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The products of 2012-2013 mud eruption event at Million Dollar Hole crater, Ioto volcano

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Explosive eruptions occurred several times in the period from February 2012 to April 2013 at the Million Dollar Hall crater in Ioto (Iwo Jima) Island. The situation of eruptions and properties of the ejecta are summarized as follows.

At the eruption occurred in the duration from 7 to 9 February 2012, muddy volcanic ash were erupted from vents arranged NNW-SSE direction. The main vents were consist of follows. Vent A that occurred within the existing crater (25m in diameter, approximately 10m deep) at south-southeast side, vent C that was occurred in center of the existing shallow crater (30m in diameter) at north-northwest side, and vent B that was probably newly formed between the two. Thickness of ejecta layer was 30 or 40 cm on rim of each vent. Because isopach contours are irregularly shaped, tephra are estimated that were emitted directionally from each vent. Then, small scale muddy volcanic ash release and steam plume activities was followed.

The eruption on 17 to 18 February 2013 was the largest. Muddy volcanic ash were erupted from the location of vent A and B, and fell on the western side. Thickness of ejecta layer are 1 to 3 meter on vent rim. Cinders and minor man-made Objects there were possibility of ballistic ejecta reached distant point approximately 220m at the maximum from the vents. After the eruption, vent A and B were combined into a single crater (35m in diameter, 17m deep). In addition, the formation of collapse crater about 40m in diameter began at the location of vent C.

The eruption on 11 April 2013 was occurred at the collapse crater (vent C). Muddy volcanic ash deposited on the southern side. The maximum thickness of ejecta layer is 45 centimeter on the vent rim. Ballistic cinders were witnessed at the eruption, but the limit of distribution was not estimated. Vent C was combined with vents A. Therefore, the whole shape of the crater became a cocoon (60m in major axis, 17m deep). Thereafter, the crater has remained in calm state.

Volcanic ash that erupted in the series of eruptions were wet at the ejection and deposition. They are composed mainly of hydrothermal alteration clay consisting of smectite and kaolin minerals and also includes large amount of lithic fragments, free crystals and volcanic glass fragments that are altered varying degree. In addition, pieces of glass and iron piece of man-made weaponry, which is said to have been abandoned after World War II. In addition, pieces of glass and iron which were derived from weapons abandoned immediately after World War II are also included. Ballistic cinders consists of such as tuffaceous sandstone, tuff and altered trachyandesite.

Eruptive volume of each eruption are estimated approximately as follows. The eruption in February 2012 is 800 m^3, the eruption on 17-18 February 2013 is 11,000 m^3, and the eruption on April 11, 2013 is 2,000-4,000 m^3. Total volume is 14,000 to 16,000 m^3 approximately. On the other hand, total amount of subsidence in this peroid is 10,000 to 15,000 m^3, it is roughly equal to the eruptive volume.

These eruptions are considered phreatic explosion that blew off strongly altered rocks surrounding the hydrothermal reservoir and shallow non- or weakly altered tuffaceous rocks. It indicates that the hydrothermal activity under Million Dollar Hole crater became active in relation to rapid crustal deformation that occurred in Ioto from early 2011 to May 2012.

Keywords: tephra, depositional structure, surface phenomena, eruption record