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Present-day knowledge on the Palinuro Seamount (south-eastern Tyrrhenian Sea)

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ABSTRACT In this paper, we present an overview of the Palinuro volcanic complex, in order to have a general outline of the main studies carried out on this seamount. The morpho-bathymetric studies show that the Palinuro volcanic complex rises from 3000 to 84 m b.s.l., extending about 55 km in the N100°E and 25 km in the N-S direction. The volcanic complex consists of several superimposed volcanic edifices that are basally connected to form a continuous volcanic ridge. Morphological evidence and magnetic data highlight the fact that the seamount is set on the northern edge of the Marsili Basin at the border between the oceanic basin and the continental shore. The presence of volcanic cones in the central sector, one of which shows a pronounced rim not obliterated by erosional events, the major amplitude of the magnetic anomalies with respect to the other sectors and the age of the products sampled on the summit, suggest that this sector is the youngest of the volcanic complex. Morphostructural, hydrothermal and magnetic data suggest that the south-eastern sector of the seamount could be active. The main fault affecting the summit (N65°E) and the E-W deep-seated, strike-slip fault system, where the formation of the volcanic complex is hypothesized, may represent the expression of two tectonic lineaments on the seamount, E-W and NE-SW striking, of the Calabrian Arc.

Keywords: marine terraces, Palinuro volcanic complex, seamount, Tyrrhenian Sea.

1. Introduction

The Tyrrhenian Sea represents one of the most interesting zones of the Mediterranian Sea owing to the complexity of the geodynamic processes acting therein. The complexity of this extensional back-arc basin is testified by the several studies performed on it (e.g., Kastens *et al*., 1988; Luongo *et al*., 1991; Carminati *et al*., 1998; Gvirtzman and Nur, 1999, 2001; Argnani and Savelli, 2001; Faccenna *et al*., 2001; Savelli, 2001; Rosenbaum and Lister, 2004; Finetti, 2005; Goes *et al*., 2006; Montuori *et al*., 2007; Chiarabba *et al*., 2008; and many others). Over the last few years, detailed knowledge of the Tyrrhenian Sea seafloor was made possible thanks to high-resolution morphobathymetry. The recent multibeam bathymetric data acquired in the south-eastern Tyrrhenian Sea (Marani and Trua, 2002) has improved our knowledge of the Marsili ocean-like basin, the youngest in the Tyrrhenian Sea, in the central part of which the Marsili Seamount is located. The Palinuro Seamount (hereafter PS) is located a few kilometres NE of the

Marsili Seamount; this is also one of the largest in the Tyrrhenian Sea. Despite the several geophysical and geological studies performed in the south-eastern Tyrrhenian Sea, this seamount has not yet been subjected to intensive geophysical and geological exploration, thus representing the least known volcanic complex of the south-eastern sector of the Tyrrhenian region. For several years, knowledge about this volcano complex was limited to the results of a first exploration, begun in the 1970s, that focused mainly on volcanological and petrological features (e.g., Ciabatti, 1970; Del Monte, 1972; Fabbri *et al*., 1973; Marinelli, 1975; Di Girolamo, 1978; Kidd and Armansson, 1979) and to bathymetric data (Fabbri *et al*., 1973). A new exploration campaign began after 2000 and was focused mainly on the acquisition of high-resolution morphobathymetry and magnetic data. Multibeam, swath bathymetry data allowed us to obtain the general physiographic characteristics of the volcanic complex (Marani *et al*., 2004) and a recent high resolution Digital Terrain Model (DTM) of the volcano complex, coupled with a geomorphological and morphometric analysis, showed several unreported morphological features on the top of the volcano complex, never observed before (Passaro *et al*., 2010). The acquisition of new magnetic data (Caratori Tontini *et al*., 2009; Passaro *et al*., 2011b) provided additional information on the volcanic structure of the Palinuro Seamount.

Due to its location, at the transition zone between the Aeolian volcanic arc the Marsili back-arc oceanic volcanism and the southern Italy passive continental margin and its size, about 50 km along an approximate E-W direction, we think that the improvement of the knowledge on this volcanic complex could allow us to better understand the structural and volcanic processes affecting the southern Tyrrhenian region, where the geodynamics are linked to subduction processes, collisional tectonics and a back-arc extension.

The aim of this paper is to present an overview of the Palinuro volcanic complex, in order to have a general outline of the main studies carried out on this seamount. For this purpose, we go over the main information published since the late 1970s but we focus on the results derived by the recent oceanographic surveys that allowed accurate structural featuring of the volcano complex. We feel that such reviews are useful as they summarize the current state of knowledge on the PS in a concise manner.

2. Geological setting of the Palinuro Seamount

The PS is a volcano complex located in the south-eastern Tyrrhenian Sea and its formation is related to the evolution of the Tyrrhenian Sea (Fig. 1). The opening of the Tyrrhenian Sea started about 11 My ago with an E-W-directed extension. This stage of evolution was characterized by widespread extension in the northern domain and rifting in the western part of the southern domain (e.g., Rosenbaum and Lister, 2004) and led to the formation of an oceanic crust in the southern Tyrrhenian and the formation of the Vavilov [4.3 – 2.6 My; e.g., Kastens and Mascle (1990) and Savelli (2001)] ocean-like basin. A subsequent change from E- to an ESE-directed extension, coeval with frontal accretion in the Southern Apennines thrust belt, affected mainly the southeast Tyrrhenian Sea, leading to the formation of the Marsili [1.8 – 0.2 My; e.g., Kastens and Mascle (1990) and Savelli (2001)] ocean-like basin. This large-scale extension produced the onset of volcanism throughout the Tyrrhenian Sea and the surrounding coasts (Beccaluva *et al*., 1982, 1985; Turco and Zuppetta, 1998) and the formation of several seamounts. The PS lies

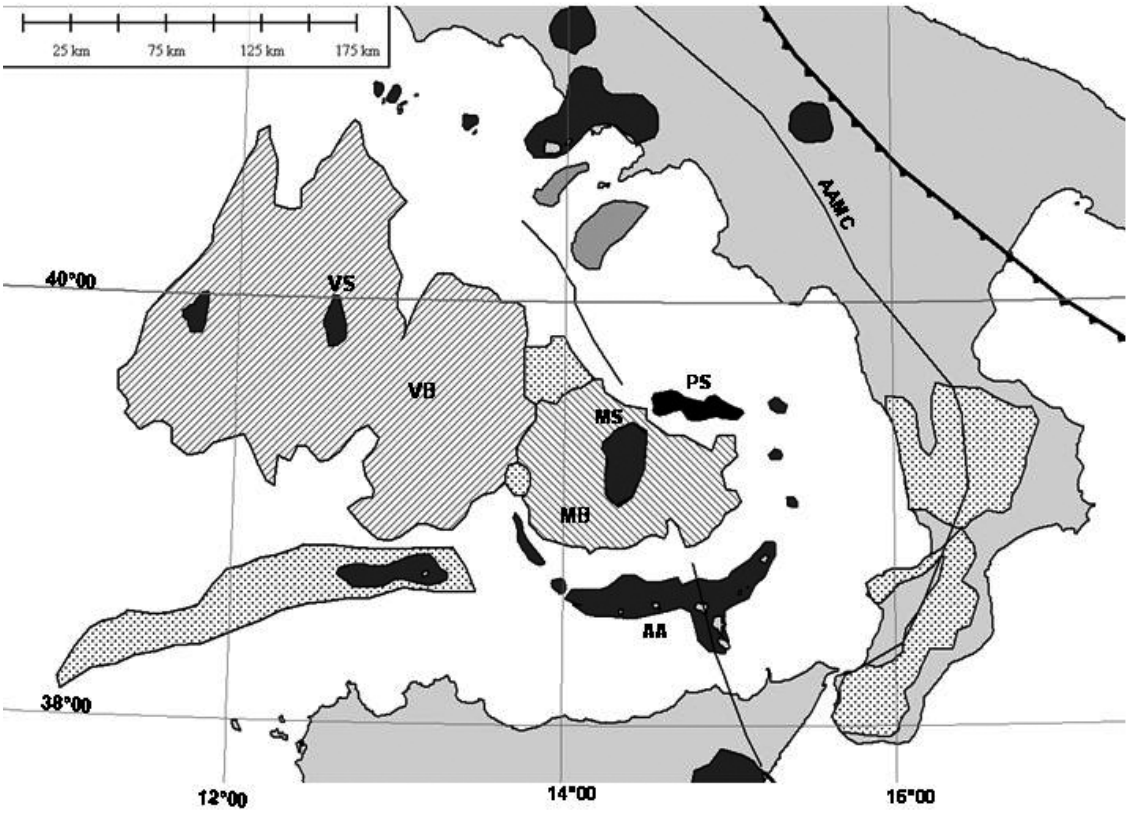

Fig. 1 - General overview of the south-eastern Tyrrhenian region (modified after Savelli, 2001): VS=Vavilov Seamount, VB=Vavilov Basin, MS=Marsili Seamount, MB=Marsili Basin, AA=Aeolian Arc, AAMC=axis of Apenninic and Maghrebian chains, PS=Palinuro Seamount.

between the Marsili basin to the south and the southern Apenninic chain to the east and is bounded by a sedimentary basin to the north (Fig. 1). This zone represents the transition between the sedimentary shelf of the Salerno Gulf, which is the only sector characterized by the absence of volcanism, the Marsili ocean-like basin and the Aeolian calc-alkaline volcanism. The southern Appenninic chain represents a part of the arcuate orogenic belt, including to the southwards, the Calabrian Arc and the Sicily Maghrebides (Fig. 1), whose evolution is associated with the simultaneous subduction of a west-dipping lithospheric slab and the back-arc extension in the Tyrrhenian Sea (e.g., Maliverno and Ryan, 1986). The active volcanic Aeolian archipelago, made up of seven major volcanic islands and several seamounts, forms a ring-shaped structure that encircles the Marsili Basin from east to west and is interpreted as a volcanic arc due to the interaction between the European Plate and the subducting Ionian slab (e.g., Beccaluva *et al*., 1985). According to De Astis *et al*. (2003), the Aeolian archipelago represents a post-collisional, rift-type volcanism emplaced in an older collision zone.

The origin of the PS is not yet clear, especially when compared with the neighboring Marsili and Aeolian Islands. Some authors hypothesize that the PS has developed along an E-W, deep-seated strike-slip fault system (e.g., Colantoni *et al*., 1981; Del Ben *et al*., 2008) and was

emplaced in a complex way and probably over a long period of time [0.5 Ma; Beccaluva *et al*. (1982, 1985) and Savelli (2002)]. Guarneri (2006) hypothesized that the strike-slip fault that triggered the genesis of PS could be a lithospheric fault and could represent the northward tear fault of the Calabrian-Arc subduction.

The role of the PS in the geodynamic context of the southeastern Tyrrhenian Sea is still debated because of the little geophysical information available. Due to the particular position occupied by the PS in the Tyrrhenian Sea, some key issues are currently unresolved. Among the open questions, it is not clear if PS is: a) a part of the Aeolian Volcanic Arc (e.g., Finetti, 2005); b) independent from the Aeolian Arc and controlled by pre-Pliocene tectonic structures (e.g., Guarnieri, 2006); and/or c) a flank volcano complex of the Marsili ocean-like basin (e.g., De Astis *et al*., 2003).

3. Morphological features of the seamount

The morphological analysis offers, in general, the opportunity of revealing surface features that, for the most part, are the outcome of the deeper geological processes acting in a region. Because deep-seated events influence the pattern of structural styles as well as the development of volcanism, a comprehensive characterization of the surface morphology also offers the opportunity of adding information on the geodynamic processes acting in a region. In this case, a detailed morphological analysis of the PS may provide new constraints towards a better understanding of regional volcanism and geodynamical processes of the south-eastern Tyrrhenian Sea.

The first, general physiographic description of the PS was made on the basis of single beam, bathymetric data (Fabbri *et al*., 1973) and side-scan sonar profiles (Colantoni *et al*., 1981). These data showed a volcanic edifice that has the form of an elongated ellipse, with its main axis extending E-W. It rises at the edge of the continental shelf, dipping westward to the deep-sea plain to depths of over 3000 m. The complex was divided into two zones: one corresponding to the eastern part of the edifice, with its summit situated at about 80 m, and the other culminating at a depth of about 600 m, making up the central-western part of the seamount. The numerous echo-sounding recordings, compared with the bathymetric charts, suggested that all the topographic summits correspond to recently formed craters having minimum sedimentary covers. The apical morphologies revealed perfectly circular or broken forms. The centres of eruption present clearly identifiable summits compared to the irregular shapes of the areas around them.

Marani and Gamberi (2004) show the existence of important structures related to instability of the edifice, such as a caldera rim located in the western part of the volcanic complex and a set of flanking faults. These authors, on the basis of multibeam swath bathymetry data, put in evidence the fact that PS stretches E-W for 75 km and it consists of at least eight single volcanic edifices that are basally connected to form a continuous volcanic ridge. A 3-D image of the seamount, obtained by interpolating the bathymetric data, shows two volcanoes displaying flat tops, reaching 175 m and 70 m depths,. To the west of these two shallower volcanoes, clusters of small cones surround a depressed area bordered by an arcuate north-western ridge and smooth slope. The authors hypothesized that this morphology could be related to a caldera-forming, gravitational collapse event of a pre-existing volcanic edifice. To the east of the shallower

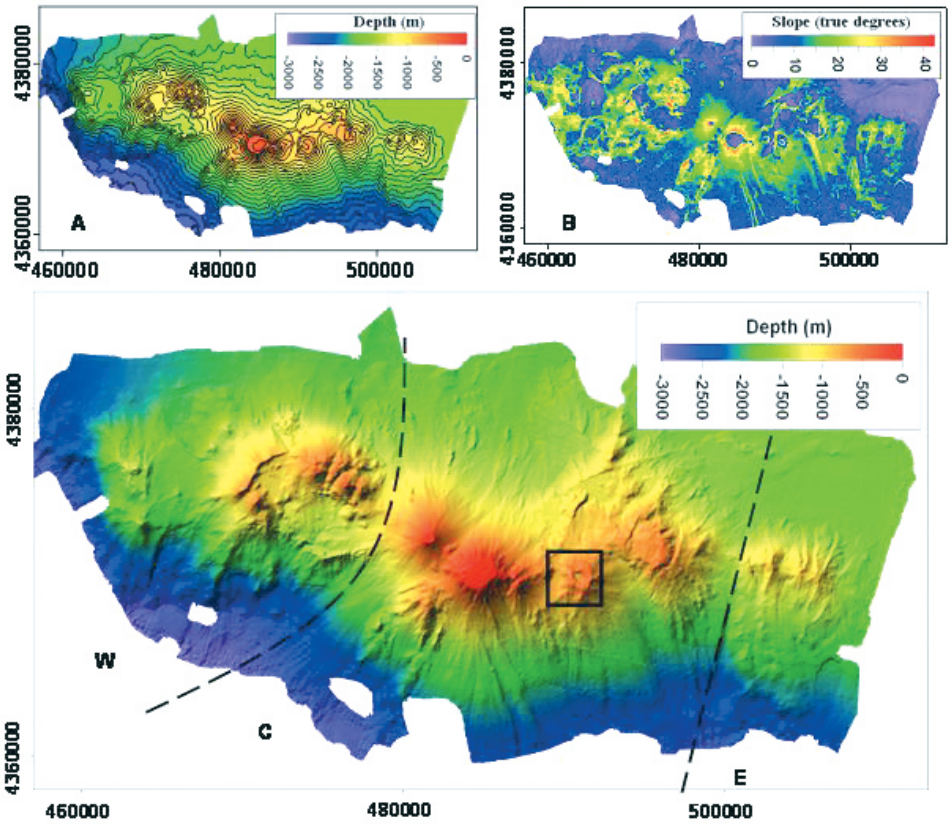

Fig. 2 - Bottom: digital terrain model of the PS (shaded relief map; coordinate system WGS 84, UTM zone 33). W, C and E indicate western, central and eastern sectors, respectively. The square encloses the volcanic cone which clearly shows a crater rim (see text for details). Top: panel A=contour map (depth line at every 100 m); panel B= slope map.

volcanoes, a series of smaller cones, mostly exhibiting horseshoe morphology and cratered summits, were recognized. Further east, tectonic structures were detected.

A detailed morpho-bathymetric description of the PS is found in Passaro *et al.* (2010). These authors utilized more than 1000 km^2 of new multibeam sonar data, collected during the second leg of the Aeolian 2007 cruise, on board of the R/V Urania in November 2007, to obtain a high resolution (25 m) DTM of the PS. The interpretation of this new DTM, coupled with a geomorphological and morphometric analysis, provided a detailed morphological description of the seamount. Passaro *et al.* (2010) point out that the PS shows a very complex morphology as it is characterized by a roughly elliptical shape extending for about 55 km along N100°E and 25 km in N–S directions (Fig. 2). The very articulated PS summit consists of a group of overlapped and/or coalescent volcanic edifices, interpreted as a sequence of volcanic cones, collapsed calderas and structurally controlled morpho-volcanic items. On the basis of the morpho-structural differences, the PS was divided into three areas: west, central and east. Both in the western and in the central sectors, relic, ridge-like shapes are identifiable (Fig. 2). In the central

sector of the seamount relic calderic rims are also identifiable. The most important previously unknown volcanic structures are found in the western sector, characterized by the presence of two calderas, one of which probably attributable to hydrothermally altered deposits (e.g., hot springs, mud pots, fumaroles) or pillow lavas (zone W in Fig. 2). This sector appears to be the oldest one.

The central sector is characterized by distinct volcanic structures. Although the existence of some of these have been already reported in previous studies, an earlier, unreported element is that one of these clearly shows a volcanic crater with a bottom, 75 m deeper than the border, the latter being located at 570 m b.s.l. (see square in Fig. 2). The pronounced rim, not obliterated by erosional events, suggests that this edifice is the youngest of the whole PS. In the others, two significant cones are characterized by flat circular tops of about 700-800 and 2500 m in diameter and are located 157 and 82 m b.s.l., respectively. This last one represents the top of the volcano complex (zone C in Fig. 2).

The easternmost zone seems to be completely different from the others, being structurally controlled by mainly N-S and N10°E trending tectonic structures (zone E in Figs. 2 and 3). N-S oriented structures are also detected in the central sector whereas roughly ENE-WSW oriented structures are found in the western and central sectors. The most significant tectonic structure detected on the summit of the PS, strikes N65°E and is located at the border between the western and central sectors (Figs. 2 and 3).

Morphological elements associated with the gravitational instability were observed both on the northern and on the southern side due to the presence of detachments and accumulation zones that could be caused by the steep slopes (25-40 degrees) of the flanks of the PS (panel B in Fig. 2). Some valleys recognized in the central sector of PS could have been produced by a lateral spreading phenomena.

4. Magnetic features

The study of the magnetic anomaly is a useful way of obtaining additional information on a volcanic structure, since volcanic rocks below the Curie isotherm are typically characterized by high magnetization values. The first magnetic investigation on the PS was performed by Morelli (1970) who performed magnetic profiles across the seamount. These data indicated that the eastern sector of the PS differs from the western one, the latter being characterized by widely ranging residual anomalies. Reporting on a magnetometric profile across the seamount, Selli (1970) hypothesized a deep E-W oriented interface as the cause of the perturbating mass responsible for the observed magnetic anomalies. Colantoni *et al*. (1981) performed a new magnetometric profile across the PS during the multidisciplinary TEST79 cruise. These data, integrated with the data of Morelli (1970), confirm the statements by Selli (1970) on the deep E-W oriented perturbating mass, although no evidence of the two maxima previous studies reported on crossing the seamount top. In relation to the top of the PS, these authors also evidenced that the strongest magnetic anomalies are found in the southern and eastern shallow crest whereas the northern one is deeper, culminating at about 570 m, and displays very weak magnetic anomalies.

The most recent and detailed magnetic anomaly map of the PS is reported in Caratori Tontini *et al*. (2009) utilizing data acquired during a ship-borne survey performed in May 2008. These authors estimated the average magnetization of PS and analyzed the corresponding residual

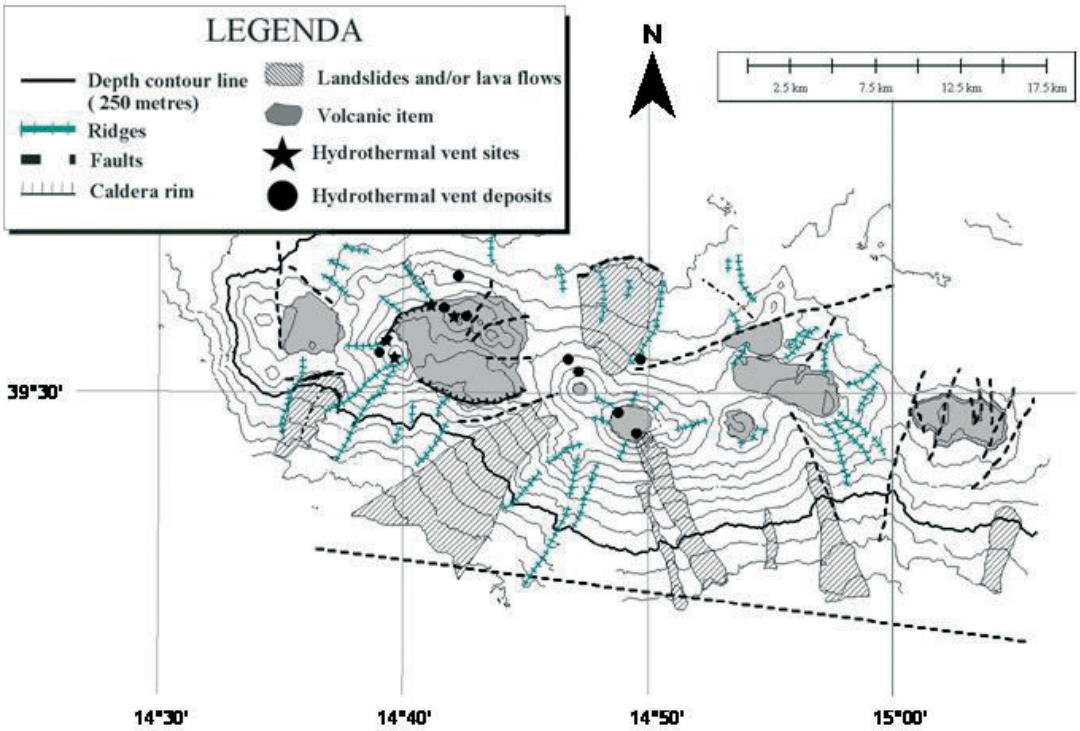

Fig. 3 - Morphostructural sketch of the PS (after Passaro *et al*., 2010) on which hydrothermal vent sites (after Lupton *et al*., 2011) and hydrothermal deposits (after Dekov and Savelli, 2004) are superimposed.

magnetic anomaly coming from the terrain corrections computed with the estimated average magnetization of 8 A/m. The magnetic anomaly map shows a clear alignment along the E-W direction that is not attributable to topographic effects. The linearity of this anomaly looks fault-like, but no shallow evidence of E-W displacement was observed. This kind of linearity has been interpreted as due to the superposition of the magnetic anomalies coming from the set of small E-W oriented summit cones. This magnetic lineament helps to distinguish a southern, high-magnetic N-S elongated portion and a northern low-magnetic area. Such a magnetic characterization reflects the morphological evidence of an asymmetric N-S development.

Further information on the residual magnetic anomaly field of the PS has been obtained utilizing data acquired in 2007 during the Aeolian 2007 cruise (Passaro *et al*., 2011b). The residual magnetic anomaly fields, -635/+700 nT magnetic range, shows a N-S oriented anomaly in the central part of the PS and a roughly N10°W in the western sector (Fig. 4). Detected residual anomalies show a normal shape with respect to the geomagnetic field which is included in a normal magnetic epoch. Both the residual to the pole transform, and the analytic signal, confirm an E-W trending differentiation of the magnetic sources but highlight a major amplitude concentred in the central sector of the PS, where cone shapes are present. Westernmost, where amphitheatre-shaped calderas are detected, the magnetic anomalies are less intense than in the

central sectors. The eastern sector appears to be the less magnetized of the volcanic complex.

5. Volcanological and petrological features

The exploration of the south-eastern Tyrrhenian Sea, dating back to 1970s, was mainly focused on the bottom sampling in order to obtain information both on the seafloor mineral deposits and on the volcanological and petrological features of the seamounts. No specific surveys were carried out on the PS and the available data are carried out by its sampling during the ship-borne surveys performed in the Tyrrhenian Sea. The samples acquired on the PS (e.g., Ciabatti, 1970; Del Monte, 1972; Fabbri *et al*., 1973; Marinelli, 1975; Di Girolamo, 1978; Kidd and Armansson, 1979; Colantoni *et al*., 1981), although limited to the summit and flanks, mainly showed lavas and sediments associated with volcanism. The mineralogic and petrographic data suggest that PS was emplaced during a wide time span [0.8-0.3 My; Beccaluva *et al*. (1985)] but its later volcanic activity could be significantly younger as testified by a recent (10 Ka) volcanic ash layer attributable to a later explosive activity of the seamount sampled in the Adriatic deep sea sediments (Siani *et al.*, 2004). Pleistocene lavas with a marked calc-alkaline affinity were sampled by Colantoni *et al*. (1981) on the top. The age of these products, computed using the radiometric K/Ar method, is of 0.35 +/– 0.05 Ma. Fragments of high-alumina basalt, low-silica andesite and high-K andesite were also recovered (Colantoni *et al*., 1981; Puchelt and Laschek, 1987). Hydrogenetic-hydrothermal Fe-Mn oxyhydroxide crusts were recovered on the top (Fig. 3) and abundant Fe-Mn nodules were found both on the summit and on the upper slopes (e.g., Rabbi, 1970; Kidd and Armansson, 1979; Dekov and Savelli, 2004). Since these sediments occur, generally, in limited areas around sites of hydrothermal discharge, Fleet (1983) suggested that the Fe-Mn micronodules on the PS are mainly attributable to hydrothermal sources with minor hydrogenetic contributions.

A recent water column survey was conducted during the first leg of the Aeolian 2007 cruise, in order to identify sites of hydrothermal activity on the seamounts of the south-eastern Tyrrhenian Sea (Lupton *et al*., 2011). Data acquired on the PS (Fig. 3) show a weak but widespread ΔNTU plume [the value above ambient nonplume water; see Lupton *et al.* (2011) for details] between about 400 and 800 m that overlies the whole seamount located in the south-eastern Tyrrhenian Sea, generally corresponding to depths of the ^{3}He anomalies. The largest δ^3He anomaly, about 2% above the background, was detected in the western zone of the PS and coincided with a strong CH_4 concentration anomaly at about a 500 m depth. Excess ^{3}He were also found on the eastern slope of the central edifice and at the far eastern end of the volcano. The most intense ΔNTU plume of the cruise at about a 700 m depth were found in the eastern part of the seamount including a strong CH_4 anomaly and a weak ^{3}He anomaly at the same depth. This plume was also observed eastwards indicating that it was a plume of substantial size. The authors underline that these observations are good proof of a robust source of hydrothermal venting at the eastern zone of the PS. Given the limited scope of samples collected over the PS, the authors do not exclude additional areas of hydrothermal activity. pH anomalies over PS were also detected. Most of the samples with pH values less than the background also have coincident CH_4 and/or δ^3He anomalies. A sample on the easternmost PS has pH values more negative than the background between a 650 and an 850 m depth, with a maximum shift of about -0.009 pH,

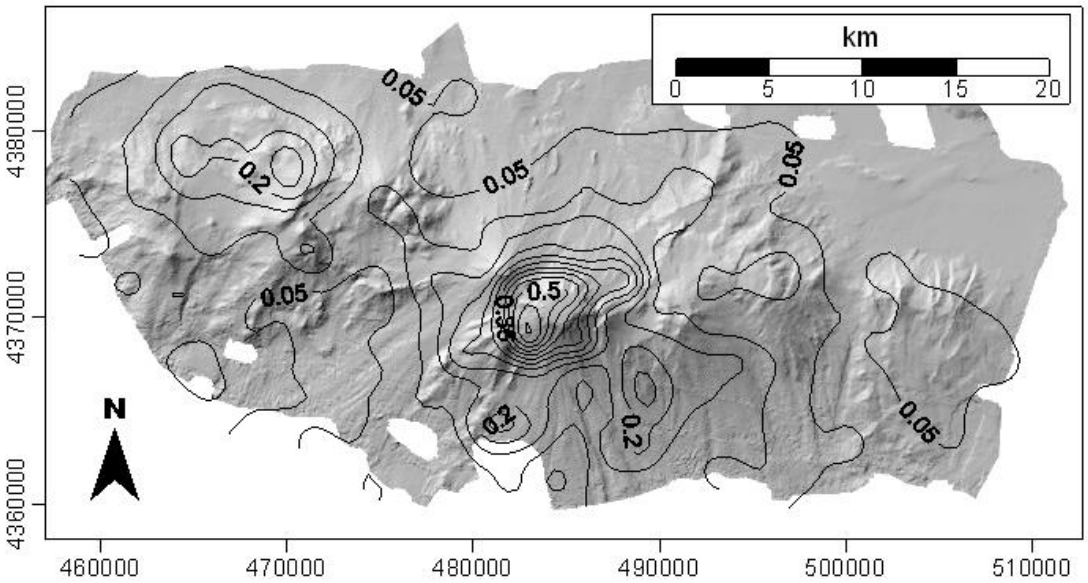

Fig. 4 - Bathimetric map (shaded relief image) of the PS where the magnetic source boundaries (analytic signal; contour map; unit of the analytic signal: nT/m^2) are reported.

coincident with the ΔNTU, CH_4 and δ^3He anomalies.

6. Discussion and conclusions

Data reported in previous sections, in particular those acquired during the most recent surveys, allow both a detailed morphological description and an accurate structural feature of the seamount. The morpho-bathymetric studies on the seamount derived by multibeam swath bathymetry data (e.g., Marani and Gamberi, 2004; Passaro *et al.*, 2010) show that the Palinuro volcanic complex rises from 3000 to 84 m b.s.l., extends about 55 km along N100°E and 25 km in the N-S direction and consists of several superimposed volcanic edifices that are basally connected to form a continuous volcanic ridge. The topography of the seamount puts in evidence a N–S asymmetric shape, with the crest separating a southern portion, characterized by steep scarps reaching a depth of about 3000 m, from the northern portion that decreases to about 1800 m with a lower topographic gradient (Caratori Tontini *et al.,* 2009). This morphological evidence, corroborated by magnetic data which show high values in the southern area and low values in the northern area, indicates that the Palinuro volcanic complex is set on the northern edge of the Marsili Basin at the border between the oceanic basin and the continental shore.

The morpho-structural differences between the western, the central and the eastern sectors could mark the different evolutionary stages of the volcanic complex. The western sector appears to be the oldest due to the presence of the collapsed structures (calderas). In this sector, the magnetic anomalies are less intense than in the other sectors (Passaro *et al*., 2011b). The central

sector is marked by the presence of younger volcanic cones. The cones, whose tops are at 84 and 157 b.s.l. show flat surfaces that may be related to the presence of marine terraces due to erosional processes connected to past still-stands of the global sea-level curve (Passaro *et al*., 2011a, 2011b). The easternmost cone clearly shows a volcanic crater with a pronounced rim not obliterated by erosional events. This evidence, together with the major amplitude of the magnetic anomalies with respect to the other sectors as well as the age of the products sampled on the summit, suggest that the central sector is younger than the western ones. The easternmost sector of the seamount seems to be completely different from the other ones, being structurally controlled and representing a potential element of transition toward the mainland. These observations, those obtained by the recent hydrothermal survey and from magnetic anomalies as well as the detected shallow volcano-like seismicity between the volcano complex and the Calabrian coast (Soloviev *et al*., 1990) strongly suggest that the south-eastern sector of the seamount could be active.

The main fault affecting the summit of the PS strikes N65°E. The arrangement of this structure suggests that it could be regarded as the dividing line between the most ancient, the NW, and the younger, the SE, sectors of the seamount. The N65°E structure may have also controlled the arrangement of the SE sector of the seamount, in which N-S and N10°E tectonic structures are detected. In this case, a right-lateral component of movement of this structure may be inferred.

The approximate E–W orientation of the summit cones, as well as the clear alignment along the same direction highlighted in the magnetic anomaly map, may represent evidence of the strike-slip lithospheric fault which may have triggered the genesis of the Palinuro complex. As inferred by several authors, this fault is located on the southern boundary of the Palinuro complex, and moves as a sinistral strike-slip system and extends toward the mainland (e.g., Savelli, 2001; Del Ben *et al*., 2008; Mantovani *et al*., 2009). The expression of this tectonic lineament on the mainland (Fig. 5) is the Cetraro-Rossano Line (e.g., Finetti and Del Ben, 1986). The kinematics of this deep-seated fault may have controlled the emplacement and the evolution both of the whole seamount and of the structures with different orientation detected on the summit. According to the fracture system model proposed by Flodin and Aydin (2004), the evolution of the structures of the PS could be interpreted as a network fracture system, with different generations of fractures, based on a sequential opening mode. In this case, the E–W deep-seated structure could be interpreted as the main fracture (the oldest) of the network, the N65°E fault can be interpreted as a second generation of faults, characterized by a right-lateral component of movement. The N–S fault system could be related to a left-lateral fault coupled to the right-lateral movement of the N65°E second generation, thus represents a third generation of fractures.

While analyzing a seismic sequence that occurred close to the boundary between the Apenninic chain and the Calabrian Arc, Guerra *et al*. (2005) observed changes of activity from a series of normal faults with Apenninic (NW-SE) trend and transfer, presumably strike slip faults with an anti-Apenninic (NE-SW) and E-W trend. The observation on the NE-SW trend of the seismicity and the suggestion of Moretti *et al*. (1990), who on the basis of a few dense microearthquake sequences both at sea and on land, hypothesized an anti-Appeninic lineament that extends towards the PS, led the authors to propose the existence of the NE-SW Palinuro-

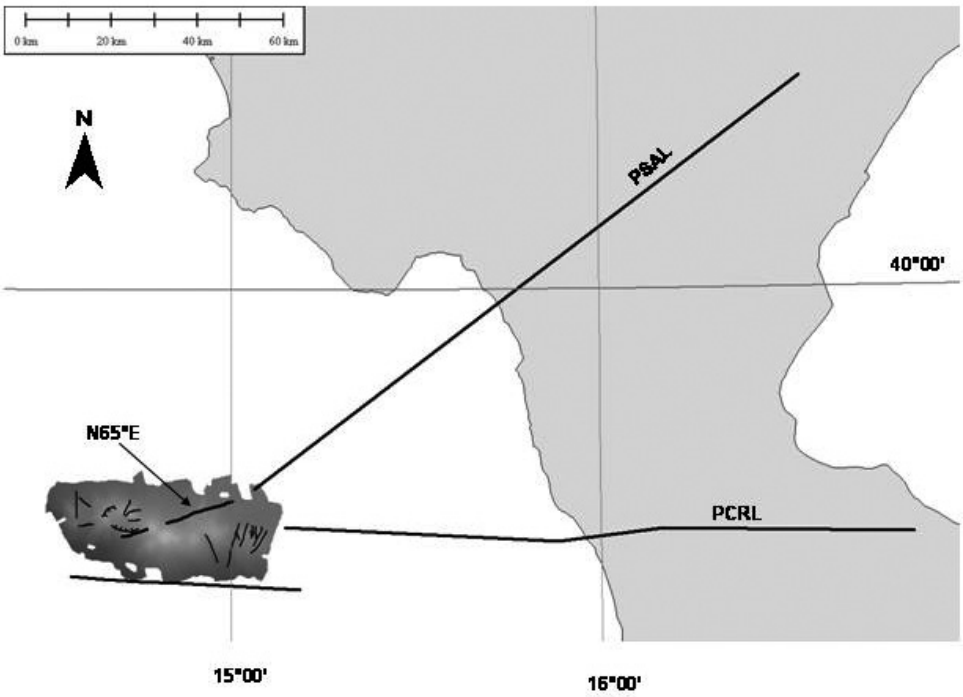

Fig. 5 - Simplified structural scheme of the south-eastern Tyrrhenian Sea and main structures identified by Passaro *et al.* (2010) on the PS. PCRL and PSAL represent the Palinuro-Cetraro-Rossano Lineament and the Palinuro-Sant'Arcangelo Lineament, respectively (after Guerra *et al*., 2005). PCRL coincides with the boundary between areas with different vertical rates of displacements (after Lambeck *et al*., 2004).

Sant' Arcangelo Lineament (Fig. 5). This tectonic lineament intersects the E-W Palinuro-Cetraro-Rossano Line in proximity of the PS (e.g., Finetti and Del Ben, 1986; Moretti *et al*., 1990). The N65°E and E-W structures of the PS may represent the expression, on the seamount, of these tectonic lineaments.

Lambeck *et al*. (2004), evaluating vertical rates of displacement of the Italian coasts by using MIS 5.5 paleoshoreline as tectonic indicators, recognized the presence of a boundary between predominant tectonic stability of the central and northern coast of Tyrrhenian Italy and a southern uplifting sector, located in correspondence with the eastward continuation of the E-W Palinuro Fault, i.e., the Palinuro-Cetraro-Rossano Line. Representing this tectonic lineament, the southern limits where Apenninic features can be observed, according to Guerra *et al*. (2005) the system composed by the Palinuro-Sant'Arcangelo Lineament and the Palinuro Cetraro-Rossano Line acts as hinge between the southern Apennines and the Calabrian Arc at crustal levels. Considering this assumption correct and taking into account the open question quoted in the previous sections, we propound that the PS is independent from the Aeolian Arc and its evolution was controlled by Pleistocenic tectonic structures.

In conclusion, we want to emphasize that the overview presented here, summarizing the current state of knowledge on the PS, could also be useful for planning future surveys to provide

answers to open questions.

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