

IPY2007-2008 ICESTAR program in Japan

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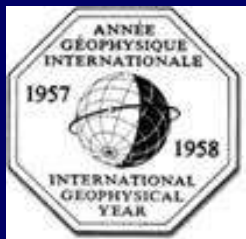


INTERNATIONAL SYMPOSIUM ASIAN COLLABORATION IN IPY 2007-2008

IPY2007-2008 kick-off meeting in Tokyo

1st March 2007, 08:45-18:00 JST
(Counting down at 00 UT = 09 JST)

<http://polaris.nipr.ac.jp/~ipy/sympo/>



IPY Out-reach Program in Japan

Open Forum
for Polar Science
for Junior high school and
High school students

JARE bring the selected
proposals to Syowa or
Dome Fuji stations to do
the experiments.

http://polaris.nipr.ac.jp/~pras/IPY_openf/index.html



国際極年2007-2008
第3回中高生南極・北極オープンフォーラム

中学生・高校生の提案を
南極・北極へ

南極・北極での研究計画
大募集!

私が南極
僕が北極へ行くなら
こんなことを調べたい!

という提案を書いてみませんか?

優秀な提案を選び、その研究計画を
観測隊員が現地で実施します!

締め切り: 9月16日(土)
優秀提案発表会、表彰式: 12月17日(日)

詳しくは、 先生 にお尋ねください。

あるいは、下記へお問い合わせください。
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国立極地研究所 山岸 久雄
電話: 03-3962-4646 e-mail: chukou-ipy@nipr.ac.jp
http://polaris.nipr.ac.jp/~pras/IPY_openf/index.html

Eol from NIPR for the ICESTAR/IHY

Eol #422

Interhemispheric study on conjugacy and non-conjugacy of auroral and polar ionospheric disturbances using ground-based observation network

- To **maintain** and **intensify** the **Syowa - Iceland conjugate observations**.
- To **develop** the **unmanned magnetometer network** in the Antarctic.
- To **maintain** other facilities at Syowa Station, including the two **SuperDARN radars**, etc.

Eol from NIPR for the ICESTAR/IHY

Eol #550

Coordinated radar studies of the Arctic and Antarctic middle and upper atmosphere during IPY-4 period (CRSAAMU)

- To do coordinated studies using MF radar, Meteo radar, EISCAT radar, etc.

Lead contact : Takehiko Aso (NIPR)
(t-aso@nipr.ac.jp)

Eol from NIPR for the ICESTAR/IHY

Eol #355

Program of the ANtarctic SYowa
MST (Mesosphere-Stratosphere-Troposphere) /
IS (Incoherent Scatter) radar (PANSY)

- To do feasibility studies for the **MST/IS radar (PANSY)** at Syowa Station

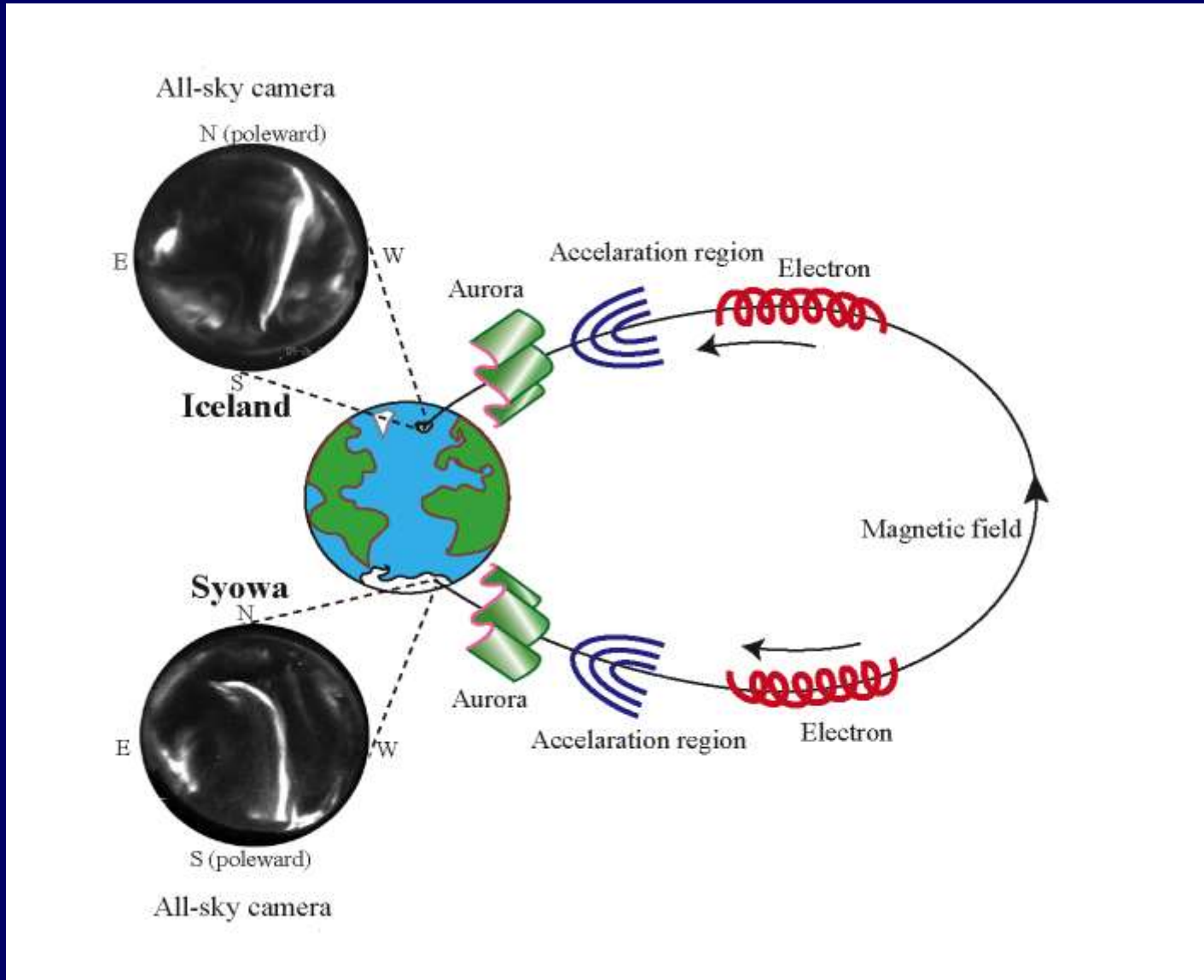
Lead contact : Masaki Tsutsumi (NIPR)

(tutumi@nipr.ac.jp)

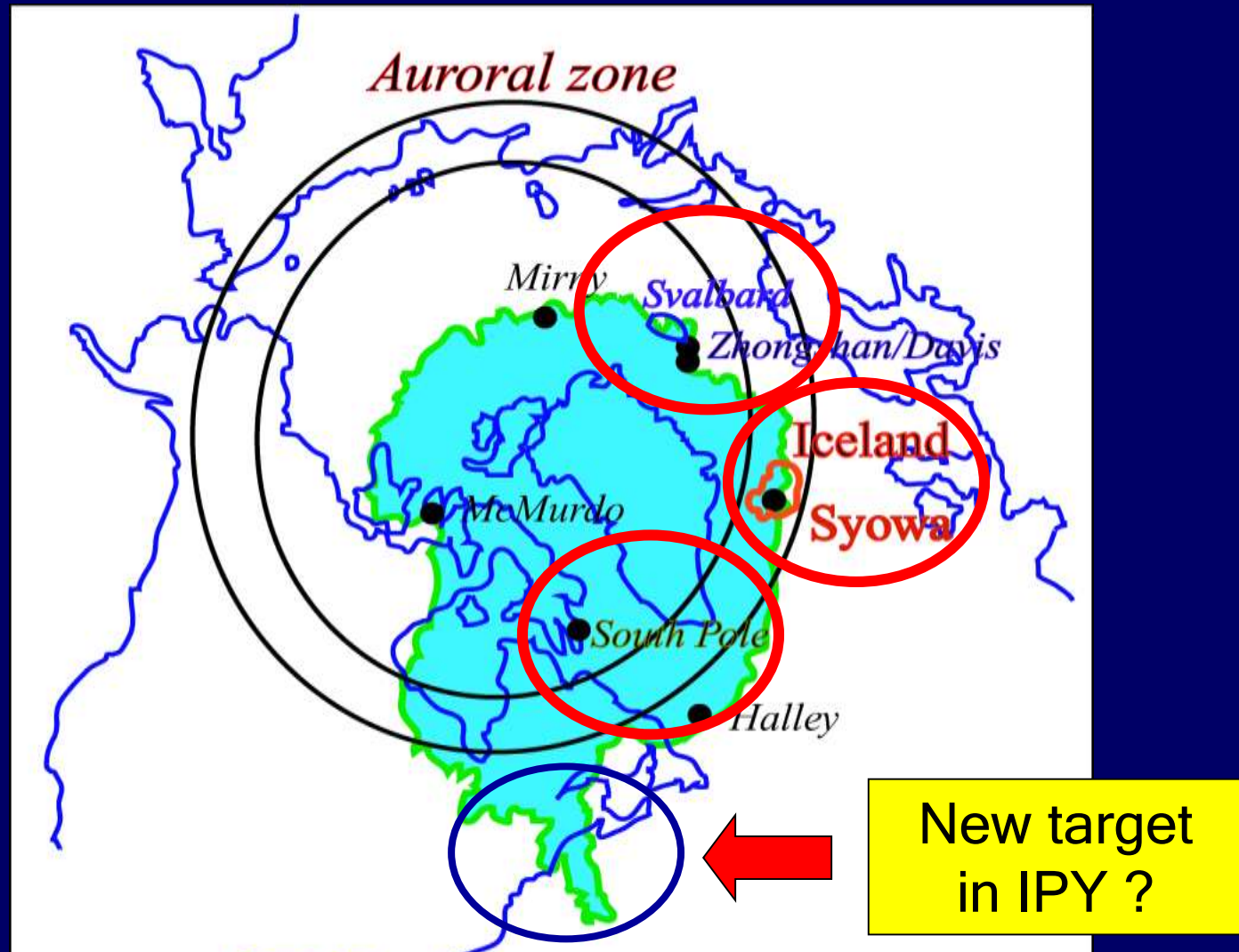
Kaoru Sato (Univ. Tokyo)

(kaoru@eps.s.u-tokyo.ac.jp)

Conjugate Observation at Syowa and Iceland



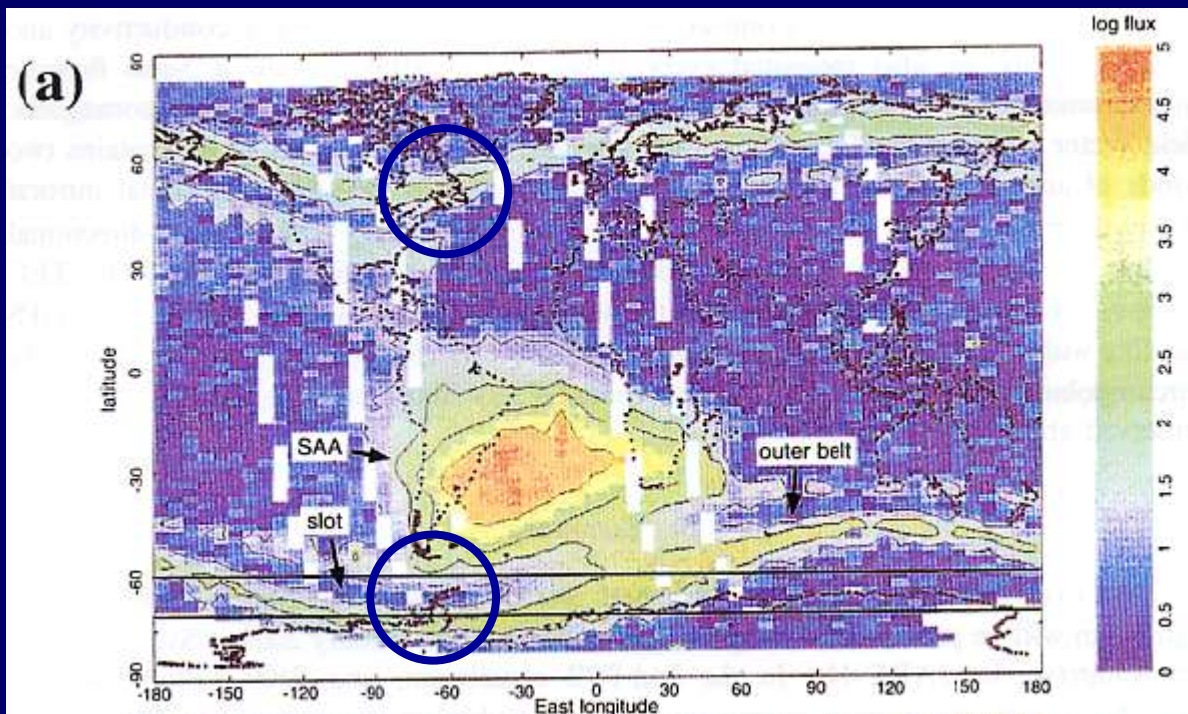
Conjugate pair relating with our EoI #422



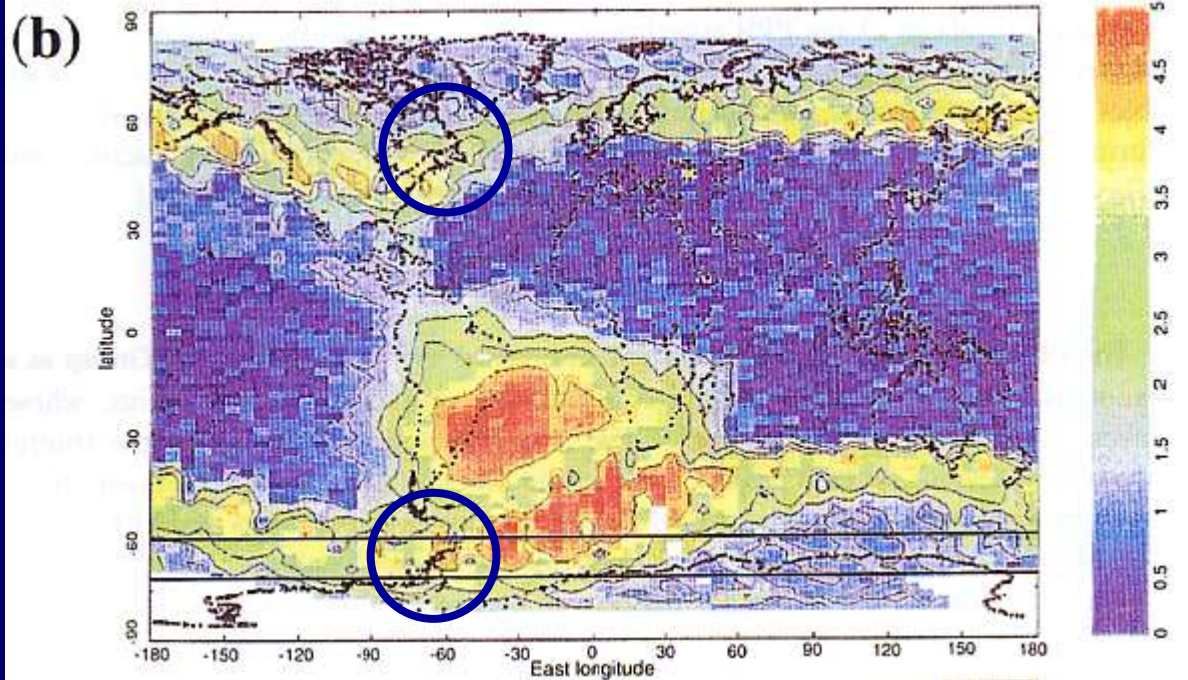
Geomagnetic mapping

Conjugacy of Radiation Belt

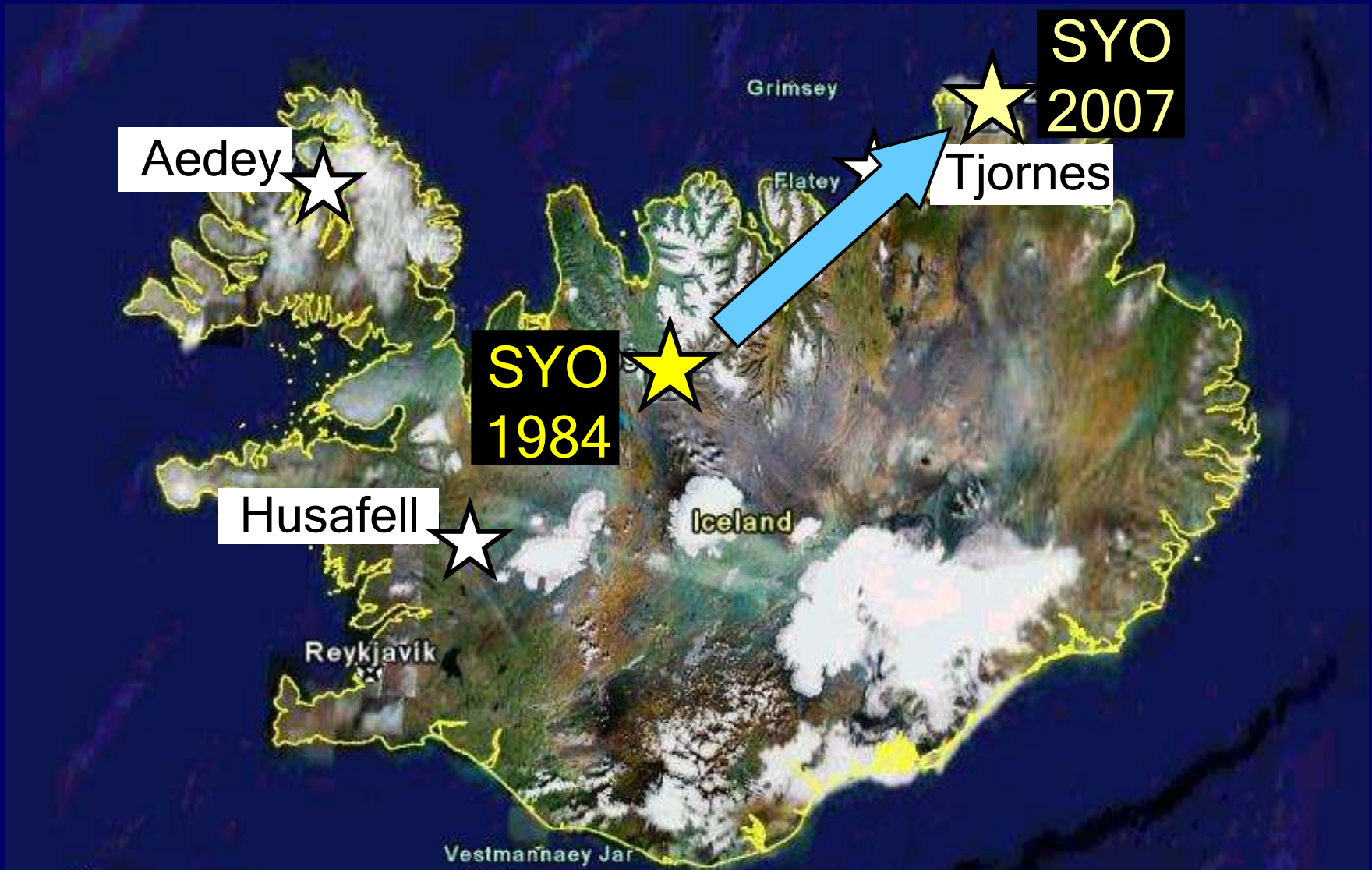
(a) Quiet time



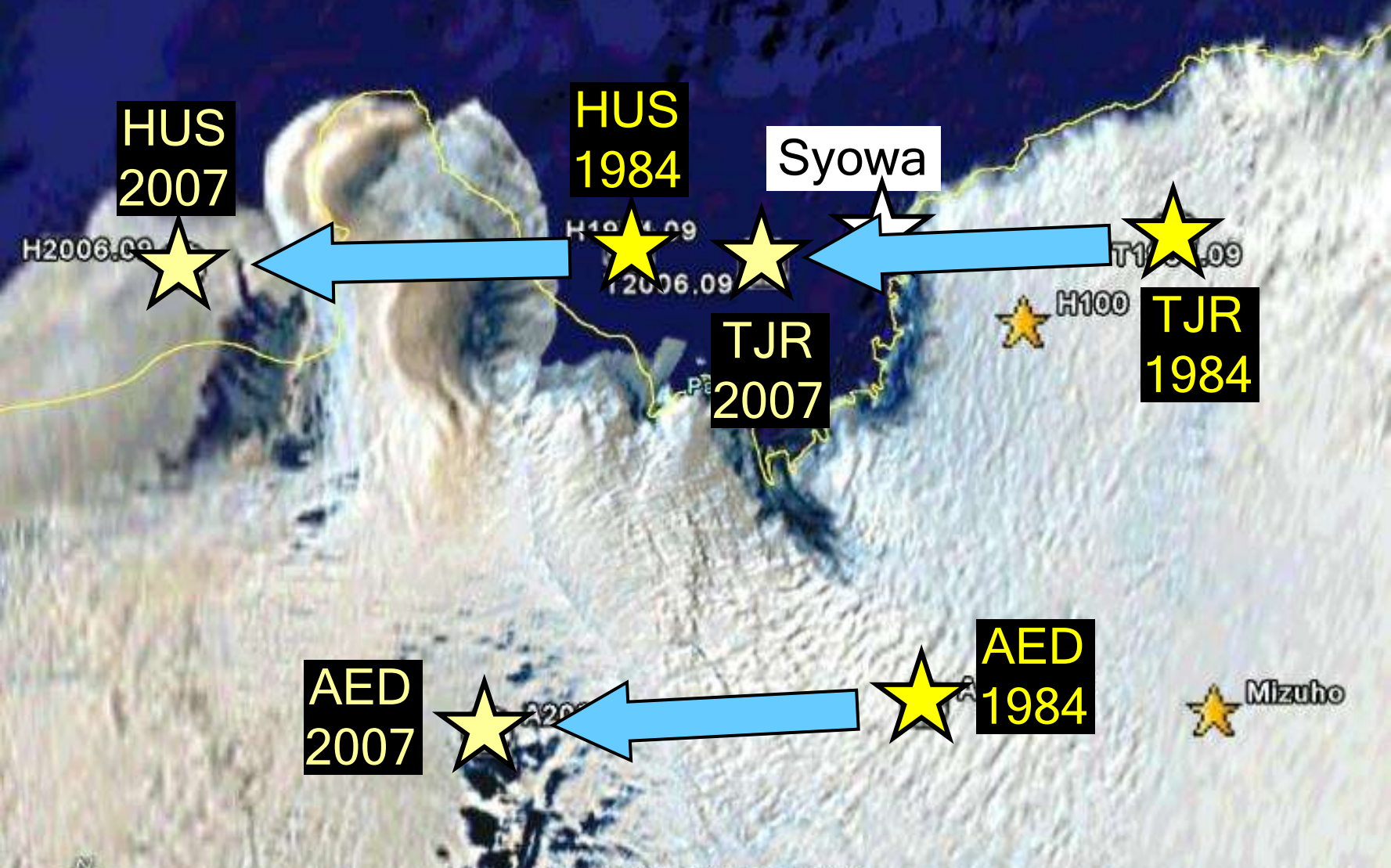
(b) Storm time



Conjugate point of Syowa Station in Iceland (IGRF)



Conjugate point of Iceland in the Antarctic (IGRF)



Geographic & Geomagnetic Parameters

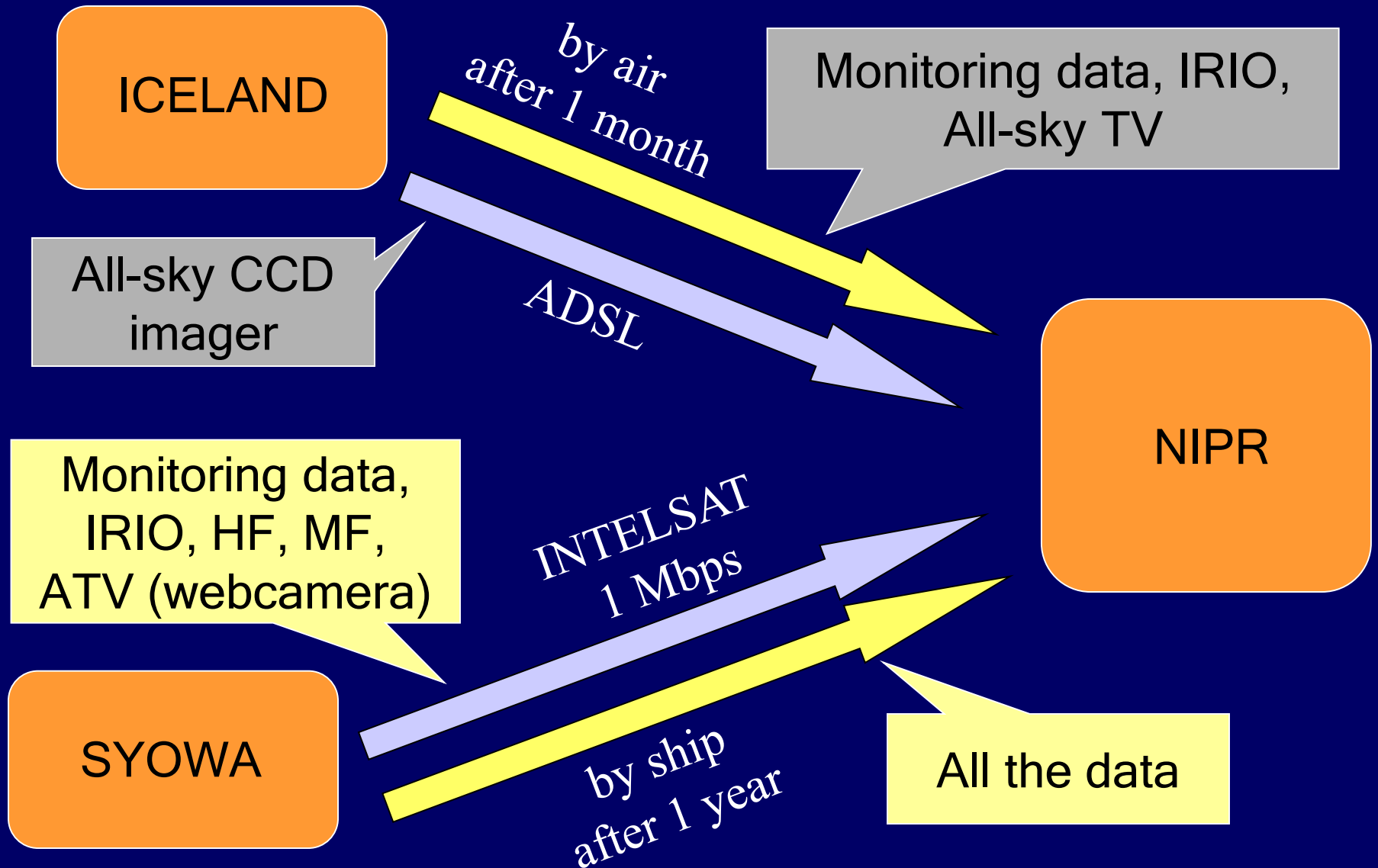
(Epoch: 00:00:00 UT, 1 Jan, 2007)

Station	Glat (deg)	Glon (deg)	Inv.lat (deg)	Mlon (deg)	MLT (hr) at 0.0 UT	L value	D (deg)	I (deg)	B (nT)
Syowa	-69.00	39.58	66.37	72.35	23.68	6.22	-49.20	-63.64	43114
Aedey	66.09	-22.65	66.99	66.69	23.30	6.54	-18.27	76.77	52775
Husafell	64.67	-21.03	65.28	67.04	23.33	5.72	-16.58	75.87	52410
Tjornes	66.20	-17.12	66.35	71.30	23.61	6.22	-15.05	76.55	52472

Instruments at conjugate stations

	SYO	HUS	TJR	AED
Fluxgate magnetometer	○	○	○	○
Induction magnetometer	○	○	○	○
Riometer	○	○	○	○
VLF receiver	○	○	○	○
Imaging Riometer	○	○	○	
All-sky TV camera (night-viewer)	○	○	○	
All-sky monochromatic Imager	○	○	○	
Meridian Scanning Photometer	○		○	
Fabry-Perot Imager	○			
SuperDARN radar	○		△	
MF-radar	○			
Ionosonde (NiCT)	○			
VHF Doppler radar (NiCT)	○			
FM/CW radar (NiCT)	○			

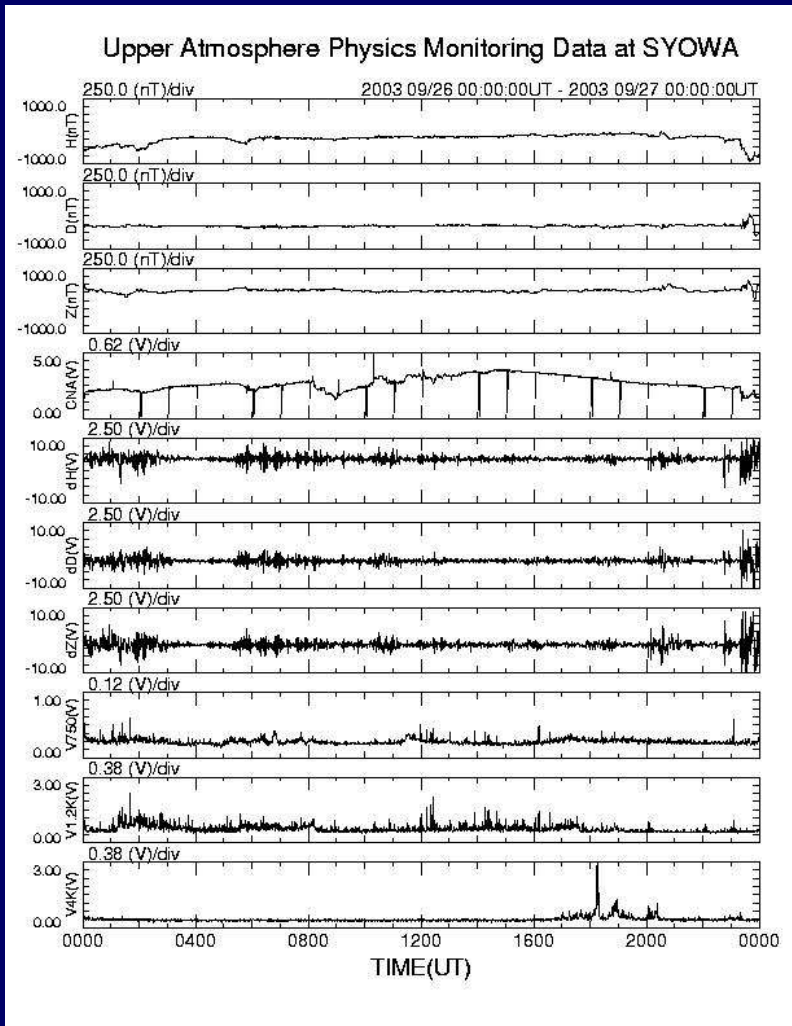
Flow of the Syowa - Iceland conjugate data



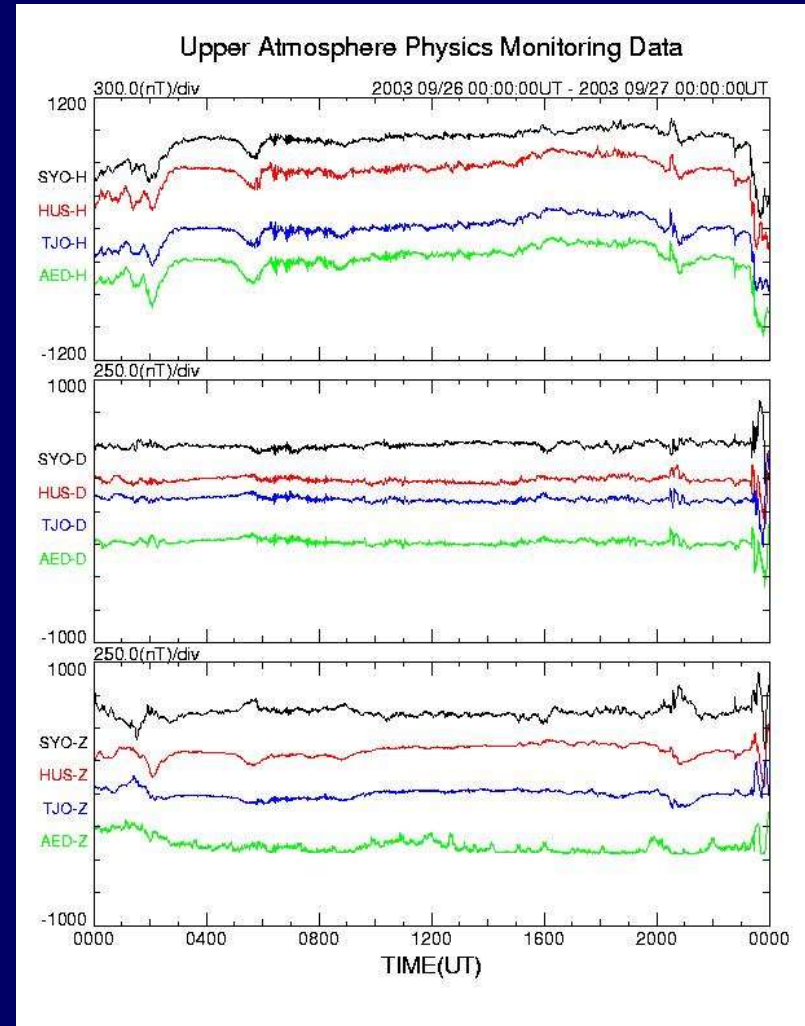
Syowa - Iceland conjugate data Web site

<http://polaris.nipr.ac.jp/~aurora/uapm/ConjugateObsTop.html>

Single Station and Multi-Item

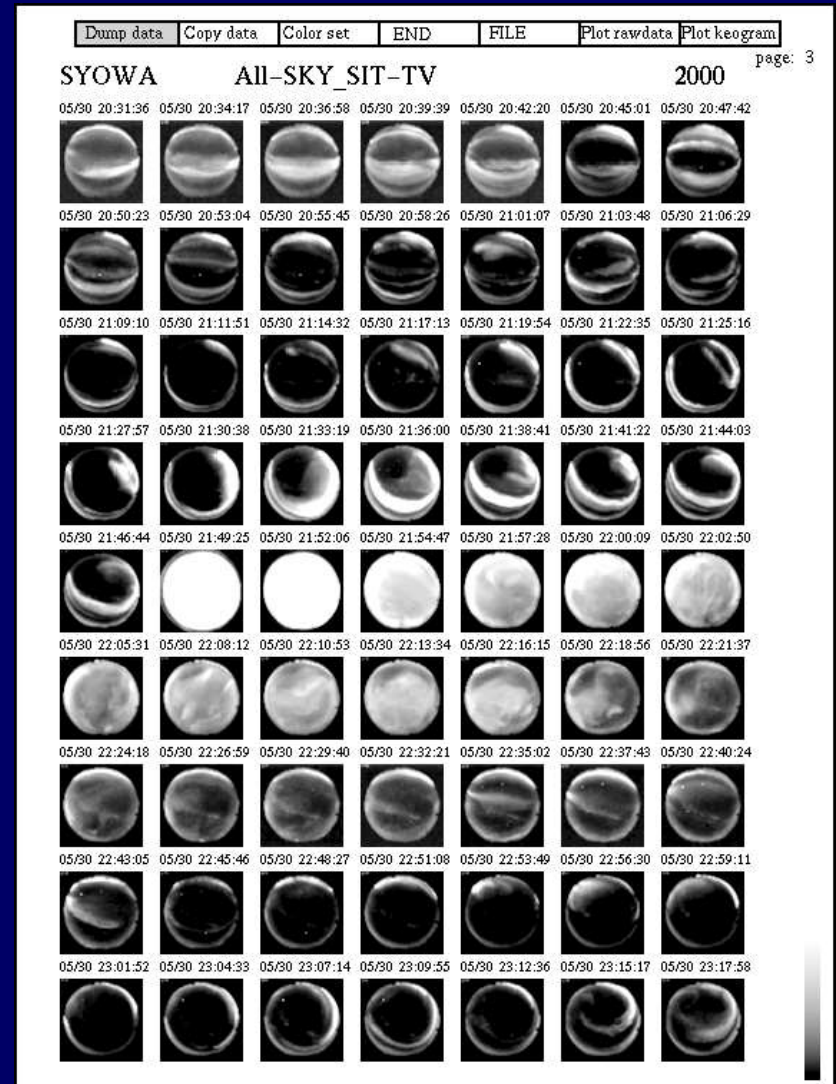
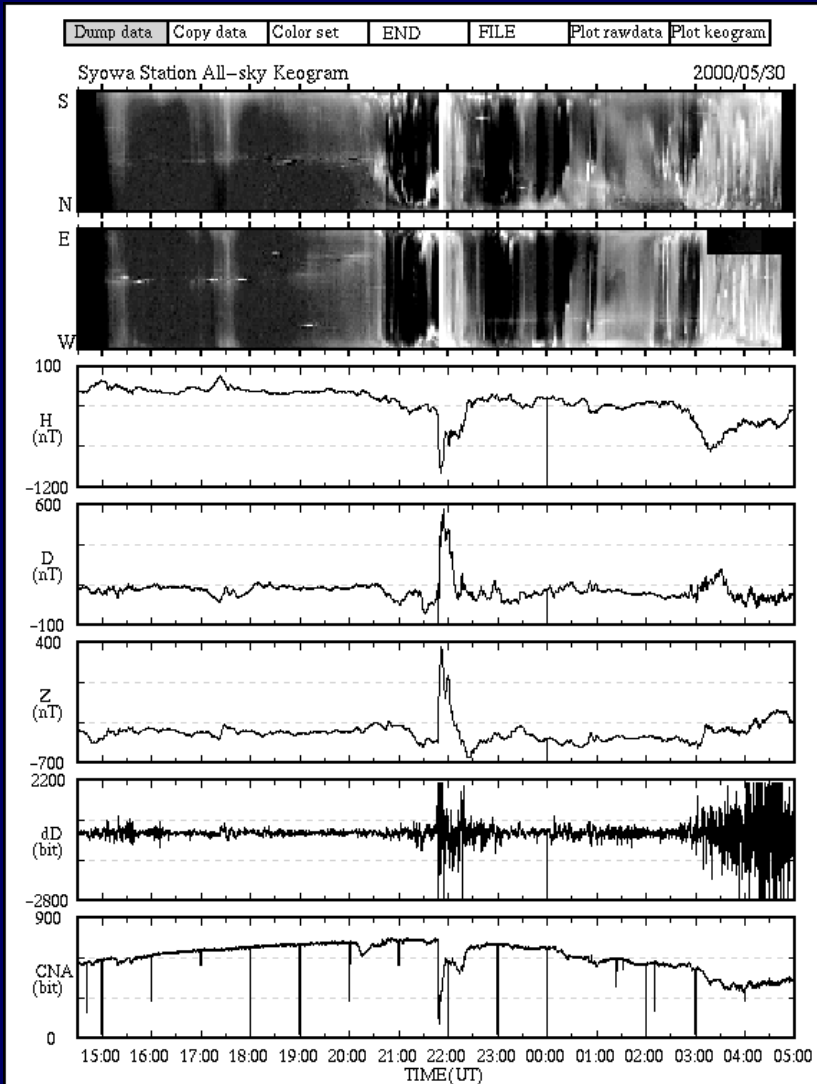


Multi-Station and Multi-Item



Syowa Auroral observation Web site

<http://polaris.nipr.ac.jp/~aurora/optical.obs/SyowaAuroraObsTop.html>



Syowa-Iceland Auroral Conjugate Observation

- Starting from 1984 (22 year history)
- Executed every year in the equinox season, mainly in September, for about 2 weeks
- Simultaneous darkness for about 4 hours
- Only 2~3 nights of simultaneous observation in one season, mainly due to weather condition
- Good conjugate event is rare

September 26, 2003 event :

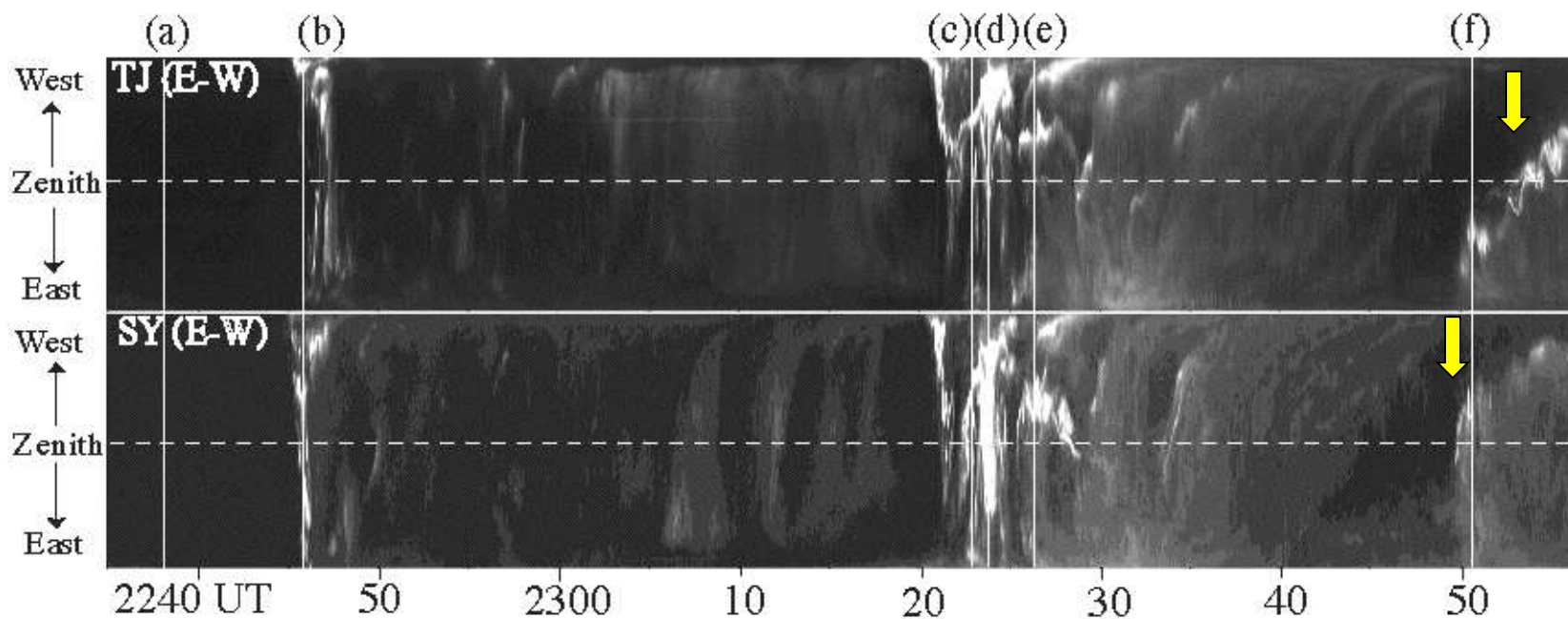
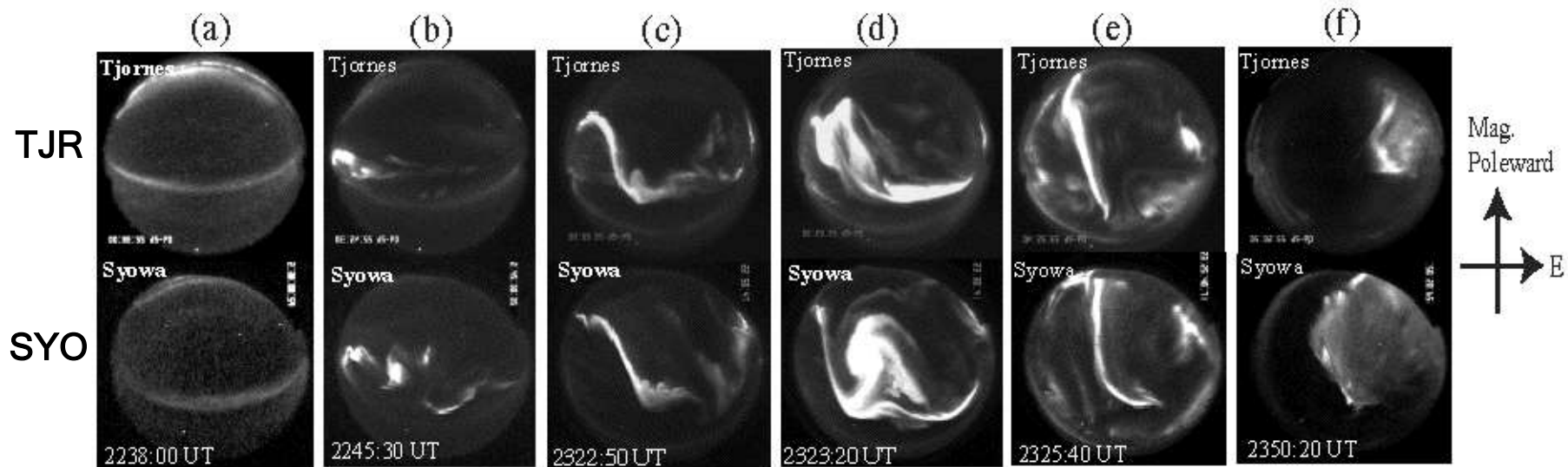
The best conjugate event in the 22 year history
Observed with All-sky TV (night-viewer)



Iceland (Tjornes)

SYOWA

September 26, 2003 event

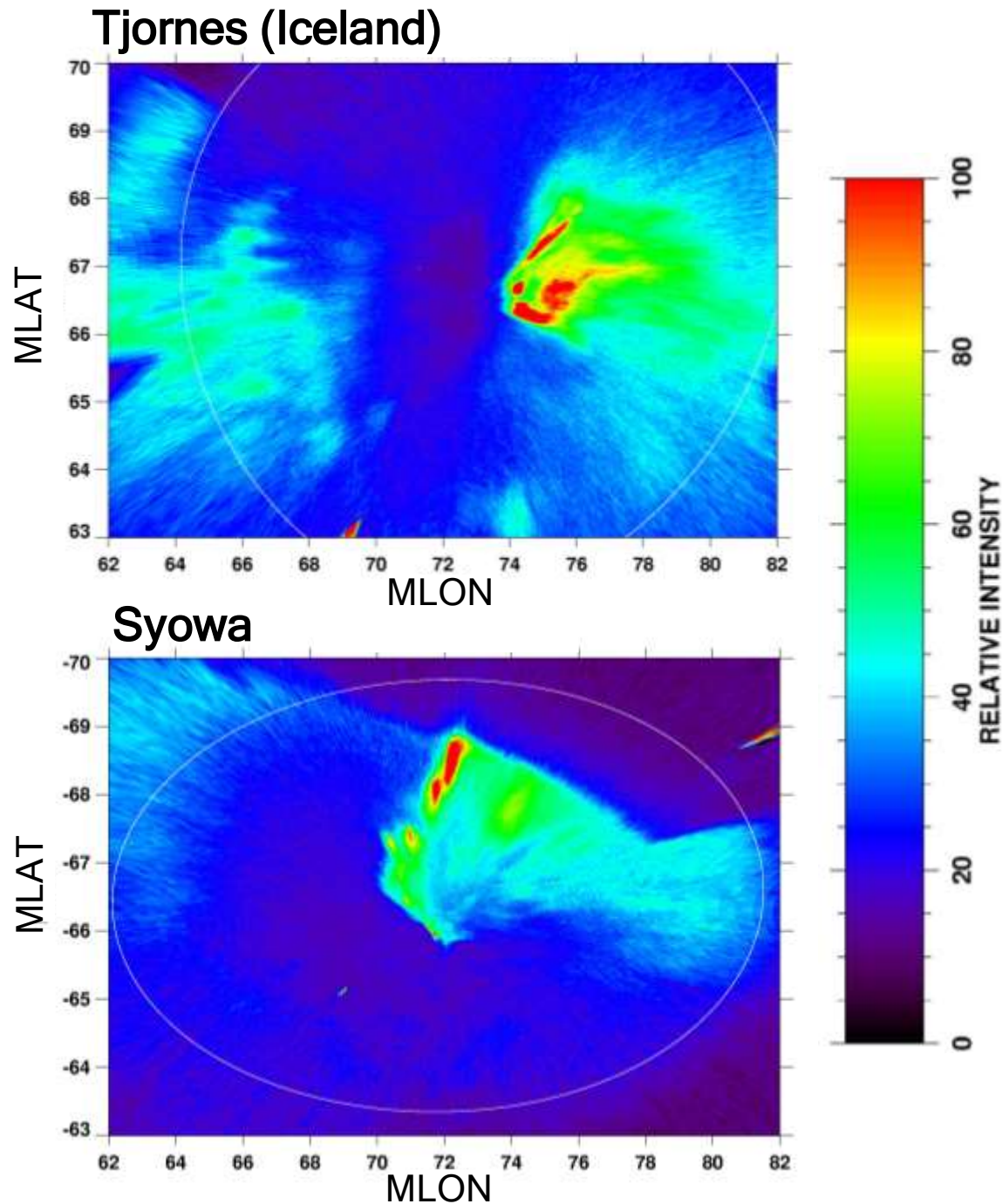


by Natsuo Sato

Image on geomagnetic plane

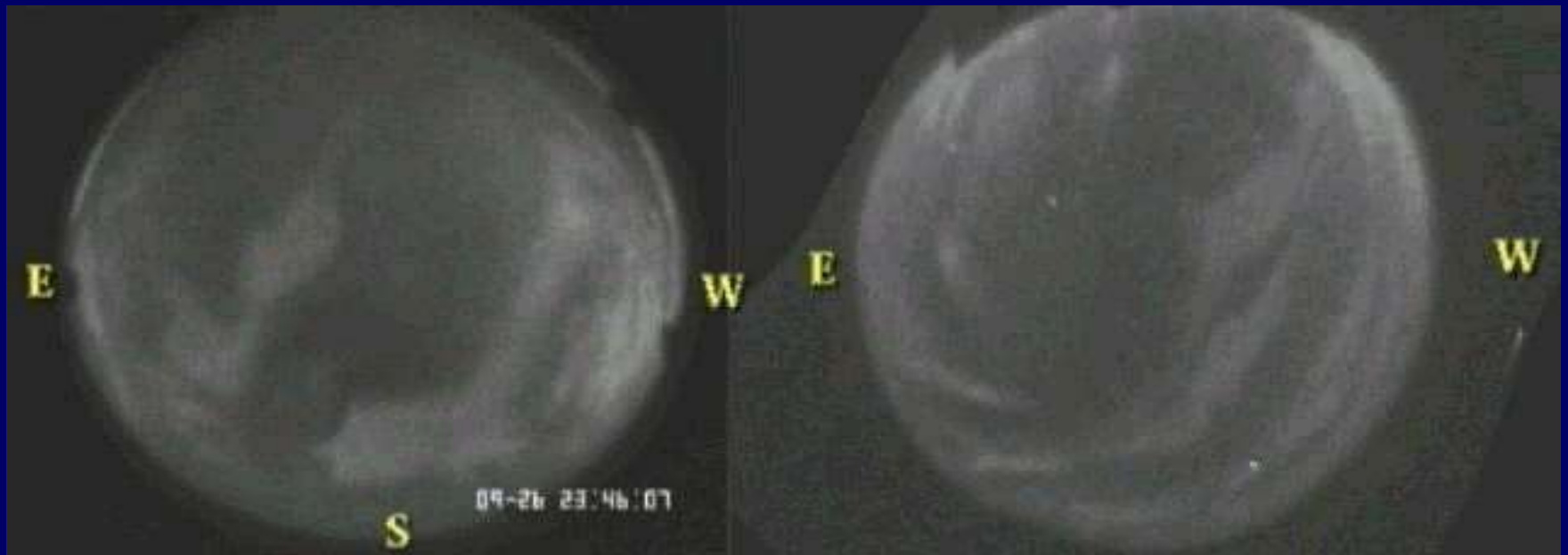
23:50:20 UT
Sep. 26, 2003

Displaced
longitudinally
about 4 deg
within 30 min



Other our target : Pulsating Aurora

September 26, 2003 event



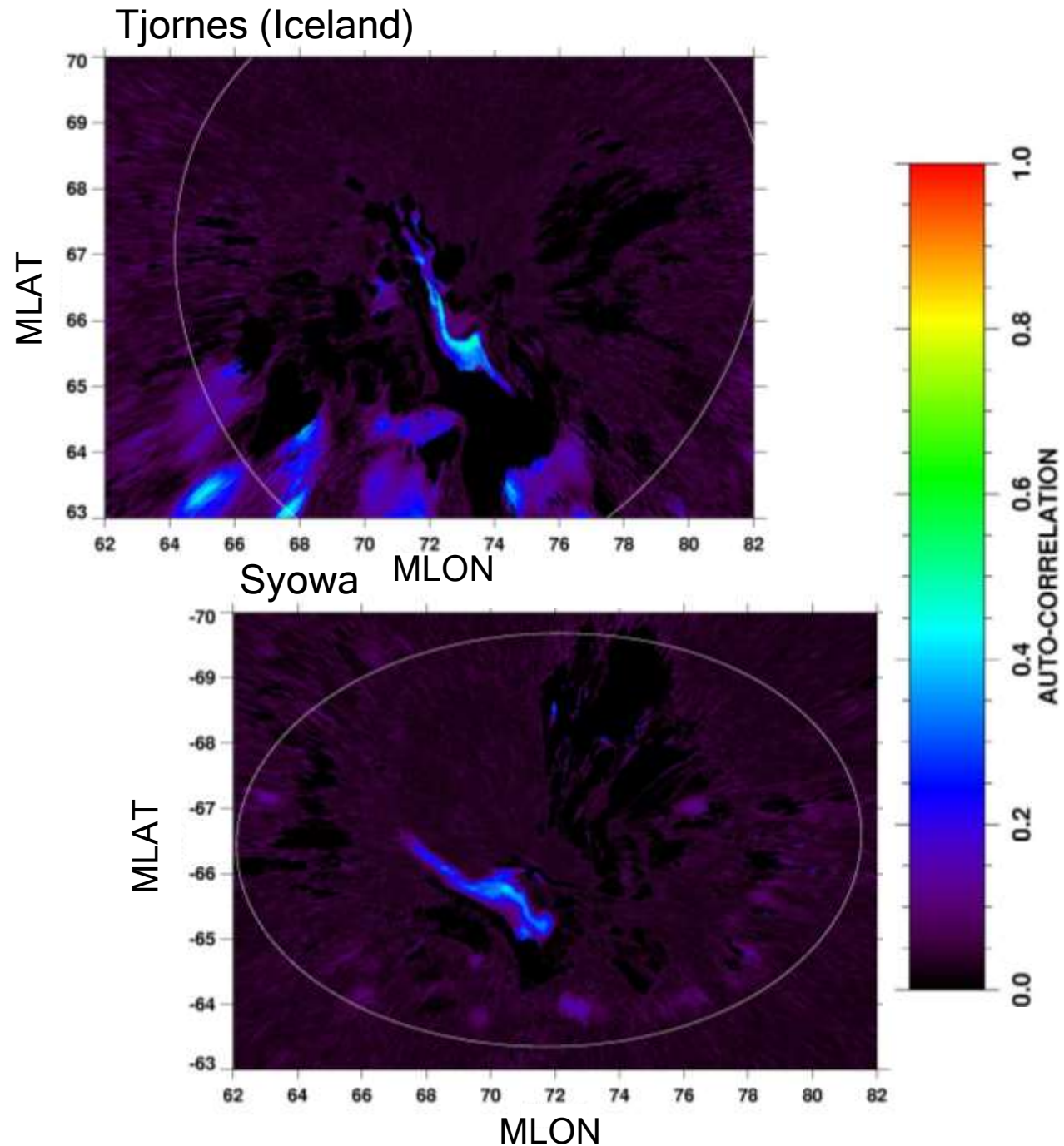
Iceland (Tjornes)

SYOWA

Auto-correlation for Pulsating Aurora

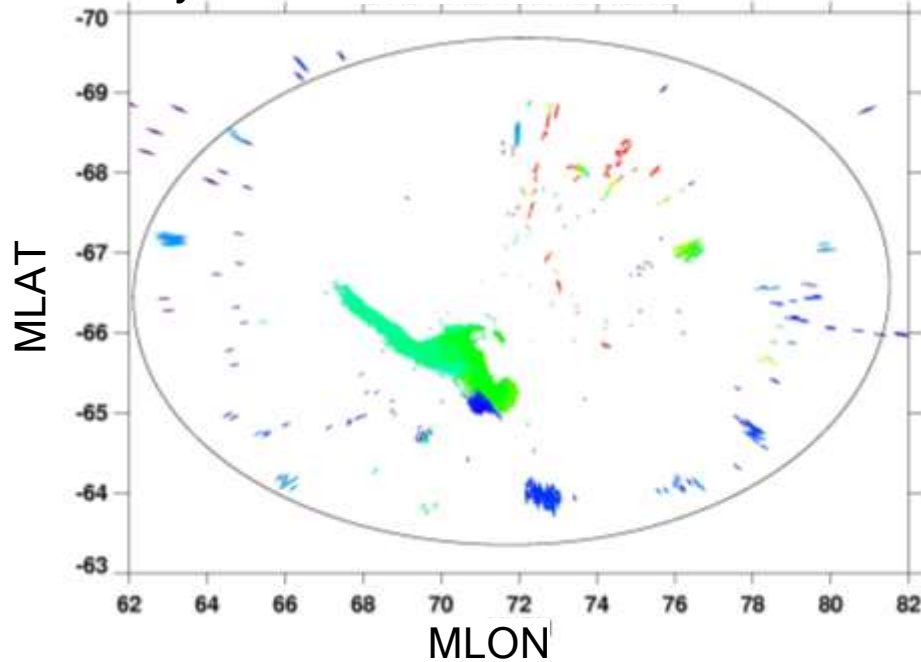
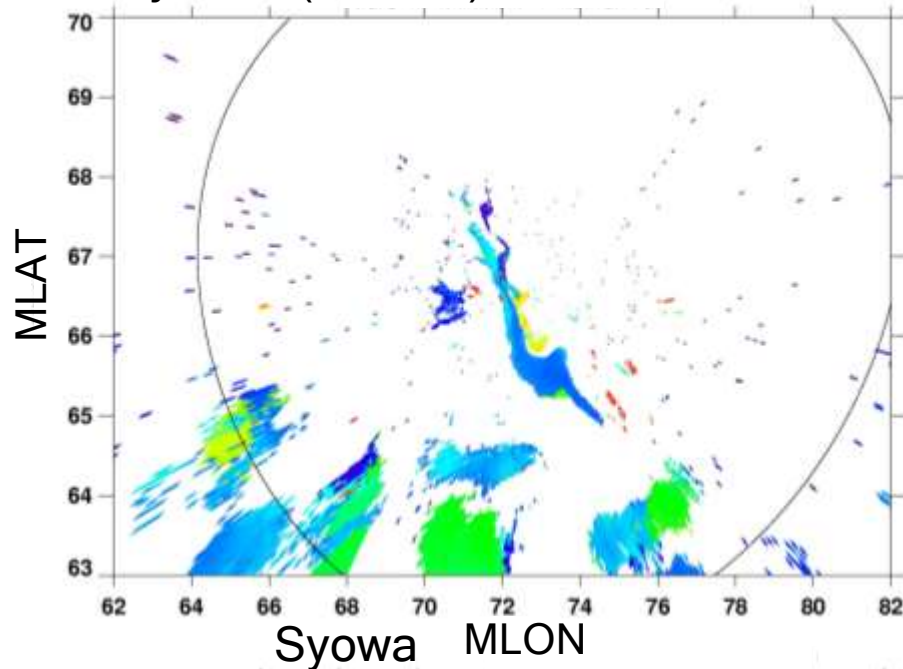
at 23:48:10 UT
on Sep. 26, 2003

Good Correspondence

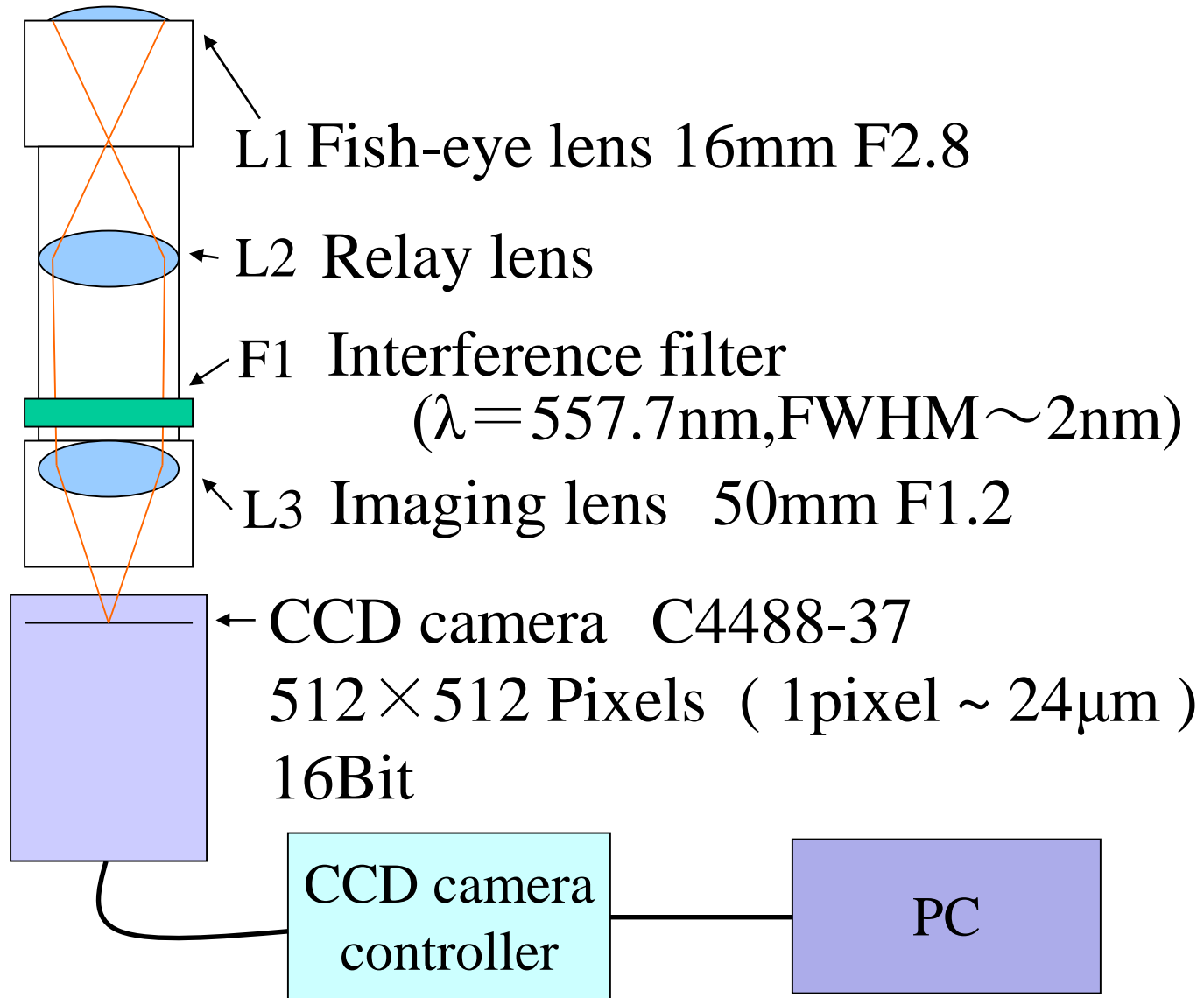


But ...
Pulsation
Period
is
different

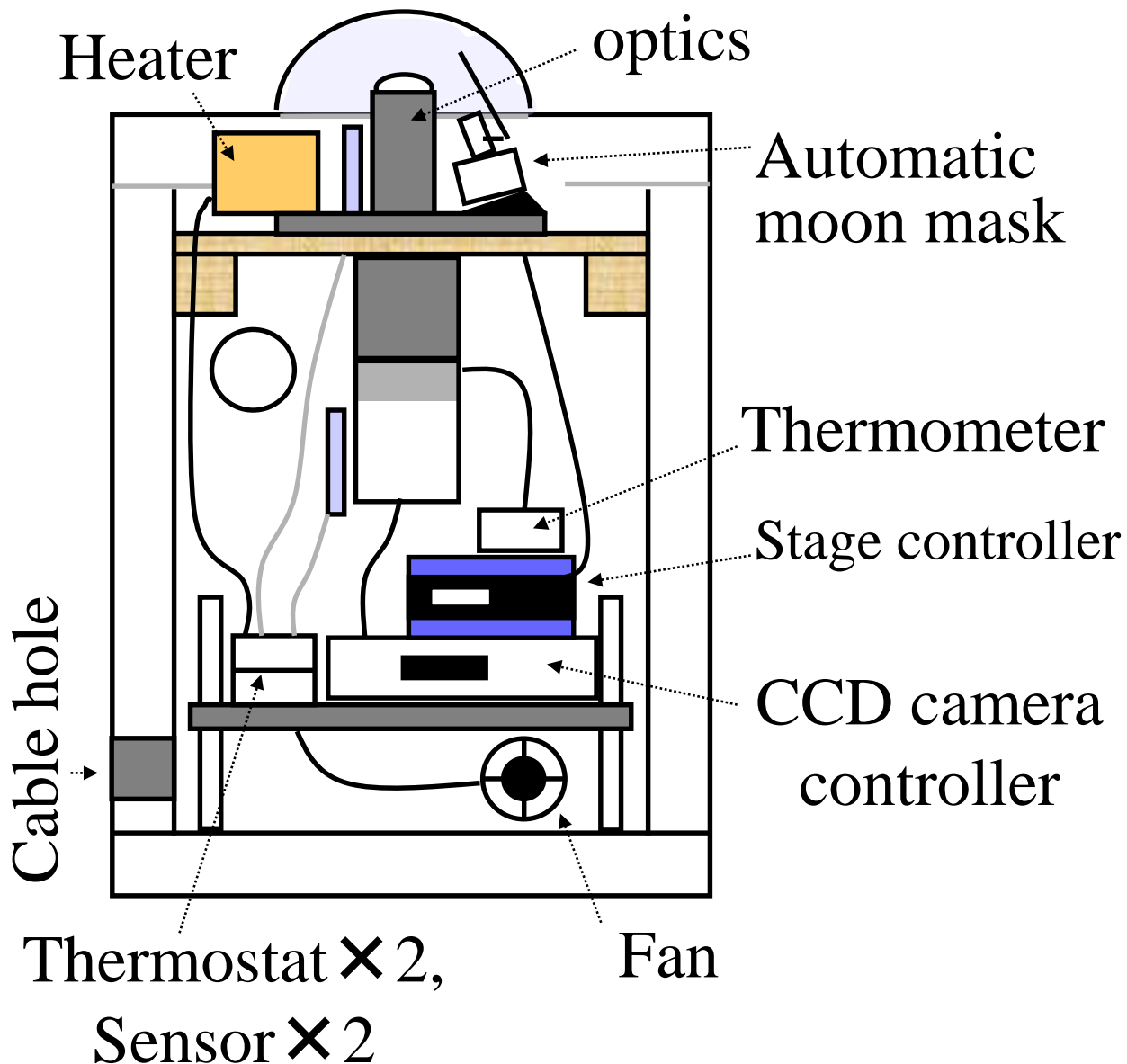
Tjornes (Iceland)



For more quantitative longer period observation Well-calibrated monochromatic imager



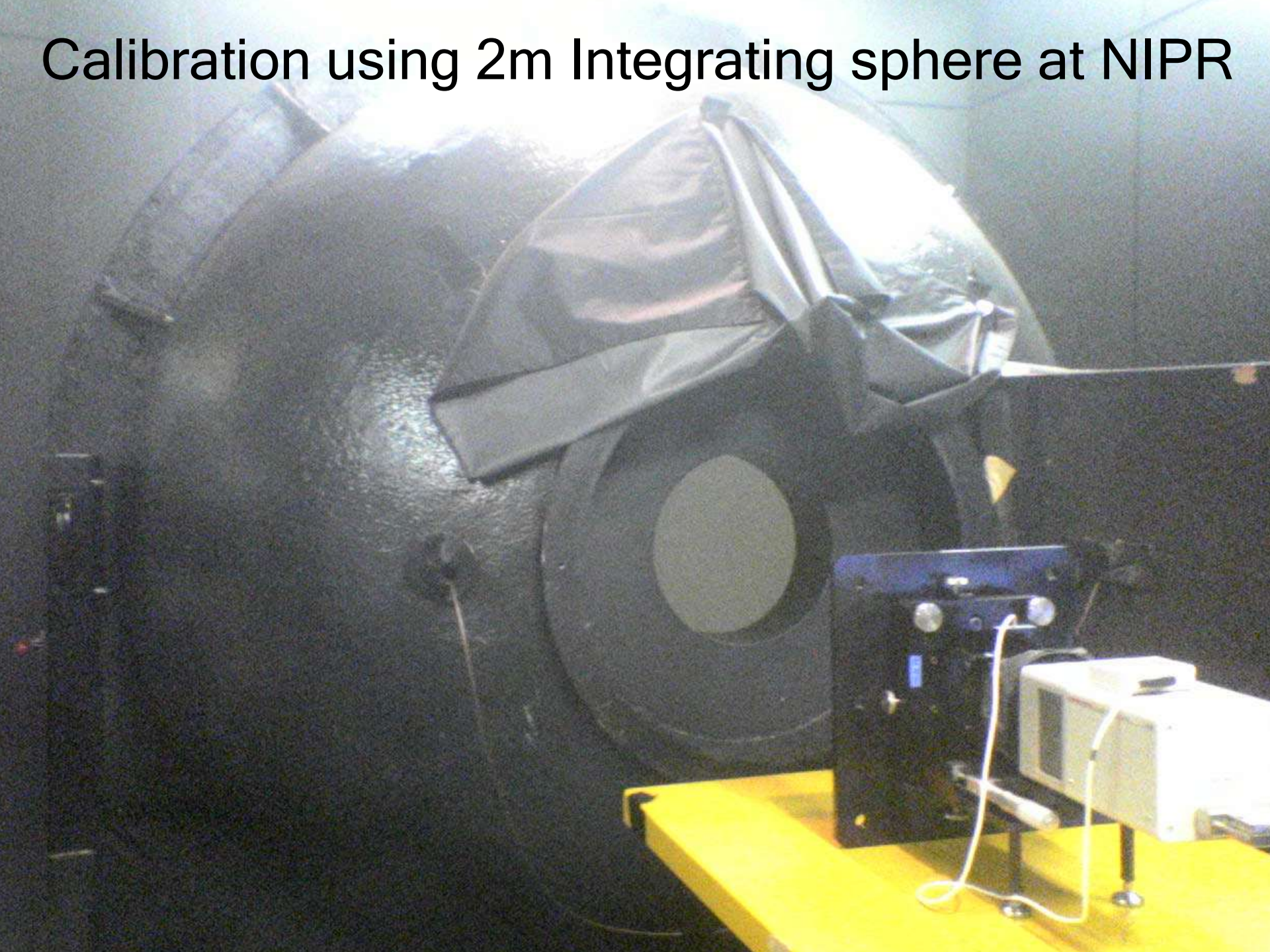
Put in a temperature controlled box





CAI
(Conjugate Auroral Imager)

Calibration using 2m Integrating sphere at NIPR



Sensitivity

$$S(\lambda) = \frac{10^6}{4\pi} A \Omega \eta G T_L T_F(\lambda)$$

T_F : transmissivity (filter)

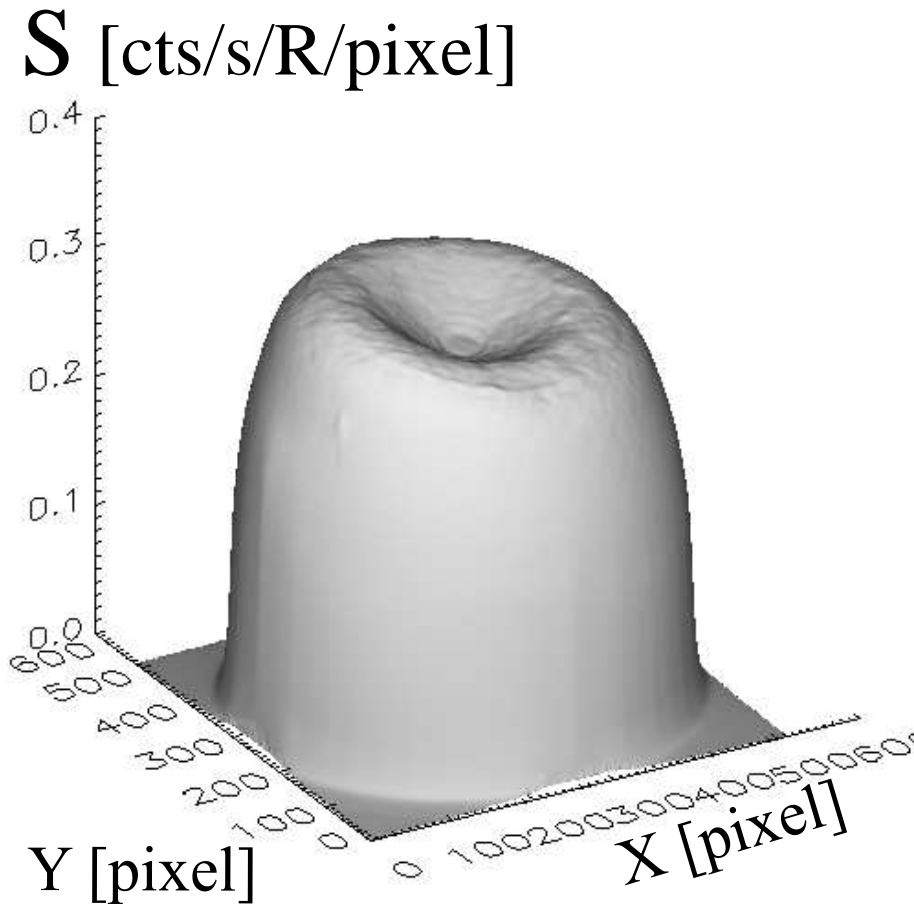
T_L : transmissivity (lens)

η : CCD quantum
efficiency [%]

Ω : solid angle of 1 pixel

G : gain [%]

A : other constant



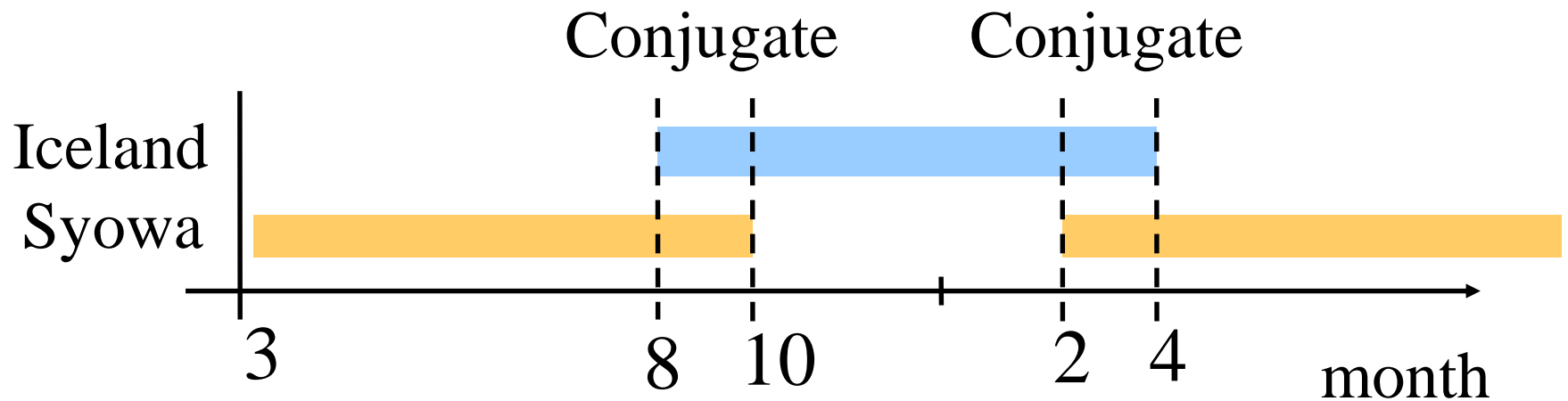
Sensitivity (25°C)

CAI : Installed at Husafell in 2005

Filter : 557.7 nm or 4278 nm
Exposure time : 1 sec
Interval : 6 sec
Observation time : Solar Zenith Angle $> 99^\circ$
Operation : Automatic and Remote
all through the season

by M. Taguchi

Now we can obtain auroral data at conjugate stations all through the year

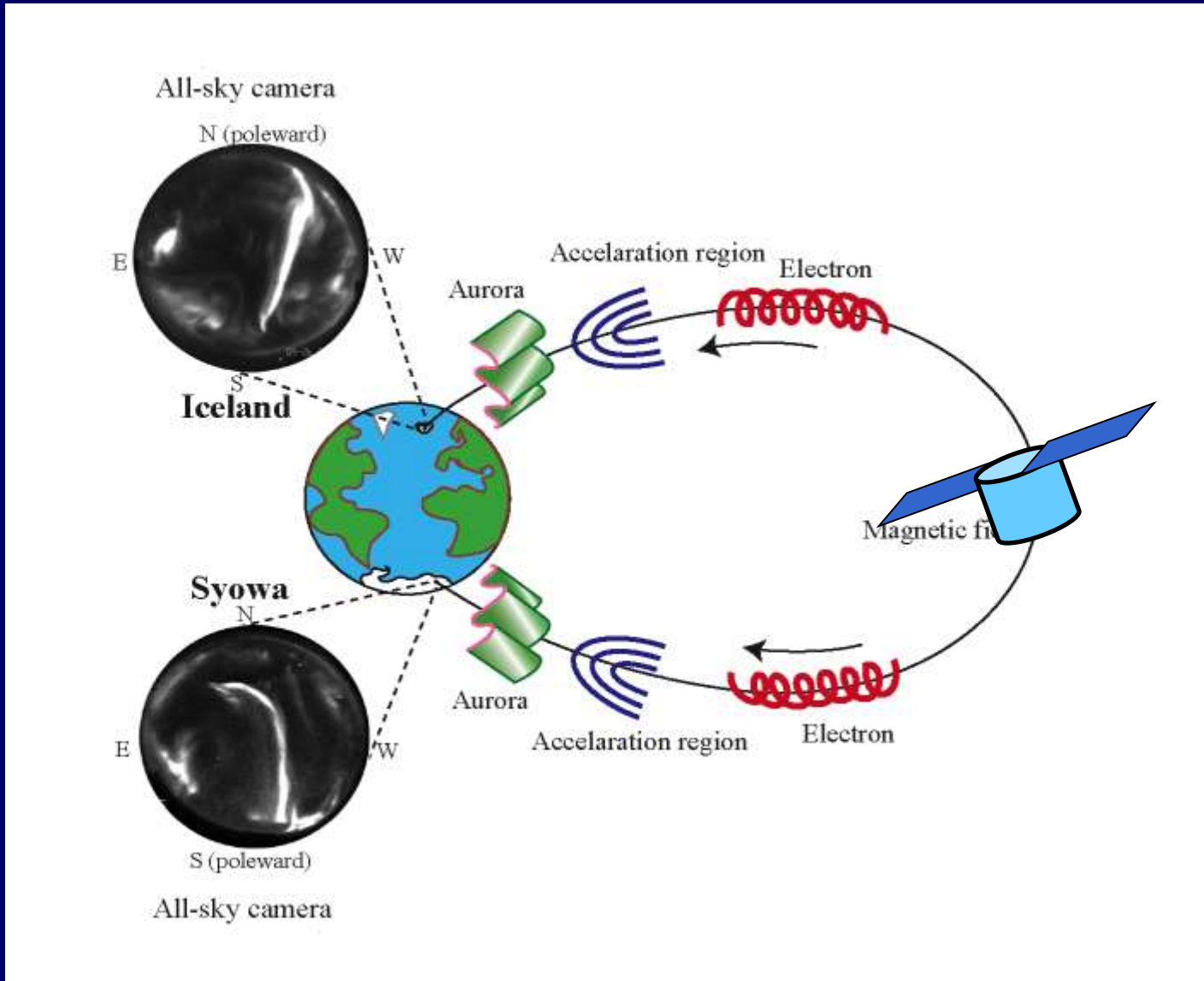


What we want to do next is

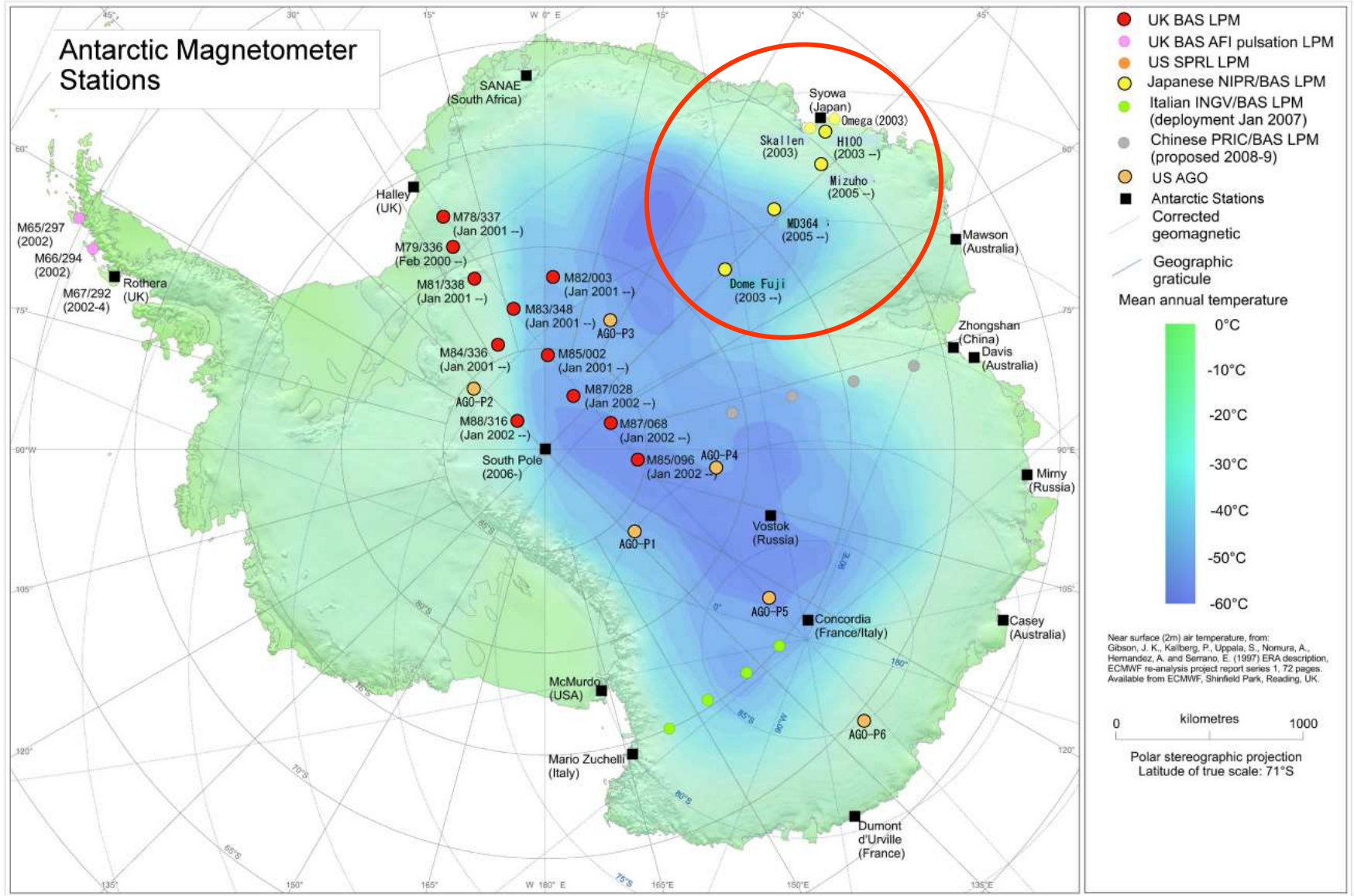
- To develop algorithm to estimate “conjugacy” more quantitatively for various auroral activity
- To develop algorithm to identify various auroral activity (breakup, poleward expansion, N-S aurora, pulsating aurora, discrete aurora, diffuse aurora, etc.) automatically to do some statistical studies by using long period Syowa Station All-sky data.

What we wish now is

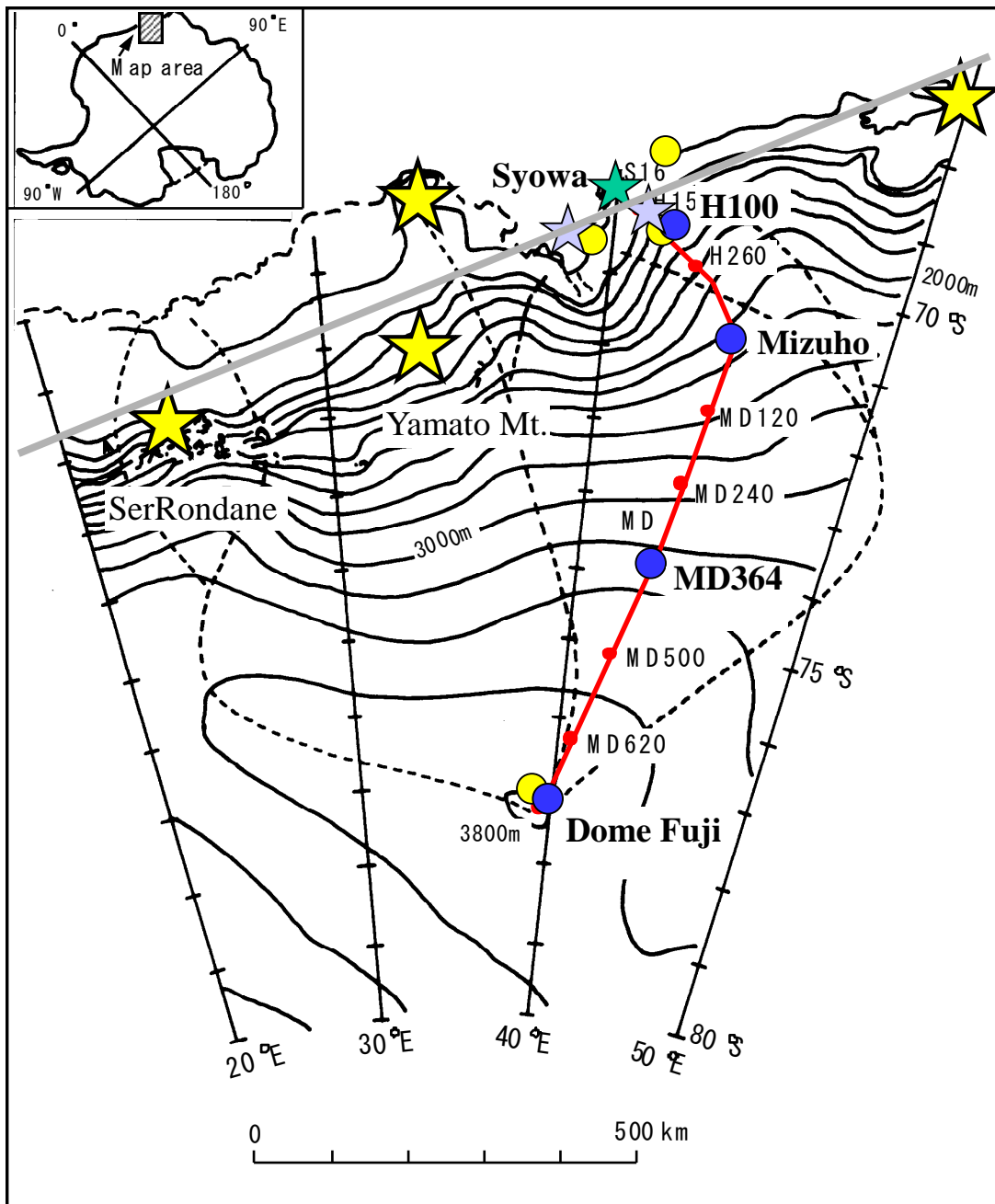
Geosynchronous Satellite on the Syowa-Iceland field line



Develop the unmanned magnetometer network



Near surface (2m) air temperature, from:
Gibson, J. K., Kalberg, P., Uppala, S., Nomura, A.,
Hernandez, A. and Serrano, E. (1997) ERA description,
ECMWF re-analysis project report series 1, 72 pages.
Available from ECMWF, Shinfield Park, Reading, UK.



Unmanned magnetometers in JARE

- **JARE-44 (2002-2004) BAS-LPM**
 Skallen [69° 40'24"S, 39° 24'07"E]
 Cape Omega [68° 34'39.4"S, 41° 04'54.1"E]
 H100 [69° 17'44"S, 41° 19'15"E]
 Dome Fuji [77° 19'01"S, 39° 42'12"E]
- **JARE-45 (2003-2005) BAS-LPM**
 H100 [69° 17'44"S, 41° 19'15"E]
 Mizuho [70° 42'7.7"S, 44° 17'4.1"E]
 Middle Point [74° 00'37.0"S, 42° 59'30.4"E]
 Dome Fuji [77° 19'01.6"S, 39° 42'31.7"E]
- ★ **JARE-46 (2004-2006) NIPR-LPM**
 S16 [69° 01'80"S, 40° 03' 65" E]
- ★ **JARE-48 (2006-2008) NIPR-LPM**
 Skallen [69° 40'24"S, 39° 24'07"E]
 H57 [69° 09'38"S, 40° 58'52"E]
- ★ **NIPR-LPM in IPY**

Comparison of BAS and NIPR type LPMs

	BAS-LPM	NIPR-LPM
Magnetometer	MAG-03MC	MAG-03MC
Resolution	16 bit	16 bit
Noise level	1 nT	0.2 nT
Low Pass Filter	100 Hz	15 Hz
Power consumption (1 sec sampling)	0.42 W	0.16 W
Data acquisition	Flash memory card	Iridium satellite Flash memory card
Command sending	×	○

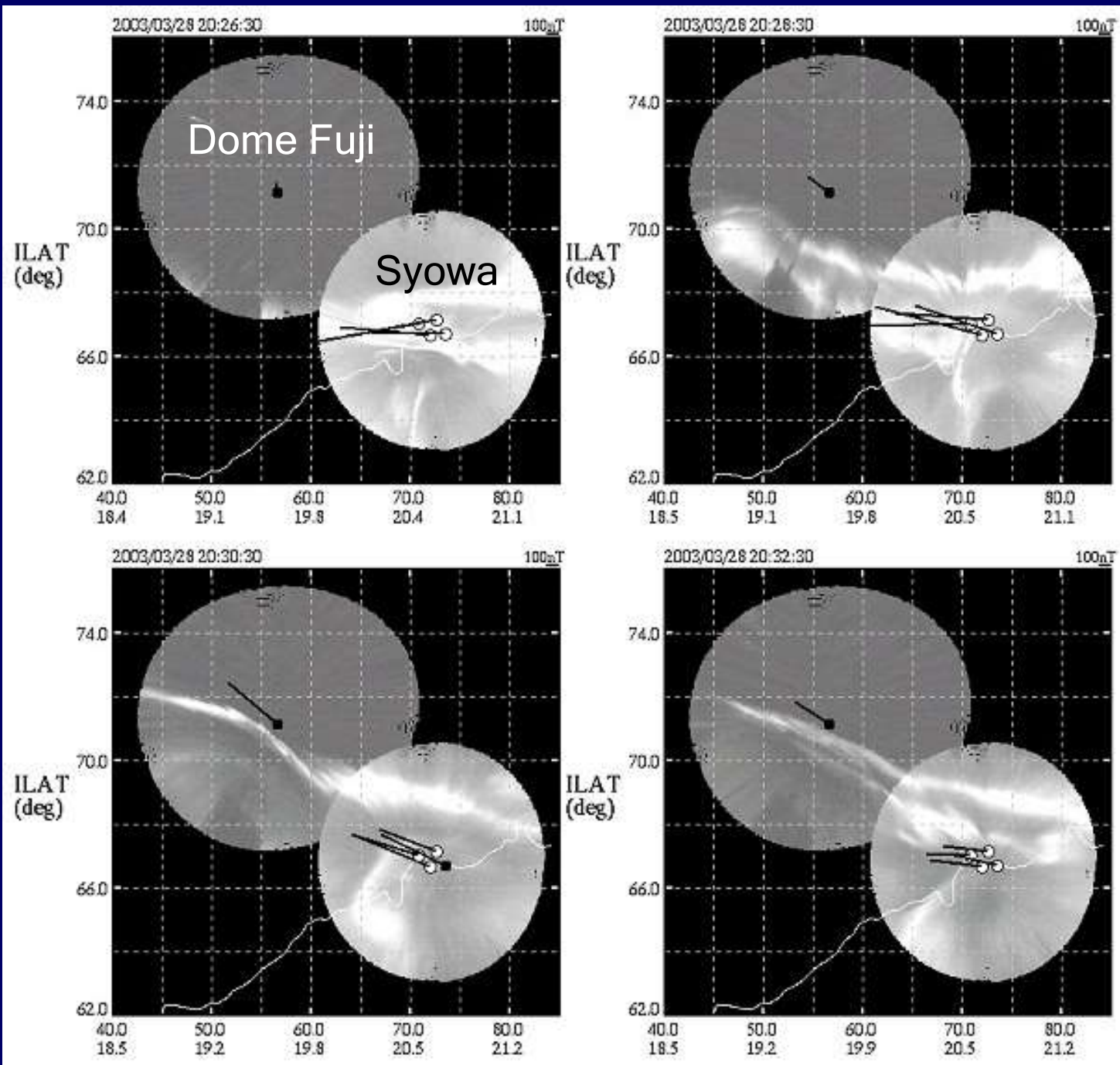
NIPR-LPM



http://polaris.nipr.ac.jp/~uap-mon/NIPR_LPM.html

BAS-LPM and All-sky TV in 2003

Middle scale evolution



Program of the Antarctic Syowa MST/IS Radar (PANSY)

Mesosphere, Stratosphere and Troposphere
/ Incoherent Scatter Radar

K Sato, M Tsutsumi, T Sato, A Saito,
Y Tomikawa, K Nishimura, T Aso, T Yamanouchi, M Ejiri



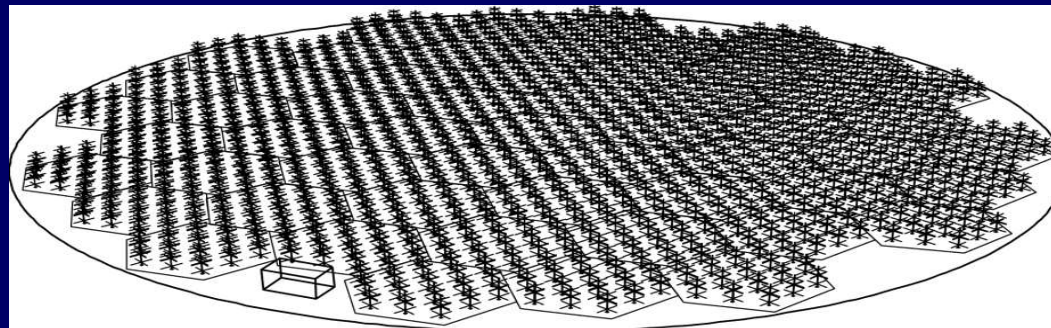
PANSY is derived from the French word, 'pensee', meaning 'thought'



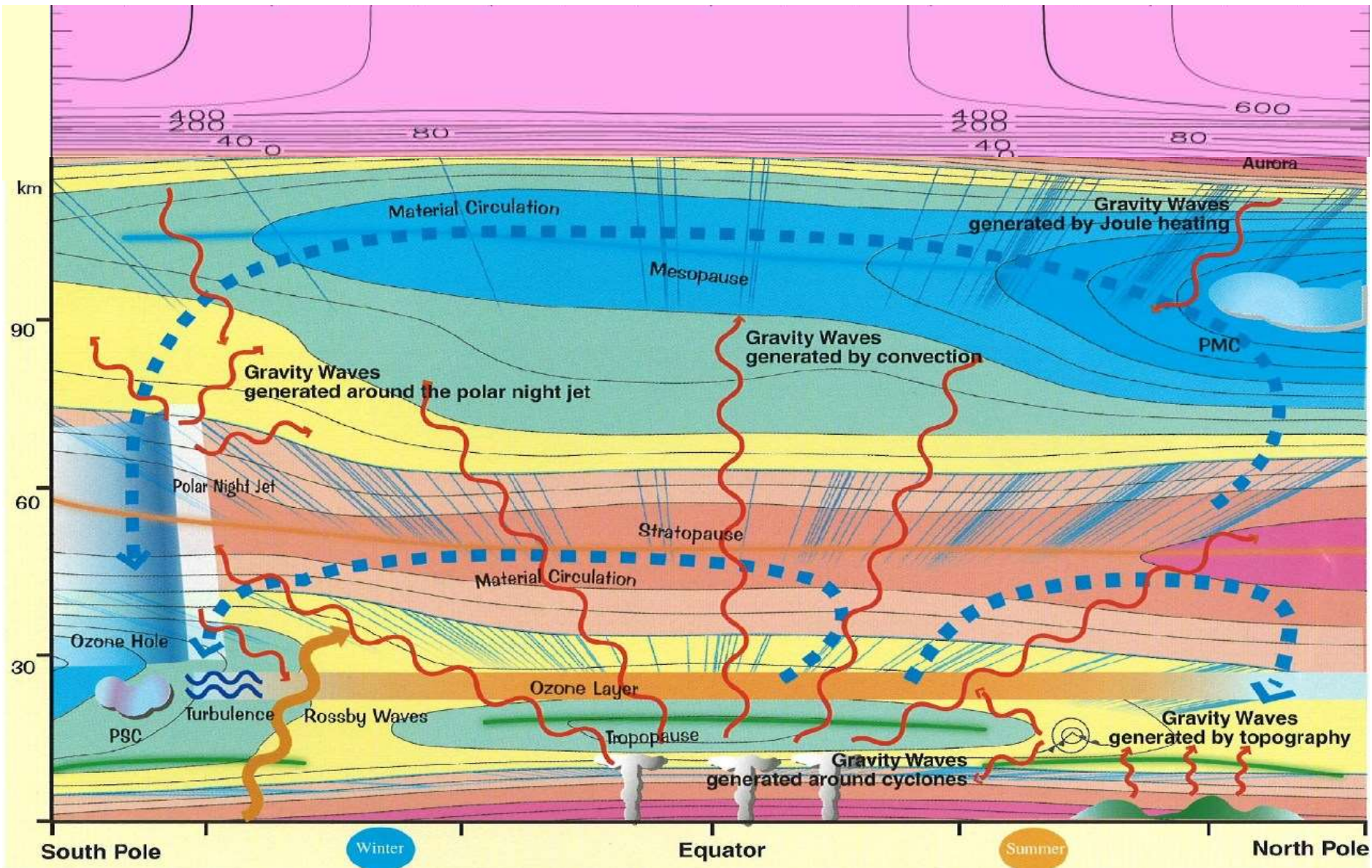
Specifications of PANSY

- Height coverage : 1 ~ 500km
- Three dimensional winds and plasma parameters
- Fine time and height resolutions

System	Pulse Doppler radar. Active phased array system
Center freq.	~ 50MHz
Antenna	A quasi-circular array consisting of about 1000 crossed Yagi antennas. Diameter about 160m
Transmitter	About 1000 solid-state TR modules Peak Power : 500kW
Receiver	About 50 channel digital receiving system



Research Topics of PANSY



The lack of observations in polar regions hinders quantitative understanding of the whole atmosphere

Feasibility Study



Syowa station



Field survey



Light-weight test antenna



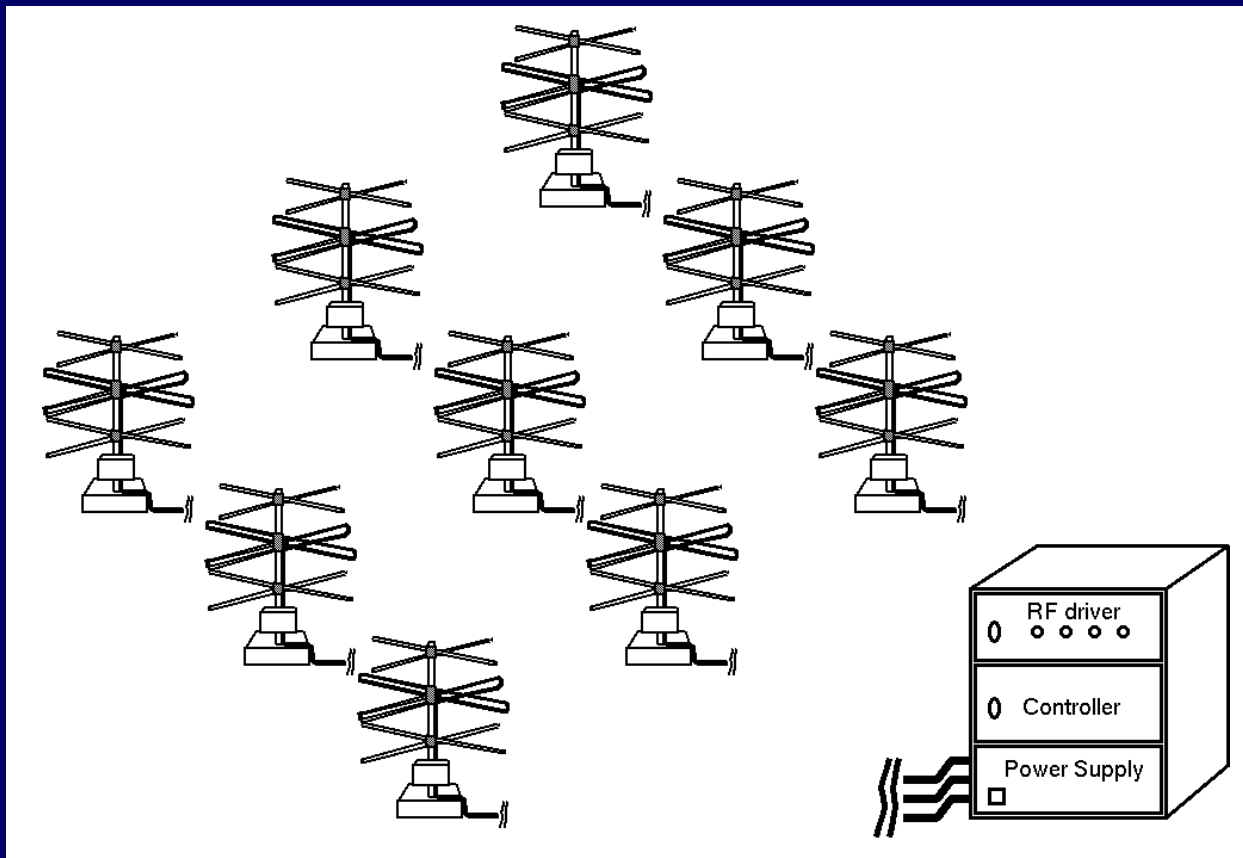
Prototype power-efficient
(class-E) amplifier



Pilot System for PANSY (2007-2008)

Comprehensive test

- Light-weight and robust antennas
- Power-efficient class-E amplifiers

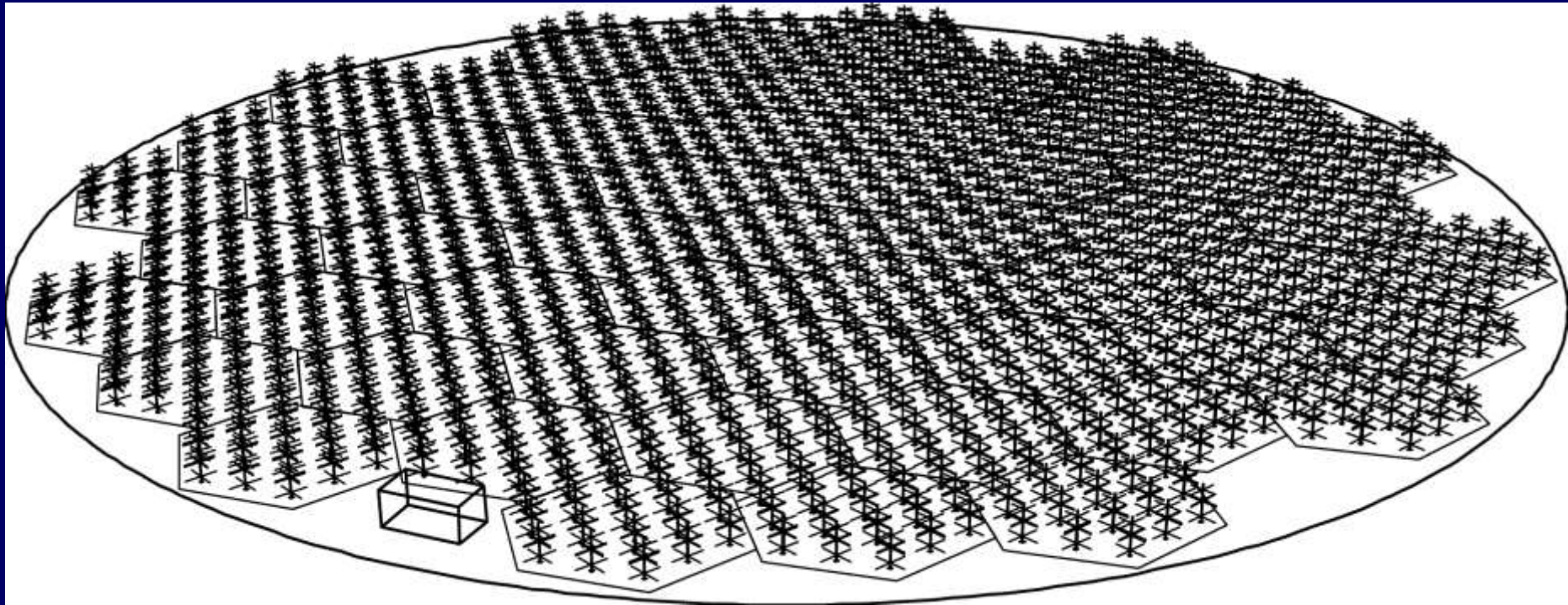


Scientific study as a meteor wind radar as well

... and Sometime in the Near Future



Problem: Budget (~5,000 million yen), Power, Land



The first MST/IS radar in the Antarctic

Summary : Japanese activity for the ICESTAR

- To maintain and intensify the **Syowa - Iceland conjugate observations**.
- *To transfer the data to Japan in near real time*
- *To make the data accessible for the community more quickly and more easily.*
- To develop the **unmanned magnetometer network** in the Antarctic.
- To maintain other facilities at Syowa Station, including the two **SuperDARN radars**, etc.
- To do coordinated studies using MF radar, Meteo radar, EISCAT radar, etc.
- To do feasibility studies for the **MST/IS radar (PANSY)** at Syowa