



Media Release

Chiefs of Staff, News Directors

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Fossil clues help to determine ocean's role in causing last Ice Age

Tiny fossils found in ocean sediments are helping scientists from IMAS and Canada to determine how the prehistoric ocean contributed to the last Ice Age 125,000 to 18,000 years ago.

Published in the journal *Earth and Planetary Science Letters*, a study by IMAS Associate Professor Zanna Chase and [Simon Fraser University \(SFU\)](#) Associate Professor Karen Kohfeld examined how the ocean drew carbon dioxide from the atmosphere into the deep ocean during the Ice Age.

The study used the fossil record to pull together the first global database of ocean temperatures over the last 125,000 years in order to explain why carbon dioxide levels were low at the time.

Lead author Associate Professor Kohfeld said the research put ocean temperature records together with other studies to show how carbon dioxide took different paths into the deep sea during different phases of the Ice Age.

"This study shows for the first time how temperatures changed across the whole ocean as the earth entered the last Ice Age," Associate Professor Kohfeld said.

"This new understanding of ocean temperature changes hints at some important thresholds in the climate system.

"It's clear that some parts of the system, such as sea ice around Antarctica, responded rapidly when the ocean cooled. Other parts, like deep ocean circulation, changed very slowly and needed a nudge of extra cooling to push the system into a new state, a whole 30,000 years after the sea ice changed."

With direct measurements only providing ocean temperatures for approximately the last 100 years, the researchers used chemical and biological clues left by tiny fossils in mud from the sea floor to understand past temperatures. Past ocean temperatures can be estimated by counting the numbers of cold versus warm fossils of species with known distinct temperature preferences.

IMAS Associate Professor Zanna Chase said they trawled the scientific literature for studies of past sea surface temperatures, finding data from 136 locations around the globe which amounted to over 40,000 estimates of temperature.

"We've combined the individual efforts of hundreds of scientists," she said.

“What emerges is a remarkably clear picture of how the ocean changed during the last Ice Age.”

The team’s next step is to combine their new temperature database with paleoclimate models to test their theories.

FAST FACTS:

- Atmospheric carbon dioxide dropped in several steps over 100,000 years, as Earth entered the last ice age 20,000 years ago.
- This study put together a global picture of how ocean surface temperatures, sea ice, and deep-ocean circulation changed over this time.
- The first drop in carbon dioxide, 115,000 years ago, occurred because of early cooling of the poles and expansion of sea ice around Antarctica.
- The second carbon dioxide drop, 70,000 years ago, was accompanied by a re-organization of the deep ocean and heightened ocean productivity.
- The lowest ice age carbon dioxide levels occurred 20,000 years ago when ocean temperatures, productivity, deep circulation, and sea-ice had changed the most.

Media Contact: Andrew Rhodes (03) 6226 6683, email: ajrhodes@utas.edu.au

Information released by:

Communications and Media Office, University of Tasmania

Phone: 61 3 6226 2124

Email: Media.Office@utas.edu.au