Article

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Temporal Variation for Magmatic Chemistry of the Sakurajima Volcano and Aira Caldera Region, Southern Kyushu, Southwest Japan since 61 ka and Its Implications for the Evolution of Magma Chamber System

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The temporal variation of magmatic chemistry and the evolution of magma chamber system of the Sakurajima volcano and Aira caldera region since 61 ka are studied based on the whole-rock major element, incompatible trace element and rare earth element chemistry of the eruptive products. The magmas of the Sakurajima volcano and Aira caldera region since 61 ka consist of four groups: (1) basaltic to basaltic andesitic magma of the mantle origin, (2) rhyolitic to high silica rhyolitic magma of the crustal origin, (3) dacitic magma and (4) andesitic magma produced by magma mixing of the mafic magma of mantle origin and the crustal felsic magma. Around 61 to 60 ka, basaltic to basaltic andesitic, andesitic and rhyolitic magmas were active in the Aira caldera region, and the Shikine andesite and the Iwato pyroclastic flow deposit were erupted. After a dormant period of about twenty-four thousands of years, the rhyolitic magmatism resumed and the voluminous high silica rhyolitic magma erupted at 29 ka to form the large-scale Osumi pumice fall and Ito pyroclastic flow deposits. The felsic magma produced the Iwato pyroclastic flow deposit and the Osumi pumice fall and Ito pyroclastic flow deposits were similar in composition; the latter high silica rhyolite can be derived from the former rhyolite by crystallization differentiation. The rhyolitic to high silica rhyolitic magma chamber system was stable and long-lived with duration of about thirty thousands of years. The magmatic activity of the Sakurajima volcano began at 26 ka after a quiescent period of about three thousands of years. The Moeshima rhyolitic magma discharged at 13.8 ka in the Aira caldera constitute another magma chamber system different from that of the Sakurajima volcano. The magma chamber system of the Sakurajima volcano was composed of the low Ti-P type and high Ti-P type dacitic and andesitic magmas. The magma chamber system of the low Ti-P type, which was active from about 14 to 4 ka, comprises at least the three sub-systems based on the whole-rock chemistry, while that of the historical eruption since 8^{th} C is restricted to the high Ti-P type and consists of the three sub-systems, the youngest of which has been active since the subaqueous An-ei eruption at 1779AD. The duration of the activity of each magma chamber sub-system of the Sakurajima volcano is rather short, the time span of which is thousands to several hundreds of years.

Key words: Sakurajima volcano, Aira caldera, felsic magma, magmatic chemistry, magma chamber

1. Introduction

The Sakurajima volcano in southern Kyushu is one of the representative active dacitic to andesitic volcanoes in the late Quaternary Japanese islands, which is constructed on the southern margin of the large-scale Aira caldera with a dimension of 24 × 20 km. The eruption of the Sakurajima volcano is now continuing from the Showa crater at the upper slope of the eastern flank of the volcano. The magma of the Sakurajima volcano is estimated to be being fed from the magma chamber beneath the Aira caldera, to

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