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SEA LEVEL CYCLES AND CLIMATE TRENDS FROM 34 TO 17 MILLION YEARS AGO RECORDED ON THE ANTARCTIC MARGIN BY THE CAPE ROBERTS PROJECT

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The Cape Roberts Project cored 1500m of shallow marine strata that record the depositional environment and climate of the Victoria Land coast from 34 to 17 million years ago. Sedimentation was rapid and the record more complete for the first three million years, but then slowed as basin subsidence declined, leaving many time gaps, but still a representative record of the entire time span.

The sedimentary facies – gravel, sand and mud with marine fossils throughout – are typical of the coastal margin of a subsiding sedimentary basin. Diamict beds in the upper 900 m record glaciers extending beyond the coast. Sediment was eroded from the Transantarctic Mountains, delivered by rivers and glaciers to the coast and distributed by waves and currents. Deposition is characterised by repetitive vertical facies successions of conglomerate and fine sandstone in the lower part of the sequence and by cyclic facies successions of diamict, sandstone and mudstone from a few to over 60 m thick in the upper part. These are thought to reflect glacio-eustatic changes in sea level on a wave-dominated coast, with diamictite and sand (nearshore) grading upwards to mud (shelf) and then to sand (inner shelf to shoreline) in concert with advance and retreat of a glacier onto the continental shelf. Therefore, each cycle represents the transgression, highstand and fall of relative sea-level on a wave-graded coast as the Antarctic ice sheet shrank and expanded. Dating of 3 cycles has confirmed they were deposited on Milankovitch timescales (40,000/100,000 years), like those seen in the continuous deep-sea isotope record, and ascribed to global ice volume changes of 30 - 60 m (Miller et al., 2005; Pekar & DeConto, 2006).

The glacial character of the sediments becomes more apparent at around 32 million years, and strengthens further above 25 million years. This long term cooling trend is consistent with increased physical weathering indicated by clays (Ehrmann et al. 2005) and the decline in terrestrial plant microfossil diversity (Raine et al., this conference).