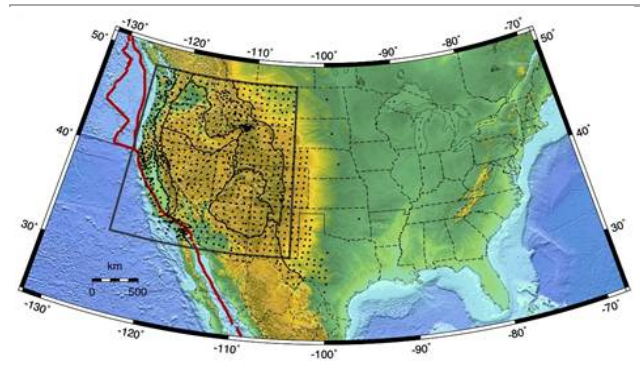


Underground column of molten rock found at Yellowstone

Research suggests activity is fueling Pacific Northwest's volcanic activity



UC, Berkeley / Keck Caves, UC, Davis
New high-resolution tomographic images show there is a continuous, whole-mantle plume beneath the Yellowstone Snake River Plain.

By Lynne Peeples

OurAmazingPlanet

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A plume of molten rock rising from deep beneath Yellowstone National Park is probably what is fueling the region's volcanic activity, as well as tectonic plate oddities across the Pacific Northwest, new research suggests.

Building on a growing body of evidence, Mathias Obrebski of the University of California, Berkeley, and his colleagues created the most convincing picture to date of a [Yellowstone mantle plume](#) — one that extends from about 621 miles below the surface of the Earth.

Debates have long been waged over whether erupting and shaking in the area over the last few millions of years — and a track marked out by a chain of volcanic calderas along the Yellowstone Snake River Plain in Idaho — could be the work of a column of hot rock rising up from deep within the [Earth's mantle](#). The mantle is the layer of hot, viscous rock

beneath the planet's crust.

The very existence of such [mantle plumes](#) is doubted by some scientists.

"They are extraordinary features, in size and in the fact that they travel upward through the whole mantle in solid form," said Vic Camp of San Diego State University, who was not involved in the new study. "It's a really simple idea to explain a number of different phenomena on Earth. But the simple idea was very difficult to test."

"Chemical and physical volcanology evidence suggested a plume, but this is the first seismic proof," Camp told OurAmazingPlanet.

Obrebski's team used data from a new, dense deployment of seismometers, called the Earthscope USArray, to get a high-resolution image of the once-elusive mantle, along with information on the unusual structure of the subducting Juan de Fuca slab to its west. The

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Juan de Fuca plate is a small tectonic plate jammed in between the much larger Pacific and North American plates.

Much like an MRI scan of a human body, seismometers' antennas capture seismic waves of earthquakes traveling through the earth from various directions. The waves' speeds provide hints of the materials and temperatures they pass through, informing the resulting 3-D image, explained Robert Smith of the University of Utah, who wasn't involved in the new research but whose group had recently imaged Yellowstone's mantle plume down to about 372 miles (600 km).

The plume is thought to be more or less stationary, with the [North American plate](#) — and the Juan de Fuca subducting beneath it — slowly sliding southwesterly over the plume. So what is now Oregon probably sat where Yellowstone is today about 17 million years ago, baking and breaking over a hot plume of rock, Camp said.

Obrebski said in an interview: "There's been subduction in the [Oregon] region for more than 150 million years, so we'd expect to see a large continuous slab. But what we see are just fragments."

The location of those pieces, he added, suggests that the slab and the plume are tightly related.

The findings were detailed in the July 22 edition of the journal *Geophysical Research Letters*.

These observations may also help explain the unusual lack of deep seismology in the Pacific Northwest, and perhaps shed light on some larger mysteries. "If you look at the mass extinctions on Earth," Camp said, "we think

that a few may have been associated with eruptions from mantle plumes."

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