Temporal change in sediment discharge from the fine ash-covered slope of Miyakejima Volcano (2)

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The Miyakejima Volcano has been covered by thick volcanic ash deposits since its last eruption in 2000. The ash cover impedes infiltration of rainwater and causes frequent occurrences of debris flows. It is well known that such an ash cover increases sediment discharge by debris flows in general and also empirically known that the increased sediment discharge decreases year by year. Miyakejima Volcano is also thought to follow the same course. However, it is difficult to predict the future sediment discharge quantitatively because the mechanism of the temporal decrease has not clarified yet. Consequently, The authors are executing the research activity to clarify the mechanism. In this paper, we reported that the present state of the sediment discharge at Miyakejima Volcano.

The authors started runoff measurement at six sites in the source area and the drainage outlet of Sanshichizawa gully and Tatsune gully which locate in the eastern and southern part of Miyakejima Volcano, respectively. Firstly, the data obtained by the runoff measurement in the source area shows that runoff coefficients obtained at the three sites where volcanic ash deposits 26-60 cm thick mark about 80% at maximum. On the other hand, runoff coefficients obtained at the site of 11cm thick were lower than 20%, especially those at the site of 5cm thick were almost zero. These data show that thickness of volcanic ash deposits seems to affect water discharge from the source area. Secondly, it is found that there is a significant difference between runoff characteristics at the outlets of the two gullies. Runoff from Sanshichizawa gully is much greater in discharge and responds to a rainstorm much more rapidly than that from Tatsune gully, where runoff appears several hours after a rainstorm. It seems to come from the fact that the source area of Sanshichizawa gully is covered by thicker ash deposit than that of Tatsune gully because it has been shown that the source area covered by thick ash deposit can generate more runoff. In Tatsune gully, however, a large amount of scoria deposits in the gully and seems to affect runoff processes. This merits further research.

A lot of typhoons hit Miyakejima Volcano in 2002. Especially, Typhoon No.13 brought about rainfall of 277 mm in one day, which is the largest rainfall event since the last eruption in 2000. Although the rainstorm caused some sediment discharge and some damages to roads, they were slighter than those received right after the eruption. This fact infers that sediment discharge has significantly decreased despite no quantitative data. As mentioned above, a lot of water runoff is still observed at torrents in which the source area is covered with thick ash deposit, such as Sanshichizawa gully. In such torrents, however, old lava flow appears in their channel bed almost through the reach of the torrents. It seems that further down-cutting hardly occurs any more. Debris flow or mud flow requires both sufficient amount of sediment as a content and that of water as a carrier. The present state that sediment discharge seems to decrease in many torrents in Miyakejima Volcano is inferred to result from the deficit of debris in the channel bed available to be eroded. On the other hand, there are some torrents in which considerable sediment still discharges. A significant sediment discharge occurred at torrents including Tatsune gully in which a large amount of scoria remains in the channel. It seems that sediment discharge will continue at torrents with a large amount of unstable sediment. However, it is necessary to pay attention to torrents without unstable sediment now because sediment discharge could occur if large slope failures or side wall collapses take place. Many of the torrents of Miyakejima volcano is still capable of generating water runoff which seems to be enough to make debris flows or mudflows.