Late Pleistocene and Holocene geochemical record of the most recent turbidite lobe of the Almeria Fan (Alboran Sea)

Introduction

Study area

The present work is focussed on the geological characterization of two sediment cores recovered from the most recent turbidite lobe of the Almeria Fan (Alboran Sea). This recent lobe is located on the base of the slope.

Dataset

Core Length Lobe Water depth
SAGAS K1 3.96 m outer part 1750 m
SAGAS K2 3.10 m channel 1762 m

Geochemical element abundances were analyzed with AVATECH XRF core scanner. Cluster statistical analyses of 9 geochemical elements were performed and terrigenous proxies (K/Al, Mn/Al, Fe/Al, Ti/Al, Rb/Al, Zr/Al and Si/Al+K ratios and Pb) were studied.

Core stratigraphy

Pleistocene-Holocene stratigraphic record comprises from top to bottom:
- Hemipelagites muds
- Turbidites sands
  - VFS: Very Fine Sands (3-4 phi)
  - FS: Fine Sands (2-3 phi)
  - MS: Medium Sands (1-2 phi)

Geochemistry of the turbidite sequence

Three major compositional types of turbidites have been identified:
- Type a: rich in Si, Cl and Br, corresponds to organic-matter rich turbidites
- Type b: rich in Ca and Sr, represents biogenic turbidites
- Type c: rich in Si, Ti, Zr and Rb, comprise terrigenous turbidites

Distribution of sedimentological and geochemical facies

Lobe channel contains numerous centimetric-thick sand deposits with sharp or erosive basal contacts (chemofacies b and c). It was built by successive turbidite events depositing sands.

Geochemistry of the hemipelagite sequence

Distribution of palaeoenvironmental proxies

High values terrigenous proxies High values of Ca/Al ratio
Low values Si/Si+K ratio
Decrease in wind flux

Low values terrigenous proxies Low values of Ca/Al ratio
High values of Si/Si+K ratio
Increase in wind flux

Geological significance

Sediment source

The late Pleistocene-Holocene geochemical records provide information about different sediment inputs to the Almeria margin:

- Eolian and fluvial: suggested by fluctuations of terrigenous contributions within the hemipelagite sequence
- Fluvial and volcanic: suggested by the geochemistry of turbidite sands. The abundance of Ti, Zr, Rb could be related to volcanism at the vicinity area. The different nature of the drainage basin could control the Ca-Sr and Si-Cl-Br enrichments
- Anthropogenic: suggested by the presence of Pb anomalies within the hemipelagites that could be related to mining activities in the Almeria region

Climatic events

Three major climatic events have been interpreted based on the chronology data and paleoenvironmental proxy distribution in the hemipelagite sequence:

- “Little Ice Age” (550-200 yr)
- Holocene “thermal maximum” (10.5-5.4 ka)
- Younger Dryas (12.6-11.5 ka)

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