



Deep Structure in the Region of the Mariana Island Arc

Ludmila P. Zabarinskaya and Natalia A. Sergeyeva
Geophysical Center, Russian Academy of Sciences (mila@wcb.ru)

Within the framework of the International Geotraverse Project, in cooperation with Japanese and Chinese scientists, a deep geological-geophysical cross section of the tectonosphere was constructed. This section included the lithosphere and the asthenosphere crosses the North China Plain, the sedimentary basins of the Yellow and East China Seas, the deep water basins of the Philippine Sea, the Mariana Island Arc, the Mariana deep water trench and the northwestern basin of the Pacific Ocean.

The results obtained in the present study cover the new data on the structure of the geotraverse in the region of the Mariana Island Arc, based on the original materials obtained in the expedition aboard the R/V Vulkanolog.

The Mariana Island Arc is a classic young island arc in the western Pacific Ocean. Most of the islands and underwater volcanoes in the northern part of the Mariana Island Arc were formed in the late Pliocene. The southern part of the arc is more ancient. The volcanoes are the Eocene-Miocene age. The Mariana Island Arc includes an active Mariana Trough and two island arcs: the active arc locates in the east, and the passive one is in the west. The basement of the arc consists of depleted peridotites. Gabbro, tonality with veins of serpentinites, diabases formed about 50-52 million years ago lie above.

The formation of the island arc began about 48 million years ago, when the collision between the Pacific Plate and the Philippine Sea Plate happened. The Pacific Plate has subducted under the Philippine Plate, and the Mariana Trench was formed as a result of this collision. The disclosure of the Mariana Trough, approximately coinciding with the formation of the presently active the East Mariana Island Arc, occurred about 6 million years ago. At the same time, the activity of the West Mariana Island Arc has stopped.

Quaternary volcanic rocks within the Mariana Island Arc are mainly represented by basalts and andesibasalts. The southern and central parts of the arc are characterized by low- and medium alkaline tholeiitic basalts enriched with potassium and iron. In the northern part of the Mariana Island Arc alkaline rocks enriched with barium, strontium and potassium are present. The thickness of the sedimentary cover is not high.