

# Review

- Orbits
- Optical and thermal
- Spatial/Temporal/Spectral
- Drones
- SAR
- Lidar
- Electromagnetic Spectrum
- Class presentations
- Essay Q

# Remote sensing applications



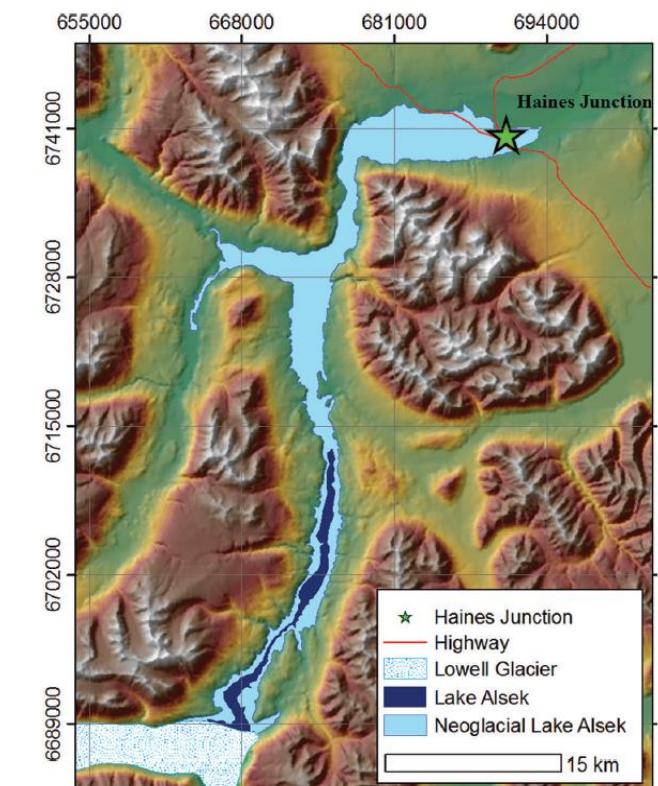
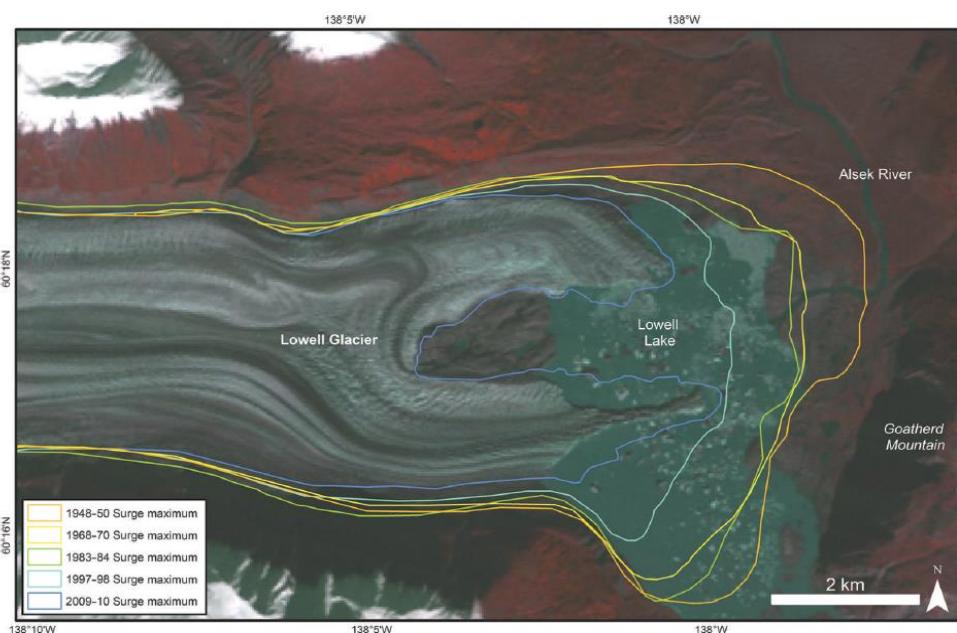
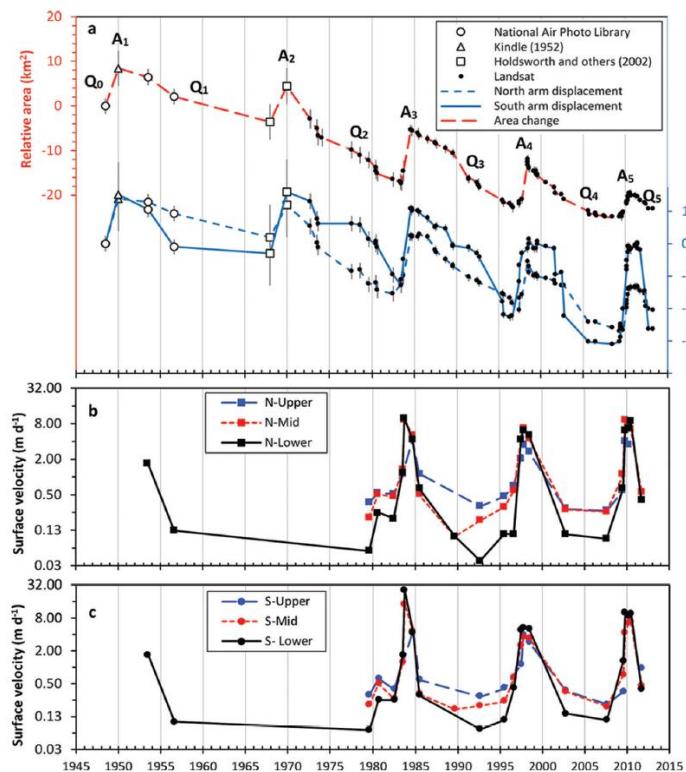
Feb 13, 2024

Alexandre.Bevington@gov.bc.ca

## Characteristics of the last five surges of Lowell Glacier, Yukon, Canada, since 1948

Alexandre BEVINGTON, Luke COPLAND

*Department of Geography, University of Ottawa, Ottawa, Ontario, Canada  
E-mail: luke.copland@uottawa.ca*







## Research Program Strategic Plan 2021 – 2024



Ministry of  
Forests, Lands, Natural  
Resource Operations  
and Rural Development

### 4 | STRATEGIC GOALS AND INITIATIVES FOR THE RESEARCH PROGRAM.....8

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Goal 3—Reinforce Research Knowledge Management and Extension Services.....10

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5.4 Species and Habitats .....12

5.5 Timber Supply .....13

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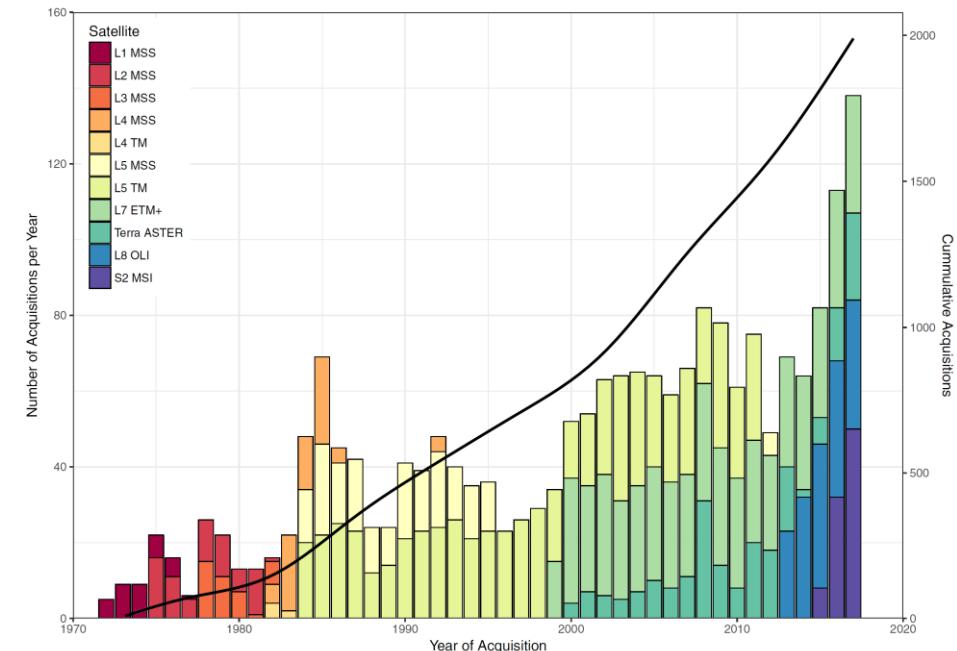
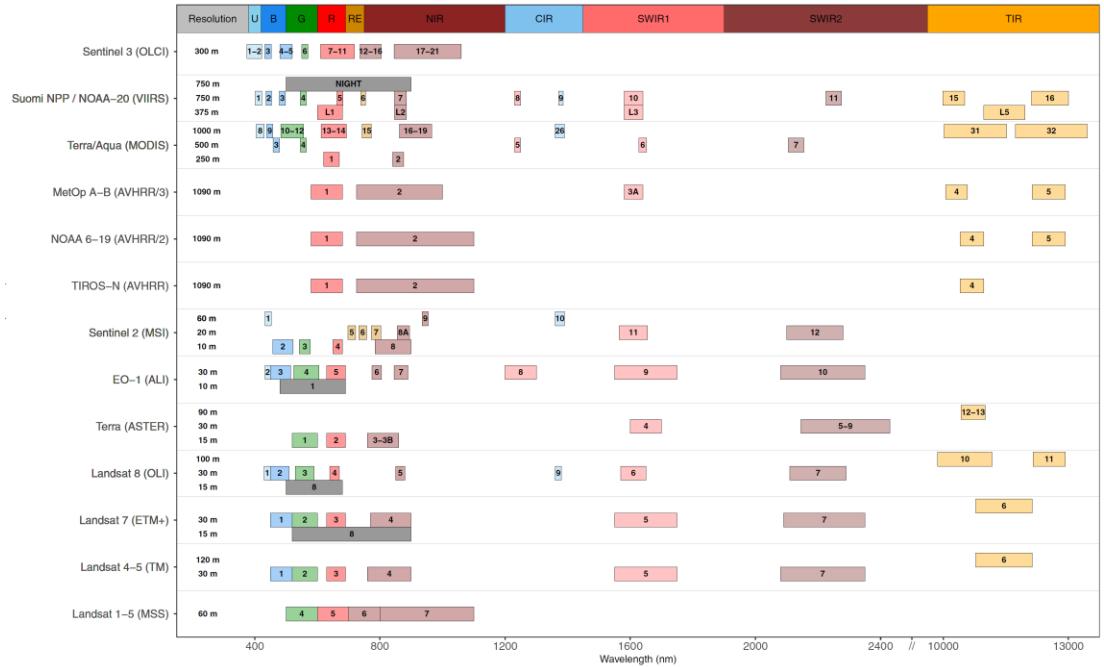
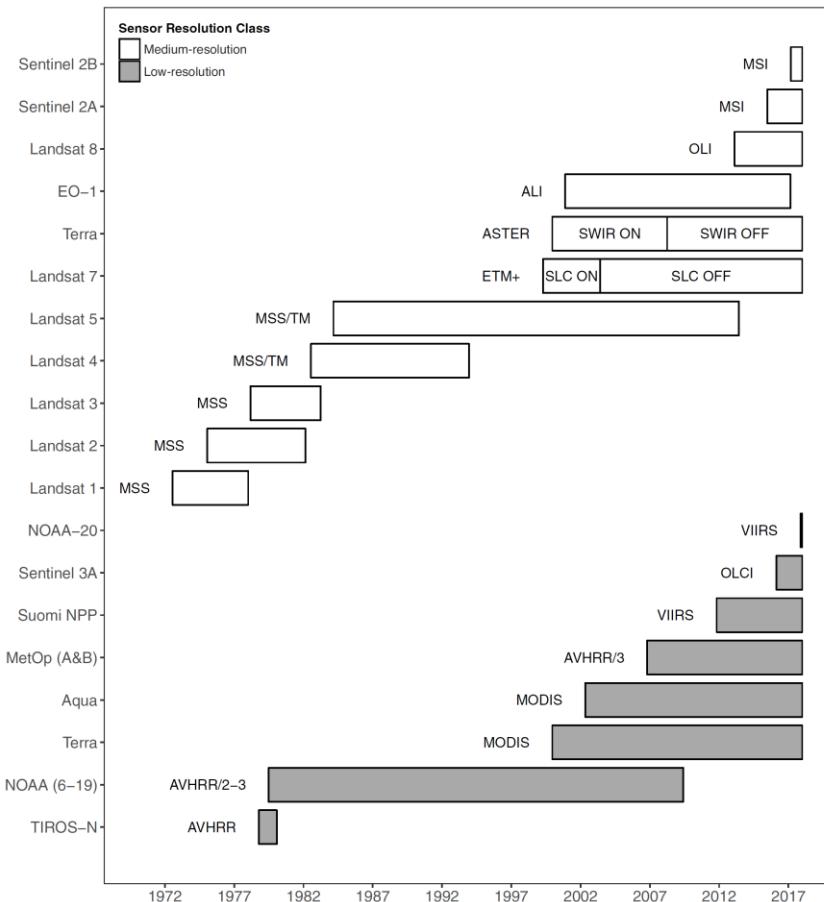
### 6 | Operating Budget 2021/22 – 2023/24

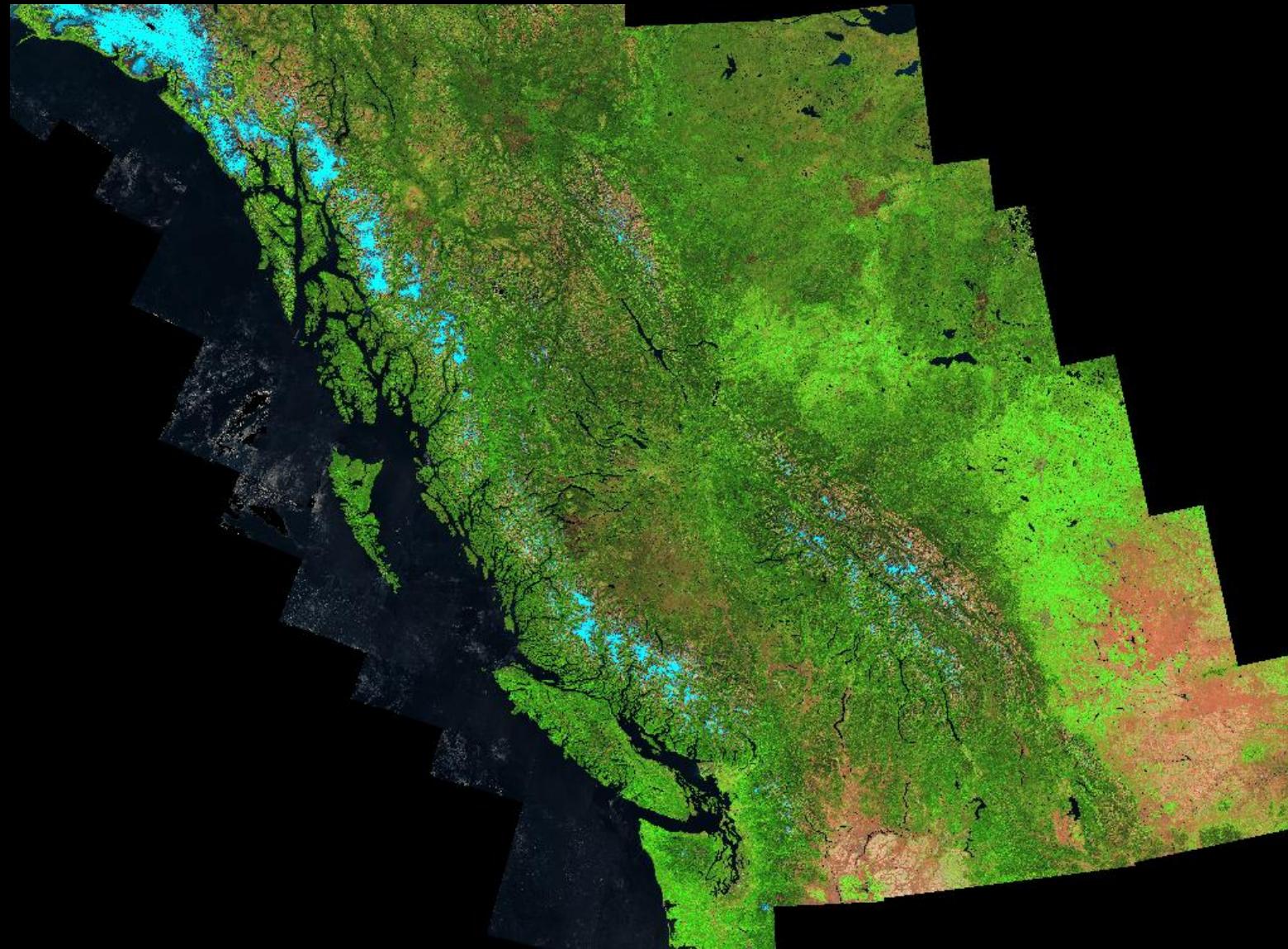
Research Portfolio <i>(Intended Outcomes)</i>	2021/22 \$	2022/23 \$	2023/24 \$
Ecosystem Stewardship	534,336	–	–
Ecosystem Health and Disturbance	434,592	–	–
Water Management	823,284	–	–
Species and Habitats	835,811	–	–
Timber Supply	697,123	–	–
Bio-economy <sup>1</sup>	45,496	–	–
Research Management and Oversight	129,358	–	–
Total	3,500,000	3,675,000 <sup>2</sup>	3,850,000 <sup>2</sup>

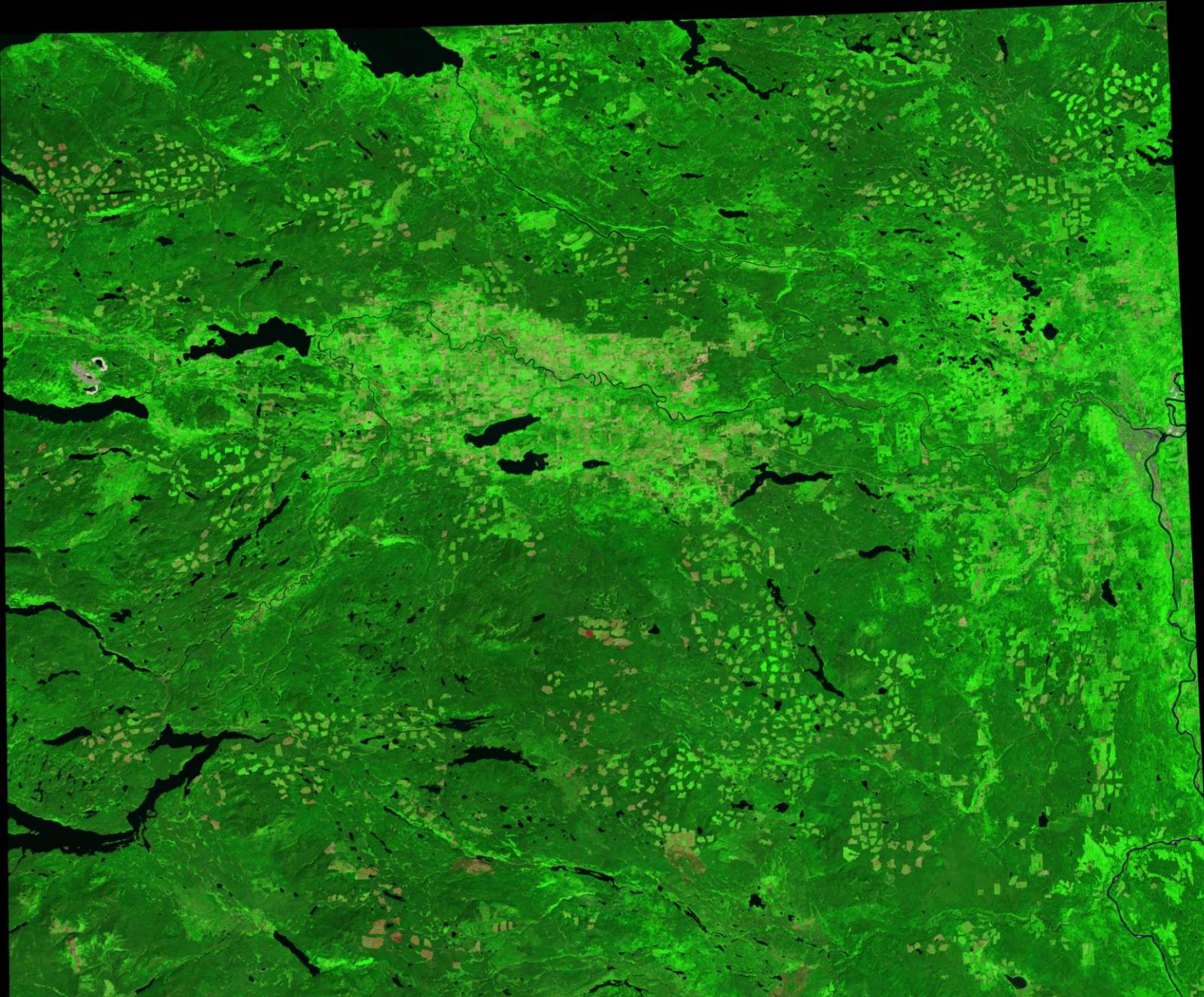


## A Review of Free Optical Satellite Imagery for Watershed-Scale Landscape Analysis

Alexandre Bevington, Hunter Gleason, Xavier Giroux-Bougard,  
& Tyler de Jong







**1984-2018**

## Earth Engine service issues > Inbox



 [REDACTED]@google.com>  
to me ▾

Sun, 19 Feb 2017, 22:01



Reply



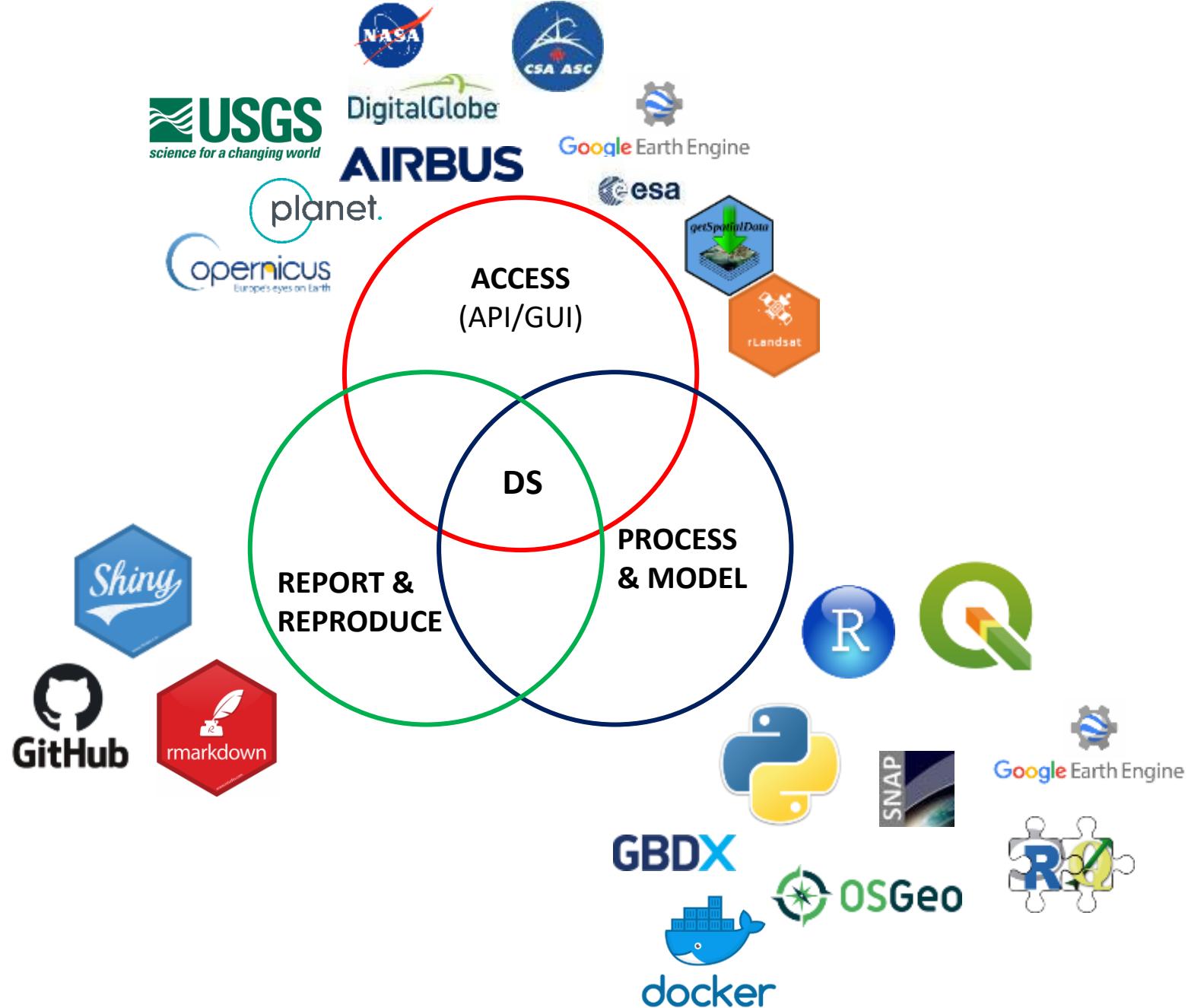
Greetings, I am monitoring some unusual activity on the Earth Engine backend that appears to be related to scripts you are running.

Would you mind stopping any running scripts or exports, until we can diagnose the precise cause of the issues? Something about your script is causing us issues.

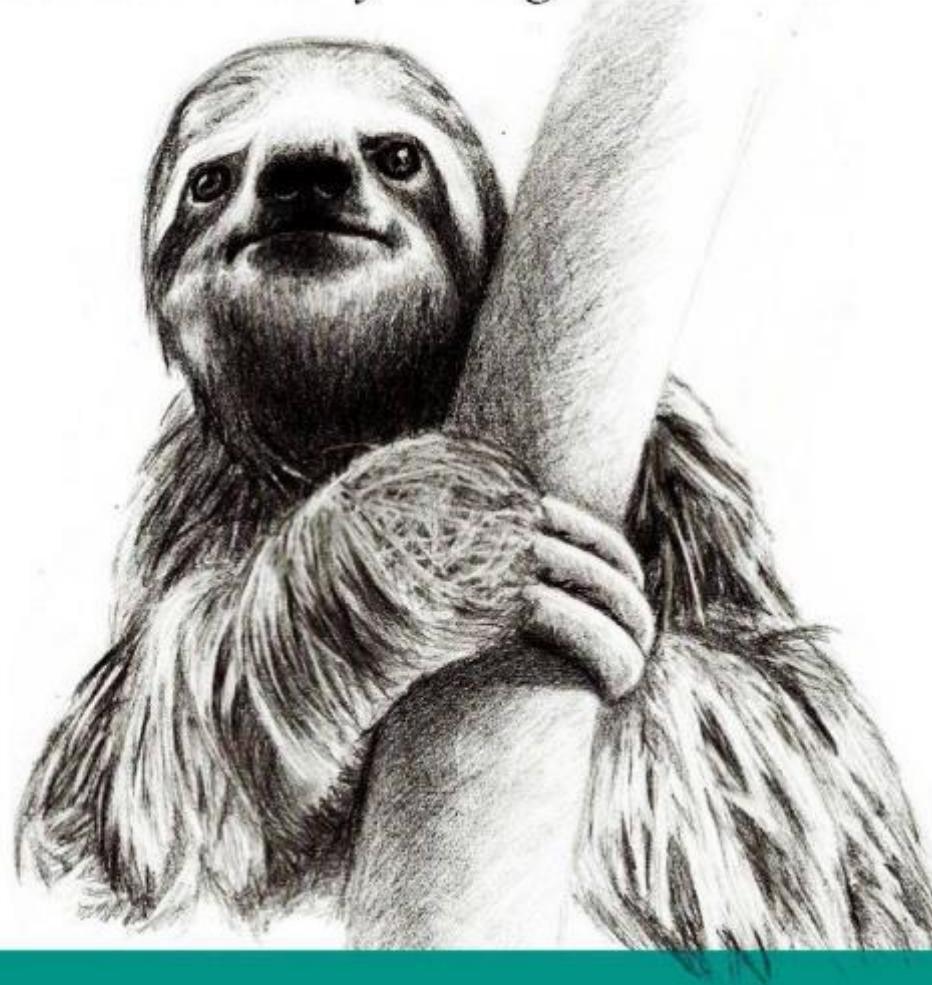
Additionally, would you mind sharing your script? We can often help optimize quite substantially, and get everyone moving again in short order.

Best regards,





*Cutting corners to meet arbitrary management deadlines*



*Essential*

# Copying and Pasting from Stack Overflow

# Communities of Practice, Git and Workshops

Province of British Columbia  
Where Ideas Work  
Canada <https://github.com/bcgov/BC-Policy-Framework-For-GitHub> [platformservicesteam@gov.bc.ca](mailto:platformservicesteam@gov.bc.ca)

Overview Repositories (1) Packages (0) People (176) Teams (174) Projects (5)

Pinned

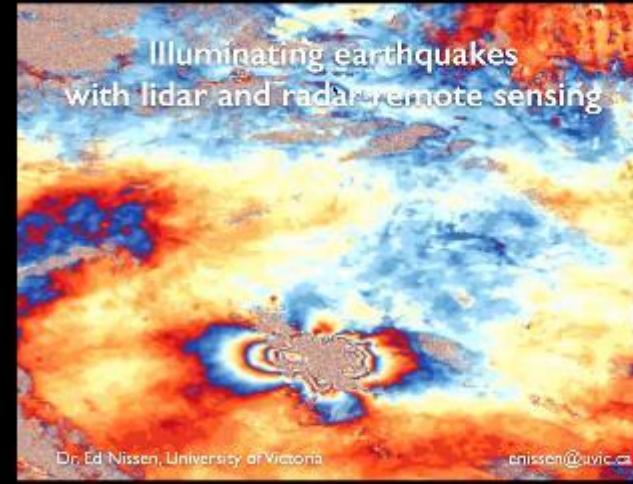
- BC-Policy-Framework-For-GitHub (Public)  
Policy information for BC Government employees using GitHub  
113 stars 58 forks 29 issues
- design-system (Public)  
British Columbia Government Design system for Digital Services  
21 stars 7 forks 7 issues
- digital-principles (Public)  
A set of principles to guide the Province of BC's continued Digital Government evolution  
19 stars 11 forks 7 issues

People

View all

Top languages

- JavaScript
- R
- Python
- Java
- TypeScript



Use of advanced remote sensing approaches for stream classification and fish habitat assessment

Nicholas Coops  
Canada Research Chair in Remote Sensing

Spencer Dakin Kuiper  
Forest Resources Management

Scott Hinch and Alyssa Nonis  
Forest Conservation Sciences

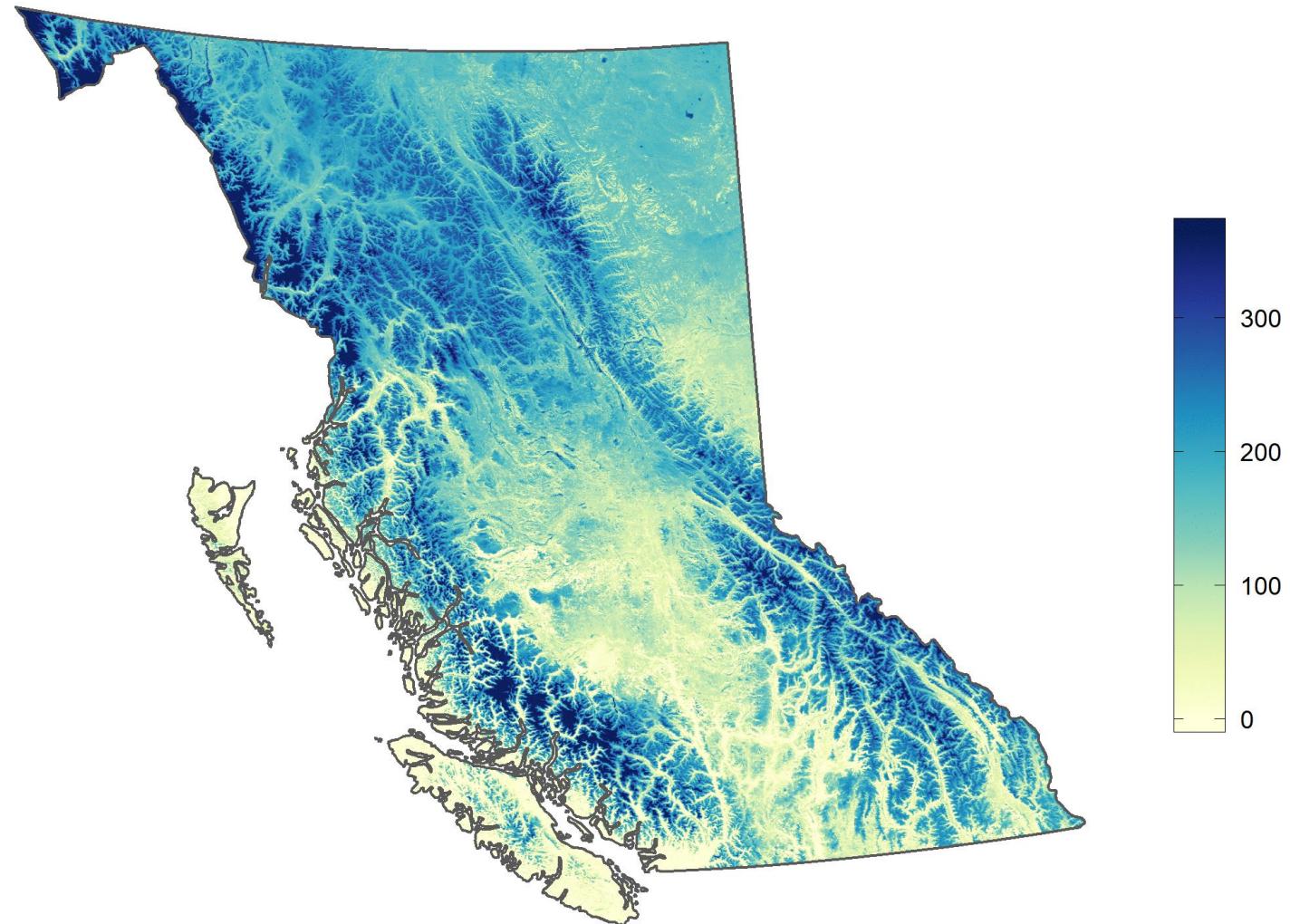
THE UNIVERSITY OF BRITISH COLUMBIA  
Faculty of Forestry



Dr. Joanne White  
Canadian Forest Service



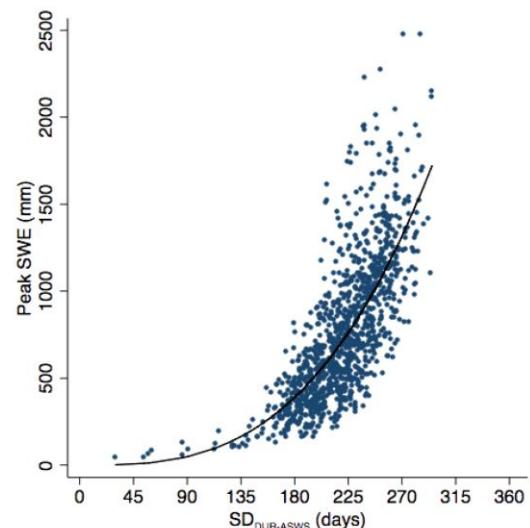
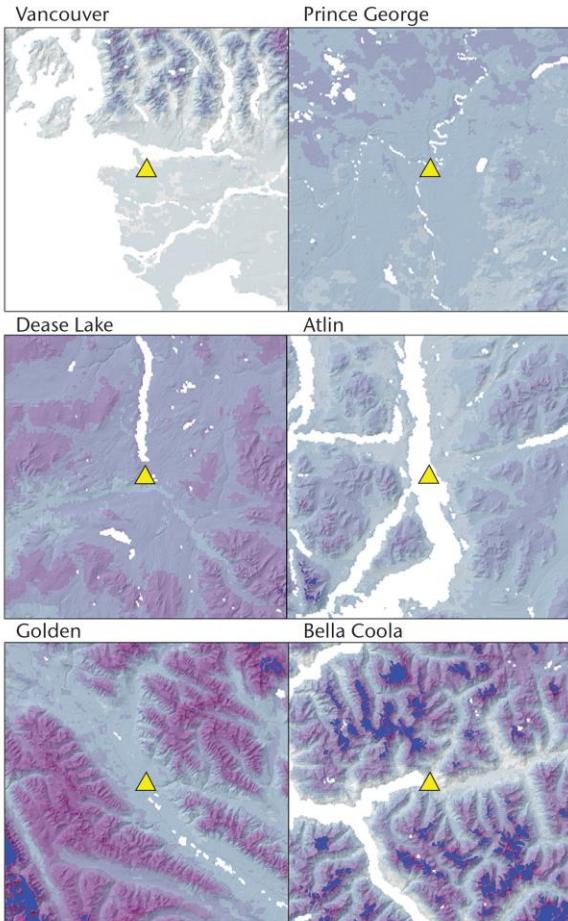
# 2002



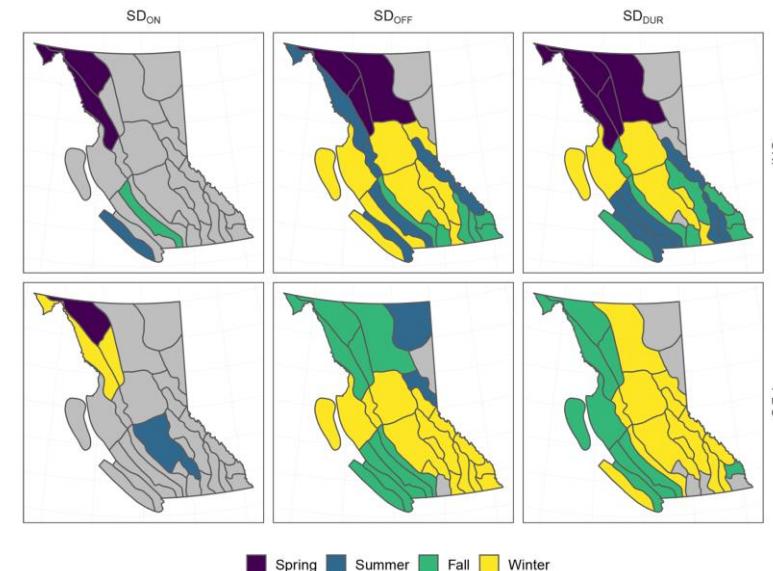
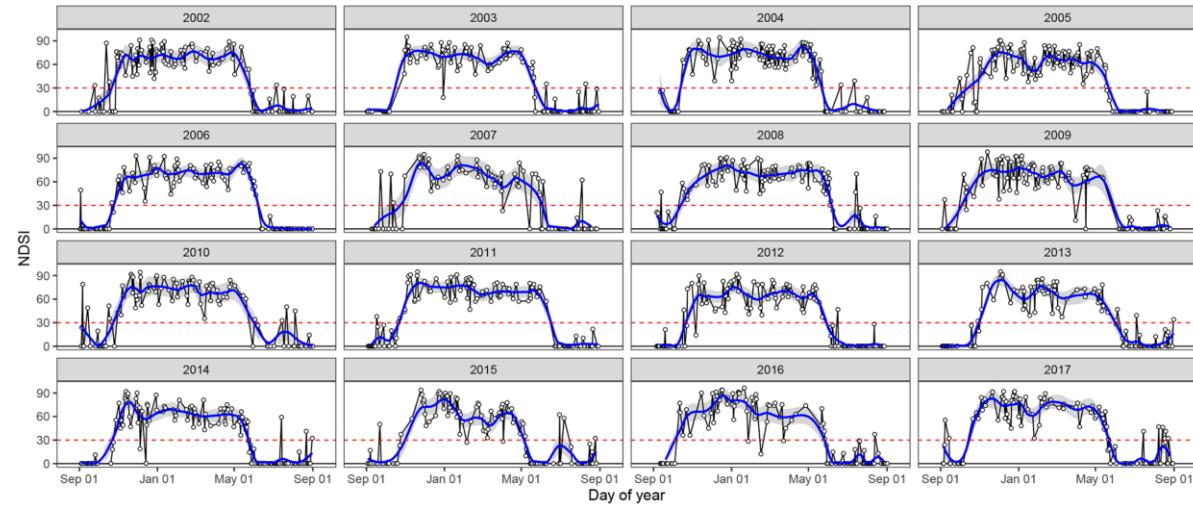


## Regional influence of ocean–atmosphere teleconnections on the timing and duration of MODIS-derived snow cover in British Columbia, Canada

Alexandre R. Bevington<sup>1,2</sup>, Hunter E. Gleason<sup>1</sup>, Vanessa N. Foord<sup>1</sup>, William C. Floyd<sup>3,4</sup>, and Hardy P. Griesbauer<sup>1</sup>



ASWS station: 1A02P MCBRIDE (UPPER) [53°18' N, 120°19' W, 1608 m]

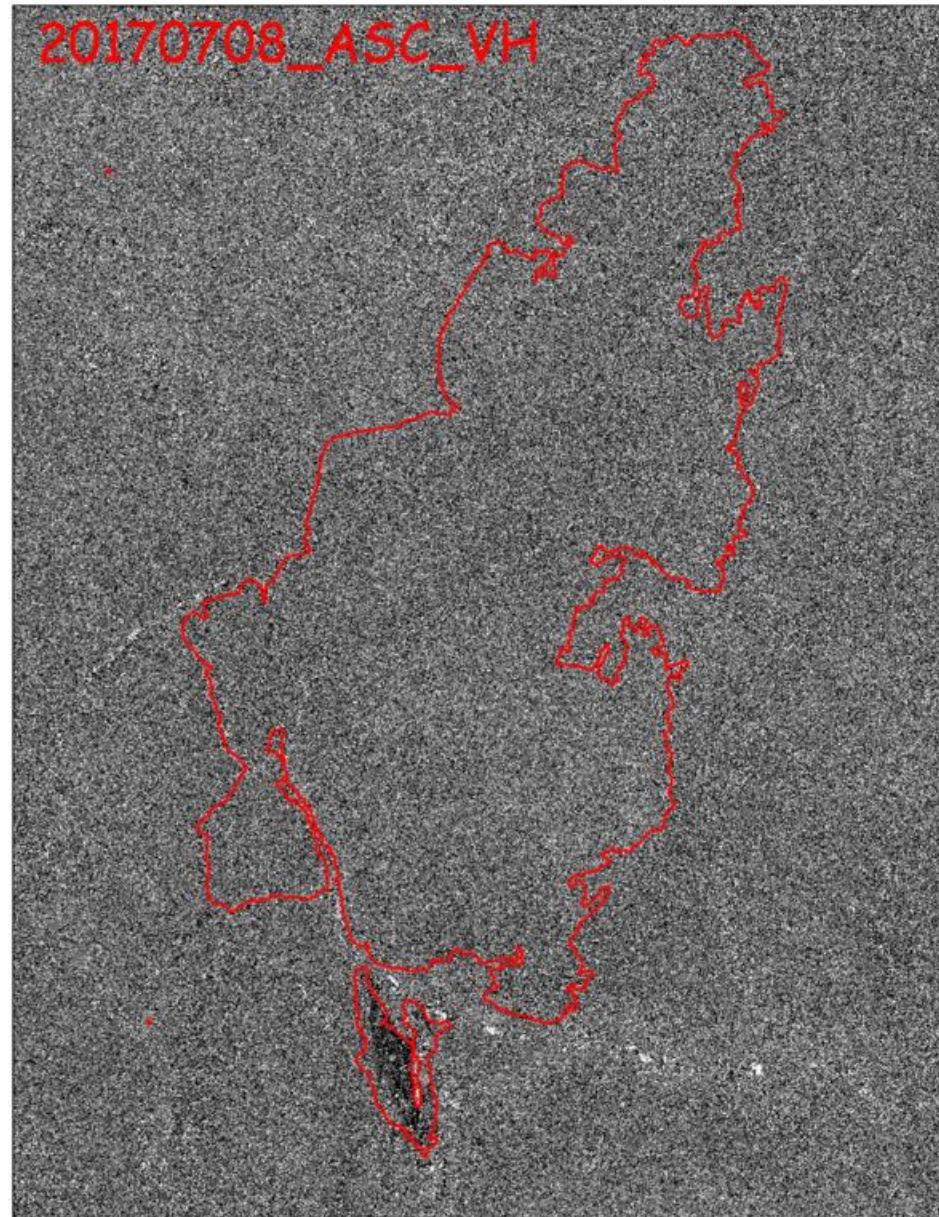
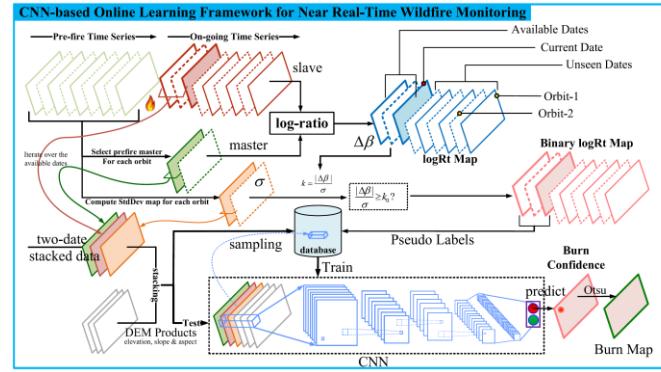
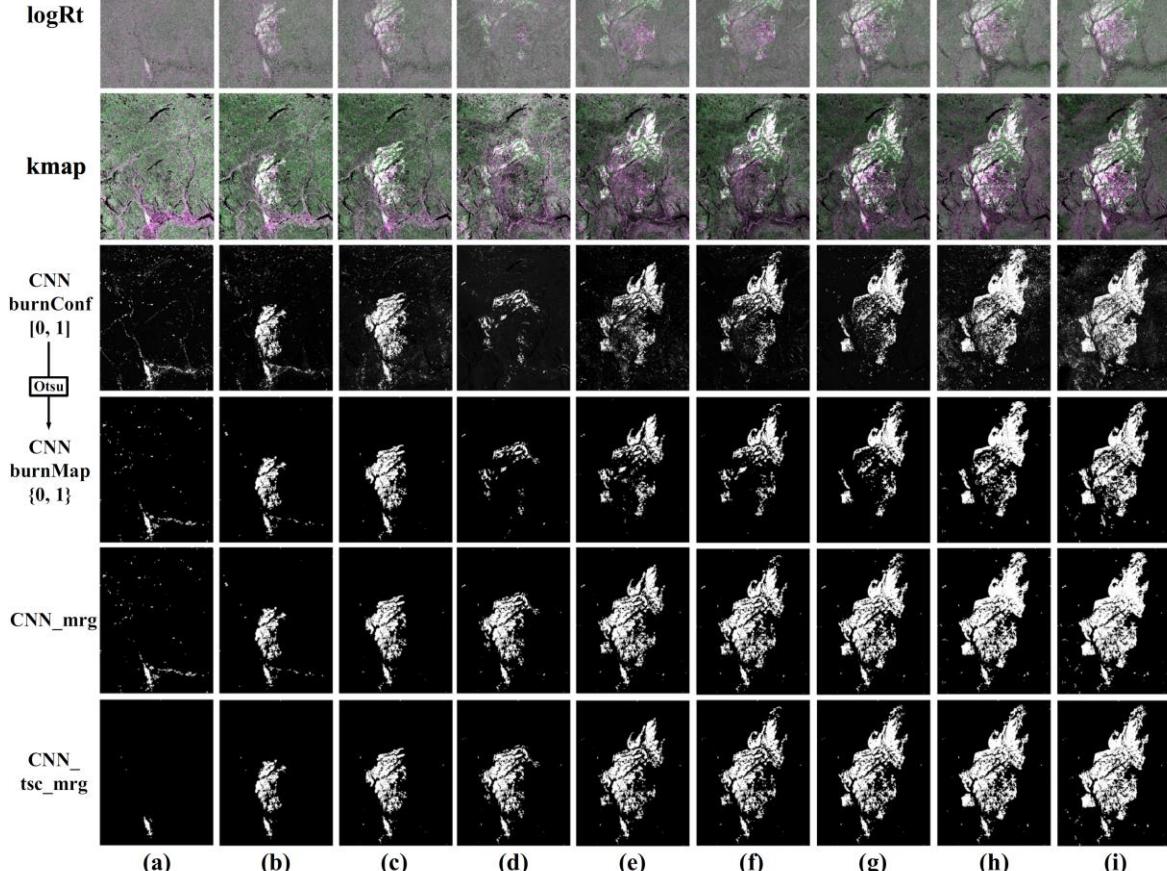


OPEN

## Near Real-Time Wildfire Progression Monitoring with Sentinel-1 SAR Time Series and Deep Learning

Yifang Ban  <sup>1,4\*</sup>, Puzhao Zhang  <sup>1,4\*</sup>, Andrea Naselli  <sup>1</sup>, Alexandre R. Bevington  <sup>2</sup> & Michael A. Wulder  <sup>3</sup>

2017 0708-ASC64 0720-ASC64 0801-ASC64 0809-DSC13 0821-DSC13 0902-DSC13 0906-ASC64 0918-ASC64 0930-ASC64



Wildfire Monitor

This app allows you to monitor wildfire progressions with MODIS, VIIRS, Landsat-8, Sentinel-2, and Sentinel-1 collection.

### 1) Select filters

#### Region of interest (ROI) mask

■ Outlook ▲ PowerPoint

www.Icbq.net

2021-06-20

old data.

ME/1-09401

Cloud Rate in ROI (%)

• 100% GENUINE

ANSWER

### 2) Select an image

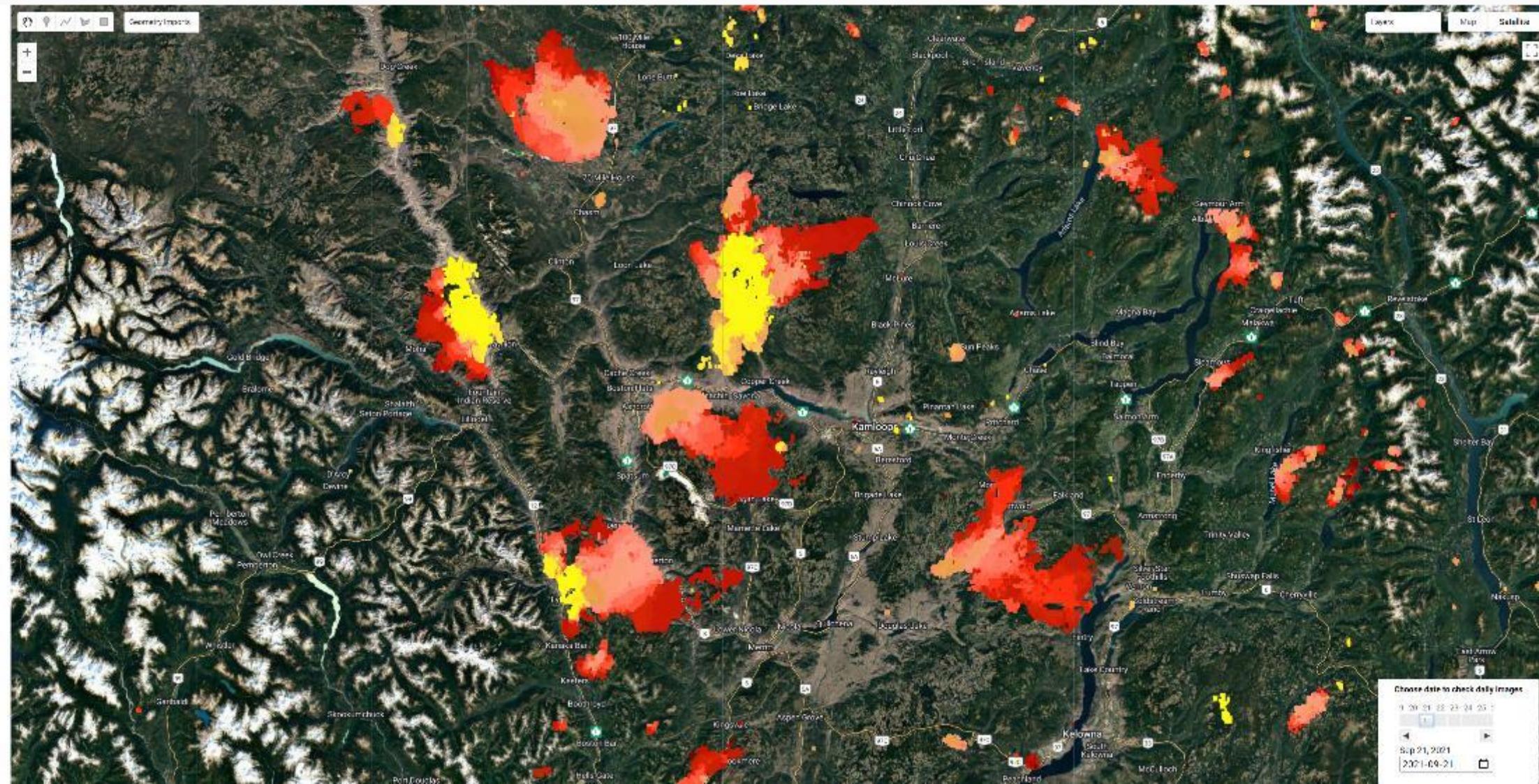
Santosh Kumar

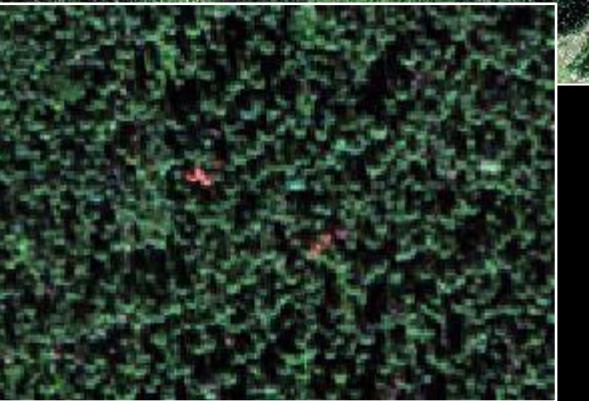
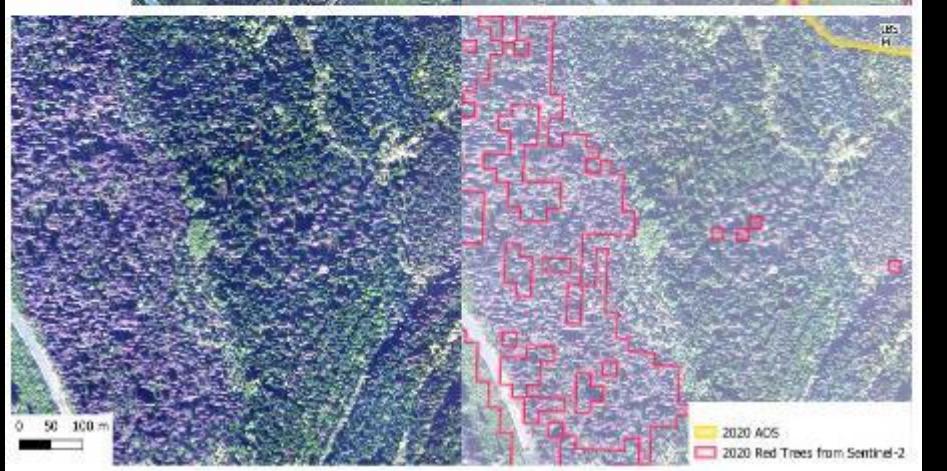
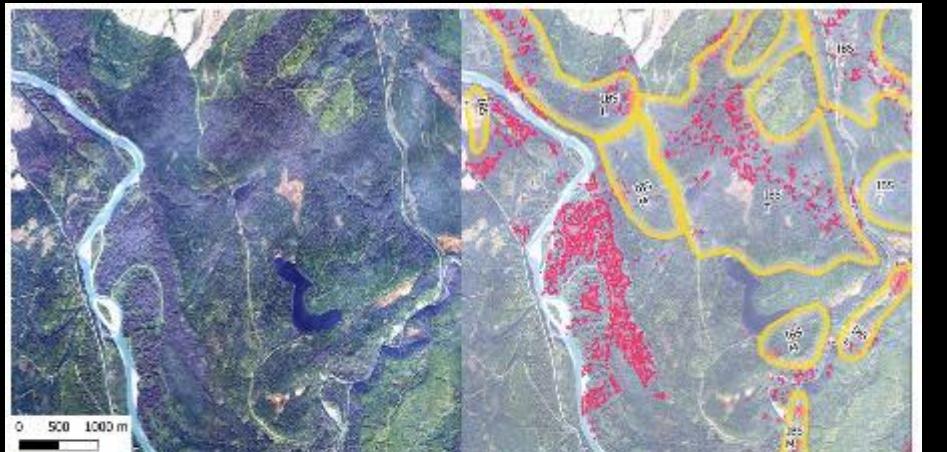
#### *Self-selective immunization*

See also *1931-1940 VERS. MODELS L3, L2, AND 8754 THERS*

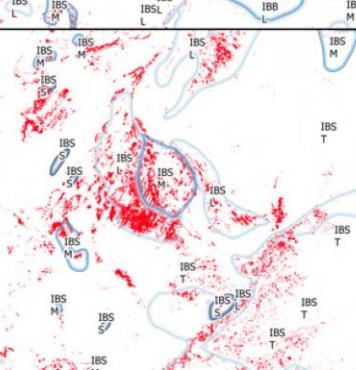
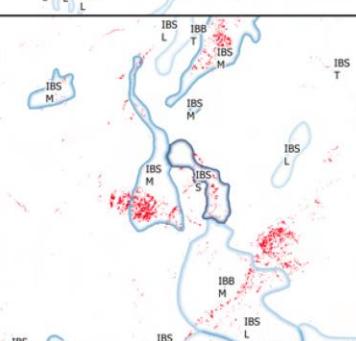
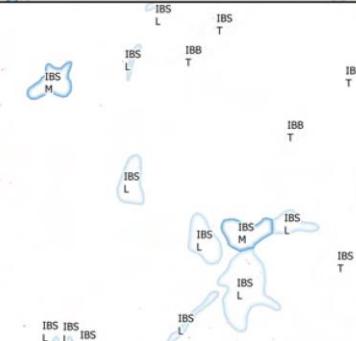
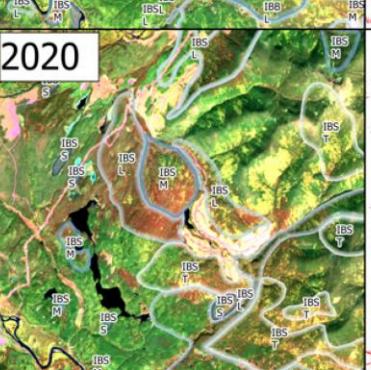
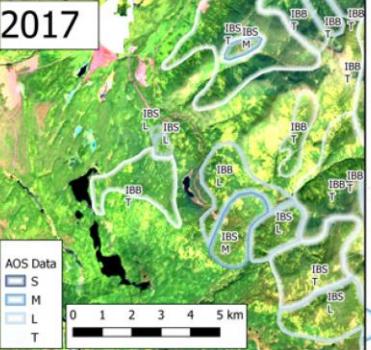
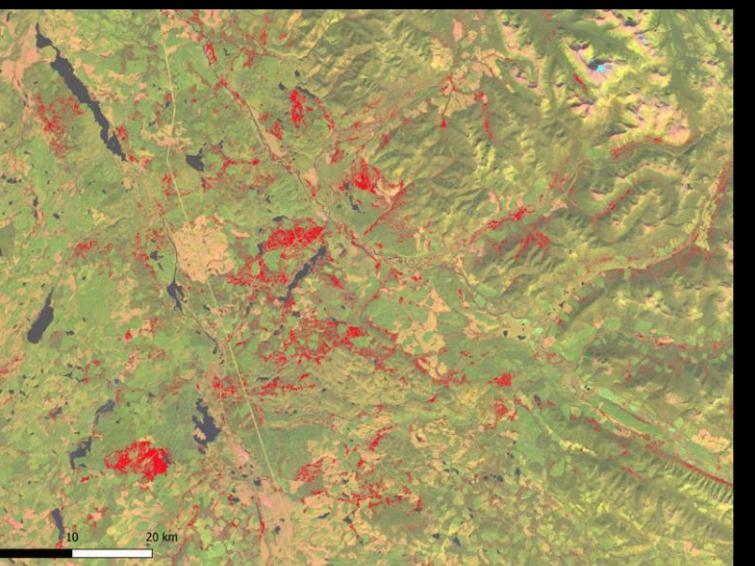
Optional: Pulse count (SWITCHES ONLY) =

Even red means white red in dark red, and activate  
sun in yellow pink at light red.

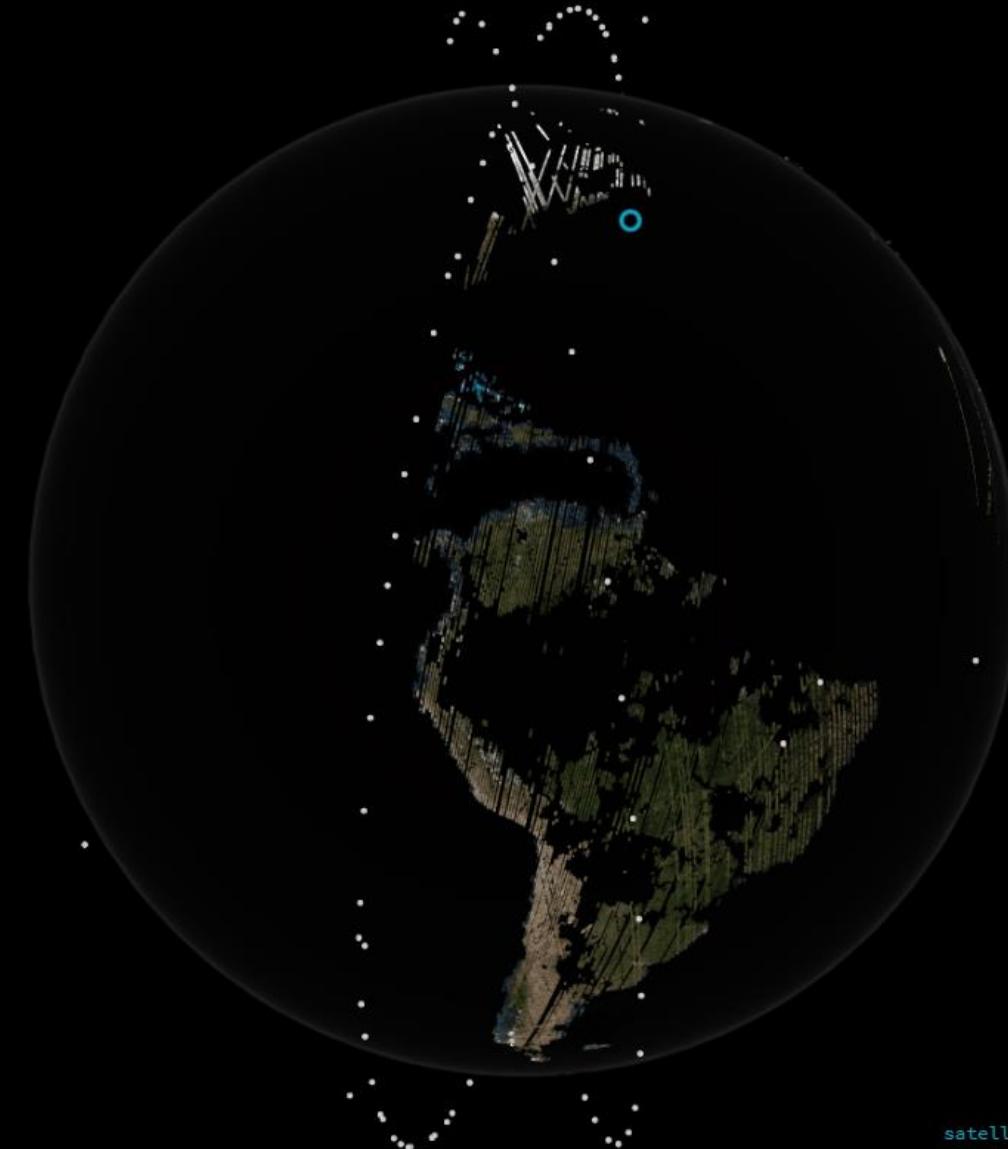




WorldView-3 RGB 16AUG2018



Thu Jan 25 2018 15:16:21 UTC



satellite | 102F

44° N, 89° E

height: 500 km  
speed: 7.62 km/s

**2016-08-18**

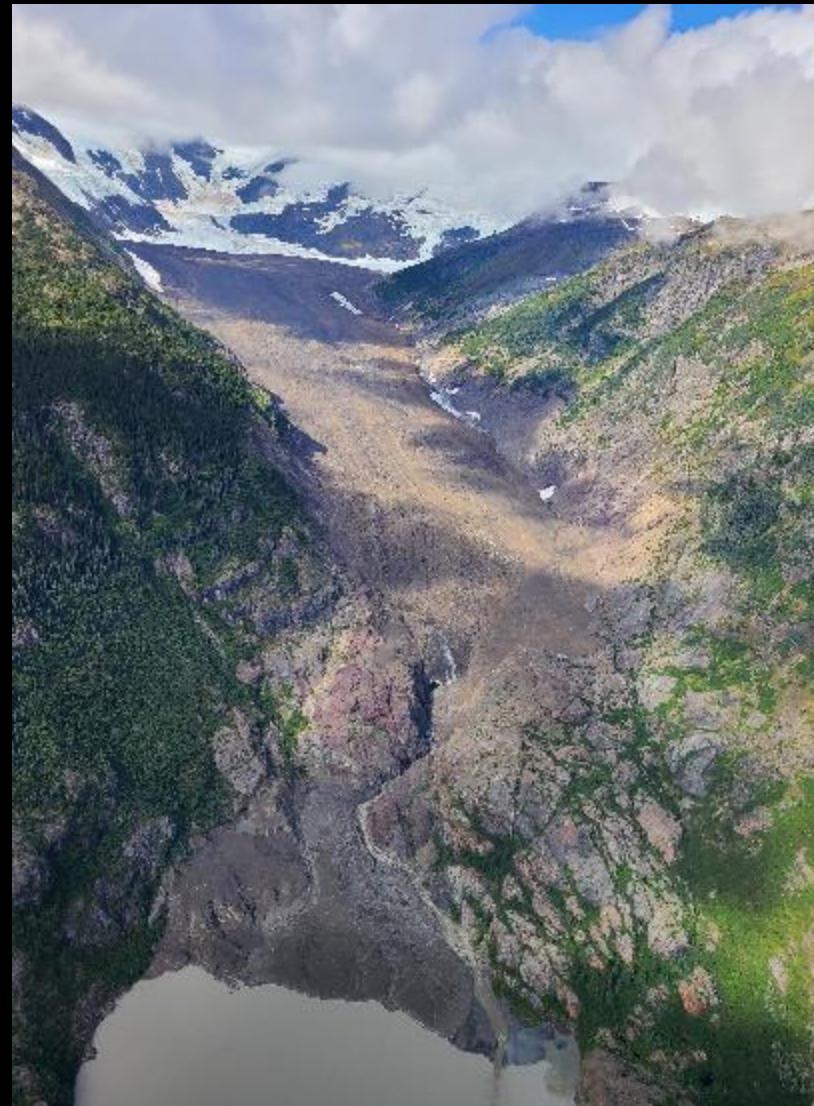


2020-04-21 12:10:50



04-21-2020 12:10 PM 12°C SPYPOINT FORCE-20

May Jun Jul Aug Sep Oct



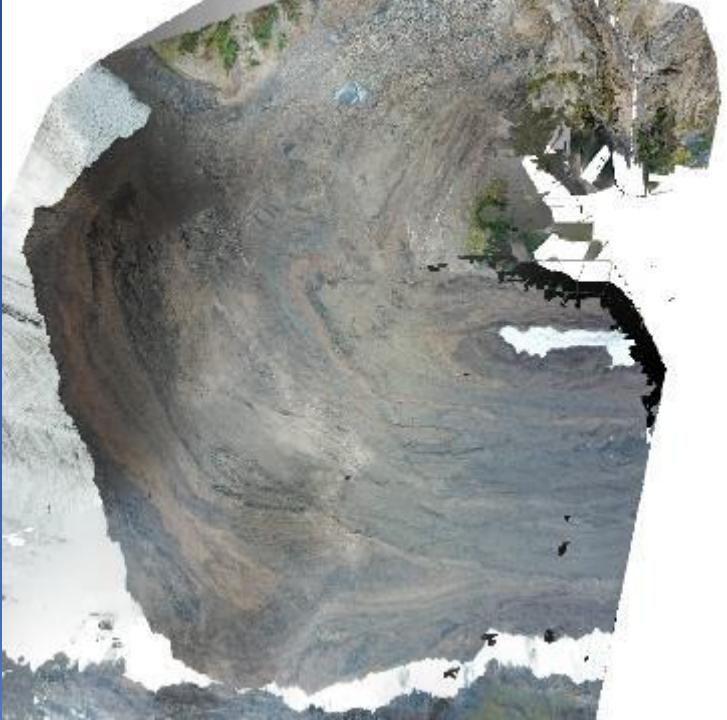
**THE TYEE**

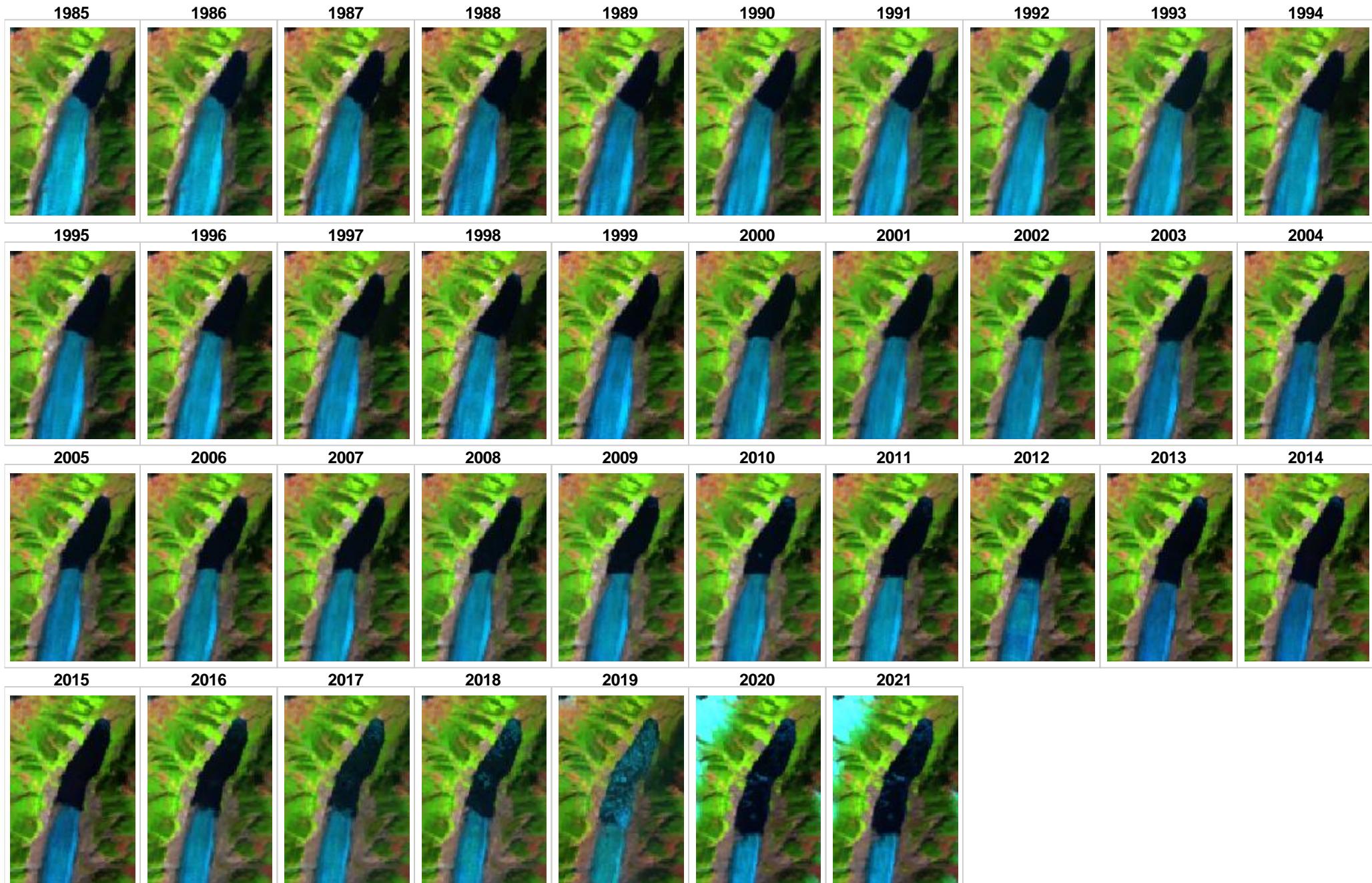
NEWS ANALYSIS CULTURE SOLUTIONS MORE ▾ SUPPORT US SEARCH Q

NEWS Energy Local Economy BC Politics Environment

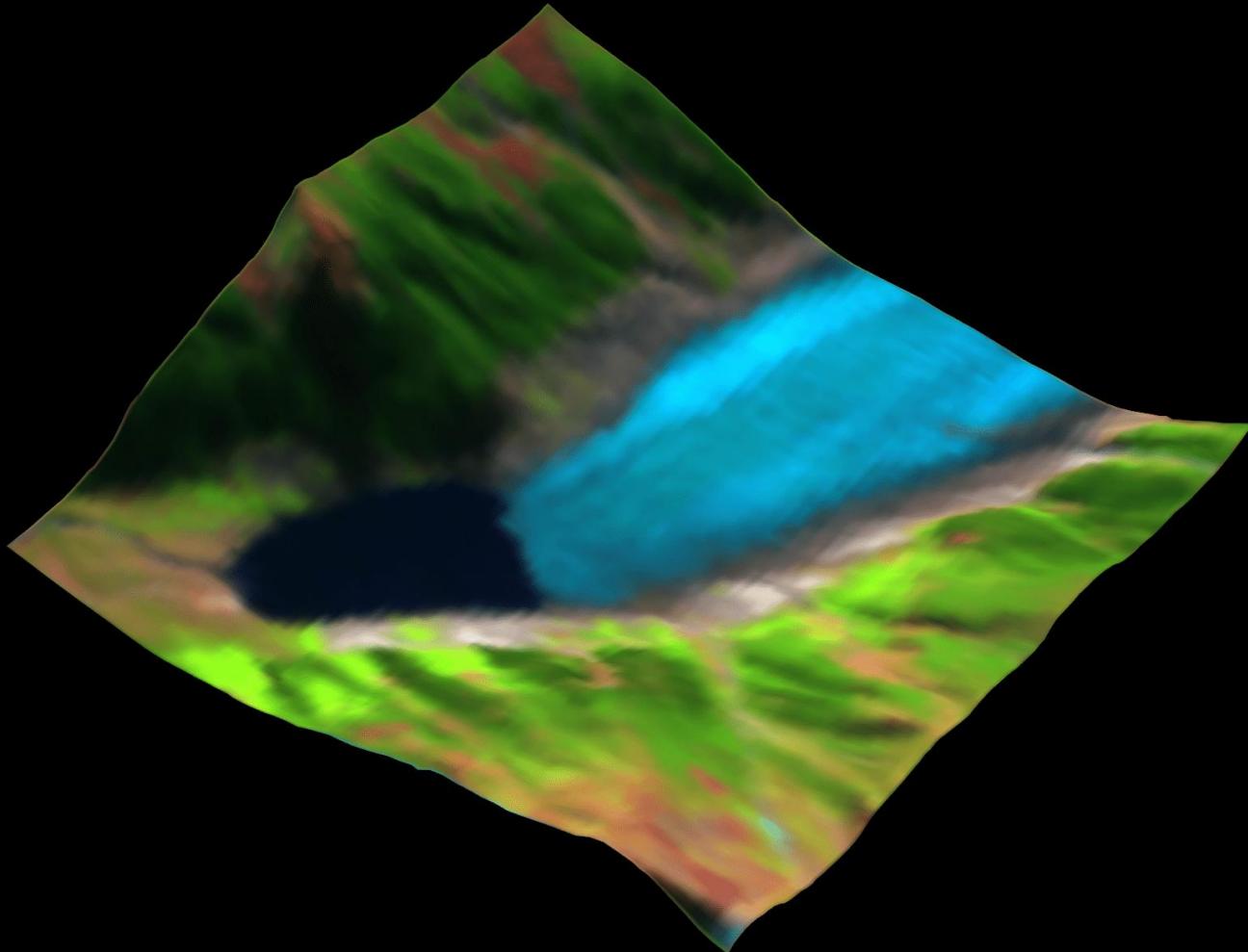
## A Massive Landslide Sends a Wake-Up to BC's Mining Sector

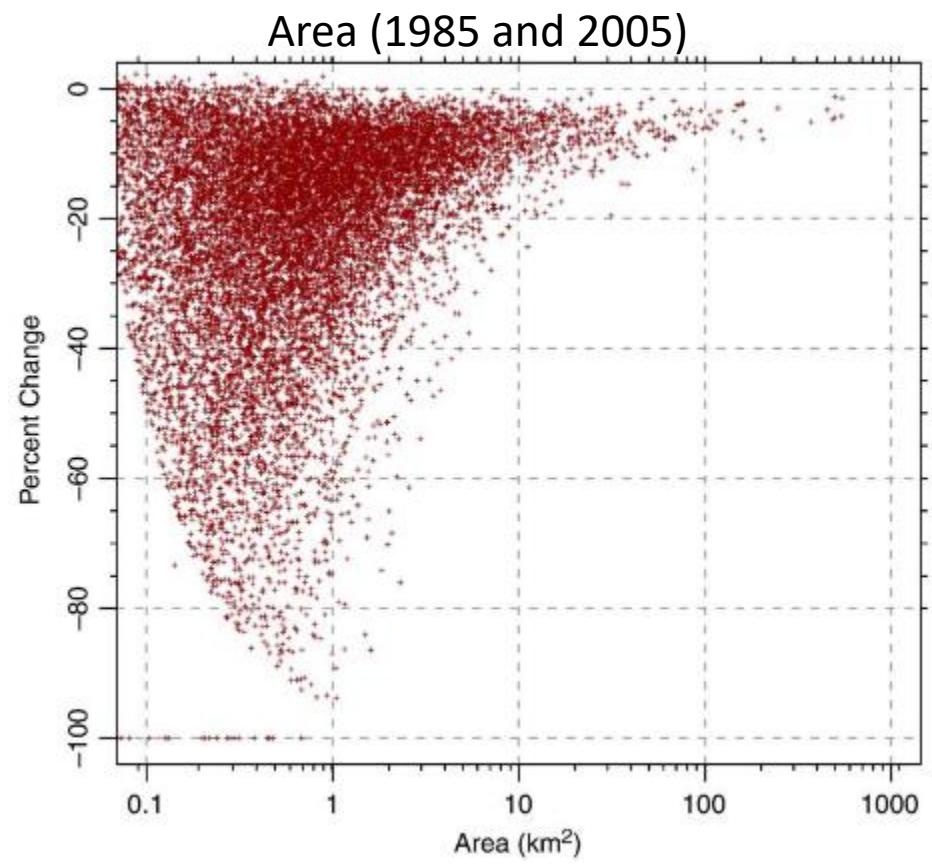
Melting glaciers in the 'Golden Triangle' expose new deposits. And pose huge risks.



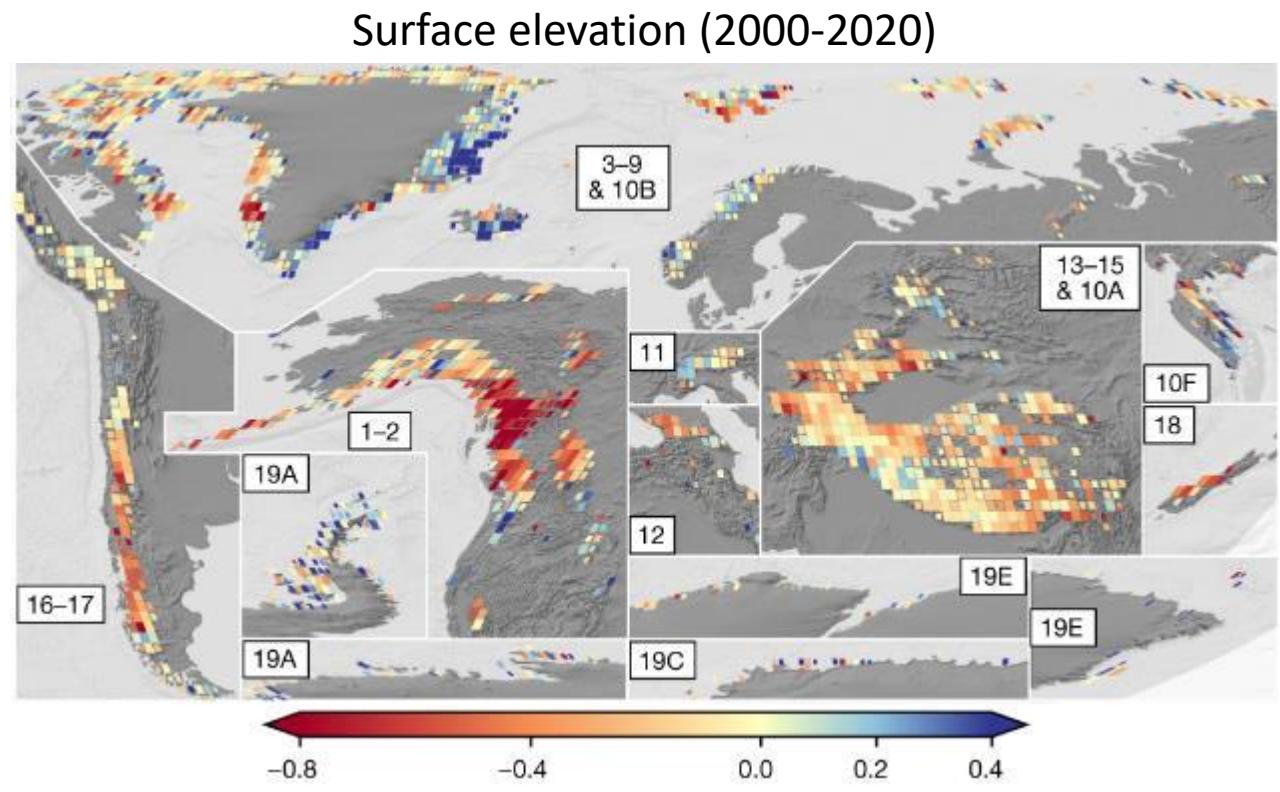


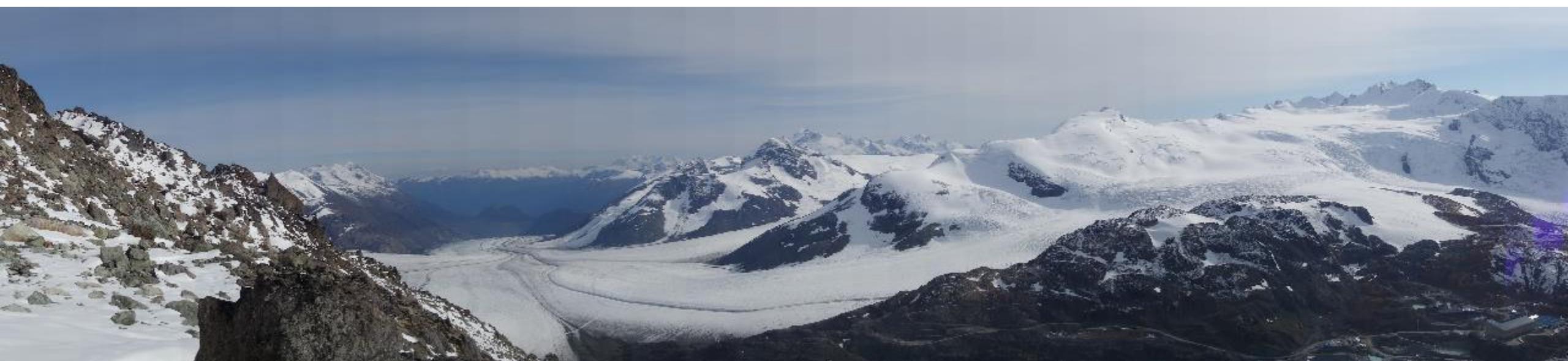
1986





Glacier area change from 1985 to 2005. Smaller glaciers see the greatest percent change. Total of  $-3056 \pm 990 \text{ km}^2 (-153 \pm 41 \text{ km}^2 \text{ yr}^{-1})$  (Bolch et al. 2010)

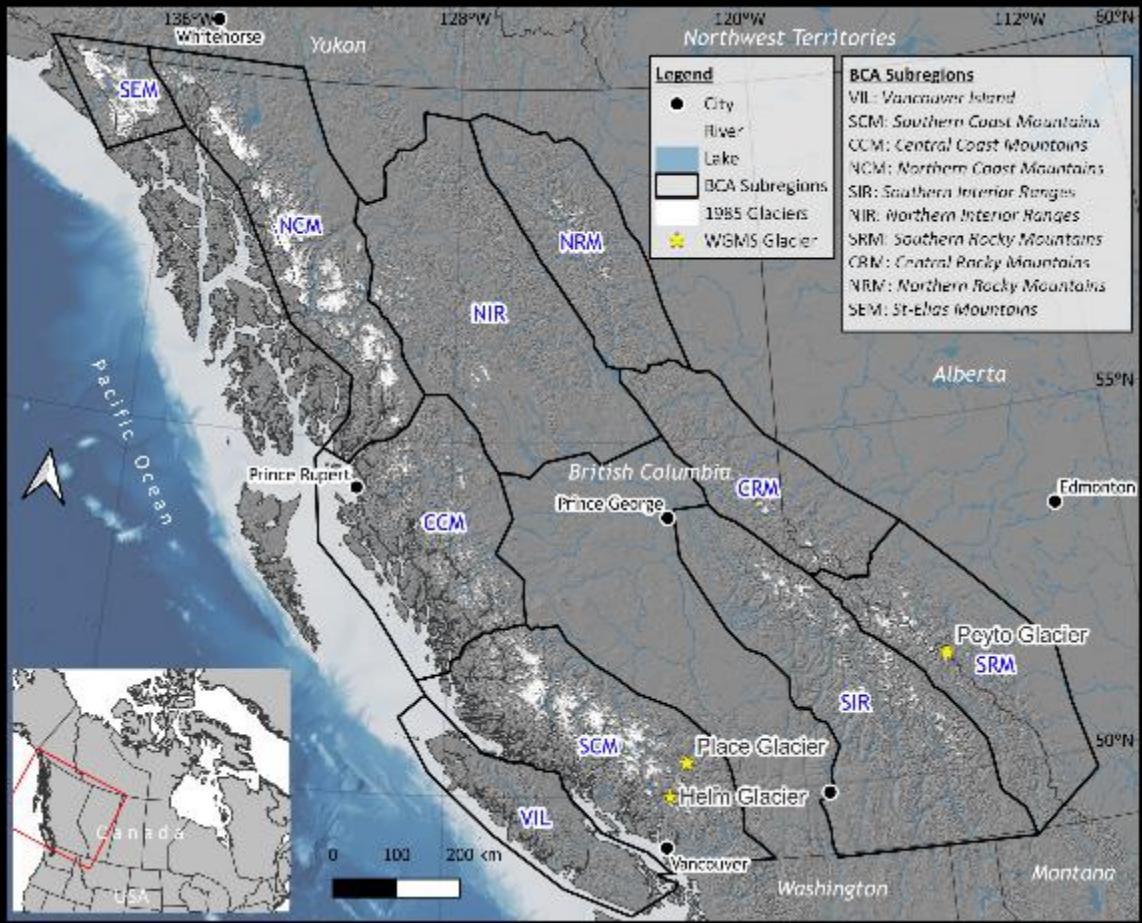




Brucejack

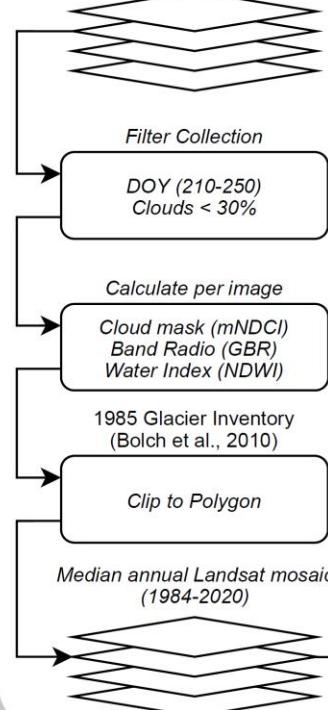
**The motivation of our study is to:**

- a) map glaciers automatically;
- b) update Bolch et al. (2010)
- c) assess drivers of glacier shrinkage



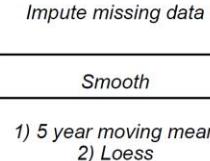
## 4.1: Annual mosaics

Landsat Surface Reflectance Archive (1984-2020)



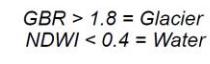
## 4.2: Gap-fill and smooth

Gap-fill

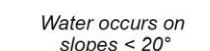


## 4.3: Thresholds

Band ratio thresholds

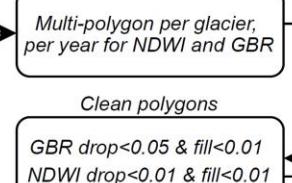


Terrain thresholds



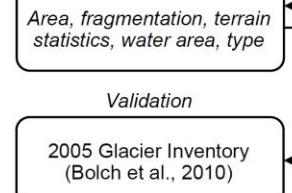
## 4.4: Clean and filter

Raster to polygon

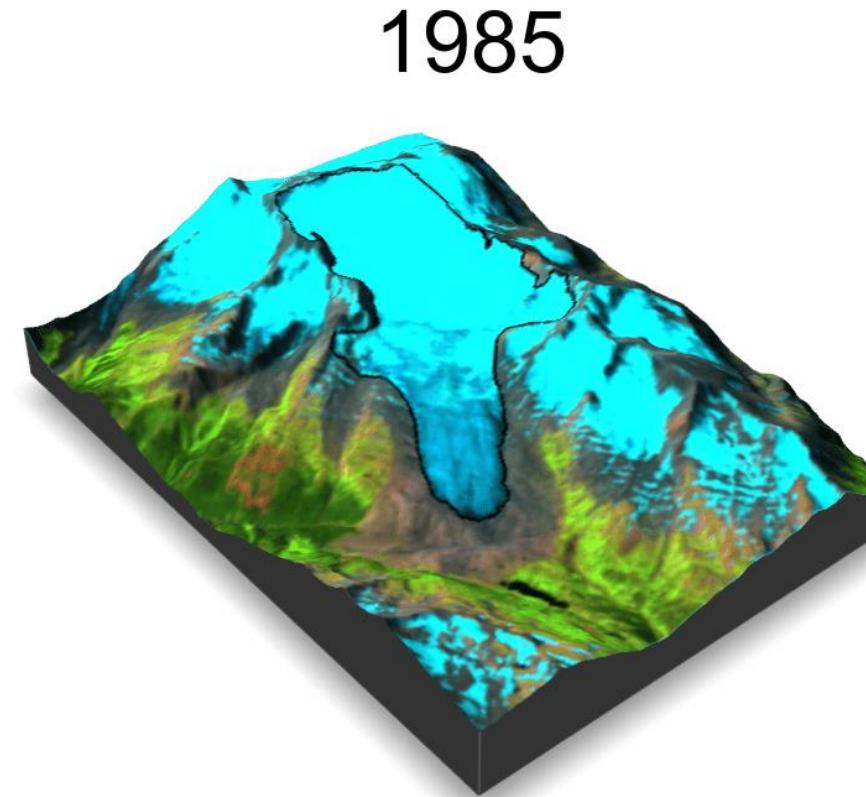
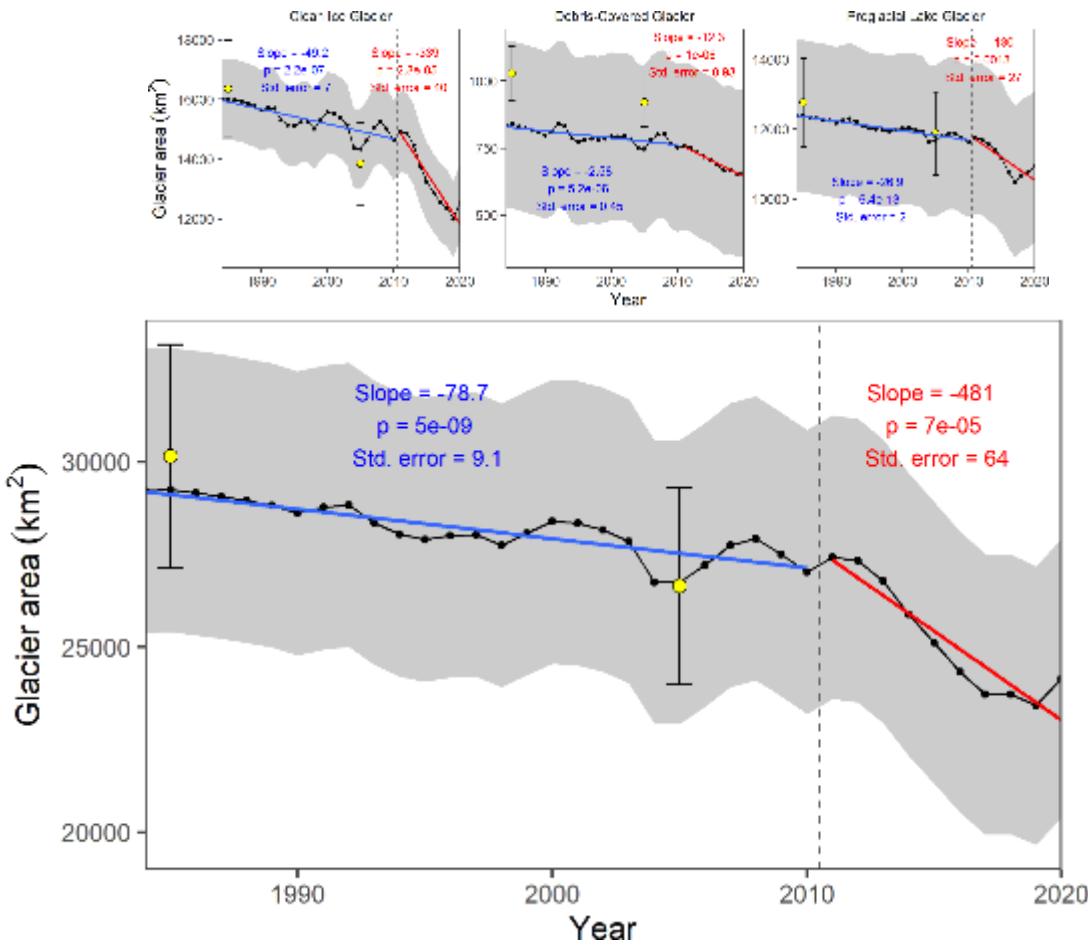


## 4.5: Attributes

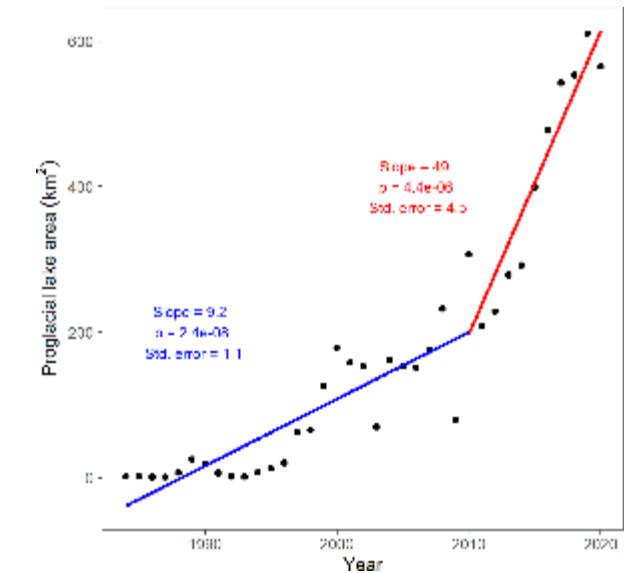
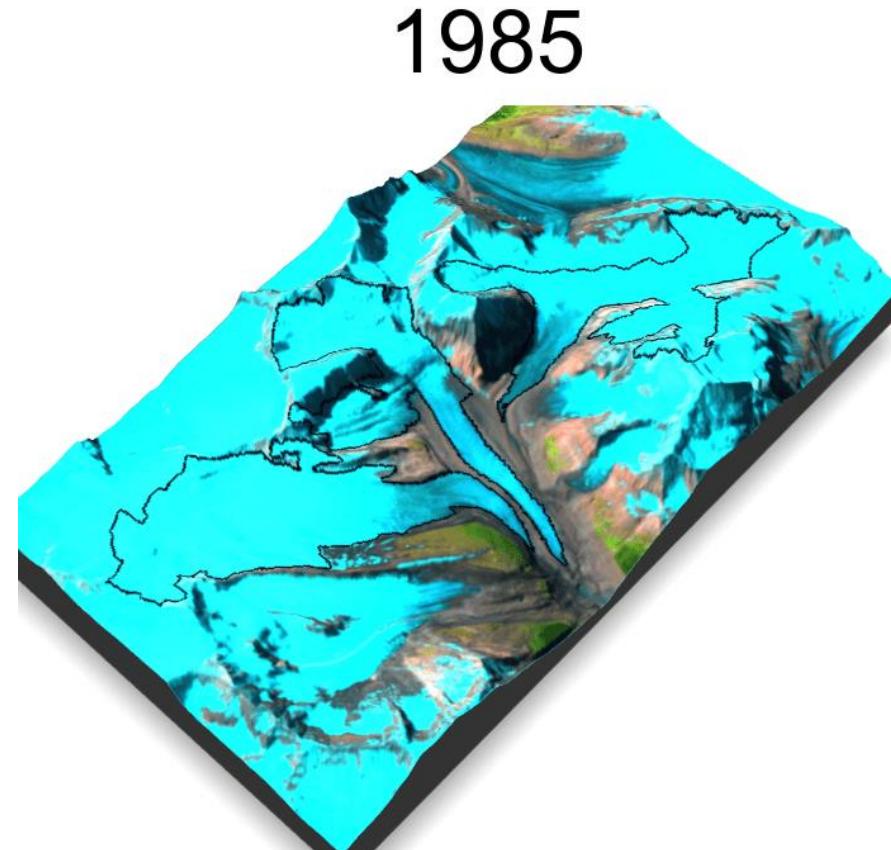
Per glacier attributes



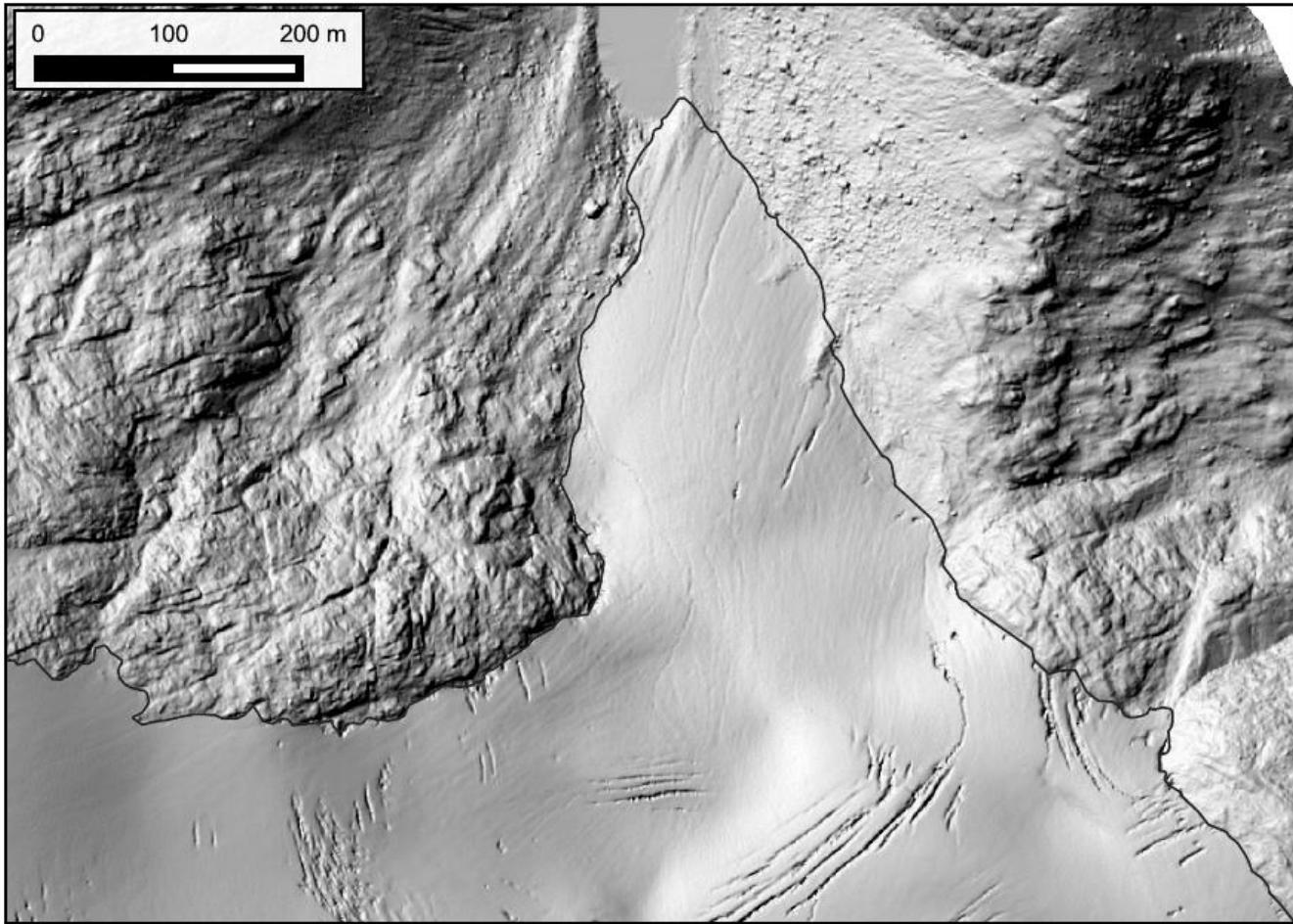
**Every glacier in BC and Alberta is retreating  
That retreat is accelerating (~7x)**



## Proglacial lakes are growing $49 \text{ km}^2$ per year

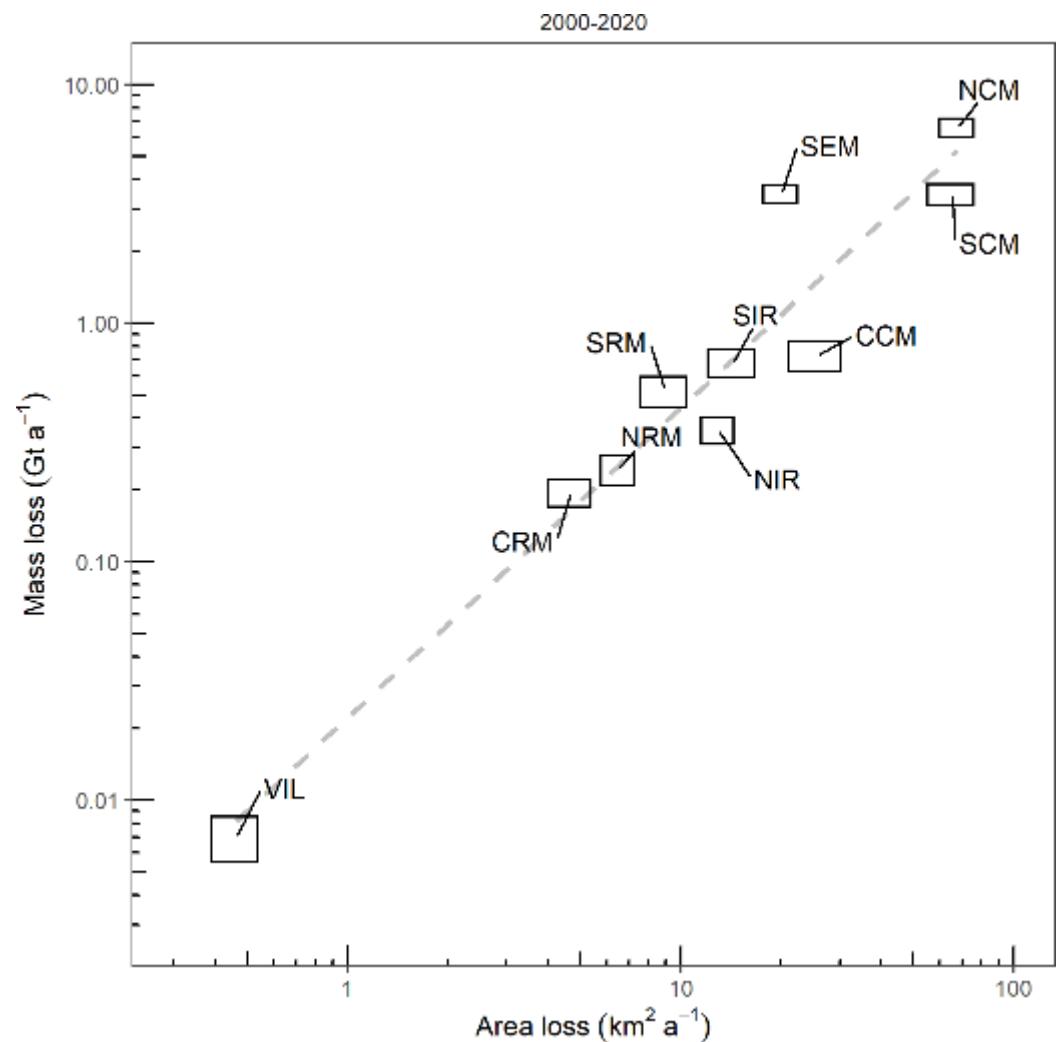


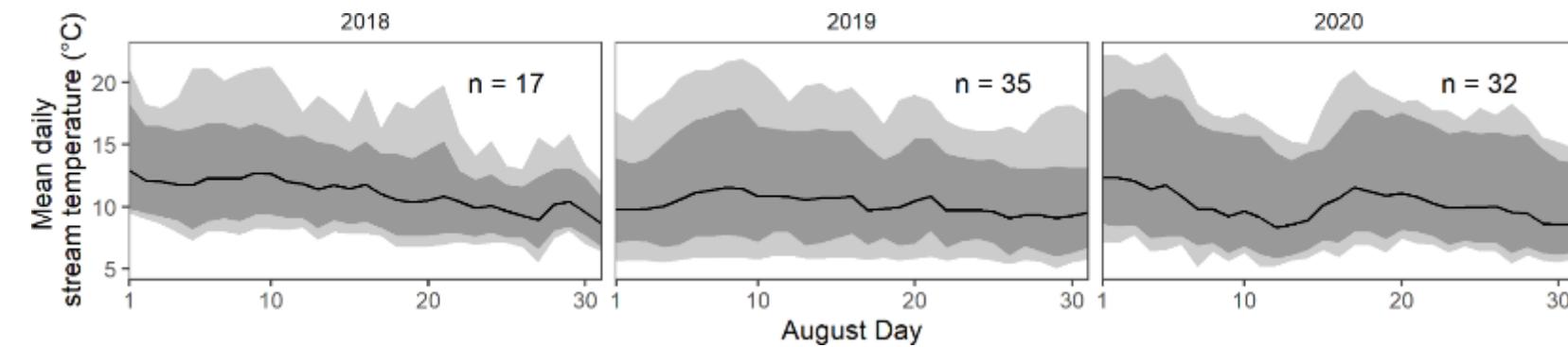
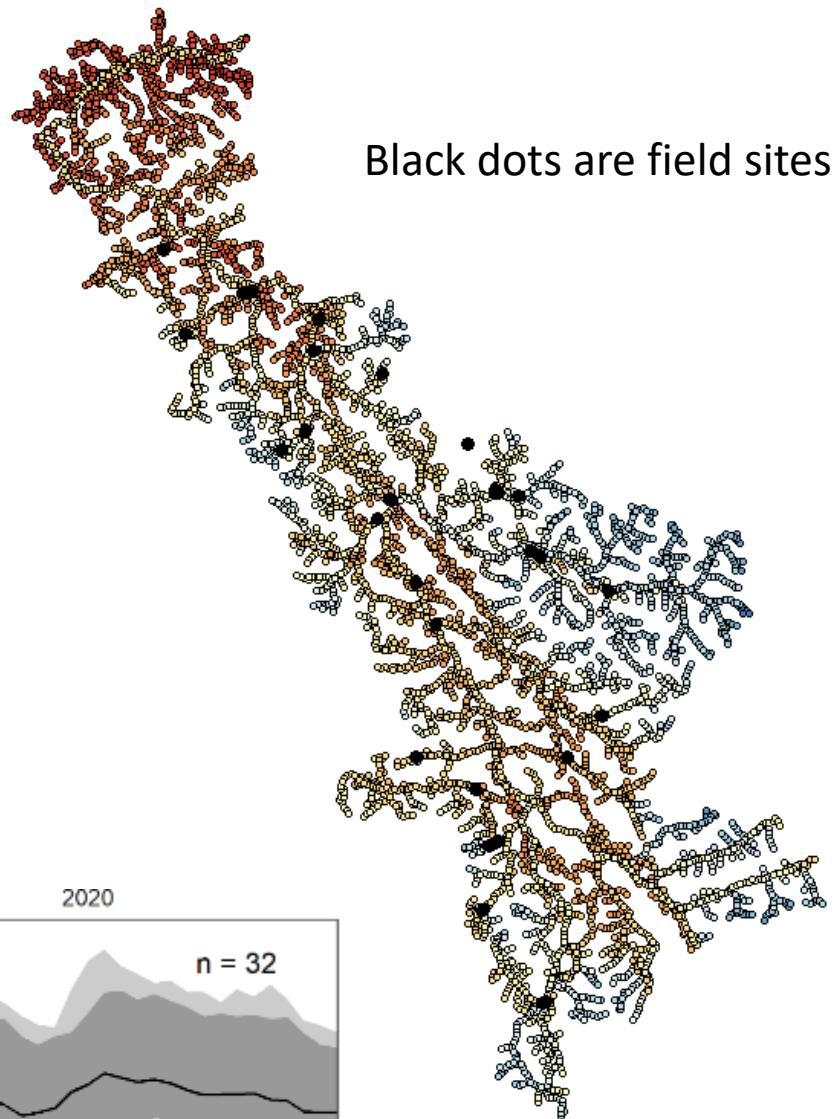
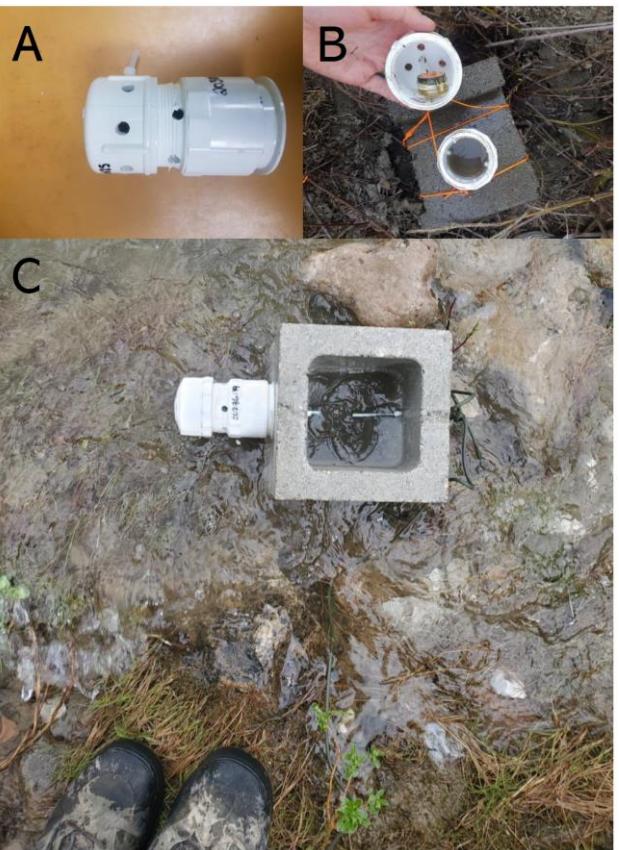
**Glacier area can be measured every year,  
Agrees well with mass change which cannot  
be measured every year**



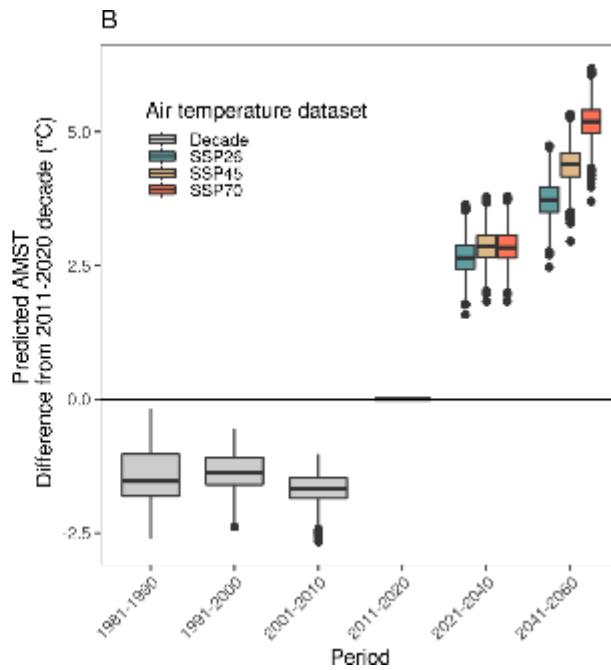
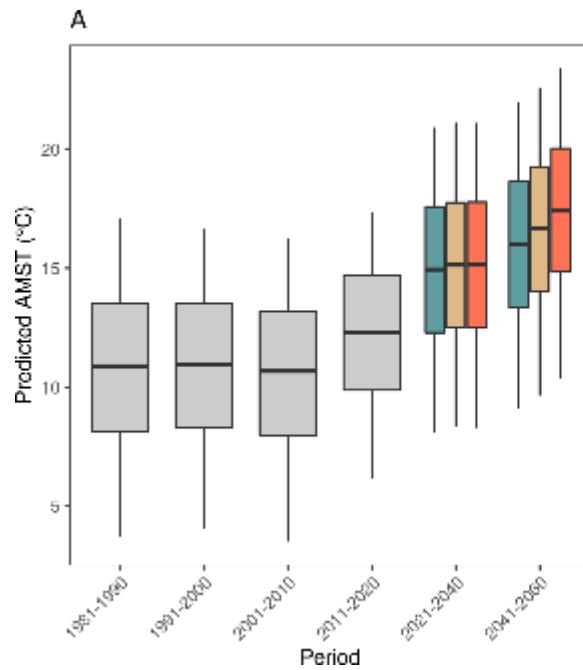
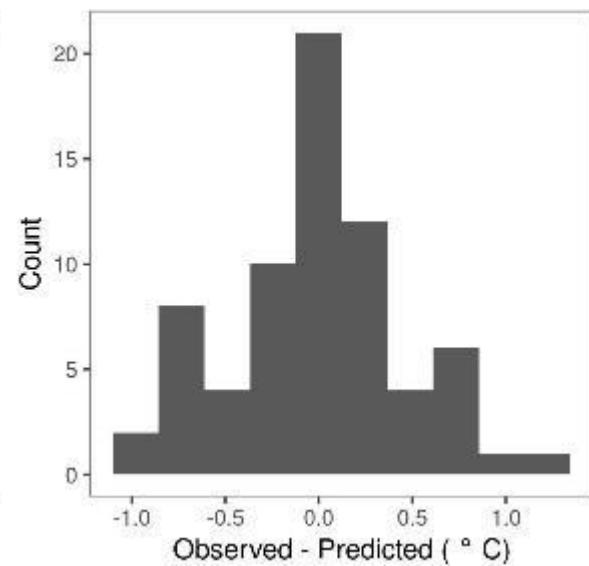
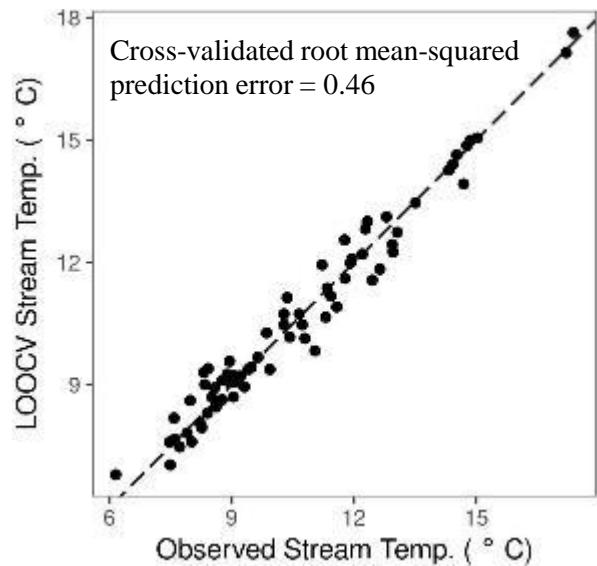
Kokanee Glacier terminus from 2015 to 2021. 140 meters of retreat for 23 m/yr. Data in the GIF are from Hakai Institute and Brian Menounos of UNBC ACO glacier surveys.

<https://blogs.agu.org/fromaglacielperspective/2021/09/28/kokanee-glacier-2021-slash-and-burn/>



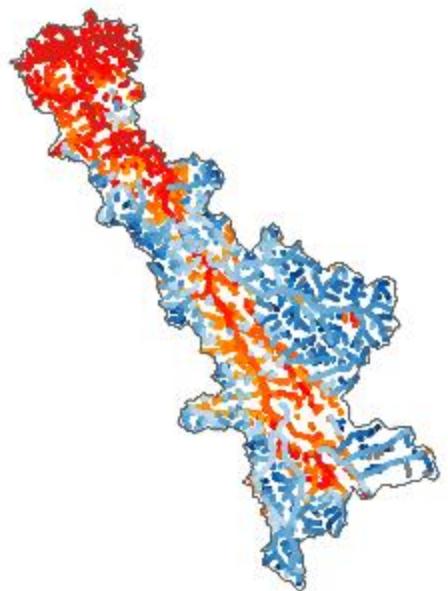


Input	Coef.	Std. Error	Std. Coef	t-value	P
avgTemp	0.97	0.057	0.67	16.87	< 2e-16 ***
avgTotPpt	-0.18	0.034	0.025	-5.29	< 2e-16 ***
PrctLk	60.47	8.97	0.40	6.75	< 2e-16 ***
BasinArea	0.0013	0.00033	0.26	4.04	0.00014 ***
avgTemp:avgTotPpt	0.014	0.0029	0.067	4.97	< 2e-16 ***
avgTemp:avgGradt	-1.69	0.48	-0.010	-3.52	0.00079 ***

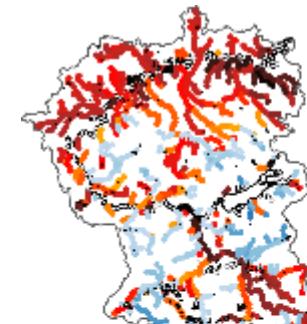
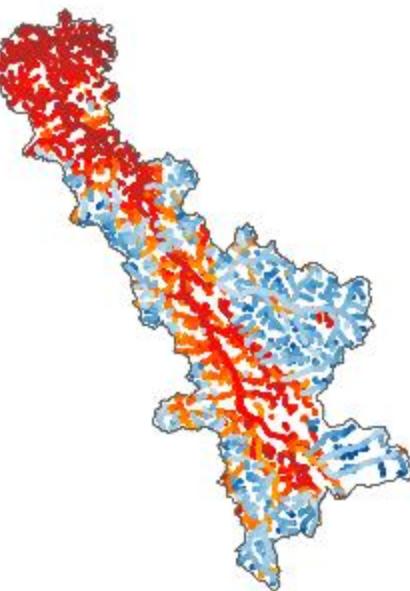


**A**

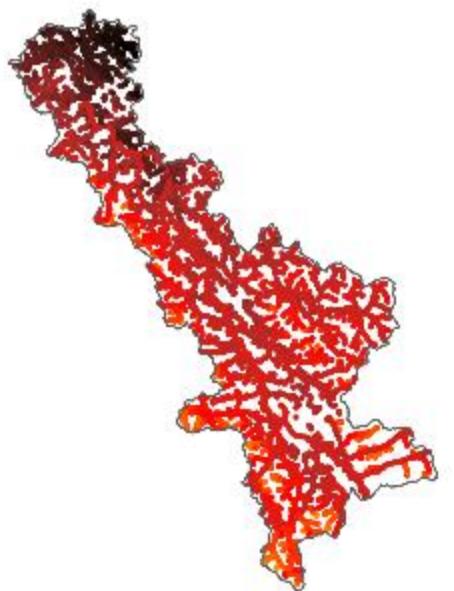
SSP45 2021-2040

**B**

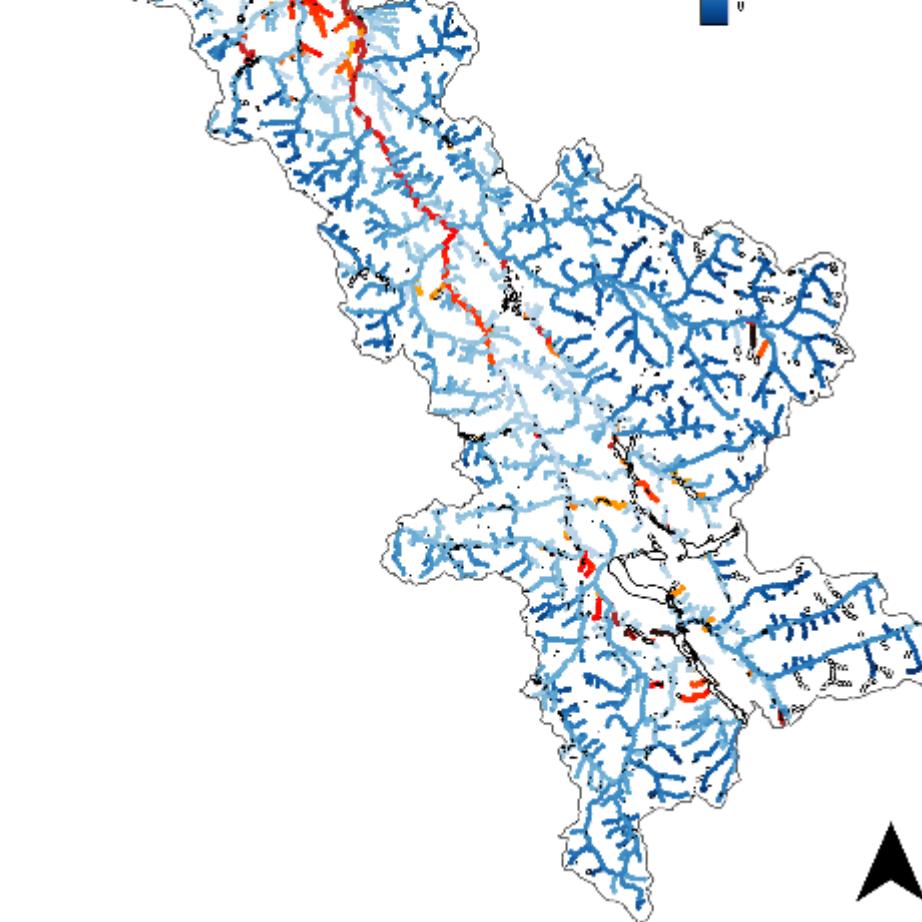
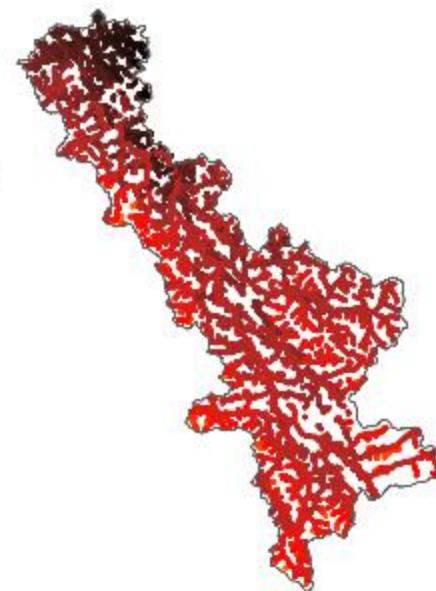
SSP45 2041-2060

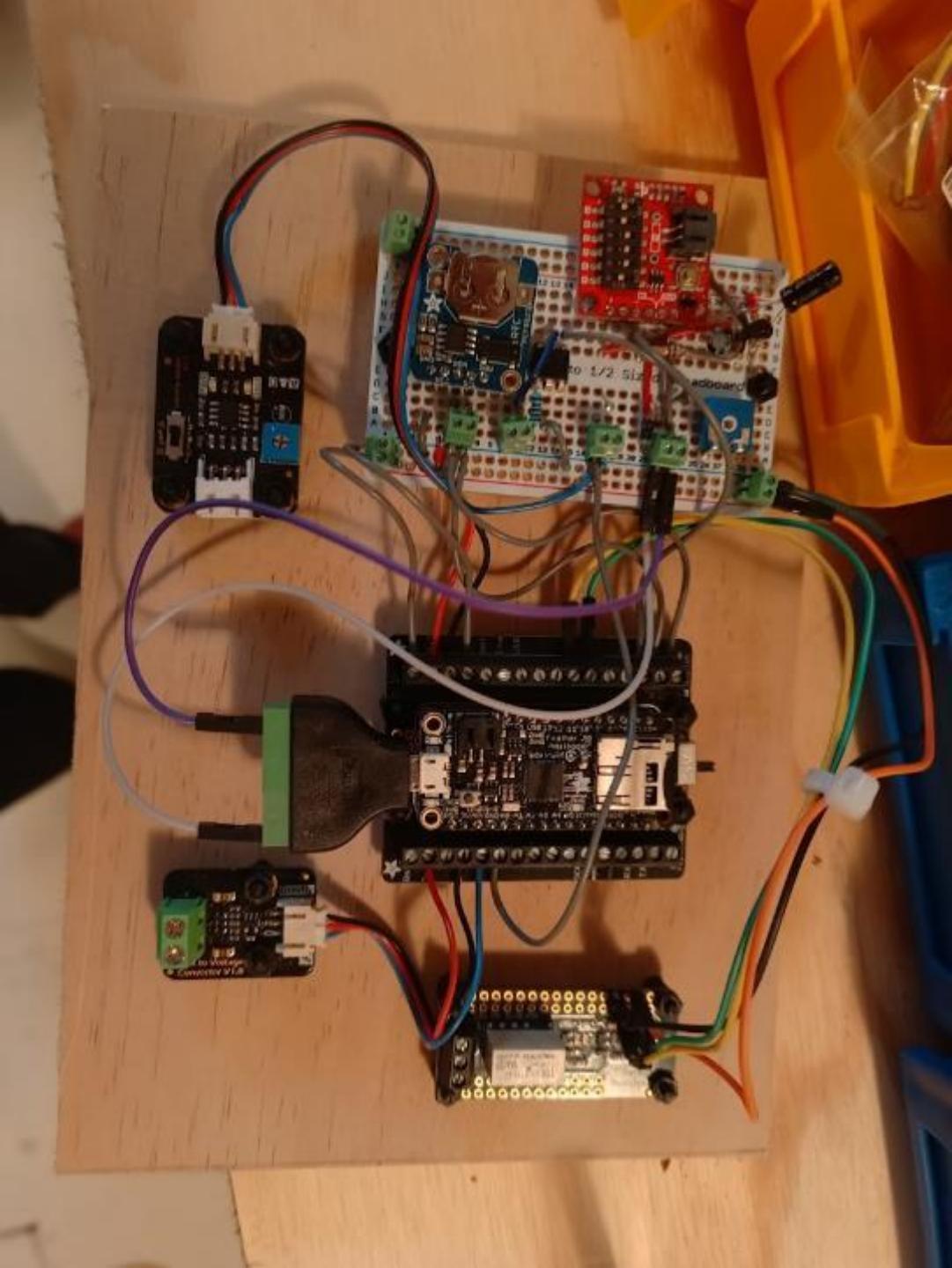
**C**

SSP45 2021-2040

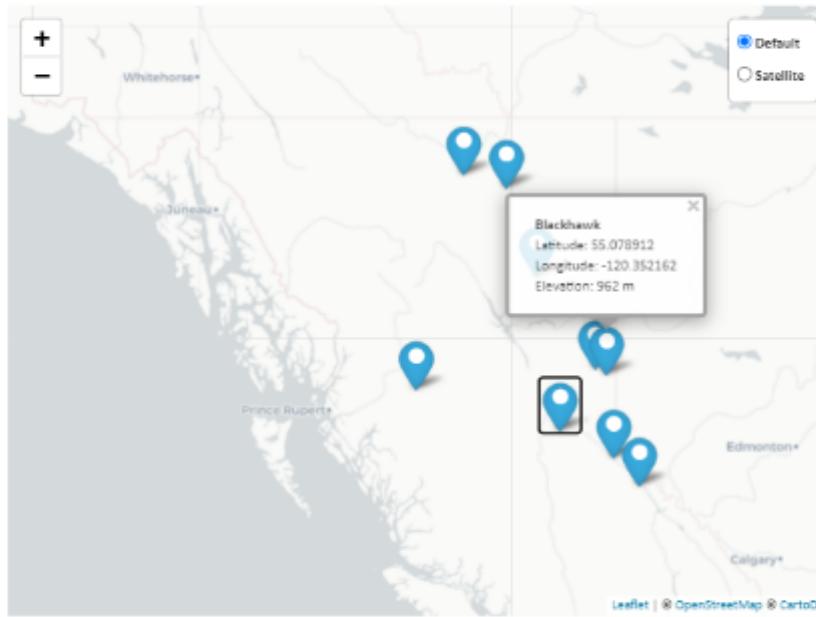
**D**

SSP45 2041-2060







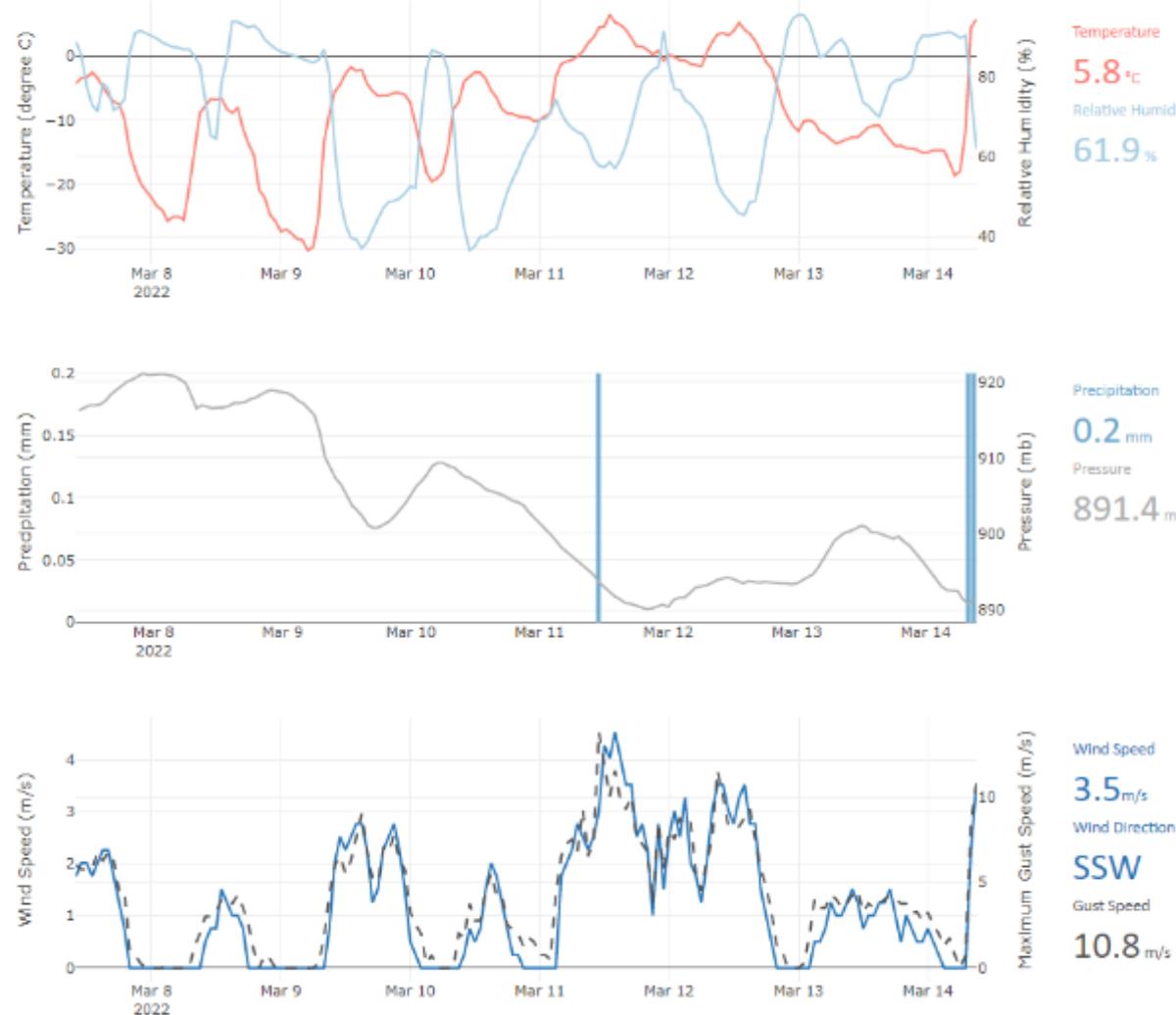
**Blackhawk**

Plots display the last available 7 days of records. For complete records, please see About page.

[Refresh plots by opening DTF](#).

[Refresh plots by opening TXT](#).

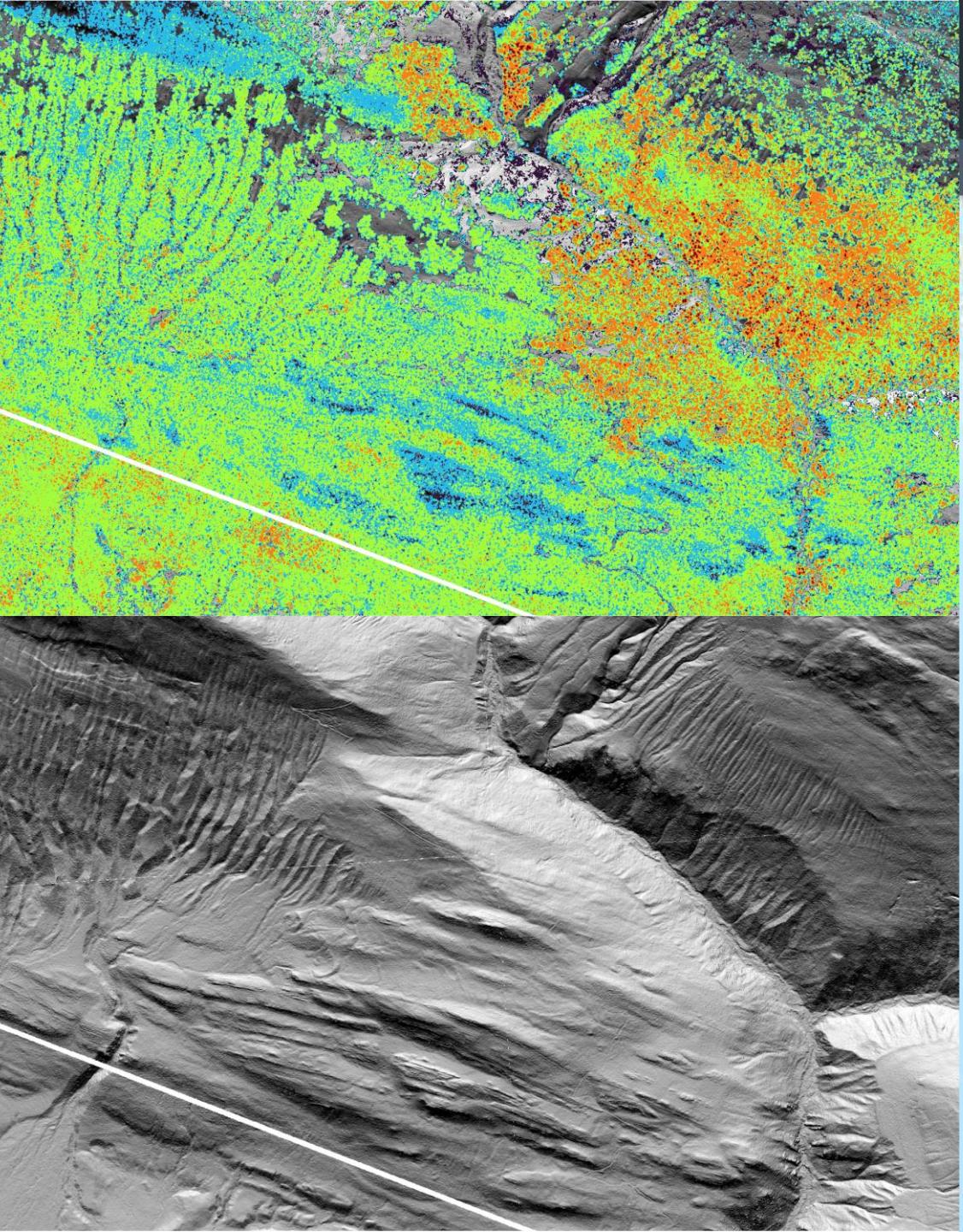
[Download](#)



Temperature  
**5.8 °C**  
Relative Humidity  
**61.9 %**

Precipitation  
**0.2 mm**  
Pressure  
**891.4 mb**

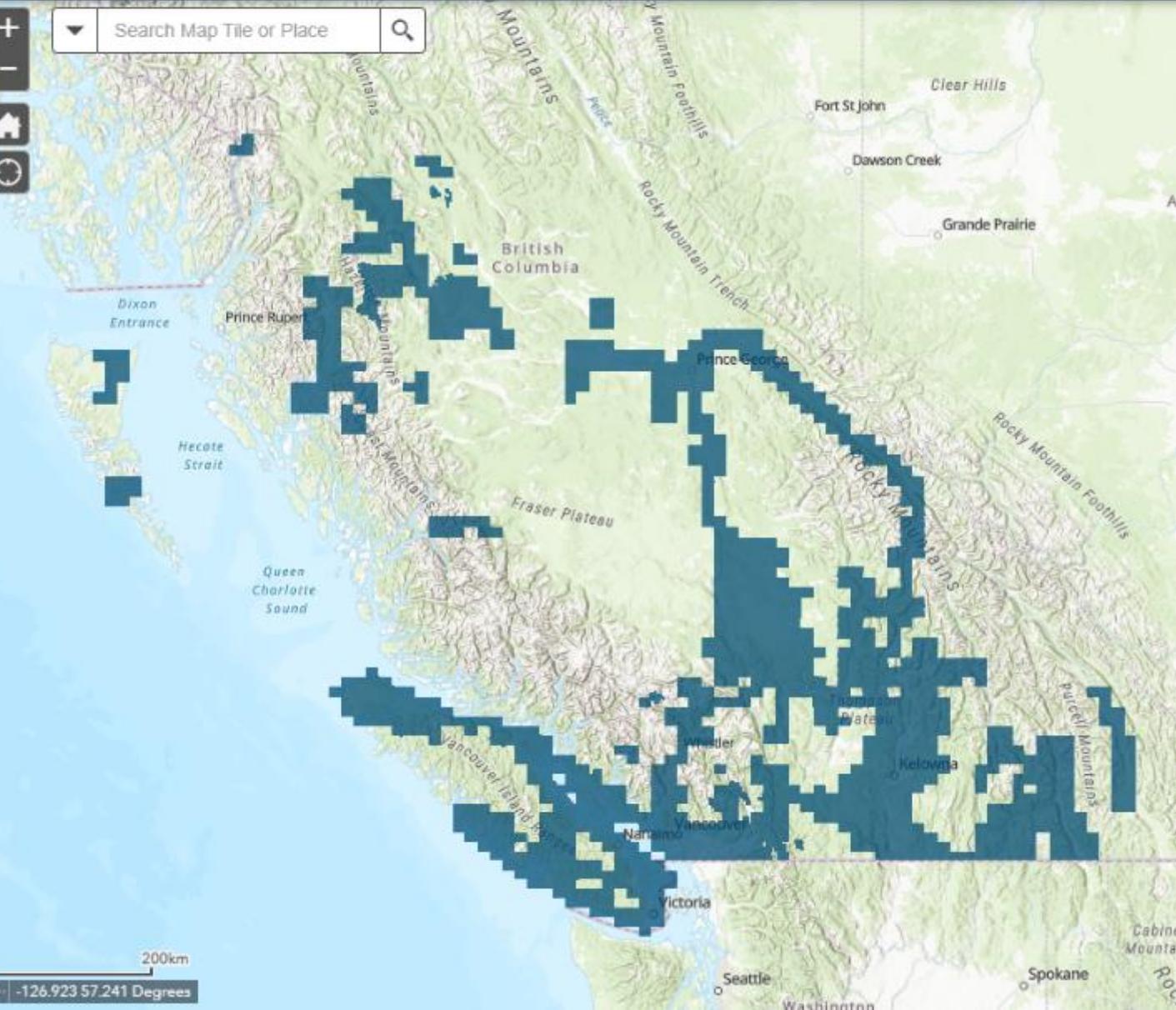
Wind Speed  
**3.5 m/s**  
Wind Direction  
**SSW**  
Gust Speed  
**10.8 m/s**



# LidarBC - Open LiDAR Data Portal

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Search Map Tile or Place



200km

-126.923 57.241 Degrees

# Conclusion

1. Remote sensing is increasingly used in provincial operations
2. There is a lag in our geospatial services
3. Still a need for custom-per-project analysis
4. Research and development continues to be needed for: Climate change, drought, floods, wildfire, landslides, watershed science ...

