Environmental Engineering Institute – IIE
Environmental Computational Science and
Earth Observation Laboratory

Sion, November 9, 2023

Master Thesis Proposal:
Characterization of outwash plains in Greenland with Planet imagery

The Arctic is warming up to four times faster than the global average and the retreat of land ice leaves behind new emerging lands, which are also called *glacial outwash plains* (Figure 1). These lands and their ecosystems are yet to be understood and remote sensing can play a key role in achieving this goal.

Relying on Planet satellite imagery (Figure 2a), the goal of this master thesis will be to build deep learning models to characterize these outwash plains across Greenland accurately. In practice, this characterization will rely on semantic segmentation maps, as seen in Figure 2b.

First, there will be a manual annotation phase of some of these outwash plains. Second, using these annotations, you will train and compare different neural network architectures to evaluate them on different plains across Greenland. Hence, the final chosen model should be robust to domain shifts between different parts of Greenland.

Third, the chosen model will be deployed at different dates to measure the evolution of these outwash plains. It will also potentially help to understand natural phenomena specific to these areas, like the flooding observed in Figure 2c.

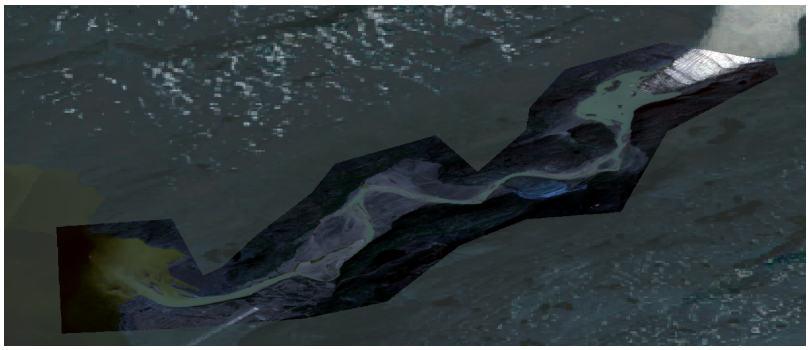
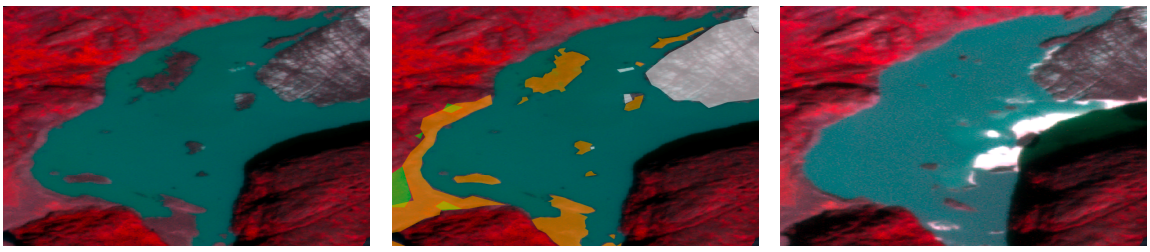


Figure 1. Outwash plain near Narsarsuaq in Greenland (observed with Planet (RGB) overlayed on Landsat in June 2023).



a) Planet imagery b) Associated ground-truth c) Planet imagery during flooding

Figure 2. a) Planet imagery (IrGB) on part of the outwash plain near Narsarsuaq in Greenland in June 2023. b) Possible characterization of this outwash plain: snow: white, soil: orange, vegetation: green. c) Same area and sensor in September during the annual flooding of this outwash plain.

School of Architecture, Civil and Environmental Engineering (ENAC)

Gaston Lenczner
EPFL VALAIS WALLIS
ENAC-IIE-ECEO
Rue des Ronquos 86
1951 Sion - Switzerland

+41 21 693 82 83
gaston.lenczner@epfl.ch
https://people.epfl.ch/gaston.lenczner

Methodologically speaking, the focus will then be on addressing domain instability due to temporal and spatial shifts across Greenland, with the application aspect remaining the most important part of this thesis project.

Don't hesitate to get in touch with us if you are interested in this project!

Gaston Lenczner gaston.lenczner@epfl.ch

Bibliography

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