

The Canadian
Geotechnical Society



La Société Canadienne
de Géotechnique

CGS Luncheon Presentation

Physically Based Numerical Modelling to Identify Permafrost Degradation due to Climate Change in Northern Manitoba

Presented by:

Bekalu Erkabu, M.Sc.

University of Manitoba

Presentation Abstract:

A critical factor in permafrost degradation is the hydrological processes' changes, which results from free-flowing water, such as soil water or groundwater, and their associated flow paths. Hydrological models calibrated under current climate conditions are less likely to accurately predict the water budget of a catchment under permafrost degradation in future climate conditions. However, such models are used to manage large watersheds in northern Canada, which are used for hydropower generation, and are essential for strategic planning on the future supply of energy. This research was conducted to understand and identify the potential impact of permafrost thawing on the hydrological regime of the Nelson-Churchill River Basin (NCRB) due to climate change. Numerical models were developed using HYDRUS-1D and Hansson's module to analyze potential changes in ground temperature resulting from climate change to establish detailed physical-based understanding of the changes in the active layer. The calibration process was carried out using soil temperature data for 2014-2015 and validated by 2011-2012 data. Data from two Global Circulation Models (GCMs), namely, CanESM2 (Canadian Center for Climate Modelling Second Generation Earth System Model) and MIROC5 (Model for Interdisciplinary Research on Climate) were used to analyze potential future changes in active layer thickness due to climate change under two emission scenarios (RCP8.5 and RCP4.5). The investigation showed that permafrost remained stable in sites with peat layers. The lower emission scenario predicted up to 1 m increase in active layer thickness whereas degradation up to 5 meters was observed for both GCMs under high emission scenarios by 2080.

About the Presenter:

Bekalu has earned a B.Sc. degree in Agricultural Engineering and Mechanization (2010) at Hawassa University (Ethiopia). After completing his undergraduate study, he worked as a Junior Water Resource Engineer, Irrigation and Land development Engineer, and Project Engineer (Environmental Consulting) in different parts of Ethiopia. He Joined the IEEQ program at the University of Manitoba to fulfill registration requirement from EGM and obtained Post Baccalaureate Diploma in Engineering and registered as an EIT in 2019.

Bekalu has also worked at Manitoba Hydro as an IEE-Coop student in the Water Resource Engineering section and Manitoba Infrastructure Flood Forecasting Center as a Junior Flood Forecaster.

He is part of the Groundwater and Geotechnical Research Group at the University of Manitoba as an M.Sc. Civil Engineering student, and recently defended his thesis on "Physical based numerical modeling of permafrost degradation due to climate change in Northern Manitoba". He is passionate about hydrogeology, Groundwater, climate change, and environmental studies and projects.

For event information, please visit:

<http://www.cgsmanitoba.ca/lunch-seminars/upcoming/>

Doreen Wang, EIT

CGS Manitoba Liaison

P: (204) 800-7189

E: cgs.manitoba@gmail.com

Date: Tuesday, June 8, 2021

Time: Presentation at 12:00 PM

Registration Fee: Free Event!

Location: MS Teams Meeting

[Click here to join the meeting](#)

- This event qualifies for 1 Professional Development Hour. The event is classified as 'Informal Activity' under EGM's CPD Program.
- Please note that if you are unable to attend, someone else can be sent in your place. We are accepting walk-ins depending on seating availability.
- If you wish to be added to the mailing list, please send an email to cgs.manitoba@gmail.com