INTERNATIONAL MINERALS INNOVATION INSTITUTE

Statistical Hazard Assessment and Modelling of Mining Seismicity

This project advanced the understanding and monitoring of mining-related seismic activity in Saskatchewan potash operations by focusing on small ground vibrations caused by mining, known as microseismicity. The work improved the ability to distinguish between normal and abnormal seismic activities that may indicate elevated risk or concerns with ground-control.

Researchers from Western University, in collaboration with IMII industrial partner Nutrien, used seismicity data collected from Saskatchewan potash mines. The research combined statistical analysis, machine learning, and seismological modelling to identify patterns in recorded seismic events, classify seismic source mechanisms, and **support forecasting of mining microseismicity.**

The research demonstrated that using guided-wave approaches can **accurately locate microseismic events** even when seismic data is obscured by noise. It also introduced unsupervised machine learning methods to **classify different types of seismic events**. Statistical and clustering methods were used to identify background versus clustered events.

By applying statistical forecasting methods, including the ETAS model and a Bayesian predictive framework, the project developed forecasting approaches and hazard metrics that can be used to better **anticipate and manage ground conditions.** This research provided practical tools to support safer and more informed decision-making by improving the ability to detect, understand, and respond to seismic activity in mining environments.

The knowledge gained from this project strengthens the ability to recognize unusual seismic patterns. This helps Saskatchewan potash operators make safer, more informed ground-control decisions.

Proponent: Nutrien & Western University
Project Duration: May 2021 to Aug. 2025

Project Cost:	$240,000
IMII Contribution:	$120,000
Mitacs:	$120,000

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