

Chemical and isotopic characteristic of submarine volcanic rocks from the southern Mariana Trough

Mitsuteru Kuno[1]; Harue Masuda[2]; Katsuhiko Furuyama[2]; Yoshiyuki Tatsumi[3]; Takashi Miyazaki[4]; Toshiro Takahashi[3]; Yuka Hirahara[5]; Minoru Kusakabe[6]

[1] Biology and Geosciences Sci., Osaka City Univ; [2] Dept. Geosci., Osaka City Univ.; [3] IFREE, JAMSTEC; [4] IFREE, JAMSTEC; [5] Niigata Univ; [6] none

In the Mariana Trough south from 14 degree north, active volcanisms associated with backarc spreading is occurring at the eastern edge along the arc volcanic front as results of repeating ridge jump from west to east. Contrasting to the northern end of the Mariana Trough, where is the convergent margin of active Mariana Ridge and remnant West Mariana Ridge, southern end of the trough is characterized by the separated arc ridges, probably due to the repeating rifting inside the arc crust from west to east. In this study, we analyzed major and minor chemistry, water contents, and Sr-Nd-Pb isotope compositions of the submarine volcanic rocks taken from the active backarc spreading ridge, located at the eastern margin of the trough, presumed old backarc and arc crusts and three rift zones at the southern end of the trough during the cruises of R/V YOKOSUKA and submersible SHINKAI 6500(YK05-06 Leg 2), and R/V KAIREI (KR06-11). Based on the analytical data, we characterize the relationship between volcanic activity in this area and discuss on the spreading history of this area.

Rocks taken from the active and old spreading ridges are basalt to andesite containing 50.6-60.1%SiO₂, and giving 1.2-3.6 FeO*/MgO ratio. Major cation contents giving linear correlations to SiO₂ contents indicate large differentiation of the magma having the similar chemical composition. Rocks taken from the arc including the western rift zones are basalts containing 48.2-51.5%SiO₂ and equivalent FeO*/MgO ratio, indicating rather primitive composition than those of the most of spreading ridge rocks. The arc rocks enrich Rb, Ba and K, suggesting that the fluids originated from sediments in the subducting slab are contaminated in the magma of those rocks. While, the rocks from the active and old spreading ridges are less affected by the slab components, however, those are also contaminated by the sediment derived fluid compared with the previously known Mariana N-MORB. Sr, Nd, and Pb isotopic ratios also support the different degree of the fluid incorporation into the arc and backarc magmas from the sediments in the subducting slab. It is notable that the rocks from the eastern rift zone, which is located at the southeast from the presently active spreading ridge, have back-arc like signatures. Thus, the rifting occurred at least three times repeating jumps from west to east, and separated arc crust into the Mariana and West Mariana ridges at the southern end of trough. At the eastern rift zone, most recent volcanic activity occurs among the studied rift zones, and backarc spreading has already started. Recent backarc volcanism was assured at the southern end of the presently active spreading ridge. Therefore, the most active backarc spreading must occur at the southeastern part of the Mariana Trough.