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1965 Quarterly Administrative reports

Introductory Note By Thomas L. Wright and Jennifer S. Nakata

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Summary 37
January, February, and March 1965
By Arnold T. Okamura, Robert Y. Koyanagi, and Howard A. Powers

Summary 38
April, May, and June 1965
By Howard A. Powers, Arnold T. Okamura,
Robert Y. Koyanagi, and Willie T. Kinoshita

Summary 39
July, August, and September 1965
By Robert Y. Koyanagi, Arnold T. Okamura, and Willie T. Kinoshita

Summary 40
October, November, and December 1965
By Robert Y. Koyanagi, Arnold T. Okamura, and Howard A. Powers

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INTRODUCTORY NOTE

The Hawaiian Volcano Observatory Summaries have been published in the current format since 1956. The Quarterly Summaries (1956 through 1973) and the Annual Summaries (1974 through 1985) were originally published as Administrative Reports. These reports have been compiled and published as U.S. Geological Survey Open-File Reports. The quarterly reports have been combined and published as one annual summary. All the summaries from 1956 to the present are now available as .pdf files at http://www.usgs.gov/pubprod.

The earthquake summary data are presented as a listing of origin time, depth, magnitude, and other location parameters. Network instrumentation, field station sites, and location algorithms are described. Tilt and other deformation data are included until Summary 77, January to December 1977. From 1978, the seismic and deformation data are published separately, due to differing schedules of data reduction.

There are eight quarters—from the fourth quarter of 1959 to the third quarter of 1961—that were never published. Two of these (4th quarter 1959, 1st quarter 1960) have now been published, using handwritten notes of Jerry Eaton (HVO seismologist at the time) and his colleagues. The seismic records for the remaining six summaries went back to California in 1961 with Jerry Eaton. Other responsibilities intervened, and the seismic summaries were never prepared.

Chronology

The following Kīlauea eruption chronology covers the two recent reports and the six missing quarters:

Location	Beginning Date	Ending Date	Comment
Kīlauea Iki crater (Kīlauea's summit)	11/14/1959	12/20/1959	19 eruptive episodes
Kapoho (lower east rift zone)	1/13/1960	2/18/1960	4 eruption stages
Halemaumau (Kīlauea's summit)	2/24/1961	2/24/1961	Intermittent activity during uninterrupted inflation following the 1960 eruption
Halemaumau (Kīlauea's summit)	3/22/1961	3/25/1961	Same as above.
Halemaumau (Kīlauea's summit)	7/10/1961	7/17/1961	Same as above.
Heiheiahulu (middle east rift zone)	9/22/1961	9/25/1961	First historical east rift eruption at this location

The 1959-1960 eruptions were among two of the most spectacular Kīlauea eruptions. The HVO staff was kept busy with acquisition of unusually high quantities of instrumental data and observations of the two sequences, which were separated by less than one month. Even with a year's interval before the beginning of the summit-east rift sequence in 1961, the staff never caught up, and the seismic records were set aside for later study.

A total of 1,672 earthquakes—1,106 for 1960 and 566 for 1961—are part of HVO's cataloged database. The annual listings have been appended to the 1st Quarter Report of 1960 and to the 4th Quarter Report for 1961. The number of earthquakes is probably low, biased toward the larger magnitudes. The entire HVO catalog, including 1960 and 1961, is accessible from the ANSS CATALOG SEARCH site at http://www.ncedc.org/anss/catalog-search.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HAWAIIAN VOLCANO OBSERVATORY

SUMMARY 37

January, February, and March, 1965

By

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Summary of activities

The big event of the quarter was the 10-day flank eruption, starting March 5, in the upper east rift zone of Kilauea. It was not unexpected, because tilt and leveling data showed a high degree of inflation of the Kilauea summit. However, no preceding events were recognized as indicating the place or time of outbreak until tremor started 1 1/2 hours before the appearance of lava. The extent of lava from this eruption is shown in Figure A.

The following events took place prior to eruption: In late December, a swarm of short bursts of long-period tremor and an episode of strong tilt in an almost due-north direction at Uwekahuna began, and continued through the first 10 days of January. Analysis of samples of the tremor recorded on the 12-channel seismic array indicates a source from 3 to 7 km beneath Halemaumau. Mid-January readings of the long-base tiltmeter net suggest that the center for the surge of rapid inflation was under the caldera rim, south of Halemaumau.

Slow inflation resumed about January 20, apparently over a center more to the north and east, and continued until the eruption started.

Several hundred short bursts of long-period tremor were recorded between January 24 and January 26, and flurries of several tens of events per day occurred sporadically six times during February. About 25 shallow-focus (less than 3 km) earthquakes were recorded on February 7 whose sources were a few km southeast of Makaopuhi Crater. Other than these seismic events, the number of daily quakes (less than 60) was low, and only eight quakes were large enough to be felt during January and February.

The eruption was preceded on March 5 by the onset of tremor at about 08^h02^m, recorded first on the Makaopuhi seismograph. Then it was picked up at all other stations of the Kilauea summit net with rapidly increasing intensity. This tremor was recorded on the 12-sensor array as well as the summit net. By 09^h00^m, constant ground trembling and continuous rockfalls were observed at Makaopuhi.

Outbreak of lava was first seen about 09^h50^m in Makaopuhi. Visibility was poor along the upper east rift because of rain and ground-level clouds. It is surmised that the first outbreaks produced an almost continuous line of fountains that cut across the north wall of Makaopuhi and the floor of Napau, nearly coincident with the two small fissure vents of 1922 and extending about 4 miles eastward from Makaopuhi Crater.

The first "curtain of fire" stage of activity erupted at least 30,000,000 cu yds during its 10-hour duration. About 2,200,000 cu yds of this lava had formed a lake 165 feet deep in the west pit of Makaopuhi when the fountains there ceased, at 18^h20^m. Napau was filled to a depth of about 40 feet, and overflowed through a graben intersecting the southeast wall; when fountaining ceased, the lake level subsided about 20 feet, which is equivalent to about 6,000,000 cu yds of flow back down the vent.

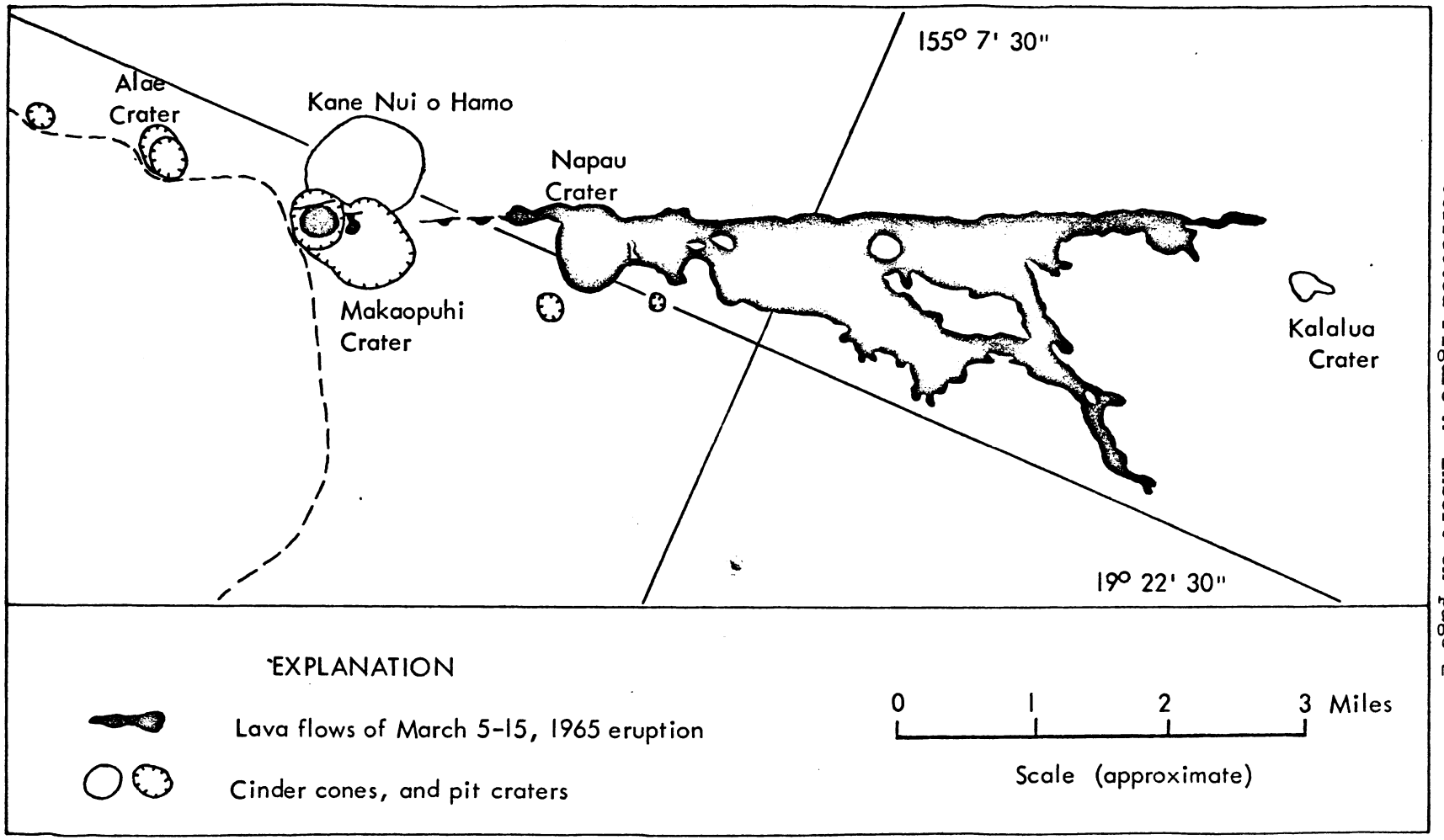

Figure A. Sketch map showing area of lava erupted March 5-15, 1965 (Makaopuhi eruption) from the east rift zone of Kilauea Volcano (Hawaii). Flow area mapped by J. G. Moore and D. L. Peck.

Pumice samples were collected from Makaopuhi and five other locations down the initial "curtain of fire," 1, 1.7, 1.9, and 3.4 miles east of Makaopuhi. Optical pyrometer measurements of Makaopuhi fountains gave 1,035°-1,070°C, but all readings were screened by fume or falling pumice and thus are undoubtedly too low.

The short-base tiltmeter monitored a summit collapse of about 70 microradians on a bearing about S. 60° E. during 10 hours, from 08^h30^m to 18^h30^m, and further collapse of about 25 microradians on a bearing of about S. 35° E. during the next 38 hours, until 09^h00^m on March 7. No further tilting was indicated. This structural deformation is further described by a shortening of the distance across Kilauea caldera (from Uwekahuna to Keanakakoi) by 25-30 cm and a measured loss of altitude of nearly a foot (relative to a benchmark on the nearest slope of Mauna Loa) at the center of collapse, which was defined by the azimuth intercepts of the long-base tilt net to be near the caldera wall south of Halemaumau.

A second phase of activity can be characterized by erratic waxing and waning at three localities scattered along nearly 8 miles of rift zone. This phase may be considered as having started before the "curtain of fire" phase died out. About 15^h25^m on March 5, new fountains broke out 6 1/2 miles east of Makaopuhi (2 1/2 miles beyond the eastern limit of the curtain of fire), and continued through the night as the only active fountains. Two more fountain groups started in the early morning, the easternmost nearly 8 miles from Makaopuhi and nearly due north of Kalalua Crater. By 09^h30^m they had coalesced into one group, and fountaining resumed in Makaopuhi 1 1/2 hours later. Activity alternated somewhat between the two rift areas outside Makaopuhi until about 10^h40^m March 7, when all activity ceased except in Makaopuhi, where sluggish eruption continued. A new vent that opened about 3 miles east of Makaopuhi during mid-morning of March 9 poured out a small flow, built a spatter rampart, and ceased activity completely about 07^h30^m March 10. This may be considered as the end of the second phase.

About 2,000,000 cu yds was erupted during these 4 1/2 days of erratic fountaining, half in Makaopuhi and half in flows to the east. Five samples of the eastern flows, representing this second phase, were collected after the eruption was over from sites 2.4 miles east of Makaopuhi and from 7.3 to 7.6 miles east of Makaopuhi. Four second-phase samples were dipped from Pahoehoe toes reaching the Makaopuhi lake margin. Temperatures in these lake-margin flows were found to be 1,090°C by both thermocouple and optical pyrometer measurement.

The third phase, consisting of activity in Makaopuhi, was characterized by an accelerated output and increased lava temperature. This phase actually started in Makaopuhi during the early hours of March 10, before the cessation of the last fountains farther down the rift. Features most noticeable included a distinctive sheen on the crust of the new more rapidly spreading flows and widespread advance of the "shore line" of the lava lake. Accelerated output continued until the sudden end of the eruption at 22^h51^m on March 15. During the last 6 hours the enormous extrusion rate averaged over 160,000 cu yds per hour. The lake reached a maximum depth of 330 feet and had a volume of 9,000,000 cu yds.

On March 12, good measurements of a temperature of 1,160°C by optical pyrometer were made at the lake's edge. The fluidity and color of the lava indicated characteristic high temperatures, though good pyrometer readings from the crater rim were not possible. Several samples of pumice, collected on canvas at intervals of as much as 24 hours beginning the morning of March 12, plus three samples dipped from the lake margin on the 12th and 14th, represent the lava of the third phase.

The fourth and last phase of activity comprised drain-back and episodic overturn of crust at Makaopuhi lava lake. These phenomena continued for 3 3/4 days after the fountaining and eruption had stopped. The altitude of the lake surface was lowered 60 feet below the high-lava shoreline during the drain-back. During this lowering, crust foundered and new crust formed over the entire lake surface 18 times.

Two days after the last overturn of the crust, surveying was started to establish benchmarks at 100-foot intervals along the two principal diameters of the lake. Two days of heavy rains, and immediate formation of thick clouds of steam rising from the thin still-hot crust, interrupted the work. But on March 19 the survey was completed, leveled, and tied to a large talus block near the level of the new lava shoreline. (Releveling 15 days later revealed an average crustal subsidence of 3.4 feet.) Measurements of gravity, magnetic field, temperatures on surface and in cracks, and detailed mapping of cracks, local relief, lines and spots of sublimate deposits, and other features of the lake crust were intitiated immediately and tied to the benchmarks. Plans were initiated to pursue a program of core drilling in the crust to help document the cooling history of the lake.

Alae Crater studies.--Work was continued on the study of the small lava lake in Alae Crater, which became solidified in September 1964. On January 21, temperatures were measured in 6 drill holes in the crust, and the elevations of 29 stations on the lake surface were determined by precise leveling. Temperatures of the lake showed a drastic decrease from those of December 8, 1964, probably influenced by the excessive rainfall during the period; the maximum temperature measured was 865°C, at a depth of 32 feet in drill hole No. 9, where the lake is 48 feet thick. The leveling showed an average subsidence of .017 foot since November 3.

Two groups of astronauts visited the observatory on consecutive weeks, each in January, for 5 days of field study. A great array of textural, structural, and mineralogical features were noted, but concentration was on a few important features that are most conspicuous and can be most readily studied in Hawaii. These include: the differences between the surface formed on a deep body of relatively stagnant lava (a confined lava lake, or a thick flood on a level plain) and the surface formed on thin gushes of rather mobile lava (layered overflows from Halemaumau on the floor of Kilauea caldera); features that characterize rift eruption; and differences between lapilli and lapilli cones formed from fluid basalt versus those formed from rather viscous feldspar-rich andesite.

Japan-United States cooperative study of Kilauea.--Professor T. Minakami, Doctor D. Shimozuru, J. P. Eaton, and J. G. Moore returned to H.V.O. to join with Arnold Okamura, Robert Koyanagi, W. T. Kinoshita, and Dallas Peck in conferences on progress made in analysing the results of the Japan-United States cooperative study of Kilauea, July-December 1963. Progress and promise of results were very gratifying and encouraged Professor Minakami to set the date and itinerary for a third general conference, to be held in Japan in October-November 1965.

Xenolith Studies.--E. D. Jackson started mapping and meticulous field study of the 1801 lava flow of Hualalai, the host to large quantities of xenoliths of coarse-grained rocks showing a great range of mineral composition. Several thousand zenoliths were described in the field study, and several hundred were collected for detailed laboratory study.

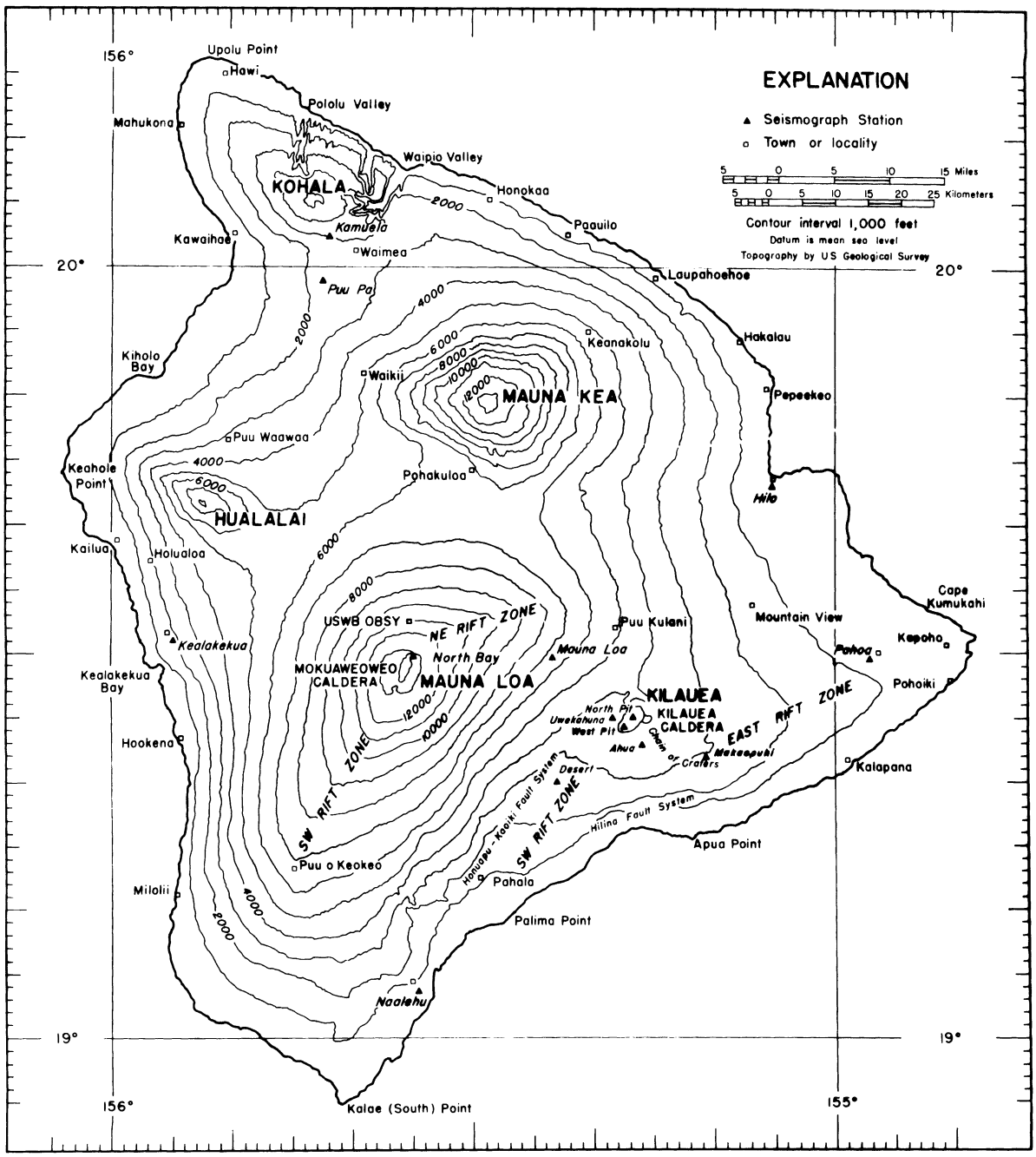

Figure 1.--Map of the island of Hawaii showing localities mentioned in the text and seismograph stations operated by the U.S. Geological Survey. Epicenters of local earthquakes are given in terms of geographic coordinates, which are indicated at the edges of the map.

Tilting of the ground around Kilauea caldera.--Tilting of the ground around the summit of Kilauea is monitored daily by a short-base water-tube tiltmeter in Uwekahuna Vault, and at irregular intervals it is measured on a regional scale by means of a network of field tilt bases and a portable water-tube tiltmeter. The attitude of the ground surface at each tilt base is reported in terms of north-south and east-west tilt coordinates. Both coordinates at each station were arbitrarily set equal to 500 when measurements at that station were begun. Increasing tilt coordinates correspond to northward and eastward tilting of the earth's surface; that is, to a relative subsidence toward the north and east. A one-unit change in coordinate corresponds to a tilting of 1 microradian (1 mm per km) in the direction indicated.

Location of and essential data on each tiltmeter station are listed in table 7, which is published only in the first-quarter issue each year.

Table 1.--Tilt coordinates at Uwekahuna Vault, January, February, and March, 1965

Date (1965)	N-S	E-W	Date (1965)	N-S	E-W
Jan. 3	494	466	Feb. 21	513	454
10	503	463	28	514	452
17	506	463	Mar. 7	478	499
24	509	461	14	460	518
31	511	458	21	458	519
Feb. 7	513	455	28	459	514
14	513	454			

Table 2a.--Tilt coordinates and changes at bases around Kilauea caldera (See tilt diagrams, figs. 2a, b.)

Tilt Base	Date (1965)	Tilt coordinates N-S	Tilt coordinates E-W	Rate (10^{-6} rad/mo) and direction of tilting since last reading		Date of last reading (1964)
Uwekahuna	Jan. 17	507.6	453.3	15.2	N. 6.6° W.	Dec. 10
Tree Molds	17	459.1	512.8	5.7	N. 0.9° E.	7
Sand Spit	19	922.0	752.6	34.9	N. 50.7° E.	11
Kalihipaa	21	318.2	385.3	3.1	S. 61.6° E.	8
Keamoku	18	527.0	539.1	32.1	N. 49.5° W.	11
Ahua Kamokukolau	18	509.3	554.4	44.8	S. 45.4° E.	10
Kipuka Nene	21	479.2	506.2	1.0	S. 27.3° W.	14
Hilina Pali	------	-----	-----	not occupied this time------		
Kapapala Ranch	19	493.6	506.4	0.4	S. 85.6° E.	9
Mehana	17	549.7	554.3	2.2	N. 32.4° E.	10

Table 2b.--Tilt coordinates and changes at bases around Kilauea caldera (See tilt diagrams, figs. 2a, b.)

Tilt Base	Date (1965)	Tilt coordinates N-S	Tilt coordinates E-W	Rate (10^{-6} rad/mo) and direction of tilting since last reading		Date of last reading (1965)
Uwekahuna	Mar. 6	441.0	504.0	52.3	S. 37.3° E.	Jan. 17
Tree Molds	7	424.8	525.9	36.7	S. 20.9° E.	17
Sand Spit	8	882.3	735.4	43.3	S. 23.4° E.	19
Kalihipaa	7	333.6	385.3	16.9	N. 00.1° W.	21
Keamoku	7	585.1	510.1	40.6	S. 63.5° E.	18
Ahua Kamokukolau	6	609.9	542.9	101.2	N. 6.5° W.	18
Kipuka Nene	9	484.0	506.2	2.9	N. 00.4° W.	21
Hilina Pali	------	-----	-----	not occupied this time ------		
Kapapala Ranch	8	493.7	506.8	.6	N. 21.8° E.	19
Mehana	9	540.7	545.2	7.5	S. 45.3° W.	17

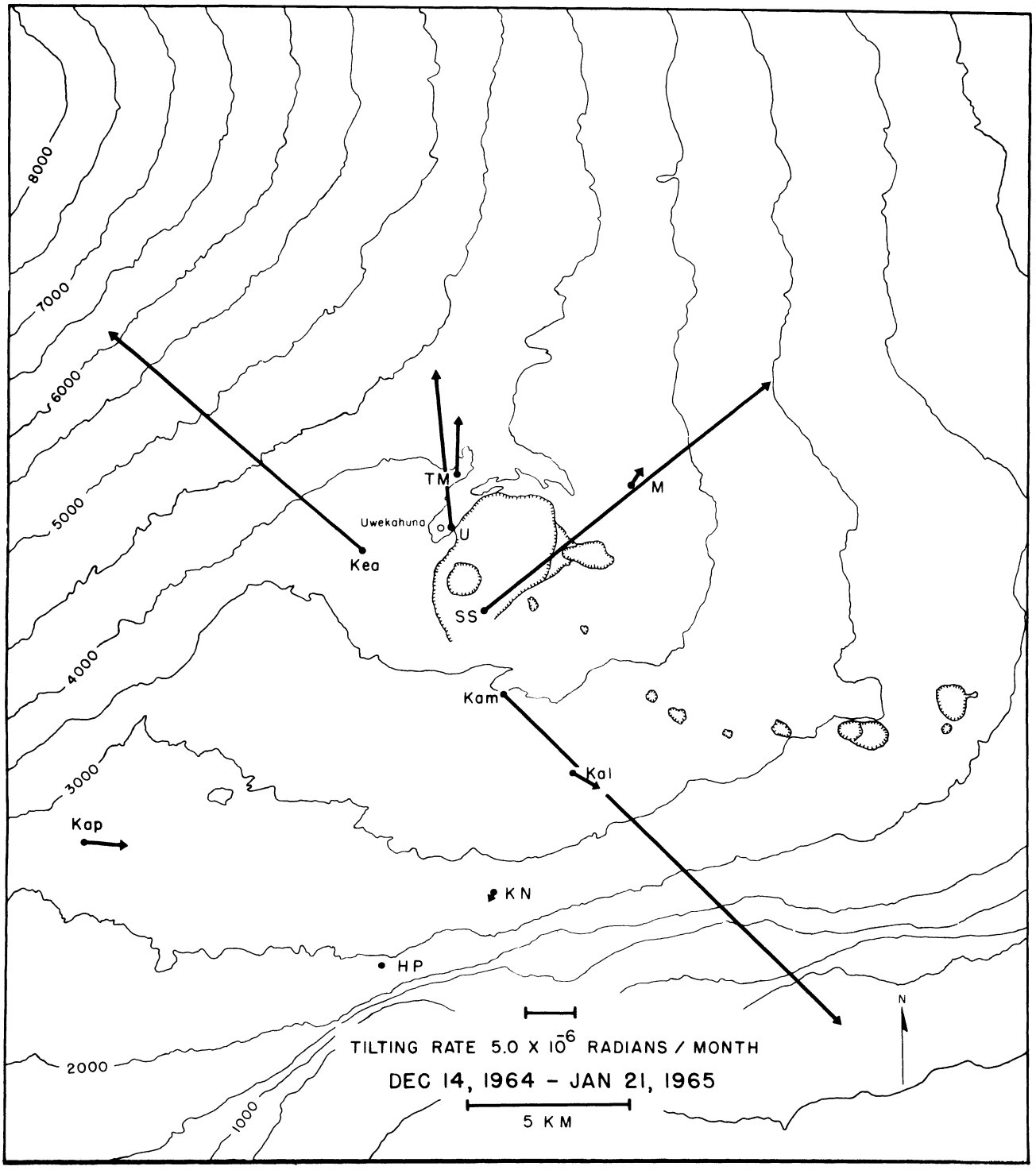

Figure 2a.--Tilting of the ground around Kilauea caldera, Dec. 14, 1964-Jan. 21, 1965. The vector depicting tilting at a given tilt base points in the direction of maximum relative subsidence and has a length proportional to the rate of tilting during the measurement interval. Closed circles represent field tilt bases; open circles, short-base water-tube tiltmeters.

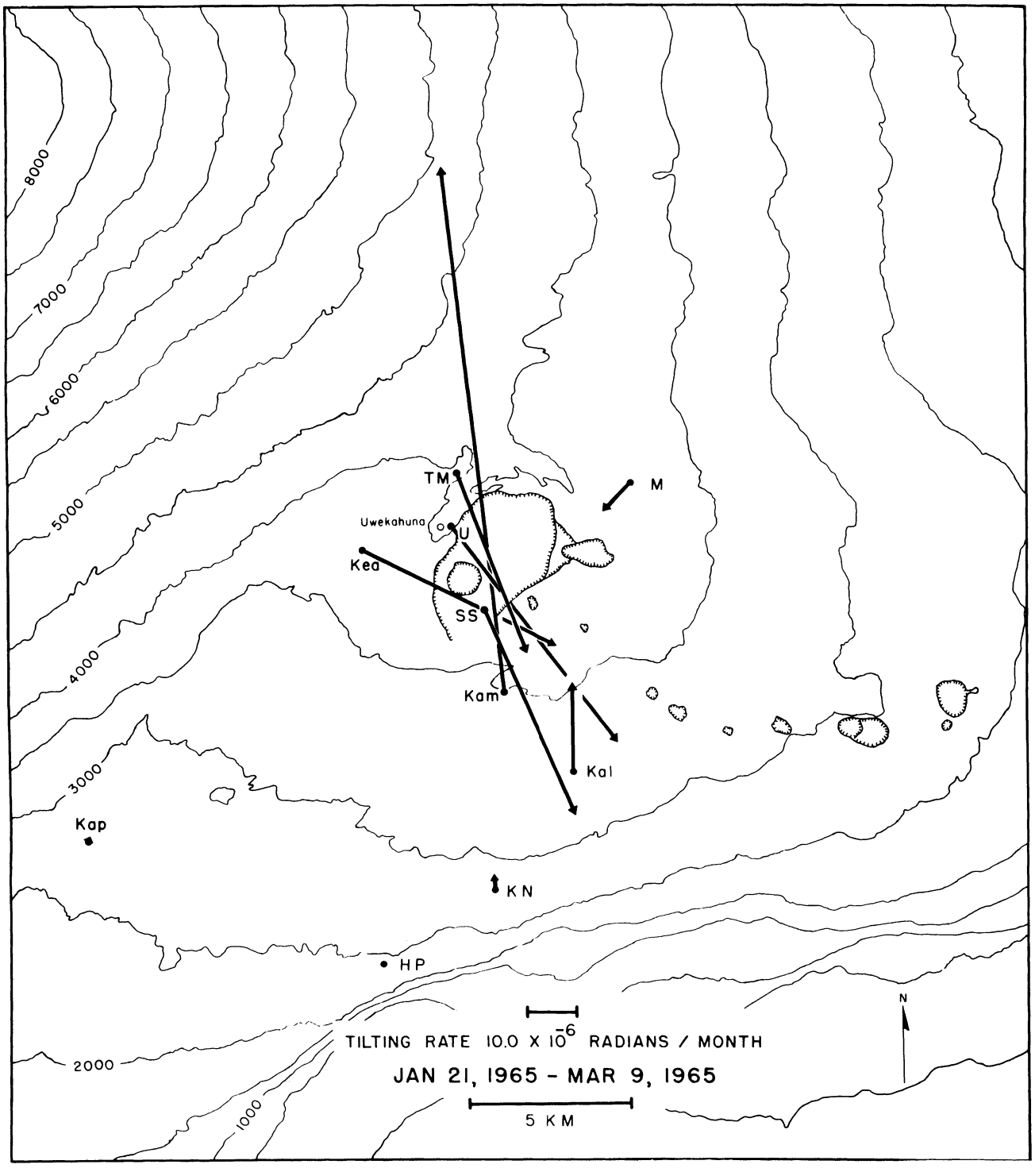

Figure 2b.--Tilting of the ground around Kilauea caldera, Jan. 21, 1965-Mar. 9, 1965. The vector depicting tilting at a given tilt base points in the direction of maximum relative subsidence and has a length proportional to the rate of tilting during the measurement interval. Closed circles represent field tilt bases; open circles, short-base water-tube tiltmeters.

Seismic summary.--Events recorded by the U.S. Geological Survey seismograph network in Hawaii fall into two categories: local earthquakes and tremor originating in the region of the Hawaiian Islands (usually within 100 km of at least one seismograph), and distant earthquakes originating more than 3,000 km from Hawaii. As an index of seismic activity at Hawaiian volcanoes, daily counts of earthquakes and minutes of tremor recorded by seismographs in Hawaii are listed in table 3. The earthquakes are separated into groups on the basis of region of origin as determined by analysis of records obtained daily at the Observatory (U, M, A, D, N, WP, MP). Earthquakes of magnitude 2.0 or greater are generally sufficiently well recorded to be located with greater precision; they are listed individually in table 4. Data on identifiable phases of distant earthquakes are listed in table 5.

Location of and essential data on each seismograph station are listed in table 6, which is published only in the first-quarter issue each year.

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera

Tremor is separated into three categories: deep, intermediate, and shallow, on the basis of relative amplitudes on seismographs in the summit region. Unless otherwise stated, tremor is presumed to be associated with movement of magma within the central complex of Kilauea.

Earthquake categories are: Kilauea summit, 30 km, earthquakes from a source about 30 km beneath the Kilauea summit region, and shallow earthquakes in the Kilauea caldera region; shallow earthquakes along the SW. rift zone of Kilauea and the adjacent portion of the Kaoiki fault system; earthquakes along the eastern half of Kilauea's east rift zone--detected largely on the Pahoa seismograph; earthquakes from the upper east rift zone and the adjacent fault systems of Kilauea's south flank; and earthquakes from other regions: Kona, Mauna Kea, etc.

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea Summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 KM	Shallow				
Jan. 1	----	------	-----	----	134	6	----	8	2 Mauna Kea
2	----	------	-----	1	99	12	----	6	----------
3	----	------	15	2+	110	4+	----	13	1 Kona
4	----	------	27+	2	135+	9	----	10	----------
5	----	------	-----	----	61	5	1	3	1 Mauna Kea
6	----	------	-----	3	63	6	1	5	----------
7	----	------	-----	1	58	7	1	3	----------
8	----	12+	-----	3	65+	10	----	3	1 Kona
9	7	------	-----	3	89	9	----	3	1 off NE. shore of Maui
10	26	------	-----	----	135	4	----	3	1 Mauna Kea
11	44	------	8	4	110	7	----	4	----------
12	4	------	-----	4	115+	7	----	11	1 Kona
13	----	------	-----	4	40	3	----	7	1 Kohala
14	30	------	-----	6	60	4	----	12	----------
15	30	------	-----	1	45	7	----	6	----------
16	----	19	-----	4	25	3	----	7	1 Mauna Loa
17	----	20±	-----	4	55	4	----	6	----------

18	----	30±	-----	3	81	6	1	6	----------
19	----	20±	-----	2	60	2	1	18	----------
20	----	15±	-----	1	69	7	----	6	----------
21	----	-----	-----	6	80	1	----	13	----------
22	----	-----	-----	2	65	5	----	12	----------
23	----	-----	-----	----	57	5	----	4	----------
24	----	-----	-----	3	40	5	----	1	1 Mauna Kea
25	----	-----	5	----	20	3	----	----	----------
26	----	------	-----	4	150+	4	----	----	----------
27	13	-----	-----	----	68	3	4	?	----------
28	----	-----	-----	----	95	4	1	10	2 Kona
29	----	-----	-----	3	20	4	----	4	----------
30	----	-----	-----	1	47	6	----	1	----------
31	18+	-----	-----	2	35	3	2	4	1 Kona
Feb. 1	----	------	-----	3	30	6	1	5	----------
2	----	-----	-----	1	54	2	1	4	----------
3	----	-----	-----	2	50	3	----	3	1 Mauna Loa
4	39	-----	-----	----	60	2	----	?	----------
5	----	-----	-----	1	45+	9	----	4	----------
6	----	-----	-----	----	38	3	----	7	----------
7	----	-----	-----	2	75	2	2	----	----------
8	----	-----	-----	----	150	2	1	----	1 Mauna Kea
9	----	-----	-----	3	88	3	2	4	1 Kona
10	----	-----	-----	----	42	1	3	8	----------
11	----	-----	-----	2	41	2	----	10	----------
12	----	3	-----	3	47	2	----	5	1 Kona
13	----	-----	-----	2	54	4	1	32	1 off south shore of Hawaii 1 Kona
14	----	-----	-----	1	59	3	1	25	----------
15	----	-----	-----	----	36	4	----	15	----------
16	----	-----	-----	2	35	4	----	13	1 Mauna Loa
17	----	-----	-----	----	28	3	----	2	----------
18	----	-----	2	4	45+	7	----	11	1 Mauna Kea
19	----	-----	-----	2	35	4	----	4	----------
20	----	-----	-----	3	51	5	----	2	----------
21	----	-----	-----	----	33	1	4	3	----------
22	30	-----	-----	1	47	5	1	5	----------

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea Summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 KM	Shallow				
Feb. 23	----	------	-------	2	45	5	1	3	----------
24	----	------	-------	2	40	3	-----	4	----------
25	----	------	-------	----	33	5	1	3	----------
26	35	------	-------	2	45	5	-----	3	----------
27	----	------	-------	1	94	5	-----	3	----------
28	----	------	-------	2	68	6	1	----	2 Kohala
Mar. 1	----	------	-------	5	43	4	2	3	----------
2	----	7	-------	1	30	4	1	3	----------
3	28	------	5	3	51	7	2	2	----------
4	----	------	-------	1	76+	4	2	19	----------
5	----	------	Harmonic Tremor.	----	----	----	-----	----	----------
6	----	------	---do--	----	25+	4	-----	----	----------
7	----	------	---do--	1	57	7	-----	----	----------
8	----	------	---do--	3	66	9	-----	----	2 off south shore of Hawaii.
9	----	------	---do--	3?	20	6?	-----	4	1 off south shore of Hawaii.
10	----	------	---do--	2	28+	2+	-----	----	----------
11	2	------	---do--	3	22	6	-----	10	----------
12	3	------	---do--	2	22+	5	-----	2	----------
13	----	------	---do--	----	17	3	-----	----	----------
14	----	------	---do--	----	37	7	-----	5	2 Kona
15	----	------	-------	----	15	4	-----	----	----------
16	----	6	-------	1	24	8	-----	10	----------
17	----	------	-------	1	20+	10	-----	4	----------
18	----	------	-------	1	30	7	-----	5	1 Mauna Kea
19	----	------	-------	1	15	6	-----	6	1 Kona
20	----	------	-------	3	25	18	-----	14	----------

Mar. 21	----	----	----	3	45	21	-----	15	1 Mauna Kea
22	----	----	----	1	120	9	-----	?	1 off south shore of Hawaii.
23	----	----	----	4	20	13	-----	5	----------
24	----	----	----	6	17	5	-----	5	1 Mauna Kea
25	14	----	----	1	23	3	-----	5	----------
26	20	----	----	13	65	9	-----	5	1 Kona
27	----	----	----	2	75	11	-----	11	1 Kona
28	----	----	----	2	60	9	-----	5	1 Mauna Loa
29	----	-----	-----	5	35	5	-----	3	----------
30	----	----	----	?	25	?	-----	?	----------
31	----	----	----	?	20	?	-----	?	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, January, February, and March, 1965

Entries for a given quake are: date, origin time (Hawaiian Standard Time), magnitude, depth, epicenter, and felt report. All earthquakes of magnitude 2.5 and larger (as well as many favorably located smaller ones) are included in the list.

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
Jan. 1	04	57	45.4	3.9	13	19°48.5'	155°25.4'	14 km NE. of Pohakuloa	Island-wide
1	13	05	00.5	3.4	10	19°47.1'	155°23.1'	15 km ENE. of Pohakuloa	----------
3	16	05	47.0	2.7	3	19°40.0'	155°52.9'	17 km NNE. of Kealakekua	----------
3	23	41	31.9	2.5	10	19°18.8'	155°13.7'	8 km SSE. of Ahua seismometer.	----------
5	16	45	11.6	2.6	5	19°53.0'	155°48.0'	20 km SW. of Kamuela	----------
6	07	18	58.7	2.1	8	19°16.2'	155°10.7'	10 km S. of Makaopuhi seismometer.	----------
8	14	51	07.9	3.1	27.5	19°23.5'	155°15.0'	Beneath Kilauea summit	Kilauea summit region.
8	17	51	44.2	2.9	5	19°24.8'	155°25.9'	Kaoiki fault system	----------
8	20	33	19.4	2.9	8	19°24.2'	155°52.8'	4 km NE. of Hookena	----------
9	05	58	46.6	3.1	13	20°50'	155°25'	83 km ENE. of Hakeakala seismometer.	----------
9	22	29	12.8	2.0	10	19°18.2'	155°13.7'	9 km SSE. of Ahua seismometer.	----------
10	01	25	19.0	2.2	8	19°46.6'	155°18.8'	25 km WNW. of Hilo	----------
10	07	15	03.4	2.4	10	19°18.6'	155°07.4'	9 km SE. of Makaopuhi seismometer.	----------
12	15	23	24.7	3.0	5	19°37.7'	155°49.4'	16 km NE. of Kealakekua	----------
12	18	37	19.7	2.1	30	19°23.1'	155°17.5'	Beneath Kilauea summit	----------
12	23	08	15.4	2.1	30	19°22.8'	155°19.8'	----do----------	----------
13	15	44	47.1	2.0	27.5	19°24.4'	155°16.2'	----do----------	----------
13	20	25	20.2	3.6	20	20°05.7'	155°50.5'	16 km NW. of Kamuela	Kamuela and Kohala.
14	03	49	35.1	2.7	45	19°34.4'	155°04.5'	5 km ENE. of Mt. View	----------
15	00	15	31.0	2.4	22.5	19°22.9'	155°18.0'	Beneath Kilauea summit	----------
16	01	56	14.1	2.8	8	19°11.8'	155°41.5'	19 km NW. of Naalehu	----------
18	00	25	52.0	2.2	10	19°20.9'	155°06.3'	9 km ESE. of Makaopuhi seismometer.	----------

Jan.	18	13	44	29.3	2.2	5	19°23.5'	155°24.6'	Kaoiki fault system	----------
	21	17	29	25.8	3.1	30	19°22.5'	155°18.2'	Beneath Kilauea summit	Kilauea summit region, Pahala.
	22	17	38	34.6	2.4	25	19°24.5'	155°16.0'	Beneath Kilauea summit	----------
	24	10	42	37.8	2.3	30	19°23.0'	155°17.4'	Beneath Kilauea summit	----------
	24	22	08	13.2	3.9	13	19°45.9'	155°34.2'	5 km NW. of Pohakuloa	Kamuela, Pahala, Kilauea summit region.
	27	02	23	10.6	2.6	8	19°19.6'	155°13.2'	7 km SW. of Makaopuhi seismometer.	----------
	27	06	14	35.1	2.0	25	19°20.8'	155°18.5'	Beneath Kilauea summit	----------
	27	12	58	17.4	2.2	22.5	19°21.9'	155°18.3'	---do----------	----------
	28	09	42	05.8	3.0	10	19°30.8'	155°04.7'	12 km W. of Kealakekua	----------
	28	20	57	19.8	2.3	13	19°41.5'	156°08.2'	10 km SW. of Keahole Point.	----------
	29	13	38	32.5	2.1	10	19°16.9'	155°07.8'	10 km SE. of Makaopuhi seismometer.	----------
	29	18	30	35.6	2.9	8	19°27.0'	155°27.0'	Kaoiki fault system	----------
	31	04	19	34.2	2.9	3	19°30.7'	155°55.8'	2 km WSW. of Kealakekua	----------
Feb.	3	16	37	28.6	2.4	13	19°24.1'	155°35.3'	10 km SSW. of North Bay seismometer.	----------
	5	05	36	50.7	2.0	<3	19°24.5'	155°10.1'	6 km NNE. of Makaopuhi seismometer.	----------
	6	06	10	21.9	2.4	8	19°17.4'	155°12.3'	10 km SSW. of Makaopuhi seismometer.	----------
	7	11	45	25.5	2.2	3	19°21.0'	155°02.2'	7 km W. of Kalapana	----------
	7	17	22	28.7	2.1	3	19°23.0'	155°08.3'	5 km ENE. of Makaopuhi seismometer.	----------
	7	21	28	19.8	2.6	3	19°23.0'	155°08.0'	5 km ENE. of Makaopuhi seismometer.	----------
	7	22	51	56.7	2.5	5	19°20.2'	155°07.1'	7 km ESE. of Makaopuhi seismometer.	----------
	8	09	40	31.0	3.7	13	19°53.0'	155°35.4'	8 km ENE. of Waikii	Kamuela, Pahala
	8	15	48	10.2	2.7	<3	19°16.8'	155°08.8'	10 km SSE. of Makaopuhi seismometer.	----------
	8	15	52	57.1	2.4	<3	19°19.7'	155°06.7'	8 km ESE. of Makaopuhi seismometer.	----------
	8	17	55	25.5	2.1	<3	19°19.5'	155°05.2'	11 km ESE. of Makaopuhi seismometer.	----------
	9	03	43	00.2	3.0	5	19°21.3'	154°59.0'	1 km NW. of Kalapana	----------
	9	10	53	21.1	3.3	8	19°29.5'	155°51.1'	8 km ESE. of Kealakekua	Kona
	10	20	05	11.3	2.3	20	19°38.4'	154°59.6'	14 km SE. of Hilo	----------
	10	21	22	05.2	2.4	8	19°17.1'	155°13.4'	10 km SW. of Makaopuhi seismometer.	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, January, February, and March, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
Feb. 11	17	36	12.4	2.1	10	19°20.7'	155°05.3'	11 km ESE. of Makaopuhi seismometer.	Keaau
11	18	11	03.3	3.0	3	19°21.8'	155°08.5'	5 km E. of Makaopuhi seismometer.	----------
12	22	01	19.2	2.8	13	18°58'	156°15'	45 km SW. of Milolii	----------
13	01	19	03.7	2.2	8	19°40.8'	155°50.2'	20 km NNE. of Kealakekua.	----------
13	13	06	29.0	4.5	13	18°45'	155°16'	48 km SE. of Naalehu	Island-wide
14	01	28	21.0	3.0	8	19°14.8'	155°14.0'	5 km WSW. of Apua Point.	Kilauea summit region.
14	19	58	18.2	2.2	8	19°26.2'	155°24.8'	Kaoiki fault system	----------
14	22	14	03.0	2.3	3	19°20.8'	155°05.8'	10 km ESE. of Makaopuhi seismometer.	----------
14	23	50	42.7	3.3	5	19°20.3'	155°05.4'	11 km ESE. of Makaopuhi seismometer.	----------
16	02	31	04.6	3.2	20	19°17.5'	154°44.0'	33 km SE. of Pahoa	----------
16	05	49	59.2	2.4	<3	19°24.4'	155°10.5'	5 km N. of Makaopuhi seismometer.	----------
16	17	48	23.8	2.4	10	19°18.1'	155°07.7'	10 km SE. of Makaopuhi seismometer.	----------
16	22	28	42.4	2.7	8	19°08.8'	155°34.0'	9 km NNE. of Naalehu	----------
18	06	36	45.0	2.8	8	19°50.8'	155°24.9'	17 km NE. of Pohakuloa	----------
18	09	18	28.8	3.5	5	19°21.0'	155°05.5'	10 km ESE. of Makaopuhi seismometer.	----------
18	20	39	08.1	2.6	8	19°16.1'	155°12.5'	2 km WNW. of Apua Point	----------
19	07	00	42.6	2.9	8	19°16.0'	155°07.1'	13 km SE. of Makaopuhi seismometer.	----------
22	07	43	02.7	2.2	10	19°15.6'	155°13.4'	4 km W. of Apua Point	----------
23	04	28	12.4	2.0	10	19°36.0'	155°06.4'	13 km SSW. of Hilo	----------
23	11	24	40.5	2.2	6	19°24.2'	155°24.2'	Kaoiki fault system	----------
25	18	18	41.4	2.4	10	19°18.7'	155°08.7'	7 km SE. of Makaopuhi seismometer.	----------
26	22	06	50.9	2.5	10	19°17.7'	155°06.2'	11 km SE. of Makaopuhi seismometer.	----------
28	03	27	52.4	2.8	8	19°26.0'	155°26.0'	8 km SW. of Mauna Loa seismometer.	----------

Feb. 28	03	55	46.0	2.6	8	19°59.1'	155°49.8'	15 km WSW. of Kamuela	----------
28	13	03	37.6	2.7	13	20°05.4'	155°50.5'	17 km WNW. of Kamuela	----------
Mar. 4	18	50	24.7	2.5	10	19°18.7'	155°14.6'	8 km SSE. of Ahua seismometer.	----------
5	Shallow harmonic tremor and earthquakes start at 08-01. Although many earthquakes were recorded during the eruption, only those with greater than 2.0 magnitudes are listed.								
5	08	42	16.7	2.7	3	19°21.8'	155°10.6'	Makaopuhi crater	----------
5	09	16	12.8	2.9	3	19°20.4'	155°07.6'	7 km SE. of Makaopuhi seismometer.	----------
5	09	21	02.7	3.1	5	19°14.2'	155°06.6'	10 km SE. of Makaopuhi seismometer.	----------
5	09	55	34.8	2.8	6	19°22.4'	155°13.6'	4 km E. of Ahua seismometer.	----------
5	10	55	14.3	2.7	5	19°24.2'	155°17.6'	2 km S. of Uwekahuna seismometer.	Kilauea summit region.
5	11	15	25.8	2.7	5	19°24.9'	155°17.2'	1 km S. of Uwekahuna seismometer.	Kilauea summit region.
5	11	27	39.6	2.8	10	19°16.5'	155°05.7'	13 km SE. of Makaopuhi seismometer.	----------
5	11	55	19.2	2.6	5	19°24.6'	155°17.7'	2 km S. of Uwekahuna seismometer.	----------
5	13	55	05.7	2.7	5	19°24.2'	155°17.6'	---do----------	----------
5	15	28	47.8	3.1	10	19°15.9'	155°05.4'	14 km SE. of Makaopuhi seismometer.	----------
5	15	37	23.2	2.7	13	19°18.3'	155°05.2'	12 km SE. of Makaopuhi seismometer.	----------
5	16	12	33.7	2.5	10	19°17.5'	155°04.1'	14 km SE. of Makaopuhi seismometer.	----------
5	16	39	17.7	2.4	8	19°25.4'	155°14.6'	5 km E. of Uwekahuna seismometer.	----------
5	17	14	12.3	3.2	6	19°19.8'	155°05.0'	11 km ESE. of Makaopuhi seismometer.	----------
5	17	56	28.6	3.5	11	19°18.5'	155°08.0'	8 km SE. of Makaopuhi seismometer.	----------
5	21	55	11.5	2.7	3	19°20.3'	155°15.8'	4 km S. of Ahua seismometer.	----------
5	22	39	08.2	2.6	3	19°21.8'	155°15.8'	1 km S. of Ahua seismometer.	----------
6	00	11	10.3	2.3	3	19°19.3'	155°14.0'	7 km SE. of Ahua seismometer.	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, January, February, and March, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
Mar. 6	01	12	12.0	4.0	5	19°15.0'	155°13.3'	3 km WSW. of Apua Point	Pahala
6	02	02	05.7	2.7	10	19°17.1'	155°03.0'	16 km SE. of Makaopuhi seismometer.	----------
6	09	50	15.9	2.8	3	19°12.4'	155°10.4'	7 km SSE. of Apua Point	----------
6	10	47	52.1	2.7	10	19°15.0'	155°09.1'	4 km ESE. of Apua Point	----------
6	13	06	06.4	2.3	10	19°18.3'	155°11.0'	7 km SSW. of Makaopuhi seismometer.	----------
6	15	44	07.6	2.0	3	19°19.7'	155°16.1'	5 km S. of Ahua seismometer.	----------
6	17	02	47.0	2.0	<3	19°22.0'	155°11.0'	1 km NW. of Makaopuhi seismometer.	----------
6	18	11	20.1	2.1	5	19°20.1'	155°16.6'	5 km SSW. of Ahua seismometer.	----------
6	20	56	11.1	2.3	10	19°16.4'	155°10.5'	10 km S. of Makaopuhi seismometer.	----------
6	01	37	37.1	2.7	3	19°19.7'	155°16.6'	6 km SSW. of Ahua seismometer.	----------
7	03	31	59.5	3.3	8	19°17.7'	155°13.6'	10 km SW. of Makaopuhi seismometer.	----------
7	06	19	47.1	2.2	5	19°10.3'	155°08.3'	11 km SE. of Apua Point	----------
7	06	22	26.1	2.5	5	19°09.1'	155°03.4'	18 km SE. of Apua Point	----------
7	06	43	36.2	2.3	8	19°16.4'	155°14.4'	5 km WNW. of Apua Point	----------
7	07	43	15.3	2.4	9	19°15.9'	155°14.0'	4 km WNW. of Apua Point	----------
7	08	45	16.0	2.4	8	19°11.5'	155°08.8'	9 km SE. of Apua Point	----------
7	09	53	12.8	2.6	3	19°23.2'	155°04.7'	11 km ENE. of Makaopuhi seismometer.	----------
7	13	59	28.7	2.1	10	19°16.8'	155°09.0'	10 km SSE. of Makaopuhi seismometer.	----------
7	16	07	28.5	2.0	8	19°19.0'	155°10.5'	5 km S. of Makaopuhi seismometer.	----------
8	00	06	36.7	2.3	8	19°18.5'	155°14.2'	8 km SSE. of Ahua seismometer.	----------
8	01	22	45.5	2.5	13	19°12.9'	155°07.6'	9 km ESE. of Apua Point	----------

Mar. 8	01	31	10.3	2.0	10	19°19.8'	155°15.1'	5 km SSE. of Ahua seismometer.	----------
8	04	11	22.4	2.3	5	19°09.8'	155°09.6'	11 km SSE. of Apua Point.	----------
8	13	31	49.0	2.6	8	19°13.0'	155°26.5'	4 km NE. of Pahala	----------
8	13	59	14.2	2.5	30	18°49.3'	155°26.2'	31 km SSE. of Naalehu	----------
8	14	17	33.6	2.0	8	18°52.0'	155°22.5'	32 km SE. of Naalehu	----------
8	14	44	18.5	2.0	10	19°11.9'	155°05.7'	12 km SE. of Apua Point.	----------
8	19	03	56.0	2.8	<3	19°19.5'	155°06.2'	10 km ESE. of Makaopuhi seismometer.	----------
9	10	30	07.7	2.3	25	19°01.5'	155°32.4'	7 km SE. of Naalehu	----------
9	14	41	23.3	2.1	5	19°07.6'	155°11.5'	15 km S. of Apua Point	----------
9	22	14	47.4	2.3	22.5	19°21.2'	155°18.0'	Beneath Kilauea summit	----------
10	01	53	52.3	2.5	45	19°46.1'	155°09.4'	9 km NW. of Hilo	----------
10	10	41	23.3	2.0	8	19°37.3'	155°07.8'	8 km NNW. of Mt. View	----------
12	19	35	06.8	2.2	8	19°11.7'	155°30.3'	4 km W. of Pahala	----------
14	00	06	25.2	2.0	8	19°15.3'	155°51.3'	10 km NNE. of Milolii	----------
14	03	58	53.6	2.0	<3	19°21.1'	155°45.4'	16 km ESE. of Hookena	----------
14	08	24	27.0	2.1	3	19°29.9'	155°49.1'	11 km ESE. of Kealakekua	----------
14	13	58	15.0	2.2	8	19°12.0'	155°01.0'	17 km SSW. of Kalapana	----------
15	05	37	44.0	2.8	8	19°10.0'	155°28.6'	4 km S. of Pahala	Pahala
16	17	15	03.4	2.6	8	19°18.1'	155°03.3'	16 km ESE. of Makaopuhi seismometer.	----------
17	22	39	52.6	3.1	13	19°02.2'	155°08.5'	25 km SSE. of Apua Point.	----------
18	20	40	55.6	2.1	8	19°56.7'	155°15.3'	7 km SSW. of Laupahoehoe	----------
19	07	14	47.7	2.9	5	19°17.1'	155°09.5'	10 km SSE. of Makaopuhi seismometer.	----------
19	12	22	16.4	3.0	<3	19°18.0'	155°58.0'	12 km SW. of Hookena	----------
20	19	37	15.2	3.7	8	19°21.9'	155°24.7'	Kaoiki Fault system	Pahala
21	05	06	56.5	2.5	5	19°56.0'	155°13.6'	8 km SSE. of Laupahoehoe	----------
21	06	05	20.2	2.0	8	19°25.6'	155°19.2'	3 km W. of Uwekahuna seismometer.	----------
21	19	52	14.7	2.5	13	19°10.0'	155°30.7'	5 km SW. of Pahala	----------
21	23	27	52.0	2.0	8	19°23.5'	155°24.2'	Kaoiki Fault system	----------
22	09	33	12.8	4.6	30	19°13.3'	155°32.3'	7 km WNW. of Pahala	Island-wide
22	11	06	30.2	2.4	30	19°11.2'	155°30.2'	4 km WNW. of Pahala	----------
22	14	03	11.8	2.6	8	19°03.2'	155°18.5'	30 km E. of Naalehu	----------
22	14	22	16.8	2.2	5	19°16.1'	154°59.7'	10 km SSW. of Kalapana	----------
24	06	19	25.5	3.4	8	19°48.6'	155°33.3'	7 km NW. of Pohakuloa	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, January, February, and March, 1965--Continued

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
Mar. 24	20	16	38.1	2.0	27.5	19°17.9'	155°22.1'	Beneath Kilauea summit	--------
25	01	32	17.4	2.4	<3	19°12.4'	155°33.3'	8 km W. of Pahala	--------
25	09	25	39.5	2.1	3	19°03.9'	155°12.0'	22 km S. of Apua Point	--------
26	08	08	51.5	2.4	3	19°31.8'	155°46.1'	16 km ENE. of Kealakekua.	--------
27	06	25	43.7	2.3	40	19°24'	154°36'	38 km ESE. of Pahoa	--------
27	13	16	39.4	2.2	8	19°24.9'	155°24.5'	Kaoiki Fault system	--------
27	13	41	00.5	3.2	5	19°20.9'	155°47.6'	13 km ESE. of Hookena	--------
28	01	50	08.6	2.2	3	19°15.2'	155°14.8'	15 km SSE. of Ahua seismometer.	--------
28	13	34	20.9	2.0	35	19°07.5'	155°29.8'	12 km NE. of Naalehu	--------
30	10	01	22.9	3.1	5	19°08.0'	155°05.7'	17 km SE. of Apua Point.	--------

Table 5.--Distant earthquakes

Times are reported in Greenwich Civil Time which is 10 hours faster than Hawaiian Standard Time. A "c" following the time of P indicates compressional first motion; a "d" indicates dilatational first motion. Station symbols, locations, and instrumentation are presented in table 6. Magnitudes calculated from the Hawaii seismograms are followed by (HVO). Location of epicenter, origin times, focal depths, and magnitude reported by other institutions are taken from "Preliminary Determination of Epicenters" published by the U.S. Coast and Geodetic Survey.

Jan. 5, 1965

M	Z	eP	18:14:06.2 c
A	Z	eP	05.8 c
U	PEE	eS	18:20:33
U	PEE	iL	18:24:06
U	PEZ	eR	18:26:08

C&GS card 3-65:
18:05:58.6
20.3° S., 174.1° W.
Tonga Islands
h about 33 km
Magnitude 6.75 (Pas), 6.25 (Brk), 6.0 (CGS).

Jan. 7

M	Z	iP	16:06:03.0 d
A	Z	eP	02.2 d
D	Z	iP	03.1 d
MP	Z	eP	01.6 d
U	Z	eP	02.2 d

C&GS card 3-65:
15:56:32.5
16.2° N., 97.2° W.
Oaxaca, Mex.
Felt: Mexico City
h about 43 km
Magnitude 5.5 (CGS).

Jan. 8

Pa	Z	Tmax	22:15:00
NB	Z	Tmax	22:15:45

C&GS card 7-65:
21:08:06.0
13.2° S., 112.0° W.
Northern Easter Island Cordillera
h about 33 km
Magnitude 5.25-5.5 (Pas), 5 (Brk), 4.9 (CGS).

Jan. 9

M	Z	iP	13:44:34.5 c
A	Z	iP	34.8 c
D	Z	iP	34.1 c
MP	Z	iP	35.5 c
U	Z	iP	34.6 c
Pa	Z	eP	36.2 c
Hi	Z	eP	35.6 c
NB	Z	iP	33.3 c
U	PEZ	eR	14:07:21

C&GS card 5-65:
13:32:46.4
11.9° N., 126.2° E.
Philippine Islands region
h about 5 km
Magnitude 6.1 (CGS).

Jan. 21, 1965

M	Z	eP	06:19:50.9 d
A	Z	eP	50.1 d
MP	Z	eP	50.3 d
U	Z	eP	50.5 d

C&GS card 15-65:
06:09:58
34.2° S., 179.8° E.
South of Kermadec Islands
h about 33 km
Magnitude 5.75-6 (Brk), 5.9 (CGS).

Jan. 24

M	Z	iP	00:23:27.4 c
A	Z	iP	27.4 c
D	Z	eP	26.9 c
MP	Z	iP	27.5 c
U	Z	iP	27.5 c
Hi	Z	iP	29.2 c
NB	Z	iP	26.4 c
Na	Z	iP	25.7 c
Ke	Z	iP	24.7 c
U	PEE	iS	00:34:01
U	PEE	eG	00:45:21
U	PEZ	eR	00:48:09

C&GS card 6-65:
00:11:12.1
2.4° S., 126.0° E.
Ceram Sea
Felt: Davao, Philippine Islands; Halmahera.
h about 6 km
Magnitude 6.6 (CGS), 7.5 (HVO).

Jan 25

M	Z	iP	16:53:58.3 c
NP	Z	iP	58.7 c

C&GS card 7-65:
16:44:18.7
13.7° N., 144.3° E.
Mariana Islands
h about 139 km
Magnitude 5.4 (CGS).

Jan. 30

M	Z	eP	17:49:50.5 c
A	Z	iP	50.6 c
D	Z	eP	50.3 c
MP	Z	iP	51.1 c
WP	Z	iP	50.7 c
Pa	Z	iP	52.5 c
Na	Z	iP	47.7 d

C&GS card 10-65:
17:42:12.3
13.0° S., 169.4° E.
Santa Cruz Islands region
h about 647 km
Magnitude 5.2 (CGS).

February 1, 1965

M	Z	eP	05:34:29.7 d
A	Z	eP	29.5 d
D	Z	eP	28.7 d
MP	Z	eP	29.7 d
U	Z	eP	29.5 d
Pa	Z	eP	31.2 d
Hi	Z	iP	32.5 d
NB	Z	iP	29.5 d
Ha	Z	iP	34.7 d
Na	Z	iP	25.1 d
Ka	Z	iP	32.3 d

C&GS card 8-65:
05:27:04.5
18.6° S., 178.1° W.
Fiji Islands region
h about 472 km
Magnitude 5.6 (CGS).

Feb. 2

A	Z	iP	04:40:08.7 c
D	Z	iP	09.6 c
MP	Z	iP	08.3 c
U	Z	iP	09.0 c

C&GS card 8-65:
04:30:33.1
17.2° N., 94.5° W.
Chiapas, Mex.
h about 140 km
Magnitude 4.75 (Brk), 5.3 (CGS).

January 10, 1965

M	Z	iP	13:45:23.5 d
A	Z	iP	23.4 d
D	Z	eP	23.0 d
U	Z	eP	23.4 d
NB	Z	iP	21.9 d
Ha	Z	eP	25.1 c
Ke	Z	eP	18.7 d
U	PEN	iS	13:52:30
U	PEE	iG	13:57:10
U	PEZ	iR	13:59:04
M	Z	Tmax	14:38:32
A	Z	Tmax	31
D	Z	Tmax	22
U	Z	Tmax	32
NB	Z	Tmax	46
Ha	Z	Tmax	53
Na	Z	Tmax	11
Ke	Z	Tmax	18
Ka	Z	Tmax	33

C&GS card 3-65A:
13:36:30.7
13.5° S., 166.6° E.
New Hebrides Islands
h about 32 km
Magnitude 6.75 (Pas), 6.5 (CGS), 7 (HVO).

Jan. 11

M	Z	iP	20:24:16.0 c
D	Z	eP	16.2 c
U	Z	eP	16.5 c
NB	Z	iP	14.2 c

C&GS card 2-65:
20:14:33.5
43.0° N., 139.2° E.
Eastern Sea of Japan
h about 189 km
Magnitude 5.3 (CGS).

Jan. 15

M	Z	iP	20:20:39.6 c
A	Z	eP	39.0 c
WP	Z	iP	39.3 c
Hi	Z	iP	42.2 c

C&GS card 8-65:
20:13:27.8
18.6° S., 178.7° W.
Fiji Islands region
h about 685 km
Magnitude 5.3 (CGS).

Jan. 15

U	PEZ	eS	23:34:01
U	PEZ	eR	23:40:25

C&GS card 6-65:
23:17:36.0
13.3° S., 166.3° E.
New Hebrides Islands
h about 8 km
Magnitude 5.5 (CGS).

Jan. 16

M	Z	iP	12:59:48.2 d
A	Z	iP	47.6 d
D	Z	eP	46.6 d
MP	Z	iP	47.7 d
U	Z	eP	47.6 d
Hi	Z	eP	50.4 d
Ka	Z	eP	50.1 d

C&GS card 5-65:
12:51:29
25.6° S., 180.0° W.
South of Fiji Islands
h about 445 km
Magnitude 4.9 (CGS).

Jan. 17

M	Z	iP	10:51:26.6 c
A	Z	iP	26.1 c
D	Z	iP	25.5 c
MP	Z	iP	26.4 c
U	Z	iP	26.1 c
Hi	Z	iP	28.9 c
NB	Z	eP	25.3 c
Na	Z	iP	23.0 c
Ka	Z	eP	28.6 c

C&GS card 5-65:
10:43:17.5
24.5° S., 178.4° E.
South of Fiji Islands
h about 568 km
Magnitude 5.5 (CGS).

February 4, 1965

MP	Z	eP	04:44:55.7 c

C&GS card 11-65:
04:33:09.5
3.9° N., 128.7° E.
North of Halmahera
h about 41 km.

Feb. 4

M	Z	eP	05:08:37.5 c
A	Z	eP	38.4 c
D	Z	eP	38.5 c
U	Z	eP	38.2 c
Pa	Z	eP	38.5 c
Hi	Z	eP	37.0 c
Ha	Z	eP	26.9 c
Ke	Z	eP	34.5 c

(All other phases lost)

C&GS card 9-65:
05:01:21.8
51.3° N., 178.6° E.
Rat Islands, Aleutian Islands
Seismic sea wave generated
h about 40 km
Magnitude 7.75 (Pas), 7.75 (Brk), 7.5 (CGS-ML).

Feb. 4

M	Z	eP	06:12:29.7 d
Hi	Z	eP	29.5 d

C&GS card 14-65:
06:04:58
51.7° N., 174.9° E.
Rat Islands, Aleutian Islands aftershock.
h about 35 km
Magnitude 6.1 (CGS).

Feb. 4

M	Z	eP	06:44:51.2 c
A	Z	eP	52.2 c
D	Z	eP	52.2 c
MP	Z	eP	52.5 c

February 4--Continued

Hi	Z	eP	51.4 c
NB	Z	iP	51.1 c

C&GS card 9-65:
06:37:05.4
52.6° N., 172.0° W.
Rat Islands, Aleutian Islands aftershock.
h about 35 km
Magnitude 5.7 (CGS).

Feb. 4

NB	Z	eP	07:30:54.1 d

C&GS card 9-65:
07:23:12.3
51.9° N., 173.2° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 5.5 (CGS).

Feb. 4

M	Z	iP	07:51:27.4 d
Hi	Z	eP	26.8 d
NB	Z	iP	27.1 d
Na	Z	eP	30.2 d

C&GS card 9-65:
07:43:43.2
52.7° N., 172.9° E.
Rat Islands, Aleutian Islands aftershock.
h about 33 km
Magnitude 5.5 (CGS).

February 4, 1965

M	Z	iP	08:14:02.2 d
A	Z	eP	03.4 d
D	Z	eP	02.8 d
MP	Z	eP	03.7 d
NB	Z	iP	01.8 d

C&GS card 9-65:
08:06:16.6
51.9° N., 174.3° E.
Rat Islands, Aleutian Islands aftershock.
h about 40 km
Magnitude 5.6 (CGS).

Feb. 4

M	Z	eP	08:47:53.4 c
A	Z	eP	54.5 c
D	Z	eP	54.4 c
MP	Z	eP	54.7 c
U	Z	eP	54.2 c
Pa	Z	eP	54.7 c
Hi	Z	iP	52.7 c
NB	Z	eP	53.2 c
Ha	Z	iP	43.0 c
Na	Z	eP	08:47:54.6 c
Ke	Z	eP	51.0 c
M	Z	Tmax	09:27:55
A	Z	Tmax	53
D	Z	Tmax	09:27:52
MP	Z	Tmax	59
U	Z	Tmax	56
Pa	Z	Tmax	48
Hi	Z	Tmax	54
NB	Z	Tmax	56
Ha	Z	Tmax	09:25:44
Na	Z	Tmax	09:28:01

C&GS card 9-65:
08:40:40.9
51.3° N., 179.5° E.
Rat Islands, Aleutian Islands aftershock.
h about 40 km
Magnitude 6.75-7 (Pas), 6.4 (CGS).

Feb. 4

M	Z	Tmax	10:22:50
Ha	Z	Tmax	20

C&GS card 9-65:
09:35:20.3
51.8° N., 176.3° E.
Rat Islands, Aleutian Islands aftershock.
h about 30 km
Magnitude 5.2 (CGS).

Feb. 4

M	Z	Tmax	10:24:53
Ha	Z	Tmax	30

C&GS card 14-65:
09:37:28.4
51.8° N., 176.3° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 5.3 (CGS).

Feb. 4

M	Z	eP	12:13:54.6 d
A	Z	eP	55.7 d
D	Z	eP	55.4 d
MP	Z	eP	56.1 d
Hi	Z	eP	53.9 d
NB	Z	eP	53.9 d
Ha	Z	iP	43.9 c
Na	Z	eP	57.6 d
Ke	Z	iP	52.8 d
U	PEZ	eS	12:20:12
U	PEZ	eR	12:25:00

C&GS card 9-65:
12:06:04.3
52.6° N., 172.1° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 6.5 (Pas), 5.8 (CGS), 6.5 (HVO).

February 4, 1965

M	Z	iP	14:26:23.9 d
A	Z	eP	25.0 d
D	Z	eP	24.9 d
MP	Z	eP	25.2 d
U	Z	eP	24.5 d
Ha	Z	iP	12.9 d
U	PEE	iS	14:32:46
U	PEE	iG	14:36:00
U	PEZ	iR	14:37:52
Ha	Z	Tmax	15:09:51

C&GS card 9-65:
14:18:27.9
53.0° N., 171.0° E.
Rat Islands, Aleutian Islands aftershock.
h about 30 km
Magnitude 6.25 (Pas), 5.7 (CGS), 6.5 (HVO).

Feb. 4

M	Z	iP	15:59:19.3 d
A	Z	eP	20.3 d
D	Z	eP	20.1 d
MP	Z	eP	20.7 d
U	Z	eP	20.1 d
Pa	Z	eP	20.8 d
Hi	Z	iP	18.6 d
NB	Z	iP	18.8 d
Ha	Z	iP	07.5 c
Na	Z	iP	21.6 d
U	PEE	eG	16:09:00
U	PEZ	eR	16:10:52
Ha	Z	Tmax	16:42:33

C&GS card 9-65:
15:51:25.5
53.1° N., 170.8° E.
Rat Islands, Aleutian Islands aftershock.
h about 40 km
Magnitude 6.25 (Pas), 5.7 (CGS), 6.5 (HVO).

Feb. 5

M	Z	eP	09:39:45.3 d
A	Z	eP	46.4 d
D	Z	eP	46.5 d
U	Z	eP	46.0 d
Pa	Z	eP	47.7 d
Hi	Z	iP	45.2 d
NB	Z	iP	44.9 d
Ha	Z	iP	33.7 c
Na	Z	eP	47.5 d
Ke	Z	eP	43.7 d
U	PEZ	eS	09:45:56
U	PEE	eG	09:49:06
U	PEZ	eR	09:50:38
Ha	Z	Tmax	10:19:59

C&GS card 9-65:
09:32:09.3
52.3° N., 174.3° E.
Rat Islands, Aleutian Islands aftershock.
h about 41 km
Magnitude 5.5 (Brk), 6.5 (Pas), 5.9 (CGS), 6.3 (HVO).

Feb. 5

U	PEZ	iR	21:05:42

C&GS card 9-65:
20:47:13.3
51.9° N., 174.6° E.
Rat Islands, Aleutian Islands aftershock.
h about 35 km
Magnitude 5.7 (CGS).

Feb. 5

A	Z	eP	22:23:46.7 c

C&GS card 14-65:
22:15:59.5
51.5° N., 176.7° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 5.6 (CGS).

February 6, 1965

M	Z	iP	01:47:16.2 d
A	Z	eP	17.4 d
D	Z	iP	17.5 d
MP	Z	iP	17.5 d
U	Z	iP	16.9 d
Pa	Z	eP	17.1 d
Hi	Z	iP	14.4 d
NB	Z	iP	16.3 d
Ha	Z	iP	04.6 d
Na	Z	iP	20.6 d
Ke	Z	iP	15.6 d
U	PEZ	iS	01:52:43
U	PEE	iL	01:54:31
U	PEZ	iR	01:55:53
M	Z	Tmax	02:25:12
A	Z	Tmax	23
MP	Z	Tmax	02:25:26
U	Z	Tmax	36
Pa	Z	Tmax	06
NB	Z	Tmax	52
Ha	Z	Tmax	02:23:38

C&GS card 11-65:
01:40:33.2
53.2° N., 161.9° W.
South of Alaska
h about 33 km
Magnitude 6.4 (CGS), 6.5 (HVO).

Feb. 6

M	Z	eP	04:10:23.5 c
A	Z	eP	24.5 c
D	Z	eP	24.5 c
MP	Z	eP	24.9 c
Hi	Z	iP	23.2 c
NB	Z	iP	23.6 c
U	PEZ	eS	04:16:23
U	PEN	eG	04:19:03
U	PEZ	iR	04:20:46
Ha	Z	Tmax	04:50:18

C&GS card 14-65:
04:02:53
52.1° N., 175.7° E.
Rat Islands, Aleutian Islands aftershock.
h about 35 km
Magnitude 6 (Pal), 5.9 (CGS).

Feb. 6

M	Z	iP	16:57:12.0 d
A	Z	eP	13.1 d
D	Z	iP	13.0 d
MP	Z	eP	13.3 d
U	Z	eP	12.7 d
Hi	Z	eP	10.5 d
NB	Z	iP	11.8 d
Ha	Z	eP	01.8 d
Na	Z	eP	16.1 d
Ke	Z	iP	11.5 d
U	PEZ	iS	17:02:43
U	PEE	iL	17:04:27
U	PEZ	iR	17:05:51
M	Z	Tmax	17:35:41
A	Z	Tmax	42
MP	Z	Tmax	34
U	Z	Tmax	40
NB	Z	Tmax	31
Ha	Z	Tmax	17:34:07

C&GS card 13-65:
16:50:29
53.3° N., 161.8° W.
South of Alaska
h about 33 km
Magnitude 6.5 (Pas), 6.25-6.5 (Brk), 6-6.25 (Pal), 6.1 (CGS), 6.5 (HVO).

Feb. 7

A	Z	iP	02:24:44.8 c
D	Z	eP	45.0 c
MP	Z	eP	45.3 c
U	Z	iP	44.3 c
Hi	Z	eP	43.9 c
NB	Z	eP	44.1 c
Na	Z	eP	45.8 c
U	PEZ	eR	02:34:51

C&GS card 9-65:
02:17:09.2
51.4° N., 173.4° E.
Rat Islands, Aleutian Islands aftershock
h about 40 km
Magnitude 6.0 (CGS).

February 7, 1965

M	Z	iP	04:18:52.2 c
A	Z	eP	53.2 c
D	Z	eP	53.2 c
MP	Z	eP	54.3 c
U	Z	eP	52.8 c
Hi	Z	iP	51.6 c
NB	Z	eP	52.2 c
U	PEZ	eR	04:29:31

C&GS card 9-65:
04:11:19.3
51.9° N., 175.3° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 5.5 (CGS), 5.4 (HVO).

Feb. 7

U	Z	eP	09:33:05.6 c
U	PEZ	iS	09:38:47
U	PEZ	iR	09:43:07

C&GS card 9-65:
09:25:51.1
51.4° N., 179.1° E.
Rat Islands, Aleutian Islands aftershock.
h about 30 km
Magnitude 5.3 (CGS), 5.5 (HVO).

Feb. 8

U	Z	eP	15:55:14.2 c
Pa	Z	eP	14.5 c
Hi	Z	eP	13.6 c
U	PEN	eG	16:05:55

C&GS card 10-65:
15:46:49.9
55.1° N., 165.7° E.
Komandorsky Islands region.
h about 40 km
Magnitude 5.6 (CGS).

Feb. 9

M	Z	iP	05:50:51.1 c
A	Z	eP	50.9 c
D	Z	eP	50.3 c
U	Z	eP	51.1 c
Pa	Z	iP	53.0 c
Hi	Z	eP	53.5 c
Na	Z	iP	47.7 c

C&GS card 18-65:
05:42:06.8
18.8° S., 169.2° E.
New Hebrides Islands
h about 223 km
Magnitude 5.5 (CGS).

Feb. 12

A	Z	eP	00:50:49.3 c
Ha	Z	Tmax	01:30:52

C&GS card 12-65:
00:43:17.1
51.5° N., 175.8° E.
Rat Islands, Aleutian Islands aftershock.
h about 33 km
Magnitude 5.75 (Pas), 5.4 (CGS).

Feb. 12

M	Z	eP	01:02:49.3 c
A	Z	eP	50.3 c
D	Z	eP	50.0 c
MP	Z	eP	50.5 c
NB	Z	eP	48.5 c
U	PEN	eS	01:09:10
U	PEE	eG	01:12:06
U	PEZ	eR	01:14:06
Ha	Z	Tmax	01:44:36

C&GS card 14-65:
00:55:06.2
52.2° N., 172.8° E.
Rat Islands, Aleutian Islands aftershock.
h about 25 km
Magnitude 6.0 (Pas), 5-5-5.75 (Pal), 5.5 (CGS), 5.8 (HVO).

Table 5.--Distant earthquakes--Continued

February 12, 1965

Pa	Z	Tmax	11:32:18
NB	Z	Tmax	50
Ha	Z	Tmax	10

C&GS card 13-65:
10:50:19.7
40.3° N., 124.9° W.
Near coast of northern Calif.
h about 33 km
Magnitude 5.3 (CGS).

Feb. 12

Ha	Z	Tmax	21:31:56

C&GS card 13-65:
20:50:46
40.3° N., 124.7° W.
Near coast of northern Calif.
h about 33 km
Magnitude 4.9 (CGS).

Feb. 15

U	PEZ	eR	01:42:20

C&GS card 12-65:
01:25:08.8
51.4° N., 179.4° E.
Rat Islands, Aleutian Islands aftershock.
h about 42 km
Magnitude 5.8 (CGS).

Feb. 15

Ha	Z	Tmax	07:27:14

C&GS card 21-65:
06:42:11.2
51.4° N., 179.5° E.
Rat Islands, Aleutian Islands aftershock.
h about 28 km
Magnitude 4.9 (CGS).

Feb. 15

M	Z	iP	10:55:20.9 c
A	Z	iP	21.0 c
D	Z	iP	20.4 c
MP	Z	iP	21.2 c
U	Z	iP	20.9 c
Hi	Z	iP	22.2 c
NB	Z	iP	19.9 c
Ha	Z	iP	18.5 c
Na	Z	eP	18.9 c

Feb. 15--Continued

Ke	Z	iP	17.6

C&GS card 023-65:
10:43:19.8
3.0° N., 125.9° E.
Talaud Islands
h about 33 km
Magnitude 6.0 (CGS).

Feb. 17

M	Z	iP	10:26:14.8 d
A	Z	eP	15.6 d
NB	Z	eP	14.7 d

C&GS card 12-65:
10:18:51.3
51.8° N., 176.6° E.
Rat Islands, Aleutian Islands aftershock.
h about 44 km
Magnitude 5-5.25 (Brk), 5.6 (CGS).

Feb. 18

M	Z	iP	23:20:51.2 c
A	Z	iP	52.4 c
D	Z	eP	52.3 c
MP	Z	iP	52.8 c
U	Z	iP	52.2 c
Pa	Z	iP	52.3 c
Hi	Z	iP	50.5 c
Ha	Z	iP	38.6 c
U	PEZ	iR	23:30:54

C&GS card 14-65:
23:13:36.3
51.4° N., 179.1° E.
Rat Islands, Aleutian Islands aftershock.
h about 28 km
Magnitude 6 (Pas), 5 (Brk), 5.5-5.75 (Pal), 5.4 (CGS).

Feb. 23

M	Z	eP	22:25:02.6 d
A	Z	iP	01.7 d
D	Z	iP	01.9 d
MP	Z	iP	01.2 d
Ke	Z	eP	04.4 d
U	PEE	iSKS	22:35:36
U	PEZ	iPS	22:37:24
U	PEZ	iSS	22:42:44
U	PEN	eG	22:50:20
U	PEZ	iR	22:54:22
M	Z	Tmax	00:09:21
A	Z	Tmax	09
D	Z	Tmax	10
MP	Z	Tmax	12
U	Z	Tmax	05
Pa	Z	Tmax	09
Hi	Z	Tmax	06
NB	Z	Tmax	19
Ha	Z	Tmax	00:10:54

C&GS card 20-65:
22:11:50.2
25.7° S., 70.5° W.
Near coast of northern Chile.
1 killed, 5 injured and heavy damage.
h about 80 km
Magnitude 7.25 (Pas), 6.75 (Brk), 6.75-7 (Pal), 6.2 (CGS), 7.25 (HVO).

Feb. 25

M	Z	eP	05:01:14.9 d
D	Z	iP	13.9 d
MP	Z	eP	13.7 d
Na	Z	eP	12.3 d
U	PEN	eS	05:09:09
U	PEN	iG	05:15:25
U	PEZ	eR	05:17:49

C&GS card 024-65:
04:51:27.8
5.5° S., 152.0° E.
New Britain region
h about 35 km
Magnitude 6.5 (Pas), 6.25-6.5 (Brk), 5.9 (CGS), 6.5 (HVO).

Feb. 25

M	Z	eP	05:29:54.8 c
A	Z	eP	55.7 c
D	Z	eP	55.6 c
MP	Z	eP	56.1 c

Feb. 25--Continued

U	Z	eP	55.4 c
Na	Z	eP	57.4 c

C&GS card 21-65:
05:22:14.5
52.1° N., 173.2° E.
Rat Islands, Aleutian Islands aftershock.
h about 35 km
Magnitude 5.6 (CGS).

Feb. 26

M	Z	iP	23:48:10.5 d
A	Z	iP	09.6 d
MP	Z	iP	09.5 d
U	Z	iP	09.7 d
NB	Z	eP	11.4 d
Ke	Z	eP	12.7 d

C&GS card 16-65:
23:36:12.2
6.9° N., 73.0° W.
Northern Colombia
Felt at Bogota, Bucaramanga, and Calcutta.
h about 146 km
Magnitude 5.75-6 (Brk), 5.7 (CGS).

Feb. 27

U	PEZ	eR	08:04:29

C&GS card 20-65:
07:46:29.1
28.5° N., 112.1° W.
Gulf of Calif.
h about 33 km
Magnitude 5.3 (CGS).

Mar. 1

M	Z	eP	07:30:42.7 d
D	Z	eP	41.6 d
Na	Z	eP	38.6 d
NB	Z	eP	41.3 d

C&GS card 024-65:
07:20:55.3
5.5° S., 152.1° E.
New Britain region
Felt at Rabaul, Doilene, and Karlai
h about 35 km
Magnitude 5.75-6 (Pal), 5.7 (CGS), 5.25-5.5 (Brk).

Table 5.--Distant earthquakes--Continued

March 1, 1965

M	Z	eP	13:32:49.9 d
D	Z	iP	49.9 d

C&GS card 023-65:
13:20:56.7
21.2° N., 121.2° E.
Taiwan region
h about 42 km
Magnitude 5.5 (CGS).

Mar. 1

M	Z	eP	19:29:40.3 c
D	Z	eP	41.1 c
MP	Z	eP	41.8 c
U	Z	eP	41.0 c
Hi	Z	eP	40.0 c
NB	Z	eP	39.6 c
Ha	Z	eP	27.8 c
Ke	Z	eP	38.0 c

C&GS card 17-65:
19:22:01.6
52.2° N., 173.9° W.
Rat Islands, Aleutian Islands aftershock.
h about 30 km
Magnitude 5.5 (CGS).

Mar. 1

M	Z	eP	21:42:07.9 d
A	Z	eP	07.1 d
D	Z	eP	07.7 d
U	Z	eP	07.2 d
Pa	Z	eP	04.7 d
Hi	Z	iP	05.4 d
NB	Z	eP	09.2 d
Ha	Z	eP	12.2 d
Ke	Z	eP	10.5 d
M	Z	ipP	31.7 c
A	Z	epP	30.7 c
D	Z	ipP	31.4 c
U	Z	epP	31.0 c
U	PEN	eS	21:50:19
U	PEN	eG	21:56:41

Mar. 1, 1965--Continued

C&GS card 023-65:
21:32:11.8
15.4° N., 92.5° W.
Mexico-Guatemala Border region
Felt at San Salvador
h about 93 km
Magnitude 6 (Pas), 5.5 (Brk), 5.75-6 (Pal), 5.9 (CGS), 6 (HVO).

Mar. 1

M	Z	eP	22:00:06.9 c
Pa	Z	iP	07.8 c
NB	Z	eP	05.9 c
Ha	Z	eP	11.2 c
Ke	Z	iP	04.7 c

C&GS card 024-65:
21:52:04.4
23.5° S., 179.0° E.
South of Fiji Islands
h about 541 km
Magnitude 5.2 (CGS).

Mar. 3

M	Z	eP	15:24:01.5 d
U	Z	eP	01.0 d
Pa	Z	eP	04.2 d
NB	Z	eP	15:23:59.7 d
U	PEE	iS	15:31:56
U	PEE	eG	15:37:54
U	PEZ	iR	15:40:34

C&GS card 026-65:
15:14:09.7
5.5° S., 151.9° E.
New Britain region
h about 44 km
Magnitude 6.75-7 (Pas), 6.5-6.75 (Brk), 7.25-7.5 (Pal), 6.0 (CGS), 6.5 (HVO).

March 3, 1965

MP	Z	eP	16:55:21.4 c
NB	Z	eP	19.7 c

C&GS card 17-65:
16:47:25.7
53.1° N., 171.2° E.
Rat Islands, Aleutian Islands aftershock.
h about 23 km
Magnitude 5.6 (CGS).

Mar. 4

M	Z	iP	01:58:56.9 d
A	Z	eP	56.5 d
D	Z	iP	55.8 d
MP	Z	eP	56.8 d
U	Z	iP	56.5 d
Hi	Z	iP	58.5 d
NB	Z	eP	55.2 d
Ha	Z	iP	54.6 d
Ke	Z	iP	52.7 d

C&GS card 024-65:
01:48:54.1
5.4° S., 147.0° E.
East New Guinea region
Felt at Lae and Aiome
h about 191 km
Magnitude 6.4 (CGS).

Mar. 8

Pa	Z	iP	15:11:31.4 c
Hi	Z	iP	33.7 c
NB	Z	eP	29.4 c
Ke	Z	iP	28.0 c

C&GS card 025-65:
15:04:16.2
17.7° S., 178.9° W.
Fiji Islands region
h about 589 km
Magnitude 4.5-4.75 (Brk),
5.0 (CGS).

Mar. 8

Pa	Z	iP	19:31:50.7 c
Hi	Z	iP	50.9 c
NB	Z	iP	48.5 c
Ha	Z	eP	52.6 c

C&GS card 025-65:
19:22:45.6
22.3° S., 171.4° E.
Loyalty Islands region
h about 125 km
Magnitude 5.75-6 (Brk),
5.4 (CGS).

Mar. 9

Hi	Z	iP	01:44:04.0 c
Ke	Z	eP	02.4 c

C&GS card 023-65:
01:36:45.4
17.0° S., 177.4° W.
Fiji Islands region
h about 386 km
Magnitude 5.75-6 (Bks),
5.5 (CGS).

Mar. 10

M	Z	iP	16:01:28.2 d
D	Z	eP	27.0 d
U	Z	eP	27.7 d
Hi	Z	iP	30.6 d
NB	Z	iP	27.8 d
Ha	Z	iP	33.0 d
Na	Z	iP	24.2 d

C&GS card 023-65:
15:53:37.8
21.9° S., 179.6° E.
South of Fiji Islands
h about 547 km
Magnitude 5.7 (CGS).

Mar. 10

M	Z	Tmax	22:38:24
A	Z	Tmax	32
D	Z	Tmax	20
U	Z	Tmax	33
Ha	Z	Tmax	22:36:42

Mar. 10, 1965--Continued

C&GS card 026-65:
21:52:57.6
56.3° N., 155.6° W.
Alaska Peninsula
h about 33 km
Magnitude 5.0 (CGS).

Mar. 14

U	PEZ	iP	16:07:14	c
Hi	Z	iP[1]	16:11:15.8	c
NB	Z	iP[1]	16:11:16.3	c
U	PEN	iSKS	16:17:34	
U	PEN	eS	16:19:06	
U	PEN	iPS	16:21:20	
U	PEN	esSS	16:28:18	
U	PEN	eG	16:39:02	

C&GS card 026-65:
15:53:06.6
36.3° N., 70.7° E.
Hindu Kush region
Light damage in Afghanistan
and West Pakistan.
Felt in India
h about 219 km
Magnitude 7.75 (Brk), 7.5-7.75 (Pas), 6.6 (CGS), 7.5 (HVO).

March 16

NB	Z	eP	16:55:52.9	c
Na	Z	iP	56.5	c
U	PEN	iS	17:03:45	
U	PEN	eG	17:09:25	
U	PEZ	eR	17:11:45	

C&GS card 025-65:
16:46:15.5
40.8° N., 142.9° E.
Near east coast of Honshu, Japan
Felt at Morioka and Aomori
h about 34 km
Magnitude 6.5 (Pas), 6.5-6.75 (Pal), 5.6 (CGS), 6.1 (HVO).

Mar. 17

M	Z	iP	12:53:04.3	c
A	Z	eP	04.7	c
WP	Z	iP	04.6	c
MP	Z	iP	05.2	c

C&GS card 029-65:
12:41:08.8
1.2° N., 126.8° E.
Molucca Passage
h about 68 km
Magnitude 5.1 (CGS).

Mar. 17

M	Z	iP	14:35:02.7	d
A	Z	iP	03.7	d
D	Z	iP	03.3	d
MP	Z	eP	04.4	d
U	Z	iP	03.2	d
Hi	Z	eP	02.6	d
NB	Z	iP	02.3	d
Na	Z	iP	05.1	d

C&GS card 025-65:
14:27:12.4
52.8° N., 171.9° E.
Near Islands, Aleutian Islands
Felt on Shemya
h about 23 km
Magnitude 6.0 (CGS).

Mar. 18

M	Z	iP	06:29:58.5	d
A	Z	iP	58.0	d
D	Z	eP	57.4	d
MP	Z	iP	58.2	d
WP	Z	iP	58.0	d
Pa	Z	eP	59.7	d
Hi	Z	iP	06:30:01.0	d
NB	Z	iP	06:29:57.5	d
Na	Z	eP	54.5	d
U	PEE	eS	06:36:10	
U	PEE	isS	06:37:28	
U	PEE	iSS	06:40:44	

March 18, 1965--Continued

C&GS card 026-65:
06:22:02.9
19.9° S., 176.1° W.
Fiji Islands region
h about 151 km
Magnitude 5.5 (CGS).

Mar. 18

M	Z	iP	16:23:16.8 c
A	Z	iP	16.4 c
M	Z	iP	16.5 c
U	Z	iP	16.5 c
Pa	Z	eP	18.1 c
Hi	Z	iP	19.4 c
NB	Z	eP	15.8 c
Na	Z	iP	12.7 c
Ka	Z	eP	19.7 c

C&GS card 026-65:
16:15:56.1
17.7° S., 178.9° W.
Fiji Islands region
h about 507 km
Magnitude 5.1 (CGS).

Mar. 19

M	Z	iP	16:33:30.9 c
A	Z	eP	31.1 c
Hi	Z	eP	32.6 c
NB	Z	eP	29.7 c

C&GS card 029-65:
16:20:51.4
2.0° S., 119.8° E.
Celebes
h about 46 km
Magnitude 5.0 (CGS).

Mar. 19

M	Z	iP	23:10:38.5 c
A	Z	iP	38.7 c
D	Z	iP	37.7 c
MP	Z	eP	39.2 c
U	Z	iP	38.7 c
Pa	Z	eP	39.9 c
Hi	Z	iP	40.0 c

Mar. 19--Continued

NB	Z	iP	37.5 c
Na	Z	eP	35.2 c

C&GS card 028-65:
22:58:34.9
0.0° N., 123.4° E.
Northern Celebes
h about 173 km
Magnitude 5.6 (CGS).

Mar. 21

M	Z	iP	11:20:21.7 c
A	Z	eP	21.9 c
D	Z	eP	21.3 c
MP	Z	eP	22.5 c
Pa	Z	eP	24.7 c
Hi	Z	eP	23.8 c
NB	Z	eP	20.5
Ke	Z	eP	18.4 c
U	PEE	iPPS	11:31:16
U	PEZ	iG	11:44:11

C&GS card 030-65:
11:08:16.2
1.5° S., 126.5° E.
Molucca Sea
h about 33 km
Magnitude 6.75 (Pas), 6.75 (Brk),
6.25-6.5 (Pal),
6.2 (CGS).

Mar. 22

M	Z	eP	02:52:10.4 c
A	Z	eP	09.8 c
D	Z	eP	09.2 c
MP	Z	eP	10.2 c
U	Z	eP	10.2 c
Pa	Z	eP	12. c
Hi	Z	eP	13.3 c
Na	Z	iP	07.0 c
Ke	Z	eP	07.9 c
U	PEN	eS	02:58:18
U	PEE	eG	03:00:46
U	PEZ	iR	03:02:34

March 22, 1965--Continued

C&GS card 035-65:
02:44:47.5
15.3° S., 173.4° W.
Tonga Islands
Felt at Apia
h about 51 km
Magnitude 6.5 (Pas), 6-6.25 (Brk), 6.5-6.75 (Pal), 5.9 (CGS), 6.2 (HVO).

Mar. 23-24

M	Z	eP	00:01:27.4	c
A	Z	eP	26.9	c
D	Z	iP	26.2	c
U	Z	eP	27.2	c
Hi	Z	eP	30.1	c
Na	Z	iP	24.1	c
U	PEZ	eS	00:07:12	
U	PEZ	eR	00:11:16	

C&GS card 036-65:
23:54:14.7
15.2° S., 173.5° W.
Tonga Islands, felt at Apia
h about 130 km
Magnitude 6.5 (Pas), 5.9 (Brk), 6.25-6.5 (Pal), 5.7 (CGS), 6.1 (HVO).

Mar. 24

M	Z	Tmax	08:54:29
A	Z	Tmax	46
D	Z	Tmax	23
U	Z	Tmax	33
Pa	Z	Tmax	36

C&GS card 031-65:
08:08:05.2
56.6° N., 152.4° W.
Kodiak Island region
h about 30 km
Magnitude 5 (Brk), 6 (Pal), 5.2 (CGS).

Mar. 24

WP	Z	eP	22:53:58.5	c

C&GS card 033-65:
22:42:09.6
8.4° N., 126.6° E.
Mindanao, P. I.
h about 51 km
Magnitude 5.8 (CGS).

Mar. 28

MP	Z	eP	13:31:37.9	c
Pa	Z	iP	39.1	c
Hi	Z	eP	36.8	c

C&GS card 030-65:
13:22:57.6
55.1° N., 162.1° E.
Near east coast of Kamchatka
h about 33 km
Magnitude 5.9 (CGS).

Mar. 28

M	Z	eP	16:46:35.9	d
A	Z	iP	34.5	d
MP	Z	iP	34.2	d
U	Z	eP	34.9	d
Pa	Z	iP	33.0	d
Hi	Z	iP	34.8	d
NB	Z	iP	37.1	d
Na	Z	iP	34.9	d
Ke	Z	eP	38.5	d
U	PEZ	iPP	16:50:40	c
U	PEE	iS	16:58:07	
U	PEZ	iR	17:16:59	
M	Z	Tmax	18:32:33	
A	Z	Tmax	27	
D	Z	Tmax	25	
MP	Z	Tmax	23	
U	Z	Tmax	27	
Pa	Z	Tmax	12	
Hi	Z	Tmax	24	
NB	Z	Tmax	52	
Na	Z	Tmax	24	

March 28, 1965--Continued

C&GS card 028-65:
16:33:14.6
32.4° S., 71.2° W.
Near coast of central Chile
About 400 dead or missing, many injured, and extensive property damage in central Chile.
h about 61 km
Magnitude 7-7.25 (Pas), 6.4 (CGS), 7.5 (HVO).

Mar. 29

M	Z	eP	10:57:17.3 c
D	Z	eP	17.9 c
MP	Z	eP	18.5 c
U	Z	eP	18.0 c
Hi	Z	eP	17.9 c
NB	Z	eP	16.6 c
Na	Z	eP	17.9 c
U	PEE	iS	11:05:14
U	PEZ	iR	11:13:20

C&GS card 031-65:
10:47:37.6
40.8° N., 142.8° E.
Near east coast of Honshu, Japan.
h about 33 km
Magnitude 6.1 (CGS), 6.3 (HVO).

Mar. 29-30

M	Z	iP	00:06:26.8 c

C&GS card 036-65:
23:57:33.5
28.7° S., 178.4° W.
Kermadec Islands
h about 228 km
Magnitude 4.4 (Brk), 5.2 (CGS).

Mar. 30

M	Z	iP	02:34:17.6 d
A	Z	eP	18.9 d
D	Z	eP	18.6 d
U	Z	eP	18.4 d

March 30, 1965--Continued

Hi	Z	eP	16.5 d
NB	Z	eP	17.3 d
Ha	Z	iP	05.7 d
Ke	Z	iP	16.5 d
U	PEE	iS	02:40:12
U	PEN	iG	02:42:44
A	Z	Tmax	03:14:50
D	Z	Tmax	47
MP	Z	Tmax	44
U	Z	Tmax	49
Ha	Z	Tmax	03:13:04

C&GS card 030-65:
02:27:07.2
50.6° N., 177.9° E.
Rat Islands, Aleutian Islands
Felt at Amchitka
Magnitude 7-7.25 (Pas), 6.75-7 (Brk), 7.75 (Pal), 7.1 (HVO).

Mar. 31

U	PEZ	iPP	10:08:06 d
U	PEZ	ePS	10:18:04
U	PEE	iSS	10:24:48
U	PEZ	eSSS	10:29:44
U	PEE	eG	10:38:44
U	PEZ	e	10:45:44

C&GS card 034-65:
09:47:30.7
38.6° N., 22.4° E.
Greece
3 killed, 16 injured, major property damage at Patras and Agrinion.
Felt in southern Italy
h about 78 km
Magnitude 6.75 (Pas), 6.75-7 (Brk), 6.5-6.75 (Pal), 6.3 (CGS).

Table 6.--U.S. Geological Survey seismograph stations in Hawaii

Station	Symbol	Location		Altitude (m) above sea level	Equipment (Z, vertical; N, north-south; E, east-west)
		Lat. N.	Long. W.		
Uwekahuna (Hawaiian Volcano Observatory)	U	19°25.4'	155°17.6'	1,240	Long-period Press-Ewing: N, E, Z. (Seismometer and galvanometer periods are 15 and 90 seconds, respectively.) Short-period Sprengnether: E, Z. HVO-1: Z[1]. Short-base liquid-level tiltmeter.
Mauna Loa	M	19°29.8'	155°23.3'	2,010	Remote recording HVO-2: Z[2].
Ahua	A	19°22.4'	155°15.9'	1,070	Do.
Desert	D	19°20.2'	155°23.3'	815	Do.
North Pit	N	19°24.9'	155°17.0'	1,115	Do.
West Pit	WP	19°24.7'	155°17.5'	1,115	Do.
Makaopuhi	MP	19°21.8'	155°10.7'	885	1.0 sec. Benioff with transistorized pre-amplifier: Z. Wired into HVO-2 recording system.

1/HVO-1 is a moving-coil, hinged, vertical-component seismograph with seismometer and galvanometer periods of 0.5 second. Overdamping of both seismometer and galvanometer is used to control the strong galvanometer reaction. This seismograph has a peak magnification of about 20,000 at a period of 0.25 second. Recording is optical, on photographic paper.

2/HVO-2 is a moving-coil, vertical-component seismograph with a seismometer period of 0.8 second. Its signal is transmitted over telephone wires to the Hawaiian Volcano Observatory, where it is recorded on smoked paper. The response of this seismograph is similar to that of HVO-1. Records from these seismographs at M, A, and D, and N, WP, and MP (Benioff) are recorded on two 3-component drums to permit more accurate comparison of arrival times at these stations.

Table 6.--U.S. Geological Survey seismograph stations in Hawaii--Continued

Station	Symbol	Location		Altitude (m) above sea level	Equipment (Z, vertical; N, north-south; E, east-west
		Lat. N.	Long. W.		
Hilo	Hi	19°43.2'	155°05.3'	20	HVO-1: Z. Wood-Anderson: N, E. Operated by Sister Thecla at St. Joseph's School.
Kipapa Oahu	Kip	21°25.4'	158°00.9'	76	HVO-1: Z. Operated by U.S. Coast and Geodetic Survey.
Naalehu	Na	19°03.8'	155°35.2'	205	1.0 sec. EV-17 seismometer, 0.5 sec. galvanometer: Z. Operated by Rev. D. Thompson at Naalehu School.
Pahoa	Pa	19°29.7'	154°56.8'	205	HVO-1: Z. Operated by Mr. K. Kimura at Pahoa school.
Kamuela	Ka	20°01.9'	155°42.0'	740	HVO-1: Operated by Mr. Ed. Van Gorder, Preparatory Academy, Kamuela.
Haleakala	Ha	20° 6.0'	156°15.0'	2,090	HVO-1: Z. Wood-Anderson: N, E. Operated by the staff of Haleakala National Park, Maui.
North Bay Installed 3/12/64	NB	19°29.7'	155°34.8'	4,005	0.8 sec. EV-17: Z. with helicorder. Operated by U.S. Weather Bureau.
Kealakekua Installed 1/28/64	Ke	19°31.2'	155°55.3'	505	1.0 sec. EV-17, 0.2 sec. galvanometer: Z. Wood-Anderson: N, E. Operated by H. Nelson at Kona County Hospital.

Table 7.--U.S. Geological Survey tiltmeter stations in Hawaii

Station	Symbol	Location		Frequency of Reading	Base Length M	Description
		Lat. N.	Long. W.			
Tree Molds	TM	19°26.3'	155°17.3'	Quarterly	50.79	NS. and EW.
Sand Spit	SS	19°24.1'	155°16.8'	--do-----	25.40	Equilateral Triangle.
Kalihipaa	Kal	19°21.4'	155°15.3'	--do-----	50.79	NS. and EW.
Keamoku	Kea	19°25.1'	155°19.0'	--do-----	47.55	Equilateral Triangle.
Ahua Kamokukolau	Kam	19°22.7'	155°16.6'	--do-----	50.79	Do.
Kipuka Nene	KN	19°19.4'	155°16.7'	--do-----	50.79	Do.
Hilina Pali	HP	19°18.2'	155°18.6'	--do-----	47.73	Do.
Kapapala Ranch	Kap	19°20.5'	155°23.8'	--do-----	50.79	Do.
Mehana	M	19°26.2'	155°14.3'	--do-----	25.00	Do.
Uwekahuna	U	19°25.5'	155°17.4'	--do-----	50.79	Do.
Uwekahuna Vault		19°25.4'	155°17.6'	Daily	3.48	NS. and EW.

The following persons or agencies reported "felt" earthquakes during the 1st quarter, 1965. Their assistance is gratefully acknowledged.

Kilauea summit area

Mr. and Mrs. G. Yong
Mr. and Mrs. H. W. Mist
Mrs. V. Hansen
Mr. A. Yamamoto
Mrs. C. K. Wentworth

North Hawaii

Mrs. E. Van Gorder
Mr. Y. Kojima
Mrs. E. Christensen
Mrs. A. Walker
Mrs. R. Eklund
Mrs. E. Lindsey

Kona

Mr. Johnston
Mr. M. Sutherland
Mr. E. Glass
Miss A. Greenwell
Mrs. Isbell
Miss N. Wallace
Mrs. Schattauer

Kau

Mr. W. Meinecke
Mrs. A. Paiva
Mrs. Oliviera
Naalehu Police Station
Lt. Araujo
Mrs. C. Ashton

Hilo region

Mr. R. Baldwin
Mrs. H. Lewis
Mrs. H. Baldwin
Mrs. T. Crabb
Mr. J. Bryan
Mrs. B. Shaffer
Miss E. Patten
Mr. H. Pierce

Puna

Mr. R. Williamson
Mrs. Torigoe
Mr. R. Edwards
Mrs. Guerino
Mr. and Mrs. Ruthvens

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HAWAIIAN VOLCANO OBSERVATORY
SUMMARY 38

April, May, and June, 1965

By

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Issued June 1966

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Summary of activities

Extreme quiet prevailed at Hawaii's volcanoes during the 3 months following the March 1965 eruption along the upper east rift of Kilauea. At no time did the total count of earthquakes reach 100 a day, and the count of local shallow Kilauea quakes did not exceed 55 on any day.

Moderate reinflation of the summit is recorded by the mid-June readings of the long-base tiltmeters. Monitoring daily from the short-base tiltmeter in Uwekahuna vault shows 3 microradians of rise to the west (with no northerly component) between April 1 and the end of May; during June there was a rise to the northwest of about 4 microradians. Long-period small quakes made up about half of the count of local Kilauea caldera quakes during June.

Field studies on Alae lava lake now include releveling once a year (done on May 11, 1965), and temperature measurements at shorter intervals. About the first of July the highest lava temperature was 725°C at 36 feet below surface, where the lake is 50 feet deep.

At Makaopuhi lava lake a net of level stations was laid out 5 days after the crust stabilized. Twenty days after stabilization the average subsidence was 3.4 feet; in the next half-month (to April 22) further subsidence averaged 0.275 feet; in the next month, 0.18 feet, and in the following month, 0.11 feet (on June 23, 1965). In the quarter April-June, crustal thickening and cooling was monitored by drilling through the crust in 14 core holes; the first hole was drilled on April 19 through 6 1/2 feet of crust. Sampling of gas from drill holes was started June 17-18 by a team from the University of Hawaii, led by Professor Naughton.

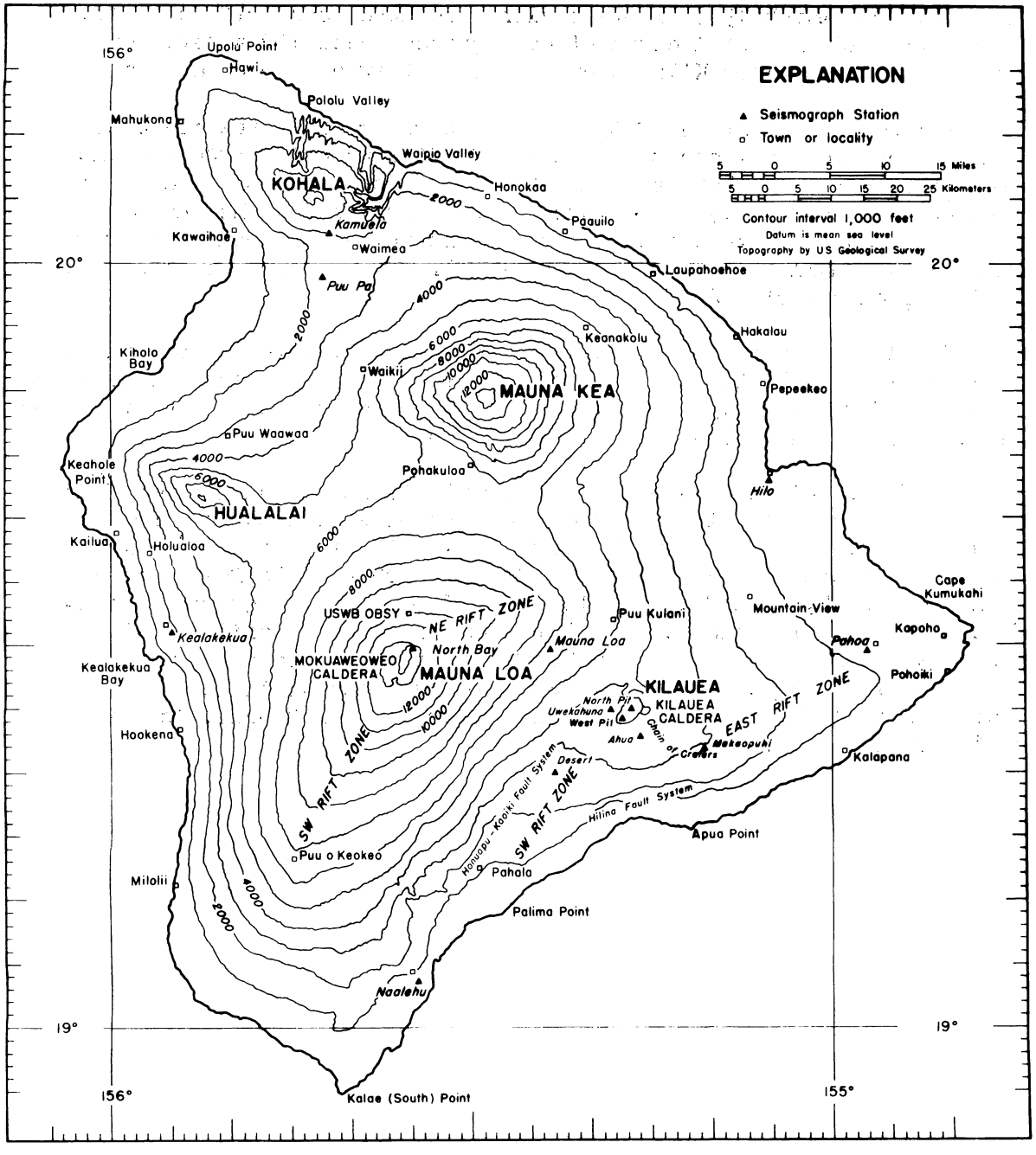

Figure 1.--Map of the island of Hawaii showing localities mentioned in the text and seismograph stations operated by the U.S. Geological Survey. Epicenters of local earthquakes are given in terms of geographic coordinates, which are indicated at the edges of the map.

Tilting of the ground around Kilauea caldera.--Tilting of the ground around the summit of Kilauea is monitored daily by a short-base water-tube tiltmeter in Uwekahuna Vault, and at irregular intervals it is measured on a regional scale by means of a network of field tilt bases and a portable water-tube tiltmeter. The attitude of the ground surface at each tilt base is reported in terms of north-south and east-west tilt coordinates. Both coordinates at each station were arbitrarily set equal to 500 when measurements at that station were begun. Increasing tilt coordinates correspond to northward and eastward tilting of the earth's surface; that is, to a relative subsidence toward the north and east. A one-unit change in coordinate corresponds to a tilting of 1 microradian (1 mm per km) in the direction indicated.

Location of and essential data on each tiltmeter station are listed in table 7, which is published only in the first-quarter issue each year.

Table 1.--Tilt coordinates at Uwekahuna Vault, April, May, and June, 1965

Date (1965)	N-S	E-W	Date (1965)	N-S	E-W
April 4	459	511	June 5	461	509
11	458	510	12	463	510
18	460	511	19	464	508
25	460	512	26	464	504
May 1	460	510			
8	460	509			
15	461	511			
22	461	509			
29	461	508			

Table 2.--Tilt coordinates and changes at bases around Kilauea caldera. (See tilt diagram, figure 2.)

Tilt base	Date (1965)	Tilt coordinates		Rate (10^{-6} rad/mo) and direction of tilting since last reading		Date of last reading (1965)
		N-S	E-W			
Uwekahuna	June 15	466.4	494.8	8.0	N. 19.9° W.	March 6
Tree Molds	9	433.0	519.9	3.2	N. 36.1° W.	7
Sand Spit	16	874.7	734.1	2.3	S. 10.0° W.	8
Kalihipaa	8	334.9	380.4	1.6	N. 75.2° W.	7
Keamoku	7	586.8	503.3	2.3	N. 75.9° W.	7
Ahua Kamokukolau	15	621.7	532.7	4.6	N. 40.9° W.	6
Kipuka Nene	8	484.0	505.3	.01	S. 88.2° W.	9
Hilina Pali	9	502.0	493.2	.7	N. 17.1° W.	Dec. 7 (1964)
Kapapala Ranch	7	493.0	506.2	.32	S. 61.1° E.	March 9
Mehana	16	539.0	547.5	.8	S. 54.4° E.	March 9

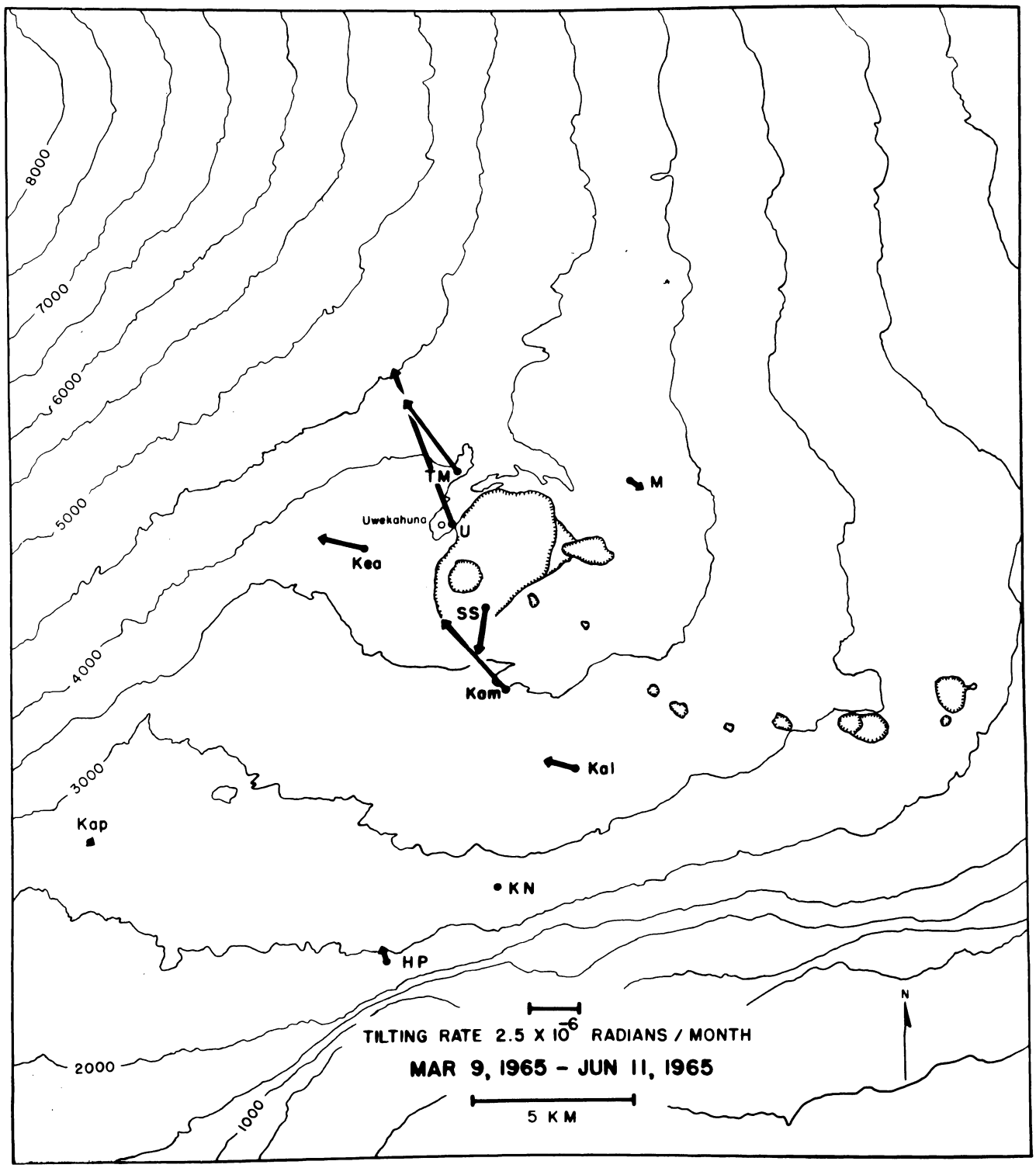

Figure 2.--Tilting of the ground around Kilauea caldera, March 9-June 11, 1965. The vector depicting tilting at a given tilt base points in the direction of maximum relative subsidence and has a length proportional to the rate of tilting during the measurement interval. Closed circles represent field tilt bases; open circles, short-base water-tube tiltmeters.

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Seismic summary.--Events recorded by the U.S. Geological Survey seismograph network in Hawaii fall into two categories: local earthquakes and tremor originating in the region of the Hawaiian Islands (usually within 100 km of at least one seismograph), and distant earthquakes originating more than 3,000 km from Hawaii. As an index of seismic activity at Hawaiian volcanoes, daily counts of earthquakes and minutes of tremor recorded by seismographs in Hawaii are listed in table 3. The earthquakes are separated into groups on the basis of region of origin as determined by analysis of records obtained daily at the Observatory (U, M, A, D, N, WP, MP). Earthquakes of magnitude 2.0 or greater are generally sufficiently well recorded to be located with greater precision; they are listed individually in table 4. Data on identifiable phases from distant earthquakes are listed in table 5.

Locations of the seismograph stations are shown on figure 1; essential data pertaining to the stations are listed in table 6, which is published only in the first-quarter issue each year.

Table 3.--Number of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera

Tremor is separated into three categories: deep, intermediate, and shallow, on the basis of relative amplitudes on seismographs in the summit region. Unless otherwise stated, tremor is presumed to be associated with movement of magma within the central complex of Kilauea.

Earthquake categories are: earthquakes from a source about 30 km beneath the Kilauea summit region; shallow earthquakes in the Kilauea caldera region; shallow earthquakes along the SW rift zone of Kilauea and the adjacent portion of the Kaoiki fault system; earthquakes along the eastern half of Kilauea's east rift zone--detected largely on the Pahoa seismograph; earthquakes from the upper east rift zone and the adjacent fault systems of Kilauea's south flank; and earthquakes from other regions: Kona, Mauna Kea, etc.

Date (1965)	Tremor (in minutes)			Kilauea Summit	Kilauea caldera	Earthquakes			
	Deep	Inter-mediate	Shallow	30 KM	Shallow	SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
April 1	----	----	----	4	20	9	----	4	1 Kona----------
2	----	----	----	3	25	8	----	2	----------
3	----	----	----	3	35	8	----	5	1 Mauna Kea----------
4	----	----	----	4	40	2	----	4	----------
5	----	----	----	2	23	4	----	4	1 Mauna Loa----------
6	----	----	----	1	15	5	----	3	----------
7	----	----	----	2	15	5	----	5	----------
8	----	----	----	2	35	7	----	1	----------
9	----	----	----	6	23	7	----	1	1 Mauna Loa----------
10	----	3	----	2	31	12	----	3	----------
11	17	----	----	2	40	4	----	2	----------
12	----	----	----	2	40	6	----	4	----------
13	----	----	----	4	49	6	----	4	----------
14	----	----	----	3	50	4	----	----	----------
15	----	----	----	1	48	3	----	5	1 off SE. shore of Hawaii.
16	----	----	----	6	20	9	1	1	1 Hualalai----------

April 17	40	----	----	----	20	6	1	2	1 Mauna Kea
18	----	----	----	----	30	7	----	4	----------
19	7	----	----	2	32	5	----	2	----------
20	----	----	----	----	20	5	----	2	----------
21	----	9	----	----	28	7	----	----	----------
22	----	----	----	3	35	16	----	2	----------
23	4	----	----	1	45	9	----	1	----------
24	----	----	----	1	53	6	----	4	1 Mauna Loa----------
25	----	----	----	3	55	4	----	8	----------
26	----	----	----	3	35	10	----	4	----------
27	----	----	----	3	45	5	----	5	1 Mauna Loa
28	----	----	----	6	30	7	----	4	----------
29	15	----	----	----	25	6	----	5	2 off S. Shore of Lanai
									1 Kona----------
30	32	----	----	----	25	4	----	10	----------
May 1	36	----	----	----	33	6	----	3	1 off SE. shore of Hawaii
2	----	----	----	1	30	9	----	----	----------
3	----	----	5	2	45	3	----	4	----------
4	----	5	----	2	45	5	----	13	1 off SW. shore of Hawaii
5	10	----	----	1	33	4	----	6	----------
6	----	----	----	5	22	12	----	1	----------
7	----	37	----	1	30	6	----	5	----------
8	----	----	----	1	14	1	----	----	1 Mauna Kea----------
9	----	3	----	----	35	2	----	----	1 Kona----------
10	----	----	----	5	20	4	----	----	----------
11	----	----	----	5	35	11	----	4	1 Mauna Kea----------
12	46	----	----	3	26	6	----	11	1 Mauna Kea----------
13	----	----	----	1	22	6	----	7	----------
14	----	2	----	2	10	10	----	4	----------
15	----	----	4	2	30	10	----	6	----------
16	----	----	----	----	25	3	----	3	1 Kona
17	----	----	----	3	20	8	----	4	----------
18	----	----	----	1	15	8	----	4	1 Mauna Loa----------
19	----	----	----	2	20	4	----	1	----------
20	----	4	----	2	23	3	----	5	1 Mauna Loa----------
21	----	5	----	3	28	5	----	10	1 off E. shore of Maui
22	----	----	----	----	15	7	----	7	1 Kona----------
23	----	----	----	6	30	11	----	8	----------

Table 3.--Number of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Kilauea Summit	Kilauea caldera	Earthquakes			
	Deep	Inter-mediate	Shallow	30 KM	Shallow	SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
May 24	----	5	----	1	25	9	----	6	1 Mauna Loa 1 Mauna Kea
25	----	----	----	3	23	8	----	11	----
26	----	----	----	2	36	7	----	8	----
27	----	----	----	2	21	5	----	14	1 Mauna Kea
28	----	----	----	4	23	5	----	6	----
29	----	----	----	6	27	5	----	10	1 Kona
30	----	----	----	1	22	8	----	8	----
31	----	----	----	3	20	4	----	6	1 Mauna Loa 1 off NE. shore of Hawaii
June 1	----	----	----	5	25	3	1	5	2 Kona
2	----	15	----	4	16	5	----	10	----
3	----	----	----	4	18	3	----	10	----
4	----	----	----	----	32	3	----	10	1 Kona 1 Hualalai
5	----	----	----	2	39	3	----	10	----
6	----	----	----	3	23	3	1	13	----
7	----	----	----	7	18	8	----	4	----
8	----	50	----	2	20	8	----	10	----
9	----	----	----	4	18	2	----	10	----
10	----	----	----	5	25	2	----	10	1 Mauna Kea
11	----	----	----	4	18	4	----	10	1 Kona
12	----	8	----	----	18	6	----	3	----
13	----	----	----	3	18	5	----	14	----
14	----	----	----	2	26	6	----	13	----
15	----	----	----	1	45	5	----	6	1 Mauna Kea
16	32	----	----	1	35	2	----	5	1 off SE. shore of Hawaii
17	----	9	----	1	41	3	----	3	----
18	----	----	----	2	70	2	----	3	1 Mauna Kea
19	----	----	----	2	31	2	----	4	1 Kona
20	----	----	----	----	23	5	----	5	----
21	----	----	2	----	38	3	----	6	----
22	----	----	----	----	46	5	----	7	----
23	47	----	----	4	33	13	----	6	----

June	24	----	8	----	2	38	3	----	4	1 off SE. shore of Hawaii
	25	----	----	----	----	42	5	----	3	----------
	26	----	20	----	3	35	6	----	6	----------
	27	----	8	----	2	35	3	1	4	1 off W. shore of Hawaii
	28	9	----	----	3	36	2	----	4	----------
	29	----	----	----	2	35	2	----	3	----------
	30	----	----	----	----	30	5	----	8	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, April, May, and June 1965

Entries for a given quake are: date, origin time (Hawaiian Standard Time), magnitude, depth, epicenter, and felt report. All earthquakes of magnitude 2.5 and larger (as well as many favorably located smaller ones) are included in the list.

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
April 1	14	01	27.3	3.5	5	19°16'	156°07'	28 km SW. of Hookena	----------
2	02	43	19.2	2.4	6.5	19°25.9'	154°51.2'	12 km SE. of Pahoa	----------
3	03	07	32.5	2.2	8	19°17.3'	155°09.7'	9 km SSE. of Makaopuhi seismometer.	----------
3	05	23	26.0	2.4	13	19°58.2'	155°33.2'	16 km ESE. of Kamuela	----------
5	16	21	44.3	2.5	8	19°08.2'	155°32.5'	10 km NE. of Naalehu	----------
6	01	21	47.8	2.4	9	19°17.5'	155°08.0'	10 km SE. of Makaopuhi seismometer.	----------
9	10	19	18.3	2.4	8	19°17.7'	155°41.8'	10 km NNE. of Puu o Keokeo.	----------
10	02	57	29.6	2.4	30	19°28.1'	155°15.7'	Beneath Kilauea summit	----------
10	05	48	35.3	3.3	35	19°22.0'	155°18.0'	---do----------	Felt: Kilauea summit area.
10	05	50	20.4	2.2	27.5	19°22.6'	155°18.2'	---do----------	----------
10	06	09	18.1	3.0	25	19°21.5'	155°19.3'	---do----------	Felt: Kilauea summit area.
10	15	34	38.0	2.2	9	19°22.6'	155°24.6'	Kaoiki fault system	----------
11	20	38	26.4	2.6	50	19°15'	154°43'	36 km SE. of Pahoa	----------
12	19	27	31.2	2.6	6.5	19°22.3'	155°30.2'	Kaoiki fault system	----------
13	05	22	13.0	2.4	9	19°16.9'	155°15.3'	10 km S. of Ahua seismometer.	----------
15	16	29	21.1	2.2	30	19°01.0'	155°16.0'	33 km ESE. of Naalehu	----------
16	00	54	40.2	3.0	40	19°52.2'	155°51.5'	10 km NNW. of Puu Waawaa	----------
16	10	30	52.0	2.5	8	19°25.6'	155°28.5'	Kaoiki fault system	----------
16	16	17	27.9	3.7	30	19°21.6'	155°16.7'	Beneath Kilauea summit	Felt: Kilauea summit area.

April	17	01	32	52.7	2.0	30	19°22.8'	155°18.9'	Beneath Kilauea summit	----------
	17	17	45	57.0	2.0	45	19°12.2'	155°08.8'	8 km SE. of Apua Point	----------
	17	18	39	24.6	2.4	8	19°50.9'	155°31.5'	11 km N. of Pohakuloa	----------
	18	07	24	57.4	2.0	8	19°26.7'	155°25.9'	Kaoiki fault system	----------
	18	19	55	20.6	2.9	8	19°24.2'	155°24.4'	---do----------	Felt: Kilauea summit area.
	18	20	47	52.0	2.0	6.5	19°24.0'	155°25.4'	---do----------	----------
	20	04	18	08.0	2.3	40	19°15.3'	155°13.7'	4 km WSW. of Apua Point	----------
	20	16	54	03.3	2.2	6.5	19°17.2'	155°14.3'	11 km SW. of Makaopuhi seismometer.	----------
	20	16	55	57.7	2.2	6.5	19°17.2'	155°14.3'	11 km SW. of Makaopuhi seismometer.	----------
	21	15	35	32.1	2.4	8	19°30.0'	155°01.0'	8 km W. of Pahoa	----------
	23	02	02	52.0	2.5	8	19°17.0'	155°10.5'	9 km S. of Makaopuhi seismometer.	----------
	23	04	10	39.7	2.0	30	19°15.3'	155°22.2'	10 km SSE. of Desert seismometer.	----------
	23	05	01	21.3	2.3	9	19°16.3'	155°08.7'	11 km SSE. of Makaopuhi seismometer.	----------
	24	10	17	28.7	2.6	5	19°11.2'	155°40.7'	17 km NW. of Naalehu	----------
	25	10	28	23.1	2.5	3	19°32.0'	154°45.0'	7 km ENE. of Cape Kumukahi.	----------
	26	18	54	21.8	2.1	9	19°22.8'	155°23.9'	Kaoiki fault system	----------
	27	23	18	14.0	3.1	10	19°31.5'	155°36.5'	5 km NW. of North Bay seismometer.	----------
	29	04	19	25.2	2.3	25	19°22.9'	155°14.8'	Beneath Kilauea summit	----------
	29	10	08	30.1	4.0	13	20°35'	157°14'	44 km S. of Lanai City, Lanai.	----------
	29	17	22	29.2	4.0	13	20°35'	157°14'	44 km S. of Lanai City, Lanai.	----------
	29	10	38	57.9	3.0	42.5	19°51.7'	155°59.1'	8 km W. of Kiholo Bay	----------
May	1	07	14	57.2	2.5	40	18°55.5'	155°12.5'	43 km ESE. of Naalehu	----------
	3	15	26	06.6	2.5	35	19°23.4'	155°17.6'	Beneath Kilauea summit	----------
	4	05	26	12.3	2.2	27.5	19°13.5'	155°25.0'	13 km SSW. of Desert seismometer.	----------
	4	09	41	32.6	2.8	13	19°16'	156°29'	68 km SW. of Kealakekua	----------
	6	19	01	59.4	2.2	35	19°22.0'	155°14.3'	Beneath Kilauea summit	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, April, May, and June 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
May 7	00	19	44.2	2.3	8	19°25.8'	155°28.8'	Kaoiki fault system	----------
7	00	47	34.7	2.0	30	19°11.6'	155°26.1'	5 km ESE. of Pahala	----------
8	14	51	48.7	2.8	13	20°04.4'	155°20.5'	5 km NE. of Paauilo	----------
9	21	42	12.5	2.4	3	19°35.2'	155°56.9'	9 km NNW. of Kealakekua	----------
10	21	02	32.5	2.6	30	19°23.3'	155°18.9'	Beneath Kilauea summit	----------
11	02	52	16.0	2.5	13	19°56.7'	155°15.3'	6 km SSW. of Laupahoehoe	----------
11	13	17	32.2	2.3	30	19°20.1'	155°17.7'	Beneath Kilauea summit	----------
12	02	58	13.4	2.1	8	19°18.8'	155°01.7'	18 km ESE. of Makaopuhi seismometer.	----------
12	03	55	13.9	2.7	13	20°02.3'	155°19.5'	6 km E. of Paauilo	----------
12	05	24	49.1	2.2	30	19°21.8'	155°19.2'	Beneath Kilauea summit	----------
12	16	10	31.0	2.2	30	19°22.9'	155°18.3'	---do----------	----------
13	07	34	13.0	2.2	10	19°15.1'	155°11.9'	1 km SW. of Apua Point	----------
13	10	46	22.7	2.3	30	19°16.6'	155°23.1'	7 km S. of Desert seismometer.	----------
16	04	27	30.7	3.5	8	19°43.2'	156°02.3'	10 km NW. of Kailua	Felt
16	09	09	42.4	3.5	8	19°20.2'	155°26.7'	Kaoiki fault system	Felt: Hilo, Pahala, Kilauea summit area.
16	17	21	39.7	2.0	30	19°20.1'	155°17.7'	Beneath Kilauea summit	----------
18	07	22	30.0	3.2	4	19°33.0'	155°37.0'	8 km NW. of North Bay seismometer.	----------
19	22	02	59.7	2.2	30	19°22.9'	155°17.3'	Beneath Kilauea summit	----------
20	07	37	00.8	2.5	8	19°09.7'	155°34.5'	11 km NNE. of Naalehu	----------
20	13	40	59.3	2.7	40	19°13.7'	155°09.4'	5 km SE. of Apua Point	----------
21	09	18	27.1	3.0	13	20°40'	155°38'	64 km ESE. of Haleakala seismometer.	----------
22	17	13	37.5	2.7	<3	19°19.8'	155°44.7'	18 km ESE. of Hookena	----------
24	01	28	08.0	3.3	8	19°22.5'	155°25.0'	Kaoiki fault system	Felt
24	08	06	44.4	2.5	<3	19°52.1'	155°36.0'	6 km E. of Waikii	----------
24	09	06	11.0	2.3	5	19°24.3'	155°30.7'	17 km SW. of Mauna Loa seismometer.	----------

May 24	20	17	26.4	3.6	10	19°23.5'	155°24.6'	Kaoiki fault system	Felt: Pahala, Hilo, Kilauea summit area.
27	03	53	47.0	2.3	10	19°53.5'	155°28.7'	16 km WSW. of Keanakolu	----------
27	21	20	19.6	2.2	6.5	19°18.1'	155°10.2'	7 km SSE. of Makaopuhi seismometer.	----------
29	09	46	42.9	2.2	13	19°23.2'	155°46.3'	14 km E. of Hookena	----------
30	03	00	27.1	3.1	25	19°22.8'	155°18.2'	Beneath Kilauea summit	Felt: Kilauea summit area.
30	04	29	12.6	2.5	27.5	19°22.9'	155°16.9'	---do----------	----------
30	04	35	07.5	2.1	27.5	19°23.9'	155°16.0'	---do----------	----------
31	00	27	03.2	2.0	8	19°51.8'	154°54.9'	25 km NE. of Hilo	----------
31	11	36	11.2	3.4	3	19°13.2'	155°39.7'	19 km NW. of Naalehu	----------
June 1	18	10	10.5	2.3	<3	19°25.8'	155°46.5'	18 km SE. of Kealakekua	----------
1	21	48	54.0	2.4	3	19°19.0'	155°45.9'	17 km SE. of Hookena	----------
2	04	47	18.2	2.0	30	19°21.5'	155°16.3'	Beneath Kilauea summit	----------
4	02	34	06.8	2.3	30	19°22.8'	155°18.6'	Beneath Kilauea summit	----------
4	02	39	48.4	3.1	40	19°23.4'	155°16.6'	---do----------	Felt: Kilauea summit area.
4	04	25	38.9	2.6	5	19°30.1'	155°48.8'	11 km ESE. of Kealakekua	----------
4	17	48	55.4	2.5	<3	19°52.4'	155°49.7'	11 km NNE. of Puu Waawaa	----------
5	18	13	29.7	2.2	30	19°22.8'	155°18.6'	Beneath Kilauea summit	----------
7	04	39	59.0	2.4	35	19°22.8'	155°18.6'	---do----------	----------
7	15	40	43.8	3.5	25	19°22.6'	155°19.4'	Beneath Kilauea summit	Felt: Kilauea summit area, Mauna Loa summit area, Pahala.
9	19	18	55.0	2.7	6.5	19°22.7'	155°25.7'	Kaoiki fault system	----------
10	03	36	34.5	2.3	30	19°23.5'	155°18.7'	Beneath Kilauea summit	----------
10	11	22	42.1	2.3	8	19°47.1'	155°34.8'	7 km WNW. of Pohakuloa	----------
11	00	54	13.9	2.1	10	19°16.1'	155°14.1'	12 km SSE. of Ahua seismometer.	----------
11	11	29	01.0	2.6	1.5	19°28.2'	155°45.2'	18 km ESE. of Kealakekua	----------
11	17	38	14.9	2.9	10	19°19.0'	155°13.4'	7 km SW. of Makaopuhi seismometer.	----------
14	03	46	40.4	2.3	10	19°20.3'	155°04.0'	12 km ESE. of Makaopuhi seismometer.	----------
15	10	28	59.0	2.8	3	19°52.8'	155°41.6'	5 km NW. of Waikii	----------
15	23	08	04.7	2.3	8	19°12.1'	155°30.7'	4 km W. of Pahala	----------
16	00	28	30.5	2.4	8	19°11.0'	155°30.7'	4 km SW. of Pahala	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, April, May, and June 1965--Continued

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
June 16	03	57	14.6	2.3	42.5	19°26.7'	155°02.9'	17 km ENE. of Makaopuhi seismometer.	----------
16	13	10	24.9	2.0	10	18°54.5'	155°26.5'	23 km SE. of Naalehu	----------
16	13	37	39.1	2.0	<3	19°13.5'	155°28.5'	2 km N. of Pahala	----------
18	19	16	34.1	2.7	10	19°48.6'	155°43.3'	10 km SW. of Waikii	----------
19	02	43	08.7	2.5	3	19°39.7'	155°56.0'	7 km ENE. of Kailua	----------
19	13	29	21.1	2.7	8	19°17.8'	155°14.6'	9 km SSE. of Ahua seismometer.	----------
23	13	21	44.9	2.4	6.5	19°24.4'	155°26.5'	Kaoiki fault system	----------
23	15	48	32.8	2.8	8	19°23.1'	155°26.4'	---do----------	----------
24	15	32	27.7	2.3	40	19°11.7'	155°06.6'	11 km SE. of Apua Point	----------
24	21	18	05.6	2.3	8	18°55.7'	155°13.4'	41 km ESE. of Naalehu	----------
25	17	01	38.3	2.2	10	19°16.8'	155°05.9'	13 km SE. of Makaopuhi seismometer.	----------
27	23	43	09.5	3.3	13	19°31'	156°31'	63 km W. of Kealakekua	----------
30	23	18	30.5	2.1	9	19°19.7'	155°05.8'	10 km ESE. of Makaopuhi seismometer.	----------

Table 5.--Distant earthquakes

Times are reported in Greenwich Civil Time which is 10 hours faster than Hawaiian Standard Time. A "c" following the time of P indicates compressional first motion; a "d" indicates dilatational first motion. Station symbols, locations, and instrumentation are presented in table 6, Summary 37. Magnitudes calculated from the Hawaii seismograms are followed by (HVO). Location of epicenter, origin times, and focal depths, and magnitudes reported by other institutions are taken from "Preliminary Determination of Epicenters" published by the U.S. Coast and Geodetic Survey.

April 4, 1965

M	Z	iP	13:38:08.5 d
A	Z	iP	09.5 d
D	Z	iP	09.6 d
U	Z	iP	09.1 d
Pa	Z	iP	10.5 d
Hi	Z	eP	07.5 d
NB	Z	eP	07.8 d
Ke	Z	eP	05.9 d
U	PEZ	eR	13:48:31
M	Z	Tmax	14:20:46
A	Z	Tmax	43
U	Z	Tmax	31
Pa	Z	Tmax	28
Hi	Z	Tmax	00

C&GS card 037-65:
13:30:37.8
51.9° N., 175.2° E.
Rat Islands, Aleutian Islands
h about 40 km
Magnitude 6 (Pas)
5.4 (Brk)
6-6.25 (Pal)
5.7 (CGS)
5.5 (HVO).

April 4

Pa	Z	eP	20:21:58.3 c
Hi	Z	iP	59.5 c
Ke	Z	eP	20:22:03.0 c

C&GS card 037-65:
20:09:41.1
8.8° S., 74.5° W.
Peru-Brazil border region
h about 143 km
Magnitude 5.3 (CGS).

April 5

U	PEZ	er	06:48:43
Ke	Z	Tmax	07:35:44

C&GS card 040-65:
06:21:34.2
3.2° S., 148.4° E.
Bismarck Sea
h about 10 km
Magnitude 5.0 (CGS).

April 5

M	Z	eP	14:01:07.7 c
MP	Z	eP	09.6 c
Hi	Z	iP	08.5 c
NB	Z	eP	07.1 c
U	PEE	eG	14:13:15
U	PEZ	eR	14:15:03

C&GS card 038-65:
13:52:13.4
44.6° N., 151.1° E.
Kurile Islands region
h about 81 km
Magnitude 5 (Brk), 5.5-5.75 (Pal), 5.7 (CGS), 5.5 (HVO).

April 8

Pa	Z	iP	12:58:43.8 d
Na	Z	iP	39.3 d
Hi	Z	iP	45.6 d
NB	Z	iP	42.4 d
Ke	Z	iP	40.9 d

C&GS card 038-65:
12:51:27.8
17.6° S., 178.7° W.
Fiji Islands region

April 8, 1965--Continued

C&GS card 038-65--continued
h about 575 km
Magnitude 5.25-5.5 (Brk),
5.2 (CGS).

April 8

NB	Z	iP	13:51:43.1 d
U	PEN	eS	13:57:54
U	PEZ	iR	14:02:22

C&GS card 039-65:
13:43:52.8
52.2° N., 173.5° E.
Near Islands, Aleutian Islands
Felt on Shemya
Magnitude 5.75 (Pas), 6 (Pal),
5.4 (CGS), 5.6 (HVO).

April 9

U	PEN	eS	11:03:04
U	PEZ	eR	11:11:30

C&GS card 043-65:
10:45:29.4
32.6° S., 178.3° W.
South of Kermadec Islands
h about 52 km
Magnitude 5.1 (CGS).

April 9

U	PEZ	eR	23:26:20

C&GS card 042-65:
22:52:24.3
4.2° S., 134.1° E.
West New Guinea region
h about 33 km
Magnitude 5.6 (CGS).

April 10

M	Z	iP	22:40:05.1 d
A	Z	eP	04.8 d
U	Z	eP	04.9 d
Pa	Z	eP	06.7 d
Na	Z	eP	01.0 d

April 10--Continued

Hi	Z	iP	07.8 d
NB	Z	iP	04.2 d
Ke	Z	iP	01.9 d
Ha	Z	eP	09.1 d
U	PEN	eS	22:46:02
U	PEZ	eSS	22:49:42

C&GS card 040-65:
22:32:46.6
17.8° S., 178.8° W.
Fiji Islands region
h about 543 km
Magnitude 6 (Pas), 5.5-5.75 (Brk),
5.9 (CGS).

April 10

M	Z	iP	23:00:42.2 d
A	Z	eP	42.7 d
MP	Z	eP	43.3 d
U	Z	eP	42.6 d
Pa	Z	eP	44.5 d
Na	Z	iP	39.9 d
NB	Z	iP	41.2 d
Ha	Z	eP	44.9 d

C&GS card 040-65:
22:53:04.8
13.4° S., 170.3° E.
New Hebrides Islands region
h about 644 km
Magnitude 6.2 (CGS).

April 11

M	Z	iP	00:22:11.8 c
MP	Z	eP	11.3 c
U	Z	iP	11.3 c
Hi	Z	eP	13.3 c
NB	Z	eP	11.1 c
Ke	Z	iP	10.2 c

C&GS card 039-65:
00:11:08.8
42.7° S., 173.9° E.
South Island, New Zealand
h about 7 km
Magnitude 6.2 (CGS).

April 11, 1965

M	Z	iP	18:59:55.0 c
A	Z	eP	54.5 c
D	Z	eP	53.9 c
MP	Z	eP	54.7 c
Pa	Z	iP	56.6 c
Na	Z	eP	51.7 c
Hi	Z	eP	58.0 c
Ke	Z	iP	53.0 c
Ha	Z	eP	19:00:00.4 c

C&GS card 040-65:
18:51:38.1
26.2° S., 178.5° E.
South of Fiji Islands
h about 581 km
Magnitude 5.6 (CGS).

April 12

M	Z	Tmax	04:46:02
A	Z	Tmax	04:46:06
D	Z	Tmax	04:45:56
MP	Z	Tmax	04:46:07
U	Z	Tmax	04:46:07
Pa	Z	Tmax	04:46:07
Hi	Z	Tmax	04:45:42
NB	Z	Tmax	04:45:38
Ha	Z	Tmax	04:44:31

C&GS card 040-65:
03:59:40.2
56.6° N., 152.7° W.
Kodiak Island region
h about 33 km
Magnitude 5.3 (CGS).

April 12

M	Z	iP	20:50:44.5 c
A	Z	eP	45.5 c
D	Z	iP	44.9 c
MP	Z	eP	45.9 c
U	Z	eP	45.2 c
Na	Z	iP	44.4 c
Hi	Z	iP	45.6 c
NB	Z	iP	43.7 c
Ha	Z	iP	36.2 c

April 12--Continued

C&GS card 039-65
20:41:16.3
30.2° N., 138.5° E.
South of Honshu, Japan
h about 421 km
Magnitude 5.75-6 (Brk)
5.8 (CGS).

April 16

M	Z	eP	23:30:39.0 c
A	Z	eP	39.7 c
D	Z	eP	40.0 c
MP	Z	eP	39.7 c
U	Z	eP	39.7 c
Pa	Z	eP	38.2 c
Na	Z	iP	42.7 c
Hi	Z	eP	36.8 c
Ke	Z	iP	38.7 c
Ha	Z	eP	29.4 c
U	PEE	eS	23:37:36
U	PEE	eG	23:40:52

C&GS card 040-65:
23:22:18.6
64.7° N., 160.1° W.
Central Alaska
Felt at Norton Sound vicinity
h about 5 km
Magnitude 5.75-6 (Pas), 5.75-6 (Brk), 5.8 (CGS), 6.0 (HVO).

April 18

U	PEZ	eR	06:47:59
M	Z	Tmax	07:14:31
A	Z	Tmax	33
D	Z	Tmax	43
MP	Z	Tmax	37
U	Z	Tmax	36
Pa	Z	Tmax	18
Hi	Z	Tmax	02
NB	Z	Tmax	49
Ha	Z	Tmax	12

April 18, 1965--Continued

C&GS card 045-65:
06:33:58.8
41.5° N., 127.1° W.
Off coast of northern Calif.
h about 20 km
Magnitude 6 (Brk), 5.75-6 (Pal), 5.6 (CGS).

April 18

M	Z	iP'	09:58:20.9 c
U	PEZ	eR	10:37:19

C&GS card 040-65:
09:39:18.7
59.8° S., 26.8° W.
South Sandwich Islands region
h about 29 km
Magnitude 5.5 (Brk), 5.9 (CGS).

April 18

U	PEZ	eR	13:40:39

C&GS card 044-65:
12:41:54.9
59.7° S., 26.4° W.
South Sandwich Islands region
h about 25 km
Magnitude 6 (Pal), 5.8 (CGS).

April 19

M	Z	iP	23:52:13.4 c
D	Z	eP	13.9 c
MP	Z	iP	15.3 c
Na	Z	eP	14.0 c
Hi	Z	iP	15.0 c
NB	Z	eP	11.8 c
Ke	Z	iP	10.4 c
Ha	Z	eP	04.7 c
U	PEZ	eR	00:09:20

C&GS card 039-65:
23:41:58.8
34.9° N., 138.0° E.
Near south coast of Honshu, Japan
h about 36 km
Magnitude 5.6 (CGS), 5.9 (HVO).

April 20

WP	Z	iP	06:58:56.1 c

C&GS card 042-65:
06:50:17.6
54.6° N., 161.4° E.
Near east coast of Kamchatka
h about 33 km
Magnitude 5.3 (CGS).

April 22

U	PEZ	eR	18:53:58

C&GS card 042-65:
18:36:01.2
51.8° N., 176.1° E.
Rat Islands, Aleutian Islands
h about 37 km
Magnitude 4.5 (Brk), 5.1 (CGS).

April 24

M	Z	eP	22:05:46.7 d
U	PEZ	eR	22:23:38

C&GS card 042-65:
21:55:26.5
11.4° N., 140.1° E.
West Caroline Islands
h about 59 km
Magnitude 5.7 (CGS).

April 25

M	Z	iP	01:10:00.2 c
D	Z	iP	00.2 c
NB	Z	eP	01:09:58.2 c
U	PEZ	eR	01:27:17.9

C&GS card 041-65:
01:00:11.6
24.5° N., 142.7° E.
Volcano Islands region
h about 15 km
Magnitude 5.75-6 (Pas), 5.6 (CGS).

April 26, 1965

M	Z	iP	02:04:52.1 c
A	Z	eP	52.5 c
D	Z	iP	53.1 c
Ke	Z	eP	52.5 c
M	Z	ePP	02:06:35.6 d
NB	Z	ePP	36.3 d

C&GS card 041-65:
01:57:14.4
58.9° N., 142.7° W.
Gulf of Alaska
h about 33 km
Magnitude 5.3 (CGS).

April 26

M	Z	eP	09:59:34
U	PEZ	eR	10:23:59

C&GS card 044-65:
09:47:25.1
1.7° S., 126.6° E.
Molucca Sea
h about 15 km
Magnitude 5.75-6 (Pal),
5.7 (CGS), 5.8 (HVO).

April 26

M	Z	iP	20:36:09.4 c
U	PEZ	iS	20:41:37
U	PEZ	iR	20:45:01
M	Z	Tmax	21:13:21
A	Z	Tmax	35
D	Z	Tmax	35
MP	Z	Tmax	28
U	Z	Tmax	38
Pa	Z	Tmax	19
Hi	Z	Tmax	21:12:52
NB	Z	Tmax	21:13:42
Ha	Z	Tmax	21:11:34

C&GS card 041-65:
20:29:07.4
54.5° N., 162.6° W.
Alaska Peninsula
h about 53 km
Magnitude 5.9 (CGS).

April 26

M	Z	iP	22:27:39.9 c
D	Z	iP	39.9 c
NB	Z	eP	38.2 c
U	PEE	eS	22:38:07
U	PEZ	eR	22:51:13

C&GS card 042-65:
22:15:42.5
21.1° N., 120.7° E.
Taiwan region
h about 33 km
Magnitude 5.9 (CGS), 6.0 (HVO).

April 27

M	Z	eP	11:06:24.2 d
A	Z	eP	24.2 d

C&GS card 043-65:
10:54:28.0
7.0° S., 129.5° E.
Banda Sea
h about 67 km
Magnitude 5.9 (CGS).

April 29

M	Z	iP	11:28:54.5 d
A	Z	eP	55.2 d
D	Z	eP	54.2 d

C&GS card 043-65:
11:19:25.6
15.3° N., 145.6° E.
Mariana Islands
h about 134 km
Magnitude 5.2 (CGS).

April 29

M	Z	eP	11:37:56.2 d
A	Z	eP	55.3 d

C&GS card 049-65:
11:28:19.1
32.5° S., 179.1° W.
South of Kermadec Islands
h about 64 km
Magnitude 5.0 (CGS).

Table 5.--Distant earthquakes--Continued

April 29, 1965

M	Z	eP	15:36:03.2 d
A	Z	eP	03.7 d
MP	Z	eP	03.4 c
U	Z	eP	03.2 d
Pa	Z	eP	01.6 d
Na	Z	iP	07.3 d
Hi	Z	iP	00.2 d
NB	Z	iP	04.9 d
Ke	Z	iP	06.0 d
Ha	Z	iP	15:35:59.7 d
U	PEZ	ePP	15:37:41
U	PEZ	iS	15:41:57
U	PEZ	iR	15:46:05
M	Z	Tmax	16:15:38
A	Z	Tmax	26
U	Z	Tmax	34
NB	Z	Tmax	40
Ha	Z	Tmax	03

C&GS card 044-65:
15:28:43.3
47.4° N., 122.4° W.
Washington, two killed, some injured, moderate property damage in Seattle area, felt in Oregon, Idaho, Montana, British Columbia, and on Vancouver.
h about 57 km
Magnitude 6.6 (Pas), 6.75-7 (Brk), 7.25 (Pal), 6.5 (CGS), 6.6 (HVO).

May 1

M	Z	iP	13:12:46.9 c
D	Z	eP	46.8 c

C&GS card 042-65:
13:02:44.5
12.3° N., 143.7° E.
South of Mariana Islands
h about 5 km
Magnitude 5.1 (CGS).

May 1

M	Z	iP	21:35:39.9 c
A	Z	iP	40.3 c
D	Z	iP	40.9 c
Ke	Z	eP	39.8 c

C&GS card 042-65:
21:27:54.4
60.4° N., 146.0° W.
Southern Alaska
h about 33 km
Magnitude 5.3 (CGS).

May 3

U	PEZ	eR	10:30:37

C&GS card 044-65:
10:01:35.2
13.5° N., 89.3° W.
El Salvador
125 killed; 400 injured;
4,000 homes wrecked in San Salvador
Cisneros district, San Marcos and Santo Tomas.
h about 23 km
Magnitude 6.25 (Pas), 6-6.25 (Pal), 5.1 (CGS).

Table 5.--Distant earthquakes--Continued

May 11, 1965

M	Z	iP	17:45:25.9 c
A	Z	iP	26.6 c
D	Z	iP	26.7 c
NB	Z	eP	26.1 c
Ke	Z	iP	26.1 c

C&GS card 044-65:
17:37:38.3
61.4° N., 149.6° W.
Southern Alaska
Felt widely in the Anchorage area.
h about 58 km
Magnitude 5.5 (CGS).

May 12

M	Z	iP	10:45:27.7 d
A	Z	iP	27.7 d
D	Z	iP	26.9 d
U	Z	iP	27.7 d
Na	Z	iP	25.4 d
Hi	Z	iP	29.5 d
Ka	Z	eP	26.0 d
Ke	Z	iP	24.6 d
Ha	Z	iP	24.6 d

C&GS card 046-65:
10:33:43.5
6.2° S., 130.3° E.
Banda Sea
Felt at Darwin
h about 125 km
Magnitude 5.25-5.5 (Pal), 5.7 (CGS).

May 13

M	Z	iP	19:32:53.5 c
A	Z	iP	53.6 c
Ke	Z	iP	50.4 c

C&GS card 046-65:
19:23:16.6
33.2° N., 138.0° E.
Near south coast of Honshu, Japan.
h about 324 km
Magnitude 4.8 (CGS).

May 16, 1965

M	Z	iP	11:47:45.6 c
A	Z	iP	45.8 c
MP	Z	iP	46.3 c
U	Z	iP	45.7 c
Pa	Z	eP	47.1 c
Hi	Z	iP	47.1 c
NB	Z	eP	44.4 c

C&GS card 047-65:
11:35:46.0
5.3° N., 125.7° E.
Mindanao, Philippine Islands
h about 36
Magnitude 6.2 (CGS).

May 17

M	Z	iP	17:31:19.9 d
D	Z	iP	19.7 d
U	Z	iP	20.5 d
Na	Z	eP	19.3 d
Hi	Z	iP	20.8 d
NB	Z	iP	19.0 d
U	PEN	iS	17:41:07
U	PEZ	eSS	17:46:15
U	PEN	eG	17:51:03
U	PEZ	iR	17:55:07

C&GS card 047-65:
17:19:25.9
22.5° N., 121.3° E.
Taiwan region
Felt at Hong Kong
h about 21 km
Magnitude 6.5 (Pas), 5.75-6 (Brk), 6.2 (CGS), 6.5 (HVO).

May 18

M	Z	eP	22:55:53.1 d
D	Z	eP	53.6 d

C&GS card 047-65
22:46:31.7
43.7° N., 146.5° E.
Kurile Islands
h about 45 km
Magnitude 5.4 (CGS).

May 19

A	Z	eP	03:10:14.6 d
D	Z	iP	13.7 d
MP	Z	eP	14.9 d
U	Z	iP	14.5 d
Pa	Z	eP	15.5 d
Na	Z	iP	11.2 d
Hi	Z	iP	16.6 d
NB	Z	iP	13.0 d

C&GS card 049-65:
03:00:59.0
9.2° S., 159.0° E.
Solomon Islands
Felt at Honiara
h about 50 km
Magnitude 5.6 (CGS).

May 20

M	Z	iP	00:49:09.8 c
A	Z	iP	09.4 c
D	Z	iP	08.5 c
MP	Z	iP	09.9 c
U	Z	iP	09.6 c
Pa	Z	iP	11.1 c
Na	Z	iP	06.3 c
Hi	Z	iP	12.5 c
NB	Z	iP	08.6 c
Ke	Z	iP	06.8 c
U	PEZ	iS	00:56:21
U	PEZ	iSS	00:59:57
U	PEN	iG	01:00:55
U	PEZ	iR	01:03:03
M	Z	Tmax	01:42:32
A	Z	Tmax	28
Na	Z	Tmax	05
NB	Z	Tmax	37
Ke	Z	Tmax	16
Ha	Z	Tmax	38

C&GS card 049-65:
00:40:10.9
14.7° S., 167.4° E.
New Hebrides Islands
Felt
h about 16 km
Magnitude 6.75-7 (Pas), 7 (Brk), 5.6 (CGS), 7.2 (HVO).

May 22, 1965

M	Z	iP	03:17:47.3 c
A	Z	eP	47.3 c
NB	Z	iP	46.1 c

C&GS card 049-65:
03:05:43.6
1.3° N., 126.3° E.
Molucca Passage
h about 25 km
Magnitude 5.5 (CGS).

May 22

M	Z	iP	10:39:15.9 d
Ke	Z	iP	13.9 d
U	PEZ	eS	10:45:23

C&GS card 049-65:
10:31:39.5
21.1° S., 178.7° W.
Fiji Islands region
h about 578 km
Magnitude 6.75-7 (Brk), 5.8 (CGS).

May 23

M	Z	iP	23:53:49.5 c
D	Z	eP	50.1 c
U	Z	eP	50.0 c
Pa	Z	eP	50.5 c
Hi	Z	eP	48.8 c
NB	Z	iP	48.6 c
U	PEZ	eS	23:59:56
U	PEE	eG	00:02:35
U	PEZ	iR	00:04:35
Ha	Z	Tmax	00:33:58

C&GS card 047-65:
23:46:12.0
52.2° N., 175.0° E.
Near Islands, Aleutian Islands
h about 22 km
Magnitude 6 (Pas), 6.1 (CGS), 5.8 (HVO).

May 24

A	Z	iP	23:33:10.3 c
D	Z	eP	10.2 c
MP	Z	iP	11.1 c
U	Z	eP	10.5 c
Pa	Z	eP	12.3 c
Hi	Z	iP	12.5 c
NB	Z	eP	08.2 c
Ke	Z	iP?	07.6 c
Ha	Z	eP	05.7 c
U	PEE	eS	23:43:16
U	PEZ	eR	23:56:08

C&GS card 048-65:--Continued
23:21:10.6
13.0° N., 124.5° E.
Samar, Philippine Islands
h about 33 km
Magnitude 5.75-6 (Pal), 6.0 (HVO), 5.9 (CGS).

May 25

U	PEN	eS	13:21:02
U	PEZ	iR	13:25:00

C&GS card 048-65:
13:07:49.7
51.3° N., 178.7° E.
Rat Islands, Aleutian Islands
h about 40 km
Magnitude 5 (Brk), 5.75-6 (Pal), 5.5 (CGS), 5.5 (HVO).

May 25

U	PEZ	iR	18:55:20

C&GS card 051-65:
18:34:28.4
17.0° S., 175.9° E.
Fiji Islands region
h about 16 km
Magnitude 5.2 (CGS).

May 26

M	Z	iP'	20:03:02.7 c
NB	Z	iP'	02.2 c

C&GS card 053-65:
19:44:10.9
56.1° S., 27.6° W.
South Sandwich Islands region
h about 120 km
Magnitude 6.7 (CGS).

May 29

U	PEZ	eR	16:11:04

C&GS card 051-65:
15:36:31.9
57.8° S., 147.3° W.
South Pacific Cordillera
h about 33 km
Magnitude 5.5 (CGS).

May 31, 1965

M	Z	Tmax	05:48:55
A	Z	Tmax	53
U	Z	Tmax	53
Pa	Z	Tmax	40
Hi	Z	Tmax	27
NB	Z	Tmax	57
Ha	Z	Tmax	33

C&GS card 052-65:
05:07:43.4
44.1° N., 128.8° W.
Off coast of Oregon
h about 33 km
Magnitude 5.5 (CGS).

May 31

WP	Z	eP	11:50:36.5 d
U	PEZ	eR	12:14:37

C&GS card 050-65:
11:38:28.0
7.5° S., 128.7° E.
Banda Sea
h about 37 km
Magnitude 6.0 (CGS).

June 2

M	Z	iP	05:20:58.5 d
A	Z	eP	58.2 d
MP	Z	iP	58.3 d
U	Z	iP	58.2 d
Ke	Z	iP	56.2 d
NB	Z	iP	57.5 d
Hi	Z	iP	05:21:00.2 d

C&GS card 050-65:
05:12:59.1
23.5° S., 180.0° E.
South of Fiji Islands
h about 539 km
Magnitude 5.5 (Brk), 5.6 (CGS).

June 2

MP	Z	eP	14:53:10.7 d
Pa	Z	eP	13.2 d
Na	Z	iP	08.4 d
Hi	Z	eP	14.8 d
NB	Z	iP	10.4 d
Ke	Z	iP	10.1 d

C&GS card 050-65:
14:45:55.8
17.9° S., 179.5° W.
Fiji Islands region
h about 637 km
Magnitude 5.1 (CGS).

June 2

M	Z	iP	15:05:48.9 d
A	Z	eP	48.5 d
U	Z	iP	48.5 d
Pa	Z	iP	49.4 d
Hi	Z	iP	51.0 d
NB	Z	iP	47.1 d
Ke	Z	iP	46.4 d

C&GS card 050-65:
14:58:31.9
18.0° S., 179.4° W.
Fiji Islands region
h about 621 km
Magnitude 4.5 (Brk), 5.1 (CGS).

June 4

M	Z	iP	15:35:57.5 c
A	Z	iP	57.0 c
MP	Z	iP	57.1 c
Pa	Z	eP	58.6 c
Hi	Z	eP	59.7 c
Ke	Z	iP	55.8 c

C&GS card 052-65:
15:26;54.7
29.9° S., 178.8° W.
Kermadec Islands region
h about 225 km
Magnitude 5.3 (CGS).

June 10

M	Z	iP	15:28:43.5 d
A	Z	eP	43.8 d

C&GS card 054-65:
15:16:50.5
1.9° N., 126.6° E.
Molucca Passage
h about 106 km
Magnitude 5.0 (CGS).

June 11

M	Z	eP	03:42:56.2 c
D	Z	eP	57.0 c
NB	Z	eP	54.9 c
U	PEE	iS	03:50:21
U	PEN	iG	03:55:27
U	PEZ	iR	03:57:37

C&GS card 052-65:
03:33:44.9
44.7° N., 148.7° E.
Kurile Islands
h about 47 km
Magnitude 6.75 (Pas), 6.5 (Brk), 6.0 (CGS), 6.5 (HVO).

June 13, 1965

U	PEZ	eS	07:24:05
U	PEZ	eR	07:31:37

C&GS card 053-65:
07:06:13.6
41.9° N., 143.4° E.
Hokaaido, Japan region
h about 32 km
Magnitude 6-6.25 (Brk), 6 (Pal), 5.7 (CGS), 6.1 (HVO).

June 14

Pa	Z	Tmax	10:20:48
NB	Z	Tmax	51
Ha	Z	Tmax	28

C&GS card 054-65:
09:40:09.5
44.6° N., 129.5° W.
Off coast of Oregon
h about 33 km
Magnitude 5.5-5.75 (Pal), 5.2 (CGS).

June 14

Pa	Z	Tmax	13:46:49
NB	Z	Tmax	13:47:05
Ha	Z	Tmax	13:46:06

C&GS card 054-65:
13:05:54.0
44.5° N., 129.4° W.
Off coast of Oregon
h about 33 km
Magnitude 5.0 (CGS).

June 14

Pa	Z	Tmax	15:16:33
NB	Z	Tmax	51
Ha	Z	Tmax	06

No C&GS listing.

June 15

A	Z	eP	09:30:46.6 c

C&GS card 054-65:
09:20:29.8
37.9° S., 177.5° E.
Off east coast of North Island, New Zealand.
Felt from Bay of Plenty to Wellington.
h about 58 km
Magnitude 5.25 (Pal), 6.2 (CGS).

June 15

U	PEZ	eP	23:19:35
U	PEN	iS	23:26:37
U	PEZ	eSS	23:30:07
U	PEZ	iR	23:33:47

C&GS card 056-65:
23:10:25.2
20.9° S., 173.7° E.
New Hebrides Islands region
h about 22 km
Magnitude 6 (Brk), 6.25 (Pas), 6.5 (Pal), 5.7 (CGS), 6.0 (HVO).

June 17

M	Z	eP	11:01:25.8 d
A	Z	eP	25.1 d
MP	Z	eP	25.3 d
U	Z	eP	25.2 d
Ke	Z	iP	24.3 d

C&GS card 063-65:
10:51:37
33.9° S., 179.5° W.
South of Kermadec Islands
h about 33 km
Magnitude 5.3 (CGS).

June 20

Pa	Z	Tmax	18:45:38

C&GS card 055-65:
18:04:35.7
42.8° N., 126.5° W.

June 20--Continued

C&GS card 055-65--Continued:
Off coast of Oregon
h about 33 km
Magnitude 5 (Brk), 5.25-5.5 (Pal), 5.6 (CGS).

June 22

U	PEZ	eR	13:36:35

C&GS card 058-65:
13:13:23.1
20.9° S., 173.2° E.
New Hebrides Islands region
h about 80 km
Magnitude 4.7 (CGS).

June 22-23

U	Z	eP	00:00:23.2 c
U	PEZ	eR	00:24:37

C&GS card 055-65:
23:48:07.1
7.1° N., 123.5° E.
Mindanao, Philippine Islands
h about 60 km
Magnitude 5.6 (CGS).

June 23

M	Z	iP	11:16:24.8 d
A	Z	eP	25.7 d
D	Z	eP	26.2 d
Na	Z	eP	31.0 d
NB	Z	eP	24.8 d
U	PEZ	iS	11:22:15
U	PEE	iG	11:24:37
U	PEZ	iR	11:26:25
M	Z	Tmax	11:55:47
A	Z	Tmax	43
D	Z	Tmax	54
MP	Z	Tmax	38
U	Z	Tmax	36
Pa	Z	Tmax	40
Hi	Z	Tmax	11
NB	Z	Tmax	33

June 23--Continued

Ha	Z	Tmax	11:54:09

C&GS card 054-65:
11:09:15.3
56.6° N., 152.9° W.
Kodiak Island region
h about 36 km
Magnitude 6.25-6.5 (Pas), 5.75 (Brk), 5.7 (CGS), 6.1 (HVO).

June 23

M	Z	Tmax	13:09:57
A	Z	Tmax	51
D	Z	Tmax	55
MP	Z	Tmax	44
U	Z	Tmax	44
Pa	Z	Tmax	49
Hi	Z	Tmax	21
NB	Z	Tmax	48
Ha	Z	Tmax	13:08:12

C&GS card 054-65:
12:23:22.2
56.6° N., 152.8° W.
Kodiak Island region
h about 25 km
Magnitude 6.0 (CGS).

June 24

M	Z	iP	07:57:04.0 d

C&GS card 055-65:
07:45:13.6
7.0° N., 126.2° E.
Mindanao, Philippine Islands
h about 50 km
Magnitude 6.0 (CGS).

June 24

M	Z	eP	14:17:22.1 d

C&GS card 056-65:
14:08:31.2
23.6° S., 176.7° W.
South of Fiji Islands
h about 91 km
Magnitude 5.5 (CGS).

Table 5.--Distant earthquakes--Continued

June 27, 1965

M	Z	Tmax	12:01:19
U	Z	Tmax	16
Pa	Z	Tmax	08
Hi	Z	Tmax	12:00:48
Ha	Z	Tmax	11:59:58

C&GS card 055-65:
11:08:55.9
60.3° N., 141.2° W.
Southeastern Alaska
h about 12 km
Magnitude 5 (Brk), 5.3 (CGS).

June 28

Na	Z	iP	03:43:12.1 c
Hi	Z	eP	17.1 c
NB	Z	eP	12.8 c
Ke	Z	iP	10.4 c
U	PEZ	eS	03:51:29
U	PEZ	eSS	03:55:29
U	PEZ	eR	03:59:37
M	Z	Tmax	04:43:55
A	Z	Tmax	59
D	Z	Tmax	56
U	Z	Tmax	48
Ke	Z	Tmax	36
NB	Z	Tmax	04:44:05

C&GS card 057-65:
03:33:36.5
5.1° S., 153.0° E.
New Ireland region
h about 50 km
Magnitude 5.25-5.5 (Brk), 6.25-6.5 (Pal),
6.1 (CGS), 5.7 (HVO).

The following persons or agencies reported "felt" earthquakes during the 2nd quarter, 1965. Their assistance is gratefully acknowledged.

Mauna Loa summit area

Mauna Loa Observatory

Kilauea summit area

Mr. B. Loucks
Mr. and Mrs. H. W. Mist
Mrs. M. Gorder
Mr. G. Yong
Mrs. V. Hansen
Miss M. English
Mrs. K. Yamamoto
Mr. C. Wentworth
Mr. J. Forbes

Kona

Mrs. Johnston

Kau

Mrs. A. Paiva

Hilo region

Mr. S. Ho
Mrs. T. Crabb
Mrs. H. Lewis
Mrs. B. Shaffer

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HAWAIIAN VOLCANO OBSERVATORY

Summary 39

July, August, and September, 1965

By

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Issued October, 1966

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Summary of activities

The summer quarter of 1965 had very little seismic activity and there was moderate swelling of the Kilauea volcanic edifice. The daily number of upper east rift quakes averaged about nine for the three months; against this background the swarm of more than 500 quakes that occurred August 24-26 was conspicuous. Only once, September 4 and 5, were more than 100 shallow Kilauea quakes recorded in a 24-hour period. Each of these two small seismic events coincided in time with an inconspicuous change from slight swelling to slight decline in the pattern of tilting that is read daily from the short-base tilt instrument in Uwekahuna Vault.

Three rather conspicuous episodes of moderate swelling were recorded by this same instrument, from July 1 to August 3, from August 13 to the 18th, and from September 12 to the 30th, separated by slight relaxation or aimless wandering. The total swelling amounts to about 25 microradians (25 mm tilt in 1 km of distance) and the direction of the center of swelling passes eastward through about the center of Kilauea. The pattern of swelling given by the plotting of movement at the long-base tiltmeter stations suggests that this center of inflation is under the upper east rift rather than under Kilauea caldera center (fig. 2).

In July, about 9 months after the liquid completely solidified in Alae lake, the hottest temperature is 725°C measured at a depth of 36 feet in the drill hole where the lake was 48 feet thick.

Several new procedures were used in the study of the perched liquid lava in Makaopuhi Crater erupted in early March 1965. Motoaki Sato developed a device, in the Survey laboratories in Washington, to measure the partial pressure of oxygen from a crystallizing silicate melt. Using the device in Makaopuhi, profiles plotting fugacity of oxygen through a range of temperatures from 1,000°C to 555°C have been measured successfully, and repeated several times, in a number of holes drilled in the crust of the lava lake.

Samples of molten magma were collected through drill holes from as deep as 8 feet below the 1,070°C isotherm marking the base of resistant crust. By rapid handling, the liquid sample was water quenched to clear glass in which no crystallization of the opaque oxides had started.

A direct measurement of the viscosity of the liquid basalt at 1,120°C was made by Reginald Okamura in drill hole No. 20 through the crust of Makaopuhi lake. The measurement was made using an instrument developed by Herbert R. Shaw and built by Burton Loucks in the HVO shop. The instrument consists of a foot-long, 4-bladed, stainless steel rotor, securely coupled with a long steel shaft that is rotated by a system of pulleys and weights which had been calibrated in hot tar of known viscosity.

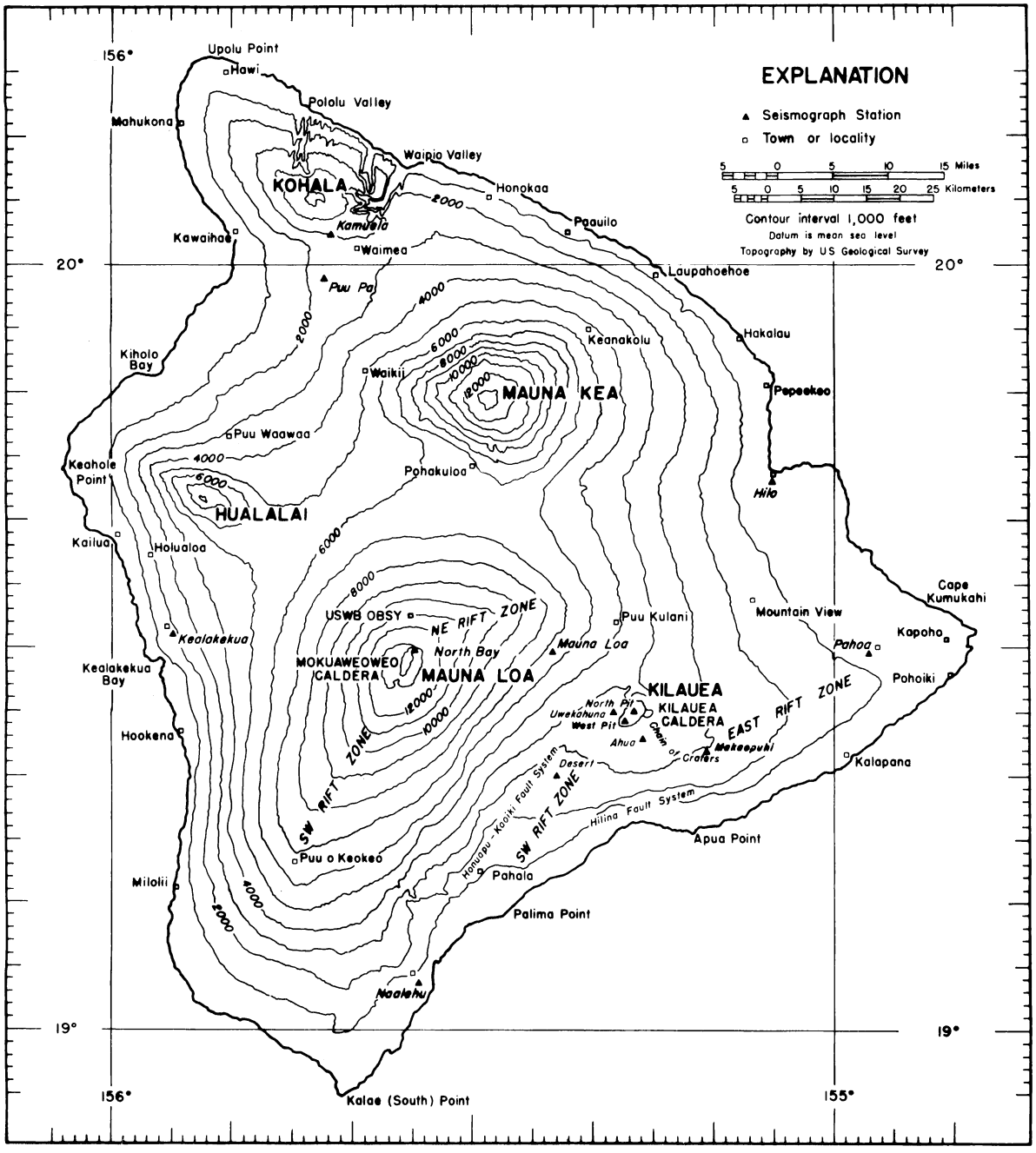

Figure 1.--Map of the island of Hawaii showing localities mentioned in the text and seismograph stations operated by the U.S. Geological Survey. Epicenters of local earthquakes are given in terms of geographic coordinates, which are indicated at the edges of the map.

Tilting of the ground around Kilauea caldera.--Tilting of the ground around the summit of Kilauea is monitored daily by a short-base water-tube tiltmeter in Uwekahuna Vault, and at irregular intervals it is measured on a regional scale by means of a network of field tilt bases and a portable water-tube tiltmeter. The attitude of the ground surface at each tilt base is reported in terms of north-south and east-west tilt coordinates. Both coordinates at each station were arbitrarily set equal to 500 when measurements at that station were begun. Increasing tilt coordinates correspond to northward and eastward tilting of the earth's surface; that is, to a relative subsidence toward the north and east. A one-unit change in coordinate corresponds to a tilting of 1 microradian (1 mm per km) in the direction indicated.

Location of and essential data on each tiltmeter station are listed in table 7, which is published only in the first-quarter issue each year.

Table 1.--Tilt coordinates at Uwekahuna Vault, July, August, and September, 1965

Date (1965)	N-S	E-W	Date (1965)	N-S	E-W
July 3	464	506	Aug. 21	470	491
10	465	509	28	470	493
17	466	504	Sept. 4	470	492
24	468	491	11	472	488
31	468	497	18	471	483
Aug. 7	468	497	25	473	480
14	469	494			

3rd Quarter, 1965

Table 2.--Tilt coordinates and changes at bases around Kilauea caldera.

(See tilt diagram, fig. 2.)

Tilt base (location)	Date (1965)	Tilt coordinates N-S	Tilt coordinates E-W	Rate (10^{-6} rad/mo) and direction of tilting since last reading		Date of last reading (1965)
Uwekahuna	Sept. 9	479.4	482.7	2.48	N. 43.0° W.	June 15
Tree Molds	Sept. 2	436.9	517.1	.68	N. 35.6° W.	9
Sand Spit	Sept. 7	871.4	723.9	1.56	S. 72.6° W.	16
Kalihipaa	Aug. 31	328.8	372.9	.88	S. 13.5° W.	8
Keamoku	Aug. 30	589.5	491.9	1.68	N. 76.8° W.	7
Ahua Kamokukolau	Aug. 30	606.6	526.7	2.6	S. 24.7° W.	15
Kipuka Nene	Aug. 31	483.5	505.3	.08	S. .2° W.	8
Hilina Pali	Not read this time					
Kapapala Ranch	Sept. 1	492.5	507.1	.76	S. 29.3° E.	7
Mehana	Sept. 9	536.3	550.5	.56	S. 47.3° E.	16

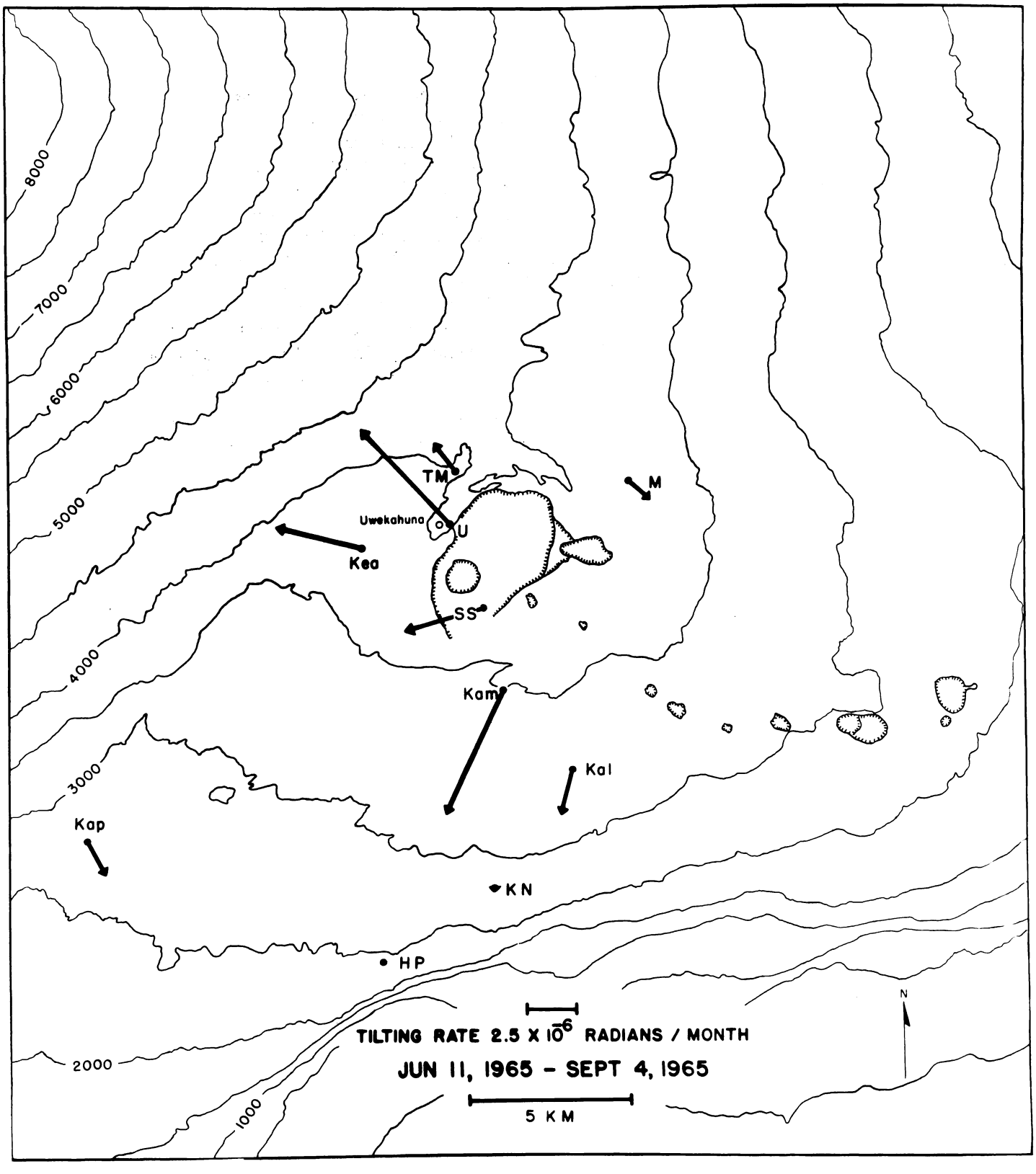

Figure 2.--Tilting of the ground around Kilauea caldera, June 11-September 4, 1965. The vector depicting tilting at a given tilt base points in the direction of maximum relative subsidence and has a length proportional to the rate of tilting during the measurement interval. Closed circles represent field tilt bases; open circles, short-base water-tube tiltmeters.

Seismic summary.--Events recorded by the U.S. Geological Survey seismograph network in Hawaii fall into two categories: Local earthquakes and tremor originating in the region of the Hawaiian Islands (usually within 100 km of at least one seismograph), and distant earthquakes originating more than 3,000 km from Hawaii. As an index of seismic activity at Hawaiian volcanoes, daily counts of earthquakes and minutes of tremor recorded by seismographs in Hawaii are listed in table 3. The earthquakes are separated into groups on the basis of region of origin as determined by analysis of records obtained daily at the Observatory (U, M, A, D, N, WP, MP). Earthquakes of magnitude 2.0 or greater are generally sufficiently well recorded to be located with greater precision; they are listed individually in table 4. Data on identifiable phases from distant earthquakes are listed in table 5.

Location of and essential data on each seismograph station are listed in table 6, which is published only in the first-quarter issue each year.

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera.

Tremor is separated into three categories: deep, intermediate, and shallow, on the basis of relative amplitudes on seismographs in the summit region. Unless otherwise stated, tremor is presumed to be associated with movement of magma within the central complex of Kilauea.

Earthquake categories are: earthquakes from a source about 30 km beneath the Kilauea summit region; shallow earthquakes in the Kilauea caldera region; shallow earthquakes along the SW. rift zone of Kilauea and the adjacent portion of the Kaoiki fault system; earthquakes along the eastern half of Kilauea's east rift zone--detected largely on the Pahoa seismograph; earthquakes from the upper east rift zone and the adjacent fault systems of Kilauea's south flank; and earthquakes from other regions: Kona, Mauna Kea, etc.

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea Summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 KM	Shallow				
July 1	----	-----	-----	2	29	8	-----	5	1 Hualalai
2	----	-----	-----	1	30	3	-----	4	----------
3	----	-----	-----	1	30	4	-----	5	1 Mauna Loa
4	----	-----	-----	5	25	9	1	5	----------
5	----	-----	-----	-----	23	5	-----	6	----------
6	----	-----	-----	3	37	5	-----	7	----------
7	----	-----	-----	1	35	2	-----	3	1 Haleakala
8	----	-----	-----	2	50	7	1	7	----------
9	----	-----	-----	2	74	4	-----	10	----------
10	----	-----	-----	3	40	9	-----	10	----------
11	4	-----	-----	6	45	10	-----	4	1 Kona
12	14	-----	-----	4	60	7	-----	6	----------
13	----	18	-----	2	30	8	-----	5	----------
14	----	4	-----	1	34	5	-----	10	1 Mauna Loa
15	----	6	-----	3	30	3	1	4	1 off W. shore of Hawaii
16	29	-----	-----	-----	35	6	-----	8	1 Mauna Loa
17	----	-----	-----	-----	32	6	-----	2	----------
18	----	-----	-----	-----	35	2	3	6	----------
19	----	-----	-----	-----	47	2	-----	5	----------
20	----	-----	3	1	35	4	-----	9	----------

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea Summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 KM	Shallow				
July 21	----	-----	-----	-----	24	3	1	3	----------
22	----	5	-----	1	50	12	------	12	1 off W. shore of Hawaii
23	----	-----	-----	3	32	4	------	6	----------
24	----	-----	5	3	48	5	------	5	----------
25	----	-----	-----	2	41	7	------	8	----------
26	----	9	-----	4	38	1	------	12	1 Mauna Loa
27	----	-----	-----	4	46	10	------	9	----------
28	----	-----	-----	1	43	8	------	4	----------
29	----	4	-----	4	47	7	------	4	----------
30	----	-----	-----	2	39	8	1	5	1 Mauna Loa
31	----	-----	-----	-----	38	8	------	4	12 Mauna Loa
Aug. 1	----	-----	4	3	61	5	------	9	14 Mauna Loa
2	----	-----	-----	2	35	7	------	4	9 Mauna Loa
3	----	-----	-----	1	25	12	------	5	15 Mauna Loa
4	----	-----	-----	-----	35	7	------	6	14 Mauna Loa
5	----	-----	7	3	45	5	------	4	10 Mauna Loa
6	----	14	-----	4	55	5	------	5	1 Kona
7	----	-----	-----	1	45	7	------	3	1 Mauna Loa
8	----	-----	-----	8	41	3	------	12	2 Mauna Loa
9	----	-----	-----	-----	38	4	------	9	----------
10	----	-----	-----	-----	37	5	------	16	1 Mauna Loa
11	32	-----	-----	2	36	6	------	12	----------
12	----	-----	-----	-----	38	5	------	10	----------
13	----	14	-----	-----	27	3	------	3	----------
14	15	-----	-----	2	45	7	------	5	----------
15	----	-----	-----	-----	40	10	------	5	1 Mauna Kea 3 Mauna Loa
16	----	24	-----	-----	57	8	1	------	4 Mauna Loa
17	----	-----	-----	3	52	8	------	10	1 Mauna Loa

Aug. 18	30	----	9	3	48	6	-----	13	----------
19	32	----	-----	4	55	6	-----	------	----------
20	31	4	-----	4	53	9	-----	12	1 off W. shore of Hawaii
21	----	10	-----	-----	43	8	-----	15	1 Mauna Loa
22	----	----	20	3	55	12	-----	10	----------
23	----	----	8	2	45	9	-----	24	----------
24	----	6	-----	3	35	5	-----	303	1 Mauna Loa
25	----	----	-----	3	17	6	-----	285±	----------
26	----	----	-----	2	35	6	-----	66	----------
27	----	----	-----	5	22	3	-----	30	1 Kona
28	----	----	-----	1	25	4	-----	20	----------
29	----	----	-----	3	23	3	-----	10	1 Kohala
30	----	11	-----	1	40	9	-----	10	1 Mauna Loa 1 off W. shore of Hawaii 1 offshore Maui.
31	----	4	-----	27	29	5	-----	5	----------
Sept. 1	----	----	-----	-----	40	3	-----	25	----------
2	----	----	-----	-----	51	11	-----	10	1 Kona 1 off SE. shore of Hawaii
3	----	----	9	4	48	5	-----	10	----------
4	----	----	-----	1	90	5	-----	10	----------
5	----	----	5	1	115	7	-----	5	----------
6	----	----	-----	2	50	6	-----	------	----------
7	----	----	4	2	80	7	-----	10	----------
8	----	----	-----	-----	48	3	-----	5	1 Mauna Kea
9	----	----	3	1	55	3	-----	13	2 Mauna Loa
10	----	----	-----	1	49	12	-----	3	----------
11	----	----	-----	12	50	8	-----	10	1 Mauna Loa
12	----	----	-----	16	40	10	1	6	----------
13	34	----	-----	8	30	8	1	10	----------
14	----	----	3	10	45	12	-----	8	1 Kona
15	----	8	-----	3	42	6	-----	10	2 off S. shore of Hawaii
16	----	----	-----	20	30	6	-----	5	----------
17	----	----	-----	10	53	12	-----	15	----------
18	----	----	-----	5	48	6	-----	7	1 off SE. shore of Hawaii 1 Mauna Loa
19	----	----	-----	2	40	6	-----	10	----------
20	----	6	-----	3	65	7	-----	21	1 Mauna Loa
21	----	----	-----	2	76	7	-----	16	1 Mauna Loa
22	----	7	-----	1	84	10	-----	5	----------

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Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea Summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 KM	Shallow				
Sept. 23	----	-----	-----	3	75	7	-----	5	1 off W. shore of Hawaii
24	----	-----	-----	2	44	7	-----	5	----------
25	----	-----	-----	3	50	5	-----	25	----------
26	----	-----	-----	3	62	12	-----	5	1 off S. shore of Hawaii
27	----	-----	-----	-----	47	7	-----	8	----------
28	----	-----	-----	-----	56	10	-----	7	----------
29	----	-----	-----	-----	45	7	-----	5	----------
30	----	-----	-----	2	73	3	-----	10	1 north of Molokai

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey July, August, September, 1965

Entries for a given quake are: date, origin time (Hawaiian Standard Time), magnitude, depth, epicenter, and felt report. All earthquakes of magnitude 2.5 and larger, as well as many favorably located smaller ones, occurring on or near the island of Hawaii are included in the list.

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
July 1	21	40	11.0	2.5	3	19°42.8'	155°47.9'	27 km NE. of Kealakekua	----------
3	11	57	40.6	3.0	8	19°11.9'	155°36.6'	15 km NNW. of Naalehu	----------
5	21	33	05.1	2.5	27	19°15.8'	155°28.2'	7 km NNE. of Pahala	----------
6	21	18	14.8	2.0	8	19°18.3'	155°08.0'	9 km SE. of Makaopuhi seismometer.	----------
7	00	31	36.8	3.6	13	20°43'	156°30'	11 km WSW. of Haleakala	Felt: Haleakala National Park.
8	23	26	07.0	2.0	5	19°21.5'	155°08.3'	5 km E. of Makaopuhi seismometer.	----------
11	14	37	13.4	2.5	8	19°24.0'	155°47.9'	18 km SE. of Kealakekua	----------
14	02	43	46.0	2.0	25	19°20.1'	155°20.8'	4 km E. of Desert seismometer.	----------
15	13	32	04.1	3.8	30	19°22.8'	155°14.3'	3 km E. of Ahua seismometer.	Kilauea Summit area, Hilo, Pahala, Puna, Mauna Loa Observatory.
16	04	26	33.0	2.0	5	19°25.0'	155°23.3'	8 km S. of Mauna Loa seismometer.	----------
16	16	54	02.6	2.5	8	19°12.4'	155°35.4'	16 km N. of Naalehu	----------
17	01	58	53.7	2.7	8	19°24.5'	155°29.2'	14 km NW. of Desert seismometer.	----------
18	04	56	15.6	2.3	3	19°23.1'	155°30.7'	14 km WNW. of Desert seismometer.	Hilo
18	12	15	37.5	2.0	3	19°22.4'	155°12.6'	4 km WNW. of Makaopuhi seismometer.	----------

July 19	17	05	09.8	2.5	8	19°22.6'	155°24.2'	5 km NNW. of Desert seismometer.	Kapapala, Puna
22	07	15	44.0	3.0	5	19°16.8'	155°13.3'	11 km SSW. of Makaopuhi seismometer.	Kilauea summit area, Hilo.
22	12	27	04.2	4.3	3	19°20.1'	155°30.6'	14 km W. of Desert seismometer.	Islandwide
22	18	37	07.5	3.0	8	18°59'	156°47'	48 km SW. of Kealakekua	----------
22	19	58	45.0	2.1	5	19°19.5'	155°10.5'	6 km S. of Makaopuhi seismometer.	----------
26	04	07	35.5	2.5	8	19°24.1'	155°40.3'	15 km SW. of North Bay seismometer.	----------
26	06	58	45.3	2.7	5	19°21.2'	155°05.3'	11 km E. of Makaopuhi seismometer.	----------
27	01	51	01.4	2.0	28	19°23.1'	155°16.1'	2 km NW. of Ahua	----------
28	10	40	23.7	3.1	5	19°24.1'	155°29.9'	14 km NW. of Desert seismometer.	Pahala, Hilo
29	14	31	28.3	2.4	5	19°23.1'	155°29.8'	13 km NW. of Desert seismometer.	----------
29	17	54	12.0	2.0	8	19°26.8'	155°28.7'	11 km SW. of Mauna Loa seismometer.	----------
29	20	16	29.8	2.2	30	19°20.1'	155°15.2'	5 km S. of Ahua seismometer.	----------
29	21	19	47.6	2.9	3	19°21.5'	155°05.5'	10 km E. of Makaopuhi seismometer.	Hilo
30	22	09	13.0	2.4	10	19°23.8'	155°34.9'	11 km S. of North Bay	----------
31	11	24	17.3	2.1	13	19°23.3'	155°37.7'	13 km SW. of North Bay seismometer.	----------
31	16	54	56.7	2.3	45	19°27.3'	155°35.7'	4 km SW. of North Bay seismometer.	----------
August 1	03	17	22.0	2.5	40	19°29.1'	155°35.6'	3 km SW. of North Bay	----------
1	15	28	32.1	2.1	3	19°24.1'	155°27.1'	10 km NW. of Desert seismometer.	----------
2	03	44	48.9	2.3	50	19°29.0'	155°32.9'	5 km ESE. of North Bay seismometer.	----------
3	11	46	55.7	2.0	27	19°23.8'	155°17.8'	3 km S. of Uwekahuna	----------
4	15	47	35.1	2.3	5	19°20.1'	155°17.9'	7 km SW. of Ahua seismometer.	----------
4	21	44	18.1	2.6	35	19°17.1'	155°00.5'	8 km SSW. of Kalapana	----------
6	00	58	10.2	2.2	5	19°29.0'	155°46.0'	17 km ESE. of Kealakekua	----------
7	07	01	08.5	2.0	3	19°24.9'	155°26.1'	10 km NW. of Desert seismometer.	----------
7	10	07	39.2	2.1	40	19°07.6'	155°25.2'	19 km ESE. of Naalehu	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey July, August, September, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
August 8	19	32	31.5	2.0	8	19°17.8'	155°12.8'	9 km SSW. of Makaopuhi seismometer.	----------
9	10	06	38.2	2.4	3	19°20.9'	155°07.3'	7 km ESE. of Makaopuhi seismometer.	----------
10	05	22	42.5	2.4	5	19°40.9'	155°35.1'	21 km N. of North Bay seismometer.	----------
11	12	18	16.5	3.7	3	19°05.7'	155°06.4'	20 km SSE. of Apua Point	Mauna Loa Observatory, Pahala, Haleakala National Park.
15	09	57	58.6	2.0	8	19°52.5'	155°26.8'	17 km NE. of Pohakuloa	----------
16	15	16	31.6	2.4	5	19°22.6'	155°27.1'	9 km NW. of Desert seismometer.	----------
17	12	28	17.4	3.3	30	19°21.2'	155°18.0'	4 km SW. of Ahua	Kilauea Summit area.
17	17	21	14.5	2.7	<3	19°15.7'	155°35.3'	22 km N. of Naalehu	----------
19	16	41	33.0	2.0	25	19°17.8'	155°14.9'	9 km SSE. of Ahua seismometer.	----------
20	09	45	47.0	3.1	13	19°39'	156°24'	56 km WNW. of Kealakekua.	----------
20	23	52	31.0	2.3	3	19°16.2'	155°13.5'	5 km WNW. of Apua Point	----------
21	13	16	46.0	2.2	8	19°21.5'	155°12.2'	3 km WSW. of Makaopuhi seismometer.	----------
21	20	33	52.5	2.1	10	19°31.5'	155°31.6'	7 km ENE. of North Bay seismometer.	----------
22	14	09	25.0	2.1	8	19°22.1'	155°26.5'	7 km WNW. of Desert seismometer.	----------
22	14	13	05.5	2.1	30	19°23.9'	155°17.5'	2 km S. of Uwekahuna	----------
23	00	26	21.4	2.0	8	19°19.8'	155°04.1'	13 km ESE. of Makaopuhi seismometer.	----------
23	11	25	07.0	3.6	8	19°16.8'	155°11.9'	2 km N. of Apua Point	Kilauea Summit, Hilo, Mt. View.
23	11	43	19.6	3.4	3	19°15.9'	155°11.2'	2 km NE. of Apua Point	Mt. View, Hilo.

August 23	14	11	44.8	2.0	8	19°21.4'	155°02.7'	15 km E. of Makaopuhi seismometer.	----------
24	10	05	28.0	2.9	8	19°19.5'	155°26.2'	6 km WSW. of Desert seismometer.	----------
24	11	38	06.2	2.9	5	19°18.7'	155°12.5'	8 km SW. of Makaopuhi seismometer.	----------
24	14	06	08.8	2.3	5	19°16.8'	155°13.0'	11 km SSW. of Makaopuhi seismometer.	----------
24	22	35	20.2	3.0	5	19°20.5'	155°08.5'	5 km SE. of Makaopuhi seismometer.	Kilauea Summit area, Pahala.
25	00	14	44.6	2.2	5	19°19.8'	155°05.7'	11 km ESE. of Makaopuhi seismometer.	----------
25	00	31	15.9	2.0	8	19°19.5'	155°10.5'	5 km S. of Makaopuhi seismometer.	----------
25	00	38	19.5	2.1	5	19°20.5'	155°11.7'	3 km SW. of Makaopuhi	Kilauea Summit area.
25	00	43	59.0	2.3	5	19°20.2'	155°11.7'	3 km SW. of Makaopuhi seismometer.	----------
25	00	46	32.8	2.0	8	19°19.0'	155°09.4'	7 km SSE. of Makaopuhi seismometer.	----------
25	00	52	49.2	2.9	3	19°21.0'	155°10.0'	3 km SE. of Makaopuhi seismometer.	----------
25	01	03	11.3	2.4	3	19°21.2'	155°07.8'	7 km ESE. of Makaopuhi seismometer.	----------
25	01	12	13.2	2.2	5	19°21.0'	155°08.9'	5 km SE. of Makaopuhi seismometer.	----------
25	01	14	28.0	2.0	5	19°20.7'	155°08.2'	6 km ESE. of Makaopuhi seismometer.	----------
25	01	23	01.3	2.3	10	19°20.9'	155°14.0'	6 km SE. of Ahua	----------
25	01	34	17.0	3.6	8	19°19.2'	155°09.8'	7 km SSE. of Makaopuhi seismometer.	Kilauea Summit area, Pahala, Hilo.
25	01	48	44.8	2.2	5	19°20.0'	155°11.2'	5 km SSW. of Desert seismometer.	----------
25	01	53	06.0	2.1	5	19°20.1'	155°12.2'	5 km SW. of Makaopuhi seismometer.	----------
25	01	58	48.0	2.1	5	19°21.2'	155°11.1'	3 km SW. of Makaopuhi seismometer.	----------
25	02	07	12.0	2.7	5	19°20.0'	155°10.1'	5 km SSE. of Makaopuhi	Kilauea Summit area, Pahala.

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey July, August, September, 1965

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
August 25	02	15	34.0	2.8	5	19°19.5'	155°10.8'	5 km S. of Makaopuhi seismometer.	Kilauea Summit area.
25	02	37	24.5	2.3	5	19°19.5'	155°12.5'	7 km SW. of Makaopuhi seismometer.	----------
25	02	59	35.5	3.5	5	19°19.0'	155°09.1'	7 km SE. of Makaopuhi seismometer.	Kilauea Summit area.
25	03	53	02.1	2.1	5	19°20.1'	155°09.5'	5 km SE. of Makaopuhi seismometer.	----------
25	05	09	47.7	2.8	5	19°20.0'	155°09.7'	5 km SE. of Makaopuhi seismometer.	----------
25	06	30	11.2	2.3	5	19°19.1'	155°12.0'	7 km SSW. of Makaopuhi seismometer.	----------
25	09	06	29.1	3.0	5	19°19.9'	155°09.9'	5 km SSE. of Makaopuhi seismometer.	Kilauea Summit area, Pahala.
25	12	33	16.5	2.7	3	19°19.9'	155°09.4'	6 km SE. of Makaopuhi	----------
27	18	37	51.6	2.7	5	19°31.9'	155°45.1'	18 km E. of Kealakekua	----------
28	16	26	31.8	2.8	27	19°22.9'	155°16.8'	2 km NW. of Ahua seismometer.	----------
29	09	31	14.5	3.1	8	20°13.2'	155°36.0'	23 km NNE. of Kamuela	----------
29	09	39	58.3	3.0	3	19°23.9'	155°27.2'	10 km NW. of Desert seismometer.	----------
30	14	05	50.3	3.1	8	19°35'	156°26'	50 km WNW. of Kealakekua	----------
30	16	43	15.0	3.2	8	20°29'	156°10'	35 km SSE. of Haleakala seismograph.	----------
30	22	18	13.7	2.0	5	19°20.9'	155°08.3'	5 km ESE. of Makaopuhi seismometer.	----------
31	16	05	02.2	3.0	5	19°25.2'	155°25.1'	10 km NNW. of Desert seismometer.	----------
31	18	00	57.0	3.8	32	19°21.8'	155°20.0'	7 km NE. of Desert seismometer.	Naalehu, Kilauea Summit area, Hilo.
31	18	05	38.3	2.3	32	19°22.8'	155°19.5'	7 km SW. of Uwekahuna	----------
31	23	49	50.5	2.3	31	19°23.0'	155°20.8'	8 km SW. of Uwekahuna	----------

September 1	09	34	28.7	2.7	5	19°25.0'	155°26.0'	11 km NW. of Desert seismometer.	Kilauea Summit area.
2	01	42	48.0	3.7	3	19°14.1'	155°03.8'	15 km ESE. of Apua Point	Hilo, Kilauea Summit area.
2	09	18	49.6	2.7	5	19°18.7'	155°12.2'	9 km SW. of Makaopuhi seismometer.	----------
3	21	17	53.2	2.6	8	19°24.4'	155°24.0'	8 km N. of Desert seismometer.	----------
5	05	55	14.2	2.0	3	19°07.2'	155°15.2'	16 km SW. of Apua Point	----------
5	07	36	07.8	2.0	5	19°23.9'	155°26.3'	9 km NW. of Desert seismometer.	----------
6	02	02	56.7	2.1	30	19°18.0'	155°18.8'	10 km ESE. of Desert seismometer.	----------
6	02	33	39.5	2.0	5	19°19.7'	155°08.7'	7 km SE. of Makaopuhi seismometer.	----------
7	05	04	37.2	2.3	27	19°23.5'	155°19.2'	5 km SW. of Uwekahuna	----------
8	15	54	59.2	2.7	35	19°15.8'	154°55.5'	11 km SSE. of Kalapana	----------
9	10	58	44.3	3.2	8	19°14.3'	155°35.7'	19 km N. of Naalehu	----------
9	11	04	22.2	2.5	8	19°13.2'	155°35.2'	17 km N. of Naalehu	Pahala
9	14	47	41.5	2.5	30	19°20.9'	155°18.5'	6 km SW. of Ahua seismometer.	----------
9	16	12	33.0	2.5	3	19°20.5'	155°10.0'	4 km SSE. of Makaopuhi seismometer.	----------
12	16	12	00.0	2.5	30	19°21.8'	155°18.7'	5 km WSW. of Ahua seismometer.	----------
13	04	49	44.2	2.7	25	19°24.5'	155°19.0'	4 km SW. of Uwekahuna	----------
14	21	32	09.0	2.3	<3	19°26.9'	155°47.4'	16 km ESE. of Kealakekua	----------
15	15	27	19.5	2.2	5	19°25.2'	155°26.3'	11 km NW. of Desert seismometer.	----------
15	18	06	54.0	2.1	27	19°24.0'	155°17.9'	4 km SSW. of Uwekahuna	----------
16	10	30	53.3	2.5	25	19°23.2'	155°19.7'	6 km SW. of Uwekahuna	----------
16	10	47	51.0	2.3	30	19°21.9'	155°18.1'	5 km WSW. of Ahua seismometer.	----------
16	14	21	40.7	3.0	30	19°22.8'	155°17.2'	3 km WNW. of Ahua seismometer.	Pahala
17	06	53	48.9	2.4	30	19°22.3'	155°18.8'	6 km W. of Ahua seismometer.	----------
17	18	17	56.8	2.9	30	19°22.4'	155°19.2'	7 km W. of Ahua seismometer.	----------
18	05	08	44.0	3.2	8	19°11.5'	155°36.1'	14 km N. of Naalehu	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey July, August, September, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
September 18	23	14	39.0	2.7	8	18°53.2'	155°06.8'	42 km SSE. of Apua Point	----------
20	00	30	24.5	2.7	3	19°12.1'	155°33.8'	15 km NNE. of Naalehu	----------
20	10	46	56.9	2.6	3	19°21.6'	155°08.3'	5 km E. of Makaopuhi seismometer.	----------
21	08	54	42.0	2.2	3	19°21.6'	155°04.8'	11 km E. of Makaopuhi seismometer.	----------
21	09	53	27.5	2.3	5	19°20.5'	155°06.8'	8 km ESE. of Makaopuhi seismometer.	----------
21	21	53	01.4	3.0	8	19°09.1'	155°36.5'	10 km NNW. of Naalehu	----------
24	00	57	15.5	3.1	8	19°28'	156°23'	51 km WSW. of Kealakekua	----------
25	11	21	25.1	2.1	5	19°21.5'	155°05.5'	10 km E. of Makaopuhi seismometer.	----------
25	15	25	32.5	2.3	5	19°19.9'	155°07.7'	7 km SE. of Makaopuhi seismometer.	----------
25	17	35	14.3	2.0	5	19°22.0'	155°05.7'	10 km ENE. of Makaopuhi	----------
26	02	21	59.3	2.3	26	19°23.8'	155°20.8'	7 km SW. of Uwekahuna	----------
26	11	20	14.2	2.5	8	18°59.8'	155°19.7'	29 km ESE. of Naalehu	----------
28	00	43	50.0	2.5	3	19°22.7'	155°04.8'	11 km ENE. of Makaopuhi seismometer.	----------
28	03	25	53.5	3.3	5	19°19.1'	155°08.6'	8 km SE. of Makaopuhi seismometer.	Hilo, Kilauea Summit area.
30	17	18	08.0	4.0	8	21°39'	157°09'	133 km NW. of Haleakala seismograph.	----------

Table 5.--Distant earthquakes

Times are reported in Greenwich Civil Time which is 10 hours faster than Hawaiian Standard Time. A "c" following the time of P indicates compressional first motion; a "d" indicates dilatational first motion. Station symbols, locations, and instrumentation are presented in table 6, Summary 37. Magnitudes calculated from the Hawaii seismograms are followed by (HVO). Location of epicenter, origin times, focal depths, and magnitudes reported by other institutions are taken from "Preliminary Determination of Epicenters" published by the U.S. Coast and Geodetic Survey.

July 1, 1965

U	PEZ	eR	23:49:36

C&GS card 058-65:
23:12:45.4
60.3° S., 163.7° W.
South Pacific Cordillera
h about 33 km
Magnitude 6.75 (Brk),
5.5 (CGS).

July 2

M	Z	eP	21:05:27.7 d
A	Z	eP	28.7 d
D	Z	eP	28.7 d
MP	Z	eP	28.7 d
U	Z	iP	28.3 d
Pa	Z	iP	29.2 d
Na	Z	iP	30.8 d
Hi	Z	iP	26.4 d
Ka	Z	eP	22.3 d
Ke	Z	iP	25.7 d
Ha	Z	iP	15.6 d
U	PEZ	iPP	21:06:46
U	PEN	iS	21:10:53
U	PEN	iG	21:12:53
U	PEZ	iR	21:14:16
M	Z	Tmax	21:43:06
A	Z	Tmax	21:43:18
D	Z	Tmax	21:42:58
MP	Z	Tmax	21:43:07
U	Z	Tmax	21:43:09
Pa	Z	Tmax	21:43:15
Hi	Z	Tmax	21:42:44
NB	Z	Tmax	21:42:44
Ke	Z	Tmax	21:42:33
Ka	Z	Tmax	21:41:54
Ha	Z	Tmax	21:41:46

July 2--Continued

C&GS card 057-65
20:58:40.0
53.1° N., 167.7° W.
Fox Islands, Aleutian Islands
Slight damage on Umnak Island
h about 59 km
Magnitude 6.75-7 (Pas), 6.75-7 (Brk),
6.75 (Pal), 7.5 (HVO).

July 6

M	Z	iP	03:13:28.0 d
Hi	Z	iP	30.8 d
U	PEZ	eR	03:27:35

C&GS card 059-65:
03:04:19.8
22.6° S., 172.9° E.
Loyalty Islands region
h about 41 km
Magnitude 6 (Brk), 5.9 (CGS).

July 6

M	Z	eP	18:45:26.9 c
A	Z	eP	26.9 c
MP	Z	eP	27.1 c
Na	Z	iP	24.2 c
Hi	Z	eP	28.8 c
U	PEZ	eS	18:52:35

C&GS card 058-65:
18:36:47.3
4.5° S., 155.1° E.
Solomon Islands
h about 510 km
Magnitude 6-6.25 (Pas),
6.25 (Brk),
6.5 (CGS).

July 7, 1965

M	Z	iP	21:48:36.0 d
D	Z	iP	36.2 d
Hi	Z	iP	37.1 d
NB	Z	iP	34.9 d

C&GS card 057-65:
21:38:50.5
32.7° N., 138.7° E.
South of Honshu, Japan
h about 218 km
Magnitude 5.6 (CGS).

July 16

U	PEZ	eR	22:56:17

C&GS card 061-65:
22:33:16
11.8° S., 166.1° E.
Santa Cruz Islands
h about 30 km
Magnitude 4.6 (CGS).

July 17

M	Z	iP	07:29:49.7 c
D	Z	iP	49.0 c
MP	Z	eP	50.0 c
U	Z	eP	49.6 c
Hi	Z	eP	51.6 c
NB	Z	iP	46.0 c
U	PEZ	eS	07:37:25
U	PEN	eG	07:42:05
U	PEZ	eR	07:43:50
NB	Z	Tmax	08:25:12
Ke	Z	Tmax	08:24:52

C&GS card 060-65:
07:20:30.5
9.7° S., 159.8° E.
Solomon Islands
Felt at Honiara
h about 23 km
Magnitude 5.5 (Brk), 6.4 (CGS), 5.6 (HVO).

July 17

Ke	Z	eP	12:57:31.7 c
Hi	Z	eP	12:57:34.5 c

C&GS card 061-65:
12:47:49.4
7.2° S., 153.6° E.
New Britain region
h about 28 km
Magnitude 5.7 (CGS).

July 17

MP	Z	eP	13:08:15.8 c
Ke	Z	eP	14.9 c

C&GS card 061-65:
12:59:10.7
27.2° S., 177.6° W.
Kermadec Islands
h about 27 km
Magnitude 5.4 (CGS).

July 20

M	Z	eP	13:30:30.7 c

C&GS card 063-65:
13:18:27.4
7.5° N., 124.3° E.
Mindanao, Philippine Islands
Felt at Cotabato, Malaybalay, and General Santos
h about 45 km
Magnitude 5.8 (CGS).

July 21

U	PEZ	eP	02:59:51
U	PEE	eS	03:06:25
U	PEN	iG	03:09:48
U	PEZ	eR	03:11:51

C&GS card 061-65:
02:51:39.0
20.8° S., 175.8° W.
Tonga Islands
h about 57 km
Magnitude 5.7 (CGS).

July 29, 1965

M	Z	eP	08:36:05.8 c
A	Z	eP	06.6 c
D	Z	eP	06.4 c
MP	Z	eP	06.7 c
U	Z	eP	06.0 c
Hi	Z	eP	04.6 c
NB	Z	iP	04.6 c
Ke	Z	eP	03.5 c
Ha	Z	eP	08:35:57.9 d
U	PEN	iPP	08:37:17
U	PEZ	iS	08:41:39
U	PEE	iL	08:43:17
U	PEZ	iR	08:44:59

C&GS card 063-65:
08:29:22.1
51.2° N., 171.3° W.
Fox Islands, Aleutian Islands.
h about 23 km
Magnitude 6.5-6.75 (Pas),
6.25-6.5 (Brk),
6.75-7 (Pal),
6.4 (CGS),
6.6 (HVO).

July 30

M	Z	iP	07:32:06.8 c
D	Z	iP	06.6 c
MP	Z	iP	05.5 c
U	Z	iP	06.1 c
Hi	Z	eP	05.1 c
NB	Z	iP	07.9 c

C&GS card 063-65:
07:20:10.3
6.7° N., 73.0° W.
Northern Colombia
Felt at Bogota
h about 174 km
Magnitude 5.3 (CGS).

August 1

M	Z	iP	15:11:58.3 d
NB	Z	iP	57.2 d

C&GS card 066-65:
15:02:56.1

August 1--Continued

C&GS card--Continued
46.9° N., 143.8° E.
Sakhalin Island
h about 400 km
Magnitude 5.7 (CGS).

August 1

M	Z	iP	16:49:36.4 c
D	Z	iP	36.9 c
MP	Z	iP	38.3 c
U	Z	eP	36.8 c
Hi	Z	iP	36.4 c
NB	Z	eP	35.7 c

C&GS card 063-65:
16:41:13.7
52.7° N., 153.4° E.
Northwest of Kurile Islands
h about 462 km
Magnitude 5.1 (CGS).

August 1

M	Z	iP	23:54:07.2 c
A	Z	iP	06.4 c
MP	Z	iP	06.8 c
Ke	Z	eP	04.3 c
Ha	Z	eP	12.7 c
U	PEZ	eR	00:10:09

C&GS card 064-65:
23:44:28.3
32.5° S., 178.9° W.
South of Kermadec Islands
h about 44 km
Magnitude 5.8 (CGS), 5.7 (HVO).

August 2, 1965

M	Z	eP	13:32:31.7 c
A	Z	eP	31.3 c
D	Z	eP	30.6 c
MP	Z	eP	31.0 c
U	Z	eP	31.4 c
Pa	Z	eP	32.3 c
U	PEZ	iPP	13:35:53
U	PEZ	iS	13:43:07
U	PEZ	iScS	13:43:37
U	PEN	iPS	13:44:05
U	PEE	iSS	13:48:45
U	PEE	iL	13:54:39
U	PEN	iG	13:55:29
U	PEZ	iR	13:58:41

C&GS card 064-65:
13:19:54.7
56.2° S., 158.2° E.
Macquarie Island region
h about 33 km
Magnitude 7-7.25 (Pas),
7.75 (Brk),
7 (Pal), 6.7 (CGS),
7.0 (HVO).

August 3

M	Z	iP	02:13:48.0 c
A	Z	iP	47.2 c
D	Z	eP	47.8 c
MP	Z	iP	46.6 c
U	Z	iP	47.3 c
Hi	Z	eP	46.9 c
Ke	Z	iP	50.7 c
Ha	Z	eP	54.0 c

C&GS card 063-65:
02:01:52.2
7.7° S., 81.3° W.
Off coast of northern Peru
h about 49 km
Magnitude 5.25-5.5 (Brk),
5 (Pal), 5.8 (CGS).

August 4

M	Z	iP	01:15:32.8 c
A	Z	iP	32.0 c
D	Z	iP	32.8 c
MP	Z	eP	31.4 c

C&GS card 68-65:
01:05:53.0
16.8° N., 94.5° W.

August 4--Continued

C&GS card--Continued

Oaxaca, Mexico
h about 117 km
Magnitude 5.2 (CGS).

August 5

A	Z	eP	00:17:39.5 c
Pa	Z	eP	41.5 c
Hi	Z	eP	41.6 c
NB	Z	eP	38.6 c
Ke	Z	iP	35.1 c
U	PEE	iS	00:25:36
U	PEN	eG	00:31:54
U	PEZ	iR	00:34:14

C&GS card 65-65:
00:07:50.5
5.3° S., 151.7° E.
New Britain region
Felt on eastern New Britain
h about 47 km
Magnitude 6.5 (Pas), 5.75-6 (Brk),
6.5-6.75 (Pal),
6.3 (CGS), 6.8 (HVO).

August 8

M	Z	iP	09:58:14.7 c

C&GS card 65-65:
09:46:29.6
4.1° N., 128.6° E.
North of Halmahera
h about 51 km
Magnitude 5.5 (CGS).

August 8

M	Z	iP	12:56:19.9 c
Ha	Z	Tmax	13:32:34

C&GS card 65-65:
12:49:23.1
51.9° N., 175.3° W.
Andreanof Islands, Aleutian Islands
Felt on Adak Island.
h about 53 km
Magnitude 4.5 (Brk), 5.1 (CGS).

August 11, 1965

M	Z	iP	03:49:59.6 c
A	Z	eP	59.5 c
D	Z	eP	58.6 c
MP	Z	eP	59.6 c
Na	Z	eP	54.9 c
Ke	Z	eP	56.5 c
Hi	Z	iP	03:50:01.2 c
U	PEE	iS	03:57:19
U	PEZ	iSS	04:00:59
U	PEN	iG	04:02:11
U	PEZ	iR	04:04:15
M	Z	Tmax	04:44:14
A	Z	Tmax	06
D	Z	Tmax	09
U	Z	Tmax	05
Na	Z	Tmax	04:43:44
NB	Z	Tmax	04:44:18
Ke	Z	Tmax	04:43:58
Ha	Z	Tmax	04:44:33

C&GS card 66-65:
03:40:56.2
15.4° S., 166.9° E.
New Hebrides Islands
h about 26 km
Magnitude 7 (Pas), 6.3 (CGS), 7.1 (HVO).

August 11

M	Z	Tmax	19:20:19
A	Z	Tmax	33
D	Z	Tmax	21
MP	Z	Tmax	10
U	Z	Tmax	23
Hi	Z	Tmax	01
NB	Z	Tmax	28
Ha	Z	Tmax	19:19:50

C&GS card 65-65:
18:29:40.1
59.6° N., 145.8° W.
Gulf of Alaska
h about 25 km
Magnitude 5.5 (CGS).

August 11

M	Z	eP	20:01:30.7 c
MP	Z	eP	30.7 c

August 11--Continued

U	Z	eP	30.7 c
NB	Z	eP	29.4 c
Ha	Z	eP	33.3 c
U	PEE	ePP	20:03:43
U	PEZ	iS	20:08:49
U	PEZ	iSS	20:12:35
U	PEE	iG	20:13:39
U	PEZ	iR	20:15:55
Ke	Z	Tmax	20:55:39

C&GS card 65-65:
19:52:29.8
15.7° S., 167.1° E.
New Hebrides Islands
h about 33 km
Magnitude 6.5 (Pas), 5.6 (CGS), 6.8 (HVO).

August 11

M	Z	eP	22:40:49.7 c
A	Z	eP	49.7 c
D	Z	eP	48.7 c
MP	Z	eP	49.7 c
Na	Z	iP	45.3 c
Hi	Z	eP	51.2 c
NB	Z	eP	49.0 c
Ke	Z	iP	47.0 c
Ha	Z	eP	52.0 c
U	PEZ	ePP	22:43:10
U	PEZ	iS	22:48:15
U	PEN	eSS	22:51:55
U	PEE	iG	22:52:55
U	PEZ	iR	22:55:03
M	Z	Tmax	23:35:31
A	Z	Tmax	18
D	Z	Tmax	11
U	Z	Tmax	01
Na	Z	Tmax	00
NB	Z	Tmax	26
Ke	Z	Tmax	12
Ha	Z	Tmax	51

C&GS card 66-65:
22:31:48.9
15.8° S., 167.2° E.
New Hebrides Islands
Damage on Espiritu Santo
h about 33 km
Magnitude 7.25-7.5 (Pas), 6.4 (CGS), 7.8 (HVO).

August 12, 1965

M	Z	eP	08:10:43.7 d
A	Z	eP	43.7 d
D	Z	eP	42.7 d
MP	Z	eP	43.7 d
U	Z	eP	43.8 d
Na	Z	eP	39.9 d
NB	Z	eP	42.8 d
Ke	Z	eP	42.2 d
Ha	Z	eP	45.7 d
U	PEZ	ePP	08:12:51
U	PEE	eS	08:18:01
U	PEZ	iSS	08:21:45
U	PEE	eG	08:22:55
U	PEZ	iR	08:25:15

C&GS card 68-65:
08:01:43.3
15.9° S., 167.5° E.
New Hebrides Islands
Felt at Port Vila
h about 25 km
Magnitude 6.75 (Pas),
6.5 (Pal),
6.3 (CGS),
6.5 (HVO).

August 12

M	Z	eP	13:06:55.3 d
Na	Z	eP	52.3 d
U	PEE	eS	13:14:55
U	PEN	eG	13:21:11
U	PEZ	iR	13:23:31

C&GS card 67-65:
12:57:09.7
5.3° S., 152.2° E.
New Britain region
Felt widely
h about 41 km
Magnitude 6.5-6.75 (Pas),
7.25 (Pal),
5.9 (CGS),
6.6 (HVO).

August 12

NB	Z	eP	18:13:52.6 c
Ha	Z	eP	56.7 c

August 12--Continued

C&GS card 68-65:
18:04:56.1
16.0° S., 167.4° E.
New Hebrides Islands
Felt at Port Vila
h about 45 km
Magnitude 5.3 (CGS).

August 13

M	Z	iP	04:49:55.9 c
Ha	Z	eP	57.2 c

C&GS card 68-65:
04:40:55.3
15.9° S., 167.5° E.
New Hebrides Islands
h about 34 km
Magnitude 5.7 (CGS).

August 13

A	Z	eP	11:33:53.5 d
D	Z	eP	52.7 d
MP	Z	eP	54.0 d
NB	Z	eP	52.0 d
U	PEZ	eS	11:41:17
U	PEE	eG	11:45:43
U	PEZ	eR	11:47:59

C&GS card 68-65:
11:24:51.8
16.0° S., 167.0° E.
New Hebrides Islands
h about 33 km
Magnitude 5.5 (CGS),
5.8 (HVO).

August 13, 1965

M	Z	eP	12:49:34.8 d
A	Z	eP	34.8 d
D	Z	eP	33.7 d
MP	Z	eP	34.9 d
Na	Z	eP	31.0 d
U	PEZ	iS	12:56:57
U	PEZ	iSS	13:00:39
U	PEN	iG	13:01:35
U	PEZ	iR	13:03:39
Ke	Z	Tmax	13:43:43

C&GS card 68-65:
12:40:08.3
15.9° S., 166.8° E.
New Hebrides Islands
h about 33 km
Magnitude 7 (Pas), 7-7.25 (Brk), 5.6 (CGS), 7.7 (HVO).

August 13

M	Z	eP	13:22:33.2 d
A	Z	eP	33.0 d
D	Z	eP	32.1 d
MP	Z	eP	33.2 d
NB	Z	eP	32.6 d
Ha	Z	eP	36.6 d

No C&GS listing.

August 13

Hi	Z	eP	18:05:30.8 c

C&GS card 68-65:
17:56:27.6
16.6° S., 167.6° E.
New Hebrides Islands
h about 39 km
Magnitude 5.4 (CGS).

August 13

Hi	Z	eP	22:07:53.9 c

C&GS card 66-65:
21:57:38.7
6.4° S., 148.5° E.
New Britain region
h about 51 km
Magnitude 5.5 (Brk), 5.2 (CGS).

August 14

U	PEZ	iR	11:31:11

C&GS card 70-65:
11:07:47.1
15.8° S., 166.8° E.

August 14--Continued

C&GS card 70-65--Continued

New Britain Islands
h about 33 km
Magnitude 6 (Pal), 5.5 (CGS).

August 14

M	Z	eP	13:26:50.7 d
A	Z	eP	51.0 d
D	Z	eP	49.6 d
U	Z	eP	50.9 d
NB	Z	eP	49.1 d
U	PEN	eG	13:38:11
U	PEZ	iR	13:40:15
Ke	Z	Tmax	14:18:26

C&GS card 66-65:
13:18:06.0
11.5° S., 166.3° E.
Santa Cruz Islands
h about 49 km
Magnitude 5.6 (CGS).

August 17

U	PEZ	eR	11:23:56

C&GS card 66-65:
10:35:04.1
5.3° N., 96.2° E.
Northern Sumatra
h about 33 km
Magnitude 5.3 (CGS).

August 17

M	Z	eP	14:12:15.2 c
A	Z	iP	14.3 c
D	Z	eP	15.1 c
MP	Z	eP	13.2 c

C&GS card 66-65:
14:02:19
15.2° N., 92.1° W.
Mexico-Guatemala border region.
h about 121 km
Magnitude 4.9 (CGS).

August 17

U	PEZ	eR	16:40:43

C&GS card 70-65:
16:17:41.5
15.2° S., 166.6° E.
New Hebrides Islands
h about 19 km
Magnitude 5.8 (CGS).

August 18, 1965

M	Z	eP	15:00:31.3 d
U	PEZ	iS	15:07:51
U	PEZ	eSS	15:11:31
U	PEN	eG	15:12:39
U	PEZ	eR	15:14:43

C&GS card 71-65:
14:51:29.3
16.0° S., 167.0° E.
New Hebrides Islands
Felt at Port Vila
h about 5 km
Magnitude 5.75-6 (Pas),
6 (Brk),
5.7 (CGS),
6.2 (HVO).

August 20

M	Z	iP	06:06:20.4 d
A	Z	eP	20.8 d
D	Z	eP	20.1 d
MP	Z	iP	21.0 d
U	Z	iP	20.5 d
Pa	Z	eP	22.0 d
Na	Z	iP	18.6 d
Hi	Z	iP	22.3 d
NB	Z	iP	19.5 d
Ha	Z	iP	17.5 d
U	PEZ	isP	06:08:07
U	PEE	iS	06:15:53
U	PEN	iG	06:27:31
U	PEZ	i	06:31:39

C&GS card 69-65:
05:54:50.0
5.7° S., 128.6° E.
Banda Sea
h about 326 km
Magnitude 6.75 (Pas),
6.2 (CGS).

August 20

U	Z	iP	21:30:14.0 c
Pa	Z	eP	15.2 c
Na	Z	iP	10.9 c
Hi	Z	iP	17.0 c
NB	Z	iP	14.0 c
Ha	Z	iP	20.4 c
U	PEE	eS	21:37:01
U	PEE	iG	21:40:49
U	PEZ	eR	21:43:04

C&GS card 69-65:
21:21:50.9
22.9° S., 176.3° W.
South of Fiji Islands
h about 77 km
Magnitude 5.75 (Brk),
6-6.25 (Pal),
6.2 (CGS).

August 23

M	Z	iP	19:55:47.3 c
D	Z	iP	47.1 c
MP	Z	eP	45.8 c
Na	Z	eP	47.6 c
NB	Z	eP	47.8 c
Ke	Z	eP	51.5 c
Ha	Z	eP	55.6 c
U	PEN	iS	20:03:37
U	PEZ	iSS	20:07:31
U	PEN	eG	20:09:47
U	PEZ	eR	20:11:39

C&GS card 69-65:
19:46:02.9
16.3° N., 95.8° W.
Oaxaca, Mexico
Five killed in Mexico City, one killed in Oaxaca. Slight damage in Mexico City and Oaxaca.
Felt throughout southern Mexico.
h about 28 km
Magnitude 7.25 (Pas), 7.5-7.75 (Brk), 7.25 (Pal), 6.7 (CGS), 7.3 (HVO).

August 24, 1965

M	Z	iP	07:14:48.6 c
A	Z	eP	48.2 c
D	Z	eP	47.6 c
MP	Z	iP	48.1 c
U	Z	iP	48.3 c
Pa	Z	iP	50.0 c
Na	Z	iP	44.0 c
Hi	Z	iP	51.0 c
NB	Z	eP	47.8 c
Ke	Z	iP	46.5 c
Ha	Z	eP	53.7 c

C&GS card 70-65:
07:06:50.0
21.9° S., 177.3° W.
Fiji Islands region
h about 290 km
Magnitude 4.75 (Brk),
5.7 (CGS).

August 24

M	Z	Tmax	14:02:56
A	Z	Tmax	51
D	Z	Tmax	14:03:03
MP	Z	Tmax	14:02:54
U	Z	Tmax	58
Pa	Z	Tmax	52
Hi	Z	Tmax	36
NB	Z	Tmax	14:03:18
Ha	Z	Tmax	14:01:36

C&GS card 69-65:
13:12:19.4
59.4° N., 145.6° W.
Gulf of Alaska
h about 19 km
Magnitude 5.25 (Brk),
5.4 (CGS).

August 29

M	Z	iP	01:56:25.7 c
A	Z	iP	25.0 c
MP	Z	iP	24.3 c
U	Z	iP	25.0 c

C&GS card 70-65:
01:45:57.3

C&GS card 70-65--Continued
14.1° N., 90.5° W.
Guatemala
h about 107 km
Magnitude 4.5 (Brk), 5.0(CGS).

August 29

M	Z	eP	12:55:35
U	PEN	eG	13:07:11

C&GS card 77-65:
12:46:30.1
15.7° S., 167.6° E.
New Hebrides Islands
Felt at Norsup
h about 10 km
Magnitude 6.0 (CGS).

September 1

M	Z	iP	04:57:23.6 d
A	Z	iP	22.9 d
D	Z	eP	21.7 d
MP	Z	eP	23.1 d
U	Z	iP	23.0 d
Na	Z	eP	19.7 d
Hi	Z	eP	24.8 d
NB	Z	iP	22.6 d
Ke	Z	iP	21.7 d
U	PEN	eS	05:05:26
U	PEZ	e	05:14:13

C&GS card 70-65:
04:47:34.9
34.6° S., 179.6° E.
South of Kermadec Islands
h about 107 km
Magnitude 6.25 (Brk),
6.2 (CGS).

September 2

M	Z	eP	04:34:09.2 d
Pa	Z	eP	10.0 d
NB	Z	iP	08.8 d
U	PEZ	eR	04:44:38

September 2, 1965--Continued

C&GS card 70-65:
04:26:37.3
51.9° N., 175.5° E.
Rat Islands, Aleutian Islands.
h about 39 km
Magnitude 4.5-5 (Brk),
5.6 (CGS).

September 4

M	Z	eP	14:40:13.0 d
A	Z	eP	13.7 d
U	Z	eP	13.2 d
Pa	Z	eP	12.6 d
Na	Z	eP	16.5 d
Hi	Z	iP	10.2 d
NB	Z	iP	13.4 d
Ke	Z	eP	13.0 d
U	PEZ	iS	14:46:12
U	PEN	eG	14:48:50
U	PEZ	iR	14:50:26
M	Z	Tmax	15:20:13
A	Z	Tmax	20
U	Z	Tmax	15:19:58
Pa	Z	Tmax	15:20:03
Hi	Z	Tmax	07
NB	Z	Tmax	45
Ha	Z	Tmax	15:18:40

C&GS card 71-65:
14:32:47.9
58.2° N., 152.6° W.
Kodiak Island region
Felt aboard USC&GSS Surveyor located at 58°57' N., 151° 23' W., and in a wide area of south-central Alaska.
h about 19 km
Magnitude 6.75-7 (Pas),
7 (Brk),
6.75-7 (Pal),
6.1 (CGS),
7.0 (HVO).

September 8

M	Z	iP	03:33:38.3 c
A	Z	eP	39.0 c
D	Z	iP	39.2 c
MP	Z	eP	39.6 c
U	Z	eP	38.7 c
U	PEZ	eS	03:39:33
M	Z	Tmax	04:13:35
U	Z	Tmax	38
Ha	Z	Tmax	04:11:58

C&GS card 72-65:
57.5° N., 152.1° W.
Kodiak Island region
h about 25 km
Magnitude 5.25-5.5 (Pal),
5.6 (CGS),
5.2 (HVO).

September 8

M	Z	iP	11:23:37.2 c
A	Z	iP	38.0 c
U	Z	eP	37.6 c
U	PEZ	eS	11:29:27
U	PEZ	eR	11:33:03
M	Z	Tmax	12:02:14
A	Z	Tmax	17
D	Z	Tmax	08
MP	Z	Tmax	07
U	Z	Tmax	03
Pa	Z	Tmax	12:02:00
Hi	Z	Tmax	12:01:58
NB	Z	Tmax	49
Ka	Z	Tmax	24
Ha	Z	Tmax	38

C&GS card 71-65:
11:16:34.4
55.7° N., 155.4° W.
South of Alaska
h about 33 km
Magnitude 5.4 (CGS),
5.3 (HVO).

September 9, 1965

A	Z	eP	10:13:37.9 d
D	Z	eP	38.4 d
U	PEZ	eS	10:23:02
U	PEN	eSS	10:27:26
U	PEN	eL	10:31:10
U	PEZ	iR	10:34:40
M	Z	Tmax	11:29:30
A	Z	Tmax	24
U	Z	Tmax	25
Hi	Z	Tmax	06
Na	Z	Tmax	36
Pa	Z	Tmax	11:28:41

C&GS card 71-65:
10:02:25.4
6.5° N., 84.4° W.
Off coast of Central America.
h about 27 km
Magnitude 6.75 (Pas),
6.75 (Brk),
5.5 (CGS),
6.3 (HVO).

September 11

A	Z	eP	07:02:39.1 c
D	Z	eP	38.1 c
U	Z	eP	39.2 c
Na	Z	iP	36.1 c
U	PEN	iS	07:10:27
U	PEN	iG	07:16:31
U	PEZ	eR	07:19:07
M	Z	Tmax	08:03:26
A	Z	Tmax	26
D	Z	Tmax	26
U	Z	Tmax	22
NB	Z	Tmax	25
Ke	Z	Tmax	09

C&GS card 71-65:
06:53:01.5
5.3° S., 153.0° E.
New Britain region
Felt at Rabaul
h about 67 km
Magnitude 6.3 (CGS).

September 12

M	Z	iP	08:50:05.4 c
D	Z	eP	04.6 c
Na	Z	iP	02.4 c
Hi	Z	eP	07.1 c
NB	Z	eP	04.1 c
U	PEE	iS	08:58:07
U	PEE	eG	09:04:31
U	PEZ	eR	09:06:47

C&GS card 71-65:
08:40:12.8
6.3° S., 151.6° E.
New Britain region
Felt at Rabaul
h about 48 km
Magnitude 6-6.25 (Brk),
6.2 (CGS),
5.7 (HVO).

September 13

M	Z	iP	13:16:14.0 c
A	Z	eP	15.1 c
D	Z	iP	14.9 c
U	Z	eP	14.8 c
Pa	Z	iP	14.9 c
NB	Z	eP	13.2 c
Ke	Z	eP	11.4 c
U	PEN	eS	13:23:11
U	PEE	eG	13:26:59
U	PEZ	eR	13:29:03

C&GS card 71-65:
13:07:48.3
55.5° N., 165.7° E.
Komandorsky Islands region
h about 23 km
Magnitude 5.4 (CGS),
5.6 (HVO).

September 13, 1965

U	PEZ	eR	16:51:51

C&GS card 74-65:
16:15:44.5
36.5° S., 97.5° W.
Southeast central Pacific Ocean
h about 33 km
Magnitude 5.75-6 (Pal),
5.4 (CGS).

September 16

Pa	Z	Tmax	04:50:54
Ha	Z	Tmax	44

C&GS card 73-65:
04:10:22.6
40.4° N., 125.7°
Off coast of northern California
h about 33 km
Magnitude 5 (Brk), 4.75-5 (Pal),
5.6 (CGS).

September 16

M	Z	iP	14:01:45.8 c
D	Z	eP	45.3 c
MP	Z	iP	46.4 c
U	Z	iP	45.9 c
Pa	Z	iP	47.7 c
Na	Z	eP	44.0 c
Hi	Z	iP	47.9 c
NB	Z	iP	44.7 c
Ha	Z	iP	41.4 c

C&GS card 73-65:
13:50:11.8
7.1° N., 126.5° E.
Mindanao, Philippine Islands
h about 179 km
Magnitude 6.0 (CGS).

September 17

M	Z	iP	11:25:41.6 d
A	Z	iP	40.7 d
D	Z	iP	41.4 d
MP	Z	iP	40.3 d
U	Z	eP	40.8 d
Pa	Z	eP	38.8 d
Na	Z	eP	42.0 d
Hi	Z	iP	40.0 d
NB	Z	iP	42.6 d
Ke	Z	iP	11:25:44.1 d
Ha	Z	eP	46.6 d
U	PEN	eS	11:35:29

C&GS card 73-65:
11:13:56.4
1.4° S., 77.6° W.
Ecuador
Felt at Guayaquil and Quito
h about 190 km
Magnitude 6.5 (Pas),
5.5-6 (Brk),
6.0 (CGS).

September 17

M	Z	eP	15:28:34.3 c

C&GS card 72-65:
15:18:38.4
36.3° N., 141.2° E.
Near east coast of Honshu, Japan
h about 66 km
Magnitude 5.2 (CGS).

September 17

M	Z	eP	16:31:05.8 c
Na	Z	eP	05.7 c
U	PEE	iS	16:39:07
U	PEN	eG	16:44:47
U	PEZ	iR	16:47:31

C&GS card 72-65:
16:21:21.9
36.3° N., 141.1° E.
Near East coast of Honshu,
Japan.
h about 72 km
Magnitude 5.8 (CGS), 6.7 (HVO).

September 18, 1965

U	PEZ	eR	21:05:32
M	Z	Tmax	21:37:46
A	Z	Tmax	47
D	Z	Tmax	21:38:02
MP	Z	Tmax	21:37:46
U	Z	Tmax	46
Pa	Z	Tmax	47
NB	Z	Tmax	38
Ha	Z	Tmax	21:36:22

C&GS card 75-65:
20:46:39.2
59.5° N., 145.1° W.
Gulf of Alaska
h about 22 km
Magnitude 6 (Pal), 5.3 (CGS).

September 18

M	Z	eP	22:14:58.8 c
MP	Z	eP	59.5 c

C&GS card 74-65:
22:03:18.8
8.2° N., 126.8° E.
Mindanao, Philippine Islands
h about 85 km
Magnitude 5.6 (CGS).

September 19

U	PEZ	eR	14:30:12

C&GS card 75-65:
13:55:39.9
54.4° S., 135.7° W.
South Pacific Cordillera
h about 33 km
Magnitude 4.8 (CGS).

September 21

WP	Z	iP	01:49:20.3 d
Na	Z	iP	19.9 d
Hi	Z	iP	21.2 d
Ke	Z	eP	17.3 d
U	PEZ	iS	01:58:12
U	PEN	eSS	02:02:28
U	PEN	iG	02:05:57

C&GS card 73-65:
01:38:30.2
29.1° N., 128.2° E.
East China Sea
h about 197 km

September 21--Continued

C&GS card--Continued

Magnitude 6.75 (Pas), 6.25 (Brk), 6.0 (CGS), 6.4 (HVO).

September 22

M	Z	iP	09:46:53.4 c

C&GS card 74-65:
09:35:25.3
1.3° S., 134.0° E.
West New Guinea region
h about 14 km
Magnitude 5.8 (CGS).

September 22

M	Z	iP	20:11:38.5 d
Na	Z	eP	35.0 d
Hi	Z	iP	39.8 d
U	PEZ	eR	20:28:32

C&GS card 74-65:
20:01:49.3
5.4° S., 151.5° E.
New Britain region
Felt at Rabaul
h about 57 km
Magnitude 5-5.5 (Brk), 6.5 (CGS), 6.0 (HVO).

September 22

M	Z	eP	22:17:48.1 c
MP	Z	eP	49.4 c
U	PEE	eS	22:25:46
U	PEN	eL	22:31:32
U	PEZ	iR	22:34:06

C&GS card 74-65:
22:08:01.1
36.4° N., 141.3° E.
Near east coast of Honshu, Japan
Felt at Tokyo
h about 44 km
Magnitude 6.75 (Pas), 6.25 (Brk), 5.6 (CGS), 6.2 (HVO).

September 26, 1965

D	Z	iP	00:45:30.2 c

C&GS card 76-65:
00:36:24
18.4° N., 101.2° W.
Guerrero, Mexico
h about 93 km
Magnitude 4.8 (CGS).

September 28

M	Z	iP	05:15:50.1 c
MP	Z	eP	48.7 c
U	PEN	iS	05:23:12
U	PEN	eSS	05:26:46
U	PEE	eL	05:27:48
U	PEN	eG	05:28:04
U	PEZ	iR	05:30:24

C&GS card 77-65:
05:06:36.8
28.0° S., 178.1° W.
Kermadec Islands
h about 33 km
Magnitude 6.5-6.75 (Pas),
6.25-6.5 (Brk),
6.5-6.75 (Pal),
5.2 (CGS),
6.4 (HVO).

September 30

M	Z	eP	23:55:34.1 c
U	PEZ	eS	00:01:58
U	PEE	eG	00:04:32
U	PEZ	iR	00:06:38
M	Z	Tmax	00:39:00
A	Z	Tmax	05
D	Z	Tmax	07
MP	Z	Tmax	07
U	Z	Tmax	04
Pa	Z	Tmax	01
Hi	Z	Tmax	00:38:57
Ha	Z	Tmax	00:37:42

September 30--Continued

C&GS card 79-65:
23:47:40.7
59.7° N., 143.4° W.
Gulf of Alaska
h about 19 km
Magnitude 5.25-5.5 (Brk),
6.25-6.5 (Pal),
4.8 (CGS),
6.1 (HVO).

The following persons or agencies reported "felt" earthquakes during the 3d quarter, 1965. Their assistance is gratefully acknowledged.

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Mauna Loa Observatory

Kilauea summit area

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HAWAIIAN VOLCANO OBSERVATORY

SUMMARY 40

October, November, and December, 1965

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Summary of Activities

Kilauea volcano continued its gradual inflation throughout much of the fall quarter of 1965. As monitored by daily readings of the short-base water-tube tiltmeters at Uwekahuna, the center of inflation lay to the southeast, just east of West Pit which is in the southwestern part of Kilauea caldera. Seismic activity remained at a normal level, punctuated by two small swarms of long-period quakes from beneath Kilauea summit and one swarm of 50 quakes from the east rift zone in mid-November.

These fairly normal conditions were abruptly interrupted by a 6-hour eruption on December 24 and 25. About 1.1 million cubic yards of lava were erupted from 2 reaches of en echelon fissures on the east rift zone of Kilauea extending from Aloi Crater, (which is midway between Ahua and Makaopuhi seismograph stations (fig. 1)), to Kane Nui o Hamo, a small lava and cinder cone about 4 km farther east. There was little prior warning of this activity--harmonic tremor and a swarm of quakes began at about 19:30 on December 24 and by 21:30 on the same evening the lava reached the surface.

The lava erupted from vents crossing the floor of Aloi Crater and formed a 47-foot-deep lava lake, but late-stage drainback withdrew all but 5 or 6 feet of this new lava.

The eruption ended as the tempo of earthquakes and ground cracking reached the maximum. The seismic crisis produced hundreds of felt quakes and thousands were detected instrumentally. This swarm continued with gradually decreasing intensity into mid-January 1966. The epicenters of most of the quakes as well as the location of most of the new ground cracks lay along the upper east rift zone and westward along the Koae fault system, a system that lies roughly between Makaopuhi and Desert seismograph stations (fig. 1), for a distance of about 15 km.

Studies in Makaopuhi lava lake, near Makaopuhi seismograph station, continued throughout this quarter. A number of samples of molten basalt were obtained from beneath the crust of the lake at temperatures ranging from 1,100° to 1,120°C. Modal studies of these melt samples as well as of samples from other levels in the crust of the lake indicate the following paragenesis of the main crystalline phases: olivine-clinopyroxene-plagioclase-opaque minerals.

Investigations of the partial pressure of oxygen are continuing in the Makaopuhi lava lake drill holes. Five drill holes now show zones of anomalously high Po_2 (up to 10^{-5} atm) within the temperature range 750°-450°C. The maxima of these anomalies moved deeper in the holes as the isotherms moved to greater depth. The explanation of these anomalies is still being explored.

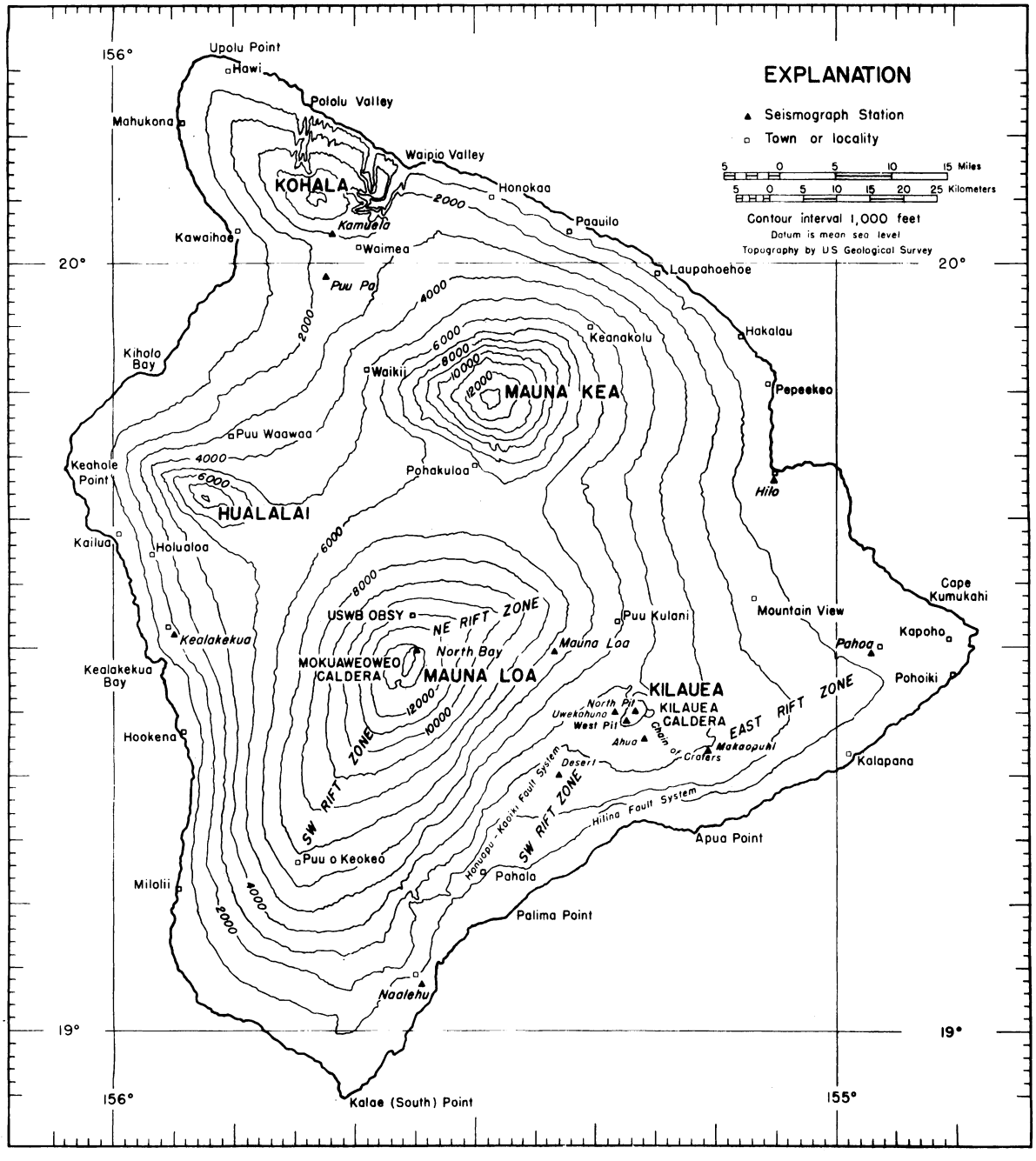

Figure 1.--Map of the Island of Hawaii showing seismograph stations operated by the U.S. Geological Survey, principal settlements, and selected geologic features. Epicenters of local earthquakes are given in table 4 in terms of geographic coordinates, which are indicated at the edges of the map.

Tilting of the ground around Kilauea caldera.--Tilting of the ground around the summit of Kilauea is monitored daily by a short-base water-tube tiltmeter at Uwekahuna (table 1), and at irregular intervals it is measured on a regional scale by means of a network of field tilt bases and a portable water-tube tiltmeter (table 2). The attitude of the ground surface at each tilt base is reported in terms of north-south and east-west tilt coordinates. Both coordinates at each station were arbitrarily set equal to 500 when measurements at that station were begun. Increasing tilt coordinates correspond to northward and eastward tilting of the earth's surface; that is, to a relative subsidence toward the north and east. A one-unit change in coordinate corresponds to a tilting of 1 microradian (1 mm per km) in the direction indicated.

Location of and essential data on each tiltmeter station are listed in table 7 of summary 37, which covers the first quarter of 1965.

Table 1.--Tilt coordinates at Uwekahuna, October, November, and December, 1965

Date (1965)	N-S	E-W	Date (1965)	N-S	E-W
October 2	473	479	November 20	471	473
9	474	478	27	471	471
16	474	478	December 4	470	468
23	474	476	11	471	467
30	474	474	18	471	467
November 6	475	474	25	467	498
13	474	475			

Table 2.--Tilt coordinates and changes at bases around Kilauea caldera.

(See tilt diagram, fig. 2.)

Tilt base	Date (1965)	Tilt coordinates N-S	Tilt coordinates E-W	Rate (10^{-6} rad/mo) and direction of tilting since last reading		Date of last reading (1965)
Uwekahuna (U)	Dec. 27	454.6	502.1	1.6	S. 38.0° E.	Sept. 9
Tree Molds (TM)	29	427.7	523.9	2.3	S. 36.4° E.	2
Sand Spit (SS)	30	858.8	738.2	1.46	S. 48.6° E.	7
Kalihipaa (Kal)	This station ruined during the eruption and earthquake swarm of Dec. 24-31, 1965.					
Keamoku (Kea)	Dec. 28	592.7	494.5	.2	N. 38.9° E.	Aug. 30
Ahua Kamokukolau (Kam).	28	662.3	532.5	11.2	N. 6.0° E.	30
Kipuka Nene (KN)	Jan. 13 (1966)	293.5	500.9	8.4	S. 1.3° W.	31
Hilina Pali (HP)	10 (1966)	463.4	507.7	1.2	S. 20.6° E.	June 9
Kapapala Ranch (Kap).	Dec. 27	492.7	508.4	.54	N. 7.2° E.	Sept. 1
Mehana (M)	29	541.3	547.8	.3	N. 28.1° E.	9

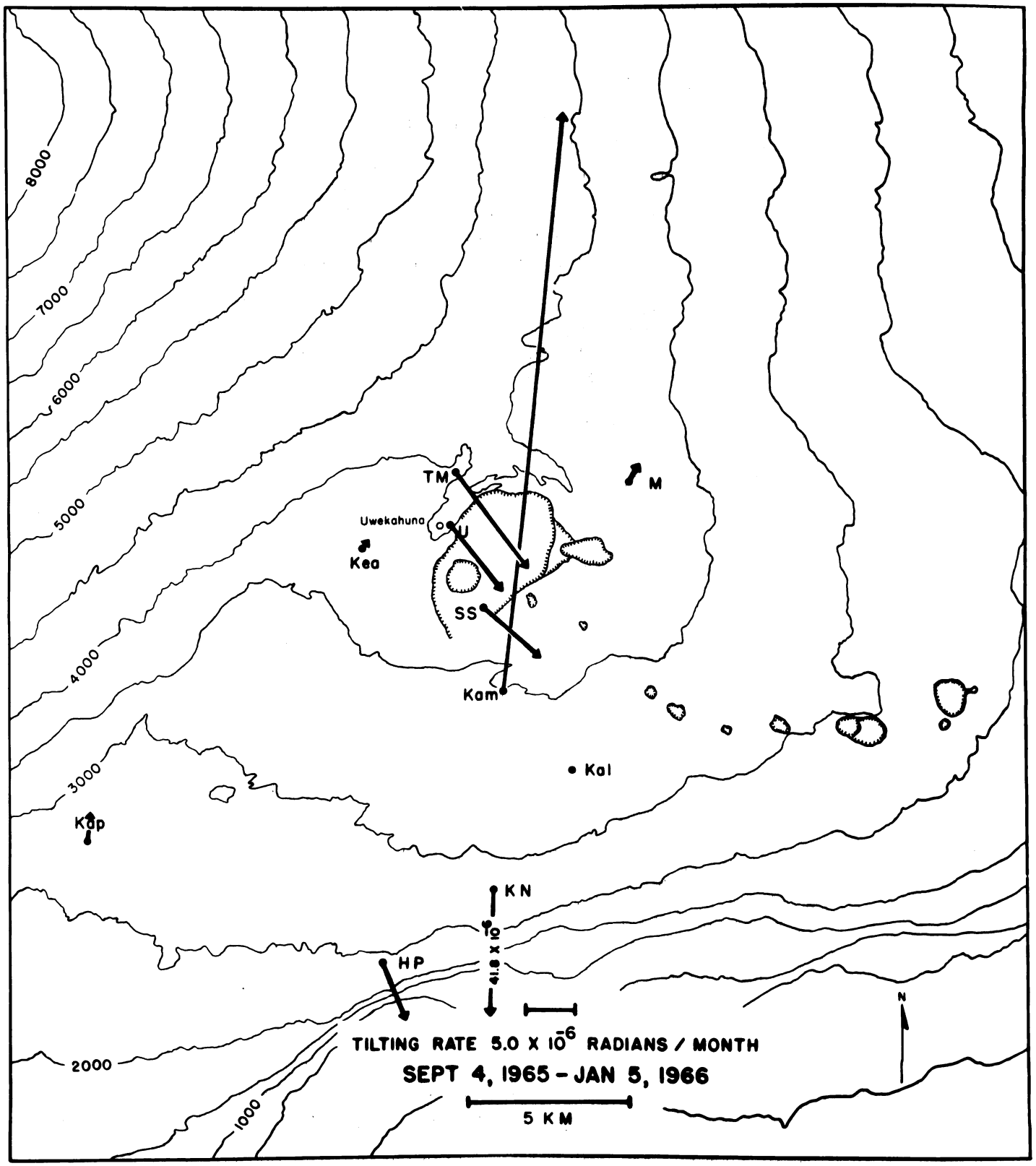

Figure 2.--Tilting of the ground around Kilauea caldera, September 4, 1965-January 5, 1966. The vector depicting tilting at a given tilt base points in the direction of maximum relative subsidence and has a length proportional to the rate of tilting during the measurement interval. Closed circles represent field tilt bases; open circles, short-base water-tube tiltmeters. See table 2 for explanation of abbreviations.

Seismic summary.--Events recorded by the U.S. Geological Survey seismograph network in Hawaii fall into two categories: local earthquakes and tremor originating in the region of the Hawaiian Islands (usually within 100 km of at least one seismograph), and distant earthquakes originating more than 3,000 km from Hawaii. As an index of seismic activity at Hawaiian volcanoes, daily counts of earthquakes and minutes of tremor recorded by seismographs in Hawaii are listed in table 3. The earthquakes are separated into groups on the basis of region of origin as determined by analysis of records obtained daily at the Observatory (stations U, M, A, D, N, WP, MP).* Earthquakes of magnitude 2.0 or greater are generally sufficiently well recorded to be located with greater precision; they are listed individually in table 4. Data on identifiable phases from distant earthquakes are listed in table 5.

Acknowledgments.--Several people or agencies reported "felt" earthquakes during the fourth quarter, 1965. Their assistance is gratefully acknowledged.

*Location of and essential data on each seismograph station are listed in table 6 of summary 37, which covers the first quarter of 1965.

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera

Tremor is separated into three categories: deep, intermediate, and shallow, on the basis of relative amplitudes on seismographs in the summit region. Unless otherwise stated, tremor is presumed to be associated with movement of magma within the central complex of Kilauea.

Earthquake categories are: Kilauea summit, 30 km, earthquakes from a source about 30 km beneath the Kilauea summit region, and shallow earthquakes in the Kilauea caldera region; shallow earthquakes along the SW. rift zone of Kilauea and the adjacent portion of the Kaoiki fault system; earthquakes along the eastern half of Kilauea's east rift zone--detected largely on the Pahoa seismograph; earthquakes from the upper east rift zone and the adjacent fault systems of Kilauea's south flank; and earthquakes from other regions: Kona, Mauna Kea, etc.

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 km	Shallow				
Oct. 1	----	------	------	2	70	4	-----	5	----------
2	----	------	------	1	59	7	-----	14	----------
3	----	------	------	-----	80	8	-----	7	1 off south shore of Hawaii
4	----	5	------	2	120	2	-----	11	1 off NW. shore of Hawaii
5	----	------	------	1	47	3	-----	6	----------
6	----	------	------	2	33	5	-----	10	----------
7	----	------	16	-----	20	5	-----	10	----------
8	----	------	------	4	32	8	-----	4	----------
9	30	------	4	4	30	9	-----	10	1 Mauna Kea
10	----	------	2	2	39	6	-----	11	----------
11	----	6	------	-----	5	1	-----	3	----------
12	9	6	------	-----	32	8	-----	14	1 off SW. shore of Hawaii
13	----	3	------	2	32	4	-----	19	1 Kohala
14	----	7	------	-----	27	2	-----	14	1 off SE. shore of Maui
15	----	22	------	-----	55	7	-----	10	1 Kona, 1 Mauna Kea
16	7	------	------	-----	65	5	-----	7	1 off south shore of Hawaii 31 Mauna Loa

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 km	Shallow				
Oct. 17	----	2	------	-----	52	7	-----	7	21 Mauna Loa
18	----	5	------	1	7	6	-----	8	30 Mauna Loa
19	----	------	------	2	40	1	1	2	10 Mauna Loa, 1 Hualalai
20	----	7	------	10	55	8	-----	3	----------
21	----	4	8	5	58	6	-----	12	1 Mauna Loa
22	36	------	------	2	40	6	-----	11	----------
23	----	------	------	2	48	9	-----	11	1 Kona
24	----	------	3	3	52	8	-----	8	3 Mauna Loa
25	----	210	------	-----	90	12	-----	18	----------
26	----	18	------	1	65	8	1	7	----------
27	----	5	------	4	74	2	2	8	----------
28	34	------	------	5	98	9	-----	9	1 Kona
29	----	8	------	1	67	7	1	5	----------
30	----	8	------	2	80	10	-----	12	----------
31	17	------	7	3	65	6	-----	17	1 Mauna Loa
Nov. 1	----	21	------	3	53	3	-----	5	----------
2	----	12	------	1	64	6	-----	3	----------
3	----	18	------	1	69	7	1	12	----------
4	----	------	------	2	67	5	1	10	----------
5	----	10	------	3	72	5	-----	7	1 off SE. shore of Hawaii
6	----	9	------	3	74	5	-----	6	2 Mauna Kea
7	----	------	------	1	70	4	-----	7	----------
8	----	6	------	4	80	2	-----	6	----------
9	----	20	Severe electrical storm--instruments turned off						
10	----	46	------	-----	110	6	5	10	----------
11	----	20	------	4	96	6	4	13	----------
12	----	50	------	-----	54	3	1	26	1 Kona
13	----	------	------	3	79	3	1	70	----------
14	----	------	------	1	106	10	5	9	1 Mauna Loa

Nov.	15	----	9	------	1	68	6	6	9	1 Mauna Loa
	16	----	------	------	3	36	5	4	5	----------
	17	----	5	------	4	56	11	9	9	1 off SE. shore of Oahu
	18	----	------	------	4	46	6	7	6	1 off SE. shore of Oahu
	19	----	9	------	3	45	3	6	11	----------
	20	----	------	------	2	53	5	-----	6	----------
	21	----	------	------	3	31	6	-----	5	----------
	22	----	------	------	7	60	6	-----	9	----------
	23	----	7	5	24	101	5	-----	5	1 Mauna Kea, 2 Kona
	24	----	------	------	6	150	2	-----	7	----------
	25	----	------	------	5	142	3	-----	4	----------
	26	----	------	------	4	135	2	-----	6	----------
	27	----	3	------	1	115	9	-----	7	1 off SW. shore of Hawaii
	28	15	------	------	6	112	9	2	10	----------
	29	6	------	------	2	145	5	-----	5	----------
	30	----	------	------	6	200	6	1	13	1 Mauna Kea
Dec.	1	----	------	------	6	159	2	1	20	----------
	2	----	------	------	2	55	3	-----	20	1 off east shore of Hawaii
	3	32	------	------	3	56	4	1	31	----------
	4	----	------	------	2	58	9	-----	26	----------
	5	----	21	------	3	50	3	-----	22	1 Mauna Loa
	6	----	------	------	3	44	5	-----	-----	----------
	7	----	------	------	1	55	3	1	19	1 Mauna Loa, 1 Kona
	8	8	------	------	3	70	3	1	10	----------
	9	15	------	------	3	95	8	-----	3	----------
	10	----	------	------	2	60	9	2	12	----------
	11	----	------	------	4	72	13	4	4	----------
	12	----	------	------	2	63	6	1	7	1 Mauna Loa
	13	----	------	------	6	60	6	1	4	1 Mauna Kea
	14	38	------	------	2	36	3	1	7	----------
	15	----	------	------	2	36	3	-----	6	----------
	16	----	------	------	-----	42	6	-----	10	1 off west shore of Hawaii
	17	----	------	------	2	30	2	1	13	1 off NW. shore of Hawaii
	18	----	------	------	2	36	5	-----	10	----------
	19	----	------	------	3	43	5	-----	5	----------
	20	----	------	------	14	80	10	-----	-----	1 off west shore of Hawaii, 1 Mauna Loa.

Table 3.--Numbers of earthquakes and minutes of tremor recorded on seismographs U, M, A, D, N, WP, and MP around Kilauea caldera--Continued

Date (1965)	Tremor (in minutes)			Earthquakes					
				Kilauea summit		SW. rift and Kaoiki	Eastern east rift	Upper east rift	Others
	Deep	Inter-mediate	Shallow	30 km	Shallow				
Dec. 21	----	------	------	10	80	15	------	6	----------
22	----	------	------	9	100	6	------	3	----------
23	----	------	3	4	93	14	------	8	----------
24, 25, 26, 27, 28	Eruption at Aloi Crater. Harmonic tremor and several thousands of earthquakes occurred beneath the southeast and south flanks of Kilauea, along the upper east rift and Koae fault system.								
29	----	------	------	3	10+	10	------	308	----------
30	----	------	------	3	17+	19	------	232	----------
31	19	------	------	2	14+	12	------	210	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, October, November, and December, 1965

Entries for a given quake are: date, origin time (Hawaiian Standard Time), magnitude, depth, epicenter, and felt report. All earthquakes of magnitude 2.5 and larger, as well as many favorably located smaller ones, occurring on or near the island of Hawaii are included in the list.

Date (1965)	Time			Magnitude	Depth (km)	Epicenter			Felt Report
	h	m	s			Lat. N.	Long. W.	Description	
Oct. 1	02	13	27.4	2.2	9	19°18.5'	155°10.7'	6 km south of Makaopuhi seismometer	----------
3	09	10	33.6	2.7	8	18°30.0'	155°28.5'	63 km SSE. of Naalehu	----------
4	22	25	33.1	3.2	13	20°09'	156°22'	48 km WSW. of Mahukona	----------
8	04	50	34.5	2.2	8	19°17.5'	155°10.1'	8 km SSE. of Makaopuhi seismometer	----------
8	14	38	29.6	2.5	5	19°24.8'	155°26.8'	Kaoiki fault system	----------
9	22	07	47.1	2.0	5	19°25.6'	155°25.7'	---do----------	----------
9	06	20	18.9	2.2	<3	19°53.9'	155°38.7'	16 km SSE. of Kamuela	----------
12	12	57	01.8	2.7	8	19°15.0'	156°01.3'	20 km SW. of Hookena	----------
13	06	46	59.2	2.2	8	19°17.2'	155°08.7'	10 km SSE. of Makaopuhi seismometer	----------
13	09	38	48.5	2.4	40	19°09.8'	155°24.3'	19 km SSW. of Desert seismometer	----------
13	14	34	24.9	2.7	8	20°10.0'	155°36.4'	17 km NE. of Kamuela	----------
14	01	57	36.5	2.3	8	19°18.0'	155°12.5'	8 km SW. of Makaopuhi seismometer	----------
14	05	49	16.2	2.1	8	19°16.0'	155°08.6'	12 km SSE. of Makaopuhi seismometer	----------
14	16	27	37.1	3.1	13	20°19'	156°12'	50 km SSE. of Haleakala seismometer	----------
15	11	36	51.1	2.8	50	19°10.5'	155°28.9'	2 km SSW. of Pahala	----------
15	11	40	00.9	3.0	50	19°08.7'	155°26.0'	8 km SE. of Pahala	----------
15	21	04	01.9	2.3	3	19°28.0'	155°47.1'	15 km ESE. of Kealakekua	----------
15	21	52	26.4	2.5	8	19°56.4'	155°27.5'	13 km ENE. of Keanakolu	----------
16	06	06	59.5	3.7	8	18°38.2'	155°31.7'	48 km SSE. of Naalehu	----------
17	20	59	28.5	2.3	8	19°26.1'	155°36.6'	8 km SW. of North Bay seismometer	----------
17	21	23	49.7	2.4	9	19°26.1'	155°35.4'	6 km SSW. of North Bay seismometer	----------
17	22	40	09.6	2.4	6	19°27.8'	155°38.5'	7 km WSW. of North Bay seismometer	----------
18	20	51	29.6	2.0	9	19°28.1'	155°30.6'	8 km ESE. of North Bay seismometer	----------
19	06	15	44.5	2.2	8	19°26.0'	154°56.1'	7 km SSE. of Pahoa	----------
20	05	50	52.0	3.2	30	19°22.4'	155°18.7'	Beneath Kilauea summit	Pahala, Kilauea summit region.

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, October, November, and December, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
Oct. 20	18	32	15.8	2.4	30	19°21.7'	155°19.5'	Beneath Kilauea summit	----------
21	06	46	48.6	2.3	5	19°13.5'	155°36.3'	17 km NNW. of Naalehu	----------
21	08	56	33.2	2.4	50	19°47.3'	155°46.0'	8 km ENE. of Puu Waawaa	----------
21	11	49	58.4	2.4	9	19°18.2'	155°08.5'	9 km SE. of Makaopuhi seismometer	----------
21	15	28	57.8	2.0	30	19°11.1'	155°20.0'	17 km SSE. of Desert seismometer	----------
21	16	14	42.6	2.2	8	19°17.6'	155°09.0'	8 km SSE. of Makaopuhi seismometer	----------
21	16	15	01.9	2.4	9	19°17.6'	155°08.6'	9 km SSE. of Makaopuhi seismometer	----------
22	03	11	17.3	2.2	8	19°21.1'	155°01.1'	5 km west of Kalapana	----------
22	23	07	32.5	2.6	8	19°17.0'	155°07.3'	11 km SE. of Makaopuhi seismometer	----------
23	05	58	05.2	2.3	8	19°17.0'	155°07.5'	11 km SE. of Makaopuhi seismometer	----------
23	08	48	06.9	2.5	8	19°18.9'	155°47.9'	14 km SE. of Hookena	----------
23	20	45	50.5	2.0	8	19°22.3'	155°02.3'	7 km WNW. of Kalapana	----------
24	12	58	59.7	2.5	8	19°11.7'	155°35.3'	14 km north of Naalehu	----------
24	14	53	47.6	2.3	3	19°10.2'	155°34.5'	12 km north of Naalehu	----------
24	21	50	08.6	2.6	<3	19°26.2'	155°36.5'	7 km SSW. of North Bay seismometer	----------
25	00	20	03.2	2.4	8	19°21.8'	155°02.9'	15 km east of Makaopuhi seismometer	----------
28	04	55	01.6	2.0	8	19°22.1'	155°29.9'	13 km WNW. of Desert seismometer	----------
28	09	48	24.8	3.3	3	19°29.9'	155°48.0'	13 km ESE. of Kealakekua	Kona
28	10	19	40.2	2.2	30	19°22.8'	155°18.4'	Beneath Kilauea summit	----------
28	17	47	02.9	2.7	30	19°22.2'	155°19.4'	---do----------	----------
28	17	58	30.9	2.0	30	19°22.2'	155°19.4'	---do----------	----------
28	23	46	34.6	2.4	5	19°24.8'	155°27.3'	Kaoiki fault system	----------
30	22	25	05.9	3.3	10	19°16.4'	155°07.1'	12 km SE. of Makaopuhi seismometer	Hilo
30	22	31	35.6	2.3	10	19°17.0'	155°06.8'	11 km SE. of Makaopuhi seismometer	----------
31	01	04	43.3	2.3	10	19°17.6'	155°08.5'	8 km SE. of Makaopuhi seismometer	----------
31	12	20	04.5	2.2	8	19°21.0'	155°03.1'	14 km ESE. of Makaopuhi seismometer	----------
31	19	22	45.5	2.7	10	19°24.6'	155°29.6'	Kaoiki fault system	----------
31	21	10	04.7	2.4	13	19°25.5'	155°35.6'	8 km SSW. of North Bay seismometer	----------
Nov. 3	20	17	25.5	2.4	5	19°25.0'	155°26.4'	Kaoiki fault system	----------
4	00	44	47.0	2.2	10	19°19.2'	155°07.9'	7 km SE. of Makaopuhi seismometer	----------

Nov. 5	02	24	13.0	2.4	10	19°19.2'	155°07.2'	7 km SE. of Makaopuhi seismometer	----------
5	19	31	58.3	2.7	40	18°58.1'	154°57.9'	42 km south of Kalapana	----------
6	00	07	44.6	2.7	30	20°06.5'	155°47.5'	8 km WNW. of Honokaa	----------
6	07	34	30.8	2.8	13	20°00.9'	155°22.2'	14 km WNW. of Laupahoehoe	----------
7	06	54	33.3	2.5	40	19°14.8'	155°25.2'	11 km SSW. of Desert seismometer	----------
7	12	34	02.4	2.5	8	19°16.8'	155°12.2'	10 km SSW. of Makaopuhi seismometer	----------
8	00	48	35.0	3.4	37	19°24.5'	154°50.0'	16 km SE. of Pahoa	----------
8	17	57	41.2	2.2	30	19°22.2'	155°18.1'	Beneath Kilauea summit	----------
8	21	48	05.1	2.0	8	19°19.4'	155°04.4'	13 km ESE. of Makaopuhi seismometer	----------
10	13	45	53.5	2.3	10	19°23.9'	154°53.9'	11 km SSE. of Pahoa	----------
11	16	19	15.6	2.4	3	19°25.8'	154°56.3'	7 km south of Pahoa	----------
12	17	35	49.3	3.4	6	19°12.9'	155°12.4'	5 km SSW. of Apua Point	----------
12	17	39	10.3	2.5	5	19°14.7'	155°11.9'	14 km SSW. of Makaopuhi seismometer	----------
12	18	10	43.4	2.1	3	19°15.0'	155°13.4'	14 km SW. of Makaopuhi seismometer	----------
12	18	20	40.4	2.4	8	19°15.8'	155°13.3'	12 km SW. of Makaopuhi seismometer	----------
12	21	51	55.7	2.7	8	19°32.7'	155°52.4'	6 km ENE. of Kealakekua	----------
13	06	29	30.5	2.5	8	19°12.7'	155°27.3'	3 km NE. of Pahala	----------
13	07	28	45.3	2.5	8	19°16.3'	155°10.4'	10 km south of Makaopuhi seismometer	----------
13	07	29	01.8	3.2	3	19°13.9'	155°09.8'	15 km SSE. of Makaopuhi seismometer	Mauna Loa Observatory.
13	07	50	59.3	3.2	6	19°14.3'	155°11.8'	15 km SSW. of Makaopuhi seismometer	Hilo
13	12	02	22.2	2.5	8	19°15.2'	155°12.3'	13 km SSW. of Makaopuhi seismometer	----------
14	17	29	19.9	2.1	8	19°24.0'	155°25.1'	Kaoiki fault system	----------
16	12	44	51.1	2.0	20	19°23.3'	155°18.2'	Beneath Kilauea summit	----------
17	04	14	42.0	3.0	10	19°22.8'	155°27.8'	Kaoiki fault system	Pahala
17	06	16	59.9	3.7	13	20°55'	157°50'	40 km south of Diamond Head, Oahu	Oahu
18	20	28	59.2	3.3	13	20°54'	157°50'	41 km south of Diamond Head, Oahu	----------
19	11	28	28.5	3.1	3	19°25.7'	154°52.9'	10 km SE. of Pahoa	Pahoa
21	20	36	30.4	2.5	8	19°19.1'	155°08.1'	7 km SE. of Makaopuhi seismometer	----------
22	18	42	56.2	2.0	25	19°23.8'	155°18.6'	Beneath Kilauea summit	----------
23	09	09	59.3	3.9	30	19°22.8'	155°19.7'	Beneath Kilauea summit	East 1/2 of Island.
23	11	08	38.8	2.7	30	19°22.2'	155°18.2'	Beneath Kilauea summit	----------
23	13	04	10.2	2.6	5	19°18.7'	155°30.0'	12 km WSW. of Desert seismometer	----------
23	14	16	19.9	2.0	30	19°22.2'	155°18.2'	Beneath Kilauea summit	----------
23	18	30	19.3	2.6	8	19°48.8'	155°31.6'	7 km north of Pohakuloa	----------
23	20	30	22.4	2.7	3	19°18.4'	155°48.7'	13 km SE. of Hookena	----------
25	03	37	16.3	2.2	25	19°23.9'	155°18.3'	Beneath Kilauea summit	----------
26	00	09	13.6	2.5	8	19°25.6'	155°28.8'	Kaoiki fault system	----------
27	09	51	21.8	2.9	13	19°05.5'	156°19.5'	45 km WSW. of Milolii	----------
29	07	49	26.1	2.3	32	19°22.2'	155°15.7'	Beneath Kilauea Summit	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey October, November, and December, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
Nov. 29	15	44	45.0	2.1	30	19°23.5'	155°18.7'	Beneath Kilauea summit	----------
30	19	09	53.0	2.0	30	19°21.6'	155°19.6'	---do----------	----------
30	19	38	13.8	3.3	13	19°58.1'	155°39.5'	8 km SSE. of Kamuela	Kona
Dec. 1	21	02	47.7	2.1	8	19°20.7'	155°09.4'	3 km ESE. of Makaopuhi seismometer	----------
2	02	37	17.7	3.8	45	19°46.7'	154°56.4'	17 km ENE. of Hilo	Hilo, Pahala
3	04	13	19.0	3.3	10	19°22.2'	155°27.1'	Kaoiki fault system	Pahala
4	07	49	06.3	2.2	25	19°25.1'	155°16.3'	Beneath Kilauea summit	----------
4	16	18	27.8	2.3	5	19°22.0'	155°30.0'	Kaoiki fault system	----------
5	19	05	08.5	3.8	30	19°35.2'	154°57.8'	10 km NNW. of Pahoa	East 1/2 of Island
5	21	08	39.6	3.5	8	19°11.6'	155°38.6'	16 km NNW. of Naalehu	----------
6	08	22	08.3	3.0	25	19°22.8'	155°17.5'	Beneath Kilauea summit	----------
7	00	00	08.8	2.6	9	19°20.8'	155°06.0'	9 km ESE. of Makaopuhi seismometer	----------
7	02	29	02.4	2.5	5	19°13.1'	155°42.6'	21 km NW. of Naalehu	----------
7	22	48	31.8	2.5	5	19°43.1'	156°08.0'	7 km WSW. of Keahole Point	----------
8	21	41	00.8	2.2	8	19°21.1'	155°05.6'	9 km ESE. of Makaopuhi seismometer	----------
12	09	18	47.1	2.6	8	19°24.9'	155°25.3'	Kaoiki fault system	Mauna Loa Observatory.
12	14	12	31.3	2.8	8	19°22.1'	155°27.9'	---do----------	
12	15	35	50.8	3.0	13	19°24.7'	155°37.0'	10 km SSW. of North Bay seismometer	----------
13	10	01	36.6	2.6	3	19°55.7'	155°50.0'	18 km SW. of Kamuela	----------
15	10	43	13.8	2.3	8	19°26.2'	155°25.2'	Kaoiki fault system	----------
16	22	18	55.4	2.0	8	19°23.1'	155°24.9'	---do----------	----------
16	01	18	36.7	2.5	13	19°27.9'	156°04.9'	18 km WSW. of Kealakekua	----------
17	17	42	53.0	3.0	13	20°06'	156°26'	77 km WSW. of Mahukona	----------
19	17	31	05.2	2.1	25	19°23.0'	155°15.8'	Beneath Kilauea summit	----------
20	10	20	56.0	2.7	8	19°52.0'	156°04.0'	15 km north of Keahole Point	----------
20	12	16	37.7	2.3	8	19°22.1'	155°25.8'	Kaoiki fault system	Pahala
20	21	34	05.0	2.3	5	19°25.8'	155°31.7'	9 km SSE. of North Bay seismometer	----------
21	15	49	19.6	3.2	31	19°21.5'	155°17.5'	Beneath Kilauea summit	South 1/2 of Island.
21	16	01	16.9	2.5	30	19°22.0'	155°18.7'	---do----------	----------

The Aloi eruption of 1965.--During the very intense period of seismic activity from late December 24 to early December 28, several thousands of earthquakes occurred south of Kilauea caldera along the east-west-trending Koae fault system, and along adjacent structures. About 300 of these earthquakes ranged in magnitude from 2 to 4.5. The many earthquakes which occurred during this time are not listed separately in the usual manner.

Dec. 28	11	18	01.5	3.0	1.5	19°21.2'	155°16.9'	3 km SW. of Ahua seismometer	----------
28	11	27	54.5	2.3	5	19°14.5'	155°23.7'	10 km south of Desert seismometer	----------
28	11	34	58.2	2.9	5	19°20.9'	155°17.9'	5 km WSW. of Ahua seismometer	----------
28	12	30	10.8	2.0	5	19°20.7'	155°18.4'	5 km SW. of Ahua seismometer	----------
28	12	41	58.5	2.2	3	19°17.3'	155°19.0'	11 km SW. of Ahua seismometer	----------
28	16	18	15.4	2.8	5	19°16.1'	155°21.8'	8 km SSE. of Desert seismometer	----------
28	17	45	44.5	2.2	5	19°18.0'	155°17.9'	8 km SW. of Ahua seismometer	----------
28	18	43	15.2	2.0	5	19°18.8'	155°16.4'	7 km SSW. of Ahua seismometer	----------
28	20	51	27.3	2.3	3	19°20.2'	155°18.8'	8 km east of Desert seismometer	----------
28	22	22	07.8	2.4	5	19°22.1'	155°12.1'	3 km west of Makaopuhi seismometer	----------
28	22	24	44.2	2.2	3	19°20.9'	155°18.1'	5 km SW. of Ahua seismometer	----------
28	22	39	27.8	1.9	3	19°20.8'	155°19.0'	6 km SW. of Ahua seismometer	----------
29	01	09	13.1	1.7	5	19°18.2'	155°16.9'	8 km SSW. of Desert seismometer	----------
29	03	43	43.9	2.5	5	19°20.6'	155°16.4'	4 km SW. of Ahua seismometer	----------
29	04	30	19.7	2.1	3	19°21.7'	155°17.2'	3 km SW. of Ahua seismometer	----------
29	06	06	08.7	2.0	5	19°21.4'	155°03.8'	13 km ESE. of Makaopuhi seismometer	----------
29	07	12	12.0	1.9	5	19°21.0'	155°18.0'	4 km SW. of Ahua seismometer	----------
29	07	48	00.0	2.6	5	19°12.3'	155°17.9'	17 km SE. of Desert seismometer	----------
29	07	52	28.4	2.0	3	19°20.8'	155°17.1'	5 km SW. of Ahua seismometer	----------
29	08	58	06.9	2.6	5	19°19.9'	155°19.0'	8 km SW. of Ahua seismometer	----------
29	12	46	10.0	2.2	3	19°20.7'	155°18.1'	5 km SW. of Ahua seismometer	----------
29	13	04	38.9	2.5	4	19°20.8'	155°18.6'	6 km SW. of Ahua seismometer	----------
29	15	17	47.9	2.8	3	19°18.5'	155°16.0'	8 km south of Ahua seismometer	----------
29	21	14	59.8	2.0	3	19°20.8'	155°16.8'	4 km SW. of Ahua seismometer	----------
29	21	24	46.9	2.3	5	19°21.8'	155°10.2'	Near Makaopuhi seismometer	----------
29	22	13	19.0	2.3	3	19°08.9'	155°16.9'	15 km SW. of Apua Point	----------
30	00	10	55.3	3.6	5	19°20.1'	155°16.9'	4 km SW. of Ahua seismometer	Kilauea summit area.
30	00	47	46.0	2.2	3	19°21.1'	155°17.2'	4 km SW. of Ahua seismometer	----------
30	00	53	42.7	2.1	0	19°21.4'	155°17.7'	4 km SW. of Ahua seismometer	----------
30	02	14	23.8	2.4	1	19°21.5'	155°15.5'	2 km SE. of Ahua seismometer	----------
30	03	03	29.5	3.1	8	19°18.9'	155°11.3'	6 km south of Makaopuhi seismometer	----------

Table 4.--Local earthquakes recorded by seismographs of the U.S. Geological Survey, October, November, and December, 1965--Continued

Date (1965)	Time h	Time m	Time s	Magnitude	Depth (km)	Epicenter Lat. N.	Epicenter Long. W.	Epicenter Description	Felt Report
Dec. 30	10	45	39.5	2.2	0	19°21.9'	155°11.1'	Near Makaopuhi seismometer	----------
30	12	21	27.4	2.8	3	19°20.6'	155°16.2'	4 km SSW. of Ahua seismometer	----------
30	19	30	57.3	1.9	6	19°25.9'	155°25.2'	9 km SW. of Mauna Loa seismometer	----------
30	22	18	30.6	2.3	8	19°10.2'	155°17.9'	15 km SW. of Apua Point	----------
31	10	35	46.3	2.2	3	19°14.3'	155°23.2'	11 km south of Desert seismometer	----------
31	10	56	20.1	2.0	8	19°15.0'	155°22.7'	10 km SSE. of Desert seismometer	----------
31	20	02	04.1	2.7	5	19°07.8'	155°13.5'	15 km SSW. of Apua Point	----------
31	20	24	04.8	2.7	8	19°07.0'	155°14.6'	16 km SSW. of Apua Point	----------
31	20	28	02.0	2.0	5	19°20.9'	155°18.1'	5 km SW. of Ahua seismometer	----------

Table 5.--Distant earthquakes

Times are reported in Greenwich Civil Time which is 10 hours faster than Hawaiian Standard Time. A "c" following the time of P indicates compressional first motion; a "d" indicates dilatational first motion. Station symbols, locations, and instrumentation are presented in table 6, Summary 37. Magnitudes calculated from the Hawaii seismograms are followed by (HVO). Location of epicenter, origin times, and focal depths, and magnitudes reported by other institutions are taken from "Preliminary Determination of Epicenters" published by the U.S. Coast and Geodetic Survey.

October 1, 1965

M	Z	eP	08:59:15.5 d
A	Z	eP	16.7 d
D	Z	eP	16.5 d
MP	Z	eP	16.8 d
Ke	Z	eP	12.8 d
Hi	Z	eP	14.6 d
NB	Z	eP	14.8 d
U	PEE	iS	09:05:08
U	PEN	eG	09:07:14
U	PEZ	eR	09:09:12

C&GS card 77-65:
08:52:05.8
50.1°N., 178.3°E.
Rat Islands, Aleutian Islands
Felt on Adak
h about 32 km
Magnitude 6.5 (Pas), 6.25-6.5 (Brk), 6.5-6.75 (Pal), 6.3 (CGS), 6.1 (HVO).

Oct. 1

M	Z	eP	13:30:27.1 c
D	Z	eP	26.1 c
MP	Z	eP	27.3 c
U	Z	eP	26.8 c
Pa	Z	eP	28.6 c
Na	Z	iP	23.5 c
Hi	Z	eP	29.6 c
Ke	Z	eP	24.4 c
Ha	Z	iP	31.1 c

C&GS card 79-65:
13:22:28.5
20.0°S., 174.4°E.
New Hebrides Islands region
h about 553 km
Magnitude 5.9 (Brk), 6.2 (CGS).

Oct. 3

M	Z	iP	10:53:09.0 c
Ha	Z	Tmax	11:28:20

C&GS card 77-65:
10:46:16.7
52.6°N., 170.6°W.
Fox Islands, Aleutian Islands
h about 22 km
Magnitude 5.3 (CGS).

Oct. 3

M	Z	iP	14:54:09.0 c
D	Z	iP	10.4 c
MP	Z	iP	11.4 c
U	Z	ep	10.5 c
Pa	Z	eP	11.4 c
U	PEE	iS	15:01:13
U	PEN	eG	15:05:09
U	PEZ	iR	15:07:25
Ha	Z	Tmax	15:45:14

C&GS card 76-65:
14:45:26.8
49.5°N., 156.5°E.
Kurile Islands
h about 33 km
Magnitude 6 (Pas), 5.5-5.75 (Brk), 5.9 (CGS).

October 3, 1965

U	PEZ	iR	16:59:13

C&GS card 76-65:
16:14:54.9
42.9°S., 75.4°W.
Off coast of southern Chile
h about 28 km
Magnitude 6-6.5 (Brk), 6.0 (CGS).

Oct. 4

M	Z	Tmax	04:54:11
A	Z	Tmax	11
WP	Z	Tmax	04:53:58
Pa	Z	Tmax	52
Ha	Z	Tmax	42

C&GS card 77-65:
04:12:49.1
44.0°N., 128.3°W.
Off coast of Oregon
h about 33 km
Magnitude 5.1 (CGS).

Oct. 7

M	Z	eP	03:48:44.7 d
A	Z	eP	45.0 d
MP	Z	eP	45.2 d

C&GS card 78-65:
03:35:59.6
12.6°N., 114.5°E.
South China Sea
h about 17 km
Magnitude 5.9 (CGS).

Oct. 7

Ha	Z	Tmax	20:35:14

C&GS card 80-65:
19:51:57
51.7°N., 176.1°W.
Andreanof Islands, Aleutian Islands.
h about 63 km
Magnitude 4.7 (CGS).

Oct. 12

WP	Z	Tmax	07:12:24
U	Z	Tmax	28
Pa	Z	Tmax	28
Hi	Z	Tmax	03
Ha	Z	Tmax	07:10:15

C&GS card 79-65:
06:27:16.7
52.2°N., 174.8°W.
Andreanof Islands, Aleutian Islands.
Felt on Adak
h about 17 km
Magnitude 5.1 (CGS).

Oct. 12

WP	Z	eP	13:48:14.1 c
U	PEN	eS	13:54:01
U	PEE	eL	13:56:17
U	PEZ	eR	13:58:03
WP	Z	Tmax	14:27:03
U	Z	Tmax	14:26:56
Pa	Z	Tmax	14:27:01
Hi	Z	Tmax	14:26:36
Ha	Z	Tmax	14:25:26

C&GS card 78-65:
13:40:55.9
56.3°N., 153.7°W.
Kodiak Island region
h about 11 km
Magnitude 5.25 (Brk), 5.3 (CGS).

Oct. 12

Pa	Z	Tmax	15:44:12
Ha	Z	Tmax	15:42:34

C&GS card 81-65:
14:58:13.6
56.3° N., 154.0°W.
Kodiak Island region
h about 24 km
Magnitude 4.2 (CGS).

October 15, 1965

U	PEZ	iR	00:57:38

C&GS card 80-65:
00:34:09.3
8.5°N., 103.0°W.
Off coast of Mexico
h about 33 km
Magnitude 4.75-5 (Brk), 5.25-5.5 (Pal), 5.2 (CGS).

Oct. 16

M	Z	iP	08:34:23.6 c
A	Z	iP	23.8 c
D	Z	eP	22.7 c
MP	Z	iP	24.3 c
U	Z	iP	23.5 c
NB	Z	eP	22.4 c

C&GS card 80-65:
08:22:56.1
3.1°N., 128.5°E.
North of Halmahera
h about 213 km
Magnitude 5.7 (CGS).

Oct. 17

M	Z	eP	02:03:07.3 c
A	Z	eP	07.4 c
D	Z	eP	05.7 c
Na	Z	eP	02.0 c
U	PEZ	eR	02:18:23

C&GS card 80-65:
01:53:42.7
8.0°S., 155.9°E.
Solomon Islands
h about 93 km
Magnitude 5.5 (CGS).

Oct. 18

M	Z	iP	22:02:08.7 c
A	Z	eP	08.2 c
U	Z	eP	08.5 c
U	PEE	eS	22:11:55
U	PEE	iPPS	22:12:53
U	PEZ	eSS	22:17:05
U	PEE	eL	22:22:01
U	PEN	iG	22:22:28
U	PEZ	iR	22:25:43

C&GS card 80-65:
21:50:04.5
1.1°S., 127.9°E.
Halmahera
h about 33 km
Magnitude 6.75 (Pas), 6.5-6.75 (Pal), 5.9 (CGS), 6.6 (HVO).

Oct. 18

M	Z	iP	23:00:27.6 c
A	Z	iP	26.7 c
D	Z	iP	27.4 c
MP	Z	iP	25.9 c
U	Z	eP	26.8 c

C&GS card 81-65:
22:50:41.9
15.7°N., 95.4°W.
Near coast of Oaxaca, Mexico
h about 36 km
Magnitude 5.3 (CGS).

Oct. 19

M	Z	eP	20:56:25.0 d
U	PEZ	eS	21:02:38
U	PEZ	iR	21:07:15
Ha	Z	Tmax	21:38:01

C&GS card 80-65:
20:48:47.4
52.3°N., 174.3°E.
Near Islands, Aleutian Islands
h about 48 km
Magnitude 5-5.25 (Brk), 5.75-6 (Pal), 5.6 (CGS), 6.0 (HVO).

October 20-21, 1965

M	Z	eP	00:05:08.6 c
A	Z	iP	07.6 c
U	PEZ	eR	00:24:54

C&GS card 80-65:
23:54:29.9
12.5°N., 87.4°W.
Near coast of Nicaragua
Felt at San Salvador
h about 70 km
Magnitude 5-5.5 (Brk), 5.75 (Pal), 5.4 (CGS).

Oct. 23

M	Z	iP	06:07:43.0 c
A	Z	iP	44.0 c
D	Z	iP	44.1 c
M	Z	Tmax	06:45:29
A	Z	Tmax	33
D	Z	Tmax	26
U	Z	Tmax	26
Pa	Z	Tmax	13
Hi	Z	Tmax	04
Ha	Z	Tmax	06:43:17

C&GS card 80-65:
06:00:48.5
53.8°N., 165.5°W.
Fox Islands, Aleutian Islands
h about 16 km
Magnitude 5.5 (CGS).

Oct. 24

M	Z	iP	14:43:57.3 c
A	Z	iP	57.7 c
D	Z	eP	57.2 c
MP	Z	eP	58.2 c
U	Z	eP	57.5 c
Ke	Z	eP	54.9 c

C&GS card 85-65:
14:32:13.7
4.1°N., 125.9°E.
Talaud Islands
h about 175 km
Magnitude 5.8 (CGS).

Oct. 24

M	Z	iP	18:23:49.9 c
D	Z	eP	50.6 c
MP	Z	eP	50.9 c

C&GS card 80-65:
18:15:04.9
49.7°N., 156.1°E.
Kurile Islands
h about 30 km
Magnitude 5.7 (CGS).

Oct. 24

M	Z	eP	18:55:01.5 c
D	Z	eP	01.9 c

C&GS card 81-65:
18:45:38.3
45.0°N., 149.3°E.
Kurile Islands
h about 48 km
Magnitude 5.0 (CGS).

Oct. 24

M	Z	eP	21:17:02.8 c
D	Z	eP	01.7 c
MP	Z	iP	02.5 c
U	Z	iP	02.5 c
Pa	Z	iP	03.7 c
Hi	Z	eP	04.8 c
NB	Z	eP	01.7 c
Ke	Z	eP	21:16:59.9 c

C&GS card 82-65:
21:09:44.3
17.7°S., 178.5°W.
Fiji Islands region
h about 515 km
Magnitude 4.7 (CGS).

October 25, 1965

M	Z	iP	22:43:38.5 d
A	Z	eP	39.6 d
D	Z	iP	39.1 d
MP	Z	iP	39.7 d
U	Z	iP	39.1 d
Pa	Z	eP	40.4 d
Na	Z	eP	39.5 d
Hi	Z	eP	38.8 d
Ha	Z	eP	28.5 d
U	PEZ	iPP	22:45:38
U	PEE	iS	22:51:02
U	PEE	iG	22:56:55

C&GS card 83-65:
22:34:24.3
44.2°N., 145.3°E.
Hokkaido, Japan region
Felt in eastern and southern Hokkaido.
h about 180 km
Magnitude 6.5 (Pas), 6-6.5 (Brk), 7-7.25 (Pal), 6.2 (CGS), 6.2 (HVO).

Oct. 28

Pa	Z	Tmax	22:00:06

C&GS card 82-65:
21:19:50
44.5°N., 130.1°W.
Off coast of Oregon
h about 33 km
Magnitude 4.4 (CGS).

Oct. 29

M	Z	iP	21:07:17.4 c
A	Z	eP	18.3 c
D	Z	eP	18.3 c
MP	Z	eP	18.9 c
U	Z	eP	18.1 c
Pa	Z	eP	19.2 c
Na	Z	iP	19.9 c
Hi	Z	eP	16.8 c
NB	Z	iP	17.0 c
Ka	Z	eP	12.7 c
Ke	Z	eP	14.8 c
Ha	Z	iP	05.1 c
M	Z	Tmax	21:47:17
A	Z	Tmax	40
Ha	Z	Tmax	21:44:53

Oct. 29--Continued

C&GS card 89-65:
21:00:00.1
51°26'17"N., 179°10'57"E.
Amchitka Island "Longshot"
h about 0 km
Magnitude 5.5 (Brk), 5.5-5.75 (Pal), 6.2 (CGS).

Nov. 1, 1965

NP	Z	iP	18:11:15.9 c
MP	Z	iP	15.8 c
Hi	Z	iP	19.3 c
NB	Z	eP	16.0 c

C&GS card 83-65:
18:03:09.6
24.1°S., 178.9°E.
South of Fiji Islands
h about 546 km
Magnitude 5.6 (CGS).

Nov. 2

M	Z	iP	00:57:14.3 d
A	Z	iP	13.5 d
D	Z	eP	12.6 d
MP	Z	iP	13.8 d
U	Z	eP	13.6 d
Pa	Z	eP	15.4 d
Hi	Z	iP	16.1 d
NB	Z	iP	12.9 d

C&GS card 83-65:
00:49:13.4
23.7°S., 179.8°W.
South of Fiji Islands
h about 522 km
Magnitude 5.4 (CGS).

Nov. 3

U	Z	eP	01:50:50.7 c
Pa	Z	eP	49.0 c
Na	Z	iP	51.2 c
Hi	Z	eP	49.7 c
NB	Z	iP	51.8 c
Ke	Z	iP	53.1 c
Ha	Z	iP	56.8 c
U	PEZ	ipP	01:52:58
U	PEZ	iPP	01:54:36
U	PEE	iSKS	02:00:18

November 3, 1965--Continued

U	PEN	iS	02:00:43
U	PEE	iSP	02:01:47
U	PEE	isPS or isSP	02:05:30
U	PEZ	iSS	02:06:56
U	PEZ	isSS	02:10:09
U	PEN	i	02:13:40

C&GS card 83-65:
01:39:02.5
9.1°S., 71.4°W.
Peru-Brazil border region
h about 583 km
Magnitude 6.75 (Pas), 6.75-7.25 (Brk), 6.25-6.5 (Pal), 6.2 (CGS), 6.6 (HVO).

Nov. 3

M	Z	iP	16:52:33.4 d
A	Z	iP	33.4 d

C&GS card 86-65:
16:41:06.1
4.7°S., 126.6°E.
Banda Sea
h about 450 km
Magnitude 5.7 (CGS).

Nov. 3

M	Z	eP	18:31:00.9
A	Z	eP	18:30:59.4
D	Z	iP	59.6
MP	Z	eP	57.6
U	PE	iS	18:39:06
U	PE	iR	18:47:50

C&GS card 83-65:
18:21:05.0
22.3°S., 114.1°W.
Easter Island region
h about 12 km
Magnitude 6.25 (Pas), 5.9 (Brk), 6 (Pal), 5.8 (CGS), 6.2 (HVO).

Nov. 5

U	PEZ	eR	19:30:20

C&GS card 83-65:
19:01:04.3
3.1°S., 143.8°E.
Near north coast of New Guinea
h about 31 km
Magnitude 5.7 (CGS).

Nov. 6

M	Z	iP	06:46:27.0 c
D	Z	iP	28.0 c

C&GS card 86-65:
06:38:41.5
60.6°N., 147.3°W.
Southern Alaska
Felt at Anchorage
h about 37 km
Magnitude 5.2 (CGS).

Nov. 6

U	PEZ	eR	09:24:30

C&GS card 87-65:
08:57:12.3
34.0°N., 138.9°E.
Near south coast of Honshu, Japan
h about 15 km
Magnitude 5.0 (CGS).

Nov. 6

M	Z	iP	09:31:40.5 c
D	Z	iP	39.3 c

C&GS card 85-65:
09:21:48.6
22.1°S., 113.8°W.
Easter Island region
h about 33 km
Magnitude 6 (Pas), 6 (Brk), 5.5-5.75 (Pal), 6.2 (CGS).

November 9, 1965

M	Z	iP	22:08:57.1 c
D	Z	eP	56.1 c

C&GS card 86-65:
21:59:04.3
22.3°S., 113.7°W.
Easter Island region
h about 33 km
Magnitude 5.2 (CGS).

Nov. 11

M	Z	eP	01:42:00.5 c
MP	Z	eP	01:41:59.6 c

C&GS card 88-65:
01:32:59.3
22.8°S., 172.6°E.
Loyalty Islands region
h about 62 km
Magnitude 5.4 (CGS).

November 11

U	PEE	iG	03:28:16
U	PEZ	eR	03:32:08

C&GS card 92-65:
02:51:25
60.7°S., 154.0°E.
West of Macquarie Island
h about 33 km
Magnitude 5.1 (CGS).

Nov. 12

U	PEZ	eR	02:41:08

C&GS card 85-65:
02:04:19.5
56.0°S., 121.5°W.
Easter Island Cordillera
h about 33 km
Magnitude 4.9 (CGS).

November 12

M	Z	eP	17:24:14.1 c
U	PEZ	eR	17:40:58

C&GS card 90-65:
17:14:27.6
30.4°N., 139.8°E.
South of Honshu, Japan
h about 150 km

November 12--Continued

C&GS card 90-65--Continued
Magnitude 5.25-5.5 (Brk),
5.2 (CGS).

Nov. 12

M	Z	iP	18:02:22.9 c
D	Z	iP	23.0 c
MP	Z	iP	24.6 c
U	Z	eP	23.2 c
Pa	Z	eP	25.3 c
Na	Z	eP	23.0 c
Ke	Z	eP	19.1 c
Ha	Z	iP	14.6 c
U	PEZ	iPcP	18:03:02
U	PEE	iS	18:10:44
U	PEZ	eSS	18:14:46
U	PEZ	iR	18:18:46
Ke	Z	Tmax	19:05:22

C&GS card 84-65:
17:52:24.1
30.5°N., 140.2°E.
South of Honshu, Japan
h about 40 km
Magnitude 6.75 (Pas), 6.5 (Brk),
6-6.25 (Pal), 6.6 (CGS),
6.8 (HVO).

Nov. 13

M	Z	iP	04:47:11.4 c
A	Z	iP	11.9 c

C&GS card 84-65:
04:33:53.0
43.8°N., 87.8°E.
Northern Sinkiang Province, China
h about 59 km
Magnitude 6.75 (Pas), 7 (Brk),
6.75-7 (Pal), 6.3 (CGS).

November 15, 1965

Pa	Z	Tmax	07:30:06
Ha	Z	Tmax	07:30:57

C&GS card 88-65:
06:49:59
40.4°N., 125.8°W.
Off coast of northern California
h about 33 km
Magnitude 4.25 (Brk), 4.8 (CGS).

Nov. 15

U	PEE	iSS	11:58:55
U	PEN	eG	12:14:56
U	PEZ	eR	12:19:29

C&GS card 85-65:
11:18:49.9
0.3°S., 18.7°W.
Central mid-Atlantic Ridge
h about 24 km
Magnitude 6.5 (Pas), 6.25 (Pal), 5.6 (CGS).

Nov. 16

U	PEZ	eR	16:09:51

C&GS card 85-65:
15:24:42.9
31.0°N., 41.5°W.
North Atlantic Ridge
h about 17 km
Magnitude 6.5 (Pas), 6.4 (Brk), 6 (Pal), 6.0 (CGS).

Nov. 16

MP	Z	iP	17:17:04.1 c

C&GS card 86-65:
17:05:37.9
25.4°N., 125.2°E.
Southwestern Ryukyu Islands

Nov. 18

M	Z	iP	17:29:06.7 d

C&GS card 87-65:
17:17:23.1
7.1°S., 129.5°E.
Banda Sea
h about 208 km
Magnitude 5.4 (CGS).

Nov. 18

M	Z	iP	20:07:49.7 d
A	Z	iP	49.1 d
D	Z	iP	48.3 d
U	Z	iP	49.3 d
Na	Z	eP	45.2 d
Hi	Z	iP	52.1 d
NB	Z	iP	48.7 d
Ke	Z	iP	47.0 d
Ha	Z	eP	54.4 d

C&GS card 87-65:
20:00:19.0
18.8°S., 177.9°W.
Fiji Islands region
h about 421 km
Magnitude 5.6 (CGS).

Nov. 18

M	Z	iP	22:06:53.4 c
A	Z	eP	54.3 c
D	Z	iP	54.0 c
MP	Z	iP	54.7 c
NB	Z	iP	52.6 c
U	PEZ	iR	22:20:13

C&GS card 87-65:
21:58:12.4
53.9°N., 160.7°E.
Near east coast of Kamchatka
h about 12 km
Magnitude 5.5 (Pal), 6.0 (CGS).

Nov. 19

U	PEZ	eR	07:33:10

C&GS card 91-65:
07:08:10.8
29.6°S., 178.6°W.

November 19, 1965--Continued
C&GS card 91-65--Continued
Kermadec Islands region
h about 33 km
Magnitude 6-6.25 (Pal), 5.0 (CGS).

Nov. 20

M	Z	eP	15:17:31.4 d

C&GS card 87-65:
15:05:39.0
7.3°S., 129.2°E.
Banda Sea
h about 132 km
Magnitude 6.1 (CGS).

Nov. 21

M	Z	iP	10:43:39.0 c
A	Z	iP	39.0 c
Hi	Z	iP	42.4 c
NB	Z	iP	37.6 c
Ke	Z	iP	35.5 c
U	PEZ	eS	10:54:02
U	PEZ	eR	11:06:50

C&GS card 88-65:
10:31:49.7
6.1°S., 130.4°E.
Banda Sea
h about 93 km
Magnitude 6 (Pas), 6-6.25 (Pal), 6.3 (CGS), 6.4 (HVO).

Nov. 22

Ha	Z	Tmax	14:43:47

C&GS card 87-65:
14:00:27.0
52.0°N., 176.1°W.
Andreanof Islands, Aleutian Islands
Felt on Adak
h about 49 km
Magnitude 5.5 (CGS).

Nov. 22

Ha	Z	Tmax	21:09:53

C&GS card 88-65:
20:25:30.4
51.3°N., 179.8°W.
Andreanof Islands, Aleutian Islands
h about 40 km
Magnitude 5.9 (CGS).

Nov. 23

NP	Z	eP	01:29:39.3 c

C&GS card 90-65:
01:17:31.2
3.0°N., 124.8°E.
Celebes Sea
h about 45 km
Magnitude 5.6 (CGS).

Nov. 25

Hi	Z	iP	22:44:50.7 c
Ke	Z	eP	44.7 c

C&GS card 88-65:
22:35:37.2
3.9°S., 150.3°E.
New Ireland region
h about 457 km
Magnitude 5.5 (CGS).

Nov. 27

U	PEZ	eR	03:30:59

C&GS card 91-65:
03:04:20.6
30.6°N., 140.2°E.
South of Honshu, Japan
h about 60 km
Magnitude 5.2 (CGS).

Nov. 27

M	Z	iP	12:11:05.8 d
A	Z	eP	05.8 d
D	Z	iP	04.8 d
MP	Z	iP	06.3 d
Pa	Z	eP	07.8 d
Hi	Z	iP	08.2 d
NB	Z	iP	04.4 d
U	PEZ	eS	12:18:51
U	PEZ	eR	12:25:51

C&GS card 89-65:
12:01:51.9
9.7°S., 159.7°E.
Solomon Islands
Felt at Honiara
h about 51 km
Magnitude 6.75 (Pas), 5.75 (Brk), 6.75 (Pal), 6.3 (CGS), 5.4 (HVO).

December 6, 1965

M	Z	iP	11:43:14.6 d
A	Z	eP	13.6 d
D	Z	eP	14.6 d
U	PEN	iS	11:49:58
U	PEN	eG	11:53:14
M	Z	Tmax	12:31:16
A	Z	Tmax	11
D	Z	Tmax	30
MP	Z	Tmax	19
Pa	Z	Tmax	12:30:54
Na	Z	Tmax	12:31:01
Hi	Z	Tmax	12:30:56
NB	Z	Tmax	12:31:39
Ha	Z	Tmax	12:32:16

C&GS card 90-65:
11:34:53.7
18.9°N., 107.1°W.
Off coast of Jalisco, Mexico
h about 37 km
Magnitude 6.75 (Pas), 7-7.5 (Brk), 6.5-6.75 (Pal), 5.9 (CGS), 7.0 (HVO).

Dec. 7

Hi	Z	iP	22:29:34.1 c
Ke	Z	eP	28.9 c

C&GS card 90-65:
22:19:14.8
6.4°S., 146.3°E.
East New Guinea region
Felt widely
h about 109 km
Magnitude 6.4 (CGS).

Dec. 9

D	Z	iP	06:16:56.8 d
U	PEN	eS	06:24:20
U	PEZ	eR	06:30:54

C&GS card 92-65:
06:07:48.6
17.3°N., 100.0°W.
Guerrero, Mexico
Felt in southern Mexico
h about 57 km
Magnitude 6.25 (Pas), 6 (Brk), 6.25-6.5 (Pal), 6.0 (CGS), 5.8 (HVO).

Dec. 13

M	Z	eP	11:01:13.5 c
D	Z	eP	13.9 c
MP	Z	eP	14.6 c
U	Z	eP	13.7 c
Hi	Z	eP	13.3 c
U	PEZ	eS	11:08:39
U	PEN	eG	11:13:38
U	PEZ	eR	11:16:08

C&GS card 92-65:
10:52:08.5
44.7°N., 150.1°E.
Kurile Islands region
h about 35 km
Magnitude 6 (Pal), 5.7 (CGS), 6.1 (HVO).

Dec. 13

U	PEN	eG	15:07:47
U	PEZ	eR	15:10:09

C&GS card 93-65:
14:46:10.2
44.7°N., 150.2°E.
Kurile Islands region
h about 33 km
Magnitude 5.4 (CGS).

Dec. 15

A	Z	Tmax	13:45:54
D	Z	Tmax	53
U	Z	Tmax	53
MP	Z	Tmax	13:46:02
Pa	Z	Tmax	13:46:06

C&GS card 94-65:
12:09:36.4
57.0°S., 141.5°W.
South Pacific Cordillera
h about 33 km

December 15, 1965

A	Z	eP	23:16:46.8 d
D	Z	eP	47.3 d
MP	Z	eP	46.3 d
U	PEN	eS	23:26:37
U	PEN	eG	23:35:23
U	PEZ	iR	23:38:35

C&GS card 93-65:
23:05:20.7
7.5°N., 82.2°W.
South of Panama
h about 15 km
Magnitude 6.75 (Pas), 6.25-6.5 (Pal), 6.0 (CGS), 6.4 (HVO).

Dec. 16

M	Z	iP	23:13:58.7 c
U	Z	eP	58.2 c
NB	Z	iP	58.0 c
Hi	Z	eP	23:14:00.9 c
Ha	Z	eP	02.3 c

C&GS card 95-65:
23:06:42.4
17.5°S., 179.1°W.
Fiji Islands region
h about 573 km
Magnitude 5.5 (CGS).

Dec. 22

M	Z	iP	19:48:45.4 d
D	Z	iP	46.2 d
MP	Z	iP	46.1 d
U	Z	iP	45.6 d
Pa	Z	iP	44.9 d
Na	Z	iP	49.0 d
Hi	Z	iP	42.9 d
NB	Z	iP	45.6 d
Ke	Z	iP	45.2 d
U	PEZ	ePP	19:50:11
U	PEE	eS	19:55:07
U	PEE	eL	19:57:41
U	PEZ	eR	19:59:27
M	Z	Tmax	20:28:38
A	Z	Tmax	58
D	Z	Tmax	51

Dec. 22--Continued

MP	Z	Tmax	57
U	Z	Tmax	48
Pa	Z	Tmax	29
Hi	Z	Tmax	18

C&GS card 94-65:
19:41:23.0
58.4°N., 153.0°W.
Kodiak Island region
Minor damage at Kodiak and felt widely.
h about 50 km
Magnitude 6.75-7 (Pas), 6.75-7 (Brk), 6.5 (CGS), 6.8 (HVO).

Dec. 23

Ke	Z	eP	20:55:31.4 c
U	PEZ	eR	21:07:32

C&GS card 94-65:
20:47:37.5
60.5°N., 141.0°W.
Southeastern Alaska
h about 33 km
Magnitude 5.4 (CGS).

Dec. 28

M	Z	iP	12:22:25.7 c
MP	Z	iP	26.2 c
U	Z	eP	25.6 c

C&GS card 98-65:
12:10:31.4
3.2°N., 127.0°E.
Talaud Islands
h about 53 km
Magnitude 5.3 (CGS).

December 28, 1965

U	PEZ	eR	20:58:59

C&GS card 96-65:
20:32:24.7
27.8°N., 141.8°E.
Bonin Islands region
h about 36 km
Magnitude 6 (Pas), 5.9 (CGS).

Dec. 30

M	Z	iP	02:13:26.1 c
A	Z	eP	27.2 c
D	Z	iP	27.2 c
MP	Z	eP	28.2 c
U	Z	eP	26.3 c
M	Z	Tmax	02:50:26
A	Z	Tmax	44
D	Z	Tmax	24
MP	Z	Tmax	45
U	Z	Tmax	26
Pa	Z	Tmax	38
Hi	Z	Tmax	15
NB	Z	Tmax	22

C&GS card 96-65:
02:06:31.1
54.1°N., 164.3°W.
Unimak Island region
h about 28 km
Magnitude 5.75 (Brk),
5.75 (Pal), 5.6 (CGS).

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