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Early Pliocene environmental variation in McMurdo Sound inferred from correlation of drill cores using models generated under constrained optimization.

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Rock cores recovered from McMurdo Sound, Antarctica, provide access to sedimentary sequences deposited during key intervals of Neogene climatic change and allow an assessment of the impact of this change on environments in Antarctica. Of particular importance are new cores, recently recovered by the Antarctic Geological Drilling (ANDRILL) Program, which afford increased spatial resolution and allow regional interpretation of environmental evolution and enable construction of coastal to offshore transects. Precise correlation of key stratigraphic intervals between cores is required to achieve these regional syntheses. We have developed a composite standard database of southern ocean diatom events and associated age models using constrained optimization (CONOP) to assist in developing these regional correlations. CONOP is a computer assisted sequencing and spacing approach to biostratigraphy. Each CONOP analysis produces a series of correlation models in which the position of any observed (raw) event is placed in the position where it would be expected to occur based on the regional composite sequence of events. Correlation models for AND-1B, CIROS-2, DVDP 10 and DVDP 11 have been developed. Initial environmental interpretations focus on early Pliocene (3 to 5 Ma) glacial/interglacial sequences to examine the relationship between cycles identified in AND-1B and 'diatom productivity' events identified in the other drill cores. Integration of near shore and distal records of these glacial-interglacial cycles allows regional understanding of the behavior of the McMurdo Ice Shelf and East Antarctic outlet glaciers during times when the Earth was

2-3 ºC warmer than today.