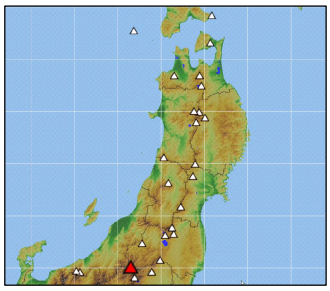
38. Hiuchigatake



Latitude: 36°57'18" N, Longitude: 139°17'07" E, Elevation: 2,356 m
(Shibayasugura) (GSI Measuring Point)

Overview of Hiuchigatake taken from the southeast side on October, 1999 by the Japan Meteorological Agency

Summary

Hiuchigatake is a stratovolcano located in the southwest corner of Fukushima Prefecture, northeast of Ozegahara, on the borders of the Fukushima, Gunma, and Niigata prefectures. The basement rock measures 8 km x 6 km, and it has a relative height of approximately 700 m. A crater with a diameter of approximately 800 m is located at its summit. It is mainly composed of andesitic and dacitic rock (Watanabe, 1989; Yokose, 1989; Hayakawa et al., 1997). The Mokake pyroclastic flow deposits and Hiuchigatake-Nanairi pumice were both formed between 150,000 and 200,000 years ago (Yamamoto, 1999; Suzuki et al., 2004), indicating that activity had already begun at Hiuchigatake. During the Holocene epoch one debris avalanche and several magmatic eruptions are considered to have occurred. However, with the exception of the phreatic eruption deposits of approximately 500 years ago, no records or radioactive dates have been available, and the activity periods of individual eruptions are not known in detail. A debris avalanche formed Ozenuma at the southeast foot of the volcano (Watanabe, 1989; Hayakawa et al, 1997). The most recent eruption known is the phreatic one which caused flooding in the 16th century, for which historical records exist (Hayakawa, 1994). Immediately before this eruption the Miikedake lava dome is considered to have formed at the summit (Hayakawa et al., 1997). The SiO_2 content of the andesite - dacite is between 54.5 and 68.5 wt%.

Red Relief Image Map

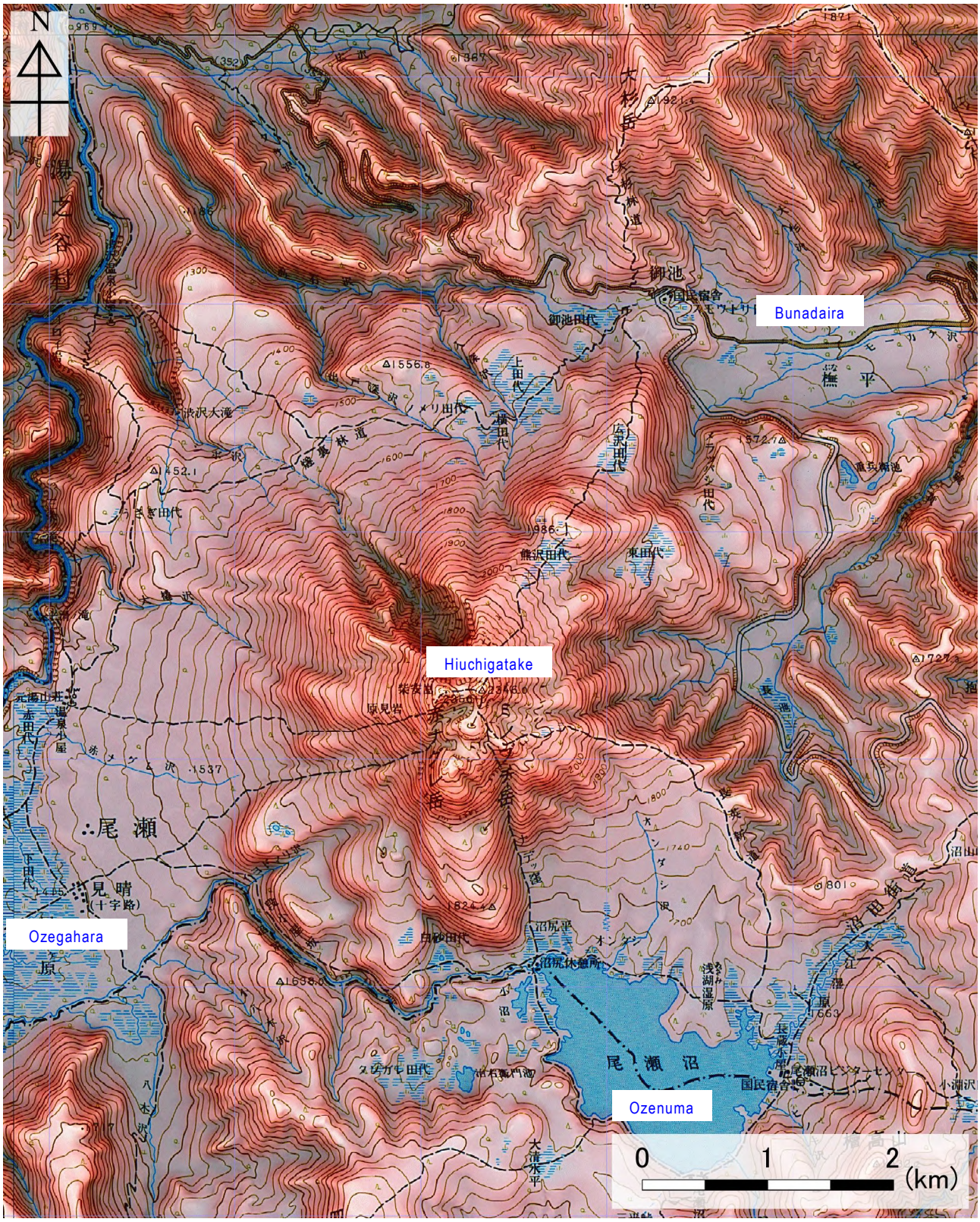


Figure 38-1 Topography of Hiuchigatake.

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

Chronology of Eruptions

・Volcanic Activity in the Past 10,000 Years

The possibility has been pointed out that the Numajiri debris avalanche which formed Ozenuma occurred approximately 8,000 years ago, based on peat deposit speed (Hayakawa, 1997). If so, then the magmatic eruptions which created the Akanagure lava flow and the Miikedake lava dome, which occurred after the Numajiri debris avalanche, would have occurred within the Holocene epoch. The most recent eruption was a phreatic eruption, considered to have occurred approximately 500 years ago based on stratigraphy. Hisatorical records of the lahar which are considered to correspond to this eruption have been found at Hinoemata Village in the eastern foot of the volcano (Hayakawa, 1994). The eruption is considered to have been caused by an explosion of the gas trapped inside the Miikedake lava dome immediately after it was formed (Hayakawa et al., 1997).

Period	Area of Activity	Eruption Type	Main Phenomena / Volume of Magma
8ka?	South side of summit	(Collapse)	Numajiri debris avalanche (0.03 km^3).
8ka?	Akanaguredake	Magmatic eruption	Lava flow.
0.5ka	Miikedake	Magmatic eruption	Miikedake lava dome eruption: Magmatic eruption volume = 0.008 km^3 DRE.

* Reference documents have been appended with reference to the catalog of eruptive events during the last 10,000 years in Japan, database of Japanese active volcanoes, and AIST (Kudo and Hoshizumi, 2006) for eruptive period, area of activity and eruption type. All years are noted in calendar years. "ka" within the table indicates "1000 years ago", with the year 2000 set as 0 ka.

A?: Eruption event apparently occurred in year A, but there is a possibility that it actually occurred in a different year.

・Historical Activity

Year	Phenomenon	Activity Sequence, Damages, etc.
1544 (Tenbun 13)	Moderate: Phreatic eruption → (lahar)	July 28. Tephra fall → lahar. The eruptive activity occurred at Miikedake. Records indicate a flood on July 28, 1544, and the eruption is considered to have occurred immediately before this flood. (VEI 2)

* Reference documents have been appended with reference to the catalog of eruptive events during the last 10,000 years in Japan, database of Japanese active volcanoes, and AIST (Kudo and Hoshizumi, 2006) for eruptive period, area of activity and eruption type.

Whole Rock Chemical Composition

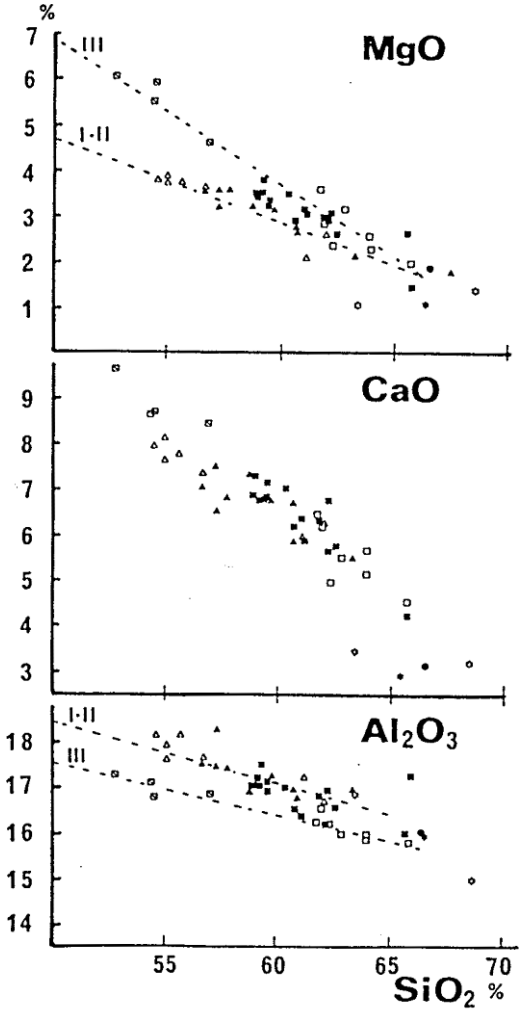


図 5-a. ハーカー図.
凡例. 白三角：第 I 期噴出物. 白星：第 I 期軽石. 黒三角：第 II 期噴出物. 黒星：第 II 期軽石. 白四角：第 III 期噴出物. 斜線を有する四角：第 III 期の "basic-inclusion". 黒四角：第 IV 期噴出物. 黒丸：槍枝岐花崗岩. MgO-SiO_2 図. Al_2O_3-SiO_2 図に於ける点線 I·II および III は. それぞれ第 I·II 期トレンドと第 III 期の混合線を示す.

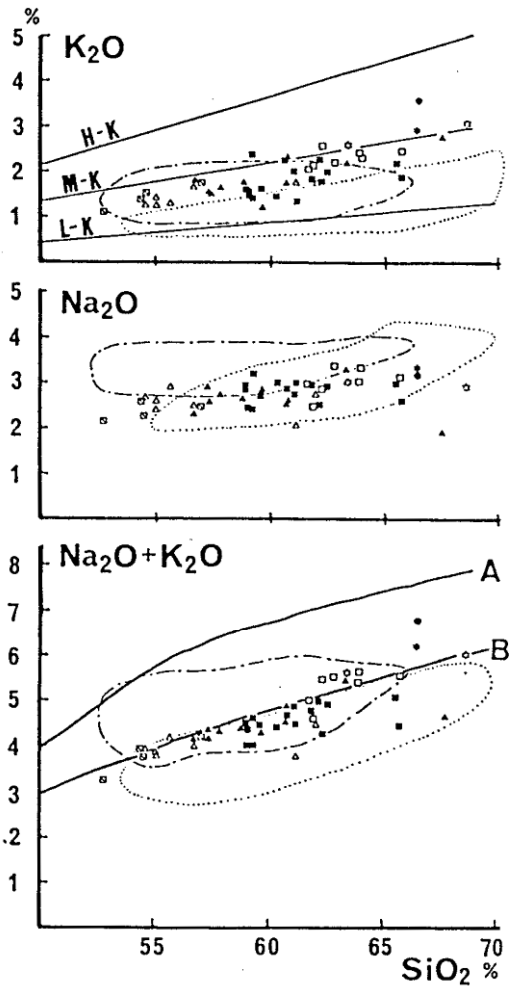


図 5-b. ハーカー図.
シンボルは. 図 5-a に同じ. H-K, M-K, L-K は. Gill (1981) による高カリ. 中間カリ. 低カリ安山岩の外挿領域を示す. 一点鎖線の領域は. 島海火山帯 (Kawano *et al.*, 1961; Onuma, 1963) を示し. 点線の領域は那須火山帯カルクアルカリ岩系を示す (青木. 1983). 実線 A, B は. Kuno (1966) によるアルカリ岩. 高アルミナ玄武岩. ソレアイトの境界を示す.

Figure 38-2 Whole rock chemical composition (Yokose, 1989).

△: Period I ejecta. White stars: Period I pumice. ▲: Period II ejecta. Black stars: Period II pumice. □: Period III ejecta.

Rectangles with diagonal lines: Period III basic-inclusion. ■: Period IV ejecta. ●: Hinoemata granite. Solid lines A and B indicate the borders between alkaline rock, high aluminum basalt, and tholeiite, according to Kuno (1966).

Recent Volcanic Activity

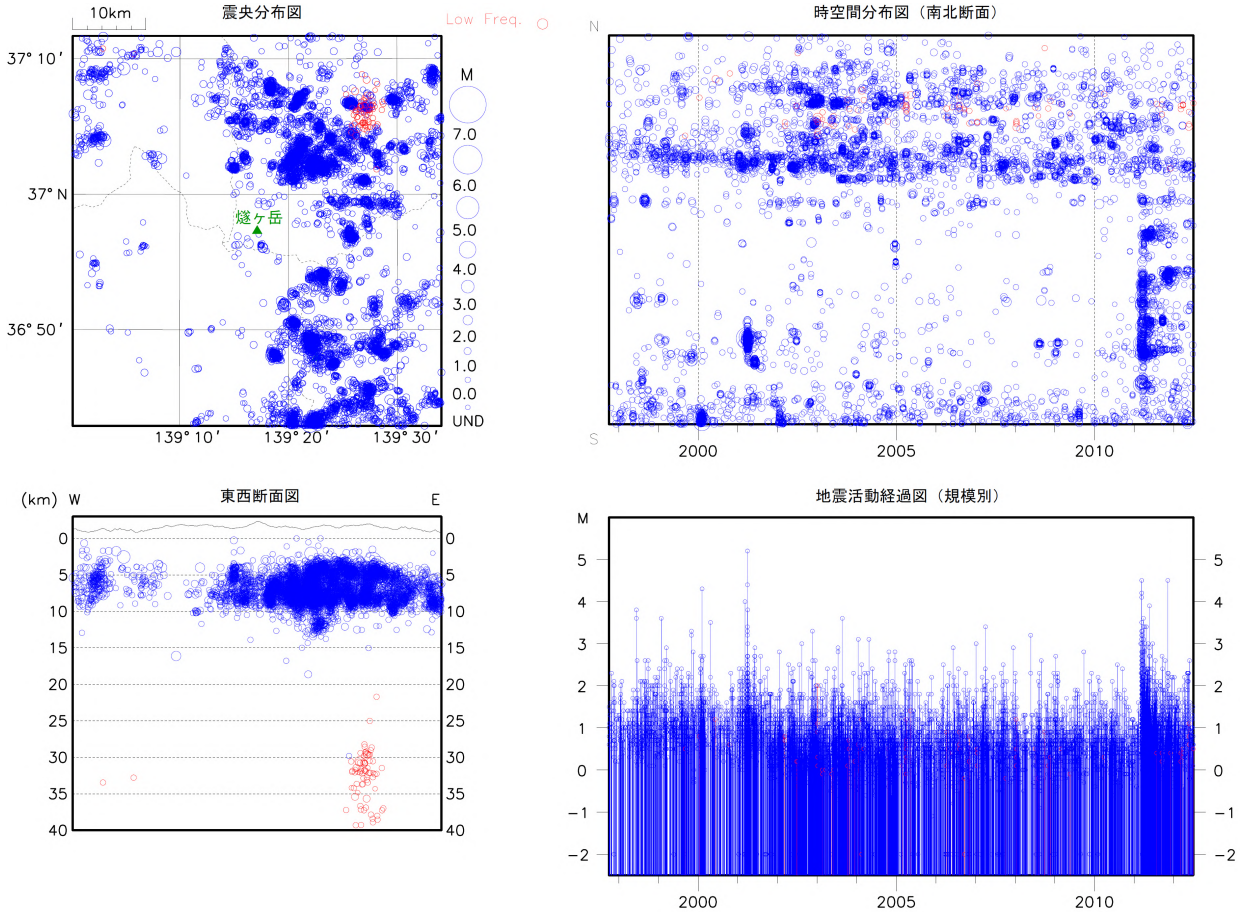


Figure 38-3 Activity of shallow VT earthquakes (blue circles) and deep low-frequenc y earthquakes (red circles) observed by a regional seismometer network (October 1, 1997, to June 30, 2012). Epicenter di stribution (upper left), space-time plot (N-S cross-sec tion) (upper right), E-W cross -section (lower left) and magnitude-time diagram (lower right).

Information on Disaster Prevention

①Hazard Map

None

Social Circumstances

①Populations

・Fukushima Prefecture

Hinoemata Village: 635 (as of March 1, 2007)

・Gunma Prefecture

Katashina Village: 5,177 (as of November, 2011)

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

・Oze National Park - Hiuchigatake

・Number of park visitors per year: Approx. 438,000

(Fukushima Prefecture: 106,000, Gunma Prefecture: 320,000, Niigata Prefecture: 120,000) (according to "National Park" website 2009 national park visitor figures)

・Number of mountain-climbers in Oze National Park: 347,000 (according to 2010 Oze National Park mountain climber number survey)

③Facilities

・Katashina Village, Gunma Prefecture

Oze-Yamanohana Visitor Center

Numajiri Rest Spot, several other cabins

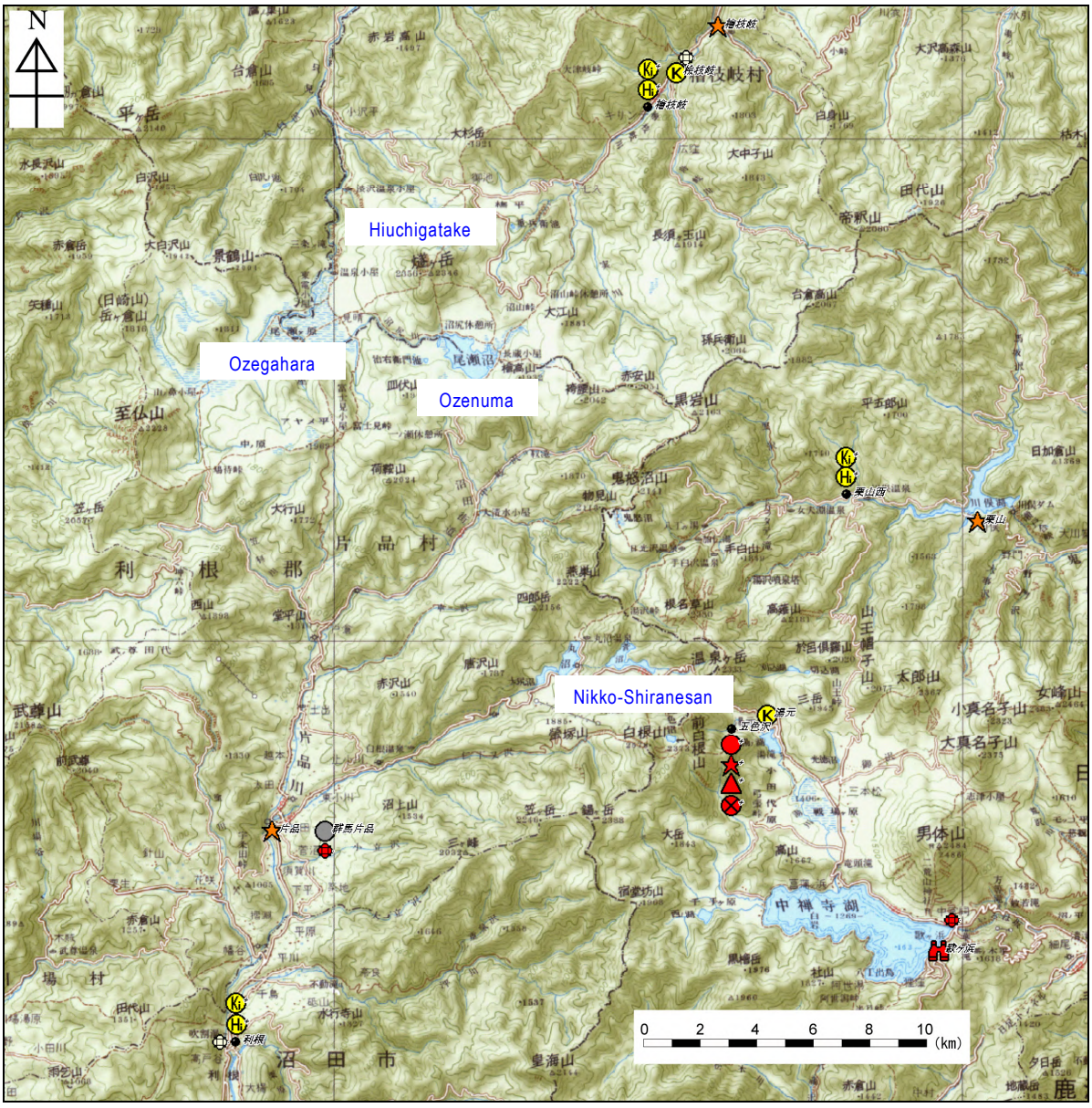
・Hinoemata Village, Fukushima Prefecture

Ozenuma Visitor Center

Monitoring Network

Wide Area

* Observation points with multiple measuring devices are indicated by a ●, with symbols showing the types of the instruments.



1:200,000 scale regional map (Nikko) published by the Geospatial Information Authority of Japan was used.

Legend

(JMA)	(GSI)	(NIED)	(Municipalities)
seismometer(SP)	GPS	Hi-net	seismic intensity meter
GPS		K-NET	
tiltmeter		KiK-net	
infrasonic microphone			
visual camera			
seismic intensity meter			
seismometer(SP) (For earthquakes and tsunamis)			

Figure 38-4 Regional monitoring network.

Bibliography

Hayakawa, Y. (1994) Bull. Volcanol. Soc. Japan, **39**, 243-246. (in Japanese)

Hayakawa, Y. et.al. (1997) Jour. Geogr., **106**, 660-664. (in Japanese with English abstract)

Kuno, H. (1966) Lateral variation of basalt magma type across continental margins and island arcs. Bull Volcanol., **29**, 195-222.

Suzuki, T. et.al. (2004) Jour. Geogr., **113**, 38-61. (in Japanese with English abstract)

Yamamoto, T. (1999) Bull. Geol. Surv. Japan, **50**, 743-767. (in Japanese with English abstract)

Yokose, H. (1989) Jour. Mineral. Petrol. Econ. Geology, **84**, 301-320. (in Japanese with English abstract)

Watanabe, H. (1989) Jour. Mineral. Petrol. Econ. Geology, **84**, 55-69. (in Japanese with English abstract)

(Kawanabe, Y.)