DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

United States Earthquakes, 1960

By

H. Carroll Talley, Jr.

and

William K. Cloud

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UNITED STATES EARTHQUAKES
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CONTENTS

ILLUSTRATIONS

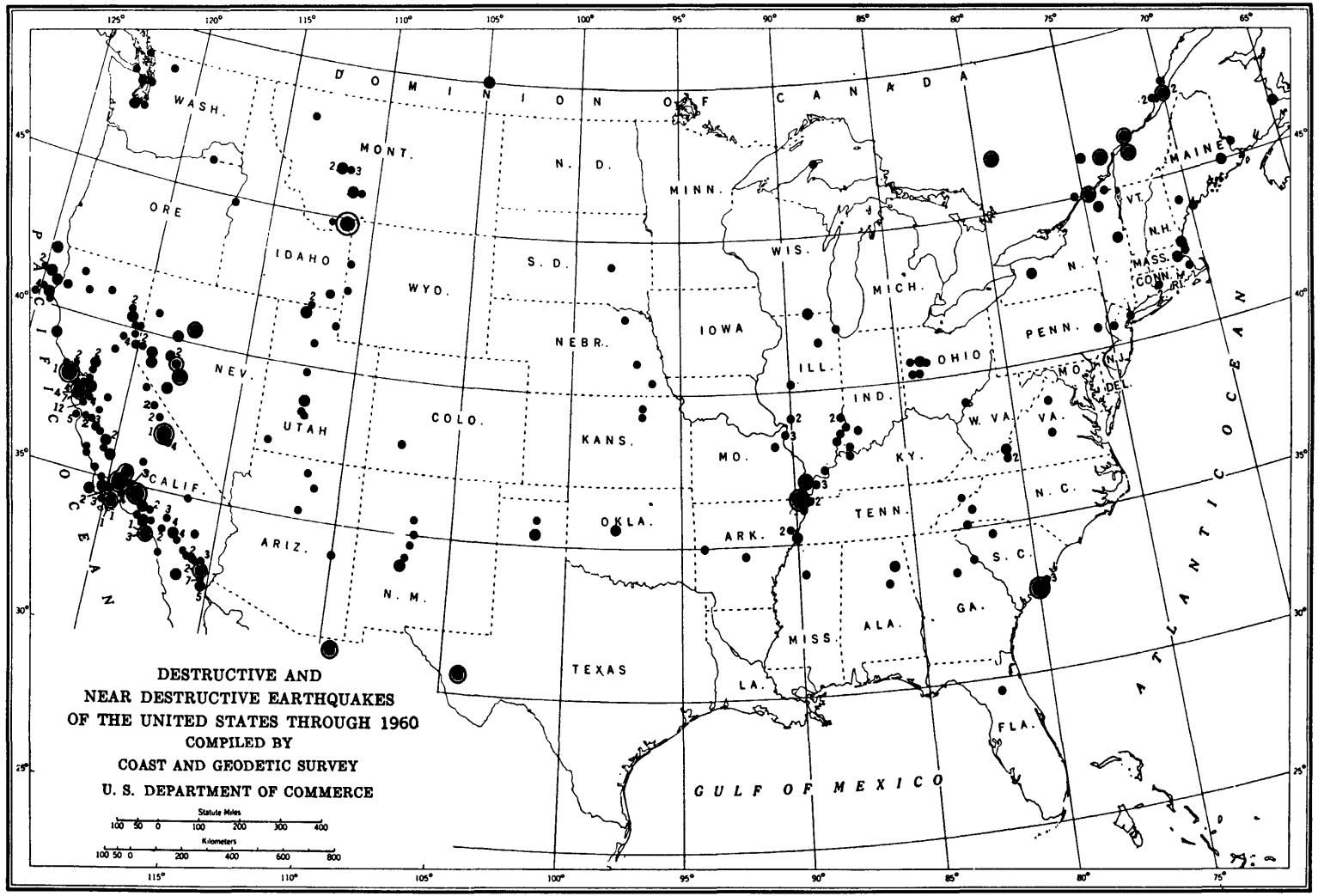

FIGURE 1.—*Destructive and near destructive earthquakes in the United States through 1960.*

UNITED STATES EARTHQUAKES, 1960

INTRODUCTION

This publication is a summary of earthquake activity in the United States and regions under its jurisdiction for the calendar year 1960. The sources of noninstrumental information used in the compilation include the United States Weather Bureau, whose observers prepare periodic reports on local seismic activity; telegraphic information collected by Science Service, Washington, D.C.; Bulletins of the Seismological Society of America; special reports of the Jesuit Seismological Association and the Northeastern Seismological Association; the *Hawaiian Volcano Observatory Summary;* newspaper clippings; and reports from interested individuals. Instrumental data used in locating earthquakes are obtained from the network of Coast and Geodetic Survey stations listed on page 43 and from other cooperating seismological stations in the United States and throughout the world.

The Coast and Geodetic Survey endeavors to coordinate efforts in collecting all types of earthquake information with the special object of correlating instrumental earthquake locations with noninstrumental reports received from the epicentral areas. This is done by local organizations making intensive regional investigations in California and elsewhere, and, when necessary, by the Coast and Geodetic Survey. This information serves to map the seismic areas of the country adequately and promote public safety through a better understanding of earthquake phenomena. Since the success of the general information service depends largely on the cooperation of local officials and citizens, all are urged to fill out and return earthquake questionnaires.

Earthquake information services.—The Coast and Geodetic Survey maintains a Seismological Field Survey in San Francisco to collect earthquake information and make field investigations of strong shocks in the Pacific coast and western mountain States. Details concerning damage, destruction, and other effects are enumerated in the quarterly *Abstracts of Earthquake Reports for the Pacific Coast and the Western Mountain Region.* This report is available on request from the Director of the Coast and Geodetic Survey, Washington 25, D.C. Active cooperation in this work is received from the University of California Seismographic Station, Berkeley (Dr. Perry Byerly, in charge); and the Seismological Laboratory, Pasadena (Dr. Frank Press, Director); as well as State Collaborators in Seismology. The following Collaborators served as agents of the Coast and Geodetic Survey in their respective States in 1960:

Arizona.—Dr. Eldred D. Wilson, University of Arizona, Tucson.

Colorado.—Prof. W. Warren Longley, University of Colorado, Boulder.

Idaho.—Dr. Earl F. Cook, Idaho Bureau of Mines and Geology, Moscow.

Montana.—Prof. Stephen W. Nile, Montana School of Mines, Butte.

Nevada.—Dr. David B. Slemmons, University of Nevada, Reno.

New Mexico.—Prof. Stuart A. Northrop, University of New Mexico, Albuquerque.

Oregon.—Dr. Ira S. Allison, Oregon State College, Corvallis.

Utah.—Prof. J. Stewart Williams, Utah State University, Logan.

Washington.—Prof. Howard A. Coombs, University of Washington, Seattle.

Wyoming.—Prof. Horace D. Thomas, University of Wyoming, Laramie.

Among the commercial agencies on the west coast rendering valuable services are telephone, power, oil, railroad, and especially insurance companies. Certain concerns interested in the manufacture of earthquake-resistant building materials are also active, together with various organizations of structural engineers and architects.

In other parts of the country the Jesuit Seismological Association with central office at St. Louis University collects information in the central Mississippi Valley area (Rev. Dr. Victor J. Blum, S.J., Dean of the Institute of Technology). The Northeastern Seismological Association with headquarters at Weston College, Weston, Mass. (Rev. Daniel J. Linehan, S.J., in charge), undertakes similar work in the northeastern States. Additional information is furnished regularly by Mr. Berlen C. Moneymaker, Chief Geologist, Tennessee Valley Authority, Knoxville, Tenn., for earthquakes in the State of Tennessee, and Dr. Gerald R. MacCarthy, Department of Geology, University of North Carolina, Chapel Hill, N.C., for earthquakes in the State of North Carolina.

Modified Mercalli Intensity Scale of 1931.—All intensities used by the Coast and Geodetic Survey refer to the Modified Mercalli Intensity Scale of 1931.[1] The abridged version of this scale is given here with equivalent intensities according to the Rossi-Forel scale.

[1] Modified Mercalli Intensity Scale of 1931. Harry O. Wood and Frank Neumann, *Bulletin of the Seismological Society of America, vol. 12, No. 4, December 1931.*

MODIFIED MERCALLI INTENSITY SCALE OF 1931

(ABRIDGED)

I. Not felt except by a very few under specially favorable circumstances. (I Rossi-Forel scale.)

II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing. (I to II Rossi-Forel scale.)

III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated. (III Rossi-Forel scale.)

IV. During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably. (IV to V Rossi-Forel scale.)

V. Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop. (V to VI Rossi-Forel scale.)

VI. Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight. (VI to VII Rossi-Forel scale.)

VII. Everybody runs outdoors. Damage **negligible** in buildings of good design and construction; **slight** to moderate in well-built ordinary structures; **considerable** in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars. (VIII Rossi-Forel scale.)

VIII. Damage **slight** in specially designed structures; **considerable** in ordinary substantial buildings with partial collapse; **great** in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motorcars disturbed. (VIII+ to IX− Rossi-Forel scale.)

IX. Damage **considerable** in specially designed structures; well-designed frame structures thrown out of plumb; **great** in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. (IX+ Rossi-Forel scale.)

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river-banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks. (X Rossi-Forel scale.)

XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII. Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into air.

Epicenter maps.—Figure 1 is designed to show the existence of destructive and near destructive earthquakes in the United States through 1960. The smallest dots indicate the shock was strong enough to overthrow chimneys or affect an area of more than 25,000 square miles (intensity VII to VIII); the largest solid dots may be associated with damage ranging from several thousand dollars to one hundred thousand dollars, or to shocks usually perceptible over more than 150,000 square miles (intensity VIII to IX); the smaller encircled dots represent damage ranging from approximately one hundred thousand to one million dollars, or an affected area greater than 500,000 square miles (intensity IX to X); the larger encircled dots represent damage of a million dollars or more, or an affected area usually greater than 1,000,000 square miles (intensity X to XII).

Figure 2 shows earthquake distribution in the United States during 1960. In a few cases where instrumental control is not satisfactory or where results of investigations are inadequate, the plotted epicenters should be considered as showing the existence of the earthquake rather than the precise location.

In figure 2, those earthquakes occurring in the California area are plotted when felt reports are received from several places. Earthquakes reported as feeble are not plotted on the epicenter map of the United States, nor are minor aftershocks plotted for heavy earthquakes in California or any other region. The number after a dot indicates the number of shocks which have occurred at or near the location shown. Bulletins of the University of California Seismographic Station, Berkeley and the Seismological Laboratory, Pasadena, should be consulted for further details regarding epicenters and often for data on additional shocks.

The selection of isoseismal or "felt area" maps (figs. 3–6) is governed largely by the size of the area affected, the minimum radius generally being of the order of 50 miles. In the case of sharp localized shocks this means that some earthquakes of intensity VI (mostly in California) will not be shown on such maps whereas others of intensity IV and V (largely in the eastern and central areas) will be shown.

Teleseismic results.—On page 43 is a list of Survey and cooperating teleseismic stations for which the Survey publishes results. During the year the locations of 1598 epicenters were announced promptly on *Preliminary Determination of Epicenter* cards. Those desiring to receive these cards should request addition of their name to the PDE mailing list. All seismogram interpretations are published in the monthly *Seismological Bulletin*, MSI series, available on mailing list CGS–7 from the Director, Coast and Geodetic Survey, Washington 25, D.C. During the year 1960, MSI–229 through 240 for the monthly bulletins of 1960 were published.

Magnitude and Intensity (Damage) Ratings.—Magnitude Rating, stated according to The Gutenberg-Richter scale, is a measure of the energy-release at the focus of the earthquake, having therefore a fundamental relation to the shock. It is estimated by the analysis of seismograph records, as explained in the *Bulletin of Seismological Society of America*, Vol. 32, No. 3, 1942. Intensity (Damage) Rating, usually expressed on the *Modified Mercalli Scale of 1931*, is a local measure of the effects on people and objects at any affected locality, being, therefore a result of many factors, including energy-release of the earthquake, distance, geological and topographic conditions, and structural properties of buildings. It varies from place to place. The two ratings are not simply comparable.

Strong-motion seismograph results.—The maintenance of a network of strong-motion seismographs and analysis of the records of destructive earthquake motions thus obtained are functions of the Bureau in connection with a broad cooperative program of research being carried out on the Pacific Coast with a number of local organizations and institutions interested in the engineering aspects of the earthquake problem. The details of this program are described in S.P. 201, *Earthquake Investigations in California, 1934–35.*

The preliminary analyses of strong-motion records are published in the *Quarterly Engineering Seismology Bulletin* which is available upon request from the Director, Coast and Geodetic Survey, Washington 25, D.C. The revised analyses are given in table 7.

Earthquake history.—A history of the more important shocks of the country appears in Publication 41–1, *Earthquake History of the United States.* Part I covers continental United States and Alaska, exclusive of California and western Nevada; Part II covers the stronger earthquakes of California and western Nevada. The first part was revised in 1958 and the latter in 1961.

A history of minor activity is covered largely in a series of references listed in Publication 41–1, in recent reports of the Coast and Geodetic Survey, and in the *Bulletin of the Seismological Society of America*, volume 29, No. 1, January 1939. The last two references give detailed information for all California earthquakes. The last one contains all information appearing in early catalogs published by the Smithsonian Institution.

A summary of the earthquake program as carried out in the United States is briefly outlined in S.P. 282, *Earthquake Investigation in the United States*, revised 1962. The major organizations and stations are listed together with a list of the independent and/or privately operated stations. This publication is available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., for 20 cents.

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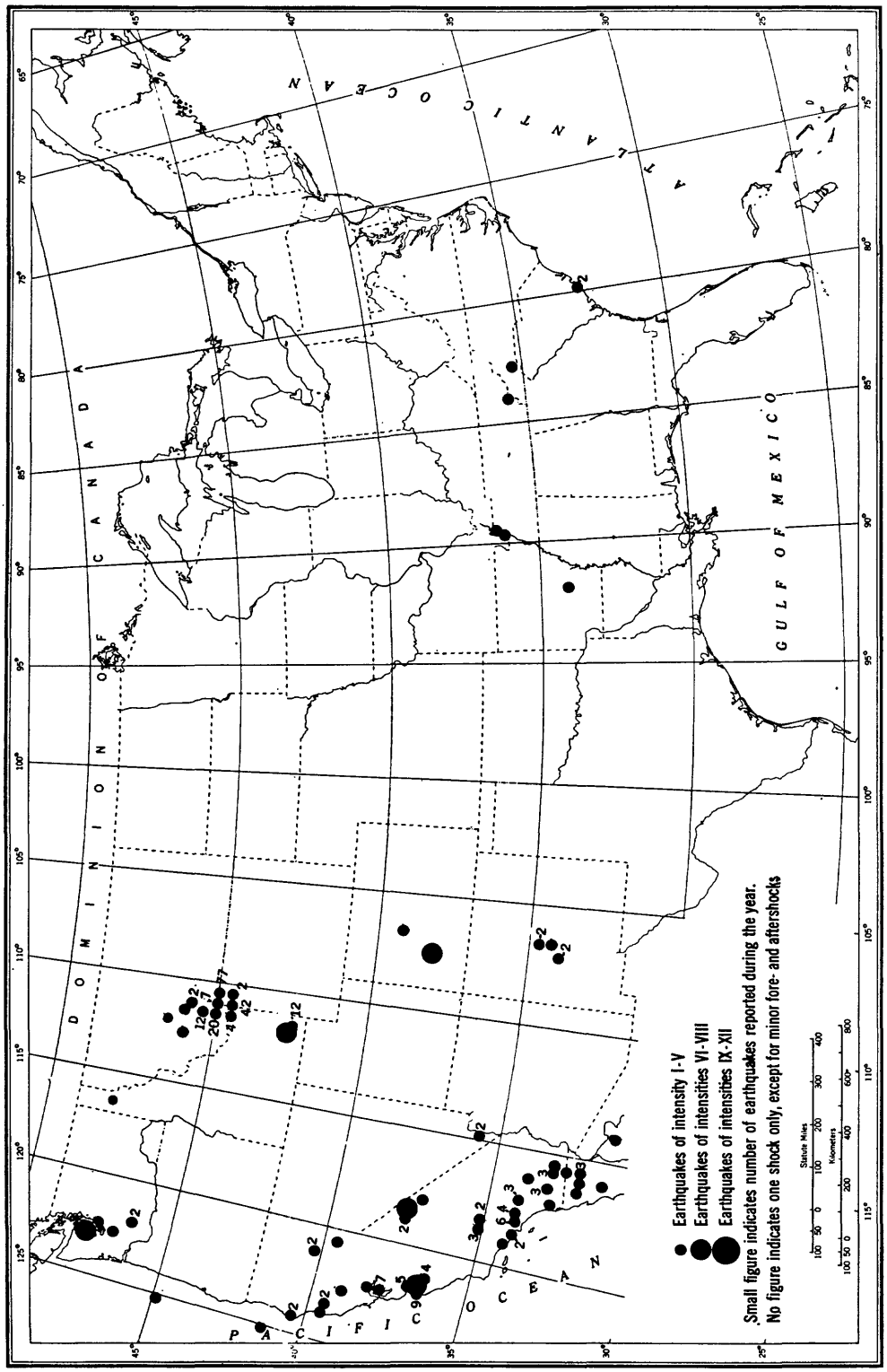


FIGURE 2.—*United States earthquake epicenters, 1960.*

NONINSTRUMENTAL RESULTS

NOTE.—The following symbols are used to indicate authority for times or reported epicenters: P, reported by the Seismological Laboratory, California Institute of Technology, Pasadena; B, reported by the Seismographic Station, University of California, Berkeley; NESA, reported by the Northeastern Seismological Association, Weston, Mass.; JSA, reported by the Jesuit Seismological Association, Saint Louis, Mo.; S, reported by the Seismograph Station, University of Washington, Seattle, Wash.; and W, reported by the Washington office of the Coast and Geodetic Survey.

An asterisk (*) indicates instrumental origin time of the earthquake when coordinates of the epicenter are given. Otherwise, instrumental times shown with asterisks are those of first motion.

When more than one degree of intensity is reported from a town, the town is listed under the highest intensity reported. More details will be found in the quarterly Abstracts of Earthquake Reports for the Pacific Coast and Western Mountain Region, MSA series, issued on mailing list CGS-3 by the Coast and Geodetic Survey, Washington 25, D.C.

EARTHQUAKE ACTIVITY IN THE VARIOUS STATES

NOTE.—The intensities of the earthquakes for which no ratings are given range from I to IV.

Alaska: January 2; 3, V; 13; 15; 16 (2); 19; 26, III; February 6; 15; 18, II, VI; 18; 26 (3); March 1; 2; 2, V; 4; 9, V; 29; May 13, IV; 16; 22; June 17; 30; July 2; 3; 9; 16; 16, V (2); 17; August 1; 3; 10; September 4; 11; 19 (2); October 14, V; 23; 30; November 9; 16; 17; 18; 23; 24; December 1; 2; 6; 9; 21 (4).

Arkansas: May 4, IV.

California: (Intensity V and above) January 19, VI; February 24, V; March 16, V; June 4, VI; 5, VI; 28, V; August 8, V; 20, V; 21, V; November 2, V; 18, V; December 14, V; 27, V.

Colorado: October 11, VI; 11; 17, V.

Georgia: March 12, IV.

Hawaii: January 9; 13 (about 1000); 18; (January 26–March 11, about 330); March 4; 7; 19; 23 (2); 24; April 3; 4; 5; 22; 26; 29; May 5; 8; 11; 12; 25; 27 (2); 31; June 2; 5; 7; 13; 14 (2); 15; 18 (2); 20 (3); 21 (2); 26; July 7 (2); 19 (2); 23; August 7; 10; 11 (2); 14; September 14; 17; 18; 19; 20; 21; 29; October 8; 17; 18; 25 (2); November 1; 5; 7 (3); 10 (2); 15; 30 (2); December 5; 13 (2); 17; 21; 25; 28.

Idaho: July 24, IV (2); August 7, VI; 7; 8; 10, V; 16, IV; 20, V (4).

Montana: January 4, V; 14, IV; February 3, V; March 22, V; April 21, V; 26, V; June 7; July 3 (2); November 17; 18; 19; December 18, IV. (Numerous aftershocks of the 1959 Hebgen Lake, Montana earthquake with intensities ranging from I to IV are not listed.)

Nevada: March 31; April 14, III.

New Mexico: July 22, V; 23, VI; 24, V; October 25, III; December 19, IV.

North Carolina: February 9; March 12, IV.

Oregon: January 7; September 10; November 8, IV.

South Carolina: March 12, V; July 23, V.

Tennessee: January 28, V; April 15, V; 21, V.

Washington: January 7, V; April 10, VI; May 10, IV; June 16, IV; September 10, VI; November 8, IV.

Wyoming: Numerous aftershocks of the 1959 Hebgen Lake, Montana earthquake with intensities ranging from I to IV are not listed.

EARTHQUAKE ACTIVITY OUTSIDE THE UNITED STATES

Panama Canal Zone: January 18, III; February 28, II, I (2); March 13, I; 27, III; May 12, IV, I (8); September 19, I; October 31, III.

Puerto Rico: January 22, IV.

NORTHEASTERN REGION

(75TH MERIDIAN OR EASTERN STANDARD TIME)

No earthquakes reported felt in the Northeastern Region during 1960.

EASTERN REGION

(75TH MERIDIAN OR EASTERN STANDARD TIME)

January 3: 02:30. Avery, McDowell, and Mitchell counties, N.C. A tremor rumbled through the mountains of North Carolina, rattling windows, shaking buildings, and alarming residents. No damage was reported. (Not recorded by the seismograph of the University of North Carolina—probably of artificial origin.)

February 7–9: Henderson County, N.C. Four tremors, accompanied by rumbling thunderlike noise, shook the residents of Edneyville and Sugar Loaf sections of Henderson County. Plaster fell; windows and dishes rattled; and buildings shook. The first shock was reported at 22:20, February 7; the second and third at 03:30 and 20:30, February 8; and the fourth at 09:00:06, February 9. These tremors, with the exception of the one on the 9th, which was recorded on the seismograph of the University of North Carolina, were probably of artificial origin.

March 12: 07:47:40*. Epicenter 33° north, 79° west, near coast of South Carolina. Charleston. V. Felt over an area of approximately 3,500 square miles of eastern and central South Carolina. (See map, p. 8.) The shock was distinctly felt at Columbia, 100 miles northwest, and as far south as Augusta, Ga. It was also reported felt at Greensboro, N.C. The earth-

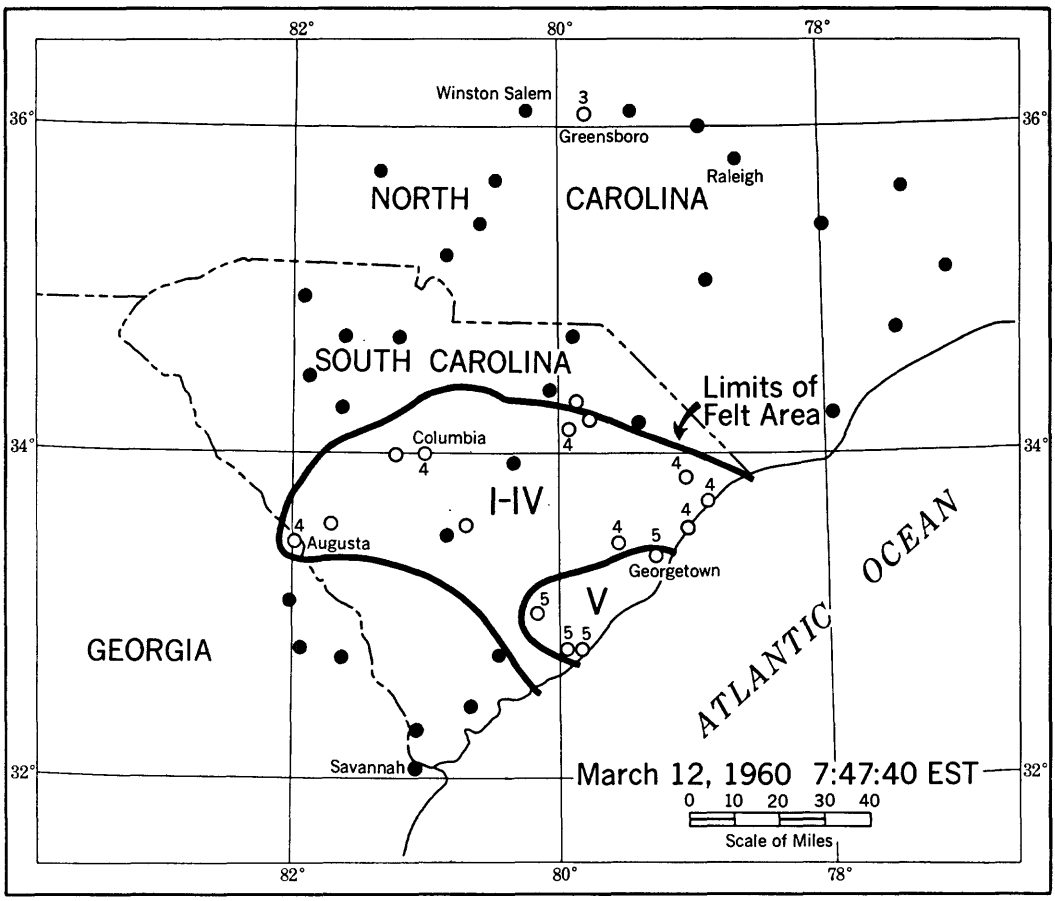


FIGURE 3.—*Area affected by earthquake of March 12.*

quake was recorded on the seismographs of the universities of North and South Carolina.

INTENSITY (DAMAGE) V IN SOUTH CAROLINA:

Charleston.—Felt by nearly all; awakened and frightened many. Buildings shook; dishes, mirrors, and windows rattled. China closet tilted against wall, but nothing broken. Doors shaken open. Sounded like a sonic boom or an explosion before the earth began to shake. Abrupt onset; trembling motion.

Georgetown.—Felt by nearly all; many awakened. Loose objects rattled; dishes displaced; doors swayed. Floor appeared to sway to the east. Thunderous sounds heard before shock. Abrupt onset; swaying motion.

Mount Pleasant.—Felt by nearly all; few alarmed. Buildings creaked; loose objects rattled. Abrupt onset; trembling motion.

Summerville.—Felt by nearly all; few alarmed. Houses shook; windows and loose objects rattled. Moderately loud noises heard before the earthquake. Gradual onset; trembling motion.

INTENSITY (DAMAGE) IV IN GEORGIA:

Augusta.—Felt by several. Houses shook; loud noises heard before shock.

INTENSITY (DAMAGE) IV IN NORTH CAROLINA:

Greensboro.—Felt by one. Bed shook. "Felt as if bed had been lifted from floor and rocked back and forth a few times." Two shocks reported—the second shock weaker.

INTENSITY (DAMAGE) IV IN SOUTH CAROLINA:

Andrews.—Felt by many. Buildings creaked; loose objects rattled. Abrupt onset; trembling motion.

Columbia.—Felt by many. Houses shook; windows rattled.

Conway.—Felt by many. Buildings creaked; loose objects and windows rattled. Many thought sensation was caused by aircraft or passing traffic. Abrupt onset; rocking motion.

Murrells Inlet.—Felt by many. Buildings shook; loose objects rattled. Rattling, moderately loud noises heard by many. Movement was felt in concrete floor of home. Sounded like

a sonic boom or explosion. Abrupt onset; trembling NNE to SSW motion.

Myrtle Beach.—Felt by many. Windows rattled.

Timmonsville.—Felt by several. Windows rattled; beds shook. Rumbling sound heard.

INTENSITY (DAMAGE) I TO III IN SOUTH CAROLINA: Aikens, Cameron, Darlington, Florence, and Lexington.

April 15: 05:10:10*. Eastern Tennessee. Felt over an area of approximately 1300 square miles of eastern Tennessee. Maximum intensity (damage) V. Recorded by the seismograph at the University of South Carolina.

INTENSITY (DAMAGE) V IN TENNESSEE:

Alcoa.—Felt by nearly all; many awakened. Houses shook; doors, windows, and dishes rattled. Accompanied by a thunderlike noise.

Greenback.—Felt by nearly all who were awake; several awakened. Houses shook; doors, windows, and dishes rattled. Accompanied by a rumbling noise like thunder.

Knoxville.—Felt by nearly all; many awakened; few alarmed. Houses shook; windows, dishes, and doors rattled. Table lamp vibrated. Rumbling sounds heard by many.

Madisonville.—Felt by about half the population; awakened many. Houses shook; doors, dishes, and windows rattled. The shock was accompanied by a "sort of a roar."

Maryville.—Felt by nearly all; many awakened. Houses shook. Thunderlike noises heard by many.

Mount Vernon.—Felt by nearly all. Houses shook; doors and windows rattled. A rumbling noise accompanied the shock.

Pumpkin Center.—Felt and heard by nearly all; many awakened by the noise and vibrations. Trembling motion.

Tallassee.—Felt by nearly all. Houses shook; windows, doors, and dishes rattled. Thunderous noises heard by many.

INTENSITY (DAMAGE) I TO IV IN TENNESSEE: Athens, Englewood, Fountain City, Friendsville, Louisville, Mentor, Rockford, Tellico Plains, Vonore, and Walland.

July 23: 22:37:30*. Charleston, S.C. V. Felt by many and alarmed several in the Charleston area. Buildings creaked; loose objects rattled. At Goose Creek, 13 miles northwest of Charleston, the tremor was reported strong enough to crack the roof of a house. Felt by many at Summerville; trembling motion. Also felt by several at Murrells Inlet; slight jarring motion.

CENTRAL REGION

(90TH MERIDIAN OR CENTRAL STANDARD TIME)

January 28: 15:38. Dyer County, Tenn. V. Felt by nearly all at Dyersburg and Finley. Houses shook; windows, doors, and dishes rattled. Felt by many at Boothspoint and Lenox, where doors, dishes and windows rattled. At Lenox, a noise accompanied the shock.

April 21: 04:45. Lake County, Tenn. V. Felt by and awakened many. Houses vibrated. Rumbling sounds like distant thunder heard by many.

May 4: 10:31:32*. Pine Bluff, Ark. IV. Felt by many. Houses shook; bottles on shelves rattled. Two observers at a service station 2½ miles north of Pine Bluff, reported the building vibrated for about 2 seconds. Recorded by the University of Arkansas seismograph.

WESTERN MOUNTAIN REGION

(105TH MERIDIAN OR MOUNTAIN STANDARD TIME)

January 1: 21:09:35*. Epicenter 45° north, 111½° west, Hebgen Lake, Mont., W. Mammoth Hot Springs, Yellowstone National Park, Wyo. III. Rapid, northeast-southwest motion felt by two. Table leaves rattled.

January 2: 03:40. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Walls creaked; object on second floor fell. Rapid, rolling, northeast-southwest motion, accompanied by loud earth noise.

January 2: 17:17:05*. Epicenter 45° north, 111½° west, Hebgen Lake, Mont., W. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Rapid, north-south motion felt by three. Windows rattled.

January 3: 02:57:32*. Epicenter 44½° north, 111½° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. IV. Rapid, brief motion awakened two. Windows rattled.

January 3: 04:03:07*. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Rapid, brief motion awakened two. Windows rattled.

January 3: 12:40:48*. Epicenter 44½° north, 111° west, Hebgen Lake, Mont., W. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by several and awakened few. Rapid, south-north motion. Also felt at Old Faithful.

January 3: 13:37:48*. Epicenter 45° north, 111° west, Hebgen Lake, Mont.,W. IV. Felt by two at Mammoth Hot Springs, Wyo. Windows rattled; rapid motion. At Helland Ranch (Papoose Creek at Madison River), Mont., felt by and frightened one. Log walls creaked; rapid, brief motion.

January 3: 14:58:10*. Mammoth Hot Springs, Yellowstone National Park, Wyo. III. Felt by two. Rapid, brief northeast-southwest motion.

January 4: 08:09:33*. West Yellowstone, Mont. IV. Felt by two. House shaken; windows rattled. Rapid, brief motion, accompanied by roaring earth noise.

January 4: 21:03:34*. Epicenter 44½° north, 111½° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. V. Cans fell from shelf in grocery store; house rattled. Rapid, brief, strong motion, accompanied by noise.

January 8: 21:26. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by three. Windows, doors, and dishes rattled; houses creaked. Rapid, brief motion. At Stevens Creek, near Gardiner, Mont., rapid motion felt by two. Windows, doors, and dishes rattled; house creaked.

January 10: 06:00. Ennis, Mont. (8 miles east of Jeffers Ranch). IV. Felt by two. Coffee pot jarred off stove; frame creaked.

January 11: 04:28:43*. West Yellowstone, Mont. IV. Felt by observer. Windows, doors, and dishes rattled. Rapid motion; duration 1 second.

January 12: 02:15. Ennis, Mont. IV. Felt by several and awakened few. Bed lamp rattled against wall. Slow, north-south motion.

January 13: 20:44:01*. Ennis, Mont. IV. Felt by several at high school. Floor vibrated; east-west motion.

January 14: 11:27:21*. Helena, Mont. IV. Felt by several in various sections of Helena, mainly on west side. Dishes rattled and tables shaken slightly. Described as weak roll and rumble followed by sharp bump or jolt. At Frontier Town, about 14 miles west of Helena (near Rimini) man reported "a sensation like dropping half an inch." Distinct thump, immediately preceded by rumble like heavy truck passing.

January 18: 05:42:55*. Gallatin Gateway, Mont. (Black Butte Ranch). IV. Felt by several; awakened one. House creaked.

January 19: 23:50. Mammoth Hot Srpings, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; house creaked. Rapid motion.

January 20: 00:15. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid motion.

January 20: 04:23. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Few awakened. Windows and doors rattled; house creaked. Rapid motion.

January 21: 15:37:28*. Epicenter 44½° north, 110½° west, Hebgen Lake, Mont., W. IV. Felt by several at Stevens Creek, Mont. (near Gardiner), where windows, doors, and dishes rattled; house creaked. Rapid, brief motion accompanied by noise. Felt by several at West Yellowstone, Mont. Windows, doors, and dishes rattled; house creaked; restaurant floor made bumping sound and beams creaked. Rapid, brief motion. In Yellowstone National Park, Wyo., at Mammoth Hot Springs, dishes and small furnishings rattled; walls creaked; hanging objects swung. Rapid motion was accompanied by a roar like truck passing. Felt by several at Old Faithful. Windows, doors, and dishes rattled; houses creaked. Rapid motion.

January 22: 07:50. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by many. Windows and doors rattled; house creaked; hanging objects swung. Rapid motion.

January 23: 08:03:20*. Epicenter 45° north, 111½° west, Hebgen Lake, Mont., W. IV. Felt by all in home at Mammoth Hot Springs, Yellowstone National Park, Wyo. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, 10-second shock. At West Yellowstone, Mont., felt by two in home. Two rapid shocks, lasting 3 seconds.

January 23: 08:33:28*, 09:05:37*, 12:18:52*, and 12:20:14*. West Yellowstone, Mont. IV. Felt by two in home. Windows rattled. Rapid, sharp jolts, lasting 1–2 seconds each.

January 25: 07:14:45* and 07:14:48*. McAllister, Mont. IV. Felt by many in community.

January 25: 12:31:08*. IV. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by many. Windows, doors, and dishes rattled; houses creaked; hanging objects swung. Rapid, 4-second, north-south motion. At West Yellowstone and Stevens Creek (near Gardiner), felt with about the same effects as at Mammoth Hot Springs.

January 25: 12:34. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid motion.

January 27: 00:15. Ennis, Mont. III. Felt by several in home. Slow motion, lasting about 6 seconds. Also felt at Jeffers Ranch, 8 miles east of Ennis.

January 29: 06:22:46*. West Yellowstone, Mont. IV. Felt in community (one active). Windows, doors, and dishes rattled; house creaked. Rapid, 1-second shock.

January 29: 14:39:01*. West Yellowstone, Mont. IV. Felt in the community. Windows, doors, and dishes rattled; house creaked. Rapid, 1-second shock, accompanied by a roaring sound.

February 1: 02:16:29*. West Yellowstone, Mont. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 1-second shaking with noise accompanied the shock.

February 1: 05:51:23*. Ennis, Mont. Slow motion, lasting 33 seconds, felt by one lying down.

February 2: 15:25. West Yellowstone, Mont. IV. Felt. Windows and doors rattled; house creaked. Rapid, 1-second shock. Also felt at Duck Creek about 9 miles north of West Yellowstone.

February 3: 11:30. Ennis, Mont. (about 8 miles east of Jeffers Ranch). V. End of haystack fell; coffee pot fell from stove; papers slithered off stack. Felt by several about 6 miles east of Ennis, where dishes rattled. Slow motion of long duration.

February 15: 20:23. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; frame creaked; hanging objects swung. Rapid, west-east, 3–4 second shock.

February 15: 20:34. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, 5–6 second shock.

February 15: 23:50. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; hanging objects swung. Rapid, west-east, 10–12 second shock.

February 16: 02:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; house creaked. Rapid, west-east motion.

February 17: 09:52:35*. Epicenter 45° north, 111° west, Hebgen Lake, Mont., W. Canyon, Yellowstone National Park, Wyo. IV. Felt by two. Windows and doors rattled; house creaked; hanging objects swung. Rapid, north-south motion.

February 17: 18:43:27*. Epicenter 45° north, 110½° west, Hebgen Lake, Mont., W. Canyon, Yellowstone National Park, Wyo. IV. Felt by four in community. Windows and doors rattled; house creaked. Rapid, north-south motion, accompanied by rumble.

February 18: 17:30:40*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several and frightened few in home. Windows and dishes rattled; walls creaked. Rapid, ½-second shock.

February 20: 19:27:09*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several and frightened few in home. Windows and dishes rattled; walls creaked.

February 23: 02:00. West Yellowstone, Mont. IV. Felt by all in home. House creaked. Motion south-north, 1-second bump.

February 23: 22:23. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, 2-second shock.

February 24: 03:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. House creaked. Rapid, 6–8 second shock.

February 27: 22:30. West Yellowstone, Mont. III. One rapid jiggle felt by several in community.

February 28: 00:40. West Yellowstone, Mont. IV. Felt by and awakened all in home. House creaked slightly. Rapid, 1-second shock.

February 28: 02:37:10*. Epicenter 45° north, 111½° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. IV. Felt by and awakened all in home. Windows, doors, and dishes rattled; house creaked; pictures knocked askew on walls. Rapid, 4-second shock.

March 1: 00:16. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by several in home. Windows, door frames, and cupboards rattled; house creaked; hanging objects swung. Sharp, northwest-southeast motion, lasting 2 seconds.

March 4: 05:07:06*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by and awakened all and frightened many in home. Windows, doors, and dishes rattled; walls creaked. Rapid, 1–2 second shock. Also felt at nearby Hutchins Bridge (Kirby Ranch).

March 8: 07:10:46* and 07:13:45*. Epicenter of second shock 44½° north, 111° west, Hebgen Lake, Mont., W. Hutchins Bridge, Mont. (Kirby Ranch). IV. Felt by observer sitting; windows rattled; walls creaked. (Report could apply to either shock.)

March 10: 22:45. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 3–4 second shock.

March 10: 23:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; hanging objects swung. Strong, 2-second jolt.

March 13: 03:30. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows rattled; house creaked. Rapid, strong shake, lasting 8 seconds.

March 16: 21:40. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by

all sitting in home. Windows and doors rattled; house creaked. Rapid, 3–4 second shock.

March 17: 05:35. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; walls creaked; hanging objects swung. Rapid, fairly strong shake.

March 20: 00:19:25*. Ennis, Mont. III. Felt by several. Loud earth noise heard.

March 20: 03:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Plaster cracked. Rapid motion.

March 20: 12:15:33*. Helland Ranch, Papoose Creek at Madison River, Mont. III. Felt by several in home (sitting and active). Rapid, ½-second shock.

March 20: 19:50. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked. Rapid, 2–3 second shock.

March 20: 21:15. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Slow, 3–4 second shock.

March 22: 20:15:13*. Epicenter 44½° north, 111° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. V. Strongly felt. Objects fell from shelves. Some persons thought it was the strongest shock since the major earthquake of August 17, 1959. Felt by several at the Helland Ranch, Papoose Creek at Madison River, Mont., where roaring noises were heard; windows, doors, and dishes rattled; walls creaked. In Yellowstone National Park, at Mammoth Hot Springs and Old Faithful, windows, doors, and dishes rattled; house creaked; stove shaken.

March 26: 19:20 and 19:35 (about). Mammoth Hot Springs, Yellowstone National Park, Wyo. II. Felt by two. Rapid, north-south shocks, lasting about 5 and 3 seconds.

March 31: 11:30. Boulder City, Nev. Felt by one in store. Moderate earth noises heard.

March 31: 12:22:20*. West Yellowstone, Mont. IV. Felt by several. Dishes rattled; house shaken. Rapid, brief motion from north.

March 31: 18:30. West Yellowstone, Mont. II. Slight, 1-second shock felt by two sitting in home.

March 31: 22:50:07*. West Yellowstone, Mont. III. Moderate motion from north, lasting 1 second, felt by two sitting in home.

April 3: 03:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; house creaked. Slow motion.

April 3: 03:15. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; walls creaked. Rapid, 4–5 second shock.

April 3: 04:30. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Rapid motion.

April 3: 21:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, 2-second shock.

April 3: 23:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Rapid, 4–5 second shock.

April 5: 05:38:38*. West Yellowstone, Mont. IV. Felt by several; awakened one. Dishes rattled. "People in town didn't feel it." Sharp, 3–4 second shock, accompanied by faint roar.

April 6: 11:52:19*. West Yellowstone, Mont. IV. Felt by few and awakened two. House creaked. Bump, accompanied by faint roar.

April 6: 23:55. West Yellowstone, Mont. IV. Felt by two lying down. Dishes rattled; house creaked. Two-second shock, accompanied by noise.

April 7: 03:12:55*. West Yellowstone, Mont. IV. Felt and awakened one in home. House creaked. Sharp, slow motion.

April 7: 04:55:04*. West Yellowstone, Mont. III. Felt by several. Prolonged vibration 15 minutes to half-hour before tremor, then bump with noise and vibration.

April 8: 07:33:11*. West Yellowstone, Mont. IV. Felt by several. Windows rattled; house vibrated. Rapid, 1-second, northeast motion, accompanied by rumble.

April 10: 00:57:09* and 00:57:13*. About 5 miles northeast of McAllister, Mont., near Power Plant at Madison Reservoir IV. Felt by and awakened all in trailer. Trailer rocked east-west. Motion rolling.

April 10: 06:16:22* and 06:22:51*. About 5 miles northeast of McAllister, Mont., near Power Plant at Madison Reservoir. Felt by one in trailer camp.

April 10: 22:54:46*. West Yellowstone, Mont. IV. Felt by two lying down. Windows rattled. Strong, 2-second bump.

April 10: 22:58:12*. West Yellowstone, Mont. IV. Felt by several. Bed moved; windows, doors, and dishes rattled. Four-second shock.

April 10: 23:01:27*. West Yellowstone, Mont. III. Felt by several. House shaken. Rapid motion, accompanied by rumble.

April 11: 03:21:29*. West Yellowstone, Mont. IV. Felt by several in community. Windows, doors, and dishes rattled; house shaken. Rapid, 4-second shock, accompanied by rumble.

April 11: 05:29:44*, 05:34:26*, and 06:03:30*. West Yellowstone, Mont. Felt by two lying down. Rapid, 3-second shock. Report probably applies to third shock (observer's time 05:55). Small vibrations felt during the night at various times.

April 13: 03:40:42*. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by one lying down. Windows and doors rattled; house creaked; hanging objects swung. Rapid, 10-second shock. Rapid, strong bump awakened two at West Yellowstone, Mont.

April 13: 07:35:08*. West Yellowstone, Mont. IV. Felt by one in home. House shaken. Rolling, northeast, 1-second shock.

April 14: 02:15. Boulder City, Nev. III. Rapid, 30-second shock, accompanied by moderate earth noises, felt by observer lying down.

April 16: 07:21:59*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several and frightened few in home. Windows, doors, and dishes rattled; log house creaked. Rapid, 1-second shock.

April 17: 04:23:12*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by and awakened all in home; frightened few. Windows, doors, and dishes rattled; walls creaked. Rapid, 2-second shock, preceded by roar. Also felt at Ennis.

April 17: 05:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Awakened all in home. Windows and doors rattled; house creaked; hanging objects swung. Rapid, sharp, 6–8 second shock, preceded by noise.

April 17: 21:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; hanging objects swung. Rapid, sharp, 4–5 second shock.

April 17: 21:55. Mammoth Hot Springs, Yellowstone National Park, Wyo. III. Rapid, light, 3–4 second shock felt by observer in home.

April 18: 23:40. Mammoth Hot Springs, Yellowstone National Park, Wyo. III. Rapid, weak motion, lasting 15 seconds, felt by observer lying down.

April 19: 02:43:27*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt in community; awakened all and frightened few in home. Windows, doors, and dishes rattled; walls creaked; pictures shifted. Rapid, 1–2 second shock, preceded by roar.

April 20: 20:52:38*. Ennis, Mont. IV. Felt by many. Also felt at Hutchins Bridge, about 12 miles northwest of Hebgen Dam, and 30 miles south of Ennis.

April 21: 10:49:30* and 10:57:55*. Epicenter 45° north, 111° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. V. Merchandise fell from shelves in two grocery stores; dishes fell from cabinets; and pictures knocked askew at West Yellowstone. To some observers, the motion felt like a strong thump from directly underneath, then moving to the north. Roaring sounds heard. In Yellowstone National Park at Old Faithful, water sloshed over sides of goldfish bowl. Reported as the sharpest jolt felt. Felt slightly at Parade Rest Ranch on Hebgen Lake, about 10 miles north of West Yellowstone. At Mammoth Hot Springs, sharp, brief shock felt by one lying down and by child playing. The shock at 10:57:55* was also felt at West Yellowstone and was described as two light, sharp thumps, one immediately following the other, from directly underneath.

April 23: 01:06:25*. Parade Rest Ranch (on Hebgen Lake about 10 miles north of West Yellowstone), Mont. Sharp shock felt by observer.

April 24: 20:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked; hanging objects swung. One strong 3-second jolt.

April 25: 17:39:03*. West Yellowstone, Mont. IV. Felt by all in home. Dishes rattled; house creaked. Sharp, 2-second bump.

April 26: 04:32:50*. West Yellowstone, Mont. III. Felt by all in home lying down. Duration of shock two seconds.

April 26: 04:53:10*, 04:55:06*, and 05:04:25*. West Yellowstone, Mont. IV. Felt by and awakened all in home (observer's time 04:56). First two shocks weaker than third.

April 26: 18:17. West Yellowstone, Mont. III. Light thump felt by all in home.

April 26: 21:32:30*. Epicenter 44½° north, 111° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. V. Felt by all in community. Small objects and furnishings shifted; vases and lamps rocked; pictures displaced; hanging objects swung east-west. People thrown off balance. One observer reported heavy jar, lasting 7 seconds; another, strong shaking for 13 seconds, then diminishing with quivery sensation.

April 27: 01:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows, doors, and dishes rattled; house creaked. Rapid, strong shake lasted 10 seconds.

April 27: 01:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 10-second shock.

April 27: 04:20. West Yellowstone, Mont. IV. Felt by and awakened all in home. Felt as

if house tipped; windows, doors, and dishes rattled; house creaked. Two-second bump.

May 4: 20:39:50*. Epicenter 46° north, 111½° west, southwestern Montana, W. Manhattan-Logan areas. IV. Dishes rattled. Preceded by rumbling sound which one observer likened to freight cars being shunted together. Also felt at Three Forks, about 6 miles west of Logan.

May 5: 02:07. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Small objects shifted; windows and doors rattled; house creaked; doors swung. Rapid, 6-second shock.

May 5: 02:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Moderate earth noises heard. Rapid, 10-second shock.

May 5: 02:20. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 6–8 second shock.

May 5: 03:15 and 03:18. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; doors swung. Rapid, 6–8 and 10-second shocks.

May 5: 04:30. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; hanging objects swung. Jolt, lasting few seconds.

May 5: 05:18. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked; doors swung. Rapid, fairly strong, 20-second shock.

May 5: 09:45. Canyon Village, Yellowstone National Park, Wyo. IV. Felt by several in community; windows and doors rattled. Quite severe, rapid, west-east, 3–4 second shock.

May 9: 16:45:53*. Epicenter 44½° north, 111½° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. III. Thump, then quivering 3-second shock from south, felt by several in community.

May 15: 03:47:47*. West Yellowstone, Mont. IV. Felt by and awakened all in home. Windows and doors rattled. Two bumps, lasting 2 seconds.

May 15: 04:34:50*. Epicenter 45° north, 111° west, Hebgen Lake, Mont., W. West Yellowstone, Mont. IV. Felt by and awakened all in home. Windows and doors rattled. One-second bump.

May 15: 19:09:21.* West Yellowstone, Mont. IV. Felt by all in home. Windows and doors rattled. One-second bump, preceded by noise. Slow, 3-second shock felt by one sitting in home at Mammoth Hot Springs, Yellowstone National Park, Wyo.

May 15: 20:00 to 20:15 (about). Mammoth Hot Springs, Yellowstone National Park, Wyo. Felt by observer sitting in home. Slight, jolting, like someone beating on floor, 1–2 second shock. (This may be the following shock.)

May 15: 20:33:22*. Canyon Village, Yellowstone National Park, Wyo. IV. Felt by several in community. Windows and table rattled. Northwest, 5-second motion.

May 16: 01:25. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by several in community (lying down and active). House sharply jarred; dishes rattled; house creaked. Rapid, north-south, 3-second motion.

May 16: 03:30. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; house creaked. Rapid, 20-second shock.

May 16: 09:15. West Yellowstone, Mont. IV. Brief bump felt by observer in home; house creaked.

May 17: 15:04:34*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several (one active) and frightened few in home. Dishes and windows rattled; walls creaked. Rapid, 1-second shock, accompanied by a roar.

May 20: 10:54:02*. Epicenter 45° north, 111° west, Hebgen Lake, Mont., W. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by many. Windows and doors rattled. Quite strong, rapid, 5-second, west-east motion. At Canyon, Yellowstone National Park, Wyo., quite strong, rapid, 5-second, west-east motion felt by two. Also felt at Gibbon Meadows in the Park and at West Yellowstone, Mont.

May 20: 11:36:06* and 11:42:22*. Epicenter of first shock 45° north, 111½° west, Hebgen Lake, Mont., W. Canyon, Yellowstone National Park, Wyo. IV. Felt by two sitting. Windows rattled. Rapid, 2-second, west-east motion. Observer's time 11:40.

May 20: 11:55 Canyon, Yellowstone National Park, Wyo. IV. Felt by two sitting. Windows rattled. Moderate, 2-second, east-west motion.

May 20: 12:40:58*. Canyon, Yellowstone National Park, Wyo. IV. Felt by two sitting. Windows rattled. Moderate, 2-second, east-west motion.

May 20: 23:45. Madison Junction, Yellowstone National Park, Wyo. III. Felt. Rapid, 20–25 second shock.

May 23: 02:03:42*. Canyon, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled.

Rapid, 5-second, northwest–southeast motion.

May 23: 02:47:06*. Canyon, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows rattled. Rapid, 2-second, northwest–southeast motion.

May 23: 03:16:25* and 03:19:07*. Canyon and Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by and awakened all in home. Windows and doors rattled; house creaked. Strong, rapid, 10-second, northwest–southeast motion.

May 23: 13:20. West Yellowstone, Mont. IV. Felt by all in home. Windows and doors rattled. Slight, rapid, 2-second shock.

May 23: 21:20:11*. West Yellowstone, Mont. IV. Felt by several in community. Windows and doors rattled. Rapid, 2-second shock.

June 2: 00:32:22*. Parade Rest Ranch (about 10 miles north of West Yellowstone on Hebgen Lake), Mont. Sharp, short, east–west motion.

June 5: 20:45. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked. Rapid, 15-second shock.

June 5: 21:55. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home and outdoors by one (quiet). Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, 10-second shock.

June 6: Between 12:00 and 13:00. Hutchins Bridge area (Kelly Ranch, about 30 miles south of Ennis), Mont. Three slight tremors felt.

June 7: 00:10. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows, doors, and dishes rattled; house creaked. Faint earth noises from east heard by two. Rapid, 30-second shock.

June 7: 00:50. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 30-second shock.

June 7: 04:25. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 10-second motion.

June 7: 13:30:38*. Butte, Mont. (east section). Motion seemed to come from southeast; duration 6–7 seconds.

June 8; 02:04:59*. West Yellowstone, Mont. IV. Felt by and awakened one. Slight, rapid bump.

June 9: 04:19:10*. Epicenter 45° north, 111½° west, Hebgen Lake, Mont., W. Southwest Montana. IV. Felt by many at Anaconda and Butte. Awakened all at the Helland Ranch (Papoose Creek at Madison River). Also felt at Belgrade, north of Dry Creek.

June 9: 18:50. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by several. Fixtures moved; desks jerked; hanging objects swung in various directions. Rapid, north–south motion, lasting 2 seconds.

June 10: 13:01:14*. Mild, but fairly noisy shock felt at Parade Rest Ranch, Mont., about 10 miles north of West Yellowstone.

June 13: 07:59:48*. Epicenter 45° north, 111° west, Hebgen Lake, Mont., W. Southwest Montana. IV. Felt by many and frightened few at Ennis, where windows, doors, and dishes rattled. Slow, 15-second motion awakened few at Gallatin Gateway (Black Butte Ranch). Windows and doors rattled; sliding doors banged together. Felt by several at the 320 Ranch, where dishes rattled. Very brief motion, seemingly southeast-northwest, preceded by roar. Awakened one at Butte. Felt by many at Mammoth Hot Springs, Yellowstone National Park, Wyo., where windows, doors, and dishes rattled; walls creaked. Rapid, 8–10 second motion with moderate earth noises.

June 13: 11:00. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by all in home and by three in offices. Windows, doors, and dishes rattled; house creaked. Rapid, 8–10 second motion.

June 15: 01:05. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Three rapid, severe jolts, awakened and frightened family. Windows, doors, and dishes rattled; house creaked; hanging objects swung.

June 18: 16:59:36*. Felt at Ennis and the Helland Ranch (Papoose Creek at the Madison River), Mont.

June 19: 22:59:57*. Canyon, Yellowstone National Park, Wyo. IV. Felt by several in community. Small objects shifted; windows, doors, and dishes rattled; trees, bushes shaken moderately. Rapid motion, very strong for 3–4 seconds.

June 21: 08:27:13*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several in community. Windows, doors, and dishes rattled; walls creaked. Rapid, 2-second motion, accompanied by a roar.

June 22: 06:05:44*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by and awakened few in home. Log walls creaked. Rapid, 1-second motion.

June 27: 05:09:21*. Lake Ranger Station, Yellowstone National Park, Wyo. IV. Felt by and awakened many in home. Windows rattled; walls creaked. Brief, rapid motion.

June 27: 17:00 (about). Fishing Bridge, Yellowstone National Park, Wyo. IV. Felt by

several and frightened few in community. Windows rattled; walls creaked; hanging objects swung. Five-second shock.

June 30: 01:54:26*, 02:01:13*, and 02:18:40*. Mount Holmes Lookout, Yellowstone National Park, Wyo. IV. Three heavy shocks and several small tremors (within 5 minutes) felt by observer. Windows, doors, and dishes rattled; house creaked.

July 3: 19:16:05* and 19:22:52*. Bozeman, Mont. Reported felt throughout the Bozeman Valley. Neither shock was strong, but both caused quite a bit of excitement.

July 8: 00:28:07*. Epicenter 44½° north, 111½° west, northeastern Idaho, W. Yellowstone National Park, Wyo. IV. Hard jolt, with loud earth noises, felt by several in community at Madison Junction and Old Faithful, where windows and doors rattled; awakened few at Old Faithful. Small tremors felt all night. Felt by several at Mammoth Hot Springs, where bed shifted and windows rattled. Sharp, north-south jolt. At Mount Holmes Lookout, 15–20 second shock felt by observer lying down. Windows and doors rattled; buildings creaked.

July 16: 14:51:15*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several in home. Windows and dishes rattled; walls creaked. Rapid, 2–3 second motion.

July 18: 16:17:30*. Epicenter 44½° north, 110½° west, Yellowstone National Park, Wyo., W. Lake Ranger Station, Yellowstone National Park, Wyo. IV. Felt by many and frightened few in community. Windows, doors, and dishes rattled; house creaked; trees, bushes shaken slightly. Slow, 10-second motion.

July 18: 21:50. Mount Holmes Lookout, Yellowstone National Park, Wyo. IV. Felt by observer. Lookout building shook. Two rapid shocks of few seconds duration. Moderate earth noises.

July 22: 08:49:30*. Epicenter 34° north, 106½° west, New Mexico, W. Lajoya. V. Trophies fell from shelves in high school. Windows and dishes rattled on ranch 6 miles west of Bernardo. Felt by several at Socorro; dishes rattled. Also felt 4 miles east of Bernardo and at San Acacia.

July 23: 07:15:26*. Epicenter 34° north, 106½° west, New Mexico, W. Felt along the Rio Grande River in Socorro County from Belen on the north, south to Socorro, and on a ranch 10 miles west of Bernardo, an area of approximately 3,000 square miles. Maximum intensity (damage) VI at Lajoya, where a weak adobe wall toppled and some adobe buildings were cracked. At Bernardo, people ran outdoors, and canned goods fell from shelves. Felt outdoors 10 miles west of Bernardo, where windows and dishes rattled. Pitcher of milk nearly toppled at Abeytas. Felt by many at Socorro; several vibrations over a period of 5–10 seconds. At San Acacia, reported as stronger than shock of the 22d. Also felt at Belen and Jarales.

July 24: 01:05 and 01:25. Southeast Idaho. IV. At Georgetown, two mild shocks felt by several in community; distinctly by observer outdoors. Windows, doors, and tools rattled during first shock. Man leaning backward in chair during second shock reported he was nearly thrown from chair. Distinctly felt at East Georgetown. Rumbling and shaking of windows awakened observer at Nounan.

July 24: 03:37. Bernardo (4 miles east of), New Mexico. V. Awakened all at Boy's Ranch. Two small windows broken. Awakened many at Bernardo.

July 28: 10:00. Mount Holmes Lookout, Yellowstone National Park, Wyo. IV. Felt by observer sitting in lookout tower. Windows rattled. Rapid, southwest-northeast, 3–4-second motion.

August 7: 09:27:16.2* (main shock), 12:20:15.1*. Epicenters 42.4° north, 111.5° west, and 42.5° north, 111.4° west, respectively, southeast Idaho, W. The main shock was felt over an area of approximately 900 square miles, principally in the Soda Springs area of Caribou County. Maximum intensity (damage) VI on a ranch about 9 miles east of Soda Springs, where plaster and concrete foundation was cracked.

INTENSITY (DAMAGE) VI:

Soda Springs (about 9 miles east of, Ezra Lakey Ranch).—Felt by and frightened all on first floor. Plaster cracked; damage considerable to concrete foundation. Furnishings shifted. Trees, bushes shaken strongly. Felt and sounded like truck hit side of house; loud earth noises heard.

INTENSITY (DAMAGE) V: Bancroft, Conda (about 10 miles north of Ezra Lakey Ranch), Soda Springs and a few miles southeast of Ellis Ranch.

INTENSITY (DAMAGE) IV: Georgetown.

INTENSITY (DAMAGE) I TO III: Bern (shock also felt at 12:20:15.1*), Bloomington (25 miles north of), Grace, Lava Hot Springs, McCammon, Montpelier and 13 miles north of, Preston, Swanlake, and Virginia.

August 7: 11:43. Tower Fall Campground, Yellowstone National Park, Wyo. III. Felt by several. Rapid, east-west, 5-second motion.

August 8: 02:27:26*. Soda Springs (about 9 miles east of, Ezra Lakey Ranch), Idaho. Slight shock, followed by two lighter shocks about 10 minutes apart.

August 9: 23:30. Mammoth Hot Springs and Mount Holmes Lookout, Yellowstone National

Park, Wyo. IV. Felt by many at Mammoth Hot Springs; by lookout in tower at Mount Holmes. Windows and doors rattled; buildings creaked. Rapid, southeast-northwest, 3-4 second motion.

August 10: 00:41:35:3*. Epicenter 42.5° north, 111.5° west, southeast Idaho, W. Soda Springs. V. Concrete patio and foundation of newly completed house cracked; glasses fell from shelf in cafe. Described as "quite strong."

August 16: (a.m.). Northern Idaho. IV. Felt at Coeur d'Alene, Kellogg, and Sandpoint. Dishes and windows rattled. Roar heard by many just before and after earthquake. Shock lasted 15–30 seconds.

August 17: 13:45. West Yellowstone, Mont. IV. Felt by several. Houses rattled. Rapid motion.

August 19: 01:30. Mount Holmes Lookout, Yellowstone National Park, Wyo. III. Felt by observer in lookout tower; tower shaken. Rapid, southeast-northwest, 2–3 second motion.

August 20: 01:01:54.3*, 03:11:40.9*, 04:01:59.0*, 07:46:51.3*. Epicenters: (1) 42.3° north, 111.3° west; (2) 42.5° north, 111.6° west; (3) 42.4° north, 111.5° west; (4) 42.5° north, 111.6° west, southeast Idaho, W. Conda. V. Felt by, awakened, and frightened many in community. Damage slight. Windows, doors, and dishes rattled; hanging objects swung. Observers at the Ira Ellis Ranch, 10 miles south of Conda, estimated 100 shocks were felt during the night; motion seemed to be from the east.

August 28: 02:30. Mount Holmes Lookout, Yellowstone National Park, Wyo. IV. Felt by observer in tower; windows rattled. Rapid, brief motion.

September 29: 03:32:21*. Sage Peak (in Gallatin Range, between the Gallatin and Madison valleys), Mont. III. This may be the shock reported felt by two members of a hunting party camped close to Sage Peak. Time given as 02:25. Observer awakened by vertical movements of camp cot; lasted 3–4 seconds; sounds like wind blowing in the trees.

October 11: 01:05:30.5*. Epicenter 38.3° north, 107.6° west, southwestern Colo., W. Magnitude 5½, B. Felt over an area of approximately 10,000 square miles. (See map, p. 18.) Slight damage, such as cracked chimneys, windows, and plaster; foundation cracked at Montrose; sidewalk buckled (no location given). Maximum intensity (damage) VI.

INTENSITY (DAMAGE) VI:

Cimarron.—Felt by, awakened, and frightened all in community. Damage slight. Small objects, furnishings shifted and overturned; few knickknacks fell.

Lake City.—Felt by, awakened, and frightened all in community. Damage slight. Plaster cracked and fell; loosened light bulbs and stove vent pipes. Small objects shifted and overturned.

Montrose.—Felt by and awakened all in home. Plaster cracked; foundation cracked in three places and all kitchen cupboards loosened from walls. Canned goods fell in grocery store; small objects shifted.

Ophir.—Felt by and awakened many in community. Plaster and chimneys cracked.

Ouray.—Felt by and awakened many in community; frightened few. Observers thought furnace had exploded. Damage to few wall decorations not securely fastened.

Placerville.—Awakened and frightened many in community; felt outdoors by some (active). Damage slight. Plaster and windows cracked; windows and dishes broken. Small objects and furnishings shifted; vases and small objects overturned; books and pictures fell.

Powderhorn.—Felt by and awakened many in community; frightened few. Damage slight. Concrete floor and windows cracked; windows broken.

Ridgeway.—Awakened and frightened all in community. Damage slight. Few dishes broken at grocery store; few vases, small objects, and furniture overturned.

Telluride.—Felt by, awakened, and frightened many in community. Very slight wall cracks. Small objects and furnishings shifted.

INTENSITY (DAMAGE) V: Almont, Cedaredge, Clifton, Crawford, Eckart, Gunnison, Hotchkiss, Iola, Lazear, Maher, Ohio (1½ miles west of), Olathe, Paonia, Parlin, Sapinero, Silverton, and Somerset.

INTENSITY (DAMAGE) IV: Austin, Bowie, Cory, Creede, Delta, Doyleville, Grand Junction, Naturita, Paradox, and Pitkin.

INTENSITY (DAMAGE) I TO III: Aspen, Cahone, De Beque, Eagle, Mesa Verde National Park, Norwood, Nucla, and Woody Creek.

October 11: 17:30. Ouray, Colo. Explosive-like shock felt by some.

October 17: 09:00. Aspen, Colo. V. Generally felt. Small objects fell from shelves. Trembling, 1-minute motion.

October 23: 19:39:16*. Mammoth Hot Springs, Yellowstone National Park, Wyo. III. Very slight, rapid, 1- to 2-second motion felt by two persons.

October 25: 12:20. Socorro, N. Mex. III. Felt by several. Single jolt of house. Also felt at 3 and 7 miles south of Socorro.

November 1: 14:57:11*. Helland Ranch, Papoose Creek at Madison River, Mont. IV.

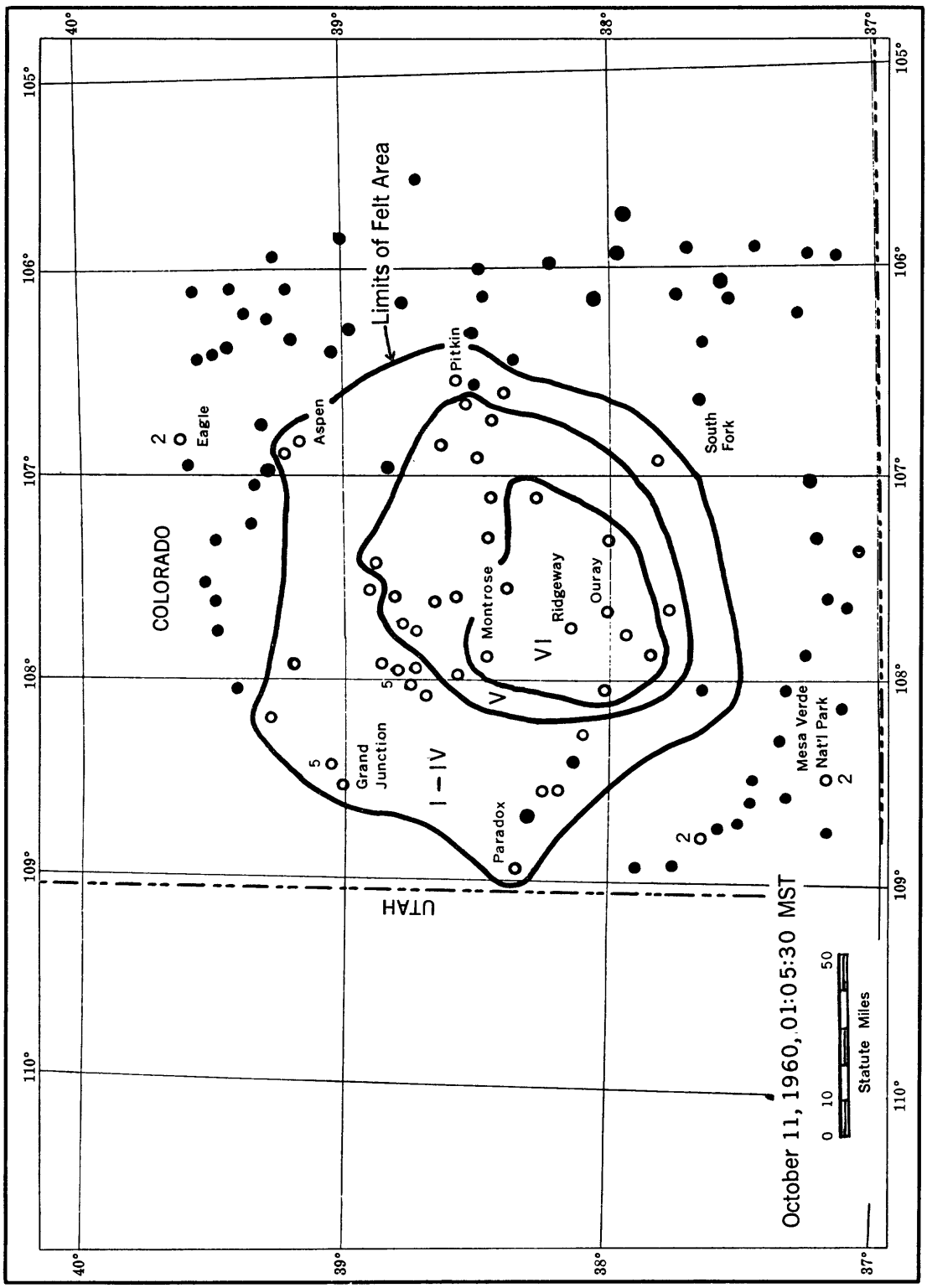


FIGURE 4.—*Area affected by earthquake of October 11.*

Rapid, 1-second motion felt by observer lying down; walls creaked.

November 1: 15:26:52*. Epicenter 45.3° north, 111.2° west, Hebgen Lake, Mont., W. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several in home; outdoors by some (active); frightened few. Windows, doors, and dishes rattled; house creaked; hanging objects swung. Rapid, roaring, 3 to 4 second blastlike motion.

November 3: 08:07:08*. Helland Ranch, Papoose Creek at Madison River, Mont. IV. Felt by several in home (one active); house creaked. Rapid, ½ second shock.

November 17: 10:06. Bozeman, Mont. Reported felt in Bozeman and vicinity. Some thought it was a blast or sonic boom.

November 18: 22:45. Billings, Mont. Blastlike disturbance. Malmstrom Air Force Base at Great Falls reported jets in the area. May have been a sonic boom.

November 19: 09:37. Helena, Mont. Blastlike disturbance. Malmstrom Air Force Base at Great Falls reported jets in the area. May have been a sonic boom.

December 4: 01:08:34. Epicenter 44.9° north, 110.4° west, West Yellowstone, Mont., W. III. Rapid, 2–3 second motion felt by two; moderate roaring sounds heard.

December 18: 04:52:59*. Epicenter 45.4° north, 111.5° west, southwest Montana, W. Reported felt over approximately 600 square miles of the Three Forks-Bozeman region. Maximum intensity (damage) IV reported from Belgrade, Churchill, Elk Creek area, Logan, Manhattan and environs, Sloan Ranch, and Trident, where principal effect was the awakening of people. In the Manhattan area it was described as a sharp, rapid jolting motion, accompanied by loud rumbling noises which seemed to come from south or southwest; two minor shocks followed. Window weights rattled 12 miles southeast of Manhattan and at Anceny. About 12 miles south of Manhattan, panel ray heater in east-west wall creaked; closet doors rattled at Manhattan. Observer at Churchill reported a shock was felt about 10 minutes after the main shock.

December 19: 16:29. Socorro, N. Mex. IV. Felt by many. Windows rattled. The New Mexico Institute of Mining and Technology seismographic station reported the shock was centered about 4½ miles southwest of Socorro. The Institute received numerous calls from Socorro residents who felt the shock.

CALIFORNIA AND WESTERN NEVADA

(120TH MERIDIAN OR PACIFIC STANDARD TIME)

NOTE.—All places are in California unless otherwise stated. The Bulletin of the Seismological Society of America is referred to as the BSSA.

January 5: 10:07:43*. Epicenter 34°02′ north, 117°44′ west, south of Pomona, P. Magnitude 3.0. Felt in the Pomona area.

January 8: 06:43:04*. Epicenter 33°51′ north, 118°22′ west, near Redondo Beach, P. Magnitude 2.4. Compton area. IV. Sharp, jolting earthquake rocked the Compton area; windows and dishes rattled.

January 11: 11:08:40*. Epicenter 37°10′ north, 117°59′ west, east of Tinemaha, P. Magnitude 3.7. Felt sharply in the Independence area.

January 11: 22:25:33*. Epicenter 36°55′ north, 121°45′ west, near Watsonville, B. Aptos (3.7 miles north of). IV. Observer awakened. Door rattled and swung north. Rapid, 2-second, northeast motion.

January 17: 10:55 and 10:56. Epicenter of both events apparently off the Golden Gate west of San Francisco. Possibly underwater explosions, B. Very slightly felt at El Cerrito. Slight rolling motion felt at San Bruno (Skyline and San Bruno Ave.).

January 19: 19:25:53* (main shock), 19:47:51*. Epicenter 36°47′ north, 121°26′ west, south of Hollister, B. Magnitude of main shock 5.0. Felt over an area of approximately 7,500 square miles of west-central California coastal areas. (See map, p. 20.) Maximum intensity (damage) VI. Minor damage occurred at the W. A. Taylor Winery, about 7 miles south of Hollister on Cienega Road: underground pipeline broke; slight cracks in asphalt pavement; small portions of ceiling fell; chimney cracked at roof line. At the Howard Harris Ranch, in the same area, walls cracked and reservoir crack enlarged. Slight damage at Hollister and Paicines, consisting of cracked plaster and broken windows and dishes.

INTENSITY (DAMAGE) VI:

Hollister (7 miles south of, W. A. Taylor Winery).—The University of California seismographic station reported that a creep recorder in the main building registered ⅛″ right-lateral movement at the time of the main shock. (For a report on this observed creep, which has been studied since 1956, see "Creep on the San Andreas Fault," BSSA, Vol. 50, No. 3, July 1960.) Creep caused the already broken wall in the middle of

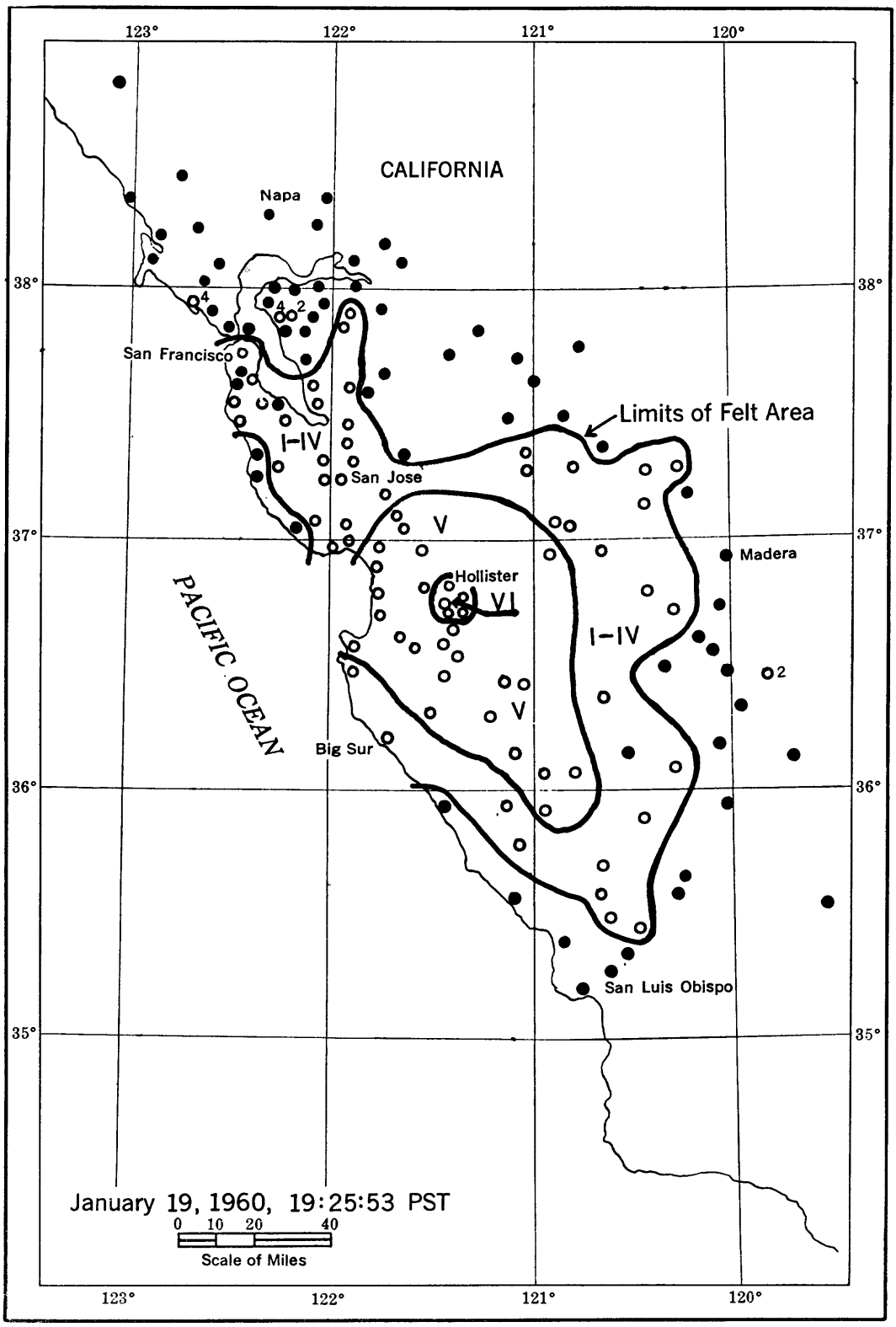


FIGURE 5.—*Area affected by earthquake of January 19.*

the winery to spall. Several 20-foot-long hairline cracks, parallel to creep zone and almost in it, were noted in asphalt pavement. Pipeline broken between boiler house and drainage ditch (this line has broken before). Many objects thrown down, pictures from walls, bottles and chemicals from shelves, bottled drinking water from stands. The 50-gallon wine barrels in racks worked loose from chocks in many instances; some chocks fell. Oscillating wine in the large 18 to 20 foot high tanks caused tanks to distort, damaging catwalks between tanks; slight leaks in some tanks.

Hollister (7½ miles south of, Harris Ranch, 7800 Cienega Road).—Felt by all and frightened many in community. Walls cracked; reservoir crack enlarged. Small objects and furnishings shifted; vases, small objects, and furniture overturned; books fell; dishes and mirror broken. Fairly strong, brief shock at 19:47:51*. Many small shocks followed during the night, also small shocks felt on morning of the 20th, with one at 05:45; several small shocks during the day.

Hollister.—Felt by and frightened all. Slight damage. Plaster cracked at Courthouse; dishes and windows broken. Merchandise fell in grocery stores. Cupboard doors flew open; telephone and electrical poles and wires swayed violently. Pendulum clock facing east stopped.

Paicines (about 7 miles southeast of the W. A. Taylor Winery).—Felt by all and frightened many in community. Damage slight. Dishes broken. Knickknacks, books, and pictures fell. Trees, bushes shaken strongly.

INTENSITY (DAMAGE) V: Castroville, Chualar (9 miles east of), Freedom, Gilroy, Gonzales, King City and 20 miles east of at intersection of State Highway 198 and Lonoak-Hollister Road, Libby Ranch (about 3 miles southwest of Paicines), Los Banos and 6 miles southeast of in Charleston District, Marina, Morgan Hill, Moss Landing, Pacific Grove, Paloma Station (about 3 miles southeast of Jamesburg), Pebble Beach, Salinas and Camp McCallum, San Ardo, San Benito, San Juan Bautista, San Lucas, San Martin, Tres Pinos, and Watsonville.

INTENSITY (DAMAGE) IV: Aptos and 3.7 miles north of, Ben Lomond, Berkeley, Big Sur, Bolinas, Bryson, Capitola, Coalinga, Coyote, Creston, Crows Landing, Diablo, Felton, Firebaugh, Greenfield, Hayward, Jolon, La Honda, Mendota, Merced, Milpitas, Mount Hermon, Parkfield, San Francisco, San Jose, San Miguel, Saratoga, Soquel, South San Francisco, Sunnyvale, Volta, and Warm Springs.

INTENSITY (DAMAGE) I TO III: Alviso, Aromas, Campbell, Caruthers, Clayton, Dos Palos, El Nido, Fremont, Lafayette, Half Moon Bay, Idria, Livingston, Moss Beach, Newman, Pinnacles National Monument (about 4 miles southwest of San Benito), Pinole, Planada, Redwood City, San Lorenzo, San Mateo, Soledad, Sunol, and Templeton.

January 20: 05:12:40*. Epicenter 36°50′ north, 121°28′ west, southwest of Hollister, B. Felt at Hollister.

January 21: 14:21:08*. Epicenter 33°04′ north, 115°54′ west, near Kane Springs, P. Magnitude 2.6. Descanso. II. Rapid motion felt by several in community.

January 21: 15:52:22*. Epicenter 32°49′ north, 117°03′ west, northeast of San Diego, P. Magnitude 2.5. Mount Helix (San Diego area). II. Rapid motion felt by several. Also felt at Descanso and La Mesa.

January 22: 14:01:18*. Epicenter 36°47′ north, 121°20′ west, southeast of Hollister, B. Hollister (7½ miles south of, Harris Ranch). IV. Felt by all in home. Windows and doors rattled; house creaked. Slow, 20-second, northeast motion.

January 24: 10:24:56*, 10:35:27*, 21:15:55*, 21:52:45*. Epicenter 36.8° north, 121.5° west, southwest of Hollister, B. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several in home. Windows, doors, and dishes rattled; house creaked. First shock slow, brief; last three shocks reported as light.

January 26: 06:44:34*. Epicenter 36°43′ north, 121°18′ west, southeast of Hollister, B. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several; awakened few in home. Windows rattled; walls creaked. Very brief shock.

January 27: 12:50:57*. Epicenter 36.7° north, 121.2° west, southeast of Hollister, B. Hollister (7½ miles south of, Harris Ranch). IV. Felt by observer. Windows and doors rattled; walls creaked. Slow, brief motion.

January 28: 18:07:48*. Epicenter 34°05′ north, 118°38′ west, near Topanga, P. Magnitude 2.3. Felt at North Hollywood and Panorama City.

February 3: 00:37.3*. Epicenter 32.1° north, 116.0° west, Baja California, P. Magnitude 4.5. Felt slightly in the Imperial Valley and San Diego areas. Felt by several in community at San Diego (intensity (damage) III). Hanging objects swung; rapid, 4-second southeast motion.

February 6: 11:48. Hollister (7½ miles south of, Harris Ranch). III. Felt by observer. House creaked faintly; slow, brief, northeast motion.

February 7: 02:20. Hollister (7½ miles south of, Harris Ranch). Very slight, brief, northeast rolling motion.

February 9: 06:01:49*. Epicenter 33°11′ north, 116°28′ west, Santa Rosa Mountains, P. Magnitude 3.7. San Diego County. Minor

shock at Borrego State Park, El Cajon, Harbison Canyon, Lakeside areas, and Lemon Grove.

February 9: 09:36. Barstow. "Felt."—*(BSSA, April 1960.)*

February 11: 15:38. Sharp, 2-second motion felt at Moss Landing.

February 13: 09:16:49*. Epicenter 36°51′ north, 121°32′ west, west of Hollister, B. Felt at Moss Landing and Salinas power plants (PG&E).

February 15: 11:03:56*. Epicenter 39.5° north, 123.3° west, northeast of Willits, B. Felt at Willits and Potter Valley power plants (PG&E).

February 17: 10:00:47*. Epicenter 34°08′ north, 118°15′ west, near Glendale, P. Magnitude 1.9. Felt at Hollywood.

February 24: 05:12:34*. Epicenter 34°00′ north, 117°34′ west, near Mira Loma, P. Magnitude 3.8. V. Felt by and awakened many in community at Etiwanda, where windows rattled. Felt by two at Ponoma. House creaked; windows rattled; trembling, brief motion. Also felt at Fontana, Ontario, and Riverside.

February 24: 15:44:57*. Epicenter 36°53′ north, 121°43′ west, near Watsonville, B. Small shock felt at the Harris Ranch, 7½ miles south of Hollister.

February 25: 09:09. Hollister (7½ miles south of, Harris Ranch). IV. Felt by all in home. Windows and doors rattled; house creaked. Rapid, 5-second, northeast motion.

February 27: 11:22:25*, 11:23:15*, 11:27:12*. Epicenter 37°56′ north, 122°01′ west, near Concord, B. Magnitude of first shock 3.4; second and third shocks, 2.7. San Francisco Bay area. IV. Slight shocks felt in some East Bay communities. Some reports (no location given) of broken dishes. Also felt slightly at San Francisco.

March 9: 21:30, 21:34. Keene. III. Felt by several in home and community. Dishes rattled very slightly. Rapid, 2-second motion.

March 16: 00:21:38*. Epicenter 34°22′ north, 118°56′ west, near Fillmore, P. Magnitude 3.2. V. "Merchandise toppled from grocery store shelves at Santa Paula."—*(BSSA, July 1960.)* Press reported the shock as light. Also felt at Fillmore.

March 22: 06:04. Keene. IV. Felt by many in community. Loud earth noises heard by many 3 seconds before shock; slow, 1-second motion.

March 22: 10:31:33*. Epicenter 37°44′ north, 122°08′ west, east of San Leandro, B. Magnitude 2.6. East Oakland and San Leandro. Mild shock. Oakland police reported they received about 50 calls.

April 14: 12:45:23*. Epicenter 32°52′ north, 115°29′ west, near El Centro, P. Magnitude 3.3. Felt at El Centro.

April 21: 15:39:20* (main shock of a swarm). Epicenter 32°44′ north, 115°42′ west, west of El Centro, P. Magnitude 4.2. San Diego. III. Felt by one in home; hanging objects swung. Also felt at El Centro. Pasadena reported this was the largest of a typical Imperial Valley swarm, including about 20 recorded shocks.

May 7: 18:26:59*. Epicenter 33°06′ north, 116°39′ west, near Julian, P. Magnitude 3.4. San Diego County. Sharp shock jarred residents of Alpine, Descanso, and Suncrest (about 5 miles east of El Cajon). Strong, rolling, east motion, accompanied by loud rumbling noise, felt on Victoria Drive northwest of Alpine.

May 11: 01:09:02*. Epicenter 37°50′ north, 122°14′ west, near Berkeley, B. Magnitude 2.4. Felt at Berkeley.

May 11: 23:22:19*. Epicenter 34°01′ north, 117°32′ west, near Mira Loma, P. Magnitude 2.7. IV. Awakened few at Corona. Also felt in the Riverside area.

May 13: 04:36:40*. Epicenter 32°25′ north, 115°48′ west near Laguna Salada, Baja California, P. Magnitude 4.1. Reported felt at one place in San Diego.

May 15: 19:34:30*. Epicenter 35°12′ north, 118°40′ west, near Bear Mountain, Kern County, P. Magnitude 2.3. Keene. IV. Felt by all in home (observer active); moderate earth noises heard.

May 23: 07:30:57*. Epicenter 34°10′ north, 118°08′ west, small disturbance near Pasadena, P. Magnitude 1.5. Felt at Flintridge.

May 23: 13:50:32*. Epicenter 36°46′ north, 121°19′ west, southeast of Hollister, B. Magnitude 2.9. Hollister (7½ miles south of, Harris Ranch). IV. Felt by observer. Windows and doors rattled; house creaked. Rapid, brief motion.

May 25: 04:38:25*, 05:34:54*, 05:51:27*. Epicenter 34°10′ north, 118°08′ west, near Pasadena, P. Magnitudes 1.5, 1.5, and 1.3, respectively. Felt at La Canada.

May 26: 11:12:16*. Epicenter 32°05′ north, 116°16′ west, Baja California northeast of Ensenada, P. Magnitude 3.7. San Diego area. IV. Windows rattled at San Diego. Described as a slight shock. Also felt in East San Diego and La Mesa.

May 27: 03:24:14*, 05:24:27*. Epicenter 34°10′ north, 118°08′ west, near Pasadena, P. Magnitudes 1.2, 1.1, respectively. Felt at La Canada.

May 28: 11:40. Wishon Dam (near North Fork, Madera County). III. Felt by several

in the area. Slow, 20-second motion, accompanied by rumbling noise.

May 30: 21:38:50*. Epicenter 35°18′ north, 118°44′ west, west of Caliente, P. Magnitude 2.3. Keene. III. Felt by several in community. Slow, 2-second motion, preceded 3 seconds by moderate earth noises.

June 3: 13:38:02*. Epicenter 31½° north, 114° west, Gulf of California, W. Magnitude 4.8. San Diego. III. Press reported many calls received from persons feeling the shock. Chandeliers shaken. Duration 2 seconds.

June 4: 23:47:08*. Epicenter 37.5° north, 118.6° west, northwest of Bishop, P. Magnitude 5.1. Felt over an area of approximately 4,800 square miles of east-central California. Maximum intensity (damage) VI reported from Crowley Lake (Long Valley Dam, about 20 miles northwest of Bishop), where water was muddied. Felt by all and awakened many in community; frightened few.

INTENSITY (DAMAGE) V: Bass Lake, Bishop area, Dinkey Creek, El Portal, Laws, and Yosemite National Park (Park Headquarters).

INTENSITY (DAMAGE) IV: Badger, Balch Power House (PG&E, near Trimmer), Benton, Big Creek, Cathay, Dunlap, Friant, Hume, Huntington Lake, June Lake, Miramonte, Mono Hot Springs, Shaver Lake, Snelling, Tollhouse, Wishon, and Woodlake.

INTENSITY (DAMAGE) I TO III: Auberry and Three Rivers. Also reported felt at Tulare and Visalia (no details).

June 5: 17:17:48*. Epicenter 40°49′ north, 124°53′ west, west of Arcata, B. Magnitude 5.7. Felt over a land area of approximately 8,000 square miles, principally in Humboldt and Trinity counties. Maximum intensity (damage) VI. At Eureka some plaster fell in the old City Hall; at Crannell a brick house chimney was slightly twisted.

INTENSITY (DAMAGE) VI:

Crannell (about 18 miles north of Eureka).—Felt by all and frightened few in home. Brick house chimney slightly twisted; damage slight to brick. Trees, bushes shaken moderately.

Eureka.—Felt by nearly all; alarmed many; several ran to the streets. Some already loosened plaster fell in the old City Hall (this building was severely damaged and partially abandoned due to the earthquake of December 21, 1954). Pendulum clock, pendulum swinging east-west, stopped. Small objects shifted. Telephone poles swayed.

Ferndale.—Felt by and frightened all. Furnishings shifted; small objects overturned; knickknacks fell.

INTENSITY (DAMAGE) V: Alton, Bayside, Blue Lake, Cutten, Denny, Ettersburg, Fields Landing, Fortuna, Freshwater, Garberville, Holmes, Hoopa, Kneeland, Korbel, Loleta, McKinleyville (Noria Lodge), Rio Dell, Samoa, and Weitchpec.

INTENSITY (DAMAGE) IV: Burnt Ranch, Carlotta, Covelo (Travis Ranch), Cummings, Eel Rock, Fort Seward, Helena, Honeydew, Hydesville, Myers Flat, Oak Knoll Ranger Station (about 15 miles northwest of Yreka), Orleans, Pepperwood, Petrolia, Phillipsville, Piercy, Salyer, Scotia, Shively, Somesbar, South Fork, Thorn, Trinidad, and Whitlow.

INTENSITY (DAMAGE) I TO III: Albion, Alderpoint, Bell Springs, Etna, Forest Glen, Fort Bragg (9 miles east of), Fort Jones, Hyampom, Junction City, Mendocino, Miranda, Redding, Requa, Scott Bar, Smith River, Weaverville, and Willits.

June 5: 20:00. Elk. III. Rapid, slight motion felt by several; cracking sound heard.

June 6: 01:40. Burnt Ranch. IV. "Another strong shock awakened us."

June 7: 18:16:57*. Epicenter 35°10′ north, 118°20′ west, near Tehachapi, P. Magnitude 2.4. IV. Abrupt jar felt by many at Tehachapi, where buildings creaked and loose objects rattled; disturbed objects observed by several. Felt by several in home at Keene. One-second motion, preceded 3 seconds by faint earth noises.

June 7: 18:54:19*. Epicenter 40°34′ north, 124°13′ west, near Ferndale, B. Magnitude 4.3. Humboldt County. Felt from Arcata in the north to Fortuna and Rio Dell, 50 miles to the south. Intensity (damage) III at Eureka. Vertical, bumping, abrupt motion felt by several. Garage creaked slightly. Only those indoors and motionless were certain of movement. Reported not as strong as the June 5 shock at 17:17:48*.

June 9: 12:53.3*. Epicenter in Baja California, P. Magnitude 4.5. Press reported the shock was felt at San Diego.

June 11: 13:36:56*. Epicenter 32°16′ north, 115°42′ west, near Laguna Salada, Baja California, P. Magnitude 4.5. Descanso. III. Felt by several sitting in home; hanging objects swung. Rapid, east-west motion.

June 11: 23:15:34*. Epicenter 40°20′ north, 121°03′ west, near Westwood, B. Magnitude 3.1. Caribou Powerhouse (near Belden, western Plumas County). IV. Awakened few in community. Rapid, 1-second motion.

June 17: 16:15. Lake Tahoe (Tac-a-Lac Lodge, south shore of Lake Tahoe, near State Line). III. Rapid, 30-second motion felt by observer indoors; hanging objects swung north-south.

June 24: 17:29. San Diego. III. Felt by several in community. Rapid motion. Sharp jolt reported at La Mesa.

June 25: 00:19:37*. Epicenter 37°43′ north, 122°33′ west, southwest of San Francisco, B. Magnitude 2.3. Light shock felt at Daly City and in the Sunset District of San Francisco.

June 27: 22:41:32*. Epicenter 40°19′ north, 121°02′ west, near Westwood, B. Magnitude 3.8. Lake Almanor and Quincy areas (PG&E). IV. Felt by several and awakened few in community. Rapid motion.

June 28: 04:40:44*. Epicenter 36°55′ north, 121°45′ west, east of Santa Cruz, B. Magnitude 3.5. Felt over an area of approximately 700 square miles of the coastal region east and northeast of Monterey Bay. Maximum intensity (damage) V at Gilroy and Watsonville, where the shock was felt by all and awakened many in the community; trees, bushes shaken slightly at Gilroy; windows rattled at Watsonville. Felt with intensity (damage) IV at Aptos and 3.7 miles north of, Boulder Creek, Morgan Hill, San Juan Bautista, San Martin, and Soquel. Also felt at Moss Landing Power Plant and San Francisco.

June 28: 12:00:48*. Epicenter 34°08′ north, 117°26′ west, northwest of San Bernardino, P. Magnitude 4.1. IV. Felt by all at the Southern California Edison Substation at Colton, where windows rattled and hanging objects swung. Rapid, east-west, 15-second motion. Rapid, northwest motion felt by many in community at Etiwanda; hanging objects swung. Also reported felt at Fontana, Los Angeles, Pomona, Rialto, Riverside, and San Bernardino.

June 29: 03:33:50*. Epicenter 34°08′ north 117°26′ west, northwest of San Bernardino, P. Magnitude 2.2. Aftershock of June 28 at 12:00:48*. Etiwanda. III. Felt by several.

June 30: 19:25:48*. Epicenter 35°15′ north, 118°35′ west, near Caliente, P. Magnitude 2.5. Keene. IV. Felt by all in sanatorium, where windows, doors, and dishes rattled very slightly. Slow, 2-second motion.

July 1: 01:31:07*. Epicenter 33°11′ north, 115°42′ west, Laguna Salada, Baja California, P. Magnitude 3.8. Descanso. IV. People awakened by sharp jolt.

July 3: 04:21.7*. Epicenter 31.7° north, 115.9° west, Baja California, P. Magnitude 3.9. San Diego area. IV. "Sharp earthquake rattled dishes in the San Diego area."—(*BSSA, October 1960.*)

July 7: 19:35:44*. Epicenter 33°43′ north, 117°52′ west, near Santa Ana, P. Magnitude 3.3. IV. Press reported the shock was widely felt in Orange County. At Balboa, felt by several (some outdoors; quiet). Windows rattled; rapid, 1-second motion. Felt at Garden Grove and Santa Ana (no details).

July 7: (no time given). San Diego area. Press reported a series of shocks were felt and heard in the San Diego area "last night." San Diego newspaper office and police departments throughout the county received calls from persons who said they felt and heard deep rumblings at 5-second intervals. The Navy and Coast Guard reported no offshore bombardments and no aircraft in the air that would cause a sonic boom at the time of the disturbance.

July 10: 21:11:39*. Epicenter 33°48′ north, 118°10′ west, north of Long Beach, P. Magnitude 2.4. Long Beach area. IV. "Slight earthquake rattled dishes and chandeliers."—(*BSSA, October 1960.*)

July 25: 18:21. San Diego area. Light shock felt in the Clairmont, La Jolla, and Rose Canyon areas.

July 31: 18:55:15*. Epicenter 34°18′ north, 119°03′ west, near Santa Paula, P. Magnitude 3.4. Fillmore. III. Felt by several sitting in home. Slow, slight shake followed by two smaller shocks in rapid succession. Also felt at Oxnard, San Fernando Valley, and Ventura.

August 1: 11:39:30*. Epicenter 33°10′ north, 116°28′ west, east of Banner, P. Magnitude 4.2. Reported felt at Descanso.

August 6: 14:11*. Epicenter 37°52′ north, 122°14′ west, B. Magnitude 3.0. Berkeley-Oakland areas. IV. Mild shock felt by scores of persons in the Claremont and Montclair districts.

August 8: 18:26:34*. Epicenter 35°19′ north, 118°30′ west, east of Caliente, P. Magnitude 3.8. Keene. III. Felt by several in home; faint earth noises from southwest-northeast heard. Rapid, 1-second shock.

August 8: 23:39:18*. Epicenter 40°19′ north, 127°04′ west, off coast of northern California, B. Magnitude 6.2. Generally felt over a land area of approximately 6,500 square miles of northwestern California. The shock was reported felt at San Francisco, Aptos (east of Santa Cruz), and at two places in southwestern Oregon. Maximum intensity (damage) V. Felt by and awakened many, frightened few at Comptche. Frame creaked; rapid, 3-second, west-east motion. Felt by and awakened many in community at Cummings, where windows and dishes rattled; walls creaked; trees, bushes shaken slightly; rapid, 10-second, east-west motion. At Ferndale, awakened and frightened many in community; windows rattled; rapid, 1-minute motion; loud earth noises heard. Felt by and awakened many in community at Fort Bragg; house creaked; rapid, 30-second, east-west motion. At Fortuna, awakened many in community; frightened few. Windows, doors, and

dishes rattled; house creaked; rapid, brief motion. Intensity (damage) IV at Caspar, Crannel (Moonstone Beach), Elk, Eureka, Fields Landing, Honeydew, Hoopa, Hyampom, Korbel, Lakeport, Mendocino, Orick, Petrolia, Rio Dell, San Francisco, Scotia, Upper Lake, and Willits. Also felt at Albion, Aptos (3.7 miles north of), Blocksburg, Garberville, Guerneville, Holmes, Orleans, Redwood Valley, and Trinidad. In Oregon, the shock was felt at Azelea and Glendale.

August 11: 20:11:59*. Epicenter 33°27′ north, 116°25′ west, east of Banner, P. Magnitude 3.6. San Diego area. III. Sharp, brief vibration like that caused by the passing of a truck.

August 20: 15:27:42*. Epicenter 33°41′ north, 118°22′ west, off Point Fermin, P. Magnitude 3.8. V. At Compton, observer reported ceiling light fixture fell. In the Long Beach area, felt by nearly all. Numerous calls to the newspaper office from alarmed residents. Several windows cracked in the northern sections of Long Beach; roof cracked in the Los Altos District. Some stock fell from shelves in store. Shock described as two consecutive, abrupt jolts, with north-south motion. At Lakewood (about 5 miles northeasterly from Long Beach), houses shook and windows rattled. About 7 miles south of the Los Angeles Airport, jolting motion felt by many. Resembled a sonic boom in the Civic Center district of Los Angeles. Reported felt (no details) at Bell, Downey, Firestone Park, Huntington Park, Lennox, Norwalk, Redondo Beach, and San Pedro.

August 21: 15:07:03*. Epicenter 34°11′ north, 117°25′ west, northwest of San Bernardino, P. Magnitude 3.8. V. At Fontana, the shock, described as a dish-rattling earthquake, jarred a shelf loose from wall, damaging some merchandise. Rapid, 4-second motion, felt by many in community at Etiwanda. Brief shock jolted Riverside and San Bernardino and other cities in the two counties; people at San Bernardino thought it was a sonic boom. Also reported felt at Cucamonga and Pasadena.

August 31: 23:35:05*. Epicenter 34°07′ north, 117°17′ west, near San Bernardino, P. Pomona. IV. Felt by two in home; awakened one. House creaked; loose objects rattled. Bumping motion, preceded by faint rumbling earth noises. Reported felt (no details) at Colton, Fontana, Highland, Redlands, Riverside, and San Bernardino.

September 1: 14:39:54*. Epicenter 33°48′ north, 116°08′ west, north of Indio, P. Magnitude 3.8. Coachella Valley. IV. Light shock rattled windows.

September 8: 10:41.6*. Epicenter 37.5° north, 118.7° west, northwest of Bishop, P. Magnitude 4.0. Bishop (Control Gorge Power Plant). IV. Abrupt, rapid motion felt by several.

September 10: 17:33:27*. Epicenter 36.7° north, 121.3° west, southeast of Vineyard, B. Magnitude 2.1. Slight shock felt at Harris Ranch (7½ miles south of Hollister).

September 12: 05:08. Aptos (3.7 miles north of). IV. Felt by observer. Cabin creaked; roof bounced; hanging objects swung north. Rapid, 2-second, north-south motion.

September 15: 01:36*. Epicenter 38°22′ north, 122°05′ west, B. Magnitude 2.9. Light shock felt in the Allendale-Winters area.

September 18: 09:42*. Epicenter 36°58′ north, 121°33′ west, southeast of Gilroy, B. Magnitude 3.1. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several. House creaked; trees, bushes shaken slightly. Northwest-southeast motion, lasting a few seconds.

October 2: 12:43:24*. Epicenter 36°49′ north, 121°23′ west, southeast of Hollister, B. Magnitude 2.7. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several. Windows and doors rattled; house creaked. Brief, rapid motion, preceded about 1 second by faint earth noises from northeast.

October 4: 01:22:16*. Epicenter 34°12′ north, 117°18′ west, north of San Bernardino, P. Magnitude 2.7. Felt at Upland.

October 13: (no time given). Long Beach. "Light earthquake shook some sections of Long Beach."—(*BSSA, January 1961.*)

October 16: 16:47. Epicenter in Baja California, P. Magnitude 4.2. San Diego. II. Rapid motion felt by several sitting in home.

October 22: 19:43:07*. Epicenter 36°48′ north, 121°24′ west, south of Hollister, B. Magnitude 3.8. Mild shock felt over an area of approximately 800 square miles of the Monterey Bay–Hollister area. IV. Felt by observer at Aptos; door swung and rattled. Rapid, light, north–south shaking for 5 seconds, then east–west shaking for 5 seconds. At Hollister, felt by all in home and frightened one at two places. Doors rattled; house creaked; hanging objects swung. Rapid, twisting, 3-second, west-east motion. Felt by several (some outdoors) at Marina. Rapid, 5-second motion. At San Juan Bautista, felt by many in community; windows rattled; motion slow. Felt by several at Tres Pinos; frame creaked. One rapid jolt felt at the Harris Ranch, 7½ miles south of Hollister. Also felt at Carmel and Paicines.

November 2: 22:50:24*. Epicenter 36°32′ north 121°08′ west, southeast of Hollister B.

Magnitude 4.1. Felt over an area of approximately 4,000 square miles of the coastal region of west-central California, principally in Monterey and San Benito counties. V. Felt by all and awakened few at Greenfield, where windows rattled; rapid, 15-second, northeast motion. At San Benito, frightened all; very slight plaster cracking; small objects and furnishings shifted. Rapid, north-south motion, preceded by loud earth noises from north-south. Intensity (damage) IV at Aptos (3.7 miles north of), Ben Lomond, Big Sur, Biola, Castroville, Coalinga, Gonzales, Hollister and 7½ miles south of, King City, Jolon, Lost Hills, Marina, Morgan Hill, Mount Hermon, Pacific Grove, Salinas, San Juan Bautista, and Seaside. Also felt at Aromas, Mountain View, Stevinson, and Tres Pinos.

November 13: 05:11:32*. Epicenter 37°50′ north, 122°13′ west, east Oakland. B. Magnitude 2.4. Felt in the Montclair District of Oakland.

November 18: 03:03:14*. Epicenter 39°36′ north, 120°28′ west, near Sierraville, B. Magnitude 4.4. Felt over an area of approximately 3,500 square miles of Plumas, Sierra, Nevada, and Placer Counties, northeastern California. Maximum intensity (damage) V. Slight plaster cracking reported from Camptonville and Genesee. "It was reported this shock may have triggered a landslide which blocked a railroad track and a portion of U.S. Highway 40–A."—(*BSSA, April 1961.*)

INTENSITY (DAMAGE) V:

Baxter.—Awakened many and frightened few in community. One jolt; rumble heard. "No noticeable widening of cracks in Crystal Springs slide area after shock."

Blue Canon.—Awakened and frightened many in community. Dishes rattled. Two shocks; motion slow; faint earth noises heard.

Camptonville.—Awakened many. Small objects shifted. Plaster cracked slightly.

Cromberg.—Felt by, awakened, and frightened few in community. Small objects shifted; knickknacks fell.

Genesee.—Felt by and awakened all in home. Plaster cracked slightly in one room.

Gold Run.—Felt by and awakened many in community; frightened few. Furnishings shifted.

Loyalton.—Felt by, awakened, and frightened many. Hard, sharp, brief jolt.

North San Juan.—Awakened few in community. Small objests shifted.

Portola.—Felt by many in community; awakened and frightened all in home. House creaked.

Sattley.—Felt by and awakened most in community. Windows rattled; house creaked.

Sierraville.—Felt by and awakened all in home.

Spring Garden.—Awakened many in community. Windows rattled.

Washington.—Frightened many in community. Windows rattled.

INTENSITY (DAMAGE) IV: Caribou, Chilcoot, Drum Powerhouse (PG&E) near Alta, Emigrant Gap and Lake Spaulding, Feather Falls, Greenville, Janesville, Keddie, Meadow Valley, Norden, Quincy and Bucks Lake area, Sloat (Camp Layman, 5 miles east of), Taylorsville, Twain, and Vinton.

November 18: (between 20:30 and 21:00). Small tremor felt by one at Mineral.

November 20: 15:50:01*. Epicenter 36°49′ north, 121°27′ west, southeast of Hollister, B. Magnitude 3.5. Light shock, accompanied by loud rumble, felt at Hollister.

November 22: 16:15:24*. Epicenter 32°43′ north, 118°15′ west, off San Clemente Island (possibly artificial), P. Magnitude 3.0. Felt at San Diego.

November 30: 21:39:55*. Epicenter 37°30′ north, 118°35′ west, northwest of Bishop, P. Magnitude 3.6. Long Valley Dam (about 20 miles northwest of Bishop). IV. Slow, 3-second motion felt by all in home; fairly loud rumble heard.

December 1: 11:52:45*. Epicenter 32°54′ north, 115°29′ west, northeast of El Centro, P. Magnitude 3.5. Brawley and Westmorland. IV. Windows rattled; rumble followed by sharp jolt.

December 8: 04:46:52*. Epicenter 39.0° north, 123.2° west, west of Lakeport, B. Magnitude 3.1. Clearlake Highlands (on southeast shore of Clear Lake, Lake County). IV. Beams in newly built living room were sprung, necessitating repairs. Observer's house strongly shaken. "Neighbors' lights came on and there was the usual shouting back and forth."

December 12: 10:41:24*. Epicenter 40°33′ north, 124°05′ west, east of Ferndale, B. Eureka. IV. Felt by many; few alarmed. Buildings creaked; loose objects rattled. Rapid, bumping motion; two settling movements, lasting an instant; direction south-north.

December 14: 21:40:26*. Epicenter 38°02′ north, 121°50′ west, northeast of Berkeley, B. Magnitude 3.9 Felt over an area of approximately 2,500 square miles of the San Francisco Bay region, principally in southern Solano and northern Contra Costa countries. Maximum intensity (damage) V. At Clayton, felt by all in community; awakened and frightened few in home; house creaked slightly; rapid, 1-minute motion, seemed a downward jolt, then trembling. Awakened and frightened all in home at Cowell; booming earth noises heard before shock. At

Daly City and Colma, felt by many and frightened few in community; small objects shifted; trees, bushes shaken slightly. Felt by many or all in community at Rio Vista; windows rattled; walls creaked. Small objects overturned and furnishings shifted at Vallejo; rapid, 4-second shock. Felt with intensity (damage) IV at Antioch, Brentwood, Brisbane, Canyon, Courtland, Fairfield, Oakland, Pittsburg, Port Chicago, Port Costa, San Francisco, Suisun City, and Walnut Creek. Intensity (damage) I to III at Banta, Clarksburg, Concord, Elmira, Knightsen, Lodi, Los Altos, Menlo Park, Pinole, Sonoma, South San Francisco, Stinson Beach, and Stockton.

December 27: 02:35:26*. Epicenter 41°31′ north, 125°03′ west, northwest of Arcata, B. Magnitude 5.4. Felt in scattered coastal communities of Del Norte and Humboldt counties from Crescent City south to Rio Dell, a distance of about 90 miles. Maximum intensity (damage) V. Felt by all, awakened many, and frightened few in community at Ferndale; moderate earth noises heard; motion slow. Felt by and awakened many at Klamath, where windows, doors, and dishes rattled; house creaked; pendulum clock stopped; rapid, 1-minute motion; moderate earth noises heard. At Rio Dell, awakened many in community; windows rattled; walls creaked; rapid, brief, northeast motion. Felt with intensity (damage) IV at Crannel, Crescent City, and Trinidad. Intensity (damage) I to III at Requa.

December 30: 21:26:21*. Epicenter 37°55′ north, 122°03′ west, near Walnut Creek, B. Magnitude 2.6. Felt at Lafayette.

December 30: 23:06. Slow motion of few seconds duration felt at Ukiah.

WASHINGTON AND OREGON

(120TH MERIDIAN OR PACIFIC STANDARD TIME)

January 7: 01:16:04*. Epicenter 46°45′ north, 122°40′ west, southwestern Washington, S. Felt over an area of approximately 3,500 square miles, principally in Lewis, Pierce, and Thurston counties. Also felt at Portland, Oreg. Maximum intensity (damage) V.

INTENSITY (DAMAGE) V:

Alder.—Felt by and awakened many in community; frightened few. Windows rattled. Rapid, 1-minute shock; loud earth noises heard by many.

Eatonville.—Felt by, awakened, and frightened many in community; felt outdoors by some. Windows, doors, and dishes rattled. Rapid, east-west shock; loud earth noises from east-west heard by many.

Elbe.—Awakened many and frightened few in community. Small objects shifted.

La Grande.—Awakened all in home. Windows rattled. Sudden, sharp blastlike noise; observer thought furnace had exploded.

McKenna.—Felt by and awakened many; frightened few. Windows, doors, and dishes rattled; house creaked.

Olympia.—Press reported many were awakened; few frightened. Jail cell bunks shaken.

Rainier.—Awakened all in home. Walls creaked. Rapid, 1-minute motion; loud earth noises heard.

Tenino.—Felt by and awakened many in community. Rapid motion; loud earth noises heard by many.

Tono (7 miles west of epicenter).—Old burned-out coal mine collapsed, causing ground to sink over a considerable area.

Tumwater.—Felt by, awakened, and frightened many. Windows, doors, and dishes rattled. Rapid, 2-minute motion.

Vail (about 5 to 6 miles north of epicenter).—Awakened many. Loud earth noises heard by many.

INTENSITY (DAMAGE) IV: Adna (8 miles west of Chehalis), Alderton, Ashford, Buckley, Bucoda, Centralia, Chehalis, Cinebar, Curtis, Ethel, Grays River, Issaquah, Kapowsin, McMillin, Mineral, Morton, Mossyrock, Napavine, Olympia (4 miles south of), Orting, Pe Ell, Randle, Rochester, Roy, Riffe, and Wilkeson.

INTENSITY (DAMAGE) I TO III: American Lake (V.A. Hospital), Anderson Island, Carbonado, Fort Steilacoom, Glenoma, La Center, Lakebay, Littlerock, Mayfield, and Sumner.

INTENSITY (DAMAGE) I TO III IN OREGON: Portland.

April 10: 22:47:35*. Epicenter 47°34′ north, 122°15′ west, about 5 miles southeast of Seattle city center, S. Felt over an area of approximately 600 square miles of western Washington, principally in western King County. Maximum intensity (damage) VI at Seattle, where slight damage was reported.

INTENSITY (DAMAGE) VI:

Seattle.—Felt by and awakened many in community; frightened few. Concrete basement wall cracked; 15-foot section of wood retaining wall broken; top on cabinet-type oil burner tipped and loosened, bearing dislodged in furnace motor. One report of plaster cracking. Small objects shifted. Woman said she was jolted from bed. Most persons reported their homes shook, dishes rattled, chandeliers swayed, and furniture moved.

INTENSITY (DAMAGE) V: Bremerton, Burien, Houghton, Orillia, Redmond, and Tukwila.

INTENSITY (DAMAGE) IV: Bothell, Des Moines, Eagledale (Port Blakely), Issaquah, Kenmore,

Kirkland, Manchester, Medina, Mercer Island, Milton, Pacific, Port Orchard, Renton, Richmond Beach, Seattle Heights, and Woodinville.

INTENSITY (DAMAGE) I TO III: Auburn, Bellevue, Duvall, Kennydale, Kingston, Longmire, Maple Valley, Monroe, Portage, Preston, Redondo, Seahurst, and Silverdale.

May 10: 19:05*. Epicenter about 7 miles west of Longmire, Wash., S. Nisqually entrance to Mount Rainier National Park (about 6 miles southwest of Longmire). IV. Windows rattled. Felt by several at Longmire; rapid, 5-second motion; faint earth noises from west heard.

June 16: 02:32:45*. Epicenter a very few miles southwest of Longmire, Wash., S. Longmire. IV. Felt by several; awakened all on second floor of home. Loud earth noises heard a few seconds before shock; rapid, 2-second motion.

September 10: 07:06:34*. Epicenter 47°42′ north, 123°09′ west, upper Duckabush River, near boundary between Olympic National Park and Olympic National Forest, S. Felt over an area of approximately 14,000 square miles of northwestern Washington. (See map, p. 29.) Maximum intensity (damage) VI. At Bremerton, concrete basement cracked; plaster cracked at Seattle.

INTENSITY (DAMAGE) VI:

Bremerton.—Felt by many; frightened few. Concrete basement floor and walls cracked in many places. Small objects shifted and overturned; knickknacks fell. Motion east-west, circular, rocking and rolling. Woman became dizzy and nauseated.

Seattle.—Felt by many; awakened and frightened few. Considerable plaster cracking at one place (one crack entirely across living room ceiling); small painted-over plaster cracks slightly reopened at one place; window partly out of frame at another place. East-west door swung north-south; north-south oriented objects, such as beds and doors, shaken strongly; hanging pictures swung north-south.

INTENSITY (DAMAGE) V: Alder, Annapolis, Arlington, Auburn, Bainbridge Island, Baring, Belfair, Blanchard, Burton, Cedar Falls, Chimacum, Clinton, Duvall, Eastsound, East Stanwood, Edison, Everett, Freeland, Gorst, Granite Falls, Grotto, Hansville, Hoodsport (Staircase Ranger Station, about 12 miles northwest of Hoodsport), Houghton, Kenmore, Le Grande, Lowell, Lyman, Medina, Mount Vernon (Big Lake area), North Bend, Orillia, Pinehurst, Port Gamble, Port Ludlow, Port Orchard, Preston, Richmond Beach, Rockport, Snohomish, Snoqualmie and Snoqualmie Falls, Sultan, Sumner, and Tracyton.

INTENSITY (DAMAGE) IV: Alderton, Alderwood Manor, American Lake (V.A. Hospital), Bothell, Brinnon, Buckley, Carbonado, Clallam Bay, Clearview, Clipper, Concrete, Darrington, Dash Point, Edmonds (Five Corners), Elbe, Elwha Ranger Station (Olympic National Park), Fall City, Friday Harbor, Gardiner, Gold Bar, Greenbank, Harper, Hoodsport, Hoquiam, Hyak, Index, Issaquah, Joyce, Keyport, Kingston, Kirkland, La Conner, Lake Crescent, Lake Stevens, Lakewood, Leavenworth, Lester, Lilliwaup, Lopez, Lost Lake (about 10 miles southwest of Shelton), Lynden, McMillin, Malone, Maple Valley, Marblemount, Marysville, Matlock, Mercer Island, Midway, Milton, Monroe, Morton, Mukilteo (vicinity of), Nordland, North Bend (9, 15, and 18 miles east of), Oak Harbor (1 mile west of), Oakville, Olalla, Olympia (3 miles west of, and 4 miles south of), Pacific, Portage, Porter, Potlatch, Poulsbo, Puyallup, Quilcene, Quinault Ranger Station (about 10 miles northeast of Quinault), Raymond, Redmond, Redondo, Ronald, Roslyn, Roy, Seabeck, Seattle Heights, Sekiu, Selleck, Silvana, Skykomish, South Colby, South Prairie, Southworth, Startup, Sumas, Suquamish, Sylvan (Fox Island), Tacoma, Tahuya, Union, Wauna, Wickersham and vicinity, and Woodinville.

INTENSITY (DAMAGE) I TO III: Aberdeen, Anderson Island, Bellingham, Black Diamond, Burien, Burlington, Coupeville, Deming, Des Moines, Dockton, Eglon, Ellensburg, Enumclaw, Everson, Indianola, Kapowsin, Kennydale, Kent, Lakebay, Lakeview, Lynnwood, McCleary, Manchester, Montesano, Neilton, Nooksack, Orting, Oso, Palmer, Port Angeles, Port Townsend, Ravensdale, Retsil, Seahurst, Sequim, Shelton, Solduc Hot Springs area, South Bend, Stanwood, Vashon, Wilkerson, and Zenith.

INTENSITY (DAMAGE) I TO III IN OREGON: Warrenton (near Astoria).

November 8: 03:36:27.2*. Epicenter 45.1° north, 125.2° west, about 50 miles off coast of Oregon, W. Reported felt with moderate intensity at scattered communities along the coastal areas of Washington and Oregon, from Aberdeen and Montesano, Grays Harbor County, Wash., south to Yachats, Lincoln County, Oreg., a distance of approximately 185 miles. In Oregon, it was felt inland to distances of about 35 miles. Maximum intensity (damage) IV.

INTENSITY (DAMAGE) IV IN OREGON: Agate Beach, Alpine, Alsea, Buxton, Nashville, Newport, Rockaway, Tidewater, Toledo, and Yachats.

INTENSITY (DAMAGE) IV IN WASHINGTON: Ilwaco and Long Beach.

INTENSITY (DAMAGE) I TO III IN OREGON: Cannon Beach, Corvallis, Depoe Bay, Hammond, and Umpqua.

INTENSITY (DAMAGE) I TO III IN WASHINGTON: Aberdeen and Montesano.

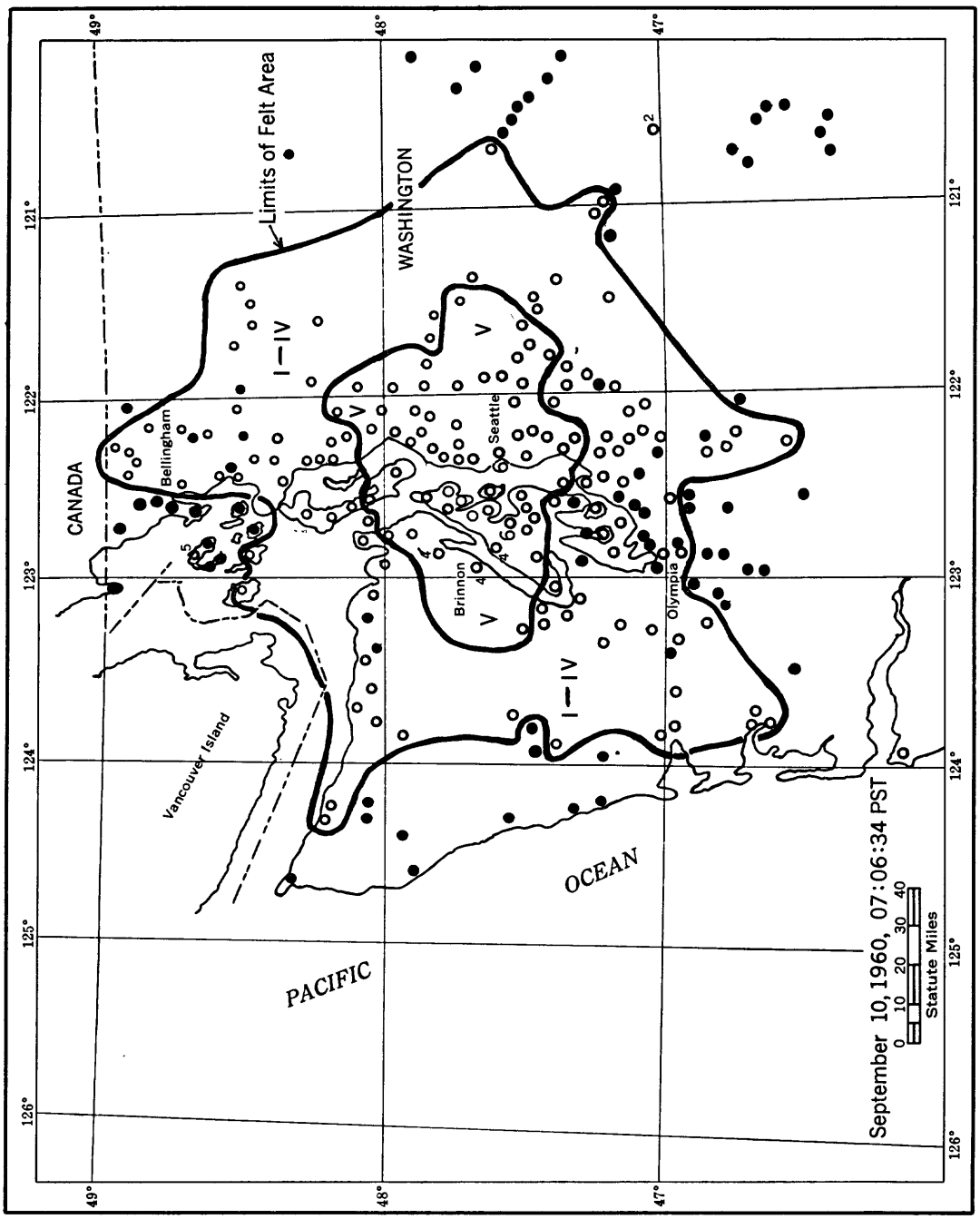


FIGURE 6.—*Area affected by earthquake of September 10.*

ALASKA

(150TH MERIDIAN OR ALASKA STANDARD TIME)

January 2: 09:28:19*. Homer (5 miles northwest of). Slight shock.

January 3: 01:38:30*. Epicenter 61° north, 152° west, south-central Alaska, W. Anchorage. V. Felt by and awakened nearly all. Slight shock felt 5 miles northwest of Homer.

January 13: 11:23:37*. Homer (5 miles northwest of). Slight shock.

January 15: 17:41:47*. Homer (5 miles northwest of). Slight shock.

January 16: 10:49:31*. Epicenter 63° north, 151° west, central Alaska, W. Depth about 150 km. Light shock felt by few at College.

January 16: 22:52. McKinley. Slight shock.

January 19: 10:44:28*. Slight shocks felt at Bear Cove, Eklutna, and 5 miles northwest of Homer.

January 26: 21:52. Matanuska Experiment Station. III. Felt by several. Abrupt onset; short, sharp motion.

February 6: 17:27:09*. Felt on Adak. Slight shock.

February 15: 21:36. Felt on Adak. Slight shock.

February 18: 14:38:12*. Felt by few at College. II. Light tremor.

February 18: 19:09:23*. Epicenter 60½° north, 151° west, Kenai Peninsula, W. Maximum intensity (damage) VI in the Anchorage area.

INTENSITY (DAMAGE) VI:

Anchorage.—Felt by all; frightened many. Damage slight to small articles. Knickknacks fell; small objects shifted. Buildings shook; windows, doors, and dishes rattled; walls creaked. Trees, bushes, shaken moderately. Hanging objects swung north–south.

Anchorage (4 miles southwest of).—Felt by nearly all at the International Airport. Buildings creaked; loose objects rattled. Disturbed objects observed by all. Walls swayed visibly; some lamps fell; water in bowls and vases agitated.

INTENSITY (DAMAGE) V:

Hope.—Felt by all; frightened few; and awakened one. Small objects shifted. Windows, doors, and dishes rattled; walls creaked; hanging objects swung north-south. Moderate to loud earth noises heard by few before shock.

Palmer.—Felt by all. Dishes and windows rattled. Faint earth noises heard from the east.

Seward.—Felt by all. Walls creaked.

Whittier.—Felt by all. Walls and frame creaked. Rapid, undulating motion.

INTENSITY (DAMAGE) I TO IV: Kenai, LaTouche, Moose Pass, Valdez, and Wasilla.

February 18: 21:11. Girdwood. Slight shock.

February 26: 13:29:25*. Epicenter 51½° north, 178° west, Andreanof Islands, Aleutian Islands, W. Magnitude 6–6¼. Felt on Adak.

February 26: 14:07:10*. Epicenter 51½° north, 178° west, Andreanof Islands, Aleutian Islands, W. Felt on Adak.

February 26: 22:10:03*. Epicenter 51½° north, 178° west, Andreanof Islands, Aleutian Islands, W. Felt on Adak.

March 1: 05:51:56*. Felt on Adak. Slight shock.

March 2: 14:29. Felt in McKinley Park. Slight shock.

March 2: 18:59:20*. Epicenter 64½° north, 150° west, central Alaska, W. Felt over an area of approximately 8,000 square miles. Maximum intensity (damage) V.

INTENSITY (DAMAGE) V:

College.—Felt by all. Windows rattled.

Fairbanks.—Felt by all. Buildings creaked; loose objects rattled. Abrupt onset; trembling motion.

McKinley Park.—Felt by many; frightened few. Hanging objects swung east-west. Trees, bushes shaken slightly.

Nenana.—Felt by many; frightened few. Windows rattled: walls creaked. Loud earth noises heard from north before earthquake.

6½ mile Richardson Highway.—Felt by all; frightened one. Windows rattled; walls creaked. Loud earth noises heard from east 10 seconds before earthquake. Rapid motion from east lasting 15 seconds.

11½ mile Richardson Highway.—Felt by all in home (North Pole Rural Post Office). Windows, doors, dishes rattled; hanging objects swung; small objects shifted. Slow motion; duration 30 seconds.

13 mile Richardson Highway.—Felt by all in trailer. Windows rattled. Motion rapid; duration 10 seconds.

17 mile Richardson Highway.—Felt by all. Windows, doors, and dishes rattled; small objects shifted; walls creaked; hanging objects swung. Trees, bushes shaken moderately. Moderately loud noises heard by many 1 second before earthquake. Motion medium; duration ¼ minute.

33 mile Richardson Highway.—Felt by all in home. Doors rattled; floor moved; hanging objects swung. "Marbles rolled; jumping horse jumped vigorously." Motion rapid.

37 mile Richardson Highway.—Felt by all. Knickknacks fell. Faint earth noises heard before earthquake. Motion slow; duration 1 minute.

68 mile Richardson Highway.—Felt by all. Windows and dishes rattled. Motion rapid; duration 3 seconds.

INTENSITY (DAMAGE) IV: Cantwell, Chatanika, Clear, Manley Hot Springs, Shaw Creek (2½ miles from Richardson Highway); and Richardson Highway 21, 39 and 41 mile posts.

INTENSITY (DAMAGE) I TO III: Richardson Highway 12½, 34, 46, 54, and 56 mile posts.

March 4: 20:50. Richardson Highway. At 56 mile post, cabin shook. Rumbling noise from the west; duration about 2 seconds. Frame in cabin creaked at the 54 mile post.

March 9: 14:24:20*. Epicenter 64° north, 149° west, central Alaska, W. Maximum intensity (damage) V. Felt by several at Healy Fork. Trees, bushes shaken slightly. Earth noises from south heard by few. Motion slow; duration a few seconds. Felt by all at Mount McKinley National Park. Windows rattled; faint earth noises heard before shock. Rapid motion; duration 10–15 seconds. At 17 mile Richardson Highway felt by several. Trees, bushes shaken slightly. Windows, doors, and dishes rattled; walls creaked; hanging objects swung. Motion slow; duration 10 seconds. Felt with intensity (damage) IV at Cantwell, Circle Springs, College, Eielson Air Force Base, Fairbanks, Manley Hot Springs, Shaw Creek (2½ miles from Richardson Highway), Harding Lake, and on Richardson Highway 37, 54, and 56 mile posts.

March 29: 20:58:36*. Epicenter 51° north, 178° west, Andreanof Islands, Aleutian Islands, W. Felt on Adak.

May 13: 06:07:14*. Epicenter 55° north, 161½° west, Alaska Peninsula, W. Magnitude 6¼. Cold Bay. IV. Felt by many. Buildings creaked; loose objects rattled. Pictures swayed; ink wells and other small objects displaced (moved toward the west). Trembling motion; abrupt onset.

May 16: 04:46:53*. Epicenter Andreanof Islands, Aleutian Islands, W. Felt on Adak.

May 22: 18:50. Girdwood. Slight shock; duration 1 second.

June 17: 06:35:32*. Epicenter 52½° north, 173½° west, Andreanof Islands, Aleutian Islands, W. Magnitude 6–6¼. Felt on Adak.

June 30: 09:58:33*. Epicenter 60° north, 151° west, Kenai Peninsula, W. Felt at Anchorage, Homer (5 miles northwest of), Kasilof, Seward, and Sterling.

July 2: 22:59:23*. Felt on Adak. Slight tremor.

July 3: 10:20:46*. Epicenter 50½° north, 177° west, Andreanof Islands, Aleutian Islands, W. Magnitude 6¾–7. Felt on Adak.

July 9: 16:47:37*. Felt on Adak. Slight tremor.

July 16: 07:57:42*. Felt on Adak. Slight tremor.

July 16: 11:19:37* and 12:02:53*. Epicenter 65½° north, 167½° west, Seward Peninsula, W. Teller. V. Felt by many; frightened few; startled all. Cans fell from shelves; walls creaked; hanging objects swung; objects shifted.

July 17: 14:18. Felt on Adak. Slight tremor.

August 1: 20:14:48.3. Epicenter 51.7° north, 178.4° west, Andreanof Islands, Aleutian Islands, W. Depth about 24 km. Felt on Adak.

August 3: 21:34:48.5. Epicenter 51.2° north, 179.0° east, Rat Islands, Aleutian Islands, W. Depth about 20 km. Magnitude 6–6¼. Felt on Adak.

August 10: 03:41. Felt on Adak. Slight tremor.

September 4: 06:44. Felt on Adak. Slight tremor.

September 11: 16:44:39.7. Epicenter 60.5° north, 153.8° west, southern Alaska, W. Depth about 195 km. Anchorage. Sharp, jolting motion; duration about 20 seconds. Also felt at Homer.

September 19: 16:22 and 21:22. Felt on Adak. Slight tremors.

October 14: 03:12:07.9. Epicenter 60.0° north, 136.4° west, southeastern Alaska, W. Depth about 32 km. Maximum intensity (damage) V. The shock was felt throughout the northern Panhandle of Alaska. At Juneau, felt by and awakened many. Buildings creaked; loose objects rattled; some lights swayed; water in containers disturbed. Felt by several; awakened and frightened few at Yakutat. Windows, doors rattled; frame creaked; hanging objects swung. Moderate earth noises heard by few before shock. Felt by, awakened many, and frightened few at Whitehorse, Yukon, Canada. Doors swung back and forth and creaked on their hinges. Beds creaked against wall and lamps rocked on tables. Rocking motion.

October 23: 01:42. Felt on Adak. Slight tremor.

October 30: 08:04. Felt on Adak. Slight tremor.

November 9: 23:08. Felt at Shemya.

November 16: 21:56:14*. Felt on Adak. Slight tremor.

November 17: 05:41:24*. Felt on Adak. Slight tremor.

November 18: 05:20:10*. Felt on Adak. Slight tremor.

November 23: 12:32. Felt on Adak. Slight tremor.

November 24: 16:43:37*. Anchorage and vicinity. East-West motion felt by many.

December 1: 20:40. Felt on Adak. Slight tremor.

December 2: 21:07:42.6. Epicenter 52.7° north, 177.4° west, Andreanof Islands, Aleutian Islands, W. Depth about 160 km. Felt on Adak. Slight tremor.

December 6: 21:42:37.9. Epicenter 62.7° north, 151.5° west, south-central Alaska, W. Depth about 64 km. Slight tremor at Summit; duration 14 seconds.

December 9: 07.22. Felt on Adak. Slight tremor.

December 21: 01:44. Felt on Adak. Slight tremor.

December 21: 04:39:48.0. Epicenter 61.5° north, 152.9° west, south-central Alaska, W. Depth about 125 km. Magnitude 5¾. Felt at Cooper Lake Project and Summit.

December 21: 06:40. Felt at Anchorage. Motion, north-south; duration 35 seconds.

December 21: 21:43. Felt at Talkeetna. Slight tremor.

HAWAIIAN ISLANDS

(150TH MERIDIAN OR HAWAIIAN STANDARD TIME)

NOTE.—Data on the following local disturbances were determined from seismograph stations on the islands of Hawaii and Maui by the Hawaiian Volcano Observatory of the U.S. Geological Survey. For additional information, see the *Hawaiian Volcano Observatory Summary* 17 through 20.

January 9: 05:26:42*. Epicenter 20°27′ north, 155°24′ west, 8 km. northwest of Honokaa at a depth of 12.5 km. Felt near Waipio Valley on Hamakua coast of Hawaii. Magnitude 2.9.

January 13: During the 14 hours preceding the outbreak of a flank eruption on the east rift zone of Kilauea at 1900 hours about 1,000 earthquakes were felt in the vicinity of the village of Kapoho. Contemporaneous with this seismic activity the Kapoho graben subsided about 4 feet. These earthquakes were of magnitude 2.0 or less, and were felt at a maximum rate of two per minute during the early part of the 14-hour period. Because of their small size and great number no attempt was made to itemize them.

January 18: 18:26:46*. Epicenter 19°24′ north, 155°45′ west, 15 km. east-northeast of Hookena at a depth of 3 km. Felt in the Kilauea caldera area, Pohakuloa and Kona. Magnitude 4.5.

January 26–March 11: Kilauea Volcano. Accompanying the summit subsidence of Kilauea Volcano, many earthquakes (about 330) with magnitudes 0.5 to 4.4, were felt in the vicinity of Kilauea caldera. Two of these shocks were felt island-wide: January 29, 09:10, magnitude 4.4; and February 7, 06:09, magnitude 3.6. On February 12, 16:34, another earthquake of this series was responsible for fault motion across Hilina Pali road and the destruction of about 50 feet of that road.

March 4: 06:04:26*. Epicenter 19°26′ north, 155°57′ west, 5 km. east of Honaunau at a depth of 8 km. Felt in north and south Kona. Magnitude 3.0.

March 7: 03:24:18*. Epicenter 19°26′ north, 155°13′ west, 8 km. northeast of Halemaumau at a depth of 5 km. Felt in the Kilauea caldera area. Dishes broken in four homes; small objects overturned. Magnitude 3.3.

March 19: 22:28:13*. Epicenter 19°18′ north, 155°57′ west, 12 km. south-southwest of Hookena at a depth of 3 km. Felt at Captain Cook, Kona. Magnitude 3.2.

March 23: 17:48:26*. Epicenter 19°25′ north, 155°15′ west, 5 km. beneath Kilauea Iki crater. Felt on the east rim of Kilauea caldera. Magnitude 3.8.

March 23: 17:53:00*. Epicenter 19°25′ north, 155°15′ west, 5 km. beneath Kilauea Iki crater. Felt on the east rim of Kilauea caldera. Magnitude 3.5.

March 24: 13:16:22*. Epicenter 19°24′ north, 155°22′ west, 10 km. east-southeast of Halemaumau at a depth of 8 km. Felt on the northwest rim of Kilauea caldera. Magnitude 3.2.

April 3: 15:41:04*. Epicenter 19°21′ north, 155°15′ west, 7 km. southeast of Kalemaumau at a depth of 3 km. Felt on the north and northwest rim of Kilauea caldera. Magnitude 2.8.

April 4: 04:34:12*. Epicenter 19°21′ north, 155°16′ west, 7 km. south-southeast of Halemaumau at a shallow depth. Felt on the north and northwest rim of Kilauea caldera. Magnitude 3.3.

April 5: 03:18:54*. Epicenter 19°25′ north, 155°17′ west, 8 km. beneath Halemaumau. Felt on the east rim of Kilauea caldera. Magnitude 3.2.

April 22: 07:20:27*. Epicenter 19°25′ north, 155°17′ west, 60 km. beneath Halemaumau. Felt on the east rim of Kilauea caldera. Magnitude 2.6.

April 26: 07:04:24*. Epicenter 19°25′ north, 155°16′ west, southeast sector of Kilauea caldera at a depth of 8 km. Felt on the east rim of Kilauea caldera. Magnitude 2.3.

April 29: 06:13:09*. Epicenter 19°25′ north, 155°26′ west, 17 km. west-northwest of Halemaumau at a depth of 8 km. Felt from Hilo to Kona. Magnitude 3.9.

May 5: 09:46:34*. Epicenter 19°25′ north, 155°17′ west, shallow depth below Halemaumau. Felt on the north rim of Kilauea caldera. Magnitude 2.6.

May 8: 06:28:39*. Epicenter 19°21′ north, 155°19′ west, 8 km. southwest of Halemaumau at a depth of 25 km. Felt throughout the Island. Magnitude 4.0.

May 11: 23:08:46*. Epicenter 19°24′ north, 155°18′ west, 2 km. southwest of Halemaumau at a shallow depth. Felt on the north rim of Kilauea caldera. Magnitude 2.6.

May 12: 11:18:10*. Epicenter 19°23′ north, 155°20′ west, 7 km. southwest of Halemaumau at a depth of 15 km. Felt throughout the Island. Magnitude 3.9.

May 25: 10:45:33*. Epicenter eastern section of Kilauea caldera at a shallow depth. Felt on the northwest rim of Kilauea caldera. Magnitude 1.6.

May 27: 05:49:08*. Epicenter 19°25′ north, 155°17′ west, northeast rim of Halemaumau at a depth of 12.5 km. Felt from Kilauea caldera area to Hilo. Magnitude 3.9.

May 27: 05:58:10*. Epicenter 19°25′ north, 155°17′ west, northeast rim of Halemaumau at a depth of 12.5 km. Felt from Kilauea caldera area to Hilo. Magnitude 3.4.

May 31: 14:12:43*. Epicenter 19°24′ north, 155°19′ west, 4 km. southwest of Halemaumau at a depth of 15 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.8.

June 2: 20:47:23*. Epicenter 19°26′ north, 155°27′ west, 20 km. east of Halemaumau at a depth of 5 km. Felt from Kilauea caldera area to Kona. Magnitude 3.5.

June 5: 23:40:31*. Epicenter 19°21′ north, 155°16′ west, 8 km. south-southeast of Halemaumau at a depth of 8 km. Felt on the east rim of Kilauea caldera. Magnitude 2.6.

June 7: 12:19:24*. Epicenter 19°10′ north, 155°34′ west, 10 km. north of Naalehu at a depth of 5 km. Felt at Pahala and north and east rims of Kilauea caldera. Magnitude 4.1.

June 13: 17:53:59*. Epicenter 19°08′ north, 155°27′ west, 8 km. south-southwest of Pahala at a depth of 25 km. Felt at Kealakekua. Magnitude 3.6.

June 14: 23:15:34*. Epicenter 19°25′ north, 155°17′ west, 8 km. below Halemaumau. Felt in the Kilauea caldera region. Magnitude 3.3.

June 14: 23:53:36*. Epicenter 19°25′ north, 155°17′ west, 8 km. below Halemaumau. Felt in the Kilauea caldera region. Magnitude 2.8.

June 15: 07:11:40*. Epicenter 19°27′ north, 155°17′ west, 6 km. north-northwest of Halemaumau at a shallow depth. Felt in the Kilauea caldera region. Magnitude 3.0.

June 18: 01:56:07*. Epicenter 19°18′ north, 155°25′ west, 18 km. southwest of Halemaumau at a depth of 8 km. Felt in the Kilauea caldera region. Magnitude 3.9.

June 18: 09:50:08*. Epicenter 19°19′ north, 155°13′ west, 14 km. southeast of Halemaumau at a depth of 3 km. Felt on the east rim of Kilauea caldera. Magnitude 3.4.

June 20: 12:58:24*. Epicenter 19°24′ north, 155°21′ west, 6 km. west-southwest of Halemaumau at a depth of 12.5 km. Felt throughout the Island. Magnitude 4.1.

June 20: 13:14:48*. Epicenter 19°22′ north, 155°22′ west, 8 km. southwest of Halemaumau at a depth of 12.5 km. Felt from Kilauea caldera area to Kona. Magnitude 3.9.

June 20: 18:58:58*. Epicenter 19°24′ north, 155°19′ west, 4 km. southwest of Halemaumau at a depth of 12.5 km. Felt on the east rim of Kilauea caldera. Magnitude 3.1.

June 21: 01:00:18*. Epicenter 19°24′ north, 155°21′ west, 6 km. west-southwest of Halemaumau at a depth of 15 km. Felt on the north rim of Kilauea caldera. Magnitude 3.2.

June 21: 10:56:49*. Epicenter 19°23′ north, 155°16′ west, 4 km. south-southeast of Halemaumau at a shallow depth. Felt in the Kilauea caldea area. Magnitude 3.5.

June 26: 14:33:09*. Epicenter 19°25′ north, 155°15′ west, 8 km. beneath the northwest rim of Kilauea Iki. Felt in the Kilauea caldera area. Magnitude 3.1.

July 7: 09:40:28*. Epicenter 19°27′ north, 155°15′ west, 3 km. north of Volcano House at a depth of 52 km. Felt on the east rim of Kilauea caldera. Magnitude 3.1.

July 7: 14:33:35*. Epicenter 19°27′ north, 155°15′ west, 3 km. north of Volcano House at a depth of 52 km. Felt on the east rim of Kilauea caldera. Magnitude 2.9.

July 19: 18:38:43*. Epicenter 19°27′ north, 155°16′ west, north rim of Kilauea, near Keauhou Ranch at a shallow depth. Felt along the north and east rims of Kilauea caldera. Magnitude 1.8.

July 19: 18:40:17*. Epicenter 19°27′ north, 155°16′ west, north rim of Kilauea near Keauhou Ranch at a shallow depth. Felt along the north and east rim of Kilauea caldera. Magnitude 1.6.

July 23: 13:20:24*. Epicenter 19°26′ north, 155°16′ west, north rim of Kilauea caldera at a depth of 5 km. Felt on the northeast rim of Kilauea caldera. Magnitude 2.7.

August 7: 17:33:22*. Epicenter 19°26′ north, 155°18′ west, north rim of Kilauea caldera at a depth of 10 km. Felt on the north and east rims of Kilauea caldera. Magnitude 3.0.

August 10: 23:16:55*. Epicenter 19°54′ north, 155°36′ west, 7 km. northeast of Waikii at a depth of 10 km. Felt near Waipio valley on Hamakua coast of Hawaii. Magnitude 3.9.

August 11: 01:47:18*. Epicenter 19°52′ north, 155°36′ west, 5 km. east of Waikii at a

depth of 10 km. Felt at Honokaa. Magnitude 3.8.

August 11: 10:03:14*. Epicenter 19°25′ north, 155°18′ west, 5 km. beneath Halemaumau. Felt on the northwest rim of Kilauea caldera. Magnitude 1.9.

August 14: 04:20:24*. Epicenter 19°33′ north, 155°41′ west, northwest flank of Mauna Loa 25 km. east of Captain Cook at a depth of 5 km. Felt at Captain Cook, Kona. Magnitude 2.5.

September 14: 04:19:39*. Epicenter 19°13′ north, 155°52′ west, 30 km. south of Captain Cook at a depth of 15 km. Felt at Captain Cook, Kona. Magnitude 3.6.

September 17: 12:33:25*. Epicenter 19°25′ north, 155°17′ west, Halemaumau at a depth of 5 km. Felt on the north rim of Kilauea caldera. Magnitude 1.8.

September 18: 22:53:34*. Epicenter 19°24′ north, 155°18′ west, southeast Kilauea caldera, very shallow depth. Felt on the north rim of Kilauea caldera. Magnitude 1.7.

September 19: 15:27:22*. Epicenter 19°25′ north, 155°20′ west, 5 km. west of Halemaumau at a depth of 10 km. Felt on the east rim of Kilauea caldera. Magnitude 1.8.

September 20: 07:29:43*. Epicenter 19°58′ north, 155°34′ west, northwest flank of Mauna Kea, 17 km. south of Kukuihaele, at a depth of 12.5 km. Widely felt; north rim of Kilauea, Kealakekua and Kukuihaele. Magnitude 3.7.

September 21: 20:08:41*. Epicenter 19°45′ north, 156°15′ west, 20 km. west of Keahole Point at a depth of about 15 km. Widely felt in north Kona; reports from Kealakekua, Honokahau and Kainaliu. Magnitude 3.3.

September 29: 08:23:20*. Epicenter 19°24′ north, 155°18′ west, Halemaumau at a depth of 27 km. Felt on the east rim of Kilauea caldera. Magnitude 2.7.

October 8: 17:27:15*. Epicenter 19°27′ north, 155°24′ west, about 20 km. east of Mokuaweoweo at a depth of 8 km. Felt at Hilo. Pahoa, and on the east rim of Kilauea caldera. Magnitude 3.7.

October 17: 13:43:26*. Epicenter 19°25′ north, 155°17′ west, Kilauea caldera at a depth of 5 km. Felt on the east rim of Kilauea caldera. Magnitude 1.5.

October 18: 09:29:53*. Epicenter 19°25′ north, 155°22′ west, about 9 km. west of Halemaumau at a depth of 48 km. Felt on the east rim of Kilauea caldera. Magnitude 2.8.

October 25: 05:18:29*. Epicenter 19°27′ north, 155°16′ west, north rim of Kilauea caldera at a depth of 10 km. Felt on the east rim of Kilauea caldera. Magnitude 2.4.

October 25: 21:31:56*. Epicenter 19°26′ north, 155°17′ west, north rim of Kilauea caldera at a shallow depth. Felt throughout Kilauea summit area. Cracked paths, roads and tennis courts at military rest camp on north rim of Kilauea caldera. Magnitude 3.2.

November 1: 06:32:51*. Epicenter 19°26′ north, 155°17′ west, Halemaumau at a depth of about 5 km. Felt on the north and east rims of Kilauea caldera. Magnitude 2.7.

November 5: 10:35:36*. Epicenter 19°21′ north, 155°05′ west, at Puu Mana on the southeast Kilauea Pali system, 40 km. south of Hilo, at shallow depth. Felt at Hilo. Magnitude 3.0.

November 7: 09:36:29*. Epicenter 19°25′ north, 155°18′ west, east rim of Kilauea caldera at a depth of 7 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.0.

November 7: 12:27:06*. Epicenter 19°25′ north, 155°18′ west, east rim of Kilauea caldera at a depth of 7 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.3.

November 7: 20:21:32*. Epicenter 19°25′ north, 155°18′ west, east rim of Kilauea caldera at a depth of 7 km. Felt on the north rim of Kilauea caldera. Magnitude 2.7.

November 10: 14:58:50*. Epicenter 19°25′ north, 155°18′ west, east rim of Kilauea caldera, at a depth of 7 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.1.

November 10: 15:45:11*. Epicenter 19°25′ north, 155°18′ west, east rim of Kilauea caldera at a depth of 7 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.4.

November 15: 11:55:18*. Epicenter 19°24′ north, 155°18′ west, Kilauea southwest rift at a depth of 5 km. Felt on the northwest rim of Kilauea caldera. Magnitude 2.1.

November 30: 13:30:58*. Epicenter 19°23′ north, 155°19′ west, Kilauea southwest rift at a depth of 30 km. Felt in the Kilauea summit area. Magnitude 3.5.

November 30: 19:47:42*. Epicenter 19°23′ north, 155°18′ west, Cone Peak region at a depth of 30 km. Felt in the Kilauea summit area. Magnitude 3.3.

December 5: 17:54:33*. Epicenter 19°26′ north, 155°20′ west, northern Kaoiki system at a depth of 15 km. Felt on the east rim of Kilauea caldera. Magnitude 1.9.

December 13: 12:06:51*. Epicenter Halemaumau at a depth of 30 km. Felt at Pohakuloa, along Kona coast, and in the Kilauea caldera region. Magnitude 4.0.

December 13: 12:08:16*. Epicenter Halemaumau at a depth of 30 km. Felt at Pohakuloa, Kilauea caldera region, and along the Kona coast. Magnitude 4.0.

December 17: 20:57:16*. Epicenter 19°42′ north, 155°45′ west, 16 km. northeast of Kealakekua at a depth of 3 km. Felt at Kealakekua. Magnitude 3.3.

December 21: 22:15:45*. Epicenter 19°21′ north, 155°17′ west, 5 km. south of Halemaumau at a depth of 10 km. Felt in the Kilauea caldera region. Magnitude 2.5.

December 25: 02:56:28*. Epicenter 19°13′ north, 155°38′ west, south flank of Mauna Loa 15 km. west of Pahala at a shallow depth. Felt in the southern half of the Island; Kilauea region to South Point to north Kona. Magnitude 4.5.

December 28: 23:27:42*. Epicenter 19°26′ north, 155°21′ west, 7 km. west of Halemaumau at a depth of 5 km. Felt on the north rim of Kilauea caldera. Magnitude 2.7.

PANAMA CANAL ZONE

(60TH MERIDIAN TIME)

January 18: 15:30:18*. Epicenter 9° north, 77° west, off the coast of Panama, W. Depth about 100 km. Intensity (damage) III at Balboa Heights.

February 28: 22:12:04.* Epicenter 7½° north, 80° west, near south coast of Panama, W. Intensity (damage) II at Balboa Heights.

February 28: 22:23:47* and 23:04:44*. Intensity (damage) I at Balboa Heights.

March 13: 19:53:32.* Epicenter 7½° north, 77° west, Panama-Colombia border, W. Depth about 60 km. Magnitude 6–6¼. Intensity (damage) I at Balboa Heights.

March 27: 20:13:38*. Epicenter 7½° north, 82° west, off south coast of Panama, W. Intensity (damage) III at Balboa Heights. Felt on Coiba Island, Panama.

May 12: 18:32:32*. Epicenter 7½° north, 81° west, off south coast of Panama, W. Magnitude 6½. Felt strongly in southwestern Panama. Intensity (damage) IV at Balboa Heights.

May 12: 18:48:14* and 18:55:17*. Intensity (damage) I at Balboa Heights.

May 12: 19:00:36*. Epicenter 7½° north, 80½° west, near south coast of Panama, W. Intensity (damage) I at Balboa Heights.

May 12: 20:30:40*. Epicenter 7½° north, 81° west, near south coast of Panama, W. Intensity (damage) I at Balboa Heights.

May 12: 20:31:08*. 20:34:02*. 21:11:02*, and 21:19:08*. Intensity (damage) I at Balboa Heights.

September 19: 15:01:25.4. Epicenter 6.9° north, 77.5° west, Colombia-Panama border, W. Depth about 66 km. Magnitude 6. Intensity (damage) I at Balboa Heights.

October 31: 15:18:33*. Intensity (damage) III at Balboa Heights.

PUERTO RICO

(60TH MERIDIAN TIME)

January 22: 22:30:18*. IV. Felt by many at Charlotte Amalie, St. Thomas, Virgin Islands. Buildings creaked; dishes and loose objects rattled. Moderately loud roaring sounds heard by many. On Water Island, St. Thomas harbor, cracks were reported in a cistern and in terraces. Felt by many at Caguas and Fajardo, P.R. Also felt weakly at San Juan.

MISCELLANEOUS ACTIVITIES

GEODETIC WORK OF SEISMOLOGICAL INTEREST

The program of repeating geodetic control surveys for the purpose of detecting horizontal and vertical movement in the earth's crust was continued in 1960.

A retriangulation was made of the closely spaced monuments near the Taylor Winery at Hollister, Calif. The results confirmed the continuous slippage taking place along the San Andreas Fault line.

A major survey was made over an extensive area identified as the Taft-Mojave area. This survey will be repeated in five years. The specifications for this survey are more rigid than the customary first-order work. The California Water Resources Board is making a comprehensive survey of this area in an effort to determine the most suitable location for an aqueduct to carry water from north to south.

Precise releveling was undertaken in California along 1,340 miles of first-order and 245 miles of second-order lines in the Los Banos-Kettleman City area, San Jose area and the Delta area (northwest of Stockton) to determine elevation changes. Additional movements in these regions were noted. The releveling in Montana in 1960, east and north of Hebgen Lake, did not reveal any large vertical changes.

TIDAL DISTURBANCES OF SEISMIC ORIGIN

Of five tsunamis reported in 1960, one was of record-breaking dimensions, two were local, one was of scientific interest only, and the fifth apparently was erroneously reported.

The tsunami, which originated off the coast of Chile on May 22, 1960 (39½° south, 74½° west), devastated the adjacent coastline and then went on to inflict loss of life and heavy property damage. In Hawaii, 61 lives lost at Hilo and property damage about $75 million, although six hours of advance warning was given by the Coast and Geodetic Survey Seismic Sea Wave Warning system; in Chile (earthquake and tsunami), more than 2,000 dead, 3,000 injured, and property damage estimated at $550 million; in Japan, 138 dead and missing, and about $50 million damage; in the Philippine Islands, 32 dead and missing; and along the west coast of the United States about $500,000 property damage. Numerous reports and articles have been published on this tsunami. *"The Tsunami of May 22, 1960, as Recorded at Tide Stations—Preliminary Report"* by J. M. Symons and B. D. Zetler, Coast and Geodetic Survey, describes the operation of the seismic sea wave warning system and presents data on the tsunami obtained from various tide gage records. A limited supply of this report is available on request; a more complete report is being prepared.

A very small tsunami of scientific interest only, was generated a day earlier by a foreshock centered at 37½° south, 73½° west. The wave was detectable on some tide records from Chile, the Hawaiian Islands and the west coast of the United States.

A tsunami was generated off the coast of Peru (6.8° south, 80.7° west) on November 20, 1960. There were 11 persons killed or missing in some nearby fishing towns. The tsunami was recorded on some Pacific Island tide gages but did no damage except along the coast of Peru.

An earthquake off the coast of Japan (40° north, 143° east) on March 20, 1960,

generated a tsunami that was recorded locally. A five-foot wave was reported at Miyako.

A tsunami was reported in the press as accompanying a severe earthquake at Agadir, Morocco (30° north, 9° west) on February 29, 1960. The tsunami was reported to have surged 300 yards inland, contributing to the damage and loss of life. Subsequent scientific articles have denied the existence of the wave, pointing out the lack of evidence on a local tide gage record and that a fishing boat slip was not damaged.

635368—62——6

FLUCTUATIONS IN WELL WATER LEVELS

INTRODUCTION

The following data are tabulated for the purpose of associating fluctuations in well-water levels with earthquakes. The data are made available by the Ground Water Branch of the U.S. Geological Survey. Complete information on earthquakes may be obtained from the *Preliminary Determination of Epicenter* cards issued by the Coast and Geodetic Survey or from registers of seismographic stations nearest the locality.

Similar data for 1943 were published by the Coast and Geodetic Survey in United States Earthquakes, 1943, and those for 1944 through 1949 appeared in United States Earthquakes, 1949. Data for the years subsequent to 1950 were published annually in United States Earthquakes, 1950 through 1959.

WELL DESCRIPTIONS

ALASKA

Well No. Anc 64, artesian, Elmendorf Air Force Base, SE NW Sec. 11, T. 13 N., R. 3 W. Owner, U.S. Geological Survey. Depth, 617 feet; diameter, 8 inches; cased to 140 feet and filled with silt to 142 feet. Aquifer, sand and gravel; Pleistocene.

Well No. Anc 114A, artesian, Third and Concrete Avenue, Anchorage, SW NE Sec. 17, T. 13 N., R. 3 W. Owner, City of Anchorage. Depth, 210 feet; diameter, 8 inches. Aquifer, sand and gravel; Pleistocene.

ARIZONA

Well No. (D–6–5)25ccc, water-table, Pinal County, SW SW Sec. 25, T. S., R. 5 E. Owner, U.S. Indian Irrigation Service. Depth, 102 feet; diameter, 20 inches; cased to 102 feet; finish, perforated 33 to 102 feet. Aquifer, sand, gravel, and clay.

Well No. (D–6–26)35aaa, NE NE Sec. 35, T. 6 S., R. 26 E., Cochise County. Other information unavailable.

Well No. (D–13–24)16bbb, water-table, Cochise County, NW NW Sec. 16, T. 13 S., R. 24 E. Owner, State of Arizona. Depth, 1,400 feet; diameter, 16 inches.

Well No. (D–17–14)18cac, water-table, NE SW Sec. 18, 17 S., R. 14 E., Pima County. Owner, Arizona State Highway Department. Depth, 73.7 feet; diameter, 36 inches. Aquifer, sand, clay, and gravel.

Well No. (D–21–20)33bdd, water-table, Cochise County, SE NW Sec. 33, T. 21 S., R. 20 E. Owner, U.S. Government. Depth 1,230 feet; diameter, 16 inches; perforated, 500–760 feet.

Well No. (D–21–26)2baa, water-table, Cochise County NE NW Sec. 2, T. 21 S., R. 26 E. Owner, Randall and Hurst. Depth, 110 feet; diameter, 20 inches; finish, perforated 50–100 feet. Aquifer, sand, gravel, and clay.

CALIFORNIA

Well No. 14/13–11D4, Fresno County, NW NW Sec. 11, T. 4 S., R. 3 E. Owner, International Agency Company. Depth, 780 feet; diameter, 8 inches; cased to 774 feet; finish, perforated, 714–774 feet.

Well No. 26/40–17N1, water-table, China Lake, Kern County. Owner, U.S. Navy. Depth, 178.1 feet; diameter, 13 inches. Aquifer, sand, gravel and clay; Pleistocene.

HAWAII

Well No. 356, artesian, Island of Oahu. Owner, Kahuku Plantation Company. Depth, 420 feet; diameter, 12 inches; cased to 156 feet. Aquifer, Koolau volcanic series; Tertiary and Pleistocene.

Well No. T–27, water-table, Island of Oahu. Owner, Honolulu Board of Water Supply, Pearl City. Depth, 71 feet; diameter, 12 inches; cased to 60 feet. Aquifer, Koolau volcanic series; Tertiary and Pleistocene.

Well No. T–28, water-table, Island of Oahu. Owner, Honolulu Board of Water Supply. Depth, 60 feet; diameter, 12 inches; cased to 39 feet. Aquifer, Koolau volcanic series; Tertiary and Pleistocene.

Well No. T–52, Waimalu Valley, near Pearl Harbor, Oahu, 21°24′16″ north, 157°55′42″ west. Owner, Honolulu Board of Water Supply. Depth, 180 feet; diameter, 16 inches; cased to 180 feet; finish, perforations 170–180 feet. Aquifer, Basalt of Koolau volcanic series.

Well No. T–69, Kapalama Elementary School, Honolulu, 21°23′35″ north, 157°56′55″ west. Owner, Honolulu Board of Water Supply. Depth, 283 feet; diameter, 8 inches; cased to 233 feet. Aquifer, Koolau volcanic series.

IDAHO

Well No. 2S–20E–1ac2, nonartesian, Blaine County, Sec. 1, T. 2 S., R. 20 E. Owner, R. N.

Leazenby. Depth, 208.5 feet; diameter, 10 inches; cased to 207.8 feet. Aquifer, Snake River Basalt; Quaternary.

Well No. 8S–19E–5da1, nonartesian, Jerome County, 42°45′ north, 114°15′ west. Owner, U.S. Bureau of Reclamation. Depth, 329 feet; diameter, 21–16 inches; finish, open end. Aquifer, Snake River Group; Quaternary.

Well No. 7N–38E–23db1, nonartesian, Madison County, 43°55′ north, 111°56′ west. Owner, U.S. Bureau of Reclamation. Depth, 236 feet; diameter, 16 inches; cased to 177 feet; finish, open hole. Aquifer, Snake River Group; Quaternary.

NEW JERSEY

Well No. 37.12.1.5.7, U.S. Coast Guard Station well, artesian, Cape May County, 38°56′42″ north, 74°53′08″ west. Owner, U.S. Geological Survey. Depth, 325 feet; diameter, 6 inches; cased to 305 feet; finish, screen, 305–325 feet. Aquifer, Cohansey Sand (?); Miocene.

Well No. 25.14.3.5.5, artesian, Morris County, about 3 miles east of Whippany at Power Plant, 40°49′00″ north, 74°23′00″ west. Owner, Jersey Central Power and Light Company. Depth, 170 feet; diameter, 6 inches; finish, steel casing-screened. Aquifer, Wisconsin drift.

NEW YORK

Well No. Sa529, Saratoga Springs, Saratoga County, 43°03′27″ north, 73°47′53″ west. Depth, 189 feet. Aquifer, Little Falls dolomite; Ordovician.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1960*

NOTE.—Complete information on earthquakes possibly associated with the following tabulations may be obtained from the *Preliminary Determination of Epicenter* cards issued by the Coast and Geodetic Survey, or from registers of seismographic stations nearest the locality.

Well No.	Date	Time G.C.T.	Depth to water				Amplitude of fluctuation
			Before disturbance	After disturbance	At highest point	At lowest point	
ALABAMA							
TW-14	May 21, 1960	10:15	46.51	46.51	46.43	46.59	0.16
TW-7	do	10:15	12.38	12.38	12.35	12.43	.08
TW-14	May 22, 1960	11:00	46.55	46.55	46.43	46.67	.24
TW-7	do	11:00	12.41	12.41	12.35	12.47	.12
ALASKA							
Ancl14A	Feb. 19, 1960	05:10	36.72	36.81	36.72	36.81	0.09
Anc50	do	05:10	102.69	102.70	102.68	102.71	.03
Ancl11A	Oct. 14, 1960	12:30	+.12	+.12	+.14	+.08	.06
Anc50	Dec. 12, 1960	11:00	45.96	45.96	45.94	46.00	.06
ARIZONA							
(D–13–24)18cac	Feb. 23, 1960	16:30	79.73	79.75	79.73	79.76	0.03
(D–6–5)25ccc	July 8, 1960	07:00	51.10	51.10	51.08	51.20	.12
(D–13–24)16bbb	July 18, 1960	18:00	114.90	114.88	114.87	114.90	.03
(D–21–20)33bdd	July 26, 1960	04:00	499.30	499.30	499.28	499.32	.04
(D–21–20)33bdd	Aug. 4, 1960	03:00	499.65	499.65	499.51	499.70	.19
(D–21–20)33bdd	Aug. 9, 1960	23:00	499.51	499.51	499.49	499.53	.04
CALIFORNIA							
7/34–12E1	Apr. 26, 1960	15:00	305.77	305.77	305.76	305.77	0.01
7/34–10M1	May 2, 1960	03:00	23.11	23.11	23.10	23.13	.03
7/35–33R1	May 22, 1960	20:00	110.20	110.20	110.19	110.21	.02
6/30–29E1	May 23, 1960	07:00	13.69	13.70	13.69	13.72	.03
6/30–29E1	June 1, 1960	03:30	13.81	13.81	13.81	13.82	.01
7/34–12E1	do	15:00	305.99	305.99	305.97	306.01	.04
7/35–33R1	June 5, 1960	04:00	110.15	110.15	110.15	110.16	.01

See footnotes at end of table.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1960*—Con.

CALIFORNIA—Continued

Well No.	Date	Time G.C.T.	Depth to water				Amplitude of fluctuation
			Before disturbance	After disturbance	At highest point	At lowest point	
7/35-33R1	June 7, 1960	03:00	110.15	110.16	110.15	110.20	0.05
26/40-17N1	June 11, 1960	22:00	100.32	100.33	100.32	100.34	.02
7/35-33R1	June 20, 1960	04:00	110.23	110.23	110.22	110.25	.03
10/33-21F5	July 17, 1960	11:00	109.74	109.81	109.73	109.82	.09
7/35-36J3	Aug. 1, 1960	19:00	33.63	33.61	33.59	33.64	.05
9/10-34N1	Aug. 2, 1960	07:00	37.73	37.73	37.71	37.74	.03
7/35-33R1	Aug. 25, 1960	18:00	113.52	113.52	113.44	113.60	.16
12/12-16H5	Sept. 9, 1960	18:00	130.93	130.90	130.84	130.90	.06
12/12-16H5	Sept. 11, 1960	09:00	(?)	130.82	130.84	131.07	.23
26/40-22F1	Sept. 13, 1960	20:00	68.81	68.80	68.79	68.81	.02
26/40-22F1	Sept. 21, 1960	22:00	68.82	68.81	68.80	68.82	.02
15/14-14J1	Oct. 18, 1960	06:00	339.17	339.18	339.14	339.31	.17
9/10-12R1	Oct. 22, 1960	07:00	43.67	43.67	43.63	43.67	.04
25/26-1A2	Dec. 1, 1960	21:00	375.94	375.94	375.81	376.21	.40
NORTHERN FLORIDA							
P45	Jan. 13, 1960	15:50	64.55	64.56	64.50	64.64	0.14
T35	do	16:15	19.05	19.05	19.00	19.09	.09
O47	do	16:15	.29	.29	.26	.34	.08
V31	do	16:15	5.03	5.04	5.02	5.04	.02
P45	Mar. 20, 1960	17:30	64.17	64.16	64.15	64.18	.03
O47	do	17:50	+8.66	+8.66	+8.65	+8.68	.03
H500	do	17:50	51.35	51.34	51.33	51.35	.02
G30	Sept. 23, 1960	22:00	8.90	8.90	8.89	8.91	.02
P45	Nov. 20, 1960	22:00	66.34	66.34	66.32	66.35	.03
T35	do	22:20	19.62	19.61	19.60	19.66	.06
D206	do	22:23	11.77	11.76	11.75	11.77	.02
P45	Dec. 2, 1960	09:30	67.18	67.17	67.14	67.21	.07
T35	do	09:40	20.95	20.95	20.90	21.00	.10
D206	do	09:51	11.93	11.92	11.89	11.96	.07
P45	Dec. 13, 1960	08:00	68.59	68.59	68.58	68.60	.02
SOUTHERN FLORIDA[1]							
S19	Jan. 13, 1960	15:30	1.03	1.03	1.06	1.01	0.05
S68	do	15:30	−.31	−.31	−.30	−.32	.02
G820	do	15:30	3.74	3.74	3.76	3.69	.07
HAWAII							
T-69	Jan. 11, 1960	20:45	56.60	56.50	56.42	56.55	0.15
T-75	Jan. 24, 1960	04:00	7.93	7.93	7.92	7.94	.02
T-69	do	05:00	56.78	56.78	56.77	56.80	.03
T-69	Feb. 4, 1960	04:00	56.89	56.89	56.87	56.91	.04
T-75	do	04:30	8.54	8.54	8.52	8.55	.03
T-69	Mar. 20, 1960	19:00	56.72	56.72	56.67	56.78	.11
T-75	do	17:20	8.25	8.25	8.23	8.28	.05
T-69	Mar. 23, 1960	00:00	56.85	56.85	56.80	56.91	.11
83	May 22, 1960	18:00	1.55	1.55	1.49	1.62	.13
T-75	do	19:00	8.36	8.37	Off chart	Off chart	+1.00
T-69	do	20:00	57.24	57.24	Off chart	Off chart	+1.00
T-41	do	20:00	----------	----------	----------	----------	.05
356	do	21:00	1.35	1.18	1.35	1.10	.25
T-24	do	21:00	36.70	36.70	36.68	36.72	.04
T-52	do	21:00	149.26	149.26	149.03	149.54	.51

See footnotes at end of table.

SEISMOLOGICAL OBSERVATORY RESULTS

The Coast and Geodetic Survey publishes the results of its teleseismic stations and cooperating stations in the monthly *Seismological Bulletin.* All seismogram interpretations are tabulated together with epicenters based on the published data and instrumental results received from seismological stations in all parts of the world. Instrumental results are published for the following stations:

Balboa Heights
(The Panama Canal Co.)
Boulder City, Nev.
(Bureau of Reclamation)
Bozeman, Mont.
(Montana State College)
Butte, Mont.
(Montana School of Mines)
Byrd, Antarctica
Chicago, Ill.
(University of Chicago and U.S. Weather Bureau)
College, Alaska
College-Outpost, Alaska
Columbia, S.C.
(University of South Carolina)
Eureka, Nev.
(Eureka Power & Light Co.)
Flaming Gorge, Utah
(Bureau of Reclamation)
Glen Canyon, Ariz.
(Bureau of Reclamation)
Guam, Mariana Islands
Honolulu, Hawaii
Hungry Horse, Mont.
(Bureau of Reclamation)
Kipapa, Hawaii
Lincoln, Nebr.
(Nebraska Wesleyan University)
Philadelphia, Pa.
(The Franklin Institute)
Rapid City, S. Dak.
(South Dakota State School of Mines and Technology)
Salt Lake City, Utah
(University of Utah)
San Juan, Puerto Rico
Sitka, Alaska
South Pole, Antarctica
Thule, Greenland
(U.S. Army Ionosphere Station)
Tucson, Ariz.
Tucson-Telemeter, Ariz.
Ukiah, Calif.
(International Latitude Observatory)
Washington, D.C.

Byrd, College, College-Outpost, Guam, Honolulu, Kipapa, San Juan, Sitka, South Pole, Tucson, Tucson-Telemeter, Ukiah, and Washington are Coast and Geodetic Survey Stations.

Balboa Heights, Boulder City, Bozeman, Butte, Chicago, Columbia, Eureka, Flaming Gorge, Glen Canyon, Hungry Horse, Lincoln, Philadelphia, Rapid City, Salt Lake City, and Thule are cooperating stations.

The Flaming Gorge and Glen Canyon stations began operation in July 1960.

All readings were made or revised at the Washington office except those for Balboa Heights, which may be obtained on loan by addressing the Seismograph Station Director, Meteorological and Hydrographic Office, Panama Canal Co., Balboa Heights, C.Z.

For detailed instrumental data regarding these stations, including instrumentation, constants, and other information, see *Seismological Bulletin, MSI–241,* January 1961. Those desiring to receive this publication as issued should request addition of their name to the CGS–7 mailing list. All requests should be made to the Director, Coast and Geodetic Survey, Washington 25, D.C.

TABLE 2.—*Summary of instrumental epicenters for 1960*

NOTE.—Beginning August 1, 1960, the origin time, coordinates of provisional epicenter and focal depth (h) are computed using an electronic computer. The origin time is computed such that the average residual (average difference between computed and observed arrival time at stations) is not greater than 2.0 seconds. All magnitudes are determined by Pasadena, except where quoted by Palisades (Pal) and Berkeley (Berk).

1960	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Jan. 1	04 11 40*	Kurile Islands	49 N.	153½ E.
1	04 17 32*	Bonin Islands	27½ N.	142 E.
1	05 57 26*	Mariana Islands	18½ N.	147 E.
1	23 12 33*	Near east coast of Kamchatka	56 N.	162½ E.
2	01 52 18*	Kamchatka	54 N.	157½ E.
2	03 21 52*	Bolivia. Depth about 150 km. Mag. 6¼	15½ S.	68 W.
2	04 09 35*	Hebgen Lake, Montana. Felt	45 N.	111½ W.
2	05 06 54*	Off coast of Sumatra	2½ N.	96 E.
2	06 59 36*	Near east coast of Kamchatka	56½ N.	163½ E.
2	08 27 14**	Sandwich Islands		
2	12 21 51**	South Atlantic Ocean, west of Bouvet Island		
2	21 22 51*	New Britain. Felt at Lolobau, Pomio, and Rabaul	5 S.	152½ E.
3	00 17 05*	Hebgen Lake, Montana. Felt	45 N.	111½ W.
3	06 55 25*	Near coast of Oaxaca, Mexico	16 N.	99 W.
3	09 57 32*	Hebgen Lake, Montana. Felt	44½ N.	111½ W.
3	11 24 00*	Sinkiang Province, China	44 N.	84½ E.
3	11 38 30*	South-central Alaska. Felt at Anchorage	61 N.	152 W.
3	19 40 48*	Hebgen Lake, Montana. Felt	44½ N.	111 W.
3	20 19 30*	Tyrrhenian Sea. Felt at Bivongi, Calabria, and Lucanie. Depth about 250 km.	39½ N.	15½ E.
3	20 37 48*	Hebgen Lake, Montana. Felt	45 N.	111 W.
3	21 20 13*	Kurile Islands. Felt at Kushiro, Japan. Depth about 150 km	45 N.	148 E.
4	03 57 03*	India-Pakistan border. Felt at Rangpur, Pakistan	26 N.	90 E.
4	06 16 30*	French Somaliland. Damage at Arta. Also felt at Ali Sabieh, Djibouti and Tadjourah.	11½ N.	42½ E.
4	06 19 49*	New Britain	4½ S.	153½ E.
4	12 51 52*	Romania	45 N.	27 E.
4	13 34 20*	Luzon, Philippine Islands	18 N.	120½ E.
4	15 05 39*	Northern Peru	5½ S.	77½ W.
5	04 03 34*	Hebgen Lake, Montana. Felt	44½ N.	111½ W.
5	05 13 48*	Northern Chile	19 S.	69½ W.
5	09 32 07*	Samoa Islands region. Felt at Apia	15 S.	173 W.
5	18 07 43	South of Pomona, California. Felt	34 02 N.	117 44 W.
6	07 37 36**	Santa Cruz Islands		
6	13 11 00*	----do	10½ S.	167 E.
6	18 45 08*	Burma	23½ N.	95 E.
6	20 16 29*	Banda Sea	6½ S.	133 E.
7	08 15 21*	Nicobar Islands	6½ N.	94 E.
7	09 16 04	Southwestern Washington. Felt in Lewis, Pierce, and Thurston counties. Also felt at Portland, Oregon.	46 45 N.	122 40 W.
7	13 28 16**	Sandwich Islands		
7	23 17 18*	Nicobar Islands	6½ N.	94½ E.
8	02 35 00*	Sandwich Islands	58½ S.	26 W.
8	11 29 18*	----do	55 S.	27½ W.
8	14 43 04	Near Redondo Beach, California. Felt at Compton	33 51 N.	118 22 W.
8	14 45 53*	Sandwich Islands	55½ S.	27½ W.
9	03 58 45*	Southwestern Turkey	37 N.	29 E.
9	07 24 03*	Hindu Kush. Felt at Lyallpur, Peshawar, and Warsak. Depth about 200 km.	36 N.	70 E.
9	07 41 57*	Celebes	1 S.	124 E.
9	17 49 07*	Unimak Island region	55½ N.	165 W.
10	06 26 00*	Mariana Islands region. Depth about 100 km	12 N.	145 E.
11	02 27 38*	Ryukyu Islands	28½ N.	131 E.
11	02 51 07*	Off coast of Luzon, Philippine Islands. Felt at Manila	13½ N.	120½ E.
11	03 10 14*	Near south coast of Burma	16 N.	96½ E.
11	14 53 29*	Timor Island region	9 S.	127 E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Jan. 11	17	49	58*	Kermadec Islands	29	S.	176	W.
11	19	08	40	East of Tinemaha, California. Felt in Independence area	37 10	N.	117 59	W.
11	22	54	03*	Near north coast of New Guinea	2	S.	140½	E.
12	01	52	37*	Near east coast of Formosa	23½	N.	122	E.
12	03	09	10*	Sandwich Islands region	55½	S.	27	W.
12	06	25	33	Near Watsonville, California. Felt	36 55	N.	121 45	W.
12	22	22	34*	Tonga Islands	17	S.	173	W.
13	07	26	26*	Northern New Guinea	3½	S.	140	E.
13	15	40	34*	Southern Peru. 57 killed, many injured, and major property damage at Arequipa, Aplao, Camana, Caraveli, Chuquibamba, and Yancarqui. Also felt at La Paz, Bolivia. Depth about 200 km. Mag. 7½.	16	S.	72	W.
13	16	29	41*	Andreanof Islands, Aleutian Islands	51½	N.	180	
14	02	41	24**	Near coast of northern Sumatra				
14	10	25	56*	Honshu, Japan. Felt at Kakioka, Tokyo, and Yokohama. Depth about 100 km.	36	N.	140	E.
14	12	49	07*	Near east coast of Kamchatka	57	N.	162½	E.
14	15	58	56*	Ceram Island region	3	S.	127½	E.
14	20	55	10*	Kurile Islands. Felt at Kushiro, Japan	44½	N.	148	E.
14	21	25	15*	Atlantic Ocean	11	N.	43	W.
15	09	30	24*	Near coast of southern Peru. 4 injured and minor damage in Ica Province. Felt in Lima area and at La Paz, Bolivia. Depth about 150 km. Mag. 7.	15	S.	75	W.
15	23	38	50**	Northern Celebes region				
16	06	59	00*	About 500 miles southwest of Macquarie Islands	59½	S.	149½	E.
16	12	30	56*	Fiji Islands region. Depth about 600 km	20½	S.	178	W.
16	15	32	56*	Loyalty Islands region	22½	S.	173½	E.
16	18	38	40*	New Hebrides Islands region. Depth about 200 km	13	S.	167½	E.
16	20	49	31*	Central Alaska. Felt at College. Depth about 150 km	63	N.	151	W.
16	21	41	44*	Solomon Islands	10	S.	161½	E.
16	23	32	28*	New Britain. Felt at Rabaul	4½	S.	152	E.
17	02	57	58*	Near coast of southern Peru. Depth about 150 km. Mag. 6¼	14½	S.	74½	W.
17	04	19	07*	Off coast of northern Honshu, Japan. Felt at Morioka	40½	N.	142	E.
18	00	14	30*	Tonga Islands region. Depth about 100 km	16	S.	174½	W.
18	01	04	11**	About 650 miles southwest of Prince Edward Islands				
18	09	04	43*	Off south coast of Mindanao, Philippine Islands. Felt at General Santos and Davao.	5	N.	126½	E.
18	19	30	18*	Off coast of Panama. Felt at Balboa Heights. Depth about 100 km.	9	N.	77	W.
18	22	00	40**	Southern Pakistan				
19	02	16	52*	Near southeast coast of Kamchatka. Mag. 6¼–6½	52	N.	158	E.
19	08	50	24*	Near coast of Oaxaca, Mexico	17	N.	98	W.
19	09	15	04*	South of Fiji Islands. Depth about 600 km. Mag. 6	23	S.	180	
19	16	10	36*	Volcano Islands. Depth about 100 km	24	N.	142	E.
19	21	26	39**	Southwestern Turkey				
20	01	03	25*	Mid-Atlantic Ocean	3½	N.	31	W.
20	02	50	02*	Fiji Islands. Depth about 500 km	17½	S.	178	W.
20	03	25	53	Near coast of central California. Minor damage in Hollister area. Mag. 5.0 (Berk).	36 47	N.	121 26	W.
20	13	12	40	Southwest of Hollister, California. Felt	36 50	N.	121 28	W.
20	19	56	14*	New Britain region. Felt at Rabaul	4½	S.	153½	E.
21	10	43	33*	Fiji Islands. Depth about 600 km	16	S.	179½	E.
21	16	43	51*	Near south coast of Mindanao, Philippine Islands	6	N.	126	E.
21	17	43	46*	Samoa Islands region. Felt at Apia. Depth about 100 km	15½	S.	174	W.
21	22	21	08	Near Kane Springs, California. Felt	33 04	N.	115 54	W.
21	22	37	28*	Hebgen Lake, Montana. Felt	44½	N.	110½	W.
21	23	52	22	Northeast of San Diego, California. Felt	32 49	N.	117 03	W.
22	02	14	11*	Near south coast of Hokkaido, Japan. Felt at Urakawa	42	N.	142½	E.
22	13	35	54*	Molucca Passage	0		125	E.
22	22	01	18	Southeast of Hollister, California. Felt	36 47	N.	121 20	W.
23	04	24	45**	Off northwest coast of Luzon, Philippine Islands				
23	04	40	56*	Ceram Island region. Mag. 6½	4	S.	127½	E.
23	06	24	08*	Fiji Islands region. Depth about 400 km	17		177	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	
Jan. 23	07	31	14*	Ceram Island region. Mag. 6¾	4	S.	127½	E.
23	15	03	20*	Hebgen Lake, Montana. Felt	45	N.	111½	W.
23	17	56	30*	Ceram Island region. Mag. 6½-6¾	4	S.	127½	E.
23	21	57	08*	New Britain. Felt at Rabaul	5½	S.	152	E.
24	00	39	33*	Off coast of Oregon. Mag. 4½ (Berk)	43½	N.	127½	W.
24	04	21	42*	Fiji Islands. Mag. 6¼-6½	15½	S.	179	W.
24	09	14	03**	Banda Sea				
24	09	17	59*	Fiji Islands region. Depth about 600 km	20½	S.	180	
24	12	16	23*	New Guinea. Depth about 100 km	4½	S.	143½	E.
24	16	56	44*	New Hebrides Islands	14½	S.	166½	E.
24	18	24	56	Southwest of Hollister, California. Felt	36.8	N.	121.5	W.
24	18	33	45*	Near east coast of Kamchatka	52½	N.	160	E.
25	08	46	25*	----do	52½	N.	160	E.
25	11	26	31*	----do	52½	N.	160	E.
25	16	29	26*	Fiji Islands. Mag. 6¼	16	S.	179	W.
26	03	17	03*	South Atlantic Ocean	16½	S.	14½	W.
26	04	17	36*	Nevada	38	N.	116½	W.
26	09	37	00*	Kurile Islands	44½	N.	149½	E.
26	09	52	00*	Turkey	39½	N.	39½	E.
26	13	05	37*	----do	37	N.	29	E.
26	14	44	34	Southeast of Hollister, California. Felt	36 43	N.	121 18	W.
26	18	19	55*	Near coast of Nicaragua. Felt at San Salvador, El Salvador. Depth about 60 km.	13	N.	87½	W.
26	20	27	05*	Romania. Depth about 150 km	46	N.	26½	E.
26	22	21	19*	Kermadec Islands. Felt on Raoul Island	30	S.	178	W.
27	20	50	57	Southeast of Hollister, California. Felt	36.7	N.	121.2	W.
29	02	07	48	Near Topanga, California. Felt at North Hollywood and Panorama City.	34 05	N.	118 38	W.
29	07	33	44*	Hindu Kush. Depth about 200 km	36½	N.	70½	E.
29	07	46	17*	Bouvet Island region	53	S.	10	E.
29	08	10	18*	New Guinea. Felt at Ambunti	4	S.	142½	E.
29	22	47	20**	Mariana Islands region				
30	02	45	03*	----do	22	N.	144½	E.
30	04	10	40**	Kermadec Islands				
30	15	27	23*	Volcano Island region	21½	N.	143½	E.
30	17	56	05*	Mariana Islands region	21½	N.	142½	E.
30	18	38	10*	----do	22	N.	144	E.
31	03	34	42*	----do	21½	N.	143½	E.
31	04	03	11*	Santa Cruz Islands. Depth about 200 km	12½	S.	167½	E.
31	05	08	18*	Near east coast of Shikoku, Japan. Felt	33½	N.	134½	E.
31	08	19	50	Mariana Islands region	21½	N.	143½	E.
31	13	52	00*	Chinghai Province, China	34	N.	91	E.
31	16	12	29**	Mariana Islands region				
31	17	26	38**	Near east coast of Kamchatka				
31	19	07	23*	Samoa Islands region	16	S.	172½	W.
31	20	28	14*	Mariana Islands region	21½	N.	143½	E.
Feb. 1	02	08	37*	Pacific Ocean, off coast of Oregon	43	N.	132	W.
1	02	41	37*	Near east coast of Honshu, Japan. Felt at Apiro, Tokyo, and Yokohama.	35	N.	140½	E.
1	11	59	39*	Near west coast of Crete	35½	N.	23	E.
1	13	56	08*	Off east coast of Kamchatka	50½	N.	160	E.
2	06	29	52*	Kermadec Islands region	33½	S.	179	W.
2	08	10	50*	Near west coast of Honshu, Japan. Depth about 60 km	38	N.	141	E.
2	09	13	09*	Chile. Felt at Vallenar and Copiapo. Depth about 150 km	28½	S.	71	W.
2	12	32	31*	Karelia, U.S.S.R	66½	N.	31	E.
2	23	40	01*	Molucca Passage	2	N.	126	E.
2	23	51	53*	Kansu Province, China	33½	N.	104½	E.
3	00	37	18	Baja California. Felt in the Imperial Valley and at San Diego, California.	32.1	N.	116.0	W.
3	02	20	55*	Off coast of North Island, New Zealand. Felt from Kaitaia to Wellington.	37	S.	179	E.
3	11	29	55*	Gulf of California	24	N.	108½	W.
3	11	50	48*	New Britain region. Felt at Gabin, Rabaul, and Rangarere	5	S.	153	E.
3	12	49	17*	Off west coast of Hokkaido, Japan. Depth about 200 km	43	N.	139½	E

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Feb. 3	13	28	29*	Solomon Islands. Depth slightly greater than normal	7	S.	154½	E.
3	14	28	39*	Tonga Islands	19	S.	173½	W.
3	17	53	03*	New Hebrides Islands	19½	S.	169½	E.
4	03	46	44*	New Ireland region. Felt at Lohano, Lolobace, Numa, and Rabaul.	4½	S.	153½	E.
4	07	07	20*	Southern Iran	28½	N.	52½	E.
4	09	27	23*	New Ireland region. Felt at Fead Island, Namatanai, and Rabaul. Depth about 100 km.	5	S.	154	E.
4	10	20	39*	Northern India. Depth about 100 km	35½	N.	78	E.
4	11	01	28*	New Ireland region. Felt at Namatanai and Rabaul. Depth about 100 km.	4½	S.	153½	E.
4	16	50	26*	Off east coast of Honshu, Japan. Felt at Fukushima, Ishinomaki, and Morioka.	38½	N.	143	E.
4	20	38	20*	Fiji Islands. Depth about 600 km	18½	S.	178	W.
4	20	57	55*	Near east coast of Honshu, Japan. Felt at Ishinomaki and Morioka	39½	N.	142½	E.
5	02	02	14*	South Pacific Ocean	37	S.	95½	W.
5	05	39	46*	New Ireland region. Felt at Rabaul	4½	S.	153½	E.
5	08	43	36*	Near coast of Kyushu, Japan. Felt at Miyazaki and Kagoshima	32½	N.	131½	E.
5	21	57	51*	Fox Islands, Aleutian Islands	52	N.	169½	W.
6	17	01	18*	Tibet	31½	N.	91	E.
6	17	10	45*	Near coast of Sumatra. Felt in southern Sumatra	6	S.	104	E.
7	03	22	16**	Near coast of Mexico				
7	04	24	50*	Venezuela	7½	N.	71½	W.
7	10	00	34*	Mariana Islands	17	N.	145	E.
7	10	07	50*	Celebes Sea. Depth about 600 km	5	N.	123	E.
7	11	16	54*	Samoa Islands region. Felt at Apia	15½	S.	173	W.
7	22	33	46*	New Britain	6	S.	148½	E.
8	03	37	20*	Kodiak Island, Alaska	58½	N.	152	W.
8	04	05	30**	Solomon Islands				
8	09	19	45*	Solomon Islands. Felt at Rabaul. Depth about 100 km	5	S.	155	E.
8	12	45	34*	Drake Passage. Mag. 6¾	58	S.	67	W.
8	14	11	16**	Solomon Islands				
8	17	41	40*	Sumatra	3	S.	102½	E.
8	18	54	23*	Afghanistan. Depth about 150 km	36½	N.	70½	E.
8	19	06	16*	Peru. Depth about 200 km	8½	S.	74½	W.
9	01	54	05*	Banda Sea	6½	S.	129½	E.
9	02	59	42*	Solomon Islands	5	S.	155	E.
9	11	09	55*	Sakhalin. Depth about 300 km	46½	N.	143½	E.
9	11	56	12*	Banda Sea	4	S.	128	E.
9	14	01	49	Santa Rosa Mountains. Felt in San Diego County, California	33	11 N.	116	28 W.
9	16	34	45*	Near north coast of New Guinea. Felt on Lae	6	S.	147	E.
9	23	55	49*	Ceram Island. Slight damage in Ambon. Mag. 6½–6¾	4	S.	128	E.
10	01	15	44*	Ceram Island	3½	S.	128	E.
10	01	59	05*	——do	3½	S.	128	E.
10	06	04	35**	Gulf of California				
10	15	44	54*	Solomon Islands region. Felt at Rabaul. Depth about 100 km	4½	S.	154½	E.
10	21	50	45*	Bismarck Sea. Felt at Rabaul	3½	S.	151½	E.
10	22	52	54*	Colombia. Depth about 200 km	7	N.	73	W.
10	23	19	55*	Samoa Islands region	15½	S.	173	W.
11	03	59	24*	South of Fiji Islands. Depth about 500 km	24	S.	180	
11	04	27	22*	New Hebrides region. Depth about 450 km	14	S.	170½	E.
11	08	28	58*	Solomon Islands. Felt at Rabaul. Depth about 100 km	6	S.	155	E.
11	10	35	39**	Solomon Islands. Felt at Rabaul				
11	12	53	59*	Chile. Felt at Higgins, Santiago, and Valpariso	34	S.	70½	W.
11	20	56	08*	Santa Cruz Islands	11½	S.	166½	E.
12	01	29	45*	New Ireland	4½	S.	154½	E.
13	00	28	24*	Mexico. Depth about 100 km	19	N.	101½	W.
13	07	55	30*	Canary Islands	27½	N.	21½	W.
13	09	36	46*	Fox Islands, Aleutian Islands	52½	N.	169	W.
13	15	41	04*	Halmahera	1½	N.	127½	E.
13	17	13	22*	Off coast of Oaxaca, Mexico	14½	N.	97½	W.
13	17	16	49	West of Hollister, California. Felt	36	51 N.	121	32 W.
13	20	40	06*	Peru. Depth about 150 km	17½	S.	70	W.
14	05	21	22*	La Rioja Province, Argentina. Depth about 150 km	31½	S.	66½	W.
14	12	51	20*	Adaman Islands	13	S.	93	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Feb. 14	12	53	08*	South of Fiji Islands. Depth about 500 km	23½	S.	179	E.
14	15	39	43*	Kermadec Islands	29	S.	177	W.
14	18	20	46*	Northern Peru. Depth about 150 km	6	S.	75½	W.
14	18	50	27**	Solomon Islands region				
14	19	28	59**	Indian Ocean, about 800 miles southeast of Mascarene Islands				
14	20	30	44*	Solomon Islands	5	S.	154½	E.
14	21	04	36*	Mariana Islands. Depth about 200 km	18½	N.	145½	E.
14	22	17	54*	Fox Islands, Aleutian Islands	52	N.	171½	W.
15	05	16	45*	Fiji Islands. Depth about 350 km	18	S.	177½	W.
15	07	36	08*	Near coast of Nicaragua	12	N.	87	W.
15	19	03	56	Northeast of Willits, California. Felt	39.5	N.	123.3	W.
15	22	18	27*	Kermadec Islands	29½	S.	176½	W.
16	01	09	29*	do	29½	S.	176½	W.
16	05	00	14*	Mariana Islands	18½	N.	146	E.
16	05	21	52*	Kermadec Islands region	32½	S.	179½	W.
16	10	35	22*	Solomon Islands	6½	S.	154½	E.
16	13	14	31*	Atlantic Ocean	22	N.	45½	W.
16	15	06	14*	Off east coast of Honshu, Japan. Felt at Choshi and Kakioka	36	N.	141½	E.
17	00	01	28*	Tonga Islands	20½	S.	175	W.
17	08	05	30*	Hindu Kush. Felt in northern Pakistan. Depth about 250 km	37	N.	71½	E.
17	10	00	25*	Kermadec Islands	28½	S.	177	W.
17	12	32	10*	Easter Island region. Mag. 6½	30	S.	112½	W.
17	16	27	40*	Near east coast of Hokkaido, Japan. Felt at Kushiro and Nemuro	43½	N.	145½	E.
17	16	49	42*	New Guinea	5	S.	142½	E.
17	16	52	35*	Hebgen Lake, Montana. Felt	45	N.	142½	E.
17	18	00	47	Near Glendale, California. Felt at Hollywood	34	08 N.	118	15 W.
18	01	43	27*	Hebgen Lake, Montana. Felt	45	N.	110½	W.
18	01	59	23*	Hindu Kush. Depth about 150 km	35½	N.	73	E.
18	19	21	49*	Near east coast of Kamchatka	52½	N.	159	E.
18	20	32	39*	China-Burma-India border	29½	N.	97	E.
18	21	35	11*	Near east coast of Kamchatka	52½	N.	160	E.
18	22	26	10*	Fox Islands, Aleutian Islands	52	N.	170	W.
19	01	02	04*	El Salvador-Honduras border. Felt in southwestern El Salvador	14½	N.	98½	W.
19	05	09	23*	Kenai Peninsula, Alaska. Slight damage in the Anchorage area	60½	N.	151	W.
19	10	36	46*	Hindu Kush. Felt in Kashmir Valley; Lahore, Rawalpindi, and Walsak, Pakistan. Depth about 200 km.	36	N.	70½	E.
20	06	05	28*	Fiji Islands region. Depth about 200 km	17½	S.	177½	W.
20	14	27	10*	Near east coast of Kamchatka	52	N.	159	E.
20	20	02	13*	Kamchatka	52½	N.	158	E.
21	00	46	56*	New Zealand. Felt at Plymouth. Depth about 60 km	42	S.	173	E.
21	02	15	34*	Mexico-Guatemala border. Depth about 150 km	14½	N.	92	W.
21	08	13	31*	Northern Algeria. 47 killed, 88 injured and 500 homes destroyed at Beni-Ilman and Melouza. Mag. 5¾.	36	N.	4½	E.
21	09	29	15*	Turkey	38	N.	42	E.
21	09	39	26*	Fiji Islands. Depth about 600 km	20	S.	178½	W.
21	17	21	59*	Andreanof Islands, Aleutian Islands	52	N.	175	W.
21	22	43	11*	Halmahera Island	2½	N.	128½	E.
21	23	25	43*	Kirghiz S. S. R.	40½	N.	72	E.
22	00	54	30*	Fiji Islands. Depth about 600 km	20	S.	178½	W.
22	05	17	18*	Jan Mayen Island region	71½	N.	2½	E.
22	05	28	19*	Andreanof Islands, Aleutian Islands	51½	N.	175	W.
22	08	34	11*	Fiji Islands. Depth about 600 km	18	S.	179½	W.
22	21	04	09*	Greece. Felt at Leucas, Louros, and Astakos	39	N.	21	E.
23	00	30	58*	Greece. Felt at Leucas, Kalamos, Leukimmi, and Michalitsion	39	N.	20½	E.
23	02	09	42*	Afghanistan. Depth about 200 km	36	N.	70	E.
23	07	34	30*	Greece. 25 houses destroyed and 37 damaged in the region of Preveza. Damage at Mytikas, Flaboura, Kamarina, and Michalitsion.	39	N.	20	E.
23	07	47	51*	Greece. Felt at Mytikas, Flaboura, and Preveza	39	N.	20½	E.
23	08	10	28*	Formosa	23½	N.	121½	E.
23	09	23	37*	Near south coast of Honshu, Japan. Felt at Yokohama, Kakioka, and Ajiro. Depth about 100 km.	34½	N.	139½	E.
23	11	31	04*	Fiji Islands. Depth about 500 km	19	S.	178	W.
23	16	04	50*	Solomon Islands. Felt at Londolovit and Rabaul. Mag. 6–6¼	6	S.	154½	E.

See footnotes at end of table.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1960*—Con.

HAWAII—Continued

Well No.	Date	Time G.C.T.	Depth to water				Amplitude of fluctuation
			Before disturbance	After disturbance	At highest point	At lowest point	
2	May 22, 1960	21:00	11.97	11.97	11.88	12.06	0.18
1A	do	22:00	10.03	10.03	9.94	10.14	.20
T-75	June 6, 1960	07:00	8.85	8.85	8.83	8.88	.05
T-69	June 11, 1960	16:00	57.63	57.63	57.59	57.64	.05
T-52	June 20, 1960	03:00	149.89	149.89	149.88	149.89	.01
T-75	do	03:00	9.14	9.14	9.10	9.19	.09
T-75	June 20, 1960	14:00	9.16	9.16	9.14	9.18	.04
T-75	July 3, 1960	20:30	9.13	9.13	9.12	9.14	.02
T-52	do	21:00	149.94	149.93	149.92	149.94	.02
T-75	July 4, 1960	04:30	8.98	8.97	8.96	8.99	.03
T-52	do	05:00	149.89	149.89	149.88	149.91	.03
T-69	do	05:00	57.98	57.98	57.96	58.00	.04
T-69	July 31, 1960	03:00	58.88	58.88	58.85	58.90	.05
T-75	do	03:00	9.32	9.32	9.30	9.34	.04
T-75	Oct. 13, 1960	15:00	9.62	9.62	9.59	9.64	.05
T-69	do	15:30	58.25	58.25	58.23	58.27	.04
T-52	Nov. 13, 1960	09:30	150.05	150.05	149.98	150.14	.16
T-75	do	09:30	9.01	9.01	8.92	9.09	.17
2	do	10:15	13.90	13.89	13.81	13.96	.15
1A	do	10:20	10.04	10.02	9.99	10.06	.07
T-69	do	11:00	57.76	57.75	57.69	57.86	.17
T-69	Nov. 21, 1960	00:00	57.63	57.63	57.61	57.65	.04
T-75	Nov. 24, 1960	08:00	8.92	8.92	8.88	8.96	.08
T-75	Dec. 2, 1960	09:00	8.90	8.90	8.85	8.92	.07
T-69	do	09:50	57.55	57.54	57.49	57.60	.11
T-69	Dec. 13, 1960	07:00	57.35	57.35	57.32	57.39	.07
IDAHO							
4N-45E-13ad1	July 3, 1960	16:10	163.08	163.08	163.01	163.12	0.11
7N-38E-23bd1	do	16:18	41.35	41.35	41.23	41.46	.23
53N-2W-9aa1	July 4, 1960	03:30	232.36	232.36	232.33	232.37	.04
8S-26E-33bc1	do	04:30	104.11	104.12	104.10	104.14	.04
7N-38E-23bd1	July 7, 1960	18:20	41.23	41.23	41.19	41.25	.06
2S-20E-1ac2	July 9, 1960	18:20	146.22	146.22	146.20	146.26	.06
5S-23E-17ca1	July 13, 1960	02:30	306.84	306.84	306.81	306.87	.06
7N-35E-20cb1	July 16, 1960	17:19	48.41	48.41	48.40	48.43	.03
7N-38E-23db2	July 21, 1960	21:23	40.71	40.71	40.69	40.74	.05
7N-35E-20cb1	July 28, 1960	20:22	50.61	50.61	50.60	50.62	.02
8S-19E-5da1	Aug. 9, 1960	05:07	264.48	264.49	264.47	264.50	.03
4N-45E-13ad1	do	07:00	175.06	175.07	175.00	175.15	.15
7N-38E-23db1	do	09:11	40.27	40.27	40.11	40.45	.34
8S-19E-5da1	Aug. 15, 1960	06:08	264.09	264.09	264.08	264.11	.03
INDIANA							
Ma 32	Jan. 13, 1960	16:00	10.76	10.76	10.73	10.80	0.07
Ma 32	Mar. 20, 1960	18:00	10.69	10.69	10.66	10.73	.07
Ma 32	May 21, 1960	10:30	11.25	11.20	11.12	11.35	.23
Ma 32	May 22, 1960	19:00	11.13	10.95	10.83	11.27	.44
Ma 32	do	20:30	10.95	10.88	10.84	10.98	.14
Ma 32	July 4, 1960	04:30	11.40	11.38	11.27	11.49	.22
Ma 32	Nov. 13, 1960	09:30	11.16	11.16	11.14	11.18	.04
Ma 32	Nov 20, 1960	22:15	11.03	11.03	11.01	11.07	.06
Ma 32	Nov. 24, 1960	07:30	11.07	11.07	11.06	11.08	.02
Ma 32	Dec. 2, 1960	09:15	11.08	11.08	11.05	11.11	.06

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1960*—Con.

MICHIGAN

Well No.	Date	Time G.C.T.	Depth to water				Amplitude of fluctuation
			Before disturbance	After disturbance	At highest point	At lowest point	
7N.7E.17-1	Jan. 13, 1960	17:00	25.92	25.92	25.88	25.95	0.07
7N.7E.17-1	Mar. 20, 1960	19:00	25.39	25.39	25.35	25.43	.08
7N.7E.17-1	July 4, 1960	04:45	30.96	30.96	30.92	31.01	.09
7N.7E.17-1	Nov. 23, 1960	14:30	27.07	27.07	27.05	27.08	.03
7N.7E.17-1	Nov. 24, 1960	07:00	27.07	27.07	27.03	27.10	.07
7N.7E.17-1	Dec. 2, 1960	09:30	27.17	27.17	27.15	27.19	.04
7N.7E.17-1	Dec. 3, 1960	04:45	27.15	27.15	27.14	27.16	.02
7N.7E.17-1	Dec. 13, 1960	08:30	26.91	26.91	26.88	26.93	.05

NEVADA

S19/60-9bcc1	Jan. 13, 1960	15:10	91.52	91.52	91.51	91.54	0.03
S19/60-9bcc1	Mar. 17, 1960	23:30	92.17	92.16	92.11	92.33	.22
S19/60-9bcc1	July 3, 1960	17:00	96.40	96.41	96.36	96.45	.09
S19/60-9bcc1	Aug. 9, 1960	08:00	98.69	98.70	98.74	98.67	.07

NEW JERSEY[1]

31.1.6.4.8	Jan. 13, 1960	16:00	−7.12	−7.12	−7.10	−7.13	0.03
26.22.4.4.4	do	16:00	+27.47	+27.47	+27.49	+27.42	.07
25.14.3.5.5	Mar. 8, 1960	17:00	+176.16	+176.16	+176.19	+176.12	.07
37.32.7.5.7	do	17:00	−8.45	−8.45	−8.32	−8.63	.31
26.22.4.4.4	July 4, 1960	04:30	+24.10	+24.11	+24.14	+24.08	.06
26.22.4.4.4	July 31, 1960	04:00	+28.78	+28.79	+28.81	+28.78	.03
26.22.4.4.4	Aug. 9, 1960	07:10	+26.91	+26.92	+26.93	+26.90	.03
26.22.4.4.4	Oct. 14, 1960	21:40	+26.79	+26.79	+26.80	+26.77	.03
26.22.4.4.4	Nov. 1, 1960	09:00	+28.68	+28.68	+28.68	+28.67	.01
26.22.4.4.4	Nov. 13, 1960	10:30	+29.49	+29.49	+29.50	+29.48	.02
26.22.4.4.4	Nov. 20, 1960	22:30	+29.47	+29.47	+29.47	+29.46	.01
26.22.4.4.4	Nov. 23, 1960	15:00	+27.89	+27.89	+27.91	+27.87	.04
26.22.4.4.4	Nov. 24, 1960	07:40	+28.12	+28.13	+28.15	+28.08	.07

NEW YORK

Sa 529	Jan. 13, 1960	15:45	43.87	43.87	43.84	43.90	0.06
Sa 529	Mar. 20, 1960	17:15	43.46	43.45	43.44	43.48	.04
Sa 529	July 4, 1960	05:00	45.58	45.58	45.56	45.60	.04
Sa 529	Aug. 9, 1960	07:30	49.77	49.77	49.76	49.77	.01
Sa 529	Nov. 20, 1960	22:30	45.30	45.30	45.30	45.31	.01

WISCONSIN

Lf-57	Jan. 13, 1960	16:00	132.37	132.39	132.36	132.42	0.06
Lf-57	Mar. 20, 1960	17:30	129.86	129.84	129.82	129.88	.06
Lf-57	July 4, 1960	02:00	118.72	118.72	118.46	118.98	.52
Lf-121	do	02:00	67.35	67.33	67.27	67.40	.13
Lf-57	Sept. 1, 1960	17:00	117.12	117.11	117.08	117.17	.09
Lf-121	Sept. 8, 1960	16:00	68.68	68.68	68.65	68.72	.07
Lf-95	Sept. 19, 1960	03:00	58.88	58.87	58.84	58.93	.09
Lf-121	do	06:00	68.79	68.78	68.75	68.83	.08

+Water surface above mean sea level or land surface datum.
−Water surface below mean sea level.
[1] Values refer to mean sea level.

TABLE 2.—*Summary of instrumental epicenters for 1960*

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter					
					Latitude			Longitude		
	h	*m*	*s*		°	′		°	′	
Feb.24	00	03	00*	Mariana Islands region. Depth about 300 km	21		N.	142		E.
24	08	41	00*	New Hebrides Islands. Felt at Port Vila and Noumea	17½		S.	168		E.
24	13	12	34	Near Mira Loma, California. Felt	34	00	N.	117	34	W.
24	18	55	20*	Turkey	38		N.	41		E.
24	21	37	04*	Solomon Islands. Felt at Buin, Kieta, Numa, and Rabaul. Mag. 6½–6¾.	7½		S.	156		E.
24	23	44	57	Near Watsonville, California. Felt	36	53	N.	121	43	W.
25	12	45	44*	Cebu, Philippine Islands. Felt at Cebu City, Catbalogan, Boronoan.	11		N.	124		E.
25	20	56	05*	Solomon Islands. Depth about 300 km	7		S.	154		E.
26	01	06	23*	Ceram Sea	2½		S.	128		E.
26	02	08	31*	New Guinea	1		S.	138		E.
26	06	32	36*	Tonga Islands	20		S.	174		W.
26	15	14	21*	Central Alaska	60½		N.	148½		W.
26	21	29	20*	Chiapas, Mexico. Felt at Coatzacoalcos. Depth about 150 km	17½		N.	93½		W.
26	23	29	25*	Andreanof Islands, Aleutian Islands. Felt on Adak. Mag. 6–6¼	51½		N.	178		W.
27	00	07	10*	Andreanof Islands, Aleutian Islands. Felt on Adak	51½		N.	178		W.
27	08	10	03*	do	51½		N.	178		W.
27	08	56	00*	Kermadec Islands	30½		S.	179½		W.
27	09	05	25*	Off south coast of Sumatra	6½		S.	102½		E.
27	13	57	56*	Solomon Islands. Depth about 150 km	7		S.	156½		E.
27	14	23	29*	do	7		S.	156		E.
27	14	56	22*	do	7		S.	156		E.
27	19	22	25	Near Concord, California. Felt in the San Francisco Bay area. Mag. 3.4 (Berk).	37	56	N.	122	01	W.
27	23	05	49*	Celebes Sea	2		N.	123		E.
28	07	26	37*	Off north coast of Norway	69½		N.	10		E.
28	09	34	12*	Kurile Islands. Felt at Nemuro	44½		N.	147½		E.
28	09	37	10*	Hebgen Lake, Montana. Felt	45		N.	111½		W.
28	23	05	39*	New Guinea. Felt at Aitape and Lumi	3		S.	142		E.
28	23	52	27*	Near north coast of New Guinea	3		S.	142½		E.
29	02	12	04*	Near south coast of Panama. Felt at Balboa Heights	7½		N.	80		W.
29	05	22	53*	Near southwest coast of Luzon, Philippine Islands. Felt on Luzon	14		N.	120		E.
29	08	34	30*	Western Burma	23½		N.	94½		E.
29	23	40	12*	Morocco. 12,000 killed, 25,000 injured, and major property damage at Agadir. 90% of Talborjit quarters, 70% of new buildings, and 20% industrial buildings destroyed. Mag. 6¼.	30		N.	9		W.
Mar. 1	03	26	41*	Fiji Islands. Depth about 600 km	8½		S.	178		W.
1	08	07	30*	Loyalty Islands region	22		S.	171		E.
1	19	59	33*	Tonga Islands	22		S.	175		W.
1	21	54	50*	Boeroe, Ceram Islands region	4		S.	127½		E.
2	00	10	26*	Michoacan, Mexico. Felt at Mexico City	19		N.	101½		W.
2	04	34	46*	Chiapas, Mexico	17		N.	93		W.
2	21	56	25*	North Atlantic Ocean	52		N.	30		W.
3	01	02	20*	Solomon Islands	7		S.	156		E.
3	01	42	46*	Near coast of Venezuela. Felt at Trinidad, W. I. Depth about 100 km.	11		N.	62½		W.
3	04	59	20*	Central Alaska. Felt	64½		N.	150		W.
3	14	11	21*	Sawoe Sea	10		S.	122½		E.
3	14	15	02*	Sinkiang Province, China	40½		N.	78½		E.
3	15	39	56*	Southern Chile. Felt on Chiloe Island. Depth about 100 km	41		S.	74		W.
3	19	17	34*	South of Fiji Islands	13½		S.	178		W.
4	01	13	20*	Andreanof Islands, Aleutian Islands	51		N.	175½		W.
4	02	16	01*	do	50½		N.	176½		W.
4	03	53	09*	Near south coast of Kyushu, Japan. Felt at Yaku-shima, Kagoshima, Miyazaki, Oita, and Kochi. Depth about 100 km. Mag. 6½.	31		N.	129		E.
4	11	55	12*	Hokkaido, Japan. Felt at Urakawa	42		N.	141½		E.
4	16	25	25*	Jan Mayen Islands region	72		N.	1½		W.
4	21	05	45*	Nicobar Islands	7½		N.	94		E.
5	11	25	00*	Nepal	29		N.	81		E.
5	13	49	18*	Halmahera Island. Mag. 6¾	1		N.	129		E.
5	15	49	53*	Halmahera aftershock	1		N.	129		E.
5	20	51	29**	Kermadec Islands. Depth about 200 km						

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Mar. 5	23	50	38*	Nepal	29	N.	81	E.
6	02	22	06*	Halmahera aftershock	1	N.	129	E.
6	04	12	00*	Gulf of California. Depth about 60 km. Mag. 5–5¼ (Berk)	24	N.	108	W.
6	07	56	28*	Kurile Islands	44½	N.	149	E.
6	22	26	49*	Colombia. Depth about 200 km	6½	N.	73	W.
7	00	51	40*	Iran	34½	N.	55	E.
7	02	08	04*	Off coast of Sumatra	5½	S.	101	E.
7	05	13	17*	Celebes. Depth about 60 km	1½	N.	125½	E.
7	06	12	07*	Sea of Okhotsk. Depth about 400 km	52	N.	153	E.
7	09	38	09*	Solomon Islands	10	S.	160½	E.
7	11	34	23*	Ryukyu Islands	23½	N.	123½	E.
7	15	47	50*	----do	24½	N.	125	E.
7	23	02	41*	Near south coast of Java. Depth about 100 km	8½	S.	106	E.
8	11	51	10*	Antarctic Ocean	65	S.	179½	E.
8	14	13	45*	Hebgen Lake, Montana. Felt	44½	N.	111	W.
8	16	33	38*	New Hebrides Islands. Felt at Port-Vila. Depth about 250 km. Mag. 7–7¼.	16½	S.	168½	E.
8	19	28	19*	South of Fiji Islands. Depth about 550 km	24	S.	180	
9	01	05	42*	New Britain. Depth about 150 km	5½	S.	148½	E.
9	19	43	53*	Solomon Islands	7	S.	156½	E.
9	23	54	25*	Southern Peru. 1 killed, 23 injured at Arequipa. Felt at Arica and Iquique. Depth about 150 km. Mag. 6–6¼.	16½	S.	72½	W.
10	00	24	20*	Central Alaska. Felt	64	N.	149	W
10	00	40	34*	About 400 miles northwest of Balleny Islands. Depth about 100 km.	61	S.	155	E.
10	05	00	23*	Kermadec Islands region. Depth about 500 km	31½	S.	179½	E.
10	09	10	47*	Mindanao, Philippine Islands	7½	N.	126	E.
10	09	44	57*	Solomon Islands	10	S.	161	E.
10	13	44	25*	Samoa Islands region. Felt at Apia	15	S.	174	W.
10	14	32	39*	Kurile Islands. Depth about 100 km	47	N.	152	E.
10	18	55	55*	Guatemala. Depth about 100 km	14½	N.	91½	W.
11	04	42	50*	Eastern Dominican Republic. Depth about 100 km	18	N.	69	W.
11	11	26	20*	Fiji Islands. Depth about 600 km	17½	S.	178½	W.
11	13	11	10*	Mariana Islands. Depth about 200 km	18½	N.	145	E.
12	01	30	15*	Kermadec Islands	29½	S.	178	W.
12	02	14	56*	Near coast of New Britain. Felt at Rabaul. Depth about 150 km	4	S.	152½	E.
12	11	54	00*	Southern Yugoslavia. 1 killed, 12 injured at Dobi Dol and Tetovo. Mag. 5½–5¾.	42	N.	21	E.
12	12	47	40*	Near coast of South Carolina. Felt at Charleston, South Carolina and Augusta, Georgia.	33	N.	79	W
12	13	47	52*	Chile-Argentina border. Depth about 150 km	36½	S.	71	W
12	20	30	39*	New Britain. Felt at Rabaul. Mag. 6½	6	S.	152	E.
13	02	23	37*	Near south coast of Hokkaido, Japan. Felt at Urakawa	42	N.	143	E.
13	11	46	56*	Guerrero, Mexico. Depth about 150 km	17	N.	98½	W
13	23	53	32*	Panama-Colombia border. Felt at Balboa Heights. Depth about 60 km. Mag. 6–6¼.	7½	N.	77	W
14	00	40	43*	Panama-Colombia aftershock. Depth about 60 km	7½	N.	77	W.
14	00	52	57*	Hokkaido, Japan. Felt at Hiroo, Urakawa, Tomakomai, and Kushiro.	42½	N.	143	E.
14	10	54	05*	Aleutian Islands	51	N.	180	
14	19	01	35*	Near coast of Northern Honshu, Japan. Felt at Hachinohe and Miyako.	41½	N.	142	E.
14	19	17	27*	Off coast of Oregon	44½	N.	129½	W.
14	20	14	33*	Persian Gulf	29	N.	49½	E.
14	20	57	03*	Off coast of Oregon	44½	N.	129½	W.
15	03	50	19**	Kermadec Islands region				
15	09	00	55*	Molucca Passage	2	N.	127½	E.
15	09	21	00*	Andreanof Islands, Aleutian Islands. Depth about 50 km	50½	N.	174½	W.
15	10	08	58*	Tonga Islands	20	S.	174	W.
15	19	31	50*	Fiji Islands region. Depth about 600 km	20½	S.	179	W.
15	20	02	33*	South Atlantic Ocean. 600 miles south of Tristan da Cunha	47	S.	10	W.
15	22	31	42*	Mariana Islands. Depth about 150 km	18½	N.	145½	E.
16	00	33	05*	Sandwich Islands	59½	S.	26	W

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter					
					Latitude			Longitude		
	h	*m*	*s*		°	′		°	′	
Mar. 16	08	21	38	Near Fillmore, California. Slight damage at Santa Paula. Mag. 3.2.	34	22	N.	118	56	W.
16	17	39	16*	Samoa Islands region	15½		S.	173		W.
17	20	13	58*	Andreanof Islands, Aleutian Islands	51		N.	180		
18	01	14	55*	Guatemala. Depth about 150 km	14½		N.	90		W.
18	10	35	31*	Solomon Islands	10½		S.	163		E.
18	12	16	51*	New Britain. Depth about 150 km	4½		S.	152		E.
18	14	09	15**	Bolivia-Peru border. Depth about 150 km						
19	09	20	51*	Molucca Passage	2½		N.	127		E.
19	19	15	37*	New Guinea	3		S.	138		E.
20	07	25	59*	Near coast of Sumatra	½		N.	99½		E.
20	13	36	54*	Off northeast coast of Honshu, Japan. Felt at Aomori, Miyako, Morioka, and Hachinohe. Depth about 60 km.	40		N.	143½		E.
20	13	44	25**	Near east coast of Honshu, Japan						
20	17	07	32*	Off northeast coast of Honshu, Japan. Felt on northern Honshu and southern Hokkaido. 5-foot seismic sea wave at Miyako. Depth about 60 km. Mag. 7-7¼.	40		N.	143		E.
20	21	36	38*	Near east coast of Honshu, Japan. Felt at Miyako	40		N.	143		E.
20	23	28	28*	North Atlantic Ocean	17		N.	46½		W.
21	00	34	50*	Near east coast of Honshu, Japan. Felt at Miyako, Morioka, and Mizusawa.	39½		N.	143		E.
21	01	49	42*	Tonga Islands region	16		S.	173		W.
21	03	45	50*	Burma	25		N.	97½		E.
21	04	43	22*	Near east coast of Honshu, Japan	40		N.	142½		E.
21	05	54	16*	Near east coast of Honshu, Japan. Felt at Morioka	40		N.	143½		E.
21	06	51	29*	Near east coast of Honshu, Japan	40		N.	143½		E.
21	08	19	55**	Loyalty Islands region						
21	08	22	00*	Near coast of Honshu, Japan	39½		N.	144		E.
21	09	18	22*	Near coast of Honshu, Japan. Felt at Aomori, Miyako, Morioka, and Mizusawa.	40		N.	143		E.
21	11	40	15*	Samoa Islands region	16½		S.	172½		W.
21	16	37	46*	New Ireland region	4½		S.	154		E.
21	19	49	00*	Near north coast of Chile. Depth about 60 km	21		S.	71		W.
21	22	56	58*	Near east coast of Honshu, Japan	39½		N.	143½		E.
21	23	21	43*	Near each coast of Honshu, Japan. Felt at Miyako and Hachinohe.	39½		N.	143		E.
22	00	51	52*	Near east coast of Honshu, Japan. Felt at Miyako and Morioka.	39½		N.	143		E.
22	01	48	24*	Near coast of Oaxaca, Mexico	16		N.	97½		W.
22	02	31	17*	About 400 miles northwest of Balleny Islands	61½		S.	154		E.
22	13	19	52*	Jalisco, Mexico. Depth about 150 km. Mag. 5½-5¾ (Berk)	19½		N.	105		W.
22	13	48	43*	Northwest of Balleny Islands	60½		S.	153		E.
22	18	31	33	East of San Leandro, California. Felt. Mag. 2.6 (Berk)	37	44	N.	122	08	W.
22	19	55	45*	Sandwich Islands. Depth about 100 km	57½		S.	26		W.
22	20	24	45*	North Atlantic Ocean	13½		N.	44½		W.
22	21	12	49*	Near coast of western Java. Depth about 150 km	6½		S.	107		E.
23	00	23	26*	Near east coast of Honshu, Japan. Felt at Miyako, Morioka, Sakata, Mizusawa, and Urakawa. Mag. 6½-6¾.	39½		N.	143		E.
23	01	07	15*	----do----	39½		N.	143		E.
23	01	32	18*	Near west coast of North Island, New Zealand. Depth about 550 km.	39		S.	174½		E.
23	01	33	36**	New Britain region. Felt at Rabaul, Gavit, Kariai, and Rangarera.						
23	01	51	37*	Near east coast of Honshu, Japan. Felt at Miyako, Morioka, and Hachinohe.	39½		N.	143		E.
23	02	09	17*	Near east coast of Honshu, Japan. Felt at Aomori, Hachinohe, Miyako, Mizusawa, and Morioka. Depth about 60 km.	40		N.	142½		E.
23	03	15	13*	Hebgen Lake, Montana. Felt	44½		N.	111		W.
23	06	38	39*	Near east coast of Honshu, Japan. Felt at Morioka. Depth about 100 km.	39		N.	143		E.
23	07	50	50*	Near east coast of Honshu, Japan. Felt at Morioka. Depth about 60 km.	39½		N.	143		E.
23	08	46	44*	Near east coast of Honshu, Japan. Felt at Hachinohe, Miyako, and Morioka.	40		N.	142½		E.
23	10	29	01*	Near east coast of Honshu, Japan. Felt at Miyako. Depth about 100 km.	39½		N.	143		E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Mar. 23	11	51	00*	Near east coast of Honshu Japan. Felt at Ishinomaki, Miyako, and Morioka.	39½	N.	143	E.
23	14	07	00**	Jalisco, Mexico				
23	16	01	13*	Near east coast of Honshu, Japan. Felt at Morioka. Depth about 100 km.	39	N.	144	E.
23	20	03	47*	Szechwan Province, China	32½	N.	103½	E.
23	21	34	19*	Near east coast of Honshu, Japan. Felt at Aomori, Mizusawa, and Morioka.	39½	N.	143½	E.
23	22	22	36*	Near east coast of Honshu, Japan. Felt at Morioka and Mizusawa. Mag. 6.	39½	N.	143	E
23	22	51	41*	Near east coast of Honshu, Japan. Felt at Morioka	40	N.	143	E.
23	23	08	49*	Switzerland. Minor damage at Brigue and Sierre. Felt in France and Italy.	46½	N.	8	E.
23	23	26	15*	Near east coast of Honshu, Japan	39	N.	143	E.
24	02	57	01*	Andreanof Islands, Aleutian Islands	50	N.	175½	W.
24	05	54	28*	Kurile Islands	47	N.	152½	E.
24	09	56	00*	Andreanof Islands, Aleutian Islands	50½	N.	173	W.
24	09	58	45*	Near east coast of Honshu, Japan	40	N.	144	E.
24	12	21	30*	do	40	N.	143½	E.
24	20	02	44*	Near east coast of Honshu, Japan. Felt at Morioka	40	N.	142½	E.
24	20	54	01*	Solomon Islands. Depth about 200 km	6½	S.	156	E.
25	02	28	56*	Fiji Islands. Depth about 400 km	19	S.	177½	W.
26	08	44	33*	Colombia. Depth about 200 km	7	N.	73	W.
27	03	48	29*	New Hebrides Islands. Mag. 6¼ (Berk)	13½	S.	166	E.
27	07	26	58*	Off coast of Mexico. Mag. 5 (Berk)	21½	N.	108½	W.
27	08	57	56*	New Hebrides Islands. Mag. 6½ (Berk)	13	S.	166	E.
27	12	23	10*	New Hebrides Islands. Depth about 150 km	14	S.	65½	E.
27	17	24	41*	Kermadec Islands	30½	S.	178	W.
27	19	35	25*	New Hebrides Islands	13	S.	166	E.
27	20	15	43*	Near coast of Jalisco, Mexico. Depth about 60 km. Mag. 6–6¼	19½	N.	105½	W.
27	21	18	30*	Near coast of Jalisco, Mexico	19	N.	105	W.
27	23	28	24*	Near coast of North Island, New Zealand. Depth about 250 km	38½	S.	175	E.
28	00	13	38*	Off south coast of Panama. Felt at Balboa Heights and on Coiba Island.	7½	N.	82	W.
28	06	35	58*	New Hebrides Islands	13½	S.	166	E.
28	06	39	32*	do	13½	S.	166	E.
28	06	42	44*	do	13½	S.	166	E.
28	07	55	59*	do	13½	S.	166	E.
28	12	37	50*	Tonga Islands region	23	S.	176	W.
28	20	48	45*	North Atlantic Ocean	58	N.	32½	W.
29	00	10	45*	Kermadec Islands region	33½	S.	177½	W.
29	06	30	54*	New Hebrides Islands. Felt at Port Vila, Vales, Norsup, and Santo.	17	S.	167	E.
29	07	30	33*	Off coast of Sumatra	0		98	E.
29	14	25	26*	New Hebrides Islands	17	S.	167½	E.
29	16	00	05*	Luzon, Philippine Islands. Felt at Calapan, Cavite, and Manila	13½	N.	121	E.
29	22	10	20*	Near east coast of New Guinea. Felt at Finschhafen, Lae, and Pindiu.	6	S.	147	E.
30	06	58	36*	Andreanof Islands, Aleutian Islands. Felt on Adak	51	N.	178½	W.
30	09	38	08*	New Hebrides Islands. Felt on Mallicolo	17	S.	167½	E.
30	10	49	47*	New Hebrides Islands. Mag. 6 (Berk)	13½	S.	166	E.
30	12	58	57*	Off east coast of Greenland	69	N.	17	W.
30	14	11	40*	Near coast of Sumatra	3½	S.	102	E.
30	15	19	30*	Loyalty Islands region	22½	S.	174	E.
31	00	39	59*	Mariana Islands. Depth about 250 km	18½	N.	146	E.
31	01	48	39*	Near coast of Jalisco, Mexico. Depth about 150 km	19½	N.	104	W.
31	03	02	03*	Off northeast coast of Honshu, Japan. Felt at Morioka	39½	N.	143	E.
31	03	29	45*	New Guinea	5½	S.	143½	E.
31	06	13	35*	Off northeast coast of Honshu, Japan	40	N.	143½	E.
31	11	41	45*	Off coast of Vancouver Island	49	N.	129½	W.
31	15	04	38*	Pacific Ocean. About 900 miles southwest of Galapagos Islands	4	S.	102½	W.
31	15	48	13*	Off northeast coast of Honshu, Japan	39½	N.	143	E.
31	17	29	40*	do	40	N.	143	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Mar. 31	19	56	14*	Gulf of California. Mag. 5½–5¾ (Berk)	26	N.	110	W.
31	20	17	45*	Gulf of California	26½	N.	110½	W.
31	21	32	44*	Near north coast of Honshu, Japan. Felt at Hachinohe, Hiroo, Hakodate, and Urakawa.	41½	N.	142	E.
31	22	07	10*	Gulf of California	26½	N.	110½	W.
Apr. 1	02	55	04*	Fiji Islands region. Depth about 650 km	22	S.	179½	W.
1	13	18	23*	Southern Peru. Depth about 100 km	14½	S.	73½	W.
1	14	12	05*	Off coast of Vancouver Island	49	N.	129½	W.
1	23	02	31*	Fiji Islands. Depth about 550 km	17½	S.	180	
2	06	39	08*	Mariana Islands	18½	N.	146	E.
2	10	29	50*	Hindu Kush. Depth about 200 km	36½	N.	71	E.
2	11	07	57*	Near coast of Ecuador	½	N.	80½	W.
2	14	14	42*	New Britain	6	S.	152	E.
2	15	00	36*	Colombia. Depth about 150 km	3	N.	76½	W.
2	22	35	58*	Western Iran. Damage at Asadabad and Malayer. Felt at Hamadan, Kermansha, and Toysarkan.	34½	N.	48½	E.
2	23	02	50*	Off south coast of Java	11	S.	113	E.
2	23	33	09*	Western Iran. Felt at Malayer and Asadabad	34½	N.	48½	E.
3	05	10	32*	Bonin Islands region. Depth about 550 km	28	N.	139½	E.
3	07	19	58*	Off northeast coast of Honshu, Japan. Felt at Miyako	40	N.	143	E.
3	09	52	05*	New Britain	6	S.	148½	E.
3	17	04	19*	Off the coast of central Chile. Depth about 150 km	31	S.	72½	W.
3	23	57	50*	Lesser Antilles	15½	N.	60½	W.
4	07	56	15*	Solomon Islands. Depth about 100 km	10	S.	161½	E.
4	10	20	12*	Bismarck Archipelago	1	S.	145½	E.
4	12	45	30*	New Britain. Felt at Rabaul and Karla. Depth about 100 km	5	S.	152	E.
4	13	12	57*	China	35	N.	103	E.
4	18	52	15*	Luzon, Philippine Islands	15	N.	119½	E.
4	20	52	15*	do	15	N.	119½	E.
4	23	22	47*	Aleutian Islands	50½	N.	177	W.
5	07	17	45*	Sandwich Islands	61	S.	26	W.
5	12	36	15*	do	60½	S.	25	W.
5	17	25	19*	North Atlantic Ocean	65	N.	2	W.
6	02	05	06*	Chile-Bolivia border. Felt at Tarapaca and Antofagasta	20	S.	68½	W.
7	03	05	35*	Fiji Islands region. Depth about 600 km	21	S.	179½	W.
7	08	36	54*	Off east coast of Honshu, Japan	40	N.	143	E.
7	13	47	28*	Fiji Islands region. Depth about 500 km	24	S.	179½	W.
7	20	03	37*	Mariana Islands	12	N.	143½	E.
7	23	55	54*	Tonga Islands. Depth about 200 km. Mag. 6 (Berk)	21	S.	177	W.
8	08	35	37*	New Guinea	6	S.	147	E.
9	02	43	51*	Near east coast of Honshu, Japan. Felt at Morioka	40	N.	143	E.
9	20	15	43*	Montana	45	N.	111½	W.
10	00	05	09*	Near coast of Honshu, Japan	36	N.	142	E.
10	04	49	41*	Mariana Islands region. Depth about 100 km	12½	N.	143½	E.
10	08	52	24*	San Luis Province, Argentina. Depth about 100 km	32½	S.	67	W.
10	13	07	30*	Bonin Islands	27	N.	141	E.
10	20	26	12*	Fox Islands, Aleutian Islands	53	N.	167½	W.
10	22	05	29*	Western Turkey. 100 homes damaged at Germencik. Felt in area of Izmir and Samos Island.	38	N.	27½	E.
11	06	47	35	Seattle, Washington. Slight damage	47 34	N.	122 15	W.
11	16	00	26*	New Hebrides Islands	17	S.	167½	E.
12	01	16	40*	Alaska Peninsula	58	N.	155	W.
12	04	22	37*	Western Turkey. Felt at Germencik, Pythagorron, and Limin-Vathos.	37½	N.	28	E.
12	07	11	54*	Off east coast of Honshu, Japan. Felt at Miyako	40	N.	143½	E.
12	11	32	10**	New Britain Island region. Felt at Rabaul				
12	20	41	10*	Outer Mongolia	46½	N.	96	E.
12	21	46	02*	New Ireland. Felt at Rabaul	3½	S.	152	E.
13	04	50	28*	Andreanof Islands, Aleutian Islands	52	N.	175	W.
13	07	57	46*	Manchuria	44½	N.	127	E.
13	11	27	58*	Crete. Felt at Kasos	35	N.	25½	E.
13	12	37	43*	Guatemala-Mexico border. 1 killed, 14 injured in the San Marcos area. Damage at Huchuatemango and San Marcos. Depth about 50 km. Mag. 6.	15½	N.	92	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Apr.13	13 14 28*	Fox Islands, Aleutian Islands	52½ N.	169 W.
14	06 24 30*	Sumbawa Island region	8 S.	118 E.
14	20 45 23	Near El Centro, California. Felt. Mag. 3.3	32 52 N.	115 29 W.
15	03 25 38*	Easter Island region. Mag. 6½	27 S.	113 W.
15	04 13 25*	New Hebrides Islands	13½ S.	166 E.
15	08 33 08*	Kermadec Islands	28 S.	177 W.
15	10 06 20*	Near south coast of Hokkaido, Japan. Felt at Hiroo, Obihiro, and Urakawa.	42½ N.	143½ E.
15	11 03 45*	do	42 N.	144 E.
15	11 39 01*	Near north coast of Honshu, Japan. Depth about 150 km	40½ N.	142 E.
15	22 05 11*	New Hebrides Islands. Depth about 45 km. Mag. 6½	13½ S.	166 E.
16	20 38 25*	Kurile Islands	45 N.	150 E.
17	01 12 44*	Unimak Island region	54 N.	164 W.
17	15 40 02*	Tonga Islands	21 S.	175½ W.
17	18 29 20**	Guatemala. Felt at Talnique, Comasagna, and Quezaltepegno		
17	21 49 24*	Fiji Islands. Depth about 500 km	20 S.	180
18	08 07 07*	Bonin Islands region. Depth about 450 km	28 N.	139½ E.
18	09 01 20*	New Hebrides Islands	13½ S.	166 E.
18	13 01 12*	do	13½ S.	166 E.
18	16 54 52*	New Hebrides Islands	16½ S.	168 E.
19	01 13 27*	Kurile Islands	46 N.	151 E.
19	09 22 31*	Tonga Islands	20 S.	173½ W.
19	19 26 00*	Andreanof Islands, Aleutian Islands	51½ N.	174 W.
19	20 06 10*	New Hebrides Islands	13½ S.	166 E.
19	20 32 51*	Fox Islands, Aleutian Islands	51 N.	172½ W.
19	22 16 42*	New Hebrides Islands	13½ S.	166½ E.
19	22 44 39*	do	13½ S.	166 E.
20	21 36 41*	Hindu Kush. Felt at Warsak and Risalpur. Depth about 200 km	37 N.	71 E.
20	21 36 41*	Near north coast of New Guinea	2½ S.	140 E.
21	02 16 38*	Pacific Ocean. About 1200 miles west of Galapagos Islands. Depth about 80 km. Mag. 5¾ (Berk).	2½ S.	109½ W.
21	12 57 41*	Mariana Islands region. Depth about 200 km	22 N.	144 E.
21	16 14 42**	Near coast of Sumatra		
21	16 21 57*	Tonga Islands	20½ S.	174 W.
21	17 49 30*	Hebgen Lake, Montana. Felt	45 N.	111 W.
21	17 57 55*	do	45 N.	111 W.
21	23 39 20	West of El Centro, California. Felt in Imperial Valley. Mag. 4.2	32 44 N.	115 42 W.
22	14 58 16*	Kermadec Islands	30½ S.	177½ W
22	18 47 17*	Masbate, Philippine Islands	12½ N.	123½ E.
22	20 26 28*	Tonga Islands. Depth about 200 km	17½ S.	174½ W.
23	06 26 16*	Iran	31½ N.	50½ E.
23	11 43 53*	Central Italy. Felt in Temo, Perugia. Depth about 60 km	42 N.	12½ E.
23	12 09 00*	Tonga Islands. Depth about 200 km	17 S.	175 W.
23	13 08 35*	Outer Mongolia	45 N.	98 E.
23	17 58 19*	Solomon Islands	6 S.	154½ E.
23	23 58 23*	Near Islands, Aleutian Islands	53 N.	172½ E.
24	03 22 28*	Java Sea. Depth about 650 km	6 S.	113½ E.
24	06 00 06*	Eastern Turkey	40 N.	39 E.
24	12 14 26*	Southern Iran. 420 dead, 3,000 injured, and $20 million property damage at Kourdeh and Lar. Damage at Latifi, Khur, Beraq, and Gerash. Mag. 6.	28 N.	54½ E.
24	14 50 45*	Near coast of central Chile. Felt at Aconcagua and Santa Lucia	32½ S.	72 W.
24	18 04 05*	Kermadec Islands	29 S.	177 W.
24	20 36 57*	Idaho	43 N.	111½ W.
25	00 14 17*	Near south coast of Hokkaido, Japan. Felt at Hakodate and Mori	42 N.	142 E.
25	04 01 10*	Off north coast of Hokkaido, Japan. Felt at Hachinohe, Hiroo, and Kushiro.	46 N.	144 E.
25	12 46 04*	Off south coast of Kamchatka	50 N.	158 E.
25	14 53 53*	Kodiak Island region	56 N.	155 W.
25	16 28 32*	Aegean Sea. Felt at Melissia, Athens	38½ N.	25 E.
25	18 53 17*	Near coast of El Salvador. Felt in southwest El Salvador	13½ N.	88½ W.
26	04 34 06*	Nicaragua-Costa Rica border	11 N.	84½ W.
26	16 23 01*	Hebgen Lake, Montana	44½ N.	111 W.
26	16 30 19*	do	44½ N.	111 W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	m	s		°	′	°	
Apr.26	18	07	46*	Santa Cruz Islands	11½	S.	166½	E.
26	20	19	10*	Off coast of Formosa	24½	N.	122½	E.
26	21	27	12*	Kansu Province, China	39	N.	101	E.
27	04	32	30*	Hebgen Lake, Montana. Felt at West Yellowstone	44½	N.	111	W.
27	11	05	48*	Solomon Islands	9	S.	160	E.
27	17	11	30*	Bismarck Sea	3½	S.	146½	E.
27	17	39	32*	Southern Iran. Depth slightly greater than normal	28	N.	54½	E.
27	21	05	51*	Near north coast of Honshu, Japan. Felt at Miyako	40	N.	142	E.
27	22	43	49*	Off coast of Luzon, Philippine Islands	18	N.	120	E.
28	00	49	16*	Fox Islands, Aleutian Islands	53½	N.	168	W.
28	02	10	14*	Sandwich Islands	59½	S.	26	W.
28	05	08	07*	Near coast of New Guinea	3½	S.	144½	E.
28	16	33	25*	Dodecanese Islands	35½	N.	27	E.
29	02	15	35*	Sandwich Islands	56½	S.	26	W.
29	03	43	04*	----do	55½	S.	25	W.
29	05	45	13*	----do	56½	S.	27	W.
29	09	16	08*	Celebes	0		121½	E.
29	09	53	26*	----do	0		122	E.
29	10	06	14*	----do	0		122	E.
29	11	30	47*	----do	0		122	E.
29	12	47	16*	Ecuador	1	S.	78½	W.
29	13	38	31*	Kermadec Islands	30	S.	178½	W.
29	14	45	42**	Kermadec Islands region				
29	15	35	08**	Near New Britain. Depth slightly greater than normal				
29	18	55	42*	Celebes	½	S.	121½	E.
29	19	32	18*	----do	0		121½	E.
29	20	44	27*	----do	0		121½	E.
30	00	20	09*	----do	0		122	E.
30	04	01	34*	----do	0		121½	E.
30	10	11	23*	----do	0		121½	E.
30	11	00	05*	Tonga Islands region	16	S.	173	W.
30	13	11	29*	Celebes	0		122	E.
30	14	17	04*	Solomon Islands	9	S.	157	E.
30	22	10	07*	Banda Sea. Depth about 600 km	6	S.	124½	E.
30	23	09	10*	Celebes	0		122	E.
May 1	02	55	10*	Fox Islands, Aleutian Islands	52½	N.	166	W
1	04	11	47*	Celebes	0		122	E.
1	17	48	24**	New Guinea. Depth about 200 km				
1	18	02	21*	North of Ascension Island	3	S.	12	W.
2	01	00	00*	Sinkiang Province, China	44	N.	84½	E.
2	02	20	50*	South of Costa Rica	17½	N.	84	W.
2	02	38	32*	Banda Sea. Depth about 60 km	7	S.	129½	E.
2	02	43	45*	Tadzhik S.S.R.	37	N.	69	E.
2	04	16	27*	Kermadec Islands region	28	S.	176	W.
2	04	35	07*	Fiji Islands region. Depth about 600 km	20½	S.	179	W.
2	04	35	56*	Celebes	½	S.	121	E.
2	05	11	46*	----do	½	S.	121	E.
2	08	33	00*	North of Ascension Island	3	S.	12	W
2	08	42	35*	----do	3	S.	12	W.
2	10	39	58*	Off coast of Samar Island, Philippine Islands	13	N.	125½	E.
2	11	51	34*	Celebes	0		121½	E.
2	12	10	11*	Celebes. Felt at Una-Una	0		121½	E.
2	14	40	50*	Off coast of Samar Island, Philippine Islands	13	N.	126	E.
2	17	51	32*	Fiji Islands region. Depth about 600 km	17½	S.	178½	W.
2	18	10	49*	Near east coast of Honshu, Japan	40	N.	143	E.
2	18	37	35*	Dodecanese Islands. Felt on Kalymnos and Patmos	37	N.	27	E.
2	20	02	26*	Celebes. Depth about 250 km	½	N.	124	E.
2	20	31	37*	Kermadec Islands region. Depth about 600 km	28	S.	178½	W.
2	22	48	42*	Near coast of Iran. Felt at Lar	27½	N.	54½	E.
3	06	59	04*	Iran. Felt at Lar	29½	N.	55	E.
3	07	55	07*	China	29	N.	99½	E.
3	07	55	54*	Tonga Islands region	24	S.	179	W.
3	08	07	08*	----do	24	S.	179½	W.
3	13	22	07*	Celebes. Felt at Una-Una	0		121½	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter				
					Latitude			Longitude	
	h	*m*	*s*		°	′		°	′
May 3	13	59	54*	Colombia. Depth about 100 km	7½		N.	73½	W.
3	14	32	34*	Near east coast of Honshu, Japan. Felt at Miyako	40		N.	143	E.
3	15	02	43*	Kurile Islands. Felt at Nemuro	44		N.	148½	E.
3	22	22	41*	South of Honshu, Japan. Felt at Hachijo-jima and Tokyo	32		N.	140	E.
3	23	57	37*	Fiji Islands. Depth about 600 km	19½		S.	178½	W.
4	01	28	52*	Near coast of Peru. Depth about 100 km	18		S.	71½	W.
4	18	26	37*	Celebes	0			122	E.
4	18	29	40*	Loyalty Islands region	20		S.	173	E.
4	22	00	01*	Near coast of New Guinea. Depth about 150 km	5½		S.	146	E.
5	01	03	43*	Fiji Islands region. Depth about 600 km	21½		S.	179	W.
5	03	39	50*	Southwestern Montana. Felt at Manhattan, Logan, and Three Forks.	46		N.	111½	W.
5	04	14	20*	Celebes. Depth about 60 km	½		S.	121½	E.
5	11	26	00*	Near east coast of Kamchatka	52½		N.	158½	E.
5	15	57	27*	Sandwich Islands region	60		S.	23½	W.
5	17	13	30*	Near east coast of Hokkaido, Japan. Felt at Kushiro, Hiroo, and Obihiro.	42		N.	144	E.
5	20	43	33*	Celebes Sea. Depth about 60 km	4		N.	126	E.
5	23	21	15**	New Ireland region					
6	06	19	20*	Near coast of Chile	21½		S.	71	W.
6	12	12	53*	Off coast of Mexico	14½		N.	101	W.
6	13	59	04*	Burma. Depth about 100 km	22		N.	94	E.
6	18	47	26*	Near east coast of Kamchatka	54		N.	161	E.
6	18	53	59*	Peru. Depth about 60 km	7½		S.	74½	W.
6	20	28	42*	Utah	39½		N.	111	W.
6	23	12	43*	Near coast of Greece	37		N.	22	E.
7	14	11	21*	Hokkaido, Japan. Felt at Hiroo, Obihiro, Sapporo, Tomakomai, and Urakawa.	42		N.	143	E.
7	19	40	42*	Near coast of Greece. Felt. Depth about 60 km	38		N.	21	E.
8	02	26	59	Near Julian, California. Felt in San Diego County. Mag. 3.4	33	06	N.	116 39	W.
8	03	22	44*	Pacific Ocean. About 900 miles southeast of Galapagos Islands	6½		S.	108	W.
8	05	10	58*	Fiji Islands. Depth about 450 km	18½		S.	178	W.
8	05	29	32*	Kermadec Islands	31		S.	178	W.
8	12	08	52*	Mexico-Guatemala border. Depth about 60 km	14½		N.	92	W.
8	12	23	57*	Hindu Kush. Depth about 200 km	37		N.	71	E.
8	13	44	56*	Hindu Kush	36½		N.	69	E.
8	14	29	14*	Kurile Islands	45½		N.	151	E.
8	20	56	50*	Fiji Islands region. Depth about 600 km	20		S.	178½	W.
9	00	11	10*	Ryukyu Islands. Felt on Yaku-shima	30½		N.	129½	E.
9	02	46	08*	Celebes Sea	5½		N.	122	E.
9	06	46	00*	Near coast of Venezuela	11		N.	63½	W.
9	06	53	11*	Mariana Islands region. Depth about 100 km	12		N.	144	E.
9	08	59	25*	Solomon Islands	7		S.	155	E.
9	14	36	27*	East Pakistan-India border	25½		N.	89½	E.
9	16	27	26*	Atlantic Ocean	6½		N.	33½	W.
9	20	13	29*	Pacific Ocean. About 900 miles southwest of Galapagos Islands. Depth about 60 km.	4½		S.	106	W.
9	23	45	53*	Hebgen Lake, Montana. Felt	44½		N.	111½	W.
10	09	32	39*	Near coast of northern Chile. Felt at Antofagasta	25		S.	71	W.
10	10	18	58*	Fiji Islands region. Depth about 500 km	20		S.	177½	W.
10	10	56	02*	Sandwich Islands	55½		S.	26	W.
10	17	36	03*	Off southeast coast of Kamchatka	51½		N.	159½	E.
10	21	51	55*	Northeastern Saudi Arabia	27		N.	47½	E.
10	23	16	17*	Near coast of Chiapas, Mexico	15½		N.	92½	W.
10	23	17	57*	Near coast of western Honshu, Japan. Felt at Hamada, Oita, and Uwajima.	34		N.	131½	E.
11	03	58	36*	Off coast of Sumatra. Depth about 200 km	7		S.	103½	E.
11	09	09	02	Near Berkeley, California. Felt. Mag. 2.4 (Berk)	37	50	N.	122 14	W.
11	18	36	00*	Ceram Sea. Mag. 6½	3		S.	131	E.
11	20	12	24*	Alaska Peninsula. Depth about 60 km	55		N.	159½	W.
12	06	22	15*	Sunda Strait. Depth about 100 km	5½		S.	105½	E.
12	07	22	19	Near Mira Loma, California. Felt. Mag. 2.7	34	01	N.	117 32	W.
12	12	09	24*	Brazil-Peru border. Felt at Cerro de Pasco. Depth about 60 km	9		S.	72½	W.
12	16	08	26*	Near coast of Oregon. Depth about 60 km	43½		N.	128½	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 12	19	12	08*	Ceram Island	3½	S.	130½	E.
12	22	32	32*	Near south coast of Panama. Felt at Balboa Heights. Mag. 6½	7½	N.	81	W.
12	23	00	36*	Near south coast of Panama. Felt at Balboa Heights	7½	N.	80½	W.
13	00	30	40*	do	7½	N.	81	W.
13	10	00	40*	Revilla Gigedo Islands region	20	N.	109	W.
13	12	36	40	Baja California. Felt at San Diego. Mag. 4.1	32 25	N.	115 48	W.
13	16	07	14*	Alaska Peninsula. Felt at Cold Bay. Mag. 6¼	55	N.	161½	W.
13	18	53	53*	New Guinea. Felt at Telefomin. Depth about 100 km	5½	S.	141½	E.
13	20	46	35*	Kermadec Islands region	32½	S.	179	W.
14	11	26	54*	Near west coast of Hokkaido, Japan	43½	N.	140	E.
14	14	43	10*	Near southeast coast of Hokkaido, Japan. Felt at Urakawa, Hiroo, and Obihiro.	42½	N.	142	E.
14	22	19	55*	Kamchatka	53½	N.	159½	E.
15	02	57	50*	Near north coast of New Guinea	3	S.	140	E.
15	04	04	24*	Bolivia	21	S.	67	W.
15	11	34	50*	Hebgen Lake, Montana. Felt at West Yellowstone	45	N.	111	W.
15	13	30	20*	Near east coast of Formosa	24	N.	121½	E.
15	21	37	08*	Alaska Peninsula	54½	N.	164½	W.
16	03	34	30	Bear Mountain, Kern County, California. Felt. Mag. 2.3	35 12	N.	118 40	W.
16	04	51	15*	Honshu, Japan. Felt at Iida, Nagoya, and Tsuruga	36	N.	136	E.
16	14	46	53**	Andreanof Islands, Aleutian Islands. Felt on Adak				
17	09	19	32*	Svalbard Islands region	78	N.	8	E.
17	15	43	33*	Tonga Islands region. Depth about 60 km	23½	S.	176	W.
18	06	35	09*	Ryukyu Islands. Felt on Yaku-shima and at Kagoshima and Miyazaki, Japan. Mag. 6¾.	29	N.	130	E.
18	08	40	57*	Persian Gulf	27	N.	52½	E.
18	18	08	54*	Celebes. Depth about 60 km	½	N.	121	E.
19	02	07	00*	Hindu Kush. Felt at Risalpur and Lahore. Depth about 200 km	36	N.	71	E.
19	10	11	51*	Mascarene Islands region	17	S.	66	E.
19	10	14	18**	Northern California				
19	16	46	10*	Fox Islands, Aleutian Islands	53	N.	166	W.
19	22	12	06*	Timor. Depth about 200 km	9½	S.	124	E.
20	00	23	22*	Near north coast of New Guinea	3½	S.	147½	E.
20	04	14	33*	Near coast of Iran, Persian Gulf. Depth about 100 km	27½	N.	53	E.
20	07	53	59*	Ryukyu Islands	28½	N.	130	E.
20	11	12	37*	Norfolk Island. Depth about 60 km. Mag. 6½–6¾	28½	S.	167½	E.
20	17	42	25*	Norfolk Island	28½	S.	167½	E.
20	17	54	02*	Hebgen Lake, Montana. Felt	45	N.	111	W.
20	18	36	06*	do	45	N.	111½	W.
20	19	37	41*	New Britain region. Felt at Karlai, Lolabau, Talilligap, and Rabaul.	4½	S.	150½	E.
21	06	08	55*	Fiji Islands region. Depth about 600 km	20½	S.	178	W.
21	06	41	10*	Near west coast of Greece. Felt at Zante	37½	N.	21	E.
21	08	17	01*	Luzon, Philippine Islands. Felt at Manila and Baguio	15½	N.	121½	E.
21	10	02	50*	Near coast of Chile. Several injured and moderate property damage at Concepcion and surrounding area. Mag. 7½.	37½	S.	73½	W.
21	10	53	51*	Chile	37½	S.	72½	W.
21	11	47	03*	Near coast of Java. Depth about 60 km	8	S.	114	E.
21	11	47	58*	Chile	38	S.	71	W.
21	12	21	16*	do	37½	S.	73	W.
21	12	59	58*	do	37½	S.	72½	W.
21	13	59	17*	do	37½	S.	72½	W.
21	14	31	59*	do	37½	S.	72½	W.
21	15	08	45*	do	37½	S.	72½	W.
21	19	06	23*	do	37½	S.	73½	W.
22	00	58	06*	Norfolk Island region	28½	S.	167½	E.
22	03	46	22*	Chile	37½	S.	73	W.
22	04	15	45*	do	37	S.	73	W.
22	06	01	36*	do	38	S.	73½	W.
22	07	07	18*	do	38	S.	75	W.
22	08	10	53*	do	37½	S.	73	W.
22	10	30	39*	Near coast of Chile. Mag. 6½	38	S.	73½	W.
22	10	32	43*	Near coast of Chile. Mag. 7¼–7½	37½	S.	73	W.
22	10	56	26*	Babuyan Islands	19½	N.	121½	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
May 22	12 16 43*	Chile	38 S.	73 W.
22	13 02 56*	----do	38 S.	73 W.
22	17 12 34*	----do	38½ S.	73½ W.
22	18 55 57*	Near coast of Chile. Mag. 6½	38 S.	73½ W.
22	19 10 37*	Chile	38½ S.	74½ W.
22	19 11 17*	Near coast of Chile. More than 2,000 killed, 3,000 injured, 2,000,000 homeless, and $550 million damage in southern Chile; seismic sea wave caused 61 deaths, $75 million damage in Hawaii; 138 deaths and $50 million damage to Japan; 32 dead and missing in the Philippines; $500 thousand damage to west coast of the United States. Mag. 8½.	39½ S.	74½ W.
22	22 07 48*	Chile. Depth about 60 km	44 S.	72 W.
22	22 14 02*	Chile	39 S.	74 W.
22	22 48 14*	Chile. Depth about 60 km	38 S.	73½ W.
22	23 04 38*	----do	41 S.	76 W.
22	23 12 39*	Chile	40 S.	75 W.
22	23 29 18*	----do	39½ S.	72 W.
22	23 32 40*	Chile. Depth about 60 km	41½ S.	73½ W.
22	23 34 59*	----do	42 S.	73 W.
22	23 56 10*	----do	42½ S.	74 W
23	00 07 58*	----do	44 S.	75 W.
23	00 25 44*	Chile	38½ S.	75 W.
23	00 41 46*	Chile. Depth about 60 km	39 S.	73½ W.
23	00 51 15*	Chile. Depth about 50 km	37½ S.	71½ W
23	00 53 57*	----do	39½ S.	73 W.
23	01 01 45*	Chile. Depth about 60 km	38½ S.	72 W.
23	01 34 53*	Chile	39½ S.	74 W.
23	01 42 40*	Chile. Depth about 60 km	39½ S.	73½ W.
23	01 43 59*	Chile	38½ S.	75 W.
23	01 55 57*	Chile. Depth about 60 km	38 S.	74 W.
23	02 04 52*	Chile	38 S.	74 W.
23	02 06 43*	Chile. Depth about 60 km	41½ S.	75 W.
23	02 12 17*	Chile	42 S.	75 W.
23	02 46 30*	----do	41½ S.	73½ W.
23	02 56 17*	----do	43 S.	75½ W.
23	03 03 16*	Chile. Depth about 60 km	44 S.	74 W.
23	03 56 18*	Chile	38½ S.	74½ W.
23	04 20 20*	Chile. Depth about 60 km	43½ S.	72½ W.
23	04 26 58*	Chile	38 S.	75½ W.
23	04 47 46*	----do	43 S.	75 W.
23	05 13 41*	Chile. Depth about 60 km	38 S.	73 W.
23	05 48 02*	Chile	46½ S.	77 W.
23	06 17 50*	Chile. Depth about 60 km	38½ S.	74 W.
23	06 25 29*	Chile	38½ S.	76 W.
23	07 09 17*	----do	48 S.	77 W.
23	08 13 15*	----do	40½ S.	75½ W.
23	09 52 20*	----do	37½ S.	73 W
23	10 37 59*	----do	43½ S.	73½ W
23	11 22 33*	----do	41 S.	74½ W.
23	12 02 36*	Chile. Depth about 60 km	38 S.	76 W.
23	14 00 29*	----do	45½ S.	77 W.
23	14 01 37*	Chile	42½ S.	74 W
23	15 30 57	Near Pasadena, California. Felt. Mag. 1.5	34 10 N.	118 08 W.
23	16 11 35*	New Hebrides Islands region. Depth about 250 km	16 S.	168 E.
23	18 22 24*	Chile	41 S.	76½ W.
23	18 55 20*	----do	38½ S.	74 W.
23	19 09 08*	----do	40 S.	75½ W.
23	19 44 24*	Chile. Depth about 60 km	38½ S.	74½ W.
23	21 07 35*	----do	40½ S.	75½ W.
23	21 50 32	Near Hollister, California. Mag. 2.9 (Berk)	36 46 N.	121 19 W.
23	22 05 44*	Chile. Depth about 60 km	37 S.	74 W.
23	23 13 14*	Chile	41½ S.	74½ W.
24	01 37 39*	Chile. Depth about 60 km	43 S.	74½ W.
24	01 40 56*	Chile	41½ S.	74½ W

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
May 24	02	47	14*	Chile	41	S.	76	W.
24	03	24	00*	do	38½	S.	74	W.
24	04	57	32*	Chile. Depth about 60 km	43½	S.	73½	W.
24	06	29	19*	Halmahera Island	1	N.	127	E.
24	08	29	19*	Sinkiang Province, China. Depth about 60 km	38½	N.	90½	E.
24	10	21	53*	Chile. Depth about 60 km	38	S.	73½	W.
24	14	06	53*	do	43½	S.	76	W.
24	14	46	34*	South Island, New Zealand. Felt on Milford Sound. Mag. 6¾–7	44½	S.	167½	E.
24	15	16	03*	Chile	42½	S.	73½	W.
24	15	44	36*	Chile. Depth about 60 km	40	S.	74	W.
24	20	32	43*	Chile	50½	S.	74	W.
24	22	10	27*	do	40½	S.	72½	W.
24	23	33	28*	Halmahera Island	1	N.	129½	E.
25	00	19	20*	Chile	45	S.	76	W.
25	03	16	13*	Chile. Depth about 60 km	42	S.	74½	W.
25	04	44	14*	do	47	S.	75	W.
25	06	33	40*	Chile	40	S.	74	W.
25	08	34	33*	Off coast of Chile. Mag. 6¾	45	S.	76	W.
25	09	28	57*	Fiji Islands. Depth about 550 km	17½	S.	179	W.
25	09	59	36*	Chile. Depth about 60 km	38	S.	73½	W.
25	10	13	39*	Kermadec Islands region. Depth about 60 km	28½	S.	177	W.
25	12	38	25	Near Pasadena, California. Felt. Mag. 1.5	34	10 N.	118	08 W.
25	12	45	42*	Chile. Depth about 60 km	41½	S.	74	W.
25	13	34	54	Near Pasadena, California. Felt. Mag. 1.5	34	10 N.	118	08 W.
25	13	38	28*	Halmahera Island	1	N.	129½	E.
25	13	51	27	Near Pasadena, California. Felt. Mag. 1.3	34	10 N.	118	08 W.
25	14	27	38*	Halmahera Island	1	N.	128½	E.
25	14	52	04*	Chile. Depth about 60 km	41	S.	74	W.
25	14	59	12*	Fiji Islands. Depth about 600 km	22	S.	179½	W.
25	15	05	15*	do	22	S.	179½	W.
25	16	22	47*	Chile	39½	S.	75	W.
25	18	39	46*	Hebgen Lake, Montana	45	N.	111½	W.
25	19	21	48*	Chile	40	S.	75½	W.
25	22	09	18*	Chile. Depth about 60 km	41	S.	74	W.
26	00	01	25*	Chile	43	S.	74	W.
26	01	11	12*	Chile. Depth about 60 km	45	S.	75½	W.
26	01	29	10*	Chile	40½	S.	74	W.
26	05	10	05*	Albania-Greece border. 8 killed, 100 injured, and 20% of the buildings destroyed in Korce. Mag. 6½.	40	N.	20	E.
26	06	43	17*	Chile	45½	S.	74	W.
26	07	44	02*	do	38½	S.	73½	W.
26	11	54	48*	Chile. Depth about 60 km	42	S.	74	W.
26	12	20	33*	do	40	S.	76½	W.
26	15	08	39*	do	41½	S.	73½	W.
26	15	36	35*	do	39	S.	75	W.
26	17	03	31*	do	43	S.	75	W.
26	18	04	50*	Near coast of Sumatra	4½	N.	96½	E.
26	19	12	16	Baja California. Felt at San Diego. Mag. 3.7	32	05 N.	116	16 W.
26	19	33	56*	Chile. Depth about 60 km	38½	S.	73	W.
26	20	05	07*	Eastern India. Felt	27	N.	93	E.
27	00	25	03*	Loyalty Islands region	22	S.	172	E.
27	00	36	17*	Chile	45	S.	73	W.
27	00	59	46*	do	44½	S.	76	W.
27	01	24	45*	Mongolia	42½	N.	98½	E.
27	03	17	21*	Chile	41	S.	76	W.
27	03	35	13*	Chile. Depth about 60 km	42	S.	75	W.
27	04	35	26*	New Britain region. Depth about 60 km	5	S.	153	E.
27	05	04	06*	Chile. Depth about 60 km	42	S.	73½	W.
27	11	24	14	Near Pasadena, California. Felt. Mag. 1.2	34	10 N.	118	08 W.
27	12	12	17*	Chile. Depth about 60 km	42	S.	73½	W.
27	13	24	27	Near Pasadena, California. Felt. Mag. 1.1	34	10 N.	118	08 W.
27	17	19	47*	Sandwich Islands	56½	S.	26½	W.
27	18	25	06*	Chile	39½	S.	74½	W.
27	20	10	00*	New Britain region. Felt at Taliligap. Depth about 150 km	5½	S.	153	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
May 27	20	49	23*	Chile-Bolivia border. Depth about 60 km	21	S.	70½	W.
27	23	06	55*	Chile	45	S.	77	W.
27	23	20	37*	do	44	S.	77	W.
28	01	26	19*	do	40½	S.	75½	W.
28	03	05	53*	do	39½	S.	74½	W.
28	06	06	11*	Chile. Depth about 60 km	46	S.	74½	W.
28	08	19	04*	Chile-Bolivia border. Depth about 150 km	19½	S.	68½	W.
28	10	44	16*	Chile. Depth about 60 km	40½	S.	74	W.
28	11	05	40*	Chile	38	S.	73	W.
28	11	35	11*	Crete. Depth about 100 km	34	N.	25½	E.
28	11	39	40*	Chile	43	S.	75½	W.
29	01	28	49*	Chile. Depth about 60 km	42½	S.	75	W.
29	01	51	19*	Chile	38½	S.	76	W.
29	03	33	22*	do	38½	S.	74	W.
29	07	39	29*	Chile. Mag. 6½	38	S.	72½	W.
29	08	20	01*	Ryukyu Islands	25½	N.	124½	E.
29	08	34	20*	Chile	37½	S.	73	W.
29	10	17	40*	do	43	S.	73	W.
29	14	05	25*	do	37½	S.	73	W.
29	19	57	30*	Celebes	0		121½	E.
29	21	23	54*	Chile	43	S.	77	W.
29	21	39	46*	Chile. Depth about 60 km	38	S.	73½	W.
30	07	00	38*	Chile	40	S.	73½	W.
30	07	01	15*	Unimak Island region	53½	N.	164	W.
30	08	29	27*	Kermadec Islands region	32	S.	177½	W.
30	16	06	09*	Near coast of Luzon, Philippine Islands. Felt at Baguio, Baler, Castgoran, Manila, and Quezon City. Depth about 100 km.	15½	N.	121½	E.
30	17	46	43*	Chile. Depth about 60 km	38½	S.	74	W.
31	00	23	49*	Gulf of Aden. Depth about 60 km	13½	N.	55	E.
31	02	40	00*	Chile. Mag. 6½	39½	S.	75	W.
31	03	54	46*	Arctic Ocean	73½	N.	13	E.
31	04	33	15*	Chile	38½	S.	73½	W.
31	04	52	28*	New Hebrides Islands region	18	S.	168½	E.
31	05	38	50	West of Caliente, California. Felt at Keene. Mag. 2.3	35	18 N.	118	44 W.
31	11	02	20*	Leeward Islands. Felt at St. Kitts and Antigua. Mag. 6½–6¾	18	N.	62	W.
31	11	42	19*	Leeward Islands region	19	N.	61½	W.
31	13	11	02*	Solomon Islands	7½	S.	156	E.
31	16	19	51*	Chile	41½	S.	73½	W.
31	18	34	04*	New Hebrides Islands region	18½	S.	168	E.
31	19	01	30*	Chile	38	S.	74½	W.
31	20	03	35*	do	42	S.	75	W.
31	21	00	40*	Java Sea. Depth about 600 km	5½	S.	109½	E.
June 1	01	35	19*	Chile	39½	S.	73½	W.
1	05	02	56*	do	38	S.	73	W.
1	12	58	45*	Off coast of Chile	39½	S.	75½	W.
1	14	06	49*	Chile	43½	S.	74	W.
1	17	42	50*	Kamchatka. Depth about 100 km	51	N.	157	E.
1	21	12	50*	Near coast of Chile	42	S.	74	W.
1	22	31	46*	Off coast of Chile. Depth about 60 km	40½	S.	75½	W.
1	23	24	44*	do	40	S.	75½	W.
2	01	52	52*	Near south coast of Mindanao, Philippine Islands. Depth about 550 km.	4½	N.	123½	E.
2	02	39	05*	Near coast of Chile. Depth about 60 km	45	S.	74	W.
2	05	02	33*	Chile	39	S.	73	W.
2	05	58	03*	Southern Chile. Mag. 6¾	46½	S.	74	W.
2	07	19	10*	Tonga Islands. Depth about 150 km	19	S.	175	W.
2	07	22	30*	Iran	33½	N.	60	E.
2	07	47	11*	New Britain. Felt at Rabaul, Kariai, Ragarere, and Palmalmal. Mag. 6½–6¾.	5½	S.	151½	E.
2	08	14	01*	Fiji Islands region. Depth about 600 km	17½	S.	176	W.
2	08	36	10*	Near coast of Chile	40	S.	74	W.
2	10	42	15*	Chile. Depth about 60 km	40	S.	73	W.
2	12	42	38*	Iran	33½	N.	49	E.
2	13	30	43*	Near coast of Chile	43	S.	73½	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
June 2	16	51	24*	Off coast of Chile. Depth about 60 km	38½	S.	75½	W.
2	18	07	51*	Leeward Islands region	18½	N.	61	W.
2	18	59	05*	Fiji Islands. Depth about 550 km	20½	S.	178½	W.
2	19	48	29*	----do----	20½	S.	178	W.
2	21	30	58*	Near coast of Chile	38½	S.	74	W.
2	23	20	01*	New Britain. Depth about 60 km	6½	S.	149½	E.
3	03	22	31*	Kermadec Islands. Depth about 60 km	29	S.	176½	W.
3	07	38	14*	New Britain. Felt at Lolobar, Palmalmal, and Taliligap	5½	S.	151	E.
3	10	27	40*	Southern Bolivia. Depth about 250 km	19	S.	66½	W.
3	13	14	38*	Fiji Islands. Depth about 600 km. Mag 6	17½	S.	179½	W.
3	13	23	37*	----do----	17½	S.	179	W.
3	13	43	20*	Near coast of South Island, New Zealand	44	S.	167½	E.
3	16	18	04*	Near south coast of Hokkaido, Japan. Felt at Aomori, Miyako, Hachinohe, and Urakawa.	41½	N.	141½	E.
3	18	17	36*	Off coast of southern Chile	42½	S.	75	W.
3	21	38	02*	Gulf of California. Felt at San Diego. Mag. 4.8	31½	N.	114	W.
3	21	48	57*	Chile	41	S.	73½	W.
4	02	27	06*	Near coast of Jalisco, Mexico. Mag. 6–6¼	20	N.	104½	W.
4	03	02	49*	Near coast of Chile	39	S.	73½	W.
4	03	18	54*	Indian Ocean	9	S.	67	E.
4	06	21	54*	Southwest of New Zealand	52½	S.	159	E.
4	08	09	55*	Azores region	40½	N.	29½	W.
4	08	51	20*	South of Crete. Depth about 150 km	34	N.	26½	E.
4	09	35	44*	Off coast of Chile	40	S.	76	W.
4	10	14	11*	Volcano Islands region	24	N.	143	E.
4	10	23	25*	Near coast of Chile. Depth about 60 km	42½	S.	74	W.
4	11	05	10*	Azores region	39½	N.	30½	W.
5	03	27	52*	Near coast of Chile. Depth about 60 km	44	S.	75	W.
5	05	29	37*	Antarctic Ocean. About 500 miles east of Balleny Islands	65	S.	178	E.
5	07	47	08	Northwest of Bishop, California. Felt in Yosemite Valley. Mag. 5.1.	37.5	N.	118.6	W.
5	09	34	58*	Central Guatemala. Depth about 200 km	14½	N.	91	W.
5	19	30	30*	Kermadec Islands	31½	S.	177	W.
5	20	27	49*	Near coast of Chile. Depth about 60 km	43	S.	74½	W.
6	01	17	48	West of Arcata, California. Slight damage at Crannell and Eureka. Mag. 5.7.	40 49	N.	124 53	W.
6	05	55	50*	Near coast of Chile. Depth about 60 km. Mag. 6¾–7	45½	S.	73½	W.
6	17	15	33*	Near coast of southern Chile	46	S.	73½	W.
6	23	30	08*	South of Fiji Islands. Depth about 600 km	23½	S.	180	
7	03	35	01*	Near coast of Chile. Depth about 60 km	46	S.	74	W.
7	05	22	34*	Southern Chile	40½	S.	72	W.
7	05	25	11*	Indian Ocean	17	S.	98	E.
7	07	00	17*	Tonga Islands region. Depth about 150 km	16	S.	174½	W.
7	10	54	31*	Sandwich Islands	56	S.	27	W.
7	11	19	49*	Sumbawa Island. Depth about 150 km	9	S.	117	E.
7	12	55	58*	Off coast of southern Chile	40½	S.	77	W.
7	12	57	15*	Near east coast of Kamchatka	53	N.	158½	E.
7	13	27	49*	Fiji Islands. Depth about 500 km	20	S.	177½	W.
7	14	02	06*	Near coast of Chile. Depth about 60 km	43	S.	73½	W.
7	15	34	50*	Arabian Sea	14	N.	57	E.
8	02	16	57	Near Tehachapi, California. Felt. Mag. 2.4	35 10	N.	118 20	W.
8	02	54	19	Near Ferndale, California. Felt in Humboldt County. Mag. 4.3	40 34	N.	124 13	W.
8	05	10	25*	Boeroe Island	3½	S.	127	E.
8	09	31	10*	Off coast of Chile	40½	S.	76	W.
8	13	27	53*	Near coast of Chile. Depth about 60 km	42	S.	74½	W.
8	16	19	48*	North Atlantic Ocean	35	N.	35	W.
8	21	47	48*	Near coast of Colombia. Depth about 100 km. Felt in western Colombia.	5	N.	77	W.
9	02	44	08*	Eastern Turkey	39½	N.	39½	E.
9	05	05	01*	Near south coast of Java. Depth about 350 km	9	S.	112½	E.
9	06	19	25*	Near coast of Chile	43	S.	74	W.
9	08	23	59*	Strait of Otranto. Felt at Jannina	39½	N.	19	E.
9	10	05	01*	Near coast of Chile	38½	S.	74	W.
9	10	53	36*	Southern Bolivia. Depth about 200 km	22	S.	69	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
June 9	11	19	10*	Hebgen Lake, Montana. Felt at Anaconda and Butte	45	N.	111½	W.
9	11	23	51*	New Hebrides Islands. Felt at Port Vila. Mag. 5¾–6 (Berk)	18	S.	169	E.
9	17	47	41*	Azores. Felt on Pico Islands, Sao Miguel, and Terceira	38	N.	26	W.
10	09	08	02*	Samoa Islands region	15½	S.	174	W.
10	11	31	37*	Fiji Islands region	17	S.	174	E.
10	11	59	06*	Banda Sea	6½	S.	131	E.
10	14	29	47*	Near coast of Chile	37	S.	75	W.
10	21	12	05*	Samoa Islands region. Mag. 5½ (Berk)	15½	S.	174	W.
11	00	34	48*	Southern Bolivia. Depth about 300 km. Mag. 6¼	21	S.	64½	W.
11	11	49	29*	Kurile Islands	48½	N.	153½	E.
11	15	14	07*	D'Entrecasteaux Islands. Mag. 6½–6¾	9	S.	152½	E.
11	16	22	00*	Off coast of Chile	43½	S.	75	W.
11	16	37	40*	D'Entrecasteaux Islands	9½	S.	152½	E.
11	17	07	57*	do	9½	S.	152½	E.
11	17	34	32*	Near coast of Chile	38	S.	73½	W.
11	18	21	30*	Off coast of Chile	40	S.	74½	W.
11	20	55	13*	D'Entrecasteaux Islands. Depth about 150 km	10	S.	152	E.
11	21	36	56	Baja California. Felt at Descanso, California. Mag. 4.5	32	16 N.	115	42 W.
11	21	48	48*	D'Entrecasteaux Islands. Depth about 200 km	9½	S.	152	E.
12	00	02	55*	Off coast of Chile	37	S.	75	W.
12	03	56	44*	South of Fiji Islands	22½	S.	179	E.
12	04	57	22*	Banda Sea. Depth about 300 km	6	S.	128	E.
12	06	58	12*	Kermadec Islands. Depth about 250 km	29½	S.	179	W.
12	07	15	34	Near Westwood, California. Felt. Mag. 3.1	40	20 N.	121	03 W.
12	07	19	43*	South Pacific Ocean. Mag. 6¼	36	S.	98	W.
12	07	38	59*	South Pacific Ocean	36½	S.	99½	W.
12	15	05	01*	Near coast of Chile	46	S.	74	W.
12	15	16	20*	Loyalty Islands region	22½	S.	172	E.
12	21	04	31*	Southern Chile	45½	S.	73	W.
12	22	50	02*	Near coast of Chile. Depth about 60 km	43½	S.	74½	W.
12	23	10	00*	Black Sea	42½	N.	28½	E.
13	00	32	05*	Off coast of Chile	40½	S.	76	W.
13	03	19	39*	Fiji Islands region. Depth about 600 km	20½	S.	178½	W.
13	05	47	05*	Off coast of southern Chile	44½	S.	76½	W.
13	11	53	24*	Banda Sea. Depth about 100 km	5	S.	130½	E.
13	12	38	45*	Hebgen Lake, Montana	45	N.	111	W.
13	14	59	48*	Hebgen Lake, Montana. Felt at Butte, Ennis, and in Gallatin River Valley.	45	N.	111	W.
13	23	31	53*	Off coast of Chile	42½	S.	74½	W.
14	02	54	13*	Near coast of southern Chile	43	S.	73	W.
14	04	27	00*	Kurile Islands	44½	N.	149	E.
14	11	45	45*	Argentina	33	S.	67	W.
14	18	53	17*	Celebes. Depth about 100 km	0		120½	E.
14	23	38	13*	D'Entrecasteaux Islands	9	S.	152½	E.
15	08	09	13*	South of New Britain	8½	S.	150	E.
15	09	40	38*	Off coast of Chile	45	S.	76½	W.
15	11	18	09*	Near coast of Chile	44	S.	74	W.
15	12	23	02*	Southwest coast of Mexico	19	N.	105	W.
15	13	45	46*	About 250 km. southwest of Guam. Depth about 100 km	12½	N.	142½	E.
15	15	36	51*	Near north coast of Honshu, Japan. Felt at Aomori, Morioka, Hachinohe, and Miyako.	41	N.	142½	E.
15	22	49	39*	Kermadec Islands	32	S.	177½	W.
15	22	50	47**	Solomon Islands				
15	23	27	40*	Western New Guinea	½	S.	133	E.
15	23	32	35*	South of Fiji Islands. Depth about 600 km. Mag. 6¼–6½	26	S.	178½	E.
16	03	04	34*	Indian Ocean	37½	S.	78½	E.
16	03	24	42*	Mariana Islands. Depth about 150 km	12	N.	143½	E.
16	04	02	46*	Near coast of Chile	38	S.	73½	W.
16	06	37	48*	Near coast of Samar, Philippine Islands	12½	N.	125	E.
16	09	05	07*	Off northeast coast of North Island, New Zealand	35	S.	179	E.
16	09	55	28*	Mariana Islands	11½	N.	144	E.
16	10	20	04*	Indian Ocean	2	S.	69	E.
17	02	44	57*	Fiji Islands. Depth about 600 km	17½	S.	178½	W.
17	05	02	34*	do	18	S.	178	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June17	10	34	38*	South of Sumbawa Island. Depth about 60 km	11½	S.	117½	E.
17	13	53	02*	Near north coast of Honshu, Japan. Felt at Miyako and Aomori	40½	N.	142	E.
17	14	45	39*	Kermadec Island region. Depth about 350 km	27	S.	179	W.
17	16	35	32*	Andreanof Islands, Aleutian Islands. Felt on Adak. Mag. 6–6¼	52½	N.	173½	W.
17	17	16	16*	Andreanof Islands, Aleutian Islands	51½	N.	174½	W.
17	18	00	29*	Off northeast coast of Honshu, Japan. Depth about 100 km	40	N.	143	E.
17	18	05	16*	Off northeast coast of Honshu, Japan. Felt at Miyako and Morioka	40	N.	143	E.
17	20	36	04*	Andreanof Islands, Aleutian Islands	51	N.	176	W.
17	21	49	17*	Hebgen Lake, Montana	45	N.	111	W.
17	23	03	29*	South of Java. Depth about 150 km	10½	S.	108½	E.
18	02	04	06*	North of Libya. Depth about 150 km	33	N.	24½	E.
18	02	32	51*	Kermadec Islands region. Depth about 200 km	30½	S.	177½	W.
18	03	19	04*	D'Entrecasteaux Islands	9½	S.	152½	E.
18	22	40	44*	Kermadec Islands region. Depth about 150 km	29	S.	176½	W
18	23	32	33*	Near coast of Sumatra. Depth about 60 km	5½	S.	102	E.
19	01	56	58*	Kurile Islands	44½	N.	148½	E.
19	02	21	21*	Andaman Islands	11½	N.	93	E.
19	02	29	30*	North central Turkey	39	N.	38½	E.
19	09	43	38*	Solomon Islands	10	S.	161	E.
19	12	21	53*	Fiji Islands region. Depth about 500 km	15	S.	178½	W.
19	12	34	34*	Kurile Islands. Felt at Nemuro	44½	N.	149	E.
19	17	17	25*	Bonin Islands	38	N.	142½	E.
19	21	42	50*	Off coast of Chile	36½	S.	76	W.
20	02	01	08*	Near coast of Chile. Mag. 7¼	38	S.	73½	W.
20	03	21	49*	Banda Sea. Depth about 60 km	5½	S.	127½	E.
20	12	05	09*	Ceram Island	3	S.	129	E.
20	12	59	40*	Southern Chile. Mag. 6¾–7	39½	S.	73	W.
20	14	23	36*	Near coast of southern Chile. Depth about 60 km	41	S.	74½	W.
20	16	56	25*	Kodiak Island, Alaska	57	N.	154½	W.
20	16	59	35*	Off coast of Chile	38½	S.	74	W.
20	17	46	48*	South of Kyushu, Japan	30	N.	130	E.
20	22	56	49*	Honshu, Japan. Felt at Choshi, Mito, Kakioka, and Tokyo	36½	N.	139½	E.
21	08	34	39*	Pacific Ocean, southwest of Galapagos Islands	4½	S.	105	W.
21	12	43	31*	Molucca Passage	3	N.	126½	E.
21	14	05	57*	Near coast of Ecuador	2	S.	80½	W.
21	18	09	19*	Fiji Islands. Depth about 400 km	19	S.	178	W.
21	21	33	45*	Sandwich Islands region	61	S.	21	W.
22	02	27	28*	Kermadec Islands	30½	S.	178	W.
22	02	58	24*	Antarctic Ocean, northwest of Balleny Islands	62	S.	156½	E.
22	04	18	53**	New Britain region				
22	06	40	15*	Near coast of Chile. Depth about 60 km	39	S.	74½	W.
22	08	11	52*	Near coast of southern Chile	44½	S.	74½	W.
22	08	57	19*	Chile	36½	S.	72½	W.
22	16	12	00*	Arabian Sea	12	N.	57½	E.
22	20	13	18*	Near coast of Chile	38½	S.	73½	W.
22	21	46	54*	——do	38	S.	73	W.
22	23	28	50*	Andreanof Islands, Aleutian Islands	52	N.	173	W.
23	12	08	13*	Timor Island region	7	S.	127½	E.
23	19	23	30*	Kurile Islands. Depth about 150 km	47	N.	152½	E.
23	23	31	21*	Near coast of Kamchatka. Depth about 60 km	53	N.	159½	E.
24	15	28	13*	New Hebrides Islands region. Depth about 60 km	21½	S.	170	E.
24	17	55	37*	Near coast of Chile. Depth about 60 km	40	S.	73½	W.
24	22	34	43*	Kermadec Islands	30	S.	177½	W.
25	00	00	38*	Sumbawa Island region	8	S.	118	E.
25	02	02	35*	Kermadec Islands	30½	S.	177	W.
25	08	19	37	Southwest of San Francisco, California. Felt. Mag. 2.3 (Berk)	37 43	N.	122 33	W.
25	12	21	30*	West of Crete	35	N.	23	E.
25	13	53	37*	Colombia. Felt in Antioquia and Santander	6½	N.	72½	W.
25	14	41	42*	Kermadec Islands. Felt on Raoul Island. Mag. 6½–6¾	30½	S.	177	W.
25	14	58	59*	Keramdec Islands	30	S.	177	W.
25	19	35	27*	Catamarca Province, Argentina. Depth about 100 km	28	S.	68	W.
25	19	55	46*	Mongolia	47	N.	94½	E.
26	06	16	55*	Near coast of Chile	44	S.	74½	W.
26	16	48	44*	Indian Ocean	26	S.	70½	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
June27	00 15 56*	Off coast of Chile	43½ S.	77 W.
27	16 50 24*	Kermadec Islands	32½ S.	178 W.
27	17 33 56*	do	31½ S.	178 W.
27	19 09 21*	Fiji Islands. Depth about 600 km	18 S.	178½ W.
28	06 41 32	Near Westwood, California. Felt. Mag. 3.8	40 19 N.	121 02 W.
28	08 20 45*	South of Volcano Islands. Depth about 150 km	22½ N.	144½ E.
28	12 40 44	East of Santa Cruz, California. Felt. Mag. 3.5	36 55 N.	121 45 W.
28	15 30 21*	Sandwich Islands region	60 S.	18½ W.
28	16 07 43*	Tonga Islands region. Depth about 550 km	21½ S.	177 W.
28	20 00 48	Northwest of San Bernardino, California. Felt. Mag. 4.1	34 08 N.	117 26 W.
28	21 03 06*	Mongolia	46 N.	94½ E.
29	01 17 00*	Near coast of Chile	38½ S.	73½ W.
29	01 57 16*	do	43 S.	74 W.
29	04 29 12*	Kermadec Islands	30 S.	177½ W.
29	05 14 56*	South of Honshu, Japan. Depth about 500 km	30 N.	139 E.
29	09 44 53*	South Pacific Ocean	36½ S.	98 W.
29	10 23 02*	Atlantic Ocean	47½ N.	27 W.
29	11 33 50	Northwest of San Bernardino, California. Felt. Mag. 2.2	34 08 N.	117 26 W.
29	17 07 00*	Fox Islands, Aleutian Islands	53 N.	168½ W.
30	19 58 33*	Kenai Peninsula, Alaska. Felt at Anchorage, Kasilof, Seward, and Sterling.	60 N.	151 W.
30	23 56 23*	Sumba Island	10 S.	119 E.
July 1	03 25 48	Near Caliente, California. Felt. Mag. 2.5	35 15 N.	118 35 W.
1	07 58 58*	Komandorskie Islands	56 N.	165 E.
1	08 18 51*	Central Chile	37 S.	73 W.
1	09 31 07	Baja California. Felt at Descanso, California. Mag. 3.8	33 11 N.	115 42 W.
1	10 10 10*	Santa Cruz Islands	10½ S.	165½ E.
1	17 40 38*	Mariana Islands. Depth about 60 km	11½ N.	142½ E.
1	22 13 44*	San Bernardino, California. Mag. 4.5	35 N.	117 W.
2	04 29 30*	Andreanof Islands, Aleutian Islands	51½ N.	173½ W.
2	08 58 01*	Southern Chile	45½ S.	75 W.
2	11 55 41*	Sandwich Islands	56 S.	27 W.
2	12 44 21*	Sea of Japan. Depth about 550 km	41 N.	131½ E.
2	21 53 22*	Andreanof Islands, Aleutian Islands	51½ N.	175½ W.
3	03 19 19*	do	52 N.	174 W.
3	05 16 08*	do	52 N.	173 W.
3	07 16 14*	do	52 N.	173½ W.
3	20 20 46*	Andreanof Islands, Aleutian Islands. Felt on Adak. Mag. 6¾–7	50½ N.	177 W.
3	22 52 24*	Andreanof Islands, Aleutian Islands	50½ N.	177 W.
4	04 09 21*	Near east coast of Honshu, Japan. Felt. Depth about 60 km	37 N.	141 E.
4	04 28 33*	Queen Charlotte Islands. Mag. 6½–6¾	52 N.	131½ W.
4	08 02 07*	Western Brazil. Depth about 600 km	8 S.	71 W.
4	08 51 20*	Queen Charlotte Islands	52 N.	131 W.
4	11 13 17*	do	52 N.	130½ W.
4	13 10 05*	Queen Charlotte Islands. Mag. 6	52 N.	131 W.
4	21 29 25*	Southern Chile. Depth about 60 km	43 S.	74 W.
5	05 07 59*	Andreanof Islands, Aleutian Islands	51½ N.	178½ W.
5	05 45 30*	Near coast of Chile	43½ S.	73½ W.
5	08 06 31*	do	39 S.	74 W.
5	21 15 09*	Western Brazil. Depth about 600 km	8 S.	71½ W.
6	05 16 44*	Hindu Kush region. Depth about 200 km	36½ N.	70½ E.
6	14 43 00*	Molucca Passage. Depth about 200 km	3 N.	126½ E.
6	23 14 19*	Tadzhik S.S.R.	39½ N.	71½ E.
6	23 17 09*	Banda Sea	5 S.	125 E.
6	23 36 04*	Solomon Islands	5½ S.	155 E.
7	15 47 14*	Southern Chile	42 S.	75½ W.
7	16 45 26*	South of Easter Island	35½ S.	105 W.
7	17 37 49*	Near coast of Chile	38½ S.	73½ W.
7	21 41 00*	do	38½ S.	74 W.
8	03 55 44	Near Santa Ana, California. Felt. Mag. 3.3	33 43 N.	117 52 W.
8	07 28 07*	Northeastern Idaho. Felt in Yellowstone National Park, Wyoming.	44½ N.	111½ W.
8	10 09 11*	Andreanof Islands, Aleutian Islands	52 N.	174½ W.
8	12 51 27*	Near south coast of Kyushu, Japan. Felt. Depth about 100 km	30½ N.	130½ E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth ,and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 8	14	44	40*	Banda Sea	7	S.	129	E.
8	15	23	42*	New Hebrides Islands. Depth about 200 km	14	S.	167½	E.
9	00	24	40*	Andreanof Islands, Aleutian Islands	50	N.	177½	W.
9	00	42	29*	Ryukyu Islands	25½	N.	125½	E.
9	02	05	39*	Southern Peru. Depth about 200 km	15	S.	70½	W.
9	21	36	40*	Northwestern Utah	41½	N.	112	W.
9	22	42	54*	Southern Yugoslavia	40½	N.	21	E.
9	23	23	17*	Hokkaido, Japan. Felt at Kiroo and Urakawa. Depth about 100 km.	41½	N.	144	E.
10	00	05	38*	Off west coast of Sumatra. Depth about 150 km	1	N.	98½	E.
10	13	39	55*	Near coast of Nicaragua. Felt at Managua. Depth about 150 km	12½	N.	86	W.
10	20	22	51*	South of Australia	53½	S.	134	E.
11	05	11	39	North of Long Beach, California. Felt. Mag. 2.4	33 48	N.	118 10	W.
11	06	58	28*	Off coast of Chile	38	S.	75	W.
11	07	33	32*	South of Australia	54	S.	140½	W.
11	11	54	16*	Andreanof Islands, Aleutian Islands	51½	S.	173	W.
11	11	55	10*	Tonga Islands region. Mag. 6	16	S.	172	W.
12	17	00	25*	Off coast of northern Honshu, Japan. Felt	41	N.	142	E.
13	02	30	32*	Near south coast of Hokkaido, Japan. Felt. Depth about 100 km	43	N.	143½	E.
13	07	24	55*	Gulf of California	30½	N.	114	W.
13	07	55	58*	Bouvet Island region	54	S.	1	E.
13	10	20	32*	Greece. Felt	40½	N	24½	E.
13	13	01	00*	Greece. Minor damage on Chalcidice Peninsula	41	N.	23½	E.
13	14	28	44*	New Hebrides Islands	15	S.	168½	E.
13	16	23	56*	Oaxaca, Mexico. Felt. Depth about 150 km	17	N.	94½	W.
13	20	27	46*	Off coast of Honshu, Japan. Felt	34	N.	139	E.
13	21	45	09*	Central Peru. Depth about 150 km	9½	S.	75	W.
14	02	07	21*	Ryukyu Islands. Depth about 200 km	25	N.	124½	E.
14	10	27	11*	Molucca Passage. Depth about 100 km	5	N.	127½	E.
14	10	45	02*	South of Fiji Islands. Depth about 600 km	23½	S.	180	
14	11	24	58*	Yellowstone National Park, Wyoming	44½	N.	110½	W.
14	15	21	41*	Celebes	1	N.	120½	E.
14	18	39	34*	Ethiopia	7	N.	38½	E.
14	20	18	45*	Celebes	0		123	E.
14	22	11	06*	Hindu Kush. Depth about 100 km	36	N.	70	E.
15	05	02	09*	Off northwest coast of Madagascar. Depth about 60 km	12	S.	45	E.
16	04	44	34*	Southern Bolivia. Depth about 150 km	21½	S.	67	W.
16	17	17	44*	Mariana Islands. Depth about 300 km	21½	N.	143	E.
16	21	19	37*	Seward Peninsula, Alaska. Felt at Teller	65½	N.	167½	W.
16	22	02	53*	do	65½	N.	167½	W.
17	02	15	07*	Samar, Philippine Islands	12	N.	125½	E.
17	05	14	56*	Hindu Kush. Depth about 200 km	36	N.	69	E.
17	11	50	15*	Near coast of Venezuela. Felt at Trinidad, West Indies. Depth about 100 km.	10½	N.	62	W.
17	19	42	38*	Ascension Island region	10	S.	13	W.
18	00	54	07*	Nicobar Islands. Depth about 150 km	7	N.	94	E.
18	01	15	24*	do	6½	N.	95½	E.
18	01	43	29*	New Britain region. Felt. Depth about 200 km	4½	S.	151	E.
18	01	48	36*	Uzbek S.S.R.	39	N.	65	E.
18	04	40	54*	Lake Baikal, U.S.S.R.	56	N.	111	E.
18	07	46	53*	Tonga Islands	17	S.	174½	W.
18	16	51	41*	Hindu Kush	37½	N.	70½	E.
18	18	50	32*	Amirante Islands	7	S.	51½	E.
18	23	17	30*	Yellowstone National Park, Wyoming. Felt	44½	N.	110½	W.
19	02	42	30*	Galapagos Islands	1	N.	87½	W.
19	04	19	14*	Near coast of Peru	7	S.	80	W.
19	11	12	55*	Argentina-Chile border. Depth about 200 km	28½	S.	68½	W.
19	16	03	18*	Chiapas, Mexico. Depth about 200 km	16½	N.	92½	W.
19	18	29	31*	Mariana Islands. Depth about 100 km	13½	N.	146	E.
20	09	30	38*	Kurile Islands region	49	N.	157½	E.
20	20	59	25*	New Hebrides Islands. Depth about 200 km	20½	S.	169	E.
20	21	38	23*	Near coast of Chile	38	S.	73½	W.
21	20	51	20*	Bonin Islands	27	N.	142½	E.
22	15	49	30*	New Mexico. Felt in the Socorro area	34	N.	106½	W

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
July 23	01	31	17*	Southeast Idaho	42½	N.	111½	W.
23	04	10	13*	----do	42½	N.	111½	W.
23	07	26	49*	----do	42½	N.	111½	W.
23	07	31	38*	Fiji Islands. Depth about 600 km	21½	S.	179½	W.
23	14	15	26*	New Mexico. Slight damage at Lajoya	34	N.	106½	W.
24	02	26	45*	Andreanof Islands, Aleutian Islands	50½	N.	177½	W.
24	09	48	56*	Near coast of Kamchatka	56	N.	164	E.
25	01	30	00*	Southeast Idaho	42½	N.	111½	W.
25	01	47	18*	----do	42½	N.	111½	W.
25	03	41	05*	Near coast of Kamchatka. Mag. 6½	55	N.	163	E.
25	10	27	00**	Fiji Islands. Depth about 500 km				
25	11	12	00*	Kamchatka. Depth about 100 km. Mag. 7	54	N.	159	E.
25	15	30	24*	Near east coast of Kamchatka	53½	N.	159	E.
25	21	11	36*	Iran	32	N.	56½	E.
25	21	36	46*	Bismarck Sea	3	S.	148	E.
26	03	55	54*	Off east coast of Hokkaido, Japan. Felt at Miyako	40½	N.	144½	E.
26	12	36	20*	Turkey. Felt at Tokat	40½	N.	37	E.
27	03	57	21*	Sandwich Islands	59½	S.	26	W.
27	08	56	10*	Near coast of Sumatra	6	S.	103½	E.
27	10	05	07*	Near coast of southern Chile. Depth about 150 km. Mag. 6¼–6½	44½	S.	76	W.
27	13	27	14*	New Hebrides Islands	19	S.	167½	E.
27	14	10	01*	Bismarck Sea. Depth about 150 km	5½	S.	147½	E.
27	21	01	00*	Kermadec Islands	29	S.	176½	W.
28	10	35	41*	Santa Cruz Islands	11½	S.	167	E.
29	00	24	06*	Loyalty Islands. Mag. 6½–6¾	19½	S.	170½	E.
29	01	50	29*	New Hebrides Islands	19½	S.	170	E.
29	09	29	37*	Venezuela-Colombia border	7½	N.	72	W.
29	10	42	43*	India	26½	N.	90½	E.
29	14	33	40*	Eastern Afghanistan. Felt at Quetta, Pakistan	32	N.	67½	E.
29	15	28	03*	New Hebrides Islands	19½	S.	170	E.
29	16	45	43*	Southern Iran. Depth about 100 km	27½	N.	54½	E.
29	17	31	45*	Honshu, Japan. Felt. Depth about 100 km. Mag. 6¾	40	N.	142½	E.
30	02	04	48*	Ecuador. 11 killed and minor property damage in Ambato area. Felt at Riobamba and Guayaquil.	1½	S.	79	W.
30	07	15	15*	Ecuador. Depth about 200 km	2½	S.	77½	W.
30	14	12	34*	Near east coast of Kamchatka	56	N.	164	E.
31	02	55	51*	New Britain. Felt. Depth about 100 km. Mag. 6¾	6	S.	150	E.
31	07	04	36*	New Britain. Felt. Depth about 100 km. Mag. 6½	6	S.	150	E.
31	09	17	49*	Banda Sea	6½	S.	130	E.
31	12	57	24*	New Hebrides Islands	20½	S.	170½	E.
31	14	54	59*	Near coast of southern Chile	43½	S.	75	W.
31	18	46	12*	Bismarck Sea	3	S.	147	E.
31	22	26	49*	Southern Iran	28	N.	55	E.
Aug. 1	02	20	50.3	Southern Iran. Depth about 67 km	28.0	N.	54.3	E
1	02	55	15.0	Near Santa Paula, California. Felt. Mag. 3.4	34 18	N.	119 03	W.
1	06	55	17.9	Arafura Sea. Depth about 305 km	8.9	S.	129.4	E.
1	09	51	14.1	Banda Sea. Depth about 88 km	5.4	S.	131.0	E.
1	12	40	22.4	Near east coast of northern Honshu, Japan. Felt. Depth about 68 km.	40.2	N.	142.2	E.
1	15	17	02.4	Near coast of Sumatra. Depth about 69 km	4.0	N.	97.3	E.
1	16	28	58.1	New Britain region. Felt at Rabaul. Depth about 76 km	4.8	S.	152.3	E.
1	19	39	30	East of Banner, California. Felt. Mag. 4.2	33 10	N.	116 28	W.
1	20	12	27.3	Near coast of Chile. Depth about 25 km	38.0	S.	73.9	W.
1	20	17	08.1	Bonin Islands region. Depth about 203 km	26.1	N.	139.8	E.
1	21	29	00.8	Timor Island. Depth about 117 km	9.2	S.	123.6	E.
1	21	56	33.6	Bonin Islands region. Depth about 108 km	28.2	N.	142.5	E.
1	22	31	34.1	Samoa Islands region. Depth about 49 km	15.0	S.	173.6	W.
2	05	07	24.5	Loyalty Islands region. Depth about 104 km. Mag. 6½	22.2	S.	171.4	E.
2	06	14	48.3	Andreanof Islands, Aleutian Islands. Felt on Adak. Depth about 24 km.	51.7	N.	178.4	W.
2	09	30	36.5	Kermadec Islands. Depth about 124 km	28.5	S.	177.0	W.
2	10	06	29.6	Kermadec Islands. Depth about 120 km	28.6	S.	177.0	W.
2	13	31	38.6	Loyalty Islands region. Depth about 272 km	19.1	S.	169.9	E.
2	13	42	25.5	Southwest of Galapagos Islands. Depth about 64 km	4.4	S.	105.1	W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Aug. 2	20	51	01.9	North Polar region. Depth about 26 km	84.5	N.	2.0	E.
3	01	13	39.4	Southern Chile. Depth about 56 km	40.5	S.	72.3	W.
3	05	43	39.8	Fiji Islands. Depth about 667 km	20.3	S.	179.2	W.
3	07	02	25.6	West Pakistan. Depth about 32 km	27.3	N.	66.5	E.
3	19	08	03.6	Off coast of Chile. Depth about 25 km	39.0	S.	75.5	W.
3	21	48	46.7	Andaman Island region. Depth about 62 km	12.6	N.	95.2	E.
4	07	34	48.5	Rat Islands, Aleutian Islands. Felt on Adak. Depth about 20 km. Mag. 6–6¼.	51.2	N.	179.0	E.
4	09	08	37.6	Rat Islands, Aleutian Islands. Depth about 75 km	51.3	N.	179.4	E.
4	11	15	52.4	Near coast of Chile. Depth about 44 km	39.0	S.	73.9	W.
4	12	57	27.3	Fiji Islands. Depth about 602 km	21.0	S.	178.9	W.
4	14	05	28.7	Rat Islands, Aleutian Islands. Depth about 34 km	51.4	N.	178.9	E.
5	08	45	31.1	Queen Charlotte Islands region. Depth about 25 km	50.7	N.	130.3	W.
5	14	37	57.0	Loyalty Islands region. Depth about 37 km	20.8	S.	169.4	E.
5	16	06	36.1	Near south coast of Kamchatka. Depth about 48 km	50.2	N.	157.0	E.
5	16	26	23.5	Sumba Island. Depth about 64 km	9.5	S.	118.8	E.
5	22	27	39.7	Rat Islands, Aleutian Islands. Depth about 46 km	51.2	N.	178.7	E.
6	03	05	56.1	Bonin Islands region. Depth about 536 km	38.1	N.	139.1	E.
6	13	55	10.1	Kermadec Islands region. Depth about 393 km	32.5	S.	179.5	E.
6	14	49	52.8	Off coast of Chile. Depth about 78 km	42.6	S.	75.7	W.
6	17	33	50.9	Off coast of Chile. Depth about 66 km	42.5	S.	75.6	W.
7	03	18	37.3	Off east coast of northern Honshu, Japan. Depth about 60 km	40.9	N.	143.5	E.
7	10	03	26.5	Rat Islands, Aleutian Islands. Depth about 53 km	51.1	N.	178.9	E.
7	12	27	47.2	Banda Sea. Depth about 153 km	7.0	S.	129.4	E.
7	16	27	16.2	Southeastern Idaho. Felt at Bancroft, Montpelier, and Soda Springs. Depth about 49 km.	42.4	N.	111.5	W.
7	19	20	15.1	Southeastern Idaho. Felt at Bancroft, Montpelier, and Soda Springs. Depth about 49 km.	42.5	N.	111.4	W.
7	22	26	05.7	Rat Islands, Aleutian Islands. Depth about 36 km	51.1	N.	178.9	E.
8	01	01	17.1	Yellowstone Park, Montana. Depth about 38 km	44.8	N.	111.7	E.
8	01	19	20.0	Komandorskie Islands. Depth about 29 km	56.0	N.	166.1	E.
8	12	28	08.5	Gulf of Aden. Depth about 15 km	12.1	N.	44.6	E.
8	15	34	26.4	North of Ascension Island. Depth about 37 km	2.1	S.	12.6	W.
8	20	36	19.0	Dodecanese Islands. Depth about 30 km	35.6	N.	27.7	E.
9	02	26	34	East of Caliente, California. Felt. Mag. 3.8	35 19	N.	118 30	W.
9	04	07	15.3	Catamarca Province, Argentina. Depth about 161 km	27.9	S.	67.0	W.
9	06	10	04.6	Off coast of northern Chile. Depth about 31 km	21.5	S.	71.7	W.
9	06	21	52.1	Off east coast of Kamchatka. Depth about 32 km	56.2	N.	164.3	E.
9	06	58	08.6	Off east coast of Kamchatka. Depth about 41 km	56.2	N.	164.1	E.
9	07	39	18.0	Off coast of northern California. Felt in northwestern California and southwestern Oregon. Mag. 6.2 (Berk).	40 19	N.	127 04	W.
9	14	02	33.3	Sakhalin Island. Depth about 35 km	47.7	N.	143.7	E.
9	16	46	33.5	Tonga Islands region. Depth about 121 km. Mag. 6–6¼	24.6	S.	177.3	W.
9	22	01	33.0	Turkey. Depth about 66 km	38.6	N.	41.1	E.
9	23	36	50.3	Santa Cruz Islands region. Depth about 35 km	11.6	S.	166.1	E.
10	06	20	01.9	Yellowstone Park, Montana. Depth about 18 km	44.9	N.	111.1	W.
10	07	41	35.3	Idaho. Slight damage at Soda Springs. Depth about 18 km	42.5	N.	111.5	W.
10	09	31	16.2	Jujuy Province, Argentina. Depth about 183 km	23.5	S.	64.7	W.
10	10	25	01.6	Sumba Island. Depth about 138 km	9.5	S.	119.0	E.
10	12	38	52.8	Near coast of Costa Rica. Depth about 76 km	9.1	N.	83.3	W.
11	02	29	22.3	Kurile Islands. Depth about 38 km	45.7	N.	152.5	E.
11	02	36	58.0	Andreanof Islands, Aleutian Islands. Depth about 126 km	52.3	N.	176.1	W.
11	02	53	21.1	Celebes. Depth about 65 km	0.1	N.	121.4	E.
11	04	50	33.0	Near coast of Mindanao, Philippine Islands. Depth about 66 km	9.0	N.	126.3	E.
11	05	49	33.2	Colombia. Depth about 168 km	6.7	N.	73.3	W.
11	06	22	53.5	Near east coast of northern Honshu, Japan. Felt. Depth about 45 km.	40.3	N.	142.6	E.
11	21	42	14.9	Tonga Islands. Depth about 25 km	20.6	S.	173.6	W.
12	04	11	59.0	East of Banner, California. Felt. Mag. 3.6	33 07	N.	116 25	W.
12	13	12	34.1	Near east coast of Honshu, Japan. Felt. Depth about 61 km	36.3	N.	141.3	E.
12	16	25	19.9	Near coast of Vancouver Island. Depth about 25 km	50.6	N.	129.6	W.
12	23	22	22.3	Banda Sea. Depth about 97 km	6.4	S.	129.9	E.
13	04	15	13.8	Indian Ocean, east of Kerguelen Islands. Depth about 52 km	46.5	S.	96.1	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Aug.13	07	11	05.9	Near east coast of northern Honshu, Japan. Felt. Depth about 54 km. Mag. 6.	40.4	N.	142.4	E.
13	14	14	56.6	Near coast of Chile. Slight damage at Valdivia. Depth about 56 km. Mag. 6¾-7.	40.0	S.	74.9	W.
13	17	12	49.0	Near coast of Mexico. Depth about 64 km	18.2	N.	102.9	W.
13	22	28	24.6	Near coast of Eritrea. Depth about 42 km	15.8	N.	40.2	E.
14	04	00	56.0	Kurile Islands. Depth about 67 km	45.9	N.	151.0	E.
14	14	41	02.6	New Guinea. Depth about 171 km	7.0	S.	146.0	E.
14	21	23	43.3	Fox Islands, Aleutian Islands. Depth about 31 km	52.8	N.	167.1	W.
14	22	37	11.4	Hindu Kush. Depth about 50 km	36.0	N.	69.4	E.
14	22	46	08.3	Jujuy Province, Argentina. Depth about 226 km	23.7	S.	66.6	W.
15	05	35	24.1	Komandorskie Islands. Depth about 34 km	56.2	N.	164.1	E.
15	05	55	52.4	Kurile Islands. Depth about 72 km	45.2	N.	148.0	E.
15	06	58	56.4	Indian Ocean. Depth about 15 km	13.5	S.	65.8	E.
15	14	33	38.4	Indian Ocean. Depth about 25 km	13.4	S.	66.7	E.
15	19	13	57.3	Southern Mexico. Depth about 122 km	17.0	N.	93.9	W.
15	23	17	14.3	Colombia. Felt at Santa Rosa de Viterbo. Depth about 157 km	6.9	N.	73.1	W.
16	02	47	17.7	Southern Peru. Depth about 110 km	16.6	S.	71.4	W.
16	08	13	37.7	Near coast of New Guinea. Depth about 68 km	6.4	S.	147.6	E.
16	10	31	01.0	Chagos Archipelago region. Depth about 41 km	3.4	S.	68.6	E.
16	22	27	49.9	Timor Island region. Depth about 41 km	7.6	S.	128.8	E.
16	22	51	53.2	Colombia-Venezuela border. Depth about 161 km	9.4	N.	72.8	W.
17	09	33	47.0	South Atlantic Ocean. Depth about 64 km	19.9	S.	11.8	W.
17	10	22	07.8	Near coast of Hokkaido, Japan. Depth about 84 km	42.3	N.	142.4	E.
17	11	24	04.7	South Atlantic Ocean. Depth about 22 km	19.5	S.	11.5	W.
17	18	08	42.0	Near north coast of New Guinea. Depth about 76 km	1.9	S.	138.8	E.
18	11	07	25.4	Near coast of Chile. Depth about 41 km	37.3	S.	73.0	W.
18	20	47	06.2	Kurile Islands. Felt on Hokkaido, Japan. Depth about 69 km	44.2	N.	147.8	E.
18	22	43	50.1	Santa Cruz Islands. Depth about 76 km	11.5	S.	166.1	E.
18	23	36	13.7	Greece-Albania border. Felt. Depth about 19 km	40.0	N	20.3	E.
19	01	37	11.3	D'Entrecasteaux Islands. Depth about 178 km	9.3	S.	152.1	E.
19	03	08	35.0	Northern Burma. Depth about 70 km	26.0	N.	95.9	E.
19	04	07	07.5	Off coast of northern California. Depth about 27 km	40.9	N.	127.2	W.
19	08	10	41.3	Negros, Philippine Islands. Depth about 36 km	10.8	N.	122.9	E.
19	12	41	48.1	Bonin Islands region. Depth about 431 km	27.1	N.	140.2	E.
19	17	03	46.6	Near east coast of Kamchatka. Depth about 77 km	54.1	N.	160.5	E.
19	21	57	44.8	Honshu, Japan. Depth about 234 km	36.5	N.	137.6	E.
20	00	19	35.2	Guatemala. Felt in El Salvador. Depth about 115 km. Mag 6	14.5	N.	91.5	W.
20	07	14	41.7	Idaho. Depth about 30 km	42.5	N.	111.7	W.
20	07	24	48.2	Idaho. Depth about 32 km	42.6	N.	111.7	W.
20	08	01	54.3	Idaho. Felt at Soda Springs and Conda. Depth about 41 km	42.3	N.	111.3	W.
20	10	11	40.9	Idaho. Felt at Soda Springs and Conda. Depth about 51 km	42.5	N.	111.6	W.
20	10	13	14.9	Idaho. Depth about 14 km	42.6	N.	111.4	W.
20	11	01	59.0	Idaho. Felt at Soda Springs and Conda. Depth about 49 km	42.4	N.	111.5	W.
20	14	46	51.3	Idaho. Felt at Soda Springs and Conda. Depth about 29 km	42.5	N.	111.6	W.
20	20	08	41.2	Tristan da Cunha region. Depth about 45 km. Mag. 6	35.7	S.	15.4	W.
20	21	19	52.7	Tristan da Cunha region. Depth about 36 km	35.3	S.	15.7	W.
20	22	22	46.2	Northern Celebes. Depth about 70 km	0.8	N.	122.1	E.
20	23	27	42	Off Point Fermin, California. Felt at Compton and Long Beach. Mag. 3.8.	33 41	N.	118 22	W.
21	00	18	03.5	Near north coast of New Guinea. Depth about 38 km	4.4	S.	143.5	E.
21	00	59	24.1	New Britain. Depth about 137 km	5.5	S.	149.4	E.
21	03	29	04.9	Nepal-India border. Depth about 29 km	27.0	N.	88.5	E.
21	03	55	36.7	Near coast of Panama. Depth about 71 km	7.9	N.	82.6	W.
21	05	04	07.3	Idaho. Depth about 25 km	42.4	N.	111.6	W.
21	12	49	34.9	Near coast of Mindanao, Philippine Islands. Felt at Hinatuan, Davao. Depth about 165 km.	5.2	N.	125.3	E.
21	17	05	13.9	Off coast of Mindanao, Philippine Islands. Depth about 141 km	7.5	N.	127.6	E.
21	17	20	54.9	Fiji Islands. Depth about 24 km	15.4	S.	176.0	W.
21	18	04	50.4	Kurile Islands. Depth about 54 km	44.6	N.	148.7	E.
21	21	43	45.0	South of Panama. Depth about 29 km	5.4	N.	78.5	W.
21	22	21	39.9	Bonin Islands region. Depth about 406 km	28.2	N.	139.4	E.
21	23	07	03	Northwest of San Bernardino, California. Felt. Mag. 3.8	34 11	N.	117 25	W.
22	07	49	27.7	Leeward Islands. Depth about 91 km	17.9	N.	61.5	W.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Aug.22	13	42	28.9	Turkey. Depth about 112 km	39.2	N.	41.1	E.
23	02	04	45.0	Santiago del Estero Province, Argentina. Depth about 568 km	27.4	S.	63.1	W.
23	07	54	39.8	Near coast of Guatemala. Depth about 77 km	13.7	N.	92.2	W.
23	08	58	11.2	Iran. Depth about 64 km	29.1	N.	59.8	E.
23	11	29	09.5	Solomon Islands region. Depth about 71 km	7.3	S.	156.6	E.
23	13	08	23.1	Fiji Islands. Depth about 452 km	20.8	S.	177.9	W.
23	14	08	15.5	Atlantic Ocean. Depth about 24 km	0.9	N.	25.9	W.
23	22	44	51.5	Fiji Islands region. Depth about 56 km. Mag. 6	14.6	S.	176.4	W.
24	01	44	12.5	Off east coast of Kamchatka. Depth about 45 km	56.2	N.	164.1	E.
24	04	26	54.1	New Britain region. Depth about 38 km	6.2	S.	150.4	E.
24	05	49	01.1	Tonga Islands. Depth about 42 km	19.1	S.	174.1	W.
24	09	45	20.6	Colombia. Felt at Santa Rosa de Viterbo. Depth about 158 km	6.6	N.	73.1	W.
24	12	55	45.8	Off east coast of northern Honshu, Japan. Depth about 35 km	40.5	N.	142.4	E.
24	19	27	50.3	Burma. Depth about 86 km	24.7	N.	95.0	E.
24	20	23	38.1	Northern Honshu, Japan. Depth about 110 km	41.4	N.	140.8	E.
25	00	59	21.3	Near coast of Chile. Depth about 75 km	42.5	S.	72.9	W.
25	12	03	19.2	Chile-Bolivia border. Depth about 32 km	18.1	S.	69.4	W.
25	17	20	24.9	Near north coast of Peru. Depth about 71 km	6.4	S.	81.1	W.
25	17	41	56.8	Fox Islands, Aleutian Islands. Depth about 22 km	52.5	N.	169.2	W.
25	23	02	18.0	Near coast of Chile. Depth about 20 km	38.3	S.	74.1	W.
26	00	14	05.8	Near coast of Chile. Depth about 25 km	38.0	S.	74.3	W.
26	01	22	39.6	Idaho. Depth about 32 km	42.4	N.	111.2	W.
26	04	41	54.3	Off east coast of Kamchatka. Depth about 20 km	56.4	N.	163.9	E.
26	07	09	47.3	West Pakistan. Depth about 64 km	29.0	N.	67.6	E.
26	09	45	32.6	Afghanistan. Depth about 43 km	34.7	N.	70.8	E.
26	11	47	32.5	Timor Island region. Depth about 71 km	11.0	S.	123.9	E.
26	16	00	26.7	West of Galapagos Islands. Depth about 14 km	1.7	S.	101.7	W.
26	18	27	19.6	New Hebrides Islands region. Depth about 53 km	13.5	S.	165.7	E.
26	20	44	05.2	New Hebrides Islands region. Depth about 69 km	13.3	S.	166.2	E.
27	10	17	16.4	Crete. Depth about 33 km	34.4	N.	26.2	E.
27	12	51	33.6	South of Fiji Islands. Depth about 538 km	23.2	S.	179.5	W.
27	15	58	59.0	India. 50 injured and minor property damage at New Delhi. Depth about 58 km.	28.6	N.	76.7	E.
27	18	16	15.1	Kurile Islands. Depth about 190 km. Mag. 6–6¼	50.1	N.	154.0	E.
27	19	25	14.9	Near coast of New Guinea. Depth about 80 km	5.9	S.	147.1	E.
28	00	05	24.6	Near coast of Peru. Depth about 46 km	16.6	S.	74.2	W.
28	00	23	41.7	Tonga Islands region. Depth about 21 km	23.3	S.	176.5	W.
28	06	05	17.4	South of Panama. Depth about 33 km	4.2	N.	82.5	W.
28	12	12	14.1	South of Panama. Depth about 25 km	2.6	N.	83.4	W.
29	04	53	23.2	Galapagos Islands region. Depth about 48 km	1.0	N.	85.2	W.
29	16	23	11.1	Hindu Kush. Depth about 103 km	36.3	N.	71.2	E.
29	18	00	40.5	Crete. Depth about 71 km	35.3	N.	26.8	E.
30	06	45	16.4	South Pacific Ocean. About 500 miles northwest of Easter Island. Depth about 40 km.	21.0	S.	113.7	W.
30	08	48	29.3	Komandorskie Islands. Depth about 36 km	54.9	N.	163.0	E.
30	10	11	30.6	New Guinea. Depth about 57 km	3.6	S.	134.2	E.
30	11	26	52.0	Colombia. Depth about 121 km	7.2	N.	72.9	W.
30	19	06	58.6	South of Fiji Islands. Depth about 483 km	23.8	S.	179.6	E.
30	20	25	54.2	Crete. Depth about 15 km	34.6	N.	26.5	E.
31	07	16	10.4	South Pacific Ocean. Depth about 25 km	21.0	S.	114.1	W.
31	17	21	57.0	Near coast of Mindoro, Philippine Islands. Depth about 24 km	13.8	N.	119.9	E.
31	22	11	51.2	Turkey. Depth about 30 km	39.2	N.	36.4	E.
Sept. 1	05	59	55.2	Panama-Colombia border. Depth about 56 km	7.0	N.	77.3	W.
1	07	35	05.0	Near San Bernardino, California. Felt	34 07	N.	117 17	W.
1	07	35	21.9	Tonga Islands region. Depth about 500 km	27.8	S.	176.9	W.
1	09	28	16.0	New Hebrides Islands. Felt on Santo. Depth about 28 km. Mag. 6.	16.6	S.	167.5	E.
1	10	35	01.1	New Hebrides Islands. Depth about 27 km. Mag. 6	16.6	S.	167.6	E.
1	11	14	59.6	New Hebrides Islands. Depth about 35 km	16.7	S.	167.4	E.
1	11	57	59.3	Kermadec Islands region. Depth about 92 km	27.9	S.	176.2	W.
1	15	37	14.4	Kodiak Island, Alaska. Depth about 24 km. Mag. 6–6¼	56.3	N.	153.7	W.
1	15	40	41.8	Kodiak Island, Alaska. Depth about 45 km	56.4	N.	153.5	W.
1	18	41	14.4	Fiji Islands. Depth about 31 km	16.0	S.	179.1	W.
1	20	01	57.2	Fiji Islands. Depth about 25 km. Mag. 5½ (Pal)	15.9	S.	178.9	W.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Sept. 1	22	39	54	North of Indio, California. Felt. Mag. 3.8	33	48 N.	116	08 W.
2	07	37	37.0	Near coast of central Chile. Depth about 41 km	37.7	S.	73.5	W.
2	10	52	17.9	New Hebrides Islands. Felt on Santo. Depth about 160 km	15.3	S.	167.4	E.
2	13	46	07.8	Tibet. Depth about 98 km	29.0	N.	98.3	E.
2	15	40	42.7	Kodiak Island, Alaska. Depth about 43 km	56.6	N.	153.1	W.
2	18	32	34.5	San Juan Province, Argentina. Depth about 149 km	32.1	S.	69.4	W.
2	22	02	48.9	Fox Islands, Aleutian Islands. Depth about 49 km. Mag. 5¾–6	52.2	N.	171.4	W.
3	00	19	24.1	Near north coast of Hokkaido, Japan. Felt on Hokkaido. Depth about 92 km.	43.1	N.	144.8	E.
3	05	41	39.9	Tonga Islands. Depth about 61 km. Mag. 5½ (Pal)	21.0	S.	174.4	W.
3	07	46	53.5	New Hebrides Islands. Depth about 212 km	19.1	S.	169.1	E.
3	12	41	34.9	Solomon Islands. Felt at Karoola and Rabaul. Depth about 457 km. Mag. 6½–6¾.	6.1	S.	154.5	E.
3	13	22	51.9	Near north coast of Honshu, Japan. Felt on Honshu and Hokkaido. Depth about 61 km.	41.1	N.	142.3	E.
3	15	05	50.6	Samoa Islands. Depth about 25 km	16.1	S.	172.7	W.
3	15	17	29.4	Fiji Islands. Depth about 614 km	20.2	S.	178.6	W.
3	15	47	12.3	Kermadec Islands region. Depth about 79 km	34.7	S.	179.7	W.
3	20	41	08.6	South of Australia. Depth about 30 km	48.5	S.	126.3	E.
3	22	32	38.3	Fox Islands, Aleutian Islands. Depth about 56 km	51.9	N.	171.5	W.
3	23	46	23.9	Kurile Islands. Depth about 27 km. Mag. 6¼	44.8	N.	149.1	E.
4	02	39	03.6	Loyalty Islands. Depth about 60 km	21.6	S.	170.4	E.
4	05	21	22.1	Kodiak Island. Depth about 48 km. Mag. 4¾–5 (Pal)	56.5	N.	153.1	W.
4	12	59	38.7	Near coast of Mindanao, Philippine Islands. Felt at General Santos. Depth about 204 km.	5.8	N.	125.1	E.
5	04	36	29.9	Hindu Kush. Depth about 220 km	36.4	N.	70.3	E.
5	05	51	29.2	Tonga Islands. Depth about 25 km	20.8	S.	173.5	W.
5	07	42	52.5	Andreanof Islands, Aleutian Islands. Depth about 62 km	52.0	N.	174.6	W.
5	09	41	50.2	South of Australia. Depth about 25 km	49.0	S.	120.9	E.
5	18	04	44.1	Banda Sea. Depth about 132 km	6.6	S.	129.4	E.
6	09	58	32.3	Kermadec Islands region. Depth about 117 km	34.2	S.	179.2	W.
6	11	15	18.5	North of North Island, New Zealand. Depth about 25 km	36.8	S.	179.3	E.
6	12	35	16.1	Near north coast of New Guinea. Depth about 38 km	4.9	S.	141.1	E.
6	14	03	01.8	Loyalty Islands. Depth about 35 km. Mag. 6¼–6½	20.5	S.	169.4	E.
6	15	24	40.1	Near south coast of Hokkaido, Japan. Felt on Hokkaido and Honshu. Depth about 102 km.	42.1	N.	142.5	E.
6	16	29	03.3	Banda Sea. Depth about 84 km	7.2	S.	129.0	E.
6	21	24	26.4	Southampton Island region. Depth about 25 km	64.8	N.	86.4	W.
7	01	17	39.1	Tristan da Cunha region. Depth about 25 km. Mag. 5¼ (Pal)	37.4	S.	16.1	W.
7	03	51	52.0	Northern Celebes. Depth about 68 km	0		125.0	E.
7	11	44	58.4	Kurile Islands. Depth about 65 km. Mag. 5 (Pal)	44.6	N.	149.1	E.
8	08	10	46.8	Fox Islands, Aleutian Islands. Depth about 83 km	51.3	N.	171.4	W.
8	10	48	08.0	Azores. Depth about 39 km	40.0	N.	30.1	W.
8	11	07	40.8	Near east coast of Mindanao, Philippine Islands. Felt at Mambajao, General Santos and Hinatuan. Depth about 47 km. Mag. 5½ (Pal).	6.2	N.	126.2	E.
8	12	32	25.9	Fiji Islands. Depth about 79 km	18.5	S.	177.6	E.
8	14	32	00.3	Kamchatka. Depth about 29 km	52.1	N.	158.8	E.
8	17	02	43.4	Near south coast of Mindanao, Philippine Islands. Depth about 312 km.	5.9	N.	126.3	E.
8	18	41	41.6	Northwest of Bishop, California. Felt. Mag. 4.0	37.5	N.	118.7	W.
8	23	12	38.8	Kurile Islands. Depth about 72 km	44.7	N.	149.5	E.
9	08	32	31.6	Mariana Islands. Depth about 35 km	13.3	N.	146.2	E.
9	10	05	21.9	Hindu Kush. Depth about 236 km	36.6	N.	71.6	E.
9	10	42	09.8	Andreanof Islands, Aleutian Islands. Depth about 22 km	51.5	N.	174.7	W.
9	16	19	19.9	Jan Mayen Island region. Depth about 25 km. Mag. 4¾ (Pal)	71.9	N.	00.3	W.
9	17	47	18.4	Near coast of southern Chile. Depth about 57 km	43.0	S.	74.9	W.
9	19	12	02.0	Kurile Islands. Depth about 16 km	43.6	N.	146.9	E.
9	19	36	51.1	Jan Mayen Island region. Depth about 17 km	72.4	N.	2.0	E.
9	20	04	32.7	Jan Mayen Island region. Depth about 23 km. Mag. 4¾ (Pal)	71.7	N.	1.3	W.
10	00	19	09.0	Crete. Depth about 20 km	34.1	N.	26.1	E.
10	10	44	47.0	Celebes Sea. Depth about 568 km	4.1	N.	122.7	E.
10	14	04	31.9	Solomon Islands. Depth about 48 km	11.3	S.	163.1	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Sept. 10	15	06	34*	Northwestern Washington. Slight damage at Bremerton and Seattle.	47	42 N.	123	09 W.
10	15	45	21.2	Nicobar Islands. Depth about 25 km	6.9	N.	94.7	E.
11	01	33	27.0	Southeast of Vineyard, California. Felt. Mag. 2.1	36.7	N.	121.3	W.
11	07	55	54.5	Off coast of Chile. Depth about 25 km	39.0	S.	74.8	W.
11	10	51	42.0	Kermadec Islands region. Depth about 21 km	33.7	S.	178.4	W.
11	21	55	51.0	Sandwich Islands. Depth about 69 km	58.7	S.	24.4	W.
12	02	44	39.7	Southern Alaska. Felt at Anchorage and Homer. Depth about 195 km.	60.5	N.	153.8	W.
12	03	40	57.5	Central Utah. Depth about 25 km	39.1	N.	111.7	W.
12	12	17	08.1	Ryukyu Islands. Depth about 48 km. Mag. 6½–6¾	27.5	N.	128.4	E.
12	14	46	19.6	Near coast of Sumatra. Depth about 164 km	2.8	N.	99.0	E.
12	16	02	05.8	Java Sea. Depth about 611 km	7.0	S.	117.0	E.
12	22	34	22.5	Banda Sea. Depth about 57 km	5.5	S.	130.5	E.
13	03	09	09.7	Bonin Islands region. Depth about 439 km	27.2	N.	140.2	E.
13	17	51	08.9	Guatemala. Felt at San Salvador. Depth about 104 km. Mag. 4¼ (Pal).	13.8	N.	90.5	W.
13	21	55	34.1	Near coast of Peru. Depth about 119 km	5.0	S.	74.5	W.
14	00	08	03.0	Near coast of Peru. Depth about 91 km	15.2	S.	76.2	W.
14	00	34	25.3	Luzon, Philippine Islands. Depth about 50 km	17.0	N.	122.3	E.
14	01	53	21.6	Dominican Republic. Depth about 15 km. Mag. 4½ (Pal)	19.7	N.	70.2	W.
14	03	49	48.8	South of Honshu, Japan. Depth about 498 km	30.2	N.	138.1	E.
14	04	57	12.5	South Pacific Ocean. Depth about 40 km. Mag. 5½ (Pal)	35.1	S.	106.0	W.
14	12	58	52.6	Northeastern Iran. Depth about 34 km	36.6	N.	57.7	E.
14	15	59	01.7	Solomon Islands. Depth about 100 km	6.5	S.	155.1	E.
14	16	24	12.8	Fiji Islands region. Depth about 562 km	17.6	S.	178.9	W.
14	23	18	35.1	Tonga Islands. Depth about 25 km. Mag. 5¼ (Pal)	21.0	S.	174.1	W.
15	03	31	17.5	New Hebrides Islands. Felt at Lamap and Erromango. Depth about 69 km. Mag. 5¼ (Pal).	16.6	S.	167.3	E.
15	05	02	56.3	Sinkiang, China. Depth about 25 km	46.4	N.	93.9	E.
15	17	57	42.7	Volcano Islands region. Depth about 361 km	21.5	N.	142.9	E.
16	01	27	50.1	East of Crete. Depth about 30 km	34.8	N.	28.6	E.
16	01	38	58.6	Tadzhik S.S.R. Depth about 45 km	38.6	N.	68.6	E.
16	19	08	38.4	Santa Cruz Islands. Depth about 132 km	11.8	S.	166.6	E.
16	21	30	08.6	Solomon Islands. Depth about 98 km	10.6	S.	161.9	E.
17	07	12	48.1	New Hebrides Islands. Depth about 23 km	17.5	S.	167.4	E.
17	07	52	50.8	Kurile Islands. Depth about 35 km	49.5	N.	155.4	E.
17	08	05	29.5	Kurile Islands. Depth about 28 km. Mag. 6	49.6	N.	155.2	E.
17	12	58	56.4	Solomon Islands. Depth about 134 km	6.3	S.	154.4	E.
17	15	12	18.4	Bismarck Sea. Depth about 220 km	3.6	S.	149.5	E.
17	15	54	38.1	New Britain. Depth about 79 km	6.3	S.	148.8	E.
17	19	56	11.1	Tonga Islands. Depth about 28 km. Mag. 6	21.0	S.	174.5	W.
18	09	40	28.3	Banda Sea. Depth about 83 km. Mag. 5¼ (Pal)	6.8	S.	129.2	E.
18	14	03	56.4	Colombia-Venezuela border. Depth about 177 km	6.9	N.	73.1	W.
18	19	26	30.9	Fox Islands, Aleutian Islands. Depth about 92 km	51.7	N.	170.1	W.
19	02	01	53.0	Southern Bolivia. Depth about 118 km	20.6	S.	65.4	W.
19	03	39	37.6	Luzon, Philippine Islands. Depth about 74 km	15.8	N.	119.4	E.
19	03	58	51.4	Near west coast of Luzon, Philippine Islands. Depth about 25 km. Mag. 5½ (Pal).	15.6	N.	120.0	E.
19	04	46	21.3	Gulf of California. Depth about 44 km	28.9	N.	113.6	W.
19	12	41	35.9	Off north coast of North Island, New Zealand. Depth about 310 km.	37.6	S.	176.0	E.
19	16	46	05.4	Santa Cruz Islands. Depth about 232 km	11.6	S.	166.1	E.
19	18	58	26.9	Colombia-Panama border. Depth about 60 km	7.0	N.	77.2	W.
19	19	01	25.4	Colombia-Panama border. Felt in Canal Zone. Depth about 66 km. Mag. 6.	6.9	N.	77.5	W.
20	00	41	34.5	Kermadec Islands. Depth about 16 km	29.9	S.	177.0	W.
20	03	05	05.8	Off north coast of North Island, New Zealand. Depth about 228 km.	37.3	S.	176.7	E.
20	03	35	34.6	Kermadec Islands. Depth about 47 km. Mag. 5¼ (Pal)	28.4	S.	177.9	W.
20	04	05	56.9	U.S.S.R.—Outer Mongolia border. Depth about 29 km	50.1	N.	88.4	E.
20	10	28	35.9	Off southeast coast of Kamchatka. Depth about 30 km	53.1	N.	160.4	E.
21	02	48	44.5	Eastern New Guinea. Depth about 115 km	8.2	S.	149.4	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Sept. 21	03	44	21.1	Off coast of El Salvador. Slight damage at San Salvador. Depth about 60 km.	10.4	N.	88.6	W.
21	07	25	26.5	Kermadec Islands. Depth about 249 km	28.1	S.	177.8	W.
21	10	38	31.0	Fox Islands, Aleutian Islands. Depth about 38 km	53.6	N.	166.1	W.
21	16	08	14.7	East China Sea. Depth about 207 km	26.7	N.	124.8	E.
21	23	05	03.8	Iran. Depth about 65 km	31.8	N.	50.5	E.
22	02	08	07.5	Near east coast of Kamchatka. Depth about 60 km	54.9	N.	163.6	E
22	05	38	14.4	Congo. Damage at Usumbura and Uvira. Depth about 29 km. Mag. 5½–5¾ (Pal).	3.4	S.	29.1	E.
22	09	05	36.8	Congo. Depth about 28 km. Mag. 6¼–6½ (Pal)	3.3	S.	29.3	E.
22	09	14	58 0	Congo. Depth about 20 km	2.8	S.	29.8	E.
22	15	11	46.4	Near north coast of Colombia. Depth about 56 km	7.2	N.	77 2	W.
22	22	47	00.6	Fox Islands, Aleutian Islands. Depth about 33 km	51.7	N.	168.8	W.
23	00	20	33.6	Atlantic Ocean. Depth about 17 km. Mag. 4 (Pal)	20.3	N.	56.7	W.
23	01	18	32.0	New Hebrides Islands. Depth about 63 km	13.3	S.	167.4	E.
23	02	27	01.4	Colombia-Panama border. Depth about 63 km	7.6	N.	77.4	W.
23	05	20	26.6	India-Burma border. Depth about 81 km	27.8	N.	96.2	E.
23	06	12	57.1	Kermadec Islands. Depth about 329 km	27.4	S.	179.9	W.
23	15	55	46.2	Tonga Islands. Depth about 473 km	23.8	S.	179.5	W.
23	20	17	47.1	Crete. Depth about 118 km	35.3	N.	24.9	E.
23	21	20	02.7	Near coast of New Guinea. Depth about 54 km	6.1	S.	148.6	E.
23	23	02	24.3	Tonga Islands. Depth about 39 km. Mag. 5¾ (Pal)	22.3	S.	174.8	W.
23	23	16	57.5	La Rioja Province, Argentina. Depth about 104 km	31.2	S.	68.7	W.
24	09	15	11.4	Solomon Islands. Depth about 36 km	11.1	S.	163.2	E.
24	11	06	39.2	North Island, New Zealand region. Depth about 43 km	41.8	S.	179.3	W.
24	13	51	42.8	Santa Cruz Islands. Depth about 161 km	12.2	S.	166.5	E.
24	13	58	33.6	Northern Peru. Depth about 146 km	3.0	S.	75.9	W.
24	14	16	52.4	Tonga Islands. Depth about 92 km	15.2	S.	176.1	W.
24	23	24	13.6	Kamchatka. Depth about 250 km	55.6	N.	161.4	E.
25	07	40	48.2	Ryukyu Islands. Depth about 101 km	27.2	N.	129.8	E.
25	08	36	27.6	Southern Iran. Depth about 53 km	28.4	N.	53.2	E.
25	15	39	27.4	Tonga Islands region. Depth about 132 km	17.4	S.	173.4	W.
25	17	30	27.7	Mariana Islands. Depth about 215 km	18.6	N.	145.5	E.
26	00	32	19.6	Catamarca Province, Argentina. Depth about 146 km	27.6	S.	69.0	W.
26	08	49	31.3	Off southeast coast of Kamchatka. Depth about 23 km	52.2	N.	159.8	E.
26	11	36	21.7	Near coast of Kyushu, Japan. Depth about 15 km	32.6	N.	131.7	E.
26	15	13	25.8	Fox Islands, Aleutian Islands. Depth about 44 km. Mag. 5 (Pal)	51.8	N.	172.2	W.
26	16	58	13.9	Southern Peru. Felt at Arequipa. Depth about 115 km	16.0	S.	72.9	W.
26	21	10	13.6	Samoa Islands region. Depth about 25 km	15.7	S.	173.4	W.
27	02	13	50.6	Coast of southern Chile. Depth about 59 km	44.8	S.	73.6	W.
27	05	51	26.9	Rat Islands, Aleutian Islands. Depth about 102 km	51.7	N.	177.8	E.
27	07	17	55.1	Western New Guinea. Depth about 107 km	00.9	S.	134.5	E.
27	16	06	13.6	South of Kyushu, Japan. Depth about 65 km	29.9	N.	130.6	E.
27	18	35	52.2	Mariana Islands. Depth about 109 km	14.5	N.	145.8	E.
28	00	05	28.9	Near coast of southern Peru. Depth about 112 km	16.6	S.	73.9	W.
28	05	29	32.1	Western China. Depth about 18 km. Mag. 5 (Pal)	32.5	N.	95.8	E.
28	06	26	15.6	Baja California. Depth about 25 km. Mag. 3.9	31.0	N.	116.6	W.
28	08	04	35.8	Near coast of southern Chile. Depth about 60 km	39.2	S.	73.8	W.
28	17	34	50.6	Fiji Islands. Depth about 592 km	18.1	S.	178.4	W.
29	06	27	56.3	Peru-Bolivia border. Felt at Arequipa, Peru. Depth about 115 km.	17.4	S.	68.5	W
29	11	18	52.9	Mariana Islands. Depth about 469 km. Mag. 6¼–6½	19.0	N.	144.7	E.
29	18	54	27.2	Guatemala. Felt in El Salvador. Depth about 86 km. Mag. 4¾–5 (Pal).	15.3	N.	90.0	W.
29	22	12	28.1	Central Chile. Felt at Santiago. Depth about 95 km	32.4	S.	70.3	W.
30	01	38	41.9	Tonga Islands. Depth about 25 km	21.1	S.	174.6	W.
30	02	20	46.2	Ryukyu Islands. Depth about 87 km	27.0	N.	127.7	E.
30	03	20	14.9	Off coast of Vancouver Island. Depth about 25 km	49.4	N.	129.6	W.
30	06	35	08.9	Vancouver Island region. Depth about 55 km. Mag. 5¼ (Pal)	49.4	N.	129.7	W.
30	07	37	05.3	Southern Chile. Depth about 53 km	41.6	S.	73.5	W.
30	21	04	24.7	Solomon Islands. Depth about 31 km	11.2	S.	162.9	E.
Oct. 1	03	00	47.0	Burma. Felt at Chittagong, East Pakistan. Depth about 2 km	23.5	N.	94.6	E.
1	05	30	28.9	Near Crete. Felt. Depth about 36 km	35.6	N.	26.2	E.
1	06	27	23.5	Mindanao, Philippine Islands. Depth about 478 km	6.5	N.	124.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Oct. 1	09	28	56.3	Northern Peru. Depth about 158 km	19.9	S.	69.6	W.
1	11	44	03.2	New Ireland region. Felt at Rabaul. Depth about 100 km	4.6	S.	153.0	E.
1	15	57	49.0	South of Honshu, Japan. Depth about 278 km	32.3	N.	137.6	E.
1	16	10	55.6	Fox Islands, Aleutian Islands. Depth about 46 km. Mag. 6½	51.6	N.	172.4	W.
1	23	56	25.5	Solomon Islands. Depth about 108 km	10.4	S.	161.5	E.
2	02	38	16.9	Honshu, Japan. Felt. Depth about 52 km	36.4	N.	141.3	E.
2	04	37	48.3	Sandwich Islands. Depth about 66 km	60.7	S.	24.4	W.
2	07	08	15.9	Southeast of Easter Island. Depth about 107 km	39.2	S.	91.6	W.
2	10	18	55.8	Santa Cruz Islands. Depth about 100 km	11.4	S.	165.7	E.
2	11	53	44.1	Southeast of Easter Island. Depth about 84 km	38.9	S.	91.5	W.
2	16	32	06.1	Molucca Passage. Depth about 31 km	3.2	N.	127.7	E.
2	18	08	10.5	Burma. Depth about 95 km	18.5	N.	94.9	E.
2	20	43	24	Southeast of Hollister, Calif. Felt. Mag. 2.7 (Berk)	36 49	N.	121 23	W.
3	00	49	18.9	West Pakistan. Felt at Quetta and Sibi. Depth about 74 km	30.0	N.	68.2	E.
3	02	33	26.4	Honshu, Japan. Felt. Depth about 59 km	36.4	N.	140.7	E.
3	05	10	37.3	Near coast of southern Chile. Depth about 43 km	38.7	S.	75.3	W.
3	10	12	07.8	Western New Guinea. Depth about 29 km	3.4	S.	137.8	E.
3	17	10	56.2	D'Entrecasteaux Islands. Depth about 100 km	8.2	S.	152.8	E.
3	19	50	48.8	Off coast of Sumatra. Depth about 51 km	5.8	S.	103.0	E.
3	22	10	52.5	Loyalty Islands region. Depth about 243 km	22.8	S.	172.3	E.
4	09	22	16	North of San Bernardino, California. Felt. Mag. 2.7	34 12	N.	117 18	W.
4	09	51	16.1	Solomon Islands. Depth about 134 km	7.6	S.	155.3	E.
4	10	45	44.7	Honshu, Japan. Felt. Depth about 240 km	36.4	N.	137.6	E.
6	06	08	18.8	Kermadec Islands region. Depth about 506 km	27.5	S.	179.8	E.
6	16	16	35.3	Near coast of southern Chile. Depth about 27 km	38.5	S.	74.9	W.
6	16	19	12.0	Lake Baikal region. Depth about 24 km	52.8	N.	107.9	W.
6	16	45	02.3	Off coast of Sumatra. Depth about 81 km	5.2	S.	103.1	E.
6	18	04	57.4	South of Honshu, Japan. Depth about 527 km	29.8	N.	138.6	E.
6	19	55	42.2	North Atlantic Ocean. Depth about 63 km	58.4	N.	31.6	W.
7	03	15	34.9	North Atlantic Ocean. Depth about 71 km. Mag. 4½–4¾ (Pal)	58.3	N.	31.9	W.
7	11	09	13.9	Fiji Islands region. Depth about 626 km	20.8	S.	178.3	W.
7	15	18	30.8	Banda Sea. Depth about 45 km. Mag. 6½–6¾ (Berk)	7.5	S.	130.7	E.
7	19	07	15.1	Near north coast of Colombia. Depth about 92 km	11.5	N.	72.9	W.
7	20	01	20.1	Easter Island region. Depth about 62 km. Mag. 5¼–5½ (Pal)	20.3	S.	114.1	W.
8	01	51	52.2	Oaxaca, Mexico. Felt. Depth about 29 km. Mag. 4¾–5 (Pal)	16.9	N.	97.8	W.
8	03	53	03.2	Sea of Japan. Felt on Hokkaido and Honshu. Depth about 651 km. Mag. 6½–6¾.	40.0	N.	129.9	E.
8	13	53	47.0	Albania. Depth about 37 km	41.4	N.	19.9	E.
8	17	34	00.7	Near coast of North Island, New Zealand. Depth about 176 km	36.1	N.	176.9	E.
8	20	40	06.6	Nicobar Islands. Depth about 84 km	8.0	N.	92.9	E.
9	01	37	19.3	Mariana Islands. Felt on Guam. Depth about 153 km	13.5	N.	144.3	E.
9	09	51	19.1	Samoa Islands region. Felt at Apia. Depth about 129 km	15.2	S.	174.0	W.
9	13	07	22.2	Sea of Japan. Depth about 623 km	40.0	N.	129.7	E.
9	17	46	40.7	Near east coast of Honshu, Japan. Depth about 66 km	39.6	N.	142.3	E.
10	16	16	00.3	Kurile Islands. Depth about 38 km	47.3	N.	153.1	E.
10	21	44	46.2	Near southeast coast of Java. Felt. Depth about 24 km	8.1	S.	112.8	E.
11	04	45	59.8	Santa Cruz Islands region. Depth about 24 km	12.3	S.	166.5	E.
11	08	05	30.5	Western Colorado. Slight damage. Depth about 49 km. Mag. 5½ (Berk).	38.3	N.	107.6	W.
11	18	26	28.2	Mascarene Islands region. Depth about 25 km	16.1	S.	67.0	E.
12	00	22	02.1	Near north coast of Honshu, Japan. Depth about 100 km	41.1	N.	140.8	E.
12	09	11	16.4	Samoa Islands region. Felt at Apia. Depth about 25 km	15.2	S.	173.2	W.
12	09	56	08.2	Near north coast of New Guinea. Depth about 19 km	2.2	S.	140.5	E.
12	10	36	36.4	Ionian Islands. Felt on Zante. Depth about 25 km	37.0	N.	20.0	E.
12	17	12	24.7	Banda Sea. Depth about 25 km	6.9	S.	130.1	E.
12	18	29	35.1	New Britain region. Depth about 119 km	6.2	S.	148.6	E.
12	22	50	32.6	Solomon Islands region. Depth about 100 km	6.0	S.	154.3	E.
13	02	21	12.7	Romania. Depth about 63 km	45.4	N.	25.8	E.
13	05	59	06.8	North of Crozet Islands. Depth about 34 km	38.0	S.	50.1	E.
13	14	52	34.7	Kamchatka. Depth about 35 km. Mag. 6¾	55.0	N.	161.2	E.
13	16	45	56.2	Mariana Islands region. Depth about 25 km	20.9	N.	144.8	E.
13	18	40	30.3	New Ireland region. Depth about 213 km	3.9	S.	152.4	E.
14	00	56	43.0	About 450 miles south of Easter Island. Depth about 25 km	33.2	S.	111.3	W.
14	00	58	05.0	Near coast of Leyte, Philippine Islands. Depth about 17 km	10.2	N.	125.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Oct. 14	11	33	14.0	Fox Islands, Aleutian Islands. Depth about 64 km	52.3	N.	166.1	W.
14	12	16	31.8	Near coast of Sumatra. Depth about 173 km	4.8	S.	103.1	E.
14	13	12	07.9	Southeastern Alaska. Felt at Juneau, Yakutat; and Whitehorse, Yukon, Canada. Depth about 32 km.	60.0	N.	136.4	W.
14	15	28	39.0	Near south coast of Mindanao, Philippine Islands. Depth about 36 km.	4.9	N.	125.5	E.
14	17	48	27.7	Off coast of Chile. Depth about 19 km. Mag. 5¼–5½ (Pal)	38.9	S.	73.5	W.
14	21	19	11.4	Fox Islands, Aleutian Islands. Depth about 50 km. Mag. 6½	51.9	N.	172.1	W.
14	22	55	41.7	North Atlantic Ocean. Depth about 40 km	55.7	N.	35.2	W.
15	01	54	09.2	North Atlantic Ocean. Depth about 37 km	55.8	N.	35.6	W.
15	02	53	34.3	Solomon Islands region. Depth about 35 km	11.0	S.	162.9	E.
15	11	30	05.7	Off east coast of Formosa. Depth about 110 km	23.1	N.	123.5	E.
15	12	12	06.7	Solomon Islands. Depth about 416 km	7.4	N.	157.2	E.
16	01	35	57.4	Near Islands, Aleutian Islands. Depth about 97 km	53.2	N.	172.1	E.
16	04	53	59.2	South of Fiji Islands. Depth about 565 km	23.1	N.	179.3	E.
16	09	34	44.7	Off coast of Nicaragua. Depth about 135 km. Mag. 5 (Pal)	14.0	N.	91.2	W.
16	13	15	34.7	Argentina-Bolivia border. Depth about 80 km	22.3	S.	67.6	W.
16	13	27	47.2	Near coast of North Island, New Zealand. Depth about 25 km	36.6	N.	177.2	E.
16	17	53	31.2	Central Alaska. Depth about 125 km	63.1	N.	151.3	W.
16	19	20	43.6	Kurile Islands. Depth about 383 km	52.2	N.	153.5	E.
16	22	37	19.1	Andreanof Islands, Aleutian Islands. Depth about 23 km	51.0	N.	179.6	E.
17	13	36	35.5	Off coast of Chile. Depth about 60 km	39.8	S.	88.5	W.
17	13	45	25.8	Near coast of Chile. Depth about 100 km	21.6	S.	71.2	W.
17	15	45	36.9	Off west coast of Colombia. Depth about 83 km. Mag. 4¾ (Pal)	4.9	N.	78.4	W.
17	15	56	13.9	Off west coast of Colombia. Depth about 79 km	5.0	N.	78.2	W.
17	18	05	34.2	North Atlantic Ocean. Depth about 25 km	31.4	N.	40.9	W.
17	19	02	15.7	North Atlantic Ocean. Depth about 19 km	31.5	N.	40.8	W.
17	22	15	32.0	Mexico-Guatemala border. Depth about 128 km. Mag 5¾–6 (Pal).	14.7	N.	92.8	W.
17	22	33	32.3	Fiji Islands region. Depth about 491 km	18.9	S.	177.6	W.
18	00	00	56.7	South of Fiji Islands. Depth about 636 km	25.5	S.	178.4	E.
18	00	21	52.8	Fox Islands, Aleutian Islands. Depth about 80 km. Mag. 4¾–5 (Pal).	52.5	N.	170.0	W.
18	06	34	11.0	Mexico-Guatemala border. Depth about 112 km	14.6	N.	92.6	W.
18	10	26	52.6	Kirghiz S.S.R. Depth about 75 km	42.3	N.	78.3	E.
18	10	52	36.6	Tonga Islands region. Depth about 90 km	18.8	S.	173.3	E.
19	06	35	05.3	Kurile Islands. Depth about 69 km	49.0	N.	156.6	E.
19	07	09	12.7	Fiji Islands region. Depth about 608 km	20.1	S.	179.9	W.
19	10	31	52.1	South Pacific Ocean. Depth about 17 km	54.8	S.	129.8	W.
20	06	12	41.2	Near coast of Venezuela. Felt. Depth about 20 km	10.6	N.	70.2	W.
20	11	05	57.6	Santa Cruz Islands region. Depth about 37 km. Mag. 6¼	11.1	S.	164.9	E.
20	12	23	01.2	Libya. Depth about 25 km	29.1	N.	20.8	E.
20	23	40	13.6	Kurile Islands region. Depth about 64 km	45.0	N.	147.8	E.
21	02	00	07.6	Nicobar Islands. Depth about 133 km	7.4	N.	94.0	E.
21	04	18	44.4	Peru-Brazil border. Depth about 100 km	7.2	S.	73.8	W.
21	06	25	20.5	Banda Sea. Depth about 134 km	7.0	S.	127.6	E.
22	08	22	00.9	Solomon Islands region. Felt at Honiara. Depth about 93 km. Mag. 6¾–7.	10.4	S.	161.2	E.
22	19	17	47.9	Hungary-Romania border. Depth about 25 km	45.9	N.	21.2	E.
23	03	43	07	South of Hollister, California. Felt. Mag. 3.8 (Berk)	36	48 N.	121	24 W.
23	06	32	20.0	North Atlantic Ocean. Depth about 18 km	31.5	N.	40.7	W.
23	19	21	15.7	Red Sea. Depth about 25 km	17.9	N.	40.3	E.
23	21	48	26.7	Off coast of El Salvador. Felt. Depth about 25 km	11.8	N.	88.7	W.
24	05	12	04.4	New Hebrides Islands region. Depth about 145 km	15.1	S.	167.4	E.
24	05	47	01.0	Hindu Kush region. Depth about 246 km	36.6	N.	71.1	E.
24	17	09	14.4	New Britain region. Depth about 122 km	6.1	S.	150.0	E.
25	01	06	20.6	Tonga Islands region. Depth about 64 km	20 1	S.	174.6	W.
25	09	36	51.7	Solomon Islands. Depth about 145 km	6.8	S.	155.1	E.
25	12	14	54.4	Near coast of southern Chile. Depth about 97 km	43.6	S.	74.1	W.
25	18	26	28.5	New Hebrides Islands region. Depth about 116 km	17.9	S.	167.7	E.
25	22	01	31.1	Tonga Islands region. Depth about 223 km	19.6	S.	176.0	W.
26	01	48	07.1	Near east coast of Kamchatka. Depth about 71 km	52.4	N.	160.2	E.
26	06	57	32.1	Sawoe Sea. Depth about 132 km	9.1	S.	121.0	E.
26	11	26	12.7	Flores Island region. Depth about 217 km	8.0	S.	121.4	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinater of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Oct.26	14	47	43.8	Mendoza Province, Argentina. Depth about 134 km	32.6	S.	67.7	W.
26	16	36	17.4	Near coast of Chile. Felt at Antofagasta. Depth about 58 km	23.7	S.	70.3	W.
26	17	34	29.8	Fiji Islands region. Depth about 589 km	17.9	S.	178.6	W.
26	19	51	55.1	Spice Islands region. Depth about 32 km	1.9	S.	126.0	E.
26	22	55	21.4	Greece. Felt. Depth about 44 km	40.3	N.	20.5	E.
27	00	16	44.2	Near coast of Chile. Felt at Antofagasta. Depth about 39 km	23.8	S.	70.2	W.
27	00	26	06.0	Near coast of Chile. Felt at Antofagasta. Depth about 19 km	23.3	S.	69.7	W.
27	03	17	46.1	Solomon Islands region. Depth about 116 km	10.4	S.	161.5	E.
27	04	32	48.6	Bonin Islands region. Depth about 549 km	27.3	N.	139.8	E.
27	05	25	04.9	Galapagos Islands region. Depth about 25 km. Mag. 4¾ (Pal)	1.5	N.	90.8	W.
27	10	51	34.7	Luzon, Philippine Islands. Depth about 81 km	16.6	N.	121.2	E.
27	12	45	40.1	Jan Mayen Island region. Depth about 70 km	71.7	N.	8.3	W.
27	14	38	29.2	Arctic Ocean, northwest of Severnaya Zemlya region. Depth about 25 km.	85.9	N.	80.4	E.
27	14	46	54.6	Near south coast of Sumatra. Felt at Lampung. Depth about 105 km.	6.3	S.	104.3	E.
27	15	39	20.3	Jan Mayen Island region. Depth about 42 km	71.4	N.	8.6	W.
27	19	42	58.7	Solomon Islands region. Depth about 118 km	6.4	S.	154.7	E.
27	22	27	55.1	Samoa Islands region. Depth about 253 km	15.3	S.	175.0	W.
28	04	18	41.9	Jan Mayen Island region. Felt. Depth about 48 km. Mag. 6¾	71.4	N.	8.6	W.
28	05	27	16.1	Jan Mayen Island region. Depth about 77 km	71.6	N.	7.7	W.
28	07	46	38.5	Jan Mayen Island region. Depth about 61 km	71.4	N.	8.4	W.
28	11	12	58.8	Celebes Sea. Depth about 25 km	2.2	N.	124.0	E.
28	12	57	08.9	Near north coast of New Guinea. Depth about 26 km	5.5	S.	146.2	E.
28	13	18	14.3	Kamchatka. Depth about 96 km. Mag. 7	52.2	N.	157.4	E.
28	22	29	26.6	Near east coast of Honshu, Japan. Felt. Depth about 96 km	34.6	N.	141.1	E.
29	00	08	41.4	Italy. Slight damage at Scarperia. Depth about 45 km	44.2	N.	11.5	E.
29	01	25	35.5	West Pakistan. Depth about 23 km	25.7	N.	67.6	E.
29	04	17	02.1	North Atlantic Ocean. Depth about 38 km. Mag. 4¾ (Pal)	15.5	N.	46.4	W.
29	09	37	41.6	Samoa Islands region. Felt at Apia. Depth about 99 km. Mag. 5½–5¾ (Pal).	15.9	S.	172.9	W.
29	11	54	17.4	North Atlantic Ocean. Depth about 25 km	47.6	N.	27.6	W.
29	13	21	50.7	Southern Bolivia. Depth about 56 km	20.2	S.	67.7	W.
29	17	12	20.5	Luzon, Philippine Islands. Depth about 163 km	14.2	N.	120.7	E.
29	20	44	07.4	Ionian Islands. Depth about 39 km	37.9	N.	20.0	E.
29	21	44	44.5	Mariana Islands. Depth about 78 km	12.2	N.	141.2	E.
29	23	42	12.3	Near south coast of Kamchatka. Depth about 35 km	49.7	N.	155.8	E.
30	08	32	39.1	North Atlantic Ocean. Depth about 25 km	47.7	N.	28.7	W.
30	12	14	36.1	Near coast of Chile. Felt at Antofagasta and Mejillones. Depth about 76 km. Mag. 6¾.	23.4	S.	70.3	W.
30	13	11	54.2	Near coast of Chile. Felt at Antofagasta and Mejillones. Depth about 65 km.	23.4	S.	70.6	W.
30	15	50	50.4	Spice Islands. Depth about 32 km	1.1	S.	127.0	E.
30	16	16	24.1	Near south coast of Kamchatka. Depth about 50 km	51.4	N.	156.8	E.
30	18	36	34.3	Near coast of Chile. Felt at Antofagasta and Mejillones. Depth about 25 km.	23.4	S.	70.4	W.
30	21	32	47.7	Chile–Bolivia border. Felt. Depth about 60 km. Mag. 6¾	22.9	S.	68.0	W.
30	21	56	20.6	Pribilof Islands. Depth about 70 km	56.6	N.	167.2	W.
31	07	03	43.7	Gulf of California. Depth about 25 km	30.5	N.	113.5	W.
31	20	50	24.2	South of Bonin Islands. Depth about 25 km	24.4	N.	141.8	E.
31	23	44	16.9	Near east coast of Kamchatka. Depth about 36 km	54.9	N.	161.7	E.
Nov.1	06	15	29.4	Ascension Island region. Depth about 35 km. Mag. 5 (Pal)	11.2	S.	12.7	W.
1	08	45	59.3	Near coast of Chile. Slight damage at Concepcion, Lebu, and Valdivia. Depth about 55 km. Mag. 7¼–7½.	38.5	S.	75.1	W.
1	10	23	57.2	Near south coast of Sumatra. Depth about 43 km	5.5	S.	102.4	E.
1	12	29	31.6	Near coast of Chile. Felt. Depth about 64 km. Mag. 5–5¼ (Pal)	38.7	S.	75.0	W.
1	16	13	56.2	Greece–Yugoslavia border. Felt at Florina, Greece. Depth about 33 km.	41.1	N.	21.0	E.
1	19	06	22.7	Near west coast of Kamchatka. Depth about 162 km	50.3	N.	153.9	E.
1	22	26	52.7	Hebgen Lake region, Montana. Felt. Depth about 38 km	45.3	N.	111.2	W.
1	23	58	09.2	Kermadec Islands. Depth about 43 km	30.4	S.	177.7	W.
2	15	29	51.6	Kodiak Island, Alaska. Depth about 104 km	58.2	N.	153.2	W.
2	16	31	53.2	Burma–East Pakistan border. Depth about 124 km	23.3	N.	93.8	E.
2	17	14	54.0	Santa Cruz Islands. Depth about 80 km. Mag. 6½–6¾	11.2	S.	164.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Nov. 2	18	09	48.8	South Indian Ocean. Depth about 23 km	45.0	S.	80.2	E.
2	19	44	46.1	Tadzhik S.S.R. Depth about 54 km	39.1	N.	71.9	E.
3	02	42	53.7	Tonga Islands. Depth about 31 km. Mag. 5½ (Pal)	22.1	S.	175.9	W.
3	06	50	24	Southeast of Hollister, California. Felt in Monterey and San Benito counties. Mag. 4.1 (Berk).	36	32 N.	121	08 W.
3	17	30	29.9	Fiji Islands region. Depth about 25 km	17.0	S.	176.5	W.
3	22	02	19.2	Southern Peru. Depth about 55 km	14.4	S.	71.6	W.
4	11	40	11.1	Fiji Islands. Depth about 638 km	20.6	S.	178.4	W.
4	14	18	09.0	Spice Islands region. Depth about 31 km	00.9	S.	126.7	E.
5	00	51	36.7	Kyushu, Japan. Depth about 74 km	30.7	N.	130.9	E.
5	20	20	53.7	Northern Greece. Damage in Epirus region. Depth about 49 km. Mag. 5.0 (Pal).	39.4	N.	20.5	E.
6	04	38	16.7	Near east coast of Kamchatka. Depth about 32 km. Mag. 6¼	53.2	N.	159.8	E.
6	06	14	53.4	Kermadec Islands. Depth about 69 km. Mag. 6½	31.1	S.	177.7	W.
6	06	40	12**	Near coast of Luzon, Philippine Islands				
6	22	10	06.4	Fox Islands, Aleutian Islands. Depth about 43 km. Mag. 5–5¼ (Berk).	52.9	N.	168.0	W.
7	13	23	06.1	Kyushu, Japan. Depth about 25 km	32.5	N.	131.6	E.
7	16	26	43.0	Solomon Islands region. Depth about 25 km	11.3	S.	162.7	E.
7	22	18	27.4	Near coast of Chile. Depth about 67 km	40.3	S.	73.5	W.
7	23	56	32**	Kermadec Islands				
8	00	20	17.5	China–Mongolia border. Depth about 51 km	41.3	N.	105.5	E.
8	00	33	18**	Kermadec Islands				
8	02	43	38**	----do				
8	04	28	08.7	North Atlantic Ocean. Depth about 25 km. Mag. 4½ (Pal)	27.4	N.	44.9	W.
8	05	22	13.3	Kurile Islands. Depth about 57 km. Mag. 5.0 (Pal)	44.9	N.	149.7	E.
8	05	27	22.1	Kurile Islands. Depth about 30 km	45.0	N.	149.7	E.
8	10	59	45.6	Kermadec Islands. Depth about 39 km	31.2	S.	177.6	W.
8	11	36	27.2	Near coast of Oregon. Felt in Oregon and Washington. Depth about 44 km. Mag. 4¾–5 (Pal).	45.1	N.	125.2	W.
8	12	33	58.0	Bonin Islands region. Depth about 23 km	28.4	N.	139.5	E.
8	13	36	12.9	Alaska Peninsula. Depth about 29 km	56.2	N.	158.8	W.
8	19	47	52.6	New Hebrides Islands. Depth about 62 km	18.5	S.	168.0	E.
8	20	28	13.2	Near north coast of New Guinea. Depth about 61 km	3.1	S.	139.5	E.
9	01	17	36.8	Near Chile–Bolivia border. Depth about 131 km	21.6	S.	67.5	W.
9	03	17	58.5	Sandwich Islands. Depth about 37 km. Mag. 6¼–6½ (Pal)	60.9	S.	24.8	W.
9	10	43	40.8	Szechwan Province, China. Depth about 31 km. Mag. 6¼–6½ (Pal).	32.8	N.	103.4	E.
9	19	32	39.0	Kermadec Islands. Depth about 68 km	30.9	S.	177.1	W.
9	20	06	16.2	Near coast of Chile. Felt at Antofagasta. Depth about 52 km. Mag. 5½–5¾ (Pal).	23.4	S.	70.6	W.
10	01	33	43.8	Gulf of Mexico. Depth about 21 km	26.4	N.	87.5	W.
10	01	54	56.6	Hindu Kush. Depth about 193 km	36.2	N.	70.8	E.
10	05	31	30.1	North Atlantic Ocean. Depth about 28 km. Mag. 5 (Pal)	30.4	N.	40.4	W.
10	14	44	48.8	Near north coast of New Guinea. Depth about 39 km. Mag. 6¾	2.7	S.	139.3	E.
10	16	30	06.8	Loyalty Islands region. Depth about 50 km	22.4	S.	172.1	E.
11	01	08	17.3	Sumba Island region. Depth about 25 km	10.2	S.	119.1	E.
11	02	53	38.8	Southern Mexico. Felt at Coatzacoalcos. Depth about 82 km	17.4	N.	95.7	W.
11	05	31	31.9	Northern Greece. Damage in Epirus region. Depth about 43 km	39.3	N.	20.8	E.
11	06	14	42**	Fiji Islands region				
11	06	53	27.0	Southern Peru. Slight damage at Arequipa. Depth about 114 km	16.1	S.	71.9	W.
11	13	45	14.3	Near east coast of Kamchatka. Depth about 28 km	55.0	N.	161.7	E.
11	22	22	18.2	Nicobar Islands. Depth about 31 km	6.8	N.	94.4	E.
11	22	23	44.8	Near coast of Chile. Felt at Antofagasta. Depth about 33 km	23.3	S.	70.7	W.
11	22	42	36.0	Near east coast of Kamchatka. Depth about 36 km	53.4	N.	159.6	E.
12	06	21	35.8	Fiji Islands region. Depth about 576 km	17.4	S.	178.9	W.
12	07	56	21.6	Near coast of Chile. Depth about 60 km	43.4	S.	73.7	W.
12	10	53	37.9	Solomon Islands region. Depth about 179 km	6.8	S.	156.3	E.
12	18	37	08.1	Kurile Islands. Depth about 134 km	46.6	N.	149.3	E.
13	06	37	06.2	Molucca Passage. Depth about 60 km. Mag. 5½ (Pal)	1.4	N.	127.3	E.
13	07	10	05**	Southern Peru. Felt at Arequipa				
13	09	20	32.3	Fox Islands, Aleutian Islands. Depth about 32 km. Mag. 7	51.4	N.	168.8	W.
13	12	25	40.2	Fox Islands, Aleutian Islands. Depth about 37 km	51.9	N.	168.5	W.
13	13	11	32	East of Oakland, California. Felt at Oakland. Mag. 2.4 (Berk)	37	50 N.	122	13 W.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Nov. 13	13	24	26.4	Fox Islands, Aleutian Islands. Depth about 26 km	51.4	N.	168.8	W.
13	13	28	11.5	Fox Islands, Aleutian Islands. Depth about 50 km	51.8	N.	168.1	W.
13	13	52	28.9	Fox Islands, Aleutian Islands. Depth about 46 km	51.5	N.	168.6	W.
13	14	29	21.1	----do----	52.1	N.	167.8	W.
13	15	28	03**	Fox Islands, Aleutian Islands				
13	17	19	18.0	Fox Islands, Aleutian Islands. Depth about 30 km	51.6	N.	167.9	W.
13	20	45	11.9	Azores. Depth about 23 km	39.9	N.	30.0	W.
14	02	08	05.5	Antarctic Ocean, south of Australia. Depth about 21 km	53.7	S.	140.7	E.
14	04	17	08.1	Antarctic Ocean, south of Australia. Depth about 47 km	53.6	S.	140.5	E.
14	12	07	44.4	Near north coast of New Guinea. Depth about 70 km	4.2	S.	142.9	E.
14	15	55	57.2	Burma. Depth about 58 km	24.5	N.	96.2	E.
14	17	53	24.6	Fiji Islands region. Depth about 536 km	20.6	S.	177.7	W.
14	19	59	35.2	Near coast of Chiapas, Mexico. Depth about 114 km. Mag. 5–5¼ (Pal).	14.9	N.	92.8	W.
14	20	10	31.2	Seville Province, Spain. Felt. Depth about 44 km	37.2	N.	4.8	W.
14	23	02	25.5	Colombia. Depth about 190 km	6.9	N.	73.2	W.
15	02	18	12.8	Mona Passage. Depth about 157 km	18.6	N.	68.5	W.
15	02	29	04**	Santa Cruz Islands region				
15	06	23	27.5	Antarctic Ocean, southeast of New Zealand. Depth about 46 km. Mag. 5½–5¾ (Pal).	62.7	S.	161.7	W.
15	09	05	59.1	Near Burma-India border. Depth about 103 km	23.4	N.	94.3	E.
15	21	40	14.5	Off coast of North Island, New Zealand. Depth about 71 km	35.4	N.	178.2	E.
16	01	23	11.1	South of Fiji Islands region. Depth about 552 km	23.9	S.	179.3	E.
16	15	38	21.7	Near coast of Colombia. Felt at Barranquila and Cartagena. Depth about 55 km. Mag. 4½–4¾ (Pal).	10.4	N.	74.1	W.
16	22	59	47.6	Sinkiang Province, China. Depth about 24 km	38.2	N.	89.5	E.
17	01	28	43.0	Near coast of Chile. Depth about 52 km	38.4	S.	73.1	W.
17	04	08	03.1	Kermadec Islands. Depth about 71 km	31.0	S.	177.7	W.
17	05	16	09.1	Near coast of Chile. Depth about 64 km	43.7	S.	75.4	W.
17	19	46	50.6	Fox Islands, Aleutian Islands. Depth about 46 km	52.6	N.	170.1	W.
17	21	22	45.6	South Pacific Ocean. Depth about 38 km	56.4	S.	122.6	W.
18	03	38	43.6	Sea of Okhotsk. Depth about 498 km	51.6	N.	151.0	E.
18	06	03	35.0	East of Crete, Mediterranean Sea. Depth about 24 km	35.2	N.	28.6	E.
18	11	03	14.0	Near Sierraville, California. Felt in Nevada, Placer, Plumas, and Sierra Counties. Mag. 4.4 (Berk).	39 36	N.	120 28	W.
18	12	42	39.3	Northern Chile. Felt at Antofagasta. Depth about 84 km	22.6	S.	68.5	W.
18	15	22	55.3	Banda Sea. Depth about 68 km	6.3	S.	130.0	E.
18	18	51	05.1	Guatemala. Depth about 168 km	14.8	N.	91.0	W.
19	04	48	51.6	Bolivia. Depth about 251 km	14.7	S.	66.2	W.
19	07	04	53.6	Fiji Islands region. Depth about 545 km	17.8	S.	178.9	W.
19	12	16	44.5	Caroline Islands region. Depth about 27 km	8.7	N.	137.6	E.
20	03	52	45.2	Ryukyu Islands. Depth about 23 km	26.2	N.	128.7	E.
20	10	49	13.4	Northern Peru. Depth about 55 km	8.4	S.	77.6	W.
20	22	01	56.4	Near coast of Peru. About 11 killed and extensive property damage from seismic sea wave at Pimentel, Eten, and Santa Rosa. Depth about 55 km. Mag. 6¾.	6.8	S.	81.0	W.
20	23	50	01.0	Southeast of Hollister, California. Felt. Mag. 3.5 (Berk)	36 49	N.	121 27	W.
21	04	21	48.6	Near coast of Peru. Felt. Depth about 73 km	6.5	S.	80.7	W.
21	04	29	05.3	New Ireland region. Depth about 369 km	3.4	S.	152.2	E.
21	18	44	02.3	Near east coast of Kamchatka. Depth about 70 km	54.4	N.	159.9	E.
22	02	32	21.8	Near coast of Peru. Felt. Depth about 51 km	7.1	S.	80.8	W.
22	03	03	02.7	Atlantic Ocean. Depth about 33 km	8.3	N.	38.4	W.
22	03	31	58.8	Tonga Islands. Depth about 66 km. Mag. 5½–5¾ (Pal)	19.3	S.	173.6	W.
22	03	45	20.8	Tonga Islands. Depth about 70 km	19.8	S.	172.6	W.
22	06	21	45.0	Indian Ocean, north of Crozet Islands. Depth about 21 km. Mag. 6¾.	36.1	S.	52.3	W.
22	07	09	14.8	Near east coast of Kamchatka. Depth about 28 km	53.2	N.	159.4	E.
22	12	28	54.8	Near coast of Chile. Felt at Valdivia. Depth about 49 km. Mag. 6½.	40.3	S.	73.9	W.
22	17	51	36**	Nicobar Island region				
23	01	24	30.1	New Britain region. Felt at Rabaul. Depth about 79 km	5.0	S.	153.3	E.
23	04	11	27.0	New Britain region. Depth about 431 km	4.7	S.	154.2	E.
23	09	42	47.3	D'Entrecasteaux Islands. Depth about 34 km	10.3	S.	151.7	E.
23	14	12	21.1	South of Tonga Islands. Depth about 28 km. Mag. 6¾	24.4	S.	176.1	W

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Nov. 23	16	52	24.2	Near coast of Mindanao, Philippine Islands. Depth about 213 km.	4.7	N.	125.8	E.
23	17	28	57.6	South of Tonga Islands. Depth about 69 km	24.2	S.	176.4	W.
23	17	56	37.2	South of Tonga Islands. Depth about 44 km	24.4	S.	176.2	W.
23	20	11	03.2	South of Tonga Islands. Depth about 71 km	24.4	S.	176.0	W.
23	21	14	29.2	South of Fiji Islands. Depth about 631 km	22.2	S.	179.5	W.
23	23	15	38.4	Near coast of Mindoro, Philippine Islands. Depth about 89 km	13.2	N.	120.2	E.
24	04	50	15.8	New Britain region. Felt. Depth about 87 km. Mag. 6-6¼	4.6	S.	153.0	E.
24	06	52	41.1	South of Tonga Islands. Depth about 23 km. Mag. 7	24.4	S.	176.1	W.
24	08	16	43.7	South of Tonga Islands. Depth about 25 km	24.6	S.	176.3	W.
24	08	26	19.0	South of Tonga Islands. Depth about 63 km	24.4	S.	176.2	W.
24	09	28	18.4	South of Tonga Islands. Depth about 67 km	24.2	S.	176.6	W.
24	18	25	46.4	Alaska Peninsula. Depth about 46 km	58.0	N.	155.9	W.
25	03	27	59.0	Near coast of Peru. Depth about 27 km	7.3	S.	81.4	W.
25	21	54	12.1	Honshu, Japan. Felt in northeastern Honshu. Depth about 105 km.	38.3	N.	140.7	E.
26	07	37	03.3	Near coast of Honshu, Japan. Felt at Tokyo. Depth about 77 km.	36.7	N.	140.9	E.
26	12	19	01.2	Solomon Islands region. Depth about 51 km	10.8	S.	162.2	E.
26	16	45	43.4	Fox Islands, Aleutian Islands. Depth about 76 km	51.9	N.	167.9	W.
26	18	20	20.6	Antarctic Ocean, south of Australia. Depth about 19 km	53.8	S.	141.0	E.
26	21	35	36.6	South of Tonga Islands. Depth about 20 km	24.5	S.	175.5	W.
27	01	40	24.1	Near coast of northern Peru. Depth about 25 km	7.7	S.	81.5	W.
27	12	00	26.3	Alaska. Depth about 140 km	63.1	N.	151.2	W.
27	13	10	06.7	Near north coast of New Guinea. Depth about 44 km	5.5	S.	146.3	E.
27	15	17	14.2	Near coast of Hokkaido, Japan. Depth about 80 km	42.9	N.	143.3	E.
27	20	37	24.7	Congo Republic. Depth about 47 km	3.4	S.	29.5	E.
27	21	24	30.7	Near coast of Chile. Depth about 61 km. Mag. 5¼-5½ (Pal)	37.2	S.	73.4	W.
28	05	12	50.1	Near coast of Turkey. Depth about 71 km	36.4	N.	31.1	E.
28	06	16	58.2	Banda Sea. Depth about 60 km	6.7	S.	128.4	E.
28	19	47	19.5	Azores. Depth about 38 km	47.5	N.	27.5	W.
29	07	14	26.0	South of Fiji Islands. Depth about 620 km	25.1	S.	180.0	
29	09	31	59.5	Near coast of southern Chile. Depth about 63 km. Mag. 5¼ (Pal)	44.1	S.	76.0	W.
29	14	06	48.8	Ryukyu Islands. Depth about 24 km	26.7	N.	126.3	E.
29	19	17	08**	Peru. Felt at Arequipa				
Dec. 1	04	02	30.4	Western Turkey. Depth about 19 km	38.6	N.	30.9	E.
1	05	39	55	Northwest of Bishop, California. Felt. Mag. 3.6	37 30	N.	118 35	W.
1	08	42	26.5	Easter Island region. Depth about 25 km	32.5	S.	113.1	W.
1	09	38	16.7	Banda Sea. Depth about 32 km	6.9	S.	128.9	E.
1	10	11	46.1	Near east coast of New Guinea. Felt. Depth about 57 km	5.7	S.	146.0	E.
1	10	40	30.0	Tonga Islands. Depth about 25 km	24.4	S.	176.2	W.
1	19	52	45	Northeast of El Centro, California. Felt at Brawley and Westmorland. Mag. 3.5.	32 54	N.	115 29	W.
1	20	49	45.5	Near coast of Vancouver Island, B.C. Depth about 15 km. Mag. 6 (Berk).	49.0	N.	129.3	W.
1	20	49	50.4	Solomon Islands region. Depth about 117 km	4.5	S.	154.0	E.
1	21	49	34.8	Near coast of Vancouver Island, B.C. Depth about 22 km	49.1	N.	129.1	W.
2	04	02	42.0	Fox Islands, Aleutian Islands. Depth about 70 km	52.6	N.	168.2	W.
2	09	10	39.1	Near coast of Chile. Felt at Antofagasta. Depth about 19 km. Mag. 6¾.	24.6	S.	69.7	W.
2	09	37	36.1	Near coast of Chile. Depth about 46 km. Mag. 6¾	24.4	S.	69.5	W.
2	17	43	08.3	Ryukyu Islands. Depth about 21 km	25.7	N.	129.1	E.
2	19	31	26.2	Eastern Turkey. Depth about 127 km	38.7	N.	40.3	E.
2	19	41	06.3	South Indian Ocean. Depth about 45 km	41.8	S.	88.3	E.
2	22	29	59.8	Northern Chile. Felt at Antofagasta. Depth about 45 km	24.4	S.	69.6	W.
3	04	24	18.9	Outer Mongolia. Depth about 60 km. Mag. 7	42.9	N.	104.4	E.
3	04	55	08.6	Off coast of Guerrero, Mexico. Depth about 30 km	15.3	N.	100.5	W.
3	07	07	42.6	Andreanof Islands, Aleutian Islands. Felt on Adak. Depth about 160 km.	52.7	N.	177.4	W.
3	09	12	19.0	Off south coast of Formosa. Depth about 35 km	21.2	N.	121.1	E.
3	17	56	31.1	Outer Mongolia. Depth about 51 km	43.1	N.	104.4	E.
3	20	21	01.3	Laptev Sea. Depth about 28 km	76.8	N.	131.1	E.
3	21	47	26.0	New Ireland region. Depth about 174 km	4.3	S.	151.9	E.
4	03	43	00.2	Northern Chile. Depth about 51 km	24.3	S.	69.6	W.
4	13	28	05.4	New Britain region. Depth about 217 km	5.6	S.	148.8	E.
4	15	47	20.3	Northern Celebes. Depth about 21 km	0.9	N.	120.4	E.

See footnotes at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Dec. 4	16	20	36.1	Off coast of Honshu, Japan. Depth about 108 km	32.7	N.	141.7	E.
4	18	30	20.4	Near coast of El Salvador. Felt. Depth about 56 km	12.9	N.	88.6	W.
4	21	44	32.9	North Atlantic Ocean. Depth about 43 km	23.8	N.	44.8	W.
4	22	14	33.6	Outer Mongolia. Depth about 39 km	43.3	N.	104.0	E.
4	23	55	39.3	Fiji Islands region. Depth about 633 km	21.2	S.	179.0	W.
5	08	38	44.8	Outer Mongolia. Depth about 24 km	43.3	N.	104.3	E.
5	17	49	41.2	Near east coast of Kamchatka. Depth about 19 km	54.9	N.	161.4	E.
5	18	07	30.2	Near east coast of Kamchatka. Depth about 40 km	54.5	N.	161.5	E.
5	21	21	51.7	Straits of Gibraltar. Depth about 66 km	35.9	N.	6.5	W.
5	23	46	29.8	Outer Mongolia. Depth about 61 km	43.4	N.	103.8	E.
6	03	35	30.6	Outer Mongolia. Depth about 55 km	43.1	N.	104.5	E.
6	03	59	52.6	Outer Mongolia. Depth about 68 km	43.1	N.	104.1	E.
6	08	56	08.4	Near coast of Panama. Depth about 25 km	8.2	N.	82.6	W.
6	08	56	09.4	Northern Chile. Felt at Antofagasta. Depth about 28 km. Mag. 5¼–5½ (Pal).	21.4	S.	69.2	W.
6	12	17	38.7	Fiji Islands region. Depth about 616 km	20.6	S.	178.8	W.
6	18	19	36.3	Samar, Philippine Islands. Felt. Depth about 25 km	11.6	N.	125.5	E.
6	21	34	09.3	Sumatra. Depth about 54 km	2.6	S.	101.5	E.
7	02	59	31.0	North Island, New Zealand region. Depth about 25 km	36.0	S.	179.3	W.
7	07	42	37.9	South-central Alaska. Felt at Summit. Depth about 36 km	62.7	N.	151.5	W.
7	16	19	09.2	Celebes Sea. Depth about 40 km	1.2	N.	121.8	E.
7	20	17	13.0	Outer Mongolia. Depth about 75 km	43.5	N.	102.5	E.
8	01	01	12.2	North Island, New Zealand region. Depth about 25 km	36.0	S.	179.1	W.
8	01	24	15.7	Fiji Islands region. Depth about 600 km	21.7	S.	179.4	W.
8	07	54	11.3	Tonga Islands. Depth about 25 km	24.6	S.	176.5	W.
8	09	21	12.1	Baja California. Depth about 39 km	29.7	N.	113.5	W.
8	10	01	06.4	Mindanao, Philippine Islands. Depth about 39 km	7.3	N.	126.3	E.
8	11	20	07.8	San Juan Province, Argentina. Felt at Santiago, Chile. Depth about 140 km.	31.8	S.	68.9	W.
8	12	46	52	West of Lakeport, California. Felt. Mag. 3.1 (Berk)	39.0	N.	123.2	W.
8	14	32	45.8	Kermadec Islands region. Depth about 70 km	30.4	S.	178.2	W.
8	19	12	05.5	Leyte, Philippine Islands. Depth about 29 km	10.1	N.	125.8	E.
8	21	36	22.8	Banda Sea. Depth about 23 km	6.0	S.	129.9	E.
9	00	36	29.8	Tonga Islands. Depth about 200 km	20.7	S.	176.2	W.
9	05	59	44.5	Baja California. Depth about 25 km	26.9	N.	116.0	W.
9	21	24	55.2	Jan Mayen Island region. Depth about 25 km	71.7	N.	2.7	W.
10	06	29	33.4	Near north coast of Luzon, Philippine Islands. Depth about 61 km.	19.1	N.	119.5	E.
10	13	32	21.6	Samoa Islands region. Felt at Apia. Depth about 36 km	15.0	S.	173.0	W.
10	13	55	16.5	Celebes Sea. Depth about 292 km	1.5	N.	124.3	E.
11	00	01	07.6	Loyalty Islands region. Depth about 90 km	22.3	S.	171.5	E.
11	01	07	52.8	Sinkiang Province, China. Depth about 77 km	37.0	N.	84.5	E.
11	03	18	10.9	Molucca Passage. Depth about 52 km	1.6	N.	126.4	E.
11	18	53	03.2	New Hebrides Islands region. Depth about 57 km. Mag. 6¼–6½	15.7	S.	167.0	E.
11	18	58	37.4	Vancouver Island region. Depth about 25 km	49.1	N.	129.8	W.
12	04	18	29.4	Santa Cruz Islands region. Depth about 90 km	10.6	S.	165.3	E.
12	10	04	00.2	Near Norfolk Island. Depth about 45 km	28.5	S.	167.4	E.
12	18	41	24	East of Ferndale, California. Felt at Eureka	40	33 N.	124	05 W.
13	07	36	16.4	Macquarie Islands. Depth about 25 km. Mag. 7¼	52.7	S.	159.1	E.
13	09	03	09.2	Tonga Islands. Depth about 84 km	21.9	S.	175.5	W.
13	10	05	24.3	Bonin Islands region. Depth about 28 km	27.9	N.	142.4	E.
14	00	20	52.7	Santa Cruz Islands. Depth about 51 km	10.8	S.	165.3	E.
14	00	57	25.0	Santa Cruz Islands. Depth about 65 km	10.9	S.	165.4	E.
14	04	02	02.1	Ryukyu Islands region. Depth about 25 km	26.8	N.	130.3	E.
14	08	13	47.9	Kermadec Islands region. Depth about 25 km	33.1	S.	179.7	W.
14	13	11	33.0	New Britain. Felt at Rabaul. Depth about 67 km	5.3	S.	151.3	E.
14	14	23	25.7	Macquarie Islands region. Depth about 77 km	52.1	S.	160.7	E.
14	23	51	31.5	Molucca Passage. Depth about 78 km. Mag. 6¾	3.0	N.	126.3	E.
15	05	40	26	Northeast of Berkeley, California. Felt in Solano and Contra Costa counties. Mag. 3.9 (Berk).	38	02 N.	121	50 W.
15	12	09	54.5	Luzon, Philippine Islands. Depth about 170 km	12.8	N.	122.2	E.
15	18	33	38.0	Fiji Islands. Depth about 614 km	18.0	S.	178.4	W.
15	23	24	35.8	Near coast of Nicaragua. Depth about 39 km	12.3	N.	87.8	W.
16	01	20	02.2	Fox Islands, Aleutian Islands. Depth about 32 km	51.3	N.	170.6	W.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		°	′	°	′
Dec.16	05	08	43.3	New Guinea. Depth about 100 km	4.3	S.	139.4	E.
16	08	52	17.3	Fiji Islands region. Depth about 44 km	16.4	S.	178.0	E.
16	16	49	15.9	Near coast of Eritrea. Depth about 29 km	14.7	N.	42.9	E.
16	18	21	31.7	North Atlantic Ocean. Depth about 21 km	44.0	N.	28.9	W.
17	02	04	31.7	Andreanof Islands, Aleutian Islands. Depth about 40 km	50.8	N.	175.2	W.
17	07	38	31.1	Southern Peru. Felt at Arequipa. Depth about 28 km	15.2	S.	73.5	W.
17	10	37	17.8	Java Sea. Depth about 297 km	6.4	S.	109.4	E.
17	13	14	32.0	North of Azores. Depth about 25 km	44.7	N.	30.9	W.
17	13	25	11.1	Mariana Islands region. Depth about 24 km	11.4	N.	141.4	E.
17	16	05	51.3	New Hebrides Islands region. Depth about 100 km	22.5	S.	173.0	E.
17	16	44	44.6	Kurile Islands. Depth about 19 km	47.4	N.	153.7	E.
17	18	05	37.0	Azores, Depth about 33 km	39.7	N.	29.7	W.
18	05	11	21.9	New Hebrides Islands. Depth about 93 km	14.9	S.	167.6	E.
18	07	35	59.8	Off east coast of Honshu, Japan. Felt. Depth about 72 km	37.5	N.	143.4	E.
18	18	20	43.3	Mindanao, Philippine Islands. Depth about 36 km	8.6	N.	125.9	E.
18	19	29	07.9	Northern Chile-Argentina border. Depth about 218 km	24.5	S.	67.5	W.
18	20	54	34 4	New Britain region. Depth about 62 km	5.4	S.	152.7	E.
19	00	01	31.4	Hindu Kush. Depth about 25 km	36.6	N.	71.6	E.
19	06	59	52.5	Loyalty Islands region. Depth about 21 km	21.1	S.	169.4	E.
19	09	40	45.7	Loyalty Islands region. Depth about 25 km	21.0	S.	169.4	E.
19	10	00	42.2	Atlantic Ocean. Depth about 25 km	8.3	N.	39.5	W.
19	13	00	09.8	Santa Cruz Islands. Depth about 96 km	10.8	S.	166.9	E.
19	13	22	01.3	Northern Chile. Felt at Antofagasta. Depth about 17 km	24.5	S.	69.6	W.
19	18	59	40.8	Mariana Islands. Depth about 77 km	11.4	N.	141.2	E.
19	22	13	58.8	New Hebrides Islands. Depth about 66 km	12.7	S.	166.8	E.
19	22	46	23.7	New Hebrides Islands. Depth about 25 km	12.2	S.	166.0	E.
20	06	04	29.7	Near north coast of Formosa. Depth about 19 km	25.2	N.	122.7	E.
20	11	42	04.8	Fiji Islands. Depth about 659 km	21.2	S.	179.2	W.
20	22	20	03.7	New Ireland region. Depth about 154 km	4.3	S.	152.1	E.
21	14	39	48.0	South-central Alaska. Felt at Cooper Lake Project and Summit. Depth about 125 km. Mag. 5¾.	61.5	N.	152.9	W.
21	20	53	51.8	Mariana Islands region. Depth about 72 km	11.3	N.	141.3	E.
21	22	29	54.9	North of Balleny Islands. Depth about 29 km	62.7	S.	167.1	E.
21	23	55	07.0	Southwestern Sumatra. Depth about 164 km	3.8	S.	103.1	E.
22	02	25	29.3	Kermadec Islands region. Depth about 379 km	30.0	S.	179.6	W.
22	03	02	20.6	Nicobar Islands. Depth about 36 km	9.8	N.	94.1	E.
22	03	47	21.7	Near coast of southern Peru. Felt at Arequipa. Depth about 147 km.	16.2	S.	72.9	W.
22	06	31	21.5	Kermadec Islands region. Depth about 46 km	31.0	S.	177.1	W.
22	11	41	06.0	Off coast of northern California. Depth about 51 km	43.3	N.	126.2	W.
22	12	21	28.2	Near coast of Chile. Depth about 61 km	30.7	S.	72.3	W.
22	14	12	18.7	Kermadec Islands region. Depth about 60 km	28.0	S.	176.1	W.
22	14	27	40.3	Fox Islands, Aleutian Islands. Depth about 57 km	53.9	N.	168.1	W.
22	21	02	41.2	Solomon Islands. Depth about 469 km	6.9	S.	155.3	E.
23	06	07	01.1	Guatemala-Mexico border. Depth about 48 km	14.4	N.	92.2	W.
23	09	41	38.7	Near coast of Sumatra. Depth about 139 km	3.5	S.	101.8	E.
23	10	47	57.9	Mindanao, Philippine Islands. Felt. Depth about 67 km	8.3	N.	125.7	E.
23	14	34	37.9	Northern Peru. Depth about 82 km	4.8	S.	75.6	W.
23	15	47	04.9	Mindanao, Philippine Islands. Felt. Depth about 120 km	8.9	N.	125.7	E.
23	16	14	14.9	Santa Cruz Islands. Depth about 25 km	10.5	S.	163.8	E.
23	19	06	58.4	Kermadec Islands. Depth about 172 km	28.5	S.	176.8	W.
23	19	30	41.6	Near east coast of Luzon. Philippine Islands. Depth about 49 km	15.7	N.	121.7	E.
24	03	55	32.6	Indian Ocean. Depth about 79 km	17.4	S.	66.5	E.
24	16	42	11.9	Victoria, Australia. Felt. Depth about 36 km	38.7	S.	143.6	E.
24	21	35	40.9	Near coast of Chile. Depth about 31 km	39.4	S.	74.1	W.
24	23	18	27.9	Peru-Ecuador border. Depth about 23 km	3.7	S.	78.0	W.
25	05	20	59.7	Bonin Islands. Depth about 25 km	28.1	N.	142.9	E.
25	05	49	54.2	Santa Cruz Islands region. Depth about 40 km	10.9	S.	164.8	E.
25	11	11	50.0	Off coast of Peru. Depth about 50 km	8.0	S.	82.5	W.
25	20	27	34.1	Near east coast of Kamchatka. Depth about 37 km	54.8	N.	161.6	E.
26	00	56	16.6	Tonga Islands region. Depth about 59 km	23.8	S.	176.9	W.
26	01	44	49.0	Near south coast of Honshu, Japan. Depth about 113 km	34.0	N.	136.2	E.

TABLE 2.—*Summary of instrumental epicenters for 1960*—Continued

1960	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Dec.26	04 32 30.1	Sandwich Islands. Depth about 25 km. Mag. 5¼ (Pal)	57.6 S.	26.2 W.
26	05 36 38.3	Costa Rica-Panama border. Depth about 25 km	8.7 N.	82.4 W.
26	13 43 12.9	South of South Island, New Zealand. Depth about 37 km	49.6 S.	164.3 E.
27	10 35 26	Northwest of Arcata, California. Felt in Del Norte and Humboldt counties. Mag. 5.4 (Berk).	41 31 N.	125 03 W.
27	11 08 47.9	Off coast of northern California. Depth about 25 km. Mag. 4¼ (Berk).	41.6 N.	124.8 W.
27	18 09 41.6	Near coast of Peru. Depth about 82 km	13.8 S.	74.3 W.
28	05 39 41.9	Near coast of Greece. Depth about 25 km	35.0 N.	22.3 E.
28	19 45 19.0	Kodiak Island, Alaska. Depth about 32 km	58.2 N.	155.3 W.
29	06 02 13.9	Tonga Islands. Depth about 104 km	18.5 S.	174.7 W.
29	10 36 38.1	Near coast of southern Chile. Depth about 17 km. Mag. 6½–6¾	45.0 S.	75.0 W.
29	11 04 20.4	Peru. Depth about 35 km	10.2 S.	75.9 W.
29	13 42 34.6	Near north coast of New Guinea. Depth about 57 km	5.5 S.	146.1 E.
29	18 19 41.6	Near Crete, Mediterranean Sea. Depth about 54 km	35.5 N.	22.6 E.
29	19 01 38.1	Northern Chile. Felt at Arequipa. Depth about 39 km	18.9 S.	69.4 W.
29	19 50 15.5	Mariana Islands region. Depth about 25 km	7.9 N.	141.3 E.
30	05 29 28.6	Sawoe Sea. Depth about 53 km	9.7 S.	121.0 E.
30	11 03 36.8	Southern Peru. Depth about 47 km	17.0 S.	70.0 W.
30	21 33 24.3	Hindu Kush. Depth about 200 km	36.3 N.	71.0 E.
31	00 08 12.1	Kermadec Islands region. Depth about 70 km	30.1 S.	177.9 W.
31	05 26 21.0	Near Walnut Creek, Calif. Felt. Mag. 2.6 (Berk)	37 55 N.	122 03 W.
31	16 05 30.0	Flores Sea. Depth about 45 km	8.6 S.	119.7 E.
31	18 08 07.9	Near coast of southern Chile. Depth about 25 km. Mag. 6½–6¾ (Berk).	44.1 S.	75.4 W.
31	19 59 08.3	Banda Sea. Depth about 112 km	6.6 S.	129.1 E.
31	21 06 03.8	New Britain. Depth about 158 km	5.3 S.	151.2 E.

*Indicates probable error of 1/10 minute.
**Indicates probable error of ¼ minute.

TABLE 3.—*Principal earthquakes of the world from January through December 1960*

NOTE.—This table lists (1) the strongest shocks of the period as revealed by seismographic records, particularly those of the Western Hemisphere stations; (2) important destructive and near destructive earthquakes; (3) earthquakes of unusual interest outside the two preceding categories; and (4) magnitude as determined by Pasadena.

1960	Origin time G.C.T.	Region	Coordinates of provisional epicenter		Remarks
			Latitude	Longitude	
	h m s		° ′	° ′	
Jan. 13	15 40 34*	Southern Peru	16 S.	72 W.	57 killed, many injured, and major property damage at Arequipa, Aplao, Camana, Caraveli, Chuquibamba, and Yancarqui. Also felt at La Paz, Bolivia. Depth about 200 km. Mag. 7½.
15	09 30 24*	Near coast of southern Peru	15 S.	75 W.	4 injured and minor damage in the Ica Province. Also felt at Lima and at La Paz, Bolivia. Depth about 150 km. Mag. 7.
Feb. 21	08 13 31*	Northern Algeria	36 N.	4½ E.	47 killed, 88 injured, and 500 homes destroyed at Ben-Ilman and Melouza. Mag. 5¾.
29	23 40 12*	Agadir, Morocco	30 N.	9 W.	12,000 killed, 25,000 injured, and major property damage at Agadir. 90% of Talborjit quarters, 70% of new buildings, and 20% of industrial buildings destroyed. Mag. 6¼.

See footnote at end of table.

TABLE 3.—*Principal earthquakes of the world from January through December 1960*—Con.

1960	Origin time G.C.T.	Region	Coordinates of provisional epicenter				Remarks
			Latitude		Longitude		
	h m s		° ′		° ′		
Mar. 8	16 33 38*	New Hebrides Islands	16½	S.	168½	E.	Felt at Port-Vila. Depth about 250 km. Mag. 7-7¼.
9	23 54 25*	Southern Peru	16½	S.	72½	W.	1 killed, 23 injured at Arequipa. Felt at Arica and Iquique. Depth about 150 km. Mag. 6-6¼.
12	11 54 00*	Southern Yugoslavia	42	N.	21	E.	1 killed, 12 injured at Dobi Dol and Tetovo. Mag. 5½-5¾.
20	17 07 32*	Off northeast coast of Honshu, Japan.	40	N.	143	E.	Felt on northern Honshu and southern Hokkaido. 5-foot seismic sea wave at Miyako. Depth about 60 km. Mag. 7-7¼.
Apr. 13	12 37 43*	Guatemala-Mexico border	15½	N.	92	W.	1 killed, 14 injured in the San Marcos area. Damage at Huchuatemango and San Marcos. Depth about 50 km. Mag. 6.
24	12 14 26*	Southern Iran	28	N.	54½	E.	420 killed, 3,000 injured, and $20 million property damage at Kourdeh and Lar. Damage at Latifi, Khur, Beraq, and Gerash. Mag. 6.
May 21	10 02 50*	Near coast of Chile	37½	S.	73½	W.	Several injured and moderate property damage at Concepcion and surrounding area. Mag. 7½.
22	10 32 43*	----do	37½	S.	73	W.	Mag. 7¼-7½.
22	19 11 17*	----do	39½	S.	74½	W.	More than 2,000 killed, 3,000 injured, 2,000,000 homeless, and $550 million damage in southern Chile; seismic sea wave caused 61 deaths, $75 million damage in Hawaii; 138 deaths and $50 million damage in Japan; 32 dead and missing in the Philippines; and $500,000 damage to the west coast of the United States. Mag. 8½.
24	14 46 34*	South Island, New Zealand	44½	S.	167½	E.	Felt on Milford Sound. Mag. 6¾-7.
26	05 10 05*	Albania-Greece border	40	N.	20	E.	8 killed, 100 injured, and 20% of buildings destroyed in Korce. Mag. 6½.
June 6	05 55 50*	Near coast of Chile	45½	S.	73½	W.	Depth about 60 km. Mag. 6¾-7.
20	02 01 08*	----do	38	S.	73½	W.	Mag. 7¼.
20	12 59 40*	Southern Chile	39½	S.	73	W.	Mag. 6¾-7.
July 3	20 20 46*	Andreanof Islands, Aleutian Islands.	50½	N.	177	W.	Felt on Adak. Mag. 6¾-7.
25	11 12 00*	Kamchatka	54	N.	159	E.	Depth about 100 km. Mag. 7.
30	02 04 48*	Ecuador	1½	S.	79	W.	11 killed and minor property damage in the Ambato area. Felt at Riobamba and Guayaquil.
Aug. 13	14 14 56.6	Near coast of Chile	40.0	S.	74.9	W.	Slight damage at Valdivia. Depth about 56 km. Mag. 6¾-7.
Oct. 22	08 22 00.9	Solomon Islands region	10.4	S.	161.2	E.	Felt at Honiara. Depth about 93 km. Mag. 6¾-7.
28	13 18 14.3	Kamchatka	52.2	N.	157.4	E.	Depth about 96 km. Mag. 7.
Nov. 1	08 45 59.3	Near coast of Chile	38.5	S.	75.1	W.	Slight damage at Concepcion, Lebu, and Valdivia. Depth about 55 km. Mag. 7¼-7½.
13	09 20 32.3	Fox Islands, Aleutian Islands.	51.4	N.	168.8	W.	Depth about 32 km. Mag. 7.
20	22 01 56.4	Near coast of Peru	6.8	S.	81.0	W.	About 11 killed and extensive property damage from seismic sea wave at Eten, Pimentel, and Santa Rosa. Depth about 55 km. Mag. 6¾.
24	06 52 41.1	South of Tonga Islands	24.4	S.	176.1	W.	Depth about 23 km. Mag. 7.
Dec. 3	04 24 18.9	Outer Mongolia	42.9	N.	104.4	E.	Depth about 60 km. Mag. 7.
13	07 36 16.4	Macquarie Islands	52.7	S.	159.1	E.	Depth about 25 km. Mag. 7¼.

*Indicates probable error of one-tenth minute.

STRONG-MOTION SEISMOGRAPH RESULTS

INTRODUCTION

During 1932, the Coast and Geodetic Survey inaugurated a program of recording strong ground movements in the seismically active regions of the country to obtain basic data needed in the design of earthquake-resistant structures. Notes pertinent to this program will be found in the preceding issues of the *United States Earthquake* series and in S.P. 201 *Earthquake Investigations in California, 1934–35.* The latter is much broader in scope than the former, and contains data on structural and ground vibrations with detailed descriptions of the various activities which comprise the seismological program as a whole.

Interpretation of records.—The analyses appearing in tables 6 and 7 are based on the assumption of simple harmonic motion. This refers especially to the computation of displacement from accelerograph records. As most accelerograph records are of irregular character, and the character of the longer period waves is often obscured by the superposition of shorter period waves of relatively large amplitude, the estimates of displacement must be considered only rough approximations. These analyses are essentially condensations of material appearing in the *Quarterly Engineering Seismology Bulletin* available through mailing list CGS–5 from the Director, Coast and Geodetic Survey, Washington 25, D.C.

Units and instrumental constants.—Quantitative results are expressed in c.g.s. units; centimeters or millimeters for displacement; and centimeters per second per second for acceleration. It is sometimes desirable to express acceleration in terms of the acceleration of gravity, indicated by "g" which is equal to 980 cm/sec.^{2} For practical purposes it is only necessary to point off three decimal places to convert cm/sec.^{2} to "g".

Most of the instruments have been adjusted so that each will register the maximum acceleration to be expected on the particular type of geological formation beneath the instrument. The following expectable earthquake accelerations were used in determining the accelerograph sensitivities: (a) rock foundation, 25 percent of gravity; (b) residual clay and shale, 40 percent of gravity; (c) alluvium, 70 percent of gravity; and (d) top floors of tall buildings, 100 to 200 percent of gravity. The four sensitivities may be roughly listed as 26, 19.5, 13, and 6.5 mm. per 0.1 g., respectively.

Sensitivity of the seismographs is expressed as the deflection of the trace, or light spot, in centimeters, for a constant acceleration of 0.1 g.

Damping ratio of the pendulum is the ratio between successive amplitudes when the pendulum oscillates.

Seismogram illustrations.—Reproductions of records in this publication are tracings of the original records and must not be accepted as genuine copies. The tabulated instrumental constants refer to the original records. The tracings are intended to show the nature of the data rather than furnish a means through which the reader can make his own measurements. Those who desire true copies for critical study should make request to the Director, Coast and Geodetic Survey, Washington 25, D.C.

Acceleration and displacement scales representing the equivalent of 0.1 g. and 1 inch are indicated on the tracings of the acceleration and displacement curves. The scales provide the investigator with a quick means for making rough measurements on the published curves. The measurements of period on records of this nature are dependent largely on the judgment of the person reading them and considerable latitude must be allowed in

appraising their accuracy. The aim of such analyses is primarily to give a fair picture of the magnitudes of the various elements involved, and the figures tabulated should therefore not be used for important studies without first referring to the illustrations for some idea of the nature of the original records.

TABLE 4.—*Coast and Geodetic Survey strong-motion stations in operation as of Dec. 31, 1960*

Station	Accelerograph	Displacement meter	Weed
NORTHERN CALIFORNIA			
Berkeley, University of California	1	1	
Eureka	1		
Ferndale	1	1	
Hollister, Library	1	1	
Monterey, City Hall			1
Oakland, City Hall, basement	1	1	
Oakland, City Hall, 16th floor	1		
Oakland, Chabot Observatory			1
Richmond, Contra Costa Jr. College	1	1	
Sacramento, Federal Building			1
San Francisco, Alexander Bldg., basement	1	1	
San Francisco, Alexander Bldg., 11th floor	1		
San Francisco, Alexander Bldg., 16th floor	1		
San Francisco, Bethlehem Pacific Bldg., basement	1	1	
San Francisco, Bethlehem Pacific Bldg., 12th floor	1	1	
San Francisco, 450 Sutter St., basement			1
San Francisco, 450 Sutter St., 29th floor			1
San Francisco, New Mint Building	1	1	
San Francisco, Shell Bldg., subbasement			1
San Francisco, Shell Bldg., 21st floor			1
San Francisco, Shell Bldg., 29th floor			1
San Francisco, Southern Pacific Bldg., basement	1	1	
San Francisco, Southern Pacific Bldg., 14th floor	1		
San Francisco, State Bldg., basement	1	2	
San Jose, Bank of America, basement	1	1	
San Jose, Bank of America, 13th floor	1		
Suisun Bay Bridge	1		
SOUTHERN CALIFORNIA			
Bakersfield	1	1	
Bishop	1		
Cachuma Dam, Crest	1	1	
Cachuma Dam, Valve House	1	1	
Colton	1	1	
El Centro	1	2	
Hollywood Storage Co., basement	1		
Hollywood Storage Co., penthouse	1		
Hollywood Storage Co., adjoining P.E. Lot	1		
Long Beach, Public Utilities Building	1	1	
Long Beach, Terminal Island	1		
Los Angeles, Edison Bldg., basement	1		
Los Angeles, Occidental Life Bldg., basement	1		
Los Angeles, Occidental Life Bldg., 11th floor	1		
Los Angeles, Subway Terminal, subbasement	1	1	
Los Angeles, Subway Terminal, 13th floor	1		
Los Angeles, Vernon, C.M.D.	1		
Pasadena, California Institute of Technology	1		1
Port Hueneme	1	1	
San Bernardino			1
San Diego	1		
San Luis Obispo	1		
Santa Ana	1		
Santa Barbara	1		
Taft	1		
Westwood, University of California, Los Angeles	1	1	

TABLE 4.—*Coast and Geodetic Survey strong-motion stations in operation as of Dec. 31, 1960*—Continued

OUTSIDE CALIFORNIA

Station	Accelero-graph	Displacement meter	Weed
Bozeman, Mont., Montana State College	1		
Butte, Mont., Montana School of Mines	1		
Columbia Falls, Mont., Hungry Horse Dam, Bureau of Reclamation	1		
Flaming Gorge, Utah	1	1	
Glen Canyon, Arizona	1	1	
Hawthorne, Nev., U.S. Naval Ammunition Depot	1		
Helena, Mont., Carroll College	1		
Hoover Dam, Nev., 1215 Gallery	1	1	
Hoover Dam, Nev., intake tower	1	1	
Hoover Dam, Nev., oilhouse	1	1	
Logan, Utah, Utah State Agricultural College	1		
Olympia, Wash., Highway Test Laboratory	1		
Portland, Oreg., State Office Bldg	1		
Ross Dam, Wash., Block 16	1		
Ross Dam, Wash., Right Bank	1		
Seattle, Wash., Federal Office Bldg	1	1	
OUTSIDE UNITED STATES			
Balboa Heights, C.Z	1		
Bogota, Colombia, South America	1		
Guatemala City, Guatemala, Central America	1		
Lima, Peru, South America	1		
Quito, Ecuador, South America	1		
San Jose, Costa Rica, Central America	1		
Santiago, Chile, South America	1		
Total	67	29	10

TABLE 5.—*List of shocks recorded and records obtained on strong-motion seismographs in 1960*

Date	Region and Recording Station	Records			Weed
		Accelero-graph	Survey displace-ment meter	Carder displace-ment meter	
Jan. 19	Central California, Hollister	1		1	
	San Jose, Bank of America	2		1	
Apr. 21	Imperial Valley, El Centro	1	1	1	
June 4	Southern California, Bishop	1			
June 5	Northern California, Eureka	1			
	Ferndale	1	1		
Aug. 8	Northern California, Eureka	1			
	Ferndale	1	1		
Total		9	3	3	

TABLE 6.—*Summary of outstanding instrumental and noninstrumental data for 196*

Epicenter	Recording Station and Distance	Location of Instrument	Intensity[1]	Acceleration	Displacement[2]
		CENTRAL CALIFORNIA EARTHQUAKE OF JANUARY 19			
36°47′ N., 121°26′ W., south of Hollister, Calif., VI.* Mag. 5.	Hollister, 4 miles	1st floor	VI	*cm/sec.*² 63	*cm.* 0.6
		NORTHERN CALIFORNIA EARTHQUAKE OF JUNE 5			
40°49′ N., 124°53′ W., west of Arcata, Calif., VI.* Mag. 5.7.	Ferndale, 37 miles	1st floor	VI	72	0.5
		NORTHERN CALIFORNIA EARTHQUAKE OF AUGUST 8			
40°19′ N., 127°04′ W. off coast of Northern Calif., V.* Mag. 6.2.	Ferndale, 150 miles	1st floor	V	43	0.0

[1] Reported intensity of earthquake at recording station.

[2] Displacement is the maximum recorded at the station reporting the maximum acceleration of the earthquake. If displacemen is much greater at another location it is given along with the maximum acceleration at the same location.

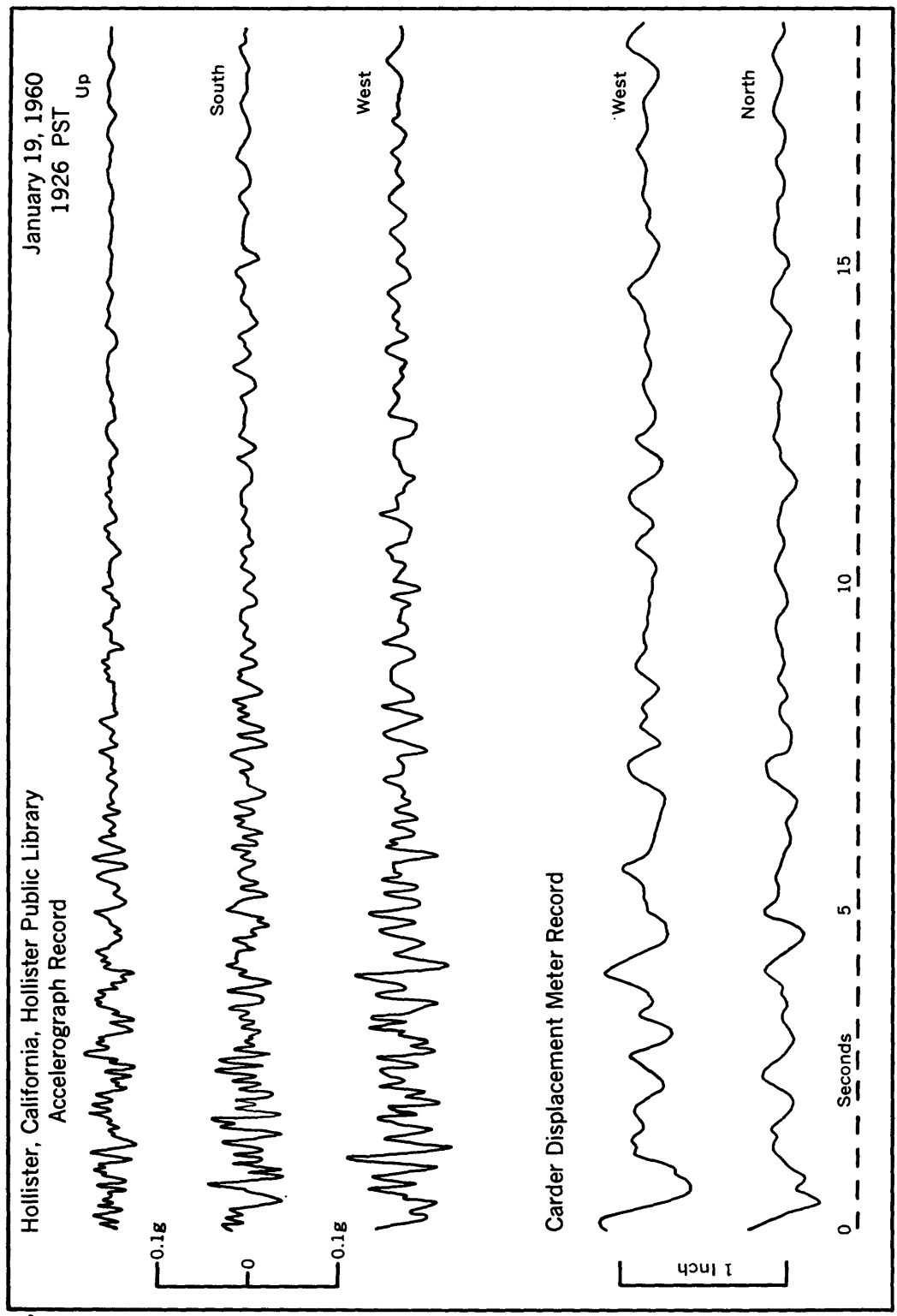
*Following intensity designation in epicenter column, indicates maximum reported intensity of earthquake.

TABLE 7.—*Composite of strong-motion instrumental data for 1960*

CENTRAL CALIFORNIA EARTHQUAKE OF JANUARY 19

Station and component	Instrument No.	T_0	V	Sensitivity	ε	Acceleration		Displacement		Remarks
						Period	Amplitude	Period	Amplitude*	
Hollister:		*sec.*		*cm./g*		*sec.*	*cm./sec.²*	*sec.*	*cm.*	
Vertical	238	0.068	123	14.5	10	0.3	24			
S. 1° W	239	.066	123	13.6	9	.2	23			
N. 89° W	240	.067	122	13.7	10	.3	63			
N. 1° E	CDM-6	2.1	1		10			1.0	0.69	
N. 89° W	CDM-5	2.2	1		10			.9	.30	
NORTHERN CALIFORNIA EARTHQUAKE OF JUNE 5										
Eureka:										
Vertical	250	0.066	116	12.9	7	0.1	2		0.001	
N. 79° E	251	.066	121	13.5	10	.5	11		.06	0.1 second waves superimposed.
S. 11° E	252	.067	120	13.5	11	.5	8		.06	Do.
Ferndale:										
Vertical	247	.066	124	13.7	11	.3	12			
S. 44° W	248	.066	123	13.6	9	.2	72			Two distinct short period groups
N. 46° W	249	.065	126	13.5	11	.1	63			Do.
S. 44° W	SDM-13	9.7	1		10			.6	.32	
S. 46° E	SDM-13	10.6	1		13			1.4	.59	
NORTHERN CALIFORNIA EARTHQUAKE OF AUGUST 8										
Eureka:										
Vertical	250	0.066	117	12.9	7	0.1	1		0.0003	
N. 79° E	251	.066	121	13.4	10	.1	1		.0003	
S. 11° E	252	.067	121	13.7	11	.1	1		.0003	
Ferndale:										
Vertical	247	.066	124	13.8	11	.2	16			
S. 44° W	248	.066	123	13.6	9	.1	43			
N. 46° W	249	.065	126	13.5	11	.1	62			
S. 44° W	SDM-13	9.7	1		10			0.5	.07	
S. 46° E	SDM-13	10.6	1		13			.7	.08	

*Estimated from acceleration if no entry in displacement column.


Hollister, California, Hollister Public Library
Accelerograph Record
January 19, 1960
1926 PST
Up
South
West
0.1g
0
0.1g
Carder Displacement Meter Record
West
North
1 Inch
0
Seconds
5
10
15

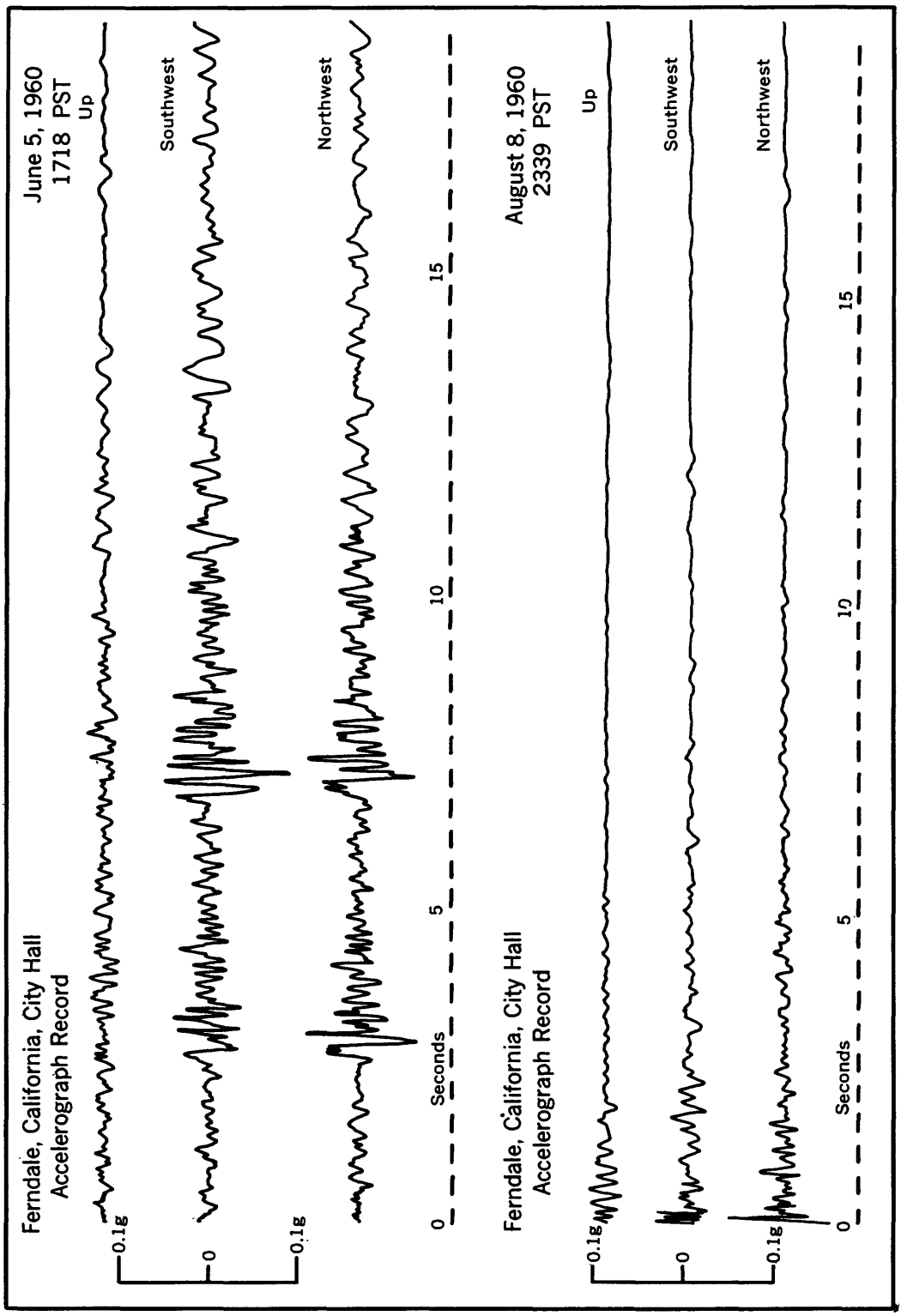


FIGURE 8.—*Tracings of accelerograph records obtained at Ferndale on June 5 and August 8.*

TILT OBSERVATIONS

Three Merritt tiltmeter stations, Table Mountain, Santiago Peak, and University of California (library), continued in routine operation.

PUBLICATION NOTICES

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