



1. Arctic Sea Ice Melt Ponds

Significance

Melt ponds are seasonal shallow water bodies that are formed by the accumulation of melt in the low-lying regions of sea ice, that begin forming during the Arctic Boreal Spring and last into the late summer.



Melt Ponds Credit: NASA

The presence of these ponds lowers the albedo of sea ice by 25%, and accelerates the loss of sea ice.

Results

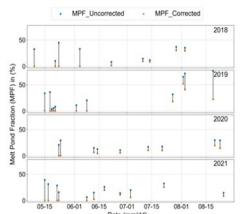


Figure shows the time-series of corrected and uncorrected MPF from 2018 to 2021, obtained from S-2.

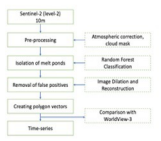
Research Questions and Methods

- How do melt ponds evolve across different melt seasons?
- How well optical imageries of Sentinel-2 perform in identifying individual melt ponds?
- How significant are the effects of brush and submerged ice in estimating true Melt Pond Fraction (MPF)?

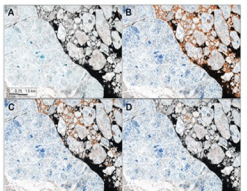


Study Area

- The study comprises of ~150 km² off the northern coast of Alaska and Canada, near Banks Island.
- The study area is located near Beaufort gyre. This region has witnessed significant loss of multi-year ice in recent decades.



Schematic Representation of Workflow



Panel A shows a true color S-2 image acquired on June 27, 2020, panel B shows the melt ponds obtained from RF classification overlaid on the S-2 image. The blue regions represent true melt ponds and the orange regions represent submerged and brush ice misclassified as melt ponds, panel C shows both true and false melt ponds after the application of the morphological dilation algorithm, and the panel D shows the true and false melt ponds after the application of the morphological reconstruction algorithm

2. River Ice

Significance

The Copper river originates from the Copper glacier in Wrangell mountains, located in the south-central Alaska.



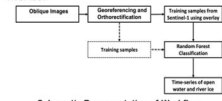
Study Area

Every year, the river undergoes freeze-up in late November/early-December and becomes completely ice free in summer. The river plays a vital role in the subsistence practices of the local population.

Our study utilizes the backscatter intensity sigma⁰ obtained from S-1 to construct a time-series of the river freeze-up/melt.

Research Questions and Methods

- How do the melt/freeze-up cycles compare with previous years?
- How does S-1 perform in identifying open water and river ice?



Schematic Representation of Workflow

Results

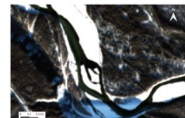


Figure shows a true color S-2 imagery acquired on October 30, 2020 over the study area.



Figure shows the oblique photo captured on October 31, 2021 by a stationary camera installed and operated by UAF.



Figure shows the oblique photo, georeferenced and orthorectified by using the python package created and maintained by Sebastian Buchelt of University of Wuerzburg.

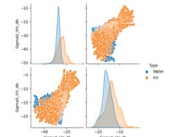
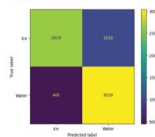


Figure shows the distribution of backscatter intensity values by class.



Confusion matrix of RF classification

Future Work

- Investigate the performance of RF classification using PCA analysis.
- Perform the RF classification on the oblique photographs.
- Create a time-series of water and river ice.