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Postdoctoral fellow – Mining geotechnique in cold regions and numerical modeling

RIME – Research Institute on Mines and the Environment

UQAT – Université du Québec en Abitibi-Témiscamingue

Water diversion capacity of alternative engineered mine covers and their impacts on the water balance in northern climates

Duration and location

2 years – Université du Québec en Abitibi-Témiscamingue (UQAT), Rouyn-Noranda, Québec

Project start

Summer 2020

Research fields

Mining geotechnique, geotechnical engineering in cold regions, mine site reclamation

Research supervision

Bruno Bussière and Vincent Boulanger-Martel assisted by a team of specialized professors and professionals.

Project description

The environmental reclamation of tailings and waste rock storage facilities located in northern environments is a growing area of research. Presently, only a few cover methods are available for these climates, and alternative cover systems must be developed. One appealing option among alternative approaches is cover systems that aim to reduce water infiltration. In northern environments, this might be accomplished by the presence of a cover layer with a high degree of saturation. During thawing, the highly saturated and frozen cover layer could act as a barrier to infiltration and divert melt water. Once thawed, this same layer could have store-and-release functions which would help guarantee system performance throughout the year.

The performance of these cover systems is mainly assessed by evaluating their water balance. Thus, a precise quantification of the different components that define the water balance (i.e., evaporation, water storage, runoff, and precipitation) is required to assess net infiltration and the performance of covers. In northern environments, the mechanisms and factors that influence the various parameters of the water balance are not well understood. In particular, the presence of freezing conditions and the effects of slope on runoff.

Specific objectives

The main objective of this research project is to assess the thermo-hydrogeological behavior and performance of alternative cover systems using laboratory tests and numerical modeling.

Specifically, this project seeks to:

1. Develop a laboratory-scale physical model (inclined box) to evaluate the thermo-hydrogeological behavior and the water diversion capacity of cover systems;
2. Understand the coupled thermal and hydrogeological mechanisms that govern the behavior of the tested cover systems based on laboratory results;
3. Analyze the relationships between the water diversion capacity, temperature (freezing and thawing), and the slope effects of the covers;
4. Determine the value of numerical tools for assessing water balances in northern environments;
5. Model (at site-scale) the long-term thermo-hydrogeological behavior of cover systems under normal and extreme climatic conditions;
6. Assess the feasibility of the tested cover systems for mine sites located in northern environments.

Salary

The financial support for this postdoctoral fellow is \$60,000/year.

Candidate profile

Doctorate degree in mining, geological or civil engineering, or any other relevant field.
Demonstrate autonomy and have good teamwork skills.

Documents required

Curriculum vitae, motivation letter, university transcripts, and three references.

Only the candidates selected for an interview will be contacted.

For more information or to apply

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- a unique proximity with Québec's mining industry;
- several research chairs in mining;
- cutting edge laboratories and equipment;
- professors internationally renowned for their expertise;
- relevant research projects related to the practice.