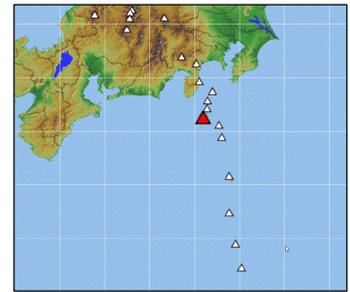


## 61. Kozushima

**Continuously Monitored by JMA**

Latitude: 34°13'10" N, Longitude: 139°09'11" E, Elevation: 572 m  
(Tenjosan) (Triangulation Point - Kozushima)



Overview of Kozushima taken from south-southeast side on October 30, 2002 by the Japan Meteorological Agency

### Summary

Kozushima is an island measuring 6 km north-south and 4 km east-west. It is composed of a group of rhyolite lava domes and pyroclastic rocks. The highest peak, Tenjosan, which was formed in the 9<sup>th</sup> century, is located at the center of the island. It experiences strong eruptions, and frequent pyroclastic surges and pyroclastic flows. Currently, there is no fumarolic activity. The lava flow covers a shallow sea area, and evidence exists of a previous secondary explosion (Taniguchi, 1982). The SiO<sub>2</sub> is between 65.1 and 78.1 wt %.

### Red Relief Image Map

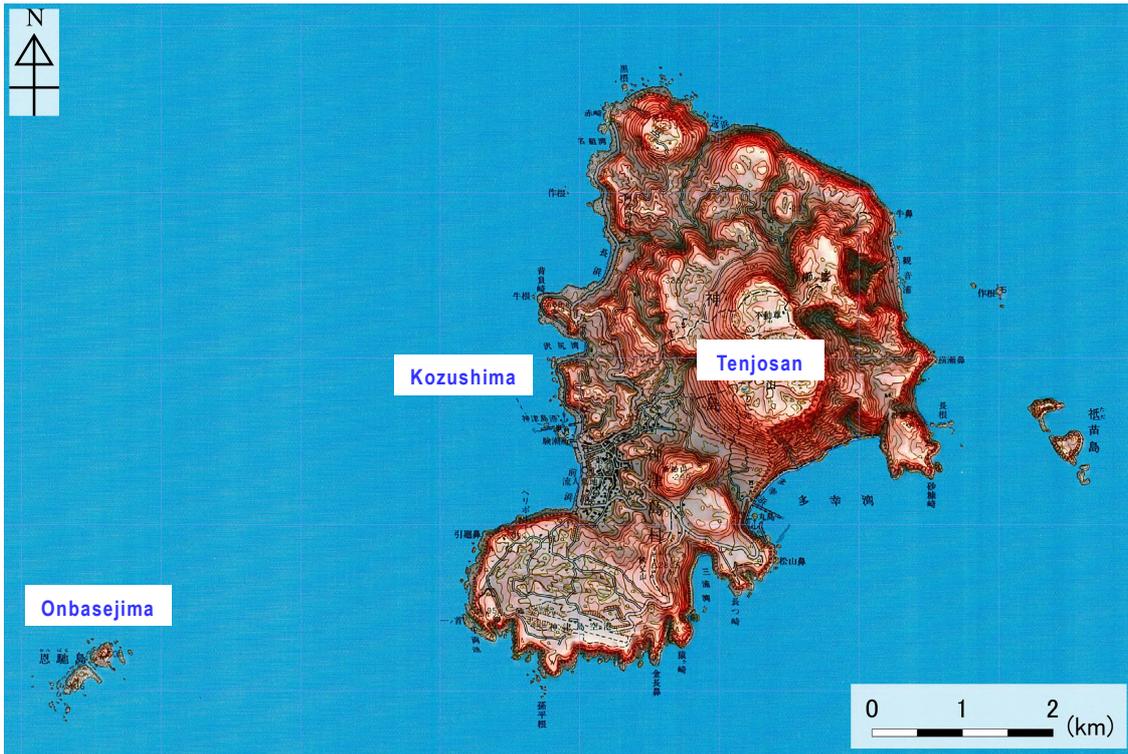


Figure 61-1 Topography of Kozushima.

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

### Submarine Topographic Map

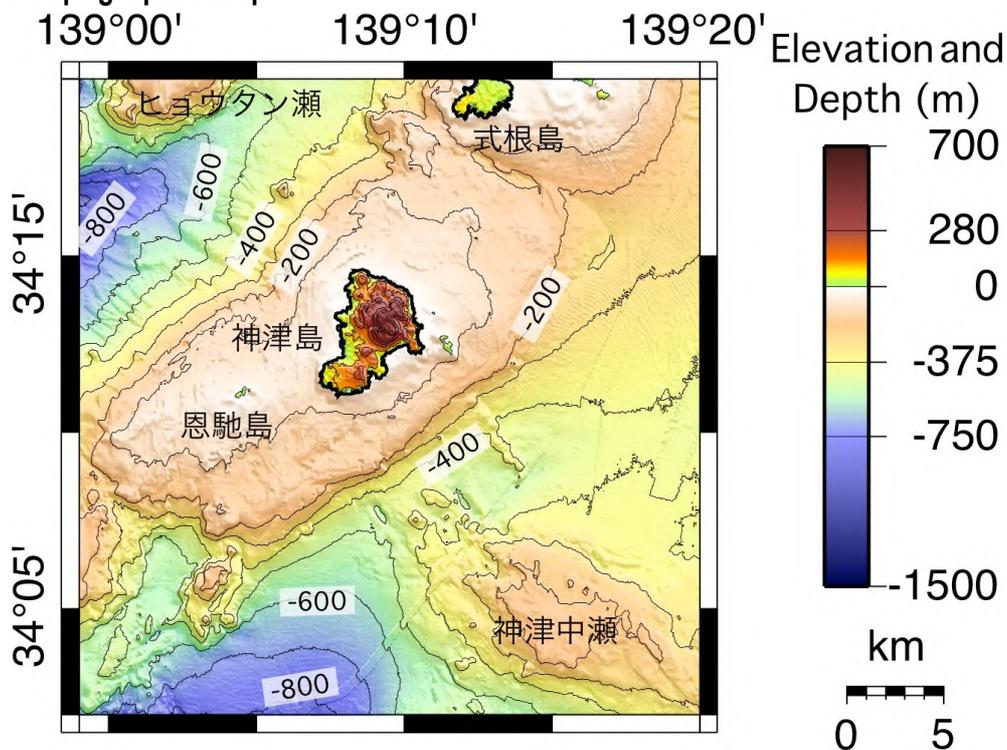


Figure 61-2 Submarine topographic map of the Kozushima area (Japan Coast Guard).

## Chronology of Eruptions

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

Kozushima is composed of 18 or more rhyolitic monogenetic volcanoes, including nearby islands (Tadanaejima and Onbasejima). Lava domes or thick lava flows have formed, and the volcano is prone to pyroclastic flows and pyroclastic surges.

The most recent activity at Kozushima was the eruption of the Tenjosan volcano in the 9<sup>th</sup> century. Reports exist of previous eruption periods, but Kozushima's chronology of eruptions is not entirely clear (Isshiki, 1982; Suga et al., 1992; Taniguchi, 1977; Ito, 1999).

Period	Area of Activity	Eruption Type	Main Phenomena / Volume of Magma
10ka	Jogoyama (Jogorozan)	Magmatic eruption	Lava dome.
3.4←→1.162 ka	Chain of 3 lava domes (Kobeyama, Ananoyama, Hanatate) on the northern island	Magmatic eruption	Lava dome.

\* 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.
838 (Jowa 5)	Large: Magmatic eruption, phreatomagmatic eruption → magmatic eruption	Tenjosan eruption: The eruption began on August 11. Pyroclastic flow, pyroclastic surge → tephra fall → lava dome. The eruption occurred at Tenjosan. Tephra fall in the Kanto, Chubu, and Kinki areas. Tenjosan was formed. The pyroclastic flow entered the sea, and volcanic ash from Tenjosan has been identified at the foot of Fuji volcano. Magma eruption volume = 0.66 km <sup>3</sup> DRE. (VEI 4)
1965 (Showa 40)	Earthquake	August 3 to 9. Earthquake swarms (at sea, to the south, maximum magnitude of M5.0).
1967 (Showa 42)	Earthquake	April 6 to 7. Earthquake swarms (on island, maximum magnitude M5.3).
1988 to 1989 (Showa 63 to Heisei 1)	Earthquake	December 28 to January 22. Earthquake swarms 10 to 20 km southwest of the island. Maximum magnitude of M5.0 (January 2).
1991 to 1995 (Heisei 3 to 7)	Earthquake	Occasional earthquake swarms in area (seismic activity near Niijima and Kozushima).
1995 (Heisei 7)	Earthquake	October 6 to end of October. Earthquake swarms. 246 felt-earthquakes, maximum JMA scale seismic intensity of 5, maximum magnitude of M5.9, cliff collapses on island.
2000 (Heisei 12)	Earthquake	October 6 to end of October. Earthquake swarms near Niijima, Kozushima, and Miyakejima.

\* 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.

\* For details regarding earthquake swarms, see Miyakejima.

### Precursory Phenomena

Although eruptions have not occurred recently, crustal deformation indicates that even now there is a possibility of magma supply below Kozushima.

## Major Volcanic Activity

### ▪ Eruptive Activity in 838 (Jowa 5)

In 838 an eruption including a pyroclastic flow and pyroclastic surge occurred. After their emission, a pyroclastic cone was formed, ultimately leading to the formation of a lava dome (Tenjosan). Air fall volcanic ash and pyroclastic surge deposits produced by this eruption have been confirmed in Niijima and Shikinejima. According to ancient records, ash fall which is considered to be related to this eruption was reported over a wide area, from the Kinki to the Kanto regions. It has been confirmed in the strata of Izu-Oshima, the city of Shizuoka, and the Tanna basin.

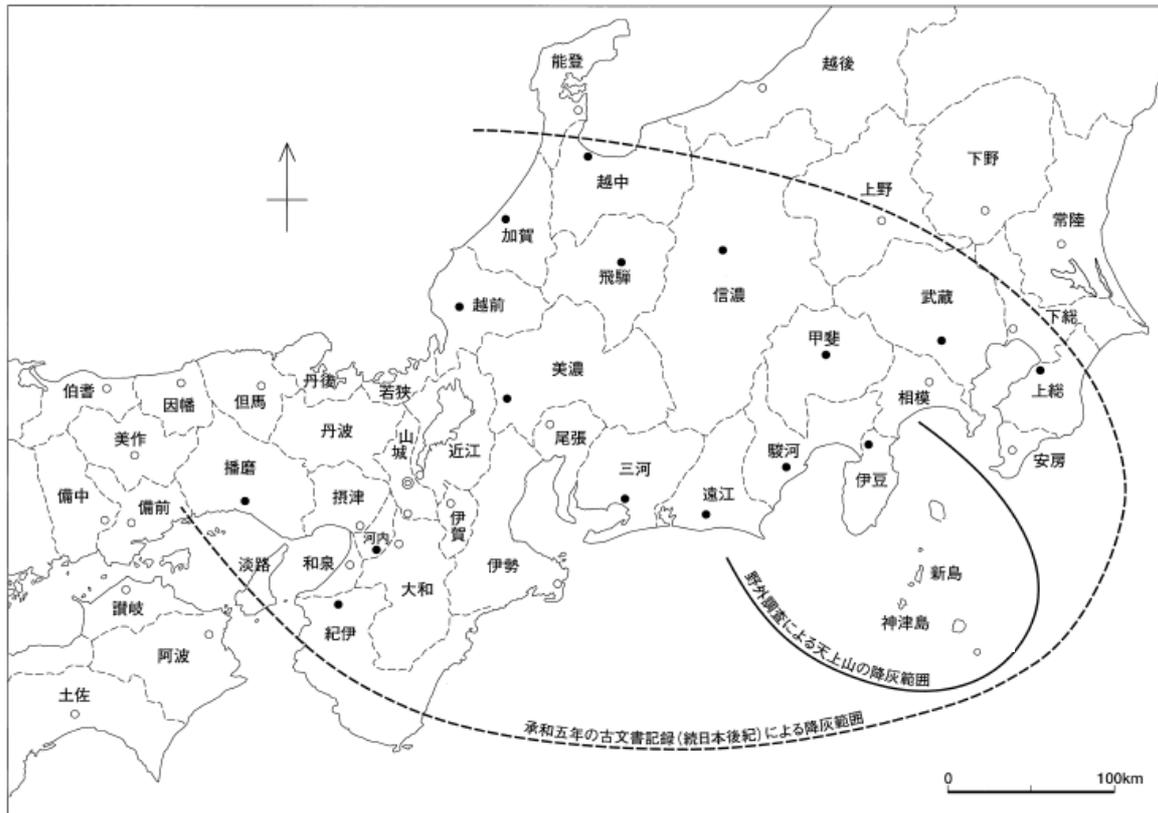


Figure 61-3 Areas of Tenjo tephra distribution from Kozushima 838 (Jowa 5) eruption (modification of Sugihara et al., 2001).

○ symbols indicate old provincial capitals in the Jowa era. ● symbols indicate provincial capitals in which ash fall was reported. ◎ symbol indicates position of Heiankyo (Kyoto). The solid line indicates the area over which tephra distribution has been confirmed by onsite investigation. The dotted line indicates the area over which tephra distribution is believed to have occurred based on records in ancient documents. For details regarding the extent of the pyroclastic surge in the Kozushima area, see Niijima.

### Recent Volcanic Activity

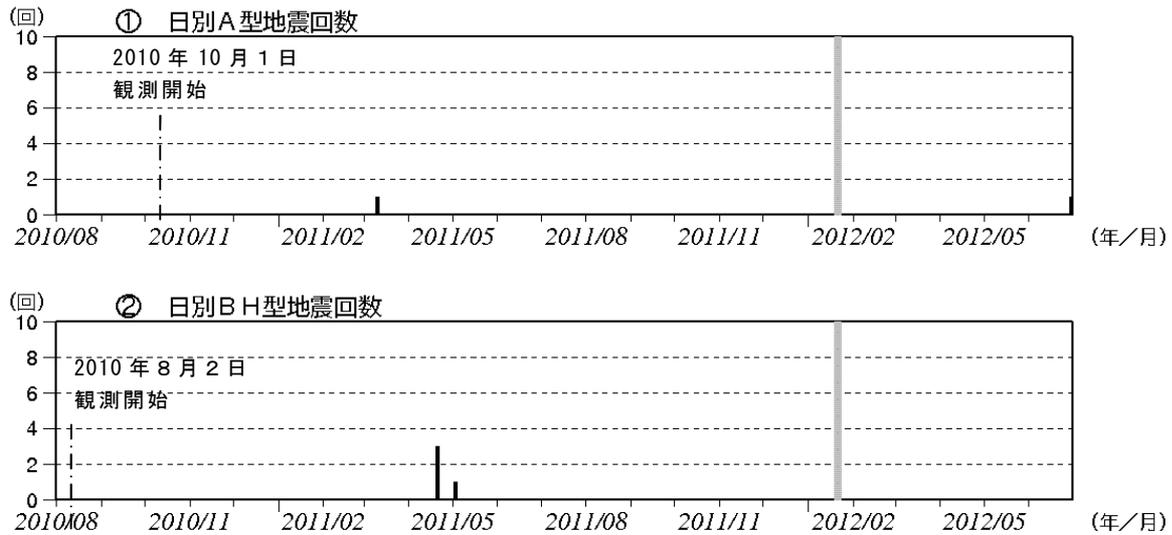


Figure 61-4 Number of BH-type (intermediate-frequency) earthquakes per day (October, 2010, to June 30, 2012).

- ① Number of A-type earthquakes per day
- ② Number of BH-type earthquakes per day

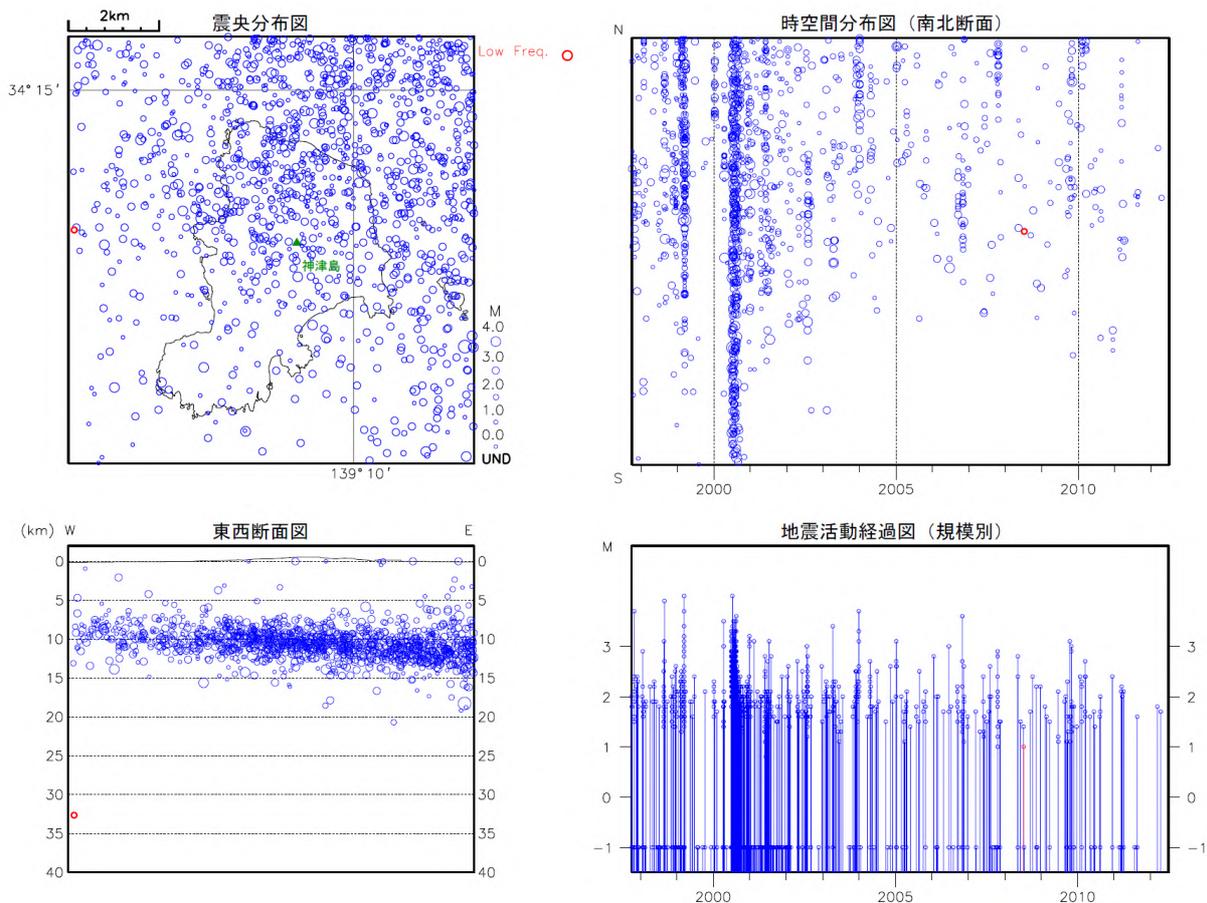


Figure 61-5 Activity of shallow VT earthquake (blue circles) and deep low-frequency earthquakes (red circles) observed by a regional seismometer network (October 1, 1997, to June 30, 2012). Epicenter distribution (upper left), space-time plot (N-S cross-section) (upper right), E-W cross-section (lower left) and magnitude-time diagram (by scale) (lower right).

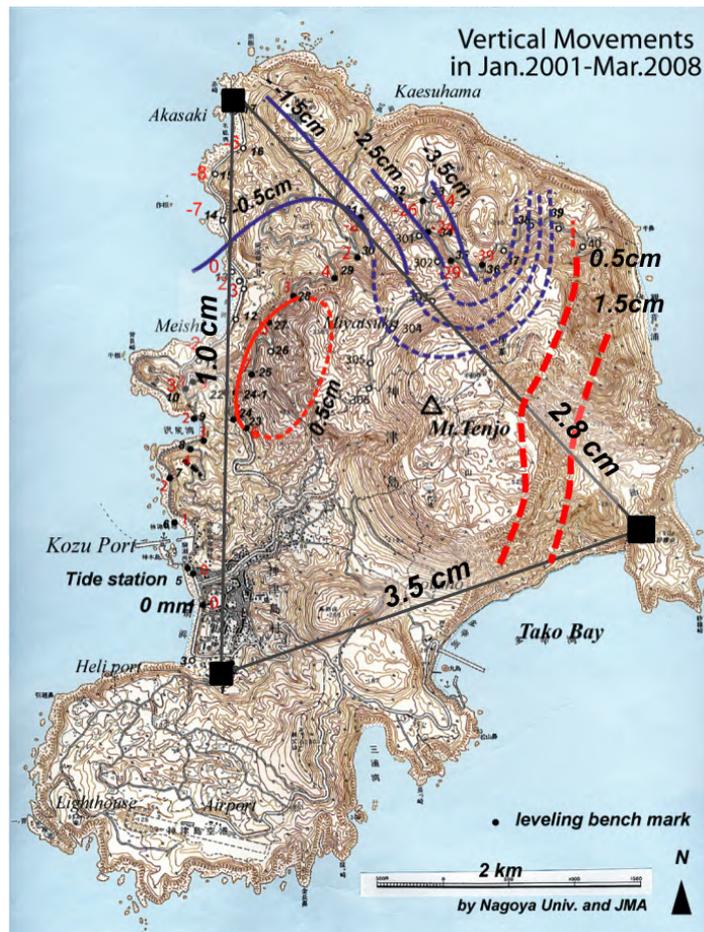


Figure 61-6 Vertical movement among Tenjosan lines at Kozushima and results of GPS measurement by the Geospatial Information Authority of Japan (2001 to 2008) (modification of Kimata et al., 2008).

Vertical movement assumes fixed positioning of tide-gauge stations, and indicates GPS measurement results in the form of changes in distance between base points. Uplifts are indicated with solid lines, and subsidence by dotted lines. The thick red dotted lines indicate hypothesized vertical movement contours, based on vertical movement data obtained via GPS measurement, and reflecting precise leveling results.

According to GPS measurement by the Geospatial Information Authority of Japan, etc., over the past 10 to 20 years, Kozushima has been uplifting by one to several cm per year. It would appear that the entire island has been continuing to experience crustal deformation due to uplifts and inflation. This uplift has been observed in the area below the center from the north of Tenjosan, and localized subsidence has been observed via precise leveling. The same crustal deformation is still ongoing as of February, 2012.

## Information on Disaster Prevention

### ① Hazard Map

None

## Social Circumstances

### ① Populations

- Island population: 1,988 (according to Tokyo statistics as of January 1, 2011)
- Volcano foot residential area, etc.: 1.0 km from Tenjosan.

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

- Fuji-Hakone-Izu National Park Kozushima

Number of sightseers per year: Approximately 40,000 (according to 2010 Tokyo Oshima Branch Office Jurisdiction Overview)

Number of mountain-climbers per year: Unknown

### ③ Facilities

Port facility

Kozushima Port, Tako Port,

Airport

Heliport

## 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 (Kozushima) published by the Geospatial Information Authority of Japan was used.

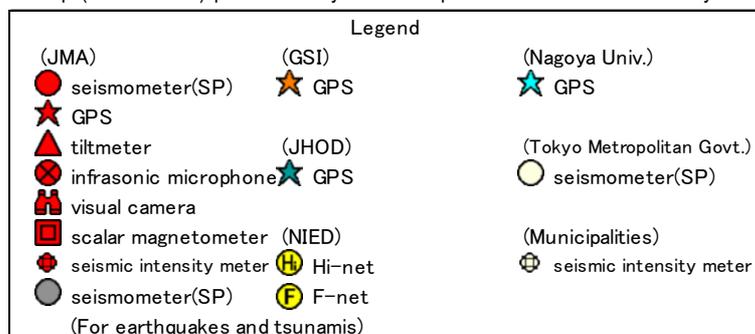


Figure 61-7 Monitoring network.

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(Tsukui, M.)