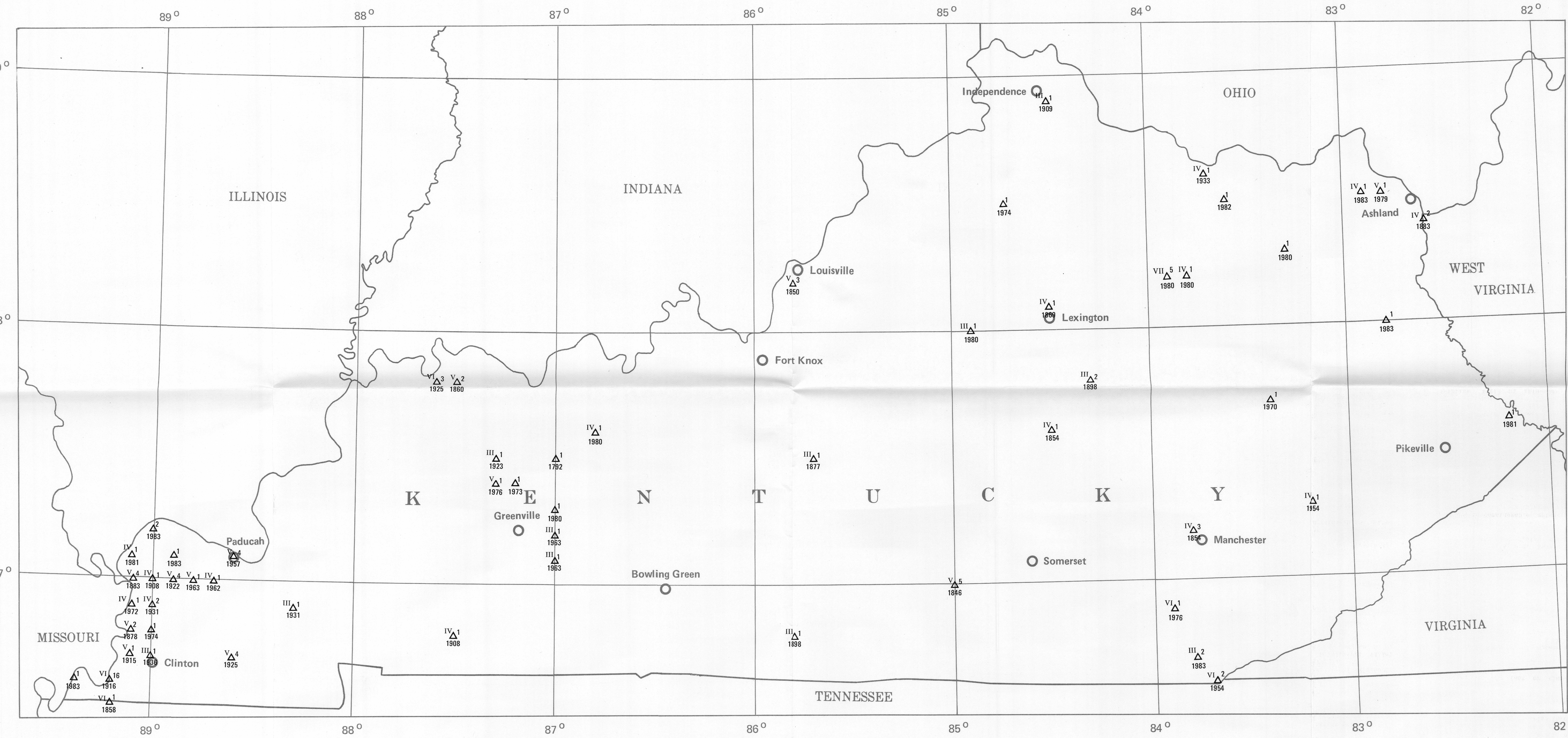

INTRODUCTION

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

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 earthquake 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 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:

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 in 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 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 each 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), ML (Richter, 1958), Mn (Nuttli, 1973), Mnx (modified Mn). 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 facilities in the eastern United States, NUREG/CR-1577, Washington, D. C.
   BLA - Virginia Polytechnic Institute and State University, Blacksburg, Va.
   DG - Dewey, J. W., and Gordon, D. W., 1984, U. S. Geological Survey, Miscellaneous Field Studies Map MF-1699 Phamphlet, 39 p.
   GS - National Earthquake Information Center (and predecessor organizations), U. S. Geological Survey, Golden, Colo.
   HRR - Herrmann, R. B., Langston, C. A., and Zollweg, J. E., 1982, Seismological Society of America Bulletin, v. 72, no. 4, p. 1219-1239.
   JLM - Jones, F. B., Long, L. T., and McKee, J. H., 1977, Seismological Society of America Bulletin, v. 67, no. 6, p. 1503-1513.
   KY - University of Kentucky, Lexington, Ky.
   SLM - St. Louis University, St. Louis, Mo.
   TEC - Tennessee Earthquake Information Center, Memphis State University, Memphis, Tenn.
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. B5, 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.

Richter, C. F., 1958, Elementary seismology: San Francisco, W. H. Freeman and Co., 768 p.

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 Kentucky

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1779	..	..	.. .. ..	37.0 N.	85.0 W. *	..	I	38	..	..	...	...	F	38
1792	APR	13	00	37.5 N.	87.0 W. *	..	I	145	..	..	...	...	F	145
1817	DEC	12	.. .. ..	37.0 N.	85.0 W. *	..	I	159	..	..	...	...	F	159
1827	JUL	05	12 00 ..	37.0 N.	85.0 W. *	..	I	159	..	..	...	...	F	159
1834	NOV	20	19 40 ..	37.0 N.	85.0 W. *	..	I	38	..	..	...	...	V	38
1839	SEP	05	.. .. ..	36.7 N.	88.6 W.	..	H	116	..	..	...	...	IV	109
1841	DEC	28	05 30 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	V	38
1842	MAR	28	05 00 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	IV	105
1842	NOV	04	06 30 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	IV	105
1842	NOV	04	08 30 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III	105
1843	JUN	13	15 00 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III	65
1846	MAR	23	12 45 ..	37.0 N.	85.0 W. *	..	I	159	..	..	...	...	V*	159
1849	JAN	24	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	IV*	159
1850	APR	05	02 05 ..	38.2 N.	85.8 W. *	..	H	159	..	..	...	...	V*	159
1852	AUG	28	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III	105
1853	DEC	18	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	IV*	105
1854	FEB	13	00	37.2 N.	83.8 W.	..	H	105	..	..	...	...	IV*	159
1854	FEB	13	06 00 ..	37.2 N.	83.8 W. *	..	H	159	..	..	...	...	IV*	159
1854	FEB	13	.. .. ..	37.2 N.	83.8 W. *	..	H	159	..	..	...	...	IV*	159
1854	FEB	28	.. .. ..	37.6 N.	84.5 W.	..	I	105	..	..	...	...	IV	105
1857	NOV	09	.. .. ..	36.6 N.	89.2 W. *	..	H	159	..	..	...	...	IV*	159
1858	SEP	21	.. .. ..	36.5 N.	89.2 W. *	..	H	159	..	..	...	...	VI*	159

Line Shore, Kentucky. At Line Shore, below Hickman, the quake was so severe that a lady, who was 40 rods from her house when it commenced, fell down four times before she got to her door; it seemed as if her house would tumble down. In the great Missouri quake of 1811 the ground sunk making a lake 12 mi long and 7 mi wide near this location.

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1860	AUG	07	15	37.8 N.	87.5 W.	..	I	105	..	..	4.4MFa BAR	...	V	105
1866	NOV	21	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III	105
1869	FEB	20	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	IV*	105
1869	DEC	14	.. .. ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III*	159
1872	MAR	26	.. .. ..	37.1 N.	88.6 W.	..	H	105	..	..	...	...	III	66
1877	MAR	26	.. .. ..	37.1 N.	88.6 W.	..	H	105	..	..	...	...	III	105
1882	JUL	12	10 00 ..	36.8 N.	89.1 W.	..	H	105	..	..	4.2MFa BAR	...	V	38
1883	MAY	23	.. .. ..	38.4 N.	82.6 W.	..	H	105	..	..	...	...	IV	105
1883	MAY	23	04 30 ..	38.4 N.	82.6 W.	..	H	105	..	..	...	...	IV	105
1883	JUL	14	07 30 ..	37.0 N.	89.1 W.	..	I	116	..	..	4.1MFa BAR	...	V*	105
1898	MAR	30	01 30 ..	36.8 N.	85.8 W.	..	H	119	..	..	...	...	III	66
1898	JUN	30	01	36.6 N.	89.2 W.	..	H	105	..	..	...	...	III	105
1898	JUN	26	08 30 ..	37.8 N.	84.3 W.	..	H	105	..	..	...	...	III*	105
1908	DEC	27	.. .. ..	37.0 N.	89.0 W.	..	H	105	..	..	...	...	IV	105
1908	DEC	27	21 15 ..	36.8 N.	89.1 W.	..	H	84	..	..	4.4MFa BAR	...	IV	105
1908	DEC	31	.. .. ..	37.0 N.	88.9 W.	..	H	105	..	..	...	...	III	67
1909	OCT	23	02	38.9 N.	84.5 W.	..	I	105	..	..	...	...	III*	105
1913	NOV	11	14 00 ..	38.2 N.	85.8 W.	..	H	105	..	..	...	...	IV	105
1915	OCT	26	07 40 ..	36.7 N.	88.6 W.	..	H	38	..	..	...	...	V	38
1915	DEC	07	18 40 ..	36.7 N.	89.1 W.	..	G	105	..	..	4.6MFa BAR	...	V	109
1916	OCT	19	06	36.7 N.	88.6 W.	..	G	38	..	..	...	...	III	67
1916	DEC	19	05 42 ..	36.6 N.	89.2 W.	..	H	105	..	..	...	...	VI*	109

Hickman, Kentucky. Chimney bricks displaced. Two strong local shocks (Docekal;105).

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1919	FEB	11	03 37 ..	37.8 N.	87.5 W.	..	H	105	..	..	3.8MFa BAR	...	IV*	105
1919	MAY	23	12 30 ..	36.6 N.	89.2 W.	..	G	105	..	..	3.9MFa BAR	...	III	67
1919	MAY	24	13 30 ..	36.6 N.	89.2 W.	..	G	105	..	..	3.9MFa BAR	...	III	67
1919	MAY	28	11 30 ..	36.6 N.	89.2 W.	..	G	105	..	..	3.8MFa BAR	...	III	67
1922	MAR	23	21 45 ..	37.0 N.	88.9 W.	..	H	105	..	..	3.7MFa BAR	...	V	38
1923	MAY	28	12 30 ..	37.5 N.	85.7 W.	..	H	105	..	..	3.5MFa BAR	...	III	67
1924	APR	02	11 15 ..	37.1 N.	88.6 W.	..	G	105	..	..	4.1MFa BAR	...	V	38
1925	APR	27	04 05 ..	37.6 N.	88.6 W.	..	G	38	..	..	3.8MFa BAR	...	V*	38
1925	SEP	02	11 55 ..	37.8 N.	87.6 W.	..	G	38	..	..	4.8MFa BAR	...	VI	113

Centered near Henderson, Kentucky. Several strong shocks. The last shock was the strongest. A chimney fell at Louisville, Kentucky and a few bricks were displaced at Evansville, Indiana. Landslides occurred at Henderson. The felt area included western Kentucky, southern Illinois and Indiana, southeastern Missouri, and northern Tennessee—3,000 sq mi (Docekal;105).

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1925	SEP	20	09 00 ..	37.8 N.	87.6 W.	..	H	67	..	..	4.1MFa BAR	...	IV	113
1925	SEP	20	11 00 ..	37.8 N.	87.6 W.	..	H	109	..	..	...	...	III*	109
1928	APR	23	11 00 ..	36.6 N.	89.2 W.	..	G	105	..	..	...	...	IV	109
1930	AUG	29	06 26 11	37.0 N.	89.1 W.	..	F	3	..	..	3.9MFa BAR	...	IV	113
1930	SEP	03	12 00 ..	37.0 N.	85.8 W.	..	G	105	..	..	...	...	III	109
1930	SEP	04	05 30 ..	37.0 N.	88.9 W.	..	G	105	..	..	...	...	III	109
1931	APR	01	23 20 09	36.9 N.	88.3 W.	..	H	105	..	..	3.8MFa BAR	...	III	105
1931	APR	06	15 37 03	36.9 N.	89.0 W.	..	H	105	..	..	3.5MFa BAR	...	IV	105
1933	MAY	28	15 10 ..	38.6 N.	83.7 W.	..	H	105	..	..	3.6MFa BAR	...	IV	6
1936	AUG	02	22 15 ..	36.7 N.	89.0 W.	..	H	105	..	..	4.1MFa BAR	...	III	105
1940	MAY	27	08 30 ..	38.2 N.	85.8 W.	..	H	13	..	..	...	...	II*	13
1940	MAY	31	19 03 04	37.1 N.	88.6 W.	..	H	105	..	..	3.6MFa TEC	...	V	105
1941	OCT	21	16 53 ..	37.0 N.	89.1 W.	..	F	105	..	..	3.7MFa BAR	...	IV	105
1943	JUL	05	11 00 ..	38.2 N.	85.7 W. x	..	G	16	..	..	...	...	IV*	105
1954	JAN	01	02 30 ..	37.3 N.	83.2 W.	..	I	116	..	..	...	...	IV	26
1954	JAN	02	03 25 ..	36.6 N.	83.7 W.	..	F	38	..	..	...	...	VI	27

Middlesboro, Kentucky. Slight damage to property and general alarm to people. Felt area included parts of Tennessee, North Carolina, and Virginia (EQH;38).

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1957	JAN	25	18 15 ..	36.6 N.	83.7 W.	..	F	173	..	..	...	...	IV	132
1957	MAR	26	08 27 06	37.1 N.	88.6 W.	..	G	105	..	..	3.3MFa BAR	...	V	30
1962	FEB	16	.. .. ..	37.0 N.	88.7 W.	..	F	113	..	..	...	...	IV	132
1963	MAR	31	17 31 04	36.9 N.	89.0 W.	..	B	177	..	..	3.0Mn SLM	...	...	..
1963	MAR	03	00 37 49.1	36.982N.	88.770W.	007	B	349	3.6	..	3.8Mn DG	...	V	38
1963	DEC	05	06 51 00.5	37.149N.	86.970W.	001	B	349	..	..	...	...	III	113
1965	DEC	15	05 31 32.9	37.2 N.	87.0 W.	..	D	74	..	..	...	...	III	36
1970	JUL	31	00 31 ..	37.7 N.	83.4 W.	..	D	203	..	..	3.5Mnx JLM	...	...	..
1971	FEB	19	23 11 41.7	37.13 N.	83.25 W. x	000	C	74	..	..	3.0Mn BAR	...	...	..
1972	JUN	19	05 46 15.1	36.926N.	89.097W.	006	A	349	4.5	..	3.2Mn BAR	...	IV	45
1972	JUN	19	16 15 18.9	37.00 N.	89.08 W.	007	B	45	4.5	..	3.2ML SLM	...	IV	45
1973	JAN	07	22 56 06.2	37.402N.	87.220W.	014	B	349	..	..	3.2Mn SLM	...	...	..
1973	JUN	05	00 16 40.2	38.477N.	84.747W.	010	B	349	..	..	3.2Mn SLM	...	...	..
1974	MAY	07	17 13 17.7	36.80 N.	89.01 W.	005	A	182	..	..	2.5Mn SLM	...	...	..
1976	JAN	19	06 20 39.6	36.866N.	83.863W.	001	A	349	4.0	..	3.6Mn BLA	...	VI	49

Eastern Kentucky. Minor damage in Knox and Bell Counties. Within the areas of maximum intensity, window broke, plaster cracked, furniture moved, and a concrete sidewalk cracked. The shock was felt in parts of Kentucky, Tennessee, North Carolina, southwestern West Virginia, and Virginia-an area estimated at 115,000 sq mi.

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1976	APR	15	07 03 34.4	37.376N.	87.311W.	004	A	349	..	..	3.3Mn BLA	.. ...	V	49
1978	DEC	05	07 00 38.6	36.81 N.	89.06 W.	005	A	247	..	..	2.5Mn SLM	.. ...	...	..
1979	NOV	09	21 29 59.8	38.494N.	82.809W.	001	A	349	..	..	3.6Mn GS	.. ...	V	262
1980	MAR	23	21 38 16.2	37.603N.	86.757W.	009	B	349	..	..	3.3Mn GS	.. ...	IV	300
1980	JUL	12	23 59 55.4	37.26 N.	86.95 W.	000	B	300	..	..	3.1Mn SLM	.. ...	...	..
1980	JUL	12	23 59 56.3	37.29 N.	86.99 W. x	000	B	214	..	..	3.1Mn GS	.. ...	III	300
1980	JUL	27	18 52 21.4	38.193N.	83.891W.	006	A	349	5.1	4.7	5.2Mn TEC	5.0 HRR	VII	300

Northern Kentucky near Sharpsburg. This earthquake is the strongest in the history of Kentucky. It was felt over a wide area of the United States (15 states) and in Canada. Property damage was estimated at $1 million occurred at Maysville, about 50 km north of the epicenter. Thirty-seven commerical structures and 269 residences sustained some degree of damage. Older, all-brick, multi-story structures in the downtown area sustained the most damage. Many of these structures were built in the early 1900's. The most common damage was to chimneys; some toppled to near roofline, others had bricks loosened or toppled from chimney tops, and some had cracks of varying lengths and widths. Ground cracks formed about 12 km from the epicenter at Owingsville and Little Rock. Felt area was estimated at 231,000 sq mi (EQH;38).

DATE YEAR	MONTH	DAY	ORIGIN TIME H M S (UTC)	LAT.	LONG.	DEPTH (KM)	HYPOCENTER QUAL	HYPOCENTER REF	MAGNITUDE USGS (mb)	(Ms)	OTHER	MOMENT (M)	INTENSITY MM	REF
1980	JUL	30	17 01 40.9	38.197N.	83.905W.	013	A	340	..	..	1.3Mn HRR	.. ...	II	300
1980	JUL	31	09 27 02.3	38.186N.	83.927W.	019	B	349	..	..	2.5Mn GS	.. ...	IV	300
1980	AUG	23	03 49 03.7	37.977N.	84.874W.	001	B	349	..	..	3.1Mn GS	.. ...	III	300
1980	AUG	25	11 41 38.3	38.194N.	83.791W.	013	C	349	..	..	2.5Mn GS	.. ...	IV	300
1980	NOV	27	05 26 54.6	38.31 N.	83.33 W.	005	B	300	..	..	2.5Mn TEC	.. ...	...	..
1980	DEC	30	03 07 08.1	38.20 N.	83.91 W.	011	B	300	..	..	1.6ML TEC	.. ...	III	300
1981	JAN	14	21 10 33.9	38.20 N.	83.91 W.	011	B	325	..	..	1.5MD TEC	.. ...	F	325
1981	FEB	11	14 42 57.6	37.05 N.	89.13 W.	002	B	325	..	..	2.7Mn SLM	.. ...	IV	325
1981	NOV	30	17 33 11.0	37.63 N.	82.20 W.	007	B	325	..	..	2.5MD TEC	.. ...	...	..
1981	DEC	07	20 01 10.6	37.277N.	82.905W. x	001	B	339	..	..	1.5MD BLA	.. ...	...	..
1982	APR	07	05 44 59.2	38.5 N.	83.6 W.	..	B	350	..	..	1.6Mn KY	.. ...	F	350
1983	FEB	22	13 09 18.2	38.048N.	82.767W.	011	B	360	..	..	2.6MD TEC	.. ...	...	..
1983	FEB	23	08 09 14.0	37.070N.	88.860W.	022	A	360	..	..	2.9Mn SLM	.. ...	F	360
1983	MAY	08	01 05 15.0	36.610N.	89.370W.	007	A	360	..	..	2.5Mn SLM	.. ...	...	..
1983	AUG	17	14 03 17.1	38.474N.	82.863W.	008	B	360	..	..	3.5Mn KY	.. ...	IV	360
1983	AUG	28	22 45 07.3	36.688N.	83.848W.	016	B	360	..	..	3.1Mn BLA	.. ...	III	360
1983	AUG	28	22 56 39.7	36.652N.	83.843W.	017	B	360	..	..	2.6MD TEC	.. ...	F	360
1983	NOV	22	10 37 06.3	37.230N.	89.000W.	003	A	360	..	..	2.5Mn SLM	.. ...	...	..
1983	DEC	31	11 59 56.1	37.210N.	89.010W.	002	A	360	..	..	2.6Mn SLM	.. ...	...	..

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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, expecially 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 is 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.

SEISMICITY MAP OF THE STATE OF KENTUCKY

By

C. W. Stover, B. G. Reagor, and S. T. Algermissen

1987

ISBN 0-607-80633-8

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—REPRINTED 1998

For sale by U.S. Geological Survey Information Services
Box 25286, Federal Center, Denver, CO 80225