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OLIGOCENE-MIOCENE ANTARCTIC CONTINENTAL WEATHERING TREND AND ICE-VOLUME VARIATIONS FROM SEDIMENT RECORDS IN THE ROSS SEA AREA

S Passchier

Montclair State University, Montclair, United States

The Cape Roberts Project (CRP) drill cores from the Victoria Land basin provide a sediment record of East Antarctic glaciation 17-33 Ma. The chemical index of alteration (CIA), a ratio indicating the proportion of chemically weathered materials in sediments, was recalculated for bulk samples (data from Krissek and Kyle, 1998, 2000, 2001) based on the carbonate-free CaO values. Carbonate contents were derived from Dietrich and Klosa (1998, 2000, 2001). The new CIAs provide a quantitative measure to correlate sediment chemical records from different sedimentary basins in Antarctica. The general assumption is that the proportion of chemically weathered materials being supplied to the basin corresponds to the areal extent of the ice-free area. Using the CIAs (45-47) of Quaternary diamicts from the CRP-1 core as a baseline, and previously published data for the Cenozoic glacial sediments of the Sirius Group in the Transantarctic Mountains (Passchier, 2004), changes in ice volume can be evaluated from the degree of alteration of the sediments supplied to the basin. The highest CIAs (65-70) represent minimum ice-sheet conditions, with only local ice caps present and no continental glaciation. The lowest CIAs (up to 47) represent ice sheet volumes larger or similar to todays.

The amplitude of the CIA-signal reduces from the Early Oligocene to the Early Miocene. There is generally good correspondence between the interpretation of the sedimentary facies of the CRP cores and the interpretation of the CIAs. Based on an interpretation using the baseline variables, a large ice sheet was feeding sediment to the Victoria Basin 32-31 Ma, ~28 Ma, ~25 Ma, and 24-18 Ma. Supply of chemically weathered sediments indicates a significant reduction in continental glaciation at ~31-28.5 Ma, ~26 Ma, and 25-24 Ma. In general these results correspond well to interpretations of composite oxygen isotope records (Pekar et al., 2006), although some interesting discrepancies exist, and are promising in view of studying bulk chemical records of future ANDRILL drillholes in McMurdo Sound.