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EUCOP 2023 Submission 7704

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Submission 7704

Title	Regional characteristics of rockwall permafrost in Central West Greenland – 68N
Track	Steep rock slope permafrost processes and hazards
Author keywords	Permafrost Rockwall Mountain Greenland Modeling
Abstract	<p>In Greenland, the public interest in landslides has increased since the 2017 Karrat event, which caused four casualties and the displacement of several settlements. A typical question asked by the stakeholders about this landslide concerns the role of permafrost and climate change. Answering is not straight forward, because in Greenland there is no knowledge of rockwall permafrost at the national scale to date. In order to start addressing the issue, Arctic DTU began researching rockwall permafrost in 2020 in the Qeqqata Kommunia, West Greenland, 68N. This area offers climatic characteristics ranging from maritime influence at the coastline, to dry continental climate towards the Greenland Icesheet (GrIs). Here, we monitor Ground Surface Temperature (GST) at elevations ranging from sea level to 1300 m.a.s.l. across the region. The GST data allow calibrating an empirical function linking atmospheric forcing – data from downscaled ERA5 reanalysis - to bedrock surface temperatures. This relation is then used to compute atmospheric boundary conditions for 1D and 2D numerical simulations of heat transfer at the landscape level for longer time scales. Model results are compared to temperature data from two lowland boreholes (100 m depth) and subsurface geophysical data - electrical resistivity tomography - acquired at each site describing freezing/thawing conditions. Overall, we observe sporadic mountain permafrost on the coastline, transitioning to continuous permafrost at elevations around 400 m.a.s.l., while towards the GrIs continuous permafrost is prevalent from sea level. By extrapolating the numerical simulations to 2100 (using emission scenarios RCP8.5 and 2.4), we observed a significant loss in rockwall permafrost. This is more dramatic at the coastline, where continuous permafrost is expected to retreat above 800 m.a.s.l on north facing slopes in the worst-case scenario. Overall, our results indicate fragile permafrost conditions on the mid-latitude coastline of West-Greenland.</p>
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