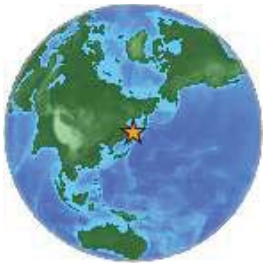
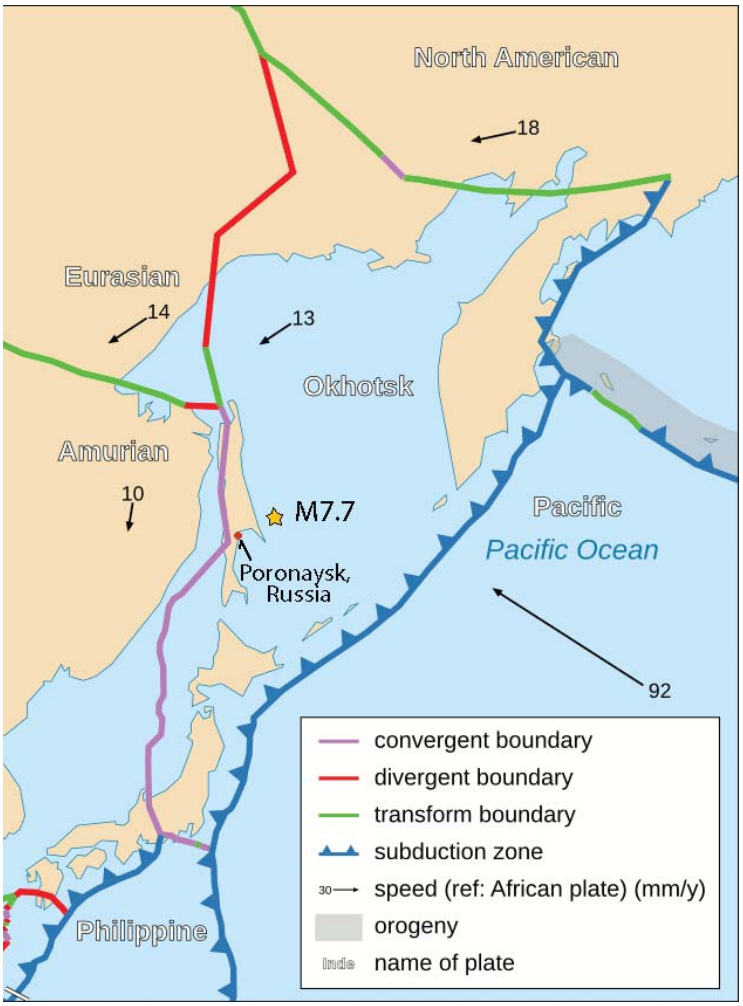
Magnitude 7.7 Earthquake - Sea of Okhotsk
Tuesday, August 14, 2012 at 02:59:42 UTC
Epicenter: Latitude 49.784°N, 145.126°E
Depth: 625.9 km



Earthquake Summary:

According to the US Geological Survey National Earthquake Information Center, a major earthquake occurred in the afternoon local time 158 km east-northeast of Poronaysk, Russia at a depth of 625 km (388 mi). There were no immediate reports of damage or injuries. While the boundary that transects Sakhalin Island is a convergent margin, subduction is not occurring there. It is not the boundary to which this earthquake is related.



East of this region the Pacific plate subducts into the mantle beneath the Okhotsk microplate, a part of the larger North America plate. This deep earthquake was in the subducting slab which reaches this depth nearing the Sakhalin Island.

To produce earthquakes, rocks must be brittle so they can accumulate elastic energy as they bend then rapidly release that energy during earthquake rupture. Rocks are brittle at low temperatures but become viscoelastic when they reach temperatures of about 600 °C.

With the exception of subducting oceanic plates, rock in Earth's mantle below about 100 km depth is viscoelastic and cannot rupture to produce earthquakes. However, rapidly subducting cool oceanic plates can reach depths up to about 700 km into the hot mantle before they become too warm to produce earthquakes.

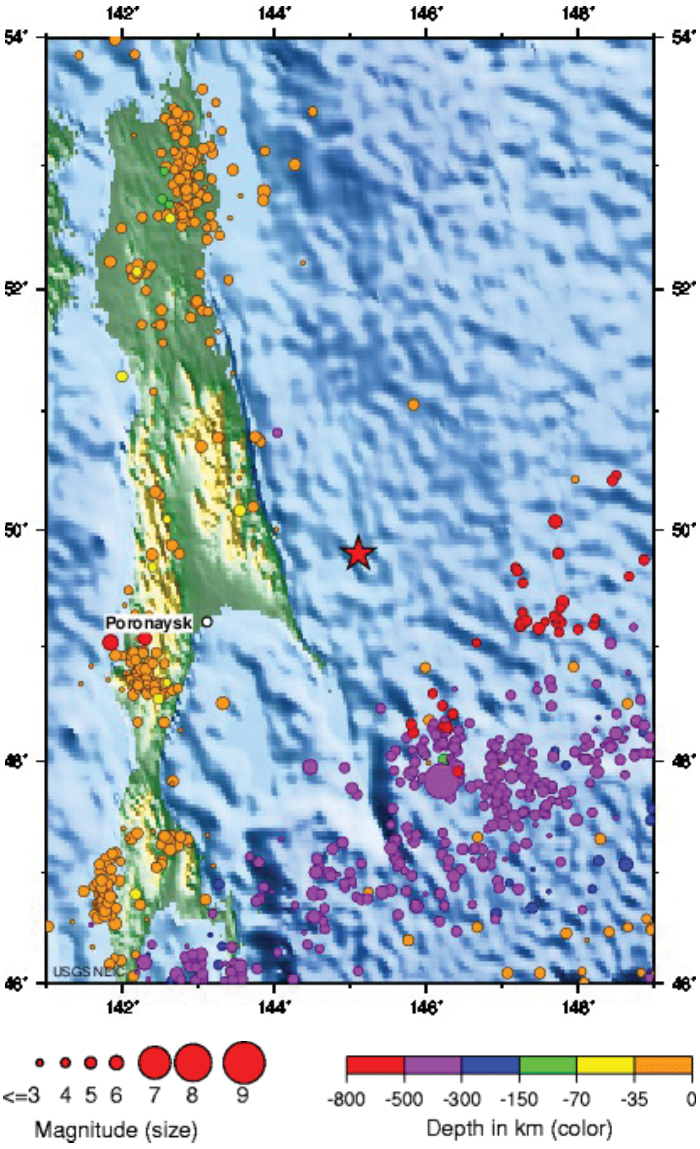
Regional Tectonics:

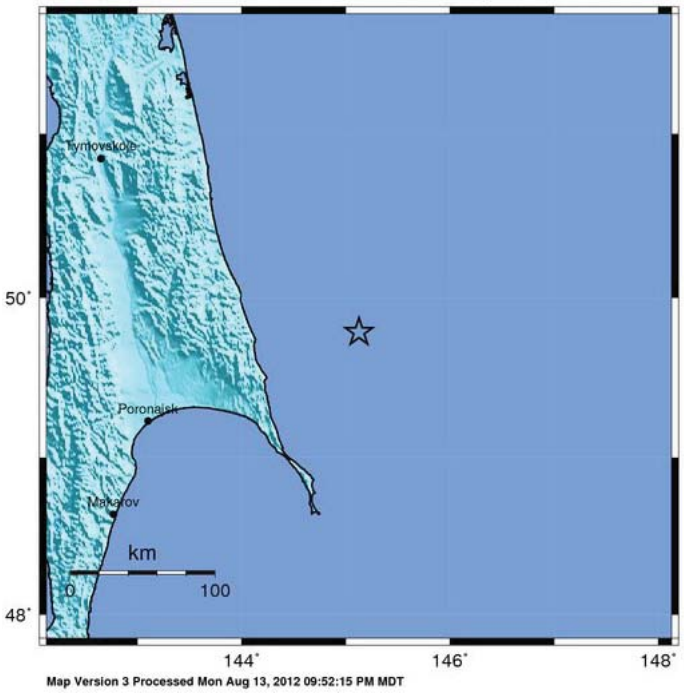
The Okhotsk Plate is a tectonic plate covering the Sea of Okhotsk, the Kamchatka Peninsula, Sakhalin Island and Tōhoku and Hokkaidō in Japan. It was formerly considered a part of the North American Plate, but recent studies indicate that it is an independent plate, bounded on the north by the North American Plate.

The image to the right is a USGS ShakeMap that is a representation of ground shaking produced by the earthquake.

Because this earthquake occurred more than 600 km below the surface of the Earth, no tsunami was produced and only light ground shaking was felt even on the island closest to the epicenter.

Historic earthquakes from 1990 to present are shown on the map below. USGS: “Subduction zones such as the Kuril-Kamchatka arc are geologically complex and produce numerous earthquakes from multiple sources.





PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2011)

Deformation of the overriding North America plate generates shallow crustal earthquakes, whereas slip at the interface of the plates generates interplate earthquakes that extend from near the base of the trench to depths of 40 to 60 km.

At greater depths, Kuril-Kamchatka arc earthquakes occur within the subducting Pacific plate and can reach depths of nearly 700 km. Since 1900, eight great earthquakes (M8.3 or larger) have occurred along the Kuril-Kamchatka arc:

M8.4 1923 Kamchatka earthquake
M8.6 1933 Sanriku-oki, Japan earthquake
M9.0 1952 Kuril Island earthquake
M8.4 1958 Kuril Island earthquake
M8.5 1963 Kuril Island earthquake
M8.4 1994 Kuril Island earthquake
M8.3 2003 Hokkiado, Japan earthquake
M8.3 2006 Kuril Island earthquake.”