

Geoscience BC Energy & Water Projects – 2021

Summary Session #2

As with Session #1 in February 2022, Geoscience BC's (GBC) 2021 scholarship recipients were invited to present the highlights of their technical work. Based on GBC's strategic objectives, the various projects and focus areas were divided into five (5) sections:

1. Identifying New Natural Resource Opportunities
2. Advancing Science and Innovative Geoscience Technologies
3. Facilitating Responsible Natural Resource Development
4. Enabling Clean Energy, and
5. Understanding Water

This session featured 4 presentations, encompassing 3 of the above-mentioned objectives (2, 3 & 4).

Opening comments were once again provided by Richard Truman, Vice President – External Relations at GBC, who also moderated the session.

Extensive research and study in understanding seismic activity in Northeastern British Columbia (NE BC) continues, including specific examination of the controlling factors. Whether these events occur naturally or are anthropogenic, building (and refining) systems and models to extend the understanding and then to be able to predict & mitigate events remain the primary objectives. As part of this work, enhanced cataloging now suggests that significantly more events have taken place than originally thought in the Kiskatinaw Seismic Monitoring and Mitigation Area, with hydraulic fracturing (HF) operations causing many more events (~94%) than water disposal (WD) schemes. However, the seismic epicenters appear to be significantly further with WD operations than for HF operations. In addition, regional structural geology and stratigraphic setting will also be included in the Comprehensive Physical Model that is being built to further this study. Concurrently, research also continues into understanding the fault sealing effects on induced seismicity and the pore pressure distribution in NE BC. It is speculated that hydraulic disconnection is likely as a result of structural discontinuity (or an impermeable fault) within the natural fault system.

One of the aspects that continues to provide uncertainties in NE BC is the H₂S distribution (and occurrence) within the Montney Formation. Although there is significant data available, work continues to further define and understand the source and mechanism of H₂S & its formation, including detailed stratigraphic analysis of the distribution in the various Montney sub-layers. Integrating this detailed stratigraphic analysis with parallel work being done to define structural corridors will likely advance the understanding of the possible localized migration patterns of H₂S. Significant collaboration among various researchers continues to revolve around identifying, understanding, and allocating the main processes of H₂S formation, namely TSR (thermochemical sulfate reduction – mostly in-situ as a result of dissolution of early anhydrite) and MSR (microbial sulfate reduction – in formation water or via injected water).

Given the potential for geothermal in Southern BC, a high-level summary was presented based on electromagnetic geophysics work to identify latent opportunities for geothermal exploration under the Clean Energy category. The Magnetotellurics (MT) method, which uses naturally occurring radio waves to image the crust and upper mantle to measure resistivity in the subsurface, was employed to conduct 2 separate studies in the area. The large study area

included 331 locations (approximate area of 700 km x 700 km), while the smaller study region had 66 locations (approximate area of 30 km x 30 km).

For additional & more detailed information on these and other projects, please visit GBC's web portal at: <https://www.geosciencebc.com/updates/summary-of-activities/>.

SUMMARY AND AGENDA

Geoscience BC's Summary of Activities 2021: Energy and Water, contains 10 papers from Geoscience BC-funded projects or scholarship recipients that are within Geoscience BC's strategic focus areas of energy (including oil and gas, and geothermal) and water.

The papers are divided into five sections, based on Geoscience BC's strategic objectives of:

- 1) Identifying New Natural Resource Opportunities
- 2) Advancing Science and Innovative Geoscience Technologies
- 3) Facilitating Responsible Natural Resource Development
- 4) Enabling Clean Energy
- 5) Understanding Water

During this webinar, we will hear from four of the scholarship recipients, covering three sections of Geoscience BC's Strategic Objectives:

- Within the 'Advancing Science and Innovative Geoscience Technologies' section, Samantha Mackie will present the results of her research on Stratigraphy, facies heterogeneities, and structure in the Montney Formation of northeastern British Columbia: Relation to H₂S distribution.
- Within the 'Facilitating Responsible Natural Resource Development' section there will be two presentations. Bei Wang will talk about a comprehensive physical model for the contrasting seismogenic behaviours of injection wells in the Kiskatinaw Seismic Monitoring and Mitigation Area of NEBC. Zahra Esmaeilzadeh will discuss her investigations of fault sealing effects on induced seismicity and pore pressure distribution in NEBC.
- Finally, the 'Enabling Clean Energy' section will have a presentation by Cedar Hanneson on Geothermal exploration in southern BC using electromagnetic geophysics: Regional perspectives.

AGENDA

(MST)

10:00 – 10:10 Welcome and Geoscience BC Introduction

10:10 – 10:30 Comprehensive Physical Model for the Contrasting Seismogenic Behaviours of Injection Wells in the Kiskatinaw Seismic Monitoring and Mitigation Area, NEBC - presented by Bei Wang, UVic and Geological Survey of Canada.

10:30 – 10:50 Investigating Fault Sealing Effects on Induced Seismicity and Pore Pressure Distribution in NEBC: Observations - presented by Zahra Esmaeilzadeh, UofC.

10:50 – 11:00 Induced Seismicity Q&A

11:00 – 11:05 Break

11:05 – 11:25 Stratigraphy, facies heterogeneities, and structure in the Montney Formation of northeastern British Columbia: Relation to H₂S distribution - presented by Samantha Mackie, UofC.

11:25 – 11:45 Geothermal exploration in southern BC using electromagnetic geophysics: Regional perspectives - presented by Cedar Hanneson, UofA.

11:45 – 11:55 Montney & Geothermal Q&A

11:55 – 12:00 Wrap Up / Close

PRESENTERS

INDUCED SEISMICITY

Comprehensive Physical Model for the Contrasting Seismogenic Behaviours of Injection Wells in the Kiskatinaw Seismic Monitoring and Mitigation Area, NEBC

Bei Wang
University of Victoria and Geological Survey of Canada

Dr. Bei Wang is a postdoc researcher at University of Victoria and Geological Survey of Canada. His research focuses on injection-induced earthquakes (IIE) in Western Canadian Sedimentary Basin, such as numerical simulation of the potential triggering mechanisms of IIE, source properties, fluid/rock interactions, and controlling factors on the seismogenic processes of IIE.



Investigating Fault Sealing Effects on Induced Seismicity and Pore Pressure Distribution in NEBC: Observations



Zahra Esmailzadeh
University of Calgary

Zahra Esmailzadeh is working on her PhD in Geophysics/Seismology with Prof. David Eaton at the University of Calgary. Zahra's current research focuses on fault stability and induced seismicity in the presence of stress barrier and pressure compartmentalization. She received an MSc in Reservoir Engineering in Iran. Before returning to academia, Zahra worked for the National Iranian Oil Company, studying large oil and gas reservoirs.

MONTNEY & GEOTHERMAL

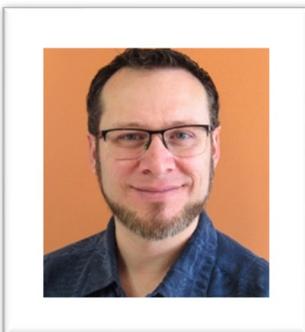
Stratigraphy, facies heterogeneities, and structure in the Montney Formation of northeastern British Columbia: Relation to H₂S distribution

Samantha J. Mackie
University of Calgary

Samantha is an MSc Geology candidate at the University of Calgary. Her current research is focused on the Montney Formation and how localized structure, stratigraphy, and facies distributions relate to H₂S enrichment. She received a BSc with honours in geology from the University of Calgary in 2019. Throughout her schooling, she has worked as an intern with various Canadian energy companies including PETRONAS Energy Canada, Cenovus Energy, Imperial Oil, and Tourmaline Oil Corp. These internships have allowed Sam to gain experience working on different formations and plays within the Western Canadian Sedimentary Basin. After graduation, she plans to join the Canadian energy industry as a geologist in training.



Geothermal exploration in southern BC using electromagnetic geophysics: Regional perspectives



Cedar Haneson
University of Alberta

Cedar Haneson is a PhD candidate in the Department of Physics at the University of Alberta. In 2017, he received a Bachelor of Science honours degree in geophysics from the University of Victoria, then moved to Edmonton to begin graduate studies under the supervision of geophysicist Dr. Martyn Unsworth. Cedar's scientific research uses geophysics to study the rocks of southern BC and he applies this research to the search for geothermal resources.

MODERATOR

Richard Truman, B.A., Dip. CIPR
Vice President, External Relations
Geoscience BC



Richard Truman is an external relations and communications professional with 15 years of community engagement and communications experience in Canada and Europe. Richard joined Geoscience BC in early 2017 and is responsible for creating and implementing communication strategies to engage the diverse audiences the organization is trying to reach, including Indigenous groups, the resource sector, universities, governments, and communities.

Prior to this role, Richard lead communications and engagement projects for CopperMoon Communications and The Castlemain Group. This included bringing together Indigenous leadership, community members, legal teams, negotiators, Provincial and Federal governments and the resource sectors on subjects such as Impact Benefit Agreements.

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Supported by



Tuesday, March 8, 2022
10:00am MST

****pre-registration is mandatory****

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TECHNICAL WEBINAR

