**SEISMIC Imaging for mining applications: a Case study**

*Amr Ibrahim, Polytechnique Montréal, Montreal, QC, Canada*

*Gabriel Fabien-Ouellet, Polytechnique Montréal, Montreal, QC, Canada*

Canadian Royalties Inc. conducted a series of high-resolution seismic reflection surveys at their nickel mining project in Nunavik, northern Quebec, Canada, in 2018 and 2019. The objectives of the seismic survey were to explore the geological mapping of the near-surface in the area where ore bodies are found, enhance drilling and targeting, and speed up the discovery process. Seismic data can provide complementary information from the first 100 meters to greater depths and are extremely useful for better understanding global geological settings. However, seismic imaging for mining applications is complicated because of the strong influence of random noise, coherent noise (surface waves), topography and near-surface statics. All these factors can complicate seismic data processing and degrade the accuracy of seismic imaging. In our case study, we tested different processing and imaging methods using one seismic line with a receiver and shot spacing of 5 m with a total length of 10.3 km. Before imaging, we used filters in the frequency-wavenumber domain to remove surface waves and reduce random noise. Then, we picked the first seismic arrivals to compute surface statics and apply static corrections. In order to image the subsurface, we used a viscoelastic finite difference in the time domain to compute the source and receiver wavefields and image the subsurface using the reverse time migration (RTM) method. We used an implementation of a finite difference modeling algorithm in the CUDA language that can run on multiple graphics processing units (GPU) to compute the source and receiver wavefields efficiently. We used a conventional RTM approach based on Laplace filters and a correlation imaging condition. In this case study, we will study the effects of seismic data processing steps on the quality of the migrated seismic sections. We will compare the effects of different approaches to mitigate the impact of random noise, surface waves and missing traces on the process of seismic imaging for mining applications.