I–8. GEOLOGICAL SETTING OF THE KIKAI CALDERA

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The surveyed sub-area is located 40 km off the Sata Peninsula, South Kyushu, and covers the large Kikai caldera (MATUMOTO, 1943). Satsuma-Io Island and Take Island constitute parts of the north rim of the caldera some 16–25 km in diameter.

The geology of Satsuma-Io Island and Take Island are summarized as follows (MATUMOTO, 1943; ONO and SOYA, 1975).

1) Pre-caldera volcanics.
2) Pyroclastics related to caldera depression.
3) Post-caldera volcanoes (central cones) which were erupted on the submarine part of the caldera floor and on Satsuma-Io Island.

Submarine Topography

The general features of the submarine topography of the sub-area are shown in Fig. I–8–1. The bathymetric contour lines in the figure are based on the depth records in chart

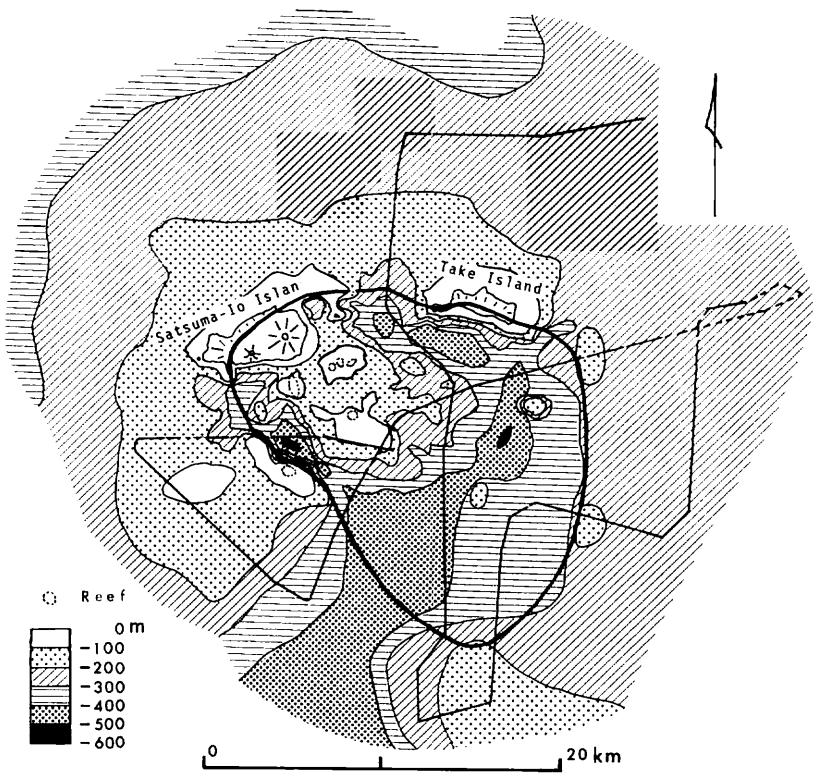

Fig. I–8–1 Submarine topography and caldera rim determined from this cruise.

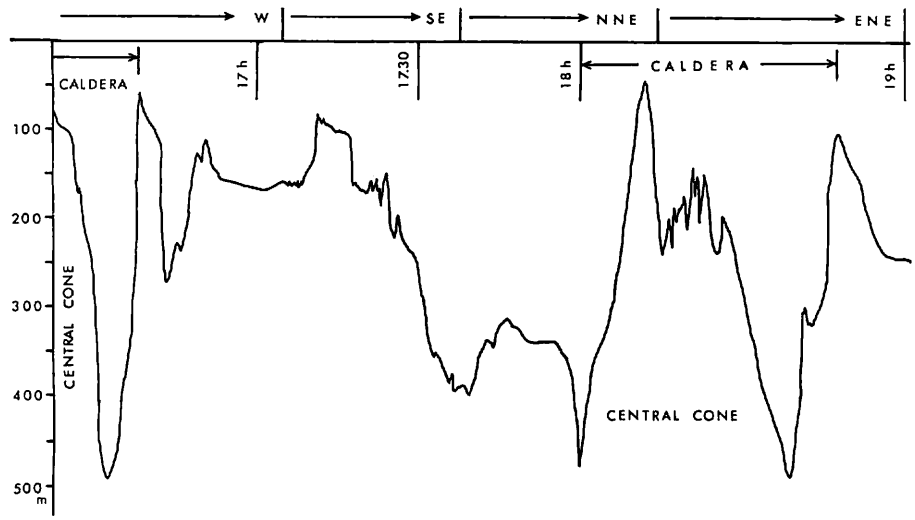

Fig. I–8–2a Bathymetric profiles in the Kikai caldera sub-area.

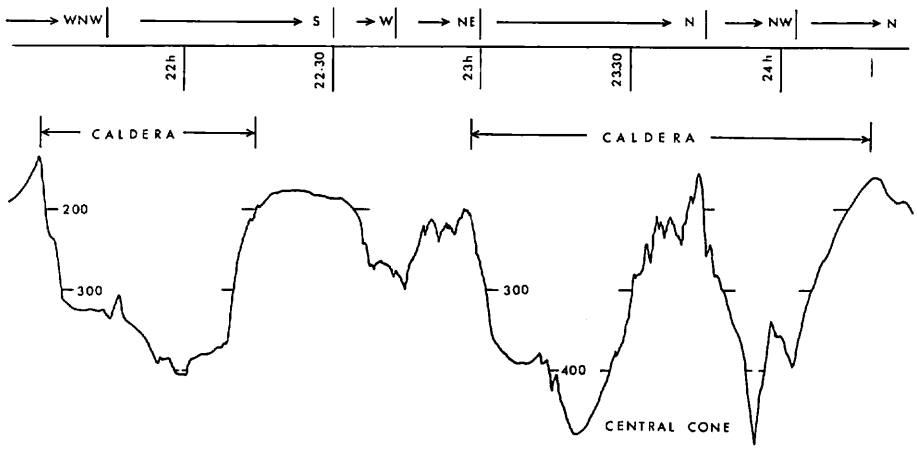

Fig. I–8–2b Bathymetric profiles in the Kikai caldera sub-area.

No. 1222, published by the Hydrographic Office, Maritime Safety Agency.

The caldera rim, shown in Fig. I–8–1, extends from the islands to the submarine part, is topographically distinguished in SW part, but is not very clear in the southern and eastern parts.

Topographic profiles obtained from this cruise are shown in Fig. I–8–2. The following is a brief description of some characteristic topographic features based on the profiles.

1) The caldera wall slopes steeply inward while the outward slope is gentle similar to that on land.
2) The topography inside the caldera is irregular and complicated by central cones or volcanic materials erupted after caldera collapse, and talus deposits.

The outline of the caldera obtained during this cruise is shown in Fig. I–8–1. The caldera rim is wider toward the southeast than that delineated by MATUMOTO (1943) as seen in Fig. I–8–1.

Undersea Beds

In the sub-area the strata lying on the acoustic basement are acoustically divided into six layers, namely, A, B, C, D, E and F layers in descending order. Of these, the A and B layers occur as strata inside the caldera. The A layer deposited on the flank of the central cones is probably a talus deposit. The B layer, 300 meters or more in thickness, has relatively strong reflective interfaces and fills deeper areas between the central cones. The C, D, E and F layers are developed only outside the caldera and their thickness ranges from 150–200 m. The upper part of the C layer probably includes the A and B layers.

The acoustic basement rocks are composed of at least two different elements. One is composed of the Shimanto Group and associated granitic rocks which may be developed widely in this region. The other consists of massive volcanic rocks or lava domes constituting the central cones. The acoustic basement rocks shown in Fig. I–8–3 are volcanic rocks of the central cones inside the caldera with the other basement rocks outside.

Bouguer Gravity Anomaly

YOKOYAMA (1961, 1967), YOKOYAMA *et al.* (1966) carried out gravity surveys many volcanic regions and found a negative residual gravity anomaly over Krakatau type calderas i.e., the low anomaly type caldera. Fig. I–8–4 illustrates the Bouguer gravity anomaly obtained during this cruise. The values on Satsuma-Io Island and Take Island are taken from YOKOYAMA *et al.* (1966). The Bouguer anomaly contours run parallel to the outline of the caldera and are almost concentric with the center of the caldera, as in many other calderas, e.g. Aira caldera (YOKOYAMA, 1961, 1963).

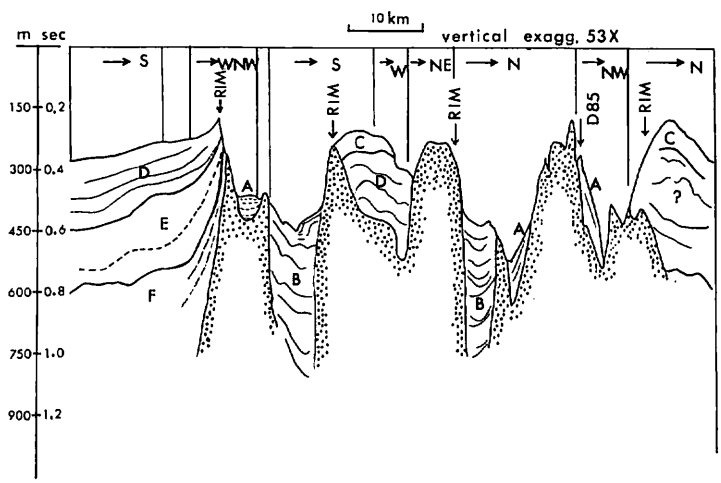

Fig. I–8–3 Interpretative seismic profiles.
Dotted parts are acoustic basements which are volcanic rocks inside the caldera and geologic basement outside.

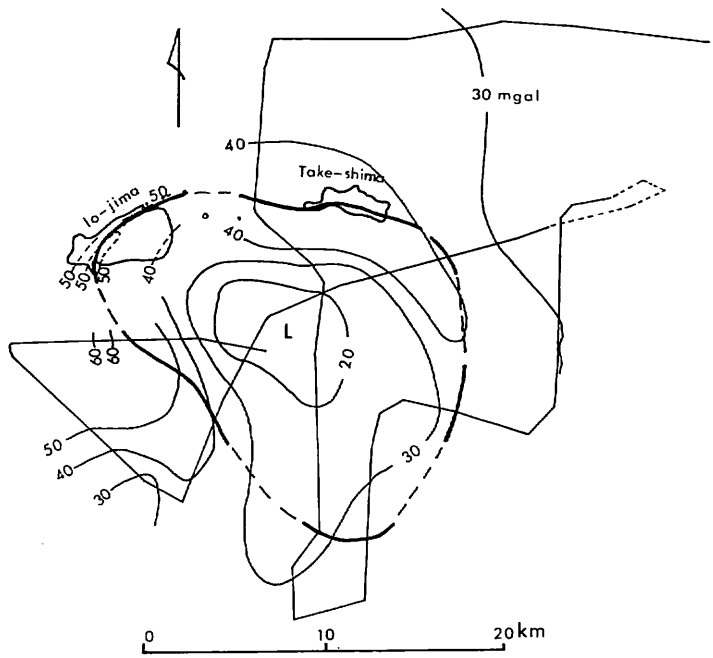

Fig. I–8–4 Bouguer gravity anomaly over the Kikai caldera.
Contours on Satsuma-Io and Take Islands are taken from YOKOYAMA *et al.* (1966). Unit is milligal p = 2.4.

The negative residual gravity anomaly of the Kikai Caldera is 30–40 milligal. The mass deficiency is computed to be 7×10^{10} tons (residual gravity anomaly: -30 mgal, diameter of the caldera: 20 km). The volume of ejecta from the Kikai caldera probably amounts to more than 200 km^3.

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