Assessing the impacts of climate change and mine dewatering on the hydrogeology of peatlands

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ABSTRACT
Peatlands host highly valuable ecosystems that can play significant roles in surface and groundwater flow systems. Such ecosystems are widespread in the Canadian Shield and their protection is critical. Nevertheless, research focusing on the impacts of open pit mine dewatering are still critically lacking. In addition, significant instabilities in the meteorological variables especially precipitation and temperature, are anticipated over the coming decades across Canada due to climate change that can affect the groundwater systems which are essential to the carbon storage, abundance, and diversity of species in peatlands. Fitting in this context, the general objective of this study is to simulate the variations in groundwater heads in a peatland under natural conditions and under the influence of climate change and mine dewatering. The target site is the Akasaba West Mining Project, property of Agnico Eagle Mines, located in the Bourlamaque River watershed, approximately fifteen kilometers southeast of Val-d'Or (Quebec, Canada). Mining at this site is expected to begin in the near future. The fieldwork carried out included the installation of six piezometers clusters in a peatland located in the immediate vicinity of the future mine pit. The field data were used to develop a flow model in *SEEP/W*. The model was first calibrated to represent current conditions (in steady and transient states) and subsequently used to develop scenarios aimed at predicting the impacts of climate change and mine dewatering on the hydrogeology of peatlands. Observable changes in aerial photos from pre-existing open pit mine sites are also used to track past changes in peatlands near mining site and predict the potential impacts of future mining sites. Ultimately, the knowledge from this study will provide tools to better asses and control the impacts of climate change and mine dewatering on peatlands and associated ecosystems.