Shallow submarine silicic eruptions at Oomurodashi Volcano, northern Izu-Bonin Arc, and their potential hazards

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Oomurodashi is a large bathymetric high located at the northern end of the Izu-Bonin Arc. Using the 200 m bathymetric contour to define its summit dimensions, the diameter of Oomurodashi is ~20 km, making it one of the biggest edifices among the Izu-Bonin Arc volcanoes. Oomurodashi has been regarded as inactive, largely because it has a vast flat-topped summit at ~100 meters below sea level (mbsl).
During cruise NT07-15 of R/V Natsushima in 2007, we conducted a dive survey in a small crater, Oomuro Hole, located in the center of the flat-topped summit, using a remotely-operated vehicle (ROV). The heat flow measurement conducted on the floor of Oomuro Hole during this dive recorded an anomalously high value of 4,200 mW/m^2. Furthermore, ROV observations revealed that the southwestern wall of Oomuro Hole consists of fresh rhyolitic lavas.
These findings suggest that Oomurodashi is an active silicic submarine volcano. To confirm this hypothesis, we conducted detailed ROV and geophysical surveys of Oomurodashi in 2012 and 2016 (cruises NT12-19 of R/V Natsushima and KS-16-6 of R/V Shinseimaru).
The ROV surveys revealed numerous active hydrothermal vents on the floor of Oomuro Hole, at ~200 mbsl, with maximum water temperature measured at the hydrothermal vents reaching 202°C. We also conducted a much more detailed set of heat flow measurements across the floor of Oomuro Hole, detecting very high heat flows of up to 29,000 mW/m^2. ROV observations revealed that the area surrounding Oomuro Hole on the flat-topped summit of Oomurodashi is covered by extensive fresh rhyolitic lava and pumice clasts with minimal biogenetic or manganese cover, suggesting recent explosive eruption(s) from the Hole. Furthermore, several small (~50 m in diameter) domes were discovered on the flat-topped summit of Oomurodashi, and an ROV survey recovered fresh rhyolite lava from one of these domes, suggesting that more effusive, lava dome-building eruptions also occurred recently.
These findings strongly indicate that Oomurodashi is an active silicic submarine volcano, with recent eruption(s) occurring from Oomuro Hole. Since the summit of Oomurodashi is in shallow water, it is possible that eruption columns are likely to breach the sea surface and generate subaerial plumes. A ~10 ka pumiceous tephra layer with identical geochemical characteristics to the rhyolites recovered during the dives has been discovered in the subaerial outcrops of the neighboring islands of Izu-Oshima and Toshima, strongly suggesting that these tephra deposits originated from Oomuro Hole.
The deeper slopes of Oomurodashi are composed of effusive and intrusive rocks that are bimodal in composition, with basaltic dikes and lavas on the northern flank and dacite volcaniclastics on the eastern flank. This suggests that Oomurodashi is a complex of smaller edifices of various magma types, similar to what has been observed at silicic submarine calderas in the southern part of the Izu-Bonin Arc (e.g. Sumisu Caldera; Tani et al., 2008, Bull. Vol.).
We will provide a geological overview of Oomurodashi Volcano and edifice growth history based on the ROV observations, and discuss its potential hazards from shallow submarine silicic eruptions.

Keywords: Shallow submarine silicic eruption, Oomurodashi, Izu-Bonin Arc

