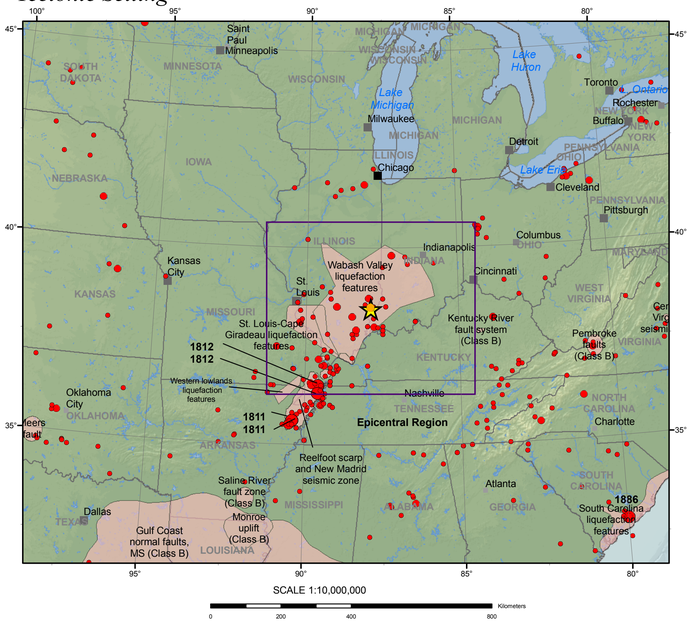
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

M5.4 Mount Carmel, Illinois, Earthquake of 18 April 2008

Prepared in cooperation with the Global Seismographic Network

Tectonic Setting



EXPLANATION

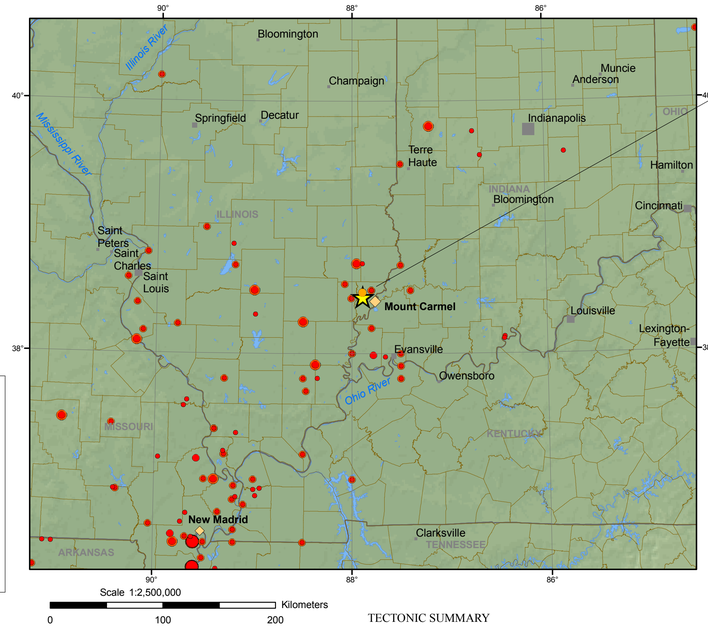
- Main Shock
- M4.6 Aftershock

Historical

- M 3.5 - 4.9
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9

Fault zones

Epicentral Region



Illinois Basin

18 April 2008 9:37:00 UTC

38.45° N., 87.89° W.
Depth 11.6 km
Mw = 5.4 (USGS)

Reports of minor structural damage in West Salem, Illinois and Louisville, Kentucky. Felt over a wide area of the central United States with felt reports as far west as Kansas, as far north as the Upper Peninsula of Michigan and as far south as Georgia.

Predicted Shaking

M 5.2, ILLINOIS
Origin Time: Fri 2008-04-18 09:37:00 UTC
Location: 38.45°N 87.89°W Depth: 11 km

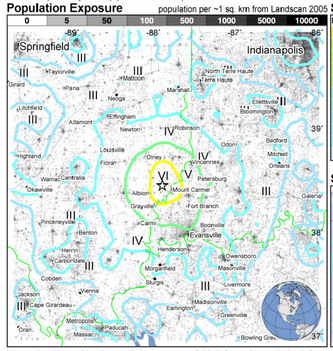
PAGER
Version 7
Created: 6 hrs, 9 mins after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		2k*	1,565k*	2,316k*	135k	19k	0	0	0	0
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
	Vulnerable Structures	none	none	none	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy	V. Heavy

*Estimated exposure only includes population within the map area.

Population Exposure population per ~1 sq. km from Landscan 2005

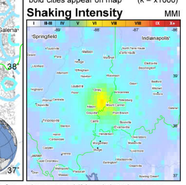


Selected City Exposure

MMI	City	Population
VI	Mount Carmel	7k
V	Albion	1k
V	Fort Branch	2k
V	Sumner	1k
V	Grayville	1k
IV	Evansville	115k
IV	Terre Haute	57k
IV	Decatur	77k
IV	Bloomington	71k
IV	Indianapolis	773k
II	Springfield	115k

bold cities appear on map (k = x1000)

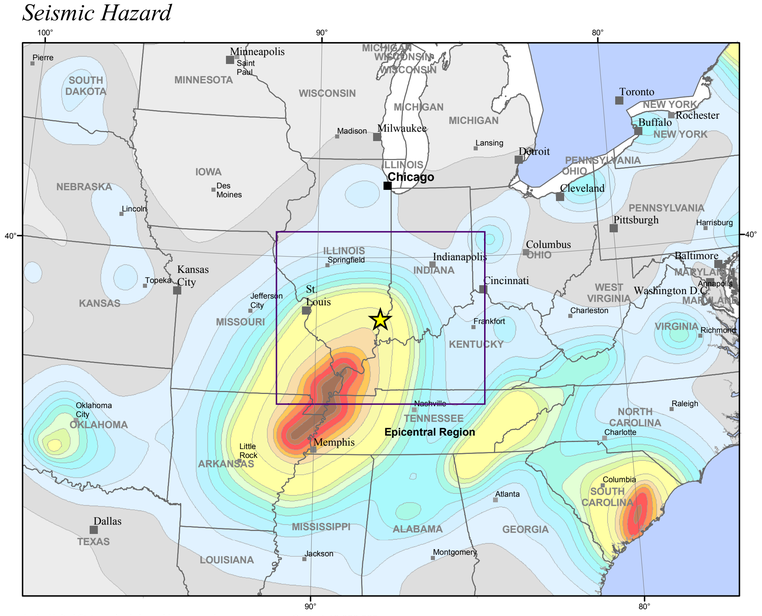
Shaking Intensity



Users should consider the preliminary nature of this information and check for updates as additional data becomes available. Population exposure estimates are NOT a direct estimate of earthquake damage; comparable shaking will result in significantly lower losses in regions with well built structures than in regions with vulnerable structures. Moderately damaging earthquakes strike somewhere in the Illinois Basin/Ozark Dome region each decade or two, and smaller earthquakes are felt about once or twice a year.

This information was automatically generated and has not been reviewed by a seismologist.
http://earthquake.usgs.gov/pager
Event ID: us2008qza6

Seismic Hazard



In the United States, seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in %g, expected to be exceeded in a 50-yr period with a probability of 2 percent.

Peak Ground Accleration in %g (2% probability of exceedance in 50 years)

2 4 6 8 10 12 14 16 18 20 30 40 50 60 80 120 160

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

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
Seismicity of the United States, 1568 - 1989 (Stover and Coffmann, 1993)
Quaternary Faults and Folds Database (2006)
National Seismic Hazard Maps (2002)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

REFERENCES

Stover, C.W., and Coffman, J.L., 1993, Seismicity of the United States: 1568-1989 (Revised), USGS Professional Paper 1527

USGS, 2006, Quaternary fault and fold database for the United States
http://earthquake.usgs.gov/regional/qfaults/

National Seismic Hazard Maps
http://earthquake.usgs.gov/research/hazmaps

TECTONIC SUMMARY

EARTHQUAKES IN THE WABASH VALLEY SEISMIC ZONE
The April 18, 2008 earthquake occurred in the Wabash Valley Seismic zone, which is defined by a zone of earthquakes that are scattered across a large area of southeastern Illinois and southwestern Indiana. The Wabash Valley fault system is the main structural feature associated with the seismic zone. The fault system consists of a network of normal faults (link to glossary) that trend north-northeastward from Gallatin and White Counties in southern Illinois and adjacent Posey County in southern Indiana. The faults extend at least 97 km (60 miles) and span across an area that is about 48 km (30 miles) wide. The faults dip steeply to both the east and west, and displacements on parallel sets of faults have created sets of horsts and grabens (link to glossary) in the subsurface beneath the region. Many of the faults have been penetrated by numerous petroleum test wells, but none of the faults are expressed at the surface.

Seismic-reflection data show that faults in the Wabash Valley fault system first formed in late Precambrian time (link to glossary), when this part of the Earth's crust was being stretched in an approximately east to east-southeast direction. Movement on the faults ceased during most of the Paleozoic Era (link to glossary), but the youngest Paleozoic sedimentary rocks, which are Pennsylvanian (link to glossary) in age, are vertically offset across faults in the system. These offsets indicate that some faults were reactivated after the Pennsylvanian rocks were deposited. Pennsylvanian rocks in the area are overlain by Quaternary (link to glossary) gravels and glacial deposits.

There is no clear evidence that these younger deposits are substantially offset across the faults, but there is compelling evidence that earthquakes stronger than the April 18 earthquake have shaken the region in the geologically recent past. Geological field studies in the past 20 years have identified prehistoric liquefaction features (link to glossary) along the banks of rivers and creeks indicate at least eight strong earthquakes have occurred in the lower Wabash Valley region in the past 20,000 years, each having an estimated magnitude between about 6.5 to 7.5. The largest of these paleoearthquakes is thought to have occurred about 6,100 years ago and was probably centered about 25 km (15 miles) west of Vincennes, Indiana. The shaking from earthquakes in the magnitude 6.5 to 7.5 range would be 20 to 200 times stronger than the April 18 earthquake.

Earthquakes of the size of the April 18 quake (Mw 5.4) typically produce smaller-magnitude aftershocks in the days following the mainshock. A few of these earthquakes could be large enough to be felt. Typically, earthquakes of this size (Mw 5.4) can cause slight damage within a few tens of miles from the epicenter.

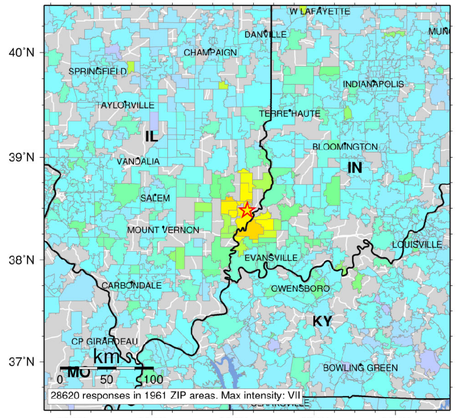
The Wabash Valley Seismic zone is located to the north of the more seismically active New Madrid seismic zone, where some of the largest earthquakes in North America occurred in the winter of 1811-1812 (link to New Madrid EQs page). The April 18 earthquake is located within the Illinois basin-Ozark dome region, which covers parts of Indiana, Kentucky, Illinois, Missouri, and Arkansas and stretches from Indianapolis and St. Louis to Memphis.
Moderately damaging earthquakes have historically occurred at irregular intervals in this region, with a significant earthquake typically occurring every decade or two. The largest historical earthquake in the Illinois basin region was a magnitude 5.4 event in November 1968 that cause damage in southern Illinois. In June 1987, a magnitude 5.2 also struck southern Illinois, and a magnitude 3.9 earthquake occurred in southern Indiana on December 7, 2000. More recently a magnitude 4.6 near Darmstadt, in extreme southwestern Indiana, occurred on June 18, 2002. Typically, smaller-magnitude earthquakes are felt in the area about once or twice a year.

Earthquakes in the central and eastern U.S., although less frequent than in the western U.S., are typically felt over a much broader region because of the properties of the Earth's crust in the region. 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 the epicenter (link to glossary), 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 as far away as 40 km (25 mi). Because earthquake waves travel efficiently through the Earth in the central and eastern U.S., it is not surprising that this earthquake was felt hundreds of miles away, as far south as Florida.

see http://earthquake.usgs.gov/regional/qfault for more information

Did You Feel It?

USGS Community Internet Intensity Map (21 miles SW of Vincennes, Indiana)
ID:2008qza6 04:36:56 CDT APR 18 2008 Mag=5.2 Latitude=N38.48 Longitude=W87.83



Map last updated on Fri Apr 18 10:05:28 2008

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

Map prepared by U.S. Geological Survey
National Earthquake Information Center
2008
Not approved for release by Director USGS
http://earthquake.usgs.gov/eqcenter/
~eqarchives/poster/2008/20080418.php