

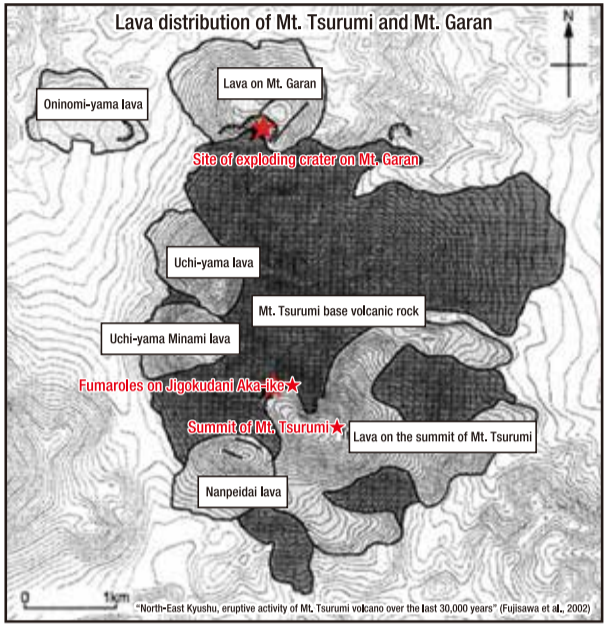
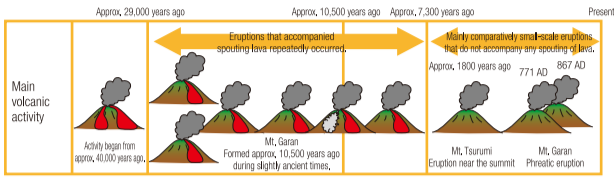
## Mt. Tsurumi and Mt. Garan's Volcanic Activity Until Now Both volcanoes are still active

(The background of Mt. Tsurumi and Mt. Garan and their main activities)

The volcanic activity of Mt. Tsurumi and Mt. Garan began approx. 40,000 years ago.

Up until now, their most active period was the period between approx. 29,000 years ago and approx. 7,300 years ago. As well as emitting lava, eruptions continuously occurred. It is estimated that Mt. Garan was formed in slightly ancient times, approx. 10,000 years ago.

Eruptions that have occurred since approx. 7,300 years ago are smaller than earlier eruptions. However, approx. 1,800 years ago, there was an explosive eruption near the summit of Mt. Tsurumi. In the years 711 and 867, there were phreatic eruptions on Mt. Garan.



### (Recent volcanic activity)

In 1949, there was fumarole activity at Jigokudani Aka-ike on Mt. Tsurumi. From 1974-1975, there was volcanic activity during which small rocks erupted into the surrounding area.

Furthermore, in 1995, at a silica collection site at the crater of Mt. Garan, a mud volcano was formed.



## Features of Mt. Tsurumi and Mt. Garan

The volcanoes are located behind Beppu City and form a connected lava dome stretching 5km from north to south, with Mt. Tsurumi at the southern end and Mt. Garan at the northern end.



On the Northern side of the summit of Mt. Tsurumi are fumaroles (Jigoku-dani and Aka-ike fumaroles), and there is strong fumarole activity on Mt. Garan.

At the base of the volcanoes, located on an alluvial fan, are the hot springs of Beppu, with Beppu being one of Japan's foremost hot spring regions.

Particularly in the areas bordering the mountainous region, there are many boiling springs and fumaroles distributed, as well as spots where you can see hot water, mud, and gas gushing from the earth. For such reasons, Beppu has become popular tourist destination both domestically and internationally.

Furthermore, part of the Mt. Tsurumi and Mt. Garan region is designated as a part of the Aso-Kuju National Park. There are beautiful views during each of the four seasons, such as Miyama-Kirishima azaleas in the spring, and hoarfrost in the winter.



## Inquiries

- ◆ Inquiries regarding volcanic activity:
  - Oita Region Meteorological Observatory TEL 097-532-2247
  - Fukuoka District Meteorological Observatory Regional Volcano Observation and Warning Center TEL 092-725-3606
- ◆ Inquiries regarding disaster prevention methods:
  - Beppu City Crisis Management Division TEL 0977-21-2255
  - Yufu City Disaster Protection Safety Division TEL 097-582-1111
  - Usa City Crisis Management Division TEL 0978-32-1111
  - Hiji Town General Affairs Division TEL 0977-73-3150
- ◆ Inquiries regarding this guide:
  - Oita Life and Environment Department, Disaster Prevention Office TEL 097-536-1111

# Volcano Disaster Prevention Guide

Oita Prefecture's Active Volcanoes

## Mt. Tsurumi, Mt. Garan

For mountain climbers and tourists

Beppu City, Yufu City  
Usa City, Hiji Town  
Oita Prefecture



# Climbing or Sightseeing on Active Volcanoes

When entering the area of active volcanoes to go climbing or sightseeing, you must do some important preparation beforehand so that you can evacuate properly should volcanic activity occur.

Proper preparation is required in order to enter areas with active volcanoes according to the Act on Special Measures for Active Volcanoes, revised July 2015. (Article 11 Paragraph 2)

## Look Up Information

If you plan on going climbing in any volcanic areas, please check the volcanic disaster prevention map and the latest volcanic activity beforehand.

Japan Meteorological Agency Website (Japanese & English)

Volcanic Information for Mountaineers (English)

volcano mountaineers jma



Oita Prefecture Website (Japanese)

Volcano Disaster Prevention Guide (English, Chinese, Korean)

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## For Mountain Climbers

Mountain climbing allows you to enjoy a magnificent environment and feel a sense of accomplishment upon arriving at your destination.

On the other hand, accidents and falls carry the risk of being life endangering, and when climbing an active volcano, another dangerous factor, the "fear of an eruption," is added to that. When mountain climbing, you must prepare yourself properly.

### ◆ Equipment

Based on the condition and specifics of the volcano you're going to climb, please prepare these essential items from the list below before embarking on a mountain climb.

#### [Items to Always Bring]

- Cell Phone or other Communication Device
  - ※ Try not to turn off its power
  - ※ Keep in mind there will be areas without radio signals
- Map of the mountain you're climbing, compass
- Emergency food rations, drinking water
- Other critical mountain climbing equipment

#### [Items to Bring Depending on the State of Volcanic Activity]

- Volcanic Disaster Prevention Map
  - ※ Make sure to look over the information in the volcanic disaster prevention map prior to climbing.
- Helmet, goggles, mask
  - ※ Equipment to protect your body from volcanic debris and ash.



### ◆ Hiking Registration

Make sure to submit hiking registration forms when going mountain climbing.

In order to be able to perform search and rescue operations should a mountaineering accident strike, the Oita Prefecture Liaison Council for Mountaineering Accident Prevention as well as all police stations are accepting hiking registration forms.

### Submitting Hiker Registration

- Register at any police station
- Complete the forms at registration stands located at major trailheads and mail them via the registration mailbox
- Register online

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## In Case of Emergency

If entering the area of the volcano becomes restricted due to abnormal volcanic activity or if sudden eruptions should occur, please take appropriate disaster prevention action as follows.

### ◆ If entering the area of the volcano becomes restricted due to abnormalities in volcanic activity (Prior to Eruption)

After acquiring information regarding the restrictions on entering the area of the volcano, avoid the crater in question and quickly move to outside of the restricted area.

If fear of an eruption grows and entering the area becomes restricted, an evacuation may be called for via emergency alert messages on your cell phone.

### ◆ If a sudden eruption occurs

#### Protecting Your Body from Volcanic Debris

The method of disaster prevention differs depending on the explosive eruption and the size of the volcanic debris ejected from the crater.

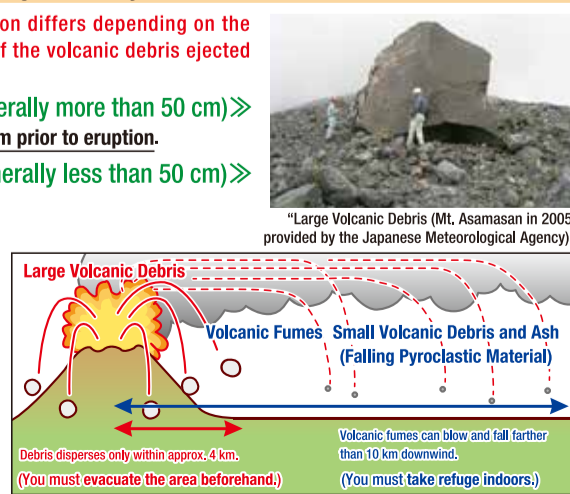
#### ◀ Large Volcanic Debris (Generally more than 50 cm) ▶

- These areas must be **evacuated from prior to eruption.**

#### ◀ Small Volcanic Debris (Generally less than 50 cm) ▶

- **Take refuge indoors** and ensure your safety.
- If there are no areas to take cover at in your vicinity, **put on your helmet and continue to move until you find an area where you can take cover.**

※ Even if you do not have a helmet with you, cover your head with your belongings, such as your backpack, or your arm. **Make sure to protect your head with whatever is available in your current location.**



#### Protecting Your Body from Volcanic Ash

Wear a mask and goggles to prevent volcanic ash from entering your body.

Volcanic ash can cause itchy eyes, pain, and hyperemia, and inhaling ash can lead to coughing and difficulty breathing as well as other effects on the respiratory system.

#### Protecting Your Body from Volcanic Gas

If you feel anything abnormal, such as increased difficulty breathing, move away from low lying areas and valleys immediately.

Volcanic gas has the property of being able to absorb into water easily, so covering your mouth with a wet towel is also effective.

Volcanic gas has toxic components, so depending on how concentrated it is it can potentially be life threatening. Volcanic gas is heavier than air, so it can gather in the low lying areas and valleys surrounding the volcano.



## For Visitors Going Sightseeing

If you are going sightseeing in the area surrounding the crater of the volcano, please do not enter any restricted areas. If there should be any unusual events in volcanic activity, please conduct yourself in accordance to the rules set by the facility's management.



Depending on the volcano, you may be able to access the area surrounding the volcano's crater via cable car or private car.





# Mt. Tsurumi & Mt. Garan Volcanic Disaster Prevention Map

There is little history of activity on Mt. Tsurumi and Mt. Garan, so we are examining a hypothetical eruption by using instances of eruption from Mt. Unzen and Mt. Kirishimasan (Mt. Shinmoedake), which have the same sort of rock formations as Mt. Tsurumi and Mt. Garan, as well as Mt. Yufu.

## Estimated Eruption Site (Crater Estimation)

Two eruption sites at Mt. Tsurumi and Mt. Garan have been estimated judging from the history of activity and the current state of activity until now.
- The summit of Mt. Tsurumi (Including the vicinity of the fumarole of Jigokudani and Akaike in the northwest)
- The area of the fumarole in the vicinity of the explosion crater of Mt. Garan. Furthermore, the area surrounding this location also experiences active seismic activity.
Therefore, we are looking at future shifts in seismic activity as well as assessments of seismic activity and devoting ourselves to increasing the number of befitting examinations conducted.

Judging by the state of activity since now, the prospect of both of these estimated craters erupting simultaneously is thought to be slim.

## Estimated Magnitude of a Major Eruption

### Large Volcanic Debris

There is no data regarding the dispersion of volcanic projectiles from these volcanoes, but by referencing the histories of other volcanoes, it is estimated that there would generally be projectiles 4 km from the estimated crater.

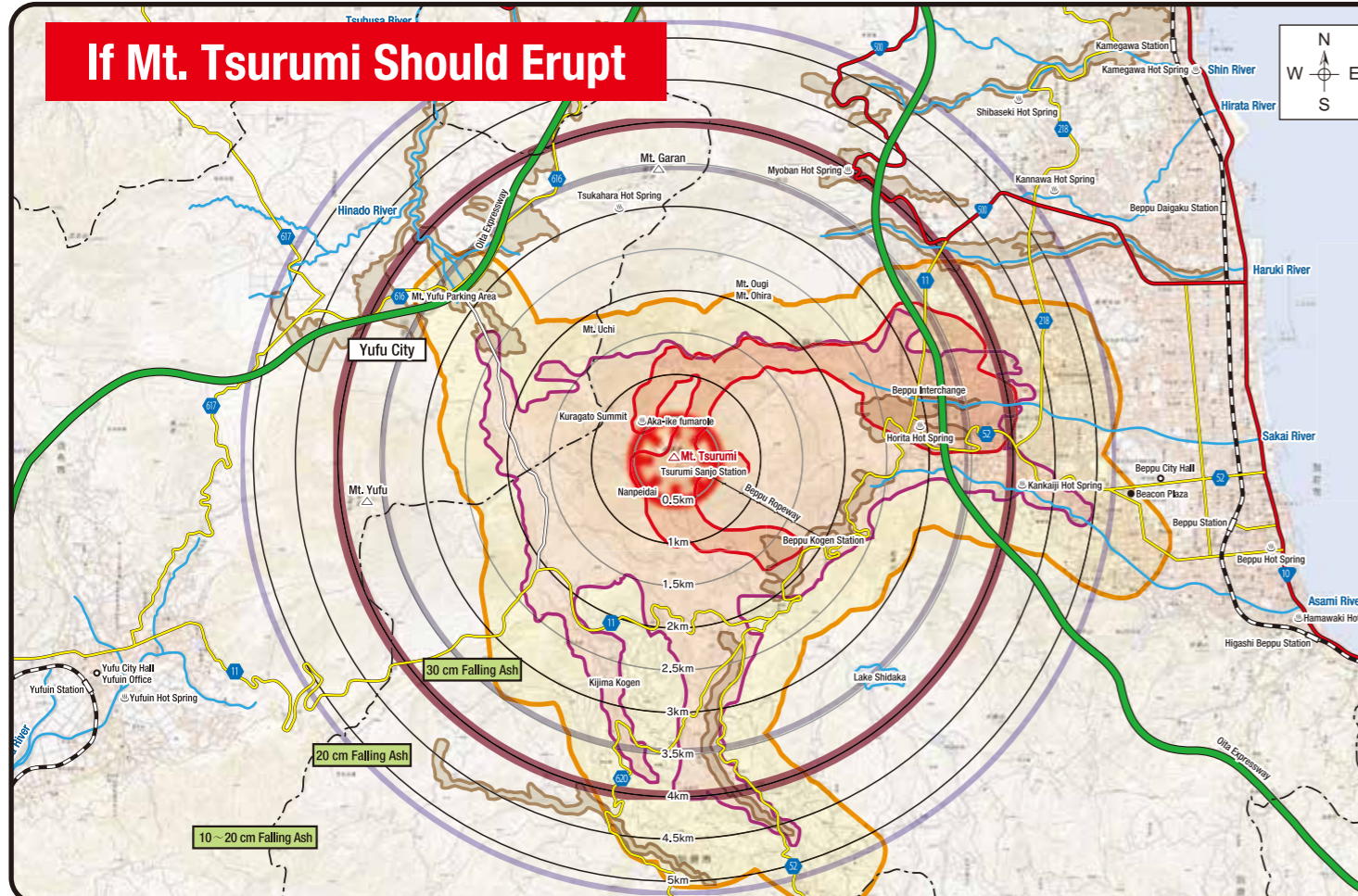
### Lava Flow and Falling Ash

In the past 10,500 years, it is estimated that approximately 150,000,000 eruptions and events of a similar magnitude occurred in the vicinity of Mt. Tsurumi's peak over a period of time 7,300 years previous.

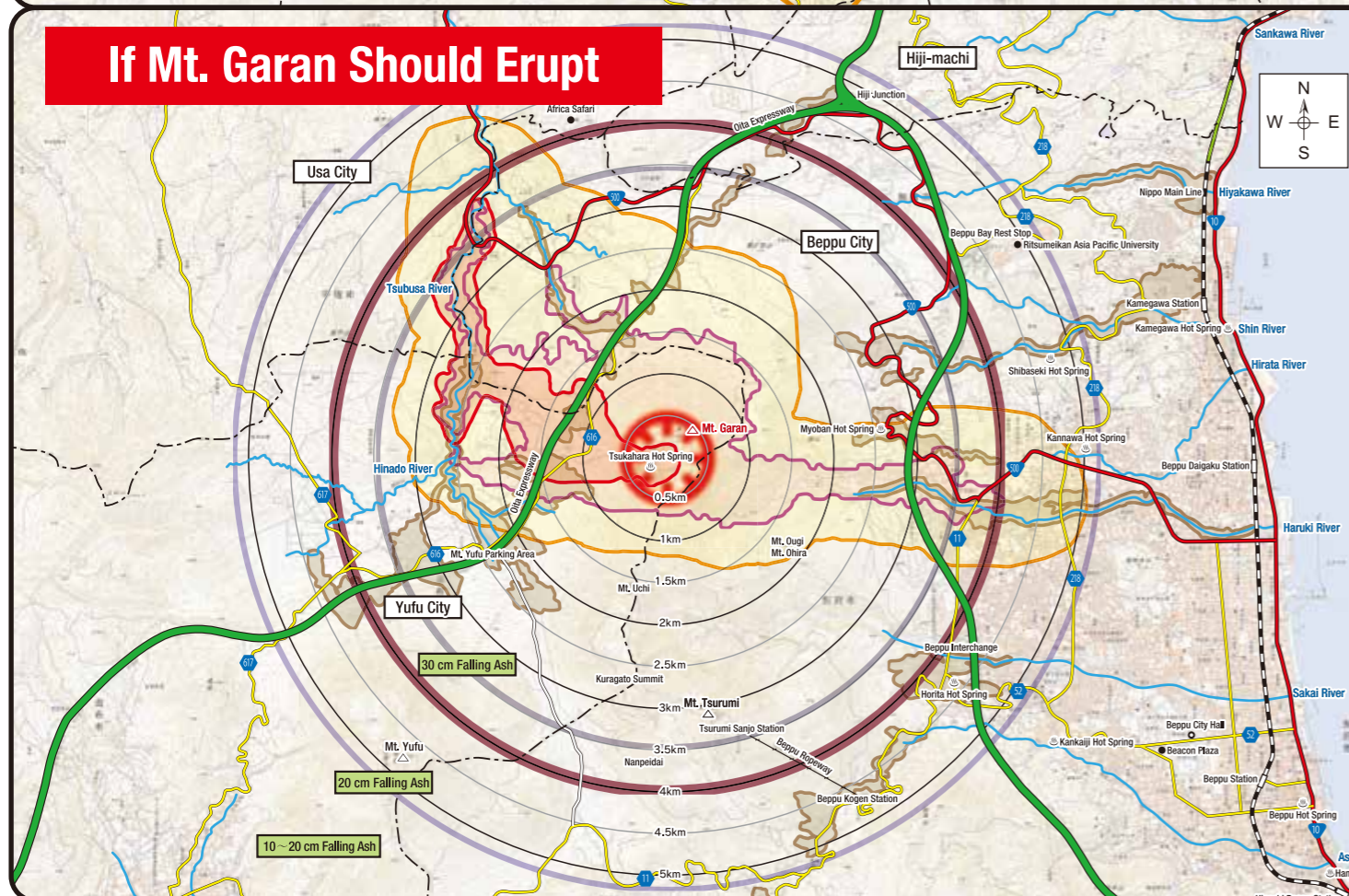
### Pyroclastic Flow and Pyroclastic Surge

As the history of instances on Mt. Tsurumi and Mt. Garan is small, Mt. Yufu's Ikeshiro was used as a reference point in order to estimate 19,000,000 occurrences of pyroclastic flow.

## If Mt. Tsurumi Should Erupt



## If Mt. Garan Should Erupt



## Advisories



Please act appropriately according to the levels published by the Japan Meteorological Agency.

## Map Legend

- Estimated Crater Location**
- Distance from the Estimated Crater**
- Density of Falling Volcanic Ash**
- Volcanic Projectiles**

**Main Section of Pyroclastic Flow**  
**Pyroclastic Surge**  
(Part of the hot air current from the pyroclastic flow)

Pyroclastic flow is the phenomena of high temperature materials from eruptions flowing down at high speeds. In the area surrounding the main section of pyroclastic flow, there is a section of hot air called "pyroclastic surge." This section reaches areas faster than the main section. This is a highly dangerous phenomena, so it is crucial that you **seek shelter prior to its occurrence.**

There are instances of pyroclastic flow even in small scale eruptions. In this case, it is important that you take ample precaution and seek refuge indoors so as not to make direct contact with any pyroclastic flow.

**Forecasted Area of Lava Flow**

**Forecasted Area of Lava Flow After Rain from Accumulated Volcanic Ash**

This is the area where debris avalanches are forecasted to occur after volcanic ash has accumulated, when rainfall strong enough to resemble rain typically experienced only once every two years has occurred. It would flow through the low-lying areas in river valleys. Lava flow is characterized by its ability to continue to occur easily over a period of many years after volcanic eruptions have ceased. Depending on the strength of the rain at the time and the state of falling ash upstream, there may also be debris avalanches that occur outside of the areas shown on this map.

## Volcanic Warning Levels for Mt. Tsurumi & Mt. Garan

Level (Keyword)	Expected Volcanic Activity	Actions to be taken by inhabitants and mountaineers	Enforced Restrictions and Disaster Procedures (Notes 1 - 4)	
			Mt. Tsurumi	Mt. Garan
Level 5 Evacuate	Eruption that will cause serious damage to residential areas farther than 3 km, or imminent eruption	Evacuation from the danger zone.	(Tertiary Evacuation Zone) • Evacuation from the areas with estimated damage shown on the Disaster Prevention Map • The area's National Highway 500, Prefectural Highways 11, 12, 218, 616, and 620 will be closed off • Signs displaying the major trails of Mt. Garan and Mt. Yufu that cannot be used will be set up	(Tertiary Evacuation Zone) • Evacuation from the areas with estimated damage shown on the Disaster Prevention Map • The area's National Highway 500, Prefectural Highway 11, 218, 616, and 617 will be closed off • Signs displaying the major trails of Mt. Tsurumi and Mt. Yufu that cannot be used will be set up
	Eruption that will cause serious damage to residential areas within 3 km, or imminent eruption		(Secondary Evacuation Zone) • Evacuation from residential areas within 3 km • Closure of the area between Oita Expressway Yufuin Interchange and the Oita Interchange • The area's Prefectural Highways 11, 52, and 620 will be closed off • Signs displaying the major trails of Mt. Garan and Mt. Yufu that cannot be used will be set up	(Secondary Evacuation Zone) • Evacuation from residential areas within 3 km • The area between National Highway 500 and Prefectural Highway 616 will be closed off • Signs displaying the major trails of Mt. Tsurumi that cannot be used will be set up
	Eruption that will cause serious damage to residential areas within 2 km, or imminent eruption		(Primary Evacuation Zone) • Evacuation from residential areas within 2 km • The area's Prefectural Highway 11 will be closed off • Signs displaying the major trails of Mt. Garan and Mt. Yufu that cannot be used will be set up	(Primary Evacuation Zone) • Evacuation from residential areas within 2 km • The area's Prefectural Highway 616 will be closed off
Level 4 Prepare to evacuate	Possibility of eruption that will cause serious damage to residential areas	Prepare to evacuate from alert areas. Let disabled persons evacuate.	• Residential areas under advisory will prepare for evacuation • Parking vehicles on prefectural highways within this area will be prohibited	• Residential areas under advisory will prepare for evacuation • Parking vehicles on prefectural highways within this area will be prohibited
Level 3 Do not approach the volcano	Eruption or possibility of eruption that may severely affect places near residential areas	Residents stay as usual. Let disabled persons prepare to evacuate in line with current volcanic activity. Refrain from entering the danger zone.	• Entering within around 1.5 km of the crater will be prohibited • Residential areas where it is necessary to take caution and Ropeway Kogen Station will be alerted • Signs displaying major trails that cannot be used will be set up	• Entering within around 1.5 km of the crater will be prohibited • The eastern area of the Tsukahara Higashino region will evacuate • Residential areas under advisory will be alerted • The area between Oita Expressway Yufuin Interchange and the Oita Interchange will be closed off • The area's Prefectural Highway 616 will be closed off • Signs displaying major trails that cannot be used will be set up
Level 2 Do not approach the crater	Eruption or possibility of eruption that may affect areas near the crater	Residents stay as usual. Refrain from approaching the crater.	• Entering within around 1 km of the crater will be prohibited • Ropeway operation will be suspended and Sanjo Station will be evacuated • Signs displaying major trails that cannot be used will be set up	• Entering within around 1 km of the crater will be prohibited • The Tsukahara Hot Spring will evacuate • The area's Prefectural Highway 616 will be closed off • Signs displaying major trails that cannot be used will be set up
Level 1 Take the usual precautions for active volcanoes	Volcanic Activity is Calm Volcanic ash emissions or other related phenomena may occur in the crater.	In some cases, it may be necessary to refrain from approaching the crater.	If the Japan Meteorological Agency releases a Volcanic Warning (Note 5), major trails and specific areas will be alerted to the content of the warning.	If the Japan Meteorological Agency releases a Volcanic Warning (Note 5), major trails and specific areas will be alerted to the content of the warning.

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(Note 1) If entrance restrictions on national or prefectural highways are being observed, signs providing prior warning will be set up at major intersections and other points, and areas for turning around prior to entering restricted areas will be arranged. (Note 2) Municipal roads will observe regulations in proportion to regulations imposed on national and prefectural roads. (Note 3) Entrance regulations on streets will be observed regardless of the volcanic alert level depending on the state of dispersion of falling ash and small volcanic projectiles. (Note 4) Based on paragraph 29 of Measures for Landslide Disaster Prevention and in accordance with the "Landslide Emergency Disaster Report" and other materials published by the Ministry of Land, Infrastructure, Transport and Tourism, special evacuation advisories and instructions, along with traffic regulation, will take place in regards to debris avalanches. (Note 5) Volcanic Warnings: Even if it does not go so far as to raise the volcanic alert level, when there are changes in volcanic activity, the Japan Meteorological Agency releases "Volcanic Activity Reports" which record special announcements.