

## **May 2023 – Geoscience BC: Student Presentations**

This instalment of CSEE's Technical Webinar Series was in collaboration with our partners at Geoscience BC. The theme of the session was "The Next Generation of Energy Geoscience Research" and was dedicated to highlight academic work from three scholarship recipients. In all three cases, the research was the basis of their respective doctoral work.

A welcome address was provided by Gavin Dirom, President & CEO of Geoscience BC. Gavin provided a quick overview of Geoscience BC, its goals & membership objectives, the Annual Student Scholarship Program, and future endeavors & opportunities for his organization.

The first presentation was from Fateme Hormozzade, a PhD Student from Carleton University in Ottawa, Canada. Her work focused on the "Influence of Fracture and Fault Systems on Fluid Flow in the Garibaldi Volcanic Belt, BC". As indicated by the speaker, in addition to an existing thermal anomaly, the reservoir needs to be at an accessible drilling depth and there needs to be sufficient porosity & permeability within the reservoir for a geothermal project to be economically successful. Various methods and studies are typically undertaken for geothermal exploration, including Geochemical Studies, Geological Studies, and Geophysical Surveys. The focus of Fateme's work has been the use of Magnetotellurics Surveys, which measure electric & magnetic fields on the earth's surface. Her study area in SW BC is known to have active thermal springs and volcanic structures, including the Mount Garibaldi & Mount Meager Volcanic Complex. As part of her research work, Fateme initially utilized water chemistry data, rock samples, available fracture mapping, and legacy & recent magnetotellurics data to generate a 3-D electrical resistivity model, which pointed to depths with the best potential for geothermal projects. This was followed by constructing a Petrophysical Model by combining the resistivity model, lab measurements, and field data to define optimal fluid flow pathways.

The second speaker was Mazyar Nazemi, a PhD student in the Department of Earth Sciences at Simon Fraser University in BC. Mazyar's talk was titled "3-D Reconstruction of the Georgian Basin and Potential for CO<sub>2</sub> Sequestration in the Lower Mainland, BC". In order to investigate locally applicable & practical solutions to lower carbon dioxide concentrations in the atmosphere, Mazyar's research objective is to identify potential sites and target horizons for carbon capture & storage (CCS) in the Lower Mainland, BC, which hosts most of the province's population and is the major industrial hub & carbon emitter. Geologically, the strata underlying the area consists of up to 6 km of siliciclastic rock, comprising the Nanaimo Group and the Cenozoic Strata as possible storage targets. While there has been previous exploration history and corresponding regional studies conducted, including potential for underground natural gas storage, there are only 40 wells that have known locations and drilling information in the area. The Upper Cretaceous does have the characteristics of a sealing layer over the Cenozoic strata. As part of his research to identify suitable sites and stratigraphic intervals, Mazyar's work will include & incorporate core description, facies analysis, porosity-permeability relationships, petrophysical data, and seismic data to produce a 3-D static geological model. The next steps in his research will include mapping the distribution & patterns of faults to identify geohazards and look at potential CO<sub>2</sub> storage mechanisms within deep saline aquifers.

The final presentation was from Zahra Esmaeilzadeh, a PhD Student from the University of Calgary, whose research focused on "Investigating Fault Sealing Effects on Induced Seismicity and Pore Pressure Distribution & Fracture Propagation in Northeast, BC". The research was initiated as a result of the

November 2018 seismic event in the Septimus region within the Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) in NE BC. The hydraulic fracture operations were conducted on two horizontal Middle Montney wells having a 10 MPa lateral pore pressure difference. At the time, relatively little attention was given to the possibility of activating a sealing fault during fluid injection. The ensuing research has focused on being able to predict such circumstances in order to have mitigating protocols in place prior to field operations. Zahra's work has included constructing a 3-D Model to assess the likelihood of a seismic event under various scenarios and circumstances (with or without pressure contrast and damaged vs. undamaged fault zone). Pressure difference and the existence of a fault damage zone appear to be significant risk factors. As such, the speaker is anticipating that the results of this research will be instrumental in optimizing future field operations and subsequent well production profiles in the presence of sealing faults that form pressure barriers.