

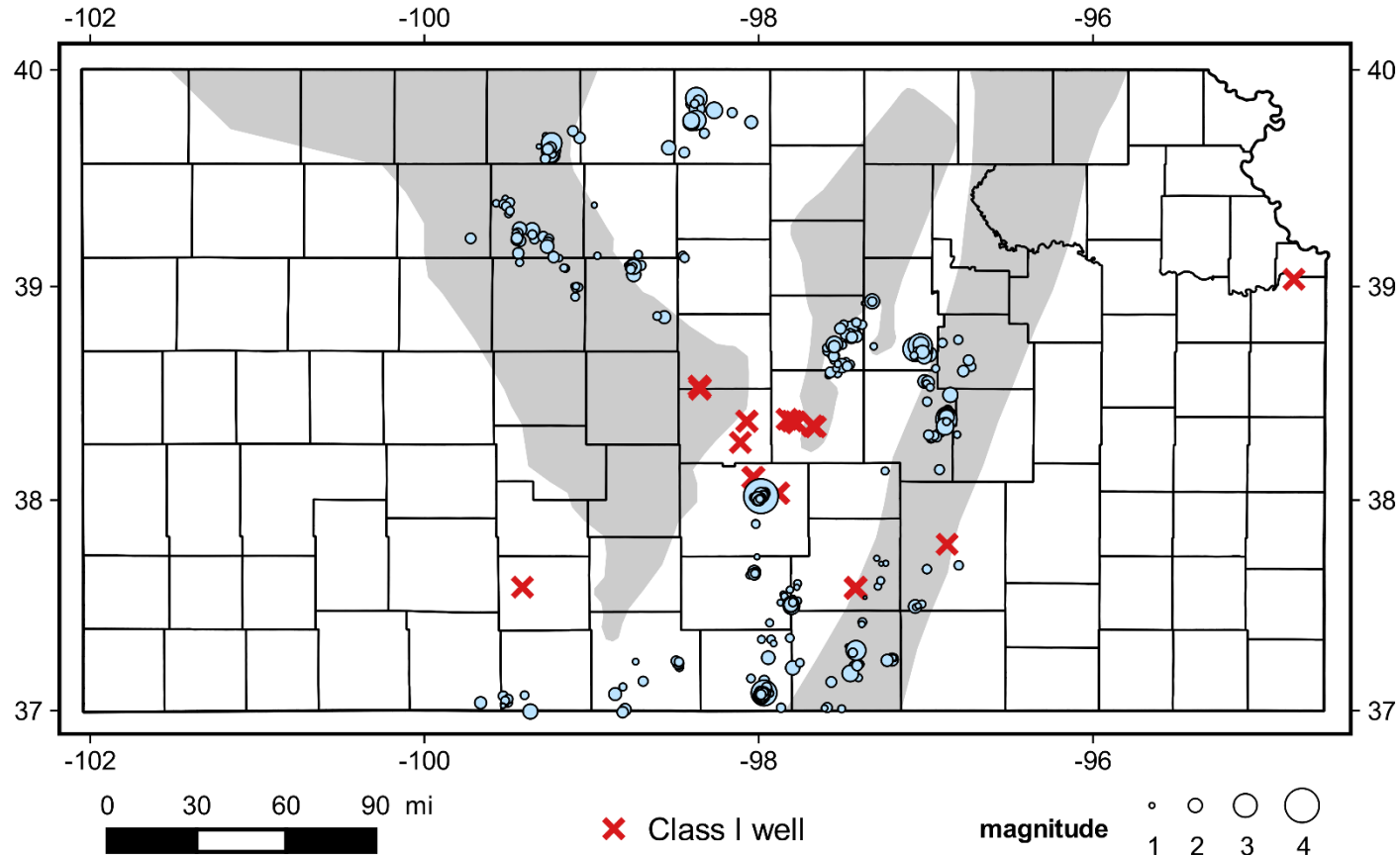
Consortium to Study Trends in Seismicity

Quarterly Report January 1 to March 31, 2020

Rex Buchanan, Shelby Peterie, Rick Miller, *Kansas Geological Survey*



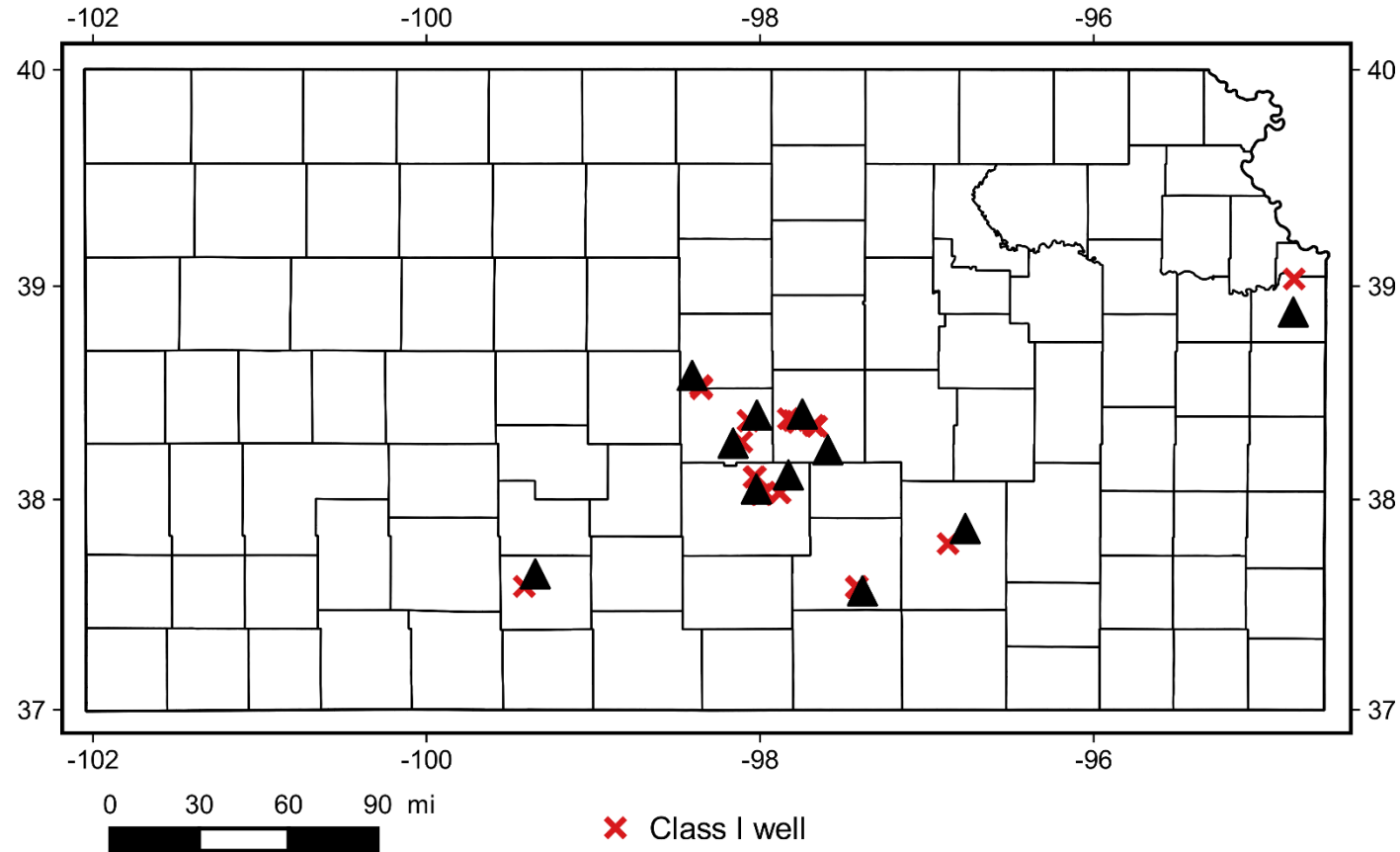
Statewide Earthquakes



377 earthquakes

561 first quarter
of 2019 (-28%)

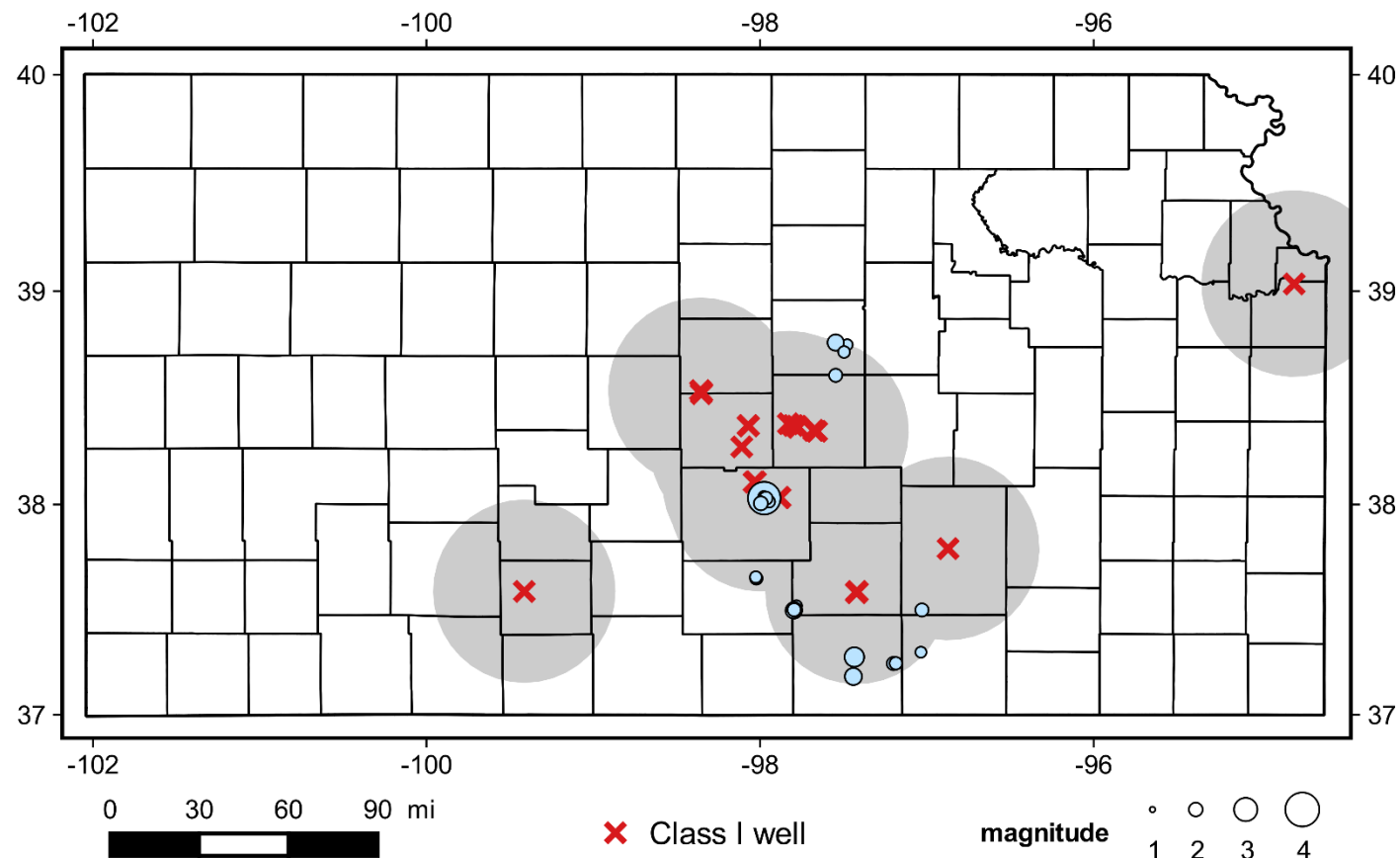
Operational Efficiency



97.5%

*fixed power and
modem issues*

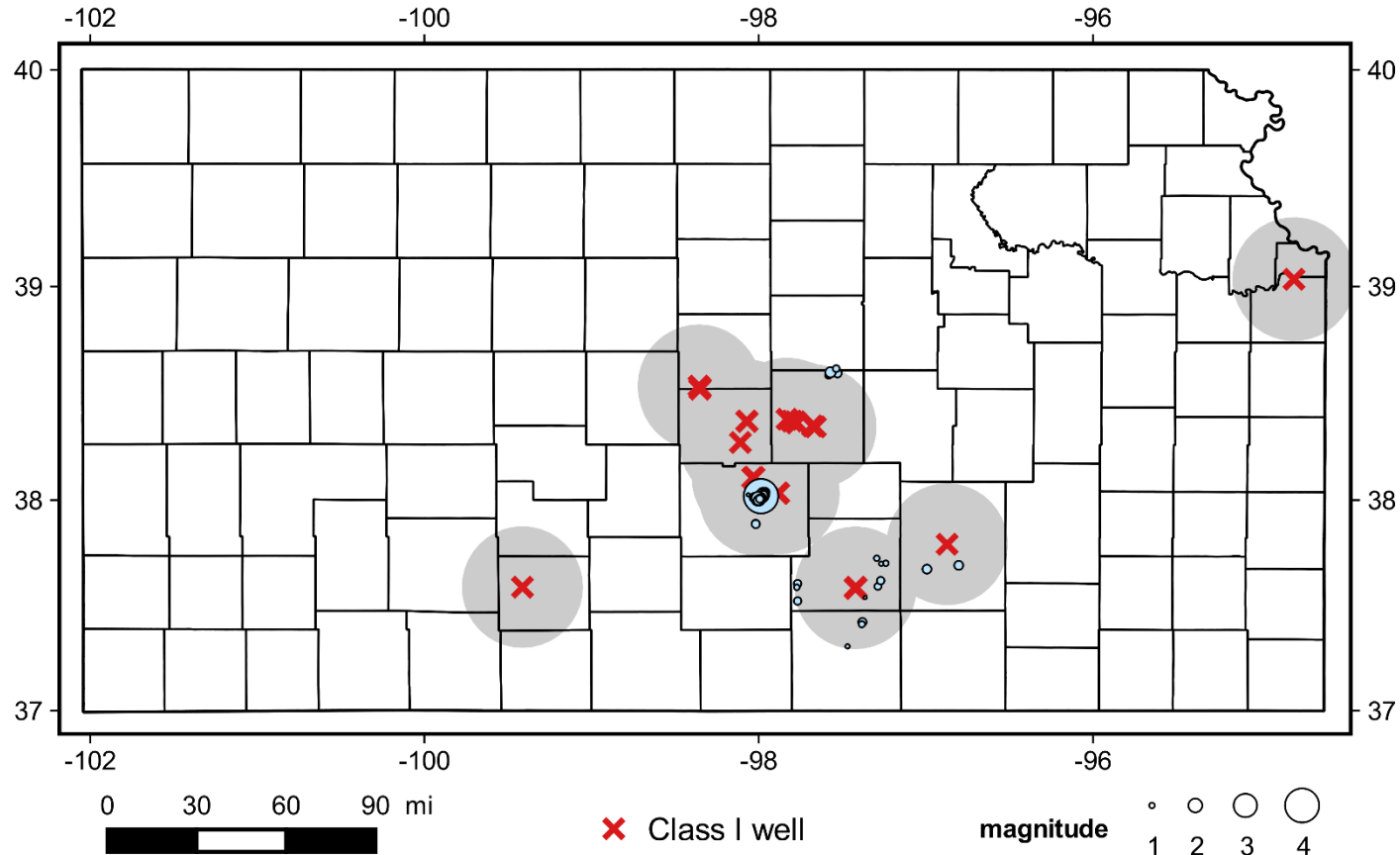
CSTS Alerts



$M \geq 2$
within 30 miles

Total: 22

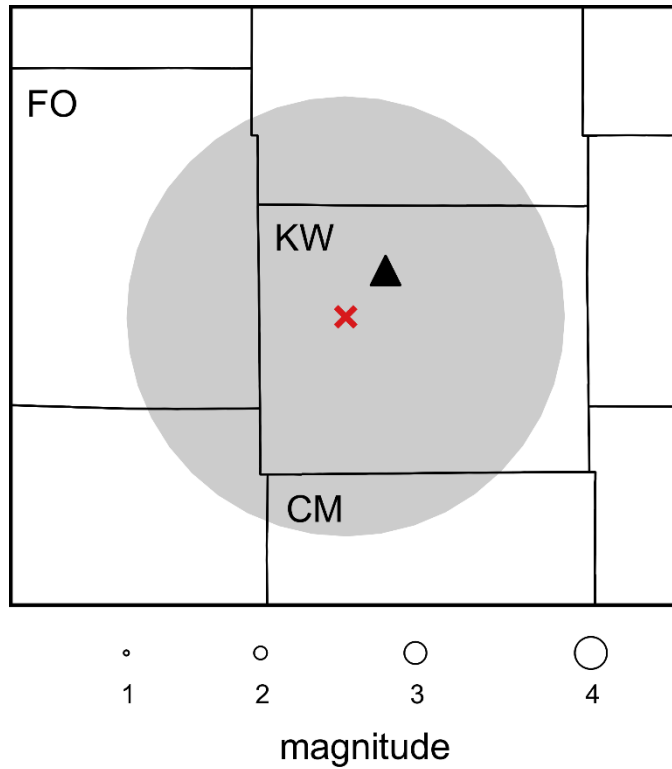
Earthquakes Within 20 miles



Total: 55

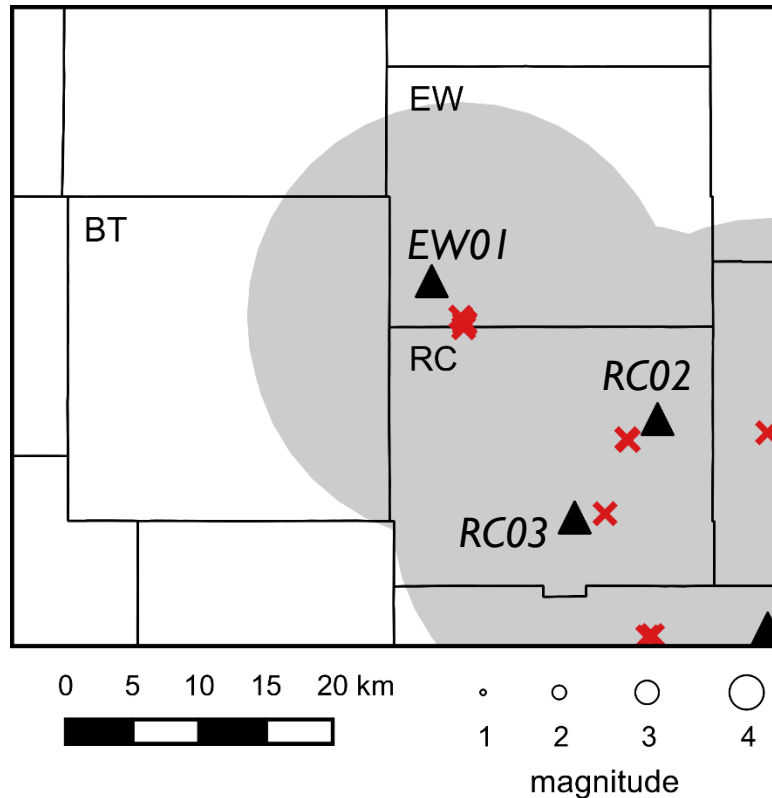
*31 in the
previous quarter*

Kiowa County



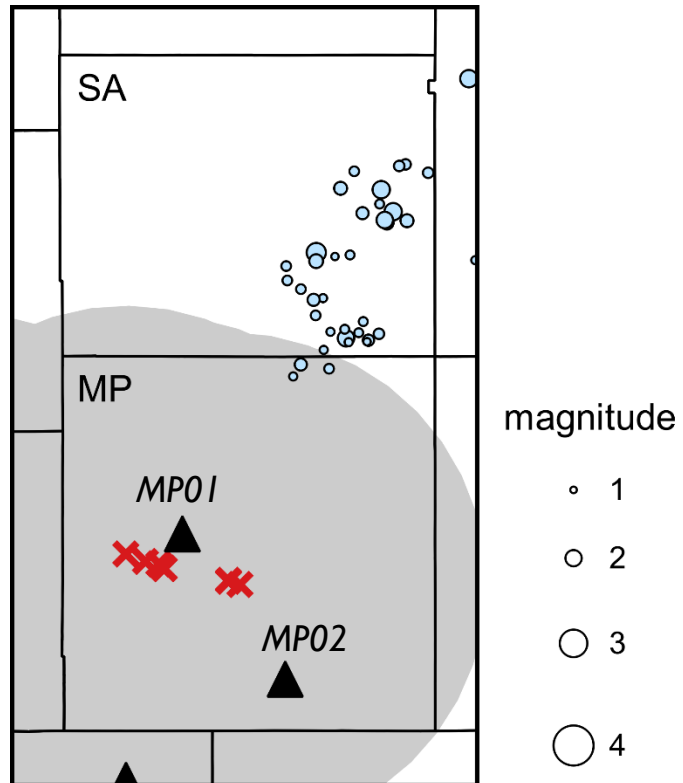
- Located earthquakes
 - none
- Subnetwork events
 - none

Rice and Ellsworth Counties



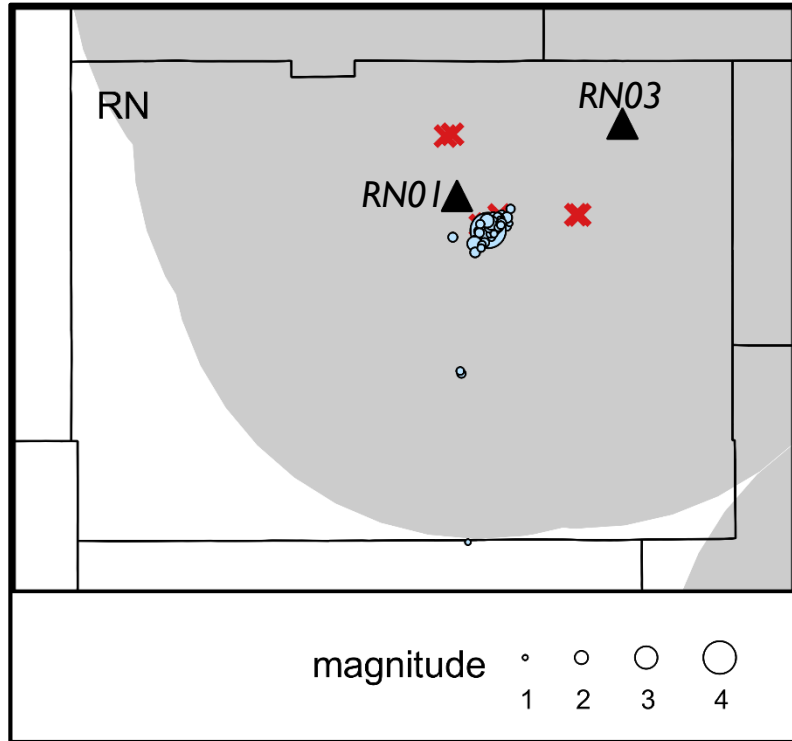
- Located earthquakes
 - none
- Subnetwork events
 - RC03: 157 (blasts)
 - RC02: none

McPherson County



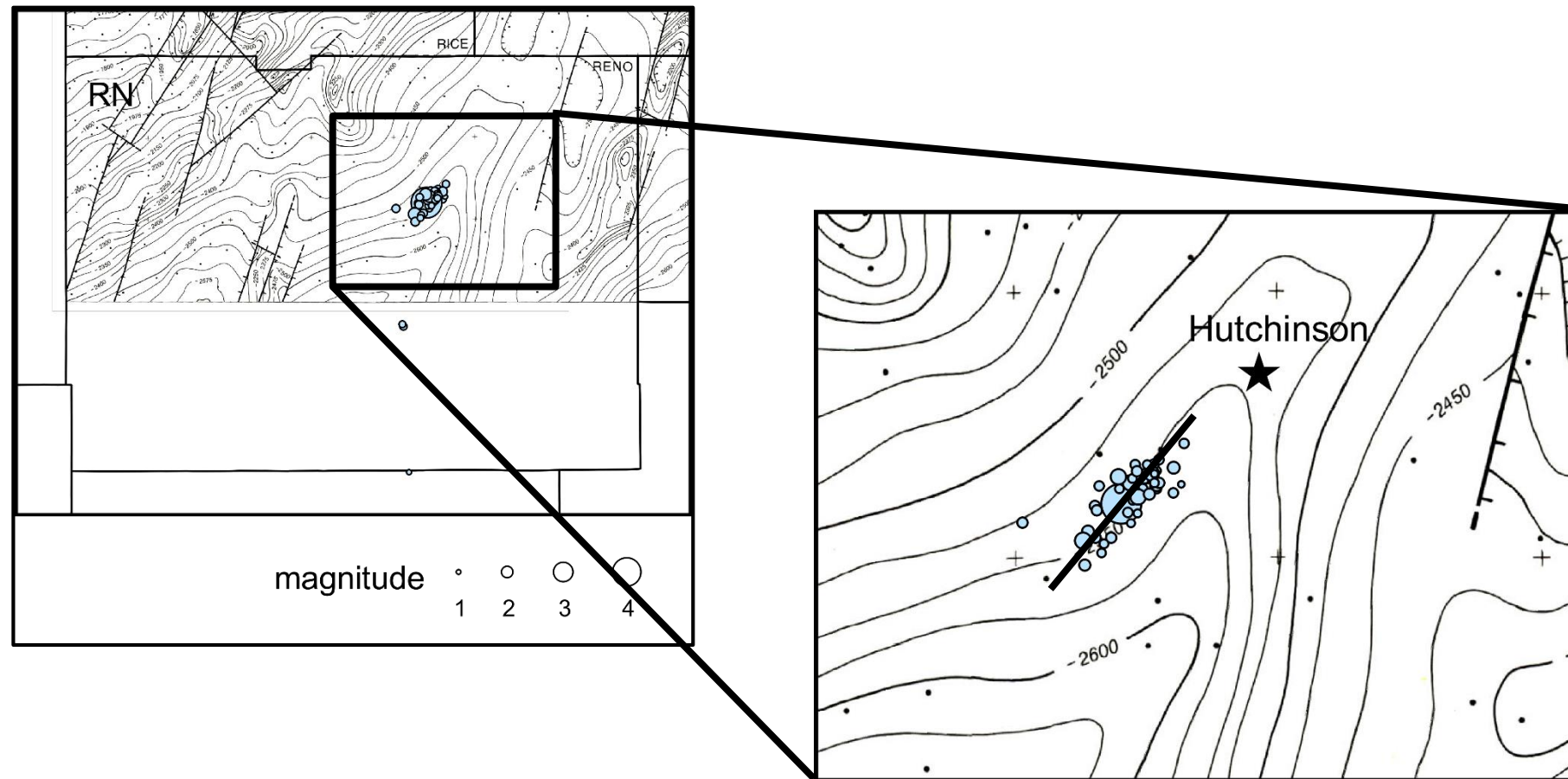
- Located earthquakes
 - 3 (M 1.4 to 1.9)
 - >15 miles from wells
 - consistent with MGA
- Subnetwork events
 - MP01: 3
 - MP02: 3
 - $M < 0$

Reno County

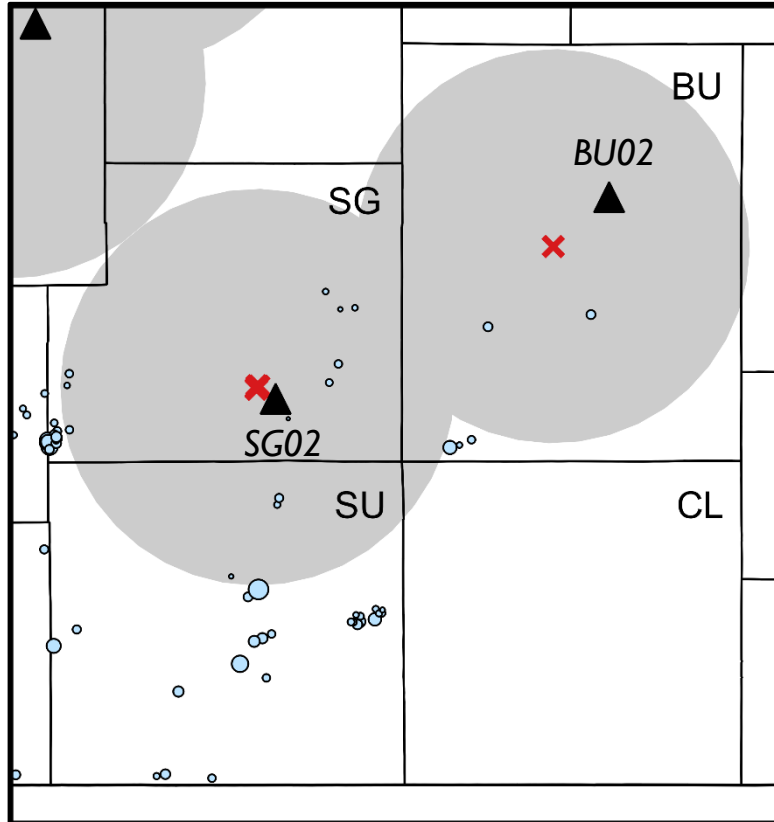


- Located earthquakes
 - 49 increase (double)
 - M 1.2 to M 4.8
 - M 2 or larger
 - this quarter: 6
 - last quarter: 17
- Subnetwork events
 - RN01: 158
 - majority in weeks following M 4.8
 - consistent with the Hutchinson cluster
 - RN03: none

Reno County

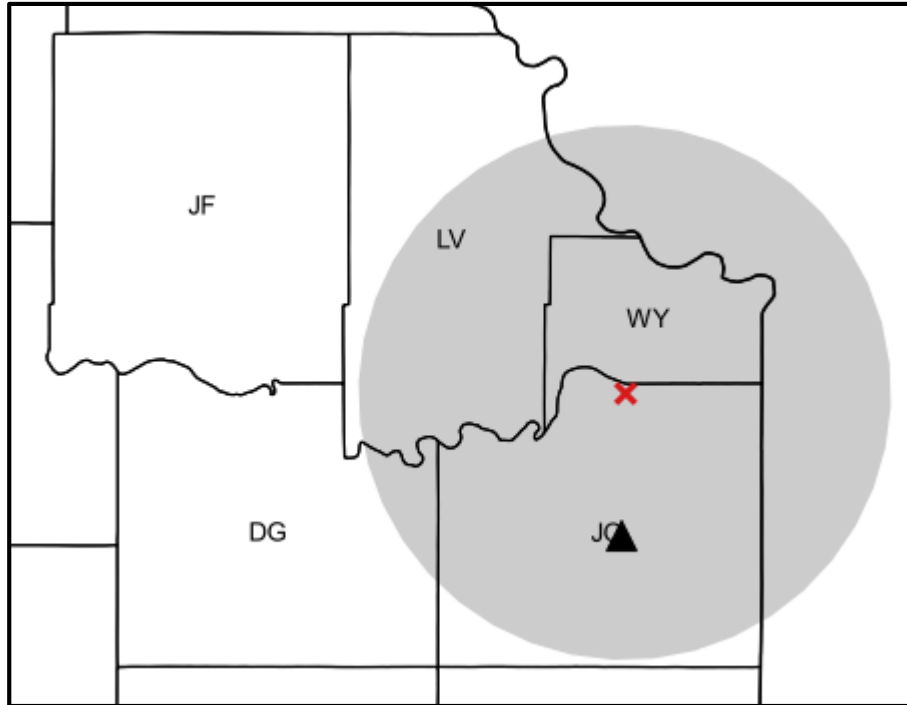


Sedgwick and Butler Counties



- Located earthquakes
 - 14 events M 0.8 to M 1.7
 - along known trends
- Subnetwork events
 - BU02: none
 - SG02: nine, $M \leq 0.6$

Johnson County

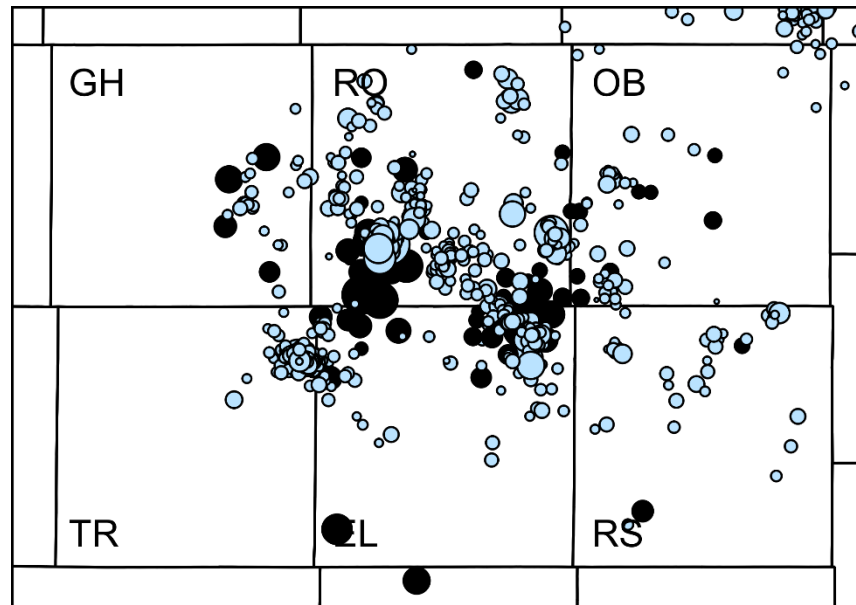


- Located earthquakes
 - none
- Subnetwork events
 - none

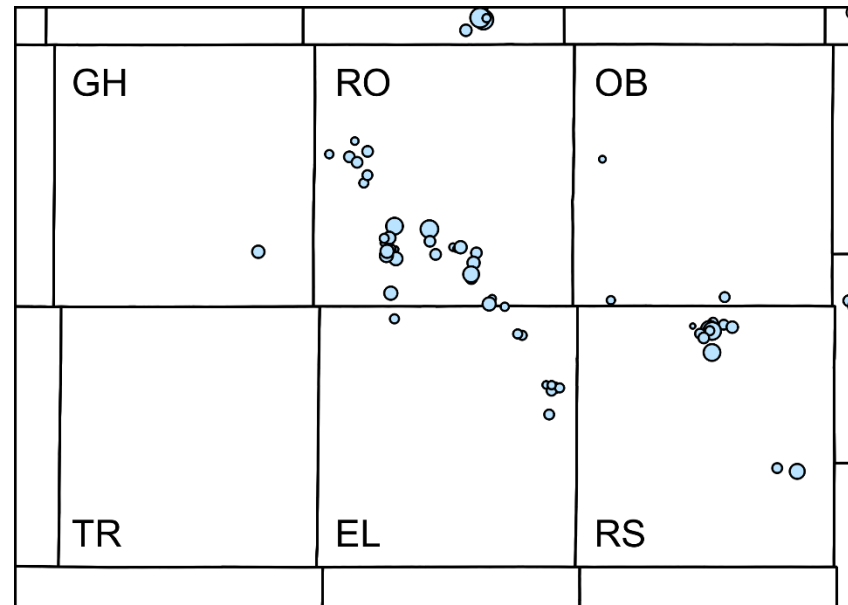
Seismicity Around the State

Central Kansas Uplift

pre-2020



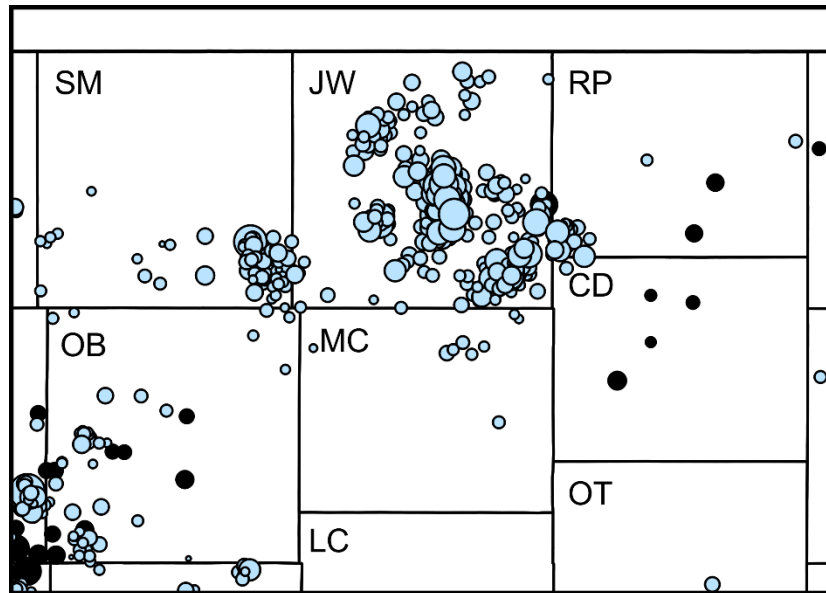
Jan 1 to Mar 31, 2020



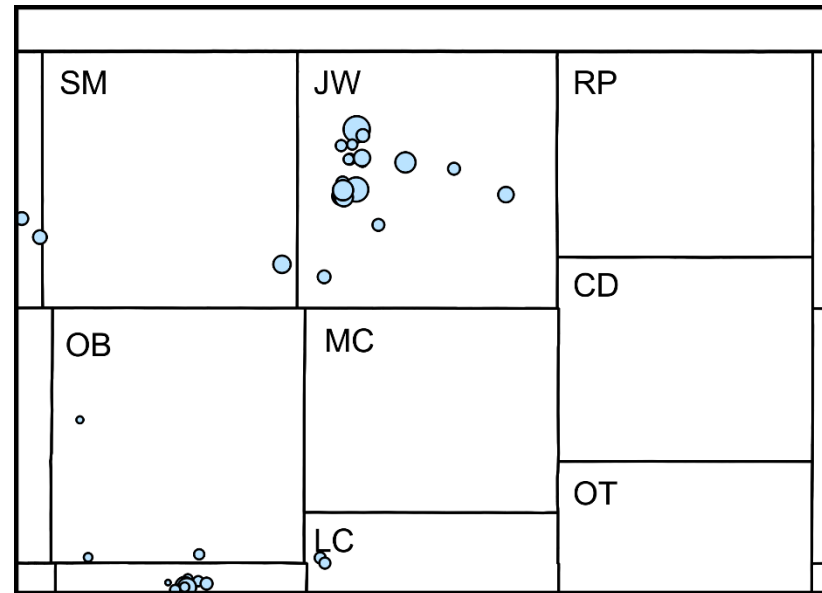
- historic earthquakes (1977-2014)
- recent earthquakes (2015-present)

Salina Basin

pre-2020

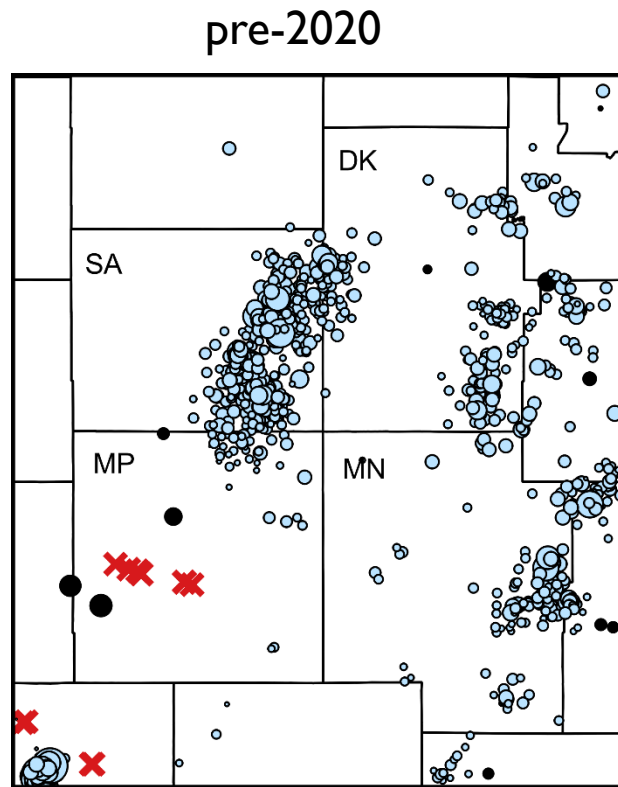


Jan 1 to Mar 31, 2020

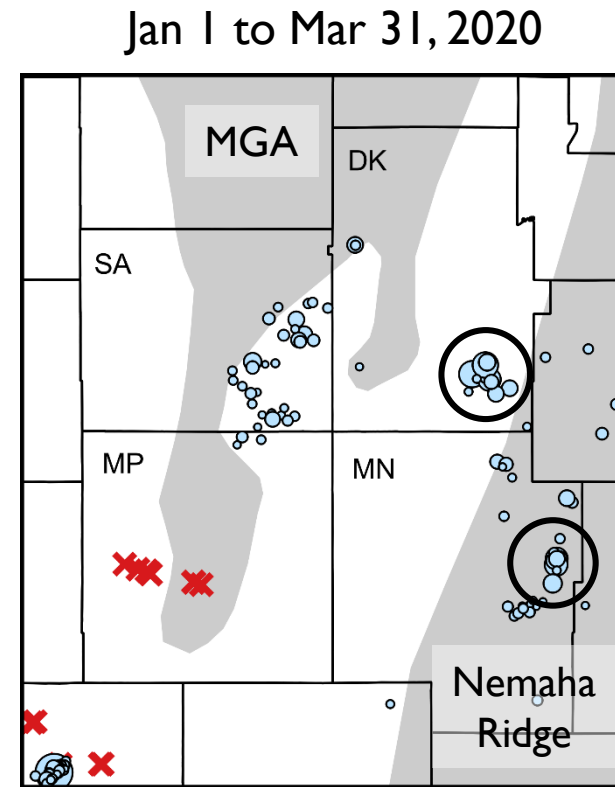


- historic earthquakes (1977-2014)
- recent earthquakes (2015-present)

Nemaha Ridge and MGA



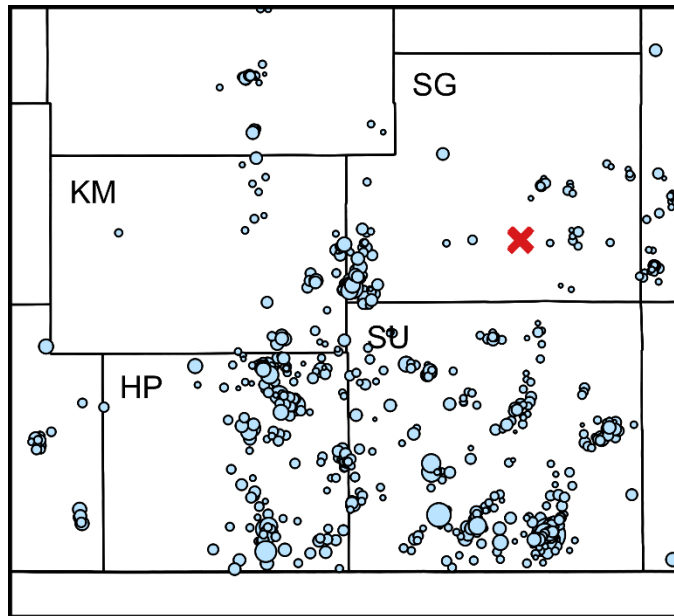
- historic earthquakes (1977-2014)
- recent earthquakes (2015-present)



Dickinson: 13 (M 1.2 to 3.7)
Marion: 11 (M 1.5 to 3.3)

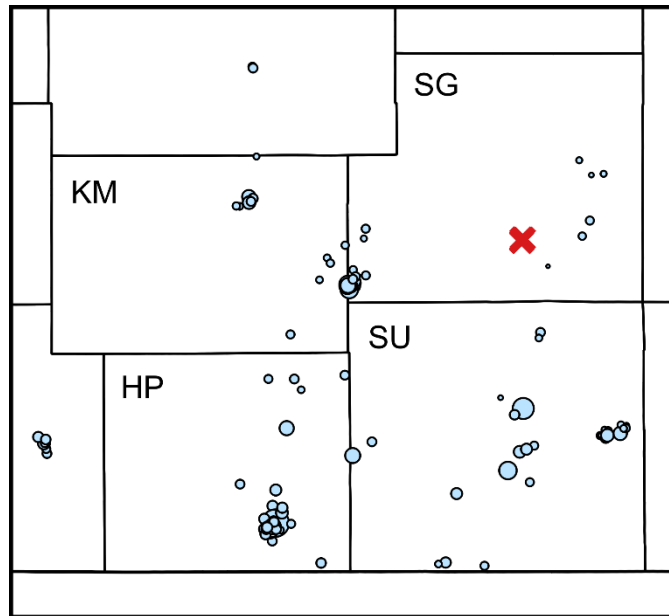
South-central Kansas

2019



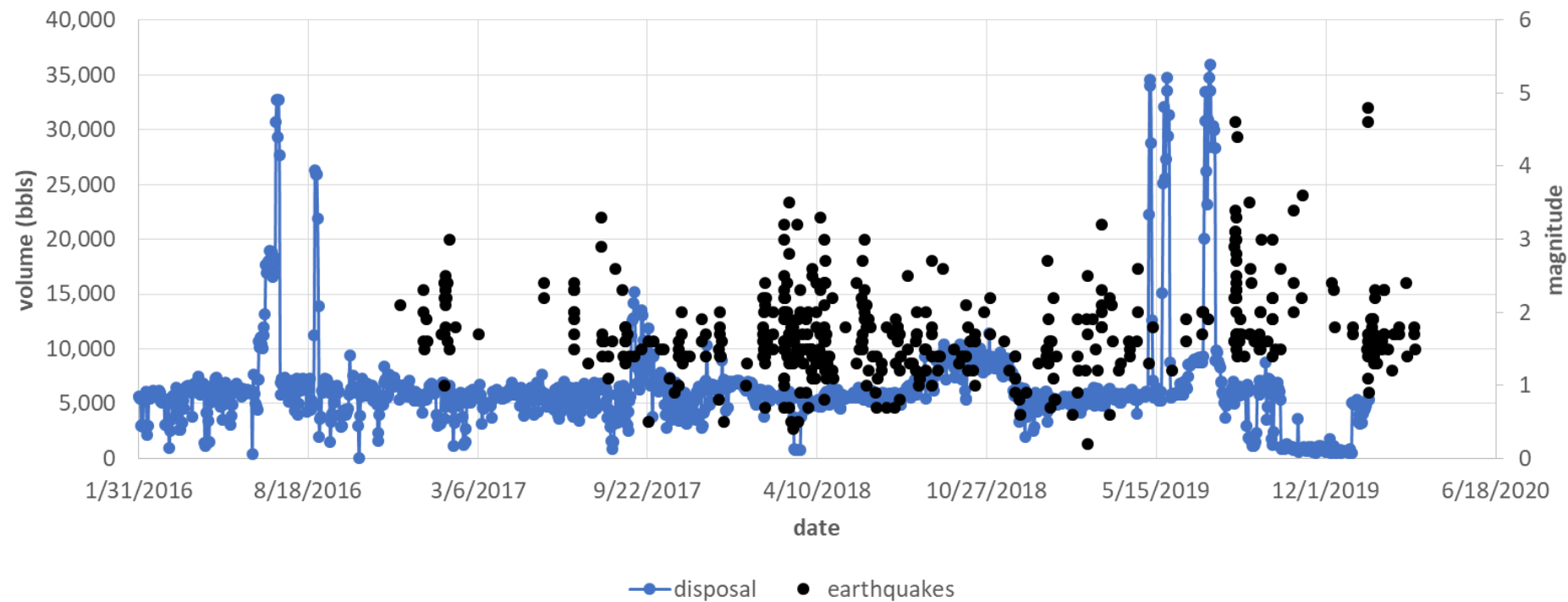
● recent earthquakes

Jan 1 to Mar 31, 2020



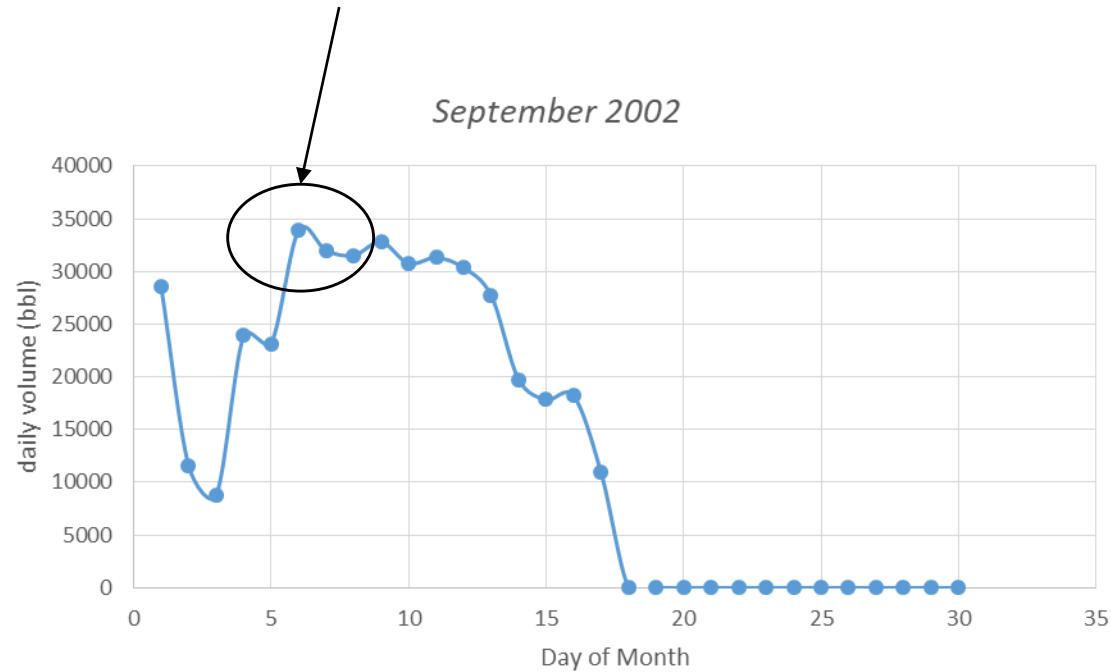
Discussion

Hutchinson: Daily Disposal within 2 mi

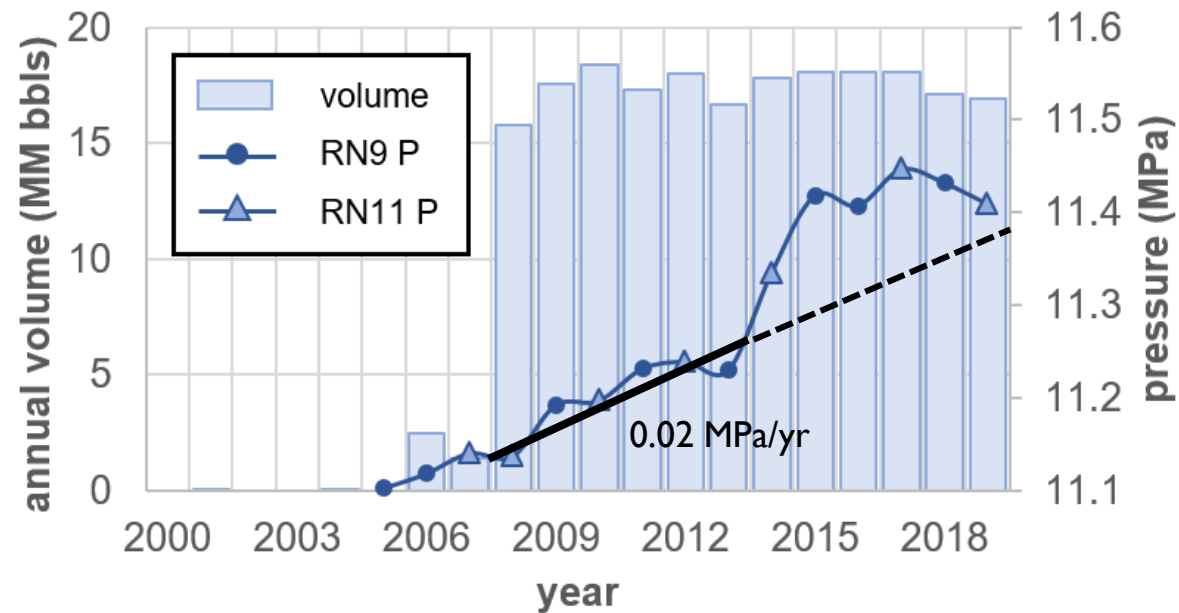


Historic daily disposal near Hutchinson cluster

larger than recent daily volumes



Injection and Pressure



it's possible triggering threshold could have eventually been reached without pressure diffusion from the south

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