

Centre for Hydrology
Coldwater Laboratory,
Canmore, Canada

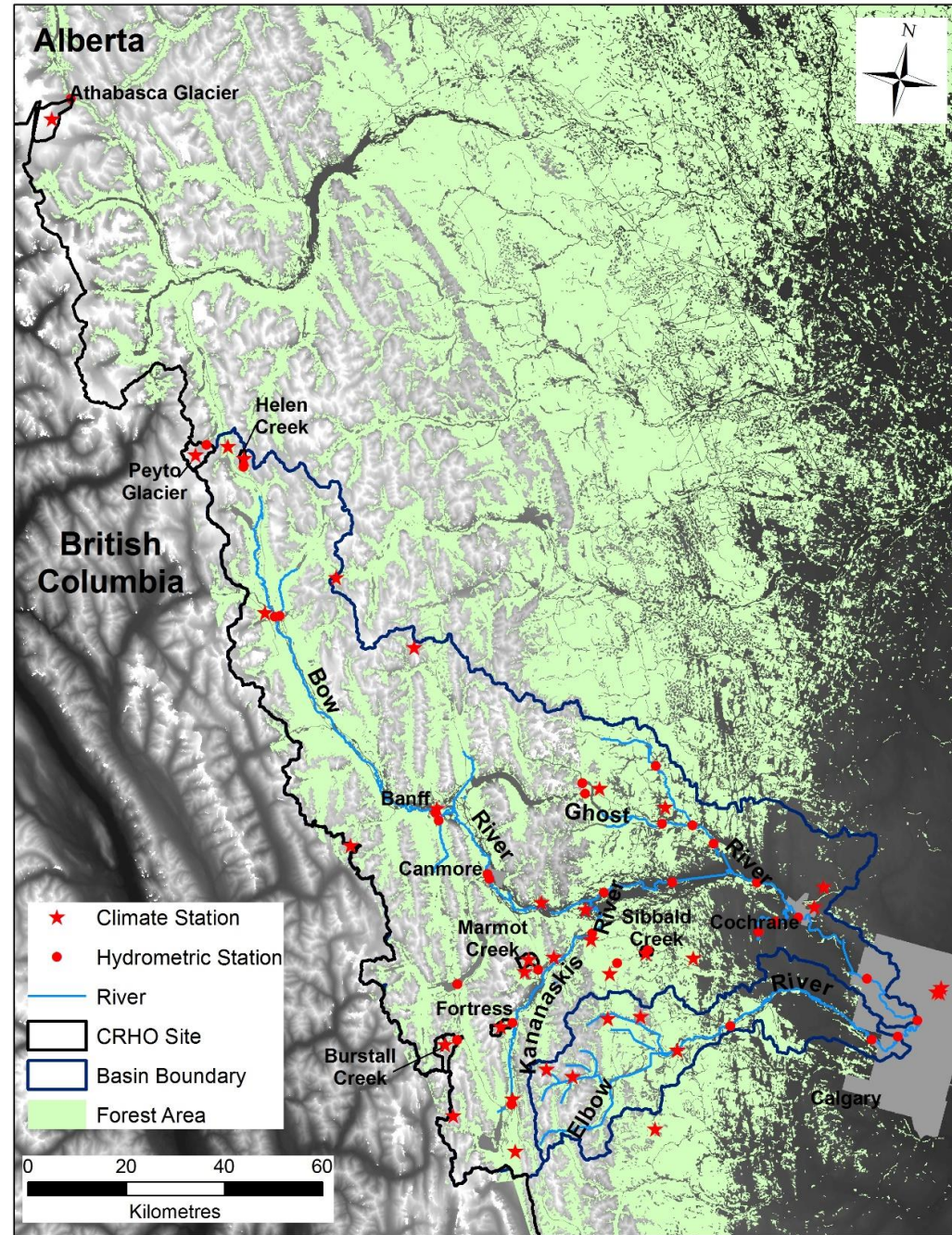
Observations in the Canadian Rockies Hydrological Observatory

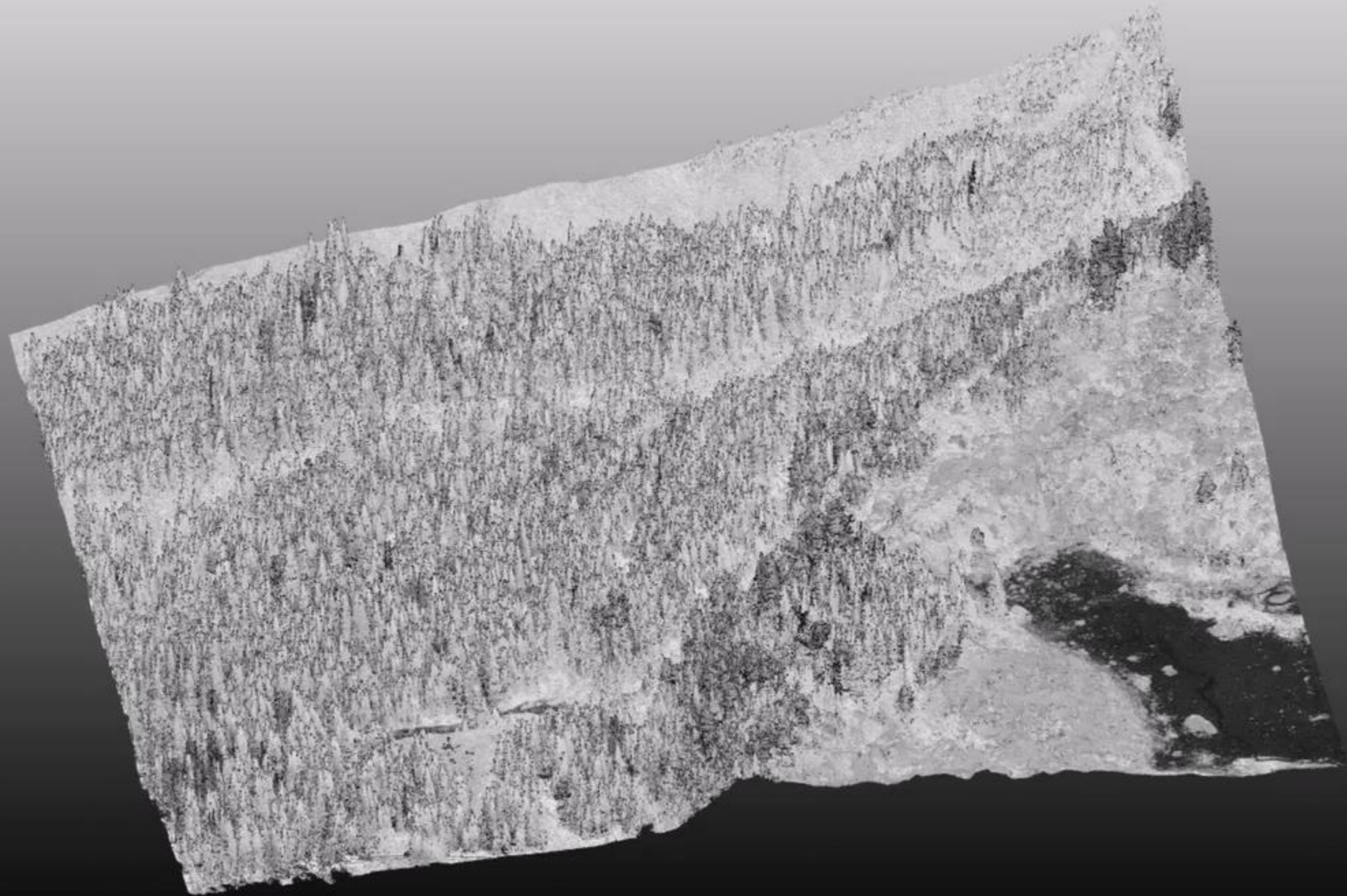
John Pomeroy, Phillip Harder,
Jacob Staines

Centre for Hydrology,
University of Saskatchewan,
Canmore & Saskatoon, Canada



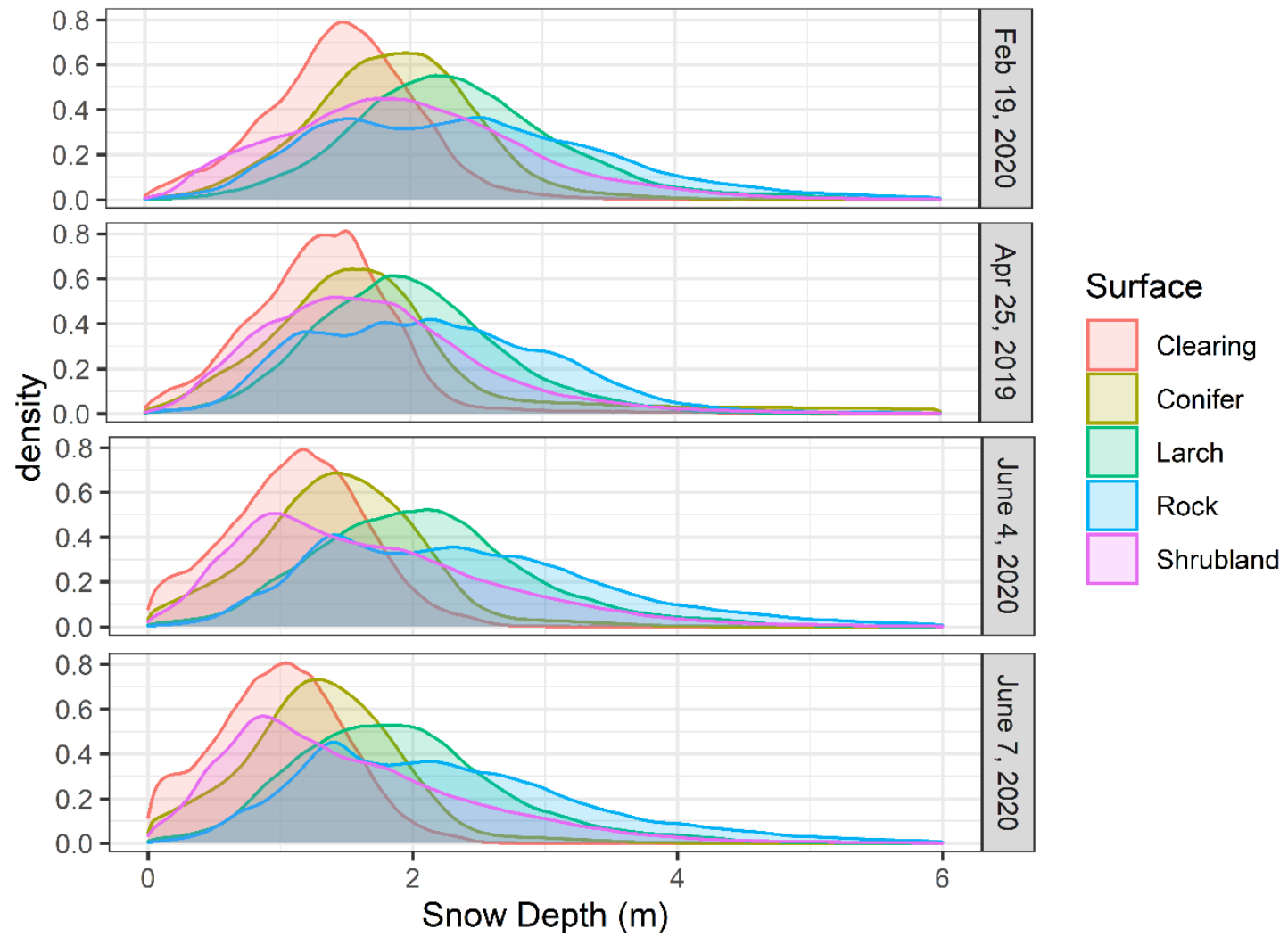
CRHO Stations





Spatial Distributions of Snow Depth

- Statistical representation of snowpack variability
- Discretizing the basin by landscape or hydrological response units reduces within-unit variability and produces reproducible statistics (Steppuhn and Dyck, 1974, *Estimating True Basin Snowcover*)

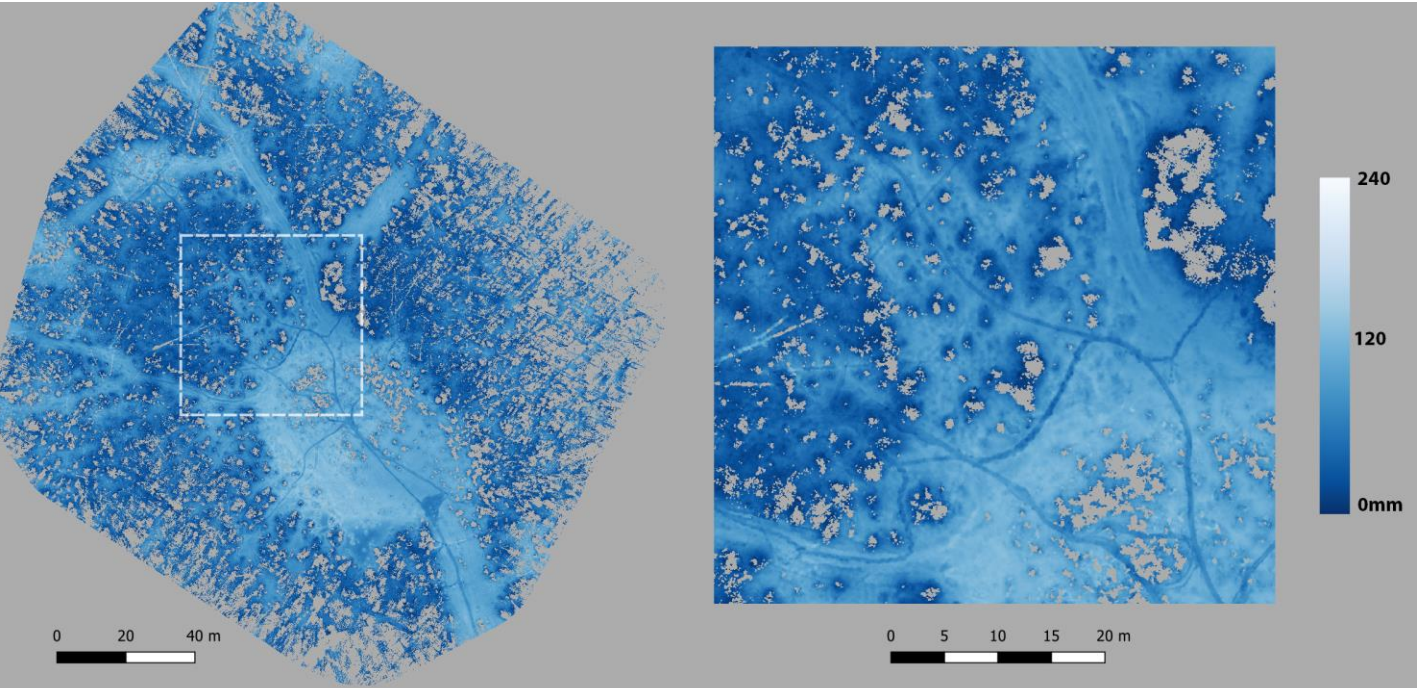


Snow depth variability segmented by HRU surface type for 4 flight dates

Subalpine Forest Detailed UAV-Lidar Depth Mapping

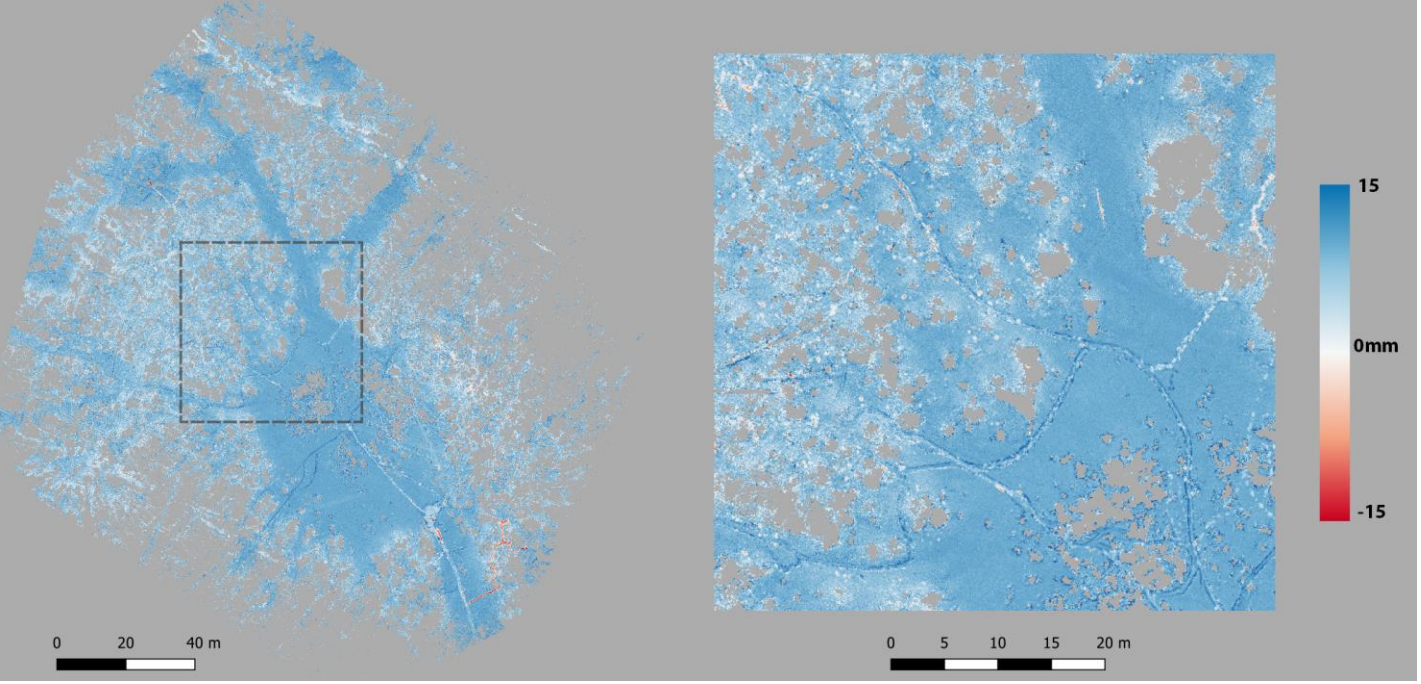
SWE maps

5 cm resolution
Each day
Forest and clearing densities



Δ SWE maps

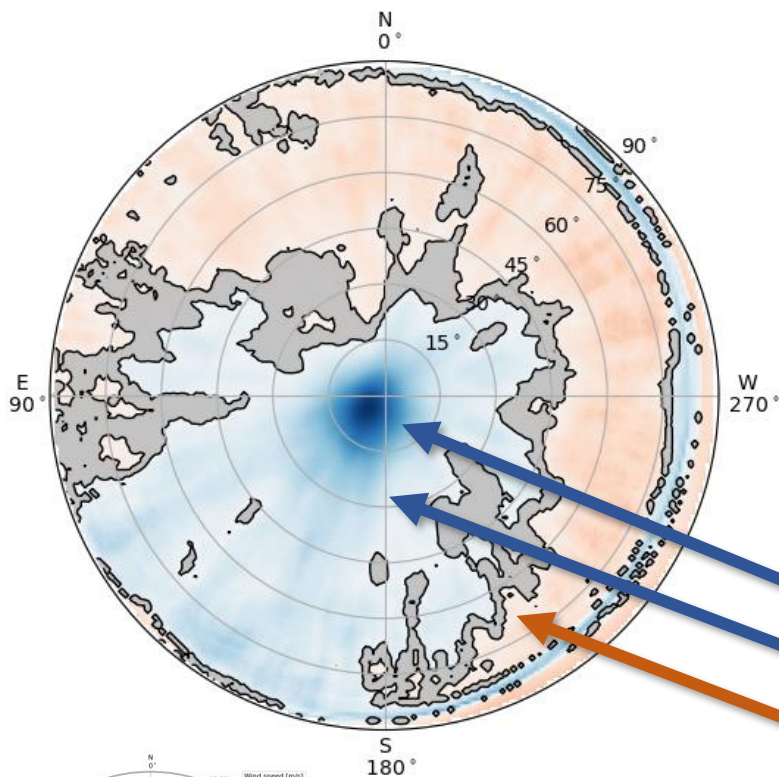
5 cm resolution
Each storm
Forest and clearing densities



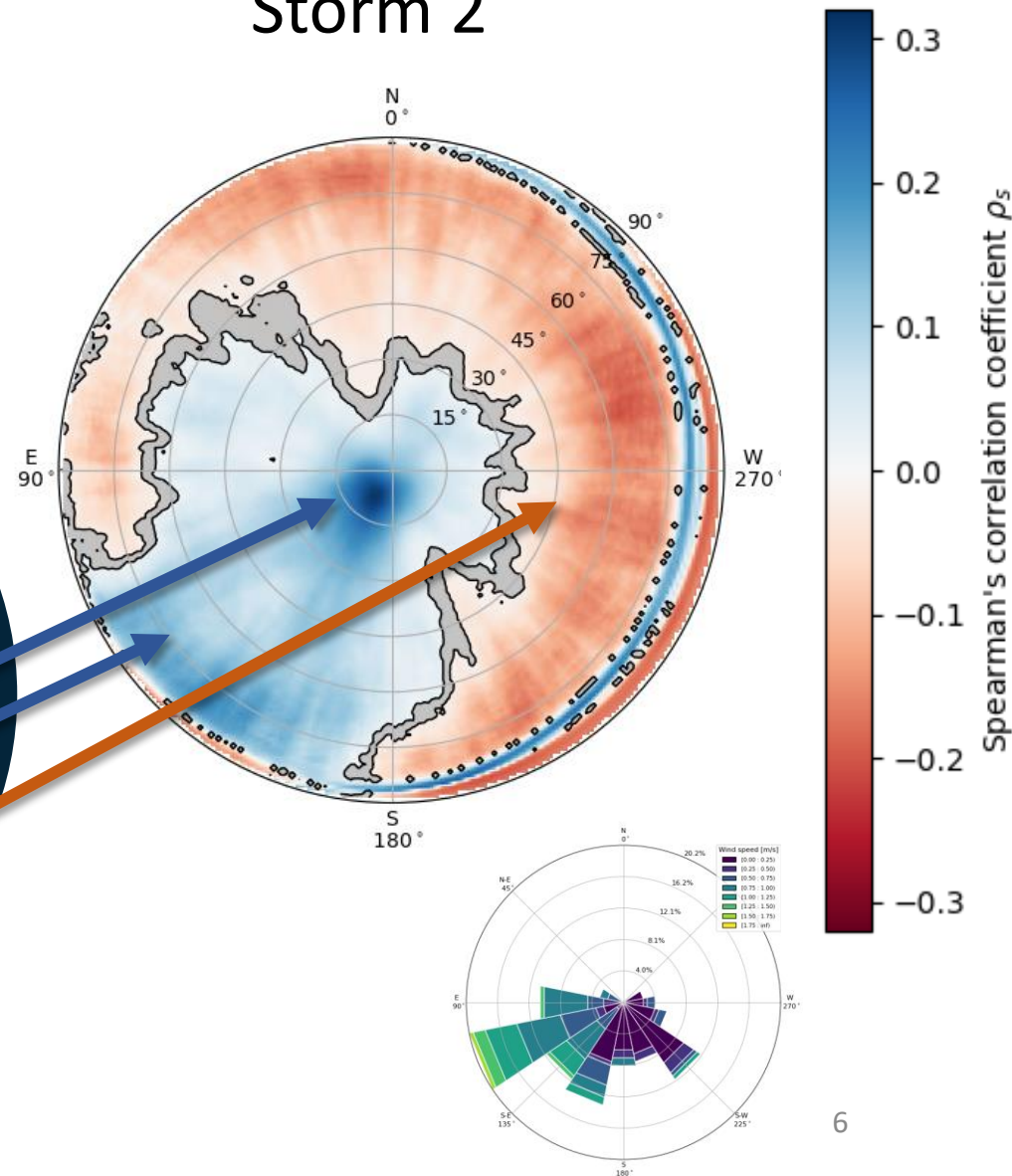
ΔSWE – light transmittance correlations

Asymmetrical snow interception

Storm 1



Storm 2



↑ ΔSWE with:

↑ overhead open sky

↑ upwind open sky

↓ downwind open sky

Over One Century of Observations at Peyto Glacier

Mass Balance:

- Early studies 1945
- 1966-present good records (IHD)
- LiDAR 2002-2009, 2017-2021

Streamflow:

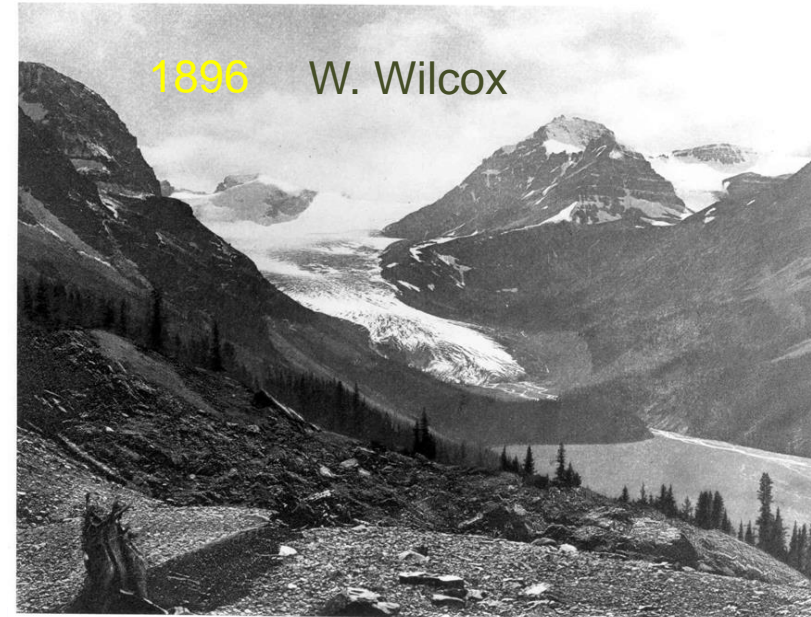
- 1967-1977 WSC Gauge
- 2008 runoff estimates on ice
- 2013-2021 USask Gauge

Meteorology

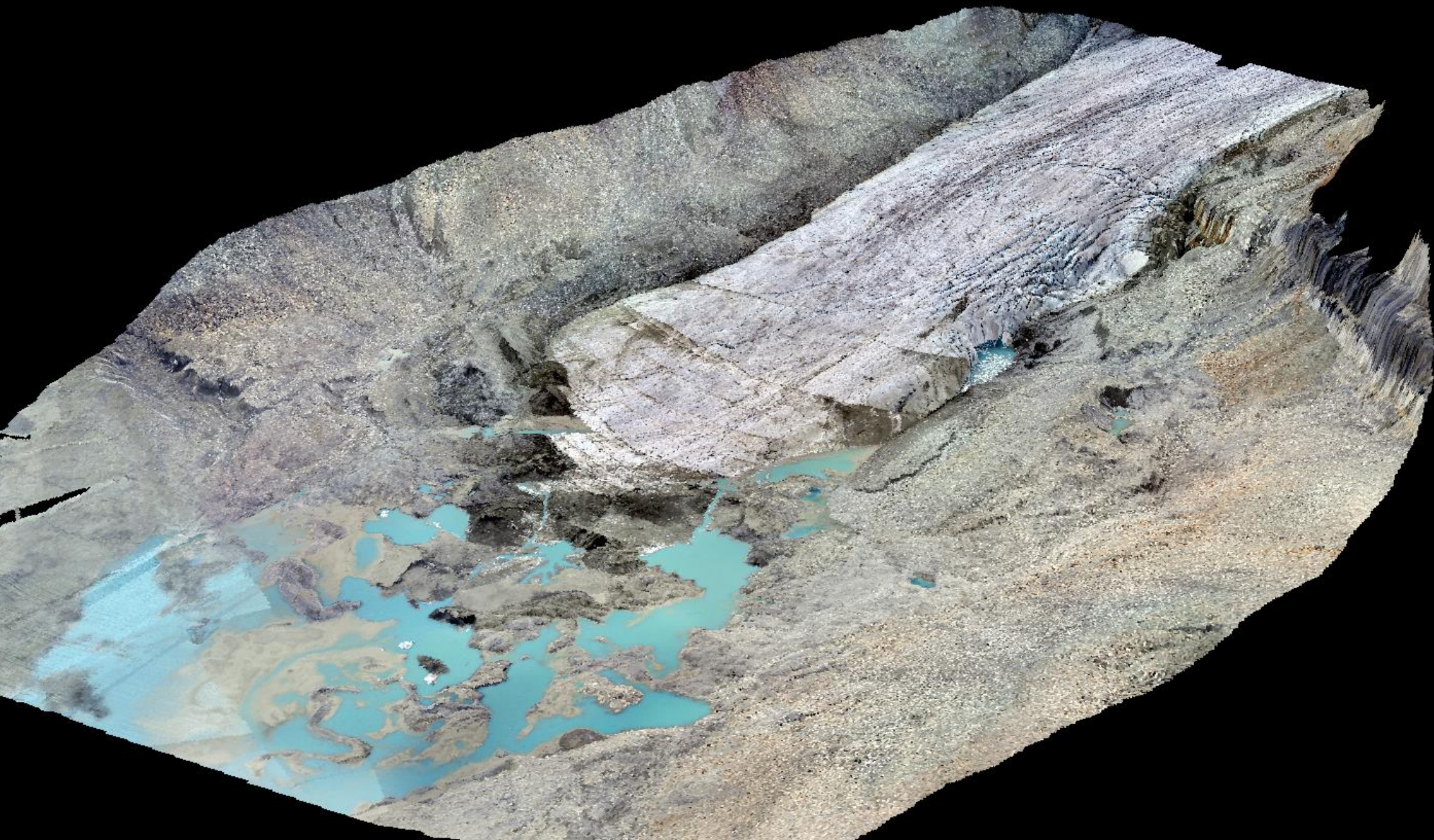
- 1966 summer observations
- 1970 automated summer obs
- 2002 automatic weather stations
 - Off glacier stations by hut
 - 3 ice stations

Process Studies

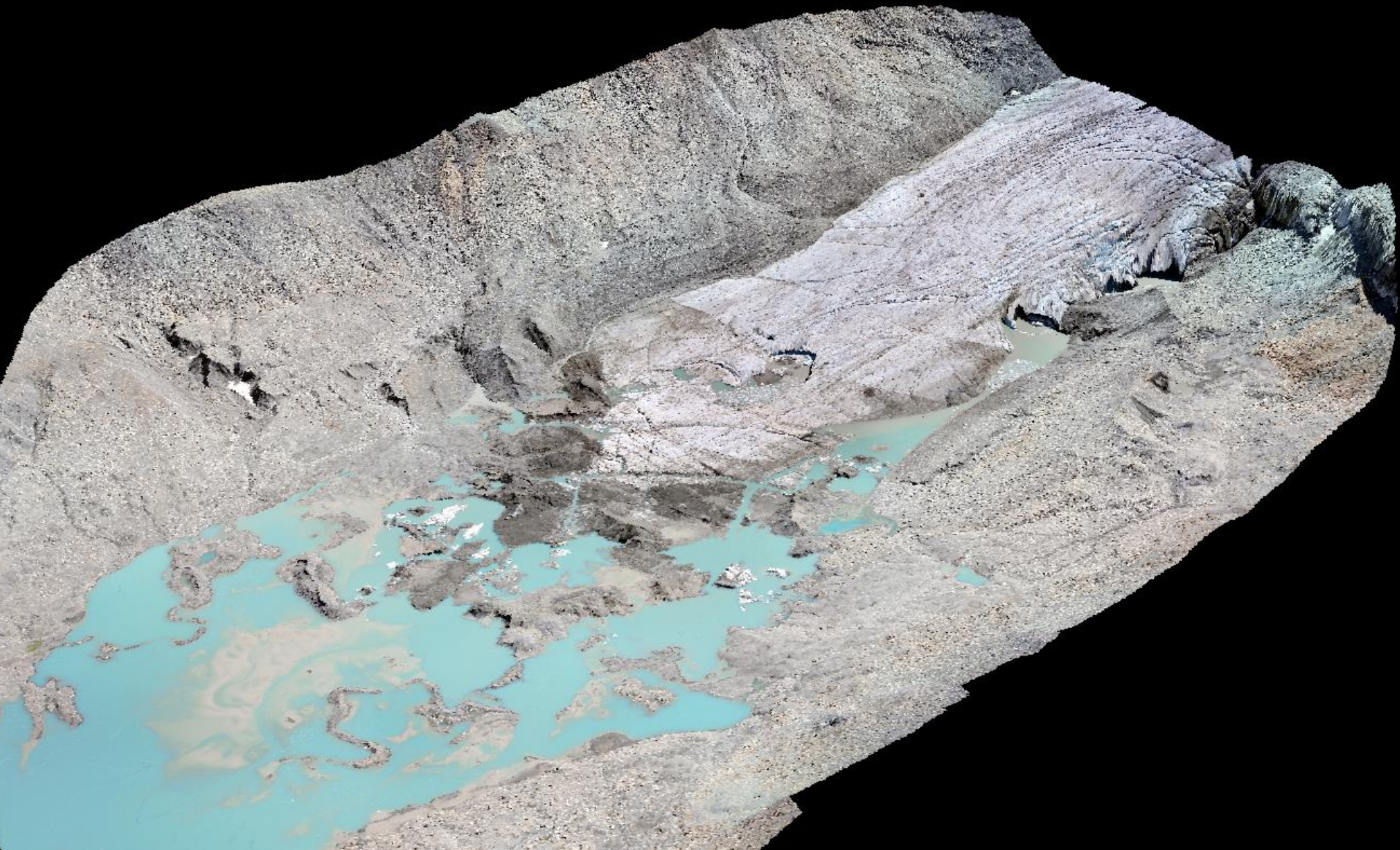
- Radiation (Goodison, Young, Munro)
- Turbulent transfer (Munro)
- Sub-glacial flow



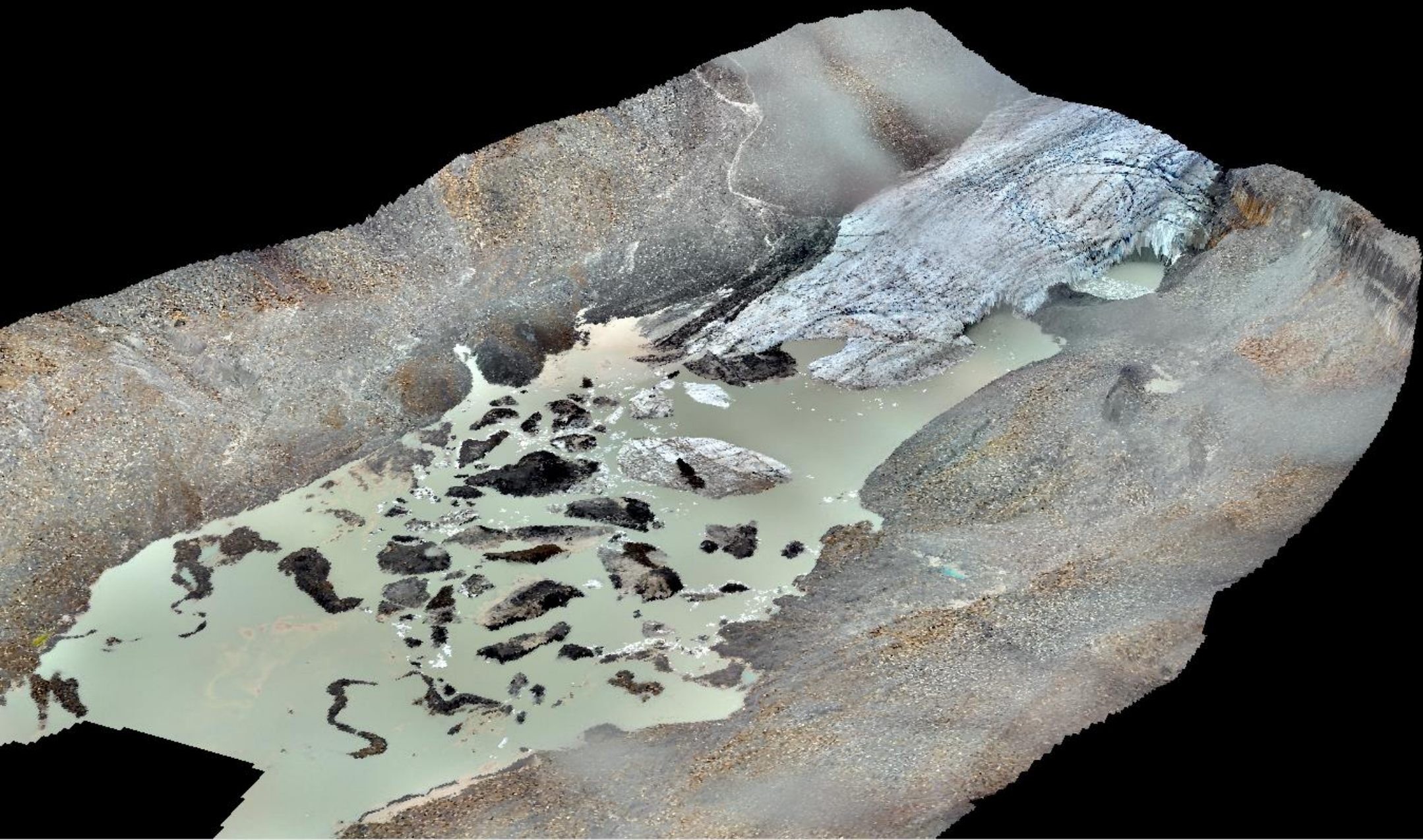
Peyto Glacier August 27, 2019



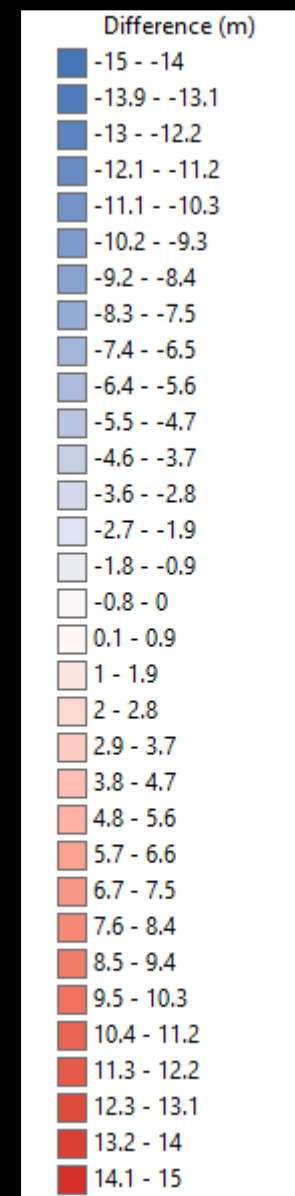
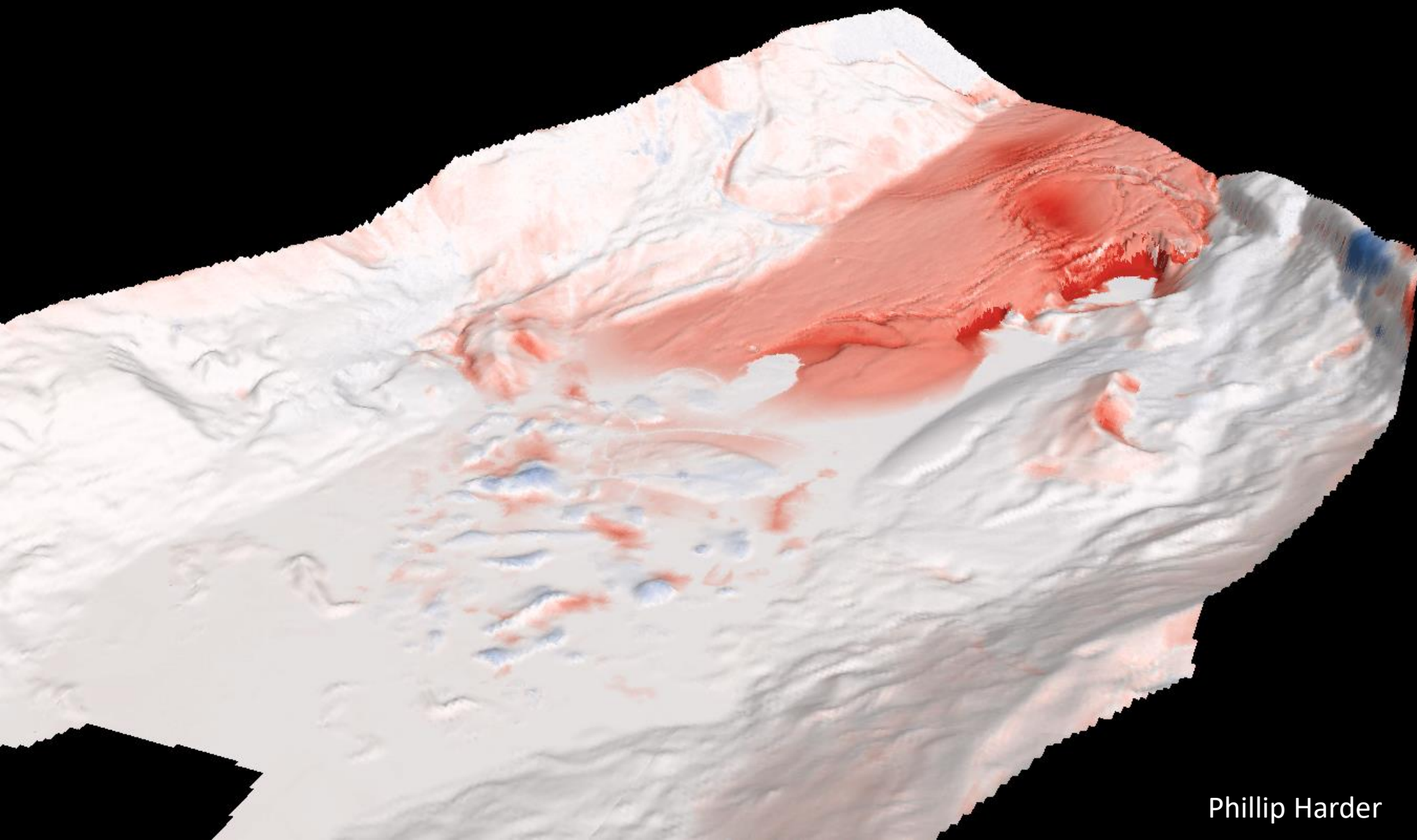
Peyto Glacier August 25, 2020



Peyto Glacier August 19, 2021



Peyto Glacier 2021-2019 surface difference



Phillip Harder

Data Publications

- Fang X., Pomeroy J.W., DeBeer C.M., Harder P. and Siemens E., (2019), Hydrometeorological data from Marmot Creek Research Basin, Canadian Rockies., Earth System Science Data, 11 , 455:471, doi: 10.5194/essd-11-455-2019
- Pradhananga D., Pomeroy J.W., Aubry-Wake C., Munro S., Shea J., Demuth M.N., Kirat N.H., Menounos B. and Mukherjee K., (2021), Hydrometeorological, glaciological and geospatial research data from the Peyto Glacier Research Basin in the Canadian Rockies., Earth System Science Data, 13 , 2875:2894, doi: 10.5194/essd-13-2875-202
- Rasouli K., Pomeroy J.W., Janowicz J.R., Williams, T.J. and Carey S.K. , (2019), A long-term hydrometeorological dataset (1993-2014) of a northern mountain basin: Wolf Creek Research Basin, Yukon Territory, Canada., Earth System Science Data, 11 , 89:100, doi: 10.5194/essd-11-89-2019

<https://research-groups.usask.ca/hydrology/data.php>