

# Ancient Ice Reveals Wild Climate Shifts

If you don't like Earth's current climate, just wait a spell. Studies of prehistoric ice drilled from deep beneath Greenland hint that the planet's thermostat has a habit of shifting back and forth with ease, making the climate much less stable than previously presumed. The findings raise new questions about how the Earth will respond to the atmospheric buildup of greenhouse gas pollution, say the European scientists who reported their discovery this week.

"We have quite a lot of rethinking to do about our basic concepts of climate change," says David A. Peel, a team member and a researcher with the British Antarctic Survey in Cambridge, England.

Some climatologists, however, question this interpretation of the data.

Peel and his colleagues involved with the Greenland Ice Core Project (GRIP) gathered clues about the ancient climate by boring a hole straight through Greenland's 3,000-meter-thick ice cap. The cylindrical ice core pulled out of the GRIP hole contains information reaching back some 250,000 years. In that span, the Earth has weathered an ice age, thawed during an interglacial period, slipped back into another ice age, and then warmed during the current interglacial era, known as the Holocene period.

A team of U.S. researchers this month finished drilling a similar hole in Greenland, 30 kilometers from the GRIP site at the ice cap's summit (SN: 7/3/93, p.7). The two cores provide the first reliable ice record of the previous interglacial, the Eemian period, which lasted from 133,000 to 114,000 years ago. The U.S. team is now analyzing its core.

Past ice core work has focused on the recent ice age, a time when the climate fluctuated rapidly between mild and cool periods. While evidence of such climate instability might seem unsettling, experts have cautioned against using the glacial events to predict what might occur during the present interglacial. Indeed, evidence from seafloor sediments, pollen, tree rings, and other sources shows that conditions have fluctuated little during the Holocene, suggesting that interglacials in general may escape the wild variations of the ice-age world.

The GRIP findings for the Eemian erases that image of a steady interglacial climate. "The dramatic finding is that the period that we previously thought was one of stable warmth was actually broken up by long periods of extensive cold," says Peel. The GRIP team describes its



Sections of Greenland ice core.

work in the July 15 NATURE.

The group charted climate changes during the Eemian principally by measuring the ratio of two oxygen isotopes within the ice. The ratio reflects several factors, including the temperature over Greenland and the temperature over the ocean region that provided the moisture for the snow.

Such records show that the 19,000-year-long Eemian consisted of three warm substages, broken up by two major cold spans lasting 2,000 years and 6,000 years. The oxygen isotopes indicate that Greenland temperatures during the cold substages averaged 7°C lower than during the warm parts of the Eemian, which was 2°C warmer than today.

Even more striking, say the GRIP scientists, was the discovery of much shorter climate shifts. Near the end of the Eemian, temperatures apparently dropped 14°C within a decade or two for a short 70-year-long span. At the beginning of the Eemian, the Greenland summit cooled quickly by 10°C and then remained chilly for 750 years. The European researchers suggest that major reorganizations in ocean circulation triggered such cold snaps and the longer Eemian cool spells.

According to the GRIP researchers, such findings show that the climate has a natural tendency to swing between different states—a pattern that has held for all but the last 8,000 years. "We really have no knowledge at the moment as to what has made the [recent] climate so stable, and it obviously raises the question: What do we have to do to the system to knock it back into its normal state of instability?" says Peel.

The ice core data undermine confidence in climate-change models, he says, because they suggest the world could display some surprising behavior if greenhouse warming alters the stabilizing factors in the current climate.

Global-change researchers have long awaited the ice core results, but not everyone buys the GRIP team's interpretation. One outstanding question is

whether the changes recorded at Greenland's summit reflect only local shifts or more pervasive climate fluctuations that would obviously carry more significance in discussions of future climate change.

Richard G. Fairbanks at the Lamont-Doherty Earth Observatory in Palisades, N.Y., says he remains "very skeptical" about the GRIP team's conclusions. In particular, the Europeans have not ruled out the chance that the changes in

the oxygen isotopic ratio stemmed from shifts in the location of Greenland's moisture supply rather than actual coolings. Says Fairbanks, "It's bordering on hype if these other options haven't been treated in a balanced way." —R. Monastersky

## Exercise builds big babies

Many physically fit women can exercise vigorously throughout pregnancy, a new study suggests. Not only does working out retain fitness, but it also helps produce bigger babies, the research shows. And that can be good news, because larger babies tend to weather physical adversities better.

Maureen C. Hatch and her co-workers at Columbia University in New York City observe that most studies of prenatal exercise have focused on occupational activities, which often require unnatural or repetitive motions that can strain the body. The Columbia team instead looked at recreational exercise, which tends to be rhythmic and build fitness.

In the just-released May 15 AMERICAN JOURNAL OF EPIDEMIOLOGY, they report that women who regularly burned up to 1,000 calories per week in recreational pursuits delivered babies weighing about 5 percent more than babies of inactive moms. Those who burned 2,000 calories a week gave birth to infants nearly 10 percent heavier. A total of 462 suburban and rural women participated in the study.

The American College of Obstetricians and Gynecologists recommends that pregnant women limit the type, intensity, and duration of exercise; how much depends upon a woman's fitness prior to pregnancy and the presence of obstetrical risk factors. Hatch says her data suggest that these guidelines may be overly stringent for fit women at low risk of problem pregnancies. □