

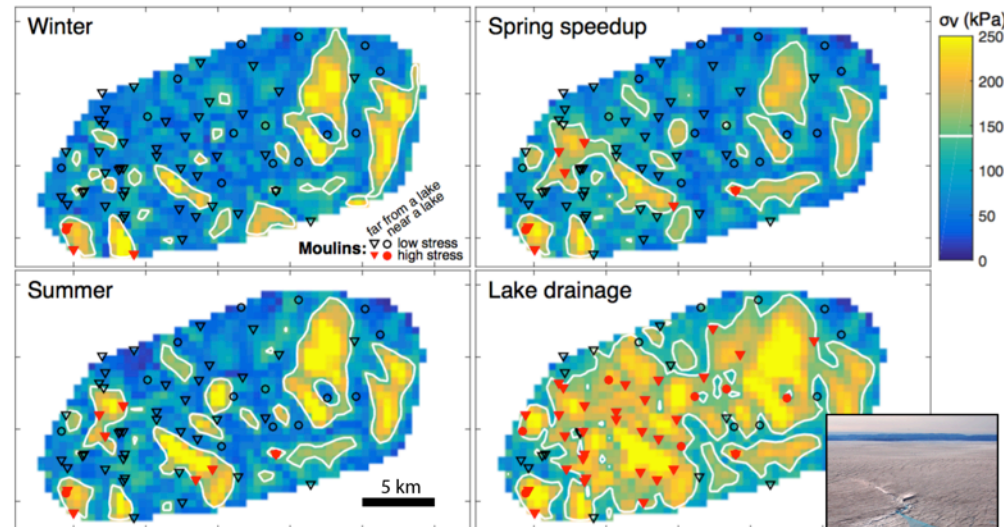
Widespread moulin formation during supraglacial lake drainages in Greenland

Objective

Moulins are the conduits that allow water melting on the Greenland Ice Sheet surface to drain to its base and cause the ice to flow faster. Forming a moulin in Greenland requires a crack on the surface that becomes filled with water that drives the crack through the ice. However, a large fraction of moulins in Greenland form away from the ice sheet's crevasse fields, making their formation a mystery.

Research

- Forced a model of ice sheet flow to match ice speed measurements at 11 GPS stations every two hours during winter, spring and summer.
- At most of the moulin locations in the area studied, the stresses predicted by the model were too small to fracture the ice and allow moulins to form during winter, spring, and most of summer.
- However, fracturing *did* occur at most moulin locations when large lakes on the surface of the ice drained catastrophically to the bed over a few hours.



Modeled surface stress at different times of year. The white contour is the stress at which the ice fractures. Moulins located where fracturing occurs are shown in red and those away from fractured areas are in black. Most moulins can only form during the lake drainage event.

Impact

These rare and brief lake drainages must be the cause of most of the moulins, and they therefore have a lasting impact on the flow of water into the ice sheet and the changes in the flow of the ice this causes.

Reference: Hoffman, M. J., M. Perego, L. C. Andrews, S. F. Price, T. A. Neumann, J. V. Johnson, G. A. Catania, and M. P. Luthi (2018), Widespread moulin formation during supraglacial lake drainages in Greenland, *Geophys. Res. Lett.*, 45. <https://doi.org/10.1002/2017GL075659>.