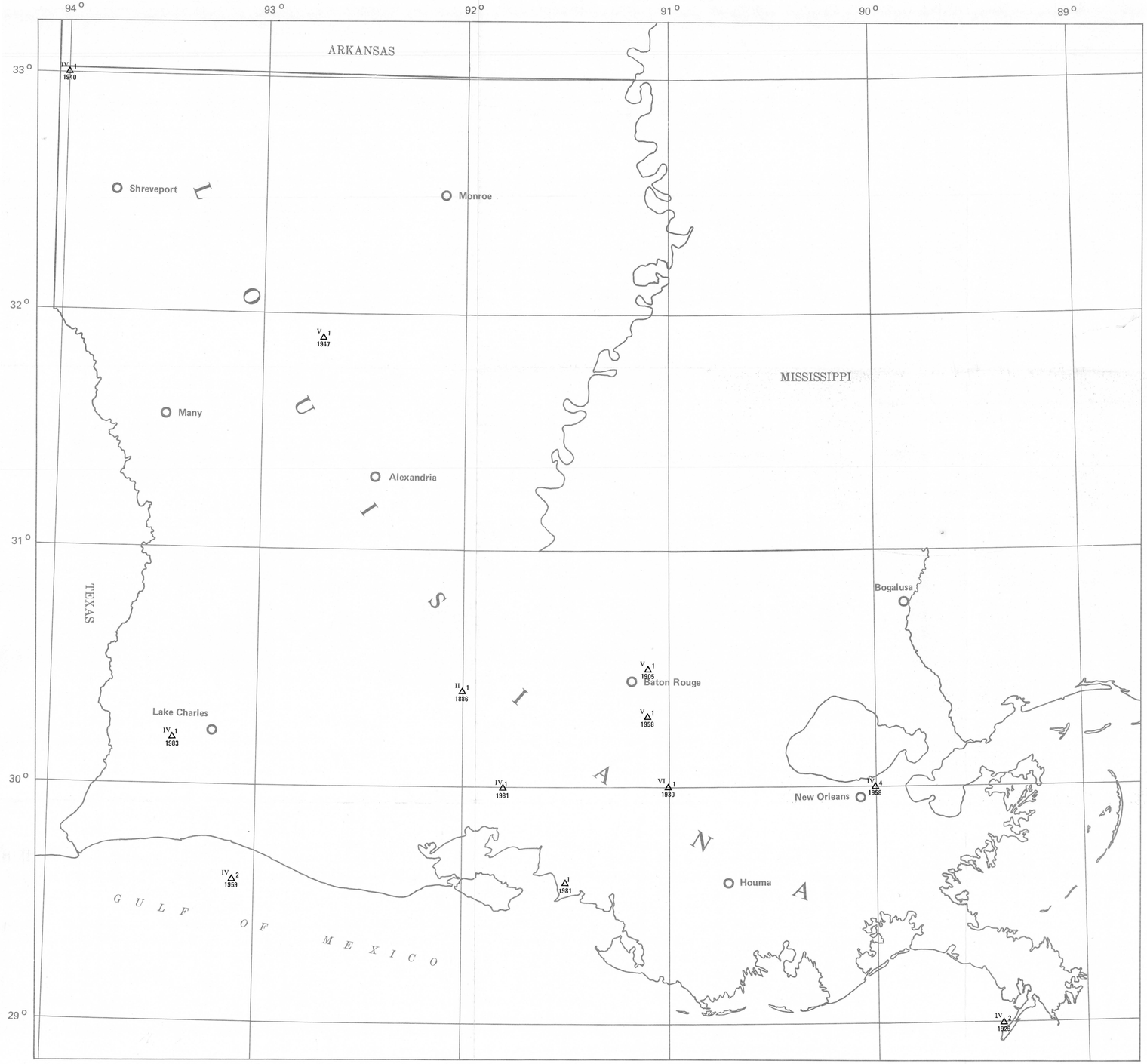
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



SCALE 1:1 000 000

25 0 25 50 75 100 MILES

25 0 25 50 75 100 KILOMETERS

SEISMICITY MAP OF THE STATE OF LOUISIANA

By

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1987

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 Louisiana, even though earthquakes in nearby states or countries may have been felt or may have caused damage in Louisiana.

The data in table 1 were used to compile the seismicity map; these data are a corrected, expanded, and updated (through 1983) version of the data used by Algermissen (1969) 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 before. 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 epicenter, magnitude, and intensity of each eqrthquake on the basis of historical and current information. Some of the aftershocks 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 a triangle. The number of earthquakes at each location is shown on the map by the arabic number to the right of the triangle. A Roman numeral 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 TABLES

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 no other 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:

1. Leaders (..) indicate information not available.
2. 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 compilers of the data file. An x to the right of the longitude indicates that the event is an explosion, a suspected explosion, a rockburst, or some other nontectonic 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.
3. The letter code in the HYPOCENTER, QUAL column is defined below:
   a. Determinations of instrumental hypocenters are estimated to be accurate within the ranges of latitude and longitude 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 to within the ranges of latitude and longitude 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

4. 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.
5. The magnitudes listed under USGS are mb (modified from Gutenberg and Richter, 1956) or Ms (Bath, 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 MD (duration or coda length), Mfa (magnitude based on felt areas or attenuation), Mn (Nuttli, 1973). Magnitudes computed solely from epicentral intensity have not been included. Moment magnitudes (Mw) are listed by value and source. The value was computed using the formula by Hanks and Kanamori (1979). The source codes are listed below:

   BAR – Barstow, N. L., Brill, K. G., Nuttli, O. W., and Pomeroy, P. W., 1981, An approach to seismic zonation for siting nuclear electric power generating for facilities in the eastern United States, NUREG/CR-1577, Washington, D. C.
   TEC – Tennessee Earthquake Information Center, Memphis State University, Memphis, Tenn.
   TUL – Oklahoma Geophysical Observatory, Oklahoma Geological Survey, Leonard, Okla.
6. An asterisk (*) in the INTENSITY, MM column indicates that the intensity was assigned by the compiler on the basis of the available data at the time the catalog was compiled.

REFERENCES

Algermissen, S. T., 1969, Seismic risk studies in the United States: Fourth World Conference on Earthquake Engineering, Santiago, Chile, January 13–18, 1969, Proceedings, v. 1, p. 14–27.
Bath, Markus, 1966, Earthquake energy and magnitude, in Physics and chemistry of the Earth, v. 7: New York, Pergamon Press, p. 115–165.
Gutenberg, Beno, and Richter, C. F., 1956, Magnitude and energy of earthquakes: Annali di Geofisica, v. 9, no. 1, p. 1–15.
Hanks, T. C., and Kanamori, Hiroo, 1979, A moment magnitude scale: Journal of Geophysical Research, v. 84, no. 85, p. 2348–2350.
Nuttli, O. W., 1973, Seismic wave attenuation and magnitude relations for eastern North America: Journal of Geophysical Research, v. 78, no. 5, p. 876–885.
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.

Table 1.--Chronological listing of earthquakes for the State of Louisiana

DATE YEAR	MONTH	DAY	ORIGIN TIME H	M	S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	MAGNITUDE USGS (Ms)	MAGNITUDE OTHER	MAGNITUDE MOMENT (M)	INTENSITY MM	INTENSITY REF
1843	FEB	14	..	..	..	30.0 N.	90.0 W.	..	H	105	..	..	..	..	III*	105
1843	FEB	15	..	..	..	30.0 N.	90.0 W.	..	H	105	..	..	..	..	III*	105
1882	APR	12	05	..	..	30.0 N.	90.0 W.	..	H	105	..	..	..	..	III	105
1886	JAN	22	16	38	..	30.4 N.	92.0 W.	..	G	105	..	..	..	..	II*	105
1905	FEB	03	..	..	..	30.5 N.	91.1 W.	..	G	106	..	..	..	..	V*	106
1927	DEC	15	04	30	..	29.0 N.	89.4 W.	*	G	105	..	..	3.9Mfa	BAR	IV	105
1929	JUL	28	17	..	..	29.0 N.	89.4 W.	..	G	105	..	..	3.8Mfa	BAR	IV	105
1930	OCT	19	12	17	..	30.0 N.	91.0 W.	..	G	3	..	..	4.2Mfa	BAR	VI	38
	Near Donaldsville, Louisiana. At Napoleonville, chimneys were damaged and a window was broken. Plaster cracked at White Castle. Felt area was estimated to be 12,000 sq mi (Docekal;105).															
1940	DEC	02	16	16	..	33.0 N.	94.0 W.	*	G	105	..	..	..	..	IV	13
1947	SEP	20	21	30	..	31.9 N.	92.7 W.	..	G	105	..	..	..	..	V*	105
1958	NOV	06	23	08	..	30.0 N.	90.0 W.	*	G	31	..	..	..	..	IV	31
1958	NOV	19	18	15	..	30.3 N.	91.1 W.	..	G	38	..	..	..	..	V	38
1959	OCT	15	15	45	..	29.6 N.	93.1 W.	..	H	105	..	..	3.6Mfa	BAR	IV	32
1959	OCT	15	..	..	..	29.6 N.	93.1 W.	..	H	105	..	..	..	..	III*	105
1981	FEB	13	02	15	..	30.0 N.	91.8 W.	*	C	325	..	..	..	..	IV	325
1981	FEB	18	06	33	48.2	29.56 N.	91.46 W.	005	B	325	..	..	3.0MD	TEC	...	..
1983	OCT	16	19	40	50.8	30.243N.	93.393W.	005	C	360	..	..	3.8Mn	TUL	IV	360

List of data sources

3. Neumann, Frank, and Bodle, R. R., 1932, United States earthquakes 1930: U. S. Coast and Geodetic Survey, Serial 539, 25 p.
13. Neumann, Frank, 1942, United States earthquakes 1940: U. S. Coast and Geodetic Survey, Serial 647, 74 p.
31. Brazee, R. J., and Cloud, W. K., 1960, United States earthquakes 1958: U. S. Coast and Geodetic Survey, 76 p.
32. Eppley, R. A., and Cloud, W. K., 1961, United States earthquakes 1959: U. S. Coast and Geodetic Survey, 115 p.
38. Coffman, J. L., von Hake, C. A., and Stover, C. W., 1982, Earthquake history of the United States: U. S. National Oceanic and Atmospheric Administration and U. S. Geological Survey, Publication No. 41-1(through 1980), 258 p.
105. Docekal, Jerry, 1970, Earthquakes of the stable interior, with emphasis on the midcontinent, v. 2: Lincoln, Neb., University of Nebraska, Ph.D. dissertation; available from Ann Arbor, Mich., University Microfilms Ltd., 332 p.
106. Mississippi Power and Light Company, 1972, Preliminary Safety Analysis Report, Grand Gulf nuclear station, Units 1 and 2, Nuclear Regulatory Commission, Public Documents Room, Table C.3-2.
325. Stover, C. W., 1984, United States earthquakes 1981: U. S. Geological Survey Special Publication, 136 p.
360. Stover, C. W., 1986, United States earthquakes, 1983: U. S. Geological Survey Bulletin 1698, 197 p.

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

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

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

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

IV. Felt indoors by many, outdoors by few. Awakened few, especially light sleepers. Frightened no one, unless apprehensive from previous experiences. 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. Distrubed 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: 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 sometime 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.

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—REVISED AND REPRINTED, 1987

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