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Sunlight: Terminator of the Ice Age in Southern Hemisphere

Greater heating from the sun during Antarctic spring very likely triggered the end to the last ice age in the Southern Hemisphere according to a new study published this week in *Science*.

The study, conducted by Lowell Stott at the University of Southern California, Axel Timmermann at the University of Hawaii-Mānoa International Pacific Research Center, and Robert Thunell at the University of South Carolina, upsets current thinking that the last Ice Age came to an end 17,000 years ago solely because CO₂ levels in the atmosphere rose. Though popular among scientists, this view has difficulties, among them the uncertainty in the exact timing between rising levels of atmospheric CO₂ and surface temperatures.

This latest study in *Science* used, among other things, radiocarbon dating to date the oxygen isotope variations in microfossils contained in a single sediment core in the tropical Pacific. Some of the tiny marine creatures in the sediment core had lived on the ocean bottom and others at the ocean surface. Those creatures that had lived on the ocean floor, however, had bathed in water that had formed 1000 years earlier in the Antarctic Southern Ocean. A comparison of the isotope records of the two types of fossils revealed that the Southern Ocean had warmed over 1000 years before the tropical Pacific. Moreover, this warming took place before the ice core records reflect any appreciable rise in atmospheric CO₂.

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What made the Southern Ocean warm? Earth varies its path around the sun in 23-, 41-, and 100-thousand-year cycles, the Milankovitch Cycles. These paths alter the light - and heat - the Earth receives from the sun. The authors of this study noted that the timing of the warming Southern Ocean coincided with a period that Antarctica received more sunlight during spring. They then reasoned - and found evidence - that the increased heat from the spring sun melted sea ice around Antarctica. The shrinking sea ice exerted a double whammy on ocean temperatures in the region. No longer could the sea ice reflect sun's rays, but the dark ocean that took its place now absorbed great amounts of heat. The warmer ocean then began to release into the atmosphere the CO₂ it had stored. The outgassing of this significant greenhouse gas, then contributed to warming globally.

Axel Timmermann has already gathered support for this scenario to the end of the last Southern Hemisphere Ice Age with a computer modeling study he led at the International Pacific Research Center.

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The International Pacific Research Center (IPRC) of the School of Ocean and Earth Science and Technology (SOEST) at the University of Hawai'i at Manoa, is a climate research center founded to gain greater understanding of the climate system and the nature and causes of climate variation in the Asia-Pacific region and how global climate changes may affect the region. Established under the "U.S.-Japan Common Agenda for Cooperation in Global Perspective" in October 1997, the IPRC is a collaborative effort between agencies in Japan and the United States.

