State-of-practice for synthesizing climate modelling data and risk-based estimation of geotechnical properties: a literature review

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Poster Abstract

There exists increasing need for improved understanding of thawing permafrost behaviour in the Arctic due to demand for infrastructure adaptation to climate change, anthropogenic impacts, and population growth. The Arctic is an important socio-economic zone that hosts communities that rely on linear infrastructure such as highways, railways, and pipelines. The Arctic is also a vital region for industrial and energy sectors such as mines, hydropower stations, and forestry, as well as growing sectors such as tourism. The Intergovernmental Panel on Climate Change (IPCC) advises that climate change impacts the Arctic more immediately and more severely compared to other regions (Meredith et al., 2019). Hazard assessment in the Arctic requires understanding of how environmental conditions influence the engineering properties of frozen ground (Arenson et al., 2015). We review the literature and state-of-practice for geotechnical characterization in Arctic regions including consideration of climate change effects on environmental variables such as temperature, precipitation, and wind speed. The review consists of three main components: 1) review of current climate models including methods for stochastic generation of forward-looking synthetic data, 2) geotechnical models for changes to soil properties resulting from changes to climate and ground temperature profile, 3) state-of-practice for incorporating climate impacts into geotechnical design and analysis

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to assist in developing mitigation and adaptation solutions. We conclude by summarising and synthesizing information from the literature on climate change models and their influence on geotechnical properties, to suggest key areas of focus for future research and improvement to design practices for sustainable and resilient infrastructure.