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# Effects of Drake Passage opening at the northwestern Weddell Sea (Antarctica): Climatic inferences from sediment accumulation and stable isotope data

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The timing of the opening and deepening of Drake Passage is subject of a considerable controversy, spanning a time frame of more than 30 million years, from early Eocene to early Miocene. Previous works suggest that the initial deepening of the seaway at the late Eocene-Oligocene led to the isolation of the South Orkney Microcontinent (SOM) from the West Antarctic continental margin due to the formation of Powell Basin. Separation of the SOM from the Antarctic Peninsula then continued until the early Miocene. The Cenozoic sedimentary record of the Ocean Drilling Program (ODP) Site 696B in the southeastern margin of the SOM was selected to gain insights regarding the environmental evolution of the region during the opening and subsequent deepening of the gateway. Here, we present a detailed sedimentological and geochemical study of the interval extending from the late Eocene to the middle Miocene. Based on the integration of a multi-proxy analysis of sediment facies analysis, ichnology, diagenesis, X-ray fluorescence, and organic matter geochemical signatures (TOC, TN, C/N ratio, $\delta$13C and $\delta$15N), we propose the following stages in the evolution of the SOM.

During the late Eocene, when the SOM was still attached to the West Antarctic continental margin, a thick terrigenous sequence deposited at shallow-water (littoral) depths under reduced-oxygen/salinity conditions. High sedimentation rates are inferred from the structureless, highly bioturbated sediments and the occurrence of Ophiomorpha. Our data points to deposition below the wave base and without important current or tidal influences. The latest Eocene is characterized by autochthonous glaucony-bearing facies recording a sharp change in environmental conditions characterized by sub-oxic, partially reducing conditions, low sedimentation rates, and rapid sea-level rise. The early stages of the recorded long-term deepening (transgression) were controlled mainly by tectonic processes, possibly related to the proto-Powell rifting phase during the late Eocene. The transgressive trend reached bathyal depths during the Oligocene and was punctuated by ocean stratification leading to dysoxic conditions. In comparison, the middle Miocene sediments, mostly siliceous-biogenic ooze, record deposition associated with oxic conditions as a result of the modern-like SOM position and the end of the long-term transgression.