

# Overview of Japanese EMCCD ASIs in Scandinavia

Keisuke Hosokawa @ Univ. of Electro-Communications

on behalf of

PsA research project      and      PWING project



# ASI locations

Since Sep 2017

- **Tromsø:**

High-speed ASI (100 Hz)

Monochromatic ASI (10 Hz) x 2  
(427.8, 844.6 nm)

20 Hz Fluxgate magnetometer

5 channel photometer

- **Sodankylä:**

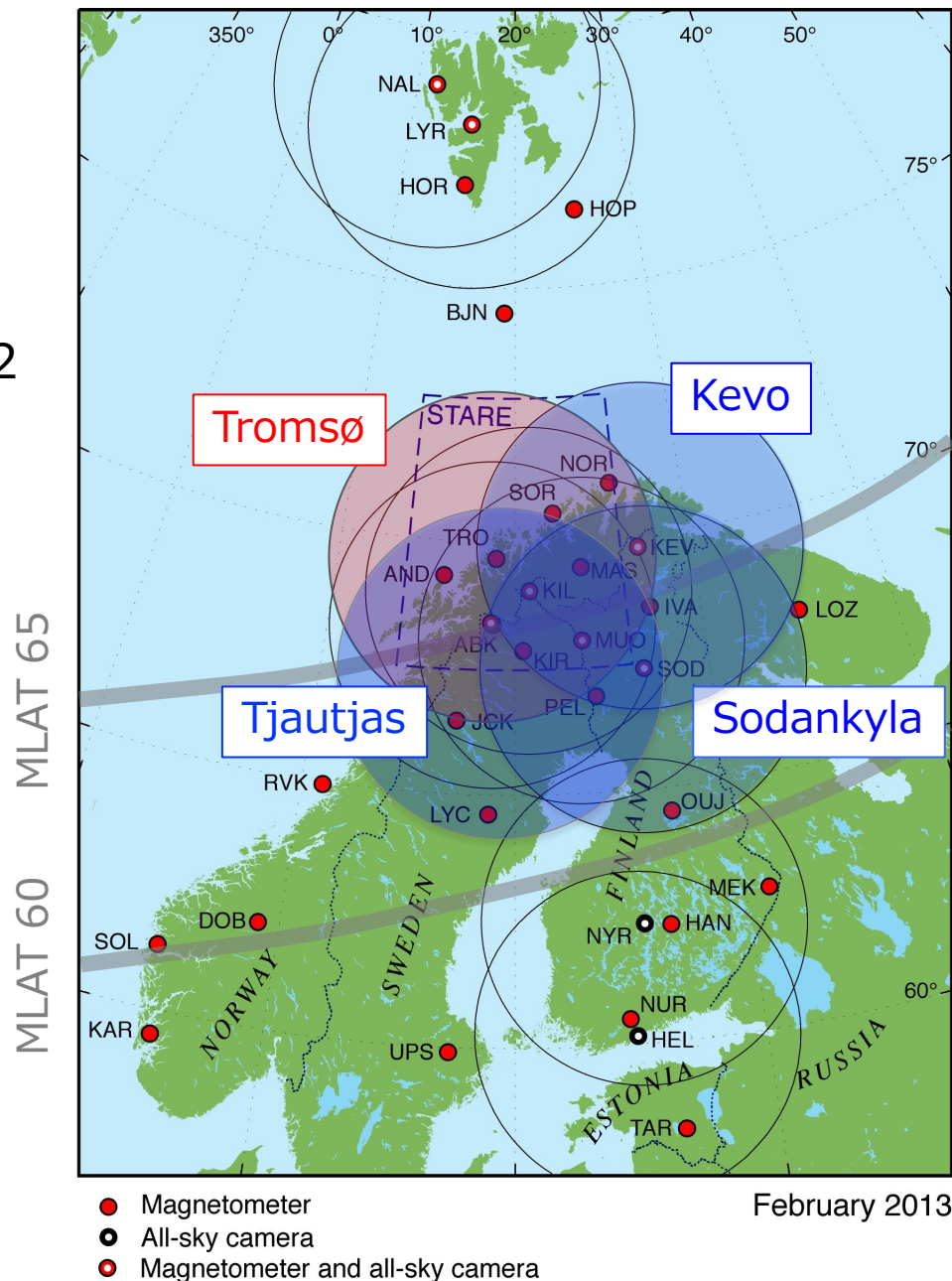
High-speed ASI (100 Hz)

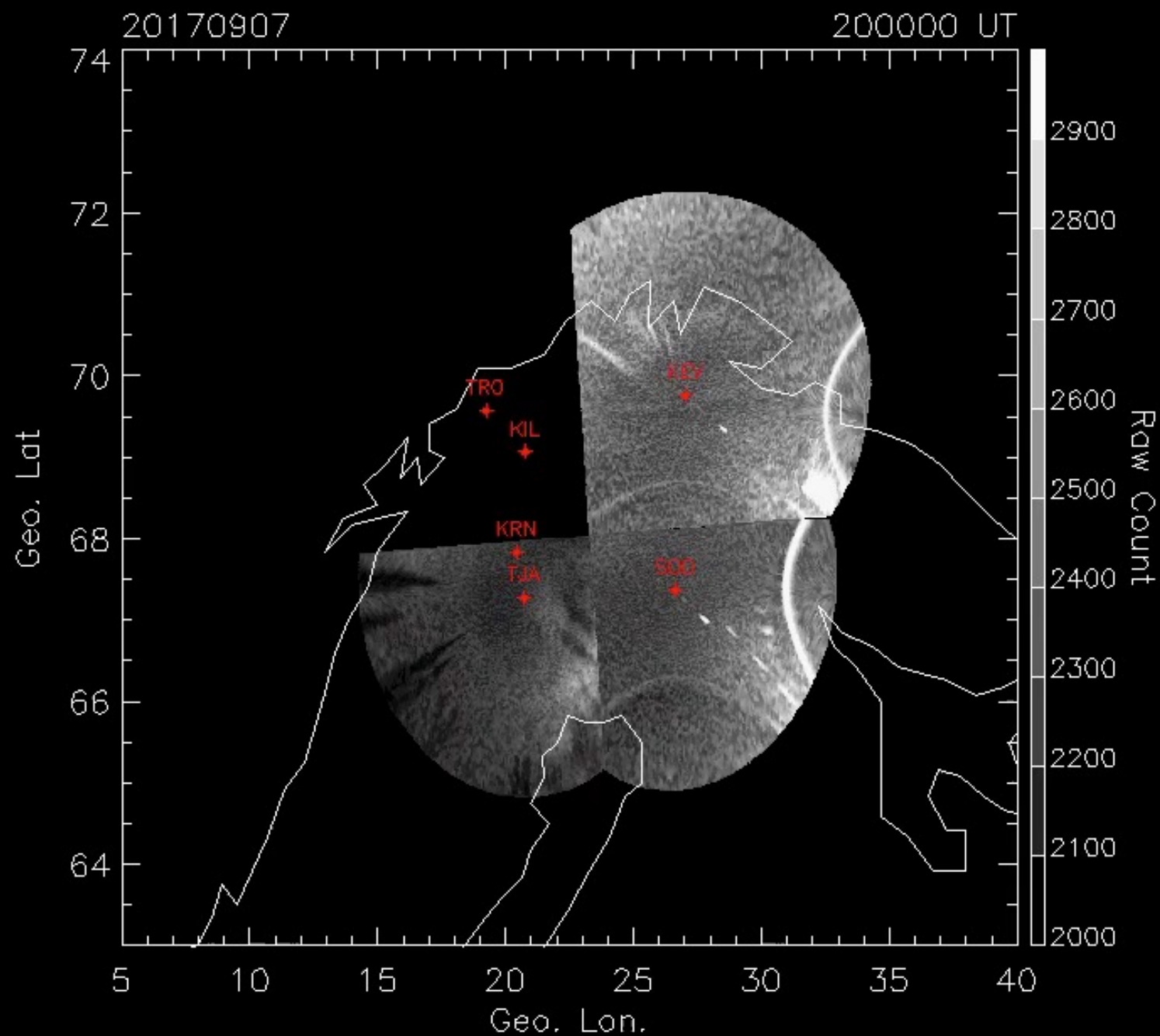
- **Tjautjas:**

High-speed ASI (100 Hz)

- **Kevo:**

High-speed ASI (100 Hz)





# A few things about the data

- Quick Look data browser:

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/bin/psa.cgi>

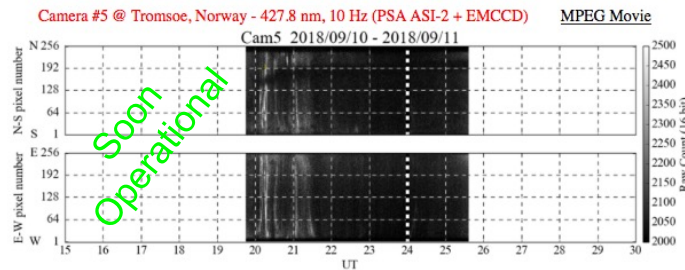
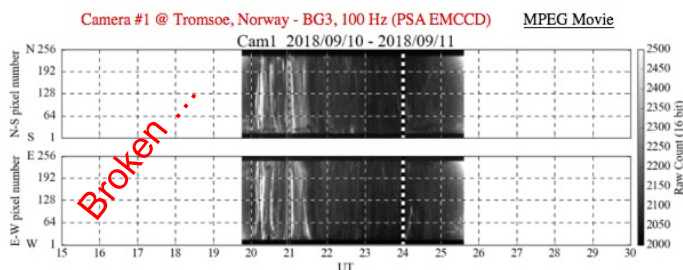
- Digital data in raw format:

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/pub/raw/>

IDL code for reading/plotting the data is provided

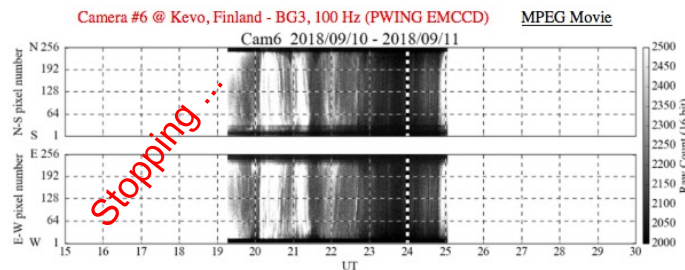
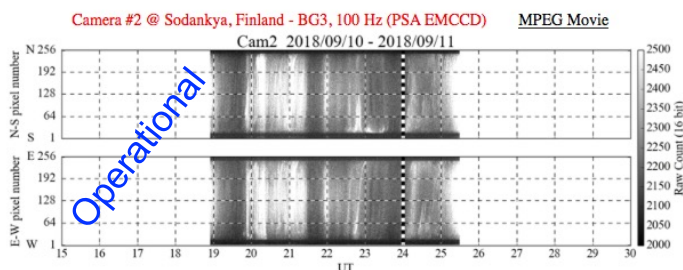
<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/bin/psa.cgi>

Tromsø  
100 Hz



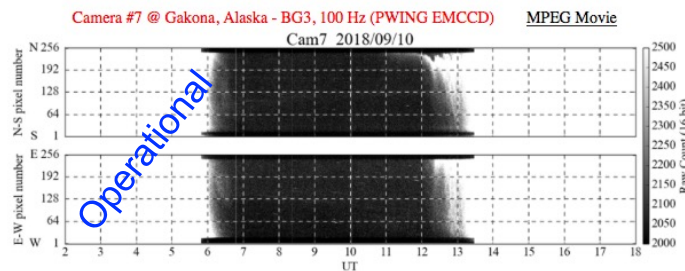
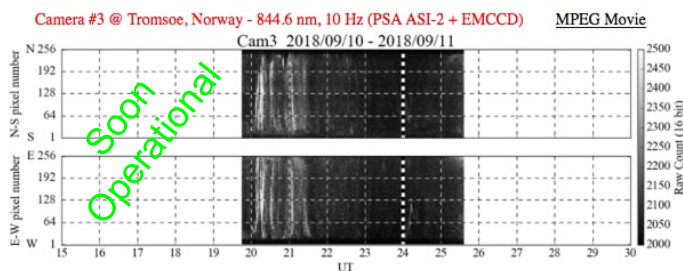
Tromsø  
427.8 nm

Sodankylä  
100 Hz



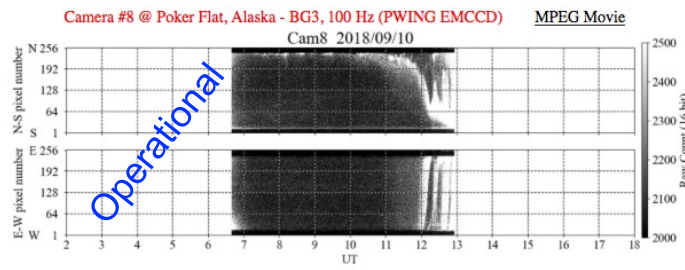
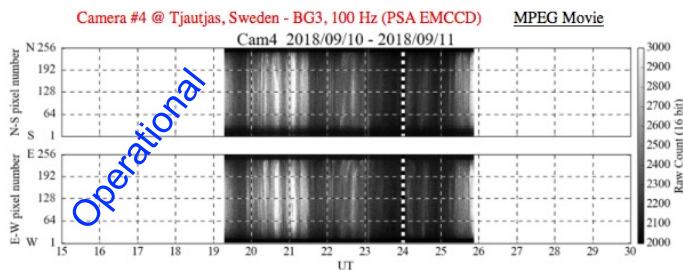
Kevo  
100 Hz

Tromsø  
844.6 nm



Gakona  
100 Hz

Tjautjas  
100 Hz



Poker Flat  
100 Hz

# Download of digital data

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/pub/raw/>

100 Hz EMCCD .raw data

PoC: [psa-project-ope@isee.nagoya-u.ac.jp](mailto:psa-project-ope@isee.nagoya-u.ac.jp)

## Index of /psa-gnd/pub/raw

| <u>Name</u>                                                                                                                 | <u>Last modified</u> | <u>Size</u> | <u>Description</u> |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|--------------------|
|  <a href="#">Parent Directory</a>           |                      | -           |                    |
|  <a href="#">cam1/</a>                      | 28-Jan-2020 19:06    | -           |                    |
|  <a href="#">cam2/</a>                      | 28-Jan-2020 19:18    | -           |                    |
|  <a href="#">cam4/</a>                      | 28-Jan-2020 19:30    | -           |                    |
|  <a href="#">cam6/</a>                      | 28-Jan-2020 19:35    | -           |                    |
|  <a href="#">cam7/</a>                     | 27-Apr-2020 16:41    | -           |                    |
|  <a href="#">cam8/</a>                    | 27-Apr-2020 16:43    | -           |                    |
|  <a href="#">operation_note.txt</a>       | 28-Aug-2020 19:41    | 540         |                    |
|  <a href="#">quickstart_wo_spedas.pdf</a> | 15-Aug-2017 14:15    | 114K        |                    |
|  <a href="#">quickstart_wt_spedas.pdf</a> | 28-Feb-2019 22:06    | 113K        |                    |
|  <a href="#">soft.tgz</a>                 | 28-Feb-2019 22:09    | 1.1G        |                    |
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# Summary

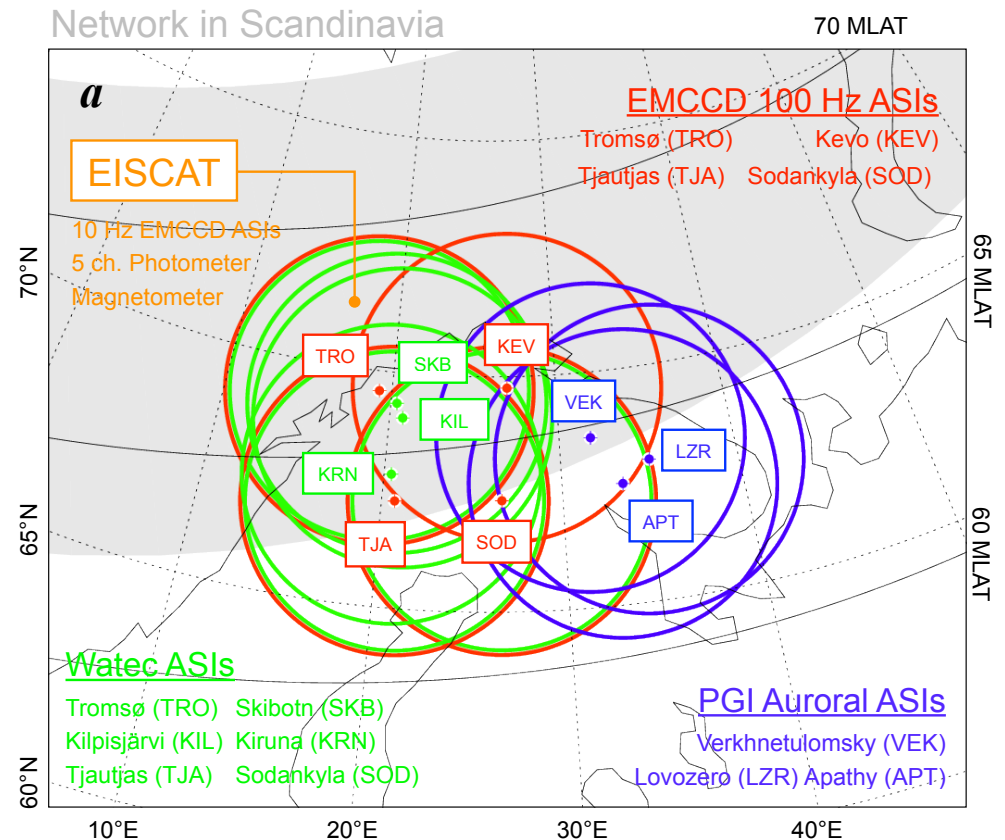
100 Hz EMCCD ASIs:

4 stations **TRO, SOD, TJA, KEV**

Waterc ASIs:

6 stations

**TRO, KRN, TJA, SOD, KIL, SKB**



Several new grant proposals have been submitted to the Japanese funding agency, which aim at continuing the current EMCCD observations and deploying additional narrower-FOV cameras in support of E3D

# A few things about the data

- Quick Look data browser:

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/bin/psa.cgi>

- Digital data in raw format:

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/pub/raw/>

IDL code for reading/plotting the data is provided

- Conjunction Interval Finder (CIF):

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/bin/cif.cgi>

# Conjunction Interval Finder – updated until 20211231

<https://ergsc.isee.nagoya-u.ac.jp/psa-gnd/bin/cif.cgi>

## ERG-GBO Conjunction Interval Finder

2020 12 05 Plot Prev Next

UPDATED: Thu Sep 17 02:25:47 2020 UTC

ORBIT DATA: erg\_orb\_mpre\_J2\_20201205\_v02.cdf

Auroral Region

Subauroral Region

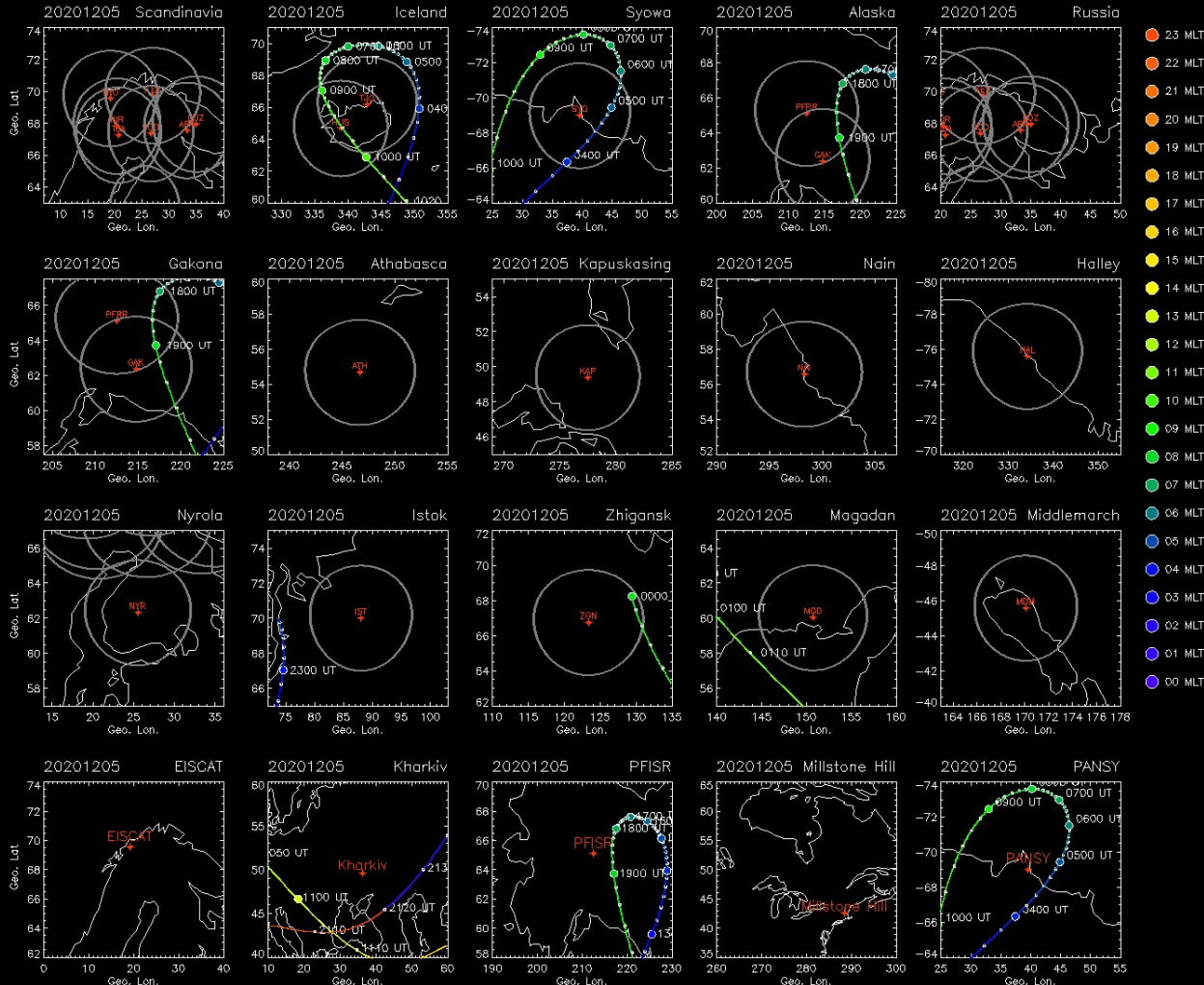
Subauroral Region

IS Radar Sites

North America, Antarctica

Euro, Russia, New Zealand

Euro, North America, Antarctica



spre (- 20201005)  
mpre (- 20210405)  
lpre (20210406 -)

Scandinavia  
Iceland  
Syowa  
Alaska  
Russia  
Gakona  
Athabasca  
Kapuskasing  
Nain  
Halley  
Nyrola  
Istok  
Zhigansk  
Magadan  
Middlemarch  
EISCAT  
Kharkiv  
PFISR  
Millstone Hill  
PANSY (Syowa)

# Phase 1

2016 Sep to 2017 Jan

- **Tromsø:**

Glat 69.66, Mlat 66.64

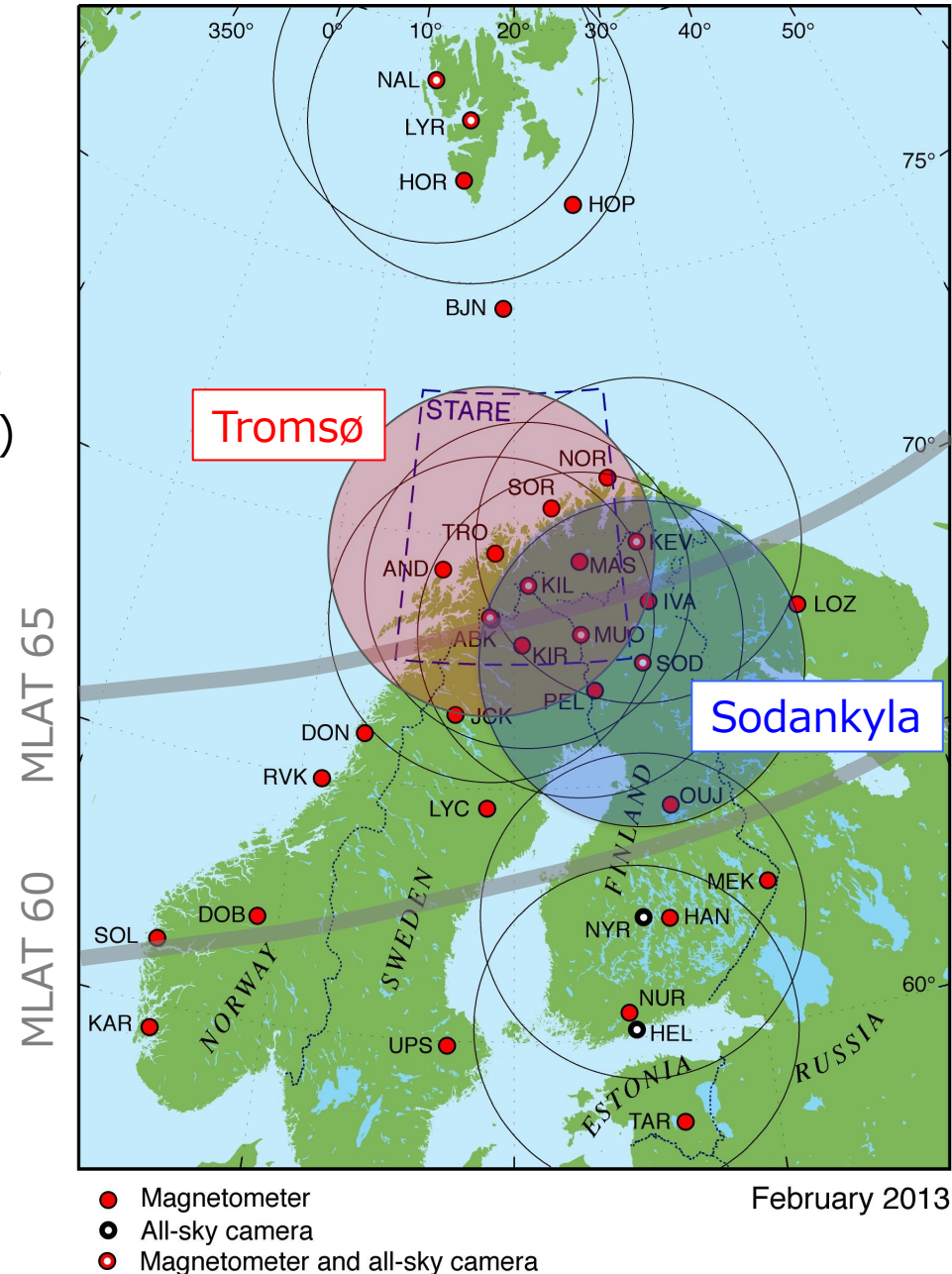
Monochromatic ASI (10 Hz) x 4  
(427.8, ~670, 777.4, 844.6 nm)

20 Hz Fluxgate magnetometer

- **Sodankylä:**

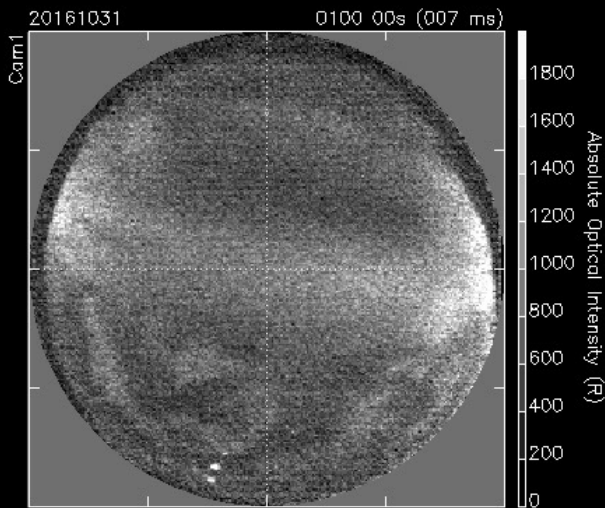
Glat 67.37, Mlat 63.92

High-speed ASI (100 Hz) x 1

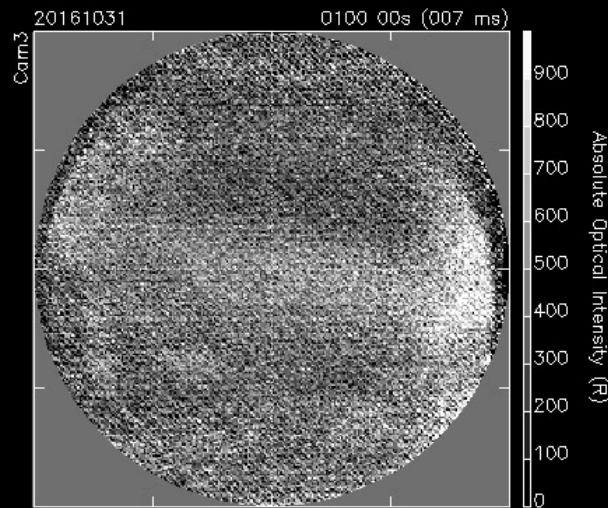


# Multi-wavelength Measurement

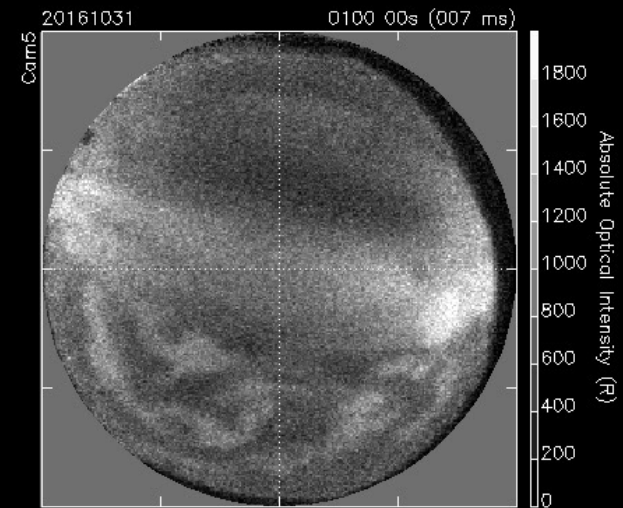
777.4 nm



844.6 nm



427.8 nm



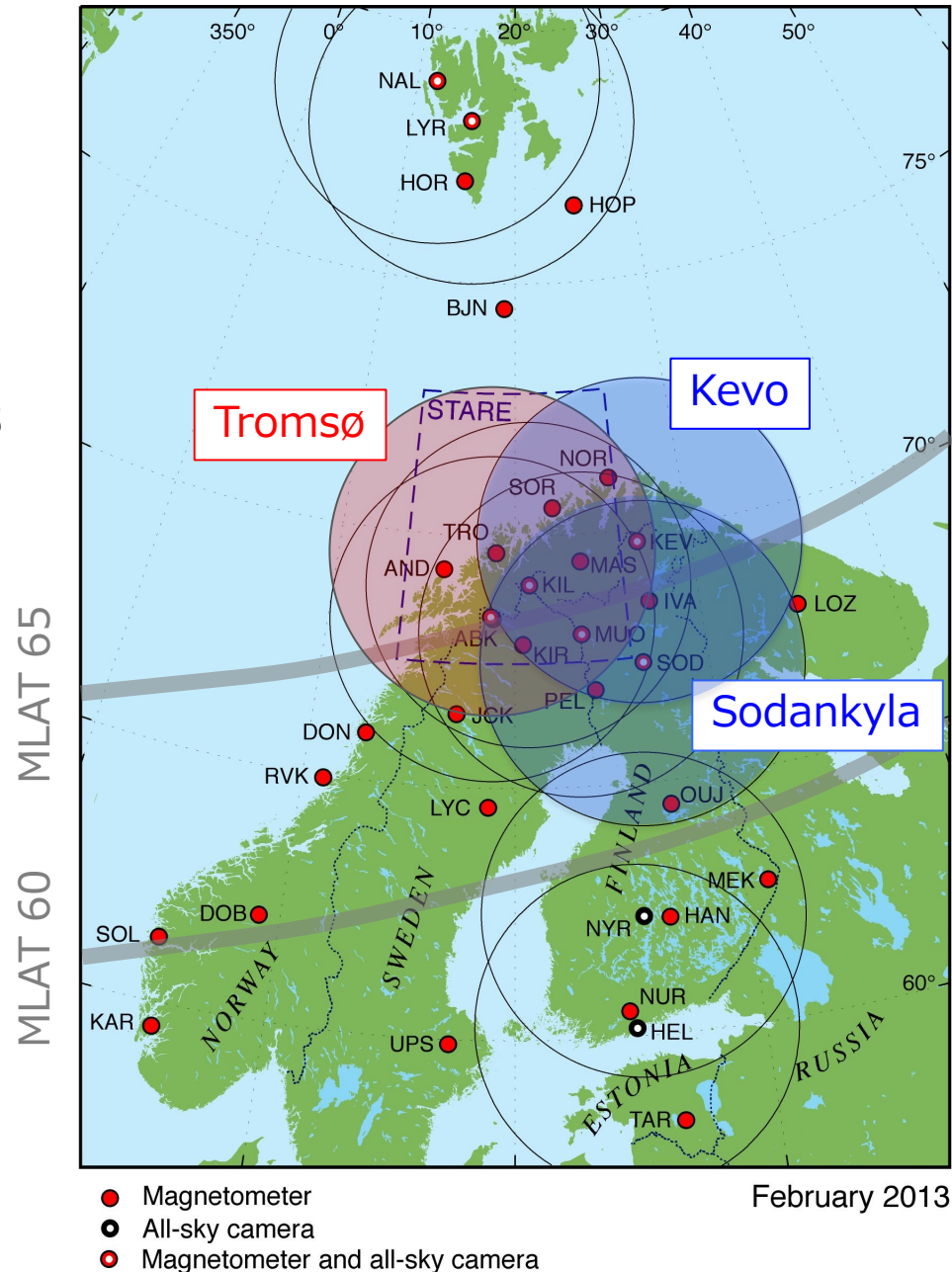
Low energy  
electrons

High energy  
electrons

# Phase 2

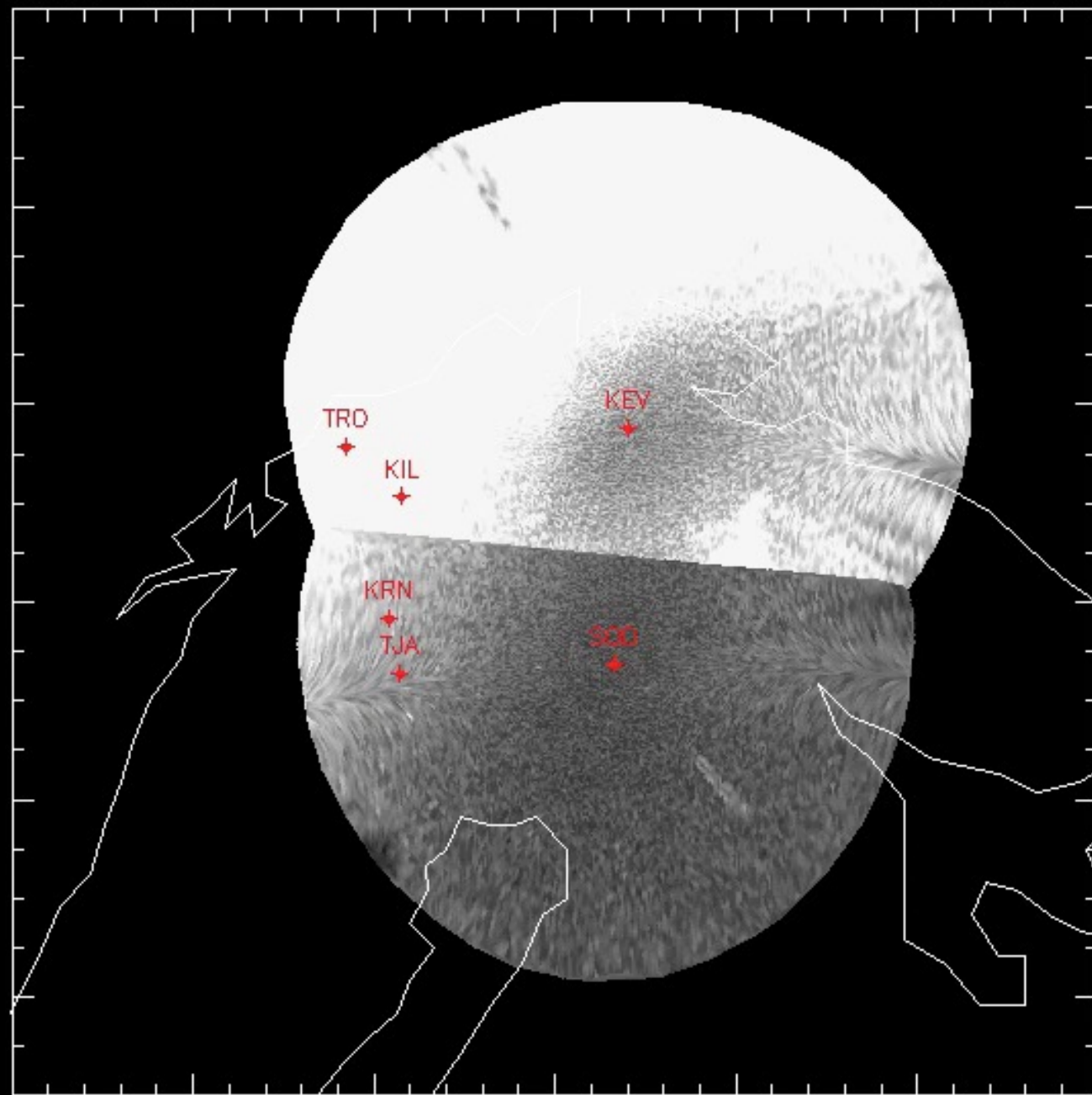
2017 Feb to Apr

- **Tromsø:**  
Glat 69.66, Mlat 66.64  
High-speed ASI (100 Hz)  
Monochromatic ASI (10 Hz) x 3  
(427.8, 670, 844.6 nm)  
20 Hz Fluxgate magnetometer  
5 channel photometer
- **Sodankylä:**  
Glat 67.37, Mlat 63.92  
High-speed ASI (100 Hz)
- **Kevo:**  
Glat 69.76, Mlat 66.32  
High-speed ASI (100 Hz)



20170328

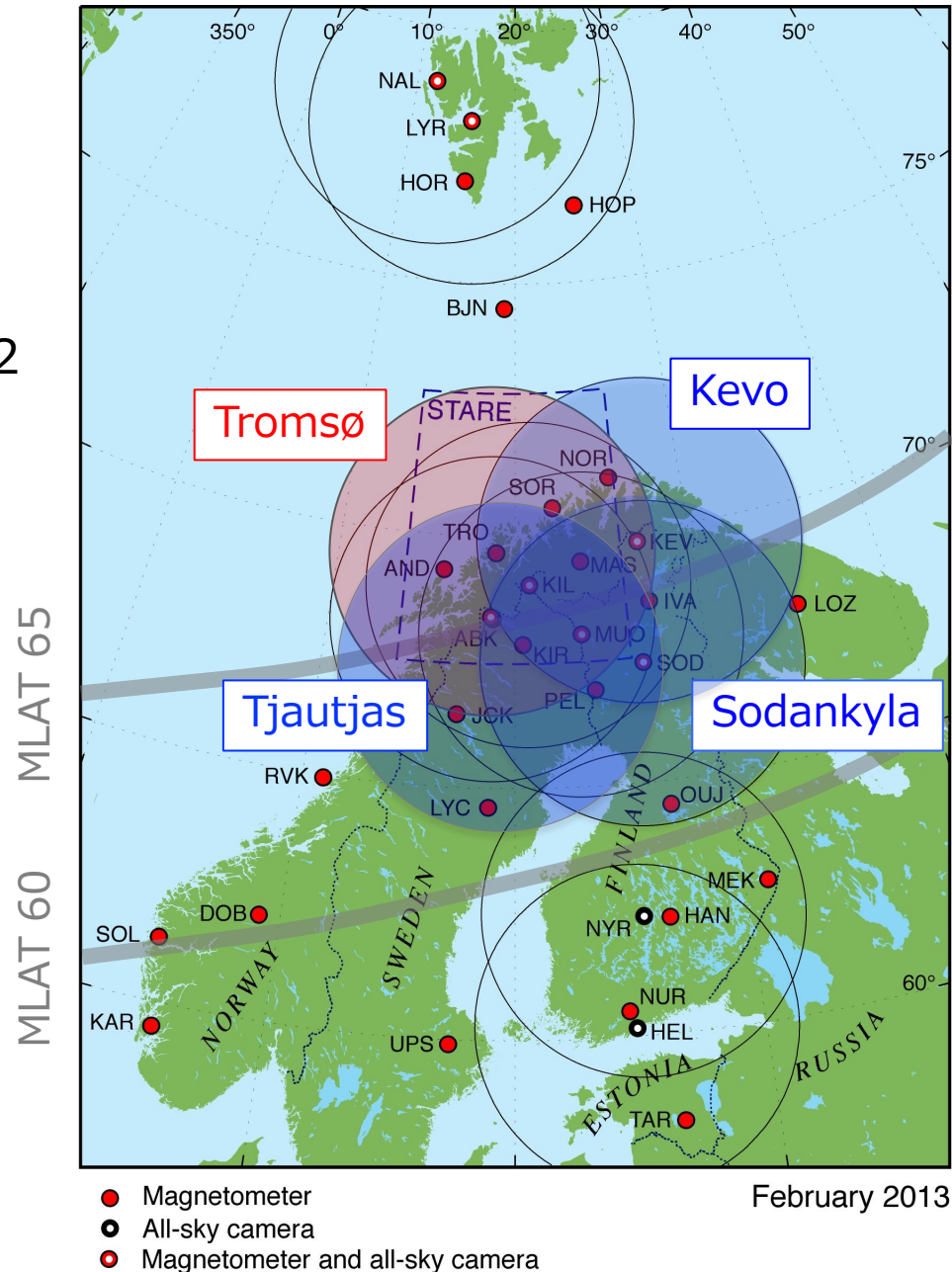
190230 UT



# Phase 3

Since Sep 2017

- **Tromsø:**  
High-speed ASI (100 Hz)  
Monochromatic ASI (10 Hz) x 2  
(427.8, 844.6 nm)  
20 Hz Fluxgate magnetometer  
5 channel photometer
- **Sodankylä:**  
High-speed ASI (100 Hz)
- **Tjautjas:**  
High-speed ASI (100 Hz)
- **Kevo:**  
High-speed ASI (100 Hz)



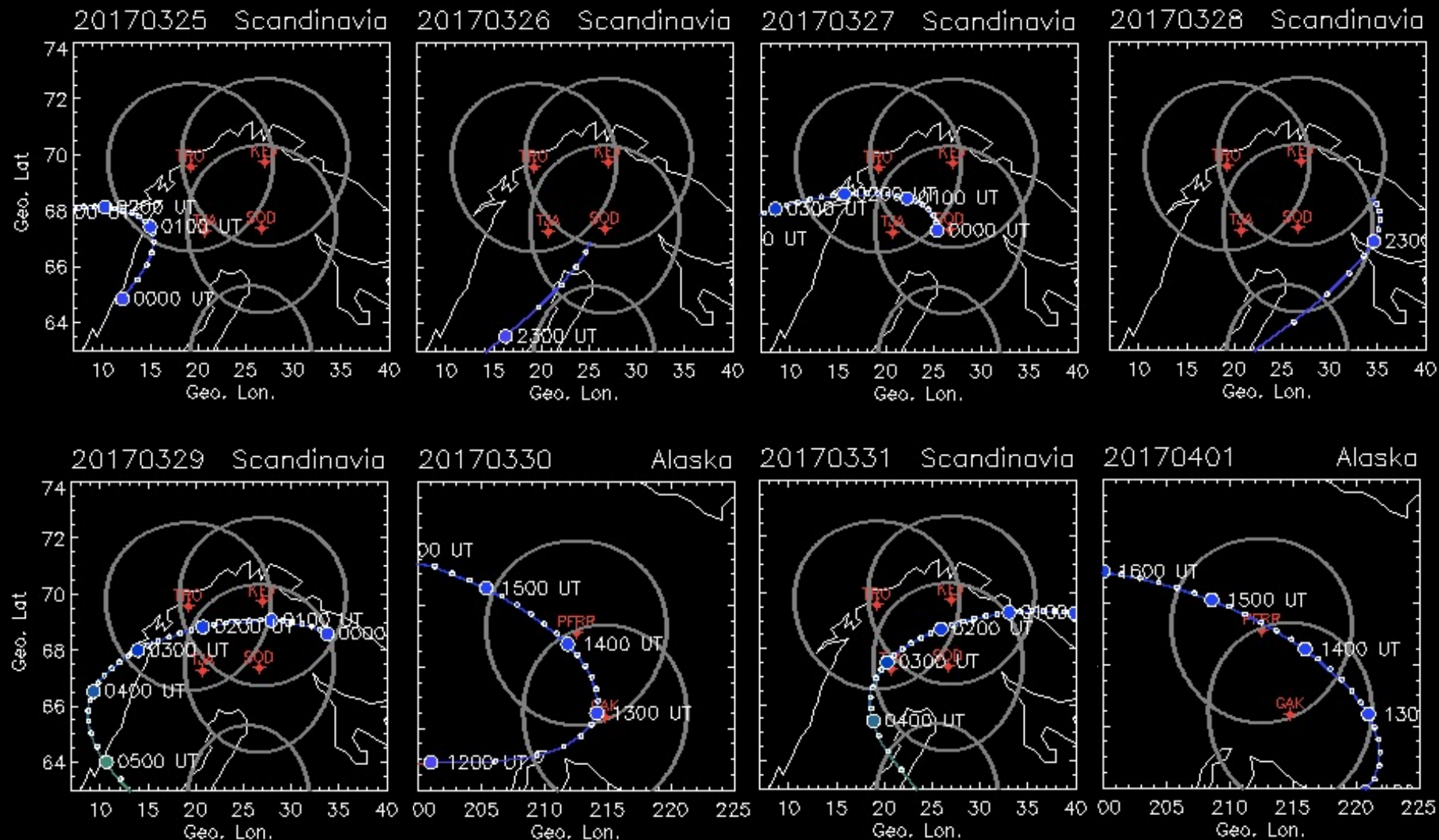
# + Watec cameras @ Kiruna + Tjautjas + Sodankyla + Tromsø

|                                                       | 427.8 nm                                                                           | N21PG<br>~670 nm | 777.4 nm | 844.6 nm | Photo<br>meter<br>(FA) | High-<br>speed<br>ASI | Magneto<br>meter |
|-------------------------------------------------------|------------------------------------------------------------------------------------|------------------|----------|----------|------------------------|-----------------------|------------------|
| <b>Tromsø</b><br>from Sep 2016<br>to Jan 26, 2017     | 10 Hz                                                                              |                  | 10 Hz    | 10 Hz    |                        |                       | 20 Hz            |
| <b>Tromsø</b><br>from Jan 26, 2017 to<br>Apr 15, 2017 | 10 Hz                                                                              | 10 Hz            |          | 10 Hz    | 20 Hz                  | 100 Hz                | 20 Hz            |
| <b>Tromsø</b><br>Since Sep 2, 2017                    | 10 Hz                                                                              |                  |          | 10 Hz    | 400 Hz                 | 100 Hz                | 20 Hz            |
| <b>Sodankylä</b><br>Since Sep 2016                    | <div>Multi-wavelength measurement<br/>→ Estimate the energy of PsA electrons</div> |                  |          |          |                        | 100 Hz                |                  |
| <b>Kevo</b><br>Since Jan 29, 2017                     |                                                                                    |                  |          |          |                        | 100 Hz                |                  |
| <b>Tjautjas</b><br>Since Sep 6, 2017                  |                                                                                    |                  |          |          |                        | 100 Hz                |                  |
| <b>Gakona</b><br>Since Mar 4, 2017                    |                                                                                    |                  |          |          |                        | 100 Hz                |                  |
| <b>Poker Flat</b><br>Since Aug 30, 2018               |                                                                                    |                  |          |          |                        | 100 Hz                |                  |

Multi-point high-speed observation  
→ Spatiotemporal variation of PsA

Spare Slides

# List of Good Conjunctions

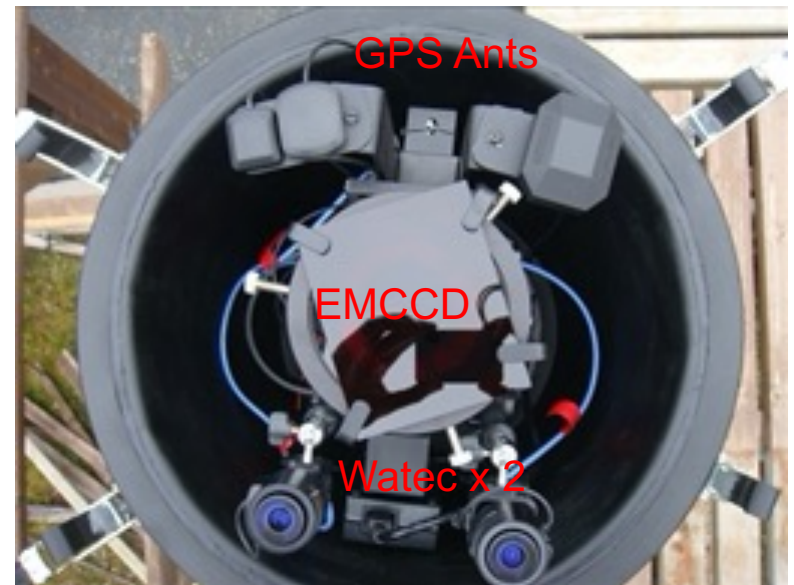
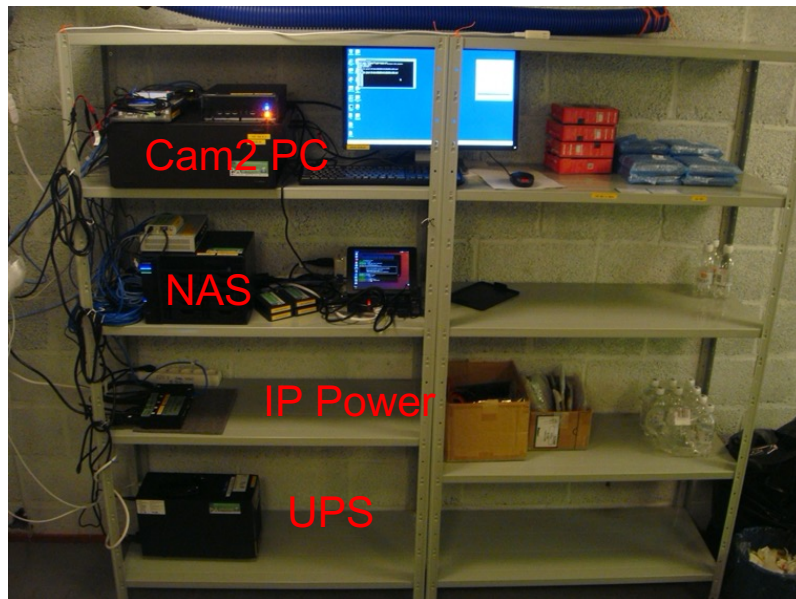


# Cam2 – Sodankylä (Pittovaara)

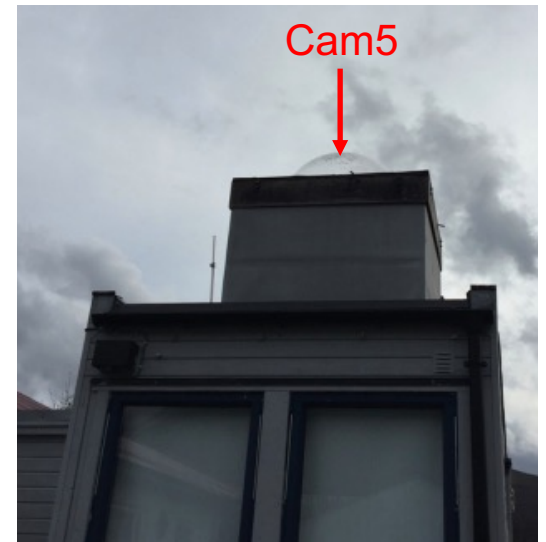
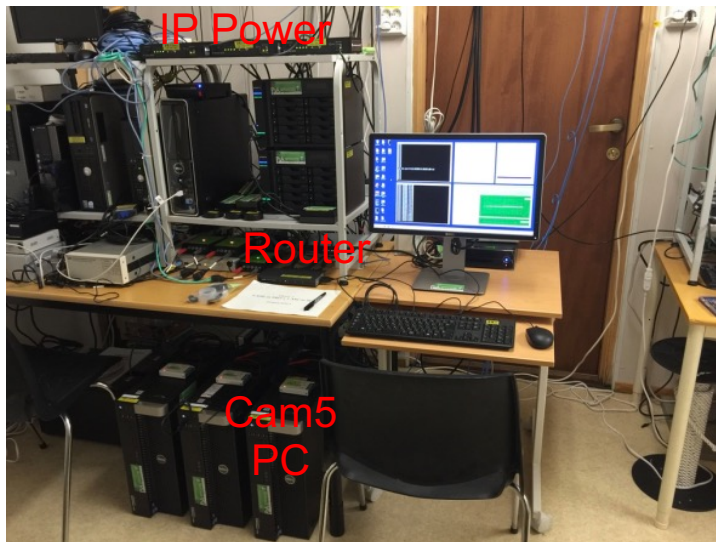
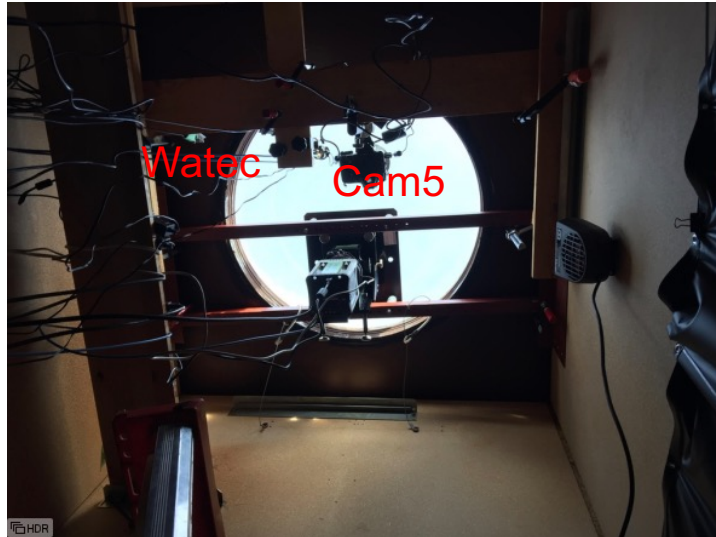
Optical Dome



# Cam2 – Sodankylä (Pittovaara)

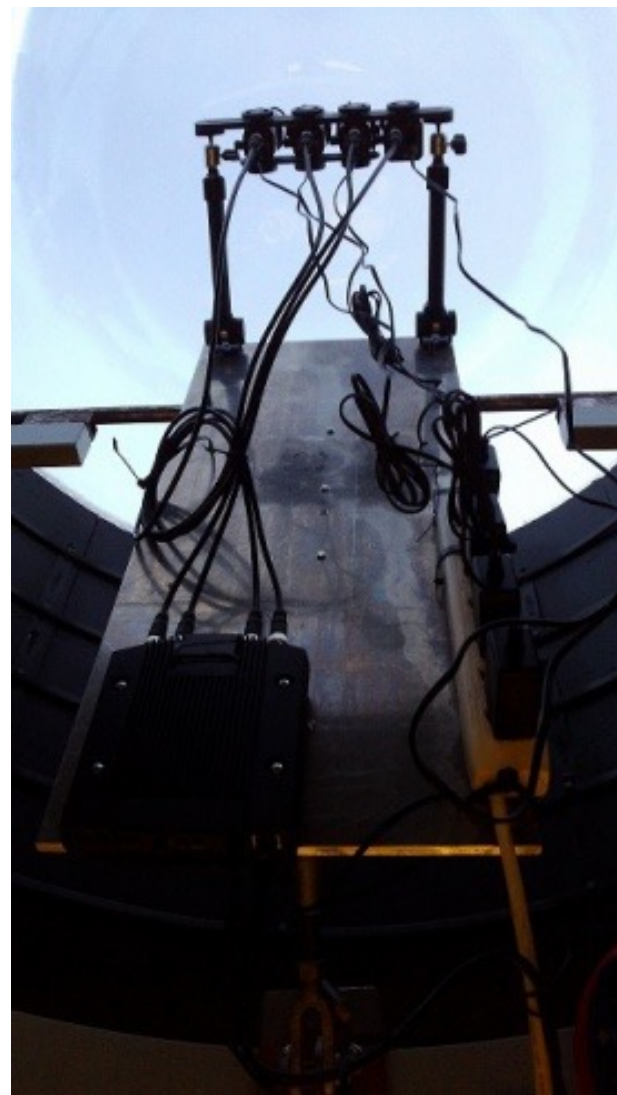


# Cam1,3,5 – EISCAT Tromsø

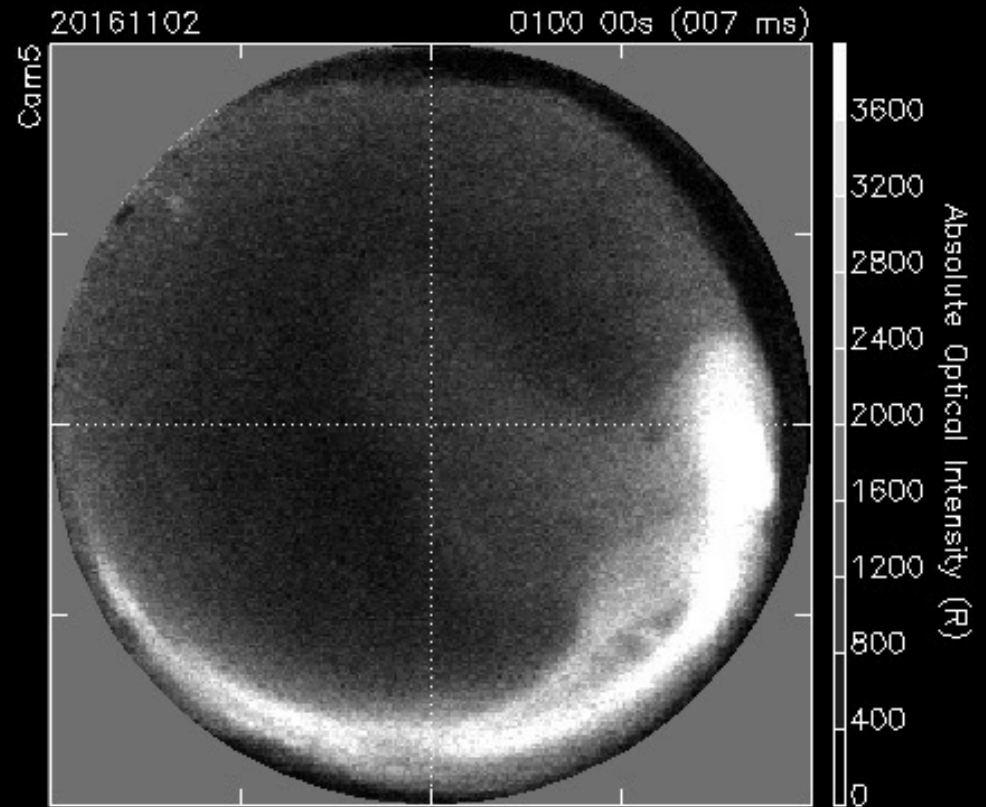
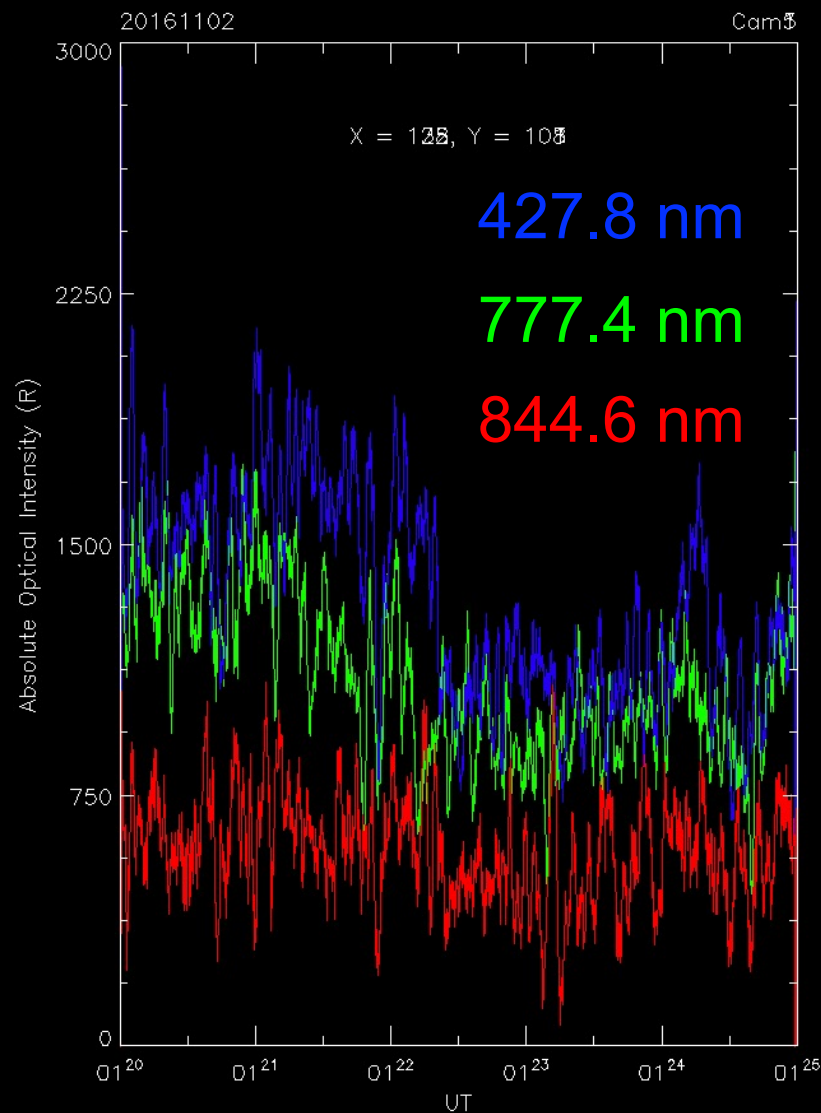


# Watec Cams @ Kiruna + Tjautjas

- カラー 1 秒露出 & 時間分解能
- 558 nm 1 秒露出 & 時間分解能
- 428 nm 4 秒露出 & 時間分解能
- 白黒 4 Hz 露出 & 時間分解能



# Multi-wavelength Measurement

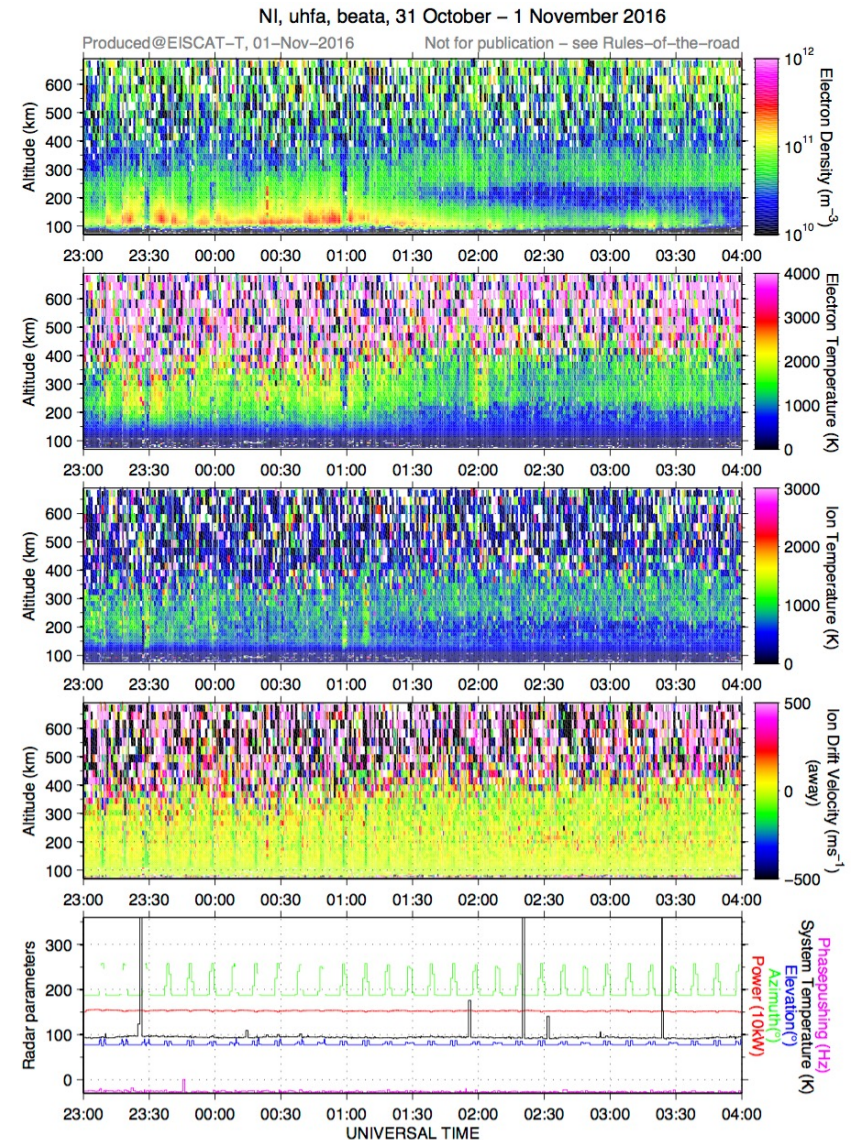
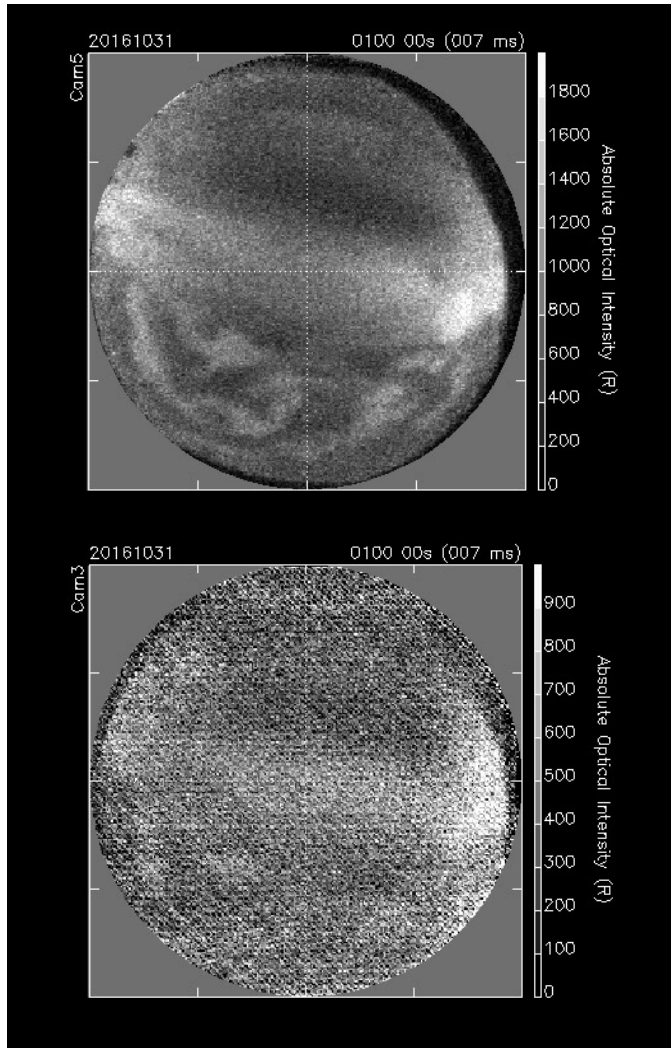


427.8 nm

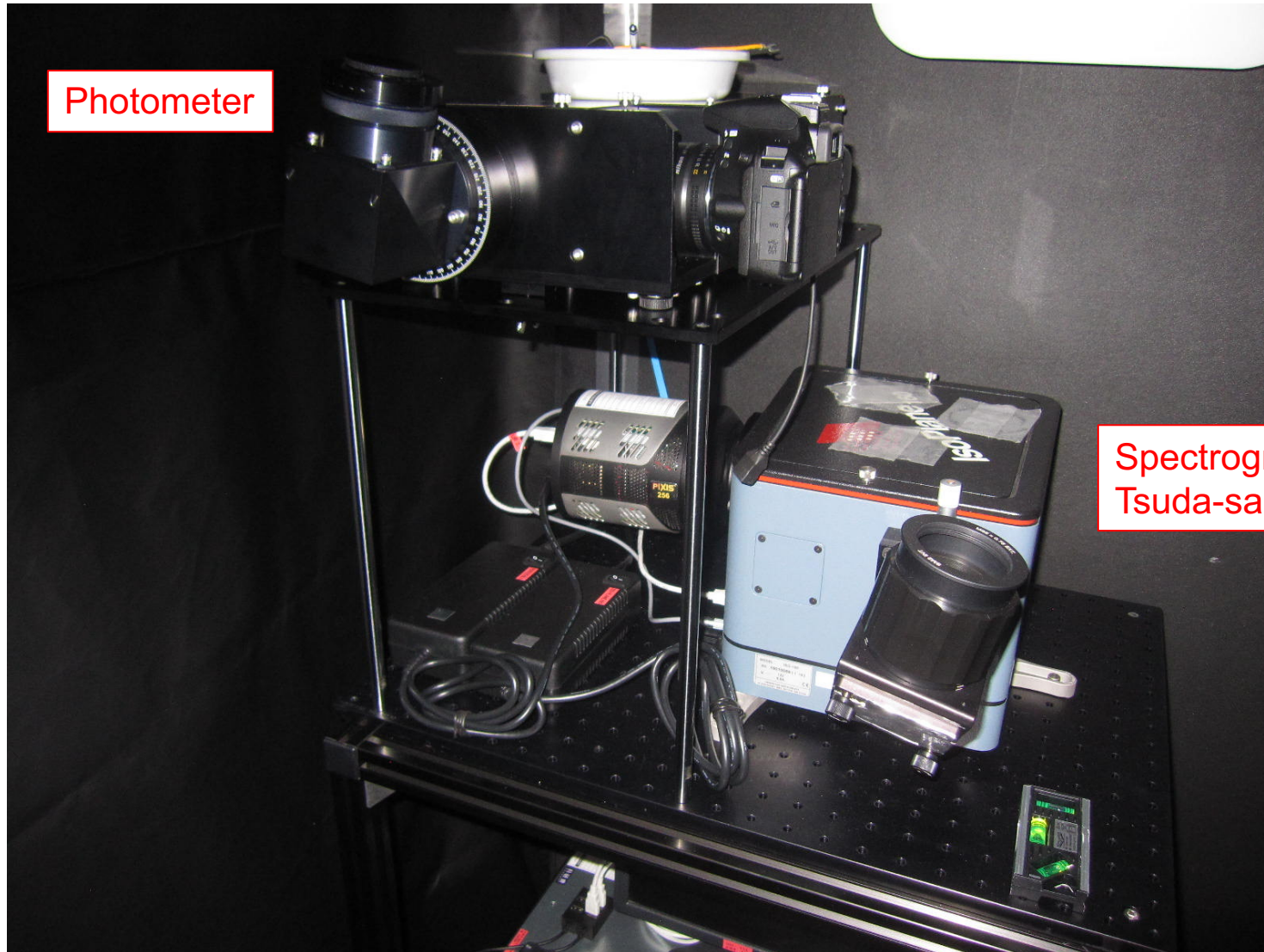
# Comparison with EISCAT

427.8 nm

844.6 nm



# 5-Ch Photometer

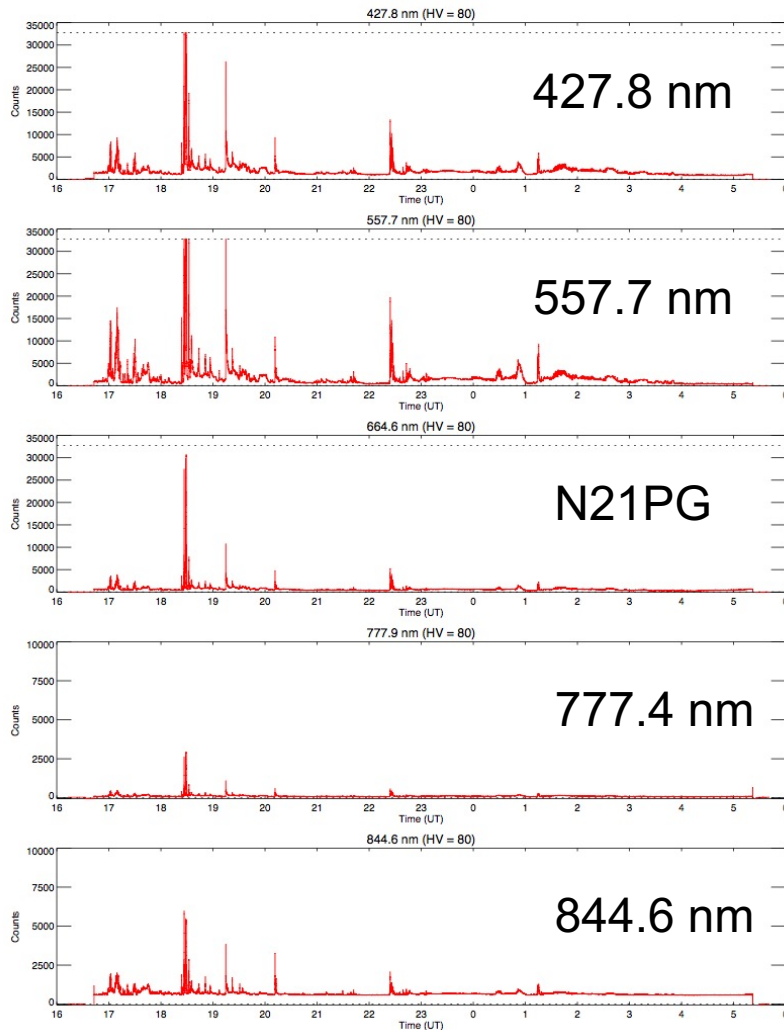


Photometer

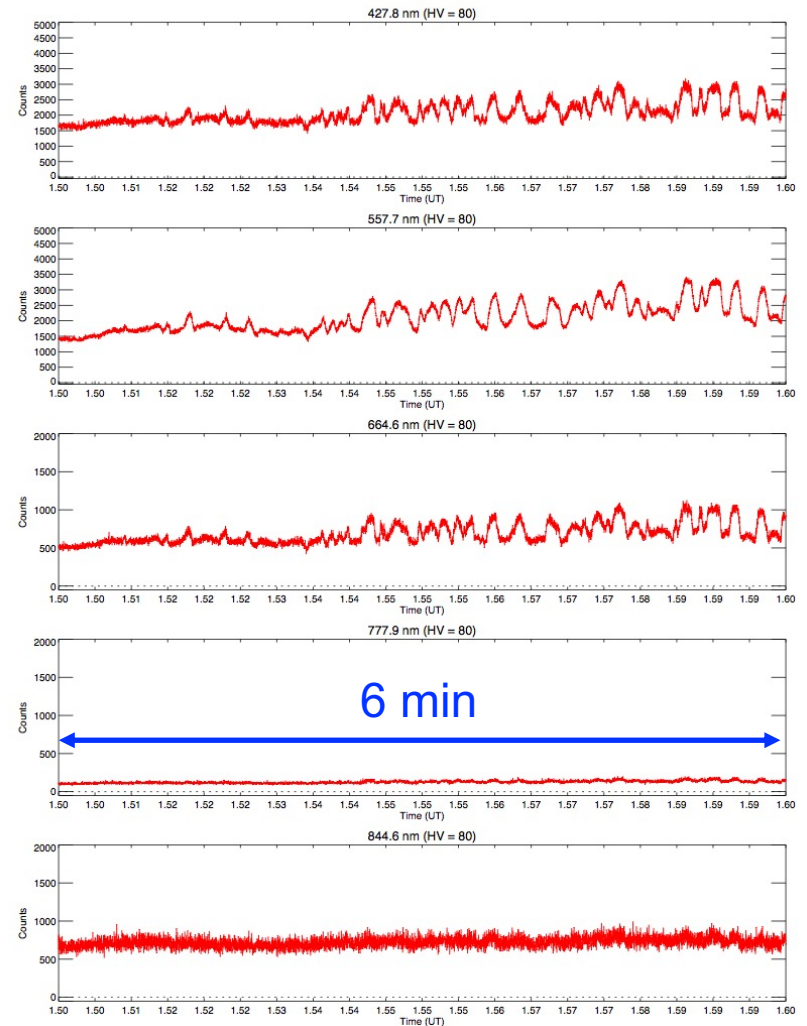
Spectrograph of  
Tsuda-san @ UEC

# 5-ch Photometer Observations

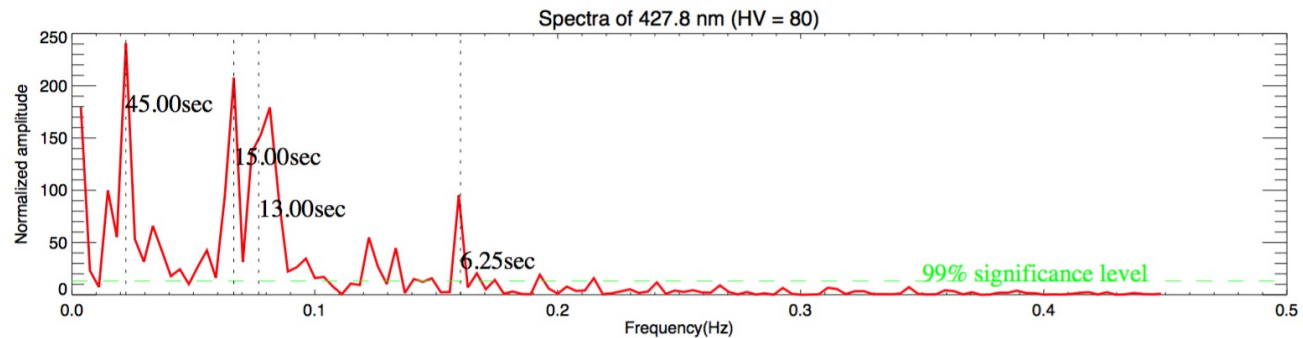
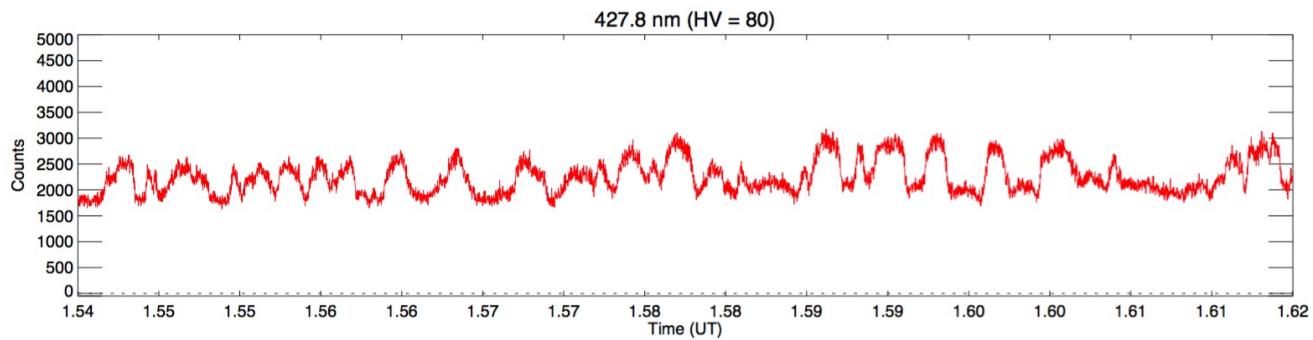
Photometer data (1 sec) on February 5, 2017



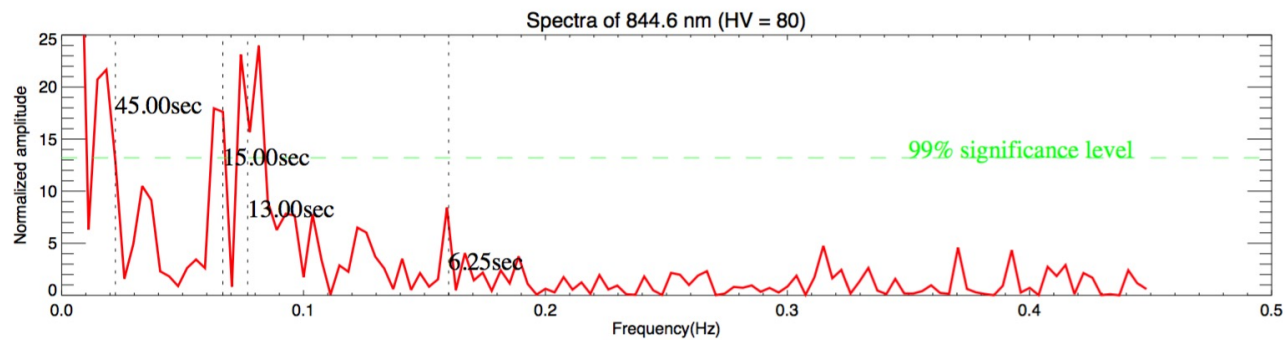
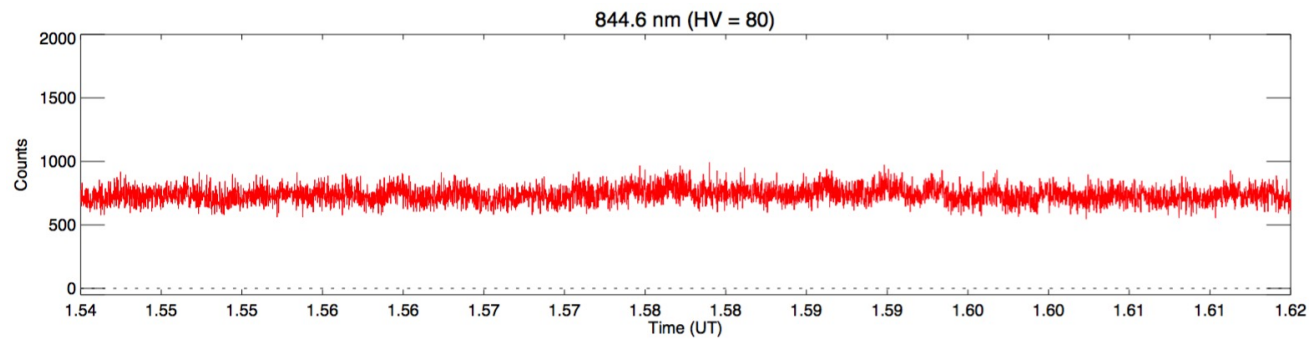
Photometer data (20 Hz) on February 5, 2017



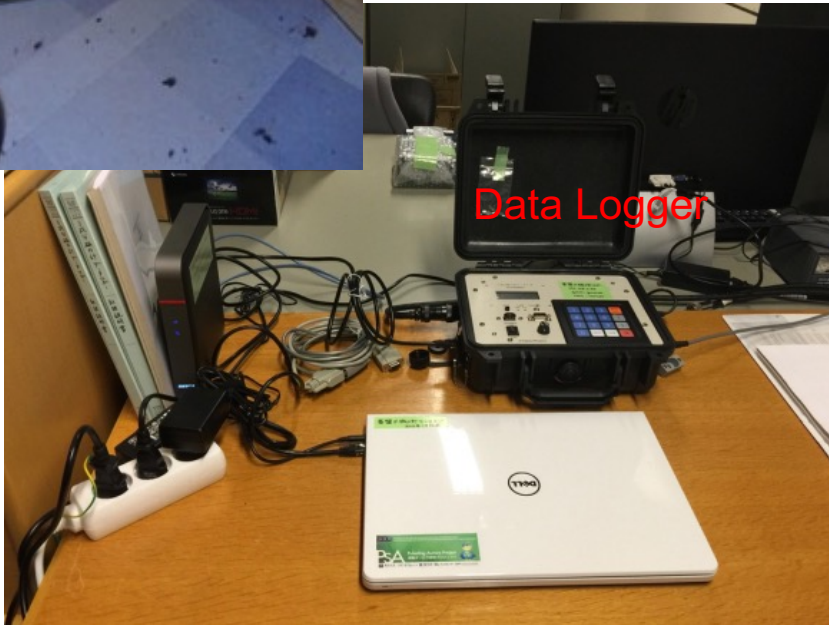
427.8 nm



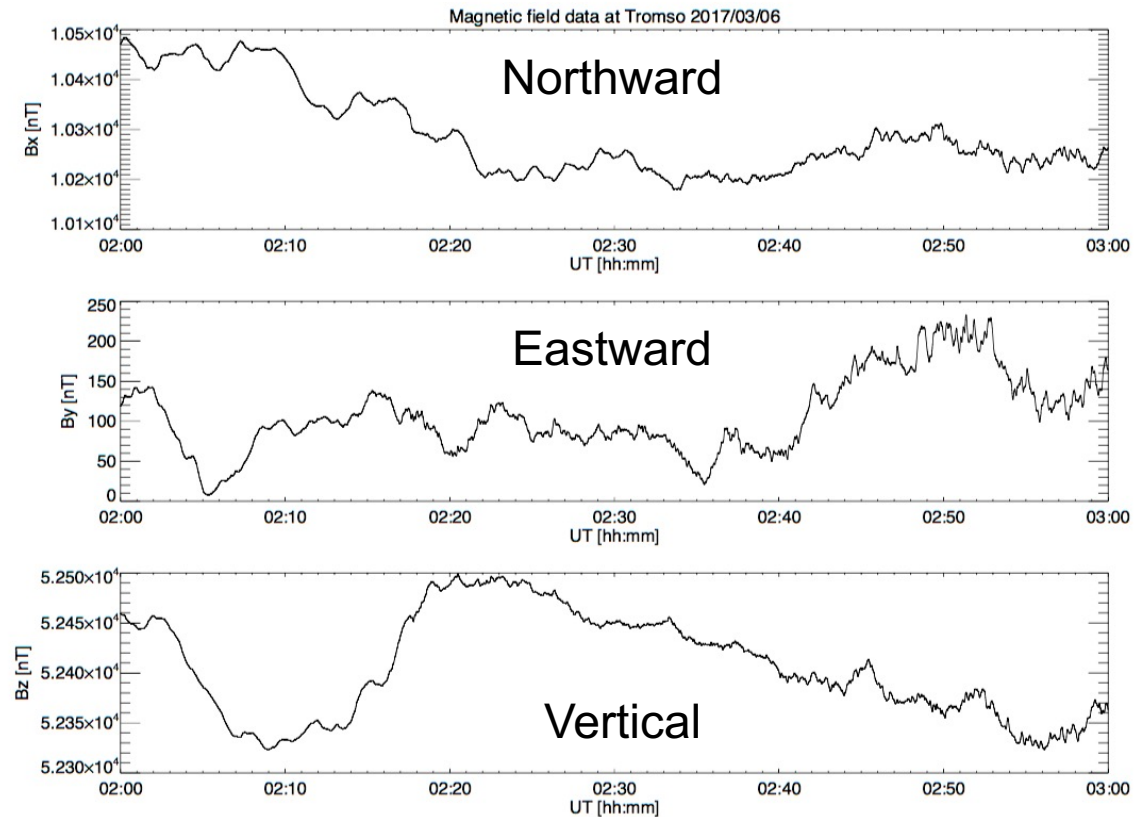
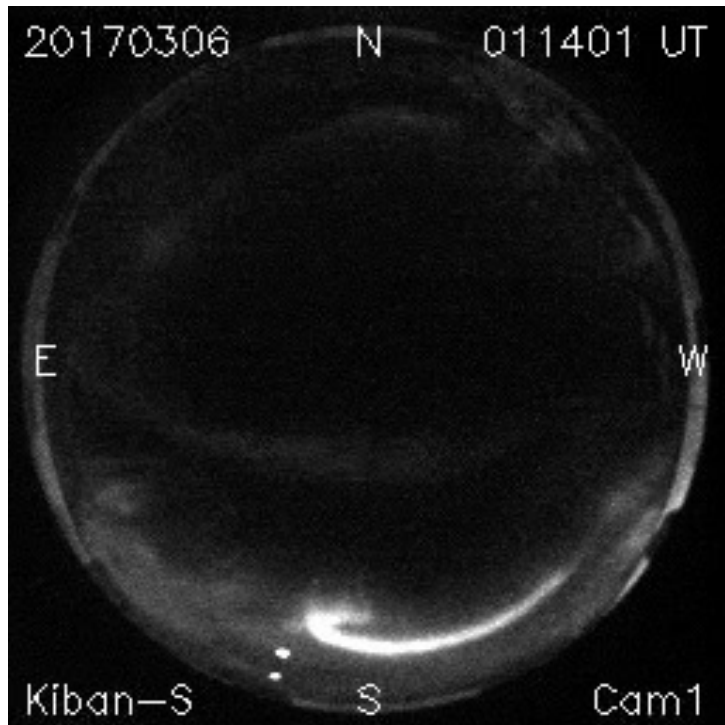
844.6 nm



# Fluxgate Magnetometer - Tromsø



# 20 Hz Fluxgate Magnetometer



What is the origin of magnetic pulsation during PsA?

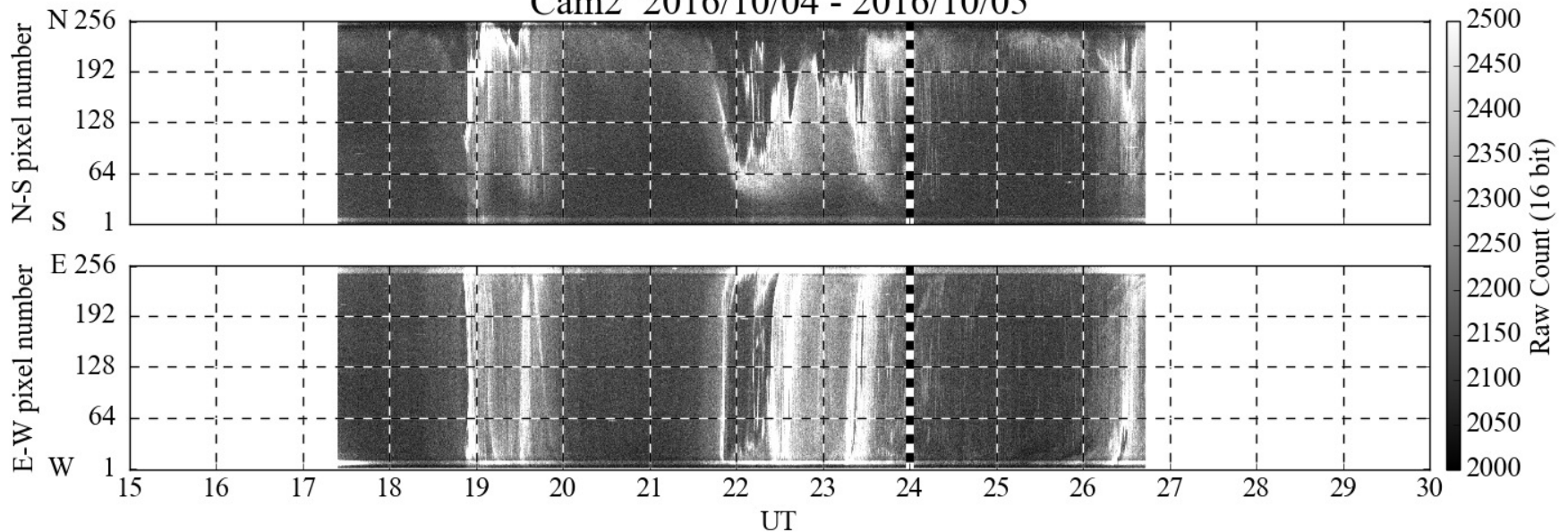
# Conjunction with VAP Satellite

Sodankylä 100 Hz High-speed ASI

VAP overpass



Cam2 2016/10/04 - 2016/10/05



# Conjunction with VAP Satellite

Sodankylä 100 Hz High-speed ASI

