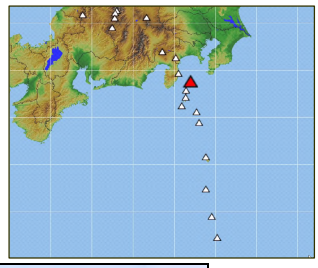
58. Izu-Oshima



Continuously Monitored by JMA

Latitude: 34°43'28" N, Longitude: 139°23'40" E, Elevation: 758 m (Miharashinzan)
(Elevation Point)

Miharayama taken from Sanchoguchi on May 16, 2011. Courtesy of Oshima Town Hall.

Summary

Izu-Oshima is a volcanic island, measuring 15 km in the north-northwest to the south-southeast by 9 km in the east-northeast to the west-southwest direction. It is a basaltic stratovolcano with a caldera and the Miharayama central cone at its center. The caldera with a diameter of 3 to 4.5 km opens to the east. The Oshima volcano began its activity several tens of thousands of years ago, and is now composed of a gently slanted main stratovolcano with many flank volcanoes formed by fissure eruptions trending in the north-northwest to the south-southeast direction. Approximately 1,700 years ago a major phreatic explosion occurred at the summit followed by its collapse to form a caldera. Another major eruption is considered to have occurred adjacent to the summit approximately 1,500 years ago, forming multiple calderas. The eruptions after the caldera formation filled the caldera with lava, which overflowed the rim in the northeast direction, reaching the coast. The formation of the caldera was followed by 10 large eruptions, with each eruption discharging several hundred million tons of volcanic material. The last major eruption occurred in 1777 to 1778. Moderate eruptions discharging several ten million tons of volcanic material occurred in 1912, 1950, and 1986 in recent years, spaced 36 to 38 years apart. Over 20 small eruptions occurred during those intervals. The major eruptions are considered to have started with scoria ejections, followed by lava flow and long-term ejections of volcanic ash (approximately 10 years). The moderate eruptions began with scoria ejections, followed by lava flows. The small eruptions ejected volcanic blocks and volcanic ash. The volcano is notable for its strombolian eruptions, but it also has experienced phreatomagmatic explosions. The eruptions between 1552 and 1974 occurred at the Miharayama crater or the bottom of the surrounding caldera, but the 1986 eruption occurred inside the Miharayama crater (A crater) and at the fissure craters in the caldera bottom (B crater) and outsid of the caldera rim (C crater). Precursors for the eruption, such as ground deformation, earthquakes and tremors, geomagnetism, resistivity, and gravity changes have been observed. The volcano, composed mainly of basalt, is between 49.5 and 58.0 wt %..

Photos

Miharayama summit A-Crater taken from the northeast on November 17, 1986. Courtesy of Osamu Oshima.

Fissure eruption on the northeast side of the summit, taken from the northeast on November 17, 1986. Courtesy of Abe Katsuyuki.

Summit of Izu-Oshima, taken from northwest side on July 12, 2002. Courtesy of Oshima Town Office.

Central Vent taken from the observation point at the south of crater on May 24, 2012 by the Japan Meteorological Agency

Red Relief Image Map

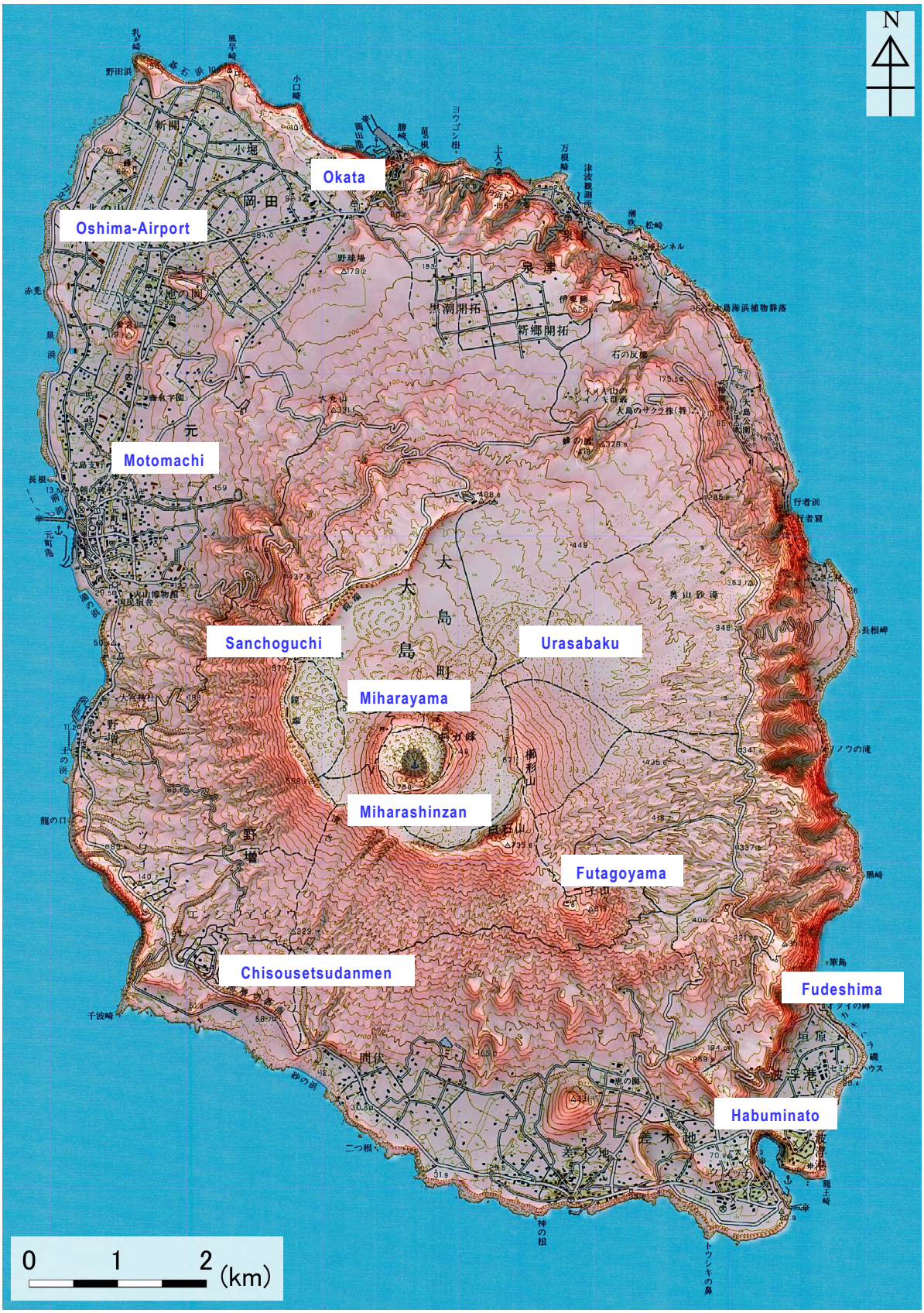


Figure 58-1 Topography of Izu-Oshima.

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

Submarine Topographic Map

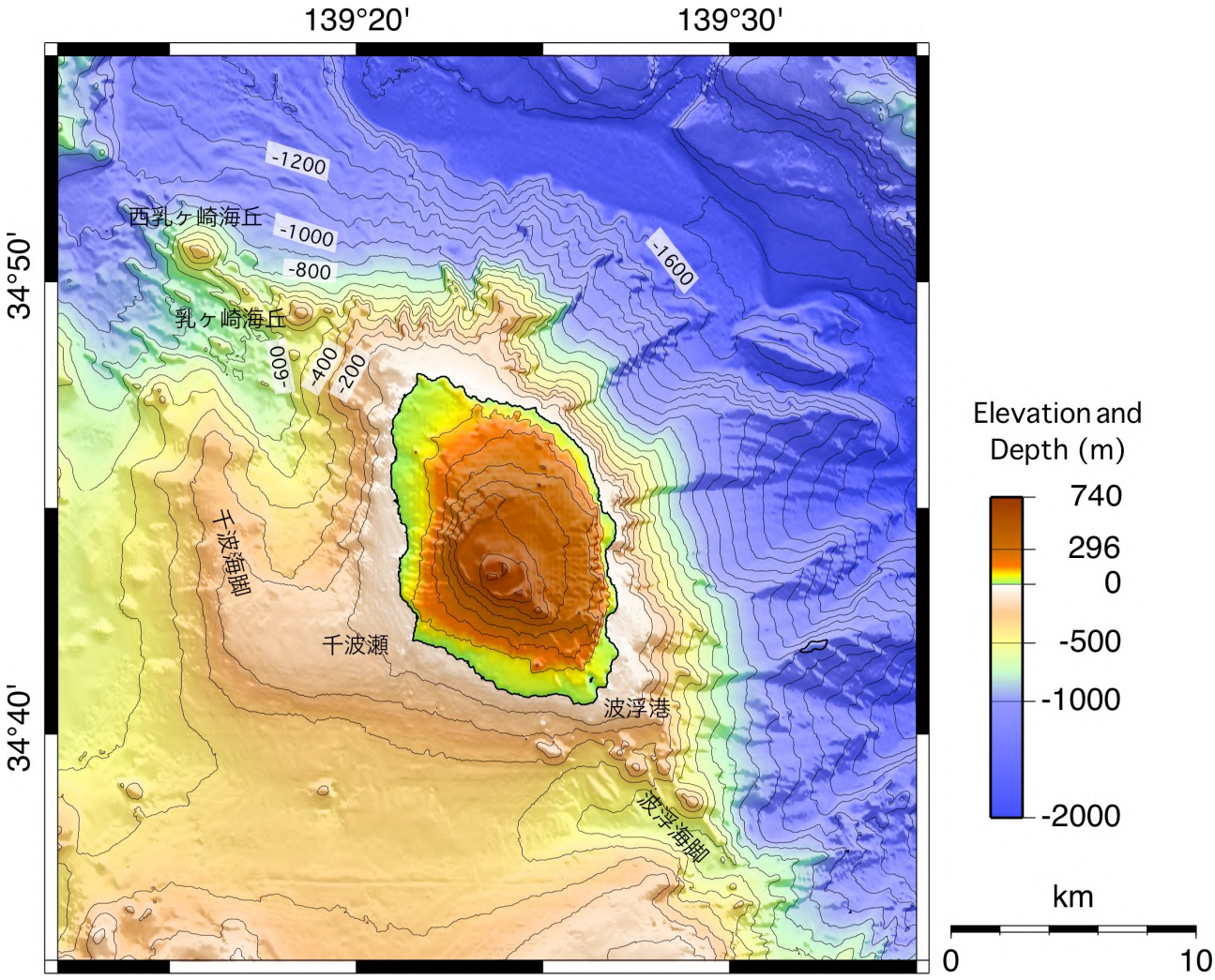


Figure 58-2 Submarine topographic map of Izu-Oshima (Japan Coast Guard).

Geological Map

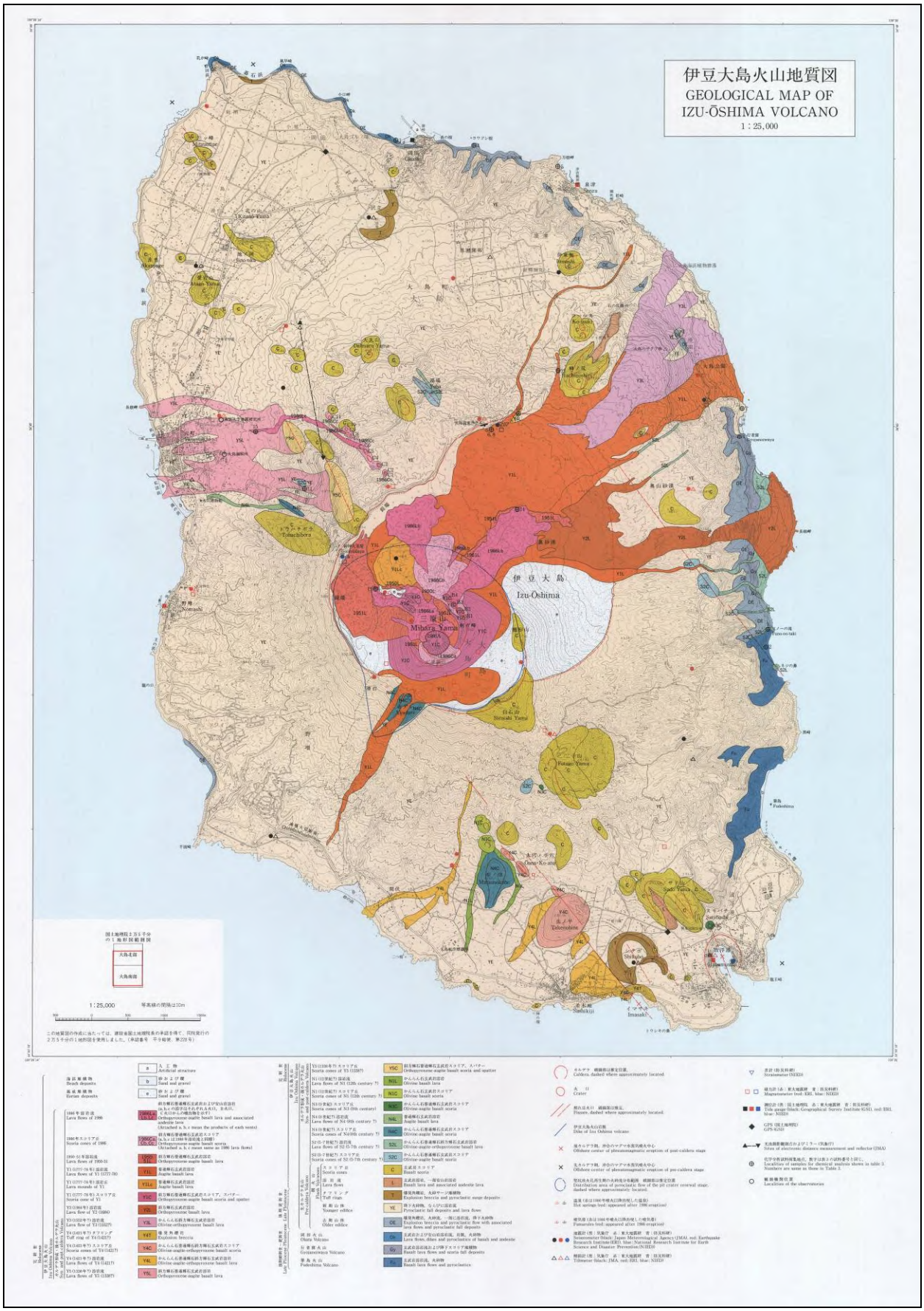


Figure 58-3 Geological map of Izu-Oshima (Kawanabe, 1998).

Chronology of Eruptions

・Volcanic Activity in Past 10,000 Years

Period	Area of Activity	Eruption Type	Main Phenomena / Volume of Magma
10.4ka		Magmatic eruption	O47 eruption: Tephra fall.
10.4←9.6ka		Magmatic eruption	Tephra fall.
10.4←9.6ka		Magmatic eruption	Tephra fall.
9.6ka		Magmatic eruption	Tephra fall.
9.6←8.6ka		Magmatic eruption	Tephra fall.
9.6←8.6ka		Magmatic eruption	Tephra fall.
8.6ka	Summit[54]	Magmatic eruption, phreatomagmatic eruption	O41 eruption: Low temperature pyroclastic flow (or debris avalanche).
8.5ka		Magmatic eruption	O40 eruption: Tephra fall, lava flow.
8.5←→7.5ka		Magmatic eruption	Tephra fall.
8.5←→7.5ka		Magmatic eruption	Tephra fall.
8.5←→7.5ka		Magmatic eruption	Tephra fall.
8.5←→7.5ka		Magmatic eruption	Tephra fall.
8.5←→7.5ka		Magmatic eruption	Tephra fall.
7.5ka		Magmatic eruption	O37 eruption: Tephra fall.
7.5←→7.33ka		Magmatic eruption	Tephra fall.
7.5←→7.33ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
7.33←→6.4ka		Magmatic eruption	Tephra fall.
6.4ka		Magmatic eruption	O35 eruption: Tephra fall.
6.2ka		Magmatic eruption	Tephra fall.
6.2←→5.7ka		Magmatic eruption	Tephra fall.
6.2←→5.7ka		Magmatic eruption	Tephra fall.
6.2←5.7ka		Magmatic eruption	Tephra fall, lava flow.
5.7ka		Magmatic eruption	Tephra fall.
5.6ka		Magmatic eruption?	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka	Koutoshi Kita Sawadachi?	Magmatic eruption, phreatomagmatic eruption or phreatic eruption	Tephra fall, lava flow.
5.6←3.4ka	Fukujuji	Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall, lava flow.
5.6←3.4ka	Okata area (northern foot of the volcano)	Magmatic eruption → phreatomagmatic eruption or phreatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall, lava flow.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
5.6←3.4ka		Magmatic eruption	Tephra fall.
3.4ka	Southeast off the coast of Oyanokubo (southeast foot of the volcano)	Phreatomagmatic eruption or phreatic eruption	O15 eruption: Tephra fall, pyroclastic surge.

Period	Area of Activity	Eruption Type	Main Phenomena / Volume of Magma
3.2←→3.1ka	Northeast of Habuminato fissure crater (southeast foot of the volcano) Hachinoshiri I	Magmatic eruption	Tephra fall, lava flow.
3.2←2.8ka		Magmatic eruption	Tephra fall.
3.2←2.8ka		Magmatic eruption	Tephra fall.
3.2←2.8ka		Magmatic eruption	Tephra fall.
3←→2.8ka	Sadoyama (southeast foot of the volcano)	Magmatic eruption	O10 eruption: Tephra fall, pyroclastic surge? Lava flow. Magma eruption volume = 0.0029 km^3 DRE. (VEI 2)
3←→2.1ka	Jinooka	Magmatic eruption	Tephra fall.
3←→2.1ka	Kakibara Iso Oki (southeast foot of the volcano)	Phreatomagmatic eruption	Tephra fall.
3←→2.1ka		Magmatic eruption	Tephra fall.
3←→2.1ka		Magmatic eruption	Tephra fall.
3←→2.1ka	Atagoyama	Magmatic eruption	Tephra fall.
2.1ka	Hachinoshiri II	Magmatic eruption	Tephra fall.
2.1ka	West of Sadoyama, northwest and southeast of Atagoyama	Magmatic eruption	Tephra fall.
1.9←→1.8ka	East of Oshima Senior High School	Magmatic eruption	Tephra fall, lava flow.
1.9←1.66ka		Magmatic eruption	Tephra fall.
1.66ka	Summit caldera, north volcano flank, northwest volcano flank, south volcano flank, east volcano flank fissure crater	Magmatic eruption → phreatic eruption → phreatic eruption (producing lahar) → phreatic eruption	S2 eruption: Tephra fall, lava flow → tephra fall → lahar → low temperature pyroclastic flow, tephra fall. Caldera forming. Magma eruption volume = 0.05 km^3 DRE. (VEI 4)
1.425ka?	Summit caldera	Magmatic eruption → phreatomagmatic eruption	Tephra fall (S1.5). Magma eruption volume = 0.006 km^3 DRE. (VEI 3)
1.4ka?	Summit caldera	Phreatomagmatic eruption, magmatic eruption, phreatic eruption	Tephra fall (S1.0). Magma eruption volume = 0.03 km^3 DRE. (VEI 3)
1.375ka?	Northeastern flank fissure crater	Magmatic eruption	Tephra fall(N4.8). Magma eruption volume = 0.01 km^3 DRE. (VEI 3)
1.35ka?	Northeastern flank fissure crater	Magmatic eruption	Tephra fall(N4.6). Magma eruption volume = 0.01 km^3 DRE. (VEI 3)
1.325ka?	West of summit fissure crater	Magmatic eruption	Tephra fall, lava flow (N4.4). Magma eruption volume = 0.04 km^3 DRE. (VEI 4)

* 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 calendar year. "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

Area of Activity: All eruptions older than 1.66ka described in this table are accompanied by summit eruption. Locations other than summit indicate the location of the flank eruption.

・Historical Activity

Year	Phenomenon	Activity Sequence, Damages, etc.
680 (Emperor Tenmu 8)	Eruption?	“Nihon Shoki”: Rumbling from the east at Kyoto. Oshima eruption?
684 (Emperor Tenmu 12)	Eruption?	“Nihon Shoki”: Rumbling from the east at Kyoto. Oshima eruption? Natural rises in west and north of Izushima. "Izushima" may refer to Oshima ?
700?	Moderate: Magmatic eruption	Tephra fall(N4.2). The site of the eruptive activity was the fissure crater on the northern side of the summit. Magma eruption volume = 0.008 km^3 DRE. (VEI 3)
713?	Large: Magmatic eruption	Tephra fall(N4.0). The eruption occurred at the central vent. Magma eruption volume = 0.08 km^3 DRE. (VEI 4)
822?	Moderate: Magmatic eruption	Tephra fall(N3.2). Eruption occurred on south side of summit? Fissure crater within the caldera. Magma eruption volume = 0.006 km^3 DRE. (VEI 3)
838?	Moderate: Magmatic eruption, phreatomagmatic eruption	Around August? Tephra fall(N3.0). Eruptions occurred at the central vent, Habuminato maar, and Suribachi crater. Magma eruption volume = 0.02 km^3 DRE. (VEI 3)
Sometime between 838 and 886	Large: Magmatic eruption, phreatic eruption	Tephra fall(N2.0). The eruption occurred at the central vent. Magma eruption volume = 0.06 km^3 DRE. (VEI 4) * In the “Nihon Montoku Tenno Jitsuroku”, it states "ash fall in the Awa Province", which may correspond with this eruption.
Sometime between 838 and 886, or 1112 (Ten'ei 3)	Large: Magmatic eruption, phreatic eruption	Tephra fall, lava flow (N1.0). Eruptions occurred at the central vent and on the south-southeastern flank. Magma eruption volume = 0.25 km^3 DRE. (VEI 4) The exact year is unknown.
1183?	Large: Magmatic eruption	Tephra fall (Y6.0). The eruption occurred at the central vent. Magma eruption volume = 0.04 km^3 DRE. (VEI 4)
1245?	Small-scale: Magmatic eruption	Tephra fall (Y5.6). Magma eruption volume = 0.0003 km^3 DRE. (VEI 1)
1307?	Moderate: Magmatic eruption	Tephra fall, lava flow (Y5.2). The site of the eruptive activity was the fissure crater on the northwestern side of the summit. Magma eruption volume = 0.011 km^3 DRE. (VEI 3)
1338 (Engen 3)	Moderate: Magmatic eruption	Mid-September to mid-November? Tephra fall (Y5.0). The eruption occurred at the central vent. Magma eruption volume = 0.03 km^3 DRE. (VEI 3)
1417?	Moderate: Magmatic eruption	Tephra fall (Y4.2). The eruption occurred at the central vent. Magma eruption volume = 0.0008 km^3 DRE. (VEI 2) It is possible that this eruption occurred in 1416 (Oei 23).
1421 (Oei 28)	Large: Magmatic eruption, phreatomagmatic eruption	May 5. Tephra fall, lava flow (Y4.0). The site of the eruptive activity was the central vent and the fissure on the southern flank to the coast. Magma eruption volume = 0.23 km^3 DRE. (VEI 4)
1442 to 1443 (Kakitsu 2 to 3)	Eruption	
1471?	Moderate: Magmatic eruption	Tephra fall (Y3.8). The eruption occurred at the central vent. Magma eruption volume = 0.003 km^3 DRE. (VEI 2)
1552 (Tenbun 21)	Large: Magmatic eruption	Tenbun (Y3) eruption. The eruption began on October 7. And ended on October 26. Tephra fall, lava flow. The eruption occurred at the central vent. Magma eruption volume = 0.16 km^3 DRE. (VEI 3)
April, 1600 (Keicho 5) or 1601 (Keicho 6)	Eruption	“Izu Shichito Meisaiki”: "Mountain burning" at Oshima.
1612 (Keicho 17) or 1613 (Keicho 18)	Eruption	“Izu Shichito Meisaiki”: "Mountain burning" at Oshima.
1623 (Genna 9 or 10)	Eruption	Record in "Atami Meidai Daidai Tebikae".
1634 (Genna 8 or 9)	Eruption	Record in "Atami Meidai Daidai Tebikae".

Year	Phenomenon	Activity Sequence, Damages, etc.
1636 (Kan'ei 13) or 1637 (Kan'ei 14)	Eruption	
1637 to 1638 (Kan'ei 14 to 15)	Eruption	""Izu Shichito Meisaiki"", "Aizu Kyuji Zakko": August 26, 1637 to April, 1638. Mountain fire and self-ignition.
1684 to 1690 (Tenna 4 to Genroku 3)	Large: Magmatic eruption, phreatic eruption	Tenna (Y2) eruption. Eruption began on February 14, 1684. Tephra fall, lava flow. The eruption occurred at the central vent. The eruption, which began at the end of March, was strong for approximately 1 month, with lava flow to the northeast coast. It is said that the central vent was, at the time, a large crater, similar in scale to the present Mihara crater. An earthquake swarm destroyed houses. It was called the "Great Jokyo Eruption". Total ejecta: 3.5×10^8 tons. The volcanic activity continued for 7 years. Magma eruption volume = 0.12 km^3 DRE. (VEI 4)
1695 (Genroku 8)	Eruption	Eruption began on April 14.
1777 to 1792 (An'ei 6 to Kansei 4)	Large: Magmatic eruption, phreatic eruption	An'ei (Y1) eruption. The eruption began on August 31. Eruption activity occurred at the central vent and the flanks to the north and southeast of the summit. A large amount of lava emitted, and lava flow reached the sea. An eruption began from the Miharayama central vent on August 31, 1777, accompanied by explosion sounds and earthquakes. Scoria fell over the whole island. Explosions were frequent and small amounts of lava flow in September and October. On April 27, 1778, lava flowed out. On November 6, 1778, lava flowed out. The southwest lava flow stopped at Akazawa, located between Nomashi and Sashikiji. The lava flow to the northeast on November 15 covered the caldera floor, and flowed eastward from the somma to the sea. There was smoke and fire by lava flow in Senzu on December 21. The volcanic activity gradually tailed off in 1779. The event was called the "Great An'ei Eruption". Total ejecta: 6.5×10^8 tons. 1783 (Tenmei 3) eruption: Tephra fall. 1784 (Tenmei 4): Eruption. 1786 (Tenmei 6): Eruption? 1789 (Kansei 1) eruption: Tephra fall. (The An'ei eruption, which began in 1777, ended in approximately 1792.) Magma eruption volume = 0.2 km^3 DRE. (VEI 4)
1803 (Kyowa 3)	Eruption?	Tephra fall· Tephra fall in Edo.
1821 (Bunsei 4)	Moderate: Magmatic eruption	Tephra fall. The eruption occurred at the central vent. Magma eruption volume = 0.008 km^3 DRE. (VEI 3)
1822 to 1824 (Bunsei 5 to 7)	Moderate: Eruption	Tephra fall· Sand and ash fall, crop damage. (Tenpo period) Large volcanic plume. (The Tenpo period: 1830-1843) Magma eruption volume = 0.008 km^3 DRE. (VEI 3)
1846 (Koka 3)	Eruption	Tephra fall.
1870 (Meiji 3)	Eruption	Tephra fall.
1876 to 1877 (Meiji 9 to 10)	Moderate: Magmatic eruption	1876 eruption. Dec. 1876 to Feb. 1827. Tephra fall. The eruption occurred at the central vent. The activity was confined to the interior of the crater, but it formed a pyroclastic cone (Naumann cone). Magma eruption volume = 0.0008 km^3 DRE. (VEI 2)
1887 to 1909 (Meiji 20 to 42)	Eruption	During the activity period in 1876 to 1877, a pit crater appeared in 1877 or possibly in 1876 on the crater floor, which was flat except for the Naumann cone. In 1896 a depression appeared on the crater floor, exposing red-hot lava. In 1907 the collapse of a crater wall expanded the crater, which reached 160m in diameter. Crater collapses and minor eruptive activity continued until 1909.

Year	Phenomenon	Activity Sequence, Damages, etc.
1912 to 1914 (Meiji 45 to Taisho 3)	Moderate: Magmatic eruption	1912-1914 eruption. Tephra fall and lava flow. The eruption occurred at the central vent. A lava flow began to flowed out from the central crater on February 23, 1912. On March 21, the central crater was buried by lava and volcanic blocks. A fissure crater began forming on April 2. Lava that flowed from multiple discharge points covered the crater floor (to a thickness of 35 m), and a pyroclastic cone (Nakamurayama) formed, but activity temporarily ceased on June 10. From July 27, approximately 10 ejection vents appeared on the crater floor, there were explosion sounds, and small pyroclastic cones were formed in the area. This activity caused the collapse of the southeastern half of the crater, and the crater floor dropped by 27m. Activity ceased after 3 days. Activity resumed on September 16, with a large lava flow from the ejection vents in the southwestern section of the crater, and the formation of a pyroclastic cone (Omoriyama). The lava filled the area that collapsed in July, and the pyroclastic cone (Omoriyama) grew to 10 times the volume of Nakamurayama. Nakamurayama was buried beneath the pyroclastic cone and lava layers, leaving only its summit. Activity ceased on October 30. However, a crater floor collapse began on January 14, 1913, and in September Omoriyama collapsed, half of it falling away. Activity resumed on May 15, 1914. The peak of activity was from May 16 to 18. Four pyroclastic cones were formed. A lava lake was formed on the crater floor. The Naumann cone, Nakamurayama, and Omoriyama were buried by ejecta. Activity gradually tailed off, ceasing on May 26. Total ejecta: $3x10^7$ m^3. Magma eruption volume = 0.031 km^3 DRE. (VEI 2)
1915 (Taisho 4)	Magmatic eruption	October 10 to end of October. Tephra fall. The eruption occurred at the central vent. Black volcanic plume and explosion sound.
1919 (Taisho 8)	Eruption	May 18 to December 23. Tephra fall. The eruption occurred at the central vent. Occasional eruptions. Pyroclastic cones were formed and collapsed.
1922 to 1923 (Taisho 11 to 12)	Moderate: Magmatic eruption	December 8 to January 30. Tephra fall, lava flow. The eruption occurred at the central vent. Explosion sound and lava flow. Magma eruption volume = 0.0062 km^3 DRE. (VEI 1)
1933 to 1934 (Showa 8 to 9)	Magmatic eruption	October to November, 1933. April 15 to 19, 1934. Tephra fall. The eruption occurred at the central vent. Small lava flow (1933). Black volcanic plume, rumbling (1934).
1935 (Showa 10)	Magmatic eruption	April 26. Tephra fall. The eruption occurred at the central vent. Lava emission.
1936 (Showa 11)	Earthquake[94]	Frequent earthquakes on May 4 and 5.
1938 (Showa 13)	Small-scale: Magmatic eruption	August 11. The eruption occurred at the central vent. Earthquake swarm in June. Lava emission in August. Magma eruption volume = 0.00004 km^3 DRE.(VEI 1)
1939 (Showa 14)	Magmatic eruption	January, February, July, September 2, September 3, September 16. The eruption occurred at the central vent. Tephra fall. Large volcanic plume in January. Volcanic blocks and rumbling in February. Large volcanic plume, rumbling, and glowing in July. Small explosions and lava lake on crater floor in September. Earthquake swarms in September, October, and December.
1940 (Showa 15)	Magmatic eruption	August 18 and 19. Tephra fall. The eruption occurred at the central vent. Earthquake swarm in March. Eruption, large volcanic plume, volcanic projectiles, lapilli, and tephra fall caused crop damage in August.
1941 (Showa 16)	Earthquake	September and October.
1942 (Showa 17)	Earthquake	April, August, and November.
1943 to 1944 (Showa 18 to 19)	Earthquake	December to January.
1944 (Showa 19)	Earthquake	February, April, May, and December.
1948 (Showa 23)	Earthquake	December.
1949 (Showa 24)	Earthquake	April.

Year	Phenomenon	Activity Sequence, Damages, etc.
1950 to 1951 (Showa 25 to 26)	Moderate: Magmatic eruption	1950-51 eruption. July 16 to September 23. 1950, February 4 to June 28, 1951. Tephra fall, lava flow. The eruption occurred at the central vent. On July 16, 1950, an eruption occurred from the southeast crater wall of the old crater (300 m in diameter, 150 m deep). Red-hot volcanic blocks were frequently ejected to heights of 200 m above the crater. Lava emission on the crater floor. Pyroclastic cone was formed on July 26, growing as tall as highest point of Miharayama (755 m) by August 29. At the end of August, lava had filled the crater. On September 13 it flowed onto the caldera floor from the northwest part of the crater rim. On September 23, ejection of volcanic blocks temporarily stopped, and around September 28, lava flow also stopped. In July and September geomagnetic inclination measurements were performed throughout the island. Inclination decreases of up to 30' were observed within the caldera. Earthquake swarms in August and September, 1950. Eruptions resumed on February 4, 1951, at a position approximately 200m northwest of the crater that was formed during the previous year. Lava was emitted from the crater floor, and, in late February, lava flowed over the crater rim, forming several lava flows. The edge of the lava flows reached the caldera wall by mid-March, but activity suddenly dropped off from April. On April 16, the volcano entered its third phase of activity, and a lava lake appeared on the crater floor. Eruptions reoccurred thereafter. On approximately June 14 explosion sounds could be heard as far as the coast of the island, and a volcanic plume measuring 5,000 m high was emitted. The topography around the crater changed dramatically, and a depression 300 m wide and 30 m deep formed on the crater floor. Over the course of a few days, starting June 28, the depth of the depression at the center of the crater reached 50m, the former central cone reappeared, and the northern half of the pyroclastic cone collapsed. Total ejecta: $3x10^7$ m^3. Magma eruption volume = 0.024 km^3 DRE.(VEI 2)
1952 (Showa 27)	Earthquake	October, December.
1953 (Showa 28)	Earthquake	January, May, June.
1953 to 1954 (Showa 28 to 29)	Small-scale: Magmatic eruption	October 5 to 12, November 11, 12, December 1 to 18, and December 29, 1953. January 16, 27, January 31 to February 8, 1954. Tephra fall, lava flow. The eruption occurred at the central vent. On October 5, 1953, an eruption occurred midway down the northern flank of the pyroclastic cone that was formed in 1951, and volcanic block activity. On November 9 there was volcanic block activity 30 m east of the October eruption crater, and a lava flow. From December 1 to February of the following year there were frequent eruptions, volcanic block activity, lava flows, and new crater formation. Total ejecta: $4x10^5$ m^3. From 1953 to February, 1954, a westward geomagnetic declination of approximately 4' was observed at Nomashi, on the west coast. Magma eruption volume = 0.00025 km^3 DRE. (VEI 1)
1954 (Showa 29)	Volcanic plume	November. Large volcanic plume.
1955 (Showa 30)	Earthquake	September.
1955 to 1956 (Showa 30 to 31)	Phreatic eruption	December 3, 7, 18, 20, 27, 28, 31, January 3 to 5, 17, 18, 23. Tephra fall. The eruption occurred at the central vent. Large volcanic plume, volcanic block activity, new crater formation.
1956 (Showa 31)	Eruption	Small eruption in January. Earthquake swarm in April and May. Large volcanic plume in August.

Year	Phenomenon	Activity Sequence, Damages, etc.
1957 to 1958 (Showa 32 to 33)	Small-scale: Magmatic eruption	August to end of December, 1957. April and June, 1958. The eruption occurred at the central vent. Earthquake swarm occurred on Jan. and Jun., 1957. There were eruptions and small explosions from August to December. A new crater was formed on October 13. The explosion that formed the crater killed 1 nearby sightseer and caused serious injuries to 53 others. Small eruption in April, 1958. In June an eruption occurred at the crater formed in October, 1957, as well as an explosion sound, tephra fall, and volcanic projectiles. The diameter of the crater grew, from 60 m in January to 150 m in June, 180 m in August, 200 m in November, and 250 m in December. (VEI 1)
1959 (Showa 34)	Eruption	January. The eruption occurred at the central vent.[57]
1959 to 1960 (Showa 34 to 35)	Eruption	October, December, 1959. February to November, 1960. Tephra fall. The eruption occurred at the central vent. Occasional small eruptions in October and December, 1959. Occasional small eruptions from February to November, 1960.
1961 (Showa 36)	Volcanic plume, rumbling	Occasional volcanic plume activity and rumbling over almost the course of the entire year. Earthquake swarms in January and July.
1962 to 1963 (Showa 37 to 38)	Eruption	August and September, 1962. January, 1963. Tephra fall. The eruption occurred at the central vent. Occasional volcanic plume activity, rumbling, infrasonic waves, tephra fall, etc. from January to March, 1962. Small eruptions in August and September. Occasional volcanic plume activity from October to December. Small eruptions in January, 1963. Volcanic plume activity from March to June.
1963 to 1965 (Showa 38 to 40)	Phreatomagmatic eruption?	July to September and December, 1963. January, March to May, July to September, and December, 1964. January, February, and May, 1965. Tephra fall. The eruption occurred at the central vent. Small eruptions from July to September and in December, 1963. Occasional small eruptions in January, from March to May, and from July to September, 1964. Eruption in December. Earthquake swarm off the coast also in December. Eruption in January, 1965. Occasional small eruptions in February and May.
1965 to 1966 (Showa 40 to 41)	Magmatic eruption	November 25 to December 2, 1965. February 7 to 16 and March to June, 1966. Tephra fall. The eruption occurred at the central vent. Occasional small eruptions in November and December, 1965. Occasional rumbling in January, 1966. Occasional small eruptions in February. Rumbling and tephra fall in March. Occasional small eruptions from April to June.
1967 to 1968 (Showa 42 to 43)	Magmatic eruption	July to August, 1967. January 19, 1968. Tephra fall. The eruption occurred at the central vent. Very occasional rumbling from January to March, 1967. Small eruptions from July to August. Small eruption in January, 1968.
1969 (Showa 44)	Magmatic eruption	January 19 to end of February, March 15 to April 9, May 7 to 15, July 3, 4, 15, 16. Tephra fall. The eruption occurred at the central vent. Intermittent small eruptions from January to March and in May. July eruption: Volcanic ash, volcanic hair, infrasonic waves.
1970 (Showa 45)	Eruption	Late January. Tephra fall[90]. The eruption occurred at the central vent. Tephra fall, rumbling, glowing, infrasonic waves.
1971 (Showa 46)	Volcanic plume	Intermittent glowing over the entire course of the year.
1972 (Showa 47)	Earthquake	M3.8 earthquake with maximum JMA scale seismic intensity of 4. January 14 to 15.
1973 (Showa 48)	Earthquake	M4.1 earthquake with maximum JMA scale seismic intensity of 4. November 14 to 24. Low level of volcanic activity.
1974 (Showa 49)	Very small-scale: Magmatic eruption	February 28 to mid-June. Tephra fall. The eruption occurred at the central vent. Small eruption from February 28 to March 1, with crater floor rise of approximately 60m. Further crater floor rising from May 7 to mid-May. A small strombolian eruption occurred on the crater floor until mid-June. Magma eruption volume = 0.000001 km^3 DRE. (VEI 0)
1975 (Showa 50)	Earthquake	January.
1976 (Showa 51)	Earthquake	February.
1977 (Showa 52)	Earthquake	October 30 to early November and November 15 to 17.

Year	Phenomenon	Activity Sequence, Damages, etc.
1978 (Showa 53)	Earthquake	"1978 Izu-Oshima Kinkai Earthquake" on January 14. Earthquake swarm off the west coast of Izu-Oshima. The largest earthquake as an M7.0 earthquake at 12:24, with a JMA scale seismic intensity of 5 at the Oshima weather station. The earthquake caused damage such as a cliff collapse.
	Earthquake	Late November to December. The largest earthquake as an M5.4 earthquake on December 3 at 22:15, with a JMA scale seismic intensity of 3 at the Oshima weather station (Note: there were frequent earthquake swarms from 1978 to 1989 off the east coast of the Izu peninsula, but they are not included in the 'Izu-Oshima' section. Please refer to the 'Izu-Tobu Volcanoes'.)
1980 (Showa 55)	Earthquake	June 29 to early July.
1981 (Showa 56)	Earthquake	June 7 to 8. The largest earthquake as an M3.7 earthquake on June 7 at 15:02, with a JMA scale seismic intensity of 3 at the Oshima weather station.
1983 (Showa 58)	Earthquake	December. The largest earthquake of M3.3 occurred on December 30 at 18:55, with a JMA scale seismic intensity of 4 at the Oshima weather station. Another earthquake at 21:51 also had a JMA scale seismic intensity of 4 at the weather station. Earthquakes continued until January, 1984.
1984 (Showa 59)	Earthquake	September 5 to 7, September 11 to 14.
1985 (Showa 60)	Earthquake	(M2.3) August 16 to 24. Unusual, periodic earthquakes occurred on August 27.
1986 (Showa 61)	Moderate: Magmatic eruption	"1986 eruption of Izu-Oshima". November 15 to 23, December 18. Tephra fall and lava flow. Eruptions occurred at the central vent, B crater chain (on the northeast side of the summit), and C crater chain (on the north-northeast flank of the volcano) From April 1 to 2 there was an earthquake swarm in the western part of the island (M2.7, 38 felt-earthquakes). Volcanic tremor began in July for the first time in 12 years, and continued until eruption. Occasional earthquake swarms from August to November in western and northeastern part of the island (21 felt-earthquakes). Fumarolic activity began on southern crater wall on November 12. An eruption began on the southern crater wall on November 15, at approximately 17:25 (A crater). The summit eruption continued from November 15 to 23, with a lava fountain, lava lake, and lava flow. On November 19 the lava flowed over the edge of the crater to the caldera floor. Strong seismic activity began at approximately 14:00 on November 21. A fissure eruption began on the caldera floor at approximately 16:15 (B crater). Lava fountain and lava flow. At approximately 17:46, another fissure eruption began on the outside of the caldera as well (C crater). The C crater eruption stopped at 20:45. At about 02:00 on November 22, the activity at the B crater declined. On November 21 the entire population of the island, 10,000 people, was evacuated (for approximately 1 month). On November 23 the summit explosions stopped. A secondary lava flow occurred within the caldera on November 23. Tremors resumed on December 17. On December 18, at approximately 17:30, an eruption resumed from the A crater, with frequent explosions, lasting approximately 2 hours. Magma eruption volume = 0.029km^3 DRE. (VEI 3)
1987 to 1988 (Showa 62 to 63)	Small-scale: Magmatic eruption	November 16, 18, 19. January 25, 27. Tephra fall. The eruption occurred at the central vent. Tremors occurred year-round. Earthquake swarm in the eastern part of the island from May 22 to 25, 1987. The number of summit earthquakes gradually increased from July to November. On November 16, at 10:47, an eruption and explosion occurred, and the central crater depressed by approximately 30 m. On November 18, further depression of the crater caused its diameter to widen to approximately 350 to 400 m, and the depth to reach approximately 150 m, causing the central fumarole to reappear. An earthquake swarm occurred on the east side of the island on November 21. Tremors occurred year-round. Tephra fall. There were small eruptions at the summit on January 25 and 27, 1988. Volcanic gas caused crop damage in the Mabushi area in June. Magma eruption volume = 0.00002 km^3 DRE. (VEI 1)
1989 (Heisei 1)	Volcanic tremors	The volume of white smoke produced at the summit gradually increased. Tremors occurred year-round.

Year	Phenomenon	Activity Sequence, Damages, etc.
1990 (Heisei 2)	Phreatic eruption	October 4, October 9, October 25. Tephra fall. The eruption occurred at the central vent. Tremors continued from January to April. On February 20 there was an M6.5 earthquake off the western coast of the island. From late February to March 2 a large number of tremors occurred. Earthquake swarm on March 1. Volcanic plume, earthquake, and tremor activity decreased from April. From mid-August the number of earthquakes gradually increased at the summit. There was a small eruption before dawn on October 4, and light tephra fall from the western to the northeastern parts of the island. An approximately 100m wide collapse vent was formed on the crater floor. An earthquake swarm occurred on the east side of the island (3km east of the summit) in November.
1993 (Heisei 5)	Volcanic tremors	March to July. Occasional tremors. Summit earthquakes and tremors were frequent from May 30 to early June.
1994 (Heisei 6)	Earthquake, crustal deformation	Earthquake swarms occurred frequently on and around the island. Crustal deformation (overall island inflation) was observed as a result.
2011 (Heisei 23)	Earthquake	March. After the 2011 off the Pacific coast of Tohoku Earthquake (March 11, 2011) earthquakes are activated off the western coast and in the northern part of the island. March 12, 23:37, M2.9.

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

Whole Rock Chemical Composition

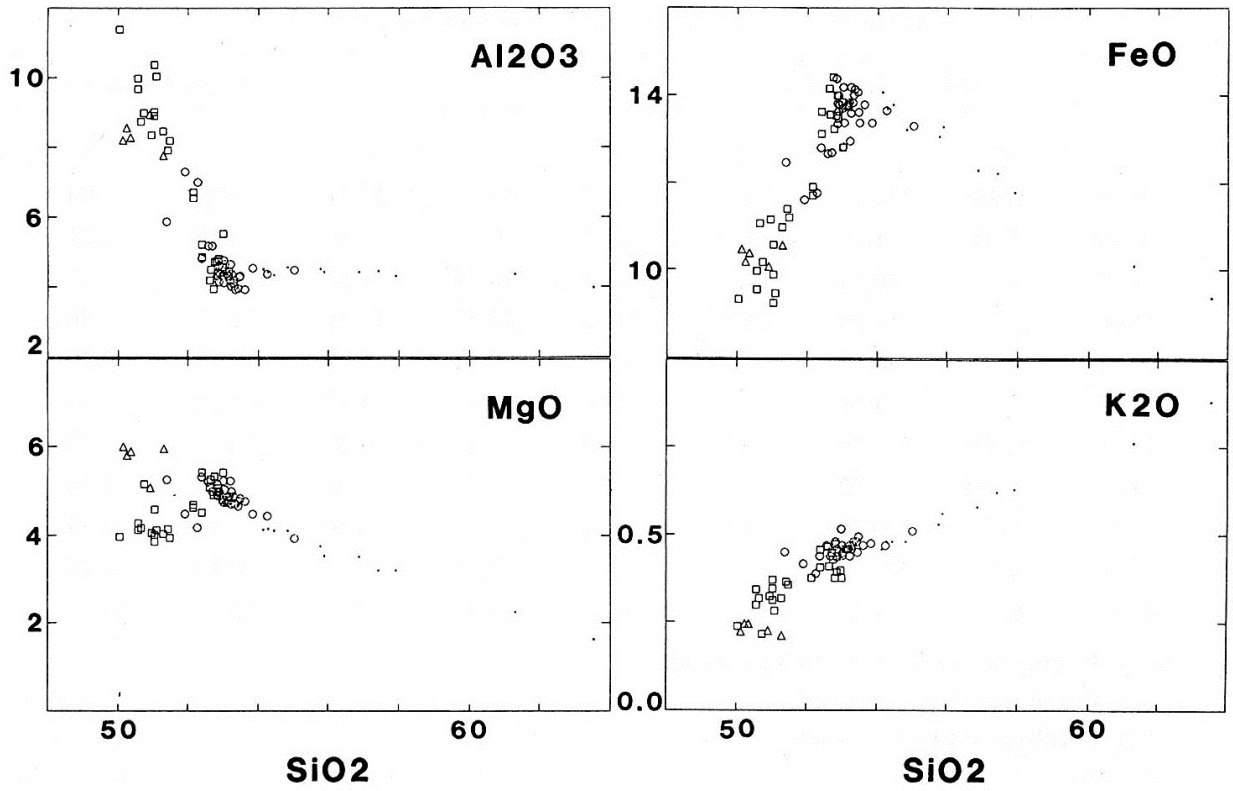


Figure 58-4 Whole rock chemical composition (Kawanabe, 1991).

△: Senzu group, □: Older Oshima group, ○: Younger Oshima group, Dot (・): 1986 B crater ejecta

Cumulative Magma

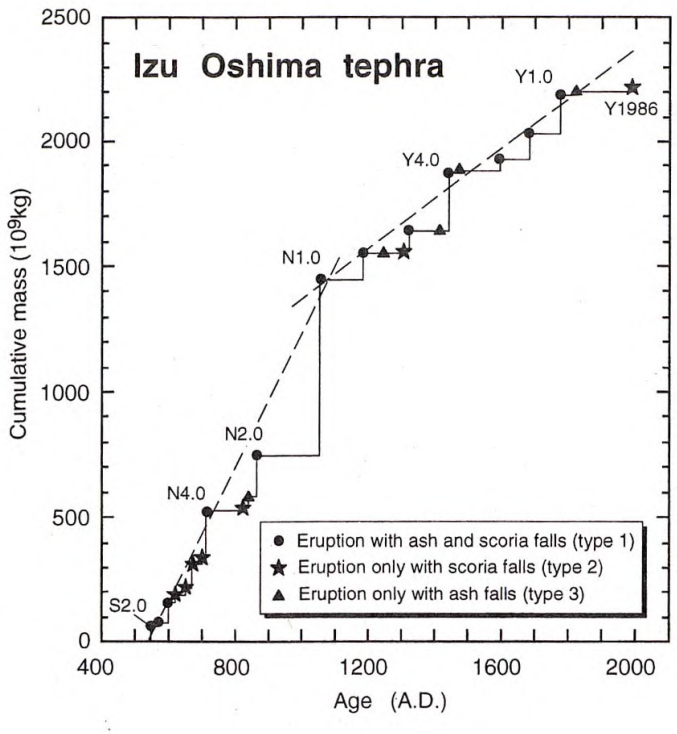


Figure 58-5 Cumulative eruption mass after 400AD (tephra only) (Koyama and Hayakawa, 1996).

Precursory Phenomena

Thermal demagnetization and resistivity decreases were observed beneath the summit crater from years before the 1986 eruption (after 1980), and volcanic tremors appeared and increased in intensity 4 months before the eruption. Several years before the eruption, the thermal anomaly region on the crater floor of Miharayama was observed to grow, rapidly expanding several months before the eruption. A new fume appeared several days before the eruption. Two hours before the fissure eruption there was a sudden increase in volcanic earthquakes with prominent ground deformation.

Even during periods of low activity after the 1986 eruption, there has been continuing volcano deformation as a result of magma supply from depths.

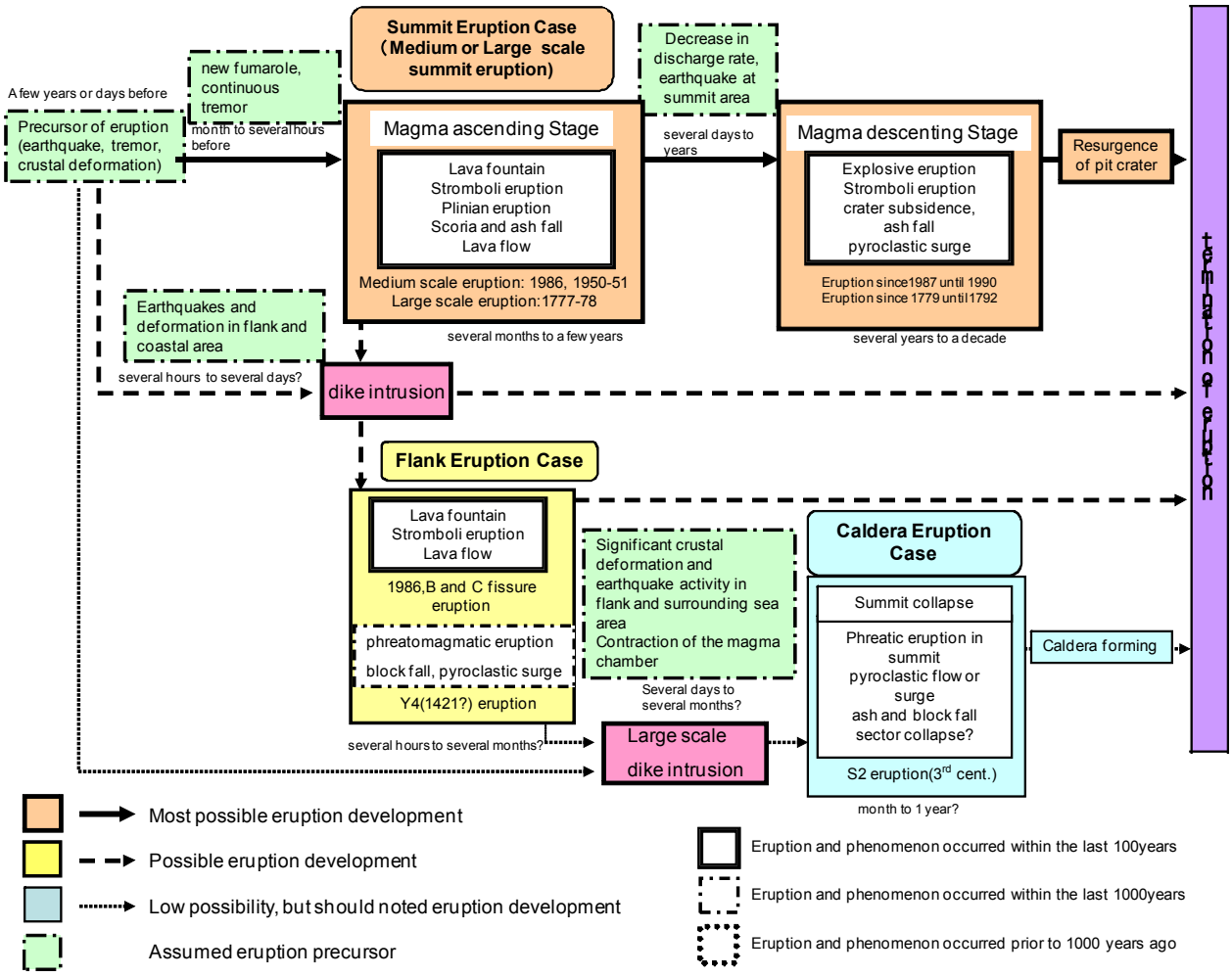


Figure 58-6 Event tree of Izu-Oshima eruption activity (Coordinating Committee for Prediction of Volcanic Eruption (CCPVE) Izu Task Force, 2008).

Major Volcanic Activity

・Eruptive Activity between 1986 and 1990

From mid-October, tremor energy increased, growing exponentially as the eruption approached.

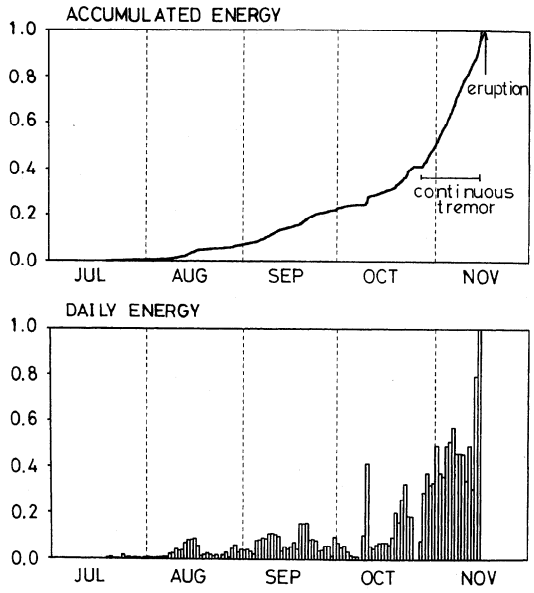


Figure 58-7 Cumulative energy of volcanic tremor before the 1986 eruption (top) and energy values per day (bottom) (Hashimoto et al., 1989).

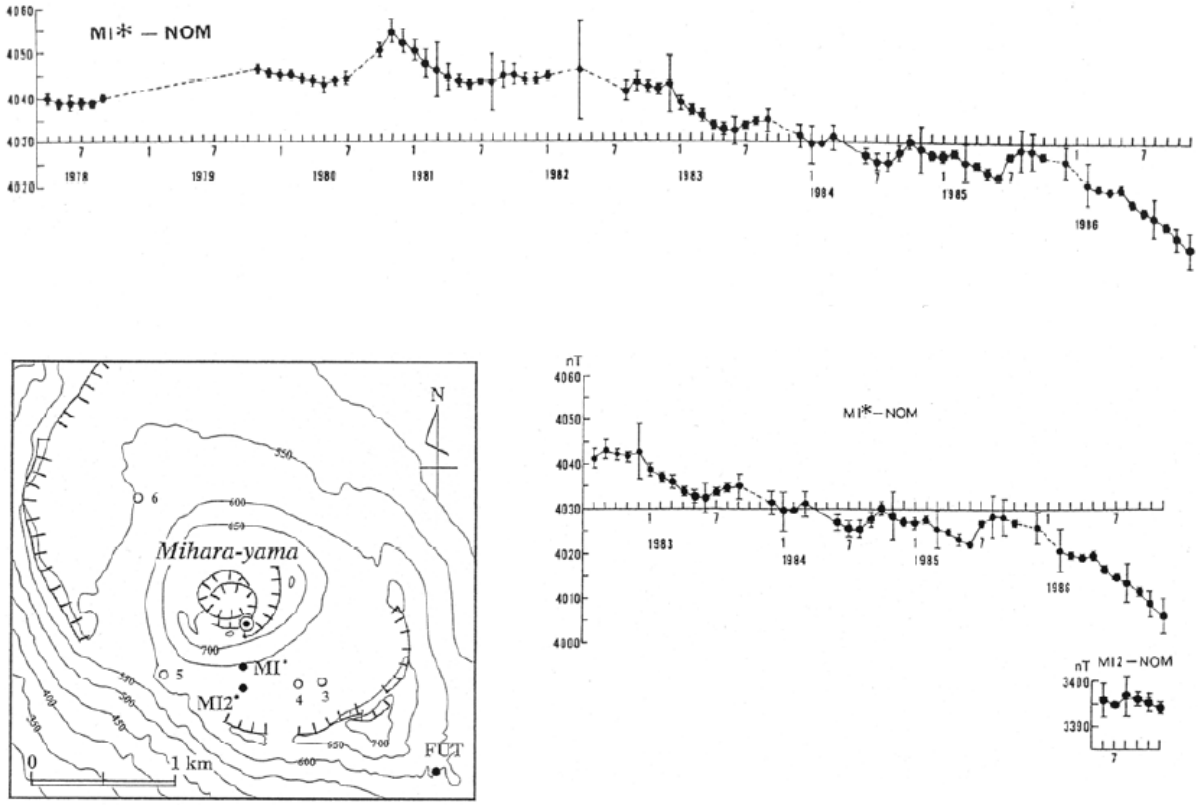


Figure 58-8 Changes in total geomagnetic force observed at southern foot of Miharayama, using Nomashi station as a reference point (Yukutake et al., 1990).

From 1980, geomagnetic total intensity stopped increasing and began decreasing. In 1986, the decrease accelerated.

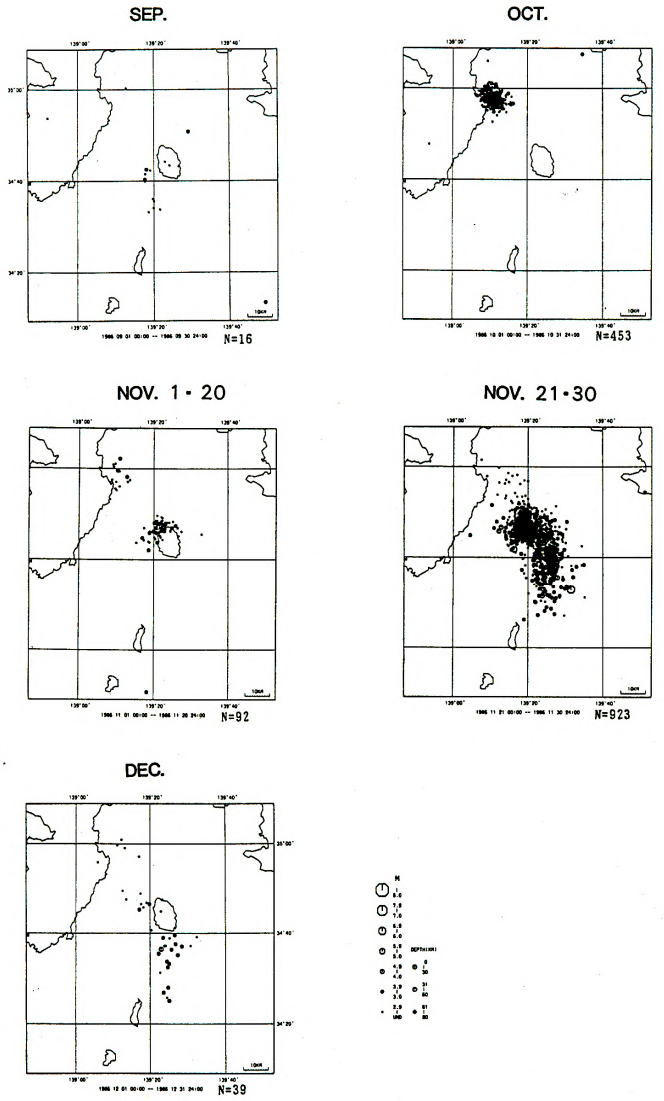


Figure 58-9 Epicenter distribution of earthquakes near Izu-Oshima (September to December, 1986) (Japan Meteorological Agency, 1987).

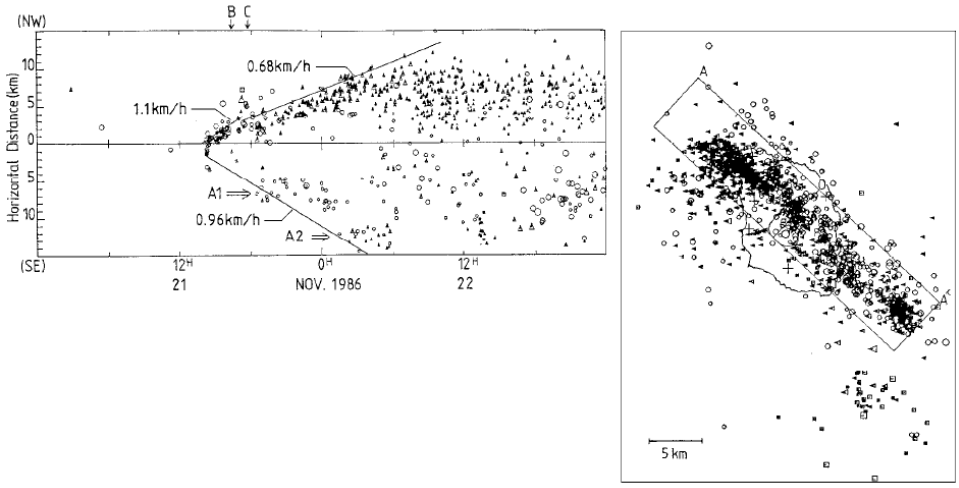


Figure 58-10 Seismic activity before and after the November 21, 1986, fissure eruption (Yamaoka et al., 1988).

Left: Space-time plot of seismic activity, Right: Epicenter distribution. From November 21, the date the fissure eruption started, epicenters were distributed widely from the northwest to the southeast, centered around the summit, and extending into the sea.

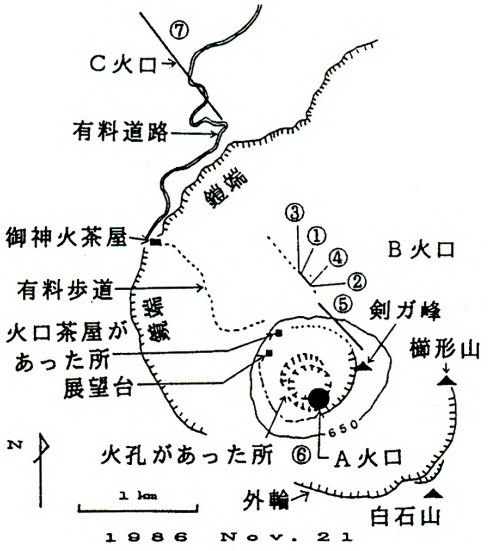


Figure 58-11 Changes in eruption craters during the eruption on November 21, 1986 (Japan Meteorological Agency, 1987).

Numbers indicate chronological sequence. This figure was produced by measurements by Japan Meteorological Agency personnel by Maritime Safety Agency helicopter.

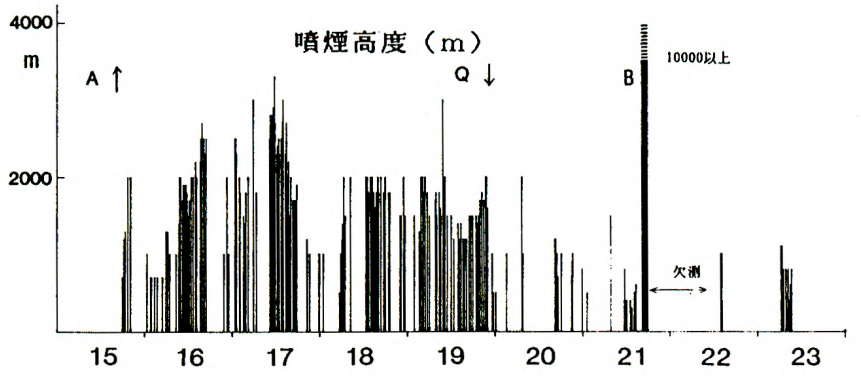


Figure 58-12 Volcanic plume heights for 1986 eruption (November 15 to 23, 1986) (Japan Meteorological Agency, 1987). "A" indicates start of summit eruption, "Q" indicates summit eruption weakening, "B" indicates start of fissure eruption.

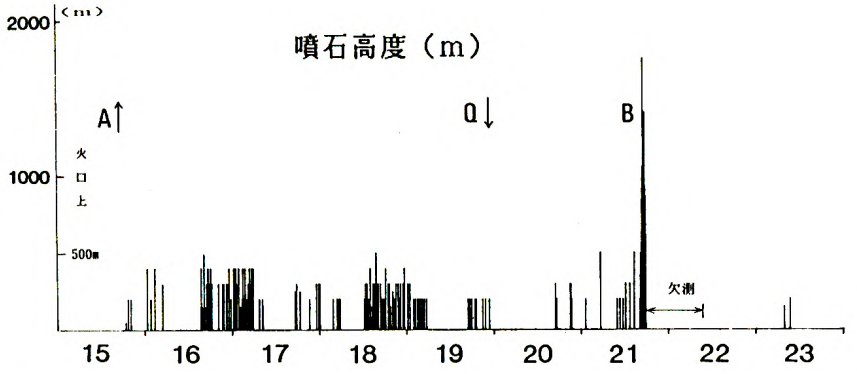


Figure 58-13 Ejection heights of volcanic blocks for 1986 eruption (November 15 to 23, 1986) (Japan Meteorological Agency, 1987). "A" indicates start of summit eruption, "Q" indicates summit eruption weakening, "B" indicates start of fissure eruption.

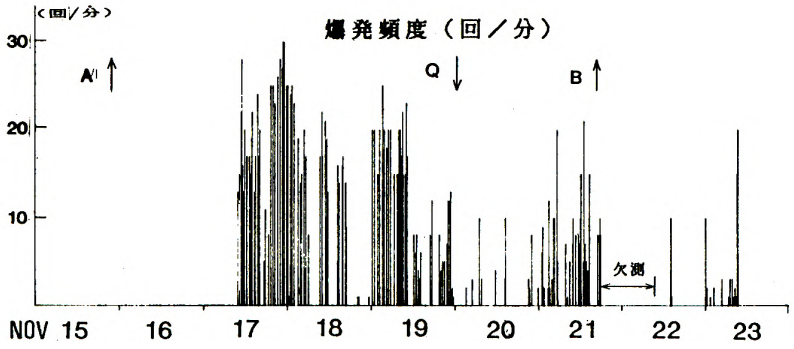


Figure 58-14 Number of explosions during 1986 eruption (November 15 to 23, 1986) (Japan Meteorological Agency, 1987). "A" indicates start of summit eruption, "Q" indicates summit eruption weakening, "B" indicates start of fissure eruption.

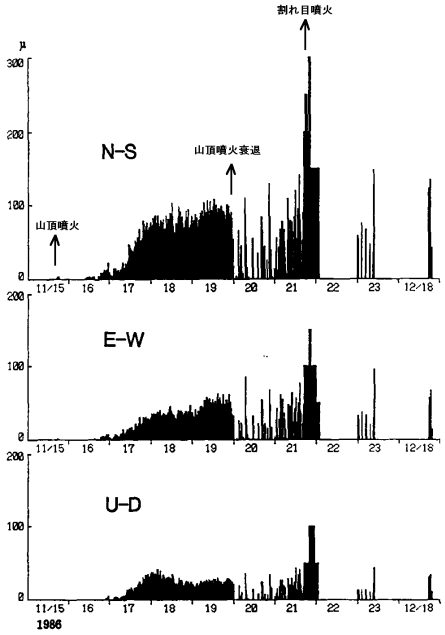


Figure 58-15 Changes in maximum amplitude of volcanic tremor during 1986 eruption
(partial modification of Yamasato et al. (1988)).
Continuous tremors grew in intensity after the summit eruption began, and when the eruption became intermittent, the tremors also became intermittent in response.
When the fissure eruption occurred, large amplitude tremors were observed.

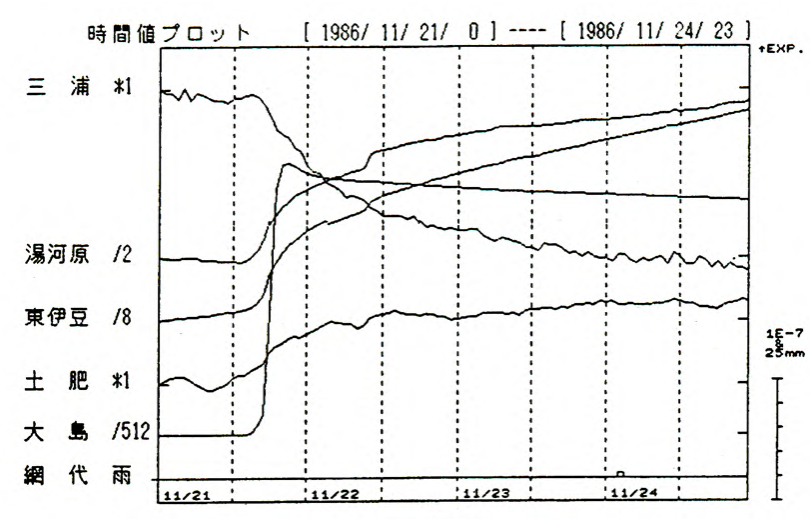
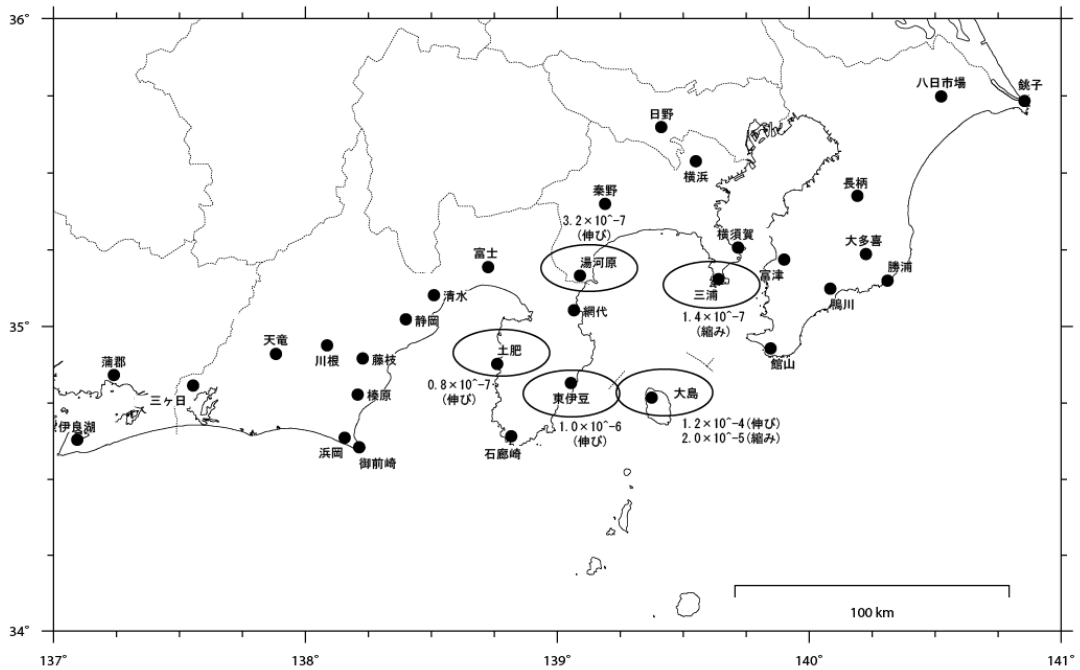


Figure 58-16 Changes in volumetric strain caused by the 1986 Izu-Oshima eruption (November 21 to 24) (top) . Total strain after the start of anomalous changes (November 21 to December 2) (bottom) (Japan Meteorological Agency, 1987).

Volumetric strain caused by the eruption was observed in the Tokai and southern Kanto areas, distant from Oshima, as well.



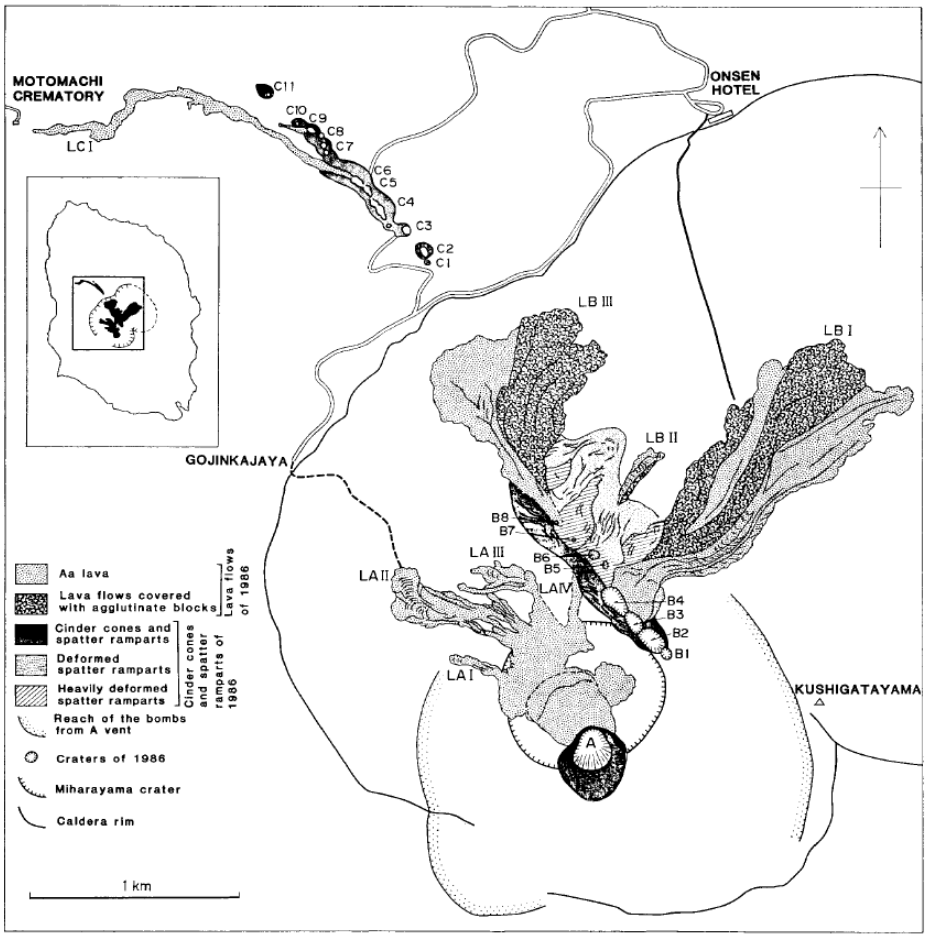


Figure 58-17 Distribution of eruption craters and eruption products during 1986 Izu-Oshima eruption (Sakaguchi et al., 1988).

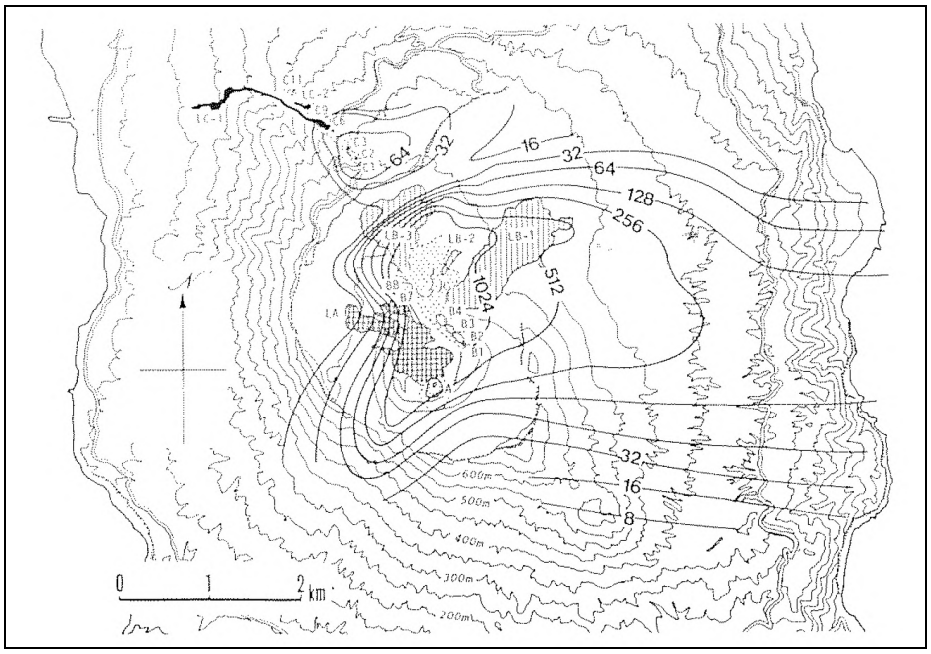


Figure 58-18 Tephra isopach (mm) and lava distribution of 1986 Izu-Oshima eruption (Endo et al., 1988).

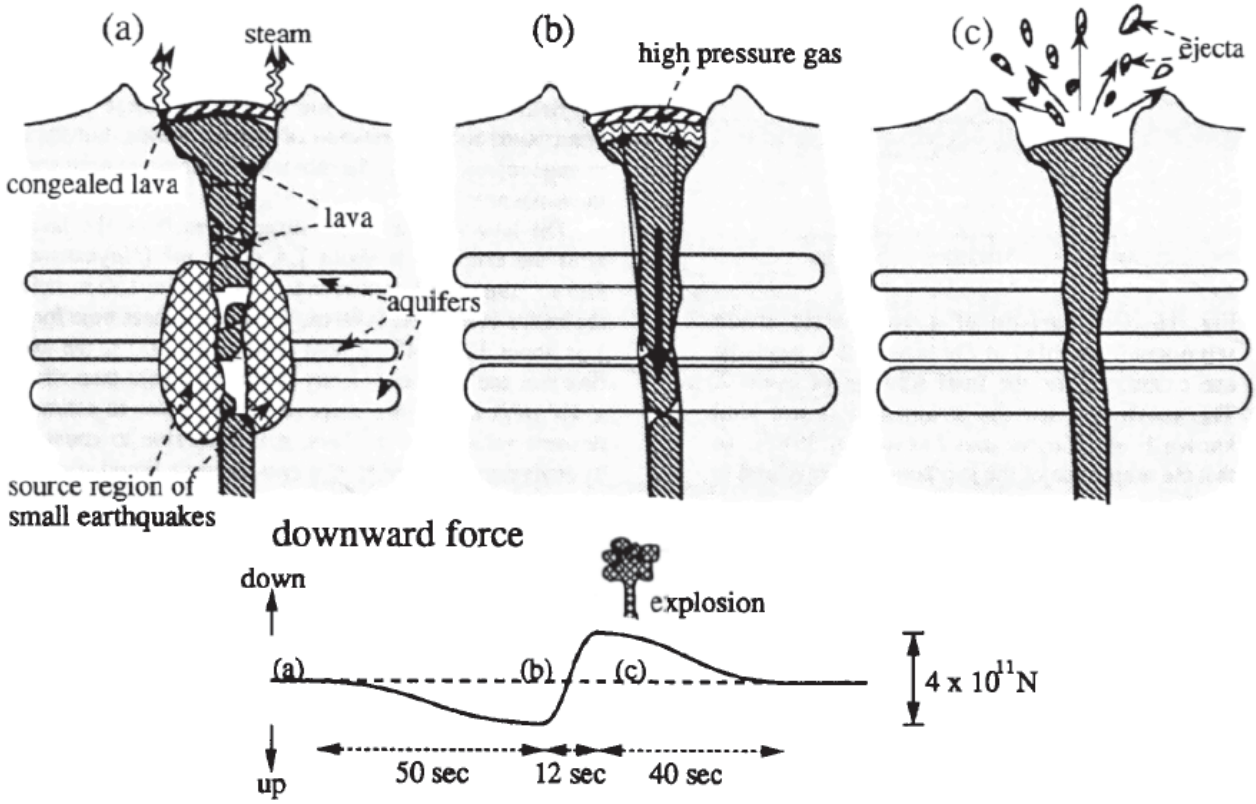
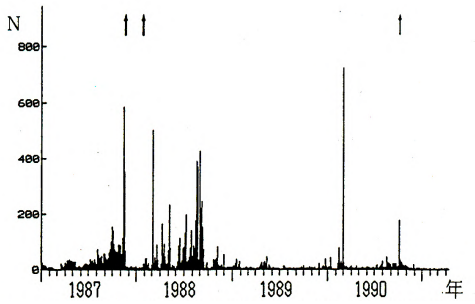
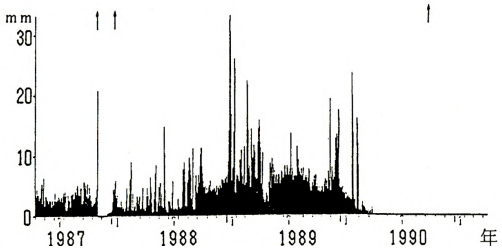


Figure 58-19 A schematic model of the eruption on November 16, 1987 at Izu-Oshima, (top) and relationship between changes in vertical force, deduced from seismic waves, and eruption (bottom) (Takeo et al., 1990).

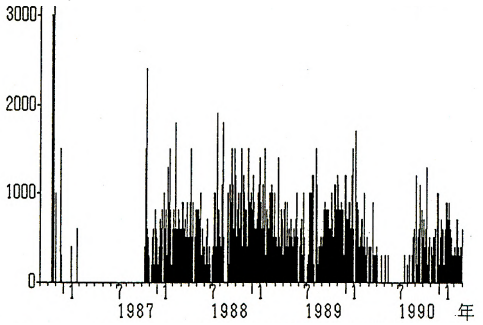
The lava supplied at the central vent during the 1986 eruption suddenly dropped into the conduit, striking the lava in deeper part to stop.



Number of earthquakes per day observed at station A of Japan Meteorological Agency. January, 1987, to March, 1991. (↑



Maximum amplitude of volcanic tremor in each day observed at station A of Japan Meteorological Agency, May, 1987, to March, 1991. (↑: eruption)



Maximum height of volcanic plume in each day (October, 1986, to March, 1991) (↑: eruption)

Figure 58-20 Volcanic activity since the 1986 eruption.

The location of station A (inside the caldera) is different from the previous station A before the 1986 eruption. In 1987 and 1988, and in March and October, 1990, earthquake swarms occurred frequently at the summit (top figure). The tremors, which had occurred frequently before, stopped in April, 1990 (middle figure). The eruption in November 1987 was accompanied by a large collapse, followed by heavy steam volcanic plume, but it decreased from the summer of 1990 (bottom figure).

Recent Volcanic Activity

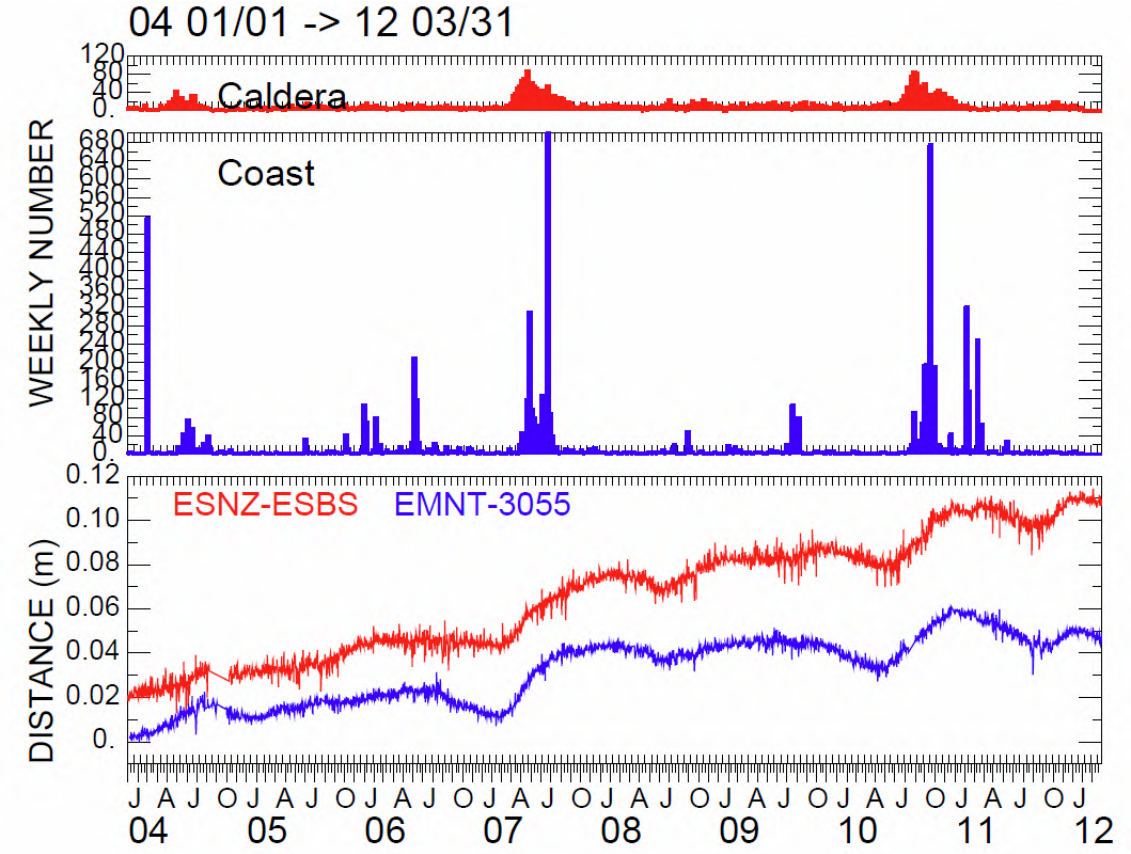


Figure 58-21 Number of earthquakes inside the caldera, number of earthquakes in the surrounding area, and change in GPS baseline lengths (Earthquake Research Institute, University of Tokyo 2012).

This figure clearly shows that magma has been intermittently supplied to a reservoir in deep part of volcano, which is indicated by extensions of baseline lengths ,syncrronizing with the increase in the number of earthquakes in and around the caldera.

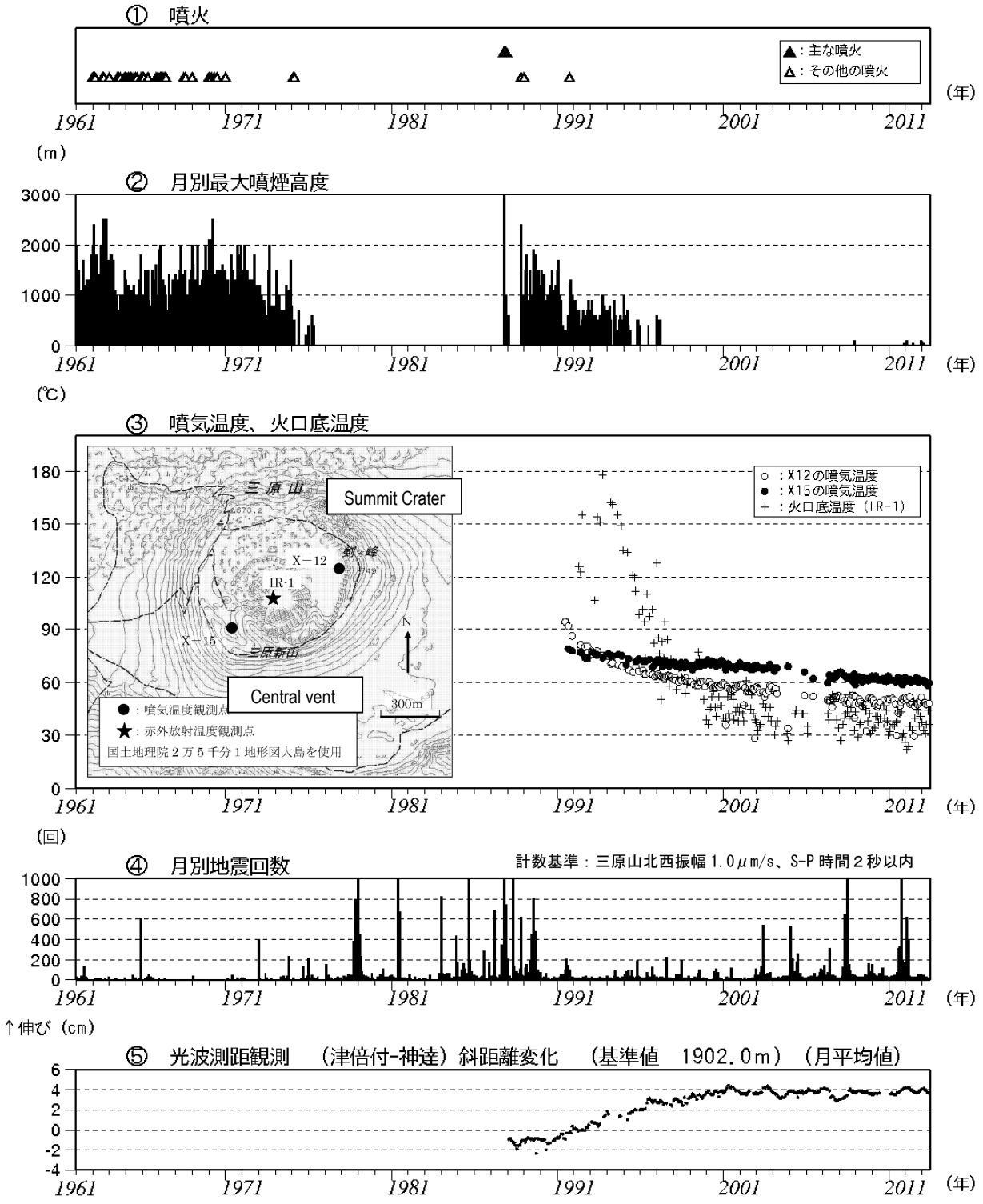
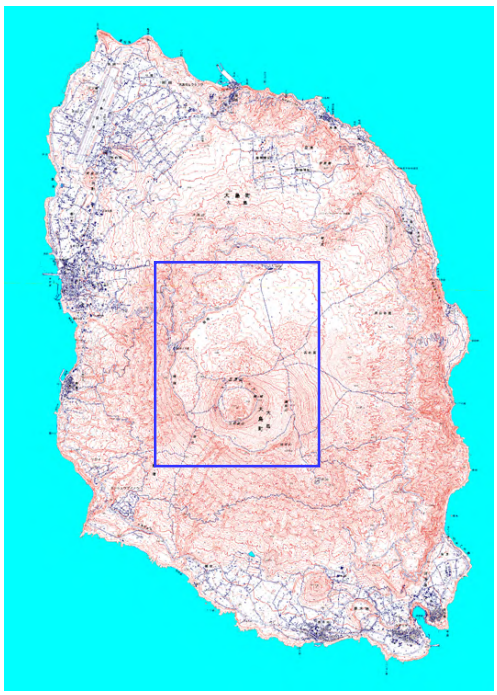


Figure58-22 Long-term volcanic activity (January, 1961, to June 30, 2012).

① Eruptions. ②Daily maximum volcanic plume height; Visual observation was performed until February, 2002, from the old Oshima weather station, so volcanic plumes with heights of less than 300m above the crater rim of Miharayama were hidden by the somma, and could not be observed. (since February, 2006, observation has been performed by high-sensitivity camera at the caldera rim).
③Temperature of fume on crater floor (IR-1) are measured by remote infrared radiation thermometer. Fume temperature (X-12, X-15) are direct measured. ④The number of earthquakes per month, including tectonic earthquakes in the area around Izu-Oshima.
⑤Change in monthly average distance by EDM (Tsubaitsuki – Kandachi, reference value: 1902.0m; measurement began in January, 1987). Blanks indicate measurement deficits due to equipment failures.



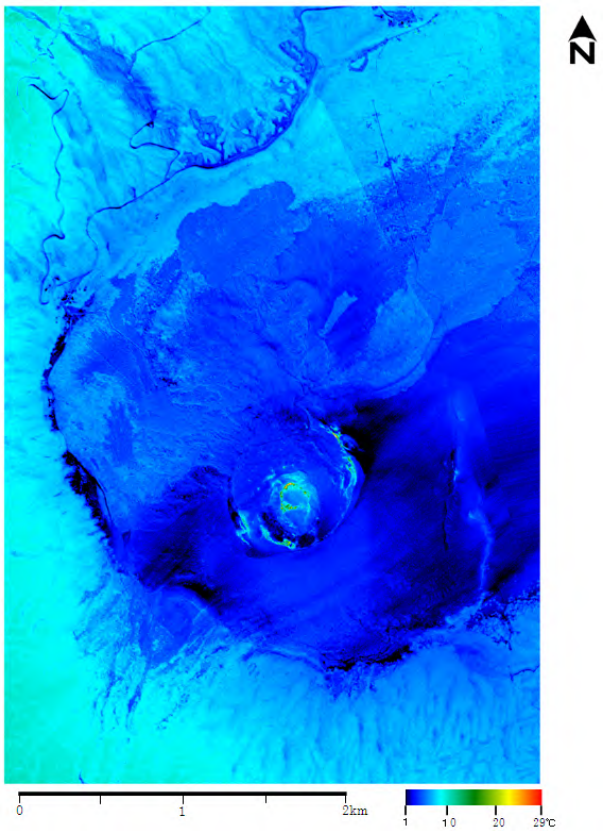


Figure 58-23 Results of airborne thermal imaging of Miharayama (performed at night on January 20, 2008).

Top: Topographic map of Izu-Oshima, Bottom: Surface temperature distribution in the blue rectangle in the map (Japan Meteorological Agency, 2008).

Compared to 1997, there are no new thermal anomaly areas, and temperatures have fallen. No thermal anomalies were observed outside the Mihara crater area either.

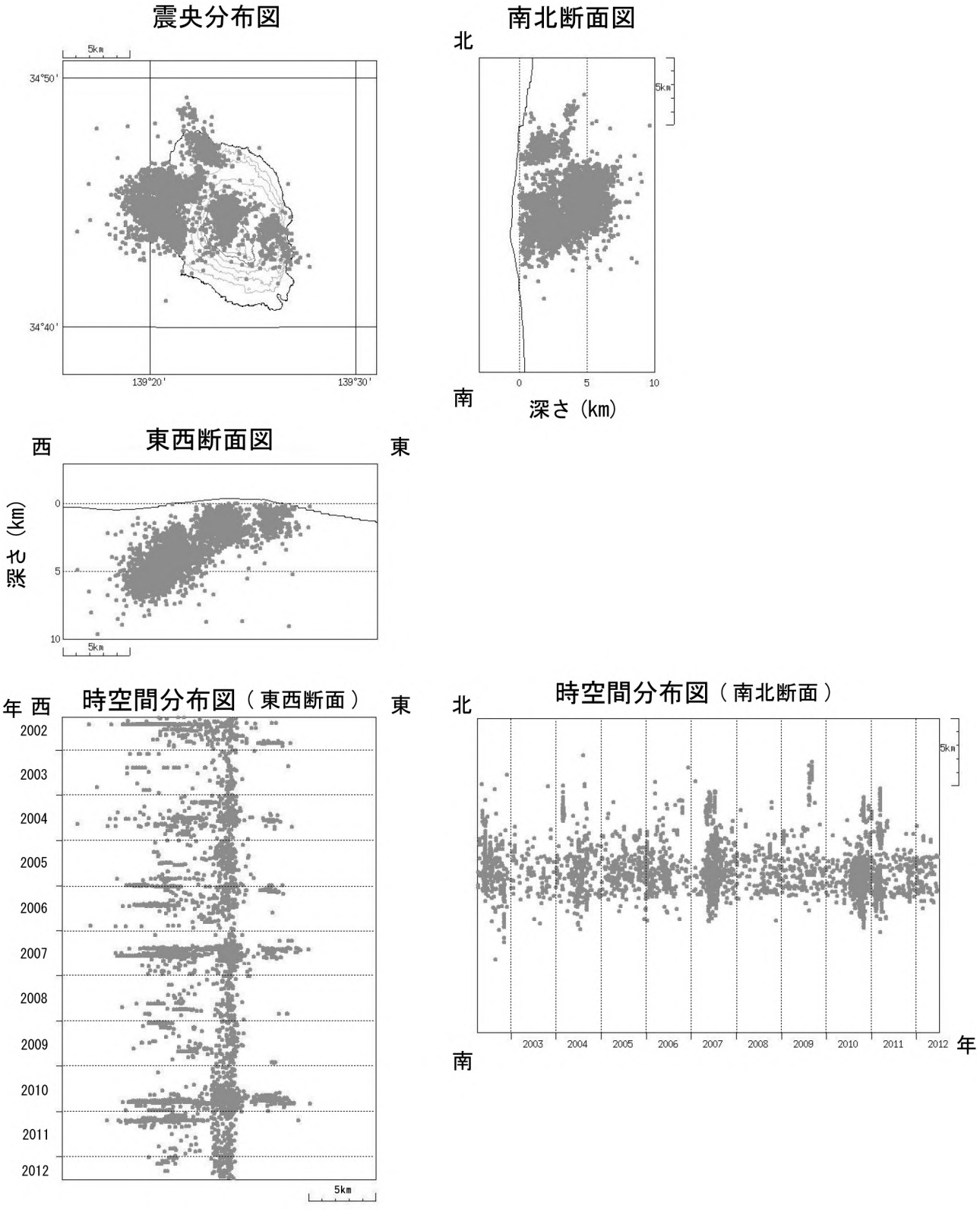


Figure 58-24 Seismic activity in and around the volcanic edifice (March 1, 2002, to June 30, 2012).

①Epicenter distribution

②N-S cross-section

③E-W cross-section

④Space-time plot (E-W cross-section)

⑤Space-time plot (N-S cross-section)

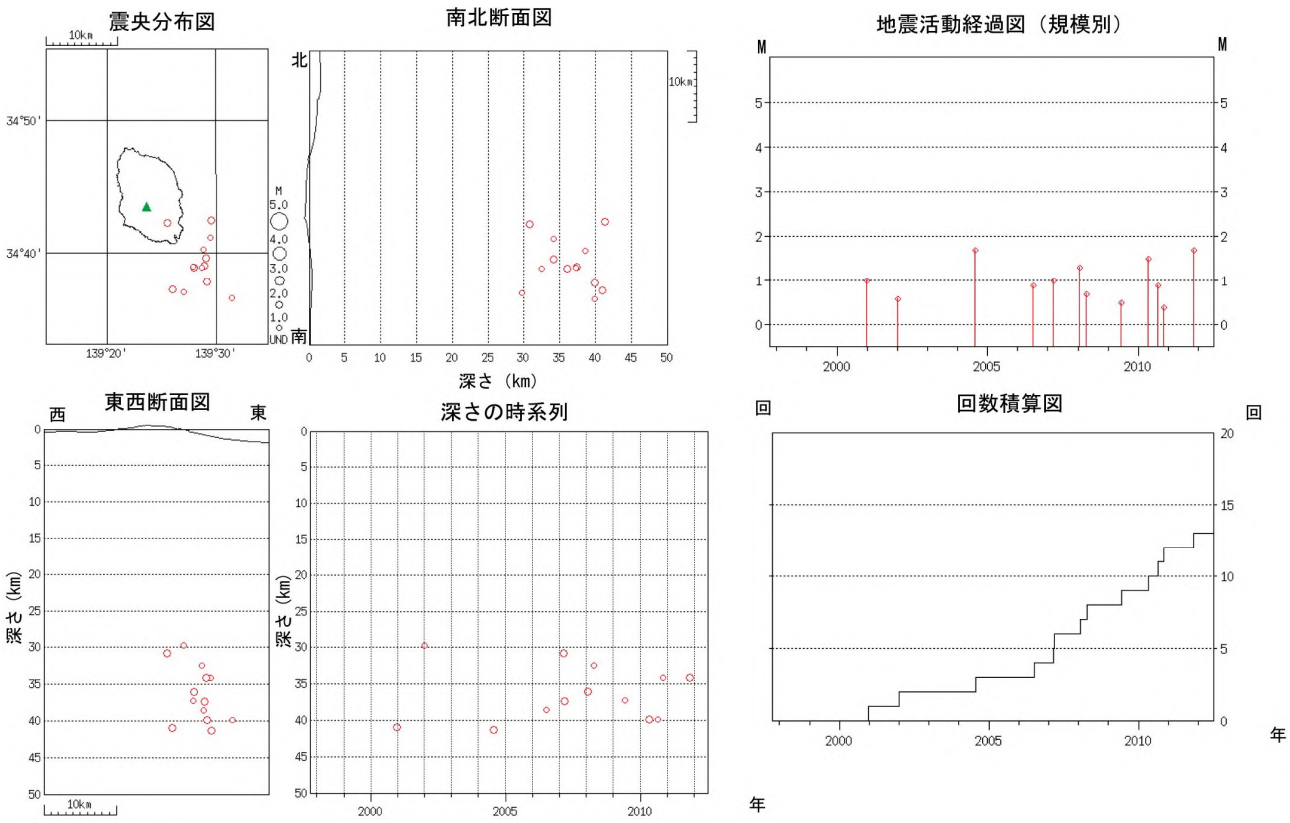


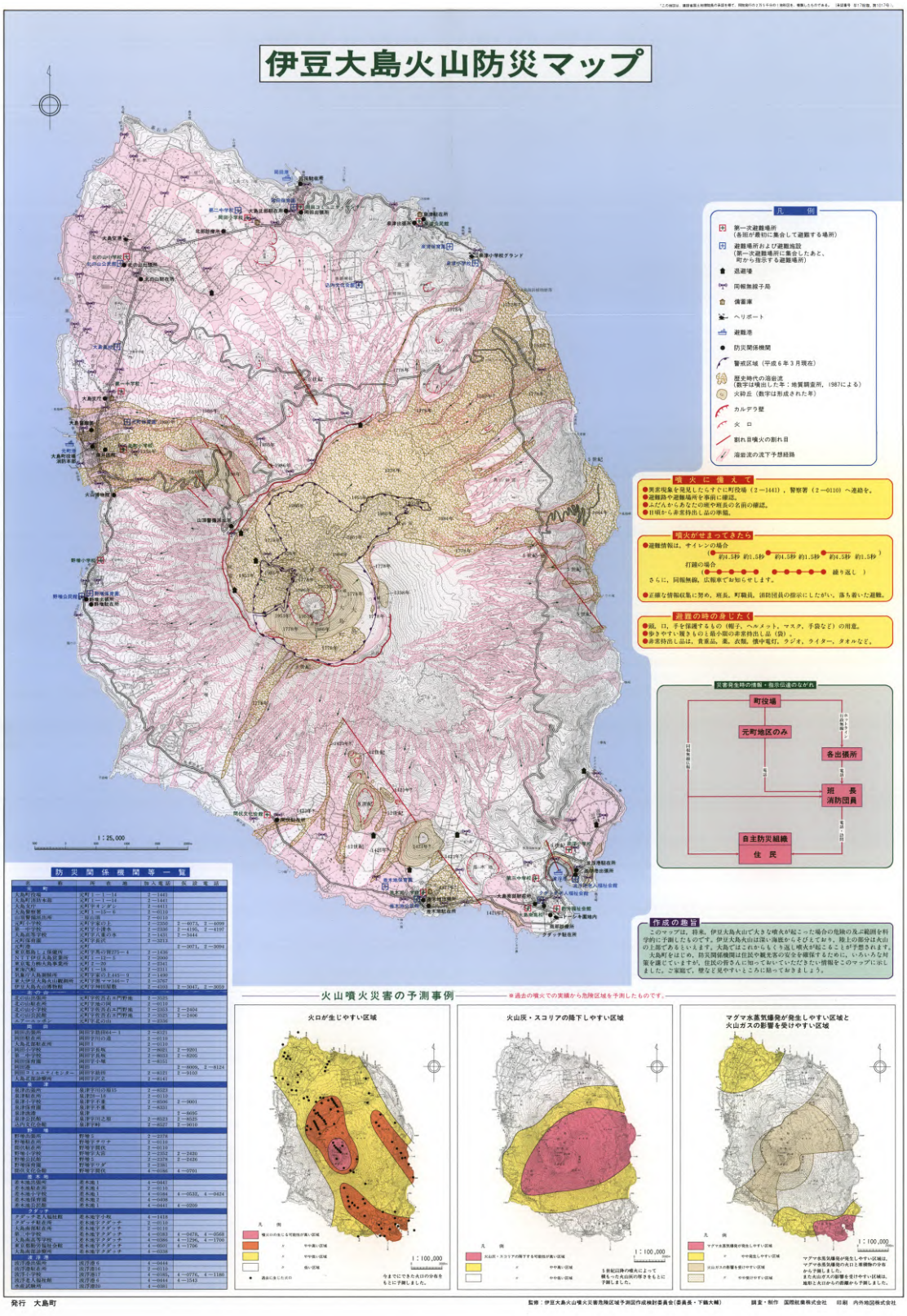
Figure 58-25 Deep low-frequency seismic activity (October 1, 1997, to June 30, 2012). Epicenter distribution (upper left), N-S cross section (upper center), Magnitude-time plot of earthquake (by scale) (upper right), E-W cross-section (lower left), depth time series (lower center) and cumulativel number of deep low frequency earthquakes (lower right).

Information on Disaster Prevention

①Hazard Map

Izu-Oshima Volcano Hazard Map (Wide Area Version) March, 1994 (Heisei 6) - Published by the Oshima Town Commission for Izu-Oshima Volcano Hazard Map

http://www.nilim.go.jp/lab/rbg/bousai_map/020_izuoshima.htm



②Volcanic Alert Levels (Used since December 1, 2007)

■伊豆大島　噴火警戒レベルに対応した規制範囲

●噴火警戒レベルに応じて下記のような防災対応が必要になります。

レベル5（避難）：
住民等の島内または島外避難

レベル4（避難準備）：
住民等の避難準備　要援護者の避難

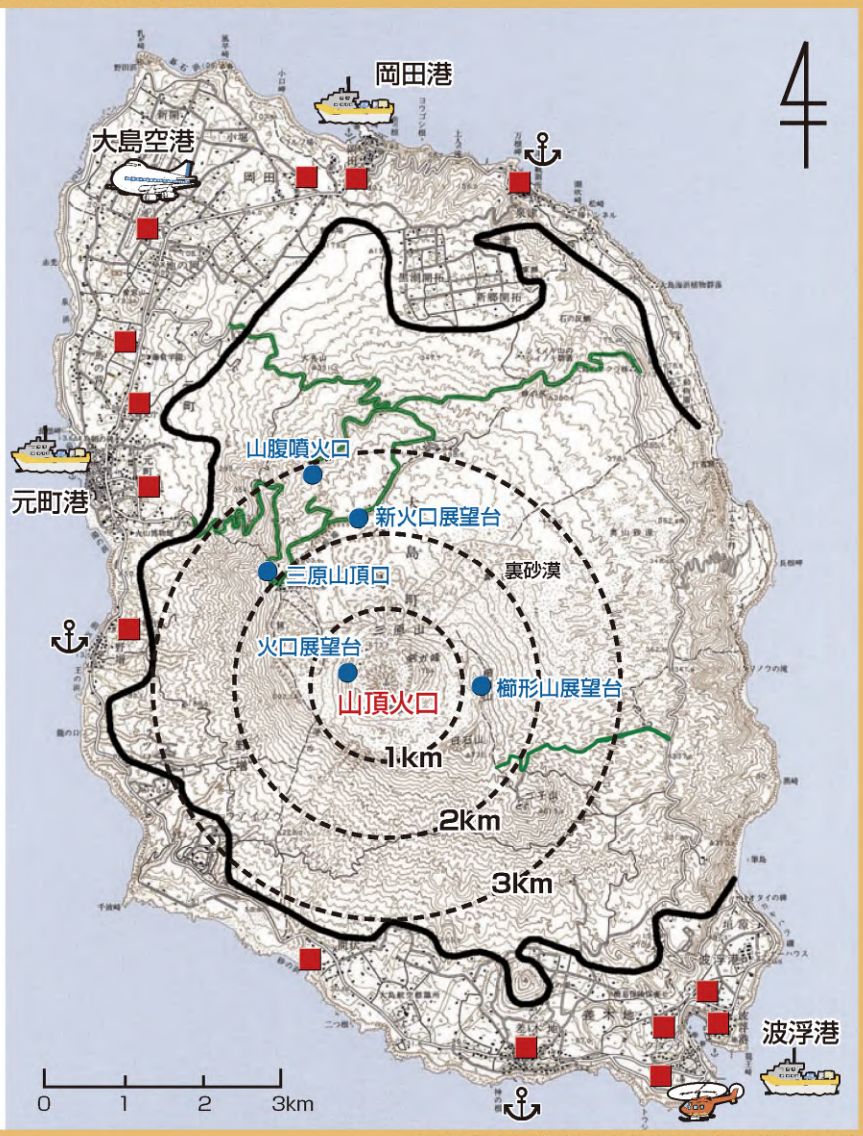
レベル3（入山規制）：
山頂火口から約3kmの範囲の立入規制
または
山頂火口から約2kmの範囲と裏砂漠の立入規制
※レベル3では火山活動の状況に応じて規制範囲が変わります。

レベル2（火口周辺規制）：
山頂火口から約1kmの範囲の立入規制

レベル1（平常）：
山頂火口から約600mの範囲と溶岩流等の危険区域、ただし遊歩道を除く

■伊豆大島の噴火警戒レベルは地元自治体等と調整して作成しました。
各レベルにおける具体的な規制範囲等は、地域防災計画に定められていますので、詳細については大島町にお問い合わせください。

図の凡例
：居住区域の境界
：登山道
：避難場所（火山噴火）
：避難港
：その他の港湾、漁港
：ヘリポート



この図は「国土地理院5万分の１地形図大島」を使用して作成しています

Volcanic Alert Levels for the Izu-Oshima Volcano (Valid as of December 1, 2007)

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**	●Lava flow reaches residential areas. Great An'ei Eruption (1778) Example November 14 or November 15: Lava flow reached northeastern coast. ●Imminent expansion of fissure eruption beyond caldera, causing serious damage to residential areas. 1986 Eruption Example November 21, 18:00 to 19:00: Crater chain expanded towards coast. From November 21, 19:00: Earthquake swarm in southeast of island. From November 21, 22:00: Crack appeared in southeast of island.
		4 Prepare to evacuate	**Possibility 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.**	●Increased probability of lava flowing out of caldera and reaching residential areas. Great An'ei Eruption (1778) Example November 6: Lava flow towards Mabushi. ●Fissure eruptions begin outside caldera, and there is a possibility of volcanic blocks or lava flow reaching residential areas. 1986 Eruption Example November 21, approximately 17:47: C crater chain eruption begins.
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.**	●Fissure eruptions begin inside caldera, and there is a possibility of volcanic blocks or lava flow inside the caldera, and, in some cases, reaching the somma area. 1986 Eruption Example November 21, approximately 16:15: B crater chain eruption begins. ●Many shallow earthquakes in the somma area and inside the caldera, and possibility of eruption with volcanic blocks and lava flow inside the caldera and in the somma area. 1986 Eruption Example November 21, approximately 14:00: Earthquake swarm in the north of the caldera. ●Lava flow within the caldera. 1986 Eruption Example November 19: Lava flow down from Miharayama central vent. Other Examples Eruptions of 1950 to 1951, May to June 1974, etc. ●Lava discharge at Miharayama central vent, with possibility of lava flow inside the caldera. 1986 Eruption Example November 15 to 18: Lava discharge inside Miharayama central vent.
	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.**	●Small eruption at Miharayama central vent, with scattering of volcanic blocks within a distance of approximately 1km. Small eruptions of November, 1987, January, 1988, and October, 1990. ●Possibility of small eruption at Miharayama central vent. 1986 Eruption Example November 15: Continuous tremors with increasing amplitudes. November 12: New fumarole appeared inside central fumarole. Late October: Continuous volcanic tremors. July: Intermittent volcanic tremors.
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 discharge which small enough it would not affect area from central fumarole to ring road around Miharayama central vent.

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

Social Circumstances

①Populations

Oshima Town: 8,608

(as of November 1, 2011, according to Oshima website, http://www.town.oshima.tokyo.jp)

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

- In April, 1955, the area was designated as the Izu Shichito Quasi-National Park, and upgraded in July, 1964, to the Fuji-Hakone-Izu National Park.
- Izu-Oshima was certified as a Japanese Geopark in September, 2010.
  http://www.izu-oshima.or.jp/geopark/
- 214,245 visitors

(2010 statistics, according to Oshima Town website, http://www.town.oshima.tokyo.jp)

③Facilities

Port facility conditions - as of April 1, 2007 (Heisei 19)

- Motomachi Port, Okada Port, Habu Port

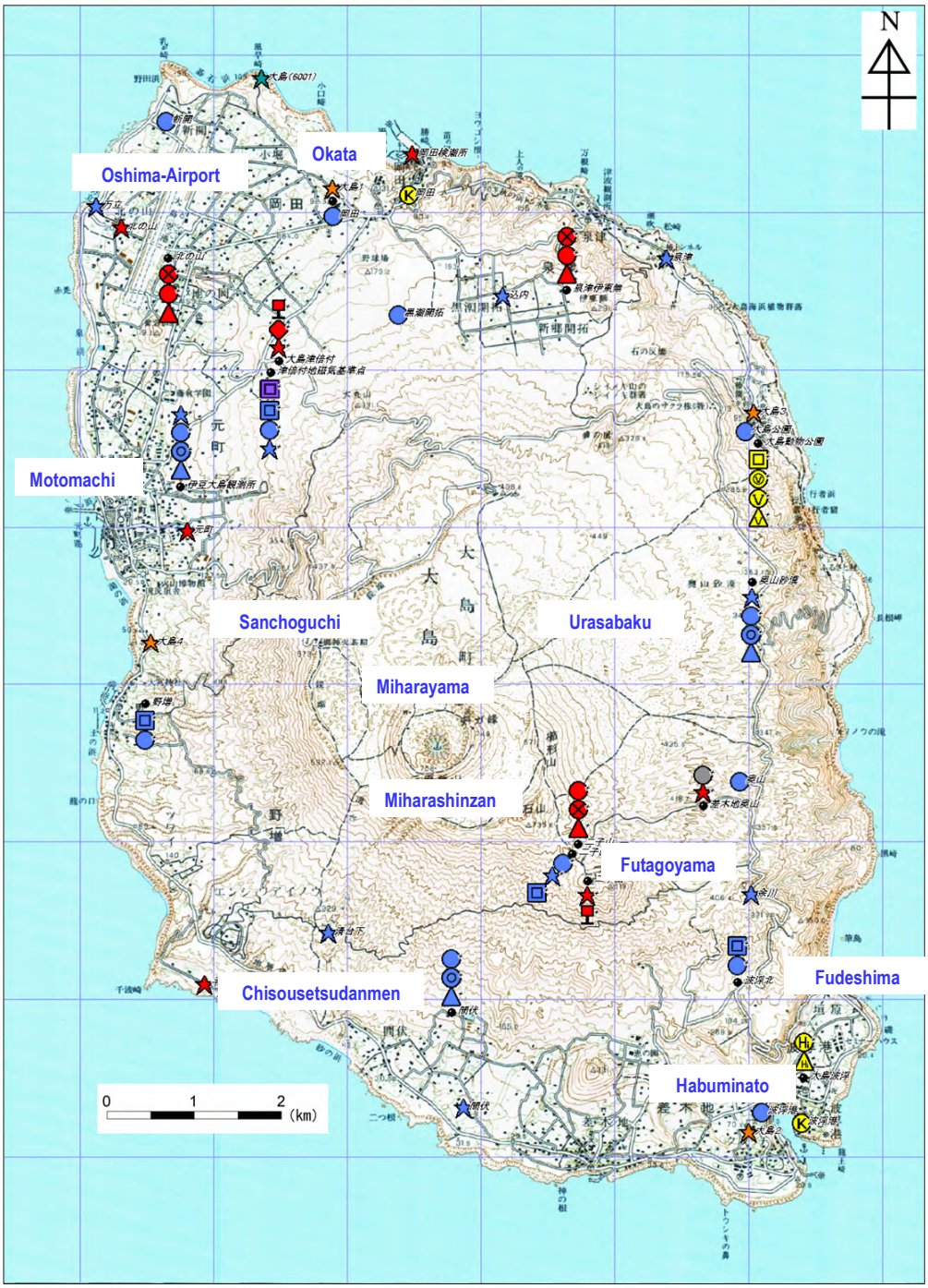
Other Facilities

- Izu-Oshima Museum of Volcanoes
- Historical Museum

Monitoring Network

Wide Area

* 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 (Oshima) published by the Geospatial Information Authority of Japan was used.

Legend

(JMA)
seismometer(SP)
GPS
tiltmeter
strainmeter
EDM
infrasonic microphone
seismometer(SP)
(For earthquakes and tsunamis)

(GSI)
GPS

(JHOD)
GPS

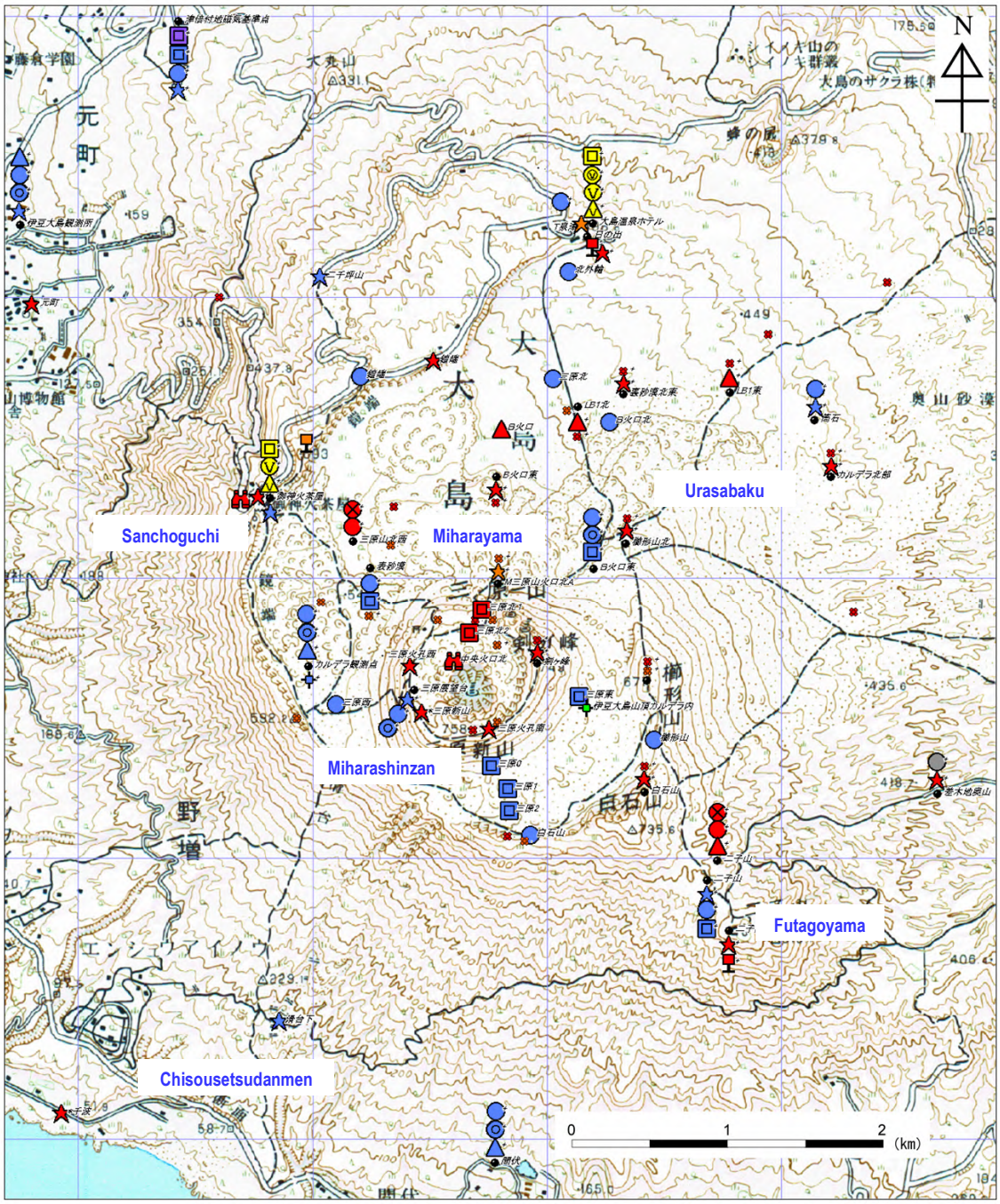
(NIED)
V-net(SP)
V-net(broadband)
V-net(tiltmeter)
Hi-net
Hi-net(tiltmeter)
K-NET
vector magnetometer

(FRI)
seismometer(SP)
seismometer (broadband)
GPS
tiltmeter
scalar magnetometer
vector magnetometer

Figure 58-26 Regional monitoring network.

In and Around the Summit

* 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 (Oshima) published by the Geospatial Information Authority of Japan was used.

Legend

(JMA)
- seismometer(SP)
- GPS
- tiltmeter
- infrasonic microphone
- visual camera
- EDM
- EDM(reflector)
- scalar magnetometer
- seismometer(SP)

(GSI)
- GPS
- EDM
- EDM(reflector)

(NIED)
- V-net(SP)
- V-net(broadband)
- V-net(tiltmeter)
- vector magnetometer

(AIST)
- self-potential

(ERI)
- seismometer(SP)
- seismometer (broadband)
- GPS
- tiltmeter
- scalar magnetometer
- vector magnetometer

(For earthquakes and tsunamis)

Figure 58-27 Local monitoring network around the summit.

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