



Timing, Nature and Consequences of the Deepening of the Tasmanian Gateway

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During the Paleogene, Australia separated from Antarctica and continued to drift northwards eventually allowing the development of the Antarctic Circumpolar Current (ACC). The exact timing and nature of the deepening of this gateway during the Eocene-Oligocene (E/O) transition is widely thought to be related to climate deterioration on Antarctica. ODP 189 recovered continuous marine sedimentary records across the E/O transition within the Tasmanian Gateway (TG) suitable for paleoenvironmental analysis. These and other field data are compared to results of fully coupled ocean-atmosphere global circulation modeling experiments. Here we report on the timing and nature of several step-wise deepening events, and paleoceanographic changes in the TG. We use integrated diatom, dinocyst, geochemical, lithological and physical property data to show that the TG deepened at ~ 35.5 Ma, preceding the E/O Antarctic glaciation event by ~ 2 Ma. Importantly our microfossil data indicate a pre-deepening shallow-water pro-deltaic setting characterized by highly endemic biota influenced by a cool clockwise rotating 'proto-Ross Sea gyre', to a post-deepening pelagic setting in the earliest Oligocene characterized by cosmopolitan biota. Interestingly these findings indicate a warming in the TG at the exact time when, according to previous hypotheses, a cool-ACC should be influencing the region. Concluding, we argue that the importance of the opening of gateways and changing ocean circulation as a driver of global climate might be overestimated.