

4. Miyake Island

Miyake Island is situated 34.1° N, 139.5° E, at 200km south of Tokyo and about 75km south of Oshima. The round island is about 8km in diameter with an area of 55km² and the summit "Oyama" is 815m above sea level.

The island is inhabited by 4,300 people in five villages, Tsubota, Ako, Igaya, Izu and Kamitsuki. Boat accesses are at Ako and Miike according to wind direction, and the airport is at Tsubota.

Ohnoharajima island is at 8km west of Miyake Island consisting of 3 major rocks and 3 small reef rocks, and these dissected remnants of a dacite volcano has long been used as the bombing and fire arms targets of the US military.

Isshiki(1960) examined the geology of this volcanic island and published a 1/50000 geological map. Soon after the publication an eruption took place in 1962 and then in 1983, and the areas of these eruptions need to be modified on the map.

Miyake Island consists of a strato-volcano cone truncated by a 3km depression caldera, and the eastern half of the caldera is covered by a later strato-volcano, Hayonotairo volcano. There is a 1.5km diameter caldera on the top of the Hayonotairo volcano in which there is a central cone Oyama.

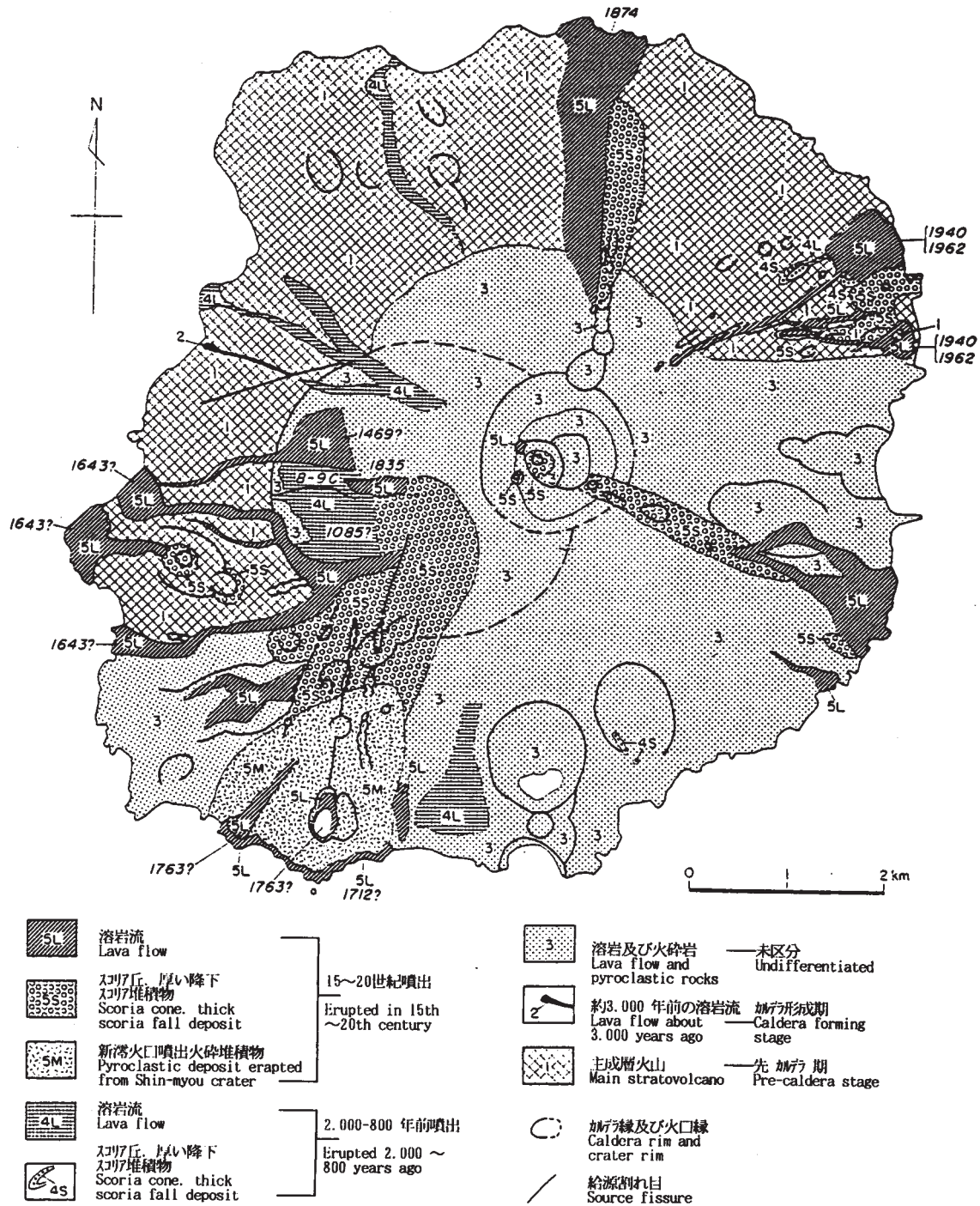
Older ejecta of the major strato-volcano is exposed at 30~80m sea cliffs on the north and north-western coasts. At the north of Igaya village there are exposed older ejecta beds containing occasional diorite and altered volcanics derived from basement formations.

3,000 year old Jomon-pottery cultural remains at Izu village were immediately covered by a thick single cycle lapilli and pisolite air fall bed. Isshiki(1960,1984) interpreted this 3,000 year old eruption to have occurred at the summit crater and it effused more than 0.2km³ of material, and that after the large scale eruption the 3km caldera depression may have taken place.

Over this sequence and between the 2,000 year old horizon, represented by Yayoi-pottery cultural remains, there are only a few air fall tephra beds. But in the next 1,200 years, until the twelfth century tephra, 11-12 eruption cycles are recognised in the tephra sequence.

図 4-1 1983 年の噴火以前の三宅島火山地質概念図

Figure 4-1 Geological sketch map of Miyakejima volcano (before the 1983 eruption)



一色 (1960, 1977, 1984), Issiki (1964) 及び一色 (未公表資料) による。
Compiled from Issiki (1960, 1964, 1977, 1984; unpublished data)

An eminent white rhyolitic pumice bed derived from the Kohzushima 838 AD or the Niishima 886 AD eruption is easily traceable among dark Miyake Island tephra and useful as a time marker.

Seventeen eruptions have been recorded in the history of Miyake Island, which was recently studied by Miyazaki (1984) and the summary is shown in Table 4-1.

The 1154 AD eruption was on a considerably large scale judging from corresponding tephra layers, and there was a 315 year period of quiescence until the next eruption in 1496 AD. It is likely that the depression of the Oyama caldera occurred immediately after the 1154 eruption.

From the 1496 eruption onwards, the mode of eruption changed to flank eruptions which occur frequently every 20 to 60 years. The recent four eruptions occurred in 1874, 1940, 1962 and 1983, and the effused eruption materials have been estimated at 1.6, 1.9, 0.9 and 1.3×10^7 tons, respectively, with intervals of 66, 22 and 21 years. Severe swarm earthquake activity accompanied these eruptions with the exception of the 1874 event.

There are four large maar type craters on the south to east coasts. From the west, they are Shinmyo, Furumyo, Mizutamari (or Yaema) and Miike. Shinmyo crater was 400×300 m and surrounded by steep walls and filled with water, this was formed at the 1763 eruption and is said to have been active for seven years. Shinmyo crater reactivated in an eruption in 1983 and half buried with new ejecta. Furumyo is a 1 km diameter crater, the southern half of its bottom being Tairoike lake, 500×300 m in size. 2000 year old Yayoi-pottery cultural remains were found underneath the ejecta from Furumyo and this crater is known to be 2000 years old. Mizutamari crater immediately east of Furumyo is a 1×0.6 km oval shape, and is also called Yaema. The crater today is not filled with water, but the name Mizutamari means "pool". The crater is buried by Furumyo ejecta and thus it is older than the latter, but probably formed just before, because of the similar states of preservation. Miike on the east coast is some 400 m in diameter and looks much older. The sand beach at the eastern front of this crater is called Miike-hama where the sand contains brownish-yellow olivine crystals, 3-5 mm in size.

The 1983 eruption started on the south-western flank at an altitude of about 450 m and soon the crater chain extended both above and below, to between 505 m and 350 m. One and a half hours later crater chains opened at the sea coast including Shinmyo crater and the whole of the crater chain reached a length of 4.5 km. A fierce eruption phase lasted ten hours and then gradually died out to cease at about fifteen hours after

commencement. Magma-steam explosions at coastal craters caused an 8cm ash fall at Tsubota, situated 4km to the east. Lava flowed down from the flank craters covering a large part of Ako village and 432 houses were burnt or buried, but fortunately no one was hurt.

An A-3 rift cave at a height of 500m and B-5 and B-9 rift caves at about 480m in height can be inspected internally. These caves are formed orifices of the dike form magma vent, after magma level dropped at the final stage of the eruption.

References

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Table 4-1 Eruption History of Miyake Island After Miyazaki(1984)

5th Century(Ko-an21)	Eruption
1085(Ohtoku 2)	Eruption
1154(Kuju 1)	Eruption
1496(Ohnin 3)	Eruption
1535(Tembun 4)	Eruption
1595(Bunroku 4)	Eruption
1643(Kan-ei 20)	A flank eruption caused Ako village to burn down completely.
1712(Shotoku 1)	Eruption started at Kuwakidaira and then a great smoke column rose at the beach. Lava flowed out 200m offshore and a few hundred metres north-west. Many houses of Ako village were buried by mudflow. The eruption ended in two weeks.
1763(Hohreki 13)	Summit eruption started in the night, and the next day an eruption occurred at Usuki near Ako village. Thick scoria and lapilli was deposited on Ako and Tsubota villages, ash also fell on the other villages. The crater at Usuki was immeasurably deep.
1777(An-ei 6)	Eruption at Oyama.
1781 or 1782(Tenmei Era)	Strombolian activity at summit crater.
1811(Bunka 8)	Fierce summit eruption made the night as light as day, ceased in six hours.
1835(Tempo 6)	At the western flank, eruption began at Nagane in Igaya village when a crater opened at the former Nakayama-kannon on Kasajiyama. Also from a high place on Toga Hirabeyama to the Tsubota road 13 craters opened up and erupted. Hot water sprung out at Yuba, Ako.
1874(Meiji 7)	Summit fire was seen at night from Niijima and the next noon an old crater at Ikenosawa on the upper northern flank started to erupt. Large and small stones were ejected with a fierce noise. Two hours later 6 other craters appeared suddenly and effused lava flows. More than 30 houses in Higashigo village were demolished. Eruption stopped in four days. Total ejecta was estimated at $1.6 \times 10^6 \text{m}^3$ (Issiki 1960) and the ejecta contained large anorthite crystals described by Kikuchi(1889).
1940(Showa 15)	Eruption started at the north-eastern flank 200m above sea level, then craters opened at 450m and at Akabakkyo shore. Lava flowed down and several cindercones were built. This phase ceased in 30 hours then summit

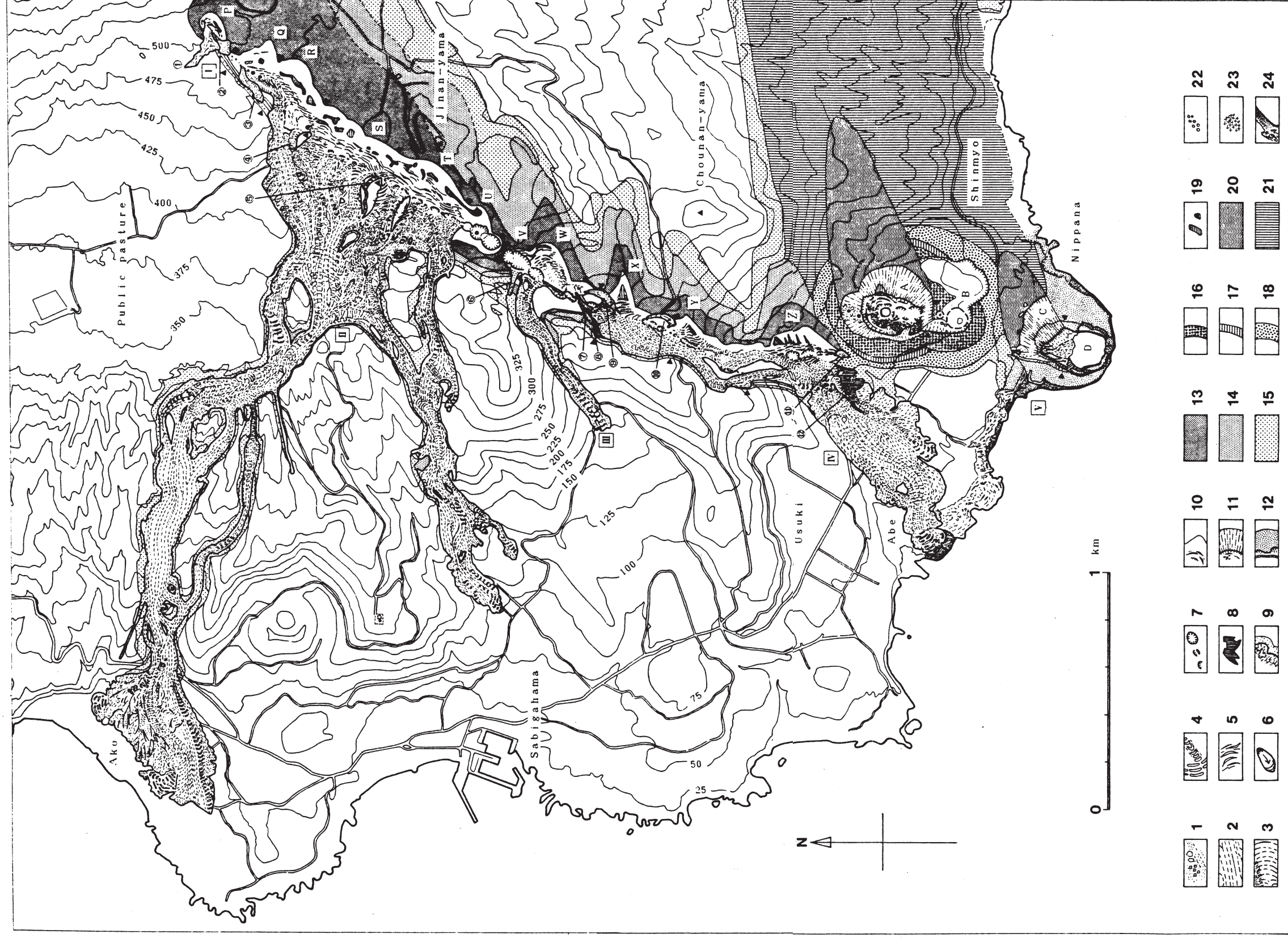


Fig. 4-2 Geological and hazard map of the 1983 Miyake-jima Eruption based mainly on the photo-interpretation. (Coastline around the Shinmyo area is that of Oct. 7.) (after Irido et al.)

1-9: micro-topography of lava flow
 10-12: type of cone

13-15: grade in damage for vegetation around spatter cones
 16-18: grade in damage for vegetation around explosion craters
 20-21: grade in damage for vegetation by scoria or ash fall

1: blocky lava, 2: flow lamination on lava surface, 3: extension crack on lava surface, 4: pressure ridge, 5: open cracks and graben-like depression along spatter rampart and cone, 6: landslide of lava, 7: explosion or pit crater, 8: rootless spatter cone, 9: marginal features of lava and damaged tree zone, 10: spatter cone, 11: scoria cone, 12: tuff cone, 13: zone of downed tree whose foot was burnt by spatter or scoria fall, 14: zone of stripped tree by spatter or scoria fall, 15: zone of leafless tree by spatter or scoria fall, 16: zone covered by breccia, 17: zone of damaged tree by breccia fall and fire scorching, 18: zone of damaged tree by breccia, 19: summit of cone with sublimate, 20: stripped tree zone covered by heavy scoria fall, 21: zone of tree coated with muddy ash, 22: secondary scoria mound, 23: spatter or dribble covering explosion crater, 24: coast. P-Z, A-D: name of grouped cones (rampart) or craters, those boundaries are shown by a pair of solid triangle. I-V: lava flow. 1-12: minor lava flow, secondary flow or rootless spatter cone.

eruption began and lasted for 23 days. Total ejecta was estimated at $1.9 \times 10^7 \text{ m}^3$ (Tsuya 1941). This eruption killed 11.

1962 (Showa 37) Eruption occurred at the north-eastern flank 200m above sea level close to the site of the 1940 eruption, meanwhile chain craters opened above and below the initial one and ejected fire columns in chain. About an hour later effusion activity weakened at the high level craters, but lower level craters were active for 30 hours. Total ejecta was estimated at $0.9 \times 10^7 \text{ m}^3$ by Suwa (1963)

1983 (Showa 58) Eruption started at Futaoyama on the south-western flank, then a chain of craters opened up above and below and effused lava. 432 houses of Ako village were demolished by the lava flow. Fierce magma-steam explosions occurred at Shinmyo crater and off Shinbana beach. Activity ceased in 15 hours. Ejecta total was estimated at $1.3 \times 10^7 \text{ m}^3$