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Early and Middle Miocene Antarctic Climate and Ice Sheet variability: ANDRILL SMS Project results

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The sedimentary archive recovered during the ANDRILL Southern McMurdo Sound Project (SMS) comprises an expanded early and middle Miocene section deposited in a high-accommodation continental margin location, proximal to glacial ice influence from the West Antarctic Ice Sheet, East Antarctic Ice Sheet, and local ice in the Transantarctic Mountains. The AND-2A drillhole reached a total depth of 1138.54 mbsf, and obtained an excellent quality core with 98% recovery through the cored interval. Stratigraphic sequences and facies interpretations reveal a cyclical history of environmental variation influenced by climate, glacial advance/retreat cycles, and water depth variation. These lower and middle Miocene shallow marine sediments were deposited in the subsiding Victoria Land Basin, during a period of relatively steady thermal subsidence, on the coastal plain and continental shelf seaward of the rising Transantarctic Mountains. A well-developed chronostratigraphic framework developed through integrated diatom biostratigraphy, magnetostratigraphy, Sr isotope geochemistry, and radiometric dating of volcanic materials, allows for the comparison of events recognized in this drillcore with events identified in distal proxy records from deep-sea stable isotope studies, and in sea-level reconstructions based on continental shelf sequence stratigraphy. More than 60 sequences recognized in the AND-2A drillcore represent repeating lithological changes in glacimarine, terrigenous, volcanic and biogenic sediments, deposited during a dynamic climate regime, that appear to reflect a variable pace of Milankovitch forcing.