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CLIMATIC STAGES CONTROL ON GRAIN-SIZE CLUSTERS IN CORE ANTA91-8 (ROSS SEA)

ABSTRACT: QUAIA T. & BRAMBATI A., *Climatic stages control on grain-size clusters in core ANTA91-8 (Ross Sea).* (IT ISSN 0391-9838, 1997).

Glacial/interglacial climatic cycles, recorded in Late Quaternary glaciomarine sediments from the Western part of the Ross Sea continental slope, are inferred by means of techniques of multivariate statistical analysis, on the basis of the relationship between the vertical variations of grain-size parameters and the Western Antarctic Ice Sheet fluctuations.

KEY WORDS: Climatic cycles, Glacio-marine sediments, Grain-size, Cluster analysis, Ross Sea.

RIASSUNTO: QUAIA T. & BRAMBATI A., *Influenza del fattore climatico sulle fluttuazioni granulometriche nella carota ANTA91-8 (Mare di Ross, Antartide).* (IT ISSN 0391-9838, 1997).

Le modificazioni tessiturali, correlate alle fasi di avanzata e ritiro della calotta antartica occidentale, che intervengono nei record sedimentari glaciomarini tardo-quaternari della scarpata continentale del Mare di Ross occidentale, vengono qui analizzate mediante l'utilizzo di tecniche di analisi statistica multivariata, al fine di consentire, su basi esclusivamente granulometriche, una precisa identificazione dei livelli sedimentari appartenenti ai differenti cicli glaciale/interglaciale.

TERMINI CHIAVE: Cicli climatici, Sedimenti glaciomarini, Granulometria, Analisi dei cluster, Mare di Ross.

INTRODUCTION

Several authors (i.e. Diester-Haass & *alii*, 1993; Pudsey, 1992; Anderson & *alii*, 1984; Ledbetter, 1984, 1979; Singer & Anderson, 1984; Blaeser & Ledbetter, 1982) have pointed out the relationship between the variations in grain-size parameters in the Antarctic sediments and the paleovelocity fluctuations of the bottom currents, which can be related to the ice-sheet progradation and retreat phases, and to the different extensions of ice-shelves on the Antarctic continental shelf.

According to the Late Quaternary glacio-marine sedimentation models recently developed for the Weddell Sea by Grobe and colleagues (Grobe & *alii*, 1993, 1990; Grobe & Mackensen, 1992), and by Pudsey (1992), warmer periods (interglacials) are characterised by high biological productivity and bottom current intensification, due to sea-ice retreat, which lead to an increased transport capacity and a consequent accumulation of better-sorted sediment, with more abundant silt and sand fractions. During glacial periods the ice-sheet expansion markedly reduces the biological productivity and the bottom current strength, giving rise to the accumulation of more clayey and less sorted sediment. Moreover, the abundance of organic matter produced during interglacials causes a strong CO_2 production (Grobe & Mackensen, 1992), which acidifies the descending cold water fluxes along the continental slope, with a consequent rise of the Ccd. Conversely, during glacial phases, Ccd deepens (from 2000 to 4000 m), thus enabling the accumulation of carbonatic fractions in relatively deep environments.

The use of the most common descriptive grain-size parameters such as mean size and skewness, calculated on the only non-carbonatic silt fraction (Pudsey, 1992; Ellwood & *alii*, 1979; Mc Cave & *alii*, 1995), can provide useful indications about the bottom current paleovelocity fluctuations. In a better way, the use of multivariate statistical tools applied to the fine fraction (<50 μm) of the sediment, which is the most representative of bottom current regime, instead of simple descriptive statistical parameters, allows a more precise discrimination of the sediment textural modifications during the climatic fluctuations. This can be obtained with a cluster analysis, by means of the definition of

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