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

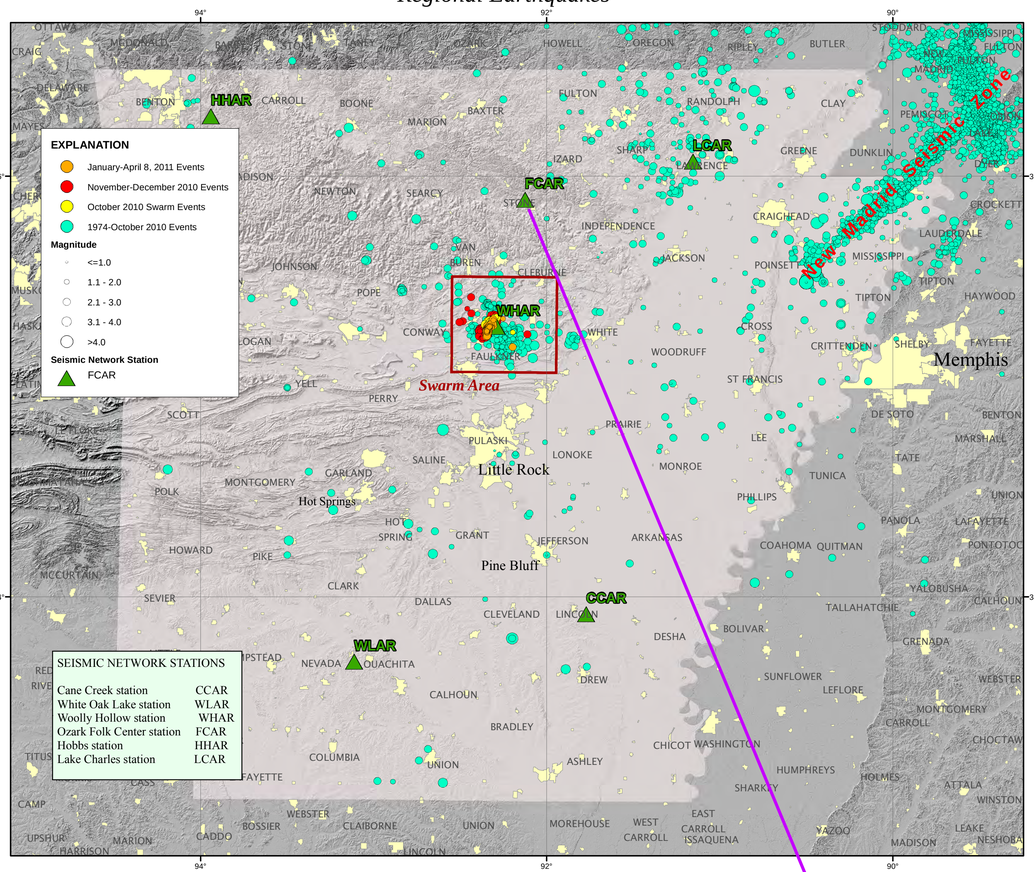
EARTHQUAKE SUMMARY MAP

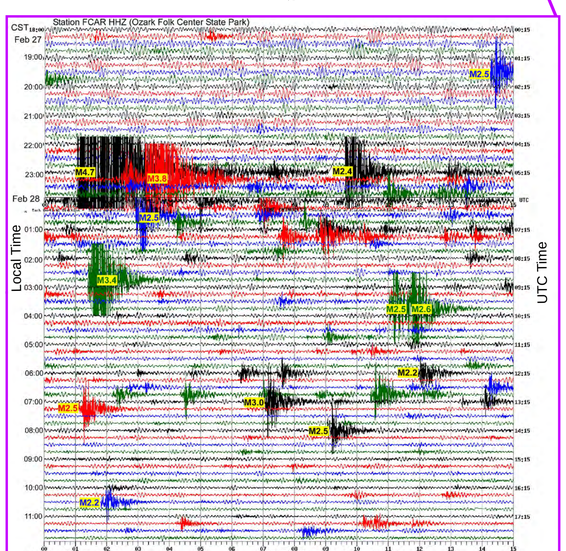
2010-2011 Arkansas Earthquake Swarm

Prepared in cooperation with the Arkansas Geological Survey and the Center for Earthquake Research and Information

Center for Earthquake Research and Information

Regional Earthquakes

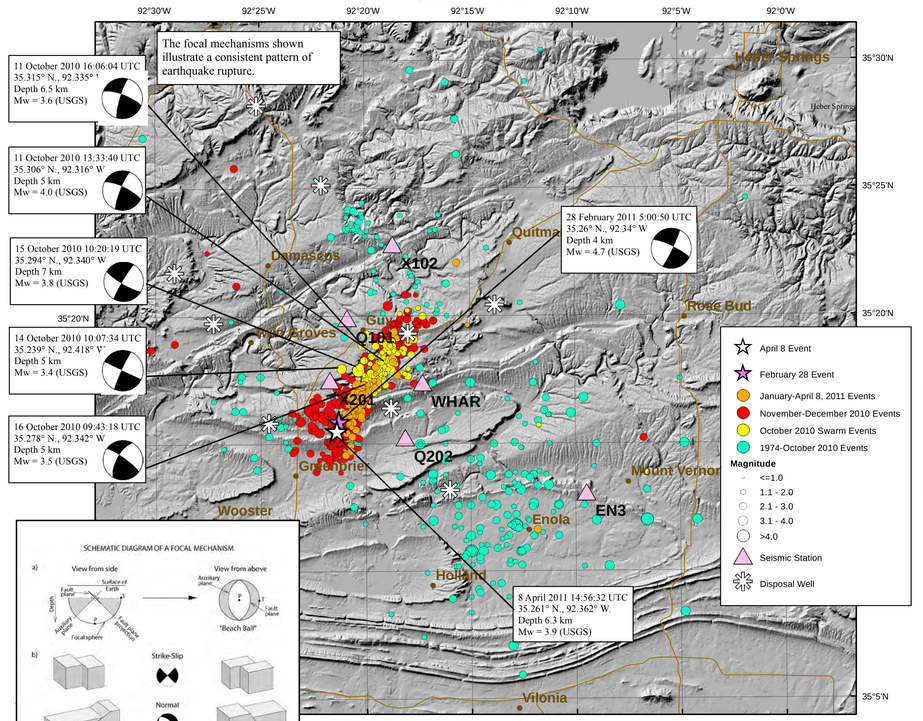




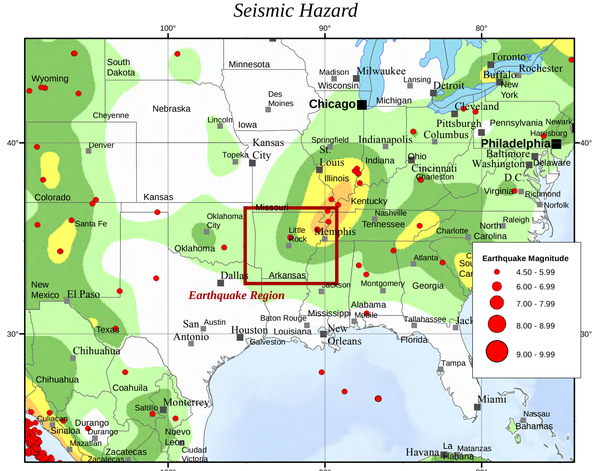
Helicorder image at station FCAR on February 28, 2011.

A traditional helicorder used a pen to record signals from a seismometer onto a piece of paper that was wrapped around a rotating drum. The paper records made a continuous display of seismic activity at a site. Today we still emulate the traditional paper record with a helicorder image that is produced digitally. In this image from February 27-28, each wiggle line represents 15 minutes of vertical ground motion beginning at 18:00 CST (top of image) until 09:00 CST (at the bottom) at the FCAR station. The lines alternate in color so each one can be easily distinguished from the next. The earth's surface is normally moving up and down a small amount (called a microseism). Microseisms cause the small wiggles in the lines. Small earthquakes show up as small spikes. As the earthquake size increases, the duration of shaking increases. The Mw4.7 earthquake is the long duration (black) signal that begins about 23:01 CST.

Swarm Area



Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

The earthquake locations shown are National Earthquake Information Center (NEIC) magnitude 4.5 and greater events from 1973 to the present.

TECTONIC SUMMARY

A magnitude 4.7 earthquake occurred near the town of Greenbrier in north-central Arkansas on Sunday night February 27, 2011 at 23:01 CST. The Mw 4.7 earthquake was felt across a ten state region. The mainshock was followed by 3.8 and 3.4 magnitude aftershocks at 23:18 CST and 02:46 CST, respectively and by dozens of small earthquakes (less than Mw 2.0) in the next several hours. The mainshock was the largest earthquake to date in the continuing earthquake swarm in the Guy-Greenbrier area known as the Guy earthquake swarm. It is also the largest earthquake that has occurred in Arkansas since a magnitude 5.0 earthquake struck northeast Arkansas along the New Madrid Seismic Zone in 1976.

The Guy swarm includes thousands of small earthquakes that have been occurring since September, 2010. The swarm has migrated from the northeast to the southwest and now forms a distinct 12 to 14 kilometer long linear trend. The linear trend of the earthquakes is now about twice the October 2010 length. The area to the south and southeast of Guy near the community of Enola has a history of earthquake activity with a swarm of thousands of earthquakes in the early 1980's and approximately 2,500 events in 2001. Because of the proximity of these two series of earthquakes to Enola, they are collectively referred to as the Enola swarm. The largest earthquake reported for the Enola swarm was a magnitude 4.5 event that occurred on January 21, 1982.

The Center for Earthquake Research and Information (CERI) at the University of Memphis and the Arkansas Geological Survey (AGS) have deployed a local seismic array in the Greenbrier-Enola area in order to augment regional seismic stations and carefully monitor this situation. USGS scientists have been working with their AGS and CERI colleagues. The CERI and AGS array and personnel are the best source of the most current information about the new earthquake swarm. The AGS and CERI are investigating whether the recent earthquakes are naturally occurring or related to human activities. The earthquake locations plotted on the maps above are from CERI.

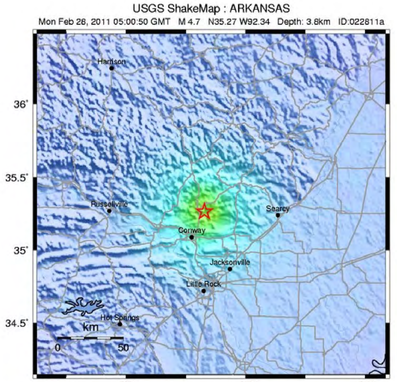
Earthquake swarms are not unusual east of the Rocky Mountains; although previous instrumentally-recorded swarms have not involved so many small earthquakes as the central Arkansas swarms. Scientists don't know how long to expect swarms to last. Most swarms subside without producing earthquakes large enough to cause significant damage. Most of North America east of the Rocky Mountains has infrequent earthquakes that can strike anywhere at irregular intervals. Earthquakes cannot be reliably predicted.

Earthquakes occur on faults and most occur miles deep. At well-studied plate boundaries like the San Andreas Fault System in California, seismologists can often determine the specific fault on which an earthquake occurred. East of the Rockies, far from plate boundaries, that is rarely the case. It has been hard to link an individual earthquake to an individual, geologically mapped, fault.

Earthquakes east of the Rocky Mountains, although less frequent than in the West, are typically felt over a much broader region. East of the Rockies, an earthquake can be felt over an area as much as ten times larger than if the earthquake had occurred 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) or more from where it occurred, and it can cause slight 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 it causes damage as far away as 40 km (25 mi).

USGS ShakeMap : ARKANSAS

Mon Feb 28, 2011 05:00:50 GMT M 4.7 N35.27 W92.34 Depth: 3.8km ID:022811a



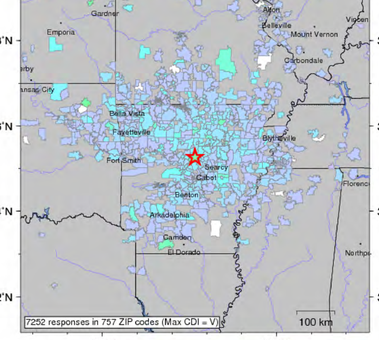
Map Version 1 Processed Sun Feb 27, 2011 10:31:43 PM MST – NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

USGS Community Internet Intensity Map

ARKANSAS

Feb 27 2011 23:00:50 local 35.265N 92.344W M4.7 Depth: 3 km ID:nm022811a



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	V. Heavy

Processed: Mon Apr 4 15:17:47 2011

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
AGS, Arkansas Geological Survey
CERI, Center for Earthquake Research and Information
USGS/NEIC, National Earthquake Information Center

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
TOPO!, National Geographic
ESRI Online

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.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
01 March 2011
Map not approved for release by Director USGS