# 62. Miyakejima

**Continuously Monitored by JMA**

Latitude: 34°05'37" N, Longitude: 139°31'34" E, Elevation: 775 m (Oyama) (Elevation Point)

Overview of Miyakejima taken from southeast side on January 29, 2010 by the Japan Meteorological Agency

## Summary

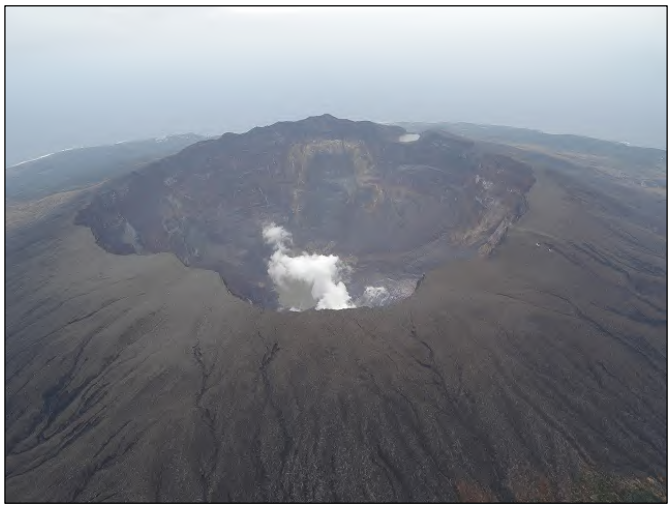
This is a basalt - andesite stratovolcano of a largely circular island with a diameter of 9 km. A caldera with a diameter of approximately 3.5 km is located at its center. A caldera with a diameter of 1.6 km, formed by an eruption in 2000, is located inside it. In addition to the summit crater, many parasitic cones also sit on the past eruption fissures, as well as many maars (Tairoike, etc.) formed by phreatomagmatic explosions near the coast. The $SiO_2$ content of basalt - andesite is between 49.9 and 55.2 wt %.

In the last 500 years 13 eruptions have occurred, separated by 17 to 69 years. Each eruption produced between roughly 20 and 30 million tons of ejecta. Activity within recorded history has consisted of short term eruptions from the eruption fissures which extend from the summit area to the north to east-southeast and to the west to south-southwest, with occasional summit eruptions. In addition to scoria and lava flow emissions, fissure vents near the coast have caused explosive phreatomagmatic eruptions (such as the 1983 eruption).

Eruptions were preceded and followed by earthquake swarm, but the area of earthquake activity did not always overlap with the eruption sites. During the 2000 eruption, earthquake activity began beneath the island and migrated to the sea to the west, culminating in a submarine eruption. Earthquake activity then began directly below the summit, resulted in a summit eruption which formed a new caldera. The year before the 1983 eruption earthquake swarms occurred in the sea to the south, and earthquake activity began one

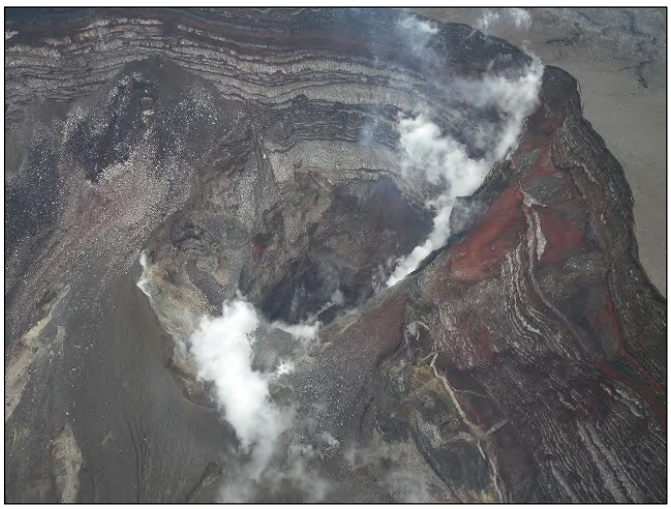
and a half hours before the eruption. Post-eruption earthquakes have felt frequently in several past eruptions, such as in 1962. In the eruptive activity which began in June, 2000. A large amount of volcanic gas containing a high concentration of sulfur dioxide was emitted, and all island residents were forced to evacuate the island. On February 1, 2005, the evacuation order was lifted for the first time in 4 years and 5 months, but even now occasionally high concentrations of sulfur dioxide are observed at the foot of the volcano.

## Photos



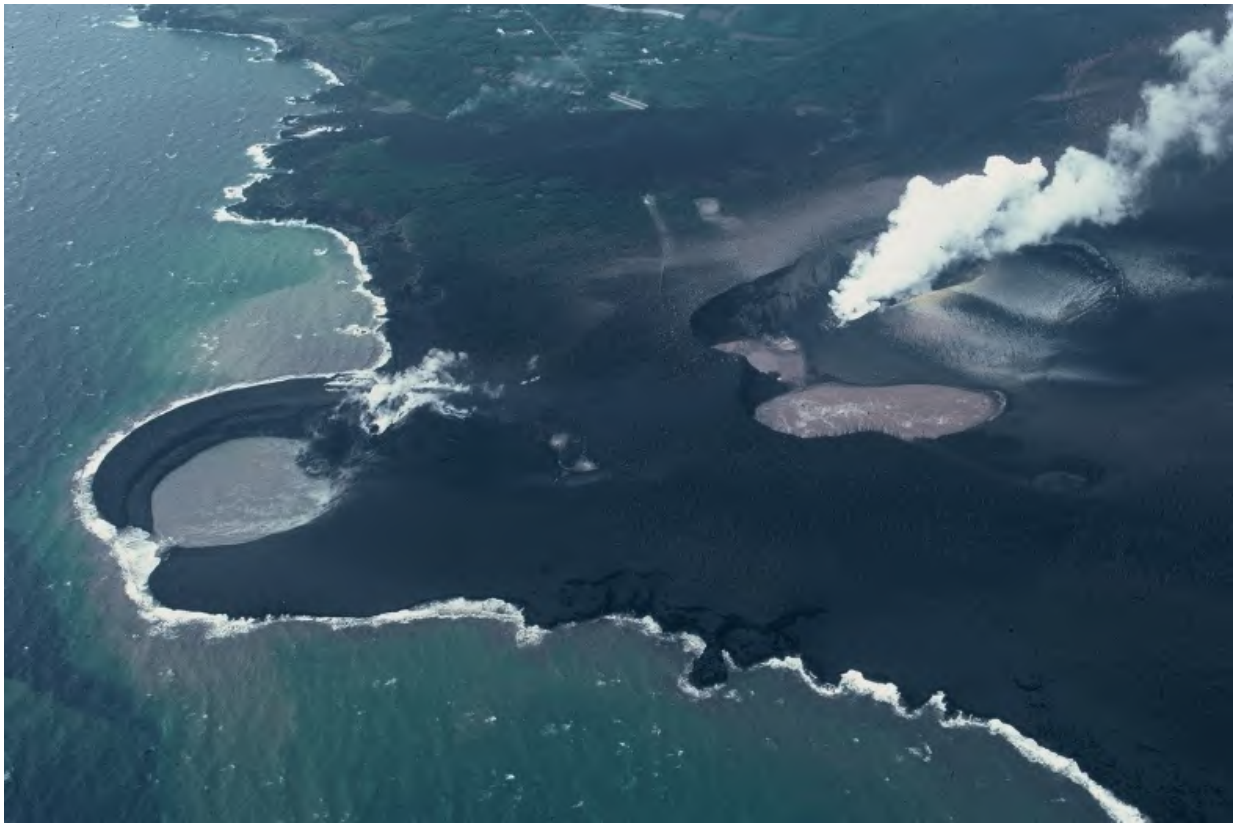
Summit - Aerial taken from south side on March 7, 2012 by the Japan Meteorological Agency

Summit Crater taken from north side on March 7, 2012 by the Japan Meteorological Agency



Main Pit taken from northwest side on March 7, 2012 by the Japan Meteorological Agency

1983 eruption on October 3. Courtesy of the Japan Maritime Self-Defense Force - Lava fountain at approximately 25 minutes after the start of the eruption.



Nippana Tuff Ring and Shinmyoike - just after the 1983 Eruption on October 4. Courtesy of Osamu Ooshima.

## Red Relief Image Map

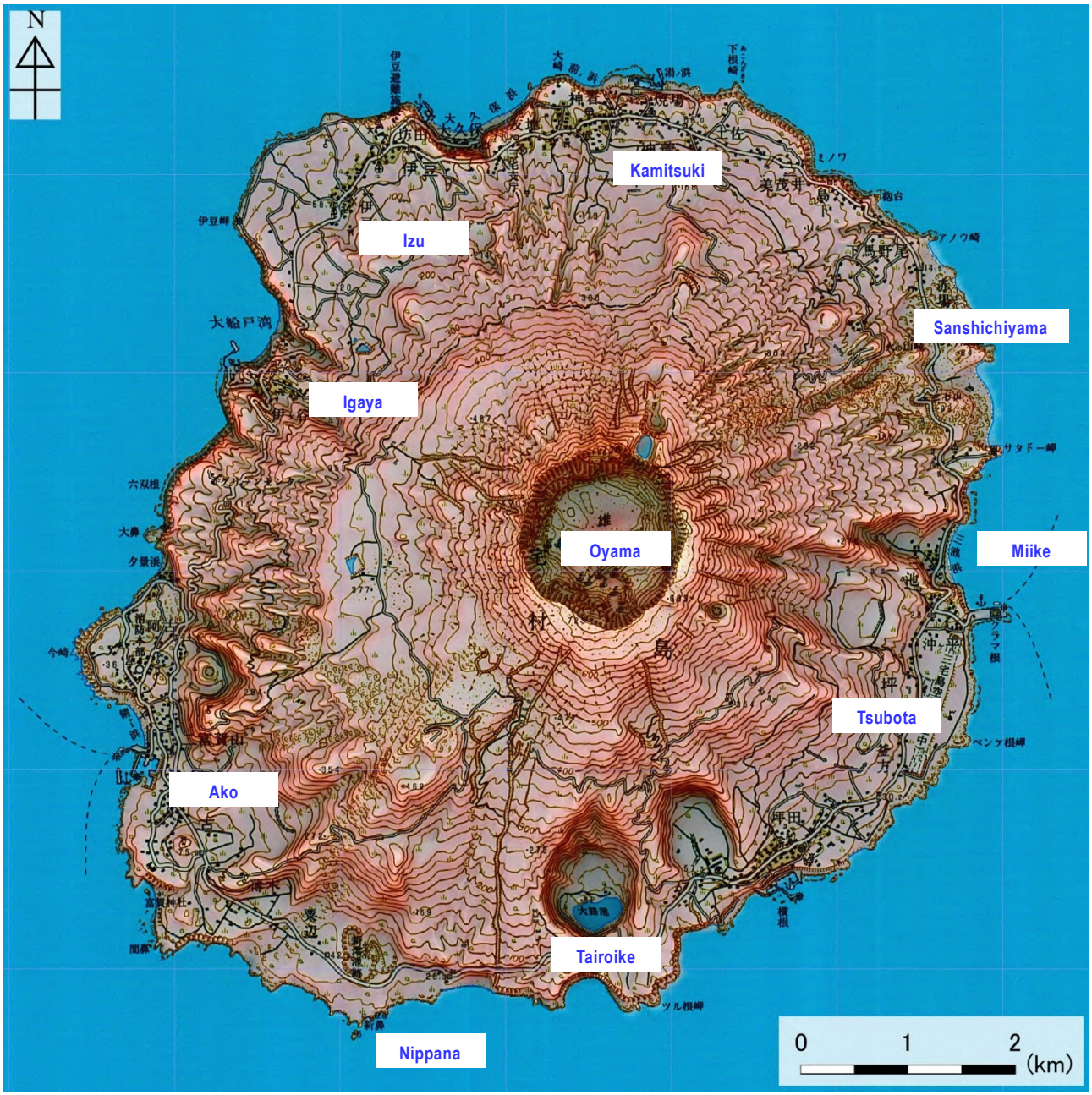



Figure 62-1 Topography of Miyakejima.

1:50,000 scale topographic map (Miyakejima) and digital map 50m grid (elevation) published by the Geospatial Information Authority of Japan were used.

## Submarine Topographic Map

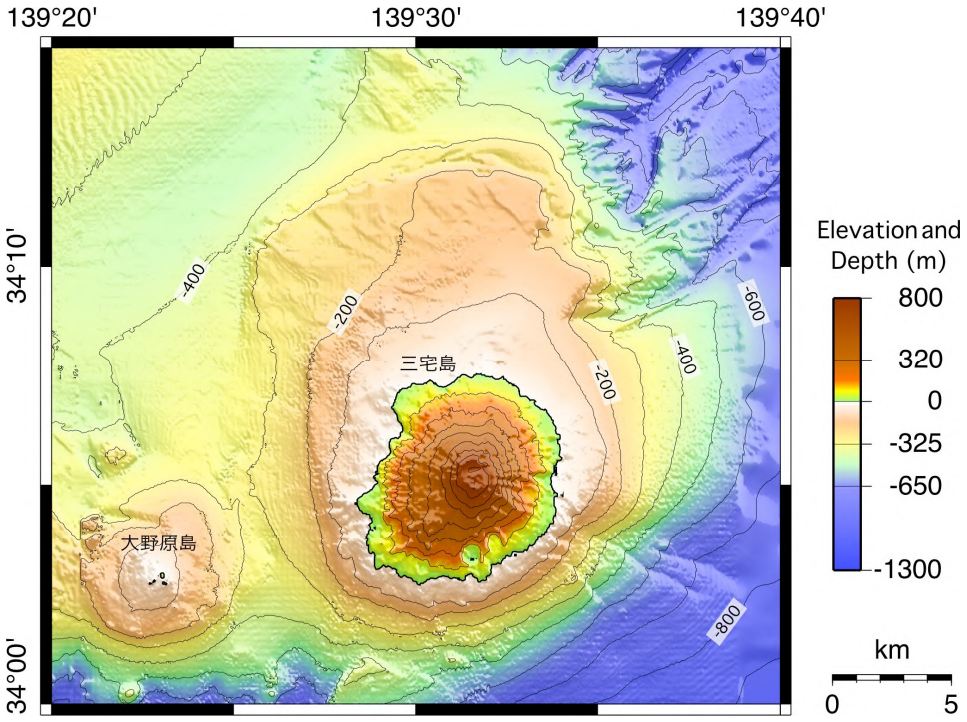



Figure 62-2 Submarine topographic map of the Miyakejima area (Japan Coast Guard).

## Geological Map

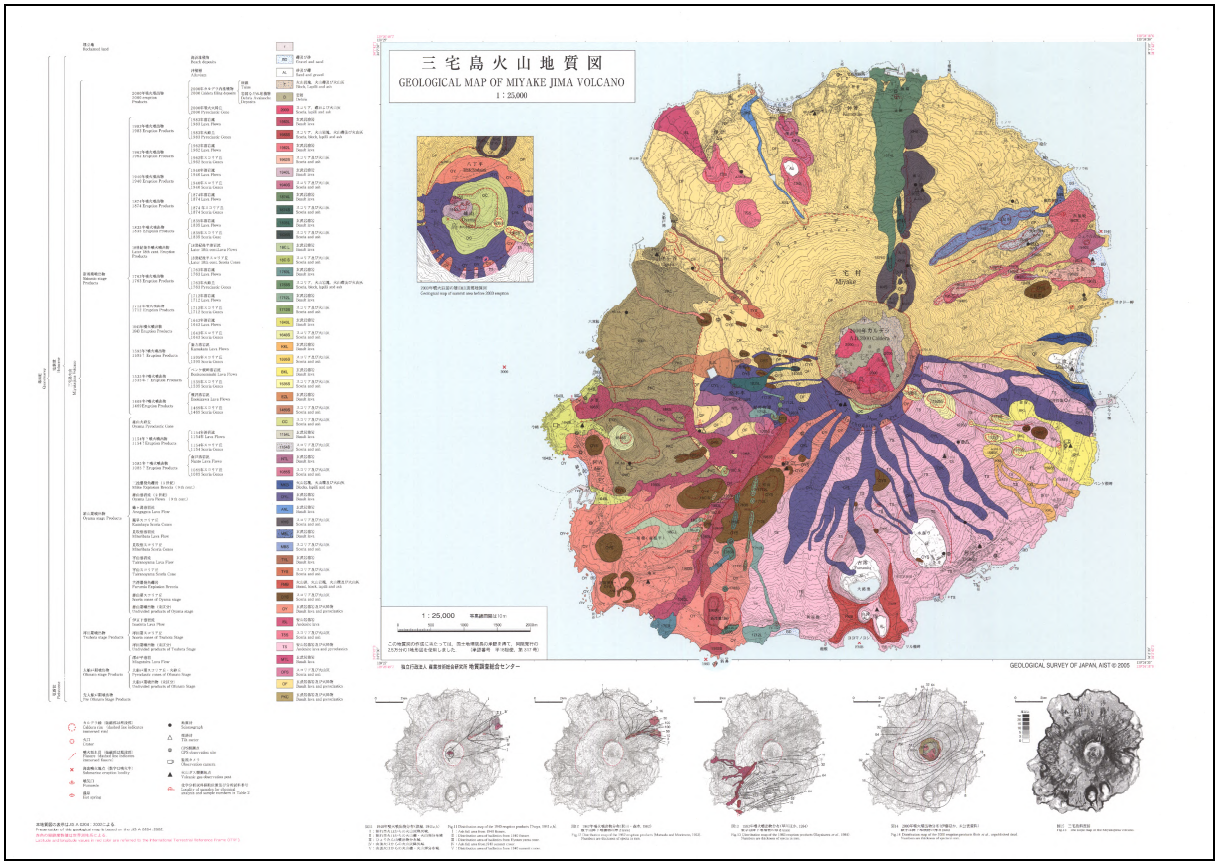



Figure 62-3 Geological map of Miyakejima (Tsukui et al., 2005).

## Chronology of Eruptions

### ・Volcanic Activity in the Past 10,000 Years

Of the activity over the past 10,000 years, deposit exposure conditions are good for the eruptions of approximately the last 7,000 years. Between approximately 4,000 and 7,000 years ago, little eruptive activity occurred, and there were no prominent deposits. Between 2,500 and 4,000 years ago, it is believed that a volcanic edifice was formed in the Kuwanokitaira caldera, which itself was formed over 10,000 years ago, but deposits have only been confirmed in the south and northwest of the island. Approximately 2,500 years ago the largest eruption in the past 10,000 years, the Hatchodaira eruption, occurred, forming the Hatchodaira caldera in the center of the island. After this eruption, other eruptions filled in the Hatchodaira caldera by the mid-12$^{th}$ century, forming the present Oyama, as well as emissions of scoria and lava. Following this, no eruptions occurred for approximately 300 years, until the latter half of the 15$^{th}$ century. Between the eruption of 1469 and 1983, 12 flank fissure eruptions occurred.

In the eruptive activity which began in June, 2000, a summit eruption occurred, forming a caldera in roughly the same location as the Hatchodaira caldera, formed approximately 2,500 years ago (Tsukui et al., 2001).

| Period | Area of Activity | Eruption Type | Main Phenomena / Volume of Magma |
|---|---|---|---|
| Before 9ka? | Northern mountain slope (Myogataira crater) | Magmatic eruption | Tephra fall, lava flow. |
| 9←→7.8ka | Ofunato Bay | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.15 km$^3$ DRE. (VEI 4) |
| 5.3←→4.4ka | Northwestern mountain slope | Magmatic eruption, phreatomagmatic eruption | Tephra fall, lava flow.<br>Magma eruption volume = 0.09 km$^3$ DRE. (VEI 4) |
| 4.1←→3.9ka | Scoria cone at southeastern edge of reservoir in east of Igaya | Magmatic eruption | Tephra fall.<br>Magma eruption volume = 0.01 km$^3$ DRE. (VEI 3) |
| 3.8←→3.7ka | Mizutamari maar | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.062 km$^3$ DRE. (VEI 3) |
| 3.2ka | Parasitic crater at southeastern flank | Magmatic eruption | Tephra fall.<br>Magma eruption volume = 0.009 km$^3$ DRE. (VEI 3) |
| 4.1←→2.7ka | Northwestern mountain slope | Magmatic eruption | Tephra fall. |
| 3.1←→2.7ka | Inside of Kuwanokitaira caldera to fissure crater on southern foot of volcano | Magmatic eruption → phreatomagmatic eruption → (lahar production) → phreatomagmatic eruption | Hatchodaira eruption: Tephra fall → lahar → tephra fall.<br>Magma eruption volume = 0.37 km$^3$ DRE. (VEI 4) |
| 3.1←→2ka | Summit crater | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.05 km$^3$ DRE. (VEI 3) |
| 2.1←→2ka | Northwestern mountain slope eruption fissure | Magmatic eruption | Tephra fall, lava flow.<br>Magma eruption volume = 0.021 km$^3$ DRE. (VEI 3) |
| 2.1←→1.29ka | Northwestern mountain slope | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.01 km$^3$ DRE. (VEI 3) |
| 2.1←→1.29ka | Southwestern volcano foot (near Toga) | Magmatic eruption | Tephra fall. |
| 2.1←→1.29ka | Western flank crater and summit crater | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.045 km$^3$ DRE. (VEI 4) |
| 2.1←→1.162ka | Flank crater near Togahama | Magmatic eruption | Lava flow.<br>Magma eruption volume = 0.0001 km$^3$ DRE. |
| 2.1←→1.162ka | Near coast near Kamane bus stop | Phreatomagmatic eruption | Tephra fall.<br>Magma eruption volume = 0.01 km$^3$ DRE. (VEI 3) |
| 2.1←→1.162ka | North-northwestern mountain slope | Magmatic eruption | Lava flow.<br>Magma eruption volume = 0.001 km$^3$ DRE. |
| 1.5←→1.4ka | Eastern flank crater | Magmatic eruption | Tephra fall.<br>Magma eruption volume = 0.01 km$^3$ DRE. (VEI 3) |
| 1.3←→1.2ka | Northeastern mountain slope fissure crater | Magmatic eruption | Tephra fall, lava flow.<br>Magma eruption volume = 0.007 km$^3$ DRE. (VEI 3) |

* Volcanic periods, areas of activity, and eruption types taken from the Active Volcano Database of Japan, AIST (Kudo and Hoshizumi, 2006 ). All years are noted in Western date notation. "ka" within the table indicates "1000 years ago", with the year 2000 set as 0 ka.

A←→B: Eruption events taking place at some point between year A and year B

## ・Historical Activity

| Year | Phenomenon | Activity Sequence, Damages, etc. |
|---|---|---|
| 832 (Tencho 9) | Moderate: Phreatomagmatic eruption | June 23. Air-fall pyroclastic material. The eruption occurred on the northern slope crater chain.<br>Magma eruption volume = 0.007 km$^3$ DRE. (VEI 3) |
| 850 (Kasho 3) | Large: Magmatic eruption → phreatomagmatic eruption | October 7. Lava flow → air-fall pyroclastic material. The eruption occurred in the Hatchodaira caldera and at the Miike maar.<br>Magma eruption volume = 0.082 km$^3$ DRE. (VEI 4) |
| 886 ←→ 1154 | Moderate: Magmatic eruption | Air-fall pyroclastic material. The eruption occurred at on the southwestern slope (southeastern Ako).<br>Magma eruption volume = 0.012 km$^3$ DRE. (VEI 3) |
| 1085 (Otoku 2) | Moderate: Magmatic eruption | Air-fall pyroclastic material and lava flow. The eruption occurred on the southwestern slope (inside the Kuwanokitaira caldera).<br>Magma eruption volume = 0.001 km$^3$ DRE. |
| 1154 (Kyūju 1) | Moderate: Magmatic eruption | November. Air-fall pyroclastic material and lava flow. The eruption occurred at the central crater (Oyama) and the northeastern foot of the volcano (eruption fissure from Hinoyama Pass to near Shitori shrine).<br>Magma eruption volume = 0.05 km$^3$ DRE. (VEI 3) |
| 1469(Bunmei 1) | Moderate: Magmatic eruption | December 24. Air-fall pyroclastic material and lava flow. The eruption occurred on the western slope (from the water reservoir area near the west of the Kuwanokitaira caldera).<br>Magma eruption volume = 0.002 km$^3$ DRE. |
| 1535 (Tenbun 4) | Moderate: Magmatic eruption | March. Air-fall pyroclastic material and lava flow. The eruption occurred between the summit and the southeastern volcano foot. Fissure eruption.<br>Magma eruption volume = 0.003 km$^3$ DRE. |
| 1595 (Bunroku 4) | Moderate: Magmatic eruption | November 22. Air-fall pyroclastic material and lava flow. The eruption occurred at the southeastern volcano foot. Fissure eruption.<br>Magma eruption volume = 0.001 km$^3$ DRE. |
| 1643 (Kan'ei 20) | Moderate: Magmatic eruption | Approximately 3 weeks from March 31. Air-fall pyroclastic material and lava flow. The eruption occurred on the western slope (from the Koshiki scoria cone to the Kuwanokitaira eruption fissure).<br>A felt-earthquake at 18:00 on March 31, and an eruption at 20:00, ejecting lava which flowed approximately 1km to the sea. The entire village of Ako (which was located in a different location from the present Ako) was buried or burned down. The former Tsubota was downwind, so a large amount of volcanic ash and incandescent lapilli fall buried houses and fields. No injuries or fatalities resulted..The eruption lasted approximately 3 weeks.<br>Magma eruption volume = 0.012 km$^3$ DRE. (VEI 3) |
| 1712 (Shotoku 1) | Moderate: Magmatic eruption | Approximately 2 weeks, starting February 4. Air-fall pyroclastic material and lava flow. The eruption occurred at the south-southwestern volcano foot. Fissure eruption.<br>Felt-earthquakes frequently from approximately 18:00 on Feb. 4. An eruption on the volcano slope (?) was observed at approximately 20:00. Lava discharged from Kuwanokitaira reached the sea (near Nippana?). Muddy water buried many houses and caused livestock damage at Ako. The sound of the eruption could be heard at Kamakura. The eruption began waning after approximately 2 weeks, and ceased in the following year.<br>Magma eruption volume = 0.001 km$^3$ DRE. |
| 1763 to 1769 (Horeki 13 to Meiwa 6) | Large: Magmatic eruption, phreatomagmatic eruption | The eruption began on August 17. Air-fall pyroclastic material and lava flow. The eruption occurred at the south-southwestern volcano foot. Fissure and summit eruptions.<br>The eruption began at night at the summit of Oyama, with rumbling and earthquakes the following day. During this time, an eruption occurred at Usugi, Ako. Volcanic blocks and ash fell in both Ako and Tsubota. A deep crater formed in Usugi, retaining water (Shinmyoike Pond?). Volcanic activity continued until 1769 (Meiwa 6).<br>Magma eruption volume = 0.066 km$^3$ DRE. (VEI 4) |
| 1811 (Bunka 8) | Moderate: Magmatic eruption | Approximately 1 week, beginning on January 27. Air-fall pyroclastic material and lava flow. The eruption occurred between the summit and the east-northeastern volcano foot eruption fissure.<br>The eruption began at night near the summit and moved to the northeastern slope. The the eruption waned at approximately 06:00 on Jan. 27, but earthquake swarms lasted until February 1. Two open cracks were formed on the northwestern foot of the volcano (flow of lava is unclear). Magma eruption volume = 0.02 km$^3$ DRE. (VEI 3) |

| Year | Phenomenon | Activity Sequence, Damages, etc. |
|---|---|---|
| 1835 (Tenpo 6) | Moderate: Magmatic eruption | 10 days, starting on November 10. Air-fall pyroclastic material and lava flow. The eruption occurred on the western slope (inside the Kuwanokitaira caldera).<br>Rumbling was frequent and an eruption occurred near Kasaji, on the western slope. Volcanic blocks and lava flow. The eruption calmed in the middle of the night. Even after the eruption ended, earthquake swarms occurred, and landslides and fissures in both Igaya and Ako. A hot spring appeared in Ako as a result of the eruption.<br>Magma eruption volume = 0.0004 $km^3$ DRE. |
| 1874 (Meiji 7) | Moderate: Magmatic eruption | Approximately 2 weeks, beginning on July 3. Air-fall pyroclastic material → lava flow. The eruption occurred on the northern slope.<br>Occasional earthquakes began at approximately 08:00 on Jul. 3. At roughly noon, an eruption occurred in the mountains to the south of Kamitsuki. Lava flowed to the north, reaching Togo and creating 5,000 $m^2$ of new land on the coast. 45 houses were buried by lava. The eruption and rumbling ended 4 days later, but activity continued for approximately 2 weeks. 1 person was killed. Total ejecta: $1.6x10^7$ $m^3$.<br>Magma eruption volume = 0.016 $km^3$ DRE. |
| 1900 (Meiji 33) | Earthquake | November. Houses were damaged in Miyakejima, Mikurajima, and Kozushima, and many aftershocks occurred (the largest being M6.6). |
| 1935 (Showa 10) | Earthquake | From August 27 to mid-September earthquake swarms occurred (maximum magnitude of M5.1). |
| 1940 (Showa 15) | Moderate: Magmatic eruption | July 12. Air-fall pyroclastic material and lava flow. The eruption occurred at the northeastern slope eruption fissure and summit crater.<br>It began from the pyroclastic cone near Akabakkyo at the end of the previous year. In May phreatic eruptions occurred on the coast of Akabakkyo and from the northeastern volcano slope. Earthquakes occurred for several days before the eruption. Divers heard rumbling underwater in Akabakkyo Bay for 2 or 3 days before the eruption. On July 12 at approximately 19:30 an eruption from the northeastern slope began. Lava flowed down and covered villages on the island, reaching Akabakkyo. The eruption on the slope was mostly over by July 13. A summit eruption began on the morning of July 14, producing a large amount of volcanic ash and volcanic projectiles. This eruption ended by approximately August 8. The eruption killed 11 people, injured 20, killed 35 cattle, completely destroyed or burned down 24 houses, and caused extensive additional damage. Total ejecta: $1.9x10^7$ $m^3$.<br>Magma eruption volume = 0.012 $km^3$ DRE. (VEI 3) |
| 1943 (Showa 18) | Earthquake | Earthquake swarms between December 9 and 31 (maximum magnitude of M5.3). |
| 1953 (Showa 28) | Rumbling, hot spring anomaly | August. Rumbling occurred on Oyama. Saplings wilted and died on the slopes, and the sea temperature rose. |
| 1956 (Showa 31) | Hot spring anomaly | August 13. Hot water was emitted on the coast of Onoharajima, approximately 9 km west-southwest of Miyakejima, and the temperature of the sea in the area rose. |
| 1959 (Showa 34) | Earthquake | Earthquake swarms from late April to early August (maximum magnitude of M4.6). |
| 1962 (Showa 37) | Moderate: Magmatic eruption | August 24. Air-fall pyroclastic material and lava flow. The eruption occurred at the northeastern slope eruption fissure.<br>After earthquake swarms in May (which continued intermittently until September), an eruption occurred after 22:00 on August 24 at an elevation of between 200 m and 400 m on the northeastern slope (near the site of the 1940 eruption). Fissure eruption, lava fountain. Lava flowed from many craters into the sea. The eruption ended in 30 hours, but many felt-earthquakes occurred from the middle of the eruption, with the number of earthquakes affecting Izu villages surpassing 2,000 by August 30. Children were evacuated from the island, and island residents were extremely nervous about the situation, but the number of earthquakes gradually tailed off by the end of the year. The earthquake hypocenters were not in the same area as the eruptions, but instead were in the northwest of the island. The largest earthquake had a magnitude of M5.9 (August 26). 5 houses were burned down, and roads, mountain forests, and agricultural land were damaged. The Sanshichipyroclastic cone (meaning a cone formed in thirtyseventh year of the Showa Era, 1962AD) was formed. Total ejecta: $1x10^7$ $m^3$ (approximately 20 million tons). Magma eruption volume = 0.007 $km^3$ DRE. (VEI 2) |
| 1963 (Showa 38) | Fumarole | A new fumarolic area appeared near the summit of Oyama. |
| 1974 (Showa 49) | Earthquake | Earthquake swarm from June 27 to 30 (maximum magnitude of M6.1).. |
| 1982 to 1983 (Showa 57 to 58) | Earthquake | December to January, 1983. Earthquake swarm (several km to approximately 20 km at sea, to the southeast, maximum magnitude of M6.4). |

| Year | Phenomenon | Activity Sequence, Damages, etc. |
|---|---|---|
| 1983 (Showa 58) | Moderate: Magmatic eruption, phreatomagmatic eruption | October 3 to 4. Air fall pyroclastic material, lava flow, pyroclastic surge. The eruption occurred at the south-southwestern volcano foot eruption fissure.<br>1983 (Showa 58) Miyakejima eruption. On October 3 at approximately 15:23, an eruption began from a fissure which appeared on the southwestern slope. Lava fountain. The lava flow went in three main directions. The lava which flowed to the south-southwest passed through Awabe and reached the sea. The lava which flowed to the west buried houses in the Ako area, and stopped short of the coast. Phreatomagmatic explosions occurred at the coast near Shinmyoike and Nippana, to the south. A large amount of blocks fell on the surrounding area, and a large volume of volcanic ash covered near Tsubota, to the east. The lava flow had mostly stopped by the early morning of the following day. Approximately 400 houses were buried or burned down. Mountain forest and agricultural land was damaged. No injuries or fatalities resulted. The total amount of ejecta was 5 to $7x10^6$ $m^3$ of lava flow (measured by the Geospatial Information Authority of Japan), and $6x10^6$ $m^3$ of volcanic ash, etc., for a total of 20 million tons. 101 felt-earthquakes occurred before and after the eruption, The largest being the earthquake at 22:33 on October 3, which had a magnitude of M6.2 and a JMA scale seismic intensity of 5.<br>Magma eruption volume = 0.012 $km^3$ DRE. (VEI 3) |
| 1990 (Heisei 2) | Earthquake | October. Earthquake swarm at sea, approximately 30 km south-southwest (Mikura Seamount), with a maximum magnitude of M4.6). |
| 2000 to 2002 (Heisei 12 to 14) | Moderate: Phreatic eruption, phreatomagmatic eruption, (sea discoloration) | From June. Air fall pyroclastic material, lava flow, pyroclastic surge. The eruptions occurred at the summit caldera, and in the sea approximately 1 km west of Miyakejima.<br>On June 26 earthquake activity began on Miyakejima, accompanied by crustal deformation. The hypocenters moved gradually towards to the sea west of Miyakejima. A submarine eruption occurred in the sea to the west of Miyakejima in the morning on June 27. The hypocenters moved even further to the west, and earthquake swarm activity continued in the seas near Niijima and Kozushima (maximum magnitude of M6.5, maximum JMA scale seismic intensity of 6-lower). From July 4, earthquake activity with hypocenters directly below the summit of Oyama began. On July 8 an eruption began at the summit. The summit subsided, followed by repeated intermittent eruptions. The eruptive activity created a caldera for the first time in approximately 2,500 years. On August 10, August 18, and August 29 large eruptions occurred. The eruption on August 18 caused volcanic blocks to fall as far as the volcano foot. On August 29, low temperature pyroclastic flow reached the sea, and rain caused frequent lahars. The entire island was evacuated at the start of September. The eruptions continued until September, followed by large discharges of volcanic gas from the summit crater. For some time, over 50,000 tons per day of sulfur dioxide were emitted. Volcanic activity slowed after that, and the amount of volcanic gas being emitted decreased. During this period small eruptions occurred occasionally, with tephar fall at the volcano foot. (June 27, July 8, July 14, 15, and August 10 to September 28, 2000. January 11, March 19, May 27, June 3, 10, 13, 24, July 10, 18, September 26, 27, 28, October 11, 16, and November 1, 2001. January 23, February 21, March 2, 31, April 2, 3, 16, June 15, August 1, September 16, October 8, and November 24, 2002)<br>Magma eruption volume = 0.0026 $km^3$ DRE. (VEI 3) |
| 2004 to 2005 (Heisei 16 to 17) | Eruption | November 30, December 2, 7 to 8, and 9, 2004. April 12 and May 18, 2005. Air-fall pyroclastic material. The eruptions occurred at the summit caldera.<br>Very small eruptions occurred in April and May. |
| 2006 (Heisei 18) | Eruption | February 17. Air-fall pyroclastic material. The eruption occurred at the summit caldera.<br>Very small eruptions occurred in February. |
| 2006 (Heisei 18) | Eruption | August 23. Air-fall pyroclastic material. The eruption occurred at the summit caldera.<br>Very small eruptions occurred in August. |
| 2008 (Heisei 20) | Eruption | Very small eruptions occurred in January and May. The eruptions occurred at the summit caldera. |
| 2009 (Heisei 21) | Eruption | Very small eruptions occurred in April, May, and November. The eruptions occurred at the summit caldera. |
| 2010 (Heisei 22) | Eruption | Very small eruptions occurred in April and July. The eruptions occurred at the summit caldera. |

* Reference documents have been appended with reference to the Active Volcano Database of Japan, AIST (Kudo and , 2006 ) for volcanic periods, areas of activity, eruption types, and eruption events.

Table 62-1 Main earthquakes in Niijima, Kozushima, and Miyakejima area from 1900 to June 25, 2000 (Japan Meteorological Agency, 2006)

| Earthquake Date | Hypocenter Location | Hypocenter | | | M | Intensity, Damage, Earthquake Activity |
|---|---|---|---|---|---|---|
| | | Latitude (N) | Longitude (E) | Depth (km) | | |
| 1900/11/05 | Sea near Miyakejima | 33°54.0' | 139°24.0' | 10 | 6.6 | Homes destroyed in Miyakejima, Mikurajima, and Kozushima. Large number of aftershocks |
| 1935/08/27 | Sea near Miyakejima | 33°33.0' | 139°24.0' | 20 | 5.1 | Earthquake swarm from August 27 to mid-September |
| 1936/12/27 | Sea near Niijima / Kozushima | 34°17.0' | 139°17.4' | 20 | 6.3 | 3 killed and 70 injured in Niijima and Shikinejima. 35 houses completely destroyed, 473 houses partially destroyed. Many incidents of landslides and fissures. Some well clouding. Earthquake swarm from December 27 to December 29 (6 felt earthquakes and 82 unfelt earthquakes in Miyakejima) |
| 1940/07/12 | | | | | | [Eruption] Eruption on northeast slope of Oyama. Several felt earthquakes approximately 1 hour before eruption. |
| 1943/12/11 | Sea near Miyakejima | 33°49.2' | 139°26.5' | 2 | 5.3 | 3: Kamitsuki, Miyake. Earthquake swarm from December 9 to December 31 (58 felt earthquakes and 82 unfelt earthquakes in Miyakejima) |
| 1956/08/13 | Off coast of Tokaido | 33°53.0' | 138°56.0' | 50 | 6.3 | 4: Kamitsuki, Miyake. Earthquake swarm from August 12 to late September (2 felt earthquakes and 208 unfelt earthquakes in Miyakejima). Hot water discharge from Onoharajima's Daikoniwa on August 13. |
| 1956/12/22 | Sea near Hachijojima | 33°44.0' | 139°32.0' | 0 | 6.0 | 3: Kamitsuki, Miyake and Okago, Hachijo. Earthquake swarm from December 21 to early January of next year (36 felt earthquakes and 245 unfelt earthquakes in Miyakejima) |
| 1957/11/11 | Sea near Niijima / Kozushima | 34°15.9' | 139°20.0' | 17 | 6.0 | 4: Kamitsuki, Miyake. 2 houses completely destroyed, 2 houses partly destroyed, many wall collapses, and 2 landslides on Shikinejima. Earthquake swarm from November 6 to end of November (40 felt earthquakes and 266 unfelt earthquakes in Miyakejima) |
| 1959/08/03 | Sea near Miyakejima | 34°06.0' | 139°23.0' | 10 | 4.6 | 2: Niijima weather station and Kamitsuki, Miyake. Earthquake swarms from end of April to start of August. April 25 to April 26 (5 unfelt earthquakes in Miyakejima), May 27 (5 felt earthquakes), July 2 to July 27 (29 unfelt earthquakes), and August 3 to August 4 (4 felt and 16 unfelt earthquakes) |
| 1962/05/05 | Sea near Miyakejima | 33°06.4' | 139°21.5' | 10 | 5.8 | 4: Kamitsuki, Miyake. 3: Niijima weather station and Okago, Hachijo. Earthquake swarms from May 5 to July 23 (33 felt earthquakes and 451 unfelt earthquakes in Miyakejima) |
| 1962/08/24 | | | | | | [Eruption] Eruption on northeast slope of Oyama. Many volcanic tremors were recorded in conjunction with the eruption. |
| 1962/08/26 | Sea near Miyakejima | 33°07.2' | 139°24.3' | 33 | 5.9 | 5: Kamitsuki, Miyake. Many incidents of damage, such as landslides and fissures, on west coast of Miyakejima (over 700 felt earthquakes and many unfelt earthquakes in Miyakejima) |
| 1962/09/07 | Sea near Miyakejima | 33°08.3' | 139°22.7' | 16 | 5.1 | 3: Niijima weather station and Kamitsuki, Miyake. 230 felt and 2,475 unfelt earthquakes in Miyakejima in September. Earthquake activity continued from October to December. |
| 1965/08/03 | Sea near Niijima / Kozushima | 34°16.0' | 139°18.0' | 0 | 5.0 | 3: Kamitsuki, Miyake. Earthquake cluster in Miyakejima and Kozushima areas from August 3 to August 9, with slight damage such as landslides (4 felt and 61 unfelt earthquakes in Miyakejima in August) |
| 1966/05/15 | Sea south of the Izu Peninsula | 34°04.0' | 139°00.0' | 20 | 5.5 | 3: Kamitsuki, Miyake. Earthquake cluster on May 15 (2 felt and 46 unfelt earthquakes in Miyakejima) |
| 1967/04/06 | Sea near Niijima / Kozushima | 34°13.0' | 139°09.0' | 10 | 5.3 | 3: Kamitsuki, Miyake. Earthquake cluster in sea near Kozushima from April 6 to April 8. 7 houses completely destroyed, 9 houses partly destroyed, and fissures on Shikinejima. 3 people injured on Kozushima (2 felt earthquakes and 63 unfelt earthquakes in Miyakejima) |
| 1968/02/25 | Sea near Niijima / Kozushima | 34°14.0' | 139°15.0' | 0 | 5.0 | 3: Kamitsuki, Miyake. Earthquake cluster from February 24 to February 27. Damage in Shikinejima and Kozushima. (8 felt earthquakes and 99 unfelt earthquakes in Miyakejima) |
| 1974/06/27 | Sea near Miyakejima | 33°45.0' | 139°12.0' | 10 | 6.1 | 5: Kamitsuki, Miyake. 3: Motomachi, Izu-Oshima and Okago, Hachijo. Earthquake swarm from June 27 to June 30 (1 felt earthquake and 87 unfelt earthquakes in Miyakejima) |
| 1975/12/01 | Sea near Hachijojima | 33°43.0' | 139°21.0' | 50 | 4.4 | 1: Okago, Hachijo. Earthquake swarm from December 1 to 7 (283 unfelt earthquakes on December 1, 157 unfelt earthquakes from December 2 to December 7). |
| 1976/04/18 | (Details unknown) | | | | | 2: Kamitsuki, Miyake. Earthquake swarm (35 earthquakes from April 17 to April 18, 9 earthquakes on April 23 in Miyakejima). |
| 1980/09/10 | Sea near Miyakejima | 34°01.0' | 139°00.0' | 20 | 5.6 | 2: Kamitsuki, Miyake. Earthquake swarms from early July to mid-September (39 unfelt earthquakes in July, 2 felt and 193 unfelt earthquakes in September in Miyakejima) |
| 1982/12/28 | Sea south of the Izu Peninsula | 33°52.0' | 139°27.0' | 20 | 6.4 | 4: Kamitsuki, Miyake and Okago, Hachijo. 3: Motomachi, Izu-Oshima and Niijima weather station. Earthquake swarms from December, 1982 to January, 1983. |
| 1983/08/31 | Sea near Niijima / Kozushima | 34°26.9' | 139°26.2' | 20 | 4.3 | August - Earthquake swarm. |
| 1983/10/03 | Sea near Niijima / Kozushima | 34°00.4' | 139°30.7' | 15 | 6.2 | 5: Kamitsuki, Miyake. [Eruption] Eruption from fissure on southwest slope of Oyama. Phreatomagmatic explosions in south and coastal areas of Miyakejima. |
| 1985/09/22 | Sea near Niijima / Kozushima | 34°24.2' | 139°16.3' | 5 | 3.4 | 3: Niijima weather station. Earthquake swarm from September 21 to September 22. |
| 1989/01/02 | Sea near Niijima / Kozushima | 34°03.7' | 139°05.8' | 16 | 5.0 | 2: Kamitsuki, Miyake. Earthquake swarms from December 28, 1988 to January 22, 1989. |
| 1990/10/27 | Sea near Miyakejima | 33°47.1' | 139°25.1' | 31 | 4.6 | 3: Kamitsuki, Miyake. Earthquake swarm in October, 1990. |
| 1991/02/02 | Sea near Niijima | 34°22.0' | 139°15.7' | 8 | 3.2 | Earthquake swarms from January to February, 1991. |
| 1995/10/06 | Sea near Niijima / Kozushima | 34°09.1' | 139°06.2' | 9 | 5.9 | 5: Kinnnaga, Kozushima. 4: Ako, Miyake. Occasional earthquake swarms from 1991 to 1995 in Niijima and Kozushima area. Earthquake activity was especially high from October 6, 1995 to the end of October, with 246 felt earthquakes and landslide damage on Kozushima. |

## Whole Rock Chemical Composition

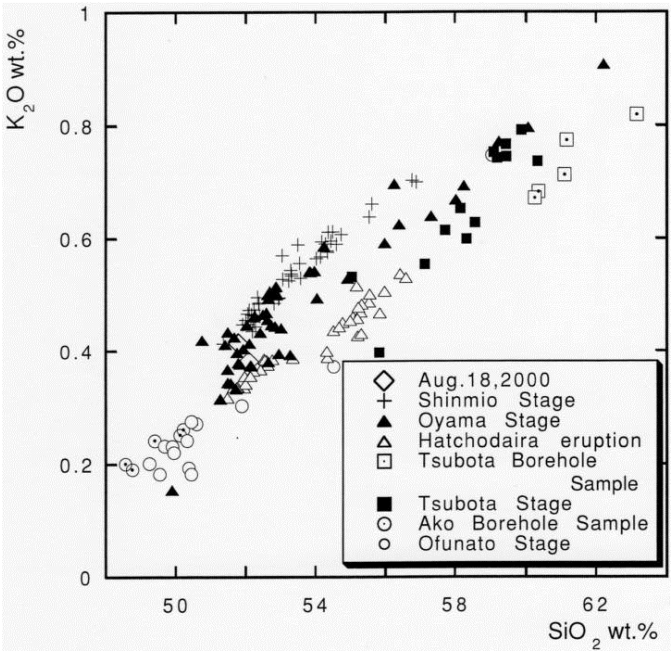



Figure 62-4 Whole rock chemical composition (Tsukui, et al., 2002).

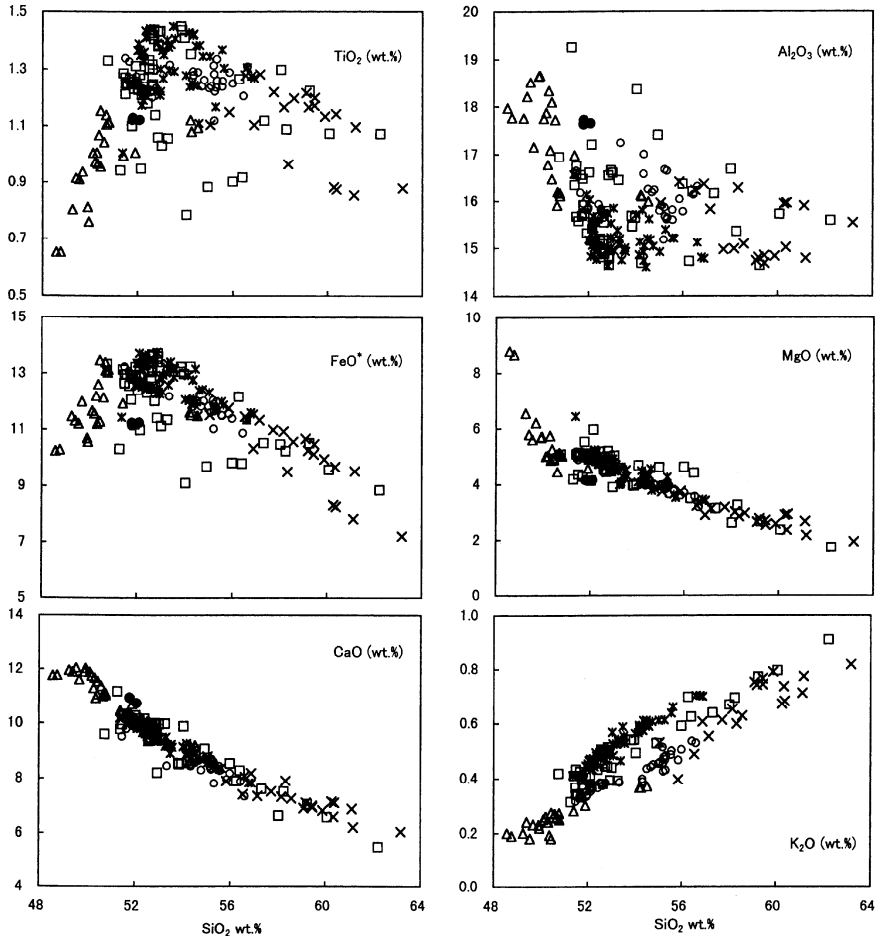



Figure 62-5 Whole rock chemical composition (NIihori,, et al., 2003).

●: 2000 eruption, *: Shinmyo period, □: Oyama period, ○: Hatchodaira eruption:, x: Tsubota period, △: Ofunato period

## Period - Cumulative Magma Volume

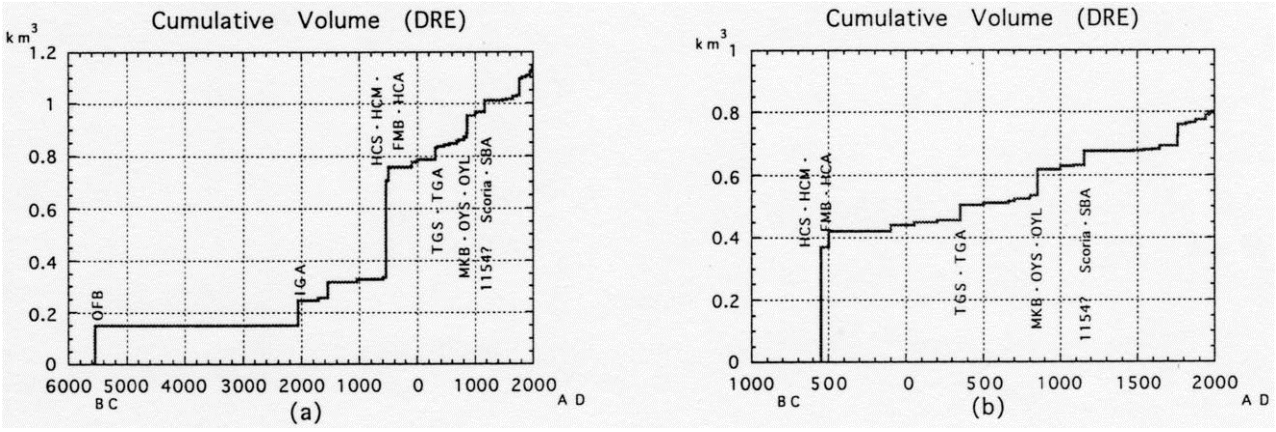



Figure 62-6 Period - cumulative magma volume (Tsukui and Suzuki, 1998).

(a) Last 7,000 years, (b) Last 2,500 years

## Precursory Phenomena

Past magmatic eruptions have been preceded by a large number of earthquakes and crustal deformation for several hours before the eruptions began. Earthquake activity increased directly below the summit during the 4 days leading up to the initial summit collapse and small eruption which formed the caldera in 2000.

Even during periods of low activity, crustal deformation occurred as a result of magma supply in a deeper area directly below Miyakejima.

In 2000, prominent earthquake swarms and crustal deformation, believed to have been caused by magma intrusion, also occurred in and around Miyakejima, Niijima and Kozushima. Thermal demagnetization was observed from years before the 2000 eruption (after Sep. 1996).

## Major Eruptive Activity

### ・1983 Eruption

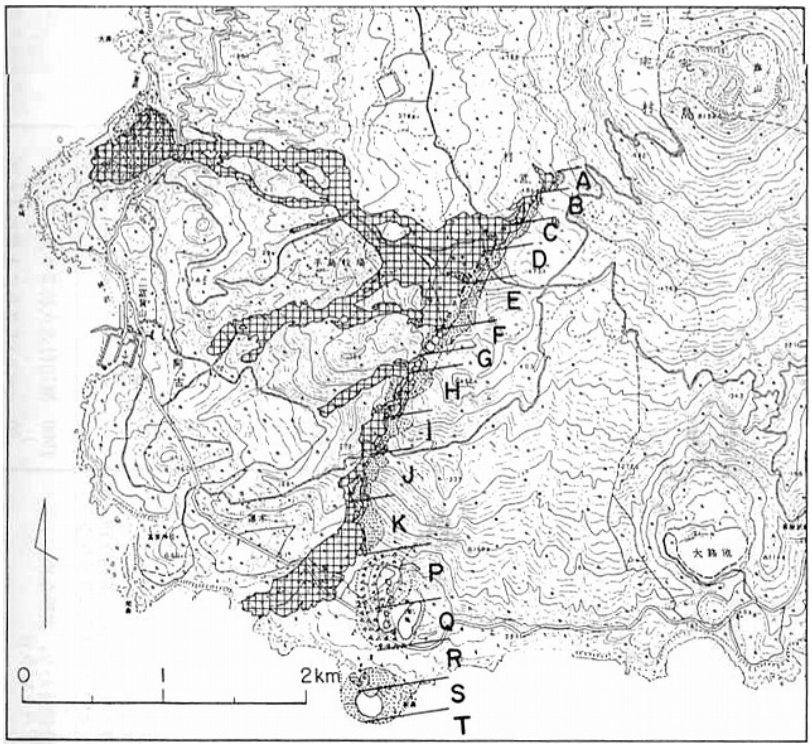



Figure 62-7 October 3, 1983, eruption crater chain and lava flow (A to T indicate names of crater groups) (Aramaki and Hayakawa, 1984).

Table 62-2 October 3, 1983, eruption sequence (A to T correspond to A to T in Figure 62-7) (Aramaki and Hayakawa, 1984)

| | |
|---|---|
| 10 月 3 日 15 時 15 分噴火開始 | |
| ステージ 1 | A-J 火口列と火口からの溶岩・噴泉とそれに伴うスコリア降下および溶岩流流下 |
| 16 時 38 分 新澪池 P 火口活動開始 | |
| ステージ 2 | P,Q,R,S 火口のマグマ水蒸気噴火とそれに伴うスコリア降下 |
| 19 時 17 分 新澪池 P,Q 火口活動再開 | |
| ステージ 3 | P,Q 火口からの岩塊放出とそれに伴う少量のスコリア降下 |
| 21 時 26 分 K 火口活動再開 | |
| ステージ 4 | K 火口からのスコリア降下と新鼻 S 火口でのタフリング形成 |
| 22 時 33 分 *M* 6.2 の地震 | |
| ステージ 5 | P,R 火口活動再開，スコリア降下 |
| 10 月 4 日 06 時以前 噴火終了 | |

October 3　15:15 Eruption started

Stage 1　Lava emission and lava fountain from A-J crater chain and craters, and accompanying air fall scoria and lava flow

16:38 Shinmyoike P crater activity started

Stage 2　Phreatomagmatic eruption from P, Q, R, and S craters, and accompanying air fall scoria

19:17 Shinmyoike P and Q crater activity resumed

Stage 3　Blocks ejected from P and Q craters, and accompanying minor amount of air fall scoria

21:26 K crater activity resumed

Stage 4　Air fall scoria from K crater and formation of tuff ring at Nippana S crater

22:33 M6.2 earthquake

Stage 5　P and R craters resumed activity. Air fall scoria

Eruption stopped before October 4, 06:00

## ・2000 Eruption

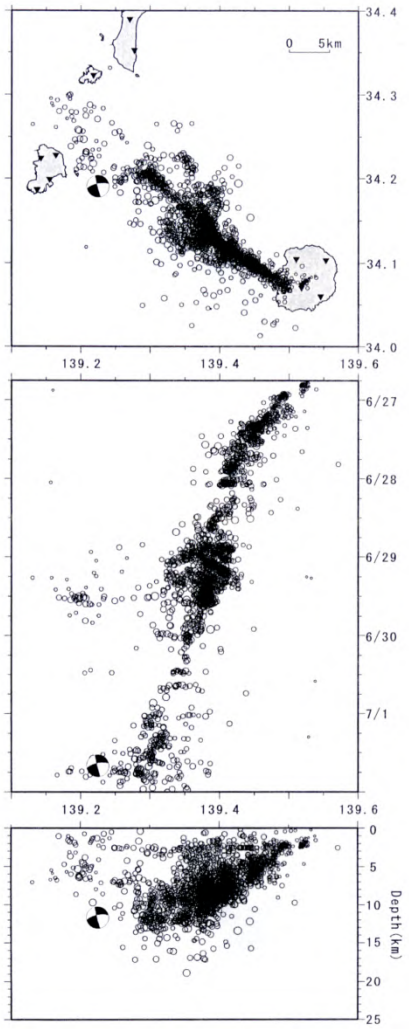



Figure 62-8 2000 earthquake swarms time series (June 26, 18:00, to July 1, 24:00) and east-west cross-section (Sakai et al., 2001)

This study includes the mechanism of the M6.4 earthquake which occurred on July 1 at 16:01, off the coast of Kozushima. The earthquake activity moved roughly to the northwest, but from the evening of June 27, this movement decelerated.

* As the hypocenters moved away from the island, they grew progressively deeper, but this is speculated to be due to a decrease in accuracy of hypocenter determination with no observation points in the sea.

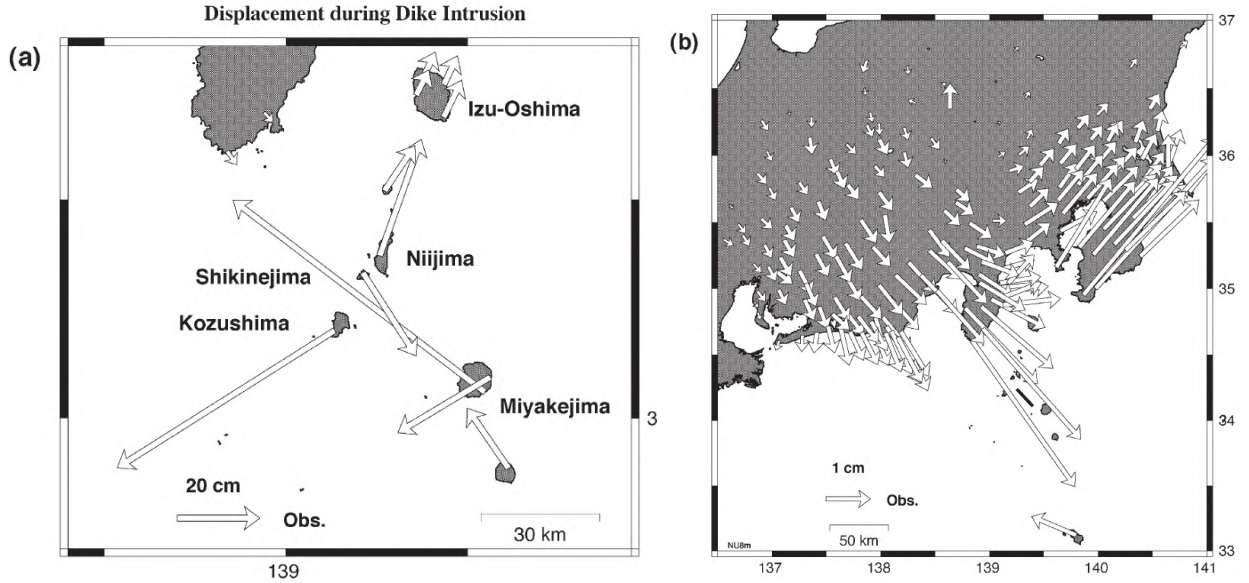
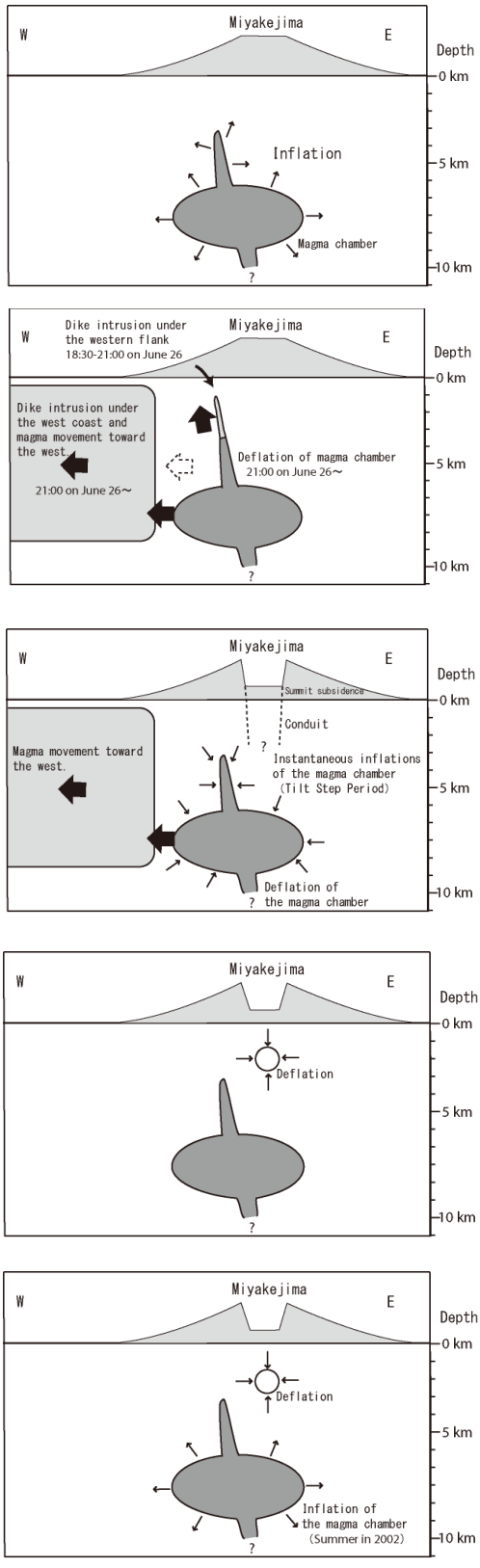



Figure 62-9 Crustal deformation in Miyakejima and surrounding area between June and August, 2000 (Yamaoka et al., 2005).
Circles indicate GPS measurement points. The distribution of hypocenters from June 26 to December 31, 2000, according to Sakai et al. (2001) is also shown. Observed crustal deformation can be explained by dyke intrusion from Miyakejima towards Niijima and Kozushima.

Figure 62-10 August 10, 2000, eruption  View from Miyakejima weather station, courtesy of the Japan Meteorological Agency.




**Pre-eruption Period　1983－2000**

The magma chamber beneath the southwest flank of Miyakejima at 3～10 km depth had been inflating during the period after the 1983 fissure eruption before the beginning the 2000 eruption.

**Dike Intrusion Period　June 26～27, 2000**

At around 18:30 on June 26, a dike began to intrude under the southwest flank of Miyakejima at 1～3 km depth from the upper end of the magma chamber. At around 21:00, a new dike began to induce toward the west and the magma chamber began to deflate. The former dike intrusion terminated at that time.

**Deflation and Tilt step Period**
**June 28～September 17, 2000**

The magma moved toward the west and the deflation of the magma chamber continued. During the period from July 8 to August 18, tilt steps by instantaneous inflations of the magma chamber were observed. During the tilt step, the subsidence of the summit progressed.

**Gas Emission Period 1　October 2000～May 2001**

The deflation magma chamber became weak and a deflation of a spherical source beneath the summit at the depth of 3 km continued.

**Gas Emission Period 2　June 2001～**

The deflation magma chamber almost terminated. Temporal inflation of the lower part of the magma chamber was observed during June-December 2002. The deflation of the spherical source beneath the summit continued.

Figure 62-11 Model of magma supply and movement below Miyakejima, hypothesized based on movement source model (National Research Institute for Earth Science and Disaster Prevention, Geospatial Information Authority of Japan, 2004).

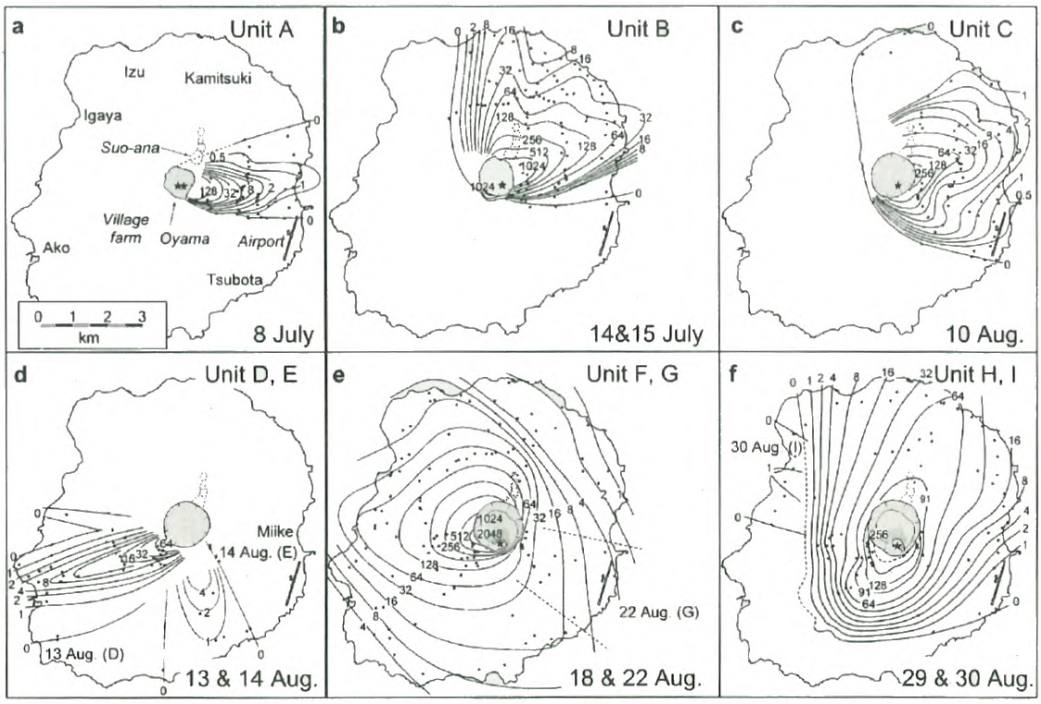



Figure 62-12 Distribution of deposits from July to August, 2000, eruptions (Nakada et al., 2005).
The ★ symbol indicates the eruption crater in the caldera. Isoline intervals are in units of mm.

## Magma Supply System

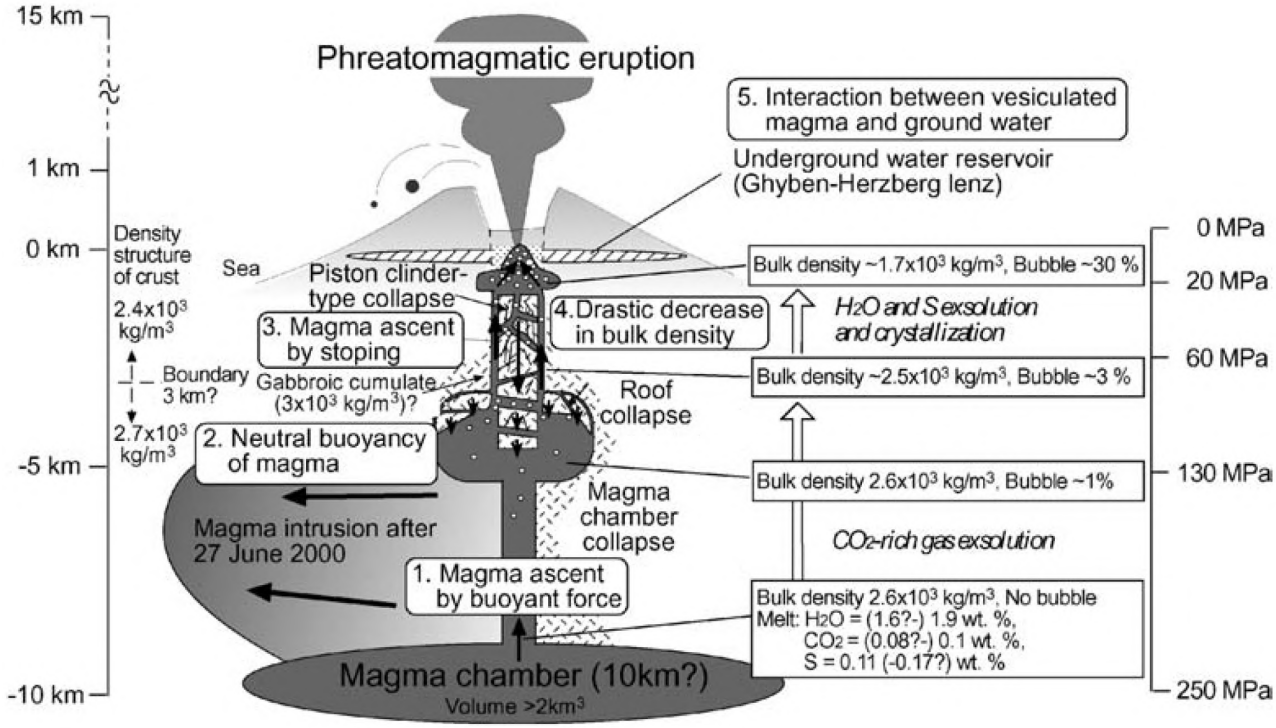



Figure 62-13 2000 eruption interior structure and magma rise model (Saito et al. (2005)).

By the time immediately before the eruption, a deeper magma chamber and shallow magma chamber had formed underground. The magma in the former magma chamber rose to the latter magma chamber due to its buoyancy. The collapse of the host rock on top of the shallow magma chamber allowed the magma to rise again. It is believed to have come in contact with ground water near the sea level, resulting in phreatomagmatic explosions.

## Recent Volcanic Activity

Table 62-3 List of eruptions since 2001

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 01.01.11 10:38 | 800 | Grayish white | East | Unknown | | |
| | 2 | 01.03.19 06:48 | 800 | Grayish white | Southwest | LF Earthquake | | Continued to approx. 07:40. LF earthquake cluster on previous morning |
| | 3 | 01.05.27 05:05 | X (Cloud) | Grayish white | East | LF Earthquake | Yes | |
| | 4 | 01.05.27 06:04 | 1,200 | Grayish white | East | LF Earthquake | Yes | Ash fall confirmed along prefectural roads (unclear which event ash was from) |
| | 5 | 01.06.03 06:34 | 700 | Grayish white | Southeast | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 6 | 01.06.10 19:25 | 500 | Grayish white | East | LF Earthquake | Yes | |
| | 7 | 01.06.13 02:29 | X (Cloud) | | (East) | LF Earthquake | Yes | Small amount of volcanic ash on airport cameras |
| | 8 | 01.06.24 20:12 | X (Cloud / Night) | | (West) | LF Earthquake | Yes | Local survey performed next day confirmed that rain mixed with ash had fallen on vehicles during night |
| | | 01.06.24 22:34 | X (Cloud / Night) | | (West) | LF Earthquake | | |
| | 9 | 01.07.10 06:38 | 500 | Grayish white | Southwest | LF Earthquake | | |
| | 10 | 01.07.10 08:23 | 500 | Grayish white | Southwest | LF Earthquake | | |
| | 11 | 01.07.18 17:42 | X (Cloud) | Grayish white | Northeast | LF Earthquake | Yes | |
| | 12 | 01.09.26 11:32 | 1000 | Grayish white | East | LF Earthquake | | |
| | 13 | 01.09.27 21:28 | 1000 | Grayish white | Northwest | LF Earthquake | Yes | Continued until approx.. 22:15. Ash fall confirmed along prefectural roads (unclear which event ash was from) |
| | 14 | 01.09.27 23:04 | 800 | Grayish white | Northwest | LF Earthquake | Yes | |
| | 15 | 01.09.28 05:28 | 800 | Gray | Northeast | Tremor | Yes | Ash fall confirmed along prefectural roads |
| | 16 | 01.10.11 03:34 | X (Cloud) | | East | Tremor | Yes | Ash fall confirmed along prefectural roads |
| | 17 | 01.10.11 09:02 | Less than 100 | Grayish white | East | None | | Ash fall confirmed on crater rim |
| | 18 | 01.10.16 07:22 | 1500 | Gray | Northwest | Tremor | Yes | Ash fall confirmed along prefectural roads |
| | 19 | 01.11.01 12:32 | 800 | Grayish white | Northeast | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| 2002 | 1 | 02.01.23 12:34 | 200 | Grayish white | East | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 2 | 02.02.21 17:37 | 300 | Grayish white | East by Northeast | LF Earthquake | Yes | Ash fall confirmed along prefectural roads (near Satado Pass) |
| | 3 | 02.03.02 05:53 | X (Cloud) | Grayish white | Northwest | LF Earthquake | Yes | |
| | 4 | 02.03.02 06:12 | X (Cloud) | Grayish white | Northwest | LF Earthquake | Yes | |
| | 5 | 02.03.31 06:03 | 800 | Gray | Northeast | Tremor | Yes | Ash fall confirmed along prefectural roads |
| | 6 | 02.04.02 10:02 | 300 | Grayish white | East | LF Earthquake | Yes | Ash fall confirmed along prefectural roads (near airport) |
| | 7 | 02.04.03 10:41 | 200 | Grayish white | Northeast | LF Earthquake | Yes | |
| | 8 | 02.04.16 06:00 | X (Cloud) | | Northeast | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 9 | 02.06.15 16:19 | 500 | Grayish white | Northeast | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 10 | 02.08.01 17:42 | X (Cloud) | | East | Tremor | Yes | Ash fall confirmed along prefectural roads (Mitsuike Bay) |
| | 11 | 02.09.16 05:10 | X (Cloud) | | Southwest | Unknown | | Ash fall confirmed along prefectural roads |
| | 12 | 02.10.08 14:51 | 200 | Grayish white | East | LF Earthquake | | Small amount of volcanic ash on airport cameras |
| | 13 | 02.11.24 13:16 | X (Cloud) | | Southwest | LF Earthquake | | Ash fall confirmed along prefectural roads |
| 2004 | 1 | 04.11.30 07:46 | 300 | Gray | East | LF Earthquake | Yes | Small amount of volcanic ash on airport cameras |
| | 2 | 04.12.02 16:45 | 600 | Gray | Southwest | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 3 | 04/12/7 15～ 04/12/8 06 | X (Night) | | (East) | LF Earthquake | Yes | Ash fall confirmed 3km east of crater on morning of April 8. Believed to be from low frequency earthquakes which occurred from 17:00 on December 7 to 06:00 on December 8 |
| | 4 | 04.12.09 06:16 | X (Cloud) | | (West by Southwest) | LF Earthquake | Yes | Volcanic ash on cameras in Otekura |
| 2005 | 1 | 05.04.12 04:45 | X (Cloud) | | (Southwest) | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 2 | 05.05.18 02:41 | 200 | White | (North) | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| 2006 | 1 | 06/2/17 22:38～ 06/2/17 23:34 | 300 | White | (East to East by Southeast) | LF Earthquake | Yes | Ash fall confirmed along prefectural roads |
| | 2 | 06.08.23 04:25 | 500 700 | Gray / White | Southeast | LF Earthquake | Yes | Gray volcanic ash on airport cameras. Ash fall confirmed on prefectural roads on southeast side of island. |
| 2008 | 1 | 08.01.07 06:54 | 300 | Gray / White | Southeast | Slightly LF Earthquake | Yes | Gray volcanic ash on airport cameras. Ash fall confirmed on prefectural roads on southeast side of island. |
| | 2 | 08.05.08 08:22 | 200 | Gray | Southeast | LF Earthquake | Yes | Gray volcanic ash on Otekura and airport cameras |
| 2009 | 1 | 09.04.01 16:17 | 600 | Gray | East | LF Earthquake | Yes | Gray volcanic ash on Otekura, Kamitsuki, Tsubota, and crater cameras. Ash fall confirmed on prefectural roads on east side of island. |
| | 2 | 09.04.18 01:06 | X (Cloud) | | (Southeast to South) | Slightly LF Earthquake | | Ash fall confirmed along prefectural roads on southeast and south of island |
| | 3 | 09.05.25 03:36 | X (Cloud) | | (South by Southwest) | Slightly LF Earthquake | | Ash fall confirmed along south by southwest side of summit crater |
| | 4 | 09.11.15 04:15 | 400 | × | East | Slightly LF Earthquake | Yes | Ash fall confirmed at Miyakejima airport |
| 2010 | 1 | 10.04.10 21:24 | X (Cloud / Night) | | (North) | Slightly LF Earthquake | | Ash fall confirmed on north side of island |
| | 2 | 10.04.11 08:40 | 500 | Grayish black | East | Slightly LF Earthquake | Yes | Black volcanic ash on Tsubota cameras. Ash fall confirmed on east side of island |
| | 3 | 10.07.04 10:19 | X (Cloud) | | (East) | Tremor | | Small amount of ash fall confirmed on east side of island |
| | 4 | 10.07.04 14:34 | X (Cloud) | | (East by Northeast) | Slightly LF Earthquake | | Small amount of ash fall confirmed on east side of island, small amount of ash fall confirmed during investigation of ash fall (approx.. 16:27) |
| | 5 | 10.07.21 09:28 | 300 | Gray | East | None | | Small amount of ash fall confirmed on east side of island |
| | 6 | 10.07.21 10:39 | 300 | Gray | East | Tremor | | |

x: Indicates that height (color) of volcanic plume could not be determined because volcanic plume occurred at night or was obscured by clouds.

Parentheses indicate the causes of the inability to observe the color / height. Directions in parentheses are estimated from ash fall areas when the volcanic plume could not be directly observed.

Note),Events before April 2009 include the cases in which colored volcanic plumes was observed by long distance camera, or in which ash fall was confirmed ash fall near prefectural roads. Events since May 2009 also include the cases in which ash fall was confirmed near the crater.

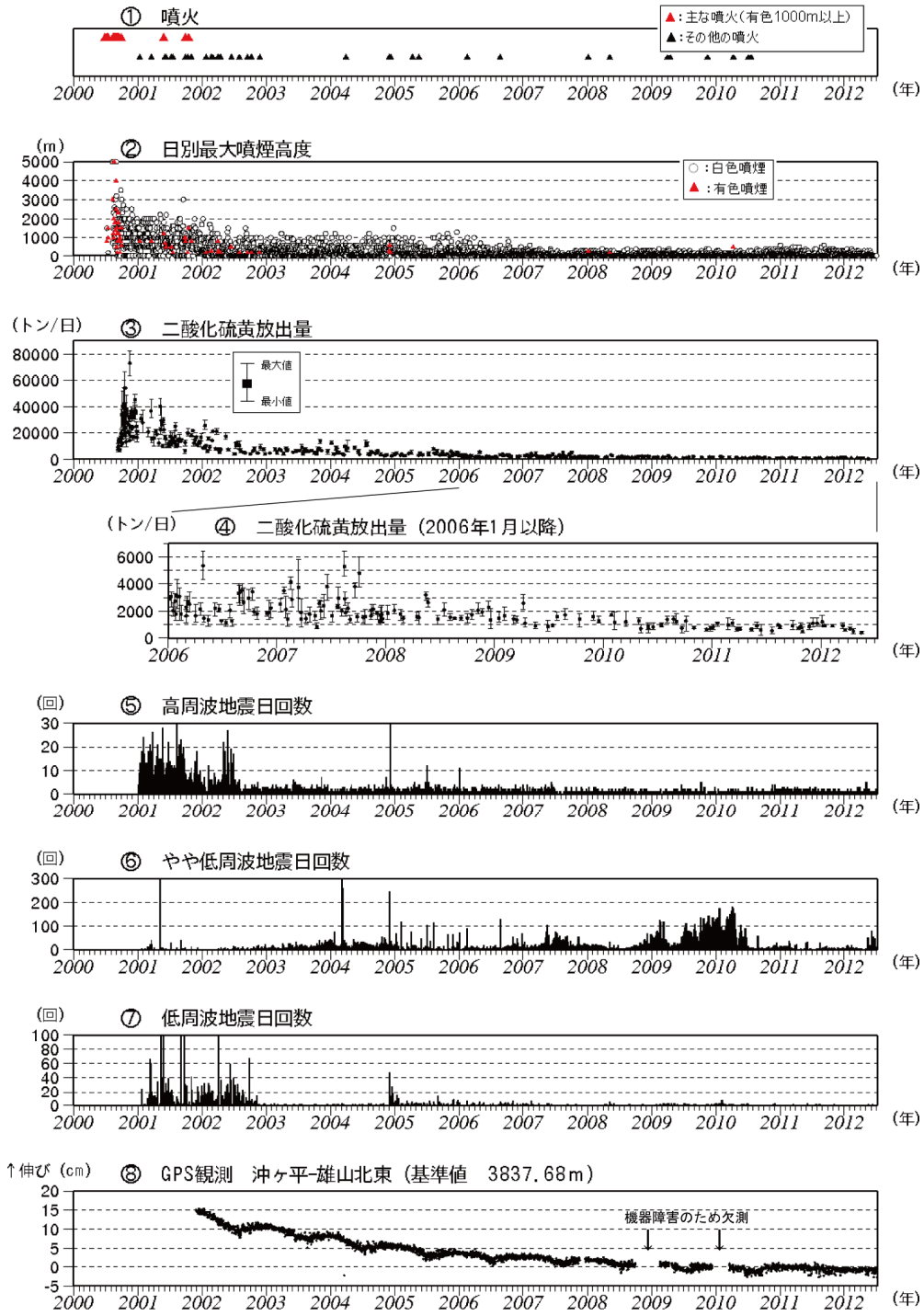



Figure 62-14 Volcano activity (January 1, 2000, to June 30, 2012) Note 1) ③ and ④ are based on measurement data courtesy of the Japan Coast Guard, Ground Self-Defense Force, Japan Maritime Self-Defense Force, Japan Air Self-Defense Force, Tokyo Fire Department, and Police Department for dates before November, 2005. Note 2) ③ and ④ performed jointly by the Japan Meteorological Agency Volcanological Division, Miyakejima weather station, National Institute of Advanced Industrial Science and Technology Geological Survey of Japan, and Tokyo Institute of Technology Volcanic Fluid Research Center. Graphs created based on COSPEC (Resonance) data for September, 2000, and beyond, and COMPUSS measurement results for May, 2005, and beyond. Note 3) ⑤, ⑥, and ⑦ contain measurement data since the start of measurement by earthquake type in 2001. * Measurement criteria: Oyama northeast observation point S-P time of 3.0

seconds or less, vertical component of 12 μm/s or more. Recently, volcanic plumes generally reached 100 m to 500 m above the crater rim.

① Eruption
② Maximum volcanic plume height per day
③ Amount of sulfur dioxide emitted
④ Amount of sulfur dioxide emitted (since January, 2006)
⑤ Number of high frequency earthquakes per day
⑥ Number of relatively low frequency earthquakes per day
⑦ Number of low frequency earthquakes per day
⑧ GPS measurements - Okigataira - Northeast Oyama (Ref. Value: 3837.68 m)

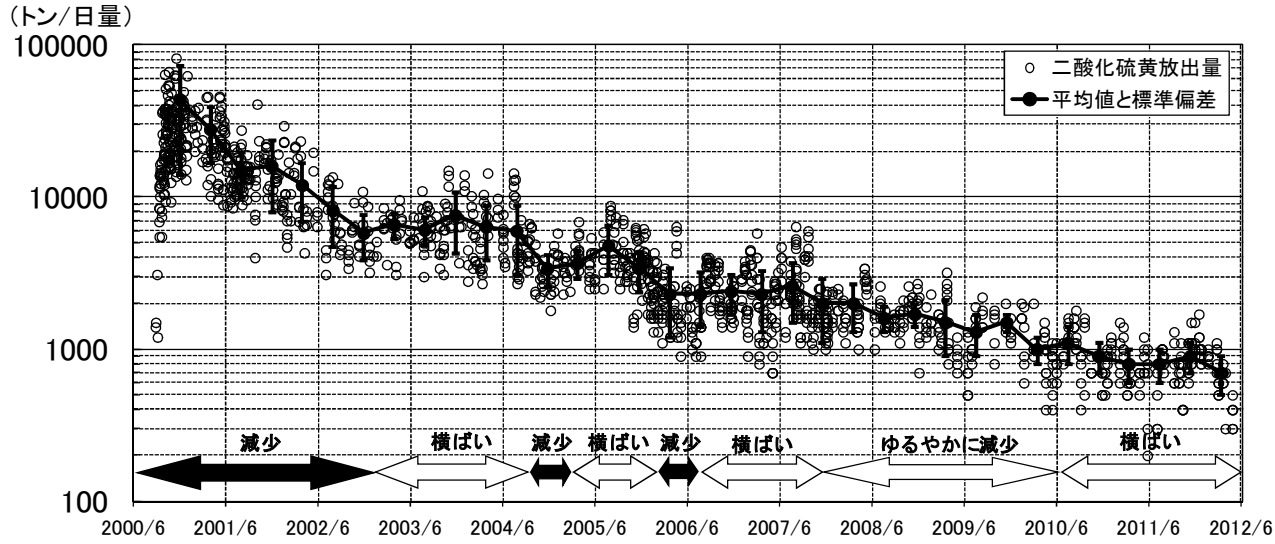



Figure 62-15 Sulfur dioxide emissions and average values (logarithmic depiction of Figure 62-14 ③). Note) Average values and standard deviations are for every 4 months. Values are plotted in the center of the time over which they are averaged. Standard deviations are indicated by error bars. Looking at average value trends, the amount of sulfur dioxide emitted fell and leveled out repeatedly, decreasing overall. The amount of sulfur dioxide emitted from the summit crater has been approximately 1,000 tons since September, 2010, a still relatively high level of volcanic gas emission.

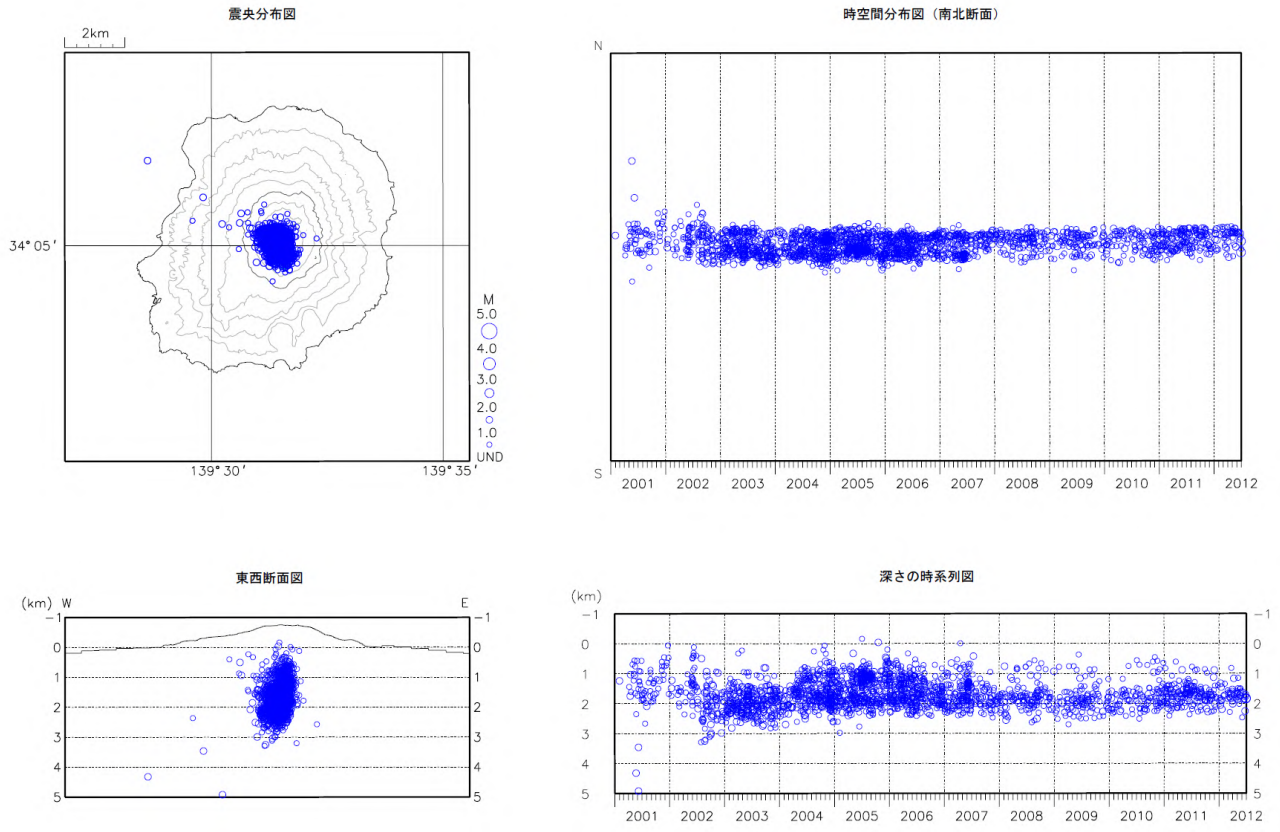



Figure 62-16 Distribution of volcanic earthquakes (2001 to June 30, 2012).

①Epicenter distribution

②Space-time plot (N-S cross-section)

③E-W cross-section

④Depth time series

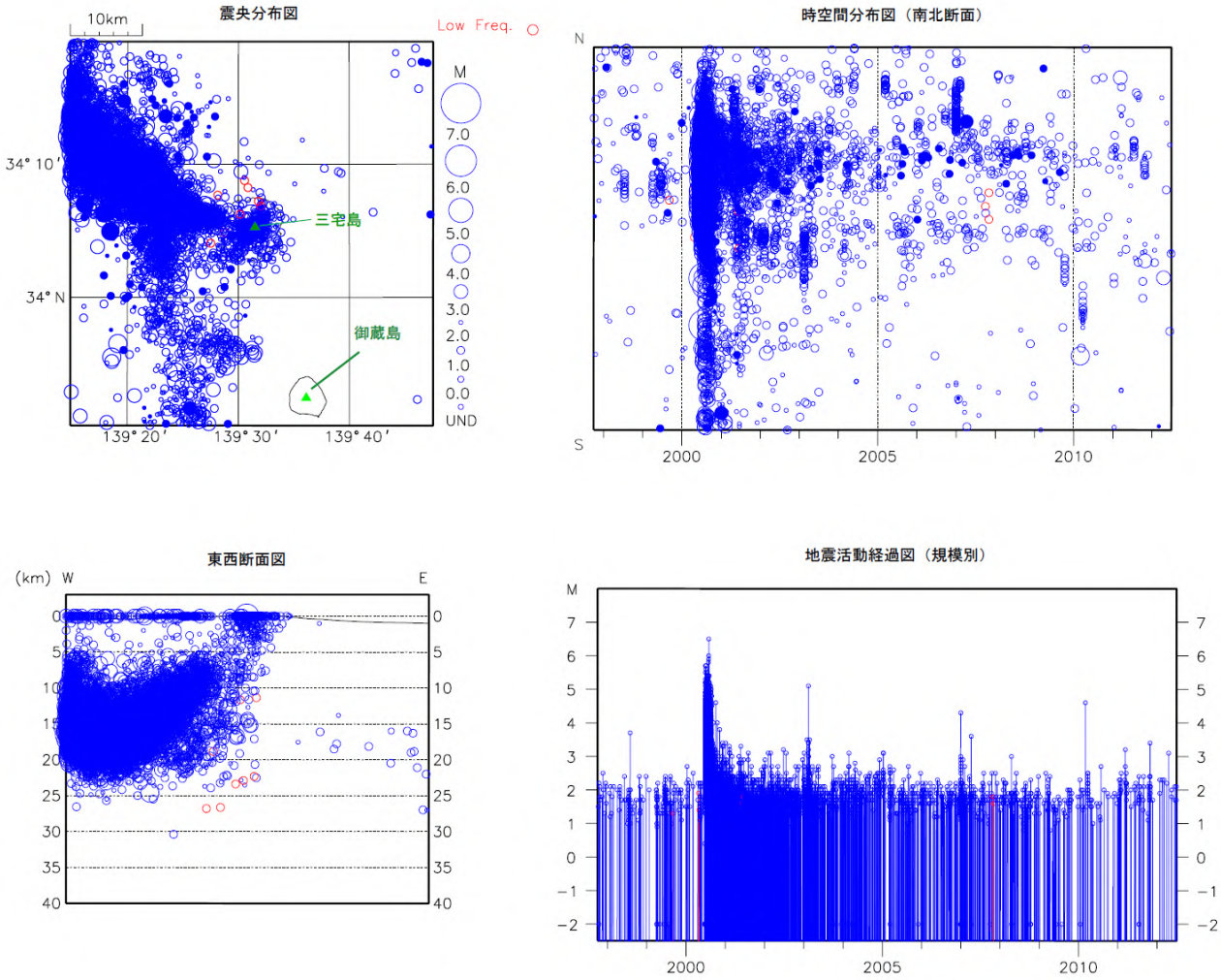
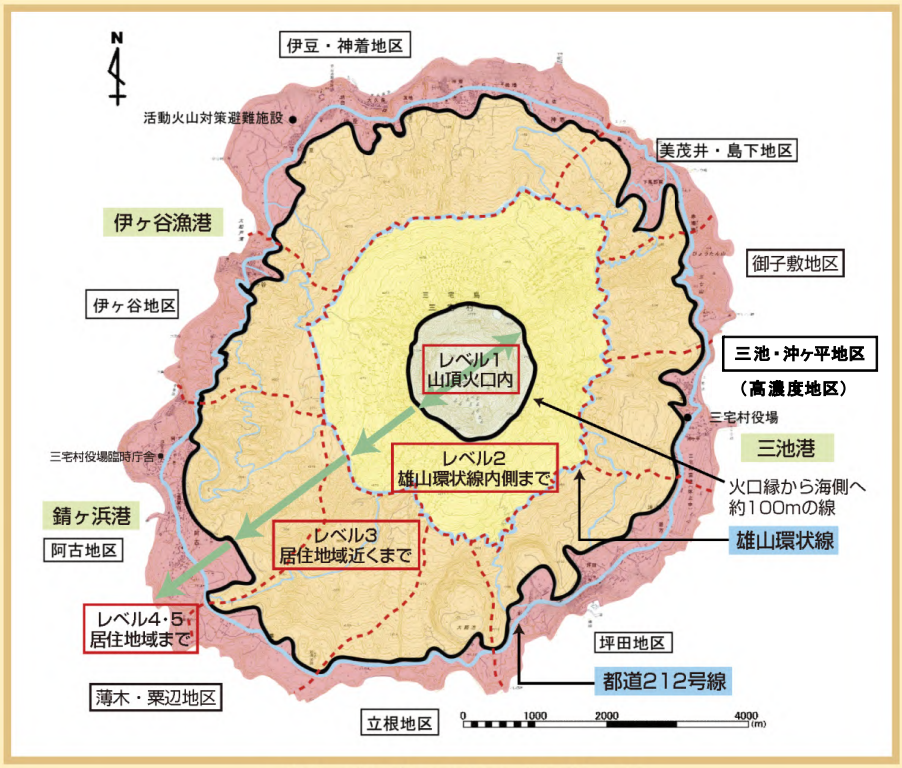



Figure 62-17 Activity of shallow VT earthquakes (blue circles) and deep low-frequency earthquakes (red circles) observed by a regional seismometer network (October 1, 1997, to June 30, 2012). Epicenter distribution (upper left), space-time plot (N-S cross-section) (upper right), E-W cross-section (lower left) and magnitude-time diagram (lower right).

## Information on Disaster Prevention

①Volcanic Alert Levels (Used since March 31, 2008)




三宅島　噴火警戒区域及び避難場所等

■図の凡例

- 噴火及び火山ガスの避難地区境界
- 居住地域の境界
- 主要道路
- 地区名
- 避難港
- 避難所

■警戒区域の指定について

○山頂火口で噴火の場合
想定される現象に応じて、警戒区域を山頂火口内から居住地域までレベル毎に指定します。

○山麓・山腹噴火の場合
噴火地点と噴火の影響が及ぶ地区を指定します。噴火前に噴火の発生する場所が特定される場合には、その影響の及ぶ地区を指定することがあります。

※左図は三宅村等と協議して作成したものです。各レベルにおける具体的な規制範囲等については地域防災計画等で定められています。

Volcanic Alert Levels for the Miyakejima Volcano (Valid as of March 31, 2008)

| Warning and Forecast | Target Area | Levels & Keywords | Expected Volcanic Activity | Actions to be Taken by Residents and Climbers | Expected Phenomena and Previous Cases |
|---|---|---|---|---|---|
| Eruption Warning | **Residential areas and areas closer to the crater** | **5 Evacuate** | **Eruption or imminent eruption causing significant damage to residential areas** | **Evacuate from the danger zone** | ●Imminent eruption with risk of serious damage to residential areas due to earthquake swarms, etc.<br>Past Examples<br>June 26, 2000, approximately 19:30: Frequent shallow earthquakes and tilt-changes on island<br>October 3, 1983, approximately 13:58: Frequent shallow earthquakes on island<br>2 hours before August 24, 1962, eruption: Volcanic tremors occurred, with gradually growing amplitudes<br>July, 1940: Earthquakes for several days before the July 12 eruption.<br>●Eruption or imminent eruption, with volcanic blocks, pyroclastic flow, and/or lava flow reaching residential areas, or large amount of volcanic gas emissions presenting continuous threat of major impact on residential areas.<br>Past Examples<br>Mid-September, 2000, to January, 2005: Continuous emissions of large amount of volcanic gas<br>August 29, 2000: Low-temperature pyroclastic flow reached residential areas in north of island<br>August 18, 2000: Possibility of volcanic blocks being scattered on residential areas by summit eruption (lowered to Level 4 after subsequent investigation)<br>October 3, 1983: Eruption on southwestern slope at approximately 15:23. Eruptions near Shinmyoike and Nippana at approximately 16:30. Lava flow reached residential areas (Prefectural road in the Ako area) at approximately 17:15.<br>August 24, 1962: Eruption on northeastern volcano slope, with lava flow reaching coast.<br>July 12, 1940: Eruption on northeastern volcano slope, with lava flow reaching residential areas. |
| | | **4 Prepare to evacuate** | **Forecast of eruption causing significant damage to residential areas (increased probability).** | **Those within the alert area should prepare for evacuation. Those requiring protection in the event of an disaster must be evacuated.** | ●Possibility of volcanic activity becoming an eruption with strong impact on residential areas as a result of increased eruptive activity at summit crater.<br>2000 Eruption Example<br>August 10: Eruption |
| Crater Area Warning | **Non-residential areas near the volcano** | **3 Do not approach the volcano** | **Eruption or prediction of eruption causing significant damage to areas near residential areas (entering area is life threatening).** | **Residents can go about daily activities as normal. When necessary, evacuation preparations should be performed for those requiring protection in the event of a disaster. Access restrictions for dangerous areas, including mountain climbing and mountain access prohibitions, etc.** | ●Possibility of volcanic activity becoming an eruption scattering volcanic blocks near residential areas as a result of expansion of an eruption at the summit crater, etc.<br>2000 Eruption Example<br>July 14 to July 15: Eruption<br>●Eruption at summit crater scattering volcanic blocks near residential areas.<br>Past Examples<br>No clear records |
| | **Crater area** | **2 Do not approach the crater** | **Eruption or prediction of eruption affecting area around crater (entering area is life threatening).** | **Residents can go about daily activities as normal. Access to crater area restricted, etc. (Access to area between summit crater and Oyama ring road prohibited since March, 2008)** | ●Possibility of small eruption at summit crater.<br>Past Examples<br>January 7, 2008: Very small eruption.<br>August 23, 2006: Very small eruption.<br>●Small eruption at summit crater scattering volcanic blocks within Oyama ring road area..<br>Past Examples<br>Morning of July 14, 1940: Eruption |
| **Eruption Forecast** | **Inside the crater** | **1 Normal** | **Little or no volcanic activity. Volcanic ash may be emitted within the crater as a result of volcanic activity (entering area is life threatening).** | **Access to interior of and area around crater restricted as necessary, etc.** | ●Little or no volcanic activity. Possibility of emission which may affect summit crater interior and nearby area. |

Note 1) The volcanic blocks mentioned in this table refer mainly to blocks large enough that their trajectories are not affected by wind.

Note 2) Determinations of alert level 5 (Evacuate) as a result of large-scale emissions of volcanic gas are made in coordination with disaster prevention related organizations, and based on the amount of volcanic gas emitted.

## Social Circumstances

①Populations (according to Miyake statistics as of June 1, 2011)

- Island population: 2,781
- Volcano foot residential area, etc.: Mainly concentrated along prefectural road 212 (ring road around island).

②National Parks, Quasi-National Parks, Number of Climbers

- Fuji-Hakone-Izu National Park Miyakejima

Number of sightseers per year: Approximately 35,000 (according to Tokyo (2011 Statistics) Miyake Branch Office Jurisdiction Overview, 2012 Edition)

Number of mountain-climbers per year: 0 (access restricted since 2000 eruption)

③Facilities

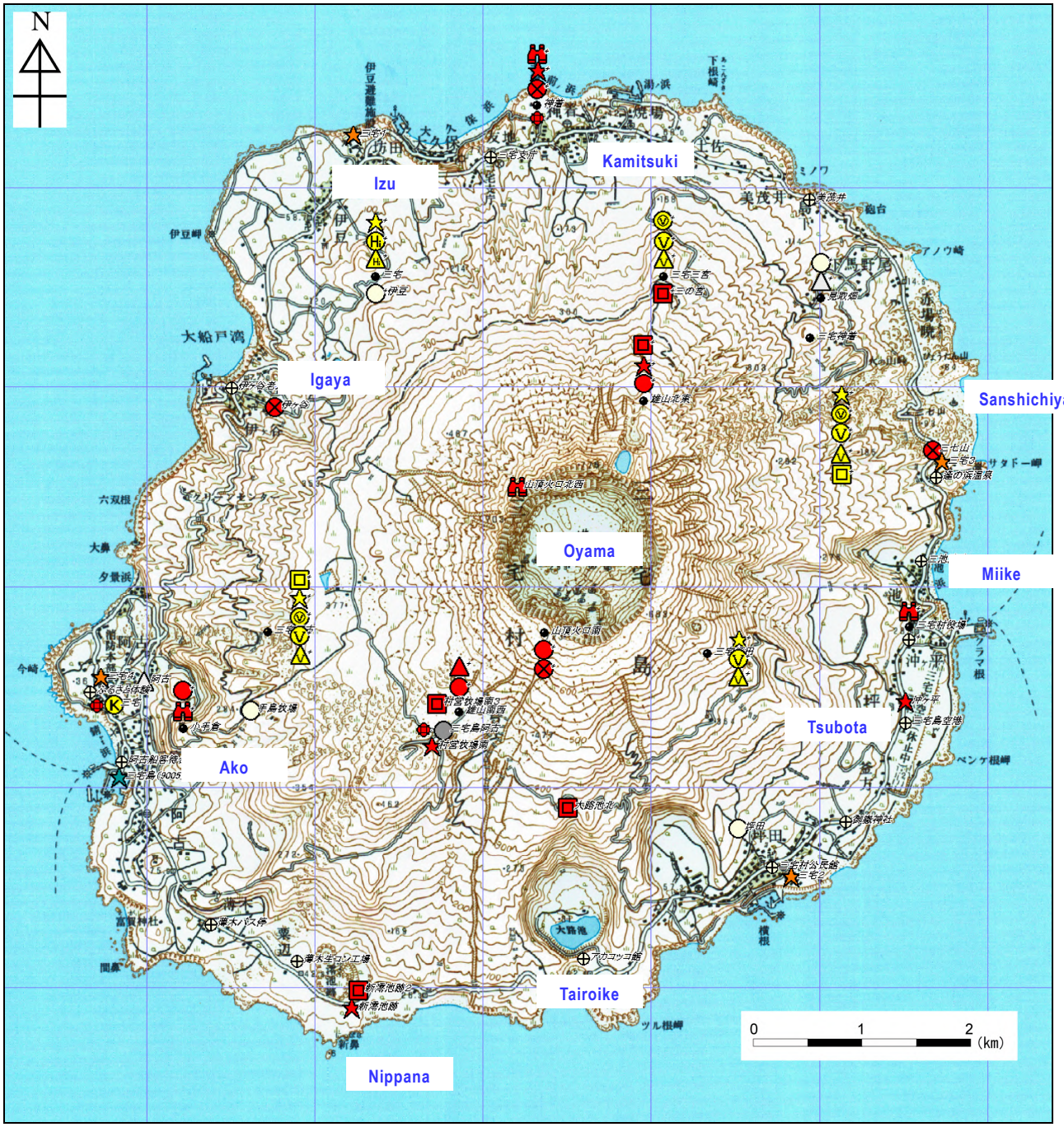
- Port facilities (evacuation ports)

Sabigahama (Ako) Port, Miike Port, Igaya Fishing Port

- Active volcano evacuation facility (Izu area)
- Miyakejima Native History Museum (Ako area)

## Monitoring Network

* Monitoring sites with multiple observation instruments are indicated by small black dots, and other symbols indicate types of monitoring.




1:50,000 scale topographic map (Miyakejima) published by the Geospatial Information Authority of Japan was used.

Legend

(JMA)
- seismometer(SP)
- GPS
- tiltmeter
- infrasonic microphone
- visual camera
- scalar magnetometer
- seismic intensity meter
- seismometer(SP) (For earthquakes and tsunamis)

(GSI)
- GPS

(JHOD)
- GPS

(NIED)
- V-net(SP)
- V-net(broadband)
- V-net(tiltmeter)
- Hi-net
- Hi-net(tiltmeter)
- K-NET
- GPS
- vector magnetometer

(Tokyo Metropolitan Govt.)
- seismometer(SP)
- tiltmeter

(Miyake village)
- gas sensor

Figure 62-18 Monitoring network.

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