

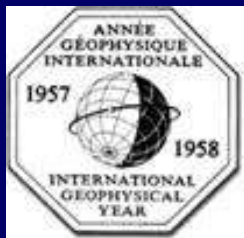
Progress in the ICESTAR related Activities in NIPR, Japan During IPY2007-2008

¹Akira Kadokura, ¹Natsuo Sato, ¹Hisao Yamagishi,
¹Takehiko Aso, ¹Makoto Taguchi, ¹Masaki Tsutsumi,
¹Akira Yukimatsu, ¹Yasunobu Ogawa, ²Kaoru Sato and
³Yusuke Ebihara

¹ *National Institute of Polar Research, Tokyo, Japan*

² *University of Tokyo, Japan*

³ *Nagoya University*



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

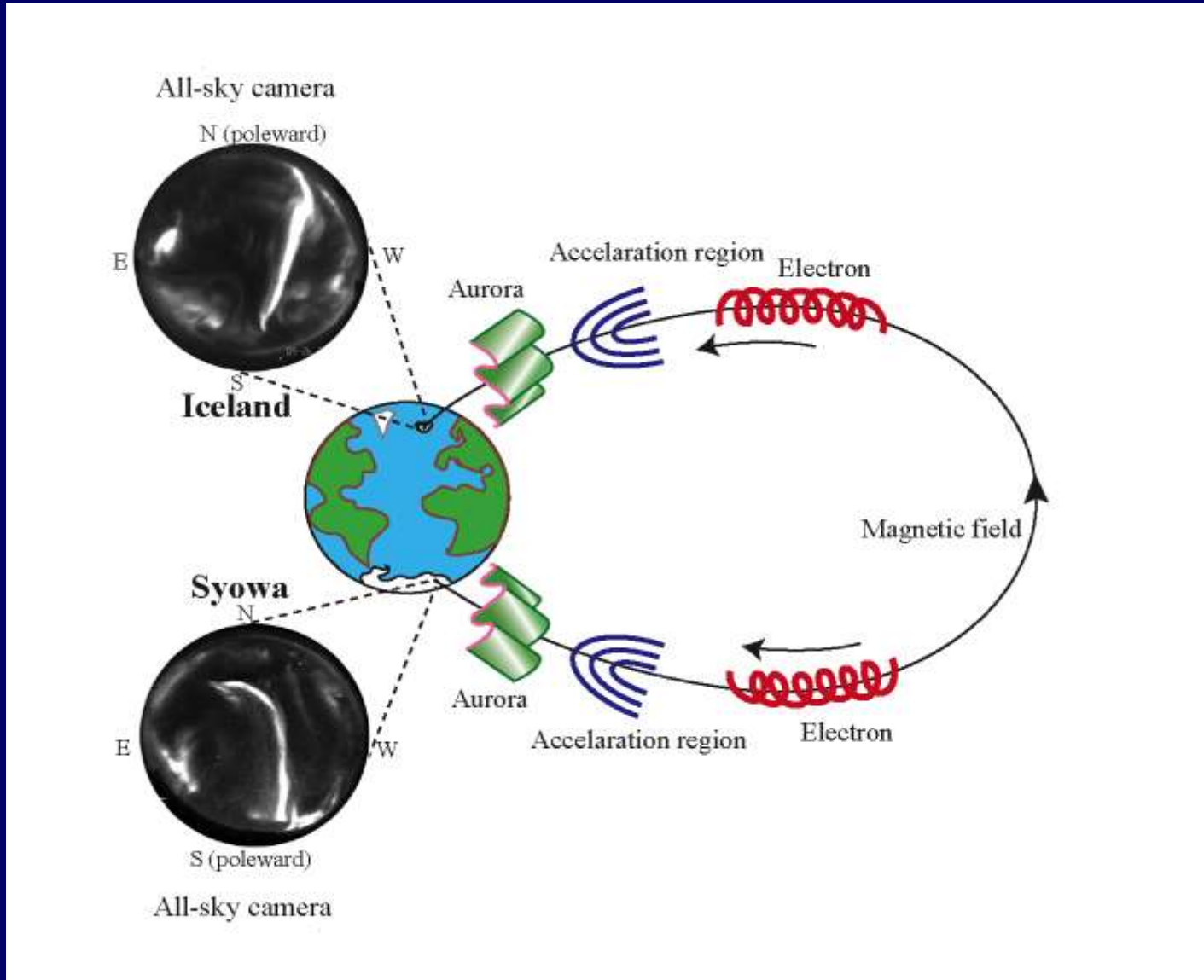
Lead contact : Masaki Tsutsumi (NIPR)

(tutumi@nipr.ac.jp)

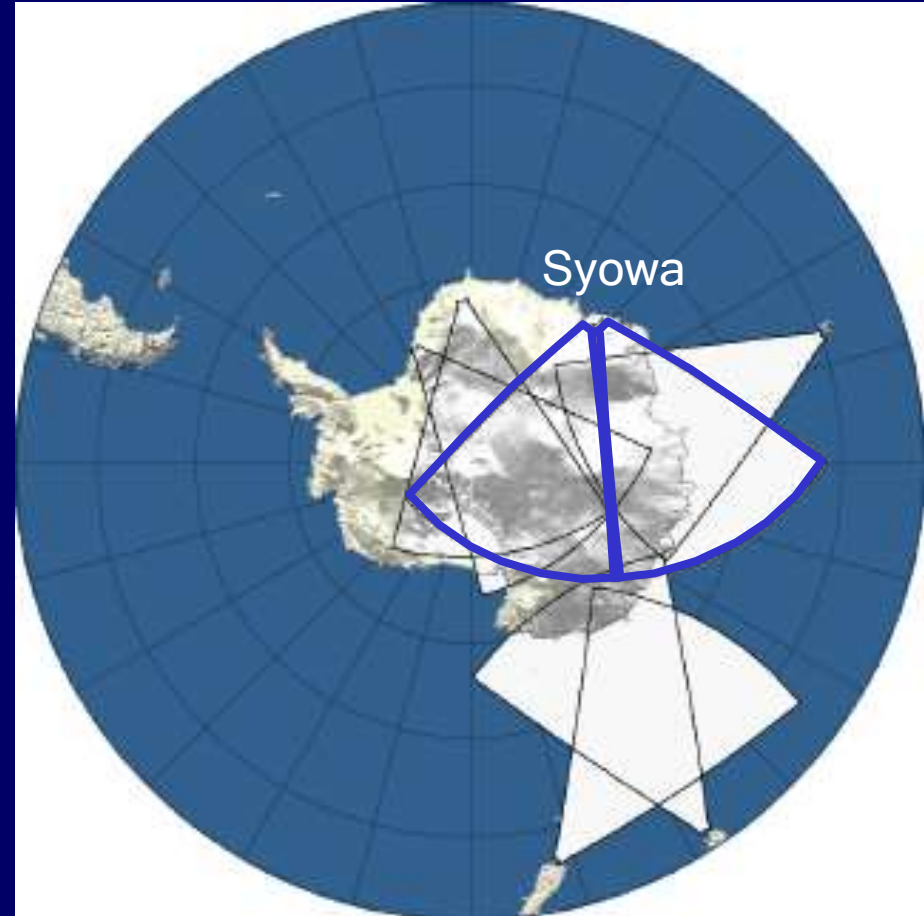
Kaoru Sato (Univ. Tokyo)

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

Conjugate Observation at Syowa and Iceland



SuperDARN radar network

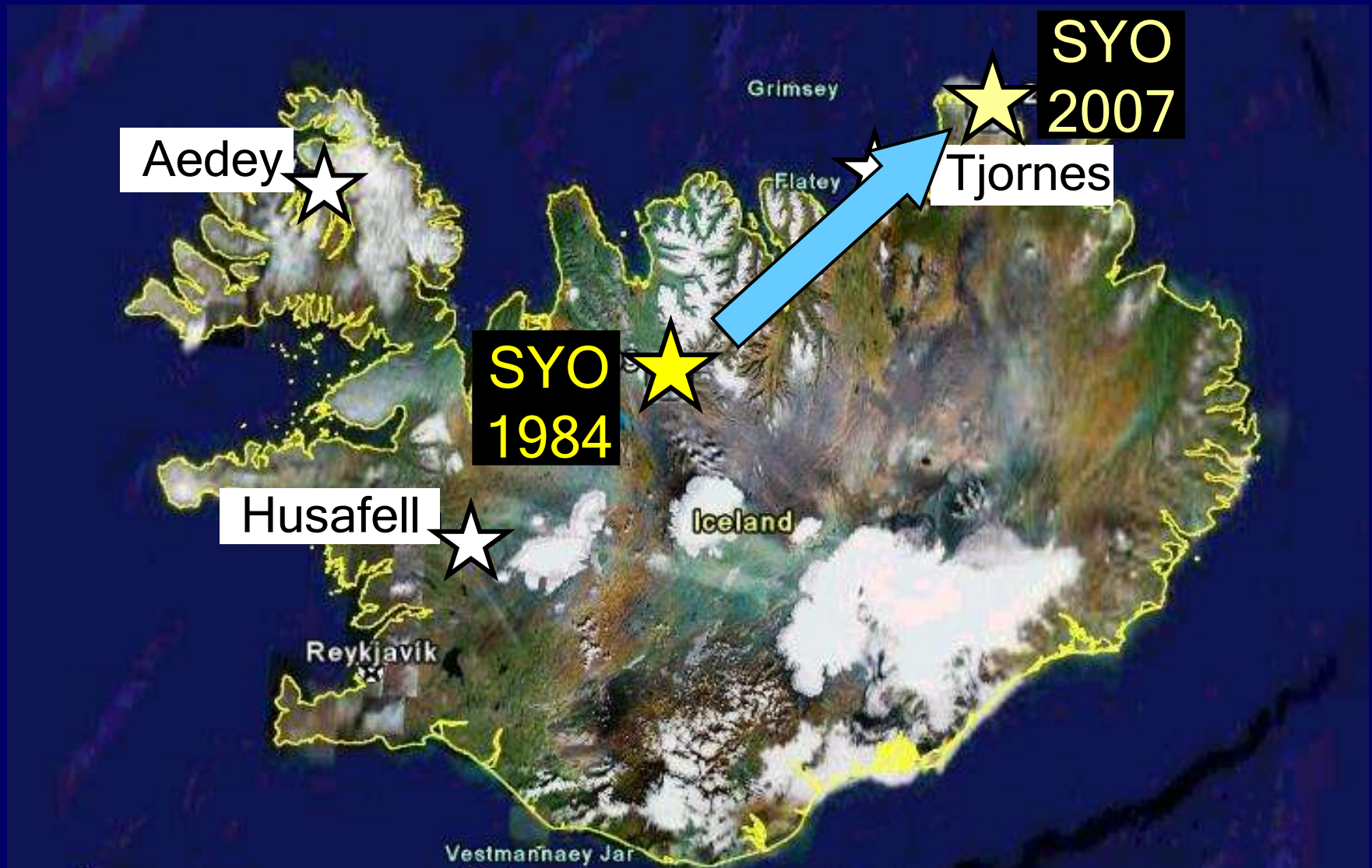


Conjugate area relating with our EoI #422

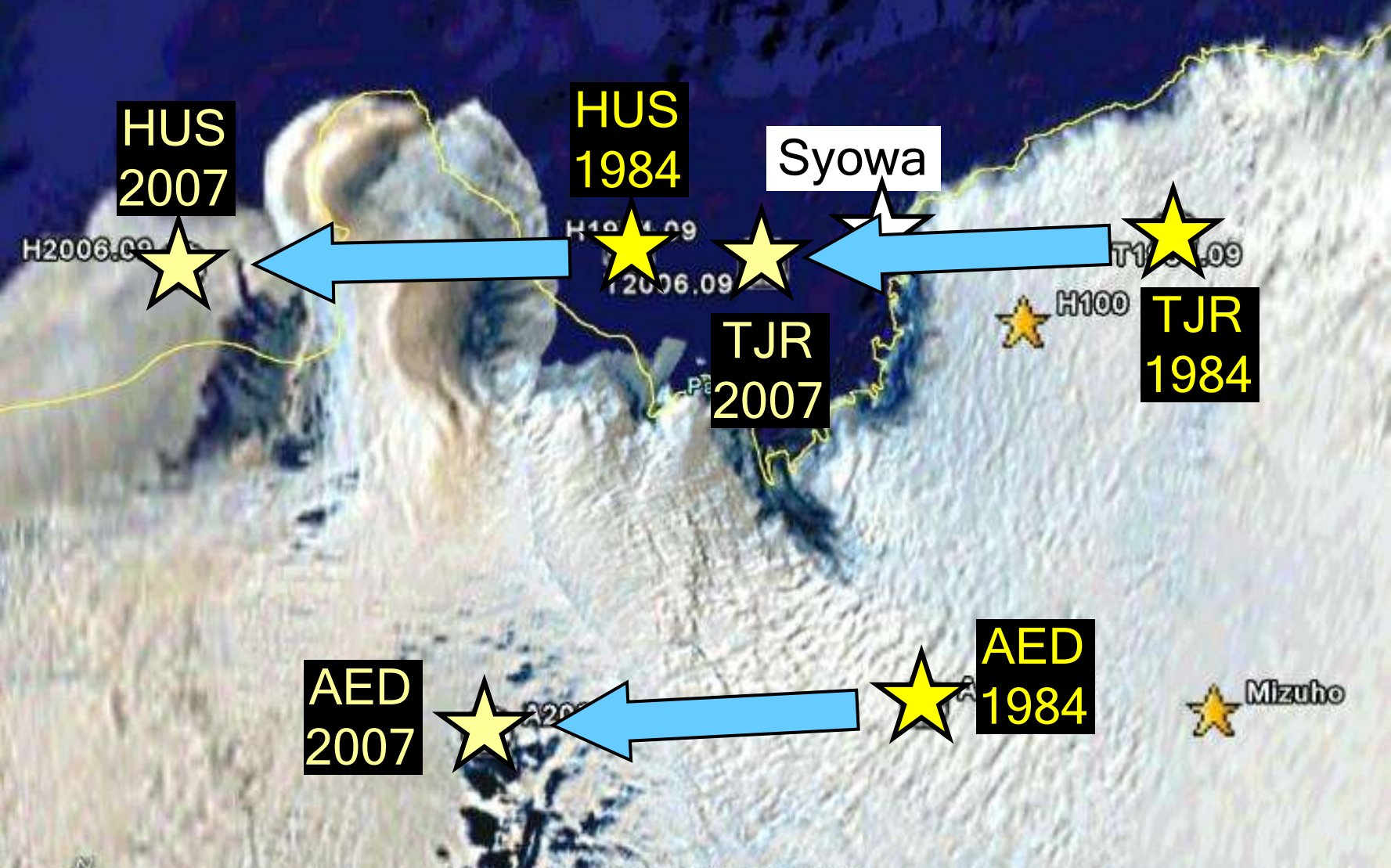


Geomagnetic mapping

Conjugate point of Syowa Station in Iceland (IGRF)



Conjugate point of Iceland in the Antarctic (IGRF)



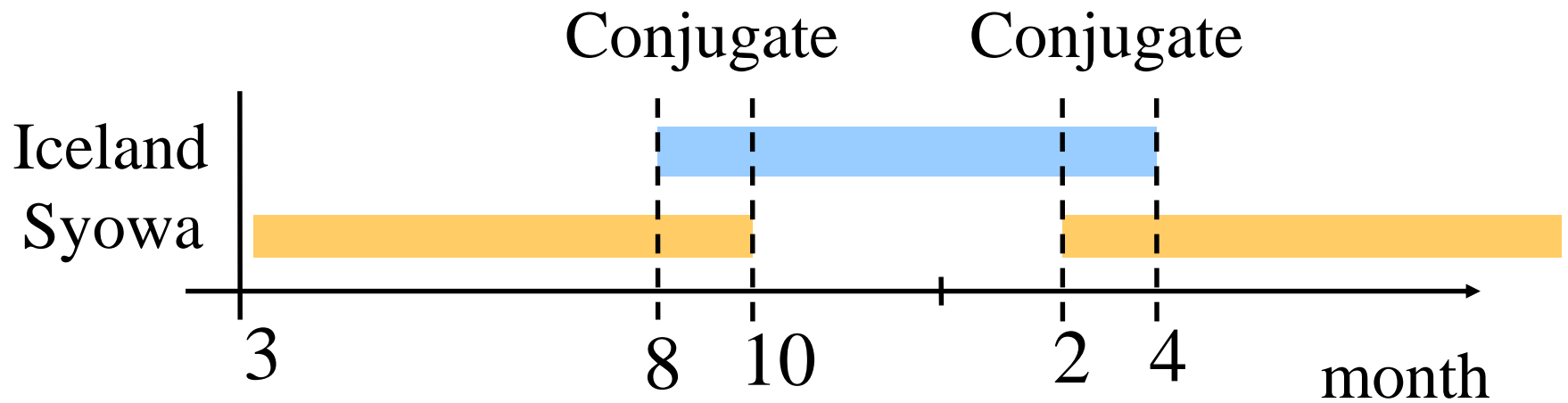
Instruments at conjugate stations (1)

	SYO	HUS	TJR	AED
Fluxgate magnetometer	○	○	○	○
Induction magnetometer	○	○	○	○
VLF receiver	○	○	○	○
Riometer	○	○	○	○
Imaging Riometer	1992	1997	1990	
All-sky TV camera (ATV)	○	○	○	
Wide field-of-view TV camera (WTV)		○	○	
All-sky Color Digital Camera (CDC)	○	2005	2005	
All-sky monochromatic Imager (CAI)	○	2005		
Meridian Scanning Photometer	○	2008		
Fabry-Perot Imager	○			

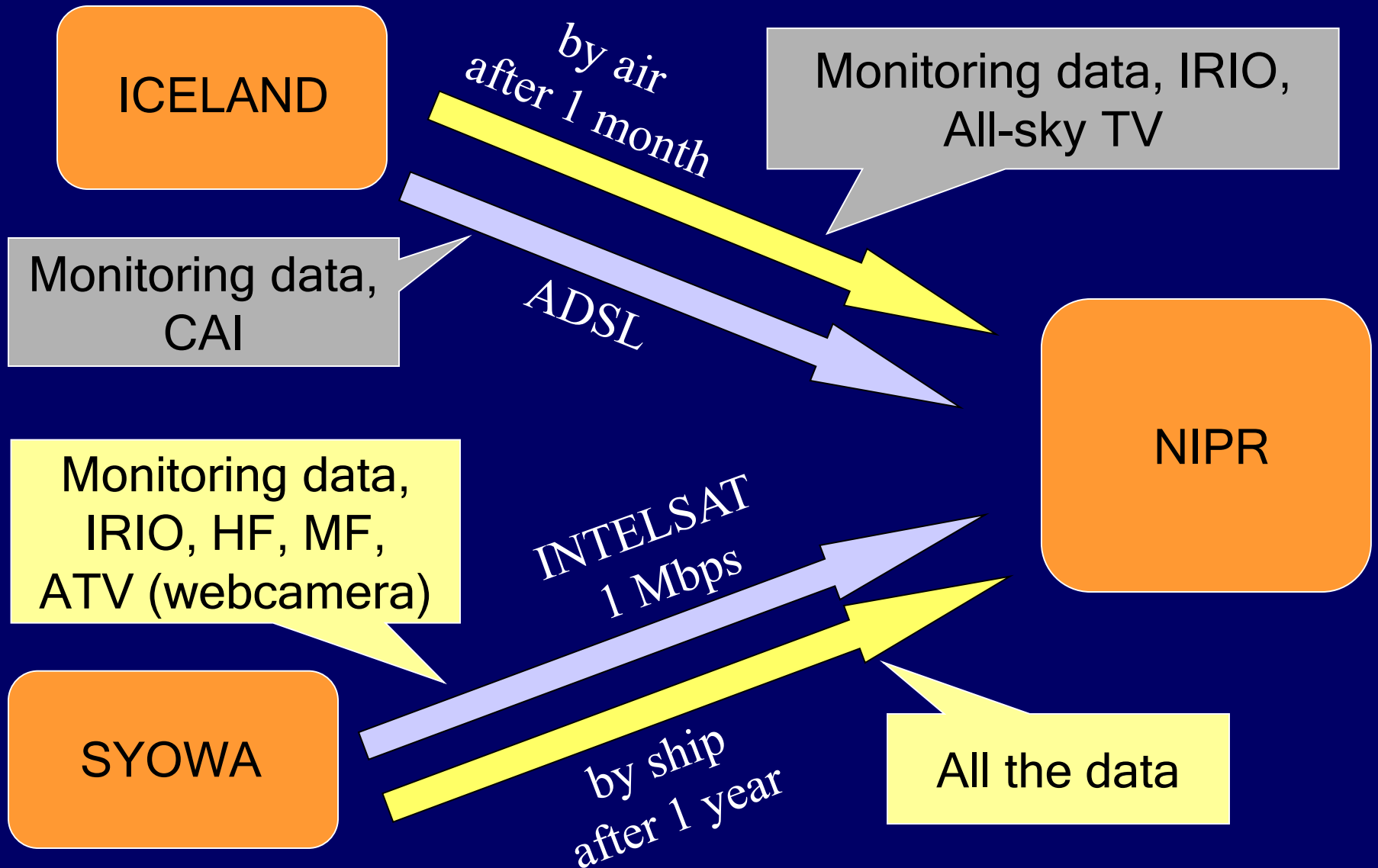
Instruments at conjugate stations (2)

	SYO	HUS	TJR	AED
SuperDARN radar	○		1996	
MF-radar	○			
Ionosonde (NiCT)	○			
FM/CW radar (NiCT)	○			
VHF Doppler radar (NiCT)	○			
Solar radio emission (Tohoku Univ.)		2004		
MF Auroral emission (Tohoku Univ.)		2005		
GPS TEC & Scintillation (A.S. of Malaysia)	○	2008		

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



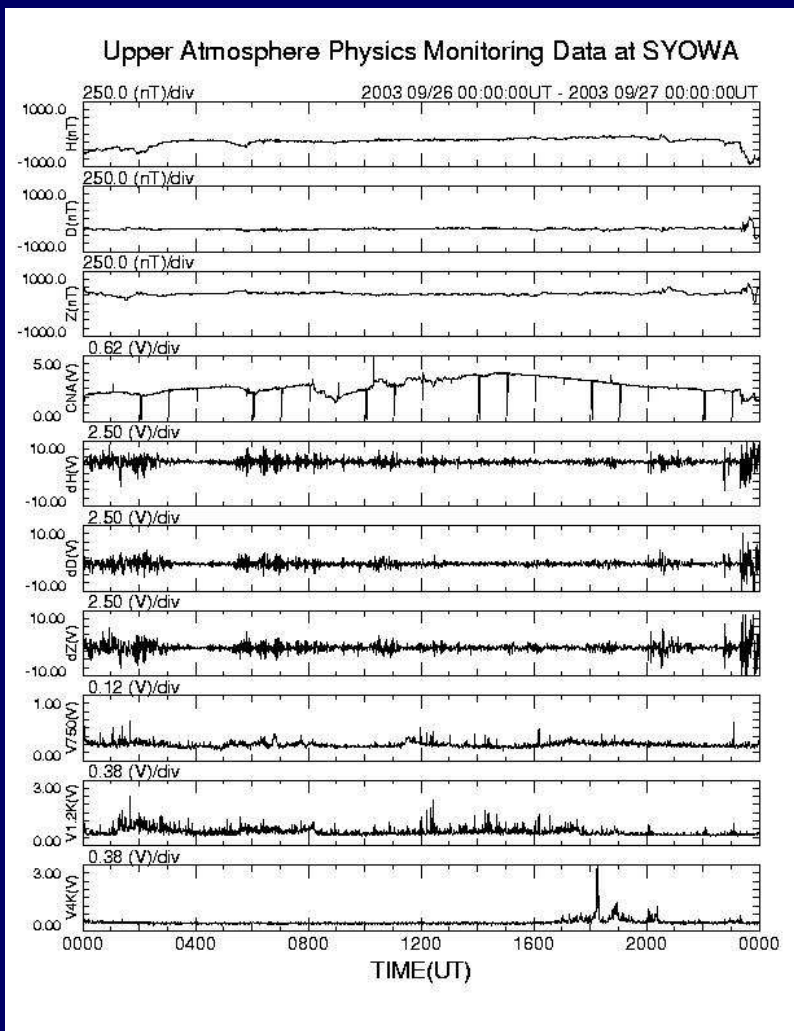
Flow of the Syowa - Iceland conjugate data



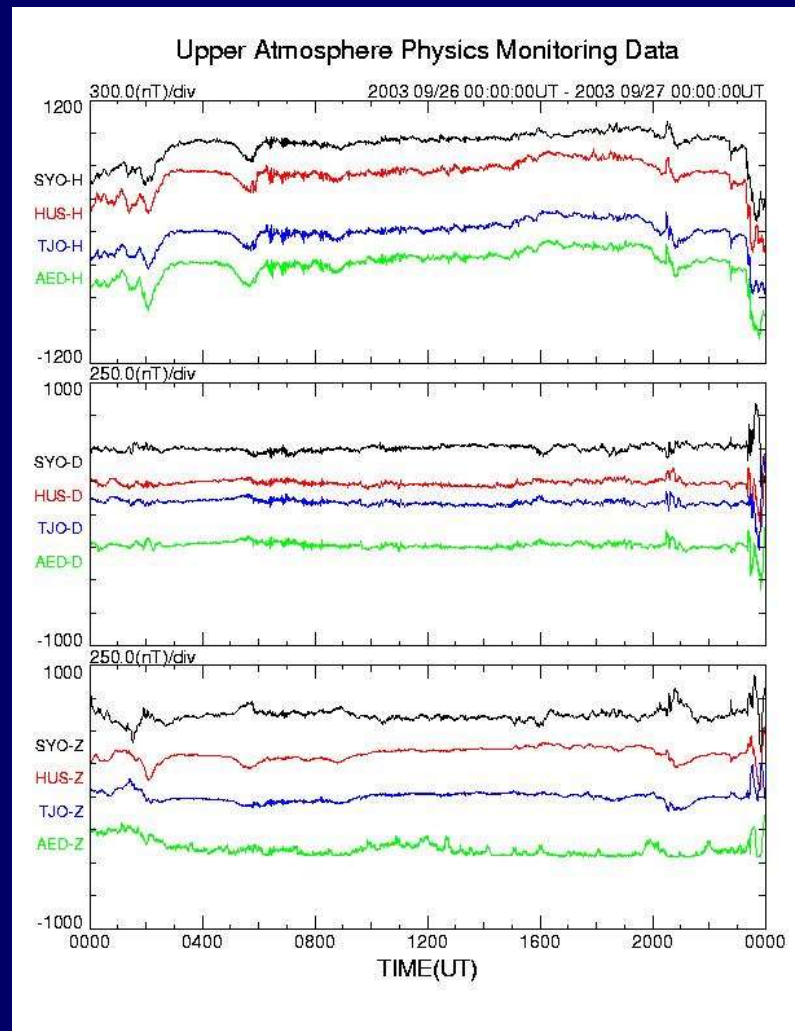
Syowa - Iceland conjugate data Web site

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

Single Station and Multi-Item

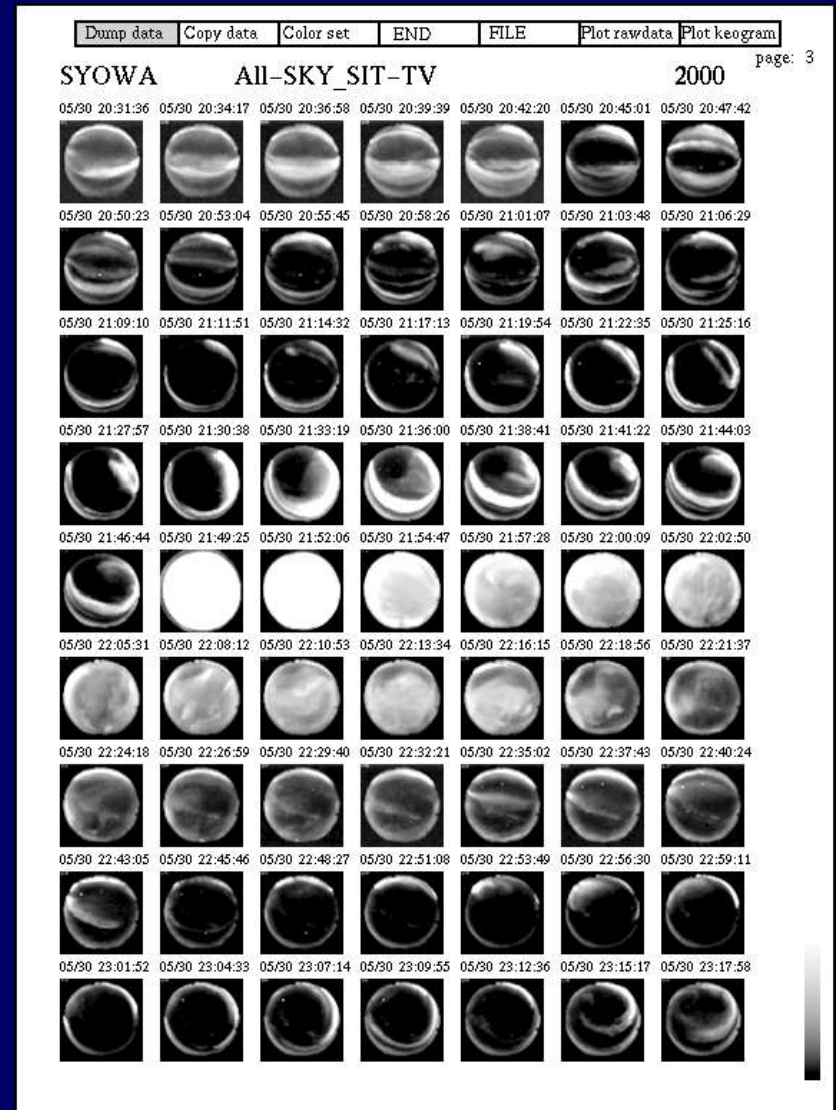
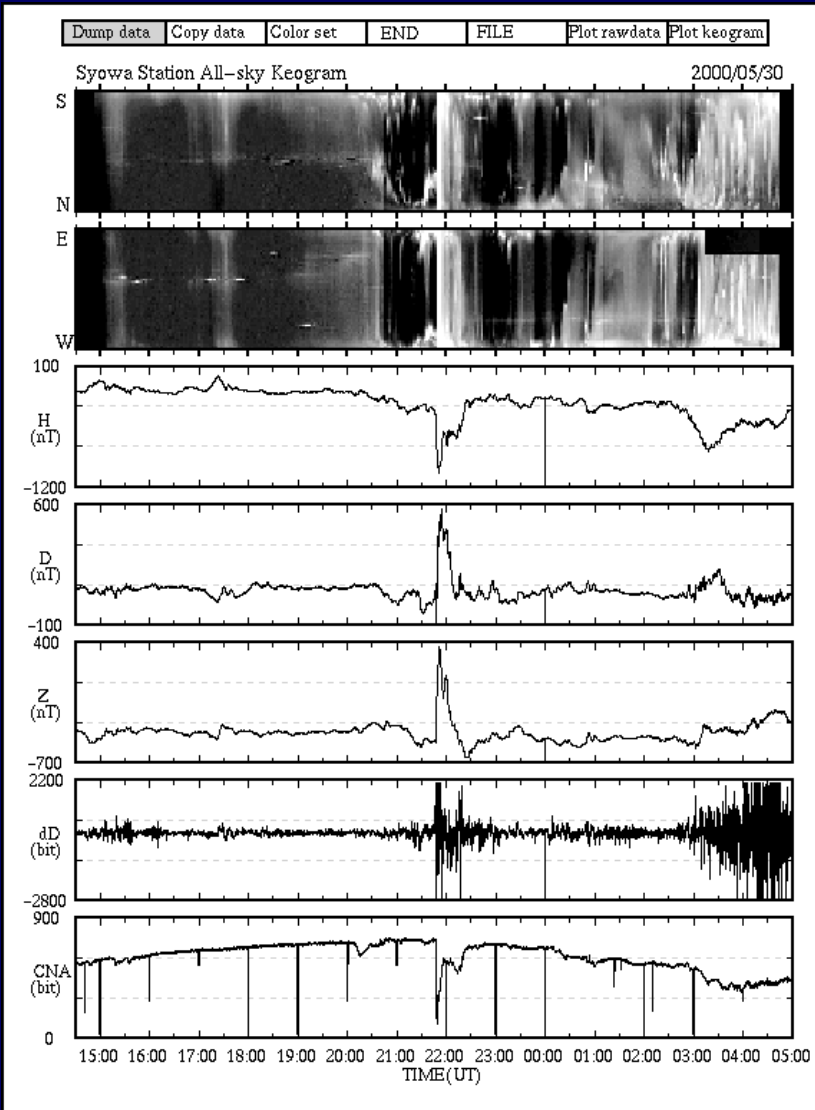


Multi-Station and Multi-Item

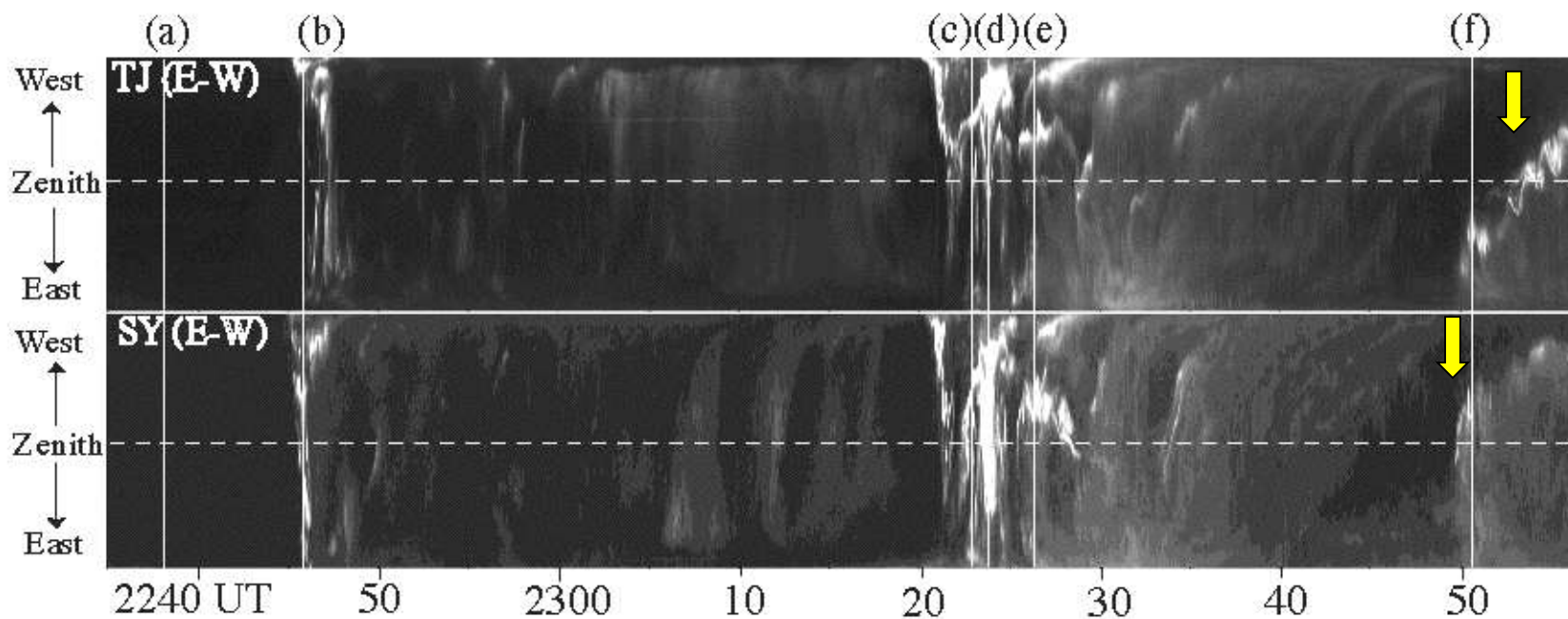
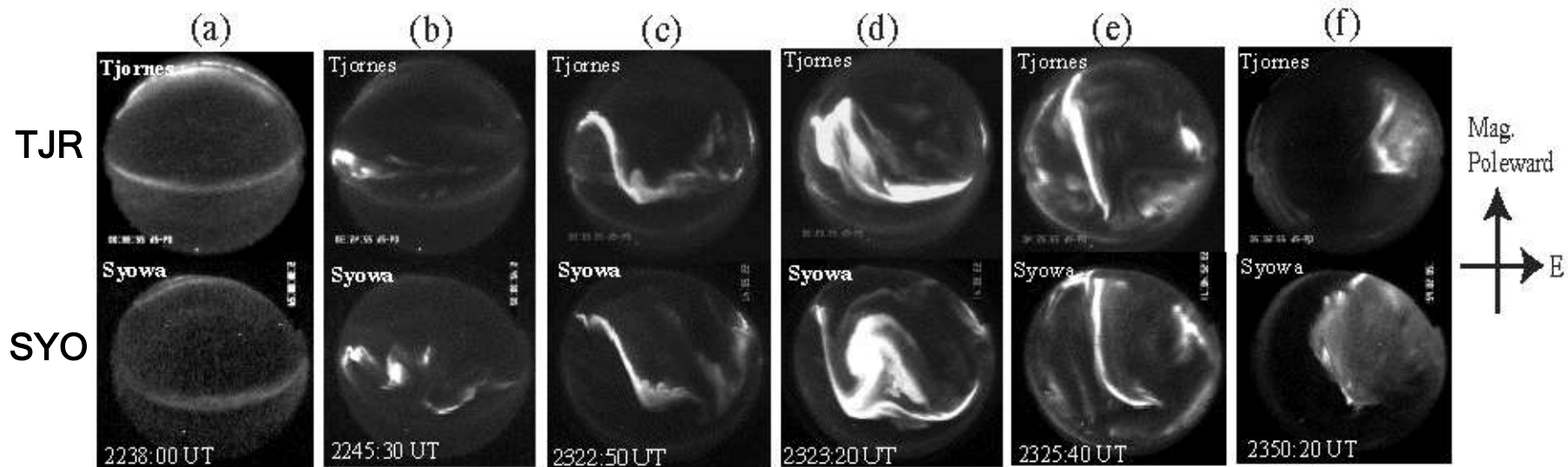


Syowa Auroral observation Web site

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



September 26, 2003 event

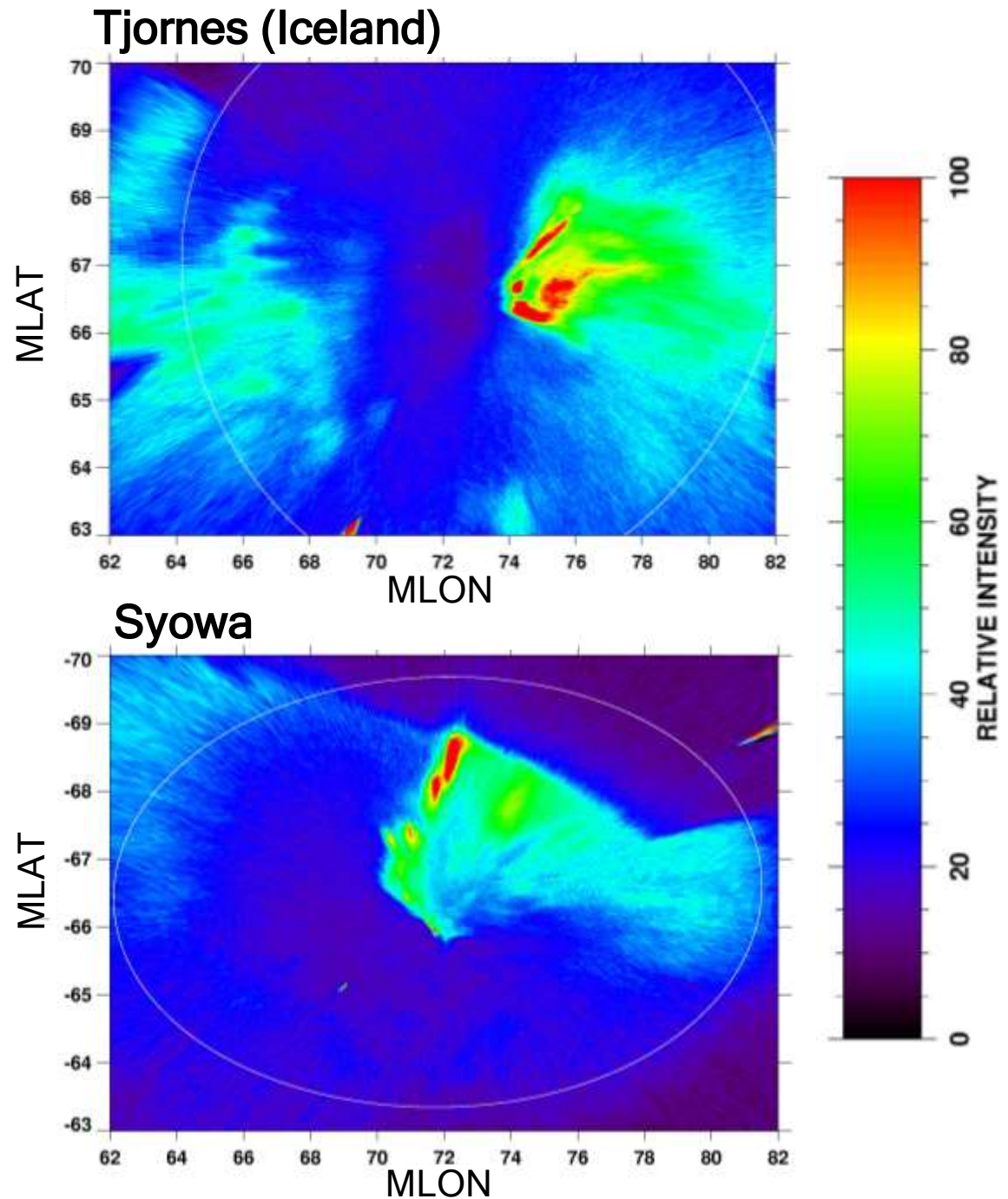


by Natsuo Sato

Best conjugate event

on Sep. 26, 2003

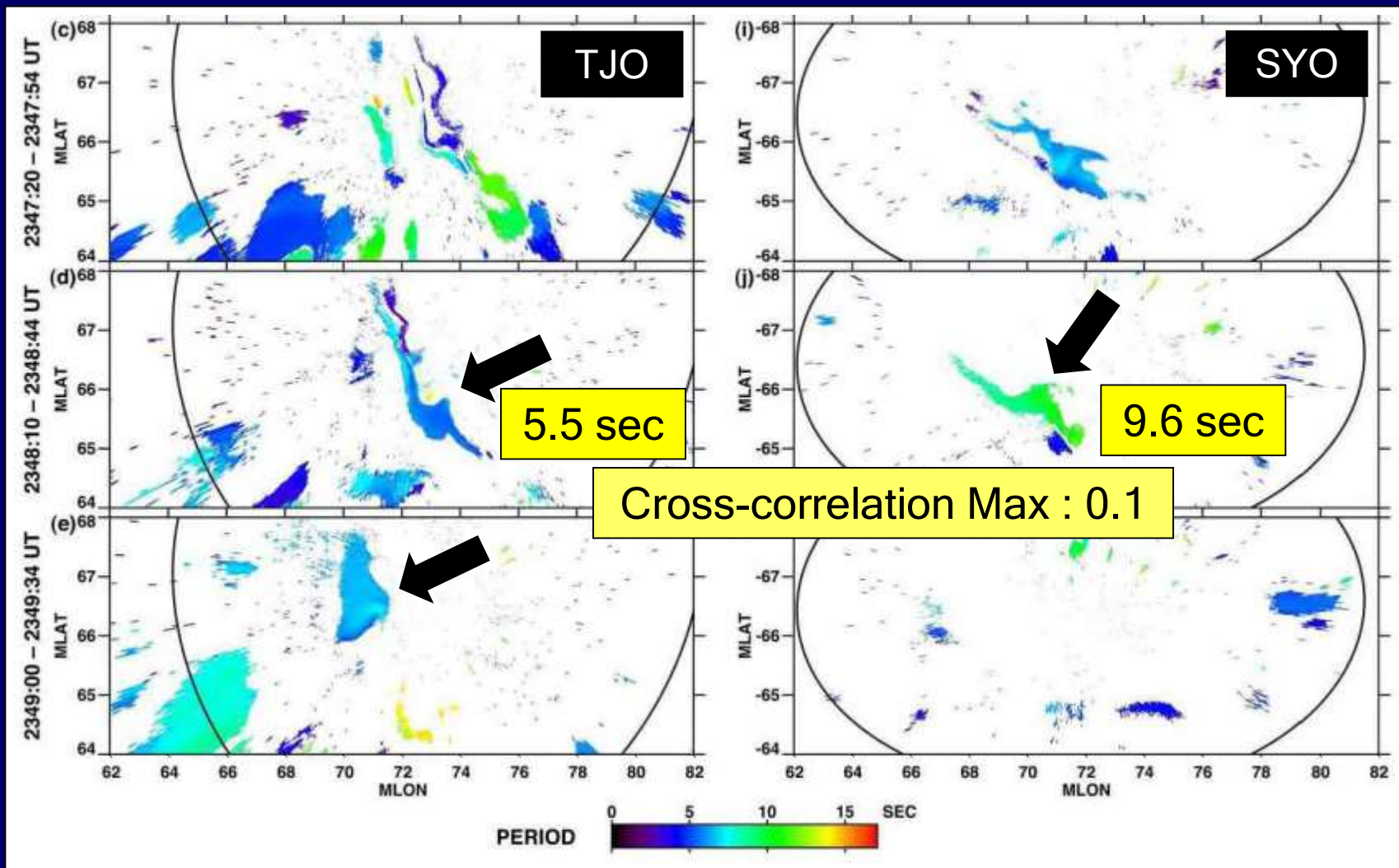
Displaced
longitudinally
about 4 deg
within 30 min



Conjugacy of Pulsating Aurora

Period ($R > 0.1$)

Sep. 26, 2003

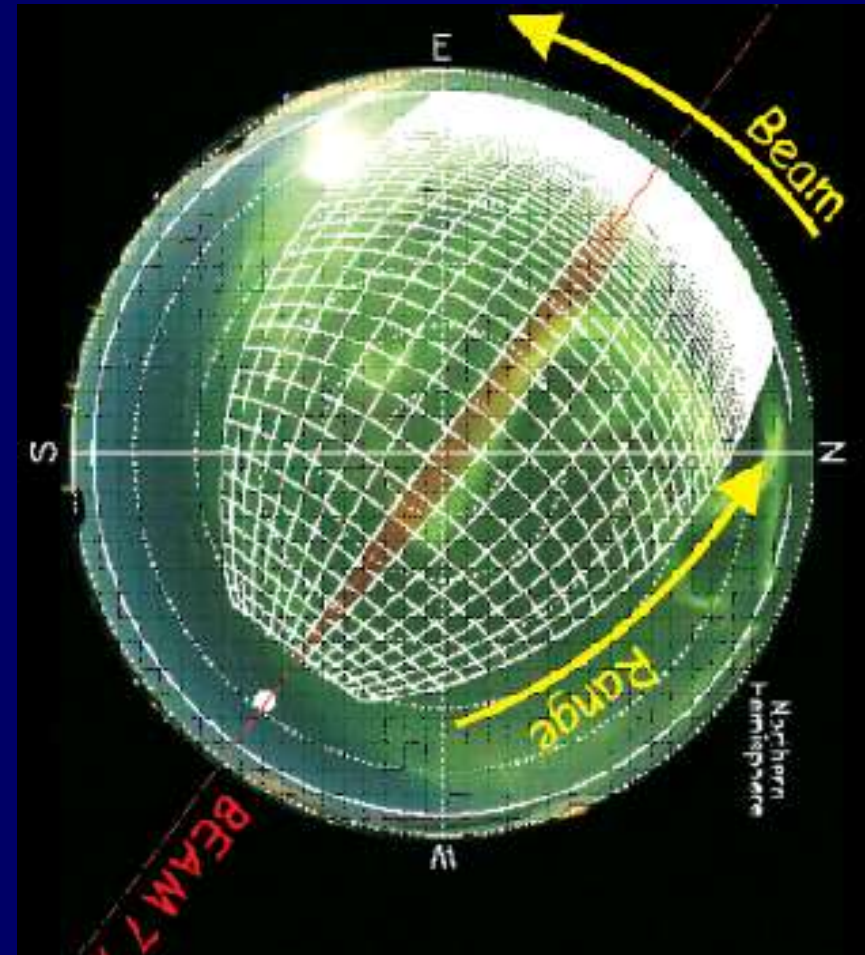
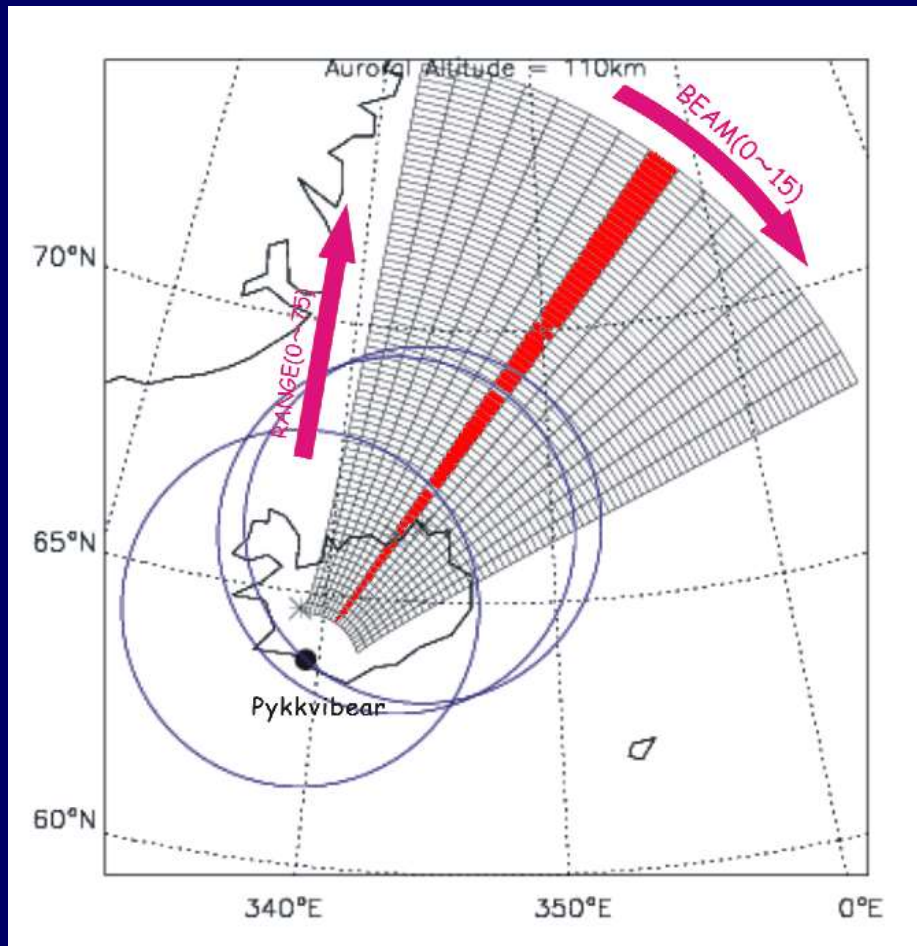


Shape is similar, but period is different.
Some appear only one hemisphere.

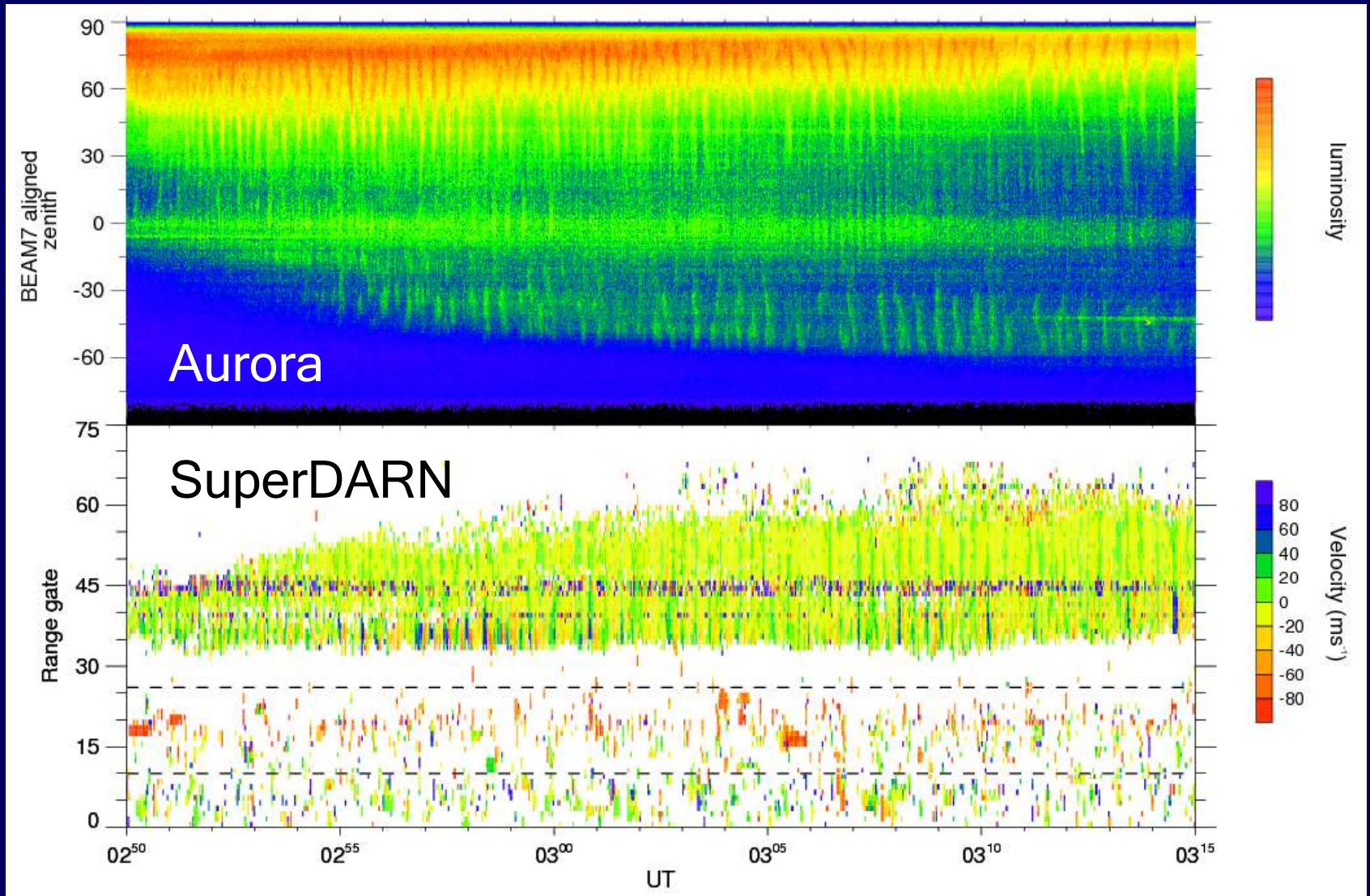
Watanabe et al.
(*GRL*, 2007)

Simultaneous observation of Pulsating aurora with SuperDARN radar and ATV at Tjornes

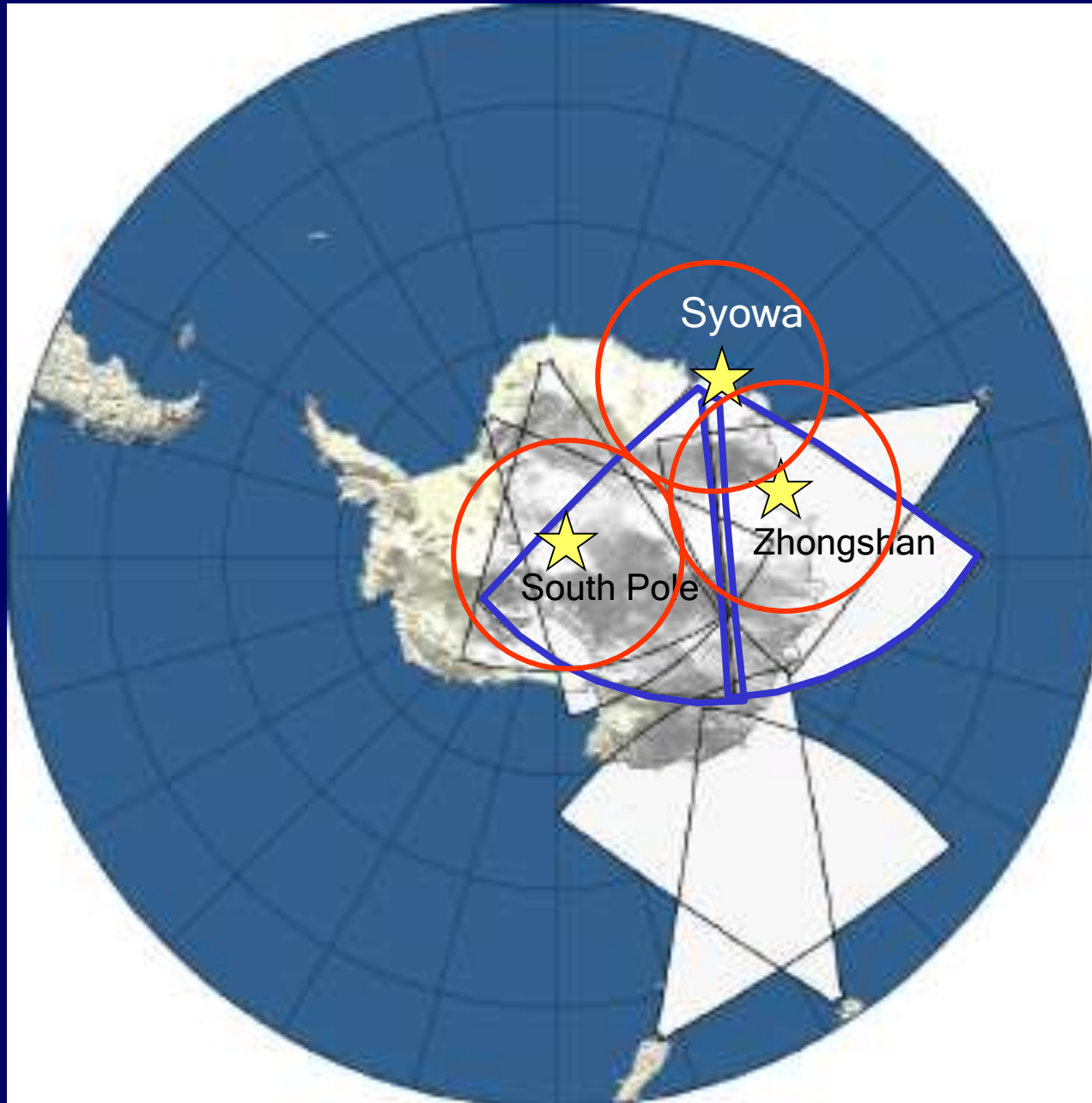
Collaboration with Univ. of Electro-Communications



Simultaneous Observation of Pulsating Aurora with SuperDARN radar and ATV at Tjornes



Optical and Radar Network in Antarctica



Multi-color All-sky Imager at South Pole

All-Sky Imager at South Pole Station

Nagoya University / Siena College / National Institute of Polar Research



日本語

We are observing aurora australis (southern lights) at the South Pole Station.

[Previous data\(2008\)](#)

[Previous data \(1997-2005\)](#)

[Sample images](#)

[Instrument](#)

[Publication](#)

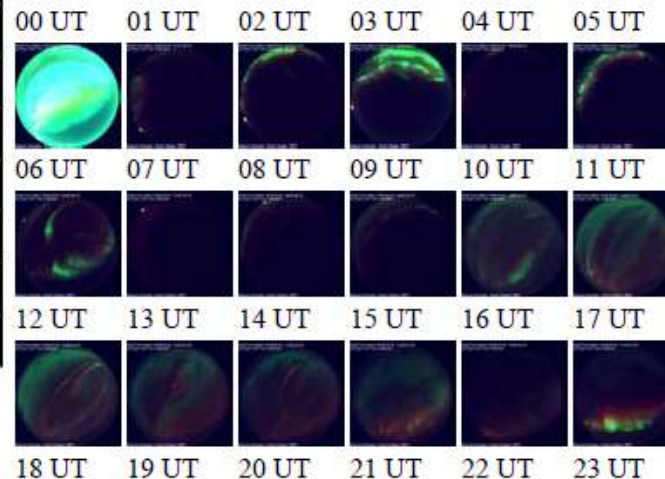
[Presentation](#)

[Contact](#)

[Acknowledgement](#)

108071 since 2003.

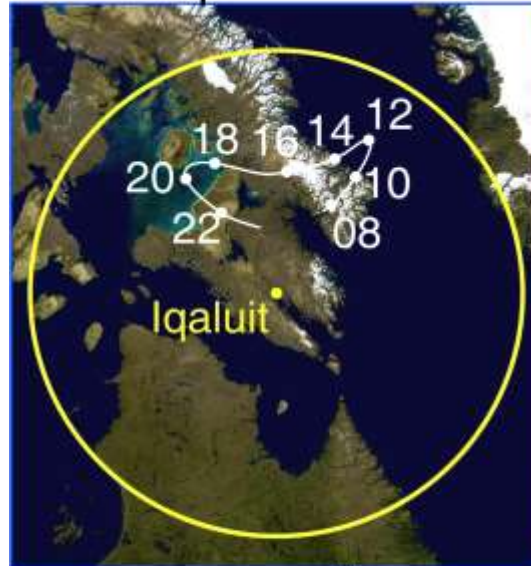
Latest auroral images taken on 2008-06-25



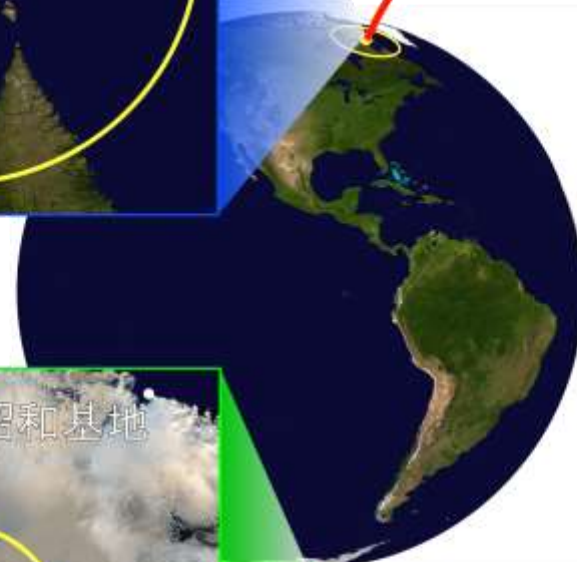
Conjugate Observation at Cusp Latitudes

South Pole
~
Iqaluit, Canada

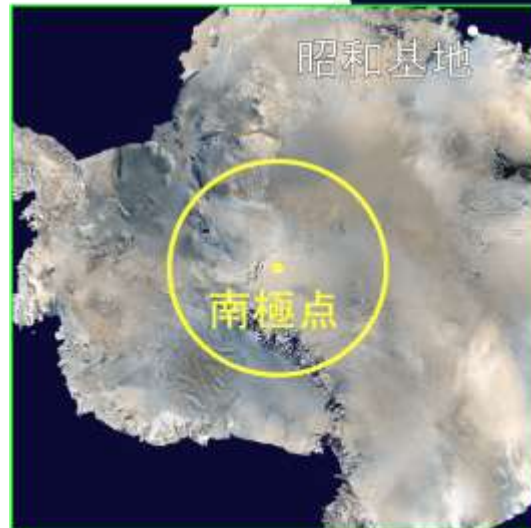
Iqaluit (Canada)



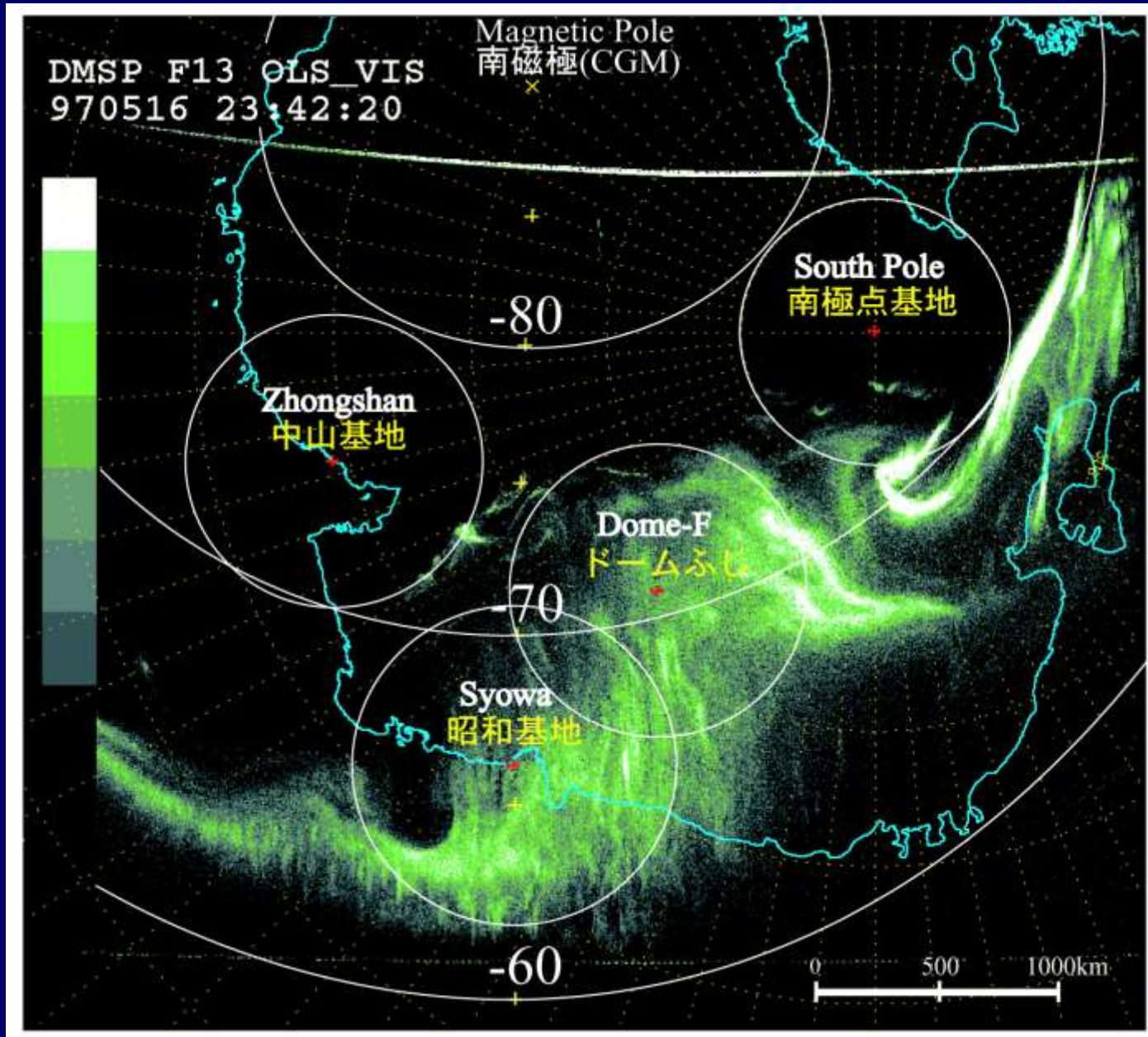
field line



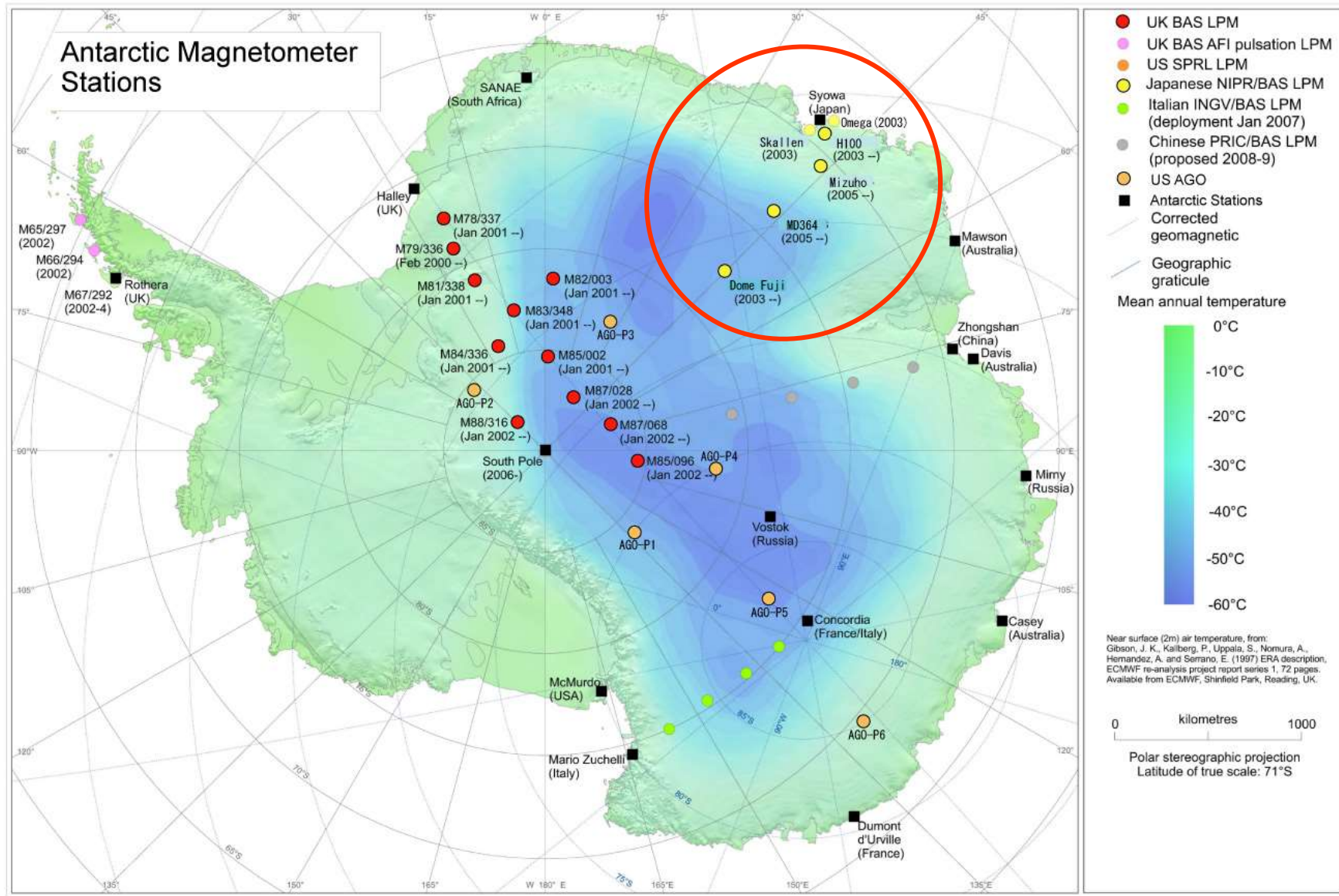
South Pole

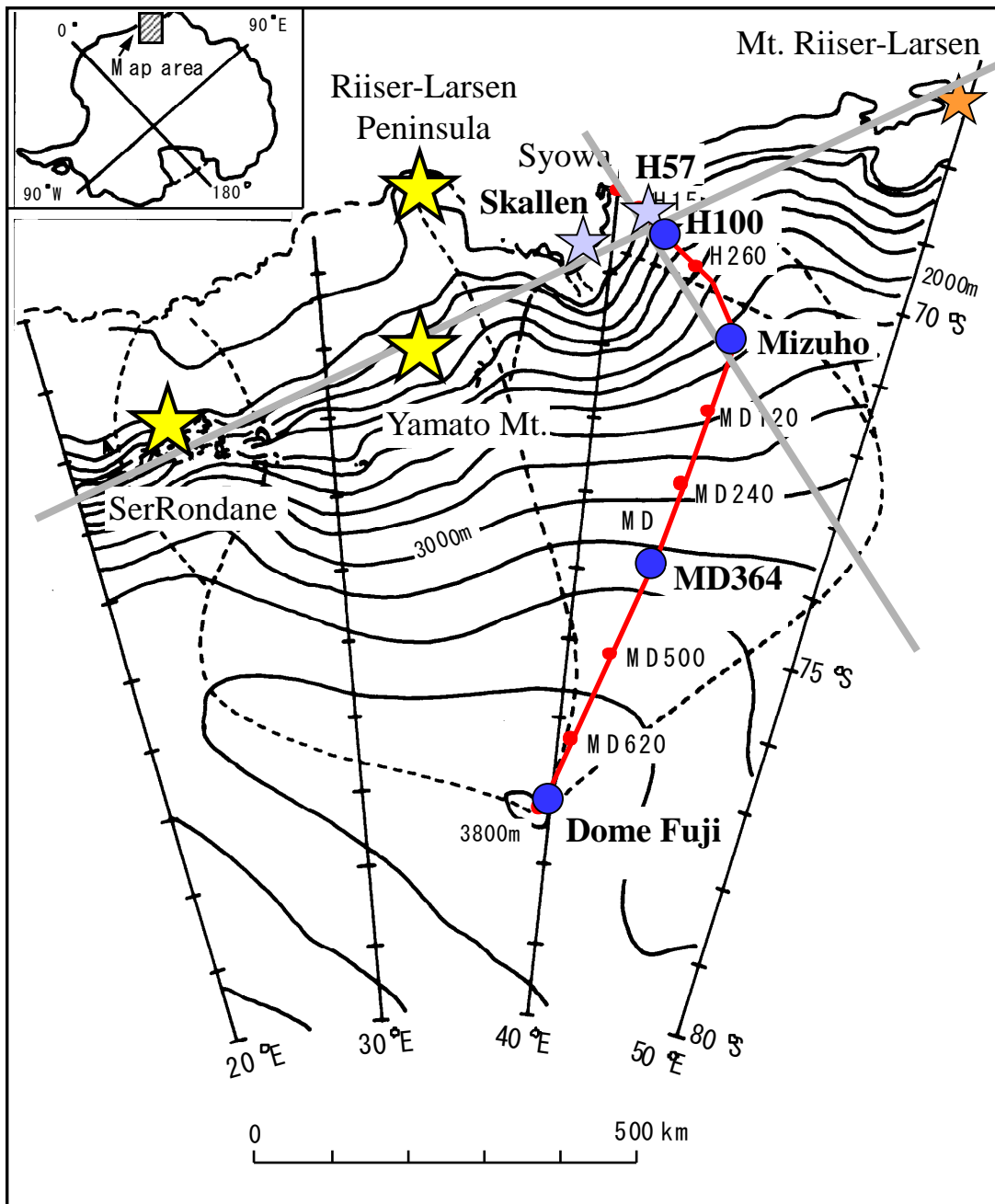


DMSP data receiving at Syowa Station



Unmanned Magnetometer Network





- **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-48 (2006-2008) NIPR-LPM**
 Skallen [69°40'24"S, 39°24'07"E]
 H57 [69°09'38"S, 40°58'52"E]
- ★ **JARE-49 (2007-2009) NIPR-LPM**
 Riiser-Larsen [69°47'44"S, 50°34'38"E]
- ★ **NIPR-LPM in future**

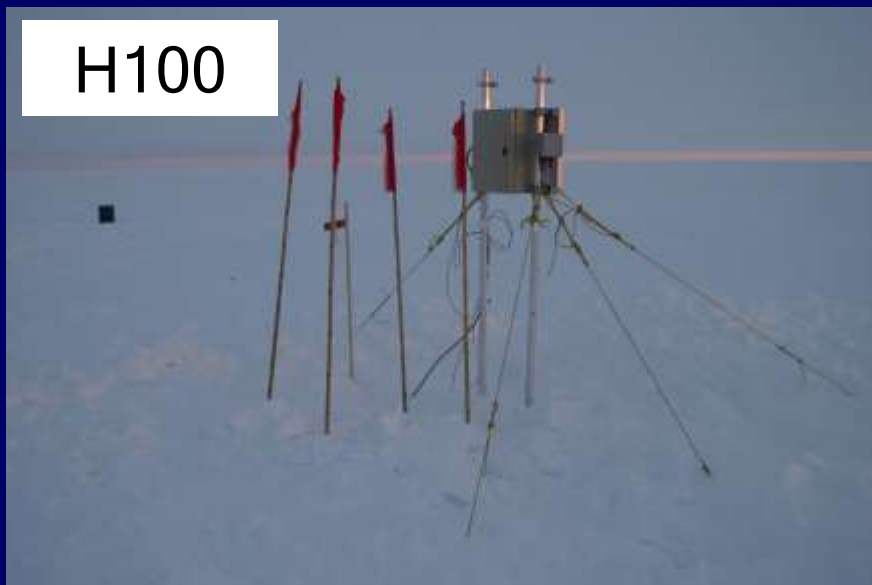
Unmanned magnetometers in JARE

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	×	○

BAS-LPM

H100



Mizuho



MD364



Dome Fuji



NIPR-LPM

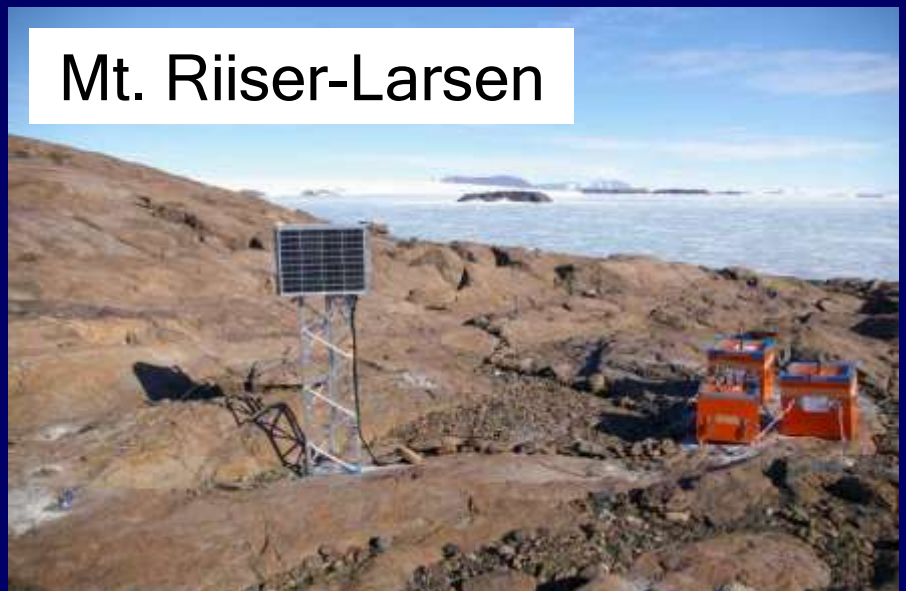
H57



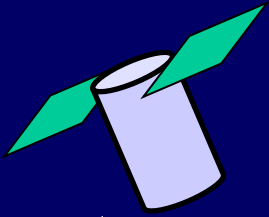
Skallen



Mt. Riiser-Larsen

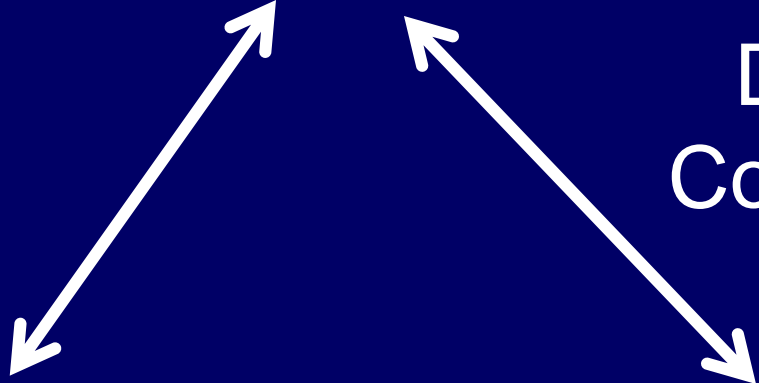


NIPR-LPM



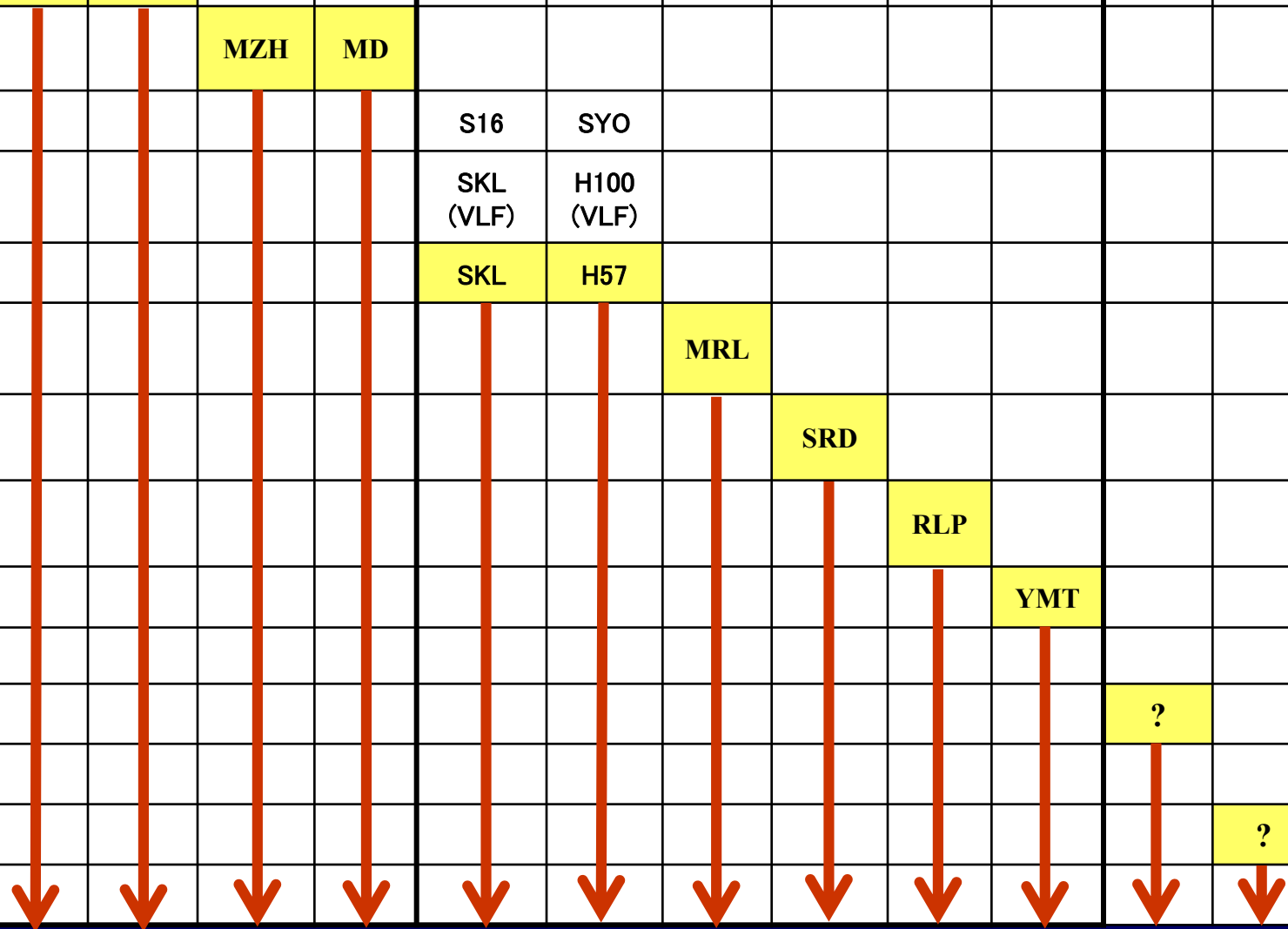
Iridium Satellite

Data &
Command



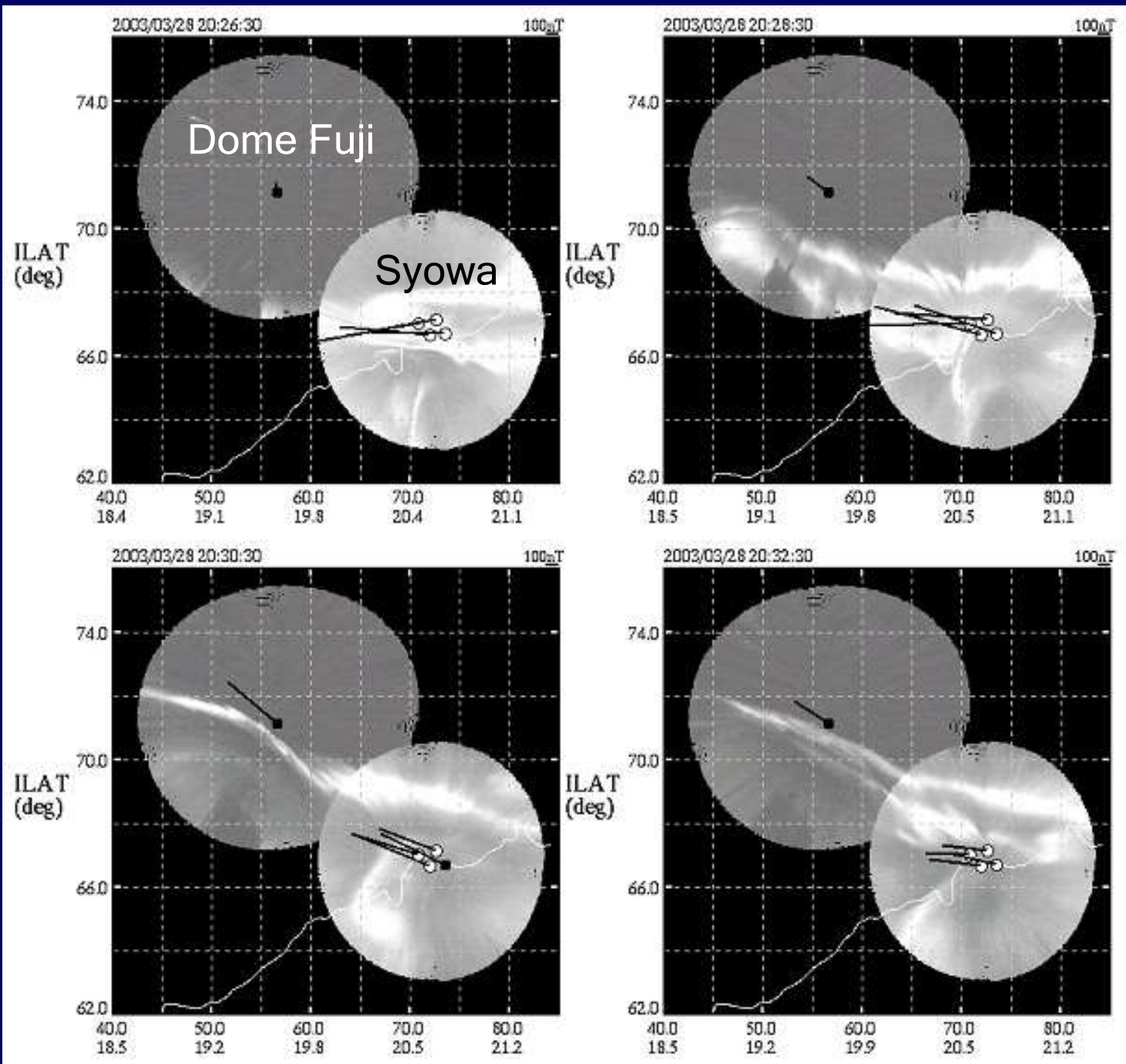
Unmanned Network Observation Project in JARE

	YR	JARE	BAS-LPM				NIPR-LPM						NIPR-AGO ?	
VI	2002	44	H100	DMF										
	2003	45			MZH	MD								
	2004	46					S16	SYO						
	2005	47					SKL (VLF)	H100 (VLF)						
VII	2006	48					SKL	H57						
	2007	49							MRL					
	2008	50								SRD				
	2009	51									RLP			
VIII	2010	52										YMT		
	2011	53												
	2012	54											?	
	2013	55												
	2014	56												?
	2015	57												

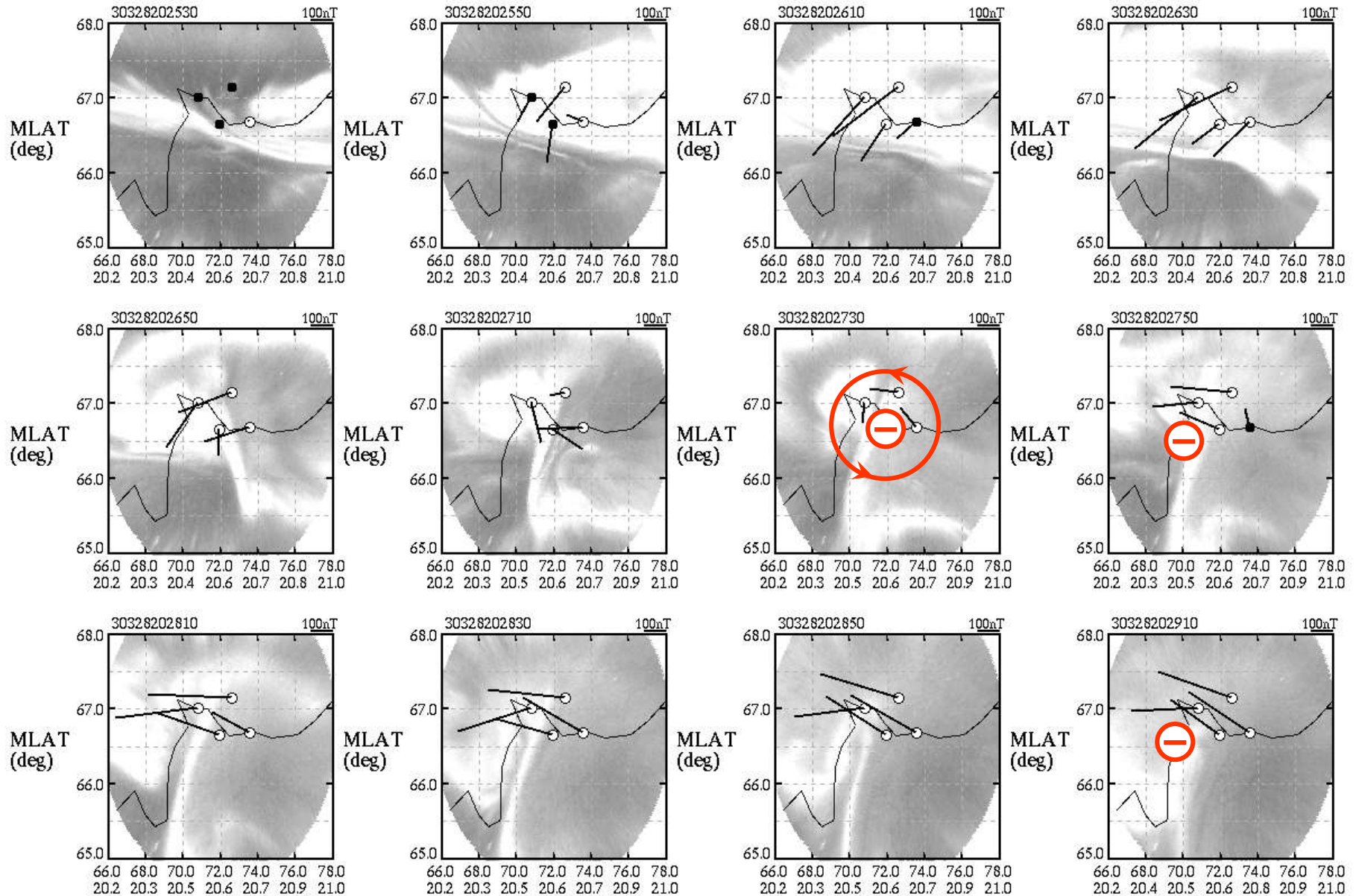


BAS-LPM and All-sky TV

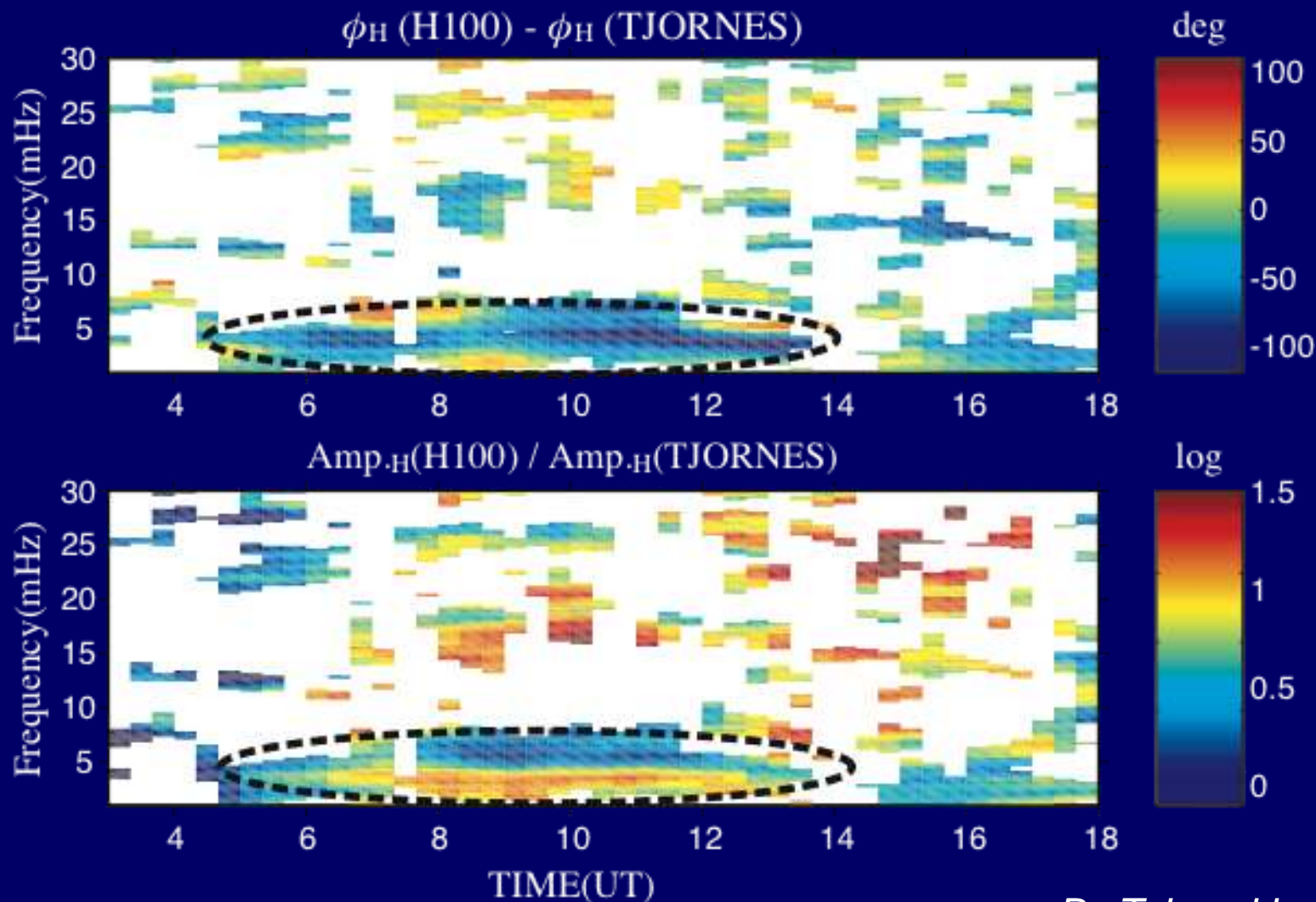
Middle scale evolution



BAS-LPM and All-sky TV : Small scale evolution



Field-Line Resonance observed between conjugate stations



By Takasaki et al 2006

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



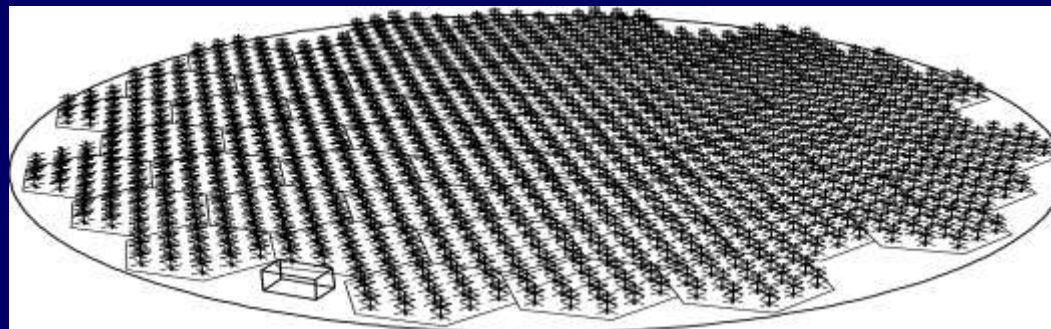
PANSY is derived from the French word, 'pensee', meaning 'thought'



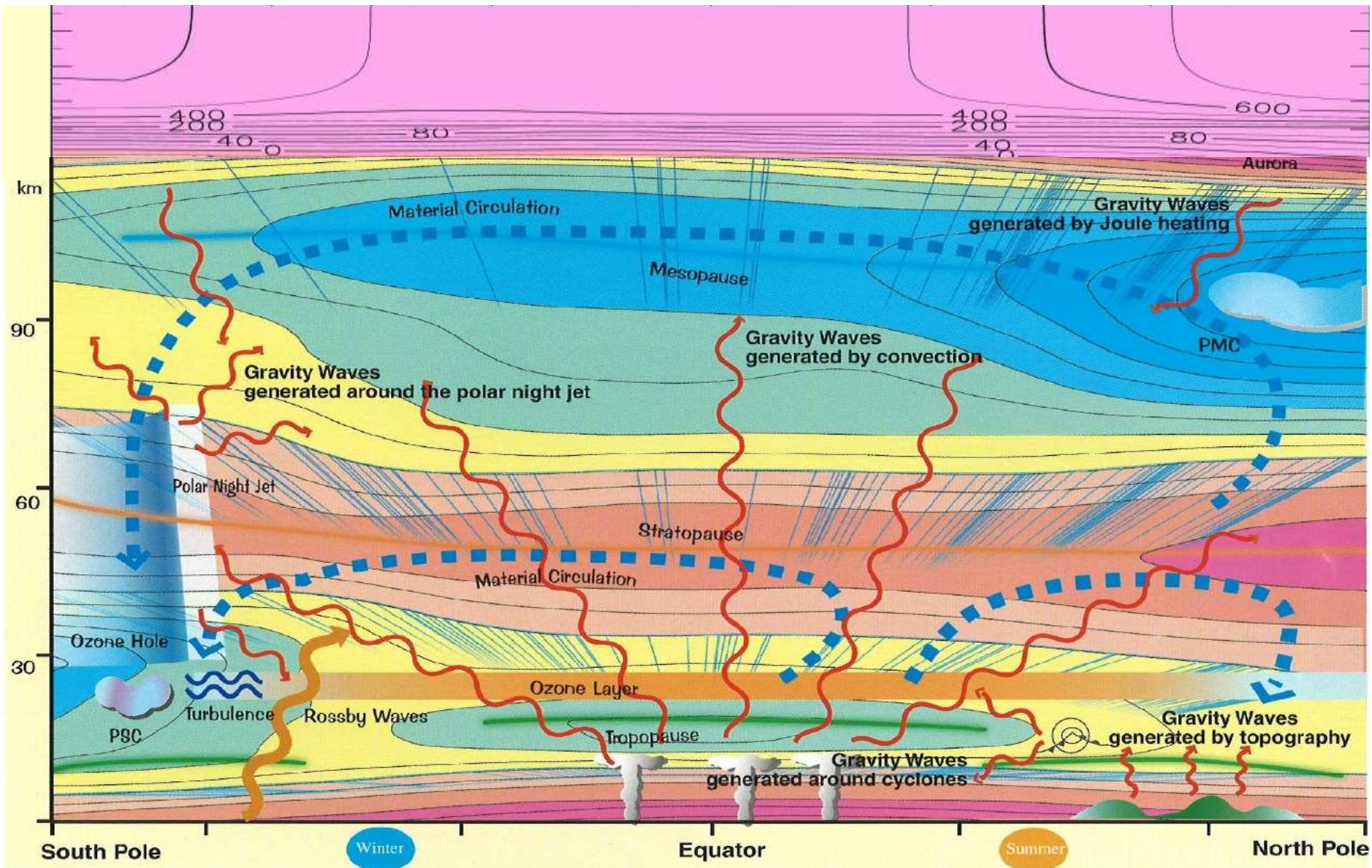
Specifications of PANSY

- 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 (2007-2009)

Comprehensive test

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



Scientific study as a meteor wind radar as well

Center Freq : 47 MHz

Peak Power : 1.5 kW