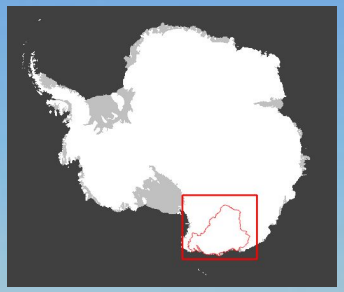

Modelling Subglacial Hydrology under Future Climate Scenarios in Wilkes Subglacial Basin, Antarctica

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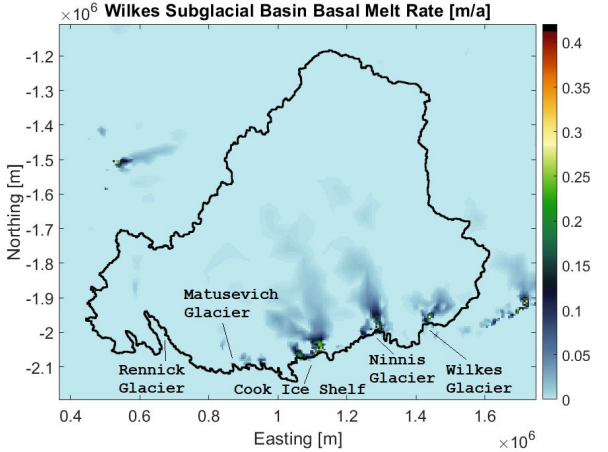
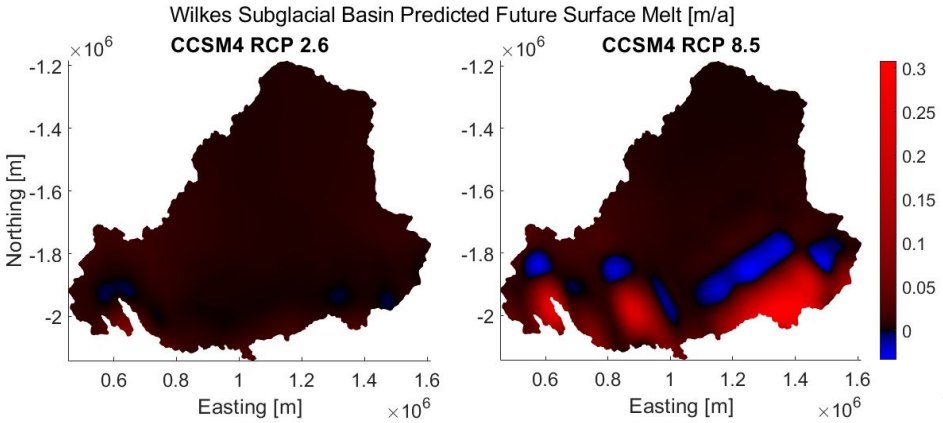
Wilkes Subglacial Basin

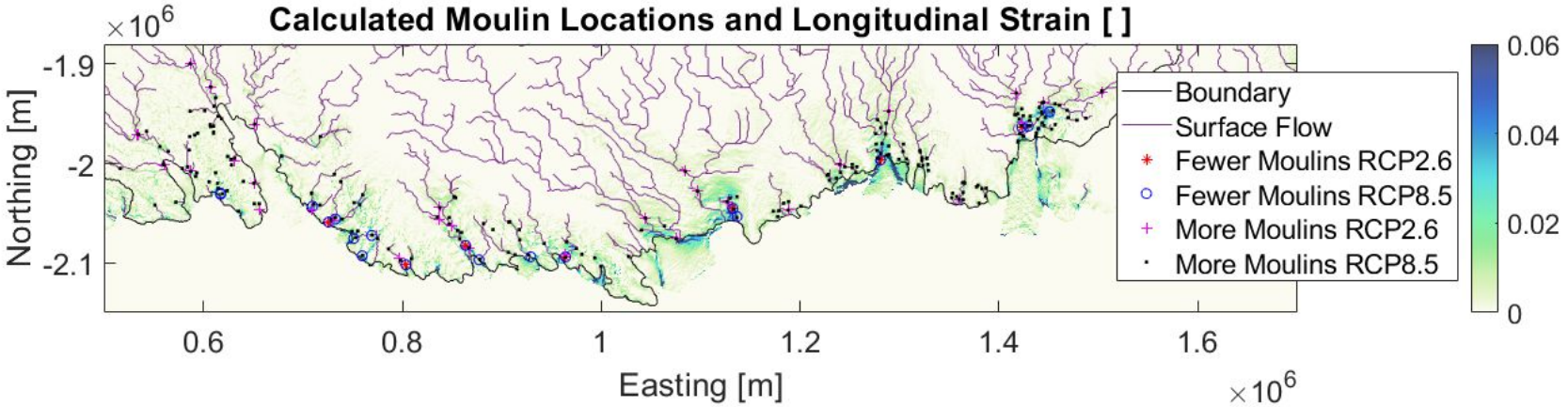
- Includes regions below sea level and glaciers with retrograde slopes (Morlighem et al., 2020)
- Subglacial hydrology impacts sliding velocities, discharge into ice shelf
- Use **GlaDS subglacial hydrology model** (Werder et al., 2013) along with **CMIP5 surface melt** predictions by the year 2100 (Barthel et al., 2020)





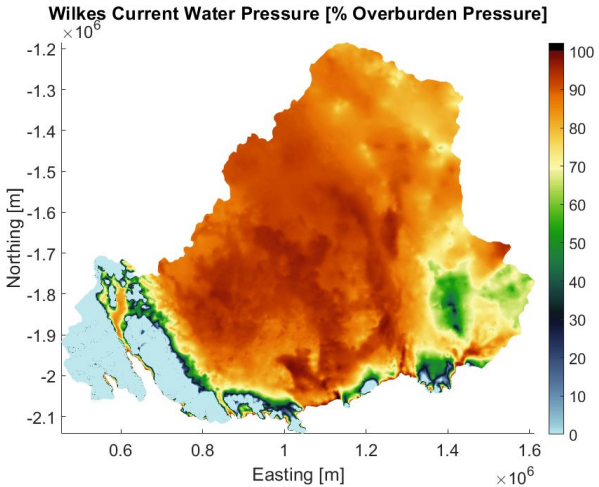
Model Runs: Current vs. Future Conditions

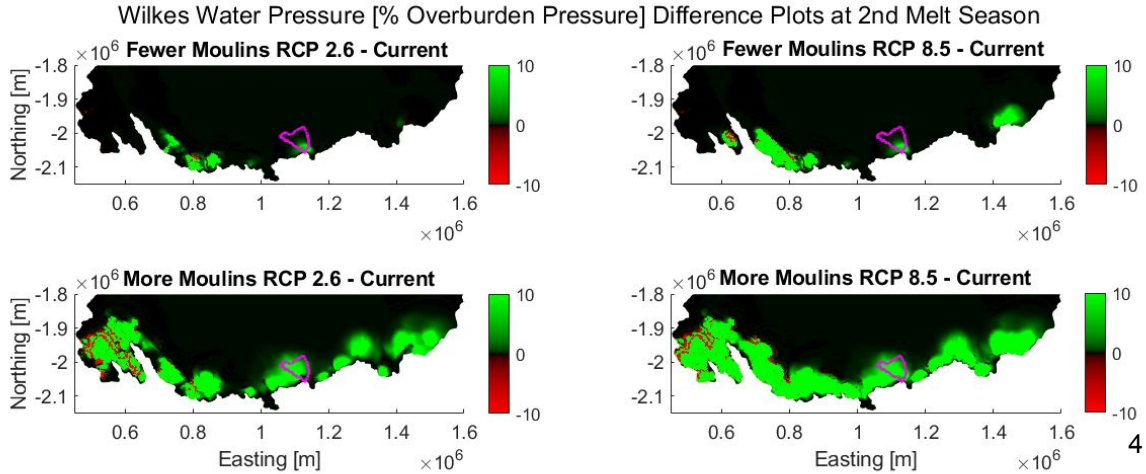
- Without vs. with moulins and surface melt respectively
- Set thresholds for surface strain rate and water accumulation to mimic triggers for hydrofracture
- Two different strain thresholds for fewer or more moulins
- Algorithm also ensures sufficient moulin catchment sizes



Model Outputs: Water Pressure

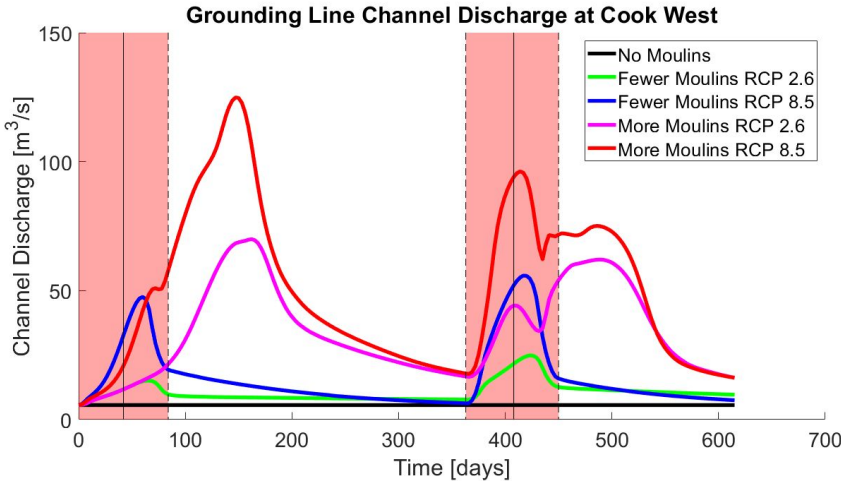
- Notable locations like Cook Ice Shelf and Mertz Glacier are marked by high pressures near the grounding line
- Runs with surface melt input generally have larger water pressures than the run that has no surface input

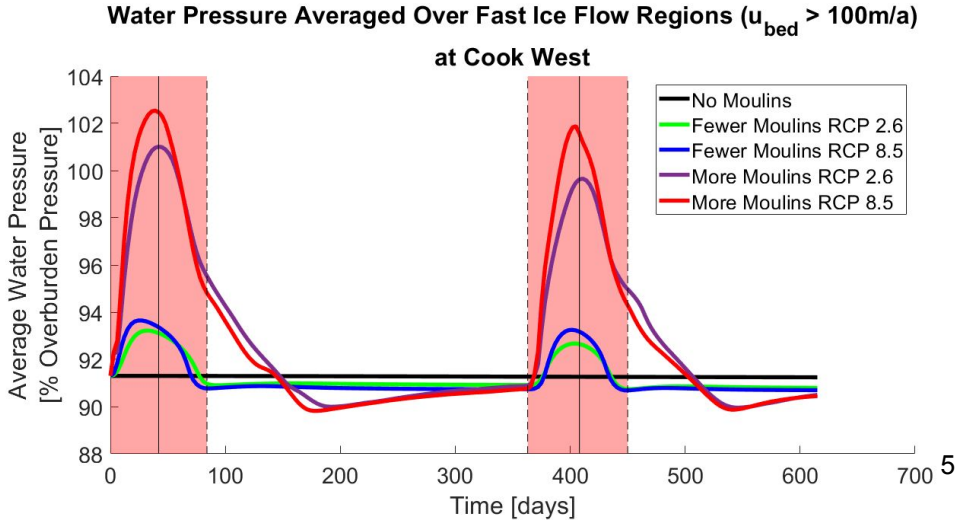




Model Outputs: Cook West Glacier

- Moulin runs also have much higher channel discharge than current run outputs, with ramp up during melt seasons
- Water pressure is affected more by increasing number of moulins than increasing melt from the higher RCP scenario





Summary

- Moulin runs with surface melt input increases water pressure and discharge which impacts sliding velocities
- A changing climate can impact ice dynamics and ice shelf melt rates through basal hydrology
- Water pressure is affected more by increasing number of moulins (lower strain threshold) than higher RCP scenario
- Unlike Greenland, average basal water pressure in the Wilkes region increases with number of moulins
- Additional work to determine accurate extent of moulins is important

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