

中緯度短波レーダ研究会, on 13/10/04 at STEL, Nagoya Univ.

MAGDASとFM-CWレーダとの 組織的観測について

Kiyohumi YUMOTO and the MAGDAS Team
(Space Environment Research Center, Kyushu University)

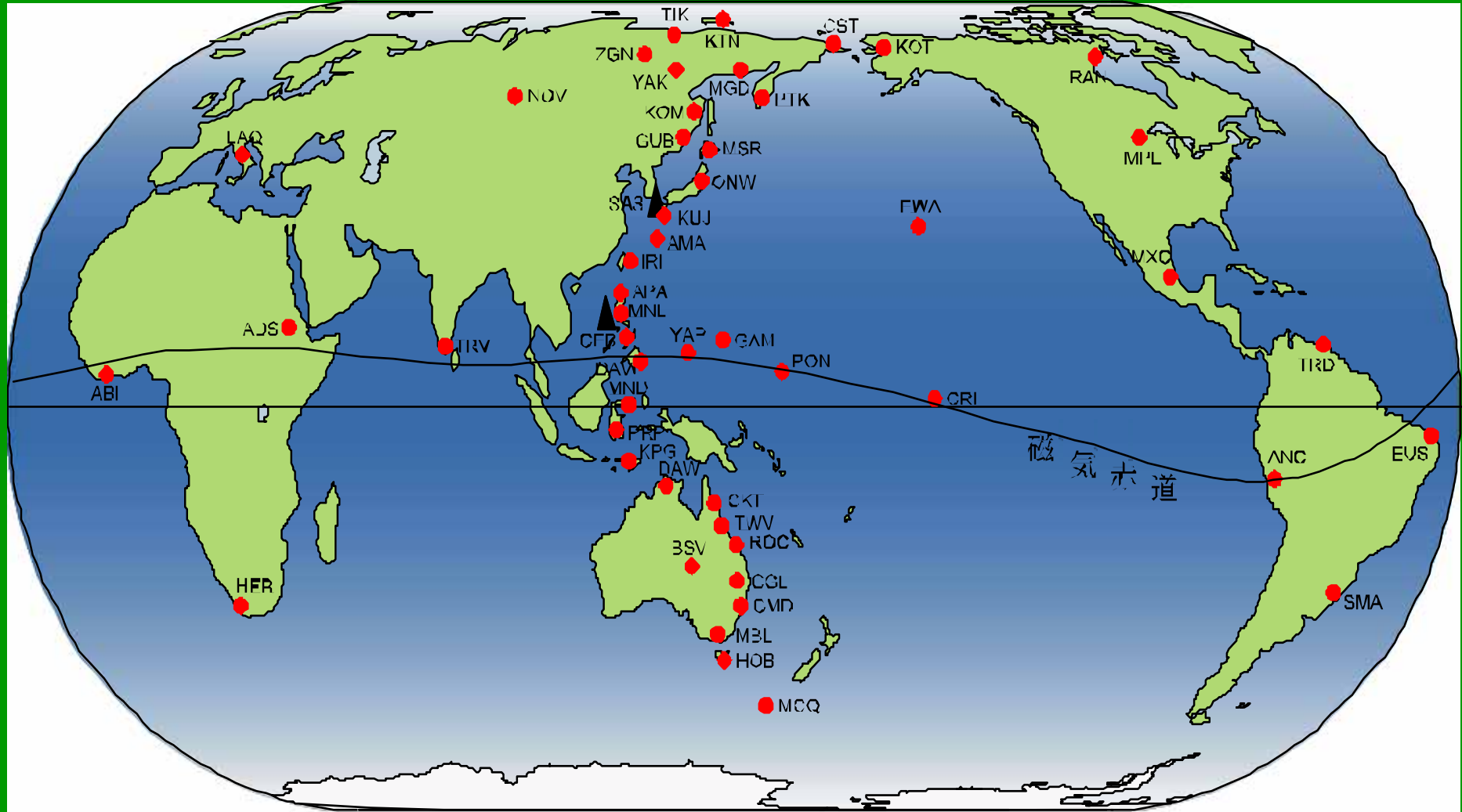


Content

1. Introduction of MAGDAS/CPMN
2. Ionospheric drift velocity by FM-CW radar and Magnetic data at CPMN
3. Summary

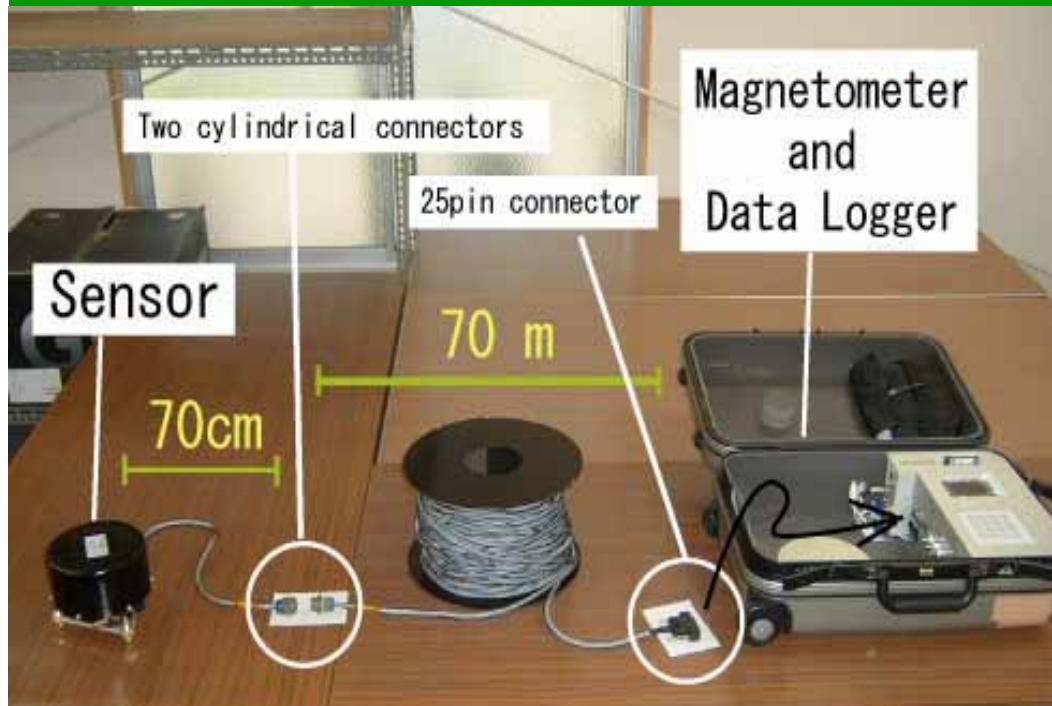
1. MAGDAS/CPMNP

(MAGnetic Data Acquisition System/Circum-pan Pacific Magnetometer Network)



- Magnetometer
- ▲ FM-CW Radar

MAGDAS Magnetometer



- **Tiltmeter of sensor**
Range: $\pm 1^\circ$,
Resolution: 0.2 arc-sec
- **Thermometer of sensor**
Range: ± 60 ,
Resolution: 0.002

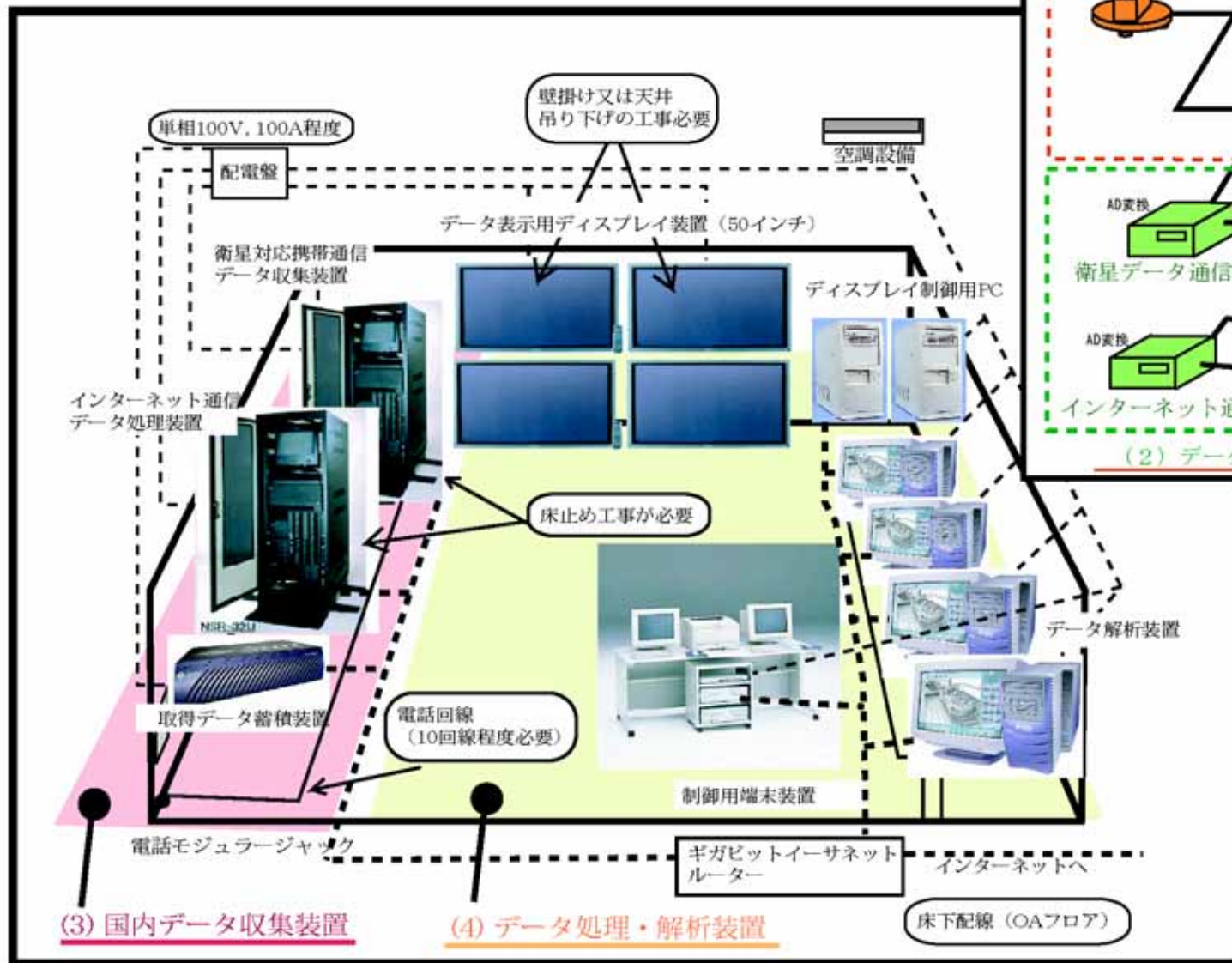
- **Fluxgate-type**
with 3-axial ring-core sensor
(amorphous metallic alloys)
- **Observation ranges**
 $\pm 300\text{nT}$, $\pm 1000\text{nT}$,
 $\pm 2000\text{nT}$, ($\pm 65000\text{nT}$)
- **16bit A/D converter**
0.0091nT/dig, 0.031nT/dig,
0.061nT/dig
- **Sampling rate**
16Hz, 1-sec, 1-min
- **Estimated noise level**
0.02nTp-p
- **Total weight**
14.5 kg

The data can be transferred to SERC/Kyushu Univ. by using three lines: (1) INTERNET, (2) Telephone and (3) Satellite mobile phone.

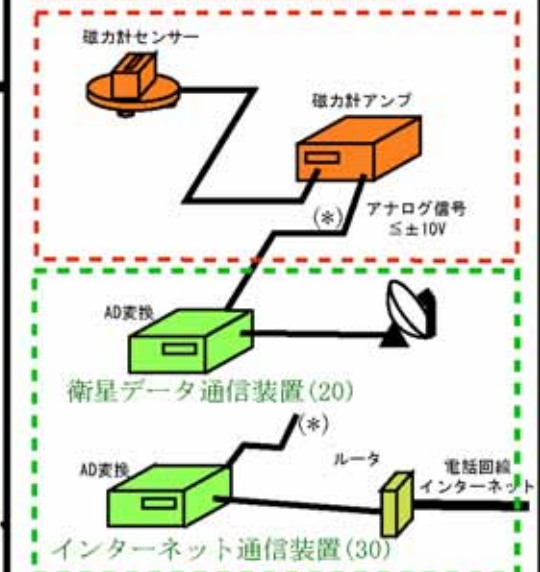
Data Acquisition & Data Analysis Systems in SERC, Kyushu University

学外地磁気観測・通信システム

センター内データ収集・処理・解析システム



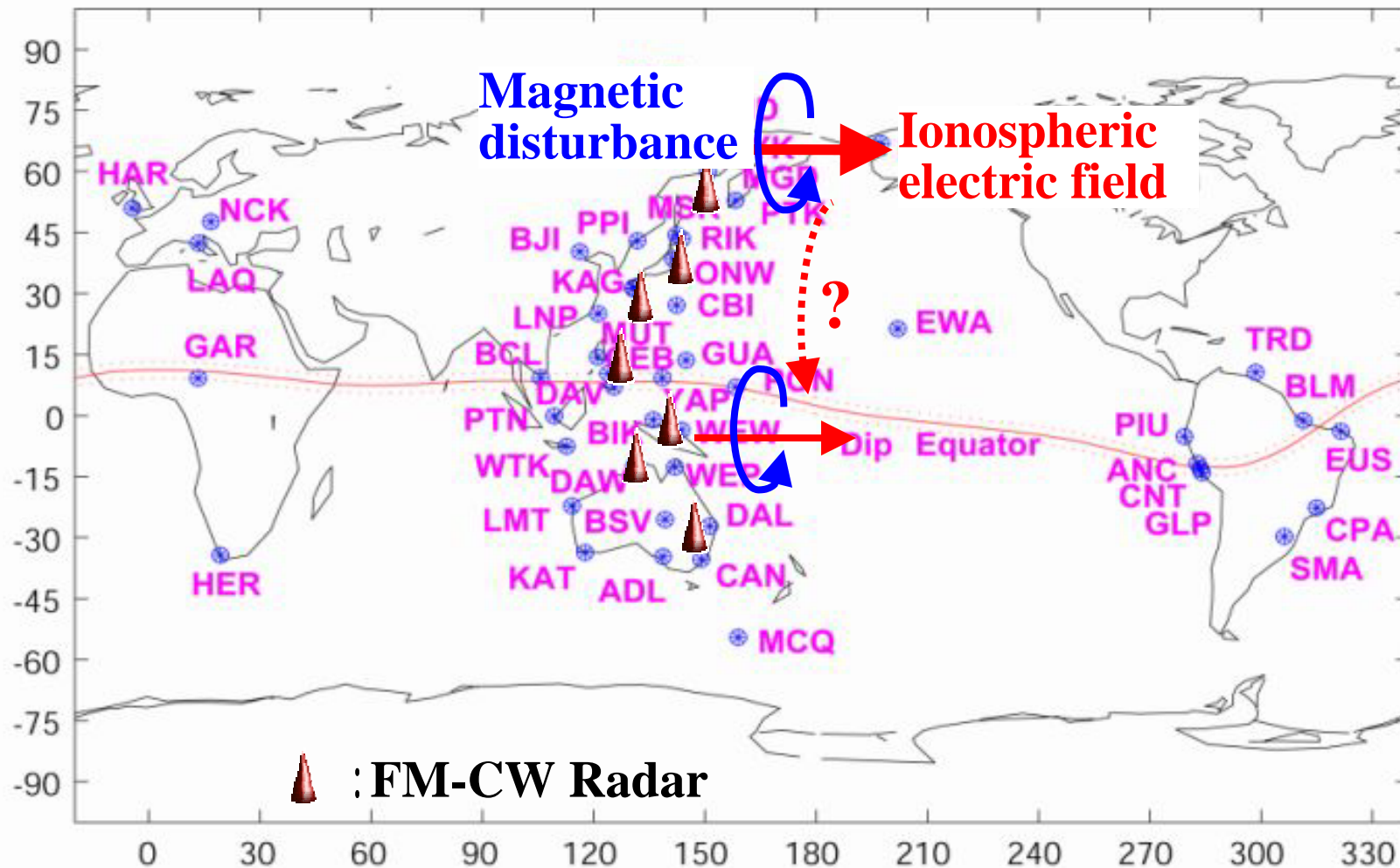
(1) 地磁気変化観測装置 (50)



(2) データ蓄積処理装置

2. Purpose of FM-CW Radar Observation

The Circum-pan Pacific Magnetometer Network (CPMNN)



Estimate the electric field from the plasma drift velocity in the ionosphere.

FM-CW Radar System at Sasaguri (GM lat. 23.2, GM lon 199.6)

Antenna



Control System



Radar control PC

Network server PC

Receiver

Transmitter

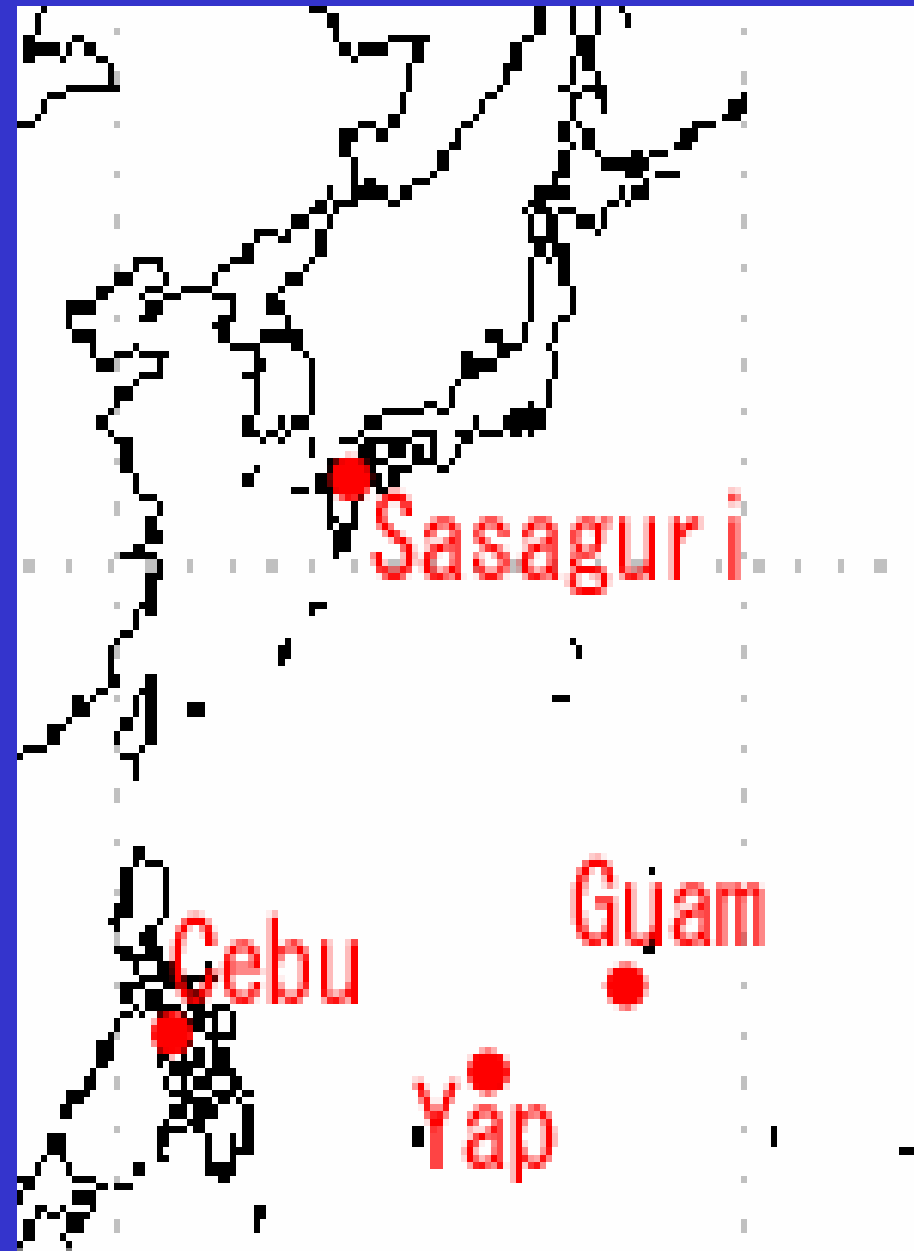
Event Study

Sc Event ••• 2003/11/04

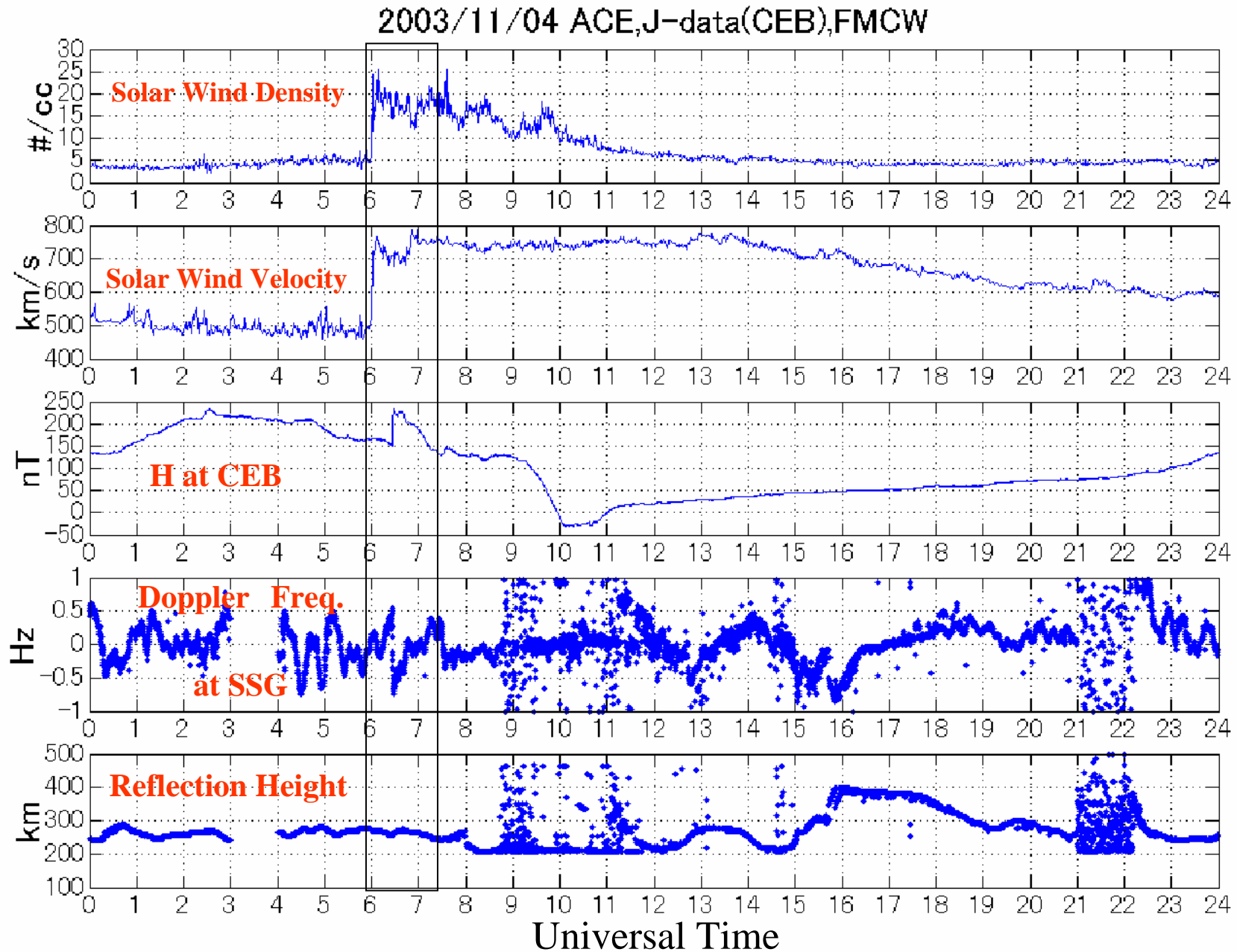
Pc 5 Event ••• 2003/10/30

Used Data :

- CEB, YAP Magnetic Data
(GM lat. 1.0, GM lon. 209.4)
- Sasaguri FM-CW Radar
(GM lat. 23.2, GM lon. 199.6)

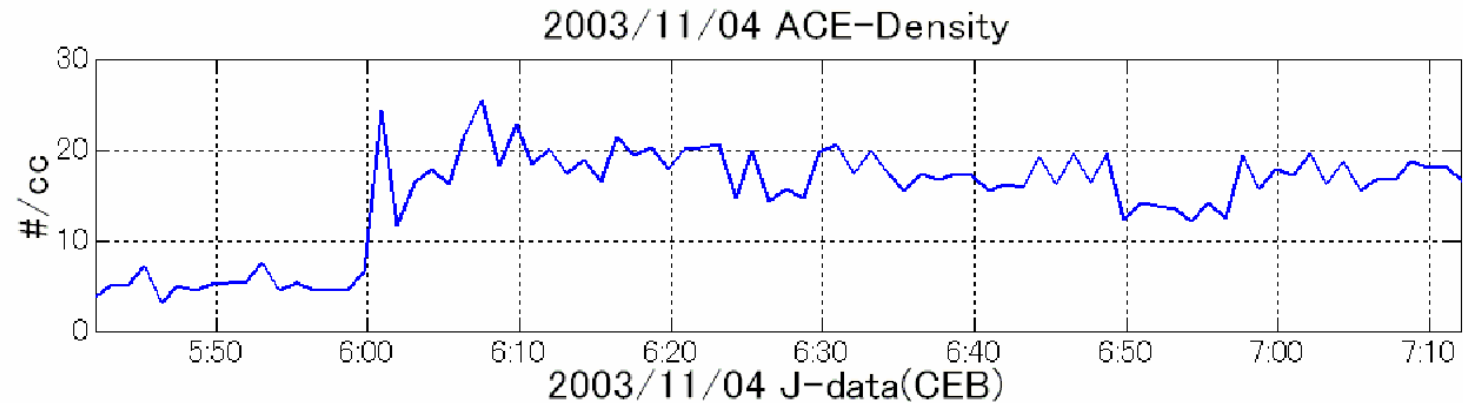


2003/11/04 Storm Event



2003/11/04 SC Event

Ni at ACE



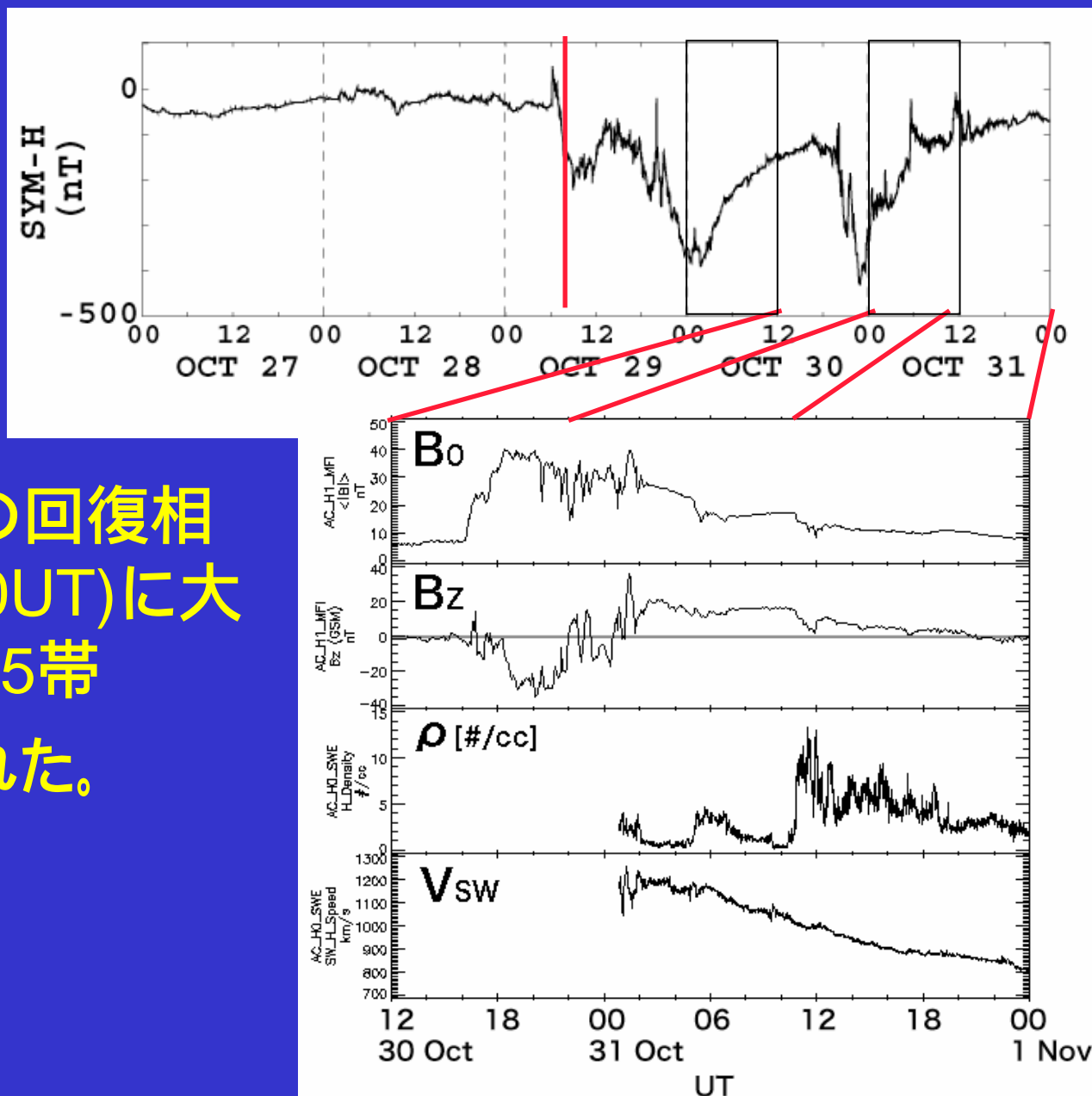
H at CEB
(L=1.0)

Doppler shift
at SSG (L=1.3)

“Halloween Event” 概況

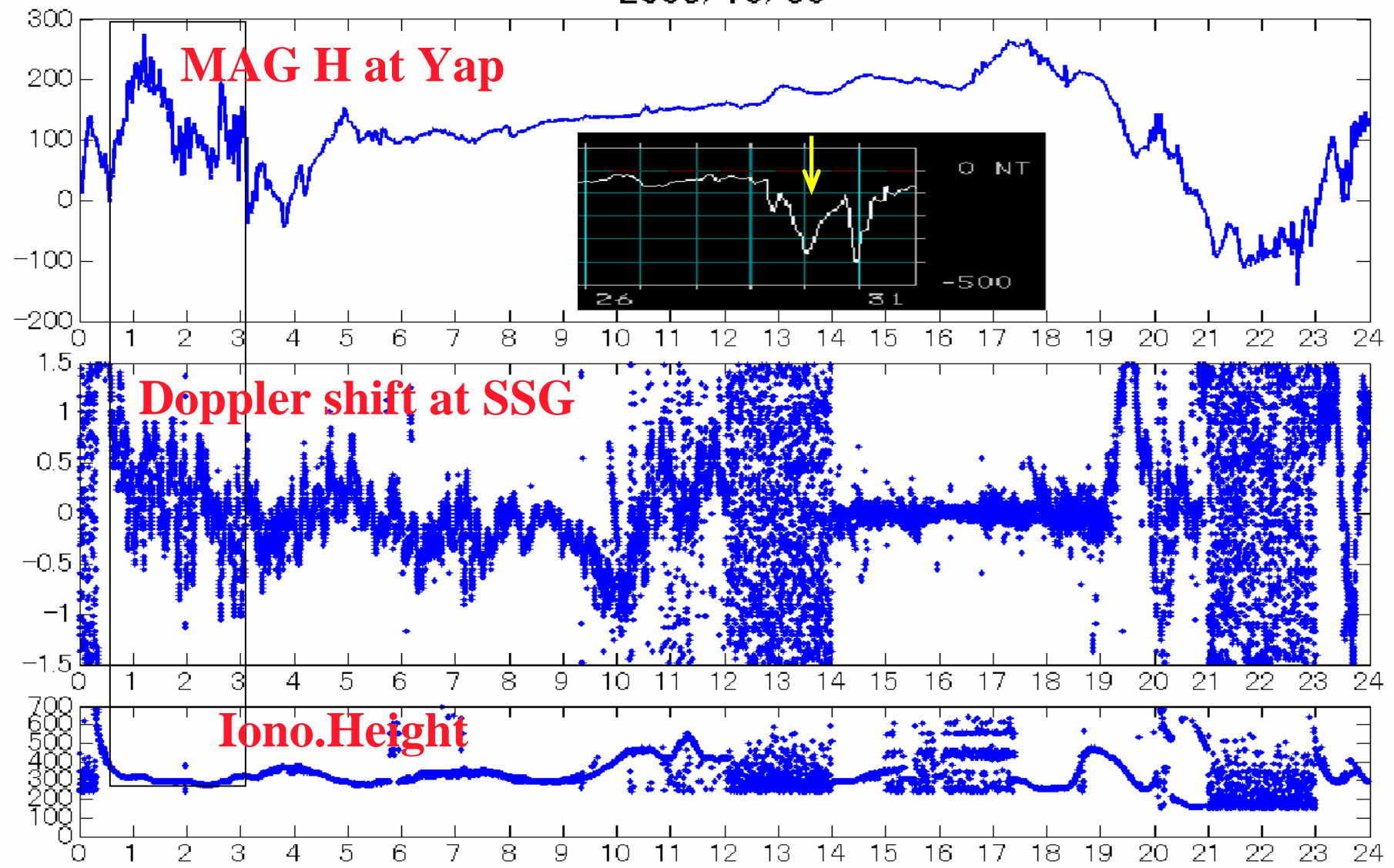
- 2003/10/29
06:11UT SC発生
- 巨大磁気嵐が発達

• 2, 3 発目の磁気嵐の回復相
(10/30 01:00, 23:00UT)に大
振幅(~200nT)のPc 5帯
地磁気脈動が見られた。



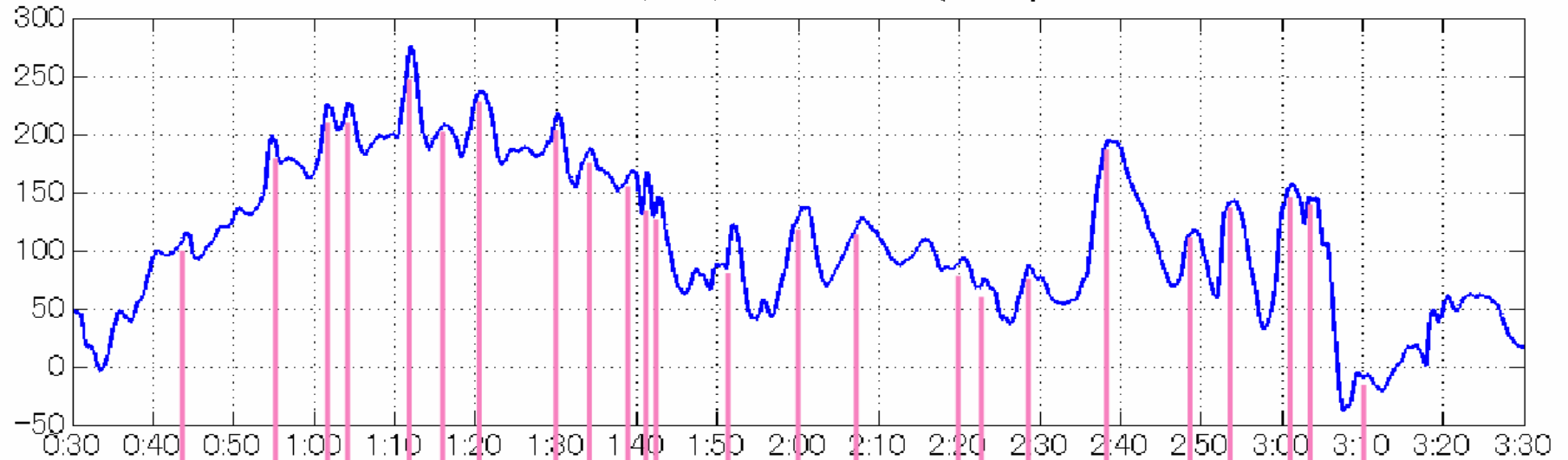
Pc 5 Event (2003/10/30)

2003/10/30

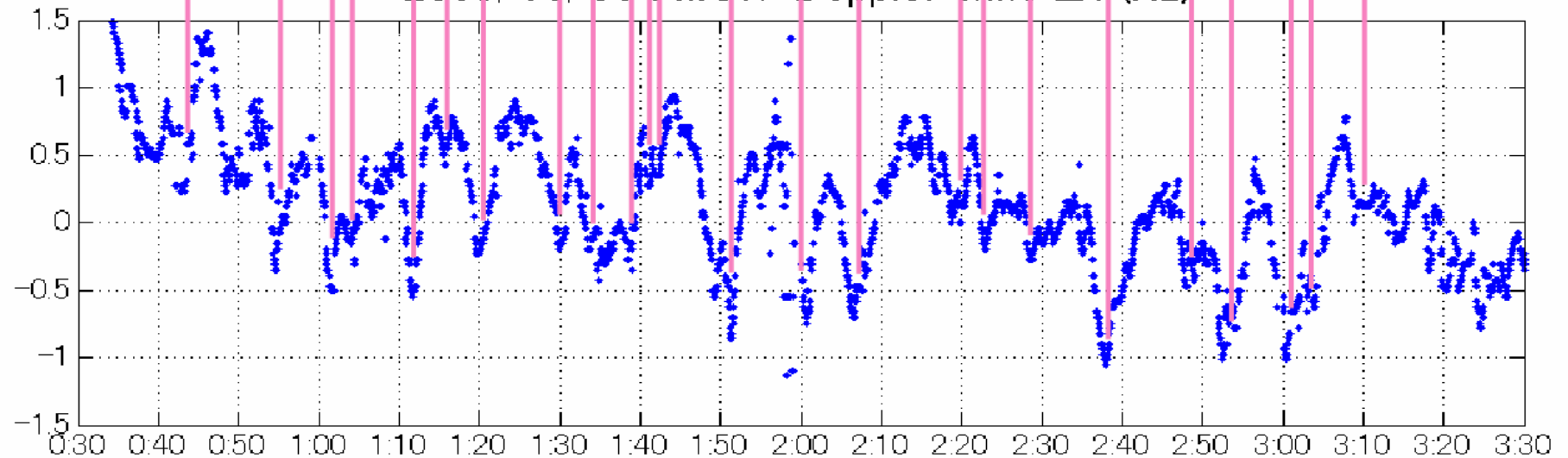


Pc 5 Event (2003/10/30)

2003/10/30 J-Data(YAP)



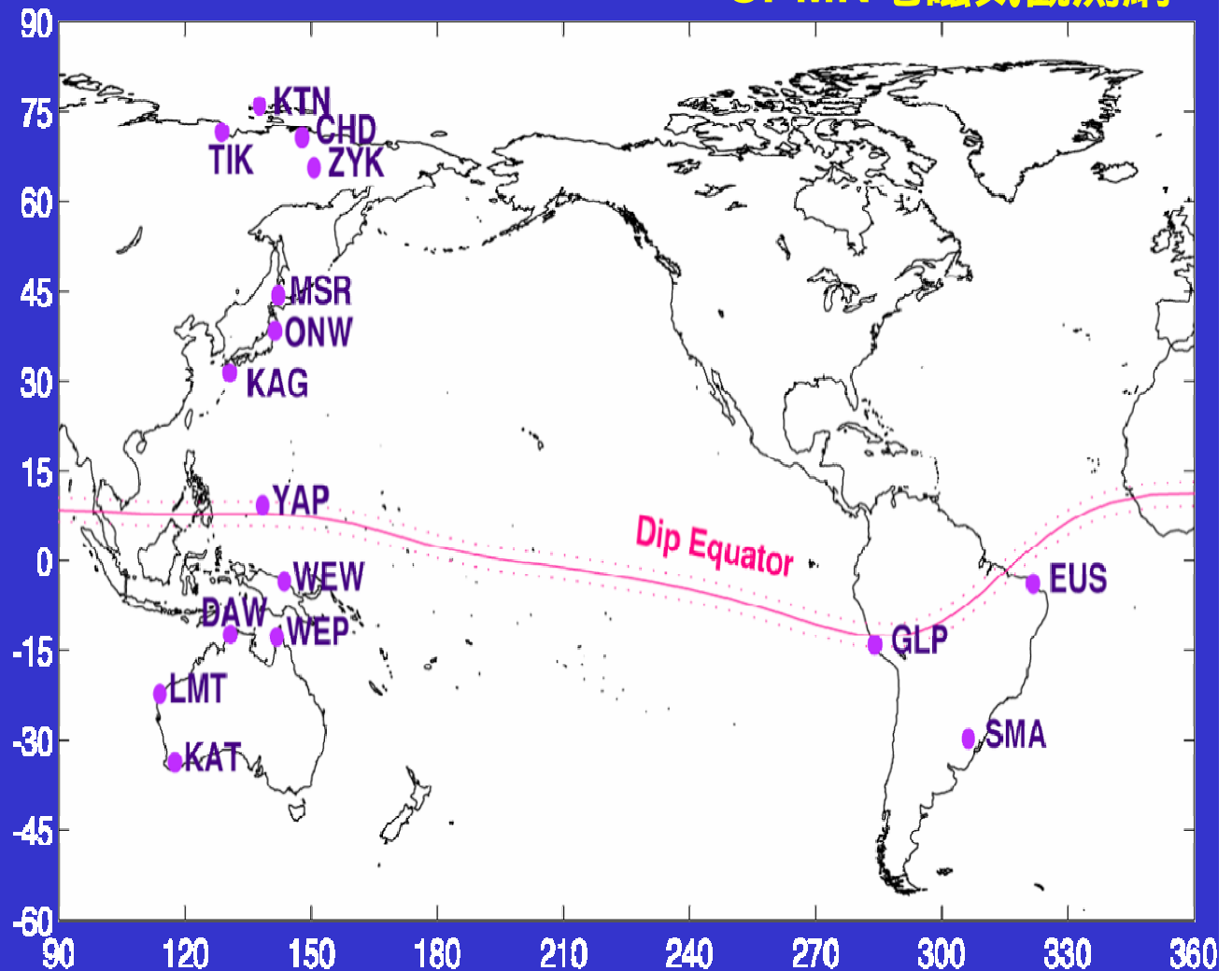
2003/10/30 FMCW-Doppler shift Δf (Hz)



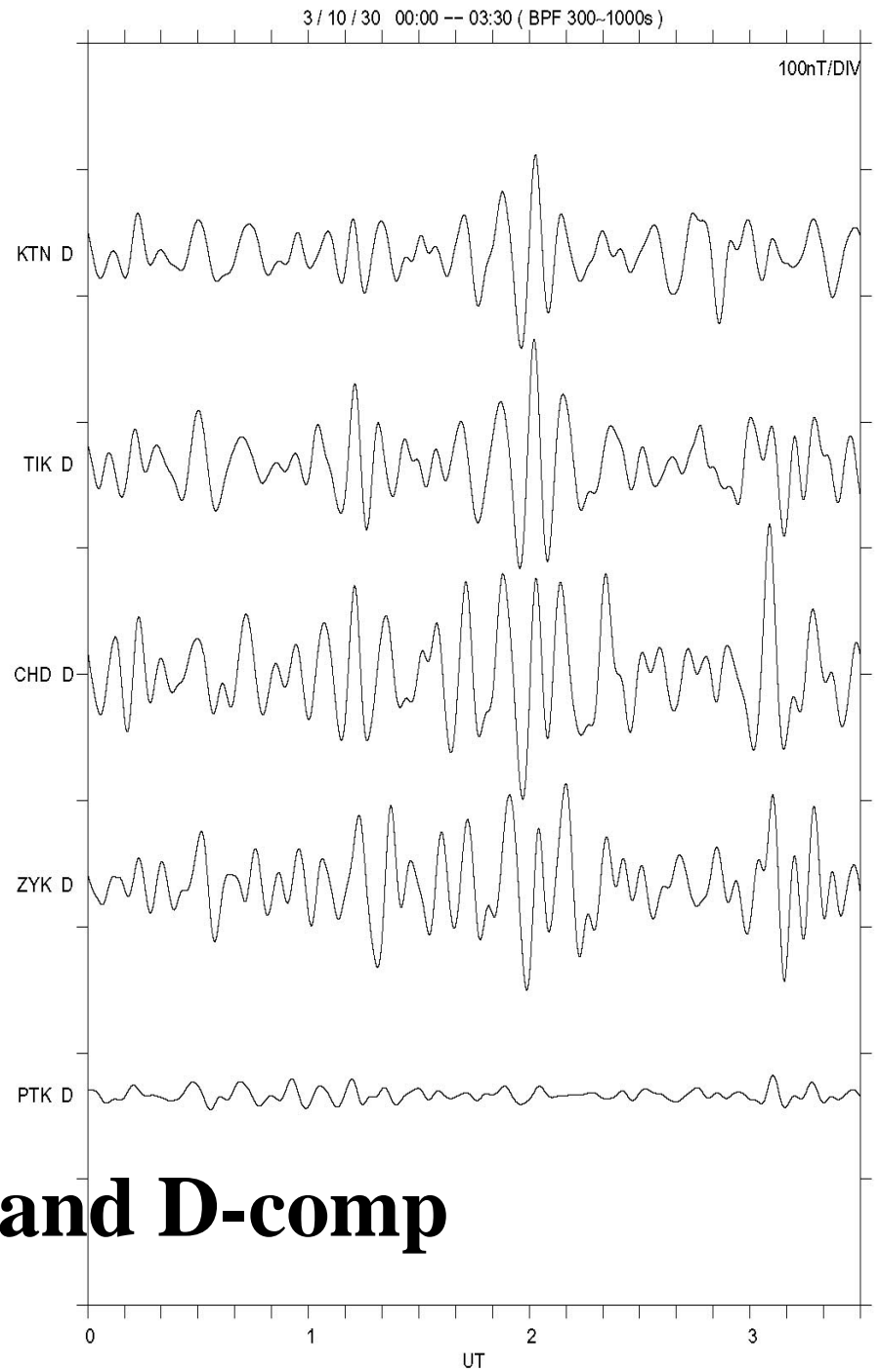
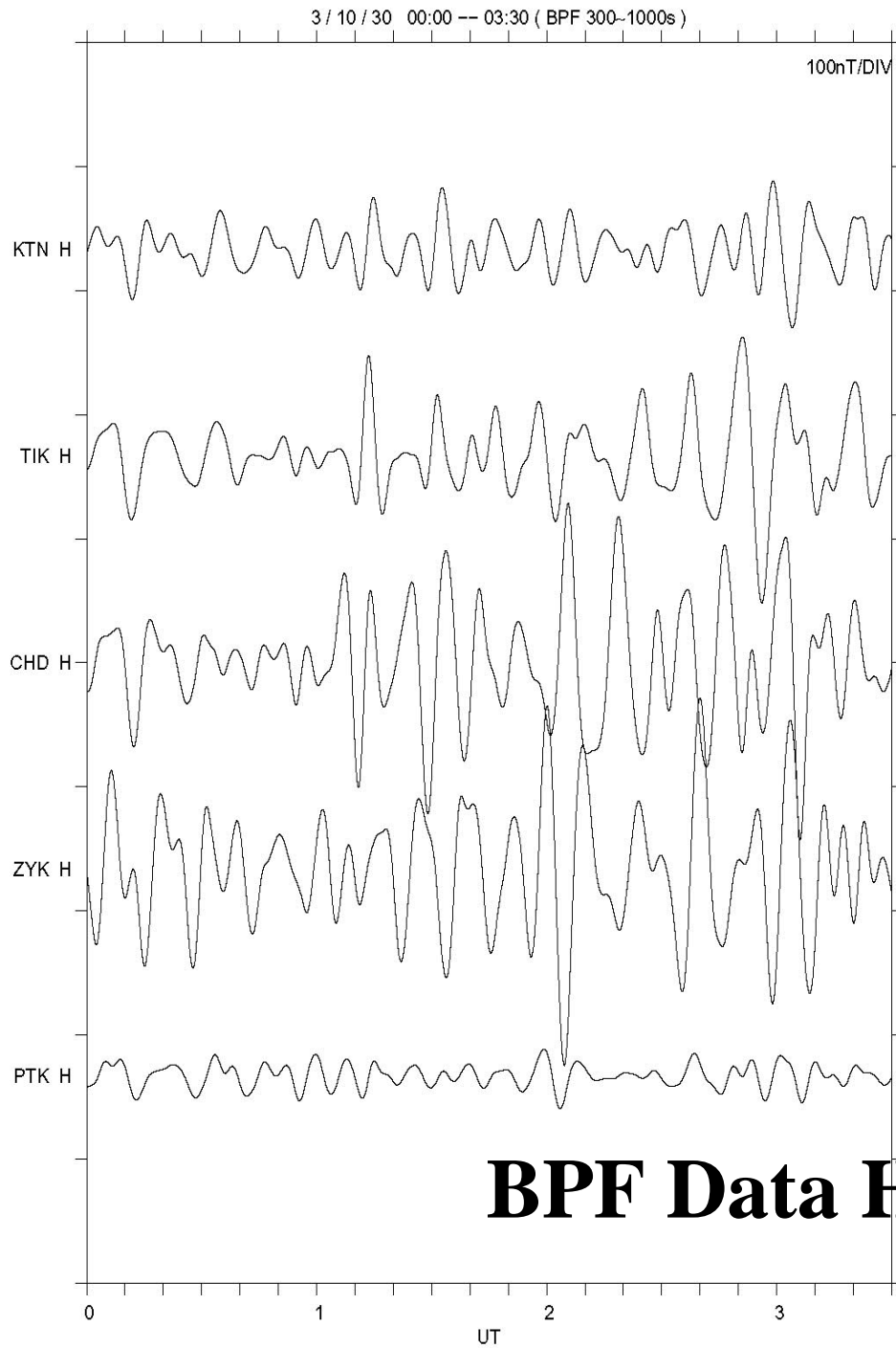
Data Set

	M.Lat	M.Lon	L
KTN	69.92	201.03	8.62
TIK	65.65	196.90	5.98
CHD	64.66	212.14	5.55
ZYK	59.60	216.76	3.97
PTK	46.17	226.02	2.12
MSR	37.28	213.34	1.60
ONW	31.15	212.63	1.39
KAG	24.37	202.36	1.22
GUA	5.61	215.55	1.03
YAP	1.02	209.42	1.02
WEW	-12.12	215.37	1.06
DAW	-22.06	202.78	1.18
WEP	-21.93	214.44	1.18
LMT	-33.59	185.11	1.46
KAT	-46.38	188.33	2.14
GLP	-0.06	355.57	1.00
EUS	0.10	34.74	1.02
SMA	-19.27	13.29	1.14

CPMN地磁氣觀測網

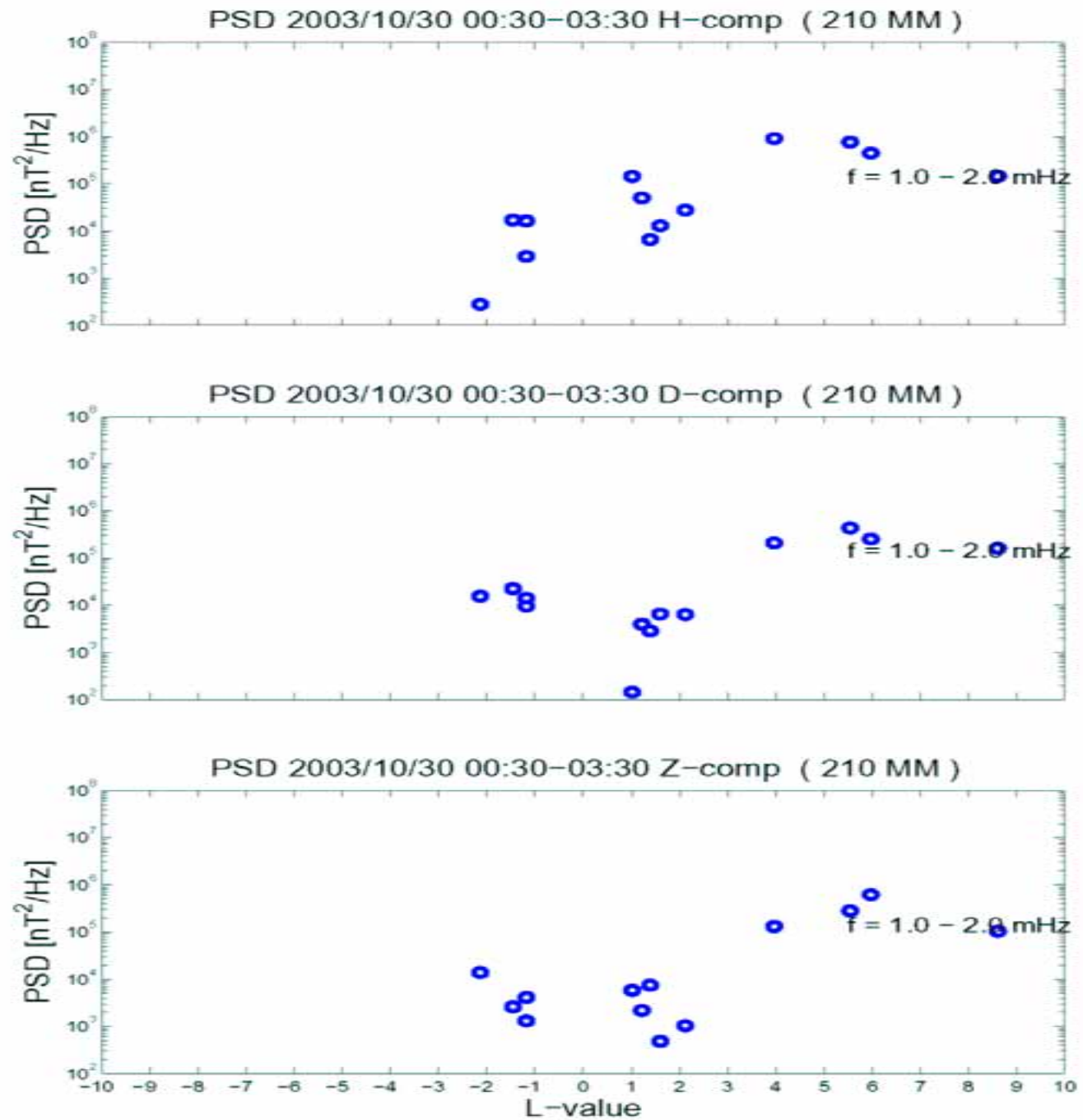


•2003/10/30 00:30-03:30



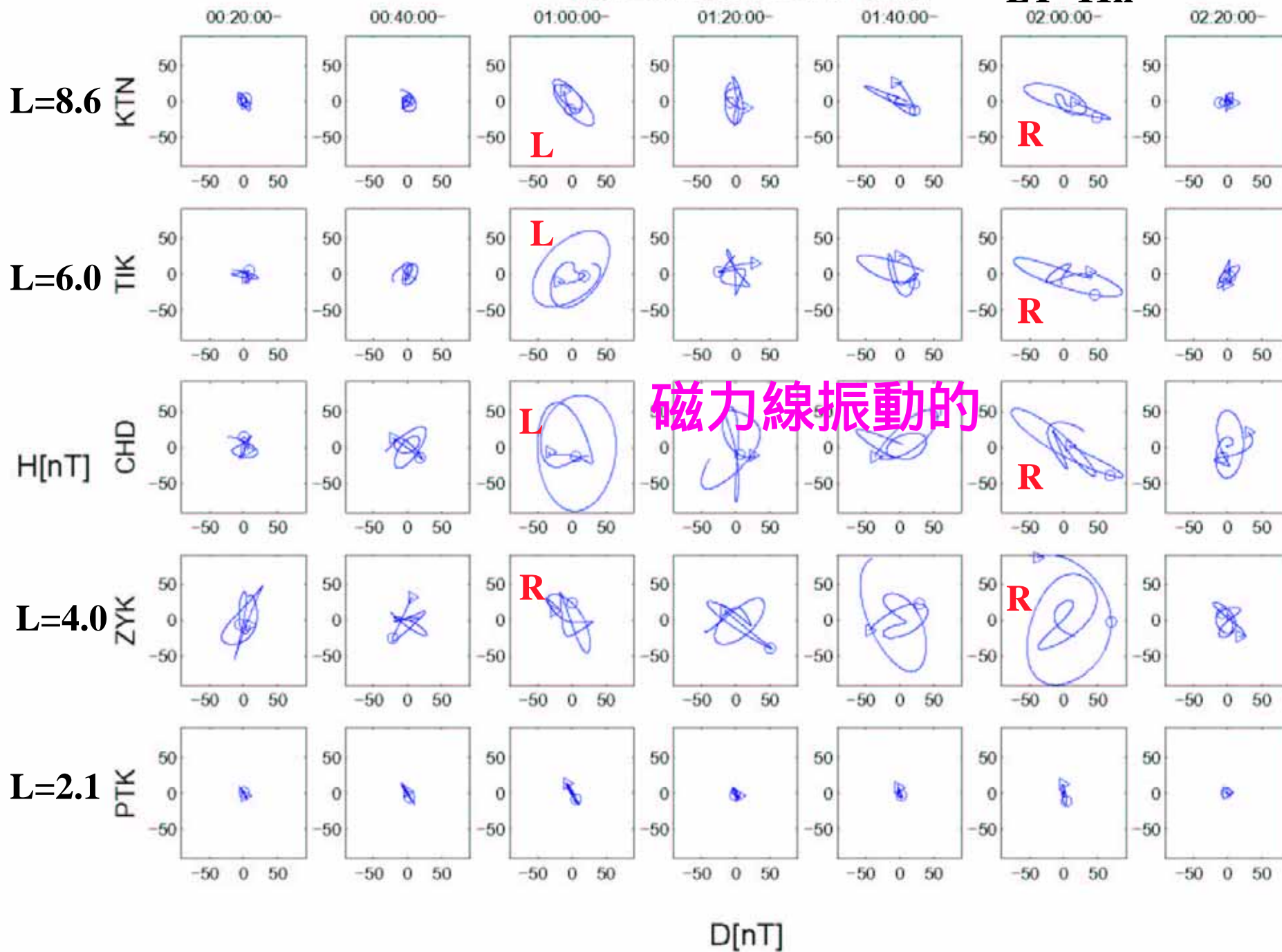
BPF Data H and D-comp

Power Spectral Density



HODOGRAM 2003/10/30

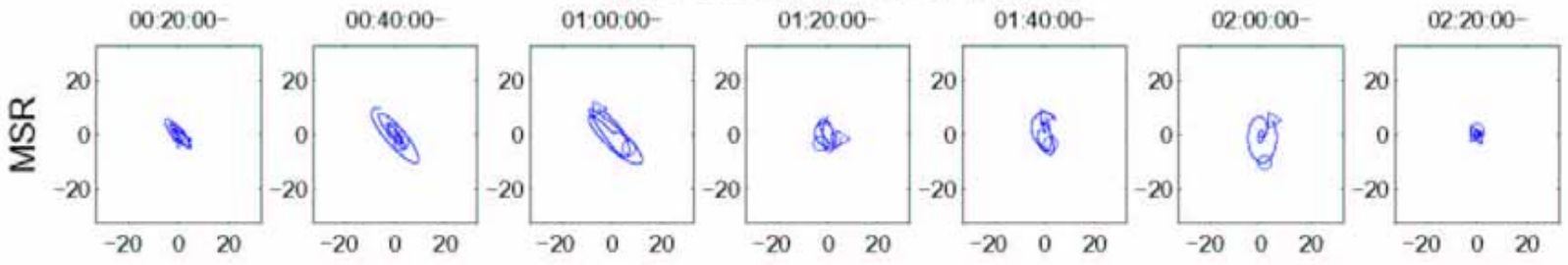
LT=11h



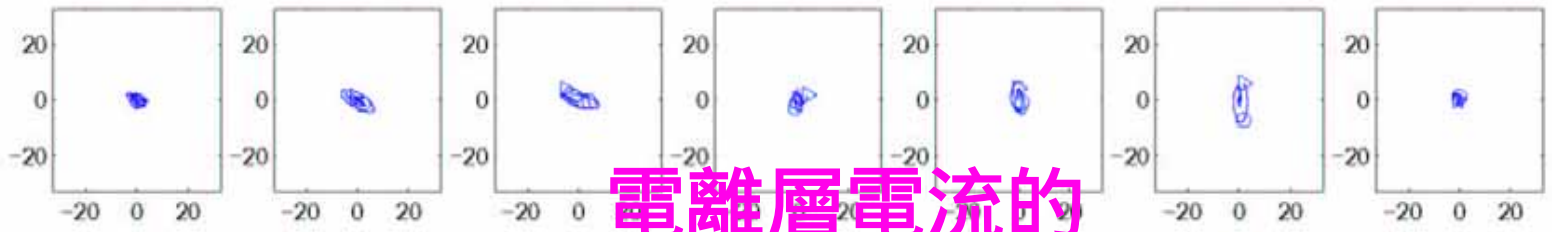
HODOGRAM 2003/10/30

LT=11h

L=1.6



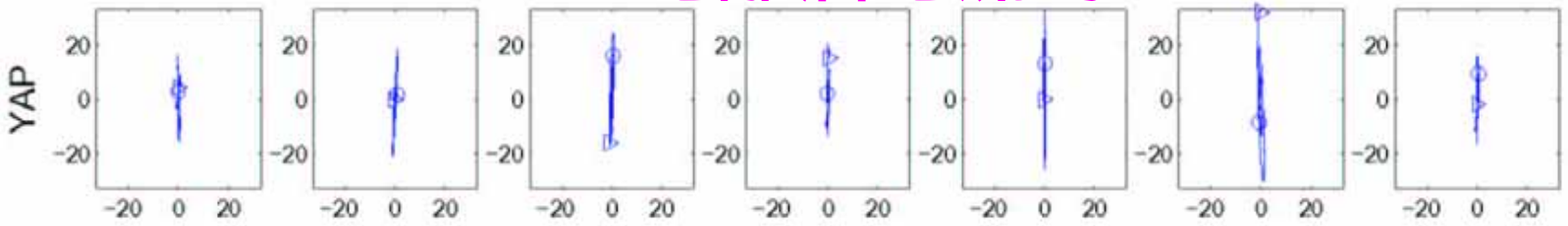
ONW



電離層電流的

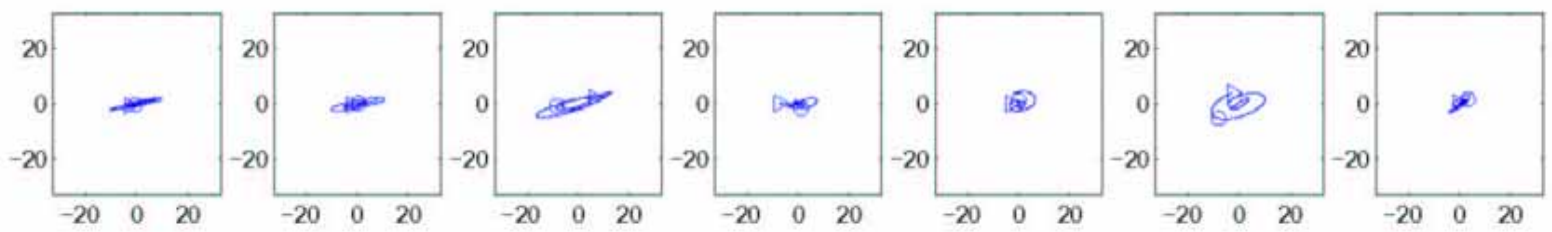
L=0.0

H[nT]

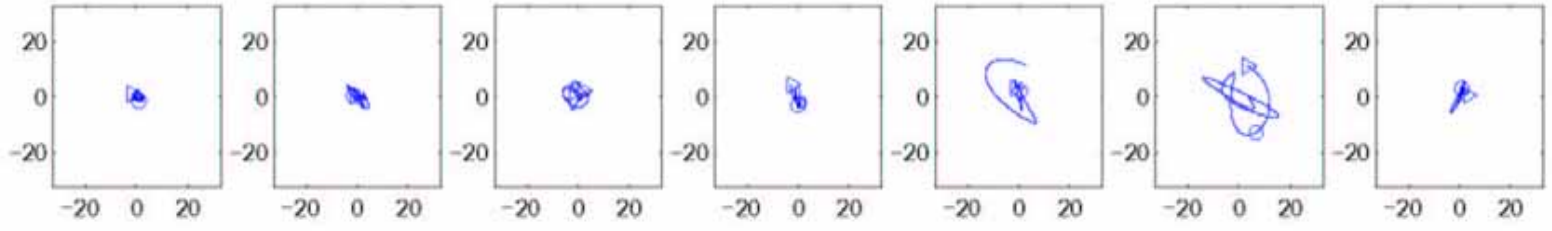


赤道異常增加

DAW



WEP



D[nT]



Space Weather Research in Kyushu University

3. Summary

- (1) Real-time acquisition and analysis of MAGDAS/CPMN data.**
- (2) Monitoring of the ionospheric drift velocity to understand the polar electric fields & ULF fields, penetrating into the magnetic equator.**
- (3) Coordinated Observations with Mid-latitude SuperDARN**