

Quaternary biogenic carbonate sediments from northwestern Ross Sea continental shelf, Antarctica: evidences from microfossils

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Abstract

The westernmost Ross Sea continental shelf exhibits several meters thick carbonate-rich sequences occurring on the western banks (Mawson and Pennell), the outer continental shelf (North-western Basin), and the upper slope. These gravel- to sand-sized sediments mainly consist of bryozoan, hydrozoan, mollusc, barnacle, foraminifer, ostracod and echinoid skeletal parts. Such Late Pleistocene to Holocene carbonate sediments represent very important paleoclimatic and paleoecological proxies for understanding of climate in a region that is particularly sensitive to the global change. The high abundance of macro and microfossils is related to water mass circulation with connected changes of nutrient content, salinity, sea ice cover and CaCO_3 saturation. The deposition of the Late Pleistocene carbonates was contemporary to the maximum expansion of the ice shelves in the Ross Sea continental shelf, indicating that high productivity also occurred during glacial times.

Gravity cores collected in 1998 and 2002 by M/N Italica were investigated from the micropaleontological point of view in the framework of the PNRA projects (Fig. 1). These sequences ranges from 26 to 1.2 ka BP. Studies of ostracod and foraminiferal assemblages from sediment cores showed some interesting results which were useful for reconstructing the climatic history of this area and for improving our understanding of the carbonate deposition in polar environments. Analyses on these microfossils aim: a) to define different accumulation patterns in selected cores from the western Ross Sea area, where carbonate rich sequences associated with glacio-marine sediments were recovered; b) to locate the more or less favorable periods when carbonate factories operated in order to produce carbonate sediment c) to exploit qualitative and quantitative variations of the microfossils together with compositional data to reconstruct the ice shelf front oscillation phases in connection with the paleoenvironmental /paleoclimatic changes. The results indicate that in the western studied sector the CaCO_3 occurrence was limited (both in thickness and in percentage) and, where present, was often diluted by vulcanoclastic sediments. These sediments were contemporary to the Last Glacial Maximum. The biological activity seemed to be limited mainly by the volcanic activity rather than by the paleoclimatic conditions. In the north-eastern sector the calcareous biogenic accumulation was more expanded and younger than the previous sector. It mainly corresponds to the accumulation of large fossils such as bryozoans and stylasterids. The good preservation of these fossils indicates a limited transport probably due to mass flows events. In the southern sector, where the glacio-marine diamicton prevailed, the carbonate accumulation was very scarce. Only rare microfossils could survive to these conditions.

In particular, the microfossils assemblage changes together with compositional settings are able to identify specific moments of crisis and environmental improvement probably related to the stages of glacial advance or retreat.

Keywords: microfossils, carbonate sedimentation, Ross Sea

