Digging deeper below Antarctica's Lake Vida

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(PhysOrg.com) -- Antarctica's Lake Vida, a geologic curiosity that is essentially an ice bottle of brine, is home to some of the oldest and coldest living organisms on Earth. Perpetually covered by more than 60 feet of ice, the brine below -- water that is five to seven times more salty than seawater -- has been found to be home to cryobiological microbes some 2,800 years old which were revived after a gradual thaw.

That widely reported finding came in 2002 from Peter Doran, associate professor of earth and environmental sciences at the University of Illinois at Chicago. But the discovery raised many new questions. Now, Doran and his department colleague Fabien Kenig with collaborators from the Nevada-based Desert Research Institute will return to Lake Vida late next year for more exploration, funded by a $1.1 million National Science Foundation grant.

Doran and Kenig plan to perform the first-ever drilling entirely through Lake Vida's thick ice cap, into the brine, and down into sediment below, retrieving about 10 feet or more of core sample for analysis.

"The main goal is to get into that brine pocket and the sediment beneath it to both document and define the ecosystem that's there today, and the history of that ecosystem," Doran said.

The sediment samples could yield clues about life in such an extreme environment dating back thousands of years, which could help geoscientists draw a better picture of processes that occur as the Earth moves into colder periods.

"If we took, for example, a Wisconsin lake and started turning the temperatures down during a climatic downturn, what is the impact on the lake's ecosystem and what strategies are used by living things to survive this extremely cold brine?" Doran said of the salty liquid that hovers around 10 degrees Fahrenheit year-round. "There are few examples on Earth of things shown to live in that water temperature."

A University of Wisconsin group will drill the ice hole, but special care will be required in preparing the site. A tent will be partitioned to provide both a drilling site cover and adjacent laboratory to analyze samples. It will be sort of like setting up a hospital operating room in the Antarctic cold, with the drill requiring the sanitary cleanliness of a surgeon's scalpel to prevent any surface contaminants from ruining samples.

Kenig, an organic geochemist, will study the lake's carbon and organic chemistry as well as molecular fossils in the sediment core. These preserved organic compounds will point to changes in the ecosystem as the lake froze.

"As this environment was isolated for some time, we need to be very cautious not to introduce any external elements that could bias our samples," Kenig said. To assure sample purity, nothing plastic or rubber will be used in the drilling and all equipment penetrating the lake water and sediment will be sterilized.

While specially preserved samples will be shipped back to UIC and the Desert Research Institute for later analysis, some work, such as microbial counts, will be done on site. Doran's previous on-site research at Lake Vida found in the ice the highest concentration of nitrous oxide -- "laughing gas" -- of any ecosystem on Earth. It was a clue that would make any scientist smile.

"This gas is produced by microbes," Doran said. "That was a hint that we had a viable ecosystem there."

Source: University of Illinois at Chicago (news : web)