AOGS 2006

Spatial Evolution of Arc Magma Along Northern Rhykyu Arc in the Philippine Sea Plate Subduction Zone

CHANG-HWA CHEN[1], SETSUYA NAKADA[2], KEIJI TAKEMURA[3]

[1] *Institute of Earth Sciences, Academia Sinica*

[2] *Earthquake Research Institute, Tokyo University*

[3] *Institute for Geothermal Sciences, Kyoto University*

In western Pacific Ocean, the Philippine Sea plate is moving about 7 mm/yr in a northwest-southeast direction. The ongoing subduction of the Philippine Sea plate beneath the Eurasian plate at the Ryukyu Trench formed the Ryukyu arc system from northern Taiwan to central Kyushu. About the Ryukyu arc system, there are four wild eruptions along about 150 km in northern Ryukyu Volcanic Front in southwest Japan within last 110 Ka. These catastrophic eruptions formed four huge calderas, which names and the ca. forming ages are Kakuto, 110 Ka; Aira, 22 Ka; Ata, 80 Ka and Kikai, 6.3 Ka from north to south, respectively (Aramaki, 1984; Ui et al., 1992). The isotopic values of samples from four syn-caldera deposits reveal significantly different ranges. The epsilon Nd values are about -2 in the Kakuto caldera, -4 in the Aira caldera, -1 in the Ata caldera and 1.5 in the Kikai caldera, respectively. Moreover, the epsilon Nd values of post-caldera eruptions always reveal higher than those of syn-caldera products. Comparison of the epsilonNd values in post-caldera products with those in syn-caldera samples, the epsilonNd values of post-caldera magma gradually changed more positive with time than those of syn-caldera products. It is a plausible interpretation that the new relative depleted magma (with higher epsilonNd value) recharged into the small post-caldera magma chamber. The new recharged magma changed the isotopic value in the magma chamber, but the major control factor was still dominated by the individual original caldera magma. Thus, the two end-member RAFC mixing model can interpret the magma generation of volcanic rocks collected from the Ryukyu Volcanic Front. Regarding to the isotopic values of four syn-caldera magmas, the magma of Aira caldera has the extreme lowest epsilonNd values and the largest eruption volume than those of other caldera eruptions. From the Aira caldera to northern ward and southern ward, the epsilonNd values of syn-caldera magmas gradually increase. The spatial zoning distribution of isotopic value of the syn-caldera magmas does matching the heat flow contour map (Ehara, 1989). The area with the lowest epsilonNd value overlaps with the area with the highest heat flow in the southwestern Kyushu. In the extreme high heat flow (HFU=3-4) area, it will be to generate a large high silica magma chamber in shallow depth due to remelt crustal material (lower epsilon Nd values).