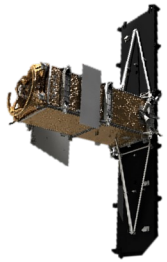


Third International SAR Workshop

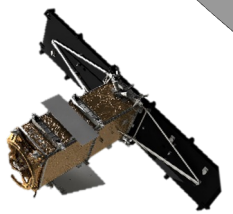
ICGS-SAR



Guennadi Kroupnik

Director General,

Space Utilization, CSA



Saga Prefecture, Japan

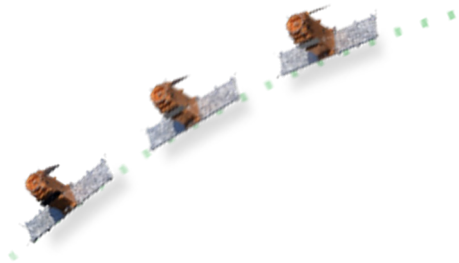
6-8 November, 2024

RADARSAT PROGRAM

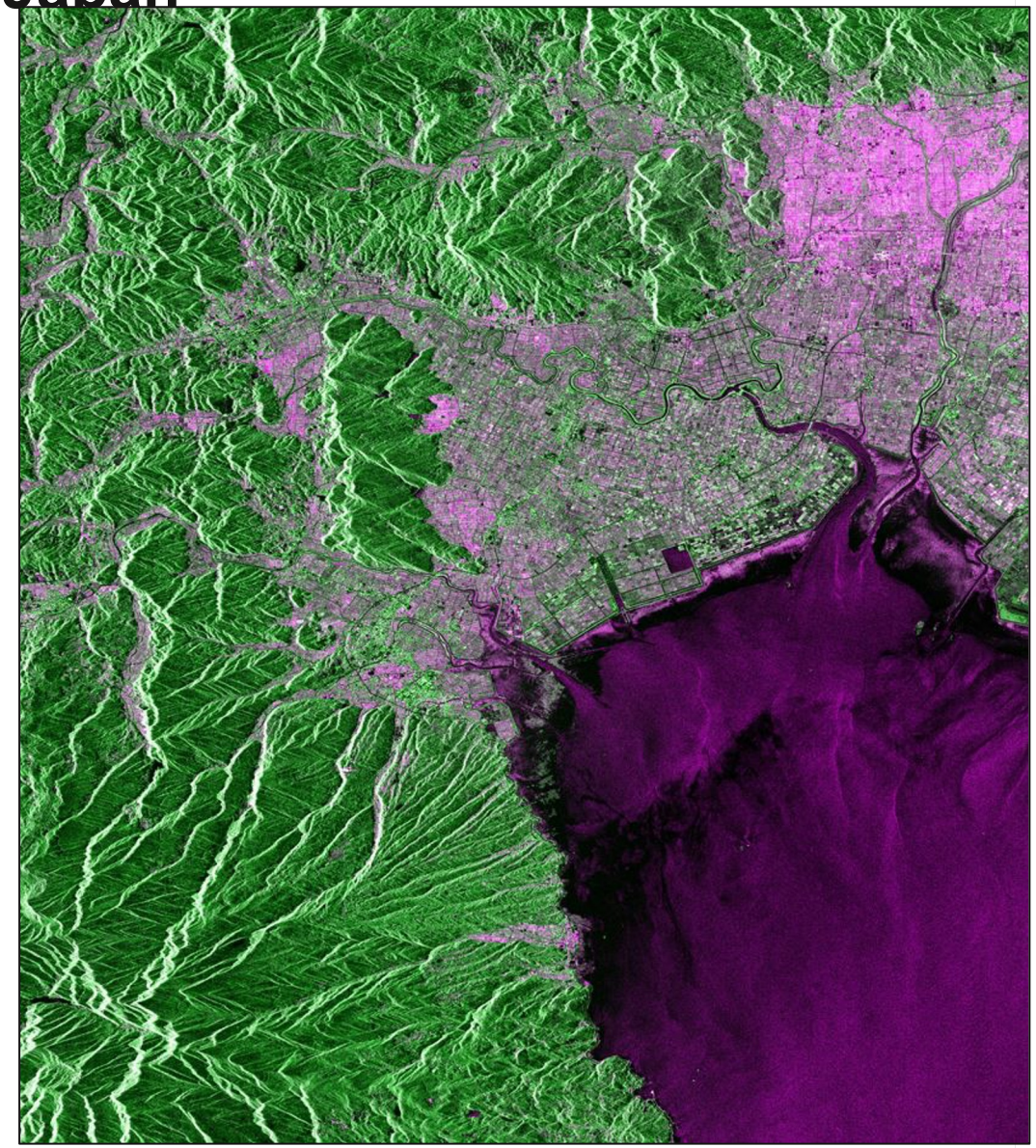
Current Status

Overview

1. RADARSAT Program overview
2. RADARSAT+
3. International Collaborations



Ureshino City, Saga Prefecture, Japan





RADARSAT Constellation Mission imagery © Government of Canada [2023]. RADARSAT is an official mark of the Canadian Space Agency

Observing Earth from space: Canada defines the future of satellite data

25 years of RADARSAT and beyond

RADARSAT-1 | RADARSAT-2 | RADARSAT Constellation | RADARSAT +

The RADARSAT program has confirmed Canadian leadership in space based SAR, established the RADARSAT brand name around the world and established a Canadian presence in the global space EO ecosystem.



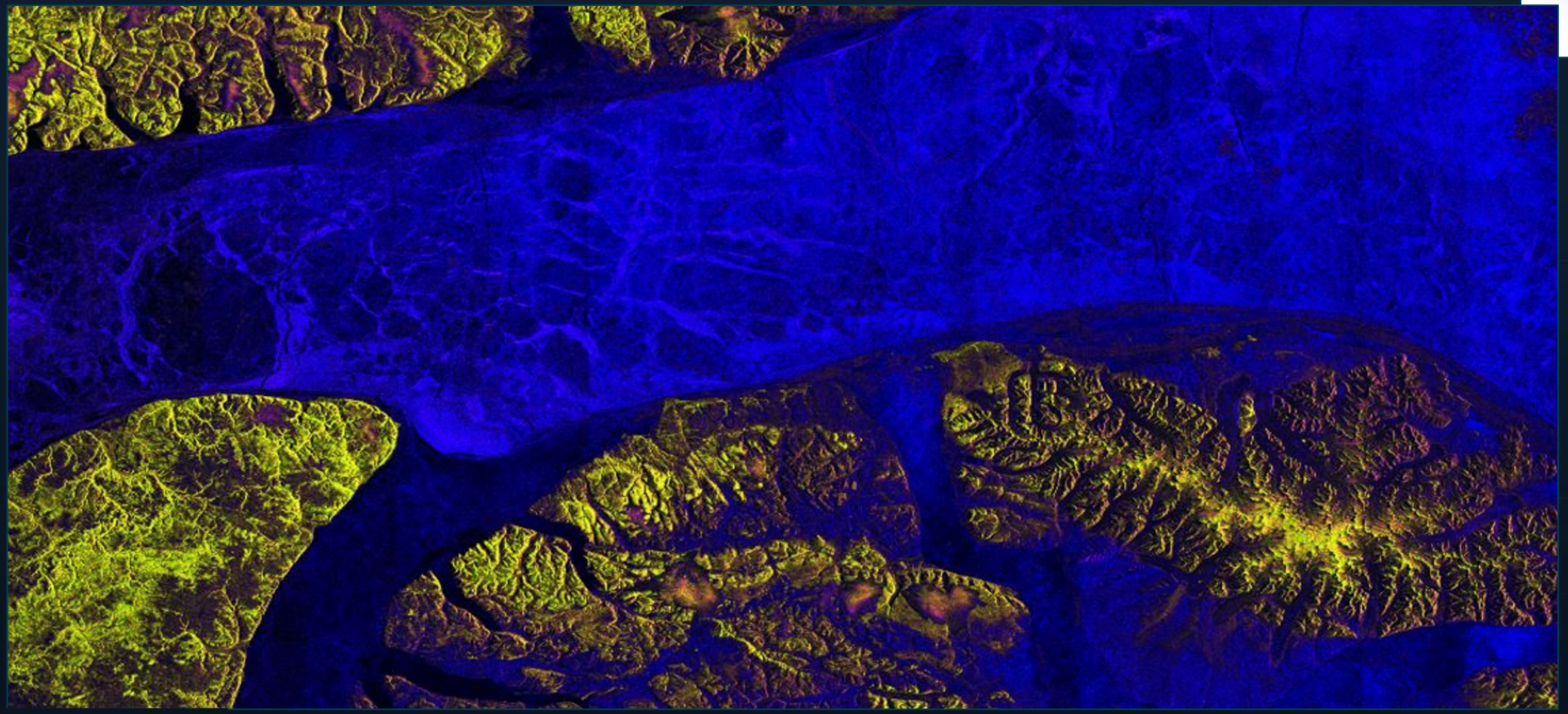
RADARSAT-1 Open Data

RADARSAT-1 was Canada's first commercial Earth Observation satellite, launched on November 4, 1995, and declared non-operational on March 29, 2013, reaching 17 years of life. It was estimated that **1 800 000 images** were acquired during its lifetime.

It provided useful information to both commercial and scientific users in fields such as disaster management, interferometry, agriculture, cartography, hydrology, forestry, oceanography, ice studies and coastal monitoring.

1 000 000th Image

On March 30 2023, RCM captured its one-millionth image of Earth, a little more than three years after the start of its operations.





RADARSAT Constellation Mission imagery © Government of Canada [2023]. RADARSAT is an official mark of the Canadian Space Agency

RADARSAT Constellation Mission

- RCM is the evolution of the RADARSAT program with the objectives to:

  *Ensure **data continuity** and improve system reliability*

  *Respond to the **increasing needs of the Government of Canada** for SAR data to support operations and the timely delivery of products and services to Canadians*

- RCM is a government-owned mission, tailored to respond to the Canadian Government needs in 3 main areas:

  Maritime surveillance

  Disaster management

  Ecosystem monitoring







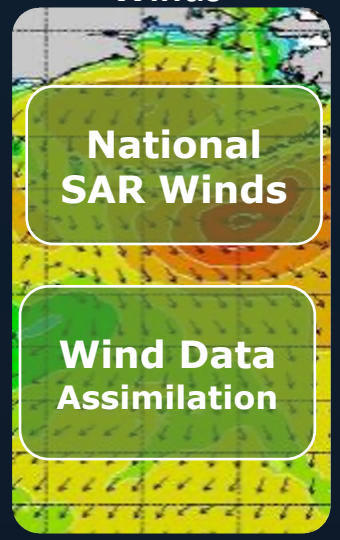
Canada

Serving Canadians

- Environment and Climate Change Canada
- National Defence
- Agriculture and Agri-Foods Canada
- Natural Resources Canada
- Fisheries and Oceans Canada
- Parks Canada
- Public Safety Canada
- Transport Canada
- Public Health Agency of Canada
- Crown-Indigenous Relations and Northern Affairs Canada







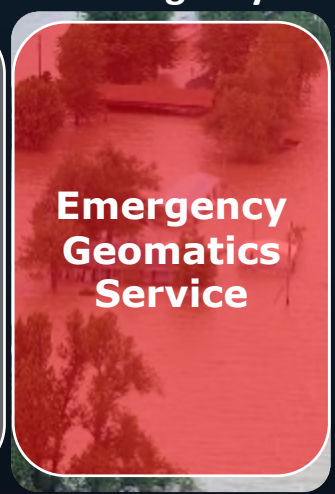














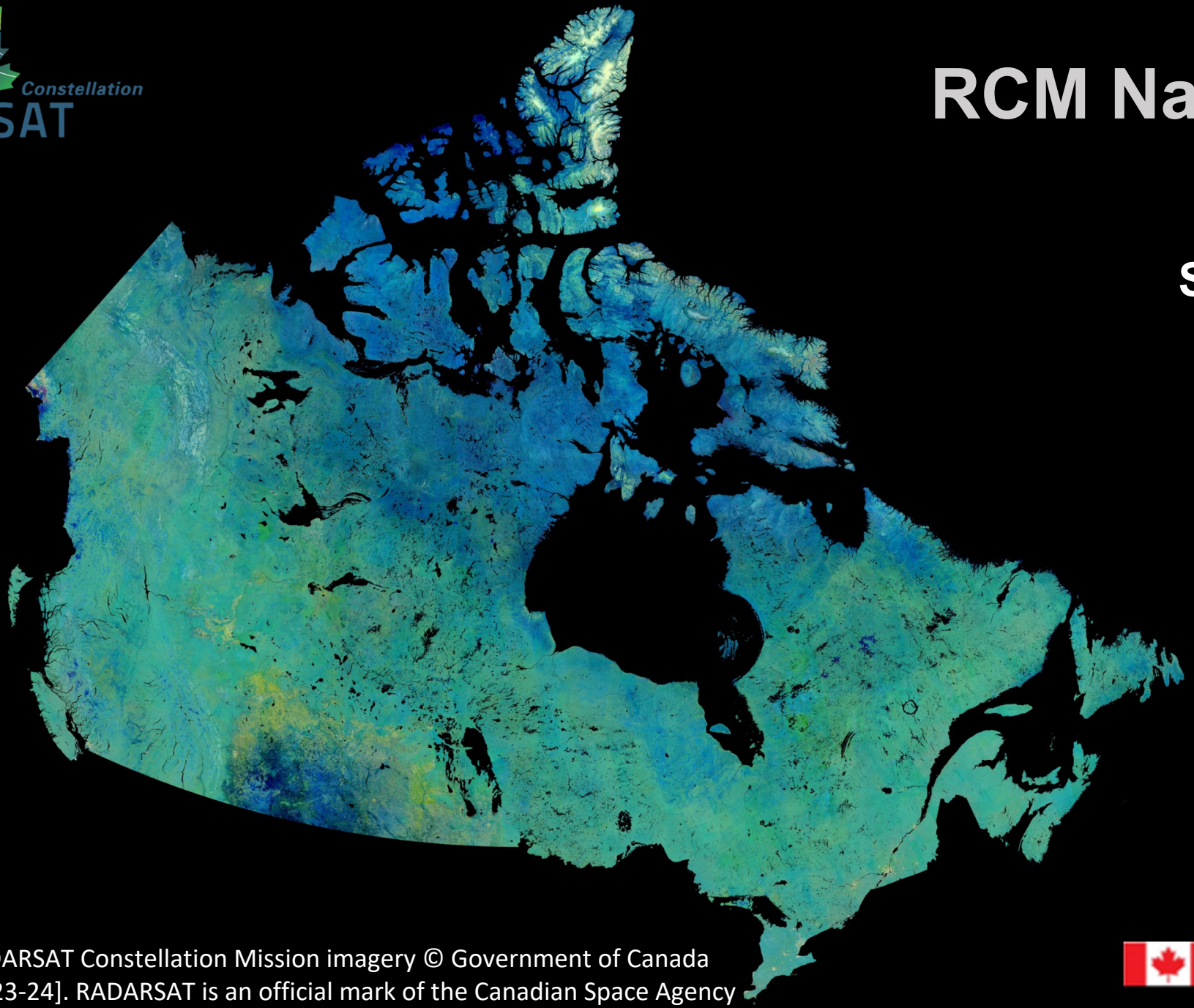


RCM Data Fully Integrated in Government of Canada Service Delivery

RCM National Land Mosaic

ScanSAR 30m CP

CEOS ARD 20m



m-c Decomposition

R: Even Bounce
G: Volume/Depol.
B: Odd Bounce

RADARSAT Constellation Mission imagery © Government of Canada [2023-24]. RADARSAT is an official mark of the Canadian Space Agency

Natural Resources Canada | Ressources naturelles Canada

RADARSAT+: RCM data continuity



$1.012 billion investment

Objectives:

- **Funding for a replacement satellite to enhance resilience of the RADARSAT Constellation Mission (RCM)**
- **Funding for the definition of a next-generation satellite system to maintain Canadian capabilities**

Timelines:

RADARSAT+

RADARSAT+ Budget Announcement

What does this mean for users?

CANADIAN SATELLITE SYSTEM

Build Replacement Satellite (RCM-R)	Development of Gen 4 Satellite System
❖ Data characteristics and quantity equivalent to at least one RCM satellite.	❖ Ongoing collection and consolidation of future user needs.
❖ Same data access and format as similar as possible.	❖ Expected resolution and coverage improvements.
❖ Performance as similar as possible to favor continuity of data/services.	❖ Maximize outreach and education on SAR data to widen user base.
❖ Mission objectives are set. Next steps are implementation and launch.	❖ Next step is to define fourth generation space assets to address user needs up to 2040.



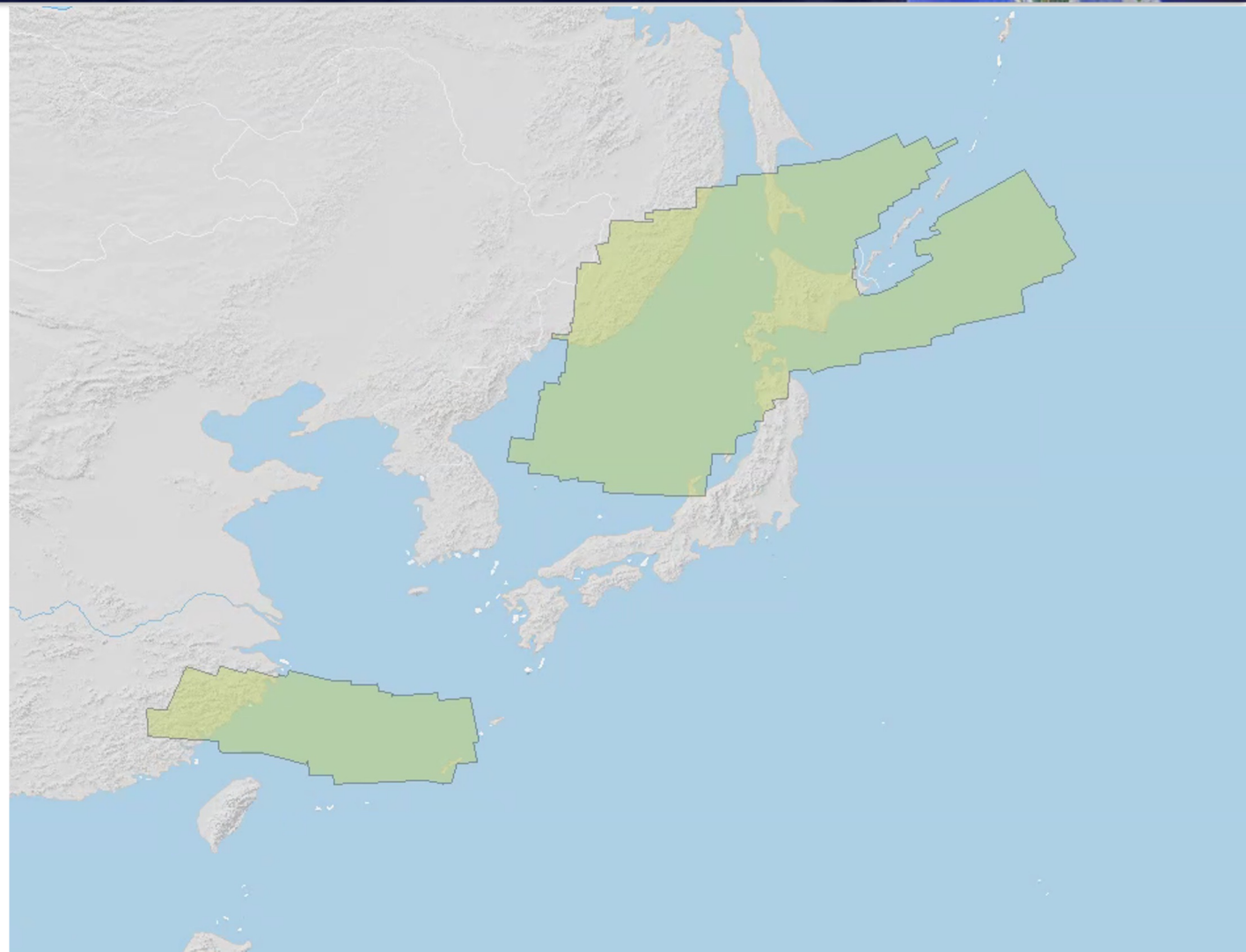
TOTAL RCM IMAGES provided to International Users

Until October 21st 2024

Country	Organization	Since	Image Count
Argentina	Instituto Nacional de Tecnologia Agropecuaria	2023-07-07	11
Austria	EOX IT Services GmbH	2023-05-23	513
	International Atomic Energy Agency	2023-05-01	45
Czechia	GISAT s.r.o.	2023-07-12	286
Denmark	Danish Meteorological Institute	2022-06-14	495 303
	National Space Institute - DTU Space	2021-03-11	291 310
Estonia	Estonian Environment Agency	2023-02-22	267
Finland	Finnish Meteorological Institute	2022-06-06	10 712
France	Institut français de recherche pour l'exploitation de la mer	2023-02-10	6 372
	Centre national d'études spatiales	2023-03-22	445
	Institut des Géosciences de l'Environnement (IGE)	2021-12-16	125
Germany	Drift+Noise Polar Services GmbH	2023-04-12	60 972
	Martin-Luther-University Halle-Wittenberg	2022-04-27	326
	German Federal Maritime and Hydrographic Agency	2023-02-03	116
Japan	Japan Aerospace Exploration Agency	2021-02-25	33 308
Norway	Kongsberg Satellite Services	2022-09-29	138 347
	Norwegian Meteorological Institute	2021-04-27	65 662
	Norwegian Polar Institute	2024-07-09	75
	The Arctic University of Norway	2024-05-01	72
	Nansen Environmental and Remote Sensing Center	2021-03-01	30
Sweden	Royal Institute of Technology	2022-09-29	8 893
United Kingdom	British Antarctic Survey	2023-02-03	17 189
USA	National Oceanic & Atmospheric Administration	2021-03-11	757 461
	University of Alaska Fairbanks	2023-02-06	22 071
	University of California, Irvine	2022-11-23	3 907
	The Aerospace Corporation	2023-05-09	3 398
	International Ice Patrol (IPP) - United States Coast Guard	2021-03-11	2 746
	Coastal Frontiers Corporation	2024-06-07	1 825
	Global Fishing Watch	2021-02-10	704
	University of Maryland	2023-02-03	392
	USNIC - U.S. National Ice Center	2021-04-30	69

JAXA – CSA Data Sharing Collaboration

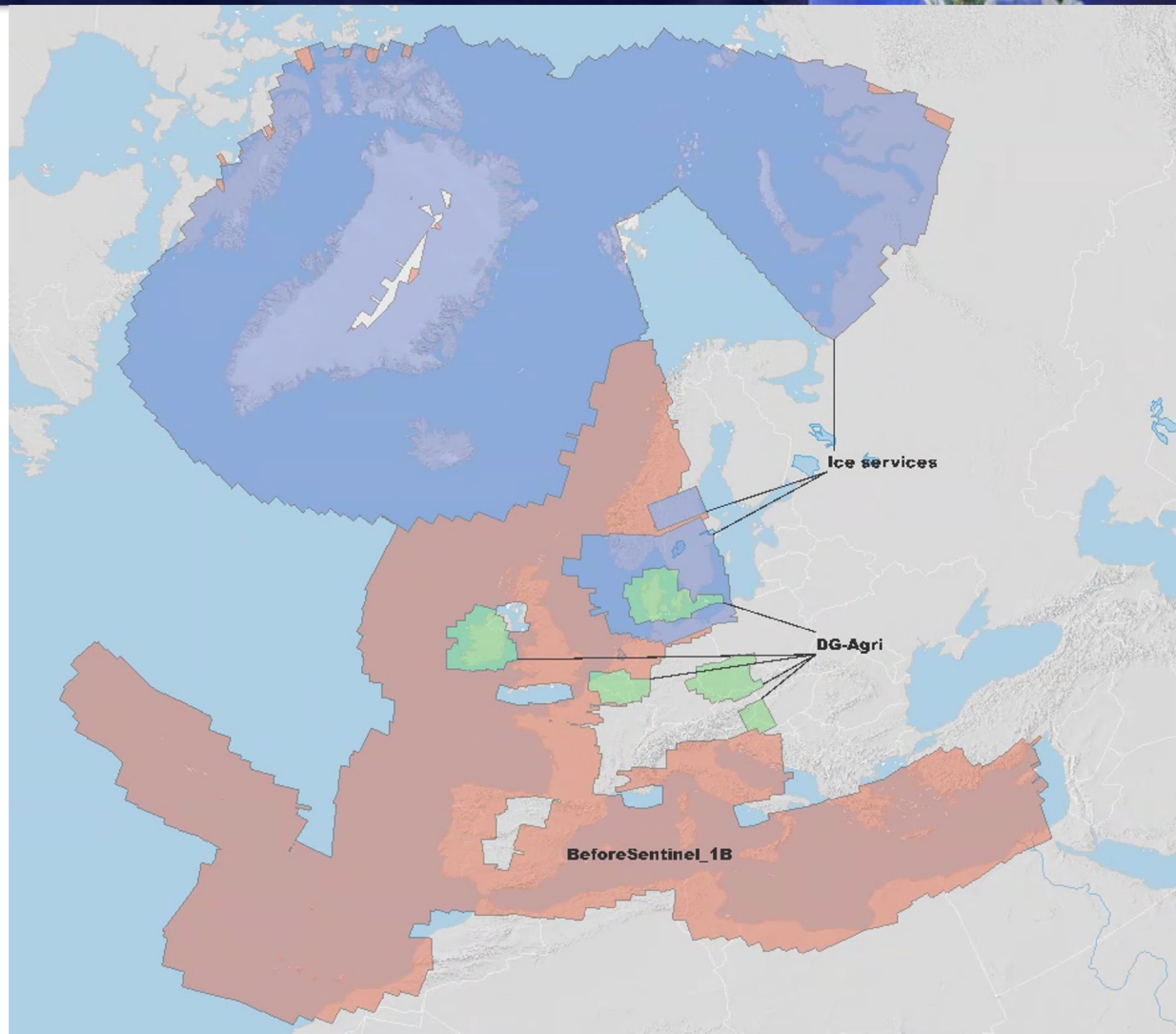
- RCM acquisition program for JAXA is designed for maritime monitoring
- In all, RCM as acquired more than 7000 images since the launch in 2019 for JAXA



Explore to Realize

ESA – CSA Data Sharing Collaboration

- The RCM support to European needs started for Copernicus sea-ice monitoring, and is on-going
- Following the Sentinel-1B anomaly (23/12/2021), the RCM coverage frequency of relevant sea-ice areas was increased, starting in Feb 2022 with a daily revisit
- In addition, the European Commission requested for RCM data coverage over specific European areas in the context of the EU Common Agricultural Policy (CAP)
- In all, RCM as acquired more than 160 000 images since the launch in 2019 for ESA



esa
European Space Agency

Copernicus
Europe's eyes on Earth

IICWG – CSA Data Sharing Collaboration

- Following the Sentinel-1B anomaly (23/12/2021), IICWG as made an official request to improve coverage around the Antarctic
- In all, RCM as acquired more than 5 500 images since the launch the start of the program in 2022

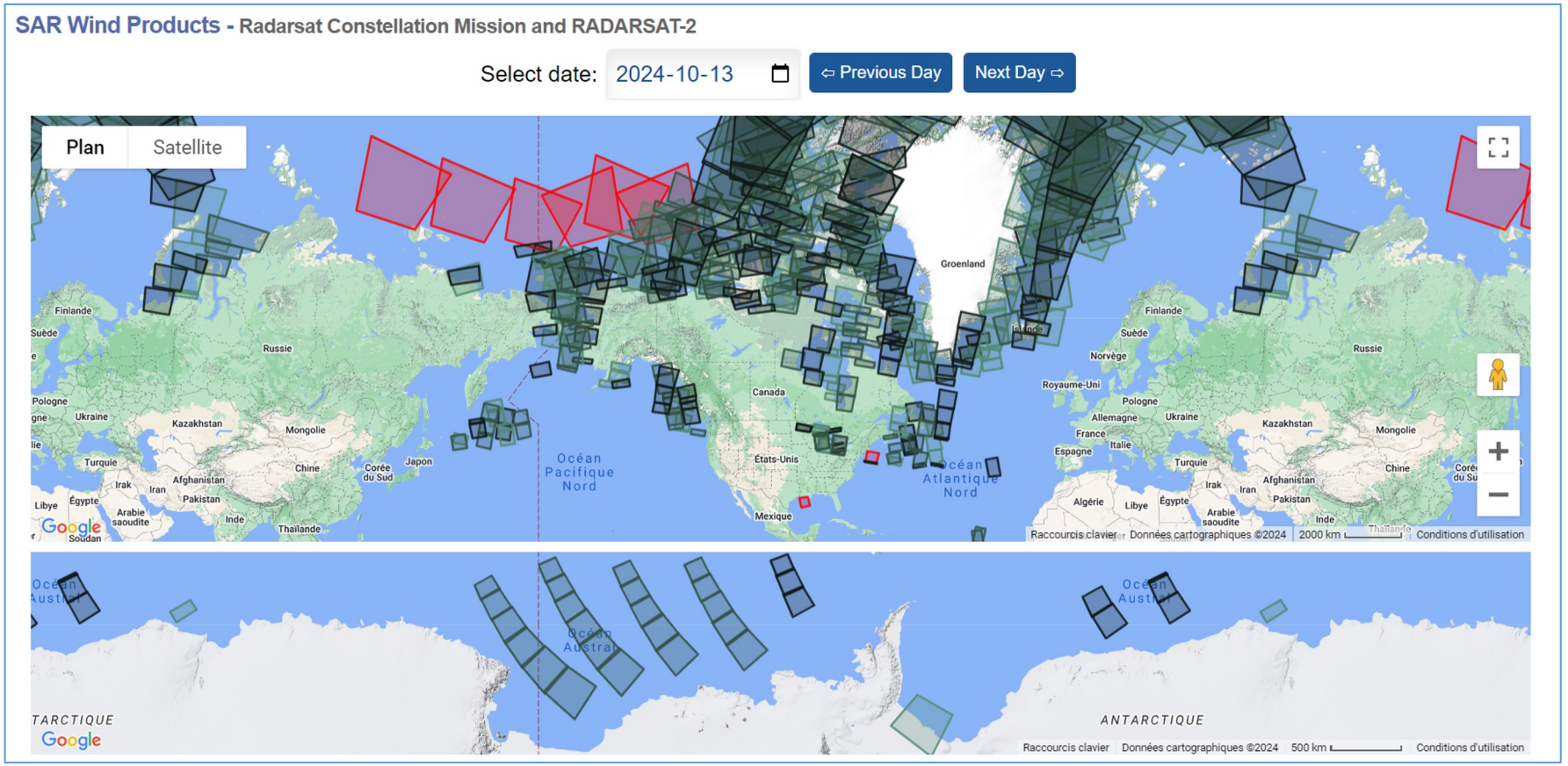


NOAA – CSA Data Sharing Collaboration

- NOAA's Satellite Oceanography and Climatology Division (SOCD) has been an active vetted users. They use most of the publicly available images to generate Ocean surface winds products

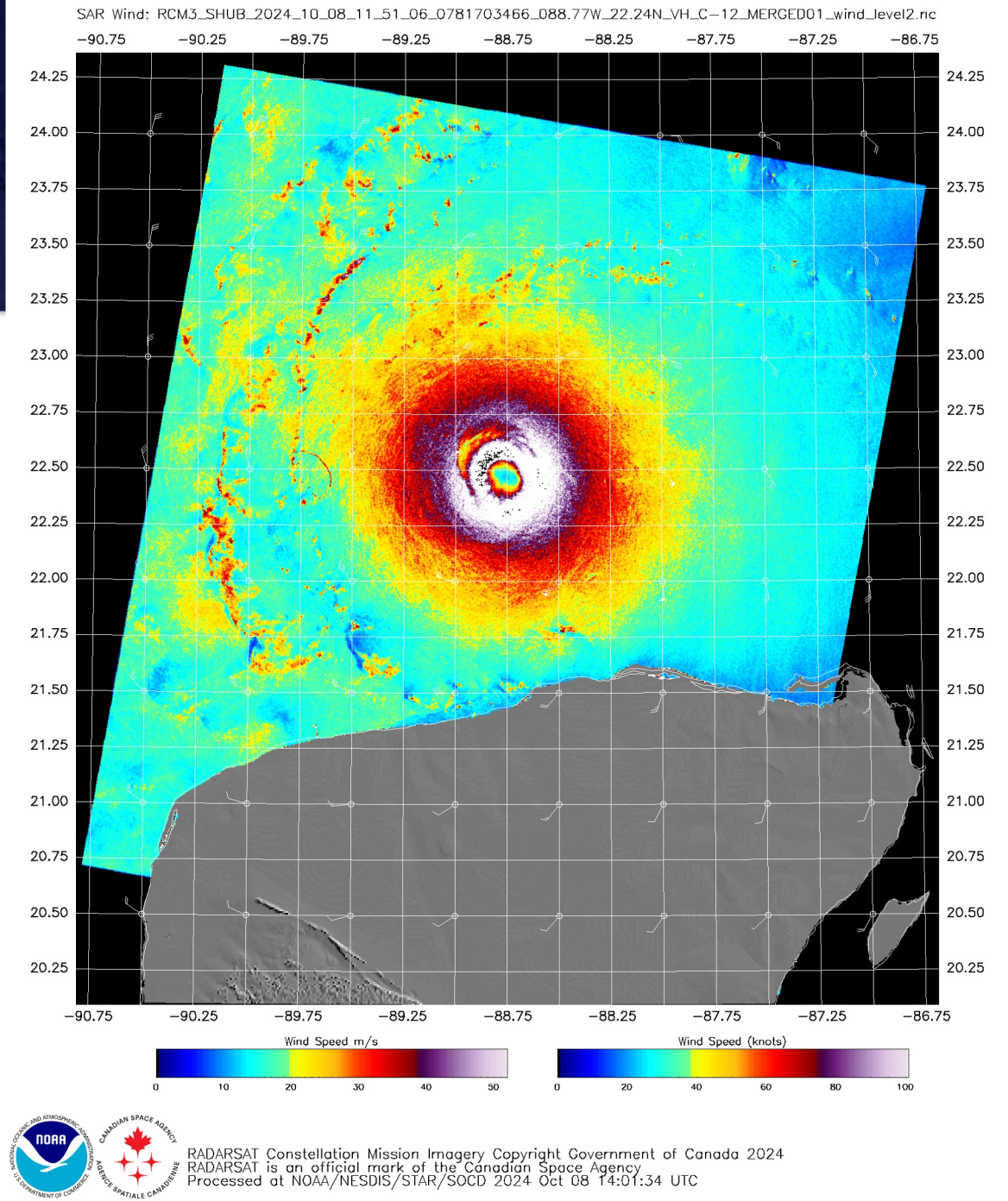
Here is an example of the Ocean surface winds products generated by NOAA from RCM images only on October 13th, 2024.

For this day alone NOAA used 487 RCM images.



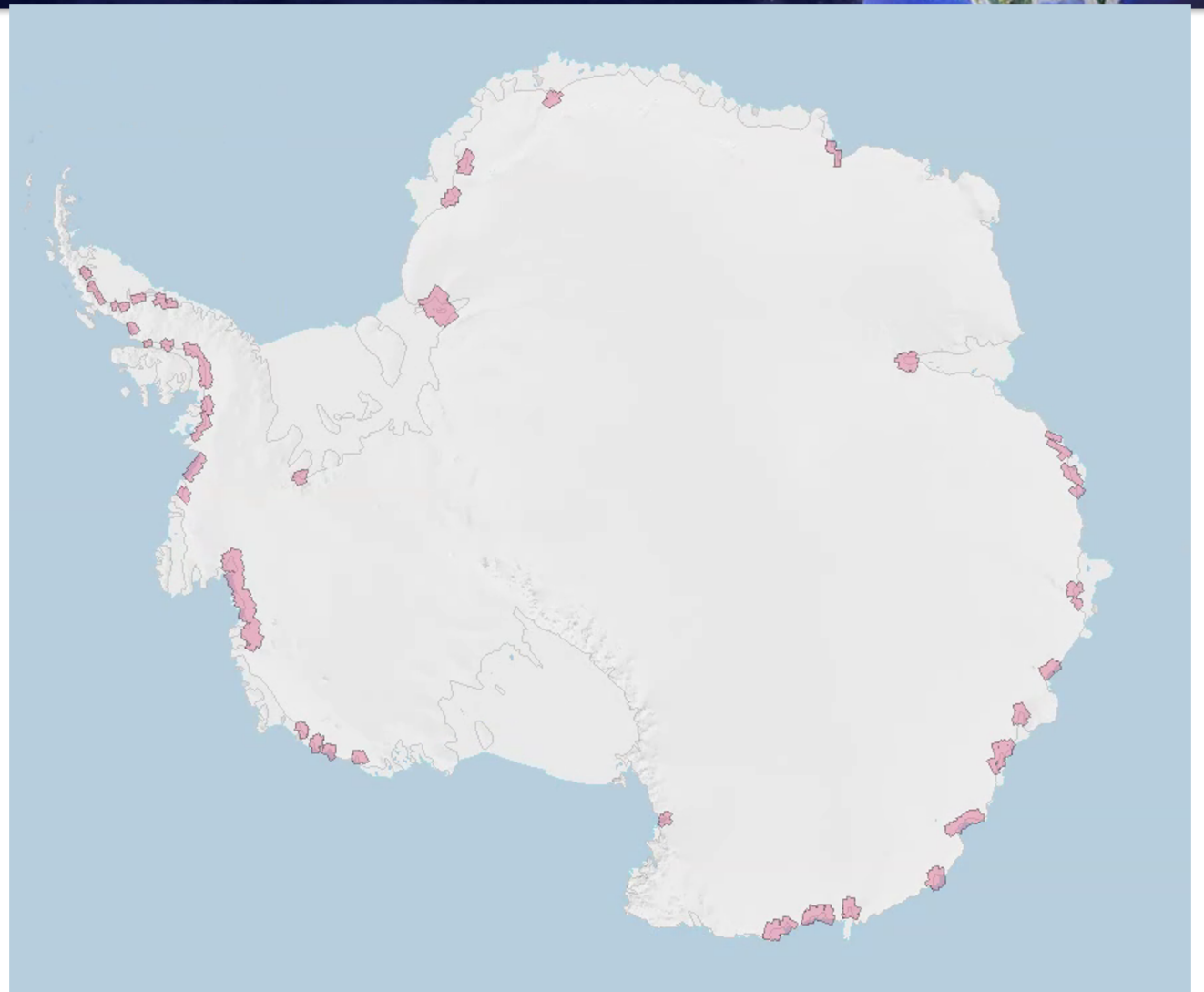
NOAA – CSA Data Sharing Collaboration

- In 2022, CSA upgraded its contribution to the Hurricane Watch program.
- This increased contribution was not only quantitative but also qualitative. With our new acquisition method, CSA increased the occurrence of hurricanes eye hits.
- As an example, here is a perfect eye hit of hurricane Milton on October 8, 2024. The high winds around the eye we're showing speeds around 100 knots (185 kph)



JPL – CSA Data Sharing Collaboration

- Following the Sentinel-1B anomaly (23/12/2021), the Eric Rignot research group, funded through a NASA Making Earth System Data Records for Use in Research Environments (MEaSUREs), as made an official request to improve ice velocity and grounding line information coverage around the Antarctic.
- RCM as acquired more than 1800 images since the launch the start of the program in 2022



GEO-TREES – CSA Data Sharing Collaboration

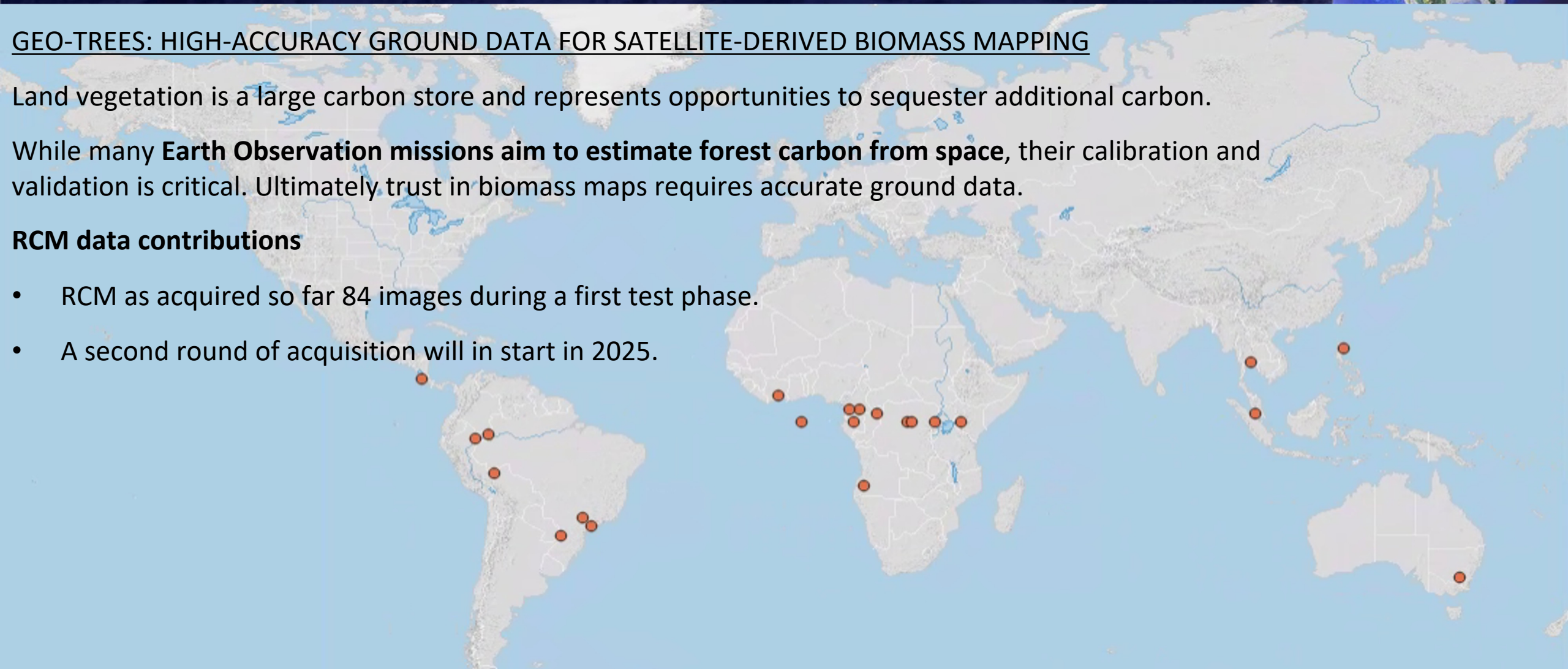
GEO-TREES: HIGH-ACCURACY GROUND DATA FOR SATELLITE-DERIVED BIOMASS MAPPING

Land vegetation is a large carbon store and represents opportunities to sequester additional carbon.

While many **Earth Observation missions aim to estimate forest carbon from space**, their calibration and validation is critical. Ultimately trust in biomass maps requires accurate ground data.

RCM data contributions

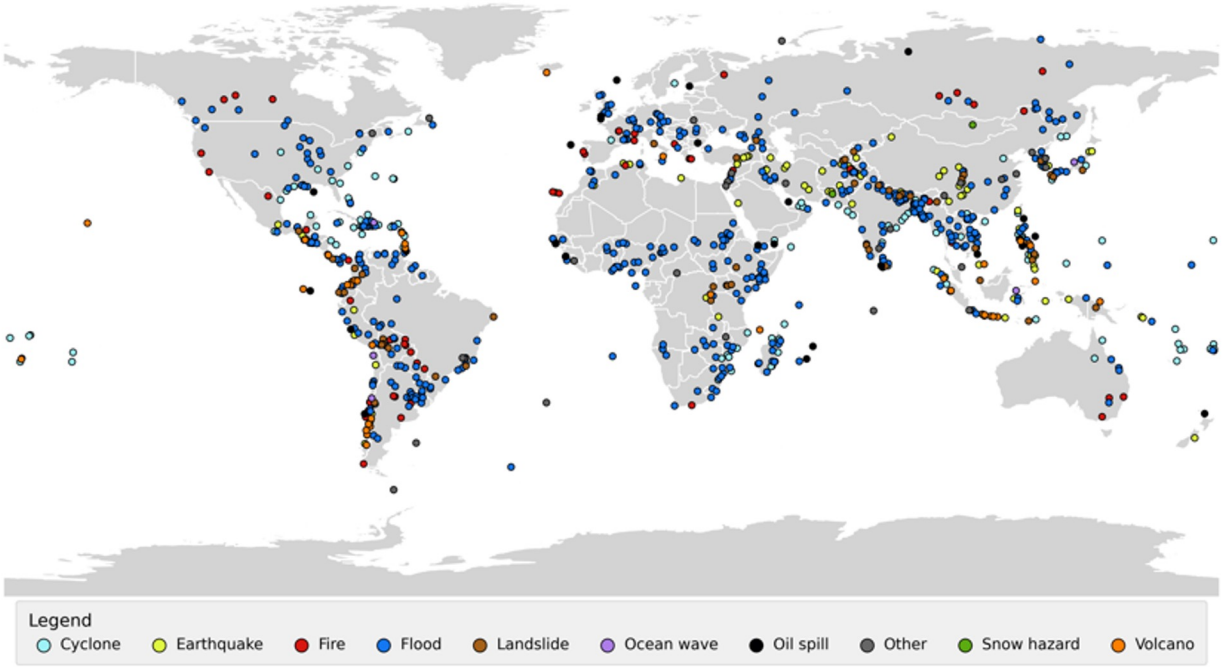
- RCM as acquired so far 84 images during a first test phase.
- A second round of acquisition will in start in 2025.



CSA implication to the International Charter ‘Space and major Disasters’

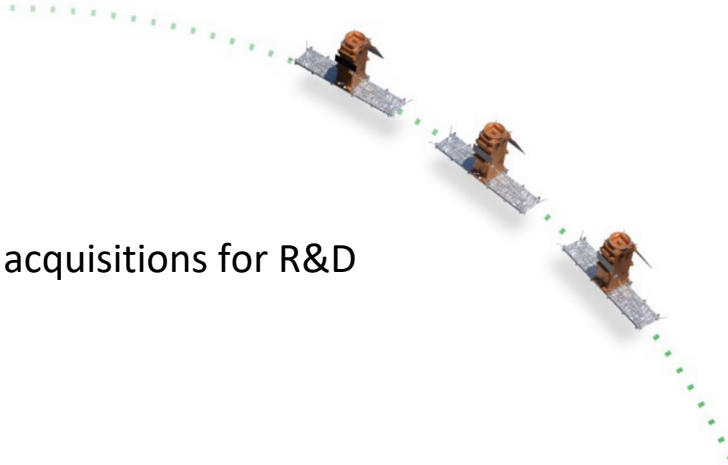
SATELLITE DATA TO SUPPORT DISASTER RESPONSE WORLDWIDE

- The Charter is an International agreement among Space Agencies to support with space-based data and information relief efforts in the event of emergencies caused by major disasters.
- Following UNISPACE III in Vienna in July 1999, ESA (European Space Agency) and CNES (Centre National d’Études Spatiales) initiated the International Charter in July 1999. CSA signed the Charter as a founding member on October 20, 2000. It was declared operational as of November 1, 2000.
- Today, there are 17 Charter Members and 270 satellites monitoring disasters. The Charter was activated **919** times for **136** countries.
- Since the commissioning of the RCM, **1990** products were delivered in response to **233** events.
- The CSA is engaged in a myriad of duties:
  Board, Executive Secretariat, Project Management, Emergency on-Call Officer & Mission Planning Personnel.



International Collaborations

CSA has data sharing agreements with other space agencies to barter RCM products in exchange for acquisitions over Canada with their missions, either for operational use or R&D.



- **European Space Agency (ESA)**
  - Contingency Plan Sentinel1/RCM
- **DLR (Germany) / INTA (Spain)**
  - Tandem-X/TerraSAR-X/PAZ/RCM joint Supersite acquisitions for R&D Announcement of Opportunity
- **Japanese Space Agency JAXA**
  - Provision of ALOS-2 products over Canada
  - Provision of RCM products over Japan
- **NASA-ISRO (India) SAR collaboration**
  - NASA-NISAR
- **Surface Water and Ocean Topography (SWOT)**
  - Canadian scientists working on cal/val over Canadian sites to be covered by RCM.


CANADIAN SPACE AGENCY
AGENCE SPATIALE CANADIENNE