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Energy production by ocean microbes

Many scientists dream of harnessing the tiny, little-known microbes responsible for methane hydrates—vast, icelike deposits found in the deep ocean and at the poles. To help characterize the potential resource, scientists at Idaho National Laboratory have produced an estimate of biological methane production that pinpoints where microorganisms are likely generating the most gas.

"Because hydrates are such an important phenomenon, people frequently try to describe the methane in these sediments using mathematical models," said principal investigator Frederick Colwell, a geobiologist at INL. "We are trying to provide [methane production] rates that are more realistic than what modelers might generally use, so that their models are more accurate."

Colwell will present his group's results Oct. 19 at the Geological Society of America's annual meeting in Salt Lake City.

Domestically, the United States Geological Survey estimates some 200,000 trillion cubic feet of methane is stored in hydrates—more than 100 times the volume of gas stored in recoverable conventional reserves. But because hydrates exist in remote environments, little is known about the critters responsible.

Colwell and collaborators at INL, the University of Idaho, Idaho Falls, and the USGS analyzed seafloor samples from an underwater mountain range, Hydrate Ridge, off the coast of Oregon. They used a DNA technique to detect methane-producing cells, or methanogens. Researchers found that three-fourths of the samples had few methane-producing organisms. But they did find large populations in samples taken less than 100 feet below the seafloor, near certain geologic formations, and from ash-bearing zones with high fluid movement.

The scientists then combined these population estimates with results of a separate experiment in which they grew methane-producing cells very slowly in the lab, starving them to mimic conditions in the deep ocean sediments. They tracked how much methane was generated to measure the per-cell productivity. The team found that overall, ocean-sediment methane production in the sparsely populated zones was lower than previous estimates. In the crowded regions, however, the rate was almost 50,000 times higher than in the barren zones.

Methane also forms an important link in the global carbon cycle, and this work has implications for climate science. The group's broader goals are to discover what controls the growth of these microbes, and how they influence and respond to changes in the deep ocean sediments.

Colwell will present his research Wednesday, Oct. 19 from 1:50 p.m. to 2:05 p.m. in the Salt Palace Convention Center, room 250 AB. The GSA Annual Meeting runs from Oct. 16 to 19, 2005. More information is available at www.geosociety.org.

Idaho National Laboratory is one of the Department of Energy's 10 multiprogram national laboratories. The laboratory performs work in each of the strategic goal areas of DOE—energy, national security, environment and science. INL is the nation's leading center of nuclear energy research and development. Day-to-day management and operation of the laboratory is the responsibility of Battelle Energy Alliance.

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