

GEOLOGICAL SURVEY CIRCULAR 788-C



**Earthquakes
in the United States,
July-September 1977**



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By C. W. Stover, R. B. Simon, and W. J. Person

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United States Department of the Interior
CECIL D. ANDRUS, *Secretary*



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INTRODUCTION

The earthquake information in this publication supplements that published in the NEIS (National Earthquake Information Service) publications, PDE ("Preliminary Determination of Epicenters") and "Preliminary Determination of Epicenters, Monthly Listing," to the extent of providing detailed felt and intensity data, as well as isoseismal maps for U.S. earthquakes. The purpose is to provide a complete listing of macroseismic effects of earthquakes, which can be used in risk studies, nuclear power plant site evaluations, seismicity studies, and answering inquiries by the public.

This publication contains two major sections. The first (table 1) is a tabular listing of earthquakes in chronological order by State, consisting of the following basic information: date, origin time, hypocenter, magnitude, maximum intensity, and computational source of the hypocenter. The second section consists of two maps and table 2, which lists detailed intensity information. The list of earthquakes in table 1 was compiled from those located in the United States or off the coasts that were published in the PDE; from hypocenters in California above magnitude 3.0, supplied by California Institute of Technology, Pasadena, the University of California, Berkeley, and other offices of the U.S. Geological Survey; from hypocenters in Hawaii supplied by the Hawaiian Volcano Observatory; and from any others that were felt or that caused damage, regardless of magnitude or availability of a hypocenter. Known or suspected explosions are also listed.

The intensities and macroseismic data were compiled from information obtained through questionnaires, from newspaper articles, and with the cooperation of other Government agencies, State institutions, local organizations, and individuals. (See "Acknowledgments" for a list of collaborators.) Figure 1 is the questionnaire in current use by the NEIS. Other versions of this questionnaire are used by State agencies, engineering firms, and other Government agencies to collect intensity data. Anyone wishing to submit felt or damage information on earthquakes for inclusion in future reports should send it

to the National Earthquake Information Service, Stop 967, Box 25046, Denver Federal Center, Denver, CO 80225. Copies of the current "Earthquake Report" questionnaire can be obtained at this address.

The primary method used by the NEIS to collect macroseismic information is a questionnaire canvass using the "Earthquake Report" forms, which are mailed to postmasters in the area affected by the earthquake. The postmasters complete the forms and return them to the NEIS, where they are evaluated and an intensity value is assigned. The intensity observations are mapped and contoured by isoseismals. Isoseismal contours present a generalization of intensity data and an extrapolation of these data to regions from which there are no observations; they do not necessarily account for every individual observation.

The data in table 2 will be included in the "Earthquake Description" section of "United States Earthquakes," an annual publication, to which later data from other sources may be added for the purpose of updating and completeness. "United States Earthquakes" is published jointly by the U.S. Geological Survey, Department of the Interior, and the Environmental Data Service, NOAA, Department of Commerce.

DISCUSSION OF TABLES

The parameters for the earthquakes in table 1 and table 2 include the date, origin time, hypocenter (epicenter and focal depth), magnitude, intensity, and hypocenter source. The origin time and date are listed in Universal Coordinated Time (UTC) and local standard time based on the time-zone maps in figures 2 and 3. The epicenters, which were taken from those published in the PDE, or from other sources as noted, are listed here to two decimals. 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 NEIS 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

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
EARTHQUAKE REPORT

Form Approved
OMB No. 42-R1700

Please answer this questionnaire carefully and return as soon as possible.

1. Was an earthquake felt by anyone in your town or zip code area recently?

- Not felt: Please refold and tape for return mail.
 Felt: Date _____ Time _____ AM Standard time
 PM Daylight time

Name of person filling out form _____

Address _____

City _____ County _____

State _____ Zip code _____

If you felt the earthquake, complete the following section. If others felt the earthquake but you did not, skip the personal report and complete the community report.

PERSONAL REPORT

- 2a. Did you personally feel the earthquake? 1 Yes No
 b. Were you awakened by the earthquake? 2 Yes No
 c. Were you frightened by the earthquake? 3 Yes No
 d. Were you at 4 Home 5 Work 6 Other?
 e. Town and zip code of your location at time of earthquake _____
- f. Check your activity when the earthquake occurred:
 7 Walking 8 Sleeping 9 Lying down 10 Standing
 11 Driving (car in motion) 12 Sitting 13 Other
 g. Were you 14 Inside or 15 Outside?
 h. If inside, on what floor were you? 16
- Continue on to next section which should include personal as well as reported observations.

COMMUNITY REPORT

Check one box for each question that is applicable.

- 3a. The earthquake was felt by No one 17 Few 18 Several 19 Many 20 All?
 b. This earthquake awakened No one 21 Few 22 Several 23 Many 24 All?
 c. This earthquake frightened No one 25 Few 26 Several 27 Many 28 All?

4. What outdoor physical effects were noted in your community?

- | | | | |
|---|---|--|--|
| Parapets or cornices fallen | 29 <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Trees and bushes shaken | 30 <input type="checkbox"/> Slightly | 31 <input type="checkbox"/> Moderately | 32 <input type="checkbox"/> Strongly |
| Standing vehicles rocked | 33 <input type="checkbox"/> Slightly | 34 <input type="checkbox"/> Moderately | 35 <input type="checkbox"/> Strongly |
| Moving vehicles rocked | 36 <input type="checkbox"/> Slightly | 37 <input type="checkbox"/> Moderately | 38 <input type="checkbox"/> Strongly |
| Ground cracks | 39 <input type="checkbox"/> Wet | 40 <input type="checkbox"/> Steep slopes | 41 <input type="checkbox"/> Dry and level ground |
| Landslides | 42 <input type="checkbox"/> Small | 43 <input type="checkbox"/> Large | |
| Underground pipes | 44 <input type="checkbox"/> Broken | 45 <input type="checkbox"/> Out of service | |
| Water splashed onto sides of lakes, ponds, swimming pools | 46 <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Elevated water tanks | 47 <input type="checkbox"/> Cracked | 48 <input type="checkbox"/> Twisted | 49 <input type="checkbox"/> Fallen (thrown down) |
| Air coolers | 50 <input type="checkbox"/> Displaced | 51 <input type="checkbox"/> Rotated | 52 <input type="checkbox"/> Fallen |
| Railroad tracks bent | 53 <input type="checkbox"/> Slightly | 54 <input type="checkbox"/> Greatly | |
| Stone or brick fences | 55 <input type="checkbox"/> Cracked | 56 <input type="checkbox"/> Fallen | 57 <input type="checkbox"/> Destroyed |
| Tombstones | 58 <input type="checkbox"/> Displaced | 59 <input type="checkbox"/> Cracked | 60 <input type="checkbox"/> Rotated |
| | 61 <input type="checkbox"/> Fallen | | |
| Chimneys | 62 <input type="checkbox"/> Cracked | 63 <input type="checkbox"/> Twisted | 64 <input type="checkbox"/> Fellen |
| | 65 <input type="checkbox"/> Broken at roof line | | 66 <input type="checkbox"/> Bricks fallen |
| Highways or streets | 67 <input type="checkbox"/> Cracked slightly | 68 <input type="checkbox"/> Large cracks | 69 <input type="checkbox"/> Displaced |
| Sidewalks | 70 <input type="checkbox"/> Cracked slightly | 71 <input type="checkbox"/> Large cracks | 72 <input type="checkbox"/> Displaced |

Continued on the reverse side

FIGURE 1.--Example of the "Earthquake Report" form used for evaluating the intensities of earthquakes. A, front side.

5. What indoor physical effects were noted in your community?

Windows, doors, dishes rattled 73 Yes No
Buildings creaked 74 Yes No
Building trembled (shook) 75 Yes No
Hanging pictures 76 Swung 77 Out of place 78 Fallen
Water in small containers 79 Spilled 80 Slightly disturbed
Windows 81 Few cracked 82 Some broken 83 Many broken

6a. Did hanging objects, doors swing? No 84 Slightly 85 Moderately
86 Violently
b. Can you estimate direction? No 87 North/South 88 East/West
89 Other

7a. Were small objects (dishes, knick-knacks, pictures) Unmoved 90 Shifted
91 Overturned 92 Fallen, not broken 93 Broken?
b. Was light furniture Unmoved 94 Shifted
95 Overturned 96 Fallen, not broken 97 Broken?
c. Were heavy furniture or appliances Unmoved 98 Overturned
99 Shifted 100 Broken?

8. Indicate effects of the following types to interior walls if any:

Plaster 101 Cracked 102 Fell
Dry wall 103 Cracked 104 Fell
Ceiling tiles 105 Cracked 106 Fell

9a. Check below any damage to buildings or structures.

Foundation 107 Cracked 108 Destroyed
Interior walls 109 Split 110 Fallen 111 Separated from ceiling or floor
Exterior walls 112 Hairline cracks 113 Large cracks 114 Bulged outward
115 Partial collapse 116 Total collapse
Building 117 Moved on foundation 118 Shifted off foundation

b. What type of construction was the building that showed this damage?
119 Wood 120 Stone 121 Brick veneer 122 Other
123 Brick 124 Cinderblock 125 Reinforced concrete

c. What was the type of ground under the building?
126 Don't know 127 Sandy soil 128 Marshy 129 Fill
130 Hard rock 131 Clay soil 132 Sandstone, limestone, shale

d. Was the ground: 133 Level 134 Sloping 135 Steep?

e. Check the approximate age of the building:
136 Built before 1935 137 Built 1935-65 138 Built after 1965

10a. What percentage of buildings were damaged?
Within 2 city blocks of your location None 139 Few (about 5%)
140 Many (about 50%) 141 Most (about 75%)
b. In area covered by your zip code None 142 Few (about 5%)
143 Many (about 50%) 144 Most (about 75%)

11a. Were springs or well water disturbed? 145 Level changed 146 Flow disturbed
147 Muddied Don't know
b. Were rivers or lakes changed? 148 Yes No Don't know

12a. Was there earth noise? No 149 Faint 150 Moderate 151 Loud
b. Direction of noise 152 North 153 South 154 East 155 West
c. Estimated duration of shaking 156 Sudden, sharp 157 Long
(less than 10 secs) (30-60 secs)
158 Short (10-30 secs) 159 Other

13. What is the approximate population of your city/town? Or are you in a
160 Less than 1,000 161 10,000 to 100,000 164 Rural area?
162 1,000 to 10,000 163 Over 100,000

This community report is associated with what town or zip code? _____

Thank you for your time and information. Refold this card and tape for return mail.

FIGURE 1.--Example of the "Earthquake Report" form used for evaluating the intensities of earthquakes. B, reverse side.

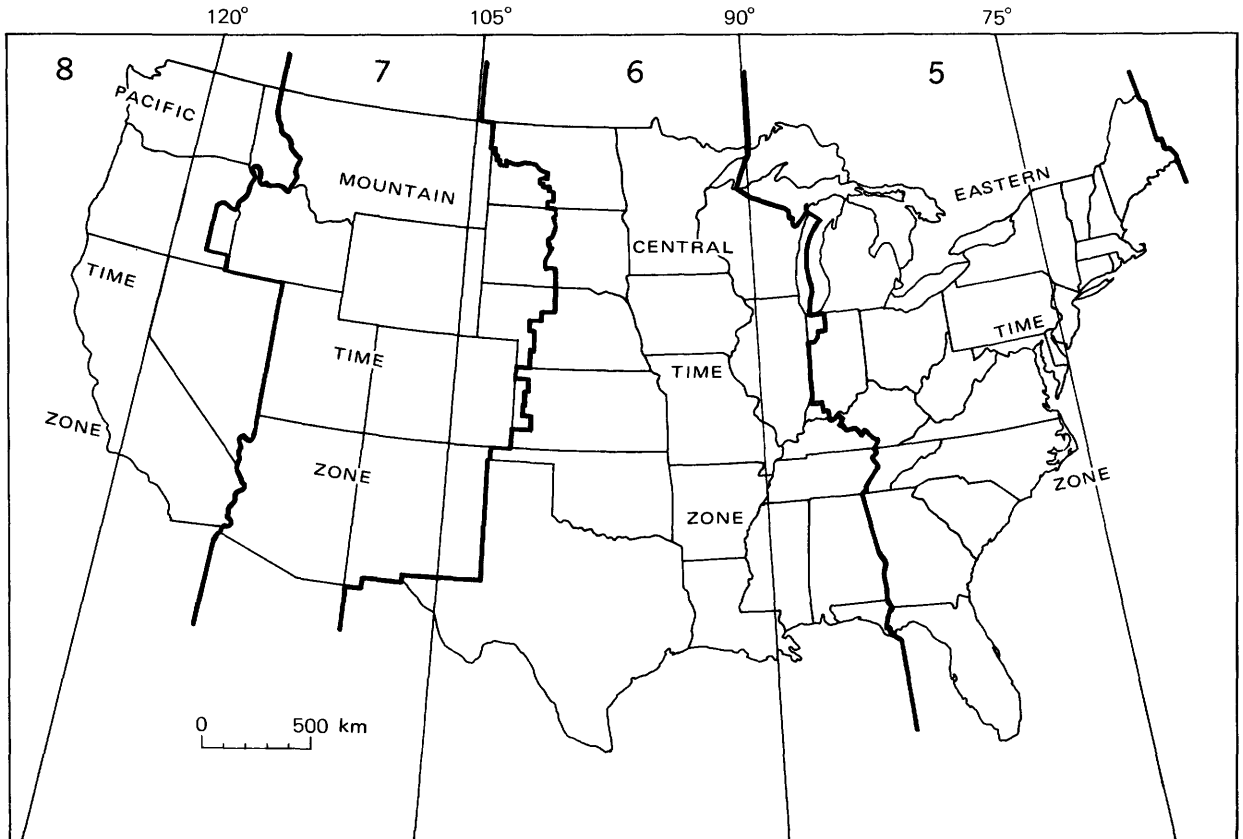


FIGURE 2.--Standard time zones of the conterminous United States. The number in each zone shows the number of hours to be subtracted from Universal Coordinated Time to convert to local standard time. (Subtract 1 hour less for local daylight-saving time.)

less accurate than those on the continent, even though both are listed to two decimals. Depths are listed to the nearest whole kilometer.

Figures 4-6 are maps summarizing the earthquake activity for the conterminous United States, Alaska, and Hawaii for the period July-September 1977. The magnitudes plotted in these figures are based on ML or mBlg; if neither was computed, then on MS; and finally on mb, when it was the only magnitude computed.

The magnitude values listed in tables 1 and 2 were furnished by cooperating institutions or determined by the NEIS. The computational sources are labeled according to the assigned letter codes shown in headnotes to tables 1 and 2; the letter follows the value listed under the column heading "Magnitude." In table 1 the absence of a letter code indicates that the NEIS is the source. In table 2 the magnitude source is the same as the location source unless indicated otherwise, by an alphabetic character to the right of the magnitude value. The magnitude values calculated by the NEIS 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 horizontal surface-wave ground amplitude, in micrometers; T is the period, in seconds, and $18 < T < 22$; and D is the distance, in geocentric degrees (station to epicenter), and $20^\circ < D < 160^\circ$. No depth correction is made for depths less 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 $0.1 < T < 3.0$, 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 $D \geq 5^\circ$.

$$ML = \log A - \log A_0, \quad (3)$$

as defined by Richter (1958, p. 340), where A is the maximum trace amplitude in millimeters, written by a Wood-Anderson torsion seismometer, and $\log A_0$ is a standard value as a function of distance, where the distance is ≤ 600 km. ML values are also calculated from other seismometers

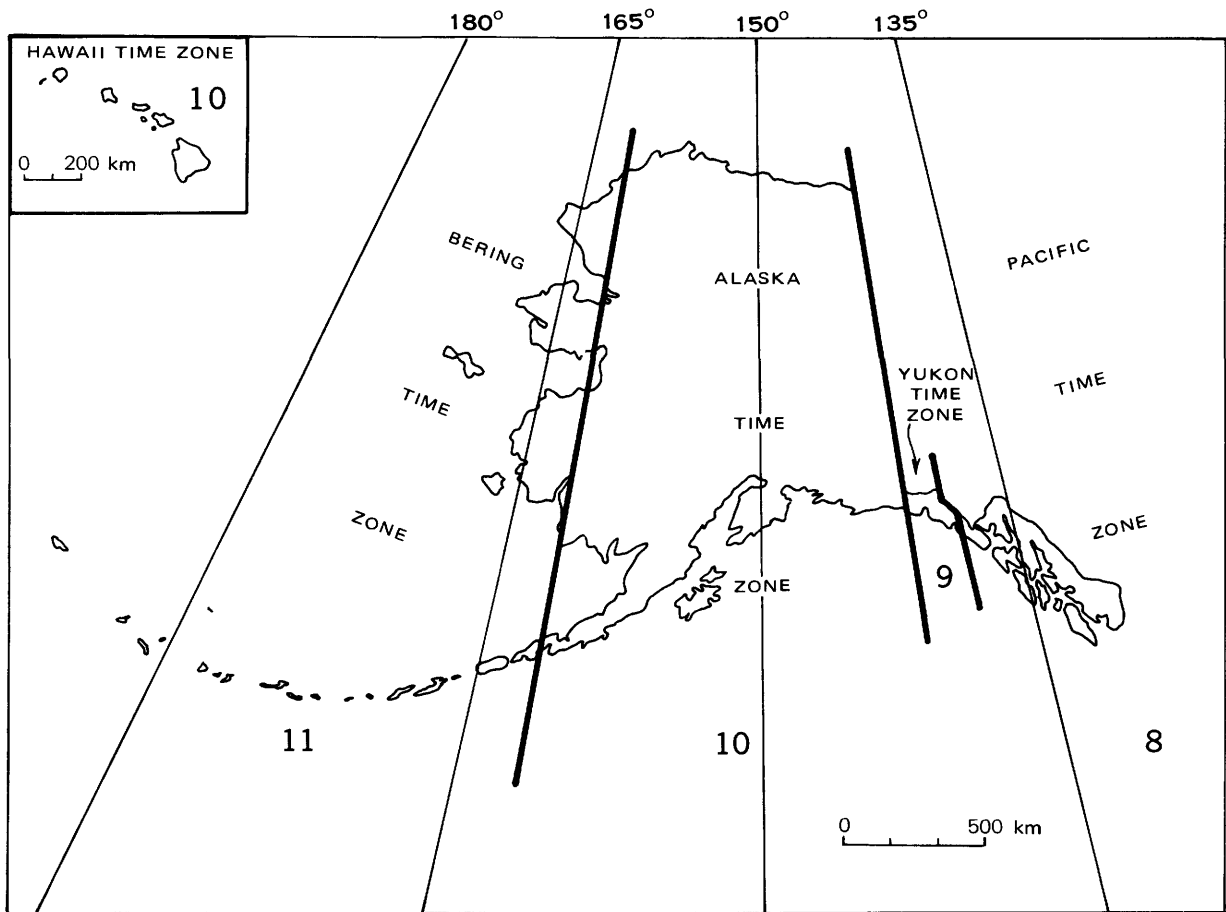


FIGURE 3.--Standard time zones of Alaska and Hawaii. The number in each zone shows the number of hours to be subtracted from Universal Coordinated Time to convert to local standard time. (Subtract 1 hour less for local daylight-saving time.)

by conversion of recorded ground motion to expected response of the torsion seismometer.

$$mbLg = 3.75 + 0.90(\log D) + \log(A/T) \quad (4)$$

$0.5^\circ \leq D \leq 4^\circ$,

$$mbLg = 3.30 + 1.66(\log D) + \log(A/T)$$

$4^\circ \leq D \leq 30^\circ$,

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.

All of the intensity values (indicated by Roman numerals) listed in this summary were derived, using the Modified Mercalli Intensity Scale of 1931 (Wood and Neumann, 1931) shown below, from the evaluation of "Earthquake Report" forms; from field reports by U.S. Geological Survey personnel, engineering firms, or universities; and from detailed macroseismic data communicated to the NEIS by people in the area affected by the earthquake. All earthquake

reports received which contain minimal information are assigned an Intensity II. These reports are filed in the offices of the NEIS or in government archives and are available for detailed study.

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.

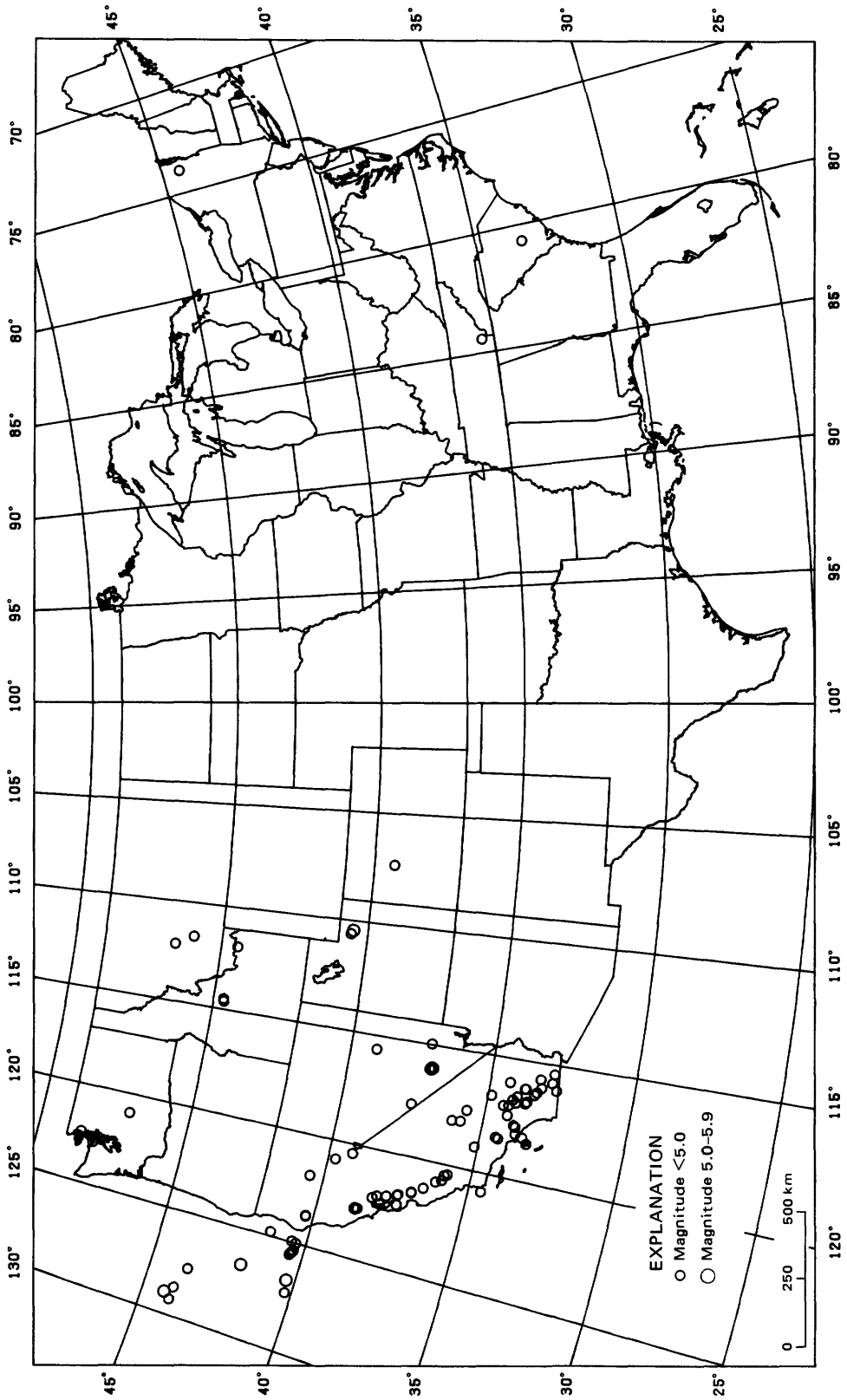


FIGURE 4.--Earthquake epicenters in the conterminous United States for July-September 1977, plotted from table 1.

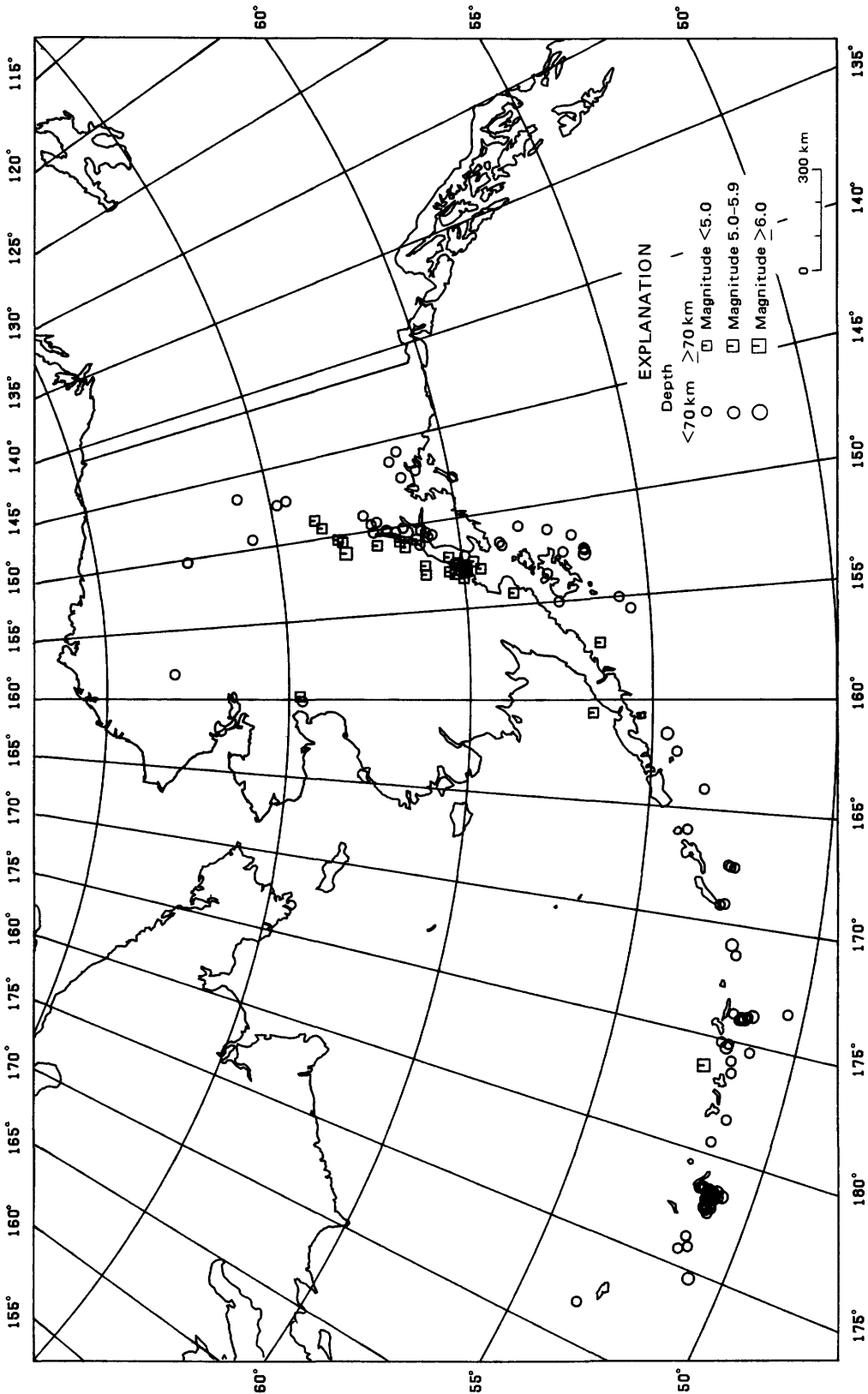


FIGURE 5.--Earthquake epicenters in Alaska for July-September 1977, plotted from table 1.

- 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.

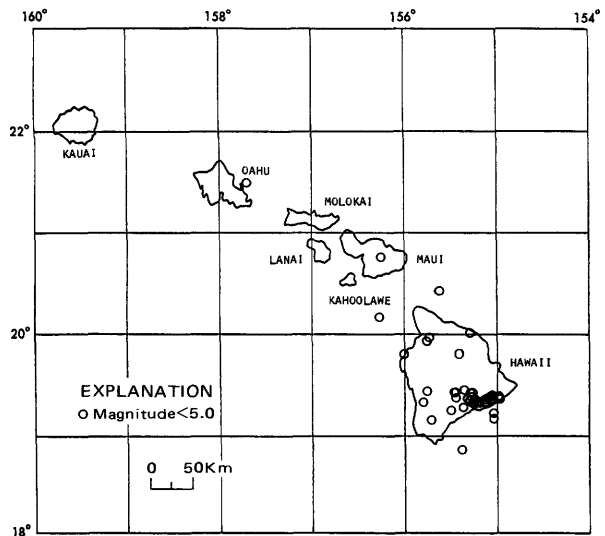


FIGURE 6.--Earthquake epicenters in Hawaii for July-September 1977, plotted from table 1.

Table 1.—Summary of U.S. earthquakes for July–September 1977

[Sources of the hypocenter and magnitudes: (A) U.S. Energy Research and Development Administration; (B) University of California, Berkeley; (F) USGS Open-File Report 78-672 (Fuis and others, 1978). (G) U.S. Geological Survey, National Earthquake Information Service; (H) U.S. Geological Survey, Hawaiian Volcano Observatory; (L) Lamont-Doherty Geological Observatory, Palisades; (M) NOAA, Alaska Tsunami Warning Center, Palmer; (P) California Institute of Technology, Pasadena; (V) Virginia Polytechnic Institute and State University, Blacksburg; (W) University of Washington, Seattle. N, Normal depth; UTC, Universal Coordinated Time. For names of local time zones, see figures 2 and 3. Leaders (...) indicate no information available]

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time		
	hr	min	s				mb	MS	ML or mbLg			Date	Hour	
ALASKA														
JULY	3	10 23	26.7	52.68 N.	167.42 W.	27	...	...	...	...	G	JULY	2 11	P.M. BST
JULY	3	12 55	41.4	52.52 N.	167.48 W.	33N	5.0	4.6	...	...	G	JULY	3 01	A.M. BST
JULY	3	17 29	49.3	52.62 N.	167.48 W.	33N	4.7	4.5	...	...	G	JULY	3 06	A.M. BST
JULY	4	05 38	11.6	62.28 N.	150.89 W.	92	...	...	...	...	G	JULY	3 07	P.M. AST
JULY	4	21 03	36.1	60.07 N.	152.89 W.	120	...	...	...	...	G	JULY	4 11	A.M. AST
JULY	7	15 58	24.8	52.30 N.	170.89 W.	52	5.0	...	...	...	G	JULY	7 04	A.M. BST
JULY	8	11 45	27.6	52.13 N.	171.32 W.	43	4.7	...	...	...	G	JULY	8 00	A.M. BST
JULY	8	19 59	39.9	61.17 N.	150.85 W.	72	4.7	...	...	V	G	JULY	8 09	A.M. AST
JULY	8	20 32	46.7	62.33 N.	150.10 W.	18	...	...	3.7M	III	G	JULY	8 10	A.M. AST
JULY	9	11 31	32.8	53.53 N.	164.08 W.	33N	4.1	...	...	...	G	JULY	9 00	A.M. BST
JULY	10	03 43	41.7	58.92 N.	151.64 W.	64	4.0	...	...	...	G	JULY	9 05	P.M. AST
JULY	11	09 38	32.4	51.41 N.	176.31 E.	13	5.1	4.8	...	...	G	JULY	10 10	P.M. BST
JULY	11	15 57	17.2	64.56 N.	147.27 W.	14	4.5	4.2	4.6M	V	G	JULY	11 05	P.M. AST
JULY	13	00 48	04.4	59.94 N.	147.76 W.	34	...	...	3.1M	...	G	JULY	12 02	P.M. AST
JULY	14	10 47	13.5	55.54 N.	155.60 W.	33N	4.7	3.6	...	...	G	JULY	14 00	A.M. AST
JULY	15	02 06	14.5	61.64 N.	150.85 W.	74	...	...	...	...	G	JULY	14 04	P.M. AST
JULY	15	06 16	17.2	51.26 N.	175.95 E.	33N	4.6	...	...	...	G	JULY	14 07	P.M. BST
JULY	16	22 00	56.1	59.99 N.	152.68 W.	87	...	...	...	...	G	JULY	16 12	P.M. AST
JULY	18	20 17	18.7	59.91 N.	152.95 W.	138	...	...	...	...	G	JULY	18 10	A.M. AST
JULY	19	02 42	11.6	61.02 N.	152.45 W.	127	...	...	...	...	G	JULY	18 04	P.M. AST
JULY	20	10 36	05.8	51.59 N.	179.45 W.	33N	4.7	...	...	...	G	JULY	19 11	P.M. BST
JULY	20	13 24	25.9	54.61 N.	161.60 W.	53	5.3	...	...	V	G	JULY	20 12	A.M. BST
JULY	20	18 05	53.9	60.13 N.	152.47 W.	107	4.1	...	...	...	G	JULY	20 08	A.M. AST
JULY	21	02 20	05.3	56.43 N.	157.18 W.	91	4.4	...	...	...	G	JULY	20 04	P.M. AST
JULY	21	18 07	41.5	60.00 N.	153.32 W.	141	4.3	...	...	...	G	JULY	21 08	A.M. AST
JULY	22	03 51	03.5	63.20 N.	150.43 W.	149	...	...	...	...	G	JULY	21 05	P.M. AST
JULY	22	05 57	00.5	61.03 N.	150.40 W.	51	3.8	...	4.0M	III	G	JULY	21 07	P.M. AST
JULY	23	13 44	54.6	54.32 N.	162.41 W.	27	5.1	4.4	...	...	G	JULY	23 02	A.M. BST
JULY	24	15 31	23.3	52.80 N.	169.21 W.	52	4.2	...	...	...	G	JULY	24 04	A.M. BST
JULY	24	15 34	50.7	52.67 N.	169.16 W.	45	4.0	...	...	...	G	JULY	24 04	A.M. BST
JULY	25	06 28	20.9	68.14 N.	158.20 W.	33N	...	...	...	...	G	JULY	24 08	P.M. AST
JULY	26	18 39	21.7	62.53 N.	149.04 W.	69	...	...	...	IV	G	JULY	26 08	A.M. AST
JULY	29	04 38	07.1	61.56 N.	146.20 W.	55	...	...	...	...	G	JULY	28 06	P.M. AST
AUG.	2	02 22	02.4	51.22 N.	175.34 W.	19	4.4	4.3	...	...	G	AUG.	1 03	P.M. BST
AUG.	3	12 33	51.7	61.33 N.	147.23 W.	57	...	...	...	...	G	AUG.	3 02	A.M. AST
AUG.	4	15 10	24.6	59.53 N.	152.89 W.	102	...	...	...	II	G	AUG.	4 05	A.M. AST
AUG.	4	22 56	07.4	58.88 N.	151.80 W.	65	3.4	...	...	...	G	AUG.	4 12	P.M. AST
AUG.	4	23 40	15.8	61.49 N.	150.11 W.	44	...	...	...	...	G	AUG.	4 01	P.M. AST
AUG.	5	04 11	27.7	60.91 N.	150.53 W.	61	...	...	...	...	G	AUG.	4 06	P.M. AST
AUG.	5	20 29	58.1	59.91 N.	152.12 W.	52	4.0	...	...	...	G	AUG.	5 10	A.M. AST
AUG.	7	04 28	52.5	61.11 N.	151.21 W.	33N	...	...	3.2M	...	G	AUG.	6 06	P.M. AST
AUG.	7	23 26	53.5	62.35 N.	176.32 W.	125	5.3	...	...	...	G	AUG.	7 12	P.M. BST
AUG.	8	05 16	59.1	60.89 N.	146.97 W.	42	...	...	...	...	G	AUG.	7 07	P.M. AST
AUG.	8	07 37	12.8	60.25 N.	153.07 W.	134	4.3	...	...	...	G	AUG.	7 09	P.M. AST
AUG.	8	18 08	46.9	57.72 N.	153.53 W.	36	4.4	...	3.7M	...	G	AUG.	8 08	A.M. AST
AUG.	10	09 35	58.7	56.64 N.	152.73 W.	33N	5.0	4.6	5.0M	...	G	AUG.	9 11	P.M. AST
AUG.	10	15 02	11.9	65.65 N.	149.38 W.	57	...	...	...	...	G	AUG.	10 05	A.M. AST
AUG.	10	20 09	19.7	57.23 N.	152.52 W.	66	...	...	...	...	G	AUG.	10 10	A.M. AST
AUG.	11	09 01	29.5	63.88 N.	148.81 W.	126	...	...	...	...	G	AUG.	10 11	P.M. AST
AUG.	12	19 28	14.2	61.51 N.	151.22 W.	90	...	...	...	...	G	AUG.	12 09	A.M. AST
AUG.	13	10 00	24.2	61.30 N.	145.72 W.	70	...	...	...	...	G	AUG.	13 00	A.M. AST

Table 1.—Summary of U.S. earthquakes for July–September 1977—Continued

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time			
	hr	min	s				mb	MS	ML or mbLg			Date	Hour	Time	Zone
ALASKA—Continued															
AUG. 14	12	12	11.4	64.70 N.	159.80 W.	97	...	...	...	...	G	AUG. 14	02	A.M.	AST
AUG. 15	00	24	33.2	51.59 N.	176.38 W.	63	4.5	...	...	IV	G	AUG. 14	01	P.M.	BST
AUG. 15	17	45	16.1	57.60 N.	151.27 W.	33N	...	...	...	...	G	AUG. 15	07	A.M.	AST
AUG. 16	06	30	18.5	67.52 N.	150.25 W.	39	...	...	3.5M	IV	G	AUG. 15	08	P.M.	AST
AUG. 17	15	59	23.9	56.63 N.	160.65 W.	226	...	...	...	...	G	AUG. 17	05	A.M.	AST
AUG. 17	16	48	31.3	51.87 N.	175.34 W.	57	5.4	...	...	IV	G	AUG. 17	05	A.M.	BST
AUG. 18	12	56	51.9	50.91 N.	174.67 E.	33	5.3	...	...	...	G	AUG. 18	01	A.M.	BST
AUG. 18	13	14	31.6	61.71 N.	150.26 W.	42	...	...	3.0M	...	G	AUG. 18	03	A.M.	AST
AUG. 18	19	02	49.0	51.83 N.	175.18 W.	33N	4.2	...	...	II	G	AUG. 18	08	A.M.	BST
AUG. 19	04	28	58.3	61.96 N.	150.09 W.	33N	...	...	...	...	G	AUG. 18	06	P.M.	AST
AUG. 19	09	08	05.0	61.96 N.	150.11 W.	33N	...	...	3.1M	...	G	AUG. 18	11	P.M.	AST
AUG. 21	15	34	37.8	59.97 N.	153.03 W.	144	3.9	...	...	...	G	AUG. 21	05	A.M.	AST
AUG. 21	20	55	22.6	52.05 N.	175.16 W.	33N	4.2	...	...	...	G	AUG. 21	09	A.M.	BST
AUG. 23	13	42	40.1	63.72 N.	149.38 W.	126	4.1	...	...	...	G	AUG. 23	03	A.M.	AST
AUG. 26	07	15	48.2	51.49 N.	175.73 E.	34	4.9	4.1	...	...	G	AUG. 25	08	P.M.	BST
AUG. 27	03	51	50.4	56.95 N.	151.72 W.	33N	4.7	...	4.4M	...	G	AUG. 26	05	P.M.	AST
AUG. 28	07	16	50.5	63.33 N.	150.20 W.	115	3.6	...	...	...	G	AUG. 27	09	P.M.	AST
AUG. 29	20	59	59.2	51.56 N.	173.97 W.	25	5.4	5.1	...	II	G	AUG. 29	09	A.M.	BST
AUG. 29	22	03	37.8	51.67 N.	174.02 W.	37	4.6	...	...	...	G	AUG. 29	11	A.M.	BST
AUG. 29	22	08	53.6	51.66 N.	173.94 W.	30	4.8	...	...	...	G	AUG. 29	11	A.M.	BST
AUG. 30	02	07	58.7	51.72 N.	174.04 W.	42	4.6	...	...	...	G	AUG. 29	03	P.M.	BST
AUG. 30	06	50	39.9	63.16 N.	151.11 W.	130	5.0	...	...	V	G	AUG. 29	08	P.M.	AST
AUG. 30	15	12	27.6	51.38 N.	173.78 W.	33	5.4	5.0	...	II	G	AUG. 30	04	A.M.	BST
AUG. 30	20	07	59.4	59.69 N.	152.47 W.	116	...	...	...	...	G	AUG. 30	10	A.M.	AST
AUG. 30	20	45	01.7	56.63 N.	152.53 W.	20	4.9	...	...	...	G	AUG. 30	10	A.M.	AST
AUG. 31	08	58	27.1	51.50 N.	173.85 W.	43	4.8	...	...	...	G	AUG. 30	09	P.M.	BST
SEPT. 1	21	38	48.3	64.64 N.	160.11 W.	33N	...	...	3.7M	...	G	SEPT. 1	11	A.M.	AST
SEPT. 4	15	40	57.3	51.21 N.	178.39 E.	34	5.6	6.4	...	II	G	SEPT. 4	04	A.M.	BST
SEPT. 4	15	53	40.8	51.02 N.	178.56 E.	33N	5.0	...	...	...	G	SEPT. 4	04	A.M.	BST
SEPT. 4	15	59	04.4	51.24 N.	178.55 E.	33N	4.6	...	...	...	G	SEPT. 4	04	A.M.	BST
SEPT. 4	16	09	48.0	51.17 N.	178.54 E.	33N	4.3	...	...	...	G	SEPT. 4	05	A.M.	BST
SEPT. 4	16	32	40.9	51.12 N.	178.54 E.	33N	4.5	...	...	...	G	SEPT. 4	05	A.M.	BST
SEPT. 4	16	44	25.2	50.85 N.	178.43 E.	33N	5.3	...	...	...	G	SEPT. 4	05	A.M.	BST
SEPT. 4	16	48	44.7	51.07 N.	178.28 E.	37	5.1	...	...	...	G	SEPT. 4	05	A.M.	BST
SEPT. 4	17	10	30.6	51.10 N.	178.26 E.	31	5.5	6.4	...	II	G	SEPT. 4	06	A.M.	BST
SEPT. 4	17	16	15.5	51.26 N.	178.40 E.	33N	5.5	...	...	...	G	SEPT. 4	06	A.M.	BST
SEPT. 4	17	24	42.8	51.14 N.	177.95 E.	8	5.8	6.6	...	II	G	SEPT. 4	06	A.M.	BST
SEPT. 4	17	38	24.8	51.22 N.	177.78 E.	45	5.3	...	...	...	G	SEPT. 4	06	A.M.	BST
SEPT. 4	18	00	11.9	51.12 N.	178.25 E.	50	4.9	...	...	...	G	SEPT. 4	07	A.M.	BST
SEPT. 4	18	25	49.8	51.20 N.	177.79 E.	41	5.3	...	...	...	G	SEPT. 4	07	A.M.	BST
SEPT. 4	18	38	23.6	51.16 N.	178.25 E.	35	5.0	...	...	...	G	SEPT. 4	07	A.M.	BST
SEPT. 4	19	23	00.5	51.16 N.	177.65 E.	35	5.0	4.7	...	...	G	SEPT. 4	08	A.M.	BST
SEPT. 4	21	27	08.3	55.82 N.	155.01 W.	22	...	...	...	...	G	SEPT. 4	11	A.M.	AST
SEPT. 4	22	18	38.8	50.95 N.	178.33 E.	33N	4.1	...	...	...	G	SEPT. 4	11	A.M.	BST
SEPT. 4	23	20	44.9	51.18 N.	178.25 E.	41	5.5	5.3	...	...	G	SEPT. 4	12	P.M.	BST
SEPT. 4	23	41	01.9	51.15 N.	178.33 E.	33N	4.5	...	...	...	G	SEPT. 4	12	P.M.	BST
SEPT. 4	23	54	27.2	51.47 N.	178.52 E.	53	4.6	...	...	...	G	SEPT. 4	12	P.M.	BST
SEPT. 5	00	58	10.9	51.03 N.	177.81 E.	26	5.0	4.1	...	...	G	SEPT. 4	01	P.M.	BST
SEPT. 5	09	13	22.8	51.12 N.	178.53 E.	33N	4.3	...	...	...	G	SEPT. 4	10	P.M.	BST
SEPT. 5	12	52	12.4	51.41 N.	178.52 E.	33N	4.7	...	...	...	G	SEPT. 5	01	A.M.	BST
SEPT. 5	22	31	04.6	51.51 N.	178.49 E.	33N	4.6	3.3	...	...	G	SEPT. 5	11	A.M.	BST
SEPT. 6	14	20	36.4	51.40 N.	178.60 E.	46	4.6	...	...	...	G	SEPT. 6	03	A.M.	BST
SEPT. 9	15	58	56.4	62.19 N.	149.53 W.	59	4.6	...	...	II	G	SEPT. 9	05	A.M.	AST
SEPT. 9	22	00	17.0	62.37 N.	149.61 W.	33N	...	...	3.6M	...	G	SEPT. 9	12	P.M.	AST
SEPT. 12	12	42	50.4	51.89 N.	173.83 W.	29	...	...	...	...	G	SEPT. 12	01	A.M.	BST
SEPT. 13	14	38	36.9	51.08 N.	177.54 E.	35	4.7	3.9	...	...	G	SEPT. 13	03	A.M.	BST
SEPT. 14	09	20	58.4	53.91 N.	165.98 W.	43	4.3	...	...	...	G	SEPT. 13	10	P.M.	BST
SEPT. 16	16	39	07.2	65.86 N.	146.49 W.	45	...	...	3.8M	...	G	SEPT. 16	06	A.M.	AST
SEPT. 17	15	42	42.2	60.86 N.	150.84 W.	33N	...	...	3.7M	...	G	SEPT. 17	05	A.M.	AST
SEPT. 17	16	28	54.2	50.45 N.	173.41 W.	33N	4.8	...	...	...	G	SEPT. 17	05	A.M.	BST
SEPT. 17	18	26	29.9	61.03 N.	152.92 W.	150	4.8	...	...	IV	G	SEPT. 17	08	A.M.	AST
SEPT. 17	21	25	21.4	64.82 N.	147.43 W.	20	...	...	4.0M	IV	G	SEPT. 17	11	A.M.	AST
SEPT. 18	01	05	33.0	60.37 N.	152.07 W.	100	3.5	...	...	...	G	SEPT. 17	03	P.M.	AST

Table 1.—Summary of U.S. earthquakes for July–September 1977—Continued

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time		
	hr	min	s				mb	MS	ML or mblg			Date	Hour	
ALASKA—Continued														
SEPT. 19	08	07	37.3	59.91 N.	152.84 W.	116	4.8	...	...	...	G	SEPT. 18	10 P.M.	AST
SEPT. 19	22	18	24.0	60.19 N.	152.53 W.	104	4.5	...	...	...	G	SEPT. 19	12 P.M.	AST
SEPT. 20	11	20	35.3	51.26 N.	178.13 E.	28	4.8	...	...	...	G	SEPT. 20	00 A.M.	BST
SEPT. 21	10	35	26.6	51.37 N.	178.36 W.	30	4.9	...	...	...	G	SEPT. 20	11 P.M.	BST
SEPT. 21	14	49	54.6	56.66 N.	152.44 W.	20	4.8	...	4.3M	...	G	SEPT. 21	04 A.M.	AST
SEPT. 22	10	25	43.1	51.66 N.	175.88 W.	61	4.4	...	...	...	G	SEPT. 21	11 P.M.	BST
SEPT. 22	14	23	05.5	57.47 N.	155.04 W.	33N	...	...	3.7M	...	G	SEPT. 22	04 A.M.	AST
SEPT. 22	20	37	11.0	53.43 N.	171.74 E.	33N	4.1	...	...	...	G	SEPT. 22	09 A.M.	BST
SEPT. 23	22	37	44.2	60.74 N.	150.70 W.	56	...	...	...	...	G	SEPT. 23	12 P.M.	AST
SEPT. 26	18	22	23.5	60.38 N.	152.92 W.	137	4.4	...	...	...	G	SEPT. 26	08 A.M.	AST
SEPT. 27	03	17	36.1	58.69 N.	154.37 W.	109	...	...	...	...	G	SEPT. 26	05 P.M.	AST
SEPT. 27	12	52	36.1	58.37 N.	150.91 W.	33N	3.8	...	3.3M	...	G	SEPT. 27	02 A.M.	AST
CALIFORNIA														
JULY 2	01	22	37.7	33.63 N.	116.72 W.	13	...	...	3.1P	...	P	JULY 1	05 P.M.	PST
JULY 3	19	46	53.0	37.38 N.	121.75 W.	4	...	...	3.2B	III	B	JULY 3	11 A.M.	PST
JULY 3	20	21	24.4	37.35 N.	121.72 W.	7	...	...	3.3B	III	B	JULY 3	12 P.M.	PST
JULY 12	01	43	28.5	40.28 N.	123.69 W.	20	5.0	3.8	4.1B	V	B	JULY 11	05 P.M.	PST
JULY 12	05	17	11.2	40.28 N.	123.66 W.	21	...	...	3.5B	V	B	JULY 11	09 P.M.	PST
JULY 12	15	22	55.8	40.28 N.	123.69 W.	19	...	...	3.3B	V	B	JULY 12	07 A.M.	PST
JULY 12	18	55	12.1	33.38 N.	118.43 W.	5	...	...	3.1P	...	P	JULY 12	10 A.M.	PST
JULY 13	08	12	48.6	34.00 N.	116.83 W.	11	...	...	3.0P	V	P	JULY 13	00 A.M.	PST
JULY 14	11	38	05.7	36.56 N.	121.21 W.	5	...	...	3.2B	V	B	JULY 14	03 A.M.	PST
JULY 16	05	01	06.9	33.67 N.	116.80 W.	5	...	...	3.0P	...	P	JULY 15	09 P.M.	PST
JULY 17	23	09	49.7	33.22 N.	116.03 W.	5	...	...	3.4P	...	P	JULY 17	03 P.M.	PST
JULY 19	23	50	30.6	38.05 N.	121.99 W.	2	...	...	3.5B	V	B	JULY 19	03 P.M.	PST
JULY 20	22	17	34.9	34.00 N.	116.83 W.	10	...	...	3.0P	...	P	JULY 20	02 P.M.	PST
JULY 26	21	42	16.3	35.94 N.	120.47 W.	9	...	...	3.7B	V	B	JULY 26	01 P.M.	PST
JULY 27	11	10	46.7	36.90 N.	121.51 W.	2	...	...	3.2B	III	B	JULY 27	03 A.M.	PST
JULY 27	21	51	17.5	37.31 N.	122.16 W.	11	...	...	3.5B	V	B	JULY 27	01 P.M.	PST
JULY 30	10	25	03.2	32.87 N.	115.78 W.	16	...	...	3.3P	...	P	JULY 30	02 A.M.	PST
JULY 30	16	35	38.1	36.91 N.	121.48 W.	11	...	...	3.8B	III	B	JULY 30	08 A.M.	PST
AUG. 2	02	31	43.8	37.91 N.	122.30 W.	3	...	...	2.8B	IV	B	AUG. 1	06 P.M.	PST
AUG. 3	00	47	12.8	34.56 N.	120.80 W.	6	3.4	...	3.3B	...	B	AUG. 2	04 P.M.	PST
AUG. 3	22	08	33.7	33.83 N.	118.13 W.	11	...	...	2.8P	II	P	AUG. 3	02 P.M.	PST
AUG. 5	00	47	43.4	33.35 N.	116.25 W.	5	...	...	3.0P	...	P	AUG. 4	04 P.M.	PST
AUG. 8	22	26	09.7	33.30 N.	115.70 W.	4	...	...	3.1P	...	P	AUG. 8	02 P.M.	PST
AUG. 9	08	34	25.0	36.17 N.	120.80 W.	14	2.9	...	3.0B	...	B	AUG. 9	00 A.M.	PST
AUG. 11	09	27	25.2	34.43 N.	117.02 W.	5	...	...	3.0P	...	P	AUG. 11	01 A.M.	PST
AUG. 12	00	58	30.3	33.77 N.	116.18 W.	5	...	...	3.1P	...	P	AUG. 11	04 P.M.	PST
AUG. 12	02	19	26.1	34.38 N.	118.47 W.	10	4.1	...	4.4P	VI	P	AUG. 11	06 P.M.	PST
AUG. 12	04	41	38.6	34.38 N.	118.45 W.	5	...	...	3.3P	III	F	AUG. 11	08 P.M.	PST
AUG. 13	11	31	09.5	32.70 N.	116.05 W.	10	...	...	3.3P	...	F	AUG. 13	03 A.M.	PST
AUG. 14	01	04	06.5	33.76 N.	116.18 W.	3	...	...	3.2F	...	F	AUG. 13	05 P.M.	PST
AUG. 14	14	25	34.8	37.74 N.	121.92 W.	9	...	...	3.4B	III	B	AUG. 14	06 A.M.	PST
AUG. 15	02	05	41.2	35.77 N.	118.03 W.	6	...	...	3.0P	...	P	AUG. 14	06 P.M.	PST
AUG. 15	10	40	13.5	40.49 N.	121.86 W.	5	...	...	3.1B	...	B	AUG. 15	02 A.M.	PST
AUG. 17	03	21	41.6	35.13 N.	118.97 W.	5	...	...	3.6P	...	P	AUG. 16	07 P.M.	PST
AUG. 17	05	20	32.1	35.84 N.	120.39 W.	10	...	...	3.2B	...	B	AUG. 16	09 P.M.	PST
AUG. 18	01	55	26.0	32.85 N.	115.42 W.	5	...	...	3.1F	...	F	AUG. 17	05 P.M.	PST
AUG. 20	04	59	38.3	39.21 N.	120.42 W.	5	...	...	3.3B	...	B	AUG. 19	08 P.M.	PST
SEPT. 1	02	16	19.7	33.43 N.	116.37 W.	5	...	...	3.0P	...	P	SEPT. 0	06 P.M.	PST
SEPT. 2	16	24	34.9	36.91 N.	121.48 W.	5	...	...	3.0B	...	B	SEPT. 2	08 A.M.	PST
SEPT. 5	13	26	50.9	35.98 N.	120.68 W.	2	...	...	3.2B	...	B	SEPT. 5	05 A.M.	PST
SEPT. 5	17	45	28.2	38.19 N.	122.12 W.	8	...	...	3.7B	VI	B	SEPT. 5	09 A.M.	PST
SEPT. 8	00	28	20.8	38.68 N.	122.75 W.	7	4.0	...	3.8B	V	B	SEPT. 7	04 P.M.	PST
SEPT. 8	04	42	16.9	34.15 N.	116.72 W.	2	...	...	3.0P	...	P	SEPT. 7	08 P.M.	PST
SEPT. 11	05	18	46.1	38.68 N.	122.80 W.	9	3.8	...	3.6B	V	B	SEPT. 10	09 P.M.	PST
SEPT. 11	23	46	12.2	38.70 N.	122.80 W.	12	3.9	...	3.8B	V	B	SEPT. 11	03 P.M.	PST
SEPT. 12	06	17	42.6	34.22 N.	116.98 W.	5	...	...	3.2P	II	P	SEPT. 11	10 P.M.	PST
SEPT. 12	12	14	02.3	34.88 N.	116.70 W.	5	...	...	3.2P	...	P	SEPT. 12	04 A.M.	PST
SEPT. 12	13	59	22.3	35.63 N.	117.52 W.	4	...	...	3.1P	...	P	SEPT. 12	05 A.M.	PST

Table 1.—Summary of U.S. earthquakes for July–September 1977—Continued

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time			
	hr	min	s				mb	MS	ML or mblg			Date	Hour		
CALIFORNIA--Continued															
SEPT. 14	21	35	23.3	33.88 N.	117.82 W.	2	...	...	2.7P	III	P	SEPT. 14	01	P.M.	PST
SEPT. 19	10	34	54.6	33.95 N.	117.78 W.	9	...	...	2.7P	II	P	SEPT. 19	02	A.M.	PST
SEPT. 20	06	46	27.5	39.76 N.	120.84 W.	2	...	...	3.2B	...	B	SEPT. 19	10	P.M.	PST
SEPT. 22	09	41	10.5	33.98 N.	116.58 W.	5	...	...	3.5P	IV	P	SEPT. 22	01	A.M.	PST
SEPT. 22	20	48	42.9	38.60 N.	122.76 W.	5	4.0	...	3.8B	V	B	SEPT. 22	12	P.M.	PST
SEPT. 22	21	13	01.3	34.22 N.	117.43 W.	5	...	...	3.0P	...	P	SEPT. 22	01	P.M.	PST
SEPT. 24	21	28	24.3	34.47 N.	118.42 W.	5	3.9	...	4.2P	VI	P	SEPT. 24	01	P.M.	PST
SEPT. 26	21	54	54.9	36.08 N.	118.07 W.	5	...	...	3.2P	...	P	SEPT. 26	01	P.M.	PST
SEPT. 27	18	10	42.1	33.55 N.	118.23 W.	6	...	...	3.1P	...	P	SEPT. 27	10	A.M.	PST
SEPT. 30	15	09	52.3	34.32 N.	116.05 W.	5	...	...	3.4P	...	P	SEPT. 30	07	A.M.	PST
CALIFORNIA--OFF THE COAST															
JULY 4	21	52	06.1	40.32 N.	126.73 W.	15	5.1	4.3	5.0B	...	G	JULY 4	01	P.M.	PST
JULY 4	22	05	42.3	40.25 N.	127.29 W.	15	5.0	...	4.6B	...	G	JULY 4	02	P.M.	PST
JULY 16	12	22	51.2	40.35 N.	125.00 W.	24	...	...	3.0B	...	B	JULY 16	04	A.M.	PST
JULY 18	21	49	28.6	40.38 N.	125.36 W.	15	4.8	3.9	4.4B	...	G	JULY 18	01	P.M.	PST
JULY 18	21	51	33.3	40.42 N.	125.48 W.	15	...	...	3.5B	...	G	JULY 18	01	P.M.	PST
JULY 23	23	48	43.5	41.31 N.	124.82 W.	15	4.5	...	3.7B	...	B	JULY 23	03	P.M.	PST
AUG. 1	20	58	35.8	40.48 N.	125.56 W.	15	...	...	4.0B	...	B	AUG. 1	12	P.M.	PST
AUG. 10	09	25	17.8	40.53 N.	124.95 W.	25	...	...	3.3B	...	B	AUG. 10	01	A.M.	PST
AUG. 20	01	51	51.3	40.40 N.	125.44 W.	18	...	...	3.3B	...	B	AUG. 19	05	P.M.	PST
SEPT. 7	03	10	45.4	41.99 N.	126.65 W.	15	5.2	...	...	...	G	SEPT. 6	07	P.M.	PST
COLORADO															
SEPT. 24	11	16	48.4	39.31 N.	107.31 W.	5	4.0	...	3.0G	...	G	SEPT. 24	04	A.M.	MST
HAWAII															
JULY 1	18	14	56.3	19.33 N.	155.13 W.	10	...	...	3.3H	IV	H	JULY 1	08	A.M.	HST
JULY 1	22	44	57.8	20.02 N.	155.30 W.	10	...	...	3.2H	...	H	JULY 1	12	P.M.	HST
JULY 4	14	20	07.9	19.93 N.	155.75 W.	9	...	...	3.3H	IV	H	JULY 4	04	A.M.	HST
JULY 5	17	59	42.0	19.43 N.	155.45 W.	10	...	...	4.1H	IV	H	JULY 5	07	A.M.	HST
JULY 6	18	50	18.6	19.34 N.	155.11 W.	9	...	...	3.6H	III	H	JULY 6	08	A.M.	HST
JULY 8	06	25	50.9	19.83 N.	155.41 W.	27	...	...	3.0H	...	H	JULY 7	08	P.M.	HST
JULY 9	11	16	30.3	19.39 N.	155.28 W.	5	...	...	3.2H	...	H	JULY 9	01	A.M.	HST
JULY 10	20	46	00.1	19.37 N.	155.00 W.	6	...	...	3.0H	III	H	JULY 10	10	A.M.	HST
JULY 12	18	59	40.1	19.32 N.	155.23 W.	10	...	...	3.1H	...	H	JULY 12	08	A.M.	HST
JULY 19	13	58	11.2	19.32 N.	155.19 W.	9	...	...	3.0H	...	H	JULY 19	03	A.M.	HST
JULY 26	00	19	57.8	19.16 N.	155.71 W.	10	...	...	3.0H	...	H	JULY 25	02	P.M.	HST
JULY 27	18	08	18.9	19.32 N.	155.27 W.	10	...	...	3.1H	...	H	JULY 27	08	A.M.	HST
JULY 29	09	56	27.7	20.77 N.	156.25 W.	8	...	...	3.5H	III	H	JULY 28	11	P.M.	HST
JULY 31	10	04	19.9	19.39 N.	155.05 W.	8	...	...	3.0H	III	H	JULY 31	00	A.M.	HST
AUG. 7	08	39	59.3	19.79 N.	156.01 W.	10	...	...	3.0H	...	H	AUG. 6	10	P.M.	HST
AUG. 8	07	54	20.3	19.34 N.	155.22 W.	10	...	...	4.1H	IV	H	AUG. 7	09	P.M.	HST
AUG. 8	13	34	32.3	19.22 N.	155.04 W.	49	...	...	3.4H	III	H	AUG. 8	03	A.M.	HST
AUG. 11	05	19	16.7	19.32 N.	155.19 W.	9	...	...	3.9H	IV	H	AUG. 10	07	P.M.	HST
AUG. 11	09	43	05.0	19.35 N.	155.23 W.	9	...	...	3.3H	III	H	AUG. 10	11	P.M.	HST
AUG. 12	23	33	58.5	19.33 N.	155.80 W.	11	...	...	3.4H	...	H	AUG. 12	01	P.M.	HST
AUG. 13	22	24	25.5	20.44 N.	155.62 W.	29	...	...	4.3H	IV	H	AUG. 13	12	P.M.	HST
AUG. 19	18	19	13.4	19.34 N.	155.12 W.	10	...	...	4.2H	IV	H	AUG. 19	08	A.M.	HST
AUG. 22	00	43	46.3	19.96 N.	155.72 W.	8	...	...	3.1H	...	H	AUG. 21	02	P.M.	HST
AUG. 25	06	07	13.8	19.33 N.	155.19 W.	10	...	...	3.6H	III	H	AUG. 24	08	P.M.	HST
AUG. 30	11	04	43.0	20.16 N.	156.27 W.	47	...	...	3.6H	...	H	AUG. 30	01	A.M.	HST
AUG. 30	12	46	21.3	19.38 N.	155.45 W.	10	...	...	3.9H	IV	H	AUG. 30	02	A.M.	HST
SEPT. 4	21	44	33.1	19.44 N.	155.46 W.	10	...	...	3.0H	...	H	SEPT. 4	11	A.M.	HST
SEPT. 5	11	59	21.2	19.45 N.	155.76 W.	10	...	...	3.1H	...	H	SEPT. 5	01	A.M.	HST
SEPT. 5	19	39	59.1	21.50 N.	157.70 W.	10	...	...	3.5H	...	H	SEPT. 5	09	A.M.	HST
SEPT. 7	23	51	06.7	19.37 N.	155.32 W.	30	...	...	4.5H	III	H	SEPT. 7	01	P.M.	HST
SEPT. 10	03	09	55.3	19.35 N.	155.13 W.	8	...	...	3.4H	...	H	SEPT. 9	05	P.M.	HST
SEPT. 12	22	44	16.7	19.43 N.	155.29 W.	13	...	...	3.0H	III	H	SEPT. 12	12	P.M.	HST
SEPT. 13	11	04	39.8	19.43 N.	155.27 W.	4	...	...	3.0H	III	H	SEPT. 13	01	A.M.	HST
SEPT. 13	13	57	05.7	19.37 N.	155.11 W.	7	...	...	3.0H	...	H	SEPT. 13	03	A.M.	HST

Table 1.—Summary of U.S. earthquakes for July–September 1977—Continued

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time	
	hr	min	s				mb	MS	ML or mbLg			Date	Hour
HAWAII—Continued													
SEPT. 13	16	00	04.5	19.37 N.	155.11 W.	8	...	...	3.3H	II	H	SEPT. 13 06 A.M. HST
SEPT. 13	22	13	13.7	19.39 N.	155.07 W.	0	...	...	3.3H	...	H	SEPT. 13 12 P.M. HST
SEPT. 13	23	46	44.7	19.40 N.	155.06 W.	0	...	...	3.0H	...	H	SEPT. 13 01 P.M. HST
SEPT. 14	05	12	24.2	19.16 N.	155.05 W.	7	...	...	3.7H	III	H	SEPT. 13 07 P.M. HST
SEPT. 14	07	31	56.6	19.35 N.	155.06 W.	8	...	...	3.8H	III	H	SEPT. 13 09 P.M. HST
SEPT. 14	10	17	20.6	19.38 N.	155.10 W.	8	...	...	3.5H	...	H	SEPT. 14 00 A.M. HST
SEPT. 14	10	20	17.6	19.35 N.	155.29 W.	1	...	...	3.8H	...	H	SEPT. 14 00 A.M. HST
SEPT. 14	13	10	03.4	19.08 N.	153.99 W.	31	...	...	4.1H	...	H	SEPT. 14 03 A.M. HST
SEPT. 14	15	18	41.9	19.39 N.	154.99 W.	7	...	...	3.1H	...	H	SEPT. 14 05 A.M. HST
SEPT. 14	16	20	54.1	19.36 N.	155.06 W.	7	...	...	3.2H	...	H	SEPT. 14 06 A.M. HST
SEPT. 14	18	42	15.7	19.35 N.	154.98 W.	9	...	...	3.0H	...	H	SEPT. 14 08 A.M. HST
SEPT. 14	21	07	38.4	19.36 N.	155.02 W.	6	...	...	3.4H	III	H	SEPT. 14 11 A.M. HST
SEPT. 14	21	29	15.2	19.36 N.	155.03 W.	9	...	...	3.0H	...	H	SEPT. 14 11 A.M. HST
SEPT. 14	21	50	08.3	19.36 N.	155.12 W.	9	...	...	3.6H	...	H	SEPT. 14 11 A.M. HST
SEPT. 15	04	04	47.4	19.42 N.	155.27 W.	4	...	...	3.1H	III	H	SEPT. 14 06 P.M. HST
SEPT. 15	04	59	46.0	19.37 N.	155.25 W.	1	...	...	3.5H	...	H	SEPT. 14 06 P.M. HST
SEPT. 15	11	32	22.3	19.36 N.	154.97 W.	3	...	...	3.1H	...	H	SEPT. 15 01 A.M. HST
SEPT. 15	16	21	46.3	19.35 N.	155.28 W.	3	...	...	3.3H	...	H	SEPT. 15 06 A.M. HST
SEPT. 15	16	46	20.3	19.33 N.	155.12 W.	8	...	...	3.7H	III	H	SEPT. 15 06 A.M. HST
SEPT. 15	18	09	03.3	19.38 N.	155.33 W.	28	...	...	3.0H	...	H	SEPT. 15 08 A.M. HST
SEPT. 15	21	14	36.8	19.37 N.	154.97 W.	4	...	...	3.5H	...	H	SEPT. 15 11 A.M. HST
SEPT. 15	22	03	42.5	19.37 N.	154.99 W.	3	...	...	3.0H	...	H	SEPT. 15 12 P.M. HST
SEPT. 16	00	46	02.0	19.36 N.	155.03 W.	7	...	...	3.1H	II	H	SEPT. 15 02 P.M. HST
SEPT. 16	04	50	05.5	19.35 N.	155.07 W.	8	...	...	4.0H	III	H	SEPT. 15 06 P.M. HST
SEPT. 16	19	20	34.1	19.36 N.	154.98 W.	4	...	...	3.1H	...	H	SEPT. 16 09 A.M. HST
SEPT. 16	21	37	44.0	19.37 N.	155.07 W.	8	...	...	3.3H	...	H	SEPT. 16 11 A.M. HST
SEPT. 16	23	59	11.1	19.46 N.	155.36 W.	6	...	...	3.3H	...	H	SEPT. 16 01 P.M. HST
SEPT. 17	06	26	13.4	19.34 N.	155.07 W.	7	...	...	3.3H	...	H	SEPT. 16 08 P.M. HST
SEPT. 18	01	19	23.7	19.37 N.	155.11 W.	9	...	...	3.7H	III	H	SEPT. 17 03 P.M. HST
SEPT. 18	20	58	59.3	19.37 N.	155.11 W.	7	...	...	3.1H	...	H	SEPT. 18 10 A.M. HST
SEPT. 19	12	59	10.0	19.32 N.	155.23 W.	10	...	...	3.5H	...	H	SEPT. 19 02 A.M. HST
SEPT. 19	13	37	50.7	19.36 N.	155.26 W.	0	...	...	3.5H	...	H	SEPT. 19 03 A.M. HST
SEPT. 19	17	14	39.4	19.36 N.	155.14 W.	8	...	...	3.2H	...	H	SEPT. 19 07 A.M. HST
SEPT. 19	19	01	45.2	19.36 N.	155.13 W.	9	...	...	4.1H	III	H	SEPT. 19 09 A.M. HST
SEPT. 20	01	17	31.8	19.36 N.	155.04 W.	7	...	...	3.0H	...	H	SEPT. 19 03 P.M. HST
SEPT. 20	02	03	14.2	19.25 N.	155.50 W.	10	...	...	3.0H	...	H	SEPT. 19 04 P.M. HST
SEPT. 23	12	08	44.1	19.36 N.	155.05 W.	8	...	...	4.0H	IV	H	SEPT. 23 02 A.M. HST
SEPT. 23	12	59	56.9	19.42 N.	155.26 W.	5	...	...	3.0H	III	H	SEPT. 23 02 A.M. HST
SEPT. 23	20	33	40.1	19.28 N.	155.37 W.	9	...	...	3.5H	...	H	SEPT. 23 10 A.M. HST
SEPT. 27	04	05	39.8	19.35 N.	155.06 W.	7	...	...	3.2H	III	H	SEPT. 26 06 P.M. HST
SEPT. 27	05	52	26.7	19.38 N.	154.98 W.	7	...	...	3.0H	...	H	SEPT. 26 07 P.M. HST
SEPT. 27	12	33	51.3	19.35 N.	155.06 W.	7	...	...	3.0H	...	H	SEPT. 27 02 A.M. HST
SEPT. 28	17	38	01.2	19.36 N.	155.06 W.	7	...	...	3.8H	III	H	SEPT. 28 07 A.M. HST
SEPT. 29	06	17	40.9	18.85 N.	155.39 W.	42	...	...	3.0H	...	H	SEPT. 28 08 P.M. HST
IDAHO													
AUG. 13	10	13	07.6	44.65 N.	114.61 W.	5	...	...	3.3A	...	G	AUG. 13 03 A.M. MST
AUG. 25	12	07	11.5	44.64 N.	114.60 W.	5	...	...	3.1A	...	G	AUG. 25 05 A.M. MST
AUG. 29	12	56	23.4	44.66 N.	114.52 W.	5	3.2	...	4.3G	...	G	AUG. 29 05 A.M. MST	
SEPT. 6	11	32	14.3	44.44 N.	111.88 W.	5	...	...	3.0A	...	G	SEPT. 6 04 A.M. MST
MONTANA													
AUG. 27	05	23	49.1	46.00 N.	111.69 W.	10	4.5	...	3.7G	...	G	AUG. 26 10 P.M. MST	
SEPT. 4	20	54	20.2	46.60 N.	112.14 W.	5	...	...	3.2A	V	G	SEPT. 4 01 P.M. MST
NEVADA													
JULY 21	16	06	22.1	37.23 N.	114.97 W.	7	...	...	3.3G	...	G	JULY 21 08 A.M. PST
JULY 28	14	07	00.2	37.11 N.	116.08 W.	5	...	...	3.7B	...	G	JULY 28 06 A.M. PST
AUG. 4	16	40	00.1	37.09 N.	116.01 W.	0	5.0	5.7	5.0B	...	A	AUG. 4 08 A.M. PST	
AUG. 7	01	10	35.5	39.10 N.	115.62 W.	5	...	...	3.0G	...	G	AUG. 6 05 P.M. PST
AUG. 8	04	51	41.5	37.58 N.	117.71 W.	2	...	...	4.0B	...	B	AUG. 7 08 P.M. PST

Table 1.—Summary of U.S. earthquakes for July–September 1977—Continued

Date (1977)	Origin time (UTC)			Lat	Long	Depth (km)	Magnitude			Maximum intensity	Hypocenter source	Local time	
	hr	min	s				mb	MS	ML or mblg			Date	Hour
NEVADA--Continued													
AUG. 16	14	41	00.4	37.15 N.	116.06 W.	5	...	...	3.5B	...	G	AUG. 16	06 A.M. PST
AUG. 16	15	49	00.2	37.16 N.	116.05 W.	5	...	...	4.0B	...	G	AUG. 16	07 A.M. PST
AUG. 19	17	32	00.1	37.04 N.	116.01 W.	5	...	...	3.5B	...	G	AUG. 19	09 A.M. PST
AUG. 19	17	55	00.1	37.11 N.	116.06 W.	0	5.6	...	5.5B	...	A	AUG. 19	09 A.M. PST
SEPT. 15	14	36	30.1	37.03 N.	116.04 W.	0	4.5	...	4.1B	...	A	SEPT. 15	06 A.M. PST
SEPT. 27	14	00	00.2	37.15 N.	116.07 W.	0	4.8	...	4.8B	...	A	SEPT. 27	06 A.M. PST
NEW YORK													
SEPT. 28	17	21	44.7	44.39 N.	73.89 W.	3	...	...	3.1L	III	L	SEPT. 28	12 P.M. EST
OREGON--OFF THE COAST													
JULY 16	19	06	21.3	43.70 N.	127.60 W.	15	4.6	...	...	...	G	JULY 16	11 A.M. PST
JULY 25	21	38	39.6	43.98 N.	128.63 W.	15	4.1	...	...	...	G	JULY 25	01 P.M. PST
JULY 28	15	22	18.5	44.24 N.	128.97 W.	15	5.1	5.4	...	...	G	JULY 28	07 A.M. PST
AUG. 25	18	04	02.6	44.01 N.	129.26 W.	15	4.2	...	...	...	G	AUG. 25	10 A.M. PST
SOUTH CAROLINA													
AUG. 25	04	20	07.0	33.39 N.	80.69 W.	10	...	...	3.1V	V	G	AUG. 24	11 P.M. EST
TENNESSEE													
JULY 27	22	03	21.3	35.42 N.	84.42 W.	7	...	...	3.5V	V	G	JULY 27	05 P.M. EST
UTAH													
SEPT. 30	10	19	21.0	40.52 N.	110.44 W.	5	5.0	...	5.1G	VI	G	SEPT. 30	03 A.M. MST
SEPT. 30	12	56	02.7	40.58 N.	110.60 W.	5	...	...	3.5G	...	G	SEPT. 30	05 A.M. MST
WASHINGTON													
JULY 10	07	19	30.3	48.53 N.	122.45 W.	11	4.3	...	3.4G	V	W	JULY 9	11 P.M. PST
JULY 13	07	15	06.3	47.06 N.	120.96 W.	0	...	...	3.6G	V	W	JULY 12	11 P.M. PST
JULY 25	21	04	03.8	48.07 N.	122.85 W.	55	...	...	3.2G	V	W	JULY 25	01 P.M. PST

Table 2.—Summary of macroseismic data for U.S. earthquakes, July–September 1977

[Sources of the hypocenter and magnitudes: (A) U.S. Energy Research and Development Administration; (B) University of California, Berkeley; (D) University of Montana, Missoula; (G) U.S. Geological Survey, National Earthquake Information Service; (H) U.S. Geological Survey, Hawaiian Volcano Observatory; (M) NOAA, Alaska Tsunami Warning Center, Palmer; (P) California Institute of Technology, Pasadena; (V) Virginia Polytechnic Institute and State University, Blacksburg; (W) University of Washington, Seattle. Dates and origin times are listed in Universal Coordinated Time (UTC) giving the hour, minute, and second. Epicenters are shown in decimal degrees. Only earthquakes with intensity data and explosions are listed]

Alaska	Alaska--Continued
8 July (G) Southern Alaska Origin time: 19 59 39.9 Epicenter: 61.17 N., 150.85 W. Depth: 72 km	Magnitude: 4.7 mb Intensity V: Anchorage (Main Station, Mountain View, Spenard Station), Chugiak. Intensity III: Fort Richardson.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Alaska--Continued	
8 July (G) Southern Alaska	
Origin time:	20 32 46.7
Epicenter:	62.33 N., 150.10 W.
Depth:	18 km
Magnitude:	3.7 ML(M)
<u>Intensity III:</u>	Talkeetna.
11 July (G) Central Alaska	
Origin time:	15 57 17.2
Epicenter:	64.56 N., 147.27 W.
Depth:	14 km
Magnitude:	4.5 mb, 4.2 MS, 4.6 ML(M)
<u>Intensity V:</u>	College, Eilson Air Force Base, Ester (many awakened, a few frightened).
<u>Intensity IV:</u>	Fairbanks.
<u>Intensity II:</u>	Nenana.
20 July (G) Alaska Peninsula	
Origin time:	13 24 25.9
Epicenter:	54.61 N., 161.60 W.
Depth:	53 km
Magnitude:	5.3 mb
<u>Intensity V:</u>	Cold Bay (awakened and frightened many, buildings creaked and trembled, small objects and light furniture shifted), False Pass (small objects shifted), King Cove (many awakened and frightened, small objects shifted), Sand Point (a few people frightened, water in small containers disturbed).
22 July (G) Southern Alaska	
Origin time:	05 57 00.5
Epicenter:	61.03 N., 150.40 W.
Depth:	51 km
Magnitude:	3.8 mb, 4.0 ML(M)
<u>Intensity III:</u>	Anchorage, Palmer.
26 July (G) Southern Alaska	
Origin time:	18 39 21.7
Epicenter:	62.53 N., 149.04 W.
Depth:	69 km
Magnitude:	None computed.
<u>Intensity IV:</u>	Talkeetna.
<u>Intensity III:</u>	Palmer, Wasilla.
<u>Intensity II:</u>	Anchorage.
4 August (G) Southern Alaska	
Origin time:	15 10 24.6
Epicenter:	59.53 N., 152.89 W.
Depth:	102 km
Magnitude:	None computed.
<u>Intensity II:</u>	Palmer.
15 August (G) Andreanof Islands, Aleutian Islands	
Origin time:	00 24 33.2
Epicenter:	51.59 N., 176.38 W.
Depth:	63 km
Magnitude:	4.5 mb
<u>Intensity IV:</u>	Adak.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Alaska--Continued	
16 August (G) Northern Alaska	
Origin time:	06 30 18.5
Epicenter:	67.52 N., 150.25 W.
Depth:	39 km
Magnitude:	3.5 ML(M)
<u>Intensity IV:</u>	Wiseman.
17 August (G) Andreanof Islands, Aleutian Islands	
Origin time:	16 48 31.3
Epicenter:	51.87 N., 175.34 W.
Depth:	57 km
Magnitude:	5.4 mb
<u>Intensity IV:</u>	Adak.
18 August (G) Andreanof Islands, Aleutian Islands	
Origin time:	19 02 49.0
Epicenter:	51.83 N., 175.18 W.
Depth:	Normal.
Magnitude:	4.2 mb
<u>Intensity II:</u>	Adak.
29 August (G) Andreanof Islands, Aleutian Islands	
Origin time:	20 59 59.2
Epicenter:	51.56 N., 173.97 W.
Depth:	25 km
Magnitude:	5.4 mb, 5.1 MS, 5.2 MS(B)
<u>Intensity II:</u>	Adak.
30 August (G) Southern Alaska	
Origin time:	06 50 39.9
Epicenter:	63.16 N., 151.11 W.
Depth:	130 km
Magnitude:	5.0 mb
<u>Intensity V:</u>	Cantwell, Chugiak, Eagle River, McKinley Park, Wasilla, Willow.
<u>Intensity IV:</u>	Talkeetna.
<u>Intensity III:</u>	Anchorage, Palmer.
30 August (G) Andreanof Islands, Aleutian Islands	
Origin time:	15 12 27.6
Epicenter:	51.38 N., 173.79 W.
Depth:	Normal.
Magnitude:	5.4 mb, 5.0 MS
<u>Intensity II:</u>	Adak.
4 September (G) Rat Islands, Aleutian Islands	
Origin time:	15 40 57.3
Epicenter:	51.21 N., 178.39 E.
Depth:	34 km
Magnitude:	5.6 mb, 6.4 MS, 6.1 MS(P), 6.3 MS(B), 6.4 MS(L)
<u>Intensity II:</u>	Adak, Shemya.
4 September (G) Rat Islands, Aleutian Islands	
Origin time:	17 10 30.6
Epicenter:	51.10 N., 178.26 E.
Depth:	31 km
Magnitude:	5.5 mb, 6.4 MS, 6.2 MS(P), 6.4 MS(L)
<u>Intensity II:</u>	Adak, Shemya.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Alaska--Continued	
4 September (G) Rat Islands, Aleutian Islands	
Origin time:	17 24 42.8
Epicenter:	51.14 N., 177.95 E.
Depth:	8 km
Magnitude:	5.8 mb, 6.6 MS, 6.4 MS(P), 6.7 MS(L)
<u>Intensity II:</u>	Adak, Shemya.
9 September (G) Southern Alaska	
Origin time:	15 58 56.4
Epicenter:	62.19 N., 149.53 W.
Depth:	59 km
Magnitude:	4.6 mb
<u>Intensity II:</u>	Anchorage, Palmer.
17 September (G) Southern Alaska	
Origin time:	18 26 29.9
Epicenter:	61.03 N., 152.92 W.
Depth:	150 km
Magnitude:	4.8 mb
<u>Intensity IV:</u>	Kenai.
<u>Intensity II:</u>	Anchorage, Wasilla, Whittier.
17 September (G) Central Alaska	
Origin time:	21 25 21.4
Epicenter:	64.82 N., 147.43 W.
Depth:	20 km
Magnitude:	4.0 ML(M)
<u>Intensity IV:</u>	Fairbanks.

California

3 July (B) Central California	
Origin time:	19 46 53.0
Epicenter:	37.38 N., 121.75 W.
Depth:	4 km
Magnitude:	3.2 ML
<u>Intensity III:</u>	San Jose area (B).
3 July (B) Central California	
Origin time:	20 21 24.4
Epicenter:	37.35 N., 121.72 W.
Depth:	7 km
Magnitude:	3.3 ML
<u>Intensity III:</u>	San Jose area (B).
12 July (B) Northern California	
Origin time:	01 43 28.5
Epicenter:	40.28 N., 123.69 W.
Depth:	20 km
Magnitude:	5.0 mb, 3.8 MS, 4.1 ML
<u>Intensity V:</u>	Alderpoint, Blocksburg, Bridgeville, Burnt Ranch, Carlotta, Denny, Eureka, Fort Bragg, Fortuna, Garberville, Hayfork, Hyampom, Korbel, Leggett, Loleta, Mad River, Miranda, Phillipsville, Piercy, Platina, Rio Dell, Scotia, Weott, Whitehorn.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

California--Continued	
<u>Intensity IV:</u>	Ferndale, Kneeland, Ruth.
<u>Intensity III:</u>	Blue Lake, Forks of Salmon.
<u>Intensity II:</u>	Big Bar, Redding, Trinidad.
12 July (B) Northern California	
Origin time:	05 17 11.2
Epicenter:	40.28 N., 123.66 W.
Depth:	21 km
Magnitude:	3.5 ML
<u>Intensity V:</u>	Bridgeville, Garberville, Leggett, Miranda, Phillipsville, Weott.
12 July (B) Northern California	
Origin time:	15 22 55.8
Epicenter:	40.28 N., 123.69 W.
Depth:	19 km
Magnitude:	3.3 ML
<u>Intensity V:</u>	Petrolia, Rio Dell.
<u>Intensity IV:</u>	Ferndale, Garberville (B), Phillipsville.
13 July (P) Southern California	
Origin time:	08 12 48.6
Epicenter:	34.00 N., 116.83 W.
Depth:	11 km
Magnitude:	3.0 ML
<u>Intensity V:</u>	Forest Falls (awakened people, buildings trembled, movement and moderate earth noise heard from northeast-southwest).
14 July (B) Central California	
Origin time:	11 38 05.7
Epicenter:	36.56 N., 121.21 W.
Depth:	5 km
Magnitude:	3.2 ML
<u>Intensity V:</u>	Pinnacles National Monument--37 km south of Paicines (all in area awakened; buildings creaked; windows, doors, and dishes rattled; small objects moved).
19 July (B) Northern California	
Origin time:	23 50 30.6
Epicenter:	38.05 N., 121.99 W.
Depth:	2 km
Magnitude:	3.5 ML
<u>Intensity V:</u>	Martinez (buildings trembled).
<u>Intensity III:</u>	Berkeley (B), Walnut Creek (B).
<u>Intensity II:</u>	Suisun City.
26 July (B) Central California	
Origin time:	21 42 16.3
Epicenter:	35.94 N., 120.47 W.
Depth:	9 km
Magnitude:	3.7 ML
<u>Intensity V:</u>	Cholame (a few frightened).
<u>Intensity III:</u>	San Miguel.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

California—Continued	
27 July (B) Central California	
Origin time:	11 10 46.7
Epicenter:	36.90 N., 121.51 W.
Depth:	2 km
Magnitude:	3.2 ML
<u>Intensity III:</u>	San Juan Bautista.
27 July (B) Central California	
Origin time:	21 51 17.5
Epicenter:	37.31 N., 122.16 W.
Depth:	11 km
Magnitude:	3.5 ML
<u>Intensity V:</u>	Boulder Creek.
<u>Intensity III:</u>	Cupertino, San Francisco South Bay area, San Jose.
30 July (B) Central California	
Origin time:	16 35 38.1
Epicenter:	36.91 N., 121.48 W.
Depth:	11 km
Magnitude:	3.8 ML(B)
<u>Intensity III:</u>	Hollister area.
2 August (B) Central California	
Origin time:	02 31 43.8
Epicenter:	37.91 N., 122.30 W.
Depth:	3 km
Magnitude:	2.8 ML
<u>Intensity IV:</u>	Albany, Berkeley, El Cerrito (shook walls, rattled windows and glass—all from press report).
3 August (P) Southern California	
Origin time:	22 08 33.7
Epicenter:	33.83 N., 118.13 W.
Depth:	11 km
Magnitude:	2.8 ML
<u>Intensity II:</u>	Cerritos.
12 August (P) Southern California	
Origin time:	02 19 26.1
Epicenter:	34.38 N., 118.47 W.
Depth:	10 km
Magnitude:	4.1 mb(G), 4.4 ML, 4.8 ML(B)
This earthquake was felt over an area of approximately 10,000 sq km (fig. 7).	
<u>Intensity VI:</u>	Acton (pictures fell), Los Angeles (windows broken), Northridge (several shopping-center windows broken—press report), Reseda (cracks in exterior walls), San Fernando (one 17-year-old girl injured when a shelf of dishes fell on her at her home—press report), Studio City (cracked plaster), Van Nuys (some windows broken, plaster cracked, many people frightened).
<u>Intensity V:</u>	Agoura, Beverly Hills, Burbank, Calabasas, Camarillo, Canoga Park,

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

California—Continued	
Canyon Country, Castaic, Chatsworth, Compton, East Irvine, El Monte, Fillmore, Fullerton, Glendale (windows cracked), Granada Hills (water sloshed from swimming pool—press report), Green Valley, Hollywood (press report), Inglewood, La Canada, La Crescenta, Lake Hughes, La Mirada, Long Beach, Lynwood, Malibu, Manhattan Beach, Maywood, Mission Hills, Montebello, Moorpark, Newbury Park, Newhall, Norco, North Glendale, North Hollywood, North Palm Springs, Oxnard, Pacoima, Palmdale, Panorama City, Pasadena, Piru, Reseda, Riverside, San Gabriel, Santa Barbara, Santa Monica, Saugus, Sepulveda, Sherman Oaks, Simi Valley, Somis, Sunland, Sun Valley, Sylmar, Ventura.	
<u>Intensity IV:</u>	Big Bear City, Bryn Mawr, La Habra, Osbourne, Placentia, San Bernardino, San Pedro, Topanga, Verdugo Viejo, West Covina.
<u>Intensity III:</u>	Anza, Portuguese Bend.
<u>Intensity II:</u>	East Los Angeles, Gardena, Montalvo, Montrose, Santa Paula.
12 August (P) Southern California	
Origin time:	04 41 38.0
Epicenter:	34.38 N., 118.45 W.
Depth:	5 km
Magnitude:	3.3 ML
<u>Intensity III:</u>	Sylmar.
14 August (B) Central California	
Origin time:	14 25 34.8
Epicenter:	37.74 N., 121.92 W.
Depth:	9 km
Magnitude:	3.4 ML
<u>Intensity III:</u>	Dublin (B), Pleasanton (B), San Ramon (B).
5 September (B) Northern California	
Origin time:	17 45 28.2
Epicenter:	38.19 N., 122.12 W.
Depth:	8 km
Magnitude:	3.7 ML(B)
<u>Intensity VI:</u>	Eastmont—in the Oakland area (unconfirmed report of cracked plaster).
8 September (B) Northern California	
Origin time:	00 28 20.8
Epicenter:	38.68 N., 122.75 W.
Depth:	7 km
Magnitude:	4.0 mb(G), 3.8 ML
<u>Intensity V:</u>	Calistoga.
<u>Intensity IV:</u>	Healdsburg and much of Sonoma County (press report).
<u>Intensity II:</u>	Cloverdale.
11 September (B) Northern California	
Origin time:	05 18 46.1
Epicenter:	38.68 N., 122.80 W.

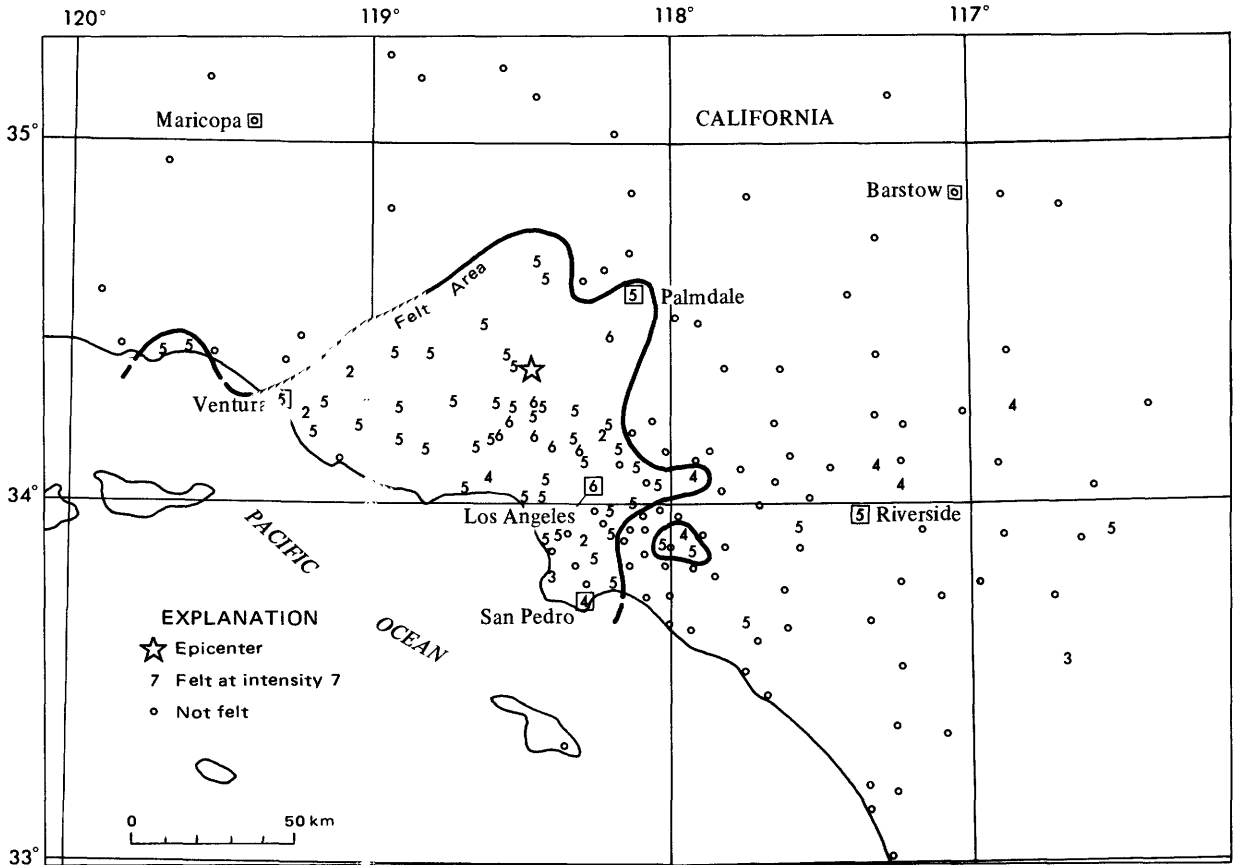


FIGURE 7.--Intensity map for the southern California earthquake of 12 August 1977, 02 19 26.1 UTC. Arabic numerals are used to represent Modified Mercalli intensities at specific sites.

Table 2.--Summary of macroseismic data for U.S. earthquakes, July-September 1977--Continued

California--Continued

Depth: 9 km
 Magnitude: 3.8 mb(G), 3.7 ML
Intensity V: Geyserville.
Intensity III: Healdsburg (B).

11 September (B) Northern California
 Origin time: 23 46 12.2
 Epicenter: 38.70 N., 122.80 W.
 Depth: 12 km
 Magnitude: 3.9 mb(G), 4.0 ML
Intensity V: Calistoga, Cloverdale, Cobb, Geyserville, Stewarts Point.
Intensity IV: Finley, Healdsburg (G).

12 September (P) Southern California
 Origin time: 06 17 42.6
 Epicenter: 34.22 N., 116.98 W.
 Depth: 5 km
 Magnitude: 3.2 ML
Intensity II: San Bernardino Mountain area.

Table 2.--Summary of macroseismic data for U.S. earthquakes, July-September 1977--Continued

California--Continued

14 September (P) Southern California
 Origin time: 21 35 23.3
 Epicenter: 33.88 N., 117.82 W.
 Depth: 2 km
 Magnitude: 2.7 ML
Intensity III: Fullerton, Placentia, Yorba Linda.

19 September (P) Southern California
 Origin time: 10 34 54.6
 Epicenter: 33.95 N., 117.78 W.
 Depth: 9 km
 Magnitude: 2.7 ML
Intensity II: Diamond Bar (P).

22 September (P) Southern California
 Origin time: 09 41 10.5
 Epicenter: 33.98 N., 116.58 W.
 Depth: 5 km
 Magnitude: 3.5 ML

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

California--Continued	
	<u>Intensity IV</u> : Forest Falls, Morongo Valley. <u>Intensity III</u> : Coachella Valley (P).
22 September (B) Northern California	Origin time: 20 48 42.9 Epicenter: 38.60 N., 122.76 W. Depth: 5 km Magnitude: 4.0 mb(G), 3.8 ML <u>Intensity V</u> : Geyserville, Middletown. <u>Intensity IV</u> : Healdsburg. <u>Intensity III</u> : Cobb (B), Santa Rosa (B).
24 September (P) Southern California	Origin time: 21 28 24.3 Epicenter: 34.47 N., 118.42 W. Depth: 5 km Magnitude: 3.9 mb(G), 4.2 ML <u>Intensity VI</u> : Los Angeles (hairline cracks in exterior walls--unconfirmed). <u>Intensity V</u> : Alhambra, Burbank, Canoga Park, Downey, Glendale, Granada Hills, La Canada, La Crescenta, Lake Hughes, Lancaster, Montrose, Newhall, North Glendale, North Hollywood, Northridge, Pacoima, Palmdale, San Fernando, Simi Valley, South El Monte, Studio City, Sunland, Sylmar, Temple City, Thousand Oaks, Tujunga, Van Nuys, Ventura. <u>Intensity IV</u> : Acton, Altadena, Atwood, Beverly Hills, Castaic, Hazard, Placentia, Sun Valley, Tarzana. <u>Intensity III</u> : Fillmore, Monrovia.

Colorado

30 September (G) Northeastern Utah
Origin time: 10 19 21.0

See Utah listing.

Georgia

27 July (G) Eastern Tennessee
Origin time: 22 03 21.3

See Tennessee listing.

Hawaii

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

1 July (H) Island of Hawaii
Origin time: 18 14 56.3

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Hawaii--Continued	
	Epicenter: 19.33 N., 155.13 W. Depth: 10 km Magnitude: 3.3 ML <u>Intensity IV</u> : Hilo (H), Volcano (H).
4 July (H) Island of Hawaii	Origin time: 14 20 07.9 Epicenter: 19.93 N., 155.75 W. Depth: 9 km Magnitude: 3.3 ML <u>Intensity IV</u> : Kohala (H).
5 July (H) Island of Hawaii	Origin time: 17 59 42.0 Epicenter: 19.43 N., 155.45 W. Depth: 10 km Magnitude: 4.1 ML <u>Intensity IV</u> : Ocean View (H), Pahala (H). <u>Intensity III</u> : Hawaii Volcanoes National Park (H), Milolii (H).
6 July (H) Island of Hawaii	Origin time: 18 50 18.6 Epicenter: 19.34 N., 155.11 W. Depth: 9 km Magnitude: 3.6 ML <u>Intensity III</u> : Hamakua (H), Hilo (H).
10 July (H) Island of Hawaii	Origin time: 20 46 00.1 Epicenter: 19.37 N., 155.00 W. Depth: 6 km Magnitude: 3.0 ML <u>Intensity III</u> : Wahaula Visitors Center (H).
29 July (H) Island of Hawaii	Origin time: 09 56 27.7 Epicenter: 20.77 N., 156.25 W. Depth: 8 km Magnitude: 3.5 ML <u>Intensity III</u> : Hawaiian Beaches (H).
31 July (H) Island of Hawaii	Origin time: 10 04 19.9 Epicenter: 19.39 N., 155.05 W. Depth: 8 km Magnitude: 3.0 ML <u>Intensity III</u> : Mountain View (H).
8 August (H) Island of Hawaii	Origin time: 07 54 20.3 Epicenter: 19.34 N., 155.22 W. Depth: 10 km Magnitude: 4.1 ML <u>Intensity IV</u> : Black Sands subdivision (H), Hilo (H), Puna (H). <u>Intensity III</u> : Pahala (H), Papaikou (H), Volcano (H).
8 August (H) Island of Hawaii	

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Hawaii—Continued	
Origin time:	13 34 32.3
Epicenter:	19.22 N., 155.04 W.
Depth:	49 km
Magnitude:	3.4 ML
<u>Intensity III:</u>	Volcano (H).
11 August (H) Island of Hawaii	
Origin time:	05 19 16.7
Epicenter:	19.32 N., 155.19 W.
Depth:	9 km
Magnitude:	3.9 ML
<u>Intensity IV:</u>	Hilo (H), Papaikou (H).
<u>Intensity III:</u>	Ahua (H), Black Sands subdivision (H), Pahala (H), Volcano (H).
11 August (H) Island of Hawaii	
Origin time:	09 43 05.0
Epicenter:	19.35 N., 155.23 W.
Depth:	9 km
Magnitude:	3.3 ML
<u>Intensity III:</u>	Volcano.
13 August (H) Island of Hawaii	
Origin time:	22 24 25.5
Epicenter:	20.44 N., 155.62 W.
Depth:	29 km
Magnitude:	4.3 ML
<u>Intensity IV:</u>	Kohala (H).
<u>Intensity III:</u>	Honokaa (H).
<u>Intensity II:</u>	Hilo (H), Kula, Maui (H).
19 August (H) Island of Hawaii	
Origin time:	18 19 13.4
Epicenter:	19.34 N., 155.12 W.
Depth:	10 km
Magnitude:	4.2 ML
<u>Intensity IV:</u>	Kalapana (H).
<u>Intensity III:</u>	Black Sands subdivision (H), Hilo (H), Mountain View (H), Pahoa (H), Volcano (H).
<u>Intensity II:</u>	Kona (H), Pahala (H).
25 August (H) Island of Hawaii	
Origin time:	06 07 13.8
Epicenter:	19.33 N., 155.19 W.
Depth:	10 km
Magnitude:	3.6 ML
<u>Intensity III:</u>	Hilo (H).
30 August (H) Island of Hawaii	
Origin time:	12 46 21.3
Epicenter:	19.38 N., 155.45 W.
Depth:	10 km
Magnitude:	3.9 ML
<u>Intensity IV:</u>	Pahala (H).
<u>Intensity III:</u>	Captain Cook (H), Hilo (H), Papaikou (H).
5 September (H) Northeast of Oahu Island	
Origin time:	19 39 59.1
Epicenter:	21.5 N., 157.7 W.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Hawaii—Continued	
Depth:	10 km
Magnitude:	3.5 ML
<u>Intensity II:</u>	Oahu Island (H).
7 September (H) Island of Hawaii	
Origin time:	23 51 06.7
Epicenter:	19.37 N., 155.32 W.
Depth:	30 km
Magnitude:	4.5 ML
<u>Intensity III:</u>	Hawaiian Volcano Observatory, Hilo (H), Honomu (H), Kamuela (H), Kohala (H), Kurtistown (H), Mountain View (H), Pohakuloa (H), Punaluu (H), Volcano (H).
12 September (H) Island of Hawaii	
Origin time:	22 44 16.7
Epicenter:	19.43 N., 155.29 W.
Depth:	13 km
Magnitude:	3.0 ML
<u>Intensity III:</u>	Hawaiian Volcano Observatory (H), Hilo (H), Volcano (H).
13 September (H) Island of Hawaii	
Origin time:	11 04 39.8
Epicenter:	19.43 N., 155.27 W.
Depth:	4 km
Magnitude:	3.0 ML
<u>Intensity III:</u>	Hawaii Volcanoes National Park (H), Volcano (H).
13 September (H) Island of Hawaii	
Origin time:	16 00 04.5
Epicenter:	19.37 N., 155.11 W.
Depth:	8 km
Magnitude:	3.3 ML
<u>Intensity II:</u>	Hilo (H).
14 September (H) Island of Hawaii	
Origin time:	05 12 24.2
Epicenter:	19.16 N., 155.05 W.
Depth:	7 km
Magnitude:	3.7 ML
<u>Intensity III:</u>	Hilo (H).
14 September (H) Island of Hawaii	
Origin time:	07 31 56.6
Epicenter:	19.35 N., 155.06 W.
Depth:	8 km
Magnitude:	3.8 ML
<u>Intensity III:</u>	Glenwood (H), Hilo (H).
14 September (H) Island of Hawaii	
Origin time:	21 07 38.4
Epicenter:	19.36 N., 155.02 W.
Depth:	6 km
Magnitude:	3.4 ML
<u>Intensity III:</u>	Volcano (H).
15 September (H) Island of Hawaii	
Origin time:	04 04 47.4
Epicenter:	19.42 N., 155.27 W.

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Hawaii--Continued	
Depth:	4 km
Magnitude:	3.1 ML
<u>Intensity III:</u>	Volcano (H).
15 September (H) Island of Hawaii	
Origin time:	16 46 20.3
Epicenter:	19.33 N., 155.12 W.
Depth:	8 km
Magnitude:	3.7 ML
<u>Intensity III:</u>	Volcano (H).
16 September (H) Island of Hawaii	
Origin time:	00 46 02.0
Epicenter:	19.36 N., 155.03 W.
Depth:	7 km
Magnitude:	3.1 ML
<u>Intensity II:</u>	Hilo (H).
16 September (H) Island of Hawaii	
Origin time:	04 50 05.5
Epicenter:	19.35 N., 155.07 W.
Depth:	8 km
Magnitude:	4.0 ML
<u>Intensity III:</u>	Black Sands subdivision (H), Volcano (H).
18 September (H) Island of Hawaii	
Origin time:	01 19 23.7
Epicenter:	19.37 N., 155.11 W.
Depth:	9 km
Magnitude:	3.7 ML
<u>Intensity III:</u>	Hilo (H).
19 September (H) Island of Hawaii	
Origin time:	19 01 45.2
Epicenter:	19.36 N., 155.13 W.
Depth:	9 km
Magnitude:	4.1 ML
<u>Intensity III:</u>	Hilo (H), Kalalua, Nanawale Estates, Papaikou (H), Volcano (H).
23 September (H) Island of Hawaii	
Origin time:	12 08 44.1
Epicenter:	19.36 N., 155.05 W.
Depth:	8 km
Magnitude:	4.0 ML
<u>Intensity IV:</u>	Glenwood (H), Hilo (H), Volcano (H).
<u>Intensity III:</u>	Mauna Kea Observatory (H), Puako.
23 September (H) Island of Hawaii	
Origin time:	12 59 56.9
Epicenter:	19.42 N., 155.26 W.
Depth:	5 km
Magnitude:	3.0 ML
<u>Intensity III:</u>	Volcano (H).
27 September (H) Island of Hawaii	
Origin time:	04 05 39.8

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Hawaii--Continued	
Epicenter:	19.35 N., 155.06 W.
Depth:	7 km
Magnitude:	3.2 ML
<u>Intensity III:</u>	Hilo (H).
28 September (H) Island of Hawaii	
Origin time:	17 38 01.2
Epicenter:	19.36 N., 155.06 W.
Depth:	7 km
Magnitude:	3.8 ML
<u>Intensity III:</u>	Hilo (H).
Idaho	
30 September (G) Northeastern Utah	
Origin time:	10 19 21.0
	See Utah listing.
Montana	
4 September (G) Western Montana	
Origin time:	20 54 20.2
Epicenter:	46.60 N., 112.14 W.
Depth:	5 km
Magnitude:	3.2 ML(A), 2.8 ML(D)
<u>Intensity V:</u>	Canyon Ferry, Helena.
<u>Intensity IV:</u>	East Helena.
Nevada	
4 August (A) Southern Nevada	
Origin time:	16 40 00.074
Epicenter:	37.09 N., 116.01 W.
Depth:	0 km
Magnitude:	5.0 mb(G), 5.7 MS(G), 5.0 ML(B)
	Nevada Test Site explosion "STRAKE" at 37°05'11.65" N., 116°00'24.73" W., surface elevation 1300 m, depth of burial 518 m.
19 August (A) Southern Nevada	
Origin time:	17 55 00.075
Epicenter:	37.11 N., 116.06 W.
Depth:	0 km
Magnitude:	5.6 mb(G), 5.5 ML(B)
	Nevada Test Site explosion "SCANTLING" at 37°06'36.12" N., 116°03'16.23" W., surface elevation 1272 m, depth of burial 701 m.
15 September (A) Southern Nevada	
Origin time:	14 36 30.077

Table 2.--Summary of macroseismic data for U.S. earthquakes,
July-September 1977--Continued

Nevada--Continued	
Epicenter:	37.03 N., 116.04 W.
Depth:	0 km
Magnitude:	4.5 mb(G), 4.1 ML(B)
Nevada Test Site explosion "EBB TIDE" at 37°01'58.05" N., 116°02'35.29" W., surface elevation 1221 m, depth of burial 381 m.	
27 September (A) Southern Nevada	
Origin time:	14 00 00.161
Epicenter:	37.15 N., 116.07 W.
Depth:	0 km
Magnitude:	4.8 mb(G), 4.8 ML(B)
Nevada Test Site explosion "COULMIERS" at 37°09'04.20" N., 116°04'03.20" W., surface elevation 1319 m, depth of burial 530 m.	

New York

28 September (L) Northeastern New York	
Origin time:	17 21 44.7
Epicenter:	44.39 N., 73.89 W.
Depth:	3 km
Magnitude:	3.1 mbLg
<u>Intensity III:</u> Wilmington (press report).	

North Carolina

27 July (G) Eastern Tennessee	
Origin time:	22 03 21.3
See Tennessee listing.	

South Carolina

25 August (G) Southeastern South Carolina	
Origin time:	04 20 07.0
Epicenter:	33.39 N., 80.69 W.
Depth:	10 km
Magnitude:	3.1 mbLg(V)
<u>Intensity V:</u> Bowman (frightened a few people; buildings trembled; windows, doors and dishes rattled).	

Tennessee

27 July (G) Eastern Tennessee	
Origin time:	22 03 21.3
Epicenter:	35.42 N., 84.42 W.
Depth:	7 km

Table 2.--Summary of macroseismic data for U.S. earthquakes,
July-September 1977--Continued

Tennessee--Continued	
Magnitude:	3.5 mbLg(V)
<u>Intensity V:</u>	
North Carolina--Murphy (buildings trembled).	
Tennessee--Athens (felt by many; some were frightened; moderate earth noise heard; windows, doors, and dishes rattled), Coker Creek, Ducktown (buildings trembled, pictures out of place, loud earth noise heard), Englewood, Etowah, Madisonville (a few frightened, buildings trembled, small objects shifted), Postelle, Reliance, Sweetwater, Tellico Plains.	
<u>Intensity IV:</u>	
Georgia--McCaysville.	
Tennessee--Farner, Riceville.	
<u>Intensity III:</u>	
North Carolina--Unaka.	
<u>Intensity II:</u>	
Georgia--Cisco.	

Utah

30 September (G) Northeastern Utah	
Origin time:	10 19 21.0
Epicenter:	40.52 N., 110.44 W.
Depth:	5 km
Magnitude:	5.0 mb, 5.1 ML

A report on this earthquake in "Survey Notes" (Nov. 1977), published by the Utah Geological and Mineral Survey (UGMS) stated "A number of lines of fracturing and faulting, separate from the Uinta Mountains, strike N70°E along the south flank of the mountains and extend out into the basin to the south. These apparently reflect an ancient, deep-seated rupture of the earth's crust that can be traced from near the northeast corner of Utah nearly to the Nevada line. This fracturing and faulting is older than the Uintas and is apparently still active to some extent. The September 30 and October 11 earthquakes occurred along this line (lineament). The lineament has very subtle but definite expression including lines of springs, sinkholes and caves, disturbed drainage lines, and in some places fault scarps with evidence of movement since the end of glacial time, perhaps as recently as 4,000 to a few hundred years.

Bruce Kaliser, UGMS Engineering Geologist, and Howard Ritzma, UGMS Assistant Director, toured the earthquake area for 2 days after the first tremor and found a few indications of minor earth movement. One possible rock fall in Rock Creek Canyon and

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Utah--Continued

slump of a rock slab in Farnsworth Canal (dry) near Moon Lake were noted. Interviews in the area turned up a number of instances of persons awakened in advance of the quake by restless horses and barking and howling dogs. In two instances horses 'raised a ruckus' in barns and corrals for half an hour before the quake. The two geologists also found road repairs in progress where the branch of the lineament on which the quake took place crosses the paved Forest Service Road leading to Moon Lake. The road obviously was not damaged by this quake, but the fault zone (lineament) does appear to coincide with a belt of very unstable ground about 100 feet wide. Where the road crosses this, repairs are required once or twice each year."

Some of the intensity values listed below were from a questionnaire canvass by H. R. Ritzma, UGMS, Salt Lake City; they were evaluated by the U.S. Geological Survey. Figure 8 shows that this earthquake was felt over an area of approximately 20,000 sq km of Colorado and Utah, with isolated intensity values being reported in Idaho and Wyoming.

Intensity VI:

- Colorado--Fruita (plaster cracked--unconfirmed), Grand Junction (stone fence and interior plaster cracked--unconfirmed).
Utah--Mountain Home (septic-system drain reported broken, old mortar of log house cracked at corners, furniture shifted).

Intensity V:

- Colorado--Mack, Maybell, Meeker, Palisade.
Idaho--Downey, Preston.
Utah--Altamont, Altona, Bluebell, Boneta (press report), Duchesne (pictures knocked from walls, windows cracked--press report), Farnsworth Canal (possible slump of rock slab--Survey Notes, 1977), Kamas, Lake Fork River (4.8 km southeast of Fisher Ranch), Rock Creek (cracked windows in Rock Creek Canyon--press report, possible rock fall found by Utah geologists--Survey Notes, 1977), Roosevelt, Salt Lake City, Sunnyside, Tabiona, Talmage, Wellington, White Rocks, Yellowstone River Canyon.

Intensity IV:

- Colorado--Clifton, Gateway, Mesa, Rangely.
Utah--Jensen, Robbins Ranch, Vernal.

Intensity III:

- Wyoming--Rock Springs (H. W. Oliver, U.S. Geological Survey, oral comm., 1977).

Table 2.—Summary of macroseismic data for U.S. earthquakes,
July–September 1977—Continued

Washington

10 July (W) Puget Sound, Washington
Origin time: 07 19 30.3
Epicenter: 48.53 N., 122.45 W.
Depth: 11 km
Magnitude: 4.3 mb(G), 3.4 ML(G)
Intensity V: Bellingham, La Connor, Lyman.
Intensity IV: Acme, Bow.
Intensity III: Clinton.
Intensity II: Hamilton.

13 July (W) Central Washington
Origin time: 07 15 06.3
Epicenter: 47.06 N., 120.96 W.
Depth: 0 km
Magnitude: 3.6 ML(G)
Intensity V: Ronald (awakened and frightened a few people).

25 July (W) Puget Sound, Washington
Origin time: 21 04 03.8
Epicenter: 48.07 N., 122.85 W.
Depth: 55 km
Magnitude: 3.2 ML(G)
Intensity V: Hansville (frightened a few people, buildings trembled), Nordland (buildings trembled).
Intensity II: Chimacum.

Wyoming

- 30 September (G) Northeastern Utah
Origin time: 10 19 21.0
See Utah listing.

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- CALIFORNIA: Clarence R. Allen, Seismological Laboratory, California Institute of Technology, Pasadena.
Bruce A. Bolt, Seismograph Station, University of California, Berkeley.
Gary S. Fuis, U.S. Geological Survey, Pasadena.
- HAWAII: Robert Y. Koyanagi, U.S. Geological Survey, Hawaiian Volcano Observatory, Hawaii National Park.

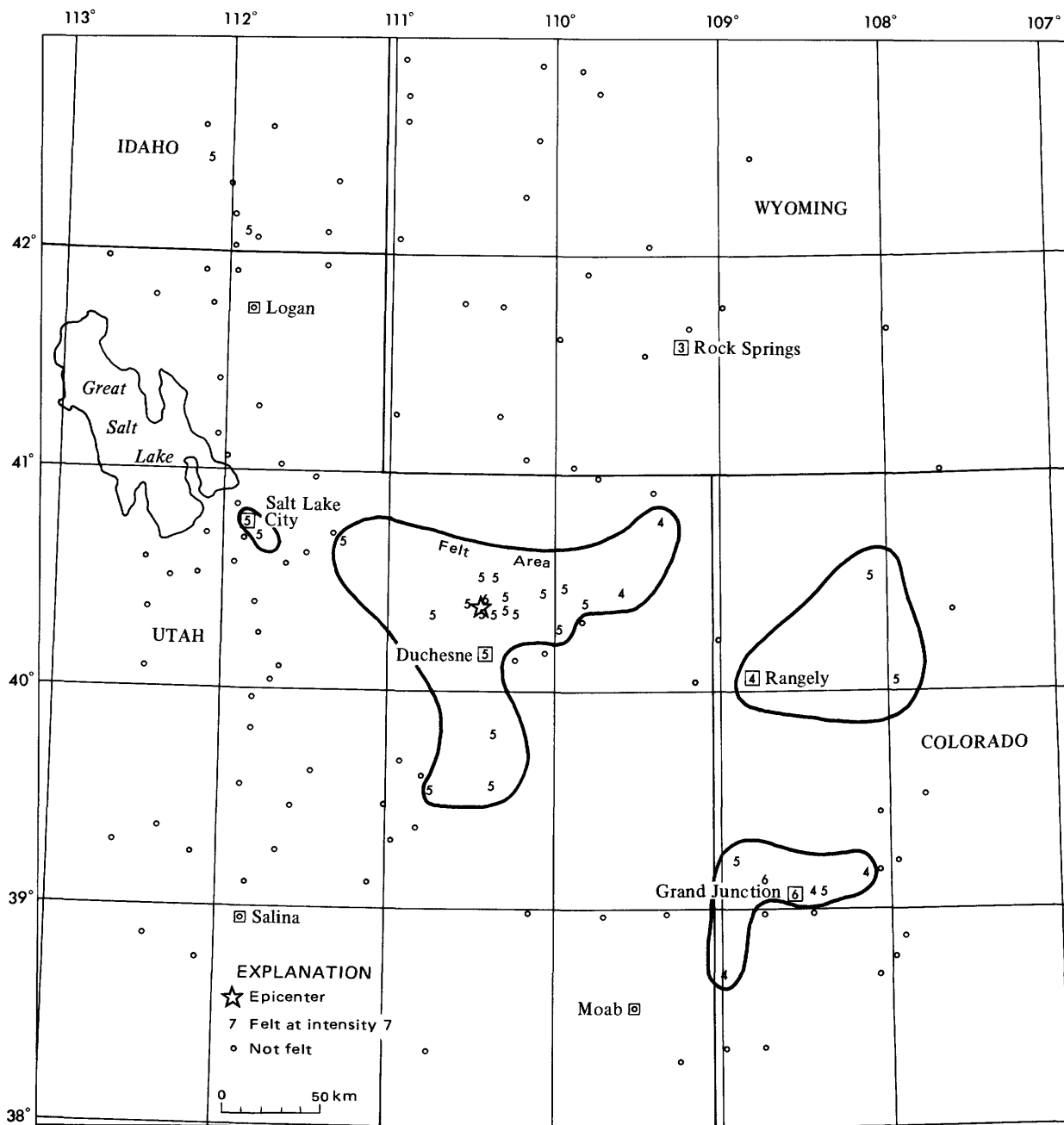


FIGURE 8.--Intensity map for the northeastern Utah earthquake of 30 September 1977, 10 19 21.0 UTC. Arabic numerals are used to represent Modified Mercalli intensities at specific sites.

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