2007年6月15日　南極研究観測シンポジウム

無人オーロラ観測点の展開

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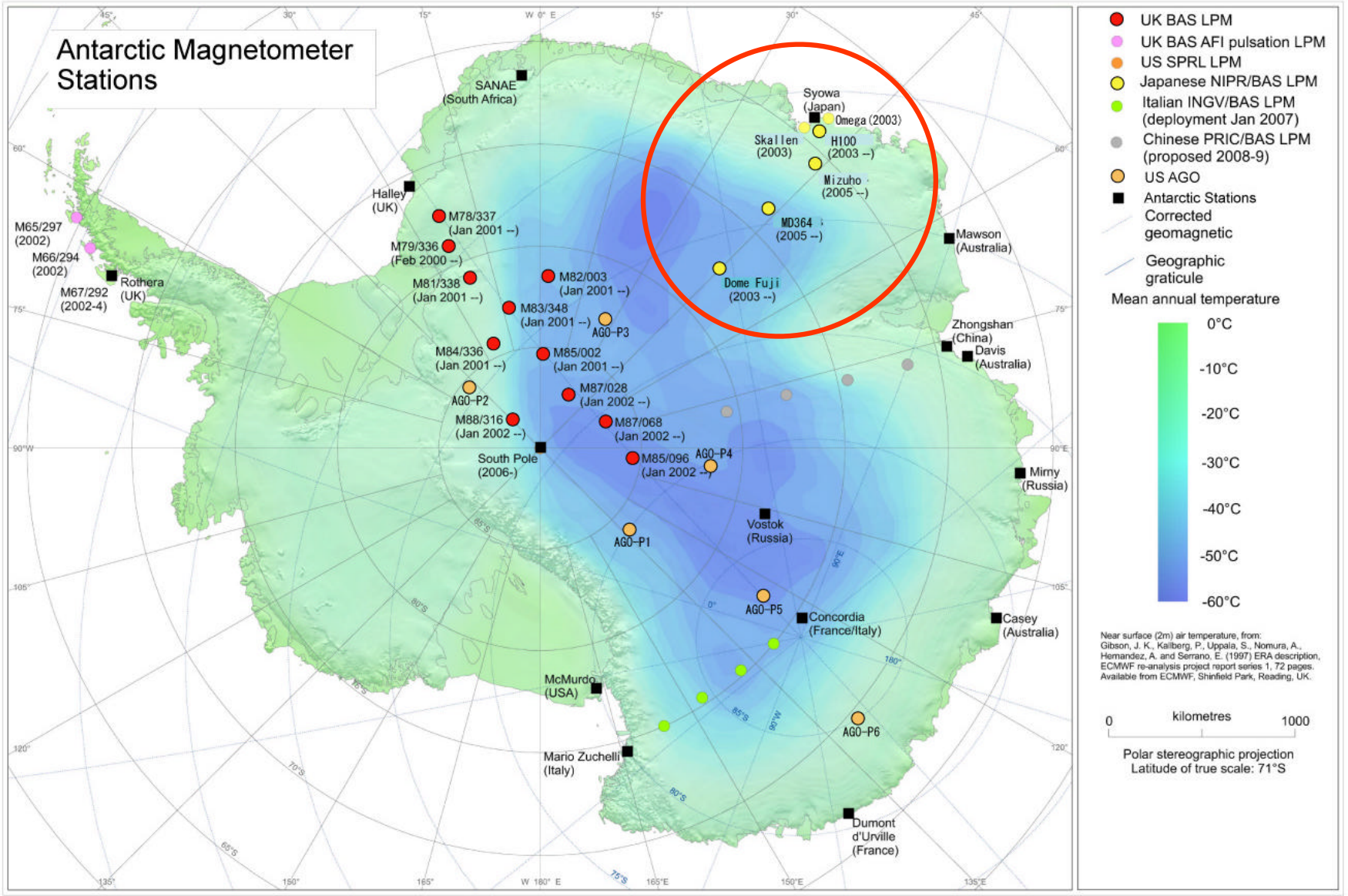
南極基地と無人観測点


Antarctic Magnetometer Stations
SANAE (South Africa)
Halley (UK)
Syowa (Japan)
Omega (2003)
Skallen (2003)
H100 (2003 --)
Mizuho (2005 --)
MD364 (2005 --)
Dome Fuji (2003 --)
Mawson (Australia)
Zhongshan (China)
Davis (Australia)
Mirny (Russia)
Vostok (Russia)
Concordia (France/Italy)
Casey (Australia)
Dumont d'Urville (France)
Mario Zuchelli (Italy)
McMurdo (USA)
South Pole (2006-)
Rothera (UK)
M65/297 (2002)
M66/294 (2002)
M67/292 (2002-4)
M78/337 (Jan 2001 --)
M79/336 (Feb 2000 --)
M81/338 (Jan 2001 --)
M82/003 (Jan 2001 --)
M83/348 (Jan 2001 --)
M84/336 (Jan 2001 --)
M85/002 (Jan 2001 --)
M87/028 (Jan 2002 --)
M88/316 (Jan 2002 --)
M87/068 (Jan 2002 --)
M85/096 (Jan 2002 --)
AGO-P1
AGO-P2
AGO-P3
AGO-P4
AGO-P5
AGO-P6
UK BAS LPM
UK BAS AFI pulsation LPM
US SPRL LPM
Japanese NIPR/BAS LPM
Italian INGV/BAS LPM (deployment Jan 2007)
Chinese PRIC/BAS LPM (proposed 2008-9)
US AGO
Antarctic Stations
Corrected geomagnetic
Geographic graticule
Mean annual temperature
0°C
-10°C
-20°C
-30°C
-40°C
-50°C
-60°C
Near surface (2m) air temperature, from: Gibson, J. K., Kallberg, 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.
0
kilometres
1000
Polar stereographic projection
Latitude of true scale: 71°S

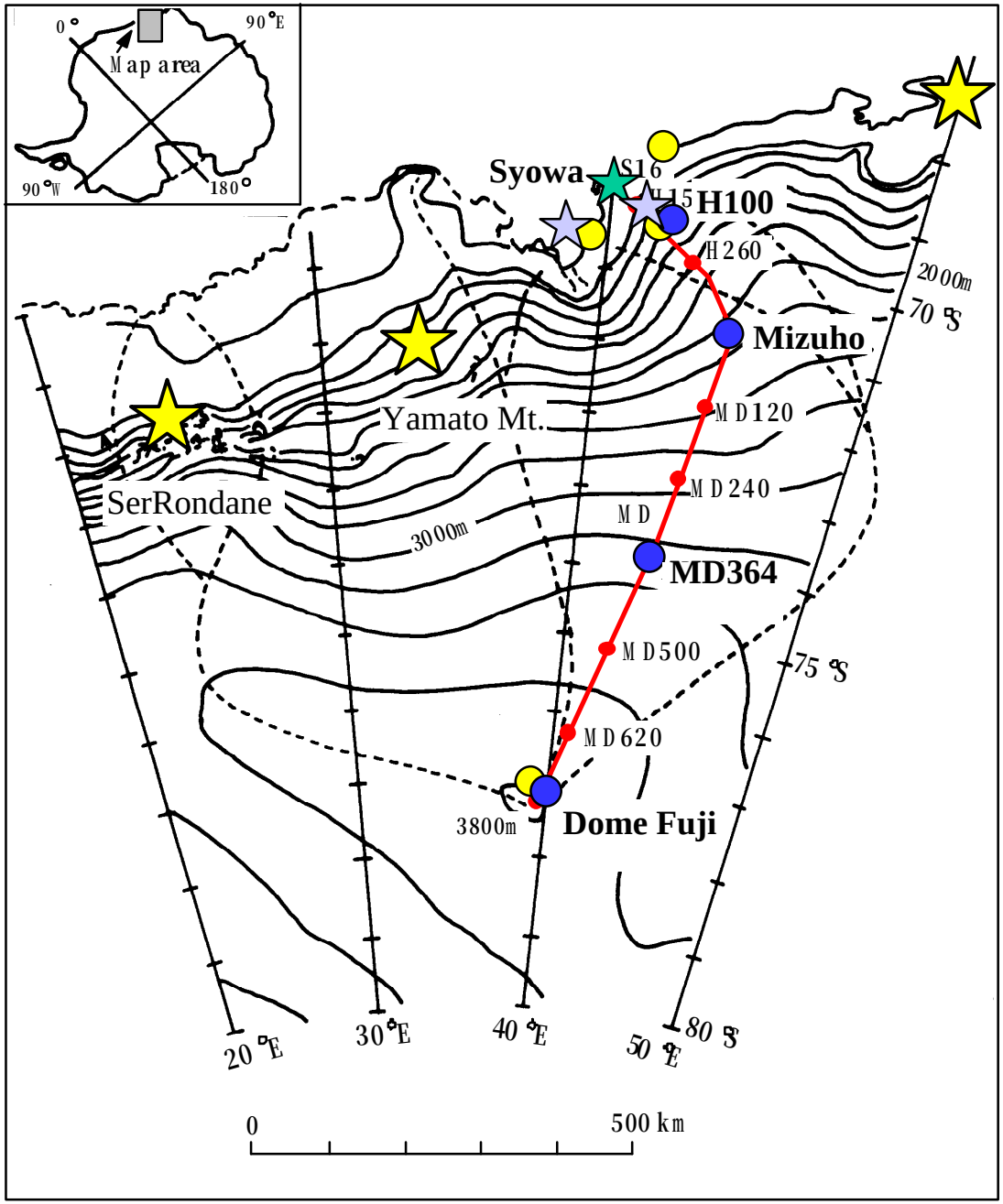
外国の南極無人観測点

U.S. AGO (Automatic Geophysical Observatories)

- Imaging Riometer
- Fluxgate Magnetometer
- Search Coil Magnetometer
- All-sky Auroral Imager
- ELF/VLF Radio Receiver
- LF/HF Radio Receiver

BAS LPM (Low Power Magnetometer)

- Fluxgate Magnetometer
- Low Power : 0.42 / 0.08 / 0.05 W
- Sampling: 1 / 10 / 60 sec
- Resolution: 1 nT
- Operating Temperature: -78℃ min
- データ回収 :年1回



JAREにおける無人磁力計観測点

● **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]

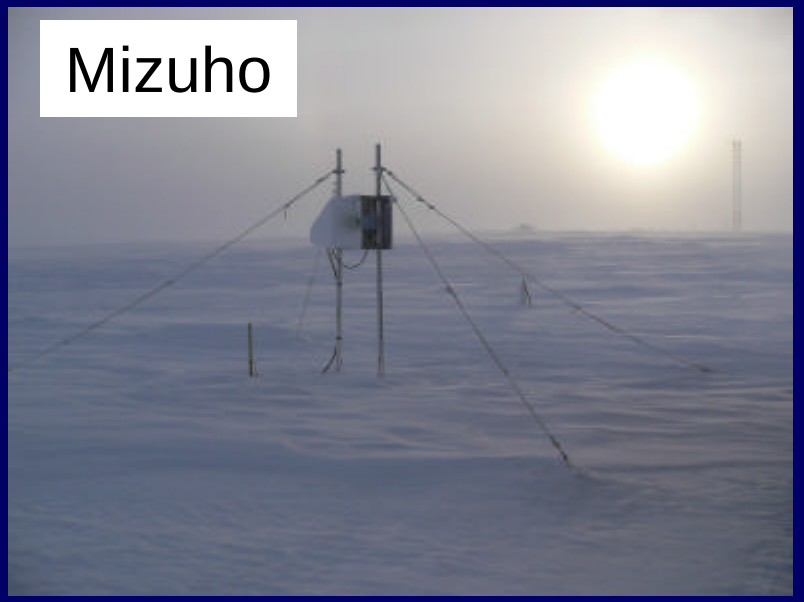
★ **JARE-48 (2006-2008) NIPR-LPM**

Skallen [69?40’24”S, 39?24’07”E]

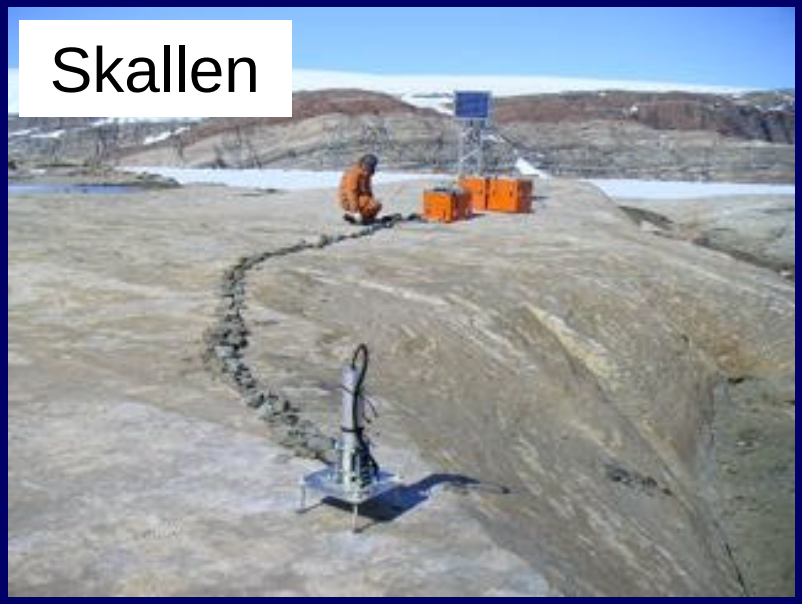
H57 [69?09‘38"S, 40?58‘52"E]

★ NIPR-LPM in future

BASタイプの無人磁力計



極地研タイプの無人磁力計



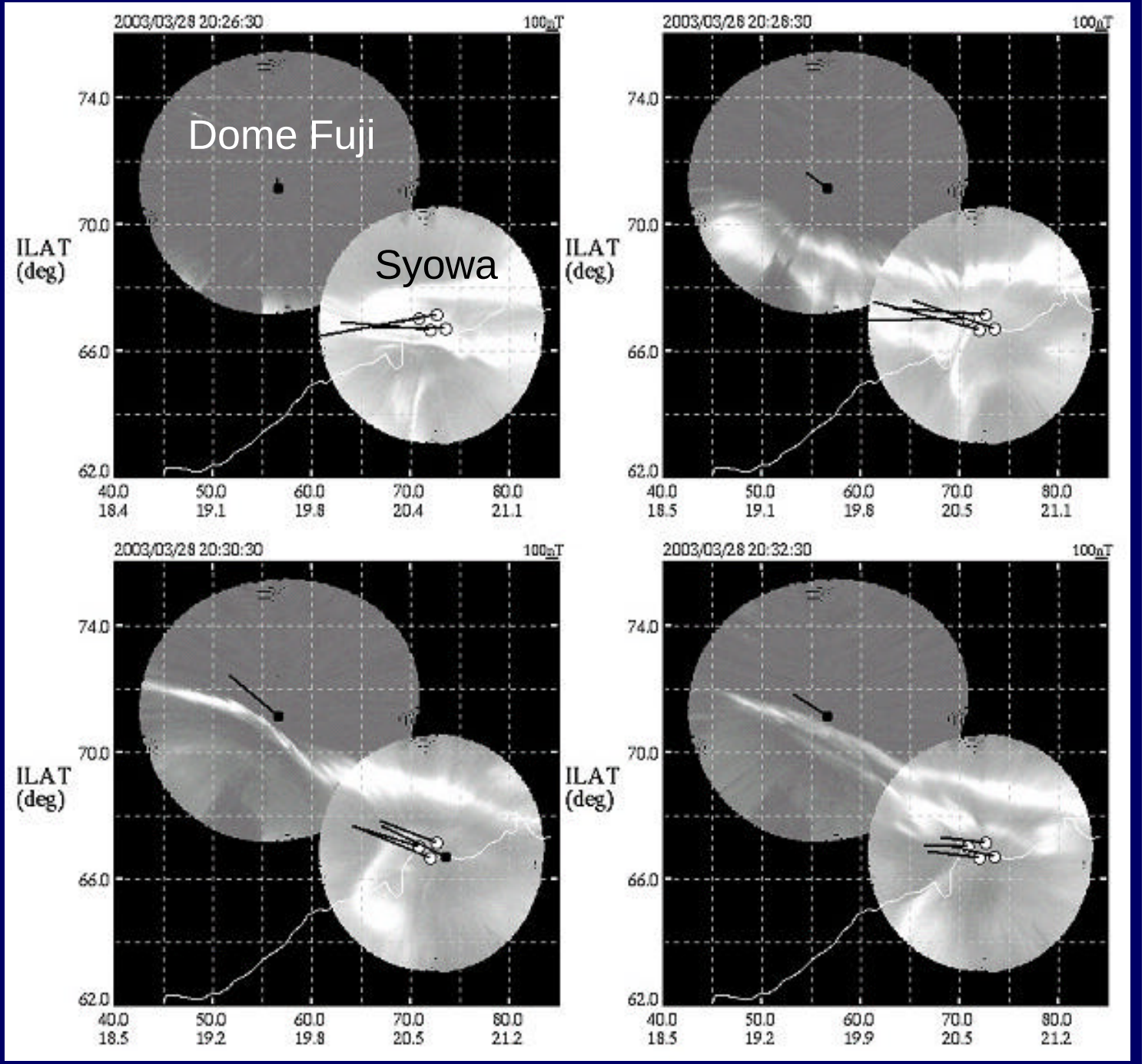
Comparison of BAS and NIPR type LPMs

	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	×	○

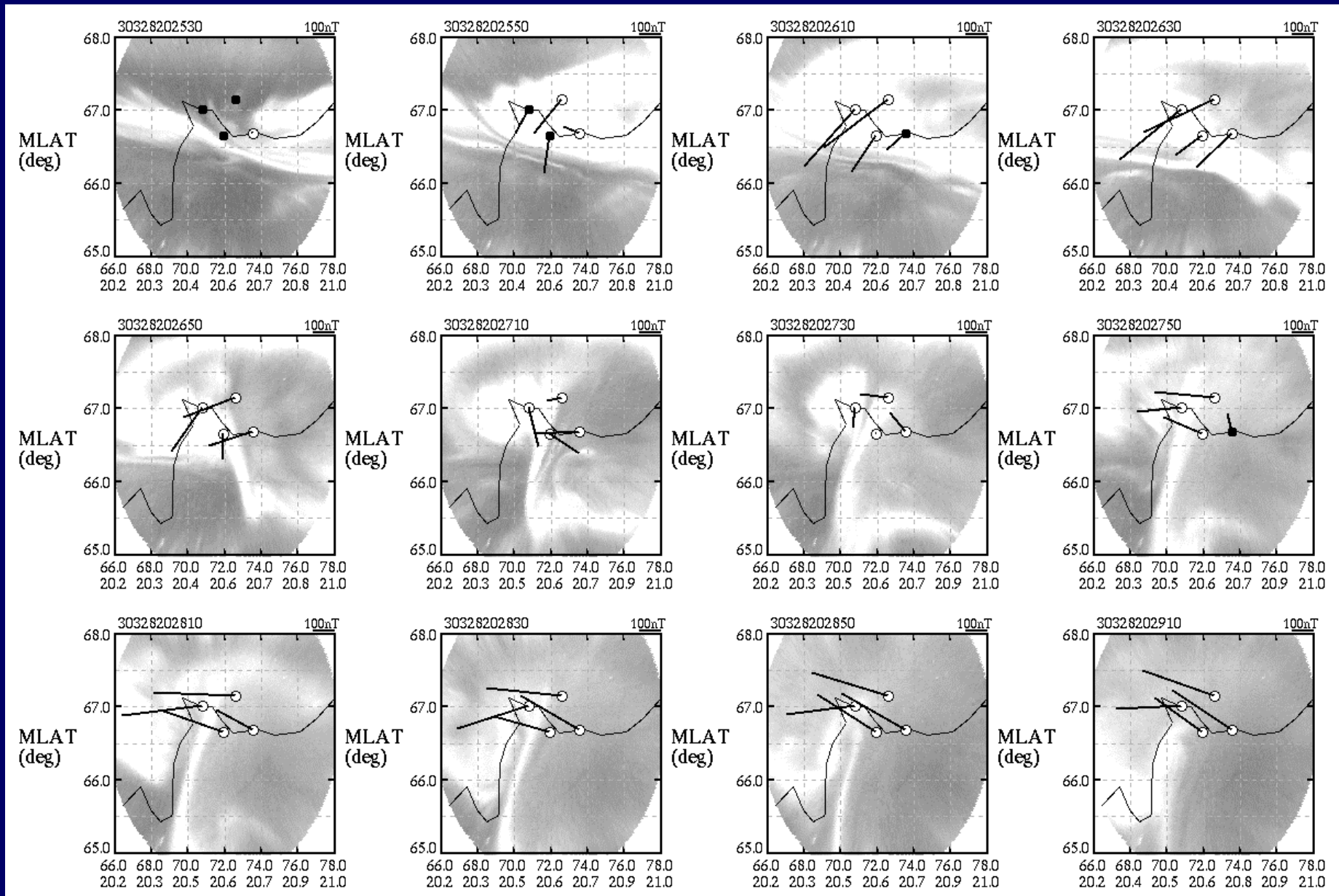
オーロラと磁場の同時観測例（1）

BAS-LPM and All-sky TV in 2003

Middle scale evolution



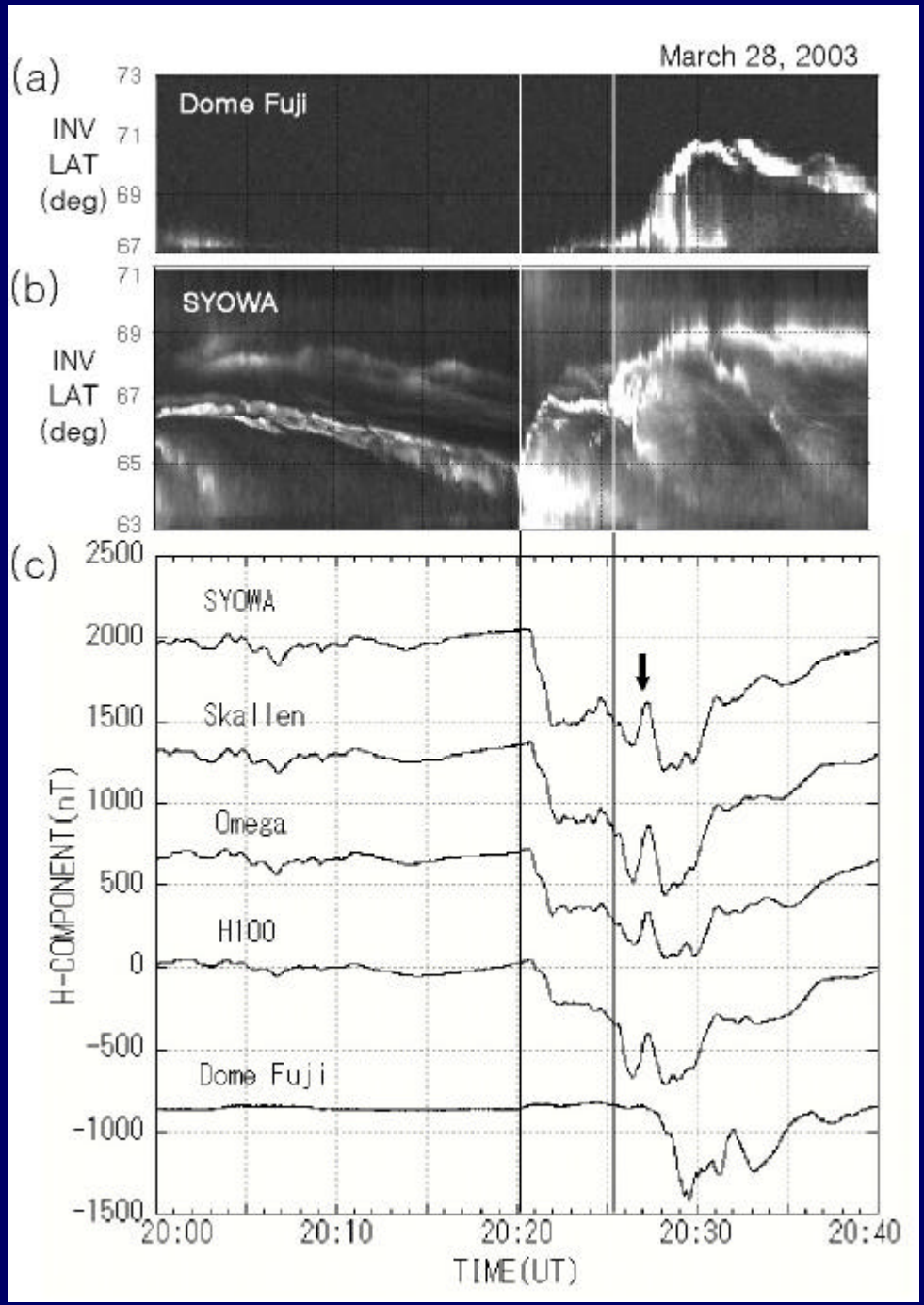
オーロラと磁場の同時観測例 (2): Small scale evolution



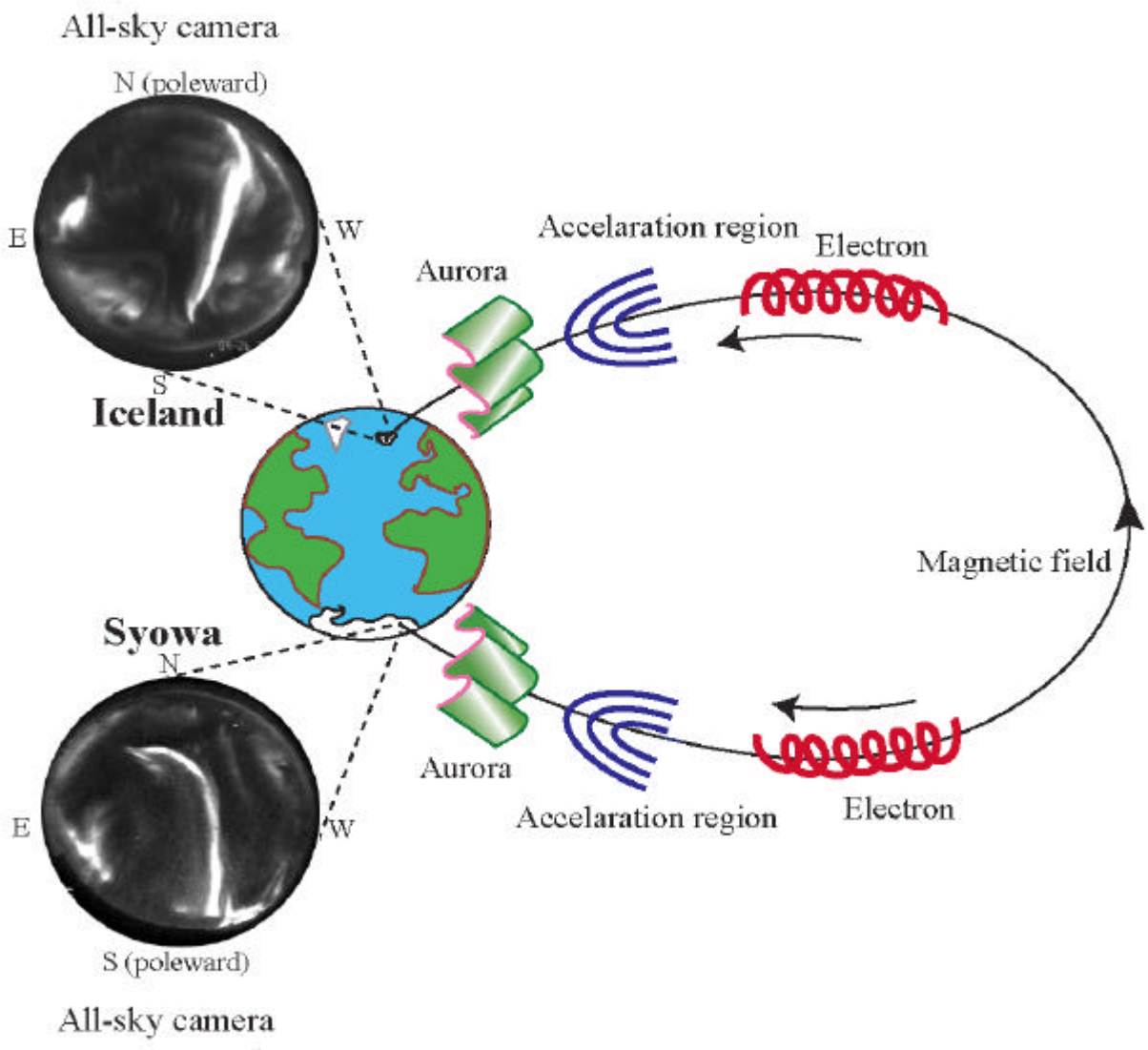
オーロラ活動と磁場変動の時間変化の比較

Auroral Keogram

子午面内の 1次元情報だけでも十分に有効



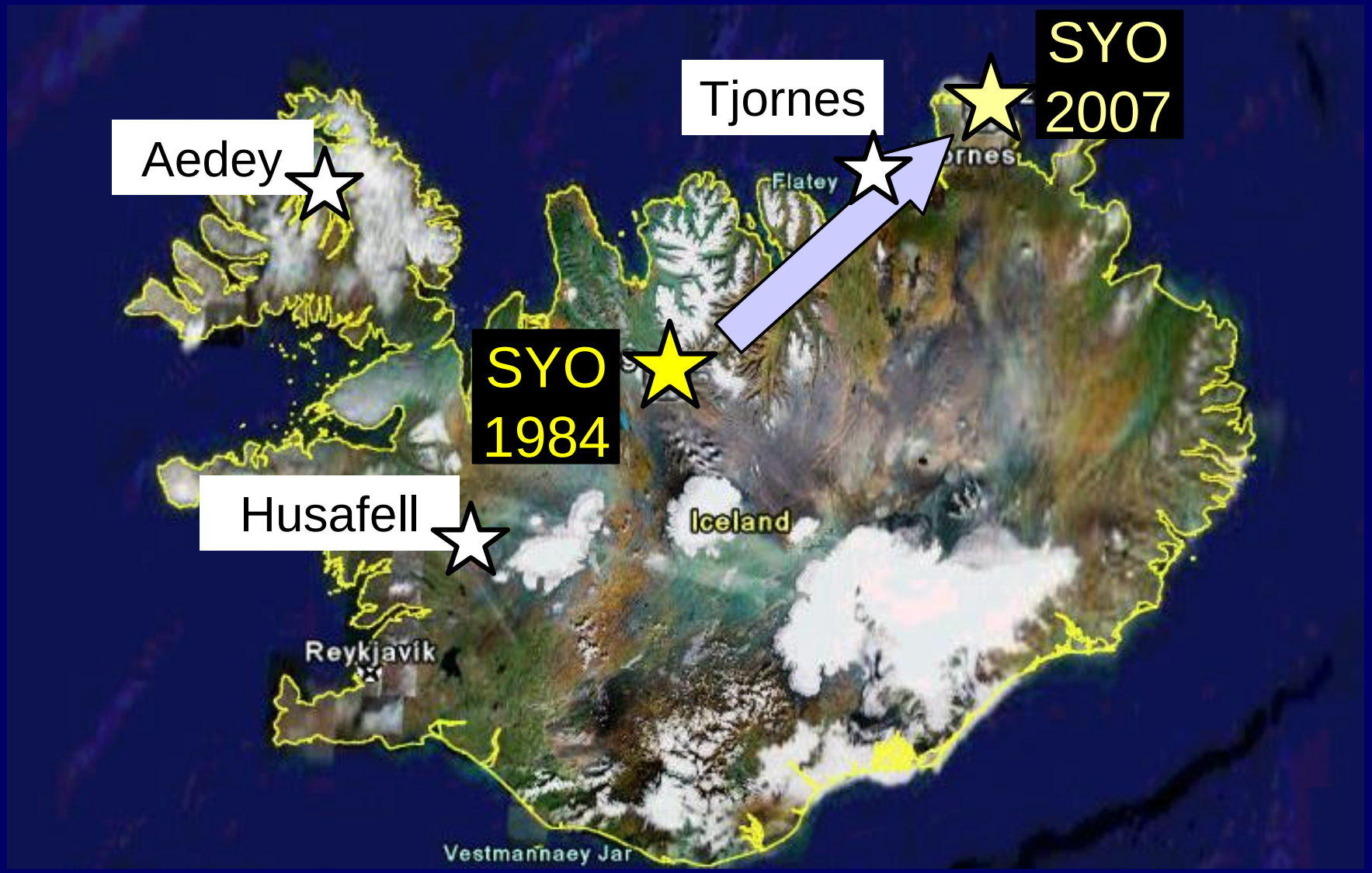
Conjugate Observation at Syowa and Iceland



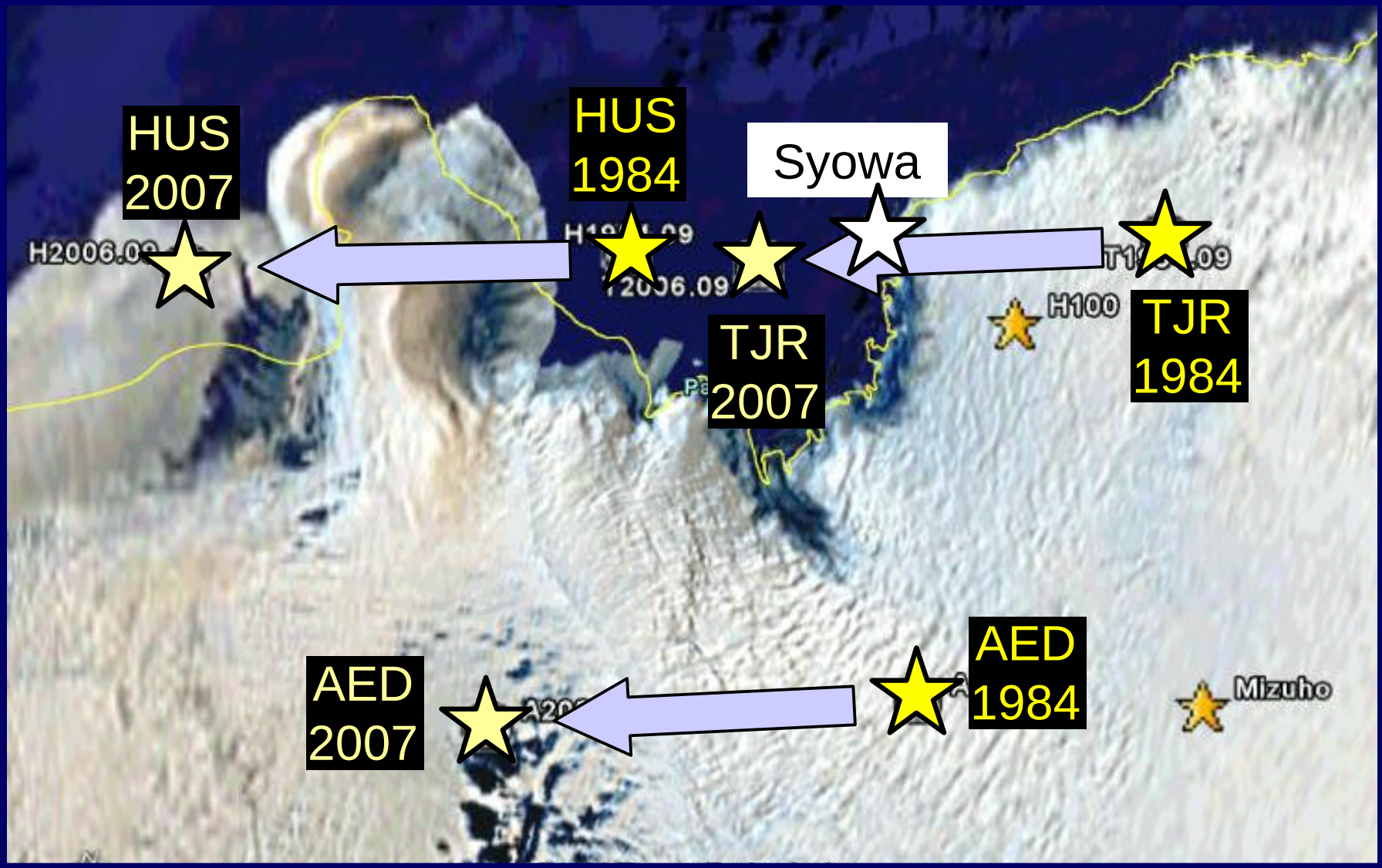
Conjugate Stations

Geomagnetic mapping

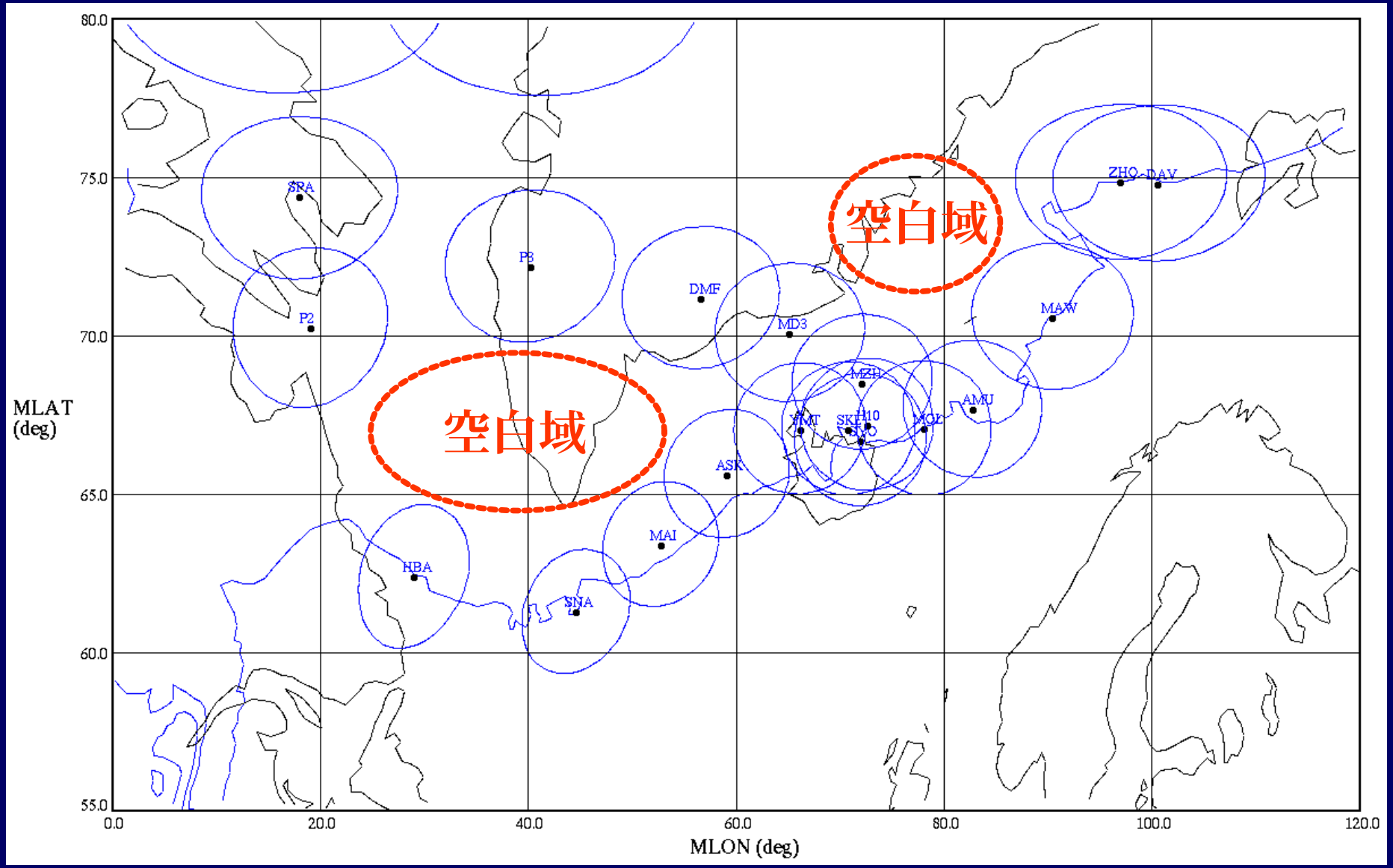
Conjugate point of Syowa Station in Iceland (IGRF)



Conjugate point of Iceland in the Antarctic (IGRF)

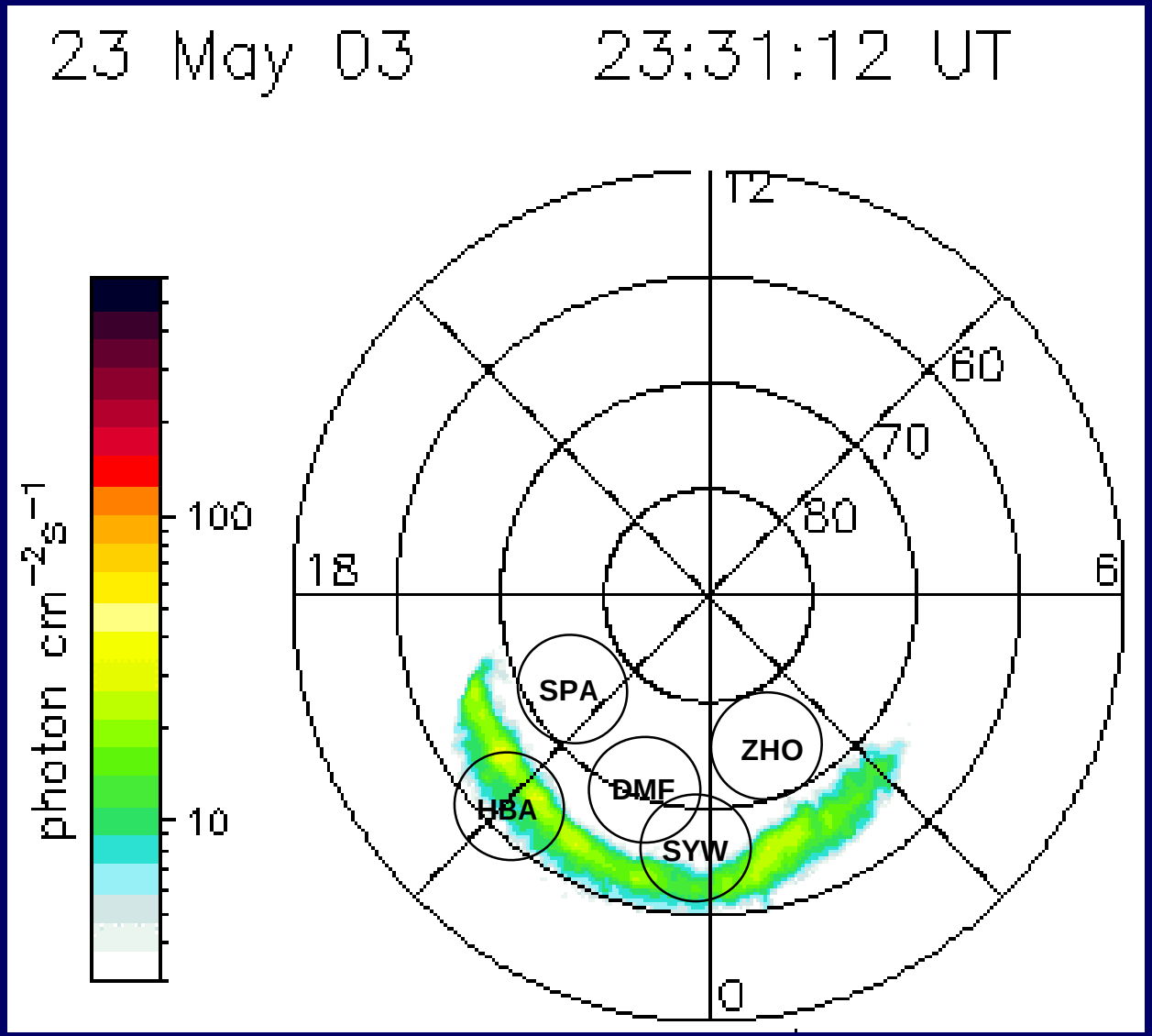


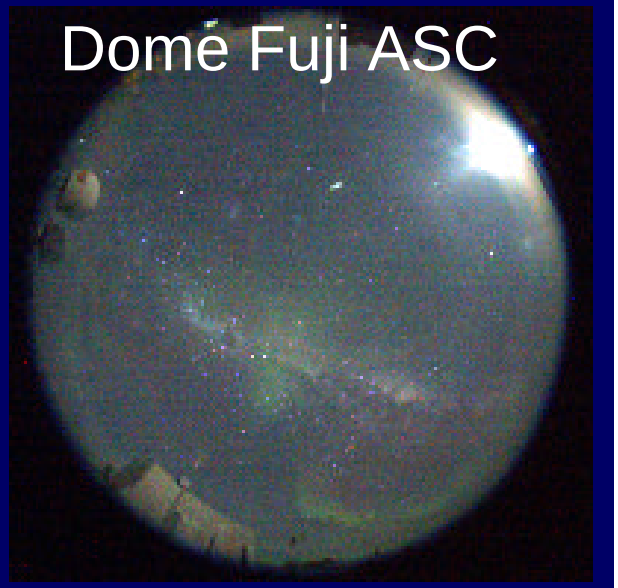
Ground-based network around Syowa



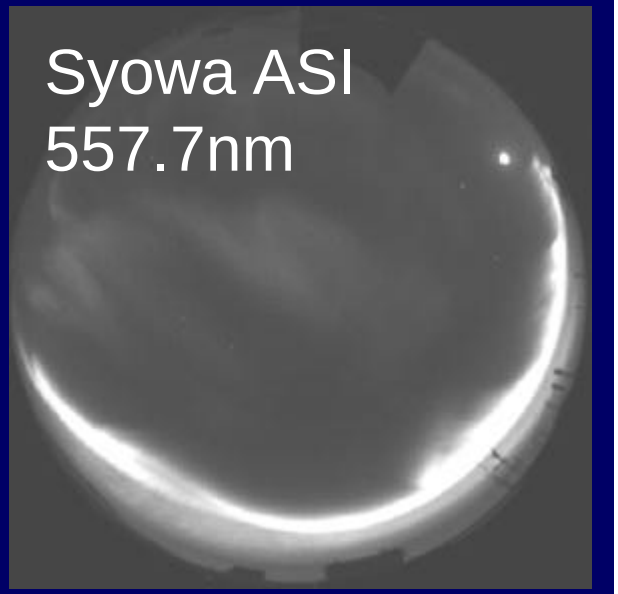
Mapping on 120 km altitude, FOV>20 deg

オーロラサブストームの衛星・地上同時観測例

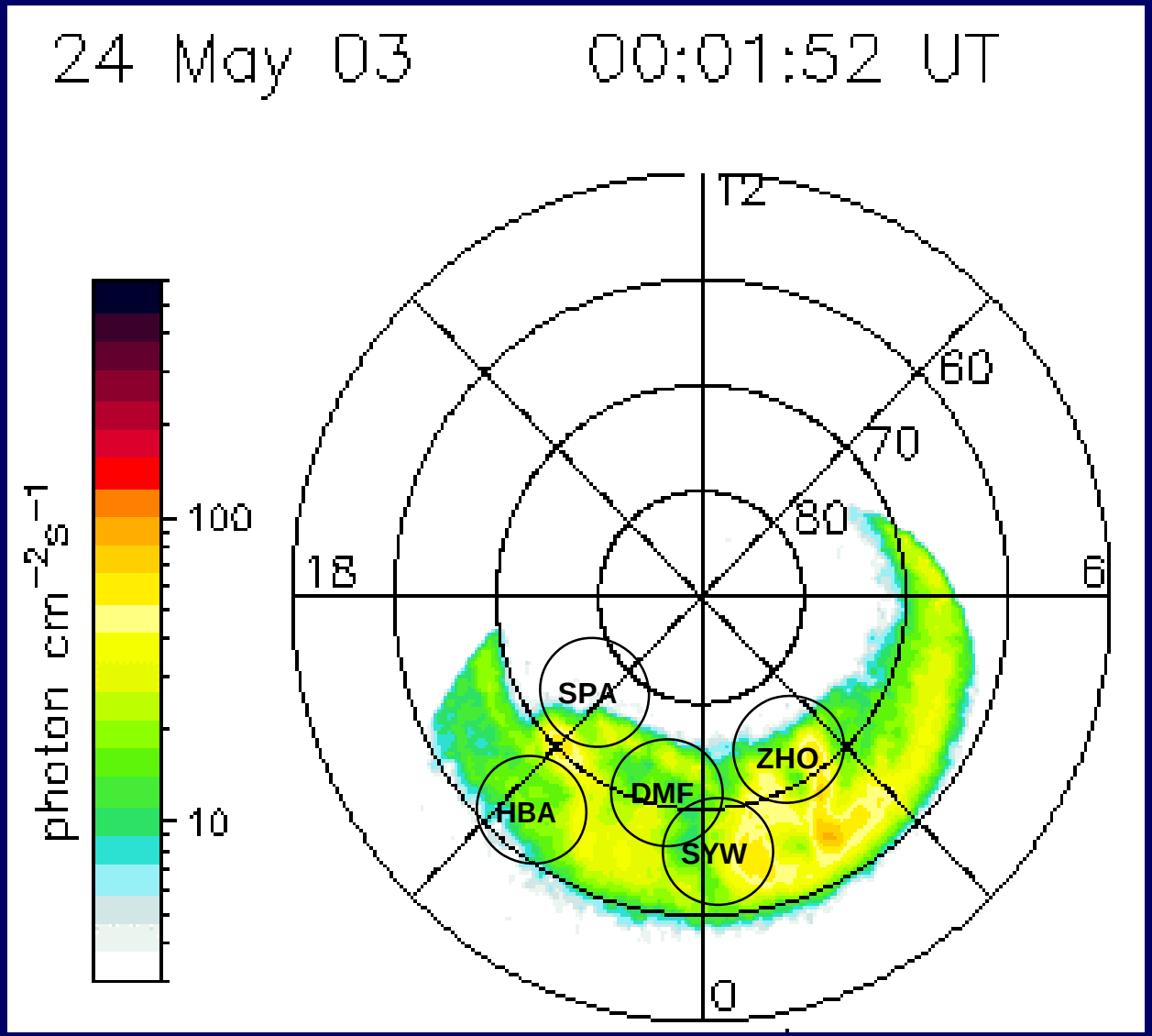


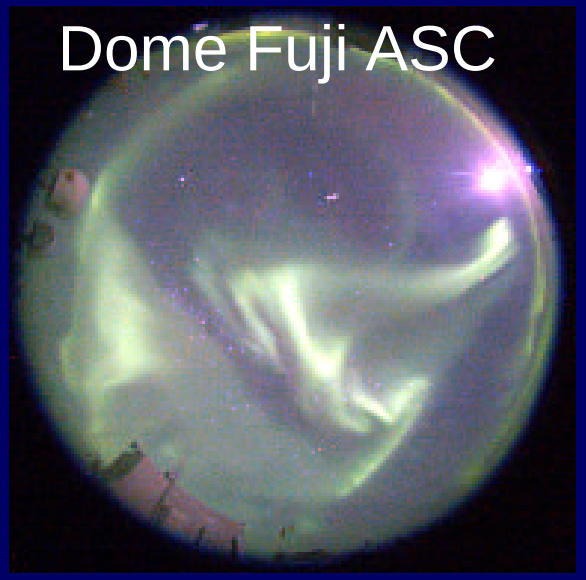


23:31:00UT



オーロラサブストームの衛星・地上同時観測例





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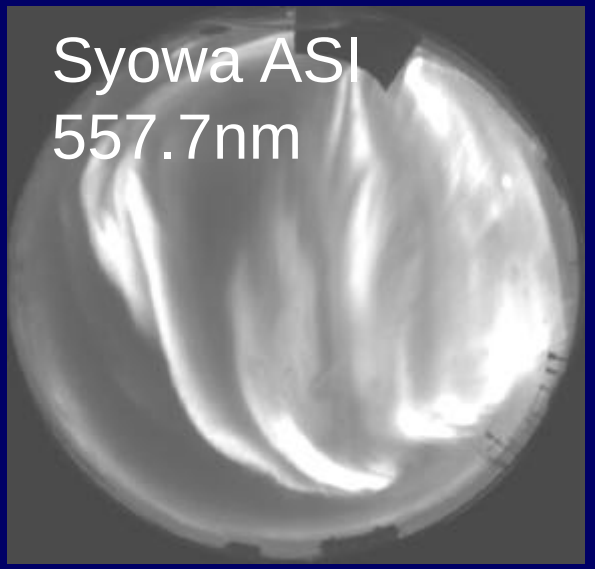

無人オーロラ観測点の展開
まとめ

無人磁力計の開発＆展開の後に、無人オーロラ観測器の開発＆展開に着手したい。

- 観測器： 全天カメラ（画像、Keogram）
- 解決すべき課題：

電力、保温、霜取り、データ圧縮、データ回収

- 外国基地、AGOとの国際協力