DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

United States Earthquakes, 1961

By

James F. Lander

and

William K. Cloud

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U.S. DEPARTMENT OF COMMERCE
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UNITED STATES EARTHQUAKES
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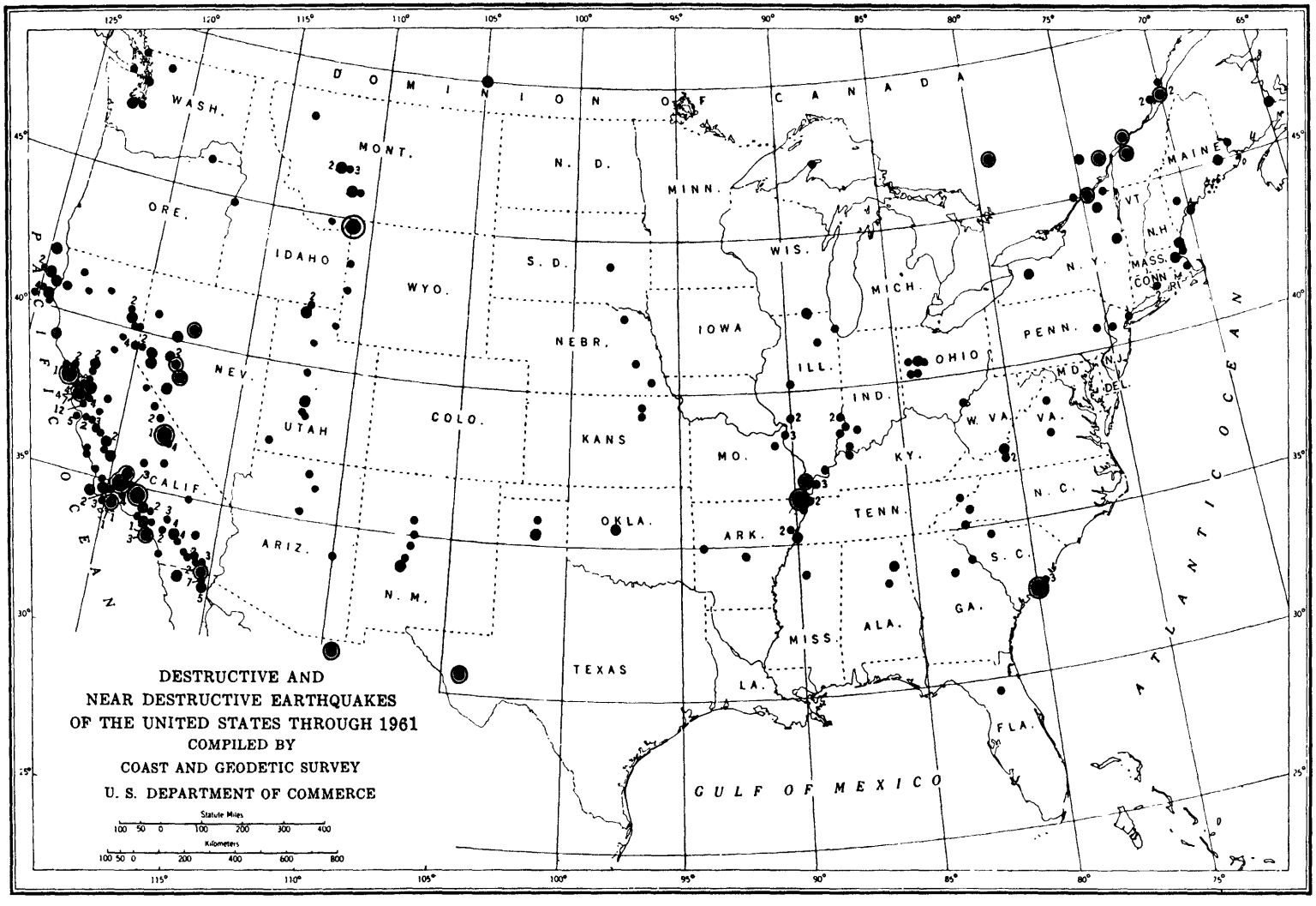

FIGURE 1.—*Destructive and near destructive earthquakes in the United States through 1961.*

UNITED STATES EARTHQUAKES, 1961

INTRODUCTION

This publication is a summary of earthquake activity in the United States and regions under its jurisdiction for the calendar year 1961. 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 46 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, D.C., 20230. 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 1961:

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 1961. 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 1961. 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 46 is a list of Survey and cooperating teleseismic stations for which the Survey publishes results. During the year the locations of 2415 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, D.C., 20230. During the year 1961, MSI–241 through 252 for the monthly bulletins of 1961 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, D.C., 20230. 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, D.C., 20402, for 25 cents.

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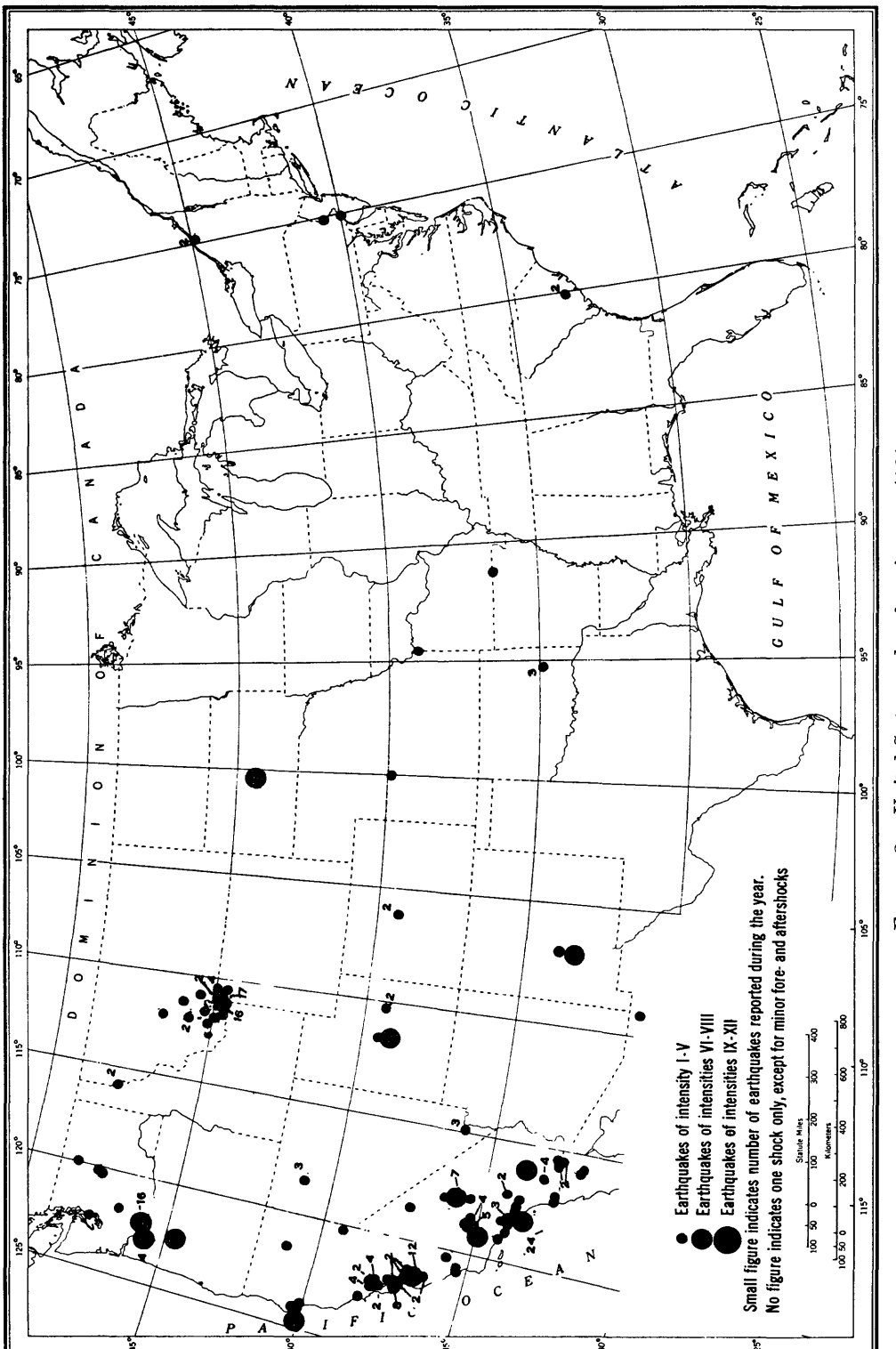

FIGURE 2.—*United States earthquake epicenters, 1961.*

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, D.C., 20230.

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 5 (3); 16; 18; 30, V; February 4; 6; 7; 16; 28; March 14; 28 (2); April 4; 26; 28; May 17; 26; June 12; 15; July 4; 8; 12; August 4, IV; 17; 23; 29; September 5 (2); 5, VI; 6 (2); 11; 24 (2); 28; October 11; 16; 26; 30; November 18; 19; 22; December 2; 5 (2); 6; 10; 19; 23, IV; 24; 25.

Arizona: February 11, IV.

Arkansas: September 9, IV.

California: (Intensity V and above) January 13, V; 28, VI, V; February 1, V (2); 16, V; April 5, VI; 8, VII (2); 27, V; May 28, VI; July 28, V (2); 30, V; August 17, V; 22, V; September 1, V; 12, V; October 3, V; 18, VII; 19, V; 20, VI, V (3); 31, V (3); November 9, V; 11, V; 14, VI; 16, V (2); 17, V; 20, V (4); December 17, V.

Colorado: November 26; 26, IV.

Hawaii: January 7; 15; 16; 21; 24; February 12; 13 (2); March 5; 8; 11 (4); 13; 18; 21; 29; April 2; 3; 9; 10; 21; 23; 27; May 9; 16 (2); 19; 26; 30; June 8; 17; 23 (3); 27; 29 (3); 30 (3); July 2; 7; 11; 12; 13; 23 (2); 23, V (2); 24 (2); 27; 29 (2); August 3; 12; 14; 15 (2); 21; 22 (4); 25; September 3; 8; 9; 12; 13; 15; 21 (7); 22, V; 24 (4); 24, V (2); 25; 27 (2); October 18; 29; November 4; 10; 14; 17; 18; 21 (3); 22; 23 (3); 24; 25; 27; December 2; 9; 11; 15; 17; 31 (2).

Idaho: September 23, IV.

Kansas: April 13, V; December 25, IV.

Missouri: September 9, IV; December 25, V (2).

Montana: January 16; February 22, IV (3); 23, IV (2); 24, IV; 26, IV (2); March 9, IV; 10, IV; 12, IV; 13, V; 26; April 3; 6, V; 7, IV (2); June 26, V; July 29, IV (12); September 23; 23, IV; November 1, IV; 2, IV; 5, IV; 26 (2); December 3, IV (2), V (2); 4, IV (3).

Nebraska: April 13, V.

Nevada: February 14; April 23, IV (2); July 3; 3, V (2); 4, IV.

New Jersey: December 27, IV.

New Mexico: January 27, IV; July 3, VI.

New York: April 20, V; September 29, IV.

Ohio: February 22, V.

Oklahoma: January 10, V; April 26 (2); 27, V.

Orgeon: January 3, IV; August 18; 18, VI; September 15, V; 17, VI; November 6, VI; November 7; 7, V; December 16.

Pennsylvania: September 14, V; December 27, V.

South Carolina: May 20, III; October 17, III.

South Dakota: December 31, VI.

Utah: April 15, VI; 16 (2); May 6, V.

Washington: January 3, IV; 3, V; 5; February 1, V; 5 (2); 9; 21; 21, IV; 25, IV; June 1; 28, IV (2); August 18; 18, IV; September 9; 15 (2); 15, VI; 16; 16, V; 17 (2); 17, VI; October 30, V; November 6, V; 7; 7, V; 30, IV.

Wyoming: June 16; 29, V; July 12, IV; 29, IV (12); September 10, IV (3); October 26, IV (3); 31, IV.

EARTHQUAKE ACTIVITY OUTSIDE THE UNITED STATES

Panama Canal Zone: January 20, I; February 5, II; July 3, I; September 19, II; December 20.

Puerto Rico: July 20, III; August 2, V; 19; October 2; 12.

NORTHEASTERN REGION

(75TH MERIDIAN OR EASTERN STANDARD TIME)

April 20: 08:15. Massena, N.Y. V. Felt by many; few alarmed. Slight plaster cracks reported in some buildings. Windows and dishes rattled. Explosivelike sounds heard by many. Trembling motion. Also reported felt in and near Cornwall, Canada.

September 29: 01:30 (about). Massena, N.Y. IV. Felt by several; awakened and frightened few. Buildings shook; windows and dishes rattled. At Rooseveltown, custom officers thought a plane had crashed into a house. Felt by few at Chase Mills, where buildings creaked and loose objects rattled. Also felt from Prescott east to Lancaster, Ontario, Canada.

EASTERN REGION

(75TH MERIDIAN OR EASTERN STANDARD TIME)

May 20: 10:43. Summerville, S.C. III. Felt by several. Slight shock; gradual onset.

September 14: 21:16:56*. Epicenter in Lehigh Valley, Pa., W. Maximum intensity (damage) V. Police and newspaper switchboards throughout the area were swamped with calls from alarmed citizens. No damage reported.

INTENSITY (DAMAGE) V:

Allentown.—Felt by nearly all; awakened and alarmed many. The strong shock shook scores from their beds, jarred several members of one family from their front porch, and caused loose bricks to fall from chimney. Buildings shook; loose objects rattled; abrupt onset; bumping motion.

Bethlehem.—Felt by nearly all; awakened and alarmed many. Buildings shook; loose objects rattled. Disturbed objects observed by many. Rapid onset; trembling motion from east.

Catasauqua.—Felt by, awakened, and alarmed many. Buildings shook; loose objects rattled. Thunderous sounds heard by many. Abrupt onset; trembling motion.

Coplay.—Felt by nearly all; awakened and alarmed many. Buildings shook; loose objects rattled. Rumbling sounds heard. Abrupt onset; trembling motion.

Egypt.—Felt by and alarmed many; jarring motion.

Fountain Hill.—Felt by and alarmed many; jarring motion.

Freemansburg.—Felt by and alarmed many; jarring motion.

Hellertown.—Felt by and alarmed many. Buildings shook; furniture vibrated; lamp shades moved. Abrupt onset; trembling motion.

Weaverville.—Felt by and alarmed many; jarring motion.

INTENSITY (DAMAGE) IV: Center Valley, Emmanus, and Fullerton.

INTENSITY (DAMAGE) I TO III: Fogelsville and Northampton.

October 17: 19:35. Summerville, S.C. III. Felt by several. Abrupt onset.

December 27: 12:06. Pennsylvania-New Jersey border. Maximum intensity (damage) V in Pennsylvania. At Bristol and in the northeast portion and suburbs of Philadelphia, buildings shook, dishes rattled, and disturbed objects were observed by many. Police and newspaper offices were swamped with calls from alarmed citizens inquiring about the loud rumbling sounds. Felt by many at Levittown and Langhorne, where buildings creaked and dishes rattled. In New Jersey, felt by many at Bordertown and Trenton, where houses shook, windows and dishes rattled. Felt by several at Burlington. "Sounded like furniture being pulled across upper floor."

CENTRAL REGION

(90TH MERIDIAN OR CENTRAL STANDARD TIME)

January 10: 19:40. Southeastern Oklahoma. V. Felt from Dow and Hartshorne in Pittsburg County to Wilburton in Latimer County. No damage reported.

INTENSITY (DAMAGE) V:

Adamson.—Felt by all. Buildings creaked; loose objects and windows rattled. Disturbed objects observed by all. Thunderous sound heard.

Dow.—Felt by nearly all; many alarmed. Buildings creaked; windows and doors rattled. Thunderous sounds heard by many.

Hartshorne.—Felt by nearly all; many alarmed. Buildings creaked; loose objects rattled. Lamps and hanging lights swayed. Thunderous sounds heard by many. Abrupt onset; rolling motion.

Jumbo.—Felt by nearly all. Windows, doors, and dishes rattled. Cracking sounds. Some thought a plane crashed, others an old mine had exploded.

Panola.—Felt by nearly all. Windows, doors, and dishes rattled; furniture shook. Abrupt onset; trembling motion. Thunderous sounds followed by two less violent ones.

INTENSITY (DAMAGE) IV: Clayton and Wilburton.

INTENSITY (DAMAGE) I TO III: Atoka, Heavener, Pittsburg, Poteau, and Tuskahoma.

February 22: 03:45:03*. Northwestern Ohio. Maximum intensity (damage) V. Recorded by the seismograph at John Carroll University.

INTENSITY (DAMAGE) V:

Amsden.—Felt by, awakened, and alarmed many. Buildings creaked; loose objects rattled. Rapid onset; trembling motion. Subterranean sounds heard by many.

Arcadia.—Felt by, awakened, and alarmed many. Buildings shook; dishes and loose objects rattled. Sounded like a sonic boom.

Fostoria.—Felt by and awakened nearly all. Police and newspaper switchboards swamped with calls from alarmed citizens. Pictures knocked askew. Buildings shook; dishes, windows, and doors rattled. Abrupt onset; bumping motion. Sounded like a sonic boom.

INTENSITY (DAMAGE) IV: Adrian, Bascom, Carey, Findlay, Fremont, Hoytville, Mount Blanchard, and Wayne.

INTENSITY (DAMAGE) I TO III: Green Springs, New Riegel, Ottawa, Tiffin, and West Millgrove.

April 13: 15:14:57.2*. Epicenter 39.9° north, 100.0° west, Kansas-Nebraska border, W. Depth about 25 km. Maximum intensity (damage) V.

INTENSITY (DAMAGE) V IN KANSAS:

Almena.—Felt by nearly all. Light objects fell from table. Buildings creaked; loose objects rattled; water in pails slopped. Abrupt onset. Trembling motion; duration 30 seconds.

Dry Creek (12 miles north of Norton).—Felt by and frightened children in school. Water bounced in stock tanks.

Norton.—Felt by nearly all; frightened many. Buildings shook. Explosive-like noise heard.

INTENSITY (DAMAGE) V IN NEBRASKA:

Beaver City.—Felt by many. Buildings creaked; loose objects rattled; chairs and small objects displaced; light fixtures swayed. Abrupt onset; rocking motion.

Wilsonville.—Felt by many. Buildings creaked; loose objects rattled; pictures fell. Subterranean sounds, "similar to an explosion or large truck colliding with something," heard by several at beginning of earthquake. Abrupt onset.

INTENSITY (DAMAGE) IV IN KANSAS:

Dellvale.—Felt by several. Buildings creaked; loose objects rattled. Trembling motion.

Oberlin.—Felt by several. Loose objects rattled. Gradual onset; trembling motion.

Prairie View.—Felt by many. Buildings shook; loose objects and dishes rattled. Thunderous earth sounds heard by many. Rapid onset; trembling motion.

INTENSITY (DAMAGE) IV IN NEBRASKA:

Alma.—Felt by one. Loose objects rattled; table lamp teetered. Rapid onset; trembling motion.

Orleans.—Felt by several. Doors, windows, pots, and pans rattled. Abrupt onset; trembling motion.

Stamford.—Felt by several. Dishes rattled. Earth sounds heard by several before earthquake. Trembling motion.

INTENSITY (DAMAGE) I TO III IN KANSAS: Norcatur and Phillipsburg.

INTENSITY (DAMAGE) I TO III IN NEBRASKA: Edison and Hendley.

April 26: 21:00, 23:00 (about). Southeastern Oklahoma. Slight tremors were reported at Cameron, Heavener, Idabel, McAlester, Panola, Poteau, Spring Hill, and Talihina.

April 27: 01:30 (about). Southeastern Oklahoma. Maximum intensity (damage) V at Antlers, Coalgate, Hartshorne, LeFlore, McCurtain, Panola, Poteau, Talihina, and Wilburton, where many were awakened. Buildings shook; windows, doors, and dishes rattled. Abrupt onset; bumping and trembling motion. Thunderous and deep rumbling sounds heard throughout the area. Maximum intensity (damage) IV at Idabel, Keota, Kiowa, Lehigh, and Vian. Also felt at Cameron, Heavener, McAlester, and Spring Hill.

September 9: 16:43:02.3*. Epicenter 36.4° north, 91.3° west, Arkansas-Missouri border, W. Maximum intensity (damage) IV. Felt by many at Doniphan, Mo., where buildings shook, and loose objects rattled. Rapid onset; sounded like a sonic boom. At Pocahontas, Ark., felt by several. Doors rattled. Abrupt onset; bumping motion.

December 25: 06:20:02.8* and 06:58:21.4*. Epicenters 39.1° north, 94.6° west, Kansas-Missouri border, W. Depth about 25 and 20 km, respectively. Felt over an area of approximately 11,000 square miles, principally in Missouri. (See map, p. 10.) Slight damage, consisting of cracked plaster and objects thrown from shelves and broken, was reported. Recorded by the seismographs at Saint Louis University and the University of Kansas.

INTENSITY (DAMAGE) V IN MISSOURI:

Corder.—Felt by and awakened several. Plaster cracked; windows and beds shook. Sounded like ice or heavy object falling from roof. Both shocks felt.

Excelsior Springs.—Both shocks felt and awakened many. Houses shook; furniture vibrated. The tremors simulated dynamite blasting.

Hardin.—Felt by and awakened several. Plaster cracked; explosive-like sounds heard.

Independence.—Felt by and awakened many. Beds shook; dishes, windows, and doors rattled; roaring sounds heard. Rolling motion; direction north-south. Both shocks felt.

Kansas City.—Both shocks felt by and awakened nearly all. Police and newspaper switchboards received hundreds of calls from alarmed residents. Plaster cracked; objects thrown from shelves and broken. Houses shook; windows rattled; pictures knocked askew; violent shaking and jolting of beds accompanied by sounds like an explosion or impact of some large heavy object against wall of building.

Lathrop.—Felt by nearly all; many awakened. Buildings swayed; windows rattled. Rumbling sounds heard.

Lawson.—Felt by and awakened many. Loose objects swayed. Rumbling sounds heard by many.

Levasy.—Felt by all. Walls creaked; vibration like passing truck.

Lexington.—Felt by and awakened many. Houses shook; dish on refrigerator moved against wall. Two shocks felt.

Mount Vernon.—Felt by and awakened several. Plaster cracked. "Sounded like two cars had collided."

Orrick.—Felt by and awakened nearly all. Rumbling sounds heard by many.

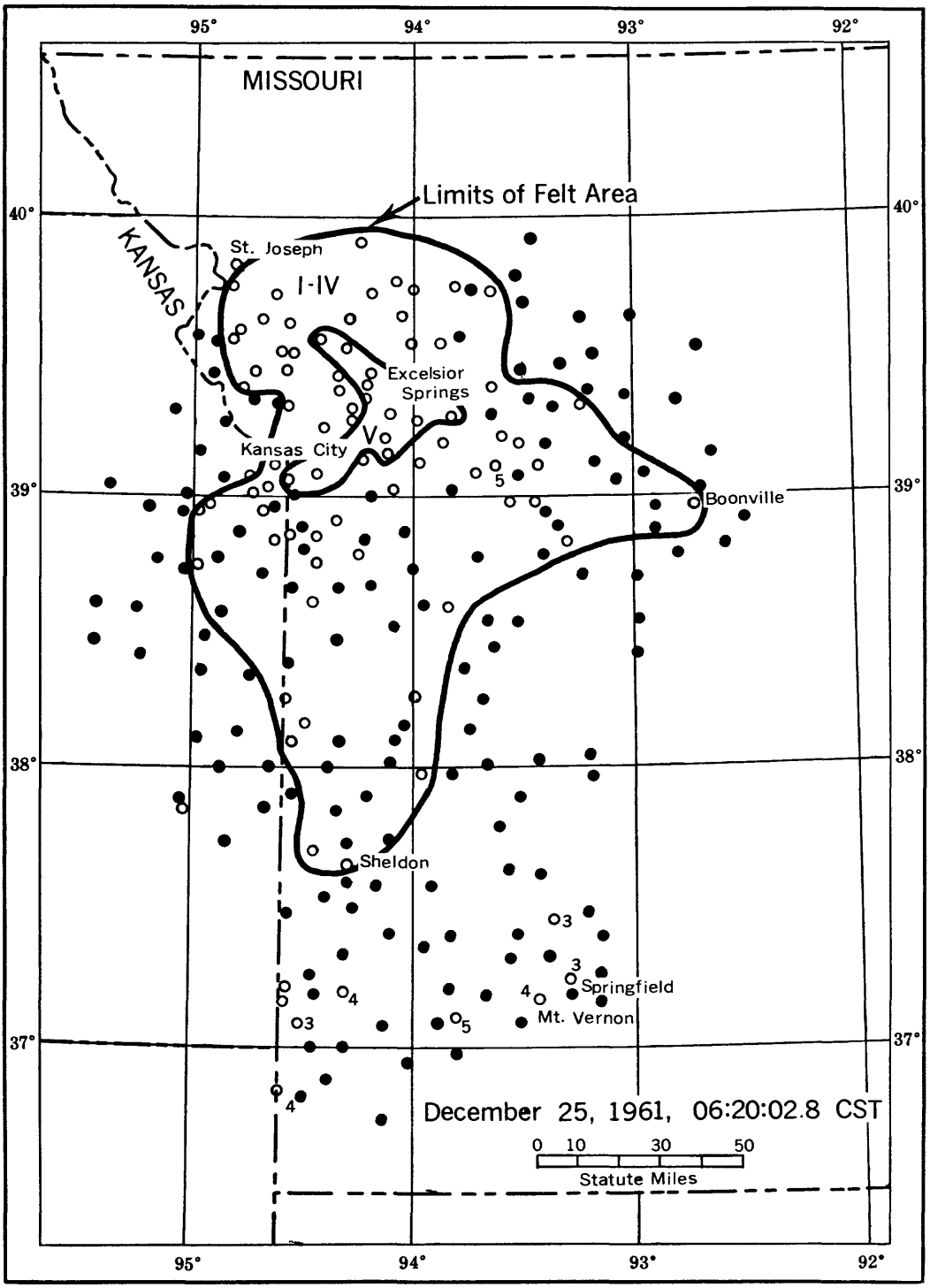

FIGURE 3.—*Area affected by earthquake of December 25.*

Plattsburg.—Both shocks felt by and awakened many. Windows and dishes rattled. Sounded like a quarry blast.

Rayville (8 miles northeast of Excelsior Springs).—Felt by and awakened several. House shook; windows, dishes, and pans rattled. Felt as if truck had struck house. Aluminum trailer home set on concrete blocks with an enclosed porch swayed and banged against porch during both shocks. Second shock stronger than the first one.

Richmond.—Felt by and awakened nearly all. Rumbling sounds heard by many.

INTENSITY (DAMAGE) IV IN MISSOURI: Blackburn, Brookline Station, Buckner, Cameron, Carthage, Dawn, Dearborn, Drexel, Easton, Edgerton, Farley, Gower, Henrietta, Kearney, Kingston, Lee's Summit, Liberty, Martin City, Martin City (8 miles east of), Miami, Missouri City, Mosby, Nashua, Oak Grove, Polo, Seneca, Stet, Trimble, Turney, Waverly, and Wellington.

INTENSITY (DAMAGE) IV IN KANSAS: Kansas City, Merriam, and Shawnee Mission.

INTENSITY (DAMAGE) I TO III IN MISSOURI: Agency, Amoret, Boonville, Breckenridge, Brighton, Bronaugh, Camden, Camden Point, Chilhowee, Concordia, Cowgill, DeKalb, Faucett, Foster, Freeman, Hamilton, Hemple, Higginsville, Hodge, Holt, Hughesville, Hume, Joplin, Kidder, Montrose, Nettleton, Peculiar, Pleasant Hill, Roscoe, Saint Joseph, Sheldon, Springfield, Tracy, and Utica.

INTENSITY (DAMAGE) I TO III IN KANSAS: DeSoto, Edgerton, Stanley, and Uniontown.

December 31; 10:35:58.7*. Epicenter 44.4° north, 100.5° west, central South Dakota, W. Pierre, S. Dak. VI. Felt with greatest intensity at Pierre, west to Midland, and as far east as Huron. Slight damage reported at Pierre. Newspaper and police switchboards were swamped with calls from alarmed residents throughout the area.

INTENSITY (DAMAGE) VI:

Pierre.—Felt by and alarmed many. Slight damage. Plaster cracked; cement floor cracked. Door of refrigerator shaken open; clothes drier moved several inches. Fishermen along the Missouri River reported the moment the earthquake struck, hundred of fishes leaped into the air. Buildings shook; loose objects rattled.

INTENSITY (DAMAGE) V:

Murdo.—Felt by many; few alarmed. Plaster on walls cracked. Venetian blinds swayed; dishes rattled. Faint earth sounds heard; trembling motion; abrupt onset.

INTENSITY (DAMAGE) IV: Presho and Winner.

INTENSITY (DAMAGE) I TO III: Draper, Hayes, Huron, Midland, Onida and Philip and White River.

WESTERN MOUNTAIN REGION

(105TH MERIDIAN OR MOUNTAIN STANDARD TIME)

January 16: 23:50:42*. West Yellowstone, Mont. III. Felt by observer. Lasted few seconds; northwest direction.

January 27: 23:33. Socorro, N. Mex. IV. Felt by many in community; awakened few. Windows, doors, and dishes rattled. Rapid motion; moderate earth noises heard.

February 11: 20:51:14*. Epicenter 31.0° north, 109.1° west, Mexico-Arizona border, W. Arizona. IV. Felt by many at Bisbee, where buildings creaked; loose objects rattled; objects swayed slightly. Three shocks with rapid onset; trembling motion in north-south direction. Buildings creaked and loose objects rattled at Dos Cabezas, where swaying motion with abrupt onset was felt by observer sitting; faint earth noises heard. At Hereford, two bumps, first heavier, with rapid onset felt by observer sitting; building creaked; loose objects rattled; faint earth noises heard few seconds before shock. Trembling motion felt by two at Douglas.

February 14: 06:48. Boulder City, Nev. III. Felt by several in community. One-second shock in south direction; moderate earth noises from south heard ½ second before shock.

February 22: 03:15, 04:00. Hebgen Dam, Mont. IV. Felt by observer; trembling and bumping motion, accompanied by earth noises. Buildings creaked; loose objects rattled.

February 22: 20:12:54.5. Epicenter 45.0° north, 111.3° west, Hebgen Lake, Mont., region, W. West Yellowstone, Mont. IV. Felt by several in community. House shook; windows rattled. Rapid, 3-second motion; roaring sound heard.

February 23: 10:45, 11:30. Hebgen Dam, Mont. IV. Building creaked and loose objects rattled. Trembling and bumping motion felt by observer; earth noises heard at time of shock.

February 24: 14:30. Hebgen Dam, Mont. IV. Felt by observer. Building creaked and loose objects rattled. Trembling and bumping motion, accompanied by earth noises.

February 26: 13:30, 14:30. Hebgen Dam, Mont. IV. Felt by observer. House creaked and loose objects rattled. Trembling and bumping motion, accompanied by earth noises.

March 9: 23:00. Hebgen Dam, Mont. IV. Felt by two; awakened one. House creaked. Bumping, south-north motion with abrupt onset; faint bumping earth noises heard at time of shock.

March 10: 12:30. Hebgen Dam, Mont. IV. Felt by two; awakened one. House creaked. Bumping motion with abrupt onset; accompanied by loud earth noises.

March 12: 16:12:32*. Helena, Mont. IV. Many calls to Police Department. Jolting motion with abrupt onset; boomlike earth noise heard.

March 13: 12:28:08*. Hebgen Dam, Mont. V. Felt by two. Power and telephone wires swayed and bounced; cupboard doors swung open; some bottles tipped over. Loud, rattling, thunderous, and roaring earth noises heard before, during, and after shock; motion swaying with gradual onset.

March 26: 22:30:16*. Bozeman, Mont. Felt.

April 3: (p.m.). Ennis, Mont. Shock reported felt during the night.

April 6: 22:50:40.6. Epicenter 44.8° north, 112.0° west, southern Madison County, Mont., W. Generally felt over an area of approximately 2,500 square miles, principally in Madison County. Maximum intensity (damage) V. At Virginia City, small plaster cracks and widening of old plaster cracks reported.

INTENSITY (DAMAGE) V:

Cameron (Yellowstone Mine).—Felt by all. Windows, doors, and dishes rattled; house creaked. Motion rapid; south-north direction; loud earth noises from east-west heard by many 5–6 seconds before shock. Generally felt in Cameron and vicinity. Some persons believed this to be the strongest shock felt in the area since the major earthquake of August 17, 1959.

Ennis.—Felt by nearly all; awakened many in community. Schoolgirls ran out of hotel. Pictures on walls knocked askew. Windows, doors, and dishes rattled. Motion slow, lasted 6 seconds; booming noise heard. At the U.S. Fish Hatchery, about 15 miles south of Ennis, it was reported the sharpest shock felt since the major earthquake of August 17, 1959.

Hutchins Bridge area (Kirby Ranch).—Awakened all. Motion slow, lasted 2–3 seconds; moderately loud earth noises from west heard.

Jeffers.—Wallpaper cracked on second floor.

Papoose Creek at Madison River (Helland Ranch).—Knocked chinking from between logs of house; knocked over a pile of loaded fertilizer bags. Motion from north.

Vigilante Ranger Station (45°01′ north, 111°58′ west, about 20 miles south of Virginia City).—Awakened all and frightened few at station. Windows, doors, and dishes rattled; house creaked. Very brief, rapid motion from east-northeast; loud earth noises from west-southwest heard by all about 1 second before shock.

Virginia City.—Felt by all who were awake; awakened and frightened many. One report of small plaster cracks and widening of old cracks. Small objects shifted. Two hard, vertical jolts; loud, thunderous, roaring, and whistling earth noises heard immediately before shock.

INTENSITY (DAMAGE) IV: Alder and 7 miles south of at Ruby Dam, Gallatin Gateway, and Hebgen Dam.

INTENSITY (DAMAGE) I TO III: Bozeman, Butte, and Three Forks.

April 7: 23:28:11*, 23:28:28*. Montana. IV. At Trident, rapid, 5-second jolt, with sinking sensation, felt by all in home. Dishes rattled. Faint earth noises from south heard. People awakened at Willow Creek. Two sharp, dropping sensations felt at Belgrade.

April 15: 22:02:39*. Epicenter 39.1° north, 111.5° west, central Utah, W. Felt over an area of approximately 2,000 square miles, principally in central Sanpete County. Slight damage at several places, consisting of plaster cracking and chimney damage. Maximum intensity (damage) VI.

INTENSITY (DAMAGE) VI:

Chester.—Felt by and awakened all in community; frightened few. Chimneys cracked. Slight damage.

Ephraim.—Felt by and frightened all in community; many went outdoors. Two chimneys fell; plaster cracked. Chandelier swung violently; bottles fell from shelves in store. About half the population thought their furnaces had exploded.

Mount Pleasant.—Felt by many. Plaster cracked.

Spring City.—Felt by many; awakened and frightened few in community. Plaster cracked. Slight damage.

INTENSITY (DAMAGE) V: Fayette, Manti, Moroni, and Wales.

INTENSITY (DAMAGE) IV: Clawson and Sterling.

INTENSITY (DAMAGE) I TO III: Clearcreek, Huntington, and Levan.

April 16: 03:00, 06:00 (about). Utah. Chester and Ephraim reported feeling small shocks; slight shock (06:00) felt by few at Spring City.

April 23: 01:58, 02:35. Boulder City, Nev. IV. Felt by several in community; awakened all in home. Windows, doors, and dishes rattled; doors swung; frame creaked. Second shock quite severe—twice as strong as first shock; rapid motion.

May 6: 09:12:20*. Epicenter 39.6° north, 110.2° west, east-central Utah, W. V. Felt by several at Columbia. Damage slight to brick. Small objects and furnishings shifted slightly. Brief motion, resembling bounce in mine. At Sunnyside, about 5 miles north of Columbia, felt throughout the area. Windows, doors, and dishes rattled; house creaked. Motion slow.

June 16: 08:51. Madison Junction, Yellowstone National Park, Wyo. Brief shock felt by observer in house.

June 26: 06:05. Papoose Creek at Madison River (Helland Ranch), Mont. V. Felt by all in community; awakened and frightened many. Plaster cracked. Cupboard doors opened; doors swung north-south. Motion slow, lasted 1 minute.

June 29: 04:45. Canyon, Yellowstone National Park, Wyo. V. Felt by and awakened many in the Canyon area. Windows rattled; walls creaked. Motion rapid, lasted 30 seconds.

July 3: 00:06:16*. Epicenter 33.6° north, 106.9° west, central New Mexico, W. Socorro. VI. Felt by and awakened many in community; frightened few. Damage slight. Plaster cracked in adobe buildings. Small objects shifted. Rapid, 3–5 second motion; moderate to loud earth noises from west heard.

July 12: 14:35. Old Faithful, Yellowstone National Park, Wyo. IV. Felt by three. Floor and telephone cables on frame in building shaken. Rapid motion in west-east direction.

July 29: 14:05, 14:15, 14:23, 14:45, 14:51, 14:57, 14:58, 15:14, 15:38, 15:40, 16:15, 16:56. Old Faithful and Madison Junction, Wyo., and West Yellowstone, Mont. IV. Felt by several. Windows rattled; walls creaked; hanging objects swung. Motion rapid, lasted 2–3 seconds each; direction north-south. Shock at 14:05 sounded like an explosion.

September 10: 20:15, 22:20, 23:15. Yellowstone National Park, Wyo. IV. Felt by several at Mammoth Hot Springs, where windows rattled. Rapid, 2-second shock; moderate earth noises heard. At Yellowstone Lake (north lake area), felt by many; awakened and frightened few. Windows and doors rattled; walls creaked. First shock very light; second heavier; third, three sharp jolts in rapid succession. Shocks showed on rain gage at Lake Hotel.

September 23: 02:37:55.4, 03:14:19*. Epicenter 47.5° north, 115.4° west, northern Idaho-Montana border, W. IV. At Thompson Falls, Mont., people awakened; few alarmed. Sliding doors rocked, dishes rattled. Shocks were accompanied by a loud rumbling noise, which one person described as like a freight train rumbling through the living room. Trembling and swaying motion; gradual onset. At Eddy, 12 miles east of Thompson Falls, the noise sounded like a rock slide. At Wallace, Idaho, rapid 35-second motion at 02:37:53* awakened few. Dishes rattled; walls creaked; rumble heard. Also felt on the Blue Slide Road, northwest of Thompson Falls.

October 26: 16:59, 17:01, 17:02. Old Faithful, Yellowstone National Park, Wyo. IV. Felt by several. Windows rattled; walls creaked. Rapid motion of few second's duration.

October 31: 23:55. Mammoth Hot Springs, Yellowstone National Park, Wyo. IV. Felt by several. Windows and doors rattled; frame creaked. Slow, 8–10 second shock.

November 1: 23:00 (about). Ennis, Mont. IV. Felt by one at Ennis, and awakened one, 1 mile north of Ennis. Electric star in Masonic Temple fell from wall. Slow, brief motion.

November 2: 22:50. Helena, Mont. IV. Felt by several. Buildings creaked and loose objects rattled. One slight jolt and vibration with abrupt onset.

November 5: 02:53:08.3. Epicenter 45.0° north, 111.0° west, south-western Montana, W. Black Butte Ranch, Gallatin Canyon, Mont. IV. People awakened. Roaring earth noises accompanied shock.

November 26: 13:30:36*, 13:30:39*. Virginia City, Mont. Explosivelike concussion and noise felt and heard in home.

November 26: 17:55:45.7, 18:05. Epicenter 39.0° north, 106.1° west central Colorado, W. Chaffee, Lake, and Park counties. IV. At Buena Vista (about 6 miles southwest of epicenter) it was reported as strongly felt. Floor shook and dishes rattled at Alma and Caro. At Jefferson, felt like something hit house; shock also felt at 18:05. At Fairplay, buildings creaked; loose objects rattled; windows and doors rattled as if shaken by high gusty winds; chair shook. At the McQuaid ranch, man said he was almost shaken out of chair. Felt mostly by persons sitting. Two persons walking into Fairplay from 12-Mile Road felt slight trembling of ground. At Hartsel (about 18 miles northeast of epicenter), felt by many; few alarmed. Buildings creaked; loose objects rattled. Trembling, bumping, and rocking motion, accompanied by blastlike earth noises. Shock also felt at 18:05. Press reported the shock was felt for 4½ minutes at Leadville.

December 3: 13:15. Hebgen Dam (Hebgen Lake), Mont. IV. Felt by two. Cupboard door swung ajar; bottles tipped. Building creaked; loose objects rattled. Motion rocking; rapid onset; moderately loud, thunderous earth noises before and during shock.

December 3: 18:41:18*, 20:24:50*. Virginia City, Mont. V. Felt by all in community. One report of slight plaster cracking (at either 20:24:47* or 20:24:50*); dirt shaken from old wall cracks at 18:41:18*. Dishes and pictures displaced; disturbed objects observed by many (during one of the second shocks). Very hard, sudden, dropping sensation with shocks; explosivelike motion, accompanied by loud explosivelike earth noises. Also felt at Alder, Harrison, Laurin, Norris, and Pony.

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December 3: 21:35:08*. West Yellowstone, Mont. IV. Felt by two. Windows rattled. Moderately loud earth noises heard. Rapid, 2-second shock.

December 4: 01:19:53*, 04:00, 06:00. Virginia City, Mont. IV. Very sharp, explosive-like jolts. People awakened. Bed shook at 01:19:53*.

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 1: 09:21. Pittsburg (PG & E Pittsburg Switching Station). Slight motion felt in control building.

January 3: 16:30:17*. Epicenter 36°52′ north, 121°40′ west, near Watsonville, B. Magnitude 4.1. Aptos (3.7 miles north of). IV. Felt by observer sitting. Cabin creaked. Hanging objects swung. Two sharp jolts, lasting 5 seconds, in north direction. Also felt slightly at Hollister, Mount Hermon, and San Francisco. At San Francisco, some reported a distinct jar; light fixtures swayed.

January 10: 01:30*. Epicenter 36°46′ north, 121°18′ west, 7 miles southeast of Hollister, B. Magnitude 1.9. Hollister (7½ miles south of, Harris Ranch). IV. One jolt felt by several in home. Windows and doors rattled; house creaked.

January 10: 10:55:01*. Epicenter 34°17′ north, 117°04′ west, east of Lake Arrowhead, P. Magnitude 3.8. Lake Arrowhead (400 yards south of lake). IV. Felt by many. Buildings creaked; loose objects rattled. Trembling, 2-second shock; abrupt onset; moderately loud earth noises before and during shock. Also felt at Loma Linda, Redlands, and San Bernardino.

January 13: 19:23:39*. Epicenter 34°04′ north, 118°13′ west, central Los Angeles, P. Magnitude 3.0. Los Angeles. V. Felt generally in the city area; frightened few. Minor cracks and broken dishes reported. Felt by many at Glendale and Pasadena. Also felt at Burbank, Chatsworth, Culver City, Flintridge, Santa Monica, South Pasadena, Van Nuys, and West Los Angeles.

January 28: 00:12:46*. Epicenter 35°46′ north, 118°03′ west, near Walker Pass, P. Magnitude 5.3. Felt over an area of approximately 13,000 square miles, principally in Kern and Tulare counties. (See map, page 15.) Maximum intensity (damage) VI at several places. Very slight damage reported. Concrete carport floor cracked at Johannesburg; dishes broken at Bodfish. Rocks rolled off high mountain at Kernville. Numerous aftershocks recorded.

INTENSITY (DAMAGE) VI:

Bodfish.—Felt by and awakened all in community; frightened few. Dishes broken; small objects overturned; knickknacks fell.

Johannesburg.—Felt by, awakened, and frightened many in community. Slight cracks in concrete floor of carport. Birds fell from perches. "Shook house up and down like an empty box."

Kernville.—Felt by many in community; awakened few. Rocks rolled off high mountain. Trees, bushes shaken.

Lake Isabella.—Felt by and awakened all in community; frightened few. Slight damage. Vases and small objects overturned; knickknacks fell.

Onyx.—Felt by and awakened all in community; frightened many. Small objects shifted and overturned; knickknacks, books, and pictures fell. "Aftershocks all during the night; almost continuous rumbling."

Weldon.—Felt by and awakened all in community; frightened few. Small objects shifted and overturned. Slight damage.

INTENSITY (DAMAGE) V: Arvin, Bakersfield, Balance Rock (near Posey), Bass Lake (Wishon), Big Creek, California Hot Springs, Cantil, Glennville, Hinkley, Inyokern, Johnsondale, Kaweah (6 miles north of), Keene, Lindsay-Strathmore area, Miracle Hot Springs, Olancha, Porterville, Posey, Randsburg, Ridgecrest, Springville, Tehachapi, Three Rivers (Ash Mountain), Trona, Tulare, and Westend.

INTENSITY (DAMAGE) IV: Balch (PG&E camp, NE¼, Sec. 12, T12S, R26E, nearest town, Trimmer), Barstow, Boron, China Lake, Corcoran, Coso Junction, Dunlap, Edison, Friant, Little Lake, McFarland, Mojave, Orange Cove, Shafter, Shaver Lake, South Pasadena, Wasco, Wheeler Ridge, Woody and Yermo.

INTENSITY (DAMAGE) I TO III: Adelanto, Alhambra, Coalinga, Lancaster, Los Angeles, Stovepipe Wells Hotel (Death Valley National Monument), Tipton, Tupman, and Visalia.

January 28: 02:27:37*, 02:42:56*, 06:01:09*, 09:00:32*, 09:02:12*, Principal aftershocks of 00:12:46*. All with epicenters at 35°46′ north, 118°03′ west, P. Magnitudes 3.3, 3.1, 3.7, 3.4, 3.6, respectively. At Glennville, sharp jolt at 06:01:09*; slight shock at either 09:00:32 or 09:02:12*. Shocks at 06:01:09* and 09:00:32* or 09:02:12* also felt at Kernville.

January 28: 09:23. Keene. V. Felt by all in community. Lasted 5 seconds; faint earth noises heard by many 5 seconds before shock.

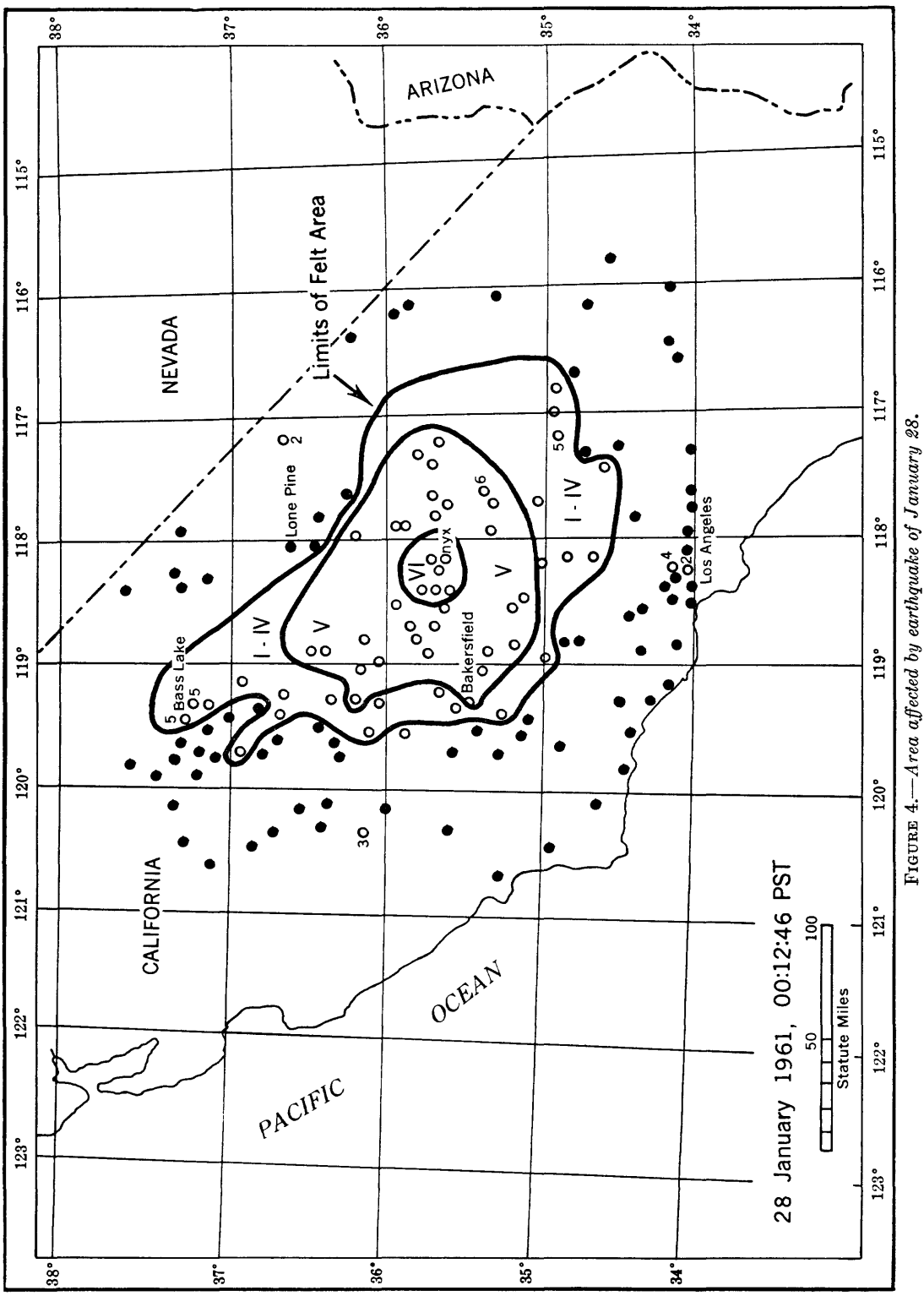

FIGURE 4.—*Area affected by earthquake of January 28.*

January 29: 01:12. Newark (PG&E Substation). Motion slow, lasted 3 seconds.

February 1: 16:04:16*, 16:07:43*. Epicenter 37°27′ north, 118°30′ west, northwest of Bishop, P. Magnitudes 5.0 and 5.2, respectively. Felt over an area of approximately 13,500 square miles of central California. Maximum intensity (damage) V. No damage reported.

INTENSITY (DAMAGE) V:

Bigpine (Bigpine Powerhouse).—Both shocks felt. Felt by and frightened all. Windows and doors rattled. Direction north-south.

Bishop.—Both shocks felt. Felt by all and frightened many in community. Some canned goods fell in store. Trees, bushes shaken moderately. Direction north-south.

Laws.—Both shocks felt. Felt by and frightened many in community (some outdoors; active). Small objects shifted; trees, bushes shaken strongly.

Long Valley Reservoir (25 miles north of Bishop, in mountains).—Both shocks felt. Felt by all and frightened few in community. Pendulum clock, facing north, started. Trees, bushes shaken moderately. Observer felt and saw ground move while standing. Direction east-west.

INTENSITY (DAMAGE) V IN NEVADA:

Dyer.—Felt by all in community; few alarmed. Disturbed objects observed by many; windmill swayed; man standing in Post Office with elbows on window sill felt wall sway inward and outward (east-west). Both shocks felt.

INTENSITY (DAMAGE) IV: Balch Powerhouse (PG&E, NE¼, Sec. 12, T12S, R26E, nearest town, Trimmer, two shocks felt), Fresno (both shocks felt), O'Neals (16:04:16*), Springville (PG&E, Tule River Powerhouse, NE¼, Sec. 26 and NE¼, Sec. 27, T20S, R30E), both shocks felt.

INTENSITY (DAMAGE) I TO III: Glennville, Independence, and Wishon.

February 1: 19:30 (about). Olancha. Felt by some persons.

February 11: 06:05:50*, 09:08:09*, 09:35, 09:37, 09:38, 11:04. Epicenter of first shock 37°44′ north, 122°04′ west, 2½ miles east of Lake Chabot; of second shock 37°45′ north, 122°05′ west, near south end of San Leandro Reservoir, B. Magnitudes 1.2, 2.6, 2.2, 2.6, 2.5, 1.6, respectively. Castro Valley and Dublin Canyon areas. Press reported a series of ten tremors were felt around Castro Valley and Dublin Canyon. First shock was reported as mild, with the strongest at 09:08:09*.

February 16: 12:12:58*. Epicenter 37°50′ north, 122°13′ west, about 3 miles southeast of Berkeley, B. Magnitude 3.6. Felt over an area of approximately 1,200 square miles of the San Francisco Bay region. One isolated report from Aptos, east of Santa Cruz. Maximum intensity (damage) V at Berkeley, where it was reported cracks were widened in the basement floor of the Hall of Justice; shut off bevatron at e Lawrence Radiation Laboratory, University of California. Intensity (damage) IV at Alvarado, Aptos (3.7 miles north of), Canyon, Lafayette, Moraga, Oakland and San Francisco. Intensity (damage) I to III at Bolinas, El Sobrante, Mill Valley, Montara, Mount Eden, Pinole, South San Francisco, Treasure Island (San Francisco Bay), and Walnut Creek.

February 21: 01:20:18*. Epicenter 34°00′ north, 117°31′ west, near Mira Loma, P. Magnitude 3.2. IV. Felt by many in community and awakened few at Etiwanda, where windows rattled; rapid motion. At Fontana, press described the shock as sharp, rattling windows and dishes. Also felt at Rialto, Riverside, and San Bernardino.

February 22: 21:58.7*. Epicenter 35.3° north, 120.8° west, near Morro Bay, P. Magnitude 2.9. Pismo Beach. IV. Felt by several; awakened and freightened few in community. Windows, doors, and dishes rattled; house creaked. Motion slow, lasted 1 minute. Reported as a light shock at Cayucos, Morro Bay, and San Luis Obispo.

March 5: 05:04:56*. Epicenter 32°47′ north, 115°28′ west, east of El Centro, P. Magnitude 3.8. Felt at El Centro.

March 8: 18:10:39*. Epicenter 35°12′ north, 118°33′ west, south of Caliente, P. Magnitude 3.6. Keene. IV. Felt by many in community (some outdoors; active). Windows, doors, and dishes rattled slightly; house creaked. Rapid motion, lasted 5 seconds; moderate earth noises heard by many 1 second before shock.

March 8: 23:35. Ben Lomond. IV. Felt by many in community. Loose objects rattled. Two shocks a few seconds apart: motion rocking; rapid onset.

March 11: 19:00:48*. Epicenter 35°12′ north, 118°39′ west, south of Caliente, P. Magnitude 3.0. Tehachapi. IV. Felt by most persons in community. Trembling motion, lasted 1–2 seconds, rapid onset.

March 14: 19:23:50*. Epicenter 40.5° north 124.0° west, 15 miles southeast of Ferndale, B. Magnitude 3.1. Fortuna-Rio Dell area. "A sharp earthquake shook the Fortuna-Rio Dell area. No damage reported."—(*BSSA, July 1961.*)

March 15: 15:15:23*. Epicenter 37°43′ north, 122°16′ west, 13 miles southeast of Berkeley, B. Magnitude 2.4. Canyon. IV. Rapid, 1-second shock felt by observer sitting in chair; slight vibration of chair. Windows rattled

slightly. Barely perceptible. Reported as slight shock in the Hayward-San Leandro area.

March 17: 12:00:03*. Epicenter 32°49′ north, 117°05′ west, near San Diego, P. Magnitude 2.7. Press reported the shock was felt in San Diego.

March 24: 08:49:22*. Epicenter 37°53′ north, 122°12′ west, about 3 miles from University of California, Berkeley, B. Magnitude 3.1. IV. Rapid, explosivelike motion, lasting fraction of second, felt by observer at Canyon, where windows rattled. At SanFrancisco, felt by persons sitting and standing in building; building swayed slightly; windows rattled; distinct jolt. Felt by several in building at Oakland.

March 31: 18:40:31*. Epicenter 36°31′ north, 121°24′ west, about 19 miles south of Hollister, B. Magnitude 3.0. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several sitting and standing. Windows rattled; house creaked. Moderate motion, lasted 2 seconds; faint earth noises heard.

April 2: 05:45. Felt at the (PG&E) Morro Bay Power Plant.

April 4: 13:32. Damaging slide, Terminal Island, Long Beach Harbor. Felt as a slight earthquake in the area of Long Beach, San Pedro and Wilmington, P. Long Beach. IV. Felt in downtown Long Beach buildings; set off fire and burglar alarms. On Terminal Island, subsurface damage to oil well pipes was estimated at approximately $4.5 million; more than 40 wells were damaged and off production. At least three wells used for injecting water to halt subsidence in Long Beach Harbor were damaged.

April 5: 20:04:46*. Epicenter 40.1° north, 124.8° west, off coast of northern California, B. Magnitude 5.0. Felt over an area of approximately 3,500 square miles, principally in Humboldt County. Maximum intensity (damage) VI at Bear Harbor Ranch (Thorn area, about 10 miles south of Ettersburg), where it was reported a 50-yard slide occurred on trail. Felt by and frightened all in home; awakened observer. Motion slow and heavy, lasting 2 minutes or more.

INTENSITY (DAMAGE) V: Arcata (previous shock felt), Bayside, Briceland, Crannell (Moonstone area), Cummings, Denny, Eureka, Ferndale, Fields Landing, Hoopa, Korbel, Loleta, Phillipsville, and Salyer.

INTENSITY (DAMAGE) IV: Alderpoint, Fort Seward, Fortuna, Freshwater, Helena, Holmes, Kneeland, Miranda, Myers Flat, Orick, Orleans, Pepperwood, Petrolia, Piercy (another shock 5 minutes later), Rio Dell, Samoa, Scotia, Shelter Cove (on coast, about 7 miles west of Thorn; two shocks), Showers Pass (about 20 miles due east of Fortuna), Trinidad, Weott, and Whitethorn.

INTENSITY (DAMAGE) I TO III: Alton, Burnt Ranch, Carlotta, Ettersburg, Forest Glen, Garberville, Junction City, Maple Creek area (Dollar Ranch, about 20 miles southeast of Eureka), Weitchpec, Whitlow, and Zenia.

April 8: 23:23:16* (main shock), 23:25:41*. Epicenter of main shock 36°41′ north, 121°18′ west, B. This location is about 13 miles south of Hollister on the San Andreas fault. Magnitudes 5.6 and 5.5, respectively. Felt over an area of approximately 13,500 square miles of west-central California. (See map, p. 18.) Maximum intensity (damage) VII. Many old-time residents believed this was the strongest shock felt in the region since 1906. No deaths or injuries occurred. Damage was estimated to be around $250,000. Hollister authorities reported more than half of all city buildings suffered some type of damage. Principal building damage occurred in Hollister and at the W. A. Taylor Winery situated directly on the San Andreas fault, about 7 miles south of Hollister on Cienega Road at Vineyard. Major building damage at Hollister was confined to three buildings: San Benito County Court House, Dabo Hotel, and the Elks Building; lesser damage occurred to several other buildings. Plateglass window breakage in downtown Hollister was estimated at $12,000. A number of chimneys were damaged, some fell; much plaster cracking. Stores suffered considerable loss from fallen merchandise. The old Hollister water line, bringing water from the Cienega Valley to Hollister, was ruptured at two places in the area to the east of the W. A. Taylor Winery. Additional breaks were also reported.

INTENSITY (DAMAGE) VII:

Hollister.—San Benito County Court House: Damage to the 3-story building, built in 1887, was confined mainly to the top floor. Brick wall cracked just below the roof line and the west wall moved outwardly about 3 inches. Elevator jammed by fallen plaster. Building was evacuated, pending a survey by structural engineers. Dabo Hotel: Cornices of the 2-story hotel were loosened and the cracked front (west) wall leaned outwardly 2–3 inches. Plaster badly cracked in many places. Elks Building: The 3-story-building has exterior X-cracks in the reinforced concrete north wall at the first floor level; large pieces of plaster fell. Bricks fell from poorly constructed brick veneer east wall of Western Auto Association store. Bricks from rear fire wall of the 2-story Bertuccio Building fell and broke through the roof of an adjoining building. A cornice over the entrance to the Hawkins Hospital fell onto the main stairway. Few chimneys fell in the Hollister area. Most homes

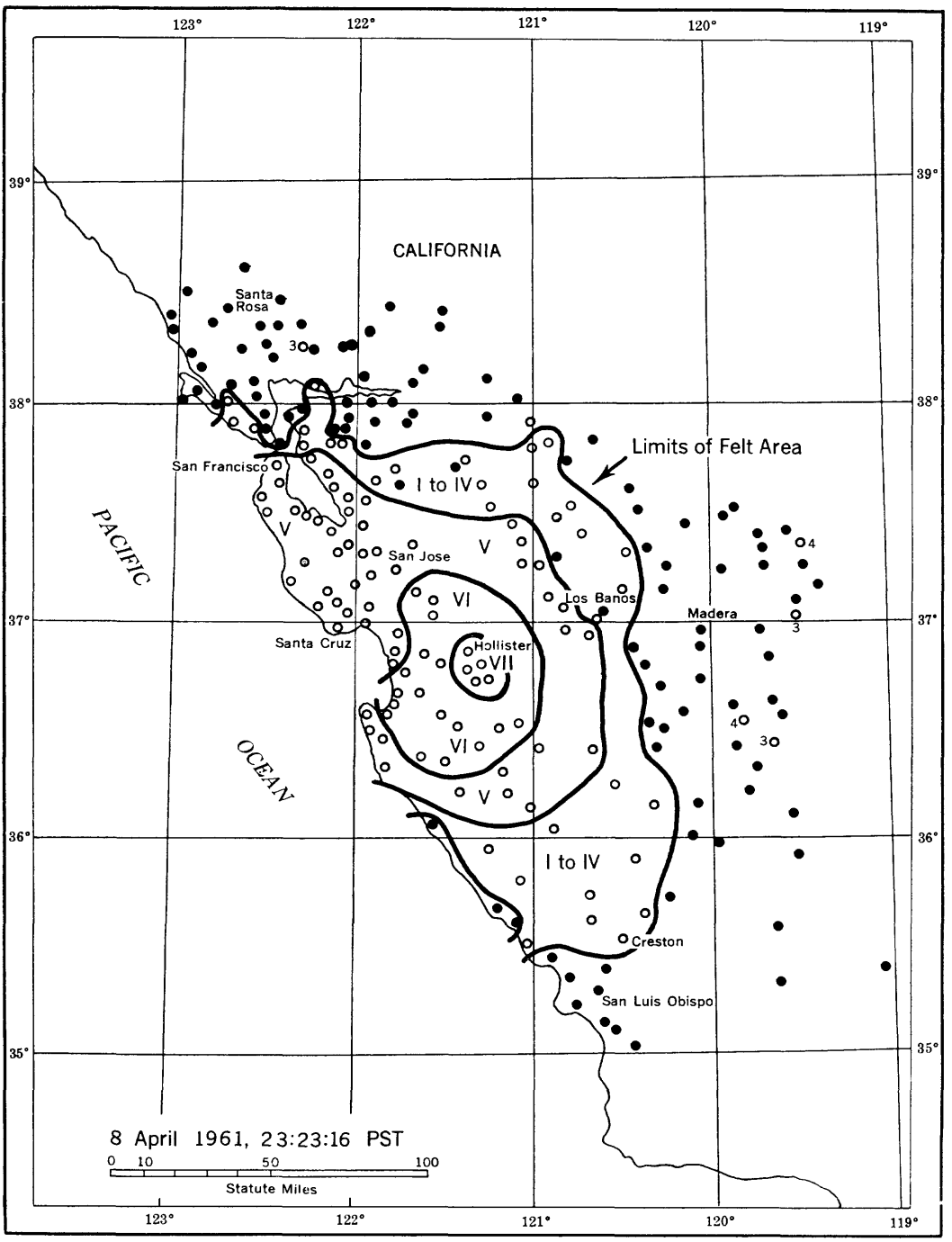

FIGURE 5.—*Area affected by earthquake of April 8.*

reported minor damage such as cracked plaster, glassware, fallen lamps, etc. Stores suffered considerable loss from fallen merchandise. Many homes in Union, Cienega, and Southside districts reported broken chimneys and cracked walls. Some ranches reported damaged water lines and pumps. Powerlines shorted in some sections; swinging lines crossed and burned out at one place in Hollister.

W. A. Taylor Winery (about 7 miles south of Hollister at Vineyard).—This location is the subject of a detailed report entitled "Creep on the San Andreas Fault," published in the *BSSA, July 1960,* issue. Studies indicate the San Andreas fault has been "creeping" at the rate of about one-half inch a year since 1948, and strong evidence suggests that it has been creeping for at least 50 years. It was reported a total of 0.4 inch "instantaneous creep" occurred during the April 8 earthquakes. Winery buildings are primarily wood frame; lower part of wall is concrete. Building damage was confined to tearing caused by the fault movement, plus the collapse of one small brick interior wall. A number of large wood stave wine tanks, resting directly on unanchored wood joists on concrete piers, were shifted off supports. The bottom of one 7,941-gallon tank was ruptured and all contents lost; another leaked badly and lost about 1,050 gallons. Small pipeline broken (broken many times in the past by the fault creep). Nearby road cracking could not be associated with the fault creep within the building. Brick house chimney fell. A 50-foot fissure about 2–3 inches wide was observed on Cienega Road about 3 miles from the winery. At the Harris Ranch on Cienega Road, pantry shelves torn from walls; chimney cracked; one-inch water pipe broken; ground cracked and landslides; concrete-lined reservoir cracked and water level lowered 5 inches; 12-inch Oak tree toppled. Motion reported as severe in both north-south and east-west directions but more severe in the north-south direction, as observed by the relative displacement of objects. Other locations on Cienega Road reported chimneys damaged, one fell; 3-inch pipeline broken; refrigerator toppled; piano moved 8 inches. At the Libby Ranch (about 10 miles southeast of Hollister and about 3½ miles southwest of Paicines), plaster and walls cracked; chimneys cracked and fell; furniture overturned; many dead limbs fell from trees.

Paicines (about 3½ miles northeast of epicenter).—Frightened all in community. Plaster, windows, walls, and ground cracked. Damage considerable to great. Furniture overturned and broken. A landslide blocked one of the two lanes on State Highway 25 between Paicines and Tres Pinos.

INTENSITY (DAMAGE) VI:

Aptos.—Felt by and awakened all in community; frightened few. Plaster cracked; furnishings shifted.

Aromas.—Felt by and awakened many; felt by some outdoors. Damage slight.

Castroville.—Felt by and frightened all in community. Small objects overturned. Tables, lamps, etc., shaken for about 10 minutes.

Chualar Canyon.—Both shocks felt. Felt by, awakened, and frightened all in community. Small objects shifted.

Gilroy.—Two hard shocks felt. Felt by and awakened all in home; frightened all in community. Damage slight. Plaster cracked; small objects shifted and overturned.

Gonzales.—Felt by all; awakened and frightened many in community. Small objects shifted; knickknacks fell.

Jamesburg area (Prince's Camp, 2 miles from Search Ranch).—Cement floor split entirely across and house settled about ½-inch further into ground. Minor earthslide on Cachugua Grade.

Loma Mar.—Felt by all in community. Stove shifted.

Marina.—Felt by and awakened many in community. Damage slight. Dishes broken; small objects shifted and overturned; knickknacks fell.

Morgan Hill.—Felt by all and awakened many in community. Damage slight. Plaster and walls cracked. Small objects shifted and overturned; furnishings shifted; knickknacks fell.

Monterey.—Felt by several in home. Ground cracked.

Pinnacles National Monument.—Felt by, awakened, and frightened all in home; felt by all campers at the Monument; all in area excited. Small objects overturned; furnishings shifted; pictures fell. Electricity off temporarily in the Pinnacles-San Benito area. Bank slid down onto road at Bakers Grade.

Salinas.—Felt by and awakened all in community; frightened few. Damage slight. Few water pipes broken. Small objects shifted; vases and small objects overturned; knickknacks, books, and pictures fell.

San Benito.—Felt by all in community. Damage slight. Plaster, windows, walls, chimneys, and ground cracked. Knickknacks, books, pictures, and plaster fell.

San Juan Bautista.—Felt by and awakened all in community. Small specks of plaster fell in old San Juan Mission. Few pieces of crockery broken in the Harmony Hills area when cupboard doors flew open. Few cans and packages

fell in supermarket and bakery. Wine bottles leaned against protective wire. Pendulum clocks stopped.

San Martin.—Felt by all; awakened and frightened many in community. Damage slight. Walls cracked. Small objects and furnishings shifted.

Tres Pinos (about 7 miles southeast of Hollister).—Entire area was blacked out due to circuit breaker opening at substation.

INTENSITY (DAMAGE) V: Agnew, Alameda, Alviso, Ben Lomond, Bitterwater and Bitterwater Valley area, Boulder Creek, Capitola, Carmel, Carmel Valley, Coyote, Crows Landing, Cupertino, Daly City-Colma, Felton, Freedom, Fremont, Gustine, Half Moon Bay, Hayward, Idria, King City and 12 miles north of, Los Banos and 6 miles south of, Mission San Jose, Moss Landing, Mount Hermon, New Almaden, Palo Alto, Paloma Station (few miles southeast of Jamesburg), Parkfield, Patterson, Pebble Beach, Pescadero, Redwood City, Redwood Estates, San Francisco, San Jose, San Lucas, San Mateo, Santa Cruz and Scotts Valley (about 7 miles north of Santa Cruz), Soledad, Soquel, South Dos Palos, and Watsonville.

INTENSITY (DAMAGE) IV: Ballico, Berkeley, Bolinas, Bryson (Weferling Ranch), Campbell, Canyon, Caruthers, Creston, Davenport, Denair, Dos Palos, Escalon, Greenfield, Harmony, Holy City, Jolon, La Selva Beach (on coast, west of Watsonville), Lone Pine Inn (about 17 miles northwest of Coalinga), Los Altos, Menlo Park, Merced, Mill Valley, Modesto, Moraga, Mount Eden, Mount Hamilton, Newman, Novato, Oakland, Pacific Grove, Paso Robles, Pinole, Port Costa, San Ardo, San Bruno, San Carlos, San Leandro, San Miguel, Shandon, Sunnyvale, Sunol, Turlock, Vallejo, Valley Home, Vernalis, Westley, and Wishon.

INTENSITY (DAMAGE) I TO III: Banta, Coalinga, El Nido, Lagunitas, Laton, Livermore, Livingston, Montara, Moss Beach, Napa, Newark, Prather, San Gregorio, South San Francisco, and Volta.

April 10: 09:19. Hollister (7½ miles south of, Harris Ranch). Slight, brief shock.

April 11: 11:36. Eureka (north section). IV. Felt by many; few momentarily alarmed. One sharp jolt with abrupt onset.

April 13: 23:20. Long Beach. "A slight earthquake shook downtown Long Beach."—(*BSSA, October 1961.*)

April 15: 12:02 to 12:06. Fort Ross State Park area. IV. Three shocks felt between 12:02 to 12:06. Building creaked; doors rattled. Some thought the disturbance was a sonic boom; others sitting in house definitely thought it was an earthquake. Trembling motion, gradual onset; rumble heard. At Bodega Bay, some residents thought the three shocks were the most severe felt in the area for many years. Distinctly felt at Jenner (12 miles by road from Fort Ross State Park). Also felt at Valley Ford (about 8 miles east of Bodega Bay) and at Wright's Beach.

April 17: 02:35. Niles Canyon (southern Alameda County). IV. Observer awakened by rattling of windows. Sharp shock in east-west direction.

April 27: 17:02:52*. Epicenter 36.3° north, 121.6° west, B. Magnitude 4.0. Felt principally in the Hollister area and in the Cienega District south of Hollister. Scattered felt reports from an area of approximately 2,000 square miles. Maximum intensity (damage) V. One report of slight plaster cracking at Hollister. "Three earthquakes were felt in Hollister between 17:02, April 27, and 06:06, April 28. Some plaster fell and cracks were widened."—(*BSSA, October 1961.*) At Chualar Canyon), frightened few; pendulum clock stopped; windows, doors, and dishes rattled; house creaked. Motion rapid; roaring earth noises heard. At Hollister, felt by most of population (some outdoors; active); frightened many. Minor damage. Plaster cracked slightly. A very light, rolling type shock. Small objects and furnishings shifted slightly; few small objects overturned. Trees, bushes shaken moderately. Motion slow, lasted 3 minutes, north-northwest direction; loud earth noises from south-southeast heard by many. Felt by and frightened many in the Cienega District, south of Hollister, where small objects shifted; furnishings shifted slightly; trees, bushes shaken moderately. Several in this district reported it was the strongest shock felt since April 8. At Paicines, felt by all; awakened and frightened few; small objects and furnishings shifted; doors swung. Motion slow, lasted 4 seconds, east-west direction. Intensity (damage) IV at Libby Ranch (about 10 miles southeast of Hollister), San Lucas, Soledad, and Tres Pinos (about 7 miles southeast of Hollister). Intensity (damage) I to III at Bitterwater Valley area (Lonoak Route), Carmel, Coalinga, Jamesburg area (Search Ranch), Mount Hermon, and Salinas (Prunedale area).

May 1: 22:26:17*. Epicenter 31°57′ north, 115°40′ west, Baja California, P. Magnitude 4.5. San Diego. Rapid motion felt by observer.

May 9: 08:46. Air wave; noticed widely in southern California, and reported in press as an earthquake, P. "A wide area of southern California, from Malibu to Pasadena was hit by a sharp jolt. No damage reported."—(*BSSA, October 1961.*)

May 19: 00:32:03*. Epicenter 37°52′ north, 122°15′ west, B. Magnitude 2.7. Berkeley. IV. Bumping motion with abrupt onset felt by observer lying down. Building creaked; loose objects rattled. Moderately loud rumbling earth noises heard before shock. Also felt at Oakland (Lake Temescal area).

May 25: 16:54:30*. Epicenter 34°02′ north, 118°16′ west, Los Angeles, P. Magnitude 2.5. West Los Angeles-Westchester area. Press reported a light shock jarred the area. Also felt in the Baldwin Hills area.

May 26: 04:58:35*. Epicenter 36°56′ north, 121°25′ west, B. Magnitude 3.5. Hollister. IV. Mild shock awakened observer. Windows rattled slightly. Also felt at Salinas.

May 28: 04:59:47*. Epicenter 33°48′ north, 116°05′ west, northeast of Indio, P. Magnitude 4.4. Felt over an area of approximately 5,000 square miles of southern California, principally in west-central Riverside County. Maximum intensity (damage) VI at Coachella, where slight damage to wood was reported.

INTENSITY (DAMAGE) VI:

Coachella.—Felt by all and frightened many in community; awakened all in home. Slight damage to wood. Small objects and furnishings shifted; small objects overturned; knickknacks fell. One hard jolt, then a slow roll for about 2–3 seconds.

INTENSITY (DAMAGE) V: Cathedral City, Hemet, Idyllwild, Indio, La Quinta (about 7 miles west of Coachella), Mecca, Palm Springs, Palm Desert, Rancho Mirage, Thermal, and Twentynine Palms.

INTENSITY (DAMAGE) IV: Anza, Calimesa, Desert Hot Springs, Gilman Hot Springs, Mountain Center, Pala, Pioneertown, Redlands, San Jacinto, White Water (White Water Canyon), Wildomar, and Winchester.

INTENSITY (DAMAGE) I TO III: Elsinore, Ludlow, Murrieta, Romoland, and Yucca Valley.

May 30: 14:02:37*. Epicenter 32°40′ north, 117°03′ west, southeast of San Diego, P. Magnitude 3.0. San Diego. IV. Press reported windows and doors rattled. Glass top on desk moved; hanging objects swung. Rapid, 45-second shock in northeast direction felt by several.

May 31: 06:17:43*. Epicenter 29.8° north, 114.0° west, Gulf of California, W. San Diego. IV. Press reported windows and doors rattled. Point Loma observer received several calls from residents.

June 2: 20:00:40*. Epicenter 37°50′ north, 122°13′ west, B. Magnitude 3.0. Canyon. IV. Felt by all in home at Canyon, where windows rattled; walls creaked. Slow, gentle rocking, lasted 4–5 seconds; earth noises from northwest-southeast. Felt as a single, moderate shove from south to observer lying down at Daly City (Palisades area), where house creaked. Sharp, momentary shock felt at Oakland. Also felt at Alameda, Berkeley, Emeryville, Piedmont, and San Francisco.

June 9: 18:17:42*. Epicenter 32°08′ north, 115°50′ west, Baja California, near Laguna Salada, P. Magnitude 4.1. San Diego. III. Barely perceptible to observer sitting. Motion slow, lasted 5 seconds.

June 11: 12:21:03*. Epicenter 36°46′ north, 121°25′ west, B. Slight shock felt at Hollister (7½ miles south of, Harris Ranch).

June 14: 13:56:08*. Epicenter 37°06′ north, 121°49′ west, B. Magnitude 3¼. Felt over an area of approximately 400 square miles of Santa Clara and Santa Cruz counties. IV. At Aptos (3.7 miles north of), two jolts in rapid succession, lasted 2 seconds, felt by observer sitting. Doors rattled and swung north; frame creaked. Felt by all in Post Office at Gilroy; outdoors by others; frightened few. Rapid, brief motion; loud earth noises from north heard by many. Also felt at Aromas, Moss Landing, San Martin, and Tres Pinos.

June 25: 05:15:26*. Epicenter 36°34′ north 121°19′ west, B. Magnitude 2¾. Hollister (7½, miles south of, Harris Ranch). IV. Weak shock, lasting few seconds, felt by several; awakened few. Windows and doors rattled; walls creaked.

June 26: 18:57:54*. Epicenter 37°48′ north, 122°14′ west, B. Magnitude 3½. Felt as a moderate shock at Albany, Berkeley, and the north Oakland Hills area. "Rumbling motion" felt at Oakland. Also felt at the McCasher Ranch in Canyon.

June 27: 09:35, 10:27:08*. (main shock). Epicenter 37°48′ north, 122°14′ west, B. Magnitude of shock at 10:27:08*, 3¼. IV. At Canyon, felt by many in community; frightened few. Windows rattled. Rapid, ½ second shock; moderate earth noises heard by few. Shock at 09:35 felt at the McCasher Ranch (Canyon). Felt by all in home and frightened few at Daly City (Palisades area), where walls creaked. Slow, 5–10 second shock in east direction. Felt at Moraga (Miramonte High School) by student sitting. Windows rattled; stacked books on table rocked. At Oakland, felt by many; windows, doors, and dishes rattled; walls creaked; trees, bushes shaken slightly. Felt at a number of locations in San Francisco; frightened few; windows, doors, and lamps rattled; walls creaked; hanging lights swung north-south. Rapid, jolting, east-west motion. Also felt at Albany, Berkeley, El Cerrito, Sobrante, and in San Mateo County.

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July 3: 20:56:00*. Epicenter 40.9° north, 118.4° west, west of Winnemucca, Nev., B. Magnitude 5.4. Probable felt area approximately 10,000 square miles. Maximum reported intensity (damage) V. Due to the very sparsely settled areas of northwestern Nevada, especially in the regions to the west and northwest of the epicenter, obtainable reports were very meager. Reported felt from Paradise Valley area on the north, southeast to Battle Mountain area, southwest to Lovelock, northwest to Gerlach, thence northeast to Paradise Valley. The shock was perceptible at two widely separated places outside of the main felt area—Eureka, about 170 miles southeast of the epicenter, and Fernley about 100 miles southwest of the epicenter. Several aftershocks were reported felt.

INTENSITY (DAMAGE) V:

Imlay.—Felt by several in home and community; awakened and frightened all in home. Windows, doors, and dishes rattled; houses creaked; doors swung; portable cooler rocked. Rapid, 3-second shock in north direction; sound like strong wind heard before shock.

Mill City.—Felt by all in community. Windows, doors, and dishes rattled. Rapid motion, lasting several seconds; moderate earth noises from northwest heard about ½ second before shock.

Paradise Valley (Vedder Ranch).—Felt by and awakened all in home; frightened few. Windows doors, and dishes rattled; knickknacks fell. Rapid motion, lasting 30 seconds; loud earth noises heard about 10 seconds before shock.

Tungsten.—Awakened many and frightened all in community. Small objects and furnishings shifted. Rapid motion, lasting ½ second; faint earth noises heard ½ second before shock.

INTENSITY (DAMAGE) IV: Golconda, Lovelock, and Winnemucca.

INTENSITY (DAMAGE) I TO III: Eureka, Fernley, and Gerlach.

July 3: 21:00 and 21:35:05*. Aftershocks of 20:56:00*. Epicenter 40.9° north, 118.4° west, west of Winnemucca, Nev., B. Magnitude of shock at 21:35:05*, 4.0. V. Awakened many in community at Unionville; motion rapid; faint earth noises heard. At Battle Mountain (about 14 miles southwest of Galena Canyon, 21:00), felt by all in home. Rapid motion, not very strong, like a short jerk, lasting 20 seconds; moderate earth noises heard. Also felt at Lovelock (21:00) and Tungsten (21:00 and 21:35:05*).

July 4: 03:09:11*. Aftershocks of July 3 at 20:56:00*. Epicenter 40.1° north, 118.6° west, north of Lovelock, Nev., B. IV. Gentle, brief motion felt by several and awakened some at Lovelock. Also felt at Mill City, Tungsten, and Unionville.

July 10: 16:25:46*. Epicenter 35°14′ north, 118°35′ west, south of Caliente, P. Magnitude 3.9. Kern Canyon Powerhouse (about 10 miles east of Bakersfield). IV. Windows and doors rattled.

July 14: 12:48:23*. Epicenter 35°13′ north, 118°34′ west, south of Caliente, P. Magnitude 3.0. Keene. IV. Felt by observer active. Moderate earth noises heard about 2 seconds before shock.

July 22: 10:01:55*. Epicenter 36.4° north, 121.2° west, east of Soledad, B. Magnitude 4.0. Pinnacles National Monument (about 25 miles southeast of Hollister). III. Felt by several. Lasted about 5 seconds; moderate earth noises heard by few 2 seconds before shock.

July 28: 18:58:15*. Epicenter 34°00′ north, 118°27′ west, near Santa Monica, P. Magnitude 2.7. Hawthorne–Lennox–Inglewood areas. IV. Press reported two slight earthquakes alarmed some persons and caused dozens of calls to police, sheriff, and newspaper offices. Set off a number of burglar alarms in Inglewood.

July 28: 22:48, 22:51. El Centro and Brawley, P. V. Shock at 22:48 reported felt over a 3-mile area of the Imperial Valley. The shock at 22:51 did only minor damage, mostly to water pipes in the city of Brawley. (Reported in *BSSA, January 1962.*) Not recorded by Pasadena network.

July 30: 16:07:07*. Epicenter 35°47′ north, 120°19′ west, near Shandon, P. Magnitude 4.5. Felt over an area of approximately 5,000 square miles of west-central California. Maximum intensity (damage) V.

INTENSITY (DAMAGE) V:

Atascadero.—Felt by many in community. Floor lamp moved. Windows rattled. Motion slow, lasting 10–20 seconds.

Cholame (about 7 miles northeast of Shandon).—Felt by several in community. Knickknacks and dishes fell; small objects and bird cage overturned. Motion rapid; faint earth noises heard by observer.

Creston (about 12 miles southwest of Shandon).—Felt by all in home and community; awakened few. Windows, doors, and dishes rattled; walls creaked; hanging objects swung north. Trees, bushes shaken slightly. Slow motion, lasting 30 seconds, in north direction.

Parkfield (1 mile south of, on ranch).—Felt by all in home (one active); by many in community. Pendulum clock facing east stopped. Windows, doors, and dishes rattled; house creaked. Motion rapid, lasted about 1 minute; loud earth noises heard.

San Ardo (Paris Valley).—Felt by several and frightened all in home. Plaster cracked and fell.

Damage slight to adobe. Motion slow, lasted few seconds.

San Luis Obispo.—Press reported police switchboards were jammed with calls from persons feeling the shock. Few cups and saucers broken. Man said he was shaken out of chair. Radio studio shaken and needle knocked sideways on phonograph record on turntable. Sharp, rolling motion.

Templeton.—Felt in home. Pendulum clock stopped. Trees, bushes, shaken slightly. Lasted 10 seconds; northeast direction.

INTENSITY (DAMAGE) IV: Avila Beach, Bitterwater Pumping Station (about 20 miles southeast of Cholame), Bryson (Weferling Ranch), Devil's Den Camp (about 18 miles east of Cholame), Hatch Ranch (1 mile east of San Andreas fault, Cholame area), Keck's Corner (about 15 miles southeast of Cholame), King City, Paso Robles, Pismo Beach, San Simeon (Hearst Ranch) Santa Margarita and vicinity, Shandon, Simmler area (about 10 miles east of, Carrisa Plains), and Valleton (about 5 miles northeast of Bradley).

INTENSITY (DAMAGE) I TO III: Adelaida (about 10 miles west of Paso Robles), Grover City, Kettleman City, Lost Hills, San Lucas, Soledad, and Wasco.

July 31: 17:36:33*. Epicenter 36°52′ north, 121°33′ west, northwest of Hollister, B. Magnitude 3.0. Hollister. IV. Dishes rattled.

August 6: 17:57:01*. Epicenter 36°52′ north, 121°16′ west, east of Hollister, B. Magnitude 3.3. Hollister (7½ miles south of, Harris Ranch). IV. Rapid, brief motion in northwest-southeast direction felt by several in home. Windows and doors rattled; walls creaked.

August 10: 08:43:41*. Epicenter 36.8° north, 121.3° west, east-southeast of Hollister, B. Magnitude 2.7. Hollister (7½ miles south of, Harris Ranch). IV. One hard jolt in north-northwest direction felt by several. Trees, bushes shaken slightly. Faint earth noises heard seconds before shock.

August 11: 20:57:20*. Epicenter 39°16′ north, 120°12′ west, southwest of Reno, B. Magnitude 4.0. Norden. III. Felt by several in community. Motion slow; lasted 2 seconds. Also felt 2 miles southeast of Norden.

August 17: 17:30:37*. Epicenter 37°56′ north, 122°00′ west, southeast of Concord, B. Magnitude 3.9. Felt over an area of approximately 1,500 square miles of the San Francisco Bay area. Maximum intensity (damage) V. At Pittsburg, press reported a patio was cracked; at Walnut Creek one home had several old hairline cracks enlarged and one new hairline crack; 5–6 second shock in north-south direction felt by observer sitting; faint earth noises heard. Intensity (damage) IV at Daly City (Palisades District) and San Bruno. Intensity (damage) I to III at Concord, Lafayette, Marin County, Moraga (PG&E Substation), Pacifica, and San Francisco.

August 21: 17:30:45*. Epicenter 33°57′ north, 117°35′ west, south of Ontario, P. Magnitude 2.8. Felt at Riverside.

August 22: 15:19:34*. Epicenter 33°03′ north, 116°16′ west, northeast of Vallecito, P. Magnitude 4.4. Press reports indicated the shock was felt at San Diego.

August 22: 17:00:48*. Epicenter 33°03′ north, 116°14′ west, northeast of Vallecito, P. Magnitude 4.7. This was the strongest of a long series of earthquakes originating northeast of Vallecito. Felt over an area of approximately 3,500 square miles, principally in south-central San Diego County. Maximum intensity (damage) V. Press reported furniture moved. This was the last of five shocks (felt?) in a 2-hour period. Beginning on August 22 at 15:19:34* and ending September 21 at 11:00:16*, there were 31 shocks recorded, ranging in magnitudes from 3.0 to 4.7.

INTENSITY (DAMAGE) V:

Descanso.—Felt by many. Small articles on shelves displaced. Moderate earth noises from east heard few seconds before shock.

Pine Valley.—Felt by all in community. Windows, doors, and dishes rattled. Motion slow, lasted few seconds.

INTENSITY (DAMAGE) IV: Alpine, Boulevard, Escondido, Jacumba, La Mesa, Palomar Mountain, San Diego, Santa Ysabel, and Tierra del Sol (formerly Hipass).

INTENSITY (DAMAGE) I TO III: Brawley, Calexico, Dulzura, El Cajon, El Centro, Holtville, Imperial, Julian, Mecca, Potrero, Santee, and Westmorland.

September 1: 08:51:49*. Epicenter 35°12′ north, 118°32′ west, northwest of Tehachapi, P. Magnitude 4.0 V. Felt by many in community (some outdoors; active) at Keene, where windows, doors, and dishes rattled; house creaked; trees, bushes shaken slightly. Motion rapid, lasted 3–5 seconds; loud earth noises heard by many before shock. Felt by all in community at Tehachapi. Windows rattled and walls cracked. Motion rapid, lasted 2 seconds; faint earth noises heard 1–2 seconds before shock. Felt by several (some outdoors; active) at Caliente; windows and doors rattled; frame creaked. Motion rapid, lasted 5 seconds; faint earth noises heard. Felt by many and frightened few in community at Monolith; house creaked. Motion slow; moderate earth noises heard 5 seconds before shock; described as "pretty strong."

September 12: 11:18:46*. Epicenter 32°34′ north, 115°27′ west, south of Mexicali, Baja

California, P. Magnitude 4.8. In the United States the shock was felt over approximately 4,000 square miles, principally along the California-Arizona-Mexico border. Maximum intensity (damage) V in the United States. Press reported several geysers were observed in the town of Delta, 30 miles south of Mexicali.

INTENSITY (DAMAGE) V:

El Centro.—Felt by all. Light fixtures swung east-west. Motion slow, rolling, rotating, lasting 10 seconds to 1 minute.

Heber.—Felt by all in community; frightened few. Icebox rattled. Motion slow.

INTENSITY (DAMAGE) V IN ARIZONA:

Yuma.—Press reported the shock was felt throughout the city area; few alarmed. Buildings shaken slightly; windows rattled. Slow, trembling motion, abrupt onset.

INTENSITY (DAMAGE) IV: Calexico, Holtville, Imperial, and Winterhaven.

INTENSITY (DAMAGE) IV IN ARIZONA: San Luis Somerton, and Tacna.

INTENSITY (DAMAGE) I TO III: Boulevard, Brawley, Descanso, Jacumba, Nestor, Pine Valley, Potrero, San Diego, and Tecate.

INTENSITY (DAMAGE) I TO III IN ARIZONA: Gadsden and Wellton.

September 13: 10:22. San Francisco (Southern Pacific Building, 65 Market Street). III. Felt by several on 10th floor. Three easy rolls at about 3-minute intervals, lasting 2–3 seconds each.

September 16: 11:49:40*. Epicenter 33°02′ north, 116°14′ west, northeast of Vallecito, P. Magnitude 4.4. San Diego. III. Felt by several in home and community. Hanging objects swung. Rapid motion in east-west direction, duration 10 seconds. Also felt at the Anza-Borrego Desert State Park; duration 3 seconds.

September 19: 21:04:10*. Epicenter 33°02′ north, 116°14′ west, northeast of Vallecito, P. Magnitude 4.4. Press reported the shock was felt at Descanso.

September 28: 00:28:29*. Epicenter 35°47′ north, 117°25′ west, near Trona, P. Magnitude 3.9. Felt at China Lake and Trona.

October 3: 18:21:32*. Epicenter 33°51′ north, 117°45′ west, east of Olive, P. Magnitude 4.1. Orange County and southeastern Los Angeles County. V. Press reported many were alarmed, but no reports of damage. At Fullerton, the 3-foot-thick cement walls of the jail were shaken. Reported felt at Anaheim, Brea, Costa Mesa, Covina, Downey, Garden Grove, Laguna Beach, La Habra, Long Beach, Lynwood, Newport Beach, Norwalk, Placentia, Santa Ana, Wilmington, and Yorba Linda. Felt by several at Pomona; motion swaying in north-south direction. Also felt in Riverside County at Corona and Riverside.

October 9: 06:41. Press reported a rolling earthquake jolted much of the Imperial Valley. Felt for about 30 seconds at Brawley, but less in the southern end of the valley.

October 16: 06:19:35*. Epicenter 36°42′ north, 121°25′ west, south of Hollister, B. Magnitude 2.3. Hollister (7½ miles south of, Harris Ranch). IV. Felt by several and awakened few in home; motion slow, lasted several seconds.

October 18: 21:01:02* (foreshock), 21:09:44* (main shock). Epicenters: (1) 35°50′ north, 117°49′ west; (2) 35°50′ north, 117°46′ west; both shocks east of Brown, P. Magnitudes 3.4 and 5.2, respectively. The felt area of the main shock was approximately 12,000 square miles of south-central California. Reported felt with slight intensity in a few scattered areas of northern Los Angeles County and a few areas in the San Bernardino region. Maximum intensity (damage) VII at one place about 5 miles east and 2 miles north of Brown, where heavy machinery and objects shifted and a change in level of well water was observed. Slight cracks in bathroom at Mojave was the only damage reported.

INTENSITY (DAMAGE) V: Bodfish, China Lake (also felt shock at 21:01:02*), Caliente, California Hot Springs, Inyokern and 5 miles north of, Johnsondale, Kern Canyon Powerhouse No. 1 (about 10 miles east of Bakersfield), Kernville, Little Lake, Mojave, Onyx (also smaller shock felt 3–5 minutes before and about 15 minutes after main shock), Ridgecrest (also two light tremors felt about 20 minutes before main shock), Sand Canyon area (about 12 miles northeast of Caliente), Springville, Tehachapi, Trona, Twin Oaks area (about 13 miles east of Caliente, Twin Oaks School), and Westend.

INTENSITY (DAMAGE) IV: Acton, Arvin, Badger, Bakersfield, Bartlett, Boron, Cantil, Cartago, Claraville, Coso Junction, Cutler, Delano, Di Giorgio, Edison, Edwards Air Force Base (Edwards), Glennville, Johannesburg, Keene, Kings Canyon National Park (Grant Grove), Lake Isabella, Miracle Hot Springs, Miramonte, Olancha, Orosi, Paris-Loraine (about 10 miles southeast of Caliente), Porterville, Posey, Randsburg, Reedley, Red Mountain, Sanger, Sequoia National Park (Ash Mountain and Giant Forest), Shoshone, Strathmore, Three Rivers, Tulare, Valyermo (Valyermo Ranger Station), Weldon, Wofford Heights (southeast of Caliente on Highway 466), Woodlake, and Woody (Fire Station).

INTENSITY (DAMAGE) I TO III: Adelanto, Armona, Barstow, Bitterwater Pumping Station (about 20 miles southeast of Cholame), Caruthers,

Castaic, Colton, Dunlap, Earlimart, Fontana, Goshen, Hanford, Helendale, Hinkley, Independence, Keeler, Kingsburg, Lamont, Lemoncove, McFarland, Mount Wilson, Newberry, Orange Cove, Oro Grande, Running Springs, San Bernardino, Saugus, Stratford, Taft, Tipton, Tupman, Visalia, and Yermo.

October 19: 00:08:47*. Epicenter 37°25′ north, 121°46′ west, northeast of San Jose, B. Magnitude 3.5. Felt over a very small area, principally in northern Santa Clara County. Maximum intensity (damage) V at Milpitas, where many were awakened. Windows rattled; walls creaked; motion rapid, duration 20 seconds; faint earth noises from east-west heard. Intensity (damage) IV at Aptos (3.7 miles north of), Mount Hamilton (Lick Observatory), San Jose, and Sunnyvale.

October 19: 05:00 (about). Mount Wilson. Slight shock felt by one person.

October 20: 11:19:12*, 11:20:18*, 11:44:25*, 11:49:51* (main shock), 11:55:10*, 12:07:14*, 13:42:41*, 14:35:34*, 20:38:52*. Epicenters: (1) 33°40′ north, 117°59′ west; (2) 33°40′ north, 117°59′ west; (3) 33°41′ north, 117°58′ west; (4) 33°39′ north, 118°00′ west; (5) 33°40′ north, 117°58′ west; (6) 33°40′ north, 117°59′ west; (7) 33°40′ north, 117°59′ west; (8) 33°40′ north, 118°01′ west; (9) 33°40′ north, 117°56′ west; all near Huntington Beach, P. Magnitudes 3.8, 3.4, 3.2, 4.3 (main shock), 3.5, 4.0, 4.0, 4.1, 3.5, respectively. Series of sharp shocks felt over an area of approximately 1,200 square miles of southern California, principally in Orange County. Maximum intensity (damage) VI at a number of Orange County communities, where slight damage occurred, consisting mainly of cracked plaster and loss of stock in a number of stores; some windows were broken. Reports apply to the main shock unless otherwise indicated.

INTENSITY (DAMAGE) VI:

Atwood.—Felt by many in community (some outdoors; quiet); frightened few. Damage slight. Plaster cracked. Small objects shifted; knickknacks and books fell. Trees, bushes shaken slightly. Motion slow, lasted 3–4 seconds.

Costa Mesa.—Felt by all; frightened few. Plaster cracked in high school building. One picture fell. Observer in large concrete and stucco building at 14:35:34* thought this shock was the hardest one of all. Motion rapid.

Garden Grove and Westminister areas.—Felt by all. Damage slight. Press reported schools were evacuated as a precautionary measure. Slight cracks in several school buildings and some window breakage. Several clocks fell from walls in school and broke. A number of markets at Garden Grove reported merchandise fell from shelves; several hundred dollars worth of liquor lost at one store. Large plate glass window broken at Safeway Store. Other observers reported plaster and walls cracked. One report stated a second rather severe shock was felt with about the same effects (intensity VI) as those occurring at 11:49:51*; many small shocks felt. Shock at 11:19:12* also felt. Motion rapid, lasted 2–3 seconds; direction north and northeast.

Midway City.—Felt by all and frightened many in community. Damage slight. Plaster cracked. Small objects shifted; vases and small objects overturned; knickknacks fell. Trees, bushes shaken moderately. Motion rapid, lasted 3 seconds; direction east-west; moderate earth noises heard by many 1 second before shock. Shocks felt for 48 hours.

Newport Beach.—Felt by all in community. Damage slight. Concrete patio deck cracked. Pictures askew on walls. Water splashed vigorously in water cooler during the shock at 11:19:12*. Press reported the first shock was felt at 11:19:12*, followed by one equally sharp at 11:20:18*. The third was felt at 11:49:51* and was more severe than the others. The fourth was felt 11:55:10* and the strongest at 12:07:14*. Each of the first two shocks was accompanied by a rolling boomlike noise which lasted for several seconds. Motion slow, lasted 2–3 seconds. Shock also felt at 14:35:34*.

Santa Ana.—Felt by all; frightened few. Press reported plaster cracked in new homes under construction; slight wall cracks at Bristol Plaza, a shopping center. Water heater pipe cracked in residence. Stock fell from shelves in some stores. Series of shocks felt. Motion rapid, lasted about 15 seconds.

Stanton.—Felt by all and frightened many in community. Small objects and furnishings shifted; small objects overturned; pictures fell. "Felt shock before 11:49:51* and quite severe one at 14:35:34*. Throughout the day and until around midnight there were shocks similar to the aftershocks of the March 10, 1933, Long Beach earthquake. With the exception of the 1933 shock, I have never felt so many aftershocks." Motion rapid, lasted 30 seconds; loud earth noises heard by many 1 second before shock.

Westminster.—Felt by all and frightened many in community. Damage slight. Plaster cracked. Small objects shifted; vases and small objects overturned; knickknacks fell. Motion rapid, lasted 5 seconds; direction east-west; moderate earth noises heard by many 1–2 seconds before shock. Shocks also felt at 11:20:18*, 11:55:10*, 14:35:34*, 20:38:52*.

INTENSITY (DAMAGE) V: Anaheim, Artesia (also sharp shocks at 11:19:12*, 12:07:14*, 13:42:41*; others felt throughout the day and evening), Buena Park (other shocks felt at various times

in p.m.), Cypress, Fullerton (shocks also felt at 11:19:12*, 11:20:18*, 12:07:14*, 13:42:41*, 14:35:34*, 20:38:52*), Huntington Beach (shocks also felt at 11:20:18*, 12:07:14*, 13:42:41*, 14:35:34*, 20:38:52*), La Habra, Long Beach (shocks also felt at 11:19:12*, 11:20:18*, 13:42:41*, 14:35:34*), Los Alamitos, Maywood, Montebello (shock also felt at 13:42:41*), and Sunset Beach.

INTENSITY (DAMAGE) IV: Balboa (shocks also felt at 11:20:18*, 12:07:14*, 13:42:41*, 14:35:34*), Irvine, Laguna (also at 14:35:34*), La Mirada (shocks also felt at 11:20:18*, 12:07:14*, 14:35:34*, 20:38:52*), Los Angeles (shocks also felt at 11:19:12*, 12:07:14*, 13:42:41*, 14:35:34*), Olive, Orange, Pomona, Santa Fe Springs, Seal Beach, Tustin, Whittier, and Yorba Linda.

INTENSITY (DAMAGE) I TO III: Alberhill, Brea, Corona del Mar (shock also felt at 14:35:34*), Dana Point, Downey (shock also felt at 14:35:34*; other small tremors), Huntington Park, Norwalk (shock also felt at 14:35:34*), San Dimas, and South Laguna.

October 21: 00:29, 00:47:59*, 01:03, 01:25. Epicenter of second shock 33°39′ north, 117°57′ west, near Huntington Beach, P. Magnitude of second shock 3.1; others less than 3.0. Felt at Westminster.

October 25: 14:37. Huntington Beach. Very light shock; rumble heard.

October 30: 16:00:42. Epicenter 35°33′ north, 118°58′ west, north of Owens Lake, P. Magnitude 3.5. Felt by few at Keeler. Duration 1 minute; rumble heard.

October 31: 04:17:54*, 04:18:01*. Epicenter 35°13′ north, 118°37′ west, southwest of Tehachapi, P. Magnitude of both shocks 3.0. Keene. V. Awakened many in community. Windows rattled; house creaked. Motion rapid, lasted 1 second; loud earth noises heard by few 4 seconds before shock.

October 31: 04:31:17*. Epicenter 35°14′ north, 118°37′ west, southwest of Tehachapi, P. Magnitude 3.0. Moderate earth noises awakened few in home at Keene. No shaking felt.

October 31: 04:38:04*. Epicenter 35°14′ north, 118°35′ west, southwest of Tehachapi, P. Magnitude 3.1. Keene. V. Felt by and awakened many in community. Windows rattled; house creaked. Motion rapid, duration 1 second; loud earth noises heard by few 4 seconds before shock. Also earth noises heard at 04:36 and shortly after 04:48.

November 6: 15:28:24*. Epicenter 35°22′ north, 117°56′ west, southwest of Garlock, P. Magnitude 3.2. Cantil. IV. Felt by several in community. Windows, doors, and dishes rattled; house creaked. Motion rapid, duration 4 seconds. "We have noticed several minor settling shocks for the past several weeks. Our buildings are old and of frame construction, so we notice the creaking of buildings at night."

November 6: 22:12:55*. Epicenter 33°38′ north, 118°03′ west, near Huntington Beach, P. Magnitude 3.0. Press reported a mild earthquake shook some parts of Orange County. Felt especially at Garden Grove.

November 9: 04:10:26*. Epicenter 40°26′ north, 123°59′ west, southeast of Ferndale, B. Magnitude 3.8. Felt over an area of approximately 1,200 square miles of the coastal area of Humboldt County. Maximum intensity (damage) V. No damage reported. Principal effect was the awakening of people.

INTENSITY (DAMAGE) V:

Briceland.—Awakened many in community. Walls creaked. Two hard shakes; motion rapid, duration 6 seconds.

Cutten (about 2½ miles southeast of Eureka).—Felt by and frightened all in home. Faint earth noises heard.

Eureka.—Felt by and awakened many; few alarmed. Windows rattled. Rocking motion in northwest-southeast direction; faint earth noises heard.

Ferndale.—Felt by and awakened many in community; frightened few. Rapid motion in north-south direction, duration 6 seconds; moderate earth noises from north-south heard by many 3 seconds before shock.

Fields Landing.—Awakened many. Doors rattled.

Fortuna.—Felt by and awakened all in home. Motion rapid, duration 1 minute; moderate earth noises from southwest heard.

Loleta.—Awakened many and frightened few in community. Moderate earth noises heard.

Weott.—Felt by several. Three cans fell from shelf in grocery store.

INTENSITY (DAMAGE) IV: Arcata, Blocksburg, Freshwater, Honeydew, Petrolia, and Rio Dell.

INTENSITY (DAMAGE) I TO III: Bayside and Blue Lake.

November 9: 05:11:25*, 05:24:43*. Epicenter 33°39′ north, 117°59′ west, near Huntington Beach, P. Magnitude of both shocks 2.8. Garden Grove. Felt.

November 9: 23:49:16*. Epicenter 33°39′ north, 117°59′ west, near Huntington Beach, P. Magnitude 3.0. Felt by few at San Pedro.

November 11: Between 07:30 and 08:30. San Bruno. IV. Felt by all in home. Windows rattled; walls creaked. Motion rapid.

November 11: 20:20:11*. Epicenter 36°58′ north, 121°40′ west, southwest of Gilroy, B. Magnitude 3.7. Felt over an area of approximately 700 square miles of Santa Clara, Santa Cruz, and San Benito counties. Maximum intensity (damage) V. Felt by all and frightened

few at Gilroy. Motion rapid, lasted 3 seconds; loud earth noises from north heard by many. At Mount Hermon, frightened all in home and community. Pendulum clock facing north stopped. Windows rattled. Hanging objects swung north. Light shock; motion rapid, duration 5 seconds; direction north. Intensity (damage) IV at Aptos (3.7 miles north of), Morgan Hill, Redwood Estates, San Juan Bautista, San Martin, and Soquel. Intensity (damage) I to III at Aromas, Hollister, and Holy City.

November 13: 10:39:54*. Epicenter 34°01′ north, 118°51′ west, west of Malibu, P. Magnitude 3.8. Manhattan Beach. IV. Two explosivelike jolts with very brief interval felt by observer sitting. Windows rattled. Also reported felt on Pico Boulevard (West Los Angeles), Long Beach, and Thousand Oaks (Ventura County).

November 14: 21:38:55*. Epicenter 34°56′ north, 118°59′ west, near Wheeler Ridge, P. Magnitude 5.0. Felt over an area of approximately 10,000 square miles of southern California, principally in Kern County. Maximum intensity (damage) VI at Wilsona in Antelope Valley (on Avenue 0 at line between Ranges 8 and 9) where walls, ground, and bottom of pool cracked. Minor damage. (It was reported this is a sensitive spot which has shown damage on former occasions of earthquakes not otherwise damaging in the vicinity.)

INTENSITY (DAMAGE) V: Buttonwillow, Caliente and Loraine, Castaic, Cummings Valley area (9 miles southwest of Tehachapi), Frazier Park, Gorman (about 15 miles southeast of Wheeler Ridge), Maricopa, Moorpark, Santa Ynez, Taft, Tehachapi, Tupman, and Ventucopa.

INTENSITY (DAMAGE) IV: Altadena, Arvin, Bakersfield, Bitterwater Pumping Station (about 20 miles southeast of Cholame), Bodfish, Cachuma Dam (about 30 miles northwest of Santa Barbara on Santa Ynez River), Camp Nelson (about 10 miles east of Springville), Carpinteria, Chatsworth, Claraville, Corcoran, Cuyama, Di Giorgio, Fellows, Goleta, Kern River Powerhouse No. 1 (about 10 miles east of Bakersfield), Kettleman City, Lake Hughes, Lamont, Long Beach, Los Angeles, Lost Hills, McKittrick, Malibu, Ozena Ranch (about 10 miles north of Wheeler Springs), Mojave, Newhall, North Hollywood, Ojai, Oxnard, Pasadena, Pond, Porterville, Sand Canyon area (east of Caliente, Twin Oaks), Sequoia National Park (Ash Mountain), Shafter, Summerland, Terra Bella, Valyermo, Van Nuys, Ventura, and Wheeler Ridge.

INTENSITY (DAMAGE) I TO III: Acton, Camarillo, Cantil, China Lake, Colton, Delano, Devil's Den, Ducor, Hanford, Johnsondale, Lancaster, Little Lake (about 30 miles south of), Littlerock, Los Olivos, Maywood, Miracle Hot Springs, Montrose, Newport Beach, Northridge, Norwalk, Olive View, Onyx, Palmdale, Piru, Port Hueneme, San Dimas, San Fernando, San Gabriel, San Pedro, Santa Barbara, Santa Monica, Santa Susana, Visalia, and Wrightwood.

November 16: 18:16:56*, 19:40:54*. Epicenter 37°58′ north, 122°02′ west, near Concord, B. Magnitudes 3.8, 3.0, respectively. Felt over a small area of the San Francisco Bay region, about 500 square miles, principally in Contra Costa County. Maximum intensity (damage) V at Clayton, where the shock was felt by all in community; windows, doors, and dishes rattled; rapid hard jolt in southeast direction. Felt with intensity (damage) IV at Alamo, Berkeley, Brisbane, Canyon (also 19:40:54), Concord, Cowell (also 19:40:54*), Orinda, Port Chicago, Saint Mary's College, San Francisco, and Walnut Creek. Intensity (damage) I to III at Lafayette and Martinez.

November 17: 19:18:36*. Epicenter 35°24′ north, 117°46′ west, west of Randsburg, P. Magnitude 4.3. V. At Johannesburg, chair slid across room. Felt by many in community at Randsburg, where disturbed objects were observed. Jarring, vertical motion, like sudden dropping of ground; abrupt onset; sharp, thumping earth noises heard by many 1 second before shock. Few leaks in water main at Red Mountain. Also felt at China Lake.

November 17: 23:08:10*. Aftershock of November 16 at 18:16:56*. Epicenter 37°58′ north, 122°02′ west, near Concord, B. Magnitude 2.5. Canyon. IV. Felt by several; frightened one. Windows rattled; walls creaked. Rapid motion, lasted 3 seconds; earth noises from northwest heard.

November 19: 00:55. Valyermo. Slight shock felt by observer sitting in chair.

November 20: 00:53:35*, 03:33:20*, 03:54:45*, 04:55:53*. Epicenters: (1) 33°41′ north, 118°00′ west, near Huntington Beach; (2) 33°54′ north, 118°11′ west, north of Long Beach; (3) 33°41′ north, 118°00′ west, near Huntington Beach; (4) 33°54′ north, 118°12′ west, north of Long Beach, P. Magnitudes 4.0, 3.0, 2.9, 2.3, respectively. V. At Buena Park (00:53:35*), felt by and awakened many; few alarmed; visible swaying of power lines and poles; all objects not fixed in place moved in north-south direction. Trembling, swaying motion; rapid onset; direction north-south; only the one shock felt. The shock at 00:53:35* awakened thousands at Long Beach, where two small sections of tile fell in one room of the Public Safety Building; glassware and utensils fell from shelves in some homes in the Lakewood Plaza-Los Altos area; disturbed objects observed by

many. Bumping motion, preceded by rumbling earth noises. Trembling motion with aftershocks. Thousands were awakened in some areas of Los Angeles County at 00:53:35*. Woman at Los Angeles knocked out of bed, and another at Huntington Park. Also felt (00:53:35*) at Hollywood, Norwalk (Los Angeles County); Santa Ana and other Orange County communities. The shock at 03:33:20* was felt in West Los Angeles and vicinity but not felt in Orange County; lasted a second or two.

November 21: 17:32:25*. Aftershock of November 16 at 18:16:56*. Epicenter 37°58′ north, 122°02′ west, near Concord, B. Magnitude 2.4. Felt in the Concord area.

November 29: 05:30:12*. Epicenter 37°18′ north, 121°51′ west, southeast of San Jose, B. Magnitude 2.6. Felt at San Jose. (*BSSA, July 1962.*)

December 9: 10:13. Pit River Powerhouse No. 1 (Fall River Mills). IV. Felt by several (some outdoors); frightened few. Frame creaked. Motion slow; lasted few seconds. Also felt at Whitmore by observer in trailer.

December 9: 10:30 Lake Arrowhead (south of Lake Arrowhead Village, at Central Fire Station). IV. Felt by several. Buildings creaked; loose objects rattled. Disturbed objects observed. Trembling motion in west-east direction; gradual onset; moderately loud roaring earth noises heard by several before and during shock; noise and vibration seemed to last about 10 seconds.

December 17: 23:35:05*. Epicenter 32°50′ north, 115°27′ west, near Holtville, P. Magnitude 3.5. Holtville. V. Press reported glass was broken in three homes. Also felt in El Centro.

December 27: 20:38:06*. Epicenter 34°08′ north, 119°04′ west, east of Oxnard, P. Magnitude 2.3. Oxnard and vicinity. Reported as sharply felt.

WASHINGTON AND OREGON

(120TH MERIDIAN OR PACIFIC STANDARD TIME)

January 3: 17:47*. Epicenter 46°00′ north, 122°10′ west, about 10 miles southeast of Cougar, Wash. (Skamania County), S. Amboy (Chelatchie Ranger Station). IV. Slow, 1-second shock felt by several and frightened few in home. Walls creaked. Also felt at Cougar (Swift Dam Powerhouse, about 5½ miles east of Cougar).

January 3: 23:26:01*. Epicenter 46°00′ north, 122°05′ west, 15 miles south-southeast of Mt. St. Helens, Wash. (Skamania County), S. Felt over an area of approximately 2,000 square miles of southwestern Washington, principally in Clark and Skamania Counties. Maximum intensity (damage) V.

INTENSITY (DAMAGE) V:

Amboy (about 20 miles southwest of epicenter).—Felt by several and frightened few in community. Furnishings shifted. Sharp motion, lasted 3 seconds; some said it felt and sounded like a car hit the house.

North Bonneville.—Felt by and awakened all in home. Hanging objects swung. Sudden, blast-like 2-second shock; moderate earth noises from northwest heard; "whoosing" sound after initial shock.

INTENSITY (DAMAGE) IV: Carson, Cougar and vicinity (slight tremors before and since), Stevenson, Woodland (4 miles east of), and Yacolt. Also felt at Battle Ground (no details).

INTENSITY (DAMAGE) IV IN OREGON: Portland (West Hills area).

January 5: Between 18:00 and 19:00. Epicenter 46°00′ north, 122°10′ west, about 10 miles southeast of Cougar, Wash., S. Felt at the Swift Dam Powerhouse (about 5½ miles east of Cougar) and at the Merwin Dam (about 10 miles southwest of Swift Dam).

February 1: 21:50:13*. Epicenter a few miles west of Longmire in Mt. Rainier National Park, Wash., S. Longmire. V. Felt by all. Set off snow avalanches in the mountains. Windows and doors rattled. Rapid, 4–6 second shock in north direction.

February 5: Between 14:00 and 15:00. Epicenter about 10 miles southeast of Cougar, Wash., S. Two light shocks felt by observer at Swift Dam Powerhouse (about 5½ miles east of Cougar).

February 9: 21:55. Light shock felt by two at Swift Dam Powerhouse (about 5½ miles east of Cougar, Wash.).

February 21: 00:35. Light shock felt at Swift Dam Powerhouse (about 5½ miles east of Cougar, Wash.).

May 21: 17:58:50*. Entiat, Wash. IV. Felt by many in community; frightened few in home. Windows rattled; hanging objects swung. Rapid, 15-second shock. Slightly felt at Wenatchee by observer and wife sitting. Motion slow, lasted few seconds. It was reported the shock was due to impounding of water in newly created Lake Entiat at Rocky Reach Dam and Hydroelectric Plant (about 10 miles upstream from Wenatchee on the Columbia River). Recorded at Seattle, Longmire, and Tumwater Seismograph Stations.

May 25: 21:51. Washington. IV. Felt by several; awakened and frightened few at Merwin, Swift, and Yale dams in the Cougar-Ariel areas. Windows and dishes rattled; rapid motion, duration 10 seconds. At Longmire, felt by observer sitting. Windows rattled; rapid, 1–3 second shock in east-west direction; faint earth noises from east heard. Felt in home and

community at Morton, where dishes rattled; rapid, 2-second shock.

June 1: 20:05. Cougar, Wash. (Swift Dam, about 5½ miles east of Cougar). III. Slight shock felt by three persons.

June 28: 02:22:44*. Wenatchee (Rocky Reach Dam), Wash. IV. Felt by several and awakened few. Doors rattled; rapid and slow motion, duration 10 seconds. Recorded at Seattle, Longmire, and Tumwater, Wash. This disturbance was also believed due to impounding of water in the newly created Lake Entiat at Rocky Reach Dam.

July 28: 06:52:44*. Swift Dam, Wash. (about 5½ miles east of Cougar). IV. Felt by several; awakened few. Windows, doors, and dishes rattled. Also felt at Yale Dam (about 8 miles southwest of Cougar).

August 18: 20:56:24.1 (main shock) and 21:06. Epicenter 44.7° north, 122.5° west, northwestern Oregon, W. Magnitude 4.5. Felt over an area of approximately 7,000 square miles of northwestern Oregon. Reported felt from Oakridge, Oreg., in southwest Lane County, north to areas along the Lewis River in Cowlitz County, Wash., a distance of about 160 miles. It was reported not felt in the coastal areas. Maximum intensity (damage) VI at Albany and Lebanon, where minor damage occurred.

INTENSITY (DAMAGE) VI:

Albany.—Generally felt. Plaster wall cracks reported by some residents.

Lebanon (about 10 miles southeast of Albany).—Felt by all. Two traffic lights, suspended over intersections, fell; five signs fell; two house chimneys toppled; store windows broken.

INTENSITY (DAMAGE) V: Keizer (about 5 miles north of Salem), Salem (two shocks felt), and Sublimity (about 15 miles southeast of Salem).

INTENSITY (DAMAGE) IV: Blue River area (about 25 miles northeast of Eugene), Detroit, Eugene, Oakridge (about 30 miles southeast of Eugene), Portland, and Silverton (about 13 miles northeast of Salem).

INTENSITY (DAMAGE) IV IN WASHINGTON: Ariel–Cougar areas at Merwin, Swift, and Yale Dams.

Also felt (no details) at Corvallis, Mill City, Scio, and Sweet Home, Oregon.

September 9: (about). Roosevelt, Wash. One person reported feeling a shock about a week previous to September 15.

September 15: 19:25:00*, 22:48, 22:50. Epicenter 45°58′ north, 122°10′ west, southeast of Cougar, Wash., in Gifford Pinchot National Park, S. Felt over an area of approximately 7,000 square miles of southwestern Washington and northwestern Oregon. (See map, p. 30.) Maximum intensity (damage) VI at Swift Dam (about 5½ miles east of Cougar). No damage reported.

INTENSITY (DAMAGE) VI:

Swift Dam (about 5½ miles east of Cougar).—Felt by all and frightened many in community. Small objects overturned; knickknacks fell. Trees, bushes shaken strongly. Hanging objects swung east-west. Rapid, 20-second shock in east-west direction. Also hard jolt felt at 22:48; hard jolts rattled objects in house at 22:50.

INTENSITY (DAMAGE) V: Amboy, Brush Prairie, Cougar (Lewis Ranger Station), Government Mineral Springs (about 15 miles northwest of Carson), Heisson, North Bonneville, and Stevenson.

INTENSITY (DAMAGE) V IN OREGON: Corbett (midway up Larch Mountain).

INTENSITY (DAMAGE) IV: Ajlune, Appleton (6 miles south of), Ashford, Battle Ground, Bingen, Cathlamet, Cook (5 miles west of), Curtis, Eatonville, Glenoma, Klickitat, Kosmos, La Center, Mayfield, Mineral, Morton, Mossyrock, Orchards, Packwood, Puyallup, Randle and Randle Ranger Station, Ridgefield, Toledo (1 mile northeast of), Vancouver, and Yacolt.

INTENSITY (DAMAGE) IV IN OREGON: Bonneville, Clatskanie, Fairview, Government Camp, Oregon City, Portland, Rainier, Sandy, and Scappoose.

INTENSITY (DAMAGE) I TO III: Ariel, Camas, Carrolls (near, on Columbia River), Castle Rock, Chehalis, Cinebar, Elbe, Husum, Longview, Richland (Hanford Atomic Works), Salkum, Seattle, Silver Creek, Skamania, Spanaway, Toutle and Spirit Lake Ranger Station, White Salmon, Washougal (also felt shock around midnight), and White Swan.

INTENSITY (DAMAGE) I TO III IN OREGON: Albany, Brightwood, Deer Island, Detroit, Gresham, Newberg, Odell, Vernonia, and Zigzag.

September 16: 03:45, 04:28. Aftershocks of September 15 at 19:25:00*. Washington. Amboy. V. Felt by and frightened many in community. Windows, doors, and dishes rattled; walls creaked. Hanging objects swung north-south. Rapid, 6-second shock. Felt by observer lying down at the Lewis River Ranger Station (Cougar), where windows, doors, and dishes rattled; rapid, 10-second shock. Sharp, hard jolts, followed by light quivering, felt at Swift Dam (about 5½ miles east of Cougar); light shock felt at 04:28. Slight, abrupt shock awakened observer from light sleep at Battle Ground. At Klickatat: "Noise heard in a.m."

September 17: 07:55:58* (principal aftershock of September 15 at 19:25:00*), 08:12, 08:34. Epicenter 45°58′ north, 122°10′ west, southeast of Cougar, Wash., in Gifford Pinchot

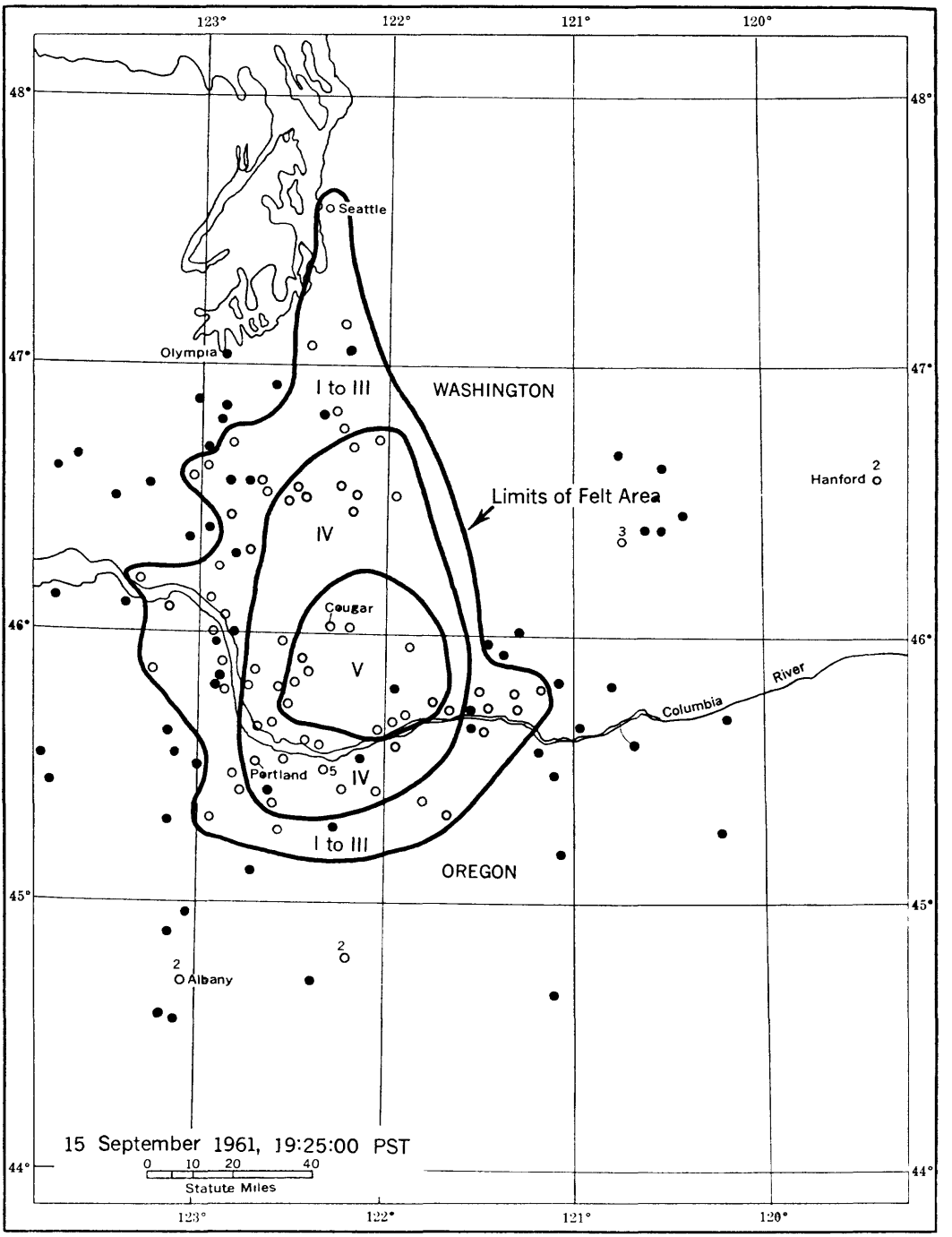

FIGURE 6.—*Area affected by earthquake of September 15.*

National Park, S. Felt over an area of approximately 9,000 square miles of southwestern Washington and northwestern Oregon. Maximum intensity (damage) VI. Slight damage reported at few towns along the Columbia River.

INTENSITY (DAMAGE) VI:

Cougar (Lewis River Ranger Station).—Felt by all in community; awakened and frightened few. Small objects shifted; vases, etc., overturned. Hanging objects swung north. Rapid motion; lasted 20 seconds; moderate earth noises heard.

North Bonneville.—Felt by all in community. Old house shifted on foundation about 1 inch. Small objects shifted. Automobile rocked strongly. Rapid, 5-second shock in west-east direction; moderate earth noises from west heard by many 1 second before shock.

Stevenson.—Felt by all and frightened few in community. Damage slight. Chimneys and cement foundations cracked; basement floor cracked. Woodstove moved 6 inches. Plate glass windows "rippled like flags." Small objects and furnishings shifted. Rapid, 2-second shock; moderate earth noises heard by many about ½ second before shock.

INTENSITY (DAMAGE) VI IN OREGON:

Latourell Falls.—Felt by and frightened all in community. Few cracks in heavy cement-block basement foundation (dirt floor in basement). Trees, bushes shaken strongly; entire house shaken strongly; hanging objects swung east-west. Rapid motion in east-west direction, long duration; loud earth noises from east-west, like thunder or approaching train, heard by many before shock.

INTENSITY (DAMAGE) V: Amboy, Ariel (Merwin Dam), Carson and Hemlock Ranger Station about 10 miles northwest of Carson, Cook, Seattle, Swift Dam (about 5½ miles east of Cougar; also booming earth noises heard at 08:12; moderate tremor at 08:34), Washougal, and Yale Dam (about 8 miles southwest of Cougar).

INTENSITY (DAMAGE) V IN OREGON: Bridal Veil, Hillsboro, Manning (near), Parkdale, and Portland.

INTENSITY (DAMAGE) IV: Kosmos, La Center, Mayfield, Mossyrock, Packwood, Randle and Randle Ranger Station, Skamania, Vancouver, and White Salmon.

INTENSITY (DAMAGE) IV IN OREGON: Aurora, Beaverton, Brightwood, Buxton, Clackamas, Deer Island, Government Camp, Hood River, Mulino, Newberg, Odell, Rhododendron, Scappoose, The Dalles, Troutdale, Zigzag, and Yamhill.

INTENSITY (DAMAGE) I TO III: Appleton (2 miles north of), Castle Rock, Elbe, Frances, Glenoma, Mineral, Raymond (3 miles west of), and Troutlake (3 miles southwest of).

INTENSITY (DAMAGE) I TO III IN OREGON: Bonneville, Columbia City, Corbett, Corvallis, Fairview, Gaston, Monitor, Saint Helens, Sherwood, Timber (about 35 miles northwest of Portland), and Woodburn.

October 30: 19:35. Epicenter 48°25′ north, 120°00′ west, 17 miles west of Okanogan, S. Felt over an area of approximately 1,200 square miles of Okanogan County, Wash. Maximum intensity (damage) V at three places.

INTENSITY (DAMAGE) V:

Conconully.—Felt by all; frightened few. Windows and dishes rattled. Rapid, brief, explosivelike shock; moderate earth noises heard by many.

Malott.—Felt by all in community; frightened few. Rapid, 30-second shock, beginning with blastlike motion followed by short period of shaking; loud earth noises heard.

Methow.—Felt by all in community. Windows doors, and dishes rattled. Felt like large object hit side of house, "Motion like a terrific far-off blast."

INTENSITY (DAMAGE) IV: Brewster, Okanogan, Omak (north section), Riverside, Synarep, and Winthrop (3 miles south of).

INTENSITY (DAMAGE) I TO III: Carlton.

November 6: 17:29:10*. Epicenter 45°40′ north, 122°52′ west about, 15 miles northwest of downtown Portland, Oreg., S. Felt over an area of approximately 9,000 square miles of northwest Oregon and southwest Washington. Maximum intensity (damage) VI at Portland and four other towns. Slight plaster cracking was the principal damage reported. Some persons thought this was the sharpest shock felt in Portland since April 13, 1949.

INTENSITY (DAMAGE) VI:

Portland.—Generally felt; frightened many. Damage slight. Plaster cracked; part of brick chimney fell; interior lights broken; door frames jammed; water fountain sprung leak. Stock fell from shelves in grocery stores; small objects and furnishings shifted. Trees, bushes shaken strongly. Window "rippled like waves." Loud earth noises from northwest, west-east, and north heard; various directions of motion—southwest, west-east, and east-west.

Glenwood (about 25 miles west by north of Portland.—Felt by all in community. Concrete-block foundation of service station broken where blocks join. Store building rocked. Loud rumbling earth noises, like several noisy trucks passing, from northeast heard by many.

Milwaukie (about 10 miles southeast of Portland city center.—Felt by all in community. Heavy

porch roof on house undergoing repairs and remodeling fell about 18:30. Small objects and furnishings shifted. Rapid, 1-minute shock; faint earth noises heard.

Scappoose (about 20 miles north by west of Portland).—Felt by all; awakened and frightened few in community. Damage slight (no details). Trees, bushes shaken slightly. Rapid, 5-second shock in northeast direction; faint earth noises from northeast heard by many.

Vernonia (about 32 miles northwest of Portland).—Felt by all and frightened few in community. Damage slight. Windows broken. Small objects shifted; knickknacks fell. Trees, bushes shaken moderately. Hanging objects swung east-west. Rapid, 7–10 second shock; moderate rumbling earth noises heard by many during shock.

INTENSITY (DAMAGE) V: Banks, Brightwood, Columbia City, Deer Creek (Merrill Creek Road, 1½ miles from Deer Creek), Dundee, Eagle Creek, Estacada (7 miles east of), Gresham, North Plains, Oregon City, Orenco, Rainier, Rhododendron, Tillamook, Timber, and West Linn.

INTENSITY (DAMAGE) V IN WASHINGTON: Camas, La Center, Vancouver, and Woodland.

INTENSITY (DAMAGE) IV: Aloha, Birkenfeld, Bonneville, Buxton, Clackamas, Clifton, Cloverdale, Corbett, Detroit, Forest Grove, Garibaldi, Gaston, Gates, Goble, Government Camp, Hillsboro, Jewell, Lake Oswego, Latourell Falls, Manning, Marquam, Molalla, Mount Hood, Mulino, Netarts, Odell, Pacific City, Saint Helens, Sandy, Scotts Mills, Sherwood, Troutdale, Tualatin, Warren, Westport, and Yamhill.

INTENSITY (DAMAGE) IV IN WASHINGTON: Amboy, Battle Ground, Bingen, Brush Prairie, Carrolls, Carson, Castle Rock, Cook, Cougar, Heisson, Home Valley, Husum, Kalama, Kelso, Longview, North Bonneville, Orchards, Ridgefield, Ryderwood, Skamokawa, Stevenson, Toutle, Underwood, Washougal, White Salmon, and Yacolt.

INTENSITY (DAMAGE) I TO III: Beaver, Beavercreek, Boring, Brownsmead, Canby, Cannon Beach, Donald, Fairview, Hood River, Nehalem, Neskowin, Rockaway, Saint Helens, Tigard, Wilsonville, and Woodburn.

INTENSITY (DAMAGE) I TO III IN WASHINGTON: Ariel and Cathlamet.

November 7: 09:53 and 10:05. Spokane, Wash. Press reported Spokane was jarred by shocks of local source. Recorded at Mt. St. Michael's east of Spokane.

November 7: 13:30. Oregon and Washington. Portland. V. Press reported the shock was felt principally in Portland and surrounding areas. Calls were received from all parts of the city, but few persons in the downtown area felt it. Pictures tilted on walls and china clinked in various parts of the city. TV slid across floor. Also felt at Vancouver and Washougal, Wash. Other slighter tremors felt during the afternoon.

November 30: 00:13. Epicenter 47°38′ north, 122°28′ west, in Puget Sound Channel of Magnolia section of Seattle, S. Felt over a small area. IV. At Bellevue, felt by all in home (awake). Windows and doors rattled; house creaked; rapid, 10-second shock; direction seemed south-north. Felt by observer lying down at Bothell, where frame creaked; rapid, 3-second shock in north direction. At Bremerton, felt by and frightened all in home; walls creaked; seemed to be one brief south-north shake, with none of the usual trembling motion after shake. At Kirkland, rapid, 2-second shock felt by observer lying down; windows rattled; moderate earth noises heard 1 second before shock. At Mercer Island (northwest end), felt by observer lying down; frame creaked; rapid motion; faint earth noises heard. At Seattle, press reported calls were received from the Magnolia and Queen Anne Hills sections. House creaked; doors rattled and swung; bed shaken slightly. Motion rapid and slow, lasted from 2–3 seconds to 2 minutes; direction east-west. Felt by all in home at Woodinville, where windows rattled. Felt by several in home and awakened few at Redmond. At Renton (near racetrack west of Renton), engineers believed the shock was responsible for a sudden drop of about 1.0 inch in a 15 by 20 foot fill. Also felt at Kingston.

December 16: (a.m.) Portland, Oreg. Press reported a slight shock was felt in Portland "early today."

ALASKA

(150TH MERIDIAN OR ALASKA STANDARD TIME)

January 5: 04:06:25.9*. Epicenter 51.8° north, 176.3° west, Andreanof Islands, Aleutian Islands, W. Depth about 37 km. Magnitude 6¾. Felt on Adak.

January 5: 08:37:48.3*. Epicenter 51.5° north, 176.6° west, Andreanof Islands, Aleutian Islands, W. Depth about 30 km. Felt on Adak.

January 5: 18:23. Felt on Adak. Slight tremor.

January 16: 02:52. Felt at Manley Hot Springs. Rumble from south-west one minute, then one short, moderate shake.

January 18: 00:45. Felt on Adak. Slight tremor.

January 30: 02:12:39.7*. Epicenter 65.3° north, 149.9° west, central Alaska, W. Depth about 34 km. Magnitude 5½ (Pal). Maximum intensity (damage) V. At Fairbanks, felt by many; few frightened. Buildings creaked; win-

dows and loose objects rattled. Display cabinet, plotting board and radiosonde receiving equipment swayed back and forth. Gradual onset; swaying motion north-south. Moderately loud noises heard by many. Felt by, awakened all, and frightened many at Manley Hot Springs. Cans fell from shelves; small alarm clock swayed back and forth. Buildings creaked; windows and loose objects rattled. Cabin on hillside "danced-pranced with terrific force." Rapid onset; 30–40 seconds duration. One moderate shake, then a harder shake from west—long vibrations.

February 4: 21:55:43.3*. Epicenter 50.9° north, 176.9° west, Andreanof Islands, Aleutian Islands, W. Depth about 44 km. Felt on Adak. Slight tremor.

February 6: 02:12:21.8*. Epicenter 51.7° north, 174.5° west, Andreanof Islands, Aleutian Islands, W. Depth about 34 km. Magnitude 5¼–5½ (Pal). Felt on Adak.

February 7: 13:27:18.9*. Epicenter 51.7° north, 177.1° west, Andreanof Islands, Aleutian Islands, W. Depth about 60 km. Felt on Adak.

February 16: 23:27. Felt on Adak. Slight tremor.

February 28: 18:44. Felt on Adak. Slight tremor.

March 14: 01:58:53.9*. Epicenter 67.8° north, 164.9° west, Bering Strait, W. Depth about 42 km. Felt on Adak.

March 28: 02:29:12.7*. Epicenter 51.7° north, 176.2° west, Andreanof Islands, Aleutian Islands, W. Depth about 60 km. Magnitude 6¼. Felt on Adak.

March 28: 03:58:58.8*. Epicenter 52.0° north, 176.0° west, Andreanof Islands, Aleutian Islands, W. Depth about 89 km. Felt on Adak.

April 4: 02:52. Felt at Kenai. Light earth tremor.

April 26: 16:15. Felt on Adak. Slight tremor.

April 28: 19:34:13.* Felt at Manley Hot Springs. Three-second rumble, then short shake.

May 17: 08:29:19.3*. Epicenter 52.2° north, 173.9° east, Near Islands, Aleutian Islands, W. Depth about 21 km. Magnitude 6. Felt at Shemya—duration 5–7 seconds.

May 26: 03:57. Felt on Adak. Slight tremor.

June 12: 15:25. Felt on Adak. Slight tremor.

June 15: 00:51. Felt on Adak. Slight tremor.

July 4: 16:28. Felt at Anchorage. Slight tremor.

July 8: 22:12. Felt at Talkeetna. Slight tremor.

July 12: 06:10. Felt at Girdwood.

August 4: 16:26:20.3*. Epicenter 60.8° north, 148.7° west, Kenai Peninsula, W. Depth about 53 km. Maximum intensity (damage) IV at Cordova. Buildings creaked; loose objects rattled; pictures swung. Rapid onset; trembling motion. Slight to severe trembling on Hinchinbrook Island (Bosewell Bay), but no damage reported.

August 17: 14:50:42*. Felt by several at Fairbanks. Rapid onset; rocking motion, west-east.

August 23: 01:59:35*. Felt at Summit. Slight tremor.

August 29: 11:35. Felt on Umnak Island.

September 5: 01:34:37.3*. Epicenter 60.0° north, 150.6° west, Kenai Peninsula, W. Depth about 43 km. Magnitude 6–6¼. Maximum intensity (damage) VI at Seward, where slight damage was reported.

INTENSITY (DAMAGE) VI:

Seward.—Felt by and awakened all; frightened many. Slight damage. Dishes and mirrors broken; plaster cracked. Buildings shook; windows rattled. Rapid, then slow onset; duration 1–2 minutes.

INTENSITY (DAMAGE) V:

Anchorage.—Felt by and awakened many. Buildings shook; windows, doors, and loose objects rattled. Hanging objects swung; clocks stopped. Slow onset; north-south motion.

Kenai (10 miles north of).—Felt by, awakened, and frightened all in home. Slight damage reported. Buildings shook; walls creaked; windows and dishes rattled. Small objects shifted. Moderate earth noises. Rapid motion; duration 45–60 seconds.

Palmer.—Felt by and awakened several. Small objects and furnishings shifted; hanging objects swung. Moderate earth noises heard. Motion slow.

Soldatna.—Felt by, awakened, and frightened all in home. Hanging objects swung. Buildings shook; loose objects rattled. Walls and frame creaked.

INTENSITY (DAMAGE) IV:

Kenai.—Felt by and awakened all in home; few frightened. Windows and dishes rattled; walls creaked.

INTENSITY (DAMAGE) I TO III: Cooper Landing, Homer (5 miles northwest of), Kasilof, and Seldovia.

September 5: 04:05. Felt at Soldatna.

September 5: 05:00, 08:00, 12:01, 14:01, and 18:00 (about). Slight tremors felt at Seward.

September 6: 07:30, 17:45, 19:30 (about). Slight tremors felt at Seward.

September 6: 17:30. Felt at Homer (5 miles northwest of).

September 11: 19:38:01.3*. Epicenter 63.4° north, 149.4° west, central Alaska, W. Depth about 50 km. Slight tremor felt at Summit and McKinley Park.

September 24: 14:00. Felt at Girdwood.

September 24: 16:27:13.4*. Epicenter 60.5° north, 153.0° west, southern Alaska, W. Depth about 125 km. Magnitude 5¾–6. Felt at Homer (5 miles northwest of).

September 28: 10:21. Felt at Homer (5 miles northwest of).

October 11: 21:09. Felt at Lazy Bay. Sharp tremor; duration 10 seconds.

October 16: 03:49. Felt on Adak. Slight tremor.

October 26: 15:41:19* and 23:59:00*. Felt on Adak. Slight tremor.

October 30: 04:57. Felt on Adak. Slight tremor.

November 18: 14:35:12.1*. Epicenter 51.3° north, 178.5° west, Andreanof Islands, Aleutian Islands, W. Depth about 60 km. Felt on Adak.

November 19: 09:06:17*. Felt at Homer.

November 22: 00:18:15.0*. Epicenter 51.7° north, 177.1° west, Andreanof Islands, Aleutian Islands, W. Depth about 33 km. Felt on Adak.

December 2: 18:00. Felt at Talkeetna.

December 5: 07:27:42*. Felt at Wiseman. Roof clicked slightly. Low rumble of 5 to 10 seconds duration.

December 5: 10:22:51*. Felt at Talkeetna. Slight tremor.

December 6: 13:33:47*. Sharp shock felt at Devils Club and Girdwood.

December 10: 23:30. Felt at Talkeetna (5 miles west of).

December 19: 08:41:17*. Felt at Seward.

December 23: 16:04:18.8*. Epicenter 65.9° north, 150.2° west, central Alaska, W. Depth about 33 km. IV. Felt by few at Manley Hot Springs. Buildings creaked; windows and loose objects rattled. Faint earth noises.

December 24: 06:53:57*. Felt at Seward.

December 25: 04:25:16.9*. Epicenter 60.9° north, 147.7° west, Kenai Peninsula, W. Depth about 33 km. Felt at Devils Club and Girdwood.

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 21 through 24.*

To simplify the description of the earthquakes in the following pages three symbols are being used to indicate their approximate ocations and the quality of the epicenters:

[a] Signifies quakes at a depth of 30 kilometers beneath Kilauea caldera (19°24'N, 155°17'W).

[b] Signifies *"Kalapana Trail"* quakes. The epicenter is not well known because of the poor records from these shallow quakes (depth less than 3 km.). N19°20', W155°05' may be used as an approximate location.

[c] Signifies shallow (depth less than 3 km.) quakes originating along the East Rift of Kilauea. The epicentral zone is within the coordinates W155°00' to W155°12', N19°19' to N19°24'. Most of these quakes took place in connection with the Puna eruption of September 1961.

January 7: 03:57:50.0*. Epicenter 19°34.0' north, 156°10.5' west, 30 km. west-northwest of Kealakekua at a depth of 8 km. Felt at Kealakekua and Captain Cook. Magnitude 3.7.

January 15: 00:44:41.3*. Epicenter 19°53.8' north, 155°37.7' west, 15 km. southeast of Kamuela at a depth of 8 km. Felt at Hilo, Paauilo, Hawi, Kealakekua, Captain Cook, and on east rim of Kilauea caldera. Magnitude 4.2.

January 16: 05:54:34.5*. Epicenter 19°22.9' north, 155°55.3' west, 5 km. west of Hookena at a depth of 3 km. Felt at Captain Cook and Kealakekua. Magnitude 3.2.

January 21: 01:39:36.1*. Epicenter 19°-12.5' north, 155°38.0' west, 17 km. north-northwest of Naalehu at a depth of 8 km. Felt at Pahala, Naalehu, Captain Cook, Kealakekua, Honalo, and on northeast rim of Kilauea caldera. Magnitude 4.7.

January 24: 13:30:42.0*. Epicenter 19°57.0' north, 155°29.0' west, 20 km. southeast of Kamuela at a depth of 8 km. Felt at Laupahoehoe. Magnitude 3.4.

February 12: 20:34:33.6*. Epicenter 19°-32.5' north, 155°55.6' west, 3 km. north-northwest of Kealakekua at a depth of 8 km. Felt in central and south Kona. Magnitude 2.9.

February 13: 05:22:53.1*. Epicenter 19°-28.0' north, 154°56.8' west, 4 km. south of Pahoa at a depth of 8 km. Felt in Kapoho. Magnitude 2.4.

February 13: 18:32:02.0*. Epicenter 19°-28.0' north, 154°56.8' west, 4 km. south of Pahoa at a depth of 5 km. Felt in Kapoho. Magnitude 2.1.

March 5: 11:09:39.1*. Epicenter 19°25.6' north, 155°14.5' west, 7 km. east-northeast of Halemaumau at a depth of 8 km. Felt on east and northeast rim of Kilauea caldera. Magnitude 2.0.

March 8: 15:55:58.6*. Epicenter 19°30.1' north, 155°56.9' west, 3 km. southwest of Kealakekua at a depth of 8 km. Felt at Kealakekua. Magnitude 2.9.

March 11: 14:54:58.1*, 21:04:19.3*, 21:19:11.2*, 23:30:31.2*. Epicenters 19°26.5' north, 154°57.4' west, 6 km. south-southwest of Pahoa at a depth of 3 km. Magnitudes 1.0, 1.2, 1.1, and 2.6, respectively. Buildings shook in the small coastal villages of Opihikao and Pohoiki. Also felt at Kapoho.

March 13: 17:06:01.6*[a]. Felt in Kukuihaele, Laupahoehoe and on east rim of Kilauea caldera. Magnitude 3.4.

March 18: 18:20:39.6*. Epicenter 19°25.7′ north, 155°15.3′ west, northeast rim of Kilauea caldera at a depth of 3 km. Felt on northeast rim of Kilauea caldera. Magnitude 1.8.

March 21: 23:28:20.8*. Epicenter 19°26.5′ north, 154°57.4′ west, 6 km. south-southwest of Pahoa at a depth of 3 km. Felt in Kapoho. Magnitude 1.0.

March 29: 18:41:14.5*. Epicenter 19°33.4′ north, 155°15.6′ west, 27 km. southwest of Hilo at a depth of 25 km. Felt throughout Kilauea caldera district. Magnitude 3.1.

April 2: 06:04:15.6*. Epicenter 20°00.6′ north, 155°24.3′ west, 17 km. west of Laupahoehoe at a depth of 8 km. Felt at Paauilo and Laupahoehoe. Magnitude 3.3.

April 3: 00:35:47.5*. Epicenter 19°18.2′ north, 155°27.2′ west, 12 km. north-northeast of Pahala at a depth of 8 km. Felt at Naalehu. Magnitude 3.0.

April 9: 18:10:23.6*[a]. Felt at Kapapala and on east rim of Kilauea caldera. Magnitude 3.3.

April 10: 15:48:49.0*. Epicenter 19°57.1′ north, 155°28.9′ west, 25 km. west-southwest of Laupahoehoe at a depth of 8 km. Felt at Laupahoehoe. Magnitude 2.9.

April 21: 11:31:04.5*. Epicenter 19°21.0′ north, 155°23.5′ west, 20 km. northeast of Pahala at a depth of 5 km. Felt at Kapapala and Kealakekua. Magnitude 3.2.

April 23: 09:30:12.0*. Epicenter 19°26.8′ north, 155°27.2′ west, 27 km. north-northeast of Pahala at a depth of 5 km. Felt at Kapapala and on north and northwest rim of Kilauea caldera. Magnitude 3.1.

April 27: 06:31:32.0*. Epicenter 19°22.9′ north, 155°23.5′ west, 11 km. west-southwest of Halemaumau at a depth of 8 km. Felt on north rim of Kilauea caldera. Magnitude 3.0.

May 9: 18:46:14.0*. Epicenter 19°25.8′ north, 155°45.8′ west, 20 km. southeast of Kealakekua at a shallow depth. Felt in central Kona. Magnitude 2.8.

May 16: 16:27:32.0*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.0.

May 16: 17:06:55.4*[a]. Felt on east rim of Kilauea caldera. Magnitude 2.3.

May 19: 00:31:50.0*. Epicenter 19°03.1′ north, 155°14.0′ west, 38 km. east of Naalehu at a depth of 12½ km. Windows rattled and walls shook at Hilo. Also felt at Pahala, Laupahoehoe, Paauilo, Kealakekua, and Puu Anahulu. Magnitude 4.3.

May 26: 22:12:45.0*. Epicenter 19°26.5′ north, 155°26.2′ west, 30 km. north-northeast of Pahala at a depth of 8 km. Felt at Hilo, and on the north and northeast rim of Kilauea caldera. Magnitude 3.8.

May 30: 03:16:01.0*. Epicenter 19°24.1′ north, 155°17.0′ west, south rim of Kilauea at a depth of 8 km. Felt on north rim of Kilauea caldera. Magnitude 2.4.

June 8: 16:00:22.0*. Epicenter 19°22.3′ north, 155°23.2′ west, 22 km. northeast of Pahala at a depth of 5 km. Felt at Kapapala. Magnitude 2.7.

June 17: 10:55:05.8*. Epicenter 19°27.3′ north, 155°16.1′ west, 5 km. northeast of Halemaumau at a depth of 8 km. Felt on the east rim of Kilauea caldera. Magnitude 3.3.

June 23: 14:16:20.4*. Epicenter 19°23.9′ north, 155°17.2′ west, south rim of Kilauea caldera at a depth of 3 km. Felt at Pohakuloa, and on the northwest and northeast rim of Kilauea caldera. Magnitude 2.8.

June 23: 14:26:59.8*. Epicenter 19°23.9′ north, 155°17.2′ west, south rim of Kilauea caldera at a depth of 3 km. Felt on northwest rim of Kilauea caldera. Magnitude 2.7.

June 23: 17:06:59.5*. Epicenter 19°19.8′ north, 155°19.7′ west, 22 km. northeast of Pahala at a depth of 5 km. Felt on northwest rim of Kilauea caldera. Magnitude 3.3.

June 27: 18:59:53.5*. Epicenter 19°16.8′ north, 155°22.1′ west, 15 km. northeast of Pahala at a depth of 3 km. Felt at Kapapala. Magnitude 2.7.

June 29: 04:15:17.0*[a]. Felt on north and east rim of Kilauea caldera, Kapapala, and Paauilo. Magnitude 3.7.

June 29: 05:46:16.2*[a]. Felt on east rim of Kilauea caldera and Kapapala. Magnitude 2.9.

June 29: 06:42:16.2*[a]. Felt on east rim of Kilauea caldera. Magnitude 2.8.

June 30: 02:23:12.8*[a]. Felt on east rim of Kilauea caldera. Magnitude 2.8.

June 30: 03:24:25.8*[a]. Felt at Kapapala. Magnitude 3.1.

June 30: 06:41:55.0*. Epicenter 19°30.9′ north, 155°10.3′ west, 8 km. southwest of Mountain View at a depth of 34 km. Felt on north rim of Kilauea caldera. Magnitude 3.5

July 2: 00:36:05.7*[a]. Felt on east rim of of Kilauea caldera. Magnitude 3.4.

July 7: 02:51:15.7*. Epicenter 19°23.1′ north, 155°19.5′ west, 5 km. southwest of Halemaumau at a depth of 3 km. Felt on north rim of Kilauea caldera. Magnitude 2.7.

July 11: 11:56:25.6*. Epicenter 19°17.6′ north, 155°23.2′ west, 5 km. south of Desert seismometer at a depth of 3 km. Felt at Pahala and Kapapala. Magnitude 2.9.

July 12: 17:37:13.6*. Epicenter 19°25.3′ north, 155°23.8′ west, 8 km. south of Mauna Loa

seismometer at a depth of 12½ km. Felt at Pahala. Magnitude 2.7.

July 13: 14:30:30.0*. Epicenter 19°17.2′ north, 155°28.2′ west, 10 km. north of Pahala at a depth of 15 km. Felt at Pahala, Naalehu and Kona. Magnitude 3.6.

July 23: 05:24:17.1*[a] and 05:28:22.5*[a]. Felt on islands of Hawaii, Maui, and Oahu. Slight damage at Kohala. Magnitudes 5.1 and 4.7, respectively. The following data were obtained from questionnaire canvass by Honolulu Observatory:

INTENSITY (DAMAGE) V:

Captain Cook.—Felt by and awakened many. Buildings rattled. Moderate earth noises from south-north heard by many.

Hakalau.—Felt by and awakened many in community; frightened few. Windows, doors, and dishes rattled; walls creaked. Trees and bushes shaken slightly. Faint earth noises heard.

Hawi.—Felt by all and awakened many. Windows rattled; walls creaked. Moderate earth noises heard by many. Rapid motion.

Hilo.—Felt by all and awakened many; frightened few. Windows rattled; small objects shifted. Faint earth noises heard.

Holualoa.—Felt by and awakened all; frightened few. Windows, doors, and dishes rattled; small objects shifted. Trees and bushes shaken strongly. Moderate earth noises heard by many before beginning of earthquake. Two shocks.

Honaunau.—Awakened and frightened all in home. Windows rattled; walls creaked. Moderate earth noises heard by one.

Honokaa.—Felt by and awakened many in community; frightened few. Windows and doors rattled; walls creaked; small objects shifted; hanging objects swung. Two shocks.

Honomu.—Felt by and awakened all in home. Windows, dishes, and doors rattled; hanging objects swung. Rapid motion. Two shocks.

Hoolehua.—Felt by and awakened all in home. Windows and doors rattled; walls creaked. Rapid motion; duration 1 minute. Moderate earth noises.

Kealakekua.—Felt by and awakened all. Windows rattled; walls creaked. Faint earth noises from southeast heard. Two shocks.

Kihei.—Felt by all in community. Windows and dishes rattled. Faint earth noises heard.

Kohala.—Felt by and awakened many; few frightened. Damage slight. Cement cracked in fish pond. Windows and doors rattled; walls and frame creaked.

Lanai City.—Felt by all and awakened few in home. Windows, doors, and dishes rattled. Two shocks.

Naalehu.—Felt by, awakened, and frightened all. Windows and doors rattled; small objects shifted; walls and frame creaked. Hanging objects swung. Trees and bushes shaken strongly. Loud earth noises heard by many. Two shocks.

Ninole.—Felt by and awakened all; frightened many. Windows rattled; walls and frame creaked. Moderate earth noises heard by few.

Olaa.—Felt by and awakened all in community; frightened few. Windows, doors, and dishes rattled; walls creaked.

Paauhau.—Felt by and awakened many in community. Windows rattled. Trees and bushes shaken slightly.

Paauilo.—Felt by and awakened all; frightened all in home. Windows rattled. Rapid motion; duration 12 seconds.

Pahala.—Felt by and awakened all. Windows and doors rattled; walls and frame creaked. Rapid motion. Two shocks.

Papaikou.—Felt by and awakened all. Windows rattled. Two shocks.

Spreckelsville.—Felt by all; awakened and frightened few in home. Windows, doors, and dishes rattled. Moderate earth noises from north heard.

INTENSITY (DAMAGE) IV:

Haina.—Felt by and awakened all in home. Windows rattled. Moderate motion; duration 1 minute. Moderate earth noises heard.

Halaula.—Felt by and awakened all in home. Windows and doors rattled; walls creaked. Faint earth noises heard.

Hawaii National Park.—Felt by and awakened few. Windows, doors, and dishes rattled.

Kailua-Kona.—Felt by several in home; awakened few. Windows rattled. Rapid motion; duration 10 seconds.

Kapoho.—Felt by several and awakened few in home. Windows rattled. Rapid motion; duration 2 minutes.

Kaunakakai.—Felt by several and awakened few in community. Windows and doors rattled; walls and frame creaked. Moderate earth noises from southeast to northwest heard.

Kula.—Felt by one. Windows rattled. Moderate earth noises heard.

Laupahoehoe.—Felt by, awakened, and frightened all in home. Windows and doors rattled. Loud earth noises heard.

Maunaloa.—Felt by several and awakened few. Windows rattled slightly.

Mountainview.—Felt by and awakened all in home; frightened few. Windows and doors rattled. Two shocks.

Ookala.—Felt by several and awakened few. Windows and doors rattled.

Puunene.—Felt. Walls rumbled. Rapid motion. Faint earth noises heard.

INTENSITY (DAMAGE) I TO III: Hana, Kamuela, Kurtistown, and Pepeekeo.

July 23: 05:36:50.0*[a]. Felt Island-wide. Magnitude 3.5.

July 23: 06:50:55.0*[a] and 10:50:03.6*[a]. Felt at Pahala. Magnitudes 2.8 and 2.7, respectively.

July 24: 03:22:42.0*[a]. Felt on east rim of Kilauea caldera and at Hilo. Magnitude 3.1.

July 24: 16:59:46.4*[a]. Felt in Kilauea caldera region and at Hilo. Magnitude 3.2.

July 27: 23:19:20.0*. Epicenter 20°05.0′ north, 155°17.2′ west, 46 km. northwest of Hilo at a depth of 3 km. Felt at Paauilo. Magnitude 3.3.

July 29: 03:57:58.9*. Epicenter 19°27.8′ north, 155°19.1′ west, 5 km. northwest of Halemaumau at a depth of 12½ km. Felt on the east and north rim of Kilauea caldera. Magnitude 2.7.

July 29: 16:21:28.5*. Epicenter 19°25.2′ north, 155°17.2′ west, northwest rim of Kilauea caldera at a depth of 3 km. Felt in Kilauea caldera region. Magnitude 2.5.

August 3: 13:36:36.5*. Epicenter 19°23.7′ north, 155°17.7′ west, 4 km. northwest of Ahua seismometer at a depth of 3 km. Felt on the east rim of Kilauea caldera.

August 12: 19:42:19.3*[a]. Felt in Kona. Magnitude 2.9.

August 14: 16:17:08.0*. Epicenter 19°30.8′ north, 155°49.5′ west, 10 km. east of Kealakekua at a depth of 8 km. Felt at Kealakekua. Magnitude 2.6.

August 15: 12:40:49.3*. Epicenter 19°23.5′ north, 155°26.3′ west, 8 km. northwest of Desert seismometer at a depth of 3 km. Felt at Kapapala Ranch. Magnitude 2.8.

August 15: 17:57:29.5*. Epicenter 19°23.7′ north, 155°17.2′ west, 3 km. northwest of Ahua seismometer at a depth of 3 km. Felt on east rim of Kilauea caldera. Magnitude 2.8.

August 21: 06:55:11.0*. Epicenter 19°25.2′ north, 155°13.2′ west, 8 km. east of Halemaumau at a depth of 3 km. Felt on the north and east rim of Kilauea caldera. Magnitude 3.0.

August 22: 07:56:53.4*. Epicenter 19°23.1′ north, 155°17.0′ west, 2 km. northwest of Ahua seismometer at a depth of 3 km. Felt on the east rim of Kilauea caldera. Magnitude 1.7.

August 22: 12:39:57.5*. Epicenter 19°24.5′ north, 155°17.8′ west, 2 km. south of Halemaumau at a depth of 3 km. Felt on east and northwest rim of Kilauea caldera. Magnitude 2.0.

August 22: 15:03:15.1*. Epicenter 19°23.0′ north, 155°17.9′ west, 5 km. south of Halemaumau at a depth of 3 km. Felt on Halemaumau overlook. Magnitude 2.0.

August 22: 16:09:50.7*. Epicenter 19°23.8′ north, 155°18.8′ west, 4 km. southwest of Halemaumau at a depth of 3 km. Felt on east rim of Kilauea caldera. Magnitude 2.0.

August 25: 08:45:35.1*. Epicenter 19°51.9′ north, 155°04.2′ west, 5 km. northeast of Pepeekeo at a depth of 35 km. Felt Island-wide. The intensity in the various districts ranged from "slight" to "real sharp." Magnitude 4.5.

September 3: 04:24:29.3*. Epicenter 19°51.3′ north, 155°26.1′ west, 12 km. southwest of Keanakolu at a depth of 12½ km. Felt at Hilo and Kealakekua. Magnitude 3.6.

September 8: 22:34:11.0*. Epicenter 19°22.0′ north, 155°16.4′ west, 1 km. southwest of Ahua seismometer at a depth of 8 km. Felt on the east rim of Kilauea caldera. Magnitude 2.1.

September 9: 20:04:45.7*. Epicenter 19°25.8′ north, 155°15.2′ west, 5 km. east of Halemaumau at a depth of 3 km. Felt on east and north rim of Kilauea caldera. Magnitude 2.7.

September 12: 13:47:12.3*. Epicenter 19°23.2′ north, 155°16.7′ west, 2 km. northwest of Ahua seismometer at a depth of 3 km. Felt on northwest rim of Kilauea caldera. Magnitude 2.5.

September 13: 19:11:02.0*. Epicenter 19°24.8′ north, 155°56.3′ west, 11 km. south-southwest of Kealakekua at a depth of 3 km. Felt at Kealakekua. Magnitude 2.6.

September 15: 20:24:30.0*. Epicenter 20°07′ north, 156°10′ west, 55 km. west-northwest of Kamuela at a depth of 3 km. Felt at Kona. Magnitude 3.7.

September 21: 13:16:02.0*[b], 13:17:03.1*[b], 13:53:55.2*[b], 14:19:37.8*[b], 14:33:0.5*[b], 14:41:56.2*[b], 14:54:21.7*[b]. Felt on east rim of Kilauea caldera. Magnitudes 3.1, 3.3, 2.8, 3.0, 3.0, 2.6, 3.0, respectively.

September 22: 17:01:32.4[c]. Epicenter 19.4° north, 155.1° west, east rift of Kilauea. Felt on Island of Hawaii. Slight damage at Hilo, Pahoa, and Papaikou. Magnitude 4.1. The following data were obtained from questionnaire canvass of the earthquake by Honolulu Observatory:

INTENSITY (DAMAGE) V:

Hilo.—Felt by and frightened all. Slight damage reported. Rapid motion; duration 45 seconds.

Honomu.—Felt by all in home. Windows, doors, and dishes rattled; walls creaked; hanging objects swung; small objects shifted. Faint earth noises heard. Rapid motion from northeast; duration 10 seconds.

Kihalani.—Felt by and frightened all. Windows rattled. Slow rolling motion.

Naalehu.—Felt by and frightened many. Windows and doors rattled; doors swung. Slow motion; duration 30 seconds.

Ninole.—Felt by and frightened all. Doors and dishes rattled; walls creaked; small objects shifted and overturned. Loud earth noises heard. Rapid motion.

Paauhau.—Felt by all. Windows and dishes rattled; hanging objects swung; knickknacks fell; small objects shifted. Faint earth noises heard by few. Rapid southeast motion; duration 8 seconds.

Pahala.—Felt by all. Windows rattled. Rapid motion; duration 5 seconds.

Pahoa.—Felt by and frightened all. Slight damage. Dishes broken; small objects shifted. Windows rattled. Bushes shaken moderately. Rapid motion.

Papaikou.—Felt by all and frightened many in home. Slight damage. Dishes broken; vases, knickknacks, and small objects overturned; furnishings shifted. Windows, doors, and dishes rattled. Faint earth noises heard by few. Rapid motion; duration 2–3 minutes.

Pepeekeo.—Felt by, awakened, and frightened all in home. Small objects overturned; furnishings shifted. Windows, doors, and dishes rattled; hanging objects swung northeast. Moderate earth noises heard from northeast. Rapid motion; duration 10 seconds.

Volcano.—Felt by many; frightened all in home. Windows and dishes rattled; hanging objects swung. Pendulum clock stopped. Trees, bushes shaken moderately. Earth noises heard by one. Slow, then rapid motion.

INTENSITY (DAMAGE) IV:

Haina.—Felt by several in home. Windows rattled. Slow motion.

Hakalau.—Felt by many. Windows rattled; walls creaked; doors swung. Faint earth noises heard by one. Rapid motion.

Honokaa.—Felt by several. Windows rattled. Moderate earth noises heard from east. "Average" motion; duration 20–30 seconds.

Kailua-Kona.—Felt by and awakened all in home. Slow motion; duration 1 second.

Kohala.—Felt by all in home. Windows rattled. Slow motion.

Laupahoehoe.—Felt by all in home. Windows and dishes rattled. Bushes shaken moderately. Moderate earth noises heard by one 2 seconds before beginning of earthquake. Rapid, north-south motion; duration 1 minute.

Ookala.—Felt by all in home. Dishes rattled slightly. Slow motion.

INTENSITY (DAMAGE) I TO III: Hoolehua and Kamuela.

September 24: 19:09:39.6*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.0.

September 24: 19:25:08.7*[c]. Felt in Hilo. Magnitude 4.1.

September 24: 19:28:53.5*[c] and 20:29:21.9*[c]. Epicenters 19.4° north, 155.1° west, east rift of Kilauea. Felt on Island of Hawaii. Slight damage at Naalehu, Pahoa, and Papaikou. Magnitudes 4.2 and 4.1, respectively. The following data were obtained from questionnaire canvass of the earthquake by Honolulu Observatory:

INTENSITY (DAMAGE) V:

Hilo.—Felt by all; frightened many. Cracked 20-foot column at Hilo Intermediate School. Windows and doors rattled; small objects shifted; hanging objects swung. Loud earth noises heard by many.

Honokaa.—Felt by all. Windows rattled; walls creaked. Moderate motion.

Honomu.—Felt by all in home; frightened few. Windows, doors, and dishes rattled; walls creaked; small objects shifted. Trees shaken moderately. Faint earth noises heard. Rapid motion; duration 15 seconds.

Kohala.—Felt by many; frightened few. Windows and doors rattled; walls creaked; hanging objects swung; small objects shifted. Earth noises heard by many. Rapid motion. Two shocks.

Laupahoehoe.—Felt by all. Windows rattled. Slow motion; duration 30 seconds. Two shocks.

Mountainview.—Felt by all; frightened all in home. Small objects and vases overturned; furnishings shifted. Windows, doors, and dishes rattled; walls creaked. "Continuous shocks every few minutes lasting an hour." Loud earth noises from northeast heard by many. Rapid motion.

Naalehu.—Felt by many; frightened all in home. Damage slight. Windows, doors, and dishes rattled; doors swung. Small objects and furnishings shifted. Rapid motion. Two shocks.

Ninole.—Felt by all; frightened all in home. Windows rattled; walls creaked; hanging objects swung. Loud earth noises heard. Rapid motion.

Olaa.—Felt by and frightened many. Windows, doors, and dishes rattled; walls creaked; hanging objects swung; vases and small objects overturned. Trees, bushes shaken moderately. Rapid motion; duration 10 seconds.

Paauhau.—Felt by all. Windows rattled. Trees, bushes shaken slightly. Faint earth noises heard. Slow motion; duration 6 seconds. Two shocks.

Pahala.—Felt by all. Windows rattled. Slow motion. Two shocks.

Pahoa.—Felt by, frightened, and awakened all. Damage slight. Windows, doors, and dishes rattled; walls creaked; hanging objects swung.

Small objects shifted. Trees, bushes shaken strongly. Rapid motion.

Papaidou.—Felt by several; frightened few in home. Slight damage. Dishes broken; furniture shifted; vases, knickknacks overturned; books fell. Windows rattled; doors swung east. Trees, bushes shaken moderately. Loud earth noises heard from east. Rapid motion; duration 2 minutes.

Volcano.—Felt by and frightened all in home. Windows, doors, and dishes rattled; hanging objects swung. Trees, bushes shaken slightly. Faint earth noises heard. Rapid motion.

INTENSITY (DAMAGE) IV:

Captain Cook.—Felt by many. Windows rattled; walls creaked. Faint earth noises heard. Slow motion.

Kihalani.—Felt by several. Windows rattled. Faint earth noises heard. Slow rolling motion.

Ookala.—Felt by all in home. Dishes rattled. Slow motion. Two shocks.

Pepeekeo.—Felt by, awakened, and frightened all in home. Windows, doors, and dishes rattled. Loud earth noises heard. Rapid motion; duration 15 seconds.

INTENSITY (DAMAGE) I TO III: Kamuela.

September 24: 20:38:27.0*[c]. Felt on east rim of Kilauea caldera. Magnitude 3.2.

September 24: 21:14:05.0*[c]. Felt at Hilo. Magnitude 2.7.

September 25: 13:02:30.5*[c]. Felt at Hilo. Magnitude 3.2.

September 27: 21:24:38.0*[c]. Felt at Hilo and on east rim of Kilauea caldera. Magnitude 3.3.

September 27: 21:29:41.0*[c]. Felt on east rim of Kilauea caldera and at Hilo. Magnitude 3.4.

October 18: 17:15:35*. Epicenter 19°46.4′ north, 155°49.9′ west, at Puu Waawaa at a shallow depth. Felt at Puu Anahulu, Keahou, and Kealakekua. Magnitude 2.6.

October 29: 07:25:21.0*. Epicenter 19°29.2′ north, 155°51.2′ west, 10 km. southeast of Kealakekua at a shallow depth. Felt at Puu Anahulu. Magnitude 2.2.

November 4: 06:56:27.0*. Epicenter 19°-47.2′ north, 155°34.8′ west, 11 km. southeast of Waikii at a depth of 12½ km. Felt at Puu Anahulu. Magnitude 3.0.

November 10: 05:38:21.4*. Epicenter 19°-25.8′ north, 155°18.8′ west, 3 km. west-northwest of Halemaumau at a depth of 12½ km. Felt at Hilo and in Kilauea region. Magnitude 3.4.

November 14: 04:51:27.0*. Epicenter 19°-25.4′ north, 155°55.3′ west, 11 km. south of Kealakekua at a depth of 3 km. Felt at Kona. Magnitude 3.3.

November 17: 19:56:49.5*. Epicenter 19°-44.3′ north, 155°57.6′ west, 25 km. north-northwest of Kealakekua at a shallow depth. Felt at Puu Anahulu and Kealakekua. Magnitude 3.0.

November 18: 08:09:14.5*. Epicenter 19°-26.3 north, 155°54.7′ west, 9 km. south of Kealakekua at a shallow depth. Felt at Kona. Magnitude 3.0.

November 21: 00:41:25.5*[a]. Felt on east rim of Kilauea caldera. Magnitude 2.9.

November 21: 23:22:39.3*[a]. Felt at Puu Anahulu, Hilo, and on east rim of Kilauea caldera. Magnitude 3.8.

November 21: 23:46:01.9*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.0.

November 22: 10:55:55.5*[a]. Felt on north rim of Kilauea caldera. Magnitude 3.2.

November 23: 16:29:36.6*[a], 17:09:55.7*[a], 17:14:30.6*[a]. Felt on east rim of Kilauea caldera. Magnitudes 3.0, 3.3, 3.8, respectively.

November 24: 05:35:40.7*[a]. Felt on north rim of Kilauea caldera. Magnitude 2.9.

November 25: 13:26:03.0*[a]. Felt on east rim of Kilauea caldera and Kona. Magnitude 3.7.

November 27: 04:51:23.5*[a]. Felt on east rim of Kilauea caldera, Pahala, and Kona. Magnitude 3.4.

December 2: 18:57:59.8*[a]. Felt on east rim of Kilauea caldera, Puu Anahulu, Kukuihaele, and Pahala. Magnitude 3.9.

December 9: 16:59:19.8*[a]. Felt on east rim of Kilauea caldera. Magnitude 2.8.

December 11: 21:55:31.5*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.0.

December 15: 11:17:57.4*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.2.

December 17: 07:50:52.5*. Epicenter 19°-37.8′ north, 155°51.2′ west, 10 km. east of Holualoa at a depth of 12½ km. Felt at Kona. Magnitude 3.4.

December 31: 06:03:23.2*. Epicenter 19°-47.0′ north, 155°31.8′ west, 5 km. north of Pohakuloa at a depth of 8 km. Felt at Pohakuloa. Magnitude 3.0.

December 31: 08:52:09.9*[a]. Felt on east rim of Kilauea caldera. Magnitude 3.9.

PANAMA CANAL ZONE

(60TH MERIDIAN TIME)

January 20: 07:22:10*. Intensity (damage) I at Balboa Heights.

February 5: 11:38:34.0*. Epicenter 8.1° north, 82.8° west, south of Panama, W. Depth about 49 km. Magnitude 5¼–5½ (Brk). Intensity (damage) II at Balboa Heights.

July 3: 03:50:01*. Intensity (damage) I at Balboa Heights.

September 19: 05:46:17.7*. Epicenter 6.7° north, 82.4° west off south coast of Panama, W. Depth about 49 km. Magnitude 6¼-6½. Intensity (damage) II at Balboa Heights. Also felt at Chitre, Panama.

December 20: 09:25:34.4*. Epicenter 4.6° north, 75.6° west, west-central Colombia, W. Depth about 176 km. Magnitude 6¾. Felt at Balboa Heights.

PUERTO RICO

(60TH MERIDIAN TIME)

July 20: 09:08:55*. Intensity (damage) III at San Juan.

August 2: 23:08:05.1*. Epicenter 18.4° north, 66.3° west, Puerto Rico, W. Depth about 132 km. Felt strongly throughout Puerto Rico. No damage reported. Also felt by several on St. Thomas, Virgin Islands. Buildings creaked; loose objects rattled.

INTENSITY (DAMAGE) V:

Aguadilla (Ramey Air Force Base).—Felt by nearly all. Buildings creaked; loose objects rattled. Roaring sounds heard by many at beginning of earthquake. Abrupt onset; trembling and swaying motion.

Caguas.—Felt by, awakened, and frightened many. Windows rattled; walls creaked; hanging objects swung.

Fortuna.—Felt by many. Lamp swayed; furniture displaced; door moved. Buildings creaked; loose objects rattled. Silenced night calling insects; awakened and frightened roosting birds. Gradual onset; swaying motion north-south.

Guaynabo.—Felt by, awakened, and frightened many. Walls creaked; hanging objects swung. "Rabbit ears on TV vibrated."

Humacao.—Felt by and frightened many. Beds, tables, lamps, and pictures displaced east-west. Buildings creaked; loose objects rattled. Roaring sounds heard. Abrupt onset; trembling motion east-west.

Mayaguez.—Felt by and frightened nearly all. Buildings creaked; loose objects rattled. Gradual onset; trembling motion.

Utuado.—Felt by nearly all. Displaced bottles in pharmacy. Moderately loud earth sounds heard at beginning of earthquake. Rapid onset; trembling motion.

INTENSITY (DAMAGE) IV:

Cayey.—Felt by many. Gradual onset; trembling motion.

Guayama.—Felt by many. Buildings creaked; loose objects rattled. Gradual onset; trembling motion.

August 19: 10:52:29.7*. Epicenter 18.0° north, 68.8° west, Mona Passage, W. Depth about 100 km. Mag. 5½ (Brk). Felt on Puerto Rico and at Santo Domingo, Dominican Republic.

October 2: 17:16:15*. Felt weakly at San Juan.

October 12: 09:53:34.4*. Epicenter 19.2° north, 64.9° west, north of Puerto Rico, W. Depth about 40 km. Felt at San Juan and on St. Thomas, Virgin Islands.

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 1961.

A resurvey was made early in 1962 over the closely spaced monuments near the Taylor Winery at Hollister, Calif. The results of this survey do not indicate any appreciable change from the observations made the previous year.

A survey was made in the Monterey Bay area which extends to the northeast through Salinas and Hollister. The previous earthquake survey in this area was made in 1951. Observations in the recent survey indicate that some movement has occurred in the vicinities of Salinas and Hollister.

A releveling was undertaken in 1961 along certain lines in the Arvin-Maricopa area of California and along "earthquake cross lines" at Gorman, Palmdale, and Cajon Pass, Calif. At each of the "cross lines" about 200 bench marks were established in 1935 normal to the San Andreas fault. These lines have now been leveled from four to six times.

At Cajon Pass the vertical change from 1935 to 1961 has been about 31 millimeters, at Palmdale about 186 millimeters, and at Gorman about 122 millimeters.

TIDAL DISTURBANCES OF SEISMIC ORIGIN

Three minor tsunamis were reported during the year, none of which were recorded on tide gages for which the Coast and Geodetic Survey serves as record repository.

A tsunami off the coast of southern Japan on February 26, 1961 (31.6° north, 131.2° east), generated a wave that was recorded locally. A 38 inch fall-to-rise tsunami was observed in southwest Shikoku.

An earthquake in the New Hebrides Islands on July 23, 1961 (18.5° north, 168.3° east) generated a tsunami with a range of 4.9 feet at Port Vila and Forari. Slight damage was caused at both locations.

An earthquake off the east coast of Hokkaido, Japan (43.0° north, 145.0° east), on August 11, 1961, generated a minor tsunami. The maximum range as recorded at Nemuro was 6 inches.

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 1960.

WELL DESCRIPTIONS

CALIFORNIA

Well No. 10/34–27L1, Santa Barbara County, Santa Maria, 3,000 feet west of Highway 100, 2,200 feet south of Mahoney Road. Owner, City of Santa Maria. Depth, 1,124 feet; diameter, 14 inches; finish, perforated. Aquifer, Paso Robles formation, alluvium, Recent.

Well No. 12/21–35E1, Kern County, location not given. Owner, Standard Oil Company. Depth, 273 feet. Aquifer, undifferentiated alluvium; Recent and Pleistocene (?).

Well No. 14/13–1103, Fresno County, NW NW, Sec. 11, T. 14 S., R. 13 E. MDB and M. Owner, Inter-Agency Committee. Depth, 240 feet; diameter, 4 inches; finish, perforated 180–240 feet below LSD. Aquifer, not given.

Well No. 23/25–17Q3, Tulare County, SW SE, Sec. 17 T. 23 S., R. 25 E. MDB and M. Owner E. K. Thompson Estate. Depth, 355 feet; diameter, 16 inches; finish, open bottom. Aquifer undifferentiated alluvium; Recent and Pleistocene (?).

IDAHO

Well No. 75–30E–24dd1, non-artesian, Power County near American Falls, 47°47′30″ north, 112°53′15″ west. Owner, C. H. Vollmer. Depth, 215 feet; diameter, 16 inches; depth of casing, 0–185 feet; finish, open hole. Aquifer, basalt; Snake River Group, Pleistocene.

Well No. 115–17E–25dd2, non–artesian, Twin Falls County, Twin Falls, 42°27′ north, 114°26′ west. Owner, U.S. Bureau of Reclamation. Depth, 352 feet; diameter, 6 inches; depth of casing, 0–175 feet; finish, perforated 145–175 feet. Aquifer, basalt; Pliocene or Pleistocene Age.

Well No. 145–15E–28ba2, non-artesian, Twin Falls County, Rogerson, 42°11′ north, 114°43′ west. Owner, U.S. Bureau of Reclamation. Depth, 455 feet; diameter, 6 inches; depth of casing, 0–331 feet; finish, perforated 231–331 feet. Aquifer, sand, ash, and welded tuff; silicic volcanic rocks of Pliocene Age.

INDIANA

Well No. Ma32., artesian, Indianapolis, Marion County, NE SW, Sec. 36, T. 17 N., R. 3 E. Owner, Indianapolis Water Company. Depth, 322 feet; diameter, 10 inches; cased to 60 feet; finish, open hole. Aquifer, Niagaran limestone, Silurian Age.

Well No. Pu6., artesian, Francisville, Pulaski County; NE SW, Sec. 4, T. 29 N., R. 4 W. Owner, Earl Overmeyer. Depth, 663 feet; diameter, 8 inches; cased to 15 feet; finish, open hole. Aquifer, Niagaran limestone, Silurian Age.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1961*

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	
ALASKA							
Anc64	Dec. 11, 1961	18:30	13.14	13.13	13.13	13.14	0.01
Anc114	do	19:00	52.77	52.78	52.77	52.79	.02
Anc590	do	22:00	+2.45	+2.45	+2.46	+2.42	.04
ARIZONA							
(D-15-13)2caa	Jan. 5, 1961	13:00	71.74	71.73	71.70	71.79	0.09
(D-15-13)2caa	Jan. 10, 1961	11:00	72.64	72.65	72.64	72.67	.03
(D-15-13)2caa	Feb. 27, 1961	12:00	71.30	71.30	71.29	71.30	.01
(D-22-20)29dca	Mar. 24, 1961	24:00	13.01	13.01	13.00	13.02	.02
(D-15-13)2caa	Apr. 17, 1961	21:30	73.46	73.45	73.44	73.49	.05
(D-15-13)2caa	May 22, 1961	12:00	75.67	75.67	75.67	75.69	.02
(D-4-2)13bcc	May 31, 1961	17:00	74.82	74.82	74.81	74.83	.02
(D-4-2)13bcc	Sept. 12, 1961	09:00	73.70	73.70	73.69	73.73	.04
CALIFORNIA							
26/40-17N1	Jan. 27, 1961	20:15	100.49	100.87	100.49	100.87	0.38
26/40-22N1	do	20:15	71.54	71.54	71.53	71.55	.02
9/10-34H1	do	20:15	33.08	33.08	33.07	33.11	.04
26/40-22N1	Feb. 14, 1961	02:00	71.69	71.69	71.61	71.80	.19
10/34-27L1	Mar. 5, 1961	19:15	136.84	136.85	136.84	136.85	.01
7/34-9H5	Mar. 25, 1961	23:00	237.26	237.26	237.25	237.27	.02
9/10-12R1	Apr. 7, 1961	08:00	42.34	42.33	42.30	42.37	.07
9/10-34H1	Apr. 28, 1961	11:00	36.14	36.14	35.99	36.78	.79
9/10-34H1	May 1, 1961	11:00	36.20	36.20	36.18	36.25	.07
9/10-34H1	May 9, 1961	17:00	37.69	37.69	37.56	37.88	.32
6/30-29D3	May 16, 1961	21:30	14.27	14.85	14.27	14.32	.05
9/10-34H1	May 22, 1961	09:00	37.37	37.36	36.95	38.80	1.85
9/10-34H1	June 4, 1961	24:00	38.05	38.05	38.03	38.07	.04
9/10-12R1	July 7, 1961	17:00	45.52	45.52	45.52	45.52	.00
9/10-34H1	Aug. 2, 1961	03:00	42.28	42.28	42.22	42.28	.06
26/40-22N1	Aug. 15, 1961	17:00	72.95	72.95	72.91	73.01	.10
9/10-12R1	Aug. 21, 1961	18:00	46.51	46.51	46.51	46.51	.00
7/34-26H3	Oct. 8, 1961	03:30	49.34	49.33	49.32	49.35	.03
26/40-17N1	Oct. 19, 1961	05:10	101.06	101.27	101.05	101.27	.22
26/40-22N1	do	05:10	72.53	72.53	72.49	72.55	.06
26/40-22P1	do	05:10	69.55	69.54	69.54	69.56	.02
7/34-26H3	do	12:30	49.27	49.27	49.26	49.29	.03
12/21-25E1	Nov. 14, 1961	11:00	170.76	170.65	170.65	170.80	.15
7/34-26H3	Nov. 15, 1961	22:00	48.88	48.88	48.88	48.91	.03
NORTHERN FLORIDA [1]							
O47	Feb. 12, 1961	12:31	+1.14	+1.10	+1.14	+1.10	0.04
P45	do	23:00	−70.23	−70.24	−70.23	−70.25	.02
D206	Feb. 26, 1961	19:17	−11.94	−11.93	−11.92	−11.94	.02
O47	do	19:26	+0.20	+0.19	+0.21	+0.18	.03
P45	do	19:30	−71.00	−70.99	−70.98	−71.02	.04
D206	Mar. 7, 1961	11:07	−12.20	−12.19	−12.21	−12.19	.02
D206	Mar. 28, 1961	10:34	−12.24	−12.24	−12.23	−12.25	.02
P16	May 31, 1961	15:15	−66.97	−66.97	−66.96	−66.98	.02
T35	Aug. 31, 1961	01:23	−24.20	−24.20	−24.18	−24.22	.04
P13	do	23:09	−8.77	−8.79	−8.74	−8.82	.08
P13	Sept. 27, 1961	20:38	−8.83	−8.83	−8.77	−8.91	.14

See footnotes at end of table.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1961—Con.*

IDAHO

Well No.	Date	Time G.C.T.	Depth to water: Before disturbance	Depth to water: After disturbance	Depth to water: At highest point	Depth to water: At lowest point	Amplitude of fluctuation
8S-14E-16bc1	Feb. 18, 1961	15:30	39.06	39.06	+39.11	+39.02	0.09
7N-38E-23db1	Feb. 26, 1961	17:00 19:00	43.30	43.30	43.27	43.33	.06
7N-38E-23db1	Apr. 9, 1961	07:00 09:00	44.14	44.14	44.12	44.16	.04
8S-25E-36da1	May 7, 1961	21:30	106.62	106.63	106.60	106.68	.08
8S-25E-36da1	May 25, 1961	22:00	106.42	106.42	106.40	106.44	.04
8S-27E-31dd1	May 31, 1961	13:00 15:00	22.81	22.81	22.77	22.85	.08
5S-23E-17ca1	June 3, 1961	01:00	308.21	308.21	308.16	308.26	.10
11S-17E-25dd2	do	05:00 07:00	90.29	90.29	90.27	90.31	.04
8S-27E-31dd1	June 14, 1961	17:00 19:00	23.01	23.01	22.96	23.06	.10
8S-25E-36da1	July 14, 1961	04:00	105.08	105.08	105.07	105.11	.04
7N-38E-23db1	July 23, 1961	22:00 24:00	41.01	41.01	40.96	41.06	.10
8S-19E-5da1	Aug. 17, 1961	08:00 09:00	268.30	268.30	268.27	268.32	.05
8S-25E-36da1	Aug. 21, 1961	11:00	104.40	104.40	104.35	104.47	.12
5S-23E-17ca1	Sept. 13, 1961	22:00	310.39	310.39	310.37	310.42	.05
8S-19E-5da1	Oct. 4, 1961	07:00 08:00	269.41	269.41	269.40	269.45	.05
7N-38E-23db1	Oct. 18, 1961	15:00 17:00	41.08	41.08	41.05	41.10	.05
7S-30E-24dd1	Oct. 30, 1961	01:00	68.56	68.56	68.54	68.58	.04
7N-38E-23db1	Oct. 31, 1961	01:00	41.19	41.19	41.16	41.22	.06

INDIANA

Ma32	Jan. 20, 1961	17:45	10.98	10.99	10.98	10.99	0.01
Ma32	Feb. 26, 1961	18:45	10.77	10.77	10.74	10.79	.05
PU6	do	18:45	15.07	15.06	15.05	15.07	.02

MICHIGAN

7N.7E.17-1	Jan. 31, 1961	01:30	26.82	26.82	26.80	26.83	0.03
7N.7E.17-1	Feb. 13, 1961	01:30	27.10	27.10	27.08	27.12	.04
7N.7E.17-1	Feb. 26, 1961	19:00	27.04	27.04	27.00	27.08	.08
7N.7E.17-1	Mar. 7, 1961	11:30	26.76	26.76	26.74	26.79	.05
7N.7E.17-1	do	20:30	26.84	26.84	26.83	26.86	.03
7N.7E.17-1	Dec. 30, 1961	01:00	25.43	25.43	25.41	25.45	.04

NEVADA

S19/60-9bcd	Aug. 19, 1961	05:15	103.29	103.28	+103.30	+103.28	0.02

See footnotes at end of table.

TABLE 1.—*Fluctuations in well-water levels, January 1 through December 31, 1961—Con.*

Well No.	Date	Time G.C.T.	Depth to water				Amplitude of fluctuation
			Before disturbance	After disturbance	At highest point	At lowest point	
NEW JERSEY [1]							
26.22.4.4.4	July 6, 1961	23:00	+27.48	+27.48	+27.49	+27.48	0.01
26.22.4.4.4	July 18, 1961	15:00	+27.87	+27.87	+27.88	+27.86	.02
26.21.5.9.2	Aug. 31, 1961	02:30	+33.74	+33.69	+33.78	+33.69	.09
26.22.4.4.4	do	02:45	+24.73	+24.73	+24.75	+24.72	.03
26.22.4.4.4	Sept. 1, 1961	01:15	+24.17	+24.16	+24.17	+24.15	.02
26.21.5.9.2	do	01:15	+32.18	+32.16	+32.19	+32.16	.03
26.22.4.4.4	Sept. 8, 1961	12:30	+24.19	+24.19	+24.21	+24.18	.03
25.14.3.5.5	Dec. 27, 1961	17:10	+175.67	+175.67	+175.77	+175.55	.22
26.22.4.4.4	Dec. 30, 1961	01:15	+24.00	+24.00	+24.03	+23.97	.06
NEW YORK							
Sa529	Feb. 12, 1961	23:00	43.24	43.24	43.23	43.25	0.02
Sa529	Feb. 26, 1961	18:15	42.51	42.51	42.49	42.52	.03
Sa529	Mar. 28, 1961	10:45	42.55	42.55	42.54	42.55	.01
Sa529	July 23, 1961	23:30	48.93	48.92	48.92	48.94	.02
Sa529	Aug. 31, 1961	02:30	47.86	47.85	47.85	47.87	.02
PUERTO RICO							
59-66.49-1-61	Aug. 3, 1961	03:10	11.67	11.68	11.64	11.71	0.07
1-66.22-1-19	do	03:10	78.72	78.73	78.72	78.73	.01
26-66.20-1-28	do	03:00	28.83	28.83	28.83	28.84	.01
WISCONSIN							
Lf-95	June 1, 1961	11:00	64.17	64.17	64.15	64.24	0.09
Lf-57	do	12:00	119.01	119.01	119.01	119.10	.09
Lf-121	do	12:00	65.06	65.06	65.06	65.14	.08

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

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:

Albuquerque, N. Mex.
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.

Albuquerque, 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.

Albuquerque began operation in October 1961, and Lincoln was discontinued in June 1961.

For detailed instrumental data regarding these stations, including instrumentation, constants, and other information, see *Seismological Bulletin*, MSI–253, January 1962. 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, D.C., 20230.

TABLE 2.—*Summary of instrumental epicenters for 1961*

NOTE.—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 (Brk).

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Jan. 1	13	09	08.5	New Hebrides Islands region. Depth about 98 km	13.1	S.	167.0	E.
1	13	52	37.6	Near north coast of Luzon, Philippine Islands. Felt at Calayan Island. Depth about 77 km.	19.5	N.	121.0	E.
1	16	38	23.8	Fiji Islands region. Depth about 600 km	18.2	S.	178.1	W.
1	18	45	49.5	Arctic Ocean. Depth about 25 km	87.2	N.	51.5	E.
1	19	33	20.1	Bouvet Island region. Depth about 91 km	54.3	N.	7.4	E.
1	20	22	17.9	South of Australia. Depth about 72 km	49.6	S.	125.9	E.
1	22	11	17.0	Kermadec Islands region. Depth about 100 km	29.2	S.	177.0	W.
2	03	16	42.2	Off coast of southern Chile. Depth about 25 km	41.5	S.	87.7	W.
2	10	11	58.1	Santa Cruz Islands region. Depth about 140 km. Mag. 6¾	12.5	S.	166.3	E.
2	12	49	14.6	Near Mindanao, Philippine Islands. Depth about 70 km	5.1	N.	127.6	E.
2	16	21	30.0	Near east coast of Kamchatka. Depth about 40 km	51.2	N.	157.7	E.
2	20	51	58.8	New Britain region. Depth about 40 km	6.9	S.	150.4	E.
2	23	07	23.9	Solomon Islands. Depth about 100 km	10.4	S.	160.9	E.
3	02	30	29.5	Kurile Islands. Depth about 42 km	46.9	N.	152.4	E.
3	05	26	56.8	Off coast of southern Chile. Depth about 25 km	44.7	S.	75.5	W.
3	06	48	59.5	Leeward Islands. Depth about 25 km	17.4	N.	61.3	W.
3	08	10	45.1	Atlantic Ocean. Depth about 25 km	1.4	N.	29.1	W.
3	11	40	42.5	Banda Sea. Depth about 72 km	6.8	S.	129.3	E.
3	17	41	51.2	Southern Bolivia. Depth about 100 km	20.5	S.	68.8	W.
3	18	02	53.6	New Britain. Depth about 113 km	6.2	S.	150.9	E.
3	19	08	08.9	Northern Chile-Argentina border region. Depth about 207 km	24.1	S.	67.0	W.
3	19	26	56.7	Banda Sea. Depth about 74 km	6.2	S.	130.2	E.
3	20	05	33.8	Banda Sea. Depth about 154 km	7.3	S.	123.0	E.
3	23	45	52.9	Central Turkey. Depth about 25 km	38.2	N.	37.0	E.
4	00	30	17*	Near Watsonville, Calif. Felt. Mag. 4.1	36 52	N.	121 40	W.
4	01	50	18.0	Celebes Sea. Depth about 633 km	5.5	N.	122.5	E.
4	07	26	01*	South-southeast of Mt. St. Helens, Wash. Felt	46 00	N.	122 05	W.
4	11	29	53.1	Flores Sea. Depth about 25 km	6.9	S.	121.7	E.
4	12	04	35.5	Near Coast of Guerrero, Mexico. Depth about 49 km	17.7	N.	101.2	W.
4	13	25	35.6	Fiji Islands. Depth about 591 km	17.5	S.	178.9	W.
4	19	16	19.5	Banda Sea. Depth about 173 km	5.5	S.	128.7	E.
5	05	40	02.9	Tonga Islands. Depth about 25 km	20.0	S.	174.1	W.
5	14	06	25.9	Andreanof Islands. Felt on Adak. Depth about 37 km. Mag. 6¾.	51.8	N.	176.3	W.
5	15	09	37.9	Kurile Islands. Depth about 19 km	45.9	N.	149.3	E.
5	15	53	56.0	New Guinea. Felt. Mag. 6¾-7. Depth about 108 km	4.1	S.	143.0	E.
5	17	57	51.1	Loyalty Islands region. Mag. 6¾. Depth about 53 km	21.2	S.	169.5	E.
5	18	14	36.7	Loyalty Islands region. Mag. 6¾. Depth about 67 km	21.1	S.	17 .0	E.
5	18	37	48.3	Andreanof Islands, Aleutian Islands. Depth about 30 km	51.5	N.	176.6	W.
5	18	47	33.5	Costa Rica-Panama border region. Depth about 82 km	8.3	N.	83.1	W.
5	20	05	12.2	Mariana Islands region. Depth about 25 km	11.6	N.	143.5	E.
5	23	57	29.6	Kermadec Islands region. Depth about 166 km	32.6	S.	178.6	W.
6	01	20	30.8	Hokkaido, Japan. Depth about 21 km	42.7	N.	143.4	E.
6	06	21	38.2	Andreanof Islands, Aleutian Islands. Depth about 40 km	52.0	N.	176.0	W.
6	07	05	47.7	Kamchatka. Depth about 24 km	53.5	N.	159.7	E.
6	10	48	22.9	Off south coast of Mexico. Depth about 45 km	14.3	N.	95.8	W.
6	23	10	42.3	Kamchatka. Depth about 25 km	56.6	N.	162.5	E.
7	10	30	41.1	East of Crete. Felt. Depth about 20 km	35.0	N.	27.0	E.
7	11	30	12.0	South of Fiji Islands. Depth about 568 km	24.5	S.	179.5	E.
7	15	52	54.0	Near west coast of Greece. Felt. Depth about 25 km	37.6	N.	20.8	E.
7	18	16	54.3	Sandwich Islands. Mag. 5½ (Pal). Depth about 51 km	57.4	S.	24.7	W.
7	21	36	48.8	Near west coast of Luzon, Philippine Islands. Depth about 25 km.	17.1	N.	119.9	E.
8	01	15	25.6	Halmahera region. Depth about 106 km	4.1	N.	129.3	E.
8	02	56	34.1	Halmahera region. Depth about 117 km	3.5	N.	129.6	E.
8	05	21	46.7	Southern Peru. Felt at Arequipa. Depth about 135 km	15.9	S.	73.1	W.
8	09	49	08.8	Yellowstone National Park, Wyoming. Depth about 25 km	45.0	N.	110.7	W.
8	10	01	06.6	Kermadec Islands region. Depth about 538 km	26.1	S.	179.6	E.
9	03	08	37.7	North Atlantic Ocean. Mag. 4¾ (Pal). Depth about 25 km	31.4	N.	41.0	W.

See footnote at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Jan. 9	07	54	25.0	Kermadec Islands region. Depth about 25 km	28.4	S.	176.8	W.
9	10	13	17.7	Loyalty Islands. Depth about 82 km	21.4	S.	169.1	E.
9	11	06	58.4	Leeward Islands. Depth about 25 km	17.8	N.	61.1	W.
9	11	11	12.5	Leeward Islands. Depth about 52 km	17.7	N.	61.0	W.
9	19	22	05.6	Leeward Islands. Mag. 4½ (Pal). Depth about 31 km	17.9	N.	61.0	W.
9	19	24	59.5	Leeward Islands. Depth about 31 km	17.8	N.	61.6	W.
9	22	16	32.3	Outer Mongolia. Depth about 38 km	43.6	N.	103.8	E.
10	09	12	54.2	Banda Sea. Depth about 84 km	5.9	S.	130.0	E.
10	11	09	13.6	Leeward Islands. Depth about 25 km	17.7	N.	60.8	W.
10	14	22	19.4	Kurile Islands region. Mag. 6¾. Depth about 25 km	50.3	N.	155.9	E.
11	11	58	23.8	Fox Islands, Aleutian Islands. Depth about 42 km	52.5	N.	170.7	W.
11	11	59	55.0	Fox Islands, Aleutian Islands. Mag. 5¾-6 (Pal). Depth about 47 km.	52.0	N.	171.0	W.
11	16	31	50.6	Macquarie Islands. Depth about 27 km	54.9	S.	162.9	E.
11	19	29	07.8	Near coast of northern Chile. Depth about 128 km	24.8	S.	68.5	W.
11	21	37	08.0	Macquarie Islands region. Depth about 25 km	52.3	S.	160.3	E.
12	05	16	06.8	New Hebrides Islands. Depth about 25 km	20.2	S.	168.9	E.
12	14	13	34.1	Alaska Peninsula. Depth about 71 km	57.8	N.	155.5	W.
13	19	18	44.7	Prince Edward Islands region. Depth about 60 km	46.7	S.	34.1	E.
14	00	35	03.0	Macquarie Islands region. Depth about 25 km	53.1	S.	160.8	E.
14	02	26	23.8	Near Islands, Aleutian Islands. Depth about 25 km	53.3	N.	172.3	E.
14	05	32	42.5	New Ireland region. Depth about 81 km	5.4	S.	152.9	E.
14	07	31	44.8	Colombia. Depth about 21 km	7.6	N.	73.3	W.
14	16	17	26.1	Colombia. Depth about 159 km	6.8	N.	73.1	W.
14	16	38	54.8	Unimak Island region. Mag. 5¾ (Pal). Depth about 38 km	53.9	N.	163.4	W.
15	01	02	50.2	South of Australia. Depth about 25 km	53.8	S.	139.6	E.
15	04	06	00.1	South of Honshu, Japan. Depth about 107 km	29.4	N.	142.3	E.
15	05	56	11.5	Leeward Islands. Depth about 17 km	17.8	N.	61.2	W.
15	08	19	55.5	Central Chile. Depth about 86 km	30.3	S.	71.1	W.
15	11	53	09.9	Near east coast of Honshu, Japan. Depth about 65 km	39.8	N.	142.8	E.
15	16	44	44.8	Loyalty Islands region. Depth about 182 km	20.5	S.	169.5	E.
15	20	34	14.3	Java Sea. Depth about 565 km	5.2	S.	110.0	E.
16	03	58	52.5	Near coast of Michoacan, Mexico. Felt. Depth about 153 km	18.3	N.	102.4	W.
16	04	15	17.5	Loyalty Islands. Depth about 25 km	20.7	S.	168.7	E.
16	07	20	12.6	Near east coast of Honshu, Japan. Felt in central and northeastern Honshu. Depth about 41 km. Mag. 7.	36.2	N.	141.7	E.
16	08	48	19.6	Near east coast of Honshu, Japan. Depth about 123 km	36.1	N.	141.6	E.
16	10	14	09.6	Near east coast of Honshu, Japan. Depth about 131 km	36.6	N.	141.4	E.
16	11	19	46.5	Near east coast of Honshu, Japan. Depth about 157 km	35.9	N.	140.6	E.
16	11	41	06.2	Near east coast of Honshu, Japan. Depth about 149 km	35.4	N.	141.0	E.
16	12	12	34.4	Near east coast of Honshu, Japan. Mag. 6¾. Depth about 105 km	35.4	N.	141.7	E.
16	13	09	17.7	Near east coast of Honshu, Japan. Depth about 144 km	35.8	N.	140.8	E.
16	14	04	05.3	Near east coast of Honshu, Japan. Depth about 127 km	36.5	N.	141.2	E.
16	14	44	15.1	Near east coast of Honshu, Japan. Depth about 108 km	36.9	N.	141.8	E.
16	15	26	19.5	Near east coast of Honshu, Japan. Depth about 113 km	36.3	N.	141.0	E.
16	15	41	25.4	Near east coast of Honshu, Japan. Mag. 6¼. Depth about 132 km.	36.6	N.	140.7	E.
17	00	29	35.7	Near east coast of Honshu, Japan. Depth about 100 km	36.7	N.	141.8	E.
17	04	23	36.3	Southeastern Alaska. Depth about 109 km	59.0	N.	135.9	W.
17	06	41	38.5	Near east coast of Honshu, Japan. Depth about 83 km	36.4	N.	141.4	E.
17	23	05	27.6	Loyalty Islands. Mag. 5½ (Pal). Depth about 35 km	21.7	S.	169.3	E.
18	04	22	24.3	Cordoba Province, Argentina. Depth about 57 km	32.1	S.	64.3	W.
18	07	12	46.0	Near east coast of Honshu, Japan. Depth about 100 km	36.3	N.	141.4	E.
18	07	27	46.4	——do——	35.1	N.	142.2	E.
18	09	05	43.8	New Hebrides Islands. Depth about 95 km	12.3	S.	166.2	E.
18	15	09	47.3	Tonga Islands region. Depth about 25 km	24.5	S.	176.3	W.
18	16	48	34.5	Near east coast of Honshu, Japan. Depth about 137 km	36.1	N.	141.7	E.
18	19	55	12.8	Southern Alaska. Depth about 150 km	61.7	N.	150.4	W.
19	04	21	16.0	New Hebrides Islands. Mag. 6 (Pal). Depth about 26 km	14.5	S.	166.7	E.
19	05	54	25.5	Loyalty Islands. Depth about 100 km	21.6	S.	170.3	E.
19	17	22	16.9	Kurile Islands. Mag. 5¼-5½ (Pal). Depth about 31 km	49.9	N.	155.8	E.
20	00	56	59.7	Near Kodiak Island, Alaska. Depth about 55 km	56.7	N.	152.1	W.
20	01	51	53.2	Off coast of Jalisco, Mexico. Mag. 4¾ (Pal). Depth about 84 km	20.2	N.	108.8	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Jan. 20	05	23	16.1	Near Kodiak Island, Alaska. Depth about 58 km	56.6	N.	152.0	W.
20	08	50	50.5	Southern Alaska. Depth about 82 km	61.9	N.	155.7	W.
20	13	33	12.8	Near Kodiak Island, Alaska. Depth about 44 km	56.7	N.	152.2	W.
20	17	09	15.7	Near Kodiak Island, Alaska. Mag. 6¼–6½. Depth about 46 km	56.6	N.	152.3	W.
20	21	31	08.7	Near Kodiak Island, Alaska. Depth about 43 km	57.0	N.	152.1	W.
20	21	37	23.4	Near Kodiak Island, Alaska. Depth about 14 km	56.7	N.	153.1	W.
20	22	34	51.1	Near east coast of Honshu, Japan. Depth about 52 km	38.3	N.	141.2	E.
21	05	29	52.8	Near coast of Norway. Depth about 25 km	68.0	N.	11.7	E.
21	13	19	28.2	Near Kodiak Island, Alaska. Depth about 63 km	56.5	N.	152.1	W.
21	14	47	57.0	Costa Rica-Panama border region. Depth about 40 km	8.7	N.	82.8	W.
21	17	42	56.2	Honshu, Japan. Depth about 25 km	36.3	N.	141.7	E.
22	03	24	04.5	Santa Cruz Islands. Mag. 7. Depth about 25 km	12.0	S.	166.2	E.
22	06	16	27.9	Santa Cruz Islands. Depth about 16 km	11.9	S.	166.3	E.
22	16	09	37.3	Kermadec Islands. Depth about 68 km	28.7	S.	174.8	W.
22	19	04	54.1	Santa Cruz Islands. Depth about 35 km	12.4	S.	166.1	E.
22	19	22	51.0	Leyte, Philippine Islands. Felt. Depth about 185 km	11.0	N.	124.6	E.
23	04	48	21.4	Kurile Islands. Depth about 46 km	43.1	N.	145.3	E.
24	07	24	59.9	New Hebrides Islands. Depth about 142 km	15.7	S.	167.7	E.
24	08	02	26.5	Antarctic Ocean, south of Australia. Depth about 25 km	61.3	S.	154.6	E.
24	23	12	49.0	Panama-Costa Rica border. Felt at David, Panama. Depth about 78 km.	8.4	N.	82.9	W.
24	23	44	52.9	Tonga Islands region. Depth about 201 km	20.4	S.	175.9	W.
25	00	54	07.2	Near south coast of Sumatra. Depth about 90 km	4.9	S.	102.9	E.
25	03	46	46.2	Near coast of Ecuador. Depth about 22 km	0.0		80.2	W.
25	05	21	25.4	New Hebrides Islands region. Depth about 21 km. Mag. 5½ (Pal)	14.0	S.	165.9	E.
25	06	06	45.8	New Hebrides Islands region. Depth about 36 km	13.9	S.	166.1	E.
25	12	05	35.6	New Hebrides Islands region. Depth about 134 km	13.9	S.	165.9	E.
25	17	20	33.3	Celebes region. Depth about 44 km	1.4	N.	121.6	E.
25	18	24	46.7	Central Peru. Depth about 210 km	8.5	S.	74.0	W.
25	18	44	44.5	New Hebrides Islands. Depth about 117 km	13.9	S.	165.8	E.
25	19	04	22.8	Kurile Islands. Depth about 98 km	50.0	N.	156.0	E.
26	01	47	05.0	Near coast of Burma. Depth about 74 km	15.3	N.	93.6	E.
26	06	02	20.1	New Hebrides Islands. Depth about 50 km	14.0	S.	165.7	E.
26	10	26	59.7	Santa Cruz Islands region. Depth about 113 km	11.8	S.	165.7	E.
26	13	12	22.6	Loyalty Islands region. Depth about 77 km	21.4	S.	169.5	E.
26	16	13	25.1	Loyalty Islands region. Mag. 6½. Depth about 119 km	21.5	S.	169.5	E.
26	17	45	42.9	Near coast of Peru. Felt at Lima. Depth about 60 km	12.3	S.	78.1	W.
26	18	48	56.9	Loyalty Islands region. Depth about 106 km	20.8	S.	169.5	E.
26	19	53	58.3	Fiji Islands. Depth about 32 km	18.7	S.	176.3	E.
26	21	20	33.7	Fiji Islands region. Depth about 25 km	18.2	S.	176.5	E.
27	00	52	20.5	Solomon Islands. Felt at Rabaul. Depth about 59 km	6.6	S.	154.7	E.
27	03	11	31.2	Loyalty Islands region. Depth about 72 km	21.8	S.	169.2	E.
27	13	55	13.0	New Ireland region. Felt at Rabaul. Depth about 66 km	5.0	S.	151.2	E.
27	14	46	52.5	Loyalty Islands region. Depth about 72 km	21.3	S.	169.3	E.
27	15	05	53.5	Loyalty Islands region. Depth about 68 km	21.3	S.	169.4	E.
27	20	07	00.4	Kurile Islands. Depth about 60 km	45.6	N.	149.3	E.
28	03	24	46.9	Near coast of Peru. Felt at Lima. Mag. 5 (Pal). Depth about 86 km.	13.6	S.	76.3	W.
28	07	18	18.6	Greece. Felt. Depth about 80 km	39.5	N.	22.0	E.
28	08	12	46.0	Near Walker Pass, Calif. Slight damage in Kern and Tulare counties. Mag. 5.3.	35.46	N.	118.03	W.
28	14	06	12.6	About 1200 miles south of Easter Island. Depth about 25 km	45.1	S.	106.4	W.
28	14	34	56.1	New Hebrides Islands region. Depth about 128 km	13.8	S.	165.8	E.
28	17	34	20.2	Loyalty Islands region. Depth about 18 km	21.2	S.	169.2	E.
28	19	43	01.4	Loyalty Islands region. Mag. 6¼. Depth about 50 km	21.4	S.	169.5	E.
29	00	18	39.7	Aroe Islands. Depth about 47 km	5.9	S.	131.8	E.
29	00	50	35.0	New Hebrides Islands region. Depth about 123 km	14.0	S.	165.9	E.
29	13	23	54.7	Andreanof Islands, Aleutian Islands. Depth about 41 km	52.0	N.	175.9	W.
29	20	33	31.3	Fiji Islands region. Depth about 446 km	15.8	S.	177.5	W.
30	12	12	39.7	Central Alaska. Felt. Mag. 5½ (Pal). Depth about 34 km	65.3	N.	149.9	W.
31	00	48	36.5	Near Kodiak Island, Alaska. Mag. 6¼. Depth about 26 km	56.0	N.	153.9	W.
31	06	13	15.2	New Hebrides Islands. Depth about 60 km	17.2	S.	166.8	E.
31	18	32	19.5	Andreanof Islands, Aleutian Islands. Depth about 53 km	51.6	N.	178.4	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Feb. 1	00	35	57.2	Vancouver Island region. Mag. 5½ (Pal). Depth about 23 km	50.3	N.	129.9	W.
1	02	46	31.6	Mariana Islands region. Depth about 60 km	11.9	N.	144.2	E.
1	04	53	41.1	Mariana Islands region. Depth about 58 km	11.9	N.	143.9	E.
1	06	27	18.9	East of New Hebrides Islands region. Depth about 40 km	13.6	S.	173.4	E.
1	18	39	02.7	Near west coast of Honshu, Japan. 5 killed, 7 injured, and extensive property damage at Nagaoka. Depth about 34 km.	37.6	N.	138.4	E.
1	20	09	14.1	Fiji Islands. Depth about 601 km	18.1	S.	178.4	W.
2	00	04	16.0	Northwest of Bishop, Calif. Felt. Mag. 5.0	37 27	N.	118 30	W.
2	00	07	43*	Northwest of Bishop, Calif. Felt. Mag. 5.2	37 27	N.	118 30	W.
2	00	41	58.2	Off coast of Mindanao, Philippine Islands. Depth about 40 km	7.7	N.	126.8	E.
2	05	50	18.4	Washington. Felt. Depth about 40 km	47.0	N.	121.5	W.
2	08	00	45.3	Santa Cruz Islands. Depth about 25 km	12.1	S.	166.0	E.
2	09	42	15.4	Ecuador. Depth about 25 km	2.8	S.	77.8	W.
2	11	13	31.3	Mariana Islands region. Felt on Guam. Depth about 139 km	13.7	N.	144.9	E.
3	02	25	53.0	Near coast of Sumatra. Depth about 29 km	3.7	N.	97.4	E.
3	11	02	51.7	Near coast of Chile. Felt in Aconcagua, Santiago, and Valparaiso Provinces. Depth about 27 km.	33.5	S.	72.3	W.
3	12	00	25.3	Near coast of Chile. Felt in Aconcagua, Santiago, and Valparaiso Provinces. Depth about 22 km	33.4	S.	72.2	W.
3	12	33	25.3	Off coast of North Island, New Zealand. Depth about 286 km	37.3	S.	176.5	E.
3	13	31	44.7	Near east coast of Honshu, Japan. Felt. Depth about 103 km	36.6	N.	141.0	E.
3	14	07	08.9	Near coast of Chile. Depth about 40 km	33.4	S.	72.1	W.
3	14	35	18.1	Near coast of southern Chile. Depth about 40 km	44.1	S.	75.6	W.
4	01	13	07.0	Northern Chile. Felt at Arequipa, Peru. Depth about 158 km	18.3	S.	69.5	W.
4	08	51	48.6	Northern Burma. Depth about 135 km	24.8	N.	95.3	E.
4	12	49	33.8	Kamchatka. Depth about 145 km	49.9	N.	156.3	E.
4	15	29	11.7	Fiji Islands region. Depth about 57 km	17.1	S.	176.8	W.
4	19	09	14.1	Off coast of Formosa. Mag. 5¾ (Pal). Depth about 31 km	24.2	N.	122.6	E.
4	23	58	58.9	Kurile Islands. Depth about 50 km	45.7	N.	148.6	E.
5	07	39	55.4	Fiji Islands. Depth about 580 km	18.5	S.	177.9	W.
5	07	55	43.3	Andreanof Islands, Aleutian Islands. Felt on Adak. Depth about 44 km.	50.9	N.	176.9	W.
5	15	38	34.0	South of Panama. Felt at Balboa Heights. Mag. 5¼–5½ (Brk). Depth about 49 km.	8.1	N.	82.8	W.
5	17	50	51.1	South Indian Ocean. Mag. 5¾–6 (Pal). Depth about 25 km	38.6	S.	78.2	E.
5	19	08	10.1	Colombia. Depth about 154 km	7.0	N.	72.8	W.
6	04	06	08.9	Mariana Islands. Depth about 22 km	14.2	N.	145.5	E.
6	06	27	49.6	Tonga Islands region. Depth about 25 km	21.1	S.	174.6	W.
6	10	30	03.5	Northern Chile. Felt at Arequipa, Peru. Depth about 120 km	19.4	S.	69.2	W.
6	11	25	38.9	South of Australia. Depth about 25 km	55.4	S.	130.6	W.
6	12	12	21.8	Andreanof Islands, Aleutian Islands. Felt on Adak. Mag. 5¼–5½ (Pal). Depth about 34 km.	51.7	N.	174.5	W.
6	18	15	23.4	Kurile Islands. Depth about 33 km	44.9	N.	149.3	E.
6	19	29	30.1	Solomon Islands region. Depth about 400 km	4.7	S.	154.3	E.
6	20	11	51.0	Solomon Islands region. Depth about 80 km	10.8	S.	161.8	E.
6	20	18	35.1	South Indian Ocean. Depth about 31 km	38.6	S.	78.2	E.
6	21	45	13.5	Solomon Islands. Felt. Mag 6¾. Depth about 59 km	6.8	S.	155.3	E.
6	21	57	40.8	Solomon Islands. Depth about 60 km	6.9	S.	155.6	E.
7	01	43	42.6	Santa Cruz Islands. Depth about 55 km	11.7	S.	166.0	E.
7	02	57	51.2	——do——	11.8	S.	166.2	E.
7	02	57	56.0	Gulf of Aden. Depth about 25 km	14.8	N.	54.3	E.
7	03	21	15.1	Near coast of Guatemala. Felt. Depth about 128 km	13.6	N.	89.9	W.
7	03	47	34.1	South of Fiji Islands. Depth about 425 km	24.4	S.	179.3	W.
7	03	59	49.4	Santa Cruz Islands. Depth about 55 km	11.9	S.	166.2	E.
7	05	11	40.9	Near coast of Sumatra. Felt at Palembang. Depth about 40 km	4.7	S.	103.0	E.
7	06	02	08.3	Santa Cruz Islands. Depth about 33 km	11.8	S.	166.2	E.
7	06	08	30.6	Vancouver Island region. Depth about 25 km	49.1	N.	129.0	W.
7	14	24	35.1	Near coast of Chile. Felt in Santiago and Valparaiso Provinces. Depth about 40 km.	33.5	S.	72.3	W.
7	15	28	33.3	Near coast of Formosa. Depth about 38 km	23.6	N.	121.0	E.
7	21	01	37.3	Kurile Islands. Depth about 36 km	44.1	N.	147.1	E.
7	22	09	44.0	Kamchatka. Depth about 55 km	49.8	N.	156.0	E.

See footnote at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Feb. 7	23	27	18.9	Andreanof Islands, Aleutian Islands. Felt on Adak. Depth about 60 km.	51.7	N.	177.1	W.
8	02	36	40.5	New Hebrides Islands region. Depth about 162 km	15.4	S.	167.5	E.
8	04	34	33.8	Kermadec Islands region. Depth about 412 km	26.3	S.	179.0	W.
8	08	04	13.4	Brazil-Peru border. Mag. 5¾. Depth about 600 km	10.4	S.	71.0	W.
8	11	59	52.3	Tonga Islands. Depth about 76 km	18.9	S.	174.9	W.
8	15	53	33.6	Loyalty Islands region. Depth about 35 km	21.8	S.	169.3	E.
8	16	57	23.3	Fiji Islands region. Depth about 543 km	20.5	S.	178.1	W.
8	17	50	45.2	----do----	20.5	S.	178.1	W.
8	19	25	59.9	New Britain region. Felt at Rabaul. Depth about 51 km	5.9	S.	151.8	E.
8	23	59	17.3	Solomon Islands region. Depth about 77 km	7.2	S.	155.0	E.
9	02	08	15.9	Kermadec Islands region. Mag. 6¾. Depth about 37 km	28.4	S.	177.4	W.
9	09	04	05.0	Santa Cruz Islands. Depth about 83 km	10.1	S.	165.5	E.
9	13	14	50.0	Near coast of Chile. Depth about 40 km	39.1	S.	74.6	W.
9	17	50	07.0	Baja California. Mag. 4.8. Depth about 25 km	32.5	N.	115.5	W.
9	20	21	20.1	Off south coast of Java. Depth about 73 km	10.0	S.	111.3	E.
10	00	37	28.0	Kermadec Islands. Depth about 25 km	30.3	S.	177.2	W.
10	07	22	50.4	Near coast of central Chile. Depth about 40 km	33.6	S.	72.1	W.
10	08	49	14.1	Peru. Depth about 35 km	11.6	S.	73.1	W.
10	13	19	22.6	Ceram Sea. Depth about 54 km	3.1	S.	127.4	E.
10	16	58	29.4	Molucca Passage. Depth about 99 km	3.6	N.	126.5	E.
11	01	02	20.9	Samoa Islands region. Depth about 21 km	16.2	S.	172.3	W.
11	02	34	31.9	Mariana Islands region. Depth about 26 km	22.7	N.	143.9	E.
11	03	53	33.4	Alaska. Depth about 56 km	59.6	N.	155.0	W.
11	06	12	29.8	South of Honshu, Japan. Depth about 400 km	28.9	N.	139.5	E.
11	11	28	07.0	Jujuy Province, Argentina. Depth about 220 km	23.5	S.	66.8	W.
11	12	23	53.5	Near coast of Mindanao, Philippine Islands. Depth about 178 km	5.2	N.	126.3	E.
11	16	46	24.6	Fiji Islands. Depth about 261 km	19.8	S.	176.2	W.
11	21	01	08.7	Kermadec Islands. Mag. 6¾. Depth about 67 km. Felt at Raoul.	28.5	S.	177.5	W.
11	22	44	07.2	Salta Province, Argentina. Depth about 169 km	24.4	S.	66.9	W.
12	01	19	16.5	Easter Islands region. Mag. 5 (Pal). Depth about 25 km	35.0	S.	106.9	W.
12	03	51	14.0	Mexico-Arizona border. Felt in Cochise County, U.S. Depth about 25 km.	31.3	N.	109.2	W.
12	06	04	07.5	Santa Cruz Islands region. Depth about 93 km	11.2	S.	166.1	E.
12	10	31	36.8	Turkey-Iran border. Depth about 60 km	36.9	N.	44.4	E.
12	12	09	21.8	Samoa Islands region. Depth about 287 km	15.1	S.	175.2	W.
12	12	57	15.3	East of New Hebrides Islands region. Depth about 598 km	13.2	S.	171.8	E.
12	13	54	30.6	Kenai Peninsula, Alaska. Depth about 79 km	59.5	N.	150.1	W.
12	15	21	04.1	Ceram Sea. Depth about 25 km	2.8	S.	129.5	E.
12	21	53	43.5	Kurile Islands. Mag. 7. Depth about 45 km	43.9	N.	147.6	E.
12	22	51	35.0	Kurile Islands. Depth about 50 km	44.1	N.	147.9	E.
12	22	54	24.2	----do----	44.3	N.	147.7	E.
12	23	13	09.6	Kurile Islands. Depth about 46 km	44.6	N.	147.7	E.
12	23	26	37.4	Kurile Islands. Depth about 50 km	44.1	N.	147.7	E.
13	00	31	59.2	----do----	44.2	N.	147.8	E.
13	01	28	01.4	----do----	44.7	N.	147.5	E.
13	02	31	23.7	----do----	44.7	N.	147.9	E.
13	03	52	48.7	Solomon Islands region. Depth about 61 km	10.6	S.	161.5	E.
13	04	43	32.9	Kurile Islands. Depth about 50 km	44.9	N.	147.4	E.
13	06	45	25.0	Tonga Islands region. Mag. 5¾–6. Depth about 43 km	17.1	S.	173.7	W.
13	09	07	01.3	Kurile Islands. Depth about 50 km	43.9	N.	147.9	E.
13	13	46	08.4	Solomon Islands. Depth about 100 km	7.2	S.	155.7	E.
13	16	10	19.8	Nepal-Tibet border. Depth about 35 km	29.9	N.	81.0	E.
13	16	17	20.1	Banda Sea. Depth about 66 km	5.1	S.	128.7	E.
13	16	27	24.2	Kurile Islands. Mag. 6–6¼. Depth about 64 km	43.5	N.	147.9	E.
13	17	50	14.1	Kurile Islands. Depth about 45 km	43.9	N.	147.7	E.
13	21	11	40.9	Kurile Islands. Depth about 51 km	43.8	N.	147.8	E.
13	22	37	13.8	----do----	44.0	N.	147.8	E.
14	00	15	37.6	----do----	43.7	N.	147.6	E.
14	01	57	02.6	Solomon Islands. Depth about 75 km	6.2	S.	154.2	E.
14	02	51	09.7	Kurile Islands. Depth about 50 km	43.8	N.	147.8	E.
14	03	15	30.3	----do----	43.8	N.	147.7	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Feb. 14	03	22	06.6	Kurile Islands. Mag. 6-6¼. Depth about 50 km	43.8	N.	147.6	E.
14	03	46	46.6	Kurile Islands. Depth about 50 km	43.9	N.	148.1	E.
14	05	44	25.5	Near coast of southern Chile. Felt at Puerto Montt and Ancud. Depth about 40 km.	42.3	S.	74.2	W.
14	10	02	45.6	New Hebrides Islands. Felt at Santo. Depth about 134 km	15.0	S.	167.7	E.
14	15	50	52.2	Samoa Islands region. Depth about 25 km	15.5	S.	175.1	W.
15	01	34	13.8	West of Galapagos Islands region. Depth about 25 km	4.6	S.	104.6	W.
15	02	09	26.4	Loyalty Islands region. Depth about 128 km	22.3	S.	171.3	E.
15	06	27	14.0	Tonga Islands region. Depth about 150 km	26.2	S.	177.5	W.
15	09	10	49.4	Idaho. Depth about 25 km	43.3	N.	111.4	W.
15	10	45	14.0	Kurile Islands. Mag. 6-6¼. Depth about 51 km	43.8	N.	147.4	E.
15	11	28	51.0	Tibet. Depth about 25 km	30.8	N.	84.4	E.
15	11	57	04.1	Kurile Islands. Depth about 50 km	43.7	N.	147.9	E.
16	03	23	53.0	West of Galapagos Islands region. Depth about 25 km	9.3	S.	106.2	W.
16	03	44	45.7	Near coast of Albania. Depth about 25 km	40.6	N.	19.8	E.
16	05	21	51.9	Nicaragua. Felt at Chinandega. Depth about 40 km	12.9	N.	86.5	W.
16	08	55	11.7	Near south coast of Honshu, Japan. Depth about 341 km	34.4	N.	137.2	E.
16	13	25	55.1	Tonga Islands region. Depth about 25 km	24.3	S.	175.8	W.
16	13	54	52.9	Kurile Islands. Mag. 6-6¼. Depth about 50 km	43.8	N.	147.4	E.
16	14	00	09.2	Solomon Islands region. Depth about 92 km	6.9	S.	155.4	E.
16	14	33	15.1	North Indian Ocean. Depth about 25 km	13.0	N.	57.6	E.
16	14	54	27.7	Kurile Islands. Depth about 50 km	43.6	N.	147.6	E.
16	15	55	42.6	Tonga Islands region. Depth about 189 km	23.8	S.	177.5	W.
16	16	09	17.3	Off coast of Java. Felt. Depth about 25 km	8.9	S.	110.6	E.
16	20	29	16.1	South Indian Ocean. Depth about 25 km	33.8	S.	57.7	E.
17	00	22	30.8	Tonga Islands. Depth about 25 km	18.8	S.	173.5	W.
17	06	11	52.7	Colombia. Depth about 159 km	6.9	N.	73.1	W.
17	06	49	04.9	Kurile Islands. Depth about 50 km	43.6	N.	147.9	E.
17	12	40	56.3	South Indian Ocean. Depth about 28 km	33.8	S.	57.2	E.
17	13	08	26.9	Hindu Kush. Depth about 195 km	36.5	N.	70.6	E.
17	15	37	52.1	Banda Sea. Depth about 300 km	5.0	S.	129.7	E.
17	18	55	04.3	New Ireland region. Depth about 108 km	4.4	S.	153.0	E.
18	01	04	07.2	Kurile Islands. Depth about 50 km	44.4	N.	147.5	E.
18	08	13	04.0	----do----	44.2	N.	147.5	E.
18	08	22	33.5	----do----	43.6	N.	147.6	E.
18	12	05	36.3	Loyalty Islands region. Depth about 38 km	22.7	S.	171.3	E.
18	15	54	00.0	Kurile Islands. Depth about 38 km	43.6	N.	148.0	E.
18	17	02	10.0	North of Ascension Islands. Mag. 5 (Pal). Depth about 25 km	1.3	S.	15.7	W.
18	20	00	28.8	Off coast of Mindanao, Philippine Islands. Depth about 72 km	4.2	N.	126.4	E.
19	07	11	22.5	East of Loyalty Islands region. Depth about 25 km	23.2	S.	171.5	E.
19	07	55	26.6	Kodiak Island, Alaska. Depth about 40 km	56.2	N.	153.5	W.
19	12	11	15.7	Kodiak Island, Alaska. Depth about 39 km	56.3	N.	153.5	W.
19	12	33	35.7	South Atlantic Ocean. Depth about 25 km	14.2	S.	14.1	W.
19	13	07	45.5	Kodiak Island, Alaska. Depth about 44 km	56.3	N.	153.4	W.
20	13	03	38.6	Galapagos Islands region. Depth about 25 km	3.3	N.	96.5	W.
20	13	05	10.8	Kodiak Island, Alaska. Depth about 30 km	56.2	N.	153.7	W.
20	14	17	26.9	New Ireland region. Felt at Rabaul. Depth about 101 km	5.1	S.	153.5	E.
20	18	08	26.7	Kamchatka. Depth about 60 km	49.2	N.	155.3	E.
20	18	25	45.0	San Juan Province, Argentina. Felt at Mendoza. Depth about 120 km.	32.0	S.	68.1	W.
20	18	47	02.2	Near north coast of Sumatra. Depth about 171 km	5.5	N.	96.4	E.
20	18	54	17.5	Windward Islands. Depth about 55 km	15.1	N.	60.6	W.
20	22	26	59.1	Ecuador. Depth about 25 km	2.4	S.	77.6	W.
21	00	03	37.1	Solomon Islands. Depth about 126 km	6.1	S.	153.7	E.
21	01	07	15.4	Near coast of Chile. Felt in Santiago and Valparaiso Provinces. Depth about 40 km.	37.3	S.	74.6	W.
21	03	01	52.6	Near south coast of Greece. Felt. Depth about 25 km	36.3	N.	22.9	E.
21	03	50	18.6	Solomon Islands region. Depth about 83 km	6.9	S.	155.7	E.
21	05	39	51.0	Central Utah. Depth about 25 km	38.9	N.	111.5	W.
21	19	10	55.4	Indian Ocean, southwest of Australia. Depth about 25 km	48.9	S.	106.5	E.
21	23	28	32.5	Celebes. Depth about 140 km	0.1	N.	123.1	E.
22	02	49	14.4	Andreanof Islands, Aleutian Islands. Depth about 50 km	51.4	N.	179.9	E.
22	15	42	50.9	Near coast of Sumatra. Depth about 29 km	0.3	S.	98.9	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Feb. 22	21	53	33.8	Kermadec Islands region. Mag. 5¾ (Brk). Depth about 66 km	28.6	S.	177.3	W.
23	01	02	59.5	Eastern Tibet. Depth about 54 km	28.1	N.	92.4	E.
23	01	46	36.9	Yellowstone National Park, Mont. Depth about 25 km	45.0	N.	111.6	W.
23	03	00	05.8	Off coast of New Guinea. Depth about 64 km	4.4	S.	133.9	E.
23	03	12	54.5	Yellowstone National Park, Mont. Felt in West Yellowstone. Depth about 25 km.	45.0	N.	111.7	W
23	03	19	07.1	Crete. Depth about 25 km	35.2	N.	27.3	E.
23	03	23	18.5	----do	35.1	N.	27.2	E.
23	04	16	24.3	Off north coast of Honshu, Japan. Felt. Depth about 116 km	38.4	N.	142.8	E.
23	04	49	38.4	Celebes. Depth about 84 km	2.0	S.	120.2	E.
23	05	34	42.2	Loyalty Islands region. Depth about 82 km	22.4	S.	171.4	E.
23	14	31	54.7	Mexico-Guatemala border. Depth about 53 km	15.5	N.	92.2	W.
23	21	45	50.5	Dodecanese Islands. Felt. Depth about 25 km	36.9	N.	27.3	E.
23	21	56	40.2	----do	35.7	N.	25.9	E.
24	01	27	56.6	Solomon Islands region. Depth about 33 km	12.7	S.	163.9	E.
24	02	38	17.4	Kamchatka. Depth about 39 km	49.3	N.	156.3	E.
24	03	04	16.1	Ryukyu Islands. Depth about 50 km	26.2	N.	125.7	E.
24	08	16	11.3	Near Chile-Peru border. Felt at Arequipa. Depth about 121 km	18.2	S.	69.7	W.
25	00	50	12.4	Fiji Islands region. Depth about 611 km	19.3	S.	177.4	W.
25	01	18	53.1	New Hebrides Islands region. Depth about 48 km	14.1	S.	165.9	E.
25	04	55	25.1	Fiji Islands region. Depth about 608 km	21.8	S.	179.6	W.
25	08	24	32.0	South of Fiji Islands region. Depth about 563 km	23.6	S.	179.9	W.
25	15	02	04.8	Samoa Islands region. Depth about 62 km	15.5	S.	175.8	W.
25	15	23	06.4	Honshu, Japan. Felt. Depth about 44 km	36.5	N.	139.6	E.
26	00	33	43.7	Solomon Islands region. Depth about 89 km	10.4	S.	161.5	E.
26	05	48	46.3	Easter Island region. Mag. 6¼–6¾. Depth about 29 km	32.9	S.	111.2	W.
26	17	49	26.5	Near coast of Hokkaido, Japan. Depth about 57 km	41.1	N.	142.3	E.
26	18	10	48.7	Near coast of Kyushu, Japan. 2 killed, several injured, and extensive property damage at Miyazaki. 3 ft. tsunami observed in southwest Shikoku. Mag. 7–7¼. Depth about 54 km.	31.6	N.	131.2	E.
26	21	01	04.8	Luzon, Philippine Islands. Felt. Depth about 32 km	16.1	N.	121.6	E.
27	01	07	51.3	Colombia. Felt at Bogota. Depth about 200 km	6.7	N.	73.0	W.
27	09	12	39.3	Gulf of California. Depth about 25 km	26.0	N.	108.8	W.
27	10	29	48.3	Southern Chile. Felt. Depth about 57 km	38.9	S.	72.4	W.
27	11	56	26.5	Samoa Islands region. Depth about 25 km	13.4	S.	175.2	W.
27	12	23	18.5	Jan Mayen Island region. Depth about 30 km	71.9	N.	10.6	W.
27	13	06	35.8	Fox Islands, Aleutian Islands. Depth about 56 km	52.7	N.	168.8	W.
27	15	44	21.6	Near coast of Costa Rica. Minor damage at San Jose. Depth about 85 km.	9.7	N.	84.0	W.
27	16	48	18.2	Near coast of New Guinea. Depth about 25 km	4.2	S.	134.9	E.
27	17	53	47.3	Tadzhik S.S.R. Depth about 180 km	38.2	N.	74.4	E.
27	21	40	02.6	Dodecanese Islands. Felt. Depth about 40 km	36.6	N.	26.9	E.
27	21	54	33.6	----do	36.5	N.	27.1	E.
28	12	33	36.5	Kurile Islands. Depth about 29 km	46.7	N.	152.2	E.
28	18	29	17.1	Guatemala. Depth about 215 km	15.6	N.	91.5	W.
28	21	18	28.7	Northern Chile-Argentina border. Depth about 130 km	24.2	S.	68.1	W.
28	22	59	14.1	Western New Guinea. Depth about 73 km	3.9	S.	135.3	E.
Mar. 1	00	23	42.5	Mariana Islands region. Depth about 221 km	13.3	N.	143.2	E.
1	03	24	10.4	La Rioja Province, Argentina. Depth about 259 km	30.9	S.	66.0	W.
1	04	24	49.3	Fiji Islands. Depth about 392 km	14.9	S.	178.8	W.
1	06	41	43.5	Fiji Islands region. Depth about 513 km	18.8	S.	177.9	W.
1	13	13	41.4	Near coast of Java. Felt at Djakarta. Depth about 33 km	8.0	S.	107.4	E.
1	13	47	37.2	Banda Sea. Depth about 25 km	7.5	S.	130.0	E.
1	14	05	08.3	Molucca Passage. Depth about 61 km	2.8	N.	126.5	E.
1	14	31	27.2	South Atlantic Ocean. Depth about 25 km	19.0	S.	12.2	W.
1	19	26	13.5	Mariana Islands. Depth about 73 km	13.8	N.	146.2	E.
1	23	42	43.8	About 900 miles west of Galapagos Islands. Depth about 59 km	2.8	S.	105.7	W.
2	00	04	12.7	Mexico-Guatemala border. Depth about 98 km	15.8	N.	92.2	W.
2	09	19	02.8	Solomon Islands region. Depth about 138 km	6.5	S.	155.8	E.
2	11	01	10.6	Solomon Islands region. Depth about 407 km	3.9	S.	154.5	E.
2	14	29	29.9	Fiji Islands. Depth about 600 km	18.5	S.	179.8	W.
2	15	18	54.3	About 1,000 miles west of Galapagos Islands. Depth about 25 km	4.7	S.	106.3	W.
3	03	19	00.1	New Hebrides Islands. Depth about 42 km	17.3	S.	168.0	E.
3	05	15	58.3	Hokkaido, Japan. Depth about 54 km	42.2	N.	143.9	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Mar. 3	06	25	37.9	Loyalty Islands region. Depth about 27 km	23.0	S.	171.4	E.
3	08	17	30.6	Kermadec Islands region. Depth about 63 km	32.0	S.	178.0	W.
3	09	46	18.9	Off coast of New Guinea. Depth about 25 km	5.6	S.	147.9	E.
3	20	14	19.7	Loyalty Islands region. Depth about 61 km	22.3	S.	171.6	W.
3	22	51	11.3	Off coast of southern Chile. Depth about 25 km	44.4	S.	75.2	W.
3	23	54	55.6	Central Chile. Depth about 25 km	37.2	S.	71.9	W.
4	07	41	37.3	Rat Islands, Aleutian Islands. Depth about 49 km	51.9	N.	179.3	E.
4	10	19	33.7	Near Chile-Bolivia border. Depth about 109 km	20.4	S.	67.5	W.
4	18	59	47.1	Fox Islands, Aleutian Islands. Depth about 25 km	51.7	N.	168.1	W.
4	21	09	09.9	Near coast of El Salvador. Depth about 85 km	12.7	N.	88.0	W.
4	22	26	01.2	Near east coast of Honshu, Japan. Depth about 61 km	37.8	N.	141.6	E.
5	01	26	26.1	Solomon Islands region. Depth about 99 km. Mag. 6¼	10.7	S.	161.6	E.
5	02	02	08.0	Near coast of Java. Depth about 76 km	7.9	S.	115.0	E.
5	10	39	50.8	Fiji Islands. Depth about 584 km	17.8	S.	179.1	W.
5	19	42	16.6	New Guinea. Depth about 79 km	3.9	S.	137.4	E.
5	21	26	23.6	Tonga Islands. Depth about 300 km	21.0	S.	176.6	W.
6	12	13	30.4	Ontario Province, Canada. Depth about 25 km	48.0	N.	79.8	W.
7	02	47	25.8	South of Honshu, Japan. Depth about 25 km	28.8	N.	139.1	E.
7	04	16	44.1	Bonin Islands region. Depth about 123 km	28.2	N.	142.8	E.
7	06	43	04.5	Off southern coast of Chile. Felt at Iquique. Depth about 25 km	44.5	S.	79.7	W.
7	10	10	38.9	Kermadec Islands region. Depth about 43 km. Mag. 7¼–7½	28.3	S.	175.7	W.
7	19	08	36.1	Indian Ocean. Depth about 30 km. Mag. 6	38.4	S.	78.1	E.
7	19	48	41.5	Kermadec Islands region. Depth about 50 km	28.1	S.	176.0	W.
7	23	11	59.6	New Britain region. Felt. Depth about 90 km	4.7	S.	153.2	E.
8	00	17	58.9	Unimak Islands, Aleutian Islands. Depth about 34 km	52.7	N.	164.7	W.
8	03	27	16.2	New Guinea. Felt at Aitpic. Depth about 217 km	4.1	S.	141.8	E.
8	05	28	35.0	Kermadec Islands. Depth about 43 km	30.0	S.	177.6	W.
8	08	28	34.6	Fiji Islands region. Depth about 620 km	17.8	S.	178.7	W.
8	12	52	28.8	Near coast of southern Chile. Depth about 96 km	40.0	S.	74.3	W.
8	19	45	43.0	Halmahera. Depth about 370 km	2.2	N.	128.3	E.
8	23	01	55.9	South of Honshu, Japan. Depth about 37 km	32.6	N.	141.7	E.
9	03	59	08.7	Atlantic Ocean. Depth about 27 km	10.9	N.	41.7	W.
9	11	35	42.2	Southern Peru. Depth about 25 km	14.2	S.	75.1	W.
9	12	51	01.6	Central Alaska. Depth about 32 km	66.1	N.	155.5	W.
10	03	00	45.5	Macquarie Islands region. Depth about 25 km	52.1	S.	161.3	E.
10	15	31	37.2	Jujuy Province, Argentina. Depth about 118 km	23.5	S.	65.4	W.
10	23	12	20.4	Near coast of Costa Rica. Depth about 56 km	10.1	N.	83.6	W.
10	23	36	08.8	Solomon Islands region. Depth about 139 km	10.1	S.	161.4	E.
11	01	27	00.4	Fox Islands, Aleutian Islands. Depth about 60 km	53.1	N.	167.5	W.
11	01	31	34.4	Kurile Islands. Depth about 26 km. Mag. 6½ (Brk)	48.7	N.	154.6	E.
11	02	25	22.8	Tonga Islands region. Depth about 25 km	16.0	S.	172.8	W.
11	07	18	44.9	Fox Islands, Aleutian Islands. Depth about 40 km	52.8	N.	168.6	W.
11	08	41	00.4	Near coast of British Somaliland. Depth about 18 km	11.2	N.	43.3	E.
11	12	28	47.6	Solomon Islands region. Depth about 85 km	6.0	S.	155.8	E.
11	16	54	21.5	Solomon Islands region. Depth about 104 km	6.8	S.	155.2	E.
12	01	24	22.0	Central Chile–Argentina border. Felt at Santiago. Depth about 100 km.	29.7	S.	71.7	W.
12	02	49	33.4	Off west coast of Mexico. Depth about 57 km. Mag. 5¼–5½ (Brk.).	17.4	N.	107.3	W.
12	04	09	03.3	Solomon Islands. Depth about 64 km	5.3	S.	155.4	E.
12	12	09	10.7	Off west coast of Mexico. Depth about 64 km	19.2	N.	107.1	W.
12	14	59	16.8	Off coast of Oregon. Depth about 19 km	43.8	N.	129.0	W.
12	23	21	42.5	Tonga Islands region. Depth about 113 km. Mag. 6¼–6½ (Brk)	28.4	S.	176.0	W.
13	04	36	57.1	Aroe Islands region. Depth about 60 km	4.8	S.	134.7	E.
13	04	51	13.9	New Britain. Depth about 25 km	5.2	S.	153.3	E.
13	07	43	25.9	Tonga Islands region. Depth about 449 km	25.4	S.	179.5	W.
13	08	03	43.9	Off west coast of Mexico. Depth about 49 km. Mag. 6¼–6½	19.2	N.	107.3	W.
13	09	16	26.5	Kermadec Islands region. Depth about 25 km	29.3	S.	178.5	W.
13	10	06	56.0	New Britain region. Depth about 75 km	5.5	S.	146.7	E.
13	15	31	56.0	Dodecanese Islands. Depth about 25 km	35.8	N.	26.6	E.
13	19	17	16.0	Crete. Depth about 25 km	34.5	N.	26.6	E.
13	20	35	12.7	Sandwich Islands. Depth about 25 km	56.1	S.	27.3	W.
13	21	16	05.0	Fiji Islands. Depth about 435 km	17.0	S.	177.7	W.
14	01	05	01.8	Off west coast of Hokkaido, Japan. Depth about 147 km	42.9	N.	140.2	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Mar. 14	01	11	55.4	Tonga Islands region. Depth about 60 km	16.9	S.	176.5	W.
14	04	18	08.4	Tonga Islands. Depth about 25 km	19.0	S.	172.6	W.
14	11	58	53.9	Bering Strait. Depth about 78 km	67.8	N.	164.9	W.
14	13	49	37.5	New Hebrides Islands region. Depth about 42 km	22.1	S.	171.9	E.
15	00	58	05.2	New Britain. Depth about 79 km	6.0	S.	151.6	E.
15	10	14	55.5	New Ireland region. Felt at Rabaul. Depth about 21 km. Mag. 6.	3.3	S.	150.6	E.
15	13	01	02.2	New Britain. Felt at Karlai and Rabaul. Depth about 99 km	4.4	S.	152.5	E.
15	16	11	56.8	New Britain region. Depth about 18 km	4.6	S.	153.4	E.
15	16	17	15.3	Volcano Islands. Depth about 55 km	27.7	N.	142.8	E.
16	03	58	00.9	New Hebrides Islands. Depth about 53 km	13.4	S.	165.8	E.
16	04	30	39.0	Kermadec Islands region. Depth about 482 km	25.1	S.	180.0	
16	04	58	00.4	Rat Islands, Aleutian Islands. Depth about 39 km	51.7	N.	176.1	E.
16	07	15	41.7	Soenda Strait. Depth about 135 km	6.6	S.	106.5	E.
16	07	52	39.6	Tonga Islands. Depth about 25 km	19.0	S.	172.7	W.
16	11	19	43.5	Banda Sea. Depth about 77 km	6.4	S.	130.7	E.
16	13	45	35.6	Flores Sea. 2 killed, 6 injured and major property damage at Endeh. Depth about 74 km. Mag. 6½.	8.2	S.	122.0	E.
16	15	26	56.2	Kurile Islands. Depth about 42 km	50.0	N.	154.3	E.
16	18	21	12.2	Flores. Depth about 43 km	8.1	S.	122.0	E.
16	20	05	27.2	Tonga Islands region. Depth about 101 km	23.6	S.	176.0	W.
16	22	33	16.8	Tonga Islands region. Depth about 25 km	23.5	S.	175.8	W.
16	23	12	43.5	Tonga Islands region. Depth about 20 km	23.6	S.	175.5	W.
16	23	31	27.2	Central Peru. Depth about 201 km	10.5	S.	74.9	W.
17	03	39	27.2	Chile-Bolivia border. Depth about 234 km	18.0	S.	69.0	W.
17	04	51	08.9	Flores Sea. Depth about 66 km	8.4	S.	121.9	E.
17	06	09	43.3	Flores Sea. Depth about 25 km	8.3	S.	122.3	E.
17	10	06	28.1	Near coast of Peru. Depth about 60 km	11.1	S.	78.8	W.
17	10	17	35.4	Off coast of central Chile. Depth about 70 km	36.9	S.	74.8	W.
17	13	57	32.5	Tonga Islands region. Depth about 49 km	23.7	S.	176.0	W.
17	14	06	56.4	Tonga Islands region. Depth about 123 km	24.1	S.	175.9	W.
17	20	11	17.4	Tonga Islands region. Depth about 79 km. Mag. 6	24.3	S.	175.6	W.
17	22	40	21.5	Off south coast of Honshu, Japan. Depth about 120 km	34.1	N.	141.0	E.
18	02	08	39.4	Flores Sea. Depth about 25 km	8.5	S.	122.6	E.
18	07	47	51.2	New Britain region. Depth about 157 km	4.8	S.	153.8	E.
18	08	27	02.9	Tonga Islands region. Depth about 25 km	24.3	S.	174.2	W.
18	09	28	35.4	Tonga Islands. Depth about 130 km	20.5	S.	174.2	W.
18	09	40	40.7	Kermadec Islands region. Depth about 385 km	29.0	S.	178.4	W.
18	10	16	51.1	South of Honshu, Japan. Depth about 477 km	29.7	N.	138.6	E.
18	11	37	53.1	Tonga Islands region. Depth about 78 km	17.1	S.	170.5	W.
18	13	16	09.2	Tonga Islands region. Depth about 25 km	16.8	S.	174.2	W.
18	13	55	34.7	Near coast of central Chile. Depth about 53 km	30.4	S.	71.1	W.
18	14	54	59.3	South of New Zealand. Depth about 38 km. Mag. 6¾–7	49.9	S.	163.3	E.
18	17	39	34.3	Off east coast of Mindanao, Philippine Islands. Depth about 63 km.	7.6	S.	126.9	E.
18	20	06	54.5	Off east coast of Formosa. Depth about 25 km	24.4	N.	122.3	E.
19	04	51	54.1	Off east coast of Honshu, Japan. Depth about 48 km	40.2	N.	143.2	E.
19	04	59	19.3	Soenda Strait. Felt at Djakarta. Depth about 120 km	6.4	S.	105.5	E.
19	07	14	57.8	New Hebrides Islands. Depth about 90 km	16.0	S.	168.2	E.
19	07	51	33.4	Molucca Passage. Depth about 59 km	2.1	N.	126.9	E.
19	09	18	50.7	Honshu, Japan. Depth about 75 km	36.8	N.	141.0	E.
19	10	13	15.0	Off coast of central Chile. Depth about 40 km	36.9	S.	75.7	W.
19	12	05	47.7	New Hebrides Islands. Depth about 16 km	16.4	S.	167.3	E.
19	12	47	22.4	Flores Sea. Depth about 46 km	8.4	S.	121.7	E.
19	20	33	55.7	Tonga Islands region. Depth about 39 km	24.1	S.	176.1	W.
20	02	17	34.5	Mariana Islands. Depth about 101 km	21.6	N.	145.8	E.
20	03	30	28.3	Hindu Kush. Depth about 86 km	36.7	N.	71.2	E.
20	06	16	21.1	Off west coast of Nicaragua. Felt at Managua. Depth about 60 km. Mag. 6–6¼.	11.3	N.	86.5	W.
20	11	27	05.4	Luzon, Philippine Islands. Depth about 30 km	16.4	N.	121.5	E.
20	11	38	39.3	Sakhalin Island. Depth about 354 km	46.3	N.	142.7	E.
20	14	00	29.5	Northern India. Depth about 74 km	36.1	N.	77.9	E.
20	15	53	26.1	Tonga Islands. Depth about 178 km. Mag. 6¾	18.4	S.	175.3	W.
20	23	42	36.8	Tonga Islands region. Depth about 25 km. Mag. 6¼	24.1	S.	176.0	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Mar. 21	04	33	53.7	Chile-Bolivia border. Depth about 42 km	21.9	S.	68.0	W.
21	09	22	31.7	South of Fiji Islands. Depth about 595 km	21.8	S.	179.9	W.
21	19	54	44.4	Loyalty Islands region. Depth about 19 km	22.9	S.	171.3	E.
22	04	14	03.4	Solomon Islands. Depth about 41 km	9.0	S.	157.9	E.
22	06	34	06.6	Tonga Islands region. Depth about 25 km	23.3	S.	176.0	W.
22	13	56	59.5	Fiji Islands. Depth about 610 km	18.1	S.	178.3	W.
22	14	19	46.5	Off west coast of Nicaragua. Felt at Managua. Depth about 172 km.	11.8	N.	86.8	W.
22	21	28	41.6	South of Fiji Islands. Depth about 517 km	24.6	S.	179.3	E.
23	01	01	53.4	Italy. Depth about 25 km. Felt	43.5	N.	12.6	E.
23	01	47	38.4	Celebes. Depth about 76 km	0.9	S.	120.2	E.
23	12	53	28.8	Solomon Islands. Depth about 80 km	6.9	S.	155.4	E.
23	20	56	28.3	Solomon Islands. Depth about 69 km	6.3	S.	154.7	E.
24	02	13	14.1	Peru. Depth about 175 km	8.5	S.	74.7	W.
24	05	17	48.0	Solomon Islands. Depth about 159 km	6.0	S.	153.8	E.
24	19	10	39.8	Off northeast coast of Mindanao, Philippine Islands. Depth about 194 km.	9.9	N.	128.5	E.
24	22	57	14.3	Near east coast of Honshu, Japan. Depth about 102 km	35.7	N.	140.9	E.
24	23	37	17.1	Near north coast of New Guinea. Depth about 118 km	2.6	S.	141.9	E.
25	02	10	13.2	Ecuador. Depth about 132 km	2.1	S.	78.7	W.
25	14	14	38.4	Tonga Islands. Depth about 171 km	17.0	S.	175.6	W.
25	16	09	40.4	Near northwest coast of Luzon, Philippine Islands. Depth about 21 km.	16.6	N.	120.3	E.
25	20	58	31.7	South of Madagascar. Depth about 25 km	37.4	S.	50.9	E.
26	01	21	57.4	Luzon, Philippine Islands. Depth about 43 km	16.2	N.	121.1	E.
26	14	29	23.8	Mindanao, Philippine Islands. Depth about 147 km	5.7	N.	126.4	E.
26	20	10	31.7	Unimak Island, Aleutian Islands. Depth about 50 km	55.7	N.	164.0	W.
26	20	10	44.4	Bristol Bay. Depth about 175 km	55.6	N.	163.8	W.
26	20	29	11.9	Off northeast coast of New Guinea. Depth about 66 km	3.6	S.	145.1	E.
26	23	11	38.9	Southern Tibet. Depth about 24 km	30.6	N.	84.4	E.
27	04	22	48.3	Banda Sea. Depth about 43 km	4.8	S.	125.1	E.
27	06	05	50.5	Santa Cruz Islands. Depth about 70 km	11.2	S.	166.2	E.
27	09	00	40.0	Southwestern Nevada. Depth about 24 km. Mag. 4.4	36.6	N.	116.3	W.
27	16	29	52.9	Kermadec Islands. Depth about 514 km	30.7	S.	179.3	E.
27	20	52	39.3	Pacific Ocean, about 700 miles south of Michoacan, Mexico. Depth about 26 km.	8.8	N.	104.2	W.
28	05	59	50.5	Fox Islands, Aleutian Islands. Depth about 49 km	52.8	N.	167.7	W.
28	09	35	55.4	Northern Celebes. Depth about 83 km. Mag. 6¾–7	0.2	N.	123.6	E.
28	12	29	12.7	Andreanof Islands, Aleutian Islands. Depth about 60 km. Mag. 6¼.	51.7	N.	176.2	W.
28	13	13	03.5	Celebes. Depth about 75 km	0.4	S.	123.3	E.
28	13	43	23.6	Solomon Islands. Depth about 89 km	10.1	S.	161.0	E.
28	13	58	58.8	Andreanof Islands, Aleutian Islands. Depth about 89 km	52.0	N.	176.0	W.
28	15	23	38.3	Molucca Passage. Depth about 120 km	2.4	N.	126.1	E.
28	20	54	40.3	Flores. Depth about 76 km	8.7	S.	121.9	E.
28	21	01	56.2	Chile-Bolivia border. Felt at Antofagasta. Depth about 125 km. Mag. 6.	22.1	S.	68.0	W.
[illegible]								
29	06	43	43.3	Near east coast of Honshu, Japan. Depth about 116 km	33.5	N.	140.9	E.
29	09	35	02.1	Northern Celebes. Depth about 84 km	0.1	N.	123.9	E.
29	18	10	24.4	Near east coast of Honshu, Japan. Depth about 127 km	37.1	N.	141.3	E.
30	01	22	19.1	Northern Celebes. Depth about 159 km	0.3	N.	123.9	E.
30	07	42	59.4	Gulf of California. Depth about 20 km. Mag. 5½ (Pal)	22.0	N.	107.8	W.
30	08	49	45.6	Samoa Islands region. Felt at Apia. Depth about 25 km. Mag. 5¾–6.	15.2	S.	172.8	W.
30	11	06	10.5	Gulf of California. Depth about 37 km	22.2	N.	107.8	W.
30	12	00	12.8	Szechwan Province, China. Depth about 81 km	32.4	N.	103.8	E.
31	05	20	18.3	South of Honshu, Japan. Depth about 280 km	31.2	N.	135.1	E.
31	11	02	34.9	Outer Mongolia. Depth about 25 km	43.7	N.	101.6	E.
31	23	18	51.3	La Rioja Province, Argentina. Depth about 35 km	29.7	S.	66.4	W.
Apr. 1	02	40	43.8	South of Honshu, Japan. Depth about 135 km	30.7	N.	139.7	E.
1	08	08	22.9	Off east coast of Kamchatka. Depth about 61 km	50.6	N.	159.7	E.
1	15	18	22.8	Sinkiang Province, China. Depth about 21 km. Mag. 6 (Pal)	39.8	N.	77.7	E.
2	02	44	48.4	South of Honshu, Japan. Depth about 95 km	31.1	N.	139.8	E.
2	11	14	28.1	Peru. Depth about 115 km	8.6	S.	75.0	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Apr. 2	12 52 10.6	Southern Iran. Depth about 33 km	26.9 N.	55.1 E.
2	13 00 29.0	Near coast of Sumatra. Depth about 33 km	1.4 S.	101.0 E.
2	14 46 08.3	Easter Island region. Depth about 33 km	24.5 S.	114.9 W.
2	17 18 52.5	Celebes. Depth about 139 km	0.5 S.	123.2 E.
2	18 47 17.5	Near north coast of New Guinea. Depth about 33 km	0.3 S.	132.9 E.
2	22 18 38.2	Macquarie Islands region. Depth about 33 km	57.2 S.	148.1 E.
3	01 10 32.2	Colombia. Depth about 221 km	6.8 N.	72.9 W.
3	02 43 49.9	Near east coast of Kamchatka. Depth about 20 km	53.5 N.	161.5 E.
3	07 06 33.6	Celebes. Depth about 205 km	0.0	123.9 E.
3	07 55 47.1	North of Swan Island, Caribbean Sea. Depth about 33 km	17.6 N.	83.6 W.
3	16 32 04.3	Near east coast of Kamchatka. Depth about 38 km	52.7 N.	158.9 E.
4	01 18 01.0	Sinkiang Province, China. Depth about 35 km	39.9 N.	78.0 E.
4	01 26 07.9	Sinkiang Province, China. Depth about 33 km	39.9 N.	78.1 E.
4	04 59 19.7	Near north coast of New Guinea. Depth about 26 km	2.7 S.	138.1 E.
4	07 38 50.2	Ryukyu Islands. Depth about 48 km	27.1 N.	125.8 E.
4	07 47 48.1	Fiji Islands region. Depth about 276 km	19.7 S.	177.1 W.
4	09 46 36.6	Sinkiang Province, China. Depth about 16 km. Mag. 6 (Pal)	40.3 N.	77.8 E.
4	10 35 08.3	New Britain. Felt. Depth about 70 km	5.8 S.	149.5 E.
4	11 59 08.8	Persian Gulf. Depth about 25 km	30.3 N.	50.5 E.
4	22 42 51.0	Near coast of Norway. Depth about 44 km	61.5 N.	4.3 E.
5	04 42 00.1	Near east coast of Luzon, Philippine Islands. Depth about 99 km	15.1 N.	123.5 E.
5	06 47 06.6	Sinkiang Province, China. Depth about 33 km	39.9 N.	78.1 E.
5	18 17 06.8	do	39.8 N.	77.8 E.
5	21 30 04.3	Macquarie Islands region. Depth about 33 km	52.7 S.	159.0 E.
6	01 33 46.9	Sinkiang Province, China. Depth about 33 km	40.1 N.	77.8 E.
6	03 18 28.1	Kurile Islands. Depth about 26 km	44.5 N.	148.1 E.
6	04 04 46.0	Off coast of northern California. Felt in Humboldt County. Mag. 5.	40.1 N.	124.8 W.
6	14 05 00.3	Near coast of Sumatra. Depth about 25 km	2.2 N.	97.2 E.
6	15 33 38.6	Loyalty Islands region. Depth about 121 km	20.4 S.	169.4 E.
6	18 12 40.7	Iran. Depth about 36 km	27.9 N.	56.7 E.
6	19 32 34.3	Santa Cruz Islands. Depth about 106 km	11.5 S.	166.0 E.
6	21 23 59.2	About 300 km. north of Socotra. Depth about 33 km	15.3 N.	54.0 E.
6	22 26 29.6	Near coast of Sumatra. Depth about 25 km	1.9 N.	96.5 E.
7	04 40 35.9	Hindu Kush region. Depth about 29 km	36.4 N.	71.0 E.
7	04 52 40.0	Hindu Kush region. Depth about 60 km	36.3 N.	70.7 E.
7	05 50 40.6	Hebgen Lake, Mont. Felt in Madison County. Depth about 25 km.	45.0 N.	112.0 W.
7	06 45 27.9	Indian Ocean. Depth about 71 km	0.7 S.	68.1 E.
7	08 35 54.9	Near south coast of Kamchatka. Depth about 33 km	51.3 N.	156.7 E.
7	10 06 49.5	Near coast of Sumatra. Depth about 25 km	0.3 S.	97.0 E.
7	17 37 09.9	Fiji Islands region. Depth about 327 km	19.4 S.	177.2 W.
7	19 54 56.8	Near east coast of Kamchatka. Depth about 42 km	57.3 N.	163.6 E.
7	21 17 45.2	Kirghiz-Tadzhik S.S.R. border. Felt at Tashkent. Depth about 34 km.	39.5 N.	73.2 E.
8	03 06 49.9	Near coast of Ecuador. Depth about 25 km	2.6 S.	81.0 W.
8	04 22 08.7	Ecuador. Several injured and extensive property damage in southern Chimborazo Province. Depth about 25 km.	2.2 S.	79.2 W.
8	04 47 01.8	Ecuador. Depth about 25 km	2.2 S.	79.2 W.
8	09 03 48.9	Ecuador. Depth about 24 km	2.1 S.	79.1 W.
8	11 48 35.9	Negros, Philippine Islands. Depth about 62 km	10.0 N.	122.1 E.
8	15 59 46.9	New Hebrides Islands region. Felt at Port Vila. Depth about 38 km.	18.4 S.	168.3 E.
8	17 59 46.7	Chile. Depth about 60 km. Mag. 6½	38.4 S.	72.7 W.
8	19 18 54.9	Honshu, Japan. Depth about 153 km	38.1 N.	140.3 E.
8	21 36 41.6	Mariana Islands region. Depth about 105 km. Mag. 6½	14.9 N.	145.1 E.
9	00 29 51.7	Mariana Islands region. Depth about 118 km	14.7 N.	145.3 E.
9	07 23 16.0	San Benito County, Calif. Moderate property damage at and near Hollister. Mag. 5.6.	36 41 N.	121 18 W.
9	07 25 41.0	San Benito County, Calif. Felt. Mag. 5.5	37 41 N.	121 18 W.
9	08 46 31.3	Fiji Islands region. Depth about 55 km	17.5 S.	176.7 W.
9	09 21 30.9	South of Fiji Islands. Depth about 633 km	26.0 S.	178.4 E.
9	13 20 57.0	South of Honshu, Japan. Depth about 413 km	29.8 N.	138.2 E.
9	15 35 10.4	Near east coast of Formosa. Depth about 33 km. Mag. 6	24.2 N.	122.3 E.
9	17 14 36.9	New Hebrides Islands. Felt at Port Vila. Depth about 130 km	19.0 S.	169.1 E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Apr. 9	17	17	47.6	Chile-Peru border. Depth about 29 km	18.3	S.	70.2	W.
9	19	56	17.8	Mariana Islands region. Depth about 33 km	18.8	N.	147.7	E.
10	06	57	13.6	Near east coast of Formosa. Depth about 22 km	24.3	N.	122.3	E.
10	17	15	47.7	Near east coast of Honshu, Japan. Depth about 60 km	36.4	N.	141.7	E.
10	17	40	27.6	Fiji Islands region. Depth about 576 km	17.3	S.	178.8	W.
10	19	40	18.9	Near coast of New Guinea. Depth about 33 km	0.3	S.	132.9	E.
10	20	40	03.8	About 1,000 km. southwest of Prince Edward Islands. Depth about 33 km.	52.8	S.	27.4	E.
11	00	27	53.3	Fiji Islands. Depth about 432 km	19.3	S.	178.6	W.
11	00	29	40.4	Near east coast of Honshu, Japan. Depth about 28 km	36.2	N.	141.7	E.
11	02	42	25.9	Sinkiang Province, China. Depth about 33 km	40.1	N.	78.9	E.
11	08	57	52.7	Western Idaho. Depth about 33 km	43.4	N.	111.2	W.
11	10	12	48.9	Sinkiang Province, China. Depth about 33 km	39.6	N.	78.4	E.
11	16	11	33.3	Loyalty Islands. Depth about 58 km	22.5	S.	169.9	E.
11	18	32	45.0	Near south coast of Sumbawa. Depth about 33 km	8.8	S.	117.3	E.
11	20	33	48.9	Vancouver Island region. Depth about 25 km	50.2	N.	128.6	W.
12	03	06	53.6	Kermadec Islands region. Depth about 159 km	31.2	S.	178.5	W.
12	07	47	12.3	Northern Celebes. Depth about 69 km	0.1	N.	123.8	E.
12	08	53	51.4	Flores. Depth about 237 km	8.3	S.	119.7	E.
12	09	57	11.4	Kermedec Islands region. Depth about 31 km	28.4	S.	175.9	W.
12	10	42	40.5	Mona Passage. Depth about 33 km	18.7	N.	67.4	W.
12	11	36	44.1	Central Colombia. Depth about 35 km	6.9	N.	73.5	W.
12	15	01	58.8	Kurile Islands. Depth about 33 km	44.8	N.	149.5	E.
12	17	17	55.3	Northern Celebes. Depth about 122 km	0.3	N.	123.8	E.
12	17	27	46.5	Kurile Islands. Depth about 42 km	48.3	N.	154.7	E.
12	17	52	02.0	Mariana Islands region. Depth about 64 km	23.3	N.	142.4	E.
12	22	20	33.6	El Salvador. Minor damage at San Salvador and southern El Salvador. Depth about 122 km. Mag. 5¾–6.	13.2	N.	88.9	W.
13	04	25	58.1	Central Burma. Depth about 25 km	23.0	N.	94.7	E.
13	15	25	57.7	Ryukyu Islands. Depth about 69 km	26.9	N.	127.6	E.
13	16	34	39.1	Sinkiang Province, China. Depth about 19 km. Mag. 6½ (Pal)	40.3	N.	77.8	E.
13	17	12	40.4	Samoa Islands region. Depth about 33 km	15.5	S.	172.8	W.
13	20	13	21.6	Sinkiang Province, China. Depth about 33 km	39.8	N.	77.6	E.
13	21	14	57.2	Kansas-Nebraska border. Felt in north central Kansas and south central Nebraska. Depth about 25 km.	39.9	N.	100.0	W.
13	21	50	31.1	Solomon Islands region. Depth about 145 km	6.7	S.	154.9	E.
13	23	43	04.7	Tucuman Province, Argentina. Depth about 219 km	28.1	S.	67.3	W.
14	04	02	31.2	Kermadec Islands. Depth about 60 km	31.3	S.	178.5	W.
14	12	04	00.8	New Hebrides Islands. Depth about 26 km	14.9	S.	168.2	E.
14	12	41	02.5	Mariana Islands. Depth about 25 km	10.3	N.	143.6	E.
14	18	57	49.9	Near coast of Sumatra. Depth about 33 km	57.7	S.	103.5	E.
15	00	14	45.9	Near east coast of Honshu, Japan. Depth about 56 km	34.2	N.	141.6	E.
15	01	18	12.3	New Hebrides Islands. Depth about 197 km	13.2	S.	167.1	E.
15	02	55	32.8	Sinkiang Province, China. Depth about 25 km	40.2	N.	77.6	E.
15	09	36	24.4	Kermadec Islands. Depth about 131 km	32.4	S.	178.9	W.
15	10	37	40.7	Off west coast of Luzon, Philippine Islands. Depth about 58 km	15.0	N.	119.3	E.
16	05	02	39.3	Central Utah. Felt in Sanpete County. Minor damage at Mt. Pleasant. Depth about 35 km.	39.3	N.	111.5	W.
16	06	17	21.3	South of Honshu, Japan. Depth about 387 km	30.1	N.	138.8	E.
16	10	17	46.5	Paraguay Province, Argentina. Depth about 176 km	22.7	S.	61.8	W.
16	11	40	56.2	Kamchatka. Depth about 160 km	53.4	N.	158.5	E.
16	12	05	53.8	New Ireland region. Depth about 109 km	3.5	S.	149.5	E.
16	12	22	47.1	Vancouver Island region. Depth about 33 km	51.7	N.	130.7	W.
16	23	12	52.2	New Britain region. Depth about 64 km	3.5	S.	149.5	E.
17	02	32	28.2	Central Chile-Argentina border. Depth about 147 km	32.0	S.	69.8	W.
17	04	37	19.6	Fiji Islands. Depth about 489 km	20.4	S.	177.8	W.
17	07	45	27.6	Tonga Islands region. Depth about 288 km	16.2	S.	175.1	W.
17	13	08	18.2	South of Honshu, Japan. Depth about 123 km	30.8	N.	142.2	E.
17	16	21	10.2	Mid-Atlantic Ocean. Depth about 25 km	3.9	N.	31.5	W.
17	20	35	10.4	Chile-Bolivia border. Depth about 119 km	20.9	S.	68.4	W.
17	20	48	12.5	Fiji Islands. Depth about 549 km	21.4	S.	178.6	W.
18	02	39	40.8	Samoa Islands. Depth about 60 km	13.8	S.	172.2	W.
18	04	10	36.4	Kermadec Islands. Depth about 25 km	33.2	S.	179.6	W.
18	04	14	13.0	Mariana Islands. Depth about 38 km	13.1	N.	146.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Apr. 18	08	26	54.8	Kurile Islands. Depth about 25 km	44.8	N.	150.1	E.
18	13	44	06.7	Banda Sea. Depth about 33 km	6.4	S.	131.4	E.
18	18	49	25.1	Near coast of southern Chile. Depth about 33 km	38.7	S.	73.3	W.
18	22	04	20.2	Near coast of Sumatra. Depth about 33 km	1.9	S.	99.3	E.
19	01	39	21.8	Guatemala. Depth about 98 km	14.1	N.	90.5	W.
19	03	43	15.3	Sawoe Sea. Depth about 33 km	9.2	S.	123.4	E.
19	05	57	15.8	New Ireland region. Depth about 114 km	5.0	S.	152.5	E.
19	06	57	28.1	East Pakistan. Depth about 33 km	30.3	N.	70.4	E.
19	07	39	07.9	New Hebrides Islands. Depth about 33 km	18.1	S.	168.2	E.
19	11	03	55.4	Bolivia. Depth about 106 km	19.6	S.	69.7	W.
19	16	12	28.7	Kurile Islands. Depth about 51 km. Mag. 5¼ (Pal)	44.4	N.	148.0	E.
19	18	13	56.4	Kamchatka. Depth about 38 km	55.3	N.	163.6	E.
19	20	19	46.4	Kurile Islands. Depth about 27 km. Mag. 5¼–5½ (Pal)	44.8	N.	150.2	E.
19	22	07	51.2	Kurile Islands. Depth about 34 km	45.1	N.	149.5	E.
20	00	15	12.5	Banda Sea. Depth about 285 km	5.6	S.	128.7	E.
20	05	44	34.7	Kurile Islands. Depth about 61 km	50.2	N.	155.4	E.
20	13	19	37.3	Near Islands, Aleutian Islands. Depth about 33 km	52.6	N.	172.1	E.
20	14	15	27.7	Kamchatka. Depth about 25 km	54.9	N.	159.6	E.
20	19	19	29.7	Kermadec Islands region. Depth about 58 km	33.1	S.	178.8	W.
20	21	39	10.3	South of Samoa Islands. Felt in Apia. Depth about 33 km. Mag. 6–6¼.	15.2	S.	173.5	W.
21	02	50	41.7	Banda Sea. Depth about 118 km	6.9	S.	129.0	E.
21	14	46	10.0	Near east coast of Kamchatka. Depth about 70 km	55.1	N.	159.6	E.
21	19	30	39.3	Kurile Islands. Depth about 25 km	48.2	N.	154.9	E.
21	20	10	38.3	Kurile Islands. Depth about 27 km	47.9	N.	154.6	E.
21	21	26	42.1	Andreanof Islands, Aleutian Islands. Depth about 36 km. Mag. 5½–5¾ (Pal).	51.9	N.	173.9	W.
22	10	36	10.2	Kermadec Islands. Depth about 97 km	31.4	S.	177.4	W.
22	18	59	23.2	New Britain region. Depth about 91 km	3.5	S.	150.1	E.
22	19	01	34.4	Near coast of Ecuador. Depth about 30 km	2.8	S.	80.8	W.
23	05	14	21.2	Ryukyu Islands. Depth about 33 km	25.9	N.	129.9	E.
23	09	01	41.8	Kurile Islands. Depth about 44 km. Mag. 6¼	44.8	N.	150.2	E.
23	12	17	56.7	Kurile Islands. Depth about 33 km	44.9	N.	150.1	E.
23	14	55	22.0	Kurile Islands. Depth about 29 km	44.7	N.	150.4	E.
23	16	32	15.6	Kurile Islands. Depth about 33 km	44.4	N.	150.4	E.
23	16	51	02.5	----do----	44.8	N.	150.0	E.
23	20	43	10.8	Fox Islands, Aleutian Islands. Depth about 33 km	52.0	N.	171.2	W.
23	22	04	16.2	Bonin Islands. Depth about 454 km	28.6	N.	140.3	E.
24	03	10	24.0	Kurile Islands. Depth about 33 km	45.1	N.	150.7	E.
24	04	52	29.3	Fox Islands, Aleutian Islands. Depth about 57 km	52.4	N.	173.1	W.
24	12	27	37.9	Kurile Islands. Depth about 33 km	44.8	N.	150.3	E.
24	13	09	51.8	Kermadec Islands. Depth about 25 km	29.4	S.	176.7	W.
25	00	28	13.2	Kurile Islands. Depth about 44 km	44.9	N.	150.2	E.
25	01	17	39.0	Kurile Islands. Depth about 33 km	44.7	N.	150.2	E.
25	02	31	37.2	Celebes region. Depth about 85 km	0.0		123.7	E.
25	09	42	07.1	Western Venezuela. Depth about 29 km	8.8	N.	70.7	W.
25	11	16	41.4	Kermadec Islands region. Depth about 45 km. Mag. 5½–5¾ (Pal).	32.9	S.	178.5	W.
25	23	40	34.3	Ryukyu Islands. Depth about 25 km	28.1	N.	129.3	E.
26	00	38	07.9	Kurile Islands. Depth about 33 km	44.7	N.	150.0	E.
26	02	21	10.5	Southern Sumatra. Depth about 93 km	5.6	S.	105.6	E.
26	05	23	24.1	Hindu Kush. Depth about 235 km	36.4	N.	71.4	E.
26	06	20	23.5	New Britain. Depth about 34 km	5.7	S.	151.1	E.
26	07	22	52.2	Fiji Islands region. Depth about 622 km	21.9	S.	179.5	W.
26	07	38	54.1	Kurile Islands. Depth about 20 km. Mag. 6 (Brk)	44.8	N.	149.9	E.
26	11	46	46.8	India-Burma border. Depth about 211 km	25.3	N.	95.4	E.
26	12	03	48.6	About 400 km southeast of Socotra. Depth about 33 km	9.8	N.	57.0	E.
26	12	18	32.0	About 1,000 km north of Galapagos Islands. Depth about 33 km	8.8	N.	91.1	W.
26	16	53	29.4	Celebes. Depth about 135 km	0.2	N.	124.1	E.
26	19	32	33.6	Kurile Islands. Depth about 26 km	44.9	N.	150.2	E.
27	00	25	48.7	Fiji Islands region. Depth about 504 km	25.5	S.	180.0	W.
27	17	52	14.2	Peru. Felt at Lima. Depth about 83 km	13.2	S.	75.1	W.
27	20	04	05.4	New Hebrides Islands. Depth about 33 km	19.2	S.	169.0	E.
27	20	24	35.1	Honshu, Japan. Depth about 63 km	36.5	N.	141.0	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Apr. 28	01 02 52.2	Monterey County, Calif. Felt in Hollister area and Cienega District. Mag. 4.0.	36.3 N.	121.6 W.
28	06 56 26.6	Iran. Depth about 20 km	31.2 N.	57.2 E.
28	08 40 26.5	Bolivia-Argentina border. Depth about 82 km	22.0 S.	62.9 W.
28	08 42 55.9	Southern Bolivia. Depth about 132 km	21.9 S.	68.0 W.
28	20 36 25.3	Fiji Islands. Depth about 595 km	17.8 S.	178.7 W.
28	22 13 02.8	Mariana Islands. Depth about 219 km	18.9 N.	144.9 E.
29	06 44 08.0	About 2,000 km south of Australia. Depth about 22 km	50.1 S.	126.7 E.
29	09 19 28.0	Off coast of northern California. Depth about 26 km. Mag. 5.5	40.6 N.	127.5 W.
29	09 29 09.5	Jan Mayen Island region. Depth about 14 km. Mag. 5½–5¾ (Pal).	71.4 N.	7.4 W.
29	10 45 42.2	Outer Mongolia. Depth about 33 km	41.7 N.	104.7 E.
29	11 10 20.0	Gulf of California. Depth about 16 km. Mag. 4.4	30.0 N.	114.4 W.
29	22 39 44.7	Ceram Sea. Depth about 33 km	3.0 S.	130.1 E.
30	00 10 22.9	About 2,000 km southwest of Australia. Depth about 33 km	49.5 S.	117.1 E.
30	07 33 53.5	About 1,000 km south of Greenland. Depth about 38 km. Mag. 5½–5¾ (Pal).	52.1 N.	31.9 W.
30	11 00 39.3	Kurile Islands. Depth about 33 km	45.3 N.	150.1 E.
30	11 15 19.8	Kurile Islands. Depth about 70 km. Mag. 5½–5¾ (Pal)	44.8 N.	149.7 E.
30	14 48 11.5	Samoa Islands region. Depth about 25 km. Mag. 5¾–6 (Pal)	15.4 S.	174.4 W.
30	17 30 38.6	Off coast of northern California. Depth about 44 km	40.9 N.	127.2 W.
30	18 35 18.9	Off coast of northern California. Depth about 33 km	40.7 N.	127.5 W.
30	21 45 48.8	Honshu, Japan. Depth about 33 km	37.2 N.	140.4 E.
May 1	00 42 07.2	Near east coast of Honshu, Japan. Depth about 52 km	35.6 N.	141.3 E.
1	01 37 39.2	Eastern Iran. Depth about 33 km	35.0 N.	59.0 E.
1	02 41 39.4	Off coast of northern California. Depth about 32 km	40.8 N.	127.6 W.
1	02 50 48.7	Off coast of northern California. Depth about 33 km	40.7 N.	127.5 W.
1	03 23 51.3	Off coast of northern California. Depth about 25 km	40.8 N.	127.5 W.
1	03 45 04.1	Tonga Islands. Depth about 25 km	18.8 S.	174.3 W.
1	07 21 25.8	Off coast of northern California. Depth about 33 km	40.9 N.	127.5 W.
1	07 45 09.6	Kurile Islands. Depth about 25 km	45.6 N.	149.6 E.
1	10 07 29.7	Off coast of northern California. Depth about 33 km	41.1 N.	127.0 W.
1	11 06 26.0	Molucca Passage. Depth about 135 km	2.8 N.	127.5 E.
1	12 19 05.6	Off coast of northern California. Depth about 29 km	40.8 N.	127.5 W.
1	12 57 14.1	Off coast of northern California. Depth about 33 km	41.0 N.	126.5 W.
1	18 45 27.2	——do——	40.8 N.	127.3 W.
1	21 30 02.3	Off coast of northern California. Depth about 16 km	40.9 N.	126.5 W.
2	00 46 45.2	Tonga Islands. Depth about 33 km	18.7 S.	173.3 W.
2	01 28 59.1	Off coast of northern California. Depth about 29 km	41.1 N.	127.3 W.
2	01 30 42.1	Fiji Islands. Depth about 608 km	17.4 S.	178.7 W.
2	03 11 45.7	Jan Mayen Island region. Depth about 22 km	71.3 N.	6.9 W.
2	06 26 17*	Baja California. Felt in San Diego. Mag. 4.5	31 57 N.	115 40 W.
2	06 42 42.0	New Britain region. Depth about 81 km	5.3 S.	151.5 E.
2	09 57 44.1	Kurile Islands. Depth about 90 km	45.5 N.	148.9 E.
2	10 10 32.3	Off coast of northern California. Depth about 36 km	40.9 N.	127.2 W.
2	11 18 05.2	Kurile Islands. Depth about 50 km	44.4 N.	149.6 E.
2	11 18 50.2	Chiapas, Mexico. Depth about 67 km	16.3 N.	93.8 W.
2	18 50 57.5	Samoa Islands region. Depth about 71 km	15.3 S.	173.1 W.
2	19 38 13.5	Kermadec Islands region. Depth about 53 km	28.0 S.	176.4 W.
2	19 39 38.2	Kermadec Islands region. Depth about 77 km	27.7 S.	176.7 W.
2	20 49 30.2	Kermadec Islands region. Depth about 43 km	32.9 S.	178.3 W.
2	22 14 21.1	New Hebrides Islands. Depth about 46 km	17.1 S.	167.8 E.
2	22 37 55.5	Off coast of northern California. Depth about 22 km	41.0 N.	127.0 W.
2	22 44 44.3	Kermadec Islands region. Depth about 47 km. Mag. 6¾	28.0 S.	176.5 W.
2	23 23 59.8	Kermadec Islands region. Depth about 33 km	27.8 S.	176.4 W.
3	00 26 19.3	Mid-Atlantic Ocean. Depth about 33 km	0.8 N.	26.3 W.
3	08 48 52.9	Off coast of northern California. Depth about 25 km	40.8 N.	127.6 W.
3	08 56 28.3	Kurile Islands. Depth about 20 km	45.3 N.	150.1 E.
3	09 26 01.6	Off coast of northern California. Depth about 33 km	40.7 N.	128.1 W.
3	12 16 46.7	Fox Islands, Aleutian Islands. Depth about 47 km	51.9 N.	168.3 W.
3	13 10 04.0	Near coast of Luzon, Philippine Islands. Depth about 25 km	18.5 N.	122.2 E.
3	14 03 06.8	Near coast of Mexico. Depth about 33 km	17.7 N.	103.6 W.
3	16 54 11.4	Kermadec Islands region. Depth about 49 km	28.0 S.	176.1 W.
3	17 03 06.2	Kermadec Islands region. Depth about 60 km	28.1 S.	176.4 W.

See footnote at end of table

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 3	19	00	40.7	Kermadec Islands region. Depth about 44 km	27.9	S.	176.0	W.
4	02	17	34.0	Off coast of northern California. Depth about 25 km	40.8	N.	127.1	W.
4	03	33	03.5	Fiji Islands. Depth about 601 km	18.0	S.	178.5	W.
4	06	46	37.6	North Atlantic Ocean. Depth about 33 km	18.3	N.	46.6	W.
4	07	00	32.9	North Atlantic Ocean. Depth about 19 km	17.8	N.	46.4	W.
4	10	29	18.3	Tonga Islands. Depth about 25 km	20.7	S.	174.1	W.
4	15	23	17.3	Near coast of Sumatra. Depth about 41 km	0.6	S.	98.8	E.
4	17	46	25.4	Molucca Passage. Depth about 25 km	5.0	N.	127.6	E.
4	20	20	36.5	Near coast of northern Peru. Depth about 49 km	5.1	S.	81.0	W.
4	20	36	42.4	Off coast of northern California. Depth about 33 km	41.3	N.	127.0	W.
4	20	59	07.8	----do----	40.7	N.	127.5	W.
5	06	39	06.3	Keramdec Islands region. Depth about 50 km	28.0	S.	176.3	W.
5	08	44	15.7	Kermadec Islands region. Depth about 42 km	27.5	S.	176.4	W.
5	12	30	20.7	Jan Mayen Island region. Depth about 33 km	72.1	N.	4.3	W.
5	13	07	53.3	Off coast of northern California. Depth about 36 km	40.7	N.	127.1	W.
5	13	43	21.7	Kermadec Islands region. Depth about 64 km. Mag. 6¼	27.8	S.	176.2	W.
5	14	52	33.6	Yellowstone National Park, Wyo. Depth about 26 km	44.8	N.	110.2	W.
5	15	28	50.7	Kermadec Islands region. Depth about 60 km	27.5	S.	176.1	W.
5	17	41	21.1	Solomon Islands region. Depth about 73 km	8.0	S.	161.0	E.
5	19	02	14.7	Kermadec Islands region. Depth about 35 km	27.8	S.	176.0	W.
5	19	31	03.5	Sinkiang Province, China. Depth about 33 km	41.3	N.	78.3	E.
5	20	37	14.3	Kermadec Islands region. Depth about 59 km	27.6	S.	176.4	W.
5	20	46	59.3	Kermadec Islands region. Depth about 50 km	28.1	S.	176.2	W.
6	03	55	23.3	Chile-Bolivia border. Depth about 247 km	20.0	S.	68.5	W.
6	16	04	33.1	Off coast of Tunisia. Depth about 30 km	37.6	N.	11.2	E.
6	16	12	20.7	Utah. Felt. Depth about 25 km	39.6	N.	110.2	W.
6	19	13	08.2	Western Colombia. Depth about 71 km	2.8	N.	76.2	W.
6	19	38	04.6	Mid-Atlantic Ocean. Depth about 24 km	1.2	S.	15.5	W.
6	21	16	34.3	Near coast of Mindanao, Philippine Islands. Depth about 93 km	6.3	N.	126.4	E.
6	22	03	24.5	Yellowstone National Park, Wyo. Depth about 36 km	44.8	N.	110.2	W.
6	22	25	05.5	Andreanof Islands, Aleutian Islands. Depth about 20 km	49.7	N.	176.5	W.
6	22	32	49.7	Near coast of Mindanao, Philippine Islands. Depth about 110 km	6.3	N.	126.3	E.
6	23	13	25.2	New Hebrides Islands. Depth about 33 km	17.4	S.	167.9	E.
6	23	40	54.7	Macquarie Islands region. Depth about 21 km	51.7	S.	161.3	E.
7	00	25	38.1	Solomon Islands region. Depth about 71 km. Mag. 6½-6¾	6.0	S.	154.5	E.
7	00	59	06.3	Kurile Islands. Depth about 37 km	44.5	N.	149.4	E.
7	01	57	02.4	North Atlantic Ocean. Depth about 25 km	8.3	N.	38.0	W.
7	02	43	58.5	North Atlantic Ocean. Depth about 46 km	8.2	N.	38.1	W.
7	04	22	19.5	Revilla Gigedo Islands region. Depth about 20 km	20.1	N.	108.9	W.
7	04	32	14.5	Near coast of Java. Depth about 113 km	8.6	S.	111.4	E.
7	04	34	11.8	Kurile Islands. Depth about 67 km	44.6	N.	149.2	E.
7	04	36	31.3	Tonga Islands. Depth about 50 km	20.3	S.	175.1	W.
7	06	03	03.3	Off coast of northern California. Depth about 32 km	40.8	N.	127.0	W.
7	09	01	26.4	Off coast of northern California. Depth about 25 km	40.8	N.	127.8	W.
7	10	22	43.7	Off coast of Mindanao, Philippine Islands. Depth about 89 km	5.8	N.	126.8	E.
7	12	14	17.1	Honshu, Japan. Felt. Depth about 34 km	35.0	N.	134.4	E.
7	12	20	03.3	Honshu, Japan. Felt. Depth about 33 km	35.0	N.	134.3	E.
7	13	22	04.8	North Atlantic Ocean. Depth about 39 km	16.1	N.	46.9	W.
7	14	50	54.8	New Britain region. Depth about 76 km	5.3	S.	151.2	E.
7	15	26	30.8	Off coast of northern California. Depth about 33 km	40.9	N.	127.2	W.
7	15	40	53.4	Jan Mayen Island region. Depth about 33 km	71.6	N.	6.3	W.
7	16	19	05.9	Off coast of northern California. Depth about 31 km	40.6	N.	127.2	W.
7	17	45	54.6	Tonga Islands. Depth about 33 km	21.1	S.	174.0	W.
7	19	22	47.5	New Hebrides Islands. Depth about 33 km	17.7	S.	168.0	E.
7	21	58	44.1	Kodiak Island region. Depth about 25 km	56.6	N.	155.8	W.
7	22	40	44.2	Solomon Islands region. Depth about 171 km	7.0	S.	154.8	E.
8	01	54	17.1	San Juan Province, Argentina. Depth about 84 km	31.5	S.	67.4	W.
8	08	24	45.7	Near coast of western New Guinea. Depth about 41 km	3.4	S.	135.6	E.
8	09	53	20.3	Kurile Islands. Depth about 33 km	44.5	N.	148.4	E.
8	12	43	43.4	Off coast of northern California. Depth about 35 km	41.2	N.	127.3	W.
8	14	24	48.6	Kermadec Islands region. Depth about 67 km	28.1	S.	176.2	W.
8	16	26	52.2	New Hebrides Islands. Depth about 206 km	14.6	S.	167.5	E.
8	18	32	03.5	Peru. Depth about 60 km	10.9	S.	75.1	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 8	19	23	35.4	Northern Chile. Felt at Antofagasta. Depth about 48 km. Mag. 5¼ (Pal).	24.5	S.	69.7	W.
8	22	45	50.0	Italy. Felt. Depth about 21 km	44.0	N.	11.8	E.
8	22	52	05.2	Northern Celebes. Depth about 88 km	0.2	N.	123.5	E.
8	23	58	56.2	Off coast of Oregon. Depth about 32 km	43.9	N.	127.9	W.
9	02	19	53.0	Revilla Gegido Islands region. Depth about 33 km	19.5	N.	109.0	W.
9	08	16	05.9	Kermadec Islands region. Depth about 50 km	28.0	S.	176.3	W.
9	09	18	08.6	Tonga Islands. Depth about 33 km	22.9	S.	175.3	W.
9	11	06	26.2	Solomon Islands region. Depth about 110 km	6.2	S.	154.5	E.
9	11	48	58.5	Near coast of Java. Depth about 99 km	6.9	S.	106.9	E.
9	12	03	06.7	Off coast of northern California. Depth about 33 km	40.7	N.	127.0	W.
9	12	06	28.5	Off coast of northern California. Depth about 46 km	41.0	N.	127.2	W.
9	13	25	29.8	Western New Guinea. Depth about 63 km	3.6	S.	136.8	E.
9	17	27	44.9	Near coast of Luzon, Philippine Islands. Depth about 18 km	13.9	N.	120.0	E.
10	06	15	15.9	Loyalty Islands region. Depth about 104 km	19.3	S.	169.3	E.
10	08	55	59.9	Venezuela. Felt. Depth about 43 km	9.2	N.	71.2	W.
10	10	05	13.7	Samoa Islands region. Depth about 52 km	15.9	S.	172.3	W.
11	00	51	32.0	Near coast of Java. Depth about 96 km	8.3	S.	112.6	E.
11	04	59	29.8	Off coast of northern California. Depth about 33 km	40.8	N.	127.2	W.
11	05	26	37.0	Fiji Islands. Depth about 465 km	19.0	S.	177.9	W.
11	07	11	47.9	Near coast of New Guinea. Depth about 122 km	6.4	S.	146.5	E.
11	08	38	27.1	Near coast of Chile. Depth about 47 km. Mag. 6¼–6½	37.4	S.	73.6	W.
11	12	55	19.3	Bonin Islands. Depth about 33 km	27.4	N.	143.8	E.
11	13	25	42.3	Kurile Islands. Depth about 32 km	43.7	N.	148.8	E.
11	13	36	37.8	Kurile Islands. Depth about 58 km	44.2	N.	148.9	E.
11	18	48	50.7	Off coast of northern California. Depth about 43 km. Mag. 4½ (Brk).	40.9	N.	127.3	W.
12	03	40	20.1	Near coast of Sumatra. Depth about 81 km	0.0		97.9	E.
12	04	44	28.6	Kermadec Islands region. Depth about 60 km	27.9	S.	176.2	W.
12	06	26	00.4	Santa Cruz Islands. Depth about 100 km	11.8	S.	167.3	E.
12	06	29	07.5	Kurile Islands. Depth about 38 km	47.1	N.	152.6	E.
12	06	29	24.3	Gulf of California. Depth about 45 km	30.4	N.	113.1	W.
12	06	47	24.0	Ryukyu Islands. Depth about 65 km	24.5	N.	125.6	E.
12	07	24	07.6	Kermadec Islands region. Depth about 35 km	28.3	S.	176.4	W.
12	12	57	36.3	Chile-Bolivia border. Depth about 120 km	22.8	S.	68.7	W.
12	16	47	41.7	West Caroline Islands region. Depth about 136 km	11.6	N.	141.5	E.
12	17	36	59.9	Off coast of northern California. Depth about 27 km. Mag. 4½ (Brk).	40.8	N.	127.4	W.
12	21	26	39.3	Fiji Islands. Depth about 600 km	19.4	S.	179.1	E.
12	21	50	10.3	Off coast of northern California. Depth about 33 km	41.2	N.	127.1	W.
13	04	52	46.7	Halmahera region. Depth about 154 km	3.2	N.	128.6	E.
13	05	43	16.1	Off coast of northern California. Depth about 25 km	41.1	N.	127.6	W.
13	07	48	23.3	Near coast of Chile. Felt. Depth about 40 km	37.1	S.	72.1	W.
13	08	47	36.7	Off coast of northern California. Depth about 43 km. Mag. 4½ (Brk).	40.8	N.	127.6	W.
13	12	45	09.2	Near coast of El Salvador. Felt in southern El Salvador. Depth about 33 km.	12.4	N.	89.0	W.
13	13	41	48.1	Kermadec Islands region. Depth about 32 km	28.0	S.	176.2	W.
13	14	17	30.0	Kermadec Islands region. Depth about 50 km	28.0	S.	176.6	W.
13	14	18	47.0	——do——	28.0	S.	176.3	W.
13	14	52	55.3	Fiji Islands. Depth about 556 km	17.6	S.	178.8	W.
13	15	49	33.3	Off coast of Hokkaido, Japan. Depth about 41 km	43.5	N.	147.9	E.
13	17	20	12.7	Mariana Islands region. Depth about 43 km	13.2	N.	143.9	E.
13	18	45	44.9	Off coast of northern California. Depth about 25 km	41.2	N.	127.0	W.
13	19	19	37.3	East China Sea. Depth about 261 km	25.5	N.	122.6	E.
13	19	48	29.8	Guerrero, Mexico. Depth about 109 km	18.1	N.	100.4	W.
14	00	12	33.6	North Island, New Zealand. Minor damage on North Island. Depth about 40 km.	39.8	S.	176.8	E.
14	02	43	22.7	Kermadec Islands region. Depth about 47 km	28.1	S.	176.3	W.
14	03	04	10.0	Sumatra. Depth about 83 km	4.1	S.	104.3	E.
14	08	21	23.4	Tonga Islands. Depth about 33 km	21.0	S.	174.3	W.
14	10	25	09.6	Banda Sea. Depth about 60 km	7.1	S.	128.0	E.
14	12	24	36.8	New Guinea. Depth about 79 km	6.3	S.	146.2	E.
14	12	48	30.9	Fiji Islands region. Depth about 620 km	22.1	S.	179.5	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 14	13	20	02.9	Tonga Islands region. Depth about 95 km	16.8	S.	173.9	W.
14	15	08	05.6	North of Iceland. Depth about 33 km	67.5	N.	18.4	W.
14	15	38	07.5	North of Iceland. Depth about 23 km	67.8	N.	18.4	W.
14	19	31	34.4	Off coast of northern California. Depth about 45 km. Mag. 4½ (Brk).	41.0	N.	127.4	W.
15	04	32	48.1	Off coast of northern California. Depth about 33 km	41.1	N.	127.4	W.
15	11	13	46.8	Flores Sea. Depth about 248 km	7.1	S.	122.3	E.
15	19	12	10.8	New Hebrides Islands. Felt at Santo. Depth about 58 km	15.4	S.	166.6	E.
15	19	49	14.1	New Hebrides Islands. Felt at Santo. Depth about 47 km	15.3	S.	166.4	E.
15	20	53	15.2	Tonga Islands region. Depth about 168 km	20.2	S.	177.1	W.
15	20	55	27.6	Fiji Islands region. Depth about 500 km	22.3	S.	179.9	E.
16	03	32	11.7	Fox Islands, Aleutian Islands. Depth about 38 km	52.0	N.	171.3	W.
16	03	52	43.1	Fox Islands, Aleutian Islands. Depth about 40 km	52.0	N.	171.3	W.
16	06	52	51.1	New South Wales, Australia. Depth about 33 km	30.8	S.	147.3	E.
16	12	05	03.6	Off coast of northern California. Depth about 25 km	41.4	N.	126.6	W.
16	17	27	34.1	Kermadec Islands region. Depth about 53 km	28.1	S.	176.4	W.
16	17	57	13.2	Honduras. Depth about 50 km	15.7	N.	87.3	W.
16	21	45	24.0	Ryukyu Islands. Depth about 25 km. Mag. 5¼–5½ (Pal)	30.2	N.	132.0	E.
17	00	55	30.6	New Hebrides Islands. Depth about 137 km	14.4	S.	170.4	E.
17	01	58	48.1	Honduras. Depth about 50 km	15.5	N.	87.0	W.
17	03	21	52.4	Off coast of northern California. Depth about 48 km	40.7	N.	127.4	W.
17	04	09	29.9	Honduras. Depth about 52 km	14.9	N.	85.9	W.
17	04	24	55.0	Mariana Islands region. Depth about 27 km	12.7	N.	143.2	E.
17	06	17	18.0	Chile-Argentina border. Depth about 130 km	33.8	S.	70.2	W.
17	06	34	46.1	Off coast of northern California. Depth about 33 km	41.0	N.	126.2	W.
17	08	34	03.2	Kurile Islands. Depth about 36 km	49.2	N.	155.6	E.
17	19	29	19.3	Near Islands, Aleutian Islands. Felt on Shemya. Depth about 21 km. Mag. 6.	52.2	N.	173.9	E.
17	22	35	44.5	Samoa Islands region. Depth about 25 km	15.5	S.	172.6	W.
18	00	23	45.2	Tsinghai Province, China. Depth about 27 km	33.5	N.	99.3	E.
18	03	09	08.9	Andreanof Islands, Aleutian Islands. Depth about 30 km	53.2	N.	165.6	W.
18	04	35	26.7	Honduras. Depth about 33 km	15.9	N.	87.2	W.
18	08	51	02.7	Off coast of northern California. Depth about 33 km	41.0	N.	127.2	W.
18	09	37	54.8	Off coast of northern California. Depth about 36 km	40.7	N.	127.5	W.
18	09	39	19.6	Svalbard region. Depth about 33 km	73.7	N.	8.5	E.
18	11	37	50.0	Southeast of Hawthorne, Nev. Depth about 47 km. Mag. 4.2	38.0	N.	118.0	W.
18	20	38	05.4	Off coast of Mindanao, Philippine Islands. Depth about 170 km	4.5	N.	125.8	E.
18	22	07	56.9	Southwest of Galapagos Islands. Depth about 33 km	3.9	S.	104.1	W.
18	23	10	18.6	Near coast of Chile. Felt at Angol. Depth about 40 km	38.2	S.	73.3	W.
18	23	57	27.9	Off coast of northern California. Depth about 33 km	41.4	N.	127.2	W.
19	00	50	20.8	Off coast of Mindanao, Philippine Islands. Depth about 77 km	3.8	N.	125.7	E.
19	01	44	05.5	Fiji Islands region. Depth about 615 km	22.6	S.	179.0	W.
19	02	21	31.8	Fiji Islands region. Depth about 600 km	22.7	S.	179.2	E.
19	03	42	31.1	Samoa Islands region. Depth about 25 km	15.9	S.	172.8	W.
19	08	31	43.4	Colombia. Depth about 237 km	5.5	N.	74.7	W.
19	09	13	23.1	Santa Cruz Islands region. Depth about 91 km	10.6	S.	164.3	E.
19	09	25	41.3	Near coast of El Salvador. Felt in southeastern El Salvador. Depth about 68 km. Mag. 4½–4¾ (Pal).	12.8	N.	88.2	W.
19	16	37	26.7	Ryukyu Islands. Depth about 50 km	23.8	N.	123.5	E.
19	21	30	16.8	Tadzhik S.S.R. Depth about 37 km	38.5	N.	72.6	E.
20	00	44	08.3	Fox Islands, Aleutian Islands. Depth about 33 km	52.1	N.	170.7	W.
20	07	06	49.1	Svalbard region. Depth about 33 km	73.9	N.	8.6	E.
20	11	51	01.2	Kurile Islands. Depth about 59 km	44.2	N.	148.8	E.
20	12	12	27.4	Near Chile-Argentina border. Depth about 45 km	30.2	S.	70.6	W.
20	17	23	20.6	Svalbard region. Depth about 33 km	75.5	N.	21.1	E.
20	17	47	19.3	Svalbard region. Depth about 46 km	73.0	N.	5.6	E.
20	17	52	01.3	Tanganyika. Depth about 33 km	6.4	S.	30.8	E.
20	19	52	10.0	Solomon Islands region. Depth about 81 km	5.5	S.	154.5	E.
20	23	20	04.4	Solomon Islands. Depth about 47 mm	10.7	S.	161.9	E.
21	01	05	53.2	Northern Sinkiang Province, China. Depth about 33 km	48.0	N.	86.4	E.
21	05	24	17.8	Near east coast of Hokkaido, Japan. Depth about 18 km	42.7	N.	144.6	E.
21	06	29	19.2	Tonga Islands region. Depth about 67 km	22.9	S.	176.6	W.
21	07	58	35.3	Off coast of northern California. Depth about 33 km	40.8	N.	127.0	W.
21	08	34	00.3	Near coast of Peru. Depth about 80 km	10.8	S.	77.9	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 21	08	43	22.5	Tonga Islands. Depth about 60 km	17.4	S.	174.7	W.
21	10	13	47.7	Ryukyu Islands. Depth about 63 km	23.9	N.	123.5	E.
21	12	43	04.3	Banda Sea. Depth about 195 km	4.6	S.	128.7	E.
21	15	15	14.7	Off coast of northern California. Depth about 25 km	40.7	N.	127.5	W.
21	17	41	28.2	Near coast of Ecuador. Depth about 27 km	3.1	S.	80.9	W.
21	18	13	02.9	Tonga Islands. Depth about 60 km	18.9	S.	173.6	W.
21	19	16	06.7	Bonin Islands region. Depth about 470 km	27.5	N.	139.9	E.
21	19	44	13.6	Iran. Depth about 32 km	30.1	N.	57.2	E.
21	21	10	01.6	Molucca Passage. Depth about 103 km	2.0	N.	127.0	E.
21	21	40	03.2	New South Wales, Australia. Minor damage at Bowral and Robertson. Depth about 27 km.	34.5	S.	150.4	E.
22	00	43	30.8	Solomon Islands region. Depth about 151 km	5.6	S.	154.7	E.
22	01	18	50.7	Salta Province, Argentina. Depth about 115 km	25.2	S.	67.4	W.
22	08	57	15.0	Kurile Islands. Depth about 32 km	49.2	N.	155.6	E.
22	11	35	18.7	Celebes. Depth about 50 km	2.8	S.	121.9	E.
22	13	44	35.8	Tonga Islands. Depth about 97 km. Mag. 6	21.4	S.	174.4	W.
22	14	24	51.7	Near coast of Mindanao, Philippine Islands. Depth about 209 km	7.5	N.	126.3	E.
22	17	32	21.6	Tonga Islands region. Depth about 35 km. Mag. 6½–6¾	22.9	S.	176.1	W.
22	22	12	21.6	Gulf of California. Depth about 33 km	29.5	N.	113.9	W.
22	22	53	01.3	Colombia. Depth about 122 km	7.2	N.	73.3	W.
22	23	46	48.1	Tonga Islands region. Depth about 336 km	22.6	S.	176.8	W.
23	01	01	36.8	Andreanof Islands, Aleutian Islands. Depth about 51 km	51.1	N.	179.7	W.
23	02	45	16.0	Dodecanese Islands. Moderate property damage in Rhodes area and at Marmaris, Turkey. Depth about 49 km. Mag. 6¼.	36.6	N.	28.3	E.
23	03	40	24.5	Costa Rica. Depth about 93 km. Mag. 5¼–5½ (Pal)	9.8	N.	84.0	W.
23	03	43	08.4	Costa Rica. Depth about 97 km	9.8	N.	84.0	W.
23	03	52	19.9	Costa Rica. Depth about 100 km	10.1	N.	84.0	W.
23	05	19	04.0	Near east coast of Formosa. Depth about 33 km	24.1	N.	122.3	E.
23	08	25	47.5	Gulf of California. Depth about 33 km	30.0	N.	113.4	W.
23	14	15	01.1	----do----	29.8	N.	113.3	W.
23	16	44	59.4	Near coast of Nicaragua. Felt at Managua and in southeastern El Salvador. Depth about 138 km. Mag. 6½.	12.7	N.	87.3	W.
23	16	56	50.0	Near coast of Luzon, Philippine Islands. Depth about 63 km	18.7	N.	120.4	E.
23	17	14	01.4	Gulf of California. Depth about 33 km	29.3	N.	113.9	W.
24	00	32	41.1	----do----	30.0	N.	113.4	W.
24	02	31	43.0	----do----	29.9	N.	113.7	W.
24	12	59	54.4	Off coast of northern California. Depth about 46 km	41.2	N.	126.7	W.
24	13	34	31.4	Off coast of Oregon. Depth about 14 km	43.5	N.	126.9	W.
24	17	18	17.6	Flores Sea. Depth about 36 km	8.2	S.	121.8	E.
24	19	00	43.8	Gulf of California. Depth about 33 km	29.4	N.	113.8	W.
25	04	44	15.1	Near coast of northern Chile. Depth about 46 km	27.4	S.	71.3	W.
25	04	59	24.8	Vancouver Island region. Depth about 33 km	49.3	N.	128.7	W.
25	09	18	48.4	South of Honshu, Japan. Depth about 171 km	31.5	N.	139.9	E.
25	13	11	44.3	Dodecanese Islands. Felt. Depth about 33 km	36.4	N.	26.5	E.
25	13	33	27.1	Sinkiang Province, China. Depth about 27 km	39.6	N.	77.8	E.
25	13	42	14.6	Kermadec Islands region. Depth about 41 km	28.2	S.	175.6	W.
25	17	33	44.6	Tonga Islands region. Depth about 25 km	22.8	S.	176.1	W.
25	18	28	03.2	Utah-Idaho border. Depth about 33 km	42.2	N.	111.9	W.
25	18	40	37.9	Tonga Islands region. Depth about 35 km	22.8	S.	176.8	W.
25	19	33	05.7	Near coast of Sumatra. Depth about 93 km	4.2	S.	103.3	E.
25	21	07	28.5	Fiji Islands region. Depth about 374 km	14.9	S.	177.5	W.
26	03	22	09.8	North of Easter Island. Depth about 33 km	33.1	S.	108.9	W.
26	04	36	08.5	North of Easter Island. Depth about 43 km	32.9	S.	109.1	W.
26	05	06	31.9	Near Mexico-Guatemala border. Depth about 150 km	15.4	N.	91.8	W.
26	06	06	53.8	New Hebrides Islands. Depth about 100 km	18.9	S.	168.9	E.
26	08	42	16.1	Peru-Brazil border. Depth about 650 km	10.2	S.	70.8	W.
26	10	23	12.5	Peru-Brazil border. Depth about 663 km	10.1	S.	71.3	W.
26	12	36	10.4	Fiji Islands region. Depth about 565 km	19.0	S.	177.5	W.
26	22	04	59.3	Santa Cruz Islands region. Depth about 33 km	10.4	S.	164.4	E.
26	22	49	49.8	Near east coast of Honshu, Japan. Depth about 52 km	38.5	N.	143.2	E.
27	02	56	50.1	Andreanof Islands, Aleutian Islands. Felt on Adak. Depth about 60 km.	51.4	N.	176.3	W.
27	05	14	54.3	Hindu Kush. Depth about 200 km	36.4	N.	70.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
May 27	07	18	06.0	Near coast of Honshu, Japan. Depth about 70 km	41.3	N.	142.2	E.
27	10	23	08.1	----do----	39.2	N.	141.6	E.
27	10	37	39.6	Eastern Afghanistan. Depth about 32 km	35.4	N.	70.0	E.
27	16	52	19.3	Near coast of Sumatra. Depth about 39 km	0.8	N.	98.5	E.
27	17	26	32.2	Near coast of Sumatra. Depth about 36 km	1.2	N.	98.4	E.
27	22	38	34.1	Near coast of Luzon, Philippine Islands. Depth about 71 km	15.9	N.	119.7	E.
28	01	04	14.5	Off coast of Chile. Depth about 40 km	38.5	S.	75.5	W.
28	02	30	20.8	New Guinea. Depth about 59 km	4.9	S.	145.0	E.
28	02	56	05.5	Colombia. Depth about 60 km	7.5	N.	73.6	W.
28	03	59	53.5	Near coast of Sumatra. Depth about 74 km	5.4	S.	102.4	E.
28	07	30	35.0	New Hebrides Islands. Depth about 33 km	17.3	S.	167.7	E.
28	10	47	17.5	New Guinea. Depth about 25 km	5.1	S.	144.8	E.
28	12	41	19.2	Kermadec Islands region. Depth about 33 km	27.9	S.	176.4	W.
28	12	59	47*	Northeast of Indio, Calif. Felt. Mag. 4.4	33 48	N.	116 05	W.
28	13	29	25.7	Flores Islands region. Depth about 25 km	8.2	S.	119.2	E.
28	16	10	00.3	Gulf of California. Depth about 33 km	29.6	N.	113.8	W.
28	17	14	38.0	Gulf of California. Depth about 25 km. Mag. 4.5	29.8	N.	113.8	W.
28	18	36	54.6	New Britain region. Depth about 137 km	5.0	S.	151.1	E.
28	22	37	15.7	Revilla Gigedo Islands region. Depth about 43 km	20.1	N.	108.8	W.
28	23	52	47.0	Mariana Islands region. Depth about 121 km	14.5	N.	144.6	E.
29	00	22	55.6	Fox Islands, Aleutian Islands. Depth about 67 km	52.3	N.	166.6	W.
29	06	35	54.8	Solomon Islands. Depth about 110 km	10.4	S.	161.6	E.
29	07	20	58.1	Revilla Gigedo Islands region. Depth about 33 km	19.3	N.	108.7	W.
29	07	23	51.2	Volcano Islands region. Depth about 79 km	23.0	N.	143.7	E.
29	07	28	17.3	Near coast of southern Chile. Felt at Temuco and Valdivia. Depth about 40 km.	39.1	S.	73.5	W.
29	10	29	27.8	Bonin Islands. Depth about 25 km	27.9	N.	141.7	E.
29	10	52	02.4	Ethiopia. Felt at Addis Ababa. Depth about 33 km	10.4	N.	39.9	E.
29	16	51	34.8	Near coast of Luzon, Philippine Islands. Depth about 25 km	16.3	N.	122.4	E.
29	17	48	21.6	Halmahera region. Depth about 25 km	2.5	N.	128.4	E.
29	19	24	04.8	Ethiopia. Felt at Addis Ababa. Depth about 33 km	10.6	N.	39.9	E.
29	22	35	02.0	Santa Cruz Islands. Depth about 105 km	11.1	S.	166.1	E.
30	12	28	42.8	North of Easter Island. Depth about 25 km	33.2	S.	109.3	W.
30	22	04	53.5	Northern Chile. Depth about 140 km	21.0	S.	69.5	W.
31	05	12	12.6	New Hebrides Islands region. Felt at Port Vila. Depth about 100 km.	18.6	S.	168.7	E.
31	10	07	44.2	New Hebrides Islands region. Depth about 108 km	14.4	S.	166.3	E.
31	13	22	56.1	South of Fiji Islands region. Depth about 497 km	24.5	S.	179.9	E.
31	14	17	38.0	Gulf of California. Felt at San Diego. Depth about 33 km. Mag. 5.5.	29.8	N.	114.0	W.
31	14	39	20.4	Kurile Islands. Depth about 50 km	49.1	N.	154.5	E.
31	15	36	28.6	Gulf of California. Depth about 33 km	30.7	N.	113.1	W.
31	16	30	50.5	Near coast of Chile. Depth about 40 km	38.0	S.	72.7	W.
31	19	15	57.0	New Britain region. Felt. Depth about 56 km. Mag. 5¾–6 (Pal).	5.3	S.	151.6	E.
31	21	02	11.8	Mariana Islands region. Depth about 130 km	13.0	N.	143.7	E.
June 1	03	27	39.3	Near east coast of Kamchatka. Depth about 25 km	55.5	N.	161.7	E.
1	07	58	21.5	Kurile Islands. Depth about 67 km	44.3	N.	148.2	E.
1	09	35	35.2	Bass Strait. Depth about 28 km	38.6	S.	144.2	E.
1	10	02	42.0	Near coast of Dominican Republic. Depth about 21 km. Mag. 4¼–4½ (Pal).	19.3	N.	69.3	W.
1	11	19	46.4	Ceram Islands. Depth about 220 km	3.8	S.	129.4	E.
1	13	19	50.8	Bass Strait. Depth about 29 km	38.5	S.	144.2	E.
1	13	32	45.8	Northern Celebes. Depth about 228 km	0.2	N.	123.3	E
1	16	31	43.8	Southern Turkey. Felt at Maras and Urfa. Depth about 60 km.	37.9	N.	36.8	E.
1	17	49	33.8	Kamchatka. Depth about 33 km	55.0	N.	161.5	E.
1	18	46	26.4	Celebes Sea. Depth about 33 km	7.1	N.	123.5	E.
1	23	29	21.2	Ethiopia. 5 killed, many injured, and village of Kara-Kore destroyed. Felt at Addis Ababa. Depth about 33 km. Mag. 6½.	10.4	N.	39.9	E.
1	23	56	48.6	Ethiopia. Depth about 60 km	10.1	N.	39.6	E.
2	00	01	46.9	Ethiopia. Depth about 33 km	10.4	N.	39.8	E.
2	00	08	57.9	----do----	10.4	N.	40.0	E.
2	00	57	48.8	----do----	9.0	N.	40.2	E.

See footnote at end of table.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June 2	01	16	07.1	Ethiopia. Depth about 33 km	9.4	N.	40.2	E.
2	02	35	24.4	do	9.0	N.	40.0	E.
2	04	36	52.3	Near coast of New Guinea. Depth about 32 km	5.5	S.	146.4	E.
2	04	51	14.8	Ethiopia. Felt at Addis Ababa. Depth about 33 km. Mag. 6¼–6½.	10.3	N.	39.8	E.
2	05	22	29.1	Ethiopia. Depth about 26 km	10.4	N.	39.6	E.
2	05	44	52.4	Ethiopia. Depth about 31 km	10.4	N.	39.8	E.
2	06	17	13.3	Ethiopia. Depth about 36 km	10.5	N.	39.7	E.
2	07	02	49.9	Ethiopia. Depth about 33 km	10.0	N.	40.0	E.
2	07	21	45.3	do	10.1	N.	39.6	E.
2	11	06	41.3	Svalbard region. Depth about 25 km	79.4	N.	4.9	E.
2	12	48	06.6	Southern Chile. Depth about 33 km	40.2	S.	73.4	W.
2	18	09	27.2	Mariana Islands region. Depth about 43 km	21.4	N.	145.9	E.
2	18	26	12.6	Near coast of Ecuador. Depth about 37 km	3.0	S.	80.4	W.
2	23	32	32.1	Ethiopia. Depth about 33 km	9.5	N.	39.8	E.
3	01	13	25.4	Off east coast of Kamchatka. Depth about 29 km. Mag. 5¼–5½ (Pal).	56.3	N.	164.8	E.
3	03	18	30.2	New Hebrides Islands. Felt at Port Vila. Depth about 31 km	17.8	S.	167.6	E.
3	03	40	20.2	New Hebrides Islands. Felt at Port Vila. Depth about 39 km	18.0	S.	167.9	E.
3	04	21	56.2	Chile-Peru border. Depth about 60 km	18.1	S.	70.3	W.
3	05	55	15.5	New Britain region. Depth about 33 km	4.3	S.	151.2	E.
3	06	16	17.1	Turkey. Depth about 45 km	39.0	N.	32.2	E.
3	09	14	36.0	New Britain region. Felt at Rabaul and Rangarere. Depth about 33 km.	4.2	S.	151.2	E.
3	15	20	30.9	Ethiopia. Depth about 33 km	10.6	N.	39.8	E.
3	15	23	15.8	do	9.8	N.	39.6	E.
3	16	25	46.9	do	9.5	N.	39.8	E.
3	17	43	22.6	Northern Celebes. Depth about 70 km	0.3	N.	123.8	E.
3	20	33	13.4	Samoa Islands region. Depth about 60 km	16.2	S.	172.9	W.
3	21	51	05.9	New Hebrides Islands. Felt at Port Vila. Depth about 25 km	17.7	S.	167.6	E.
3	22	54	17.8	Svalbard region. Depth about 33 km	72.8	N.	8.7	E.
4	07	33	06.0	Tibet. Depth about 32 km. Mag. 6½	34.1	N.	82.0	E.
4	07	43	43.6	Tibet. Depth about 30 km	34.4	N.	82.2	E.
4	08	45	22.0	Flores Island. Depth about 18 km	8.8	S.	124.2	E.
4	10	39	13.7	Off coast of northern California. Depth about 36 km	41.1	N.	126.3	W.
4	11	18	33.1	Hindu Kush. Depth about 19 km	37.1	N.	71.9	E.
4	13	51	29.9	Tibet. Depth about 32 km	33.9	N.	82.1	E.
4	13	58	16.1	Fiji Islands. Depth about 600 km	17.5	S.	177.9	E.
4	15	13	43.8	South of Mindanao, Philippine Islands. Depth about 125 km	4.5	N.	125.6	E.
4	22	54	50.9	New Hebrides Islands. Depth about 216 km	14.1	S.	167.7	E.
4	23	35	26.9	Northern India. Depth about 25 km	33.5	N.	75.4	E.
5	03	30	56.0	Southern Iran. Depth about 30 km	27.9	N.	55.1	E.
5	03	45	25.1	Fiji Islands region. Depth about 631 km	20.1	S.	178.6	W.
5	05	35	25.4	New Hebrides Islands. Depth about 33 km	18.0	S.	167.6	E.
5	06	11	32.9	Southern Iran. Depth about 36 km	28.5	N.	54.9	E.
5	06	32	18.2	New Britain. Depth about 25 km	5.5	S.	153.0	E.
5	17	29	54.5	New Britain. Depth about 43 km	5.0	S.	153.5	E.
6	00	33	38.2	Leeward Islands. Depth about 50 km	17.7	N.	60.9	W.
6	03	46	08.6	Off coast of Oregon. Depth about 25 km	43.6	N.	127.7	W.
6	08	11	54.7	Tonga Islands region. Depth about 117 km	15.6	S.	173.6	W.
6	09	46	18.6	Iran. Depth about 25 km	30.1	N.	52.4	E.
6	20	56	20.1	Sinkiang Province, China. Depth about 102 km	39.4	N.	77.9	E.
6	23	40	57.6	Santa Cruz Islands. Depth about 72 km	11.5	S.	166.2	E.
7	05	03	10.7	Kurile Islands. Depth about 61 km	45.5	N.	150.8	E.
7	13	05	51.2	Korea-China border. Depth about 300 km	43.0	N.	130.5	E.
7	14	15	18.9	Ascension Island region. Depth about 17 km. Mag. 5¼–5½ (Pal).	5.4	S.	11.6	W.
7	15	38	13.1	Santa Cruz Islands. Depth about 209 km	10.8	S.	166.3	E.
7	19	18	28.5	Western New Guinea. Depth about 59 km	1.0	S.	134.1	E.
7	22	54	46.2	Samoa Islands region. Depth about 33 km	16.0	S.	172.7	W.
8	03	59	21.3	Hindu Kush. Depth about 264 km	36.4	N.	71.0	E.
8	08	54	38.6	Samoa Islands region. Depth about 88 km	15.5	S.	172.6	W.
8	09	34	26.7	Solomon Islands. Depth about 71 km	10.1	S.	161.5	E.
8	15	44	02.4	Flores Sea. Depth about 18 km	8.3	S.	122.0	E.
8	16	47	14.6	Flores Sea. Depth about 33 km	8.1	S.	122.1	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June 9	03	55	51.4	Northern India. Depth about 110 km	34.7	N.	73.8	E.
9	05	53	54.8	Southwestern Colombia. Depth about 33 km	1.5	N.	76.7	W.
9	09	36	49.2	Caspian Sea. Depth about 17 km	41.0	N.	50.7	E.
9	14	23	20.6	South of Honshu, Japan. Depth about 451 km	28.0	N.	139.9	E.
9	15	17	46.1	Near coast of Sumatra. Depth about 33 km	4.8	N.	95.2	E.
9	15	43	02.8	South of Honshu, Japan. Depth about 154 km	30.3	N.	139.9	E.
9	18	52	37.9	Santa Cruz Islands. Depth about 50 km	10.9	S.	165.7	E.
9	22	05	54.7	Flores Sea. Depth about 33 km	8.4	S.	121.9	E.
10	00	39	05.1	Solomon Islands. Depth about 170 km	10.8	S.	162.0	E.
10	05	52	58.5	Near south coast of Kamchatka. Depth about 37 km	48.9	N.	157.7	E.
10	08	47	48.0	Banda Sea. Depth about 78 km	5.2	S.	129.1	E.
10	08	52	05.4	South of Mexico. Depth about 33 km. Mag. 4¾-5 (Pal)	8.5	N.	103.3	W.
10	09	11	51.8	Easter Island region. Depth about 25 km	24.1	S.	111.4	W.
10	11	32	13.5	Andreanof Islands, Aleutian Islands. Depth about 28 km	51.4	N.	179.0	W.
10	11	44	50.7	Near coast of southern Chile. Felt at Santiago. Depth about 49 km.	32.6	S.	71.9	W.
10	16	03	25.5	Kamchatka. Depth about 33 km	54.9	N.	161.6	E.
10	20	31	50.9	Easter Island region. Depth about 47 km. Mag. 6	24.2	S.	112.1	W.
11	04	02	44.4	Kamchatka. Depth about 33 km	51.6	N.	159.3	E.
11	05	10	26.3	Southern Iran. 60 killed and many injured at Lar and villages of Dehkhouyeh and Khaneh totally destroyed. Depth about 37 km. Mag. 6½.	27.9	N.	54.6	E.
11	05	30	14.5	Southern Iran. Depth about 62 km	27.8	N.	55.0	E.
11	05	52	51.7	Near south coast of Kamchatka. Depth about 18 km	51.6	N.	159.3	E.
11	06	10	42.3	Southern Iran. Depth about 46 km	27.8	N.	54.9	E.
11	06	46	57.9	Southern Iran. Depth about 41 km	27.7	N.	55.1	E.
11	06	51	29.6	Southern Iran. Depth about 49 km	27.8	N.	54.9	E.
11	08	04	10.0	Southern Iran. Depth about 70 km	27.6	N.	55.3	E.
11	09	21	39.4	Southern Iran. Depth about 48 km	27.8	N.	55.0	E.
11	10	03	06.3	Southern Iran. Depth about 42 km	27.7	N.	55.0	E.
11	10	19	23.6	North Atlantic Ocean. Depth about 22 km	46.8	N.	27.4	W.
11	11	24	09.4	Southern Iran. Depth about 33 km	28.1	N.	54.7	E.
11	12	30	23.5	Southern Iran. Depth about 35 km	27.8	N.	54.4	E.
11	12	31	26.8	Southern Iran. Depth about 36 km	28.2	N.	54.6	E.
11	12	42	58.7	Southern Iran. Depth about 61 km	30.4	N.	55.3	E.
11	13	57	58.3	Southern Iran. Depth about 34 km	27.8	N.	54.6	E.
11	14	48	13.6	Kermadec Islands region. Depth about 603 km	24.4	S.	178.9	E.
11	15	06	16.7	Southern Iran. Depth about 39 km	27.8	N.	54.5	E.
11	17	13	45.5	Central Idaho. Depth about 25 km	44.7	N.	114.8	W.
11	17	15	34.5	Burma-China border region. Depth about 33 km	25.2	N.	98.6	E.
11	20	42	56.0	Near coast of Kamchatka. Depth about 58 km	51.6	N.	159.4	E.
11	22	00	28.1	Volcano Islands region. Depth about 100 km	22.2	N.	141.8	E.
11	22	22	40.2	Fiji Islands. Depth about 640 km	17.9	S.	178.6	W.
11	23	13	07.8	Southern Iran. Depth about 42 km	27.8	N.	54.9	E.
12	00	14	28.7	Revilla Gigedo Islands region. Depth about 33 km	18.9	N.	107.4	W.
12	06	54	39.5	Off south coast of Java. Depth about 44 km	9.3	S.	110.4	E.
12	07	35	24.3	Southwest of South Island, New Zealand. Depth about 34 km	49.8	S.	163.8	E.
12	09	58	17.1	North Viet-Nam. Depth about 33 km	21.6	N.	106.0	E.
12	10	39	54.8	Kamchatka. Depth about 60 km	52.3	N.	159.9	E.
12	17	04	56.0	Southern Iran. Depth about 49 km	27.1	N.	54.9	E.
12	17	53	27.4	Solomon Islands. Depth about 110 km	6.9	S.	155.0	E.
12	21	02	38.5	Southern Iran. Depth about 33 km	27.5	N.	54.3	E.
12	21	48	30.1	Southern Iran. Depth about 35 km	27.5	N.	55.1	E.
13	02	24	25.9	Andreanof Islands, Aleutian Islands. Depth about 56 km	52.1	N.	176.5	W.
13	07	15	59.4	South Atlantic Ocean. Depth about 33 km	22.9	S.	12.7	W.
13	11	55	44.1	Celebes. Depth about 20 km	0.0		121.5	E.
13	13	16	38.5	Kermadec Islands. Depth about 239 km	33.1	S.	180.0	
13	13	36	29.4	Panama-Costa Rica border. Depth about 43 km	8.7	N.	83.2	E.
13	15	16	09.9	Kurile Islands. Depth about 44 km	44.2	N.	148.4	E.
13	17	12	12.7	Tristan da Cunha region, South Atlantic Ocean. Depth about 33 km	22.7	S.	12.9	W.
13	18	23	17.7	Southwestern Montana. Depth about 23 km	45.1	N.	111.8	W.
13	21	37	55.0	Tonga Islands region. Depth about 146 km	21.5	S.	176.4	W.
13	22	12	17.0	Solomon Islands region. Depth about 25 km	9.8	S.	164.7	E.
14	00	16	22.1	New Hebrides Islands. Depth about 33 km	13.9	S.	165.9	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June 14	00	24	27.3	Southern Iran. Depth about 36 km	27.9	N.	55.0	E.
14	00	41	13.0	Northern Burma. Depth about 62 km	24.5	N.	94.8	E.
14	02	59	49.3	New Britain. Felt at Rabaul and Rangarere. Depth about 98 km	5.5	S.	151.9	E.
14	08	15	34.9	Mediterranean Sea, southwest of Crete. Depth about 58 km	34.8	N.	23.6	E.
14	09	03	37.0	Southern Iran. Depth about 34 km	28.0	N.	55.0	E.
14	09	07	34.7	Off north coast of Luzon, Philippine Islands. Depth about 25 km	20.2	N.	121.5	E.
14	17	31	45.7	Hindu Kush. Depth about 220 km	36.6	N.	68.1	E.
14	18	44	31.3	Gulf of California. Depth about 39 km	26.1	N.	110.0	W.
14	20	32	21.6	Ethiopia. Depth about 33 km	10.5	N.	39.9	E.
14	23	50	26.6	Fox Islands, Aleutian Islands. Depth about 33 km	51.8	N.	175.0	W.
15	00	51	30.6	Colombia. Felt at Bogota. Depth about 146 km	6.9	N.	73.1	W.
15	06	21	35.6	Southern Iran. Depth about 35 km	27.8	N.	54.8	E.
15	06	54	52.2	Near coast of New Guinea. Depth about 52 km	2.4	S.	138.9	E.
15	13	41	25.1	Southwestern Montana. Depth about 23 km	44.9	N.	111.8	W.
15	20	49	42.3	Tadzhik S.S.R. Depth about 45 km	39.1	N.	70.0	E.
15	22	25	50.6	Near south coast of Kamchatka. Depth about 25 km	51.9	N.	158.8	E.
15	22	38	54.7	Off east coast of Honshu, Japan. Depth about 78 km	40.1	N.	146.2	E.
15	23	24	43.8	Kurile Islands. Depth about 36 km	45.9	N.	151.2	E.
16	03	18	01.4	Kurile Islands. Depth about 64 km	45.1	N.	151.8	E.
16	06	31	29.8	Andreanof Islands, Aleutian Islands. Depth about 33 km	51.3	N.	176.8	W.
16	07	08	16.5	Off coast of southern Chile. Depth about 17 km	41.3	S.	74.5	W.
16	08	45	29.7	Southern Iran. Depth about 37 km	27.2	N.	54.5	E.
16	10	31	56.2	Northern Colombia. Felt. Depth about 120 km. Mag. 6	8.9	N.	73.4	W.
16	12	12	04.4	Southern Outer Mongolia. Depth about 23 km	43.3	N.	103.9	E.
16	14	59	48.3	Dodecanese Islands region. Depth about 38 km	35.1	N.	27.5	E.
16	15	46	03.0	Chile-Bolivia border. Depth about 89 km	21.9	S.	68.4	W.
16	16	01	02.2	New Britain. Depth about 78 km	5.4	S.	150.8	E.
16	16	10	06.3	Near north coast of Mindanao, Philippine Islands. Depth about 63 km.	11.2	N.	125.0	E.
16	18	38	30.4	Hebgen Lake, Montana area. Depth about 33 km	45.2	N.	111.5	W.
16	21	28	00.0	Solomon Islands. Depth about 124 km	6.9	S.	156.3	E.
16	22	54	07.2	New Hebrides Islands. Depth about 25 km	16.1	S.	167.4	E.
17	04	58	58.5	Tonga Islands. Depth about 31 km	20.6	S.	175.3	W.
17	08	05	53.0	Southern Iran. Depth about 38 km	27.9	N.	55.0	E.
17	09	29	02.3	Solomon Islands. Depth about 49 km	10.1	S.	161.0	E.
17	09	34	18.7	Kermadec Islands. Depth about 292 km	28.7	S.	178.9	W.
17	10	56	30.3	Peru. Depth about 29 km. Mag. 5 (Pal)	12.0	S.	75.3	W.
17	14	32	51.6	Mindanao, Philippine Islands. Depth about 190 km	9.9	N.	125.8	E.
17	15	07	33.7	Mexico-Guatemala border. Depth about 85 km. Mag. 6	14.2	N.	92.0	W.
17	15	24	17.8	Central New Guinea. Depth about 139 km	3.7	S.	138.2	E.
17	18	39	51.4	Near coast of Guatemala. Depth about 105 km	14.6	N.	92.1	W.
17	21	49	25.8	Fiji Islands region. Depth about 627 km	20.9	S.	178.9	W.
18	03	12	35.7	Java Sea. Depth about 641 km	5.9	S.	113.0	E.
18	06	26	06.1	Tibet. Depth about 33 km	33.7	N.	81.8	E.
18	08	12	07.0	Southern Arizona. Depth about 25 km. Mag. 4.7	32.2	N.	112.5	W.
18	08	16	55.0	Near north coast of New Guinea. Depth about 22 km	1.7	S.	136.9	E.
18	10	10	08.8	Southern Iran. Depth about 33 km	27.8	N.	55.2	E.
18	10	52	03.0	----do----	27.3	N.	54.7	E.
18	12	36	56.0	Fiji Islands region. Depth about 561 km	19.2	S.	178.0	W.
18	13	21	55.9	Celebes. Depth about 91 km	0.2	N.	123.9	E.
18	13	55	16.6	Kermadec Islands region. Depth about 434 km	31.5	S.	179.8	E.
18	14	51	32.1	Southern Iran. Depth about 27 km	28.0	N.	54.9	E.
18	16	13	58.0	Near coast of western Australia. Depth about 13 km	20.1	S.	119.3	E.
18	16	47	03.9	Tonga Islands. Depth about 360 km	21.3	S.	176.1	W.
18	17	33	19.1	Off coast of central Chile. Depth about 44 km	39.1	S.	74.8	W.
18	21	42	43.7	Western Montana. Depth about 25 km	44.9	N.	112.0	W.
18	22	13	25.1	South Pacific Ocean. Depth about 33 km	56.6	S.	142.2	W.
19	00	47	29.1	Tonga Islands region. Depth about 410 km	22.4	S.	179.0	W.
19	01	45	25.5	Near south coast of Luzon, Philippine Islands. Felt. Depth about 48 km.	12.7	N.	122.1	E.
19	02	22	53.1	Near south coast of Luzon, Philippine Islands. Felt. Depth about 44 km.	12.6	N.	121.9	E.
19	02	45	59.6	Off east coast of Honshu, Japan. Depth about 42 km	39.3	N.	143.1	E.
19	04	34	15.1	Ethiopia. Depth about 33 km	10.3	N.	40.1	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June 19	06	29	07.1	South of Fiji Islands. Depth about 591 km	24.2	S.	179.6	E.
19	07	38	25.0	Near east coast of Honshu, Japan. Depth about 29 km	39.3	N.	143.0	E.
19	07	59	41.1	Near east coast of Honshu, Japan. Depth about 39 km	39.6	N.	142.9	E.
19	17	04	37.0	Hindu Kush. Felt. Depth about 200 km	36.5	N.	70.9	E.
19	22	17	19.7	Kamchatka. Depth about 59 km	53.8	N.	161.1	E.
20	03	21	34.3	Gulf of Aden. Depth about 33 km	12.2	N.	44.2	E.
20	04	22	05.5	Near coast of southern Chile. Depth about 26 km	38.3	S.	73.4	W.
20	06	38	47.1	New Hebrides Islands. Depth about 172 km	14.8	S.	167.3	E.
20	09	49	02.5	Honduras. Depth about 35 km	15.6	N.	87.2	W.
20	10	15	58.5	Southern Iran. Depth about 45 km	28.9	N.	54.7	E.
20	14	27	02.6	Loyalty Islands. Depth about 64 km	21.9	S.	169.8	E.
20	16	32	14.3	Santa Cruz Islands. Depth about 50 km	10.6	S.	164.9	E.
20	21	21	47.1	Near north coast of Honduras. Depth about 67 km	15.4	N.	87.2	W.
21	02	41	56.2	Mariana Islands region. Depth about 77 km	11.7	N.	144.6	E.
21	03	57	41.1	Honduras. Depth about 58 km	15.5	N.	87.2	W.
21	06	07	04.1	Tonga Islands region. Depth about 269 km	21.7	S.	177.0	W.
21	06	39	23.0	Southern Iran. Depth about 40 km	27.8	N.	54.8	E.
21	07	33	34.4	Eastern New Guinea. Felt at Wau. Depth about 25 km	7.8	S.	146.7	E.
21	09	04	23.0	Near north coast of Mindanao, Philippine Islands. Depth about about 610 km.	8.0	N.	123.9	E.
21	15	10	32.1	Near coast of Guatemala. Felt at San Salvador, El Salvador. Depth about 100 km.	13.6	N.	90.1	W.
21	15	40	46.6	Western Iran. Depth about 33 km	34.1	N.	48.3	E.
21	16	04	47.2	Western Turkey. Slight damage at Sarakoy. Depth about 31 km	37.9	N.	28.7	E.
21	16	37	37.1	Banda Sea. Depth about 389 km	5.9	S.	128.5	E.
21	18	13	59.4	Tonga Islands. Depth about 25 km	18.9	S.	173.3	W.
21	19	14	34.9	Southern Iran. Depth about 45 km	27.5	N.	54.8	E.
21	20	25	00.9	Near north coast of Java. Felt. Depth about 163 km	7.6	S.	110.0	E.
21	23	04	00.2	Near north coast of Honduras. Depth about 75 km	15.4	N.	86.4	W.
22	00	56	03.7	Northern Albania-Yugoslavia border. Slight damage at Titograd. Depth about 30 km.	42.4	N.	19.3	E.
22	03	22	55.8	New Hebrides Islands. Depth about 67 km	18.0	S.	168.9	E.
22	05	33	35.4	Loyalty Islands. Depth about 55 km	21.3	S.	170.3	E.
22	07	43	51.6	Near coast of Northern Chile. Depth about 76 km	19.1	S.	70.8	W.
22	09	05	15.1	Southern Iran. Depth about 43 km	28.0	N.	54.9	E.
22	20	00	13.8	Off coast of El Salvador. Depth about 64 km	12.9	N.	90.0	W.
23	01	08	33.1	Honduras. Depth about 67 km	15.2	N.	86.4	W.
23	01	11	12.8	Honduras. Depth about 60 km	15.5	N.	87.2	W.
23	08	55	55.2	Off coast of Oregon. Depth about 56 km. Mag. 5¼-5½ (Brk), 5¾-6 (Pal).	44.1	N.	128.8	W.
23	09	22	49.8	Off coast of Oregon. Depth about 53 km	44.1	N.	128.8	W.
23	10	05	35.4	Mariana Islands. Depth about 256 km	18.6	N.	145.2	E.
23	11	05	00.1	Honshu, Japan. Felt at Tokyo. Depth about 94 km	35.8	N.	139.9	E.
23	13	20	13.9	Kurile Islands. Depth about 35 km	47.1	N.	153.9	E.
23	16	36	22.8	Southern Iran. Depth about 32 km	27.6	N.	55.1	E.
24	03	01	10.5	Tonga Islands region. Depth about 542 km	20.2	S.	177.4	W.
24	05	07	55.6	Near coast of El Salvador. Depth about 81 km. Mag. 4¾-5 (Pal)	13.4	N.	89.9	W.
24	09	36	05.6	Sumatra. Depth about 135 km	4.0	N.	97.5	E.
24	12	11	02.3	Near coast of southern Chile. Depth about 33 km	40.1	S.	70.7	W.
24	16	01	17.7	Molucca Passage. Depth about 33 km	1.9	N.	127.3	E.
24	16	19	23.7	Near north coast of New Guinea. Felt. Depth about 212 km	4.6	S.	144.9	E.
24	16	57	11.5	Solomon Islands. Depth about 32 km	10.6	S.	162.5	E.
24	17	11	13.7	Solomon Islands. Depth about 90 km	6.5	S.	154.7	E.
24	19	34	32.6	Ceram Sea. Depth about 19 km	2.9	S.	130.4	E.
25	02	29	28.2	Near north coast of Honshu, Japan. Depth about 26 km	40.9	N.	144.2	E.
25	09	10	04.2	Fiji Islands. Depth about 489 km	19.5	S.	177.9	W.
25	10	58	18.5	Near north coast of Colombia. Felt at Barranquilla. Depth about 33 km.	11.3 11.3	N. N.	74.7 74.7	W. W.
25	12	18	53.3	Off northeast coast of Honshu, Japan. Depth about 24 km	40.7	N.	144.6	E.
25	12	40	23.7	Southern Iran. Depth about 54 km	27.9	N.	53.7	E.
25	16	21	53.3	Near north coast of Luzon, Philippine Islands. Depth about 128 km.	18.8	N.	121.2	E.
25	16	46	38.6	North of Mariana Islands. Depth about 33 km. Mag. 5¾ (Brk)	21.8	N.	143.5	E.
25	19	14	02.3	Near east coast of Honshu, Japan. Depth about 25 km	36.8	N.	141.6	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
June 25	19	32	14.4	Near coast of southern Chile. Depth about 124 km	37.9	S.	73.3	W.
26	02	41	55.5	Kermadec Islands region. Depth about 33 km	35.6	S.	178.7	W.
26	07	02	52.9	Loyalty Islands. Depth about 33 km	21.5	S.	170.1	E.
26	12	56	56.6	Baja California. Depth about 60 km	27.3	N.	112.9	W.
26	13	49	00.6	Tonga Islands. Depth about 33 km	20.7	S.	174.6	W.
26	14	47	27.3	Near Islands, Aleutian Islands. Depth about 40 km. Mag. 5½–5¾ (Pal).	52.2	N.	174.7	E.
26	16	43	39.4	Near north coast of Colombia. Felt at Barranquilla, Cartagena and Santa Maria. Depth about 59 km.	11.3	N.	74.2	W.
27	00	49	47	5 killed, many injured, and village of Maqsoudabad destroyed. (Shiraz, Iran epicenter.)	33 31	N.	49 21	E.
27	03	07	47.8	Peru-Brazil border. Depth about 170 km	8.6	S.	74.4	W.
27	03	22	09.2	Unimak Island region. Depth about 93 km	53.8	N.	163.4	W.
27	05	39	57.7	Central Peru. Depth about 33 km	8.6	S.	76.1	W.
27	07	03	42.2	Yunan Province, China. Depth about 33 km. Mag. 6	28.0	N.	99.4	E.
27	07	52	53.5	Kamchatka. Depth about 273 km	54.6	N.	158.6	E.
27	10	40	31.6	Kermadec Islands. Depth about 25 km	28.7	S.	176.1	W.
27	10	45	54.7	Yunan Province, China. Depth about 33 km	28.0	N.	99.9	E.
27	14	35	39.9	Kermadec Islands. Depth about 33 km	29.4	S.	176.9	W.
27	15	22	11.9	Off coast of southern Chile. Depth about 33 km	38.3	S.	73.8	W.
27	19	15	13.1	Oaxaca, Mexico. Felt at Salina Cruz. Depth about 33 km	17.0	N.	94.3	W.
27	21	56	01.8	Yunan Province, China. Depth about 38 km	27.7	N.	99.6	E.
28	01	17	15.6	Off coast of El Salvador. Felt at San Salvador. Depth about 33 km.	12.0	N.	89.0	W.
28	02	06	10.2	Central Peru. Depth about 25 km	11.5	S.	74.0	W.
28	04	21	53.8	Szechwan Province, China. Depth about 34 km	31.4	N.	104.0	E.
28	06	17	44.5	Kermadec Islands. Depth about 33 km	29.9	S.	177.6	W.
28	13	15	28.5	Near south coast of Sumatra. Depth about 90 km	4.5	S.	102.8	E.
28	18	02	47.2	Northern Colombia. Depth about 137 km	7.1	N.	73.2	W.
28	20	36	13.5	Kermadec Islands. Depth about 33 km	29.7	S.	177.5	W.
29	01	12	24.9	Near north coast of western New Guinea. Depth about 33 km	1.3	S.	134.0	E.
29	01	48	51.5	New Hebrides Islands. Depth about 146 km	14.8	S.	166.3	E.
29	03	14	45.6	Mindanao, Philippine Islands. Depth about 229 km	6.5	N.	125.7	E.
29	09	22	55.8	New Hebrides Islands. Depth about 37 km. Mag. 6¼–6½ (Brk), 5½–5¾ (Pal).	13.9	S.	166.0	E.
29	10	24	07.3	Fiji Islands region. Depth about 654 km	22.7	S.	179.1	E.
29	11	34	55.7	Kurile Islands. Depth about 68 km	45.5	N.	151.3	E.
29	14	02	42.5	Andreanof Islands, Aleutian Islands. Depth about 76 km	52.4	N.	173.4	W.
29	15	11	11.1	New Hebrides Islands. Depth about 92 km	13.6	S.	165.5	E.
29	15	39	32.5	New Hebrides Islands. Depth about 74 km	13.8	S.	165.9	E.
29	22	01	24.1	Severnaya Zemlya region. Depth about 33 km	85.0	N.	97.8	E.
30	04	18	11.1	Tonga Islands. Depth about 148 km	20.5	S.	175.8	W.
30	05	05	24.8	Mediterranean Sea, south of Crete. Depth about 40 km	34.8	N.	26.3	E.
30	06	22	51.9	Sumatra. Depth about 71 km	3.8	S.	102.5	E.
30	18	51	12.7	Banda Sea. Depth about 134 km	6.7	S.	129.3	E.
30	19	44	07.3	Ceram Sea. Depth about 81 km	2.8	S.	128.0	E.
July 1	00	02	39.2	Unimak Island, Aleutian Islands. Depth about 34 km	54.1	N.	164.3	W.
1	03	48	36.9	New Hebrides Islands. Depth about 33 km	13.9	S.	166.1	E.
1	03	52	33.1	——do——	14.0	S.	165.7	E.
1	08	00	11.6	Bonin Islands region. Depth about 117 km	29.9	N.	140.5	E.
1	10	38	13.0	New Hebrides Islands. Depth about 43 km	13.7	S.	165.8	E.
1	11	39	50.5	Near east coast of New Guinea. Depth about 64 km	7.7	S.	148.3	E.
1	13	10	40.9	Near coast of Peru. Depth about 68 km	15.3	S.	74.8	W.
1	13	33	08.8	Fiji Islands. Depth about 600 km	17.7	S.	178.7	W.
1	18	50	57.5	Fiji Islands. Depth about 601 km	18.0	S.	178.4	W.
1	23	44	05.7	Near Islands region, Aleutian Islands. Depth about 19 km	53.9	N.	169.8	E.
2	02	07	15.0	Hokkaido, Japan. Depth about 100 km	43.5	N.	142.9	E.
2	05	12	50.9	Banda Sea. Depth about 33 km	5.6	S.	123.8	E.
2	10	10	16.3	Mariana Islands region. Depth about 64 km	20.8	N.	142.6	E.
2	11	43	38.1	Tonga Islands. Depth about 108 km	19.0	S.	174.8	W.
2	14	09	43.2	Loyalty Islands. Depth about 33 km	21.0	S.	169.4	E.
2	16	33	35.4	New Hebrides Islands. Depth about 56 km	13.7	S.	165.7	E.
2	16	47	22.7	New Hebrides Islands. Depth about 33 km	14.0	S.	166.1	E.
2	18	00	36.3	Near Islands region, Aleutian Islands. Depth about 33 km	49.8	N.	171.9	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 3	07	06	16.5	Central New Mexico. Depth about 15 km	33.6	N.	106.9	W.
3	08	26	13.4	Near coast of Ecuador. Depth about 33 km	2.8	S.	79.7	W.
3	12	15	27.3	Off coast of Michoacan, Mexico. Depth about 25 km	15.3	N.	104.6	W.
3	14	49	30.3	Near coast of Peru. Depth about 57 km	8.7	S.	79.1	W.
3	15	48	16.2	Mariana Islands region. Depth about 65 km	11.8	N.	142.2	E.
4	02	19	47.3	New Hebrides Islands. Felt at Port Vila. Depth about 33 km	18.0	S.	167.4	E.
4	04	56	02.1	Western Nevada. Depth about 33 km. Mag. 5.0 (Brk)	40.9	N.	118.1	W.
4	06	10	44.8	Mariana Islands. Depth about 145 km	18.0	N.	146.4	E.
4	08	23	35.6	Near coast of South Island, New Zealand. Depth about 33 km	44.3	S.	168.4	E.
4	11	09	11.0	Western Nevada. Depth about 33 km. Mag. 5.4 (Brk)	41.0	N.	117.8	W.
4	12	07	20.7	Kermadec Islands. Depth about 361 km	30.4	S.	179.7	W.
4	18	07	41.0	Celebes Sea. Depth about 599 km	3.3	N.	122.6	E.
4	19	17	48.9	Macquarie Islands region. Depth about 33 km	55.9	S.	147.5	E.
4	19	58	29.1	----do----	55.7	S.	147.6	E.
5	02	21	56.1	Ryukyu Islands. Depth about 33 km	28.7	N.	129.7	E.
5	02	28	41.2	About 1,000 km. southwest of Macquarie Islands. Depth about 33 km.	58.4	S.	150.3	E.
5	05	02	26.9	Windward Islands. Depth about 60 km	15.1	N.	60.4	W.
5	06	22	09.3	Sinkiang Province, China. Depth about 58 km	40.0	N.	77.6	E.
5	06	34	30.7	Sinkiang Province, China. Depth about 44 km	39.7	N.	78.1	E.
5	08	17	53.0	Iran. Depth about 30 km	27.7	N.	54.8	E.
5	23	31	09.5	Solomon Islands. Depth about 46 km	10.8	S.	161.5	E.
6	03	42	31.8	Western Nevada. Depth about 33 km	41.1	N.	117.6	W.
6	05	12	37.1	Near north coast of Honduras. Depth about 33 km	15.9	N.	87.2	W.
6	16	08	20.8	Ascension Island region. Depth about 19 km	7.0	S.	13.1	W.
6	18	34	35.4	Flores Sea. Depth about 600 km	7.0	S.	120.4	E.
6	22	09	29.4	Loyalty Islands region. Felt at Port Vila. Depth about 27 km. Mag. 6½.	20.6	S.	169.4	E.
6	23	06	16.4	Loyalty Islands region. Depth about 33 km	20.7	S.	169.3	E.
7	02	02	39.0	Kenai Peninsula, Alaska. Depth about 33 km	61.1	N.	148.0	W.
7	03	21	19.7	New Hebrides Islands. Felt on Santo. Depth about 184 km	14.4	S.	167.3	E.
7	07	42	06.4	D'Entrecasteaux Islands. Depth about 33 km	9.1	S.	154.2	E.
7	08	05	06.7	Kurile Islands. Depth about 90 km	47.2	N.	153.2	E.
7	12	33	40.8	Loyalty Islands region. Depth about 33 km	20.5	S.	169.2	E.
7	13	10	43.8	New Britain. Depth about 57 km. Mag. 6–6¼	5.7	S.	149.7	E.
7	14	41	48.8	Loyalty Islands region. Depth about 33 km	20.4	S.	169.2	E.
7	15	28	14.5	Near east coast of Kamchatka. Depth about 20 km	53.7	N.	159.9	E.
7	17	01	51.9	Northern Burma. Depth about 33 km	23.9	N.	98.5	E.
7	22	19	31.6	Loyalty Islands region. Depth about 41 km. Mag. 5–5¼ (Pal)	20.2	S.	169.0	E.
7	23	42	55.0	Loyalty Islands region. Depth about 33 km	20.3	S.	168.9	E.
8	02	35	20.5	Loyalty Islands region. Depth about 33 km. Mag. 5¾ (Pal)	20.2	S.	168.7	E.
8	03	18	32.8	Loyalty Islands region. Depth about 33 km	20.0	S.	168.9	E.
8	03	25	23.4	----do----	20.7	S.	169.1	E.
8	05	49	02.0	Peru. Depth about 15 km	6.2	S.	77.1	W.
8	11	16	16.1	Mariana Islands. Depth about 193 km	18.6	N.	145.4	E.
8	15	08	32.6	Loyalty Islands region. Depth about 33 km	20.2	S.	169.0	E.
8	15	34	37.4	Loyalty Islands region. Depth about 26 km. Mag. 6–6¼	20.1	S.	168.7	E.
8	16	34	01.3	Loyalty Islands region. Depth about 33 km	20.3	S.	169.3	E.
8	21	13	59.5	Loyalty Islands region. Depth about 33 km. Mag. 5¼–5½ (Pal)	20.4	S.	169.0	E.
8	21	48	42.3	Loyalty Islands region. Depth about 18 km. Mag. 5¼–5½ (Pal)	20.4	S.	169.0	E.
8	22	13	10.0	Tonga Islands. Depth about 33 km	20.2	S.	174.4	W.
9	04	57	36.8	Near north coast of Honduras. Depth about 50 km. Mag. 4¼	16.4	N.	87.8	W.
9	06	32	47.5	Near north coast of Honduras. Depth about 46 km	15.6	N.	87.3	W.
9	08	05	45.9	Iran. Depth about 25 km	29.0	N.	54.7	E.
9	13	51	09.8	Near north coast of Honduras. Depth about 33 km	16.1	N.	87.9	W.
9	16	46	02.0	Rat Islands, Aleutian Islands. Depth about 33 km	51.9	N.	176.2	E.
10	03	49	56.4	Chile-Bolivia border. Depth about 117 km	19.3	S.	68.4	W.
10	11	59	50.4	New Britain. Depth about 33 km	5.8	S.	149.7	E.
10	12	16	29.4	Fiji Islands region. Depth about 564 km	20.8	S.	179.5	W.
10	12	54	03.0	Off coast of Michoacan, Mexico. Depth about 33 km. Mag. 4½ (Brk).	17.9	N.	104.9	W.
10	14	18	13.7	Campeche, Mexico. Depth about 56 km	18.3	N.	89.8	W.
10	14	21	31.0	Kermadec Islands. Depth about 334 km	30.4	S.	179.4	W.
11	01	21	06.2	Kurile Islands. Depth about 33 km	45.2	N.	148.1	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 11	05	45	29.5	Kermadec Islands region. Depth about 58 km	27.5	S.	177.1	W.
11	08	02	34.7	Banda Sea. Depth about 132 km	7.3	S.	128.5	E.
11	09	31	42.6	Nicobar Islands. Depth about 17 km. Mag. 5½–5¾ (Pal)	8.0	N.	93.1	E.
11	11	23	51.5	Fiji Islands region. Depth about 598 km	21.1	S.	177.7	W.
11	16	26	44.1	Tonga Islands. Depth about 90 km	21.6	S.	175.7	W.
11	17	23	42.3	Northeastern India. Depth about 25 km	27.1	N.	81.0	E.
11	18	35	54.3	Banda Sea. Depth about 530 km	6.9	S.	125.7	E.
12	01	38	25.2	South of Panama. Depth 44 km	4.8	N.	82.9	W.
12	02	48	31.0	Near east coast of Greece. Felt. Depth about 33 km	29.1	N.	23.4	E.
12	04	47	33.6	Molucca Passage. Depth about 100 km	3.4	N.	128.1	E.
12	13	29	56.6	Kurile Islands. Depth about 40 km	45.4	N.	151.0	E.
12	14	36	58.6	Loyalty Islands region. Depth about 53 km	22.9	S.	171.4	E.
12	17	19	44.9	Near coast of southern Chile. Depth about 33 km	43.1	S.	74.5	W.
12	20	43	05.5	New Ireland region. Depth about 54 km	1.6	S.	150.6	E.
12	22	38	48.6	South of Panama. Depth about 20 km	5.0	N.	82.9	W.
13	01	22	44.4	New Britain region. Felt at Pomio. Depth about 54 km	5.9	S.	147.4	E.
13	02	11	43.6	Volcano Islands. Depth about 333 km	26.6	N.	139.8	E.
13	07	19	01.9	Tonga Islands region. Depth about 33 km	16.1	S.	173.2	W.
13	09	28	53.0	Iran. Depth about 33 km	27.4	N.	54.9	E.
13	10	32	02.2	New Britain. Depth about 55 km	5.4	S.	151.4	E.
13	11	14	48.8	New Britain region. Depth about 33 km	6.9	S.	146.8	E.
13	13	45	02.4	Tonga Islands. Depth about 29 km	21.4	S.	175.7	W.
13	14	56	49.0	Loyalty Islands region. Depth about 33 km	20.5	S.	168.9	E.
13	21	44	33.4	Near east coast of Formosa. Depth about 33 km	22.9	N.	122.7	E.
13	22	10	01.4	Kermadec Islands region. Depth about 468 km	25.3	S.	180.0	
14	00	06	52.5	Luzon, Philippine Islands. Depth about 168 km	15.8	N.	120.9	E.
14	06	07	10.9	New Britain. Depth about 77 km	5.4	S.	151.9	E.
14	03	35	25.1	Fiji Islands region. Depth about 100 km	14.8	S.	177.2	W.
14	04	22	15.9	Fiji Islands. Depth about 540 km	17.9	S.	178.2	W.
14	08	52	17.0	South of Java. Depth about 33 km	11.4	S.	112.9	E.
14	21	44	12.8	Fox Islands, Aleutian Islands. Depth about 33 km	53.4	N.	169.8	W.
15	00	17	53.5	Luzon, Philippine Islands. Depth about 70 km	13.3	N.	120.6	E.
15	05	43	11.0	Off south coast of Kamchatka. Depth about 31 km	48.8	N.	157.4	E.
15	06	03	43.2	Loyalty Islands region. Depth about 25 km	20.2	S.	169.1	E.
15	07	57	19.2	About 1,000 km southwest of Macquarie Islands. Depth about 33 km.	58.0	S.	146.9	E.
15	11	54	14.8	Ceram. Depth about 100 km	3.8	S.	131.4	E.
15	13	55	26.5	Java Sea. Depth about 565 km	6.8	S.	116.9	E.
15	20	15	14.4	New Hebrides Islands. Depth about 33 km	15.7	S.	166.8	E.
15	20	33	23.0	Fiji Islands. Depth about 511 km	20.4	S.	178.2	W.
16	00	47	52.6	Southeastern Alaska. Depth about 33 km	58.6	N.	137.2	W.
16	01	51	04.2	Banda Sea. Depth about 42 km	3.7	S.	131.2	E.
16	02	47	23.1	Solomon Islands. Depth about 104 km	10.9	S.	162.4	E.
16	05	22	39.1	Tonga Islands. Depth about 200 km	19.0	S.	175.4	W.
16	06	47	26.4	Tonga Islands. Depth about 206 km	18.9	S.	175.6	W.
16	09	04	40.2	Hindu Kush. Depth about 206 km	36.4	N.	70.7	E.
16	14	01	35.8	Loyalty Islands region. Depth about 15 km. Mag. 5½ (Brk)	23.0	S.	171.4	E.
16	15	33	44.2	Tonga Islands. Depth about 100 km	19.2	S.	173.7	W.
16	20	00	08.6	Kermadec Islands region. Depth about 67 km	34.6	S.	178.4	W.
16	20	57	40.9	Azores. Depth about 33 km	40.9	N.	29.9	W.
16	21	08	45.6	Kurile Islands. Depth about 29 km	49.5	S.	155.1	E.
16	23	03	26.9	Fiji Islands. Depth about 591 km	18.1	S.	179.3	W.
17	01	01	09.7	Oaxaca, Mexico. Depth about 40 km. Mag. 4¼–4½ (Brk)	16.8	N.	97.6	W.
17	03	30	50.4	Oaxaca, Mexico. Depth about 33 km	16.8	N.	97.7	W.
17	05	13	21.3	Iran. Depth about 16 km	27.8	N.	55.1	E.
17	09	08	07.9	Off coast of Michoacan, Mexico. Depth about 33 km	17.3	N.	105.1	W.
17	09	17	49.0	Near coast of central Chile. Depth about 33 km	37.7	S.	72.4	W.
17	14	02	48.2	Mid-Atlantic Ocean. Depth about 25 km	1.8	N.	29.5	W.
17	14	53	30.9	Kirghiz S.S.R. Depth about 64 km	41.2	N.	72.3	E.
17	15	04	45.8	Near northeast coast of New Guinea. Depth about 33 km	2.6	S.	142.0	E.
17	15	32	50.4	do	2.8	S.	141.9	E.
17	16	20	19.1	Near east coast of Honshu, Japan. Felt. Depth about 51 km	35.8	N.	141.3	E.
17	17	08	18.8	New Britain. Depth about 64 km	5.4	S.	152.5	E.
18	07	16	59.2	Kermadec Islands region. Depth about 60 km	28.0	S.	176.8	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 18	13	03	28.3	Banda Sea. Depth about 25 km	5.9	S.	128.5	E.
18	14	03	36.5	Northern Ryukyu Islands. Felt on Kyushu, Japan. Depth about 21 km. Mag. 6¾.	29.4	N.	131.6	E.
18	14	34	03.1	Northern Ryukyu Islands. Depth about 33 km	29.7	N.	131.5	E.
18	15	16	12.5	Northern Ryukyu Islands. Depth about 35 km	29.7	N.	131.3	E.
18	15	36	45.4	Northern Ryukyu Islands. Depth about 25 km	29.7	N.	131.7	E.
18	16	20	07.7	Northern Ryukyu Islands. Depth about 33 km	29.7	N.	131.4	E.
18	16	22	46.9	Catamarca Province, Argentina. Depth about 37 km	28.2	S.	66.5	W.
18	16	48	38.1	Northern Ryukyu Islands. Depth about 33 km	29.7	N.	131.5	E.
18	18	33	38.2	----do	29.7	N.	131.7	E.
18	19	29	07.5	----do	29.3	N.	131.8	E.
18	21	26	30.5	Socotra Island region. Depth about 43 km	13.9	N.	56.6	E.
18	23	42	36.5	Northern Ryukyu Islands. Depth about 39 km	29.8	N.	131.5	E.
19	00	10	42.9	Near west coast of Honshu, Japan. Depth about 33 km	40.9	N.	139.6	E.
19	03	50	42.0	Sandwich Islands. Depth about 39 km	59.0	S.	25.3	W.
19	05	29	59.3	Northern Ryukyu Islands. Depth about 43 km	29.7	N.	131.9	E.
19	06	33	18.1	Northern Ryukyu Islands. Depth about 27 km	29.8	N.	131.7	E.
19	09	19	27.8	Off east coast of Honshu, Japan. Depth about 62 km	37.0	N.	142.0	E.
19	10	35	41.4	Northern Ryukyu Islands. Depth about 20 km	29.9	N.	131.5	E.
19	11	58	43.7	Northern Ryukyu Islands. Depth about 31 km	29.8	N.	131.5	E.
19	18	00	26.9	Samoa Islands region. Depth about 33 km	19.6	S.	173.7	W.
19	18	26	37.9	Fiji Islands region. Depth about 531 km	23.7	S.	179.9	E.
19	19	31	54.7	New Hebrides Islands. Felt at Port Vila. Depth about 50 km	18.1	S.	167.7	E.
19	19	45	33.2	Northern Ryukyu Islands. Depth about 33 km	29.7	N.	131.8	E.
19	22	36	36.5	Andreanof Islands, Aleutian Islands. Depth about 42 km	51.9	N.	173.4	W.
19	23	00	56.7	Ionian Sea. Depth about 37 km	37.9	N.	20.2	E.
20	02	04	50.5	Molucca Passage. Depth about 27 km	2.2	N.	127.5	E.
20	03	04	42.8	Northern Ryukyu Islands. Depth about 33 km	29.6	N.	131.5	E.
20	06	47	43.4	Leyte, Philippine Islands. Depth about 37 km	10.9	N.	124.8	E.
20	07	00	19.9	Leyte, Philippine Islands. Depth about 25 km	10.4	N.	129.9	E.
20	08	44	20.2	Near coast of Michoacan, Mexico. Depth about 33 km	18.3	N.	103.4	W.
20	09	02	44.9	Northern Ryukyu Islands. Depth about 33 km	30.4	N.	131.7	E.
20	09	04	32.2	Loyalty Islands. Depth about 17 km	21.1	S.	168.6	E.
20	10	33	16.0	South of Panama. Depth about 33 km	4.9	N.	82.1	W.
20	13	18	04.2	Southern Bolivia. Depth about 128 km	20.8	S.	64.7	W.
20	15	10	26.7	Fiji Islands. Depth about 570 km	17.6	S.	178.7	W.
20	17	21	49.3	Tonga Islands region. Depth about 117 km	24.5	S.	177.3	W.
20	19	58	03.0	Kermadec Islands. Depth about 44 km	32.0	S.	177.2	W.
21	01	10	36.7	Loyalty Islands region. Depth about 112 km	22.4	S.	171.5	E.
21	02	48	58.7	Nicobar Islands. Depth about 24 km	8.3	N.	93.4	E.
21	04	32	28.2	Azores region. Depth about 33 km	40.5	N.	30.5	W.
21	07	44	04.0	Santa Cruz Islands. Depth about 52 km	11.4	S.	166.4	E.
21	13	07	12.9	New Hebrides Islands. Depth about 33 km	19.5	S.	169.5	E.
21	17	59	14.4	Northern Ryukyu Islands. Depth about 38 km	30.2	N.	131.4	E.
21	18	34	20.0	Northern Ryukyu Islands. Depth about 33 km	29.6	N.	131.4	E.
21	18	50	54.7	----do	29.8	N.	131.7	E.
21	19	05	15.3	Tonga Islands. Depth about 25 km	22.5	S.	176.0	W.
21	22	39	53.2	Northern Ryukyu Islands. Depth about 32 km	29.8	N.	131.6	E.
22	02	42	32.1	Tonga Islands region. Depth about 33 km	25.1	S.	175.5	W.
22	05	21	20.9	Fiji Islands. Depth about 584 km	20.8	S.	178.8	W.
22	09	56	33.7	Java. Depth about 110 km	7.3	S.	107.8	E.
22	10	27	51.8	Tonga Islands. Depth about 25 km	20.3	S.	174.0	W.
22	13	53	56.1	Northeastern Afghanistan. Depth about 200 km	36.6	N.	70.2	E.
22	16	24	31.7	Off coast of Nicaragua. Depth about 33 km	12.2	N.	88.6	W.
22	18	12	28.1	About 1,000 km southwest of Macquarie Islands. Depth about 34 km.	54.1	S.	140.4	E.
22	20	53	30.0	Kirghiz S.S.R. Depth about 54 km	40.8	N.	72.2	E.
23	00	05	32.8	Jalisco, Mexico. Depth about 75 km	20.0	N.	105.0	W.
23	11	14	27.0	New Britain region. Depth about 41 km	7.6	S.	151.0	E.
23	11	29	22.3	Juyjuy Province, Argentina. Depth about 168 km	23.7	S.	66.3	W.
23	12	09	53.1	Southern Bolivia. Depth about 89 km	21.1	S.	65.4	W.
23	13	35	55.6	Northern Chile. Depth about 40 km	25.7	S.	70.0	W.
23	14	03	39.8	New Hebrides Islands. Felt at Port Vila, Tanna, and Erromango. Depth about 44 km. Mag. 5¾–6 (Brk).	18.6	S.	168.2	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 23	14	16	34.3	New Hebrides Islands. Felt at Port Vila, Tanna, and Erromango. Depth about 33 km.	18.5	S.	168.1	E.
23	14	37	56.9	Pacific Ocean, about 3,000 km northwest of Galapagos Islands. Depth about 33 km. Mag. 5¾–6.	6.8	N.	123.5	W.
23	15	28	52.6	New Hebrides Islands. Felt at Port Vila. Depth about 44 km	18.5	S.	168.2	E.
23	15	30	17.2	New Hebrides Islands. Depth about 33 km. Mag. 5½ (Brk)	18.3	S.	168.2	E.
23	21	51	07.5	New Hebrides Islands. Slight damage at Port Vila. Seismic sea wave at Port Vila and Forari. Depth about 44 km. Mag. 7–7¼.	18.5	S.	168.3	E.
23	22	01	55.3	New Hebrides Islands. Depth about 37 km	18.5	S.	168.3	E.
23	22	41	01.2	New Hebrides Islands. Depth about 33 km	18.1	S.	168.1	E.
23	23	22	07.8	New Hebrides Islands. Depth about 18 km	18.7	S.	168.0	E.
23	23	46	18.5	New Hebrides Islands. Depth about 23 km	18.6	S.	168.2	E.
24	00	34	53.7	New Hebrides Islands. Depth about 33 km	18.2	S.	168.0	E.
24	01	30	56.6	Fiji Islands region. Depth about 598 km	21.2	S.	179.2	W.
24	01	46	28.9	New Hebrides Islands. Felt at Port Vila. Depth about 33 km	18.4	S.	168.4	E.
24	01	53	29.9	Ecuador. Depth about 33 km	2.1	S.	79.4	W.
24	01	58	52.3	New Hebrides Islands. Felt at Port Vila. Depth about 23 km	18.3	S.	168.4	E.
24	02	07	18.6	Ecuador. Depth about 30 km	1.6	S.	78.3	W.
24	03	44	48.2	New Hebrides Islands. Depth about 33 km	18.3	S.	168.2	E.
24	08	48	09.7	Northern Celebes region. Depth about 104 km	0.1	N.	124.1	E.
24	09	49	37.7	New Hebrides Islands. Depth about 33 km	18.4	S.	167.8	E.
24	10	39	23.7	Vancouver Island region. Depth about 25 km	50.8	N.	128.9	W.
24	11	01	46.7	New Hebrides Islands. Felt at Port Vila. Depth about 16 km	18.9	S.	168.4	E.
24	18	09	49.6	Ceram Sea. Depth about 33 km	3.8	S.	130.9	E.
24	20	06	14.9	New Hebrides Islands. Depth about 33 km	18.7	S.	168.2	E.
25	01	30	34.4	New Hebrides Islands. Depth about 40 km	18.9	S.	167.6	E.
25	02	26	27.2	New Hebrides Islands. Depth about 33 km	18.7	S.	168.2	E.
25	02	48	13.4	Western Brazil. Depth about 593 km	8.9	S.	71.4	W.
25	05	15	37.2	Near coast of Oaxaca, Mexico. Depth about 33 km	15.8	N.	96.7	W.
25	05	59	40.6	Near east coast of Kamchatka. Depth about 32 km	55.1	N.	164.2	E.
25	08	00	56.9	Indian Ocean, about 1,500 km northeast of Kerguelen Islands. Depth about 19 km.	38.4	S.	78.6	E.
25	08	50	40.5	New Hebrides Islands. Depth about 33 km	18.3	S.	167.6	E.
25	10	01	58.9	Tonga Islands. Depth about 221 km	18.4	S.	175.7	W.
25	11	08	16.3	New Hebrides Islands. Depth about 25 km	18.4	S.	168.2	E.
25	12	00	54.7	Off southeast coast of Formosa. Depth about 33 km	20.9	N.	123.3	E.
25	17	56	35.8	Near south coast of Java. Depth about 131 km	8.3	S.	110.1	E.
25	18	39	24.1	Celebes region. Depth about 43 km	0.0		124.7	E.
26	01	34	18.2	About 1,000 km. southeast of Easter Island. Depth about 24 km	35.9	S.	104.5	W.
26	02	55	59.9	Banda Sea. Depth about 96 km	7.5	S.	128.0	E.
26	09	18	58.8	North Island, New Zealand. Felt. Depth about 83 km	37.1	S.	177.1	E.
26	20	38	07.4	South of Honshu, Japan. Depth about 33 km	27.6	N.	132.5	E.
27	02	07	23.1	Kermadec Islands. Depth about 469 km	30.5	S.	178 6	W.
27	06	09	25.9	Bolivia-Chile border. Felt at Arica, Chila. Depth about 47 km	18.4	S.	70.2	W.
27	08	27	46.9	Fiji Islands. Depth about 562 km	17.8	S.	178.1	W.
27	10	30	17.4	New Hebrides Islands. Depth about 33 km	18.2	S.	167.5	E.
27	11	33	49.6	New Hebrides Islands. Depth about 173 km	19.1	S.	169.2	E.
27	15	33	38.1	Kermadec Islands region. Depth about 33 km	34.8	S.	179.0	W.
27	18	35	44.2	Aegean Sea. Felt. Depth about 33 km	34.9	N.	25.4	E.
27	19	00	02.2	Juyjuy Province, Argentina. Depth about 246 km	23.3	S.	67.2	W.
27	19	28	32.2	New Britain. Depth about 33 km	6.3	S.	150.0	E.
27	23	59	26.9	Lake Baikal region, U.S.S.R. Depth about 33 km	53.7	N.	110.7	E.
28	00	01	13.9	South of Mindanao, Philippine Islands. Depth about 80 km	4.6	N.	125.5	E.
28	00	34	19.5	Ryukyu Islands. Depth about 149 km	27.1	N.	126.6	E.
28	01	05	30.0	Ecuador. Depth about 136 km. Mag. 6¼	2.2	S.	77.1	W.
28	04	54	55.1	New Hebrides Islands. Depth about 50 km	18.6	S.	167.9	E.
28	06	11	38.7	New Hebrides Islands. Depth about 41 km. Mag. 5¾ (Brk)	18.7	S.	167.7	E.
28	08	29	09.2	New Hebrides Islands. Depth about 33 km	18.9	S.	167.8	E.
28	10	13	50.5	About 500 km west of Jalisco, Mexico. Depth about 33 km. Mag. 5½ (Brk).	20.0	N.	109.3	W.
28	10	38	13.1	About 500 km west of Jalisco, Mexico. Depth about 19 km. Mag. 5¼–5½ (Brk).	19.6	N.	109.2	W.
28	12	38	48.1	Tonga Islands. Depth about 33 km	17.2	S.	172.5	W.
28	13	20	36.5	Celebes region. Depth about 33 km	0.7	S.	122.4	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
July 28	15	19	40.0	Near east coast of Hokkaido, Japan. Depth about 34 km	43.6	N.	146.1	E.
28	16	38	20.6	New Hebrides Islands. Depth about 33 km	19.8	S.	167.9	E.
28	16	59	31.9	Tonga Islands. Depth about 33 km	17.3	S.	172.7	W.
28	17	17	04.8	Loyalty Islands. Depth about 125 km	20.6	S.	170.0	E.
28	20	01	48.7	Aegean Sea. Depth about 33 km	35.8	N.	27.5	E.
28	23	57	09.7	Near east coast of New Guinea. Depth about 38 km	8.0	S.	149.5	E.
29	01	53	28.3	Sandwich Islands. Depth about 33 km	57.1	S.	25.8	W.
29	10	31	42.4	Fiji Islands. Depth about 33 km	16.6	S.	174.3	E.
29	11	55	36.1	Sandwich Islands. Depth about 33 km	57.0	S.	25.1	W.
29	16	27	19.0	Tonga Islands. Depth about 23 km. Mag. 5½ (Brk)	24.1	S.	176.1	W.
29	23	35	39.3	Flores Sea. Depth about 33 km	6.9	S.	118.7	E.
30	02	31	10.4	Sumatra. Depth about 146 km	3.9	S.	103.3	E.
30	07	25	46.8	Northern Peru. Depth about 42 km	5.4	S.	78.7	W.
30	08	08	07.7	Near north coast of New Guinea. Depth about 44 km	7.0	S.	146.1	E.
30	11	02	06.7	Leyte, Philippine Islands. Depth about 49 km	11.2	N.	124.7	E.
30	14	06	17.3	New Hebrides Islands. Depth about 37 km	18.3	S.	168.5	E.
30	15	36	16.8	Tonga Islands. Depth about 33 km	20.4	S.	174.1	W.
30	17	42	11.8	Ceram. Depth about 29 km	3.8	S.	130.9	E.
31	00	07	07.0	San Luis Obispo County, California. Felt. Depth about 23 km. Mag. 4½.	35.7	N.	120.4	W.
31	00	15	55.3	Near north coast of Java. Depth about 244 km	5.3	S.	107.2	E.
31	05	02	17.4	South of Honshu, Japan. Depth about 35 km	33.0	N.	140.9	E.
31	08	30	41.1	New Hebrides Islands. Depth about 30 km	18.7	S.	168.3	E.
31	19	08	41.5	Sumbawa. Depth about 32 km	9.8	S.	117.6	E.
Aug. 1	00	54	43.9	South of Kermadec Islands region. Depth about 60 km	33.3	S.	179.3	W.
1	01	17	44.7	New Hebrides Islands. Depth about 26 km	14.3	S.	166.7	E.
1	03	16	13.4	North Atlantic Ocean. Depth about 33 km	15.8	N.	46.8	W.
1	05	08	20.9	Near coast of southern Chile. Depth about 33 km	47.2	S.	73.9	W.
1	05	39	53.2	Solomon Islands. Felt. Depth about 50 km. Mag. 6½–6¾	9.9	S.	160.5	E.
1	07	21	12.3	Sandwich Islands. Depth about 44 km	57.0	S.	25.1	W.
1	09	24	22.4	Sandwich Islands. Depth about 61 km	56.8	S.	24.0	W.
1	09	34	40.7	Sandwich Islands. Depth about 31 km	57.3	S.	26.1	W.
1	10	27	47.7	New Ireland region. Depth about 25 km	2.1	S.	152.2	E.
1	14	30	41.1	Near coast of Jalisco, Mexico. Depth about 55 km	19.3	N.	104.6	W.
1	14	42	26.9	Sandwich Islands. Depth about 33 km	56.9	S.	25.1	W.
1	14	58	25.4	New Hebrides Islands. Depth about 25 km	17.9	S.	167.7	E.
1	16	18	49.2	South of Fiji Islands. Depth about 482 km	25.4	S.	179.9	E.
1	16	42	18.3	Solomon Islands. Depth about 46 km	10.6	S.	161.6	E.
1	19	26	51.1	Solomon Islands. Depth about 59 km	10.2	S.	160.8	E.
1	21	06	17.8	North of Ascension Island. Depth about 25 km	0.6	S.	16.2	W.
1	22	11	32.4	New Hebrides Islands. Depth about 33 km	18.2	S.	168.6	E.
1	23	12	19.2	Near north coast of New Guinea. Depth about 102 km	6.6	S.	148.0	E.
2	01	17	08.1	South Pacific Ocean. Depth about 22 km	53.5	S.	134.9	W.
2	02	03	56.0	New Hebrides Islands. Depth about 18 km	19.0	S.	168.0	E.
2	02	31	28.9	Sandwich Islands. Depth about 33 km	57.0	S.	24.8	W.
2	03	59	29.9	Sandwich Islands. Depth about 67 km	57.8	S.	26.6	W.
2	04	54	37.5	Loyalty Islands region. Depth about 39 km	22.8	S.	171.8	E.
2	12	12	02.0	Kurile Islands. Depth about 38 km	44.6	N.	148.8	E.
2	14	32	27.9	Near east coast of Kamchatka. Depth about 50 km	52.1	N.	157.8	E.
2	16	55	56.8	South of Panama. Depth about 33 km	4.9	N.	82.7	W.
2	19	54	23.3	Solomon Islands. Depth about 60 km	9.7	S.	160.2	E.
2	20	14	42.5	Santa Cruz Islands. Depth about 33 km	12.7	S.	165.7	E.
2	23	38	31.2	Fiji Islands region. Depth about 325 km	20.5	S.	177.6	W.
3	00	41	36.0	Gulf of Aden. Depth about 33 km	14.7	N.	52.2	E.
3	03	08	05.1	Puerto Rico. Felt. Depth about 132 km	18.4	N.	66.3	W.
3	04	50	14.5	South of Fiji Islands. Depth about 497 km	23.7	S.	180.0	
3	06	23	46.8	Ceram. Depth about 33 km	4.0	S.	131.2	E.
3	06	51	44.1	Ceram. Depth about 22 km	3.5	S.	130.8	E.
3	07	32	07.8	Banda Sea. Depth about 30 km	4.4	S.	131.6	E.
3	14	24	58.2	Near Islands, Aleutian Islands. Depth about 41 km	52.4	N.	174.0	E.
3	15	18	36.8	Kermadec Islands. Depth about 46 km	29.1	S.	177.2	W.
3	16	33	50.1	Tonga Islands region. Depth about 346 km	21.2	S.	177.0	W.
3	23	33	37.7	Mariana Islands region. Felt on Guam. Depth about 20 km	12.2	N.	143.8	E.
4	07	17	43.8	Eastern Hokkaido, Japan. Depth about 18 km	42.9	N.	144.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Aug. 4	09	00	14.6	Samoa Islands region. Depth about 48 km	15.4	S.	173.0	W.
4	10	36	25.7	Andreanof Islands, Aleutian Islands. Depth about 20 km	51.6	N.	177.4	W.
4	11	24	18.5	Near coast of Oaxaca, Mexico. Depth about 33 km	16.0	N.	95.4	W.
4	16	56	09.1	Western Nevada. Depth about 12 km. Mag. 4½ (Brk)	39.2	N.	117.7	W.
4	17	49	46.4	Kermadec Islands region. Depth about 69 km	28.5	S.	176.6	W.
4	18	19	22.8	New Hebrides Islands. Depth about 119 km	20.0	S.	169.7	E.
4	18	35	20.8	North Atlantic Ocean. Depth about 26 km	35.0	N.	38.7	W.
4	22	52	54.0	Kurile Islands. Depth about 45 km	45.2	N.	151.2	E.
4	23	32	24.0	South of Fiji Islands. Depth about 460 km	25.3	S.	179.7	W.
5	01	07	50.3	New Hebrides Islands. Felt on Santo. Depth about 33 km	13.8	S.	166.0	E.
5	01	33	12.2	Vancouver Island region. Depth about 15 km	49.6	N.	129.0	W.
5	02	26	20.3	Kenai Peninsula, Alaska. Felt at Cordova. Depth about 53 km	60.8	N.	148.7	W.
5	06	10	18.8	Near east coast of Kamchatka. Depth about 33 km	52.6	N.	159.1	E.
5	06	43	05.0	Kermadec Islands region. Depth about 66 km	28.4	S.	176.7	W.
5	08	16	47.5	Tonga Islands region. Depth about 229 km	19.3	S.	176.0	W.
5	09	27	45.5	Chile-Bolivia border. Felt at Arequipa, Peru. Depth about 113 km.	18.9	S.	68.2	W.
5	19	00	20.1	Burma. Depth about 50 km	21.8	N.	93.9	E.
6	03	20	39.0	Bonin Islands region. Depth about 36 km	26.9	N.	141.8	E.
6	09	04	04.1	Crete. Depth about 39 km	35.4	N.	26.8	E.
6	10	34	33.4	Celebes. Depth about 69 km	2.7	S.	122.0	E.
6	17	07	11.3	New Guinea. Depth about 79 km	3.2	S.	139.6	E.
7	04	02	15.0	Southern Hokkaido, Japan. Depth about 60 km	42.2	N.	142.1	E.
7	04	22	20.5	Celebes. Depth about 18 km	2.7	S.	121.6	E.
7	05	53	03.4	New Hebrides Islands. Depth about 33 km	18.7	S.	167.0	E.
7	10	43	21.6	Northern Celebes. Depth about 53 km	0.3	N.	124.0	E.
7	12	22	24.2	Kermadec Islands region. Depth about 33 km. Mag. 5¼ (Brk)	28.4	S.	176.4	W.
7	14	28	10.6	Banda Sea. Depth about 50 km	7.1	S.	129.2	E.
7	16	11	41.4	North of Balleny Islands. Depth about 49 km	61.3	S.	160.4	E.
7	16	57	49.6	Kermadec Islands region. Depth about 33 km	28.1	S.	177.4	W.
7	23	30	03.5	----do	27.5	S.	176.3	W.
8	00	18	52.3	----do	28.3	S.	176.4	W.
8	01	45	55.8	Kenai Peninsula, Alaska. Depth about 65 km	61.0	N.	148.6	W.
8	05	36	28.9	Andreanof Islands, Aleutian Islands. Depth about 57 km	52.1	N.	176.3	W.
8	07	18	34.9	Solomon Islands. Depth about 61 km	8.2	S.	156.6	E.
8	07	49	55.3	West of Easter Island. Depth about 38 km	24.7	S.	116.2	W.
8	09	07	55.1	Banda Sea. Depth about 408 km	7.0	S.	126.4	E.
8	12	18	23.1	Fox Islands, Aleutian Islands. Depth about 33 km. Mag. 6–6¼	51.2	N.	170.7	W.
8	13	37	53.0	Fox Islands, Aleutian Islands. Depth about 39 km	51.5	N.	170.5	W.
8	15	42	25.3	Fox Islands, Aleutian Islands. Depth about 59 km	51.4	N.	170.3	W.
8	16	39	19.2	Solomon Islands. Depth about 63 km	9.8	S.	160.4	E.
8	18	02	50.2	Revilla Gigedo Islands region. Depth about 33 km	21.0	N.	109.0	W.
8	18	53	15.7	Northern India. Depth about 23 km	34.3	N.	74.6	E.
8	23	45	17.4	Fox Islands, Aleutian Islands. Depth about 33 km	51.5	N.	170.4	W.
8	23	46	28.4	Solomon Islands. Depth about 40 km	10.3	S.	160.9	E.
8	23	49	16.4	Fox Islands, Aleutian Islands, Depth about 33 km	51.3	N.	170.8	W.
9	00	18	44.6	Samoa Islands region. Depth about 35 km	15.2	S.	173.2	W.
9	03	24	47.2	Fiji Islands. Depth about 600 km	17.9	S.	178.8	W.
9	04	02	28.2	Near coast of northern Honshu, Japan. Depth about 53 km	40.8	N.	142.8	E.
9	05	54	10.6	New Hebrides Islands. Depth about 21 km	18.8	S.	167.6	E.
9	16	02	35.5	New Hebrides Islands. Felt at Port Vila. Depth about 44 km. Mag. 5¾ (Brk).	19.2	S.	168.8	E.
9	23	00	41.6	New Britain region. Felt at Rabaul. Depth about 90 km	5.7	S.	151.4	E.
10	00	58	38.9	Alaska Peninsula. Depth about 68 km	58.7	N.	155.1	W.
10	01	34	23.8	Eastern U.S.S.R. Depth about 35 km	54.1	N.	132.0	E.
10	01	43	32.6	Kermadec Islands. Depth about 149 km	30.5	S.	179.7	W.
10	05	35	31.9	Mariana Islands. Depth about 448 km	18.5	N.	144.4	E.
10	06	37	05.0	Fiji Islands region. Depth about 360 km	21.0	S.	177.8	W.
10	07	32	01.1	Tonga Islands. Depth about 33 km	20.3	S.	174.2	W.
10	12	03	20.9	Near west coast of Honshu, Japan. Depth about 28 km	37.2	N.	137.0	E.
10	12	05	29.8	Eastern Hokkaido, Japan. Depth about 55 km	43.8	N.	144.9	E.
10	16	30	54.8	Near coast of central Chile. Depth about 21 km	38.2	S.	73.3	W.
10	17	22	31.6	Solomon Islands. Depth about 44 km	9.7	S.	159.7	E.
11	00	43	29.6	Komandorskie Islands. Depth about 27 km	56.3	N.	164.3	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Aug. 11	06	08	16.7	Eastern Kyushu, Japan. Depth about 33 km	32.0	N.	131.7	E.
11	06	55	32.2	Rat Islands, Aleutian Islands. Depth about 33 km	51.5	N.	178.7	E.
11	09	08	23.9	New Hebrides Islands. Depth about 48 km	17.9	S.	167.8	E.
11	10	24	58.9	New Hebrides Islands. Felt at Port Vila. Depth about 25 km	18.6	S.	168.2	E.
11	11	04	39.1	Northern Celebes. Depth about 143 km	0.2	N.	124.0	E.
11	12	51	47.7	New Britain region. Depth about 79 km	5.3	S.	152.4	E.
11	15	51	34.6	Eastern Hokkaido, Japan. Slight tsunami. Depth about 50 km. Mag. 7¼.	43.0	N.	145.0	E.
11	22	37	24.7	Celebes. Depth about 33 km	2.9	S.	122.1	E.
11	23	11	48.2	Near northeast coast of Honshu, Japan. Felt. Depth about 95 km	41.7	N.	141.8	E.
11	23	33	52.2	Eastern Hokkaido, Japan. Depth about 50 km	43.1	N.	145.2	E.
12	04	52	54.9	New Hebrides Islands. Depth about 33 km	18.7	S.	168.2	E.
12	05	30	39.9	New Hebrides Islands. Depth about 25 km	18.9	S.	167.9	E.
12	13	05	44.5	Southern Bolivia. Depth about 202 km	21.3	S.	67.0	W.
12	13	20	14.9	New Hebrides Islands. Depth about 33 km	17.9	S.	167.9	E.
13	02	33	09.9	Banda Sea. Depth about 135 km	6.1	S.	130.3	E.
13	02	46	33.1	New Hebrides Islands. Depth about 33 km	18.7	S.	167.5	E.
13	06	01	01.8	Near coast of Formosa. Felt at Taipei. Depth about 38 km	24.4	N.	121.7	E.
13	10	19	17.5	Fox Islands, Aleutian Islands. Depth about 68 km	52.9	N.	168.4	W.
13	12	45	51.8	Banda Sea. Depth about 160 km	7.8	S.	127.5	E.
13	13	36	31.9	Windward Islands. Depth about 158 km	14.9	N.	60.3	W.
13	15	54	23.3	Fox Islands, Aleutian Islands. Depth about 33 km	52.9	N.	166.6	W.
13	18	22	50.3	Bolivia. Depth about 218 km	19.3	S.	67.9	W.
13	21	58	41.7	South of Fiji Islands. Depth about 443 km	24.9	S.	179.8	E.
13	22	34	18.7	Northern Italy. Felt. Depth about 22 km	45.2	N.	10.1	E.
13	23	40	43.3	Solomon Islands. Depth about 111 km	6.1	S.	154.8	E.
14	01	56	56.2	Near coast of northern Peru. Depth about 35 km	3.4	S.	81.3	W.
14	06	37	19.6	Fiji Islands. Depth about 535 km	19.7	S.	178.1	W.
14	13	35	43.7	Banda Sea. Depth about 83 km	6.7	S.	127.3	E.
14	13	46	07.8	Alaska Peninsula. Depth about 80 km	58.1	N.	158.5	W.
14	18	50	55.3	Tonga Islands region. Depth about 70 km. Mag. 5½ (Brk)	24.6	S.	175.7	W.
14	22	04	59.7	Near east coast of Kyushu, Japan. Depth about 20 km	31.6	N.	131.5	E.
14	23	28	46.5	New Hebrides Islands region. Felt at Port Vila. Depth about 97 km. Mag. 6–6¼.	20.4	S.	169.4	E.
15	12	25	58.8	Near south coast of Alaska. Depth about 36 km	59.1	N.	136.9	W.
15	15	35	31.0	Kurile Islands. Depth about 34 km	47.8	N.	155.3	E.
15	17	51	18.6	New Hebrides Islands. Depth about 36 km	14.8	S.	168.3	E.
15	19	03	55.7	South of Honshu, Japan. Depth about 39 km	33.0	N.	142.4	E.
15	19	43	54.8	South of Fiji Islands. Depth about 595 km	23.5	S.	180.0	
15	23	26	40.2	South of Honshu, Japan. Depth about 33 km	32.8	N.	142.2	E.
16	03	33	52.6	Kermadec Islands. Depth about 70 km	32.0	S.	177.9	W.
16	04	04	07.9	Kermadec Islands. Depth about 33 km	32.1	S.	177.9	W.
16	04	17	24.8	La Rioja Province, Argentina. Depth about 213 km	31.0	S.	66.1	W.
16	08	57	36.9	South of Honshu, Japan. Depth about 32 km	32.4	N.	142.1	E.
16	11	11	44.0	Solomon Islands. Depth about 55 km	6.8	S.	156.0	E.
16	12	23	12.7	Hindu Kush. Depth about 220 km	36.5	N.	71.2	E.
16	15	53	42.4	Off east coast of Honshu, Japan. Depth about 340 km	33.7	N.	137.2	E.
16	16	15	57.5	South of Ascension Island. Depth about 25 km	13.9	S.	14.7	W.
16	19	19	01.3	Kermadec Islands. Depth about 51 km	31.9	S.	178.0	W.
16	22	22	08.7	Leyte, Philippine Islands. Depth about 50 km	11.3	N.	125.2	E.
17	01	04	35.2	Kermadec Islands. Depth about 45 km	31.7	S.	179.1	W.
17	03	35	42.3	Hindu Kush. Depth about 205 km	35.7	N.	69.7	E.
17	05	06	02.7	South Pacific Ocean. Depth about 33 km	55.6	S.	125.5	W.
17	06	36	23.0	South of Easter Island. Depth about 25 km	34.6	S.	109.0	W.
17	06	51	13.8	Off east coast of Honshu, Japan. Depth about 33 km	34.4	N.	142.6	E.
17	08	36	17.9	Near north coast of New Guinea. Depth about 101 km	6.7	S.	147.3	E.
17	11	37	13.9	Northern Honshu, Japan. Depth about 125 km	39.0	N.	140.8	E.
17	12	54	47.9	Kermadec Islands. Depth about 33 km	32.0	S.	178.3	W.
17	17	49	25.2	New Hebrides Islands. Depth about 52 km	18.4	S.	168.5	E.
17	17	49	43.3	Near coast of southern Peru. Depth about 46 km	17.4	S.	72.7	W.
17	21	16	30.1	Kurile Islands. Depth about 160 km. Mag. 6¾	46.4	N.	149.3	E.
18	05	30	00.8	Bonin Islands. Depth about 440 km	28.4	N.	139.3	E.
18	10	16	49.4	Solomon Islands. Depth about 33 km	8.5	S.	156.5	E.
18	11	01	26.5	South of Fiji Islands. Depth about 519 km	24.2	S.	179.9	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Aug. 18	12	51	24.5	New Guinea. Depth about 168 km	7.0	S.	145.8	E.
19	01	12	24.5	New Hebrides Islands. Depth about 25 km	18.4	S.	167.1	E.
19	02	42	58.2	Eastern Hokkaido, Japan. Depth about 32 km	43.3	N.	145.0	E.
19	04	56	24.1	Northwestern Oregon. Minor damage at Albany and Lebanon. Depth about 33 km. Mag. 4.5.	44.7	N.	122.5	W.
19	05	09	49.5	Peru-Brazil border. Felt at Arequipa, Peru. Depth about 649 km. Mag. 7.	10.8	S.	71.0	W.
19	05	33	30.6	Near west coast of Honshu, Japan. 10 killed, 34 injured and moderate property damage at Fukui, Gifu and Ishikawa. Depth about 17 km. Mag. 7¼.	36.2	N.	136.5	E.
19	06	21	54.9	Near coast of northern California. Depth about 33 km	40.3	N.	124.2	W.
19	07	08	49.5	Sandwich Islands. Depth about 33 km	56.9	S.	25.2	W.
19	08	07	18.3	Near west coast of Honshu, Japan. Depth about 25 km	36.1	N.	136.6	E.
19	12	45	05.5	Eastern Hokkaido, Japan. Depth about 50 km	43.9	N.	145.5	E.
19	14	19	05.8	Fiji Islands. Depth about 623 km	18.1	S.	178.4	W.
19	14	52	29.7	Mona Passage. Felt at Puerto Rico and at Santo Domingo, Dominican Republic. Depth about 100 km. Mag. 5½ (Brk).	18.0	N.	68.8	W.
19	16	01	26.3	Peru-Brazil border. Depth about 610 km	11.5	S.	70.8	W.
19	17	02	04.9	Southwestern Montana. Depth about 33 km	45.1	N.	111.3	W.
19	20	26	18.0	Near coast of Sumatra. Depth about 25 km	2.1	N.	96.9	E.
19	21	22	22.9	Near coast of Mindanao, Philippine Islands. Depth about 222 km	6.1	N.	126.1	E.
19	21	46	52.7	New Hebrides Islands. Depth about 75 km	14.7	S.	167.1	E.
20	00	07	24.0	Peru-Brazil border. Depth about 614 km	10.4	S.	70.6	W.
20	01	30	19.2	New Hebrides Islands. Depth about 36 km	17.9	S.	169.0	E.
20	02	26	46.8	Tonga Islands region. Depth about 25 km	16.6	S.	172.6	W.
20	04	28	37.4	Baja California. Depth about 33 km. Mag. 4.6	31.6	N.	116.5	W.
20	05	04	14.3	Fiji Islands. Depth about 592 km	17.9	S.	178.8	W.
20	09	10	11.4	Peru-Brazil border. Depth about 630 km	11.5	S.	70.6	W.
20	10	20	01.3	Solomon Islands. Depth about 105 km	6.2	S.	154.9	E.
20	12	48	56.4	Mid-Atlantic Ocean. Depth about 33 km	0.5	N.	29.0	W.
20	15	15	06.3	Chiapas, Mexico. Depth about 33 km	15.6	N.	92.4	W.
21	01	28	50.5	Salta Province, Argentina. Depth about 197 km	24.0	S.	67.3	W.
21	02	06	45.3	Fiji Islands region. Depth about 540 km	22.7	S.	179.3	W.
21	07	00	19.6	Hindu Kush. Depth about 120 km	36.4	N.	71.7	E.
21	07	58	52.9	Revilla Gigedo Islands region. Depth about 33 km	19.1	N.	108.7	W.
21	11	20	39.7	Fox Islands, Aleutian Islands. Depth about 33 km	51.1	N.	170.9	W.
21	16	06	55.4	Tonga Islands. Depth about 74 km. Mag. 5¾-6 (Brk)	17.9	S.	174.4	W.
21	16	39	03.8	Banda Sea. Depth about 187 km	7.3	S.	129.0	E.
21	17	00	38.9	Near coast of northern Honshu, Japan. Felt. Depth about 40 km	40.9	N.	139.1	E.
22	03	03	56.6	New Hebrides Islands. Depth about 77 km	17.8	S.	168.5	E.
22	06	12	11.9	Eastern Hokkaido, Japan. Depth about 50 km	42.9	N.	144.9	E.
22	08	59	27.9	New Hebrides Islands. Depth about 63 km	13.5	S.	166.7	E.
22	22	21	47.6	Fox Islands, Aleutian Islands. Depth about 53 km	52.5	N.	172.2	W.
22	23	19	32.6	San Diego County, Calif. Felt at San Diego. Depth about 25 km. Mag. 4.4.	33.0	N.	116.2	W.
23	01	00	47.1	San Diego County, Calif. Felt at San Diego and in Imperial Valley. Depth about 27 km. Mag. 4.7.	33.1	N.	116.3	W.
23	04	12	35.9	Tadzhik S.S.R. Felt at Dushambe. Depth about 25 km	38.9	N.	68.7	E.
23	14	37	46.9	Near coast of Mindanao, Philippine Islands. Depth about 25 km	5.6	N.	126.3	E.
23	19	13	05.0	Ascension Island region. Depth about 33 km	7.3	S.	13.4	W.
24	04	52	20.5	Eastern Hokkaido, Japan. Depth about 44 km	43.1	N.	145.3	E.
24	09	11	24.5	New Hebrides Islands. Felt on Santo. Depth about 91 km	14.8	S.	167.2	E.
24	09	51	18.3	Hokkaido, Japan. Depth about 125 km	43.0	N.	141.7	E.
24	17	25	38.2	New Britain region. Depth about 74 km	5.8	S.	150.1	E.
24	20	58	13.2	Loyalty Islands. Depth about 32 km	21.4	S.	173.9	E.
24	21	59	42.7	New Britain region. Depth about 95 km	5.3	S.	151.7	E.
24	22	40	54.6	Eastern Hokkaido, Japan. Depth about 45 km	43.0	N.	145.3	E.
25	05	42	01.2	Honduras. Depth about 48 km	15.3	N.	87.0	W.
25	05	51	46.3	Admiralty Islands region. Depth about 51 km	0.9	S.	148.3	E.
25	06	59	30.2	Alaska Peninsula. Depth about 36 km	53.7	N.	161.2	W.
25	12	21	55.0	Austria-Germany border. Felt at Reutte, Austria. Depth about 14 km.	47.5	N.	10.8	E.
25	21	26	22.7	Flores Sea. Depth about 100 km	8.1	S.	122.8	E.
26	01	19	39.1	Colombia. Depth about 183 km	7.1	N.	73.2	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Aug. 26	02	45	29.0	Loyalty Islands. Depth about 33 km	20.2	S.	169.0	E.
26	05	09	23.4	New Hebrides Islands. Depth about 39 km	17.7	S.	168.2	E.
26	08	15	58.1	Solomon Islands region. Depth about 33 km	6.3	S.	152.9	E.
26	08	45	10.8	Eastern Hokkaido, Japan. Depth about 45 km	43.0	N.	144.6	E.
26	14	37	40.6	Guerrero, Mexico. Depth about 152 km	17.7	N.	99.6	W.
26	18	02	33.0	New Hebrides Islands. Depth about 56 km	13.5	S.	166.3	E.
26	18	41	57.2	Sandwich Islands. Depth about 33 km	56.1	S.	26.5	W.
26	18	49	47.1	Mariana Islands. Depth about 53 km	18.1	N.	146.4	E.
27	00	58	35.9	Revilla Gigedo Islands region. Depth about 33 km	21.1	N.	109.2	W.
27	01	51	51.8	South of Ascension Island. Depth about 49 km	15.4	S.	13.1	W.
27	04	20	19.7	Near south coast of Panama. Depth about 33 km	7.5	N.	82.1	W.
27	06	43	29.9	Fiji Islands. Depth about 488 km	18.6	S.	178.2	W.
27	15	28	25.0	Easter Island region. Depth about 25 km	22.9	S.	114.4	W.
27	16	22	12.8	Kurile Islands. Depth about 45 km. Mag. 6½	47.0	N.	154.0	E.
27	16	47	49.1	Mariana Islands. Depth about 58 km. Mag. 6¼–6½	18.1	N.	146.6	E.
27	17	02	27.3	Halmahera. Depth about 238 km	2.2	N.	128.6	E.
27	17	23	18.6	Mariana Islands. Depth about 82 km	18.0	N.	146.2	E.
27	17	57	59.0	Mariana Islands. Depth about 60 km	18.1	N.	146.5	E.
27	19	50	47.2	Kurile Islands. Depth about 45 km	47.5	N.	154.0	E.
27	20	56	20.9	Kurile Islands. Depth about 51 km	46.9	N.	154.1	E.
27	20	59	47.4	Kurile Islands. Depth about 45 km	47.4	N.	154.2	E.
27	21	11	38.0	Mariana Islands. Depth about 55 km	18.0	N.	146.7	E.
27	22	08	45.2	Crete. Felt. Depth about 33 km	35.6	N.	23.8	E.
28	06	28	19.4	Southern Peru. Depth about 185 km	15.2	S.	70.2	W.
28	07	41	26.7	Santa Cruz Islands region. Depth about 640 km	12.7	S.	169.6	E.
28	09	10	13.0	Near east coast of Kamchatka. Depth about 25 km	53.8	N.	159.1	E.
28	09	44	14.2	Fiji Islands. Depth about 548 km	18.9	S.	177.8	W.
28	10	40	20.2	Southern Peru. Depth about 120 km	17.0	S.	70.7	W.
28	12	13	50.6	Kurile Islands. Depth about 45 km	46.8	N.	153.9	E.
28	13	08	05.7	——do——	46.8	N.	154.1	E.
28	15	04	53.1	Southwest of Australia. Depth about 33 km	47.8	S.	99.0	E.
28	18	01	58.1	Kurile Islands. Depth about 26 km	46.9	N.	154.2	E.
28	20	26	01.4	Easter Island region. Depth about 33 km	23.0	S.	113.5	W.
28	21	27	16.9	Peru. Depth about 100 km	14.1	S.	73.9	W.
29	04	15	49.4	New Hebrides Islands. Depth about 33 km	13.8	S.	166.0	E.
29	05	55	37.6	Eastern Hokkaido, Japan. Depth about 50 km	42.9	N.	145.3	E.
29	07	50	37.7	Near north coast of New Guinea. Depth about 37 km	5.9	S.	147.3	E.
29	10	04	10.9	Kermadec Islands region. Depth about 33 km	28.4	S.	176.0	W.
29	10	44	44.6	Banda Sea. Depth about 166 km	7.3	S.	128.3	E.
29	11	48	31.1	Northern Chile. Depth about 125 km	23.2	S.	68.1	W.
29	14	51	14.2	Fox Islands, Aleutian Islands. Depth about 41 km. Mag. 5–5¼ (Pal).	52.4	N.	170.8	W.
29	17	12	53.0	Near Dominican Republic. Depth about 33 km	19.4	N.	68.7	W.
29	17	31	04.2	Banda Sea. Depth about 551 km	7.1	S.	125.2	E.
29	19	49	52.9	Kurile Islands. Depth about 17 km	47.0	N.	153.8	E.
29	21	33	57.1	New Hebrides Islands. Felt on Santo. Depth about 135 km	15.4	S.	167.5	E.
29	22	36	23.1	Fox Islands, Aleutian Islands. Depth about 66 km	53.1	N.	166.7	W.
30	02	25	45.4	Fox Islands, Aleutian Islands. Depth about 67 km	53.9	N.	166.3	W.
30	03	35	02.7	Mid-Atlantic Ocean. Depth about 33 km. Mag. 4½–4¾ (Pal)	5.8	N.	34.4	W.
30	03	45	28.0	Northern Peru. Depth about 33 km	3.9	S.	77.8	W.
30	14	51	38.6	Sinkiang Province, China. Depth about 33 km	39.8	N.	77.7	E.
30	17	42	30.3	Peru-Bolivia border. Depth about 250 km	15.7	S.	69.4	W.
30	19	10	54.4	Loyalty Islands. Depth about 46 km	21.1	S.	170.2	E.
30	22	16	08.3	Western New Guinea. Depth about 60 km	3.4	S.	135.7	E.
31	00	22	47.3	Kermadec Islands region. Depth about 56 km	28.3	S.	176.7	W.
31	01	48	37.5	Peru-Brazil border. Depth about 626 km. Mag. 7–7¼	10.7	S.	70.9	W.
31	01	57	08.0	Peru-Brazil border. Felt at Arequipa, Peru. Depth about 629 km. Mag. 7½.	10.5	S.	70.7	W.
31	03	30	18.2	Fiji Islands region. Depth about 388 km	15.4	S.	177.4	W.
31	03	56	49.4	Samoa Islands region. Depth about 60 km	15.1	S.	173.1	W.
31	14	58	59.0	Near coast of northern Peru. Depth about 60 km	9.6	S.	78.7	W.
31	21	06	22.8	New Ireland region. Felt at Rabaul. Depth about 40 km	3.7	S.	153.4	E.
31	23	24	42.6	New Guinea. Depth about 108 km	3.2	S.	139.4	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Sept. 1	00	09	34.6	Sandwich Islands. Depth about 131 km. Mag. 7½	59.5	S.	27.3	W.
1	03	16	04.2	Honduras. Felt in northern Honduras. Depth about 35 km	15.5	N.	87.2	W.
1	04	31	24.0	Kurile Islands. Depth about 49 km	47.4	N.	154.1	E.
1	04	43	13.4	Chiapas, Mexico. Depth about 155 km	16.5	N.	93.8	W.
1	16	25	07.8	Fiji Islands. Depth about 568 km	17.2	S.	179.1	W.
1	16	36	49.9	Fiji Islands region. Depth about 437 km	16.5	S.	176.6	W.
1	16	51	48.5	Kern County, Calif. Felt at Caliente, Keene, Monolith, and Tehachapi. Depth about 22 km. Mag. 4.0.	35.2	N.	118.5	W.
1	18	41	32.4	Fiji Islands. Depth about 619 km	18.1	S.	178.3	W.
1	18	50	35.4	Off coast of Guatemala. Depth about 37 km. Mag. 6½	13.6	N.	92.5	W.
1	18	59	36.3	Near east coast of Honshu, Japan. Felt at Tokyo. Depth about 87 km.	35.6	N.	138.8	E.
1	20	03	46.5	South of Australia. Depth about 33 km	50.2	S.	120.5	E.
1	20	14	51.6	Honduras. Depth about 33 km	15.4	N.	87.0	W.
2	00	26	06.2	Fox Islands, Aleutian Islands. Depth about 39 km	52.2	N.	170.9	W.
2	00	55	47.7	Northwest of Balleny Islands. Depth about 33 km	61.4	S.	153.5	E.
2	03	46	36.8	West of Macquarie Islands. Depth about 41 km	56.8	S.	147.1	E.
2	06	19	02.4	Kermadec Islands. Depth about 33 km	28.9	S.	176.7	W.
2	07	33	24.3	Southern Hokkaido, Japan. Depth about 31 km	42.4	N.	142.6	E.
2	09	57	53.0	Off coast of Chile. Depth about 33 km	41.3	S.	83.1	W.
2	10	50	25.8	Indian Ocean, southwest of Maldive Islands. Depth about 33 km	2.0	S.	67.8	E.
2	14	16	10.5	Aegean Sea. Felt in Skopelos Islands. Depth about 33 km	39.1	N.	23.9	E.
2	17	52	46.1	Soenda Strait. Depth about 127 km	6.0	S.	105.9	E.
3	04	48	25.6	Near coast of Nicaragua. Felt at Managua. Depth about 124 km	12.2	N.	86.9	W.
3	10	19	28.8	Colombia. Depth about 185 km	6.7	N.	73.0	W.
3	17	29	25.2	Near east coast of Kamchatka. Depth about 33 km	52.4	N.	158.9	E.
4	00	52	23.5	Near Islands, Aleutian Islands. Depth about 41 km	52.3	N.	173.4	E.
4	03	17	24.6	South of Honshu, Japan. Depth about 492 km	30.2	N.	138.3	E.
4	04	53	19.2	Kurile Islands. Depth about 60 km	47.1	N.	154.1	E.
4	09	49	13.5	Andreanof Islands, Aleutian Islands. Depth about 40 km. Mag. 6¼ (Brk).	51.6	N.	178.2	W.
4	16	09	20.1	Halmahera. Depth about 156 km	1.3	N.	127.7	E.
4	16	27	24.2	Venezuela. Felt. Depth about 33 km	9.9	N.	70.9	W.
4	17	15	49.7	Near Islands, Aleutian Islands. Depth about 67 km	52.3	N.	173.8	E.
4	18	41	59.5	Tonga Islands region. Depth about 402 km	18.4	S.	175.8	W.
4	18	44	54.4	Fox Islands, Aleutian Islands. Depth about 33 km	52.8	N.	167.6	W.
4	19	12	34.4	Fox Islands, Aleutian Islands. Depth about 47 km	53.0	N.	167.1	W.
4	22	33	34.6	Tonga Islands. Depth about 181 km	20.3	S.	175.8	W.
5	00	39	31.0	Near east coast of Greece. Felt in eastern Greece. Depth about 33 km.	38.6	N.	23.6	E.
5	00	46	29.8	Tonga Islands region. Depth about 33 km	16.2	S.	172.8	W.
5	01	16	51.7	Near east coast of Greece. Slight damage at Chalkis, Euboea Island. Felt in eastern Greece. Depth about 33 km.	38.5	N.	23.6	E.
5	02	21	50.9	Near east coast of Hokkaido, Japan. Depth about 59 km	43.0	N.	145.5	E.
5	02	37	37.8	Svalbard region. Depth about 33 km	80.2	N.	2.3	W.
5	06	12	59.7	Tadzhik S.S.R. Felt at Peshawar, Rawalpindi, and Lahore, Pakistan. Depth about 104 km.	38.5	N.	73.2	E.
5	09	11	23.5	Kurile Islands. Depth about 42 km	44.3	N.	149.0	E.
5	10	34	45.5	Andreanof Islands, Aleutian Islands. Depth about 60 km	51.5	N.	179.6	W.
5	11	34	37.3	Kenai Peninsula, Alaska. Felt in Kenai Peninsula area. Depth about 43 km. Mag. 6–6¼.	60.0	N.	150.6	W.
5	13	37	33.2	Southern Peru. Felt at Arequipa. Depth about 79 km	16.4	S.	72.6	W.
5	13	59	32.1	Kenai Peninsula, Alaska. Depth about 45 km	59.9	N.	150.3	W.
5	14	09	51.8	Northern Iran. Felt at Gorgan and Beh-Chahr. Depth about 33 km.	36.8	N.	54.5	E.
5	21	07	32.6	Mariana Islands region. Depth about 25 km	11.9	N.	141.9	E.
6	06	57	41.9	New Britain region. Depth about 61 km	6.0	S.	149.5	E.
6	08	14	21.7	Molucca Passage. Depth about 80 km	2.7	N.	125.7	E.
6	10	07	14.0	Banda Sea. Depth about 208 km	6.1	S.	130.4	E.
6	13	35	41.7	Hindu Kush. Depth about 197 km	36.5	N.	70.6	E.
6	15	30	20.4	Off coast of Peru. Depth about 45 km	10.9	S.	79.1	W.
7	02	46	43.4	South of Fiji Islands. Depth about 543 km	24.7	S.	179.8	E.
7	16	46	32.0	Aroe Islands. Depth about 22 km	5.7	S.	134.2	E.
8	00	05	13.8	Alaska. Depth about 135 km	63.3	N.	150.5	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Sept. 8	02	41	49.1	Tonga Islands region. Depth about 153 km	16.3	S.	175.0	W.
8	03	01	34.9	Southwest of Juan Fernandez Islands. Depth about 25 km	41.1	S.	90.2	W.
8	04	52	08.6	Queen Charlotte Islands region. Depth about 23 km. Mag. 5 (Brk).	51.7	N.	131.3	W.
8	05	57	37.5	Near coast of Ecuador. Depth about 33 km	1.8	S.	81.4	W.
8	06	07	52.4	----do----	1.5	S.	80.9	W.
8	08	29	03.5	Fiji Islands region. Depth about 552 km	20.2	S.	177.5	W.
8	10	38	25.1	Off coast of Greece. Depth about 33 km	36.7	N.	20.9	E.
8	11	26	32.9	Sandwich Islands. Depth about 125 km. Mag. 7½-7¾	56.3	S.	27.1	W.
8	12	42	59.6	Tonga Islands region. Depth about 181 km	23.0	S.	177.7	W.
8	14	52	22.8	Banda Sea. Depth about 143 km	5.9	S.	129.9	E.
8	17	30	37.4	Northern Celebes. Depth about 169 km	0.4	S.	123.3	E.
9	09	10	25.2	Fox Islands, Aleutian Islands. Depth about 61 km	52.7	N.	169.4	W.
9	09	16	08.6	Off coast of Honshu, Japan. Felt in southern Kanto area. Depth about 151 km.	34.0	N.	139.6	E.
9	11	47	12.4	Andreanof Islands, Aleutian Islands. Depth about 50 km	51.9	N.	174.9	W.
9	15	23	57.8	Santa Cruz Islands region. Depth about 79 km	10.7	S.	164.4	E.
9	19	10	45.7	Galapagos Islands region. Depth about 33 km	1.3	N.	90.8	W.
9	21	09	48.1	Crete. Depth about 55 km	34.3	N.	26.2	E.
9	22	43	02.3	Arkansas-Missouri border. Felt at Pocahontas, Arkansas and Doniphan, Missouri. Depth about 33 km.	36.4	N.	91.3	W.
10	01	43	11.0	South of Kamchatka Peninsula. Depth about 33 km	49.5	N.	158.6	E.
10	02	51	05.9	Kermadec Islands. Depth about 50 km	31.5	S.	178.1	W..
10	04	45	28.8	Salta Province, Argentina. Depth about 527 km	22.8	S.	63.5	W
10	09	00	09.2	Novaya Zemlya. Depth about 0 km	74.2	N.	52.5	E..
10	11	41	18.3	Flores. Depth about 21 km	8.3	S.	121.7	E.
10	14	45	43.4	Tonga Islands region. Depth about 219 km	19.4	S.	175.8	W.
10	16	17	20.0	Turkey. Felt at Osmaniye and Adana. Depth about 28 km	37.4	N.	36.6	E.
10	17	43	47.6	Near coast of northern Chile. Depth about 77 km	24.5	S.	70.1	W
10	18	09	07.3	Kermadec Islands region. Depth about 152 km	27.8	S.	177.8	W.
10	18	16	07.5	Fiji Islands. Depth about 619 km	17.9	S.	178.5	W.
11	02	46	50.3	Rat Islands, Aleutian Islands. Depth about 60 km	51.4	N.	180.0	
11	04	39	43.6	Off coast of Oregon. Depth about 22 km	43.5	N.	127.2	W.
11	05	20	40.7	Nepal-Tibet border. Depth about 23 km	28.2	N.	88.3	E.
11	05	56	34.6	La Rioja Province, Argentina. Depth about 120 km	28.7	S.	69.2	W.
11	09	02	44.7	Rat Islands, Aleutian Islands. Depth about 50 km	51.3	N.	180.0	
11	09	13	18.8	Off east coast of Kamchatka. Depth about 33 km	52.5	N.	160.4	E.
11	09	44	37.5	Kurile Islands. Depth about 40 km	44.0	N.	149.9	E.
11	11	36	46.5	Northern Celebes. Depth about 35 km	1.1	N.	120.1	E.
11	14	47	14.3	Central Chile. Felt in central Chile. Depth about 40 km	38.1	S.	72.8	W.
11	19	57	58.2	Near coast of western New Guinea. Depth about 19 km	4.1	S.	134.3	E.
11	22	15	02.6	Near coast of Venezuela. Felt on Trinidad and in Carupano, Venezuela area. Depth about 134 km.	10.9	N.	62.4	W.
11	23	47	23.1	Near east coast of Hokkaido, Japan. Depth about 49 km	42.9	N.	145.3	E.
12	00	17	12.4	Fiji Islands. Depth about 530 km	18.1	S.	177.9	W.
12	01	14	32.9	New Hebrides Islands. Depth about 208 km	18.4	S.	169.1	E.
12	05	19	37.8	Santa Cruz Islands region. Depth about 25 km	11.5	S.	164.9	E.
12	05	38	01.3	Alaska. Felt at Summit and McKinley Park. Depth about 50 km.	63.4	N.	149.4	W.
12	08	01	37.3	Samoa Islands region. Depth about 90 km	15.2	S.	173.2	W.
12	09	28	07.6	Near coast of Guatemala. Depth about 46 km	13.5	N.	92.3	W.
12	10	08	15.3	Novaya Zemlya. Depth about 0 km	74.2	N.	52.1	E.
12	11	18	25.3	Peru-Brazil border. Depth about 543 km	11.1	S.	70.6	W.
12	11	58	01.4	Tonga Islands region. Depth about 39 km	23.1	S.	176.2	W.
12	12	27	07.6	Kurile Islands. Depth about 50 km	44.0	N.	147.9	E.
12	19	18	42.9	Near California-Mexico border. Felt in southern California, Arizona, and Mexico. Depth about 33 km. Mag. 4.8.	32.4	N.	115.2	W.
12	19	29	09.2	Sandwich Islands region. Depth about 33 km	59.9	S.	30.4	W.
13	03	05	37.1	New Guinea. Felt at Kundiawa and Madang. Depth about 100 km.	5.6	S.	145.0	E.
13	11	21	03.8	Kurile Islands. Depth about 25 km	47.1	N.	153.3	E.
13	12	26	25.6	Off south coast of Java. Depth about 33 km	9.0	S.	112.5	E.
13	13	12	45.1	Near coast of Greece. Felt at Amalias. Depth about 33 km	37.7	N.	20.7	E.
13	14	04	34.2	Off south coast of Java. Depth about 33 km	9.2	S.	112.6	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Sept. 13	15	48	23.7	Iran-Iraq border. Felt in Tang-Fanni, Iran area. Depth about 33 km.	33.0	N.	47.3	E.
13	21	19	19.9	Off coast of southern Chile. Depth about 40 km. Mag. 7 (Brk)	41.7	S.	75.2	W.
13	23	17	23.6	Honshu, Japan. Felt at Tokyo. Depth about 83 km	36.3	N.	140.0	E.
14	01	07	23.7	Guatemala. Depth about 152 km	15.0	N.	91.6	W.
14	01	11	32.9	Honduras. Depth about 33 km	15.7	N.	87.3	W.
14	06	15	17.0	Northern Chile. Depth about 105 km	20.7	S.	69.5	W.
14	08	03	08.7	Iran-Iraq border. Felt in Tang-Fanni, Iran area. Depth about 33 km.	33.0	N.	47.4	E.
14	09	56	16.7	Novaya Zemlya. Depth about 0 km	74.6	N.	51.1	E.
14	18	31	17.8	South Pacific Ocean. Depth about 25 km	56.4	S.	139.9	W.
14	18	44	48.7	South of Fiji Islands. Depth about 550 km	23.4	S.	180.0	
14	21	50	43.2	Near east coast of Honshu, Japan. Depth about 55 km	37.6	N.	141.4	E.
14	22	38	32.1	Tonga Islands. Depth about 25 km	19.9	S.	173.6	W.
15	00	30	41.8	Solomon Islands. Depth about 200 km	5.5	S.	153.9	E.
15	01	20	35.8	Solomon Islands. Depth about 68 km	6.8	S.	155.3	E.
15	01	46	09.9	Cyprus. Slight damage on Cyprus. Felt at Mersin, Turkey; Beyrouth, Lebanon; northern Israel; and Syria. Depth about 36 km.	34.9	N.	33.8	E.
15	10	06	36.4	Solomon Islands. Felt at Honiara. Depth about 66 km	10.2	S.	160.7	E.
15	21	24	07.9	Off south coast of Java. Depth about 65 km	10.7	S.	112.9	E.
16	03	24	58.1	Skamania County, Wash. Felt in southwestern Washington and northwestern Oregon. Depth about 33 km.	46.0	N.	122.0	W.
16	05	50	46.8	San Diego County, Calif. Depth about 13 km. Mag. 3½	32.9	N.	116.2	W.
16	09	08	13.7	Novaya Zemlya. Depth about 0 km	74.0	N.	51.9	E.
16	11	48	58.7	New Guinea. Depth about 33 km	4.4	S.	143.1	E.
16	12	09	53.7	South of Honshu, Japan. Depth about 430 km	28.4	N.	138.6	E.
16	13	31	34.5	Mid-Atlantic Ocean. Depth about 19 km	14.5	N.	46.0	W.
16	17	17	46.1	Near east coast of Kamchatka. Depth about 49 km	52.3	N.	158.5	E.
16	19	49	38.4	San Diego County, California. Felt in Anza-Borrego Desert State Park and at San Diego. Depth about 25 km. Mag. 4.4.	32.9	N.	116.3	W.
16	20	02	47.8	Peru-Brazil border. Depth about 629 km	10.7	S.	69.8	W.
16	21	15	31.0	Indian Ocean, 900 km southwest of Chagos Islands. Depth about 33 km.	12.8	S.	66.5	E.
17	01	11	43.7	Ceram. Depth about 46 km	4.1	S.	129.7	E.
17	03	07	29.5	Tonga Islands region. Depth about 67 km	22.8	S.	175.8	W.
17	05	30	09.6	Iran-Turkmen S.S.R. border. Felt at Kachmar and Bujnourd, Iran. Depth about 33 km.	37.5	N.	57.5	E.
17	06	08	42.2	New Hebrides Islands. Depth about 242 km	19.1	S.	169.4	E.
17	08	41	57.3	Near east coast of Formosa. Felt on Formosa. Depth about 53 km	23.9	N.	122.1	E.
17	15	42	41.2	Near north coast of New Guinea. Depth about 33 km	2.6	S.	139.2	E.
17	15	55	58.8	Skamania County, Wash. Slight damage at Stevenson and North Bonneville, Wash. and Latourell Falls, Oreg. Felt in southwestern Washington and northwestern Oregon. Depth about 33 km.	46.0	N.	122.0	W.
17	17	13	59.1	Near north coast of New Guinea. Depth about 44 km	3.6	S.	143.4	E.
17	20	56	48.3	Crete. Depth about 33 km	34.4	N.	25.4	E.
17	23	22	06.3	Near north coast of New Guinea. Depth about 45 km	5.9	S.	147.4	E.
18	00	09	32.8	South Island, New Zealand. Felt at Haast and Wanaka. Depth about 33 km.	43.8	S.	169.1	E.
18	02	25	19.3	Vancouver Island region. Depth about 21 km. Mag. 4¾-5 (Pal)	49.0	N.	128.9	W.
18	04	52	30.9	Near coast of Ecuador. Depth about 16 km	0.4	S.	80.4	W.
18	05	08	31.9	Crete. Depth about 39 km	34.7	N.	26.5	E.
18	07	59	36.8	Novaya Zemlya. Depth about 0 km	74.0	N.	52.0	E.
18	09	23	37.1	South Island, New Zealand. Felt on Centre Island. Depth about 33 km.	46.1	S.	166.8	E.
18	11	01	04.5	Caspian Sea. Depth about 55 km	41.0	N.	50.2	E.
18	12	16	40.3	New Hebrides Islands. Depth about 192 km	15.7	S.	168.1	E.
18	15	37	34.5	Loyalty Islands region. Depth about 33 km	20.9	S.	173.5	E.
18	21	35	17.4	Vancouver Island region. Depth about 33 km	49.0	N.	128.5	W.
19	02	25	49.2	Southern Bolivia. Depth about 580 km. Mag. 6½	20.5	S.	62.9	W.
19	06	09	56.6	Mariana Islands. Depth about 61 km	14.9	N.	146.8	E.
19	09	18	51.4	Molucca Passage. Depth about 33 km	2.5	N.	126.0	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Sept. 19	09	31	18.6	Indian Ocean, southeast of Mascarene Islands. Depth about 33 km.	26.1	S.	70.8	E.
19	09	46	17.7	Off south coast of Panama. Felt at Chitre. Depth about 33 km. Mag. 6¼–6½.	6.7	N.	82.4	W.
19	13	13	01.0	Oaxaca, Mexico. Depth about 60 km	17.1	N.	96.9	W.
19	13	44	27.5	Molucca Passage. Depth about 34 km	1.2	N.	125.4	E.
19	18	25	28.9	Fiji Islands region. Depth about 592 km	21.6	S.	179.3	W.
19	20	05	17.6	Caspian Sea. Felt at Baku, Azerbaijan S.S.R. Depth about 33 km	41.1	N.	50.0	E.
19	21	34	42.3	Sandwich Islands region. Depth about 33 km	60.1	S.	23.3	W.
19	22	29	24.8	Tonga Islands. Depth about 25 km	18.9	S.	173.4	W.
20	03	56	06.5	Banda Sea. Depth about 110 km	7.2	S.	127.6	E.
20	05	04	09.2	San Diego County, Calif. Felt at Descanso. Depth about 33 km. Mag. 4.0.	32.8	N.	116.2	W.
20	19	03	37.7	New Ireland region. Depth about 44 km. Mag. 6¼–6½	3.6	S.	151.0	E.
21	10	21	12.5	Near east coast of Kamchatka. Depth about 33 km	53.9	N.	160.6	E.
21	18	19	19.1	Near coast of northern Chile. Depth about 36 km	26.3	S.	70.5	W.
22	15	14	32.7	Ceram. Depth about 16 km	3.8	S.	131.1	E.
22	16	04	31.8	Fiji Islands region. Depth about 585 km	20.0	S.	177.6	W.
22	18	38	41.8	Tanimbar Islands. Depth about 81 km	7.3	S.	131.5	E.
22	20	08	38.5	West of Macquarie Islands. Depth about 33 km	55.4	S.	146.3	E.
23	00	16	47.1	New Hebrides Islands. Depth about 33 km	18.8	S.	168.1	E.
23	03	01	32.4	Hawaii Island, Hawaii. Slight damage at Hilo. Depth about 3 km.	19.4	N.	155.1	W.
23	03	01	47.4	Near coast of Mindanao, Philippine Islands. Depth about 74 km	7.2	N.	123.2	E.
23	03	48	26.0	Sea of Japan. Depth about 441km	42.0	N.	132.0	E.
23	06	51	29.5	Off coast of Mindanao, Philippine Islands. Depth about 33 km	9.6	N.	127.0	E.
23	08	16	23.0	Kermadec Islands region. Felt on Raoul Island. Depth about 41 km.	28.4	S.	177.3	W.
23	09	37	55.4	Idaho-Montana border. Felt at Thompson Falls, Montana and Wallace, Idaho. Depth about 33 km.	47.5	N.	115.4	W.
23	15	05	04.2	San Juan Province, Argentina. Depth about 100 km	32.0	S.	70.0	W.
23	21	17	25.1	Kurile Islands. Depth about 33 km	50.2	N.	155.1	E.
24	04	40	03.7	South of Kermadec Islands. Depth about 33 km	33.8	S.	179.3	W.
24	16	52	40.8	Sandwich Islands. Depth about 25 km	56.7	S.	26.2	W.
24	19	04	36.3	Puebla, Mexico. Felt at Chilpancingo and in Federal District. Depth about 55 km.	18.3	N.	98.6	W.
24	21	40	57.3	Off coast of Honshu, Japan. Depth about 50 km	33.5	N.	141.3	E.
25	01	22	31.3	Southern Peru. Depth about 96 km	15.8	S.	73.7	W.
25	01	46	32.2	South of Honshu, Japan. Depth about 33 km	29.2	N.	141.5	E.
25	02	27	13.4	Southern Alaska. Felt at Homer. Depth about 125 km. Mag. 5¾–6.	60.5	N.	153.0	W.
25	05	28	53.5	Hawaii Island, Hawaii. Minor damage at Hilo. Depth about 3 km.	19.4	N.	155.1	W.
25	10	46	26.0	Near coast of Sumatra. Depth about 33 km	0.9	N.	99.5	E.
25	14	11	01.5	North Island, New Zealand. Depth about 257 km	37.2	S.	176.4	E.
25	14	47	13.9	Celebes Sea. Depth about 620 km	4.2	N.	122.7	E.
25	15	53	34.0	Fiji Islands. Depth about 632 km	18.7	S.	177.6	W.
25	20	22	38.7	Southern Alaska. Depth about 136 km	61.7	N.	152.1	W.
25	21	12	36.3	Svalbard region. Depth about 33 km	75.6	N.	5.4	E.
26	03	59	37.0	Off coast of northern Honshu, Japan. Depth about 36 km	39.6	N.	144.6	E.
26	07	12	44.2	South of Tonga Islands. Depth about 33 km	24.4	S.	175.7	W.
26	09	50	50.3	New Hebrides Islands. Depth about 130 km	15.2	S.	167.3	E.
26	12	45	38.5	Near coast of central Chile. Depth about 47 km	37.2	S.	73.2	W.
26	22	31	59.8	Southern Boliva. Depth about 242 km	20.6	S.	67.3	W.
27	00	46	39.8	Fiji Islands region. Depth about 281 km	15.6	S.	175.0	W.
27	01	55	28.1	Near coast of Jalisco, Mexico. Depth about 33 km	19.0	N.	105.0	W.
27	06	34	05.4	Fiji Islands. Depth about 555 km. Mag. 5¾–6	17.3	S.	178.7	W.
27	08	21	59.6	Southern Iran. Depth about 33 km	28.5	N.	54.7	E.
27	10	17	07.7	Near coast of central Chile. Depth about 33 km	29.0	S.	71.3	W.
27	10	47	18.3	Northern Celebes. Depth about 143 km	0.5	S.	123.4	E.
27	11	20	46.8	Fox Islands, Aleutian Islands. Depth about 27 km	52.5	N.	168.7	W.
27	12	07	32.6	Sandwich Islands region. Depth about 33 km	59.3	S.	23.3	W.
27	19	20	48.6	Fox Islands, Aleutian Islands. Depth about 42 km	52.7	N.	168.7	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Sept. 27	19	27	00.7	Fox Islands, Aleutian Islands. Depth about 22 km. Mag. 5¼ (Pal).	52.4	N.	168.7	W.
27	20	12	58.4	Off north coast of Luzon, Philippine Islands. Depth about 33 km	19.8	N.	120.4	E.
27	21	07	12.1	East China Sea. Depth about 160 km	26.3	N.	124.7	E.
28	01	23	59.6	Near coast of Sumatra. Depth about 78 km. Mag. 5½-5¾ (Pal)	3.9	S.	102.0	E.
28	03	24	37.7	South of Honshu, Japan. Depth about 41 km. Mag. 6	30.8	N.	141.6	E.
28	03	32	03.8	Fox Islands, Aleutian Islands. Depth about 33 km	52.4	N.	168.7	W.
28	04	19	06.4	South of Honshu, Japan. Depth about 33 km	30.6	N.	141.6	E.
28	05	00	43.4	Hindu Kush. Depth about 204 km	36.4	N.	70.7	E.
28	17	37	09.3	New Britain region. Felt at Rabaul. Depth about 75 km	5.5	S.	152.1	E.
28	18	50	09.3	Yellowstone National Park, Wyoming. Depth about 33 km	45.0	N.	110.8	W.
28	21	33	59.1	South of Easter Island. Depth about 33 km	34.9	S.	111.7	W.
28	22	36	24.7	Near coast of Iran. Felt at Minab. Depth about 41 km	27.2	N.	57.1	E.
29	05	34	51.7	Kermadec Islands. Depth about 58 km	30.2	S.	177.7	W.
29	08	19	38.0	Jujuy Province, Argentina. Depth about 250 km	23.0	S.	66.7	W.
29	08	24	31.7	Andreanof Islands, Aleutian Islands. Depth about 33 km	52.4	N.	176.4	W.
29	08	45	22.3	Andaman Islands. Depth about 60 km	13.5	N.	93.9	E.
29	11	24	04.8	South of Fiji Islands. Depth about 589 km	23.6	S.	179.6	W.
29	11	56	37.7	Kurile Islands. Depth about 33 km	44.1	N.	148.3	E.
29	12	29	06.3	New Hebrides Islands. Depth about 33 km	18.5	S.	167.7	E.
29	16	50	35.4	Near east coast of Hokkaido, Japan. Depth about 45 km	42.9	N.	145.3	E.
29	19	06	13.4	Northern Celebes. Depth about 110 km	0.5	N.	122.4	E.
29	22	36	28.5	Nepal-Tibet border. Depth about 100 km	28.0	N.	87.6	E.
29	22	38	04.1	Near coast of southern Colombia. Depth about 33 km	1.7	N.	79.3	W.
30	00	21	18.8	Kurile Islands. Depth about 49 km	44.4	N.	148.9	E.
30	01	36	40.0	Ryukyu Islands. Depth about 131 km	24.1	N.	125.5	E.
30	13	13	11.9	Near coast of northern Honshu, Japan. Depth about 55 km	40.4	N.	142.1	E.
30	18	50	14.6	Guatemala. Depth about 104 km	14.5	N.	91.1	W.
30	22	11	40.1	Near east coast of Hokkaido, Japan. Depth about 40 km	43.5	N.	145.4	E.
Oct. 1	00	16	03.1	Kansu Province, China. Depth about 32 km	34.4	N.	104.9	E.
1	00	43	52.4	Central Italy. Depth about 64 km	43.6	N.	12.5	E.
1	03	07	08.5	Sinkiang Province, China. Depth about 25 km	43.5	N.	86.0	E.
1	03	29	27.0	Kamchatka. Depth about 33 km	55.7	N.	162.0	E.
1	07	44	16.0	Loyalty Islands region. Depth about 122 km	22.2	S.	172.8	E.
1	14	17	41.0	Hindu Kush region. Depth about 122 km	37.6	N.	71.8	E.
1	19	59	52.2	Hebgen Lake, Montana area. Depth about 19 km	45.0	N.	110.2	W.
1	23	12	08.1	Near coast of Formosa. Depth about 33 km	24.0	N.	122.3	E.
2	05	53	37.5	Off coast of North Island, New Zealand. Depth about 30 km	33.9	S.	179.6	E.
2	06	07	40.1	Off coast of North Island, New Zealand. Depth about 33 km	33.9	S.	179.5	E.
2	06	21	36.2	Near coast of Java. Depth about 88 km	7.4	S.	107.1	E.
2	07	02	37.6	Off coast of North Island, New Zealand. Depth about 33 km	33.9	S.	179.6	E.
2	07	21	44.7	Near coast of Greece. Moderate damage in southwestern Peloponnisos. Depth about 33 km.	36.7	N.	21.9	E.
2	08	09	07.1	Andreanof Islands, Aleutian Islands. Depth about 45 km	51.4	N.	179.4	E.
2	11	52	33.8	Near north coast of western New Guinea. Depth about 41 km	1.5	S.	138.3	E.
2	13	02	59.8	New Hebrides Islands region. Depth about 62 km	13.4	S.	167.7	E.
2	13	20	21.6	Southern Greece. Felt. Depth about 135 km	37.4	N.	23.2	E.
2	21	28	11.5	Near Chile-Bolivia border. Depth about 100 km	19.5	S.	69.5	W.
3	01	01	18.2	Crete. Depth about 99 km	35.4	N.	24.1	E.
3	06	03	40.1	New Hebrides Islands region. Depth about 33 km	17.6	S.	167.5	E.
3	09	34	52.2	Western Iran. Depth about 59 km	34.3	N.	47.9	E.
3	11	13	35.6	New Britain region. Depth about 204 km	5.2	S.	153.7	E.
3	18	27	05.3	Loyalty Islands region. Depth about 39 km	20.5	S.	170.7	E.
3	22	22	16.5	Kermadec Islands region. Depth about 345 km	31.6	S.	179.7	W.
3	23	21	14.8	Mariana Islands region. Depth about 25 km	22.5	N.	143.5	E.
4	02	21	30.6	Orange County, Calif. Slight damage. Depth about 18 km. Mag. 4.1.	33.8	N.	117.8	W.
4	02	23	23.5	New Hebrides Islands region. Felt at Vanikoro. Depth about 66 km.	13.2	S.	166.5	E.
4	03	23	18.3	Kermadec Islands region. Depth about 100 km	28.5	S.	176.7	W.
4	04	15	46.6	Fiji Islands region. Depth about 211 km	19.1	S.	176.7	W.
4	04	30	46.9	Near east coast of Kamchatka. Depth about 33 km	52.0	N.	159.1	E.
4	06	14	55.0	Northern Mariana Islands. Depth about 154 km	22.7	N.	143.8	E.
4	07	08	09.2	Fiji Islands region. Depth about 475 km	21.2	S.	177.8	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Oct. 4	07	30	54.8	Novaya Zemlya. Depth about 0 km	73.7	N.	53.8	E.
4	10	46	54.9	New Britain region. Depth about 204 km	5.4	S.	154.2	E.
4	21	29	15.0	Tonga Islands region. Depth about 80 km	17.6	S.	173.4	W.
5	15	41	10.9	Molucca Passage. Depth about 186 km	1.2	S.	125.6	E.
5	17	24	27.5	Southeastern Alaska. Depth about 33 km	58.5	N.	137.4	W.
5	18	08	43.4	Loyalty Islands region. Depth about 58 km	19.4	S.	169.0	E.
5	19	27	45.5	Mariana Islands region. Depth about 47 km	18.6	N.	146.9	E.
5	22	34	58.9	Near coast of Formosa. Depth about 39 km	24.0	N.	121.7	E.
5	23	01	07.3	Sea of Okhotsk. Depth about 518 km	51.0	N.	149.7	E.
6	01	25	47.7	Kurile Islands. Depth about 150 km	48.3	N.	152.6	E.
6	02	24	55.2	Solomon Islands region. Depth about 46 km	6.0	S.	153.8	E.
6	06	46	49.2	Solomon Islands region. Depth about 50 km	10.1	S.	163.0	E.
6	07	00	12.2	Novaya Zemlya. Depth about 0 km	74.3	N.	51.6	E.
6	08	02	25.9	Near coast of Mexico. Depth about 33 km	16.5	N.	98.3	W.
6	09	02	42.6	Peru-Chile border. Depth about 184 km	18.2	S.	69.5	W.
6	11	04	22.5	Hokkaido, Japan. Depth about 115 km	42.4	N.	142.1	E.
6	13	26	46.3	Near coast of Luzon, Philippine Islands. Depth about 70 km	19.6	N.	122.1	E.
6	19	39	12.6	New Hebrides Islands region. Depth about 161 km	15.4	S.	167.8	E.
7	04	21	56.1	West Pakistan. Depth about 59 km	31.4	N.	70.2	E.
7	08	15	10.0	Chile-Bolivia border. Depth about 144 km	21.3	S.	68.4	W.
7	08	15	14.8	Sandwich Islands. Depth about 33 km	56.2	S.	27.0	W.
7	09	55	55.4	Near coast of Ecuador. Depth about 56 km	0.4	S.	80.4	W.
7	14	18	37.7	Catamarca Province, Argentina. Depth about 33 km	28.1	S.	68.0	W.
7	15	54	01.3	Off coast of Oregon. Depth about 25 km	43.5	N.	128.8	W.
7	17	26	41.4	Northern Chile. Depth about 100 km	20.4	S.	69.0	W.
7	19	24	32.5	Sandwich Islands region. Depth about 33 km	56.2	S.	26.8	W.
8	00	53	20.0	Ceram. Depth about 178 km	3.8	S.	128.5	E.
8	02	57	49.0	Fox Islands, Aleutian Islands. Depth about 25 km	51.6	N.	170.9	W.
8	11	45	25.0	Solomon Islands region. Depth about 94 km	9.8	S.	160.4	E.
8	12	41	36.0	Near coast of central Chile. Depth about 65 km	30.0	S.	71.4	W.
8	21	56	44.0	Fox Islands, Aleutian Islands. Depth about 48 km	53.1	N.	166.7	W.
8	23	41	33.1	Halmahera. Depth about 106 km	1.5	N.	127.2	E.
9	01	36	56.0	Tonga Islands region. Depth about 48 km	21.9	S.	175.5	W.
9	03	16	58.2	Near south coast of Mexico. Depth about 154 km	16.1	N.	94.0	W.
9	06	50	29.7	Tsinghai Province, China. Depth about 33 km	38.4	N.	91.5	E.
9	10	27	41.4	New Britain region. Depth about 71 km	5.9	S.	147.7	E.
9	10	42	10.6	Banda Sea. Depth about 21 km	6.7	S.	128.9	E.
9	11	04	45.6	New Hebrides Islands region. Depth about 26 km	13.2	S.	167.8	E.
9	22	14	13.9	Halmahera region. Depth about 33 km	2.3	N.	127.1	E.
10	01	46	35.3	Kurile Islands. Depth about 33 km	46.2	N.	152.7	E.
10	03	44	38.3	South of Fiji Islands. Depth about 576 km	22.9	S.	180.0	
10	04	00	24.9	Banda Sea. Depth about 138 km	7.4	S.	128.2	E.
10	08	25	54.6	Solomon Islands region. Depth about 154 km	5.4	S.	154.3	E.
10	11	24	34.6	Flores Sea. Depth about 100 km	7.8	S.	123.5	E.
10	17	24	58.9	Western New Guinea. Depth about 36 km	4.7	S.	138.2	E.
10	18	44	28.6	Fiji Islands region. Depth about 361 km	16.1	S.	176.3	W.
11	00	29	35.6	Kermadec Islands. Depth about 46 km	28.7	S.	175.8	W.
11	04	02	39.5	Near north coast of New Guinea. Depth about 18 km	2.5	S.	140.9	E.
11	06	19	02.0	South of Samoa Islands. Depth about 25 km	15.4	S.	172.4	W.
11	07	03	58.6	Kodiak Island. Depth about 42 km	57.5	N.	154.1	E.
11	07	39	59.4	Kazakh S.S.R. Depth about 0 km	50.0	N.	77.7	E.
11	09	28	17.7	Santa Cruz Islands. Depth 52 km	11.6	S.	166.3	E.
11	10	43	44.9	New Hebrides Islands region. Depth about 262 km	19.2	S.	169.6	E.
11	12	28	35.2	Near coast of Peru. Depth about 137 km	13.3	S.	75.5	W
11	16	04	18.0	South of Fiji Islands. Depth about 560 km	24.5	S.	179.8	E.
11	17	20	15.4	Ryukyu Islands. Depth about 52 km	29.7	N.	129.7	E.
11	19	47	12.0	South of Honshu, Japan. Depth about 40 km	32.7	N.	142.0	E.
11	19	53	02.2	New Hebrides Islands region. Depth about 175 km	13.2	S.	165.6	E.
11	20	19	58.0	New Hebrides Islands region. Depth about 87 km	14.9	S.	167.5	E.
11	22	01	37.9	Santa Cruz Islands. Depth about 135 km	10.5	S.	165.9	E.
12	03	42	49.2	Talaud Islands. Depth about 104 km	5.4	N.	126.1	E.
12	05	56	51.0	Guerrero, Mexico. Depth about 60 km	17.3	N.	99.0	W.
12	06	01	28.6	Near north coast of New Guinea. Depth about 33 km	3.2	S.	145.1	E.
12	07	36	34.6	Kermadec Islands. Depth about 300 km	32.0	S.	179.7	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.	Region, focal depth, and remarks	Coordinates of provisional epicenter	
			Latitude	Longitude
	h m s		° ′	° ′
Oct. 12	08 24 10.0	New Britain. Felt at Gavit and Rabaul. Depth about 41 km	5.6 S.	151.9 E.
12	13 53 34.4	North of Puerto Rico. Felt at San Juan and at St. Thomas, Virgin Islands. Depth about 40 km.	19.2 N.	64.9 W.
12	14 27 37.9	Wyoming. Depth about 25 km	43.3 N.	108.8 W.
12	19 07 30.0	Near west coast of Formosa. Felt. Depth about 25 km	24.4 N.	120.2 E.
12	21 57 36.1	South of Macquarie Islands. Depth about 33 km	60.7 S.	154.5 E.
13	02 22 08.2	Off southeast coast of Mindanao, Philippine Islands. Depth about 241 km.	6.2 N.	126.7 E.
13	04 59 02.2	Sandwich Islands. Depth about 33 km. Mag. 5¼–5½ (Pal)	55.9 S.	27.7 W.
13	10 46 46.1	Sandwich Islands region. Depth about 33 km. Mag. 5½–5¾ (Pal).	60.2 S.	33.8 W.
13	14 30 58.4	Panay, Philippine Islands. Depth about 33 km	11.2 N.	123.8 E.
13	17 28 21.5	Tonga Islands region. Depth about 55 km	22.0 S.	176.9 W.
14	07 00 39.4	Western Iran. 2 killed, many injured, and heavy property damage at Aliabad-Magh and Malayer. Depth about 33 km.	33.6 N.	48.1 E.
14	11 15 28.2	New Britain. Depth about 35 km	5.1 S.	150.7 E.
14	12 30 45.3	South of Honshu, Japan. Depth about 47 km	33.3 N.	142.2 E.
14	16 13 48.7	New Hebrides Islands. Felt at Port Vila. Depth about 28 km	19.1 S.	168.4 E.
14	21 18 03.4	Near coast of Ecuador. Depth about 25 km	0.9 S.	80.3 W.
14	21 58 59.7	Kamchatka. Depth about 100 km	51.2 N.	159.2 E.
15	17 08 01.3	Near southwest coast of Sumatra. Depth about 101 km	4.0 S.	102.7 E.
15	21 05 02.0	Central Utah. Depth about 33 km	39.2 N.	111.4 W.
15	21 18 53.3	Banda Sea. Depth about 558 km	6.9 S.	125.4 E.
16	01 07 08.2	Kamchatka. Depth about 44 km	50.9 N.	157.9 E.
16	02 08 21.0	Fox Islands, Aleutian Islands. Depth about 60 km	53.0 N.	168.3 E.
16	03 27 44.1	Tonga Islands region. Depth about 224 km	19.9 S.	176.1 W.
16	09 04 44.5	Off south coast of Kamchatka. Depth about 33 km	50.3 N.	156.5 E.
16	09 38 10.3	New Hebrides Islands. Depth about 131 km	14.8 S.	167.7 E.
16	09 57 58.4	New Hebrides Islands region. Depth about 257 km	19.0 S.	170.0 E.
16	10 01 25.3	New Hebrides Islands. Depth about 28 km	18.8 S.	168.4 E.
16	11 42 56.1	Off coast of central Chile. Depth about 25 km	38.3 S.	74.4 W.
16	17 55 04.8	Bismarck Sea. Depth about 190 km	5.6 S.	147.2 E.
16	19 13 06.5	Central Utah. Depth about 18 km	39.2 N.	111.5 W.
17	00 16 16.7	Near coast of Peru. Depth about 42 km	13.7 S.	76.1 W.
17	00 59 41.8	Central Utah. Depth about 21 km	39.2 N.	111.5 W.
17	03 28 09.7	Near north coast of New Guinea. Depth about 87 km	2.9 S.	141.0 E.
17	03 54 46.7	Northern Utah. Depth about 28 km	40.0 N.	112.5 W.
17	04 27 31.3	Bouvet Island region. Depth about 33 km. Mag. 5¼ (Pal)	54.8 S.	1.5 E.
17	09 51 32.8	New Hebrides Islands. Depth about 25 km	14.9 S.	168.4 E.
17	11 02 34.4	South of Guam. Depth about 16 km	12.3 N.	143.7 E.
18	01 38 28.8	New Hebrides Islands. Depth about 117 km	18.0 N.	168.6 E.
18	02 49 59.6	Kermadec Islands. Depth about 65 km	29.9 S.	177.6 W.
18	03 56 30.1	Fiji Islands region. Depth about 519 km	20.0 S.	177.7 W.
18	06 38 43.8	Tonga Islands. Depth about 91 km	15.1 S.	173.9 W.
18	07 31 39.3	Fiji Islands region. Depth about 576 km	17.4 S.	178.6 W.
18	10 44 12.2	Fox Islands, Aleutian Islands. Depth about 33 km	53.7 N.	165.3 W.
18	15 31 18.5	Burma. Depth about 69 km	23.1 N.	91.6 E.
18	16 51 57.3	Near coast of southern Chile. Minor damage in area between Curico and Valdivia. Depth about 33 km. Mag. 6½.	36.7 S.	73.0 W.
18	18 10 30.4	Near coast of southern Chile. Depth about 55 km	36.9 S.	73.5 W.
19	05 09 44.0	Kern County, Calif. Slight damage at Mojave. Depth about 22 km. Mag. 5.2.	35.8 N.	117.9 W.
19	08 31 29.3	Near coast of southern Chile. Depth about 61 km	36.9 S.	72.7 W.
19	09 12 26.4	West of Macquarie Islands. Depth about 33 km	55.2 S.	146.7 E.
19	10 56 55.3	Sea of Japan. Depth about 230 km	43.0 N.	139.4 E.
19	11 19 20.1	Neuquen Province, Argentina. Depth about 149 km. Mag. 6¼	37.1 S.	70.6 W.
19	13 31 57.1	New Hebrides Islands. Depth about 75 km	21.6 S.	170.1 E.
19	19 26 32.2	South of Australia. Depth about 50 km	55.3 S.	146.4 E.
19	20 24 41.9	Tonga Islands. Depth about 25 km	17.6 S.	174.0 W.
20	03 49 58.2	Solomon Islands region. Felt at Honiara. Depth about 21 km	9.4 S.	160.4 E.
20	05 40 44.1	Andreanof Islands, Aleutian Islands. Depth about 36 km	51.8 N.	176.0 W.
20	08 06 12.9	Flores Sea. Depth about 33 km	8.0 S.	117.9 E.
20	08 07 02.0	Novaya Zemlya. Depth about 0 km	73.8 N.	53.2 E.
20	17 46 47.4	Tsinghai Province, China. Depth about 33 km	38.4 N.	97.3 E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Oct. 20	19	02	18.6	Off coast of central Chile. Depth about 33 km	36.9	S.	72.7	W.
20	19	19	13.3	Orange County, Calif. Felt. Depth about 19 km. Mag. 3.8	33.7	N.	117.9	W.
20	19	49	50.5	Orange County, Calif. Minor damage at Anaheim, Garden Grove, and Santa Ana. Depth about 17 km. Mag. 4.3.	33.6	N.	118.0	W.
20	20	07	14.8	Orange County, Calif. Felt. Depth about 20 km. Mag. 4.0	33.7	N.	118.0	W.
20	22	35	34.2	Orange County, Calif. Felt Depth about 27 km. Mag. 4.1	33.7	N.	118.0	W.
21	11	43	41.3	Fiji Islands. Depth about 618 km	18.0	S.	178.5	W.
21	17	34	33.6	Santa Cruz Islands. Depth about 161 km	10.8	S.	166.2	E.
21	22	21	52.2	Andreanof Islands, Aleutian Islands. Depth about 35 km	51.6	N.	176.0	W.
22	07	01	42.1	West of Galapagos Islands. Depth about 60 km	0.2	S.	94.6	W.
22	07	30	41.8	Banda Sea. Depth about 172 km	7.3	S.	128.0	E.
22	09	50	30.8	New Hebrides Islands. Depth about 65 km. Mag. 5½ (Brk)	20.0	S.	172.7	E.
22	13	08	11.1	West of Galapagos Islands. Depth about 65 km	2.2	N.	95.9	W.
22	14	41	03.0	Fiji Islands. Depth about 554 km	17.7	S.	178.7	W.
22	15	13	32.3	Off west coast of Costa Rica. Depth about 51 km	10.5	N.	86.6	W.
22	18	40	26.9	New Hebrides Islands. Felt at Port Vila. Depth about 45 km	18.0	S.	168.7	E.
22	22	56	31.8	Southern Iran. Depth about 33 km	27.5	N.	54.6	E.
23	00	08	36.6	Sandwich Islands. Depth about 33 km. Mag. 6¼–6½ (Pal)	60.2	S.	33.6	W.
23	01	24	01.9	Central Chile. Depth about 108 km	28.7	S.	70.3	W.
23	02	32	52.8	New Hebrides Islands. Depth about 25 km	14.9	S.	166.8	E.
23	04	40	22.1	Southern Iran. Depth about 33 km	27.9	N.	54.5	E.
23	06	03	11.9	Banda Sea. Depth about 60 km	6.2	S.	130.3	E.
23	07	54	58.9	Unimak Island, Aleutian Islands. Depth about 35 km	54.0	N.	163.8	W.
23	08	31	22.1	Novaya Zemlya. Depth about 0 km. Mag. 4¾–5 (Pal)	73.9	N.	53.8	E.
23	09	14	47.3	Bismarck Sea. Depth about 73 km	3.2	S.	146.6	E.
23	10	30	48.8	Novaya Zemlya. Depth about 0 km	70.7	N.	53.5	E.
23	14	39	35.3	Molucca Passage. Depth about 20 km. Mag. 6½	3.5	N.	126.6	E.
23	14	52	30.5	Molucca Passage. Depth about 33 km	3.6	N.	126.7	E.
23	17	11	57.1	Tonga Islands. Depth about 41 km	16.5	S.	173.9	W.
23	17	45	20.1	Molucca Passage. Depth about 102 km	3.3	N.	125.9	E.
23	19	20	54.3	Fiji Islands. Depth about 499 km	19.8	S.	178.1	W.
23	20	38	26.5	Molucca Passage. Depth about 33 km	3.5	N.	126.2	E.
24	00	18	18.6	Hokkaido, Japan. Depth about 14 km	42.9	N.	144.6	E.
24	01	19	31.3	Molucca Passage. Depth about 33 km	4.1	N.	127.3	E.
24	07	25	24.7	Kurile Islands. Depth about 126 km	44.7	N.	146.5	E.
24	07	36	17.1	Fiji Islands. Depth about 40 km	16.5	S.	178.3	E.
24	15	30	11.9	Northern Celebes. Depth about 130 km	0.3	N.	123.9	E.
24	18	04	32.3	Sandwich Islands region. Depth about 33 km	59.3	S.	25.2	W.
24	22	28	00.9	Near coast of southern Chile. Felt. Depth about 49 km	38.1	S.	73.3	W.
25	08	54	34.6	Off coast of Peru. Depth about 110 km	9.6	S.	78.4	W.
25	12	49	07.9	Kermadec Islands region. Depth about 25 km	34.7	S.	178.4	W.
25	14	20	32.4	Tonga Islands. Depth about 114 km	20.5	S.	174.3	W.
25	16	24	20.8	Gulf of Aden. Depth about 66 km	14.2	N.	56.6	E.
25	22	38	20.7	Tonga Islands. Depth about 125 km	20.1	S.	174.3	W.
26	00	38	22.8	Bismarck Sea. Depth about 33 km. Mag. 6¼	3.1	S.	148.1	E.
26	08	16	02.4	Off coast of southern Chile. Depth about 43 km	38.0	S.	72.8	W.
26	11	11	26.2	New Hebrides Islands. Depth about 124 km	17.9	S.	167.7	E.
26	15	27	05.9	Off west coast of Sumatra. Depth about 34 km. Mag. 6	0.3	S.	98.7	E.
26	15	41	51.5	Loyalty Islands region. Depth about 35 km	22.4	S.	170.9	E.
26	16	05	49.5	Off west coast of Sumatra. Depth about 87 km	0.1	S.	98.6	E.
26	17	22	19.0	Guerrero, Mexico. Depth about 91 km	17.4	N.	100.2	W.
26	19	28	38.4	Off west coast of Sumatra. Depth about 62 km	0.5	S.	98.8	E.
26	21	56	16.5	Colombia. Depth about 154 km	6.9	N.	73.0	W.
27	02	37	10.4	New Hebrides Islands. Depth about 17 km	17.9	S.	167.7	E.
27	08	30	26.6	Novaya Zemlya. Depth about 0 km	70.7	N.	53.5	E.
27	10	30	42.9	Sumatra. Depth about 33 km	6.2	S.	105.4	E.
28	01	34	55.7	Fiji Islands. Depth about 518 km	17.5	S.	178.9	W.
28	05	30	04.5	Off coast of Peru. Depth about 33 km	9.3	S.	80.0	W.
28	06	00	33.7	Santa Cruz Islands. Depth about 34 km	11.6	S.	166.4	E.
28	06	20	09.2	New Hebrides Islands. Depth about 66 km	19.0	S.	168.4	E.
28	06	48	07.6	Fiji Islands. Depth about 571 km	18.8	S.	178.1	W.
28	09	22	39.9	Tonga Islands. Depth about 76 km	20.3	S.	174.1	W.
28	10	46	42.2	Western Iran. Depth about 52 km	33.6	N.	48.5	E.
28	14	49	17.5	Near coast of southern Chile. Depth about 53 km	38.6	S.	73.9	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Oct. 28	18	23	30.9	New Hebrides Islands. Depth about 33 km	13.7	S.	165.8	E.
28	22	44	30.2	New Hebrides Islands. Depth about 37 km	13.9	S.	166.0	E.
28	22	45	45.6	Lake Baikal, U.S.S.R. region. Depth about 33 km	53.4	N.	109.3	E.
28	23	31	32.7	New Hebrides Islands. Depth about 225 km	13.9	S.	166.3	E.
29	02	22	20.5	New Hebrides Islands. Depth about 25 km	13.7	S.	165.7	E.
29	09	12	15.7	Vancouver Island region. Depth about 16 km. Mag. 5¾	49.0	N.	128.7	W.
29	14	00	12.0	Vancouver Island region. Depth about 56 km	49.4	N.	127.6	W.
29	14	47	16.8	Vancouver Island region. Depth about 33 km. Mag. 4¾-5 (Pal)	49.0	N.	128.3	W.
29	23	55	55.9	New Hebrides Islands. Depth about 25 km	13.8	S.	166.0	E.
30	01	44	52.1	Off coast of Oregon. Depth about 33 km	42.5	N.	126.6	W.
30	02	16	32.7	Off coast of Oregon. Depth about 36 km. Mag. 5-5¼ (Pal)	42.3	N.	126.7	W.
30	04	47	59.8	Off south coast of Kamchatka. Depth about 32 km	50.8	N.	158.3	E.
30	08	33	27.8	Novaya Zemlya. Depth about 0 km. Mag. 5¼-5½ (Pal)	73.8	N.	53.5	E.
30	13	13	57.6	Atlantic Ocean. Depth about 33 km	1.1	N.	29.8	W.
30	17	35	03.3	Kermadec Islands. Depth about 219 km	28.5	N.	178.1	W.
30	21	15	35.2	South of Honshu, Japan. Depth about 31 km	28.9	N.	141.8	E.
30	22	36	19.5	South of Honshu, Japan. Depth about 80 km	29.3	N.	141.8	E.
31	01	43	53.3	Rat Islands, Aleutian Islands. Depth about 35 km	51.9	N.	176.1	E.
31	03	19	28.0	Near coast of Sumatra. Depth about 27 km	5.0	S.	104.1	E.
31	03	46	03.2	Kermadec Islands. Depth about 232 km	31.2	S.	178.3	W.
31	08	29	17.2	Novaya Zemlya. Depth about 0 km. Mag. 4¾ (Pal)	73.6	N.	56.2	E.
31	08	38	00.5	Novaya Zemlya. Depth about 0 km	75.1	N.	56.7	E.
31	08	39	11.1	Mariana Islands region. Depth about 270 km	21.9	N.	142.9	E.
31	23	58	50.7	Off east coast of Hokkaido, Japan. Depth about 15 km	43.6	N.	146.5	E.
Nov. 1	10	42	19.8	Fiji Islands. Depth about 564 km	17.7	S.	178.6	W.
1	20	10	42.8	Fiji Islands. Depth about 593 km	17.9	S.	178.5	W.
2	05	22	42.0	Fiji Islands. Depth about 566 km	17.7	S.	178.5	W.
2	06	59	45.5	Afghanistan-Pakistan border. Depth about 38 km	33.9	N.	69.6	E.
2	23	03	55.6	Leeward Islands. Depth about 29 km	17.2	N.	62.7	W.
2	23	35	52.5	Alaska Peninsula. Depth about 33 km	54.4	N.	162.0	W.
3	04	04	08.0	New Hebrides Islands. Depth about 100 km	13.4	S.	167.7	E.
3	15	20	42.3	Santa Cruz Islands. Depth about 33 km	10.6	S.	165.9	E.
3	21	05	52.6	Tonga Islands. Depth about 33 km	19.8	S.	173.9	W.
3	22	15	42.5	Loyalty Islands region. Depth about 33 km	21.9	S.	170.1	E.
3	22	24	48.1	Banda Sea. Depth about 69 km	5.3	S.	131.1	E.
4	02	08	46.2	Northern Ryukyu Islands. Depth about 36 km	29.8	N.	131.8	E.
4	03	04	20.9	Near north coast of New Guinea. Depth about 35 km	2.9	S.	137.2	E.
4	03	38	30.1	Northern Kurile Islands. Depth about 32 km	50.0	N.	155.5	E.
4	07	20	19.7	Novaya Zemlya. Depth about 0 km	73.7	N.	55.7	E.
4	13	05	06.1	Tibet. Depth about 33 km	32.4	N.	92.1	E.
4	14	34	36.9	Andreanof Islands, Aleutian Islands. Depth about 60 km	52.5	N.	176.0	W.
4	18	17	01.7	Fox Islands, Aleutian Islands. Depth about 33 km	52.2	N.	167.6	W.
5	00	20	04.7	Santa Cruz Islands. Depth about 70 km	11.5	S.	166.3	E.
5	03	15	42.1	Near east coast of Honshu, Japan. Depth about 52 km	35.9	N.	140.9	E.
5	03	41	40.0	Kurile Islands. Depth about 18 km	44.2	N.	148.4	E.
5	08	36	31.6	Southern Iran. Depth about 44 km	27.8	N.	55.0	E.
5	09	53	08.3	Southwestern Montana. Depth about 25 km	45.0	N.	111.0	W.
5	10	08	12.9	New Hebrides Islands. Depth about 39 km	13.0	S.	166.4	E.
5	10	26	05.6	San Juan Province, Argentina. Depth about 100 km	31.8	S.	69.3	W.
5	10	36	39.5	Kurile Islands. Depth about 142 km	45.7	N.	147.9	E.
5	13	04	54.4	Tonga Islands region. Depth about 33 km	27.3	S.	175.3	W.
5	19	26	08.2	Chile-Argentina border region. Depth about 100 km	33.6	S.	70.1	W.
5	23	56	25.4	About 500 km southwest of South Island, New Zealand. Depth about 35 km.	49.4	S.	163.3	E.
6	05	13	19.9	Near coast of Peru. Depth about 80 km	13.3	S.	76.7	W.
6	05	28	22.8	New Hebrides Islands. Felt on Banks and Santo. Depth about 59 km.	13.3	S.	166.5	E.
6	07	11	42.6	Chile-Argentina border region. Depth about 105 km	34.5	S.	70.5	W.
6	07	59	04.1	Bhutan. Depth about 37 km	26.7	N.	91.9	E.
6	10	10	23.6	Banda Sea. Depth about 57 km	6.6	S.	129.3	E.
6	12	29	05.5	Hindu Kush region. Depth about 191 km	36.0	N.	72.9	E.
6	13	09	50.2	Near coast of New Guinea. Depth about 15 km	5.8	S.	146.5	E.
6	13	34	55.1	Mariana Islands. Depth about 225 km	17.5	N.	145.2	E.
6	18	21	59.9	Catamarca Province, Argentina. Depth about 184 km	27.6	S.	66.2	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Nov. 7	00	40	06.0	Fiji Islands. Depth about 601 km	21.3	S.	179.1	W.
7	01	12	55.7	Samar, Philippine Islands. Depth about 47 km	11.6	N.	126.1	E.
7	01	29	08.4	Western Oregon-Washington border. Minor damage in Portland, Oregon area. Depth about 33 km.	45.7	N.	122.4	W.
7	05	52	20.8	Kurile Islands. Depth about 25 km	48.2	N.	153.0	E.
7	08	39	35.6	Southern Iran. Depth about 33 km	27.8	N.	54.5	E.
7	12	15	03.5	Tonga Islands region. Depth about 33 km	27.2	S.	176.4	W.
7	21	09	47.4	Kermadec Islands region. Depth about 39 km	34.3	S.	179.2	W.
7	23	40	04.0	Leeward Islands. Depth about 33 km	17.1	N.	62.6	W.
8	04	54	43.8	Near coast of Oaxaca, Mexico. Depth about 45 km	15.6	N.	95.8	W.
8	19	28	38.6	Western New Guinea. Depth about 33 km	4.1	S.	136.0	E.
8	22	37	17.4	Central Chile. Depth about 55 km	29.3	S.	71.1	W.
9	01	09	15.3	Loyalty Islands region. Depth about 33 km	22.0	S.	170.0	E.
9	04	19	42.0	Northern Chile-Argentina border. Felt at Antofagasta. Depth about 84 km. Mag. 6¼.	22.9	S.	67.9	W.
9	12	40	34.6	Mariana Islands. Depth about 57 km	13.5	N.	144.5	E.
9	16	01	46.9	Andreanof Islands, Aleutian Islands. Depth about 49 km	51.7	N.	176.0	W
9	17	39	39.3	New Hebrides Islands. Depth about 33 km	13.8	S.	165.9	E.
9	18	37	13.7	Banda Sea. Depth about 80 km	5.9	S.	129.8	E.
9	23	06	55.9	Tonga Islands region. Depth about 292 km	15.8	S.	174.8	W
10	02	07	34.7	Peru. Depth about 68 km	14.3	S.	71.9	W
10	07	29	59.3	Western New Guinea. Depth about 35 km	2.4	S.	138.2	E.
10	13	20	04.2	Honduras-Nicaragua border region. Felt at San Salvador. Depth about 38 km.	13.6	N.	86.7	W
10	13	52	41.9	Off coast of northern Somalia. Depth about 26 km	13.2	N.	51.1	E.
10	18	00	49.6	Fiji Islands. Depth about 586 km	17.5	S.	178.8	W.
10	22	43	24.9	Mackenzie Mountains, Canada. Depth about 33 km	62.6	N.	125.0	W.
11	08	47	33.8	West New Guinea. Depth about 33 km	2.3	S.	138.2	E.
11	12	27	07.7	Near coast of Guatemala. Depth about 90 km	13.7	N.	90.9	W.
11	17	42	36.8	Fox Islands, Aleutian Islands. Depth about 33 km	52.6	N.	169.3	W.
11	21	46	59.5	Peru. Depth about 117 km	8.1	S.	75.0	W.
12	02	15	16.7	Congo. Depth about 39 km. Mag. 5 (Pal)	0.8	N.	29.5	E.
12	08	21	06.8	Mascarene Islands region. Depth about 34 km	16.9	S.	66.9	E.
12	10	15	10.7	Near south coast of South Island, New Zealand. Depth about 19 km.	45.5	S.	167.3	E.
12	14	11	51.0	Tonga Islands region. Depth about 145 km	15.7	S.	175.6	W.
12	18	12	22.0	Fiji Islands region. Depth about 556 km	23.2	S.	180.0	
12	18	38	36.2	Molucca Passage. Depth about 149 km	0.2	S.	125.7	E.
13	07	39	55.6	West New Guinea. Depth about 30 km	4.1	S.	136.2	E.
13	09	12	12.3	Hindu Kush. Depth about 123 km	35.9	N.	70.4	E.
13	16	31	26.6	New Hebrides Islands. Depth about 43 km	14.9	S.	167.0	E.
13	19	38	15.5	Kurile Islands. Depth about 39 km	46.8	N.	153.9	E.
13	19	45	30.7	Kermadec Islands. Depth about 33 km	30.3	S.	177.8	W.
14	00	56	53.5	West New Guinea. Depth about 33 km	4.1	S.	135.9	E.
14	01	06	01.3	Near east coast of Formosa. Depth about 33 km	24.1	N.	121.8	E.
14	04	42	26.5	Off south coast of Panama. Depth about 29 km. Mag. 6¼	7.3	N.	82.4	W.
14	10	02	32.3	Near east coast of Honshu, Japan. Felt at Tokyo. Depth about 163 km.	36.0	N.	139.1	E.
14	10	28	33.4	Kurile Islands. Depth about 26 km	47.0	N.	153.7	E.
14	12	38	51.9	Kermadec Islands region. Depth about 51 km	33.9	S.	179.6	W.
14	13	11	14.1	Chile-Bolivia border region. Depth about 121 km	19.5	S.	69.6	W.
14	15	20	30.6	Fiji Islands. Depth about 590 km	21.9	S.	179.0	W.
14	17	14	03.9	Near south coast of Sumatra. Depth about 33 km	5.7	S.	104.1	E.
14	22	26	47.9	Kurile Islands. Depth about 25 km	44.2	N.	147.6	E.
15	04	22	50.5	Southeast Sumatra. Depth about 112 km	3.9	S.	105.0	E.
15	05	38	54.3	Kern County, Calif. Felt. Depth about 26 km. Mag. 4.9	34.9	N.	119.1	W.
15	07	17	12.4	Near east coast of Hokkaido, Japan. Felt. Depth about 43 km. Mag. 6¾.	43.1	N.	145.1	E.
15	13	41	37.3	Samoa Islands region. Depth about 33 km	15.2	S.	173.1	W.
15	14	25	49.5	Near east coast of Mindanao, Philippine Islands. Depth about 136 km.	7.3	N.	126.8	E.
15	19	26	55.5	Tonga Islands. Depth about 44 km	20.9	S.	175.7	W.
15	22	01	43.6	Sandwich Islands. Depth about 40 km	56.5	S.	25.6	W.
16	03	17	26.4	Near north coast of New Guinea. Depth about 33 km	4.1	S.	142.8	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Nov. 16	08	19	54.1	Dominican Republic. Depth about 152 km	18.5	N.	68.8	W.
16	16	03	54.8	New Hebrides Islands region. Depth about 33 km	20.2	S.	172.9	E.
17	08	13	49.8	Fiji Islands. Depth about 598 km	17.7	S.	178.6	W.
17	09	16	12.7	Sandwich Islands. Depth about 33 km	58.3	S.	25.9	W.
17	14	49	03.0	Fox Islands, Aleutian Islands. Depth about 27 km	52.4	N.	170.7	W.
17	19	03	55.9	Tonga Islands. Depth about 196 km	19.4	S.	175.6	W.
17	21	34	38.0	New Hebrides Islands. Depth about 60 km	13.3	S.	167.3	E.
17	22	12	29.4	New Hebrides Islands. Felt at Santo. Depth about 140 km	15.3	S.	167.8	E.
18	01	43	07.6	West Pakistan. Depth about 48 km	32.7	N.	73.6	E.
18	03	18	35.5	Kern County, Calif. Felt at China Lake and Randsburg. Depth about 23 km. Mag. 4.	35.4	N.	117.8	W.
18	03	18	44.2	Romania. Depth about 100 km	45.5	N.	26.7	E.
18	06	02	34.3	Halmahera region. Depth about 38 km	0.9	S.	126.9	E.
18	07	27	40.3	Sandwich Islands. Depth about 25 km	56.2	S.	25.2	W.
18	10	09	10.4	South of Honshu, Japan. Depth about 339 km	29.9	N.	138.9	E.
18	10	34	05.8	Peru. Depth about 50 km	8.8	S.	74.7	W.
18	11	16	56.8	Tonga Islands region. Depth about 61 km	27.0	S.	176.3	W.
18	11	47	56.6	Tonga Islands. Depth about 114 km	21.4	S.	175.8	W.
18	14	27	51.4	New Hebrides Islands. Depth about 25 km	18.4	S.	167.4	E.
18	22	09	51.9	Near east coast of Formosa. Felt. Depth about 38 km	23.9	N.	121.7	E.
19	00	35	12.1	Andreanof Islands, Aleutian Islands. Depth about 60 km	51.3	N.	178.5	W.
19	03	40	58.5	New Hebrides Islands. Depth about 24 km	18.3	S.	167.4	E.
19	08	05	15.8	Galapagos Islands region. Depth about 33 km	3.9	S.	101.9	W.
19	10	12	48.4	Solomon Islands region. Depth about 42 km	6.9	S.	154.9	E.
19	23	21	55.5	Celebes region. Depth about 157 km	0.8	N.	124.3	E.
20	04	03	56.7	Outer Mongolia-Siberia border. Depth about 33 km	50.8	N.	92.3	E.
20	04	32	34.7	Near east coast of Honshu, Japan. Depth about 33 km	38.0	N.	141.2	E.
20	06	40	19.7	Near east coast of Kamchatka. Depth about 60 km	54.7	N.	161.8	E.
20	08	53	33.7	Orange County, Calif. Felt. Depth about 33 km. Mag. 4	33.6	N.	118.1	W.
20	11	44	19.4	Loyalty Islands region. Depth about 33 km. Mag. 5½–5¾ (Pal)	21.8	S.	169.9	E.
20	12	21	51.6	Loyalty Islands region. Depth about 33 km	21.9	S.	169.9	E.
20	13	04	04.6	----do----	22.1	S.	169.9	E.
20	17	58	17.5	Azores region. Depth about 34 km. Mag. 5–5¼ (Pal)	31.3	N.	40.8	W.
20	18	51	36.7	Loyalty Islands region. Depth about 24 km	21.7	S.	170.0	E.
20	19	08	06.6	Near north coast of New Guinea. Felt at Mendi, Simbai, and Manam. Depth about 65 km.	5.0	S.	144.4	E.
20	23	07	47.5	South of Honshu, Japan. Depth about 525 km	28.3	N.	138.9	E.
21	01	16	45.7	Near east coast of Hokkaido, Japan. Depth about 110 km	44.0	N.	145.4	E.
21	05	00	10.5	Tadzhik S.S.R. Depth about 66 km	40.3	N.	70.2	E.
21	06	38	50.6	Near coast of Venezuela. Depth about 44 km	10.6	N.	62.9	W.
21	08	03	52.7	Near coast of Venezuela. Depth about 38 km	10.4	N.	62.7	W.
21	08	08	08.7	Loyalty Islands region. Depth about 33 km	22.1	S.	169.9	E.
21	11	06	40.2	Northern Celebes. Depth about 112 km	0.8	N.	122.4	E.
21	18	04	54.7	Mascarene Islands region. Depth about 33 km	13.6	S.	66.3	E.
21	20	19	58.8	Southern Alaska. Depth about 60 km	62.2	N.	156.4	W.
22	02	45	26.1	Loyalty Islands region. Depth about 33 km	21.6	S.	169.8	E.
22	03	28	08.9	----do----	21.6	S.	170.0	E.
22	08	51	41.8	Michoacan, Mexico. Depth about 60 km	19.3	N.	100.5	W.
22	10	18	15.0	Andreanof Islands, Aleutian Islands. Depth about 33 km	51.7	N.	177.1	W.
22	10	36	12.7	Loyalty Islands region. Depth about 52 km	21.4	S.	170.2	E.
22	11	06	39.2	Loyalty Islands region. Depth about 37 km	21.6	S.	169.9	E.
22	12	27	03.8	Guatemala. Depth about 84 km	15.4	N.	91.7	W.
22	13	01	40.1	Off coast of Ecuador. Depth about 37 km	2.7	N.	84.8	W.
22	20	16	13.3	Western New Guinea. Depth about 33 km	4.2	S.	135.9	E.
22	20	39	15.8	Tonga Islands region. Depth about 43 km	26.9	S.	176.4	W.
22	22	30	43.4	Near south coast of Java. Depth about 100 km	8.7	S.	110.4	E.
23	05	54	53.6	Kermadec Islands. Depth about 33 km	32.4	S.	178.7	W.
23	10	35	49.0	Nicaragua-Costa Rica border region. Depth about 33 km	10.8	N.	84.9	W.
23	11	17	27.7	Peru. Depth about 61 km	5.6	S.	80.3	W.
23	15	26	55.8	Tonga Islands. Depth about 128 km	18.7	S.	175.0	W.
23	16	58	47.4	Tonga Islands region. Depth about 15 km	23.5	S.	176.0	W.
24	07	43	40.6	Off coast of central Chile. Depth about 48 km	38.3	S.	74.4	W.
25	06	18	11.2	Fiji Islands. Depth about 593 km	18.0	S.	178.4	W.
25	14	11	22.9	Solomon Islands. Depth about 81 km	3.6	S.	154.9	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Nov. 25	20	19	50.4	Near east coast of Honshu, Japan. Felt at Honshu. Depth about 45 km.	36.2	N.	141.4	E.
25	22	54	50.0	Tonga Islands. Depth about 33 km	22.1	S.	175.7	W.
26	03	32	06.8	Kermadec Islands region. Depth about 33 km	33.6	S.	177.5	W.
26	05	26	27.6	New Britain region. Depth about 145 km	4.7	S.	151.4	E.
26	14	17	45.4	Azores region. Depth about 33 km	29.2	N.	43.7	W.
26	18	12	18.9	Near north coast of New Guinea. Depth about 52 km	5.6	S.	146.3	E.
26	19	03	59.0	D'Entrecasteaux Islands. Depth about 36 km	9.4	S.	150.7	E.
27	00	55	45.7	Colorado. Felt in Chaffee, Lake and Park counties. Depth about 33 km.	39.0	N.	106.1	W.
27	01	54	20.6	Sandwich Islands. Depth about 163 km	56.4	S.	28.2	W.
27	05	57	07.6	Near south coast of Kyushu, Japan. Felt on Kyushu. Depth about 25 km. Mag. 6¼–6½ (Pas).	31.6	N.	131.1	E.
27	10	53	44.0	About 1,500 km south of Australia. Depth about 33 km	49.0	S.	120.8	E.
27	16	49	44.8	Halmahera region. Depth about 44 km	1.0	S.	126.9	E.
27	17	10	38.1	Halmahera region. Depth about 33 km. Mag. 6¼–6½	0.4	S.	127.6	E.
27	17	47	59.9	Halmahera region. Depth about 25 km	1.9	S.	127.0	E.
27	23	30	45.1	Macquarie Islands. Depth about 33 km	60.0	S.	158.8	E.
28	00	37	12.3	Fiji Islands. Depth about 530 km	19.1	S.	177.5	W.
28	02	40	22.0	Halmahera region. Depth about 33 km	0.4	S.	127.8	E.
28	05	01	51.5	----do----	0.9	S.	127.1	E.
28	07	53	43.5	Kurile Islands. Depth about 81 km	46.6	N.	153.6	E.
28	08	47	41.6	Banda Sea. Depth about 107 km	6.1	S.	130.2	E.
28	08	58	48.4	Dardenelles. Felt. Depth about 17 km	40.2	N.	25.9	E.
28	10	14	44.5	India-Pakistan border. Depth about 31 km	35.7	N.	73.6	E.
28	16	37	58.5	Near east coast of Honshu, Japan. Depth about 101 km	35.9	N.	140.2	E.
28	18	34	36.1	About 1200 km southwest of Macquarie Islands. Depth about 33 km.	56.9	S.	142.7	E.
28	22	55	09.4	New Hebrides Islands. Felt on Santo. Depth about 146 km	14.8	S.	167.3	E.
29	04	43	09.3	Off coast of central Chile. Depth about 60 km	38.5	S.	75.9	W.
29	09	28	11.7	South Atlantic Ocean. Depth about 33 km	37.0	S.	18.6	W.
29	10	54	55.1	Tanimbar region. Depth about 39 km	7.3	S.	130.7	E.
29	17	50	06.0	Near southeast coast of Kamchatka. Depth about 80 km	52.2	N.	158.4	E.
29	20	38	09.2	Peru. Depth about 33 km	7.2	S.	76.4	W.
29	21	55	44.7	Loyalty Islands region. Depth about 29 km	23.1	S.	170.9	E.
29	22	15	39.9	New Hebrides Islands. Felt at Port Vila. Depth about 33 km	18.3	S.	168.1	E.
29	23	16	07.3	Near east coast of North Island, New Zealand. Depth about 33 km	38.1	S.	177.7	E.
30	12	20	07.3	Near Vladivostok, U.S.S.R. Depth about 469 km	43.8	N.	132.1	E.
30	14	14	32.8	New Hebrides Islands region. Depth about 42 km	14.4	S.	170.9	E.
30	16	46	49.4	Ceram Sea. Depth about 39 km	3.3	S.	127.2	E.
30	18	27	25.3	New Hebrides Islands. Felt at Port Vila. Depth about 33 km	18.2	S.	168.0	E.
30	20	03	34.1	Fiji Islands. Depth about 556 km	17.3	S.	178.5	W.
30	21	43	16.1	Molucca Passage. Depth about 33 km	2.3	N.	126.7	E.
Dec. 1	06	55	10.9	New Ireland region. Depth about 342 km	3.6	S.	152.5	E.
1	07	34	22.2	Kamchatka. Depth about 35 km	56.4	N.	159.0	E.
1	07	58	50.1	Off coast of Negros, Philippine Islands. Felt at Dumaguete. Depth about 50 km.	8.8	N.	121.9	E.
1	09	16	01.1	Banda Sea. Depth about 22 km	6.0	S.	130.6	E.
1	15	04	17.5	South of Fiji Islands. Depth about 374 km	25.5	S.	179.4	W.
1	20	17	51.3	Bonin Islands region. Depth about 90 km	28.0	N.	141.5	E.
1	21	13	04.1	East China Sea. Depth about 206 km	26.5	N.	124.9	E.
2	04	47	53.7	Near coast of Guatemala. Depth about 33 km	13.9	N.	92.3	W
2	07	20	17.6	Revilla Gigedo Islands region. Depth about 33 km	20.1	N.	108.5	W.
2	12	40	16.2	Algeria-Tunisia border. Felt at Bone, Lamy and Philippeville. Depth about 33 km.	36.5	N.	8.2	E.
2	14	05	50.8	New Hebrides Islands. Depth about 33 km	17.4	S.	168.6	E.
2	18	45	47.3	Tonga Islands region. Depth about 33 km	22.4	S.	175.1	W.
2	19	19	57.4	Rat Islands, Aleutian Islands. Depth about 50 km	51.6	N.	179.5	E.
2	19	33	16.5	Near north coast of New Guinea. Depth about 100 km	2.7	S.	138.8	E.
3	01	00	31.8	Near coast of Guerrero, Mexico. Depth about 46 km	17.1	N.	99.3	W.
3	08	40	29.2	Off northeast coast of Formosa. Felt on Formosa. Depth about 140 km.	25.0	N.	123.1	E.
3	09	32	25.5	Kirghiz S.S.R. Depth about 24 km	41.5	N.	75.3	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Dec. 3	10	00	09.0	New Hebrides Islands. Depth about 39 km	13.3	S.	166.5	E.
3	11	17	36.6	Near coast of Veracruz, Mexico. Depth about 33 km	19.8	N.	95.9	W.
3	12	08	40.7	Java. Depth about 140 km	7.4	S.	112.1	E.
3	14	27	43.4	Northern Chile-Argentina border. Depth about 217 km	24.0	S.	68.1	W.
3	16	14	31.4	Santa Cruz Islands. Depth about 122 km	11.6	S.	166.1	E.
3	18	31	56.1	Armenia S.S.R. Felt at Kars, Turkey and in Georgia S.S.R. Depth about 33 km.	40.9	N.	44.1	E.
3	19	55	05.5	Sea of Japan. Depth about 386 km	43.6	N.	135.1	E.
3	21	03	23.4	New Guinea. Depth about 120 km	4.2	S.	142.3	E.
4	03	42	37.0	Alaska Peninsula. Depth about 62 km	55.2	N.	160.1	W.
4	05	33	17.9	New Britain region. Felt. Depth about 47 km	5.5	S.	151.7	E.
4	07	36	23.1	Near coast of Dominican Republic. Depth about 140 km	18.6	N.	69.0	W.
4	08	20	17.7	Northern Kamchatka. Depth about 45 km	60.2	N.	160.4	E.
4	12	38	11.9	Tsinghai Province, China. Depth about 45 km	33.2	N.	95.3	E.
4	16	12	12.0	Ecuador. Depth about 33 km	0.3	N.	78.3	W.
5	06	44	14.8	Southern Chile. Depth about 33 km	45.8	S.	73.2	W.
5	13	01	04.3	Southwest of Tasmania. Depth about 33 km	50.8	S.	139.7	E.
5	13	02	35.7	New Hebrides Islands. Felt on Santo. Depth about 205 km. Mag. 6¼–6½.	16.4	S.	168.0	E.
5	22	39	11.0	Fiji Islands region. Depth about 532 km	21.0	S.	178.4	W.
6	02	15	59.5	Off east coast of Honshu, Japan. Depth about 47 km	37.8	N.	142.6	E.
6	04	50	17.1	Southern Alaska. Depth about 70 km	61.4	N.	147.9	W.
6	05	48	38.3	Andaman Islands. Depth about 35 km. Mag. 5¼ (Pal)	13.6	N.	93.4	E.
6	13	35	48.2	Tonga Islands region. Depth about 45 km. Mag. 6¼ (Brk)	23.5	S.	176.1	W.
6	15	18	09.5	Tonga Islands region. Depth about 45 km	24.0	S	175.8	W.
6	15	40	34.4	Soembawa. Depth about 77 km	8.3	S.	117.4	E.
6	16	39	37.6	Kurile Islands. Felt on Paramushiro. Depth about 60 km. Mag. 6–6¼.	49.3	N.	155.4	E.
7	00	18	26.0	Tonga Islands region. Depth about 45 km	23.4	S.	175.9	W.
7	09	11	06.0	Solomon Islands. Depth about 62 km	6.8	S.	155.2	E.
7	14	24	03.4	Tonga Islands region. Depth about 45 km	23.4	S.	175.9	W.
7	16	29	15.4	----do----	23.8	S.	175.9	W.
8	03	46	24.5	----do----	23.6	S.	175.8	W.
8	06	07	38.6	Western New Guinea. Depth about 64 km	3.0	S.	136.9	E.
8	07	57	52.8	Off west coast of Mexico. Depth about 33 km	15.3	N.	104.7	W.
8	08	13	07.3	Flores. Depth about 144 km	8.5	S.	119.4	E.
8	09	36	24.9	Near north coast of New Guinea. Depth about 55 km	1.8	S.	139.4	E.
8	10	19	53.1	Tibet. Depth about 33 km	30.6	N.	87.0	E.
8	10	40	42.6	Gulf of Aden. Depth about 33 km	13.5	N.	50.2	E.
8	11	17	03.6	Soembawa. Depth about 33 km	8.5	S.	117.4	E.
8	14	27	06.5	New Hebrides Islands. Depth about 178 km	15.0	S.	168.5	E.
8	14	42	50.1	Tonga Islands region. Depth about 45 km	23.5	S.	176.0	W.
8	16	11	44.0	Solomon Islands. Depth about 54 km	6.7	S.	155.0	E.
9	02	15	22.0	Kodiak Island, Alaska. Depth about 31 km. Mag. 5½–5¾ (Brk)	56.3	N.	153.9	W.
9	02	33	26.9	New Hebrides Islands. Depth about 252 km	18.8	S.	169.5	E.
9	03	58	55.4	Near coast of Peru. Depth about 39 km. Mag. 5 (Pal)	14.9	S.	75.7	W.
9	10	18	21.9	Near south coast of Java. Depth about 230 km	7.8	S.	108.1	E.
9	11	18	08.9	Near coast of southern Chile. Depth about 34 km. Mag. 6¾	43.7	S.	75.2	W.
9	16	35	53.2	South of Java. Depth about 35 km	8.9	S.	105.6	E.
9	19	17	35.1	Solomon Islands. Depth about 100 km	10.1	S.	161.2	E.
9	19	49	41.3	Fiji Islands region. Depth about 620 km	21.7	S.	179.9	E.
9	21	21	51.3	Kodiak Island, Alaska. Depth about 33 km	56.3	N.	153.5	W.
9	21	41	45.8	Tonga Islands region. Depth about 45 km	22.4	S.	177.3	W.
9	22	39	00.2	New Britain region. Depth about 123 km	6.0	S.	149.3	E.
10	04	58	35.9	Kodiak Island, Alaska. Depth about 33 km	56.4	N.	153.1	W.
10	08	39	03.6	Crete. Depth about 17 km	34.6	N.	26.0	E.
10	16	50	54.1	Samoa Islands region. Depth about 35 km	16.3	S.	172.6	W.
11	04	48	00.4	Central Mexico. Minor damage in Mexico City. Depth about 33 km	19.7	N.	99.1	W.
11	05	08	51.1	Kermadec Islands. Depth about 279 km	29.8	S.	179.1	W.
11	09	52	15.8	Burma. Depth about 83 km	23.3	N.	94.6	E.
11	15	06	50.4	Near coast of central Chile. Depth about 45 km	37.5	S.	72.8	W.
11	16	53	06.4	Near coast of southern Greece. Felt. Depth about 33 km	36.4	N.	23.6	E.
11	18	05	18.4	Kermadec Islands region. Depth about 33 km	27.1	S.	176.6	W.
11	22	10	49.4	New Hebrides Islands. Felt on Santo. Depth about 38 km	15.2	S.	166.7	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Dec. 12	03	55	10.2	Banda Sea. Depth about 65 km	4.3	S.	127.2	E.
12	11	18	24.0	Windward Islands region. Depth about 80 km	11.9	N.	60.2	W.
12	17	23	04.0	Mariana Islands region. Depth about 24 km	21.7	N.	146.0	E.
12	21	18	32.5	Near coast of Luzon, Philippine Islands. Depth about 120 km	13.9	N.	120.6	E.
12	22	14	38.7	Revilla Gegido Islands region. Depth about 33 km. Mag. 5¼ (Brk).	18.9	N.	107.7	W.
12	23	06	20.6	Near east coast of Hokkaido, Japan. Depth about 65 km	43.4	N.	146.2	E.
13	08	40	48.3	Ryukyu Islands. Depth about 55 km	26.6	N.	129.4	E.
13	11	23	28.6	Near coast of southern Chile. Depth about 50 km	50.9	S.	73.6	W.
13	16	49	50.4	New Hebrides Islands. Felt at Port Vila. Depth about 30 km	18.9	S.	168.4	E.
13	19	18	56.0	Chile-Argentina border. Depth about 125 km	32.0	S.	70.7	W.
13	19	59	13.4	Near north coast of Mindanao, Philippine Islands. Depth about 69 km.	9.9	N.	125.8	E.
14	01	40	24.3	Revilla Gegido Islands region. Depth about 33 km	21.2	N.	109.0	W.
14	04	40	17.0	Tonga Islands. Depth about 33 km	20.1	S.	173.6	W.
14	07	10	23.2	Near north coast of New Guinea. Depth about 44 km	3.1	S.	140.9	E.
14	12	14	38.9	Flores Sea. Depth about 62 km	7.8	S.	120.5	E.
14	18	48	55.5	Fiji Islands. Depth about 398 km	19.8	S.	177.7	W.
14	23	26	04.3	South of Fiji Islands. Depth about 488 km	26.2	S.	179.5	E.
15	12	36	32.0	New Britain region. Depth about 197 km	5.5	S.	147.2	E.
15	14	10	29.8	Near coast of Guatemala. Depth about 160 km	13.6	N.	92.8	W.
15	16	42	57.6	New Hebrides Islands. Depth about 39 km	13.9	S.	165.9	E.
15	19	36	02.7	Molucca Passage. Depth about 28 km	1.0	N.	126.0	E.
15	22	03	04.1	Crete. Felt. Depth about 33 km	34.3	N.	24.8	E.
16	01	37	17.1	Near north coast of Mindanao, Philippine Islands. Depth about 135 km.	9.8	N.	125.6	E.
16	09	16	56.1	South of Tonga Islands. Depth about 33 km	26.5	S.	177.0	W.
16	09	59	16.5	South of Tonga Islands. Depth about 50 km	23.9	S.	175.9	W.
16	13	40	26.3	Off east coast of Kamchatka. Depth about 62 km	51.9	N.	160.1	E.
16	20	35	29.0	Kermadec Islands. Depth about 295 km	28.4	S.	179.2	W.
17	00	51	47.3	Honduras. Depth about 33 km	15.7	N.	88.3	W.
17	21	32	03.1	Near coast of Peru. Depth about 84 km	14.4	S.	75.5	W.
17	22	05	21.6	Banda Sea. Depth about 33 km	4.8	S.	126.7	E.
17	22	12	32.3	South of Tasmania. Depth about 45 km	54.5	S.	143.9	E.
18	02	18	31.3	Near north coast of Luzon, Philippine Islands. Felt on Calayan. Depth about 32 km.	19.6	N.	120.8	E.
18	16	42	22.3	Northern Burma. Depth about 93 km	26.3	N.	96.3	E.
18	22	24	52.9	Tonga Islands. Depth about 33 km	20.9	S.	174.5	W.
19	13	02	43.5	New Hebrides Islands. Depth about 172 km	14.4	S.	168.1	E.
19	15	41	26.4	Off south coast of Mindanao, Philippine Islands. Depth about 123 km.	4.9	N.	127.4	E.
19	16	10	08.8	Celebes. Depth about 93 km	2.6	S.	122.2	E.
19	17	30	10.6	Near east coast of Formosa. Depth about 59 km	24.2	N.	122.4	E.
20	01	44	23.3	Near east coast of Borneo. Depth about 33 km	3.2	N.	118.5	E.
20	13	25	34.4	West-central Colombia. 23 killed, 100 injured and moderate property damage in Caldas Province. Felt at Balboa Heights, C.Z. Depth about 176 km. Mag. 6¾.	4.6	N.	75.6	W.
20	14	28	18.7	Banda Sea. Depth about 105 km	6.6	S.	129.8	E.
20	23	00	28.3	Near coast of Guatemala. Depth about 98 km	14.3	N.	90.8	W.
20	23	47	51.7	New Hebrides Islands. Depth about 33 km	15.9	S.	168.6	E.
21	00	44	28.1	Off coast of Mindanao, Philippine Islands. Depth about 33 km	6.7	N.	127.0	E.
21	07	10	45.1	Halmahera. Depth about 238 km	0.9	N.	127.6	E.
21	12	07	31.7	Sandwich Islands region. Depth about 33 km	55.1	S.	32.5	W.
21	13	30	40.3	Banda Sea. Depth about 165 km	7.2	S.	129.1	E.
21	23	36	55.1	Near north coast of New Guinea. Depth about 33 km	1.5	S.	138.1	E.
22	01	37	44.8	Banda Sea. Depth about 38 km	6.4	S.	128.9	E.
22	10	33	42.5	Western New Guinea. Depth about 38 km	2.8	S.	136.7	E.
22	11	26	46.5	Off coast of northern California. Depth about 33 km. Mag. 4.6 (Brk).	40.5	N.	126.3	W.
22	14	58	33.4	Kodiak Island, Alaska. Depth about 26 km	56.2	N.	154.3	W.
22	15	36	18.3	Nicaragua. Depth about 49 km	11.9	N.	85.5	W.
22	22	11	10.0	New Hebrides Islands. Depth about 95 km	14.7	S.	167.2	E.
22	22	46	24.6	Mariana Islands. Depth about 155 km	18.6	N.	145.6	E.
22	23	43	34.4	Luzon, Philippine Islands. Felt at Baguio. Depth about 33 km	16.4	N.	120.4	E.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Dec. 23	03	49	37.6	Solomon Islands. Depth about 90 km	10.1	S.	160.3	E.
23	06	53	36.5	Yellowstone National Park, Montana. Depth about 23 km	44.9	N.	111.2	W.
23	14	36	27.1	Colombia. Depth about 197 km	6.4	N.	73.4	W.
23	18	09	04.7	Hindu Kush. Depth about 183 km	36.3	N.	71.3	E.
23	19	11	53.3	Near coast of southern Honshu, Japan. Felt. Depth about 245 km.	34.3	N.	138.3	E.
23	21	18	12.5	Chile-Bolivia border. Depth about 215 km	19.9	S.	68.3	W.
24	02	04	18.8	Alaska. Felt at Manley Hot Springs. Depth about 33 km	65.9	N.	150.2	W.
24	02	40	07.6	New Guinea. Depth about 29 km	3.4	S.	140.3	E.
24	02	54	50.0	Mariana Islands. Depth about 85 km	15.1	N.	144.0	E.
24	03	50	45.6	Near north coast of New Guinea. Depth about 39 km	3.2	S.	140.1	E.
24	06	50	54.0	Near coast of northern Hokkaido, Japan. Depth about 125 km	43.3	N.	144.0	E.
24	07	13	27.5	Nepal. Depth about 33 km	29.5	N.	80.8	E.
24	09	19	02.7	Tonga Islands. Depth about 45 km	20.4	S.	173.6	W.
24	11	26	32.2	New Guinea. Depth about 95 km	4.7	S.	144.2	E.
24	14	25	30.6	Near coast of northern Peru. Depth about 33 km	5.7	S.	80.9	W.
24	16	23	02.4	New Guinea. Depth about 44 km	3.4	S.	140.1	E.
24	16	58	23.2	New Guinea. Depth about 33 km	3.2	S.	140.0	E.
24	17	15	44.4	Near coast of northern Peru. Depth about 33 km	5.8	S.	81.0	W.
24	20	28	09.0	Svalbard region. Depth about 33 km	74.6	N.	7.9	E.
24	23	43	19.2	Near coast of central Chile. Depth about 31 km. Mag. 6–6¼ (Pal)	38.3	S.	74.6	W.
25	00	01	55.0	New Guinea. Depth about 29 km	3.3	S.	140.3	E.
25	08	00	59.3	Ceram. Depth about 47 km	3.7	S.	127.7	E.
25	08	13	10.0	Halmahera. Depth about 33 km	0.8	S.	126.8	E.
25	08	57	31.9	South of Panama. Depth about 33 km	6.0	N.	82.6	W.
25	09	09	07.4	Ceram. Depth about 33 km	3.8	S.	127.6	E.
25	09	14	12.1	Ceram. Depth about 42 km	3.8	S.	127.5	E.
25	09	21	22.5	Ceram. Depth about 27 km	3.7	S.	127.3	E.
25	11	19	11.2	Bhutan. Depth about 33 km	27.1	N.	90.4	E.
25	12	20	02.8	Kansas-Missouri border. Felt. Depth about 25 km	39.1	N.	94.6	W.
25	12	58	21.4	Kansas-Missouri border. Felt. Depth about 20 km	39.1	N.	94.6	W.
25	13	55	38.8	Tonga Islands. Depth about 64 km	20.4	S.	173.7	W.
25	14	25	16.9	Kenai Peninsula, Alaska. Felt at Devils Club and Girdwood. Depth about 33 km.	60.9	N.	147.7	W.
25	15	49	06.9	Timor. Depth about 33 km	10.1	S.	125.1	E.
25	19	58	28.6	Hudson Bay, Canada. Depth about 33 km	63.9	N.	89.3	W.
25	21	47	50.0	Near coast of northern Hokkaido, Japan. Depth about 257 km	44.2	N.	142.9	E.
25	21	51	03.9	Sinkiang Province, China. Depth about 130 km	39.5	N.	76.9	E.
25	22	24	56.9	Off coast of Java. Depth about 97 km	9.0	S.	109.9	E.
26	04	24	57.3	Java Sea. Depth about 550 km	5.6	S.	110.7	E.
26	06	17	30.6	Prince Edward Islands region. Depth about 22 km	44.2	S.	38.1	E.
26	06	34	50.6	Java Sea. Depth about 549 km	5.6	S.	110.7	E.
27	02	16	02.3	Northern Chile. Depth about 120 km	22.5	S.	68.8	W.
27	02	25	58.3	Near north coast of New Guinea. Depth about 115 km	2.9	S.	141.2	E.
27	07	18	04.5	Fiji Islands. Depth about 616 km	18.7	S.	177.5	W.
27	09	38	13.2	Near coast of Oaxaca, Mexico. Depth about 117 km	15.9	N.	96.9	W.
27	11	51	10.3	Tonga Islands. Depth about 33 km	17.3	S.	173.5	W.
27	15	19	15.8	Near east coast of Kamchatka. Depth about 35 km	53.4	N.	160.3	E.
27	16	46	31.2	Atlantic Ocean, north of Ascension Island. Depth about 37 km	1.7	S.	12.9	W.

TABLE 2.—*Summary of instrumental epicenters for 1961*—Continued

1961	Origin time G.C.T.			Region, focal depth, and remarks	Coordinates of provisional epicenter			
					Latitude		Longitude	
	h	*m*	*s*		° ′		° ′	
Dec. 27	23	18	12.1	New Britain region. Depth about 33 km	6.0	S.	147.9	E.
27	23	48	01.7	Near coast of North Island, New Zealand. Felt at Wellington. Depth about 40 km. Mag. 6¾.	41.2	S.	175.8	E.
28	05	12	21.2	Alaska. Depth about 60 km	62.6	N.	155.0	W.
28	05	44	58.2	Near coast of southern Chile. Depth about 33 km	45.3	S.	74.8	W.
28	18	18	00.4	Fiji Islands. Depth about 592 km	17.7	S.	178.6	W.
28	23	55	55.5	Santa Cruz Islands. Depth about 81 km	12.4	S.	166.3	E.
29	08	00	08.9	Hokkaido, Japan. Depth about 43 km	42.6	N.	142.7	E.
29	10	00	37.2	Solomon Islands. Depth about 70 km	6.4	S.	154.4	E.
29	14	53	19.4	Near Mexico-Guatemala border. Depth about 45 km	14.3	N.	92.8	W.
29	15	34	38.2	Chile-Bolivia border. Depth about 127 km	21.5	S.	68.7	W.
29	21	34	38.3	Rat Islands, Aleutian Islands. Depth about 50 km	52.1	N.	177.9	E.
30	00	39	27.1	Rat Islands, Aleutian Islands. Depth about 56 km. Mag. 6¾	52.3	N.	177.6	E.
30	01	11	22.7	Rat Islands, Aleutian Islands. Depth about 50 km	52 3	N.	177.9	E.
30	03	43	11.6	Near north coast of New Guinea. Depth about 58 km	7.3	S.	148.0	E.
30	06	56	53.0	Off coast of Guatemala. Depth about 33 km	13.4	N.	92.3	W.
30	07	08	39.1	Sinkiang Province, China. Depth about 35 km	39.7	N.	77.7	E.
30	08	53	15.5	Rat Islands, Aleutian Islands. Depth about 50 km	52.1	N.	177.5	E.
30	08	59	31.7	Tonga Islands. Depth about 41 km	22.9	S.	175.2	W.
30	09	17	15.0	Rat Islands, Aleutian Islands. Depth about 50 km	51.8	N.	178.0	E.
30	10	14	39.2	----do----	52.1	N.	177.9	E.
30	11	40	12.1	Unalaska Island, Alaska. Depth about 59 km	54.0	N.	166.2	W.
30	15	31	41.7	New Hebrides Islands. Depth about 65 km	16.0	S.	170.0	E.
30	15	42	16.2	Off coast of Java. Depth about 76 km	7.9	S.	106.9	E.
30	16	41	54.7	Rat Islands, Aleutian Islands. Depth about 35 km	52.2	N.	177.7	E.
30	18	18	32.6	Near coast of Mindanao, Philippine Islands. Depth about 119 km	8.7	N.	126.3	E.
30	19	08	48.0	Rat Islands, Aleutian Islands. Depth about 50 km	52.1	N.	177.9	E.
30	23	20	16.9	North Atlantic Ocean. Depth about 32 km	16.5	N.	46.6	W.
31	02	19	16.5	Rat Islands, Aleutian Islands. Depth about 50 km	52.1	N.	177.8	E.
31	13	46	01.8	Halmahera. Depth about 140 km	1.6	N.	127.3	E.
31	15	54	49.3	Rat Islands, Aleutian Islands. Depth about 50 km	52.3	N.	177.8	E.
31	16	07	46.2	Off coast of Java. Depth about 46 km	8.1	S.	106.6	E.
31	16	35	58.7	Central South Dakota. Felt. Depth about 16 km	44.4	N.	100.5	W.
31	17	48	27.8	Fox Islands, Aleutian Islands. Depth about 47 km	51.8	N.	171.2	W.
31	18	04	30.3	Off coast of Jalisco, Mexico. Depth about 33 km	18.4	N.	106.1	W.

*Indicates probable error of 1/10 minute.

TABLE 3.—*Principal earthquakes of the world from January through December 1961*

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.

1961	Origin time G.C.T.	Region	Coordinates of provisional epicenter		Remarks
			Latitude	Longitude	
	h m s		° ′	° ′	
Jan. 5	15 53 56.0	New Guinea	4.1 S.	143.0 E.	Felt. Depth about 108 km. Mag. 6¾–7.
16	07 20 12.6	Near east coast of Honshu, Japan.	36.2 N.	141.7 E.	Felt in central and northeastern Honshu. Depth about 41 km. Mag. 7.
22	03 24 04.5	Santa Cruz Islands	12.0 S.	166.2 E.	Depth about 25 km. Mag. 7.
Feb. 1	18 39 02.7	Near west coast of Honshu, Japan.	37.6 N.	138.4 E.	5 killed, 7 injured, and extensive property damage at Nagaoka. Depth about 34 km.
12	21 53 43.5	Kurile Islands	43.9 N.	147.6 E.	Depth about 45 km. Mag. 7.
26	18 10 48.7	Near coast of Kyushu, Japan.	31.6 N.	131.2 E.	2 killed, 7 injured, and over 170 homes destroyed at Miyazaki. 3-foot tsunami observed in southwest Shikoku Island. Depth about 54 km. Mag. 7–7¼.
Mar. 7	10 10 38.9	Kermadec Islands region	28.3 S.	175.7 W.	Depth about 43 km. Mag. 7¼–7½.
16	13 45 35.6	Flores Sea	8.2 S.	122.0 E.	2 killed, 6 injured, and over 90% of the buildings damaged or destroyed at Endeh. Depth about 74 km Mag. 6½.
18	14 54 59.3	South of New Zealand	49.9 S.	163.3 E.	Depth about 38 km. Mag. 6¾–7.
28	09 35 55.4	Northern Celebes	0.2 N.	123.6 E.	Depth about 83 km. Mag. 6¾–7.
June 1	23 29 21.2	Ethiopia	10.4 N.	39.9 E.	5 killed, many injured, and village of Kara-Kore destroyed. Felt at Addis Ababa. Depth about 33 km. Mag. 6½.
11	05 10 26.3	Southern Iran	27.9 N.	54.6 E.	60 killed and many injured at Lar and villages of Dehkhouyeh and Khaneh totally destroyed. Depth about 37 km. Mag. 6½.
27	00 49 47*	Western Iran	33 31 N.	49 21 E.	5 killed, many injured, and village of Maqsoudabad destroyed. (Shiraz, Iran epicenter.)
July 23	21 51 07.5	New Hebrides Islands	18.5 N.	168.3 E.	4.9-foot tsunami caused slight damage at Port Vila and Forari. Depth about 44 km. Mag. 7–7¼.
Aug. 11	15 51 34.6	Eastern Hokkaido, Japan	43.0 N.	145.0 E.	Slight tsunami. Depth about 50 km. Mag. 7¼.
19	05 09 49.5	Peru-Brazil border	10.8 S.	71.0 W.	Felt at Arequipa, Peru. Depth about 649 km. Mag. 7.
19	05 33 30.6	Near west coast of Honshu, Japan.	36.2 N.	136.5 E.	10 killed, 34 injured, and moderate property damage at Fukui, Gifu, and Ishikawa. Depth about 17 km. Mag. 7¼.
28	07 41 26.7	Santa Cruz Islands	12.7 S.	169.6 E.	Depth about 640 km.
31	01 48 37.5	Peru-Brazil border	10.7 S.	70.9 W.	Depth about 626 km. Mag. 7–7¼.
31	01 57 08.0	----do----	10.5 S.	70.7 W.	Felt at Arequipa, Peru. Depth about 629 km. Mag. 7½.
Sept. 1	00 09 34.6	Sandwich Islands region	59.5 S.	27.3 W.	Depth about 131 km. Mag. 7½.
8	11 26 32.9	----do----	56.3 S.	27.1 W.	Depth about 125 km. Mag. 7½–7¾.
Oct. 14	07 00 39.4	Western Iran	33.6 N.	48.1 E.	2 killed, many injured, and heavy property damage at Aliabad-Magh and Malayer. Depth about 33 km.
Dec. 20	13 25 34.4	West-central Colombia	4.6 N.	75.6 W.	23 killed, 100 injured, and moderate crop and property damage in Caldas Province. Felt at Balboa Heights, C.Z. Depth about 176 km. Mag. 6¾.

*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, D.C., 20230.

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, D.C., 20230.

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, 1961*

NORTHERN CALIFORNIA

Station	Accelerograph	Displacement meter	Weed
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
Pleasant Hill, Diablo Valley College	1	1	
Sacramento, Federal Building			1
San Francisco, Alexander Building, basement	1	1	
San Francisco, Alexander Building, 11th floor	1		
San Francisco, Alexander Building, 16th floor	1		
San Francisco, Bethlehem Pacific Building, basement	1	1	
San Francisco, Bethlehem Pacific Building, 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 Building, subbasement			1
San Francisco, Shell Building, 21st floor			1
San Francisco, Shell Building, 29th floor			1
San Francisco, Southern Pacific Building, basement	1	1	
San Francisco, Southern Pacific Building, 14th floor	1		
San Francisco, State Building, basement	1	2	
San Jose, Bank of America, basement	1	1	
San Jose, Bank of America, 13th floor	1		
San Pablo, Contra Costa Junior College	1	1	
Suisun Bay Bridge	1		

TABLE 4.—*Coast and Geodetic Survey strong-motion stations in operation as of Dec. 31, 1961*—Continued

SOUTHERN CALIFORNIA

Station	Accelero-graph	Displace-ment meter	Weed
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 Building, basement	1		
Los Angeles, Occidental Life Building, basement	1		
Los Angeles, Occidental Life Building, 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	1	
Santa Barbara	1		
Taft	1		
Westwood, University of California, Los Angeles	1	1	
OUTSIDE CALIFORNIA			
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, Ariz	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 University	1		
Olympia, Wash., Highway Test Laboratory	1		
Portland, Oreg., State Office Building	1		
Ross Dam, Wash., Block 16	1		
Ross Dam, Wash., Right Bank	1		
Seattle, Wash., Federal Office Building	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	68	31	10

TABLE 5.—*List of shocks recorded and records obtained on strong-motion seismographs in 1961*

Date	Region and Recording Station	Records			
		Accelero-graph	Survey displace-ment meter	Carder displace-ment meter	Weed
Jan. 28	Southern California, Bakersfield	1	1		
Feb. 1	Central California, Bishop	1			
Feb. 1	do	1			
Apr. 4	Southern California, Long Beach	1			
Apr. 5	Northern California, Eureka	1			
Apr. 8	Central California, Hollister	1		1	
	Oakland, City Hall	2		1	
	San Francisco, Alexander Building	3		1	
	San Francisco, Bethlehem Pacific Building	2		2	
	San Francisco, Southern Pacific Building	2		1	
	San Jose, Bank of America	2		1	
Apr. 8	Central California, Hollister	1		1	
	Oakland, City Hall	2		1	
	San Francisco, Alexander Building	3		1	
	San Francisco, Bethlehem Pacific Building	2		2	
	San Francisco, Southern Pacific Building	2		1	
	San Jose, Bank of America	2		1	
Sept. 12	Imperial Valley, El Centro	1	1	1	
Oct. 18	Southern California, Bakersfield	1	1		
Oct. 20	Southern California, Los Angeles, Occidental Life Building	1			
	Santa Ana	1		1	
Oct. 20	Southern California, Los Angeles, Occidental Life Building	1			
	Los Angeles, Subway Terminal Building	1			
	Los Angeles, Vernon, C.M.D	1			
	Santa Ana	1		1	
	Westwood, University of California, Los Angeles	1		1	
Oct. 20	Southern California, Santa Ana	1		1	
Oct. 20	do	1		1	
Oct. 20	do	1		1	
Nov. 6	Oregon, Portland, State Office Building	1			
Nov. 9	Northern California, Ferndale	1	1		
Nov. 14	Southern California, Bakersfield	1	1		
	Cachuma Dam, Crest	1		1	
	Cachuma Dam, Valve House	1		1	
	Taft	1			
Nov. 20	Southern California, Los Angeles, Subway Terminal Building	2	1		
	Santa Ana	1		1	
	Total	50	6	24	0

TABLE 6.—*Summary of outstanding instrumental and noninstrumental data for 1961*

Epicenter	Recording Station and Distance	Location of Instrument	Intensity [1]	Acceleration	Displacement [2]
		CENTRAL CALIFORNIA EARTHQUAKE OF FEBRUARY 1, 16:04			
				cm/sec.²	*cm.*
37°27′N., 118°30′W., northwest of Bishop, Calif., V*. Mag. 5.0.	Bishop, 48 miles	1st floor	V	38	0.02
		CENTRAL CALIFORNIA AFTERSHOCK OF FEBRUARY 1, 16:08			
Bishop aftershock, V*. Mag. 5.2.	Bishop, 48 miles	1st floor	V	35	0.01
		SOUTHERN CALIFORNIA EARTHQUAKE OF APRIL 4			
Terminal Island, Long Beach harbor, IV*.	Long Beach	1st floor	IV	25	0.03
		CENTRAL CALIFORNIA EARTHQUAKE OF APRIL 8, 23:23			
36°41′N., 121°18′W., south of Hollister, Calif., VII*. Mag. 5.6.	Hollister, 13 miles	1st floor	VII	157	1.73
		CENTRAL CALIFORNIA AFTERSHOCK OF APRIL 8, 23:25			
Hollister aftershock, VII*. Mag. 5.5.	Hollister, 13 miles	1st floor	VII	83	1.47
		SOUTHERN CALIFORNIA EARTHQUAKE OF OCTOBER 20			
33°39′N., 118°00′W., near Huntington Beach, Calif., VI*. Mag. 4.3.	Santa Ana, 7 miles	1st floor	VI	34	0.09
		NORTHERN CALIFORNIA EARTHQUAKE OF NOVEMBER 9			
40°26′N., 123°59′W., southeast of Ferndale, Calif., V*. Mag. 3.8.	Ferndale, 17 miles	1st floor	V	42	0.06

[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 displacement 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 1961*

Station and component	Instrument No.	T_0	V	Sensitivity	ϵ	Acceleration		Displacement		Remarks
						Period	Amplitude	Period	Amplitude*	
CENTRAL CALIFORNIA EARTHQUAKE OF FEBRUARY 1, 16:04										
Bishop:		*sec.*		*cm./g*		*sec.*	*cm./sec.²*	*sec.*	*cm.*	
Vertical	241	0.0657	119	12.8	11	0.11	12		0.004	
East	242	.0653	116	12.3	12	.11	26		.008	
South	243	.0647	119	12.4	16	.14	38		.02	
CENTRAL CALIFORNIA AFTERSHOCK OF FEBRUARY 1, 16:08										
Bishop:										
Vertical	241	0.0657	119	12.8	11	0.12	7		0.003	
East	242	.0653	116	12.3	12	.11	31		.009	
Sonth	243	.0647	119	12.4	16	.11	35		.01	
SOUTHERN CALIFORNIA EARTHQUAKE OF APRIL 4										
Long Beach:										
Vertical	1004	0.0681	122	14.0	9	0.07	7		0.001	
S. 69° W	1005	.0675	120	13.6	10	.20	25		.03	Impulsive wave group.
N. 21° W	1006	.0670	116	12.9	11	.10	25		.006	Do.
CENTRAL CALIFORNIA EARTHQUAKE OF APRIL 8, 23:23										
Hollister:										
Vertical	238	0.0671	123	13.7	10	0.17	31			
S. 1° W	239	.0660	124	13.4	9	.20	59			
N. 89° W	240	.0659	122	13.2	9	.31	157			
N. 1° E	CDM-6	2.11	1.0		10			0.96	1.08	
N. 89° W	CDM-5	2.21	1.0		9			1.29	1.73	
CENTRAL CALIFORNIA AFTERSHOCK OF APRIL 8, 23:25										
Hollister:										
Vertical	238	0.0671	123	13.7	10	0.25	48			
S. 1° W	239	.0660	124	13.4	9	.29	66			
N. 89° W	240	.0659	122	13.2	9	.31	83			
N. 1° E	CDM-6	2.11	1.0		10			0.80	0.68	
N. 89° W	CDM-5	2.21	1.0		9			1.05	1.47	
SOUTHERN CALIFORNIA EARTHQUAKE OF OCTOBER 20										
Santa Ana:										
Vertical	1022	0.0641	113	11.5	9	0.12	16			
S. 4° E	1023	.0636	117	11.8	9	.26	31			
S. 86° W	1024	.0642	114	11.7	9	.18	34			
S. 4° E	CDM-B	4.80	.96		9			1.60	0.07	
N. 86° E	CDM-B	4.98	.94		8			1.70	.09	
NORTHERN CALIFORNIA EARTHQUAKE OF NOVEMBER 9										
Ferndale:										
Vertical	247	0.0661	124	13.4	11	0.20	19			
S. 44° W	248	.0663	125	13.6	9	.13	27			
N. 46° W	249	.0646	123	12.8	10	.16	42			
S. 44° W	SDM-13	9.73	1.0		10			0.24	0.06	
S. 46° E	SDM-13	9.90	1.0		10			.23	.05	

*Estimated from acceleration if no entry in displacement column

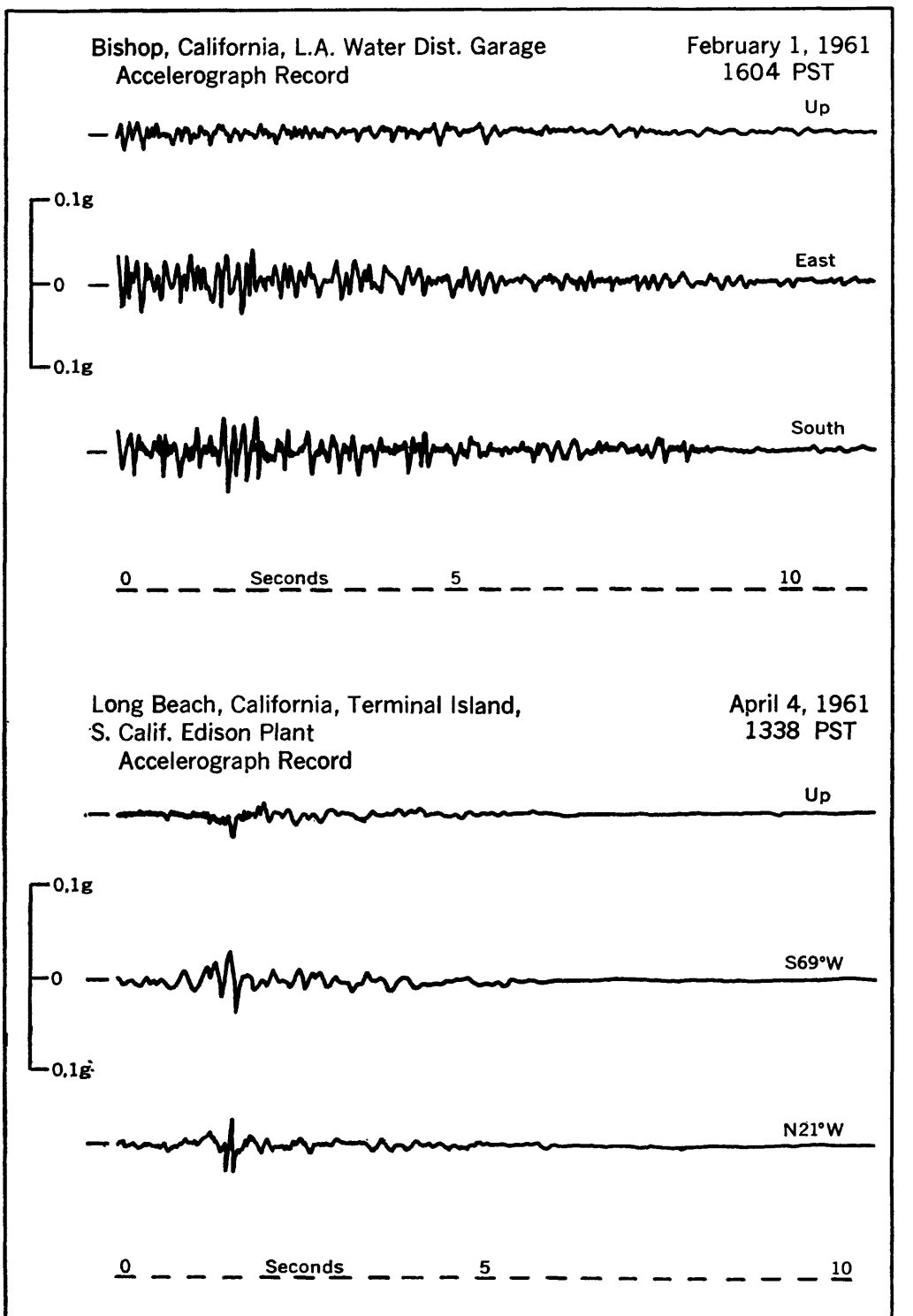

FIGURE 7.—*Tracings of accelerograph records obtained at Bishop on February 1, and at Long Beach on April 4.*

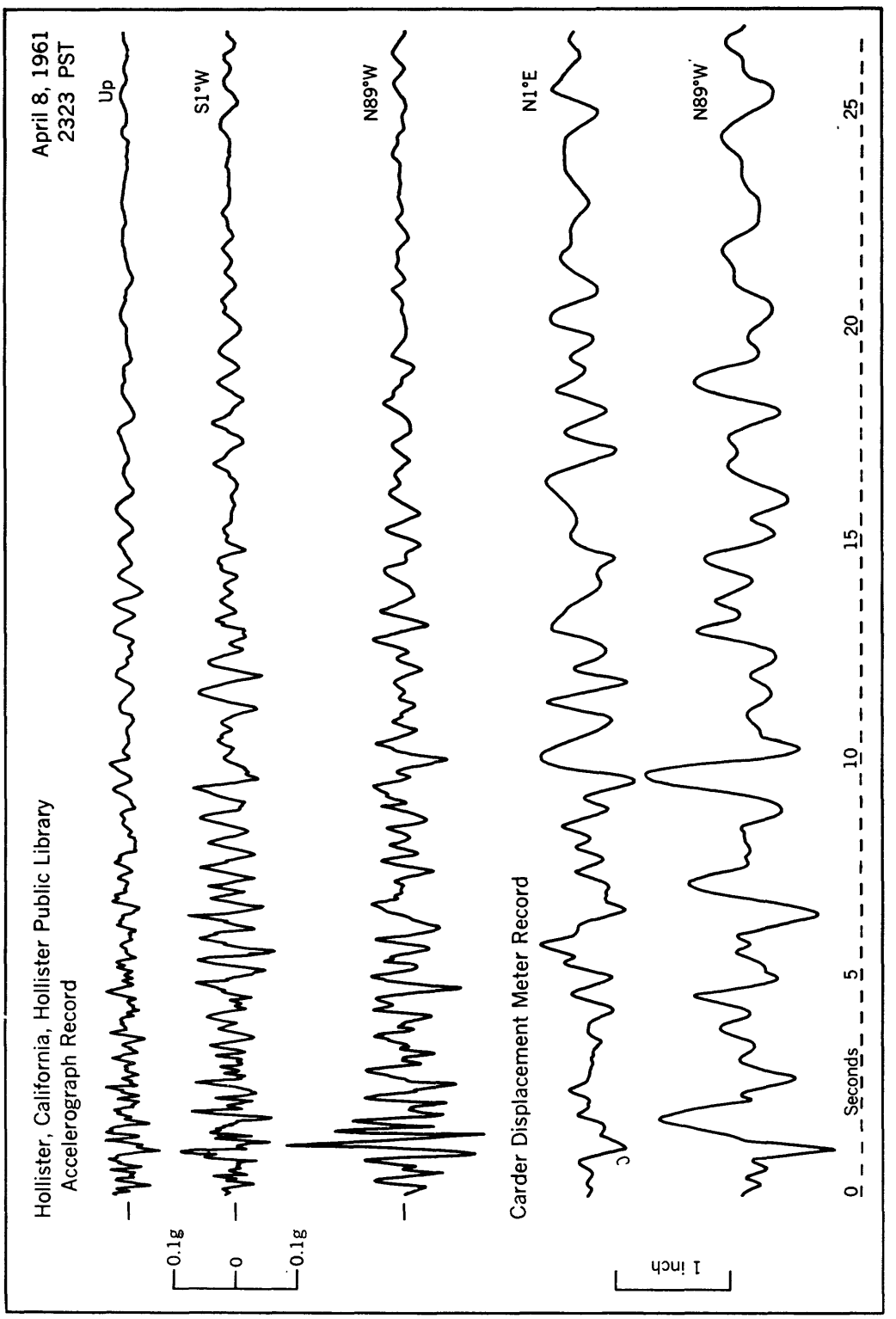

FIGURE 8.—*Tracings of accelerograph and Carder Displacement Meter records obtained at Hollister on April 8 at 23:23 PST.*

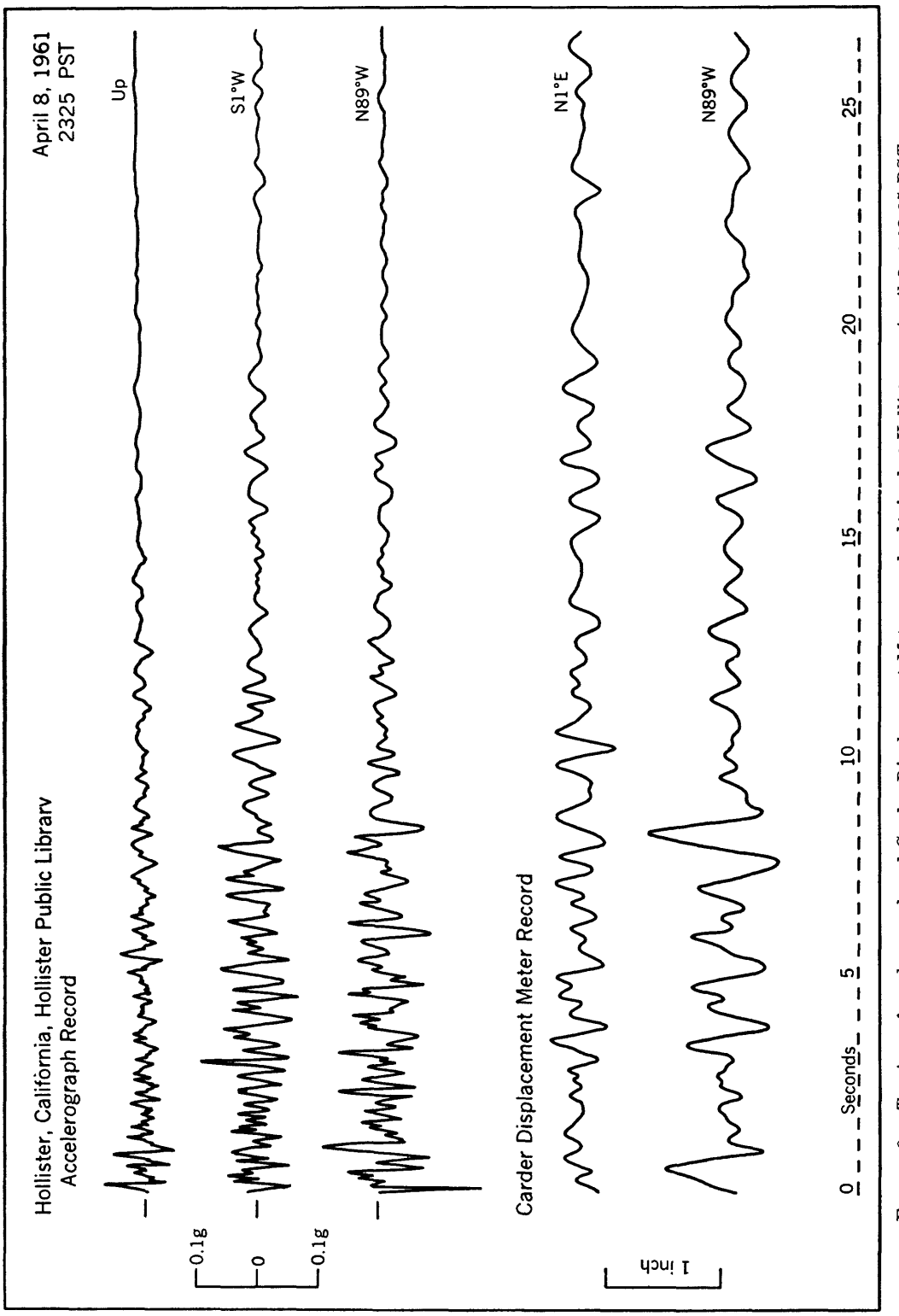

FIGURE 9.—*Tracings of accelerograph and Carder Displacement Meter records obtained at Hollister on April 8 at 23:25 PST.*

TILT OBSERVATIONS

Three Merritt tiltmeter stations, Table Mountain, Santiago Peak, and University of California (library), continued in routine operation.

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