OATS

The Oregon Array for Teleseismic Study Newsletter

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In this issue

The OATS Team:

Richard M Allen
Mei Xue
THE UNIVERSITY CALIFORNIA BERKELEY

Andrew Lockman
Neal Lord
Lee Powell
Robert Pyzalski
William Unger
THE UNIVERSITY WISCONSIN MADISON

John Nabelek
Anne Trehu
OREGON STATE UNIVERSITY

Newsletter editor: Mei Xue

If you have any questions or comments about our work please feel free to contact:

Richard M Allen

Dept. Earth & Planetary Science
U. of California - Berkeley
279 McCone Hall
Berkeley, CA 94720-4767
Phone: (510) 642-1275
Fax: (510) 643-9980
rallen@berkeley.edu

Come visit us at:
http://seismo.berkeley.edu/~rallen/research/oregon

Dear OATS Participant,

After three years' operating, OATS stations have collected sufficient data of excellent quality to investigate the geodynamics in Oregon.

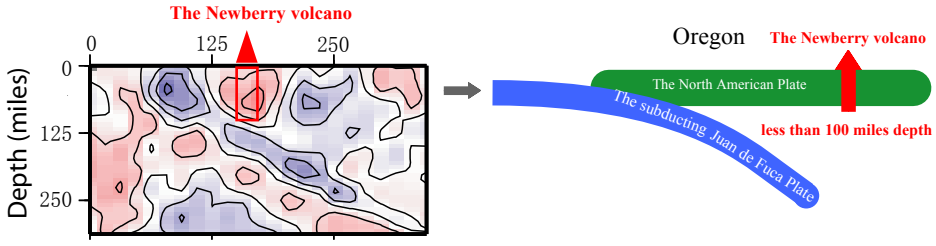
As OATS stations have fulfilled their task, we pulled out most of the stations in May 2006. OT01 and OT03 have been left in order to continue recording new observations of seismic tremor - low amplitude seismic burbling - west of the Cascades.

We want to thank you for helping us with this project and have summarized some of our results below. The scientific discoveries made during this experiment have resulted in one publication and five presentations at scientific meeting so far. This would not have been possible without your help.

- The OATS team

OATS overview

Oregon is located on the North American Plate (the horizontal green bar in the right figure below). The Juan de Fuca plate (beneath the Pacific Ocean and shown as the dipping blue bar) is subducting beneath the North American Plate from the west. The Newberry volcano (the red column) is the western end of a hotspot track, consisting of a sequence of volcanic domes and lava flows, that started near the McDermitt Caldera and have gradually moved westward to Newberry over the last ~12 million years.



Waves from big earthquakes all over the world can be recorded by our stations and provide information about the structure of the Earth beneath Oregon. We analyzed these waves using seismic techniques to view the structure beneath Oregon. We now can answer questions including: what happens to the Juan de Fuca Plate subducting beneath Oregon and what is the source depth of the Newberry volcano?

OATS overview (continued)

By using tomography (similar to X-ray imaging), we can view the velocity structure beneath Oregon (the left figure on page 1). Red indicates warm region and blue indicates cold region. We observed hot material beneath the Newberry volcano to a depth shallower than 100 miles. This is consistent with the conclusion from our shear-wave splitting analysis (shown in the No. 4 Newsletter) that the source for Newberry volcano is shallow and the Newberry hotspot track is also a product of shallow processes happening within the lithosphere. The lithosphere is the rigid and brittle outter shell of the earth with the typical thickness of 60 miles. The tomographic image also shows that the subducting Juan de Fuca Plate reaches a depth of at least 250 miles. This is the first time that the Juan de Fuca plate has been imaged east of the Cascades.

Publications from OATS team so far

Xue, M. and R.M. Allen, Origin of the Newberry Hotspot Track, Evidence from shear-wave splitting, Earth Planet. Sci. Lett. 244, 315–322, doi:10.1016/j.epsl.2006.01.066.

Xue, M. and R.M. Allen, The fate of the Juan de Fuca Plate, in preparation.

Presentations at scientific meetings from OATS team so far

Xue, M. and R.M. Allen, Seismic imaging of the Newberry hotspot track, AGU 2005 Fall Meeting.

Xue, M. and R.M. Allen, Identifying the Origin of the Newberry Hotspot Track, Chapman Conferences on the Great Plume Debate, 2005.

Allen, R.M. and M. Xue (2005) The origin of hotspot volcanism in the Pacific Northwest. IRIS/UNAVCO Annual Meeting.

Xue, M. and R.M. Allen, (2004) Upper Mantle Origin of the Newberry Hotspot Track: Evidence From Shear-Wave Splitting, AGU Fall Meeting 2004.

Allen, R.M., and M. Xue (2004) Newberry upwelling and Cascadian subduction: Convective interactions in the mantle beneath Oregon, MYRES Conference.

Photos from the field trip in May 2006

Bob West (host of OT01, in the middle) and the OATS team (Rob, Richard, Mei, and Dennise, from left to right), May 3rd, 2006

Neal, Dennise, Mei, and Rob at OT12 after pulling out the last station, May 6th, 2006