MUD VOLCANOES ON THE MEDITERRANEAN RIDGE : DISTRIBUTION AND POSSIBLE MECHANISM OF FORMATION

A. F. LIMONOV[1], M. K. IVANOV[1], M. B. CITA[2], E. ERBA[2], J. M. WOODSIDE[3] R. B. KIDD[4] and R. LUCCHI[4]

[1]UNESCO Research and Training Center on Marine Geology and Geophysics Geological Faculty, Moscow State University, Russia
[2] Dipartamento di Scienze della Terra, Universitá degli studi di Milano, Italy
[3] Faculteit der Aardwetenschappen, Vrije Universiteit, Amsterdam, the Netherlands
[4] Department of Geology, University of Wales, Cardiff, U.K

About twenty new mud volcanoes and mud diapirs on the Mediterranean Ridge south of Crete were discovered during the TTR-3 Cruise of the R/V Gelendzhik (June-July 1993) with the aid of swath survey with two types of sidescan sonars. Nine of them were checked by bottom sampling and the mud breccia were found occurring at shallow depth (a few centimetres to a few metres) below the seafloor. The comparison of the coordinates of the newly-discovered mud volcanoes and the highly reflective patches in the GLORIA mosaic (KENYON *et al.*, 1982) shows that most of these patches (with the possible exception in the Hellenic Trench area) represent not the dissolution structures related to the Messinian evaporites but mud volcanoes and mud diapirs.

These structures are widespread on the Mediterranean Ridge, especially south and west of Crete and they concentrate mainly in the crestal and inner parts of the Ridge, decreasing in size towards the Ridge flanks. The structures are mostly elongated and are aligned according to the general trend of the Ridge. Many of them are related to the principal thrust(?) planes.

The mud volcanism and diapirism phenomenon is closely tied to the Mediterranean Ridge accretionary complex evolution. A strong lateral compression results in stacking of sedimentary slabs with different lithologies and densities, contacting along thrust planes. Less dense plastic rocks saturated with gas and fluid could be overlain by denser rocks. This would create the density inversion and overpressuring in the plastic units, giving rise to the diapiric growth or the breakthrough of the deep-seated material to the seafloor along fault and thrust planes. At the same time, tectonic compressional stress across the Ridge can squeeze plastic material upward to the seafloor. The role of the Messinian evaporites in this process seems to be insignificant. They hardly can form an impermeable layer enhancing the overpressuring effect in the underlying rocks. Recently obtained seismic data (HIRSCHLEBER *et al.*, 1994) confirmed by the data of the TTR-3 Cruise suggest that the Messinian is missing at many places on the Mediterranean Ridge crest. Moreover, we suppose that the mud volcanoes and diapirs are located just at the places where the Messinian is missing, otherwise the greatest manifestation of the mud volcanism should be expected on the southern Ridge flank covered by relatively thick Messinian layer.

REFERENCES

HIRSCHLEBER H. B., HARTMANN J. M. and HIEKE W., 1994. The Mediterranean Ridge accretionary complex and its forelands - seismic reflection studies in the Ionian Sea. Universität Hamburg 1994 - Schlaglichter der Forschung zum 75. Jahrestag, ed. by R. Ansorge. Hamburger Beiträge zur Wissenschaftsgeschichchte, Reimer Verlag, Berlin, 15 : 491-509.

KENYON N. H., BELDERSON R. H. and STRIDE A. H., 1982. Detailed tectonic trends on the central part of the Hellenic Outer Ridge and in the Hellenic Trench system. Trench-Forearc Geology, Geol. Soc. Spec. Publ., ed. by J. Leggat, 10 : 335-343.