PyAuroraX, and more

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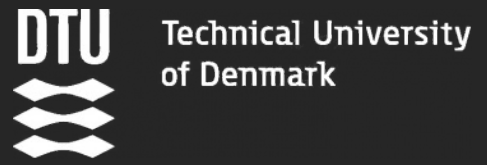
University of Calgary



Space Remote Sensing Open Science Platform

UNIVERSITY OF CALGARY

121 operational instruments (Canada, Alaska, Greenland, Antarctica)

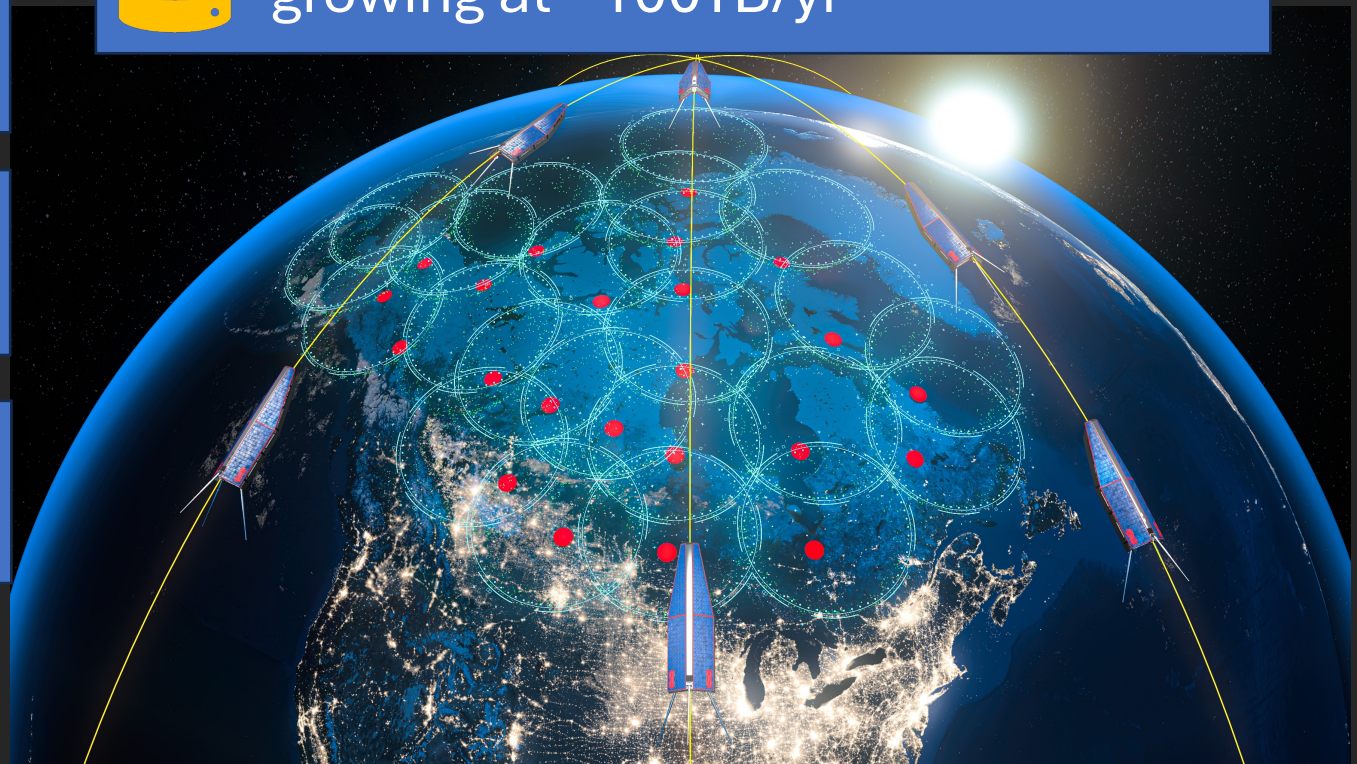
+122,000 public users
+1800 scientific users (last 12m)

285 virtual machines across 5 data centres in 3 countries

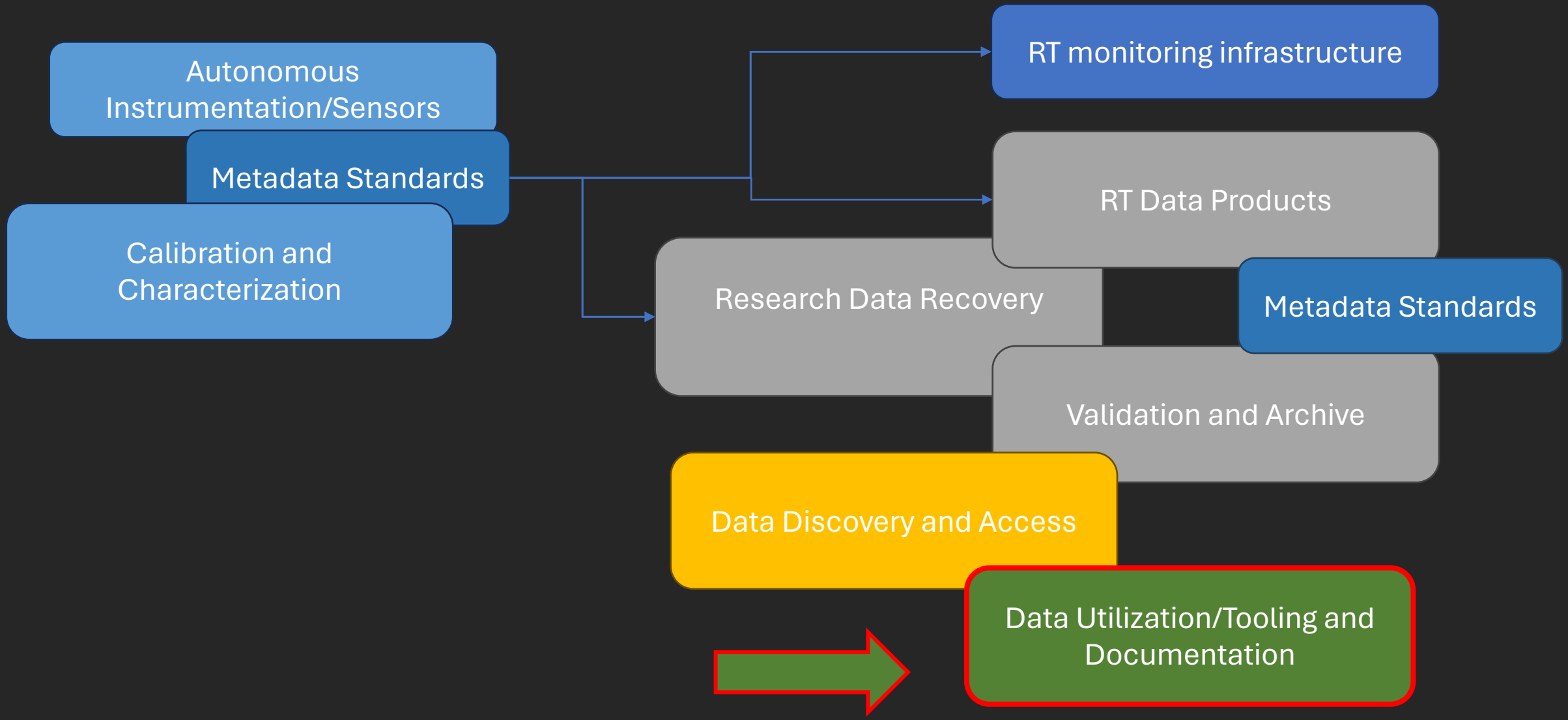
4 external partners with active data integrations

+55k active real-time data streams

1.1PB of data (+800 million files) growing at ~100TB/yr



What does it mean to operate an instrument in the field?

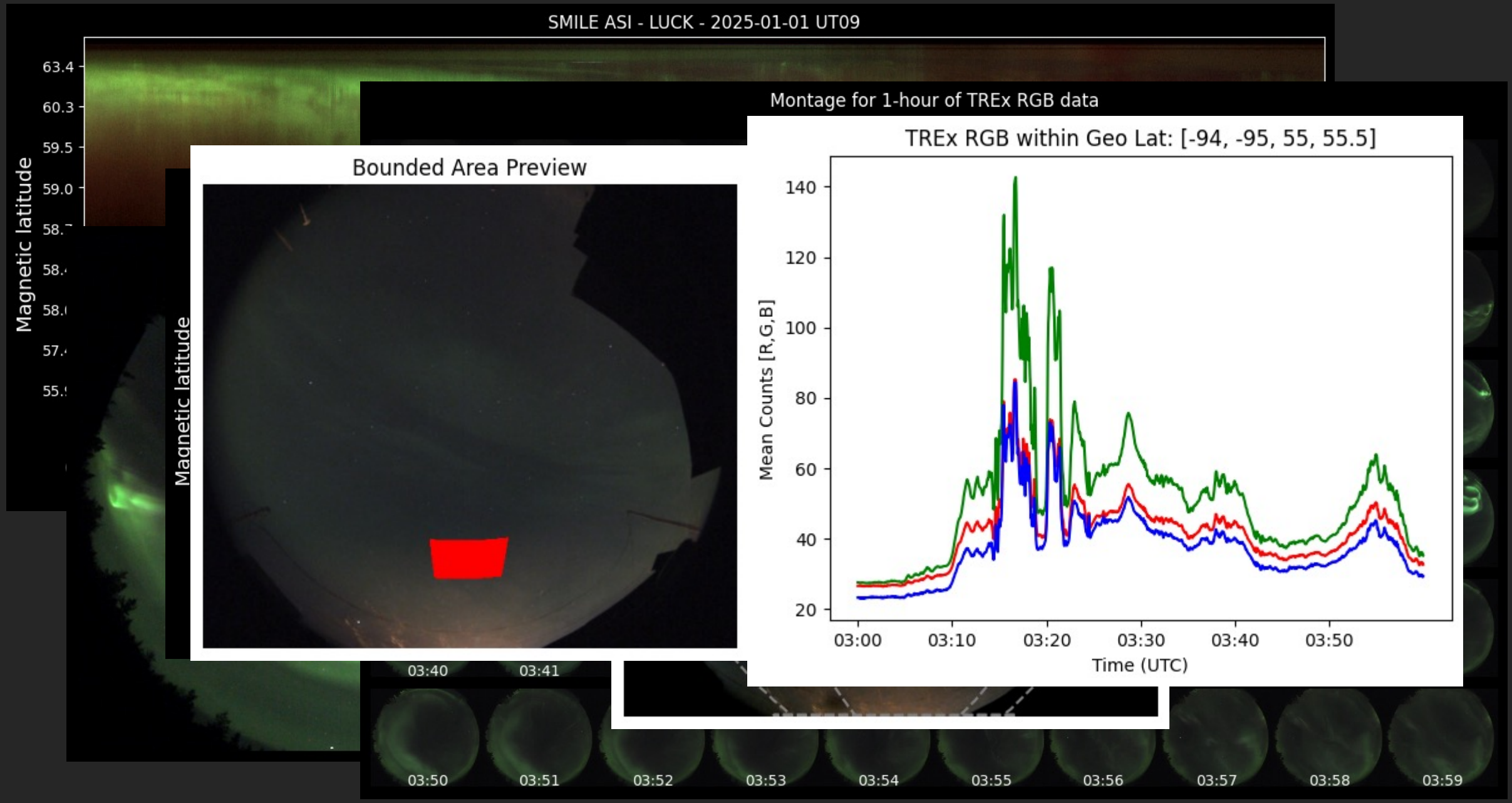


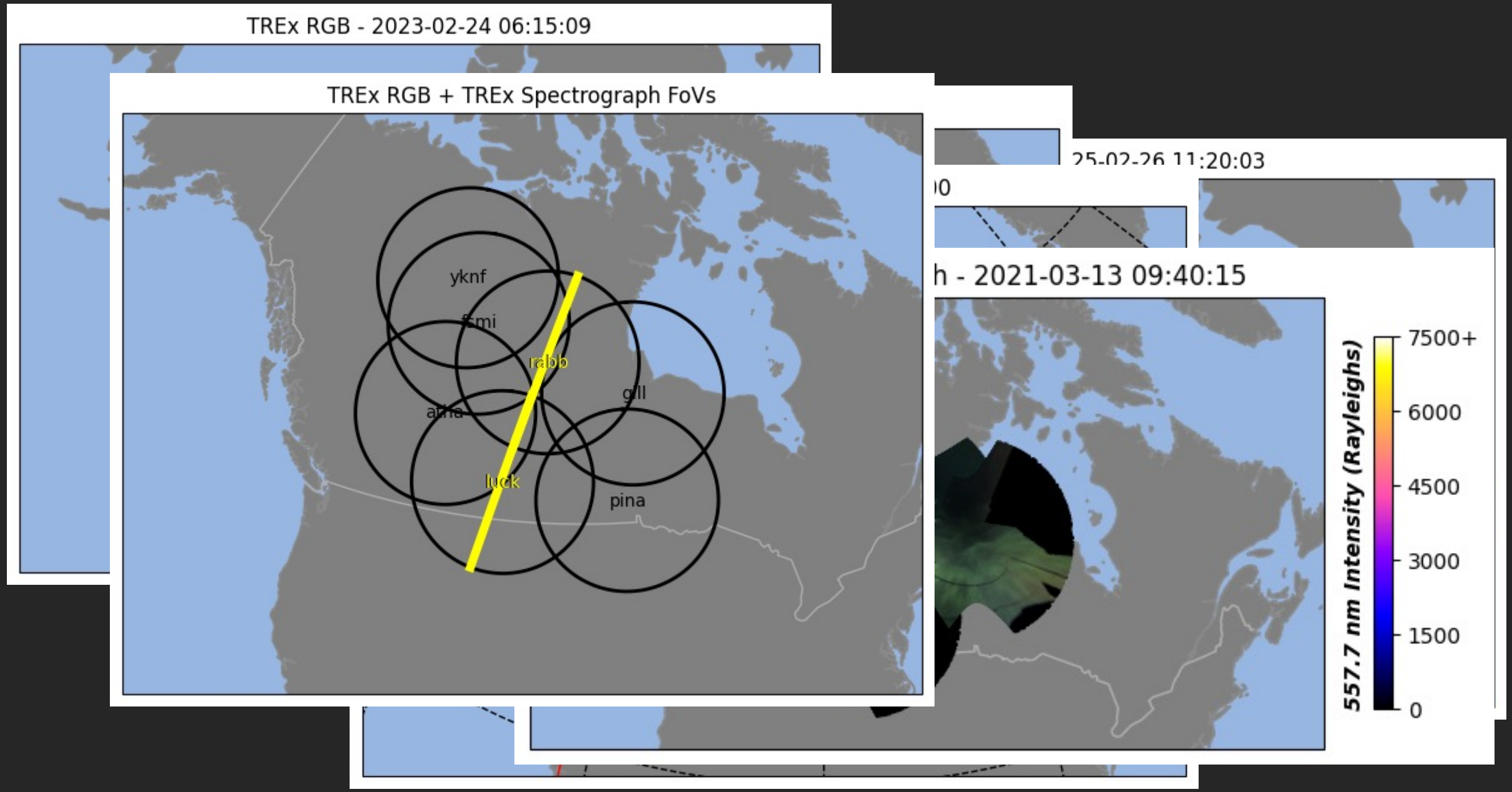
PyAuroraX – where it fits in

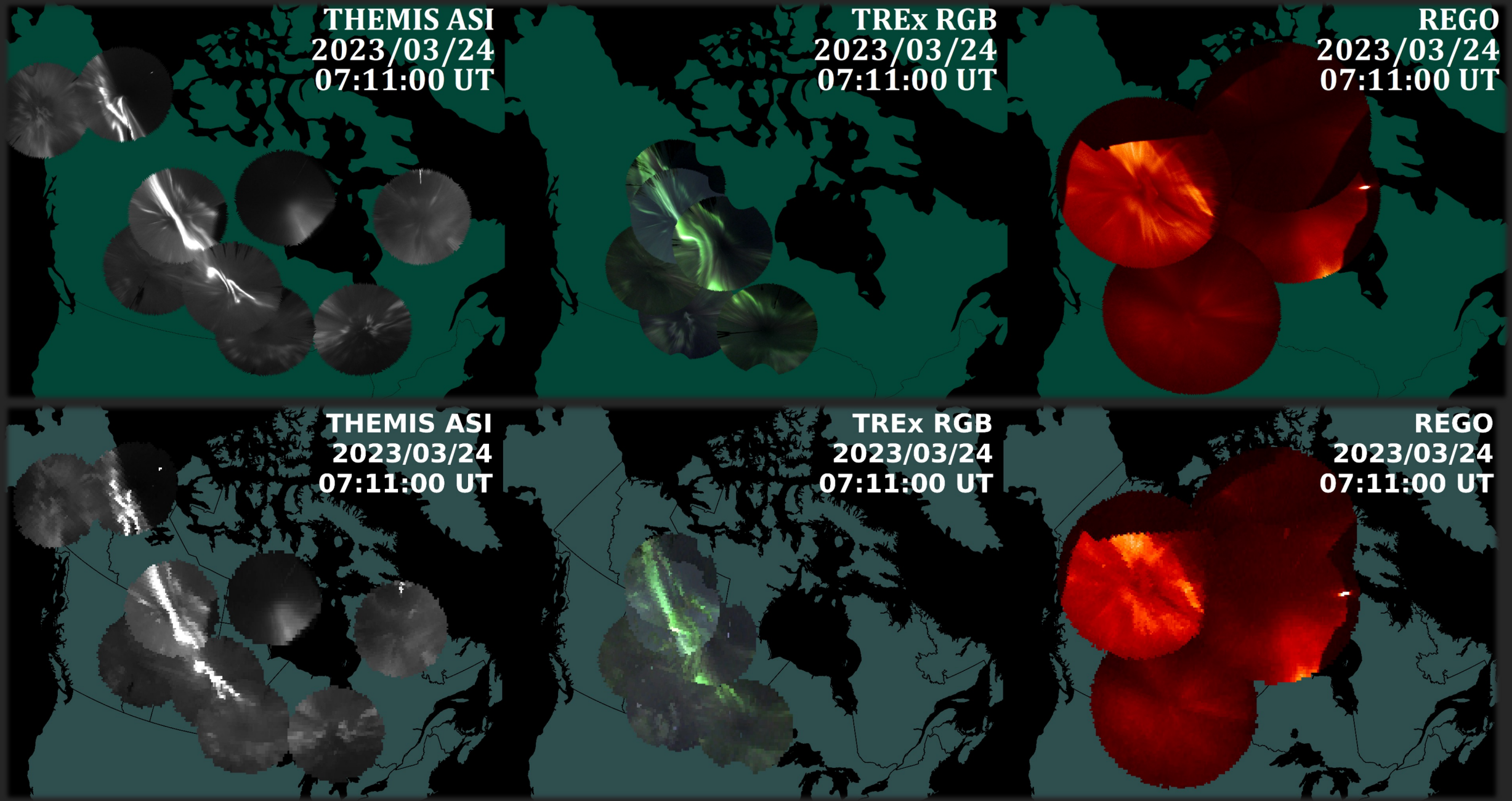
- A component of the AuroraX Data Platform
- Data access and analysis support for All-Sky Imager (ASI) data
  - THEMIS ASI
  - SMILE ASI (THEMIS full-colour replacement) **NEW**
  - TREx RGB
  - TREx NIR
  - TREx Blueline
  - TREx Spectrograph
  - REGO (redline imagers)
- AuroraX Data Platform includes:
  - Conjunction and ephemeris search engine, including ML-enhanced integrations
  - Data access and analysis support libraries (PyAuroraX, IDL-AuroraX)
  - Web visualizations and summary data browsing tools
- All libraries we provide are core components of our operations, allowing development and support to continue as long as the instruments collect data.

PyAuroraX – what can it do?

- Download and read ASI data (L0 raw, L1+ summary)
- Provides common analysis functions, meanwhile exposing the data to the users to enable complex analysis, and empower new processing techniques/ideas.
- Perform conjunction and ephemeris searches
- Filter searches using cloud and auroral type ML models
- Utilize the TREx Auroral Transport Model (ATM)


SMILE ASI - LUCK - 2025-01-01 UT09
Magnetic latitude
63.4
60.3
59.5
59.0
Bounded Area Preview
Magnetic latitude
Montage for 1-hour of TREx RGB data
TREx RGB within Geo Lat: [-94, -95, 55, 55.5]
Mean Counts [R,G,B]
140
120
100
80
60
40
20
03:00
03:10
03:20
03:30
03:40
03:50
Time (UTC)
03:40
03:41
03:50
03:51
03:52
03:53
03:54
03:55
03:56
03:57
03:58
03:59


TREx RGB - 2023-02-24 06:15:09
TREx RGB + TREx Spectrograph FoVs
yknf
fsmi
rabb
gill
atha
luck
pina
h - 2021-03-13 09:40:15
7500+
6000
4500
3000
1500
0
557.7 nm Intensity (Rayleighs)


THEMIS ASI
2023/03/24
07:11:00 UT
TREx RGB
2023/03/24
07:11:00 UT
REGO
2023/03/24
07:11:00 UT
THEMIS ASI
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REGO
2023/03/24
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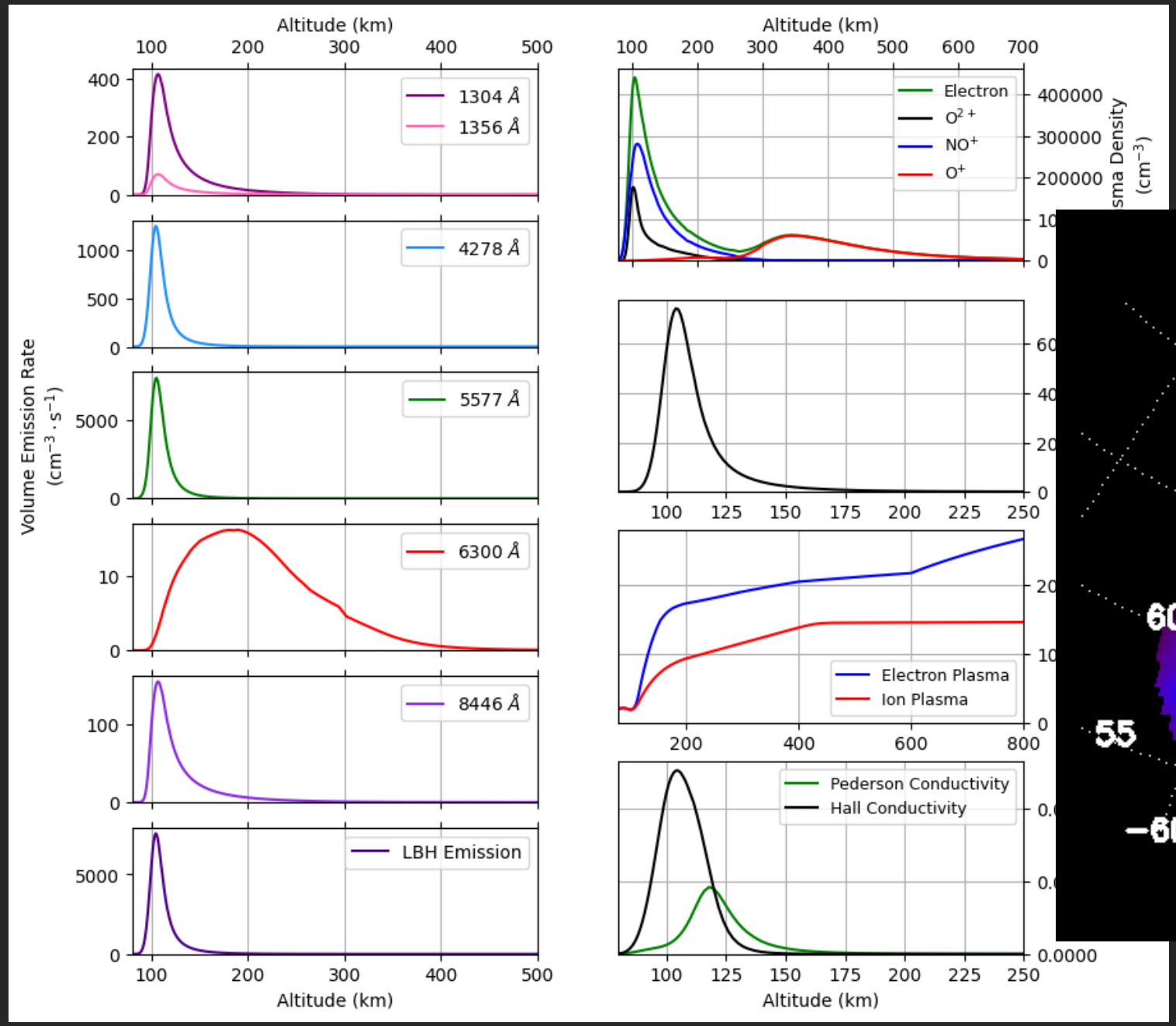
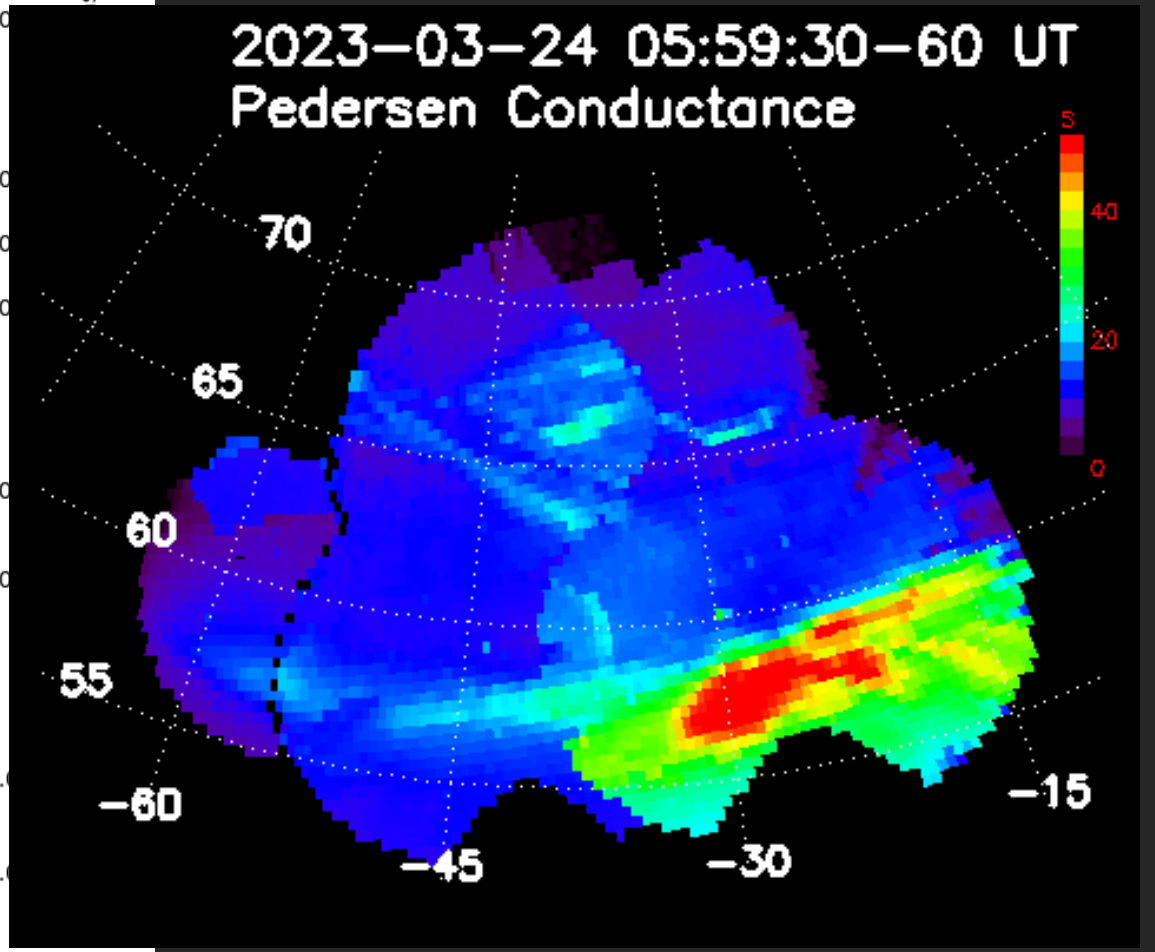
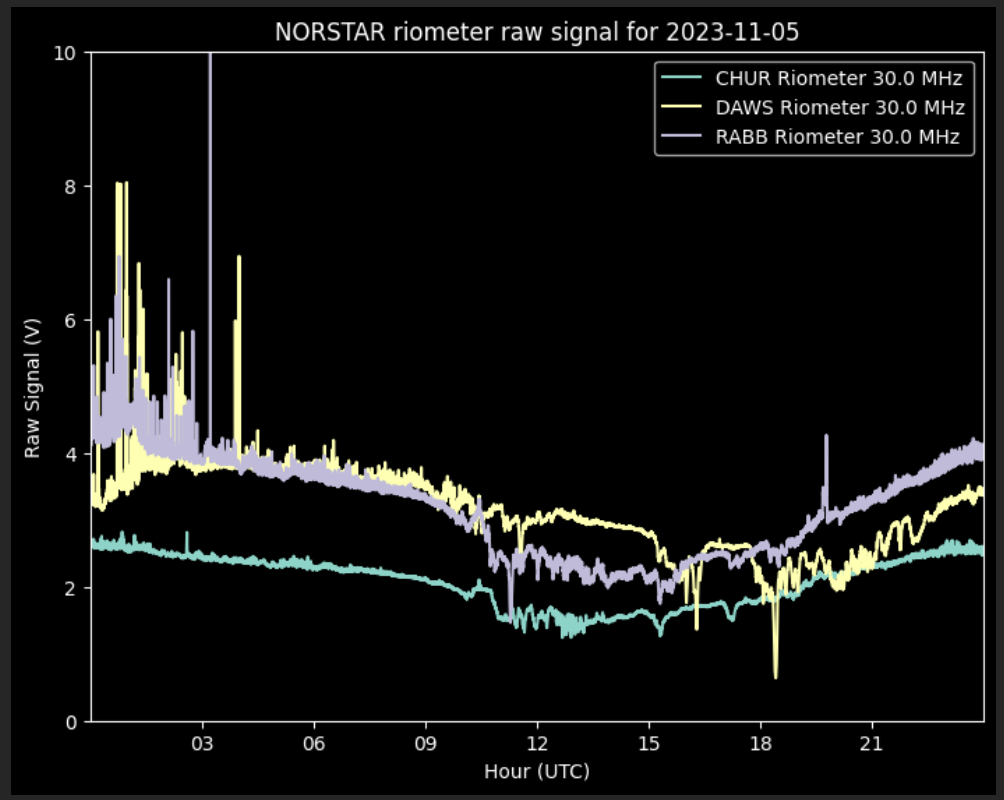

Altitude (km)
Volume Emission Rate
(cm⁻³ · s⁻¹)
1304 Å
1356 Å
4278 Å
5577 Å
6300 Å
8446 Å
LBH Emission
Electron
O²⁺
NO⁺
O⁺
Electron Plasma
Ion Plasma
Pederson Conductivity
Hall Conductivity

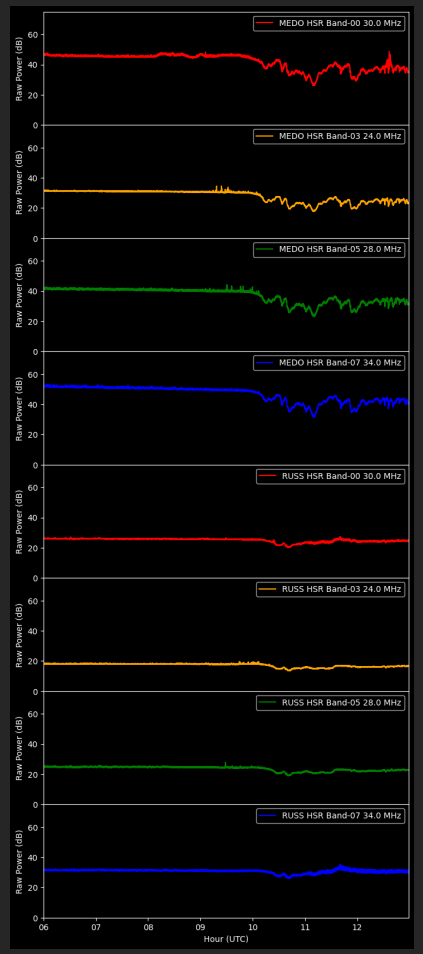
TREx ATM

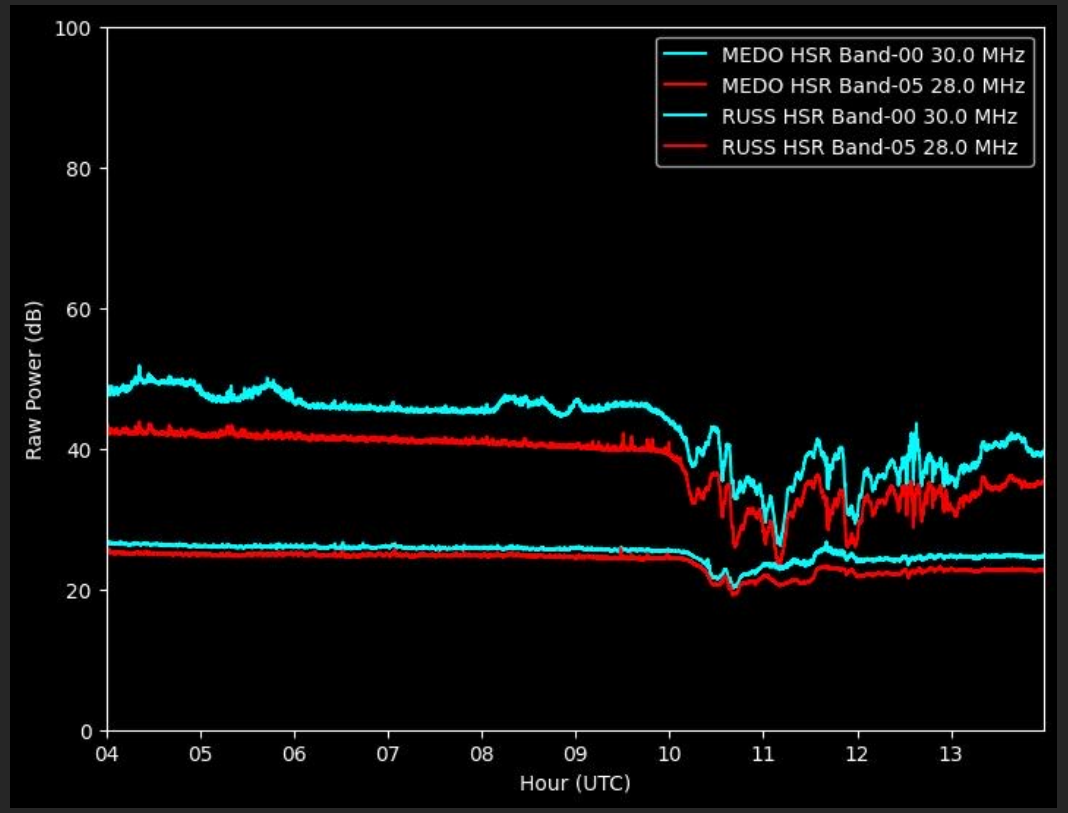

2023-03-24 05:59:30-60 UT
Pedersen Conductance
70
65
60
55
-60
-45
-30
-15
S
40
20
0

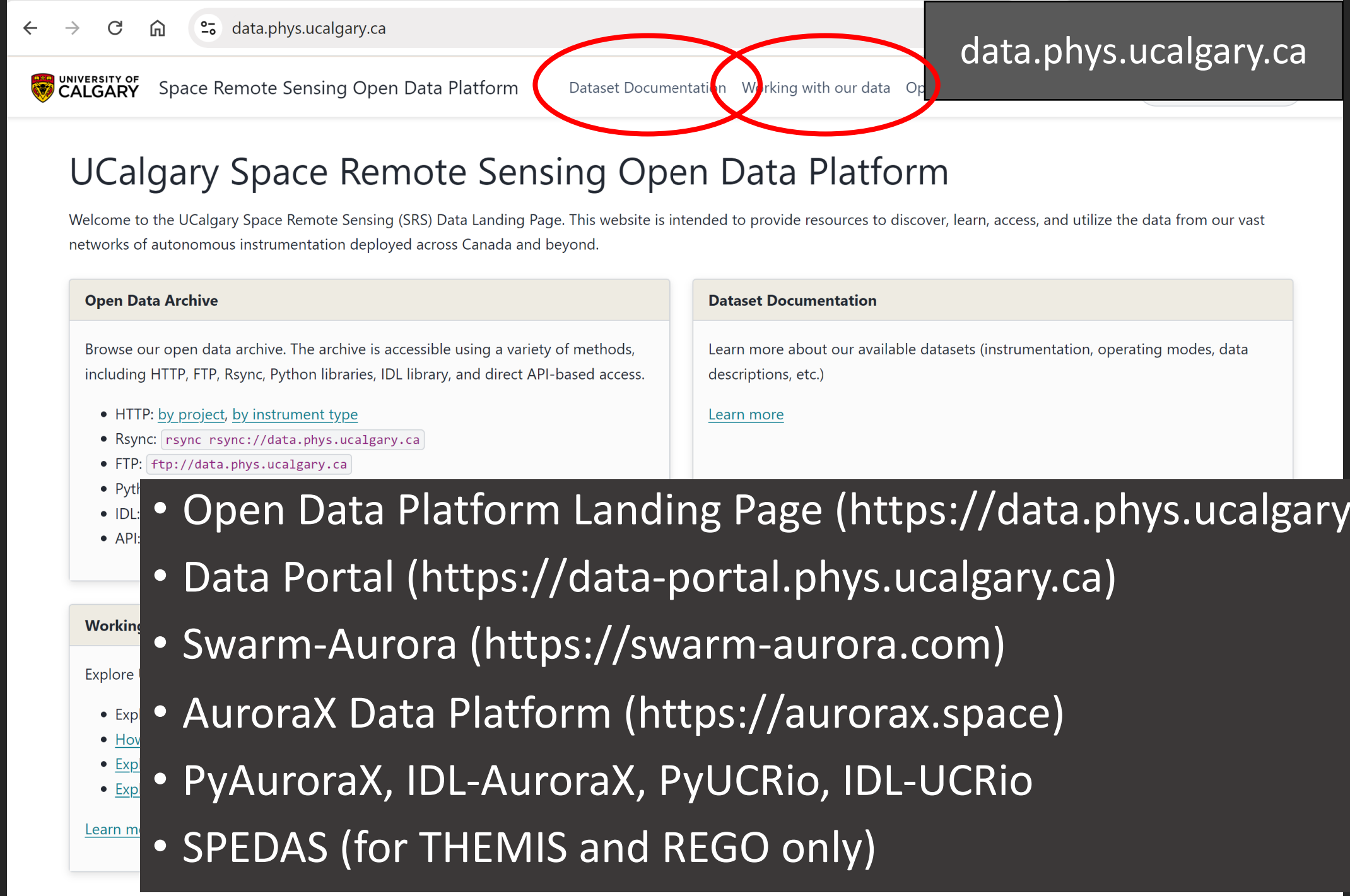
PyUCRio
IDL-UCRio

Python and IDL libraries for working with the UCalgary Riometer data (NORSTAR Riometers, SWAN Hyper-Spectral Riometers)







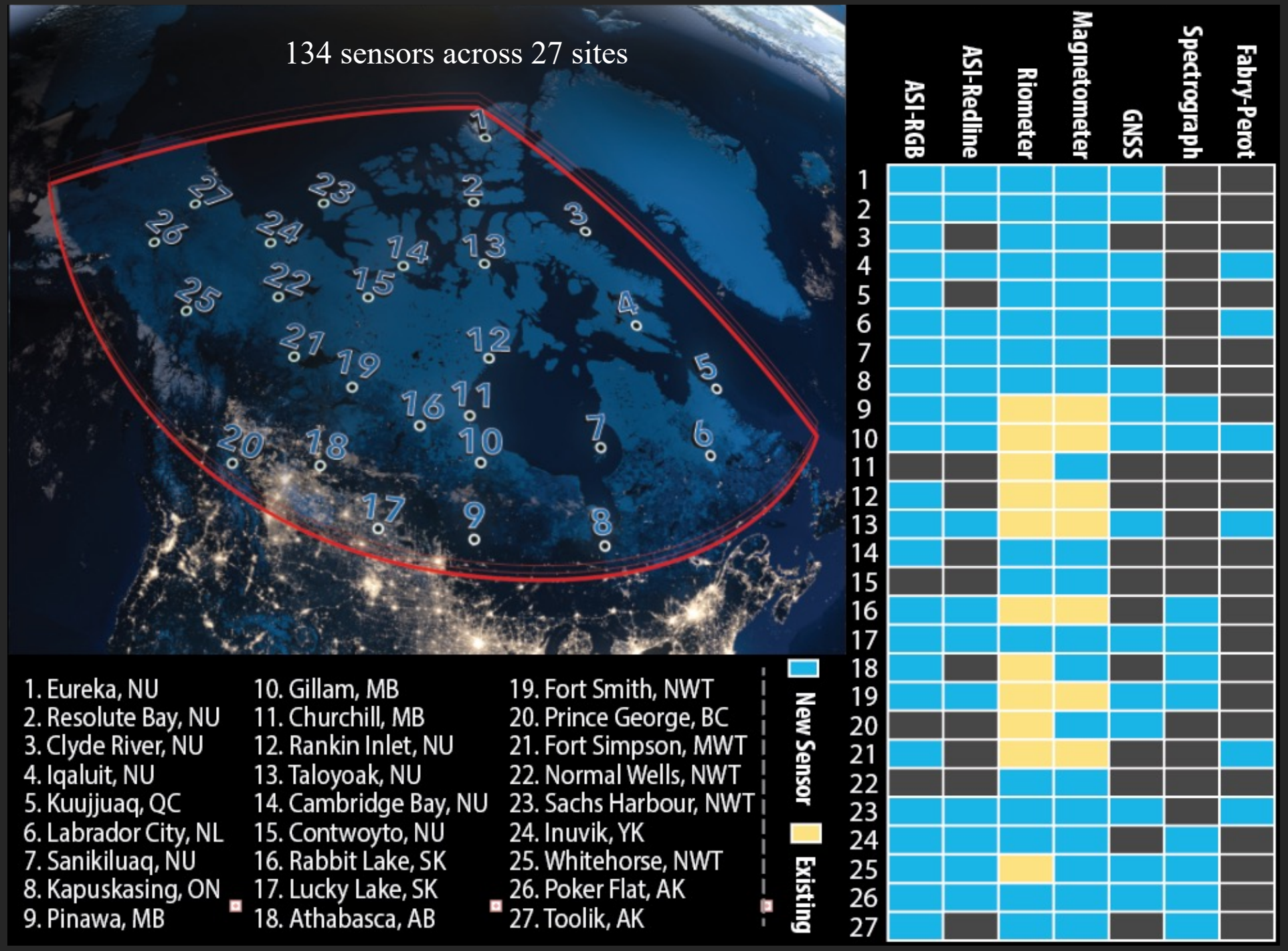

data.phys.ucalgary.ca
UNIVERSITY OF CALGARY
Space Remote Sensing Open Data Platform
Dataset Documentation
Working with our data
Op
data.phys.ucalgary.ca
UCalgary Space Remote Sensing Open Data Platform
Welcome to the UCalgary Space Remote Sensing (SRS) Data Landing Page. This website is intended to provide resources to discover, learn, access, and utilize the data from our vast networks of autonomous instrumentation deployed across Canada and beyond.
Open Data Archive
Browse our open data archive. The archive is accessible using a variety of methods, including HTTP, FTP, Rsync, Python libraries, IDL library, and direct API-based access.
HTTP: by project, by instrument type
Rsync: rsync rsync://data.phys.ucalgary.ca
FTP: ftp://data.phys.ucalgary.ca
Dataset Documentation
Learn more about our available datasets (instrumentation, operating modes, data descriptions, etc.)
Learn more
Open Data Platform Landing Page (https://data.phys.ucalgary.ca)
Data Portal (https://data-portal.phys.ucalgary.ca)
Swarm-Aurora (https://swarm-aurora.com)
AuroraX Data Platform (https://aurorax.space)
PyAuroraX, IDL-AuroraX, PyUCRio, IDL-UCRio
SPEDAS (for THEMIS and REGO only)

GDC-Ground (Canada)

2022 Canada Foundation for Innovation Proposal

Spanswick, Donovan, Skone and Mann

23 RGB ASI
8 SPECT
16 RED ASI
27 MAG (fluxgate)
27 GNSS (total)
27 RIO (hyperspectral)
6 FPI



AuroraX Event Explorer https://aurorax.space