Consortium to Study Trends in Seismicity

Quarterly Report
October 1 to December 31, 2020

Rex Buchanan, Shelby Peterie, Rick Miller, Kansas Geological Survey
Statewide Earthquakes

307 earthquakes
largest = M 3.9
near Wichita
Quarterly Number of Earthquakes Statewide
CSTS Alerts

Total: 40

$M \geq 2$
within 30 miles

Total: 40
Earthquakes Within 20 miles

Total: 78

22 in the previous quarter

more than double due to Wichita area events
Quarterly Number of Earthquakes w/in 20 mi
Kiowa County

- Located earthquakes
  - none
- Subnetwork events
  - none
- Consistent with past observations
Rice and Ellsworth Counties

- Located earthquakes
  - none w/in 20 mi

- Subnetwork events
  - EW01: 2, largest M 0.2
  - RC02: 7, largest M 0.4
  - RC03: 151 (blasts)

- Consistent with past observations

- Earthquakes in new area
  - Russell County
  - 7 earthquakes M ≥ 2
  - largest M 2.5
  - none reported by USGS
Progression of Earthquakes into Russell County

*cumulative seismicity 2015-2020*

occurred along the margin of the Central Kansas Uplift
pronounced eastward progression from Ellis/Rooks counties
McPherson County

• Located earthquakes
  – 2 (M 1.5 and 1.2)
  – >15 miles from wells
  – consistent with MGA

• Subnetwork events
  – MP01: 7
  – MP02: 5
  – largest = M 0.1

• Consistent with past observations
Reno County

- Notable decrease in activity
- Located earthquakes
  - 3 earthquakes
  - largest = M 1.3
  - (5 last quarter)
- Subnetwork events
  - RN01: 31
    - consistent with the Hutchinson cluster
    - decrease from 58 previous quarter
  - RN03: none
Sedgwick County

- Located earthquakes
  - 65 events late Nov to Dec
  - M 1.9 to M 3.9
  - Two dozen M2+
  - M 3.9 occurred Dec. 30

- Subnetwork events
  - SG02: 6
  - M ≤ 0
  - timing and distance consistent with Wichita cluster
Butler County

• Located earthquakes
  – 17 events near De Graff
  – M 3.0 on Oct. 27
    ▪ previous seismicity
    ▪ 2016-2017
  – M 1.7
    ▪ 4 mi from facility
    ▪ consistent with low-energy seismicity observed here in the past

• Subnetwork events
  – BU02: 8
  – 11 mi
  – timing and distance consistent with the De Graff cluster
Johnson County

- Located earthquakes
  - none

- Subnetwork events
  - none
2020 Formation Pressures
Arbuckle Formation Pressure

*Harper County*

2020 pressure consistent with 2019, ~70 psi above historic
pressures increased about 10 psi and are 40-50 psi above historic levels
Arbuckle Formation Pressure

*Reno County*

pressures either steady or slightly decreasing, but remain about 40 psi above historic levels
Arbuckle Formation Pressure

Rice County

pressures increased slightly in 2020 and are 30-40 psi above historic levels
Arbuckle Formation Pressure

**McPherson County**

consistent with 2019 pressures, 30-40 psi above historic levels