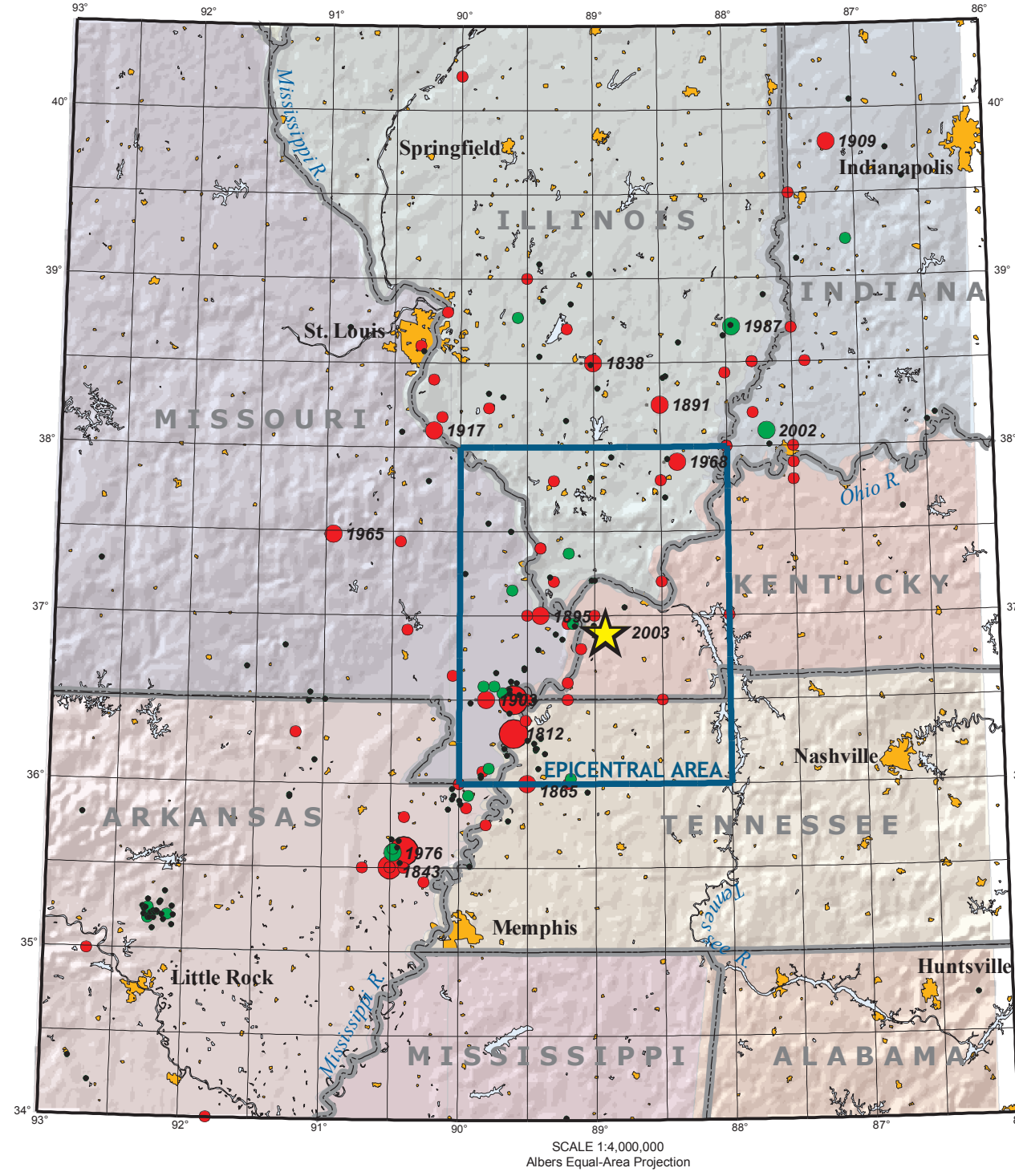


M3.6 Western Kentucky Earthquake of 20 June, 2005



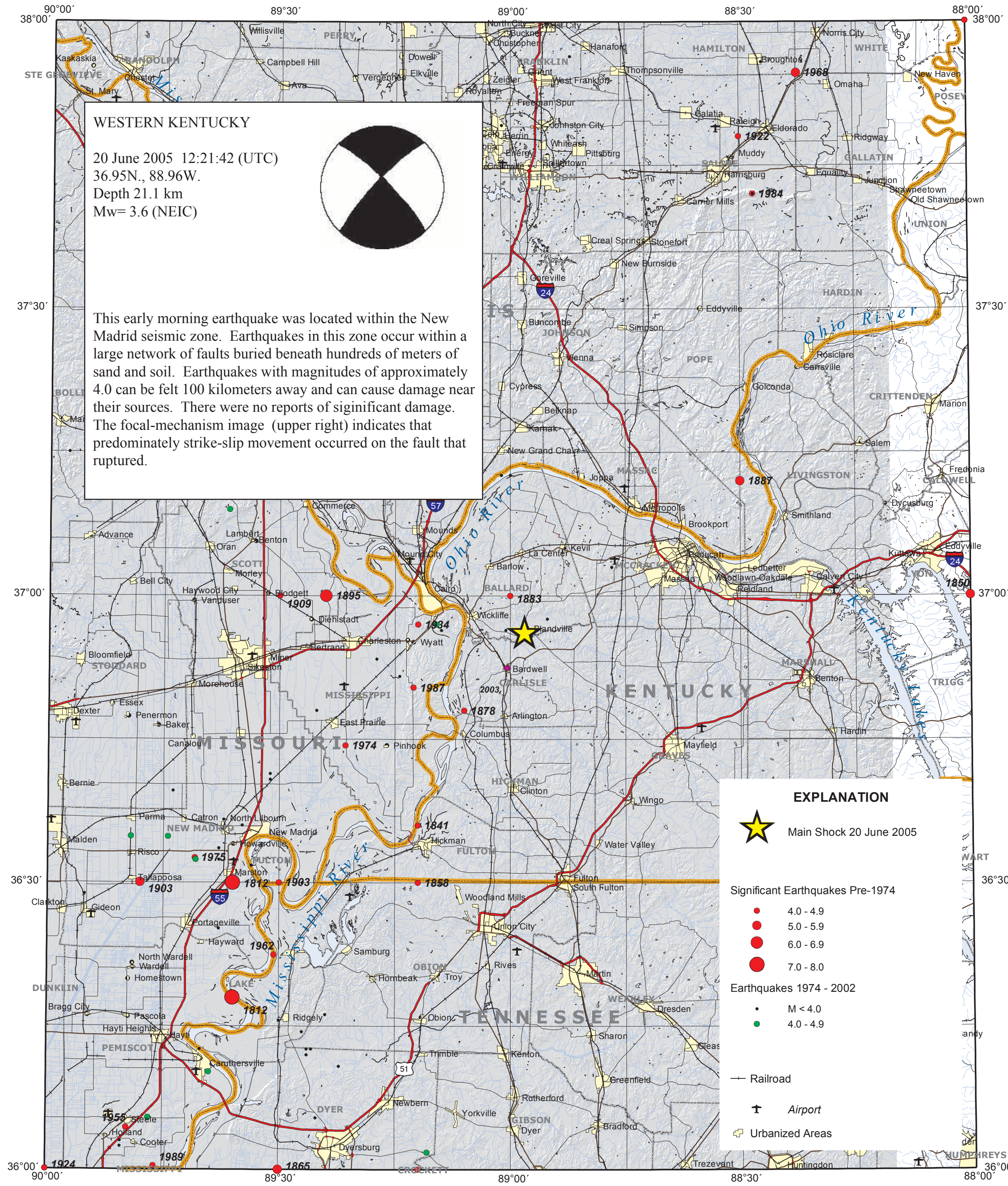
Earthquakes in the Central U.S.



EXPLANATION
Main Shock 20 June 2005

- ★ 2005
- Earthquakes Pre-1974
 - 4.0 - 4.9
 - 5.0 - 5.9
 - 6.0 - 6.9
 - 7.0 - 7.9
- Earthquakes 1974 - 2002
 - M < 4.0
 - 4.0 - 4.9
 - 5.0 - 5.2

Epicentral Area



WESTERN KENTUCKY
20 June 2005 12:21:42 (UTC)
36.95N, 88.96W
Depth 21.1 km
Mw= 3.6 (NEIC)

This early morning earthquake was located within the New Madrid seismic zone. Earthquakes in this zone occur within a large network of faults buried beneath hundreds of meters of sand and soil. Earthquakes with magnitudes of approximately 4.0 can be felt 100 kilometers away and can cause damage near their sources. There were no reports of significant damage. The focal-mechanism image (upper right) indicates that predominately strike-slip movement occurred on the fault that ruptured.

EXPLANATION
★ Main Shock 20 June 2005

- ★ Significant Earthquakes Pre-1974
 - 4.0 - 4.9
 - 5.0 - 5.9
 - 6.0 - 6.9
 - 7.0 - 8.0
- Earthquakes 1974 - 2002
 - M < 4.0
 - 4.0 - 4.9

— Railroad
✈ Airport
■ Urbanized Areas

DISCUSSION

EARTHQUAKES IN THE NEW MADRID SEISMIC ZONE

The New Madrid seismic zone of southeast Missouri and adjacent States is the most seismically active in North America east of the Rockies. During the winter of 1811-1812, three very large earthquakes devastated the area and were felt throughout most of the Nation. Hundreds of aftershocks, some severely damaging by themselves, continued for years. Prehistoric earthquakes similar in size to those of 1811-1812 occurred in the middle 1400's and around 900 A.D. Strongly damaging earthquakes struck the southwestern end of the seismic zone near Marked Tree, Arkansas in 1843 (magnitude 6.3), and the northeastern end near Charleston, Missouri in 1895 (magnitude 6.6). Since 1900, moderately damaging earthquakes have struck the seismic zone every few decades. About twice a year people feel still smaller earthquakes that do not cause damage.

Earthquakes in the central and eastern U.S. are typically felt over a much broader region than in the western U.S. East of the Rockies, an earthquake can be felt over an area as much as ten times larger than a similar magnitude earthquake on the west coast. A magnitude 4.0 eastern U.S. earthquake typically can be felt at many places as far as 100 km (60 mi) from where it occurred, and it infrequently causes damage near its source. A magnitude 5.5 eastern U.S. earthquake usually can be felt as far as 500 km (300 mi) from where it occurred, and sometimes causes damage out to 40 km (25 mi).

FAULTS

Earthquakes everywhere occur on faults within bedrock, usually several miles deep. The earthquakes of the New Madrid seismic zone occur within a large network of faults called the Reelfoot rift. The rift formed about 500 million years ago, when this region was stretched in the northwest-south-east direction. Along a northeast-southwest zone at least 70 km (40 mi) wide and 500 km (300 mi) long, the rocks in the rift were slowly dropped down about 1-2 km (1 mi) along some of the faults. Now the region is undergoing east-west shortening, and the ancient faults of the Reelfoot rift are being reactivated to generate earthquakes. Today the Reelfoot rift and the New Madrid seismic zone are 2,000 km (1,200 mi) from the nearest plate boundary, which is in the Caribbean Sea.

The network of faults in the seismic zone is buried beneath hundreds to thousands of feet of sand and mud. Four of the largest faults are recognized as alignments of abundant small earthquakes, and movements along two of these faults dammed rivers and created lakes during the earthquakes of 1811-1812. A few more deeply buried faults were detected during oil and gas exploration, and a few small faults are known from geologic mapping. However, many earthquakes occur away from the few known faults, so there must be additional, unknown faults that can generate earthquakes in the seismic zone. Accordingly, the best overall guide to seismic hazard in the New Madrid seismic zone is the earthquakes themselves.

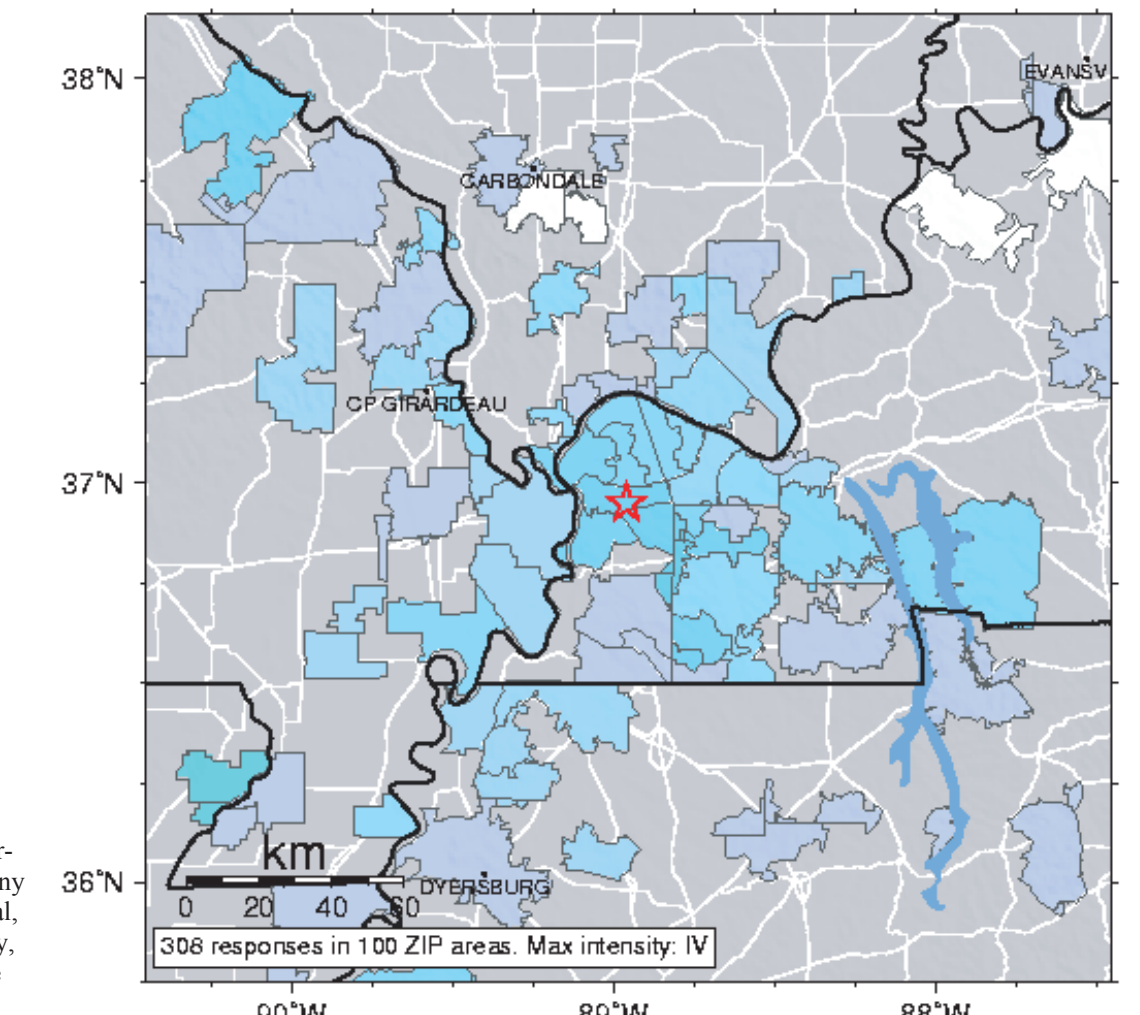
LARGEST EARTHQUAKES IN THE CENTRAL U.S.

YR	MO	DAY	LAT	LONG	MAGNITUDE
1811	12	16	35.6	-90.0	7.3-8.0
1811	12	16	35.6	-90.0	7.3-8.0
1812	1	23	36.3	-89.6	7.3-8.0
1812	2	7	36.5	-89.6	7.3-8.0
1838	6	9	38.5	-89.0	5.2
1843	1	5	35.5	-90.5	6.3
1865	8	17	36.0	-89.5	5.0
1891	9	27	38.25	-88.5	5.2
1895	10	31	37.0	-89.4	6.6
1903	11	4	36.5	-89.8	5.1
1909	9	27	39.8	-87.2	5.1
1917	4	9	38.1	-90.2	5.1
1965	10	21	37.479	-90.944	5.1
1968	11	9	37.911	-88.373	5.5
1974	3	27	38.550	-90.130	5.6
1976	3	25	35.590	-90.480	5.0
1977	1	3	37.550	-89.790	5.0
1987	6	10	38.713	-87.954	5.1
1990	9	26	37.165	-89.577	5.0
1991	5	4	36.564	-89.823	5.0
2002	6	18	38.069	-87.680	5.0

COMMUNITY INTERNET INTENSITY MAP

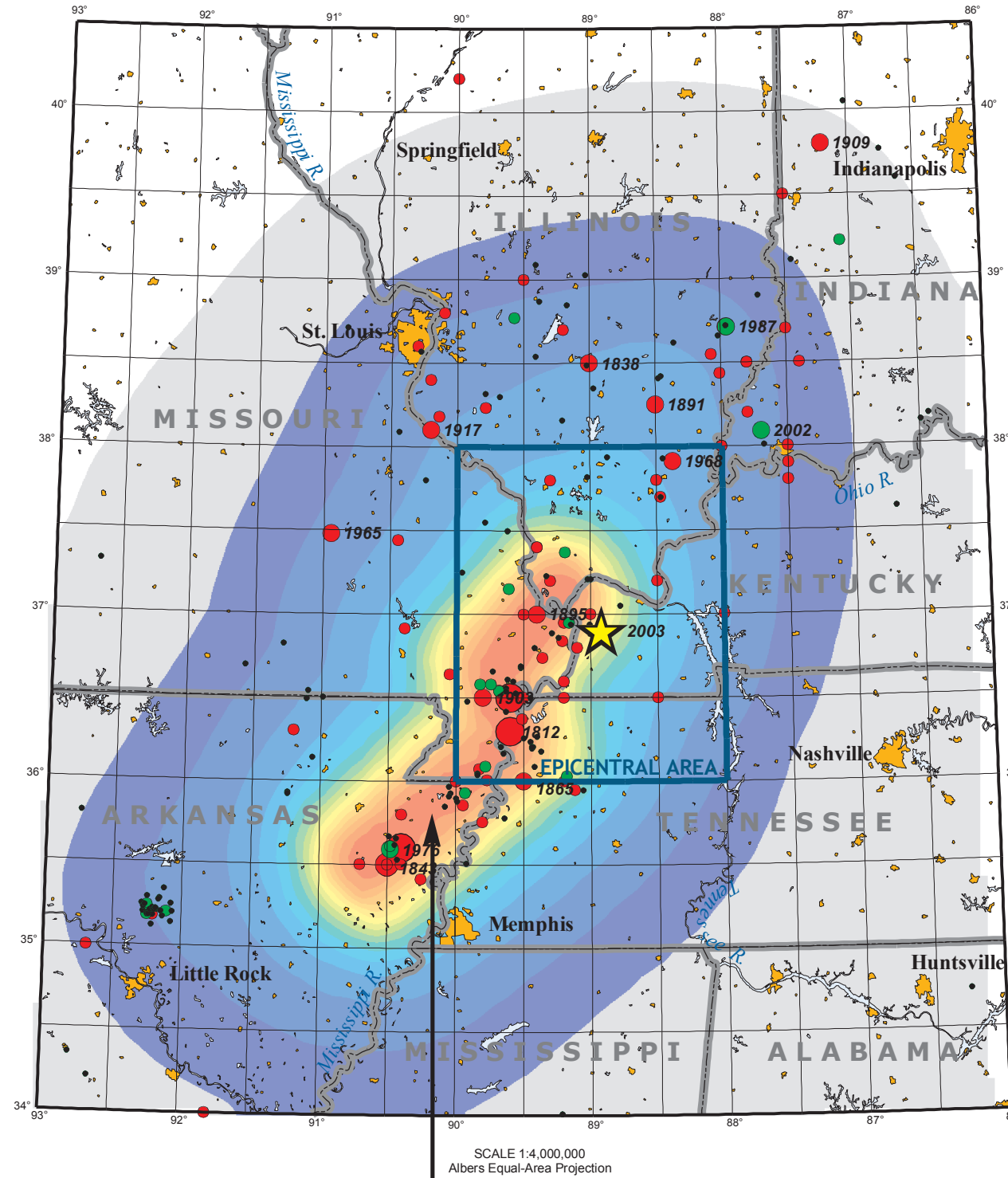
The Community Internet Intensity Map (CIM) summarizes the online questionnaire responses provided by Internet users. An intensity number is assigned to each community from which a filled-out CIM questionnaire was received; each intensity value reflects the effects of earthquake shaking on the people and structures in the community. The color-coded ZIP Code zone on the map represents the average of the individual intensity values in that ZIP Code zone.

USGS Community Internet Intensity Map (13 miles ESE of Cairo, Illinois)



INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy

Generalized Seismic Hazard



EXPLANATION
★ Main Shock 20 June 2005

- ★ 2005
- Earthquakes Pre-1974
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- Earthquakes 1974 - 2002
 - M < 4.0
 - 4.0 - 4.9
 - 5.0 - 5.2

Seismic Hazard

- 170 - 180% g Highest Hazard
- 160 - 170
- 150 - 160
- 140 - 150
- 130 - 140
- 120 - 130
- 110 - 120
- 100 - 110
- 90 - 100
- 80 - 90
- 70 - 80
- 60 - 70
- 50 - 60
- 40 - 50
- 30 - 40
- 20 - 30
- 10 - 20
- 4 - 10% g Lowest Hazard

Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in percent g, expected to be exceeded with a probability of two percent in a 50-year period.

DATA SOURCES
EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
University of Memphis Center for Earthquake Research and Information (CERI)
Saint Louis University Earthquake Center (SLUEC)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center

ONLINE RESOURCES
<http://earthquakes.usgs.gov>
<http://www.ceri.memphis.edu>
http://www.eas.slu.edu/Earthquake_Center



DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.

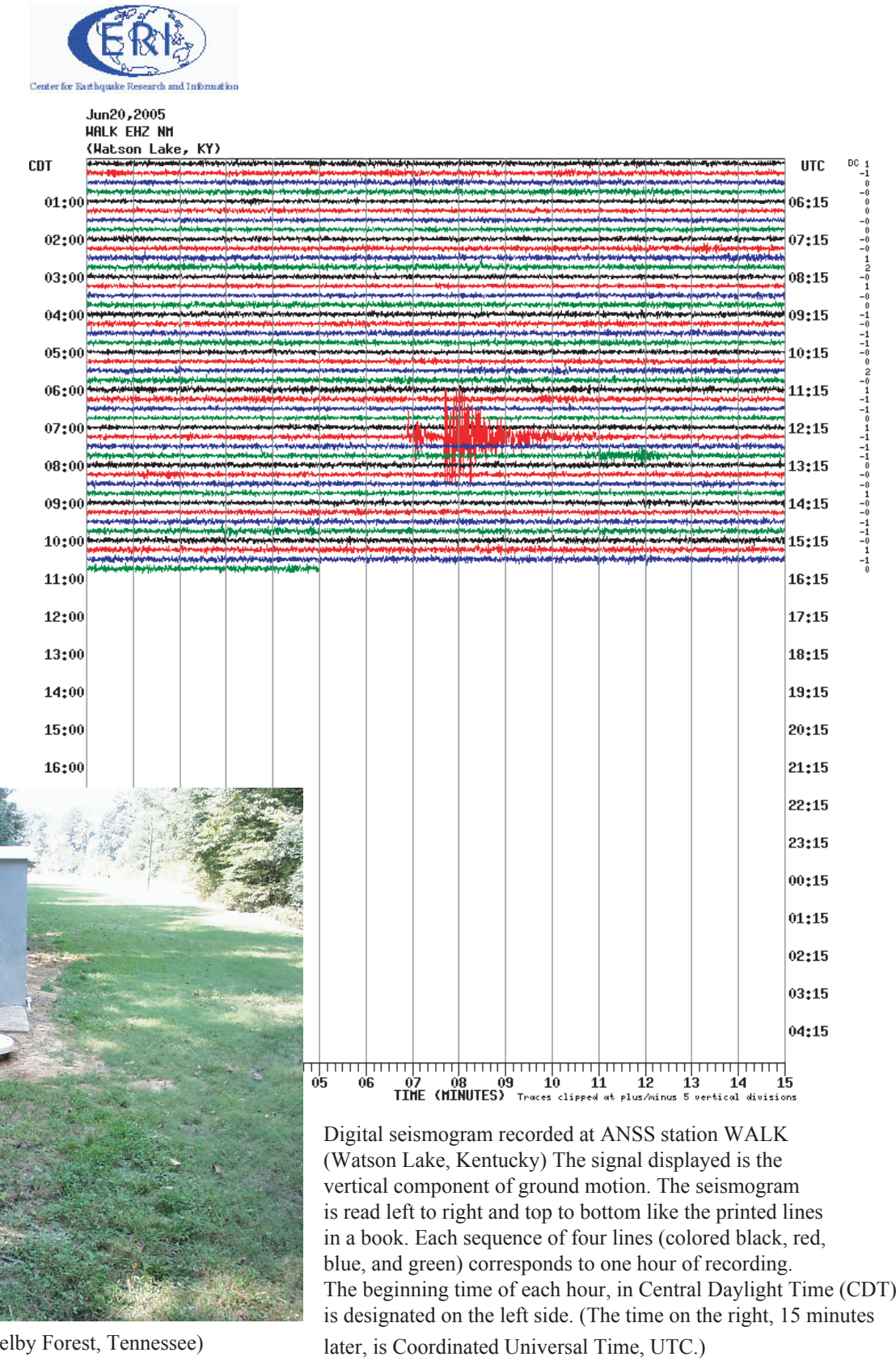
DATA SOURCES FOR TABLE

USGS National Earthquake Information Center (NEIC):
Significant U.S. Earthquakes (1838 - 1986)
Preliminary Determination of Epicenters (1987 - 2002)
Johnston, A.C., 1996, Seismic moment assessment of earthquakes in stable continental regions - III, New Madrid 1811-1812, Charleston 1886 and Lisbon 1755, Geophysical Journal International, v. 126, p. 314-344. (1843, 1895)
Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rakusales, K.S., 2002, Documentation for the 2002 Update of the National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 02-0420, 39 p. (1811, 1812)

Magnitudes are approximate; authorities differ on exact values.



ANSS seismic station SFTN (Shelby Forest, Tennessee)



Digital seismogram recorded at ANSS station WALK (Watson Lake, Kentucky) The signal displayed is the vertical component of ground motion. The seismogram is read left to right and top to bottom like the printed lines in a book. Each sequence of four lines (colored black, red, blue, and green) corresponds to one hour of recording. The beginning time of each hour, in Central Daylight Time (CDT), is designated on the left side. (The time on the right, 15 minutes later, is Coordinated Universal Time, UTC.)