Indonesian ice field may be gone in a few years, core may contain secrets of Pacific El Nino events

August 10 2010

Glaciologists who drilled through an ice cap perched precariously on the edge of a 16,000-foot-high Indonesian mountain ridge say that the ice field could vanish within in the next few years, another victim of global climate change. Credit: Photo courtesy of Paolo Gabrielli, Ohio State University.

Glaciologists who drilled through an ice cap perched precariously on the edge of a 16,000-foot-high Indonesian mountain ridge say that the ice field could vanish within in the next few years, another victim of global climate change.

The Ohio State University researchers, supported by a National Science Foundation grant and the Freeport-McMoRan mining company and collaborating with Meteorological, Climatological and Geophysical

Agency (BMKG) Indonesia and Columbia University, drilled three ice cores, two to bedrock, from the peak's rapidly shrinking ice caps.

They hope these new cores will provide a long-term record of the El Nino-Southern Oscillation (ENSO) phenomenon that dominates climate variability in the tropics.

"We were able to bring back three cores from these glaciers, one 30 meters (98.4 feet) long, one 32 meters (105 feet) long and the third 26 meters (85 feet) long," explained Lonnie Thompson, Distinguished University Professor in the School of Earth Sciences and a senior researcher with Ohio State's Byrd Polar Research Center.

While the cores are relatively short compared to those retrieved during some of Thompson's previous 57 expeditions, "We won't know what history they contain until we do the analyses." A short 50-meter core previously drilled in 2000 through ice fields atop Mount Kilimanjaro in Africa yielded an 11,700-year history of climate.

This project is largely focused on capturing a record of ENSO. Last year, Thompson's team drilled through an ice cap atop Hualcán, a mountain in the Peruvian Andes on the eastern side of the Pacific Ocean.

From there, they brought back a 189-meter (620-foot) and a 195-meter (640-foot) core (to bedrock) from which they are reconstructing a high-resolution climate record going back over 500 years. The Hualcán record should complement the more recent part of their 19,000-year record recovered from nearby Huascarán in 1993.

This year's effort focused on several small and rare ice fields almost due west of the Andes on the other side of the Pacific - near a mountain called Puncak Jaya. Along with the ice core, the team collected rainwater

samples from locations ranging in elevation from sea level up to the site of the glacier.

Coupled with weather data garnered from 11 weather stations operated by Freeport-McMoRan, the isotopic composition of the rainwater samples will help the team interpret the climate history locked in the ice cores.

The relative abundances of the stable isotopes of oxygen and hydrogen provide a proxy for temperature, while concentrations of different chemical species preserved in the ice reveal changes in the atmosphere such as those occurring during major volcanic eruptions.

Elevated dust content in the ice may signal increased drought while the presence of specific organic compounds may reflect increased fire activity (forest burning).

Radioactivity from atomic bomb tests in the 1950s and 1960s provide time markers that help date the cores. However, cores recently collected from Himalayan ice fields lacked these radioactive layers indicating the glaciers are now losing mass from the surface down, destroying the time markers.

The drill site itself was hazardous. "The area was riddled with crevasses and lacked any substantial snowfall," Thompson said. This meant that the team had to wear crampons - pointed metal cleats on their boots - to maneuver on the ice. Daily rainstorms in the area, complete with lightning, increased the risks at the drill site.

The expedition was stalled almost before it began when a pallet containing the ice core drills was missing from the equipment delivered to the drill site. Inquiries with the shipping company failed to uncover the missing pieces SO Freeport-McMoRan offered their own machine

shop to fabricate a new drill. While that effort got underway, Thompson, Freeport liaison Scott Hanna and researcher Dwi Susanto of Columbia University flew back to Jakarta and eventually found the lost equipment inside the shipper's warehouse.

Near the end, the project came close to catastrophe again at the end when members of a local native tribe, after failing in their attempt to reach the ice core drilling site, broke into the freezer facility where the cores were stored, intent on destroying them. Company officials, fearing the worst, had secretly transported the ice to another facility for safekeeping a few hours earlier.

Four local tribes claim the ice fields as their own, Thompson said. "They believe that the ice is their god's skull, that the mountains are its arms and legs and that we were drilling into the skull to steal their memories," he said. "In their religion they are a part of nature, and by extension they are a part of the ice, so if it disappears, a part of their souls will also be lost."

Several days later, at a public forum arranged by Freeport-McMoRan, Thompson addressed over 100 tribal members and Freeport employees to explain the importance of the project to understanding local to global climate changes. After 4.5 hours of discussion, the local people agreed to allow the ice cores to be returned to Ohio State for analysis.

Thompson said that the project could never have been done without the aid of Freeport-McMoRan which provided aircraft and helicopter support, provided cooks and food for the drill camp, and long-term storage of the ice cores and safe transport of the ice from Papua back to Jakarta.

"They provided hundreds of thousands of dollars worth of support to the project. And the result is that these cores are in the best possible

condition of any core we've ever brought out of the field," Thompson said.

The ice fields near Punkak Jaya are tiny. Together they total barely 1.7 square kilometers (0.6 square miles), an area very similar to the current 1.8 square kilometers (0.7 square miles) on the summit of Mount Kilimanjaro in Africa. An analysis of the first of the cores is expected by December, the researchers said.

Provided by The Ohio State University

Citation: Indonesian ice field may be gone in a few years, core may contain secrets of Pacific El Nino events (2010, August 10) retrieved 26 April 2024 from https://phys.org/news/2010-08-indonesian-ice-field-years-core.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.