New Data on the structure of the Sardinian Underwater Margin in the Tyrrhenian Sea

N.A. BOGDANOV, V.Ye. KHAIN, I.A. BASOV and A.V. FEDORCHUK

Institute of Lithosphere, Russian Academy of Sciences, MOSCOW (**Russia**)

New additional data on the structure and composition of the Sardinian margin in the Tyrrhenian Sea were obtained during the 10th leg of RN "Antares", which was carried out in the Mediterranean Sea in the summer of 1991 by the Institute of Lithosphere of the Russian Academy of Sciences in collaboration with Italian scientists from the Ferrara, Udine and Torino universities. The following conclusions could be drawn:

1. Gneisses, quarzites, schists and metabasalts dredged at the Cornalia mountain and in the southern edge of the Baroni ridge, confirm that the Sardinian margin basement is mostly composed of the Paleozoic metamorphic complex, exposed in Sardinia. Of particular interest are findings of basalts and diabases metamorphosed in the greenschist facies.

The content of minor elements (TiO_2=1.94%, K_2O=0.2%, Ni=238 ppm) and their ratios (Ti/Zr=80, Zr/Y=4.9, Zr/Nb=24, La 104/Ti=6.01) point to affinities to MORB-like tholeiites. They are somewhat similar to ophiolitic and "schistes lustres" basalts developed in Corsica and supposed to be of Late Jurassic age. This implies that the ophiolite sequence obducted upon the metamorphic basement from the west, also extends along the underwater margin of Sardinia.

2. The sedimentary cover of the Sardinian underwater margin has a maximal thickness amounting to 600m. It comprises three stratigraphic unites embracing the time interval from the Late Miocene to the Holocene and lies unconformably on the acoustic Paleozoic-Jurassic (?) basement. If the last epoch of the basement fold-nappe deformation was completed as in the Apennines, the lower pre-Messinian sedimentary complex should belong to the Tortonian. The same age for these formations was obtained by the shipboard party of ODP Leg 107 on the basis of the materials of Hole 654. The seismic profiling data suggest that initially this complex must have been continuous and that its absence in certain parts is due to pre-Messinian and later erosion.

3. The thickness of Messinian evaporites reflects differentiated block shifts, connected with rifting in the Tyrrhenian Sea in Messinian time. The absence of Messinian deposits on certain blocks may be explained either by a position higher than the level of the brines, or by later erosion. The occurrence of underwater-slumping or underwater-avalanche deposits confirms the intensity of tectonic movements during the Messinian.

4. Pliocene-Quaternary deposits unconformably overlie the older deposits up to the basement, locally adjoining them unconformably and revealing facies changes near the uplifts. This is indicative of pre-Pliocene movements along faults. Intensive movements were also recorded in Late Quaternary and in fact determined the recent structure of the margins. Salt diapirism also occurs at that time. These young movements are synchronous with the opening of the easternmost deepwater basin of the Tyrrhenian Sea - the Marsili basin.

5. A previously unknown volcano has been discovered on the southern edge of the Baroni ridge. Slightly altered basalts corresponding petrochemically to MORB tholeiites have been dredged here. It differs from the MORB-like tholeiites have been dredged here. It differs from the MORBlike tholeiites drilled in the deep part of the Tyrrhenian Sea in being enriched in incompatible trace elements (Rb=9 ppm, Ba=109 ppm, Sr=621 ppm, La 10^4/l=14.2), similar to MORB E-type.

Moreover, according to continuous seismic profiling data, a Tortonian or pre-Tortonian caldera-like structure buried under sedimentary cover is inferred to exist. The new data as well as previous ones suggest an extremely intensive tectonic mobility of the Sardinian margin under active extension from the Late Miocene to the present, i.e; during the opening of deep Tyrrhenian basin.