High Lava Plains Seismic Experiment

Earthquakes & Volcanoes in Our Backyard

A major geologic investigation to examine the crust and deep layers of the earth to understand why the High Lava Plains was a focus for voluminous volcanism.

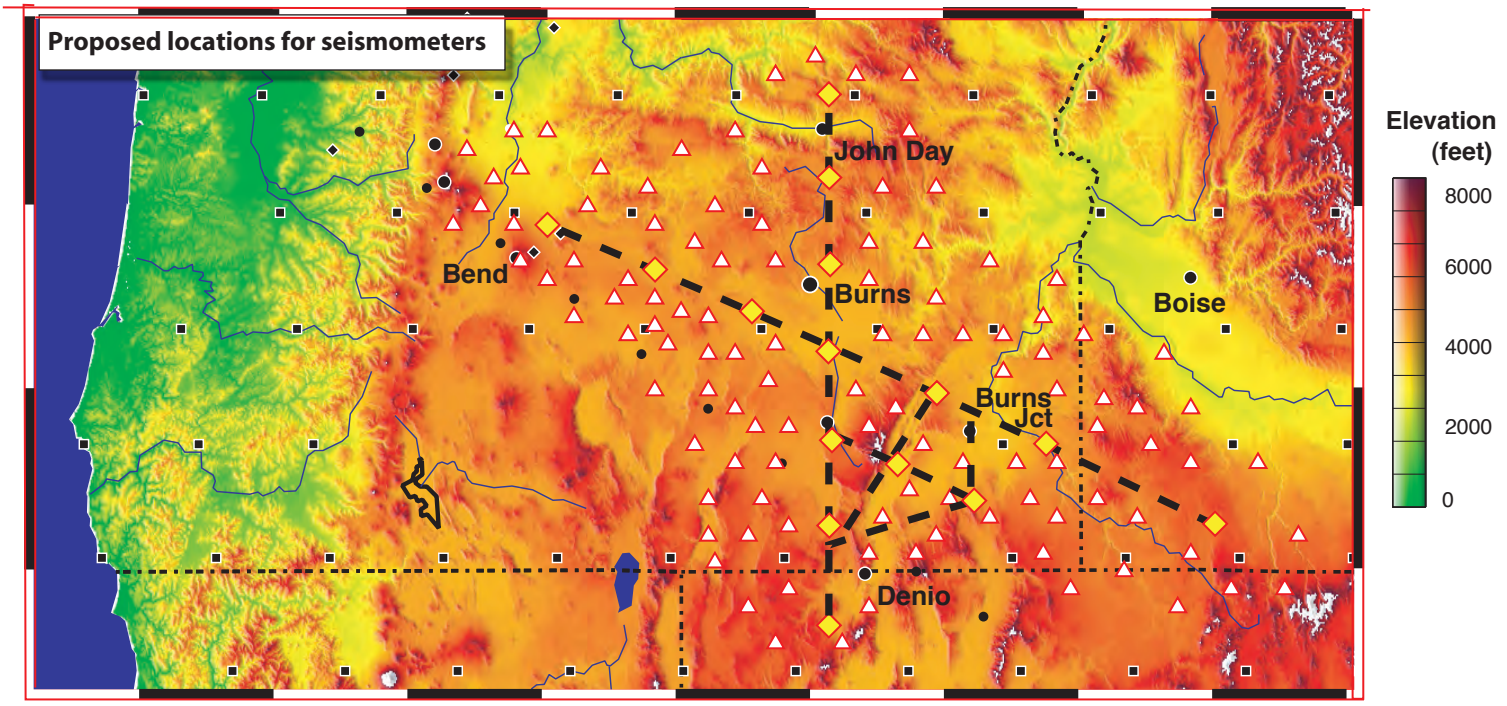
During late summer 2008, teams of seismologists, geologists, and college students are setting up a network of over 2000 miniature seismometers that extend from Bend, Oregon, to western Idaho, and from John Day south to Nevada. It part of a three-year scientific study to examine the crust and the deeper layers beneath the region.

Why are we doing this? This area is covered with lava and ash-flows that poured out from many widely spaced volcanoes. The rock layers were later broken up by countless earthquakes, producing both the Steens Mountain escarpment and the linear cliffs that stretch between Burns and Bend. Scientists wish to understand connections between surface geology and structures tens of miles deep.

What does the network do? The portable seismic monitoring systems are deployed along "active-source lines" (dashed lines on map) to detect extremely small movements of the earth that will be created by borehole seismic detonations (yellow diamonds). These detonations do not disturb the ground surface and are too small to be felt by people even a few hundred yards away. The "geophones" and seismic recorers will be in the ground for les than two weeks in September 2008.

Where are the instruments placed? We have permits from State and County Road departments, from BLM land managers, and from some private landowners, to place our miniature recorders in the "disturbed area" along the verge of existing roads.

Typical installation of a portable seismic monitoring system. The recorder (grey steel cylinder) is connected to a geophone (orange plastic case on a short spike) that moves up and down as the earth moves up and down. Everything is buried in a small hole (see shovel for scale) to protect it from wind vibrations that can be much stronger than the earth vibrations we are monitoring.

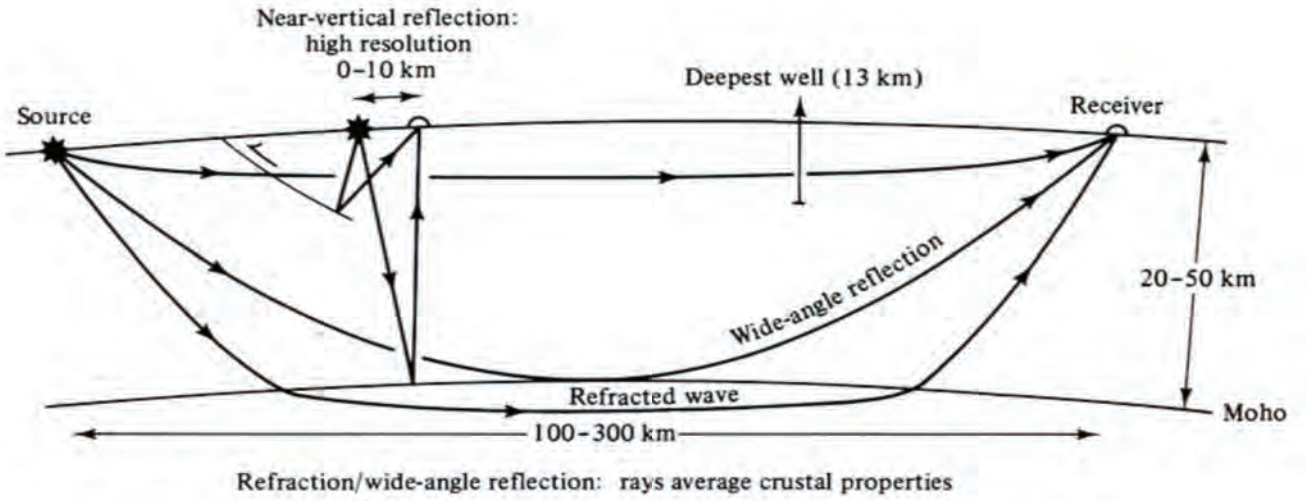


Borehole seismic sources

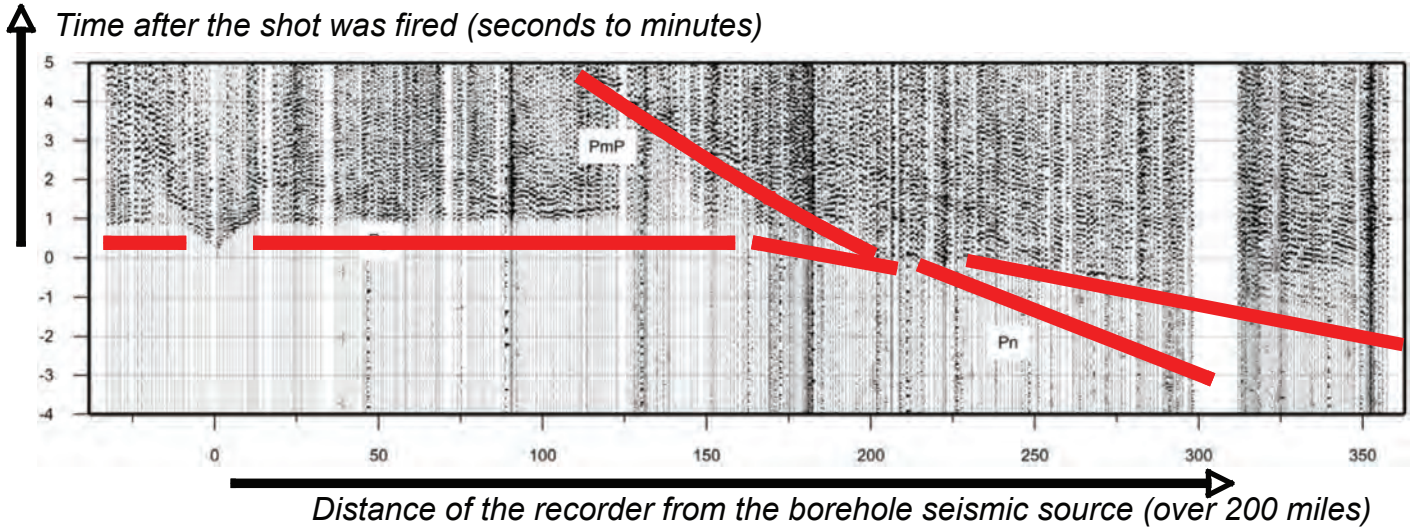
Lines of miniature seismic recorders and geophones

Earthquake recorders installed by our project, 2006-2008

Seismic Imaging uses seismic waves to probe the earth beneath the stations. One method, called seismic "tomography", is like a CAT scan of the human body. This is used to determine the hidden structures deep in the earth's crust. Seismologists also use methods very similar to those used in oil and gas exploration that, together with tomography, will give a comprehensive picture of the earth's structure beneath central and eastern Oregon, western Idaho, and northern Nevada.



The seismic waves spread out through the earth from the borehole detonation ...
... each vertical line is the ground-motion at a single recorder



We pick the arrival times of the seismic energy at each recorder ...
the arrival time tells us the seismic wavespeed ...
... the wavespeed tells us the rock type (geology)

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