NATURE AND ORIGIN OF SMALL MUD DOMES FROM THE CENTRAL SOUTHERN MEDITERRANEAN RIDGE (EASTERM MEDITERRANEAN SEA)

C. Huguen *, J. Mascle and the NAUTINIL Scientific Party
UMR 6526 Geosciences Azur, B.P. 48, 06235 Villefranche sur mer, France

Abstract
Swath mapping, (PRISMED 2 survey) over the Mediterranean Ridge, have revealed, north of the libyan promontory, the presence of numerous small dome-shaped features delineating a NW-SE, 80 km long, belt. The morphology and backscatter characteristics of some of these features have been precised by near bottom side scan sonar. These structures were interpreted as mud volcanoes or mud diapirs [1]. During the recent NAUTINIL survey (Sept. 2003), one dive has been made, on one of theses domes ("Lorient" dome), to determine the nature of these enigmatic reliefs and provide constraints on their geology and type of emplacement.

Key-Words: Mud Diapirs, Deep dives, Central Mediterranean Ridge, Eastern Mediterranean.

Regional swath bathymetric and backscatter data from PRISMED II survey have shown the presence, within the inner Central Mediterranean Ridge, north of the Libyan promontory, of tens of small sub-circular domes delineating a NW-SE arcuate belt at about 50-60 km south of Olimpi Mud volcano field [1, 2]. Side scan sonar and sub bottom profiles from MEDINETH survey over one of theses features (Lorient dome) have provided details on their morphological and acoustic characteristics (Fig. 1). "Lorient" mud dome is a relatively steep, elevated (up to 200 m), and irregular relief characterized by an acoustic signature which does not support significant recent mud flows. Only restricted areas, with weak to intermediate backscatter strengths (Fig. 1) and chiefly seen at the base of the feature are suggestive of mud outflows; high backscatter patches (Fig. 1), could be interpreted as evidences of probable debris flows. One characteristic, well evidenced on the side scan sonar data (Fig. 1), is the presence of sets of lineaments which explain that the domes do not appear on near bottom plan views as sub-circular features but rather as angular reliefs. The main, N70 and N145, oriented lineaments, also expressed as vertical offsets on sub bottom profiles, are interpreted as R (N70), R' (N145) Riedel secondary faults generated along regional strike slip faults as determined from surface geophysical data.

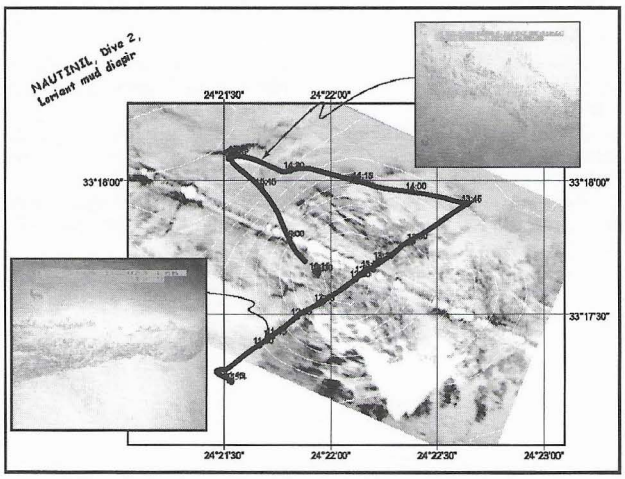

Fig. 1. Side scan sonar data over the "Lorient" mud diapir. The dive track is located as well as two seafloor pictures over the southern slope and the northern surroundings of the structure.

The objective of the Nautile dive, made on "Lorient dome" during the recent NAUTINIL cruise was, through direct seafloor observations, to collect informations on the nature and origin of this feature, in order to compare it to the well known Olimpi field mud volcanoes which lies at about 50 km north of this belt [1].

No mud flows nor specific fluid venting, authigenic carbonate pavements , or biologic communities, all characters typical of active mud volcanoes [3] were observed. "Lorient" dome is characterized by strong slope sedimentary unstabilities, especially along its southern border (Fig. 1). Several observations, such as the existence of numerous N60 trending metric/decametric scarps, a recent fault plane (showing sliken slides) support a tectonic control for the emplacement of the structure whose, moreover, displays near its top numerous anastomosed open fractures similar to fractures commonly seen on salt diapir caprock covers

All available data (geophysical and in situ observations), support that the feature results from diapiric emplacement mechanisms rather than from mud extrusion processes. This suggests that the Southern Belt is made of a series of mud diapirs emplaced through recent to active regional fractures cutting across the cover of the Mediterranean Ridge and therefore proceeds from different mud levels and different expulsion mechanisms than the active mud volcanoes from the Olimpi field.

References

(1) - Huguen, C. 2001. Déformation récente à actuelle et argilo-cinèse associèe au sein de la Ride Méditerranéenne (Méditerranée Orientale). Thèse de Doctorat, Université Paris VI.
(2) - Mascle J., Huguen C., Benkhelil J., Chamot-Rooke N., Chaumillon E., Foucher J.P., Griboulard R., Kopf A., Lamarche G., Volkonskia A., Woodside J. and T. Zitter, 1999. Images may show start of European-African plate collision. *E.O.S.* 80: 421, 425, 428.
(3) - MEDINAUT/MEDINETH Shipboard Scientific Parties, 2000. Linking Mediterranean brine pools and mud volcanism. *EOS, Transactions, American Geophysical Union*, 81(51): 625, 631-633.