DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

United States Earthquakes, 1978

By

Carl A. Stover
and
Carl A. von Hake

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Contributors

Contributors to this publication are listed below according to the type of data supplied or service performed:

Hypocenters and magnitudes:

John S. Derr, U.S. Geological Survey
W. LeRoy Irby, U.S. Geological Survey
R. Kangas, U.S. Geological Survey
John H. Minsch, U.S. Geological Survey
Russ Needham, U.S. Geological Survey
Waverly J. Person, U.S. Geological Survey
Bruce W. Presgrave, U.S. Geological Survey
Hawaiian Volcano Observatory, U.S. Geological Survey

Intensities:

Carl W. Stover, U.S. Geological Survey

Network Operations (by institution):

University of Alaska
University of California, Berkeley
California Institute of Technology
Kansas Geological Survey
University of Oklahoma
Oklahoma Geological Survey
St. Louis University
U.S. Geological Survey
Virginia Polytechnic Institute and State University

Geodesy:

Sandford R. Holdahl, NOAA, NOS, National Geodetic Survey
Richard A. Snay, NOAA, NOS, National Geodetic Survey
William E. Strange, NOAA, NOS, National Geodetic Survey

Tsunamis:

Mark G. Spaeth, NOAA, National Weather Service

Strong-motion seismograph data:

Ronald L. Porcella, U.S. Geological Survey

Editorial assistance and manuscript preparations:

Paula K. Smith, U.S. Geological Survey

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United States Earthquakes, 1978

Carl W. Stover, U.S. Geological Survey
Carl A. von Hake, NOAA, Environmental Data and Information Service

Introduction

This publication describes all earthquakes that were reported felt in the United States and nearby territories in 1978. It has been compiled by the U.S. Geological Survey (USGS) and published jointly with NOAA, Environmental Data and Information Service (EDIS). Its purpose is to provide a continuous history of U.S. earthquakes for studying seismic risk, evaluating nuclear powerplant sites, designing earthquake-resistive structures, and answering inquiries from the scientific and general public.

The publication is composed of four major chapters: "Earthquake Descriptions," which includes a summary of macroseismic data reported for each earthquake and a chronological list of earthquakes by State (table 1); "Network Operations," which summarizes the results from local seismic networks; "Miscellaneous Activities," which contains information on crustal movement studies, tsunamis, and principal earthquakes of the world (table 7), and "Strong-Motion Seismograph Data" (table 8). The intensity and macroseismic data in "Earthquake Descriptions" are compiled from questionnaire canvasses (see next paragraph), newspaper articles, and reports prepared by other government organizations, State institutions, local organizations, and individuals. Each description includes date, origin time, hypocenter, and hypocenter source of the earthquake, maximum intensity (Modified Mercalli), and macroseismic effects reported in the area.

The USGS collects macroseismic intensity information primarily by mailing questionnaires, "Earthquake Report" forms, to postmasters in the earthquake area. Postmasters complete the forms and return them to the USGS, where they are evaluated and intensities are assigned. For damaging earthquakes, the questionnaires are supplemented by USGS field investigations. The USGS publishes preliminary intensity data in its quarterly Earthquakes in the United States. The final information is published in the United States Earthquakes series, issued annually since 1928.

DISCUSSION OF TABLES

The earthquake values in tables 1 and 7 include date, origin time, hypocenter (epicenter and focal depth), and magnitude. Table 1 also contains the Modified Mercalli (MM) intensity. The origin time and date are listed in Universal Coordinated Time (UTC). The epicenters were taken principally from the USGS Preliminary Determination of Epicenters, Monthly Listings[1] or Earthquakes in the United States[2]. The accuracy of the epicenters is that claimed by the institution supplying the hypocenter and is not necessarily the accuracy indicated by the number of decimals listed. The epicenters located by the USGS have a varying degree of accuracy, usually two-tenths of a degree or less, depending on their continental or oceanic location. The oceanic hypocenters are less accurate than those on the continent, even though both are listed to two decimals. Depths are listed to the nearest whole kilometer.

Magnitude values listed in the tables were furnished by cooperating institutions or determined by the USGS. The computational sources are labeled according to the assigned letter codes shown in headnotes to the tables.

EPICENTER MAPS

Figures 1-3 are computer plots of all earthquake epicenters in the conterminous United States, Alaska, and Hawaii listed in table 1. Each earthquake is indicated by a small circle.

Figures 4-6 are computer plots of 1978 earthquakes in the conterminous United States, Alaska, and Hawaii by Modified Mercalli (MM) intensity. Maximum intensities are represented by Arabic numerals at the location that each occurred. Earthquakes of intensity I-IV are represented by dots.

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[1]For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

[2]Copies of these reports are available free on application to Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, Va. 22202.

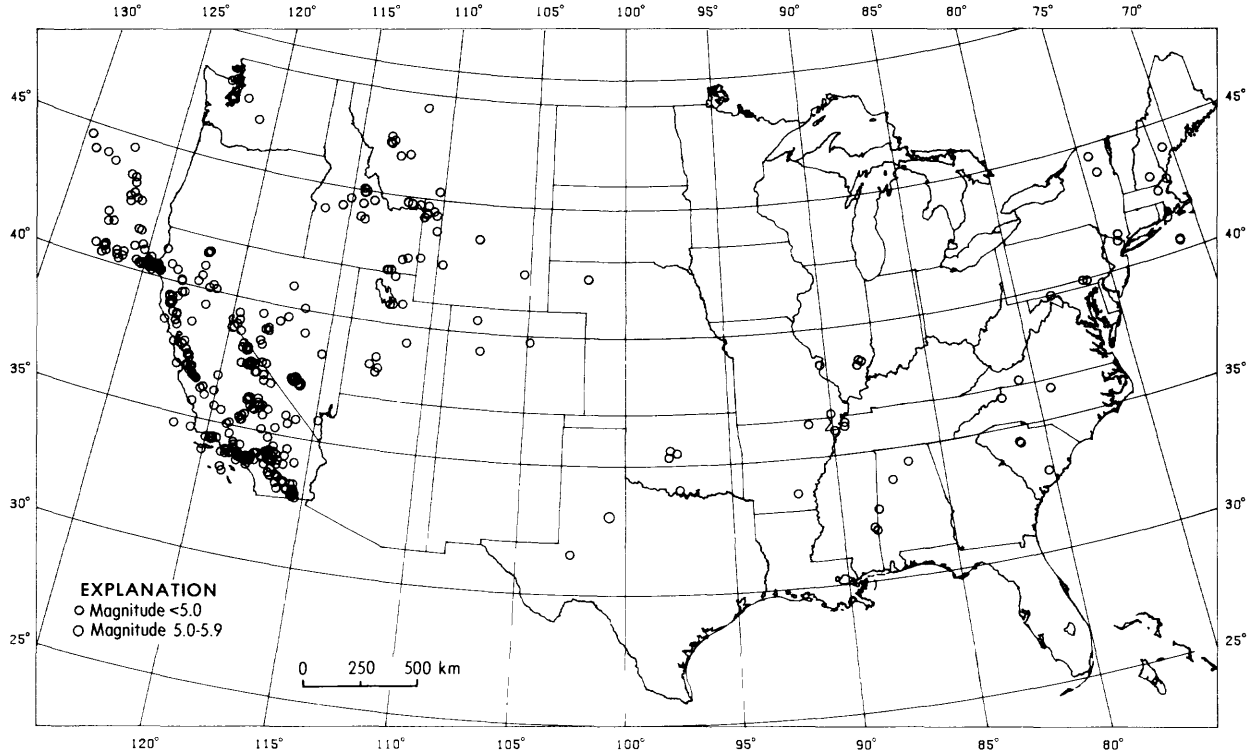

FIGURE 1.--Summary of earthquake epicenters in the conterminous United States for 1978.

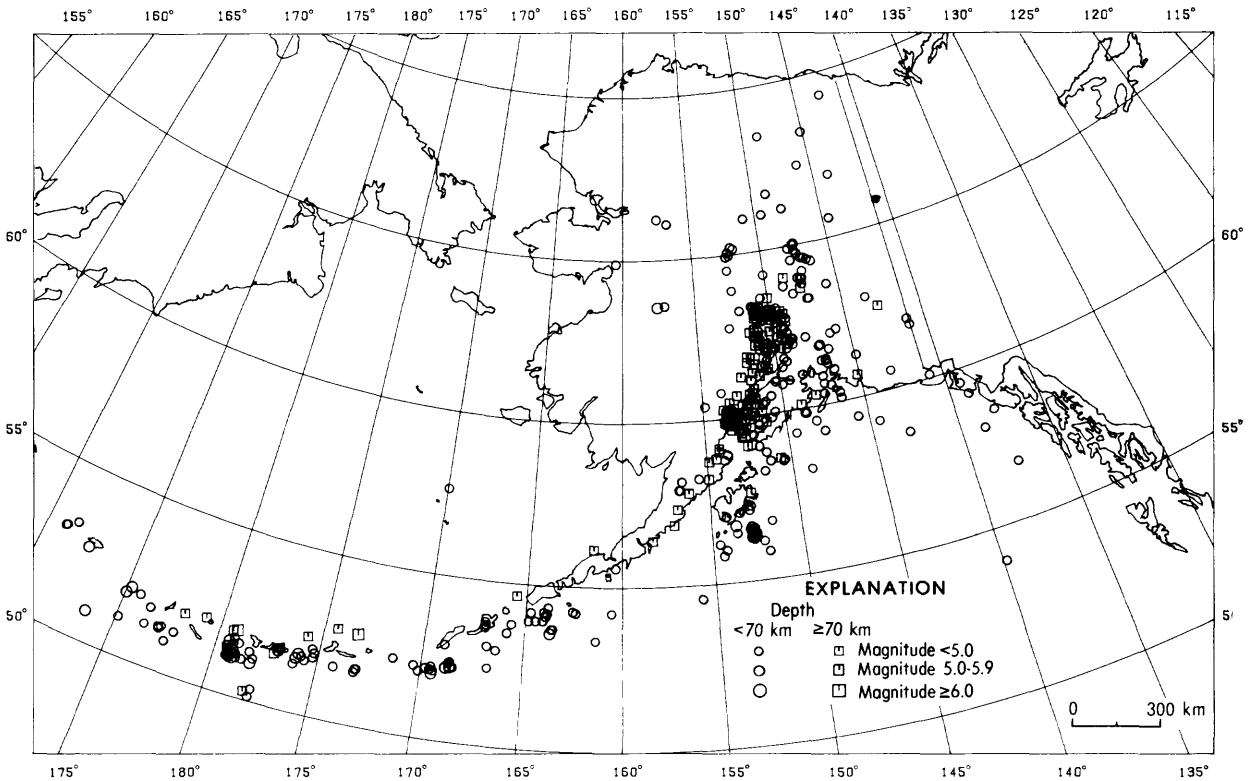

FIGURE 2.--Summary of earthquake epicenters in Alaska for 1978.

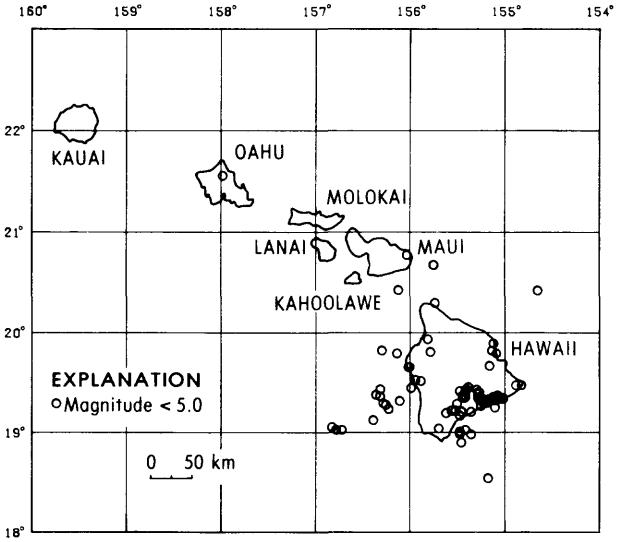

FIGURE 3.--Summary of earthquake epicenters in Hawaii for 1978.

The selection of intensity or isoseismal maps shown in the Earthquake Descriptions is governed largely by the size of the area affected. This means that sharp, localized shocks of intensity VI (which occur mostly in California) may not be represented by these maps, whereas other earthquakes of intensity V and VI (which occur largely in the Eastern and Central States) often will be illustrated because of the larger felt areas. Numerals on these computer-plotted maps represent the maximum MM intensities at each town. Isoseismal contours are a generalization of intensity data and are extrapolated to regions that have no observations. The contours do not include each intensity observation.

EARTHQUAKE INFORMATION SERVICES

The USGS coordinates the collection of all types of earthquake information, with the special objective of correlating instrumentally determined earthquake locations with noninstrumental locations indicated by intensity data. This correlation is achieved through intensive regional investigations of earthquakes by local organizations and the USGS. Primary data are gathered by a canvass of the epicentral area using questionnaire cards. When returned and analyzed, this information is used to map the seismic areas of the country in order to promote public safety through a better understanding of earthquake phenomena.

The National Geophysical and Solar-Terrestrial Data Center (NGSDC), one of the five major facilities of NOAA's Environmental Data and Information Service, is responsible for data activities in seismology. Its services include preparing local and regional seismic histories for engineers, actuaries, and other scientists and answering direct inquiries from the public on all aspects of historical earthquakes. Additional services and products include publishing annual earthquake summaries and revised historical earthquake reports; and making available copies of seismograms, accelerograms, displacement meter records, digitized strong-motion seismograms, and epicenter lists in several formats. Many of these products and services are based on seismic records or other data that have originated with USGS recording networks or with USGS data-reduction facilities. Information concerning services and products of NGSDC may be obtained from the National Geophysical and Solar-Terrestrial Data Center, NOAA/EDIS, Boulder, CO 80303.

MAGNITUDE AND INTENSITY RATINGS

Magnitude, a measure of the "size" of an earthquake, is roughly related to the energy release at the focus of an earthquake. Although the magnitude scale has neither "top" nor "bottom" values the highest ever recorded was magnitude 8.9 and the lowest about -3. On this logarithmic scale, a magnitude 6 shallow-focus earthquake represents elastic-wave energy about 30 times greater than that generated by a magnitude 5 earthquake, 900 times greater than that of a magnitude 4 shock, and so forth. Many factors enter into the determination of earthquake magnitude, including earthquake focal depth, frequency content of the sampled energy, and the earthquake radiation pattern. Magnitude values calculated by the USGS are based on the following formulas:

$$MS = \log (A/T) + 1.66 \log D + 3.3, \quad (1)$$

as adopted by the International Association of Seismology and Physics of the Earth's Interior (IASPEI; Bath, 1966, p. 153), where A is the maximum vertical surface-wave ground amplitude, in micrometers; T is the period, in seconds, and $18 \leq T \leq 22$; and D is the distance in geocentric degrees (station to epicenter), and $20° \leq D \leq 160°$. No depth correction is made for depth less than 50 km, and no MS magnitudes are computed for depths greater than 50 km.

$$mb = \log (A/T) + Q(D,h), \quad (2)$$

as defined by Gutenberg and Richter (1956), except that T, the period in seconds, is restricted to $0.1 \leq T \leq 3.0$, and A, the ground amplitude in micrometers, is not necessarily the maximum of the P-wave group. Q is a function of distance D and depth h, where $D \geq 5°$.

$$ML = \log A - \log A_o, \quad (3)$$

as defined by Richter (1958, p. 340),

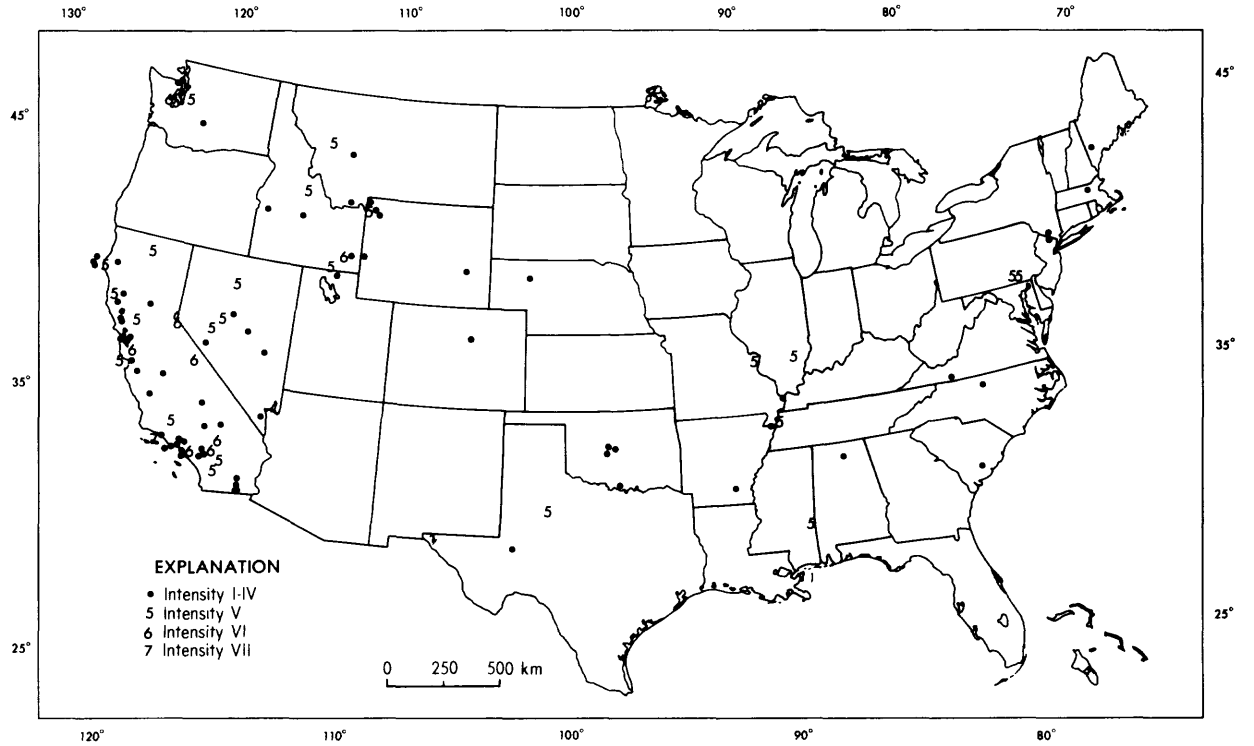

Figure 4.--Earthquakes plotted by Modified Mercalli Intensity in the conterminous United States for 1978.

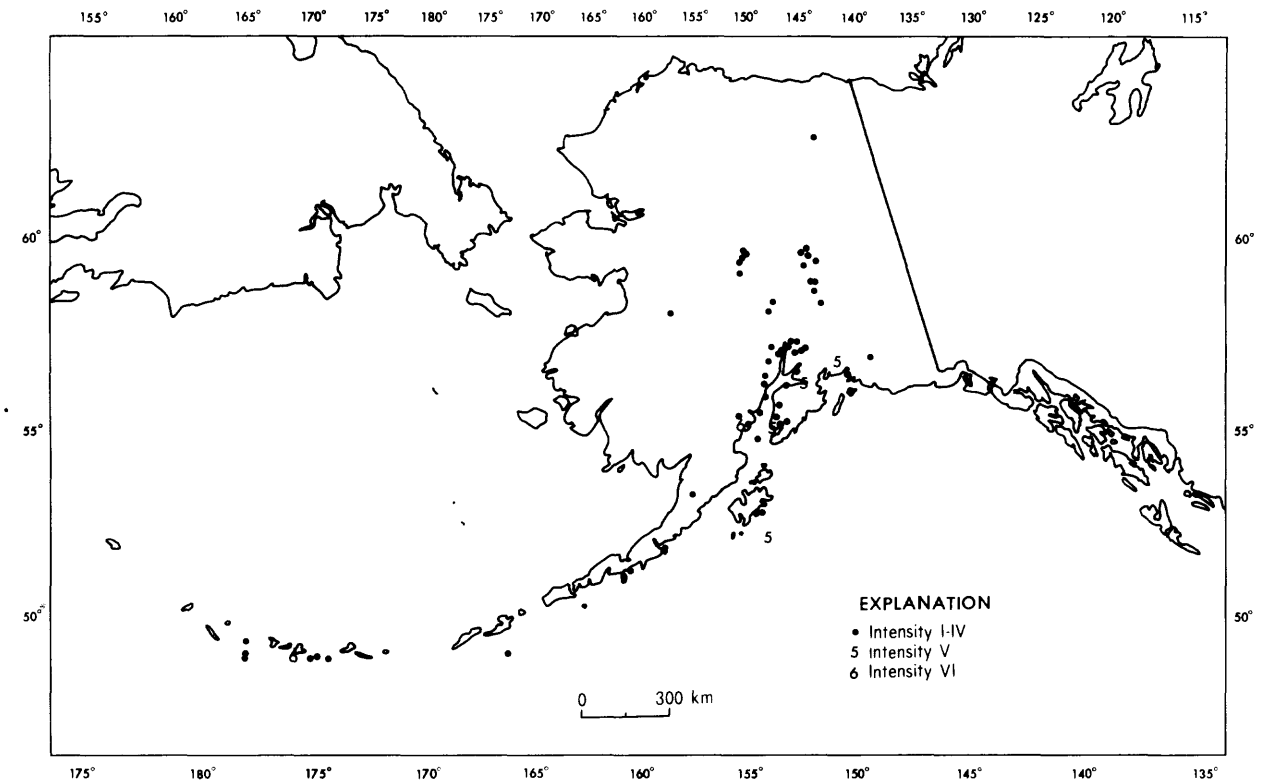

Figure 5.--Earthquakes plotted by Modified Mercalli Intensity in Alaska for 1978.

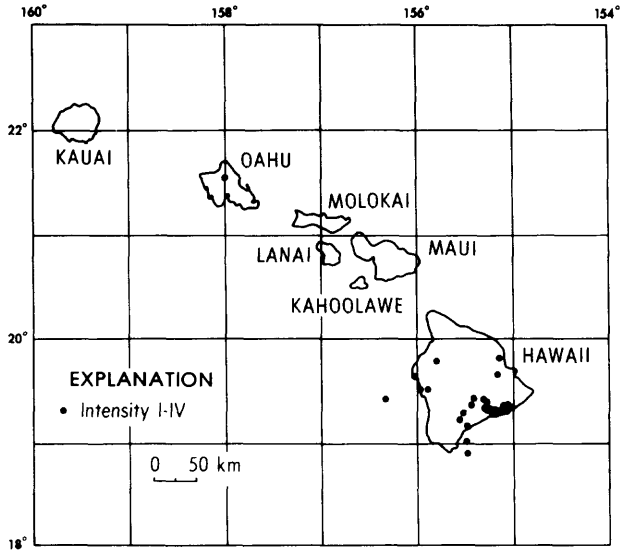

Figure 6.--Earthquakes plotted by Modified Mercalli Intensity in Hawaii for 1978.

where A is the maximum trace amplitude in millimeters, written by a Wood-Anderson torsion seismometer, and log A_o is a standard value as a function of distance, where the distance is $\leq$600 km. ML values are also calculated from other seismometers by conversion of recorded ground motion to the expected response of the torsion seismometer:

$$mbLg = 3.75 + 0.90(\log D) + \log (A/T) \quad 0.5° \leq D \leq 4°, \qquad (4)$$

$$mbLg = 3.30 + 1.66(\log D) + \log(A/T) \quad 4° \leq D \leq 30°,$$

as proposed by Nuttli (1973), where A/T is expressed in micrometers per second, calculated from the vertical-component 1-second Lg waves, and D is the distance in geocentric degrees.

Intensity, as applied to earthquakes, represents a quantity determined from the effects on people, manmade objects, and the Earth's surface (landslides, ground fissures). Intensities are assigned according to the descriptions listed in the Modified Mercalli Intensity Scale of 1931 (Wood and Neumann, 1931). There are 12 discrete steps in the MM scale (see next section). An earthquake in a populated area will have different intensities at different localities, owing to the distance from the epicenter of the earthquake, local geological conditions, structural design of buildings, and the earthquake magnitude.

The text of this publication gives the intensity for each city where the earthquake was felt and summaries of the strongest effects reported. Each earthquake is further characterized by its maximum intensity, which is given in the text and in table 1.

Although the Modified Mercalli Intensity Scale is in many instances inadequate for present-day requirements, the scale has been the guide used by the USGS and NOAA and will continue to be so used until a new scale has been devised and has acceptance in the engineering and seismological communities. Questions concerning the interpretation of historical earthquake intensities should be referred to the USGS.

MODIFIED MERCALLI INTENSITY SCALE OF 1931

Adapted from Sieberg's Mercalli-Cancani scale, modified and condensed.

I. Not felt - or, except rarely under especially favorable circumstances. Under certain conditions, at and outside the boundary of the area in which a great shock is felt: sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced; sometimes trees, structures, liquids, bodies of water, may sway--doors may swing, very slowly.

II. Felt indoors by few, especially on upper floors, or by sensitive, or nervous persons. Also, as in grade I, but often more noticeably: sometimes hanging objects may swing, especially when delicately suspended; sometimes trees, structures, liquids, bodies of water, may sway, doors may swing, very slowly; sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced.

III. Felt indoors by several, motion usually rapid vibration. Sometimes not recognized to be an earthquake at first. Duration estimated in some cases. Vibration like that due to passing of light, or lightly loaded trucks, or heavy trucks some distance away. Hanging objects may swing slightly. Movements may be appreciable on upper levels of tall structures. Rocked standing motor cars slightly.

IV. Felt indoors by many, outdoors by few. Awakened few, especially light sleepers. Frightened no one, unless apprehensive from previous experience. Vibration like that due to passing of heavy or heavily loaded trucks. Sensation like heavy body striking building or falling of heavy

objects inside. Rattling of dishes, windows, doors; glassware and crockery clink and clash. Creaking of walls, frame, especially in the upper range of this grade. Hanging objects swung, in numerous instances. Disturbed liquids in open vessels slightly. Rocked standing motor cars noticeably.

V. Felt indoors by practically all, outdoors by many or most: outdoors direction estimated. Awakened many, or most. Frightened few--slight excitement, a few ran outdoors. Buildings trembled throughout. Broke dishes, glassware, to some extent. Cracked windows--in some cases, but not generally. Overturned vases, small or unstable objects, in many instances, with occasional fall. Hanging objects, doors, swing generally or considerably. Knocked pictures against walls, or swung them out of place. Opened, or closed, doors, shutters, abruptly. Pendulum clocks stopped, started or ran fast, or slow. Moved small objects, furnishings, the latter to slight extent. Spilled liquids in small amounts from well-filled open containers. Trees, bushes, shaken slightly.

VI. Felt by all, indoors and outdoors. Frightened many, excitement general, some alarm, many ran outdoors. Awakened all. Persons made to move unsteadily. Trees, bushes, shaken slightly to moderately. Liquid set in strong motion. Small bells rang--church, chapel, school, etc. Damage slight in poorly built buildings. Fall of plaster in small amount. Cracked plaster somewhat, especially fine cracks chimneys in some instances. Broke dishes, glassware, in considerable quantity, also some windows. Fall of knick-knacks, books, pictures. Overturned furniture in many instances. Moved furnishings of moderately heavy kind.

VII. Frightened all--general alarm, all ran outdoors. Some, or many, found it difficult to stand. Noticed by persons driving motor cars. Trees and bushes shaken moderately to strongly. Waves on ponds, lakes, and running water. Water turbid from mud stirred up. Incaving to some extent of sand or gravel stream banks. Rang large church bells, etc. Suspended objects made to quiver. Damage negligible in buildings of good design and construction, slight to moderate in well-built ordinary buildings, considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Cracked chimneys to considerable extent, walls to some extent. Fall of plaster in considerable to large amount, also some stucco. Broke numerous windows, furniture to some extent. Shook down loosened brickwork and tiles. Broke weak chimneys at the roof-line (sometimes damaging roofs). Fall of cornices from towers and high buildings. Dislodged bricks and stones. Overturned heavy furniture, with damage from breaking. Damage considerable to concrete irrigation ditches.

VIII. Fright general--alarm approaches panic. Disturbed persons driving motor cars. Trees shaken strongly--branches, trunks, broken off, especially palm trees. Ejected sand and mud in small amounts. Changes: temporary, permanent; in flow of springs and wells; dry wells renewed flow; in temperature of spring and well waters. Damage slight in structures (brick) built especially to withstand earthquakes. Considerable in ordinary substantial buildings, partial collapse: racked, tumbled down, wooden houses in some cases; threw out panel walls in frame structures, broke off decayed piling. Fall of walls. Cracked, broke, solid stone walls seriously. Wet ground to some extent, also ground on steep slopes. Twisting, fall, of chimneys, columns, monuments, also factory stacks, towers. Moved conspicuously, overturned, very heavy furniture.

IX. Panic general. Cracked ground conspicuously. Damage considerable in (masonry) structures built especially to withstand earthquakes: Threw out of plumb some wood-frame houses built especially to withstand earthquakes; great in substantial (masonry) buildings, some collapse in large part; or wholly shifted frame buildings off foundations, racked frames; serious to reservoirs; underground pipes sometimes broken.

X. Cracked ground, especially when loose and wet, up to widths of several inches; fissures up to

a yard in width ran parallel to canal and stream banks. Landslides considerable from river banks and steep coasts. Shifted sand and mud horizontally on beaches and flat land. Changed level of water in wells. Threw water on banks of canals, lakes, rivers, etc. Damage serious to dams, dikes, embankments. Severe to well-built wooden structures and bridges, some destroyed. Developed dangerous cracks in excellent brick walls. Destroyed most masonry and frame structures, also their foundations. Bent railroad rails slightly. Tore apart, or crushed endwise, pipe lines buried in earth. Open cracks and broad wavy folds in cement pavements and asphalt road surfaces.

XI. Disturbances in ground many and widespread, varying with ground material. Broad fissures, earth slumps, and land slips in soft, wet ground. Ejected water in large amounts charged with sand and mud. Caused sea-waves ("tidal" waves) of significant magnitude. Damage severe to wood-frame structures, especially near shock centers. Great to dams, dikes, embankments often for long distances. Few, if any (masonry) structures remained standing. Destroyed large well-built bridges by the wrecking of supporting piers, or pillars. Affected yielding wooden bridges less. Bent railroad rails greatly, and thrust them endwise. Put pipe lines buried in earth completely out of service.

XII. Damage total--practically all works of construction damaged greatly or destroyed. Disturbances in ground great and varied, numerous shearing cracks. Landslides, falls of rock of significant character, slumping of river banks, etc., numerous and extensive. Wrenched loose, tore off, large rock masses. Fault slips in firm rock, with notable horizontal and vertical offset displacements. Water channels, surface and underground, disturbed and modified greatly. Dammed lakes, produced waterfalls, deflected rivers, etc. Waves seen on ground surfaces (actually seen, probably, in some cases). Distorted lines of sight and level. Threw objects upward into the air.

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California (southern).--Clarence R. Allen, California Institute of Technology, Pasadena.
Connecticut.--Robert Miller, University of Connecticut, Groton.
Delaware.--Kenneth D. Woodruff, University of Delaware, Newark.
Florida and Georgia.--Leland T. Long, Georgia Institute of Technology, Atlanta.
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Indiana.--Robert F. Blakely, Department of Natural Resources, Geological Survey, Bloomington.
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Washington.--Norman Rasmussen and Robert S. Crosson, University of Washington, Seattle.

West Virginia.--R. W. Laird, West Virgina University, Morgantown.

Wisconsin.--David E. Willis, University of Wisconsin, Milwaukee.

Earthquake Descriptions

This section lists all earthquakes alphabetically by State. The origin time of earthquake occurrences is given in Universal Coordinated Time (UTC). Times are expressed continuously from midnight to midnight, or 0 to 24 hours.

Sources of noninstrumental information (macroseismic data) in this publication include questionnaire canvasses conducted by the USGS; newspaper articles; bulletins of the Seismological Society of America; and special earthquake reports of other organizations. Instrumental data are provided by the USGS, National Earthquake Information Service.

Roman numerals in the earthquake descriptions refer to the Modified Mercalli Intensity Scale of 1931 (see page 2), which gives about equal weight to the disturbance of inanimate objects and to personal reactions. When more than one degree of intensity is reported from a town, the town is assigned the highest intensity reported. All earthquake reports that contain minimal information are assigned intensity II.

[The following symbols are used to indicate authority for arrival or origin times, epicenters, and/or magnitudes: (A) Geophysical Institute, University of Alaska, Fairbanks; (B) University of California, Berkeley; (D) University of Montana, Missoula; (E) U.S. Department of Energy, Las Vegas, Nevada; (G) U.S. Geological Survey, National Earthquake Information Service, Golden, Colo.; (H) U.S. Geological Survey, Hawaiian Volcano Observatory, Hawaii National Park; (J) Weston Observatory, Weston, Mass.; (K) Lee, W. H. K. and others, 1978; (L) Lamont-Doherty Geological Observatory, Palisades, N.Y.; (M) NOAA, Alaska Tsunami Warning Center, Palmer; (O) Earth Physics Branch, Ottawa, Canada; (P) California Institute of Technology, Pasadena; (Q) Pacific Geoscience Centre, Sydney, B.C., Canada; (S) St. Louis University, St. Louis, Mo.; (T) University of Oklahoma, Leonard; (U) University of Utah, Salt Lake City; (V) Virginia Polytechnic Institute and State University, Blacksburg; (W) University of Washington, Seattle]

Alabama

1 March (G) Northern Alabama
Origin time: 04 08 26.6
Epicenter: 34.42 N., 86.61 W.
Depth: 5 km
Magnitude: 2.5 mbLg
Intensity III: Huntsville area (V).

11 December (G) Alabama-Mississippi border area
Origin time: 02 06 48.2

See Mississippi listing.

Alaska

5 January (G) Southern Alaska
Origin time: 19 56 09.8
Epicenter: 61.33 N., 151.65 W.
Depth: 110 km
Magnitude: 4.4 mb
Intensity III: Anchorage (M), Wasilla (M).
Intensity II: Palmer (M).

6 January (G) Andreanof Islands, Aleutian Islands
Origin time: 07 08 43.8
Epicenter: 51.78 N., 176.01 W.
Depth: 63 km
Magnitude: 5.3 mb
Intensity IV: Adak (M).

6 January (G) Kenai Peninsula
Origin time: 21 59 01.1
Epicenter: 60.91 N., 149.38 W.
Depth: 45 km
Magnitude: 4.6 mb, 4.9 ML(M)
Intensity V: Girdwood (small objects fell, not broken).
Intensity IV: Anchorage, Chugiak, Clam Gulch, Cooper Landing, Eagle River, Kenai, Ouzinkie, Seward, Soldotna, Whittier.
Intensity III: Elmendorf AFB, Moose Pass, Palmer.

9 January (G) Southern Alaska
Origin time: 07 06 05.8
Epicenter: 62.00 N., 148.82 W.
Depth: 9 km
Magnitude: 3.5 ML(M)
Intensity III: Anchorage, Lower Susitna Valley, Matanuska.

9 January (G) Andreanof Islands, Aleutian Islands
Origin time: 22 18 14.6
Epicenter: 51.61 N., 177.17 W.
Depth: 121 km
Magnitude: 3.9 mb
Intensity II: Adak (M).

Alaska--Continued

10 January (A) Central Alaska
Origin time: 12 09 16.4
Epicenter: 64.74 N., 147.44 W.
Depth: 24 km
Magnitude: 2.8 ML(M)
Intensity III: Fairbanks.

18 January (G) Fox Islands, Aleutian Islands
Origin time: 17 04 18.1
Epicenter: 52.92 N., 166.43 W.
Depth: 70 km
Magnitude: None computed.
Intensity IV: Unalaska (M).

22 January (G) Cook Inlet
Origin time: 02 02 54.0
Epicenter: 60.24 N., 152.33 W.
Depth: 115 km
Magnitude: None computed.
Intensity III: Anchorage (M).

27 January (G) Kenai Peninsula
Origin time: 18 52 59.2
Epicenter: 60.37 N., 151.12 W.
Depth: 70 km
Magnitude: 4.7 mb
Intensity III: Anchorage (M), Eagle River (M), Kenai (M), Soldotna (M).

28 January (G) Kenai Peninsula
Origin time: 18 53 06.8
Epicenter: 60.07 N., 151.33 W.
Depth: 77 km
Magnitude: 4.5 mb
Intensity III: Kenai (M), Nikishka (M).
Intensity II: Anchorage (M).

12 February (G) Cook Inlet
Origin time: 08 56 38.9
Epicenter: 59.45 N., 152.62 W.
Depth: 72 km
Magnitude: 5.4 mb
Intensity IV: Anchor Point, Homer, Ouzinkie, Seldovia.
Intensity III: Kodiak, Kokhanok, Port Graham.
Intensity II: English Bay (M), Homer (M), King Salmon (M).

16 February (G) Southern Alaska
Origin time: 20 53 49.0
Epicenter: 61.31 N., 144.89 W.
Depth: Normal.
Magnitude: 4.1 ML(M)
Intensity IV: Chitina.

6 March (G) Andreanof Islands, Aleutian Islands
Origin time: 18 40 23.6
Epicenter: 51.76 N., 175.81 W.
Depth: 65 km
Magnitude: 4.7 mb
Intensity II: Adak (M).

Alaska--Continued

20 March (G) Southern Alaska
Origin time: 03 59 05.0
Epicenter: 60.18 N., 153.61 W.
Depth: 153 km
Magnitude: 4.9 mb
Intensity II: Anchorage (M), Homer (M).

20 March (G) Southern Alaska
Origin time: 08 15 37.5
Epicenter: 59.84 N., 153.24 W.
Depth: 134 km
Magnitude: 3.8 mb
Intensity III: Soldotna (M).
Intensity II: Homer (M), Kenai (M).

31 March (G) Southern Alaska
Origin time: 00 38 13.4
Epicenter: 61.77 N., 151.41 W.
Depth: 90 km
Magnitude: 5.1 mb
Intensity IV: Anchorage (M), Chugiak, Cooper Landing, Girdwood, Kasilof, Kenai, Skwentna, Talkeetna, Tyonek, Wasilla, Whittier, Willow.
Intensity III: Elmendorf AFB, Homer (M), Moose Pass, Palmer (M).

9 April (G) Kenai Peninsula
Origin time: 17 12 59.9
Epicenter: 60.69 N., 151.84 W.
Depth: 101 km
Magnitude: 4.5 mb
Intensity III: Anchorage (M), Kenai (M).
Intensity II: Homer (M).

12 April (G) Kodiak Island region
Origin time: 03 42 03.5
Epicenter: 56.42 N., 152.69 W.
Depth: 14 km
Magnitude: 6.0 mb, 6.6 MS, 6.5 MS(B), 6.3 MS(P), 5.8 ML(A)
Intensity V: Sitkinak Island.
Intensity IV: Kodiak, Old Harbor (M).
Intensity III: Ouzinkie.
Intensity II: Olga Bay (M), Zechar Bay (M).

19 April (G) Southern Alaska
Origin time: 01 49 03.5
Epicenter: 60.14 N., 153.54 W.
Depth: 158 km
Magnitude: 4.6 mb
Intensity II: Anchorage (M).

19 April (G) Southern Alaska
Origin time: 14 52 18.1
Epicenter: 61.00 N., 146.49 W.
Depth: 40 km
Magnitude: 3.3 ML(M)
Intensity IV: Valdez (M).

21 April (G) Central Alaska
Origin time: 20 40 37.7

Epicenter: 64.53 N., 147.95 W.
Depth: 30 km
Magnitude: 3.7 ML(M)
Intensity II: College (M).

24 April (G) Andreanof Islands, Aleutian Islands
Origin time: 04 28 47.0
Epicenter: 51.64 N., 176.09 W.
Depth: 53 km
Magnitude: 5.2 mb, 4.8 MS
Intensity III: Adak.

5 May (G) Southern Alaska
Origin time: 05 32 47.4
Epicenter: 63.30 N., 150.97 W.
Depth: 134 km
Magnitude: 5.2 mb
Intensity IV: Skwentna, Talkeetna, Willow to Wide Pass (M).
Intensity III: Anchorage to Palmer (M).

11 May (G) Andreanof Islands, Aleutian Islands
Origin time: 00 23 37.6
Epicenter: 51.67 N., 176.10 W.
Depth: 59 km
Magnitude: 5.6 mb, 5.9 MS, 5.8 MS(B)
Intensity IV: Adak (M).

12 May (G) Central Alaska
Origin time: 12 16 03.9
Epicenter: 62.25 N., 149.40 W.
Depth: 67 km
Magnitude: 5.1 mb

Felt throughout the Susitna Valley (press report).

Intensity IV: Anchorage, Chugiak, Elmendorf AFB, Gakona, Girdwood, Glennallen, Gold Creek (M), Homer, Kashwitna (M), McKinley Park, Palmer (M), Skwentna, Talkeetna, Wasilla (M), Whittier.
Intensity III: Fairbanks (M).
Intensity II: Ester, Moose Pass.

24 May (G) Andreanof Islands, Aleutian Islands
Origin time: 06 16 55.4
Epicenter: 51.23 N., 179.21 W.
Depth: 25 km
Magnitude: 6.0 mb, 6.7 MS, 6.4 mb(P), 6.2 MS(P), 6.4 MS(B)
Intensity IV: Adak (M).

24 May (G) Andreanof Islands, Aleutian Islands
Origin time: 09 53 03.4
Epicenter: 51.13 N., 179.20 W.
Depth: Normal.
Magnitude: 5.2 mb, 5.4 MS
Intensity III: Adak.

Alaska--Continued

25 May (G) Central Alaska
Origin time: 10 39 57.4
Epicenter: 64.55 N., 152.59 W.
Depth: Normal.
Magnitude: 4.0 ML
Intensity IV: Tanana.

31 May (G) Southern Alaska
Origin time: 18 29 25.6
Epicenter: 61.36 N., 149.70 W.
Depth: 44 km
Magnitude: 3.0 ML(M)
Intensity II: Palmer (M).

10 June (G) Alaska Peninsula
Origin time: 08 23 59.6
Epicenter: 57.92 N., 156.72 W.
Depth: 10 km
Magnitude: 4.5 mb, 3.9 MS, 4.6 ML(M)
Intensity II: Egegik (M).
Intensity I: King Salmon (M).

10 June (G) Southern Alaska
Origin time: 19 35 10.2
Epicenter: 60.30 N., 146.45 W.
Depth: 20 km
Magnitude: 4.8 mb, 4.7 ML(M)
Intensity IV: Cordova (M).
Intensity III: Anchorage (M), Valdez (M).

12 June (G) Kenai Peninsula, Alaska
Origin time: 07 30 39.3
Epicenter: 59.86 N., 150.76 W.
Depth: 55 km
Magnitude: 4.0 mb
Intensity III: Homer (M).

22 June (G) Andreanof Islands, Aleutian Islands
Origin time: 05 41 27.7
Epicenter: 51.61 N., 179.41 W.
Depth: Normal.
Magnitude: 4.8 mb, 5.9 MS, 5.0 ML(M)
Intensity III: Adak (M).

13 July (G) Southern Alaska
Origin time: 15 27 33.5
Epicenter: 62.11 N., 149.95 W.
Depth: 40 km
Magnitude: 3.5 ML(M)
Intensity II: Palmer (M).

16 July (G) Central Alaska
Origin time: 05 03 02.3
Epicenter: 63.57 N., 150.52 W.
Depth: 31 km
Magnitude: 3.5 ML(M)
Intensity III: McKinley Park (M).

19 July (A) Southern Alaska
Origin time: 18 54 32.8
Epicenter: 61.33 N., 149.98 W.
Depth: 13 km
Magnitude: 3.0 ML(M)

Intensity II: Chugiak (M), Eagle River (M), Susitna Flats--15 km north of Anchorage (A).

23 July (G) Central Alaska
Origin time: 15 19 35.5
Epicenter: 63.31 N., 147.26 W.
Depth: Normal.
Magnitude: 5.0 mb, 4.8 ML(M)
Intensity III: Throughout central Alaska (M).

27 July (G) Central Alaska
Origin time: 14 18 48.0
Epicenter: 65.00 N., 147.60 W.
Depth: 20 km
Magnitude: 3.8 ML(A)
Intensity IV: Fairbanks.

27 July (G) Central Alaska
Origin time: 15 51 42.2
Epicenter: 64.85 N., 147.59 W.
Depth: 10 km
Magnitude: 3.6 ML(A)
Intensity III: Fairbanks (press report).

27 July (G) Central Alaska
Origin time: 17 11 21.1
Epicenter: 64.93 N., 148.02 W.
Depth: 10 km
Magnitude: 3.7 ML(A)
Intensity III: Fairbanks (press report).

3 August (G) Kenai Peninsula
Origin time: 06 33 30.9
Epicenter: 59.78 N., 151.15 W.
Depth: 89 km
Magnitude: None computed.
Intensity III: Homer (M).

8 August (G) Southern Alaska
Origin time: 09 30 03.3
Epicenter: 61.39 N., 146.91 W.
Depth: 53 km
Magnitude: 4.3 mb
Intensity V: Palmer (few windows cracked).
Intensity IV: Delta Junction, Glennallen, Valdez, Whittier.
Intensity III: Anchorage (M), Girdwood.
Intensity II: Chugiak.

13 August (G) Southern Alaska
Origin time: 00 49 41.0
Epicenter: 62.28 N., 149.71 W.
Depth: 65 km
Magnitude: 4.1 mb
Intensity IV: Anchorage, Chugiak, Skwentna.
Intensity III: Big Lake (M), Palmer (M), Wasilla (M).

18 August (G) Southern Alaska
Origin time: 18 52 28.4
Epicenter: 59.89 N., 153.53 W.

Depth: 123 km
Magnitude: 5.4 mb, 5.7 mb(B)
Intensity VI: Clam Gulch (cracked plasterboard, hairline cracks in exterior cinderblock walls, small objects shifted).
Intensity V: Sterling.
Intensity IV: Anchorage, Chugiak, Cooper Landing, Eagle River, Girdwood, Homer, Kenai, Larsen Bay, Moose Pass, Port Lions, Seldovia, Skwentna, Tyonek, Whittier.
Intensity III: Cordova (M), Healey (M), King Salmon (M), Kodiak (M), Soldotna, Spenard, Willow.
Intensity II: Fairbanks (M), Nikishka.

22 August (G) Central Alaska
Origin time: 04 13 55.3
Epicenter: 65.16 N., 151.99 W.
Depth: 14 km
Magnitude: 4.0 ML(M)
Intensity II: Tanana (M).

22 August (G) Central Alaska
Origin time: 09 53 24.2
Epicenter: 65.23 N., 152.12 W.
Depth: 17 km
Magnitude: 3.8 ML(M)
Intensity II: Tanana (M).

22 August (A) Central Alaska
Origin time: 10 12 02.8
Epicenter: 64.92 N., 152.53 W.
Depth: 1 km
Magnitude: 3.8 ML(A)
Intensity II: Tanana.

22 August (A) Central Alaska
Origin time: 10 29 08.0
Epicenter: 64.99 N., 152.31 W.
Depth: 1 km
Magnitude: 3.4 ML(A)
Intensity II: Tanana.

26 August (G) Central Alaska
Origin time: 13 44 31.2
Epicenter: 65.08 N., 152.36 W.
Depth: Normal.
Magnitude: 3.3 ML(A)
Intensity II: Tanana (M).

3 September (A) Central Alaska
Origin time: 06 27 05.4
Epicenter: 64.58 N., 147.16 W.
Depth: 11 km
Magnitude: 3.9 ML
Intensity II: Eielson AFB (A), Fairbanks (A).

18 September (G) Central Alaska
Origin time: 17 02 54.9
Epicenter: 63.66 N., 147.59 W.
Depth: 88 km
Magnitude: None computed.
Intensity IV: Cantwell, Usibelli.

Intensity II: Talkeetna (A), Willow (A).

19 September (G) Southern Alaska
Origin time: 08 37 56.0
Epicenter: 61.34 N., 147.18 W.
Depth: 32 km
Magnitude: 3.9 ML(M)
Intensity III: Anchorage to Valdez (A).
Intensity II: Gakona, Valdez.

20 September (G) Southern Alaska
Origin time: 11 46 05.9
Epicenter: 61.92 N., 149.23 W.
Depth: 8 km
Magnitude: 3.8 ML(M)
Intensity IV: Girdwood, Palmer, Sutton.
Intensity II: Anchorage (M), Independence Mine area (M), Skwentna.

21 September (G) Southern Alaska
Origin time: 14 45 19.6
Epicenter: 61.11 N., 151.81 W.
Depth: 81 km
Magnitude: 4.5 mb
Intensity IV: Anchorage (M), Eagle River (M), Girdwood, Kenai, Palmer, Soldotna, Sterling.
Intensity II: Sutton.

25 September (G) Andreanof Islands, Aleutian Islands
Origin time: 09 37 01.9
Epicenter: 51.79 N., 175.28 W.
Depth: 62 km
Magnitude: 4.6 mb
Intensity II: Adak (telephone report).

26 September (G) Central Alaska
Origin time: 16 08 18.6
Epicenter: 64.99 N., 147.55 W.
Depth: 27 km
Magnitude: 3.7 mb, 3.9 ML(M)
Intensity III: Eielson AFB (A), Fairbanks, North Pole (A).

28 September (G) Central Alaska
Origin time: 23 53 13.7
Epicenter: 63.99 N. 147.71 W.
Depth: Normal.
Magnitude: 4.4 mb, 4.5 ML(M)
Intensity III: Big Delta (M), Delta Junction (A), Fairbanks (M), Healey (M), Nenana (M), North Pole (M), Solcha (A).

4 October (G) Andreanof Islands, Aleutian Islands
Origin time: 18 53 00.1
Epicenter: 51.81 N., 177.05 W.
Depth: 58 km
Magnitude: 4.5 mb
Intensity IV: Adak Island (M).

Alaska--Continued

4 October (G) Near Islands, Aleutian Islands
Origin time: 19 55 17.5
Epicenter: 50.93 N., 173.53 E.
Depth: Normal.
Magnitude: 5.3 mb, 5.0 MS
Intensity III: Shemya Island (M).

6 October (G) Southern Alaska
Origin time: 05 54 05.2
Epicenter: 61.93 N., 150.67 W.
Depth: 6 km
Magnitude: 4.6 ML(M)
Intensity III: Willow-Hatcher Pass area (M).
Intensity II: Palmer (M), Wasilla (M).

17 October (G) Andreanof Islands, Aleutian Islands
Origin time: 20 50 48.7
Epicenter: 51.72 N., 176.94 W.
Depth: 61 km
Magnitude: 5.0 mb

Eighty-six questionnaires were completed for this earthquake from the Naval Air Station, Adak Island. The evaluated intensities from the information on these questionnaires ranged from intensity IV to VI.

27 October (G) Southern Alaska
Origin time: 04 29 31.5
Epicenter: 62.20 N., 151.05 W.
Depth: 102 km
Magnitude: None computed.
Intensity II: Talkeetna.

30 October (G) Southern Alaska
Origin time: 11 11 38.4
Epicenter: 60.96 N., 150.32 W.
Depth: 48 km
Magnitude: 3.3 mb
Intensity III: Anchorage area (M).

31 October (G) Southern Alaska
Origin time: 12 28 30.1
Epicenter: 61.91 N., 149.57 W.
Depth: Normal.
Magnitude: 3.5 mb, 3.4 ML(M)
Intensity II: Palmer area (M).

14 November (G) Central Alaska
Origin time: 22 27 45.7
Epicenter: 64.54 N., 147.03 W.
Depth: 25 km
Magnitude: 3.7 ML
Intensity II: Fairbanks area (M).

19 November (G) Near Islands, Aleutian Islands
Origin time: 19 42 35.7
Epicenter: 52.70 N., 172.48 E.
Depth: 47 km
Magnitude: 5.3 mb(G), 5.2 MS(G)
Intensity V: Shemya Island.

Alaska--Continued

24 November (G) Southern Alaska
Origin time: 00 28 12.8
Epicenter: 62.03 N., 150.52 W.
Depth: 74 km
Magnitude: 4.5 mb
Intensity II: Palmer (M), Talkeetna (M).

24 November (G) Southern Alaska
Origin time: 08 50 45.4
Epicenter: 61.99 N., 150.51 W.
Depth: 77 km
Magnitude: 3.2 mb
Intensity II: Willow (M).

2 December (G) Kenai Peninsula
Origin time: 21 57 20.0
Epicenter: 59.69 N., 151.66 W.
Depth: 13 km
Magnitude: 3.7 ML(M)
Intensity V: Homer.

3 December (G) Central Alaska
Origin time: 19 39 31.2
Epicenter: 62.31 N., 149.75 W.
Depth: 74 km
Magnitude: 4.7 mb
Intensity IV: Chugiak, Talkeetna (M).
Intensity III: Anchorage (M), Palmer (M), Willow (M).
Intensity II: Wasilla.

4 December (G) Central Alaska
Origin time: 12 11 06.4
Epicenter: 65.04 N., 147.51 W.
Depth: 24 km
Magnitude: 3.3 ML (M)
Intensity II: Fairbanks (M).

8 December (G) Northern Alaska
Origin time: 10 01 51.5
Epicenter: 68.33 N., 145.17 W.
Depth: Normal.
Magnitude: 4.0 ML(M)
Intensity II: Fairbanks (M).

15 December (G) Rat Islands, Aleutian Islands
Origin time: 08 30 34.7
Epicenter: 52.11 N., 175.23 E.
Depth: 47 km
Magnitude: 5.6 mb, 5.6 MS, 5.4 MS(B)
Intensity V: Shemya AFB (light furniture and small objects shifted).
Intensity IV: Attu.

17 December (G) Central Alaska
Origin time: 13 15 26.0
Epicenter: 63.95 N., 147.42 W.
Depth: 22 km
Magnitude: 4.8 mb, 4.6 ML(M)
Intensity IV: Clear AFB (M), Ester, Fairbanks.

Alaska--Continued

22 December (G) Alaska Peninsula
Origin time: 03 25 29.9
Epicenter: 55.57 N., 160.37 W.
Depth: 12 km
Magnitude: 4.5 mb, 4.2 ML(M)
Intensity IV: Sand Point (M).

24 December (G) Central Alaska
Origin time: 13 13 08.1
Epicenter: 63.56 N., 157.59 W.
Depth: Normal.
Magnitude: 5.0 mb(G), 4.4 MS(G), 5.3 ML(M)
Intensity IV: Galena Airport (people were awakened and the control tower was evacuated).

Arizona

10 March (P) Baja California
Origin time: 20 34 36.2
Epicenter: 32.33 N., 115.03 W.
Depth: 5 km
Magnitude: 3.5 ML
Intensity III: Yuma (telephone report).

11 March (G) Baja California
Origin time: 23 57 46.8
Epicenter: 32.26 N., 115.12 W.
Depth: 5 km
Magnitude: 4.8 mb, 5.0 ML(P)

This earthquake destroyed approximately 30 houses, cracked dozens of buildings, and interrupted electric power and telephone communications in the cities of San Luis, Sonora, and Luis Sanchez, Mexico.

Intensity VI: Arizona--Yuma (cracked plaster).
Intensity III: California--El Centro (press report).

12 March (G) Baja California
Origin time: 00 30 15.7
Epicenter: 32.23 N., 115.14 W.
Depth: 5 km
Magnitude: 4.5 mb, 4.7 ML(P)
Intensity IV: Arizona--Yuma.
Intensity III: California--southern Imperial Valley (telephone report).

12 March (G) Baja California
Origin time: 18 42 24.3
Epicenter: 32.26 N., 115.11 W.
Depth: 5 km
Magnitude: 4.9 mb, 4.9 ML(P)
Intensity VI:
Arizona--Yuma (cracked plaster, cracked streets).
Intensity IV:
Arizona--Somerton.
California--Imperial, Winterhaven.

Arizona--Continued

16 March (P) Baja California
Origin time: 01 51 10.1
Epicenter: 32.30 N., 115.12 W.
Depth: 5 km
Magnitude: 4.2 mb(G), 4.2 ML
Intensity IV: Yuma.

5 May (P) Baja California
Origin time: 21 03 15.8

See California listing.

Arkansas

31 August (S) New Madrid, Missouri region
Origin time: 00 31 00.3

See Tennessee listing.

23 September (S) Southern Arkansas
Origin time: 07 33 57.5
Epicenter: 33.65 N., 91.89 W.
Depth: 2 km
Magnitude: 3.1 mbLg
Intensity IV: Wilmar.

21 November (S) Northeastern Arkansas
Origin time: 23 31 22.1
Epicenter: 35.97 N., 89.92 W.
Depth: 10 km
Magnitude: 2.4 ML
Intensity II: Blytheville.

California

4 January (B) Northern California
Origin time: 12 23 00.5
Epicenter: 40.65 N., 124.77 W.
Depth: 27 km
Magnitude: 3.7 ML
Intensity IV: Ferndale, Fortuna.
Intensity III: Eel River Valley.

6 January (B) Northern California
Origin time: 10 42 44.8
Epicenter: 39.42 N., 123.33 W.
Depth: 14 km
Magnitude: 2.9 ML
Intensity IV: Willits.

14 January (B) Northern California
Origin time: 15 45 45.6
Epicenter: 38.81 N., 122.79 W.
Depth: 5 km
Magnitude: 3.1 ML
Intensity III: Southern Lake County (press report).

15 January (B) Northern California
Origin time: 14 38 26.2
Epicenter: 39.14 N., 123.25 W.
Depth: 5 km
Magnitude: 3.0 ML
Intensity IV: Ukiah (press report).

California--Continued

Intensity III: Willits (press report).

17 January (B) Northern California
Origin time: 20 59 12.9
Epicenter: 39.15 N., 123.26 W.
Depth: 8 km
Magnitude: 2.9 ML
Intensity V: Ukiah (hairline crack in the wall, dishes rattled, buildings swayed--press report).

25 January (P) Southern California
Origin time: 10 40 50.0
Epicenter: 34.32 N., 118.33 W.
Depth: 5 km
Magnitude: 2.7 ML
Intensity III: La Crescenta, Sylmar.

28 January (B) Northern California
Origin time: 08 49 02.5
Epicenter: 39.40 N., 123.35 W.
Depth: 5 km
Magnitude: 2.5 ML(B)
Intensity V: Willits (furniture and small objects moved; people awakened; windows, doors, dishes rattled).

31 January (P) Southern California
Origin time: 14 18 10.0
Epicenter: 34.18 N., 118.63 W.
Depth: 6 km
Magnitude: 2.1 ML
Intensity III: Canoga Park, Chatsworth.

6 February (P) Southern California
Origin time: 00 39 25.8
Epicenter: 34.03 N., 116.78 W.
Depth: 6 km
Magnitude: 3.1 ML
Intensity III: Palm Springs.

6 February (P) Southern California
Origin time: 01 01 28.9
Epicenter: 34.03 N., 116.78 W.
Depth: 6 km
Magnitude: 3.3 ML
Intensity III: Palm Springs.

6 February (P) Imperial Valley
Origin time: 12 57 14.2
Epicenter: 33.25 N., 115.57 W.
Depth: 4 km
Magnitude: 3.4 ML
Intensity IV: Niland (many awakened; windows, doors, dishes rattled; buildings shook).
Intensity III: Brawley (telephone report).

7 February (B) Northern California
Origin time: 13 39 22.7
Epicenter: 39.41 N., 123.17 W.
Depth: 5 km
Magnitude: 2.7 ML(B)
Intensity IV: Willits (many awak-

ened; small objects shifted; buildings shook; windows, doors, dishes rattled).

11 February (P) Imperial Valley
Origin time: 01 45 30.5
Epicenter: 33.02 N., 115.53 W.
Depth: 7 km
Magnitude: 2.5 ML
Intensity II: Brawley.

11 February (P) Imperial Valley
Origin time: 01 45 51.0
Epicenter: 33.02 N., 115.53 W.
Depth: 5 km
Magnitude: 2.5 ML
Intensity II: Brawley.

11 February (P) Imperial Valley
Origin time: 02 25 51.4
Epicenter: 33.02 N., 115.53 W.
Magnitude: 3.1 ML
Depth: 6 km
Intensity III: Brawley.

13 February (P) Southern California
Origin time: 18 04 06.3
Epicenter: 34.02 N., 117.22 W.
Depth: 6 km
Magnitude: 2.9 ML
Intensity II: Redlands.

14 February (B) Northern California
Origin time: 16 33 46.9
Epicenter: 38.41 N., 122.65 W.
Depth: 8 km
Magnitude: 2.8 ML
Intensity II: Santa Rosa.

14 February (B) Northern California
Origin time: 20 03 09.5
Epicenter: 38.42 N., 122.66 W.
Depth: 9 km
Magnitude: 2.5 ML
Intensity II: Santa Rosa.

14 February (B) Northern California
Origin time: 21 03 55.4
Epicenter: 40.30 N., 124.27 W.
Depth: 10 km
Magnitude: 4.0 ML
Intensity IV: Rio Dell.
Intensity III: Ferndale, Fortuna.

23 February (P) Imperial Valley
Origin time: 16 43 03.7
Epicenter: 32.82 N., 115.60 W.
Depth: 19 km
Magnitude: 3.6 ML
Intensity IV: Imperial, Seeley.

1 March (P) Southern California
Origin time: 04 54 31.2
Epicenter: 34.53 N., 116.77 W.
Depth: 5 km
Magnitude: 4.4 ML, 4.4 ML(B)
Intensity VI: White Water (cracked plaster; light furniture shifted).

California--Continued

Intensity V: Colton, Fawnskin, Highland.
Intensity IV: Angelus Oaks, Apple Valley, Big Bear City, Bryn Mawr, Chino, Crestline, Etiwanda, Green Valley Lake, Montrose, Mount Baldy, Palomar Mountain, Rimforest, San Bernardino, Twin Peaks.
Intensity III: Barstow, Big Bear Lake, Crest Park, Del Rosa, Lake Arrowhead, Lucerne Valley, Newberry Springs, Norton AFB, Victorville (press report).
Intensity II: Azusa, Blue Jay, Burbank, Daggett, West Covina (press report), Wrightwood.

8 March (P) Southern California
Origin time: 14 49 34.9
Epicenter: 33.83 N., 117.88 W.
Depth: 5 km
Magnitude: 2.9 ML
Intensity IV: Anaheim (Brookhurst Center, Sunkist), Fullerton, Long Beach, Orange, Placentia, Santa Ana, Westminster.
Intensity III: Brea (press report), Buena Park (press report), Cypress (press report), Garden Grove, La Mirada, Midway City, Stanton, Sunny Hills, Tustin (press report), Yorba Linda.

11 March (G) Baja California
Origin time: 23 57 46.8

See Arizona listing.

12 March (G) Baja California
Origin time: 00 30 15.7

See Arizona listing.

12 March (G) Baja California
Origin time: 18 42 24.3

See Arizona listing.

13 March (P) Southern California
Origin time: 16 38 15.7
Epicenter: 33.93 N., 117.98 W.
Depth: 4 km
Magnitude: 3.2 ML
Intensity VI: La Mirada (cracked plaster).
Intensity V: Buena Park, La Habra, Surfside.
Intensity IV: Anaheim (press report), Bellflower, Fullerton, Perry, Pico Rivera, Whittier.
Intensity III: Alhambra, Brea (press report), Compton, Manhattan Beach, Rowland Heights.
Intensity II: La Puente, Norwalk, Santa Ana.

14 March (P) Southern California
Origin time: 16 09 51.2

Epicenter: 33.95 N., 117.97 W.
Depth: 4 km
Magnitude: 2.5 ML
Intensity IV: La Habra.
Intensity III: Fullerton, Santa Fe Springs, Whittier.

15 March (P) Imperial Valley
Origin time: 04 02 49.4
Epicenter: 32.78 N., 115.53 W.
Depth: 5 km
Magnitude: 2.9 ML
Intensity III: El Centro, Imperial (telephone report).

15 March (P) Imperial Valley
Origin time: 04 09 39.7
Epicenter: 32.78 N., 115.57 W.
Depth: 5 km
Magnitude: 3.2 ML
Intensity III: El Centro, Imperial (telephone report).

20 March (P) Southern California
Origin time: 00 07 56.7
Epicenter: 36.00 N., 117.87 W.
Depth: 1 km
Magnitude: 3.0 ML, 3.6 ML(B)
Intensity III: Haiwee Reservoir (telephone report).

21 March (B) Northern California
Origin time: 14 05 12.1
Epicenter: 40.44 N., 124.45 W.
Depth: 11 km
Magnitude: 3.5 ML
Intensity IV: Bayside, Loleta, Rio Dell, Scotia.
Intensity III: Ferndale.

26 March (B) Northern California
Origin time: 00 27 04.8
Epicenter: 39.21 N., 123.17 W.
Depth: 9 km
Magnitude: 4.9 mb(G), 4.4 ML

This earthquake was felt over an area of about 8,200 sq km centered in the Ukiah area (fig. 7).

Loss of about $10,000 from glass bottles and containers being thrown to the floor and broken was sustained by grocery and liquor stores in the Ukiah area. This earthquake triggered three accelerographs located at Coyote Dam near Ukiah (Porcella, 1978a). The accelerographs are located at the center crest, center toe, and south abutment of the dam. Maximum acceleration recorded at the crest was 0.30 g, at the toe was 0.34 g, and at the south abutment was 0.20 g.

The press reported damage at a new warehouse at the Parducci Winery south of Ukiah. Huge storage tanks in the warehouse, welded to plates

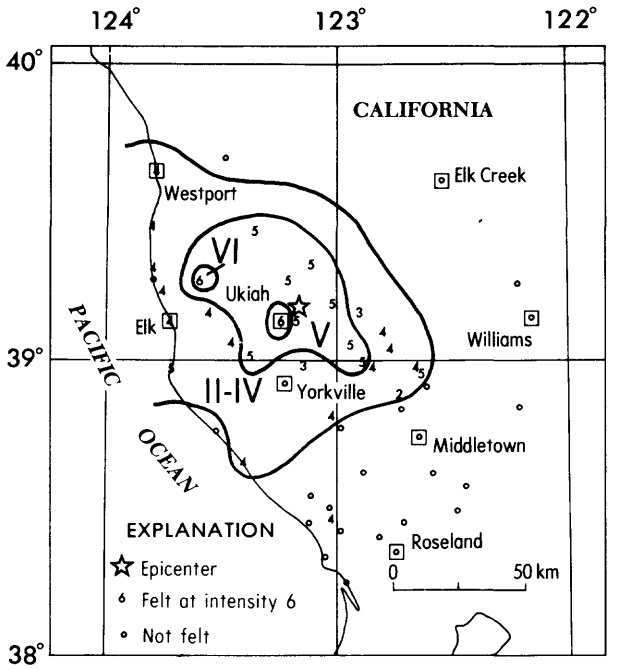

FIGURE 7.--Isoseismal map for the northern California earthquake of 26 March 1978, 00 27 04.4 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

on the floor to hold them rigid, contained 200 tons of liquid. The liquid moved and about 1,000 gallons spilled, damaging the tanks. Liquid in free-floating tanks in another building sustained minor spillage, but there was no damage to the tanks. The drop ceiling in the new warehouse was also damaged.

Intensity VI: Comptche (windows broken), Ukiah (pictures fell, glass bottles and jars broken in grocery and liquor stores, burglar alarm set off, damage to Parducci Winery).
Intensity V: Boonville, Clearlake Highlands, Finley, Kelseyville, Lakeport, Manchester, Potter Valley, Redwood Valley, Talmage, Willits, Witter Springs.
Intensity IV: Albion, Clearlake Park, Cloverdale, Elk, Fort Bragg, Glenhaven, Lucerne, Mendocino, Monte Rio, Navarro, Philo, Stewarts Point, Westport.
Intensity III: Hopland, Upper Lake.
Intensity II: Loch Lomond.

26 March (B) Northern California
Origin time: 00 34 11.9
Epicenter: 39.21 N., 123.14 W.
Depth: 5 km
Magnitude: 3.1 ML
Intensity IV: Talmage, Ukiah.
Intensity III: Willits.

26 March (B) Northern California
Origin time: 01 19 10.0
Epicenter: 39.20 N., 123.17 W.
Depth: 10 km
Magnitude: 3.6 mb(G), 3.6 ML
Intensity IV: Talmage, Ukiah.
Intensity III: Willits.

26 March (B) Northern California
Origin time: 02 29 16.9
Epicenter: 39.21 N., 123.17 W.
Depth: 5 km
Magnitude: 3.3 ML
Intensity IV: Talmage, Ukiah.
Intensity III: Willits.

26 March (B) Northern California
Origin time: 04 28 18.6
Epicenter: 39.23 N., 123.19 W.
Depth: 3 km
Magnitude: 3.5 ML
Intensity IV: Talmage, Ukiah.
Intensity III: Comptche, Willits.

27 March (B) Northern California
Origin time: 08 44 03.0
Epicenter: 40.43 N., 124.31 W.
Depth: 14 km
Magnitude: 3.2 ML
Intensity IV: Ferndale, Fortuna, Rio Dell.
Intensity III: Scotia (press report), Weotl.

1 April (P) Southern California
Origin time: 10 52 27.4
Epicenter: 34.20 N., 116.97 W.
Depth: 6 km
Magnitude: 4.2 ML, 3.8 mb(G)
Intensity V: Angelus Oaks, Big Bear City, Llano, Rosamund.
Intensity IV: Big Bear Lake, Blue Jay, Bryn Mawr, Cedar Glen, Coachella, Fawn-skin, Forest Falls, Green Valley Lake, Highland, Loma Linda, Lucerne Valley, Redlands, Running Springs, Sunnymead, Yucaipa.
Intensity III: Palm Springs.

4 April (B) Northern California
Origin time: 03 23 31.8
Epicenter: 37.84 N., 122.06 W.
Depth: 8 km.
Magnitude: 2.5 ML
Intensity II: Alamo (B), Walnut Creek (B).

8 April (B) Northern California
Origin time: 09 22 18.9
Epicenter: 39.14 N., 123.19 W.
Depth: 5 km
Magnitude: 3.2 ML
Intensity IV: Talmage, Willits.
Intensity III: Redwood Valley, Ukiah.

14 April (P) Central California
Origin time: 10 01 05.2
Epicenter: 35.28 N., 116.83 W.
Depth: 5 km
Magnitude: 3.7 ML
Intensity II: Goldestone Tracking Station.

18 April (P) Southern California
Origin time: 22 42 36.2
Epicenter: 33.88 N., 117.55 W.
Depth: 6 km
Magnitude: 3.0 ML
Intensity II: Corona, Riverside.

22 April (P) Southern California
Origin time: 13 04 27.8
Epicenter: 34.05 N., 118.97 W.
Depth: 14 km
Magnitude: 3.4 mb(G), 3.2 ML
Intensity III: Malibu to Point Dume (P).

25 April (P) Imperial Valley region
Origin time: 04 58 38.2
Epicenter: 33.00 N., 115.58 W.
Depth: 11 km
Magnitude: 2.4 ML
Intensity II: Brawley (P).

25 April (P) Imperial Valley region
Origin time: 05 13 25.3
Epicenter: 33.00 N., 115.58 W.
Depth: 9 km
Magnitude: 2.3 ML
Intensity II: Brawley (P).

25 April (P) Southern California
Origin time: 21 56 30.2
Epicenter: 33.72 N., 118.37 W.
Depth: 4 km
Magnitude: 2.5 ML
Intensity II: Long Beach (P).

26 April (P) Southern California
Origin time: 06 08 21.9
Epicenter: 33.95 N., 118.30 W.
Depth: 5 km
Magnitude: 2.7 ML
Intensity II: Hawthorne (P), Los Angeles (P), Northern Orange County (press report), Santa Monica (P).

29 April (P) Southern California
Origin time: 03 32 11.8
Epicenter: 33.83 N., 117.73 W.
Depth: 5 km
Magnitude: 3.2 ML, 4.6 mb(G)
Intensity III: Santa Ana, Villa Park (P).

29 April (P) Southern California
Origin time: 04 03 46.2
Epicenter: 34.23 N., 116.57 W.
Depth: 6 km
Magnitude: 3.8 ML
Intensity V: Landers.
Intensity IV: Fawnskin, Lake Arrowhead, Riverside.
Intensity III: Helendale, Orange, Santa Ana.
Intensity II: Anaheim Hills (press report), Big Bear (P), Tustin (press report).

1 May (P) Southern California
Origin time: 08 02 54.4
Epicenter: 34.37 N., 119.97 W.
Depth: 5 km
Magnitude: 3.7 ML
Intensity IV: Goleta, Santa Barbara.

5 May (P) Baja California
Origin time: 21 03 15.8
Epicenter: 32.22 N., 115.32 W.
Depth: 5 km
Magnitude: 4.8 mb(G), 4.1 MS(G), 5.5 ML
Intensity IV:
Arizona--San Luis, Yuma.
California--Calexico, Del Mar, Campo, El Centro, Heber, Ocotillo, Potrero, Seeley.
Intensity III:
California--Plaster City, San Diego.

6 May (B) Owens Valley region
Origin time: 10 14 14.9
Epicenter: 37.47 N., 118.57 W.
Depth: 8 km
Magnitude: 3.7 ML
Intensity IV: Bishop.

8 May (B) Central California
Origin time: 01 07 02.4
Epicenter: 36.83 N., 120.03 W.
Depth: 9 km
Magnitude: 3.3 ML
Intensity II: Madera.

8 May (B) Central California
Origin time: 06 56 23.3
Epicenter: 37.37 N., 121.75 W.
Depth: 3 km
Magnitude: 3.4 ML

This earthquake is the beginning of a swarm along the Caleveras fault northeast of San Jose.

Intensity III: East San Jose (press report).

10 May (B) Central California
Origin time: 15 55 40.5
Epicenter: 37.38 N., 121.75 W.
Depth: 2 km
Magnitude: 3.3 ML

California--Continued

Intensity III: East San Jose (press report).

11 May (P) Southern California
Origin time: 05 47 32.4
Epicenter: 34.00 N., 118.35 W.
Depth: 5 km
Magnitude: 2.8 ML
Intensity III: Culver City, Inglewood, Los Angeles, Santa Monica, Southgate.

11 May (B) Central California
Origin time: 11 56 05.6
Epicenter: 37.37 N., 121.76 W.
Depth: 3 km
Magnitude: 3.8 ML
Intensity IV: East San Jose.

11 May (B) Central California
Origin time: 11 56 56.6
Epicenter: 37.37 N., 121.76 W.
Depth: 2 km
Magnitude: 3.8 ML
Intensity IV: East San Jose.

11 May (B) Central California
Origin time: 12 18 11.8
Epicenter: 37.38 N., 121.75 W.
Depth: 4 km
Magnitude: 3.7 mb(G), 3.7 ML
Intensity IV: East San Jose.

11 May (B) Central California
Origin time: 12 28 03.5
Epicenter: 37.38N., 121.75 W.
Depth: 4 km
Magnitude: 3.4 ML
Intensity IV: East San Jose.

11 May (P) Southern California
Origin time: 17 57 40.6
Epicenter: 34.00 N., 118.45 W.
Depth: 5 km
Magnitude: 2.9 ML
Intensity III: Beverly Hills, Inglewood, Santa Monica.

22 May (B) Central California
Origin time: 21 56 06.9
Epicenter: 36.64 N., 121.31 W.
Depth: 4 km
Magnitude: 3.7 mb(G), 3.7 ML
Intensity II: Hollister, Stone Canyon.

22 May (B) Northern California
Origin time: 22 01 58.2
Epicenter: 36.64 N., 121.31 W.
Depth: 5 km
Magnitude: 2.9 ML
Intensity II: Hollister (B), Stone Canyon (B).

23 May (P) Southern California
Origin time: 09 16 50.8
Epicenter: 33.90 N., 119.17 W.
Depth: 5 km

Magnitude: 4.0 mb(G), 3.9 ML
Intensity IV: Compton, Hollywood Beach (press report), Oxnard (press report), Port Hueneme (press report), Silver Strand Beach.
Intensity III: Glendale.
Intensity II: Point Mugu.

27 May (B) Northern California
Origin time: 18 22 41.3
Epicenter: 38.54 N., 122.74 W.
Depth: 9 km
Magnitude: 3.8 ML
Intensity II: Santa Rosa (B), Sonoma County (B).

31 May (P) Imperial Valley region
Origin time: 05 16 49.2
Epicenter: 32.87 N., 115.48 W.
Depth: 10 km
Magnitude: 2.7 ML
Intensity II: Brawley.

31 May (P) Imperial Valley region
Origin time: 11 44 45.2
Epicenter: 32.87 N., 115.48 W.
Depth: 10 km
Magnitude: 2.9 ML
Intensity II: Brawley.

4 June (P) Southern California
Origin time: 03 57 17.3
Epicenter: 33.92 N., 117.83 W.
Depth: 6 km
Magnitude: 3.5 ML

This earthquake was felt over an area of approximately 1,800 sq km (fig. 8).

Intensity V: Whittier (light furniture and small objects shifted).
Intensity IV: Anaheim, Arcadia, Atwood, Big Bear City, Bonsall, Brea, Buena Park, Burbank, Costa Mesa, Covina, Cudahy, Cypress, Diamond Bar, Downey, El Segundo, Fawnskin, Fountain Valley, Fullerton, Garden Grove, Gardena, Glendale, Hancock, Ladera Heights, La Habra, Long Beach, Los Angeles, Maywood, Midway City, Monrovia, Monterey Park, Montrose, Murrieta, Norwalk, Paramount, Pasadena, Placentia, Pomona, San Jacinto, Sierra Madre, South Gate, Stanton, Sunset Beach, Vista, West Covina, Westminster, Wildomar, Yorba Linda.
Intensity III: Glendora, Glenoaks, Los Alamitos, Santa Ana.
Intensity II: Altadena, Green Valley Lake, Huntington Beach, Montclair, Phelan, San Gabriel, Van Nuys.

5 June (P) Southern California
Origin time: 16 03 03.8
Epicenter: 33.42 N., 116.70 W.

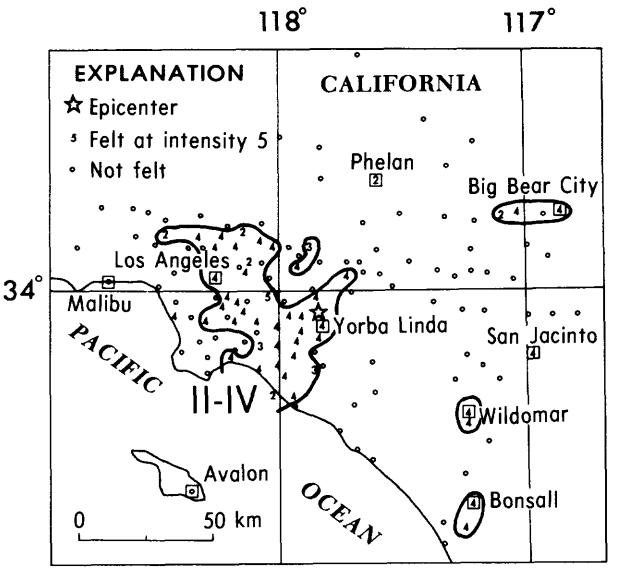

FIGURE 8.--Isoseismal map for the southern California earthquake of 4 June 1978, 03 57 17.3 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Depth: 12 km
Magnitude: 3.9 mb(G), 4.4 ML

This earthquake was felt over an area of approximately 11,000 sq km (fig. 9).

Intensity V: Anza (hairline cracks in exterior brick walls, small objects shifted), Winchester (few cracked windows; windows, doors, and dishes rattled).
Intensity IV: Aguanga, Alpine, Banning, Bonita, Borrego Springs, Camp Pendleton, El Cajon, Escondido, Guatay, Hemet, Idyllwild, Indio, Jamul, Julian, La Mirada, Laguna Niguel, Lakeside, North Palm Springs, Pala, Palm Springs, Palomar Mountain, Pauma Valley, Pico Rivera, Pine Valley, Pomona, Ramona, Ranchita, San Diego, San Diego NAB, San Marcos, Santa Ysabel, Valley Center, Vista, Warner Springs.
Intensity III: Boulevard, Del Mar, La Jolla, Mountain Center, North Shore, Palm Desert, Pico Rivera, Rincon Springs (press report), San Diego--Lindbergh Field, South Whittier.
Intensity II: Lake Elsinore, Mt. Baldy.

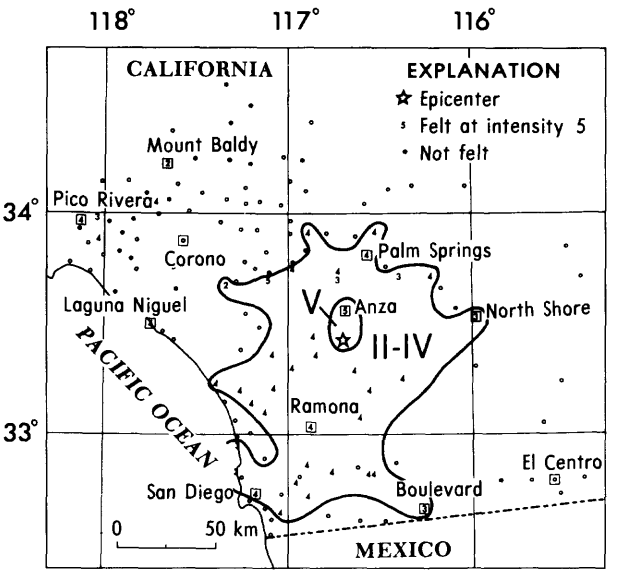

FIGURE 9.--Isoseismal map for the southern California earthquake of 5 June 1978, 16 03 03.8 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

California--Continued

11 June (B) Northern California
Origin time: 20 12 03.9
Epicenter: 41.44 N., 121.89 W.
Depth: 2 km
Magnitude: 3.5 ML
Intensity II: Mt. Shasta area (B).

12 June (B) Northern California
Origin time: 09 18 44.1
Epicenter: 41.46 N., 121.86 W.
Depth: 2 km
Magnitude: 3.8 ML
Intensity II: Mt. Shasta area (B).

14 June (P) Southern California
Origin time: 04 27 49.4
Epicenter: 34.38 N., 118.63 W.
Depth: 6 km
Magnitude: 2.9 ML
Intensity II: Newhall (P).

16 June (P) Central California
Origin time: 04 21 31.9
Epicenter: 35.03 N., 119.13 W.
Depth: 5 km
Magnitude: 4.1 mb(G), 4.1 ML, 4.4 ML(B)
Intensity V: Mettler (small objects overturned), Pumpkin Center (furniture shifted), Tupman (small objects fell).
Intensity IV: Fellows, Lebec, Taft.
Intensity III: Frazier Park, Shafter.
Intensity II: Buena Vista pumping plant (P), New Cuyama, Santa Barbara (P), Saugus.

California--Continued

25 June (P) Southern California
Origin time: 07 31 11.4
Epicenter: 34.05 N., 117.27 W.
Depth: 5 km
Magnitude: 3.1 ML
Intensity II: Fontana (P).

2 July (B) Northern California
Origin time: 11 57 57.0
Epicenter: 36.90 N., 122.18 W.
Depth: 10 km
Magnitude: 4.2 ML
Intensity V: Capitola (small objects fell), Watsonville (small objects fell).
Intensity IV: Aptos, Boulder Creek, Davenport, East Santa Cruz, Felton, Mount Herman, Pescadero, Salinas, Santa Cruz.
Intensity II: Brookdale, Santa Clara.

5 July (P) Southern California
Origin time: 10 47 55.6
Epicenter: 33.88 N., 116.50 W.
Depth: 1 km
Magnitude: 3.8 ML
Intensity V: North Palm Springs (small objects fell, few windows cracked, light furniture shifted).
Intensity IV: Banning, Desert Hot Springs (press report), Indio, Landers, Palm Springs.

18 July (B) Central California
Origin time: 19 09 03.7
Epicenter: 36.99 N., 121.67 W.
Depth: 5 km
Magnitude: 2.9 ML
Intensity IV: Corralitos.
Intensity III: Watsonville.

21 July (P) Southern California
Origin time: 13 24 41.9
Epicenter: 34.05 N., 118.90 W.
Depth: 13 km
Magnitude: 3.0 ML
Intensity III: Newbury Park (P), Redondo Beach (P).

23 July (B) Northern California
Origin time: 07 33 35.6
Epicenter: 39.40 N., 121.46 W.
Depth: 5 km
Magnitude: 3.3 ML
Intensity III: Nevada City, Oroville.

23 July (B) Central California
Origin time: 14 38 42.4
Epicenter: 35.93 N., 120.51 W.
Depth: 12 km

Magnitude: 3.2 ML
Intensity II: Bradley.

26 July (P) Southern California
Origin time: 00 38 53.6
Epicenter: 34.35 N., 116.92 W.
Depth: 6 km
Magnitude: 3.8 ML
Intensity IV: Apple Valley, Big Bear City, Big Bear Lake, Green Valley Lake.
Intensity III: Fawnskin, Lucerne Valley, San Bernardino.

31 July (B) Northern California
Origin time: 09 15 44.3
Epicenter: 37.71 N., 122.14 W.
Depth: 9 km
Magnitude: 3.0 ML
Intensity IV: Danville (press report).
Intensity III: Castro Valley (press report), Hayward (press report), Lafayette (B), Oakland (B), San Leandro (press report), San Lorenzo (press report).

1 August (B) Northern California
Origin time: 09 02 34.5
Epicenter: 41.45 N., 121.88 W.
Depth: 2 km
Magnitude: 4.5 mb(G), 4.6 ML

This is the largest event in a series of earthquakes which occurred in this area over a period of several months, six of which were felt within the following 7 hours. The magnitude 4.3 event at 09 46 44.6 was felt at about the same intensity as this one, but because it occurred only 44 minutes later, the intensity data for the separate events could not be differentiated. Most of these earthquakes that were over magnitude 3.0 were felt by Forest Service personnel. The intensities listed below are associated with this event, the largest in the series, but may also include data from the following event at 09 46 44.6.

Surface fractures were associated with this activity. The ruptures occurred along the Stephens Pass fault (Bennett and others, 1979), a 2-km-long fault trending north from a point 260 m south of Stephens Pass Road, at a point about 31 km northeast of McCloud.

Intensity V: Dunsmuir (heavy furniture shifted).
Intensity IV: Bieber, Big Bend, Dorris, Edgewood, Etna, Gazelle, Klamath River, Macdoel, McCloud, Mount Hebron, Mount Shasta, Scott Bar, Tennant, Weed.

California--Continued

3 August (P) Southern California
Origin time: 04 30 42.1
Epicenter: 33.67 N., 116.70 W.
Depth: 5 km
Magnitude: 3.5 ML
Intensity IV: Palm Springs.
Intensity II: Idyllwild (P).

11 August (P) Southern California
Origin time: 00 47 30.1
Epicenter: 34.15 N., 117.45 W.
Depth: 4 km
Magnitude: 4.0 ML
Intensity IV: Arlington, Bloomington, Brea, Bryn Mawr, Colton, Compton, Crestline, Del Rosa, Etiwanda, Fawnskin, Fontana, Glendale, Lake Arrowhead, Lakewood, Llano, Loma Linda, Los Angeles, Mount Baldy, Norton AFB, Pacific Palisades, Redlands, Rimforest, Riverside, Rubidoux, San Bernardino, Santa Fe Springs, Sunnymead, Wrightwood.
Intensity III: Bellflower, Canoga Park, Cedarpines Park, Leona Valley, Northridge, Palm Springs, Pasadena (press report), Sylmar, Westside.
Intensity II: Blue Jay, El Toro Marine Air Station, Montrose, Ontario, Saugus, Toluca Lake.

13 August (B) Northern California
Origin time: 05 55 48.0
Epicenter: 41.43 N., 121.89 W.
Depth: 2 km
Magnitude: 4.3 mb(G), 4.1 MS(G), 4.3 ML
Intensity IV: Horse Creek, McCloud, Weed.
Intensity II: Forks of Salmon.

13 August (K) Southern California
Origin time: 22 54 52.4
Epicenter: 34.37 N., 119.72 W.
Depth: 12 km
Magnitude: 5.5 mb(G), 5.6 MS(G), 5.1 ML, 5.7 ML(B)

The damage described below was taken from a report by Miller and Felszeghy, 1978.

About 65 people were injured, but there were no fatalities. The worst damage (intensity VII) occurred at the University of California Santa Barbara (UCSB) campus, at Goleta, and at Santa Barbara. At the UCSB campus several of the multi-story, reinforced-concrete structures sustained moderate diagonal cracking of the shear walls in the lower stories. Instruments and supplies were destroyed in some laboratories. Damage occurred to

light fixtures, ceilings, and plaster throughout the campus. Similar but less severe damage occurred in the commercial district of Goleta and in the Santa Barbara area. The damage loss is estimated at $7.31 million.

A Southern Pacific Transportation Company freight-train derailment occurred west of Goleta near Winchester Canyon Road in an area of cut-and-fill roadbed (fig. 10). The 49 empty and 9 loaded cars travelling at about 50 mph derailed when passing over a "kink" in the tracks, apparently the result of roadbed-fill failure; 30 of the cars were derailed and a section of the track was damaged.

A total of three overpasses crossing U.S. Highway 101, all steel-reinforced concrete structures located in the Goleta area, suffered significant earthquake damage. These overpasses are: the adjacent curving bridges on Ward Memorial Road, the one at Glen Annie Road, and the one at the western end of Hollister Avenue just east of the railroad derailment. The most extensive damage was sustained by the Ward Memorial bridges, which were subjected to considerable transverse motion that shifted the superstructures relative to the abutments causing the concrete to crack and spall in a number of places. Most of the Ward Memorial Road bridges' bents sustained damage that ranged from light cracking and incipient spalling, to localized deep spalling that exposed reinforcement bars.

The earthquake caused several rock slides on San Marcos Pass Road, the section of State Highway 154 that runs northwest through the Santa Ynez Mountains from U.S. Highway 101 between Goleta and Santa Barbara. Most of the slides occurred on roadcuts where there were steep inclines. Extension fractures opened in at least one area on a steep slope which forms the shoulder of the highway. Some minor slides occurred along the cliffs at the coastline and off the roads in the Santa Ynez Mountains.

Porcella and others (1978) reported that eight accelerograms were recovered from strong-motion stations at Santa Barbara, Goleta, Cochuma Dam, and the UCSB campus. The highest accelerations that were

California--Continued

recorded at the three-story North Hall building on the UCSB campus were 0.44 g, 0.66 g, and 0.99 g, for the ground, third floor, and roof levels, respectively.

Due to an error, the affected area of this earthquake was insufficiently canvassed with USGS questionnaires; as a result, the isoseismal map shown in figure 11 does not have as much intensity data as would normally be collected. However, the data is extensive enough to show this earthquake was felt over an area of approximately 25,000 sq km along the southern California coast.

Intensity VII:

Goleta-University of California Santa Barbara area--There was significant earthquake damage to buildings within an 8-km radius of the UCSB campus. On campus there was extensive cracking of reinforced-concrete shear walls in the Biological Sciences II Building, Engineering Building, Library III, University Center, Anacapa Residence Hall, Santa Cruz Residence Hall, and North Hall. Mechanical equipment on or near the roof tops of multistory buildings suffered considerable damage from building movement during the earthquake. A few very old adobe or wood-frame buildings were seriously damaged.

The Air Traffic Control Tower at the airport, a steel-frame structure with lateral reinforcment, was shaken so that it sustained an estimated permanent deflection of 1.3 to 2.5 cm. Two other buildings sustained cracked concrete-floor slabs, with shifted wood columns and walls in one. Damage to the hangars consisted of buckled diagonal steel bracings and failure of some of the structural connections at the supports for the large sliding doors.

The Ward Memorial Road bridges were damaged by the shifting of the ground, which caused the bridge decks to impact at several expansion joints and resulted in cracked and spalled concrete. The bridges were temporarily closed.

The most common damage to residential and small commercial buildings consisted of

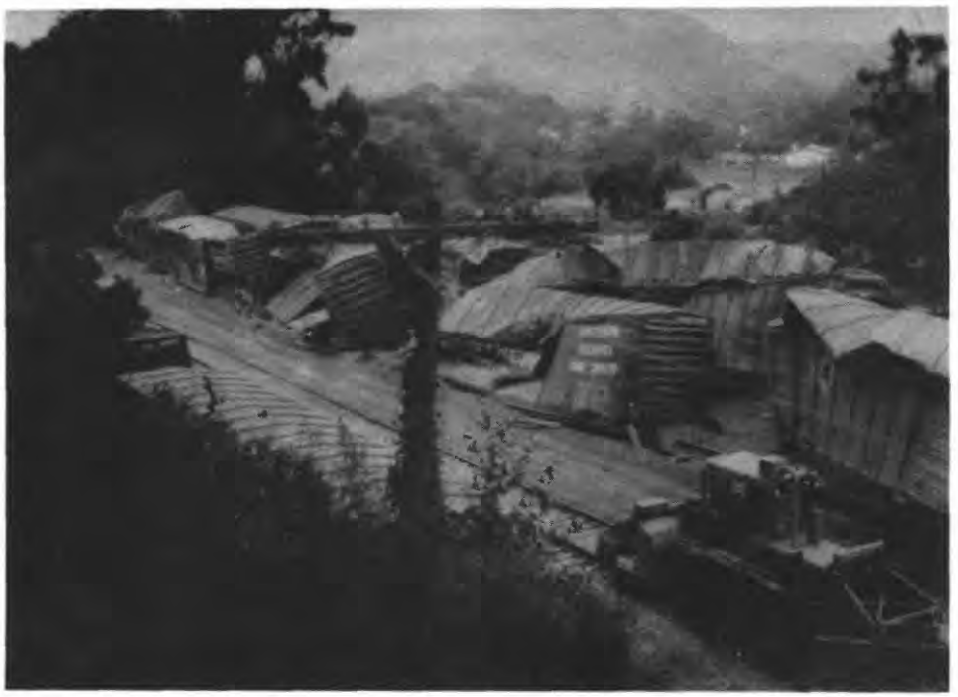

FIGURE 10.--Southern Pacific Transportation Company freight train derailment west of Goleta, Calif.

California--Continued

cracked and fallen plaster and stucco, differential settlement of foundations, failure of unreinforced chimneys, fallen hot water heaters, dislodgement of air-conditioning ducts, dislodgement of tiles and panels from suspended acoustical ceilings, lighting fixtures loosened or fallen, and glass broken. A common type of damage to mobile homes is shown in figure 12. The mobile homes were thrown off their mounts, crumpling the skirts around the base and dislodging the contents of the home.

The most widespread type of damage was breakage of household belongings and store merchandise that toppled from shelves. In homes, cupboards and refrigerators were thrown open, spilling their contents. Liquor stores and supermarkets sustained heavy losses from breakage. About one-third of the UCSB library's 1.2 million books were thrown to the floor. The UCSB laboratories suffered much damage and glass breakage when wall cabinets broke loose and fell, spilling their contents.

Santa Barbara--Several multistory

California--Continued

buildings sustained diagonal cracks in their reinforced-concrete shear walls, particularly in the lower floors. The Freitas Building at 200 E. Carrillo Street and the Santa Barbara Court House Building suffered some damage. The Santa Barbara County Administration Building at Anacapa and Anapamu Streets suffered diagonal tension cracks in some of the columns on the north side of the building. The roof of an unoccupied restaurant that was being remodeled at 100 W. Anapamu Street collapsed. The floating dock at Marina No. 1 was damaged by the movement of the concrete support piles which were buried 3.6 m into the mud. Several water mains were broken. There was widespread breakage and damage to household belongings or store merchandise as described for the Goleta area above.

Intensity VI: Solvang (cracked drywall, hairline cracks in exterior walls, stone or brick fences cracked, few windows cracked, small objects shifted, vehicles rocked moderately, felt by all).

Intensity V: Carpenteria, Los Alamos, Santa Maria, Santa Ynez.

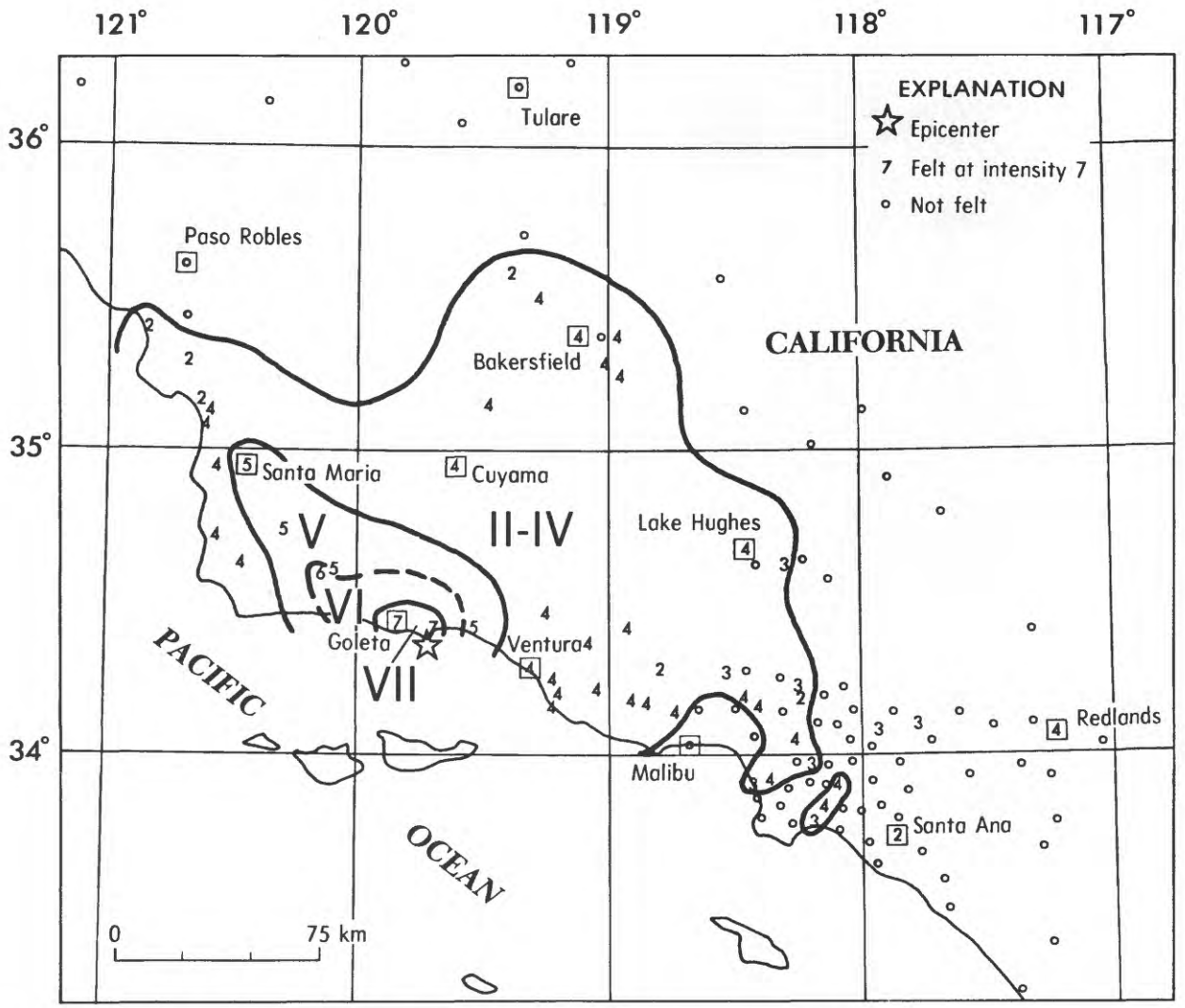

FIGURE 11.--Isoseismal map for the southern California earthquake of 13 August 1978, 22 54 53.5 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

California--Continued

Intensity IV: Agoura, Arroyo Grande, Artesia, Bakersfield, Camarillo, Cuyama, East Ventura, Fillmore, Grover City, Guadalupe, Halcyon, Hawthorne, Hillcrest Center, Lake Hughes, Lakewood, Lamont, Lompoc, Montalvo, Newbury Park, Norwalk, Oxnard, Palms, Pineside, Port Hueneme, Pumpkin Center, Oceano, Ojai, Redlands, Santa Paula, Shafter, Sherman Oaks, Studio City, Taft, Thousand Oaks, Van Nuys, Vandenburg AFB, Ventura.
Intensity III: Bellflower, Granada Hills, La Crescenta, La Verne, Leona Valley, Long Beach, Manhattan Beach, West Covina.
Intensity II: Montrose, Morro Bay,

California--Continued

Pismo Beach, San Luis Obispo, Santa Ana (Marine Corps Air Station), Simi Valley, Wasco.

13 August (K) Southern California
Origin time: 23 11 01.7
Epicenter: 34.40 N., 119.76 W.
Depth: 13 km
Magnitude: 3.4 ML(P), 3.3 ML
Intensity II: Santa Barbara area.

13 August (K) Southern California
Origin time: 23 15 02.5
Epicenter: 34.41 N., 119.77 W.
Depth: 13 km
Magnitude: 3.1 ML(P), 3.0 ML
Intensity II: Santa Barbara area.

FIGURE 12.--Damage to mobile home near Goleta, Calif.

California--Continued

13 August (K) Southern California
Origin time: 23 23 53.8
Epicenter: 34.40 N., 119.74 W.
Depth: 12 km
Magnitude: 3.4 ML(P), 2.9 ML
Intensity II: Santa Barbara area.

14 August (K) Southern California
Origin time: 01 02 35.1
Epicenter: 34.40 N., 119.72 W.
Depth: 14 km
Magnitude: 3.1 ML(P), 2.7 ML
Intensity II: Santa Barbara area.

16 August (B) Northern California
Origin time: 07 45 32.4
Epicenter: 40.33 N., 124.39 W.
Depth: 23 km
Magnitude: 3.8 ML
Intensity IV: Fortuna, Rio Dell.
Intensity III: Eureka, Ferndale, Freshwater, Scotia.

16 August (K) Southern California
Origin time: 13 35 11.6
Epicenter: 34.41 N., 119.80 W.
Depth: 11 km
Magnitude: 3.5 ML(P), 3.2 ML
Intensity IV: Goleta (University of California Santa Barbara campus), Los Olivos, Oxnard, New Cuyama, Santa Barbara.
Intensity II: Ventura.

19 August (P) Baja California
Origin time: 09 31 07.3
Epicenter: 32.42 N., 116.83 W.
Depth: 5 km

California--Continued

Intensity V: Tecate (light furniture shifted; small objects shifted; windows, doors, and dishes rattled, few awakened).
Intensity IV: Alpine, Bonita, Bostonia, Boulevard, Campo, Chula Vista, Dulzura, El Cajon, Guatay, Imperial Beach, Jamul, La Jolla, Lakeside, La Mesa, Lemon Grove, Pine Valley, Ramona, San Diego, San Diego (Lindbergh Field), San Diego (Montgomery Field), Santee, University City.
Intensity II: San Ysidro.

28 August (B) Central California
Origin time: 03 32 18.4
Epicenter: 37.55 N., 121.86 W.
Depth: 11 km
Magnitude: 2.8 ML
Intensity IV: Fremont, Mountain View, Warm Springs (all reported windows, doors, and dishes rattled; buildings creaked or trembled).
Intensity III: San Leandro.
Intensity II: Livermore (press report), Pleasanton, Redwood, Walnut Creek (press report).

29 August (B) Northern California
Origin time: 00 14 46.4
Epicenter: 37.36 N., 121.72 W.
Depth: 8 km
Magnitude: 4.1 ML
Intensity VI: San Jose--east side of the city (acoustical ceiling tiles fell in an East Side supermarket; at 3720 Sierra Road cracks

and the walls were lifted 1.7 cm from the floor; in Eastridge a small amount of glassware was broken--press report).
Intensity V: Hayward (small objects broken; windows, doors, and dishes rattled), Mount Hamilton--Lick Observatory (small cracks in dry-wall, hairline cracks in exterior walls), San Jose (Cambrian Park--small objects overturned).
Intensity IV: Boulder Creek, Burlingame, Felton, Moffett Field NAS, Mountain View, Oakland, Santa Clara, Sunnyvale, Union City, Vallejo.
Intensity III: Fremont (B), Milpitas, Pacifica.
Intensity II: Alameda, Belmont, Livermore (press report), Newark (press report), Santa Cruz, Stockton (Airport Control Tower).

29 August (B) Northern California
Origin time: 00 18 45.3
Epicenter: 37.35 N., 121.72 W.
Depth: 7 km
Magnitude: 3.8 ML
Intensity IV: Mount Hamilton--Lick Observatory.
Intensity III: Fremont (B), San Jose (press report), San Jose (Cambridge Park).

29 August (P) Southern California
Origin time: 06 04 49.8
Epicenter: 34.38 N., 119.77 W.
Depth: 5 km
Magnitude: 2.8 ML
Intensity II: Santa Barbara (P).

29 August (P) Southern California
Origin time: 10 51 46.0
Epicenter: 34.38 N., 119.80 W.
Depth: 5 km
Magnitude: 2.5 ML
Intensity II: Santa Barbara (P).

1 September (B) Northern California
Origin time: 09 31 25.4
Epicenter: 37.34 N., 121.78 W.
Depth: 8 km
Magnitude: 3.3 ML
Intensity II: San Jose (B).

3 September (P) Southern California
Origin time: 18 10 46.5
Epicenter: 33.95 N., 117.72 W.
Depth: 6 km
Magnitude: 3.8 ML
Intensity IV: La Puente, Pomona, Riverside, Yorba Linda.
Intensity III: Los Serranos.
Intensity II: Anaheim (press report), Chino, Diamond Bar, East Los Angeles County (P), North Orange County (P), Redlands, South San Bernardino.

4 September (B) Lake Tahoe region
Origin time: 04 52 32.3
Epicenter: 38.82 N., 119.81 W.
Depth: 18 km
Magnitude: 3.9 mb(G), 4.6 ML

Only the Topaz and eastern Amador County intensity data are from USGS questionnaires, all the other intensities are based on press reports.

Intensity V:
California--South Lake Tahoe (few broken dishes).
Intensity IV:
California--Eastern Amador County, in the Lake Tahoe Sierra region.
Nevada--Gardnerville, Stateline, Topaz.
Intensity III:
California--Grass Valley, Ione, Jackson, Leek Springs (El Dorado National Forest), Placerville, Pollock Pines, Tahoe City, Truckee.
Nevada--Carson City, Incline Village, Minden, Zephyr Cove.
Intensity II:
California--Stockton, Strawberry.

4 September (B) Lake Tahoe region
Origin time: 21 54 53.2
Epicenter: 38.81 N., 119.82 W.
Depth: 19 km
Magnitude: 4.7 mb(G), 5.3 ML

This is the largest magnitude event of a series of earthquakes on September 3 and 4 in the area south of Lake Tahoe. It was felt over an area of approximately 45,500 sq km of California and Nevada (fig. 13).

Intensity VI:
California--Mt. Aukum (dry wall cracked, hairline cracks in exterior walls, water splashed onto sides of lakes and pools).
Nevada--Genoa (plaster and dry wall cracked; hairline cracks in exterior walls; windows, doors, and dishes rattled; vehicles rocked slightly; buildings shook).
Intensity V:
California--Bear Valley (heavy furniture shifted; small objects shifted; pictures fell; buildings shook; windows, doors, and dishes rattled), Camp Connell (light furniture shifted; small objects shifted; hanging pictures swung; buildings shook; windows, doors, and dishes rattled), Glencoe (heavy furniture shifted; hanging pictures swung; buildings shook; windows, doors, and dishes rattled), South Lake Tahoe (small objects fel ; water in smal con

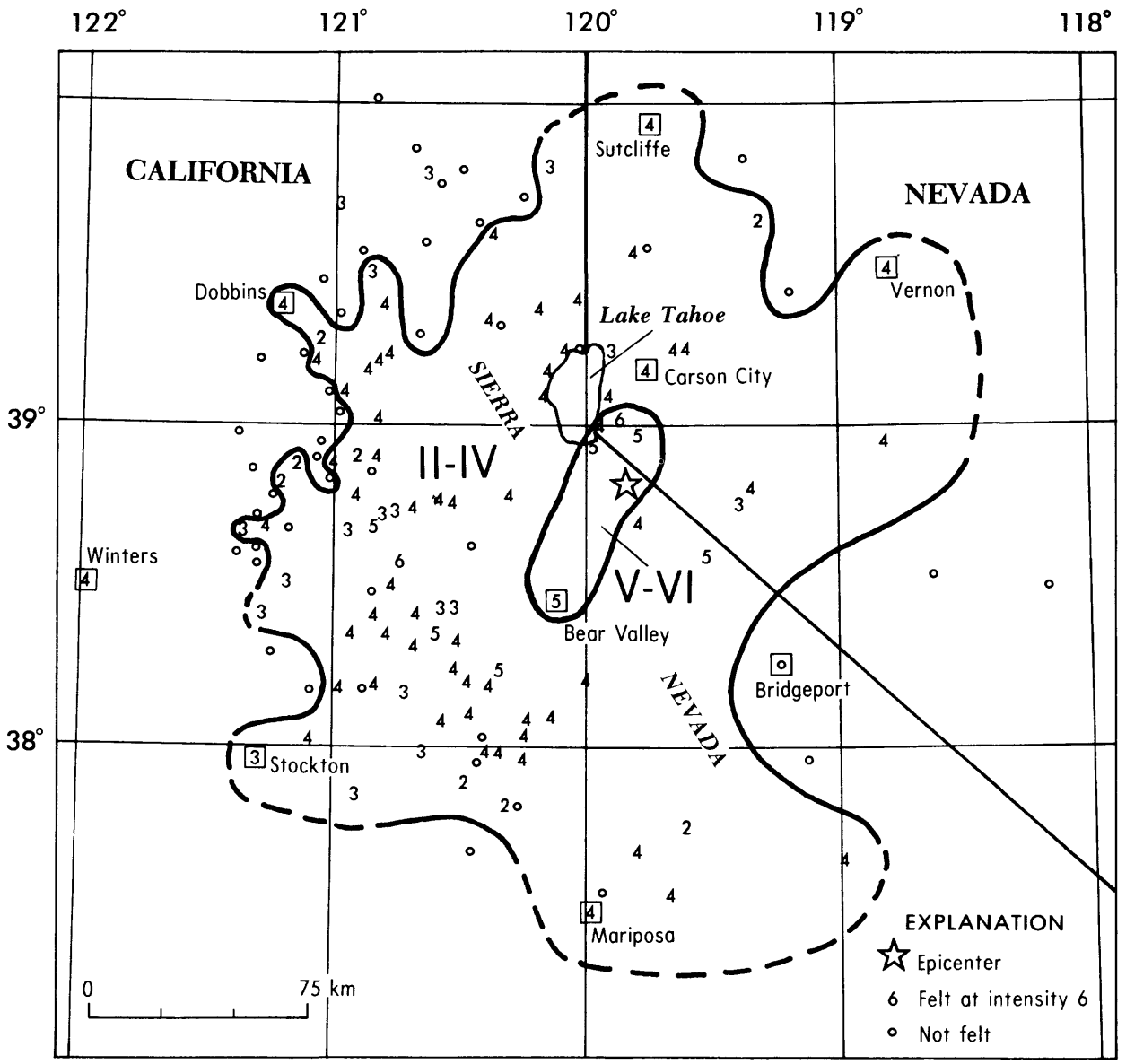

FIGURE 13.--Isoseismal map for the Lake Tahoe earthquake of 4 September 1978, 21 54 53.2 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

California--Continued

tainers slightly disturbed; buildings shook; windows, doors, and dishes rattled), Topaz (small objects fell, buildings shook; windows, doors, and dishes rattled). Twin Bridges (light furniture shifted; small objects fell; hanging pictures swung; buildings shook; windows, doors, and dishes rattled).

Nevada--Minden (light furniure shifted; small objects overturned, fell, and broke; water in

California--Continued

small containers spilled; hanging pictures swung out of place; buildings shook; windows, doors, and dishes rattled).

Intensity IV:

California--Alta, Altaville, Amador City, Angels Camp, Arnold, Baxter, Camino, Carnelian Bay, Chicago Park, Citrus Heights, Coleville, Colfax, Cool, Diamond Springs, Dobbins, Douglas Flat, Echo Lake area, El Portal, Fiddletown, Floriston, Foresthill,

California--Continued

Georgetown, Gold Run, Hathaway Pines, Homewood, Ione, Jackson, Kyburz, Linden, Long Barn, Lotus, Mammoth Lakes, Mariposa, Markleville, Mi-Wuk Village, Mokelumne Hill, Mono Vista, Mountain Ranch, Murphys, Pacific House, Penn Valley, Pine Grove, Pollock Pines, Rail Road Flat, River Pines, Sheep Ranch, Sierraville, Soda Springs, Sonora, Standard, Stateline (press report), Strawberry, Sutter Creek, Tahoe City, Tahoe Vista, between Tamarak Lake and Echo Lake, Truckee, Tuolumne, Twain Harte, Valley Springs, Wallace, Washington, Wawona, White Pines, Winters.
Nevada--Carson City, Dayton, Fallon, Gardnerville, Glenbrook, Reno, Schurz, Silver City, Smith, Zephyr Cove.

Intensity III:
California--Alleghany, Blairsden, Chilcoot, Copperopolis, Grass Valley (press report), La Porte, Pioneer, Placerville (press report), Sacramento (Foothill Farms), San Andreas, Shingle Springs, Sloughhouse, Smithflat, Stockton, Valley Home, Volcano, West Point, Wilton.
Nevada--Incline Village, Wellington.

Intensity II:
California--Avery, Chinese Camp, Dutch Flat, Greenwood, Loomis, Moccasin, Nevada City, Newcastle, Yosemite Lodge.
Nevada--Wadsworth.

8 September (B) Northern California
Origin time: 16 59 47.8
Epicenter: 38.64 N., 121.91 W.
Depth: 17 km
Magnitude: 4.4 mb(G), 4.2 ML

This earthquake was felt over an area of approximately 4,500 sq km of northern California (fig. 14).

Intensity V: Madison (light furniture and small objects shifted; windows, doors, and dishes rattled; buildings shook; pictures swung), North Highlands (few windows cracked; windows, doors, and dishes rattled).
Intensity IV: Brooks, Capay, Citrus Heights, College City, Davis, Dixon, Esparto, Liberty Farms, Rescue, Sacramento, Steele Park, Vacaville, Winters (press report), Woodbridge, Woodland, Yolo, Zamora.
Intensity III: Courtland, Fairfield (press report), Loma Mar, Napa (press report), Robbins, Sonoma (press report), Yountville.
Intensity II: Benecia, Cobb,

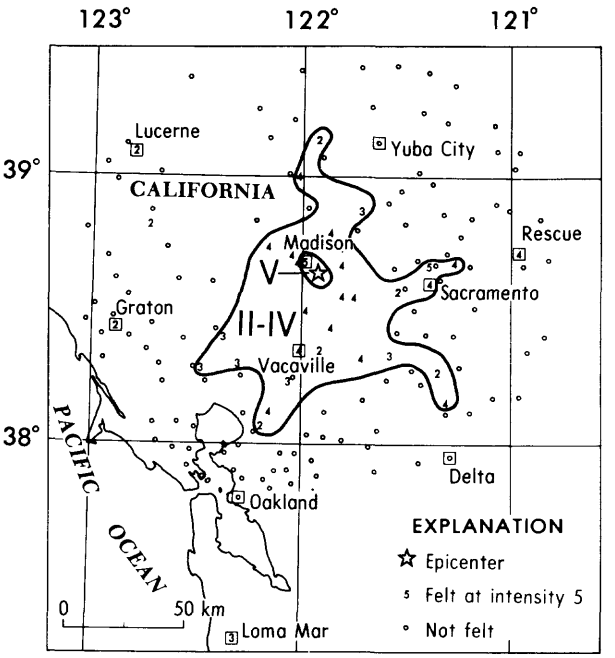

FIGURE 14.--Isoseismal map for the northern California earthquake of 8 September 1978, 16 59 47.8 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

California--Continued

Elmira, Galt, Graton, Lucerne, Meridian, West Sacramento.

12 September (P) Southern California
Origin time: 11 57 55.4
Epicenter: 34.38 N., 119.77 W.
Depth: 6 km
Magnitude: 3.6 ML
Intensity V: Santa Barbara (few windows cracked; light furniture and small objects shifted; hairline cracks in exterior walls; windows, doors, and dishes rattled).
Intensity IV: Goleta, Solvang, Summerland.

17 September (B) Central California
Origin time: 15 38 33.1
Epicenter: 36.68 N., 121.36 W.
Depth: 6 km
Magnitude: 3.9 ML
Intensity IV: San Juan Bautista.

19 September (B) Northern California
Origin time: 15 52 41.5
Epicenter: 37.73 N., 122.56 W.
Depth: 8 km
Magnitude: 2.9 ML

Intensity II: Daly City.

21 September (B) Central California
Origin time: 03 18 57.1
Epicenter: 36.99 N., 121.68 W.
Depth: 8 km
Magnitude: 2.9 ML
Intensity III: Gilroy (B), Monterey (B), Santa Cruz (B), Watsonville (B).

22 September (P) Southern California
Origin time: 03 13 26.8
Epicenter: 33.87 N., 117.83 W.
Depth: 4 km
Magnitude: 2.9 ML
Intensity II: Anaheim.

22 September (B) Northern California
Origin time: 03 26 19.8
Epicenter: 40.63 N., 123.63 W.
Depth: 20 km
Magnitude: 3.7 mb(G), 3.7 ML
Intensity III: Rio Dell.

24 September (P) Southern California
Origin time: 02 04 27.5
Epicenter: 34.38 N., 119.73 W.
Depth: 4 km
Magnitude: 3.6 ML
Intensity IV: Goleta, Isla Vista, Santa Barbara.

26 September (P) Southern California
Origin time: 05 35 03.9
Epicenter: 34.03 N., 118.40 W.
Depth: 6 km
Magnitude: 2.1 ML
Intensity II: Beverly Hills (P).

4 October (P) Owens Valley area
Origin time: 16 42 48.6
Epicenter: 37.53 N., 118.63 W.
Depth: 9 km
Magnitude: 5.4 mb(G), 5.1 MS(G), 5.8 ML(B), 5.8 ML

The press reported that in grocery stores throughout the Bishop area considerable amounts of canned and bottled goods were shaken from shelves and pictures were knocked from walls; and there was a report of a policeman being swayed back and forth and finding it difficult to stand. Boulders rolled onto roads and minor landslides occurred in the canyon areas near Bishop. Landslides were also reported near Mammoth Lakes and in Yosemite National Park. At the Union Carbide Corporation Pine Creek Mine near Bishop about 130 miners were underground at the time of the earthquake, but none were hurt. The earthquake shook rock slides loose throughout the vicinity of the mine causing some road obstructions. A pickup truck was jiggled over the edge on one of the high mine roads. The University of California at Berkeley reported 30 aftershocks in the following 24 hours.

California--Continued

Porcella (1978c) reported that eight accelerographs at Pine Flat and Buchanan Dams northeast of Fresno, California were triggered by this earthquake. The maximum recorded acceleration was less than 0.05 g. This earthquake was felt over an area of approximately 105,000 sq km of California and Nevada (fig. 15).

All of the aftershocks listed in Table 1 were felt in the epicentral region including the town of Bishop; however, not enough specific information is available to assign intensities at individual locations for any of the aftershocks.

Intensity VI:
California--
Benton (plaster cracked, small objects broken, hanging objects swung violently, hanging pictures fell, felt by all)
Bishop (Safeway Supermarket just north of Bishop had a window broken and merchandise knocked from shelves. Grocery stores throughout the area reported considerable amounts of canned and bottled goods shaken from shelves, pictures knocked from walls--press report. Reports of other effects included windows broken, plaster cracked, small objects broken, and felt by all)
Easton (cracked plaster and cracks in exterior walls, small objects overturned, felt by many)
Friant (cracked plaster, cracked interior wall, light furniture shifted, small objects and hanging pictures fell, water in small containers spilled, felt by all)
Mammoth Lakes-Timber Ridge (a swimming pool was cracked to such an extent that it had to be drained--press report)
Paradise Camp--24 km northwest of Bishop (most of the bar stock and glasses were broken and stucco walls were cracked. In Paradise Estates, items were shaken from walls, a mounted deer head fell from a wall, a mirror was broken, and fluorescent light panels fell--press report).

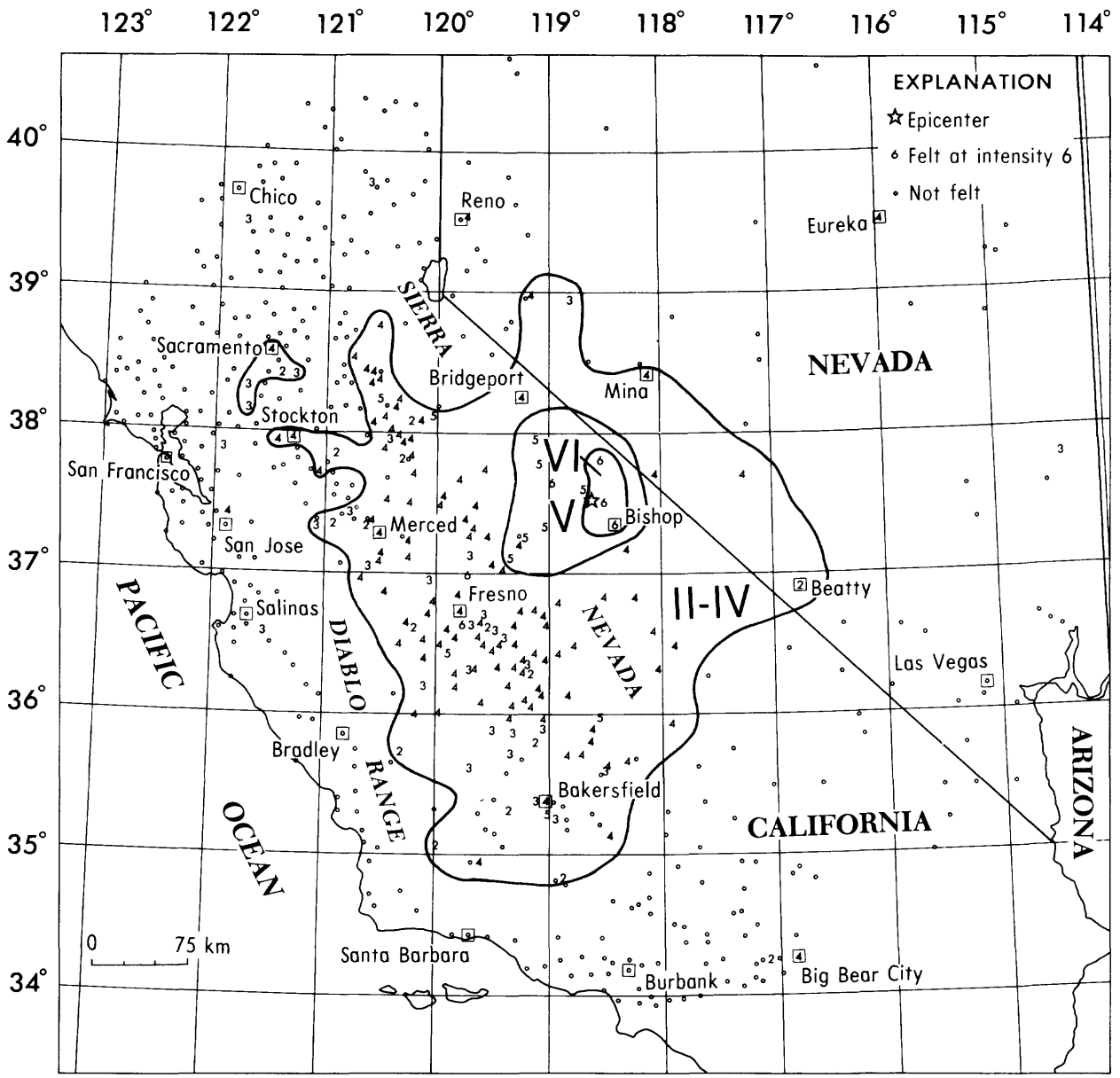

FIGURE 15.--Isoseismal map for the Owens Valley earthquake of 4 October 1978, 16 42 48.6 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

California--Continued

Intensity V:
California--Columbia (press report), Crowley Lake, Crowley Lake Dam, Johnsondale, June Lake, Lakeshore, Lee Vining, Mono Hot Springs, Mountain Ranch, Pumpkin Center, Riverdale, Shaver Lake, Strawberry, Toms Place.

California--Continued

Intensity IV:
California--Ahwahnee, Altaville, Arnold, Auberry, Avenal, Badger, Bakersfield, Bass Lake, Big Bear City, Big Creek, Big Pine, Biola, Bridgeport, Burrel, California Hot Springs, Camp Connell, Cantua Creek, Cartago, Caruthers, Castle AFB,

Catheys Valley, Chinese Camp, Chowchilla, Clovis, Coarsegold, Corcoran, Coulterville, Cutler, Cuyama, Del Rey, Dos Palos, Dunlap, El Nido, El Portal, Farmersville, Farmington, Firebaugh, Fish Camp, Five Points, Fresno, Glencoe, Glennville, Goshen, Groveland, Hanford, Hathaway Pines, Helm, Holt, Hornitos, Hume, Independence, Ivanhoe, Keeler, Kerman, Kettleman City, Kingsburg, Kings Canyon, Lake Isabella, Le Grand, Lemoncove, Lemoore, Lindsay, Little Lake, London, Lone Pine, Long Barn, Mariposa, Merced, Midpines, Miramonte, Murphys, North Fork, Oakhurst, Olancha, Orange Cove, Orosi, Pacific House, Piedra, Pinedale, Pine Grove, Pioneer, Pixley, Poplar, Porterville, Posey, Prather, Rail Road Flat, Raisin, Redtop, River Pines, Sacramento, Salida, Selma, Sequoia National Park, Snelling, Soulsbyville, South Dos Palos, Springville, Squaw Valley, Standard, Stockton, Stratford, Strathmore, Tehachapi (press report), Terra Bella, Three Rivers, Tipton, Tollhouse, Tranquillity, Traver, Tulare, Tuolumne, Twain Harte, Vallecito, Visalia, Volcano, Wawona, Weldon, Wilseyville, Wishon, Woodlake, Woodville, Woody, Yosemite Lodge, Yosemite National Park.

Nevada--Dyer, Eureka, Goldfield, Mina, Sparks, Yerington.

Intensity III:

California--Alpaugh, Armona, Avery, Blairsden, Bodfish, Calwa, Chualar, Delhi, Diablo, Dinuba, Ducor, Earlimart, Fowler, Huron, Jamestown, Lamont, Laton, Liberty Farms, Lost Hills, Madera, Newman, O'Neals, Pollock Pines, Pond, Reedley, Richvale, Rio Vista, Sanger, Santa Rita Park, Wilton.

Nevada--Panaca, Schurz.

Intensity II:

California--Arcata (press report), Atwater, Cholame, Coalinga (press report), Deep Springs (press report), Elk Grove, Exeter, Green Valley Lake, Lebec, Mi-Wuk Village, Moccasin, Mono (press report), Parlier, Richgrove, San Joaquin, Stevinson, Tupman, Valley Home.

Nevada--Beatty.

California--Continued

5 October (B) Northern California
Origin time: 09 56 40.4
Epicenter: 41.46 N., 121.88 W.
Depth: 2 km
Magnitude: 4.2 mb(G), 3.8 MS(G), 4.1 ML(B)
Intensity IV: McCloud.

6 October (B) Northern California
Origin time: 21 26 34.4
Epicenter: 40.38 N., 124.27 W.
Depth: 20 km
Magnitude: 4.8 mb(G), 4.2 MS(G), 4.6 ML

Felt in the coastal areas from Arcata to Cape Mendocino (B).

Intensity V: Miranda.
Intensity IV: Bayside, Bridgeville, Eureka, Fortuna, Rio Dell, Weott.
Intensity III: Garberville (press report), Redway (press report).

9 October (B) Central California
Origin time: 20 49 45.8
Epicenter: 36.68 N., 121.37 W.
Depth: 6 km
Magnitude: 3.3 ML
Intensity III: Chualar and San Benito County (B).

10 October (B) Central California
Origin time: 01 38 36.9
Epicenter: 36.61 N., 121.28 W.
Depth: 8 km
Magnitude: 3.8 ML
Intensity II: San Benito County (B).

10 October (B) California
Origin time: 04 28 51.8
Epicenter: 38.80 N., 119.82 W.
Depth: 10 km
Magnitude: 3.1 ML(B)
Intensity II: Markleeville area (B).

10 October (P) Central California
Origin time: 09 06 57.4
Epicenter: 35.08 N., 117.50 W.
Depth: 6 km
Magnitude: 3.6 ML
Intensity II: Edwards AFB (P).

16 October (B) Northern California
Origin time: 02 18 07.0
Epicenter: 40.46 N., 124.30 W.
Depth: 20 km
Magnitude: 3.7 ML(B)
Intensity III: Rio Dell.

19 October (P) Southern California
Origin time: 09 10 24.5
Epicenter: 33.83 N., 118.07 W.
Depth: 5 km

Magnitude: 1.9 ML
Intensity II: Lakewood (P).

26 October (P) Owens Valley area
Origin time: 19 00 41.3
Epicenter: 37.52 N., 118.58 W.
Depth: 9 km
Magnitude: 4.0 ML(B), 3.9 ML(P)
Intensity IV: Mariposa.
Intensity II: Yosemite (B).

27 October (B) Central California
Origin time: 12 00 22.2
Epicenter: 37.26 N., 121.64 W.
Depth: 4 km
Magnitude: 3.1 ML
Intensity II: San Jose (B).

29 October (B) Northern California
Origin time: 06 50 49.1
Epicenter: 40.30 N., 124.73 W.
Depth: 20 km
Magnitude: 3.8 ML
Intensity IV: Rio Dell.

29 October (P) Southern California
Origin time: 08 09 59.5
Epicenter: 33.92 N., 118.30 W.
Depth: 5 km
Magnitude: 2.9 ML

Felt in the southwest Los Angeles Basin (P).

Intensity IV: El Segundo (press report), Hawthorne, Inglewood (press report), Los Angeles, Manhattan Beach (press report), Torrance (press report).

29 October (P) Southern California
Origin time: 22 16 09.0
Epicenter: 34.32 N., 118.63 W.
Depth: 3 km
Magnitude: 3.6 ML(P)
Intensity IV: Tarzana.
Intensity II: Canoga Park, Malibu (P).

30 October (B) Central California
Origin time: 16 05 04.6
Epicenter: 36.67 N., 121.36 W.
Depth: 6 km
Magnitude: 3.2 ML
Intensity II: Hollister (B).

1 November (P) Imperial Valley
Origin time: 06 42 22.6
Epicenter: 32.75 N., 115.52 W.
Depth: 6 km
Magnitude: 2.8 ML
Intensity II: El Centro (P).

6 November (P) Owens Valley area
Origin time: 16 22 25.0
Epicenter: 37.53 N., 118.62 W.
Depth: 9 km

California--Continued

Magnitude: 3.4 ML(B), 3.5 ML
Intensity II: Bishop (B).

11 November (P) Southern California
Origin time: 04 24 04.6
Epicenter: 33.63 N., 117.88 W.
Depth: 3 km
Magnitude: 2.7 ML
Intensity V:
Costa Mesa (dishes, pots, and pans crashed to the floor when cupboard doors flew open--press report),
Santa Ana Heights (press reports of breakage of stored items when they were knocked loose from their "moorings").
Intensity IV: Huntington (press report), Newport Beach (press report).

12 November (B) Northern California
Origin time: 13 07 57.3
Epicenter: 39.49 N., 122.95 W.
Depth: 6 km
Magnitude: 3.8 ML
Intensity IV: Potter Valley, Willits.

13 November (P) Southern California
Origin time: 16 49 43.1
Epicenter: 34.43 N., 119.70 W.
Depth: 13 km
Magnitude: 3.2 ML
Intensity II: Goleta, Santa Barbara.

13 November (P) Southern California
Origin time: 16 50 58.3
Epicenter: 34.43 N., 119.70 W.
Depth: 15 km
Magnitude: 3.3 ML
Intensity II: Goleta, Santa Barbara.

16 November (P) Southern California
Origin time: 13 28 46.7
Epicenter: 34.15 N., 117.60 W.
Depth: 6 km
Magnitude: 3.2 ML
Intensity IV: Etiwanda.
Intensity II: Claremont (P), Pomona (P).

19 November (P) Southern California
Origin time: 04 20 05.6
Epicenter: 33.85 N., 118.17 W.
Depth: 12 km
Magnitude: 2.7 ML
Intensity II: Lakewood (P), Long Beach (P).

19 November (P) Southern California
Origin time: 17 40 56.9
Epicenter: 33.85 N., 118.18 W.
Depth: 5 km
Magnitude: 3.1 ML(P)

Felt in the Los Angeles area (press

California--Continued

report).

Intensity IV: Bellflower, Harbor City, Lakewood, Long Beach, Los Alamitos, Maywood.
Intensity III: Cypress, Montebello.
Intensity II: Downey (P), Hawthorne, Watts (P).

19 November (P) Southern California
Origin time: 18 00 16.4
Epicenter: 33.85 N., 118.17 W.
Depth: 12 km
Magnitude: 2.8 ML(P)

Felt in the Los Angeles area (press report).

Intensity III: North Long Beach, Watts.

20 November (P) Southern California
Origin time: 06 55 09.4
Epicenter: 34.15 N., 116.97 W.
Depth: 5 km
Magnitude: 4.0 mb(G), 4.2 ML

Felt in Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties.

Intensity VI: Redlands (interior plaster walls cracked and split, hairline cracks in exterior walls, light furniture and small objects shifted, windows cracked).
Intensity V: Auga Caliente Springs (small objects fell), Highland (pictures knocked off walls--press report).
Intensity IV: Beaumont, Cathedral City, El Cajon, Hemet, Landers, Mead Valley, Morongo Valley, Palm Springs, Rancho Mirage, Rialto, Riverside, Running Springs, Sunnymead, Yucaipa.
Intensity III: Cypress, Long Beach, San Bernardino.
Intensity II: Anaheim (P), Downey (P), Newport Beach (P), Pasadena (P), Twentynine Palms.

20 November (P) Southern California
Origin time: 06 58 45.0
Epicenter: 34.15 N., 116.97 W.
Depth: 6 km
Magnitude: 3.5 ML(P)
Intensity III: Cathedral City, Running Springs.

20 November (P) Southern California
Origin time: 21 21 49.1
Epicenter: 34.15 N., 116.98 W.
Depth: 5 km
Magnitude: 3.1 ML
Intensity II: Big Bear Lake (P).

California--Continued

25 November (P) Owens Valley area
Origin time: 03 24 55.3
Epicenter: 37.50 N., 118.70 W.
Depth: 8 km
Magnitude: 3.4 ML, 3.5 ML(B)
Intensity II: Bishop (B).

25 November (P) Owens Valley area
Origin time: 04 06 41.4
Epicenter: 37.53 N., 118.68 W.
Depth: 9 km
Magnitude: 3.5 ML, 3.3 ML(B)
Intensity II: Bishop (B).

1 December (P) Southern California
Origin time: 23 20 46.5
Epicenter: 33.93 N., 116.68 W.
Depth: 5 km
Magnitude: 3.6 ML
Intensity II: Palm Springs (press report).

6 December (P) Southern California
Origin time: 10 03 49.3
Epicenter: 34.38 N., 119.75 W.
Depth: 5 km
Magnitude: 3.2 ML
Intensity III: Santa Barbara (press report).

6 December (P) Southern California
Origin time: 11 21 48.7
Epicenter: 34.37 N., 119.75 W.
Depth: 5 km
Magnitude: 2.2 ML
Intensity II: Santa Barbara (press report).

14 December (P) Southern California
Origin time: 08 55 20.4
Epicenter: 34.40 N., 119.50 W.
Depth: 5 km
Magnitude: 3.1 ML
Intensity IV: Carpenteria (press report).
Intensity III: Santa Barbara (press report).

29 December (P) Southern California
Origin time: 06 30 30.4
Epicenter: 33.93 N., 118.33 W.
Depth: 3 km
Magnitude: 2.3 ML
Intensity II: Hawthorne (P), Inglewood (P).

California--Off the coast

23 May (B) Northern California
Origin time: 21 42 02.9
Epicenter: 40.44 N., 124.85 W.
Depth: 35 km
Magnitude: 4.4 mb(G), 4.6 ML
Intensity IV: Bayside, Eureka, Fortuna, Miranda.
Intensity III: Bridgeville, Eel

California--Off the coast--Continued

River and Van Duzen River Valleys (press report).

1 June (B) Northern California
Origin time: 18 38 20.9
Epicenter: 40.34 N., 124.84 W.
Depth: 5 km
Magnitude: 3.7 mb, 4.0 ML(B)
Intensity IV: Rio Dell.

Colorado

10 June (G) Northern Colorado
Origin time: 20 57 53.5
Epicenter: 39.78 N., 104.87 W.
Depth: 20 km
Magnitude: 2.9 ML
Intensity IV: Denver (Park Hill), Denver (1335 Rosemary St, 1680 Magnolia St, 1603 Clermont St--press report), Thornton (2501 E. 104th St--press report), Henderson (1098 Brighton Road).
Intensity III: Commerce City.
Intensity II: Thornton (post office).

Delaware

16 July (G) Southeastern Pennsylvania
Origin time: 06 39 37.8

See Pennsylvania listing.

Florida

12 January Central Florida
Origin time: 21 10
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity IV: Haines City (press report).

6 November Northern Florida
Origin time: 23 00
Epicenter: 30.20 N., 82.65 W.
Depth: None computed.
Magnitude: None computed.

The epicenter given is a macroseismic location taken from the felt information. The magnitude is estimated to be less than 2.0. There were reports of two events, on November 14 at 20 14 UTC and on November 16 at 19 00 UTC; both were reported felt, but neither were recorded on the nearest seismographs and may not have been seismic.

Florida--Continued

Intensity IV: Lake City (press reported doors rattled and houses shook).

Hawaii

The locations listed below that are followed by (H) designate intensity values assigned by the Hawaiian Volcano Observatory.

4 January (H) Island of Hawaii
Origin time: 18 42 27.2
Epicenter: 19.33 N., 155.18 W.
Depth: 10 km
Magnitude: 3.7 ML
Intensity IV: Hilo (H).
Intensity III: Kurtistown (H), Laupahoehoe (H), Volcano (H).

5 January (H) Island of Hawaii
Origin time: 13 58 46.6
Epicenter: 19.32 N., 155.27 W.
Depth: 10 km
Magnitude: 3.2 ML
Intensity IV: Ainahou Ranch (H).

11 January (H) Island of Hawaii
Origin time: 08 33 11.3
Epicenter: 19.33 N., 155.22 W.
Depth: 10 km
Magnitude: 3.8 ML
Intensity IV: Hilo (H).
Intensity III: Glenwood (H), Hamakua (H), Mountain View (H), Puna (H), Volcano (H).

13 January (H) Island of Hawaii
Origin time: 00 34 06.1
Epicenter: 19.53 N., 155.95 W.
Depth: 10 km
Magnitude: 3.0 ML
Intensity III: Kona (H).

23 January (H) Island of Hawaii
Origin time: 06 21 38.5
Epicenter: 19.33 N., 155.06 W.
Depth: 9 km
Magnitude: 3.7 ML
Intensity IV: Glenwood (H), Hilo (H), Kalapana (H), Kurtistown (H), Mountain View (H), Volcano (H).
Intensity III: Papaikou (H).

23 January (H) Island of Hawaii
Origin time: 06 28 26.9
Epicenter: 19.34 N., 155.07 W.
Depth: 9 km
Magnitude: 3.6 ML
Intensity IV: Glenwood (H), Hilo (H), Kurtistown (H), Mountain View (H), Volcano (H).
Intensity III: Papaikou (H).

25 January (H) Island of Hawaii
Origin time: 01 18 16.8
Epicenter: 19.33 N., 155.10 W.
Depth: 9 km
Magnitude: 3.2 ML
Intensity III: Hilo (H).

3 February (H) Island of Hawaii
Origin time: 05 32 45.8
Epicenter: 19.43 N., 155.30 W.
Depth: 16 km
Magnitude: 3.5 ML
Intensity IV: Glenwood (H), Hilo (H), Kurtistown (H), Mountain View (H), Volcano (H).
Intensity III: Honomu (H), Papaikou (H).

14 February (H) Island of Hawaii
Origin time: 20 05 06.2
Epicenter: 19.40 N., 155.28 W.
Depth: 15 km
Magnitude: 3.4 ML
Intensity III: Hawaiian Volcano Observatory (H), Volcano (H).

25 February (H) Island of Hawaii
Origin time: 08 55 27.2
Epicenter: 19.44 N., 156.32 W.
Depth: 17 km
Magnitude: 3.2 ML
Intensity III: Holualoa.

2 March (H) Island of Hawaii
Origin time: 10 51 02.9
Epicenter: 19.33 N., 155.22 W.
Depth: 9 km
Magnitude: 3.7 ML
Intensity IV: Hilo (H), Volcano (H).

21 March (H) Island of Hawaii
Origin time: 05 13 25.4
Epicenter: 19.37 N., 155.42 W.
Depth: 12 km
Magnitude: 3.3 ML
Intensity III: Kukaiau Ranch.

3 April (H) Island of Hawaii
Origin time: 04 28 32.9
Epicenter: 19.30 N., 155.19 W.
Depth: 9 km
Magnitude: 3.0 ML
Intensity III: Volcano (H).

6 April (H) Island of Hawaii
Origin time: 13 47 14.1
Epicenter: 19.33 N., 155.13 W.
Depth: 10 km
Magnitude: 3.2 ML
Intensity III: Hilo (H).

8 April (H) Island of Hawaii
Origin time: 02 43 44.2
Epicenter: 19.83 N., 155.14 W.
Depth: 29 km
Magnitude: 3.6 ML
Intensity IV: Hilo (H), Papaiko

Hawaii--Continued

(H), Pepeekeo (H), Honolii (H).
Intensity III: Glenwood (H), Hawaiian Volcano Observatory (H), Honokaa (H), Laupahoehoe (H).
Intensity II: Ahualoa (H), Hawaiian Ocean View Estates (H), Waimea (H).

13 April (H) Island of Hawaii
Origin time: 06 55 12.7
Epicenter: 19.34 N., 155.07 W.
Depth: 8 km
Magnitude: 3.4 ML
Intensity IV: Hawaii Volcanoes National Park (H), Hilo (H).

3 May (H) Island of Hawaii
Origin time: 17 29 06.4
Epicenter: 19.29 N., 155.50 W.
Depth: 8 km
Magnitude: 3.1 ML
Intensity IV: Pahala (H).

23 May (H) Island of Hawaii
Origin time: 07 09 26.7
Epicenter: 19.31 N., 155.22 W.
Depth: 10 km
Magnitude: 3.4 ML
Intensity IV: Hilo (H).
Intensity III: Glenwood (H), Hawaii Volcanoes National Park (H), Mountainview (H), Papaikou (H), Volcano (H).

3 June (H) Island of Hawaii
Origin time: 01 02 02.1
Epicenter: 19.67 N., 155.16 W.
Depth: 14 km
Magnitude: 3.2 ML
Intensity IV: Hilo (H).
Intensity III: Glenwood (H), Hawaii Volcanoes National Park (H), Honokaa (H), Kalapana (H), Paauilo (H), Volcano (H).

4 June (H) Island of Hawaii
Origin time: 08 00 44.9
Epicenter: 19.81 N., 155.79 W.
Depth: 16 km
Magnitude: 3.0 ML
Intensity IV: Kona (H).

12 June (H) Island of Hawaii
Origin time: 21 57 12.1
Epicenter: 19.40 N., 155.26 W.
Depth: 3 km
Magnitude: 3.0 ML
Intensity IV: Kilauea Caldera (H).
Intensity III: Hawaiian Volcano Observatory (H), Hawaii Volcanoes National Park (H), Volcano (H).

13 June (H) Island of Hawaii
Origin time: 02 49 35.0
Epicenter: 18.90 N., 155.46 W.
Depth: 15 km
Magnitude: 3.4 ML
Intensity IV: Hawaiian Ocean View Estates (H), Naalehu (H).

13 June (H) Island of Hawaii
Origin time: 16 54 01.2
Epicenter: 19.34 N., 155.05 W.
Depth: 6 km
Magnitude: 3.1 ML
Intensity IV: Kalapana (H), Kapaahu (H).
Intensity III: Mountainview (H), Volcano (H), Wainaku (H).

21 June (H) Island of Hawaii
Origin time: 10 20 44.1
Epicenter: 19.32 N., 155.22 W.
Depth: 10 km
Magnitude: 3.4 ML
Intensity III: Hawaii Volcanoes National Park (H), Pahala (H), Volcano (H).

23 June (H) Island of Hawaii
Origin time: 11 47 58.6
Epicenter: 19.32 N., 155.26 W.
Depth: 11 km
Magnitude: 4.9 mb(G), 4.2 ML
Intensity IV: Captain Cook, Hawaii Volcanoes National Park, Hamakua (H), Hilo, Honokaa, Honomu, Keaau, Kukuihaele, Kurtistown, Naalehu, Paauhau, Paauilo, Pahala, Pahoa, Papaikou, Pepeekeo, Puna (H), Volcano.
Intensity III: Kau, Kohala, Kona.
Intensity II: Kalaupapa.

30 June (H) Island of Hawaii
Origin time: 22 28 02.8
Epicenter: 19.17 N., 155.48 W.
Depth: 9 km
Magnitude: 3.1 ML
Intensity III: Hawaiian Ocean View Estates (H).

1 July (H) Island of Hawaii
Origin time: 19 18 13.3
Epicenter: 19.32 N., 155.12 W.
Depth: 7 km
Magnitude: 3.9 ML
Intensity IV: Hilo (H), Puna (H).
Intensity III: Mauna Loa Observatory (H), Pohakuloa (H).
Intensity II: Kohala (H), Kona (H).

4 July (H) Island of Hawaii
Origin time: 07 05 16.3
Epicenter: 19.35 N., 155.08 W.
Depth: 9 km
Magnitude: 3.0 ML
Intensity III: Glenwood (H).

9 July (H) Island of Hawaii
Origin time: 23 07 56.9
Epicenter: 19.37 N., 155.10 W.
Depth: 9 km
Magnitude: 3.1 ML
Intensity III: Hilo (H).

14 July (H) Island of Hawaii
Origin time: 12 56 37.2

Hawaii--Continued

Epicenter: 19.35 N., 155.25 W.
Depth: 10 km
Magnitude: 3.2 ML
Intensity III: Volcano (H).

16 July (H) Island of Hawaii
Origin time: 18 29 41.8
Epicenter: 19.35 N., 155.02 W.
Depth: 8 km
Magnitude: 3.3 ML
Intensity IV: Kalapana (H).
Intensity III: Glenwood (H), Hilo (H).

9 August (H) Island of Hawaii
Origin time: 07 10 10.3
Epicenter: 19.30 N., 155.22 W.
Depth: 10 km
Magnitude: 3.4 ML
Intensity III: Glenwood (H), Hilo (H), Kurtistown (H), Mountainview (H), Volcano (H).

12 August (H) Island of Hawaii
Origin time: 10 52 50.5
Epicenter: 19.33 N., 155.11 W.
Depth: 10 km
Magnitude: 3.1 ML
Intensity IV: Hilo (H).
Intensity III: Mountainview (H), Volcano (H).

29 August (H) Island of Hawaii
Origin time: 21 44 08.9
Epicenter: 19.32 N., 155.20 W.
Depth: 10 km
Magnitude: 3.1 ML
Intensity II: Hilo (press report).

30 August (H) Island of Hawaii
Origin time: 22 40 15.7
Epicenter: 19.34 N., 155.03 W.
Depth: 7 km
Magnitude: 3.1 ML
Intensity III: Blacksand Subdivision (H), Hilo (H), Kalapana (H), Volcano (H).

31 August (H) Island of Hawaii
Origin time: 23 07 21.4
Epicenter: 19.01 N., 155.48 W.
Depth: 35 km
Magnitude: 4.0 ML
Intensity IV: Kau (H).
Intensity III: Ahualoa (H), Ainaloa (H), Glewnood (H), Hawaiian Beaches (H), Hawaiian Paradise Park (H), Hawaiian Volcano Observatory (H), Hilo (H), Honokaa (H), Kamuela (H), Volcano Golf Course (H).

3 September (H) Island of Hawaii
Origin time: 14 26 10.5
Epicenter: 19.32 N., 155.20 W.
Depth: 9 km
Magnitude: 3.0 ML
Intensity III: Volcano (H).

5 September (H) Island of Hawaii
Origin time: 20 26 46.8
Epicenter: 19.33 N., 155.23 W.
Depth: 10 km
Magnitude: 3.7 ML
Intensity IV: Hilo (H).
Intensity III: Glenwood (H), Hawaii Volcanoes National Park (H), Hawaiian Volcano Observatory (H), Volcano (H).

12 September (H) Island of Hawaii
Origin time: 06 16 06.1
Epicenter: 19.33 N., 155.11 W.
Depth: 10 km
Magnitude: 4.1 ML
Intensity IV: Glenwood, Hawaii Volcanoes National Park, Hilo, Honomu, Keaau, Kurtistown, Mountainview (H), Ookala, Pahoa (H), Papaaloa, Volcano.
Intensity III: Hakalau (H), Kalapana (H), Naanaleau (H), Papaikou.
Intensity II: Honokaa.

19 September (H) Island of Hawaii
Origin time: 09 44 29.2
Epicenter: 19.39 N., 155.28 W.
Depth: 4 km
Magnitude: 3.2 ML
Intensity III: Namakanipaio (H), Volcano (H).

20 September (H) Island of Hawaii
Origin time: 01 41 08.7
Epicenter: 19.44 N., 155.40 W.
Depth: 9 km
Magnitude: 3.3 ML
Intensity IV: Red Hill (H).

20 September (H) Island of Hawaii
Origin time: 23 20 27.0
Epicenter: 19.52 N., 155.88 W.
Depth: 9 km
Magnitude: 3.1 ML
Intensity IV: Kealakekua (H).

30 September (H) Island of Hawaii
Origin time: 23 56 13.3
Epicenter: 19.38 N., 155.45 W.
Depth: 9 km
Magnitude: 3.2 ML
Intensity IV: Pahala (H).
Intensity III: Glenwood (H), Naalehu (H).
Intensity II: Hilo (H).

15 October (H) Island of Hawaii
Origin time: 15 35 48.6
Epicenter: 19.38 N., 155.07 W.
Depth: 9 km
Magnitude: 3.3 ML
Intensity IV: Hawaiian Paradise Park (H), Kalapana (H).
Intensity III: Hilo (H), Kaimu (H).
Intensity II: Volcano (H), Hawaii Volcanoes National Park (H).

Hawaii--Continued

28 October (H) Island of Hawaii
Origin time: 22 37 33.2
Epicenter: 21.56 N., 157.98 W.
Depth: 5 km
Magnitude: 4.2 ML
Intensity IV: Honolulu, Kaaawa, Kapalama, Kunia, Pearl City, Waipahu.
Intensity III: Kaneohe (H).
Intensity II: Waikiki.

22 November (H) Island of Hawaii
Origin time: 23 23 14.8
Epicenter: 19.35 N., 155.05 W.
Depth: 6 km
Magnitude: 3.3 ML
Intensity III: Wahaula Visitors Center (H).
Intensity II: Blacksand Subdivision (H), Hawaii Volcanoes National Park (H).

23 November (H) Island of Hawaii
Origin time: 13 16 15.9
Epicenter: 19.23 N., 155.55 W.
Depth: 11 km
Magnitude: 4.2 ML
Intensity IV: Hawaiian Ocean View Estates (H), Naalehu (H), Pahala (H).
Intensity III: Honaunau (H), Keokea (H).
Intensity II: Ahualo (H), Hilo (H), Kailua-Kona (H), Kainaliu (H), Keauhou (H), Mauna Loa Observatory (H), Papaikou (H).

28 November (H) Island of Hawaii
Origin time: 11 31 36.7
Epicenter: 19.31 N., 155.22 W.
Depth: 10 km
Magnitude: 3.6 ML
Intensity III: Ainahou Ranch (H).
Intensity II: Volcano (H).

29 November (H) Island of Hawaii
Origin time: 07 50 40.3
Epicenter: 19.65 N., 156.01 W.
Depth: 9 km
Magnitude: 3.3 ML
Intensity III: Kona (H).

29 November (H) Island of Hawaii
Origin time: 08 42 59.6
Epicenter: 19.37 N., 155.45 W.
Depth: 11 km
Magnitude: 3.5 ML
Intensity III: Kailua-Kona (H), Pahala (H).
Intensity II: Volcano Golf Course (H).

1 December (H) Island of Hawaii
Origin time: 01 22 39.4
Epicenter: 19.35 N., 155.28 W.
Depth: 29 km
Magnitude: 3.4 ML
Intensity III: Ainaloa (H).

Hawaii--Continued

5 December (H) Island of Hawaii
Origin time: 21 36 39.7
Epicenter: 19.33 N., 155.19 W.
Depth: 10 km
Magnitude: 3.8 ML
Intensity III: Ainaloa (H), Hilo (H), Kalapana (H), Nanawale (H), Volcano (H).

13 December (H) Island of Hawaii
Origin time: 04 44 31.5
Epicenter: 19.36 N., 155.08 W.
Depth: 9 km
Magnitude: 3.6 ML
Intensity IV: Glenwood (H), Kalapana (H), Mountain View (H), Pahoa (H).
Intensity III: Hilo (H).

14 December (H) Island of Hawaii
Origin time: 14 12 44.9
Epicenter: 19.32 N., 155.22 W.
Depth: 10 km
Magnitude: 4.1 ML
Intensity IV: Glenwood (H), Hilo (H), Kurtistown (H), Mountain View (H).
Intensity III: Ainaloa (H), Volcano (H).
Intensity II: Blacksand Subdivision (H), Hawaii Volcanoes National Park (H).

27 December (H) Island of Hawaii
Origin time: 10 40 55.7
Epicenter: 19.33 N., 155.22 W.
Depth: 10 km
Magnitude: 4.0 ML
Intensity IV: Ainaloa (H), Glenwood (H), Hilo (H), Kurtistown (H), Mountain View (H), Papaikou (H), Volcano (H).
Intensity III: Ahualoa (H), Hawaii Volcanoes National Park (H), Hawaiian Beaches (H), Hawaiian Ocean View Estates (H), Honokaa (H), Kau (H), Kona (H).

Idaho

3 April (G) Western Idaho
Origin time: 10 10 08.1
Epicenter: 44.05 N., 116.36 W.
Depth: 5 km
Magnitude: 3.2 ML, 3.6 ML(D)
Intensity IV: Sweet.

20 April (G) Southeastern Idaho
Origin time: 14 56 47.6
Epicenter: 42.66 N., 111.55 W.
Depth: 5 km
Magnitude: 2.5 ML
Intensity IV: Conda.
Intensity III: Soda Springs (telephone report).

Idaho--Continued

23 April (G) Western Montana
Origin time: 23 24 37.0

See Montana listing.

29 July (U) Northern Utah
Origin time: 14 04 03.2

See Utah listing.

28 September (G) Southern Idaho
Origin time: 08 58 20.7
Epicenter: 42.10 N., 112.33 W.
Depth: 5 km
Magnitude: 2.7 ML
Intensity IV: Malad City.

24 October (U) Southeastern Idaho
Origin time: 20 30 59.3
Epicenter: 42.55 N., 111.84 W.
Depth: 7 km
Magnitude: 4.2 mb(G), 4.3 ML(G), 4.1 ML
Intensity VI:
Idaho--Thatcher (cracked plaster, cracked cement foundation).
Intensity V:
Idaho--Lava Hot Springs (furniture shifted; windows, doors, and dishes rattled; felt by many).
Intensity IV:
Idaho--Aberdeen, Arimo, Bancroft, Downey, Grace, Inkom, McCammon, Pocatello, Swanlake.
Intensity II:
Idaho--Franklin.
Utah--Plymouth.

29 October (G) Central Idaho
Origin time: 13 46 44.5
Epicenter: 44.96 N., 114.27 W.
Depth: 5 km
Magnitude: 4.2 mb, 5.0 ML, 5.0 ML(D)

This earthquake was felt over an area of approximately 25,000 sq km of Idaho and Montana (fig. 16).

Intensity V:
Idaho--
Ellis (light furniture and small objects shifted, hanging pictures knocked out of place, felt by all),
Lowman (light furniture shifted; small objects fell; windows, doors, and dishes rattled; awakened and felt by many).
Intensity IV:
Idaho--Carmen, Challis, Clayton, Cobalt, Hailey, Lemhi, Northfork, Salmon, Shoup, Sweet, Tendoy.
Intensity III:
Idaho--Golden.
Montana--Jackson.
Intensity II:
Idaho--Garden Valley, Leadore.

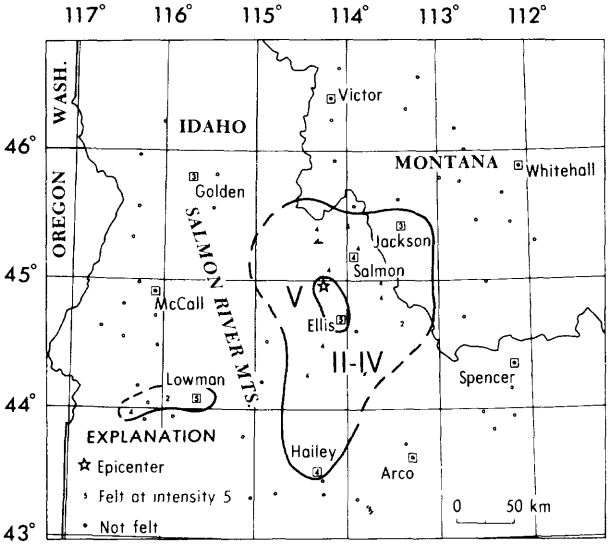

FIGURE 16.--Isoseismal map for the central Idaho earthquake of 29 October 1978, 13 46 44.5 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Idaho--Continued

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20 November (G) Central Idaho
Origin time: 14 25 51.8
Epicenter: 44.00 N., 114.41 W.
Depth: 5 km
Magnitude: 3.2 ML, 3.7 ML(D)
Intensity IV: Clayton.

30 November (U) Southeastern Idaho
Origin time: 06 53 40.1
Epicenter: 42.11 N., 112.49 W.
Depth: 4 km
Magnitude: 4.6 mb(G), 4.7 ML

This earthquake is located in the Pocatello Valley of Idaho in the same area as the March 27, 1975 intensity VIII event of magnitudes 6.1 mb(G), 6.0 MS(G), and 6.1 ML(G). It was felt over an area of approximately 18,000 sq km of Idaho and Utah (fig. 17).

Intensity V:
Utah--Snowville (water in small containers spilled; small objects shifted; windows, doors, and dishes rattled; felt by all).
Intensity IV:
Idaho--Arimo, Clifton, Dayton, Elba, Franklin, Holbrook, Malad City, Malta, Naf, Pocatello, Stone, Swanlake, Weston.
Utah--Bear River City, Cache Junction, Clarkston, Corinne, Cornish, Fielding, Garland (press report), Honeyville, Howell, Huntsville, Lewiston, Newton, Plymouth, Providence, Richmond, Riverside, Tremonton.
Intensity III:
Utah--Kelton.
Intensity II:
Idaho--American Falls, Inkom.
Utah--Wellsville.

Idaho--Continued

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30 November (U) Southeastern Idaho
Origin time: 11 55 09.3
Epicenter: 42.11 N., 112.55 W.
Depth: 4 km
Magnitude: 3.5 ML
Intensity II: Stone.

20 December (U) Southeastern Idaho
Origin time: 13 46 22.6
Epicenter: 42.12 N., 112.49 W.
Depth: 6 km
Magnitude: 3.9 ML

Intensity IV:
Idaho--Holbrook, Malad City, Stone, Swanlake.
Utah--Clarkston, Lewiston, North Ogden, Portage, Riverside, Snowville.
Intensity III:
Utah--Garland.
Intensity II:
Idaho--Inkom.
Utah--Fielding, Trenton.

Illinois

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2 June (S) Southern Illinois
Origin time: 02 07 28.8
Epicenter: 38.42 N., 88.46 W.
Depth: 20 km
Magnitude: 3.5 mbLg(V)
Intensity IV: Fairfield, Flora.

29 August (S) Southern Illinois
Origin time: 07 05 50.3
Epicenter: 38.53 N., 88.22 W.
Depth: 17 km
Magnitude: 2.4 mbLg
Intensity II: West Salem.

20 September (S) Eastern Missouri
Origin time: 12 24 08.8

See Missouri listing.

5 December (S) Southern Illinois
Origin time: 01 48 01.3
Epicenter: 38.62 N., 88.36 W.
Depth: 25 km
Magnitude: 3.5 mbLg

This earthquake was felt over an area of approximately 11,5000 sq km of Illinois and Indiana (fig. 18).

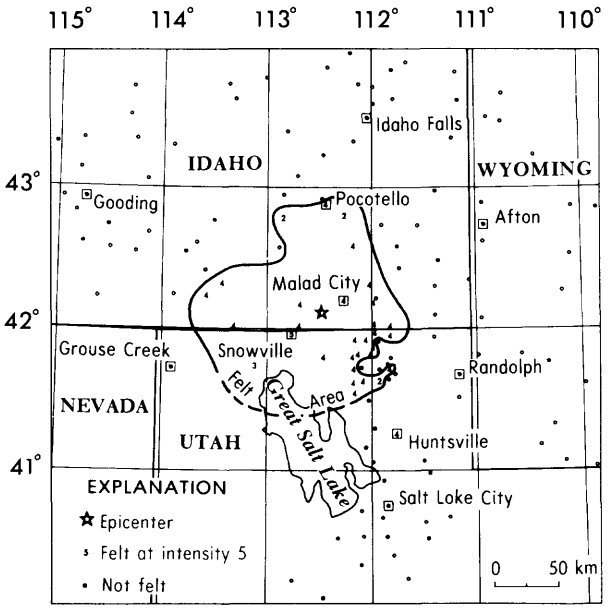

FIGURE 17.--Isoseismal map for the southeastern Idaho earthquake of 30 November 1978, 06 53 40.1 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Illinois--Continued

Intensity V:
Illinois--
Barnhill (one report of cracked plaster; hanging pictures swung; buildings creaked and trembled; windows, doors, and dishes rattled; felt by many)
Newton (light furniture and small objects shifted; hanging pictures swung; windows, doors, and dishes rattled; felt by all)
West Liberty (light furniture shifted; small objects fell; windows, doors, and dishes rattled; felt by many)
Willow Hill (few windows cracked; small objects shifted; hanging pictures swung; windows, doors, and dishes rattled; felt by many).

Intensity IV:
Illinois--Alma, Annapolis, Belle Rive, Bluford, Bone Gap, Bridgeport, Browns, Carmi, Cisne, Coulterville, Dieterich, Dundas, Edgewood, Effingham, Fairfield, Farina, Flora, Geff, Golden Gate, Grayville, Hoyleton, Ingraham, Iola, Iuka, Johnsonville, Kell, Kinmundy, Lancaster, Louisville,

Illinois--Continued

Mason, Mount Erie, Noble, Olney, Opdyke, Parkersburg, Patoka, Rinard, Saint Peter, Sainte Marie, Salem, Sims, Robinson, Texico, West Union, Xenia, Yale.
Indiana--Buffaloville, Owensville.

Intensity III:
Illinois--Albion, Bellmont, Bonnie, Sailor Springs, Sullivan.

Intensity II:
Illinois--Bible Grove, Buckner, Fillmore, Flat Rock, Glen Carbon, Irving, Keenes, Lawrenceville, Oakdale, Shobonier, Teutopolis, West Salem, West York.
Indiana--Fairbanks, Stewartsville, Switz City.

Indiana

5 December (S) Southern Illinois
Origin time: 01 48 01.3

See Illinois listing.

Maine

4 January (J) Southwestern Maine
Origin time: 19 28 10.8
Epicenter: 44.04 N., 70.51 W.
Depth: 0 km
Magnitude: 3.2 mbLg, 3.2 mbLg(L)
Intensity IV: Cisco (J), Naples (press report), Otisfield (press report).
Intensity III: Harrison (J), Oxford (J), Poland (J).
Intensity II: Bridgton (J), Canton (J), Johnson Hill (J), West Poland (J).

Maryland

16 July (G) Southeastern Pennsylvania
Origin time: 06 39 37.8

See Pennsylvania listing.

Massachusetts

24 March (G) Southwest of Bermuda Islands
Origin time: 00 42 38.2
Epicenter: 29.86 N., 67.39 W.
Depth: 22 km
Magnitude: 6.1 mb, 6.0 MS, 6.1 MS(B), 6.0 ML(P)

Intensity IV:
Massachusetts--New Bedford.

Intensity III:
Massachusetts--Boston (press

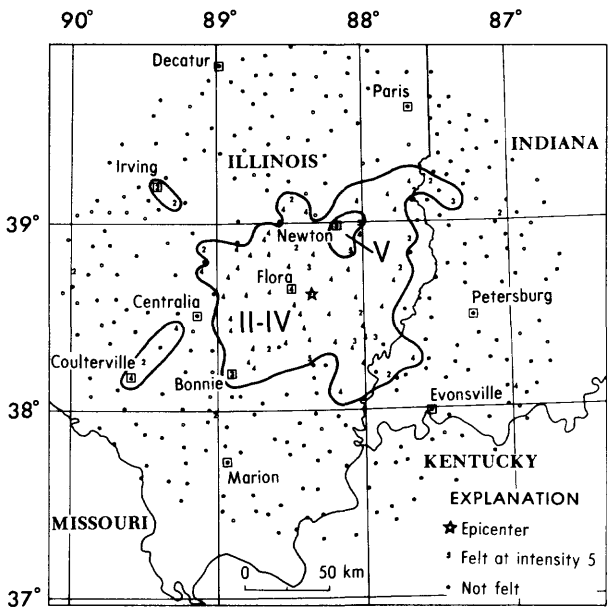

FIGURE 18.--Isoseismal map for the southern Illinois earthquake of 5 December 1978, 01 48 01.3 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Massachusetts--Continued

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report).
North Carolina--Asheville (press report), Camp Lejune (press report), Hatteras (press report), Wake County (press report).

1 September (J) Eastern Massachusetts
Origin time: 03 33 43.6
Epicenter: 42.48 N., 71.46 W.
Depth: 0 km
Magnitude: 2.0 mbLg
Intensity III: Stow.
Intensity II: Acton.

Mississippi

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11 December (G) Alabama-Mississippi border area
Origin time: 02 06 48.2
Epicenter: 31.95 N., 88.48 W.
Depth: 5 km
Magnitude: 3.5 mbLg
Intensity V:
Alabama--
Gilbertown (light furniture shifted, small objects fell), Melvin (small objects broken).
Intensity II:
Mississippi--Carmichael.

Missouri

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31 August (S) New Madrid, Missouri region
Origin time: 00 31 00.3

See Tennessee listing.

20 September (S) Eastern Missouri
Origin time: 12 24 08.8
Epicenter: 38.57 N., 90.28 W.
Depth: 2 km
Magnitude: 3.1 mbLg, 3.0 mbLg(G)

O. W. Nuttli, St. Louis University, reported two places with minor damage that are not reflected in the intensity values listed below. One was in southeast St. Louis where one of the concrete posts, 76 cm high and 25 cm square, which supported a wooden porch, cracked entirely across and showed evidence of slight displacement. The other occurred at Ladue where a plaster ceiling cracked down the middle.

This earthquake was felt over an area of approximately 3,700 sq km of Illinois and Missouri (fig. 19).

Intensity V:
Illinois--Belleville (plaster cracked in one home, small objects shifted, windows rattled), East Alton (few windows cracked; windows, doors, and dishes rattled).
Missouri--North County (few windows cracked; buildings shook; windows, doors, and dishes rattled).
Intensity IV:
Illinois--Alton, Caseyville, Dupo, East Carondelet, Edwardsville, Elsah, Glen Carbon, Godfrey, Granite City, Lebanon, Litchfield (press report), Lovejoy, Madison, Marine, Moro, National Stock Yards, O'Fallon, Roxana, Smithton, South Roxana, Venice.
Missouri--Affton, Benton Park, Berkeley, Brentwood, Carondelet, Chesterfield, Christian Bechtold, Clayton, Crestwood (press report), Defiance, Ferguson, Florissant, Gravois, Jennings, Lambert Airport, Manchester, Maplewood, Northwest Plaza, Northwood, Olivette, Pierre Laclede, Portage Des Sioux, Richmond Heights, Sappington, St. Ann, St. Charles, St. Louis, St. Peters, University City, Webster Groves, West Alton.
Intensity III:
Illinois--Columbia, Wood River.
Missouri--Des Peres, Fenton.
Intensity II:
Illinois--Chicago (press report), Dow.
Missouri--Grover, Hematite.

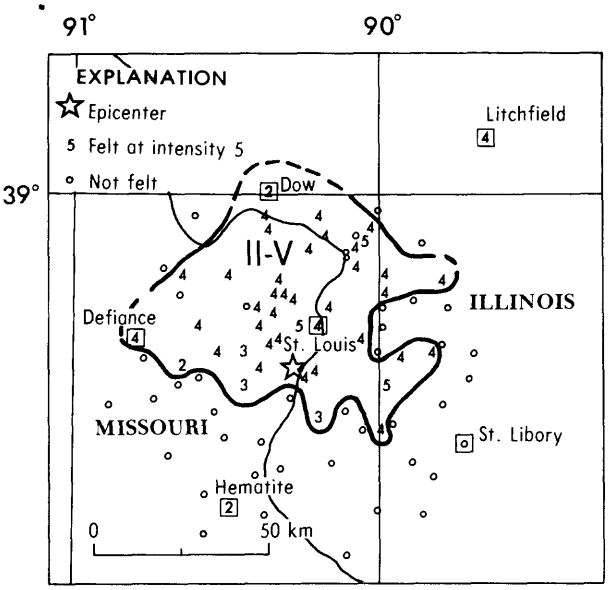


FIGURE 19.--Isoseismal map for the eastern Missouri earthquake of 20 September 1978, 12 24 08.8 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Montana

14 January (G) Southwestern Montana
Origin time: 16 53 50.3
Epicenter: 44.77 N., 111.94 W.
Depth: 5 km
Magnitude: 3.6 ML
Intensity II: Lake Village (Yellowstone National Park).

23 April (G) Western Montana
Origin time: 23 24 37.0
Epicenter: 46.97 N., 113.27 W.
Depth: 5 km
Magnitude: 4.5 mb, 4.3 MS, 4.9 ML

This earthquake was felt over an area of approximately 94,000 sq km of eastern Idaho and western Montana (fig. 20).

Intensity V:
Montana--Ovando (hanging pictures fell), Ravalli (small objects overturned).
Intensity IV:
Idaho--Calder, North Fork.
Montana--Anaconda, Arlee, Augusta, Big Arm, Black Eagle, Bonner, Boulder, Butte, Canyon Creek, Carter, Charlo, Choteau, Clancy, Clinton, Conrad, Corvallis, Deer Lodge, Dixon, East Helena, Elliston, Fairfield, Florence, Frenchtown, Garrison, Great Falls, Greenough, Hall, Hamilton, Helena, Helmville, Hot Springs, Jefferson City, Kalispell, Lincoln, Lolo, Marysville, Milltown, Missoula, Moiese, Monarch, Montana City, Oilmont, Pablo, Paradise, Pendroy, Philipsburg, Polson, Power, Radersburg, Rollins, Ronan, Saint Ignatius, Saint Regis, Saltese, Seeley Lake, Silver Star, Simms, Sunburst, Sun River, Superior, Swan Lake, Toston, Townsend, Trout Creek, Troy, Ulm, Valier, Victor, Warmsprings, Whitehall, White Sulphur Springs, Winston.
Intensity III:
Idaho--Elk River, Headquarters.
Montana--Basin, Brady, Cascade, Darby, Dutton, Essex, Fort Shaw, Jackson, Kevin, Orofino, Raynesford, Stockett, Sula, Vaughn, Willow Creek, Wolf Creek.
Intensity II:
Idaho--Kellogg.
Montana--Fort Benton, Heart Butte, Polaris, Sand Coulee, Wise River, Wisdom.

Montana--Continued

23 April (G) Western Montana
Origin time: 23 36 43.7
Epicenter: 47.00 N., 113.31 W.
Depth: 5 km
Magnitude: 3.7 ML
Intensity II: Dixon, Polson (telephone report).

7 October (G) Western Montana
Origin time: 12 35 55.3
Epicenter: 46.62 N., 112.13 W.
Depth: 5 km
Magnitude: 2.7 ML(G), 2.9 ML(D)
Intensity IV: East Helena, Helena.

16 October (G) Western Montana
Origin time: 01 15 35.3
Epicenter: 47.09 N., 113.16 W.
Depth: 5 km
Magnitude: 2.9 ML(D), 3.4 ML
Intensity II: Missoula, Potomac (telephone report).

21 October (G) Western Montana
Origin time: 12 28 15.3
Epicenter: 46.97 N., 113.25 W.
Depth: 5 km
Magnitude: 3.5 ML
Intensity III: Ovando.

29 October (G) Central Idaho
Origin time: 13 46 44.5

See Idaho listing.

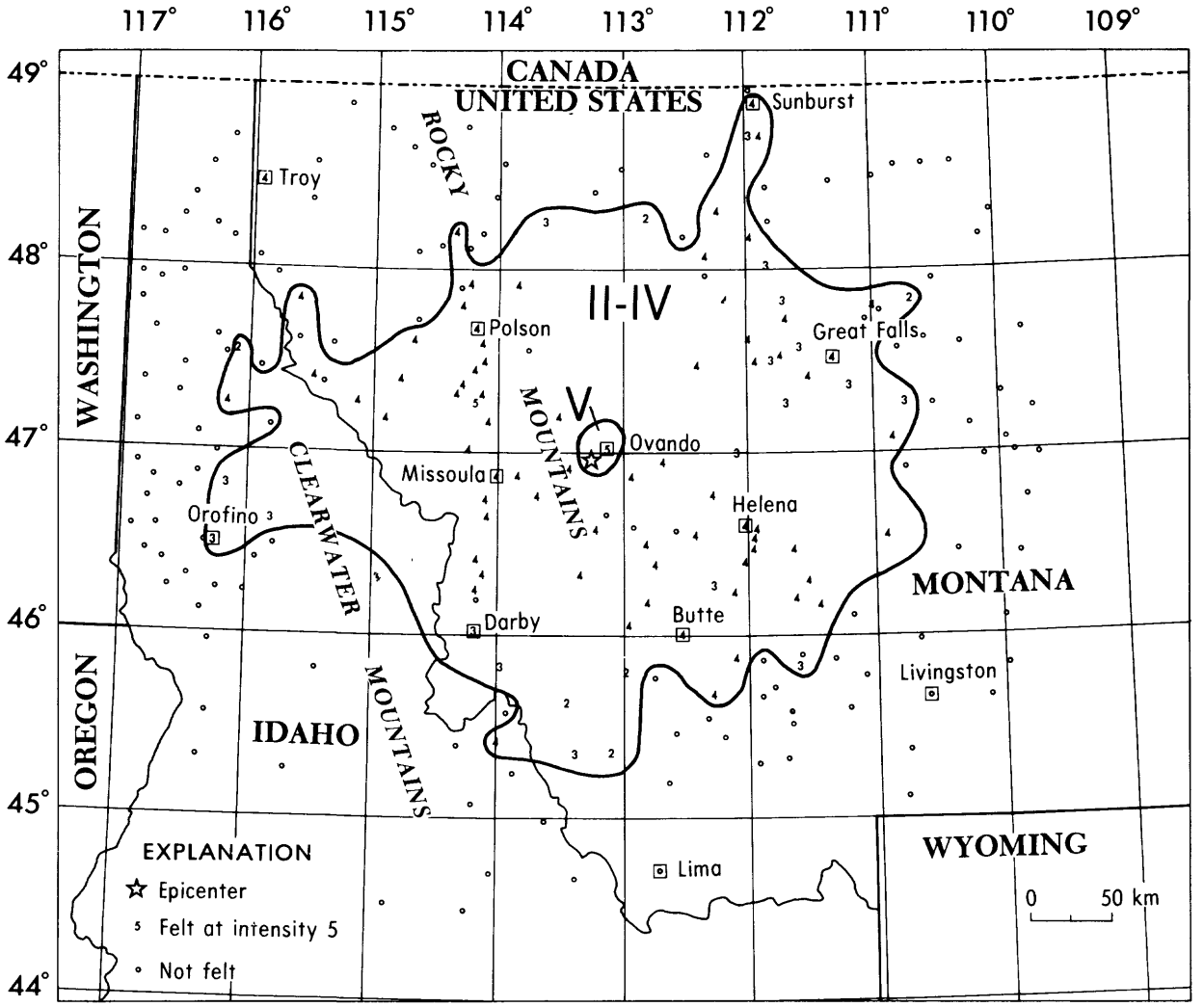


FIGURE 20.--Isoseismal map for the western Montana earthquake of 23 April 1978, 23 24 37.0 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Montana--Continued

4 November (G) Hebgen Lake region
Origin time: 15 49 43.8
Epicenter: 44.75 N., 111.23 W.
Depth: 5 km
Magnitude: 3.5 ML(G)
Intensity III:
Wyoming--Old Faithful, Yellowstone National Park.

10 November (G) Western Montana
Origin time: 09 53 45.6
Epicenter: 47.01 N., 113.33 W.
Depth: 5 km
Magnitude: 4.3 ML
Intensity IV: Seeley Lake
Intensity III: Ovando.

Nebraska

7 May (G) Central Nebraska
Origin time: 16 06 19.6
Epicenter: 42.30 N., 101.93 W.
Depth: 15 km
Magnitude: 4.3 mbLg, 4.0 mbLg(S)
Intensity IV: Arthur, Ashby, 27 km north and 5 km east of Ashby, 27 km north of Ashby, 26 km north of Ashby, 16 km north of Ashby, 10 km south of Ashby, 26 km south of Ashby, 27 km north of Bingham, 60 km west of Hyannis, 13 km southwest of Lewellen, 13 km north of Mullen, Whitman, 37 km north of Whitman.
Intensity III: Elsie, 56 km north of Hyannis, 40 km north-northeast of Mullen, 5 km west of Oshkosh.

Nevada

13 January (G) Southern Nevada
Origin time: 03 39 37.0
Epicenter: 39.42 N., 117.60 W.
Depth: 5 km
Magnitude: 4.1 ML(B)
Intensity V: Austin.

14 February (G) Southern Nevada
Origin time: 04 35 24.0
Epicenter: 39.63 N., 117.18 W.
Depth: 5 km
Magnitude: 4.4 mb, 4.8 ML(B)
Intensity IV: Austin, Eureka, Gabbs, Round Mountain, Yerington.
Intensity II: Manhattan.

23 February (E) Southern Nevada
Origin time: 17 00 00.164
Epicenter: 37.12 N., 116.06 W.
Depth: 0 km
Magnitude: 5.7 mb(G), 5.4 ML(B)

Nevada Test Site explosion "REBLOCHON" at 37°07'25.24" N., 116°03'49.79" W., surface elevation 1288 m, depth of burial 658 m.

5 March (G) Northern Nevada
Origin time: 22 46 18.2
Epicenter: 38.94 N., 118.03 W.
Depth: 5 km
Magnitude: 4.0 mb, 4.6 ML(B)
Intensity V: Gabbs (small objects fell).

15 March (G) Western Nevada
Origin time: 03 09 14.9
Epicenter: 38.35 N., 118.22 W.
Depth: 5 km
Magnitude: 3.2 ML
Intensity IV: Gabbs, Luning, Mina.

23 March (E) Southern Nevada
Origin time: 16 30 00.200
Epicenter: 37.10 N., 116.05 W.
Depth: 0 km
Magnitude: 5.7 mb(G), 5.5 ML(B)

Nevada Test Site explosion "ICEBERG" at 37°06'06.39" W., 116°03'04.13" W., surface elevation 1266 m, depth of burial 640 m.

11 April (E) Southern Nevada
Origin time: 15 30 00.161
Epicenter: 37.30 N., 116.33 W.
Depth: 0 km
Magnitude: 5.3 mb(G), 5.3 ML(B)

Nevada Test Site explosion "FONDOTTA" at 37°17'58.66" N., 116°19'36.12" W., surface elevation 2099 m, depth of burial 633 m.

11 April (E) Southern Nevada
Origin time: 17 45 00.073
Epicenter: 37.23 N., 116.37 W.
Depth: 0 km

Nevada--Continued

Magnitude: 5.5 mb(G), 4.5 MS(G), 5.3 ML(B)

Nevada Test Site explosion "BACKBEACH" at 37°14'00.57" N., 116°22'06.49" W., surface elevation 2066 m, depth of burial 611 m.

20 April (G) Southern Nevada
Origin time: 13 15 47.3
Epicenter: 35.80 N., 114.90 W.
Depth: 10 km
Magnitude: 1.9 ML
Intensity II: Boulder City.

20 April (G) Southern Nevada
Origin time: 13 18 44.5
Epicenter: 35.80 N., 114.90 W.
Depth: 10 km
Magnitude: 1.9 ML
Intensity II: Boulder City.

23 May (G) Northern Nevada
Origin time: 05 47 55.4
Epicenter: 40.87 N., 117.26 W.
Depth: 11 km
Magnitude: 4.1 mb, 4.6 ML(B)
Intensity V: Battle Mountain, Valmy.
Intensity IV: Golconda, Winnemucca.

6 July (G) Northern Nevada
Origin time: 22 21 22.0
Epicenter: 39.11 N., 116.22 W.
Depth: 10 km
Magnitude: 3.8 ML
Intensity IV: Eureka.

12 July (E) Southern Nevada
Origin time: 17 00 00.075
Epicenter: 37.079 N., 116.044 W.
Depth: 0 km
Magnitude: 5.5 mb(G), 4.1 MS(G), 5.4 ML(B)

Nevada Test Site explosion "LOWBALL" at 37°04'43.21" N., 116°02'37.63" W., surface elevation 1252 m, depth of burial 564 m.

29 July (G) Central Nevada
Origin time: 22 32 07.1
Epicenter: 38.40 N., 115.24 W.
Depth: 5 km
Magnitude: 3.9 mb, 4.2 ML
Intensity II: Ely (R), Eureka.

31 August (E) Southern Nevada
Origin time: 14 00 00.164
Epicenter: 37.28 N., 116.36 W.
Depth: 0 km
Magnitude: 5.6 mb(G), 5.5 ML(B)

Nevada Test Site explosion "PANIR" at 37°16'33.34" N., 116°21'26.43" W., surface elevation 2040 m, depth of burial 681 m.

Nevada--Continued

4 September (B) Lake Tahoe region
Origin time: 04 52 31.6

See California listing.

4 September (B) Lake Tahoe region
Origin time: 21 54 52.5

See California listing.

4 October (P) Owens Valley area
Origin time: 16 42 48.6

See California listing.

13 September (E) Southern Nevada
Origin time: 15 15 00.161
Epicenter: 37.21 N., 116.21 W.
Depth: 0 km
Magnitude: 4.6 mb(G), 4.6 ML(B)

Nevada Test Site explosion "DIABLO HAWK" at 37°12'31.68" N. 116°12'38.78" W., surface elevation 2239 m, depth of burial 388 m.,

27 September (E) Southern Nevada
Origin time: 17 00 00.071
Epicenter: 37.07 N., 116.02 W.
Depth: 0 km
Magnitude: 5.0 mb(G), 5.0 ML(B)

Nevada Test Site explosion "DRAUGHTS" at 37°04'25.92" N., 116°01'11.40" W., surface elevation 1253 m, depth of burial 442 m.

27 September (E) Southern Nevada
Origin time: 17 20 00.076
Epicenter: 37.08 N., 116.05 W.
Depth: 0 km
Magnitude: 5.7 mb(G), 4.1 MS(G), 5.5 ML(B)

Nevada Test Site explosion "RUMMY" at 37°04'47.29" N., 116°03'04.76" W., surface elevation 1262 m, depth of burial 640 m.

2 November (E) Southern Nevada
Origin time: 15 25 00.169
Epicenter: 37.29 N., 116.30 W.
Depth: 0 km
Magnitude: 4.2 mb(G), 4.3 ML(B)

Nevada Test Site explosion "EMMENTHAL" at 37°17'16.60" N., 116°17'50.98" W., surface elevation 2131 m, depth of burial 576 m.

18 November (E) Southern Nevada
Origin time: 19 00 00.166
Epicenter: 37.13 N., 116.08 W.
Depth: 0 km
Magnitude: 5.1 mb(G), 5.2 ML(B)

Nevada Test Site explosion "QUARGEL" at 37°07'36.73" N., 116°05'01.94" W., surface elevation 1302 m, depth of burial 542 m.

16 December (E) Southern Nevada
Origin time: 15 30 00.158
Epicenter: 37.27 N., 116.41 W.
Depth: 0 km
Magnitude: 5.5 mb(B), 5.5 ML(B)

Nevada Test Site explosion "FARM" at 37°16'24.22" N., 116°24'36.99" W., surface elevation 2006 m, depth of burial 689 m.

New Hampshire

25 August (J) Southeastern New Hampshire
Origin time: 20 01 30.5
Epicenter: 42.87 N., 70.83 W.
Depth: 0 km
Magnitude: 2.3 mbLg
Intensity III: Seabrook (J).

New Jersey

30 June (L) Northern New Jersey
Origin time: 20 13 43.6
Epicenter: 41.07 N., 74.20 W.
Depth: 5 km
Magnitude: 2.9 mbLg
Intensity IV:
New Jersey--Mahwah (press report), Oakland (press report).
New York--Hillburn (press report), Suffern (press report).
Intensity III:
New York--Pine Grove (press report), Sloatsburg (press report), Tuxedo Park (press report).

30 June (L) Northern New Jersey
Origin time: 22 39 49.7
Epicenter: 41.08 N., 74.20 W.
Depth: 6 km
Magnitude: 2.2 ML
Intensity III: Oakland, New Jersey-Suffern, New York area (press report).

New Mexico

16 June (G) West Texas
Origin time: 11 46 54.2

See Texas listing.

New York

18 February (O) Southern Quebec
Origin time: 14 48 25.0

New York--Continued

Epicenter: 46.35 N., 74.11 W.
Depth: 7 km
Magnitude: 4.0 mb(G), 4.0 mbLg, 3.8 mbLg(J)
Intensity V:
Quebec--Saint Donat de Montcalm region.
Intensity IV:
New York--Rouses Point.

5 March (L) Southeastern New York
Origin time: 07 53 25.6
Epicenter: 41.35 N., 74.15 W.
Depth: 5 km
Magnitude: 2.1 mbLg
Intensity III: Highland Mills (J).

30 June (L) Northern New Jersey
Origin time: 20 13 43.6

See New Jersey listing.

30 June (L) Northern New Jersey
Origin time: 22 39 49.7

See New Jersey listing.

North Carolina

25 February (V) Northern North Carolina
Origin time: 03 53 27.7
Epicenter: 36.19 N., 79.30 W.
Depth: 8 km
Magnitude: 2.2 mbLg
Intensity IV: Burlington.

22 March (V) Northern North Carolina
Origin time: 15 52 26.7
Epicenter: 36.20 N., 81.73 W.
Depth: 1 km
Magnitude: 2.9 mbLg

Possible explosion (V).

24 March (G) Southwest of Bermuda Islands
Origin time: 00 42 38.2

See Massachusetts listing.

Oklahoma

9 March (T) Southern Oklahoma
Origin time: 06 30 51.2
Epicenter: 34.07 N., 97.40 W.
Depth: 5 km
Magnitude: 2.5 mbLg
Intensity II: Simon area (T).

17 May (T) Central Oklahoma
Origin time: 23 11 15.7
Epicenter: 35.53 N., 97.91 W.
Depth: 5 km
Magnitude: 2.3 mbLg
Intensity I: El Reno (T).

Oklahoma--Continued

18 May (T) Central Oklahoma
Origin time: 00 19 22.4
Epicenter: 35.50 N., 97.50 W.
Depth: 5 km
Magnitude: 2.7 mbLg
Intensity III: El Reno (T).

18 May (T) Central Oklahoma
Origin time: 00 32 17.6
Epicenter: 35.60 N., 97.83 W.
Depth: 5 km
Magnitude: 2.1 mbLg
Intensity II: El Reno (T).

Pennsylvania

16 July (G) Southeastern Pennsylvania
Origin time: 06 39 37.8
Epicenter: 39.92 N., 76.26 W.
Depth: 5 km
Magnitude: 2.9 mbLg(V), 3.1 mbLg(J)

This earthquake was felt over an area of approximately 1,600 sq km of Pennsylvania, Delaware, and Maryland (fig. 21).

Intensity V:
Pennsylvania--Lancaster (few plaster cracks), New Providence (few plaster cracks).
Intensity IV:
Delaware--Wilmington.
Maryland--Cardiff, Pylesville, Whiteford.
Pennsylvania--Airville, Bart, Bausman, Brogue, Buck, Columbia, Conestoga, Craley, East Prospect, Fawn Grove, Gordonville, Holtwood, Kirkwood, Millersville, Mount Nebo, Mountville, Paradise, Peach Bottom, Penryn, Pequea, Rawlinsville, Red Lion, Refton, Smoketown, Strasburg, Washington Boro, Willow Street, Windsor, Wrightsville (11 km south).
Intensity III:
Maryland--Darlington.
Pennsylvania--Manheim.

6 October (G) Southeastern Pennsylvania
Origin time: 19 25 41.6
Epicenter: 39.97 N., 76.51 W.
Depth: 5 km
Magnitude: 2.8 mbLg, 3.0 mbLg(L)

According to the press, this earthquake shook buildings throughout Lancaster and its suburbs. Buildings trembled briefly, a loud noise (described variously as a boom, roar, or vehicle collision) could be heard, and some startled people ran outside.

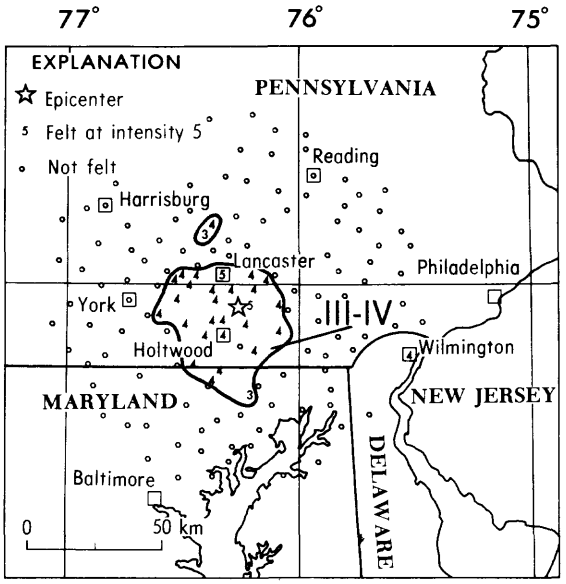


FIGURE 21.--Isoseismal map for the southeastern Pennsylvania earthquake of 16 July 1978, 06 39 37.8 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Pennsylvania--Continued

Intensity V: Brunnerville (few cracked windows), Mount Joy (unconfirmed report of cracked plaster).
Intensity IV: Akron, Bausman, Bird in Hand, Brogue, Brownstown, Conestoga, Delta, East Petersburg, Lancaster, Landisville, Leola, Mountville, New Holland, Peach Bottom, Penryn, Quarryville, Refton, Ronks, Smoketown, Talmage, Washington Boro, Willow Street, Wrightsville.
Intensity III: Intercourse, Millersville, Pequea, Strasburg.
Intensity II: Ephrata (press report), Manheim, Marticville (press report), Millersville (press report).

Puerto Rico

15 May (G) Mono Passage
Origin time: 19 25 14.1
Epicenter: 18.73 N., 67.43 W.
Depth: Normal.
Magnitude: 4.7 mb
Intensity II: Aguadilla.

South Carolina

7 September (G) Eastern South Carolina
Origin time: 22 53 22.3
Epicenter: 33.07 N., 80.22 W.
Depth: 11 km
Magnitude: 2.7 mbLg
Intensity IV: Summerville--Corey Woods (4.2 km southwest on Highway 17A--windows, doors, and dishes rattled).
Intensity III: Jedburg, Summerville--city area, Summerville--Briarwood (3.2 km south on State Highway 199), College Park (7.8 km east off Interstate 26), Flowertown Village (5.1 km southwest on Highway 17A), King's Grant (8 km south on Highway 642), Knightsville (5.8 km west on Highway 13), Oakdale Subdivision (4 km southwest on Highway 17A), Old Orangeburg Road (5.3 km west on Highway 22), Owen's Circle (5.9 km south on Highway 165), Pine Forest Estates (4 km southwest on Highway 17A), Quail Arbor II (3.8 km south on Highway 165), Quail Arbor V (4.6 km south on Highway 199), Shepard Park (2.2 km west on Highway 17A), Twin Oaks (1.8 km south off Highway 165), Waring Hall (3.4 km west on Highway 13), Warrington Subdivision (1.3 km west on Highway 13).
Intensity II: Summerville--Old Fort Estates (7.2 km south on Highway 642).

Tennessee

18 January (S) Western Tennessee
Origin time: 23 46 26.1
Epicenter: 36.25 N., 89.42 W.
Depth: 5 km
Magnitude: 2.6 mbLg
Intensity III: Ridgely (Tennessee Earthquake Information Center).

31 August (S) New Madrid, Missouri region
Origin time: 00 31 00.3
Epicenter: 36.09 N., 89.42 W.
Depth: 4 km
Magnitude: 3.5 mbLg
Intensity V:
Tennessee--Dyersburg (S).
Intensity IV:
Arkansas--Leachville.
Missouri--Braggadocio, Hayti, Pascola.
Tennessee--Bogota, Findley, Lenox, Troy.
Intensity III:
Arkansas--Etowah.
Missouri--Caruthersville, Portageville.
Tennessee--Memphis, Samburg, Yorkville.
Intensity II:

Tennessee--Continued

Arkansas--Keiser.
Tennessee--Kenton.

Texas

2 March (G) Southwestern Texas
Origin time: 10 04 52.7
Epicenter: 31.56 N., 102.51 W.
Depth: 11 km
Magnitude: 3.5 ML
Intensity III: Kermit (telephone report).

16 June (G) West Texas
Origin time: 11 46 54.2
Epicenter: 33.03 N., 100.77 W.
Depth: 10 km
Magnitude: 4.4 mb, 5.3 ML, 4.6 mbLg(S)

This earthquake was felt over an area of approximately 52,000 sq km of west Texas (fig. 22).

Intensity V:
Texas--Carlsbad (hanging pictures fell, small objects broke), Fluvanna (one broken window, hanging pictures fell, light furniture shifted), Justiceburg (unconfirmed report of cracked plaster), Peacock (few cracked windows), Rotan (light furniture shifted), Snyder (cracked window, mirror fell and broke).
Intensity IV:
New Mexico--Hobbs.
Texas--Abilene, Ackerly, Albany (press report), Anson, Aspermont, Ballinger, Big Lake, Big Spring, Blackwell, Breckenridge, Bronte, Coahoma, Coleman, Clyde, Colorado City, Dermott, Dunn, Eola, Gail, Girard, Goldsboro, Goodfellow AFB, Guthrie, Hamlin, Hermleigh, Ira, Jayton, Knott, Lamesa, Lorenzo, Lubbock, Lueders, Maryneal, McCaulley, Mereta, Merkel, Mertzon, Miles, Moran, New Home, Nolan, Old Glory, Ovalo, Roby, Roscoe, Rule, San Angelo, San Angelo--Angelo State University, Spur, Stamford, Stanton, Sylvester, Sweetwater (press report), Tahoka, Tuscola (press report), Valdera, Veribest, Water Valley, Westbrook, Windgate, Winters, Woodson.
Intensity III:
Texas--Gouldbusk, Loraine, Talpa.
Intensity II:
Texas--Glen Cove, Post, Sagerton.

Utah

28 February (U) Northern Utah
Origin time: 00 20 06.5
Epicenter: 40.76 N., 112.20 W.
Depth: 14 km
Magnitude: 2.7 ML
Intensity IV: Magna, Salt Lake City.
Intensity III: Tooele.
Intensity II: Farmington.

9 March (U) Northern Utah
Origin time: 06 30 51.8
Epicenter: 40.76 N., 112.08 W.
Depth: 9 km
Magnitude: 3.3 ML
Intensity VI: Magna (cracks in the exterior wall of fire station no. 2; windows broken, plaster and dry wall cracked).
Intensity V: Salt Lake City.
Intensity IV: Hooper, Murray.
Intensity III: Centerville (press report), Lincoln, Midvale.

9 March (U) Northern Utah
Origin time: 06 46 20.0
Epicenter: 40.77 N., 112.08 W.
Depth: 7 km
Magnitude: 2.5 ML
Intensity IV: Magna (press report).

13 March (U) Northern Utah
Origin time: 13 35 43.4
Epicenter: 40.76 N., 112.08 W.
Depth: 13 km
Magnitude: 2.8 ML
Intensity IV: Magna.
Intensity III: Bountiful (press report), Granger (press report), Salt Lake City (Glendale area and University of Utah Hospital--press report).
Intensity II: Midvale.

29 July (U) Northern Utah
Origin time: 14 04 03.2
Epicenter: 41.85 N., 112.13 W.
Depth: 7 km
Magnitude: 3.1 ML
Intensity IV:
Idaho--Weston.
Utah--Cornish, Fielding, Howell, Logan, Newton, Plymouth, Portage, Preston, Richmond, Riverside, Smithfield, Trenton.
Intensity III:
Idaho--Franklin.
Utah--Cherry Creek, Collinston, Garland.
Intensity II:
Idaho--Dayton.
Utah--Clarkston.

24 October (U) Southeastern Idaho
Origin time: 20 30 59.3

See Idaho listing.

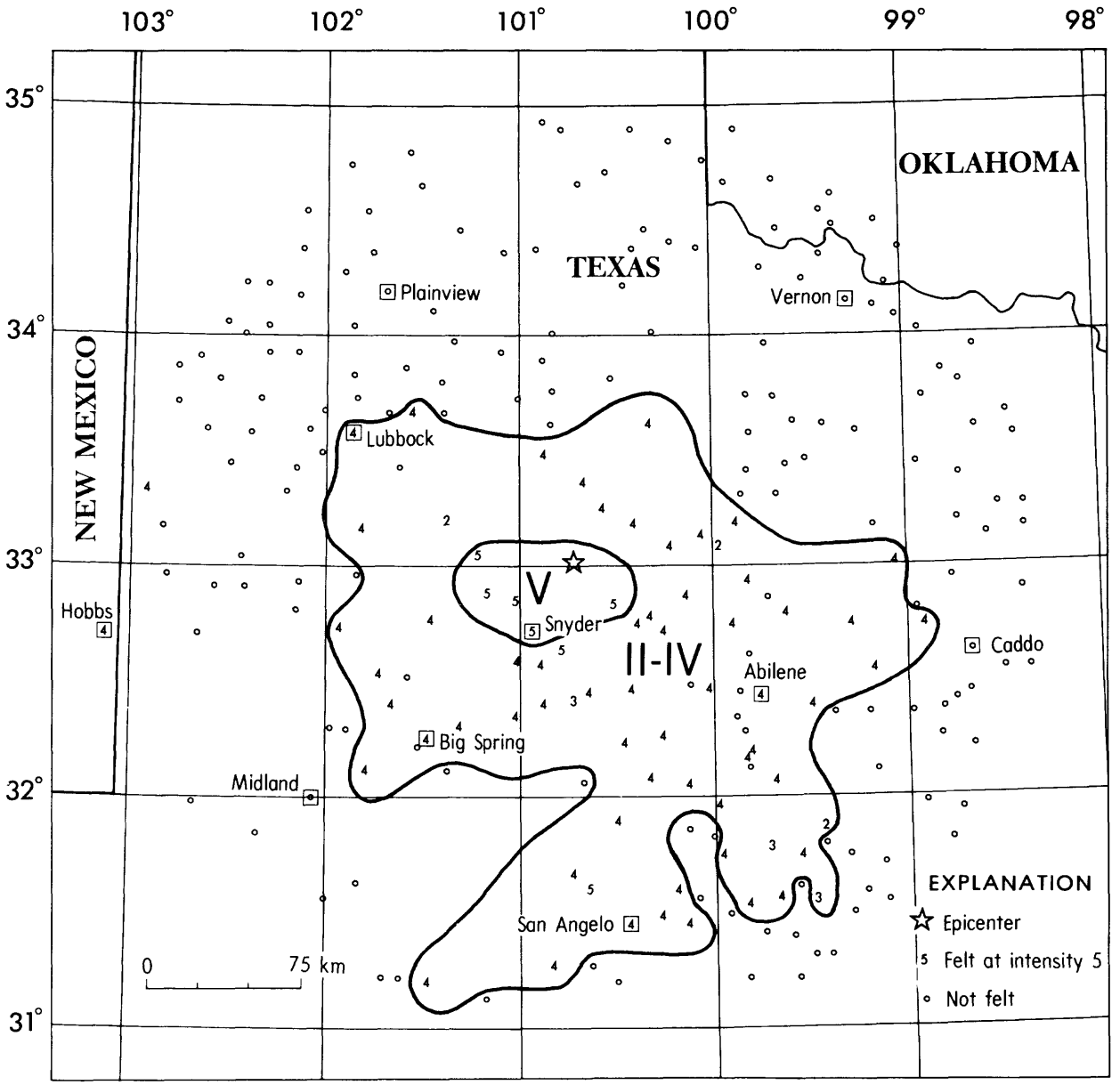


FIGURE 22.--Isoseismal map for the west Texas earthquake of 16 June 1978, 11 46 54.2 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Utah--Continued

30 November (U) Southeastern Idaho
Origin time: 06 53 40.1

See Idaho listing.

20 December (U) Southeastern Idaho
Origin time: 13 46 22.6

See Idaho listing.

Virginia

17 March (V) Southwestern Virginia
Origin time: 18 26 34.5
Epicenter: 36.75 N., 80.74 W.
Depth: 7 km
Magnitude: 2.8 mbLg
Intensity IV: Galax, Hillsville, Lambsburg, Laurel Fork, Woodlawn.
Intensity III: Dugspur.
Intensity II: Austinville, Independence.

Washington

5 March (W) Puget Sound area
Origin time: 18 13 35.9
Epicenter: 48.06 N., 123.00 W.
Depth: 57 km
Magnitude: 4.0 mb(G), 3.3 ML(G)
Intensity IV: Nordland.
Intensity III:
British Columbia--Victoria (telephone report).
Washington--North Seattle (telephone report), Oak Harbor (telephone report).
Intensity II: Hansville.

11 March (W) Puget Sound area
Origin time: 15 52 11.2
Epicenter: 47.42 N., 122.71 W.
Depth: 25 km
Magnitude: 4.3 mb(G), 4.8 ML, 3.2 MS(G)

This earthquake was felt over an area of 20,000 sq km of northwest Washington (fig. 23).

Intensity VI: Crystal Mountain Ski Resort (crack in rock and mortar wall at the Summit House; open beams supporting the roof moved 1-2 cm), Freeland (cracked plaster), Grotto (cracked plaster), Longbranch (cracked plaster and windows).
Intensity V: Ashford, Bremerton, Centralia, Dockton, Enumclaw, Everett, Federal Way, Hobart, Issaquah, La Grande, Leavenworth, Olympia, Port Orchard, Poulsbo, Preston, Redondo, Ronald, Seabeck, Seattle, Snoqualmie Pass, South Colby, Tacoma.
Intensity IV: Aberdeen, Allyn, Anderson Island, Baring, Belfair, Blakely Island, Brinnon, Burley, Cinebar, Clearlake, Des Moines, East Olympia, Eatonville, Fort Lewis (Gray Army Airfield), Fox Island, Gig Harbor, Glenoma, Hadlock, Hoodsport, Indianola, Kapowsin, Kent, La Conner, Lakebay, Little Rock, Lyman, Lynnwood, McKenna, Medina, Milton, Mukilteo, Olalla, Olga, Orting, Pacific, Parkland, Port Angeles, Proctor, Puyallup, Ranier, Renton, Roy, Skykomish, Spanaway, Tillicum, Tracyton, Union, Vashon, Vaughn, Wilkeson, Winslow, Yelon.
Intensity III: Buckley, Carbonado, Carnation, Fircrest, Fort Lewis, Gold Bar, Lake Stevens, Lakewood Center, McMillin, Napavine, Oakville, Randle, Redmond, Wallingford, Wenatchee (press report).
Intensity II: Bellevue, Edmonds, Fall City, Forest Park, Index, Lester, Lilliwaup, Mineral.

Washington--Continued

29 March (W) Northwest Washington
Origin time: 12 16 38.4
Epicenter: 48.20 N., 122.76 W.
Depth: 24 km
Magnitude: 2.7 ML(G)
Intensity IV: Oak Harbor.

31 March (W) Puget Sound area
Origin time: 08 03 00.2
Epicenter: 47.42 N., 122.72 W.
Depth: 23 km
Magnitude: 4.2 ML(G)

This earthquake was felt over an area of 7,000 sq km of the Puget Sound area (fig. 24).

Intensity V: Bremerton (hairline cracks in exterior walls), Brinnon, Chimacum, Hadlock, Manchester, Olalla, Port Orchard, Port Ludlow, Poulsbo, Quilcene, Rollingbay, Seabeck, Seattle, Tacoma, Tracyton, Union.
Intensity IV: Auburn, Baring, Belfair, Bellevue, Burley, Crystal Mountain, Dockton, Fircrest, Fox Island, Hansville, Index, Indianola, Kapowsin, Kingston, Lilliwaup, Matlock, Medina, Olympia, Puyallup, Ravensdale, Tahuya, Vaughn.
Intensity III: La Grande.
Intensity II: Carnation, Nordland.

27 June (W) Washington
Origin time: 02 18 58.8
Epicenter: 46.86 N., 120.96 W.
Depth: 1 km
Magnitude: 3.7 ML(G)
Intensity II: Naches Ranger Station (W), Snoqualmie.

23 August (Q) Vancouver Island, British Columbia
Origin time: 10 37 18.0
Epicenter: 48.38 N., 123.20 W.
Depth: 17 km
Magnitude: 4.4 mb(G), 3.5 ML

Felt at intensity V on Vancouver Island.

Intensity IV: Eastsound, Friday Harbor.
Intensity II: Port Angeles (W).

31 December (W) Seattle area
Origin time: 03 23 46.7
Epicenter: 47.58 N., 121.85 W.
Depth: 20 km
Magnitude: 4.0 ML(G)

This earthquake was felt over an area of approximately 8,500 sq km of Washington and British Columbia (fig. 25).

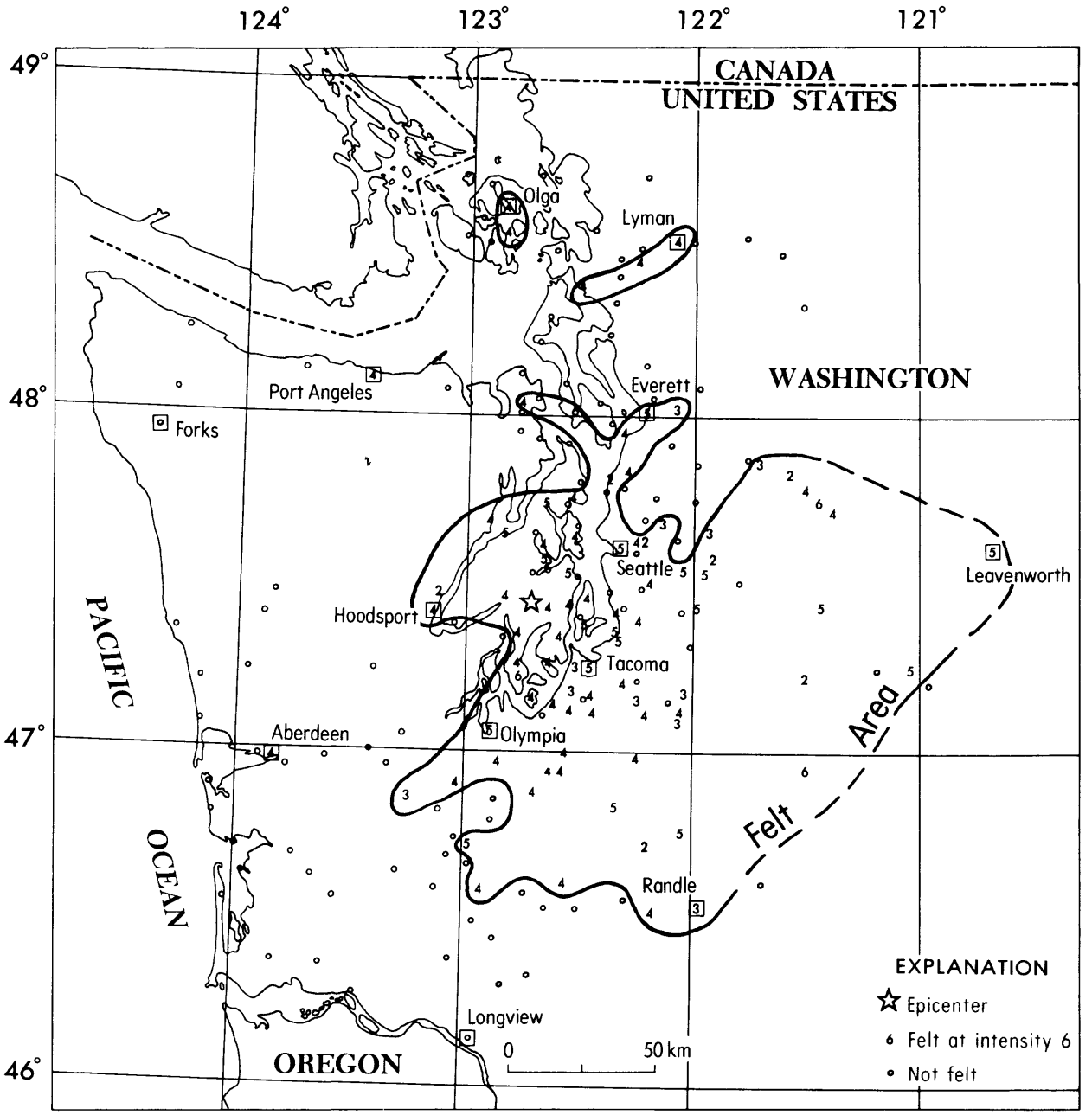


FIGURE 23.--Isoseismal map for the Puget Sound, Washington, earthquake of 11 March 1978, 15 52 11.2 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites. Dashed line indicates the isoseismal is not well defined by the data.

Washington--Continued

Intensity V:
Washington--
Granite Falls (light furniture and small objects shifted, felt by many),
North Seattle (press reported small cracks in walls and ceiling of one home).

Washington--Continued

Intensity IV:
Washington--Bothell, Clinton, Fall City, Freeland, Gold Bar, Grotto, Hobart, Index, Kenmore (press report), Kingston, Lake City (press report), Lake Forest Park

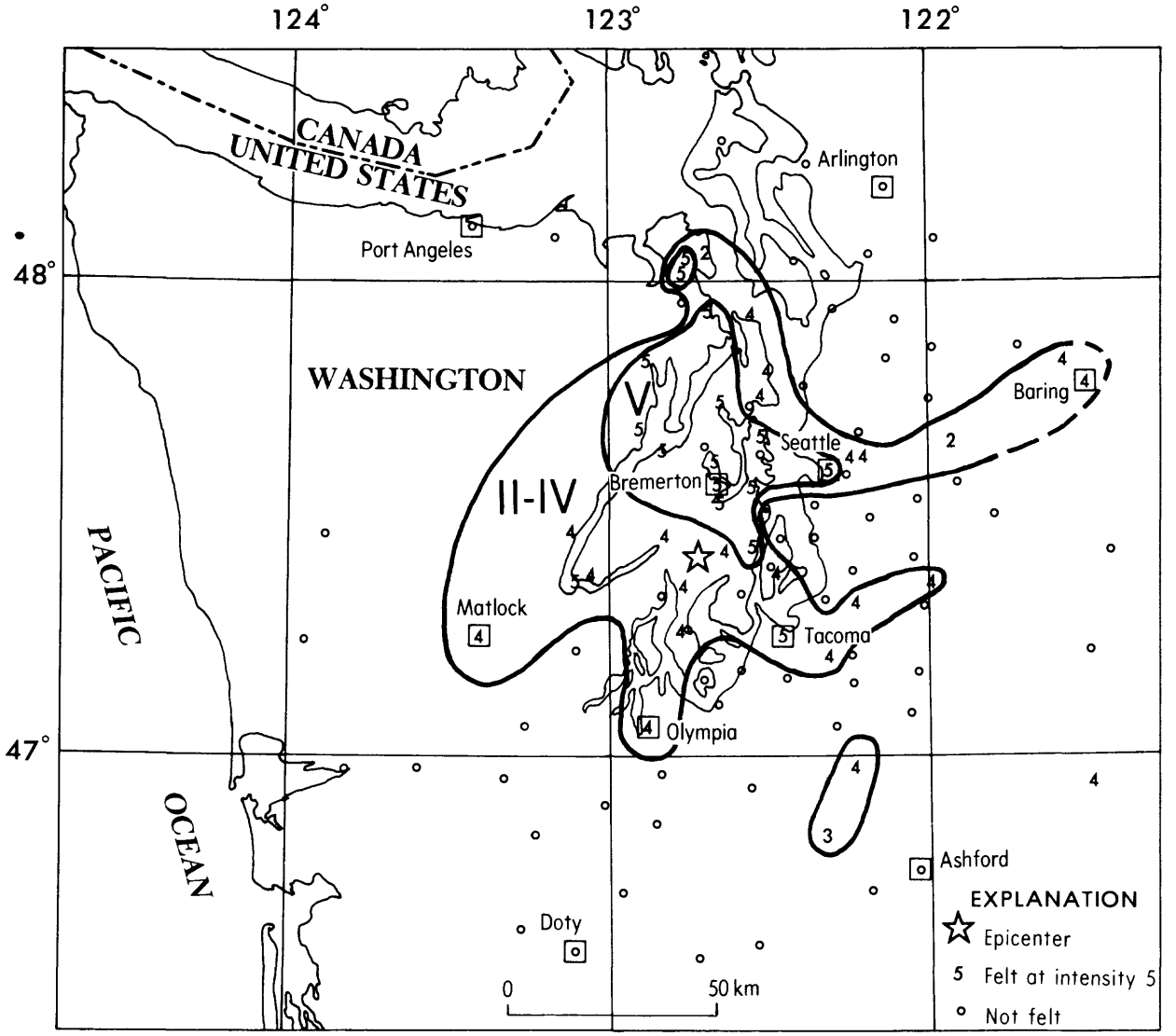


FIGURE 24.--Isoseismal map for the Puget Sound, Washington, earthquake of 31 March 1978, 08 03 00.2 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites. Dashed line indicates the isoseismal is not well defined by the data.

Washington--Continued

(press report), Lake Stevens, Magnolia (press report), Monroe, Mukilteo, Northbend, Port Orchard, Preston, Ravensdale, Renton, Seattle, Seattle-Tacoma Airport (furniture shifted on the fifth floor), Snoqualmie, Sultan, Woodinville.

Intensity III:

Washington--Belfair, Conway, Darrington, Everett, Kirkland, Medina, Mountlake Terrace, Port Townsend, Shaw Island, Startup.

Intensity II:

Washington--Continued

British Columbia--Victoria (press report).
Washington--Black Diamond, Coupeville, Edmonds, North Bend, Retsil, Skykomish, Tacoma.

Wyoming

13 January Yellowstone National Park

Seven earthquakes were felt in the eastern part of the park from Janu-

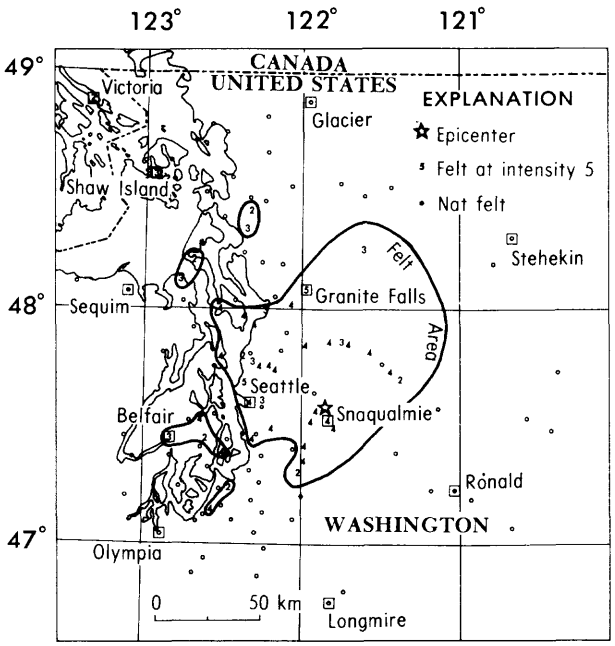


FIGURE 25.--Isoseismal map for the Seattle earthquake of 31 December 1978, 03 23 46.7 UTC. Roman numerals represent Modified Mercalli intensities between isoseismals; Arabic numerals are used to represent these intensities at specific sites.

Wyoming--Continued

ary 13 to 21. The largest magnitude of these quakes was about 1.8 ML. They were felt at Canyon Village and Lake, with the smaller magnitude events only being felt at Lake. Maximum intensity was IV.

16 January (G) Southeast Wyoming
Origin time: 03 50 03.1
Epicenter: 42.43 N., 105.31 W.
Depth: 5 km
Magnitude: 3.0 ML
Intensity III: 14.5 km north of Laramie, Wheatland (telephone report).

2 February (G) Yellowstone National Park
Origin time: 00 36 25.6
Epicenter: 44.39 N., 110.81 W.
Depth: 5 km
Magnitude: 3.6 mb, 3.4 ML, 3.6 ML(D)
Intensity III: Old Faithful. (Shocks at 00 49 01.4 and 04 30 25.9 with magnitudes of 2.8 ML and 2.6 ML were also felt.)

2 February (G) Yellowstone National Park
Origin time: 12 35 56.2
Epicenter: 44.38 N., 110.83 W.

Wyoming--Continued

Depth: 4 km
Magnitude: 3.3 mb, 3.1 ML, 3.5 ML(D)
Intensity III: Old Faithful.

7 March (G) Yellowstone National Park
Origin time: 01 10 47.6
Epicenter: 44.43 N., 110.84 W.
Depth: 5 km
Magnitude: 3.7 mb, 3.5 ML, 3.8 ML(D)

From March 7 at 01 09 UTC, to 18 30 UTC, a swarm of 129 tremors was felt at Old Faithful. This series was known to have immediately induced minor changes in the thermal activity in the Upper Geyser Basin. These included increased turbidity in Heart Spring and Calida, and more vigorous splashing in Tea Kettle, with a rise in water level.
No changes in thermal activity occurred at the Norris Geyser Basin for 2.5 days after the swarm. But by March 23, Palpitar Spring had drained and the algae had died. At Steamboat Geyser minor eruptions appeared to have greater volume, and on March 28 the geyser had its first major eruption in 9 years. Runoff and sinter deposition at Cistun Springs had shifted from the west side of the pool to the southeast side, where two small trees were dying from the hot water (R. A. Hutchinson, National Park Service, written commun., 1978).

Intensity V: Old Faithful.

7 March (G) Yellowstone National Park
Origin time: 07 39 33.1
Epicenter: 44.30 N., 110.92 W.
Depth: 5 km
Magnitude: 3.8 mb, 3.1 ML
Intensity IV: Old Faithful.

15 April (G) Western Wyoming
Origin time: 05 23 50.8
Epicenter: 42.72 N., 110.88 W.
Depth: 5 km
Magnitude: 2.5 ML
Intensity II: Afton.

7 June Yellowstone National Park
Origin time: 12 28
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity IV: Canyon Village.
Intensity III: Lake.

8 June Yellowstone National Park
Origin time: 15 01 54
Epicenter: Not located.
Depth: None computed.

Magnitude: None computed.
Intensity III: Old Faithful.

18 June Yellowstone National Park
Origin time: 22 40
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity III: Old Faithful.

19 June Yellowstone National Park
Origin time: 05 43
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity IV: Lake-Fishing Bridge area.

15 July Yellowstone National Park
Origin time: 08 26
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity IV: Norris.
Intensity III: Canyon Village.

21 July Yellowstone National Park
Origin time: 10 01
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity IV: Grant Village.

21 August Yellowstone National Park
Origin time: 12 14
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.
Intensity III: Old Faithful (earthquakes at 12:16, 12:27, and 12:32 were also felt at intensity III).

21 August Yellowstone National Park
Origin time: 13 14
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.

Five other earthquakes were felt at Old Faithful following this one. They were felt at 13:16, 13:27, 13:32, 14:25, and 14:27 (R. A. Hutchinson, Park Geologist).

Intensity III: Old Faithful.

15 September (G) Yellowstone National Park
Origin time: 13 45 44.8

Wyoming--Continued

Epicenter: 44.56 N., 110.49 W.
Depth: 5 km
Magnitude: 2.5 ML
Intensity IV: Canyon Village, Fishing Bridge, Lake.

2 October (G) Yellowstone National Park
Origin time: 13 59 10.7
Epicenter: 44.74 N., 110.78 W.
Depth: 5 km
Magnitude: 3.5 ML, 3.5 ML(D)

This earthquake and the one at 23 55 42.6 are two of nine which were felt in the park area on October 2 in a 12-hour period from 11 59 to 23 55 UTC. The intensity data are from R. A. Hutchinson, Park Geologist (written commun., 1979).

Intensity III: Madison Junction.
Intensity II: Old Faithful.

2 October (G) Yellowstone National Park
Origin time: 23 55 42.6
Epicenter: 44.71 N., 110.80 W.
Depth: 5 km
Magnitude: 3.6 ML, 3.7 ML(D)
Intensity IV: Madison Junction, Norris.
Intensity III: Canyon Village.
Intensity II: Old Faithful.

12 October Yellowstone National Park
Origin time: 13 52
Epicenter: Not located.
Depth: None computed.
Magnitude: None computed.

This is the first of about 35 earthquakes occurring in a 90-minute period which were felt at Grant Village (R. A. Hutchinson, written commun., 1979).

Intensity IV: Grant Village.

4 November (G) Hebgen Lake region
Origin time: 15 49 43.8

See Montana listing.

11 November (G) Yellowstone National Park
Origin time: 20 46 20.8
Epicenter: 44.39 N., 110.25 W.
Depth: 6 km
Magnitude: 3.2 ML, 3.9 ML(D)
Intensity II: Lake.

Table 1.--*Summary of U.S. earthquakes for 1978*

[The following symbols are used to indicate authority for arrival or origin times, epicenters, and/or magnitudes: (A) Geophysical Institute, University of Alaska, Fairbanks; (B) University of California, Berkeley; (D) University of Montana, Missoula; (E) U.S. Department of Energy, Las Vegas, Nevada; (G) U.S. Geological Survey, National Earthquake Information Service, Golden, Colo.; (H) U.S. Geological Survey, Hawaiian Volcano Observatory, Hawaii National Park; (J) Weston Observatory, Weston, Mass.; (K) Lee, W. H. K. and others, 1978; (L) Lamont-Doherty Geological Observatory, Palisades, N.Y.; (M) NOAA, Alaska Tsunami Warning Center, Palmer; (P) California Institute of Technology, Pasadena; (R) University of Nevada, Reno; (S) St. Louis University, St. Louis, Mo.; (T) University of Oklahoma, Leonard; (U) University of Utah, Salt Lake City; (V) Virginia Polytechnic Institute and State University, Blacksburg; (W) University of Washington, Seattle]

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALABAMA													
JAN. 8	11	34	23.6	32.76 N.	88.24 W.	5	...	...	3.0G	...	G	JAN. 8	05 A.M. CST
MAR. 1	04	8	26.6	34.42 N.	86.61 W.	5	...	...	2.5G	III	G	FEB. 28	10 P.M. CST
OCT. 27	13	53	54.4	33.82 N.	87.45 W.	5	...	...	2.9T	...	G	OCT. 27	07 A.M. CST
ALASKA													
JAN. 2	04	23	11.0	60.81 N.	151.72 W.	87	4.0	...	...	...	G	JAN. 1	06 P.M. AST
JAN. 2	20	57	38.2	51.10 N.	178.15 W.	33N	5.1	...	...	...	G	JAN. 2	09 A.M. BST
JAN. 3	20	07	43.4	64.43 N.	146.56 W.	23	...	...	3.9M	...	G	JAN. 3	10 A.M. AST
JAN. 5	19	56	09.8	61.33 N.	151.65 W.	110	4.4	...	...	III	G	JAN. 5	09 A.M. AST
JAN. 5	21	00	13.2	56.02 N.	154.27 W.	33N	4.9	...	4.1M	...	G	JAN. 5	11 A.M. AST
JAN. 6	07	08	43.8	51.78 N.	176.01 W.	63	5.3	...	...	IV	G	JAN. 5	08 P.M. BST
JAN. 6	21	59	01.1	60.91 N.	149.38 W.	45	4.6	...	4.9M	V	G	JAN. 6	11 A.M. AST
JAN. 7	20	48	45.0	61.91 N.	150.67 W.	67	...	...	...	...	G	JAN. 7	10 A.M. AST
JAN. 8	22	13	57.1	57.11 N.	153.41 W.	26	4.8	...	...	...	G	JAN. 8	12 M. AST
JAN. 9	07	06	05.8	62.00 N.	148.82 W.	9	...	...	3.5M	III	G	JAN. 8	09 P.M. AST
JAN. 9	22	18	14.6	51.61 N.	177.17 W.	121	3.9	...	...	II	G	JAN. 9	11 A.M. BST
JAN. 10	12	09	16.4	64.74 N.	147.44 W.	24	...	...	2.8M	III	Z	JAN. 10	02 A.M. AST
JAN. 13	23	33	25.2	60.54 N.	151.83 W.	79	...	...	...	...	G	JAN. 13	01 P.M. AST
JAN. 14	20	30	38.7	54.17 N.	164.09 W.	40	4.8	...	...	...	G	JAN. 14	09 A.M. BST
JAN. 15	21	08	58.7	59.16 N.	144.39 W.	33N	4.7	...	3.7M	...	G	JAN. 15	11 A.M. AST
JAN. 17	18	49	45.0	63.26 N.	150.90 W.	33N	...	...	3.0M	...	G	JAN. 17	08 A.M. AST
JAN. 18	04	51	51.1	52.18 N.	170.35 W.	33N	4.6	...	...	...	G	JAN. 17	05 P.M. BST
JAN. 18	17	04	18.1	52.92 N.	166.43 W.	70	...	...	...	IV	G	JAN. 18	06 A.M. BST
JAN. 19	16	24	48.2	63.15 N.	149.92 W.	103	...	...	...	...	G	JAN. 19	06 A.M. AST
JAN. 21	22	49	37.7	66.24 N.	157.40 W.	33N	...	...	4.1M	...	G	JAN. 21	12 M. AST
JAN. 22	02	02	54.0	60.24 N.	152.33 W.	115	...	...	...	III	G	JAN. 21	04 P.M. AST
JAN. 22	08	09	28.4	51.30 N.	177.90 E.	32	5.2	4.7	...	...	G	JAN. 21	09 P.M. BST
JAN. 23	13	46	54.2	61.65 N.	150.63 W.	52	...	...	...	...	G	JAN. 23	03 A.M. AST
JAN. 25	09	20	21.4	69.30 N.	142.83 W.	5	...	...	...	...	G	JAN. 24	11 P.M. AST
JAN. 25	11	32	06.6	60.64 N.	147.27 W.	33N	...	...	3.7M	...	G	JAN. 25	01 A.M. AST
JAN. 25	21	43	03.6	52.13 N.	169.81 W.	21	5.0	4.2	...	...	G	JAN. 25	10 A.M. BST
JAN. 26	03	10	55.8	54.56 N.	155.73 W.	33N	4.7	...	...	...	G	JAN. 25	05 P.M. AST
JAN. 27	18	52	59.2	60.37 N.	151.12 W.	70	4.7	...	...	III	G	JAN. 27	08 A.M. AST
JAN. 28	02	19	39.4	63.25 N.	150.68 W.	120	...	...	...	...	G	JAN. 27	04 P.M. AST
JAN. 28	02	25	01.6	63.06 N.	150.96 W.	126	4.4	...	...	...	G	JAN. 27	04 P.M. AST
JAN. 28	18	53	06.8	60.07 N.	151.33 W.	77	4.5	...	...	III	G	JAN. 28	08 A.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
JAN. 29	12	58	48.8	62.90 N.	150.48 W.	114	3.4	...	...	...	G	JAN. 29	02 A.M. AST
FEB. 2	21	49	02.1	62.01 N.	149.06 W.	49	...	...	...	...	G	FEB. 2	11 A.M. AST
FEB. 4	05	00	34.7	62.26 N.	150.96 W.	79	...	...	...	...	G	FEB. 3	07 P.M. AST
FEB. 5	12	40	26.1	58.18 N.	154.92 W.	133	...	...	...	...	G	FEB. 5	02 A.M. AST
FEB. 6	07	00	50.0	59.79 N.	152.90 W.	117	...	...	...	...	G	FEB. 5	09 P.M. AST
FEB. 10	13	18	43.3	62.16 N.	148.71 W.	33N	...	...	3.0M	...	G	FEB. 10	03 A.M. AST
FEB. 11	12	10	27.6	53.07 N.	171.03 E.	33N	5.2	4.7	...	...	G	FEB. 11	01 A.M. BST
FEB. 12	08	56	38.9	59.45 N.	152.62 W.	72	5.4	...	...	IV	G	FEB. 11	10 P.M. AST
FEB. 13	01	16	54.3	59.86 N.	153.76 W.	131	4.9	...	...	...	G	FEB. 12	03 P.M. AST
FEB. 16	14	52	42.0	59.43 N.	145.63 W.	52	4.0	4.7	...	...	G	FEB. 16	04 A.M. AST
FEB. 16	18	33	42.3	52.38 N.	166.75 W.	33	4.6	...	...	...	G	FEB. 16	07 A.M. BST
FEB. 16	20	53	49.0	61.31 N.	144.89 W.	33N	...	...	4.1M	IV	G	FEB. 16	10 A.M. AST
FEB. 19	06	28	57.6	63.36 N.	151.17 W.	50	...	...	3.6M	...	G	FEB. 18	08 P.M. AST
FEB. 19	14	29	53.8	50.26 N.	178.14 W.	71	4.1	...	...	...	G	FEB. 19	03 A.M. BST
FEB. 20	03	43	11.6	51.32 N.	177.12 E.	37	4.2	...	...	...	G	FEB. 19	04 P.M. BST
FEB. 20	03	45	39.4	51.26 N.	177.10 E.	44	4.8	...	...	...	G	FEB. 19	04 P.M. BST
FEB. 21	05	31	26.6	62.78 N.	152.78 W.	33N	3.5	...	...	...	G	FEB. 20	07 P.M. AST
FEB. 22	21	55	57.3	51.46 N.	176.17 W.	56	4.1	...	...	...	G	FEB. 22	10 A.M. BST
FEB. 26	10	52	37.8	60.07 N.	152.85 W.	125	4.4	...	...	...	G	FEB. 26	12 P.M. AST
MAR. 1	11	58	47.6	66.09 N.	149.49 W.	33N	...	...	3.5M	...	G	MAR. 1	01 A.M. AST
MAR. 2	01	48	33.7	61.19 N.	151.27 W.	97	...	...	...	...	G	MAR. 1	03 P.M. AST
MAR. 2	10	56	19.3	53.23 N.	171.49 E.	33N	4.3	...	...	...	G	MAR. 1	11 P.M. BST
MAR. 2	14	41	40.7	56.39 N.	158.28 W.	88	4.9	...	...	...	G	MAR. 2	04 A.M. AST
MAR. 3	18	48	36.7	56.32 N.	152.80 W.	35	4.5	...	...	...	G	MAR. 3	08 A.M. AST
MAR. 4	07	34	10.7	52.93 N.	168.95 W.	48	4.4	...	...	...	G	MAR. 3	08 P.M. BST
MAR. 4	10	23	01.4	56.26 N.	152.72 W.	20	4.6	...	...	...	G	MAR. 4	12 P.M. AST
MAR. 5	00	33	26.8	59.96 N.	153.50 W.	155	4.5	...	...	...	G	MAR. 4	02 P.M. AST
MAR. 6	18	40	23.6	51.76 N.	175.81 W.	65	4.7	...	...	II	G	MAR. 6	07 A.M. BST
MAR. 6	20	47	25.6	59.00 N.	154.27 W.	138	...	...	...	...	G	MAR. 6	10 A.M. AST
MAR. 7	01	53	13.8	59.65 N.	152.71 W.	102	...	...	...	...	G	MAR. 6	03 P.M. AST
MAR. 10	02	34	35.0	60.79 N.	153.77 W.	44	...	...	3.5M	...	G	MAR. 9	04 P.M. AST
MAR. 11	13	30	06.4	59.41 N.	152.08 W.	68	...	...	...	...	G	MAR. 11	03 A.M. AST
MAR. 12	03	15	19.2	61.48 N.	150.76 W.	46	...	...	...	...	G	MAR. 11	05 P.M. AST
MAR. 14	02	30	23.6	51.97 N.	179.11 W.	102	5.1	...	...	...	G	MAR. 13	03 P.M. BST
MAR. 15	15	01	51.4	52.26 N.	168.44 W.	20	4.7	...	...	...	G	MAR. 15	04 A.M. BST
MAR. 16	02	00	50.4	52.27 N.	168.59 W.	38	5.1	...	...	...	G	MAR. 15	03 P.M. BST
MAR. 16	02	09	38.4	52.30 N.	168.62 W.	49	5.5	5.3	...	...	G	MAR. 15	03 P.M. BST
MAR. 16	02	31	10.5	52.43 N.	168.59 W.	51	4.6	...	...	...	G	MAR. 15	03 P.M. BST
MAR. 16	03	29	59.6	52.31 N.	168.58 W.	33N	5.0	...	...	...	G	MAR. 15	04 P.M. BST
MAR. 18	16	12	35.3	59.63 N.	153.34 W.	126	...	...	...	...	G	MAR. 18	06 A.M. AST
MAR. 18	21	26	38.8	62.55 N.	150.88 W.	34	...	...	3.3M	...	G	MAR. 18	11 A.M. AST
MAR. 19	03	37	05.3	63.78 N.	147.50 W.	11	3.4	...	3.5M	...	G	MAR. 18	05 P.M. AST
MAR. 20	03	59	05.0	60.18 N.	153.61 W.	153	4.9	...	...	II	G	MAR. 19	05 P.M. AST
MAR. 20	08	15	37.5	59.84 N.	153.24 W.	134	3.8	...	...	III	G	MAR. 19	10 P.M. AST
MAR. 22	15	45	20.3	64.88 N.	160.48 W.	33N	4.7	...	3.8M	...	G	MAR. 22	05 A.M. AST
MAR. 23	07	23	13.4	52.01 N.	169.47 W.	23	5.6	5.8	...	...	G	MAR. 22	08 P.M. BST
MAR. 24	05	22	09.9	52.22 N.	169.52 W.	33	4.7	...	...	...	G	MAR. 23	06 P.M. BST
MAR. 25	06	20	19.3	57.00 N.	154.17 W.	33N	4.0	...	...	...	G	MAR. 24	08 P.M. AST
MAR. 26	09	30	29.5	63.28 N.	151.12 W.	33N	...	...	3.4M	...	G	MAR. 25	11 P.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
MAR. 26	20	08	12.2	67.36 N.	146.07 W.	33N	...	...	...	...	G	MAR. 26	10 A.M. AST
MAR. 28	10	28	50.8	59.05 N.	151.83 W.	33N	...	...	...	...	G	MAR. 28	12 P.M. AST
MAR. 31	00	19	06.2	60.33 N.	152.52 W.	128	4.5	...	...	...	G	MAR. 30	02 P.M. AST
MAR. 31	00	38	13.4	61.77 N.	151.41 W.	90	5.1	...	...	IV	G	MAR. 30	02 P.M. AST
APR. 2	16	46	11.3	62.55 N.	149.17 W.	54	...	...	4.5A	...	A	APR. 2	06 A.M. AST
APR. 3	16	08	53.0	62.18 N.	148.79 W.	33N	...	...	3.0M	...	G	APR. 3	06 A.M. AST
APR. 6	04	44	04.2	64.08 N.	148.65 W.	130	3.6	...	...	...	G	APR. 5	06 P.M. AST
APR. 9	17	12	59.9	60.69 N.	151.84 W.	101	4.5	...	...	III	G	APR. 9	07 A.M. AST
APR. 10	10	47	02.9	63.07 N.	150.64 W.	131	4.2	...	...	...	G	APR. 10	12 P.M. AST
APR. 10	18	12	56.4	58.29 N.	151.67 W.	33N	3.8	...	2.6A	...	G	APR. 10	08 A.M. AST
APR. 11	05	12	55.1	53.53 N.	163.73 W.	33N	5.5	5.6	...	...	G	APR. 10	06 P.M. BST
APR. 12	01	56	28.4	63.13 N.	149.92 W.	100	...	...	...	...	G	APR. 11	03 P.M. AST
APR. 12	03	42	03.5	56.42 N.	152.69 W.	14	6.0	6.6	5.8A	V	G	APR. 11	05 P.M. AST
APR. 12	03	48	55.6	56.74 N.	153.64 W.	23	5.2	...	...	...	G	APR. 11	05 P.M. AST
APR. 12	04	16	05.7	56.50 N.	152.53 W.	33N	4.7	...	4.6A	...	G	APR. 11	06 P.M. AST
APR. 12	04	20	40.0	57.69 N.	152.62 W.	87	4.6	...	...	...	G	APR. 11	06 P.M. AST
APR. 12	04	26	56.5	56.63 N.	152.63 W.	16	4.7	...	4.3A	...	G	APR. 11	06 P.M. AST
APR. 12	04	47	16.6	56.35 N.	152.56 W.	15	4.6	...	5.1A	...	G	APR. 11	06 P.M. AST
APR. 12	05	22	28.9	56.46 N.	152.58 W.	24	5.1	...	5.1M	...	G	APR. 11	07 P.M. AST
APR. 12	08	56	19.2	56.37 N.	152.54 W.	19	4.6	...	3.6M	...	G	APR. 11	10 P.M. AST
APR. 12	09	33	38.2	56.58 N.	152.84 W.	27	5.1	4.5	4.5M	...	G	APR. 11	11 P.M. AST
APR. 12	10	40	43.8	55.86 N.	151.90 W.	33N	4.4	...	3.5M	...	G	APR. 12	12 P.M. AST
APR. 12	22	07	06.4	61.82 N.	147.02 W.	22	...	...	3.1M	...	G	APR. 12	12 M. AST
APR. 13	13	59	58.6	56.17 N.	152.17 W.	33	4.5	...	3.5M	...	G	APR. 13	03 A.M. AST
APR. 14	18	27	10.2	56.36 N.	152.86 W.	33N	4.3	...	3.8A	...	G	APR. 14	08 A.M. AST
APR. 15	08	08	44.4	60.30 N.	151.27 W.	90	3.5	...	...	...	G	APR. 14	10 P.M. AST
APR. 15	17	33	14.7	61.76 N.	141.09 W.	33N	3.3	...	3.8M	...	G	APR. 15	07 A.M. AST
APR. 15	18	09	50.6	61.96 N.	141.13 W.	33N	...	...	3.5M	...	G	APR. 15	08 A.M. AST
APR. 16	08	49	17.6	59.50 N.	152.72 W.	87	3.9	...	...	...	G	APR. 15	10 P.M. AST
APR. 16	09	50	52.2	56.66 N.	152.76 W.	24	4.9	4.2	4.6M	...	G	APR. 15	11 P.M. AST
APR. 16	20	36	18.2	62.95 N.	143.44 W.	33N	...	...	3.0M	...	G	APR. 16	10 A.M. AST
APR. 17	05	49	51.1	54.15 N.	163.96 W.	33N	4.8	...	...	...	G	APR. 16	06 P.M. BST
APR. 18	02	18	08.3	56.37 N.	152.84 W.	33N	4.5	...	4.0M	...	G	APR. 17	04 P.M. AST
APR. 18	20	40	32.4	56.51 N.	152.70 W.	24	...	...	4.8A	...	A	APR. 17	10 A.M. AST
APR. 19	01	49	03.5	60.14 N.	153.54 W.	158	4.6	...	...	II	G	APR. 18	03 P.M. AST
APR. 19	14	52	18.1	61.00 N.	146.49 W.	40	...	...	3.3M	IV	G	APR. 19	04 A.M. AST
APR. 21	03	56	30.4	53.68 N.	163.64 W.	51	4.4	...	...	...	G	APR. 20	04 P.M. BST
APR. 21	10	01	17.0	60.00 N.	151.83 W.	92	4.1	...	...	...	G	APR. 21	12 P.M. AST
APR. 21	20	40	37.7	64.53 N.	147.95 W.	30	...	...	3.7M	II	G	APR. 21	10 A.M. AST
APR. 22	13	24	04.8	56.48 N.	152.82 W.	33N	4.7	4.0	...	...	G	APR. 22	03 A.M. AST
APR. 23	08	24	51.3	62.39 N.	151.21 W.	75	...	...	...	...	G	APR. 22	10 P.M. AST
APR. 23	11	00	08.0	53.69 N.	167.05 W.	33N	4.1	...	...	...	G	APR. 23	12 P.M. BST
APR. 24	04	28	47.0	51.64 N.	176.09 W.	53	5.2	4.8	...	III	G	APR. 23	05 P.M. BST
APR. 25	00	21	31.3	58.22 N.	155.51 W.	33N	3.7	...	2.9A	...	G	APR. 24	02 P.M. AST
APR. 25	07	36	06.2	60.05 N.	153.46 W.	171	4.5	...	...	...	G	APR. 24	09 P.M. AST
APR. 27	01	41	17.3	56.57 N.	152.72 W.	33N	4.7	4.4	4.6M	...	G	APR. 26	03 P.M. AST
APR. 28	02	52	58.8	57.29 N.	152.70 W.	70	4.3	...	...	...	G	APR. 27	04 P.M. AST
APR. 29	17	30	31.3	63.81 N.	148.74 W.	33N	...	...	3.4M	...	G	APR. 29	07 A.M. AST
APR. 30	11	47	52.1	60.35 N.	147.91 W.	88	...	...	...	...	G	APR. 30	01 A.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
MAY 1	04	10	51.1	51.25 N.	176.39 E.	33N	4.2	...	...	...	G	APR. 30	05 P.M. BST
MAY 2	06	57	44.7	61.58 N.	151.48 W.	110	...	...	...	...	G	MAY 1	08 P.M. AST
MAY 5	05	32	47.4	63.30 N.	150.97 W.	134	5.2	...	...	IV	G	MAY 4	07 P.M. AST
MAY 8	14	05	24.7	62.97 N.	149.88 W.	92	3.2	...	...	...	G	MAY 8	04 A.M. AST
MAY 11	00	23	37.6	51.67 N.	176.10 W.	59	5.6	5.9	...	IV	G	MAY 10	01 P.M. BST
MAY 12	12	16	03.9	62.25 N.	149.40 W.	67	5.1	...	...	IV	G	MAY 12	02 A.M. AST
MAY 12	14	59	47.8	62.18 N.	149.13 W.	71	...	...	...	...	G	MAY 12	04 A.M. AST
MAY 12	16	00	37.3	53.92 N.	164.14 W.	33N	4.9	...	...	...	G	MAY 12	05 A.M. BST
MAY 13	13	43	53.7	62.20 N.	149.22 W.	75	...	...	...	...	G	MAY 13	03 A.M. AST
MAY 15	19	56	48.9	54.34 N.	163.91 W.	33N	4.4	...	...	...	G	MAY 15	08 A.M. BST
MAY 16	01	11	36.0	62.00 N.	150.16 W.	33	...	...	2.8M	...	G	MAY 15	03 P.M. AST
MAY 17	08	45	33.8	53.03 N.	170.98 E.	24	5.0	4.0	...	...	G	MAY 16	09 P.M. BST
MAY 21	00	42	41.9	63.06 N.	149.24 W.	90	...	...	...	...	G	MAY 20	02 P.M. AST
MAY 21	14	55	32.8	56.36 N.	152.58 W.	33N	4.7	3.6	4.3M	...	G	MAY 21	04 A.M. AST
MAY 22	13	05	47.1	51.78 N.	176.88 W.	62	4.7	...	...	...	G	MAY 22	02 A.M. BST
MAY 23	02	25	04.8	57.80 N.	156.20 W.	140	3.9	...	...	...	G	MAY 22	04 P.M. AST
MAY 24	06	16	55.4	51.23 N.	179.21 W.	25	6.0	6.7	...	IV	G	MAY 23	07 P.M. BST
MAY 24	06	33	17.6	51.14 N.	179.07 W.	33N	5.0	...	...	...	G	MAY 23	07 P.M. BST
MAY 24	06	47	25.1	51.46 N.	179.44 W.	33N	4.5	...	...	...	G	MAY 23	07 P.M. BST
MAY 24	07	19	10.9	51.15 N.	179.38 W.	33N	4.5	...	...	...	G	MAY 23	08 P.M. BST
MAY 24	07	20	54.4	51.27 N.	179.27 W.	33N	4.9	...	...	...	G	MAY 23	08 P.M. BST
MAY 24	07	34	05.6	51.23 N.	179.27 W.	33N	4.2	...	...	...	G	MAY 23	08 P.M. BST
MAY 24	07	40	55.2	51.58 N.	179.15 W.	33N	4.3	...	...	...	G	MAY 23	08 P.M. BST
MAY 24	07	49	30.6	51.31 N.	179.16 W.	33N	4.5	...	...	...	G	MAY 23	08 P.M. BST
MAY 24	08	19	25.1	51.16 N.	178.86 W.	33N	3.9	...	...	...	G	MAY 23	09 P.M. BST
MAY 24	08	30	00.4	58.54 N.	150.38 W.	33N	...	...	3.5M	...	G	MAY 23	10 P.M. AST
MAY 24	09	23	56.7	51.20 N.	179.18 W.	33N	4.8	...	...	...	G	MAY 23	10 P.M. BST
MAY 24	09	25	46.5	51.38 N.	179.08 W.	33N	4.3	...	...	...	G	MAY 23	10 P.M. BST
MAY 24	09	31	02.6	54.23 N.	160.55 W.	33N	4.0	...	...	...	G	MAY 23	11 P.M. AST
MAY 24	09	46	14.3	51.38 N.	179.40 W.	33N	4.2	...	...	...	G	MAY 23	10 P.M. BST
MAY 24	09	53	03.4	51.13 N.	179.20 W.	33N	5.2	5.4	...	III	G	MAY 23	10 P.M. BST
MAY 24	11	35	23.7	51.27 N.	179.38 W.	33N	4.1	...	...	...	G	MAY 24	12 P.M. BST
MAY 24	13	35	16.7	60.85 N.	147.24 W.	33N	...	...	3.4M	...	G	MAY 24	03 A.M. AST
MAY 24	15	01	00.1	51.72 N.	179.16 W.	33N	3.9	...	...	...	G	MAY 24	04 A.M. BST
MAY 24	18	54	29.8	51.45 N.	179.42 W.	33N	4.8	3.7	...	...	G	MAY 24	07 A.M. BST
MAY 24	22	00	22.5	51.14 N.	179.29 W.	33N	4.2	...	...	...	G	MAY 24	11 A.M. BST
MAY 24	23	49	37.3	51.24 N.	179.30 W.	33N	4.5	...	...	...	G	MAY 24	12 M. BST
MAY 25	10	39	57.4	64.55 N.	152.59 W.	33N	...	...	4.0M	IV	G	MAY 25	12 P.M. AST
MAY 27	14	50	09.1	60.55 N.	150.70 W.	38	...	...	3.5M	...	G	MAY 27	04 A.M. AST
MAY 28	19	02	10.7	52.13 N.	169.53 W.	36	4.1	...	...	...	G	MAY 28	08 A.M. BST
MAY 29	06	24	44.6	60.08 N.	153.42 W.	152	4.1	...	...	...	G	MAY 28	08 P.M. AST
MAY 31	18	29	25.6	61.36 N.	149.70 W.	44	...	...	3.0M	II	G	MAY 31	08 A.M. AST
JUNE 2	16	23	45.1	54.20 N.	162.45 W.	21	4.4	...	...	...	G	JUNE 2	05 A.M. BST
JUNE 3	20	18	36.7	51.34 N.	177.19 E.	58	4.2	...	...	...	G	JUNE 3	09 A.M. BST
JUNE 3	23	11	07.7	56.21 N.	154.59 W.	33N	4.4	...	...	...	G	JUNE 3	01 P.M. AST
JUNE 4	11	32	28.0	58.91 N.	153.72 W.	13	...	...	3.2M	...	G	JUNE 4	01 A.M. AST
JUNE 6	11	39	39.6	62.99 N.	150.42 W.	117	3.6	...	...	...	G	JUNE 6	01 A.M. AST
JUNE 7	12	37	47.6	59.93 N.	152.50 W.	98	...	...	...	...	G	JUNE 7	02 A.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
JUNE 8	02	49	03.6	60.10 N.	146.45 W.	68	3.9	...	...	...	G	JUNE 7	04 P.M. AST
JUNE 9	22	08	11.0	52.38 N.	168.67 W.	33N	4.9	4.1	...	...	G	JUNE 9	11 A.M. BST
JUNE 10	08	23	59.6	57.92 N.	156.72 W.	10	4.5	3.9	4.6M	II	G	JUNE 9	10 P.M. AST
JUNE 10	13	02	03.3	62.99 N.	149.14 W.	102	...	...	...	...	G	JUNE 10	03 A.M. AST
JUNE 10	19	35	10.2	60.30 N.	146.45 W.	20	4.8	...	4.7M	IV	G	JUNE 10	09 A.M. AST
JUNE 11	05	01	15.7	62.13 N.	148.99 W.	51	...	...	...	...	G	JUNE 10	07 P.M. AST
JUNE 11	07	53	20.6	58.84 N.	151.46 W.	69	...	...	...	...	G	JUNE 10	09 P.M. AST
JUNE 12	00	26	41.7	58.56 N.	142.90 W.	33N	...	...	3.4M	...	G	JUNE 11	02 P.M. AST
JUNE 12	07	30	39.3	59.86 N.	150.76 W.	55	4.0	...	...	III	G	JUNE 11	09 P.M. AST
JUNE 12	15	28	41.5	61.03 N.	148.53 W.	48	...	...	3.9A	...	G	JUNE 12	05 A.M. AST
JUNE 14	11	27	03.8	61.63 N.	149.51 W.	33N	...	...	3.6M	...	G	JUNE 14	01 A.M. AST
JUNE 18	19	31	04.1	62.65 N.	151.21 W.	85	...	...	...	...	G	JUNE 18	09 A.M. AST
JUNE 19	19	05	03.2	51.66 N.	174.20 W.	33	4.9	3.9	...	...	G	JUNE 19	08 A.M. BST
JUNE 20	02	30	08.6	56.87 N.	157.09 W.	99	4.6	...	...	...	G	JUNE 19	04 P.M. AST
JUNE 21	02	37	55.5	57.29 N.	152.86 W.	83	4.2	...	...	...	G	JUNE 20	04 P.M. AST
JUNE 22	02	22	07.0	61.50 N.	149.35 W.	33N	...	...	2.7M	...	G	JUNE 21	04 P.M. AST
JUNE 22	05	14	04.1	63.12 N.	150.81 W.	121	...	...	...	...	G	JUNE 21	07 P.M. AST
JUNE 22	05	41	27.7	51.61 N.	179.41 W.	33N	4.8	5.9	5.0M	III	G	JUNE 21	06 P.M. BST
JUNE 22	10	38	22.6	51.91 N.	175.22 W.	33N	4.3	...	...	...	G	JUNE 21	11 P.M. BST
JUNE 24	01	20	42.7	51.28 N.	178.95 W.	66	4.6	...	...	...	G	JUNE 23	02 P.M. BST
JUNE 24	23	17	59.6	58.61 N.	150.60 W.	75	4.2	...	...	...	G	JUNE 24	01 P.M. AST
JUNE 25	01	11	29.9	62.12 N.	151.24 W.	98	3.8	...	...	...	G	JUNE 24	03 P.M. AST
JUNE 26	02	52	56.5	57.61 N.	169.92 W.	33N	4.2	...	...	...	G	JUNE 25	03 P.M. BST
JUNE 27	23	40	58.0	55.82 N.	154.40 W.	15	4.8	4.0	4.6M	...	G	JUNE 27	01 P.M. AST
JUNE 29	06	44	30.6	61.34 N.	150.74 W.	52	...	...	...	...	G	JUNE 28	08 P.M. AST
JUNE 29	08	52	33.4	62.91 N.	150.91 W.	119	...	...	...	...	G	JUNE 28	10 P.M. AST
JUNE 29	09	10	57.6	52.76 N.	173.31 W.	147	5.0	...	...	...	G	JUNE 28	10 P.M. BST
JUNE 30	18	13	23.7	61.84 N.	151.92 W.	123	...	...	...	...	G	JUNE 30	08 A.M. AST
JULY 1	14	26	48.7	63.12 N.	150.71 W.	135	...	...	...	...	G	JULY 1	04 A.M. AST
JULY 8	06	27	46.6	51.26 N.	178.98 W.	67	4.9	...	...	...	G	JULY 7	07 P.M. BST
JULY 10	00	14	31.9	53.70 N.	163.60 W.	33N	4.9	4.3	...	...	G	JULY 9	01 P.M. BST
JULY 12	06	30	11.4	51.60 N.	178.85 W.	56	4.4	...	...	...	G	JULY 11	07 P.M. BST
JULY 12	18	53	35.8	56.70 N.	137.50 W.	38	4.1	...	...	...	G	JULY 12	10 A.M. PST
JULY 13	13	25	19.7	52.24 N.	168.82 W.	33N	5.8	5.6	...	...	G	JULY 13	02 A.M. BST
JULY 13	15	24	57.9	62.88 N.	149.61 W.	94	...	...	...	...	G	JULY 13	05 A.M. AST
JULY 13	15	27	33.5	62.11 N.	149.95 W.	40	...	...	3.5M	II	G	JULY 13	05 A.M. AST
JULY 15	08	50	30.6	63.53 N.	149.97 W.	125	...	...	...	...	G	JULY 14	10 P.M. AST
JULY 15	12	21	13.0	59.59 N.	152.67 W.	103	4.1	...	...	...	G	JULY 15	02 A.M. AST
JULY 16	05	03	02.3	63.57 N.	150.52 W.	31	...	...	3.5M	III	G	JULY 15	07 P.M. AST
JULY 16	19	28	10.8	62.89 N.	149.59 W.	95	...	...	...	...	G	JULY 16	09 A.M. AST
JULY 17	05	18	36.8	63.59 N.	157.13 W.	33N	...	...	4.3M	...	G	JULY 16	07 P.M. AST
JULY 18	21	18	40.7	61.98 N.	149.99 W.	33N	...	...	2.9M	...	G	JULY 18	11 A.M. AST
JULY 19	09	32	08.6	56.77 N.	151.65 W.	33N	5.7	5.5	4.9M	...	G	JULY 18	11 P.M. AST
JULY 19	18	54	32.8	61.33 N.	149.98 W.	13	...	...	3.0M	II	A	JULY 19	08 A.M. AST
JULY 20	05	44	39.2	60.68 N.	152.83 W.	149	...	...	...	...	G	JULY 19	07 P.M. AST
JULY 20	18	15	08.7	51.13 N.	175.14 E.	33N	5.2	4.6	...	...	G	JULY 20	07 A.M. BST
JULY 20	20	02	41.5	51.15 N.	178.61 W.	68	3.9	...	...	...	G	JULY 20	09 A.M. BST
JULY 21	06	10	08.0	60.07 N.	152.02 W.	73	...	...	...	...	G	JULY 20	08 P.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
JULY 21	09	41	38.8	60.25 N.	153.42 W.	188	...	...	...	...	G	JULY 20	11 P.M. AST
JULY 21	20	50	30.8	51.43 N.	178.29 W.	54	4.9	...	...	...	G	JULY 21	09 A.M. BST
JULY 23	00	24	54.4	52.01 N.	175.78 E.	61	4.4	...	...	...	G	JULY 22	01 P.M. BST
JULY 23	15	19	35.5	63.31 N.	147.26 W.	33N	5.0	...	4.8M	III	G	JULY 23	05 A.M. AST
JULY 23	17	03	27.9	63.29 N.	147.18 W.	33N	...	...	4.1A	...	G	JULY 23	07 A.M. AST
JULY 25	22	58	27.4	53.89 N.	164.86 W.	33N	4.7	...	...	...	G	JULY 25	11 A.M. BST
JULY 26	14	04	30.2	58.57 N.	151.23 W.	33N	...	...	3.3M	...	G	JULY 26	04 A.M. AST
JULY 26	19	42	45.3	62.75 N.	149.02 W.	89	...	...	...	...	G	JULY 26	09 A.M. AST
JULY 27	04	14	48.0	60.14 N.	152.81 W.	117	...	...	...	...	G	JULY 26	06 P.M. AST
JULY 27	06	31	21.3	59.58 N.	139.18 W.	33N	...	...	3.2M	...	G	JULY 26	09 P.M. YST
JULY 27	14	18	48.0	65.00 N.	147.60 W.	20	...	...	3.8A	IV	G	JULY 27	04 A.M. AST
JULY 27	15	51	42.2	64.85 N.	147.59 W.	10	...	...	3.6A	III	G	JULY 27	05 A.M. AST
JULY 27	17	11	21.1	64.93 N.	148.02 W.	10	...	...	3.7A	III	G	JULY 27	07 A.M. AST
JULY 29	16	31	15.4	50.13 N.	177.85 W.	33N	4.5	...	...	...	G	JULY 29	05 A.M. BST
JULY 31	09	45	55.4	62.45 N.	151.23 W.	86	...	...	...	...	G	JULY 30	11 P.M. AST
AUG. 2	10	12	12.5	51.65 N.	175.65 W.	49	4.8	...	...	...	G	AUG. 1	11 P.M. BST
AUG. 3	06	33	30.9	59.78 N.	151.15 W.	89	...	...	...	III	G	AUG. 2	08 P.M. AST
AUG. 3	07	59	36.8	58.45 N.	137.79 W.	33N	4.5	...	...	...	G	AUG. 2	11 P.M. PST
AUG. 4	02	07	33.0	62.14 N.	150.53 W.	33N	...	...	3.9A	...	G	AUG. 3	04 P.M. AST
AUG. 4	09	13	50.5	59.82 N.	148.69 W.	33N	4.4	...	4.3M	...	G	AUG. 3	11 P.M. AST
AUG. 5	23	19	39.2	60.68 N.	151.98 W.	105	...	...	...	...	G	AUG. 5	01 P.M. AST
AUG. 8	01	50	05.9	53.76 N.	167.07 W.	33N	4.3	...	...	...	G	AUG. 7	02 P.M. BST
AUG. 8	04	35	06.5	52.30 N.	171.41 W.	43	4.8	3.8	...	...	G	AUG. 7	05 P.M. BST
AUG. 8	05	39	04.5	62.90 N.	149.56 W.	106	...	...	...	...	G	AUG. 7	07 P.M. AST
AUG. 8	09	30	03.3	61.39 N.	146.91 W.	53	4.3	...	...	V	G	AUG. 7	11 P.M. AST
AUG. 9	03	16	04.0	59.83 N.	148.80 W.	33N	4.0	...	3.1M	...	G	AUG. 8	05 P.M. AST
AUG. 9	07	45	37.0	59.59 N.	152.89 W.	114	...	...	...	...	G	AUG. 8	09 P.M. AST
AUG. 10	14	01	32.3	60.41 N.	154.84 W.	33N	...	...	3.4M	...	G	AUG. 10	04 A.M. AST
AUG. 11	09	00	20.9	60.58 N.	146.86 W.	33N	...	...	3.1M	...	G	AUG. 10	11 P.M. AST
AUG. 13	00	49	41.0	62.28 N.	149.71 W.	65	4.1	...	...	IV	G	AUG. 12	02 P.M. AST
AUG. 13	20	57	37.5	60.68 N.	145.10 W.	102	...	...	...	...	G	AUG. 13	10 A.M. AST
AUG. 14	01	59	02.8	60.23 N.	153.47 W.	184	4.4	...	...	...	G	AUG. 13	03 P.M. AST
AUG. 16	12	11	48.9	66.10 N.	156.73 W.	33N	...	...	3.6M	...	G	AUG. 16	02 A.M. AST
AUG. 17	07	06	52.4	66.67 N.	148.84 W.	29	...	...	3.7M	...	G	AUG. 16	09 P.M. AST
AUG. 18	01	27	13.8	62.61 N.	149.39 W.	89	...	...	...	...	G	AUG. 17	03 P.M. AST
AUG. 18	18	52	28.4	59.89 N.	153.53 W.	123	5.4	...	...	VI	G	AUG. 18	08 A.M. AST
AUG. 19	03	58	55.4	56.44 N.	152.67 W.	26	4.6	...	4.1M	...	G	AUG. 18	05 P.M. AST
AUG. 19	19	24	33.9	64.19 N.	147.29 W.	33N	...	...	3.5M	...	G	AUG. 19	09 A.M. AST
AUG. 19	19	55	26.0	62.88 N.	150.02 W.	139	...	...	...	...	G	AUG. 19	09 A.M. AST
AUG. 19	21	28	25.3	59.97 N.	153.26 W.	136	4.3	...	...	...	G	AUG. 19	11 A.M. AST
AUG. 21	15	18	59.6	57.90 N.	156.64 W.	14	...	...	4.4M	...	G	AUG. 21	05 A.M. AST
AUG. 22	03	20	07.2	61.65 N.	151.96 W.	123	4.0	...	...	...	G	AUG. 21	05 P.M. AST
AUG. 22	04	13	55.3	65.16 N.	151.99 W.	14	...	...	4.0M	II	G	AUG. 21	06 P.M. AST
AUG. 22	09	53	24.2	65.23 N.	152.12 W.	17	...	...	3.8M	II	G	AUG. 21	11 P.M. AST
AUG. 22	10	12	02.8	64.92 N.	152.53 W.	1	...	...	3.8A	II	A	AUG. 22	12 P.M. AST
AUG. 22	10	29	08.0	64.99 N.	152.31 W.	1	...	...	3.4A	II	A	AUG. 22	12 P.M. AST
AUG. 23	20	59	05.7	51.74 N.	176.43 E.	54	5.4	4.8	...	...	G	AUG. 23	09 A.M. BST
AUG. 24	01	31	54.2	60.13 N.	148.90 W.	71	...	...	...	...	G	AUG. 23	03 P.M. AST
AUG. 25	02	53	25.9	53.60 N.	167.01 W.	49	4.9	...	...	...	G	AUG. 24	03 P.M. BST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
AUG. 25	04	09	43.8	59.92 N.	153.54 W.	153	...	...	...	...	G	AUG. 24	06 P.M. AST
AUG. 25	05	56	50.5	54.14 N.	164.76 W.	64	4.8	...	...	...	G	AUG. 24	06 P.M. BST
AUG. 25	09	08	47.8	63.11 N.	150.94 W.	153	...	...	...	...	G	AUG. 24	11 P.M. AST
AUG. 26	13	44	31.2	65.08 N.	152.36 W.	33N	...	...	3.3A	II	G	AUG. 26	03 A.M. AST
AUG. 27	03	14	07.1	60.08 N.	140.81 W.	17	3.4	...	3.6M	...	G	AUG. 26	06 P.M. YST
AUG. 29	06	11	23.2	58.73 N.	153.92 W.	33N	...	...	3.1M	...	G	AUG. 28	08 P.M. AST
AUG. 29	23	06	41.9	60.27 N.	153.77 W.	212	...	...	...	...	G	AUG. 29	01 P.M. AST
SEPT. 1	10	19	51.6	57.99 N.	138.63 W.	33N	4.1	...	...	...	G	SEPT. 1	01 A.M. YST
SEPT. 1	17	38	52.3	59.76 N.	153.41 W.	139	4.2	...	...	...	G	SEPT. 1	07 A.M. AST
SEPT. 1	19	51	20.8	59.12 N.	152.52 W.	77	3.7	...	...	...	G	SEPT. 1	09 A.M. AST
SEPT. 3	06	27	05.4	64.58 N.	147.16 W.	11	...	...	3.9A	II	A	SEPT. 2	08 P.M. AST
SEPT. 3	18	53	07.5	53.75 N.	165.73 W.	33N	4.2	...	...	...	G	SEPT. 3	07 A.M. BST
SEPT. 4	16	05	38.5	59.56 N.	148.13 W.	52	3.6	...	...	...	G	SEPT. 4	06 A.M. AST
SEPT. 7	05	54	35.0	54.04 N.	164.02 W.	40	5.1	4.6	...	...	G	SEPT. 6	06 P.M. BST
SEPT. 9	07	08	20.3	60.08 N.	152.21 W.	103	...	...	...	...	G	SEPT. 8	09 P.M. AST
SEPT. 11	14	18	10.6	61.48 N.	151.05 W.	69	...	...	...	...	G	SEPT. 11	04 A.M. AST
SEPT. 12	08	52	29.3	51.94 N.	178.13 E.	143	4.8	...	...	...	G	SEPT. 11	09 P.M. BST
SEPT. 13	05	24	13.9	59.90 N.	152.46 W.	117	...	...	...	...	G	SEPT. 12	07 P.M. AST
SEPT. 13	15	06	42.9	60.36 N.	151.99 W.	106	...	...	...	...	G	SEPT. 13	05 A.M. AST
SEPT. 15	18	08	38.8	59.96 N.	153.11 W.	128	4.7	...	...	...	G	SEPT. 15	08 A.M. AST
SEPT. 16	11	06	53.6	52.38 N.	175.74 W.	167	4.2	...	...	...	G	SEPT. 16	12 P.M. BST
SEPT. 18	17	02	54.9	63.66 N.	147.59 W.	88	...	...	...	IV	G	SEPT. 18	07 A.M. AST
SEPT. 19	08	37	56.0	61.34 N.	147.18 W.	32	...	...	3.9M	III	G	SEPT. 18	10 P.M. AST
SEPT. 20	11	46	05.9	61.92 N.	149.23 W.	8	...	...	3.8M	IV	G	SEPT. 20	01 A.M. AST
SEPT. 21	14	45	19.6	61.11 N.	151.81 W.	81	4.5	...	...	IV	G	SEPT. 21	04 A.M. AST
SEPT. 22	08	00	21.9	51.94 N.	179.37 W.	90	4.5	...	...	...	G	SEPT. 21	09 P.M. BST
SEPT. 22	10	35	35.4	59.82 N.	152.99 W.	114	...	...	...	...	G	SEPT. 22	12 P.M. AST
SEPT. 22	18	14	29.2	60.46 N.	153.34 W.	186	...	...	...	...	G	SEPT. 22	08 A.M. AST
SEPT. 25	00	26	49.5	59.13 N.	152.22 W.	76	...	...	...	...	G	SEPT. 24	02 P.M. AST
SEPT. 25	09	25	08.4	52.05 N.	179.18 E.	130	4.9	...	...	...	G	SEPT. 24	10 P.M. BST
SEPT. 25	09	37	01.9	51.79 N.	175.28 W.	62	4.6	...	...	II	G	SEPT. 24	10 P.M. BST
SEPT. 26	16	08	18.6	64.99 N.	147.55 W.	27	3.7	...	3.9M	III	G	SEPT. 26	06 A.M. AST
SEPT. 28	22	41	33.8	57.36 N.	156.88 W.	115	4.2	...	...	...	G	SEPT. 28	12 M. AST
SEPT. 28	23	53	13.7	63.99 N.	147.71 W.	33N	4.4	...	4.5M	III	G	SEPT. 28	01 P.M. AST
OCT. 1	00	16	17.8	61.31 N.	146.88 W.	33N	...	...	3.0M	...	G	SEPT. 30	02 P.M. AST
OCT. 3	05	08	21.3	59.67 N.	152.15 W.	123	...	...	...	...	G	OCT. 2	07 P.M. AST
OCT. 4	14	26	37.8	63.00 N.	151.08 W.	112	...	...	...	...	G	OCT. 4	04 A.M. AST
OCT. 4	18	53	00.1	51.81 N.	177.05 W.	58	4.5	...	...	IV	G	OCT. 4	07 A.M. BST
OCT. 4	19	55	17.5	50.93 N.	173.53 E.	33N	5.3	5.0	...	III	G	OCT. 4	08 A.M. BST
OCT. 6	05	54	05.2	61.93 N.	150.67 W.	6	...	...	4.6M	III	G	OCT. 5	07 P.M. AST
OCT. 7	10	44	28.6	58.17 N.	156.52 W.	33N	...	...	3.3M	...	G	OCT. 7	12 P.M. AST
OCT. 8	02	52	56.9	66.15 N.	147.85 W.	33N	...	...	3.5M	...	G	OCT. 7	04 P.M. AST
OCT. 8	05	13	10.5	60.27 N.	153.08 W.	158	...	...	...	...	G	OCT. 7	07 P.M. AST
OCT. 11	01	10	53.4	50.95 N.	177.58 E.	33N	4.8	...	...	...	G	OCT. 10	02 P.M. BST
OCT. 11	18	06	52.1	63.63 N.	145.82 W.	12	...	...	3.0M	...	G	OCT. 11	08 A.M. AST
OCT. 12	06	02	10.6	52.04 N.	175.37 W.	48	4.3	...	...	...	G	OCT. 11	07 P.M. BST
OCT. 13	09	08	54.0	60.56 N.	143.07 W.	33N	...	...	3.4M	...	G	OCT. 12	11 P.M. AST
OCT. 14	11	16	06.9	60.07 N.	152.49 W.	114	...	...	...	...	G	OCT. 14	01 A.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
OCT. 14	18	09	16.3	59.87 N.	153.48 W.	146	...	...	...	...	G	OCT. 14	08 A.M. AST
OCT. 15	00	55	31.5	50.38 N.	177.81 W.	33N	4.3	...	...	...	G	OCT. 14	01 P.M. BST
OCT. 15	00	57	42.2	63.11 N.	150.97 W.	45	...	...	...	...	G	OCT. 14	02 P.M. AST
OCT. 15	19	27	46.9	59.08 N.	154.20 W.	141	...	...	...	...	G	OCT. 15	09 A.M. AST
OCT. 17	20	50	48.7	51.72 N.	176.94 W.	61	5.0	...	...	VI	G	OCT. 17	09 A.M. BST
OCT. 19	04	49	06.4	61.82 N.	147.14 W.	33N	...	...	3.1M	...	G	OCT. 18	06 P.M. AST
OCT. 19	20	02	51.3	62.85 N.	150.65 W.	33N	...	...	3.5M	...	G	OCT. 19	10 A.M. AST
OCT. 20	18	38	28.3	59.84 N.	152.69 W.	110	...	...	...	...	G	OCT. 20	08 A.M. AST
OCT. 23	22	17	49.1	59.26 N.	149.48 W.	33N	...	...	3.2M	...	G	OCT. 23	12 M. AST
OCT. 24	02	56	35.8	63.54 N.	148.21 W.	33N	3.5	...	3.4M	...	G	OCT. 23	04 P.M. AST
OCT. 25	22	02	18.1	59.22 N.	147.75 W.	19	4.9	4.4	4.6M	...	G	OCT. 25	12 M. AST
OCT. 27	03	39	02.7	68.48 N.	148.69 W.	33N	...	...	...	...	G	OCT. 26	05 P.M. AST
OCT. 27	04	29	31.5	62.20 N.	151.05 W.	102	...	...	...	II	G	OCT. 26	06 P.M. AST
OCT. 29	01	25	08.0	62.84 N.	148.99 W.	37	...	...	3.0M	...	G	OCT. 28	03 P.M. AST
OCT. 30	11	11	38.4	60.96 N.	150.32 W.	48	3.3	...	...	III	G	OCT. 30	01 A.M. AST
OCT. 31	12	28	30.1	61.91 N.	149.57 W.	33N	3.5	...	3.4M	II	G	OCT. 31	02 A.M. AST
NOV. 1	15	00	16.3	59.17 N.	138.96 W.	23	3.2	...	...	...	G	NOV. 1	06 A.M. YST
NOV. 1	15	17	22.4	62.53 N.	150.11 W.	88	...	...	...	...	G	NOV. 1	05 A.M. AST
NOV. 1	23	12	17.9	63.10 N.	150.68 W.	129	3.4	...	...	...	G	NOV. 1	01 P.M. AST
NOV. 2	00	12	52.8	60.19 N.	153.33 W.	155	...	...	...	...	G	NOV. 1	02 P.M. AST
NOV. 2	05	22	18.6	53.89 N.	164.53 W.	27	4.6	...	...	...	G	NOV. 1	06 P.M. BST
NOV. 2	16	47	17.8	53.40 N.	161.36 W.	33N	4.7	...	...	...	G	NOV. 2	05 A.M. BST
NOV. 3	12	17	26.7	60.83 N.	149.90 W.	33N	...	...	3.2M	...	G	NOV. 3	02 A.M. AST
NOV. 3	17	35	05.5	63.14 N.	150.95 W.	135	...	...	...	...	G	NOV. 3	07 A.M. AST
NOV. 3	17	36	14.4	51.93 N.	175.01 E.	33N	4.9	5.1	...	...	G	NOV. 3	06 A.M. BST
NOV. 4	18	22	56.7	53.96 N.	139.84 W.	10	4.4	...	...	...	G	NOV. 4	09 A.M. YST
NOV. 5	06	35	30.1	58.51 N.	150.51 W.	33N	...	...	3.2M	...	G	NOV. 4	08 P.M. AST
NOV. 5	09	29	11.5	63.90 N.	152.46 W.	44	...	...	3.0M	...	G	NOV. 4	11 P.M. AST
NOV. 6	08	03	36.5	63.24 N.	152.04 W.	33N	...	...	3.1M	...	G	NOV. 5	10 P.M. AST
NOV. 6	22	17	19.8	60.35 N.	147.43 W.	33N	...	...	3.0M	...	G	NOV. 6	12 M. AST
NOV. 8	05	44	06.9	62.37 N.	149.07 W.	33N	...	...	3.0M	...	G	NOV. 7	07 P.M. AST
NOV. 10	15	22	54.5	53.48 N.	165.94 W.	33N	4.7	...	...	...	G	NOV. 10	04 A.M. BST
NOV. 10	23	42	03.8	58.13 N.	148.88 W.	33N	4.7	...	4.5M	...	G	NOV. 10	01 P.M. AST
NOV. 13	12	05	49.0	66.88 N.	143.86 W.	10	...	...	3.2M	...	G	NOV. 13	02 A.M. AST
NOV. 14	10	02	24.8	62.97 N.	150.49 W.	122	3.8	...	...	...	G	NOV. 14	12 P.M. AST
NOV. 14	20	34	18.1	60.51 N.	151.71 W.	87	...	...	...	...	G	NOV. 14	10 A.M. AST
NOV. 14	22	27	45.7	64.54 N.	147.03 W.	25	...	...	3.7M	II	G	NOV. 14	12 M. AST
NOV. 15	10	20	22.5	63.18 N.	150.48 W.	112	...	...	...	...	G	NOV. 15	12 P.M. AST
NOV. 15	13	33	30.5	61.83 N.	150.38 W.	48	...	...	...	...	G	NOV. 15	03 A.M. AST
NOV. 15	15	59	35.3	60.10 N.	153.14 W.	151	...	...	...	...	G	NOV. 15	05 A.M. AST
NOV. 15	18	09	24.0	62.61 N.	142.79 W.	76	4.3	...	...	...	G	NOV. 15	08 A.M. AST
NOV. 15	21	06	31.6	62.24 N.	150.94 W.	77	...	...	...	...	G	NOV. 15	11 A.M. AST
NOV. 16	07	58	51.9	63.12 N.	150.91 W.	143	...	...	...	...	G	NOV. 15	09 P.M. AST
NOV. 16	14	44	12.8	62.74 N.	149.68 W.	40	...	...	...	...	G	NOV. 16	04 A.M. AST
NOV. 16	17	54	02.4	64.50 N.	146.87 W.	7	...	...	3.2M	...	G	NOV. 16	07 A.M. AST
NOV. 18	17	11	53.1	56.12 N.	161.55 W.	182	4.6	...	...	...	G	NOV. 18	06 A.M. BST
NOV. 19	12	06	13.7	63.33 N.	151.12 W.	33N	4.0	...	4.3M	...	G	NOV. 19	02 A.M. AST
NOV. 19	19	42	35.7	52.70 N.	172.48 E.	47	5.3	5.2	...	V	G	NOV. 19	08 A.M. BST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ALASKA--Continued													
NOV. 20	23	41	19.1	51.82 N.	176.95 W.	51	4.8	...	...	...	G NOV.	20	12 M. BST
NOV. 22	15	42	55.1	59.88 N.	148.72 W.	33N	3.6	...	3.7M	...	G NOV.	22	05 A.M. AST
NOV. 24	00	28	12.8	62.03 N.	150.52 W.	74	4.5	...	...	II	G NOV.	23	02 P.M. AST
NOV. 24	07	01	04.2	62.11 N.	146.26 W.	10	3.9	...	3.9M	...	G NOV.	23	09 P.M. AST
NOV. 24	08	50	45.4	61.99 N.	150.51 W.	77	3.2	...	...	II	G NOV.	23	10 P.M. AST
NOV. 25	02	41	58.5	61.23 N.	146.81 W.	33N	...	...	3.0M	...	G NOV.	24	04 P.M. AST
NOV. 26	00	45	46.6	59.83 N.	153.55 W.	145	...	...	...	...	G NOV.	25	02 P.M. AST
NOV. 27	06	01	32.0	58.81 N.	154.42 W.	163	...	...	...	...	G NOV.	26	08 P.M. AST
NOV. 28	17	41	04.1	52.03 N.	170.11 W.	11	5.2	4.5	...	...	G NOV.	28	06 A.M. BST
DEC. 2	21	57	20.0	59.69 N.	151.66 W.	13	...	...	3.7M	V	G DEC.	2	11 A.M. AST
DEC. 3	19	39	31.2	62.31 N.	149.75 W.	74	4.7	...	...	IV	G DEC.	3	09 A.M. AST
DEC. 4	12	11	06.4	65.04 N.	147.51 W.	24	...	...	3.3M	II	G DEC.	4	02 A.M. AST
DEC. 6	11	05	35.2	60.14 N.	153.26 W.	137	4.5	...	...	...	G DEC.	6	01 A.M. AST
DEC. 7	00	16	49.1	54.66 N.	165.59 W.	127	4.6	...	...	...	G DEC.	6	01 P.M. BST
DEC. 8	00	00	52.9	62.56 N.	151.51 W.	92	3.8	...	...	...	G DEC.	7	02 P.M. AST
DEC. 8	10	01	51.5	68.33 N.	145.17 W.	33N	...	...	4.0M	II	G DEC.	8	12 P.M. AST
DEC. 9	00	50	48.1	60.36 N.	152.29 W.	117	4.4	...	...	...	G DEC.	8	02 P.M. AST
DEC. 9	17	10	38.8	61.40 N.	150.65 W.	73	3.9	...	...	...	G DEC.	9	07 A.M. AST
DEC. 10	10	26	18.5	61.66 N.	146.54 W.	33N	3.4	...	3.9M	...	G DEC.	10	12 P.M. AST
DEC. 14	11	22	51.4	52.81 N.	174.31 W.	224	4.5	...	...	...	G DEC.	14	12 P.M. BST
DEC. 14	13	32	52.4	62.43 N.	150.64 W.	84	...	...	...	...	G DEC.	14	03 A.M. AST
DEC. 14	17	21	42.1	52.10 N.	169.39 W.	37	4.9	...	...	...	G DEC.	14	06 A.M. BST
DEC. 14	21	03	07.3	51.27 N.	178.04 W.	45	4.6	...	...	...	G DEC.	14	10 A.M. BST
DEC. 15	08	30	34.7	52.11 N.	175.23 E.	47	5.6	5.6	...	V	G DEC.	14	09 P.M. BST
DEC. 15	22	20	40.7	66.06 N.	150.85 W.	54	...	...	...	...	G DEC.	15	12 M. AST
DEC. 17	13	15	26.0	63.95 N.	147.42 W.	22	4.8	...	4.6M	IV	G DEC.	17	03 A.M. AST
DEC. 17	14	53	22.9	61.22 N.	152.41 W.	147	...	...	...	...	G DEC.	17	04 A.M. AST
DEC. 18	11	44	59.8	63.95 N.	147.55 W.	33N	...	...	3.5M	...	G DEC.	18	01 A.M. AST
DEC. 20	07	17	03.5	63.17 N.	149.53 W.	33N	...	...	2.7M	...	G DEC.	19	09 P.M. AST
DEC. 20	10	15	41.7	59.89 N.	152.52 W.	99	...	...	...	...	G DEC.	20	12 P.M. AST
DEC. 22	03	25	29.9	55.57 N.	160.37 W.	12	4.5	...	4.2M	IV	G DEC.	21	05 P.M. AST
DEC. 24	06	37	54.2	60.05 N.	150.58 W.	33N	3.8	...	3.8M	...	G DEC.	23	08 P.M. AST
DEC. 24	09	59	21.7	65.59 N.	144.55 W.	33N	3.9	...	4.6M	...	G DEC.	23	11 P.M. AST
DEC. 24	10	46	18.9	64.27 N.	150.07 W.	33N	...	...	3.1M	...	G DEC.	24	12 P.M. AST
DEC. 24	13	13	08.1	63.56 N.	157.59 W.	33N	5.0	4.4	5.3M	IV	G DEC.	24	03 A.M. AST
DEC. 24	19	31	58.4	59.39 N.	152.79 W.	91	...	...	...	...	G DEC.	24	09 A.M. AST
DEC. 25	06	52	12.0	63.06 N.	150.06 W.	121	...	...	...	...	G DEC.	24	08 P.M. AST
DEC. 25	09	24	25.4	58.75 N.	154.85 W.	158	...	...	...	...	G DEC.	24	11 P.M. AST
DEC. 25	16	03	37.3	51.74 N.	173.12 W.	33N	4.3	...	...	...	G DEC.	25	05 A.M. BST
DEC. 25	16	12	12.7	51.60 N.	173.22 W.	33N	4.3	...	...	...	G DEC.	25	05 A.M. BST
DEC. 25	16	25	20.9	51.72 N.	173.17 W.	33N	4.1	...	...	...	G DEC.	25	05 A.M. BST
DEC. 27	19	50	33.1	54.23 N.	162.57 W.	37	4.7	4.1	...	...	G DEC.	27	08 A.M. BST
DEC. 28	02	42	45.4	61.97 N.	150.99 W.	61	...	...	...	...	G DEC.	27	04 P.M. AST
DEC. 28	13	41	23.8	63.94 N.	147.36 W.	33N	...	...	3.5M	...	G DEC.	28	03 A.M. AST
DEC. 29	01	10	42.6	60.40 N.	152.20 W.	110	...	...	...	...	G DEC.	28	03 P.M. AST
DEC. 29	09	00	48.1	53.05 N.	166.89 W.	33N	4.8	...	...	...	G DEC.	28	10 P.M. BST
DEC. 29	10	08	01.6	56.52 N.	153.59 W.	28	3.6	...	...	...	G DEC.	29	12 P.M. AST
DEC. 30	09	40	54.0	62.16 N.	147.90 W.	33N	...	...	3.0M	...	G DEC.	29	11 P.M. AST
DEC. 31	19	16	10.0	62.37 N.	149.46 W.	61	...	...	...	...	G DEC.	31	09 A.M. AST
DEC. 31	19	48	50.5	62.21 N.	145.78 W.	17	...	...	3.0M	...	G DEC.	31	09 A.M. AST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ARKANSAS													
SEPT. 23	07	33	57.5	33.65 N.	91.89 W.	2	...	...	3.1S	IV	S	SEPT. 23	01 A.M. CST
SEPT. 23	21	56	26.3	36.31 N.	91.14 W.	10	...	...	2.8G	...	S	SEPT. 23	03 P.M. CST
NOV. 21	23	31	22.1	35.97 N.	89.92 W.	10	...	...	2.3S	II	S	NOV. 21	05 P.M. CST
CALIFORNIA													
JAN. 4	12	23	0.5	40.65 N.	124.77 W.	27	...	...	3.7B	IV	B	JAN. 4	04 A.M. PST
JAN. 5	10	52	21.2	36.25 N.	117.93 W.	2	...	...	3.3P	...	P	JAN. 5	02 A.M. PST
JAN. 6	06	11	42.4	36.18 N.	118.38 W.	5	...	...	3.2B	...	G	JAN. 5	10 P.M. PST
JAN. 6	10	42	44.8	39.42 N.	123.33 W.	14	...	...	2.9B	IV	B	JAN. 6	02 A.M. PST
JAN. 10	08	21	35.8	36.63 N.	121.31 W.	4	...	...	3.0B	...	B	JAN. 10	12 P.M. PST
JAN. 10	22	10	31.3	40.10 N.	121.09 W.	5	...	...	3.4B	...	B	JAN. 10	02 P.M. PST
JAN. 14	15	45	45.6	38.81 N.	122.79 W.	5	...	...	3.1B	III	B	JAN. 14	07 A.M. PST
JAN. 14	16	13	8.9	40.32 N.	124.07 W.	5	...	...	3.0B	...	B	JAN. 14	08 A.M. PST
JAN. 15	09	47	2.4	35.80 N.	118.03 W.	5	...	...	3.4P	...	P	JAN. 15	01 A.M. PST
JAN. 15	10	5	12.7	37.52 N.	119.04 W.	5	...	...	3.3B	...	B	JAN. 15	02 A.M. PST
JAN. 15	12	29	0.9	37.48 N.	119.03 W.	10	...	...	3.8B	...	B	JAN. 15	04 A.M. PST
JAN. 15	14	38	26.2	39.14 N.	123.25 W.	5	...	...	3.0B	IV	B	JAN. 15	06 A.M. PST
JAN. 17	20	59	12.9	39.15 N.	123.26 W.	8	...	...	2.9B	V	B	JAN. 17	12 M. PST
JAN. 21	11	20	40.5	40.26 N.	121.28 W.	15	...	...	2.9B	...	B	JAN. 21	03 A.M. PST
JAN. 21	11	26	9.4	40.25 N.	121.27 W.	11	...	...	2.6B	...	B	JAN. 21	03 A.M. PST
JAN. 24	08	13	21.7	33.27 N.	116.00 W.	5	...	...	3.3P	...	P	JAN. 24	12 P.M. PST
JAN. 24	12	26	44.2	34.68 N.	118.93 W.	5	...	...	3.0P	...	P	JAN. 24	04 A.M. PST
JAN. 25	10	40	50.0	34.32 N.	118.33 W.	5	...	...	2.7P	III	P	JAN. 25	02 A.M. PST
JAN. 28	08	49	02.5	39.40 N.	123.35 W.	5	...	...	2.5B	V	B	JAN. 28	12 P.M. PST
JAN. 29	01	55	49.8	37.18 N.	117.85 W.	11	...	...	2.9B	...	B	JAN. 28	05 P.M. PST
JAN. 29	02	56	9.0	34.03 N.	115.62 W.	4	...	...	3.4B	...	P	JAN. 28	06 P.M. PST
JAN. 31	14	18	10.0	34.18 N.	118.63 W.	6	...	...	2.1P	III	P	JAN. 31	06 A.M. PST
FEB. 2	14	8	44.6	32.97 N.	115.85 W.	2	...	...	3.0P	...	P	FEB. 2	06 A.M. PST
FEB. 5	09	53	41.5	34.32 N.	116.72 W.	5	...	...	3.6P	...	P	FEB. 5	01 A.M. PST
FEB. 6	00	39	25.8	34.03 N.	116.78 W.	6	...	...	3.1P	III	P	FEB. 5	04 P.M. PST
FEB. 6	01	1	28.9	34.03 N.	116.78 W.	6	...	...	3.3P	III	P	FEB. 5	05 P.M. PST
FEB. 6	12	57	14.2	33.25 N.	115.57 W.	4	...	...	3.4P	IV	P	FEB. 6	04 A.M. PST
FEB. 7	13	39	22.7	39.41 N.	123.17 W.	5	...	...	2.7B	IV	B	FEB. 7	05 A.M. PST
FEB. 8	20	8	21.2	36.91 N.	121.70 W.	14	...	...	3.0B	...	B	FEB. 8	12 M. PST
FEB. 11	01	45	30.5	33.02 N.	115.53 W.	7	...	...	2.5P	II	P	FEB. 10	05 P.M. PST
FEB. 11	01	45	51.0	33.02 N.	115.53 W.	5	...	...	2.5P	II	P	FEB. 10	05 P.M. PST
FEB. 11	02	25	51.4	33.02 N.	115.53 W.	6	...	...	3.1P	III	P	FEB. 10	06 P.M. PST
FEB. 13	06	8	46.5	40.23 N.	122.11 W.	15	...	...	3.3B	...	B	FEB. 12	10 P.M. PST
FEB. 13	18	4	6.3	34.02 N.	117.22 W.	6	...	...	2.9P	II	P	FEB. 13	10 A.M. PST
FEB. 14	16	33	46.9	38.41 N.	122.65 W.	8	...	...	2.8B	II	B	FEB. 14	08 A.M. PST
FEB. 14	20	3	9.5	38.42 N.	122.66 W.	9	...	...	2.5B	II	B	FEB. 14	12 M. PST
FEB. 14	21	3	55.4	40.30 N.	124.27 W.	10	...	...	4.0B	IV	B	FEB. 14	01 P.M. PST
FEB. 16	10	54	35.3	33.42 N.	116.40 W.	5	...	...	3.0P	...	P	FEB. 16	02 A.M. PST
FEB. 17	07	35	26.7	40.10 N.	121.43 W.	10	...	...	3.0B	...	B	FEB. 16	11 P.M. PST
FEB. 17	10	13	45.2	35.72 N.	115.92 W.	4	...	...	3.0P	...	P	FEB. 17	02 A.M. PST
FEB 20	23	38	54.3	35.65 N.	121.04 W.	5	...	...	3.1B	...	B	FEB. 20	03 P.M. PST
FEB. 23	10	14	6.1	38.29 N.	119.11 W.	7	...	...	3.2B	...	B	FEB. 23	02 A.M. PST
FEB. 23	16	43	3.7	32.82 N.	115.60 W.	19	...	...	3.6P	IV	P	FEB. 23	08 A.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
FEB. 28	16	20	52.1	40.51 N.	121.93 W.	5	...	...	3.0B	...	B	FEB. 28	08 A.M. PST
MAR. 1	04	54	31.2	34.53 N.	116.77 W.	5	...	...	4.4P	VI	P	FEB. 28	08 P.M. PST
MAR. 3	18	37	24.0	36.02 N.	117.63 W.	3	...	...	3.0P	...	P	MAR. 3	10 A.M. PST
MAR. 7	15	28	33.7	36.00 N.	117.63 W.	5	...	...	3.3P	...	P	MAR. 7	07 A.M. PST
MAR. 8	14	49	34.9	33.83 N.	117.88 W.	5	...	...	2.9P	IV	P	MAR. 8	06 A.M. PST
MAR. 13	16	38	15.7	33.93 N.	117.98 W.	4	...	...	3.2P	VI	P	MAR. 13	08 A.M. PST
MAR. 14	16	9	51.2	33.95 N.	117.97 W.	4	...	...	2.5P	IV	P	MAR. 14	08 A.M. PST
MAR. 14	23	59	55.0	34.00 N.	118.68 W.	12	...	...	3.2P	...	P	MAR. 14	03 P.M. PST
MAR. 15	04	2	49.4	32.78 N.	115.53 W.	5	...	...	2.9P	III	P	MAR. 14	08 P.M. PST
MAR. 15	04	9	39.7	32.78 N.	115.57 W.	5	...	...	3.2P	III	P	MAR. 14	08 P.M. PST
MAR. 18	08	20	36.5	35.32 N.	118.52 W.	5	...	...	3.5P	...	P	MAR. 18	12 P.M. PST
MAR. 20	00	7	56.7	36.00 N.	117.87 W.	1	...	...	3.0P	III	P	MAR. 19	04 P.M. PST
MAR. 21	14	5	12.1	40.44 N.	124.45 W.	11	...	...	3.5B	IV	B	MAR. 21	06 A.M. PST
MAR. 21	20	17	6.8	40.44 N.	124.46 W.	13	...	...	3.4B	...	B	MAR. 21	12 M. PST
MAR. 22	06	33	17.3	40.12 N.	122.95 W.	5	...	...	3.2B	...	B	MAR. 21	10 P.M. PST
MAR. 22	08	40	35.3	40.09 N.	122.95 W.	14	...	...	3.2B	...	B	MAR. 22	12 P.M. PST
MAR. 26	00	27	4.8	39.21 N.	123.17 W.	9	4.9	...	4.4B	VI	B	MAR. 25	04 P.M. PST
MAR. 26	00	34	11.9	39.21 N.	123.14 W.	5	...	...	3.1B	IV	B	MAR. 25	04 P.M. PST
MAR. 26	01	19	10.0	39.20 N.	123.17 W.	10	3.6	...	3.6B	IV	B	MAR. 25	05 P.M. PST
MAR. 26	02	29	16.9	39.21 N.	123.17 W.	5	...	...	3.3B	IV	B	MAR. 25	06 P.M. PST
MAR. 26	04	28	18.6	39.23 N.	123.19 W.	3	...	...	3.5B	IV	B	MAR. 25	08 P.M. PST
MAR. 26	10	56	22.4	36.93 N.	117.46 W.	5	...	...	3.2B	...	B	MAR. 26	02 A.M. PST
MAR. 27	04	27	1.1	34.85 N.	117.08 W.	5	...	...	3.1P	...	P	MAR. 26	08 P.M. PST
MAR. 27	04	29	13.9	37.00 N.	117.83 W.	2	...	...	3.1B	...	B	MAR. 26	08 P.M. PST
MAR. 27	08	44	3.0	40.43 N.	124.31 W.	14	...	...	3.2B	IV	G	MAR. 27	12 P.M. PST
MAR. 27	16	15	33.6	39.19 N.	123.16 W.	8	...	...	3.0B	...	B	MAR. 27	08 A.M. PST
MAR. 31	01	3	27.7	38.48 N.	123.34 W.	7	4.1	...	3.6B	...	B	MAR. 30	05 P.M. PST
APR. 1	10	52	27.4	34.20 N.	116.97 W.	6	3.8	...	4.2P	V	P	APR. 1	02 A.M. PST
APR. 1	13	14	23.5	37.50 N.	118.77 W.	10	...	...	3.1B	...	B	APR. 1	05 A.M. PST
APR. 1	18	13	00.5	41.47 N.	121.85 W.	2	...	...	3.5B	...	B	APR. 1	10 A.M. PST
APR. 4	03	23	31.8	37.84 N.	122.06 W.	8	...	...	2.5B	II	B	APR. 3	07 P.M. PST
APR. 4	23	38	01.7	40.42 N.	124.41 W.	20	...	...	3.6B	...	B	APR. 4	03 P.M. PST
APR. 8	09	22	16.5	39.14 N.	123.19 W.	5	...	...	3.2B	IV	G	APR. 8	01 A.M. PST
APR. 9	16	00	41.1	35.38 N.	118.63 W.	5	...	...	3.0P	...	P	APR. 9	08 A.M. PST
APR. 11	11	39	42.4	32.88 N.	115.52 W.	18	...	...	3.1P	...	P	APR. 11	03 A.M. PST
APR. 11	23	17	06.5	36.21 N.	118.36 W.	5	...	...	3.5B	...	G	APR. 11	03 P.M. PST
APR. 12	02	07	39.3	36.22 N.	120.10 W.	5	...	...	3.0B	...	G	APR. 11	06 P.M. PST
APR. 14	04	13	28.0	32.82 N.	115.45 W.	5	...	...	3.1P	...	P	APR. 13	08 P.M. PST
APR. 14	10	01	05.2	35.28 N.	116.83 W.	5	...	...	3.7P	II	P	APR. 14	02 A.M. PST
APR. 14	15	00	33.9	36.75 N.	121.50 W.	5	...	...	3.1B	...	B	APR. 14	07 A.M. PST
APR. 14	17	22	35.2	40.28 N.	124.19 W.	20	...	...	3.4B	...	B	APR. 12	09 A.M. PST
APR. 15	12	38	18.7	34.37 N.	118.67 W.	5	...	...	3.0P	...	P	APR. 15	04 A.M. PST
APR. 17	00	21	23.6	34.25 N.	117.08 W.	3	...	...	3.0P	...	P	APR. 16	04 P.M. PST
APR. 17	03	43	07.1	35.93 N.	118.22 W.	5	...	...	3.5B	...	G	APR. 16	07 P.M. PST
APR. 18	08	54	18.6	39.66 N.	122.77 W.	4	...	...	3.2B	...	B	APR. 18	12 P.M. PST
APR. 18	17	11	39.6	39.68 N.	122.79 W.	2	...	...	3.2B	...	B	APR. 18	09 A.M. PST
APR. 18	22	42	36.2	33.88 N.	117.55 W.	6	...	...	3.0P	II	P	APR. 18	02 P.M. PST
APR. 19	01	38	17.7	39.67 N.	122.76 W.	9	...	...	3.4B	...	B	APR. 18	05 P.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr min s	Lat	Long	Depth (km)	Magnitude mb	Magnitude MS	Magnitude ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Local time Hour
CALIFORNIA--Continued											
APR. 19	04 19 50.8	39.67 N.	122.75 W.	8	...	...	3.2B	...	B	APR. 18	08 P.M. PST
APR. 22	13 04 27.8	34.05 N.	118.97 W.	14	3.4	...	3.2P	III	P	APR. 22	05 A.M. PST
APR. 25	01 32 59.7	39.71 N.	122.64 W.	5	...	...	2.9B	...	G	APR. 24	05 P.M. PST
APR. 25	04 58 38.2	33.00 N.	115.58 W.	11	...	...	2.4P	II	P	APR. 24	08 P.M. PST
APR. 25	05 13 25.3	33.00 N.	115.58 W.	9	...	...	2.3P	II	P	APR. 24	09 P.M. PST
APR. 25	21 56 30.2	33.72 N.	118.37 W.	4	...	...	2.5P	II	P	APR. 25	01 P.M. PST
APR. 25	22 06 32.4	33.98 N.	116.93 W.	5	...	...	3.1P	...	P	APR. 25	02 P.M. PST
APR. 26	06 08 21.9	33.95 N.	118.30 W.	5	...	...	2.7P	II	P	APR. 25	10 P.M. PST
APR. 29	03 32 11.8	33.83 N.	117.73 W.	5	4.6	...	3.2P	III	P	APR. 28	07 P.M. PST
APR. 29	04 03 46.2	34.23 N.	116.57 W.	6	...	...	3.8P	V	P	APR. 28	08 P.M. PST
MAY 1	08 02 54.4	34.37 N.	119.97 W.	5	...	...	3.7P	IV	P	MAY 1	12 P.M. PST
MAY 1	18 24 40.2	33.95 N.	118.75 W.	9	...	...	3.0P	...	P	MAY 1	10 A.M. PST
MAY 2	06 17 29.4	32.85 N.	115.42 W.	4	...	...	3.2P	...	P	MAY 1	10 P.M. PST
MAY 2	10 37 04.8	32.85 N.	115.42 W.	5	...	...	3.1P	...	P	MAY 2	02 A.M. PST
MAY 6	09 17 02.3	37.47 N.	118.56 W.	14	...	...	3.5B	...	B	MAY 6	01 A.M. PST
MAY 6	10 14 14.9	37.47 N.	118.57 W.	8	...	...	3.7B	IV	B	MAY 6	02 A.M. PST
MAY 8	01 07 02.4	36.83 N.	120.03 W.	9	...	...	3.3B	II	B	MAY 7	05 P.M. PST
MAY 8	06 56 23.3	37.37 N.	121.75 W.	3	...	...	3.4B	III	B	MAY 7	10 P.M. PST
MAY 10	15 55 40.5	37.38 N.	121.75 W.	2	...	...	3.3B	III	B	MAY 10	07 A.M. PST
MAY 11	05 47 32.4	34.00 N.	118.35 W.	5	...	...	2.8P	III	P	MAY 10	09 P.M. PST
MAY 11	11 56 05.6	37.37 N.	121.76 W.	3	...	...	3.8B	IV	B	MAY 11	03 A.M. PST
MAY 11	11 56 56.6	37.37 N.	121.76 W.	2	...	...	3.8B	IV	B	MAY 11	03 A.M. PST
MAY 11	12 18 11.8	37.38 N.	121.75 W.	4	3.7	...	3.7B	IV	B	MAY 11	04 A.M. PST
MAY 11	12 28 03.5	37.38 N.	121.75 W.	4	...	...	3.4B	IV	B	MAY 11	04 A.M. PST
MAY 11	17 57 40.6	34.00 N.	118.45 W.	5	...	...	2.9P	III	P	MAY 11	09 A.M. PST
MAY 12	00 27 47.6	37.38 N.	121.76 W.	1	...	...	3.0B	...	B	MAY 11	04 P.M. PST
MAY 12	15 49 24.5	33.48 N.	116.43 W.	5	...	...	3.0P	...	P	MAY 12	07 A.M. PST
MAY 17	00 45 16.8	41.45 N.	121.88 W.	2	...	...	3.1B	...	B	MAY 16	04 P.M. PST
MAY 20	05 50 57.0	40.45 N.	123.29 W.	1	...	...	3.0B	...	B	MAY 19	09 P.M. PST
MAY 22	21 56 06.9	36.64 N.	121.31 W.	4	3.7	...	3.7B	II	B	MAY 22	01 P.M. PST
MAY 22	22 01 58.2	36.64 N.	121.31 W.	5	...	...	2.9B	II	B	MAY 22	02 P.M. PST
MAY 23	05 01 16.5	32.70 N.	115.37 W.	6	...	...	3.4P	...	P	MAY 22	09 P.M. PST
MAY 23	09 16 50.8	33.90 N.	119.17 W.	5	4.0	...	3.9P	IV	P	MAY 23	01 A.M. PST
MAY 23	20 14 10.3	33.90 N.	119.17 W.	5	...	...	3.2P	...	P	MAY 23	12 M. PST
MAY 25	06 43 05.9	34.15 N.	116.72 W.	6	...	...	3.3P	...	P	MAY 24	10 P.M. PST
MAY 26	14 12 39.4	32.87 N.	115.48 W.	5	...	...	3.0P	...	P	MAY 26	06 A.M. PST
MAY 27	18 22 41.3	38.54 N.	122.74 W.	9	...	...	3.8B	II	B	MAY 27	10 A.M. PST
MAY 31	05 16 49.2	32.87 N.	115.48 W.	10	...	...	2.7P	II	P	MAY 30	09 P.M. PST
MAY 31	11 44 45.2	32.87 N.	115.48 W.	10	...	...	2.9P	II	P	MAY 31	03 A.M. PST
JUNE 4	03 57 17.3	33.92 N.	117.83 W.	6	...	...	3.5P	V	P	JUNE 3	07 P.M. PST
JUNE 5	16 03 03.8	33.42 N.	116.70 W.	12	3.9	...	4.4P	V	P	JUNE 5	08 A.M. PST
JUNE 8	23 48 52.3	35.87 N.	117.37 W.	5	...	...	3.4P	...	P	JUNE 8	03 P.M. PST
JUNE 11	19 08 26.0	41.44 N.	121.88 W.	2	...	...	3.2B	...	B	JUNE 11	11 A.M. PST
JUNE 11	20 12 03.9	41.44 N.	121.89 W.	2	...	...	3.5B	II	B	JUNE 11	12 M. PST
JUNE 12	03 03 35.2	41.46 N.	121.86 W.	2	...	...	3.0B	...	B	JUNE 11	07 P.M. PST
JUNE 12	03 22 29.1	40.92 N.	121.96 W.	5	...	...	3.3B	...	G	JUNE 11	07 P.M. PST
JUNE 12	06 17 34.3	36.09 N.	118.44 W.	5	...	...	3.4B	...	G	JUNE 11	10 P.M. PST
JUNE 12	09 18 44.1	41.46 N.	121.86 W.	2	...	...	3.8B	II	B	JUNE 12	01 A.M. PST
JUNE 14	04 27 49.4	34.38 N.	118.63 W.	6	...	...	2.9P	II	P	JUNE 13	08 P.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
JUNE 14	19	44	33.4	33.50 N.	116.78 W.	5	...	...	3.0P	...	P	JUNE 14	11 A.M. PST
JUNE 16	04	21	31.9	35.03 N.	119.13 W.	5	4.1	...	4.1P	V	P	JUNE 15	08 P.M. PST
JUNE 17	22	31	24.2	35.82 N.	116.47 W.	6	...	...	3.1P	...	P	JUNE 17	02 P.M. PST
JUNE 21	19	26	05.0	35.28 N.	118.57 W.	4	...	...	3.1P	...	P	JUNE 21	11 A.M. PST
JUNE 22	06	04	29.2	36.95 N.	121.45 W.	2	...	...	2.8B	...	B	JUNE 21	10 P.M. PST
JUNE 25	07	31	11.4	34.05 N.	117.27 W.	5	...	...	3.1P	II	P	JUNE 24	11 P.M. PST
JULY 2	11	57	57.0	36.90 N.	122.18 W.	10	...	...	4.2B	V	B	JULY 2	03 A.M. PST
JULY 5	10	47	55.6	33.88 N.	116.50 W.	1	...	...	3.8P	V	P	JULY 5	02 A.M. PST
JULY 7	20	05	26.9	36.90 N.	121.49 W.	10	...	...	3.0B	...	B	JULY 7	12 M. PST
JULY 10	02	55	25.4	35.85 N.	118.08 W.	5	...	...	3.0P	...	P	JULY 9	06 P.M. PST
JULY 10	09	02	27.4	33.38 N.	116.30 W.	5	...	...	3.0P	...	P	JULY 10	01 A.M. PST
JULY 11	10	14	55.0	40.23 N.	124.17 W.	20	...	...	3.2B	...	B	JULY 11	02 A.M. PST
JULY 11	19	05	48.2	35.02 N.	119.17 W.	5	...	...	3.2P	...	P	JULY 11	11 A.M. PST
JULY 12	12	17	03.2	33.23 N.	115.67 W.	5	...	...	3.0P	...	P	JULY 12	04 A.M. PST
JULY 15	07	24	42.1	40.32 N.	124.30 W.	17	...	...	3.1B	...	B	JULY 14	11 P.M. PST
JULY 17	14	46	13.5	35.50 N.	116.32 W.	5	...	...	4.0P	...	P	JULY 17	06 A.M. PST
JULY 18	19	09	03.7	36.99 N.	121.67 W.	5	...	...	2.9B	IV	B	JULY 18	11 A.M. PST
JULY 20	23	25	57.3	35.97 N.	117.75 W.	5	...	...	3.1P	...	P	JULY 20	03 P.M. PST
JULY 21	13	24	41.9	34.05 N.	118.90 W.	13	...	...	3.0P	III	P	JULY 21	05 A.M. PST
JULY 23	07	25	33.4	34.60 N.	120.77 W.	5	...	...	3.0P	...	P	JULY 22	11 P.M. PST
JULY 23	07	33	35.6	39.40 N.	121.46 W.	5	...	...	3.3B	III	B	JULY 22	11 P.M. PST
JULY 23	14	38	42.4	35.93 N.	120.51 W.	12	...	...	3.2B	II	B	JULY 23	06 A.M. PST
JULY 26	00	38	53.6	34.35 N.	116.92 W.	6	...	...	3.8P	IV	P	JULY 25	04 P.M. PST
JULY 31	09	15	44.3	37.71 N.	122.14 W.	9	...	...	3.0B	IV	B	JULY 31	01 A.M. PST
AUG. 1	09	02	34.5	41.45 N.	121.88 W.	2	4.5	...	4.6B	V	B	AUG. 1	01 A.M. PST
AUG. 1	09	05	10.2	41.40 N.	121.91 W.	2	...	...	4.2B	...	B	AUG. 1	01 A.M. PST
AUG. 1	09	09	00.4	41.47 N.	121.86 W.	2	...	...	3.4B	...	B	AUG. 1	01 A.M. PST
AUG. 1	09	35	50.6	41.41 N.	121.91 W.	2	...	...	3.5B	...	B	AUG. 1	01 A.M. PST
AUG. 1	09	38	16.6	41.43 N.	121.89 W.	2	3.9	3.5	3.9B	...	B	AUG. 1	01 A.M. PST
AUG. 1	09	46	44.6	41.46 N.	121.87 W.	2	4.3	5.1	4.5B	...	B	AUG. 1	01 A.M. PST
AUG. 1	10	26	32.5	41.46 N.	121.87 W.	2	4.3	3.6	4.2B	...	B	AUG. 1	02 A.M. PST
AUG. 1	10	47	27.0	41.44 N.	121.88 W.	2	...	...	3.3B	...	B	AUG. 1	02 A.M. PST
AUG. 1	11	11	43.9	41.41 N.	121.91 W.	2	...	...	3.1B	...	B	AUG. 1	03 A.M. PST
AUG. 1	11	22	43.0	41.40 N.	121.92 W.	2	...	...	3.2B	...	B	AUG. 1	03 A.M. PST
AUG. 1	14	16	10.5	41.43 N.	121.89 W.	2	...	...	3.6B	...	B	AUG. 1	06 A.M. PST
AUG. 1	15	53	20.5	41.44 N.	121.89 W.	2	...	...	3.9B	...	B	AUG. 1	07 A.M. PST
AUG. 1	18	22	15.7	41.43 N.	121.89 W.	2	...	...	3.3B	...	B	AUG. 1	10 A.M. PST
AUG. 1	18	34	11.4	41.45 N.	121.86 W.	2	...	...	3.3B	...	B	AUG. 1	10 A.M. PST
AUG. 1	21	02	36.9	41.44 N.	121.88 W.	2	...	...	3.3B	...	B	AUG. 1	01 P.M. PST
AUG. 2	00	6	58.0	41.42 N.	121.90 W.	2	...	...	3.8B	...	B	AUG. 1	04 P.M. PST
AUG. 2	02	15	34.0	41.42 N.	121.89 W.	2	4.1	...	3.4B	...	B	AUG. 1	06 P.M. PST
AUG. 2	06	31	13.4	33.00 N.	115.85 W.	3	...	...	3.1P	...	P	AUG. 1	10 P.M. PST
AUG. 2	14	31	47.0	41.43 N.	121.89 W.	2	...	...	3.4B	...	B	AUG. 2	06 A.M. PST
AUG. 3	04	30	42.1	33.67 N.	116.70 W.	5	...	...	3.5P	IV	P	AUG. 2	08 P.M. PST
AUG. 3	21	11	39.3	36.22 N.	118.33 W.	5	...	...	3.2P	...	P	AUG. 3	01 P.M. PST
AUG. 4	05	18	52.9	41.44 N.	121.88 W.	2	...	...	3.5B	...	B	AUG. 3	09 P.M. PST
AUG. 8	18	02	29.1	36.22 N.	118.33 W.	5	...	...	3.0P	...	P	AUG. 8	10 A.M. PST
AUG. 11	00	47	30.1	34.15 N.	117.45 W.	4	...	...	4.0P	IV	P	AUG. 10	04 P.M. PST
AUG. 13	05	55	48.0	41.43 N.	121.89 W.	2	4.3	4.1	4.3B	IV	B	AUG.	

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
AUG. 13	05	57	05.0	41.43 N.	121.89 W.	2	...	...	4.1B	...	B	AUG. 12	09 P.M. PST
AUG. 13	05	58	22.0	41.43 N.	121.89 W.	2	4.1	...	4.3B	...	B	AUG. 12	09 P.M. PST
AUG. 13	06	21	32.0	41.44 N.	121.88 W.	2	...	...	3.3B	...	B	AUG. 12	10 P.M. PST
AUG. 13	07	03	18.1	41.48 N.	121.85 W.	2	3.7	...	3.3B	...	B	AUG. 12	11 P.M. PST
AUG. 13	22	54	52.4	34.37 N.	119.72 W.	12	5.5	5.6	5.1P	VII	K	AUG. 13	02 P.M. PST
AUG. 13	23	08	27.1	34.40 N.	119.78 W.	12	...	...	3.1K	...	K	AUG. 13	03 P.M. PST
AUG. 13	23	11	01.7	34.40 N.	119.76 W.	13	...	...	3.4P	II	K	AUG. 13	03 P.M. PST
AUG. 13	23	15	02.5	34.41 N.	119.77 W.	13	...	...	3.1P	II	K	AUG. 13	03 P.M. PST
AUG. 13	23	23	25.9	34.41 N.	119.78 W.	12	...	...	3.0K	...	K	AUG. 13	03 P.M. PST
AUG. 13	23	23	53.8	34.40 N.	119.74 W.	12	...	...	3.4P	II	K	AUG. 13	03 P.M. PST
AUG. 13	23	56	03.0	34.41 N.	119.80 W.	10	...	...	3.1K	...	K	AUG. 13	03 P.M. PST
AUG. 14	01	02	35.1	34.40 N.	119.72 W.	14	...	...	3.1P	II	K	AUG. 13	05 P.M. PST
AUG. 14	16	09	45.8	36.10 N.	117.87 W.	5	...	...	3.4P	...	P	AUG. 14	08 A.M. PST
AUG. 14	21	52	41.6	41.42 N.	121.90 W.	2	4.2	4.0	4.2B	...	B	AUG. 14	01 P.M. PST
AUG. 15	00	22	50.9	32.82 N.	115.47 W.	14	...	...	3.3P	...	P	AUG. 14	04 P.M. PST
AUG. 15	01	23	45.2	35.10 N.	119.08 W.	5	...	...	3.3P	...	P	AUG. 14	05 P.M. PST
AUG. 15	04	16	52.4	41.45 N.	121.88 W.	2	...	...	3.3B	...	B	AUG. 14	08 P.M. PST
AUG. 15	04	32	52.8	41.43 N.	121.89 W.	2	...	...	3.4B	...	B	AUG. 14	08 P.M. PST
AUG. 16	07	45	32.4	40.33 N.	124.39 W.	23	...	...	3.8B	IV	B	AUG. 15	11 P.M. PST
AUG. 16	13	35	11.6	34.41 N.	119.80 W.	11	...	...	3.5P	IV	P	AUG. 16	05 A.M. PST
AUG. 17	07	51	40.0	41.44 N.	121.89 W.	2	...	...	3.3B	...	B	AUG. 16	11 P.M. PST
AUG. 19	17	35	09.7	41.46 N.	121.86 W.	2	...	...	3.9B	...	B	AUG. 19	09 A.M. PST
AUG. 20	08	28	23.6	41.43 N.	121.89 W.	2	...	...	3.1B	...	B	AUG. 20	12 P.M. PST
AUG. 20	09	47	47.0	41.42 N.	121.90 W.	2	...	...	3.6B	...	B	AUG. 20	01 A.M. PST
AUG. 20	10	11	31.3	41.44 N.	121.89 W.	2	...	...	3.1B	...	B	AUG. 20	02 A.M. PST
AUG. 21	13	08	35.4	41.46 N.	121.86 W.	2	...	...	3.2B	...	B	AUG. 21	05 A.M. PST
AUG. 24	19	08	32.7	35.08 N.	117.50 W.	5	...	...	3.3P	...	P	AUG. 24	11 A.M. PST
AUG. 25	01	35	49.8	38.06 N.	118.89 W.	8	...	...	3.2B	...	B	AUG. 24	05 P.M. PST
AUG. 25	10	50	31.8	38.11 N.	118.92 W.	5	...	...	3.1B	...	G	AUG. 25	02 A.M. PST
AUG. 28	03	32	18.4	37.55 N.	121.86 W.	11	...	...	2.8B	IV	B	AUG. 27	07 P.M. PST
AUG. 28	19	07	27.3	38.16 N.	118.87 W.	5	...	...	3.2B	...	G	AUG. 28	11 A.M. PST
AUG. 29	00	14	46.4	37.36 N.	121.72 W.	8	...	...	4.1B	VI	B	AUG. 28	04 P.M. PST
AUG. 29	00	18	45.3	37.35 N.	121.72 W.	7	...	...	3.8B	IV	B	AUG. 28	04 P.M. PST
AUG. 29	06	04	49.8	34.38 N.	119.77 W.	5	...	...	2.8P	II	P	AUG. 28	10 P.M. PST
AUG. 29	10	51	46.0	34.38 N.	119.80 W.	5	...	...	2.5P	II	P	AUG. 29	02 A.M. PST
AUG. 29	15	43	46.5	33.18 N.	116.42 W.	5	...	...	3.2P	...	P	AUG. 29	07 A.M. PST
AUG. 30	02	26	40.2	33.22 N.	115.65 W.	4	...	...	3.0P	...	P	AUG. 29	06 P.M. PST
AUG. 31	00	6	55.9	38.05 N.	118.90 W.	5	...	...	3.0B	...	G	AUG. 30	04 P.M. PST
SEPT. 1	09	31	25.4	37.34 N.	121.78 W.	8	...	...	3.3B	II	B	SEPT. 1	01 A.M. PST
SEPT. 3	11	25	53.7	38.82 N.	119.80 W.	20	...	...	3.1B	...	B	SEPT. 3	03 A.M. PST
SEPT. 3	18	10	46.5	33.99 N.	117.72 W.	6	...	...	3.8P	IV	P	SEPT. 3	10 A.M. PST
SEPT. 4	04	52	32.3	38.82 N.	119.81 W.	18	3.9	...	4.6B	V	B	SEPT. 3	08 P.M. PST
SEPT. 4	04	59	55.6	38.82 N.	119.83 W.	14	...	...	3.2B	...	B	SEPT. 3	08 P.M. PST
SEPT. 4	12	00	57.9	38.82 N.	119.81 W.	20	...	...	3.0B	...	B	SEPT. 4	04 A.M. PST
SEPT. 4	21	05	18.3	35.57 N.	118.40 W.	4	...	...	3.0P	...	P	SEPT. 4	01 P.M. PST
SEPT. 4	21	54	53.2	38.81 N.	119.82 W.	19	4.7	...	5.3B	VI	B	SEPT. 4	01 P.M. PST
SEPT. 4	22	03	35.5	38.81 N.	119.82 W.	16	...	...	4.1B	...	B	SEPT. 4	02 P.M. PST
SEPT. 4	22	11	53.3	38.82 N.	119.83 W.	13	...	...	3.0B	...	B	SEPT. 4	02 P.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
SEPT. 4	22	37	26.0	38.81 N.	119.82 W.	14	...	...	3.1B	...	B	SEPT. 4	02 P.M. PST
SEPT. 8	16	59	47.8	38.64 N.	121.91 W.	17	4.4	...	4.2B	V	B	SEPT. 8	08 A.M. PST
SEPT. 11	11	00	30.3	38.81 N.	119.84 W.	16	...	...	3.1B	...	B	SEPT. 11	03 A.M. PST
SEPT. 12	11	57	55.4	34.38 N.	119.77 W.	6	...	...	3.6P	V	P	SEPT. 12	03 A.M. PST
SEPT. 17	15	06	05.0	36.68 N.	121.37 W.	7	...	...	3.3B	...	B	SEPT. 17	07 A.M. PST
SEPT. 17	15	08	02.3	36.67 N.	121.36 W.	8	...	...	3.0B	...	B	SEPT. 17	07 A.M. PST
SEPT. 17	15	38	33.1	36.68 N.	121.36 W.	6	...	...	3.9B	IV	B	SEPT. 17	07 A.M. PST
SEPT. 17	16	00	26.2	36.67 N.	121.36 W.	6	...	...	3.8B	...	B	SEPT. 17	08 A.M. PST
SEPT. 19	15	52	41.5	37.73 N.	122.56 W.	8	...	...	2.9B	II	B	SEPT. 19	07 A.M. PST
SEPT. 20	09	53	24.3	37.54 N.	118.37 W.	3	...	...	3.7B	...	B	SEPT. 20	01 A.M. PST
SEPT. 21	03	18	57.1	36.99 N.	121.68 W.	8	...	...	2.9B	III	B	SEPT. 20	07 P.M. PST
SEPT. 22	03	13	26.8	33.87 N.	117.83 W.	4	...	...	2.9P	II	P	SEPT. 21	07 P.M. PST
SEPT. 22	03	26	19.8	40.63 N.	123.63 W.	20	3.7	...	3.7B	III	B	SEPT. 21	07 P.M. PST
SEPT. 24	02	04	27.5	34.38 N.	119.73 W.	4	...	...	3.6P	IV	P	SEPT. 23	06 P.M. PST
SEPT. 26	05	35	03.9	34.03 N.	118.40 W.	6	...	...	2.1P	II	P	SEPT. 25	09 P.M. PST
SEPT. 28	23	13	53.4	32.97 N.	116.25 W.	5	...	...	3.8P	...	P	SEPT. 28	03 P.M. PST
SEPT. 29	13	49	32.8	33.80 N.	117.07 W.	6	...	...	2.9P	...	P	SEPT. 29	05 A.M. PST
OCT. 4	03	34	26.8	41.46 N.	121.87 W.	2	...	...	3.3B	...	B	OCT. 3	07 P.M. PST
OCT. 4	16	42	48.6	37.53 N.	118.63 W.	9	5.4	5.1	5.8P	VI	P	OCT. 4	08 A.M. PST
OCT. 4	16	48	24.0	37.52 N.	118.66 W.	10	...	...	3.2B	...	B	OCT. 4	08 A.M. PST
OCT. 4	16	57	04.8	37.52 N.	118.63 W.	9	...	...	3.1P	...	P	OCT. 4	08 A.M. PST
OCT. 4	16	59	04.6	37.53 N.	118.63 W.	12	...	...	4.4P	...	P	OCT. 4	08 A.M. PST
OCT. 4	17	07	35.3	37.45 N.	118.67 W.	9	...	...	3.4P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	18	50.6	37.50 N.	118.63 W.	10	...	...	3.0P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	31	31.1	37.55 N.	118.60 W.	10	...	...	4.3P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	33	04.6	37.53 N.	118.60 W.	9	...	...	3.8P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	39	02.9	37.58 N.	118.62 W.	10	5.0	...	5.3P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	43	46.8	37.55 N.	118.62 W.	10	...	...	3.8P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	46	47.5	37.53 N.	118.62 W.	8	...	...	4.2P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	49	28.5	37.55 N.	118.65 W.	9	...	...	3.5P	...	P	OCT. 4	09 A.M. PST
OCT. 4	17	54	11.3	37.55 N.	118.57 W.	10	...	...	3.4P	...	P	OCT. 4	09 A.M. PST
OCT. 4	18	01	53.3	37.53 N.	118.65 W.	8	...	...	3.9P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	03	42.4	37.55 N.	118.50 W.	11	...	...	3.5P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	07	00.2	37.55 N.	118.58 W.	9	...	...	3.3P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	09	32.8	37.50 N.	118.58 W.	8	...	...	3.4P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	12	42.1	37.53 N.	118.63 W.	9	...	...	3.1P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	19	51.8	37.55 N.	118.60 W.	9	...	...	3.1P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	20	47.1	37.52 N.	118.62 W.	9	...	...	3.2P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	22	41.6	37.52 N.	118.62 W.	9	...	...	4.4P	...	P	OCT. 4	10 A.M. PST
OCT. 4	18	44	43.2	37.53 N.	118.60 W.	9	...	...	3.5P	...	P	OCT. 4	10 A.M. PST
OCT. 4	19	22	25.0	37.48 N.	118.78 W.	9	...	...	3.3P	...	P	OCT. 4	11 A.M. PST
OCT. 4	19	47	41.9	37.57 N.	118.58 W.	10	...	...	3.0P	...	P	OCT. 4	11 A.M. PST
OCT. 4	20	09	33.2	37.52 N.	118.62 W.	8	...	...	3.2P	...	P	OCT. 4	12 M. PST
OCT. 4	20	11	42.1	37.52 N.	118.63 W.	9	...	...	3.4P	...	P	OCT. 4	12 M. PST
OCT. 4	20	48	37.6	37.53 N.	118.65 W.	10	...	...	3.2P	...	P	OCT. 4	12 M. PST
OCT. 4	23	06	28.4	37.52 N.	118.60 W.	9	...	...	3.0P	...	P	OCT. 4	03 P.M. PST
OCT. 5	01	17	47.3	37.53 N.	118.62 W.	6	4.1	...	4.4P	...	P	OCT. 4	05 P.M. PST
OCT. 5	01	41	57.3	37.47 N.	118.68 W.	8	...	...	3.3P	...	P	OCT. 4	05 P.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
OCT. 5	01	45	06.4	37.50 N.	118.58 W.	6	...	...	3.3P	...	P	OCT. 4	05 P.M. PST
OCT. 5	04	23	55.3	41.44 N.	121.87 W.	2	...	...	3.2B	...	B	OCT. 4	08 P.M. PST
OCT. 5	06	41	30.1	37.48 N.	118.63 W.	8	...	...	4.5P	...	P	OCT. 4	10 P.M. PST
OCT. 5	09	56	40.4	41.46 N.	121.88 W.	2	4.2	3.8	4.1B	IV	B	OCT. 5	01 A.M. PST
OCT. 5	10	46	18.4	37.48 N.	118.65 W.	5	...	...	3.2P	...	P	OCT. 5	02 A.M. PST
OCT. 5	12	04	29.9	37.50 N.	118.63 W.	9	...	...	3.0P	...	P	OCT. 5	04 A.M. PST
OCT. 5	16	09	02.9	41.46 N.	121.87 W.	2	...	...	3.2B	...	B	OCT. 5	08 A.M. PST
OCT. 5	22	54	13.3	37.55 N.	118.58 W.	12	...	...	3.5P	...	P	OCT. 5	02 P.M. PST
OCT. 6	01	32	21.9	37.57 N.	118.55 W.	12	...	...	3.6P	...	P	OCT. 5	05 P.M. PST
OCT. 6	02	11	04.1	37.52 N.	118.65 W.	9	...	...	3.0B	...	B	OCT. 5	06 P.M. PST
OCT. 6	16	37	10.4	37.23 N.	118.20 W.	6	...	...	3.5B	...	B	OCT. 6	08 A.M. PST
OCT. 6	21	04	37.2	41.44 N.	121.88 W.	2	...	...	4.0B	...	B	OCT. 6	01 P.M. PST
OCT. 6	21	26	34.4	40.38 N.	124.27 W.	20	4.8	4.2	4.6B	V	B	OCT. 6	01 P.M. PST
OCT. 6	21	43	00.9	40.38 N.	124.26 W.	23	...	...	3.3B	...	B	OCT. 6	01 P.M. PST
OCT. 6	22	51	30.1	41.42 N.	121.90 W.	2	...	...	3.0B	...	B	OCT. 6	02 P.M. PST
OCT. 7	02	49	16.9	37.52 N.	118.67 W.	9	...	...	3.2P	...	P	OCT. 6	06 P.M. PST
OCT. 7	04	46	59.0	40.40 N.	124.60 W.	32	...	...	3.5B	...	B	OCT. 6	08 P.M. PST
OCT. 7	12	30	40.7	37.24 N.	118.21 W.	8	...	...	3.1B	...	B	OCT. 7	04 A.M. PST
OCT. 7	13	47	50.6	37.52 N.	118.65 W.	9	...	...	3.1P	...	P	OCT. 7	05 A.M. PST
OCT. 8	13	29	18.6	37.52 N.	118.70 W.	10	...	...	3.2P	...	P	OCT. 8	05 A.M. PST
OCT. 8	19	11	54.0	37.53 N.	118.60 W.	9	...	...	3.0P	...	P	OCT. 8	11 A.M. PST
OCT. 8	23	59	11.3	36.55 N.	121.19 W.	4	...	...	3.0B	...	B	OCT. 8	03 P.M. PST
OCT. 9	20	49	45.8	36.68 N.	121.37 W.	6	...	...	3.3B	III	B	OCT. 9	12 M. PST
OCT. 10	01	38	36.9	36.61 N.	121.28 W.	8	...	...	3.8B	II	B	OCT. 9	05 P.M. PST
OCT. 10	02	08	08.4	37.50 N.	118.60 W.	9	...	...	3.2P	...	P	OCT. 9	06 P.M. PST
OCT. 10	04	28	51.8	38.80 N.	119.82 W.	10	...	...	3.1B	II	B	OCT. 9	08 P.M. PST
OCT. 10	09	06	57.4	35.08 N.	117.50 W.	6	...	...	3.6P	II	P	OCT. 10	01 A.M. PST
OCT. 11	02	51	22.3	35.51 N.	119.53 W.	12	...	...	3.0B	...	B	OCT. 10	06 P.M. PST
OCT. 11	10	33	59.0	34.27 N.	117.05 W.	5	...	...	3.1P	...	P	OCT. 11	02 A.M. PST
OCT. 11	12	36	07.9	34.53 N.	116.10 W.	5	...	...	3.2P	...	P	OCT. 11	04 A.M. PST
OCT. 11	13	22	04.5	41.43 N.	121.88 W.	2	...	...	3.2B	...	B	OCT. 11	05 A.M. PST
OCT. 13	18	47	07.7	41.41 N.	121.90 W.	2	...	...	3.9B	...	B	OCT. 13	10 A.M. PST
OCT. 14	20	59	44.6	36.93 N.	121.46 W.	10	...	...	2.9B	...	B	OCT. 14	12 M. PST
OCT. 14	23	38	41.8	37.48 N.	118.63 W.	9	...	...	3.0P	...	P	OCT. 14	03 P.M. PST
OCT. 16	02	18	07.0	40.46 N.	124.30 W.	20	...	...	3.7B	III	B	OCT. 15	06 P.M. PST
OCT. 16	04	22	44.1	40.67 N.	127.22 W.	5	4.5	4.1	4.2B	...	B	OCT. 15	08 P.M. PST
OCT. 17	02	26	18.8	41.43 N.	121.90 W.	2	...	...	3.0B	...	B	OCT. 16	06 P.M. PST
OCT. 19	09	10	24.5	33.83 N.	118.07 W.	5	...	...	1.9P	II	P	OCT. 19	01 A.M. PST
OCT. 20	08	38	29.0	34.23 N.	116.18 W.	6	...	...	3.2P	...	P	OCT. 20	12 P.M. PST
OCT. 20	21	25	14.4	38.06 N.	118.91 W.	6	...	...	3.8B	...	B	OCT. 20	01 P.M. PST
OCT. 21	00	56	06.5	41.42 N.	121.91 W.	2	...	...	3.1B	...	B	OCT. 20	04 P.M. PST
OCT. 21	02	06	27.4	33.90 N.	118.93 W.	5	...	...	3.6P	...	P	OCT. 20	06 P.M. PST
OCT. 24	02	11	55.0	38.09 N.	118.90 W.	5	...	...	3.3B	...	B	OCT. 23	06 P.M. PST
OCT. 24	06	57	05.0	38.06 N.	118.90 W.	5	...	...	3.4B	...	G	OCT. 23	10 P.M. PST
OCT. 25	12	38	10.3	34.23 N.	116.18 W.	9	...	...	3.1P	...	P	OCT. 25	04 A.M. PST
OCT. 26	19	00	41.3	37.52 N.	118.58 W.	9	...	...	3.9P	IV	P	OCT. 26	11 A.M. PST
OCT. 27	12	00	22.2	37.26 N.	121.64 W.	4	...	...	3.1B	II	B	OCT. 27	04 A.M. PST
OCT. 29	04	33	03.2	40.35 N.	124.45 W.	20	...	...	3.3B	...	B	OCT. 28	08 P.M. PST
OCT. 29	06	50	49.1	40.30 N.	124.73 W.	20	...	...	3.8B	IV	B	OCT. 28	10 P.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--Continued													
OCT. 29	08	09	59.5	33.92 N.	118.30 W.	5	...	...	2.9P	IV	P	OCT. 29	12 P.M. PST
OCT. 29	22	16	09.0	34.32 N.	118.63 W.	3	...	...	3.6P	IV	P	OCT. 29	02 P.M. PST
OCT. 30	16	05	04.6	36.67 N.	121.36 W.	6	...	...	3.2B	II	B	OCT. 30	08 A.M. PST
NOV. 1	06	42	22.6	32.75 N.	115.52 W.	6	...	...	2.8P	II	P	OCT. 31	10 P.M. PST
NOV. 3	04	24	53.0	37.52 N.	118.60 W.	9	...	...	3.3P	...	P	NOV. 2	08 P.M. PST
NOV. 5	09	35	01.2	37.65 N.	118.05 W.	10	...	...	3.3B	...	B	NOV. 5	01 A.M. PST
NOV. 6	16	22	25.0	37.53 N.	118.62 W.	9	...	...	3.5P	II	P	NOV. 6	08 A.M. PST
NOV. 9	23	00	29.3	33.23 N.	116.07 W.	5	...	...	3.1P	...	P	NOV. 9	03 P.M. PST
NOV. 11	04	24	04.6	33.63 N.	117.88 W.	3	...	...	2.7P	V	P	NOV. 10	08 P.M. PST
NOV. 12	13	07	57.3	39.49 N.	122.95 W.	6	...	...	3.8B	IV	B	NOV. 12	05 A.M. PST
NOV. 13	16	49	43.1	34.43 N.	119.70 W.	13	...	...	3.2P	II	P	NOV. 13	08 A.M. PST
NOV. 13	16	50	58.3	34.43 N.	119.70 W.	15	...	...	3.3P	II	P	NOV. 13	08 A.M. PST
NOV. 14	14	51	38.8	38.11 N.	119.16 W.	21	...	...	3.0B	...	B	NOV. 14	06 A.M. PST
NOV. 16	13	28	46.7	34.15 N.	117.60 W.	6	...	...	3.2P	IV	P	NOV. 16	05 A.M. PST
NOV. 19	02	12	10.5	35.62 N.	119.93 W.	5	...	...	3.2P	...	P	NOV. 18	06 P.M. PST
NOV. 19	03	55	31.6	34.02 N.	118.65 W.	12	...	...	3.0P	...	P	NOV. 18	07 P.M. PST
NOV. 19	04	20	05.6	33.85 N.	118.17 W.	12	...	...	2.7P	II	P	NOV. 18	08 P.M. PST
NOV. 19	17	40	56.9	33.85 N.	118.18 W.	5	...	...	3.1P	IV	P	NOV. 19	09 A.M. PST
NOV. 19	18	00	16.4	33.85 N.	118.17 W.	12	...	...	2.8P	III	P	NOV. 19	10 A.M. PST
NOV. 20	06	55	09.4	34.15 N.	116.97 W.	5	4.0	...	4.2P	VI	P	NOV. 19	10 P.M. PST
NOV. 20	06	58	45.0	34.15 N.	116.97 W.	6	...	...	3.5P	III	P	NOV. 19	10 P.M. PST
NOV. 20	21	21	49.1	34.15 N.	116.98 W.	5	...	...	3.1P	II	P	NOV. 20	01 P.M. PST
NOV. 21	20	54	52.5	34.02 N.	116.43 W.	8	...	...	3.0P	...	P	NOV. 21	12 M. PST
NOV. 22	19	09	42.8	35.32 N.	118.52 W.	5	...	...	3.0P	...	P	NOV. 22	11 A.M. PST
NOV. 25	03	24	55.3	37.50 N.	118.70 W.	8	...	...	3.4P	II	P	NOV. 24	07 P.M. PST
NOV. 25	04	06	41.4	37.53 N.	118.68 W.	9	...	...	3.5P	II	P	NOV. 24	08 P.M. PST
NOV. 28	16	54	59.0	35.08 N.	117.52 W.	5	...	...	3.3P	...	P	NOV. 28	08 A.M. PST
DEC. 1	02	29	41.3	33.48 N.	116.45 W.	5	...	...	3.1P	...	P	NOV. 30	06 P.M. PST
DEC. 1	23	20	46.5	33.93 N.	116.68 W.	5	...	...	3.6P	II	P	DEC. 1	03 P.M. PST
DEC. 6	10	03	49.3	34.38 N.	119.75 W.	5	...	...	3.2P	III	P	DEC. 6	02 A.M. PST
DEC. 6	11	21	48.7	34.37 N.	119.75 W.	5	...	...	2.2P	II	P	DEC. 6	03 A.M. PST
DEC. 8	15	44	44.4	36.54 N.	121.08 W.	9	...	...	3.1B	...	B	DEC. 8	07 A.M. PST
DEC. 9	16	02	27.7	38.79 N.	122.78 W.	4	...	...	3.4B	...	B	DEC. 9	08 A.M. PST
DEC. 13	03	03	00.0	37.52 N.	118.65 W.	5	...	...	3.2B	...	B	DEC. 12	07 P.M. PST
DEC. 14	07	38	12.1	36.18 N.	120.79 W.	6	...	...	3.1B	...	B	DEC. 13	11 P.M. PST
DEC. 14	08	55	20.4	34.40 N.	119.50 W.	5	...	...	3.1P	IV	P	DEC. 14	12 P.M. PST
DEC. 15	03	01	19.0	38.84 N.	123.02 W.	1	3.6	...	3.0B	...	B	DEC. 14	07 P.M. PST
DEC. 15	03	36	58.0	33.90 N.	116.17 W.	4	...	...	3.3P	...	P	DEC. 14	07 P.M. PST
DEC. 15	12	27	57.8	33.90 N.	116.17 W.	4	...	...	3.3P	...	P	DEC. 15	04 A.M. PST
DEC. 16	11	17	28.7	41.17 N.	124.07 W.	20	...	...	3.7B	...	B	DEC. 16	03 A.M. PST
DEC. 18	20	05	48.7	36.26 N.	120.67 W.	5	...	...	3.0B	...	G	DEC. 18	12 M. PST
DEC. 20	04	14	31.7	35.62 N.	117.53 W.	5	...	...	3.0P	...	P	DEC. 19	08 P.M. PST
DEC. 25	10	25	32.8	35.47 N.	118.50 W.	5	...	...	3.0P	...	P	DEC. 25	02 A.M. PST
DEC. 29	04	26	43.2	37.23 N.	118.30 W.	5	...	...	3.2P	...	P	DEC. 28	08 P.M. PST
DEC. 29	06	30	30.4	33.93 N.	118.33 W.	3	...	...	2.3P	II	P	DEC. 28	10 P.M. PST
DEC. 31	12	06	37.8	38.05 N.	118.89 W.	6	...	...	3.2B	...	B	DEC. 31	04 A.M. PST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
CALIFORNIA--OFF THE COAST													
JAN. 2	06	39	19.5	40.86 N.	125.23 W.	16	3.9	4.1	4.1B	...	B	JAN. 1	10 P.M. PST
JAN. 11	18	25	34.3	40.60 N.	126.20 W.	5	...	...	3.8B	...	B	JAN. 11	10 A.M. PST
JAN. 12	08	53	50.5	40.90 N.	125.75 W.	5	...	...	3.0B	...	B	JAN. 12	12 P.M. PST
JAN. 18	16	8	39.2	40.53 N.	124.83 W.	25	...	...	3.7B	...	B	JAN. 18	08 A.M. PST
JAN. 24	13	2	3.9	34.61 N.	121.62 W.	10	...	...	3.0B	...	G	JAN. 24	05 A.M. PST
JAN. 27	16	50	50.3	33.25 N.	118.95 W.	14	...	...	3.3P	...	P	JAN. 27	08 A.M. PST
JAN. 29	05	51	04.8	40.20 N.	124.60 W.	5	...	...	3.2B	...	B	JAN. 28	09 P.M. PST
JAN. 29	06	1	22.0	40.41 N.	124.93 W.	22	...	...	3.6B	...	B	JAN. 28	10 P.M. PST
APR. 3	13	46	57.8	33.37 N.	119.08 W.	1	...	...	3.4P	...	P	APR. 3	05 A.M. PST
APR. 11	08	34	23.0	40.31 N.	127.27 W.	15	...	...	3.7B	...	G	APR. 11	12 P.M. PST
APR. 19	09	42	14.6	40.38 N.	126.48 W.	5	4.1	...	4.7B	...	B	APR. 19	01 A.M. PST
APR. 24	20	15	11.5	41.57 N.	125.61 W.	10	4.2	...	3.8B	...	B	APR. 24	12 M. PST
MAY 5	07	49	29.6	41.57 N.	125.80 W.	5	4.7	...	4.2B	...	B	MAY 4	11 P.M. PST
MAY 10	18	30	25.0	40.37 N.	125.10 W.	5	...	...	4.0B	...	B	MAY 10	10 A.M. PST
MAY 21	16	34	19.2	40.31 N.	124.57 W.	20	4.4	...	3.7B	...	B	MAY 21	08 A.M. PST
MAY 23	21	42	02.9	40.44 N.	124.85 W.	35	4.6	...	4.4B	IV	B	MAY 23	01 P.M. PST
MAY 29	00	46	35.1	40.39 N.	126.20 W.	5	4.5	...	4.8B	...	B	MAY 28	04 P.M. PST
JUNE 1	18	38	20.9	40.34 N.	124.84 W.	5	3.7	...	4.0B	IV	B	JUNE 1	10 A.M. PST
JUNE 18	23	04	52.7	40.31 N.	125.29 W.	5	4.4	3.9	4.2B	...	B	JUNE 18	03 P.M. PST
JUNE 19	12	50	54.1	40.28 N.	124.35 W.	20	...	...	3.5B	...	B	JUNE 19	04 A.M. PST
JUNE 29	11	28	10.4	41.54 N.	127.43 W.	5	4.7	...	4.1B	...	B	JUNE 29	03 A.M. PST
JUNE 29	11	42	25.1	41.91 N.	127.55 W.	5	4.3	4.4	4.0B	...	B	JUNE 29	03 A.M. PST
JUNE 29	11	45	04.2	41.63 N.	127.13 W.	15	4.5	...	...	...	G	JUNE 29	03 A.M. PST
JULY 3	08	15	04.0	33.87 N.	120.08 W.	5	...	...	3.2P	...	P	JULY 3	12 P.M. PST
JULY 11	06	53	05.2	40.33 N.	124.94 W.	10	4.1	...	3.8B	...	B	JULY 10	10 P.M. PST
AUG. 3	00	45	30.4	40.26 N.	126.41 W.	15	4.0	...	3.5B	...	G	AUG. 2	04 P.M. PST
AUG. 20	18	42	04.3	40.48 N.	124.86 W.	20	...	...	3.3B	...	B	AUG. 20	10 A.M. PST
SEPT. 10	01	09	35.8	40.41 N.	125.44 W.	5	...	...	4.0B	...	B	SEPT. 9	05 P.M. PST
SEPT. 25	02	10	51.0	41.06 N.	125.38 W.	5	4.6	4.3	4.6B	...	B	SEPT. 24	06 P.M. PST
OCT. 15	15	36	31.7	40.62 N.	127.22 W.	5	4.8	4.0	4.1B	...	B	OCT. 15	07 A.M. PST
OCT. 15	19	54	50.4	40.59 N.	127.24 W.	5	4.8	4.2	4.3B	...	B	OCT. 15	11 A.M. PST
NOV. 11	09	35	31.1	40.54 N.	126.54 W.	5	4.3	4.1	4.2B	...	B	NOV. 11	01 A.M. PST
NOV. 22	23	02	41.8	40.31 N.	125.22 W.	5	...	...	3.9B	...	B	NOV. 22	03 P.M. PST
NOV. 30	16	38	39.3	40.43 N.	127.15 W.	5	...	...	4.0B	...	B	NOV. 30	08 A.M. PST
DEC. 3	06	47	45.9	40.63 N.	127.70 W.	15	...	...	4.0B	...	G	DEC. 2	10 P.M. PST
COLORADO													
MAY 29	16	45	18.0	39.28 N.	107.32 W.	5	...	...	3.0G	...	G	MAY 29	09 A.M. MST
JUNE 10	20	57	53.5	39.78 N.	104.87 W.	20	...	...	2.9G	IV	G	JUNE 10	01 P.M. MST
NOV. 30	18	50	15.8	40.47 N.	107.61 W.	5	...	...	2.8G	...	G	NOV. 30	11 A.M. MST
HAWAII													
JAN. 4	18	42	27.2	19.33 N.	155.18 W.	10	...	...	3.7H	IV	H	JAN. 4	08 A.M. HST
JAN. 5	13	58	46.6	19.32 N.	155.27 W.	10	...	...	3.2H	IV	H	JAN. 5	03 A.M. HST
JAN. 11	08	33	11.3	19.33 N.	155.22 W.	10	...	...	3.8H	IV	H	JAN. 10	10 P.M. HST
JAN. 13	00	34	06.1	19.53 N.	155.95 W.	10	...	...	3.0H	III	H	JAN. 12	02 P.M. HST
JAN. 20	01	52	10.0	19.80 N.	155.09 W.	37	...	...	3.0H	...	H	JAN. 19	03 P.M. HST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
HAWAII--Continued													
JAN. 22	15	41	32.7	19.32 N.	155.12 W.	9	...	...	3.3H	...	H	JAN. 22	05 A.M. HST
JAN. 23	06	21	38.5	19.33 N.	155.06 W.	9	...	...	3.7H	IV	H	JAN. 22	08 P.M. HST
JAN. 23	06	28	26.9	19.34 N.	155.07 W.	9	...	...	3.6H	IV	H	JAN. 23	08 P.M. HST
JAN. 25	01	18	16.8	19.33 N.	155.10 W.	9	...	...	3.2H	III	H	JAN. 24	03 P.M. HST
JAN. 30	10	38	02.5	19.38 N.	156.36 W.	5	...	...	3.2H	...	H	JAN. 30	12 P.M. HST
FEB. 2	21	03	47.7	19.33 N.	155.23 W.	33	...	...	3.3H	...	H	FEB. 2	11 A.M. HST
FEB. 3	02	21	21.6	19.33 N.	155.13 W.	9	...	...	3.0H	...	H	FEB. 2	04 P.M. HST
FEB. 3	05	32	45.8	19.43 N.	155.30 W.	16	...	...	3.5H	IV	H	FEB. 2	07 P.M. HST
FEB. 12	15	06	14.4	19.20 N.	155.62 W.	11	...	...	3.1H	...	H	FEB. 12	05 A.M. HST
FEB. 14	20	05	06.2	19.40 N.	155.28 W.	15	...	...	3.4H	III	H	FEB. 14	10 A.M. HST
FEB. 15	16	37	32.6	19.32 N.	156.11 W.	17	...	...	3.0H	...	H	FEB. 15	06 A.M. HST
FEB. 19	00	51	59.6	19.32 N.	155.14 W.	9	...	...	3.0H	...	H	FEB. 18	02 P.M. HST
FEB. 19	21	49	47.6	19.02 N.	155.42 W.	42	...	...	3.1H	...	H	FEB. 19	11 A.M. HST
FEB. 21	11	56	55.7	19.37 N.	155.09 W.	8	...	...	3.3H	...	H	FEB. 21	01 A.M. HST
FEB. 23	16	06	11.0	19.33 N.	155.10 W.	9	...	...	3.1H	...	H	FEB. 23	06 A.M. HST
FEB. 24	18	37	04.6	19.45 N.	155.99 W.	21	...	...	3.1H	...	H	FEB. 24	08 A.M. HST
FEB. 25	08	55	27.2	19.44 N.	156.32 W.	17	...	...	3.2H	III	H	FEB. 24	10 P.M. HST
MAR. 2	10	51	02.9	19.33 N.	155.22 W.	9	...	...	3.7H	IV	H	MAR. 2	12 P.M. HST
MAR. 10	15	24	43.2	19.33 N.	155.13 W.	10	...	...	3.1H	...	H	MAR. 10	05 A.M. HST
MAR. 17	12	29	01.5	19.44 N.	155.42 W.	9	...	...	3.2H	...	H	MAR. 17	02 A.M. HST
MAR. 17	12	46	13.9	19.33 N.	155.22 W.	10	...	...	3.0H	...	H	MAR. 17	02 A.M. HST
MAR. 21	05	13	25.4	19.37 N.	155.42 W.	12	...	...	3.3H	III	H	MAR. 20	07 P.M. HST
Mar. 24	23	06	30.0	19.47 N.	154.88 W.	44	...	...	3.0H	...	H	MAR. 24	01 P.M. HST
MAR. 27	05	12	56.9	19.17 N.	155.48 W.	37	...	...	3.0H	...	H	MAR. 26	07 P.M. HST
MAR. 27	21	31	08.4	19.35 N.	155.43 W.	11	...	...	3.1H	...	H	MAR. 27	11 A.M. HST
MAR. 28	07	57	50.6	19.48 N.	154.83 W.	7	...	...	3.1H	...	H	MAR. 27	09 P.M. HST
MAR. 29	01	42	46.2	18.55 N.	155.18 W.	13	...	...	3.4H	...	H	MAR. 28	03 P.M. HST
MAR. 31	15	23	41.3	19.42 N.	155.48 W.	11	...	...	3.3H	...	H	MAR. 31	05 A.M. HST
APR. 3	04	28	32.9	19.30 N.	155.19 W.	9	...	...	3.0H	III	H	APR. 2	06 P.M. HST
APR. 6	13	47	14.1	19.33 N.	155.13 W.	10	...	...	3.2H	III	H	APR. 6	03 A.M. HST
APR. 8	02	43	44.2	19.83 N.	155.14 W.	29	...	...	3.6H	IV	H	APR. 7	04 P.M. HST
APR. 12	19	35	28.0	19.33 N.	155.12 W.	10	...	...	3.1H	...	H	APR. 12	09 A.M. HST
APR. 13	06	55	12.7	19.34 N.	155.07 W.	8	...	...	3.4H	IV	H	APR. 12	08 P.M. HST
MAY 3	17	29	06.4	19.29 N.	155.50 W.	8	...	...	3.1H	IV	H	MAY 3	07 A.M. HST
MAY 11	00	23	57.9	19.32 N.	155.11 W.	9	...	...	3.0H	...	H	MAY 10	02 P.M. HST
MAY 16	06	45	42.1	19.36 N.	156.31 W.	32	...	...	3.0H	...	H	MAY 15	08 P.M. HST
MAY 23	07	09	26.7	19.31 N.	155.22 W.	10	...	...	3.4H	IV	H	MAY 22	09 P.M. HST
MAY 24	13	59	15.4	19.35 N.	155.03 W.	7	...	...	3.3H	...	H	MAY 24	03 A.M. HST
MAY 27	13	41	03.0	19.65 N.	156.02 W.	8	...	...	3.0H	...	H	MAY 27	03 A.M. HST
JUNE 1	05	16	44.8	20.30 N.	155.74 W.	7	...	...	3.1H	...	H	MAY 31	07 P.M. HST
JUNE 3	01	02	02.1	19.67 N.	155.16 W.	14	...	...	3.2H	IV	H	JUNE 2	03 P.M. HST
JUNE 4	08	00	44.9	19.81 N.	155.79 W.	16	...	...	3.0H	IV	H	JUNE 4	10 P.M. HST
JUNE 11	06	07	44.7	19.33 N.	155.11 W.	10	...	...	3.0H	...	H	JUNE 10	08 P.M. HST
JUNE 12	21	57	12.1	19.40 N.	155.26 W.	3	...	...	3.0H	IV	H	JUNE 12	11 A.M. HST
JUNE 13	02	49	35.0	18.90 N.	155.46 W.	15	...	...	3.4H	IV	H	JUNE 12	04 P.M. HST
JUNE 13	16	54	01.2	19.34 N.	155.05 W.	6	...	...	3.1H	IV	H	JUNE 13	06 A.M. HST
JUNE 16	08	22	19.8	19.05 N.	156.83 W.	7	...	...	3.0H	...	H	JUNE 15	10 P.M. HST
JUNE 18	03	34	23.7	19.34 N.	155.02 W.	9	...	...	3.0H	...	H	JUNE 17	05 P.M. HST
JUNE 20	09	36	53.5	20.67 N.	155.76 W.	6	...	...	3.3H	...	H	JUNE 19	11 P.M. HST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
HAWAII--Continued													
JUNE 21	10	20	44.1	19.32 N.	155.22 W.	10	...	...	3.4H	III	H	JUNE 21	12 P.M. HST
JUNE 22	04	49	55.0	19.03 N.	156.78 W.	11	...	...	3.1H	...	H	JUNE 21	06 P.M. HST
JUNE 23	08	03	29.7	19.13 N.	156.38 W.	13	...	...	3.1H	...	H	JUNE 22	10 P.M. HST
JUNE 23	11	47	58.6	19.32 N.	155.26 W.	11	4.9	...	4.2H	IV	H	JUNE 23	01 A.M. HST
JUNE 30	04	31	10.9	19.36 N.	155.12 W.	9	...	...	3.0H	...	H	JUNE 29	06 P.M. HST
JUNE 30	22	28	02.8	19.17 N.	155.48 W.	9	...	...	3.1H	III	H	JUNE 30	12 M. HST
JULY 1	19	18	13.3	19.32 N.	155.12 W.	7	...	...	3.9H	IV	H	JULY 1	09 A.M. HST
JULY 4	07	05	16.3	19.35 N.	155.08 W.	9	...	...	3.0H	III	H	JULY 3	09 P.M. HST
JULY 7	21	31	21.5	19.03 N.	156.72 W.	26	...	...	3.3H	...	H	JULY 7	11 A.M. HST
JULY 9	23	07	56.9	19.37 N.	155.10 W.	9	...	...	3.1H	III	H	JULY 9	01 P.M. HST
JULY 14	12	56	37.2	19.35 N.	155.25 W.	10	...	...	3.2H	III	H	JULY 14	02 A.M. HST
JULY 16	18	29	41.8	19.35 N.	155.02 W.	8	...	...	3.3H	IV	H	JULY 16	08 A.M. HST
AUG. 6	06	00	23.4	19.43 N.	155.40 W.	10	...	...	3.0H	...	H	AUG. 5	08 P.M. HST
AUG. 9	07	10	10.3	19.30 N.	155.22 W.	10	...	...	3.4H	III	H	AUG. 8	09 P.M. HST
AUG. 12	01	08	51.4	20.77 N.	156.03 W	16	...	...	3.1H	...	H	AUG. 11	03 P.M. HST
AUG. 12	10	52	50.5	19.33 N.	155.11 W.	10	...	...	3.1H	IV	H	AUG. 12	12 P.M. HST
AUG. 18	14	32	42.0	19.23 N.	155.52 W.	31	...	...	3.4H	...	H	AUG. 18	04 A.M. HST
AUG. 23	21	48	53.1	19.33 N.	155.13 W.	8	...	...	3.1H	...	H	AUG. 23	11 A.M. HST
AUG. 29	21	44	08.9	19.32 N.	155.20 W.	10	...	...	3.1H	II	H	AUG. 29	11 A.M. HST
AUG. 30	22	40	15.7	19.34 N.	155.03 W.	7	...	...	3.1H	III	H	AUG. 30	12 M. HST
AUG. 31	23	07	21.4	19.01 N.	155.48 W.	35	4.5	...	4.0H	IV	H	AUG. 31	01 P.M. HST
SEPT. 1	00	14	53.5	18.99 N.	155.48 W.	37	...	...	3.0H	...	H	AUG. 31	02 P.M. HST
SEPT. 3	14	26	10.5	19.32 N.	155.20 W.	9	...	...	3.0H	III	H	SEPT. 3	04 A.M. HST
SEPT. 5	06	14	44.1	19.32 N.	155.14 W.	9	...	...	3.1H	...	H	SEPT. 4	08 P.M. HST
SEPT. 5	16	18	18.2	19.32 N.	155.13 W.	10	...	...	3.2H	...	H	SEPT. 5	06 A.M. HST
SEPT. 5	20	26	46.8	19.33 N.	155.23 W.	10	...	...	3.7H	IV	H	SEPT. 5	10 A.M. HST
SEPT. 7	14	42	54.3	19.24 N.	156.22 W.	8	...	...	3.2H	...	H	SEPT. 7	04 A.M. HST
SEPT. 7	21	37	46.0	19.37 N.	155.07 W.	7	...	...	3.2H	...	H	SEPT. 7	11 A.M. HST
SEPT. 11	11	21	57.6	18.99 N.	155.35 W.	50	...	...	3.6H	...	H	SEPT. 11	01 A.M. HST
SEPT. 12	06	16	06.1	19.33 N.	155.11 W.	10	...	...	4.1H	IV	H	SEPT. 11	08 P.M. HST
SEPT. 15	17	15	55.7	20.43 N.	156.12 W.	17	...	...	3.0H	...	H	SEPT. 15	07 A.M. HST
SEPT. 19	09	44	29.2	19.39 N.	155.28 W.	4	...	...	3.2H	III	H	SEPT. 18	11 P.M. HST
SEPT. 19	18	43	44.1	19.04 N.	155.69 W.	43	...	...	3.2H	...	H	SEPT. 19	08 A.M. HST
SEPT. 20	01	41	08.7	19.44 N.	155.40 W.	9	...	...	3.3H	IV	H	SEPT. 19	03 P.M. HST
SEPT. 20	23	20	27.0	19.52 N.	155.88 W.	9	...	...	3.1H	IV	H	SEPT. 20	01 P.M. HST
SEPT. 21	12	15	12.6	19.89 N.	155.12 W	43	...	...	3.1H	...	H	SEPT. 21	02 A.M. HST
SEPT. 24	02	35	48.7	17.20 N.	153.83 W.	7	...	...	3.9H	...	H	SEPT. 23	04 P.M. HST
SEPT. 26	06	02	33.4	18.99 N.	155.35 W.	39	...	...	3.0H	...	H	SEPT. 25	08 P.M. HST
SEPT. 30	23	56	13.3	19.38 N.	155.45 W.	9	...	...	3.2H	IV	H	SEPT. 30	01 P.M. HST
OCT. 10	21	17	22.9	19.93 N.	155.81 W.	18	...	...	3.1H	...	H	OCT. 10	11 A.M. HST
OCT. 11	17	34	58.2	19.22 N.	155.56 W.	1	...	...	3.2H	...	H	OCT. 11	07 A.M. HST
OCT. 13	23	00	24.3	19.28 N.	156.25 W.	15	...	...	3.0H	...	H	OCT. 13	01 P.M. HST
OCT. 13	23	10	21.0	19.30 N.	156.29 W.	12	...	...	3.0H	...	H	OCT. 13	01 P.M. HST
OCT. 15	15	35	48.6	19.38 N.	155.07 W.	9	...	...	3.3H	IV	H	OCT. 15	05 A.M. HST
OCT. 21	09	09	53.7	19.44 N.	155.40 W.	10	...	...	3.3H	...	H	OCT. 20	11 P.M. HST
OCT. 28	22	37	33.2	21.56 N.	157.98 W.	5	...	...	4.2H	IV	H	OCT. 28	12 M. HST
OCT. 29	02	44	13.7	19.21 N.	155.35 W.	45	...	...	3.1H	...	H	OCT. 28	04 P.M. HST
NOV. 5	02	25	01.6	19.33 N.	155.18 W.	9	...	...	3.1H	...	H	NOV. 4	04 P.M. HST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
HAWAII--Continued													
NOV. 7	22	56	57.8	19.80 N.	156.13 W.	12	...	...	3.0H	...	H	NOV. 7	12 M. HST
NOV. 11	06	05	23.3	19.36 N.	155.08 W.	9	...	...	3.3H	...	H	NOV. 10	08 P.M. HST
NOV. 13	01	08	02.5	19.37 N.	155.08 W.	0	...	...	3.2H	...	H	NOV. 12	03 P.M. HST
NOV. 15	13	27	17.7	19.42 N.	155.41 W.	10	...	...	3.2H	...	H	NOV. 15	03 A.M. HST
NOV. 16	02	47	46.8	19.40 N.	155.42 W.	11	...	...	3.3H	...	H	NOV. 15	04 P.M. HST
NOV. 17	09	32	45.9	20.42 N.	154.65 W.	13	...	...	3.3H	...	H	NOV. 16	11 P.M. HST
NOV. 22	18	20	42.9	19.21 N.	155.46 W.	7	...	...	3.1H	...	H	NOV. 22	08 A.M. HST
NOV. 22	23	23	14.8	19.35 N.	155.05 W.	6	...	...	3.3H	III	H	NOV. 22	01 P.M. HST
NOV. 23	13	16	15.9	19.23 N.	155.55 W.	11	...	...	4.2H	IV	H	NOV. 23	03 A.M. HST
NOV. 28	02	19	50.1	19.34 N.	155.20 W.	10	...	...	3.3H	...	H	NOV. 27	04 P.M. HST
NOV. 28	11	31	36.7	19.31 N.	155.22 W.	10	...	...	3.6H	III	H	NOV. 28	01 A.M. HST
NOV. 29	07	50	40.3	19.65 N.	156.01 W.	9	...	...	3.3H	III	H	NOV. 28	09 P.M. HST
NOV. 29	08	42	59.6	19.37 N.	155.45 W.	11	...	...	3.5H	III	H	NOV. 28	10 P.M. HST
NOV. 29	21	40	25.3	19.66 N.	156.02 W.	8	...	...	3.2H	...	H	NOV. 29	11 A.M. HST
DEC. 1	01	22	39.4	19.35 N.	155.28 W.	29	...	...	3.4H	III	H	NOV. 30	03 P.M. HST
DEC. 1	02	16	52.1	19.35 N.	155.01 W.	10	...	...	3.4H	...	H	NOV. 30	04 P.M. HST
DEC. 5	21	36	39.7	19.33 N.	155.19 W.	10	...	...	3.8H	III	H	DEC. 5	11 A.M. HST
DEC. 13	04	44	31.5	19.36 N.	155.08 W.	9	...	...	3.6H	IV	H	DEC. 12	06 P.M. HST
DEC. 14	14	12	44.9	19.32 N.	155.22 W.	10	...	...	4.1H	IV	H	DEC. 14	04 A.M. HST
DEC. 21	23	29	27.5	19.33 N.	155.22 W.	10	...	...	3.5H	...	H	DEC. 21	01 P.M. HST
DEC. 22	02	25	15.5	19.46 N.	155.39 W.	9	...	...	3.3H	...	H	DEC. 21	04 P.M. HST
DEC. 27	10	40	55.7	19.33 N.	155.22 W.	10	4.6	...	4.0H	IV	H	DEC. 27	12 P.M. HST
DEC. 28	13	15	27.3	19.25 N.	155.10 W.	47	...	...	3.1H	...	H	DEC. 28	03 A.M. HST
DEC. 28	18	51	01.7	19.26 N.	155.25 W.	10	...	...	3.0H	...	H	DEC. 28	08 A.M. HST
DEC. 29	00	51	17.1	19.83 N.	156.30 W.	3	...	...	3.1H	...	H	DEC. 28	02 P.M. HST
IDAHO													
FEB. 13	17	35	36.9	45.06 N.	114.44 W.	5	...	...	3.3G	...	G	FEB. 13	10 A.M. MST
FEB. 22	00	37	1.1	44.61 N.	115.06 W.	5	3.9	...	3.8G	...	G	FEB. 21	05 P.M. MST
FEB. 25	21	22	21.2	44.64 N.	113.80 W.	5	...	...	...	...	G	FEB. 25	02 P.M. MST
MAR. 19	02	33	48.7	44.50 N.	114.33 W.	5	...	...	3.2G	...	G	MAR. 18	07 P.M. MST
MAR. 22	14	30	17.0	44.28 N.	115.47 W.	5	4.5	...	4.1G	...	G	MAR. 22	07 A.M. MST
APR. 3	10	10	08.1	44.05 N.	116.36 W.	5	...	...	3.2G	IV	G	APR. 3	02 A.M. PST
APR. 20	14	56	47.6	42.66 N.	111.55 W.	5	...	...	2.5G	IV	G	APR. 20	07 A.M. MST
APR. 26	07	16	45.3	43.91 N.	114.11 W.	5	...	...	3.1G	...	G	APR. 25	11 P.M. PST
JULY 19	04	17	30.6	45.09 N.	114.42 W.	5	...	...	3.6G	...	G	JULY 18	08 P.M. PST
SEPT. 28	08	58	20.7	42.10 N.	112.33 W.	5	...	...	2.7G	IV	G	SEPT. 28	01 A.M. MST
OCT. 24	20	30	59.3	42.55 N.	111.84 W.	7	4.2	...	4.1U	VI	U	OCT. 24	01 P.M. MST
OCT. 29	13	46	44.5	44.96 N.	114.27 W.	5	4.2	...	5.0G	V	G	OCT. 29	05 A.M. PST
OCT. 29	17	20	19.4	44.92 N.	114.35 W.	5	...	...	3.3G	...	G	OCT. 29	09 A.M. PST
NOV. 20	14	25	51.8	44.00 N.	114.41 W.	5	...	...	3.2G	IV	G	NOV. 20	06 A.M. PST
NOV. 30	06	53	40.1	42.11 N.	112.49 W.	4	4.6	...	4.7U	V	U	NOV. 29	11 P.M. MST
NOV. 30	11	55	09.3	42.11 N.	112.55 W.	4	...	...	3.5U	II	U	NOV. 30	04 A.M. MST
DEC. 5	11	24	57.8	42.10 N.	112.48 W.	4	...	...	3.7U	...	U	DEC. 5	04 A.M. MST
DEC. 5	11	56	27.6	42.10 N.	112.54 W.	3	...	...	3.0U	...	U	DEC. 5	04 A.M. MST
DEC. 12	08	24	58.2	43.99 N.	114.41 W.	5	...	...	3.5G	...	G	DEC. 12	12 P.M. PST
DEC. 20	13	46	22.6	42.12 N.	112.49 W.	6	...	...	3.9U	IV	U	DEC. 20	06 A.M. MST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
ILLINOIS													
JUNE 2	02	07	28.8	38.42 N.	88.46 W.	20	...	...	3.5V	IV	S	JUNE 1	08 P.M. CST
AUG. 29	07	05	50.3	38.53 N.	88.22 W.	17	...	...	2.4S	II	S	AUG. 29	01 A.M. CST
DEC. 5	01	48	01.3	38.62 N.	88.36 W.	25	...	...	3.5S	V	S	DEC. 4	07 P.M. CST
MAINE													
JAN. 4	19	28	10.8	44.04 N.	70.51 W.	0	...	...	3.2J	IV	J	JAN. 4	02 P.M. EST
MARYLAND													
APR. 26	19	30	23.3	39.70 N.	78.24 W.	15	...	...	3.1V	...	G	APR. 26	02 P.M. EST
MASSACHUSETTS													
SEPT. 1	03	33	43.6	42.48 N.	71.46 W.	0	...	...	2.0J	III	J	AUG. 31	10 P.M. EST
MISSISSIPPI													
JUNE 9	23	15	19.1	32.09 N.	88.58 W.	10	...	...	3.3G	...	G	JUNE 9	05 P.M. CST
DEC. 11	02	06	48.2	31.95 N.	88.48 W.	5	...	...	3.5G	V	G	DEC. 10	08 P.M. CST
MISSOURI													
APR. 3	12	24	21.1	36.62 N.	90.00 W.	5	...	...	3.1S	...	S	APR. 3	06 A.M. CST
SEPT. 20	12	24	08.8	38.57 N.	90.28 W.	2	...	...	3.1S	V	S	SEPT. 20	06 A.M. CST
MONTANA													
JAN. 14	16	53	50.3	44.77 N.	111.94 W.	5	...	...	3.6G	II	G	JAN. 14	09 A.M. MST
MAR. 24	18	35	3.3	47.22 N.	113.33 W.	5	...	...	3.8G	...	G	MAR. 24	11 A.M. MST
MAR. 29	03	53	26.6	44.73 N.	111.74 W.	5	...	...	3.0D	...	G	MAR. 28	08 P.M. MST
APR. 14	09	18	06.8	45.30 N.	110.26 W.	5	...	...	2.8G	...	G	APR. 14	02 A.M. MST
APR. 23	23	24	37.0	46.97 N.	113.27 W.	5	4.5	4.3	4.9G	V	G	APR. 23	04 P.M. MST
APR. 23	23	36	43.7	47.00 N.	113.31 W.	5	...	...	3.7G	II	G	APR. 23	04 P.M. MST
MAY 19	10	50	19.5	47.00 N.	113.31 W.	5	...	...	3.2G	...	G	MAY 19	03 A.M. MST
AUG. 30	16	33	21.2	48.49 N.	111.48 W.	5	...	...	3.1B	...	B	AUG. 30	09 A.M. MST
SEPT. 14	03	30	46.6	46.99 N.	113.31 W.	5	...	...	3.0D	...	G	SEPT. 13	08 P.M. MST
OCT. 7	12	35	55.3	46.62 N.	112.13 W.	5	...	...	2.7G	IV	G	OCT. 7	05 A.M. MST
OCT. 16	01	15	35.3	47.09 N.	113.16 W.	5	...	...	3.4G	II	G	OCT. 15	06 P.M. MST
OCT. 21	12	28	15.3	46.97 N.	113.25 W.	5	...	...	3.5G	III	G	OCT. 21	05 A.M. MST
NOV. 4	15	49	43.8	44.75 N.	111.23 W.	5	...	...	3.5G	III	G	NOV. 4	08 A.M. MST
NOV. 10	09	53	45.6	47.01 N.	113.33 W.	5	...	...	4.3G	IV	G	NOV. 10	02 A.M. MST
NOV. 12	00	29	12.5	46.50 N.	112.70 W.	5	...	...	3.4G	...	G	NOV. 11	05 P.M. MST
NEBRASKA													
MAY 7	16	06	19.6	42.30 N.	101.93 W.	15	...	...	4.3G	IV	G	MAY 7	10 A.M. CST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
NEVADA													
JAN. 13	03	39	37.0	39.42 N.	117.60 W.	5	...	...	4.1B	V	G	JAN. 12	07 P.M. PST
JAN. 18	06	37	2.7	37.63 N.	117.84 W.	1	...	...	3.4B	...	B	JAN. 17	10 P.M. PST
JAN. 18	08	53	32.3	37.63 N.	117.84 W.	2	...	...	3.7B	...	B	JAN. 18	12 P.M. PST
JAN. 21	17	22	23.5	39.15 N.	119.62 W.	5	...	...	3.0B	...	G	JAN. 21	09 A.M. PST
JAN. 24	22	45	26.7	39.04 N.	118.07 W.	12	...	...	3.0G	...	G	JAN. 24	02 P.M. PST
FEB. 13	21	53	0.8	37.14 N.	116.04 W.	2	3.8	...	4.0B	...	G	FEB. 13	01 P.M. PST
FEB. 14	04	35	24.0	39.63 N.	117.18 W.	5	4.4	...	4.8B	IV	G	FEB. 13	08 P.M. PST
FEB. 15	09	25	31.6	39.53 N.	118.45 W.	11	...	...	3.7B	...	G	FEB. 15	01 A.M. PST
FEB. 23	17	00	00.2	37.12 N.	116.06 W.	0	5.7	...	5.4B	...	E	FEB. 23	09 A.M. PST
MAR. 5	22	46	18.2	38.94 N.	118.03 W.	5	4.0	...	4.6B	V	G	MAR. 5	02 P.M. PST
MAR. 15	03	9	14.9	38.35 N.	118.22 W.	5	...	...	3.2G	IV	G	MAR. 14	07 P.M. PST
MAR. 16	15	0	0.9	37.11 N.	116.11 W.	2	3.9	...	4.4B	...	G	MAR. 16	07 A.M. PST
MAR. 23	16	30	0.2	37.10 N.	116.05 W.	0	5.7	...	5.5B	...	E	MAR. 23	08 A.M. PST
APR. 10	07	31	55.9	40.06 N.	116.42 W.	5	...	...	3.0G	...	G	APR. 9	11 P.M. PST
APR. 11	15	30	00.2	37.30 N.	116.33 W.	0	5.3	...	5.3B	...	E	APR. 11	07 A.M. PST
APR. 11	17	45	00.1	37.23 N.	116.37 W.	0	5.5	4.5	5.3B	...	E	APR. 11	09 A.M. PST
APR. 20	13	15	47.3	35.80 N.	114.90 W.	10	...	...	1.9G	II	G	APR. 20	05 A.M. PST
APR. 20	13	18	44.5	35.80 N.	114.90 W.	10	...	...	1.9G	II	G	APR. 20	05 A.M. PST
MAY 23	05	47	55.4	40.87 N.	117.26 W.	11	4.1	...	4.6B	V	G	MAY 22	09 P.M. PST
JUNE 1	17	00	00.0	37.03 N.	116.04 W.	2	...	...	3.4G	...	G	JUNE 1	09 A.M. PST
JULY 6	22	21	22.0	39.11 N.	116.22 W.	10	...	...	3.8G	IV	G	JULY 6	02 P.M. PST
JULY 7	13	59	59.3	37.10 N.	116.01 W.	2	4.0	...	4.3B	...	G	JULY 7	05 A.M. PST
JULY 12	14	54	45.1	38.51 N.	118.33 W.	5	...	...	3.3B	...	G	JULY 12	06 A.M. PST
JULY 12	17	00	00.1	37.08 N.	116.04 W.	0	5.5	4.1	5.4B	...	E	JULY 12	09 A.M. PST
JULY 29	22	32	07.1	38.40 N.	115.24 W.	5	3.9	...	4.2G	II	G	JULY 29	02 P.M. PST
JULY 30	01	32	23.2	38.72 N.	119.39 W.	5	...	...	3.0B	...	G	JULY 29	05 P.M. PST
AUG. 31	14	00	00.2	37.28 N.	116.36 W.	0	5.6	...	5.5B	...	E	AUG. 31	06 A.M. PST
SEPT. 5	22	28	50.3	38.98 N.	118.16 W.	5	...	...	3.6B	...	G	SEPT. 5	02 P.M. PST
SEPT. 13	15	15	00.2	37.21 N.	116.21 W.	0	4.6	...	4.6B	...	E	SEPT. 13	07 A.M. PST
SEPT. 22	19	38	13.0	38.95 N.	119.64 W.	5	...	...	3.2B	...	B	SEPT. 22	11 A.M. PST
SEPT. 27	17	00	00.0	37.07 N.	116.02 W.	0	5.0	...	5.0B	...	E	SEPT. 27	09 A.M. PST
SEPT. 27	17	20	00.0	37.08 N.	116.05 W.	0	5.7	4.1	5.5B	...	E	SEPT. 27	09 A.M. PST
OCT. 10	06	13	53.8	39.43 N.	119.64 W.	5	...	...	3.0B	...	G	OCT. 9	10 P.M. PST
NOV. 2	15	25	00.2	37.29 N.	116.30 W.	0	4.2	...	4.3B	...	E	NOV. 2	07 A.M. PST
NOV. 18	19	00	00.2	37.13 N.	116.08 W.	0	5.1	...	5.2B	...	E	NOV. 18	11 A.M. PST
NOV. 29	08	34	06.9	37.28 N.	116.51 W.	4	...	...	3.3G	...	G	NOV. 29	12 P.M. PST
DEC. 1	17	07	29.8	37.03 N.	116.03 W.	2	...	...	3.8B	...	G	DEC. 1	09 A.M. PST
DEC. 16	15	30	00.2	37.27 N.	116.41 W.	0	5.5	...	5.5B	...	E	DEC. 16	07 A.M. PST
NEW HAMPSHIRE													
MAR. 31	14	27	57.0	43.10 N.	71.63 W.	0	...	...	2.7J	...	J	MAR. 31	09 A.M. EST
AUG. 25	20	01	30.5	42.87 N.	70.83 W.	0	...	...	2.3J	III	J	AUG. 25	03 P.M. EST
NEW JERSEY													
JUNE 30	20	13	43.6	41.07 N.	74.20 W.	5	...	...	2.9L	IV	L	JUNE 30	03 P.M. EST
JUNE 30	22	39	49.7	41.08 N.	74.20 W.	6	...	...	2.2L	III	L	JUNE 30	05 P.M. EST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
NEW YORK													
MAR. 5	07	53	25.6	41.35 N.	74.15 W.	5	...	...	2.1L	III	L	MAR. 5	02 A.M. EST
APR. 5	14	45	49.5	43.86 N.	74.24 W.	11	...	...	2.6L	...	L	APR. 5	09 A.M. EST
JULY 26	04	17	08.7	40.40 N.	71.11 W.	0	...	...	2.8J	...	J	JULY 25	11 P.M. EST
AUG. 10	21	12	11.6	40.46 N.	71.13 W.	29	...	...	3.5J	...	J	AUG. 10	04 P.M. EST
AUG. 21	08	47	10.9	44.52 N.	74.51 W.	1	...	...	3.1L	...	L	AUG. 21	03 A.M. EST
NORTH CAROLINA													
FEB. 25	03	53	27.7	36.19 N.	79.30 W.	8	...	...	2.2V	IV	V	FEB. 24	10 P.M. EST
MAR. 22	15	52	26.7	36.20 N.	81.73 W.	1	...	...	2.9V	...	V	MAR. 22	10 A.M. EST
OKLAHOMA													
MAR. 9	06	30	51.2	34.07 N.	97.40 W.	5	...	...	2.5T	II	T	MAR. 9	12 P.M. CST
MAY 17	23	11	15.7	35.33 N.	97.91 W.	5	...	...	2.3T	I	T	MAY 17	05 P.M. CST
MAY 18	00	19	22.4	35.50 N.	97.50 W.	5	...	...	2.7T	III	T	MAY 17	06 P.M. CST
MAY 18	00	32	17.6	35.60 N.	97.83 W.	5	...	...	2.1T	II	T	MAY 18	06 P.M. CST
OREGON--OFF THE COAST													
JAN. 4	16	15	5.6	43.26 N.	126.63 W.	13	4.5	...	...	...	G	JAN. 4	08 A.M. PST
FEB. 1	05	7	29.0	43.84 N.	128.05 W.	24	4.7	...	...	...	G	JAN. 31	09 P.M. PST
FEB. 6	09	55	50.8	43.55 N.	126.96 W.	21	4.1	...	...	...	G	FEB. 6	01 A.M. PST
FEB. 16	12	0	22.2	42.68 N.	126.03 W.	15	5.0	4.5	4.8B	...	G	FEB. 16	04 A.M. PST
FEB. 23	12	45	1.5	44.10 N.	129.25 W.	15	4.3	3.7	...	...	G	FEB. 23	04 A.M. PST
FEB. 24	06	58	36.9	42.91 N.	126.57 W.	15	4.5	4.2	...	...	G	FEB. 23	10 P.M. PST
APR. 15	15	29	23.1	42.76 N.	126.67 W.	15	4.1	...	...	...	G	APR. 15	07 A.M. PST
APR. 23	20	10	02.4	44.55 N.	127.24 W.	15	3.9	...	...	...	G	APR. 23	12 M. PST
JUNE 18	01	03	45.3	42.70 N.	126.29 W.	15	4.3	...	...	...	G	JUNE 17	05 P.M. PST
JULY 9	23	50	05.5	42.54 N.	126.63 W.	15	4.0	...	...	...	G	JULY 9	03 P.M. PST
OCT. 5	00	12	07.5	43.45 N.	126.71 W.	15	...	...	...	...	G	OCT. 4	04 P.M. PST
OCT. 18	01	25	38.9	44.11 N.	128.54 W.	15	4.3	...	...	...	G	OCT. 17	05 P.M. PST
DEC. 18	12	10	35.5	44.56 N.	129.59 W.	15	4.4	...	...	...	G	DEC. 18	04 A.M. PST
PENNSYLVANIA													
JULY 16	06	39	37.8	39.92 N.	76.26 W.	5	...	...	2.9V	V	V	JULY 16	01 A.M. EST
OCT. 6	19	25	41.6	39.97 N.	76.51 W.	5	...	...	3.0L	V	G	OCT. 6	02 P.M. EST
RHODE ISLAND													
SEPT. 3	12	41	14.4	41.36 N.	71.37 W.	0	...	...	2.8J	...	J	SEPT. 3	07 A.M. EST
SOUTH CAROLINA													
JAN. 25	08	29	39.0	34.30 N.	81.24 W.	1	...	...	2.6G	...	G	JAN. 25	03 A.M. EST
APR. 22	06	36	22.7	34.39 N.	81.32 W.	0	...	...	2.6V	...	G	APR. 22	01 A.M. EST
SEPT. 7	22	53	22.3	33.07 N.	80.22 W.	11	...	...	2.7G	IV	G	SEPT. 7	05 P.M. EST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
TENNESSEE													
JAN. 18	23	46	26.1	36.25 N.	89.42 W.	5	...	...	2.6S	III	S	JAN. 18	05 P.M. CST
AUG. 31	00	31	00.3	36.09 N.	89.42 W.	4	...	...	3.5S	V	S	AUG. 30	06 P.M. CST
TEXAS													
MAR. 2	10	4	52.7	31.56 N.	102.51 W.	11	...	...	3.5G	III	G	MAR. 2	04 A.M. CST
JUNE 16	11	46	54.2	33.03 N.	100.77 W.	10	4.4	...	5.3G	V	G	JUNE 16	05 A.M. CST
UTAH													
FEB. 24	19	49	48.8	38.33 N.	112.83 W.	1	...	...	3.0U	...	U	FEB. 24	12 M. MST
FEB. 28	00	20	6.5	40.76 N.	112.20 W.	14	...	...	2.7U	IV	U	FEB. 27	05 P.M. MST
MAR. 9	06	30	51.8	40.76 N.	112.08 W.	9	...	...	3.3U	VI	U	MAR. 8	11 P.M. MST
MAR. 9	06	46	20.0	40.77 N.	112.08 W.	7	...	...	2.5U	IV	U	MAR. 8	11 P.M. MST
MAR. 13	13	35	43.4	40.76 N.	112.08 W.	13	...	...	2.8U	IV	U	MAR. 13	06 A.M. MST
JULY 29	14	04	03.2	41.85 N.	112.13 W.	7	...	...	3.1U	IV	U	JULY 29	07 A.M. MST
AUG. 30	15	34	38.8	38.03 N.	112.49 W.	7	...	...	2.9U	...	U	AUG. 30	08 A.M. MST
SEPT. 23	08	20	06.6	39.32 N.	111.09 W.	2	...	...	3.0U	...	U	SEPT. 23	01 A.M. MST
OCT. 14	07	58	09.4	38.19 N.	112.35 W.	7	...	...	2.9U	...	U	OCT. 14	12 P.M. MST
DEC. 9	14	59	48.3	38.66 N.	112.53 W.	4	...	...	3.3U	...	U	DEC. 9	07 A.M. MST
DEC. 9	23	49	08.0	38.65 N.	112.52 W.	5	...	...	3.3U	...	U	DEC. 9	04 P.M. MST
DEC. 10	14	59	07.2	40.81 N.	111.57 W.	7	...	...	2.8U	...	U	DEC. 10	07 A.M. MST
VIRGINIA													
MAR. 17	18	26	34.5	36.75 N.	80.74 W.	7	...	...	2.8V	IV	V	MAR. 17	01 P.M. EST
WASHINGTON													
MAR. 5	18	13	35.9	48.06 N.	123.00 W.	57	4.0	...	3.3G	IV	W	MAR. 5	10 A.M. PST
MAR. 11	15	52	11.2	47.42 N.	122.71 W.	25	...	...	4.8G	VI	W	MAR. 11	07 A.M. PST
MAR. 29	12	16	38.4	48.20 N.	122.76 W.	24	...	...	2.7G	IV	W	MAR. 29	04 A.M. PST
MAR. 31	08	3	0.2	47.42 N.	122.72 W.	23	...	...	4.2G	V	W	MAR. 31	12 P.M. PST
JUNE 27	02	18	58.8	46.86 N.	120.96 W.	1	...	...	3.7G	II	W	JUNE 26	06 P.M. PST
DEC. 31	03	23	46.7	47.58 N.	121.85 W.	20	...	...	4.0G	V	W	DEC. 30	07 P.M. PST
WYOMING													
JAN. 16	03	50	3.1	42.43 N.	105.31 W.	5	...	...	3.0G	III	G	JAN. 15	08 P.M. MST
FEB. 2	00	36	25.6	44.39 N.	110.81 W.	5	3.6	...	3.4G	III	G	FEB. 1	05 P.M. MST
FEB. 2	12	35	56.2	44.38 N.	110.83 W.	4	...	...	3.1G	III	G	FEB. 2	05 A.M. MST
FEB. 7	05	3	10.4	42.50 N.	109.70 W.	30	...	...	3.3G	...	G	FEB. 6	10 P.M. MST
MAR. 7	01	10	47.6	44.43 N.	110.84 W.	5	3.7	...	3.5G	V	G	MAR. 6	06 P.M. MST
MAR. 7	07	39	33.1	44.30 N.	110.92 W.	5	3.8	...	3.1G	IV	G	MAR. 7	12 P.M. MST
MAR. 10	07	47	12.6	43.80 N.	110.18 W.	5	...	...	3.2G	...	G	MAR. 10	12 P.M. MST
APR. 15	05	23	50.8	42.72 N.	110.88 W.	5	...	...	2.5G	II	G	APR. 14	10 P.M. MST
JUNE 6	21	23	34.7	43.63 N.	107.83 W.	5	4.0	...	3.7G	...	G	JUNE 6	02 P.M. MST
SEPT. 15	13	45	44.8	44.56 N.	110.49 W.	5	...	...	2.5G	IV	G	SEPT. 15	06 A.M. MST

Table 1.--*Summary of U.S. earthquakes for 1978*--Continued

Date (1978)	Origin time (UTC) hr	min	s	Lat	Long	Depth (km)	Magnitude mb	MS	ML or mbLg	Maximum intensity	Hypocenter source	Local time Date	Hour
WYOMING--Continued													
OCT. 2	13	59	10.7	44.74 N.	110.78 W.	5	...	...	3.5G	III	G	OCT. 2	06 A.M. MST
OCT. 2	23	55	42.6	44.71 N.	110.80 W.	5	...	...	3.6G	IV	G	OCT. 2	04 P.M. MST
NOV. 11	20	46	20.8	44.39 N.	110.25 W.	6	...	...	3.2G	II	G	NOV. 11	01 P.M. MST

Network Operations

ALASKA EARTHQUAKES, 1978

By Larry Gedney
Geophysical Institute
University of Alaska
Fairbanks, Alaska 99701

During 1978, the Geophysical Institute of the University of Alaska located 4,281 Alaskan earthquakes occurring within the boundaries of its existing Alaskan seismographic network. The results were presented in the series of publications, "Summary of Alaskan Earthquakes," prepared quarterly by the Geophysical Institute. Magnitudes of the individual earthquakes ranged from below 0 (in areas which are heavily instrumented, such as the Fairbanks seismic zone) to magnitude 6.5. That largest event occurred southeast of Kodiak Island on April 12, 1978. The Institute's seismographic coverage does not permit the location of earthquakes in either southeast Alaska or the Aleutians.

Owing to various research and monitoring needs, there exists several identifiable subnets of stations in the Geophysical Institute's seismographic coverage. A 6-station subnet was operated in northeastern Alaska to evaluate seismic hazards in the Brooks Range and adjacent areas where petroleum development and production activities are underway or planned. A subnet around the Seward Peninsula was established to evaluate hazards in an area planned for future hydrocarbon development in Norton and Kotzebue Sounds. A subnet in southern Alaska, around Cook Inlet and Kodiak Island, was also designed to provide information of seismic hazards in an area soon to be undergoing hydrocarbon development, as well as for monitoring a seismic gap, expected to undergo a major earthquake in the near future. These three subnets have been largely supported by funds from the Outer Continental Shelf Environmental Assessment Program, administered by the National Oceanographic and Atmospheric Administration, and the southern subnet has also received support from the U.S. Department of Energy. A subnet in central Alaska has been supported largely by funds from the State of Alaska. This subnet occupies the most populated area of the state and most of the transportation corridors.

Data originating at the various seismometers were transmitted in analog form to central recording sites at Fairbanks and Homer, Alaska, via combinations of VHF, tropospheric scatter and satellite radio links. Communication ties with the NOAA Alaska Tsunami Warning Center at Palmer, Alaska, permit real-time mutual data exchange with both the USGS and NOAA. Cooperative data acquisition and analysis also is performed with the Lamont Geophysical Observatory which operated seismic stations in the Shumagin region of the Aleutians.

NORTHERN AND CENTRAL CALIFORNIA EARTHQUAKES, 1978

By Robert A. Uhrhammer
Seismographic Station
475 Earth Sciences Building
University of California, Berkeley
Berkeley, California 94720

Some 5,200 events were noted on summary sheets and 1,220 teleseisms and 440 local earthquakes were analyzed during 1978. The Bulletin of the Seismographic Stations, Volume 48, Nos. 1 and 2 (McKenzie and others, 1978), contains location and magnitude information for 210 earthquakes ($3.0 \leq ML \leq 5.8$) located in northern and central California and adjoining regions. The epicentral locations are plotted in figure 26 (the numbers correspond to a list in the bulletin).

A plot of the cumulative number of earthquakes versus local Richter magnitude (ML) is given in figure 27. The data set consists of 895 earthquakes ($3.0 \leq ML \leq 5.9$) listed in the U. C. Bulletin of the Seismographic Stations, in a 280,000 sq km region in northern and central California during the decade of January 1, 1967 to December 31, 1976. The region is bounded on the north and east by the California border, on the southeast by the dashed line in figure 26, on the southwest by a line connecting 35° N. - 121° W. and 39° N. - 125° W., and on the west by 125° W. longitude. The earthquakes are grouped into 20 consecutive 6-month intervals for analysis and the average cumulative number of earthquakes (N) (total number a magnitude $\geq$ ML) in a 6-month interval is given by

$$\log(N) = 4.412 - 0.912\ ML$$

(valid for $3.0 \leq ML \leq 5.9$). The shaded zone in figure 27 depicts the 95 percent confidence interval for log(N).

The open circles in figure 27 give the cumulative number of earthquakes (59 earthquakes, $3.0 \leq ML \leq 4.6$) in the first 6 months of 1978 and the solid circles give the cumulative number of earthquakes (96

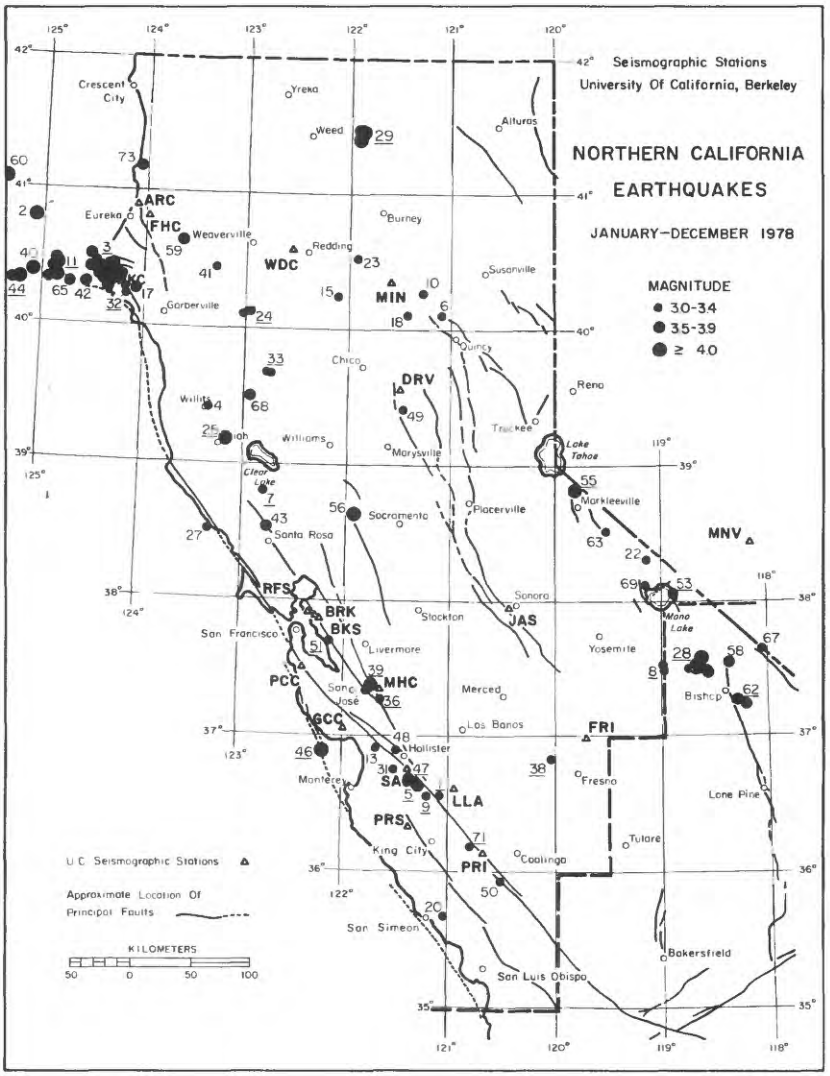


Figure 26.--Northern California earthquakes during 1978.

earthquakes $3.0 \leq ML \leq 5.3$) in the last 6 months of 1978. There is thus no indication that the rate of seismicity for the first 6 months of 1978 is significantly different from the average semiannual rate of seismicity over the past decade. However, the rate of seismicity for the last 6 months of 1978 is significantly higher than the average semiannual rate of seismicity over the past decade. The high rate of seismicity for the last 6 months of 1978 (41 earthquakes, $3.0 \leq ML \leq 4.6$) is attributed to the occurrence of the earthquake sequence to the east of Mt. Shasta (#29 in figure 26)

A sequence of 43 earthquakes ($3.0 \leq ML \leq 5.8$) centered approximately 30 km northwest of Bishop (#28 in figure 26) occurred during the last quarter of 1978. This sequence contained the largest earthquake (ML = 5.8) to have occurred in northern and central California during 1978.

The Seismographic Station operated a network of 19 stations during 1978. Two instruments located at Berkeley (BKS) are of particular interest: a pair of Wood-Anderson torsion instruments which are recorded on helicorders and on magnetic tape, and a three-component ultralong-period seismograph (T = 100 sec) which is recorded photographically and on magnetic tape.

A pair of Wood-Anderson torsion seismometers are mounted in phototube amplifiers that provide electrical signals proportional to their deflection. The signals are recorded on helicorders at two magnification levels, 700X and 14000X, and also on analog magnetic tape at two gain levels. The helicorder recordings are used for preliminary local magnitude (ML) estimates.

A three-component ultralong-period seismograph (T = 100 sec) is undergoing

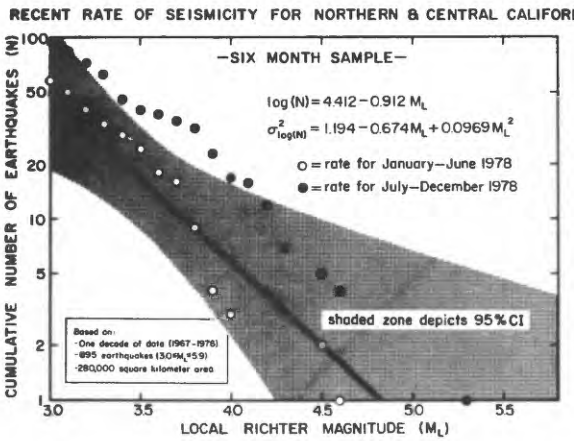


Figure 27.--Plot of cumulative number of earthquakes versus local Richter magnitude (ML).

continuous development. Displacement transducers are used on the seismometers to detect the boom deflection. The displacement transducer output is filtered to simulate a velocity transducer coupled to a 300 sec galvonometer and recorded photographically with a peak magnification of 500 at a period of 100 sec. The signals are also recorded on analog magnetic tape at two gain levels, ± 20 microns full-scale (flat in displacment response from 0.1 sec to 100 sec) and ±2 mm full-scale (passband: 0 - 10 Hz). The ultralong-period seismograph is used primarily to analyze major teleseisms and strong local earthquakes.

SOUTHERN CALIFORNIA EARTHQUAKES, 1978

By L. K. Hutton, J. H. Whitcomb, and C. R. Allen
Seismological Laboratory
California Institute of Technology
Pasadena, California 91125

and

G. S. Fuis and C. E. Johnson
U.S. Geological Survey at
Seismological Laboratory
California Institute of Technology
Pasadena, California 91125

During 1978, 5,643 local earthquakes were located by the 135-station Southern California Seismographic Network, which is operated jointly by the California Institute of Technology and the U.S. Geological Survey. Figure 28 shows these events plotted on a map of the region, with the major faults indicated. Caltech maintains an earthquake catalog complete above magnitude 3.0 in the area enclosed by the box in the figure.

Twenty-six of the year's earthquakes were 4.0 or greater in magnitude. The most significant sequences were: (1) a swarm in the Cerro Prieto area, Baja California, in March which included 288 events; (2) the Santa Barbara earthquake (ML = 5.1) of August 13 and its 403 aftershocks; and (3) the Bishop (Owens Valley) earthquake (ML = 5.8) with its 223 aftershocks. The latter two main shocks caused light to moderate damage in their respective epicentral areas.

1978 marked the second year of routine operation of the CEDAR (Caltech Earthquake Detection and Recording) on-line computer system (Johnson, 1979). Experience shows that the seismicity data can be processed in a reasonably timely fashion, with a detection threshold maintained at 1.8 in the dense part of the network. The seismicity data are currently available in preliminary monthly catalogs (Whitcomb and others, 1978, 1979), and will soon be printed in final form.

CENTRAL MISSISSIPPI VALLEY EARTHQUAKES, 1978

By W. Stauder, R. Herrmann, C. Nicholson, S. Singh, M. Woods, C. Kim, R. Perry, S. Morrissey, and E. Haug
Department of Earth and Atmospheric Sciences
Saint Louis University
St. Louis, MO 63156

During 1978, 244 earthquakes were located and 388 other nonlocatable earthquakes were detected by a twenty-four station regional microearthquake network operated by Saint Louis University under contract for the USGS and NRC. Figure 29 shows the earthquakes located within a 4° x 4° region centered on 37.0° N., and 89.5° W. The magnitudes are indicated by the size of the open symbols. Figure 30 shows the locations and magnitudes of 210 earthquakes located within a 1.5° x 1.5° region centered at 36.25° N. and 89.75° W.

The year 1978 marked the beginning of expansion of the original 16 station USGS southeast Missouri regional seismic network by the addition of eight NRC sponsored stations in southeastern Illinois. Funding was also obtained from the USGS and the NRC to add 24 stations along the seismicity trends of figure 30. The resultant station separation of about 10 km will significantly improve hypocenter accuracies and detection thresholds.

Significant earthquakes during 1978 included the following:

1. 2 June 0207 UTC, 38.4° N., 88.5° W., felt in Fairfield, Illinois, m3Hz = 3.7 (FVM).
2. 29 August 0705 UTC, 38.5° N., 88.2° W., felt in West Salem, Illinois, m3Hz = 2.4 (FVM).
3. 31 August 0031 UTC, 36.1° N.,

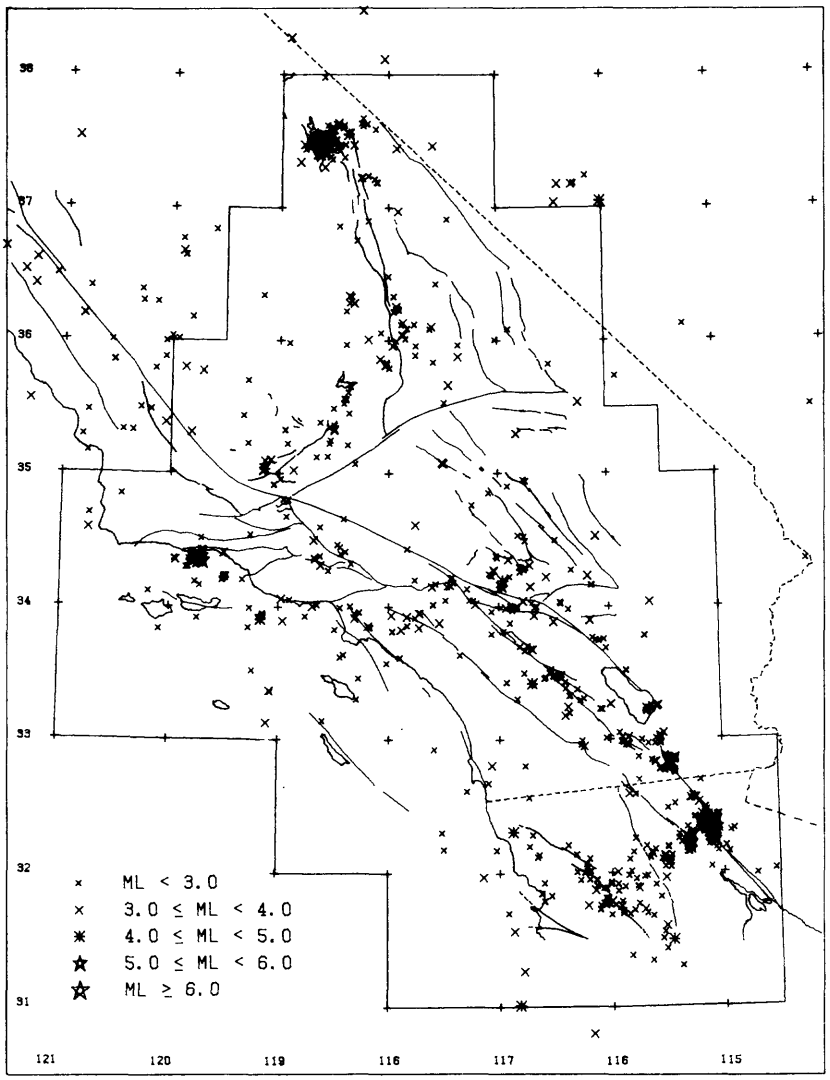


Figure 28.--Southern California earthquakes of magnitude 2.5 ML or greater during 1978.

89.4° W., felt in Dyersburg, Tennessee, MM V, mb = 3.5 (FVM).

4. 20 September 1224 UTC, 38.6° N., 90.3° W., felt in St. Louis, Missouri, MM IV, mb = 3.0 (BLA).
5. 21 November 2331 UTC, 36.0° N., 89.9° W., felt in Blytheville, Arkansas, m3Hz = 2.3 (FVM).
6. 5 December 0148 UTC, 38.6° N., 88.4° W., felt in West Salem, Illinois and neighboring five counties, mb = 3.5 (FVM).

The Illinois earthquakes located between WSIL and BPIL exhibit focal depths between 15 and 25 km, making them deeper on the average than those in the Mississippi Embayment where the focal depths are usually less than 15 km. A microearthquake survey using portable seismographs was conducted near Ridgely, Tennessee by Nicholson and Singh (1978). Northwest striking, southwesterly dipping reverse faulting was identified, near the station GRT of figure 30, through the use of composite focal mechanisms and vertical depth profiles.

KANSAS EARTHQUAKES, 1978

By Don W. Steeples
Kansas Geological Survey
University of Kansas
Lawrence, Kansas 66044

During 1978, the Kansas Geological Survey operated nine telemetered microearthquake seismograph stations (fig. 31) in eastern Kansas. Four additional stations were to be installed in northwest Kansas and south-central Nebraska during 1979. Station locations are given in table 2.

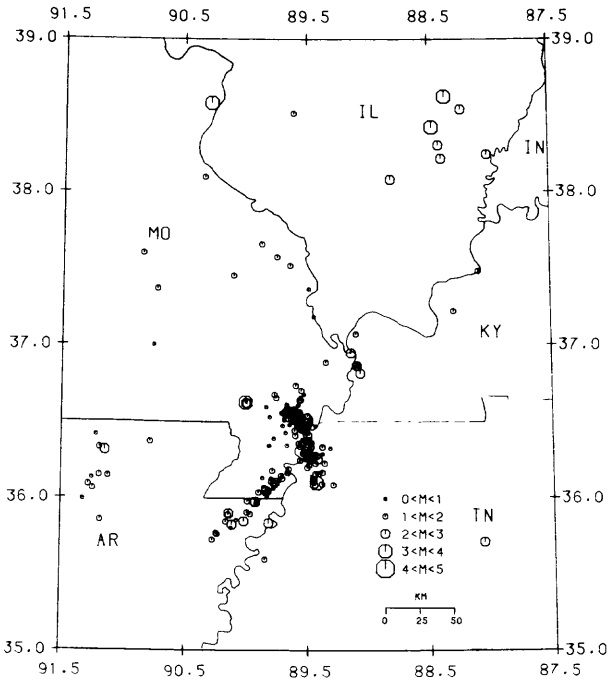


Figure 29.--Central Mississippi Valley earthquakes during 1978 within a 4' x 4' region centered at 37.0' N. and 89.5' W.

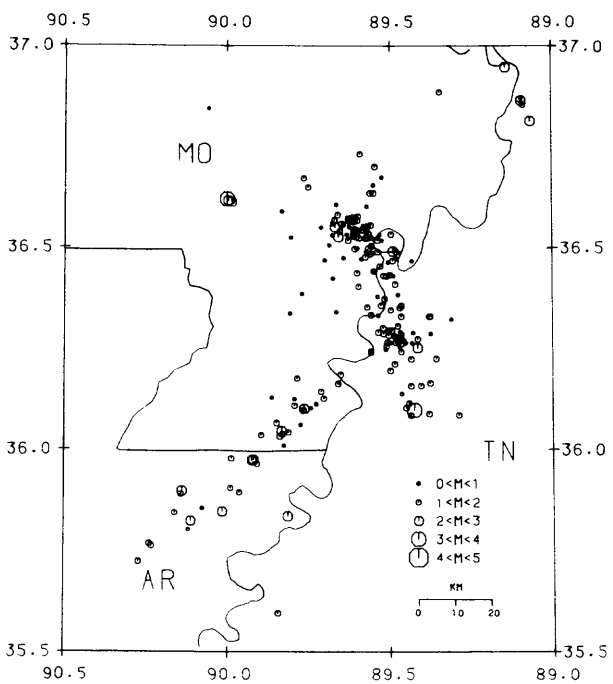


Figure 30.--Central Mississippi Valley earthquakes during 1978 within a 1.5' x 1.5' region centered at 36.25' N. and 89.75' W.

A series of 16 microearthquakes occurred within or near the Kansas borders between December 1, 1977 and the end of 1978 (fig. 32). Location parameters are given in table 3. Several of the microearthquake locations seem to trend along the Nemaha/Humboldt structure, indicating that parts of it are at least slightly active.

The occurrence of microearthquakes along the approximate trace of the Humboldt fault implies the possible occurrence in the past and future of larger earthquakes. Previously unknown felt reports from the 1867 so-called "Manhattan earthquake" (Modified Mercalli Intensity VII) suggest that the epicenter may have been east of Manhattan near the known Humboldt fault trace (DuBois and Wilson, 1978) rather than "22 miles northwest of Manhattan" (Merriam, 1956). Several years of microearthquake data will be required in conjunction with historical earthquake data to estimate the average return period for the 1867-type earthquake.

The series of felt earthquakes in the Manhattan vicinity in 1929 remain an enigma in regard to their structural source. Isoseismal patterns clearly indicate that the epicenters were 20 to 40 km west of the trace of the Humboldt fault. It is expected that this question will be answered in the future by microearthquake recording.

The microearthquakes plotted in figure 32 in northwest Kansas and southwest Nebraska occurred between December 1, 1977 and September 30, 1978. The events are only located with an estimated accuracy of 20 to 25 km, but they all clearly lie on a structural trend known as the Central Kansas Uplift in Kansas and as the Chadron and Cambridge Arch in Nebraska. On May 7, 1978 an event with mbLg = 3.9 (not shown in fig. 32) occurred on the Chadron Arch in western Nebraska. The seismicity pattern of 1977-78, coupled with several historical epicenters (Woollard, 1958) suggests that some low to moderate level of tectonic activity is occurring along this whole structure in central and northwest Kansas and in western Nebraska. A long-term trend of such tectonic movement is explicitly suggested by Stanley and Wayne (1972) on the basis of drainage and sedimentation patterns in the area during the Pleistocene Epoch and by present-day stream gradients and knickpoints on several rivers that cross the structural trend.

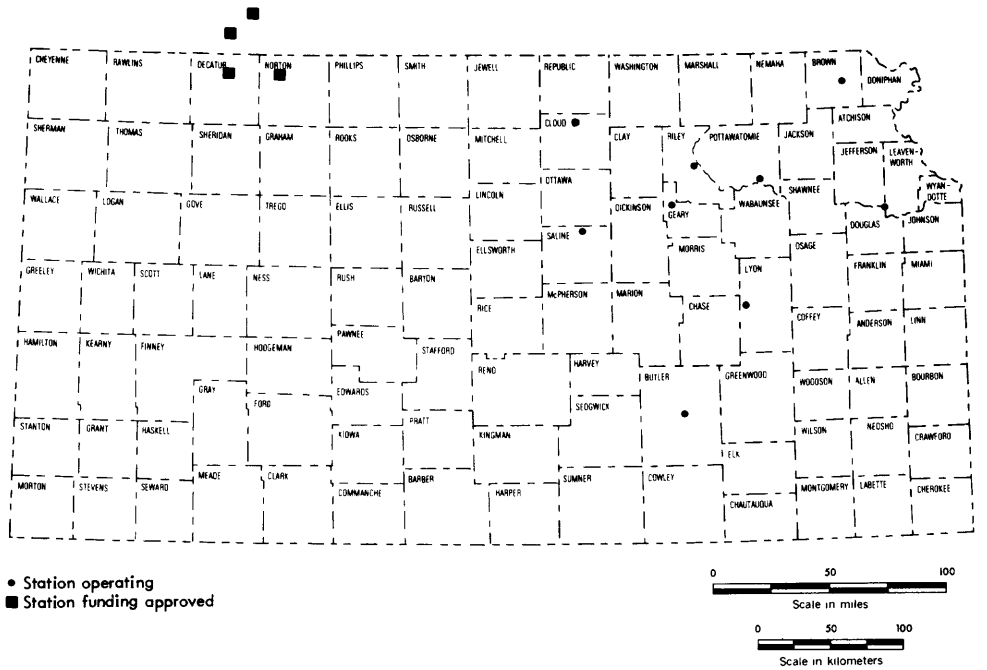


Figure 31.--Kansas Geological Survey seismograph network in 1978. Stations in Cloud, Saline, and Butler Counties did not begin operating until April, 1978. Stations shown by squares were to be added in 1979.

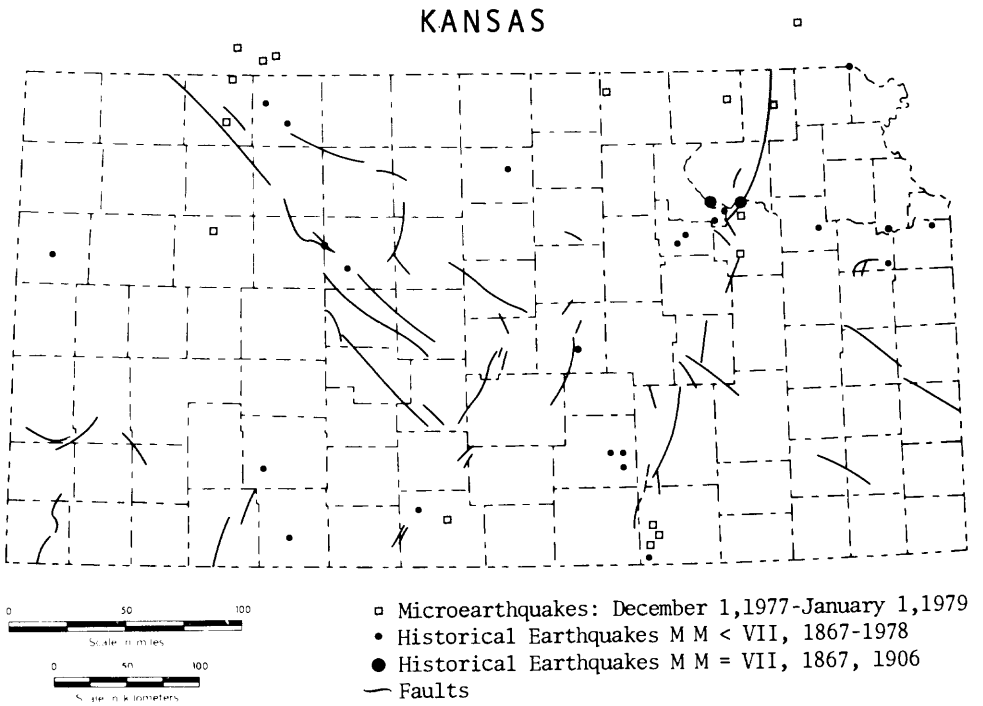


Figure 32.--Kansas earthquakes and the Humboldt Fault Zone that trends north-northeasterly across the State. The Central Kansas Uplift is associated with the faults that trend north-westerly in northwestern Kansas.

Table 2.--*Station locations in Kansas*

Station	Lat. (°N.)	Long. (°W.)	Elevation (m)
BEK	39.263	96.200	349
EMK	38.447	96.317	307
HWK	39.802	95.497	320
LAK	39.046	95.205	326
MLK	39.106	96.892	386
TCK	39.385	96.723	377
EDK	37.774	96.795	418
SNK	38.953	97.603	407
CNK	39.508	97.713	465
OBK	39.929	100.439	805
NNK	39.936	100.042	730

Table 3.--*Microearthquake locations in Kansas*

Date (1978)	Origin time (UTC)	Lat. (°N.)	Long. (°W.)	Depth (km)	Mag. (DUR)
Jan. 11	21 32 03.88	38.868	96.201	0.41	1.6
Jan. 13	20 15 33.39	40.093	95.700	5.00	1.7
Jan. 27	11 25 37.65	39.836	95.974	9.03	2.4
Feb. 3	00 25 47.62	40.032	100.333	5.00	2.4
Apr. 14	23 27 38.29	39.814	96.395	1.18	1.9
May 20	01 53 43.36	39.998	100.333	5.00	2.3
May 22	04 28 35.06	39.135	96.292	8.86	2.3
Sep. 14	08 06 18.59	40.896	100.367	5.00	2.2
Nov. 1	08 44 59.88	39.860	97.349	5.00	1.6
Dec. 4	23 06 14.64	37.340	98.640	0.52	2.2
Dec. 4	23 06 23.20	39.138	100.455	5.00	2.3
Dec. 10	13 41 02.12	39.477	93.259	5.00	2.0

OKLAHOMA EARTHQUAKES, 1978

By James E. Lawson, Jr.
Oklahoma Geophysical Observatory
University of Oklahoma
Leonard, Oklahoma

and

Kenneth V. Luza
Oklahoma Geological Survey
University of Oklahoma
Norman, Oklahoma 73019

The article below is a condensed version of a paper by Lawson and Luza originally published in Oklahoma Geology Notes, vol. 39, June 1979.

A statewide network of 10 seismograph stations are recording seismological data in Oklahoma (fig. 33). The Oklahoma Geophys-ical Observatory station, TUL, has been recording earthquake data since December 1961. The Observatory, located near Leonard, Oklahoma, in southern Tulsa County, operates seven seismometers, three long-period and four short-period, which are installed in a vault detached from the main building. The seismic responses at TUL are recorded on 11 paper-drum recorders; 16 seismograms are recorded on 16-mm film. Seven semipermanent, volunteer-operated seismograph stations and two radio-telemetry stations constitute Oklahoma's regional network. The installation and maintenance of these stations are being supported by the U.S. Nuclear Regulatory Commission (NRC) (Luza, 1978).

Each of the seven volunteer-operated seismograph stations consists of a Geotech S-13 short-period, vertical seismometer; a Sprengnether MEQ-800 B unit, including amplifier, filters, ink-recording unit and a clock; and a Kinemetrics time-signal radio receiver for high-frequency WWV time signals. Each radio-telemetry system consists of one Geotech S-13 seismometer and one Emheiser Rand telemetry unit. Seismographs from the radio-telemetry stations are recorded at the Oklahoma Geophysical Observatory.

In 1978, 35 Oklahoma earthquakes were located (fig. 34) by the Oklahoma Geophysical Observatory staff. Magnitude values range from a low of 1.3 (m3Hz) in Okfuskee County to as high as 3.1 (m3Hz) in Le Flore County. The listing only represents those earthquakes that could be located by using three or more seismograph records. Only four earthquakes were reported felt by people living in the vicinity of the earthquake epicenters. These earthquakes include the March 9 earthquake in Love County, MM II (modified Mercalli intensity), the May 18 earthquake in Canadian County, MM I, and two earthquakes on May 19 in Canadian County, MM III and MM II.

The 1978 earthquake epicentral data, which form a limited data set, when combined with previous earthquake data produce some seismic trends worthy of discussion. Five 1978 earthquakes, of which three were felt, occurred near El Reno in Canadian County. This location is near the site of the April 9, 1952 earthquake with the magnitude of 5.5 (m_b). Three additional earthquakes occurred northeast of El Reno in Logan County. These earthquakes, when combined with the historical earthquakes in this area, form a zone 30 km wide and 145 km long that crosses the Nemaha Uplift at a 30° angle. It is not clear what this trend represents; however, it is subparallel to a a regional northeast-southwest structural grain in northeastern Oklahoma. In south-central Oklahoma, there is a concentration of earthquakes in the Wilson area, Carter and Love Counties. This area has also been the site of numerous small earthquakes in the past. The subsurface geology near Wilson consists of deformed, complexly faulted Paleozoic rocks. Several 1978 epicenters as well as pre-1978 earthquake epicenters fall within and (or) along the northern front of the Ouachita Mountains. Several of these epicenters are within 1 or 2 km of known surface faulting.

An HP-9825A desk-top computer system

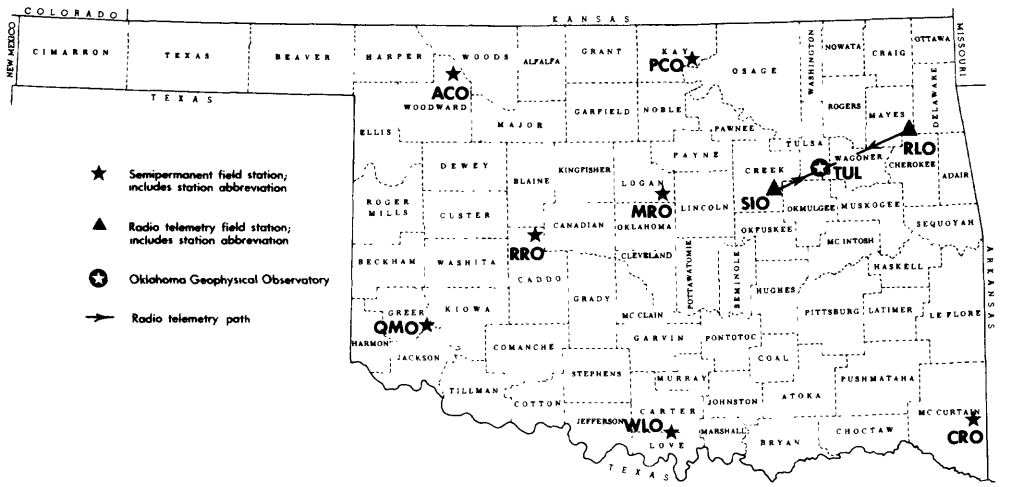
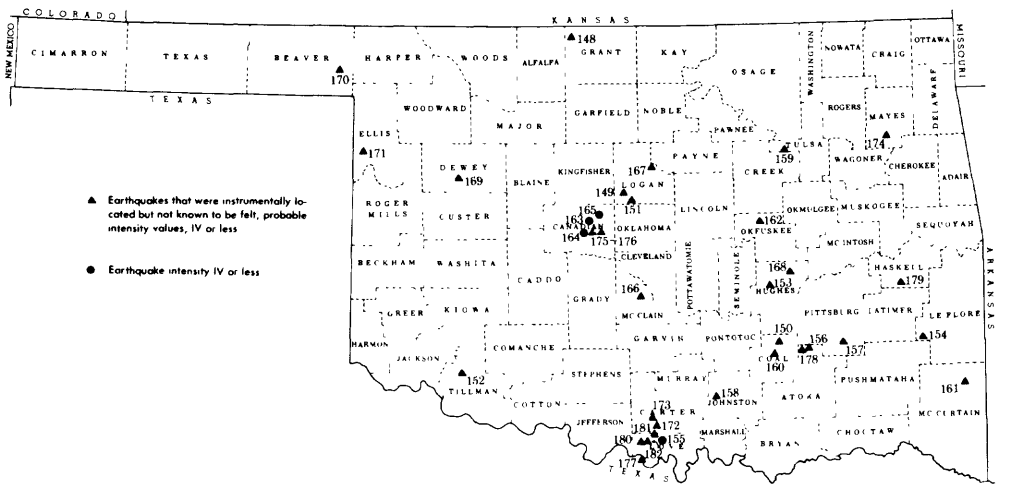


Figure 33.--Active seismograph stations in Oklahoma.



igure 34.--Distribution of Oklahoma earthquakes during 1978. Numbers correspond to event numbers in table 4.

is used to calculate local earthquake epicenters. A catalog containing date, origin time, county, intensity, magnitude, location, focal depth, and references is printed in page-size format. Table 4 contains the 1978 Oklahoma earthquakes displayed in a modified version of the regional earthquake catalog.

There are several different scales used to report magnitude. Table 4 has three magnitude scales which are mbLg (Nuttli, 1973), m3Hz (Nuttli, 1973), and MDUR (Lawson, 1978). Each magnitude scale was established to accommodate specific criteria, such as the distance from the epicenter, as well as the availability of certain seismic data.

For earthquake epicenters located from 11 km to 222 km from a seismograph station, Otto Nuttli developed the m3Hz magnitude scale (Zollweg, 1974). This magnitude is derived from the following expression:

$$m3Hz = \log(A/T) - 1.63 + .87\log(D),$$

where A is the maximum center-to-peak vertical-ground-motion amplitude sustained for three or more cycles of Sg waves, near 3 hertz in frequency, measured in nanometers; T is the period of the Sg waves measured in seconds; and D is the great-circle distance from epicenter to station measured in kilometers.

Otto Nuttli's (1973) earthquake magnitude, mbLg, for seismograph stations located between 55.6 km and 445 km from the epicenter, is derived from the following equation:

$$mbLg = \log(A/T) - 1.09 + 0.90\log(D).$$

Where seismograph stations are located

between 445 km and 3,360 km from the epicenter, mbLg is defined as

$$mbLg = \log(A/T) - 3.10 + 1.66\log(D),$$

where A is the maximum center-to-peak vertical-ground-motion amplitude sustained for three or more cycles of Sg waves, near 1 hertz in frequency, measured in nanometers; T is the period of Sg waves measured in seconds; and is the great-circle distance from station to epicenter measured in kilometers.

The MDUR magnitude scale was developed by Lawson (1978) for earthquakes in Oklahoma and adjacent areas. It is defined as

$$MDUR = 1.86\log(DUR) - 1.49,$$

where DUR is the duration or difference, in seconds, between the Pg-wave arrival time and the time the final coda amplitude decreases to twice the background-noise amplitude. If the Pn wave is the first arrival, the interval between the earthquake-origin time and the decrease of the coda to twice the background-noise amplitude is measured instead.

The depth to the earthquake hypocenter is measured in kilometers. For most Oklahoma earthquakes the focal depth is unknown. In almost all Oklahoma events, the stations are several times farther from the epicenter than the likely depth of the event. This makes the locations indeterminate at depth, which usually requires that the hypocenter depth be restrained to an arbitrary 5 km for purposes of computing latitude, longitude, and origin time. All available evidence indicates that no Oklahoma hypocenters have been deeper than 15 to 20 km.

Table 4.--*Oklahoma earthquake catalog for 1978*

Event number	Date (1978)	Origin time (UTC)	Lat (N.)	Long (W.)	Depth (km)	Magnitudes 3Hz	mbLg	DUR	County	Intensity (MM)
148	Jan. 8	04 16 33.56	36.971	97.463	5.0 R	1.5	---	1.5	Kay	---
149	Jan. 8	10 19 17.65	35.824	97.642	5.0 R	2.1	2.0	2.2	Logan	---
150	Feb. 10	06 42 02.39	34.712	96.157	5.0 R	2.1	1.5	1.9	Coal	---
151	Feb. 14	01 09 38.64	35.777	97.585	5.0 R	1.7	---	1.7	Logan	---
152	Feb. 21	11 12 48.11	34.535	99.003	5.0 R	2.5	2.2	2.0	Tillman	---
153	Mar. 3	02 24 37.28	35.086	96.278	5.0 R	2.5	2.1	2.4	Hughes	---
154	Mar. 5	14 46 50.48	34.699	95.033	7.0 R	3.1	2.9	2.7	LeFlore	---
155	Mar. 9	06 30 50.82	34.010	97.378	5.0 R	---	2.6	2.5	Love	II
156	Apr. 2	21 32 48.08	34.635	96.057	5.0 R	2.5	2.3	2.5	Atoka	---
157	Apr. 11	08 51 02.43	34.693	95.681	5.0 R	1.7	---	1.8	Pittsburg	---
158	Apr. 13	03 43 50.76	34.351	96.820	5.0 R	1.9	2.0	1.9	Johnston	---
159	Apr. 19	14 20 54.06	36.088	96.136	5.0 R	1.5	---	1.1	Tulsa	---
160	Apr. 20	08 13 04.00	34.586	95.293	5.0 R	1.7	---	1.6	Coal	---
161	May 1	22 59 13.38	34.400	94.673	5.0 R	2.1	2.2	2.2	McCurtain	---
162	May 4	04 35 52.89	35.588	96.345	5.0 R	1.3	---	1.5	Okfuskee	---
163	May 17	23 11 15.65	35.525	97.910	5.0 R	2.1	2.3	2.0	Canadian	I
164	May 18	00 19 22.43	35.502	97.949	5.0 R	2.5	2.7	2.6	Canadian	III
165	May 18	00 32 17.57	35.601	97.828	5.0 R	2.2	2.1	2.1	Canadian	II
166	May 19	00 39 37.46	35.135	97.503	5.0 R	1.7	2.0	1.9	McClain	---
167	May 19	06 27 32.70	36.002	97.367	5.0 R	1.8	---	1.4	Logan	---
168	May 28	09 19 00.22	35.213	96.144	5.0 R	2.1	---	1.8	Hughes	---
169	June 22	05 10 15.54	35.923	99.089	5.0 R	2.0	---	2.2	Dewey	---
170	Aug. 3	00 35 37.09	36.689	100.162	5.0 R	2.3	2.1	2.4	Beaver	---
171	Aug. 6	04 28 56.83	36.073	99.935	5.0 R	3.0	2.2	2.6	Ellis	---
172	Aug. 8	12 07 48.69	34.127	97.463	5.0 R	2.3	2.2	1.9	Carter	---
173	Aug. 26	14 57 51.99	34.178	97.463	5.0 R	---	---	1.4	Carter	---
174	Sep. 8	05 16 06.60	36.155	95.275	5.0 R	---	---	1.4	Mayes	---
175	Sep. 26	21 17 17.72	35.519	97.866	5.0 R	2.2	2.2	2.2	Canadian	---
176	Sep. 27	01 56 03.81	35.519	97.843	5.0 R	2.2	2.1	2.2	Canadian	---
177	Sep. 27	20 56 03.75	33.883	97.477	5.0 R	2.4	---	1.9	Love	---
178	Dec. 8	11 18 53.92	34.676	96.063	5.0 R	2.0	1.8	1.7	Atoka	---
179	Dec. 19	02 00 28.87	35.086	95.125	5.0 R	1.2	1.7	1.7	Haskell	---
180	Dec. 27	22 00 30.02	33.996	97.512	5.0 R	2.0	---	1.9	Love	---
181	Dec. 28	05 30 32.43	34.080	97.462	5.0 R	1.4	1.9	1.5	Love	---
182	Dec. 28	13 54 09.81	33.991	97.456	5.0 R	1.9	2.1	1.9	Love	---

The hypocenter is restrained (R) at an arbitrary depth of 5.0 km, except where indicated, for purposes of computing latitude, longitude, and origin time.

SOUTHEASTERN UNITED STATES EARTHQUAKES, 1978

By G. A. Bollinger
Department of Geological Sciences
Virginia Polytechnic Institute
and State University
Blacksburg, Virginia 24061

There were 25 earthquakes located in the southeastern United States during 1978. Of these, seven had M $\geq$ 3 and/or were felt (table 5). Considerable microearthquake (M $<$ 3) activity was reported near reservoirs in South Carolina and Georgia. Finally, some microearthquake occurrences, not in the vicinity of reservoirs, were reported in Virginia. Figure 35 shows the spatial distribution of the 1978 seismicity. A full data listing for all 1978 shocks was given in Southeastern United States Seismic Network Bulletins No. 2 and 3. Copies of those reports may be obtained by contacting the author.

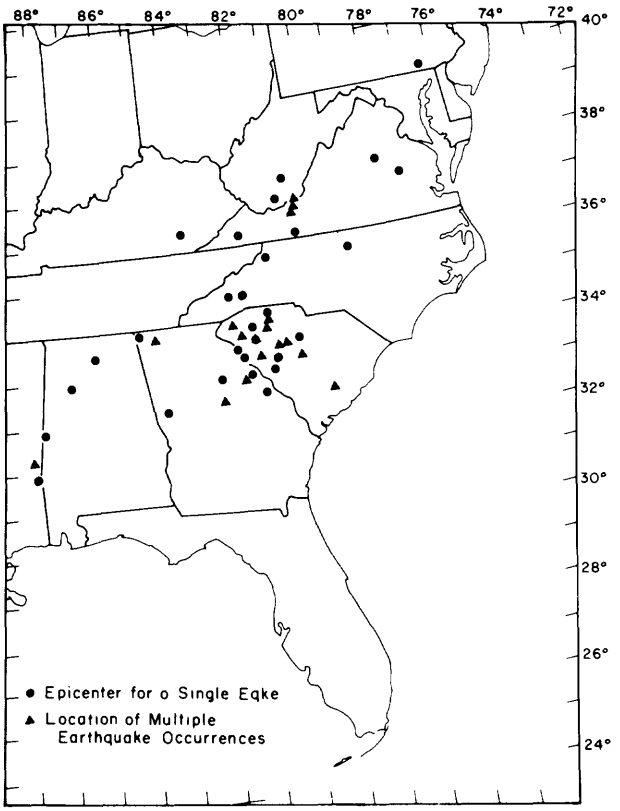


Figure 35.--Southeastern United States earthquake epicenters during 1978.

The number of seismic stations operating in the region varied between 62 and 81. Figure 36 shows the station distribution (81) present at the end of 1978.

Table 5.--*Southeastern United States earthquakes*

Date (1978)	Origin time (UTC)	Lat. (°N.)	Long. (°W.)	Depth (km)	Mag. (mbLg)	State felt
Jan. 8	11 34 22.4	32.78	88.25	5	3.0	AL-MS
Feb. 25	03 53 27.7	36.19	79.30	8	2.2	NC
Mar. 1	04 08 26.1	34.49	86.68	5	2.5	AL
Mar. 17	18 26 34.5	36.75	80.74	7	2.8	VA
June 9	23 15 19.1	32.09	88.58	10	3.3	AL-MS
July 16	06 39 37.8	39.93	76.26	5	3.0	PA
Dec. 11	02 06 49.4	31.90	88.49	5	3.5	MS

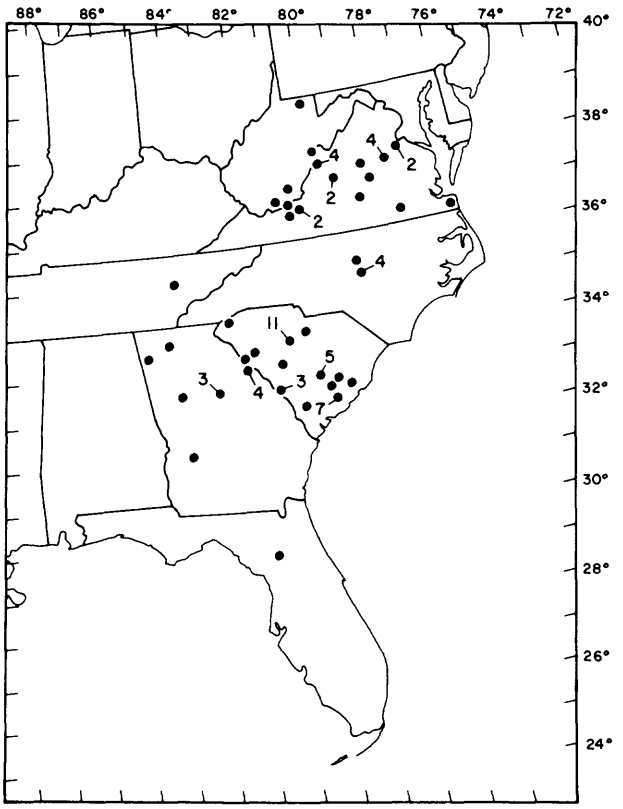


Figure 36.--Southeastern United States seismic stations (solid circles) operating at the close of 1978. Numbers indicate the number of closely-spaced multiple stations at a given location.

VIRGINIA EARTHQUAKES, 1978

By G. A. Bollinger
Department of Geological Sciences
Virginia Polytechnic Institute
and State University
Blacksburg, Virginia 24061

Installation of a 10-station seismic network in Virginia was completed in 1978. That network consists of two 5-station clusters: One in the Giles County area of western Virginia and the other in the central portion of the state. Additionally, 4-station subarrays, in the North Anna (central Virginia) and Bath County (north central Virginia), were obtained from Virginia Electric and Power Company. By the end of 1978, 16 of the 18 total stations were operational (see fig. 37).

During this initial monitoring period, a total of 26 earthquakes ($-0.9 \leq M \leq 2.8$) were detected. Of these, only 11 were locatable (three or more recording stations; see fig. 38). Their HYPO71 parameters are shown in table 6. For the remaining 15 nonlocatable events, 8 were in the Giles County area, 3 were in central Virginia, 1 was near North Anna, and 3 were in Bath County.

Table 6.--*Virginia earthquakes*

Date (1978)	Origin time (UTC)	Lat. (°N.)	Long. (°W.)	Depth (km)	Mag. (DUR)
Jan. 28	23 13 23.3	37.230	80.780	9	1.0
Mar. 17	18 26 34.5	36.748	80.741	7	2.8
May 10	04 19 12.8	37.403	80.670	5	0.4
May 25	08 30 27.0	37.075	80.817		1.0
June 9	04 42 48.9	37.747	81.233	10	0.7
June 22	06 42 29.0	36.798	82.357	10	1.0
July 28	08 39 40.8	37.343	80.682	10	0.5
Aug. 30	02 19 38.2	37.293	80.700	11	0.6
Sep. 14	19 37 06.5	37.495	81.232		-0.3
Oct. 14	01 50 52.8	37.303	80.562		-0.3
Oct. 29	12 22 42.6	38.025	78.102	12	0.6
Nov. 15	08 33 47.2	37.652	77.545		0.8

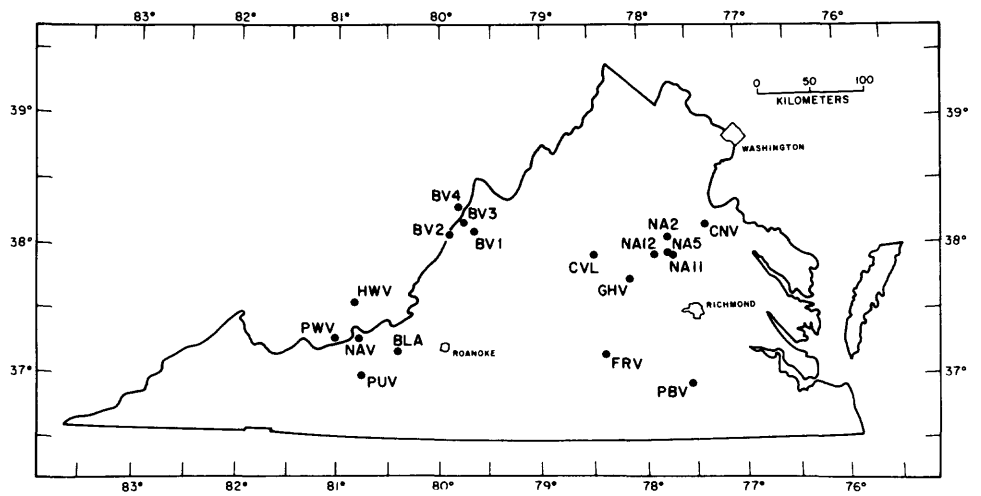


Figure 37.--Virginia Technical Seismic Network.

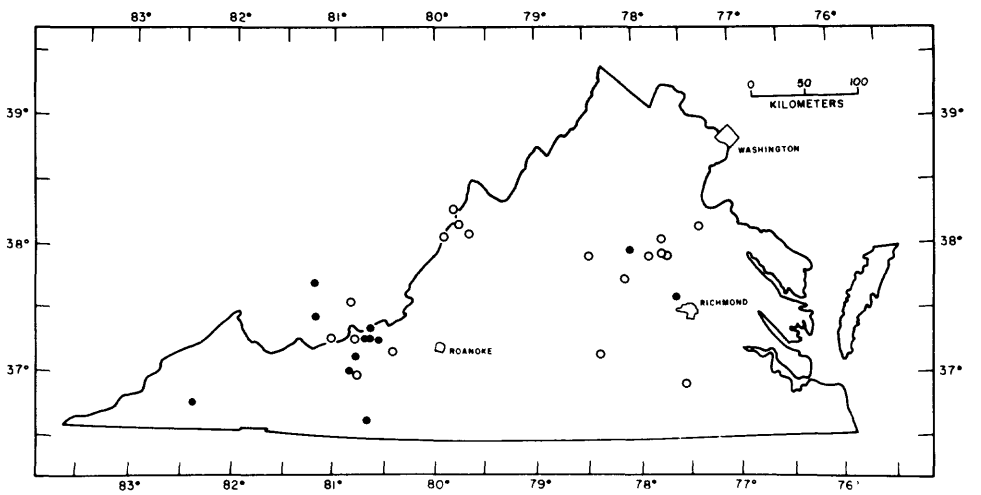


Figure 38.--Virginia earthquake epicenters during 1978. Solid circles represent earthquake epicenters and o en circles represent seismic stations.

Miscellaneous Activities

CRUSTAL MOVEMENT STUDIES

Vertical Control Surveys

By Sandford R. Holdahl
NOAA, National Ocean Survey
National Geodetic Survey
Rockville, Maryland 20852

Alaska

The results of four leveling surveys carried out by the National Geodetic Survey between Anchorage and Whittier, Alaska, combined with an analysis of sea level measurements at Anchorage, indicate as much as 0.55 m of land uplift in the decade following the 1964 Prince William Sound earthquake. There is some indication that the position of maximum uplift is migrating away from Anchorage toward the Aleutian trench. The uplift occurs in a region which subsided as much as 1.9 m during the earthquake. The uplift is decreasing exponentially since the time of the 1964 earthquake, and seems to represent postseismic deformation. The observations are most easily explained by creep along the down dip extension of the fault which ruptured in 1964.

Imperial Valley, California

A releveling survey of the Imperial Valley was cooperatively accomplished in the winter of 1977-78 by local and federal agencies. The purpose of the survey was to detect the trend of natural vertical motion prior to the utilization of geothermal resources in the Valley. The economically significant agricultural development within the Imperial Valley relies heavily on irrigation, and hence, it is directly affected by subsidence or tilting of the land. The continuation of the leveling program will measure the impact of geothermal development on the agricultural community. Existing data reveal that a maximum subsidence of 19 cm relative to Ocotillo occurred near the south end of the Salton Sea for the 1972-77 time interval. A large area between the Salton Sea and El Centro has subsided more than 10 cm during the 5-year interval.

Southern California

In early 1978, a massive 4,400 km releveling survey of the Palmdale region of Southern California was begun. The objective of the project was to establish a time-homogeneous reference network for calculating future elevation changes, and also to calculate recent vertical movement in the region which spans the San Andreas and Garlock faults. The 3-month, $1.5 million, multiagency survey was coordinated by the National Geodetic Survey, involved 18 leveling and 5 gravity teams from the National Geodetic Survey and the U.S. Geological Survey. In addition, 20 leveling teams were provided by Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties, Los Angeles City, the Los Angeles Water and Power Department, and the Metropolitan Water District of Southern California in this cooperative effort. A joint report by the U.S. Geological Survey and the National Geodetic Survey is in preparation.

Houston, Texas

Leveling surveys in approximately 5-year intervals are being used to monitor subsidence in the Houston, Texas area. The maximum subsidence for the last interval, 1973-78, occurred approximately 25 km from the center of Houston and amounted to 43 cm. An area of approximately 2500 sq km has subsided more than 20 cm during this interval. In calculating the subsidence, the known rate of subsidence at the Galveston tide gauge was used to initialize the new set of heights; in addition, various points well outside Houston were assumed to be stable during the period.

Horizontal Control Surveys

By Richard A. Snay
NOAA, National Ocean Survey
National Geodetic Survey
Rockville, Maryland 20852

The National Geodetic Survey has recently observed fault monitoring networks in the Shelter Cove area of northern California and on the Tejon Ranch in the foothills of California's Tehachapi Mountains. The Shelter Cove network straddles part of the fault which ruptured during the 1906 San Francisco earthquake. Analysis of the recent survey data, combined with data from a 1930 network yields an estimate of N. 13.2° W. $\pm$ 4.5° for the direction of maximum right-lateral shear strain through the area. The mean shear strain rate in this direction is 1.01 $\pm$ 0.18 μrad/yr for the 1930-76 time interval.

The Tejon Ranch network spans two

branches of the Garlock fault where this fault intersects the California aqueduct. The network incorporates two interior networks which were established in 1964 and 1970, and have been repeatedly observed at one to three intervals. Network stations positioned on one side of the Garlock fault's southern branch have moved left-laterally relative to stations lying approximately 500 m away on the opposite side, according to the following rates:

Time Interval	Rate (mm/yr)
1964-68	1.7 ± 0.5
1968-72	1.7 ± 0.6
1972-78	0.2 ± 0.3

The report for each survey is available from the National Geodetic Survey, National Ocean Survey, NOAA, Rockville, Maryland 20852.

Gravity Surveys

By William E. Strange
National Ocean Survey
National Geodetic Survey
Rockville, Maryland 20852

In conjunction with large scale releveling surveys in southern California, the National Geodetic Survey established a network of high-accuracy gravity stations for future monitoring. The network included 29 stations which were continuously interconnected during the period of the survey using helicopter transportation. Measurements were made at 2180 benchmarks along the level lines using multiple gravimeters to interconnect to the helicopter stations. Information on this network is available from the National Geodetic Survey of the National Ocean Survey, Rockville, Maryland 20852.

TSUNAMIS

By Mark Spaeth
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland 20910

During 1978, seven tsunamis were reported to the National Oceanic and Atmospheric Administration; however, none were recorded on NOAA tide gauges.

An earthquake on January 14 (mag. 6.6 MS) near the south coast of Honshu (34.8° N., 139.3° E.) caused a tsunami which was recorded at four nearby stations. Maximum amplitudes were 70 cm at Oshima and 25 cm at Mera.

On March 23, an earthquake (mag. 7.5 MS) in the Kuril Islands (44.9° N., 148.4° E.) generated a tsunami which reached maximum amplitudes of 28 cm at Chichijima and Hanasaki and 25 cm at Yuzhno Kurilsk.

A second earthquake (mag. 7.6 MS) in the same area on March 24 (44.2° N., 148.9° E.) also caused a minor tsunami with maximum wave heights of 42 cm at Hanasaki and 30 cm at Chichijima.

The June 12 earthquake (mag. 7.7 MS) near the east coast of Honshu also caused a minor tsunami which was recorded with the following representative maximum amplitudes; Hachinohe, 42 cm; Ayukawa, 34 cm; Onahama and Ofunato, 30 cm; and Kushiro, 25 cm.

The Mindanao earthquake (8.2° N., 122.4° E., mag. 6.9 MS) of June 14 caused a slight tsunami which was recorded at Jolo with a maximum amplitude of 3 cm.

An earthquake (mag. 7.4 MS) on July 23 in the Taiwan region (22.3° N., 121.5° E.) caused a tsunami which reached a maximum amplitude of 8 cm at Ishigaki Shima.

The final tsunami of the year on November 29 was generated by an earthquake (mag. 7.7 MS) near Oaxaca, Mexico, (16.0° N., 96.6° W.) and was recorded at Acajutla, El Salvador, with a maximum amplitude of 29 cm.

PRINCIPAL EARTHQUAKES OF THE WORLD

Table 7 lists principal world earthquakes for 1978. The list has been included in this annual series since 1941. It includes earthquakes of magnitude 6.8 or greater; those of smaller magnitude that were locally destructive to life and property; and events of unusual interest.

Table 7.--*Principal earthquakes of the world during 1978*

Date (1978)	Origin time (UTC) hr min sec	Geographic Coordinates Lat. (°)	Long. (°)	Depth (km)	USGS Magnitude mb	MS	Other Magnitude	Region	Remarks
Jan. 14	03 24 39.0	34.81 N.	139.26 E.	14	6.2	6.6		Near south coast of Honshu, Japan	Twenty-one killed, 119 injured, and 4 people reported missing. Damage at Yokohama and on Oshima. Tsunami recorded.
Feb. 9	21 35 12.7	30.68 S.	177.36 E.	33	5.7	7.2	7.2MS(PAS) 7.7MS(BRK)	Kermadec Islands	
Feb. 15	03 17 37.3	39.69 N.	39.79 E.	33	4.8	4.5		Turkey	Twenty injured, 500 homes destroyed in the Erzincan area, and 25 homes were damaged at Pulumur.
Feb. 22	06 07 37.0	14.25 N.	91.38 W.	100	5.7			Guatemala	Two killed. Damage in the Coatepeque and Mirian areas.
Mar. 7	02 48 47.6	32.01 N.	137.61 E.	439	6.9		7.0mb(PAS) 6.9mb(BRK)	South of Honshu, Japan	
Mar. 11	19 20 49.1	38.10 N.	16.03 E.	33	5.6	5.0		Southern Italy	Two reported killed, several injured, and considerable damage in southwestern Italy.
Mar. 16	02 00 00.5	29.93 N.	66.30 E.	33	5.3	5.9		Pakistan	One killed and considerable damage in the Nushki area.
Mar. 19	01 39 14.0	17.03 N.	99.74 W.	36	5.8	6.4	6.6MS(PAS)	Guerrero, Mexico	One killed, 25 injured, and damage in Acapulco.
Mar. 23	00 31 02.1	44.21 N.	148.97 E.	46	6.1	6.8	6.5MS(PAS) 6.6MS(BRK)	Kuril Islands	
Mar. 23	03 15 20.3	44.93 N.	148.44 E.	33	6.4	7.5	7.2MS(PAS)	Kuril Islands	Felt at Kurilsk and on Hokkaido, Japan. Tsunami recorded.
Mar. 23	19 12 23.6	44.34 N.	149.74 E.	33	6.0	6.8	6.6MS(PAS) 6.4MS(BRK)	Kuril Islands	
Mar. 24	19 47 50.7	44.24 N.	148.86 E.	33	6.5	7.6	7.5MS(PAS) 7.2MS(BRK)	Kuril Islands	Felt at Kurilsk and on Hokkaido and Honshu, Japan. Tsunami recorded.
Mar. 24	21 05 48.2	42.84 N.	78.61 E.	33	6.2	7.1		Alma-Ata region	Damage in northeastern Kirgiz SSR, USSR.
Apr. 15	23 33 47.2	38.39 N.	15.07 E.	14	5.5	5.7		Sicily	Five killed and 400 houses damaged.

Table 7.--*Principal earthquakes of the world during 1978*--Continued

Date (1978)	Origin time (UTC) hr min sec	Geographic Coordinates Lat. (°)	Long. (°)	Depth (km)	USGS Magnitude mb	MS	Other Magnitude	Region	Remarks
May 26	23 58 22.0	24.27 N.	142.66 E.	33	5.8	6.8	6.8MS(PAS) 6.5MS(BRK)	Volcano Islands region	
June 12	08 14 26.4	38.19 N.	142.03 E.	44	6.8	7.7	7.5MS(PAS) 7.2MS(BRK)	Near east coast of Honshu, Japan	Twenty-two killed, 421 injured, and extensive damage in the Sendai area.
June 14	12 32 33.9	8.25 N.	122.40 E.	24	6.1	6.9	6.6MS(PAS) 6.7MS(BRK)	Mindanao, Philippine Islands	Felt strongly at Zamboanga.
June 17	15 11 33.5	17.10 S.	172.26 W.	33	6.6	7.0	7.2MS(BRK)	Tonga Island region	
June 19	10 31 05.4	40.75 N.	23.22 E.	10	5.3	4.8		Greece	One killed, 10 injured, and damage in the Thessaloniki area.
June 20	20 03 21.0	40.74 N.	23.23 E.	3	6.1	6.4	6.5MS(PAS) 6.6MS(BRK)	Greece	Fifty killed, many injured and considerable damage in the Thessaloniki area.
July 4	22 23 28.0	40.75 N.	23.06 E.	19	5.1	4.8		Greece	One killed, 16 injured, and minor damage in the Thessaloniki area.
July 23	14 42 36.9	22.28 N.	121.51 E.	17	6.5	7.4	6.9MS(PAS) 6.8MS(BRK)	Taiwan region	Felt strongly on Taiwan. Tsunami recorded.
July 29	14 37 32.7	14.84 N.	91.02 W.	10	4.9	4.5		Guatemala	Five killed, many injured, and considerable damage and landslides in the Putzun area.
Aug. 3	18 11 17.1	26.51 S.	70.54 W.	58	6.3		7.0mb(PAS) 6.6mb(BRK)	Near coast of northern Chile	Thirteen injured and major damage in the Copiapo-Talta area.
Aug. 23	00 38 32.2	10.20 N.	85.22 W.	56	5.7	7.0	6.6MS(PAS) 7.2MS(BRK)	Costa Rica	Minor damage at Santa Cruz. Also felt in southern Nicaragua.
Sep. 16	15 35 56.6	33.39 N.	57.43 E.	33	6.5	7.4	7.8MS(BRK)	Iran	Estimated deaths of 15,000. Extensive damage in Tabas and surrounding areas.
Nov. 1	19 48 28.0	39.35 N.	72.62 E.	40	6.2	6.8	6.8MS(PAS)	Kirgiz SSR	Felt in the Osh-Andizhan area and at Tashkent.

Table 7.--*Principal earthquakes of the world during 1978*--Continued

Date (1978)	Origin time (UTC) hr min sec	Geographic Coordinates Lat. (°) Long. (°)	Depth (km)	USGS Magnitude mb	USGS Magnitude MS	Other Magnitude	Region	Remarks
Nov. 4	22 29 22.1	11.23 S. 162.18 E.	33	5.8	6.9	6.8MS(PAS) 6.8MS(BRK)	Solomon Islands	Felt on San Cristobal and Guadalcanal.
Nov. 5	22 02 07.1	11.13 S. 162.14 E.	33	6.3	7.1	7.4MS(PAS) 7.4MS(BRK)	Solomon Islands	Felt strongly on San Cristobal and at Honiara, Guadalcanal.
Nov. 29	14 52 47.6	16.01 N. 96.59 W.	18	6.4	7.7	7.5MS(PAS) 7.9MS(BRK)	Oaxaca, Mexico	Eight killed, many injured, and extensive damage in the Mexico City area. One killed, several injured, and damage in the state of Oaxaca.
Dec. 6	14 02 01.0	44.59 N. 146.58 E.	91	6.7		7.5mb(PAS) 6.9mb(BRK)	Kuril	Damage in the southern Kuril Islands and on Hokkaido, Japan.
Dec. 12	11 44 16.0	7.33 N. 123.49 E.	33	6.2	6.9	6.8MS(PAS) 7.4MS(BRK)	Mindanao, Philippine Islands	Felt on Mindanao, Jolo, Negros, and Panay.
Dec. 14	07 05 20.6	32.14 N. 49.65 E.	33	5.7	6.2		Western Iran	Seventy-six killed, some injured, and considerable damage in the area of Izeh and Masjed-e-Soleyman.
Dec. 23	11 23 12.0	23.25 N. 122.08 E.	33	6.6	7.0	6.7MS(PAS) 6.8MS(BRK)	Taiwan region	Two killed and three injured at Pingtung, Taiwan. Felt at Hong Kong and in the Ryuku Islands.

Abbreviations used in Other Magnitude column: PAS--California Institute of Technology, Pasadena; BRK--University of California Berkeley.

Strong-Motion Seismograph Data

By Ronald L. Porcella
Seismic Engineering Branch
U.S. Geological Survey
Menlo Park, California 94025

INTRODUCTION

The first engineering seismology program in the United States was administered by the Seismological Field Survey of the Coast and Geodetic Survey (C&GS). This program was begun in 1931 and effectively remained the responsibility of the Seismological Field Survey (SFS) for more than 40 years. During this period the SFS was shifted from one acronymic agency to another, including C&GS, ESSA, NOS, NOAA, ERL, ESL, and finally, in 1973, USGS; soon afterwards the SFS became the Seismic Engineering Branch of the USGS. In spite of these numerous high-level administrative changes, the program has retained a distinct identity and its basic objectives and field-level operations have remained remarkably consonant throughout the years.

The current program of strong-motion instrumentation administered by the USGS is supported by the National Science Foundation (Grant CA-114) in cooperation with both private industry and education institutions, as well as numerous Federal, State, and local agencies and organizations. The objectives of the program are to record strong ground motions and the response of representative types of engineered structures during potentially damaging earthquakes and to disseminate processed data and information about the records, sites, and structures to external users in earthquake engineering research and design practice and engineering seismology. The dissemination of this information and data is achieved in various ways.

Preliminary earthquake reports and a summary of recent accelerograph records are presented on a regular basis in Seismic Engineering Program Reports[1]. These summaries include a brief description of the earthquake and strong-motion recording station, the results of routine scalings of those records that contain peak accelerations greater than 0.05 g, and photographic reproductions of many of the more significant accelerograms. The program reports also contain abstracts of recent reports, notes on strong-motion information sources and the availability of digitized data, and other information pertinent to the USGS and other strong-motion programs.

Strong-Motion event and strong-motion data reports are periodically published as USGS Open-file Reports and include the results of digitization and routine analyses of strong-motion accelerograms that contain peak accelerations greater than 0.10 g or are related to a specific event, particular strong-motion station, or geographic group of stations. The minimum acceleration level is based primarily on the current capability of the USGS to process strong-motion records and may vary with both the degree of seismic activity and number of personnel available at any given time. Although maximum acceleration is not directly related to frequency content or duration of strong-motion, the peak acceleration can be readily obtained from an accelerogram and thus the value is commonly used as a general indicator of the potential significance of the record. Detailed information on the availability of digitized data from various sources is published regularly in Seismic Engineering Program Reports.

The Strong-Motion Accelerograph Station List is periodically published as a USGS Open-file Report and includes information on all of the accelerograph stations in the western hemisphere known to the USGS. Because of the ever-changing nature of this information, it is impossible to have a complete list of all of the stations in existence at any one time. Rather, the list is intended to provide that community of persons interested in strong-motion programs with a reasonably complete indication of the current status of the various strong-motion networks. Information presented in this list includes the station name and geographic coordinates, site characteristics, type and size of structure, location of instruments, and the primary sources of data. The current list contains information on approximately 1200 stations located in 38 states, Canada, the Caribbean, and throughout Central and South America.

A strong-motion information retrieval system (SMIRS) has been developed to provide up-to-date information about strong-motion records and the circumstances in

[1]Copies of these reports are available free on application to Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, Va. 22202.

which they were recorded. The system is accessible through a data terminal (300 baud, half duplex). The system is operational, but the information within it is incomplete and needs to be verified. A user's manual is available (Converse, 1978). To retrieve information, dial (415) 329-8600 and place the telephone handset into the terminal. When the carrier light comes on press the "line-feed" key and wait for the computer to respond (two lines will be printed); type the following:

enter your name SMIRS

Type the "enter" and "SMIRS" exactly as shown above, but replace your name with your own name. The word "enter" is five lowercase characters followed by one space; your name is typed as one continuous character string and followed by one space; and "SMIRS" is five uppercase characters. Type the carriage-return key and then the line-feed key; then you will be given instructions.

ACCELEROGRAPH DATA

Table 8 is a summary of the 95 accelerograph records recovered, although not necessarily recorded, during 1978. This value can be compared to a yearly average of 188 records for the period 1972 to 1977 inclusive. This decrease in the reported number of accelerograms recovered in 1978 is largely due to State legislation that has given responsibility to the California Division of Mines and Geology's Office of Strong-Motion Studies (OSMS) for dissemination of that organization's strong-motion data; OSMS data are no longer routinely listed in Seismic Engineering Program Reports.

The earthquakes (table 8) are listed in chronological order and include date, time (UTC), general location, geographic coordinates, and magnitude. Information about the recording station consists of the name and location, owner, and geographic coordinates. Record data include S-wave minus trigger time and the orientation, maximum acceleration, and duration of strong-motion (greater than 0.10 g) for each instrument component. Record data is included only when one or more components recorded at least 0.05 g at ground stations or 0.10 g at upper floors of buildings. The event information has been compiled principally from the Preliminary Determination of Epicenters, published by the Geological Survey.

The following paragraphs summarize the results of the most significant earthquakes from which strong-motion records were obtained in 1978.

UKIAH, CALIFORNIA - MARCH 25

A magnitude 4.6 (ML) earthquake on March 25, at 4:27 p.m. (local time) triggered three accelerographs at Coyote Dam located 18 km from the epicenter (Porcella, 1978a), a U.S. Army Corps of Engineers (COE) facility approximately 175 km northwest of San Francisco near the town of Ukiah. The earthquake occurred off the coast of northern California at a depth of about 5 km and was felt in the Ukiah area; no damage was reported. The instrumentation at Coyote Dam is owned by the COE and operated by the USGS as part of the cooperative National Strong-Motion Network supported by the National Science Foundation.

Coyote Dam is an earthfill embankment approximately 1070 m long and 50 m high; the axis is aligned in a nearly north-south direction. Accelerographs are located at the center crest, center toe, and south abutment, and are equipped with horizontal starters; thus, the relatively short trigger minus S-wave intervals (approximately 0.5 s) recorded at the crest, toe, and abutment stations (fig. 39) are the result of the accelerographs triggering on horizontal ground motion perhaps 2 or 3 sec after the first P-wave arrival. Maximum accelerations recorded at the crest, toe, and south abutment stations are 0.30 g, 0.34 g, and 0.20 g, respectively (fig. 39 and table 8).

In addition to the magnitude 4.6 earthquake, three smaller aftershocks produced minor records at Coyote Dam (table 8). The maximum acceleration (0.11 g) was recorded on the crest instrument. Additionally, the California Division of Mines and Geology recovered several strong-motion records from stations located in the Willits-Ukiah area (Toppozada, 1978).

SANTA BARBARA, CALIFORNIA - AUGUST 13

Eight accelerograms were recovered from strong-motion stations at Santa Barbara, Goleta, Cachuma Dam, and the University of California, Santa Barbara campus (UCSB) in the days immediately following the August 13 earthquake (Porcella and others, 1978c). The main event occurred at 3:54 p.m. (local time) and was assigned magnitudes (ML) of 5.1 (California Institute of Technology), and 5.7 (University of California, Berkeley). The hypocenter was located offshore about 6 km south of Santa Barbara at a depth of 7 km (fig. 40).

Strong-motion instruments that triggered during the earthquake include triaxial accelerographs located at crest and toe sites at Cachuma Dam, a U.S. Bureau of Reclamation facility at an epicentral distance of 34 km. A maximum horizontal ground acceleration of 0.12 g (fig. 41) was recorded at the crest in a southwest direction, transverse to the axis of the embankment. A triaxial accelerograph installed at the basement level of the

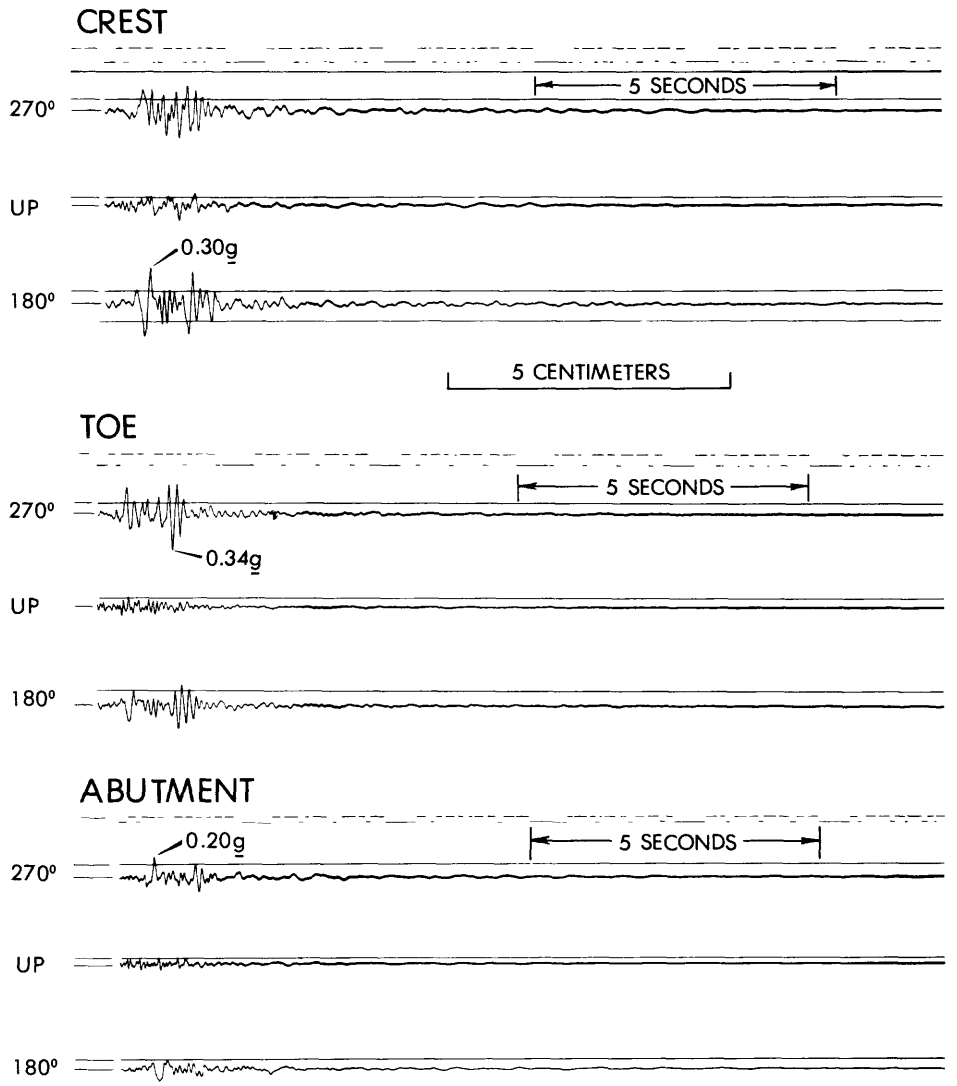


Figure 39.--Coyote Dam accelerograms from the Ukiah, California earthquake of 25 March 1978.

Santa Barbara Courthouse recorded a maximum horizontal ground acceleration of 0.21 g in the southwest direction (epicentral distance 6 km); the duration of strong-motion (greater than 0.1 g) was approximately 1.3 sec. Additionally, this instrument recorded a small aftershock about 14 sec after triggering during the main shock (fig. 41).

The Southern California Edison (SCE) Company recovered a strong-motion record from an SCE power facility on Glen Annie Road in Goleta; the triaxial recording system (SMA-2) employs FM modulation on a four-track magnetic tape cassette. The analog readout indicates a peak horizontal ground acceleration of 0.28 g (north direction). Epicentral distance is 19 km.

The California Division of Mines and Geology strong-motion program (CSMIP) includes four sites in the Santa Barbara area that produced records during the August 13 event (Porter, 1978). Three of these sites are buildings instrumented by CSMIP in accordance with recently developed building instrumentation criteria. The record from a nine-channel system installed at the three-story North Hall building on the UCSB campus indicates peak horizontal accelerations of 0.44 g, 0.66 g, and 0.99 g for the ground, third floor, and roof levels, respectively. Durations of strong (horizontal) motion (greater than 0.1 g) range from 2 sec at the ground level to approximately 9 sec at the roof level. Epicentral distance is about 13 km.

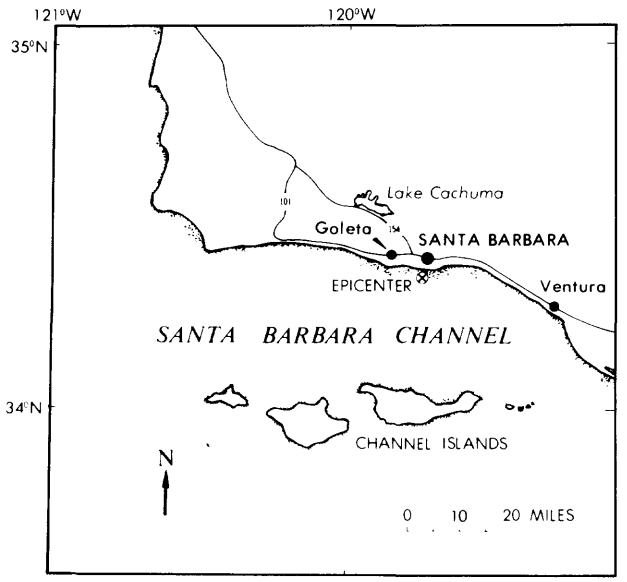


Figure 40.--Location map, Santa Barbara, California earthquake of 13 August 1978.

The four-story Freitas Building in downtown Santa Barbara (epicentral distance 6 km) is instrumented with a nine-channel remote-recording system; the strong-motion record from the August 13 event shows peak horizontal accelerations of approximately 0.22 g, 0.30 g, and 0.67 g at the basement, second floor, and roof levels, respectively. Durations of strong-motion range from 0.5 sec at the second floor to 7 sec at the roof level.

The twelve-story Holiday Inn on Harbor Boulevard in Ventura is instrumented with a twelve-channel remote-recording system; accelerometers are located at ground, fourth floor, eighth floor, and roof levels. Maximum recorded acceleration is less than 0.05 g at an epicentral distance of 40 km.

A CSMIP triaxial accelerograph at the Physical Plant station on the UCSB campus recorded a peak horizontal ground acceleration of about 0.37 g in the south direction (epicentral distance 13 km). Duration of strong-motion was approximately 1.5 sec. Additionally, this instrument recorded a small aftershock about 17 sec after triggering during the main event; maximum acceleration is less than 0.05 g.

JENKINSVILLE, SOUTH CAROLINA - FEBRUARY to NOVEMBER

Twenty-one earthquakes were recorded between February and November 1978 at Monticello Dam in north-central South Carolina; the dam and reservoir are part of the Virgil C. Summer Nuclear Power Facility operated by the South Carolina Electric and Gas Company (SCEG) and are located approximately 4 km northwest of Jenkinsville, S.C. The reservoir covers an area of about 2750 hectares and has an average depth of about 25 m. Filling of the reservoir began in late December 1977 and was accompanied by an abrupt increase in seismic activity (up to 100 events per day) recorded by a network of four seismographs operated by SCEG (Porcella, 1978b). Prior to filling of the reservoir, the USGS seismograph station at Jenkinsville had recorded one event about every six days. This increase in activity tapered off and then resumed abruptly in August 1978. Two strong-motion accelerographs were installed by the USGS in February 1978 as a result of the first increase in seismic activity. One accelerograph was placed in an office building a few hundred meters west of the power plant; the other instrument was installed on the south abutment of the largest of four embankment sections. Thirteen records with peak accelerations greater than 0.05 g have been recovered from these two stations (table 8). The largest acceleration was recorded at the abutment site and suggests a 0.253 g peak horizontal ground acceleration in the "south" direction (fig. 42); the duration of strong-motion (greater than 0.1 g) is about 0.06 sec at approximately 25 Hz. This record has been attributed to a magnitude 2.7 event (depth 1.5 km) on August 27, 1978 at 10:23:08 UTC and contains the largest known recorded acceleration from an earthquake in central or eastern North America. Epicentral distance is about 1 km. The absence of trigger minus S or S-P intervals on any of the 21 records indicates sources very near the recording stations.

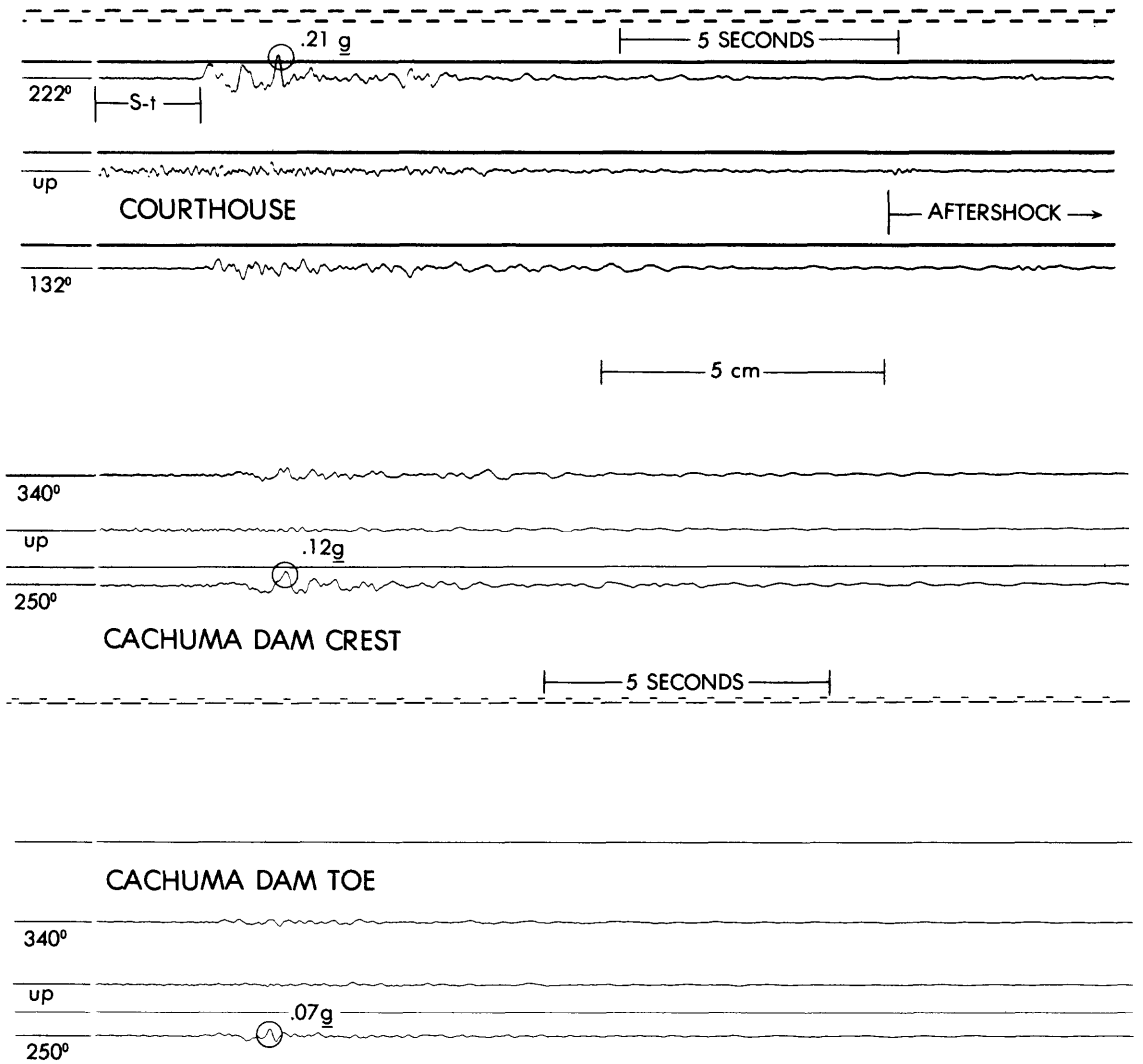


Figure 41.--Accelerograms from Santa Barbara Courthouse and Cachuma Dam, Santa Barbara earthquake of 13 August 1978. Component direction refers to direction of case acceleration for upward trace deflection on accelerogram.

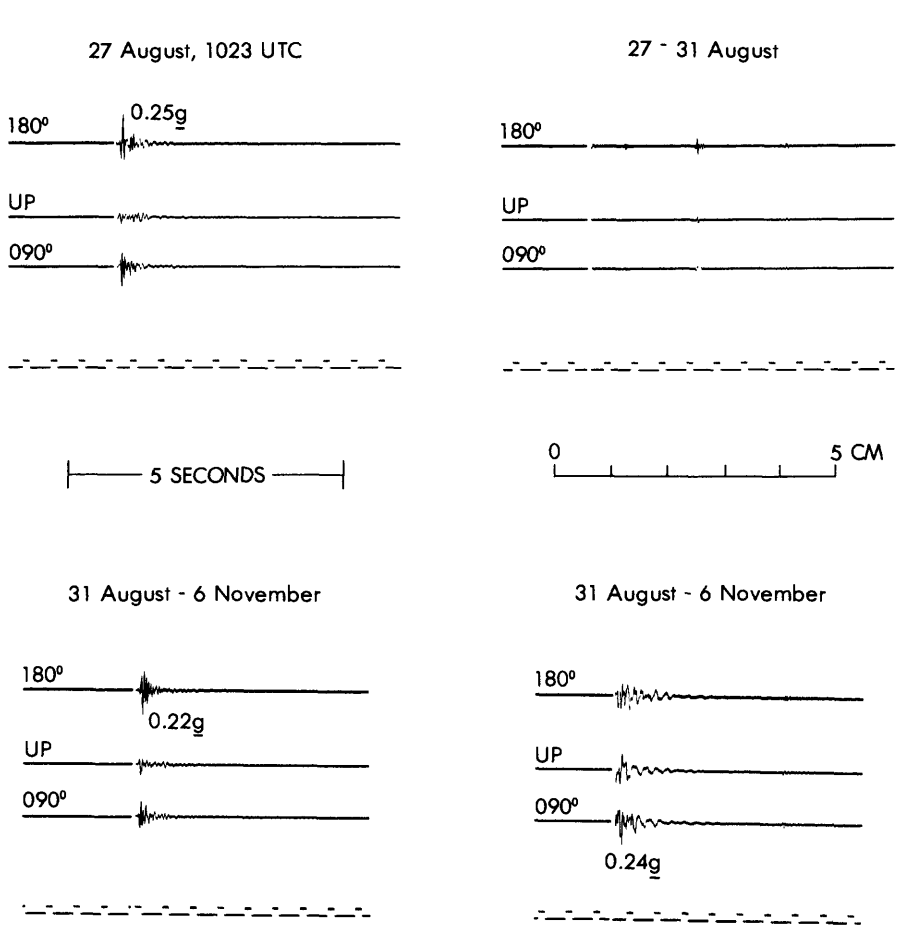


Figure 42.--Selection of Monticello Dam accelerograms from the Jenkinsville, South Carolina earthquakes of February to November 1978.

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
7 June 1977- 16 November 1977 S. Hawaii Epicenters and magnitudes unknown	Wahaula, Hawaii Visitor Center (USGS)	19.33 N. 155.03 W.	-		**	
	Note: Two additional records were obtained at Wahaula; maximum acceleration less than 0.05 g.					
9 June 1977- 10 November 1977 S. Hawaii Epicenters and magnitudes unknown	Pahala, Hawaii Kau Hospital (USGS)	19.20 N. 155.47 W.	-	155 Up 065	.05 .02 .03	- - -
	Note: One additional record was obtained at Pahala; maximum acceleration less than 0.05 g.					
13 October 1977- 3 March 1978 S. California Epicenter and magnitude unknown	Carbon Canyon Dam Crest (ACOE)	33.91 N. 117.84 W.	2.9		**	
3 October 1977- 21 March 1978 Imperial Valley Epicenter and magnitude unknown	Niland, Calif. Fire Station (CDMG)	33.24 N. 115.51 W.	1.7	090 Up 360	.11 .04 .04	1-peak - -
4 November 1977- 20 March 1978 Imperial Valley Epicenters and magnitudes unknown	El Centro Array 2 Keystone Rd. (USGS)	32.92 N. 115.37 W.	-		**	
	Note: One additional record was obtained at Array 2; maximum acceleration less than 0.05 g.					
14 November 1977- 20 March 1978 Imperial Valley Epicenters and magnitudes unknown	El Centro Array 6 Huston Rd. (CDMG)	32.84 N. 115.49 W.	2.2	230 Up 140	.14 - .21	1-peak - 0.3
			2.1	230 Up 140	.07 - .17	- - 1-peak
			2.1		**	
			2.0	230 Up 140	.04 - .06	- - -
15 November 1977 1913 UTC Imperial Valley 32.83N., 115.47W. Magnitude 3.4	El Centro Array 7 Imp. Valley College (USGS)	32.83 N. 115.50 W.	1.1		**	
15 November 1977 2200 UTC Imperial Valley Epicenter and magnitude unknown	El Centro Array 7 Imp. Valley College (USGS)	32.83 N. 115.50 W.	1.6	230 Up 140	.05 .03 .06	- - -
15 November 1977- 23 March 1978 Imperial Valley Epicenter and magnitude unknown	El Centro Array 9 Commercial Ave. (USGS)	32.79 N. 115.55 W.	-		**	

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
11 December 1977 0557 UTC Imperial Valley 32.57N., 115.32W. Magnitude 3.4	Bonds Corner, Calif. Ground Level (USGS)	32.693 N. 115.338 W.	-		**	
26 March 1978 0027 UTC N. California 39.09N., 123.34W. Magnitude 4.5	Ukiah, Calif. Coyote Dam, Crest (ACOE)+	39.20 N. 123.18 W.	-	270 Up 180	.25 .14 .30	1.0 0.3 1.3
	Ukiah, Calif. Coyote Dam, Toe (ACOE)+	39.20 N. 123.18 W.	-	270 Up 180	.34 .09 .22	1.1 - 1.2
	Ukiah, Calif. Coyote Dam, Abutment (ACOE)+	39.19 N. 123.18 W.	-	270 Up 180	.20 .07 .11	0.8 - 1-peak
26 March 1978- 27 March 1978 N. California Epicenters and magnitudes unknown	Ukiah, Calif. Coyote Dam, Crest (ACOE)	39.20 N. 123.18 W.	-	270 Up 180	.11 .04 .07	1-peak - -
	Note: Two additional aftershocks recorded at crest station and three aftershocks each recorded at abutment and toe stations. Maximum acceleration less than 0.05 g.					
25 March 1977 1544 UTC Imperial Valley 32.97N., 115.50W. Magnitude 3.4	Brawley Airport Ground Level (USGS)	32.99 N. 115.51 W.	1.8	315 UP 225	.06 .02 .07	- - -
21 October 1977 0612 UTC Imperial Valley 32.90N., 115.50W. Magnitude 4.3	Brawley Airport Ground Level (USGS)	32.99 N. 115.51 W.	-		**	
24 February 1978- 16 March 1978 Jenkinsville, S.C. Epicenters and magnitudes unknown	Jenkinsville, S.C. Monticello Dam (USGS) Abutment (Office)	34.30 N. 81.33 W.	- - -	090 Up 360 180 Up 090	.05 .03 .03 ** ** .15 .10 .07	- - - 1-peak 1-peak -
			- - -	180 Up 090 180 Up 090	.06 .06 .07 ** ** .06 .04 .09	- - - - - -
16 March 1978- 3 May 1978 Jenkinsville, S.C. Epicenters and magnitudes unknown	Jenkinsville, S.C. Monticello Dam (USGS) Shared abutment (Center crest)	34.30 N. 81.33 W.	-			

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
			-		**	
			-		**	
	Note: One additional (questionable) event was recorded; maximum acceleration less than 0.05 g.					
20 March 1978- 31 May 1978 Imperial Valley Epicenter and magnitude unknown	El Centro Array 2 Keystone Rd (USGS)	32.92 N. 115.37 W.	-		**	
	El Centro Array 9 Commercial Ave (USGS)	32.79 N. 115.55 W.	-		**	
2 May 1978 0617 UTC (a) Imperial Valley 32.85N., 115.42W. Magnitude 3.2	El Centro Array 4 Anderson Rd (USGS)	32.86 N. 115.43 W.	-	230	.05	-
				Up	.02	-
				140	.05	-
	El Centro Array 6 Huston Rd (CDMG)+	32.84 N. 115.49 W.	2.7		**	
2 May 1978 0617 UTC (b) Imperial Valley Epicenter and magnitude unknown	El Centro Array 4 Anderson Rd (USGS)	32.86 N. 115.43 W.	2.0*	230	.03	-
				Up	.07	-
				140	.05	-
	El Centro Array 6 Huston Rd (CDMG)+	32.84 N. 115.49 W.	2.8*		**	
5 May 1978 0533 UTC Central Alaska 63.14N., 150.85W. Magnitude 5.0	Talkeetna, Alaska FAA-VOR (USGS)+	62.30 N. 150.10 W.	-		**	
11 May 1978 1157 UTC San Jose, Calif. 37.38N., 121.76W. Magnitude 3.8	Halls Valley Grant Ranch (CDMG)+	37.34 N. 121.71 W.	1.1		**	
11 May 1978 1218 UTC San Jose, Calif. 37.37N., 121.77W. Magnitude 3.7	Halls Valley Grant Ranch (CDMG)+	37.34 N. 121.71 W.	-		**	
12 May 1978 1216 UTC Central Alaska 62.1N., 149.2W. Magnitude 5.0	Talkeetna, Alaska FAA-VOR (USGS)+	62.30 N. 150.10 W.	-		**	
4 June 1978 0357 UTC S. California 33.92N., 117.83W. Magnitude 3.6	Carbon Canyon Dam (ACOE)+	33.91 N. 117.84 W.				
	Crest		1.8		**	
	Right Abutment		1.8		**	
	Diemer Filter Plant (MWD)+	33.91 N. 117.82 W.				
	Admin. Bldg.		1.8		**	

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
	Reservoir		1.8		**	
	Orange Co. Reservoir (MWD)+	33.94 N. 117.88 W.	2.0		**	
13 August 1978 2254 UTC Santa Barbara, Calif. 34.37N., 119.72W. Magnitude 5.5	Cachuma Dam (USBR)	34.59 N. 119.98 W.				
	Crest		2.1	340	.08	-
				Up	.02	-
			250	.12	1-peak	
	Toe		2.1	340	.03	-
				Up	.02	-
				250	.07	-
	Santa Barbara Courthouse Basement (USGS)	34.424 N. 119.712 W.	1.9	222	.21	1.3
				Up	.07	-
				132	.10	1-peak
	U.C. Santa Barbara Physical Plant (CDMG)	34.422 N. 119.851 W.	3.0	180	.37	1.5
				Up	.14	1-peak
				090	.31	1.5
	U.C. Santa Barbara North Hall (CDMG)	34.416 N. 119.846 W.	3.0			
	Ground Floor (center) channel (1)				360	.442.0
	Ground Floor (center) channel (2)				Up	.111-peak
	Ground floor (center) channel (3)				090	.272.5
	Ground floor (end) channel (4)			360	.38	2.0
	Third floor (center) channel (5)				360	.645
	Third floor (cente) channel (6)			090	.56	6
	Roof level (center) channel (7)			180	.99	9
	Third floor (west end) channel (8)				360	.595
	Third floor (east end) channel (9)				360	.665
	Santa Barbara Freitas Bldg. (CDMG)	34.424 N. 119.698 W.	0.9			
	Roof level (center) channel (1)			360	.30	5
	Second floor (center) channel (2)				090	.301

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
	Basement (center) channel (3)			090	.221	
	Roof level (center) channel (4)			090	.67	7
	Roof level (west end) channel (5)			360	.215	
	Second Floor (center) channel (6)			360	.171	
	Second floor (west end) channel (7)			360	.16	.5
	Basement (center) channel (8)			360	.13	1-peak
	Basement (center) channel (9)			Up	.10	1-peak
	Note: Acceleration and duration data for UCSB (Physical Plant and North Hall) and Goleta (Freitas Bldg.) are approximations.					
	Ventura, Calif. Holiday Inn (CDMG)	34.276 N. 119.294 W.	-	**		
	Note: Building is 12 stories above ground level and is instrumented with a 12-channel CRA-1 remote recording system. Accelerometers are located at ground, 4th floor, 8th floor, and roof levels. A vertical starter is located at ground level; a horizontal starter is located at the roof level.					
	Goleta, Calif. Glen Annie Rd (SCE)	34.47 N. 119.89 W.	2.4	090 Up 360	.24 .08 .28	1.0 - 1.8
	Note: A small aftershock was recorded at U.C. Santa Barbara Physical Plant and Santa Barbara Courthouse. Maximum acceleration less than 0.05 g. Two seismoscope records were recovered at UCSB and Santa Barbara Courthouse; maximum relative displacements are 4.06 and 3.42 cm, respectively.					
27 August 1978 1023 UTC Jenkinsville, S.C. 34.31N., 81.33 W. Magnitude 2.7	Jenkinsville, S.C. Monticello Dam (USGS)+	34.30 N. 81.33 W.				
	Shared abutment (Center crest)		-	180 Up 090	.25 .08 .20	.06 - .16
			-		**	
			-	180 Up 090	.08 .04 .06	- - -
31 August 1978- 6 November 1978 Jenkinsville, S.C. Epicenters and	Jenkinsville, S.C. Monticello Dam (USGS)	34.30 N. 81.33 W.				

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
magnitudes unknown	Shared abutment (Center crest)		-	180	.06	-
				Up	.03	-
				090	.06	-
			-	180	.07	-
				Up	.03	-
				090	.10	1-peak
			-	180	.04	-
				Up	.03	-
				090	.06	-
			-		**	
			-	180	.05	-
				Up	.05	-
				090	.12	1-peak
			-	180	.08	-
				Up	.06	-
				090	.09	-
			-	180	.22	.1
				Up	.11	1-peak
				090	.16	0.1
			-	180	.13	0.3
				Up	.17	0.2
				090	.24	0.3
11 November 1977-25 August 1978 Palm Springs, Calif. Epicenter and magnitude unknown	Palm Springs North Post Office (USGS)	33.92 N. 116.54 W.	1.3	300	.12	1-peak
				Up	.03	-
				210	.07	-
28 March 1978-27 August 1978 S. Hawaii Epicenters and magnitudes unknown	Pahala, Hawaii Kau Hospital (USGS)	19.20 N. 155.47 W.	-		**	
	Honokaa, Hawaii Fire Station (USGS)	20.081 N. 155.465 W.	-		**	
	Wahaula, Hawaii Visitor Center (USGS)	19.33 N. 155.03 W.	1.4		**	
	Note: Three additional records were obtained at Visitor center; maximum acceleration less than 0.05 g.					
23 June 1978 0404 UTC S. California Epicenter and magnitude unknown	Salton Sea National Wildlife Refuge (USGS)	33.18 N. 115.62 W.	0.9	315	.08	-
				Up	.03	-
				225	.02	-
15 August 1978-11 December 1978 Santa Barbara, Calif. Epicenter and magnitude unknown	Santa Barbara Courthouse Basement (USGS)	34.434 N. 119.712 W.	1.7		**	

Table 8.--*Summary of U.S. accelerograph records recovered during 1978*--Continued

Event	Station name (owner)[1]	Station coord.(s)	S-t[2]	Direction[3]	Max accl[4] (g)	Duration[5] (s)
4 October 1978 1642 UTC Bishop, Calif. 37.53N., 118.66W. Magnitude 5.7	Pine Flat Dam Piedra, Calif. (ACOE)+	36.83 N. 119.33 W.	-		**	
	Note: One event recorded at stations located at the toe, downstream, and outlet tower levels 2 and 5; maximum acceleration less than 0.05 g.					
	Buchanan Dam (ACOE)+	37.22 N. 119.98 W.	-		**	
	Note: One event recorded at stations located at the crest, abutment, and outlet tower upper and lower levels; maximum acceleration less than 0.05 g.					

[1]ACOE - U.S. Army Corps of Engineers
CDMG - California Division of Mines and Geology
MWD - Metropolitan Water District
SCE - Southern California Edison
USBR - U.S. Bureau of Reclamation
USGS - U.S. Geological Survey
+ - WWVB time code is incomplete or nonexistent; correlation of accelerogram with event is questionable.

[2]S-wave minus trigger time.
* Denotes S-P interval, that is, the earthquake occurred within the instrumental run-time of a previous event.

[3]Azimuthal direction of case acceleration for upward trace deflection on accelerogram (opposite direction to pendulum motion). Case acceleration for vertical component indicated as up or down.

[4]Unless otherwise noted, maximum acceleration recorded at ground or basement level.
** Denotes maximum acceleration is less than 0.05 g at ground stations or less than 0.10 g at upper floors of buildings.

[5]Duration for which peaks of acceleration exceed 0.10 g.

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