

Submarine topography and subsurface geology of Sumisu caldera volcanic complex and adjacent area, Izu-Bonin arc

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Sumisu caldera, located about 150km south of the Hachijyo-jima, is one the best developed submarine calderas along the Izu-Bonin arc. The caldera has a diameter of 9km and is accompanied by several knolls, such as Sumisu-jima, Dai-ichi (No.1) Sumisu knoll, and Dai-ni (No.2) Sumisu knoll. The Sumisu volcanic complex is characterized by bimodal, basaltic and dacitic-rhyolitic, volcanism.

In September 2002, we used the submersible SHINKAI 2000 and ROV DOLPHIN 3K to make geological observations and collect rock samples from the caldera floor, caldera wall, and central cones. In December 2002, the R/V KAIREI research cruise was used to collect Sea Beam bathymetric/side-scan sonar surveys, single-channel seismic surveys, and dredge hauls. We here present preliminary interpretations of the surface geology of the Sumisu volcanic complex and the overall structure of the caldera.

The lower part of the caldera wall is composed mainly of well-jointed massive basalt and dacite, and the upper part is made up of volcanic breccia and bedded pumice. At a depth of about 300 m on the northeastern caldera rim, we observed low, elongated ridges of semi-consolidated pumice that are cemented by as yet unidentified red-brown minerals. These may represent fumarolic mounds, slightly hardened by rising hydrothermal fluids, and thus may indicate heat retention in the thick, syn-caldera pumice deposit. There are several central cones on the caldera floor; the largest is Shirane, located on the eastern margin of the caldera, where the caldera wall is unclear. Two cones on the southern caldera floor are made of dacite and have a fresh lava dome appearance.

Single-channel seismic surveys were performed along several traverses across the caldera and surrounding knolls. The results reveal that the basement of the caldera floor dips southwest, suggesting asymmetric collapse of the caldera. The out-flow syn-caldera pumice deposits clearly mantle the foothills of Dai-ni (No.2) and Dai-san (No.3) Sumisu knolls, indicating they are pre-caldera features. According to a previous microfossil study, the caldera formed in the late Pleistocene (Iwabuchi, 1999). From these results, we can assume that Dai-ni and Dai-san Sumisu knolls pre-date the late Pleistocene. The eastern slope of Sumisu caldera is covered by thick deposits that thicken towards the caldera center.

Bathymetry shows the lower parts of the outer slopes of the volcanic complex have abundant wavy, stair step-like structures parallel to the caldera rim. These wavy structures disrupt the near-surface bedding and likely represent shallow landslide deposits. These landslides probably post-date the caldera.