Gulf of Cadiz and the Alboran Sea : A Target for Post-Messinian Paleoceanography and Paleoclimatology Study

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The post-Messinian paleogeography of the Atlantic-Mediterranean area is characterized by a single communication gateway between both oceans, through the Gibraltar Strait. During pre-Messinian times however a double communication existed through the Riffean and Betic gateways.

The Alboran Sea (western Mediterranean) is connected with the Atlantic Ocean through a narrow passage, the Strait of Gibraltar, which opened in the Pliocene. During a major part of the Pliocene, Atlantic-Mediterranean water exchange was of estuarine type, with a deep Atlantic water inflow below a less dense Mediterranean outflow (THUNELL *et al.*, 1987). During the Quaternary the water exchange was mainly of antiestuarine type with net outflow of a deep layer of more saline Mediterranean water, a situation that remains until present (THUNELL *et al.*, 1987; MILLOT, 1987). Although the mechanism for changing from an estuarine to an antiestuarine exchange pattern is not well understood, it seems to have occurred some time near the Plio-Pleistocene boundary. Several reversals in the exchange pattern have been recognized during the Quaternary, leading to the development of organic-rich layers in the Mediterranean which are also affected by important climatic and eustatic changes during this time (THUNELL *et al.*, 1984; EMEIS *et al.*, 1991) .

In the Gulf of Cadiz the Mediterranean outflow through the Gibraltar Strait is responsible for an upper slope boundary current that flows northward along the Iberian margin (GARDNER and KIDD, 1987). As a result of the Mediterranean outflow, contourite deposits have been developed at the Gulf of Cadiz continental slope since the early Pliocene (GONTHIER *et al.*, 1984). The alternation of contourite deposits and sediment drapes in the upper part of the Pliocene to Quaternary sequence indicates fluctuations in the Mediterranean outflow (NELSON *et al.*, 1992). The development of these deposits has to be related to the eustatic sea level changes as well as to the pattern of the Atlantic-Mediterranean water exchange through the Gibraltar Strait.

Key Scientific Questions

The key scientific objectives related to the above issues are the following:

* to evaluate the impact of the Atlantic-Mediterranean water exchange pattern since the Pliocene to present under different climatic conditions in the sedimentary record.

* to assist in the understanding of the mechanism that controls climate change.

* to validate established climatic models for the glacial-interglacial cycles in the Quaternary.

Scientific Relevance

The proposed areas are of particular importance because:

* the Strait of Gibraltar provided the communication gate for Atlantic-Mediterranean exchange from the Pliocene to present.

* the Alboran Sea is an important source of saline waters to the Global Ocean.

* the Atlantic-Mediterranean water exchange pattern has fluctuated throughout the Plio-Quaternary with a subsequent influence on the Mediterranean and Global Ocean History.

All of these scientific targets require the penetration of the sea floor and the recovery of continuous undisturbed sediment cores. We propose at least two reference sediment cores using the techniques of the Ocean Drilling Program the Alboran Sea and the deep-sea zone of the Gulf of Cadiz. The study of these areas is required to understand the communication between and the fluctuations in exchange of the Atlantic-Mediterranean system, as well as the climatic changes that occurred during Plio-Quaternary times. It will also allow for comparison with the Neogene record, when the Riffean and Betic gateways existed.

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