1811–1812 New Madrid Sequence: Intensities and Magnitudes

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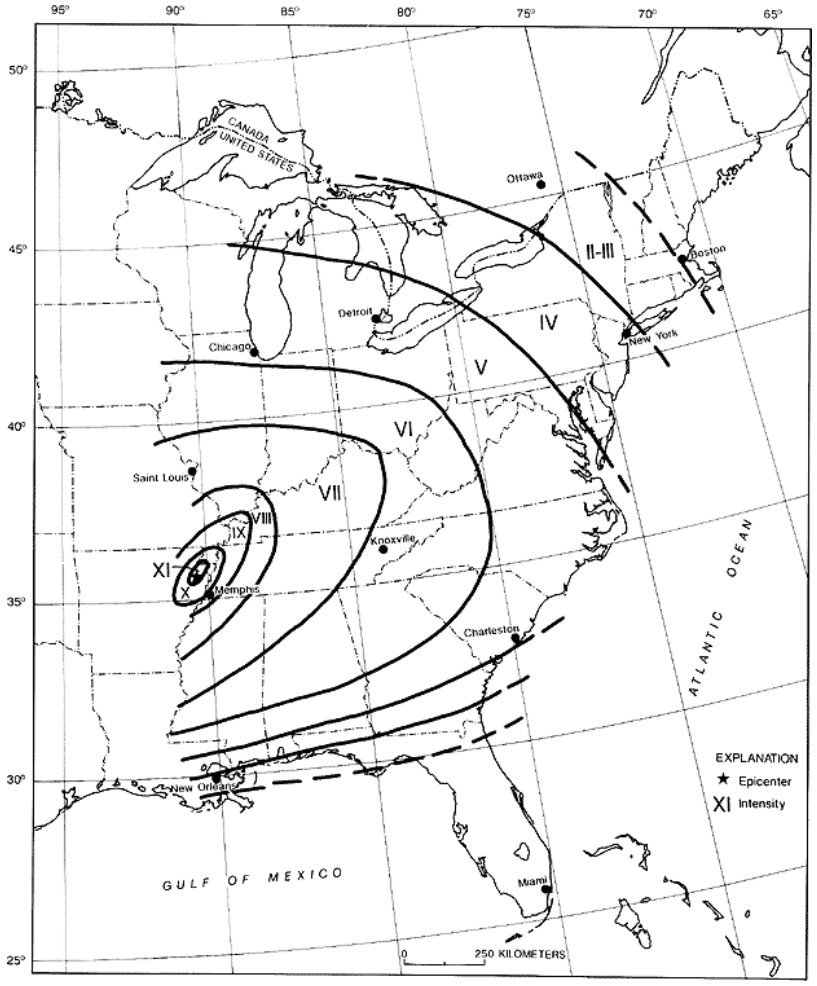
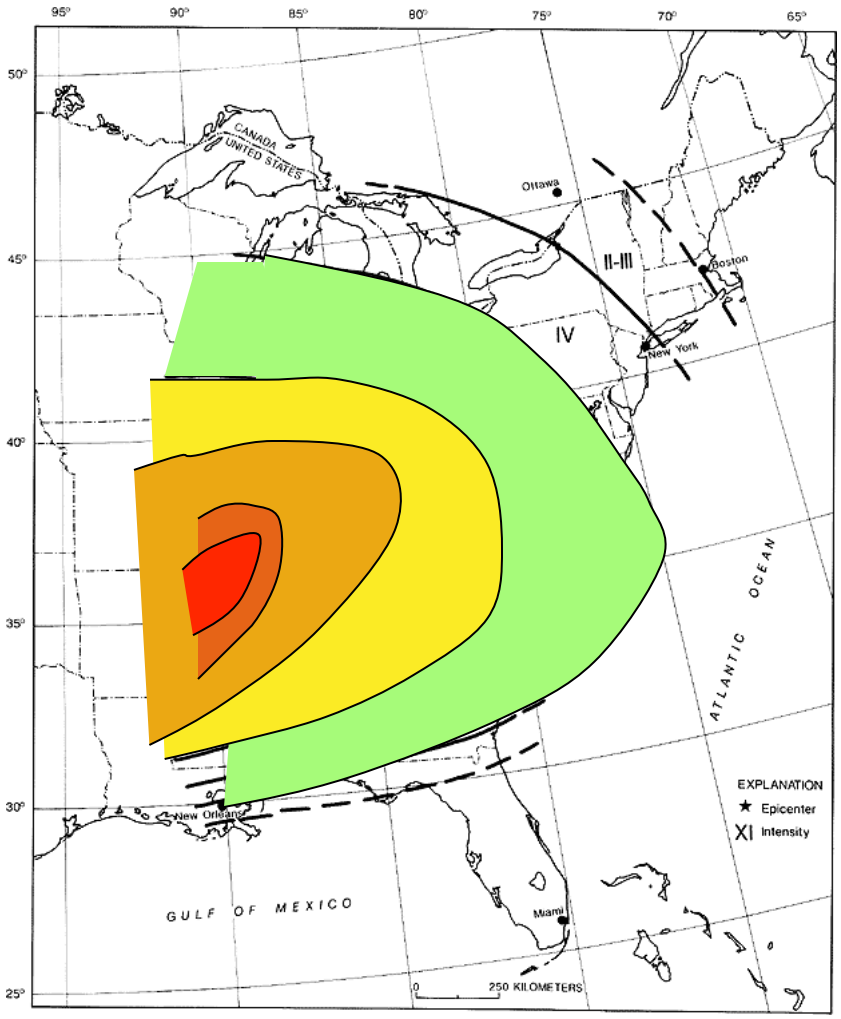
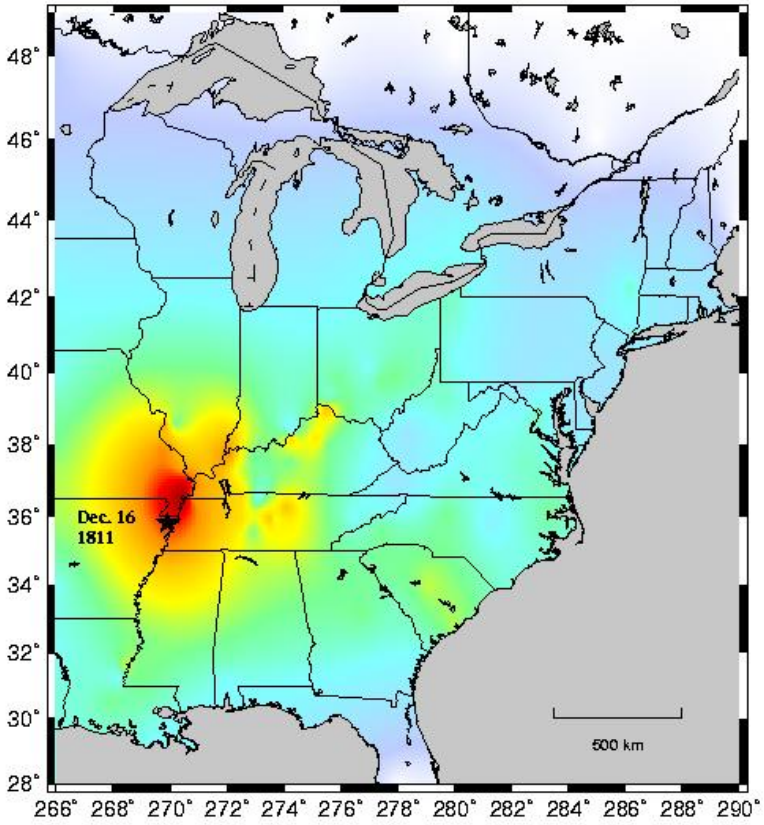
Macroseismic Data



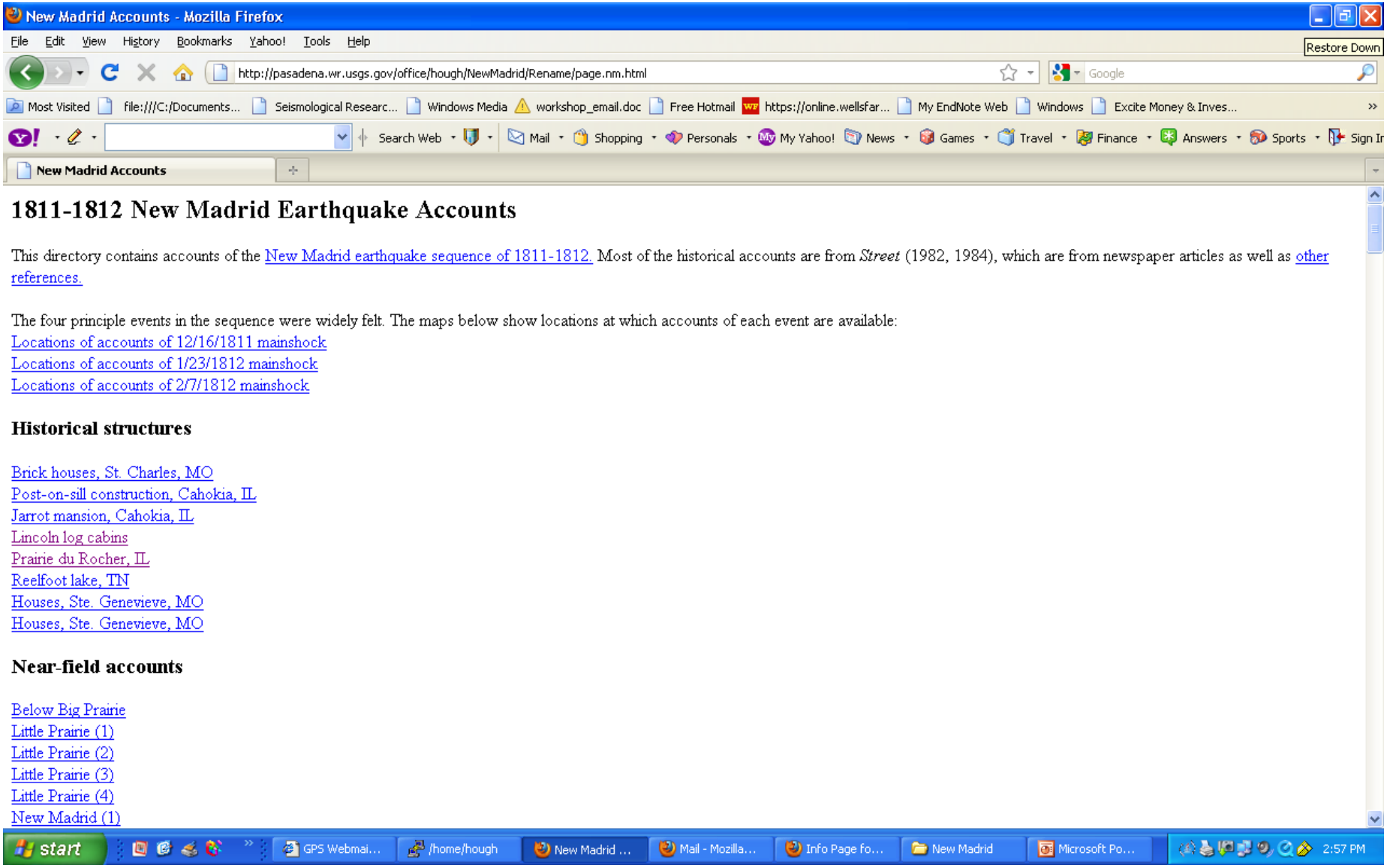




PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1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

Taking the "I" out of "Intensity"

Archival Sources



Account 1.

Jarrot, a fur trader and land speculator, built his house of hand-made brick (probably made by slave labor) strong enough to withstand several remodeling jobs, including one in the Parks ownership period. The 1811 earthquake at New Madrid, MO, cracked the back wall and broke two of the chimneys.

The hand-made bricks are of a Flemish bond pattern across the back and west sides of the house with almost-black banding (created by over-firing the bricks) and with haphazard brick courses on the other two sides. Logs were cut from groves nearby for the woodwork and floor boards, including pine plank flooring of the ballroom.

Exterior walls and interior partitions are 16 inches thick; the door frames, of walnut, are doweled and tenoned together with oak, pegs, and the windows are 12-paned throughout.

Reference: Flannery, Toni, Two Illinois houses, one restored, one in the raw, 1972.
http://cusd187.stclair.k12.il.us/Tricentennial/Records/

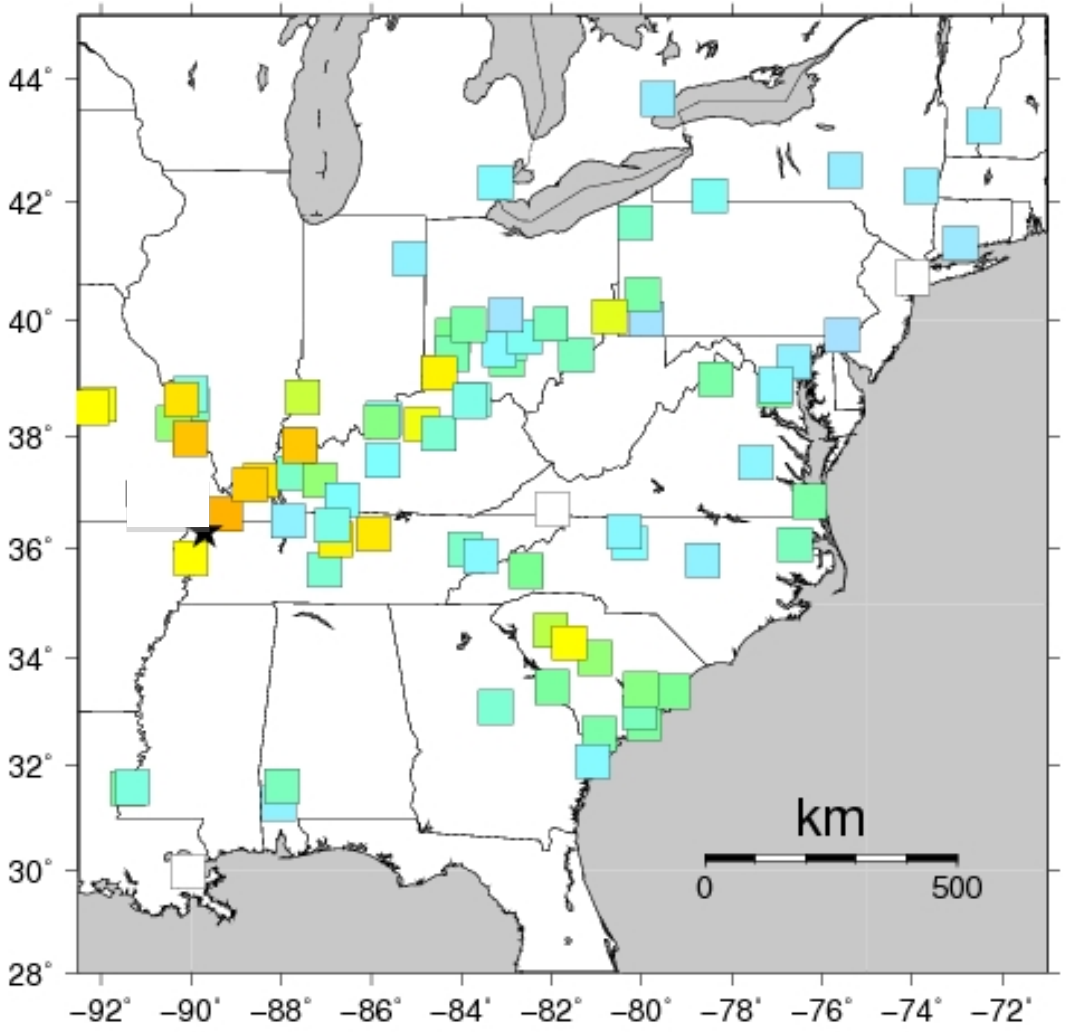
Account 2.

St. Clair County court records corroborate this account. A case for for Jarrot vs. Hicak (1813) contains an invoice dating from the approximately period of the earthquakes, which itemizes repair work on one of the chimneys. The date of other damage is more difficult to substantiate.

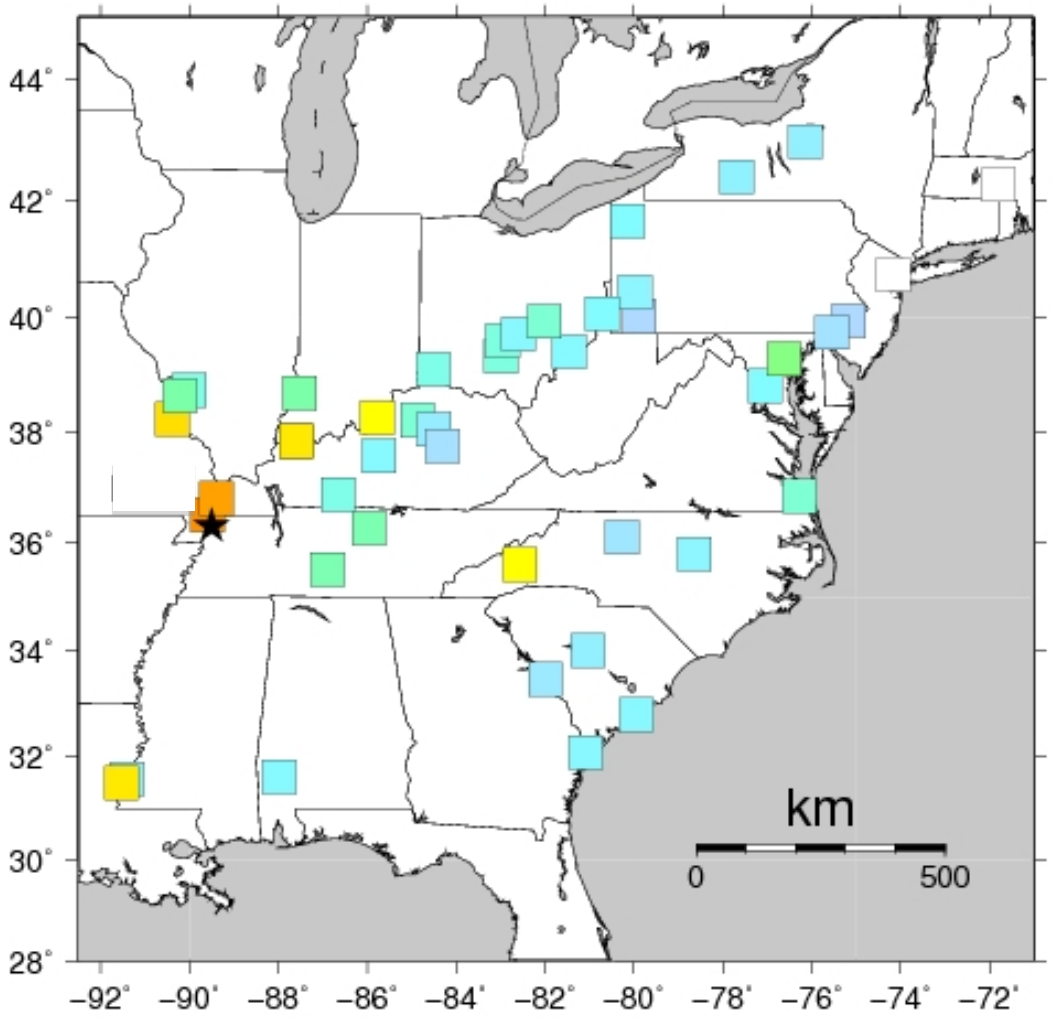
Reference: Restoration Inventory, Nicholas Jarrot House, Illinois Dept. of Conservation, Historic Sites Division, Springfield, Illinois, June 14, 1982.

Historical Sketch (date unknown) showing Jarrot Mansion (towards left), Holy Family Church (middle), and houses no longer standing.

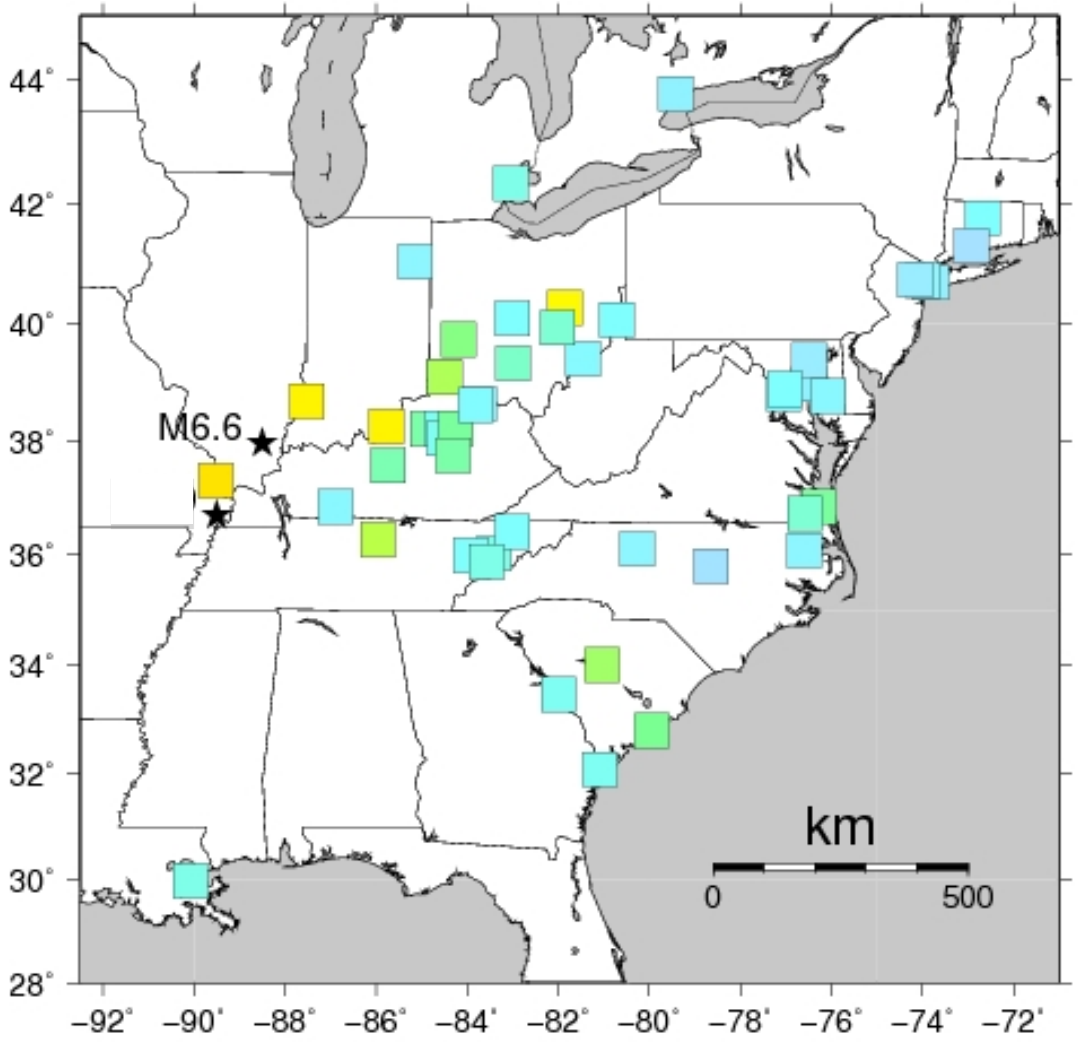
16 December 1811 Mainshock: Consensus Intensities



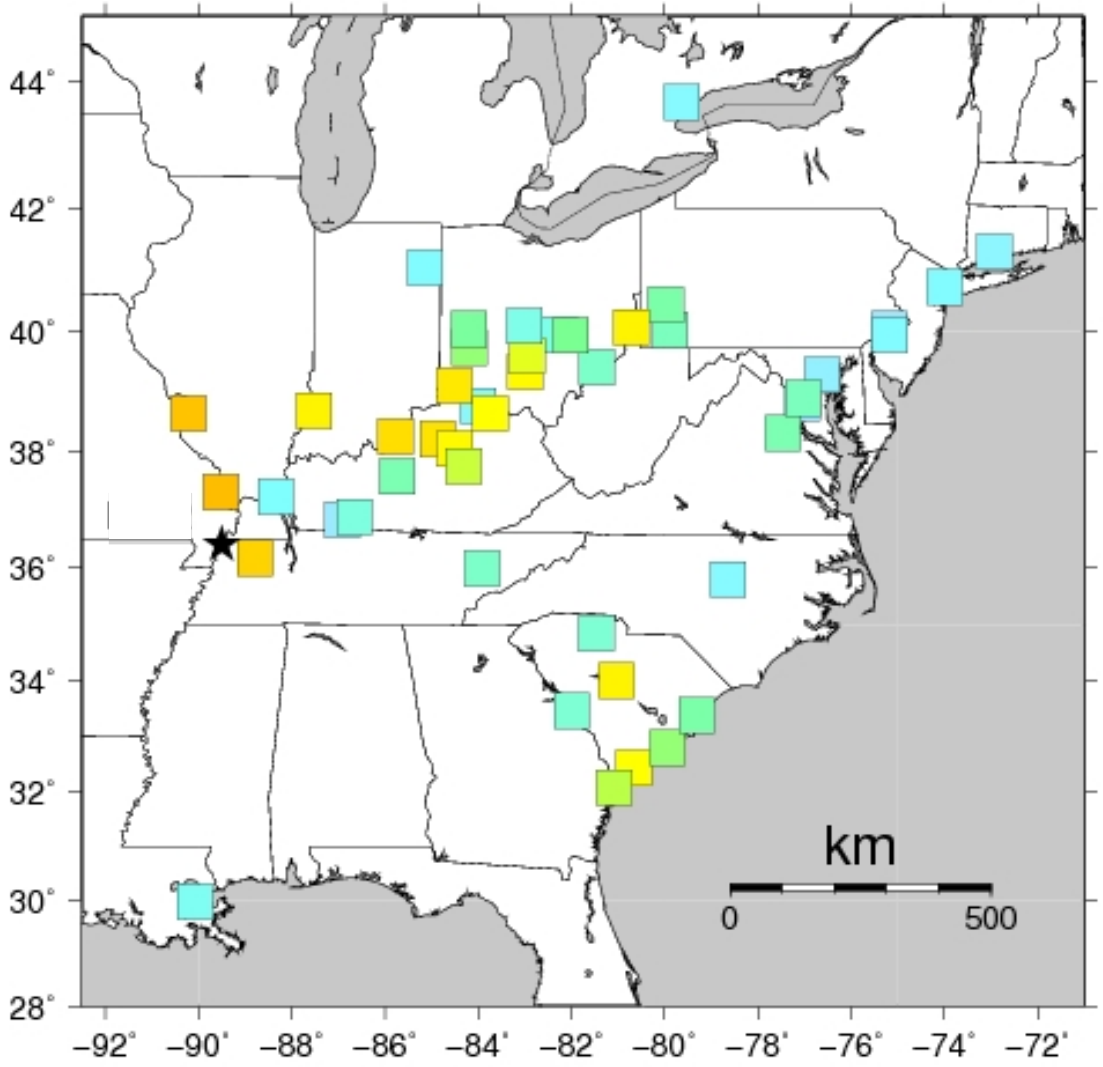
16 December 1811, Dawn Aftershock



23 January 1812 Mainshock

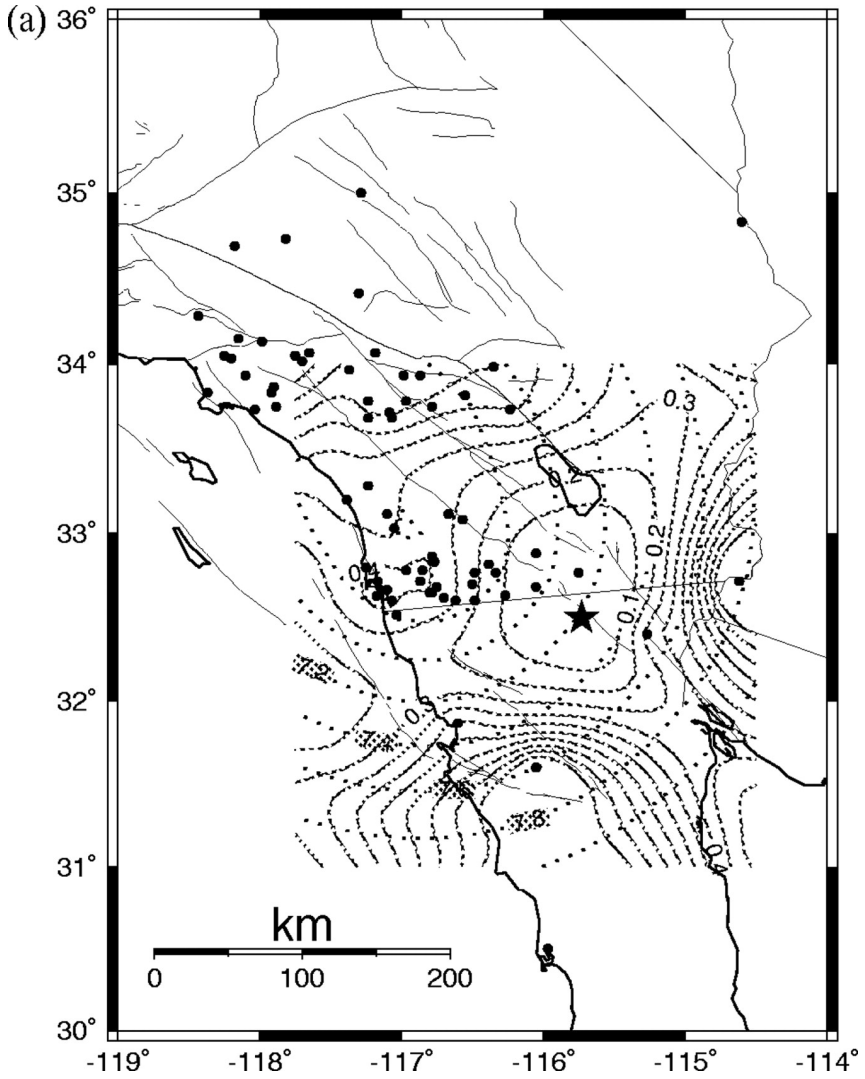


7 February 1812 Mainshock



Bakun Method

- Develop regional intensity attenuation relation from calibration events
- For grid of trial epicenters, fit MMI(r), determine misfit, magnitude
- Optimal solution ⇒ preferred magnitude/ location
- "Model 1" vs "Model 3"

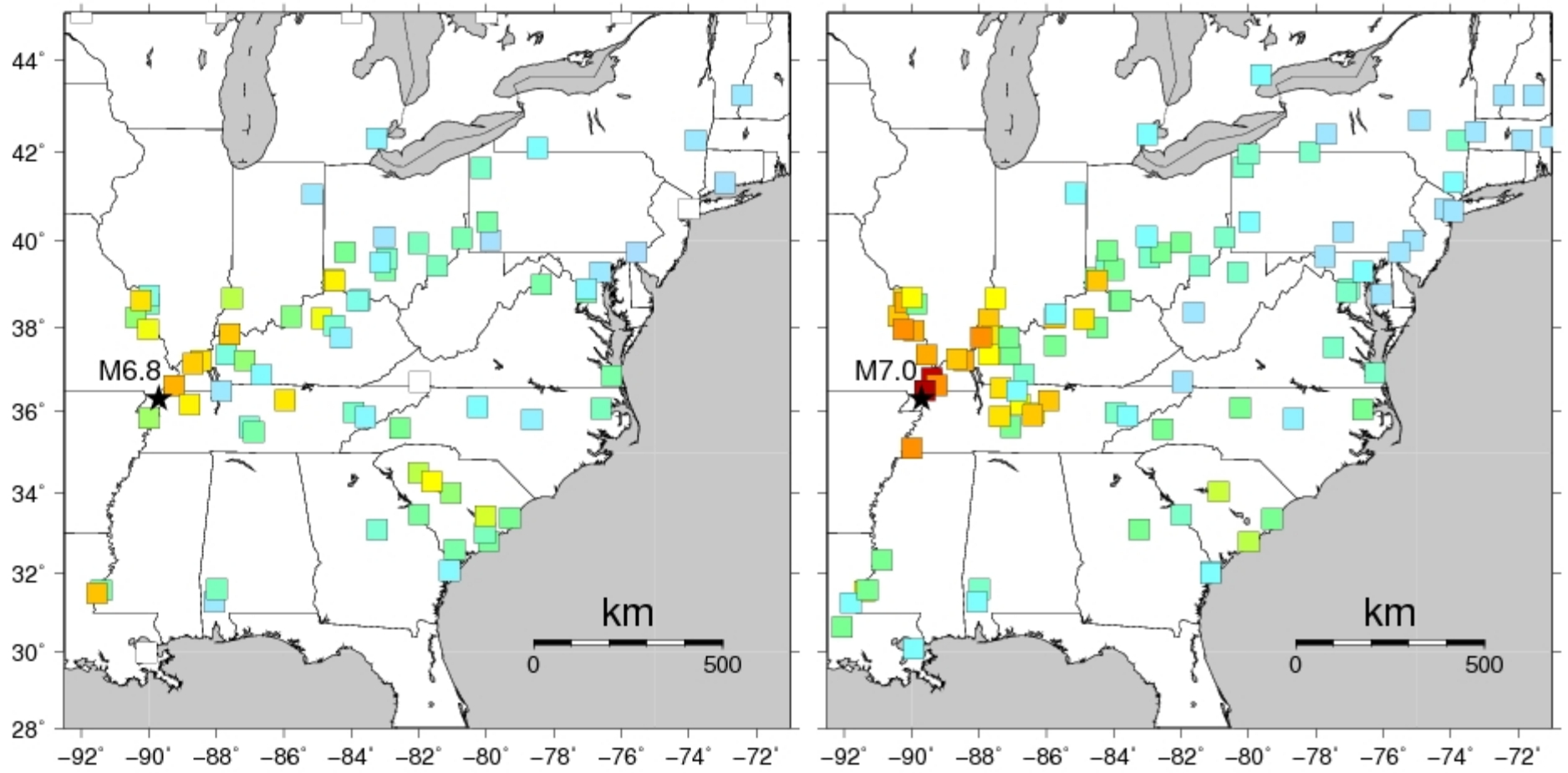


Magnitude Range

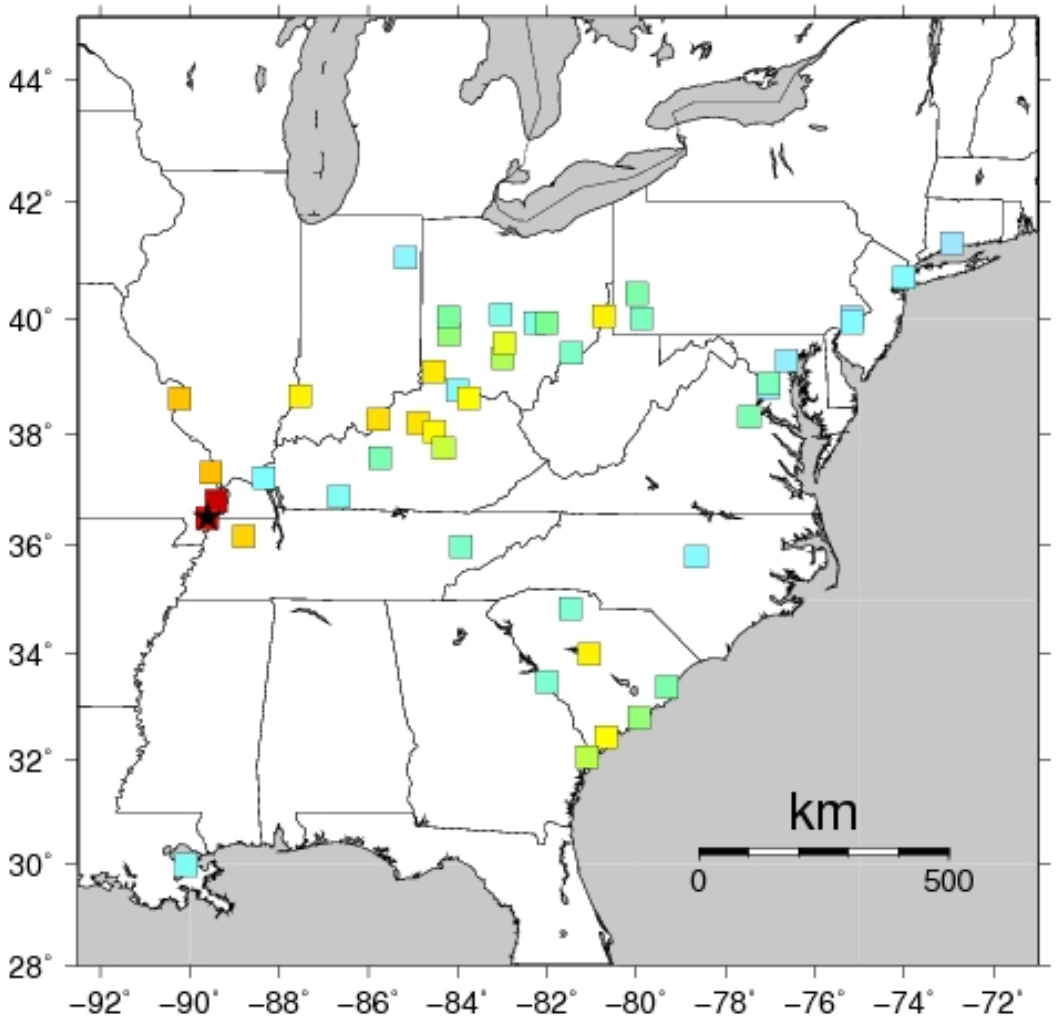
- December: 6.7 – 7.1 (6.9)
- dawn a/s: 6.3 – 6.9 (6.6)
- January: 6.7-7.1* (6.9*)
- February: 6.8-7.5 (7.1)

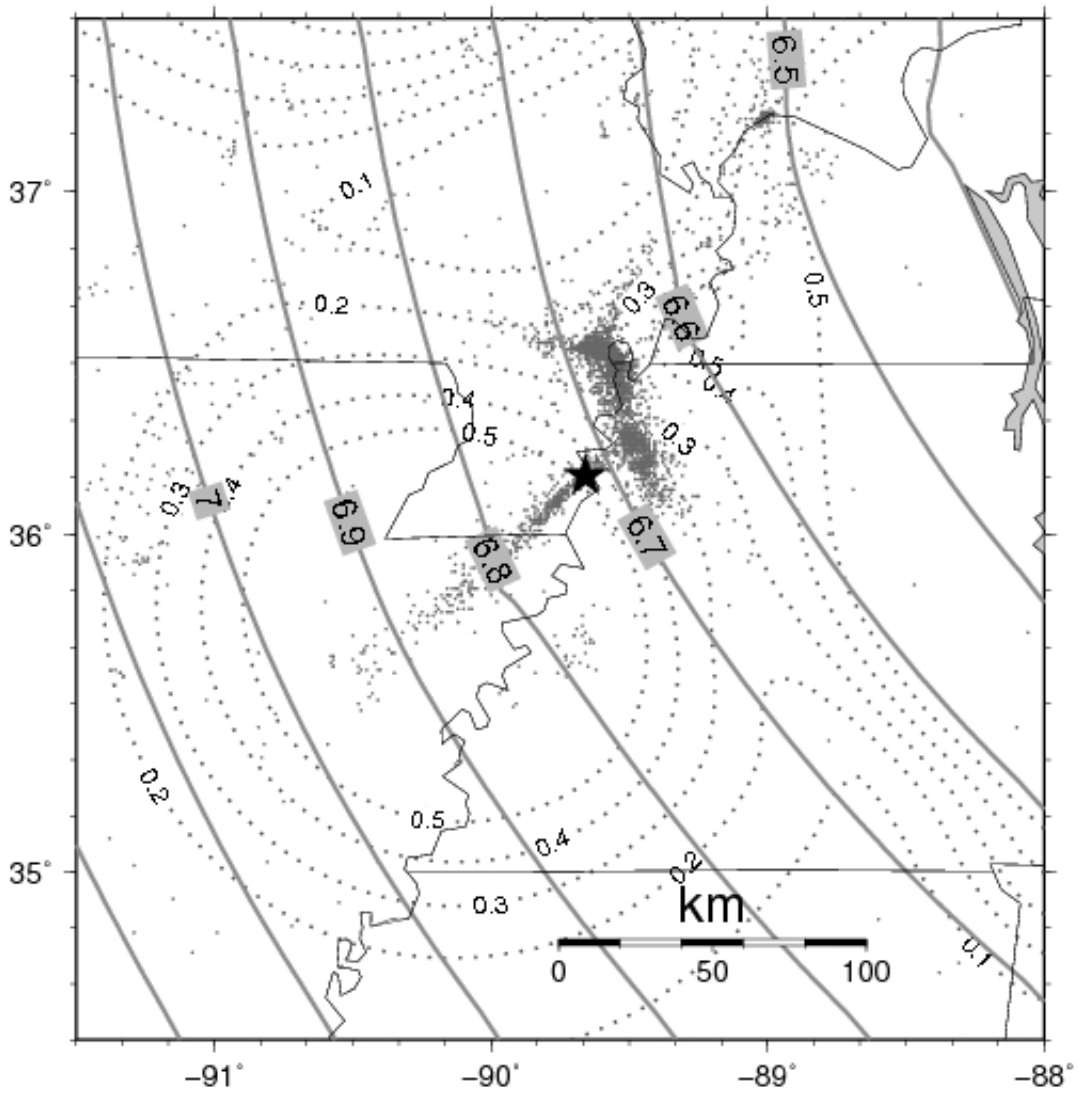
Hough and Page, JGR 2011

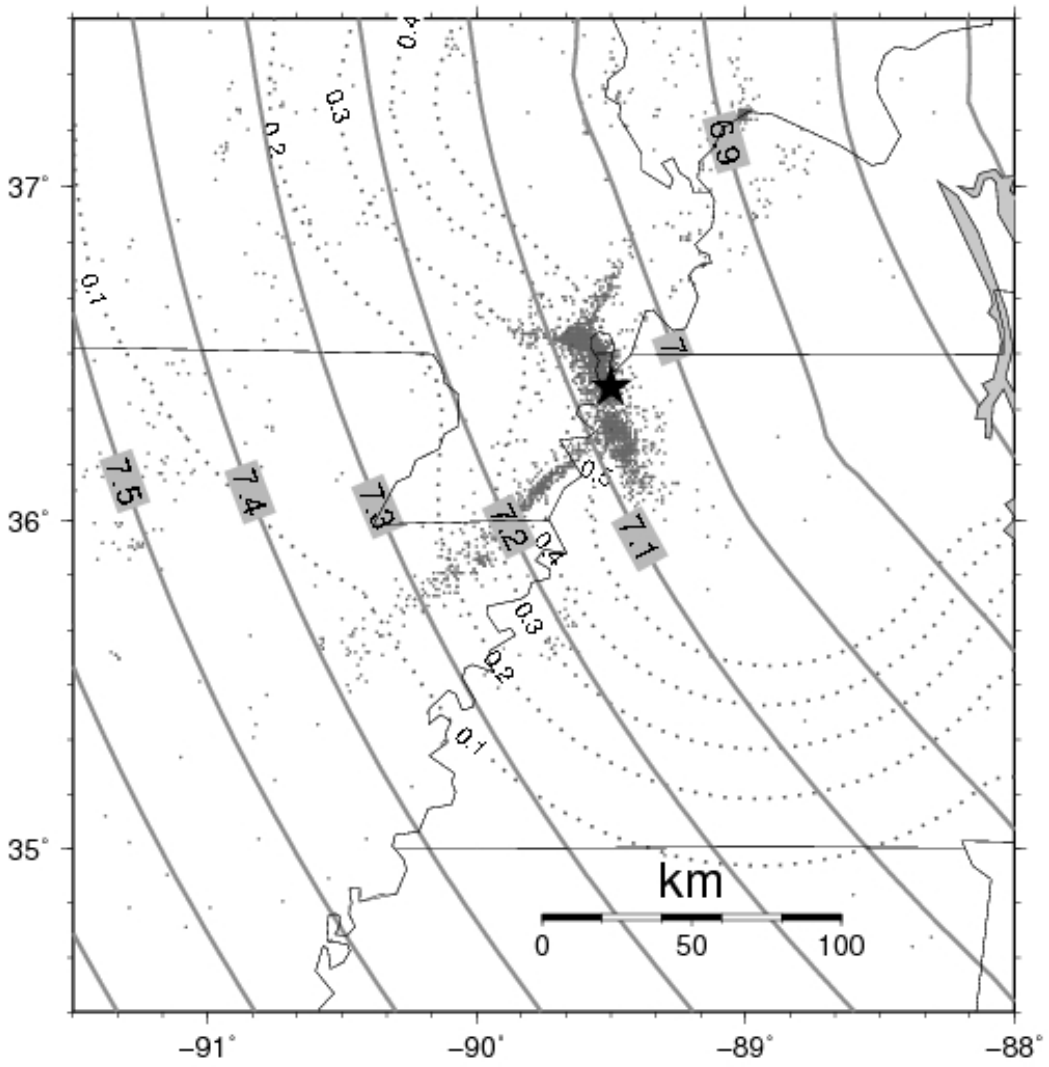
vs Hough et al. (2000)



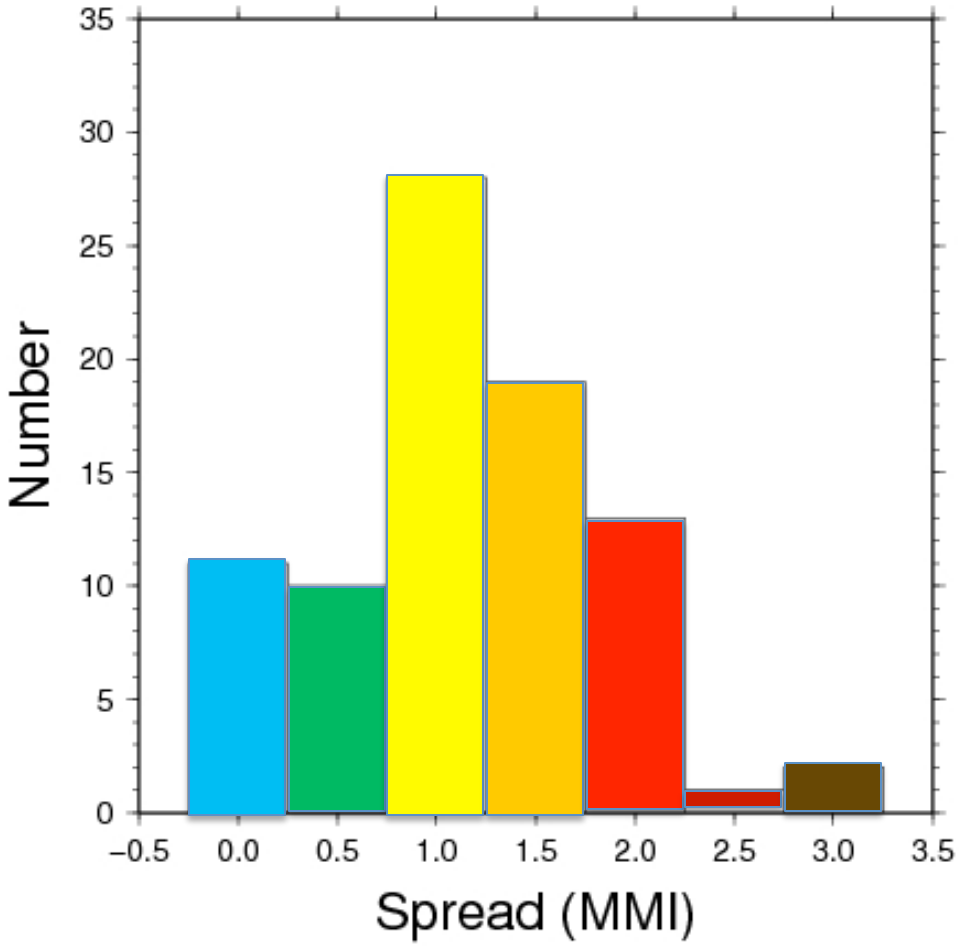
Near-field MMI?

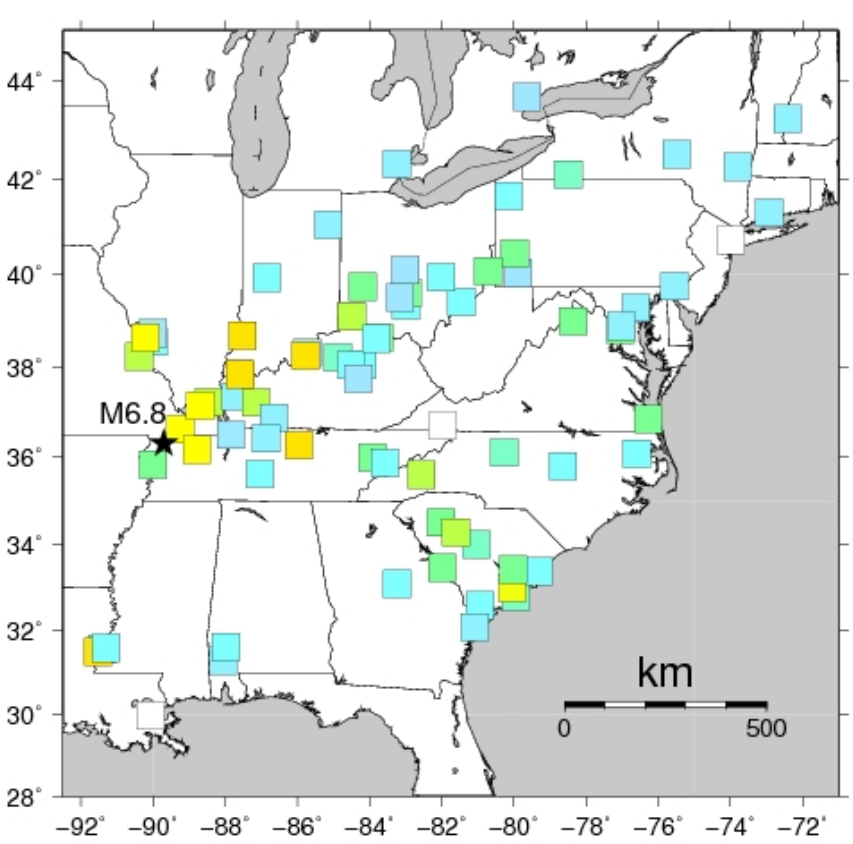


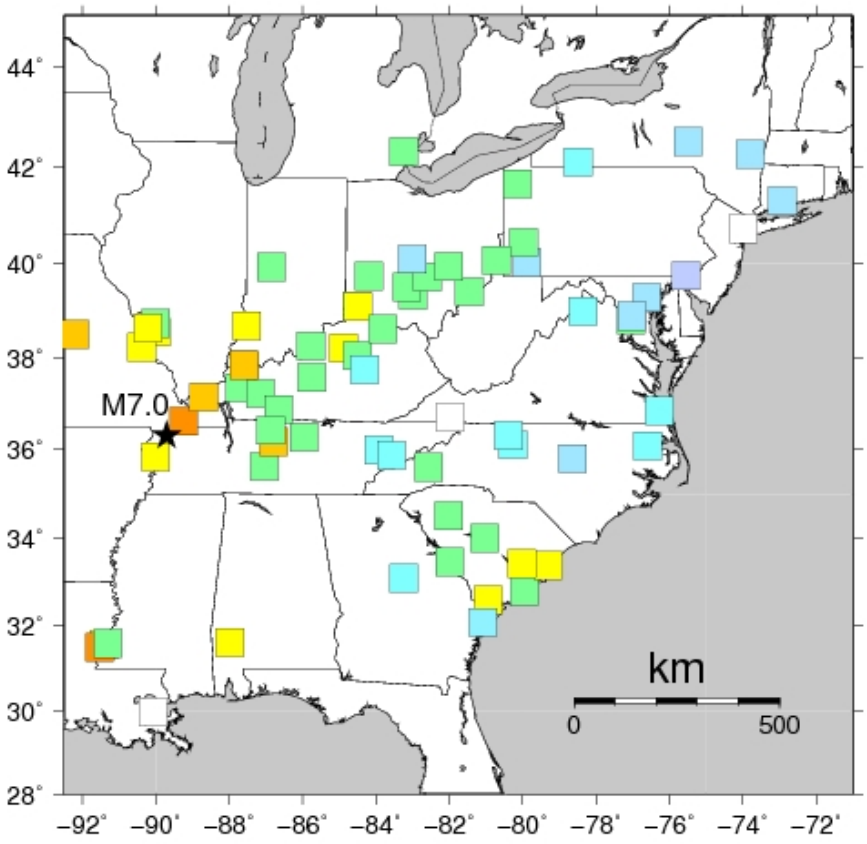

37°
36°
35°
−91°
−90°
−89°
−88°
6.5
6.6
6.7
6.8
6.9
7
0.1
0.2
0.3
0.4
0.5
km
0
50
100


37°
36°
35°
−91°
−90°
−89°
−88°
km
0
50
100
6.9
7
7.1
7.2
7.3
7.4
7.5
0.1
0.2
0.3
0.4

MMI Variability

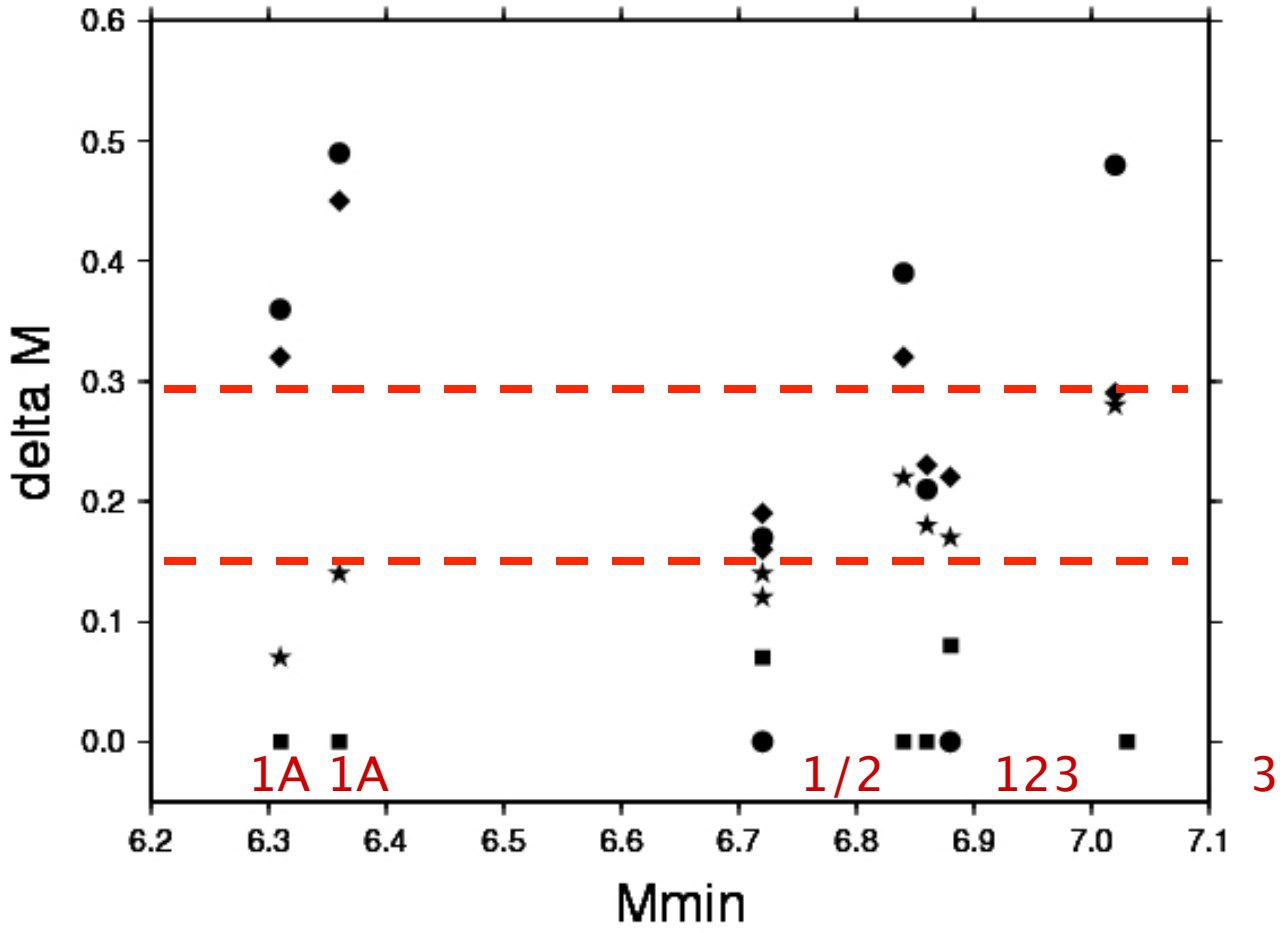



M6.8
km
0
500
44°
42°
40°
38°
36°
34°
32°
30°
28°
−92°
−90°
−88°
−86°
−84°
−82°
−80°
−78°
−76°
−74°
−72°


M7.0
km
0
500
44°
42°
40°
38°
36°
34°
32°
30°
28°
−92°
−90°
−88°
−86°
−84°
−82°
−80°
−78°
−76°
−74°
−72°

M6.8

M7.0


0.6
0.5
0.4
0.3
0.2
0.1
0.0
delta M
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
Mmin
1A 1A
1/2
123
3

“Issues”

- Revisited 1811–1812 MMIs, not calibration events
- Site response biases (settlement patterns)
- Calibration events limited

Reconsider key calibration events

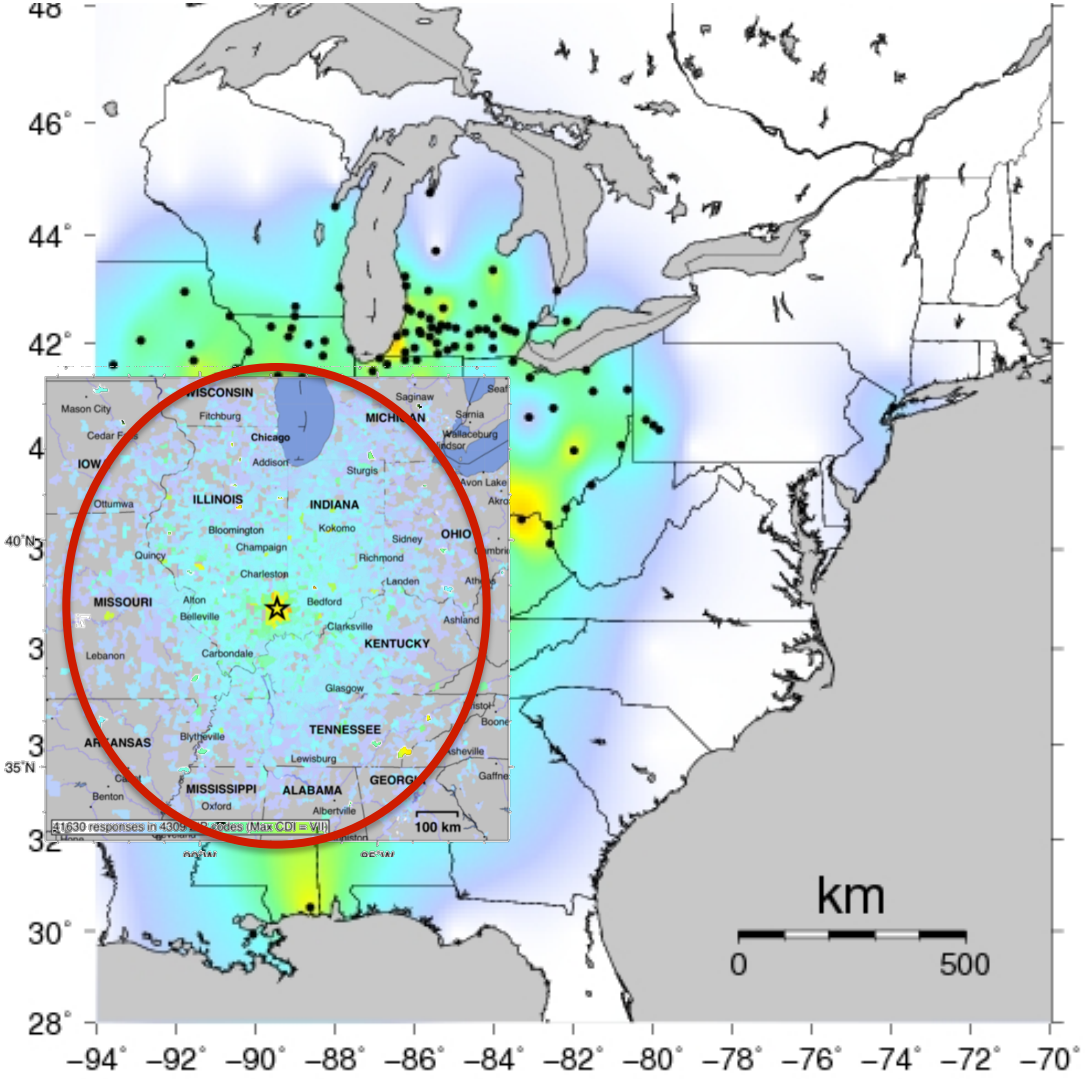
Insights from DYFI data (recent events)

CEUS Event Heirarchy

- 2008 Mt. Carmel (5.2): R_{felt} ~ 1000 km
- Mineral, VA (M5.8): R_{felt} ~ 1500 km
- 1925 Charlevoix (M6.2): R_{felt} ~ 1500+ km

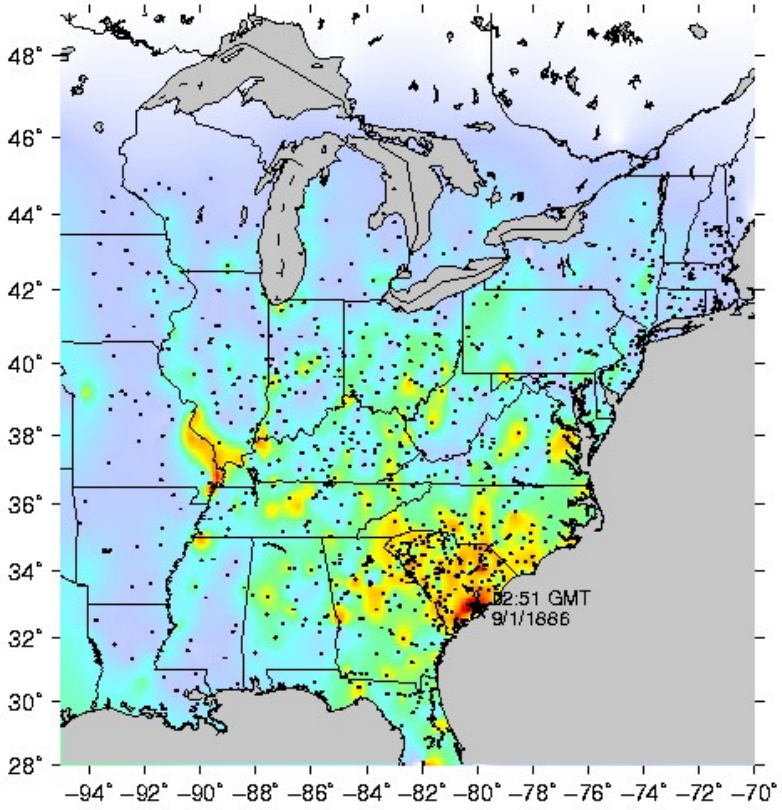
- 1895
- 1886
- 1811-1812

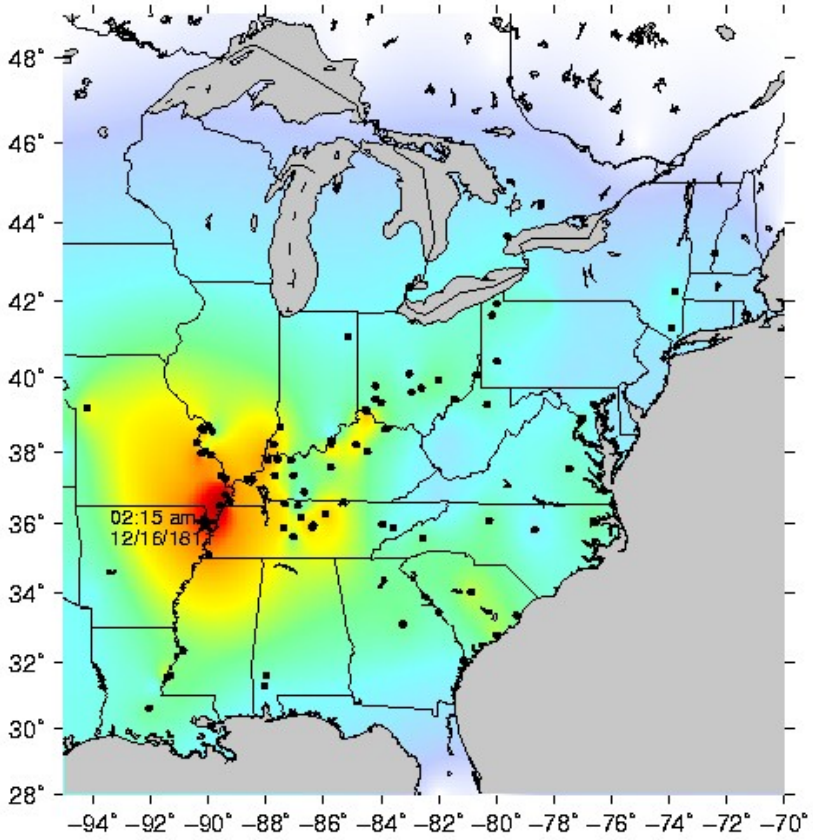
1895 Charleston, MO

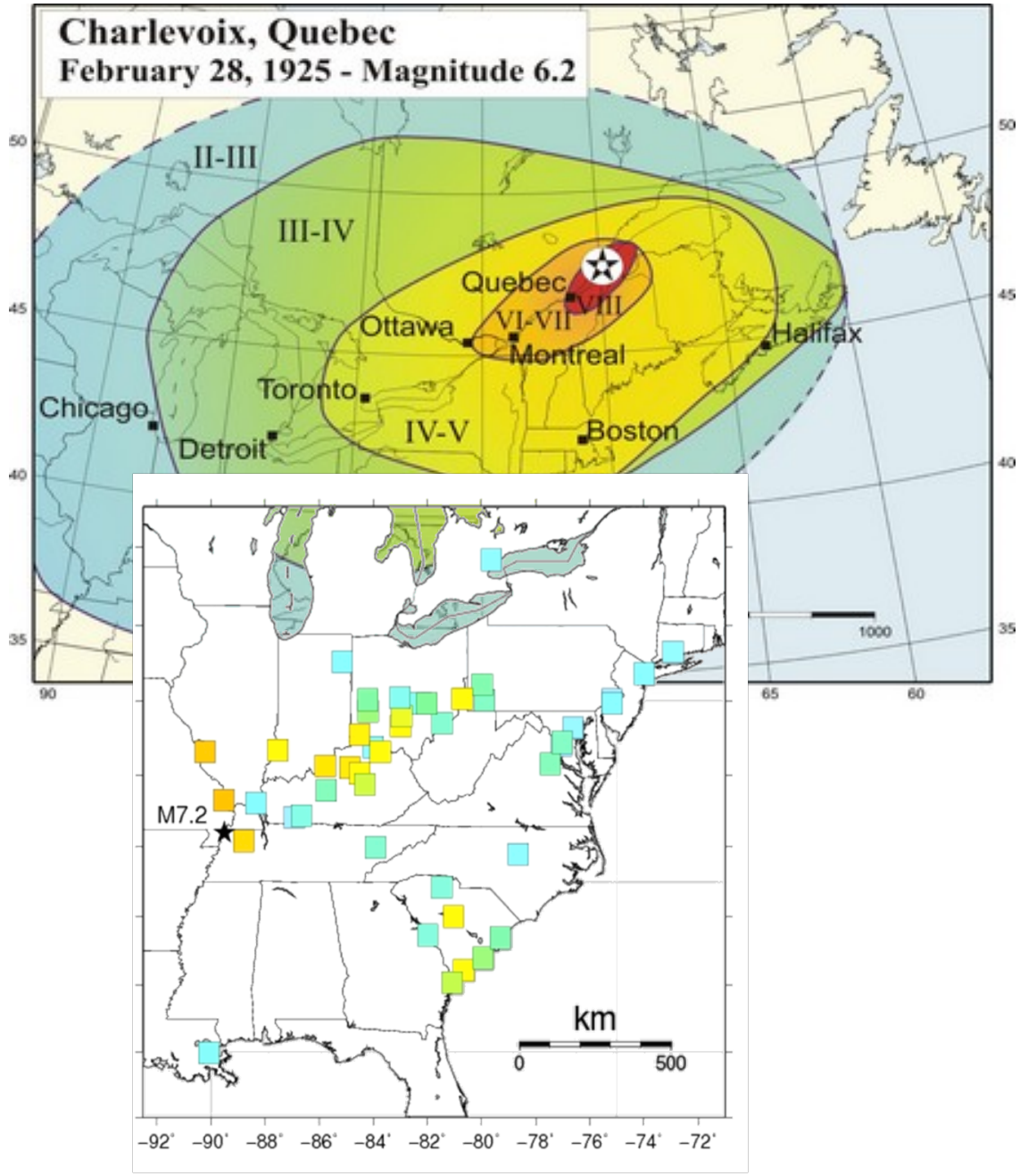


5.2 ≤ M ≤ 6.2

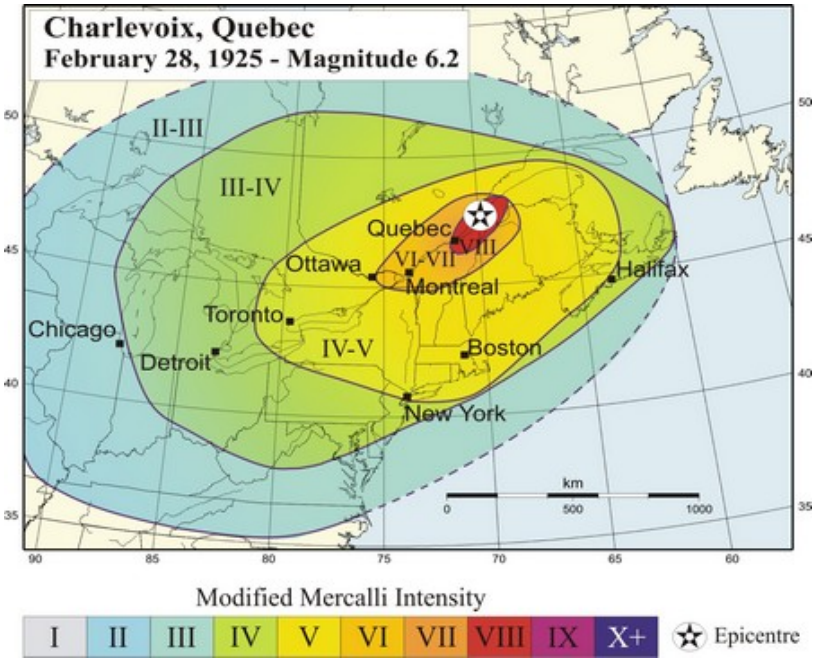
1886 Charleston, SC



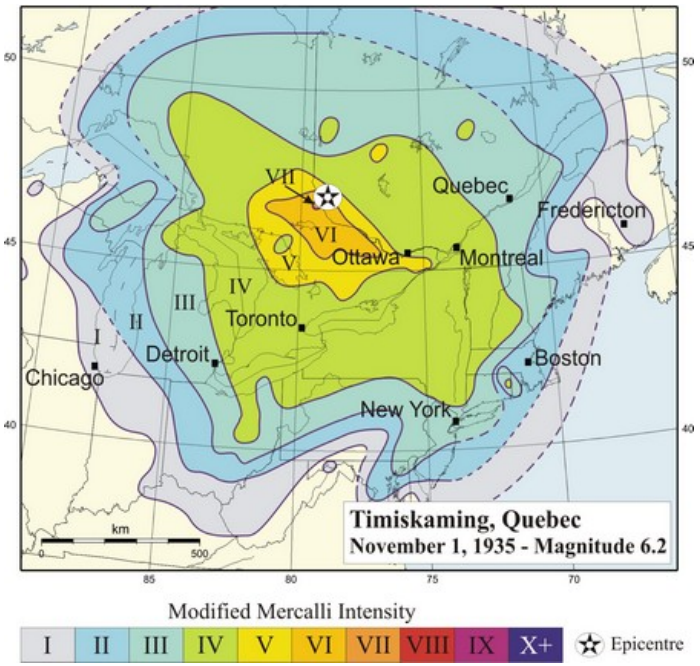



Charlevoix, Quebec
February 28, 1925 - Magnitude 6.2
II-III
III-IV
IV-V
VI-VII
VIII
Quebec
Ottawa
Montreal
Halifax
Toronto
Chicago
Detroit
Boston
1000
M7.2
km
0
500
−92°
−90°
−88°
−86°
−84°
−82°
−80°
−78°
−76°
−74°
−72°

1925



1935



Wickham Steed
Discusses Britain's interest in European security.
—Page 13.

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EARTH TREMORS ARE FELT OVER GREATER PART OF U.S.; BALTIMORE ALSO SHAKEN

Shocks Varying From Slight To Pronounced Reported From Points Extending From Maine To Colorado, From Canada To South Carolina.

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2 CENTS PAY NO MORE!

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ICKINSON SEES AA AS G. O. P. ICTORY LADDER

ites Defects; Offers Substitute Plan.

NEWS SUMMARY

CHICAGO AND BIG EASTERN CITIES FEEL TREMORS

Two Die as Montana Is Jolted Again.

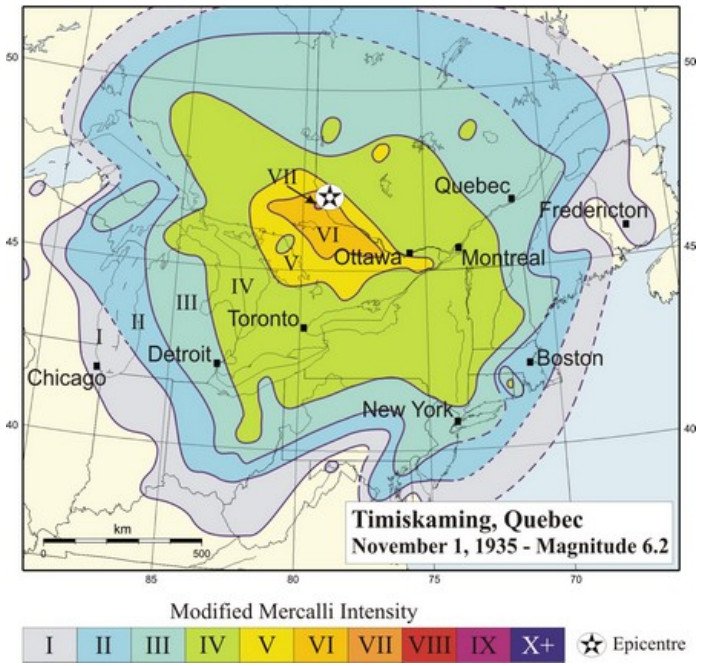
CARTOONS OF THE DAY

Witness Tells How Sweitzer Got $200,000

ANGRY ITALIANS RIOT AGAINST BRITAIN IN ROME

Crowds Cry: 'Down with England.'

Peace Hopes Fade



"There was no connection between the tremor felt over the Eastern half of the country and the more intense one at Helena, Mont, he said. The Helena shake was intense within a ten-mile radius of the city, while the Eastern tremor was of moderate intensity over an area of several thousand square miles"
New York Times, November 2, 1935

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- 1895 M5.8
- 1886 M7
- 1811-1812 M7