Secondary explosion occured in the bottom felsic lava flow and an alteration of the eruption style in Himeshima

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There are some felsic lava flows and pyroclastic cones in Himeshima Volcanic Group. Ito (1989) described that both of magmatic eruption and phreatomagmatic eruption are occurred, in terms of existence of lava flows and pyroclastic surge deposits. But, no one has discussed the continuous alteration of the eruption style from magmatic eruption to phreatomagmatic eruption. We described some spiracles penetrating into lava flows, and considered its genesis and the alteration of the eruption style from a geological viewpoint.

There are some volcaniclastic dykes, which are, at a maximum, a dozen meters in width and several tens of meters in length, in Shiroyama, located at north-west part of Himeshima island, Inazumi, located at the east end, and Darumayama lava flows, exposed at the west end. Volcaniclastic dykes are composed of brecciated lava fragments and matrix, and major axes of lava fragments are more of the same direction in the central part of volcaniclastic dykes. The more central part of volcaniclastic dykes they are, the more relative displacements between fragments increase. Fragments composed of volcaniclastic dykes and pyroclastic cones are same with lava, and there are a few andesite pebbles which are derived from the basement rocks, Himeshima Formation, in both volcaniclastic dykes and pyroclastic cones. The eruption activity was continuous from the bottom part of lava flow to pyroclastic cones through volcaniclastic dykes. There are essential fragments which have water-quenched fractures and covered with obsidian rind in such eruption products, which suggests that lava contacted with external water. In consequence, volcaniclastic dykes are spiracles, which formed when lava overlied water, and release pyroclastic products from the surface of lava. Such secondary explosion can be interpreted as phreatomagmatic explosion of the destruction of phase-equilibrium type (Taniguchi, 1996), which is the explosive activity ejecting multi-phase flow on the ground due to the rapid destruction of the steam reservor formed at the bottom lava flow.

Next, we examined the process for the formation of pyroclastic cones directly covered with lava. These pyroclastic cones are respectively different extents of vesicularity unlike with pumice cone, being generally defined as products of phreatomagmatic explosion. Shiroyama pyroclastic cone is composed of low-vesiculated deposits in the lower part and high-vesiculated deposits in the upper part. Inazumi pyroclastic cone is mostly composed of low-vesiculated deposits. Darumayama volcano is composed of high-vesiculated pyroclastic flow and surge deposits and low-vesiculated pyroclastic cones. The high-vesiculated essential fragments are derived from magmatic eruption, and its existence suggests that the magmatic eruption was occurred. We consider two models that explain the cause of magmatic eruption during process for the formation of low-vesiculated pyroclastic cone. First model is that enlarged zents introduce new supplied magma and magmatic eruption occurs. Second model is that lava vesiculates secondarily because of spiracles penetrate into the poorly-lithified lava, and high-vesiculated essential fragments form. Both of two models are possible, though they require additional studies.