AGE CONSTRAINTS AND ORIGIN OF THE MARSILI DEEP BASIN'S FLOOR (TYRRHENIAN SEA)

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The deep basin of Marsili in the SE Tyrrhenian sea is a subcircular, very young structure floored with basaltic crust. The central part of the structure is occupied by the Marsili volcano, the largest of the Tyrrhenian seamounts (55 by 25 km and about 3 km high). The volcano's top is at the depth of 485 m. Results of the drill hole 650 (Leg 107 of the Ocean Drilling Program) indicate that hole bottom volcanism occurred during the chron C2 (Olduvai event; 1.78 - 2.02 Ma along the western margin of the Marsili basin. Lavas from the volcano's top have K/Ar age of <0.2 Ma.

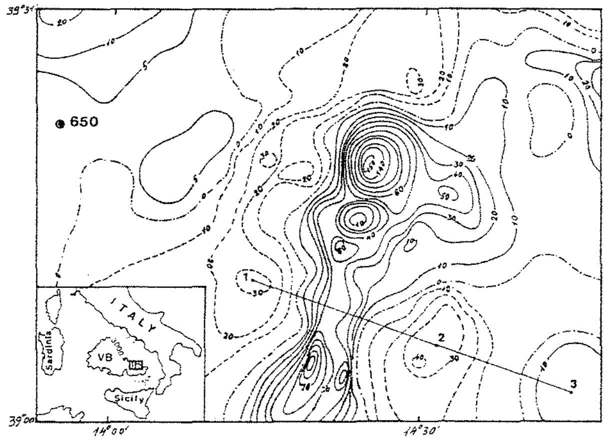

Fig.1- Magnetic anomaly field. Continuous lines =positive isodynams; dashed =negative; dashed-dotted =zero isodynams based on data from PINNA *et al.*, (1987) and BELIAIEV *et al.* (1991).

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The basaltic seafloor originated in an intra-orogenic back-arc setting. Important information for a conceptual framework of the origin of basement and of seamount in study can be obtained by the geological-geophysical interpretation of magnetic data. The geomagnetic field of Marsili seamount is represented by positive and negative anomalies which have either elongated or subcircular configurations (Fig. 1). The elongated intense magnetic high with maximum intensity of 1500 nT correlates with the morphological axis of Marsili seamount. In the West margin of the basin at a distance of 40-45 km from Marsili physiographic axis, there is an overall round-shaped high of the magnetic field with intensity of 100 nT near to the 650 Site. To the East, at an approximate distance of 35 km from the ridge axis another round-shaped positive anomaly occurs which has intensity of 100 nT. The opening process may have started with diffusional spreading in the basin's margins. Growth of the basaltic crust with time from the borders to the central parts of the basin can be characterized by the changing of magnetic patterns. The quasi-linear forms of the subsequent magnetic patterns seem to be associated with better organized fractures cracking the thin, weak parts of the lithosphere. Propagation of short extension fractures (short speading axes) into the adjoining lithosphere's sectors is impeded by increase of the lithosphere thickness. In such conditions, high rates of magma supply lead to formation of large volcanic seamounts like the Marsili. With time, the linear fractures feeding axial volcanoes estinguish. The increasing loads of thick lava piles reduce and finally stop the eruptive activity of the edifices. The geodynamic history of the Tyrrhenian sea is characterized by migration of large axial volcanoes from the West to the East, from the mature, estinguishing edifices to young ones in new weak zones of thin lithosphere. Basalt and andesite rocks were obtained only from the Marsili seamount's portions associated with the positive anomaly. The mean values of magnetic suscebtibility (9 x 10-3 SI), remanent magnetization (10 A/m) and Koenigsberger ratio (50) of the recovered lavas are high. The figure 2 shows the geomagnetic age model of Marsili volcano based on 3D modelling of the magnetic field. K/Ar dating indicates that the positive magnetized body of Marsili was erupted in the period of the Brunhes positive polarity epoch (Chron 1; 0-0.78 Ma). It is possible that the two negative magnetized areas at the footsteps of the volcano and surroundings consist of products erupted during the Matuyama polarity epoch (C1r; 0.78-1.78 or C2r; 2.02-2.64; Fig. 2). No rocks have been recovered by dredging and coring from these areas. Here, such sampling is very difficult or impossible because of the occurrence of thick sediment (about 100 ms). The mode of formation of Marsili seamount and of its basement are open problems. It is not known what are the age and nature of the volcanites associated with the negative anomalies. New drilling results in the volcano footsteps will serve to ascertain whether these rocks belong to the same chron, or not. This will provide important evidence in favor or against volcanic spreading in the case of Marsili. To obtain such evidence we discuss two drill targets which both are in areas of maximum intensity of the negative magnetic anomalies (Fig. 1). Their coordinates are the following: 39'10.6N-14'13.9E; 39'05.5N-14'31.1E. We discuss a third drilling target to reach basement rocks in the area of positive magnetic anomaly along the basin's eastern margin (39'01.9N-14'44.8E; Fig.1) possibly associated with early diffusional spreading. The principal problem which can be solved by drilling into these rocks is the following: does basaltic basement in this marginal Site of the basin belong to the Olduvai subchron like the basement of Site 650, or not ?

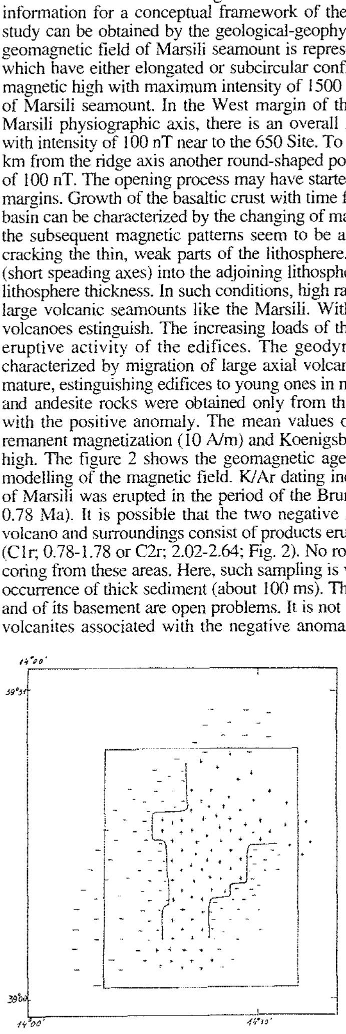

Fig.2- Distribution of the positive (Brunhes) and negative (Matuyama?) magnetized bodies.