

Unregulated Earthquakes

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July, 2014

FOX 25
USGS issues earthquake warning
The nation's significant earthquakes increased the previous record, and in the last 10 days, the U.S. Geological Survey has had 145 earthquakes of 3.0 or greater in the area that includes Oklahoma.

DAILY KOS
NEWS · COMMUNITY · ACTION
USGS issues 'damaging earthquake' advisory for Oklahoma, its first ever for east of the Rockies
As of May 2, 2014
Number of Earthquakes Magnitude 3.0 and greater
Year
1970 1975 1980 1985 1990 1995 2000 2005 2010 2015

U.S. Geological Survey
Advisory Issued for Oklahoma
Warning adds new worries to prone Oklahoma

No, the USGS Warning? To
USGS
Last Month's Hill in Colorado Caused \$109 Million in Insured Losses
Frustrating Bureaucracy Leads to Ridiculous Tornado Forecast
NBC Reports a "Gustnado" Threatens Millions, Uses Day Old Weather Map
Rare Heat Burst Causes Temps to Soar to 95° at Night in Kansas Town
Tampa Airport Welcomes 787 by Damaging Wing with Fretnick
"Stay Away from Windows" is Not Just a Suggestion in Bad Storms
Rare "High Risk" for Severe Storms Issued, Detects Imminent in Midwest
Church Billboard Quotes Hitler on the Importance of Educating the Kids
Andrea Thompson over at Climate Central has a great read on how the...
Who Are the GOP Strategists Running the Anti-Bowen Bergdahl Show?
Radar Shows Millions of Locusts a Mile Deep in the Air Over New Mexico
Major Severe Weather Outbreak Likely in the Central Plains Today
Albuquerque Grasshopper Swarms Are Showing Up on Weather Radar

OFF THE GRID NEWS
Better Ideas for Off The Grid Living
What You're Not Being Told About Those Oklahoma Earthquakes
Generate FREE Electricity
Free Book & Video Kit Tells You How!
CLAIM FREE KIT

PoliticalUSA
REAL LIBERAL POLITICS
The Area Under The Keystone XL Pipeline To Experience Earthquakes
Click to subscribe to our daily newsletter
Our Latest on Facebook
Our Sponsors
No more secrets - and that Koch-backed front ups disclose their donors!
SIGN THE PETITION >>



Recent events

Oklahoma

50% increase in seismicity since Fall
2014 seismicity rate higher than California
modeling points to large-volume injectors

Kansas

Oklahoma quakes invade southern Kansas

Ohio

small earthquakes triggered during fracking
fracking halted; new regulations implemented

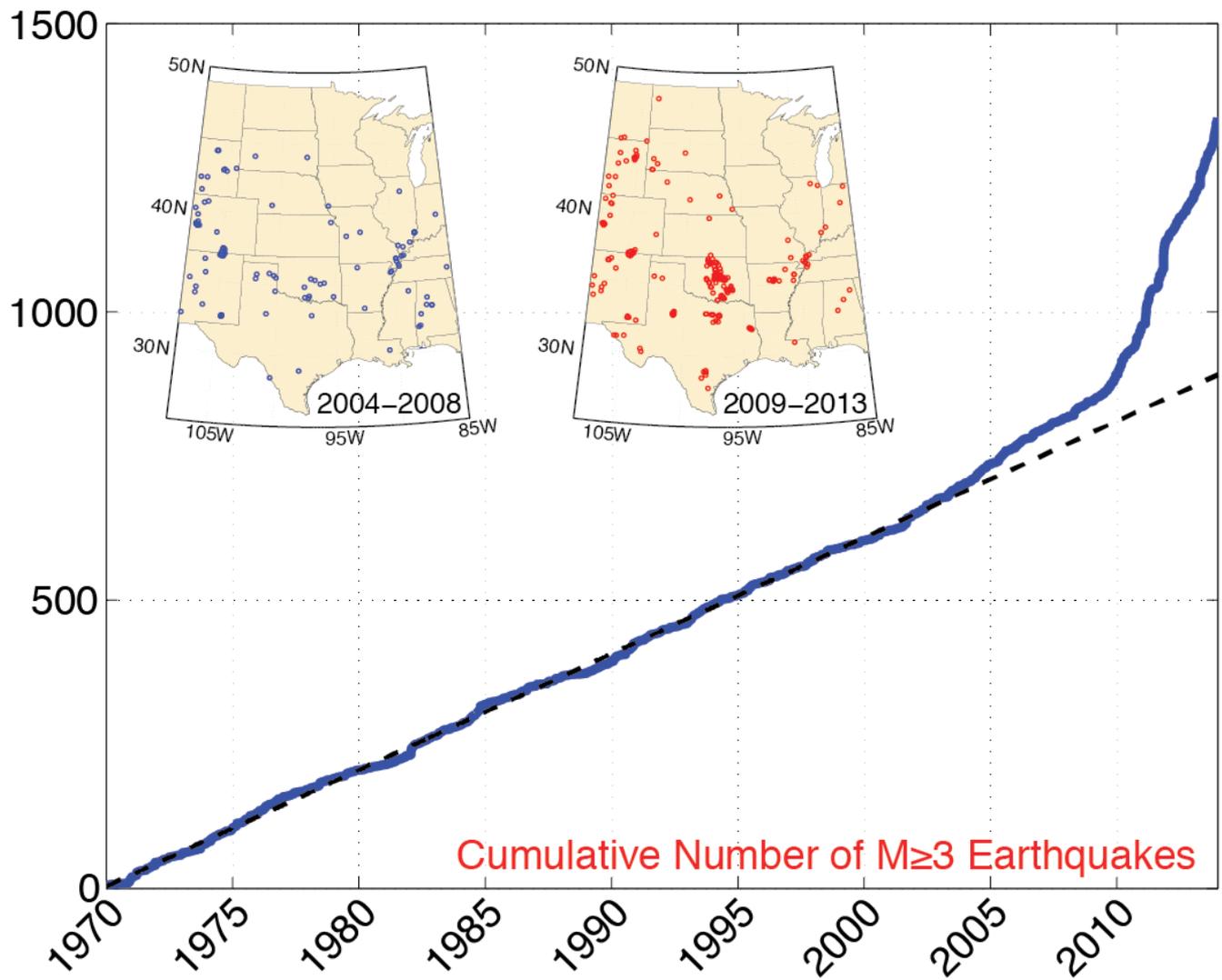
Colorado

series of earthquakes north of Denver
injection halted

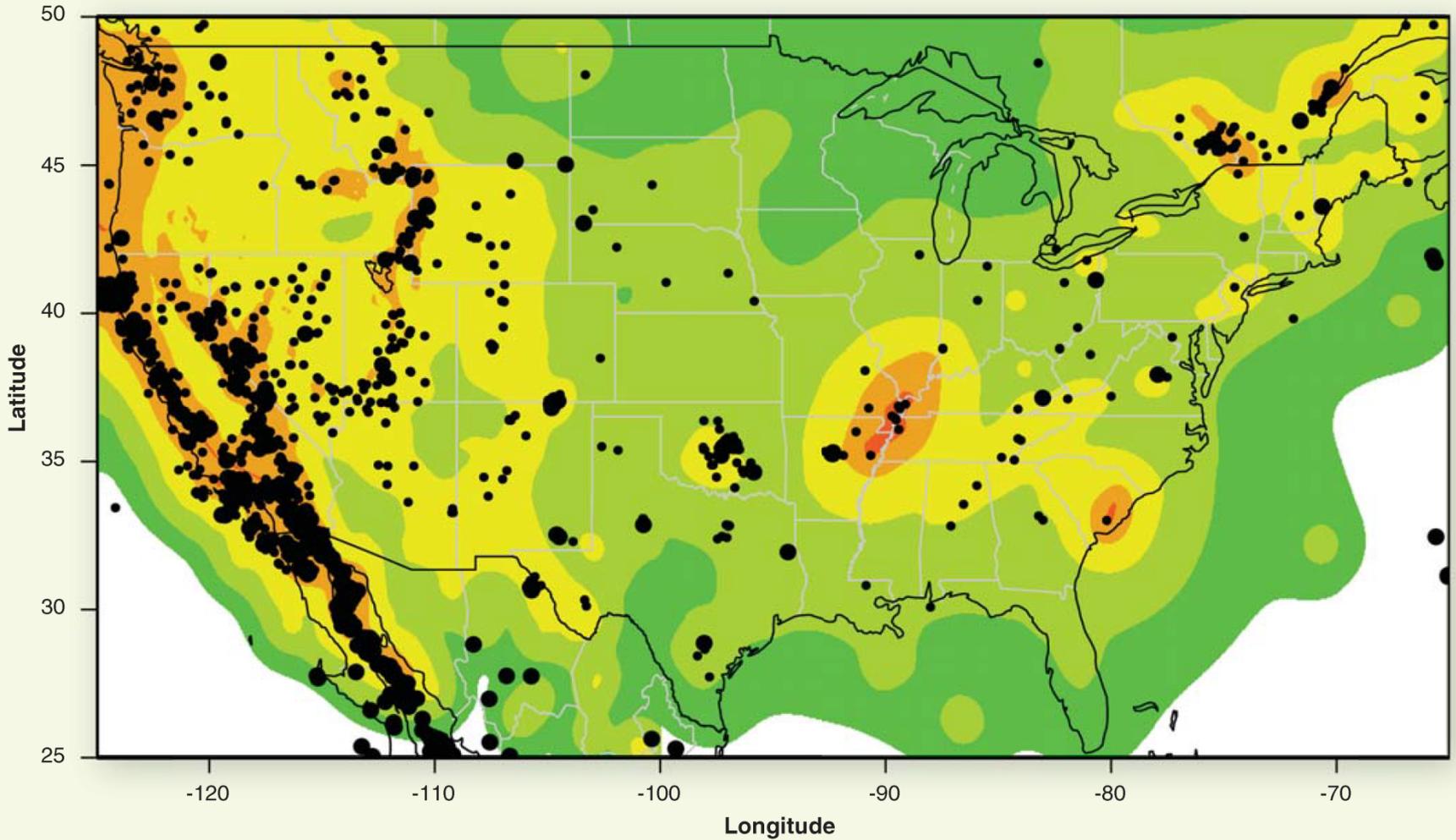
NRC induced seismicity study completed

EPA analysis and recommendations... still not released

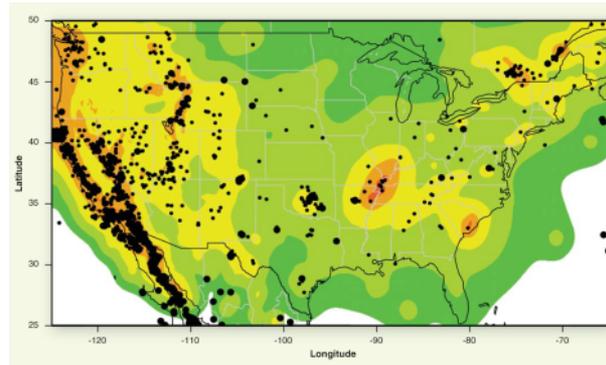
High rate of earthquakes in the midcontinent since 2001



U. S. National Seismic Hazard Map (2008) and Seismicity (2009 – 2012)



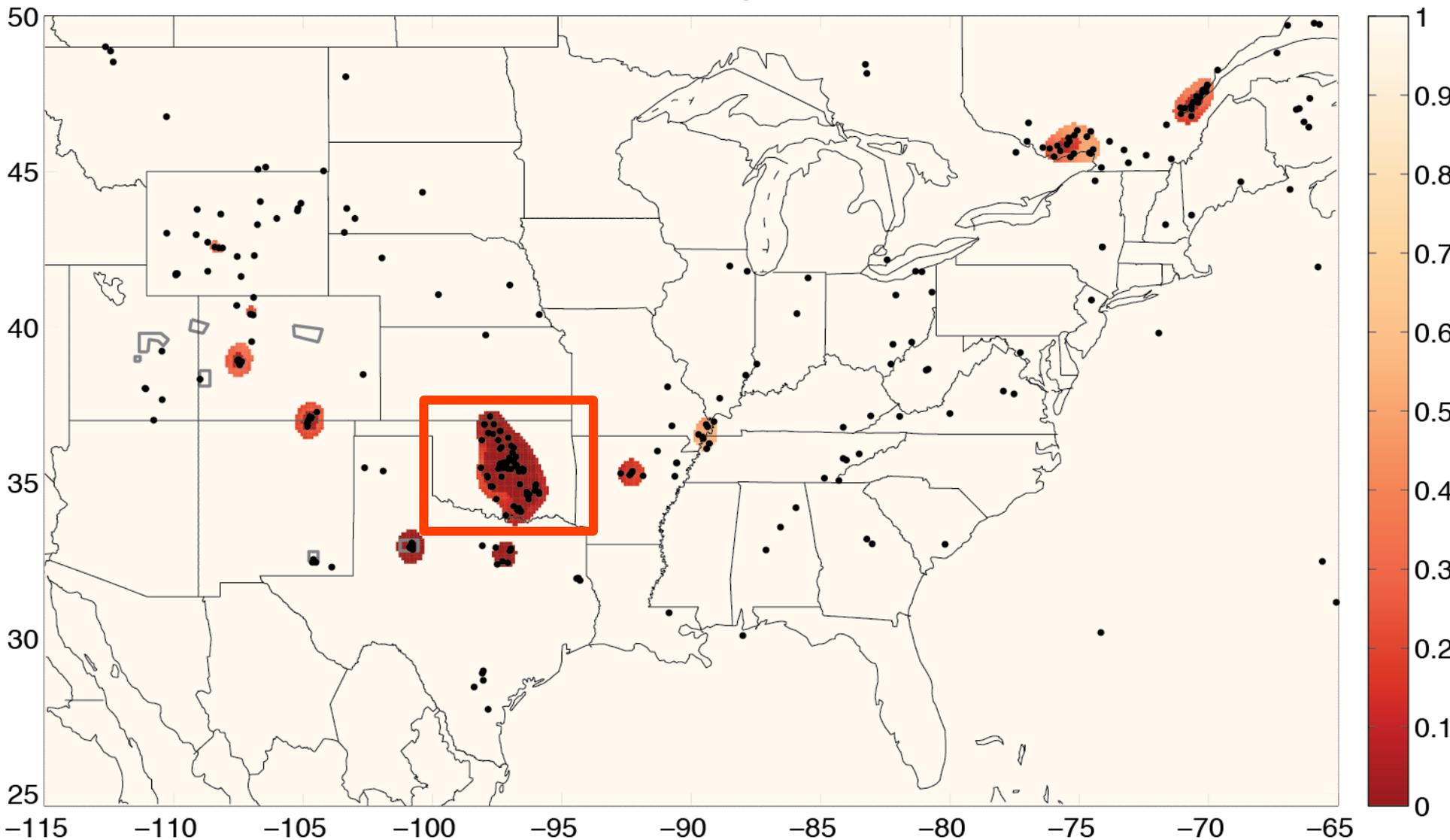
How well does the national hazard map forecast 2009-2013 seismicity?



- How many earthquakes were expected to occur in 2009 – 2013?
- How many earthquakes did occur?
- How likely was it that the differences were by chance?

Excess earthquakes, 2009-2013

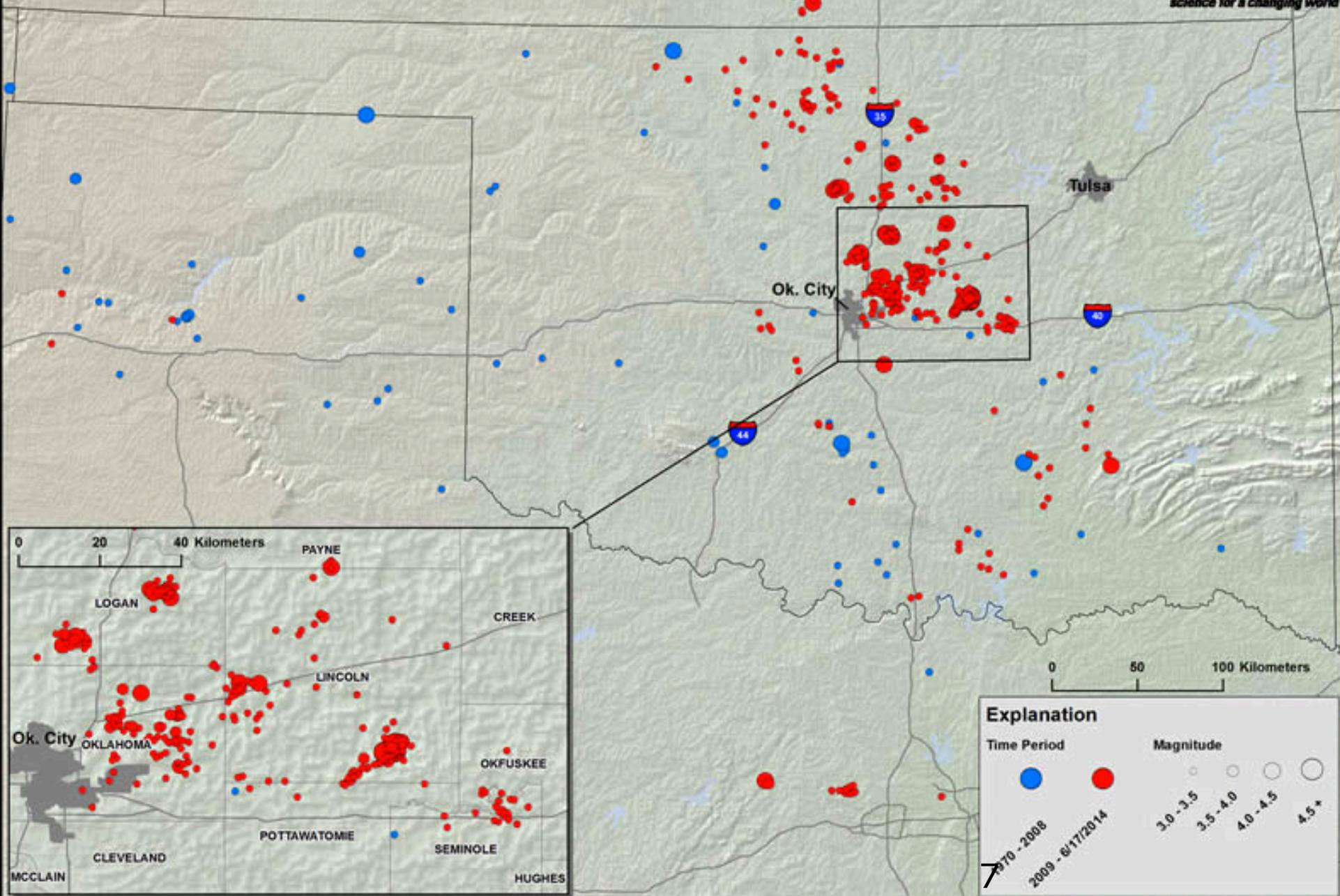
Probability



Content is preliminary and should not be considered a final USGS product.

Llenos, 2014

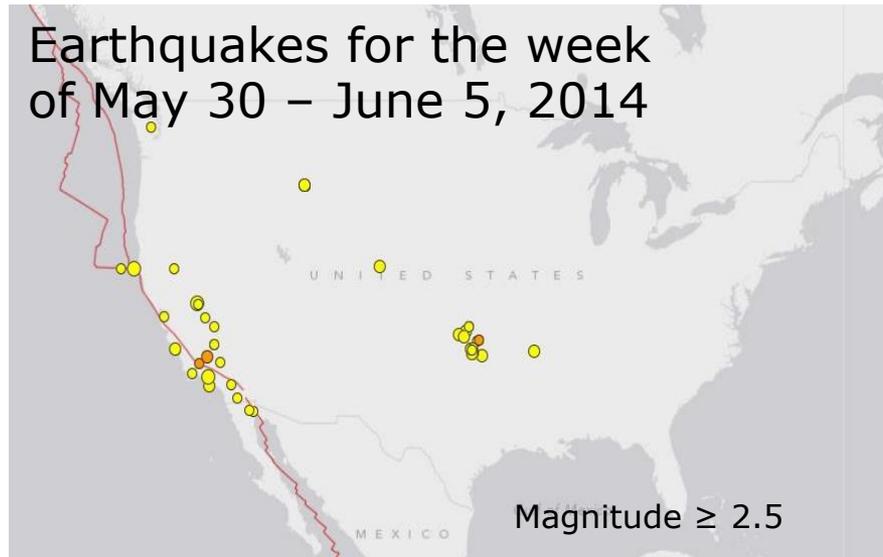
Oklahoma Seismicity (1970 - 6/17/2014)



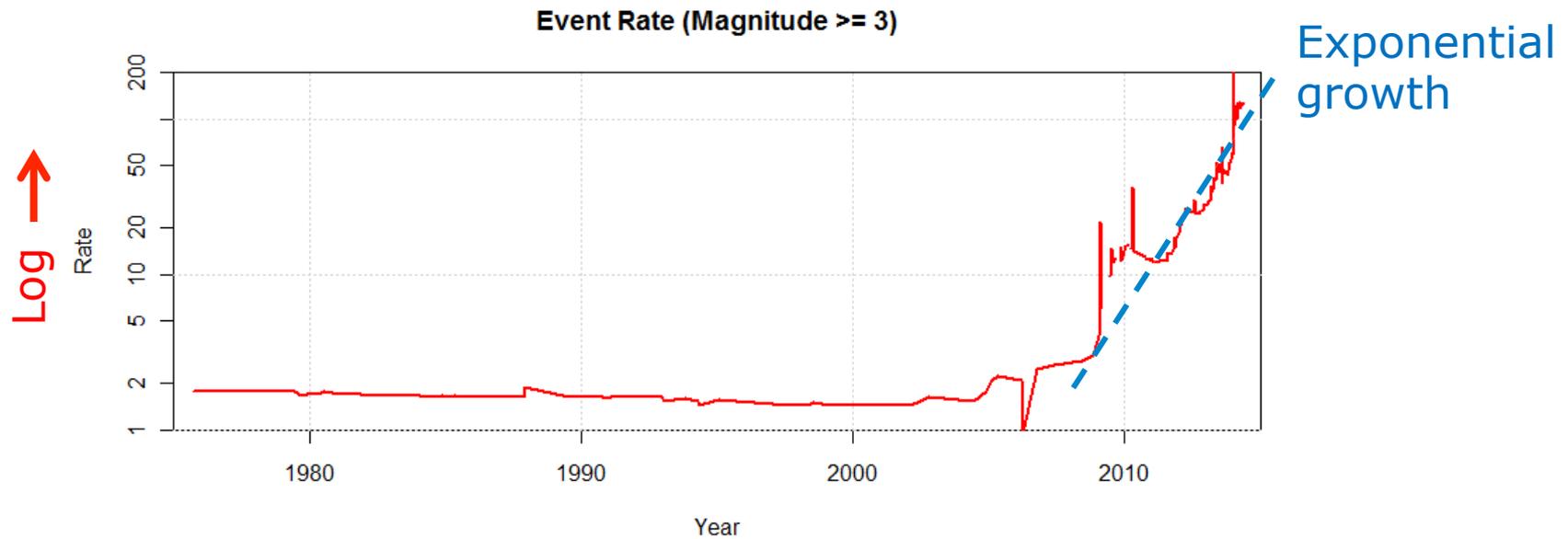
Explanation

Time Period	Magnitude
1970 - 2008	3.0 - 3.5
2009 - 6/17/2014	3.5 - 4.0
	4.0 - 4.5
	4.5 +

Earthquakes for the week of May 30 – June 5, 2014

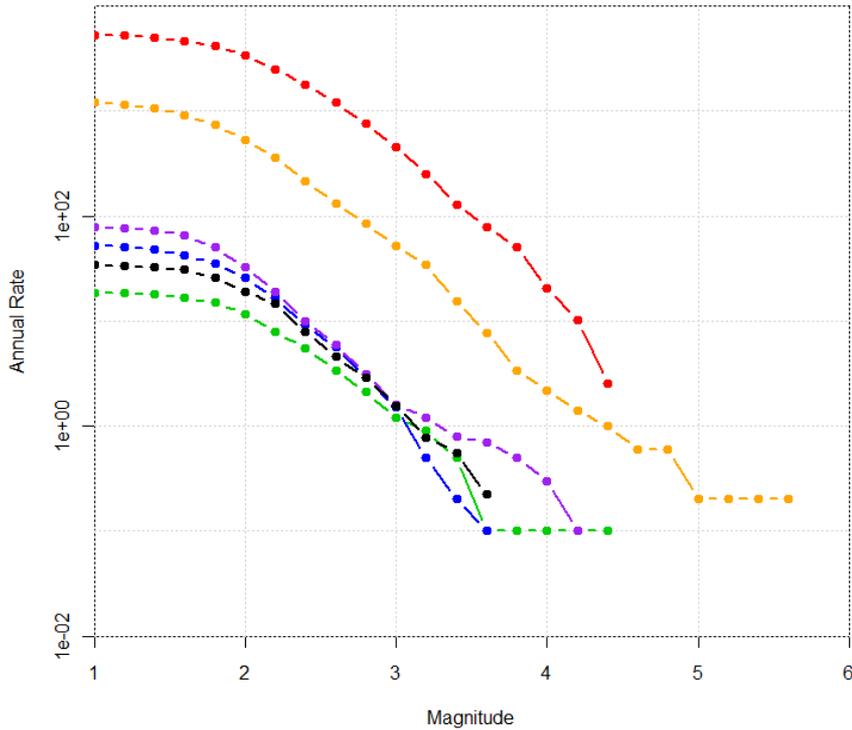


What is Happening Now

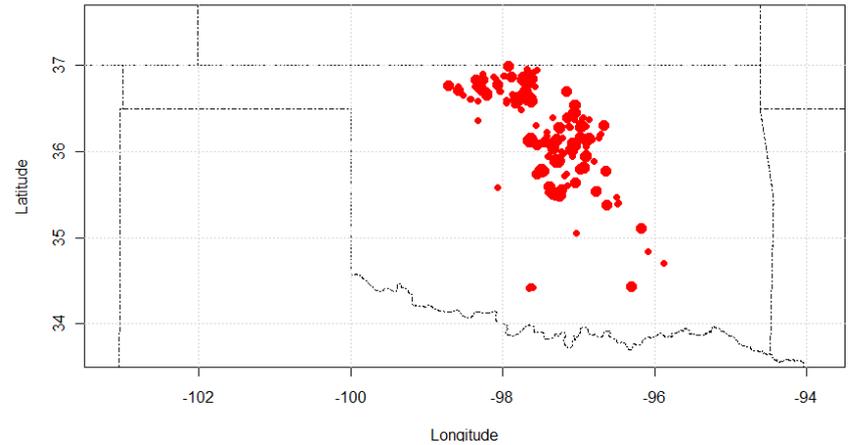


2014 to date

Annual Frequency of Occurrence (OGS Catalog)



Oklahoma Geological Survey Catalog January - May 2014



$P(M \geq 5\frac{1}{2}) = 0.23$ to 0.53
in the next 12 months

Compared with the 1970-2008
expectation of
 $P(M \geq 5\frac{1}{2}) = 0.003$

Record Number of Oklahoma Tremors Raises Possibility of Damaging Earthquakes

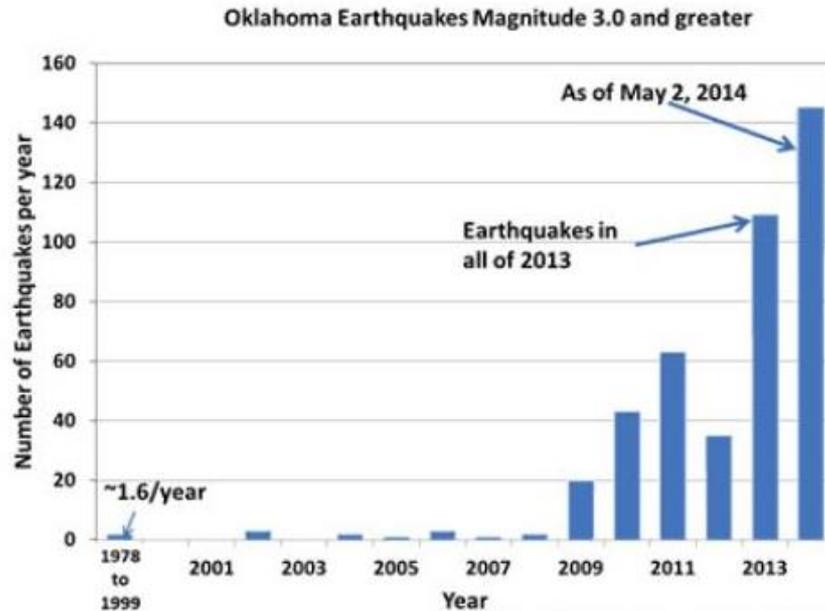
Updated USGS-Oklahoma Geological Survey Joint Statement on Oklahoma Earthquakes
 Originally Released: 10/22/2013 1:07:59 PM; Updated May 2, 2014

The rate of earthquakes in Oklahoma has increased remarkably since October 2013 **by about 50 percent** – significantly increasing the chance for a damaging magnitude 5.5 or greater quake in central Oklahoma.

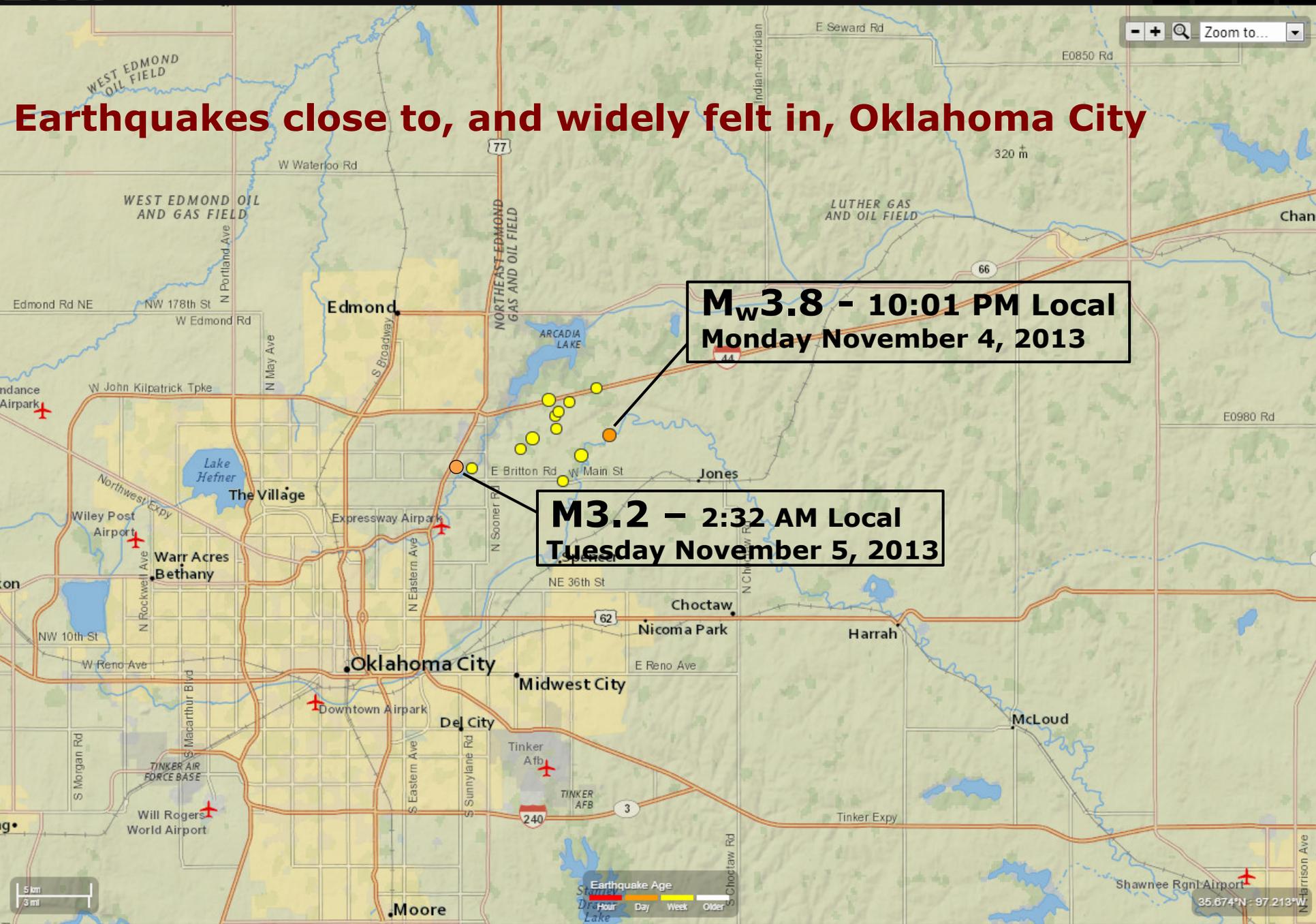
[View map of Oklahoma seismicity.](#)
[View animation of Oklahoma Seismicity.](#)

A new U.S. Geological Survey and Oklahoma Geological Survey analysis found that 145 earthquakes of magnitude 3.0 or greater occurred in Oklahoma from

January 2014 (through May 2; see accompanying graphic). The previous annual record, set in 2013, was 109 earthquakes, while the long-term average earthquake rate, from 1978 to 2008, was just two magnitude 3.0 or larger earthquakes per year. Important to people living in central and north-central Oklahoma is that the likelihood of future, damaging earthquakes has increased as a result of the increased number of small and moderate shocks.

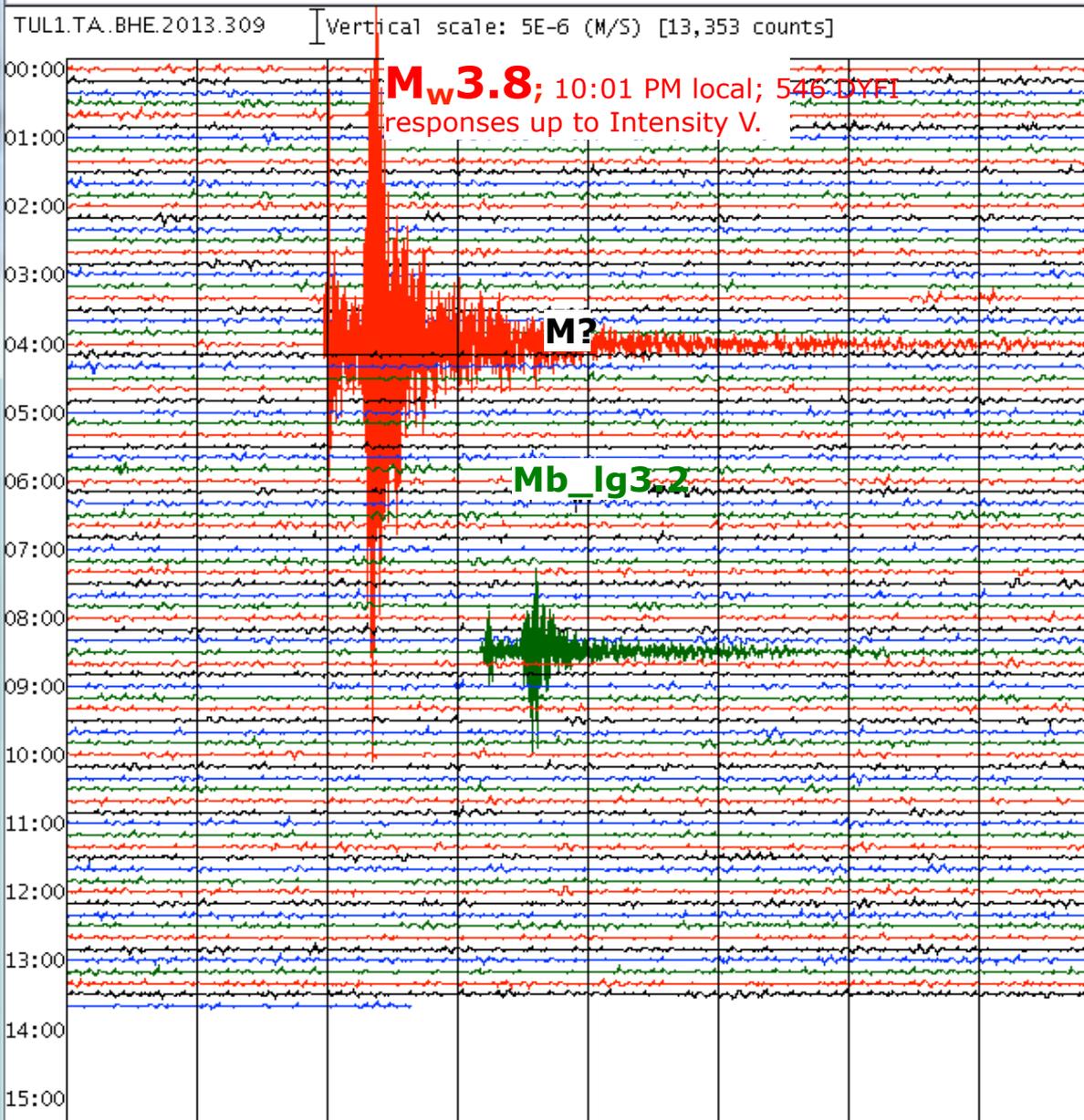


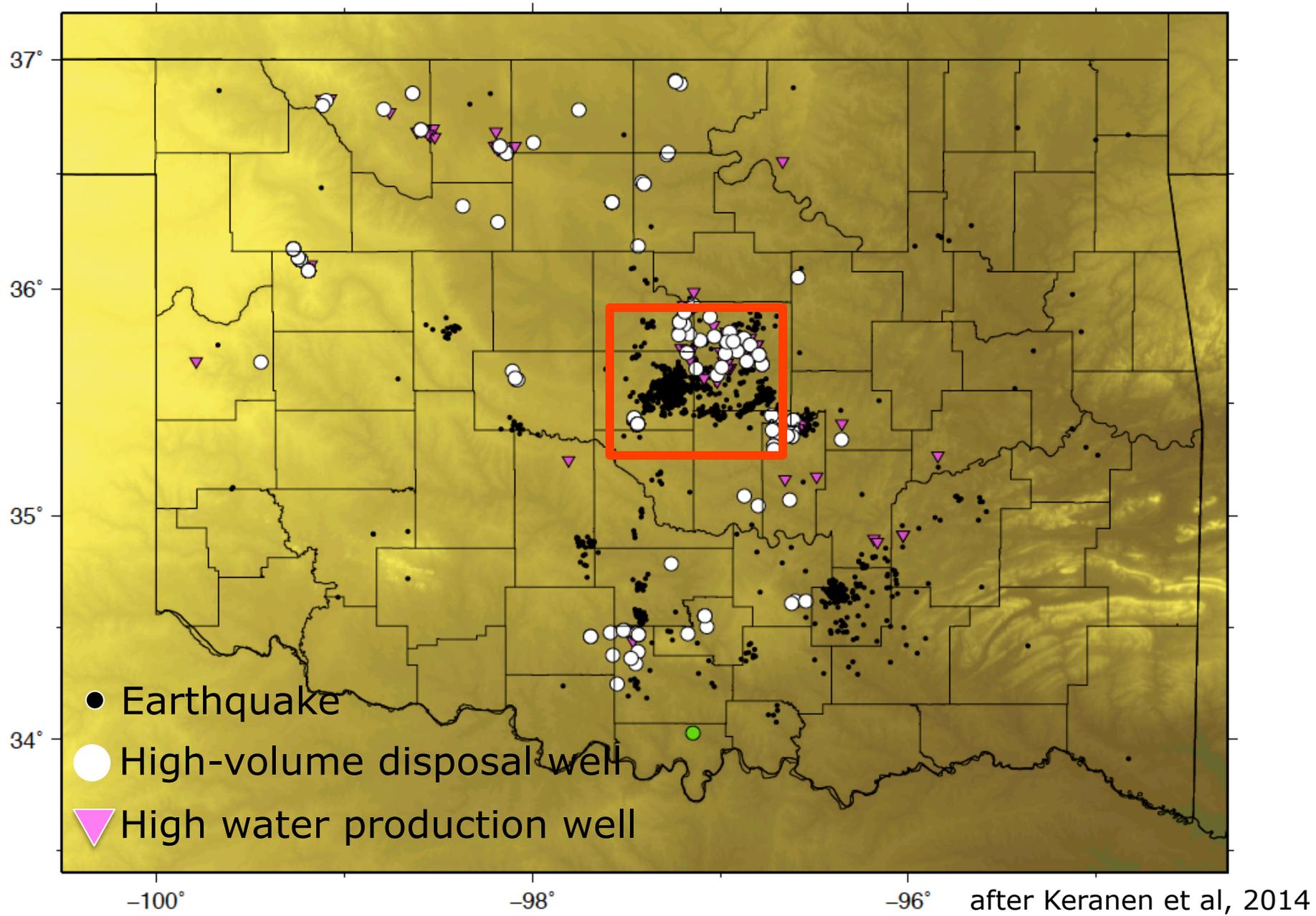
Earthquakes close to, and widely felt in, Oklahoma City



Oklahoma Earthquakes November 5, 2013 (UTC) recorded at station TUL1 (~160km from epicenters)

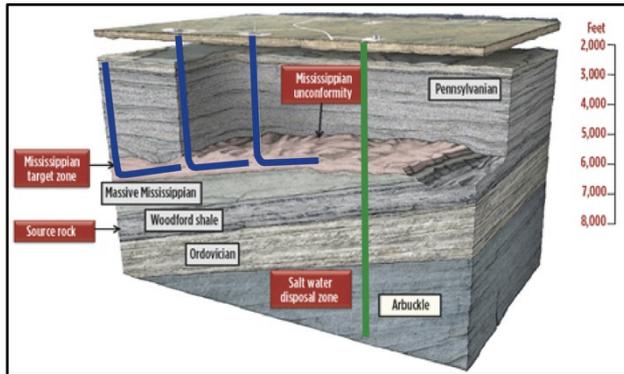
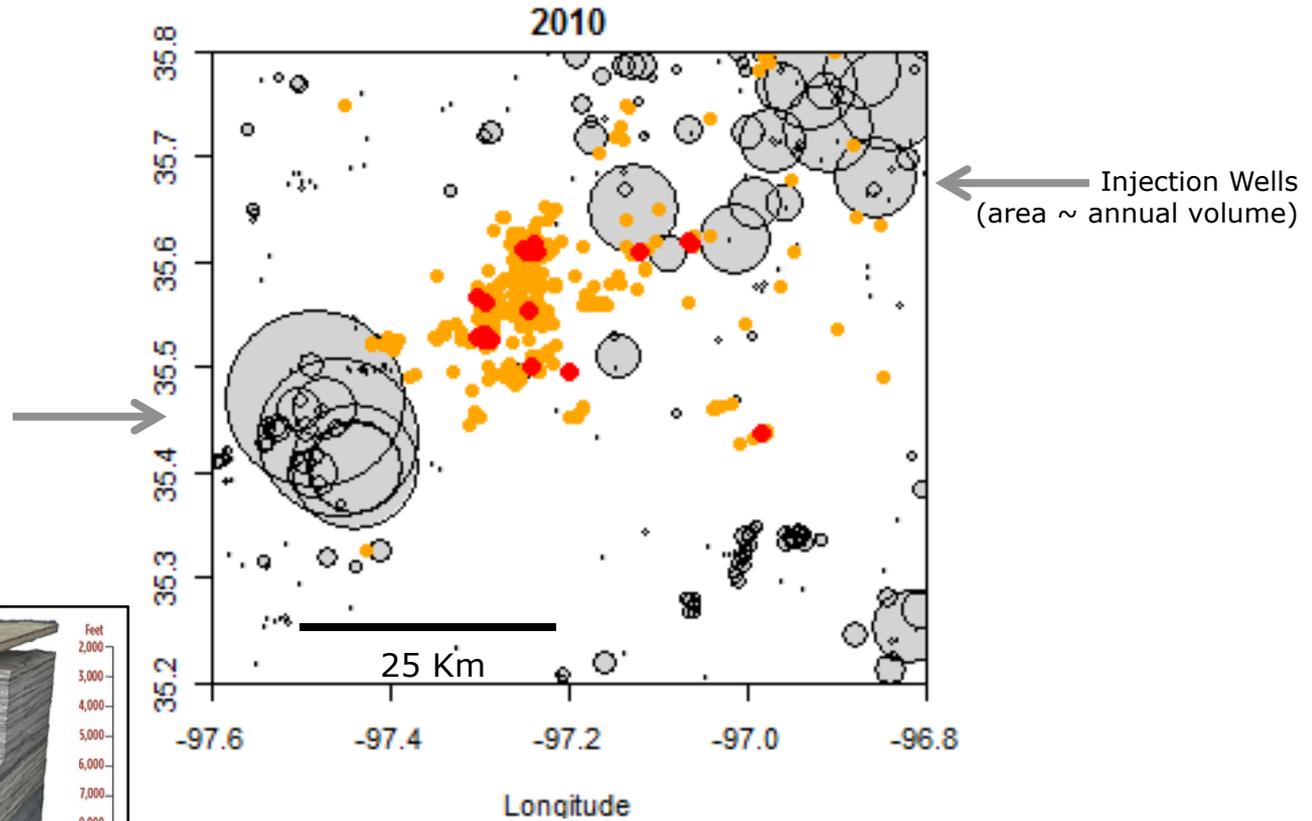
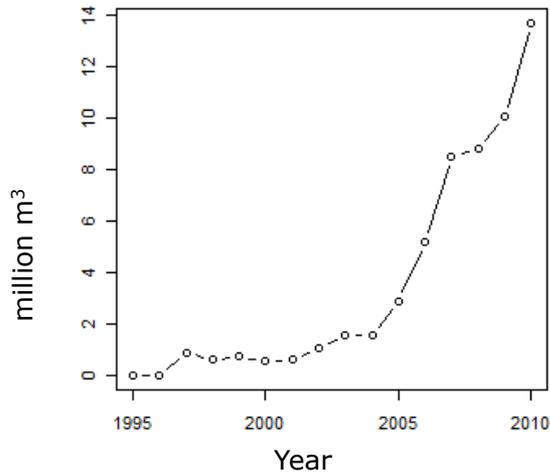
www.iris.edu/servlet/quackquery/plotcache/webicorder_TUL1.IA..BHE.2013.309.png





Central Oklahoma "Jones" Swarm 2009-2011

Oklahoma City Injection



-97°30'

-97°15'

-97°00'

Proposed triggering at 30km or more from high-volume injection wells

ENERGYWIRE

Mon., Jul. 7 Thu., Jul. 3 Wed., Jul. 2 Tue., Jul. 1 Edition Archive

Monday, July 7, 2014 — 8:03 AM

[READ FULL EDITION](#)

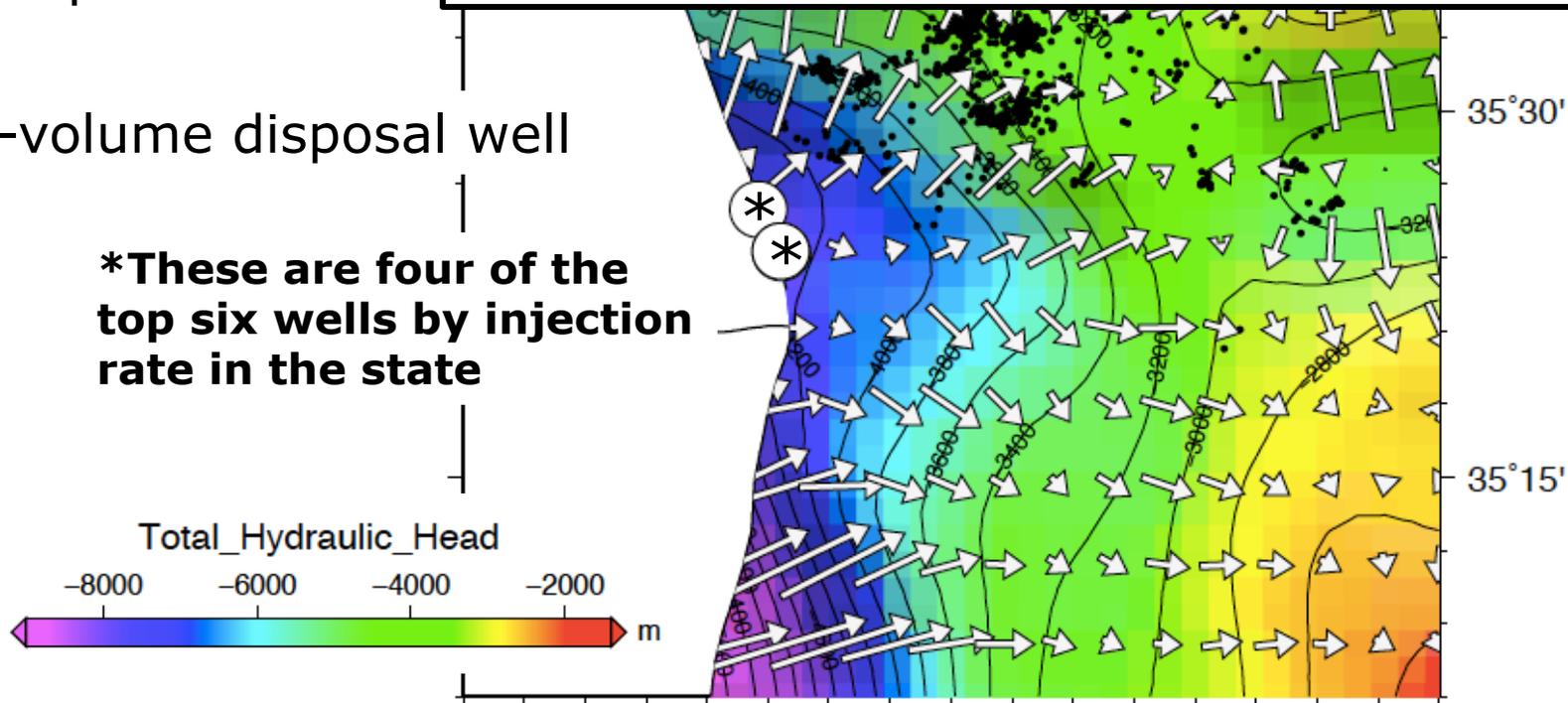
1. EARTHQUAKES: 'Flower Power' and 'Deep Throat' are shaking up Oil City, study says

Gradient of hydraulic

- Earthquake

High-volume disposal well

***These are four of the top six wells by injection rate in the state**



Ohio Earthquakes Linked To Fracking, A First For Region

AP | By JULIE CARR SMYTH

Posted: 04/11/2014 7:55 pm EDT | Updated: 04/11/2014 7:59 pm EDT



20k	6499	719	1	565	1267



COLUMBUS, Ohio (AP) — Geologists in Ohio have for the first time linked earthquakes in a geologic formation deep under the Appalachians to hydraulic fracturing, leading the state to issue new permit conditions Friday in certain areas that are among the nation's strictest.

Ohio

Ten seismic events were detected by the OhioSeis network from October 2-9, 2013, near active three fracking wells in Harrison Co., Ohio.

Magnitudes were in the range of 2.0-3.0, large enough to be felt locally. Waveform matching found 298 events, as far back in time as Sept 8. During this same time, hydraulic fracturing was conducted at the three wells.

An additional 190 earthquakes were observed between Oct. 2 and Dec. 13, 2013. Using data from an array installed later by ODNR, a cluster of 30 seismic events were located directly below the three fracking wells. These define a fault plane.

ODNR halted the fracking operation. Under Ohio's new permit conditions, all new drilling sites within 3 miles of a known fault or seismic activity of 2.0 magnitude or higher will be conditioned on the installation of sensitive seismic-monitoring equipment.

Friberg (2014) concluded that the fracking operation triggered a preexisting fault.

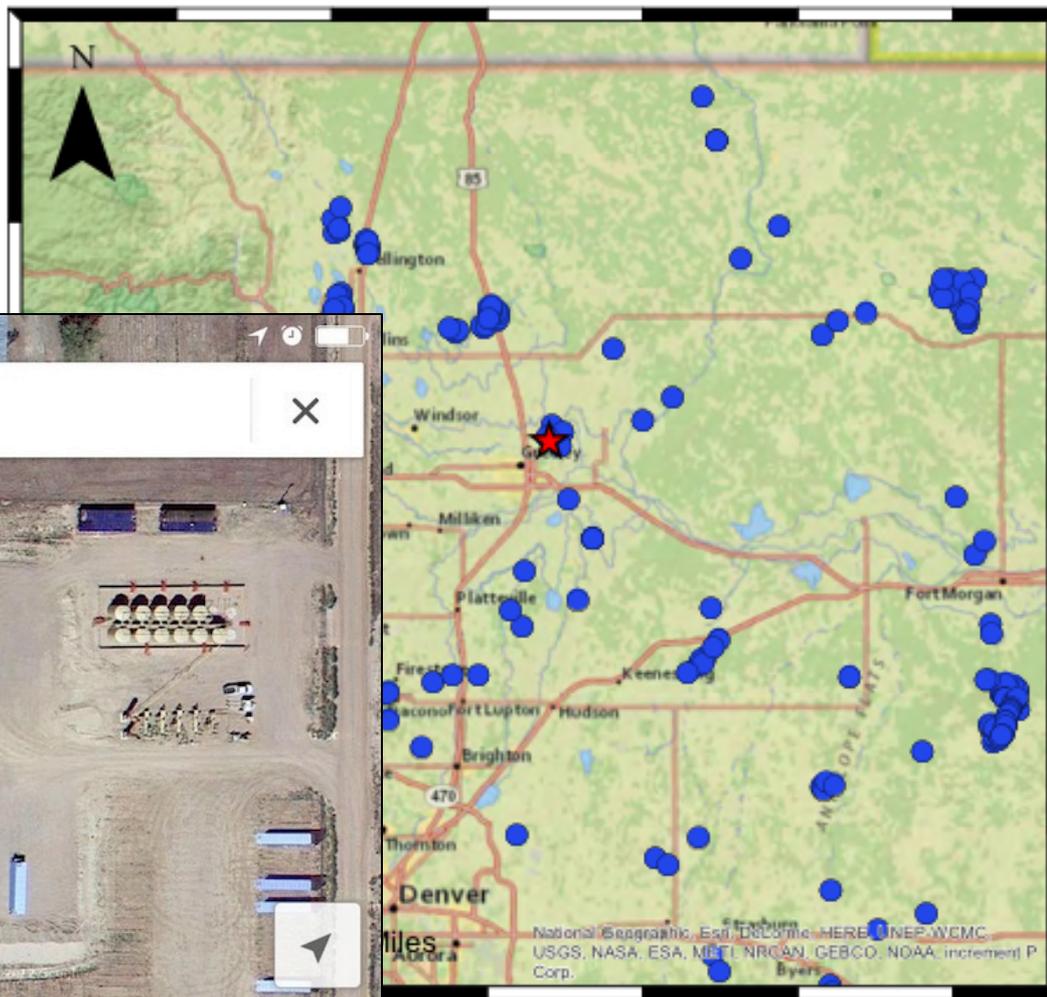
These are the largest known fracking-induced earthquakes in the U.S. (larger events have occurred in the Horn River Basin)

After Friberg,
2014

Class II Injection wells (blue circles) in NE Colorado
Red star is earthquake epicenter

Colorado

Magnitude 3.2
earthquake
occurred on
May 31, 2014

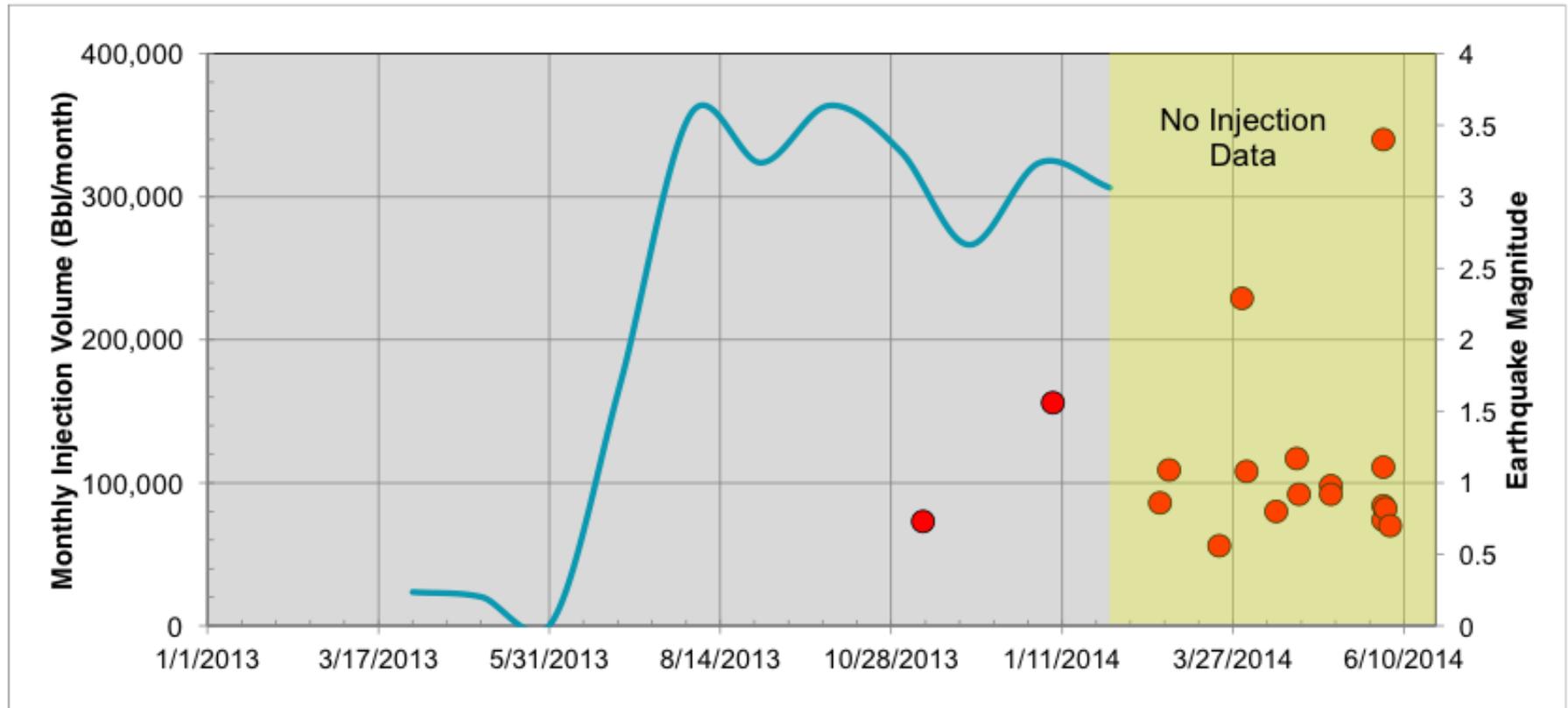


- ★ Greeley Earthquake
- Class II Injection Wells

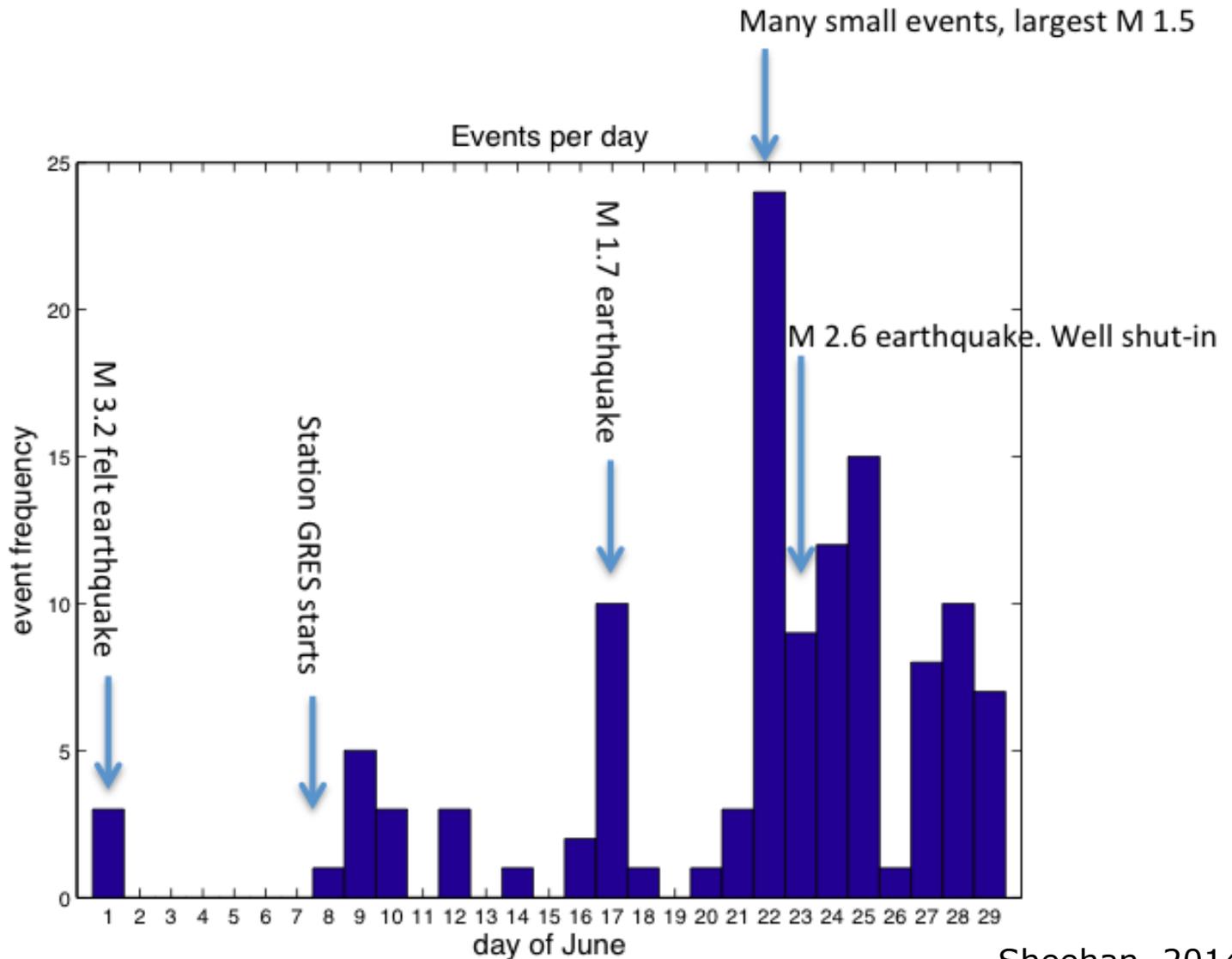
Sheehan, 2014

Greeley, Colorado

Correlation with injection rate at well C4A



Greeley, Colorado

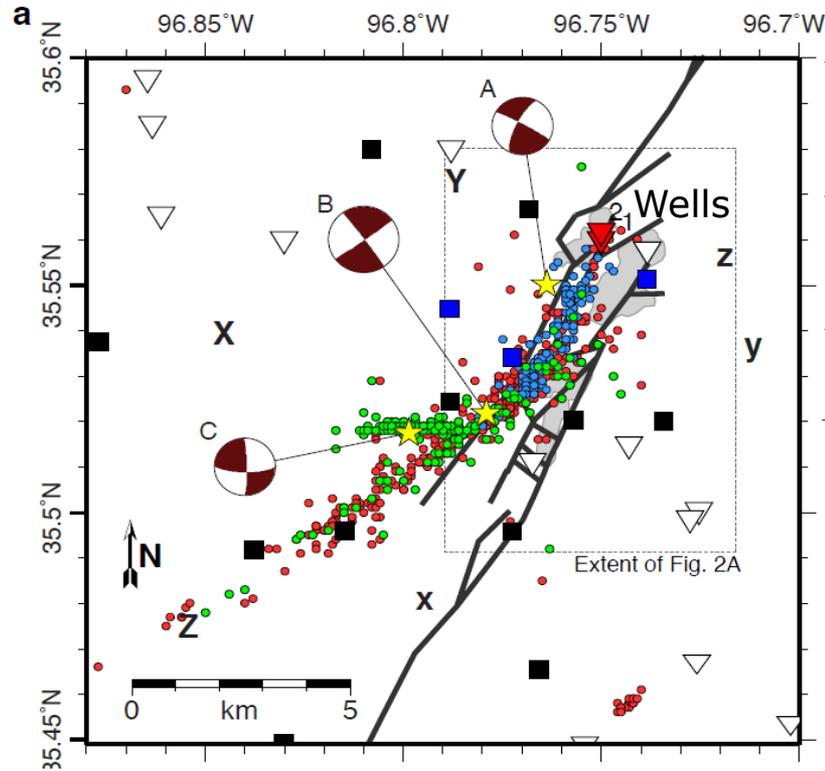
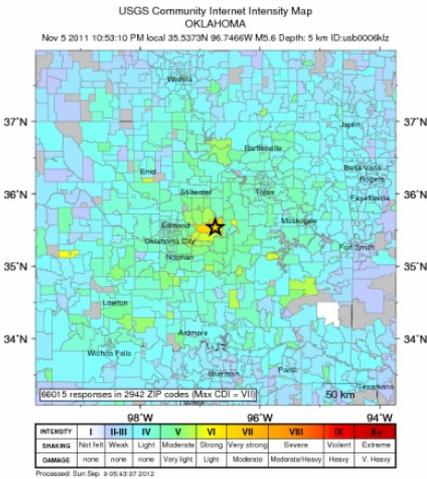


Think Locally, Act Globally

2011 Prague, Oklahoma Earthquake

M_w 5.7

No fatalities; a few injuries; moderate economic damage

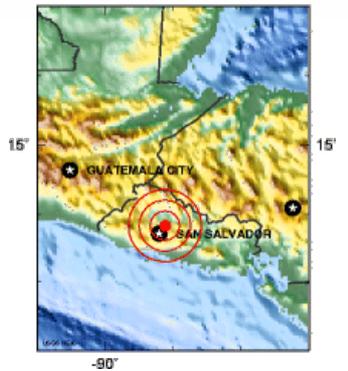
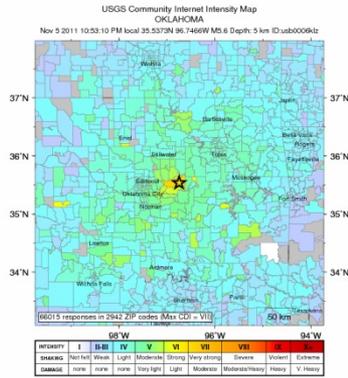


Think Locally, Act Globally

2011 Prague, Oklahoma Earthquake

M_w 5.7

No fatalities; a few injuries; moderate economic damage



1986 San Salvador Earthquake

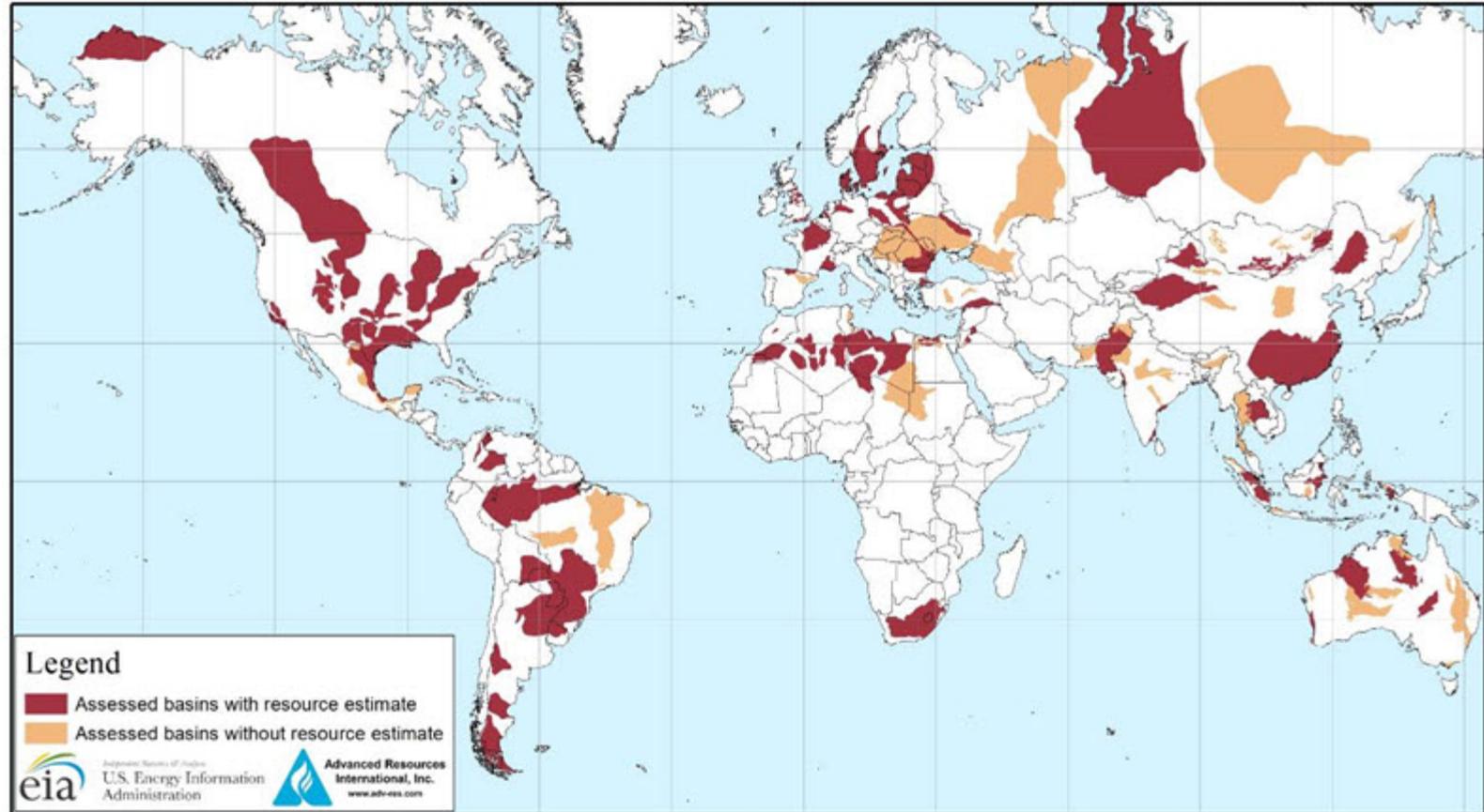
M_w 5.7

1500 fatalities; 10,000 injuries;
100,000 homeless



Think Locally, Act Globally

Figure 1. Map of basins with assessed shale oil and shale gas formations, as of May 2013



Source: United States basins from U.S. Energy Information Administration and United States Geological Survey; other basins from ARI based on data from various published studies

