Mudflow and debris-flow deposits on the eastern foot of Iwate Volcano, northeast Honshu, Japan

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Iwate Volcano is divided into eastern and western part. In the eastern part, a large part of the mountain collapsed and the horseshoe-shaped caldera were formed in ca. 6000 years before present. Since this event, Yakushi-dake central cone have been formed with the eruptions of scoria and lavas. This study is aimed at revealing the stratigraphic horizon, age, distribution and lithological characteristics of each mudflow deposit or debris-flow distributed on the eastern foot of the mountain, and we will discuss the origin or flow mechanism of these mudflow and debris-flow deposits. The geological survey was performed both in artificially excavated trenches and on a ground surface, with the cooperation of Japan Ground Self-Defence Force. The main surveyed area is located around the downstream of Koborizawa, the headstream of which is in the outer rim of the caldera with many scars of slope failures, and Ohorizawa, the headstream of which is near the younger central cone (Fig. 1).

The mudflow and debris-flow deposits are divided into three types, type I, type II and type III, based on their lithological characteristics. Type I, most of the mudflow and debris-flow deposits, consists mainly of poor sorted fine-grained sand and subangular breccias of lava and is often accompanied by thin layer of fine-grained sand or clay. More than twenty-six deposits of this type above the horizon of Sugo Scoria erupted in ca. 4800 year before present were found in the study. The volcanic fan to the south of Koborizawa, where many lava blocks or breccias are distributed, is underlain by debris-flow deposit of this type. Judging from the lithological characteristics and distribution pattern, we consider type I is debris-flow deposit resulted from slope failure of the outer rim.

Type II includes unconsolidated pebbles to cobbles such as black soil and scoria layer in poor sorted sandy matrix. In the main part of this type laminated structure were often found, and in the basal part thin layer of fine-grained sand were frequently observed. Type II distributes around both Koborizawa and Ohorizawa, and overlies black soil just above Shirishida Scoria. The lithology suggests that this type is more viscous mudflow deposit relative to debris avalanche.

Type III is characterized by including lava blocks and volcanic bombs in poor sorted fine-grained sand matrix. These bombs have not been ground and are irregular-shaped. They have concentric ring-like fractures in them and no sign of high temperature oxidation. These facts possibly suggest that this type of mudflow resulted from melting snow by the volcanic eruption. Some of the lava blocks are more than six meters in diameter. This type of mudflow deposits and huge lava blocks are distributed around Ohorizawa. The mudflow bringing these huge blocks is inferred to have been more than fifteen meters in height from the distribution pattern of the blocks. The chemical composition of these blocks is almost the same as the lava exposed near Ohorisawa, which strongly suggests that these blocks were parts of the lava.

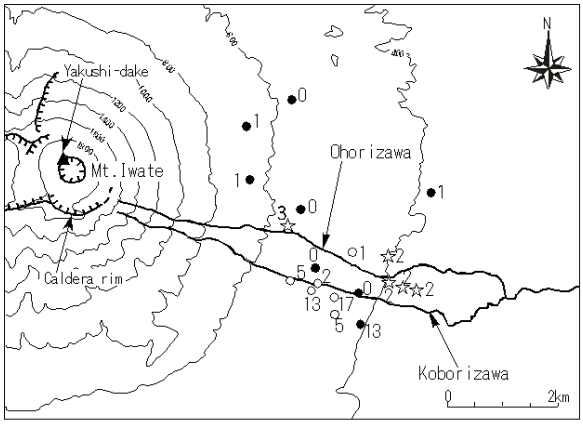

Fig. 1 Map showing trench sites and the number of mudflow deposits The numbers near symbols denote the number of mudflow deposits after ca. 4800 y.b.p. Stars indicate trench sites in which a mudflow deposit includes volcanic bombs. Open circles and stars represent sites where a mudflow deposit including unconsolidated sediments such as black soil or scoria layer is distributed.