UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Preliminary Report of the Distribution of Intensities for the Kentucky Earthquake of July 27, 1980

Open-File Report 81-198

1981

Preliminary Report of the Distribution of Intensities for the Kentucky Earthquake of July 27, 1980

by

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Abstract

The July 27, 1980 earthquake in northern Kentucky is estimated to have a maximum Modified Mercalli intensity of VII. An extensive post office canvass and a field survey of the epicentral area indicates the strongest shaking and the largest concentration of damage occurred at Maysville, Kentucky. Excluding Maysville, chimney damage was observed to be the cominant form of damage within the epicentral area.

Introduction

A moderate earthquake, centered in northern Kentucky, shook an area of approximately 600,000 sq km in the Central United States and Canada on Sunday afternoon July 27, 1980. Response to the postal intensity questionnaire survey and newspaper accounts indicated the tremor was felt in all or parts of 16 States and the southern part of Ontario, Canada (Robert Wetmiller, Earth Physics Branch, Division of Seismology and Geothermal Studies, Ottawa, Canada, written commun., 1980). Initial reports indicated that this earthquake was felt most strongly in the vicinity of Maysville, Kentucky approximately 50 km north of the epicenter on the Ohio River. Location of the earthquake, as determined by the National Earthquake Information Center, is as follows.

Origin Time:	18 52 21.8 U.T.C.
Latitude:	38.174°N.
Longitude:	83.907°W.
Depth:	8 Km
Magnitude:	5.2 mb, 4.7 Ms

The epicenter, located near Sharpsburg, Kentucky in Bath County, lies within an agricutural region of gently rolling topography of moderate relief.

Following the earthquake, the USGS conducted a field survey of the epicentral area to document the areal extent and type of earthquake related damage. The results of the field survey are

published in a report by Hopper and Reagor (1980). In addition, an extensive questionnaire program was carried out by mail to determine intensities and the extent of the felt area on a regional basis.

This report covers the analysis and interpretation of the intensity data together with descriptions and comments on observations of damage in the epicentral area. The results are shown as a generalized isoseismal map, and a compilation of localities with the associated felt intensities.

Seismicity

The historic record of Kentucky earthquakes, known to have occurred during the period 1779 - 1977 (Stover and others, 1979A), is illustrated in figure 1. The map shows earthquake locations and the number of earthquakes at that location, maximum intensity and the most recent year of that intensity. In figure 1, all recorded earthquakes prior to 1965 are plotted. After 1965, only felt earthquakes and non-felt earthquakes with magnitudes above 2.5 are plotted. An inspection of the seismicity map indicates that the July 27, 1980 shock, with intensity of VII, is the strongest earthquake to be centered in Kentucky. This earthquake occurred in a region of northern Kentucky where the maximum intensity associated with previous shocks has been estimated as IV or less.

Earthquakes of maximum intensity of VII or more in the region bounded by 36 - 40 degrees North latitude and 81 - 91 degrees West longitude are listed in table 1 (Stover and others, 1979A, 1979B, 1979C, 1979D, 1979E, 1979F; Reagor and others, 1980A, 1980B, 1980C, 1980D; Meyers and von Hake, 1980).

Table 1.--Earthquakes with maximum intensity of VII or more for the period 1812 - 1979

DATE	STATE	LOCATION		INTENSITY
		Lat(N.)	Long(W.)	(MM)
1812 Jan 23	Missouri	36.6	89.6	XI
1812 Feb 07	Missouri	36.6	89.6	XI
1838 Jun 09	Illinois	38.5	89.0	VII
1857 Oct 08	Illinois	38.7	89.2	VII
1857 Oct 08	Illinois	38.7	89.2	VII
1857 Aug 17	Tennessee	36.0	89.5	VII
1895 Oct 31	Missouri	37.0	89.4	IX
1899 Apr 30	Indiana	38.5	87.0	VII
1903 Nov 04	Missouri	36.9	89.3	VII

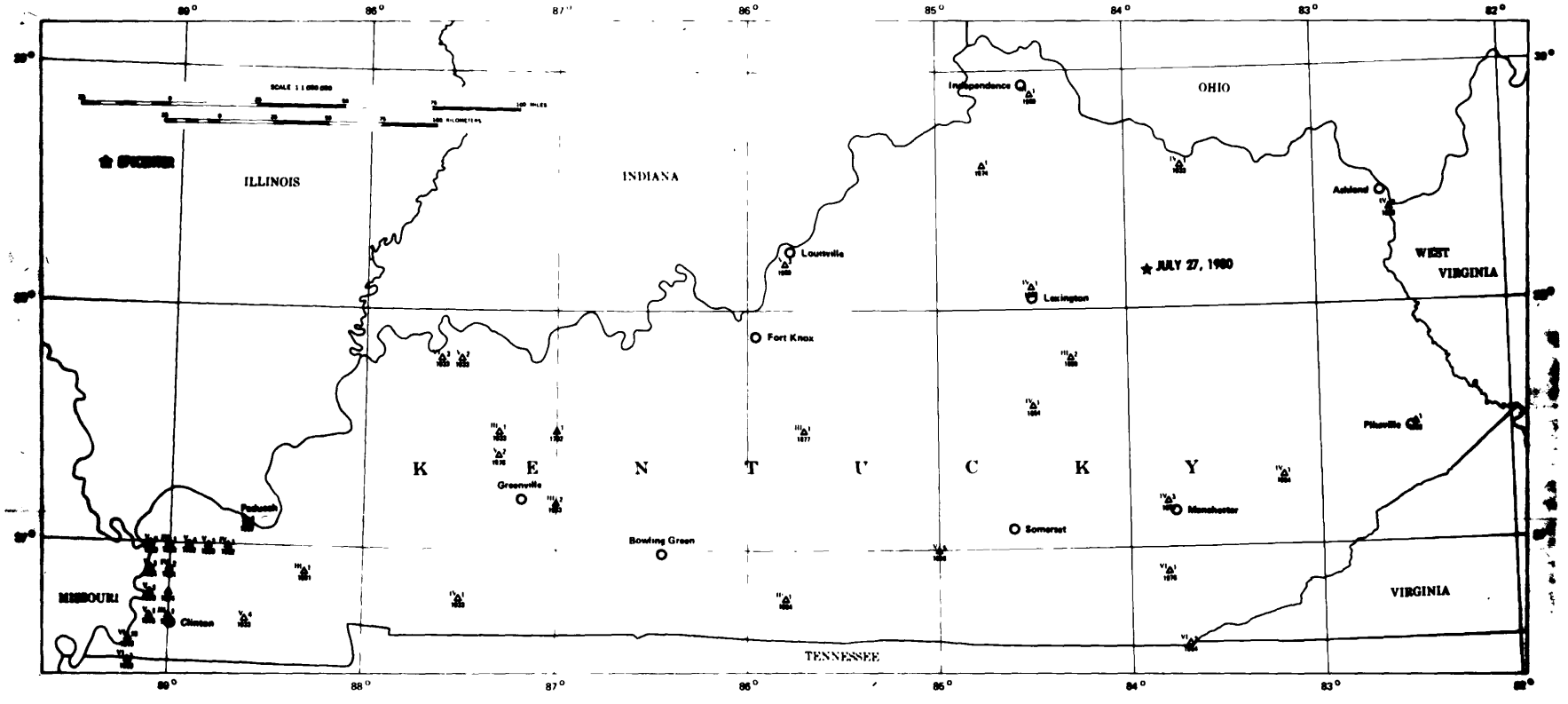

Figure 1. Seismicity map of Kentucky after Stover and others, (1979A). Earthquake locations are defined by a triangle. The arabic number on the right side of the triangle denotes the number of earthquakes at that position and the Roman numeral on the left indicates the maximum intensity of the strongest earthquake at that position. The absence of an intensity implies that no intensity was assigned to earthquakes at that location. The most recent year of occurrence of the maximum intensity is shown below the triangle.

1905 Aug 22	Missouri	36.8	89.6	VII
1909 Sep 27	Indiana	39.5	87.4	VII
1913 Mar 28	Tennessee	36.2	83.7	VII
1922 Nov 27	Illinois	37.8	88.5	VII
1926 Nov 05	Ohio	39.1	82.1	VII
1934 Aug 20	Illinois	37.0	89.2	VII
1965 Aug 14	Illinois	37.1	89.2	VII
1968 Nov 09	Illinois	37.9	88.4	VII
1980 Jul 27	Kentucky	38.1	83.9	VII

The 1980 shock ranks among the stronger earthquakes to have occurred within this region and it is the strongest earthquake since the southern Illinois earthquake of 1968.

Distribution of Damage and Effects

Damage and effects from the 1980 earthquake were distributed over a broad area of the Central United States. Observed damage in the area surrounding the epicenter in northern Kentucky and in parts of southern Ohio varied greatly and depended on the type of structure, construction materials, age of the buildings, and the geologic conditions at that location.

On-site inspections and interviews were conducted with local residents in over 100 communities in northern Kentucky and in southern Ohio. For these communities, observed or reported earthquake effects are tabulated by Hopper and Reagor (1980). Excerpts from this report are presented here for selected communities.

The heaviest apparent ground shaking and largest concentration of damage occurred in the Ohio Valley at Maysville, Kentucky. An intensity of VII has been assigned to this community which was founded in the 19th Century and has a present day population of about 10,000. The older downtown section of the city, which lies adjacent to and extends several blocks back from the Ohio River, is underlain by the Ohio River flood plain (Anderson and others, 1980). Most of the significant damage to structures occurred in this lower section of downtown Maysville which extends westward from Limestone Street, through the center of the business district, along West 1st through West 4th Streets. Estimates of property damage were reported to consist of major damage to 59 homes and 27 businesses and some 200 homes incurred minor damage. The damage was mostly to older brick structures, probably built during the middle 1800's, such as two-story commerical buildings, churches, and townhouses. Buildings or homes with solid masonry walls appeared to have suffered more damage than wood-frame buildings, which is probably

because of the greater inflexibility of masonry. Damage to chimneys exhibited varying degrees of damage, including those broken at or near the roofline, those with several courses of bricks knocked off at the top, or those with bricks dislodged and fallen (figures 2,3,4,5). Other visible damage included partial collapse or bricks dislodged and fallen from several unbraced parapets (figure 6), and cracks in exterior masonry walls. In figure 7, each of the four 6-m (20-foot) columns in front of the Hayswood Hospital was cracked about mid-length. In the figure, the crack can be seen in the extreme left column only. There were reports of broken or shattered windows, cracked basement walls, merchandise thrown to the floor, dishes broken, furniture shifted and hanging pictures fallen from walls. Figure 8 illustrates the change of terrain over which the older section of Maysville is built. The elevation of the city begins a gradual rise from the river wall to near 4th Street where the elevation increases abruptly. In this vicinity, the city begins to ascend the bluffs which overlook the Ohio River Valley. On 5th and 6th Streets, mid-way on the bluffs, the chimney damage that was associated with smaller, post-1900, wood-frame homes appeared to be mostly related to bricks knocked out of chimney tops or the formation of diagonal shear cracks (figures 9,10,11). Due to the poorly maintained condition of these homes (especially on 6th Street), it was difficult to determine if any of these homes were damaged by the earthquake. On top of the bluff, in the Edgewood Road subdivision, a fashionable area of large well-built expensive homes, no visible damage was observed to these homes or to the chimneys.

The Central Shopping Center, located on US Highway 62 between Maysville and Washington, Kentucky, and 2 to 3 km south of the Edgewood Road subdivision, appeared to have suffered little damage. The only apparent damage to the brick-veneered reinforced concrete-block buildings was to the north-facing wall of Murphys Department Store where a slight diagonal crack along the mortar seams and several concrete-blocks appeared to be slightly pushed forward. Most merchants could not verify the apparent damage as caused by the earthquake. The most commonly reported effect from the earthquake was the minor displacement of items from shelves in a few stores. The shopping center was built in 1972 (figures 12,13).

In contrast, Aberdeen, Ohio, directly across the Ohio River from Maysville, was apparently less affected by the earthquake. This may be due in part to the difference in the design and age of the commerical buildings and homes. The commerical buildings were mostly low-rise, relatively modern design structures. Most of the residential damage was on 2nd Street which is closest to and parallels the Ohio River. On this street, there was at least 50 percent chimney damage to the older homes, which were a mixture of brick or wood-frame construction (figures

Figure 2. Buldging chimney with one brick missing beneath the chimney cap on a house located at the corner of 4th Street and Market in Maysville, Kentucky.

Figure 3. Chimney damage on East 3rd Street west of Market in Maysville, Kentucky.

Figure 4. Damage to chimney and cracks at window corners on East 3rd Street and east of Stanley Reid Court in Maysville, Kentucky.

Figure 5. Bricks knocked out of middle of chimney. Parapet damage to building in background in Maysville, Kentucky (photo by G. A. Bollinger).

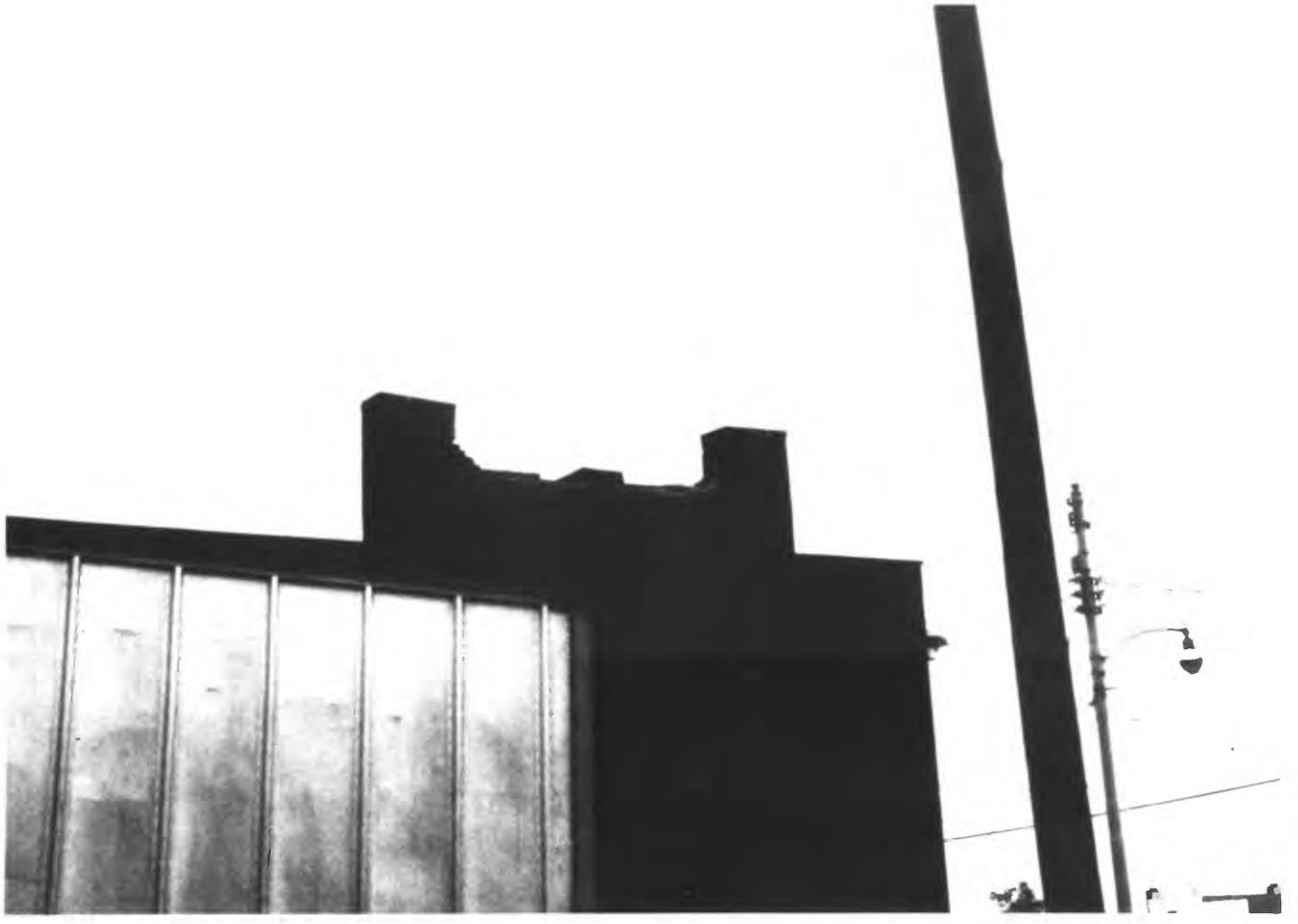

Figure 6. Parapet damage in Maysville, Kentucky (photo by G. A. Bollinger).

Figure 7. All four concrete columns were cracked about mid-length at the Hayswood Hospital in Maysville, Kentucky. In this picture, only the crack in the extreme left column can be seen (photo by G. A. Bollinger).

Figure 8. This picture shows an overview of the older section of Maysville, Kentucky where much of the damage to buildings occurred. This section of Maysville, which lies between the Ohio River and the tree-covered bluffs, is underlain by flood plain sediments. This picture also shows the change of terrain over which the city of Maysville is built.

Figure 9. Bricks thrown from chimney on a house located on 5th Street between Sutton and Banks Streets in Maysville, Kentucky.

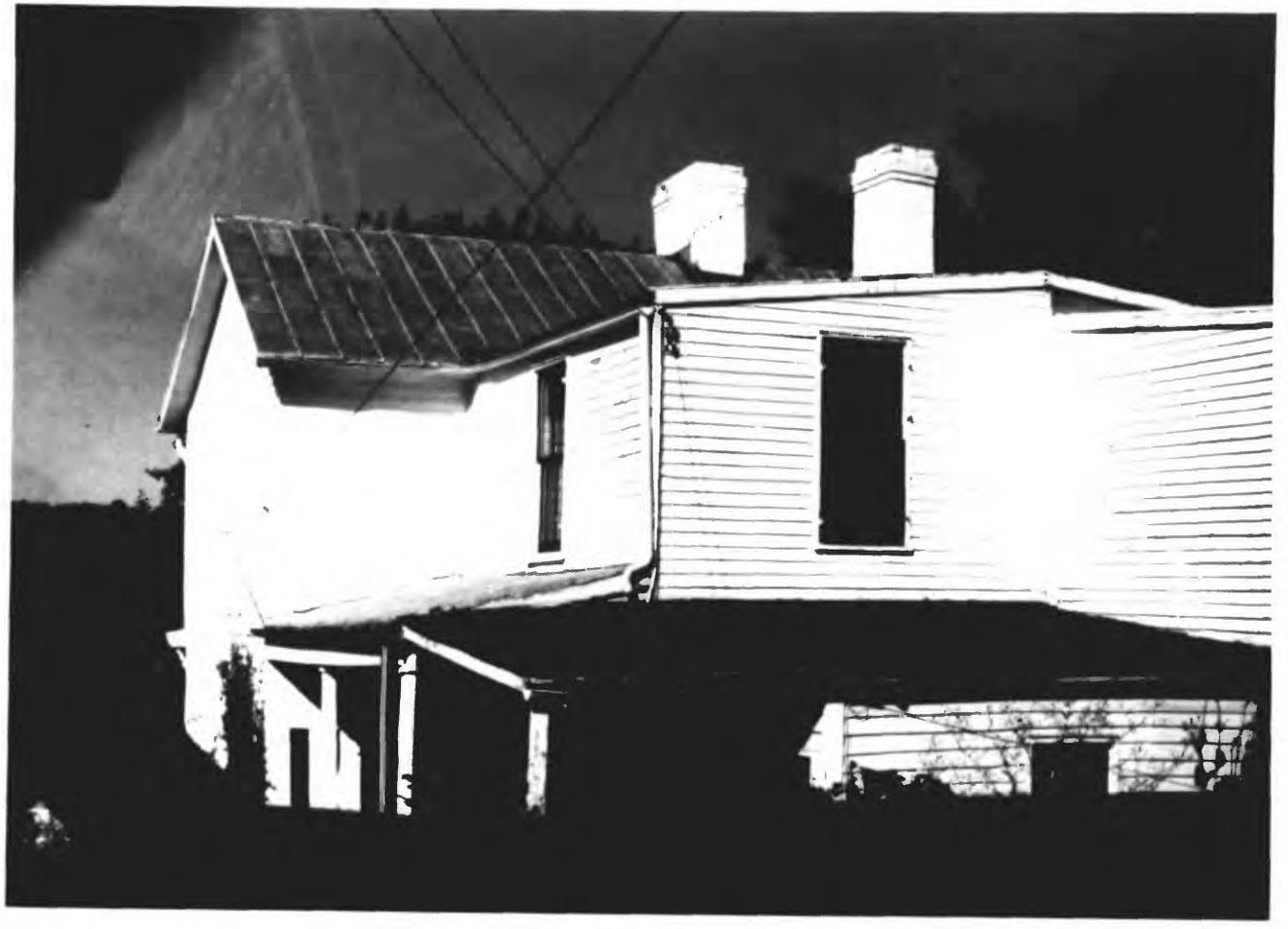

Figure 10. Diagonal cracks in a chimney on a wood-frame house located on 5th Street between Banks and Sutton Streets in Maysville, Kentucky.

Figure 11. Bricks knocked out of chimney on 5th Street in Maysville, Kentucky.

Figure 12. Diagonal cracks along mortar seams in the north-facing wall of Murphys Department Store in the Central Shopping Center located between Maysville and Washington, Kentucky.

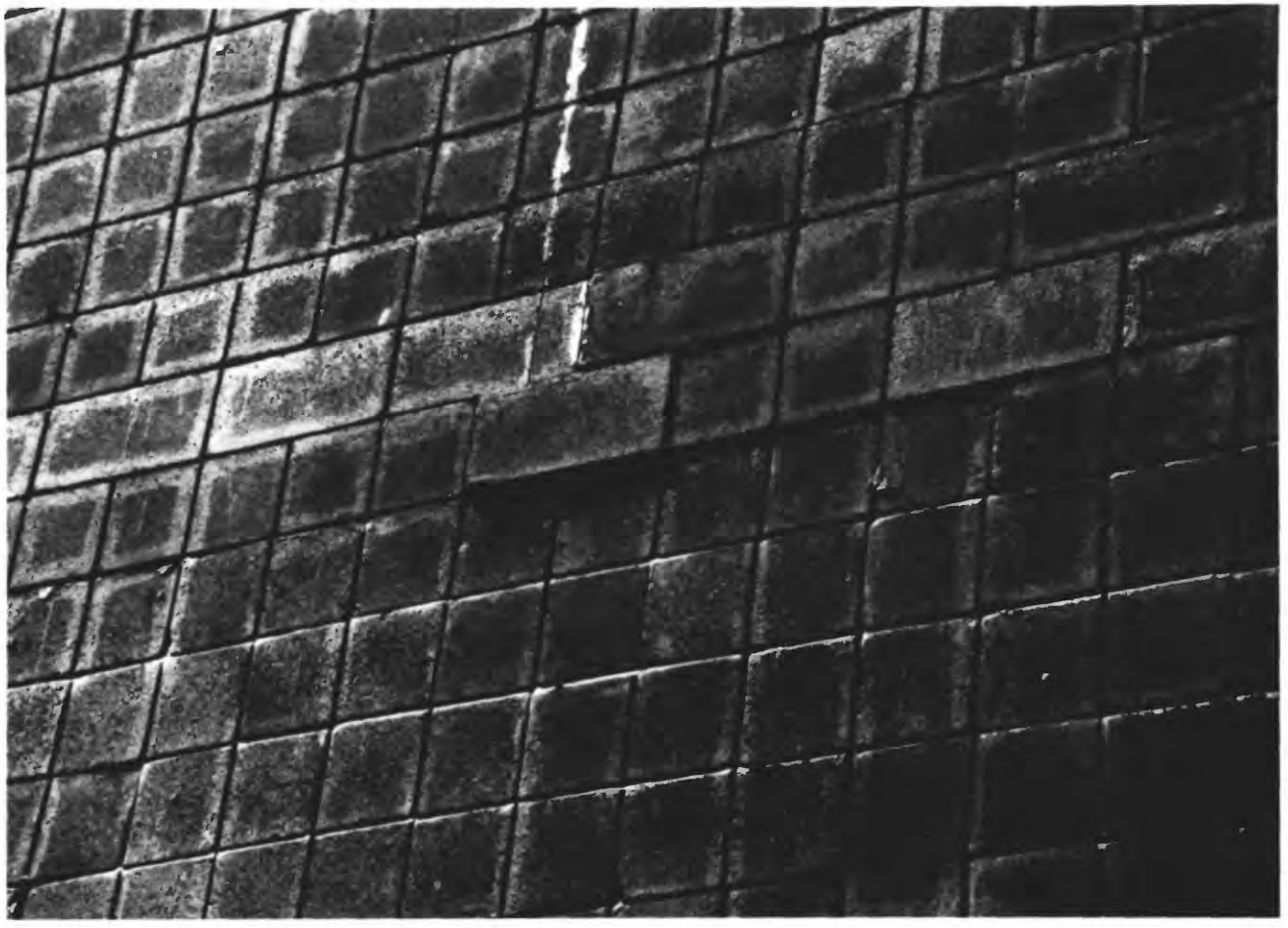

Figure 13. Several concrete-blocks pushed forward in the north-facing wall of Murphys Department Store located in the Central Shopping Center between Maysville and Washington, Kentucky.

14,15,16,17). An example of a bowed chimney, as a result of the earthquake, is shown in figure 18. This home was reported to have survived numerous floods.

Earthquake damage and effects in areas outside of Maysville and within the field survey consisted of chimney damage, cracked concrete-block basement walls and cisterns, cracks in brick or concrete-block walls and in concrete foundations. Non-structural effects that were reported included cracked and broken windows, plaster cracks, objects thrown from shelves and walls with some breakage in scattered instances. Ground cracks were reported to have occurred about 12 km from the epicenter at at Owingsville (James Zollweg, Tennessee Earthquake Information Center, Memphis, Tenn., oral commun., 1980) and Little Rock, Kentucky. At Owingsville, east of the epicenter, the ground cracks were estimated to be 6 - 10 cm deep and 30 m in length. To the west of the epicenter, on Stoner Road near Little Rock, ground cracks were observed by residents to run toward a cistern. The owner of Davis Grocery described the cracks as, "not dry-weather cracks because of the amount of rainfall lately and the cracks were wide enough to stick a thickness of a hand into." After the earthquake, tombstones were observed to be rotated at Sharpsburg (figure 19), Bethel, and Washington, Kentucky (figure 20).

The field survey revealed the most obvious and prevailing type of damage occurred to chimneys. The damage to chimneys was noted to take many forms and exhibited a wide variation in the degree of damage. Typical chimney damage included cracks of varying lengths and widths, bricks loosened, bricks knocked out of tops, bricks toppled from top of chimneys, and in a few scattered instances, chimneys were toppled down to near the roofline. Chimney bricks were frequently observed to be knocked out between the chimney top and the roofline. There were many reports of bricks, dislodged from inside the chimney, that fell onto the hearth. A common feature to many of these chimneys was the absence of a flue pipe and weak mortar used in the construction of the chimneys. In general, the more extensive damage was related to older chimneys that were constructed without reinforcement and with mortar of mud and lime or a mortar mixture called "brickment." Both types of mortars, which reportedly become soft with time, weather and erode quite easily. The bricks on many chimneys appeared to be sitting atop one another with little mortar between them. Not all similarly constructed chimneys were damaged. There were instances of chimneys adjacent to one another, where one would be damaged and the other would not. For example, at Sherburne, Kentucky, approximately 11 km northeast of the epicenter, we talked to a man who was repairing chimneys. It was his opinion that most of the chimneys in the area were in such a poor state-of-repair that he could push them over with his hand. In this small community, seven chimneys were damaged and one was toppled down to the point

Figure 14. Bricks knocked out of chimney between chimney top and the roofline on 2nd Street in Aberdeen, Ohio.

Figure 15. Chimney damage associated with a two-story masonry home on 2nd Street in Aberdeen, Ohio.

Figure 16. Bricks knocked out of chimney top on 2nd Street one block west of Market in Aberdeen, Ohio.

Figure 17. Chimney damage on 2nd Street in Aberdeen, Ohio.

Figure 18. Bowed chimney on 2nd Street in Aberdeen, Ohio. The Ohio River is in the background.

Figure 19. A rotated two-tiered tombstone at Sharpsburg, Kentucky.

Figure 20. A four-tiered tombstone with rotation shown on three bases in Washington, Kentucky.

where the base widened (figure 21). The upper part of the chimney, which was not thrown down by the earthquake, was further torn down by the repairman to prevent possible injury. These seven chimneys represent 20 to 25 percent of the older chimneys in Sherburne.

At Sharpsburg, Kentucky, the town nearest to the epicenter, the effects of the shock included several cracked basements and damage to chimney tops (figure 22,23,24,25). On State Highway KY 11, nearly 50 percent of the chimneys, which were associated with two-story homes about a century old, were estimated to have the tops knocked out. These chimneys, according to the residents, were unreinforced and some of the older chimneys were laid up with lime and mud mortar. Many of these chimneys were "dead chimneys," that is, they were used for ventilating instead of heating purposes. In the immediate area of the chimney damage, the Post Office, a brick-veneered reinforced concrete-block structure, sustained no damage. A one-story unreinforced concrete-block fire house on a concrete slab west of the Post Office, and a one-story concrete-block grocery east of the Post Office were observed to be undamaged.

In several communities, there were a few instances of damage to chimneys which had been repaired and strengthened before the earthquake. At Millersburg, Kentucky, a chimney on a two-story wood-frame house at 2nd and Main Streets lost about a meter of bricks. Other chimneys, on surrounding houses, were not observed to be damaged. Another such example occurred at Owingsville, Kentucky, where a chimney, rebuilt in 1978, was damaged (figure 26). The 45-year old, two-story, wood-frame house was located at 151 High Street. In some other communities as close as 10 km from the epicenter, a few well-built chimneys were observed to be damaged. The severest damage to these chimneys occurred in the upper courses of chimney bricks that were loosened or dislodged and had fallen. At Plum, Kentucky, for example, a well-built chimney lost a few bricks from the top course (figure 27). At Little Rock, Kentucky, where there were reports of cracked chimneys or bricks knocked off, a chimney reported to be recently rebuilt was not observed to be damaged.

Commonly the damage was not a general effect, but was scattered within a community. It was not unusual for a home to have several chimneys among which the extent of damage varied (figure 28). At several locations, damaged chimneys were observed, but upon inquiry it was found that the apparent damage was not caused by the earthquake.

A common practice throughout the area was to place a wire screen, which was held in place by two to six bricks, over the

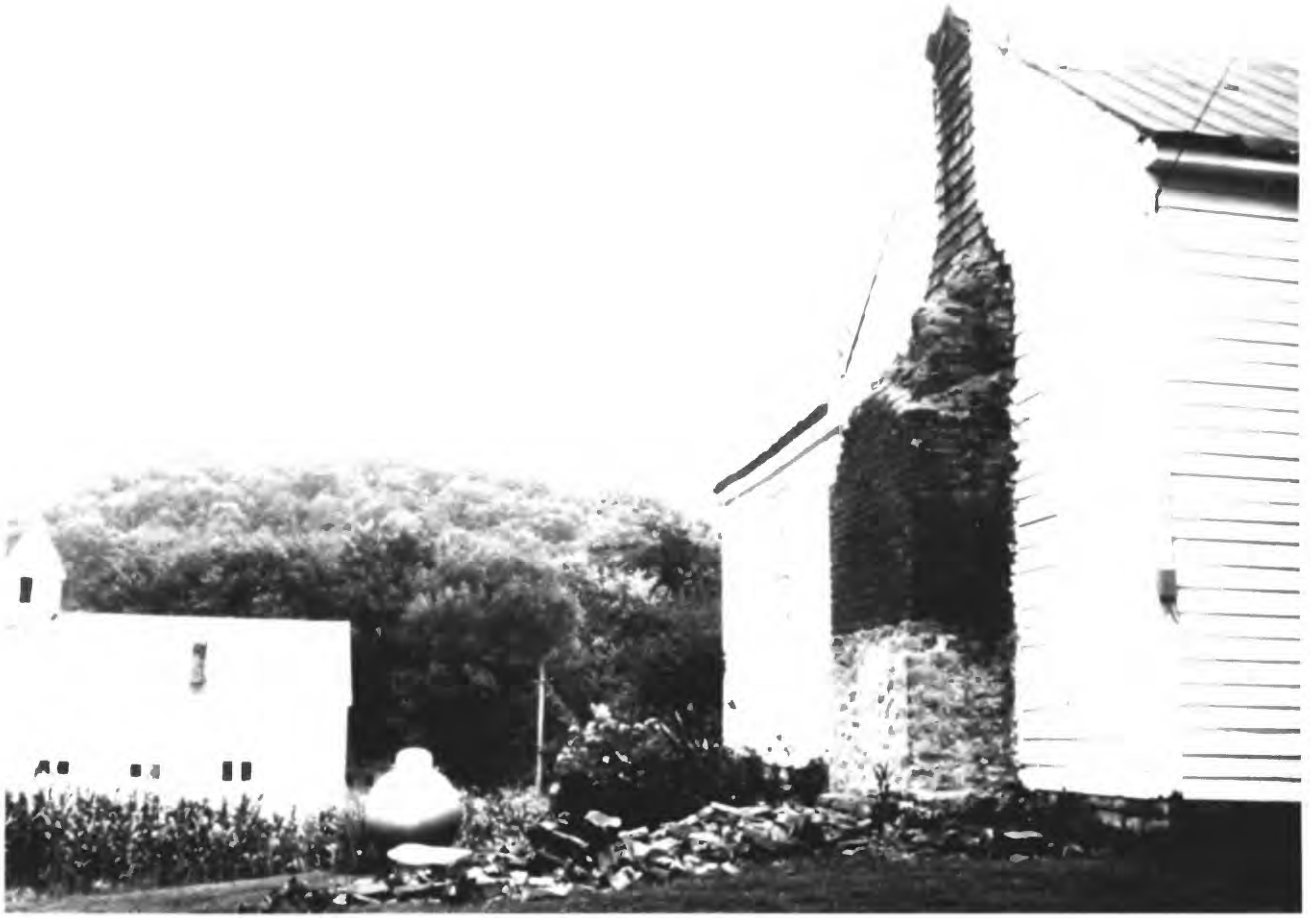

Figure 21. Chimney collapsed to the point of the wider base during the earthquake. The remaining part was pulled down. Sherburne, Kentucky.

Figure 22. Chimney damage on State Highway KY 11 in Sharpsburg, Kentucky.

Figure 23. Bricks knocked off chimney top. Note crack through bricks along side of the house. Sharpsburg, Kentucky on State Highway KY 11.

Figure 24. The picture illustrates the variation of chimney damage. The chimney to the left is the same chimney shown in figure 23. Sharpsburg, Kentucky on State Highway KY 11.

Figure 25. Chimney damage to a home north of Sharpsburg, Kentucky on State Highway KY 11.

Figure 26. Damage to a chimney which was rebuilt in 1978. The home is located at 151 High Street in Owingsville, Kentucky.

Figure 27. Slight damage to a recently built chimney in Plum, Kentucky.

Figure 28. A century old masonry home with 3 damaged chimneys in Judy, Kentucky. The center chimney experienced the severest damage. Note the bricks from the extreme right chimney lying on the roof.

chimney top to prevent birds from nesting in the chimney. In several instances, these bricks were toppled from the chimney tops and were lying on the roof. Although the earthquake may have been responsible for the fallen bricks, no other apparent damage to the chimney was observed.

The accompanying photographs illustrate observed damage in other communities including Poplar Plains, Kentucky (figure 29), Mount Sterling, Kentucky (figure 30), Ripley, Ohio (figure 31), and Manchester, Ohio (figure 32).

Due to the large area of damage surrounding the epicenter, it was not possible to inspect every occurrence of reported damage. Additional damage reports were obtained through newspaper accounts and the postal survey. Typical reported damage included cracked patios, basements, and foundations, and bricks loosened or fallen from chimneys.

The reaction of people to the earthquake ranged from interested or excited to frightened. Generally, the noise associated with the shock was described as similar to a low-flying jet, a sonic boom, or an air conditioner or furnace exploding, but the most common description was a blown natural gas pipeline. Several people also commented that the noise sounded like a clap of thunder and because there were isolated thunderstorms in the area at the time of the earthquake, it may have been thunder. The ground near the epicenter appeared to have waves which was described "as if the streets and sidewalks were made out of rubber." However, it was reported that no one experienced difficulty in standing or walking.

Intensity

Intensity questionnaires were distributed to postmasters and selected government agencies in a radius of 700 km from the epicenter. The effects of the earthquake, based on the field survey, postal canvass, and newspaper accounts, were evaluated using the Modified Mercalli Intensity Scale of 1931 (Wood and Neumann, 1931). The evaluated intensities at individual locations, alphabetically ordered by state and city, are listed in the appendix.

For this earthquake, the intensity assignments were characterized by the following list of reported effects for intensity levels II - VI. However, it must be noted that all of the effects for an intensity level may not be represented on a given report.

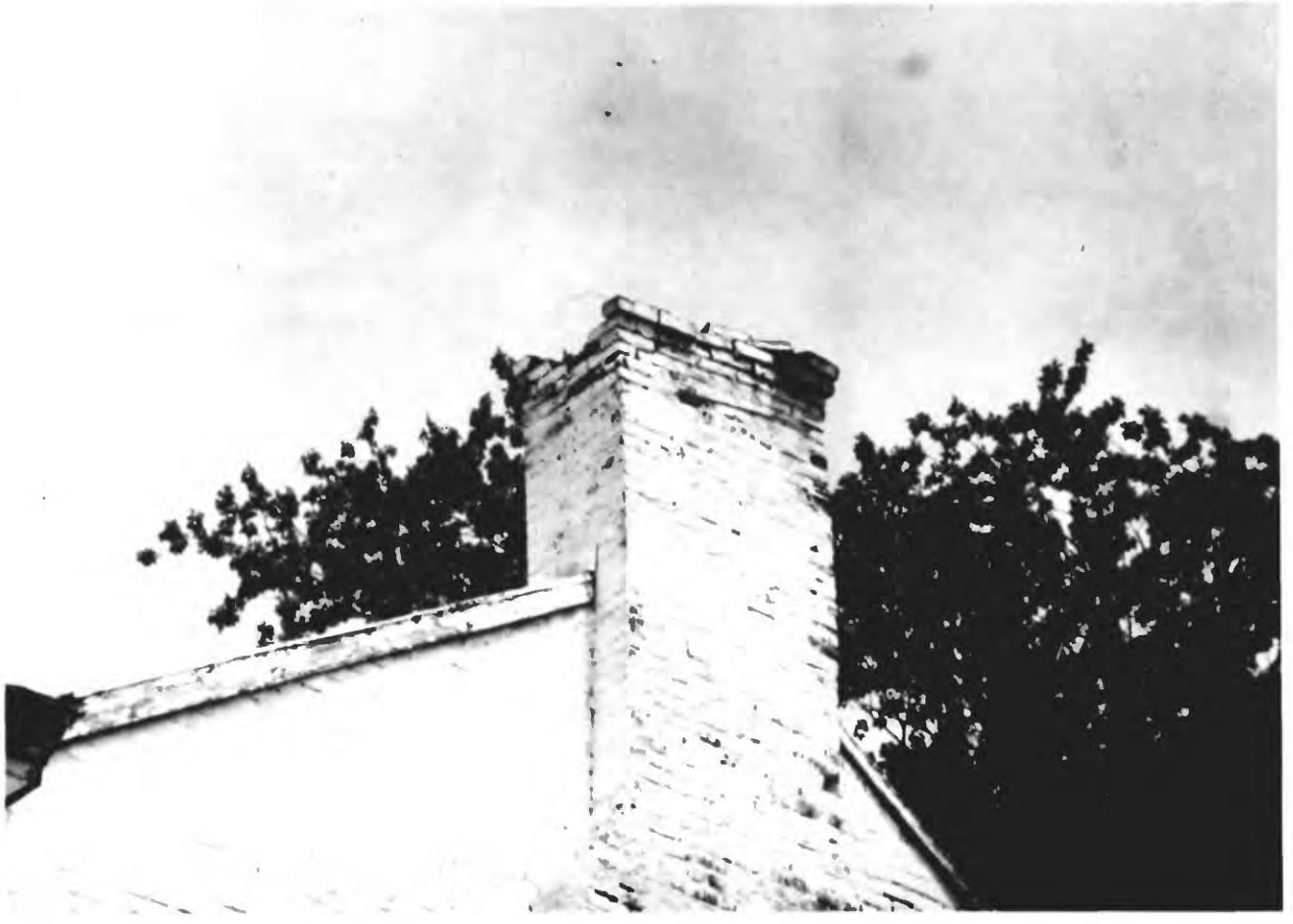

Figure 29. Chimney damage in Poplar Plains, Kentucky. The two-story masonry home is located at the junction of State Highways KY 111 and 156.

Figure 30. Typical chimney damage on White Avenue in Mount Sterling, Kentucky.

Figure 31. Parapet damage at Taylors Village Mart in Ripley, Ohio.

Figure 32. Parapet damage in Manchester, Ohio. This brick structure is the oldest building in the business district. The new concrete-block store in the foreground was not damaged.

Intensity II - felt; felt by few; felt in high-rise buildings.

Intensity III - hanging objects (including pictures), or doors swung slightly; building trembled slightly; vibration described as light; duration of shaking estimated; sometimes not recognized to be an earthquake.

Intensity IV - windows, doors, and dishes rattled; small objects moved; building creaked; building trembled slightly to strongly; furniture moved; hanging pictures moved out-of-place.

Intensity V - cracked few windows; hanging pictures fell; small objects overturned, broken; hanging objects or doors swung moderately to violently accompanied by picture movement or furniture movement; felt by all with reported movement of furniture.

Intensity VI - some windows broken; large quanities of items or merchandise displaced from shelves or walls; bricks loosened; bricks fell; masonry cracks; plaster cracks.

It may be noted that furniture movement is placed at both the IV and V intensity levels. If the Modified Mercalli Scale is taken literally, reported furniture movement would be assigned a V. However, the preferred interpretation in assigning a V to this effect is when actual displacement occurs rather than a vibrating or felt motion. In several reports, especially at greater distances from the epicenter, furniture movement was noted to occur when a person was sitting or lying on a piece of furniture and felt it move.

Isoseismals

The combined intensity data, as previously indicated, are the basis for the generalized isoseismals as shown in figure 33. Due to the high density of intensity points within the VI isoseismal which encloses the epicenter, only representative

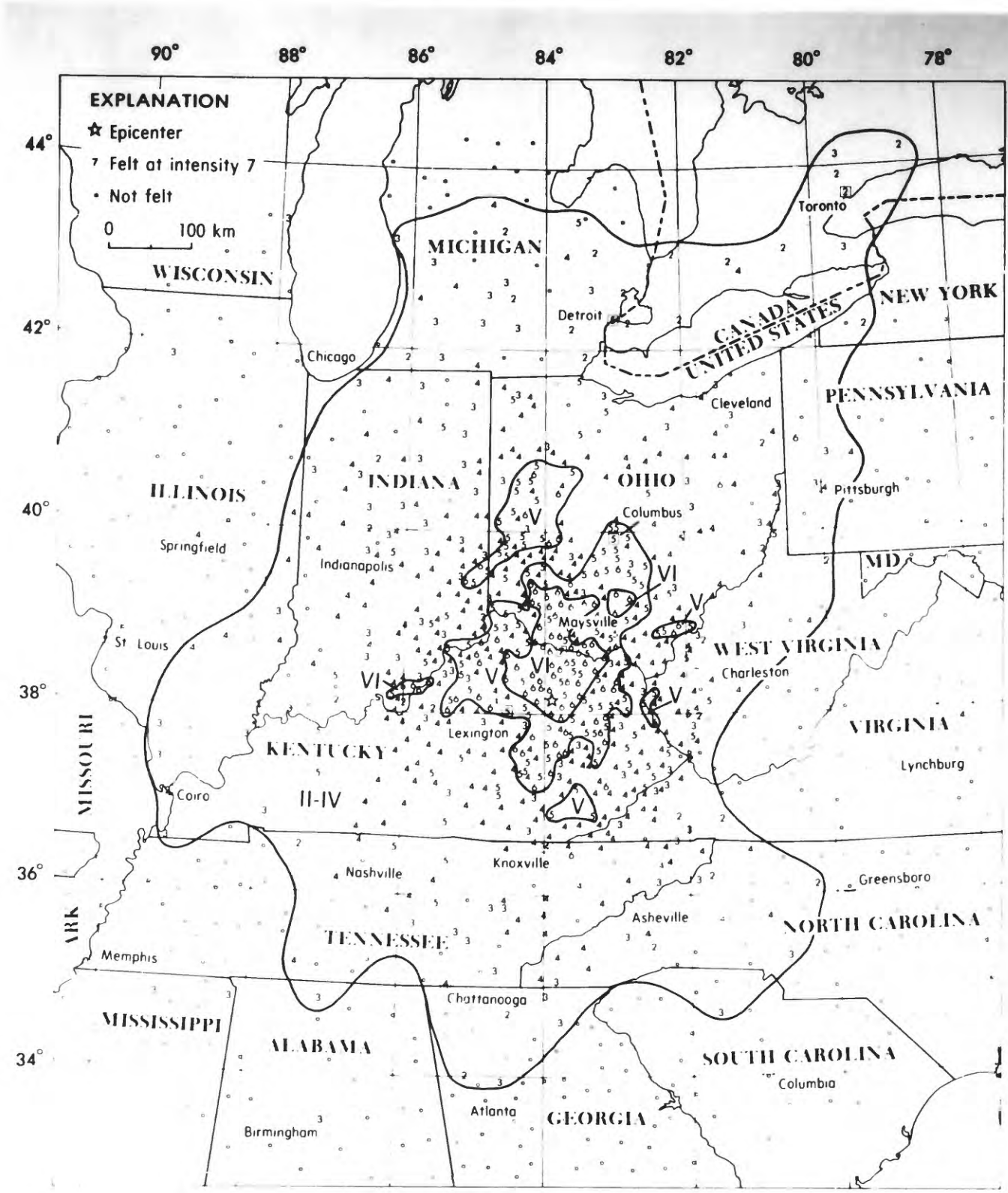

Figure 33. Generalized isoseismal map of the northern Kentucky earthquake of July 27, 1980.

intensity numbers are shown. Outside of this isoseismal, all intensity VI points are plotted. This procedure was followed with respect to points enclosed by the isoseismals V and II-IV.

The isoseismals show the regional intensity patterns subject to the uncertainties of intensity data. This concept of contouring the observed intensity data, the isoseismal map is directed more toward the engineering use rather than the geological use (Richter, 1958).

The results of the intensity study can be used to compare epicentral distance to observed intensity levels. Following the technique described by Bollinger (1977), the basic data used in the generalized contouring of the map is presented in table 2. This table tabulates the distribution of observations for specified distance intervals. The difficulty in assigning a specific intensity level to a specific distance interval is distinctly shown.

Table 2.--Number of intensity observations as a function of epicentral distance intervals for the Kentucky earthquake

Epicentral Distance (Km)	VII	VI	V	IV	II-III	No. of Obs.
0 - 50	-	46	25	13	2	86
51 - 99	1	42	46	110	17	216
100 - 199	-	38	84	353	80	555
200 - 299	-	4	25	84	31	144
300 - 399	-	1	6	54	36	97
400 - 499	-	1	1	10	27	39
500 - 599	-	-	1	6	13	20
600 - 699	-	-	-	1	5	6
700 - 799	-	-	-	-	3	3
800 - 899	-	-	-	-	1	1
900 - 999	-	-	-	-	-	-
1000 - 1999	-	-	-	-	1	1

The isoseismals shown on the map form irregular concentric rings about the epicenter with several outlier anomalies of higher intensities within zones of generally lower intensities. These anomalies appear to correlate with the principal rivers in the felt area. The VI isoseismal encloses the epicenter as well as the VII intensity at Maysville, Kentucky. Two of the intensity V anomalies are associated with low lying areas near the Ohio River. In eastern Ohio, an intensity V anomaly occurred at the junction of the Kanawha River and another V zone occurred in West Virginia along the Big Sandy River. A zone of intensity

VI on the Kentucky - Indiana border along the Ohio River was delineated near Louisville, Kentucky. A small intensity VI zone is associated with the Scioto River and its smaller tributaries northeast of Maysville. The triangular-shaped intensity V area in southeastern Kentucky is proabably related to lowlands near the Cumberland River. A separate, but distinctive, intensity V zone located in the middle of the western half of Ohio coincides with the drainage pattern of the Miami River and its tributaries.

There were isolated reports from localities outside the delineated felt area. These reports were mostly from people in high-rise buildings or the locality was situated in a favorable geologic enviornment.

Discussion

This earthquake is particularly notable for the widespread distribution of damage at a relatively low Modified Mercalli intensity of VI. This seems to be a result of numerous old buildings, many over 100 years old, located throughout the area. It was not uncommon for the occupants of older buildings to report damage to chimneys ($\geq$ VI) although little or nothing fell off shelves inside ($\leq$ V). The greater concentration of older construction, geologic setting, and the duration of ground shaking, which was estimated to range between 15 to 45 seconds, were important factors that contributed to the significant amount of damage in Maysville.

The effects of the earthquake at the epicenter, near Sharpsburg, Kentucky, were estimated to be near the upper limit of the intensity VI level. Based on our observations, a maximum intensity of VII was assigned to Maysville, Kentucky approximately 50 km north of the epicenter. If the shock was located on the basis of macroseismic effects as many of the pre-instrumental historic earthquakes have been, the epicenter would be placed at Maysville, Kentucky.

Acknowledgments

The authors would like to extend their thanks to Mr. John bertram of the U.S. Department of the Army, Corps of Engineers, Huntington, West Virginia and to Mr. Robert Wetmiller of the Earth Physics Branch, Division of Seismology and Geothermal Studies, Ottawa, Canada for their assistance in the collection of intensity data used in this report. We also thank David Gordon and Jim Taggart for their review and comments and to G. A. Bollinger of the Department of Geological Sciences, Virginia

Polytechnic Institute and State University, Blacksburg, Virginia for the use of his slides. Photos not otherwise noted were taken by M. G. Hopper.

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Appendix

Earthquake intensities by state and city, Kentucky earthquake July 27, 1980

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Alabama			
Athens	34.83	86.98	III
Birmingham	33.50	86.91	III
Georgia			
Blairsville	34.88	83.96	III
Cleveland	34.60	83.76	III
Ellijay	34.70	84.46	II
Marietta	33.95	84.56	III
Rome	34.01	85.03	II
Illinois			
Cairo	37.00	89.16	II
Danville	40.15	87.61	IV
Decatur	39.85	88.96	IV
Dixon	41.85	89.48	III
Jonesboro	37.41	89.31	III
Lawrenceville	38.75	87.73	IV
Louisville	38.76	88.50	IV
Murphysboro	37.76	89.35	III
Paris	39.61	87.66	IV
Robinson	39.06	87.76	III
Salem	38.61	88.95	IV
Shawneetown	37.70	88.13	III
Indiana			
Anderson	40.08	85.71	III
Angola	41.63	85.00	IV
Auburn	41.38	85.05	III
Batesville	39.30	85.23	IV
Bath	39.51	84.86	IV
Bedford	38.86	86.48	III
Berne	40.65	84.95	IV
Bloomfield	39.03	86.93	IV
Bloomington	39.16	86.55	IV
Bluffton	40.73	85.18	III

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Borden	38.46	85.95	IV
Boston	39.73	84.85	III
Brazil	39.53	87.13	II
Brookville	39.43	85.01	V
Brownstown	38.86	86.05	IV
Brownsville	39.66	85.00	IV
Butlerville	39.03	85.51	IV
Cambridge City	39.80	85.18	IV
Canaan	38.86	85.41	III
Carmel	39.98	86.13	IV
Cedar Grove	39.35	84.93	IV
Clarksburg	39.43	85.35	IV
Columbia City	41.15	85.48	V
Commiskey	38.86	85.65	IV
Connersville	39.61	85.16	IV
Cortland	38.96	85.96	IV
Corydon	38.20	86.13	V
Covington	40.13	87.41	IV
Crandall	38.28	86.06	IV
Crawfordsville	40.05	86.90	IV
Cross Plains	38.95	85.20	IV
Crothersville	38.81	85.81	IV
Crown Point	41.41	81.36	II
Danville	39.76	86.53	III
Decatur	40.78	84.95	IV
Delphi	40.60	86.68	III
Deputy	38.80	85.65	III
Dillsboro	39.01	85.06	IV
Dupont	38.88	85.51	IV
East Enterprise	38.86	84.98	IV
Edinburg	39.33	85.96	II
Elizabeth	38.11	85.96	II
Elizabethtown	39.13	85.81	IV
Elwood	40.28	85.85	IV
Evansville	38.00	87.55	III
Floyds Knobs	38.31	85.86	V
Fort Wayne	41.06	85.16	III
Fowler	40.63	87.35	III
Frankfort	40.25	86.53	III
Franklin	39.61	86.05	IV
Fredericksburg	38.43	86.18	IV
Gas City	40.50	85.70	IV
Georgetown	38.29	85.98	VI
Glenwood	39.61	85.30	IV
Goshen	41.60	85.81	III
Greenfield	39.76	85.70	III
Greensburg	39.30	85.50	IV
Greenville	38.38	85.98	IV
Guilford	39.16	84.91	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Hagerstown	39.90	85.18	III
Hanover	38.71	85.46	IV
Hartford City	40.50	85.35	VI
Hartsville	39.26	85.70	IV
Holton	39.06	85.38	V
Huntington	40.91	84.46	IV
Indianapolis	39.75	86.16	V
Ireland	38.41	86.00	IV
Jasper	38.38	86.93	V
Jonesville	39.06	85.88	IV
Knightstown	39.75	85.53	IV
Kokomo	40.50	86.15	IV
La Porte	41.61	86.73	III
Laconia	38.03	86.08	IV
Lafayette	40.43	86.88	IV
Laurel	39.50	85.18	III
Lawrenceburg	39.11	84.88	IV
Lebanon	40.01	86.51	II
Lexington	38.65	85.61	IV
Liberty	39.61	84.91	VI
Locansport	40.78	86.41	II
Madison	38.74	85.39	IV
Marion	40.56	85.71	IV
Martinsville	39.41	86.45	IV
Marysville	38.58	85.65	IV
Memphis	38.48	85.76	IV
Metamora	39.45	85.13	VI
Milan	39.13	85.15	IV
Milroy	39.50	85.46	IV
Mitchell	38.73	86.46	IV
Monticello	40.71	86.80	IV
Mooreland	39.00	85.25	IV
Moores Hill	39.11	85.08	IV
Morris	39.28	85.18	IV
Mount Saint Francis	38.35	85.90	III
Muncie	40.16	85.41	IV
Nabb	38.60	85.63	IV
Napoleon	39.20	85.33	IV
New Albany	38.30	85.83	VI
New Castle	39.91	85.36	IV
New Middletown	38.16	86.05	IV
New Point	39.31	85.33	IV
New Salisbury	38.31	86.10	IV
New Washington	38.56	85.55	IV
North Vernon	39.05	85.70	IV
Oldenburg	39.33	85.20	IV
Osgood	39.11	85.31	IV
Otisco	38.55	85.66	V
Paoli	38.60	86.50	III

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Paris Crossing	38.83	85.65	IV
Patriot	38.83	84.81	IV
Pekin	38.50	86.00	IV
Pendleton	39.00	85.75	III
Peru	40.78	86.05	IV
Petersburg	38.50	87.25	IV
Plainfield	39.71	86.40	IV
Portland	40.45	85.00	III
Ramsey	38.31	86.15	IV
Richmond	39.83	84.91	IV
Rising Sun	38.96	84.86	IV
Rockville	39.76	87.23	IV
Rushville	39.58	85.61	IV
Salem	38.60	86.06	III
Santa Claus	38.11	86.90	II
Scipio	39.08	85.71	IV
Scottsburg	38.68	85.78	IV
Sellersburg	38.40	85.75	III
Seymour	38.95	85.86	IV
Shelbyville	39.50	85.80	IV
South Bend	41.66	86.30	IV
Spencer	39.26	86.80	IV
Sunman	39.23	85.10	IV
Tell City	37.96	86.76	III
Tipton	40.26	86.05	III
Union City	40.16	84.83	IV
Vernon	38.98	85.60	V
Versailles	39.06	85.26	IV
Vevay	38.75	85.06	V
Wabash	40.80	85.83	III
Warsaw	41.21	85.83	IV
Westport	39.18	85.56	IV
Williamsburg	39.95	84.00	III
Winamac	41.05	86.60	IV
Winchester	40.16	84.98	IV
Zionsville	39.95	86.25	III
	<u>Kentucky</u>		
Alexandria	38.98	84.36	V
Annville	37.31	83.96	IV
Athol	37.55	83.56	IV
Augusta	38.75	84.00	VI
Auxier	37.73	82.76	IV
Bagdad	38.26	85.05	V
Barbourville	36.88	83.88	V
Barnetts Creek	37.83	82.88	IV
Barterville	38.37	84.06	VI

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Baxter	36.86	83.33	V
Bays	37.65	83.25	IV
Bear Branch	37.16	83.55	V
Beattyville	37.58	83.70	VI
Beauty	37.83	82.43	IV
Beaver	37.40	82.65	IV
Bedford	38.60	85.31	IV
Beechburg	38.44	83.64	IV
Belfry	37.61	82.26	IV
Benham	36.95	82.95	III
Berea	37.56	84.28	IV
Berry	38.51	84.38	VI
Bethany	37.65	83.46	IV
Bethel	38.24	83.86	VI
Bethlehem	38.40	85.06	III
Betsy Layne	37.55	82.63	III
Bighill	37.55	84.21	IV
Blacks Crossroads	38.25	84.13	IV
Blaine	38.03	82.83	V
Blairs Mills	38.08	83.30	IV
Bledsoe	36.91	83.35	V
Bloomfield	37.91	85.31	IV
Blue Lick	38.43	83.92	VI
Bonnieville	37.38	85.90	IV
Booneville	37.48	83.66	IV
Boston	37.78	85.66	III
Bowen	37.85	83.76	IV
Bowling Green	37.00	86.45	IV
Bradfordsville	37.50	85.15	V
Brandenburg	38.00	86.18	IV
Brodhead	37.40	84.41	IV
Bronston	36.98	84.61	IV
Brooks	38.06	85.71	IV
Bruin	38.18	83.01	V
Bryantsville	37.71	84.65	IV
Buckner	38.38	85.43	IV
Buena Vista	38.43	84.16	VI
Buffalo	37.51	85.70	IV
Bulan	37.30	83.16	IV
Burdine	37.18	82.60	V
Burke	38.10	83.05	III
Burkesville	36.80	85.35	V
burlington	39.03	84.73	IV
Burnside	36.98	84.60	IV
Buskirk	37.81	83.43	IV
Bypro	37.36	82.70	IV
Cadiz	36.86	87.83	III
California	38.91	84.26	IV
Camargo	37.99	83.88	VI

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Camp Dix	38.48	83.28	VI
Campbellsburg	38.51	85.20	V
Campton	37.73	83.55	IV
Canada	37.61	82.33	IV
Caney	38.06	83.35	V
Cannel City	37.78	83.28	V
Canoe	37.45	83.45	IV
Carlisle	38.30	84.03	VI
Carrollton	38.65	85.18	IV
Carter	38.43	83.13	IV
Cawood	36.78	83.23	IV
Cecilia	37.66	85.95	IV
Central City	37.30	87.11	V
Chaplin	37.90	85.21	IV
Charters	38.57	83.43	VI
Clay City	37.86	83.91	V
Clayhole	37.46	83.28	V
Clearfield	38.16	83.43	V
Clermont	37.93	85.65	III
Climax	37.46	84.21	V
Clintonville	38.08	84.26	V
Cobhill	37.71	83.83	IV
Columbia	37.11	85.30	III
Colville	38.36	84.21	IV
Combs	37.26	83.21	IV
Concord	38.68	83.50	VI
Conway	37.48	84.33	IV
Corbin	36.93	84.11	IV
Corinth	38.50	84.56	IV
Cornettsville	37.13	83.08	IV
Cottageville	38.61	83.62	IV
Cottle	37.88	83.20	V
Cowan	38.40	83.91	VI
Coxs Creek	37.90	85.48	IV
Crestwood	38.31	85.46	IV
Crittenden	38.78	84.60	V
Crockett	37.98	83.08	IV
Cromona	37.18	82.66	IV
Crystal	37.66	83.83	VI
Cumberland	36.96	82.98	IV
Cutuno	37.71	83.23	III
Cynthiana	38.36	84.30	V
Danville	37.80	84.80	IV
De Mossville	38.80	84.41	IV
Denniston	37.91	83.53	IV
Denton	38.26	82.86	II
Dorton	37.28	82.58	III
Dover	38.76	83.88	VI
Dreyfus	37.61	84.18	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Drift	37.48	82.75	IV
Dry Ridge	38.68	84.58	IV
Dunnville	37.20	85.00	IV
East Bernstadt	37.18	84.11	VI
East Union	38.24	83.82	V
Eastview	37.58	86.05	IV
Edna	37.80	83.15	IV
Egypt	37.31	83.90	IV
Ekron	37.93	86.18	IV
Elizabethtown	37.70	85.90	IV
Elizaville	38.41	83.81	VI
Elkfork	37.96	83.13	VI
Elna	37.91	82.96	IV
Elsie	37.78	83.13	III
Emerson	38.35	83.25	IV
Eminence	38.41	85.18	IV
Erlanger	39.01	84.60	IV
Ermine	37.11	82.78	IV
Eubank	37.29	84.66	IV
Evarts	36.86	83.20	IV
Ewing	38.43	83.86	VI
Ezel	37.90	83.45	IV
Fairview	38.45	83.93	VI
Falmouth	38.66	84.36	V
Farmers	38.15	83.55	V
Fearisville	38.62	83.60	IV
Ferguson	37.06	84.60	IV
Fernleaf	38.65	83.91	V
Finchville	38.15	85.31	V
Firebrick	38.68	83.05	IV
Flat Fork	37.83	83.03	IV
Flatwoods	38.55	82.73	IV
Flemingsburg	38.43	83.80	VI
Florence	38.98	84.66	IV
Foraker	37.66	83.13	IV
Ford	37.88	84.26	III
Fort Knox	37.90	85.96	IV
Foster	38.80	84.21	V
Foxport	38.47	83.59	V
Frakes	36.65	83.92	IV
Frankfort	38.18	84.91	VI
Franklin	36.73	86.56	IV
Freeburn	37.56	82.15	IV
Frenchburg	37.95	83.61	V
Fritz	37.70	83.15	VI
Fuget	37.88	82.91	III
Fultz	38.28	83.01	VI
Garrard	37.11	83.75	IV
Garrett	37.48	82.83	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Garrison	38.60	83.17	V
Georgetown	38.20	84.56	IV
Germantown	38.65	83.96	V
Ghent	38.73	85.06	IV
Gifford	37.76	83.11	IV
Gillmore	37.73	83.36	IV
Glasgow	37.00	85.91	IV
Glencoe	38.71	84.81	IV
Glendale	37.60	85.90	IV
Glenview	38.28	85.63	IV
Goshen	38.40	85.56	IV
Grahn	38.28	83.08	IV
Grange City	38.24	83.66	V
Gratz	38.46	84.95	IV
Gravel Switch	37.58	85.05	IV
Gray	36.95	84.00	IV
Gray Hawk	37.40	83.93	IV
Grayson	38.35	82.98	VI
Green Hall	37.40	83.83	IV
Greensburg	37.23	85.50	IV
Greenup	38.56	82.83	V
Guerrant	37.51	83.50	IV
Haddix	37.48	83.35	IV
Hager	37.75	83.23	V
Haldeman	38.25	83.31	IV
Hardy	37.61	82.25	IV
Hardyville	37.25	85.78	IV
Harlan	36.88	83.31	IV
Harold	37.53	82.63	IV
Harper	37.80	83.20	VI
Harrods Creek	38.33	85.63	IV
Hatton	38.23	85.00	V
Hazard	37.26	82.20	IV
Hazel Green	37.80	83.41	V
Head of Grassy	38.40	83.26	V
Headquarters	38.35	84.11	VI
Hebron	39.06	84.70	IV
Heidelberg	37.55	83.78	VI
Helechawa	37.76	83.33	V
Helena	38.49	83.77	V
Hellier	37.28	82.46	III
Hi Hat	37.38	82.73	IV
Hickman	36.55	89.16	III
Hillsboro	38.29	83.66	V
Hindman	37.33	82.98	IV
Hitchins	38.28	82.91	IV
Hoogenville	37.55	85.76	IV
Hookstown	38.35	84.15	VI
Hueysville	37.53	82.83	III

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Hulen	36.78	83.51	IV
Hustonville	37.48	84.28	IV
Independence	38.95	84.55	III
Index	37.90	83.28	V
Insko	37.76	83.30	IV
Irvine	37.66	83.96	V
Isonville	38.06	83.05	V
Ivel	37.58	82.65	IV
Jackhorn	37.21	82.70	III
Jackstown	38.24	84.06	III
Jacobs	38.23	83.26	V
Jamestown	36.98	85.06	IV
Jeff	37.20	83.13	VI
Jeffersonville	37.98	83.85	VI
Jenkins	37.16	82.63	II
Jeremiah	37.16	82.93	IV
Johnetta	37.41	84.20	III
Johns Run	38.23	82.91	IV
Jonesville	38.63	84.76	IV
Judy	38.12	83.96	VI
Junction City	37.55	84.81	IV
Keaton	37.98	82.96	III
Keene	37.95	84.63	IV
Kenton	38.86	84.45	IV
Kentontown	38.49	84.12	V
Kenvir	36.85	83.16	IV
Kerby Knob	37.51	84.11	IV
Kings Mountain	37.36	84.68	IV
La Grange	38.43	85.40	III
Lackey	37.46	82.83	III
Lair	38.34	84.31	IV
Lancaster	37.60	84.56	IV
Langley	37.53	82.78	IV
Lawrenceburg	38.03	84.93	IV
Lawton	38.35	83.21	III
Lebanon Junction	37.83	85.75	IV
Leeco	37.71	83.70	V
Lenox	37.96	83.20	V
Lerose	37.48	83.61	IV
Letcher	37.15	82.96	IV
Lewisburg	38.55	83.76	V
Lexington	38.03	84.51	V
Lily	37.03	84.28	IV
Little Rock	38.19	84.05	VI
Livingston	37.30	84.21	IV
Logville	37.86	83.11	V
London	37.11	84.11	III
Lone	37.53	83.60	IV
Lookout	37.31	82.46	V

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Loretto	37.63	85.40	IV
Louisville	38.25	85.75	VI
Lynn	38.56	82.94	IV
Lytten	38.08	83.21	V
Maceo	37.86	86.00	IV
Mackville	37.73	85.06	III
Maggard	37.81	83.11	IV
Magnolia	37.45	85.75	IV
Malone	37.86	83.26	IV
Manchester	37.15	83.76	IV
Mariba	37.91	83.58	IV
Martha	38.01	82.91	IV
Marthas Mills	38.36	83.76	V
Martin	37.56	82.75	IV
Mary	37.66	83.51	III
Mason	38.58	84.58	IV
Mayking	37.13	82.76	IV
Mays Lick	38.51	83.83	VI
Maysville	38.63	83.76	VII
Mazie	38.03	82.96	IV
McAndrews	37.56	82.25	V
McCarr	37.61	82.17	V
McDowell	37.46	82.73	IV
McKee	37.41	83.00	IV
McRoberts	37.20	82.66	IV
Means	37.95	83.76	VI
Melbourne	39.03	84.36	V
Middlesboro	36.60	83.71	III
Midway	38.15	84.66	IV
Millersburg	38.30	84.15	VI
Millstone	37.16	82.75	IV
Milton	38.71	85.36	V
Minerva	38.70	83.91	VI
Mintonville	37.18	84.81	IV
Mize	37.86	83.38	III
Monticello	36.80	84.85	IV
Moon	37.98	83.05	IV
Moorefield	38.26	83.93	VI
Moranburg	38.67	83.81	V
Morehead	38.20	83.50	VI
Morning Glory	38.40	84.14	VI
Morrill	37.53	84.19	IV
Mount Carmel	38.48	83.64	VI
Mount Eden	38.05	85.15	IV
Mount Olivet	38.53	84.03	VI
Mount Sterling	38.06	83.96	VI
Mount Vernon	37.33	84.33	V
Mount Washington	38.05	85.55	II
Mousie	37.41	82.88	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Mouthcard	37.38	82.25	III
Murphysville	38.56	83.86	VI
Muses Mills	38.35	83.53	VI
Myers	38.35	83.95	V
Nancy	37.06	84.75	IV
Nazareth	37.85	85.46	IV
Neon	37.20	82.71	IV
Nerinx	37.66	85.38	IV
New Castle	38.43	85.16	V
New Haven	37.65	85.60	IV
New Hope	37.63	85.51	IV
New Liberty	38.61	84.90	IV
Newfoundland	38.13	83.10	IV
Newport	39.08	84.49	V
Nicholasville	37.91	84.58	IV
North Middletown	38.14	84.11	VI
Odoville	38.45	84.23	V
Oil Springs	37.81	82.95	IV
Old Landing	37.63	83.80	IV
Oldtown	38.43	82.90	IV
Olive Hill	38.28	83.16	VI
Olympia	38.06	83.66	VI
Oneida	37.26	83.65	IV
Ophir	37.90	82.98	IV
Orangeburg	38.56	83.68	VI
Orlando	37.36	84.26	V
Owensboro	37.76	87.13	V
Owenton	38.56	84.91	VI
Owingsville	38.15	83.76	VI
Paint Lick	37.61	84.40	VI
Paintsville	37.83	82.83	IV
Paris	38.23	84.26	VI
Parrot	37.31	84.05	V
Pathfork	36.75	83.46	IV
Pendleton	38.46	85.30	III
Perryville	37.65	84.95	IV
Petersburg	39.06	84.86	III
Petersville	38.44	83.49	V
Pewee Valley	38.31	85.48	IV
Phyllis	37.43	82.35	IV
Pikeville	37.43	82.53	V
Pilgrim	37.80	82.41	IV
Pine Grove	38.03	84.26	IV
Pine Knot	36.65	84.43	IV
Pine Ridge	37.76	83.61	V
Pineville	36.76	83.70	IV
Pinsonfork	37.55	82.25	IV
Pippa Passes	37.33	82.88	III
Pittsburg	37.16	84.11	VI

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Pleasant Valley	38.38	83.93	VI
Pleasureville	38.35	85.11	V
Plum	38.18	84.03	VI
Plummers Landing	38.31	83.55	V
Plumville	38.60	83.67	VI
Polksville	38.13	83.65	VI
Pomeroyton	37.88	83.53	IV
Poplar Flat	38.59	83.52	IV
Poplar Grove	38.50	83.68	V
Poplar Plains	38.36	83.67	VI
Port Royal	38.55	85.08	IV
Preston	38.08	83.75	VI
Prestonsburg	37.63	82.83	V
Primrose	37.60	83.61	IV
Prospect	38.35	85.61	VI
Pryse	37.66	83.88	IV
Quicksand	37.53	83.35	IV
Quincy	38.61	83.13	VI
Raywick	37.56	85.43	IV
Rectorville	38.57	83.64	VI
Redbush	37.95	82.95	IV
Regina	37.36	82.40	IV
Revelo	36.68	84.46	IV
Reynoldsville	38.19	83.82	V
Ricetown	37.38	83.61	IV
Richmond	37.75	84.33	IV
Rhineyville	37.75	85.96	III
Roark	37.03	83.51	V
Robinson Creek	37.38	82.55	V
Rockholds	36.83	84.11	IV
Rockhouse	37.33	82.45	IV
Rogers	37.75	83.63	IV
Rosslyn	37.85	83.81	IV
Rousseau	37.60	83.23	V
Royalton	37.68	83.01	IV
Rush	38.33	82.76	IV
Sadieville	38.38	84.53	VI
Saint Catharine	37.71	85.26	IV
Saint Francis	37.63	85.43	IV
Saint Helens	37.58	83.65	IV
Saldee	37.45	83.36	IV
Salt Lick	38.11	83.61	VI
Salvisa	37.91	84.85	III
Salyersville	37.75	83.06	IV
Sand Hill	38.68	83.58	VI
Sandy Hook	38.08	83.13	V
Sanders	38.65	84.95	VI
Sanggap	37.48	84.10	VI
Sardis	38.54	83.95	VI

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Sassafras	37.21	83.05	IV
Science Hill	37.18	84.63	V
Scottsville	36.76	86.18	IV
Sebastians Branch	37.43	83.46	IV
Sextons Creek	37.31	83.78	III
Shady Nook	38.39	84.19	IV
Shannon	38.54	83.89	VI
Sharpsburg	38.20	83.93	VI
Shawhan	38.30	84.27	IV
Shelbiana	37.43	82.50	IV
Shelbyville	38.16	85.23	VI
Shepherdsville	38.00	85.70	IV
Sherburne	38.23	83.80	VI
Sidney	37.61	82.35	IV
Silver Grove	39.05	84.41	IV
Silverhill	37.88	83.05	IV
Slade	37.80	83.70	VI
Smithfield	38.38	85.25	IV
Smiths Creek	38.46	83.18	IV
Soldier	38.26	83.30	IV
Somerset	37.10	84.61	V
Sonora	37.53	85.90	IV
South Portsmouth	38.73	83.00	IV
South Shore	38.71	82.98	VI
Sparta	38.68	84.90	IV
Springfield	37.71	85.20	III
Stacy Fork	37.83	83.26	IV
Stamping Ground	38.26	84.68	IV
Stanford	37.50	84.70	IV
Stanton	37.90	83.86	V
Stanville	37.58	82.65	IV
Stephens	38.13	82.96	IV
Strunk	36.63	84.43	IV
Sulphur	38.50	85.28	III
Summersville	37.33	85.50	V
Sweeden	37.25	86.28	IV
Talbert	37.41	83.45	IV
Tateville	36.96	84.58	IV
Taylorsville	38.03	85.30	VI
Tilton	38.34	83.76	V
Tollesboro	38.57	83.59	V
Tomahawk	37.86	82.60	IV
Topmost	37.37	82.79	IV
Trappist	37.66	85.53	IV
Trinity	38.66	83.61	IV
Turners Station	38.55	85.16	V
Tyner	37.35	83.90	VI
Union	38.95	84.68	V
Upper Tygart	38.30	83.28	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Upton	37.46	85.90	IV
Vada	37.61	83.58	III
Van Lear	37.76	82.76	IV
Vanceburg	38.60	83.33	V
Vancleve	37.63	83.41	IV
Verona	38.81	84.66	VI
Versailles	38.06	84.75	VI
Vicco	37.21	83.06	IV
Vincent	37.46	83.78	III
Vine Grove	37.80	85.96	IV
Viper	37.18	83.15	IV
Virgie	37.33	82.58	IV
Waco	37.75	84.15	VI
Waddy	38.13	85.06	IV
Wallingford	38.40	83.61	VI
Wallins Creek	36.83	83.41	IV
Walton	38.85	84.63	IV
Waneta	37.48	84.03	III
Warfield	37.85	82.41	IV
Warsaw	38.78	84.90	VI
Washington	38.61	83.80	VI
Wayland	37.45	82.80	V
Webbville	38.18	82.86	V
Wedonia	38.49	83.75	VI
Weeksbury	37.33	82.70	IV
Wellington	37.91	83.51	IV
Wendover	37.13	83.26	IV
West Liberty	37.93	83.26	VI
West Point	38.00	85.98	IV
West Van Lear	37.78	82.78	V
Westbend	37.90	83.96	V
Westport	38.48	85.48	IV
Wheelersburg	37.83	83.01	III
Wheelwright	37.35	82.75	IV
White Oak	37.86	83.20	IV
Whitesburg	37.11	82.86	IV
Whitesulphur	38.07	83.61	VI
Whitley City	36.75	84.48	IV
Wildie	37.41	84.30	IV
Willard	38.21	82.90	IV
Williamsburg	36.71	84.20	III
Williamstown	38.65	84.53	VI
Willisburg	37.81	85.11	IV
Wilmore	37.83	84.66	IV
Winchester	37.98	84.20	V
Wind Cave	37.51	83.93	V
Winston	37.70	84.08	IV
Woodbine	36.90	84.08	IV
Wooton	37.18	83.30	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Worthington	38.55	82.68	IV
Worthville	38.61	85.06	IV
Wrigley	38.01	83.26	IV
Wyoming	38.21	83.70	V
Yocum	37.98	83.33	IV
York	38.56	83.05	III
Zachariah	37.70	83.68	IV
Michigan			
Allegan	42.56	85.86	IV
Cassopolis	41.91	86.01	II
Centreville	41.91	85.53	III
Charlotte	42.61	84.83	III
Coldwater	41.83	85.00	IV
Detroit	42.33	83.00	V
Flint	43.03	83.66	IV
Grand Rapids	42.97	85.68	III
Hastings	42.70	85.33	IV
Ithaca	43.31	84.60	II
Jackson	42.25	84.42	III
Kalamazoo	42.30	85.63	III
Lansing	42.75	84.58	III
Lapeer	43.08	83.25	II
Marshall	42.30	84.93	III
Mason	42.56	84.46	II
Monroe	41.93	83.40	II
Mount Pleasant	43.61	84.78	IV
Muskegon	43.21	86.23	III
Pontiac	42.66	83.30	III
Saginaw	43.42	83.50	V
Selfridge A.F.B.	42.64	82.82	II
Ypsilanti	42.23	83.61	II
Mississippi			
Ashland	34.83	89.18	III
Iuka	34.81	88.18	III
New York			
Jamestown	42.11	79.23	II
North Carolina			

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Asheville	35.58	82.58	IV
Banner Elk	36.16	81.86	III
Boone	36.21	81.68	II
Bryson City	35.43	83.45	IV
Canton	35.55	82.85	III
Fletcher	35.43	82.50	II
Franklin	35.20	83.38	IV
Harrisburg	35.31	80.65	III
Hayesville	35.05	83.81	III
Morganton	35.73	81.56	IV
Murphy	35.08	84.03	IV
Robbinsville	35.31	83.80	IV
Sparta	36.50	81.15	IV
Statesville	35.76	80.90	IV
Winston-Salem	36.10	80.24	II
Ohio			
Aberdeen	38.65	83.76	VI
Ada	40.78	83.71	IV
Addison	38.88	82.15	VI
Adelphi	39.46	82.75	IV
Akron	41.08	81.50	IV
Albany	39.23	82.20	IV
Alpha	39.71	84.01	IV
Amanda	39.65	82.75	III
Amelia	39.03	84.21	IV
Ashland	40.86	82.31	IV
Ashville	39.71	82.95	V
Athens	39.38	82.15	III
Bainbridge	39.21	83.28	VI
Barnesville	38.96	81.16	III
Batavia	39.08	84.16	IV
Beaver	39.03	82.81	V
Bellbrook	39.63	84.06	IV
Belle Center	40.51	83.75	IV
Bellefontaine	40.41	83.80	VI
Belpre	39.28	81.60	IV
Bentonville	38.75	83.61	VI
Bethel	38.96	84.06	VI
Bidwell	38.91	82.30	V
Blacklick	39.00	82.81	III
Blanchester	39.28	83.98	VI
Blue Creek	38.78	83.33	VI
Bluffton	40.88	83.88	IV
Botkins	40.46	84.18	IV
Bourneville	39.28	83.15	IV
Bowersville	39.58	83.73	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Bradysville	38.67	83.69	V
Branch Hill	39.25	84.30	III
Bremen	39.71	82.43	IV
Bridgeport	40.06	80.76	IV
Brookville	39.83	84.41	IV
Bryan	41.46	84.48	V
Bucyrus	40.83	82.80	IV
Buford	39.08	83.85	VI
Cambridge	40.03	81.58	IV
Camden	39.63	84.65	IV
Camp Dennison	39.20	84.30	IV
Canal Winchester	39.85	82.80	IV
Canton	40.83	81.36	IV
Cardington	40.51	82.91	III
Cedarville	39.73	83.78	IV
Celina	40.56	84.61	III
Cherry Fork	38.88	83.61	IV
Chesapeake	38.43	82.46	III
Cheshire	38.95	82.11	V
Cheviot	40.16	84.61	III
Chillicothe	39.33	82.96	VI
Chilo	38.80	84.13	VI
Cincinnati	39.10	84.53	V
Circleville	39.60	82.95	VI
Clarksburg	39.50	83.15	V
Clarksville	39.40	83.98	V
Clayton	39.86	84.36	IV
Cleveland	41.50	81.70	IV
Cleves	39.16	84.73	V
Clifton	39.80	83.83	IV
Coalton	39.11	82.61	IV
Coldwater	40.46	84.61	IV
College Corner	39.56	84.81	V
Columbus	39.93	83.00	V
Columbus Grove	40.91	84.08	IV
Commercial Point	39.76	83.06	IV
Coolville	39.23	81.79	IV
Coshocton	40.28	81.88	III
Covington	40.15	84.38	IV
Crestline	40.80	82.73	IV
Cridersville	40.63	84.15	VI
Crown City	38.58	82.28	IV
Dayton	39.75	84.20	IV
Decatur	38.81	83.70	V
Defiance	41.28	84.35	IV
Delphos	40.83	84.36	IV
Derby	39.76	83.20	IV
Donnelsville	39.91	83.95	III
Eaton	39.76	84.65	V

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Eldorado	39.90	84.68	IV
Ellsberry	38.67	83.72	IV
Elyria	41.36	82.11	IV
Englewood	39.86	84.30	V
Enon	39.88	83.93	V
Fairborn	39.80	84.05	IV
Fayetteville	39.18	83.93	VI
Felicity	38.85	84.10	IV
Findlay	41.08	83.48	V
Fizzleville	38.72	83.72	V
Frankfort	39.40	83.18	IV
Franklin	39.56	84.31	IV
Franklin Furnace	38.65	82.86	IV
Fremont	41.33	83.10	V
Friendship	38.70	83.10	IV
Gahanna	40.05	82.95	V
Galion	40.73	82.78	IV
Gallipolis	38.83	82.25	IV
Georgetown	38.86	83.90	VI
Glouster	39.16	82.08	IV
Gordon	39.93	84.51	V
Goshen	39.23	84.16	VI
Gratis	39.65	84.53	IV
Greenfield	39.33	83.43	III
Greenville	40.11	84.65	V
Greenwich	41.03	82.53	IV
Grove City	39.88	83.10	V
Hamden	39.16	82.53	V
Hamersville	38.91	83.98	V
Harrisburg	39.81	83.16	IV
Harrison	39.26	84.80	III
Haverhill	38.58	82.83	IV
Higginsport	38.78	83.96	VI
Highland	39.35	83.60	IV
Hillsboro	39.18	83.62	VI
Hooven	39.18	84.76	IV
Ironton	38.53	82.70	III
Jackson	39.06	82.70	IV
Jamestown	39.65	83.75	IV
Jeffersonville	39.65	83.56	IV
Kenton	40.66	83.60	V
Kings Mills	39.35	84.25	IV
Kingston	39.48	82.70	V
Kitts Hill	38.56	82.58	IV
Langsville	39.05	82.18	IV
Latham	39.10	83.25	IV
Laura	39.00	84.41	IV
Lebanon	39.41	84.20	VI
Lees Creek	39.43	83.63	VI

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Leesburg	39.35	83.55	IV
Lewisburg	39.85	84.55	V
Lima	40.73	84.11	V
Lisbon	40.96	80.81	II
Lockbourne	39.80	82.96	V
Londonderry	39.26	82.78	VI
Loveland	39.26	84.26	IV
Lucasville	38.88	82.98	V
Ludlow Falls	39.00	84.33	IV
Lynchburg	39.21	83.76	VI
Lynx	38.76	83.41	VI
Maineville	39.31	84.25	III
Manchester	38.70	83.63	VI
Mansfield	40.78	82.53	IV
Mantua	41.28	81.26	III
Marietta	39.40	81.50	IV
Marion	40.61	83.11	IV
Martinsville	39.31	83.81	V
Mason	39.31	84.30	IV
Massillon	40.83	81.53	IV
McArthur	39.25	82.48	IV
McDermott	38.83	83.06	V
Medway	39.88	83.98	VI
Miamisburg	39.66	84.30	IV
Miamiville	39.21	84.30	IV
Middleport	39.00	82.08	VI
Middletown	39.50	84.45	IV
Milford	39.18	84.26	III
Millersburg	40.56	81.93	III
Minford	38.85	82.86	IV
Minster	40.38	84.40	IV
Monroe	39.43	84.36	IV
Montpelier	41.60	84.60	IV
Morrow	39.35	84.13	VI
Moscow	38.86	84.23	V
Mount Gilead	40.56	82.88	IV
Mount Orab	39.05	83.93	V
Mount Saint Joseph	39.10	84.65	IV
Mount Sterling	39.71	83.28	V
Mount Vernon	40.43	82.50	V
Napoleon	41.40	84.16	IV
Nelsonville	39.50	82.23	IV
Neville	38.81	84.21	IV
New Bremen	40.45	84.40	V
New Carlisle	39.93	84.03	V
New Concord	40.00	81.76	IV
New Holland	39.55	83.25	VI
New Lebanon	39.75	84.38	IV
New Lexington	39.75	82.20	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
New Marshfield	39.31	82.21	V
New Paris	39.86	84.76	IV
New Philadelphia	40.50	81.45	VI
New Richmond	38.95	84.28	IV
New Vienna	39.31	83.70	IV
Newark	40.08	82.41	IV
Newtonsville	39.18	84.08	V
North Bend	39.15	84.75	V
North Hampton	39.98	83.93	IV
Oak Harbour	41.51	83.13	III
Oak Hill	38.90	82.56	IV
Okeana	39.35	84.76	III
Oregonia	39.45	84.10	IV
Orient	39.80	83.15	V
Ottawa	41.03	84.06	IV
Otway	38.86	83.18	IV
Overpeck	39.45	84.51	IV
Owensville	39.11	84.13	IV
Oxford	39.53	84.76	IV
Pandora	40.95	83.96	III
Patriot	38.76	82.38	IV
Paulding	41.13	84.61	IV
Pedro	38.63	82.66	IV
Peebles	38.95	83.23	IV
Phillipsburg	39.90	84.40	IV
Piketon	39.05	83.01	IV
Piqua	40.18	84.26	VI
Pleasant Plain	39.28	84.11	IV
Point Pleasant	38.90	84.23	V
Port Clinton	41.50	82.95	III
Port William	39.55	83.78	IV
Portsmouth	38.75	82.98	VI
Proctorville	38.45	82.40	III
Racine	38.96	81.91	V
Rainsboro	39.21	83.41	VI
Rarden	38.91	83.25	V
Ray	39.20	82.68	IV
Reynoldsburg	39.95	82.78	V
Rickenbacker A.F.B.	39.93	83.00	III
Rio Grande	38.88	82.38	V
Ripley	38.75	83.83	VI
Rockbridge	39.58	82.53	IV
Ross	39.31	84.65	IV
Russellville	38.86	83.78	VI
Rutland	39.05	82.13	IV
Sabina	39.50	83.63	IV
Saint Clairsville	40.08	80.90	III
Saint Marys	40.55	84.38	V
Sandusky	41.45	82.71	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Sardinia	39.08	83.81	IV
Scioto Furnace	38.80	82.76	IV
Scottown	38.55	82.38	IV
Seaman	38.93	83.56	IV
Sedalia	39.73	83.48	IV
Seven Mile	39.48	84.55	V
Sherrodsville	40.50	81.25	IV
Sidney	40.35	84.11	V
Somerville	39.56	84.63	IV
South Bloomingville	39.41	82.60	V
South Charleston	39.80	83.61	IV
South Lebanon	39.36	84.21	V
South Point	38.43	82.58	IV
South Solon	39.73	83.61	III
South Vienna	39.91	83.61	IV
South Webster	38.81	82.73	IV
Spring Valley	39.61	84.01	V
Springboro	39.55	84.25	V
Springfield	39.93	83.80	VI
Steubenville	40.40	80.66	IV
Stout	38.66	83.38	V
Stoutsville	39.60	82.83	III
Stryker	41.51	84.40	III
Sugar Grove	39.63	82.55	V
Summit Station	39.00	82.75	IV
Syracuse	38.00	81.96	V
Tarlton	39.55	82.78	V
Terrace Park	39.16	84.35	V
Tipp City	39.95	84.20	IV
Toledo	41.66	83.50	V
Trenton	39.48	84.45	IV
Troy	40.03	84.25	III
Upper Sandusky	40.83	83.36	IV
Urbana	40.10	83.76	IV
Utopia	38.77	84.05	IV
Van Wert	40.83	84.63	IV
Vandalia	39.90	84.21	IV
Verona	39.90	84.48	IV
Versailles	40.23	84.45	V
Wakefield	38.98	83.01	IV
Wapakoneta	40.56	84.20	V
Washington Court House	39.53	83.43	V
Waterloo	38.70	82.46	IV
Wauseon	41.50	84.21	IV
Waverly	39.11	82.98	VI
Waynesville	39.53	84.08	IV
Wellington	41.16	82.20	III
Wellston	39.13	82.61	V
West Alexandria	39.73	84.55	V

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
West Chester	39.33	84.41	IV
West Elkton	39.58	84.55	IV
West Manchester	39.90	84.63	IV
West Milton	39.95	84.31	V
West Union	38.80	83.55	IV
Westerville	40.13	82.96	IV
Wheelersburg	38.73	82.85	IV
Wilberforce	39.71	83.88	IV
Williamsburg	39.05	84.05	V
Williamsport	39.58	83.11	V
Willow Wood	38.56	82.46	IV
Willowick	41.63	81.48	III
Wilmington	39.35	83.81	VI
Winchester	38.95	83.65	VI
Woodsfield	39.75	81.15	IV
Wooster	40.81	81.93	IV
Worthington	40.05	83.05	V
Wright-Patterson A.F.B.	39.80	84.08	IV
Xenia	39.71	83.91	IV
Yellow Springs	39.78	83.90	IV
Youngstown	41.08	80.66	IV
Zaleski	39.28	82.40	IV
Zanesville	39.93	82.03	V
Pennsylvania			
Avalon	40.50	80.07	III
Butler	40.85	79.90	III
Erie	42.13	80.08	IV
Kittanning	40.81	79.52	IV
New Castle	41.00	80.33	VI
Pittsburgh	40.45	79.95	IV
South Carolina			
Union	34.70	81.61	III
Tennessee			
Alcoa	35.78	84.00	IV
Arthur	36.55	83.66	IV
benton	35.16	84.65	III
Blountville	36.53	82.31	IV
Carthage	36.23	85.98	IV
Chattanooga	35.03	85.30	IV
Clairfield	36.55	83.95	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Clarksville	36.51	87.35	II
Cookeville	36.16	85.50	IV
Cumberland Gap	36.60	83.66	IV
Dayton	35.50	85.01	III
Duff	36.45	84.06	IV
Elizabethton	36.36	82.25	IV
Erwin	36.15	82.41	III
Greeneville	36.16	82.83	IV
Harriman	35.95	84.53	IV
Jefferson City	36.11	83.50	IV
Jellico	36.58	84.13	IV
Johnson City	36.33	82.38	IV
Jonesboro	36.46	82.48	IV
Kingsport	36.55	82.56	IV
Kingston	35.86	84.51	III
Knoxville	35.96	83.95	IV
La Follette	36.36	84.15	IV
Lafayette	36.51	86.03	V
Lawrenceburg	35.23	87.33	IV
Lenoir City	35.78	84.28	IV
Livingston	36.38	85.33	V
Loudon	35.73	84.33	IV
Maryville	35.58	83.96	IV
McMinnville	35.68	85.76	III
Mountain City	36.48	81.81	IV
Nashville	36.16	86.81	IV
New Tazewell	36.45	83.60	VI
Newport	35.93	83.20	IV
Oneida	36.51	84.50	IV
Pikeville	35.60	85.18	III
Portland	36.58	86.51	IV
Rockwood	35.86	84.70	III
Smithville	35.98	85.81	IV
Sneedville	36.53	83.21	IV
Sparta	35.91	85.45	V
Speedwell	36.45	83.91	III
Sweetwater	35.60	84.48	IV
Tazewell	36.55	83.56	IV
Woodbury	35.81	86.10	IV
Virginia			
Abingdon	36.71	81.98	III
Andover	36.91	82.80	III
Big Rock	37.35	82.18	IV
Big Stone Gap	36.88	82.83	IV
Blackwater	36.63	83.05	IV
Bristol	36.60	82.16	III

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Clinchco	37.16	82.36	IV
Clintwood	37.15	82.45	III
Coeburn	36.95	82.45	IV
Dryden	36.78	82.95	III
Dungannon	36.83	82.46	IV
East Stone Gap	36.86	82.75	IV
Ewing	36.63	83.43	IV
Grundy	37.28	82.10	IV
Haysi	37.20	82.30	III
Hurley	37.41	82.11	IV
Jonesville	36.68	83.11	IV
Kents Stone	37.88	78.13	IV
Lebanon	36.86	82.11	II
Marion	36.83	81.53	II
McClure	37.10	82.36	III
Norton	36.95	82.61	IV
Pennington Gap	36.73	83.05	IV
Pound	37.11	82.60	IV
Rose Hill	36.66	83.36	IV
Saint Charles	36.80	83.06	IV
Wisconsin			
Port Washington	43.38	87.88	III
West Virginia			
Accoville	37.76	81.83	III
Ashton	38.63	82.16	IV
Bancroft	38.51	81.83	IV
Barboursville	38.40	82.28	III
Branchland	38.21	82.20	IV
Bruno	37.70	81.86	IV
Buckhannon	39.00	80.23	IV
Buffalo	38.61	81.98	V
Chapmanville	37.98	82.01	II
Charleston	38.36	81.63	IV
Charlton Heights	38.25	81.25	IV
Chattaroy	37.70	82.28	IV
Costa	38.16	81.71	IV
Cottageville	38.86	81.81	III
Crum	37.90	82.45	VI
Delbarton	37.71	82.20	III
Dingess	37.86	82.16	IV
East Lynn	38.16	82.38	IV
Eleanor	38.53	81.93	IV
Ethel	37.86	81.90	III

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Fort Gay	38.11	82.60	V
Foster	38.10	81.78	III
Fraziers Bottom	38.56	81.98	III
Genoa	38.11	82.46	IV
Glenwood	38.58	82.18	IV
Griffithsville	38.23	81.98	II
Harrisville	39.18	81.05	IV
Harts	38.03	82.11	IV
Henderson	38.83	82.13	IV
Henlawson	37.43	81.98	IV
Hewett	38.06	81.85	IV
Holden	37.83	82.17	II
Huntington	38.41	82.41	IV
Hurricane	38.43	82.03	IV
Institute	38.38	81.76	IV
Jeffrey	37.96	81.81	II
Kermit	37.83	82.40	III
Lavalette	38.33	82.45	IV
Lenore	37.80	82.28	IV
Leon	38.75	81.96	IV
Lesage	38.51	82.30	IV
Letart	38.90	81.93	IV
Logan	37.83	82.00	IV
Mallory	37.73	81.85	III
Man	37.75	81.90	V
Mason	39.03	82.03	IV
Matewan	37.62	82.16	II
Middlebourne	39.50	80.90	IV
Morgantown	39.63	79.95	II
Moundsville	39.95	80.71	V
Naugatuck	37.78	82.35	IV
New Cumberland	40.50	80.60	III
New Haven	38.98	81.96	III
New Martinsville	39.78	80.86	II
Parkersburg	39.33	81.55	IV
Peach Creek	37.88	81.98	IV
Peytona	38.13	81.68	III
Point Pleasant	38.83	82.13	IV
Prichard	38.25	82.60	III
Racine	38.15	81.66	IV
Ranger	38.11	82.18	IV
Ravenswood	38.95	81.78	III
Red Jacket	37.65	82.13	III
Ripley	38.81	81.73	II
Saint Albans	38.36	81.86	III
Scott Depot	38.45	81.91	IV
Sod	38.25	81.88	IV
Sophia	37.25	81.71	IV
Southside	38.71	81.96	IV

Location	Coordinates (deg) Lat (N.)	Long (W.)	Intensity MM
Stollings	37.85	81.96	II
Sumerco	38.23	81.90	III
Switzer	37.78	81.98	V
Tornado	38.33	81.85	IV
Varney	37.66	82.10	IV
Washington	39.26	81.66	IV
Wayne	38.23	82.45	V
Wellsburg	40.23	80.63	III
West Columbia	38.98	82.06	III
West Hamlin	38.28	82.20	IV
Wharncliffe	37.55	81.96	III
Williamson	37.66	82.25	V
Winfield	38.53	81.88	II
Ontario Canada			
Allanburg	43.10	79.50	III
Belle River	42.30	82.77	II
Belmont	42.86	81.10	IV
Bethany	44.18	78.56	II
Blenheim	42.33	81.99	II
Bradford	44.11	79.56	III
Burford	43.10	80.40	II
Camlachie	43.06	82.10	II
Kleinburg	43.90	79.55	II
London	42.96	81.25	II
Ottawa	45.41	75.71	II
Toronto	43.70	79.41	II