



INTRODUCTION

This map is one of a series of seismicity maps produced by the U. S. Geological Survey that show earthquake data of individual states or groups of states at the scale of 1:1,000,000. This map shows only those earthquakes with epicenters located within the boundaries of Idaho, even though earthquakes in nearby states or countries may have been felt or may have caused damage in Idaho.

The data in table 1 were used to compile the seismicity map; these data are a corrected, expanded, and updated (through 1987) version of the data used by Algermissen (1968) for a study of seismic risk in the United States. The locations and intensities of some earthquakes were revised and intensities were assigned where none had been assigned. Many earthquakes were added to the original list from new data sources, as well as from some old data sources that had not been previously used. The data in table 1 represent best estimates of the location of the earthquake, magnitude, and intensity of each earthquake on the basis of historical and current information. Some of the earthquakes from large earthquakes are listed, but not all, especially for earthquakes that occurred before seismic instruments were universally used.

The latitude and longitude coordinates of each epicenter were rounded to the nearest tenth of a degree and sorted so that all identical locations were grouped and counted. These locations are represented on the map by the number of earthquakes at each location. The number of earthquakes at each location is shown on the map by the Arabic number to the right of the triangle. Roman numerals to the left of a triangle is the maximum Modified Mercalli intensity (Wood and Neumann, 1931) of all earthquakes at that geographic location. The absence of an intensity value indicates that no intensities have been assigned to earthquakes at that location. The year shown below each triangle is the latest year for which the maximum intensity was recorded.

EXPLANATION OF THE TABLE

The data in table 1 are listed chronologically in the following categories: date, origin time in Coordinated Universal Time (UTC), N. latitude, W. longitude, depth, hypocenter quality and reference, magnitude, intensity (Modified Mercalli), and intensity reference. The letter F is recorded in the intensity column if an earthquake was felt but not enough information was available to assign an intensity. Table 1 has some basic limitations in terms of the size (magnitude or intensity) of the earthquakes listed. All felt earthquakes or those with computed magnitudes greater than 2.5 are listed. If no magnitude was computed and the earthquake was felt or an epicenter published, it was included in the earthquake list. The low-magnitude events located in recent years with data from dense seismograph networks have not been included.

Listed below is an explanation of the symbols and codes used in table 1:

- Leaders (...) indicate information not available.
- Latitude and longitude are listed to a hundredth of a degree if they have been published with that degree of accuracy or greater; however, most historical events have assigned locations based on felt or damage information and are listed in table 1 only to the nearest degree or tenth of a degree. An asterisk (*) to the right of the longitude indicates that the latitude and longitude were not given in the source reference but were assigned by the compiler of the data file. An asterisk (*) to the right of the latitude indicates that the event is an explosion, a suspected explosion, a rockburst, or some other non-tectonic event; these have not been plotted on the map. A question mark (?) to the right of the longitude indicates that published descriptions of the event are inconclusive and it may or may not be an earthquake.
- The letter code in the HYPOCENTER, QUAL, and INTENSITY columns is defined below.
 - a. Determinations of instrumental hypocenters are estimated to be accurate within the ranges of latitude and longitude (in decimal degrees) listed below, each range is letter coded as indicated:

A	0.0-0.1
B	0.1-0.2
C	0.2-0.5
D	0.5-1.0
E	1.0 or larger
 - b. Determinations of noninstrumental epicenters from felt data are estimated to be accurate within the ranges of latitude and longitude (in decimal degrees) listed below; each range is letter coded as indicated:

F	0.0-0.5
G	0.5-1.0
H	1.0-2.0
I	2.0 or larger
- The reference identification numbers in the HYPOCENTER, REF and INTENSITY, REF columns indicate the sources of the hypocenter and intensity data. They are listed in numerical order in the list of data sources.
- The magnitudes listed under 1955 are modified from Gutenberg and Richter, 1956) or Ms (Both, 1966) values published in the Preliminary Determination of Epicenters (PDE) by the National Earthquake Information Center, U. S. Geological Survey and predecessor organizations. Associated with the magnitude values listed under OTHER are the source code and type type is defined by MO (duration or code length), Mfo (magnitude based on felt areas or attenuation), M_r (Richter, 1935), M_{sc} (modified M_s), M_n (Nuttall, 1973), M_o (Both, 1966 or Gutenberg, 1945), and M_u (Unknown). Magnitudes computed solely from epicentral intensity have not been included. Moment magnitudes (M) are listed by value and source. The value was computed using the formula by Hanks and Kanamori (1979). The source codes are listed below:
 - BSK - Seismograph Station, University of California, Berkeley, Calif.
 - DW - Dewey, J. W., 1987, Seismological Society of America Bulletin, v. 97, no. 3, p. 819-836.
 - EPB - Seismological Service, Geological Survey of Canada (formerly Earth Physics Branch, Seismological Service of Canada), Ottawa.
 - ERD - U. S. Department of Energy (formerly U. S. Energy Research and Development Administration and U. S. Atomic Energy Commission).
 - GM - U. S. Geological Survey, Menlo Park, Calif.
 - GR - Gutenberg, Beno, and Richter, C. F., 1954, Seismicity of the Earth and Associated Phenomena, New York, McGraw-Hill Publishing Company, 310 p.
 - GS - National Earthquake Information Center, U. S. Geological Survey (and predecessor organizations), Golden, Colo.
 - ISC - International Seismological Centre Bulletin.
 - MT - Montana College of Mineral Sciences and Technology, Butte, Mt.
 - MO - University of Montana, Missoula, Mt.
 - PAS - Seismological Laboratory, California Institute of Technology, Pasadena, Calif.
 - REN - University of Nevada, Mackay School of Mines, Reno, Nev.
 - UU - Seismograph Stations, University of Utah, Salt Lake City, Utah.
- An asterisk (*) in the INTENSITY, M_o column indicates that the intensity was assigned by the compiler on the basis of the available data of the time the catalog was compiled.

REFERENCES

Algermissen, S. T., 1968, Seismic risk studies in the United States: Fourth World Conference on Earthquake Engineering, Santiago, January 13-18, 1968, Proceedings, v. 1, p. 14-27.

Bats, Markus, 1966, Amplitudes of surface waves and magnitudes of shallow earthquakes: Seismological Society of America Bulletin, v. 35, no. 1, p. 3-12.

Gutenberg, Beno, and Richter, C. F., 1954, Seismicity of the Earth and Associated Phenomena, New York, McGraw-Hill Publishing Company, 310 p.

Hanks, T. C., and Kanamori, Hiroo, 1979, A moment magnitude scale: Journal of Geophysical Research, v. 84, no. 23, p. 2361-2369.

Nuttall, D. W., 1973, Seismic wave attenuation and magnitude relations for eastern North America: Journal of Geophysical Research, v. 78, no. 3, p. 876-885.

Richter, C. F., 1935, Elementary seismology: San Francisco, W. H. Freeman and Co., 768 pp.

Wood, H. O., and Neumann, Frank, 1931, Modified Mercalli intensity scale of 1931: Seismological Society of America Bulletin, v. 21, no. 4, p. 277-283.

MODIFIED MERCALLI INTENSITY SCALE OF 1931
Adapted from Sieberg's Mercalli-Cannon scale, modified and condensed (Wood and Neumann, 1931)

- 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; some small objects, structures, liquids, bodies of water, may sway—doors may swing, very slowly.
- Felt indoors by few, especially on upper floors, or by sensitive or nervous persons. Also, on in grade, but not more than locally; sometimes trees, 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.
- Felt indoors by several, motion usually rapid vibration. Sometimes not recognized to be an earthquake at first. Duration of first vibration usually less than 10 seconds; that due to passing of light or lightly loaded trucks, or heavy trucks some distance away. Hanging objects may swing slightly. Swaying may be appreciable on upper levels of tall structures. Rocking standing motor cars slightly.
- Felt indoors by many, outdoors by few. Awakened few, especially light sleepers. Frightened no one, unless apprehensive from previous experiences. Vibration like that due to passing of heavy or heavily loaded trucks, or heavy trucks, and 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.
- 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. Glassware in some extent. Cracked windows—in some cases, but not generally. Overturned vases, small or unstable objects, in many instances, with occasional fall. 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 in 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 neck chimneys, of the roof-line (sometimes damaging roof). Fall of cornices from towers and high buildings. Disturbed bricks and stones. Overturned heavy furniture, with damage from breaking. Damage considerable to concrete irrigation ditches.
- 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 or 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; rickety, tumbled down, wooden houses in some cases; threw out some 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.
- Panic general. Cracked ground conspicuously. Damage considerable in (masonry) structures built especially to withstand earthquakes. Three out of four wood-frame houses built especially to withstand earthquakes; great in substantial (masonry) buildings, some collapse in large parts; or wholly shifted frame buildings off foundations, rocked frames, serious to reservoirs; underground pipes some broken.
- Cracked ground, especially when loose and wet, up to width 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 laterally on beaches and flat lands. Changed level of water in wells, three water on banks of canals, lakes, rivers, etc. Damage serious to dams, dikes, embankments. Severe to well-built wooden structures, destroyed large and medium bridges by the wrecking of supporting piers or pillars. Affected railroad bridges, and crushed endgears, cracks in excellent brick walls. Destroyed most masonry and frame structures, also their foundations. Bent railroad rails slightly, or crushed endgears, pipe lines buried in earth. Open cracks and broad wavy folds in cement pavements and asphalt road surfaces.
- Disturbances in ground many and widespread, varying with ground material. Broad fissures, earth slumps, and land slips in soft, wet ground. Ejected sand and mud in large amounts charged with sand and mud. Caused sea-waves ("tidal" waves) of significant magnitude. Damage severe to wood-frame structures, especially near shore locations. Great to dams, dikes, embankments often for long distances. Few, if any, (masonry) structures remain standing. Destroyed large and medium bridges by the wrecking of supporting piers or pillars. Affected railroad bridges, and crushed endgears, pipe lines buried in earth. Open cracks and broad wavy folds in cement pavements and asphalt road surfaces.
- 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 (locally seen, probably, in some cases). Distorted lines of sight and level. Three objects upward into the air.

SEISMICITY MAP OF THE STATE OF IDAHO
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1991