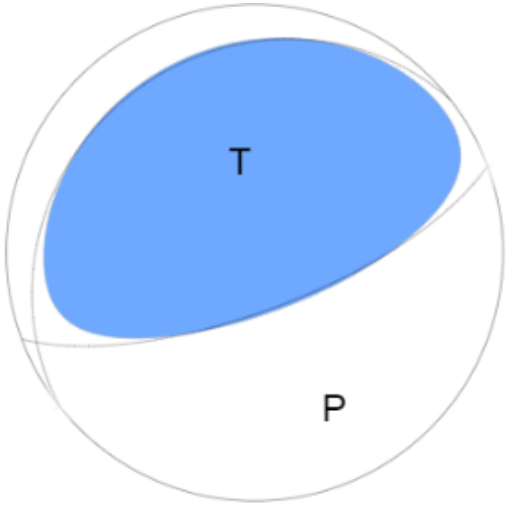
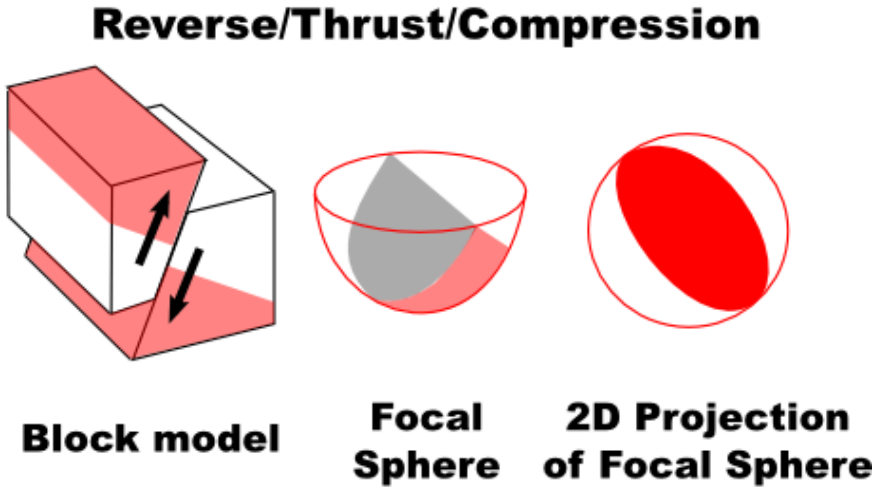
The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. Because an earthquake occurs as slip on a fault, it generates primary (P) waves in quadrants where the first pulse is compressional (shaded) and quadrants where the first pulse is extensional (white). The orientation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

In this case, the earthquake location and focal mechanism indicate it was due to thrust faulting on the megathrust boundary between the subducting Pacific Plate and the overriding North American Plate.



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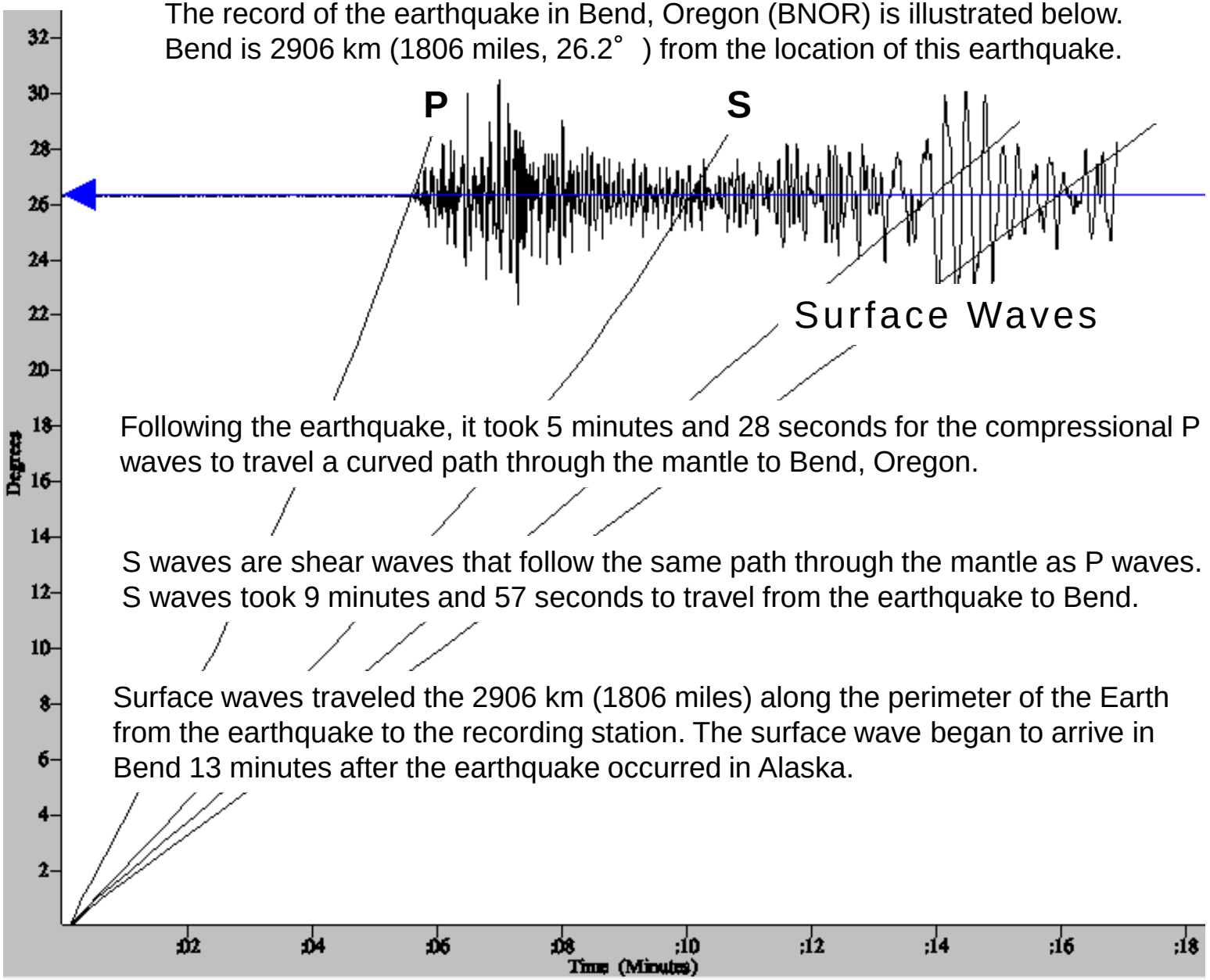
The record of the earthquake in Bend, Oregon (BNOR) is illustrated below. Bend is 2906 km (1806 miles, 26.2˚) from the location of this earthquake.



Following the earthquake, it took 5 minutes and 28 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 9 minutes and 57 seconds to travel from the earthquake to Bend.

Surface waves traveled the 2906 km (1806 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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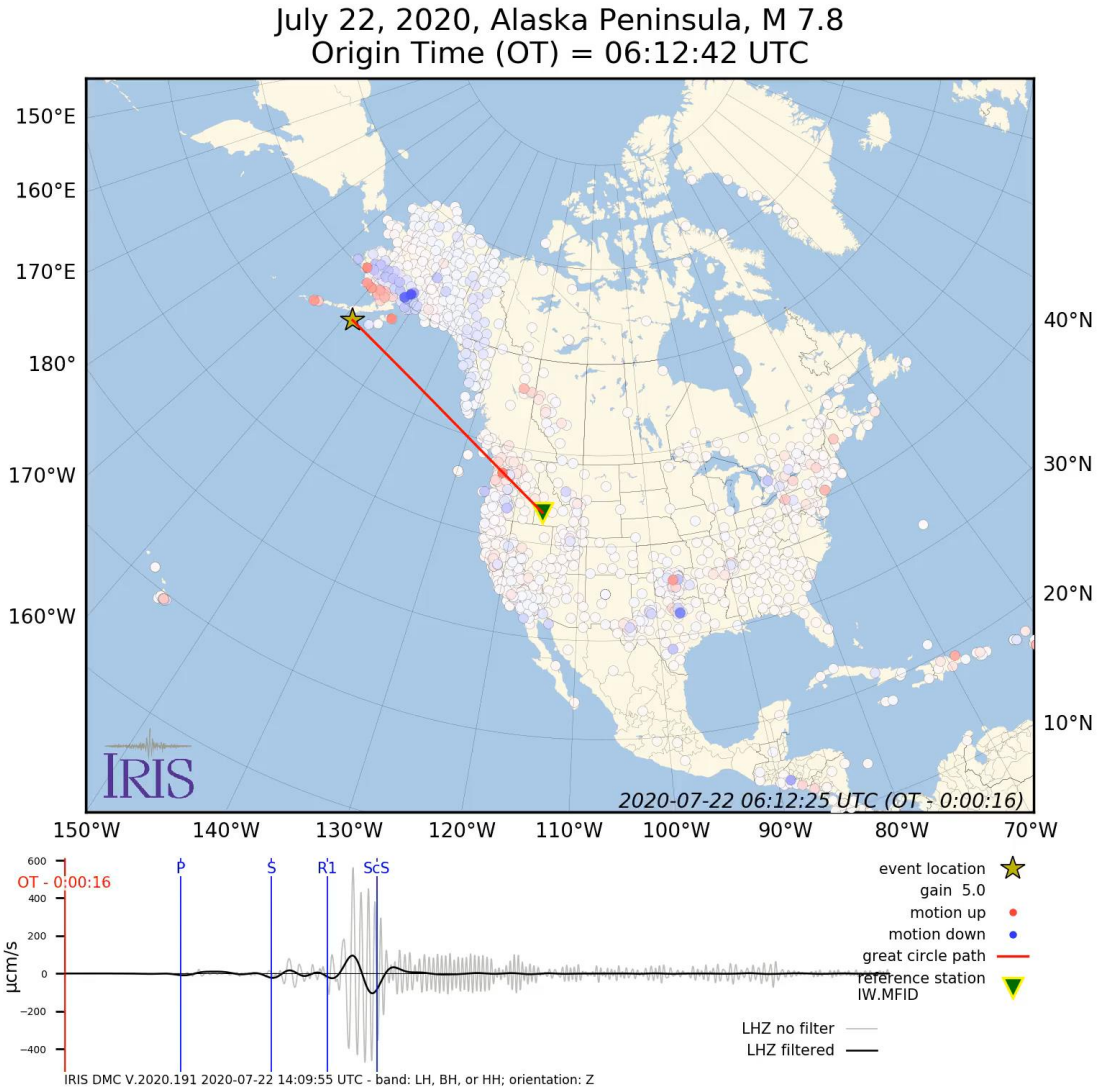
As earthquake waves travel along the surface of the Earth, they cause the ground to move. With the earthquake recording stations in EarthScope's Transportable Array, the ground motions can be captured and displayed as a movie, using the actual data recorded from the earthquake.

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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