

Environmental Change in Antarctica: Clues from Marine Sediments and Implications for the Future



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In the 1970s the late John Mercer, a glaciologist at the Institute for Polar Studies, The Ohio State University, predicted that “one warning sign that a dangerous warming is beginning in Antarctica will be the breakup of ice shelves in the Antarctic Peninsula.” Over the past several decades the world has witnessed exactly this response, with the catastrophic loss of ice shelves on both sides of the Peninsula. Marine sediment cores from Antarctica archive oceanographic responses to changes in the cryosphere, providing both a longer-term perspective on these recent changes and a blueprint for the future. Based on these records, how unusual is recent ice shelf loss? And what kinds of changes can we anticipate in the near future? As ice shelf disintegration proceeds southward along the eastern side of the Antarctic Peninsula, ship-based access to the newly open ocean allows unprecedented access to sampling the sea floor. These sediment cores, along with others taken from the circum-Antarctic allow us to evaluate the relative roles of atmospheric and oceanic warming, combined with underlying sea floor structure, in driving deglaciation. They also record the procession of deglaciation, starting with instability at the grounding zone, followed by rapid ice stream retreat and the development of seasonally sea-ice covered settings, where new, highly productive ecosystems are fueled by iron-rich glacial meltwater. These “deglacial” systems appear to be relatively short-lived, lasting only a few hundred years, followed by more gradual ice retreat across shallower regions and evolution into more stable systems.

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