



**Alberta
Energy
Regulator**

Linking Science to Regulation for Rapid Response to Induced Seismicity: The Power of AGS Applied Science in the Alberta Energy Regulator

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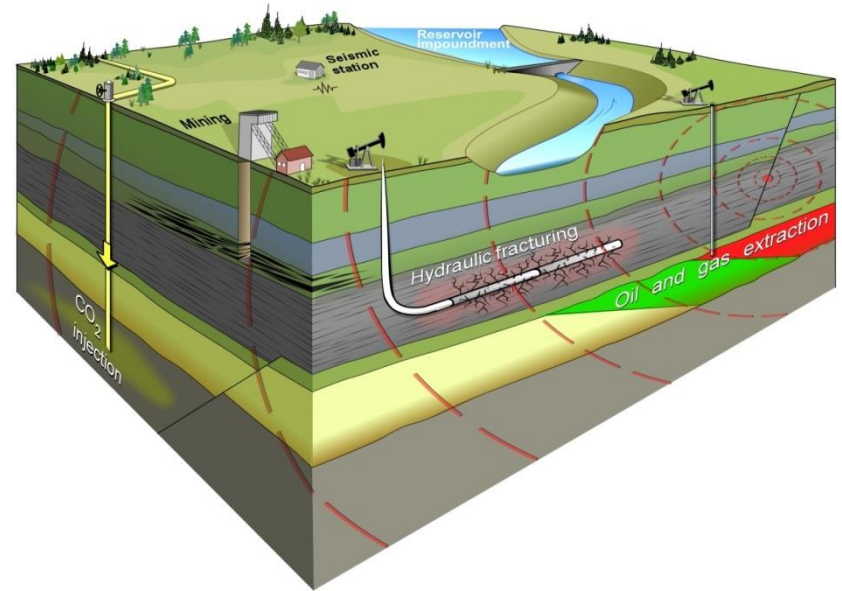
Banff 2018 International Induced Seismicity Workshop

October 26th, 2018

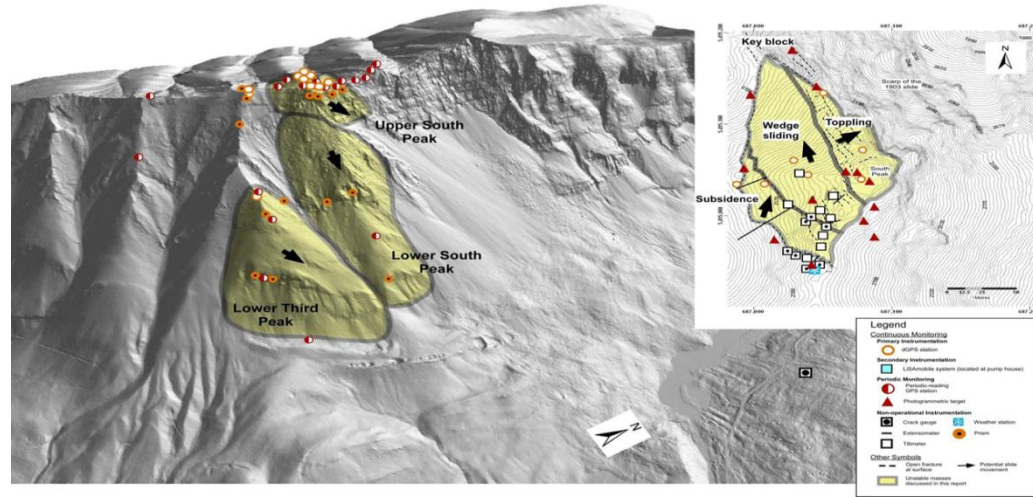
Alberta Geological Survey

Main Programs

- › Energy and Mineral Resources
- › Groundwater Resources
- › Maps and 3D Models of Alberta Geology.
- › Geological Hazards

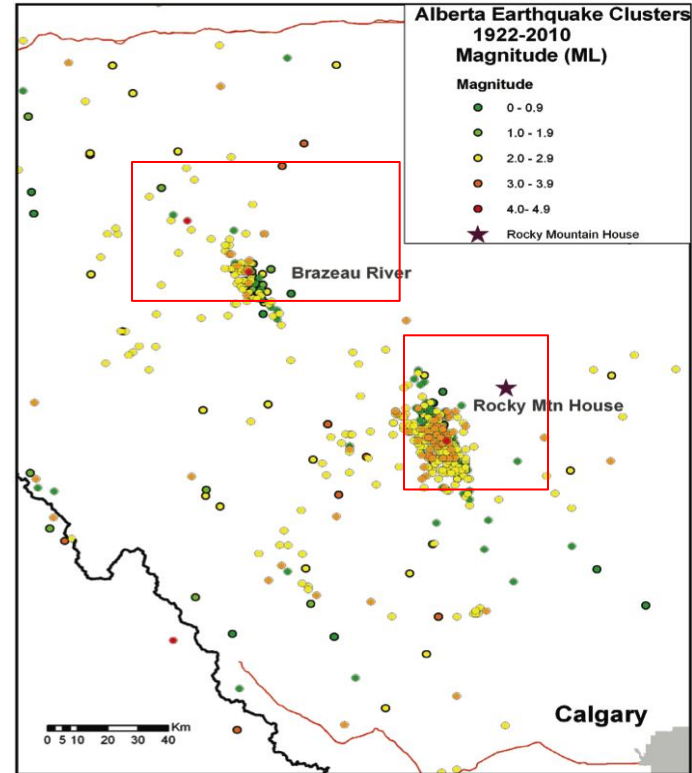


Turtle Mountain: Monitoring and Landslide Risk



Induced Seismicity in Alberta

- 1960s and 70's – production-related seismicity documented Strachan Gas Field near Rocky Mountain House.
- Early 1990's - suspected injection-well related seismicity in Cordel Field.

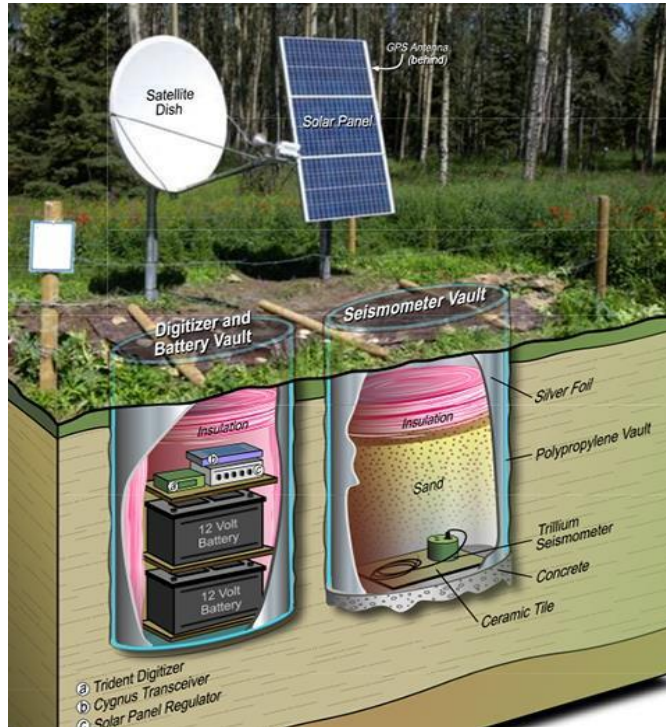


Cold Lake Area – CSS 1990s

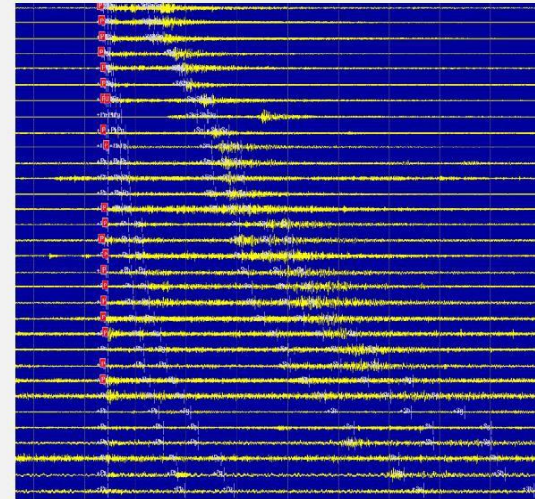
- › Induced seismicity noted in CSS developments in Cold Lake area, 1990s. Industry monitoring programs developed under AER direction.



AGS Earthquake Monitoring and Begins in 2010

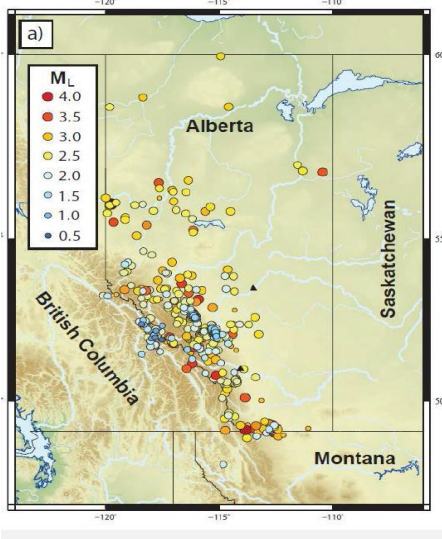


Raw Waveform Data

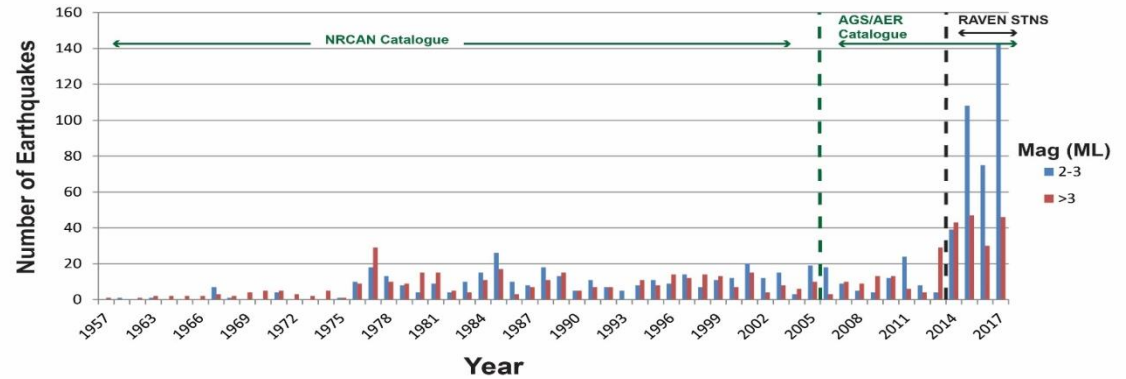


AGS Earthquake Catalogue

Earthquake Catalogue

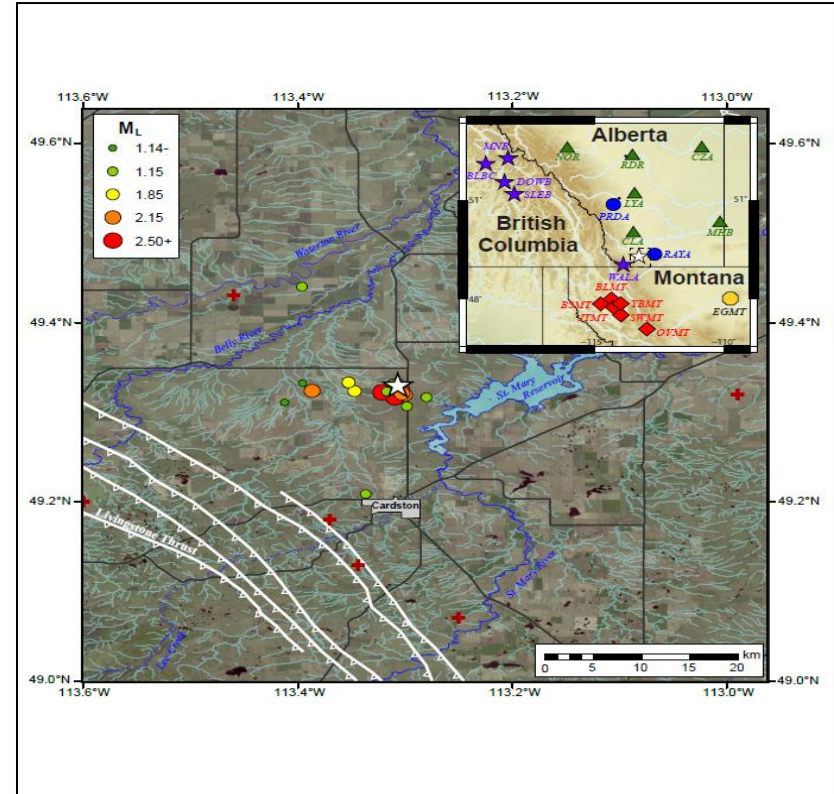


Alberta Earthquakes from 1957 through 2017 with M_L Magnitude 2 and Above



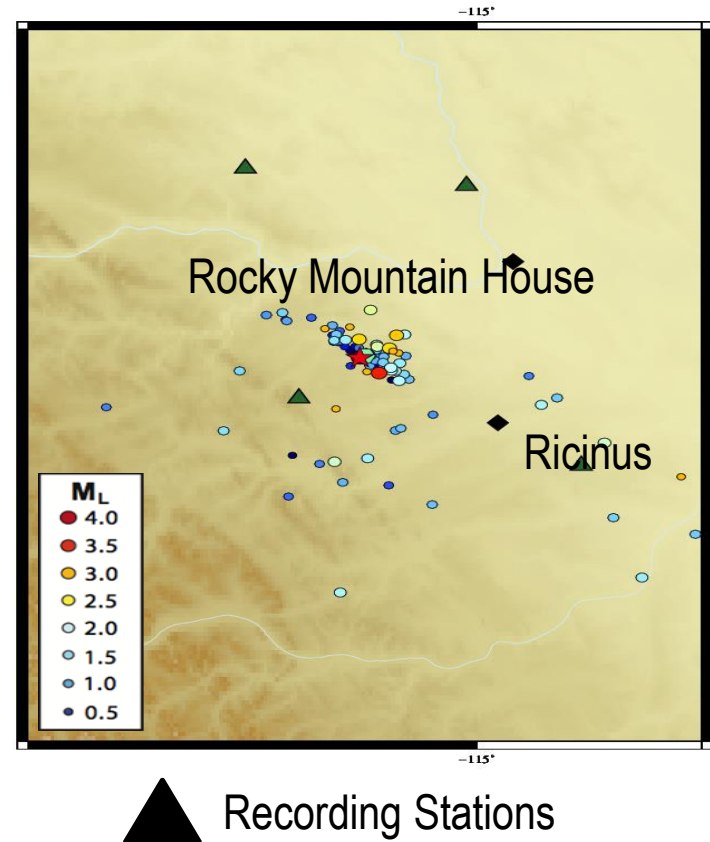
The 2011 Cardston Event

- Cluster of events in southern Alberta ~13 km north of Cardston
- 60 detected events (Dec 2011)
- Magnitudes up to 3.0 M_L
- Events occur in the vicinity of a horizontal well completed in the Exshaw Formation (CHW).



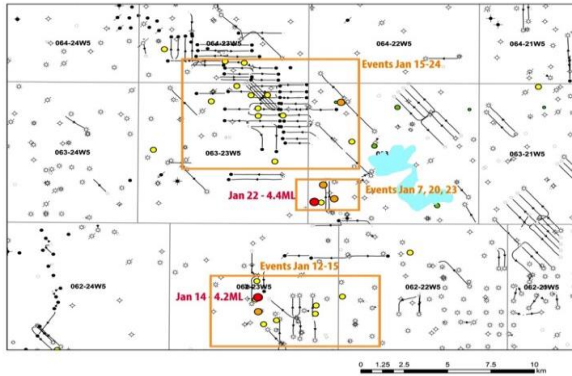
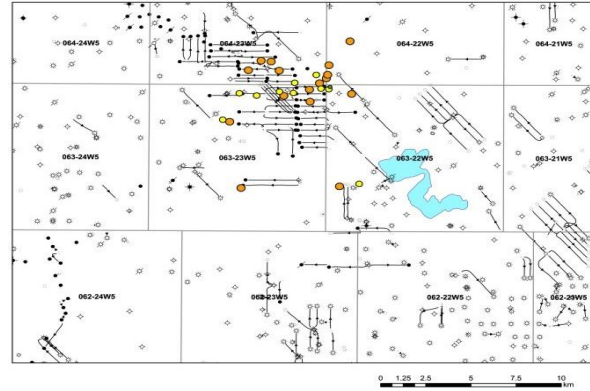
The Rocky Mountain House Events

- Suspected injection-well induced seismic events near Rocky Mountain House, 2014 (M_L 3.9-4.3).
- Causality uncertain as is part of the Strachan cluster.



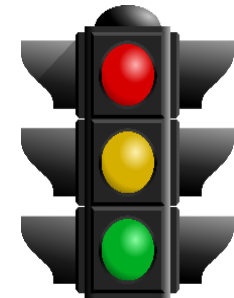
MSHF Induced Seismicity

- Dec 2013 - Jan 14 Crooked Lake 3.8 M_L



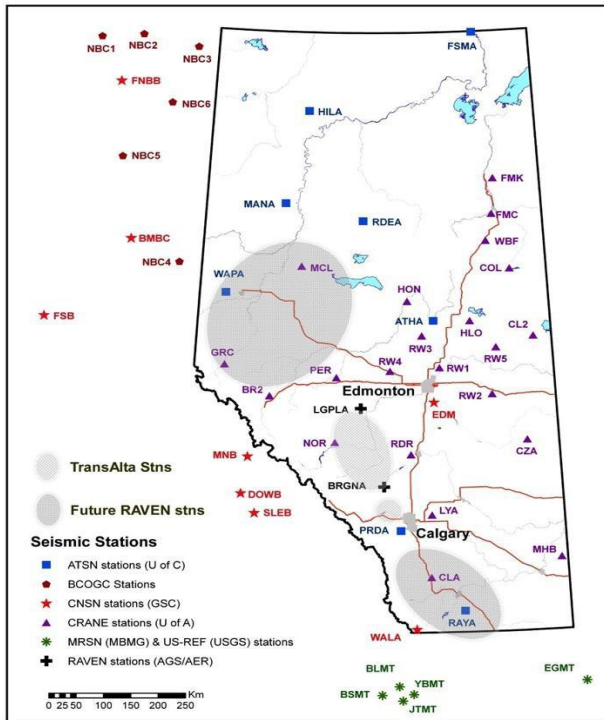
- Dec 2014 - Jan 15
Crooked Lake 4.4 ML

- SO 2, Feb 2015

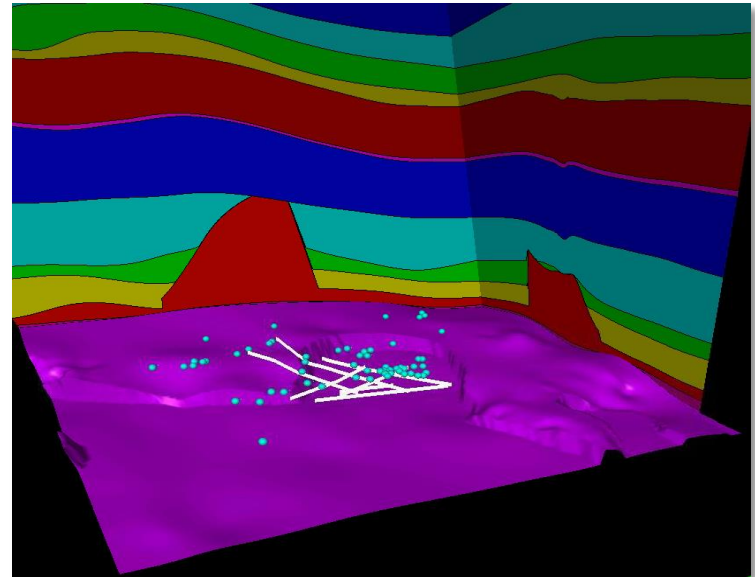


AGS Shared Seismic Network and the 3-D Geological Framework – understanding seismicity in Alberta

Network Distribution



Geological models



A landscape photograph showing a dirt road winding through a vast field of yellow and green crops under a bright blue sky with scattered white clouds. The road leads towards the horizon, flanked by tall grasses in the foreground.

Thank you