



Magma evolutions in the northern Luzon Arc

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Taiwan is an active mountain belt created by the oblique collision between the northern Luzon arc and the Asian continent in the western Pacific Ocean. Volcanic rocks cropped out in the Coastal Range and the islets, Lutao and Lanyu islands of Taiwan were resulted from the South China Sea subducting into the Philippine Sea plate and exposing after arc-continent collision. The volcanic sequence, named as the Tuluanshan Formation, is composed of basaltic to andesitic lavas, pyroclastic breccias, tuffs and tuffaceous sediments. Based on the average volcanic territory of the northern Luzon arc, the near-vent volcanic lithofacies of field occurrences and geochemical characteristics, four volcanic bodies can be recognized in the Coastal Range. Although abundant geochemical data of volcanic rocks have been published previously, most of those samples were collected randomly and did not compare with each other sequentially.

In this study, more than eight continuously volcanic sequences were chosen to collect the samples systematically in the Coastal Range. Geochemically, they show the increasing of K₂O content and the LREE-enrichment and decreasing of ε Nd value from the older to the younger in all volcanic sequences of these four volcanoes. Meanwhile, the age data of Ar-Ar dating from the top of the volcanic sequences show that the ceased time of each volcanic body.

Comparing with these dating and geochemical data, an evolution model of the magma from the depleted mantle to the subducted sediments involved into the genesis of magma during the north Luzon arc approaching to the Asian continent can be recognized. The first stage was the primary magma with the similar characteristic of the depleted mantle. The second stage was less geochemical enrichment and fractional crystallization than the third stage. Crustal and source contamination occurred in these two stages caused by the assimilation and the arc-continental collision, respectively. Finally, the angles of subducted slab shifted and caused the most geochemical enrichment magmas in the last stage.