



## **Plio-Pleistocene (2.6-0.99 Ma) chemically weathered glacial muds of the Bardin Bluffs Formation in East Antarctica and a comparison with the marine Sr isotope record**

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Major and trace element chemical analyses of the Plio-Pleistocene Bardin Bluffs Formation (1.8-0.99 Ma) on the margin of a major ice-stream of the East Antarctic Ice Sheet are discussed here to determine its provenance and pre-depositional weathering history. The Bardin Bluffs Formation of the Pagodroma Group is one of the key deposits on the Antarctic continent recording glaciomarine sedimentation under open marine fjord conditions as recent as the late Pliocene-early Pleistocene. Major and trace element results and statistical analyses indicate that the compositional variability is predominantly governed by facies dependant grain-size effects: the deposits have a uniform provenance. Average elemental abundances approach average upper crustal compositions and the element ratios are similar to those of terrestrial tills deposited by the East Antarctic Ice Sheet, except for Ca, which is strongly depleted in the Bardin Bluffs Formation. The Ca depletion is also reflected in the chemical index of alteration (CIA), which has values similar to those of the average shale formed under conditions of chemical weathering. The Ca-depletion of the Bardin Bluffs Formation may signal a scarcity in the supply of detrital carbonate and plagioclase, which is generally leached from soils in proglacial landscapes. Continental glaciation exposes fresh  $^{87}\text{Sr}$ -rich shieldrocks through physical erosion. Carbonate dissolution and initial weathering of glacial sediments result in the supply of more radiogenic Sr to the ocean. Indeed, a sharp rise of the marine Sr isotope record of seawater is recorded through the Plio-Pleistocene transition, and particularly between 1.4 and 1 Ma. Although, the initiation of continental-scale Northern Hemisphere glaciation with a shift

from chemical to physical weathering also occurred through this interval, it is evident that the Neogene chemical composition of seawater should be approached as a multi-component system reflecting processes in both hemispheres.