Project Outline

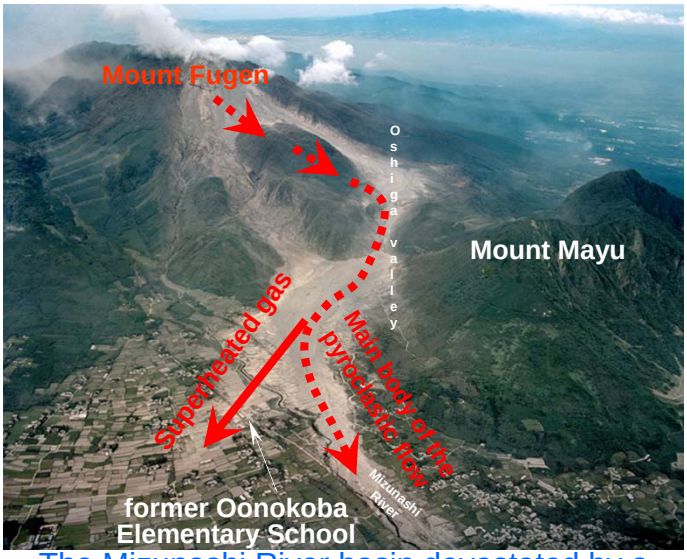
Striving Toward a Disaster-Resistant Country

Unzen Restoration Project Office
Kyushu Regional Development Bureau
Ministry of Land, Infrastructure, Transport and Tourism

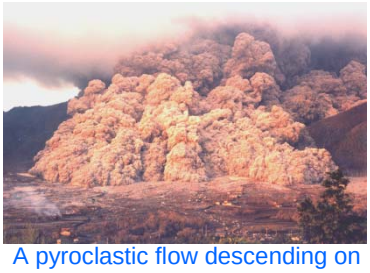
1. Mount Unzen-Fugen Eruption Disaster

The eruptive activity of the volcano Mount Unzen-Fugen inflicted immense damage on the local community

◆Damage from pyroclastic flows



The Mizunashi River basin devastated by a pyroclastic flow



A pyroclastic flow descending on the Senbongi district

The Oonokoba Elementary School reduced to ashes

Pyroclastic flow = a current of superheated volcanic blocks, ash and pumice moving down together with superheated gas

◆Damage from debris flows

The Mizunashi River basin decimated by a debris flow

Damage from a debris flow

Debris flow = massive flow of boulders and sediments piled up in a valley typically after a long rain

[Disaster Background]

1990. 11. 17	**First eruption of Mount Unzen-Fugen in 198 years**
1991. 5. 15	First debris flow descended on Mizunashi River
1991. 6. 3	**A major pyroclastic flow killed 40 people**, and left 3 missing and 9 wounded
1993. 4. 6	MLIT Unzen Restoration Office Established (the then-Construction Ministry Unzen Restoration Office)
1996. 6. 3	Eruptive activity declared to have ended

[Damage]

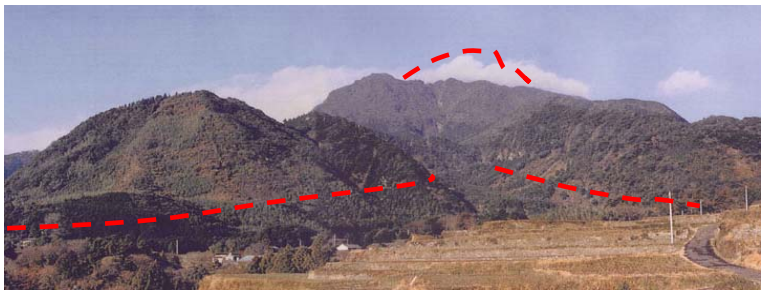
41 dead, 3 missing, 12 wounded, 2,511 buildings damaged, 229.9 billion JPY of damage
62 debris flows, total sediment discharge of ca. 7.6 million m^3, and 9,432 pyroclastic flows

2. Risk of debris flows

Unzen Restoration Office, MLIT

◆Condition of Sediment Deposition

Debris flows still occur in spite of the cessation of eruptive activity



Fixed-point at Kitakamikoba (photographed in December 1989)

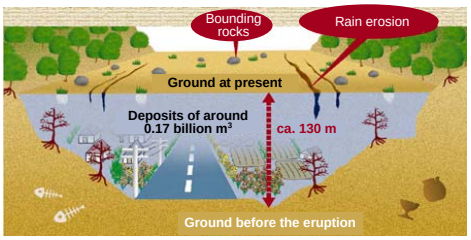
Formation of lava dome: 100 million m^3

240 m higher than the crater

Sediment deposited by pyroclastic flows: 170 million m^3

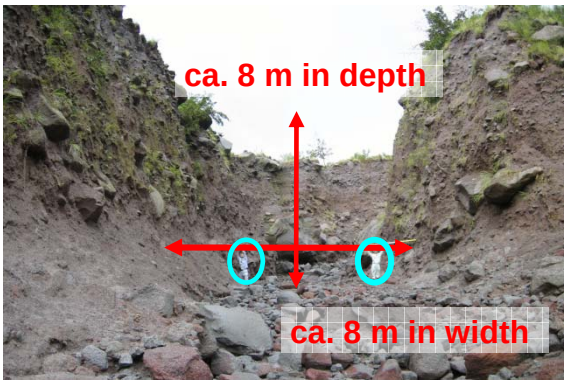
170 m higher at its peak

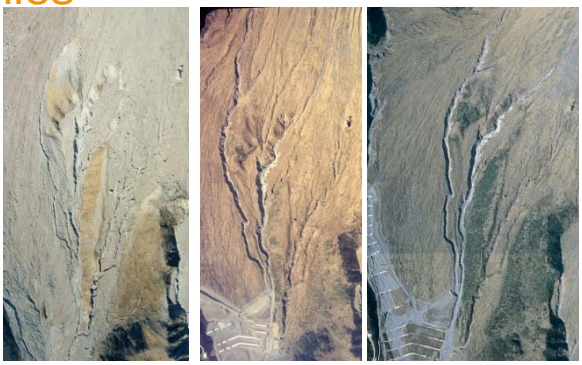
Fixed-point at Kitakamikoba (photographed in May 2011)



Schematic of sediment deposition

◆Condition of Developing Gullies



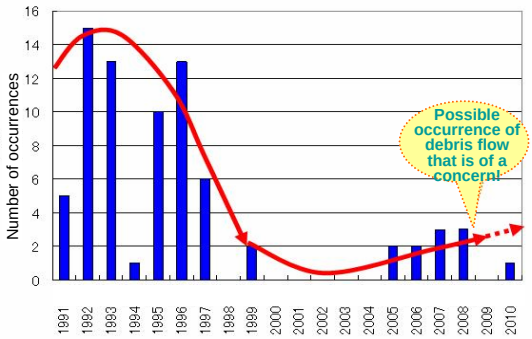


1996 2001 2007

Condition of Developing Gullies
(Valleys by Erosion)

◆Still Repeating Debris Flows

Image of a debris flow in the upper reach of the Mizunashi River
(June 30, 2010)

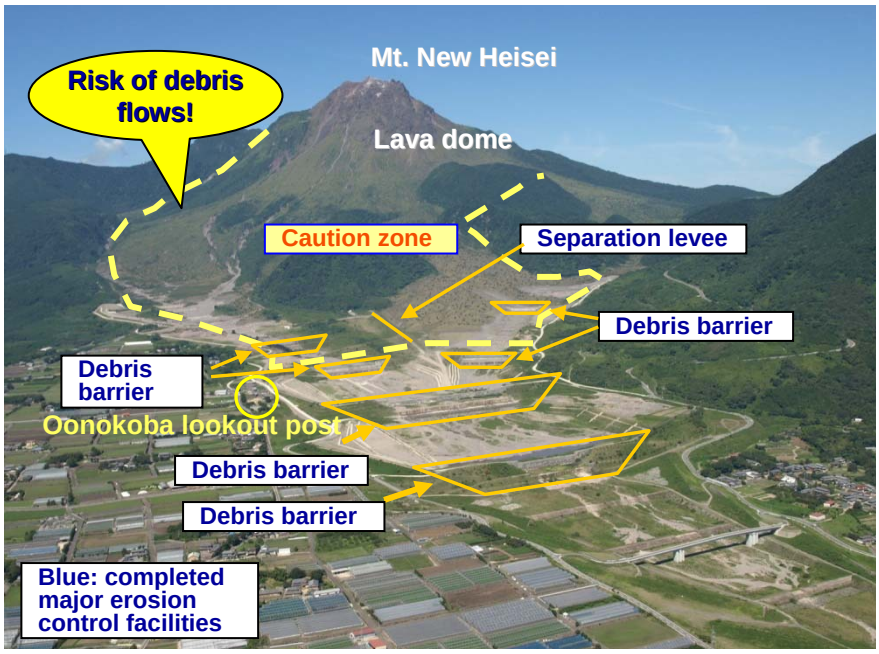


Frequency of Debris Flows

3. Status of Erosion Control Facilities Development

Erosion control is being carried out in order to protect the local community from debris flows

◆Development Status of Erosion Control Facilities



Erosion Control Facilities in the upper Mizunashi River Basin (photographed in 2011)

Erosion Control Facilities in the Nakao River Basin (photographed in 2009)

Erosion Control Facilities in the Yue River Basin (photographed in 2011)

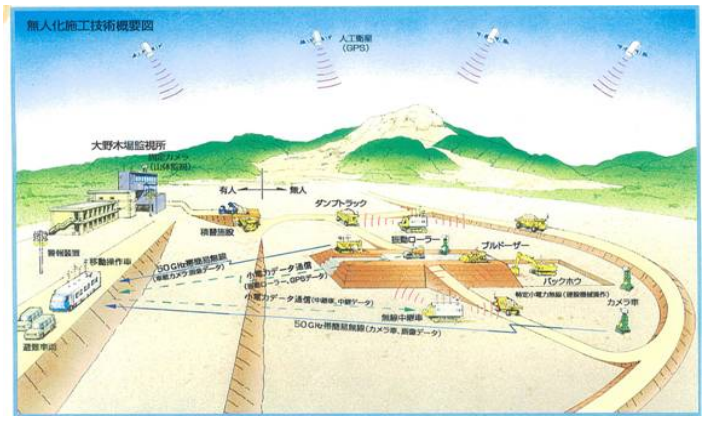
Erosion Control Project in the Mizunashi River Basin (ongoing)
Debris barrier - 6 units, groundsill work - 17 units, separation levee - 1 unit, training dike in the lower course - 30 units, Akamatsu training dike - 3 units, Akamatsu training dike raising – 1 unit

Erosion Control Project in the Nakao River Basin (Completed in 2010)
Debris barrier - 8 units, separation levee - 2 units, training work in the lower course – 4 km

Erosion Control Project in the Yue River Basin (Completed in 2010)
Debris barrier - 1 unit

4. Application and Development of Unmanned Work Technology

◆Application and Development of Unmanned Work Technology



Conceptual Diagram of Unmanned Work

Work in dangerous spots is carried out making use of unmanned construction technology

Removal of rock from deposited sediment became an urgent task in the caution zone due to the frequent occurrence of debris flows in 1992 and 1993.

• Ideas for technology were publicly collected in 1993 from the private sector in order to enable earthwork and transportation of deposited sediments in the caution zone at risk of pyroclastic flows

Conditions:

(1) Ability to fracture boulder conglomerates of 2–3 m in size

(2) Ability to carry out work at 100°C and 100% humidity

(3) Ability to carry out remote operations from distances over 100 m

Background of the Application of Unmanned Work Technology

◆Large Unmanned Machineries

55 t Dump Truck

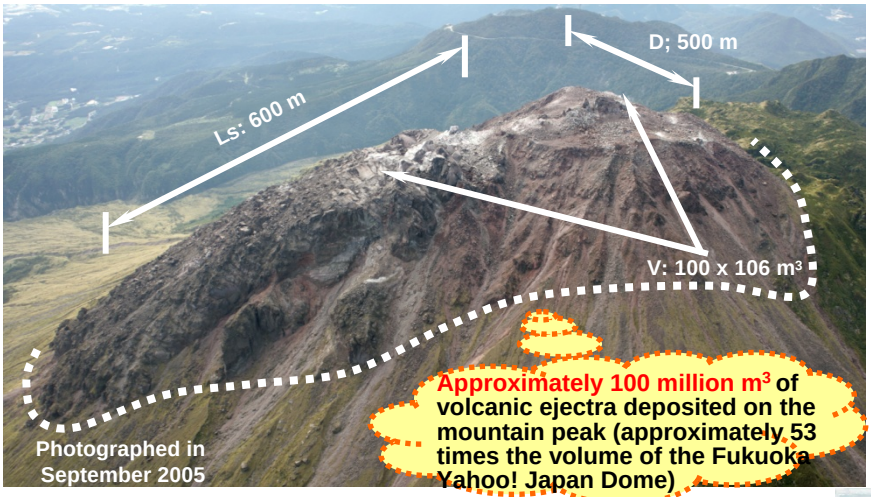
4 m^3 Backhoe

◆Remote Control Room

Performance of Unmanned Work

▼5. Concerns of a Lava Dome Collapse

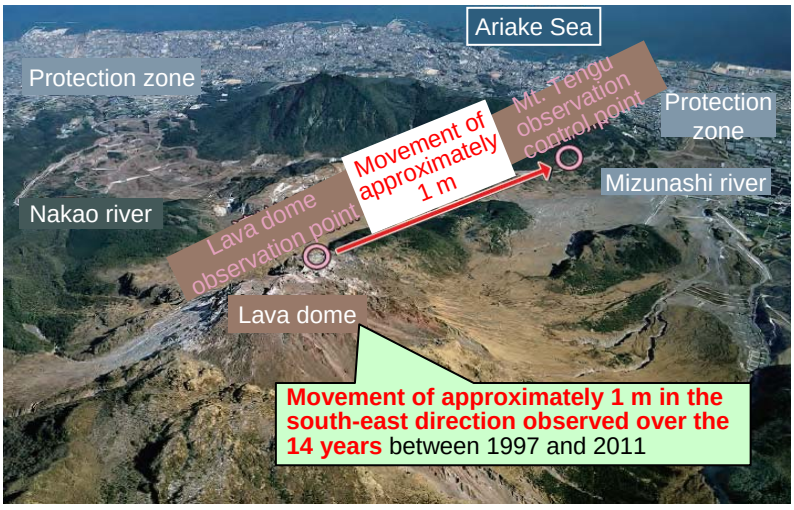
A new concern is the risk of the collapse of the lava dome



Full view of the lava dome at Mt. New Heisei seen from the north

Lava dome = volcanic body resulting from the ejection of viscous lava

- **A gigantic amount of lava** remains **at the peak of the mountain in an unstable state**
- **The lava dome is shifting**, which poses the **risk of collapse** triggered for example by an earthquake or heavy rain.



State of the Peak of the Mount New Heisei
(Red circle indicates the size of a human being)