UNIVERSITE DE TOULOUSE LE MIRAIL

Cetim
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Sujet Anglais

MASTER 2

Consignes

1 - Traduire vers le français l'intégralité du document suivant

2 - Lister à la suite de votre traduction les sources électroniques consultées

Deep Sea Vents: Science at the Extreme

With a mile and a half (two and a half kilometers) of Pacific Ocean sitting on their shoulders, ghost-pale crabs and fish forage among blood-red tube worms. Such communities flourish where super-heated water gushes from seafloor springs. Advances in the tools that scientists use to investigate deep-sea ecosystems are expanding knowledge of these creatures and their hostile environment.

Strange Life Clearly Seen

Water heated as high as 760°F (404°C) by magma from Earth's interior billows from a seafloor chimney. The surrounding ocean is just a few degrees above freezing. When the two fluids meet, iron sulfide precipitates, giving the "black smoker" its color. In these dark depths, chemosynthesis—based on thermal and chemical energy from the vents—is the primary mechanism sustaining life.

A living cloud flecks the water around a clump of limpet-encrusted tube worms and mustard-yellow mussels in the high-definition image at far right. With a magnifying lens on another camera the cloud resolves into a crowd of flea like crustaceans called amphipods. Amphipod swarms like this one—observed at 9° N on the East Pacific Rise—may be the densest concentrations of invertebrate life on Earth.

High-intensity lighting and high-resolution imaging technologies provide researchers with the equivalent of a microscope to examine life in the deep sea. These tools can reveal organisms that have always been part of vent communities but have been hidden until now.

Timothy Shank, a marine ecologist at Woods Hole Oceanographic Institution, calls the array of previously unknown species found at vents "mind-boggling." He has calculated that, on average, a new species has been described every week and a half since biologists first visited the Galápagos Rift vents in 1979. "More than 20 years later," he says, "we're still on the tip of the iceberg. We're trying to understand relationships among vent animals—and we're still discovering new species!"

Evaluating an Arctic Oasis

Launch and recovery of submersibles can become a daily drama in Arctic waters, where storms packing 45-mile-an-hour (74-kilometers-an-hour) winds and 20-foot (6-meters) waves blow up rapidly. Undaunted by grueling conditions, scientists from Russia, Germany, Norway, and the U.S. Naval Research Lab (NRL) used Russia's twin *Mir* submersibles to investigate the Haakon-Mosby mud volcano 4,100 feet (1,250 meters) below the surface.

The team discovered "a chemosynthetic oasis," says NRL geophysicist Peter Vogt. It is populated by small worms, numerous eelpout fish, and nearly 20 previously unknown species of bottom-dwelling organisms. The team also found white bacterial mats growing on frozen methane hydrate that coated much of the seafloor around the volcano. If the Arctic Ocean warms by just a few degrees, as some climate-change models predict, massive amounts of methane could be released into the water column and then into the atmosphere, says City University of New York geologist Kathy Crane. "Methane is ten times more effective than carbon dioxide as a greenhouse gas," she notes. "The effect on climate would be powerful."

Hot Spots in the Deep Sea

We've studied a handful of sites on the East Pacific Rise and Mid-Atlantic Ridge in detail, but most of the 46,600-mile (75,000-kilometer) globe-circling mid-ocean ridge system still beckons—unexplored. Off the ridges, researches examining deep-sea mud volcanoes have discovered communities of animals as exotic as those found at hydrothermal vents.

Hydrothermal Vent

The Earth's crustal plates pull apart along the mid-ocean ridges, and lava surges up between them, cracking as it cools into new crust. Seawater penetrates fissures that can be miles deep; then, heated as it nears the magma layer, the water expands and rises rapidly. Heavy with minerals leached from surrounding rocks, it gushes from the bottom in fuming geysers or in lower temperature springs with a gentler flow.

Mud Volcano

Gassy mud, rather than molten rock, erupts from mud volcanoes. Heat from deep in the mantle liquefies miles of overlying sediments, driving them upward and releasing fluids and gases into the water column. High pressure and low temperature transform released methane gas into a stable solid—methane hydrate—that covers much of the seafloor surrounding the volcano, like frozen icing on a warm cake.

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Lutz, R.A., (2000). "Deep-sea vents: Science at the Extreme". *National Geographic Magazine*, 198(4):116-127.