Mediterranean undercurrent contourites in the Gulf of Cadiz (Spain) : (I) Pliocene-Quaternary seismic facies and bedform patterns

Andrés MALDONADO[1], C. Hans NELSON[2], Jesus BARAZA[3]

[1]Inst. Andaluz Geologia Mediterranea, CSIC/Univ. GRANADA (**Spain**)
[2]U.S. Geological Survey, MENLO PARK, CA. (**USA**)
[3]Inst. Ciencias del Mar, CSIC, BARCELONA (**Spain**)

The seismic stratigraphy of the central region in the Gulf of Cadiz exhibits three majo sequences well characterized in both single and multichannel reflection profiles (Fig. 1). Th underlying sequence forms the nucleus of linear diapir structures intersecting the slope in WSW-ENE direction. The intermediate sequence is composed of several units wit discontinuous and parallel reflectors, separated by unconformities. These units are largel attributed to low-energy, terrigenous deposits, which are characterized by the absence of majo channels or erosional/depositional features. The youngest sequence is Plio-Quaternary in ag and it shows at the base a major erosional unconformity, which is deeply entrenched in th underlying deposits. This sequence is made of contourite facies which formed on the easter Gulf of Cadiz continental slope. Here the Mediterranean undercurrent has flowe northwestward parallel to the slope contours since the Pliocene opening of the Strait o Gibraltar.

The contourite facies change westward and downstream because of an interaction betwee the linear diapiric ridges that are perpendicular to the slope contours and the progressiv northwest decrease in speeds of the undercurrent. Coincident with the decrease i undercurrent speeds from the Strait of Gibraltar, the following northwestward gradation o contourite seismic facies occurs: (1) sand dune contourite facies on the upstream mid-slop terrace, (2) sediment-drift facies banked against the diapiric ridges, and (3) smooth slope facie with generally continuous, parallel-stratified reflectors (Fig. 2). Downstream, there are severa hundred-meter thick sediment drift wedges of sediment drape deposits and high-energ deposits with irregular erosional surfaces and broad-scale, low-angle unconformities.

In the upstream contourite facies, sonar images reveal a wide variation of bedform field on the present seafloor, caused by variations in undercurrent speeds, as well as by changes i superficial sediment texture. These bedforms range laterally from (a) 2-D, transverse sand dunes in channel floors, to (b) 3-D barchan dunes that laterally evolve to (c) large, straight crested 2-D dunes, and to (d) 3-D irregularly-shaped dunes, in the silt-covered slope terrace. I contrast, down-valley Mediterranean undercurrent ribbons flowing along the channel between the ridges modify the basic east to west sequence of contourite facies. The down valley facies exhibit major erosional truncation, and extensive cut and fill facies on seismi profiles (Fig. 1). Sonographs collected across the channelized central sector show (e) erosiona scarps, sand patches or rock-outcrops exposed on channel floors; (f) small and parallel 2-D dunes, or (g) regularly shaped, variably size, 3-D dunes along valley walls.

The surface contourite and sediment drift facies on the Gulf of Cadiz slope have formed during the present Holocene high sea-level and full development of the Mediterranean undercurrent. Late Pleistocene hemipelagic-drape facies underlying the Holocene surfac sand dune and drift facies correlate with the last lowstand and apparent weak Mediterranean undercurrent development. This Late Quaternary history and the facies stratigraphy observed in reflection profiles suggests that the cyclic Pliocene and Quaternary deposition of contourite and sediment drift, alternating with mud drape facies is related to sea level changes and Mediterranean/Atlantic water circulation patterns.

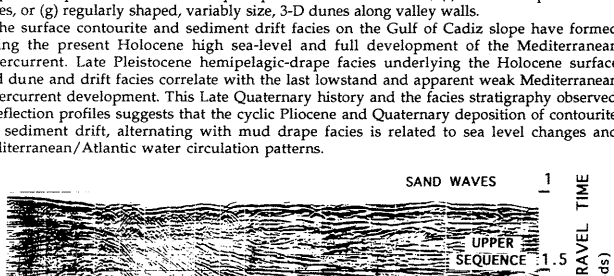

Fig. 1. - High resolution MCS profile from sand wave area showing the three main lithoseismic sequences in the central sector of the Gulf of Cadiz.

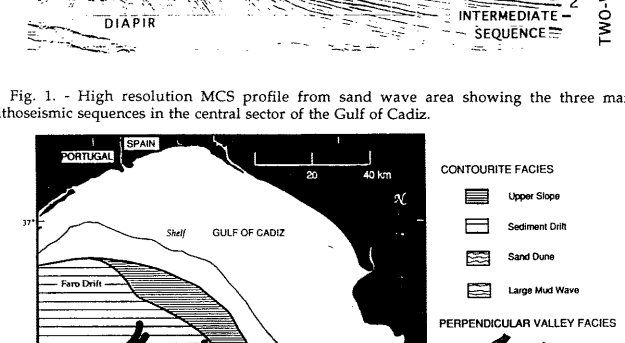

Fig. 2.- Distribution of contourite and other current-deposited facies of the Cadiz margin slope (Modified from NELSON *et al.*, 1992).

REFERENCES

NELSON C.H., BARAZA J., and MALDONADO A., 1992. - Mediterranean undercurrent sandy contourites, Gulf of Cadiz, Spain. *In* : Stow, D.A.V. and Faugeres, J.C. (Eds.), Contourites and Hemipelagites in the Deep Sea, *Sedimentary Geology Special Issue*, (in press).