Magnitude 7.5 SOUTHEASTERN ALASKA

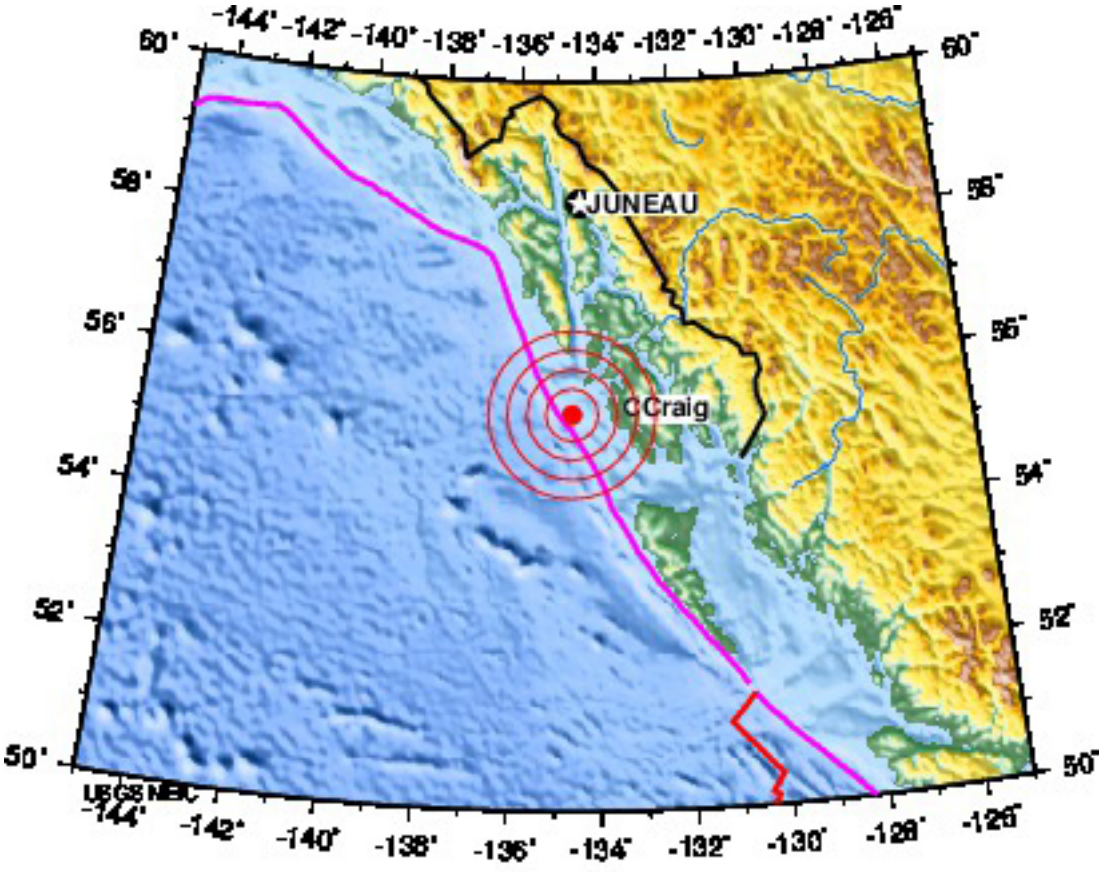
Saturday, January 5, 2013 at 08:58:19 UTC

A major 7.5 magnitude earthquake struck at approximately midnight local time off the west coast of southeastern Alaska. There were no immediate reports of damage or casualties.

This earthquake was 94 km (58 miles) west of Craig, Alaska and 326 kilometers (203 miles) south of Juneau, Alaska.

This earthquake is related to the M 7.8 Queen Charlotte Island earthquake in October 2012, and is an expression of deformation along the same plate boundary system.

Images courtesy of the US Geological Survey



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The epicenter (yellow star) of this earthquake is shown on a regional plate tectonic map. Bold red arrows show motions of the Pacific and Juan de Fuca plates relative to the North American Plate.

The Queen Charlotte fault forms the boundary between the Pacific and North American plates along the western edge of central British Columbia and southeast Alaska.

In the region of this earthquake the Pacific Plate moves approximately north at a rate of 5.1 cm/yr (2 in/yr).

The Queen Charlotte fault is dominantly a right-lateral transform (strike-slip) fault, with a component of compression between the Pacific and North American plates along the southern portion of the fault where three plates converge.

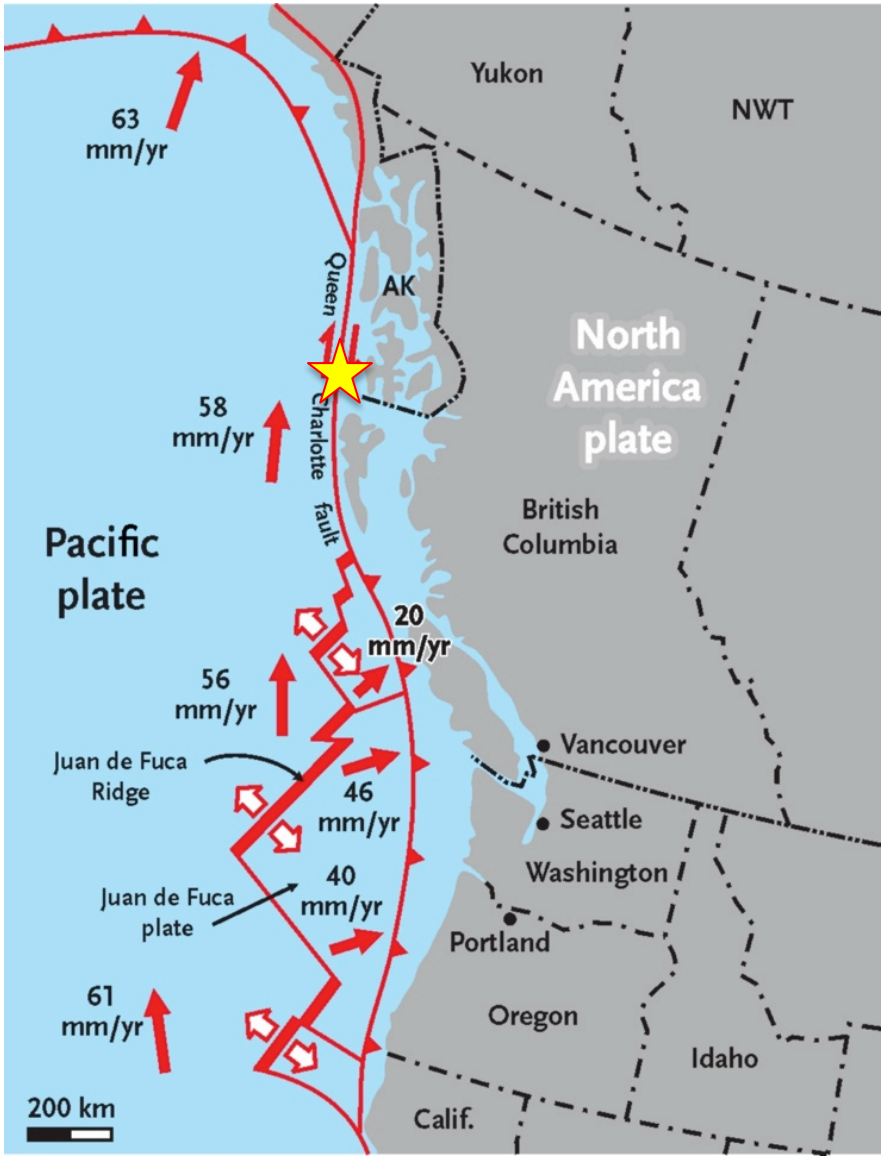

Image from *At Risk: Earthquakes and Tsunamis on the West Coast*

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This earthquake (orange star) is plotted with epicenters of earthquakes in the region since 1990. This earthquake occurred at a depth of 9.8 km (6.1 mi).

According to the USGS National Earthquake Information Center, the area surrounding this earthquake has hosted 8 earthquakes of magnitude 6 or greater over the past 40 years.

In 1949, a M 8.1 strike-slip earthquake occurred close to the Pacific-North America plate boundary approximately 230 km to the south east of this earthquake.

In October 2012, a M 7.8 oblique-thrust earthquake occurred approximately 330 km to the south east of this earthquake.

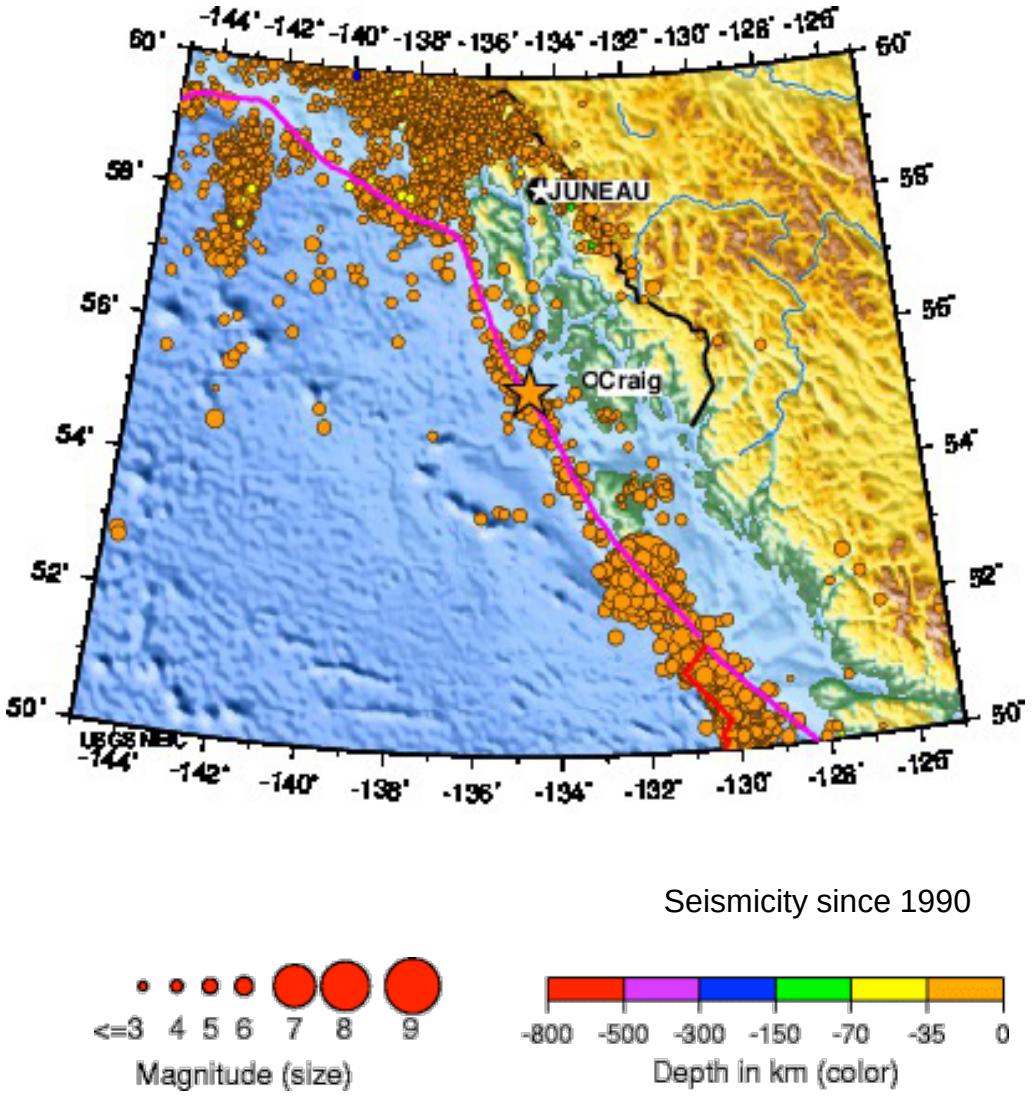

Image courtesy of the US Geological Survey

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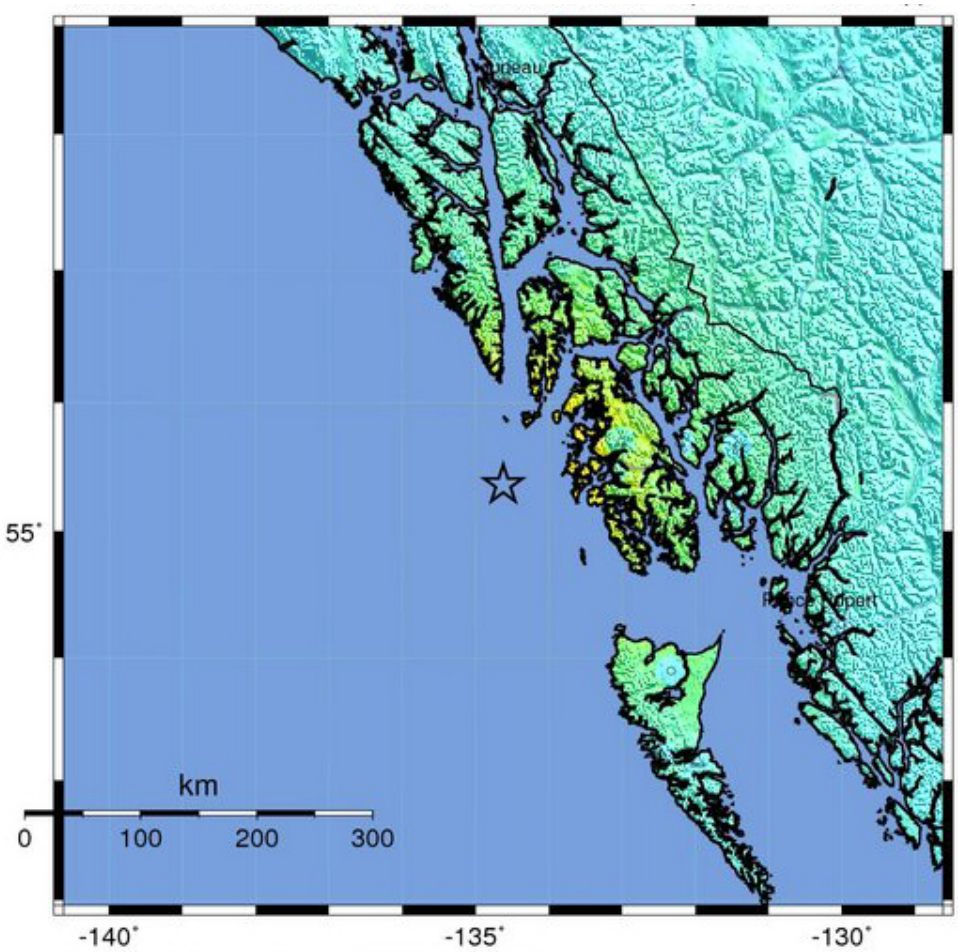
The Modified-Mercalli Intensity scale is a twelve-stage scale, numbered from I to XII. The lower numbers represent imperceptible shaking levels, while XII represents total destruction. A value of IV indicates a level of shaking that is felt by most people. The area nearest the epicenter of this earthquake experienced strong ground shaking.

Intensity is dependent on the magnitude, depth, bedrock, and location.

	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 (Depth 9.8 km)

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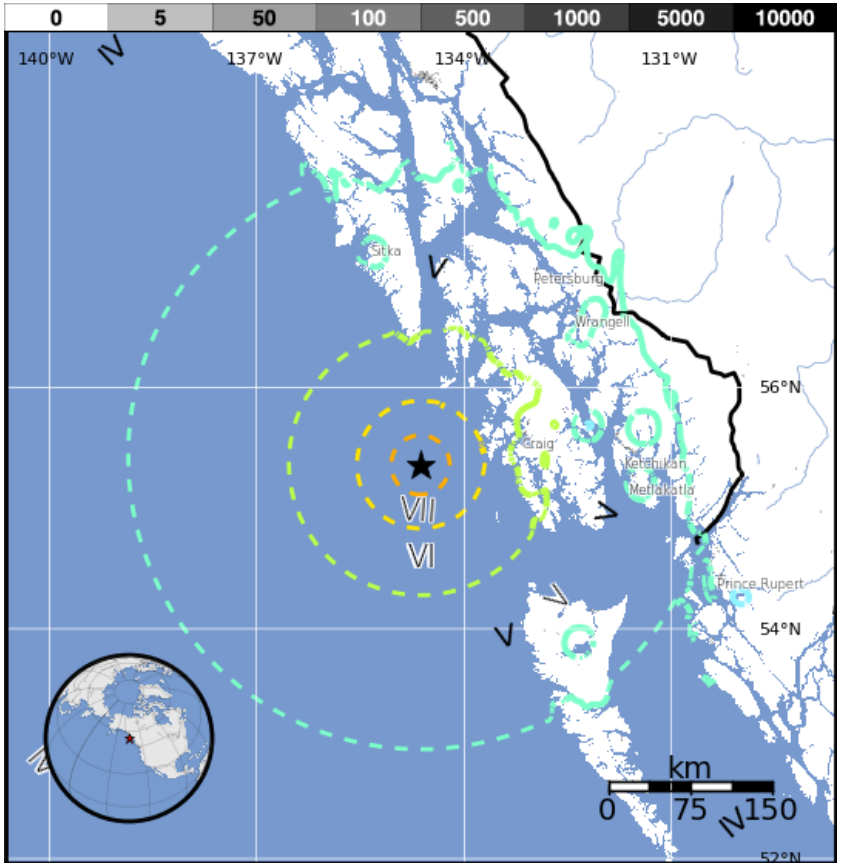
USGS PAGER
Population Exposed to Earthquake Shaking

The USGS PAGER map shows the population exposed to different Modified-Mercalli Intensity (MMI) levels. MMI describes the severity of an earthquake in terms of its effect on humans and structures and is a rough measure of the amount of shaking at a given location.

For this earthquake, 26,000 people experienced moderate ground shaking and 81,000 people felt light ground shaking.



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

Estimated Modified Mercalli Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X
Est. Population Exposure	--*	0k*	81k*	26k	0k	0k	0k	0k	0k
Perceived Shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme

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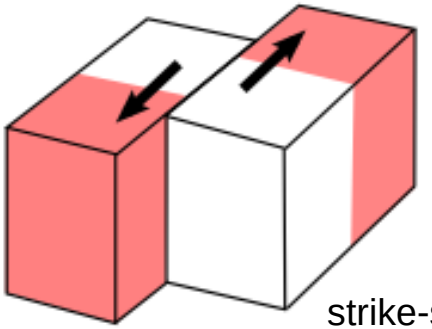
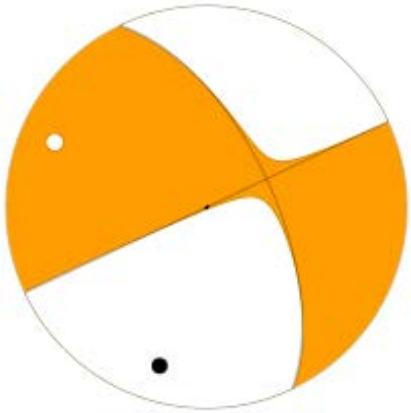
The earthquake occurred off the west coast of southeastern Alaska as a result of shallow strike-slip faulting on or near the plate boundary between the Pacific and North America plates.

Since an earthquake occurs as slip on a portion of the fault, compression and extension as the two sides of the fault move. For the strike-slip motion shown in the block diagram on the right, the shaded regions experience compression during fault motion while the unshaded regions experience extension.



strike-slip fault

The focal mechanism is how seismologists plot the 3-D stress orientations of an earthquake. The focal mechanism for this earthquake is shown on the right. Shaded areas show quadrants of the focal sphere in which the P-wave first-motions were away from the source, and unshaded areas show quadrants in which the P-wave first-motions were toward the source. The black dot shows the axis of maximum compressional strain, called the "P-axis˜, and the white circler shows the axis of maximum extensional strain, called the "T-axis˜. This focal mechanism is consistent with right-lateral strike-slip faulting on a near-vertical fault oriented NNW-SSE, parallel to the Queen Charlotte Transform Fault.



USGS Centroid Moment Tensor Solution

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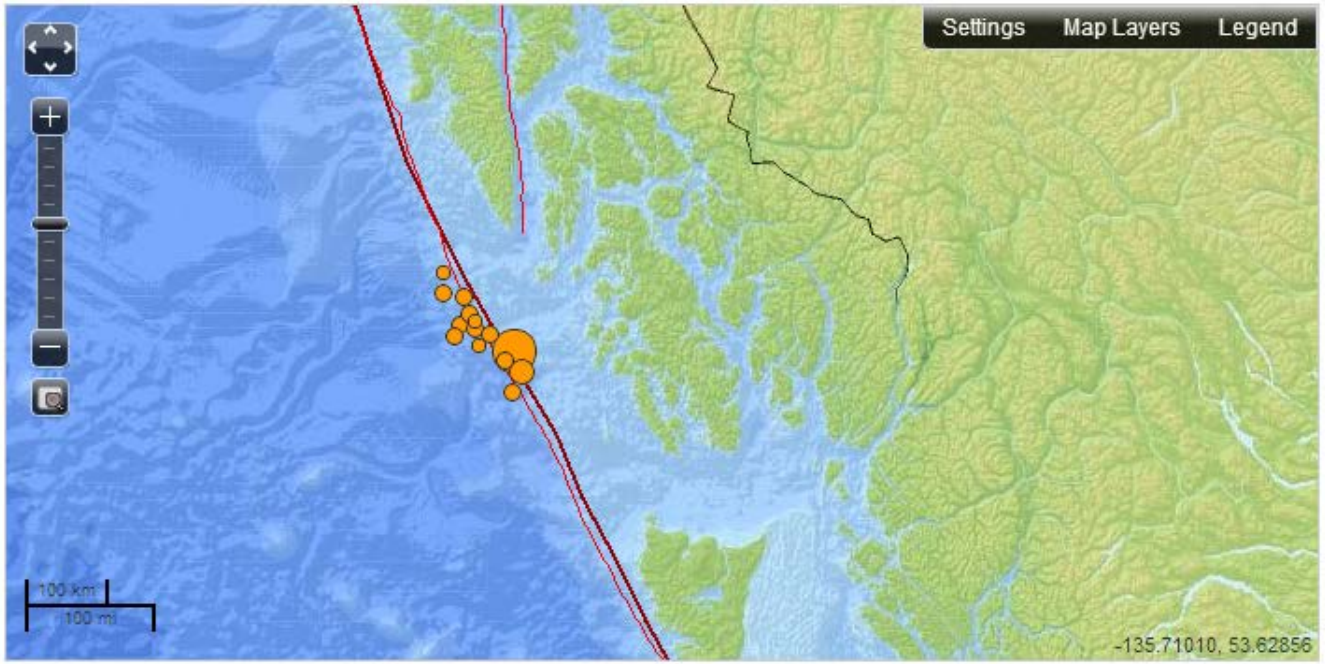
Since the earthquake, there have been over 14 aftershocks (plotted below), the largest a magnitude 5.1.

The huge amount of strain released in the main shock is variable across the slip surface. Therefore the change in stress resulting from the main shock is variable from place to place over the area of the plate boundary that moved. The aftershocks are basically small earthquakes induced by the redistribution of stress that occurred during the main shock. Accordingly, the aftershock distribution gives us another measure of the area of plate boundary that moved in the main shock.



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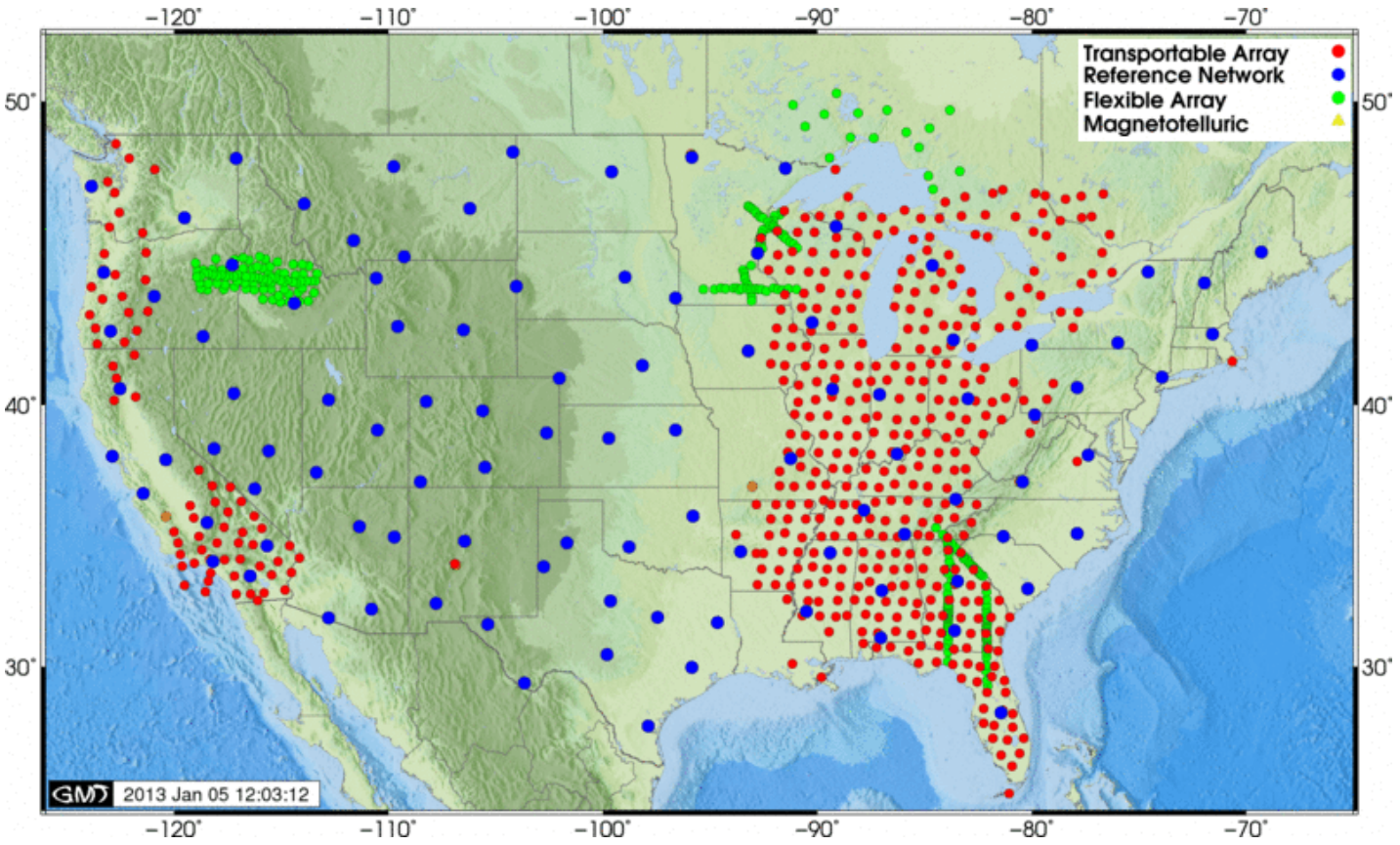
USArray: A Continental-Scale Seismic Observatory

USArray's transportable array is a network of 400 high-quality broadband seismographs that are moving (every two years) across the United States from west to east, and Alaska, in a regular grid pattern. These data are being used to answer questions about the North American continent and underlying mantle.



Operating USArray Stations. The 400 active transportable array stations are plotted in red. Permanent stations are plotted in blue.

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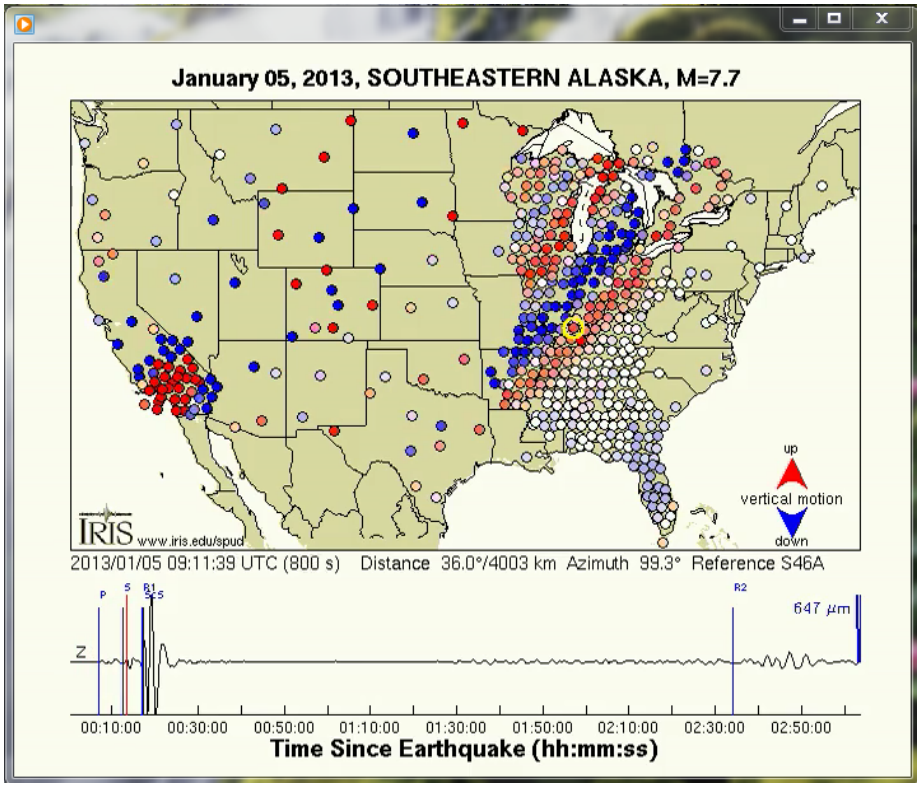
As earthquake waves travel along the surface of the Earth, they cause the ground to move. With the 400 earthquake recording stations in EarthScope's Transportable Array, the ground motions can be captured and displayed as a movie, using the actual data recorded from the earthquake.

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.

A random representative trace is displayed on the lower part of the animation with its horizontal axis representing the time (in seconds) after the event. Location of the representative station is marked on the map by a yellow circle.



Seismic waves crossing the US recorded by the USArray.

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The record of the earthquake on the University of Portland seismometer (UPOR) is illustrated below. Portland is about 1374 km (853 miles, 12.38˚) from the location of this earthquake.