

Occurrence and origin of potholes developed on the eastern slope of Miharayama in Hachijojima, Izu Islands, Tokyo Prefecture, Japan

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Introduction

In Hachijojima (Hachijo Town, Tokyo), a lot of potholes are seen along swamps on the eastern slope of Miharayama. The finding of the potholes was in recent years, and they were designed as cultural property by Hachijo Town in 2016. But the distribution and its origin had not been elucidated enough, the potholes had surveyed in many aspects of geography four times over from 2014 to 2016. We will report the knowledge obtained from the survey and discuss the origin of the potholes. The study area is the special area of Fuji Hakone Izu National Park. The sampling of study specimens approved by the permission of the Minister of the Environment specified by Natural Park Act (No.1509143).

Definition of pothole

"Cyclopedia of Earth Science" (The Association for the Geological Collaboration in Japan, 1996) defines pothole as 'a round shape structural failure developed on the surface of riverbed by erosion', but the definition of pothole is not strict in general. So, in the case of Hachijojima potholes, we measured the size of pothole as follows. 1. The depth of pothole is the vertical distance from the surface of bedrock to the bottom of pothole. 2. The width of pothole is average of the major axis and the minor axis, which are the horizontal distance at the attitude of the surface of pothole. We accept the hole whose depth and width are bigger than 10 cm and 30 cm, respectively. Furthermore, the holes developed on the soil made by water current are excluded.

Potholes developed on the eastern slope of Miharayama

Potholes occur in Sueyoshi district, eastern Miharayama. On the eastern slope of Miharayama, some small valleys are lined in the WNW-ESE direction. Potholes are formed on the waterway of the valleys continuously. Over 700 potholes are found in 9 valleys. Among them, the "main" valley is the biggest one. In addition, schematic occurrence of potholes is recognized in the main valley. So, we will report the survey of the main valley chiefly. The types of the potholes are divided into two types. 1. Pothole type : a typical pothole removed by pebbles deeply. 2. Spoon type : a pothole whose depth is small as compared with its width. In the main valley, we found 19 pothole type potholes and 122 spoon type potholes. Some potholes had captured pebbles. The waterways are commonly step-wise. The steps of the waterway are several meters away from each other. Waterfalls are common on the step. The bedrock of the potholes is basaltic lava, which has 1-2 cm euhedral anorthite crystals. Under the microscope, the lava shows intersertal texture, and plagioclase, clinopyroxene and orthopyroxene (up to 1 mm) were recognized. Intergranular basaltic xenoliths usually occur in the lava. They seem to be crusts of volcanic vent when the lavas erupted. Potholes exist only in the area the basaltic lavas occur. The lavas must be a part of the main volcanic body of Miharayama, whose age is estimated to be 26-30 ka (Suga, 1998).

Origin of potholes

It is necessary to form potholes that water flow and pebbles which remove the bedrock exist. Over and under the basaltic lavas, scoriaceous beds are recognized. Waterfalls are formed usually on the scoriaceous beds because they are weak and water-permeable layer although the basaltic lavas are impermeable layer. Basaltic rocks over the waterfall turn to pebbles when the waterfall goes back. The occurrence of pebbles is a factor of formation of potholes as described above. In addition, sands which are formed by boll mill crushing accelerate erosion of the bedrocks. They must be a factor of spoon type pothole.

Reference : Suga(1998): *The Quaternary research*, **37**, 59-75. ; The Association for the Geological Collaboration in Japan (1996): 1228.

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