

Unzen Volcano : the 1900-1992 eruption

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16. Geological Examination of the Two Old Maps from the Tokugawa Era Concerning the “Shimabara Catastrophe”

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Introduction

The Mayu-yama lava dome of the Unzen volcanic area in Western Kyushu, Japan, suddenly collapsed on 21 May 1792 (the 4th year of Kansei). Approximately 15,000 people were killed in the collapse and the tsunami subsequent to the disaster. This is the worst disaster in the history of volcanic hazards in Japan and is called the “Shimabara Catastrophe”.

Two old maps from the Tokugawa Era concerning the “Shimabara Catastrophe” have been discovered. Studying these maps geologically, the author will discuss in this paper the mechanism of the collapse of Mayu-yama.

Outline of the historical studies of the “Shimabara Catastrophe”

A large number of maps concerning the “Shimabara Catastrophe” must have been drawn. Kobayashi et al. (1986) collected twenty-seven maps depicting the disaster examined them historically in detail and concluded that only two maps out of twenty-seven had important historical value. One of the maps is titled “Daishin-zu in Kansei 4”^{*} (Fig. 16-1) and the other is “Big map of the Shimabara Catastrophe” (Fig. 16-2). Kobayashi et al. (1986) clarified that both maps had important historical value, because they were submitted to the Tokugawa Shogunate in 1792 as the official documents of the “Shimabara Catastrophe”.

Using many old records concerning the “Shi-

mabara Catastrophe”, Sekihara et al. (1986) examined the detailed circumstances in which the Shimabara-han^{**} submitted six maps of the disaster to the Tokugawa Shogunate. The six maps are as follows: Two maps were submitted on 18 May in the 4th year of Kansei^{***}, two on 3 June in Kansei 4^{***}, and the last two on 25 September in the same year^{***}. Firstly the Shimabara-han took two roughly drawn (painted) maps and the documents relevant to the disaster to the Tokugawa Shogunate to ask whether the method of drawing was acceptable or not. Secondly getting approval from the Shogunate, the Shimabara-han painted two more-detailed maps and submitted them as the official maps of the disaster to the Shogunate on 3 June in Kansei 4. However, the Tokugawa Shogunate did not accept these maps, because the maps were drawn in too much detail. The Shogunate commanded the Shimabara-han to repaint the disaster maps. Finally, the Shimabara-han painted two new maps in Edo (Tokyo) and submitted them to the Shogunate on 25 September in Kansei 4 together with the former detailed maps.

On the back of the “Big map of the Shimabara Catastrophe”, there is a written endorsement titled “Paired Maps” on the middle part of the left side. The endorsement says as follows:

“These maps were made to be submitted to the Tokugawa Shogunate. However, these were unacceptable since they were too detailed. Two new and less detailed maps were painted in Edo and submitted to the Shogunate.”

Submitted: 25 September, Kansei 4.

The content of this endorsement was the same

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^{*} “Daishin-zu in Kansei 4” means the map of the big disaster in the fourth year of the Kansei Period (1792).

^{**} Shimabara feudal lord.

^{***} The lunar calendar.



Fig. 16-1. "Daishin-zu in Kansei 4" (this is owned by the Honkoji Buddhist temple, 136.0 x 234.0 cm).

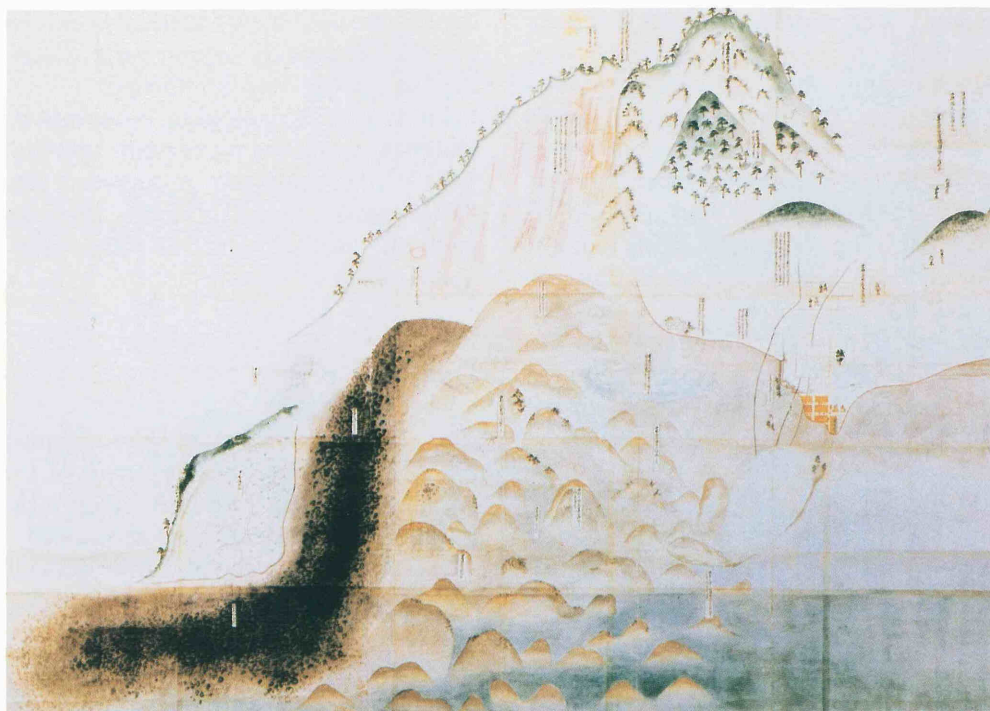


Fig. 16-2. "Big map of the Shimabara Catastrophe" (this map is owned by the city library in Shimabara, 152.5 x 221.5 cm).

as the result deduced from the old records studied by Sekihara et al. (1986). The same endorsement is on the upper left corner of the "Daishin-zu in Kansei 4" map. Therefore, it is clear that the "Big map of the Shimabara Catastrophe" was paired with the map of the "Daishin-zu in Kansei 4". Some old records say that strong earthquakes occurred on 1 March in Kansei 4 and two or three large fissures were formed in the Shimabara Castle area. On the "Big map of the Shimabara Catastrophe" (Fig. 16-2), four fissures were drawn, but there was no fissure on the map of "Daishin-zu in Kansei 4". The sights of the eruptions in Fugen-dake volcano from 18 January to 29 February in Kansei 4 were drawn on the "Daishin-zu". Therefore, it is clear that the map of "Daishin-zu" shows the Shimabara City area before 1 March in Kansei 4. We can therefore "Daishin-zu in Kansei 4" and "Big map of the Shimabara Catastrophe" name as the pre- and post-disaster maps, respectively.

Geological study of the two important maps concerning the "Shimabara Catastrophe"

In the center of the post-disaster map (Fig. 16-2), approximately 50 debris mounds have been shown and on the left hand side (southern part) of the group of debris mounds, the volcanic debris flow has been depicted. Therefore the map tells us that Mayu-yama was broken down by two different forms of collapse, a movement which caused the debris mounds and the debris flow. The map also tells us that these movements did not occur at the same time. The movement which made the debris mounds may have begun first and the debris flow occurred subsequently. The author will discuss the properties of the deposits of debris mounds and debris flow in the field. The debris mounds deposit has been composed mainly of dacite blocks, large and small. The dacite is biotite hornblende dacite and it is the same as the one which formed the Mayu-yama lava dome. The sorting of the debris mounds deposit is extremely poor. The mounds deposit

contains some large blocks of several meters width. Each block has a lot of cracks, which were formed at the time when the debris mound settled in each place. In some outcrops of debris mounds deposit, a part of the soil which comprised the previous surface has been found in fact. From such field observations the author obtained the following result: the debris mounds deposit moved from Mayu-yama to the Shimabara City area without influence from water. If a lot of water had been used in forming the debris mounds, many cracks in large blocks or a part of soft previous surface would not be kept in the deposit. Such a deposit is called debris avalanche deposit.

On the lower part of the pre-disaster map (Fig. 16-1), many small islands have been painted in the sea. The islands are also composed of debris avalanche deposit. The deposit of this debris avalanche is older than the one which formed in 1792 as it has been depicted on the pre-disaster map. The older debris avalanche deposit is also composed mainly of blocks of biotite hornblende dacite. Since the rock feature is very similar to that of the newer avalanche deposit which was formed in 1792, it is very difficult to distinguish between them. By observing the deposit carefully, however, we can distinguish the old avalanche deposit from the new one. In the old avalanche debris deposit, tuff breccia blocks of biotite hornblende dacite have sometimes been found. We can observe that the surface color of dacite or tuff breccia blocks in the deposit becomes slightly red.

The debris flow deposit distributes in the south area of Shimabara City, for instance, as in the vicinity of Antoku Shrine, Kitaantoku-cho or in Minamikueyama-cho etc. The debris flow deposit on the "Big map of the Shimabara Catastrophe" (post-disaster map) has been shown southern part of the group of the new debris mounds (Fig. 16-2) the distribution of the debris flow on the map is coincident with distribution in the field. Therefore, it is inferred that the post-disaster map was painted exactly and precisely. In any outcrop of the debris flow deposit, we can not recognize large blocks with cracks. It is clear that the deposit was formed under the influence of the water. In the deposit, the small fragments of shale and siltstone which formed the basement of

the Unzen area, have frequently been contained. These sedimentary rocks were taken in the deposit on the way of flowing.

From such a geological observation, we can understand that the movements and the distributions of the two types of deposits, which are a debris avalanche and a debris flow, have been precisely painted on the Big map of the Shimabara Catastrophe".

Conclusion

1. The two official maps (pre- and post-disaster maps) concerning the "Big map of the Shimabara Catastrophe" were discovered. Both maps have great historical value from two points of view: they were painted as the official disaster maps to be submitted to the Tokugawa Shogunate and they were painted immediately after Mayu-yama collapsed.

2. On the "Big map of the Shimabara Catastrophe" (post-disaster map), two different forms of the collapse have been accurately painted, a movement which caused debris mounds and a debris flow.

3. The field survey was done to check whether the map was geologically correct or not. In the areas where the debris mounds and the debris flow are painted on the map, the deposits of the debris avalanche and the debris flow have been presented, correctly. It is inferred that the map (post-disaster map) has been painted accurately.

4. Small islands which were painted on the "Daishin-zu in Kansei 4" (pre-disaster map), are composed of debris avalanche deposit. Therefore, it is inferred that a movement which made the debris mounds had occurred before 1792.