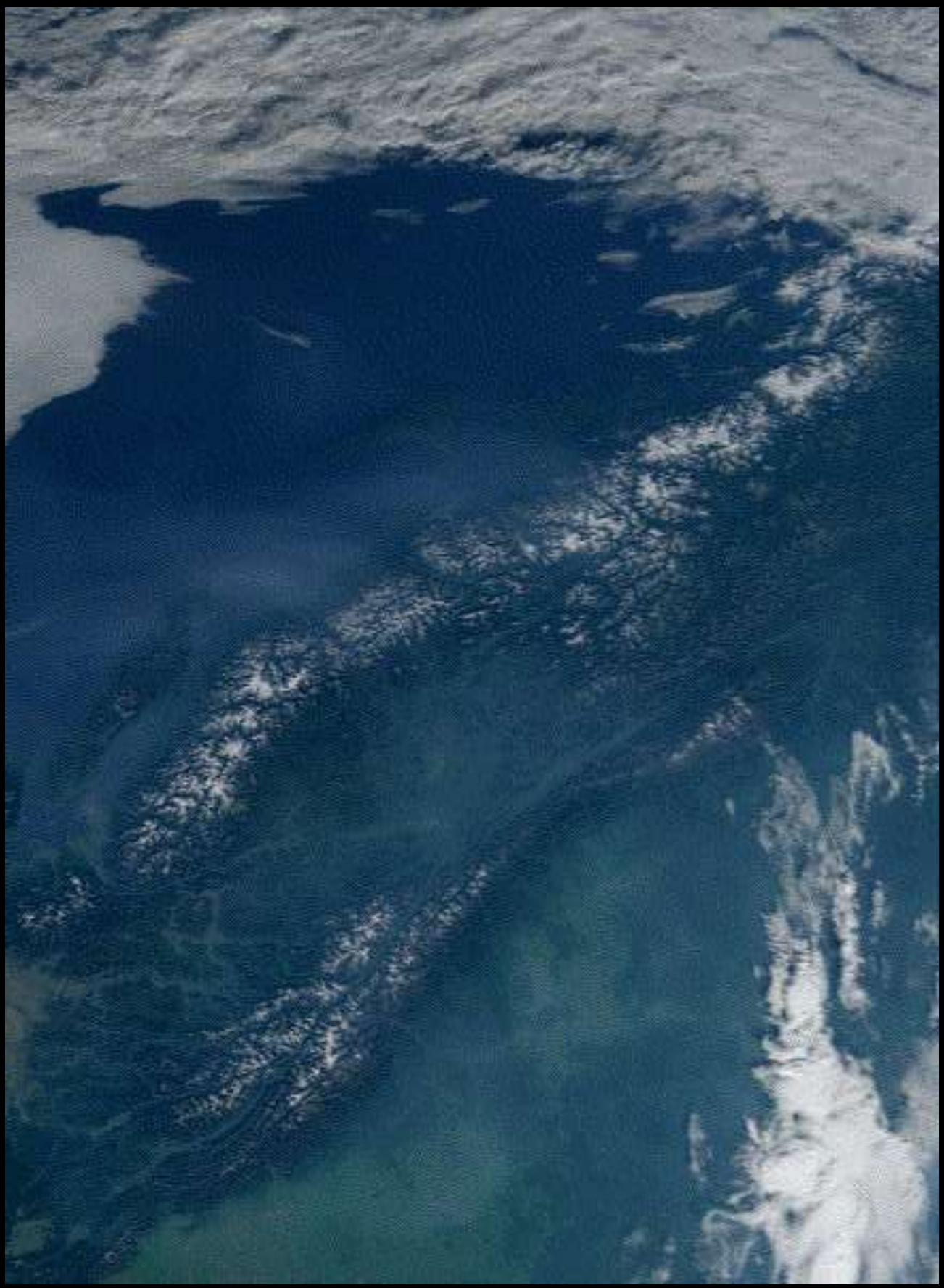
Emergency response and humanitarian remote sensing

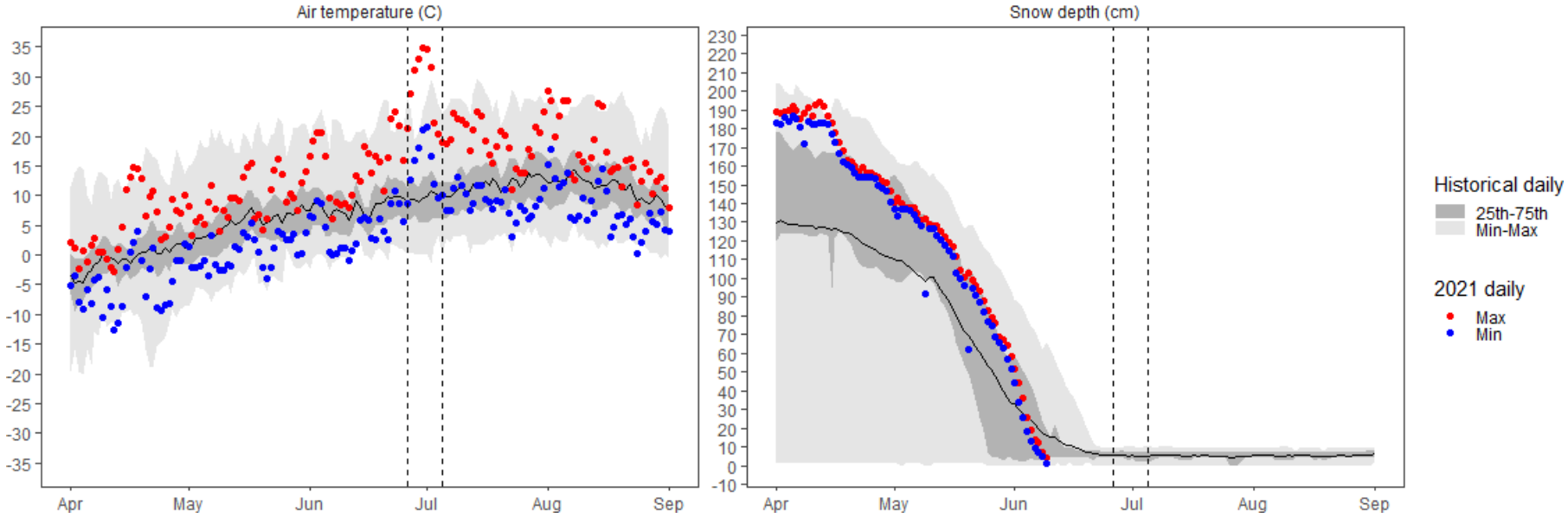
Alexandre.Bevington@gov.bc.ca

March 21, 2022

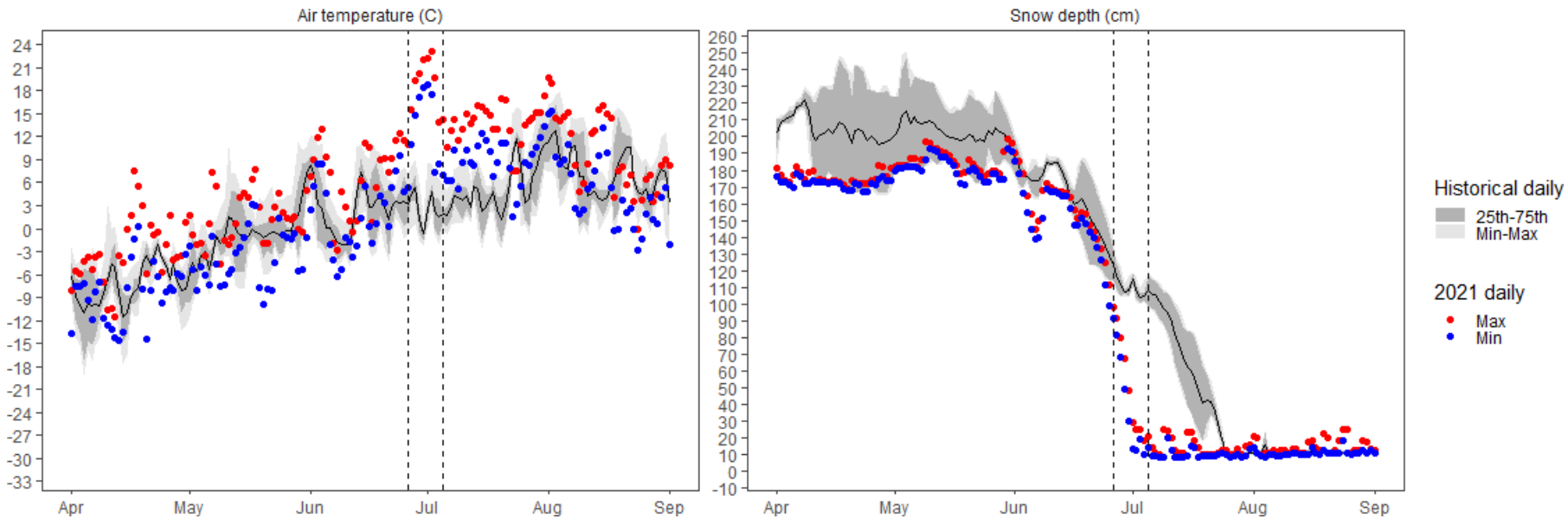


Snowline (June 26 – Jul 9)
+300 m on N slopes (1800 to 2100 m)
+600 m on S slopes(2100 to 2700 m)
Google Earth
Image © 2021 Maxar Technologies
Image © 2021 Province of British Columbia
Image © 2021 CNES / Airbus

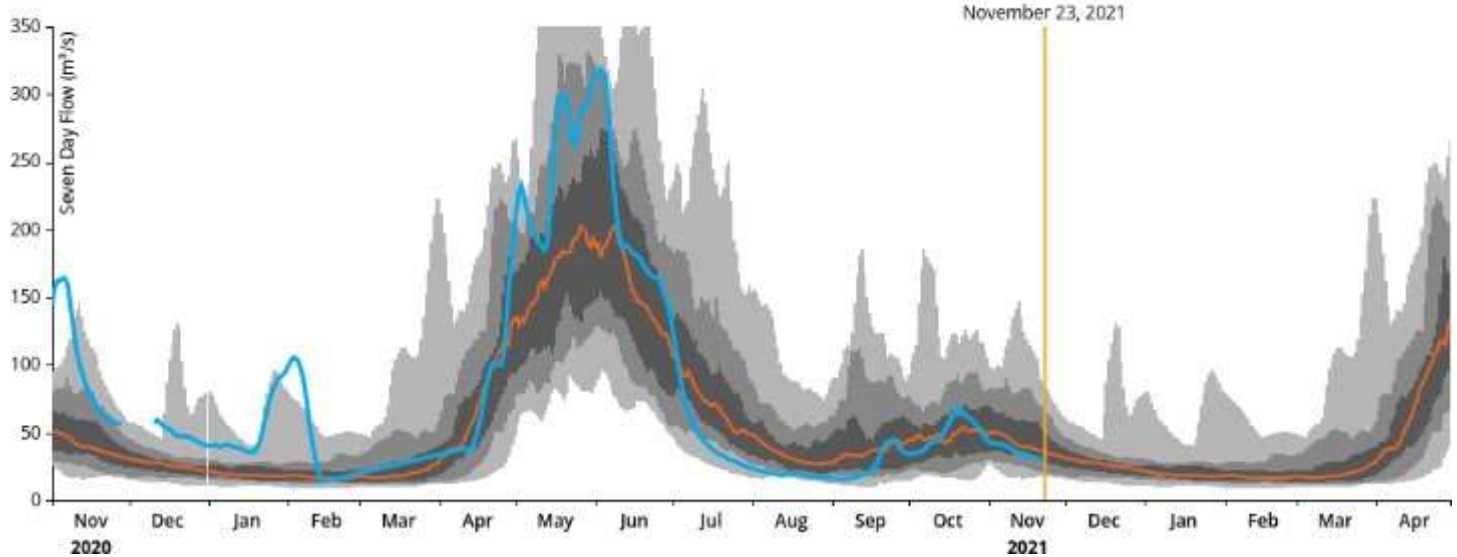
McBride Upper (1A02P) 1610m (2006-2021)



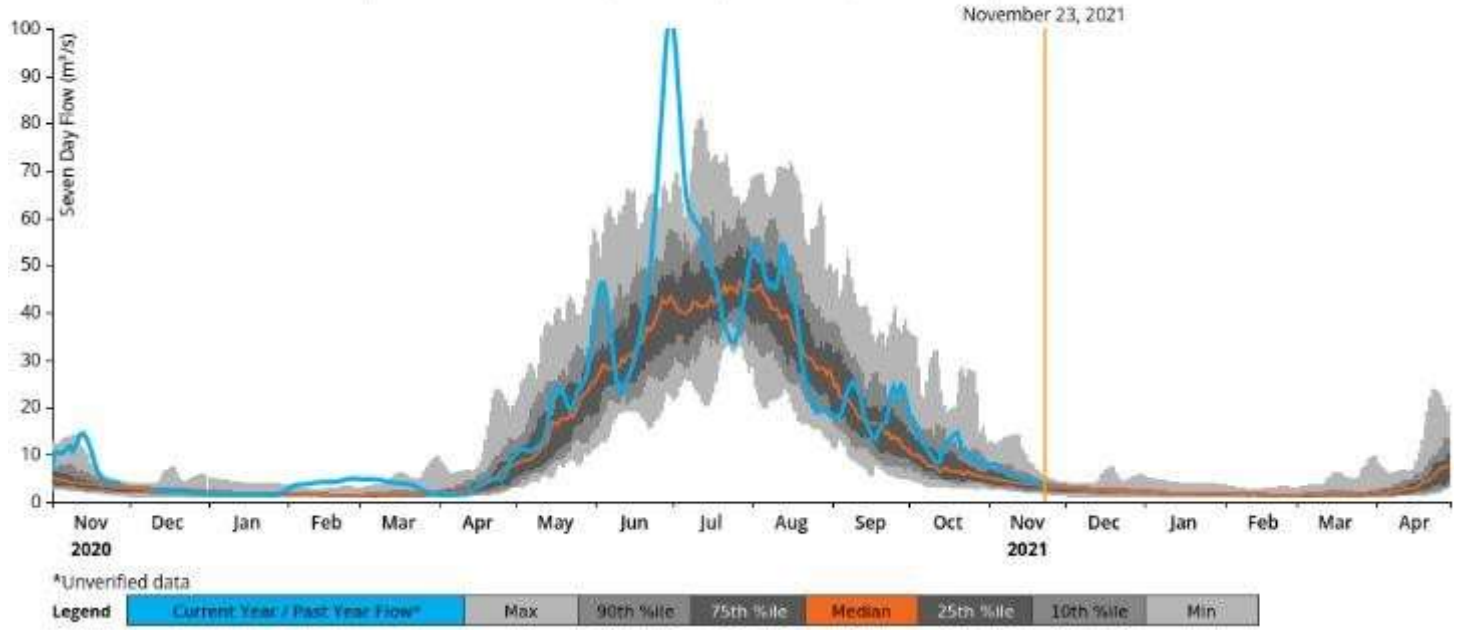
Conrad Glacier (2A33P) 2599m (2018-2021)



08KD007	NETWORK	STATUS	YEAR RANGE	AREA	MEAN ANNUAL DISCHARGE
Bowron River Below Box Canyon	Water Survey of Canada	Current	1977-2021	3330.00 km²	65.83 m³/s

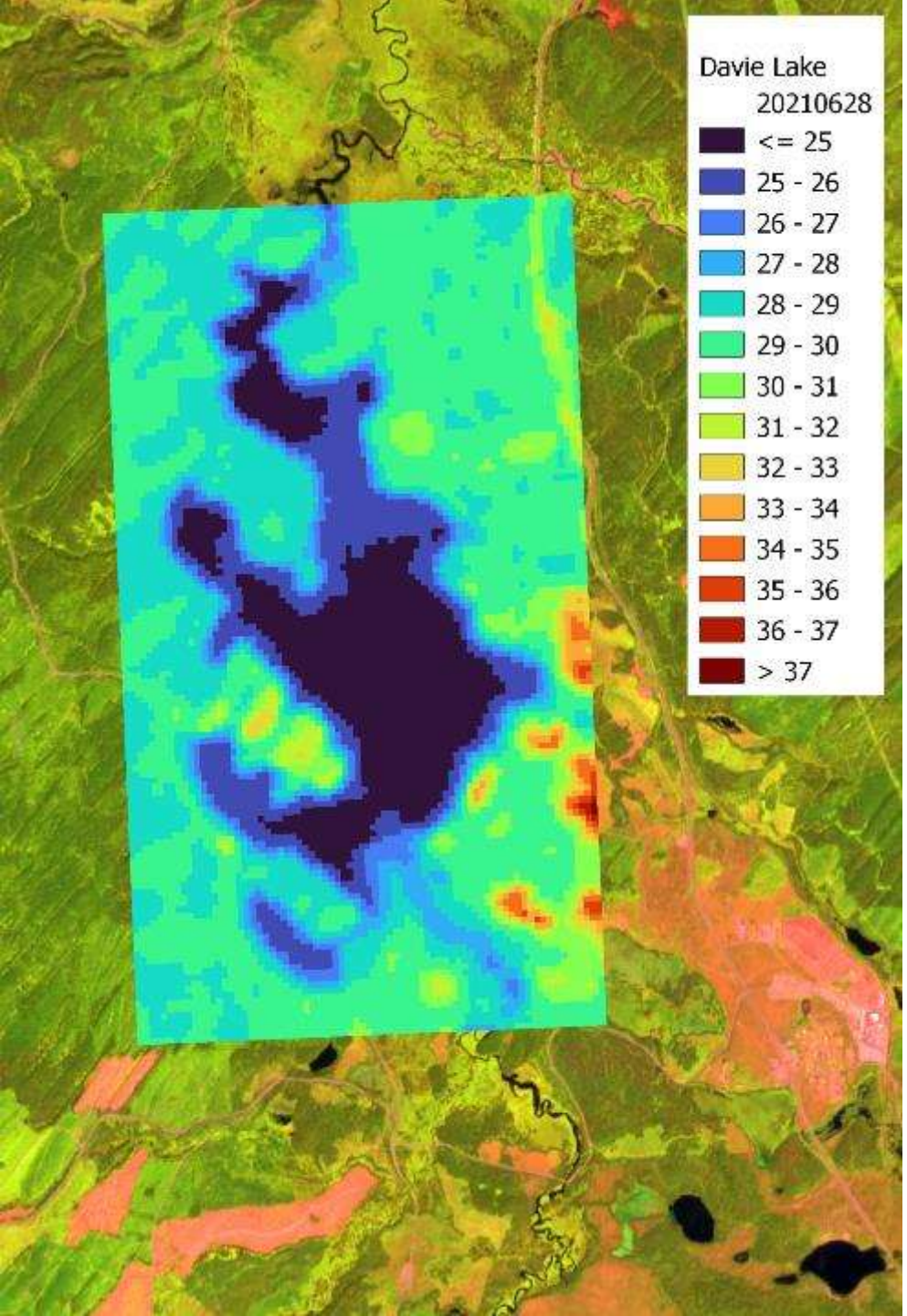


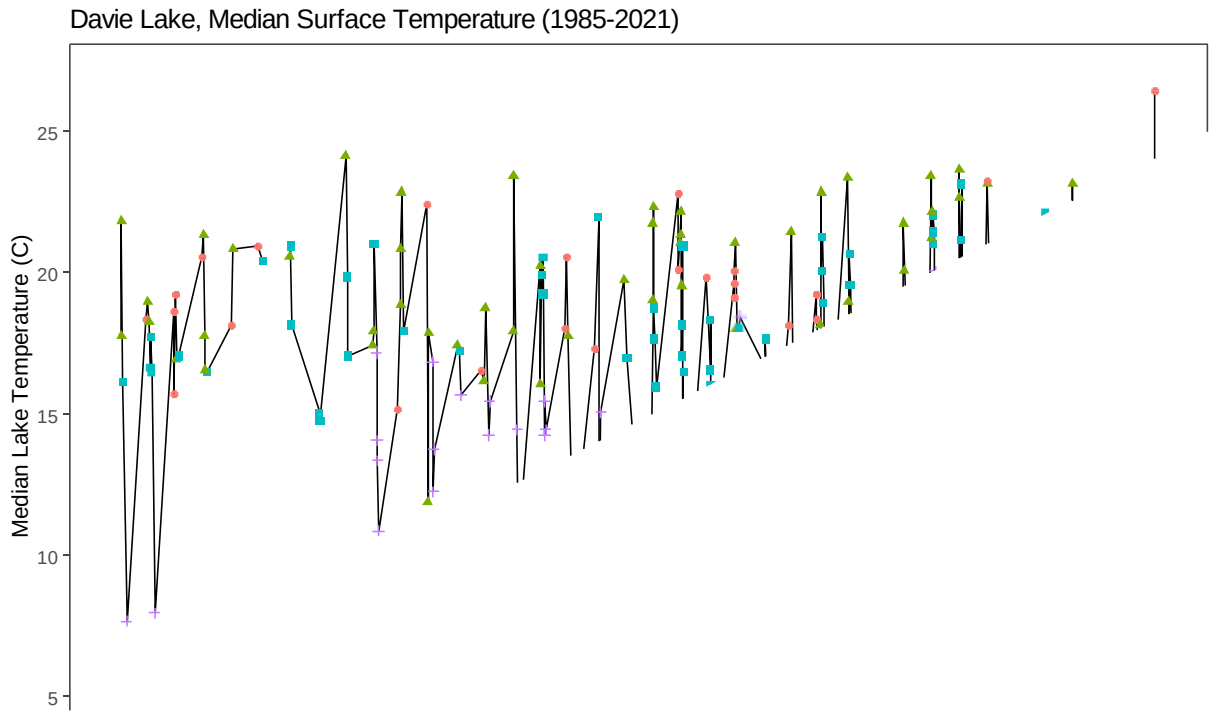
08NC004	NETWORK	STATUS	YEAR RANGE	AREA	MEAN ANNUAL DISCHARGE
Canoe River Below Kimmel Creek	Water Survey of Canada	Current	1971-2021	305.00 km²	14.79 m³/s



McBride June 26-29
McBride

June 30


Davie Lake
20210628
<= 25
25 - 26
26 - 27
27 - 28
28 - 29
29 - 30
30 - 31
31 - 32
32 - 33
33 - 34
34 - 35
35 - 36
36 - 37
> 37


Davie Lake, Median Surface Temperature (1985-2021)
Median Lake Temperature (C)
25
20
15
10
5

A WORLDWIDE COLLABORATION FOR DISASTER RELIEF

The Charter provides a unified system to make satellite data of affected areas available to support relief efforts.
Timely, reliable and accurate information enables response teams to be better equipped to save lives and limit damage.

Founding members:

esa cnes

17 members

61 contributing satellites

Canada's participating satellites:
RADARSAT-2 and **RADARSAT Constellation Mission**

Types of disasters:
floods, cyclones/hurricanes, volcanic eruptions, landslides, oil spills, earthquakes, tsunami, wildfires

INTERNATIONAL CHARTER SPACE & MAJOR DISASTERS
CHARTE INTERNATIONALE ESPACE ET CATASTROPHES MAJEURES

24 hours a day, **7**days a week

Effective since **November 2000**

Activations from 2000 to October 6, 2020:
678 in 126 countries
14 in Canada

Members cooperate on a **voluntary** basis, **at no cost to the user**

Canada

Types of Disaster

Cyclones ▸

Earthquakes ▸

Fires ▸

Ocean Waves ▸

Oil spills ▸

Volcanoes ▸

Floods ▸

Snow and Ice ▸

Landslides ▸

Other ▸

Greenland
Iceland
Canada
Sweden
Norway
Finland
Russia
Denmark
Ireland
Poland
Belarus
Ukraine
Kazakhstan
Mongolia
Kyrgyzstan
Turkmenistan
Spain
Portugal
Algeria
Libya
Egypt
Saudi Arabia
Oman
Iran
India
Mauritania
Mali
Niger
Chad
Ethiopia
Angola
Botswana
South Africa
Brazil
Argentina
Australia
New Guinea
North Atlantic Ocean
South Atlantic Ocean
Indian Ocean
South Pacific Ocean
North Pacific Ocean
2000 km

Mapping our world together

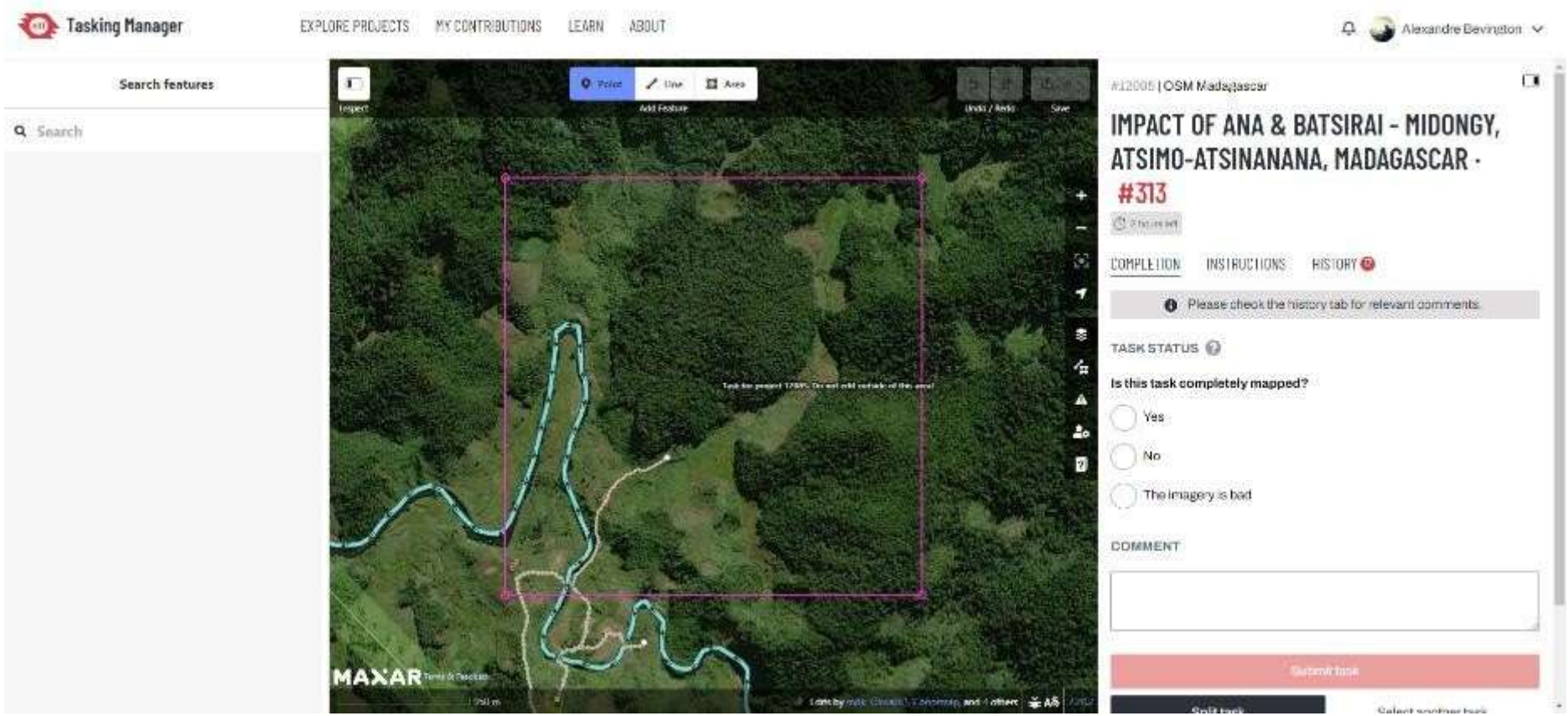
DONATE

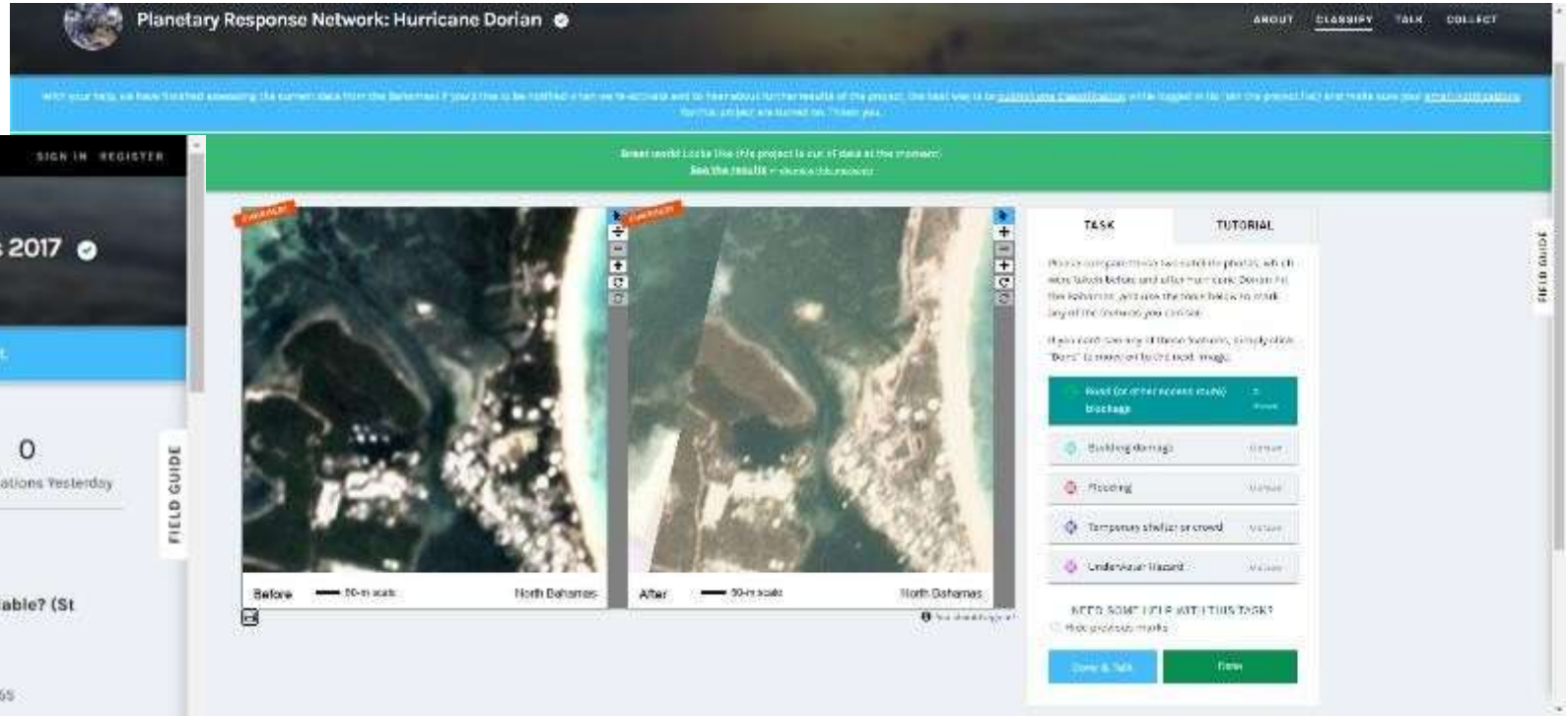
Humanitarian OpenStreetMap Team

WHAT WE DO | OUR WORK | TOOLS & DATA | NEWS | OPEN MAPPING HUBS | COMMUNITY & ORGANIZATION | PARTNER WITH US | GET INVOLVED

HOT is an international team dedicated to humanitarian action and community development through open mapping.

https://tasks.hotosm.org/explore





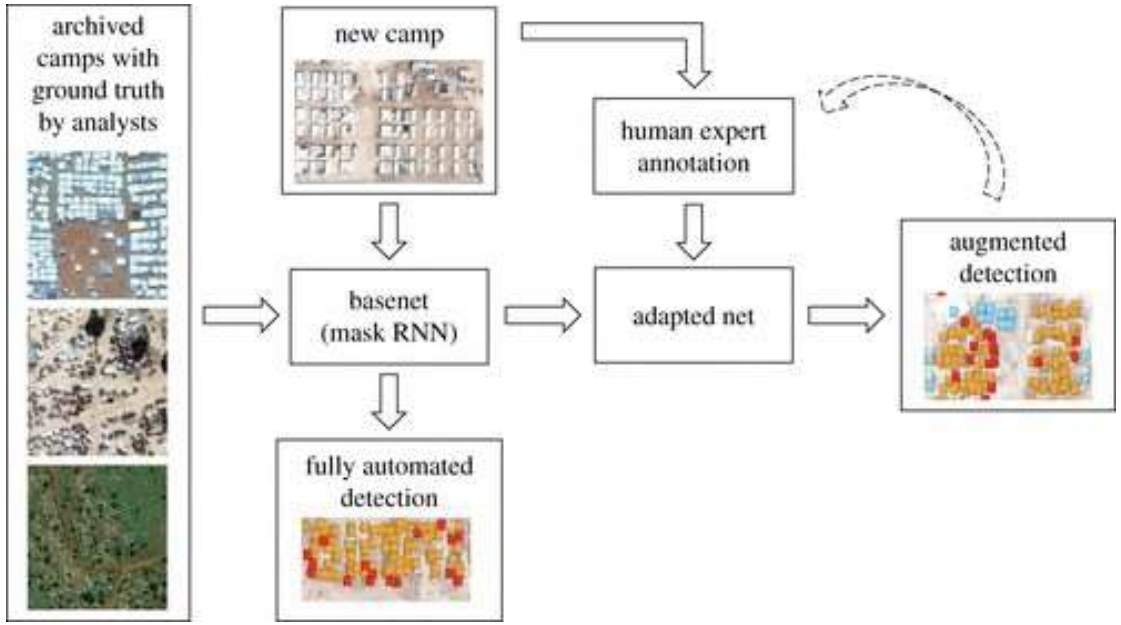
https://www.zooniverse.org/projects/mrniaboc/planetary-response-network-hurricane-dorian

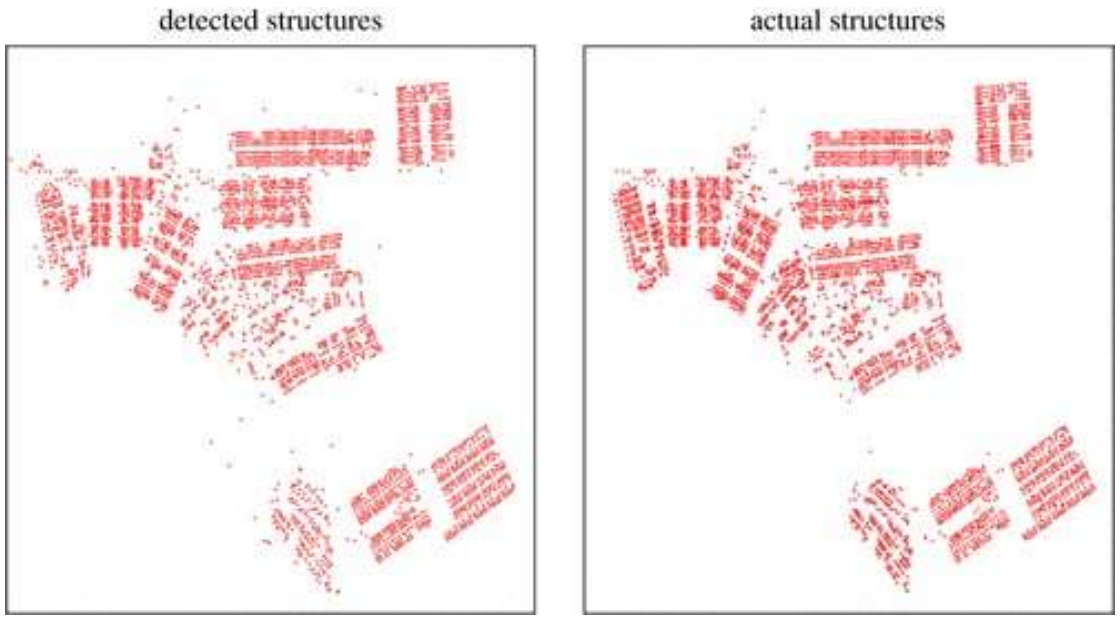
Research article

Humanitarian applications of machine learning with remote-sensing data: review and case study in refugee settlement mapping

John A. Quinn ✉, Marguerite M. Nyhan, Celia Navarro, Davide Coluccia, Lars Bromley and Miguel Luengo-Oroz

Published: 06 August 2018 | https://doi.org/10.1098/rsta.2017.0363





SCIENTIFIC REPORTS
nature research

The Spatial and Temporal Influence of Cloud Cover on Satellite-Based Emergency Mapping of Earthquake Disasters

Tom R. Robinson[1,2], Nick Rosser[1] & Richard J. Walters[1]

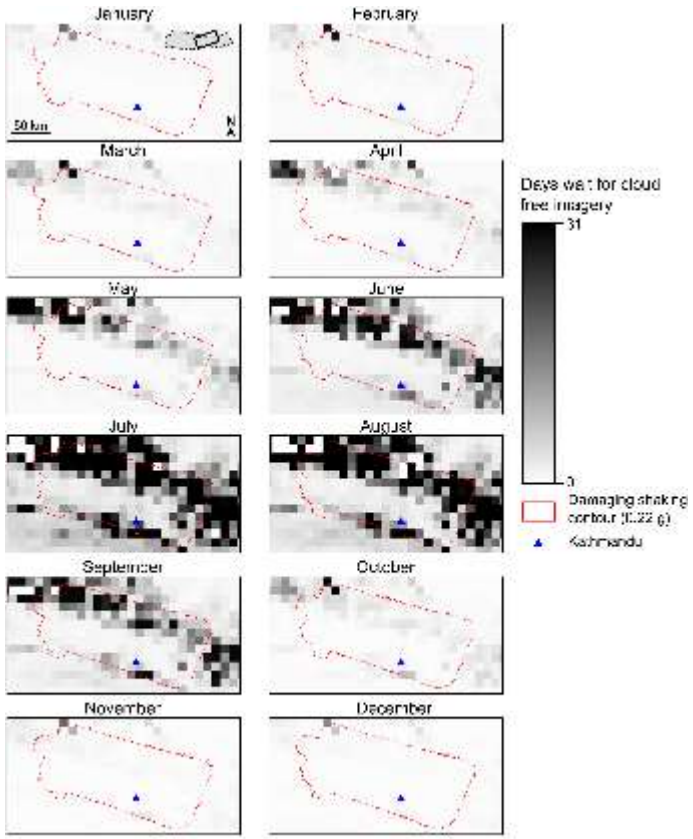


Figure 5. Average number of days wait for cloud free imagery in central Nepal. Monthly variation in wait time for cloud free imagery over the area affected by damaging shaking during the April 2015 Nepal earthquake.

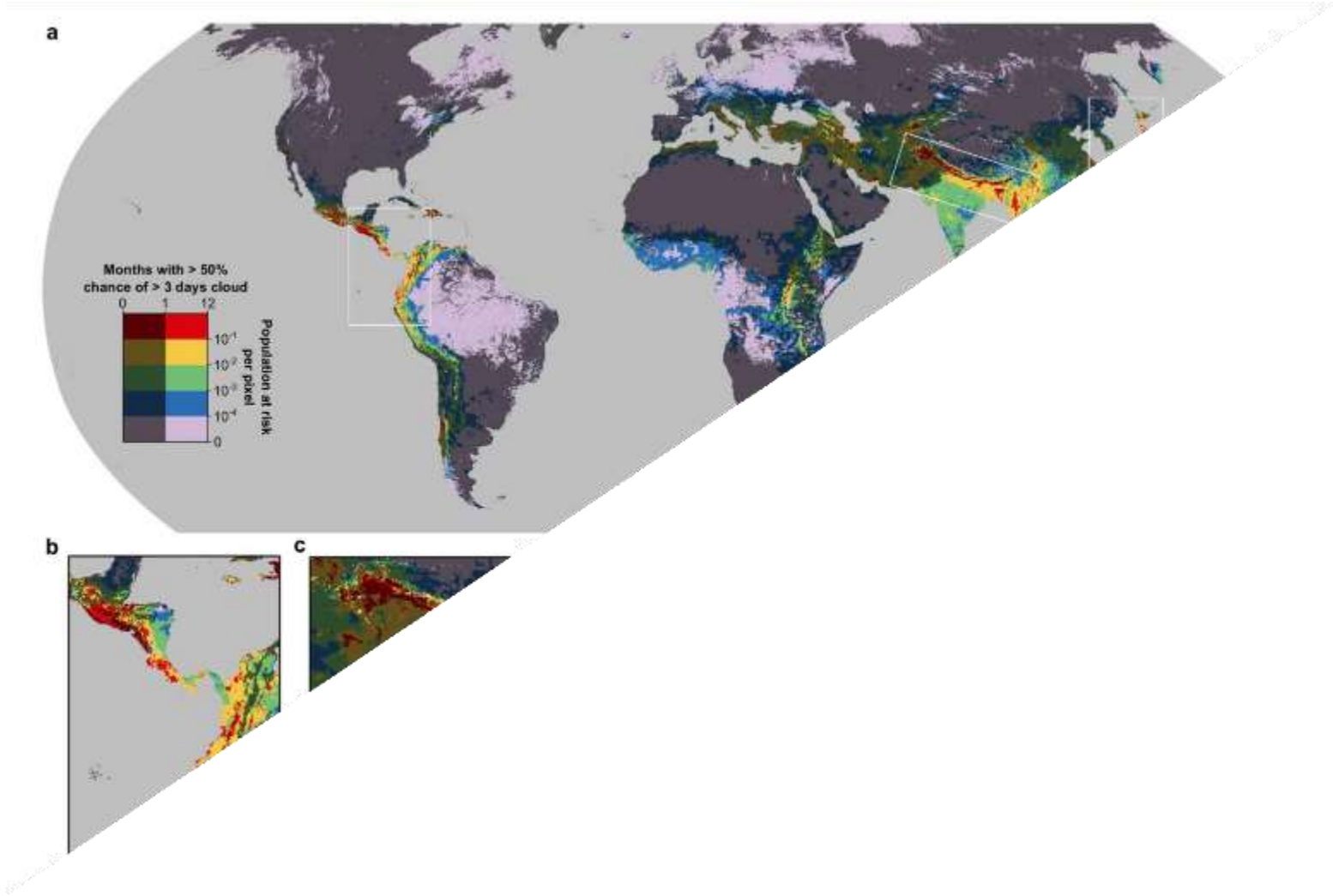
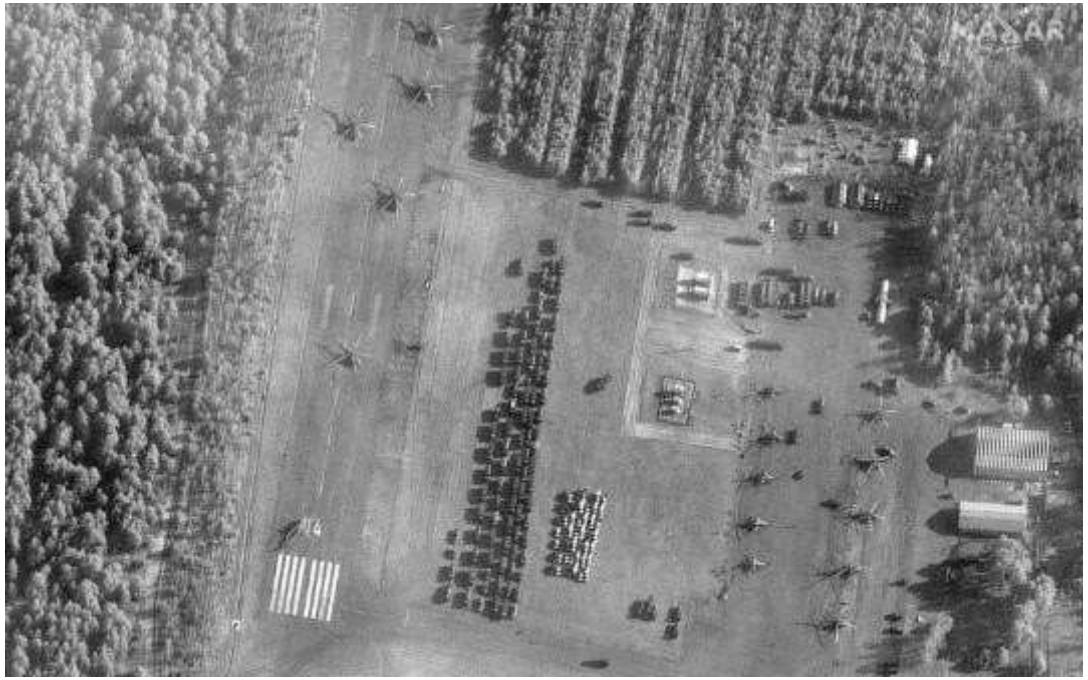


Figure 1. Global map of obscured earthquake risk, plotted with a Robinson projection. (**a**) Population at risk of earthquake impacts in colour overlain in dark grey with locations where the probability of >3 consecutive days cloud cover exceeds 50% in ≤1 month of the year. Areas obscured in >1 month of the year are left lighter to highlight the underlying earthquake risk in these regions. (**b**–**e**) More detailed views of Central America and northern South America (**b**), the Himalaya and surrounding regions (**c**), Indonesia and Papua New Guinea (**d**) and Japan, Taiwan and the Philippines (**e**). (**f**) Monthly variation in total global obscured population at risk showing median (red) and median ± one standard deviation (dark grey).

www.outsideonline.com/outdoor-adventure/exploration-survival/drones-search-rescue/



Mykhailo Fedorov
@FedorovMykhailo
Ukraine government official

@eos_da and @maxpolyakov appeal to the global remote sensing firms and organizations to provide real-time SAR data to support the Armed Forces of Ukraine with actionable intelligence.

Dear Colleagues,

In this difficult time, we call on You to help Ukraine!

We are winning with our armed forces and courageous people, but we need help in the information and technological war that Russia is also waging against us.

Our appeal is based on the strong understanding that Your Cooperation and the information you can provide can save lives of our people!

Russia is bombarding our cities every day and night and so many civilians are in danger.

We badly need the opportunity to watch the movement of Russian troops especially at night when our technologies are blind in their SAR satellite data is important to understanding Russian troop and vehicles movements at night considering that clouds cover about 60 percent of Ukraine during the day.

We sincerely ask You to consider the following cooperation:

- Provide high-resolution satellite imagery in the real time to Armed Forces of Ukraine;

Vice Prime Minister of Ukraine – Minister — Mykhailo FEDOROV

6:20 AM · Mar 1, 2022 · Twitter for iPhone

373 Retweets **48** Quote Tweets **670** Likes

Monitoring war destruction from space using machine learning

Hannes Mueller[a,b,1], Andre Groeger[b,c,1], Jonathan Hersh[d], Andrea Matranga[d,e], and Joan Serrat[f,g]

[a]Institute of Economic Analysis, Spanish National Research Council (CSIC), 08193 Bellaterra, Spain; [b]Barcelona Graduate School of Economics, 08005 Barcelona, Spain; [c]Department of Economics and Economic History, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain; [d]Argyros School of Business, Chapman University, Orange, CA 92868; [e]Smith Institute for Political Economy and Philosophy, Chapman University, Orange, CA 92868; [f]Computer Science Department, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain; and [g]Computer Vision Center, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

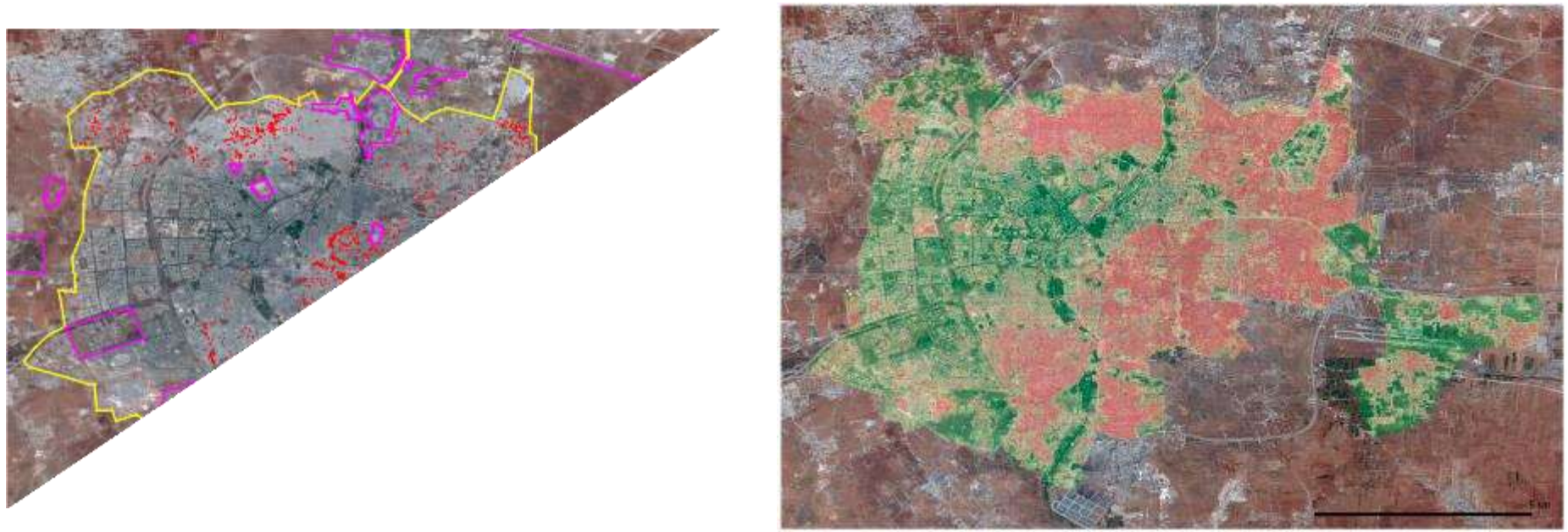


Fig. 1. Imagery of Aleppo on September 18, 2016. Red dots indicate UNOSAT annotations as destroyed. Areas enclosed by magenta lines are no analysis zones, excluded from the UNOSAT damage assessment due to being noncivilian. The yellow line encloses the populated areas of Aleppo under analysis. Sources: Google Earth/Maxar satellite imagery and UNITAR/UNOSAT damage annotations. *A* shows an overview of the urban area of Aleppo. *B* shows an area in central Aleppo close to the Citadel.

Exam

- In person only
- Closed book
- Review: Friday, March 25th
- Exam: Monday, March 28th
- Grading:
  - Multiple choice: 10 x 1 pts = 10
  - Short answer: 8 x 3 pts = 24
  - Long answer: 1 x 16 pts = 16

Final project

- Initial Proposal (2 points)
  Due Friday, March 25th in class
- Updated proposal with a flowchart (2 points)
  Due Monday, April 4th in class
- Final Project (36 points)
  Due Monday, April 11th in class