

Technology opens promise, perils of ocean mining

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BOSTON – There's gold in that thar sea floor. Silver, copper, zinc and lead, too. The problem is, it's a mile or two underwater and encased in massive mineral deposits that layer a dark, mysterious world.

But new technology and worldwide demand have combined to make mining for these metals economically feasible for the first time. A breakthrough project is moving forward in New Guinea, and new rules to govern deep ocean mining will be set by an international authority this spring.

On Thursday, scientists, businessmen and policymakers from 20 countries meet on Cape Cod for a public forum on how to best extract these riches while protecting hidden worlds in the earth's oceans. Strange animals, from six-foot tubeworms to "blind" shrimp, thrive in water as acidic as battery acid, near "hydrothermal vents" that spew out mineral-laden liquid as hot as 750 degrees.

"It's a unique set of life down there. Frankly, we haven't found everything. We need make sure we go in with our eyes open," said Maurice Tivey, a geologist at the Woods Hole Oceanographic Institution, which is hosting the public ocean mining colloquium.

Scientists have long known about remarkably pure concentrations of metals found near some of the hydrothermal vents, nicknamed "black smokers" because they resemble underwater chimneys.

The vents sprout in areas with heavy seismic activity, including the mid-Atlantic ocean ridge and the Pacific's volcanic "Ring of Fire," which stretches along the west coast of the Americas, to Asia and down near New Zealand. There, the earth's spreading plates allow sea water to seep into the earth's crust, where it becomes heated, leaching precious minerals from the surrounding rock.

Eventually, the water is hot enough to become buoyant and bursts toward the surface, similar to when cold milk is poured into a cup of coffee, gets heated and rises to the top. The minerals cool in the frigid sea water and solidify into the deposits.

About 200 active vents have been found, though only 10 nearby deposits are considered prolific enough to mine, according to a report by the International Seabed Authority. Dormant vents are much tougher to locate, but the deposits around them may also be fruitful.

The ISA report indicates a single deposit could weigh 100 million tons.

"We want to be cautious about concluding, in effect, that all our problems are solved. But clearly there's a possibility of significant quantities of resource there," said Rod Eggert of the Colorado School of Mines.

High demand for metals has fueled interest in deep ocean mining, as land-based resources get stretched and need increases in nations such as China and India, which have growing economies but relatively few natural resources. The projects cost hundreds of millions of dollars just to get started, and widespread ocean mining is years away. But new technology has investors seeing possibilities.

The first full-scale deep ocean mining project is being run by Canada-based Nautilus Minerals Inc., which is negotiating to mine an area about 1,600 meters (5,249 feet) deep off Papua, New Guinea, and hopes to be operating by 2011 or 2012. The project is piggybacking on technology developed by oil companies for deep water drilling, said Scott Trebilcock, Nautilus's vice president of business development.

Deposits would be extracted by 180-ton, remotely operated machines that oil companies developed to dig trenches for pipelines. The material is pumped in a mix of sea water to a ship on the surface, then pumped down so that the highly acidic water doesn't kill surface level sea life.

The Nautilus project is planned within New Guinea's territorial water, a 200-mile zone from every country's coastline where it has exclusive ocean floor mining rights. But Trebilcock said the rules set by the ISA at its annual session, beginning in late May, will likely set precedents for all projects.

Most of the earth's known hydrothermal vents are outside the 200-mile zones, in open ocean that is under the jurisdiction of the ISA, which was established in 1982 by the United Nations Convention on the Law of the Sea. The United States still has not signed onto the Law of the Sea treaty, which has been stalled for decades by Senate opponents who say it requires the country to surrender important sovereignty rights.

The United States has been consulted as the rules have been drafted, but proponents say the country could be shut out from future claims to deep ocean mines, since the seabed authority would award the rights.

The Obama administration has indicated it wants to sign the treaty, and this week's meeting at Woods Hole is proceeding as if the U.S. ultimately will have a say as a treaty participant.

The unique species that thrive near the vents are a chief concern of scientists, including marine geologist Peter Rona of Rutgers University, who discovered the Atlantic's first hydrothermal vents in the 1980s. He describes the area near the vents as "like another planet." Creatures there include footlong clams, man-length tubeworms and a shrimp species that has no eyes, but may have sensors that detect the vents' infrared radiation.

The species there may tell us more about the origins of life of earth, and even what life elsewhere might look like, Rona said. Already, he said, the species there have been a benefit. For instance, an enzyme from microbes found there is being used to enhance the flow of oil extracted from deep reservoirs.

"The mining needs to go forward, the environments need to be sustained and conserved," Rona said. "That's a challenge, but it's doable."

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