Paper Number: 3958

Reexamination of the radiometric ages of the Miocene forearc magmatism SW Japan

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In Middle Miocene Southwest Japan arc, intensive magmatism took place in the region closer to the Nankai trench than Quarternary volcanic front. Distribution of the igneous rocks is up to 800 km along arc, 150 km across arc directions, respectively. Origin of the magmatism is usually ascribed to the subduction of young hence hot Shikoku Basin of the Philippine Sea plate, because this episodic igneous activities were almost coeval with the initiation of the subduction of Shikoku Basin of the Philippine Sea plate, immediately after the opening of the Japan Sea and clockwise rotation of Southwest Japan.

The forearc igneous complexes were subdivided into three types depending on the distance from the trench[1] [2]. Closest to the Nankai trench, tholeiitic or alkaline basaltic igneous complexes with or without felsic intrusive rocks are distributed. These basaltic magmas were considered to be derived from on- or off-ridge volcanism of the subducting Shikoku Basin at the deceasing stage of the spreading[2][3]. To the north of these basaltic igneous complexes, voluminous felsic to intermediate volcano-plutonic igneous complexes are distributed (Outer Zone granitic rocks). These igneous complexes are mainly composed of S-type granitic plutons and volcano-plutonic complexes including large scale caldera bearing bodies with I-type granitic plutons. Generation of S-type felsic magmas of the Outer Zone granitic rocks can be explained by melting of sediment above the subducting hot Shikoku Basin slab, with possible additional heat source by the injection of mantle derived magma[4].
In the region farthest to the trench, mafic to felsic volcanic rocks (Setouchi volcanic rocks) are distributed. Setouchi volcanic rocks are characterized by the production of high-Mg andesite which can be equilibrated with mantle peridotite. High-Mg andesite magmas are considered to be formed by the reaction of slab melt with mantle wedge peridotite[5]. This assumption is reinforced by the coexistence of the dacite/rhyolite with high Sr/Y ratio and depleted HREE, which suggested the occurrence of slab melting beneath the Setouchi region[6] [7].

We have carried out reexamination of radiometric age of the forearc igneous rocks of Southwest Japan by zircon U-Pb dating using the LA-ICPMS, and was confirmed that the ages of Outer Zone granitic rocks and Setouchi volcanic rocks are well concentrated (15.5-13.5 Ma) and no obvious along arc variation of the magimatism is observed. Two contrasting hypothesis for the Middle Miocene Nankai margin have been proposed; triple junction of the Pacific-Philippine Sea-Eurasia plates migrated to the east during the Middle Miocene magmatism[8][9] or it was located to the east of the Southwest Japan arc during the magmatism[2]. Our data favour the latter hypothesis, because age of the magmatism related to the subduction of the Shikoku Basin does not show along arc polarity.

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