Advancing Arctic coastal erosion measurement and monitoring through UAV-SfM and object-based image analysis – PhD Overview

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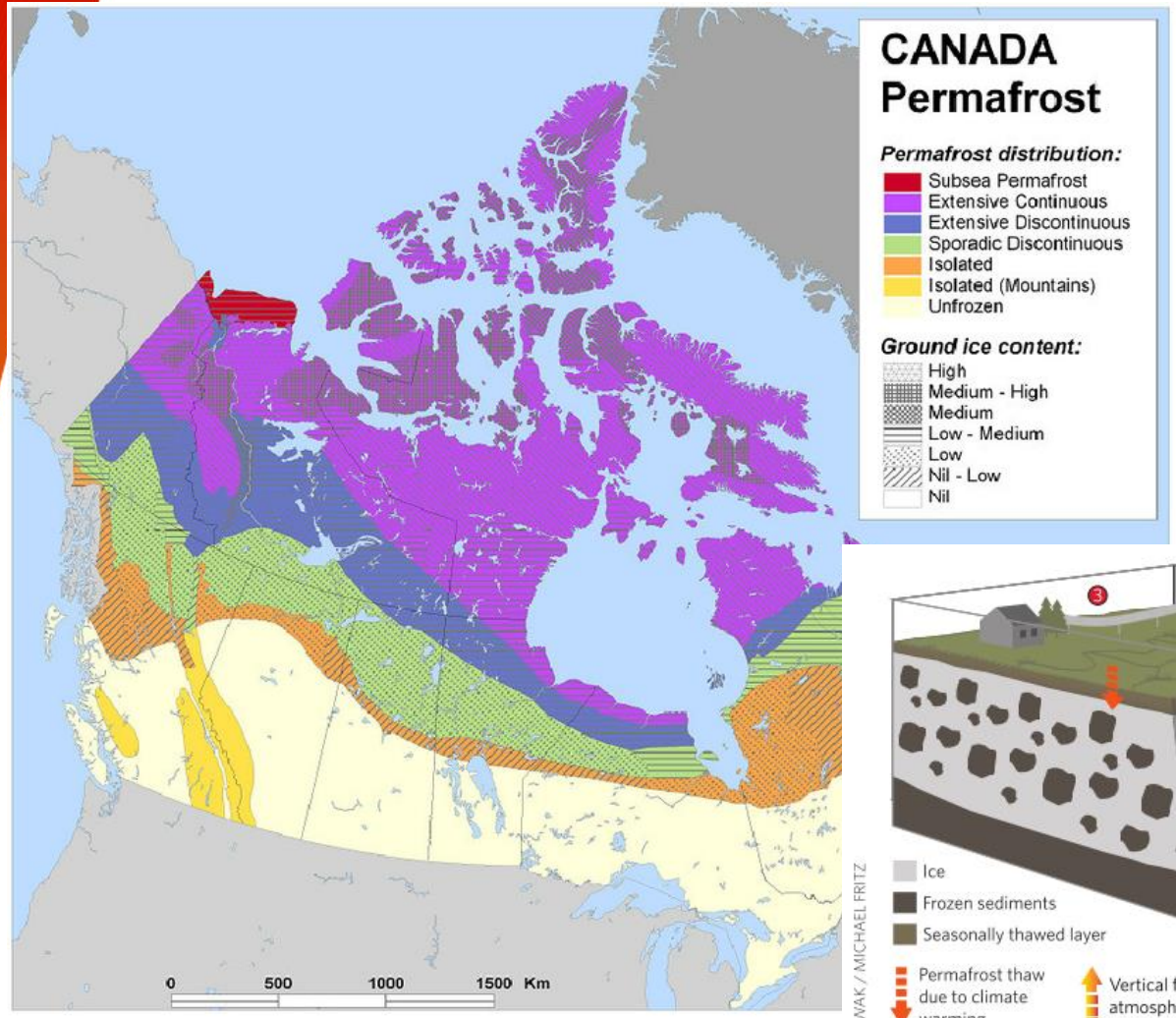
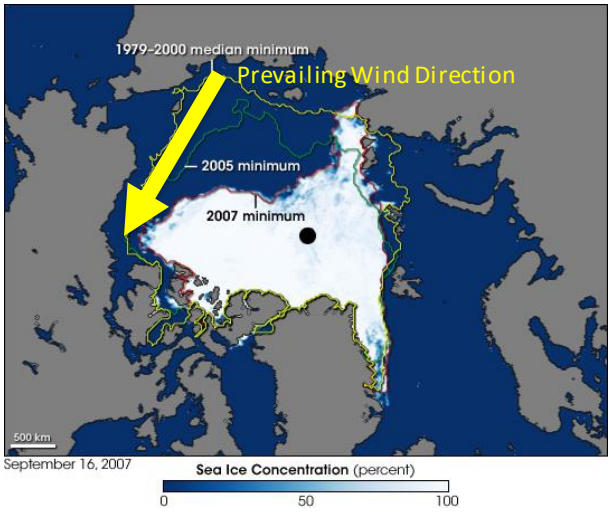
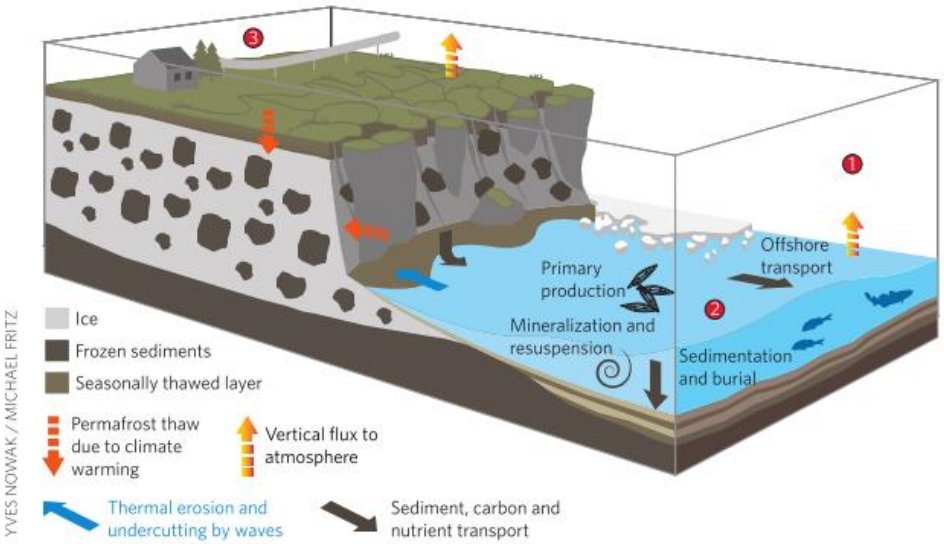
Arctic Coasts

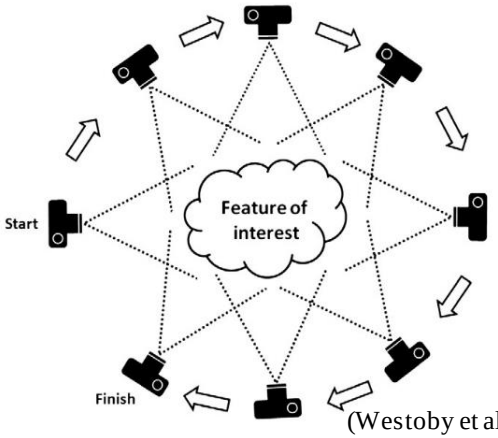


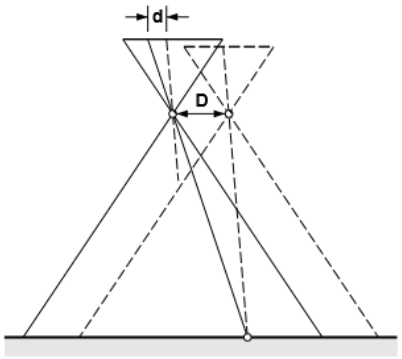




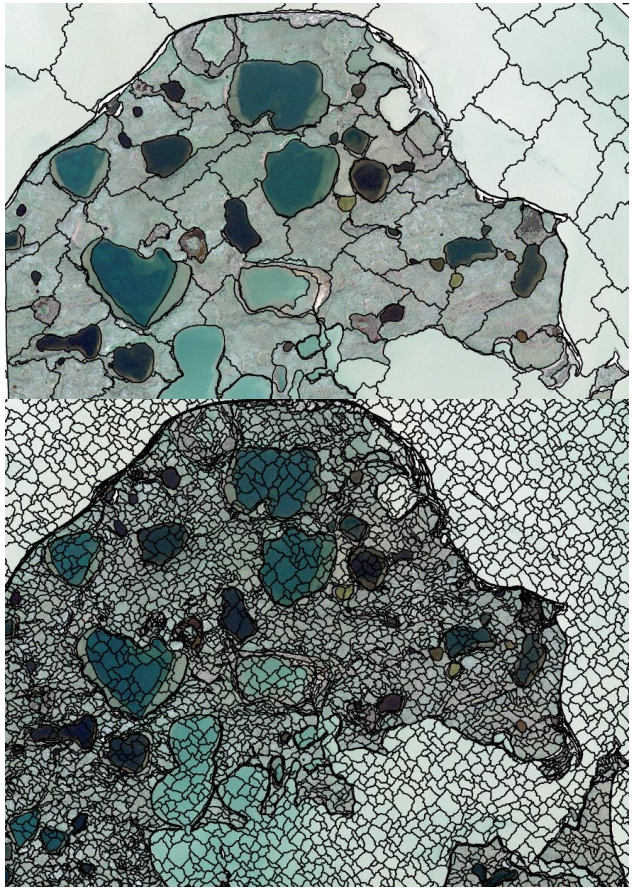
Research Objectives

Primary objective: advance the measurement of Arctic coastal erosion by focusing on two emerging technologies. (UAV-SfM and OBIA)





(Westoby et al., 2012)



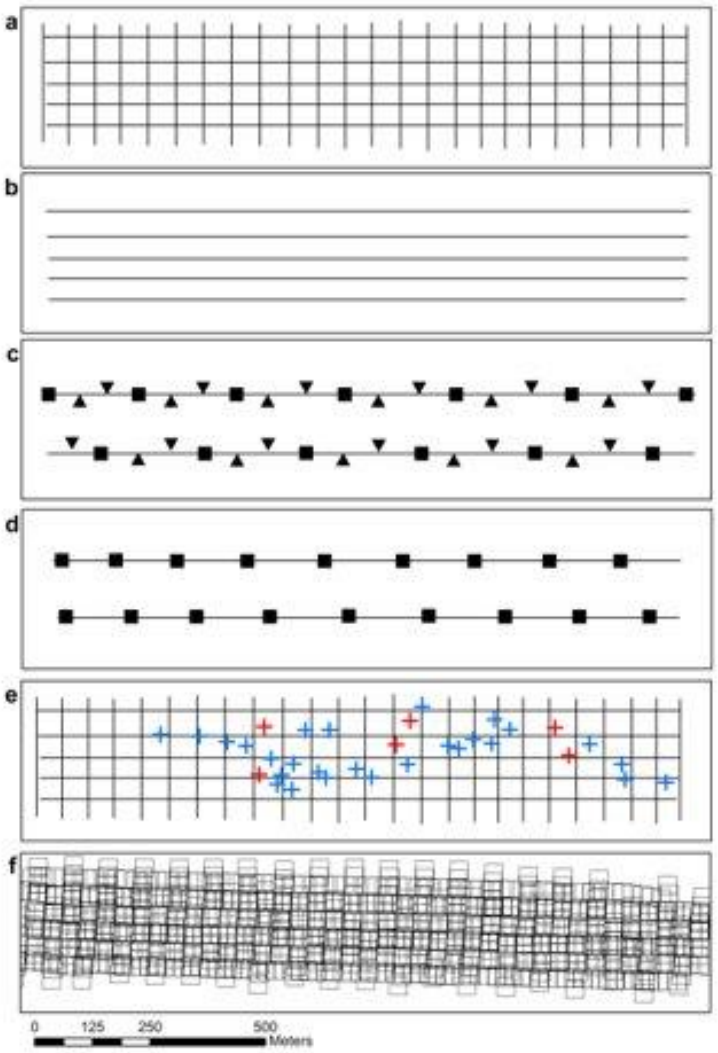
Themes:

1. Planimetric and volumetric quantification
2. Multi-proxy analysis
3. OBIA feature extraction

Thesis Components

- Paper 1: Arctic coastal erosion: UAV-SfM data collection strategies for planimetric and volumetric measurements (*Arctic Science*)
- Paper 2: UAV-SfM and geographic object-based image analysis for multi-temporal planimetric and volumetric erosion of Arctic coasts (*Canadian Journal of Remote Sensing*)
- Paper 3: Multiscale object-based classification and feature extraction along Arctic coasts (*Remote Sensing*)
- Paper 4: Towards broad-scale Arctic multi coastline proxy delineation based on object-based image classifications (*Coasts* – in preparation)

Paper 1: Arctic coastal erosion: UAV-SfM data collection strategies for planimetric and volumetric measurements



a) Cross hatch/Perpendicular flight lines

b) Parallel flight lines

c) Nadir (square) and Oblique images (triangle)

d) Nadir images

e) Target locations
Red - GCP
Blue - Independent check points

f) Image block

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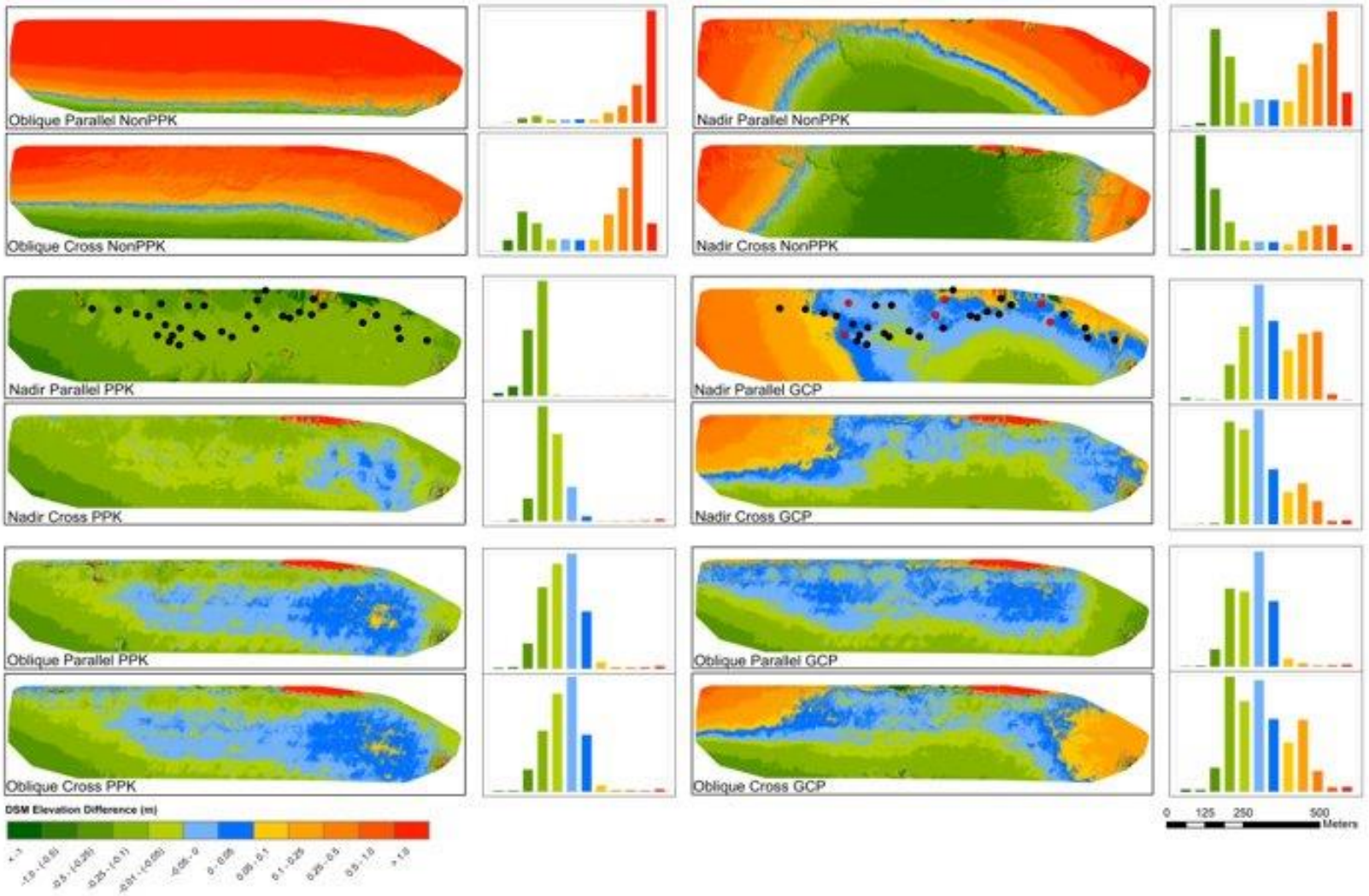
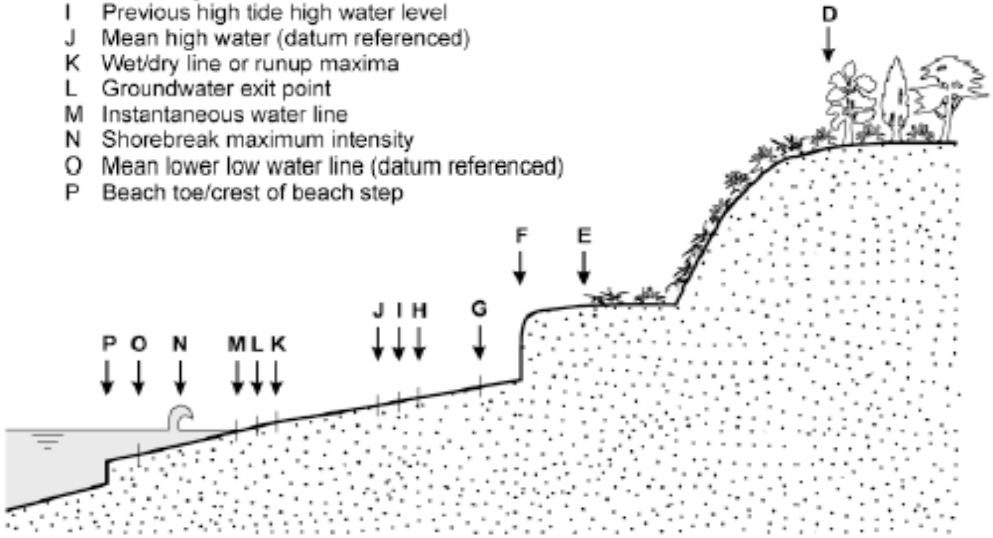
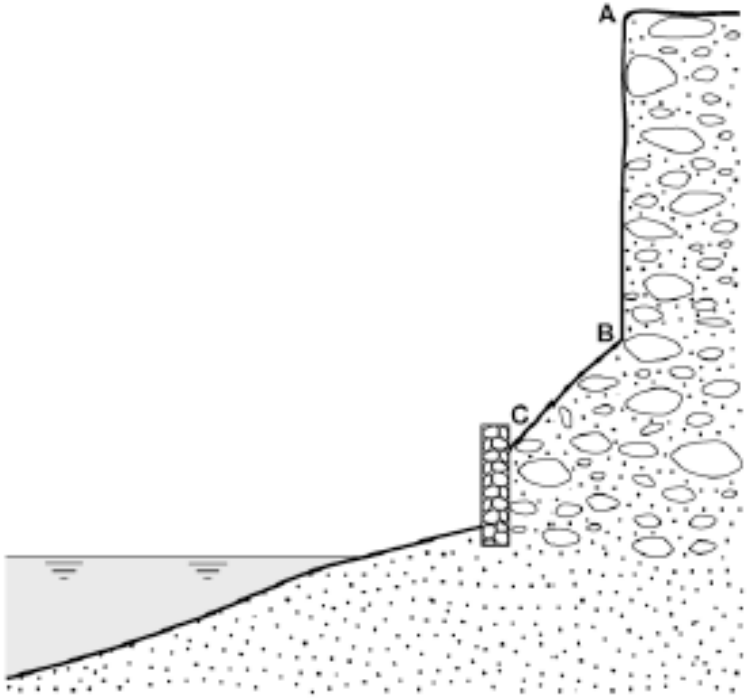


Multi-proxy analysis - What's a coastline?

KEY

A Bluff top/cliff top
B Base of bluff/cliff
C Landward edge of shore protection structure
D Seaward stable dune vegetation line
E Seaward dune vegetation line
F Erosion scarp
G Storm/debris line
H An old high tide water level
I Previous high tide high water level
J Mean high water (datum referenced)
K Wet/dry line or runup maxima
L Groundwater exit point
M Instantaneous water line
N Shorebreak maximum intensity
O Mean lower low water line (datum referenced)
P Beach toe/crest of beach step





Boak and Turner, 2005

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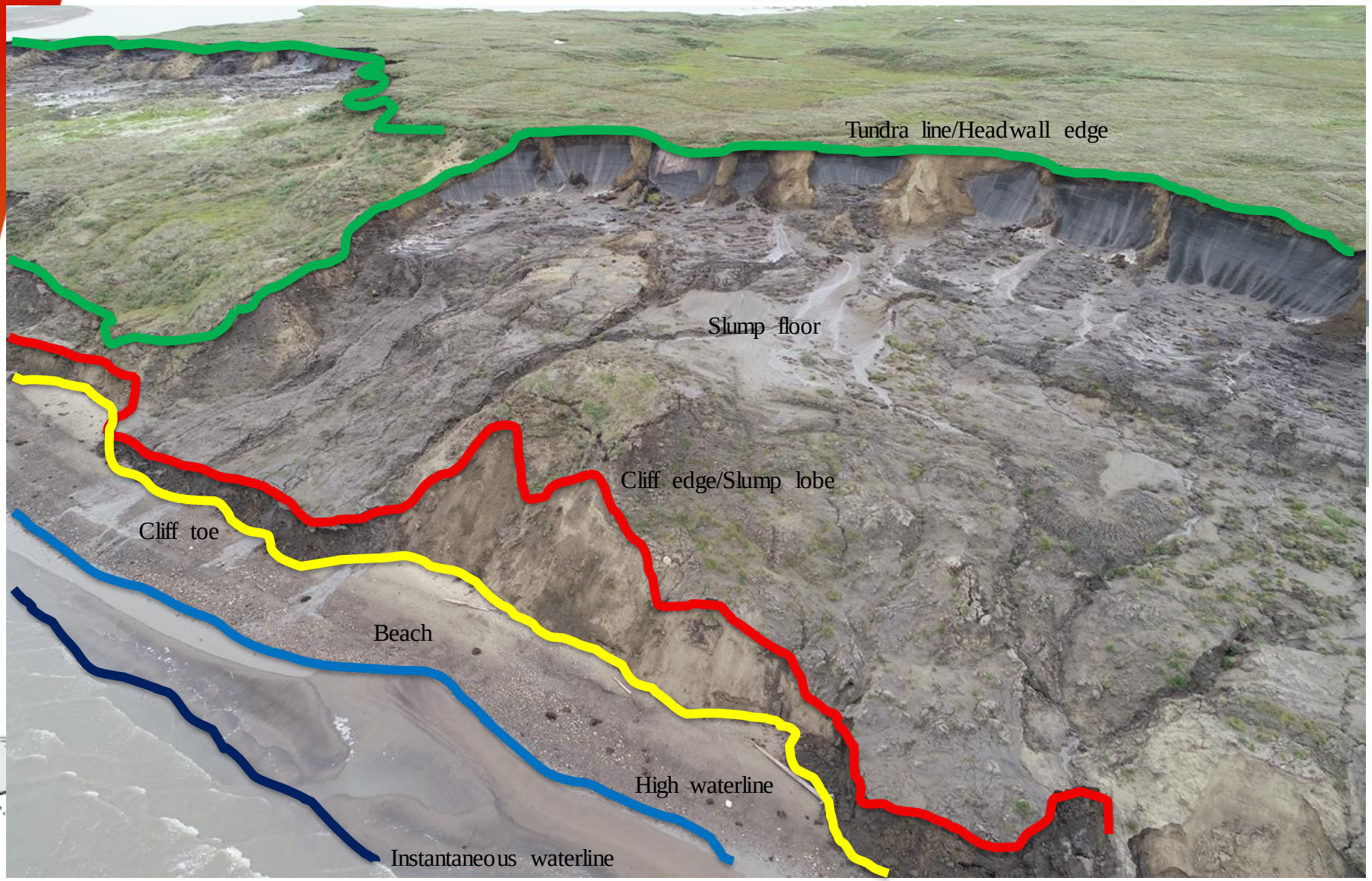
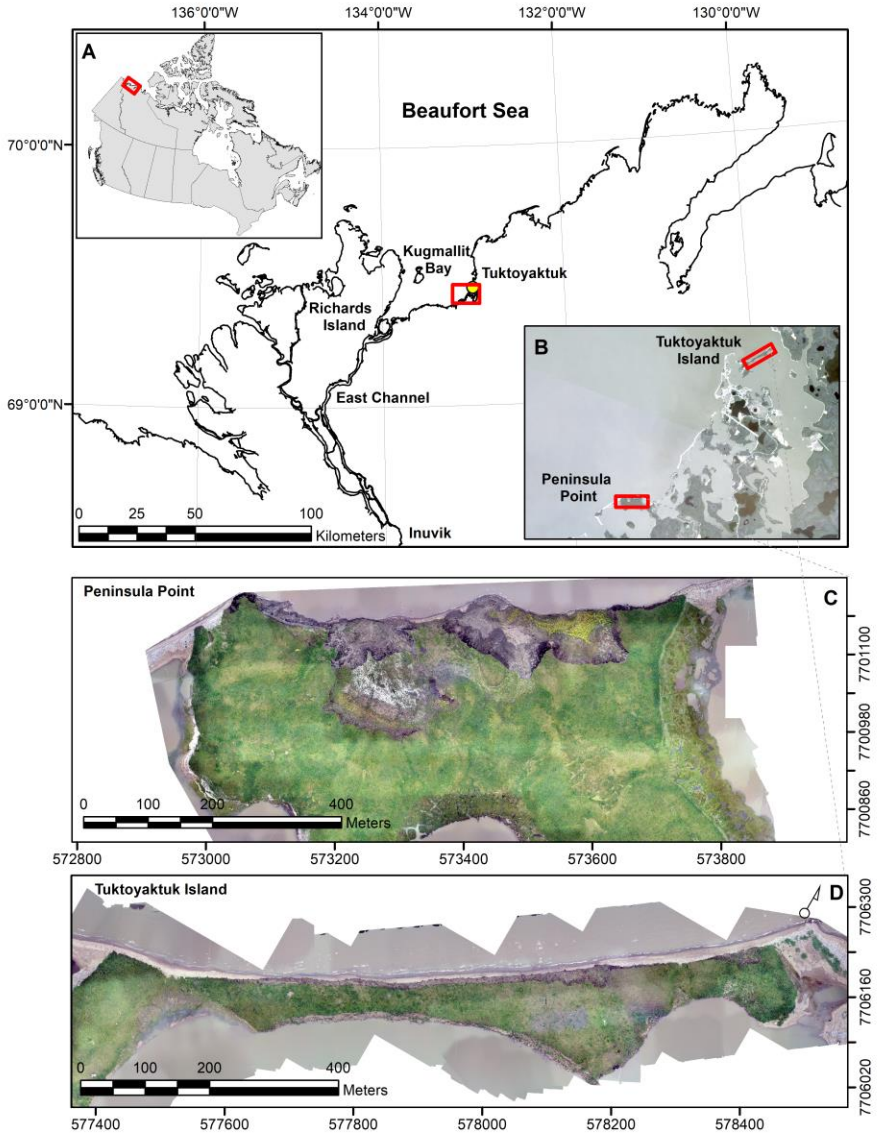
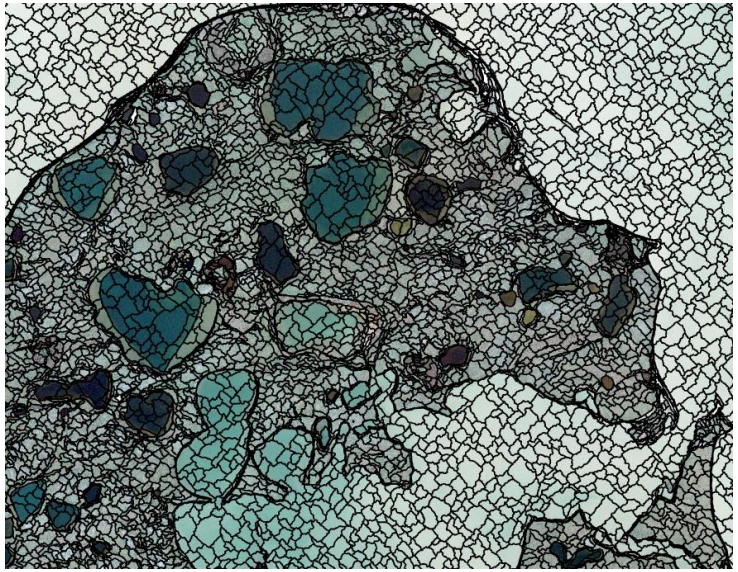
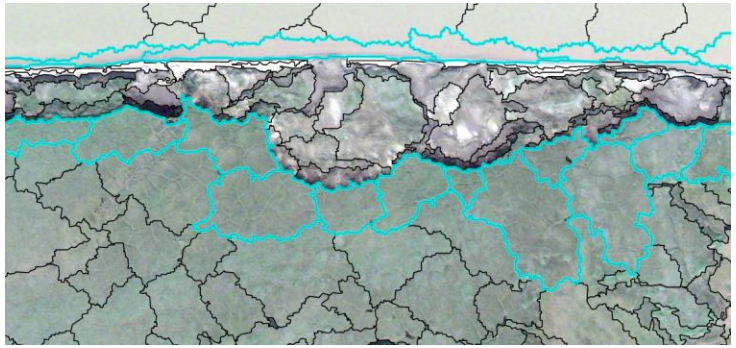


Paper 2: UAV-SfM and geographic object-based image analysis for multi-temporal volumetric erosion of Artic coasts







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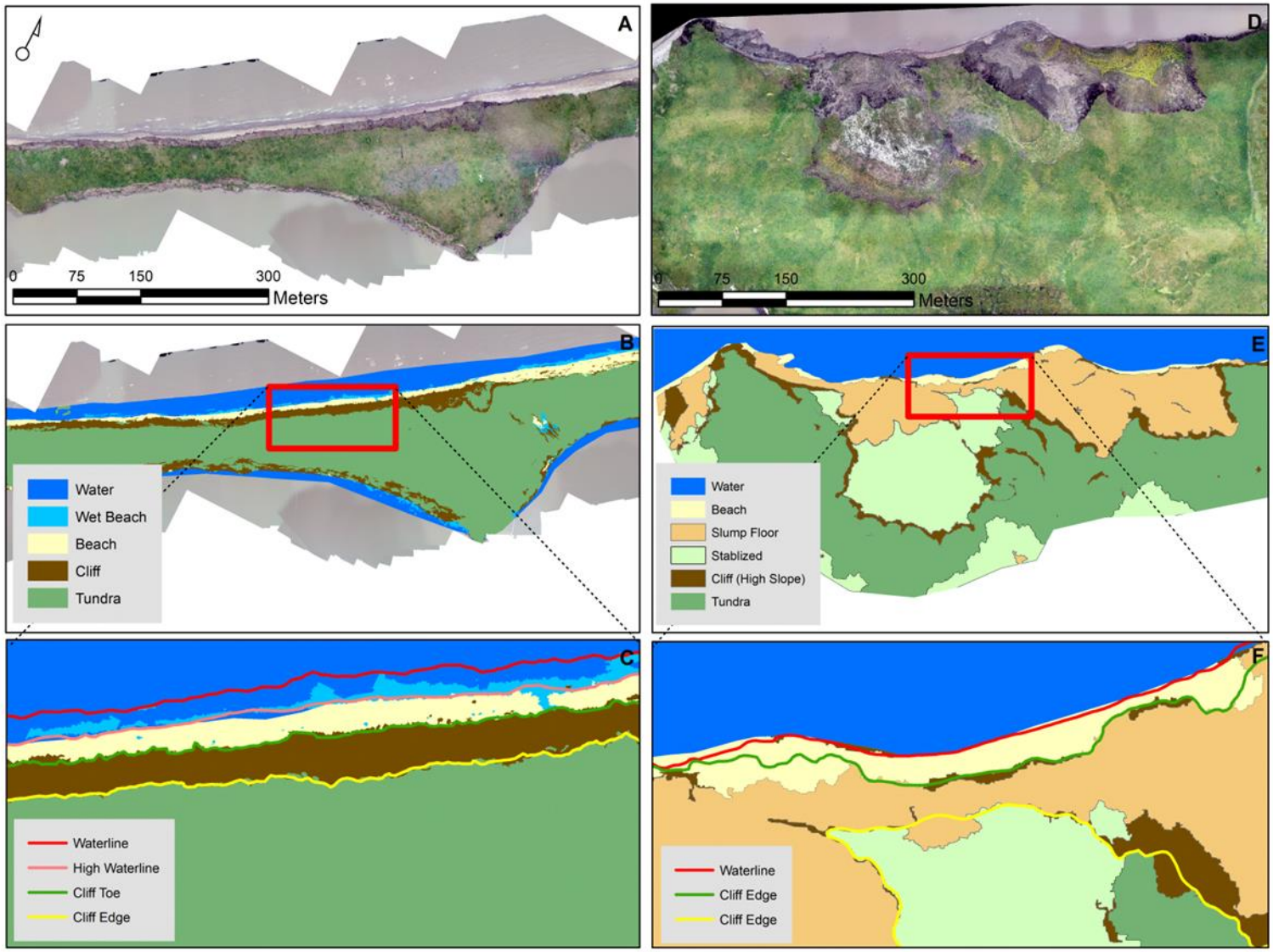

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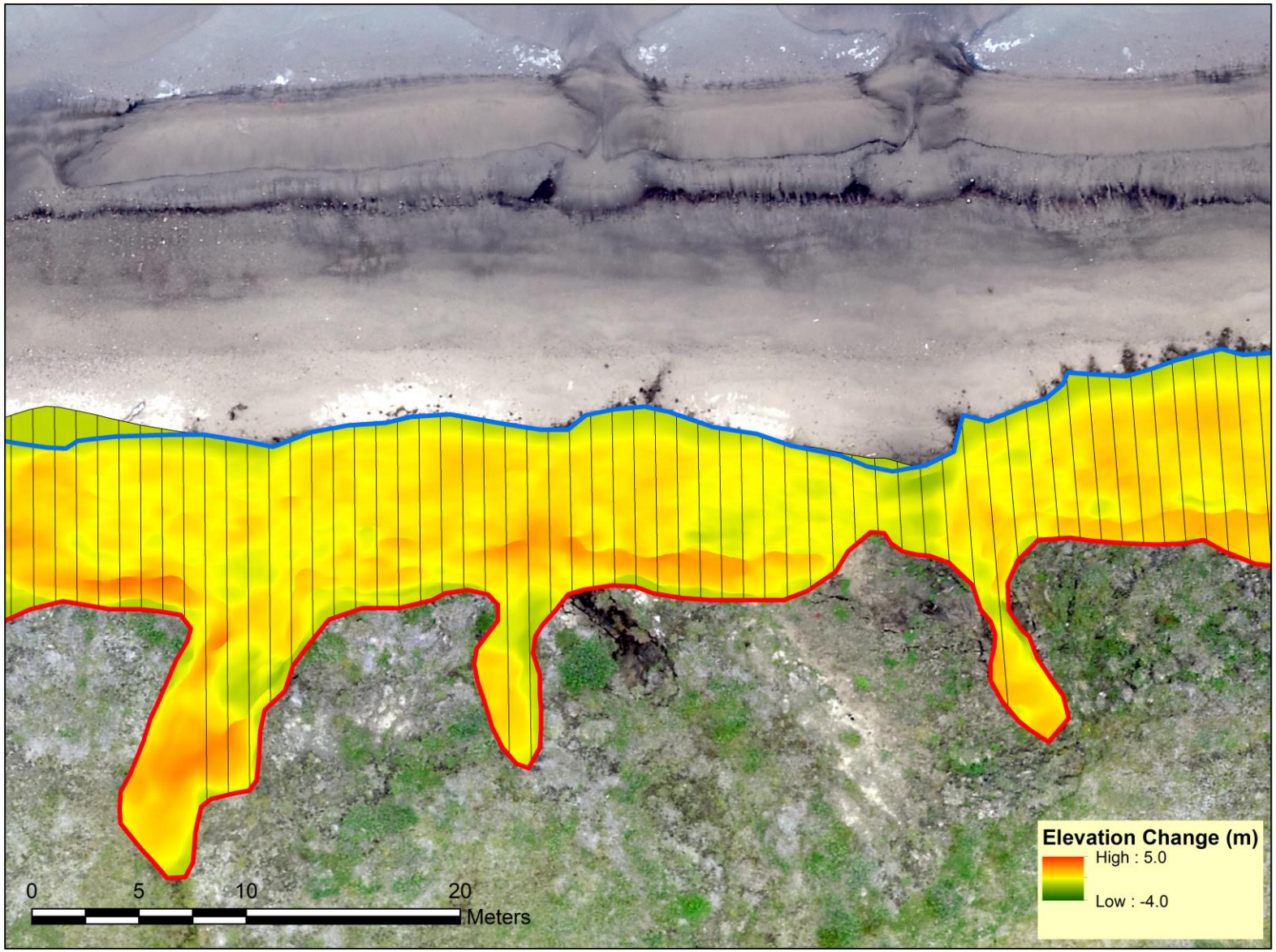

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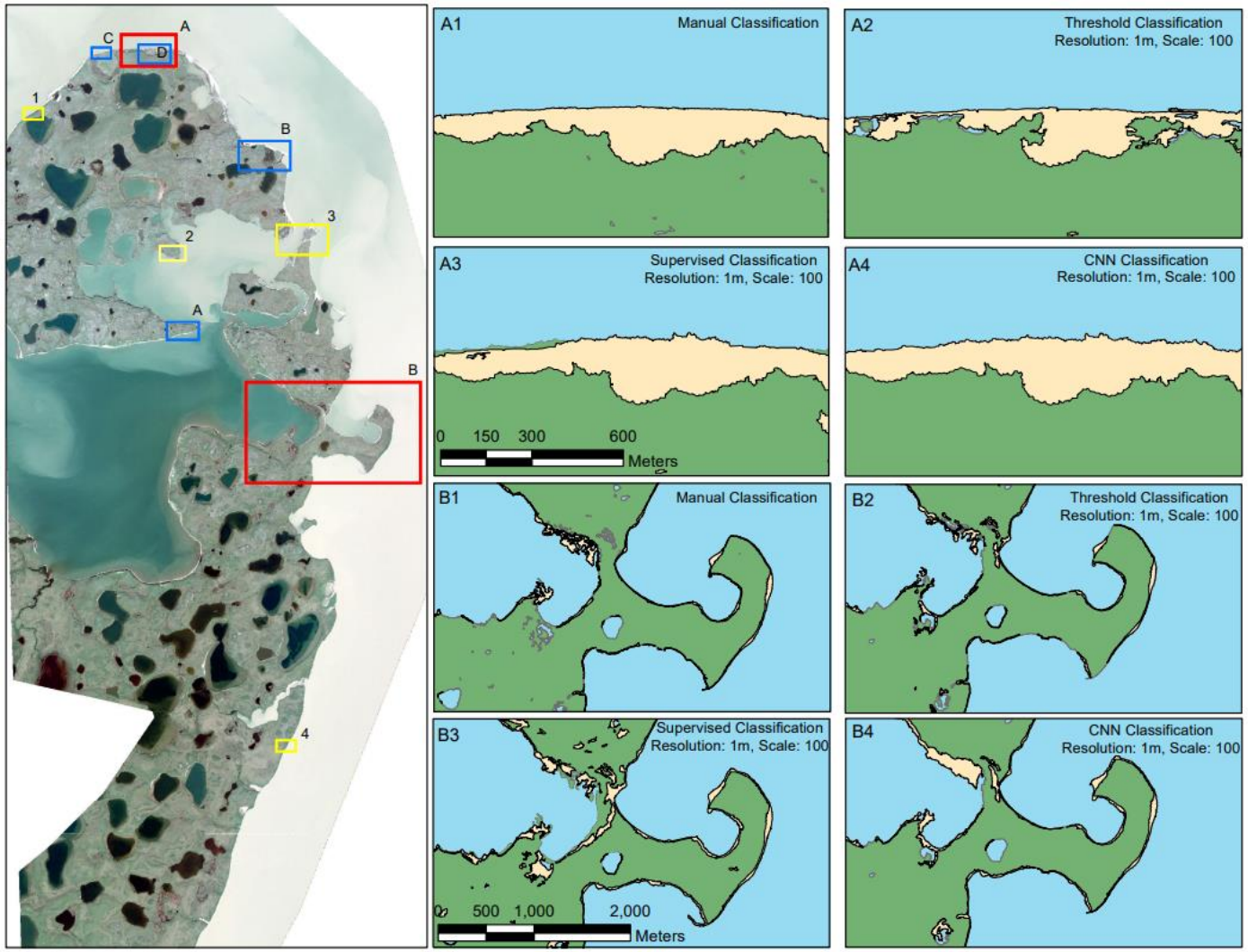

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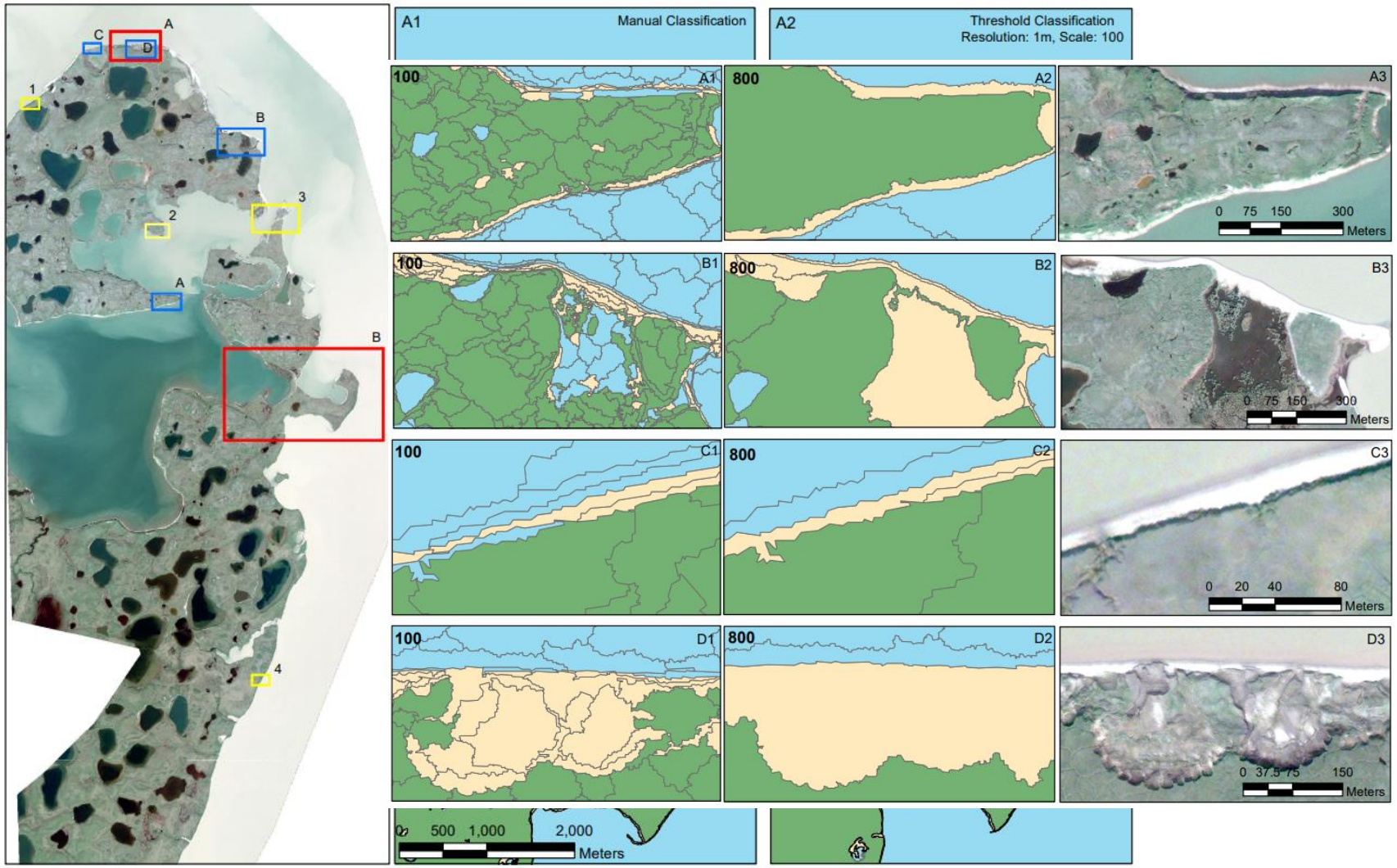

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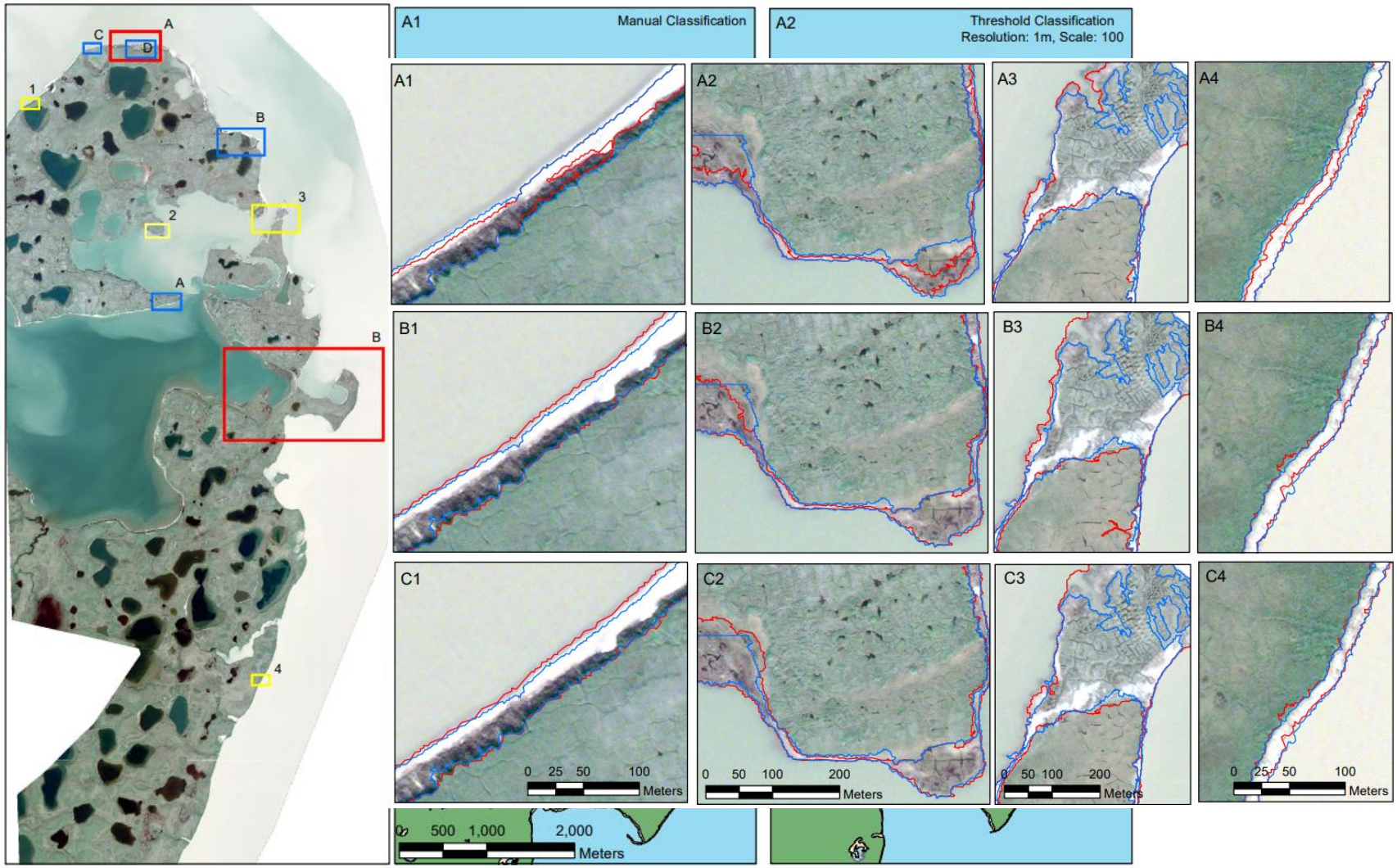

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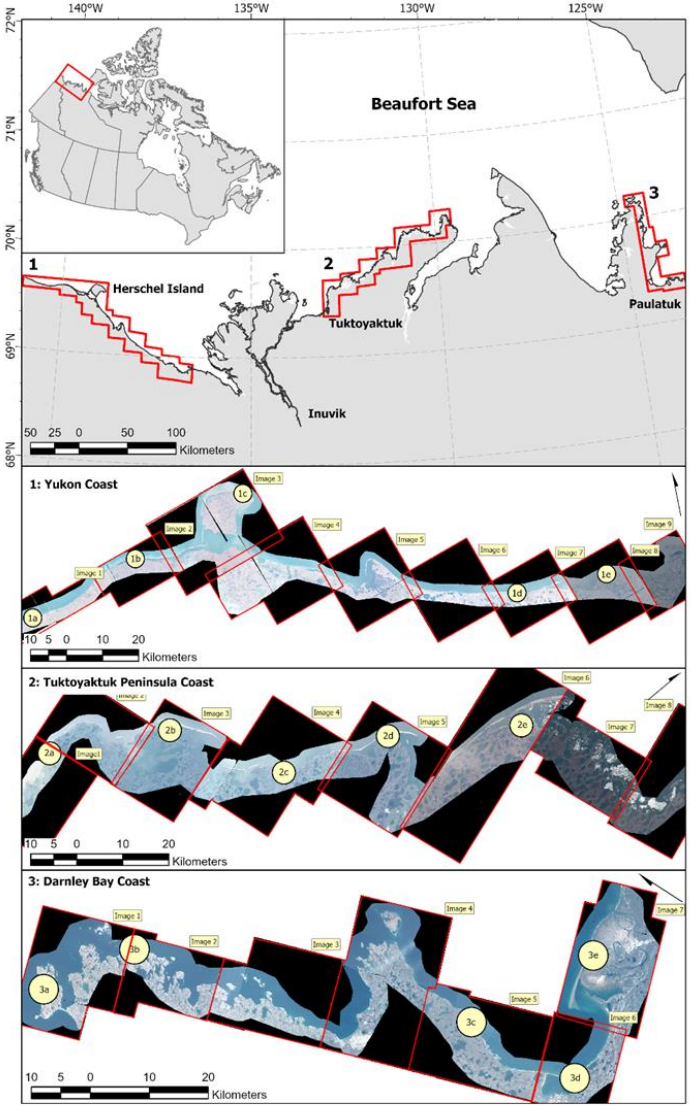

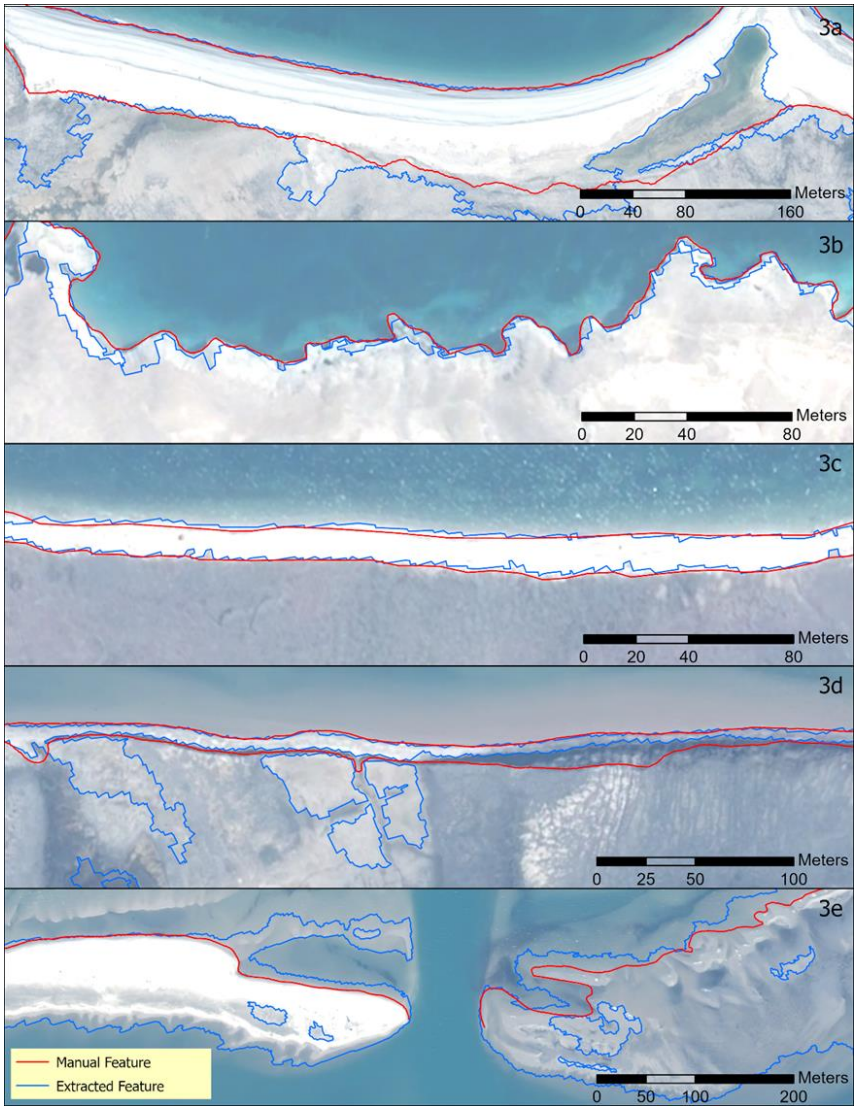

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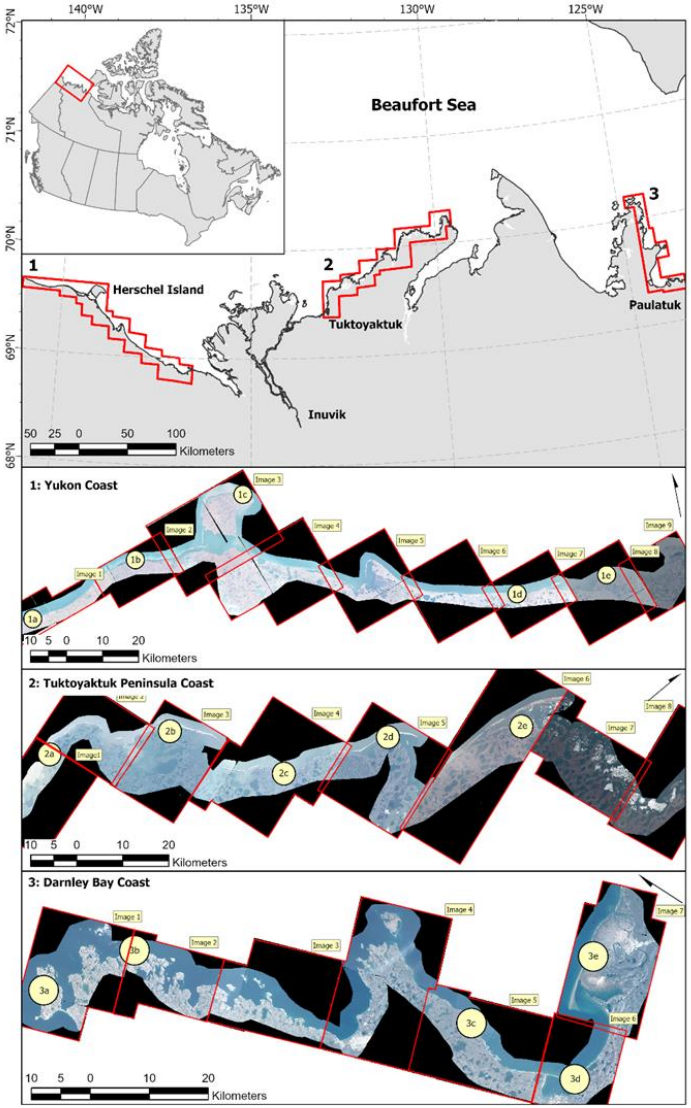

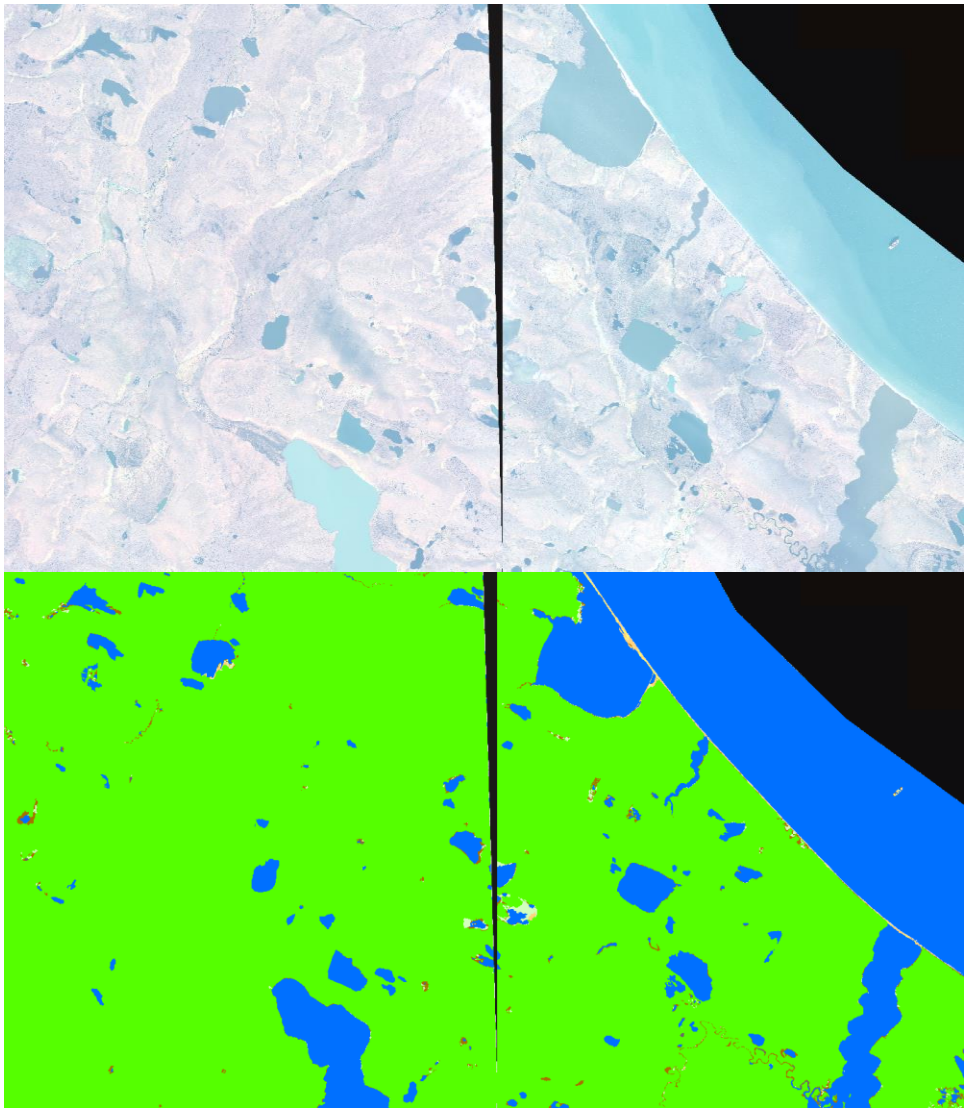

Acknowledgements

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