Geochemical characteristics of the peraluminous felsic igneous rocks in the Middle Miocene SW Japan

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We have determined whole rock major and trace element compositions of the Middle Miocene peraluminous felsic igeneous rocks of Southwest Japan Arc for the samples collected in Kii peninsula. Difference of rare earth elments patterns of the peraluminous felsic igneous rocks between Outer Zone of Southwest Japan and Setouchi Volcanic Belt suggests that the depth of the felsic magma production may be greater in Setouchi Volcanic Belt where was farther from trench.

Intense magmatism took place at the place close to trench in the Middle Miocene Southwest Japan, which was coeval with the opening of the Japan Sea. Igneous bodies formed by the igneous activities are usually divided into two; Acidic rocks in the Outer Zone of Southwest Japan (AROZSJ), and Setouchi Volcanic Rocks (SVR). AROZSJ are distributed to the south of the Median Tectonic Line, and composed of felsic to intermediate volcano-plutonic complexes. SVR are to the north of MTL, and consisting of high-Mg andesite, olivine tholeiite, and calc-alkaline andesite-dacite-rhyolite. Width of the igneous activities measured across-arc direction extends ca. 100 km in Kii peninsula.

Felsic igneous rocks with peraluminous bulk rock compositions are one of the major constituents of these igneous bodies; 'S-type' granitic rocks of the AROZSJ, and garnet-bearing rhyolites of the SVR.

We analyzed major and trace element compositions of the Middle Miocene felsic igneous rocks in the SW Japan arc in Kii peninsula (Nijyo-san, Muro pyroclastic deposit, Ohmine acidic rocks, and Kumano acidic rocks). Major and some trace elements compositions were analyzed on XRF and trace elements including rare earth elements (REE) were analyzed on LA-ICP-MS using glass beads. In this presentation, we will discuss on across arc variation of these peraluminous felsic igneous rocks.

Peraluminous felsic igneous rocks in the Outer Zone of Southwest Japan (southern part of the Ohmine acidic rocks, and Kumano acidic rocks) are rich in light REE, and have REE patterns with flat heavy REE and large negative Eu anomalies. On the contrary, rhyolites of the SVR (Nijyo-san) have the fractionated REE patterns with no or small negative Eu anomalies. Rhyolites of the SVR are richer in Sr and poorer in K and Rb than peraluminous felsic igneous rocks in the Outer Zone of Southwest Japan.

These characteristics of the trace element compositions of the rhyolites of SVR may be explained that they were formed via partial melting of the sedimentary rocks under relatively high pressure condition with garnett-bearing and depleted in plagioclase residue. It was suggested that the peraluminous felsic magmas in the Outer Zone of Southwest Japan was formed by partial melting of the sedimentary rocks under the pressure of 0.5 GPa (Murata, 1984), and 0.6-0.7 GPa (Shinjoe, 1997) Rhyolitic magmas of the SVR may be formed by partial melting under still higher pressure, that is, in the lower crustal level.

Muro pyroclastic flow deposit in the middle of the Kii peninsula was usually included in SVR, because it is distributed to the north of MTL. However, it is still unclear where is the source of the deposit. Shinjoe and Sumii (2000) suggested that it was derived from some 'S-type' felsic igneous body in the Outer Zone of Southwest Japan, based on the petrographic description and bulk rock major element compositions. Bulk rock REE compositions of Muro pyroclastic flow deposit also resemble those of the 'S-type' felsic igneous rocks in the Outer Zone of Southwest Japan, which support the argument of Shinjoe and Sumii (2000).