

HAWAIIAN SEISMIC EVENTS DURING 1965

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Abstract.—During 1965, 565 earthquakes having magnitudes of 2.0 to 4.6, were located in the Hawaiian Islands. These are exclusive of some 300 associated with the December 24–25 eruption of Kilauea Volcano. In all, nearly 30,000 earthquakes were recorded during 1965. The active volcanoes Mauna Loa and Kilauea on the island of Hawaii were zones of highest seismic concentration. In addition to 69 shocks reported as felt by local residents during 1965, many more were felt during the December swarm but were not properly documented.

The following report is a graphical presentation of earthquake locations compiled in the 1965 U.S. Geological Survey Hawaiian Volcano Observatory Summaries 37, 38, 39, and 40 (Okamura and others, 1966; Powers and others, 1966; Koyanagi and others, 1966; Koyanagi and others, in press). It is the fourth of a series of reports (Koyanagi, 1964; Koyanagi and Endo, 1965; Koyanagi and Okamura, 1966) showing locations of Hawaiian earthquakes for specific periods.

Earthquakes of magnitude 2.0 or greater occurring beneath the five volcanoes of the island of Hawaii (fig. 1) and offshore along the Hawaiian Ridge from lat 18° to 23° N. and long 154° to 161° W. are located in figures 2 and 3. The quakes plotted are divided into three depth groups (< 10, 10–20, and 20–60 km) (fig. 4) and two magnitude groups (2.0–3.5, and > 3.5).

Methods and limitations of earthquake determination remain similar to the previous reports. Hawaiian seismic-wave traveltime curves are applied to P-wave arrivals and to S–P values read with 1/10-second accuracy. Earthquakes of magnitude 2.5 or greater beneath the island of Hawaii are generally located within a 5-km sphere of error, although errors as great as 10-km may be expected from earthquakes located offshore or on land at some distance from stations.

1965 CHRONOLOGY OF SEISMIC EVENTS

Of significance during the first quarter of 1965 was the seismic activity that accompanied the March 5–15

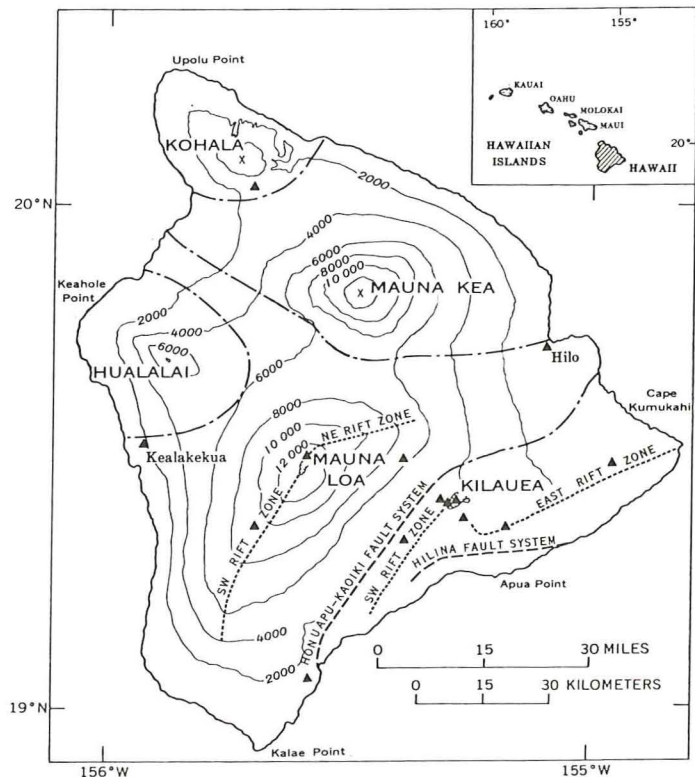


FIGURE 1.—Map of the island of Hawaii, showing the five volcanoes and their principal structural features. Dot-and-dash lines are boundaries of volcanic systems. Locations of seismograph stations are indicated by closed triangles. Contour interval is 2,000 feet, and datum is mean sea level.

flank eruption of Kilauea Volcano. Harmonic tremor and many hundreds of earthquakes occurred during the eruptive period. Except for a few shocks, however, most earthquakes were too small to be located in the usual manner. On March 22 at 09^h33^m,¹ a 4.6-magnitude earthquake was recorded and located about 30 km beneath Mauna Loa's southeast flank. This proved to be the largest event of the year.

¹ All times given are in hours and minutes, Hawaiian standard time.

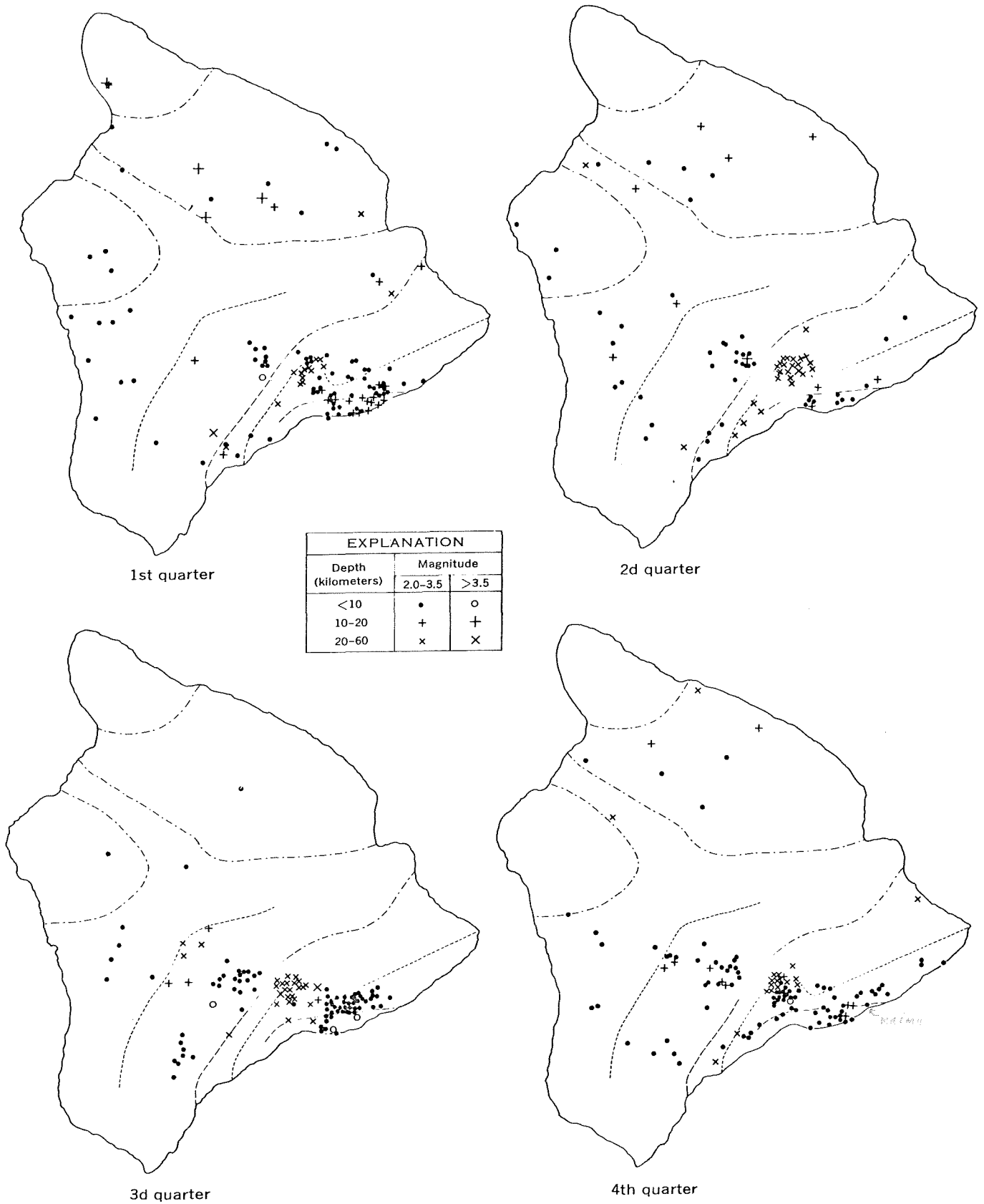
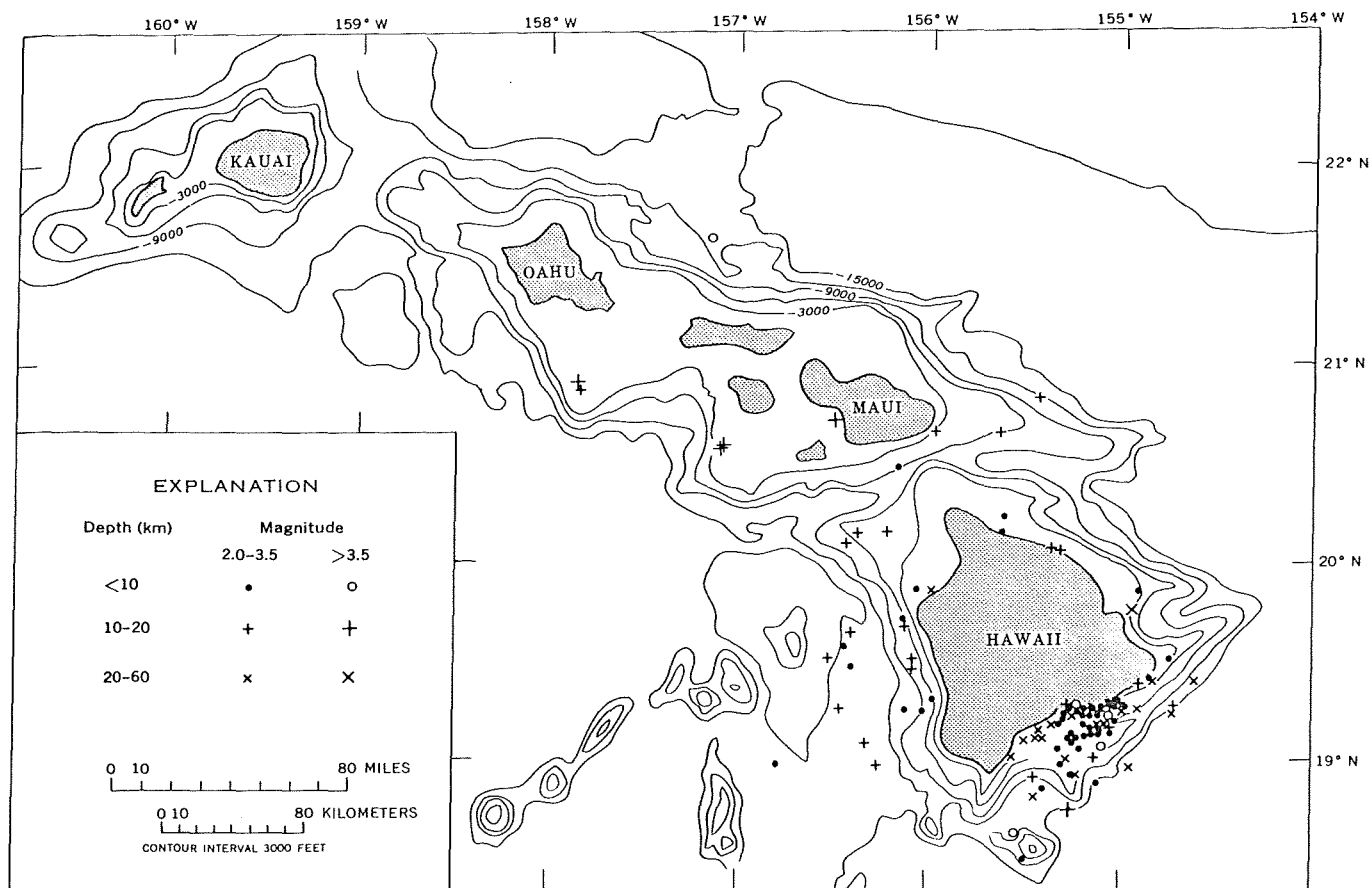


FIGURE 2.—Quarterly plot of epicenters of earthquakes of magnitude 2.0 or greater beneath the island of Hawaii during 1965. Dot-and-dash lines are boundaries of volcanic systems, long-dashed lines are fault systems, and short-dashed lines are rift zones. Geographic names are shown in figure 1.



Base from U.S. Navy Hydrographic Office Preliminary Sheet BC 04N

FIGURE 3.—Map of the Hawaiian Islands, showing epicenters of earthquakes having magnitudes of 2.0 or greater that occurred off the island of Hawaii during 1965.

Relative quiescence prevailed throughout the second quarter and early third quarter of 1965. During August 24-26, however, a swarm of more than 500 small earthquakes occurred beneath Kilauea's upper east rift area. Seven of these earthquakes with moderate intensities were reported felt by local residents.

The largest seismic concentration of the year showed at the end of the fourth quarter, during and after a 6-hour flank eruption of Kilauea. Shallow earthquakes, ranging in magnitude from nearly 0 to 4½, numbered many thousands. Most of these quakes were along fault systems curving parallel to the south coastline of Kilauea, south of the summit caldera. Roughly 300 were of magnitude 2 or greater. A special study of this swarm of earthquakes is in preparation, and the details are not presented in this report.

SUMMARY

Nearly 30,000 earthquakes were recorded in Hawaii during 1965; of these, 565 having magnitudes of 2 or greater were located and plotted. As in 1962, 1963, and 1964, the major concentration of earthquakes was near the southeastern part of the Hawaiian Ridge. The

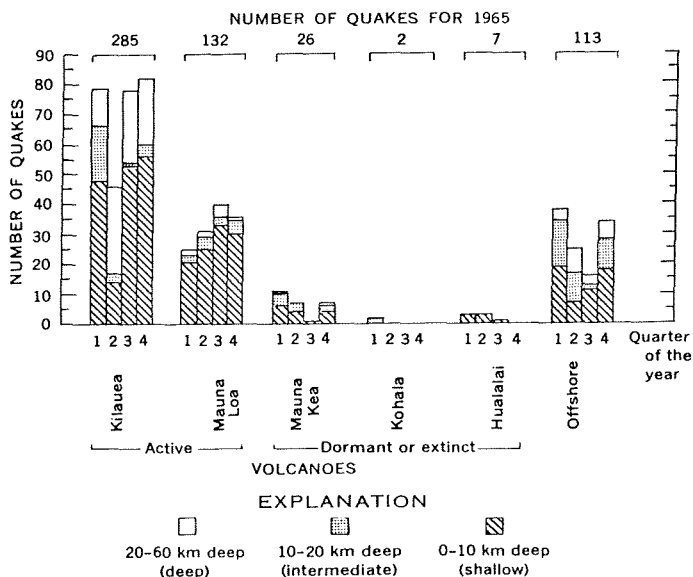


FIGURE 4.—Bar graph showing the geographic location and the distribution, with depth, of earthquakes of magnitude 2.0 and greater which occurred in the Hawaiian Islands during 1965. The graph does not include about 300 Kilauea quakes of shallow origin associated with the December eruption.

epicenters outline active volcanic regions beneath Kilauea and Mauna Loa. Most of the shallow earthquakes occurred beneath Kilauea's caldera region and in areas of recent volcanic eruptions along Kilauea's east rift zone. Many of these small caldera events originate from extremely shallow sources, at depths of 1 km or even less. About 75 percent of the deep earthquakes were concentrated beneath (or several kilometers south of) the Kilauea summit region. These originated from a zone 30 km deep.

In addition to 69 shocks recorded as felt by residents, many dozens felt during the December swarm were not properly reported or documented. Felt earthquakes ranged in magnitude from 2 to 4½. Three of these between 4 and 4½ magnitude were sensed over the entire island.

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