

September 2020 – CSUR Technical Webinar #2

CSUR and Geoscience BC Host Webinars to Celebrate Young Geoscience Researchers

SESSION I

CSUR, in collaboration with Geoscience BC, was pleased to jointly host the first of 2 sessions to highlight the research work of four graduate students who have recently earned Graduate Scholarships from Geoscience BC. The objective of the first session was to focus on the research in the area of Induced Seismicity.

Paulina Wozniakowska, a Ph.D. Student at the University of Calgary, and Ali Mehrabifard, a Ph.D. Student at the University of British Columbia, were invited to participate in the 1st session to present their respective work in this field and also to provide their perspectives on the state of the energy industry in Canada. In addition, they were also presented with the opportunity to elaborate on their personal goals and motivating factors for choosing a career in this industry. Dr. Brad Hayes, President of Petrel Robertson Consulting and Chair of CSUR's Outreach Program, was on hand to moderate the session.

Opening remarks from Carlos Salas, Geoscience BC Executive VP & Chief Scientific Officer, and Randy Hughes, newly appointed Manager of Energy & Water at Geoscience BC, expanded on the scope and specifics of the scholarship program and also on the ongoing research under the auspices of Geoscience BC. The research component, which is in collaboration with industry partners & associations, academia and other stakeholders, is considered critical to assure the long-term sustainability of the



CSUR
Canadian
Society for
Unconventional
Resources

**TECHNICAL
WEBINAR
SERIES**

"INDUCED SEISMICITY"
By
Paulina Wozniakowska
University of Calgary
and
Ali Mehrabifard
University of British Columbia

oil & gas sector in British Columbia and Western Canada.

The speakers then individually took to the stage to describe their respective research in the field of Induced Seismicity. Paulina's work has focused on the Montney play, while Ali's project scope has been more general within this field. Interestingly enough, there appeared to be a strong connection and some similarities between their studies in that they're both attempting to incorporate machine learning into their distinct projects. The overall scope of their specific work involves trying to ascertain the influencing factors on induced seismicity such as geological parameters (pre-existing faults & natural fractures, tectonics, etc.) and industrial elements (hydraulic fracture treatment volumes & rates, injection fluids, etc.). Finally, with the machine learning component, the key objective for both of them was to continually classify the parameters in order of importance or influence and then refine as more data becomes available & is integrated into their studies.

ABSTRACT: The Canadian Society for Unconventional Resources and Geoscience BC will jointly host two webinars in September and October to highlight the geoscience research of four graduate students who have recently earned Geoscience BC Graduate Scholarships.

Each webinar will feature a presentation by two students, highlighting their research on induced seismicity, geothermal resources and hydrogeology. The researchers are M.Sc and PhD candidates working at University of British Columbia, University of Alberta, and University of Calgary.

Webinars will be open to CSUR members and all other interested parties, and will offer insights into current geoscience research and the opportunity to ask questions of the students. Each session will also feature a discussion highlighting views from these young leaders on their engagement in geoscience and how they see the future of geoscience, industry and employment opportunities unfolding.

PRESENTATION #1

Investigation of seismogenic activation potential in Montney using supervised machine learning.

Hydraulic fracturing-induced seismicity in Montney is a subject of the extensive research. Seismicity patterns observed in British Columbia and Alberta provinces do not correlate with any change in industrial activity. The proposed approach incorporates machine learning technique into complex geological analysis and prediction of induced seismicity potential Montney. In the study, data from over 6400 multistage horizontal hydraulic fracturing wells drilled into the Montney Formation were analyzed to evaluate the impact of geological, geomechanical and tectonic characteristics on the induced seismicity distribution.

PRESENTER: Paulina Wozniakowska, PhD Student in Geophysics - University of Calgary.

Paulina Wozniakowska is working on her PhD in Geophysics with Dr. David Eaton at the University of Calgary. She received her MSc (2016) and BSc (2015) in Applied Geophysics at the AGH University of Science and Technology in Krakow, Poland. Paulina's current research focuses on geospatial analysis of induced seismicity. Before returning to academia, she worked in Czech Republic as a microseismic data analyst. She is a current president of the UofC Student Exploration Geophysics Association (SEGA) and 2019 and 2020 Geoscience BC Scholarship Recipient

PRESENTATION #2

Injection induced seismicity: what we think we know!

Global warming is a real critical challenge that has to be addressed ASAP. A large portion of CO2 emissions of the released greenhouse gas is resulted from electricity generation. Globally coal is the main source of electricity generation. However, for the same amount of energy, burning coal releases 2.4 times more CO2 than that of natural gas. In fact, the shift from coal to natural gas has played a key role in bringing U.S. electricity-related CO2 emissions to 1990s levels despite significant growth in energy demand. In addition, the abundance and versatility of natural gas make it a valuable energy source to meet a wide variety of needs and help the world shift to less-carbon-intensive energy sources. Natural gas is an ideal and immediate fuel for reliable power generation, and supplements intermittent renewable sources such as solar or wind.

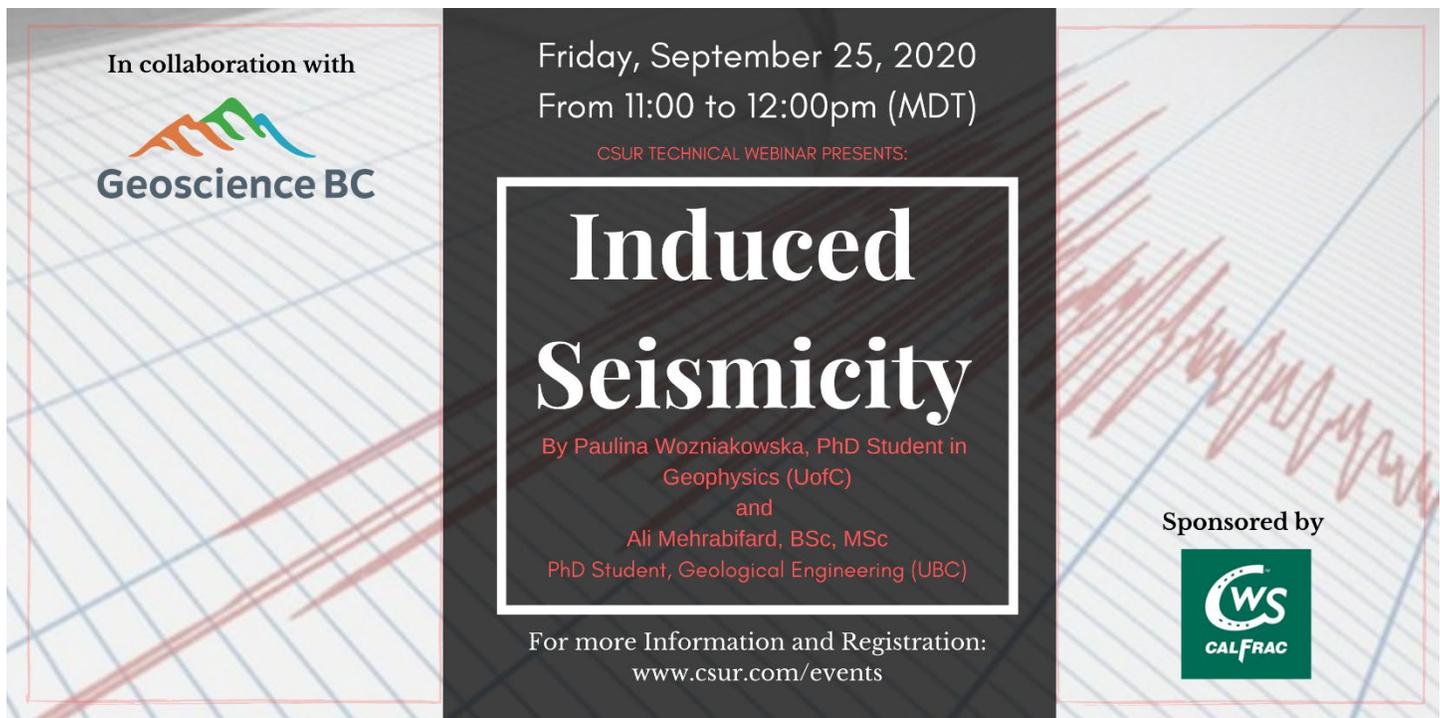
Inevitably, the development of unconventional resources (shale gas) requires fluid injection. It is well known since 1960s that underground injection causes earthquakes. Although, most of these earthquakes are small in magnitude in comparison with that of tectonic ones, they could impose risk not only to the equipment and facilities used in the site by the operator but also to the nearby communities, as it was observed in Oklahoma. So, what we can do about it?

Here is where my research comes in; I am trying to improve our understanding of the mechanism of induced earthquakes in more details so that it could be used in the pre-assessment of the risk of the actual underground injection operation and calculating the magnitude exceedance probability for the site of interest. During this presentation I would try to cover at least one of the major factors in injection induced seismicity.

PRESENTER: Ali Mehrabifard, PhD Student in Geological Engineering - University of British Columbia

Ali is a PhD student in geological engineering at the University of British Columbia since 2018, working under supervision of Dr. Erik Eberhardt and Dr. Doug Stead. He earned his BSc in petroleum engineering from Tehran Polytechnic in 2015 (Iran), and his MSc in energy systems engineering in Seoul National University in 2018 (South Korea). His previous experiences are in geothermal field hydraulic stimulation and fully coupled numerical and laboratory simulation of this operation. Ali is also an active member of the SPE and Geothermal UBC student chapter. His main current research topic is on injection induced seismicity in underground energy development.

Both presentations were moderated by Brad Hayes, PhD, P.Geol - Petrel Robertson Consulting Ltd. President and CSUR Outreach Director.



In collaboration with

Geoscience BC

Friday, September 25, 2020
From 11:00 to 12:00pm (MDT)

CSUR TECHNICAL WEBINAR PRESENTS:

Induced Seismicity

By Paulina Wozniakowska, PhD Student in Geophysics (UofC)
and
Ali Mehrabifard, BSc, MSc
PhD Student, Geological Engineering (UBC)

For more Information and Registration:
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