

Magma Discovered in Situ for First Time

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(PhysOrg.com) -- A crew drilling on the Big Island of Hawaii has discovered magma, the molten rock material — never before found in its natural habitat underground — that is the central ingredient in the evolution of planets and the lifeblood of all volcanoes.

The chance discovery far beneath the Earth's surface gives scientists an unprecedented opportunity to understand the important substance.

"As scientists, we've hypothesized about the nature and behavior of magma in literally countless studies, but before now the real thing has never been found or been physically investigated in its natural habitat within the earth," said Bruce Marsh, a professor of earth and planetary sciences at The Johns Hopkins University's Krieger School of Arts and Sciences.

Magma is the subterranean form of what, when it is ejected from the earth in volcanoes and cools, is known as lava. Underground, it reaches temperatures of more than 1,000 degrees Celsius, or more than 1,900 degrees Fahrenheit.

"Magma resides inside the earth and lava is its equivalent on the surface. But once magma erupts, it begins cooling unusually quickly and it loses any gases that it may contain, so it really is a different animal," Marsh said. "We've never seen, until now, the real animal in its natural habitat. And it's not going anywhere: it's caged, so to speak."

Earth scientists are excited about the discovery not only because it's a

first, but also because the magma is a highly unusual type called "dacite." Evidence of cooled-off dacite magma is not common in the geology of Hawaii; it is believed to be made by, in effect, distilling basalt, the material which makes up the floor of the ocean.

Marsh is collaborating on the discovery with William Teplow, a consultant to Nevada-based Ormat Technologies Inc., the company which discovered the magma during drilling operations at its Puna Geothermal Venture power plant.

"This gives scientists an extraordinary chance to examine magma in its natural habitat, which is very, very exciting," he said.

Teplow and Marsh will announce the discovery on Tuesday, Dec. 16, at the 2008 fall meeting of the American Geophysical Union in San Francisco.

Marsh, nicknamed the "Magma PI," has spent his career investigating the processes by which magma is forced from the bowels of the planet to the surface and creates the geologic features — continents, mountains, valleys — among which we live. He does much of his field work in an area quite different from Hawaii: Antarctica. In 2005, a glacial valley there, in the Olympus Range just south of Mount Hercules, was named "Marsh Cirque" in his honor.

Workers at Ormat, one of the world's largest geothermal producers, discovered the magma in October 2005 when they hit a chamber of the magma about a mile and a half down while drilling an injection well. The substance quickly rose about 20 feet up into the drill hole before becoming glasslike as it cooled. Ormat workers redrilled the area several times, with the same result.

It quickly became apparent that the magma was the highly unusual

dacite, Marsh said.

"No dacite lava or rocks have ever been found on the Big Island of Hawaii, though some have hypothesized that basalt can transform into dacite through a form of distillation through crystallization," he said.

After discovering the magma, Ormat installed a permanent seismic and ground monitoring network to provide early warning of any impending volcanic activity for the power plant and surrounding community.

Provided by Johns Hopkins University

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