GEOLOGICAL STRUCTURE AND BOTTOM SEDIMENTS OF THE SEAMOUNTS IN THE TYRRHENIAN SEA

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Abstract

Geological structure and recent evolution of tectonically different types of seamount spreaded in the Tyrrhenian basin discussed on the data of complex geological-geophysical investigations conducted by some Russian expeditions. Modern and Late Quaternary sedimentation on the seamounts including ore formation as a result of hydrothermal activity are also described.

Key-words: metals, stratigraphy, tectonics, sediments, Tyrrhenian Sea

Introduction

The structure and geological evolution of the submarine mounts in the Tyrrhenian Sea is fraught with many uncertainties till now although they have been studied almost half a century [1-5]. In the course of the 7th and 12th cruises of the r/v *Vityaz* (1984,1986), the 4th and 10th cruises of the r/v *Rift* (1984, 1988) and 16 th cruise of r/v *Akademik Mstislav Keldysh* (1988), an underwater geological survey of five seamounts (Verchelli, Baroni, Magnaghi, Marsili, Vavilov) was carried out with the help of inhabited submersible apparatus, such as "Argus", "Mir-1", "Mir-2" and towed submerged apparatus. Visual observation, continous video- and sidescan survey, undersea photography, sampling with the help of manipulator and small drilling sets installed on the submersibles were done. The mount tops and near-top areas but also the slopes down the base (Magnaghi, Vavilov), *i.e.* down the depth of 3300 m (Fig. 1) were investigated. Samples of bottom sediments and rocks were thoroughly studied in the laboratory. Data on composition and stratigraphy of bottom deposits and on petrography of bedrocks were obtained.

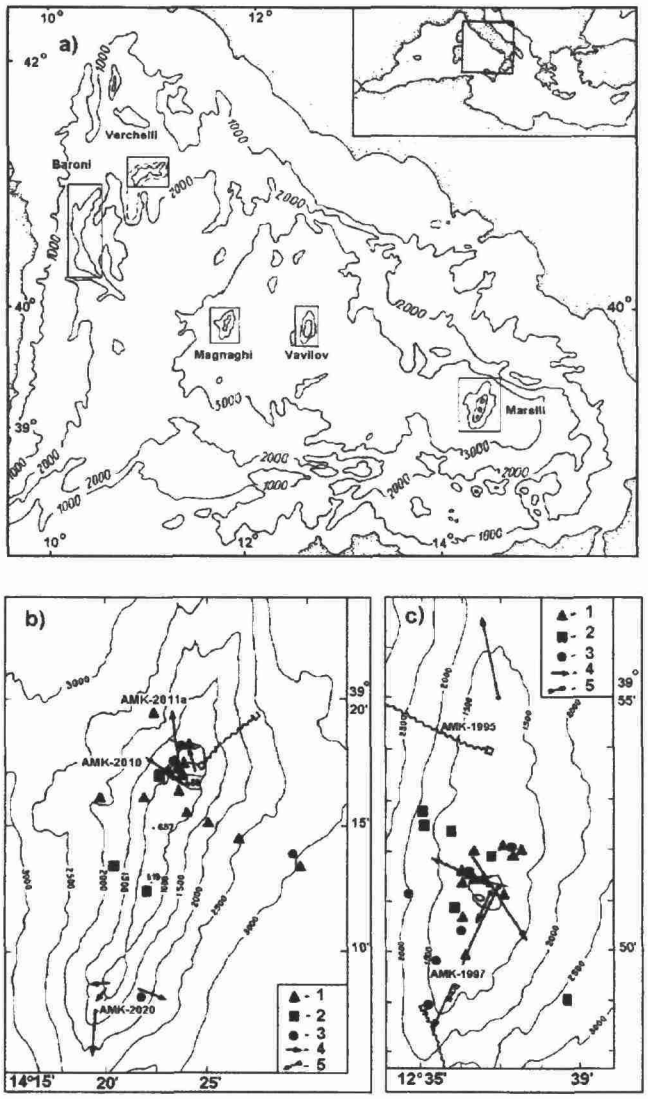

Fig. 1 : Geological studies of the seamounts in the Tyrrhenian Sea a) polygons, b) smt. Marsali, c) smt. Vavilov. 1 - grab sampling, 2 - dredging, 3 - gravity coring, 4 - route of towed submersible aparatus, 5 - route of manned submersibles "Mir-1" and "Mir-2".

Mount structure and their recent evolution

Baroni and Verchelli mounts are tectonically elevated horst type blocks made of a basement with continental crust rocks, stretched in submeridional direction. Their slopes are complicated by numerous faults and tectonic steps.

The lower part of the Verchelli mount consists of Palaeozoic metamorphic rocks. They are intruded by a granite batholith which composes the middle part of the mount and its domed top. The batholith is complicated by intrusions of pegmatite-aplites of Tortonian age. Most probably, a deep denudation of them occured in subaerial conditions, beginning from the time of Messinian regression. In Pliocene-Quaternary this island underwent an irregular sinking which was marked by several belts of corals and series of bench-like steps on the mount slopes [6]. Ancient coastlines are marked by surf wave niches in rock granite outcrops. The central part of the Baroni mount's is formed by an ophiolite rock complex, outcropping on land in the Ligurian Alps [4]. Outcrops of olivine basalts were found in the mount centre, and on the Quirra mount, located to the south. Dark rock outcrops are widely spread on the mount slopes (depth is 232 and 446-458 m). Cores drilled out in one outcrop by submersible "Argus" brought breccias and conglomerates made of olivine basalts clasts. Submarine volcanoes (Magnaghi, Vavilov, Marsili) are situated on the submeridional fractures which cross the basaltic basement of the deep Tyrrhenian basin. Their cones were built up by basaltic lava flows in several stages preceeded by repeated rupturing of volcanic structures by submeridional faulting. Faults can be traced by the presence of steps and benches on seamount slopes and tops. Morphologically they resemble as "swallow tail" (Fig. 1b c). These areas are the most barest ones. Just here numerous pillow and tubular lava covers were found, that allow to trace zones with the largest volcanic activity. The top area of the Magnaghi mount is covered mainly with loose sediments and does not show tectonic activity.

The top area of the Vavilov mount is more bare of sediments. Near the southern top only a small volcanic cone resembling "hayrick" and made of tubular lavas was found. Crater-like holes composed by pillow and tubular lavas were also found. They are slightly powdered with sediments. Most parts of the Vavilov mount are covered with Late Quaternary sediments, separate lumps or lava flows outcrop ping under them. All this testifies to the damping of volcanic activity in Late Quaternary period. Lithified foraminifera-coccolithic muds of Early-Quaternary age covering lavas in the lower part of the Vavilov mount slope (Fig. 2b) indicate that formation of

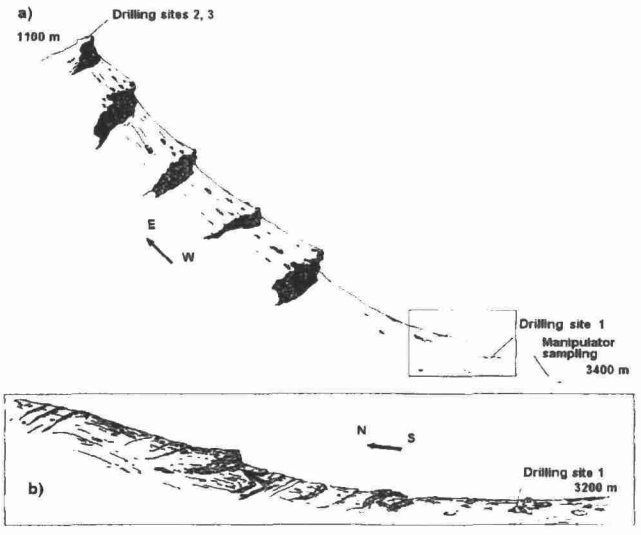

Fig. 2 : Outcrops of basaltic lava flows along recent faults heading N-E (a) and that ones of Early Quaternary marlstones (b), on the western slope of the Vavilov mount - geological sketch compiled on visual observations during dive of manned submersible "Mir-1" (route AMK-1995, depth is 1100-3400 m).