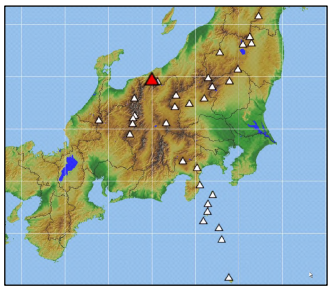
# 47. Niigata-Yakeyama



**Continuously Monitored by JMA**

Latitude: 36°55'15" N, Longitude: 138°02'09" E, Elevation: 2,400 m (Yakeyama)
(Triangulation Point)

Overview of Niigata-Yakeyama taken from the north side on September 29, 2003 by the Japan Meteorological Agency

## Summary

Niigata-Yakeyama volcano is located on the western side of Niigata Prefecture. It is a small dome-capped stratovolcano with a relative height of roughly 400m, sitting on the Neogene basement rock with an elevation of approximately 2,000m. It is an andesite-dacite volcano. A lava flow and pyroclastic flow deposits are distributed north of the summit. A pyroclastic-flow event occurred in 1773. The younger events are phreatic explosions. This volcano is prone to producing lahars. Fumaroles exist on the summit.

## Red Relief Image Map

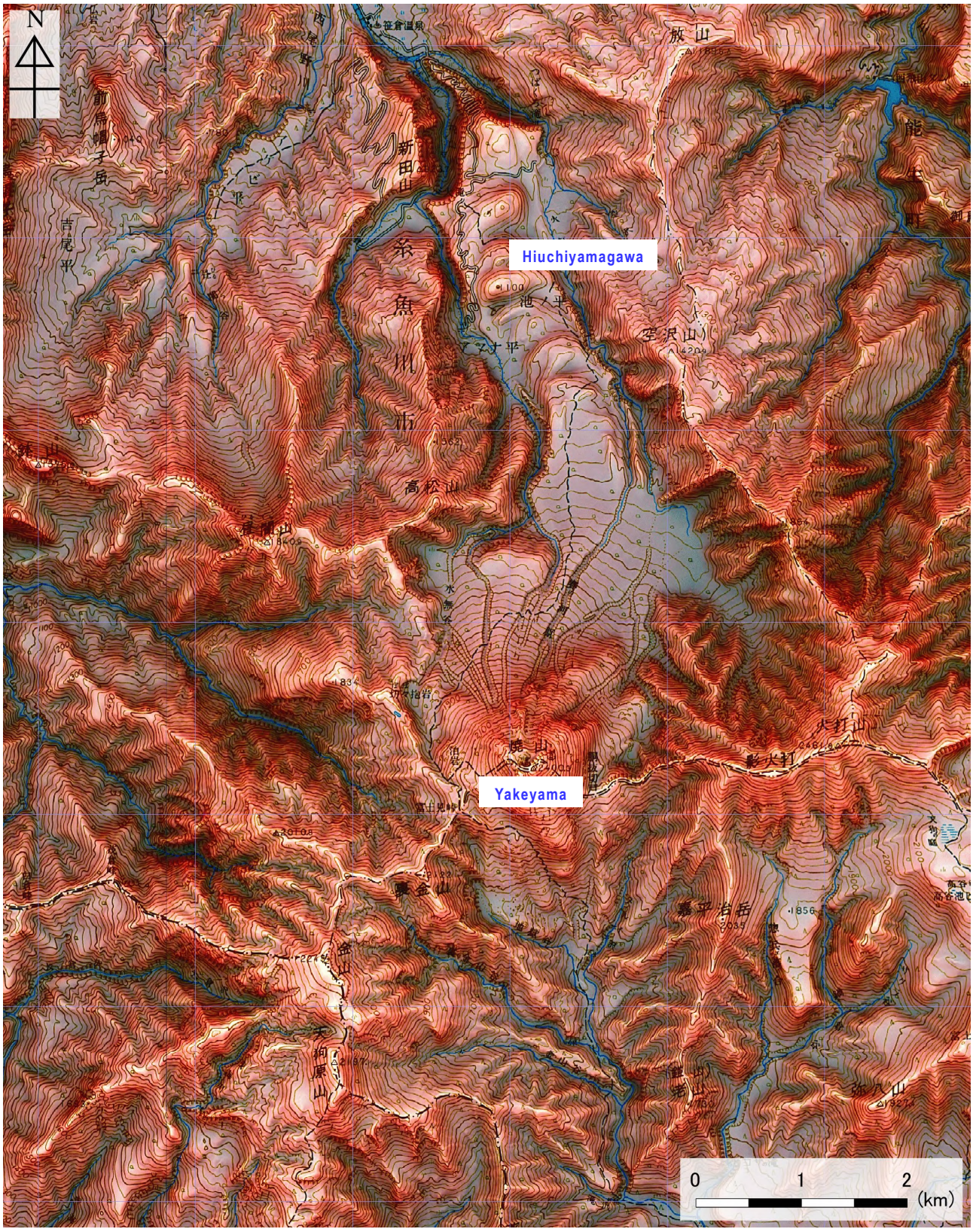



Figure 47-1 Topography of Niigata-Yakeyama.

1:50,000 scale topographic maps (Kotaki and Myokosan) 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 first stage of activity at Niigata-Yakeyama volcano began around 3,000 years ago. Approximately 1,000 years ago it began its second stage of activity, followed by the third stage roughly 650 years ago and the fourth stage in 1773. During the first stage volcanic ash and pyroclastic and lava flows were emitted. During the second stage, the largest-scale activity occurred at Niigata-Yakeyama, with a pyroclastic flow which reached the Sea of Japan and a 6.5km long lava flow. During the third stage volcanic ash and a pyroclastic flow were emitted. The pyroclastic flow reached within 1.5km of the sea. At the end of this stage, the lava dome, which corresponds to the current summit of the volcano, was formed. During the fourth stage, the activity in 1773 started with an explosive eruption, followed by a pyroclastic flow. This pyroclastic flow was smaller in scale than those of the previous two stages. No magmatic eruptions have occurred since this eruption, but in the mid-19th century a large amount of sulfur was discharged, and afterwards, during the 20th century, small phreatic explosions occurred (Hayatsu, 1994).

| Period | Area of Activity | Eruption Type | Main Phenomena / Volume of Magma |
|---|---|---|---|
| 3 ka | Summit area? | Magmatic eruption | Tephra fall or pyroclastic surge. |
| 3 ka | Summit area? | Magmatic eruption, (producing lahar) | Pyroclastic flow, lahar. |
| 3 ka? | Summit area? | Magmatic eruption | Lava flow. |
| 3 ka? | Summit area? | Magmatic eruption | Lava flow. |
| 3 ka? | Summit area? | Magmatic eruption | Pyroclastic flow. |
| 3 ka? | Summit area? | Magmatic eruption | Lava flow. |
| 3 ka? | Summit area? | Magmatic eruption | Lava flow. |
| 3 ka? | Summit area? | Magmatic eruption | Lava flow. |
| 2.5 ka | Summit area? | Magmatic eruption | Tephra fall or pyroclastic surge. |

* Volcanic periods, areas of activity, and eruption types taken from the Active Volcano Database of Japan, AIST (Kudou 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?: 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. |
|---|---|---|
| 887 (Ninna 3) | Phreatic eruption → Magmatic eruption | Tephra fall or pyroclastic surge → pyroclastic flow to lava flow. It is possible that the eruptive activity occurred in the summit area. |
| 989 (Eien 3) | Magmatic eruption | Tephra fall or pyroclastic surge, lava flow. It is possible that the eruptive activity occurred in the summit area. |
| 1361 (Shohei 16) | Large: Magmatic eruption | Tephra fall or pyroclastic surge, pyroclastic flow, lava flow. The eruptive activity occurred at the summit.<br>Collapse? (Large eruption? Pyroclastic flow? Formation of current dome?)<br>Magma eruption volume = 0.33 $km^3$ DRE. (VEI 3) |
| 1773 (An'ei 2) | Moderate: Magmatic eruption | Pyroclastic flow to the north. Tephra fall or pyroclastic surge, pyroclastic flow. The eruptive activity occurred at the summit crater (Ohachi).<br>Magma eruption volume = 0.02 $km^3$ DRE. (VEI 3) |
| 1852 to 1854 (Kaei 5 to Ansei 1) | Phreatic eruption | Tephra fall, sulfur flow. The eruptive activity occurred at the fissure crater on the northwest flank.<br>An eruption began on the night of November 1, 1852, continuing until roughly May of the following year. An eruption also occurred in 1854. The eruption occurred at the fissure on the northwest flank, forming many fumaroles and causing an overflow of a large amount of sulfur. The period of activity appears to have peaked in1852. |

| Year | Phenomenon | Activity Sequence, Damages, etc. |
|---|---|---|
| 1949 (Showa 24) | Phreatic eruption | On February 5 and 8, May 19, September 13. Tephra fall and lahar. The eruptive activity occurred at the fissure crater extending from the southwest to the northeast flank of the summit.<br>An explosion sound and tephra fall occurred in the northern Kanto region. On February 8 an eruption being associated by large explosion sound also occurred. May 19, an eruptionoccurred following rumbling. As the snow melted, water of the Haya River discolored on May 14. On July 30, heavy rains produced a lahar, which caused damage. An eruption occurred on September 13. |
| 1962 (Showa 37) | Phreatic eruption | On March 14, Tephra fall. The eruptive activity occurred at the summit crater. |
| 1963 (Showa 38) | Phreatic eruption | On February 14, February 15, March 19, and July 10, tephra fall. The eruptive activity occurred at the summit. |
| 1974 (Showa 49) | Phreatic eruption | On July 28. Tephra fall, lahar. The eruptive activity occurred at the summit fissure crater group.<br>On the early morning of July 28 a fissure eruption phreatic explosion occurred. 650,000 tons of ash fell, reaching as far as 100km to the northeast. A lahar flow also occurred. Volcanic blocks killed 3 who were camping near the summit.<br>(VEI 1) |
| 1983 (Showa 58) | Phreatic eruption | On April 14 and 15, tephra fall. The eruptive activity occurred on the west side of the summit crater.<br>An small phreatic explosion occurred at an old fumarole on the west side of central crater. Ash fall near summit. |
| 1997 to 1998<br>(Heisei 9 to 10) | Small-scale:<br>Phreatic eruption | Tephra fall on October 29, November 8-9, and December 1997, and February to March 30, 1998. The eruptive activity occurred on the east flank of the summit.<br>Increased fumarolic activity near the summit. Activity was high in May 1987, and from March to April 1989, and light-gray volcanic plumes and snow surface discoloration were observed. Fumarolic activity increased from October 1997. After October 29, 1997 to to March 30, 1998, volcanic ash was issued 4 times.<br>(VEI 1) |

※1 Volcanic periods, areas of activity, and eruption types taken from the Active Volcano Database of Japan, AIST (Kudou and Hoashizumi, 2006 ).

※2 This was previously considered to have been during the Heian period, approximately 1,000 years ago, based on strata positioning relationships with radiocarbon dates and archaeological finds, but it has been reported that recent wiggle matching has produced a date of roughly 1235, during the Kamakura period.

## Whole Rock Chemical Composition

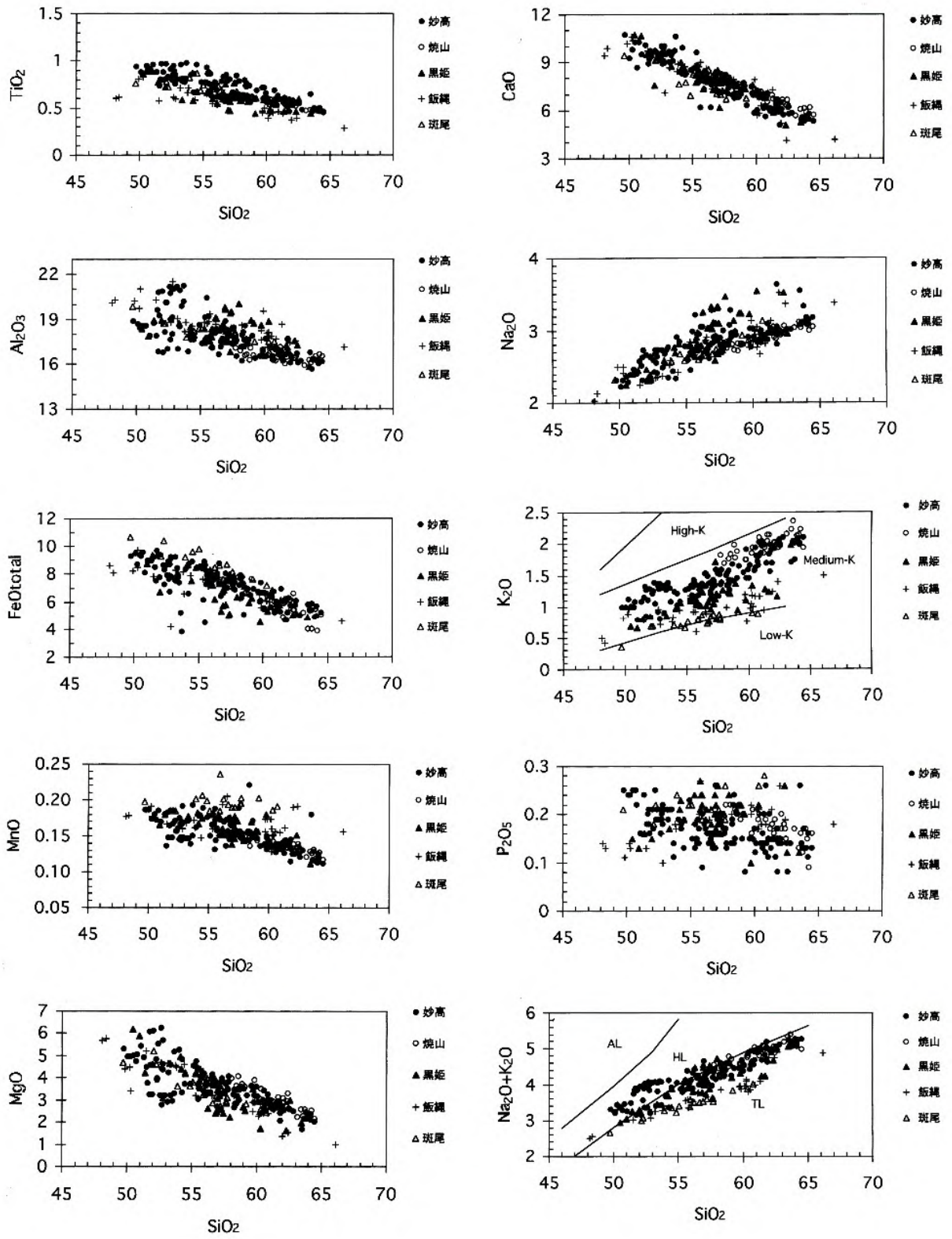



Figure 47-2 Whole rock chemical composition (Hayatsu, 2008).

## Major Volcanic Activity

### ・1974 Volcanic Activity

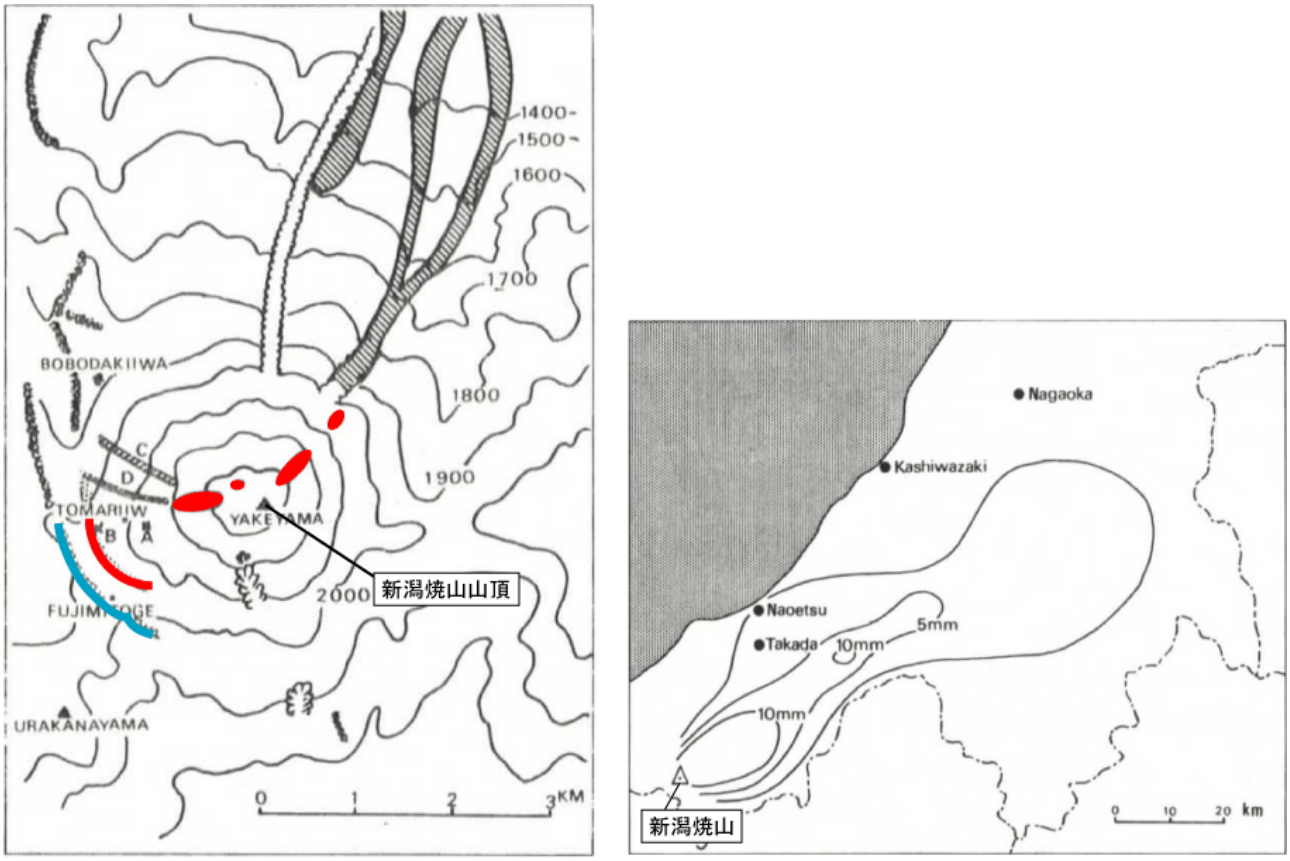



Figure 47-3 Distribution of volcanic blocks (left) and ash fall (right) in the 1974 eruption (modified from Japan Meteorological Agency (1975)).

A: Location where climbers were killed. B: Location of sign board destroyed. Red dots: Locations of crater and fumaroles, Hatched area: Lahar. Red line: Location where volcanic blocks in size of baseball to soccer ball were observed. Blue line: Location where volcanic blocks smaller than baseball' ball were observed.

## ・1997 to 1998 Eruption

Figure 47-4 Volcanic plumes emitted from Niigata-Yakeyama on October 29, 1997. Courtesy of Disaster Prevention Planning Division, Niigata Prefecture. The photo was taken from the southeast. Two fumaroles can be observed. Snow near the fumaroles turned gray by volcanic ash.

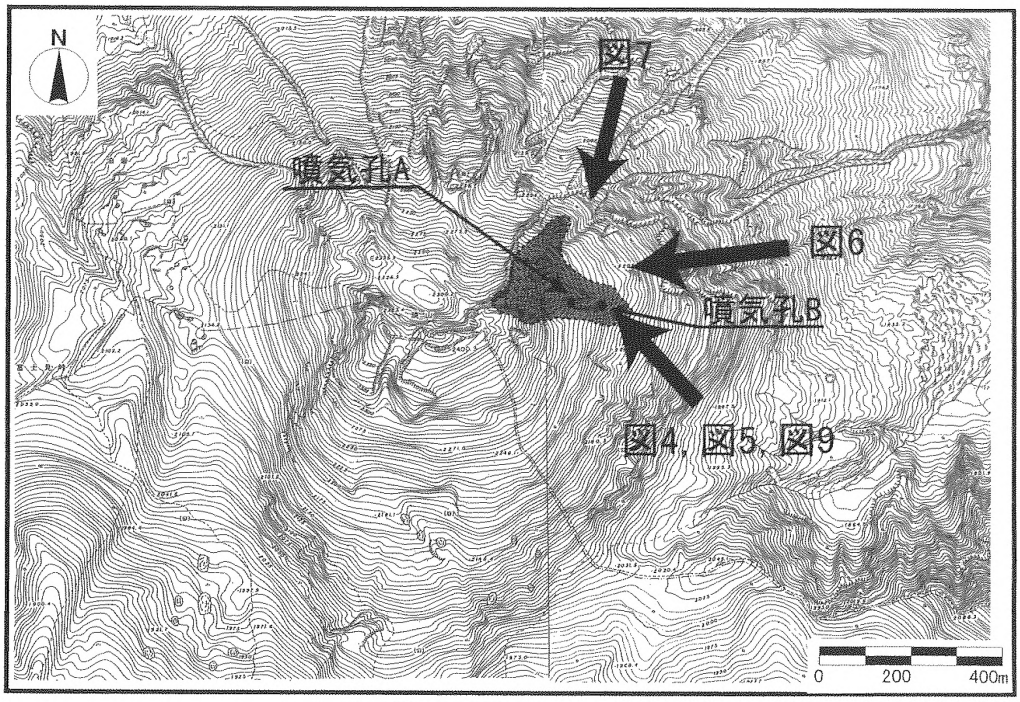



Figure 47-5 Distribution of ash fall on March 30, 1998 at Niigata-Yakeyama (Ito et al., 2000).
The amount of ash decreased with the distance from the source.

## Recent Volcanic Activity

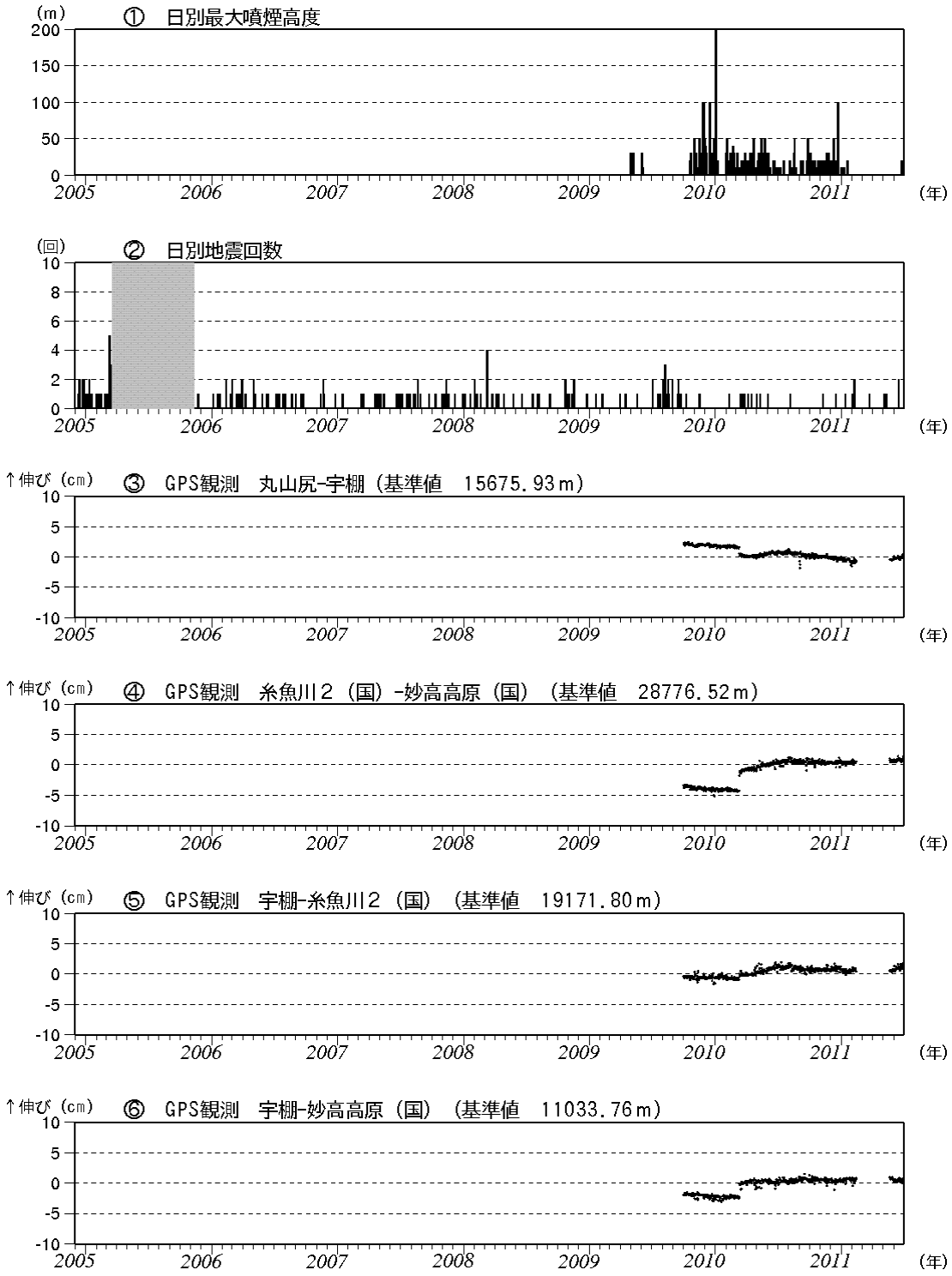



Figure 47-6 Recent volcanic activity (December 1, 2005 to June 30, 2012).

① Daily maximum height of volcanic fumarole ( after April 16, 2010)

② Daily number of earthquakes

③ GPS baseline between Maruyamajiri and Udana

④ GPS baseline between Itoigawa 2 and Myoko Kogen

⑤ GPS baseline between Udana and Itoigawa 2

⑥ GPS baseline between Udana and Myoko Kogen

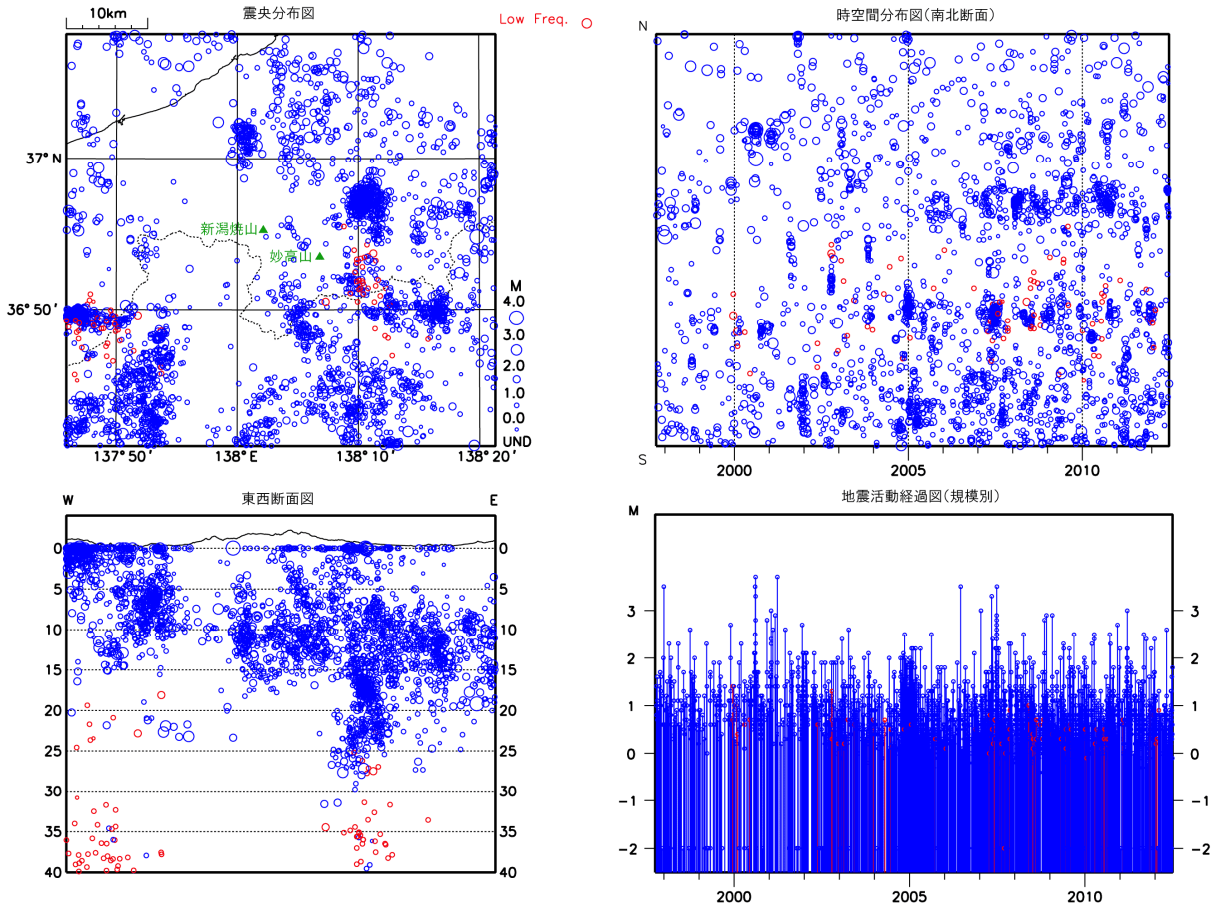


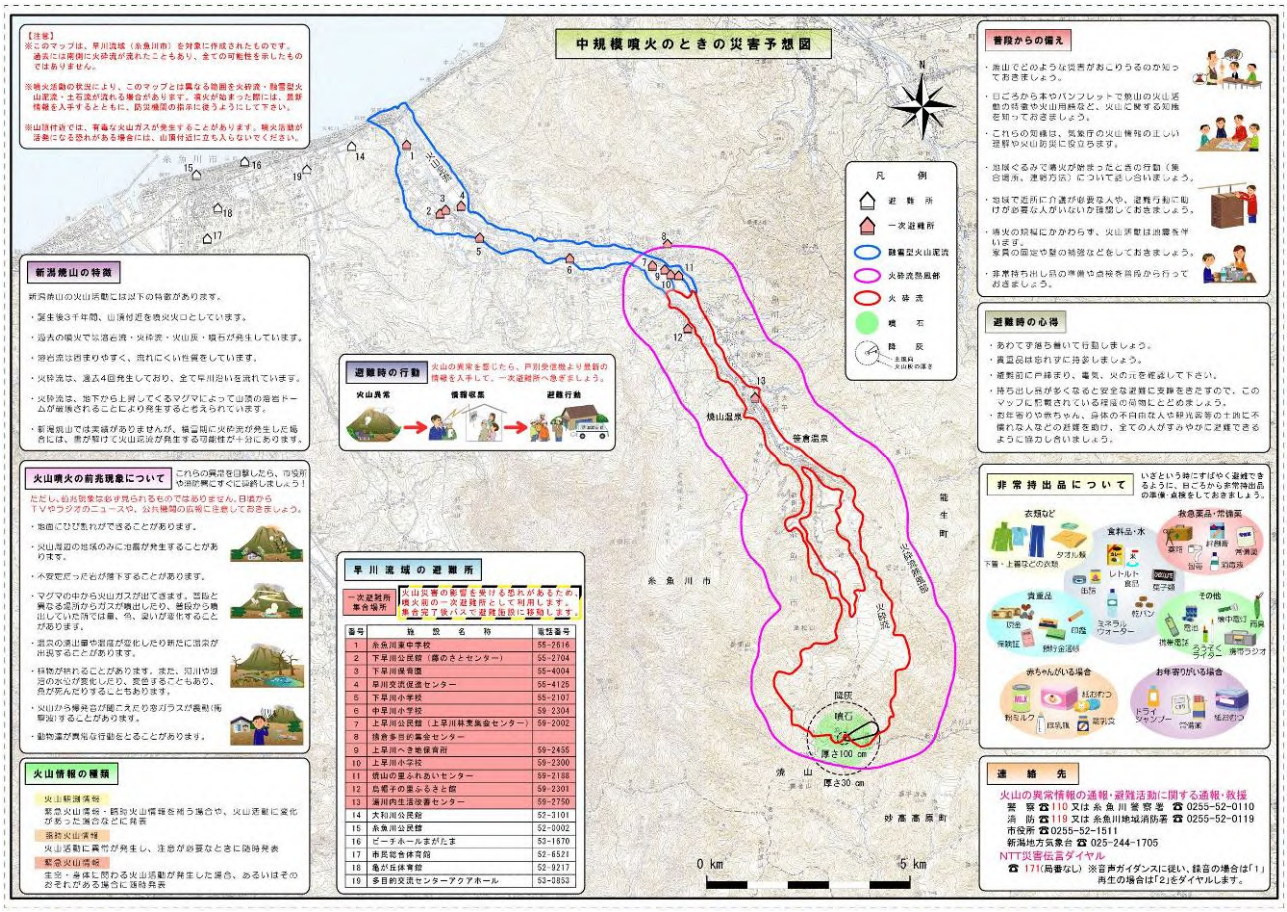

Figure 47-7 Activity of shallow VT earthquakes (blue circles) and deep low-frequency earthquakes activity (red circles) observed by a regional seismometer network (October 1, 1997, to June 30, 2012). Epicenter distribution (upper left), space-time plot (N-S cross-section) (upper right), E-W cross-section (lower left) and magnitude-time diagram (by scale) (lower right).

## Information on Disaster Prevention

①Hazard Map

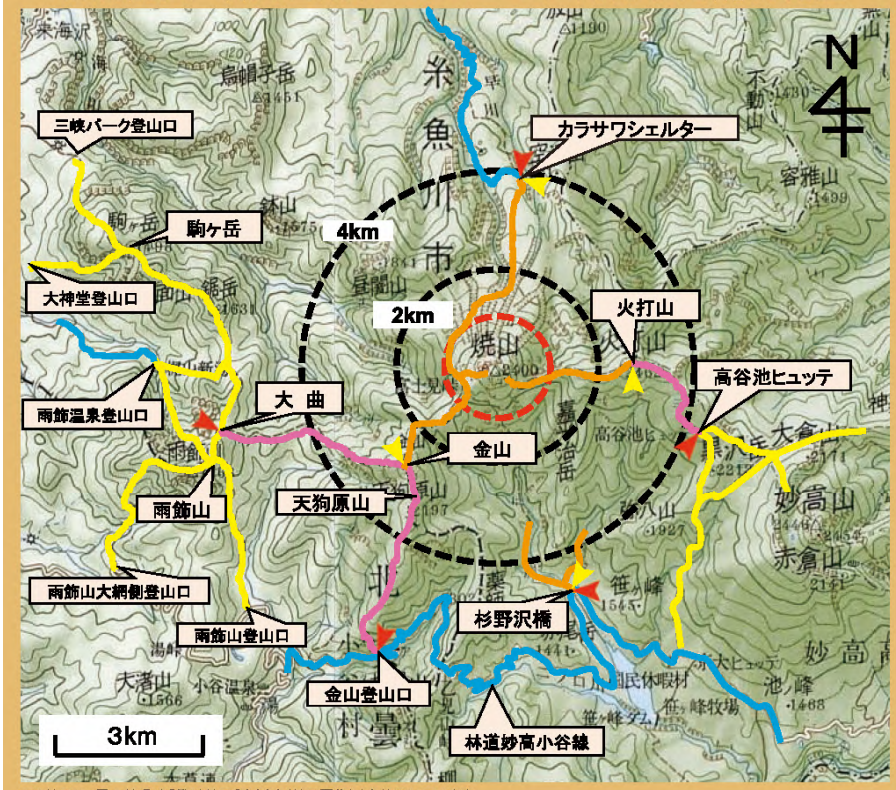
Niigata-Yakeyama Volcano Disaster Prevention Map (Wide Area Version) - published in May 2004 by Itoigawa General Affairs Division and Planning and Coordination Department (Itoigawa Civil Engineering Office), Regional Development Department, Itoigawa Area Promotion Bureau.

http://www.city.itoigawa.lg.jp/dd.aspx?menuid=3494


中規模噴火のときの災害予想図
【注記】
※このマップは、早川流域（糸魚川市）を対象に作成されたものです。過去には周囲に火砕流が流れたこともあり、全ての可能性を示したものではありません。
※噴火活動の状況により、このマップとは異なる範囲を火砕流・融雪型火山泥流・土石流が流れる場合があります。噴火が始まった際には、気象情報を入手するとともに、防災機関の指示に従うようにして下さい。
※山頂付近では、有毒な火山ガスが発生することがあります。噴火活動が活発になる恐れがある場合には、山頂付近に立ち入らないでください。
新潟焼山の特徴
新潟焼山の火山活動には以下の特徴があります。
・誕生後3千年間、山頂付近を噴火口としています。
・過去の噴火で溶岩流・火砕流・火山灰・噴石が発生しています。
・溶岩流は粘りやすく、流れにくい性質をしています。
・火砕流は、過去4回発生しており、全て早川沿いを流れています。
・火砕流は、地下から上昇してくるマグマによって山頂の溶岩ドームが破壊されることにより発生すると考えられています。
・新潟焼山では実績がありませんが、積雪期に火砕流が発生した場合には、雪が解けて火山泥流が発生する可能性が十分にあります。
火山噴火の前兆現象について
これらの異常を目撃したら、市役所や消防署にすぐに連絡しましょう！
ただし、前兆現象は必ず見られるものではありません。日頃からTVやラジオのニュースや、公共機関の広報に注意しておきましょう。
・地面にひび割れができることがあります。
・火山周辺の地域のみに地震が発生することがあります。
・水質が変化することがあります。
・不安定だった岩が落下することがあります。
・マグマの中から火山ガスが出てきます。普段と異なる場所からガスが噴出したり、量段から噴出していた所では量、匂、温いが変化することがあります。
・温泉の湧出量や温度が変化したり新たに温泉が出現することがあります。
・植物が枯れることがあります。また、川水や湖沼の水位が変化したり、変色することもあり、魚が死んだりすることもあります。
・火山ガスや爆発音が聞こえたり窓ガラスが震動（衝撃波）することがあります。
・動物達が異常な行動をとることがあります。
火山情報の種類
火山観測情報
緊急火山情報・臨時火山情報を補う場合や、火山活動に変化が見った場合などに発表
臨時火山情報
火山活動に異常が発生し、注意が必要なときに随時発表
緊急火山情報
生命・身体に関わる火山活動が発生した場合、あるいはその恐れがある場合に随時発表
避難時の行動
火山の異常を感じたら、戸惑受信機より最新の情報を入手して、一次避難所へ急ぎましょう。
火山異常
情報収集
避難行動
早川流域の避難所
一次避難所 集合場所
火山災害の影響を受ける恐れがあるため、噴火前の一次避難所として利用します。集合完了後バスで避難施設に移動します。
番号 施設名称 電話番号
1 糸魚川東中学校 55-2616
2 下早川公民館（藤のさとセンター） 55-2704
3 下早川保育園 55-4004
4 早川交流促進センター 55-4125
5 下早川小学校 55-2107
6 中早川小学校 59-2304
7 上早川公民館（上早川林業集会センター） 59-2002
8 猿倉多目的集会センター
9 上早川へき地保育所 59-2455
10 上早川小学校 59-2300
11 焼山の里ふれあいセンター 59-2188
12 鳥帽子の里ふるさと館 59-2301
13 浦川内生活改善センター 59-2750
14 大和川公民館 52-3101
15 糸魚川公民館 52-0002
16 ビーチホールまがたま 53-1670
17 市民総合体育館 52-6521
18 亀が丘体育館 52-9217
19 多目的交流センターアクアホール 53-0853
凡例
避難所
一次避難所
融雪型火山泥流
火砕流想定区域
火砕流
噴石
降灰
焼山登山口
猿倉温泉
糸魚川市
能生町
妙高高原町
焼山
噴石
厚さ100 cm
降灰
厚さ30 cm
0 km
5 km
普段からの備え
・噴火でどのような災害がおこりうるのか知っておきましょう。
・日ごろから本やパンフレットで焼山の火山活動の特徴や火山用語など、火山に関する知識を知っておきましょう。
・これらの知識は、気象庁の火山情報の正しい理解や火山防災に役立ちます。
・地域ぐるみで噴火が始まったときの行動（集合場所、連絡方法）について話し合いましょう。
・地域で近所に介護が必要な人や、避難行動に助けが必要な人がいないか確認しておきましょう。
・噴火の規模にかかわらず、火山灰対は道路を半埋没します。
家具の固定や壁の補強などをしておきましょう。
・非常持ち出し品の準備や点検を普段から行っておきましょう。
避難時の心得
・あわてず落ち着いて行動しましょう。
・貴重品は忘れずに持参しましょう。
・避難前に戸締まり、電気、火の元を確認して下さい。
・持ち出し品が多くなると安全な避難に支障をきたすので、このマップに記載されている程度の荷物にとどめましょう。
・お年寄りや赤ちゃん、身体の不自由な人や視覚害等の上肢に不慣れな人などの避難を助け、全ての人がすみやかに避難できるように協力し合いましょう。
非常持出品について
いざという時にすばやく避難できるように、日ごろからお常持出品の準備・点検をしておきましょう。
衣類など
食料品・水
救急薬品・常備薬
貴重品
その他
赤ちゃんがいる場合
お年寄りがいる場合
連絡先
火山の異常情報の通報・避難活動に関する通報・教授
警察 ☎110 又は 糸魚川警察署 ☎0255-52-0110
消防 ☎119 又は 糸魚川地域消防署 ☎0255-52-0119
市役所 ☎0255-52-1511
新潟地方気象台 ☎025-244-1705
NTT災害伝言ダイヤル
☎171（局番なし）※音声ガイダンスに従い、録音の場合は「1」再生の場合は「2」をダイヤルします。

②Volcanic Alert Levels (Used since March 31, 2011)

## 新潟焼山　噴火警戒レベル1～3に対応した規制範囲




この地図は、国土地理院「数値地図20000（地図画像）」を使用しています。

【新潟焼山の特徴】

●妙高火山群の北端に位置し、活動開始時期は約3000年前と考えられ、日本の複成火山の中では最も新しい火山の一つである。

●火砕流や溶岩流、火山灰や軽石が堆積した安山岩質成層火山で、約1000年前の火砕流は日本海まで達した。最近では1974年に水蒸気爆発があり、噴石のため山頂付近にキャンプ中の登山者3名が死亡している。

■この地図は噴火警戒レベル1～3のときの規制範囲を示しています。

■居住地域※まで影響が及ぶ場合はレベル4（避難準備）・レベル5（避難）となります。

登山道の規制範囲等

- レベル2以上のとき通行不能
- レベル3以上のとき通行不能
- レベルによる登山規制なし
- 道路
- レベル3の立入規制地点
- レベル2の立入規制地点
- 想定火口（山頂から半径1㎞）山頂溶岩ドーム付近

●噴火警戒レベルに応じて次のような防災対応が必要になります。

| | |
|---|---|
| レベル5（避難） | ：警戒が必要な居住地域※からの避難等 |
| レベル4（避難準備） | ：警戒が必要な居住地域※での避難準備<br>災害時要援護者の避難等 |
| レベル3（入山規制） | ：火口から居住地域近くまで立入り禁止<br>（山頂火口から概ね4㎞立入り禁止） |
| レベル2（火口周辺規制） | ：火口周辺立入り禁止（山頂火口から概ね2㎞立入り禁止） |
| レベル1（平常） | ：規制なし。活動状況より火口内への立ち入り規制等 |

■新潟焼山の噴火警戒レベルは、地方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については、地域防災計画等で定められていますので、詳細については、糸魚川市、妙高市、小谷村にお問い合わせください。

※レベル4または5の場合に噴火に伴い警戒が必要となる居住地域は、この地図の範囲外（山頂の北方約8㎞以遠）に位置します。

Volcanic Alert Levels for the Niigata-Yakeyama Volcano (Valid as of March 31, 2011)

| 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 dangerous residential areas | ●Magmatic eruption or imminent Magmatic eruption , with pyroclastic flow, lava flow, and/or lahar by melted snow (during periods when snow has accumulated) reaching residential areas.<br>Past Examples<br>887: A pyroclastic flow and lava flow occurred. The pyroclastic flow is considered to have reached the Sea of Japan. The lava flow extended approximately 5km from the crater.<br>1361: A pyroclastic flow reached the Sea of Japan.<br>1773: Pyroclastic flow. Part flowed to the south as well. |
| | | **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. | ●Possibility of eruption creating pyroclastic flow, lava flow, and/or lahar by melted snows (during periods when snow has accumulated) which reach residential areas.<br>Past Examples<br>No observed examples<br>●Pyroclastic flow and/or lava flow which are expected to reach residential areas if the eruption grows larger.<br>Past Examples<br>No observed examples |
| **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 activity 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. | ●Eruption or possibility of eruption scattering volcanic blocks within a radius of roughly 4 km around the summit.<br>Past Examples<br>No observed examples |
| | **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 activity as normal. Access to crater area restricted, etc. | ●Eruption or possibility of eruption scattering volcanic blocks within a radius of roughly 2 km around the summit.<br>Past Examples<br>1974: A Phreatic eruption occurred, scattering volcanic blocks approximately 1 km from the crater. |
| **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 may affect summit crater interior and nearby area.<br>Current status as of March, 2011 |

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

- Itoigawa City, Niigata Prefecture: 47,137 (as of October, 2011)
- Myoko City, Niigata Prefecture: 35,103 (as of October, 2011)
- Kotani Village, Kita-Azumi District, Nagano Prefecture: 3,171 (as of October, 2011)

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

- Joshinetsu Kogen National Park
- The Itoi River area, including Niigata-Yakeyama, was certified as a "Japanese Geopark" in December, 2008.
- The Itoi River area, including Niigata-Yakeyama, was certified as a "World Geopark" in August, 2009.

http://geo-itoigawa.com/

Number of mountain-climbers: Estimated to be 300 to 400 per year (no detailed statistics are available)

③Facilities

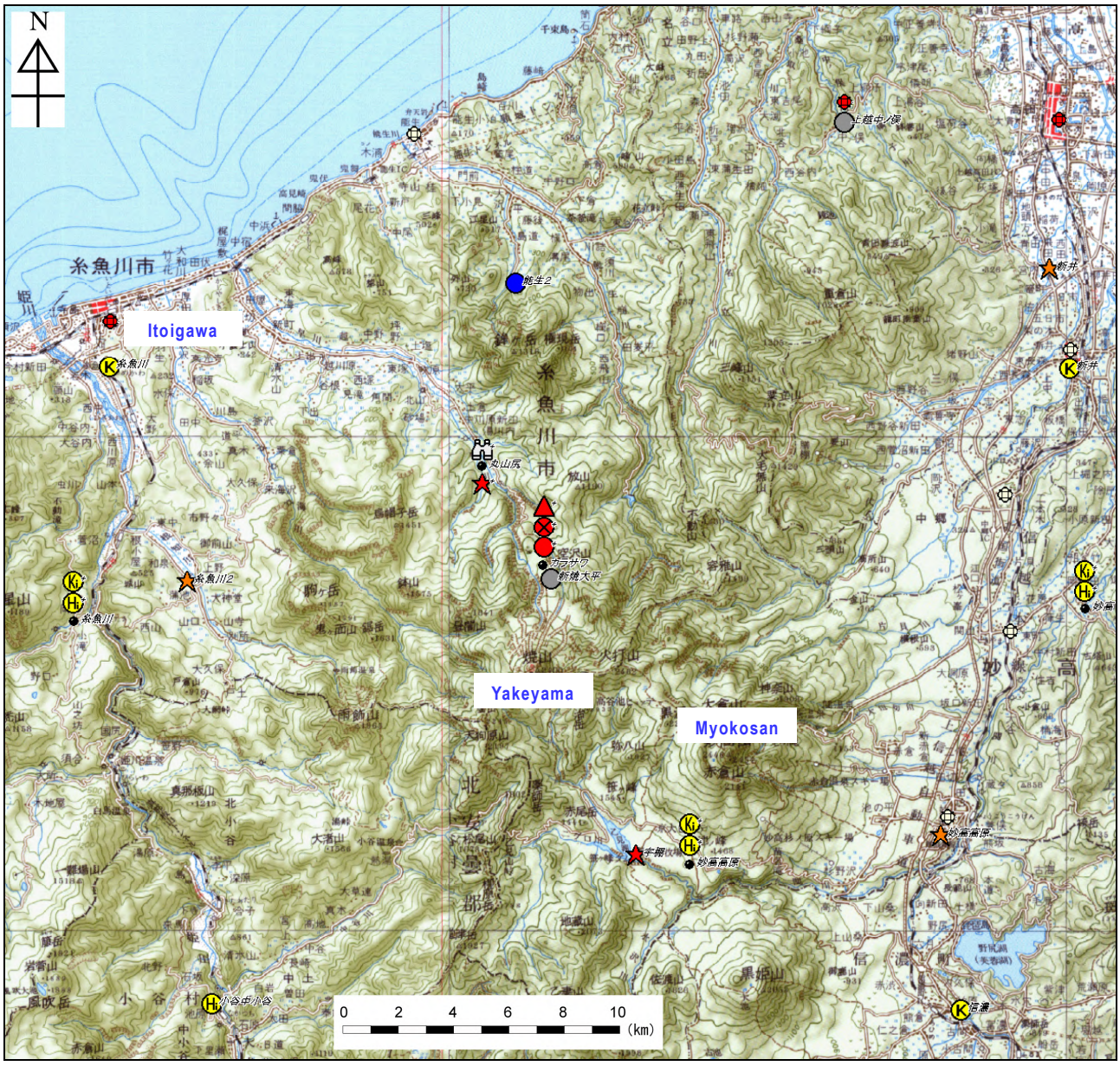
- Fossa Magna Museum

## Monitoring Maps

Wide Area

* Including Myokosan monitoring network.

* 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 (Toyama and Takada) published by the Geospatial Information Authority of Japan were used.

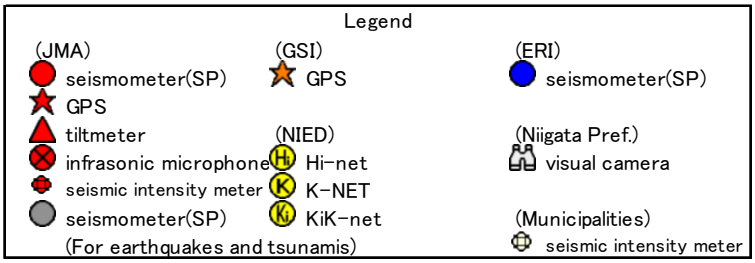



Figure 47-8 Regional monitoring network.

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(Hayatsu, K., and Nakada, S.)