



ANDRILL-Southern McMurdo Sound (SMS) Project: Early Miocene to Recent paleoclimate and Geological History of the Victoria Land Basin, Antarctica

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During the past austral summer season, the ANtarctic geological DRILLing Program (ANDRILL) successfully completed the drilling phase of its second project: the Southern McMurdo Sound Project (SMS). Completed in early December 2007, the AND-2A drill-hole ($77^{\circ} 45.488$ S; $165^{\circ} 16.613$ E) was successfully recovered from a [U+FB02] floating sea-ice platform (8.5 meters thick), over 380 meters of water, reaching a total depth of 1138.54 mbsf (98% core-recovery). A chief objective was to recover sediment from the middle Miocene, which has long been held as one of the fundamental time intervals in development of the modern Antarctic ice sheets. The AND-2A drillcore recovered several distinct stratigraphic intervals separated by disconformities: (1) a lower Miocene section (1138.54 up to c. 800 mbsf) correlative with an interval previously recovered during Cape Roberts Project drilling; (2) a 600 m-thick early and middle Miocene interval (800-223mbsf), including an expanded section through two Miocene climatic optima and truncated by a c. 7 m.y. disconformity; and (3) an upper Miocene-Recent interval (uppermost 223 meters) that is thinner but correlative with parts of the upper Neogene section recovered by the ANDRILL MIS Project in drill core AND-1B. Shallow marine deposits dominate the lower AND-2A section until c. 1.5 Ma when the basin deepened rapidly in response to volcanic loading by Mt Erebus. Lower and middle Miocene strata record periodic lithological changes that reflect variation in sea level, glacial proximity, and climate in the SW Ross Sea between c. 20-14.5 Ma. Sediment deposited close to or beneath grounded glaciers alternate with fine-grained marine sediments, providing clear evidence for cycles of ice advance, followed by substantial retreat during climate transitions to warmer conditions. Fossil assemblages preserved in these strata suggest non-polar climate conditions, similar to southern Patagonia today, influenced by high sediment discharge from river run-off and high coastal turbidity. An excellent chronostratigraphy for the AND-2A drillcore developed from combined biostratigraphy, magnetostratigraphy and radiometric dating of abundant tephra and volcanic materials, provides age control for the drillhole and the network of seismic lines in the western Ross Sea.