

Ocean floor geysers warm flowing sea water

September 22 2008

An international team of earth scientists report movement of warmed sea water through the flat, Pacific Ocean floor off Costa Rica. The movement is greater than that off midocean volcanic ridges. The finding suggests possible marine life in a part of the ocean once considered barren.

With about 71 percent of the Earth's surface being ocean, much remains unknown about what is under the sea, its geology, and the life it supports. A new finding reported by American, Canadian and German earth scientists suggests a rather unremarkable area off the Costa Rican Pacific coast holds clues to better understand sea floor ecosystems.

Carol Stein, professor of earth and environmental sciences at the University of Illinois at Chicago, is a member of the research team that has studied the region, located between 50 and 150 miles offshore and covering an area the size of Connecticut. The sea floor, some two miles below, is marked by a collection of about 10 widely separated outcrops or mounts, rising from sediment covering crust made of extinct volcanic rock some 20-25 million years old.

Stein and her colleagues found that seawater on this cold ocean floor is flowing through cracks and crevices faster and in greater quantity than what is typically found at mid-ocean ridges formed by rising lava. Water temperatures, while not as hot as by the ridge lava outcrops, are surprisingly warm as well.

Finding so much movement in a bland area of the ocean was surprising.

"It's like finding Old Faithful in Illinois," said Stein. "When we went out to try to get a feel for how much heat was coming from the ocean floor and how much sea water might be moving through it, we found that there was much more heat than we expected at the outcrops."

The water gushing from sea floor protrusions warms as it moves through the insulated volcanic rock and picks up heat.

"It's relatively warm and may have some of the nutrients needed to support some of the life forms we see on the sea floor," said Stein. Her best guess as to why the water flows so rapidly is that it accelerates off nearby sea mounts and follows a well-connected network of cracks beneath the sea floor.

The earth scientists dropped probes from ships down to the pitch-dark ocean floor to collect temperature and heat-flow data to form images of what is happening in this area of the ocean, with water flowing down into rock, heating up and remixing below the floor sediment, and then escaping above the sea floor.

Only in recent decades have earth scientists discovered such life forms as bacteria, clams and tubeworm species living near the hot water discharges along the mid-ocean volcanic ridges. The rather flat undersea areas which Stein and her colleagues studied were thought to be lifeless, but the nutrient-enhanced warm water flows they discovered suggests this area too may be capable of supporting life.

"The sea floor may not be quite as much of a desert even as we thought maybe 20 or 10 years ago, but rather there may be a lot of locations similar to this well-studied area in terms of the water flow where there's a lot more biological activity," she said.

The earth scientists hope to do follow-up studies to add details to their

findings, and see if they can find other regions comparable to the one off Costa Rica.

"We're only beginning to really understand the interplay of the water flow and the nature of the ecosystem on the sea floor," said Stein. "I think as we move away from the ridge crests, understand what's going in the overall ocean, we'll have a better understanding of how life is distributed and affects the oceans and our planet."

The findings were reported in a letter printed in *Nature Geoscience's* September 2008 issue.

Source: University of Illinois at Chicago

Citation: Ocean floor geysers warm flowing sea water (2008, September 22) retrieved 23 April 2024 from <https://phys.org/news/2008-09-ocean-floor-geysers-sea.html>

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