

A view from the terrace; ice-sheet dynamics during the Eocene Oligocene Transition climate tipping point

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Glaciation of Antarctica was the pièce de résistance of the shift in global climate that took place during the Eocene Oligocene Transition (EOT; ca. 34 Ma). The timing and progression of ice-sheet development is constrained by benthic foraminiferal d180 records and geochemical proxies for continental weathering from deep-sea sediment cores. The terrace interval is the roughly 500 kyr interval after the precursor glaciation at 34.2 Ma, when ice-sheet expansion reached a short-lived plateau prior to the coalescence of a continent-scale ice sheet at 33.7 Ma. The terrace interval appears to be the tipping point between greenhouse and icehouse climate states, however ice-sheet dynamics are poorly understood during this crucial time.

We present evidence for rapid changes in the Nd isotopic composition of bottom waters bathing a sediment core on Maud Rise (ODP Site 689) during the terrace interval of the EOT. Three distinct excursions toward less radiogenic eNd values suggest either 1) changes in the flux of Antarctic weathering products into the Weddell Sea and/or 2) pulses of deep water production that brought shelf waters with the Antarctic Nd isotope fingerprint into contact with Maud Rise. Both interpretations support a scenario of expansion and contraction of the Antarctic ice sheet during the terrace interval.