

Volcanic History of Ogasawara Ioto (Iwo-jima)

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Ioto (Iwo-Jima; Sulphur Island) is a volcanic island located at the volcanic front of the south end of Izu-Bonin arc. The island consists of a central cone and southwest rim of a submarine caldera with a diameter of about 10 km. High rates of geothermal activity and crustal uplift have been observed, which are considered to be related to magma intruding at a shallow depth. Therefore, Ioto volcano is considered to be an active resurgent dome. However, eruptive history, including the process and timing of caldera formation, has not been clarified. Eruptive history based on our recent field survey, dating, and chemical analysis is as follows. A pre-caldera edifice was formed by volcanic activity of trachyandesite-trachyte magma in a subaerial and subaqueous environment. The K-Ar ages of the lavas on the Western rim represents about 0.07-0.08 Ma, but these results have large error. The magma composition and types of eruption were similar to those of the post-caldera edifice. It is still unclear when the caldera was formed. The caldera floor, which was a sedimentary basin with shallow marine sediments and a subaqueous lava flow, has been present at least since 2.7 kBP. Furthermore, a small volcanic island covered with trees used to exist in the Motoyama area. The complicated sequence of the Motoyama 2.7 kBP eruption is described as follows. First, on the volcanic island or in the surrounding shallow water, an explosive phreatomagmatic eruption occurred that formed subaqueous welded tuff (Hinodehama ignimbrite) and a subsequent thick subaqueous lava flow (Motoyama lava). While the Motoyama lava was still hot, the eastern part collapsed. The collapsed mass was quenched to form large blocks similar to pillow lava. A subsequent large phreatomagmatic eruption occurred, destroying the hot Motoyama lava, the older edifice, and the marine sediment. The resultant subaqueous pyroclastic flow generated the Motoyama pyroclastic deposit. Then, the eruption center shifted to the Suribachiyama area, which is just outside the southwest caldera rim. Deposits from three different eruption periods have been identified-lower, middle, and upper pyroclastic deposits-and a lava flow that erupted during the middle pyroclastic period. The lower unit was formed by a subaqueous eruption at a deeper level; the middle deposit was formed by a phreatomagmatic explosion at a shallow depth; and, the following lava emission generated a lava island. The upper pyroclastic deposit was generated by a combination of phreatomagmatic and Strombolian eruptions. Although the ages of these eruptions are not obvious, the first phase of the eruption occurred during the period between 2.7 kBP and 0.8-0.5 kBP, which is estimated from the age of the reworked deposit sandwiched between Motoyama pyroclastic deposit and the upper marine terrace X (Kaizuka *et al.*, 1983) deposit. The eruption of the upper deposit occurred before AD 1779 (ca. 0.2 kBP). The eruptive products described so far are covered with younger sediment from marine terraces and spits. Recently, small-scale deposits from phreatic explosions accompanied by geothermal and uplift activities have been found in various places on the island, but juvenile material has not been confirmed to exist in the products.

Keywords: caldera, subaqueous pyroclastic flow, subaqueous lava