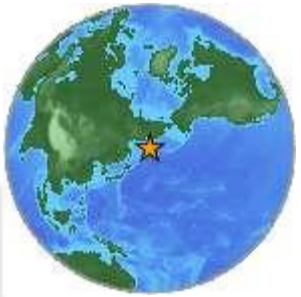
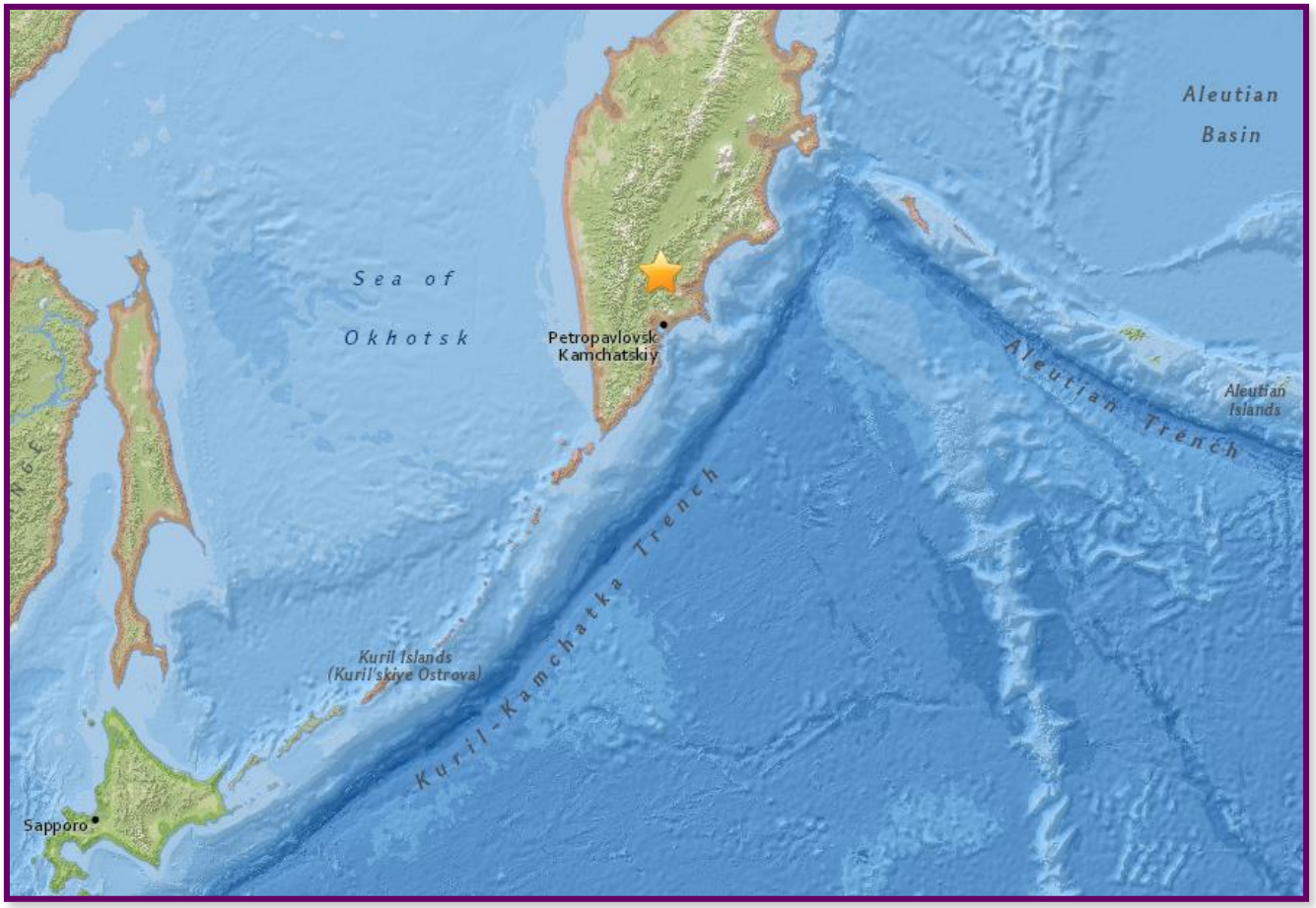
Magnitude 7.2 KAMCHATKA PENINSULA

Saturday, January 30, 2016 at 03:25:10 UTC





A magnitude 7.2 earthquake occurred on Saturday January 30, 2016 at a depth of 161 km (100 miles) beneath the Kamchatka Peninsula. The epicenter was located 107 km (66 miles) north of Petropavlovsk-Kamchatskiy, Russia. Moderate to strong shaking was felt across the southern Kamchatka Peninsula. There have been no reports of damage or injuries and the earthquake was too deep to displace the ocean floor and generate a tsunami.

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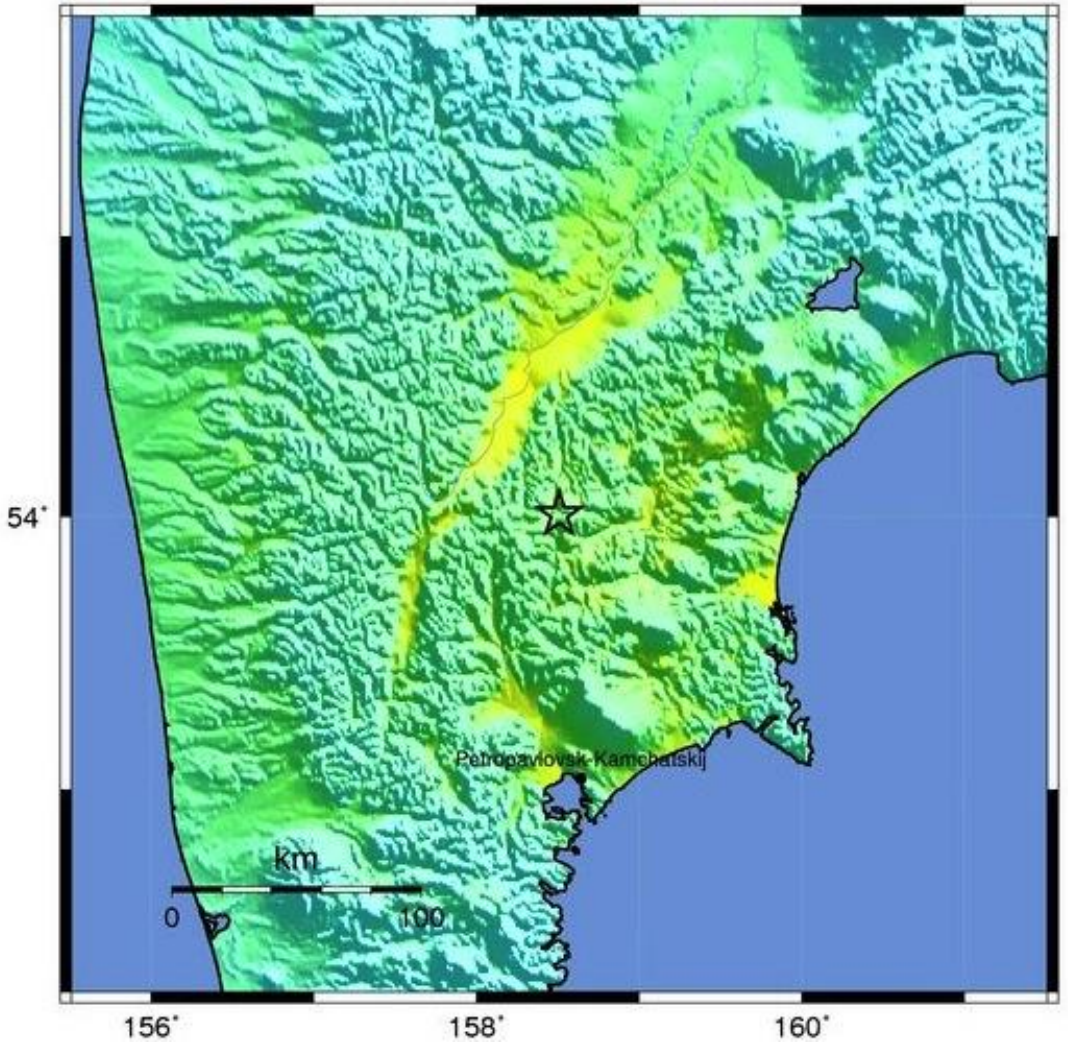
Shaking Intensity

The Modified Mercalli Intensity (MMI) scale depicts shaking severity. In the vicinity of the epicenter, moderate shaking was experienced except in sediment-filled valleys where seismic waves were amplified to strong shaking.

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 7.2 Earthquake

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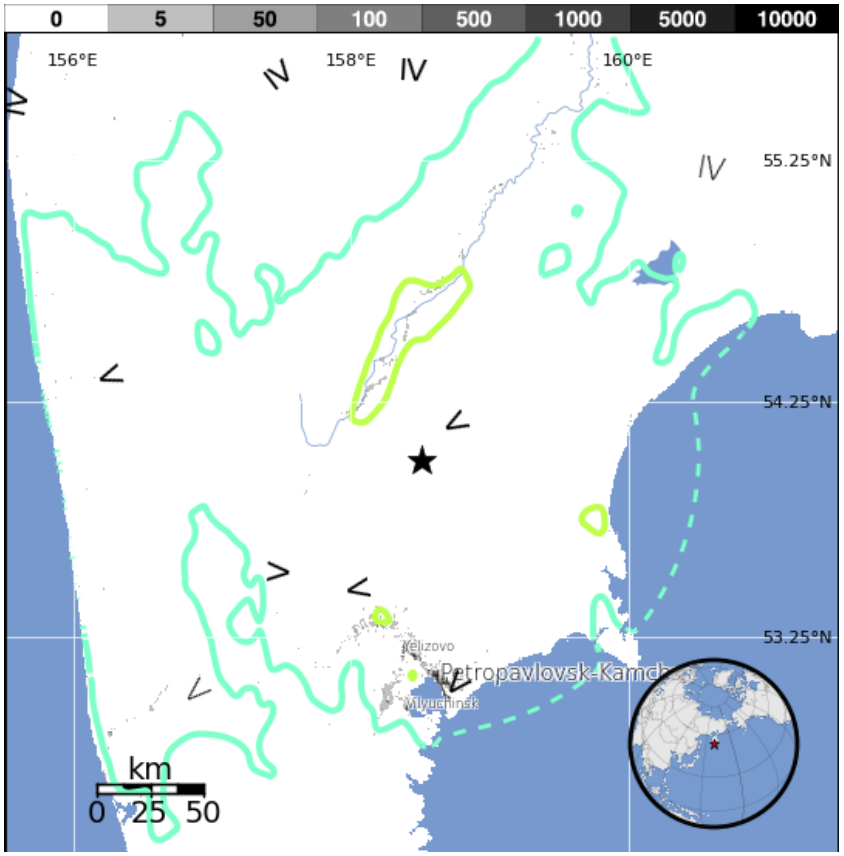
USGS PAGER

Population Exposed to Earthquake Shaking

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

The USGS is estimating that 11,000 people experienced strong shaking and an additional 259,000 people experienced moderate shaking.



MMI	Shaking	Pop.
I	Not Felt	--*
II-III	Weak	--*
IV	Light	8k*
V	Moderate	259k
VI	Strong	11k
VII	Very Strong	0k

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 below.

Image courtesy of the US Geological Survey

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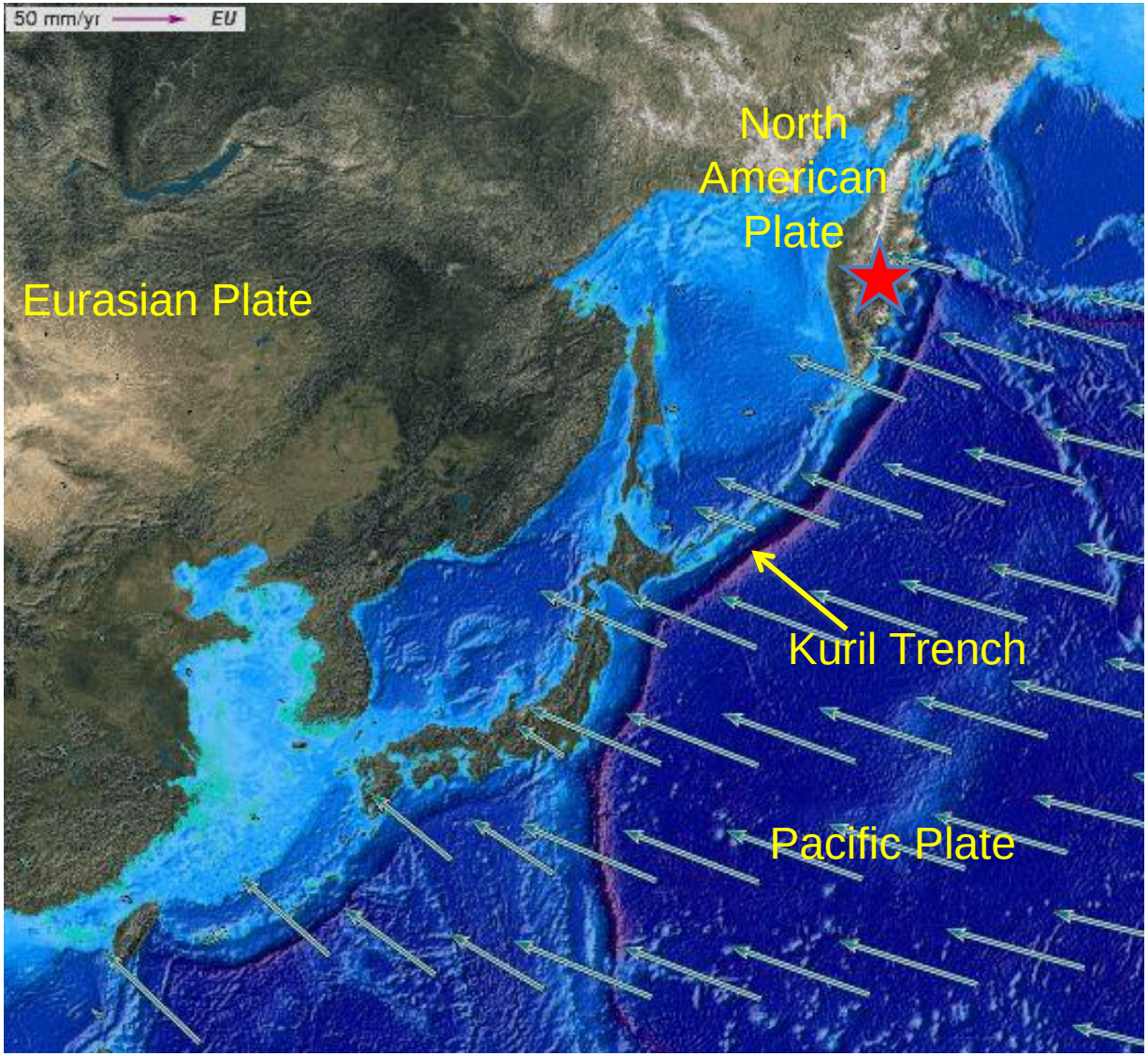
The blue arrows show the motion of the Pacific Plate with respect to the North American Plate. The red star is the epicenter of the January 30, 2016 earthquake.

At the northern end of the Kuril-Kamchatka Trench, the Pacific Plate subducts beneath the North American Plate at a rate of 77 mm/yr (7.7 cm/yr).



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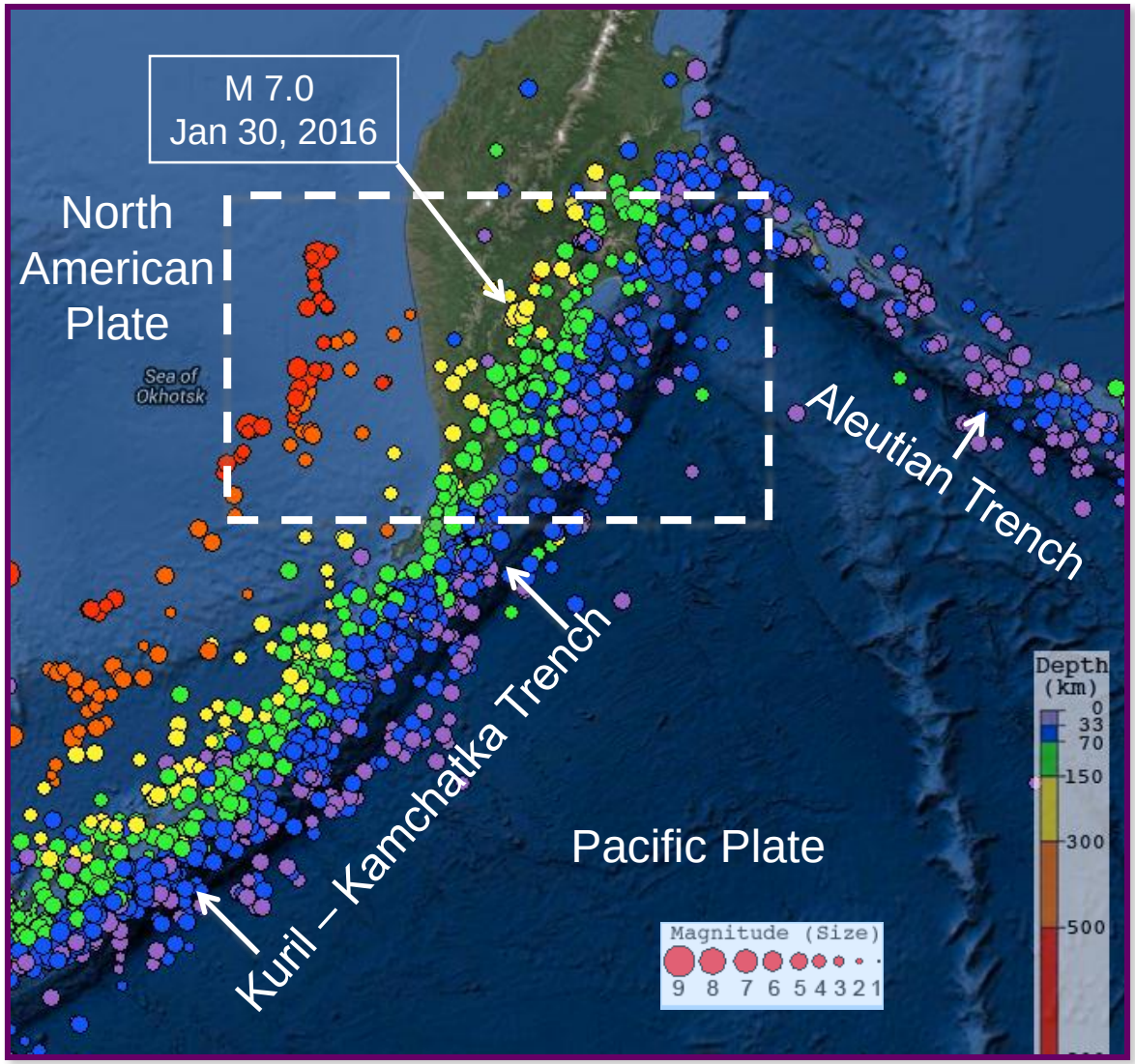
The map on the right shows regional seismicity in the area where the northern Kuril-Kamchatka Trench meets the westernmost Aleutian Trench.

This earthquake fits within the general pattern of shallow earthquakes near the Kuril-Kamchatka Trench with increasing earthquake depth toward the northwest.

A cross section of earthquakes within the area outlined by the dashed rectangle is shown in the next slide.



Map created using the IRIS Earthquake Browser: *www.iris.edu/ieb*

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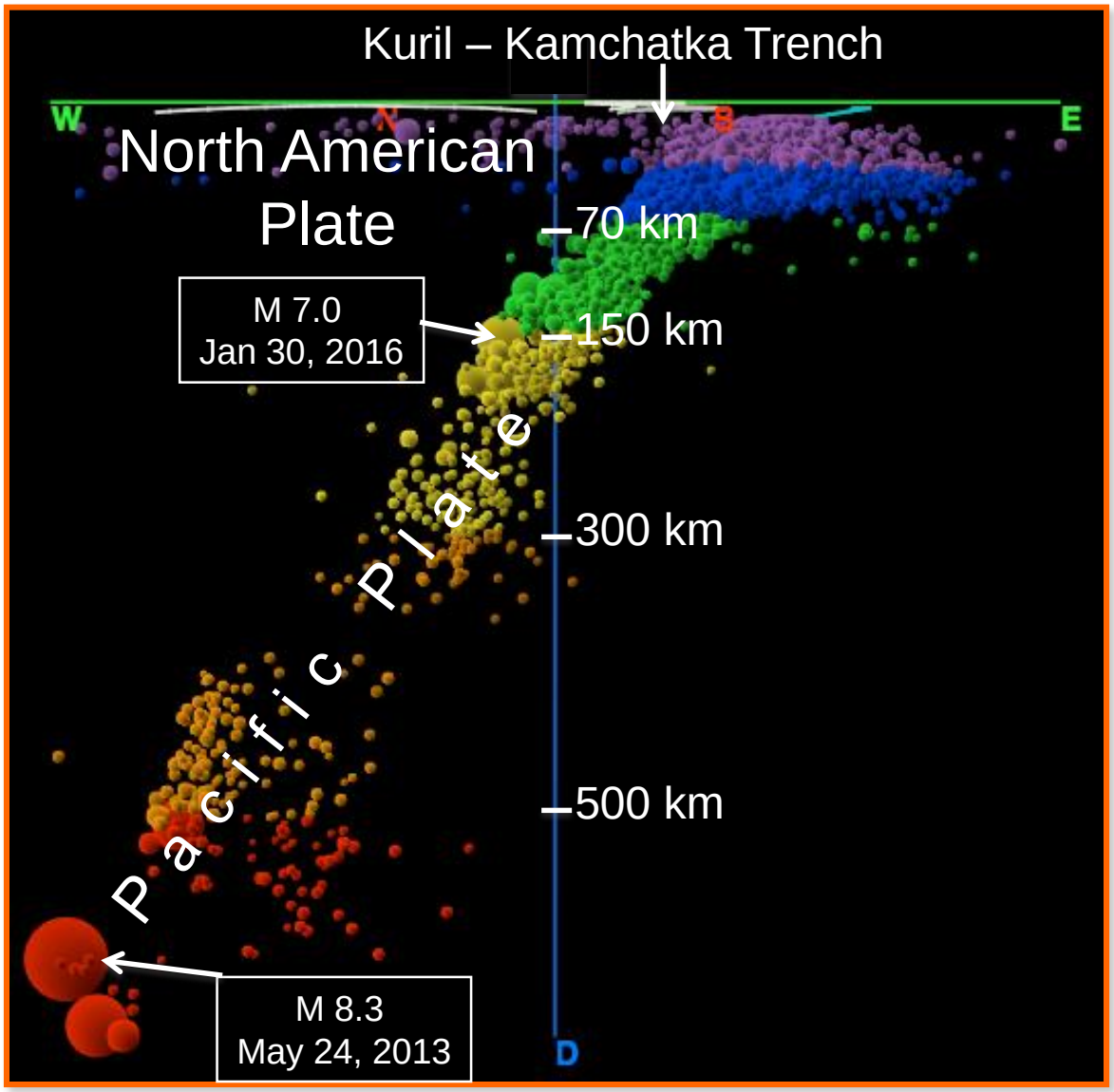
Earthquakes shallower than 150 km are within the Pacific or North American Plates or on the interface between these plates. Events deeper than 150 km, including the January 30, 2016 event, are within the subducting lithosphere of the Pacific Plate. Some of the deepest earthquakes worldwide occur within the Pacific Plate in this region. According to the USGS: “The most significant of these deep-focus earthquakes to date was the May 24, 2013 M8.3 event beneath the Sea of Okhotsk, currently the largest deep-focus earthquake on record.”



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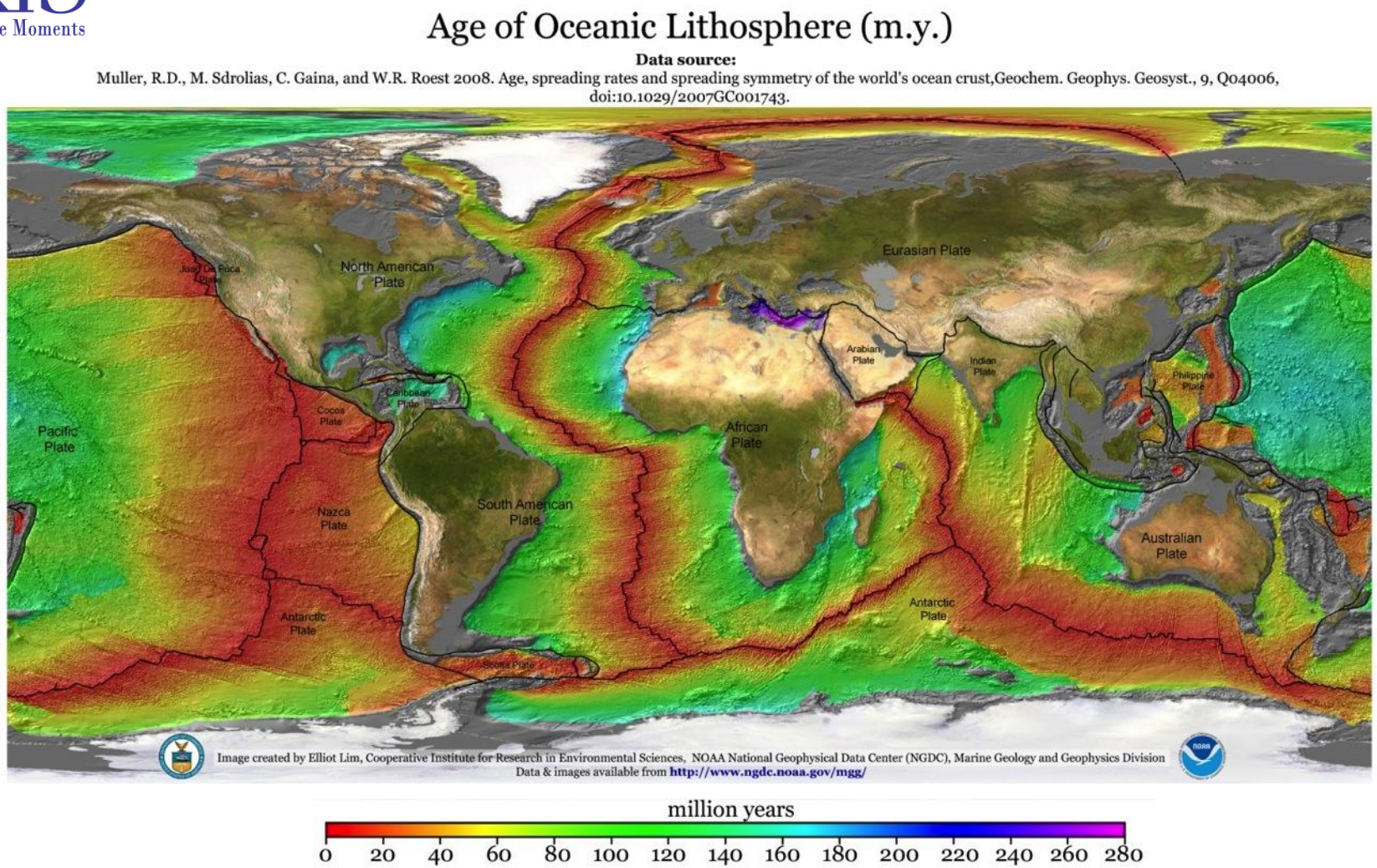

The subducting Pacific Plate adjacent to Kamchatka is more than 100 million years old and is therefore quite cold when it subducts into the Kuril-Kamchatka Trench. Although it warms during subduction, the Pacific Plate remains cool enough to be brittle and capable of producing earthquakes to depths of approximately 650 km.

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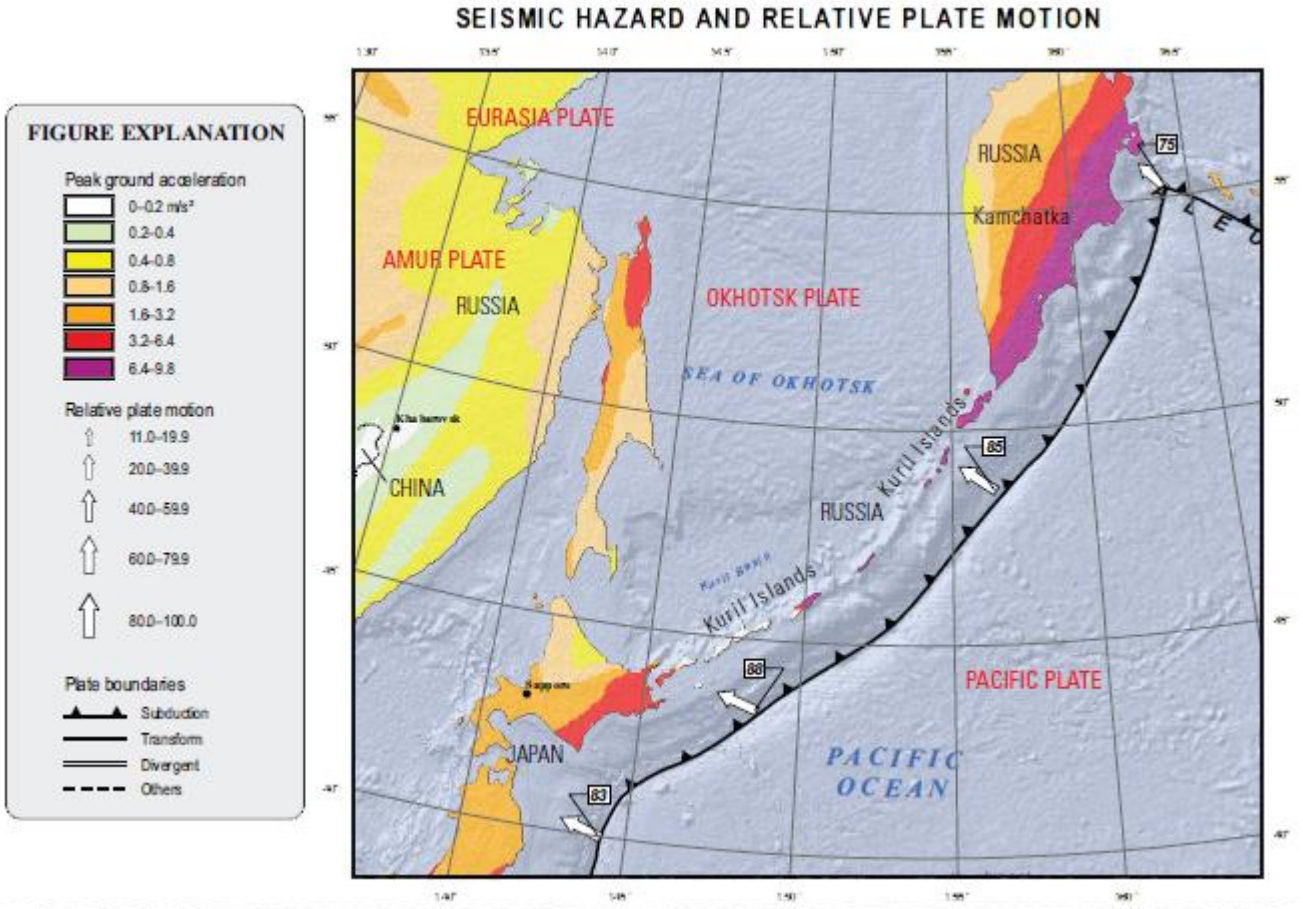
As reported by the USGS National Earthquake Information Center, the Kamchatka Peninsula is one of the most seismically active regions in the world. Deformation of the overriding North America Plate generates shallow crustal earthquakes, whereas slip at the subduction zone interface between the Pacific and North America Plates generates interplate earthquakes that extend from near the base of the trench to depths of 40 to 60 km.

Fortunately the region is sparsely populated so the human impact of earthquake ground shaking is limited. However, tsunamis produced by large shallow earthquakes have caused significant damage.



Source: USGS Open-File Report 2010-1083-C

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Locations of strong M6, major M7, and great M8 and M9 earthquakes in the northern Kuril-Kamchatka subduction zone are shown on the map below. For the M8 and M9 events on the interface between the Pacific and North American plates, the rupture zones are outlined. According to the USGS: "The largest earthquake to occur along the entire Kuril-Kamchatka arc in the 20th century was the November 4, 1952 M9.0 event." Both that 1952 earthquake and the M8.5 megathrust event produced tsunamis that caused widespread damage. The 2006 M8.3 Kuril Island earthquake generated a tsunami that caused damage in Crescent City in northern California. An animation of that tsunami and its record at two DART buoys adjacent to the Aleutian Trench can be found at nctr.pmel.noaa.gov/kuril20061115.html

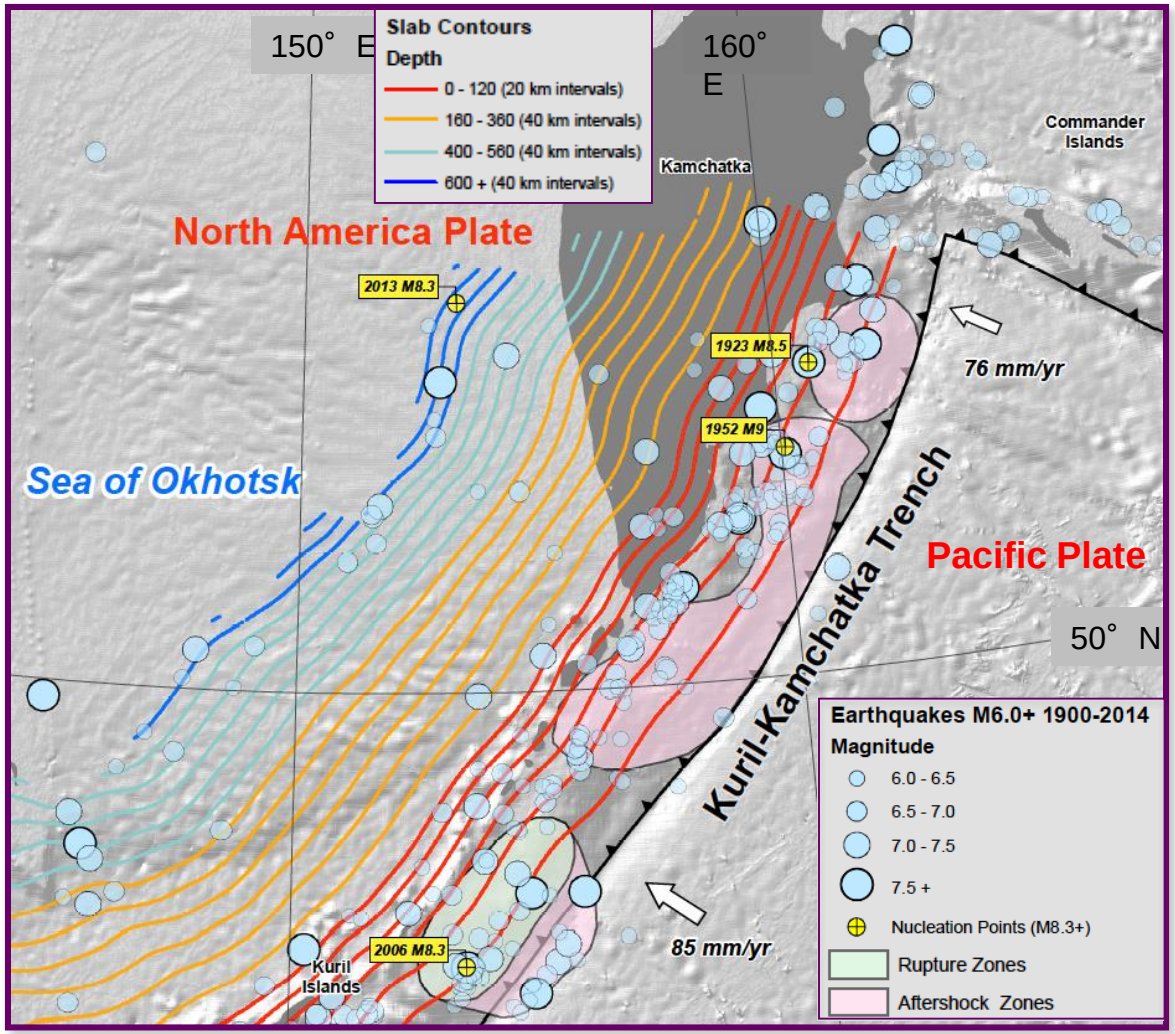

Image courtesy of the US Geological Survey

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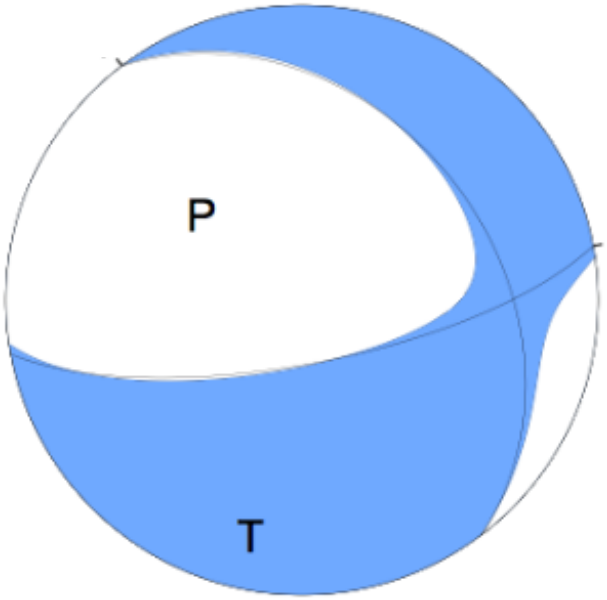
This earthquake occurred as a result of oblique normal faulting at intermediate depths within the subducting lithosphere of the Pacific Plate.

The depth of this earthquake, and its oblique-faulting mechanism, indicate that it involved intraplate faulting within the subducting slab, rather than being an interplate thrust event on the shallower seismogenic zone between the two tectonic plates.



USGS Centroid Moment Tensor Solution

Shaded areas show quadrants of the focal sphere in which the P-wave first-motions are away from the source, and unshaded areas show quadrants in which the P-wave first-motions are toward the source. The dots represent the axis of maximum compressional strain (in black, called the "P-axis") and the axis of maximum extensional strain (in white, called the "T-axis") resulting from the earthquake.

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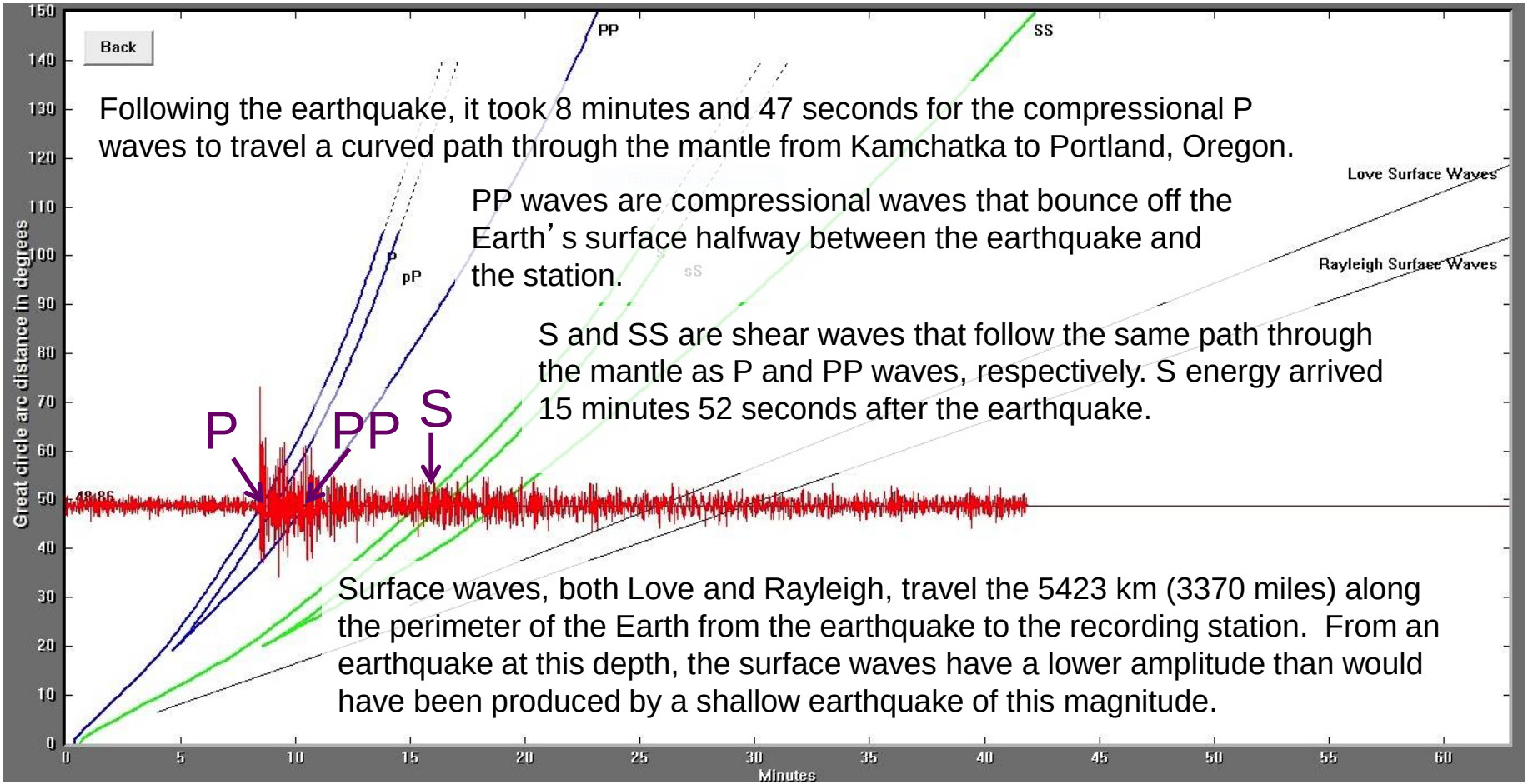
The record of the earthquake on the University of Portland seismometer (UPOR) is illustrated below. Portland is 5423 km (3370 miles, 48.86˚) from the location of this earthquake.



Following the earthquake, it took 8 minutes and 47 seconds for the compressional P waves to travel a curved path through the mantle from Kamchatka to Portland, Oregon.

PP waves are compressional waves that bounce off the Earth's surface halfway between the earthquake and the station.

S and SS are shear waves that follow the same path through the mantle as P and PP waves, respectively. S energy arrived 15 minutes 52 seconds after the earthquake.

Surface waves, both Love and Rayleigh, travel the 5423 km (3370 miles) along the perimeter of the Earth from the earthquake to the recording station. From an earthquake at this depth, the surface waves have a lower amplitude than would have been produced by a shallow earthquake of this magnitude.

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