

Grand Ethiopian Renaissance Dam (GERD)

- 14 km east of border with Sudan on the Blue Nile
- Expected to supply 6,450 MW of power to Ethiopia
- Increase quality of life for millions of people
- On going political issue between Ethiopia (Upstream) and Egypt and Sudan (Downstream)
- Started filling in July 2020, filling completed in ~October 2024



Google Earth

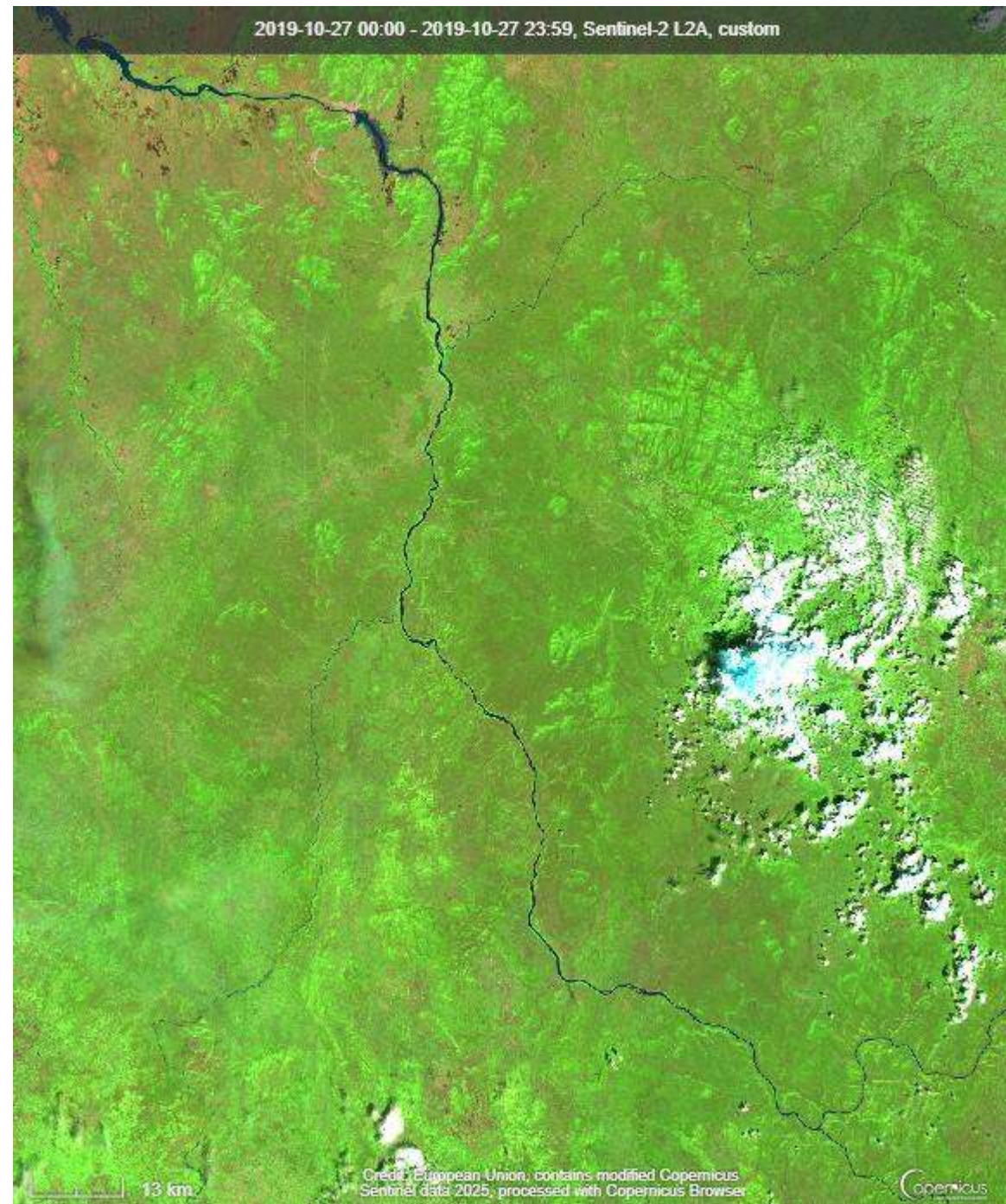


Image taken October 27, 2019,
Sentinel 2
SWIR, NIR, Red



Google Earth

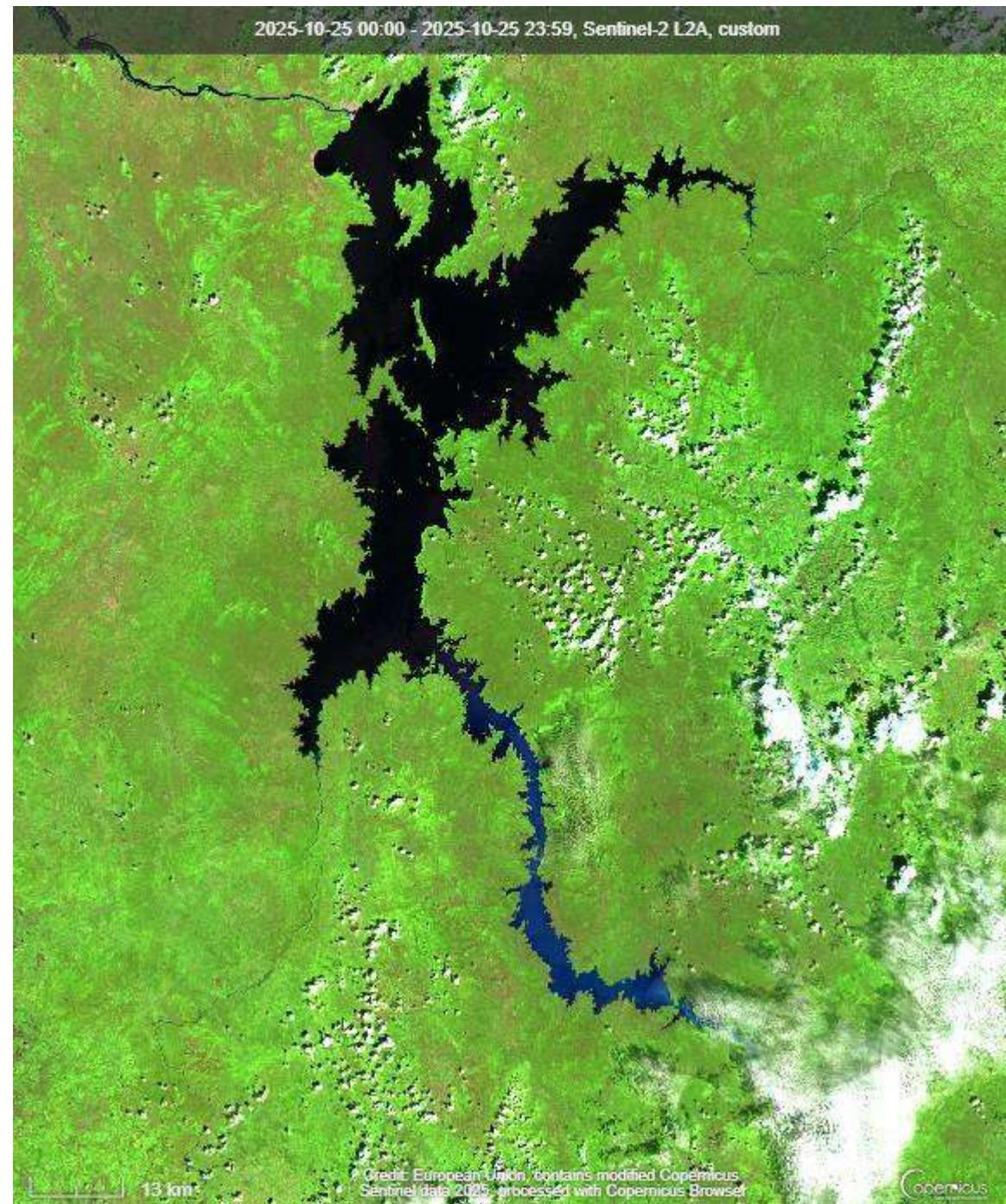


Image taken October 25,
2024,
Sentinel 2
SWIR, NIR, Red

GERD Filling Stages (animation)

- Wet/Rainy seasons of 2020,
2021, 2022, 2023, 2024

Sentinel 2 SWIR NIR Red

Oct 27, 2019

Nov 5, 2020

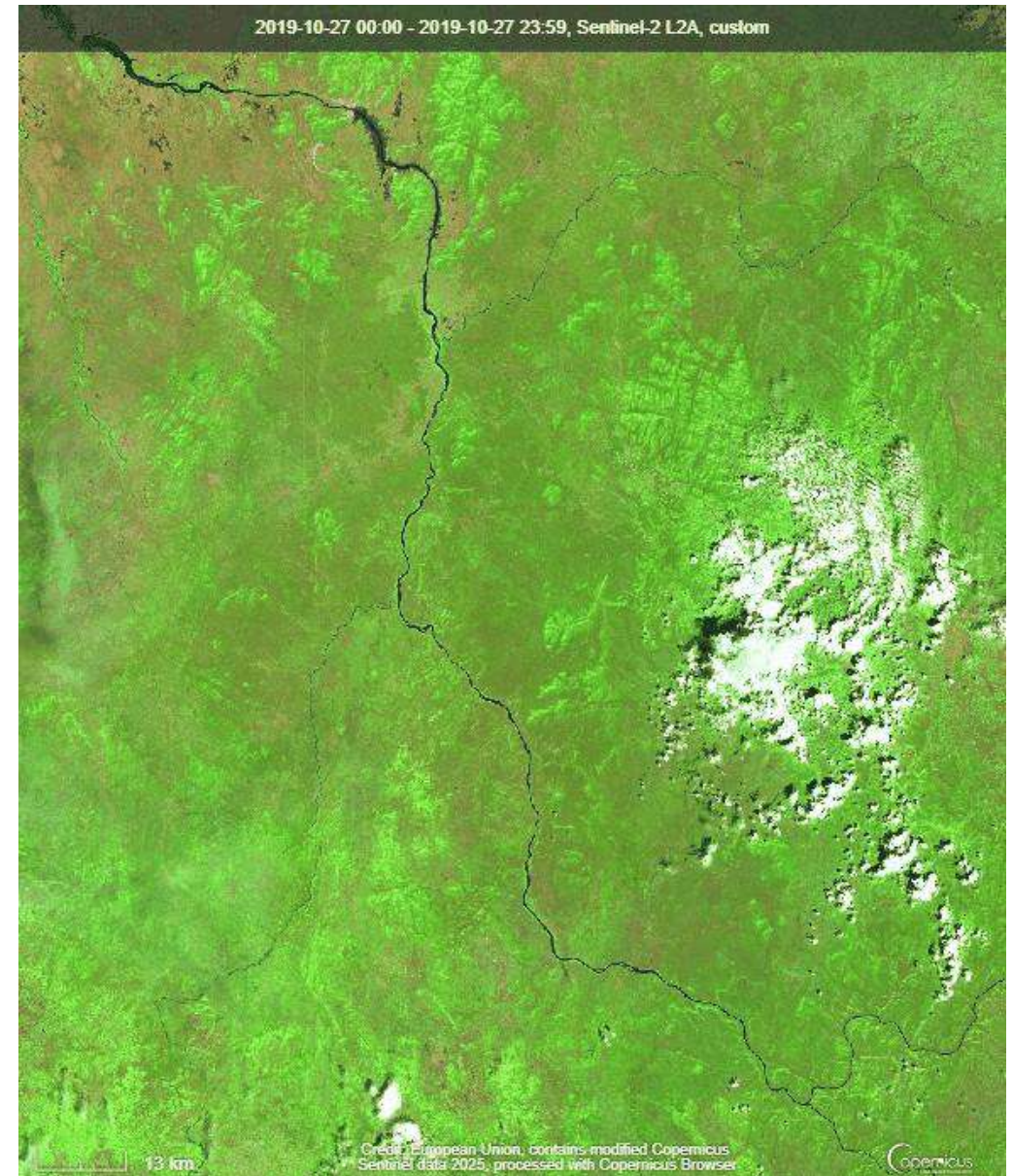
Nov 5, 2021

Nov 5, 2022

Oct 31, 2023

Nov 4, 2024

Oct 25, 2025



Gaza Strip, Palestine

Gaza Strip Population 2023: 2.2

million people Gaza Strip

Population 2025: 2.1 million

~57,000 killed and 100,000 left the country

*Although the drop in population is only 100,000 people over the 2 years, this is on top of previously having a growing population in 2023, making the 2.1 million people in 2025 10% lower than the original population estimates for 2025 (Samra C Yilmaz, 2025).

References

- Chughtai, A., C Okur, M. (2024, October 8). *One year of israel's war on gaza - by the numbers*. Al Jazeera. <https://www.aljazeera.com/news/longform/2024/10/8/one-year-of-israels-war-on-gaza-by-the-numbers>
- Copernicus Data. (2023). *Sentinel-2*. Copernicus Data Space Ecosystem. <https://dataspace.copernicus.eu/data-collections/copernicus-sentinel-data/sentinel-2>
- Samra, Q. A., C Yilmaz, B. (2025). *Gaza's population drops by 10% amid israel's genocidal war*. Aa.com.tr. <https://www.aa.com.tr/en/middle-east/gaza-s-population-drops-by-10-amid-israel-s-genocidal-war/3627261>

September 27th, 2023

- SWIR is being shown
- Imagery prior to any bombing (October 7th, 2023)

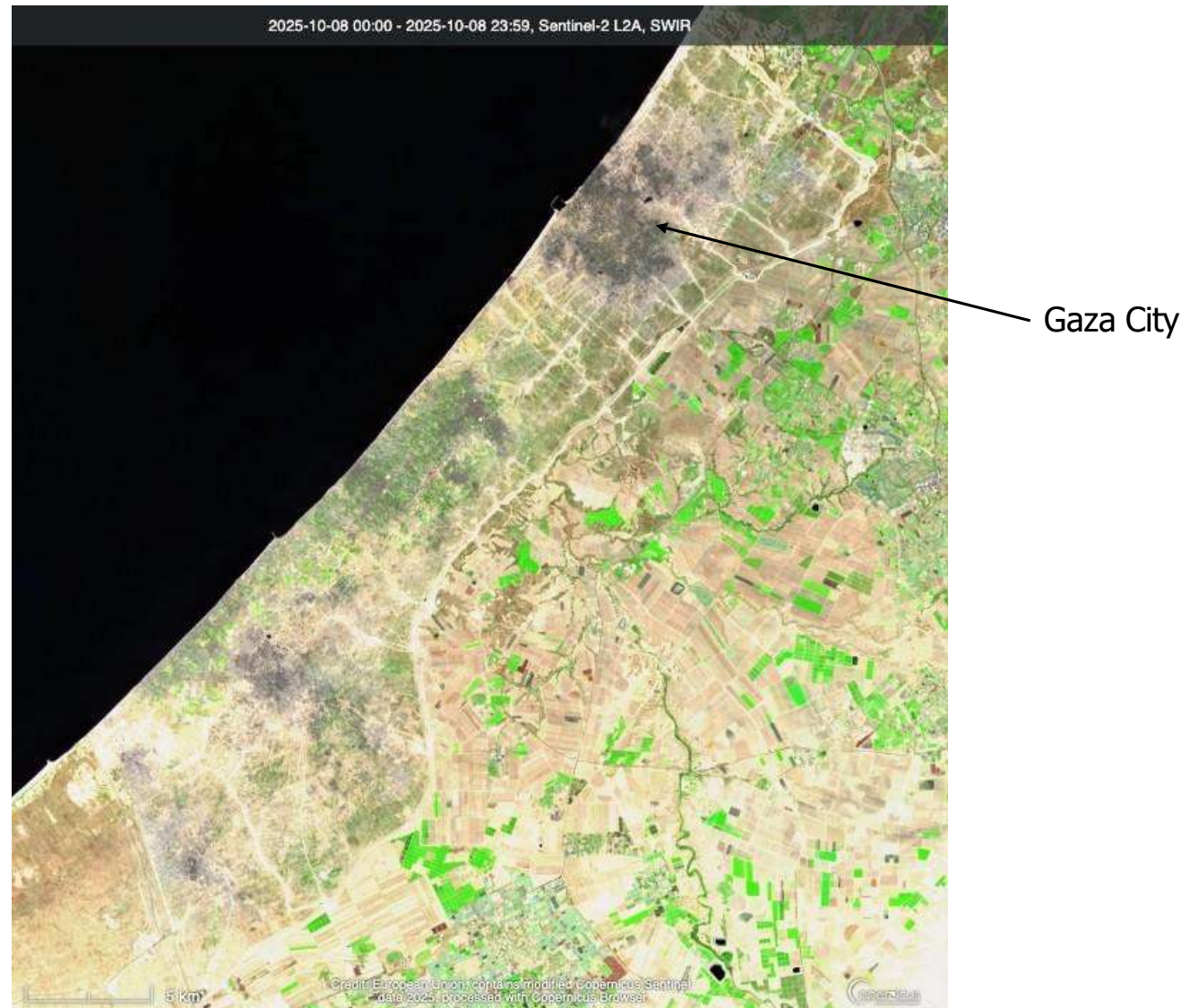


Gaza City

(Chughtai C Okur, 2024)

October 10th, 2025

- SWRI is being shown
- 2 years after initial imagery



September 27th, 2023

- False Colour is being shown
- Imagery prior to any bombing (October 7th, 2023)

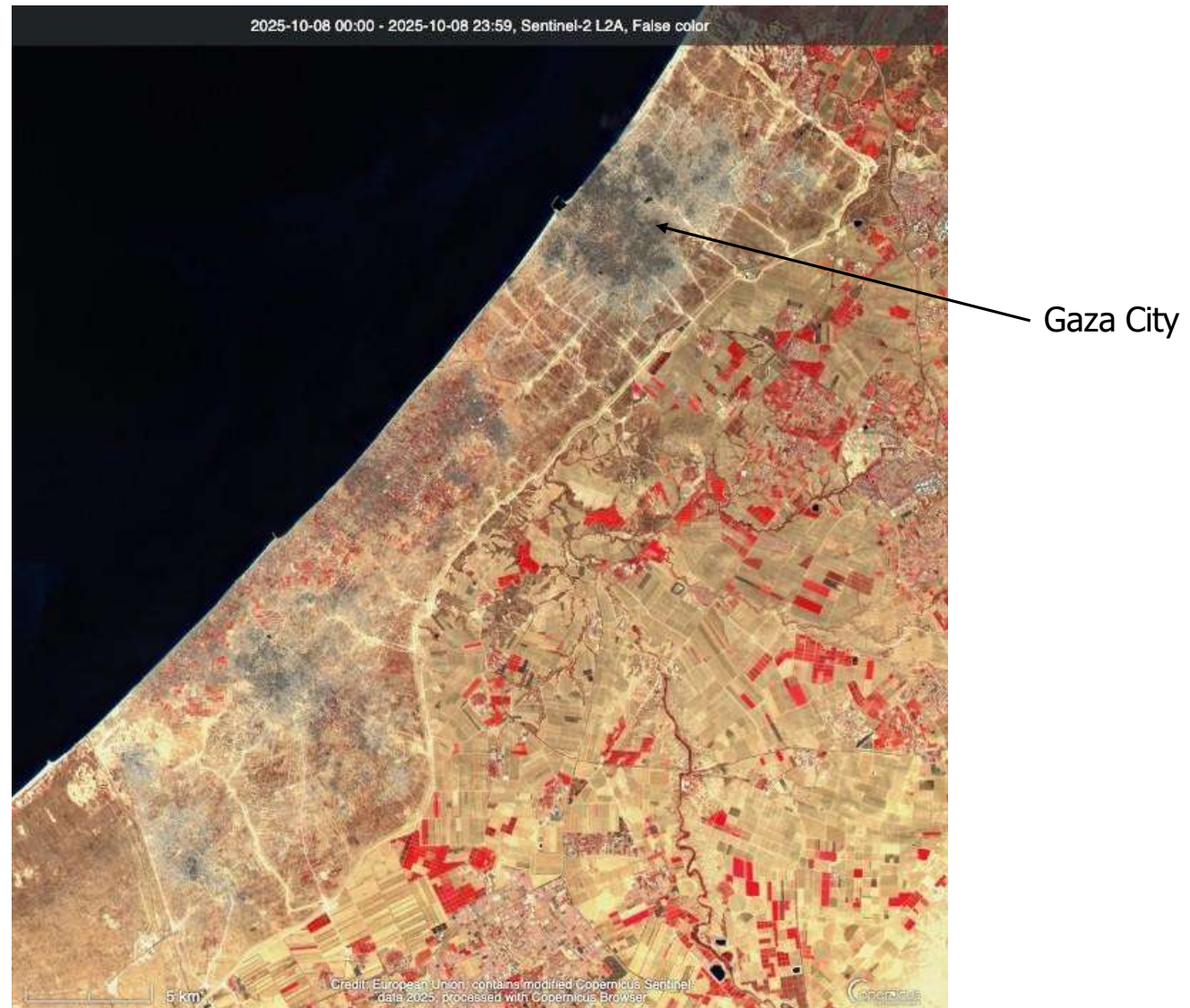


Gaza City

(Chughtai C Okur, 2024)

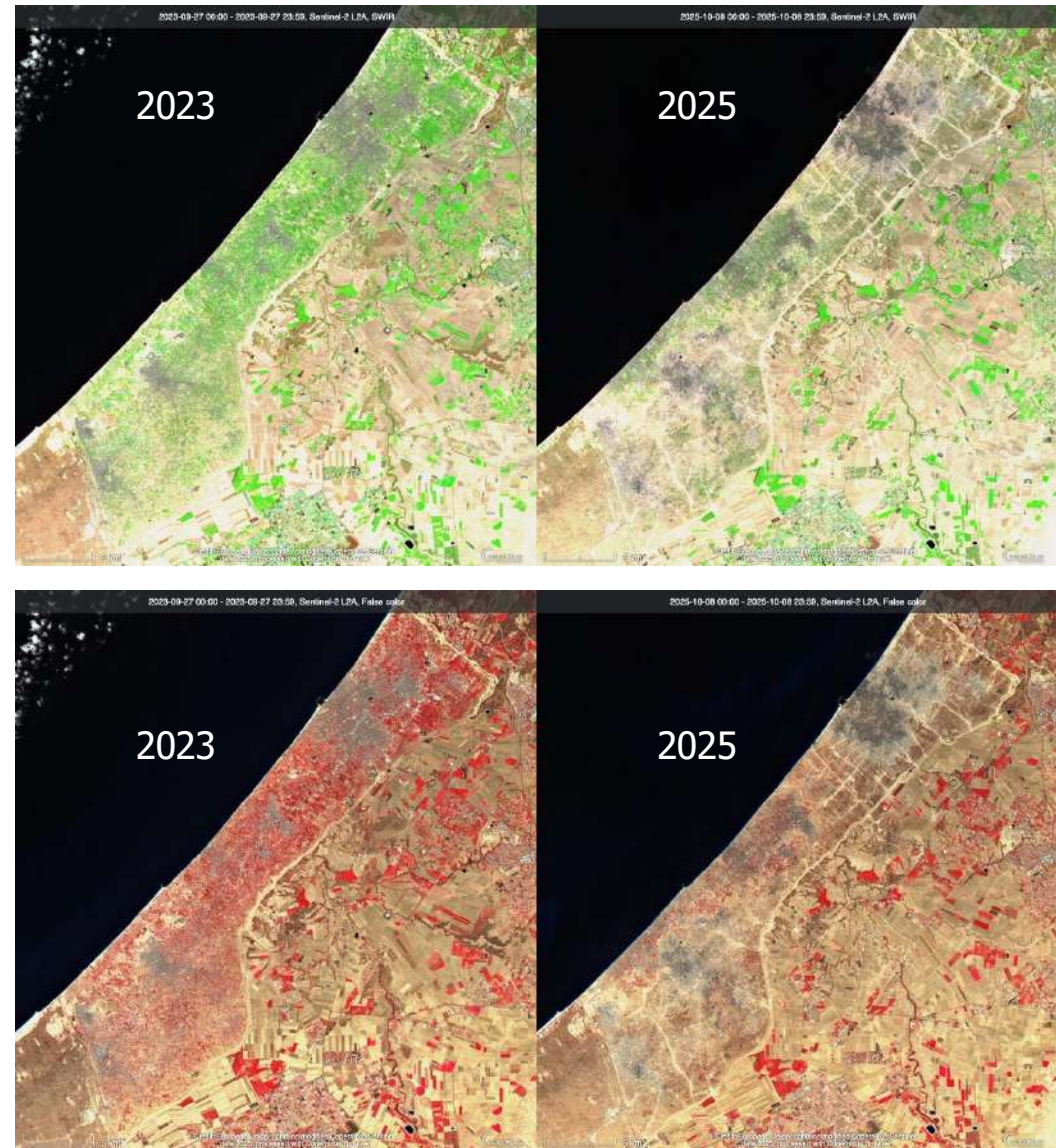
October 10th, 2025

- False Colour is being shown
- 2 years after initial imagery



Key Changes

- Huge change in vegetation across the Gaza Strip as well as in the surrounding area
- Huge change in the City of Gaza from clearly defined buildings and roads to unconsolidated rubble (shown by dark grey mass)
- Development of new roads and roots of travel



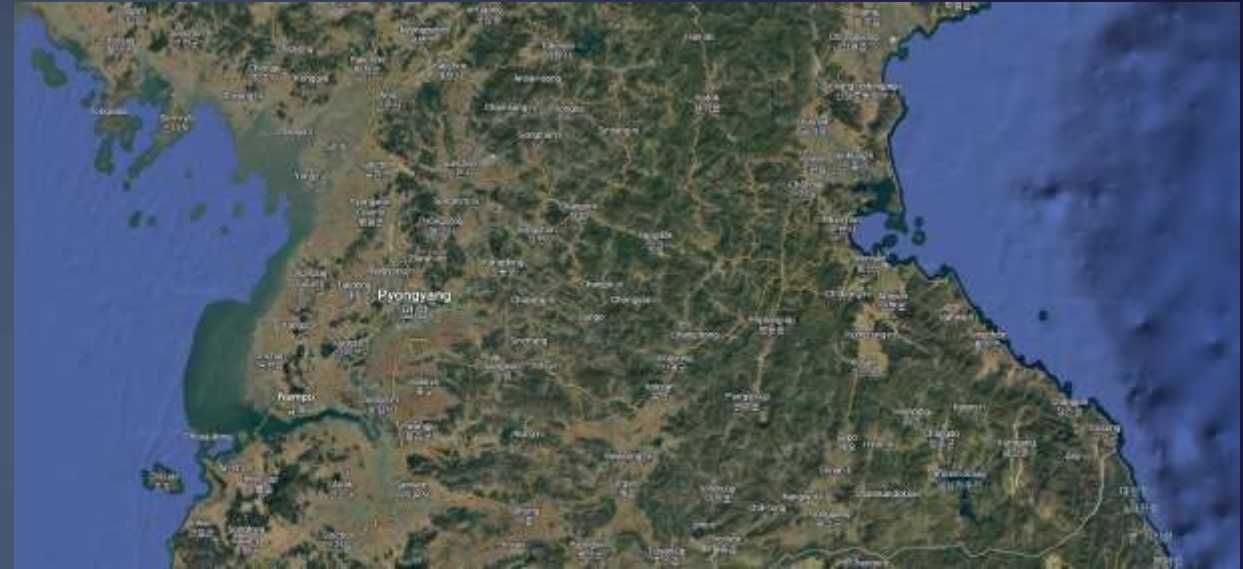
North Korea's 1990s Famine

From 1994 – 1998, North Korea had one of the worst famines to hit the country. Crops were incredibly hard to grow in the **acidic soil**, existing policies **rejecting foreign imports**, and **natural disasters** made the food shortage even worse.

In 1997 in particular, there was a large drought that devastated North Korea furthermore. This massive drought ironically followed after a flooding in 1995.

Roughly 3-5% of North Korea's population starved to death, which is around 3 million people

This presentation will show the differences from the start of the famine, the massive drought and lastly after famine using SWIR-NIR-Red bands.

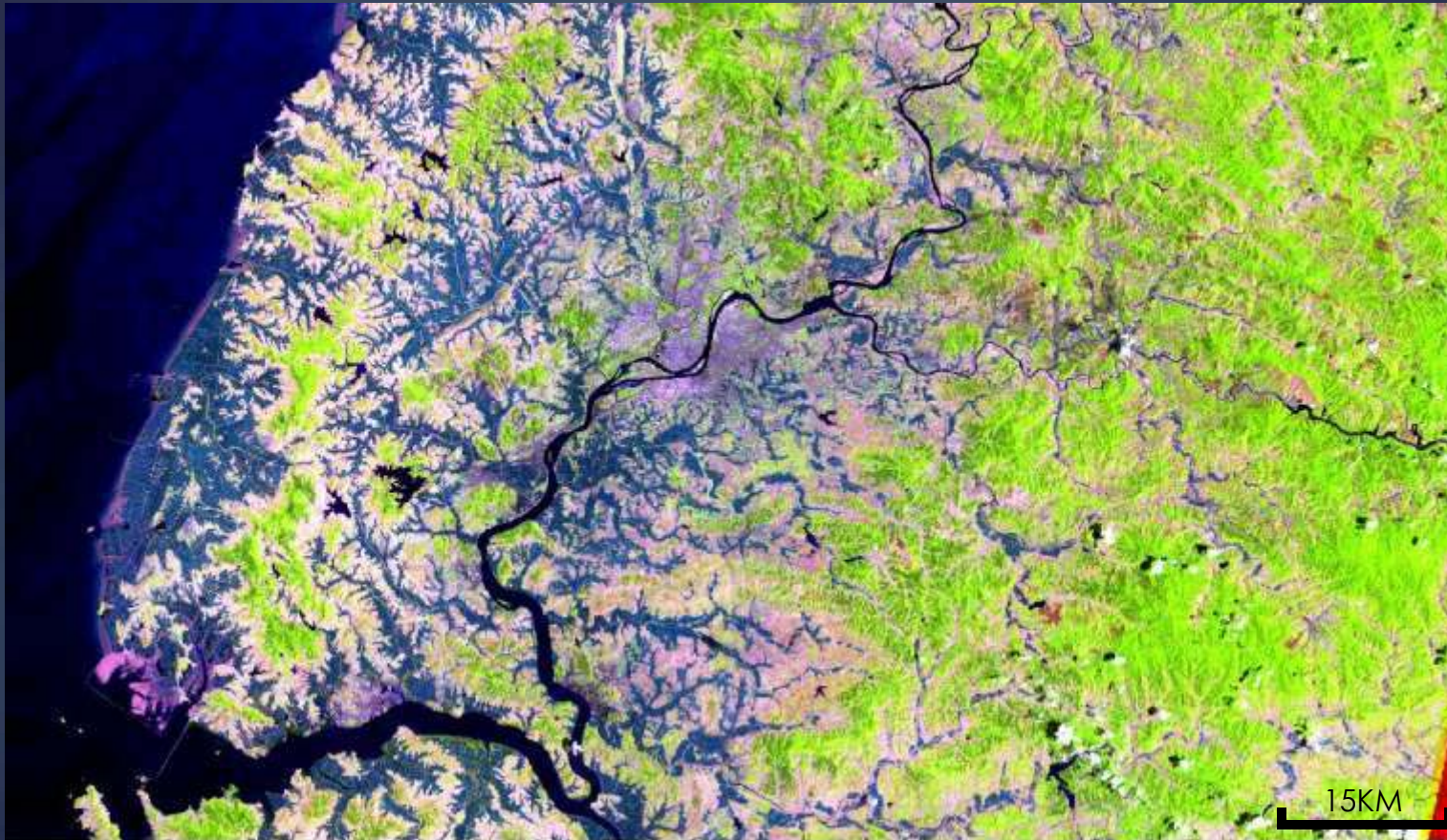


Landsat 4-5 was used for images: <https://earthexplorer.usgs.gov/>

Famine Source:

<https://www.asianstudies.org/publications/ea/archives/north-koreas-1990s-famine-in-historical-perspective/>

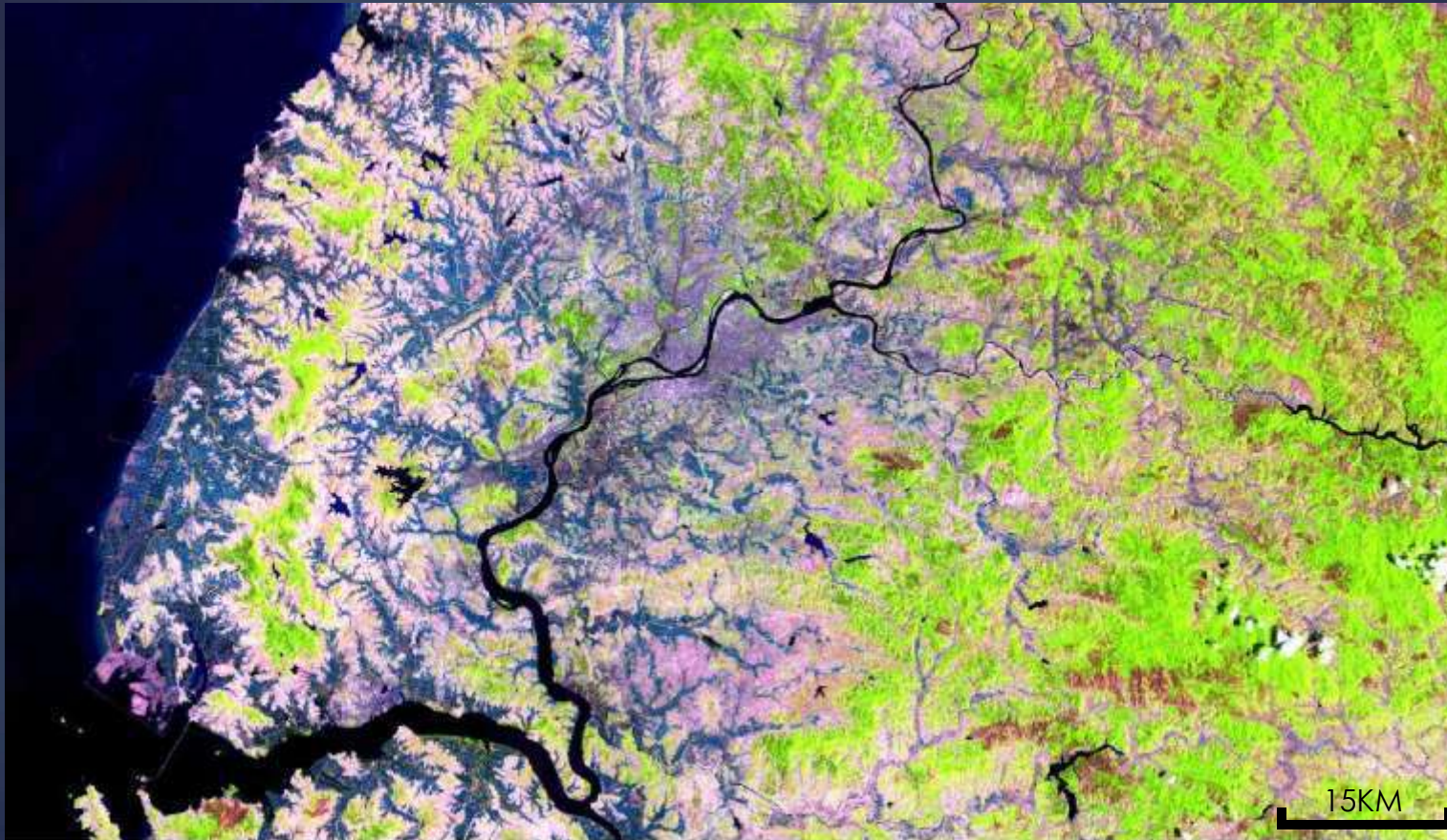
1994 – Start of Famine



Notice the darker areas: they change the most

SWIR is low in these parts due to low moisture content from famine.

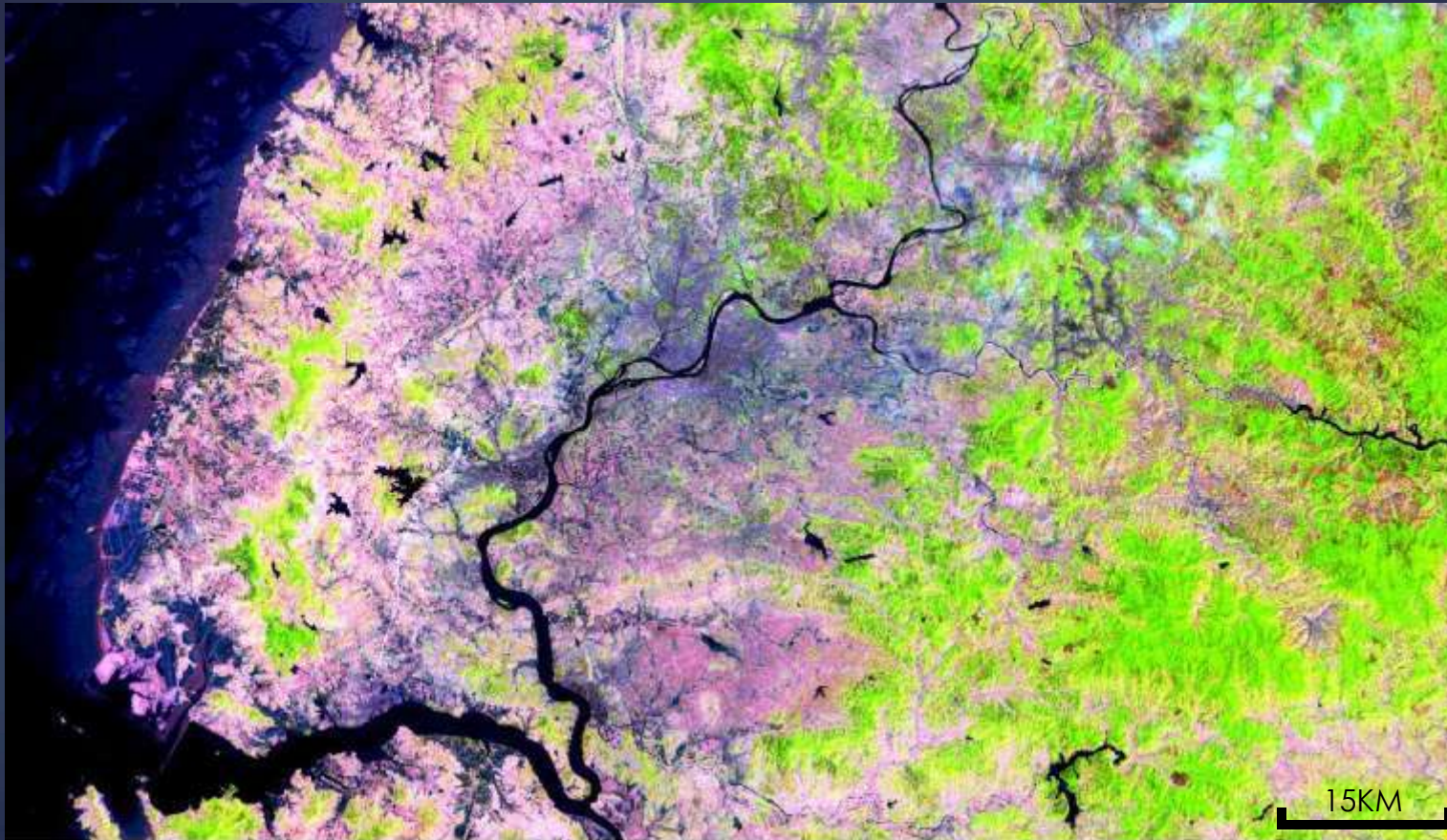
1997 – Natural Disasters (flood followed by drought)



Darker area increased in SWIR, NIR and Red stayed the same.

Remember that previously there was a flood before this.

1999 – Famine Stabilizes



SWIR, NIR and Red bands jump heavily due to famine stabilization.

Most notable in the previously darker areas, where SWIR is significantly higher.

Environmental Change Project

GEOG 357 Introduction to Remote Sensing



Photo: Liz Henson

Mendenhall Glacier – Juneau Alaska







A satellite map of Lake Urmia and Shahi Island, Iran. The lake is a large, dark blue body of water with a complex, irregular shape, surrounded by a rugged, brownish-tan landscape. The text "Lake Urmia and Shahi Island, Iran" is overlaid in white, sans-serif font, centered horizontally and partially overlapping the lake. Below it, the text "Changes from 1995-2025" is also in white, sans-serif font, centered horizontally and overlapping the lake and the surrounding land.

Lake Urmia and Shahi Island, Iran

Changes from 1995-2025

Iran and Lake Urmia

- **Iran:** Large country in Middle East / Western Asia
 - Prone to droughts due to arid climate
 - Compounded by effects of climate change
- **Lake Urmia:** Iran's largest inland body of water
 - Endorheic (closed drainage) salt lake
 - Often considered the largest lake in the Middle East (up to 6,000 km²)
 - Sixth-largest salt lake in the world
 - Federally protected as a wetland region since 1967



Location of Lake Urmia within Iran (Google Earth)

Lake Urmia and Shahi Island

- Lake Urmia has lost much of its water since 1990s due to irrigation, dams, and drought
 - Government restoration efforts undertaken since 2013 have been largely unsuccessful
- **Shahi (Islami) Island:** Largest and only inhabited island on Lake Urmia
 - ~24 km in length north/south, ~15 km east/west
 - ~230 km² in area
 - Location of seven villages
 - Predominantly rural area



Lake Urmia and Shahi Island, 1995 (Google Earth)

Shahi Island, 1995 (Landsat)



Shahi Island, 2025 (Landsat)



Shahi Island (1995)



Shahi Island (2025)



Shahi Island In Context: Lake Urmia from 1995 to 2017



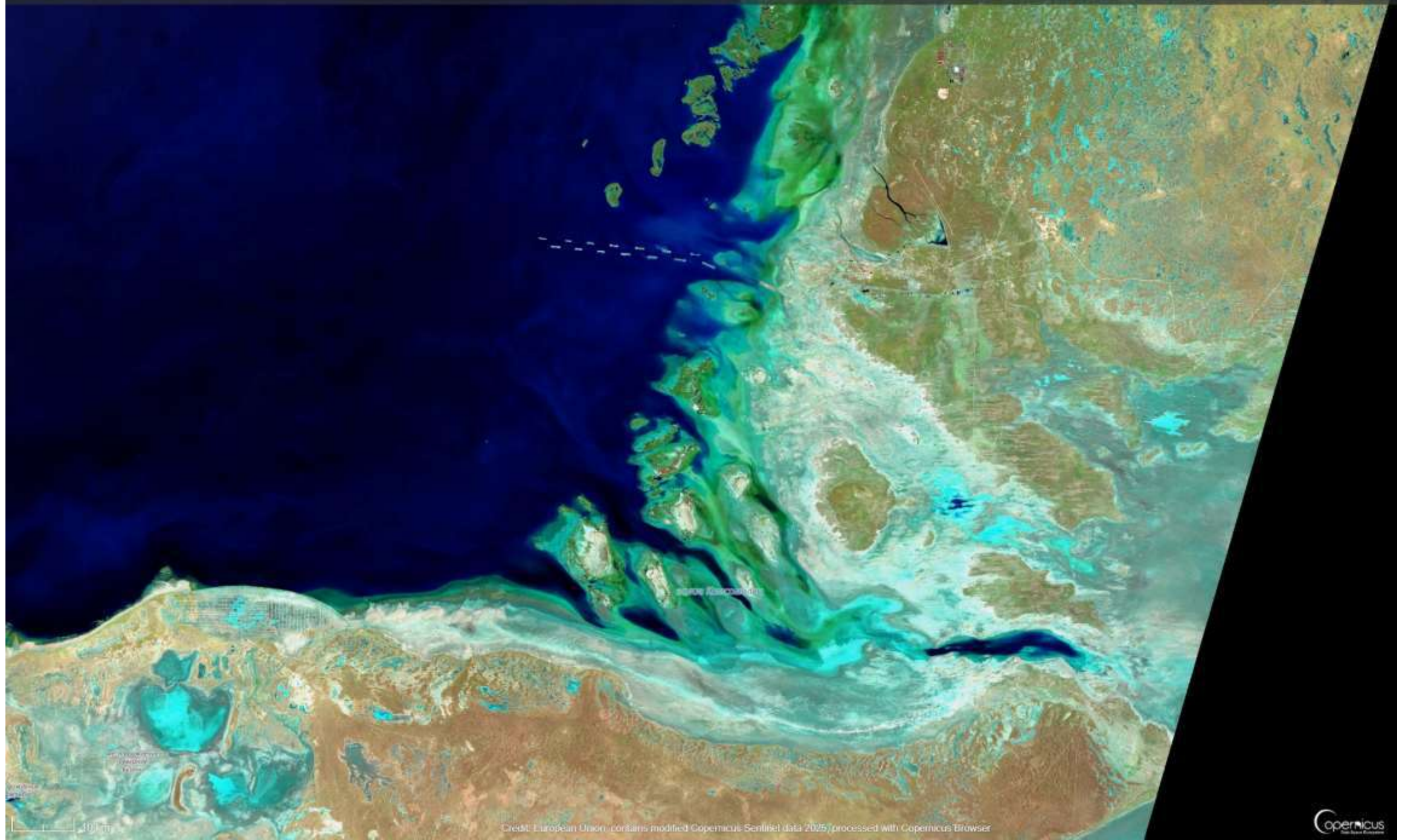
Lake Urmia, 1995 (Google Earth)

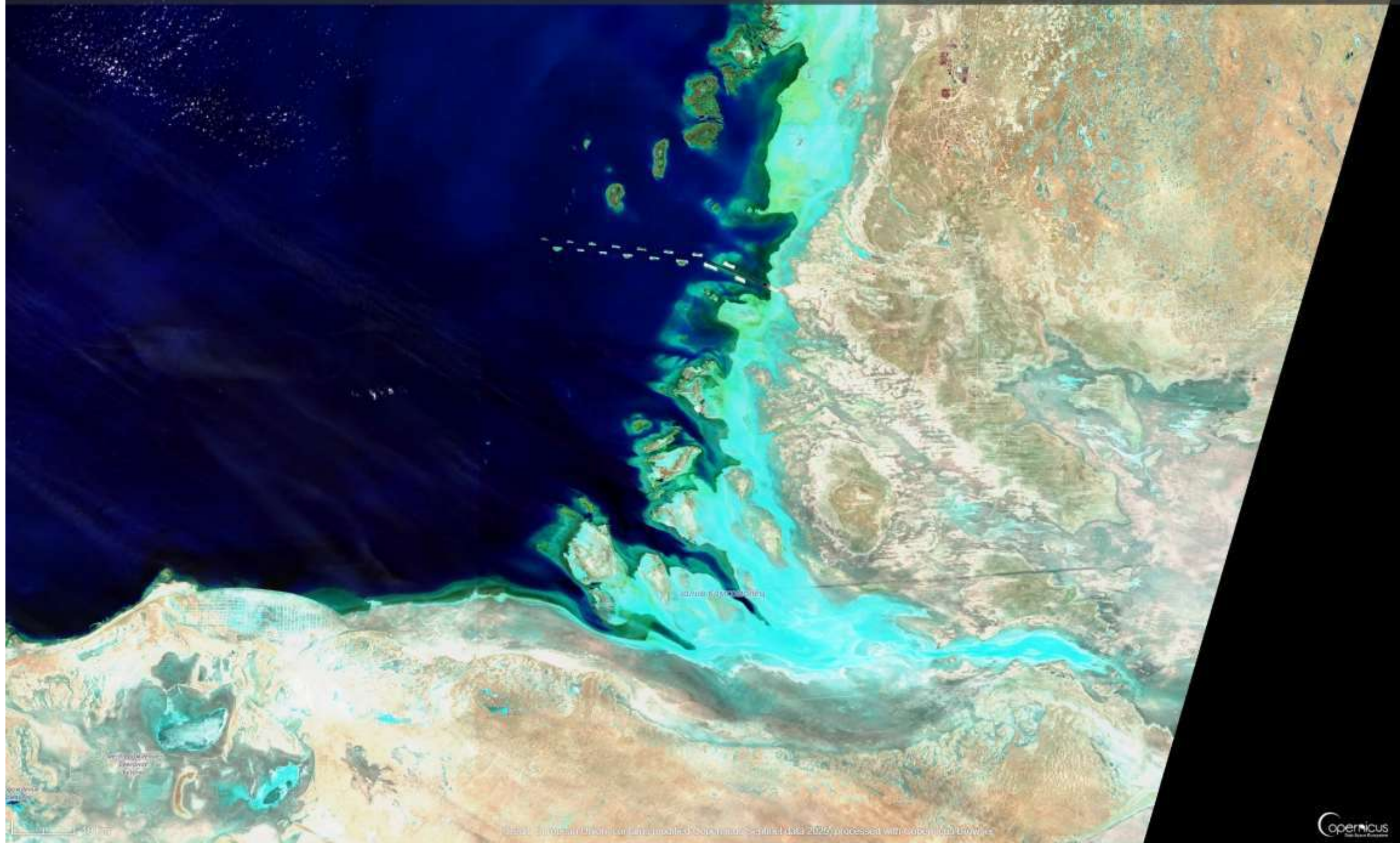


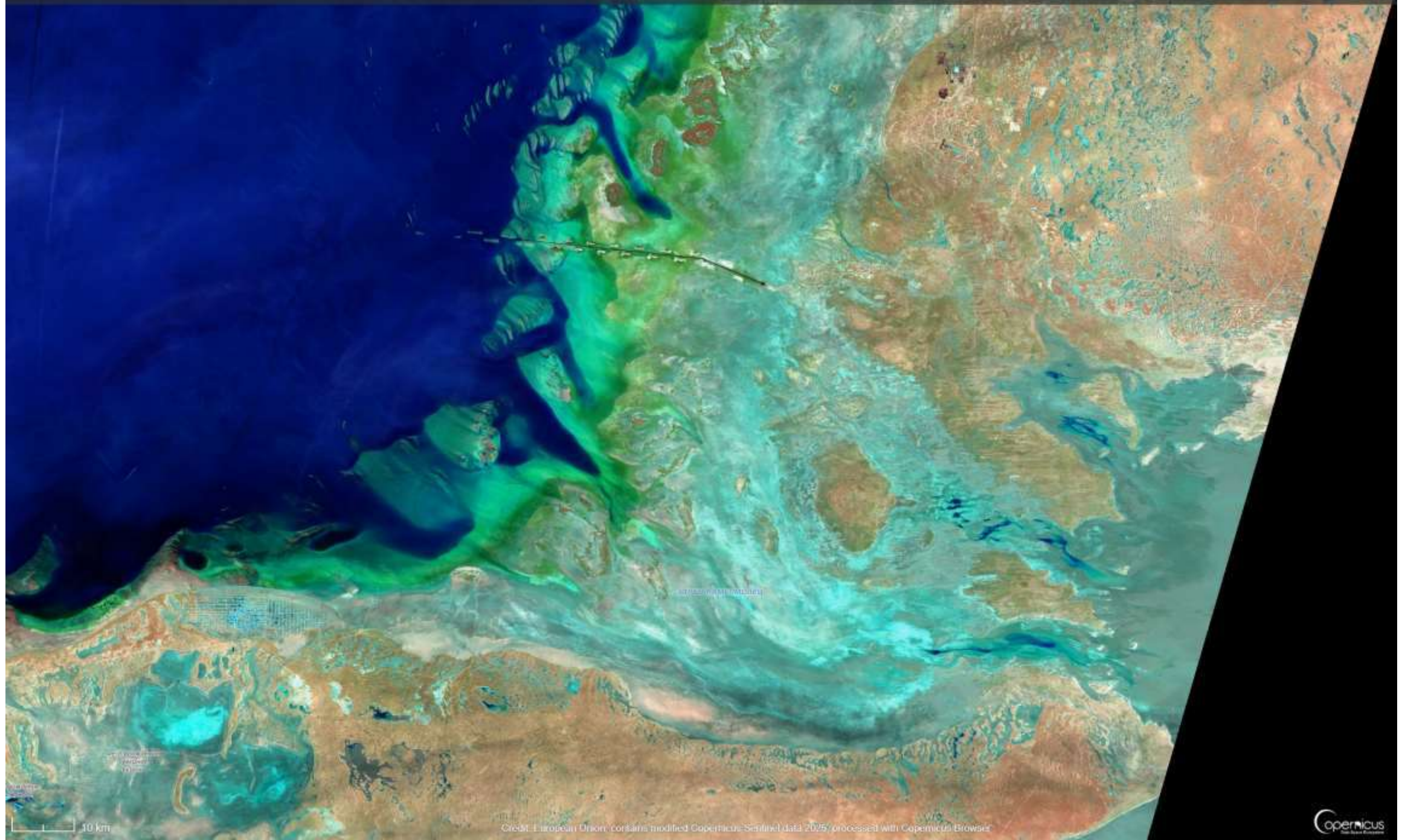
Lake Urmia, 2017 (Google Earth)

Caspian Sea water recession 2016-2025







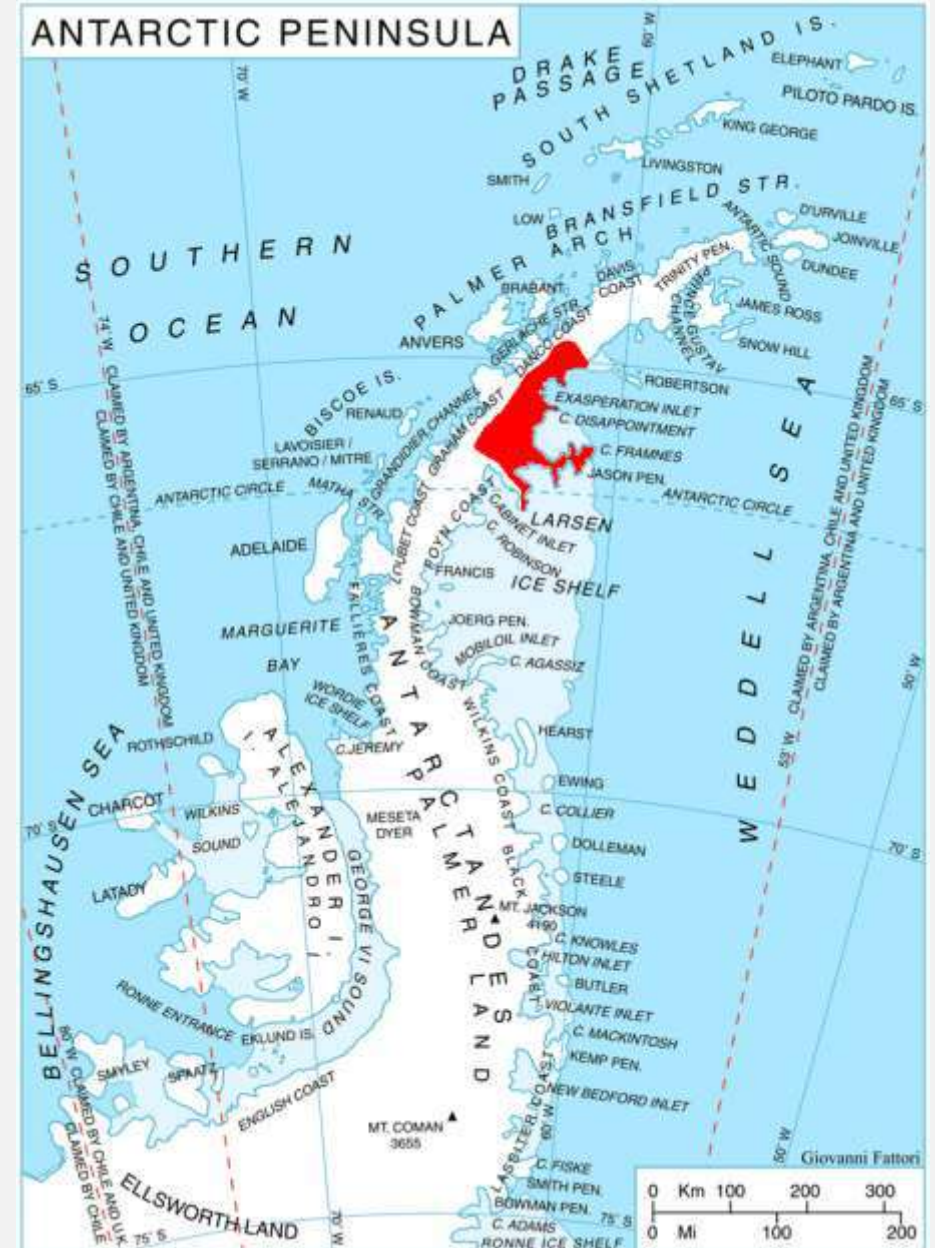


An aerial photograph of a glacier system. The glacier is a light blue-grey color, showing various crevasses and meltwater channels. A large, dark blue meltwater lake is visible in the lower right quadrant. The surrounding terrain is rugged and rocky, with some snow patches.

Significant Recession at Hektoria Glacier

Hektoria Glacier

- Located on the Eastern Antarctic Peninsula
- Glacier receded 25 km from 2022-2023
 - 8.2 ± 0.2 km retreat from November to December of 2022 (~ 800 m d⁻¹)
- Recent publication by Ochwat et al. (November 3, 2025)
 - Suggests rapid retreat due to glacier ice shelf thinning caused by rapid velocity



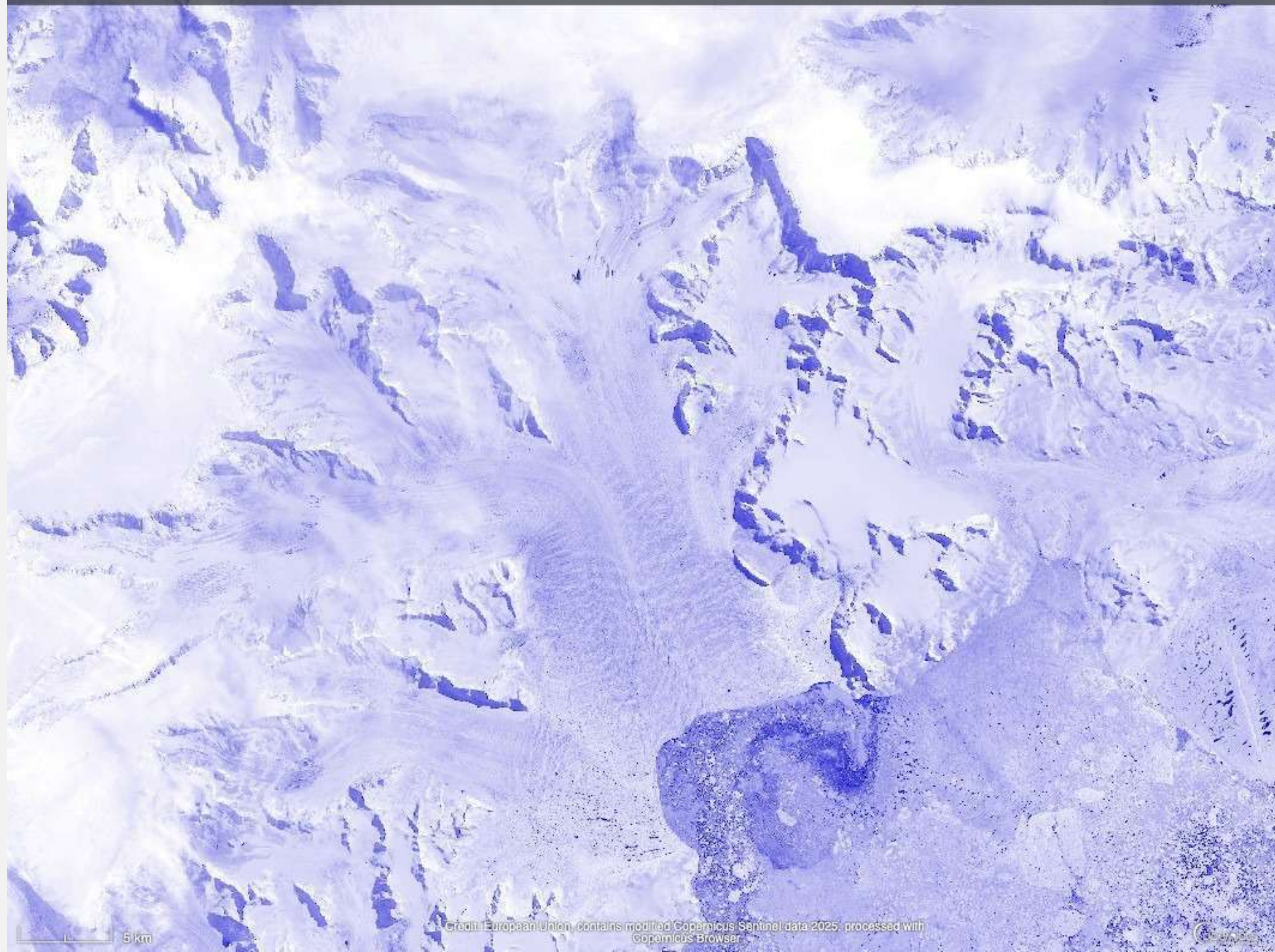
(Wikipedia)

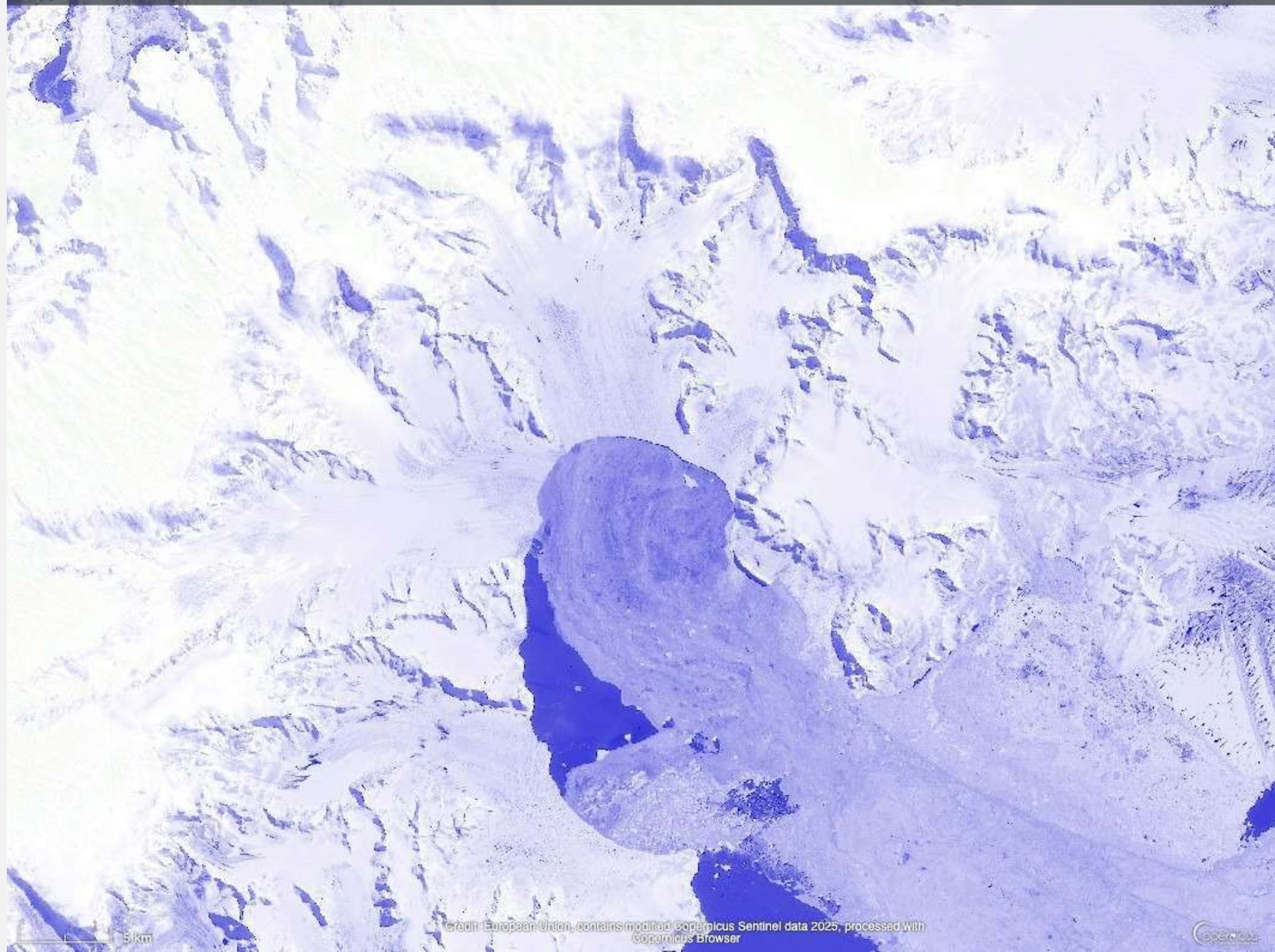
Imagery

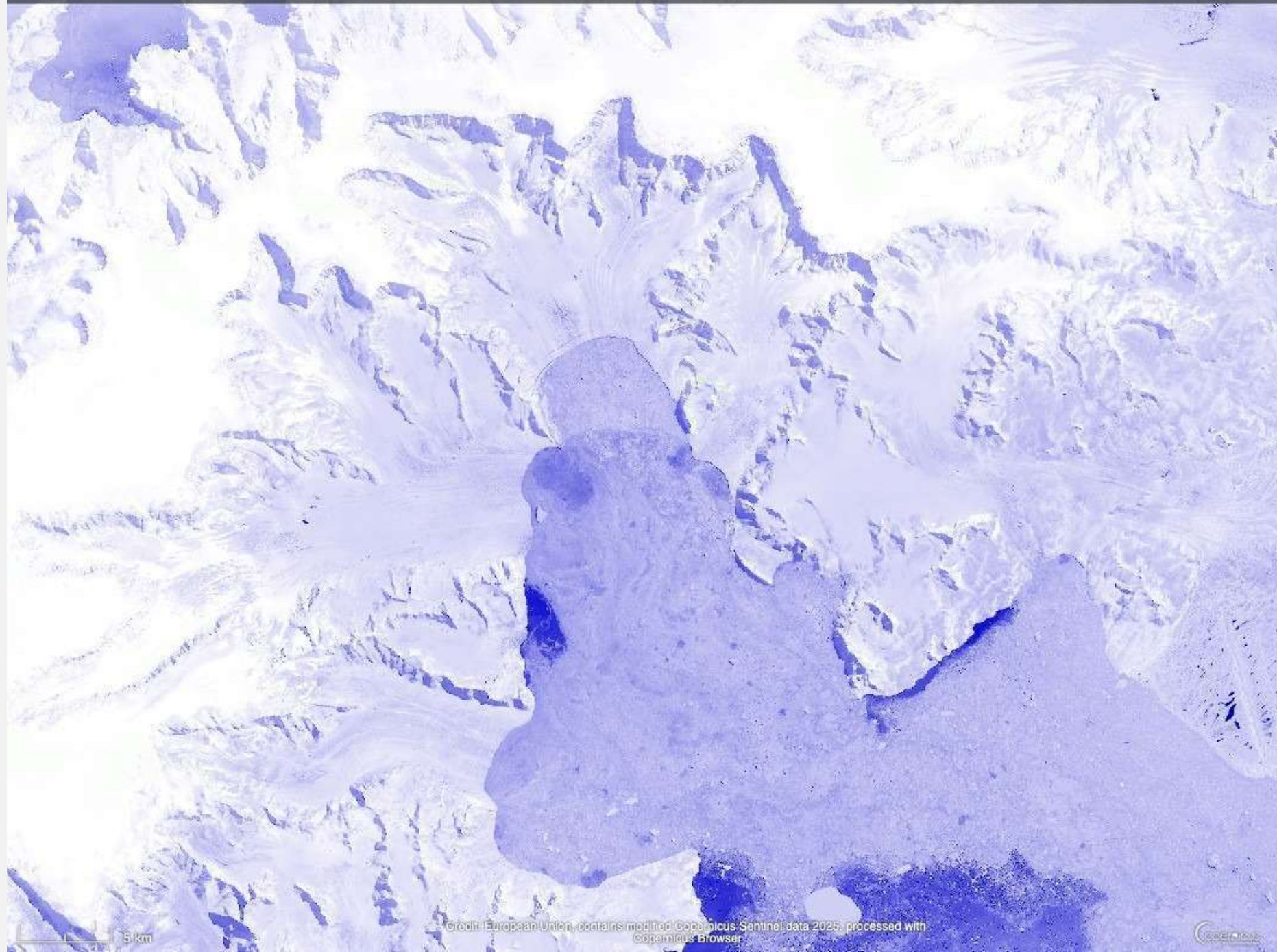
- Sentinel-2 LC1
 - Better data coverage than Sentinel-2 L2A
- Images selected through 2022 and early 2023
 - Only ~5 mostly cloud free images per year
- Glacier extent most visible with NDWI

References

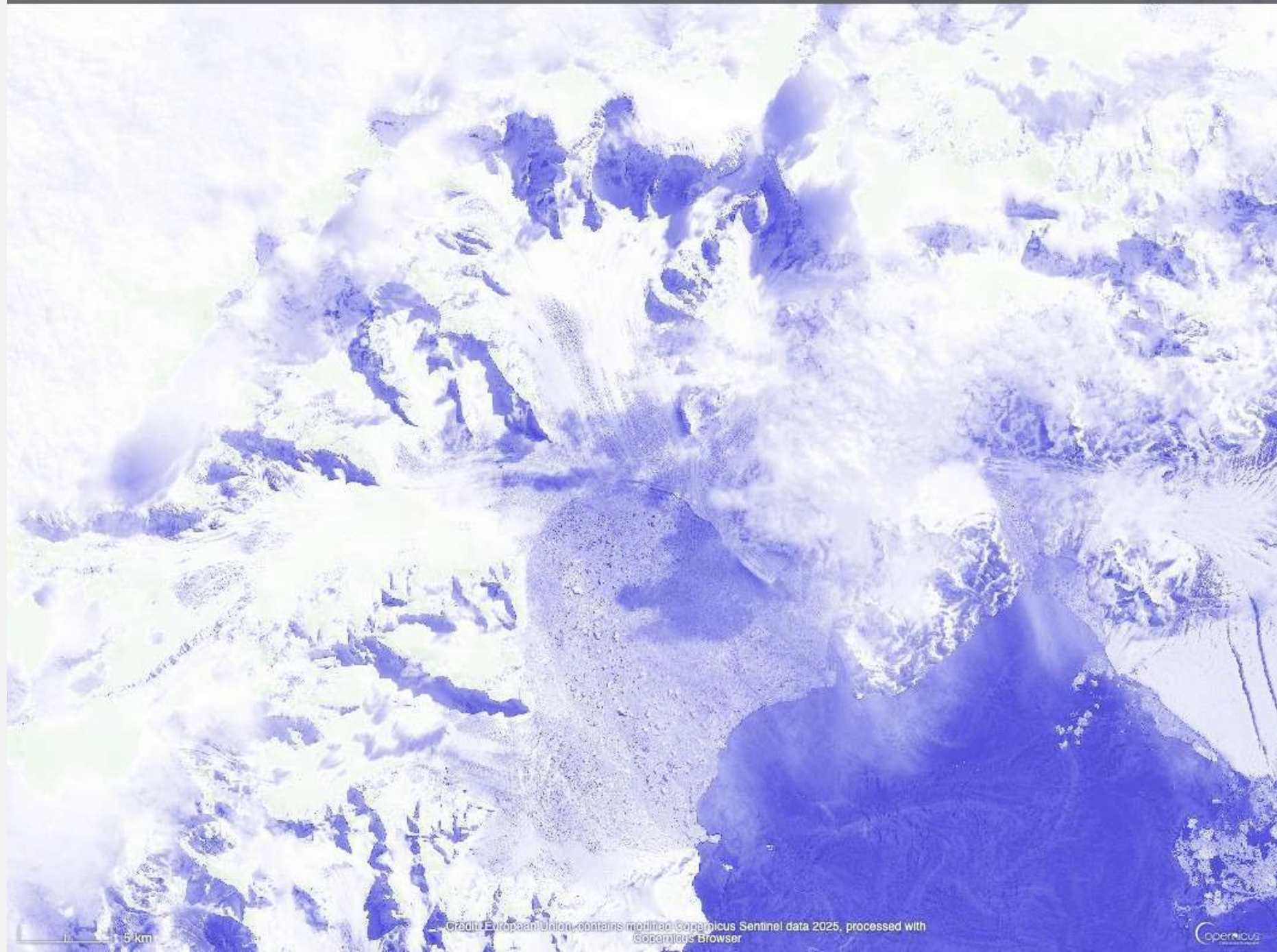
- Copernicus Browser*. (n.d.). Copernicus Browser. <https://browser.dataspace.copernicus.eu>
- Ochwat, N., Scambos, T., Anderson, R. S., Winberry, J. P., Luckman, A., Etienne Berthier, Bernat, M., & Antropova, Y. K. (2025). Record grounded glacier retreat caused by an ice plain calving process. *Nature Geoscience*. <https://doi.org/10.1038/s41561-025-01802-4>







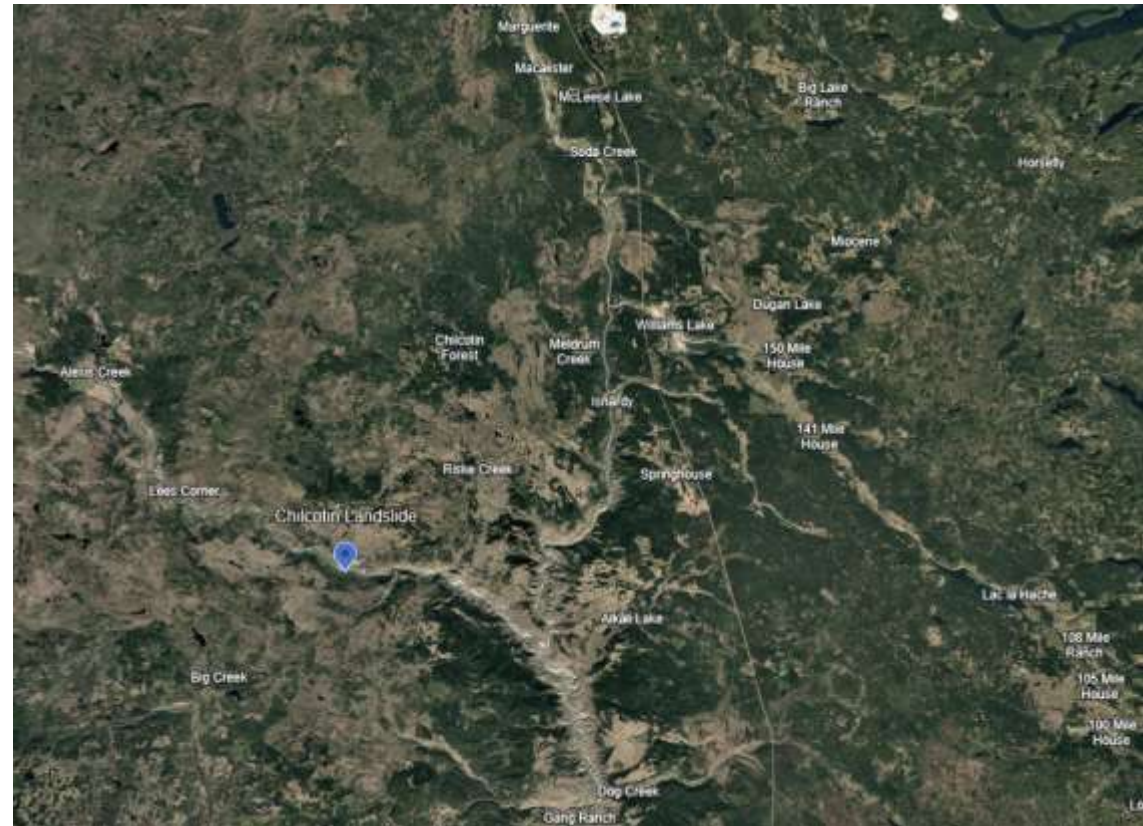


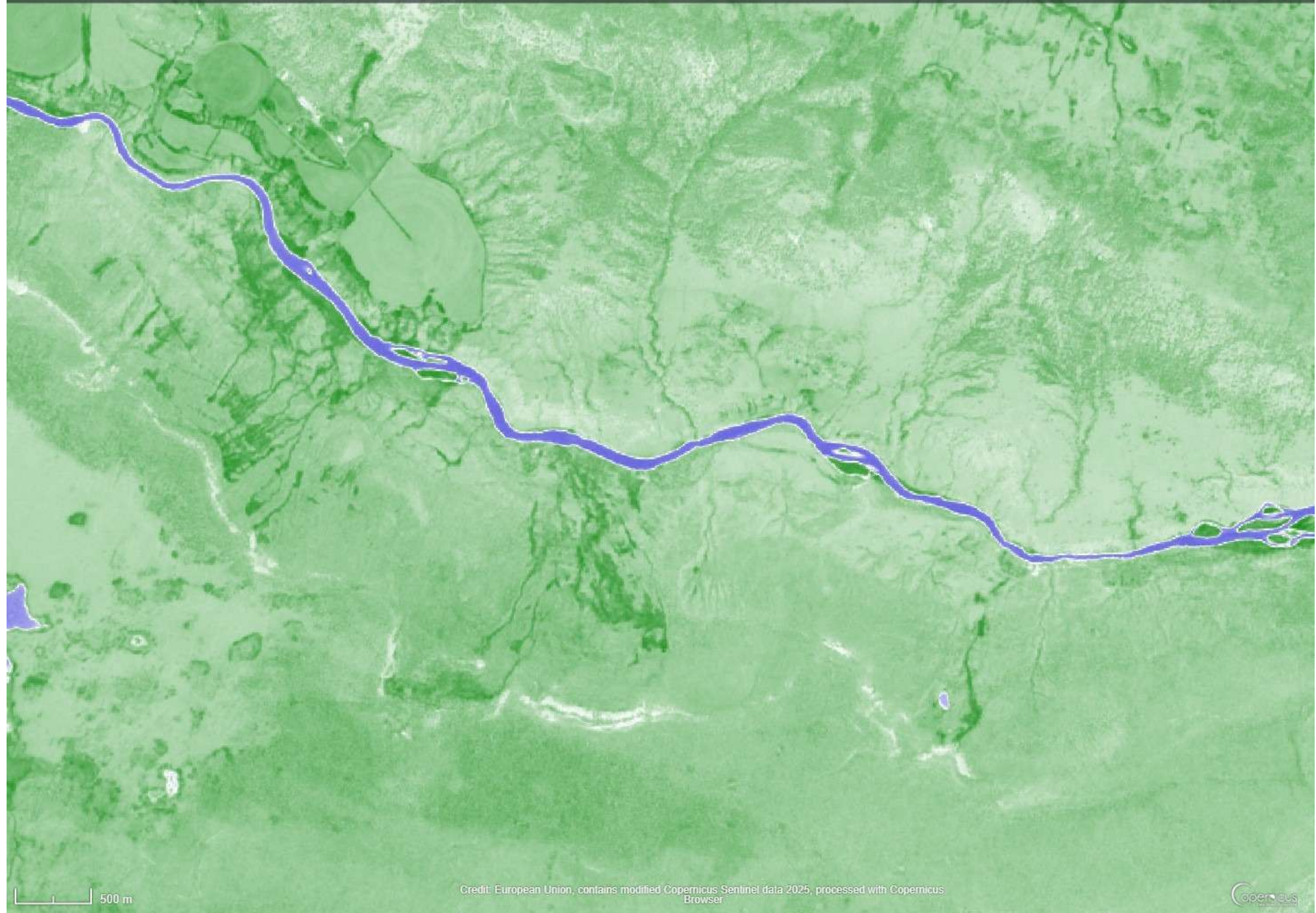


0 5 km

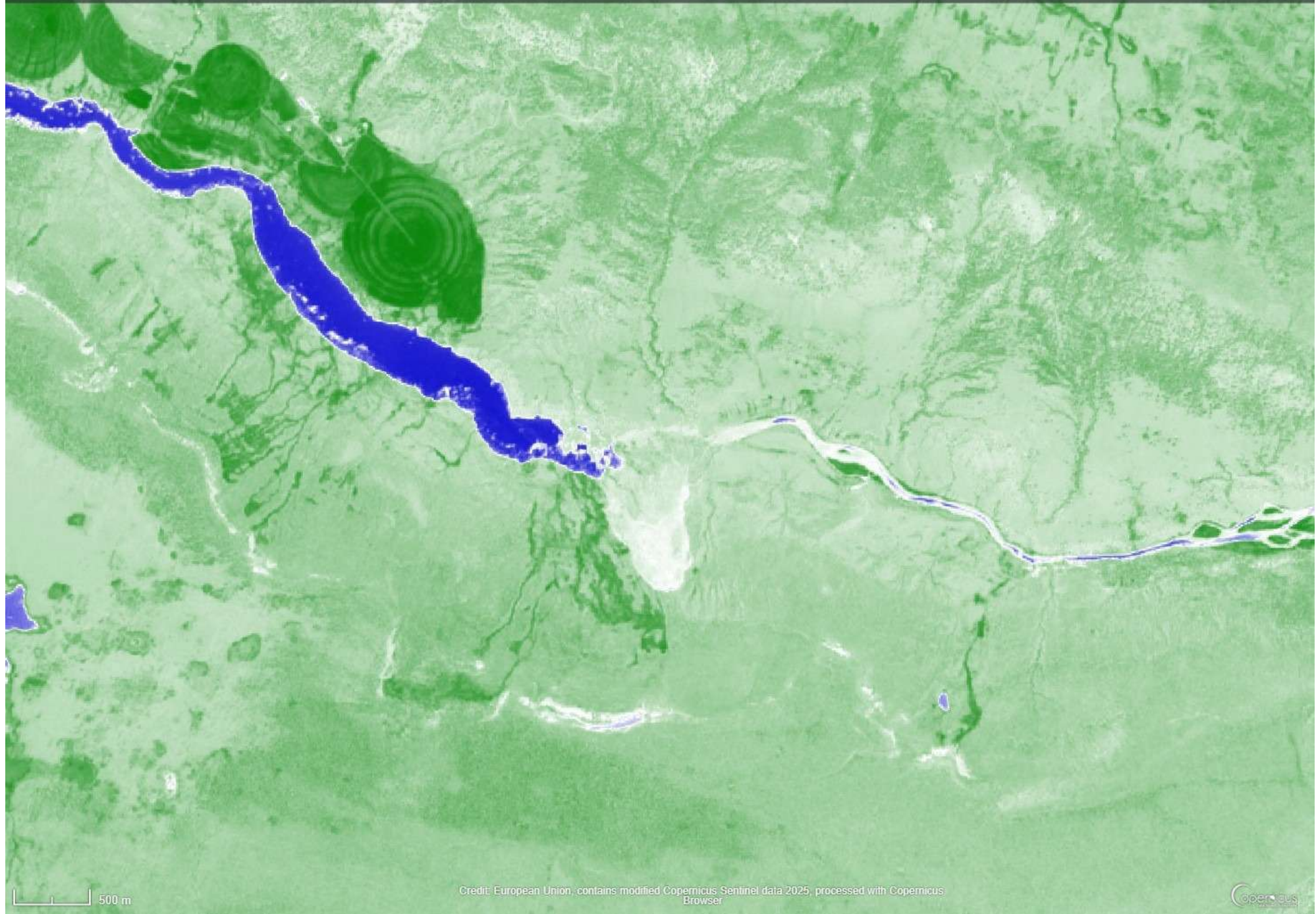
2024 Chilcotin River (Tâsilhqox) Landslide

- Landslide happened in late July 2024
- Blocked river for 6 days
- Impact to salmon run



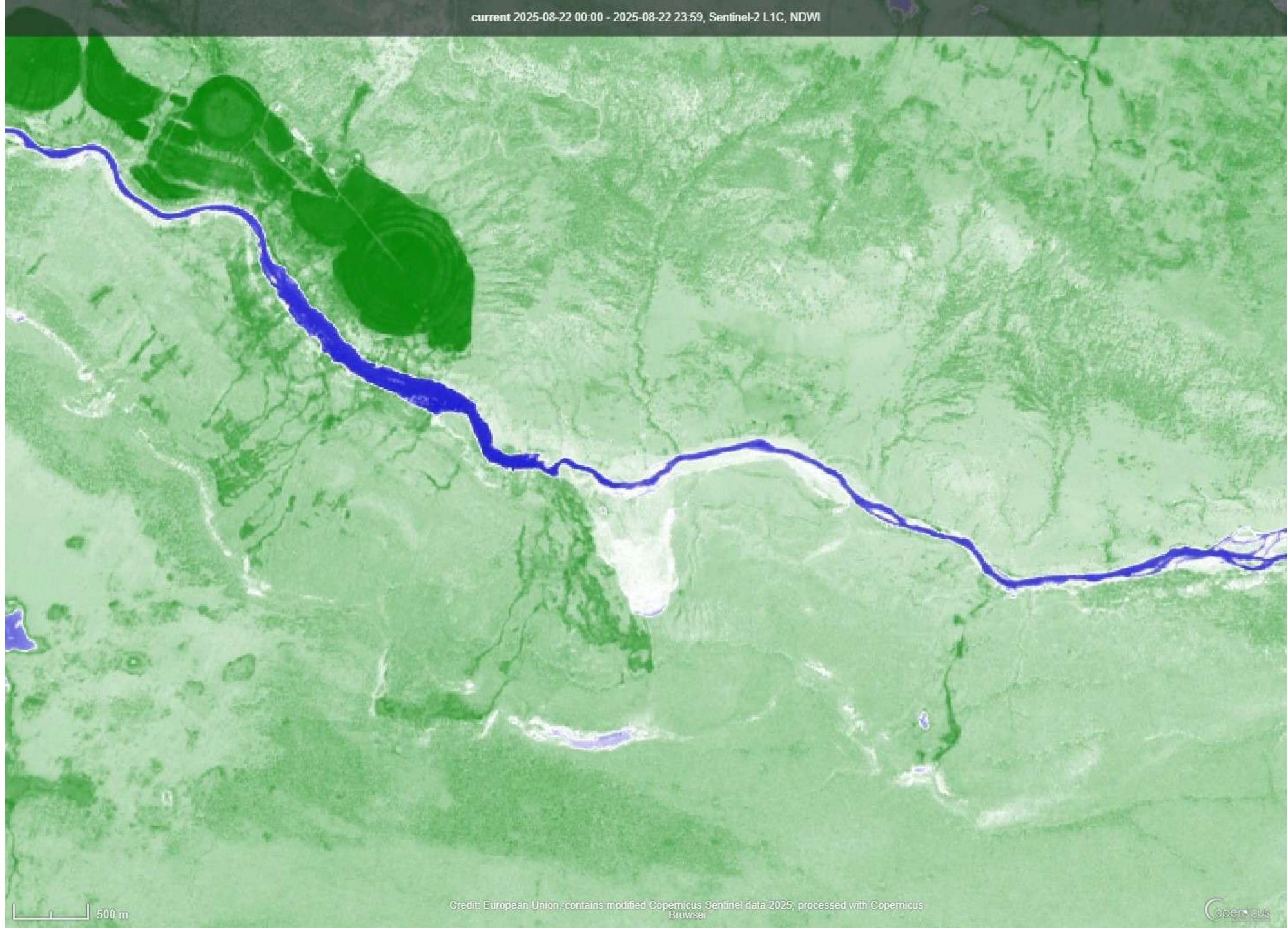


Before
July 8, 2024



During
August 8,
2024

500 m



After
August
22, 2025



September
22, 2025

What Are We Looking At?

By Thomas Jacob

In the summer of 2021, the Sparks Lake wildfire broke out northwest of Kamloops, British Columbia, and rapidly spread across the Bonaparte Plateau, burning through large areas of forest and grassland. The fire began in late June 2021 during an extended heatwave and drought period, and by August it had become one of the largest wildfires of the season. At its peak, the fire covered approximately 90,000 hectares, affecting portions of Bonaparte Provincial Park and surrounding Crown lands.

The fire caused extensive loss of mature forest cover and habitat, transforming large sections of the landscape into open, charred terrain. In the months following, early signs of vegetation recovery began to appear, but the ecological and visual before-and-after satellite imagery changes remained dramatic.

The below illustrates the scale of environmental change resulting from the Sparks Lake wildfire showing the transition from dense, continuous forest cover prior to 2021, to a post-fire mosaic of burned forest, ash, and emerging regrowth. These images highlight both the destructive intensity of the event and the subsequent natural recovery processes underway within Bonaparte Provincial Park.



Bonaparte Provincial
Park Pre Sparks Lake
Wildfire (2021-06-29)



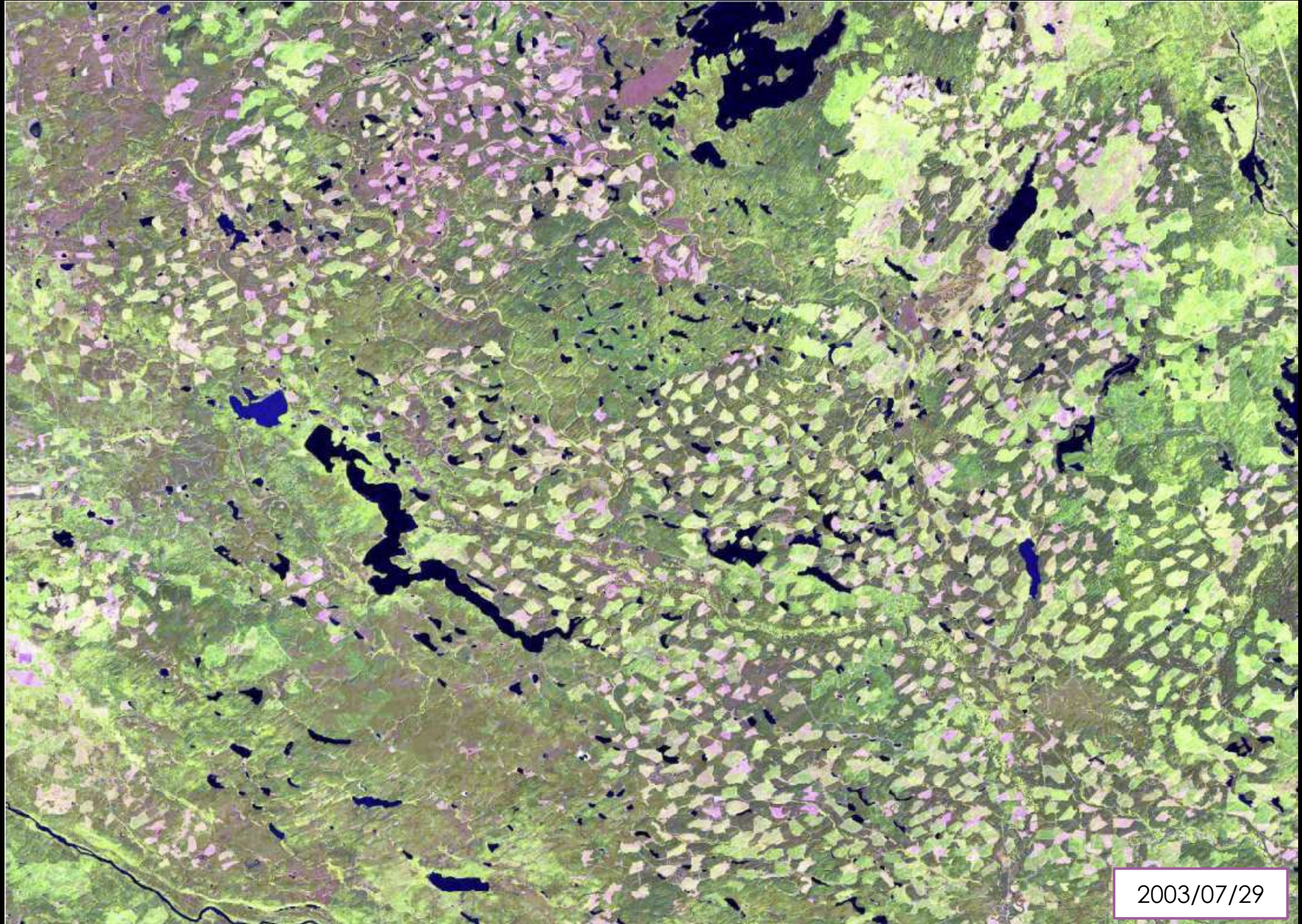
Bonaparte Provincial
Park Post Sparks
Lake Wildfire (2022-
07-31)

Great Beaver Lake

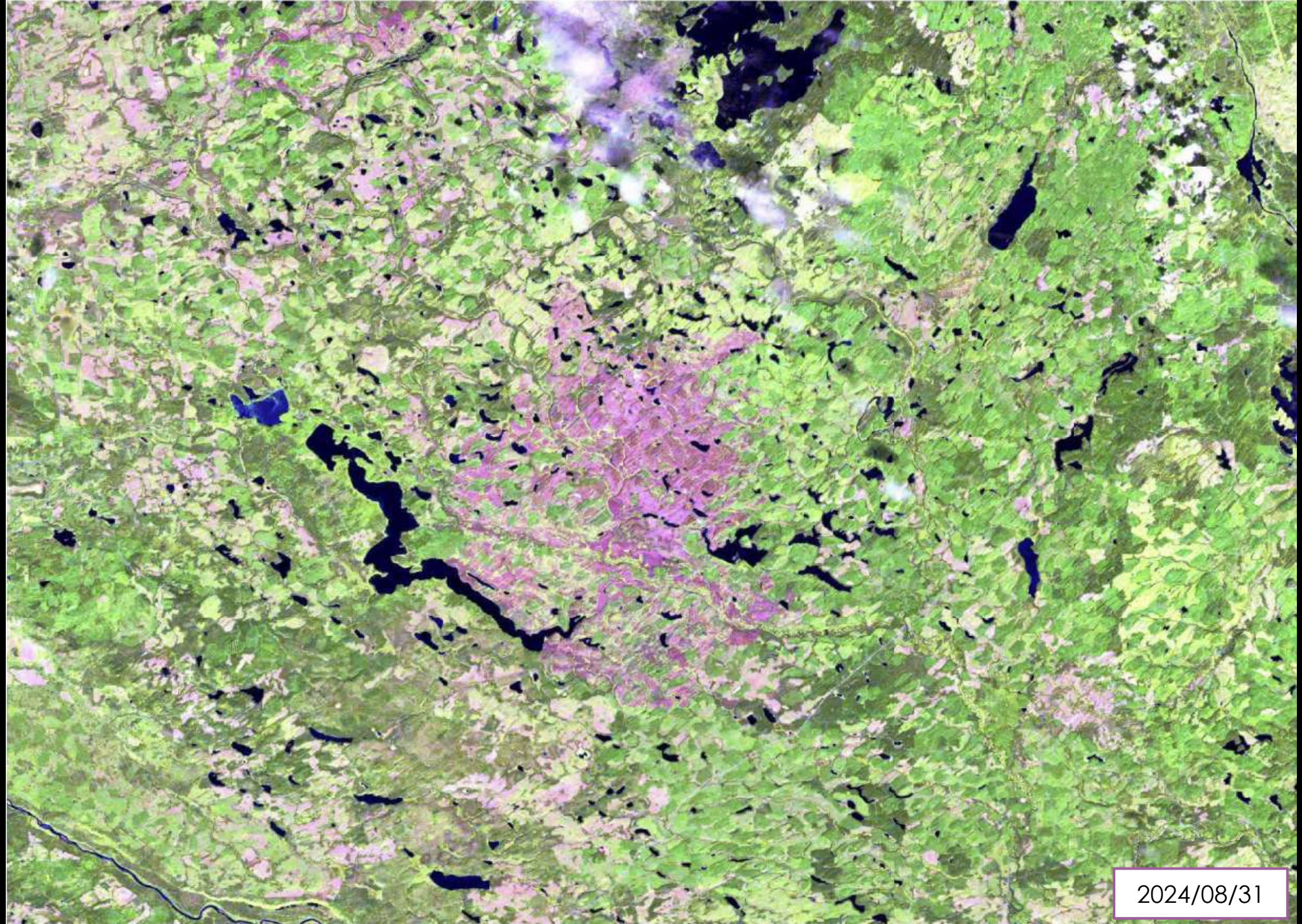
- ▶ East of **Fort St James**
- ▶ Home to a rec site
- ▶ Located in a region of heavy **forestry activity**



Credit: Google Maps



2003/07/29



2024/08/31

Visible Spectrum Comparison (2003 vs 2022)



Credit: Google Maps (from time lapse feature)

What's Going On?

Massive increase in number of **cutblocks**

- Most have grown back to some degree, but the varying green color makes the difference in maturity visible
- The cutblocks are more visible in the 2003 scene because there was less activity in the region overall

Pink area in the center of the 2024 scene

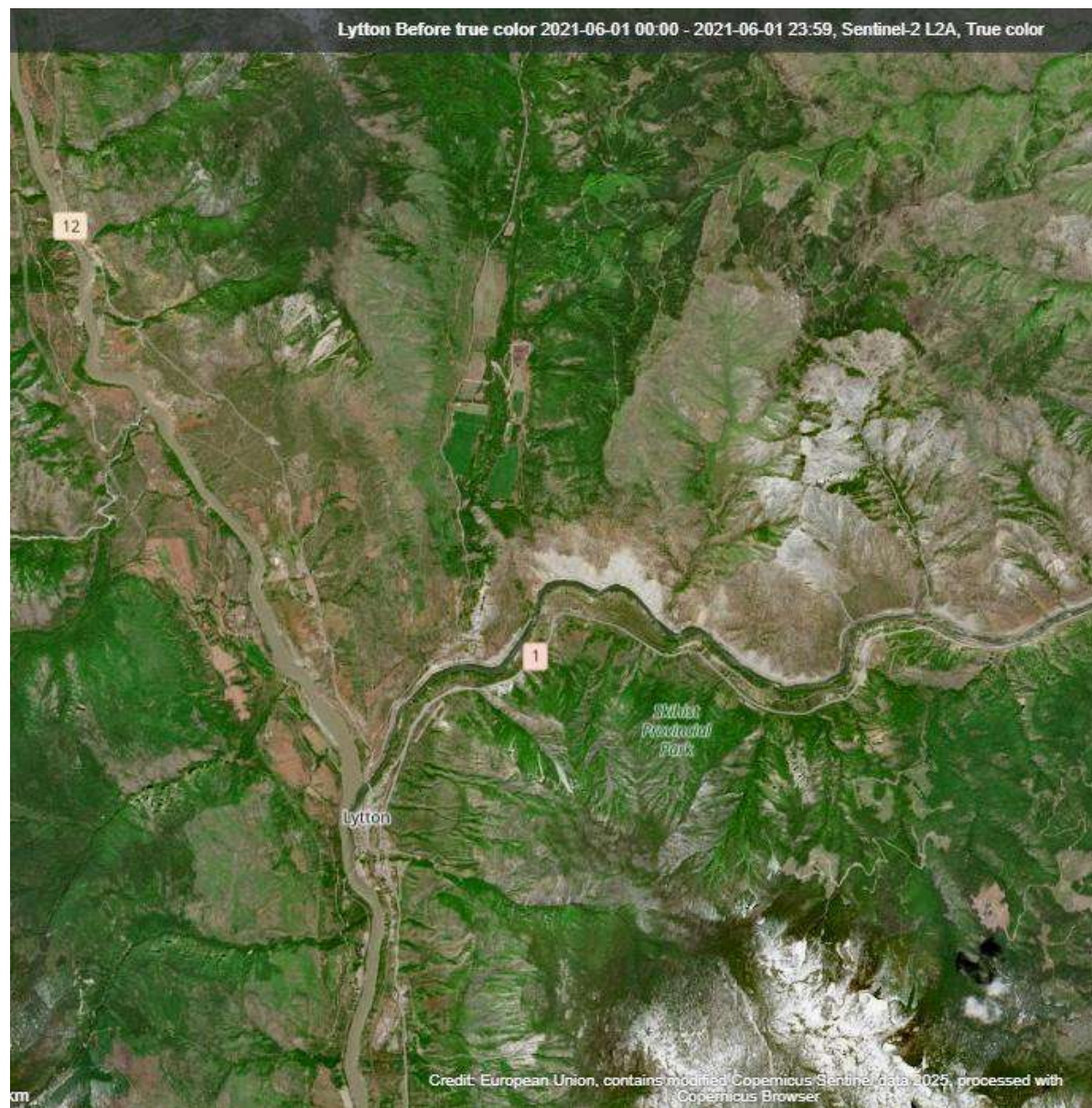
- This may have been due to a fire in the region, but clearly there has been logging activities in that area

New forest service road (if you squint your eyes)

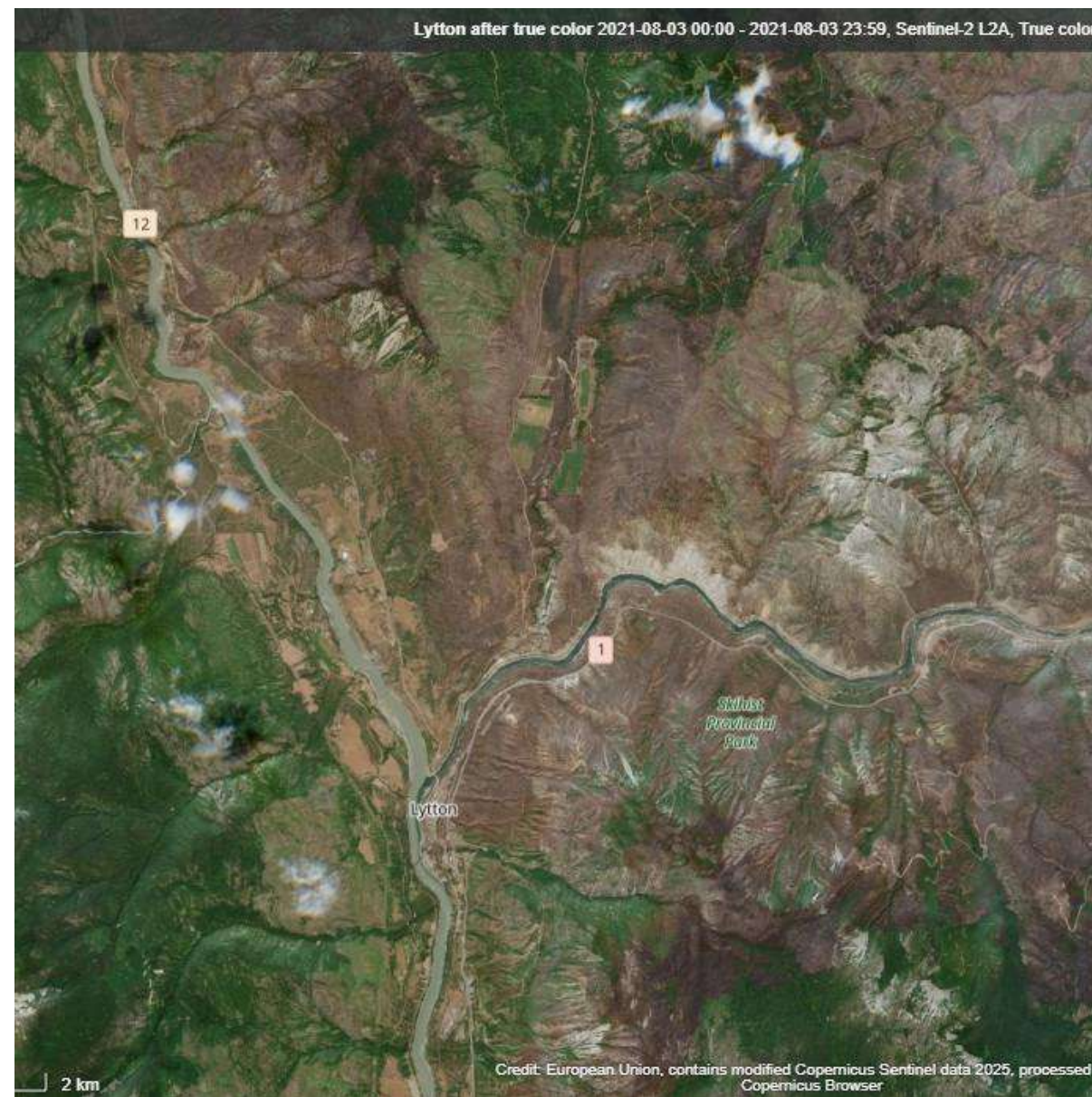
2021 Lytton Creek Wildfire

- 83 000 hectares burned
- 151 homes and business destroyed

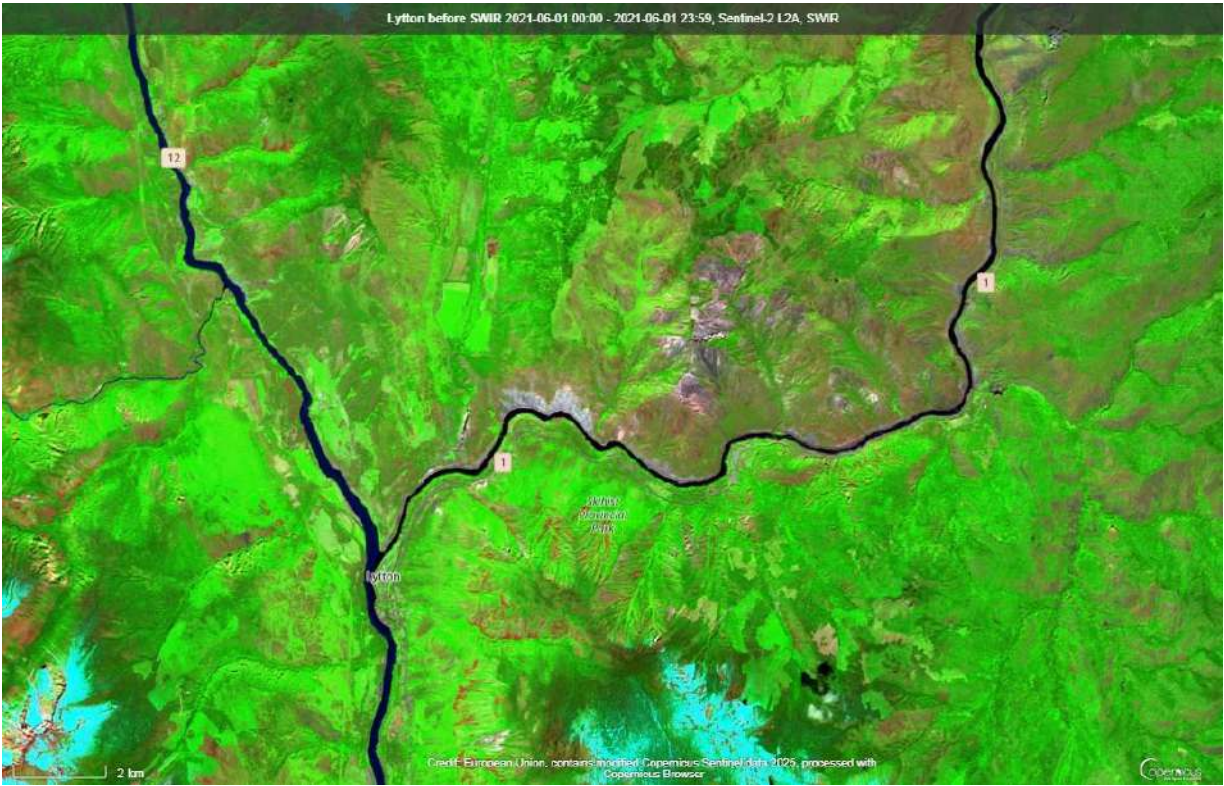




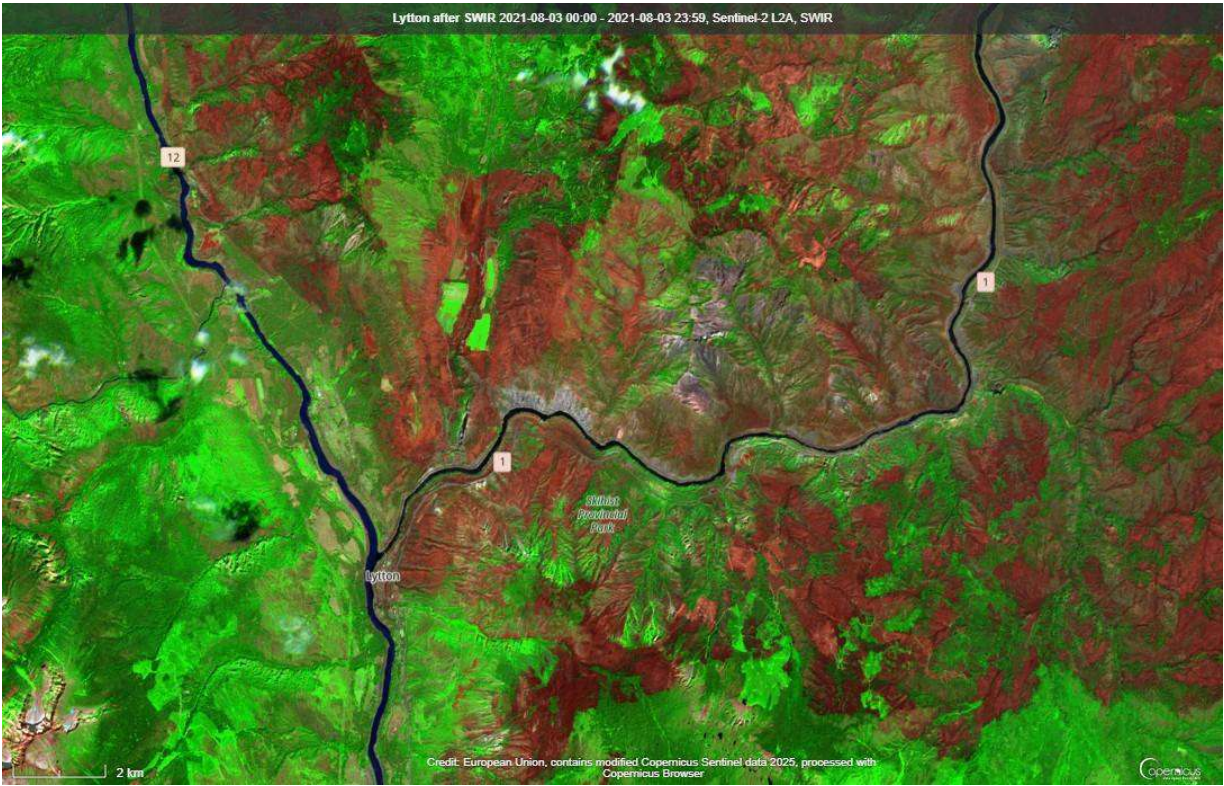
Lytton/ Hwy 1 June 1st 2021



Lytton/ Hwy 1 August 3rd 2021



Lytton/ Hwy 1 June 1st 2021



Lytton/ Hwy 1 August 3rd 2021

Lytton after SWIR 2021-08-03 00:00 - 2021-08-03 23:59, Sentinel-2 L2A, SWIR



Credit: European Union, contains modified Copernicus Sentinel data 2025, processed with Copernicus Browser

