Snapshot of past climate reveals no ice in Antarctica millions of years ago

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A snapshot of New Zealand's climate 40 million years ago reveals a greenhouse Earth, with warmer seas and little or no ice in Antarctica, according to research published this week in the journal *Geology*.

The study suggests that Antarctica at that time was yet to develop extensive ice sheets. Back then, New Zealand was about 1100 km further south, at the same latitude as the southern tip of South America – so was closer to Antarctica – but the researchers found that the water temperature was 23-25°C at the sea surface and 11-13°C at the bottom.

"This is too warm to be the Antarctic water we know today," said Dr Catherine (Cat) Burgess from Cardiff University's School of Earth and Ocean Sciences, and lead-author of the paper. "And the seawater chemistry shows there was little or no ice on the planet."

These new insights come from the chemical analysis of exceptionally well preserved fossils of marine micro-organisms called foraminifers, discovered in marine rocks from New Zealand. The researchers tested the calcium carbonate shells from these fossils, which were found in 40 million-year-old sediments on a cliff face at Hampden Beach, South Island.

"Because the fossils are so well preserved, they provide more accurate temperature records." added Dr Burgess. "Our findings demonstrate that the water temperature these creatures lived in was much warmer than previous records have shown."

"Although we did not measure carbon dioxide, several studies suggest that greenhouse gases forty million years ago were similar to those levels that are forecast for the end of this century and beyond.

Our work provides another piece of evidence that, in a time period with relatively high carbon dioxide levels, temperatures were higher and ice sheets were much smaller and likely to have been completely absent."

The rock sequence from the cliff face covers a time span of 70,000 years and shows cyclical temperature variations with a period of about 18,000 years. The temperature oscillation is likely to be related to the Earth's orbital patterns.

Source: Cardiff University