The Pacing of Antarctic Ice-Rafted Debris Deposition in Response to Climate Change During the Mid-Pleistocene Transition

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The abundance, flux, and pacing of ice-rafted debris (IRD) in glacial-marine sediments are useful proxies for iceberg production and thus ice sheet behavior. Combining these observations with environmental parameters allows the reconstruction of ice dynamics during past climate changes. Near Antarctica, Iceberg Alley - located at the boundary between the Weddell Sea Gyre and Antarctic Circumpolar Current - is a key region that receives many of Antarctica's icebergs, calved from both proximal and distant Antarctic continental margins. Icebergs follow the Antarctic Coastal Current, through the Weddell Gyre and then spiral into the warmer waters of the Antarctic Circumpolar Current. Sediment cores retrieved from IODP Expedition 382 Site U1537 (59°6.65′S, 40°54.37′W, 3713 m) have high sediment accumulation rates and a well-constructed age-depth model, providing a rare opportunity to study IRD deposition in this region. This study focuses on the section of the record deposited during the Mid-Pleistocene Transition (MPT), from 950- to 600- ka, representing a critical period with a significant change in global ice volume periodicity from 40- to 100- kyr. We present the results of the IRD weight percentages and counts from the MPT section of Site U1537, with a sampling interval of 30 cm (3 kyr), compared with the physical properties of the core, local, and global climate proxies. The IRD pacing is mostly aligned with global ice volume changes, with more IRD deposition during interglacial periods and less during glacial periods. However, out-of-phase IRD peaks within glacial cycles have been observed in our records, hinting at some role for local and global climate factors. This study will contribute to a better understanding of the climate change and ice dynamics of the Antarctic ice sheet during the MPT.