

SOME EARLY EARTHQUAKES IN TENNESSEE AND ADJACENT STATES (1699 TO 1850)

BERLEN C. MONEYMAKER
Tennessee Valley Authority, Knoxville, Tennessee

INTRODUCTION

In the course of compiling data on the seismic history of Tennessee the writer recognized the desirability of bringing together in one source the available information on the earliest known earthquakes in Tennessee and contiguous portions of neighboring states. The present paper has been prepared with that objective in mind. Figure 1 shows the extent of the region and the location of the known epicenters of the earthquakes.

SOURCES OF EARLY SEISMIC DATA

Reliable information on the early seismic history of Tennessee and the adjoining territory is quite sketchy. Hundreds of earthquakes probably were experienced by the white man prior to 1850, but very few of them are described, or even mentioned, in published literature. Before the advent of the newspaper, local earthquakes, if recorded at all, were recorded only in the accounts of missionaries, soldiers, explorers and adventurers. Some of these accounts have been published but in many cases it is not possible to determine precisely the date and place of the events described. By 1811, local newspapers were in existence in the larger towns and they afford good accounts of the major shocks of the New Madrid earthquakes and some of the later earthquakes.

A wide variety and large volume of published material has been consulted by the writer in his study of early Tennessee earthquakes. In the accounts of individual earthquakes presented below, the sources of the information are indicated.

PREHISTORIC EARTHQUAKES

The earliest earthquakes to affect the region under consideration were, of course, prehistoric shocks. It may be assumed that earthquakes have occurred throughout geologic time, whenever and wherever the forces of diastrophism were operative. The number, intensity and duration of the shocks which must have accompanied displacements along the innumerable faults in Tennessee and adjacent states can be only imagined at best.

That some prehistoric disturbances have occurred in Tennessee and the adjacent portions of Mississippi, Kentucky, Arkansas, and Missouri in Eocene or post Eocene time is attested by the presence of sand filled cracks in widely separated localities. These filled cracks, called "sandstone dikes" or "clastic dikes," represent old earthquake cracks filled with sand (Glenn, 1906, pp. 30-31; Fuller, 1912, p. 12).

A clastic dike, called to the writer's attention by Portland P. Fox and Leland F. Grant, is shown in Figure 2. In the New Madrid area, especially in Tennessee and Missouri, certain topographic features also prove that great prehistoric earthquakes have occurred.

Sir Charles Lyell, the famous English geologist who visited New Madrid, Missouri, late in March, 1846, reported an Indian tradition of a previous great earthquake:

I was informed at New Madrid that the Indians, before the year 1811, had a tradition of a great earthquake which had previously devastated the same region yet there is so wide an area of forest without sink holes, or any great inequalities of surface, and without dead trees . . . that we cannot suppose any convulsion of equal magnitude to have occurred for many centuries previous to 1811. (Lyell, 1850, pp. 238-239).

Fuller (1912) found numerous topographic evidences of previous great earthquakes which Lyell had overlooked.

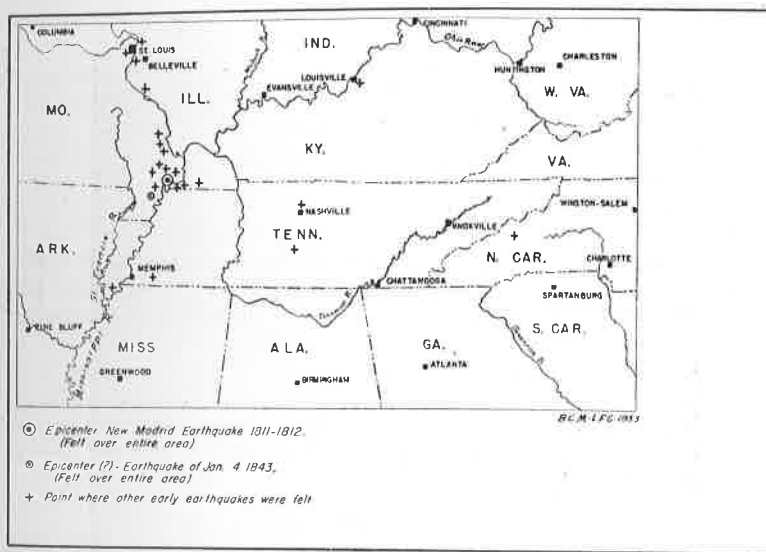


Fig. 1. Distribution of early earthquakes in Tennessee and adjacent states. Points designated by the symbol + are not earthquake epicenters but merely localities where early earthquakes were reportedly felt.

Although nothing is known definitely about the prehistoric earthquakes of the region the geologic evidence marshalled by Fuller (1912, p. 12) and others shows conclusively that great earthquakes had occurred previously in the Mississippi Valley between the present St. Louis, Missouri, and Rosedale, Mississippi. It is quite likely that this section of the Mississippi Valley had been active seismically for hundreds of years prior to the New Madrid earthquake of December 16, 1811, and that the Indians had experienced great earthquakes before the advent of the white man.

RECORDED EARTHQUAKES

The earliest earthquake to be recorded in the region under consideration was felt by a party of French missionaries who were spending Christmas Day, 1699, on the Mississippi River somewhere between Memphis, Tennessee, and Helena, Arkansas. It was more than three quarters of a century before another disturbance was recorded, although many more must have occurred. Since 1811, a very large number of shocks have been felt, most of them being in the great series of New Madrid earthquakes of 1811-1812 and the following years. Very few of these numerous shocks have been reported in detail.

All of the earthquakes known to have been felt in Tennessee and nearby portions of adjoining states from 1699 to 1850 are treated individually in the following paragraphs. The data are arranged in a



Fig. 2. Clastic dike near Gilbertsville, Kentucky. An old earthquake crack in the Ripley sand has been filled with alluvial sand and clay.

chronological sequence and, in many cases, includes all of the information available. The dates and times given are those given in the published sources of the data.

On basis of the evidence available, the writer has attempted to assess the maximum degree of intensity of each earthquake in terms of the Woods-Neumann Scale on which the maximum degree is XII. The intensity, indicated by the Roman numeral, may be much too low in the case of any earthquake felt at only one point and at an unknown distance from the epicenter.

1699, December 25, 1:00 p.m., Memphis area:

Father J. F. Buisson St. Cosme, a French missionary on a voyage down the Mississippi River reports an earthquake on Christmas Day, 1699:

On the 24th we cabined early so that our people might prepare for the great feast of Christmas. We made a little chapel; we sang a high mass at midnight where our people and all the French attended their duties. Christmas day was spent in saying our masses, all which our people heard and in the afternoon we chanted Vespers. We were greatly astonished to see the earth tremble at one clock (*sic*) in the afternoon, and although this earthquake did not last long, it was violent enough for all to perceive it easily. Williams, Samuel Cole: *Early Travels in the Tennessee Country*, Johnson City, Tennessee, 1928, p. 66. (IV).

1776, November 5/6, night, western North Carolina:

An earthquake was felt on the night of November 5, 1776, by a company of soldiers under Captain William Moore. In his report to General Rutherford, Captain Moore reported: "That night we lay upon a prodigious Mountain where we had a Severe Shock of an Earthquake which surprised our men very much."

The "prodigious Mountain" mentioned in this account is in Jackson County, between the Tuckasegee River and Richland Creek, a tributary of Pigeon River. North Carolina Colonial Records, Vol. X, p. 897. (IV-V).

1795, January 8, 3:00 a.m., Mississippi Valley:

This earthquake is reported by Shaler (1869) as follows: "At 3 A.M. on the 8th of January 1795, a considerable shock was felt at Kaskaskia, in the Territory of Illinois and in the part of Kentucky to the south. Its direction was . . . from west to east, its duration about one minute and a half. A subterranean noise accompanied the shock."

Early maps in the writer's possession show a place named Kaskaskia near the mouth of Kaskaskia River in Randolph County, Illinois. In addition to Illinois and Kentucky, this earthquake almost certainly affected Missouri and probably also Tennessee and Arkansas (III-V).

1811, December 16, 2:00 a.m., New Madrid, Missouri (XII);

1812, January 23, 9:00 a.m., New Madrid, Missouri (XII);

1812, February 7, 3:45 a.m., New Madrid, Missouri (XII):

The great series of earthquakes of 1811-1812, known collectively as the New Madrid earthquake, is too well known to require detailed treatment in this paper. The following account is quoted from Fuller (1912):

A little after 2 o'clock on the morning of December 16, the inhabitants of the region were suddenly awakened by the groaning, creaking, and cracking of the timbers of the houses or cabins in which they were sleeping, by the rattle of furniture thrown down, and by the crash of falling chimneys. In fear and trembling they hurriedly groped their way from their houses to escape the falling debris, and remained shivering in the winter air until morning, the repeated shocks at intervals during the night keeping them from returning to their weakened or tottering

dwelling. Daylight brought little improvement to their situation, for early in the morning another shock, preceded by a low rumbling and fully as severe as the first, was experienced. The ground rose and fell as earth waves, like the long, low swell of the sea, passed across its surface, tilting the trees until their branches interlocked and opening the soil in deep cracks as the surface was bent. Landslides swept down the steeper bluffs and hillsides; considerable areas were uplifted, and still larger areas sunk and became covered with water emerging from below through fissures or little "craterlets" or accumulating from the obstruction of the surface drainage. On the Mississippi great waves were created, which overwhelmed many boats and washed others high upon the shore, the return current breaking off thousands of trees and carrying them out into the river. High banks caved and were precipitated into the river, sand bars and points of islands gave way, and whole islands disappeared.

During December 16 and 17 shocks continued at short intervals but gradually diminished in intensity. They occurred at longer intervals until January 23, when there was another shock, similar in intensity and destructiveness to the first. This shock was followed by about two weeks of quiescence, but on February 7 there were several alarming and destructive shocks, the last equaling or surpassing any previous disturbance, and for several days the earth was in a nearly constant tremor.

For fully a year from this date small shocks occurred at intervals of a few days, but as there were no other destructive shocks the people gradually became accustomed to the vibrations and gave little or no further attention to them.

These earthquakes consisted of thousands of individual shocks, a few of which were quite violent and were felt over extensive areas. The initial shock at about 2:00 a.m., December 16, 1811, was one of the most severe. It was felt over an area of about 2,000,000 square miles and resulted in topographic changes over an estimated area of 30,000 to 50,000 square miles. It was followed at about 2:30 a.m. by a somewhat less severe shock, which was followed, in turn, by 27 light shocks at intervals of six to ten minutes. At daylight, a shock equal in intensity to the first occurred and was followed within an hour or so by two other shocks, one of which was "very severe." Another violent shock occurred at 11:00 a.m. On the following day, strong to "severe" shocks occurred at 5:00 a.m., 7:00 a.m., 12:00 noon, and 7:30 p.m. On December 18, "slight" to "violent" shocks occurred at 3:00 a.m. to 4:00 a.m., 6:00 a.m., 12:00 noon, 6:00 p.m. and 9:00 p.m. Other shocks were felt on the twenty-first at 4:30 a.m. A shock "as violent as worst of preceding" occurred on January 23, 1812. Shocks were felt at frequent intervals between January 23 and February 4, on which date a shock "nearly as severe as any" occurred. Four "severe" shocks occurred on February 5, followed by a shock described as "hard" and "big" on February 7. Subsequently, shocks were felt at frequent intervals for several months. From December 16 to March 15, a total of 1874 shocks were recorded in Louisville, Kentucky. As shocks continued to occur at frequent intervals for at least two years, the total number of shocks was actually much greater.

It is not unlikely that between 2000 and 3000 shocks were felt in Tennessee in 1811 and 1812. Even as late as July, 1816, shocks occurred every few days in the New Madrid area. The great shocks of December 16, 1811, January 23, 1812, and February 7, 1812, were felt throughout the eastern United States.

1816, July 25, 9:00 a.m. and 3:00 p.m., New Madrid, Missouri:

Heinrich (1941) quotes from the *Missouri Gazette* for July 31, 1816, as follows: "We had (in New Madrid) on Thursday last two distinct shocks of earthquake, one in the forenoon about nine o'clock, the other about three o'clock P.M. which revived in a small degree the apprehensions of danger among the populace here. It is not unusual to have shocks here every few days, but these mentioned above were more severe than usual."

Heinrich estimates the intensity of these shocks at III-IV. Both of these shocks almost certainly affected northwest Tennessee.

1816, about 12:00 midnight, New Madrid, Missouri:

In the published account of a voyage down the Mississippi River in 1816, Mr. Tilly Buttrick reports an earthquake as follows:

Getting into the Mississippi River, our first stop at any town was at New Madrid. We made the boat fast to the shore, and about twelve o'clock at night was awaked by a noise which appeared like a cable drawing over the boat's side. I started and went on deck; found all quiet. My fear was that the boat had struck a drift and was running over a log; but on inquiry found it was an earthquake. *Voyages, Travels and Discoveries of Tilly Buttrick, Jr., 1812-1819* (Boston 1831). This account is reprinted in Thwaites, Reuben Gold: *Early Western Travels, 1748-1846*, Vol. VIII, Cleveland, Ohio, 1905, p. 59. (III).*

1818, March, Mississippi Valley:

A traveler going down the Mississippi River in March, 1818, "... experienced eight or ten shocks, some of them so severe as to shake from their places loose articles in the boat. Each shock continued about two minutes and was preceded by a rumbling noise like distant thunder or the discharge of a cannon at a great distance. We experienced light shocks, at intervals, for a distance of one hundred miles below Little Prairie." Williams, S. C., *Beginnings of West Tennessee*, Johnson City, Tennessee, 1930, p. 93 (quoting James McBride, of the Miami Country, Qr. Pubs. Hist. and Phil. Soc. of Ohio, Vol. V, p. 27). (II-V).

1819, September 2, 2:30 a.m., Mississippi Valley:

Heinrich (1941) quotes from the *St. Louis Enquirer*, September 22, 1819, as follows: "The shock of an earthquake was sensibly felt at St. Louis, Cape Girardeau, New Madrid and throughout a large extent of country along the Mississippi on the morning of the 2d inst., between 2 and 3 o'clock."

This earthquake is reported to have been felt at 2:30 a.m. at Edwardsville, Illinois, where "... it appeared to move in the direction from S.S.W. to N.N.E.; and the oscillations of the earth continued about one and a half minutes." (III-IV).

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1819, September 16, 10:00-11:00 p.m., Mississippi Valley:

"A shock was felt at Cape Girardeau, Missouri 'between 10 and 11 in the evening.'" (Heinrich, 1941). (III-IV).

1820, November 9, 4:00 p.m., Cape Girardeau, Missouri:

On the 9th at four p.m. the shock of an earthquake was felt. The agitation was such as to cause considerable motion in the furniture and other loose articles in the room where we were sitting. Before we had time to collect our thoughts and run out of the house, it had ceased entirely; we had, therefore, no opportunity to form an opinion of its direction. Several others occurred in the time of our stay at the Cape, but they all happened at night and were all of short duration. "Shakes," as these concussions are called by the inhabitants, are in this part of the country extremely frequent and are spoken of as matters of every day occurrences. Long, Major S. H.—*Account of An Expedition from Pittsburgh to the Rocky Mountains in the Years 1819, 1820*, London, 1823. (Quoted from Thwaites, Reuben Gold: *Early Western Travels*, Vol. 17, p. 88). (IV).*

1820, Mississippi Valley:

Several persons, passengers on board a steamboat, ascending the Mississippi, in 1820, went on shore near New Madrid. In one of the houses which they entered they found a small collection of books: As they were amusing themselves with these, they felt the house so violently shake, that they were scarce able to stand upon their feet; some consternation was of course felt, and as several of the persons were ladies, much terror was expressed; "Don't be alarmed," said the lady of the house, "It's nothing but an earthquake." James, Dr. Edwin (Footnote to Major S. H. Long's *Account on An Expedition from Pittsburgh to the Rocky Mountains in the Years 1819, 1820*, London, 1823; Reprinted in Thwaites, Reuben Gold: *Early Western Travels 1748-1846*, Vol. 17, Cleveland, Ohio, 1905, p. 88). (III-IV).*

1839, September 5, Mayfield, Kentucky:

An earthquake lasting several seconds was felt at Mayfield, Kentucky, only 16 miles north of the Kentucky-Tennessee state line. The shock was strong enough to rattle windows and shift furniture. (Heinrich, 1941). (III-IV).

1842, May 27, 11:00 p.m., Hickman, Kentucky:

An earthquake accompanied by "violent rumblings," was felt at Hickman, then Mills Point, Kentucky, some five miles north of the Tennessee-Kentucky state line. (III).

1843, January 4, 8:45 p.m., Mississippi Valley:

A severe earthquake, with its center somewhere in the New Madrid region, was felt as far eastward as the Atlantic seaboard, northeastward to Providence, Rhode Island, and westward to points beyond the frontier posts. It was felt strongly throughout Arkansas, Tennessee, the Carolinas, and over large sections of other states. In Memphis, it was very destructive, causing chimneys to topple, walls to crack, and similar phenomena. In Knoxville, it was strongly felt and

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caused considerable alarm but did no damage. It was sharply felt at Nashville, Tennessee, and St. Louis, Missouri, where chimneys fell and people were frightened. Persons standing or walking found it difficult to stand upright in St. Louis, Missouri, and Louisville, Kentucky. In the New Madrid region in Missouri, subsidence of the land reportedly gave rise to a lake, which was said to have developed with sufficient suddenness to drown some hunters. Heck (1938) assigns an intensity of 9 (Rossi-Forel Scale) to this earthquake. (IX-X).

1843, February 16, 11:00 p.m., St. Louis, Missouri:

This earthquake affected a wide area and was felt at St. Louis, Missouri, Louisville, Kentucky, and Nashville, Tennessee. Press reports, stating the time as ". . . about 11 o'clock" p.m., indicate that the shock was light at Nashville (*Knoxville Register*, February 23, 1843). (III-IV).

1843, June 13, 9:00 a.m., Hickman, Kentucky:

A light shock at Mills Point, now Hickman, Kentucky, is reported by the *Knoxville Register*, June 28, 1843. (III).

1843, August 9, Columbia and Somerville, Tennessee:

A light shock reported by the *Knoxville Register*, September 6, 1843. (III-IV).

1846 March 26, 11:25 a.m., New Madrid:

On his second visit to the United States, Sir Charles Lyell spent a few days in the New Madrid area late in March, 1846, and reported this earthquake as follows:

While I was riding with Mr. Love he stopped his horse and asked me if I did not feel the shock of an earthquake. When my attention was called to it, I fancied I had perceived it, but was not sure. He said they were frequent, although he had not felt one for the last fortnight. It was now three years since they had been seriously alarmed by any movement. We looked at our watches, and when we returned to the farm he inquired of the family if anything had happened. They said they had felt a shock, and heard a sound like distant thunder, at twenty-five minutes past eleven o'clock, which agreed exactly with the time when my companion had felt the motion. Lyell, Sir Charles: *A Second Visit to the United States of America*, (Second Edition Revised and Corrected), Vol. 2, p. 236. (II-III).

In addition to the above listed earthquakes, several other well documented earthquakes, which were felt in other parts of the country, may have affected the region also. The more important of such shocks are listed in the following tabulation.

1663, February 5, 1:00 p.m., Quebec:

A very violent earthquake strongly felt over eastern Canada and northeastern United States. The limits of the area affected are unknown but Heck (1938) estimates that it was felt over an area of 750,000 square miles. Detailed accounts of this earthquake are given by Hobbs, 1907, pp. 315-320.

1776, Summer, 8:00 a.m., southeastern Ohio:

This earthquake, reported by John Heckewelder, a missionary of the United Brethren, on the Muskingum River in southeastern Ohio, occurred at 8:00 a.m. and lasted some two or three minutes. "The southwest side of the house was raised with such violence that the furniture was nearly overturned. It was accompanied by a subterranean rumbling noise. The cattle were frightened by the shock." (Shaler, 1869, p. 550).

1779, northern Kentucky:

A shock was felt in northern Kentucky (Hobbs, 1911, p. 69).

1791 or 1792, April or May, 7:00 a.m., Kentucky:

Furniture in the houses was agitated by the jar. The shock was preceded by a rumbling noise in the earth, which seemed to come from the west. The course of this movement was evidently the same as that of the great shocks of 1811. The region where the shock was felt was confined to the northern and eastern parts of Kentucky. There were at that time few settlements farther west, where it may have had a wider range without being observed. (Shaler, 1869, p. 550).

1804, August 24¹, 2:10 p.m., Illinois-Indiana:

It seems to have been quite a strong shock though we have no accurate description of it. It was felt as far east as Fort Wayne in Indiana, nearly two hundred miles distant. As with the preceding shocks the impression left upon the minds of the observers was that it came from the west. (Shaler, 1869, p. 550; Hobbs, 1911, p. 70).

CONCLUSIONS

All of the earthquakes listed in the foregoing catalog are well documented and are known to have occurred. That the catalog is very incomplete is recognized. The writer's estimate that between 2000 and 3000 individual shocks were felt in the Mississippi Valley in 1811 and 1812 is probably conservative. Several writers who visited the New Madrid area subsequent to the great shocks of 1811-1812 refer to the continued frequency of light shocks up to 1846. Although records of a few as yet unknown earthquakes might be found by searching the accounts of missionaries and other early travelers, early newspapers, and old letters, the vast majority of the early earthquakes of the region must remain forever unknown.

ACKNOWLEDGMENTS

The writer gratefully acknowledges indebtedness to the late Dr. Leonidas C. Glenn, Professor Emeritus, Vanderbilt University, whose many suggestions were most helpful in the research on the seismic history of Tennessee; to Miss Pollyanna Creekmore of the Lawson McGhee Library, who made available certain early newspaper files and historical writings; to Leland F. Grant, who prepared Figure 1; and to Miss Mary Anne McFerrin, who rendered valuable assistance in the preparation and typing of the manuscript.

¹Hobbs (1911) and Heck (1938) give August 20, 1804, as the date of this earthquake.

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NEWS OF TENNESSEE SCIENCE

(Continued from page 223)

With this strengthening of the natural sciences, Fisk University is planning to go into a summer school program in the sciences.

University of Tennessee engineers under the direction of Dr. Floyd V. Schultz, are developing a "two-ring" transmitting antenna for the U. S. Navy which will eliminate echo effect.

Dr. Jacob Furth, head of the ORNL Biology Division's pathology and physiology section, has left Oak Ridge to become a staff member of the department of pathology of the Children's Medical Center of Harvard University.

Dr. O. W. Hyman, vice president of the University of Tennessee in charge of the College of Medicine, was awarded the 1953 Citizenship Award by the Newspaper Guild of Memphis.

Dr. Sam H. Sanders, Jr., was recently named head of the department of otology, laryngology and rhinology at the University of Tennessee College of Medicine. He succeeds Dr. Charles Blassingame who asked to be relieved of his administrative duties.

Dr. James Robert Teabeaut of the Armed Forces Institute of Pathology, Washington, will join the staff of the University of Tennessee College of Medicine, September 1, as assistant professor in the division of pathology and bacteriology.

Dr. Oscar Touster of the department of biochemistry, Vanderbilt University, has received a grant from the Eli Lilly Company, renewing support of a study of carbohydrate metabolism in pentosuria.

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