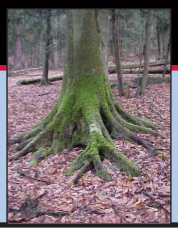
766 SARS search sputters



768 Looking for long-term survivors





774 When friends become parasites

GLACIOLOGY

Warmer Ocean Could Threaten Antarctic Ice Shelves

When two chunks of ice the size of a small country broke off the Antarctic Peninsula's Larsen Ice Shelf in 1995 and 2002, experts scrambled to figure out how it had happened. The pat answer, global warming, was too simple: Some parts of Antarctica are cooling, and the soaring air temperatures along the peninsula that seemed to have triggered the collapse have not yet been convincingly linked to a worldwide pattern. But as a model for what could happen elsewhere in Antarctica as temperatures rise, it was crucial to understand the Larsen Ice Shelf's demise.

Now a detailed look at the Larsen's shrinking ice is challenging conventional wisdom about the collapse. Andrew Shepherd, a glaciologist at the University of Cambridge, U.K., and co-workers analyzed satellite data to produce the first estimate of how quickly the Larsen Ice Shelf is thinning. They report on page 856 that since 1992, the thinning has been too fast for rising air temperatures to explain. They conclude that the shelf must be melting due to warmer ocean waters below. If so, the rest of the Larsen is doomed, and other Antarctic ice shelves could be more endangered than had been thought. "We need to understand the potential for other ice shelves to be hit," says glaciologist David Vaughan of the British Antarctic Survey (BAS) in Cambridge, U.K.

Researchers were stunned when the Larsen's two roughly Luxembourg-sized northern sections abruptly shattered, each breakup taking just a few weeks. Suspicion fell on air temperatures on the peninsula, which for a half-century have risen by 0.5°C a decade, 10 times faster than the global trend. Glaciologist Ted Scambos of the National Snow and Ice Data Center in Boulder, Colorado, and co-workers have suggested that summertime pools of meltwater on the Larsen Ice Shelf eventually force crevasses apart and lead to collapse.

But Shepherd's study suggests that although air temperatures may strike the final blow, they can't be the whole story. He and colleagues at the U.K.-funded Centre for Polar Observation and Modelling and in Argentina quantified the thinning using satellite radar measurements of the shelf's height corrected for tides. They found that the shelf thinned by up to 18 meters between 1992 and 2001. One possible explanation, that the summer meltwater includes snow that refreezes into denser ice, fell through when the team calculated that the shelf doesn't receive enough solar energy to drive that process. "The temperature is just not enough to provide that amount of melt," Shepherd says.

That suggests melting from below. Although there are no long-term ocean temperature data from the Larsen shelf, deep waters farther out in the Weddell Sea have been warming over the past 3 decades, Shepherd's team notes. Also, a BAS ship sailing near the Larsen shelf in 2002 detected midlevel temperatures warm enough to melt ice at that depth. At the current melting rate, the Larsen will reach the breaking point within this century, Sheperd's team predicts.

Others caution that the findings are not that solid; the satellite data are imprecise, Scambos notes, and there is no direct evidence that ocean waters off the Larsen have warmed. But if the results hold up, the study will serve as a wake-up call that larger ice shelves on mainland Antarctica may also be vulnerable to ocean warming, says oceanographer Stan Jacobs of the Lamont-Doherty Earth Observatory in Palisades, New York. These larger shelves hold back massive aboveground ice sheets that would dramatically raise global sea level if they melted. "It's a good model for what could happen," Jacobs says. —JOCELYN KAISER



Cold discomfort. The Larsen Ice Shelf is imperiled from above and below.

FORENSIC GEOCHEMISTRY

Isotopic Data Pinpoint Iceman's Origins

The renowned Alpine Iceman, known as Ötzi, has proven to be an extraordinarily rich source for researchers interested in life during the late Neolithic era. They know Ötzi's age, his health, his mitochondrial DNA sequence, what he ate, and how he died. But where did he live?

Image not available for online use.

Hard data. The Iceman's teeth and bones indicate where he spent his youth and later years.

Plant matter in his intestine had suggested that the Iceman spent his final days in an area south of where he was found in 1991, sticking out of melting snow near the mountainous border between Italy and Austria. Now researchers have used isotopic signatures from teeth and bones to pinpoint his origins to a few valleys in southern Tyrol; they report their findings on page 862. They say Ötzi probably did not stray more than 60 kilometers from his birthplace until his death more than 5000 years ago.

Wolfgang Müller of Australian National University in Canberra, who began the research 3 years ago while at the Swiss Federal Institute of Technology, and an international team cleverly used various parts of Ötzi's body and three kinds of isotopes to trace his whereabouts during his lifetime. "It's a marvelous paper," says ▶

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