

Characterizing Cretaceous Glaciation Events: K-Ar Ages of Southern Ocean Sediments

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Evidence from paleosols and carbonate weathering models suggest that the Late Cretaceous had a supergreenhouse climate due to atmospheric CO₂ concentrations two to four times greater than modern levels, tropical sea surface temperatures exceeding 35°C, and high-latitude temperatures exceeding 20°C. Despite this warmth, the Late Cretaceous was apparently punctuated by large (>25 m) and rapid (<<1 million year) sea-level changes, as recorded by marginal marine stratigraphic architectures and pelagic stable isotope compositions. The magnitude and tempo of these changes suggest a glacio-eustatic control, presumably from the growth and decay of continental ice sheets on Antarctica. Because continental glaciation tends to increase the weathering of bedrock and production of sediment delivered to the oceans, circum-Antarctic marine sediment flux would be expected to increase during periods of glaciation. In order to identify a Late Cretaceous glaciation signal from such marine records, we must first constrain the compositional signal of continental detritus in marine sediments. Here we report the results of downcore K-Ar analysis of the terrigenous sediments of Quaternary Weddell Sea cores PS1170-1 and PS1388-3 in order to identify the compositional signature of continent-derived detritus deposited in the Weddell Sea during a known glacial period. Further, we use our K-Ar analyses of circum-Weddell Quaternary sediment cores to pinpoint potential sediment source areas. Having constrained this glaciation signal, we also present preliminary K-Ar and Sm-Nd analysis to the 69 Ma Campanian-Maastrichtian boundary event at Ocean Drilling Project site 690C to assess the controversial hypothesis of Late Cretaceous glaciation of Antarctica.