

New Evidence of Early Glacial Development, History of Antarctic Ice Sheet Revised

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Sediments characteristic of deposition by glacial ice near the Eocene-Oligocene boundary on Seymour Island. Credit: Linda C. Ivany

Syracuse University Professors Linda C. Ivany and Scott D. Samson along with colleagues at the University of Leuven in Belgium and Hamilton College have found evidence that expands our understanding about how the ice sheet covering most of Antarctica really began. Their findings were published in the article “Evidence for an Earliest Oligocene Ice Sheet on the Antarctic Peninsula,” in the May 2006 issue of the journal, *Geology*. The research was supported by funding from the National Science Foundation’s Office of Polar Programs.

“One of the most fundamental climate shifts that this planet has undergone since the events that precipitated the extinction of the dinosaurs is the so-called ‘greenhouse to icehouse transition’—the time when Earth went from having virtually no ice on it at all to one with a more or less permanent ice sheet covering Antarctica,” says Ivany, professor of earth science in The College of Arts and Sciences at SU and principal investigator on the project. “This happened about 34 million years ago, and is marked by dramatic changes in the chemistry of the oceans and the appearance of ‘ice rafted debris’ in ocean sediments around Antarctica, carried there by icebergs from land that floated out and melted far from the continent, releasing the sand and rock that had been frozen into them.”

Though scientists are quite sure that glaciers grew on Antarctica at this time, it is not clear where that ice was, nor how much of it there was initially. This is because most of the continent is now under the ice, and it is difficult to find places where sediments are exposed that record this interval of time.

Until now, the assumption has been that glaciers were confined to the eastern part of Antarctica, where the biggest ice sheet is today. Ivany’s research team found evidence that glaciers may have covered a much bigger area at the early stages of this transition. Sediments on Seymour Island, off the northern tip of the Antarctic Peninsula, have been dated to just this time, and show features characteristic of deposition by glacial ice. Because this island is at the far northern reaches of the Peninsula, in western Antarctica, they suggest that the initial pulse of glaciation was far more extensive than originally suspected.

Scientists believe that growth of the Antarctic ice sheet was initiated by a drop in greenhouse gas concentrations in the atmosphere in combination with a change in ocean circulation caused by South America pulling away from Antarctica. The climatic response to these gradual changes

now appears to be even bigger than previously thought, showing that Earth cooled fast enough to allow the growth of ice on the entire continent all at once.

Ivany's team concludes that because Earth's climate system is capable of shifting this rapidly and dramatically to such a new and different state, their discovery may provide an insight into how things could change in the future if we continue to alter our environment.

Source: Syracuse University

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