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Published in:
Polar 2018: Open Science Conference - Abstract Proceedings

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Mätzler, E., Bojesen, M. H., Caduff, R., Gottlieb, J., Helland, A., Ingeman-Nielsen, T., Langley, K., Mikkelsen, M., & Strozzi, T. (2018). Permafrost thaw related surface displacement in Qaanaaq Village, NW Greenland. In *Polar 2018: Open Science Conference - Abstract Proceedings* (pp. 438-438). Article Tue_240_CR-1_1840

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Tue_240_CR-1_1840

Permafrost Thaw Related Surface Displacement in Qaanaaq Village, NW Greenland

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The infrastructure of the village Qaanaaq in NW Greenland suffers from surface displacement due to permafrost thawing. The typical gable-roofed single-family wooden houses in Qaanaaq are constructed on shallow wooden foundations, which suffer from active layer slope movement and differential settlements from seasonal freeze-thaw cycles.

The aim of this investigation is to assess surface displacements in the Qaanaaq area of NW Greenland from a combination of remote sensing data and in situ measurements.

We have used a number of different techniques and data sources to assess ground movement around the settlement and neighbouring region. This allows a range of temporal and spatial scales to be addressed in the study as well as providing some means of cross-validation of results.

The study uses Sentinel-1 differential radar interferometry, DEM-differencing, long term GNSS survey, ground observations and base maps of the town to determine and validate surface displacements.

Assessment is challenging due to the lack of stable benchmarks in a region where it is likely that surface displacement is occurring non-linearly over a wider area. However, first results indicate that surface displacements occur in order of 3 - 15 cm/yr in the region.