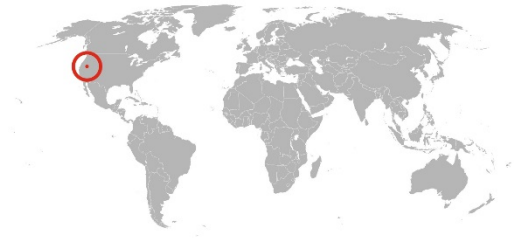


HOTSPOT

Snake River Scientific Drilling Project
Idaho, USA



Goal & Scientific Objective

The primary goal of the HOTSPOT project is to document the volcanic and stratigraphic history of the Snake River Plain, which represents the surface expression of this hotspot, and to understand how it affected the evolution of the continental crust and lithospheric mantle. An additional goal is to evaluate the geothermal potential of southern Idaho.

Operational Achievements

Three drill holes at three sites were completed.

Kimama site was drilled Sep 2010 – Jan 2011 and reached a final depth of 1912 m. Cased and open hole logging was carried out in the deepest parts of the Kimama hole.

Kimberly site was drilled Jan 2011 – Jun 2011 and reached 1958 m depth.

Mountain Home site was drilled Jul 2011 – Jan 2012 to a final depth of 1821 m. Borehole logging was carried out to a depth of 1690 m.

Except for the uppermost 214 m of Kimberly, all holes were fully cored (total core recovery: 5.9 km).

Geophysical studies included high-resolution gravity and magnetic surveys, high-resolution seismic surveys (vertical seismic profile) and borehole geophysical logging. The latter include natural gamma, neutron hydrogen index, $\rho\text{-}\rho$ density, resistivity, magnetic susceptibility and full vector magnetic field, 4-arm caliper, full waveform sonic and ultrasonic borehole televiwer imaging.

Data & Sample Access

Data is available on ICDP website. Volcanic Rocks are stored (Mtn. Home) at Utah State University and (Kimama and Kimberly) at U.S. Geological Survey, Core Research Center (CRC). Sedimentary Rocks are stored in the National Lacustrine Core Repository at the University of Minnesota.

Web & Media Resources

<https://www.facebook.com/Project-Hotspot-Yellowstone-Snake-River-Plain-144194715624402/>

www.usu.edu/geo/shervais/Shervais-USU-Geology/Project_Hotspot.html

<http://snakeriver.icdp-online.org/>

Timeline

2008 ICDP proposal submission

2010 (September) – 2012 (January) drilling operations

Principal Investigators

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Scientific Findings

Basalts near the bottom of the Kimama core hole are ~6 Ma in age, while rhyolite lava overlain by basalt in the uppermost Kimberly core hole has been dated at 6.25 Ma.

Basalts in the Kimama hole are at least 50% thicker than anticipated and preserve a remarkable record of essentially continuous mafic volcanism within the Axial Volcanic Zone. Clastic fluvial sediments have been found at ~1800 m depth.

Kimberly documents the intercalation of basalt and rhyolite immediately after the initial phase of rhyolite volcanism, and because it reveals the occurrence of massive rhyolite ignimbrites that may be up to 900 m thick. The Mountain Home penetrates an older basaltic basement, which underlies Pliocene-Pleistocene paleolake sediments that are over 600 m thick.

The Kimama well samples an aquifer three times thicker than normal (960 m), suppressing the thermal gradient. A temperature gradient of 75-80°C/km underlies the aquifer. The Kimberly well taps a warm water aquifer at 55-60°C, while Mountain Home intersected a 135-140°C (or higher) geothermal resource with artesian flow to the surface.



Drilling at Kimberley

Key Publications

Shervais, J.W.; Nielson, D.L.; Evans, J.P.; Lachmar, T.; Christiansen, E.H.; Morgan, L.; Shanks, W.C.P.; Delahunty, C.; Schmitt, D.R.; Liberty, L.M.; Blackwell, D.D.; Glen, J.M.; Kessler, J.E.; Potter, K.E.; Jean, M.M.; Sant, C.J.; Freeman, T.G. (2012): Hotspot: The Snake River Geothermal Drilling Project - Initial Report. Geothermal Resources Council Transactions 36 767-772

Shervais, J.W.; Schmitt, D.R.; Nielson, D.; Evans, J.P.; Christiansen, E.H.; Morgan, L.; Shanks, W.C.P.; Prokopenko, A.A.; Lachmar, T.; Liberty, L.M.; Blackwell, D.D.; Glen, J.M.; Champion, D.; Potter, K.E.; Kessler, J.A. (2013): First Results from HOTSPOT: The Snake River Plain Project, Idaho, U.S.A. Scientific Drilling 15 35-45. doi:10.2204/iodp.sd.15.06.2013

Shervais, J.W.; Evans, J.P. (2014): Drilling Into the Track of the Yellowstone Hot Spot. Eos, Transactions, American Geophysical Union 95(10) 85-86

Liberty, L.M.; Schmitt, D.R.; Shervais, J.W. (2015): Seismic imaging through the volcanic rocks of the Snake River Plain: Insights from Project Hotspot. Geophysical Prospecting. doi:10.1111/1365-2478.12277



Rhyolite with propylitic alteration