

VOLCANIC ACTIVITY OF THE SATSUMA-IWOJIMA VOLCANO IN RECENT 6500 YEARS

Yoshihisa Kawanabe and Genji Saito
Geological Survey of Japan. email: yagi@gsj.go.jp

Satsuma-Iwojima is small volcanic island located in the south of Kyusyu Island, western Japan and is, along with Takeshima island, located in the northern rim of the submarine Kikai Caldera and famous for its active high temperature fumaroles (Shinohara et al., 1993). The geology and eruptive history of Satsuma-Iwojima volcano is well described by One et al. (1982) and shown in the Geological map published by Geological Survey of Japan. New outcrops observation and new ¹⁴C dating data shows more detailed eruptive history of the volcano in recent 6300 years. In this paper, we describe these new descriptions of eruptive history on the Satsuma-Iwojima volcano.

The Kikai caldera was formed at least three large scale eruptions with pyroclastic flow (erupted volume >100km³). The rim of Kikai caldera is running in the Satsuma-Iwojima island and forms a steep cliff from southwest to northeast. Most recent major eruption that erupted Takeshima pfl. dated about 6300 y.B.P. (Ono et al., 1982).

The products of the last caldera forming eruption of the Kikai caldera are Funakura pumice fall deposit, Funakura pyroclastic flow deposit and large Takeshima pfl. successively (Ono et al., 1982), but the Funakura pfl. are not distributed in Satsuma-Iwojima. The main facies of the Takeshima pfl. are rhyolitic pumice flow deposit. This pyroclastic flow deposit is non welded and contains white vesiculated pumice and have from several to 30m or more thick. The Akahoya tephra, orange colored fine ash that covers though western to central Japan, is a coignimbrite ash of the Takeshima pfl.. Very near part of the caldera rim, there is matrix depleted facies with a lot of accessory rocks. Same pumice that contained in the main facies of the Takeshima pfl. is found in the matrix. In the eastern sea cliff of Heikenojo, it can be seen that this facies covers the main facies of the Takeshima pfl. This facies is maybe the near vent facies of the large scale eruption.

After the Takeshima pfl. eruption and caldera formation, two post caldera cones, Iwodake and Inamuradake, were made in south of the caldera rim and pyroclastics began to deposit the whole area of Satsuma-Iwojima. We named this tephra layers as Kikai-Sakamoto tephra (K-Sk tephra). The pyroclastics mainly consists of fine ash with small amount of rhyolitic pumice from Iwodake and basaltic scoria from Inamuradake:

K-Sk tephra can be broadly divided into eight units by black to brown colored humic soil layers which suggest inactive eruptive period. These units are named K-Sk-1 to K-Sk-8 from lower to upper. Although the thickness of each pyroclastic units can change, each units can be traced almost all the area of Satsuma-Iwojima volcano. Most of these units

contain fine rhyolitic ash and pumice, except K-Sk-3 and -4 which have basaltic scoria layers.

Several tephra layers can be observed on the slope of Iwodake (Kikai-Iwodake tephra; K-Iw tephra). This tephra distributed only at relatively gently inclined slopes and facies changes frequently, thus it is difficult to correlate between K-Iw and K-Sk. At the western area of the summit of Iwodake, thick(6m+) partially welded pumice bed(K-Iw-P1) is developed. K-Iw-P1 is covered by surge deposit(K-Iw-S1) and pumice flow which contain obsidian fragment and breadcrust bomb(K-Iw-P2). The same obsidian is contained pyroclastic flow and breadcrust bomb are distributed in the western slope and foot of Iwodake.

Nine samples from K-Sk and K-Iw tephra were dated by ^{14}C dating method. Soil sample below K-Sk-3, first basaltic eruption after Takeshima pfl., shows 3890 ± 40 y.B.P. Thus, the eruption of Inamuradake began at about 3900 years ago. Charcoal sample collected between K-Sk-4 and K-Sk-5 covered by explosion breccia shows 2210 ± 40 y.B.P.. This suggests that rhyolitic Iwodake eruption resumed at about 2200 years ago with explosive eruption. Upper soil and charcoal of K-Sk-6 show the age of about 920-940 y.B.P.. Considering that silicified ash appear in K-Sk-7 and dominant in K-Sk-8, intense fumarolic activity as now began about 1000 years ago.

Sample from K-Iw-P1 shows 1130 ± 40 y.B.P.. Three charcoal samples from K-Iw-P2 distributed in three different outcrops are 610-500 y.B.P.. Formerly, the last magmatic eruption of Iwodake was thought to be 1100 years ago by Ono et al.(1982), but it is revealed that magmatic eruption lasted until 13 to 14 centuries, however, there are no known historical records of the eruption at that time.

REFERENCES

- Matsumoto T., The four gigantic caldera volcanoes of Kyusyu, Jap. Jour. Geol. Geogr., 19, sp.no., 57p., 1943
- Ono K., T. Soya and T. Hosono, Geology of the Satsuma-Iwojima district, Quadrangle series, scale 1:50000, Geol. Surv. Japan, 80p. (in Japanese with English abstract), 1982.
- Shinohara H., W.F. Giggenbach, K. Kazahaya and J.W.Hedenquist, Geochemistry of volcanic gases and hot springs of Satsuma-Iwojima, Japan, Following Matsuo, Geochem. Jour., 27, 271-285, 1993