FIRST SEISMIC SURVEY ON WESTERN PALINURO SEAMOUNT, TYRRHENIAN SEA

H. Schroeder [1]*, J. Schroeder [1], D. Klaeschen [1], N. Erogluer [1] and J. Bialas [1]
[1] GEOMAR Helmholtz Centre for Ocean Research Kiel - hschroeder@geomar.de

Abstract
The Palinuro volcanic complex in the Tyrrhenian Sea, a hydrothermally active area with observed massive sulfide deposits, has been target of the 2015 R/V Poseidon cruise POS484. Being the first seismic survey carried out on the western part of the complex, it reveals the structure of Palinuro and gives insight on its formation history . Combination of surface and deep-towed seismic and borehole leads to a redefined geological model of the complex.

Keywords: Tyrrhenian Sea, Geophysics, Seismics

Palinuro Seamount (PS) is a volcanic complex in the Tyrrhenian Sea and represents the northern part of the Aeolian Volcanic arc. The whole complex has an E-W orientation and an extent of about 55 km, the shallowest peaks lay at less than 500 mbsl while depth reaches 3500 mbsl in the Marsili basin south of PS.

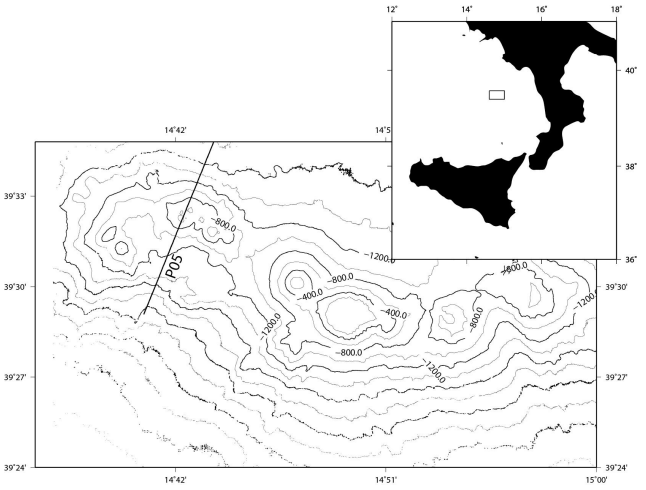

Fig. 1. Overview Map of the Tyrrhenian Sea with target area, Bathymetry of Palinuro Seamount with seismic line P05

Its formation is related to the opening of the Tyrrhenian Sea about 11 million years ago. Back-arc spreading followed the rollback of the Ionian slab and caused the development of back-arc volcanism around the Marsili basin [1]. At present day, PS shows no more active volcanism, but the presence of hydrothermal activity as well as the deposition of [extinct] seafloor massive sulfides ([e]SMS) have been observed in the past [2].
Until cruise POS484, no seismic data have been acquired on Palinuro except one seismic line crossing the east of the complex. Therefore, existing geological models of the Palinuro massive sulfide bodies are based merely on drilling results. Combination of seismic and borehole data should lead to a much more detailed model of west PS, which should give a better insight on the evolution of the complex itself as well as on the processes involved in forming a hydrothermal system and a [e]SMS deposit in general. The geological model of PS should then be used in a synthetic modelling to correlate real and synthetic data to improve both procedures.
To reach these aims, different seismic systems were used to identify the structure of the eSMS deposit as well as the shallower sedimentary structure of the western complex during cruise POS484-2 in April/ May 2015. In total, 22 seismic profiles were acquired using a 312.5 m long surface towed 2D streamer with 160 channels. Furthermore, 7 profiles using a 50 m deep towed (about 100 m above seafloor) streamer with 25 channels (DTMCS) were shot. The deployment of 6 Ocean Bottom Seismometers adds refraction data and allows to obtain seismic velocity information. All systems recorded the shots from a Mini-GI airgun (15 / 15 in³ @ ~180 bars) with a shotrate of 5 sec. Throughout the cruise, the ship´s multibeam system L3-ELAC Nautik SBE 3050 was used to collect bathymetric data to complete existing datasets [3].

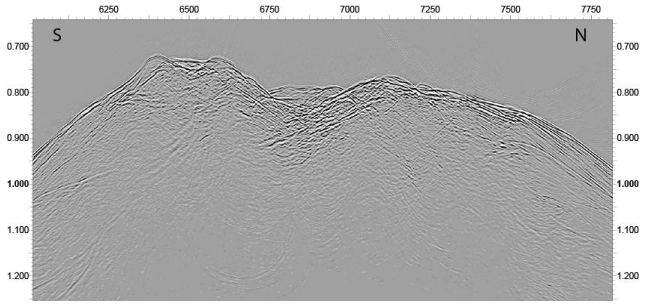

Fig. 2. Time section of seismic line P05 (surface towed streamer) showing the peak of western Palinuro Seamount, x-axis in meters

The seismic data have been processed afterwards using mainly geometry correction, frequency as well as dip-filtering and a multiple suppression. Post-stack time migration has then been carried out for the surface-towed data while the deep-towed data required a pre-stack depth migration.
After the processing, a main focus besides redefining the geological model was to compare the standard surface-towed streamer data with the deep-towed data. In theory, a deep-towed configuration allows a better seismic resolution and due to the larger offset an undershooting of, for example, strong reflecting cap rock formations.
Based on seismic images, velocity depth information and geological sampling, a geological depth model will be developed for PS. Synthetic seismograms based on such a model will be tested against the acquired data to confirm the sediment layers and [e]SMS deposit distribution. Furthermore the capabilities of the deep towed system in terms of mapping [e]SMS deposits will be evaluated.
This work has been supported by the EU Blue Mining project under grant 604500.

References
1 - Milano, G., Passaro, S., and Sprovieri, M., 2012, *Present-day knowledge on the Palinuro seamount (south-eastern Tyrrhenian Sea)*, Bollettino di Geofisica Teorica e Applicata, doi:10.4430/bgta0042.
2 - Petersen et al, 2014, *Drilling shallow water massive sulfides at the Palinuro Volcanic Complex, Aeolian Island Arc, Italy*, Economic Geology, 109 (8). pp. 2129-2157. DOI 10.2113/econgeo.109.8.2129.
3 - Bialas, Jörg, ed., 2015, POS484/2, RV POSEIDON - MARSITE: *Seismic investigations at the Palinuro volcanic complex*, Cruise Report, 27th April 2015 - 09th May 2015 . GEOMAR Helmholtz-Center for Ocean Research, Kiel, 18 pp. DOI 10.3289/CR_POS_484/2.