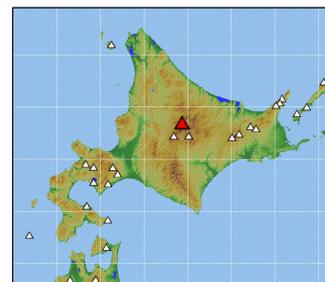


## 9. Taisetsuzan

**Continuously Monitored by JMA**

Latitude: 43°39'49" N, Longitude: 142°51'15" E, Elevation: 2,291 m (Asahidake)  
(Triangulation Point - Nutakku)



Overview of Asahidake taken from west side on July 15, 2004 by the Japan Meteorological Agency

### Summary

Taisetsuzan is made up of over 20 stratovolcanoes and lava domes, composed of andesite and dacite (The  $\text{SiO}_2$  is between 55.8 and 66.7 wt %). 8 peaks of them are circularly-arranged. In the middle there is a small caldera (Ohachidaira), 2 km in diameter, which was formed by about  $8 \text{ km}^3$  of pyroclastic flow. The Ohachidaira caldera was formed approximately 38,000 years ago (calendar years), followed by the Kumagatake, Ushiro-Asahidake, and Asahidake stratovolcanoes. The Mikurasawa lava flow occurred at the flank of Hokkaidake on the east wall of the Ohachidaira caldera. The strata of the pyroclastic flow deposits in Sounkyo and Tenninkyō reach a thickness of 200 m, welded to form columnar joints. Asahidake, the highest and the largest peak in the Taisetsuzan volcano group, is the stratovolcano located at the southwest of the Ohachidaira caldera, and produced lava flows covering a wide area to the west. A horseshoe-shaped crater opening west (Jigokudani crater) exists on the west slope of Asahidake. Many active fumaroles exist at the bottom of the crater, and was used as a source of sulfur in the past.

Photos



Asahidake Jigokudani crater taken from southwest side (Lake Sugatami at the bottom) on September 26, 2011 by the Japan Meteorological Agency



Ohachidaira taken from east side on August 24, 2005 by the Japan Meteorological Agency



Camera image from east side of Lake Chubetsu on September 13, 2011 by the Japan Meteorological Agency

### Topography around the Crater

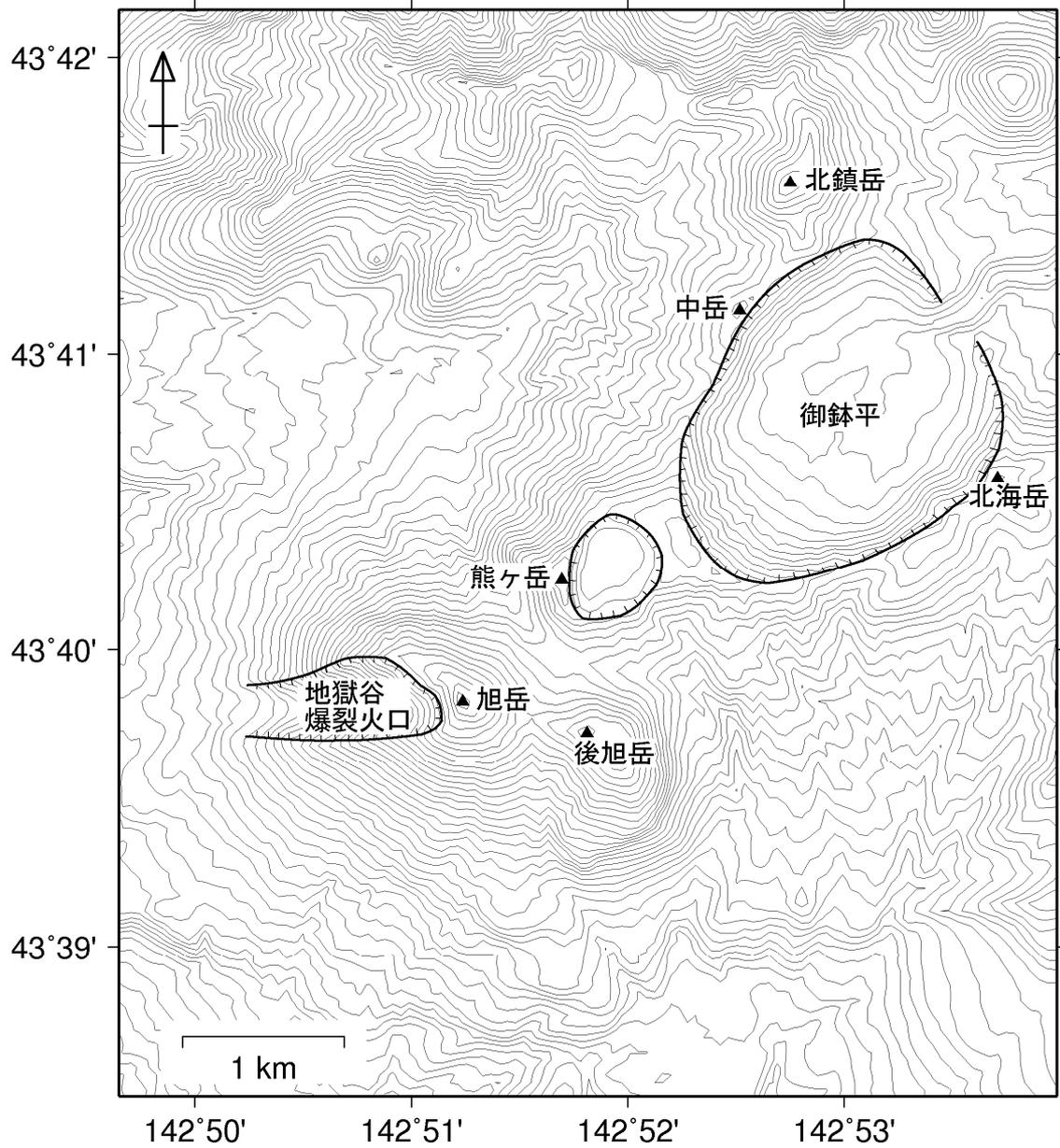


Figure 9-1 Detailed topography of the crater area.

### Red Relief Image Map

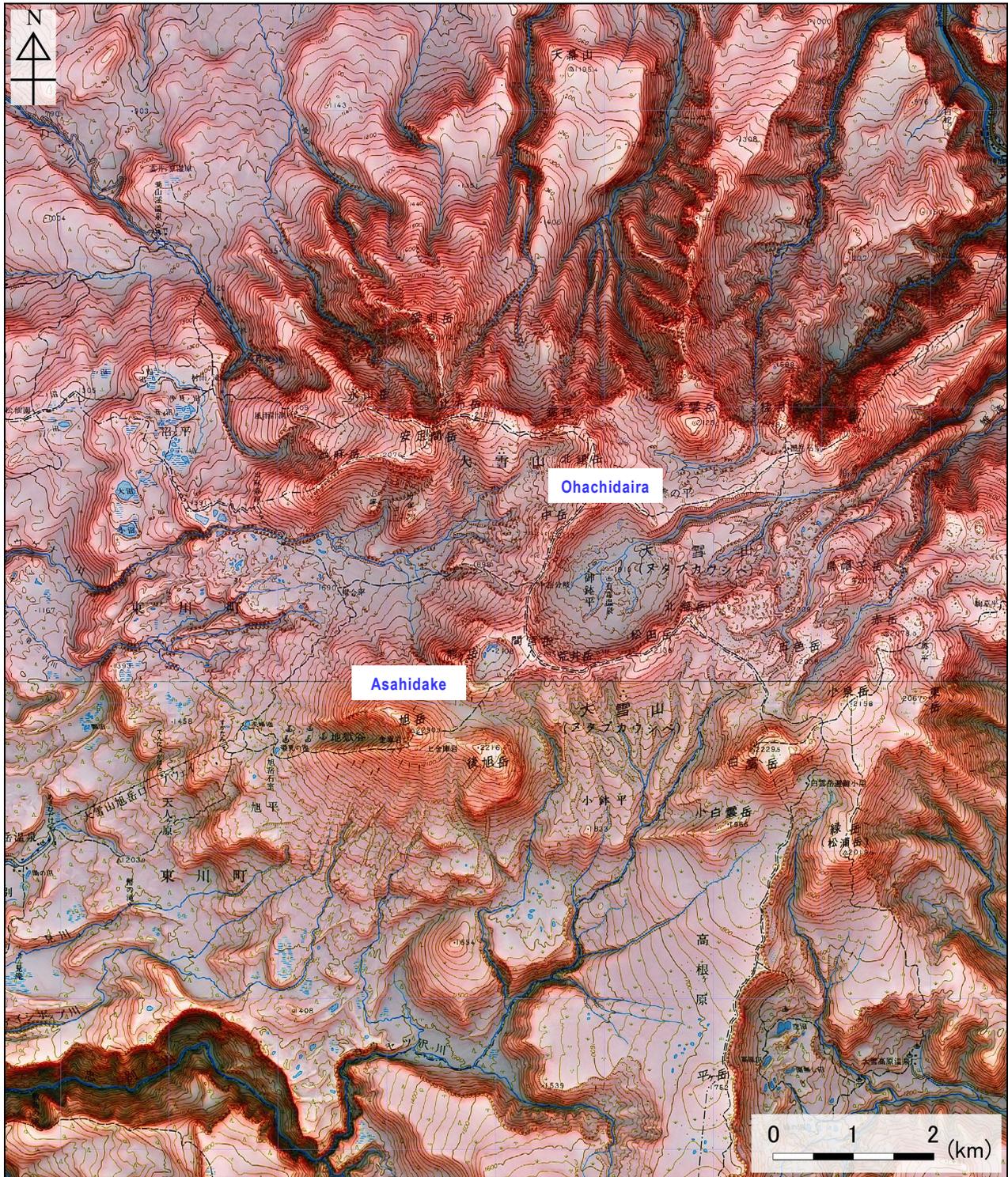


Figure 9-2 Topography of Taisetsuzan.  
1:50,000 scale topographic maps (Asahidake and Taisetsuzan) and digital map 50 m grid (elevation) published by the Geospatial Information Authority of Japan were used.

## Chronology of Eruptions

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

Asahidake's volcanic activity began in the Holocene era, and the current summit of Asahidake was formed from air-fall scoria by approximately 5,000 years ago. 2,000 to 3,000 years ago, a collapse created the horseshoe-shaped Jigokudani crater on the west of the summit. Deposits of the rock avalanche reached as far as Asahidake Onsen. Phreatic explosions have occurred frequently since 1,000 years ago, producing a group of small craters such as Lake Sugatami. Two layers of volcanic ash from Asahidake have been identified on top of volcanic ash from the 1739 Tarumaesan eruption, and the last phreatic eruption was approximately 250 or more years ago. No prominent magmatic eruptions have occurred in the last 3,000 years (Wada et al., 2003).

Period	Area of Activity	Eruption Type	Main Phenomena / Volume of Magma
5.3←→5.1ka	Asahidake	Magmatic eruption	Tephra fall
4.9←→4.7ka	Asahidake western slope	Phreatic eruption	Tephra fall
3.5←→3.4ka	Asahidake western slope	Phreatic eruption	Tephra fall
3←→2ka	Asahidake - Jigokudani	Phreatic eruption (collapse)	Jigokudani crater formed. Volcanic ash deposit sedimentation over western slope, on top of debris avalanche deposits.
0.261ka>	Asahidake Jigokudani western explosion crater group	Phreatic eruption	Jigokudani crater western side small explosion crater group formed (inferred). Thin layer of volcanic ash sedimentation around small explosion crater group area.

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

A>: Eruption event after year A.

### ▪ Historical Activity

There are no historical records of volcanic activity.

### Whole Rock Chemical Composition

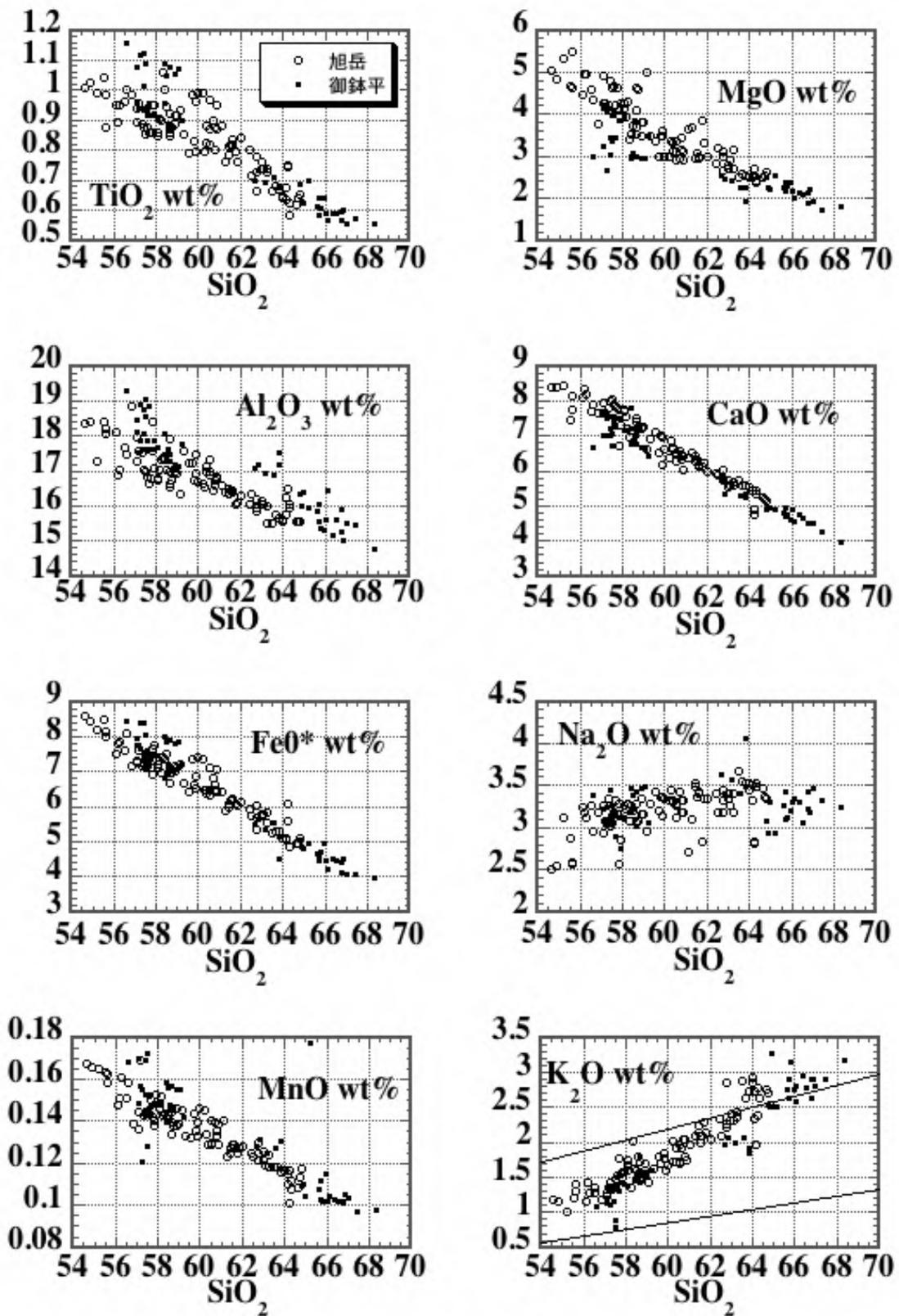


Figure 9-3 Ohachidaira caldera and Asahidake whole rock chemical composition Harker diagram (Sato et al., 2005).

Period - Cumulative Magma Volume

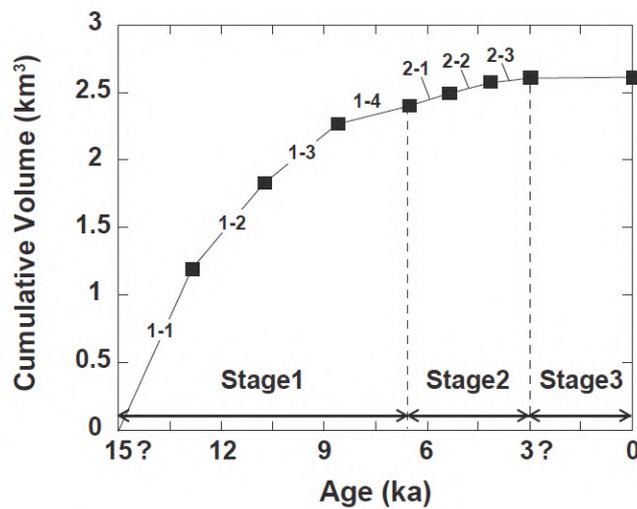
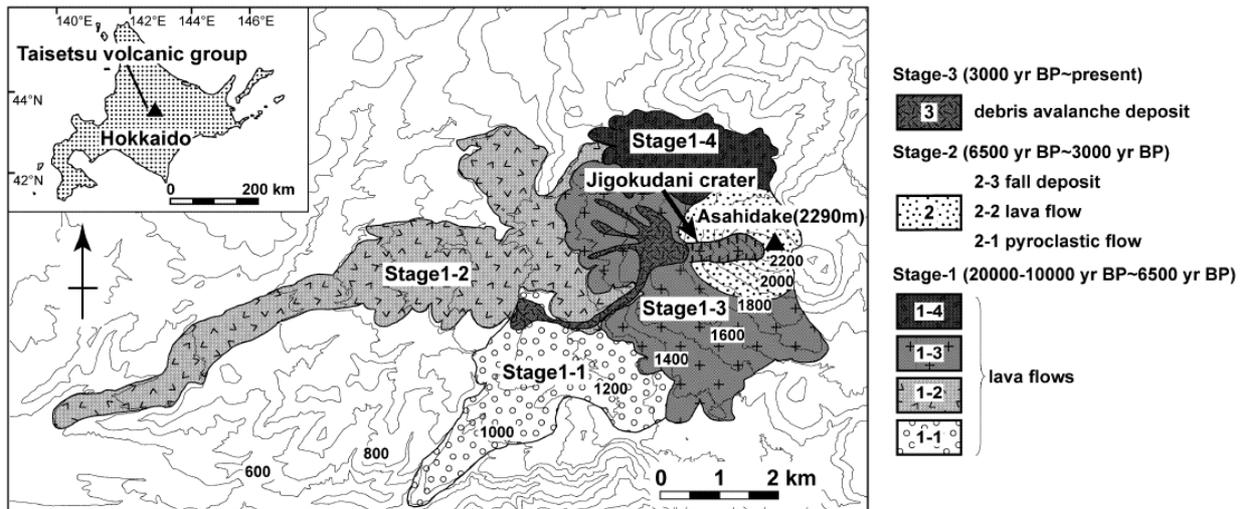


Figure 9-4 Asahidake period - cumulative magma volume (Sato and Wada, 2007).

■ symbols indicate fixed intervals within each stage.

Major Volcanic Activities

- Eruption 2,000 to 3,000 Years Ago

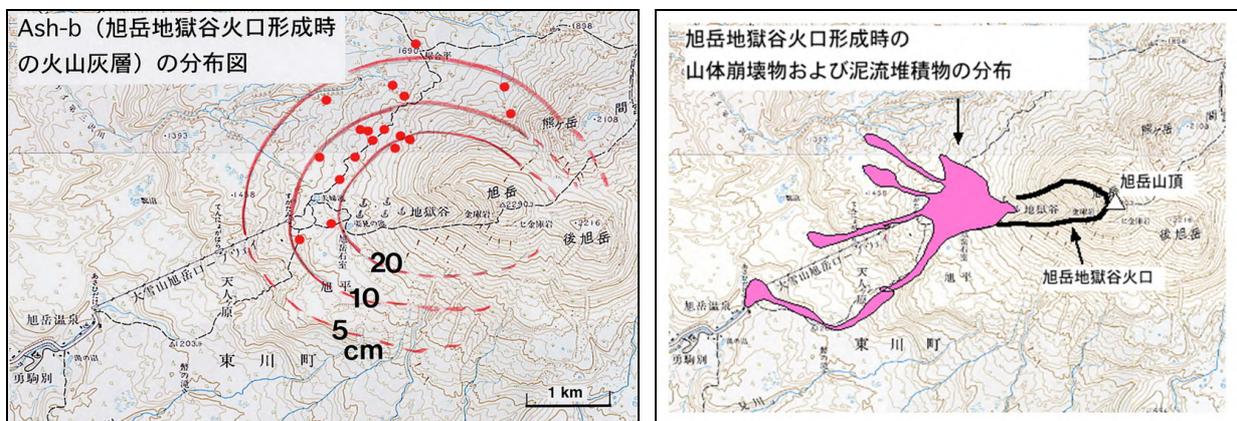


Figure 9-5 Distribution of tephra (Ash-b layer) and collapse materials / lahar deposits at formation of Jigokudani crater (Wada, 2003).

## Recent Volcanic Activity

### Activity Chronograms

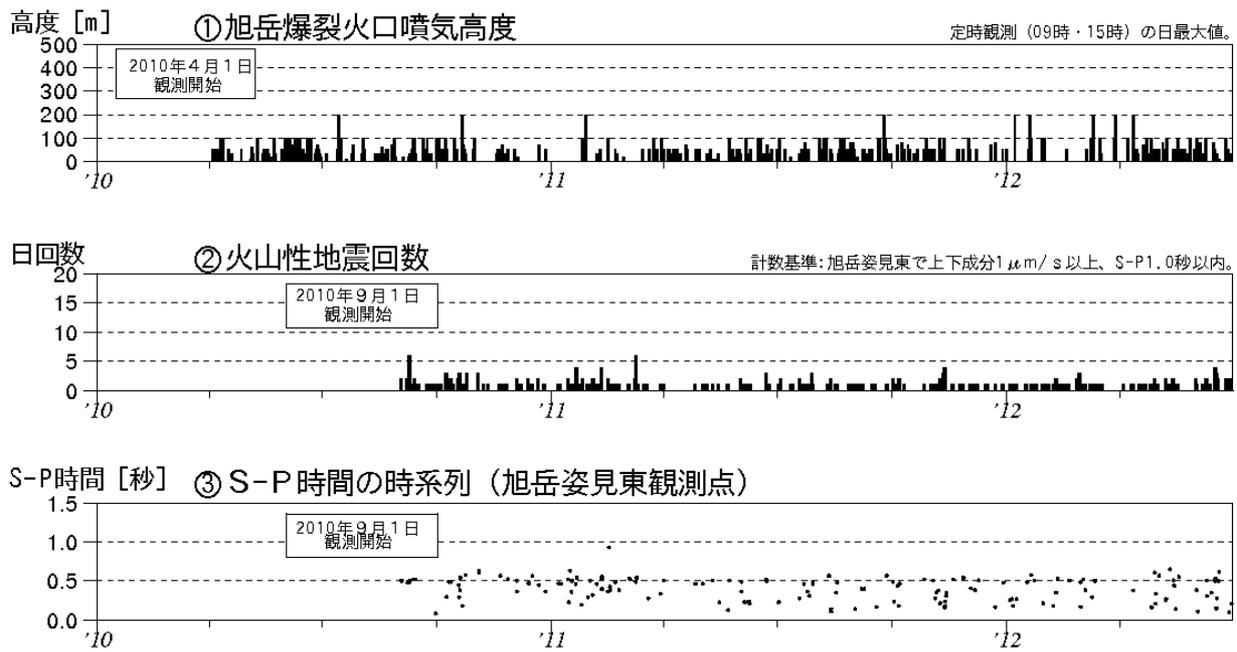


Figure 9-6 Volcano activity (April, 2010, to June, 2012).

- ① Fumarole height at Asahidake explosion crater
- ② Number of volcanic tremors
- ③ S-P time series (Asahidakemi eastern observation point)

## Seismic Activity

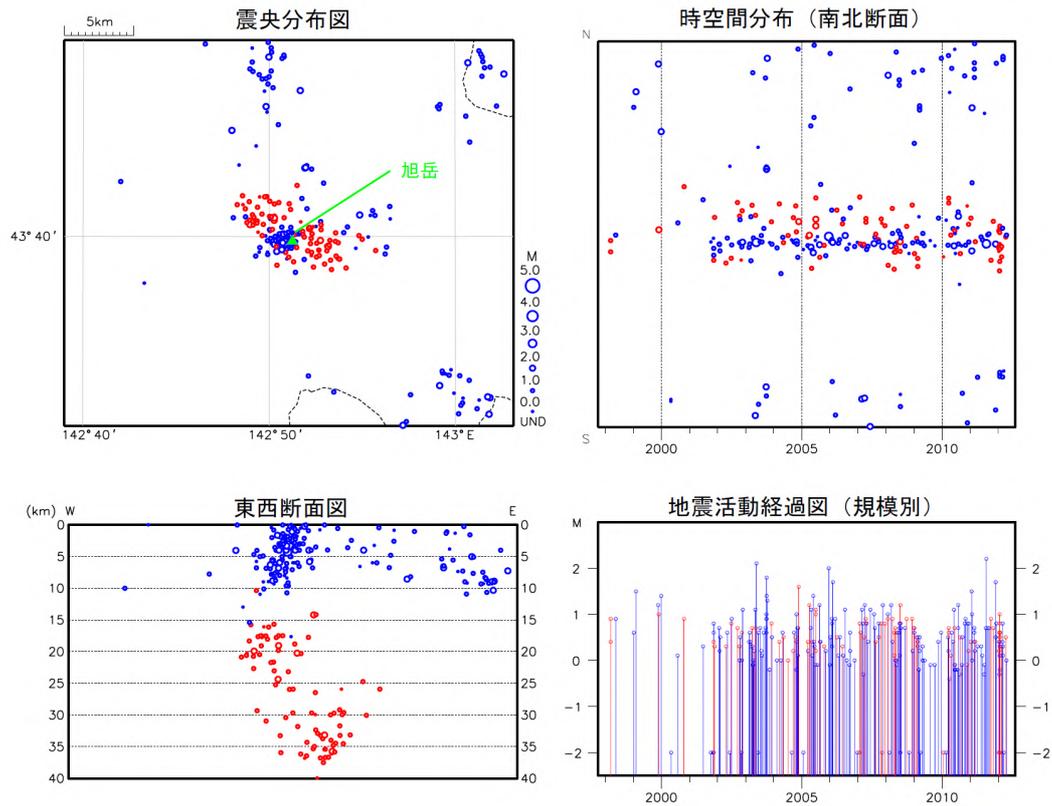


Figure 9-7 Activity of shallow VT earthquakes (blue circles) and deep low-frequency earthquakes (red circles) observed by a regional seismometer network (October 1, 1997, to June 30, 2012). Epicenter distribution (upper left), space-time plot (N-S cross-section) (upper right), E-W cross-section (lower left) and magnitude-time diagram (lower right).

▪ Fumarole Temperature Trends

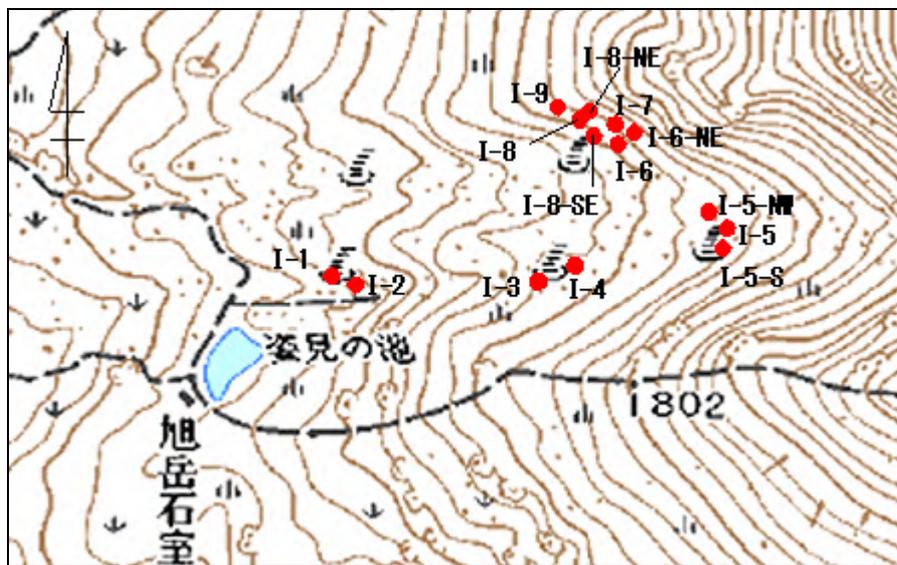
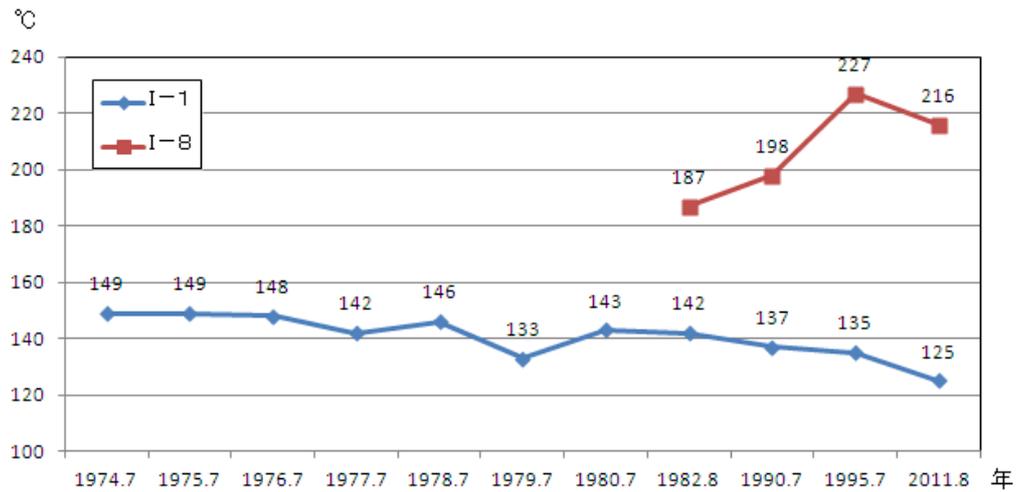


Figure 9-8 Temperature shifts in fumaroles inside Jigokudani crater (1974 to 2011) (top) and fumarole locations (I-1 to I-9) (bottom). The 1:25,000 Scale Topographic Map published by the Geospatial Information Authority of Japan was used to create this map.

## Information on Disaster Prevention

### ① Hazard Map

None

## Social Circumstances

### ① Populations

- Higashikawa Town: 7,894 (As of September 30, 2011)
- Kamikawa Town: 4,198 (As of September 30, 2011)
- Biei Town: 10,921 (As of September 30, 2011)

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

- Daisetsuzan National Park  
Asahidake area - Number of sightseers per year: Approximately 300,000 (estimated number of sightseers to Asahidake area, according to 2009 survey by Higashikawa)
- Asahidake - Number of mountain-climbers per year: Approx. 12,000  
(according to 2010 study by Kamikawa General Subprefectural Bureau Office of South Forestry Management)

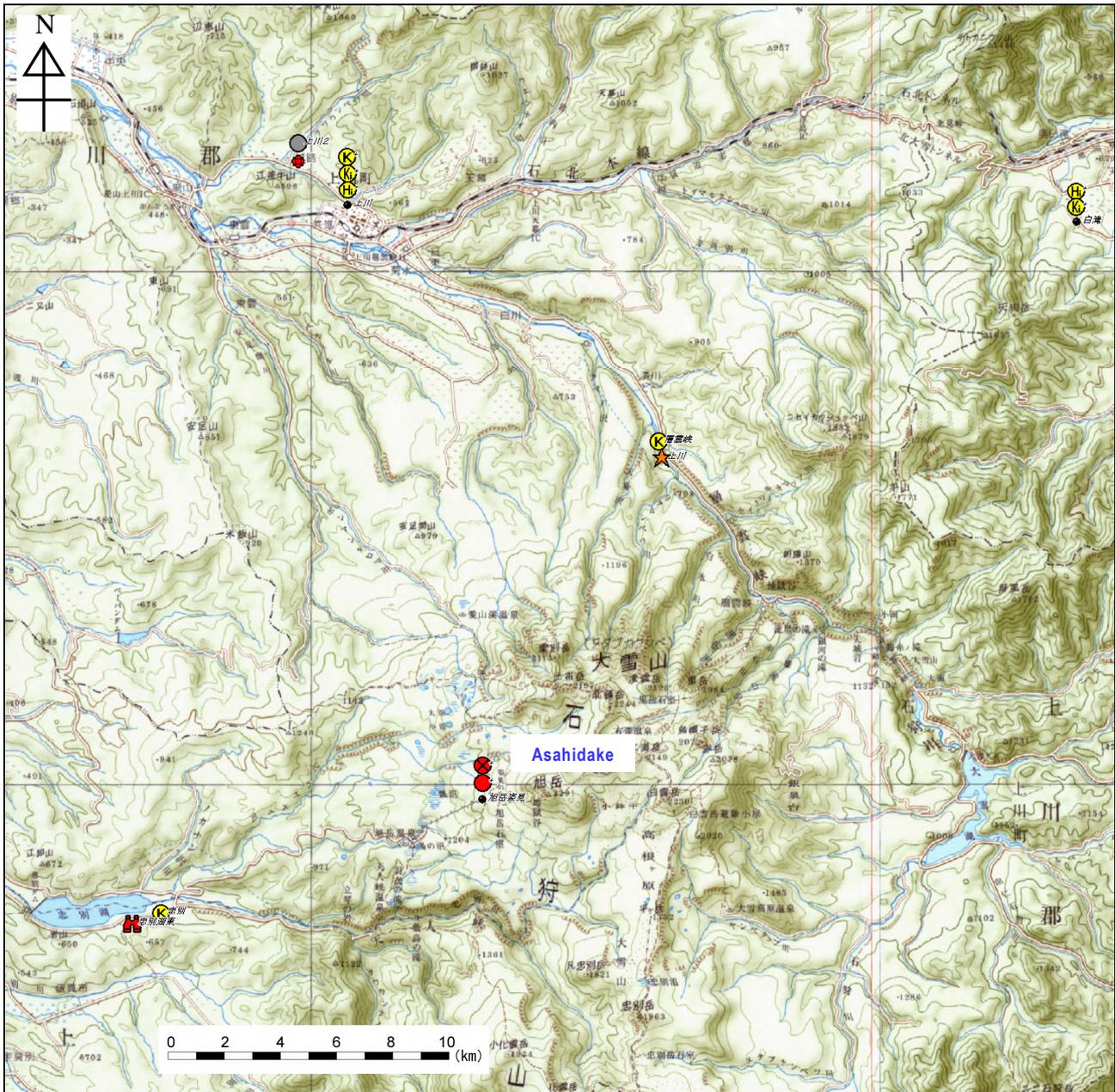
### ③ Facilities

- Higashikawa Town Asahidake Onsen  
Asahidake Visitor Center

# Monitoring Network

## Wide Area

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



1:200,000 scale regional maps (Kitami, Obihiro, Asahikawa and Yubaridake) published by the Geospatial Information Authority of Japan were used.

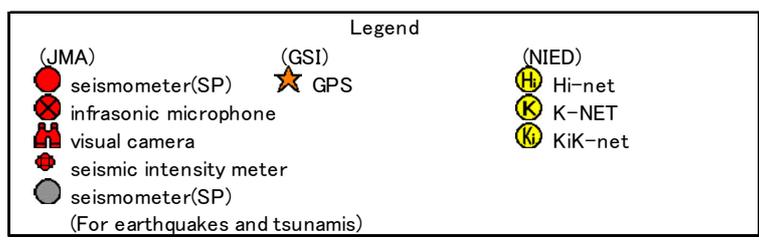


Figure 9-9 Regional monitoring network.

## Bibliography

- Katsui, Y. et al. (1979) Asahidake, Hokkaido Disaster Management Council, 42p (in Japanese).
- Metsugi, H. (1987) Bull. Sounkyo Museum **7**, 1-8 (in Japanese).
- Nakamura, Y. and Hirakawa, K. (2000) Bull. Volcanol. Soc. Jap., **45**, 281-288 (in Japanese with English Abstract).
- Noguchi, M. and Wada, K. (1998) Bull. Asahikawa Museum, **4**, 1-12 (in Japanese with English abstract).
- Sato, E. et al. (2005) Rep. Taisetsuzan Ins. Sci. **39**, 1-16 (in Japanese with English abstract).
- Sato, E. and Wada, K. (2007) J. Mineral. Petrol. Econ. Geol. **36**, 125-139 (in Japanese with English Abstract).
- Sato, E. and Wada, K. (2012) Bull. Volcanol. Soc. Jap., **57**, 177-197 (in Japanese with English Abstract).
- Wakasa, H. et al. (2006) Monthly Earth, **28**, 296-301 (in Japanese).
- Wada, K. (1995) Rep. Taisetsuzan Ins. Sci., **30**, 1-12 (in Japanese with English abstract).
- Wada, K. et al. (2001) Rep. Taisetsuzan Ins. Sci., **35**, 9-18 (in Japanese with English abstract).
- Wada, K. et al. (2003) Programme and abstracts, Volcanol. Soc. Jap., **2**, 158 (in Japanese with English Abstract).
- Wada, K. et al. (2007) Rep. Taisetsuzan Ins. Sci., **41**, 55-65 (in Japanese with English abstract).

(Wada, K.)