

UPPER ATMOSPHERE PHYSICS DATA,  
SYOWA STATION, 1984

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1. Introduction

This data book summarizes upper atmosphere physics data measured by the "Upper Atmosphere Physics" monitoring system at Syowa Station in 1984. The items of data are as follows.

- 1) Geomagnetism: H-, D- and Z-components of magnetic variation  
Total force of geomagnetic field  
H-, D- and Z-components of magnetic pulsation
- 2) ELF-VLF wave: Intensities at 0.35, 0.75, 1.2, 2, 4, 8,  
30, 60 and 95 kHz  
Wide-band signal of ELF-VLF emissions
- 3) Ionosphere : Cosmic noise absorption at 30 MHz
- 4) Aurora : Meridian scanning record of  $\text{OI } 5577 \text{ \AA}^{\circ}$  and  
 $\text{H}_{\beta} 4861 \text{ \AA}^{\circ}$   
Auroral intensity of  $\text{ING N}_2^{+} 4278 \text{ \AA}^{\circ}$  at three  
directions ( $65^{\circ}$  poleward, zenith and  $45^{\circ}$   
equatorward)

The UAP (Upper Atmosphere Physics) monitoring system was installed at Syowa Station in January 1981. An outline of the system is given in Section 2. Section 3 presents specifications of the data acquisition system. Some examples of computer plots were already reported by Sato et al. (1984), Fujii et al. (1985) and Sakurai et al. (1985). The recording periods are also listed in Section 3 for each of digital and analogue tapes. The format of the compiled digital data is given in Section 4. Magnetograms and frequency-time spectra of magnetic pulsations in the period of January 1 - December 31, 1984 are given in the appendices.

Digital tapes of the magnetograms are available to users on request. The request should be addressed to:

World Data Center C2 for Aurora  
National Institute of Polar Research  
9-10, Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan

Digital and analogue data described here are available to scientists who cooperate with our studies. The request should be addressed to:

Upper Atmosphere Research Division  
National Institute of Polar Research  
9-10, Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan



## 2. UAP Monitoring System

For the last fifteen years upper atmosphere phenomena such as geomagnetic variations, ELF-VLF emissions, cosmic noise absorption and optical auroras were observed by individual equipments and recording methods such as films, chart papers and analogue magnetic tapes. Therefore, when we use these data for computer analysis, we have to convert them into digital data through complicated procedures. The best way to save these procedures is a systematic measurement of upper atmosphere phenomena using digital recording system in real time. Thus we developed a new system which comprises various kinds of sensors and data acquisition facilities. This system is called the Upper Atmosphere Physics (UAP) monitoring system. The system was constructed at Syowa Station in January 1981.

As shown in Fig. 1, this system comprises sensors and data acquisition facilities. The sensors for measuring weak natural electromagnetic waves such as ELF-VLF emissions, ULF magnetic pulsations and cosmic radio noise are set up at a remote station located about 5 km apart from Syowa Station in order to avoid interferences due to man-made electromagnetic noise. The sensors of fluxgate and proton magnetometers are set up about 150 m apart from the data processing building. The sensors of meridian scanning photometer and three-direction photometer are set up on the roof of the data processing building.

The data acquisition facilities are installed inside the data processing building. The remote station and the data processing building are linked by VHF and UHF telemeters. All

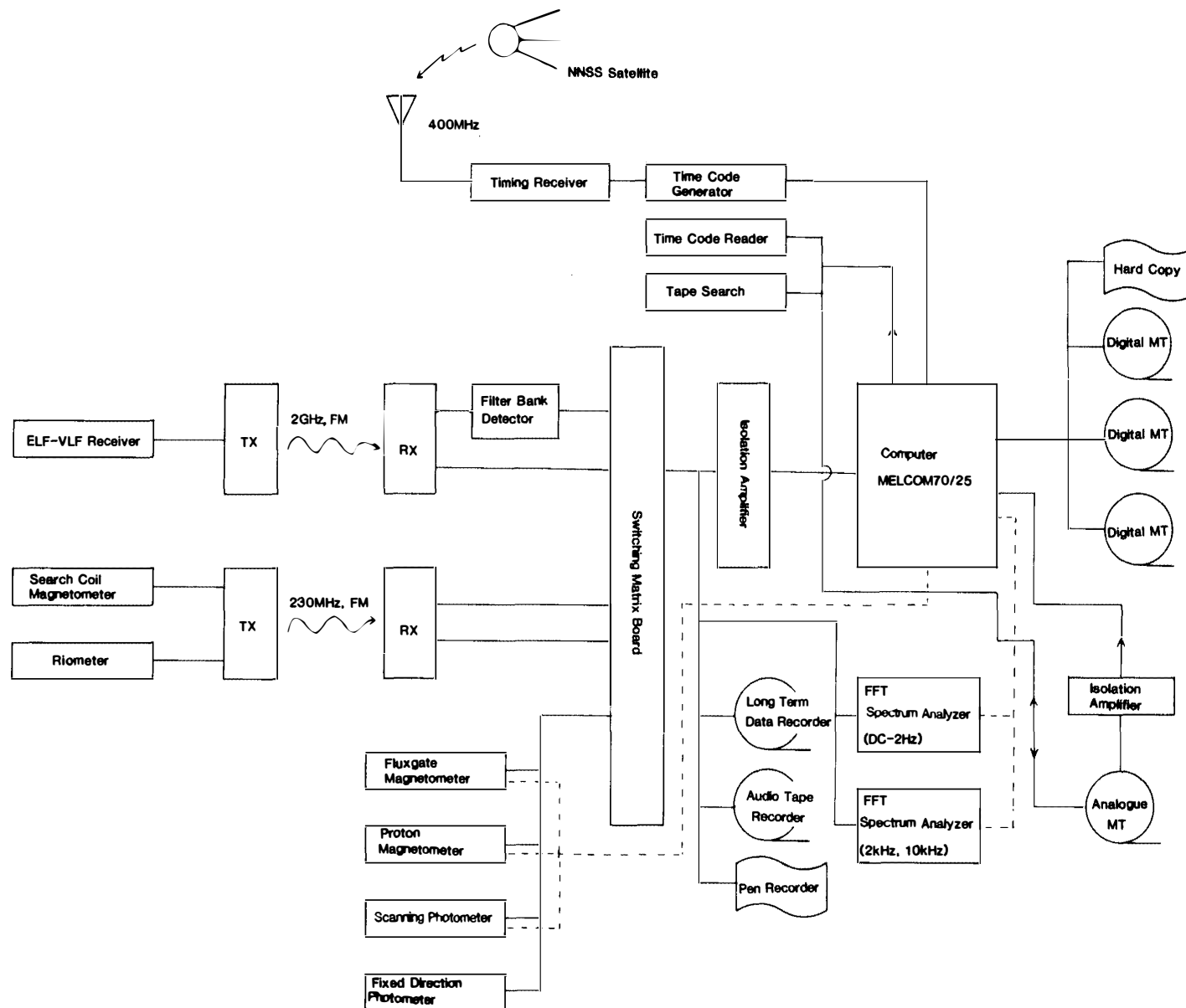


Fig. 1. Block diagram of the "Upper Atmosphere Physics" monitoring system.

the outputs from the observation instruments are relayed by a switching matrix board and then they are delivered into MELCOM 70/25 computer system. The data acquisition system has both digital and analogue data recorders since analogue magnetic tapes are quite useful for recording wave phenomena in the high frequency range. For example, one roll of standard 3600 ft audio tape can record VLF emissions up to 15 kHz over 6 h, while recording time of standard 2400 ft digital tape is only 15 min. The data access to the analogue data recorders is controlled by a tape search unit being linked to the computer. The dynamic spectra of ULF magnetic pulsations and ELF-VLF emissions are obtained by two sets of FFT (Fast Fourier Transform) spectrum analyzers. The output digital signals from the FFT spectrum analyzers are supplied to the computer. All the data are recorded with universal time supplied from a clock/frequency standard unit. This unit consists of NNSS satellite timing receiver, rubidium frequency standard and time code generator. The time code generator supplies IRIG A, B, E and slow codes(S) for the analogue data recorders and 36-bit time code to the computer. The absolute accuracy of these time codes is about 10  $\mu$ s. The computer is driven by 1 MHz clock signal from the rubidium standard.

### 3. Instrumentation and Data Format

#### 3.1. Geomagnetism

##### 3.1.1. Magnetogram

Magnetic variations are measured by a three axis fluxgate magnetometer. The full scale range is  $\pm 1000$  nT, and the frequency response is DC-2 Hz. The noise level is less than 0.5 nT. Both the analogue and digital output signals are recorded on magnetic tapes. Sampling frequency of the digital data is 1 Hz.

Continuous computer plots of magnetogram in the period of January 1 to December 31, 1984 are given in the Appendix 1. In these plots positive sign of the H-, D- and Z-components indicates northward, eastward and upward, respectively. One division of the vertical axis corresponds to 100 nT for the H-, D- and Z-components.

##### 3.1.2. Total force of geomagnetic field

The total force of geomagnetic field (F) is continuously measured by a proton magnetometer. The observation range is 0 - 65000 nT, and the frequency response is up to 0.2 Hz. The noise level is less than 0.2 nT. The digital output signals are recorded on digital magnetic tapes with sampling frequency of 0.1 Hz.

##### 3.1.3. ULF magnetic pulsations

The H-, D- and Z-components of ULF magnetic pulsations are detected by a search coil magnetometer. The three search coil

sensors use permalloy cores wound by copper wire (0.4 mm $\phi$ , 40000 turns). The dimensions of the permalloy core are 1 cm in diameter and 100 cm in length. The intensity range of the magnetometer is 0.001 - 5 nT/s, and the frequency range is 0.001 - 3 Hz. The search coil magnetometer is set at the remote station. The output signals from the telemetry receiver are supplied to both the analogue data recorder and the computer. The data period recorded on analogue long term data recorder(R-950L) is listed in Table 1. The sampling frequency of the digital data is 1 Hz for each components.

Frequency-time (f-t) spectra of magnetic pulsations are easily reproduced from analogue magnetic tapes by using FFT spectrum analyzer. The f-t spectra of the H-component in the frequency range from 0.05 to 2.5 Hz in 1984 are presented in Appendix 2.

#### 3.1.4. Standard magnetic field and K-index

The ordinary magnetogram is recorded continuously on chart paper with a recording speed of 5 cm/h. The sensitivities of the H-, D- and Z-components on chart paper is 118 nT/cm, 100 nT/cm and 111 nT/cm, respectively. Using the value of the maximum deviation of the H-component from the base line, which was measured during quiet time, K-indices were calculated for each 3-hour interval adopting the following scale.

Table 1. The recording period of ULF magnetic pulsation and auroral photoemission signals recorded on long term FM data recorder (R-950L and R-950A).

R-950L

Start time		End time		MT-number
Date	Time (UT)	Date	Time (UT)	
Jan.25	2109	Feb. 9	1150	84-02
Feb. 9	1210	Feb.25	0540	03
Feb.25	0600	Mar.11	1135	04
Mar.11	1155	Mar.27	1140	05
Mar.27	1200	Apr.12	1740	06
Apr.12	1800	Apr.28	1140	07
Apr.28	1200	May 14	0840	08
May 14	0900	May 29	1340	09
May 29	1400	Jun.13	1140	10
Jun.13	1200	Jun.28	0740	11
Jun.28	0800	Jul.17	1250	12
Jul.17	1310	Aug. 8	0810	13
Aug. 8	0830	Aug.24	1210	14
Aug.24	1230	Sep. 9	1330	15
Sep. 9	1350	Sep.25	0625	16
Sep.25	0645	Oct.10	0530	17
Oct.10	0550	Oct.25	0800	18
Oct.25	0820	Nov.10	1220	19
Nov.10	1240	Nov.25	1830	20
Nov.25	1850	Dec.10	1400	21
Dec.10	1420	Dec.26	0650	22
Dec.26	0710	Jan.10	1650	23
Jan.10	1710	Jan.25	0530	85-01

R-950A

Start	End	MT-number
Mar. 6	Mar.14	84A-01
Mar.14	May 12	02
May 12	Jun.16	03
Jun.16	Jul. 5	04
Jul. 5	Jul.28	05
Jul.28	Sep. 3	06
Sep. 3	Oct.30	07

Table 2. The values of the geomagnetic base-line.

DATE	TIME (UT)	TOTAL INT. (nT)	HORI- ZONTAL INT. (nT)	VERTI- CAL INT. (nT)	DECLI- NATION	DIPANGLE
MAR. 5 1984	11 <sup>h</sup> 15 <sup>m</sup>	44466	18992	40206	-46° 43.3'	-64° 42.9'
APR. 14	10 35	44473	18998	40211	-46° 42.5'	-64° 42.7'
JUNE 5	08 21	44453	19009	40184	-46° 43.6'	-64° 41.0'
AUG. 7	10 54	44437	19008	40166	-46° 43.6'	-64° 40.5'
AUG. 22	10 24	44431	19003	40162	-46° 44.9'	-64° 40.7'
SEP. 16	12 42	44426	19002	40157	-46° 43.7'	-64° 40.6'
OCT. 28	11 45	44424	18991	40160	-46° 45.6'	-64° 41.5'
NOV. 27	10 20	44385	19009	40108	-46° 49.7'	-64° 38.5'
DEC. 14	11 30	—	—	—	-46° 42.9'	-64° 39.2'
DEC. 20	12 26	44397	18996	40128	-46° 42.0'	-64° 40.1'
JAN. 19 1985	07 24	44384	19016	40104	-46° 49.0'	-64° 37.9'

Table 3. K-indices at Syowa Station in 1984.

	FEB. (1984)		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEP.		OCT.		NOV.		DEC.		JAN. (1985)	
1	5443	2333	0222	4356	5754	3444	5643	3345	3101	1122	2422	1154	6875	4465	5331	1134	3221	1222	3434	3222	3433	2226	3523	2366
2	3221	2466	6544	3366	7555	2466	5655	3212	4442	2233	5432	1235	4543	3344	3532	1222	5221	1344	2221	1354	6553	3456	4532	2125
3	5322	2354	6653	3356	7644	3477	1043	1245	2232	4453	6212	2323	4533	3214	3541	1114	5652	2224	4222	4345	4423	4464	4422	1124
4	6663	5556	5532	2200	7754	3676	4333	2225	5545	2225	3331	1244	4333	2236	4454	5744	3100	0223	5433	3345	5343	3445	3221	1234
5	4532	2222	1111	0011	6554	3666	5322	3467	6654	3224	5443	2212	4332	1232	6873	3464	4410	1112	5532	2223	5533	2435	3222	2235
6	4321	1245	2463	2465	5523	2244	6441	1111	4432	2133	4432	2233	3211	1123	4322	2324	2331	1245	2322	2323	5432	3345	4311	1223
7	3422	2125	6732	2346	5225	4344	3011	2001	4434	2222	3222	1224	2210	1003	4313	0120	6542	5446	2422	2547	5432	3333	3221	1233
8	4221	2224	5533	4475	5565	2465	0111	0110	1000	1144	4333	2214	5522	2124	1122	1225	6433	2246	5534	3333	4422	2223	4222	2544
9	3322	2225	5542	2235	6642	3345	1321	1235	3353	3243	4422	2212	3223	3136	3222	1126	5333	2246	2322	2445	5222	2234	4655	5444
10	4222	4555	5431	2357	3421	1123	5644	3322	5543	3224	2322	2233	3322	1154	4544	2466	6553	5334	5421	3235	2222	2332	4634	3435
11	5442	3333	5311	1345	5222	2343	3221	3245	4442	3223	4100	1354	2233	2125	6542	2235	6543	3357	4422	3225	2322	3345	4432	3343
12	2321	1334	5531	1235	3432	1224	5123	1333	5532	2001	6631	0123	6422	3134	4222	2336	6443	2456	2522	2112	5522	3223	4522	3335
13	5563	4675	5422	4322	3421	1323	5521	0000	0220	0120	5765	5445	6520	0012	6532	2223	5423	3113	2222	2345	6632	3443	4522	2233
14	6652	4445	2222	1110	3321	1446	0000	2344	3100	0000	7754	3455	1022	2445	5331	2346	5521	1336	4322	2334	2212	3334	2221	2332
15	5541	1224	1121	1123	4232	2111	3243	2111	2312	2355	6554	2246	5643	2324	6222	1224	5320	0245	4434	4466	3222	3266	2222	3443
16	4422	1232	2342	4422	1122	1123	2211	1103	7665	3225	5645	2256	6642	2235	5221	0133	3434	3325	6775	5565	5443	3456	4422	1111
17	3342	2223	2542	3432	2111	1122	4534	1423	4233	2131	5764	4455	5432	2125	3221	0002	3110	0112	5443	4455	4432	4545	0112	2433
18	5542	2332	4433	2434	1321	0011	2231	2236	4323	4545	5533	3444	2321	1012	1110	0002	1435	4575	5432	1334	4422	3333	3221	2133
19	3321	2332	5532	1001	1122	1024	5763	2235	5454	4366	5553	3245	2101	2454	2223	3446	6554	4566	6552	3435	3111	2222	2222	2311
20	4222	1356	3111	1000	3563	1213	5453	3356	6643	2100	4442	2206	4552	0230	4522	1354	5653	4566	4453	3444	4210	2222	3221	1331
21	4532	3334	0101	1235	4221	1125	6664	2347	4000	0034	4132	1103	2200	0100	2212	2125	5544	4477	4433	3456	1321	2345	2543	2323
22	3421	1233	4452	2245	5222	1000	5453	3546	5541	1223	3521	1015	0000	0000	4233	2265	6433	3466	2322	2334	3221	2333	2221	2325
23	4242	2333	4333	3232	2211	0145	6644	4346	3320	0136	5320	1114	1110	2224	6665	5566	5553	3455	4332	2011	3332	2334	4663	4445
24	4222	1234	4422	1223	3321	0104	4344	4456	6622	2104	4523	2123	4544	3444	7574	3456	6653	4445	3421	2233	2311	1123	3211	2224
25	4222	2113	5544	4435	1221	4555	5232	2336	4522	1223	4432	3134	5434	2235	4653	4456	4432	2256	5221	0244	3421	1111	5531	0121
26	2222	3444	3222	2244	7765	5776	6653	2210	5432	0134	552-	---3	4440	2222	6654	4446	5221	1324	5321	1232	5643	4443	3322	1334
27	6552	2266	4333	2356	7643	2346	0023	2234	6532	2002	6420	1244	5412	3457	5543	3256	3211	2322	2211	2333	3213	4436	3421	0244
28	2321	3222	4643	4476	4434	2333	3311	2136	5653	3345	5542	2232	7354	2456	4512	2354	3221	1235	3311	0122	5443	3455	6643	4565
29	1232	2521	7664	4356	3232	3344	5622	2233	4322	1224	3322	2443	5553	2325	5430	2125	4412	2234	2232	1233	4433	2336	6422	2246
30			5563	3366	2531	1006	6444	3334	5421	2232	4312	1213	5532	3334	6430	0024	3221	0011	4563	4344	5533	3344	4432	2335
31			5533	3357			4221	1004			2111	2125	5331	1235			3111	1024			5432	4454	5422	3324



K-indices	Deviation in nT
0	0 - 25
1	25 - 50
2	50 - 100
3	100 - 200
4	200 - 350
5	350 - 600
6	600 - 1000
7	1000 - 1660
8	1660 - 2500
9	2500 and more

Tables 2 and 3 give the values of the baselines and K-indices measured at Syowa Station, 1984. Inquiries or requests for data copies of the ordinary magnetic field measurements should be addressed to:

World Data Center C2 for Aurora  
National Institute of Polar Research  
9-10, Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan

### 3.2. ELF-VLF wave

The receiving site of natural ELF-VLF electromagnetic waves should be located far away from man made power line radiation sources. Therefore, a telemeter link between the remote station and the data processing building is used in this system. The remote station is located at West Ongul Island about 5 km apart from Syowa Station.

The ELF-VLF receiving system at the remote station comprises triangle-shaped three turn loop antenna (10 m in height, 20 m at the base), pre-amplifier and main amplifier. The gains of the pre- and main-amplifiers are 60 and 40 dB, respectively. The ELF-VLF wave intensities at the frequencies of 0.35, 0.75, 1.2, 2, 4, 8, 30, 60 and 95 kHz are measured by using 9-channel band pass filter units. The ELF-VLF emissions within the range from  $10^{-17}$  to  $10^{-13}$  W/m<sup>2</sup>.Hz are detected by this system.

The wide-band ELF-VLF signals up to 15 kHz are recorded on audio tape recorders. The recording periods of each audio tapes are listed in Table 4. The wide-band signals are also supplied to FFT spectrum analyzer and dynamic spectra in the frequency ranges 0.1 - 2 kHz and 0.1 - 10 kHz are calculated every 10 min. These dynamic spectral data are recorded on the digital magnetic tapes. Output signals from the 9-channel filter units are recorded on digital magnetic tapes with sampling frequency of 0.5 Hz.

Some examples of computer plots of ELF-VLF wave intensities and frequency-time spectra were shown by Sato et al. (1984).

### 3.3. Ionosphere

Cosmic noise absorption at 30 MHz is measured by the riometer made by La Jolla Science. The bandwidth and time constant of the receiver are 150 kHz and 0.25 s, respectively. The riometer is installed at the remote station.

Table 4. The recording period of ELF-VLF wide band signals recorded on audio tapes.

Start time	(UT)	Stop time	(UT)	Tape number	Start time	(UT)	Stop time	(UT)	Tape number
Mar.20	0600	Mar.20	1200	84-001	Apr.08	0000	Apr.08	0600	84-050
	1200		1800	002		1800		2400	051
	1800		2400	003	09	0000		0600	052
21	0000		0600	004	13	1100		1200	053
	0600		1200	005		1200		1800	054
	1900		2400	006	18	1800		2400	055
22	0000		0600	007	19	0000		0600	056
	0600		1200	008	21	1800		2400	057
	1200		1800	009	22	0000		0600	058
	1800		2400	010	23	0000		0600	059
23	0000		0600	011		0600		1200	060
	0600		1200	012		1800		2400	061
	1200		1800	013	24	0000		0600	062
	1800		2400	014	26	1800		2400	063
24	0000		0600	015	27	0000		0600	064
	0600		1200	016		0600		1200	065
	1200		1800	017		1200		1800	066
	1800		2400	018		1800		2400	067
25	0000		0600	019	28	0000		0600	068
	0600		1200	020		0600		1200	069
	1200		1800	021		1200		1800	070
26	0000		0600	022		1800		2400	071
	0600		1200	023	29	0635		1200	072
	1200		1800	024		1200		1800	073
	1800		2400	025		1800		2400	074
27	0000		0600	026	30	0000		0600	075
	0600		1200	027		0600		1200	076
	1200		1800	028		1200		1800	077
	1800		2400	029		1800		2400	078
28	0000		0600	030	May 01	0000	May 01	0600	84-079
	0600		1200	031		0600		1200	080
	1200		1800	032		1200		1800	081
	1800		2400	033		1800		2400	082
29	0000		0600	034	02	0000		0600	083
	0600		1200	035		0600		1200	084
	1200		1800	036		1200		1800	085
	1800		2400	037		1800		2400	086
30	0000		0600	038	03	0000		0600	087
	0600		1200	039		0600		1200	088
	1200		1800	040		1200		1800	089
	1800		2400	041		1800		2400	090
31	0000		0600	042	04	0000		0600	091
	0900		1200	043		0600		1200	092
	1200		1800	044		1200		1800	093
	1900		2400	045		1800		2400	094
Apr.01	0000	Apr.01	0600	84-046	05	0352		0600	095
04	1725		1800	047		0600		1200	096
	1800		2400	048	10	1800		2400	097
07	1810		2400	049	11	0000		0600	098

Start time	(UT)	Stop time	(UT)	Tape number
May 11	0600	May 11	1200	84-099
	1200		1800	100
	1800		2400	101
12	0000		0600	102
19	0000		0600	103
	1800		2400	104
20	1800		2400	105
21	0000		0600	106
	1800		2400	107
22	0000		0600	108
23	0820		1120	109
	1800		2400	110
24	0000		0600	111
25	0000		0600	112
	1800		2400	113
26	0000		0600	114
	1800		2400	115
27	1800		2400	116
28	0000		0600	117
	1800		2400	118
29	0000		0600	119
30	2100		2400	120
31	0000		0600	121
Jun. 01	1800	Jun. 01	2400	84-122
02	0000		0600	123
	1800		2400	124
03	0000		0600	125
	1800		2400	126
04	0000		0600	127
	1800		2400	128
05	0000		0600	129
	1855		2400	130
06	0000		0600	131
07	0025		0625	132
	2100		2400	133
08	0000		0600	134
09	0000		0300	135
	0300		0900	136
10	0000		0300	137
	0300		0900	138
14	2100		2400	139
15	0000		0600	140
	2316	16	0516	141
16	0900		1200	142
	1200		1800	143
18	0600		1200	144
	1200		1800	145
	1800		2400	146
19	1325		1800	147
	1800		2400	148
20	0000		0600	149
	1800		2400	150

Start time	(UT)	Stop time	(UT)	Tape number
Jun. 21	0000	Jun. 21	0600	84-151
	1915		2400	152
22	0000		0600	153
	1800		2400	154
23	0000		0600	155
24	1800		2400	156
25	0000		0600	157
	1800		2400	158
26	0000		0255	159
	0255		0855	160
	1800		2400	161
27	0000		0600	162
	1500		1800	163
	1800		2400	164
28	1305		1800	165
	1800		2400	166
29	0000		0600	167
	0600		1200	168
	1200		1800	169
	1800		2400	170
30	1400		1800	171
	1800		2400	172
Jul. 01	1800	Jul. 01	2400	84-173
02	0000		0600	174
03	1800		2400	175
04	0000		0600	176
	0600		1200	177
	1200		1800	178
	1800		2400	179
05	0055		0600	180
	0600		1200	181
	1800		2400	182
06	0000		0600	183
	0600		1200	184
07	0600		1200	185
14	0000		0600	186
	0600		1200	187
	1500		1800	188
	1800		2400	189
15	0000		0600	190
16	0600		1200	191
	1800		2400	192
17	0000		0600	193
	0600		1200	194
	1200		1800	195
	1800		2400	196
18	1330		1930	197
19	0000		0600	198
	0600		1200	199
	1200		1800	200
	1800		2400	201
20	0000		0600	202

Start time	(UT)	Stop time	(UT)	Tape number	Start time	(UT)	Stop time	(UT)	Tape number
Jul.20	0600	Jul.20	1200	84-203	Aug.23	0930	Aug.23	1530	84-255
	1200		1800	204	24	1215		1800	256
21	1420		1800	205		1800		2400	257
	1800		2400	206	25	1800		2400	258
22	1430		1800	207	26	0000		0600	259
	1800		2400	208	27	1200		1800	260
23	0500		1100	209		1800		2400	261
	1100		1700	210	28	0000		0600	262
	1920	24	0120	211	29	0600		1200	263
24	0725		1100	212	31	1800		2400	264
	1100		1700	213					
	1700		2300	214	Sep.01	0000	Sep.01	0600	84-265
25	0000		0600	215		0635		1200	266
	0600		1200	216		1200		1800	267
	1200		1800	217		1800		2400	268
	1800		2400	218	02	0000		0600	269
26	0000		0600	219		0600		1200	270
	0600		1200	220		1200		1800	271
	1200		1800	221		1800		2400	272
	1800		2400	222	03	0000		0600	273
27	0500		1100	223		0600		1200	274
	1445		1700	224		1200		1800	275
	1700		2300	225		1800		2400	276
28	0525		1100	226	04	0000		0600	277
	1100		1700	227		0600		1200	278
	1915	29	0115	228		1200		1800	279
29	0600		1200	229		1800		2400	280
31	0900		1500	230	05	0000		0600	281
	1500		2100	231		0600		1200	282
						1200		1800	283
Aug.01	0900	Aug.01	1500	84-232		1800		2400	284
	1500		2100	233	06	0000		0600	285
	2100	02	0300	234		0600		1200	286
02	0900		1500	235		1200		1800	287
	1500		2100	236		1800		2400	288
	2100	03	0300	237	07	0000		0600	289
03	0600		1200	238		0600		1200	290
	1200		1800	239		1200		1800	291
04	1800		2400	240		1800		2400	292
05	0000		0600	241	08	0000		0600	293
08	1200		1800	242		0600		1200	294
09	1200		1800	243		1200		1800	295
10	1220		1820	244		1800		2400	296
14	1025		1625	245	09	0000		0600	297
	1820		2400	246		0600		1200	298
15	0000		0600	247		1200		1800	299
	1040		1640	248		1800		2400	300
16	0600		1200	249	10	0000		0600	301
	1200		1800	250		0600		1200	302
17	0810		1410	251		1200		1800	303
18	1020		1620	252	13	0000		0600	304
21	1800		2400	253		0600		1200	305
22	1200		1800	254		1200		1800	306

Start time	(UT)	Stop time	(UT)	Tape number
Sep.13	1800	Sep.13	2400	84-307
14	0000		0600	308
	0600		1200	309
	1200		1800	310
	1800		2400	311
15	0000		0600	312
	0700		1200	313
	1200		1800	314
	1800		2400	315
16	0000		0600	316
	0600		1200	317
	1200		1800	318
	1800		2400	319
17	0000		0600	320
	0600		1200	321
	1200		1800	322
	1800		2400	323
18	0000		0600	324
	0815		1200	325
	1200		1800	326
	1800		2400	327
19	0000		0600	328
	0600		1200	329
	1800		2400	330
20	0000		0600	331
	0600		1200	332
	1200		1800	333
	1800		2400	334
21	0135		0600	335
	0600		1200	336
	1200		1800	337
	1800		2400	338
22	0000		0600	339
	0600		1200	340
	1200		1800	341
	1800		2400	342
23	0000		0600	343
	0600		1200	344
	1200		1800	345
	1800		2400	346
24	0000		0600	347
	0600		1200	348
	1200		1800	349
	1800		2400	350
25	0000		0600	351
	0600		1200	352
	1200		1800	353
	1800		2400	354
26	0000		0600	355
	0600		1200	356
	1800		2400	357
27	0000		0600	358
	0600		1200	359

Start time	(UT)	Stop time	(UT)	Tape number
Sep.27	1200	Sep.27	1800	84-360
	1800		2400	361
28	0000		0600	362
	0810		1200	363
	1200		1800	364
	1800		2400	365
29	0000		0600	366
	0600		1200	367
	1200		1800	368
	1800		2400	369
30	0000		0600	370
	0600		1200	371
	1200		1800	372
	1800		2400	373
Oct.01	0000	Oct.01	0600	84-374
	0600		1200	375
	1200		1800	376
	2130		2400	377
02	0000		0600	378
	0600		1200	379
	1200		1800	380
	1800		2400	381
03	0000		0600	382
	0600		1200	383
	1200		1800	384
	1800		2400	385
06	0600		1200	386
	1200		1800	387
07	0600		1200	388
	1200		1800	389
08	0600		1200	390
09	0600		1200	391
	1200		1800	392
10	0600		1200	393
12	0600		1200	394
13	0710		1230	395
	1230		1830	396
14	0600		1200	397
15	0600		1200	398
16	0600		1200	399
18	0600		1200	400
20	0600		1200	401
26	Calibration Data			402
	"			403

The riometer data are recorded on digital magnetic tapes with sampling frequency of 0.5 Hz.

Observations of the ionosphere vertical soundings, the cosmic noise absorption (30 MHz), the CW field strength (10 and 15 MHz) and the aurora radar (50 and 112 MHz) were also carried out by other observation systems continuously at Syowa Station, 1984. Inquiries and requests for data copies should be addressed to:

World Data Center C2  
Radio Research Laboratory  
Ministry of Posts and Telecommunications  
2-1, Nukui-Kitamachi 4-chome, Koganei-shi,  
Tokyo 184, Japan

### 3.4. Aurora

#### 3.4.1. Meridian scanning photometer

The auroral photoemissions at the wavelengths of OI 5577 Å and H<sub>β</sub> 4861 Å which are typical emission lines in electron and proton auroras, are observed by using the meridian scanning photometers. The interference filter for H<sub>β</sub> is tilted with 1 s period to measure the doppler effect of the auroral H<sub>β</sub> emission. The field of view of the photometers are 3° for 5577 Å and 5° for H<sub>β</sub>. The scanning period from the poleward horizon to the equatorward horizon is 30 s. The sensitivity range is 4 R - 15 kR for 5577 Å and 0.1 - 100 R/Å for H<sub>β</sub>. The meridian scanning photometer has digital interface to the computer which can record on digital magnetic tapes with sampling frequency of 1 Hz.

#### 3.4.2. Three-direction photometer

The three-direction photometer detects 4278 Å emission at three zenith angles (zenith, 65° poleward and 45° equatorward). The field of view is 5°. The measurable auroral intensity is within the range from 7 R to 28 kR. The output signals are recorded on digital magnetic tapes with sampling frequency of 1 Hz.

#### 3.4.3. Examples of the auroral photometric observations

The examples of the auroral photometric observations are given in Figs. 2, and 3. Figure 2 gives the correlated display of auroral emissions together with geomagnetic, ionospheric and ELF-VLF activities observed on July 25-26, 1984. Figure 3 gives the two dimensional displays of 5577 Å and 4861 Å scanning photometer observations on July 25, 1984.

#### 3.4.4. All sky camera

The black and white all sky aurora images were observed by using the 35 mm cine-pulse camera with the fish eye lens of f/1.4 and the exposure time of 7 s. The observations were carried out during clear nights between February 25 and October 13, 1984, as it is given in Table 5. Inquiries or requests for the all sky data copies should be addressed to:

World Data Center C2 for Aurora  
National Institute of Polar Research  
9-10 Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan



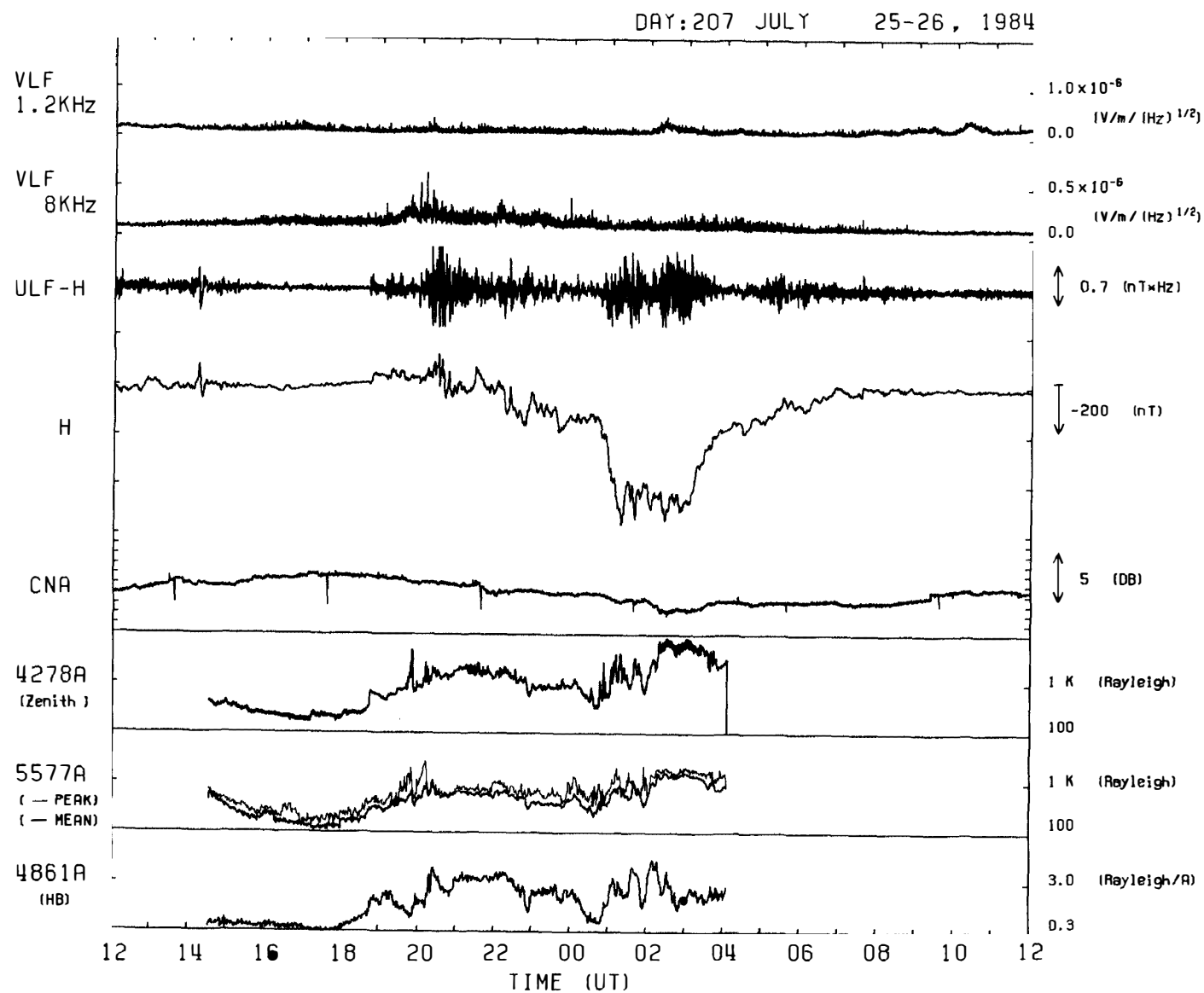


Fig. 2. The correlated display of auroral, geomagnetic, ionospheric and ELF-VLF activities observed on July 25-26, 1984.

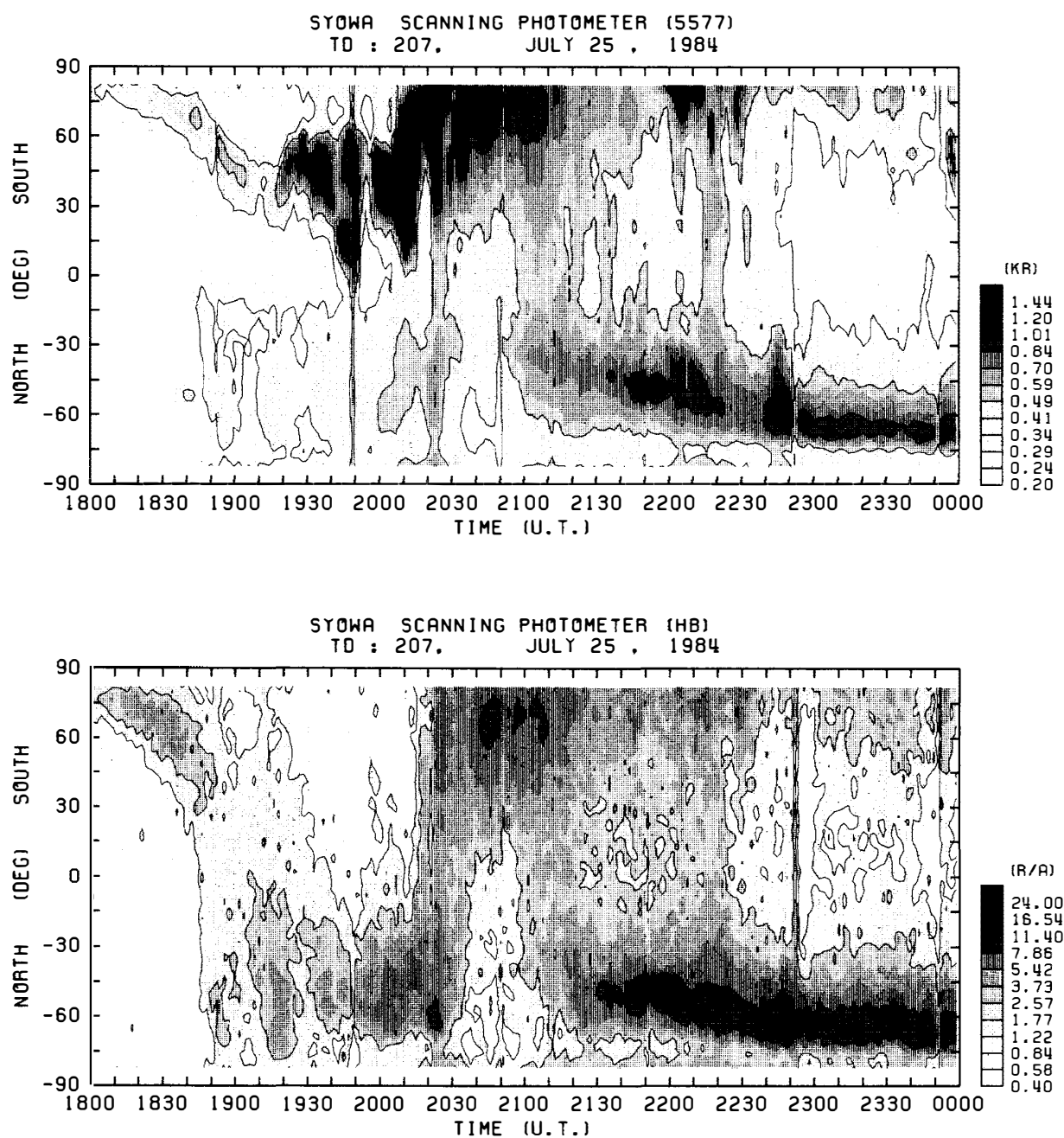


Fig. 3.      The two dimensional displays of 5577 Å and 4861 Å meridian scanning photometric observations on July 25, 1984.

Table 5. The day and time of observations by the all sky camera. The end time of the observations are indicated by (-) signs.

Date	Hours (Universal Time)									K-Index	
	h	m	s	h	m	s	22 <sup>h</sup>	00 <sup>m</sup>	00 <sup>s</sup>		
Feb. 25										4222	2113
26	-00	29	47	21	00	00	-23	59	37	2222	3444
Mar. 3				19	00	00	-23	59	52	6653	3356
4				21	00	00	-23	59	37	5532	2200
6				20	20	00	-23	59	52	2463	2465
8				19	12	00	-23	59	52	5533	4475
9				20	00	00	-23	59	37	5542	2235
10				19	30	00	-23	59	37	5431	2357
11				19	30	00	-22	59	37	5311	1345
12				18	30	00	-22	59	37	5531	1235
14				18	30	00	-22	59	37	2222	1110
19				18	31	00	-22	59	37	5532	1001
20				18	51	00	-23	59	37	3111	1000
26							17	31	00	3222	2244
27	-01	29	37							4333	2356
Apr. 4							17	00	00	7754	3676
5	-00	59	37							6554	3666
6				18	40	00	-19	40	37	5523	2244
7							17	40	00	5225	4344
8	-02	59	37				16	31	00	5565	2465
9	-01	46	37							6642	3345
18				15	31	00	-19	13	37	1321	0011
20				17	21	00	-18	44	37	3563	1213
21							17	31	00	4221	1125
22	-01	34	37	17	31	00	-19	06	37	5222	1000
23				17	00	00	-21	32	37	2211	0145

Date		Hours (Universal Time)						K-Index	
		h	m	s	h	m	s	17 <sup>h</sup>	39 <sup>m</sup> 00 <sup>s</sup>
Apr	27							7643	<u>2346</u>
	28	-03	59	57				<u>4434</u>	2333
	29							16 01 00	3232 <u>3344</u>
	30	-02	59	37				15 30 00	<u>2531</u> <u>1006</u>
May	1	-02	58	37				15 30 00	<u>5643</u> <u>3345</u>
	2	-03	59	57				15 34 00	<u>5655</u> <u>3212</u>
	3	-03	59	37				15 20 00	<u>1043</u> <u>1245</u>
	4	-03	59	57				18 00 00	<u>4333</u> <u>2225</u>
	5	-03	59	37					<u>5322</u> 3467
	9							15 00 00	1321 <u>1235</u>
	10	-02	59	37				15 00 00	<u>5644</u> <u>3322</u>
	11	-02	59	37	15	00	00	-22 01 37	<u>3221</u> <u>3245</u>
	18							22 49 00	2231 <u>2236</u>
	19	-01	03	37					<u>5763</u> 2235
	20	21	54	00	-22	29	37	22 32 00	5453 <u>3356</u>
	21	-01	21	37	01	25	00	-02 39 37	<u>6664</u> 2347
	23							15 00 00	6644 <u>4346</u>
	24	-02	09	37				22 44 00	<u>4344</u> <u>4456</u>
	25	-03	59	37				19 10 00	<u>5232</u> <u>2336</u>
	26	-03	59	37				15 20 00	<u>6653</u> <u>2210</u>
	27	-03	59	37				14 00 00	<u>0023</u> <u>2234</u>
	28	-03	59	37				14 20 00	<u>3311</u> <u>2136</u>
	29	-04	59	47					<u>5622</u> 2233
June	1							18 30 00	3101 <u>1122</u>
	2	-04	23	37				15 00 00	<u>4442</u> <u>2233</u>
	3	-00	34	52				14 30 00	<u>2232</u> <u>4453</u>
	4	-04	59	37				14 30 00	<u>5545</u> <u>2225</u>
	5	-04	59	37				16 00 00	<u>6654</u> <u>3224</u>
	6	-04	59	37					<u>4432</u> 2133

Date		Hours (Universal Time)									K-Index	
		h	m	s	h	m	s	14 <sup>h</sup>	30 <sup>m</sup>	00 <sup>s</sup>		
June	7										4434	<u>2222</u>
	8	-04	59	37	15	14	00	-22	19	37	<u>1000</u>	<u>1144</u>
	9							15	00	00	3353	<u>3243</u>
	10	-05	39	37				14	00	00	<u>5543</u>	<u>3224</u>
	11	-05	59	37				15	00	00	<u>4442</u>	<u>3223</u>
	12	-05	59	37				14	01	00	<u>5532</u>	<u>2001</u>
	13	-05	59	37				14	00	00	<u>0220</u>	<u>0120</u>
	14	-05	59	37							<u>3100</u>	0000
	15							19	45	00	2312	<u>2355</u>
	16	-04	59	07				14	00	00	<u>7665</u>	<u>3225</u>
	17	-04	59	07				14	00	00	<u>4233</u>	<u>2131</u>
	18	-04	59	07				14	00	00	<u>4323</u>	<u>4545</u>
	19	-04	59	07				14	00	00	<u>5454</u>	<u>4366</u>
	20	-04	59	07				14	05	00	<u>6643</u>	<u>2100</u>
	21	-04	59	07				14	00	00	<u>4000</u>	<u>0034</u>
	22	-04	59	07				14	00	00	<u>5541</u>	<u>1223</u>
	23	-04	59	07				14	30	00	<u>3320</u>	<u>0136</u>
	24	-04	59	07				17	20	00	<u>6622</u>	<u>2104</u>
	25	-04	59	07				15	00	00	<u>4522</u>	<u>1223</u>
	26	-04	59	07				19	49	00	<u>5432</u>	<u>0134</u>
	27	-04	59	07				14	00	00	<u>6532</u>	<u>2002</u>
	28	-05	59	07				14	09	00	<u>5653</u>	<u>3345</u>
	29	-04	59	37				15	00	00	<u>4322</u>	<u>1224</u>
	30	-05	29	37				14	00	00	<u>5421</u>	<u>2232</u>
July	1	-05	29	37				14	00	00	<u>2422</u>	<u>1154</u>
	2	-05	29	37							<u>5432</u>	1235
	3							14	00	00	6212	<u>2323</u>
	4	-05	44	37				14	06	00	<u>3331</u>	<u>1244</u>
	5	-05	59	37				14	00	00	<u>5443</u>	<u>2212</u>

Date	Hours (Universal Time)						K-Index	
July 6	-05 <sup>h</sup> 59 <sup>m</sup> 37 <sup>s</sup>	h	m	s	14 <sup>h</sup> 00 <sup>m</sup> 00 <sup>s</sup>		<u>44</u> 32	<u>22</u> 33
7	-05 04 37				14 08 00		<u>32</u> 22	<u>12</u> 24
8	-05 59 37						<u>43</u> 33	2214
14					14 00 00		7754	<u>34</u> 55
15	-05 59 07				13 40 00		<u>65</u> 54	<u>22</u> 46
16	-05 59 07				14 00 00		<u>56</u> 45	<u>22</u> 56
17	-05 59 07				14 00 00		<u>57</u> 64	<u>44</u> 55
18	-05 59 07				14 30 00		<u>55</u> 33	<u>34</u> 44
19	-04 59 07				15 00 00		<u>55</u> 53	<u>32</u> 45
20	-04 59 37				14 00 00		<u>44</u> 42	<u>22</u> 06
21	-04 12 37				14 30 00		<u>41</u> 32	<u>11</u> 03
22	-04 59 37				15 00 00		<u>35</u> 21	<u>10</u> 15
23	-04 29 07				15 00 00		<u>53</u> 20	<u>11</u> 14
24	-04 29 37				15 01 00		<u>45</u> 23	<u>21</u> 23
25	-03 59 07				15 01 00		<u>44</u> 32	<u>31</u> 34
26	-04 29 07				15 21 00		<u>55</u> 2X	<u>XX</u> X3
27	-04 59 52				15 30 00		<u>64</u> 20	<u>12</u> 44
28	-04 29 52				15 00 00		<u>55</u> 42	<u>22</u> 32
29	-02 59 37						<u>33</u> 22	2443
30					20 00 00		4312	<u>12</u> 13
31	-03 59 37						<u>21</u> 11	2125
Aug. 2					21 30 00		4543	<u>33</u> 44
3	-03 59 37				20 47 00		<u>45</u> 33	<u>32</u> 14
4	-03 59 37				15 00 00		<u>43</u> 33	<u>22</u> 36
5	-03 59 52						<u>43</u> 32	1232
7					18 00 00		2210	<u>10</u> 03
8	-03 59 37				15 00 00		<u>55</u> 22	<u>21</u> 24
9	-03 59 37						<u>32</u> 23	3136
11					15 00 00		2233	<u>21</u> 25

X: No data

Date	Hours (Universal Time)									K-Index	
Aug. 12	-03 <sup>h</sup> 59 <sup>m</sup> 37 <sup>s</sup>			h	m	s		h	m	s	<u>6422</u> 3134
14								19	00	00	1022 <u>2445</u>
15	-03 59 37							16	00	00	<u>5643</u> <u>2324</u>
16	-03 59 37										<u>6642</u> 2235
17								17	20	00	5432 <u>2125</u>
18	-03 29 37	17	00	00				-19	29	37	<u>2321</u> <u>1012</u>
19								16	50	00	2101 <u>2454</u>
20	-03 29 37										<u>4552</u> 0230
21								16	00	00	2200 <u>0100</u>
22	-03 41 37							15	30	00	<u>0000</u> <u>0000</u>
23	-02 59 37							17	00	00	<u>1110</u> <u>2224</u>
24	-02 59 37							16	00	00	<u>4544</u> <u>3444</u>
25	-02 58 37							18	00	00	<u>5434</u> <u>2235</u>
26	-02 59 37							16	50	00	<u>4440</u> <u>2222</u>
27	-03 04 37							16	47	00	<u>5412</u> <u>3457</u>
28	-03 29 37							16	00	00	<u>7354</u> <u>2456</u>
29	-02 25 37							16	21	00	<u>5553</u> <u>2325</u>
30	-03 29 37										<u>5532</u> 3334
Sep. 1								16	01	00	5331 <u>1134</u>
2	-03 29 37							17	00	00	<u>3532</u> <u>1222</u>
3	-03 29 37							16	31	00	<u>3541</u> <u>1114</u>
4	-02 11 37							22	38	00	<u>4454</u> <u>5744</u>
5	-03 29 37							16	01	00	<u>6873</u> <u>3464</u>
6	-02 59 57										<u>4322</u> 2324
8								16	08	00	1122 <u>1225</u>
9	-02 59 37										<u>3222</u> 1126
13								16	01	00	6532 <u>2223</u>
14	-02 32 37										<u>5331</u> 2346
15								16	01	00	6222 <u>1224</u>

Date	Hours (Universal Time)						K-Index	
Sep. 16	-02 <sup>h</sup> 59 <sup>m</sup> 37 <sup>s</sup>	h	m	s	16 <sup>h</sup> 01 <sup>m</sup> 00 <sup>s</sup>		<u>5</u> 221	<u>0</u> 1 <u>3</u> 3
17	-02 20 37				16 01 00		<u>3</u> 221	<u>0</u> 0 <u>0</u> 2
18	-01 59 57				16 00 00		<u>1</u> 110	<u>0</u> 0 <u>0</u> 2
19	-01 59 57				17 08 00		<u>2</u> 223	<u>3</u> 4 <u>4</u> 6
20	-02 19 37				17 00 00		<u>4</u> 522	<u>1</u> 3 <u>5</u> 4
21	-01 59 57				17 00 00		<u>2</u> 212	<u>2</u> 1 <u>2</u> 5
22	-01 59 57						<u>4</u> 233	2265
23					17 07 00		6665	<u>5</u> 5 <u>6</u> 6
24	-01 59 57				17 01 00		<u>7</u> 574	<u>3</u> 4 <u>5</u> 6
25	-01 09 57				18 30 00		<u>4</u> 653	<u>4</u> 4 <u>5</u> 6
26	-01 14 57				17 20 00		<u>6</u> 654	<u>4</u> 4 <u>4</u> 6
27	-01 14 57				17 31 00		<u>5</u> 543	<u>3</u> 2 <u>5</u> 6
28	-00 59 57				17 31 00		<u>4</u> 512	<u>2</u> 3 <u>5</u> 4
29	-00 59 57				17 11 00		<u>5</u> 430	<u>2</u> 1 <u>2</u> 5
30	-00 59 57				19 31 00		<u>6</u> 430	<u>0</u> 0 <u>2</u> 4
Oct. 1	-00 29 57				18 51 00		<u>3</u> 221	<u>1</u> 2 <u>2</u> 2
2	-00 29 57	20	45	00	-22 59 57		<u>5</u> 221	<u>1</u> 3 <u>4</u> 4
4		18	00	00	-23 59 37		3100	<u>0</u> 2 <u>2</u> 3
5		19	20	00	-23 59 37		4410	<u>1</u> 1 <u>1</u> 2
6		18	01	00	-23 59 37		2331	<u>1</u> 2 <u>4</u> 5
13		19	01	00	-22 59 37		5423	<u>3</u> 1 <u>1</u> 3



### 3.5. Telemetry system

ELF-VLF radio wave receiver, riometer and search coil magnetometer are located at the remote station. The output signals from these instruments are transmitted to data processing building at Syowa Station. The PCM telemeter is used for the transmission of CNA and the three components of ULF waves. The FM telemeter is used for the transmission of the ELF-VLF signal. Specifications of telemeters which link between the remote station and the data processing building are given in Table 6.

Electric powers at the remote station are supplied by dry batteries and rechargeable car batteries. The car batteries are charged up once a month using power generator aided by a diesel engine with output power of 16 kVA.

### 3.6. Clock / frequency standard unit

The clock system comprises a timing receiver, a rubidium frequency standard and a time code generator. The timing receiver detects the universal time signals transmitted from the NNSS satellite using the telemetry link at 400 MHz. The absolute accuracy is about 10  $\mu$ s. The frequency standard with a rubidium oscillator is synchronized with the time pulse of the timing receiver. The stability of the frequency standard is higher than  $1 \times 10^{-11}$  s/day. The time code generator generates both analogue code (IRIG A, B, E and slow code) and BCD digital code outputs.

#### 4. Compiled Digital Tape Format

The formats of compiled computer compatible tapes (Edit tapes) from the original digital magnetic tapes are defined as follows. Edit tapes are generated on FACOM/HITAC M-180 which is compatible to IBM computer. The DCB for this 9-track, 6250 BPI is RECFM=F(or FB), LRECL = 34, BLKSIZE = 20434, DEN = 4 (see Table 7).

On Edit tape 17 kinds of upper atmospheric data are recorded for every one second as shown in Table 8. Every observation data is recorded in the form of 2 bytes (A2) and a set of data for one second make a logical record (2 bytes  $\times$  17 = 34 bytes). An observation time which is expressed by 34 bytes and 10-min data (600 1-s data sets) make a block the length of which is 20434 bytes. On the head of every block, the observation time is recorded in the form as shown in Table 9, which shows the start time of the block data. As it is noted in Fig. 4, every block starts on the 10th min. One-day data sets (144 blocks) make one file and a tape mark is written between each blocks. One-month data files make one volume.

An example how to read Edit tape is shown in the following:

```
INTEGER*2  TIME(4), DATA (17,600)
READ (10,100) TIME, DATA
100 FORMAT (4A2, 26X, 10(60(17A2)))
```

For co-researchers of National Institute of Polar Research it is permitted to use our M-180 computer system. NIPR has various kinds of softwares such as tape-to-tape copy, 6250 to

1600 BPI conversion and copy, various kinds of display and spectrum analysis programs.

#### Acknowledgments

It is a pleasure to acknowledge all the members of the 25th Japanese Antarctic Research Expedition for their kind support in making the observations at Syowa Station in Antarctica. Valuable work of developing computer program of this work by Dr. Y. Tonegawa is greatly appreciated. Thanks are also due to the members of Information Processing Center, especially Messrs. H. Sakurai and K. Uchida for their kind support in operating the HITAC M-180 computer system. The tables of the ordinary magnetic field measurements and the observation logs of the all sky photographs are provided by Mr. H. Ohtsuka and Mrs. E. Yasuda. The UAP monitoring system has been accomplished by the constructive support of the Antarctic Computer Introducing Committee in NIPR.

### References

Fujii,R., Sato,N. and Fukunishi,H. (1985): Upper atmosphere physics data, Syowa Station, 1982. JARE Data Rep., 105, (Upper Atmosphere Physics 2), 226 p.

Sakurai, H., Shibasaki, K., Fujii, R. and Sato, N. (1985): Upper atmosphere physics data, Syowa Station, 1983. JARE Data Rep., 108 (Upper Atmosphere Physics. 3), 212 p.

Sato,N., Fujii,R., Fukunishi,H. and Nakajima, D.(1984): Upper atmosphere physics data, Syowa Station, 1981. JARE Data Rep., 93, (Upper Atmosphere Physics 1), 206 p.

Table 6. Specifications of telemeter links between the remote station and the data processing building.

	UHF telemeter	VHF telemeter
Modulation	PCM	FM
Carrier frequency	1859 MHz	240 MHz
Transmitter power	0.4 W	0.4 W
Antenna	Parabola(1 m $\phi$ )	Yagi(7 elements)
Max frequency deviation	200 kHz	125 kHz
VCO stability	better than 1 %	better than 1 %
VCO lineality	better than 1 %	better than 1 %
Carrier spurious	less than -30 dB	less than -30 dB

Table 7. The tape format of the compiled digital tape.

Item	Specification
Track	9 tracks
Record density	6250 BPI
Record format	F (FB)
Block length	20,434 bytes (1byte=8 bits)
Record length (Logical record length)	34 bytes
Label	Non-label
Filing	Single volume/multi-file

Table 8. The data sequence in each logical record on the compiled digital tape.

Sequence	Observation items
1	VLF 750 Hz
2	VLF 2 kHz
3	VLF 4 kHz
4	VLF 30 kHz
5	VLF 350 Hz
6	VLF 1.2 kHz
7	VLF 8 kHz
8	VLF 60 kHz
9	VLF 90 kHz
10	CNA
11	Total magnetic fiel intensity
12	H-component of magnetic field
13	D-component of magnetic field
14	Z-component of magnetic field
15	H-component of ULF wave
16	D-component of ULF wave
17	Z-component of ULF wave

Table 9. The format of the observation time on the compiled digital tape.

Sequence	Items
1	Year (2 Bytes)
2	Total day (Jan. 1=1) (2 Bytes)
3	Hour (2 Bytes)
4	Minute (2 Bytes)
5	Space (26 Bytes)

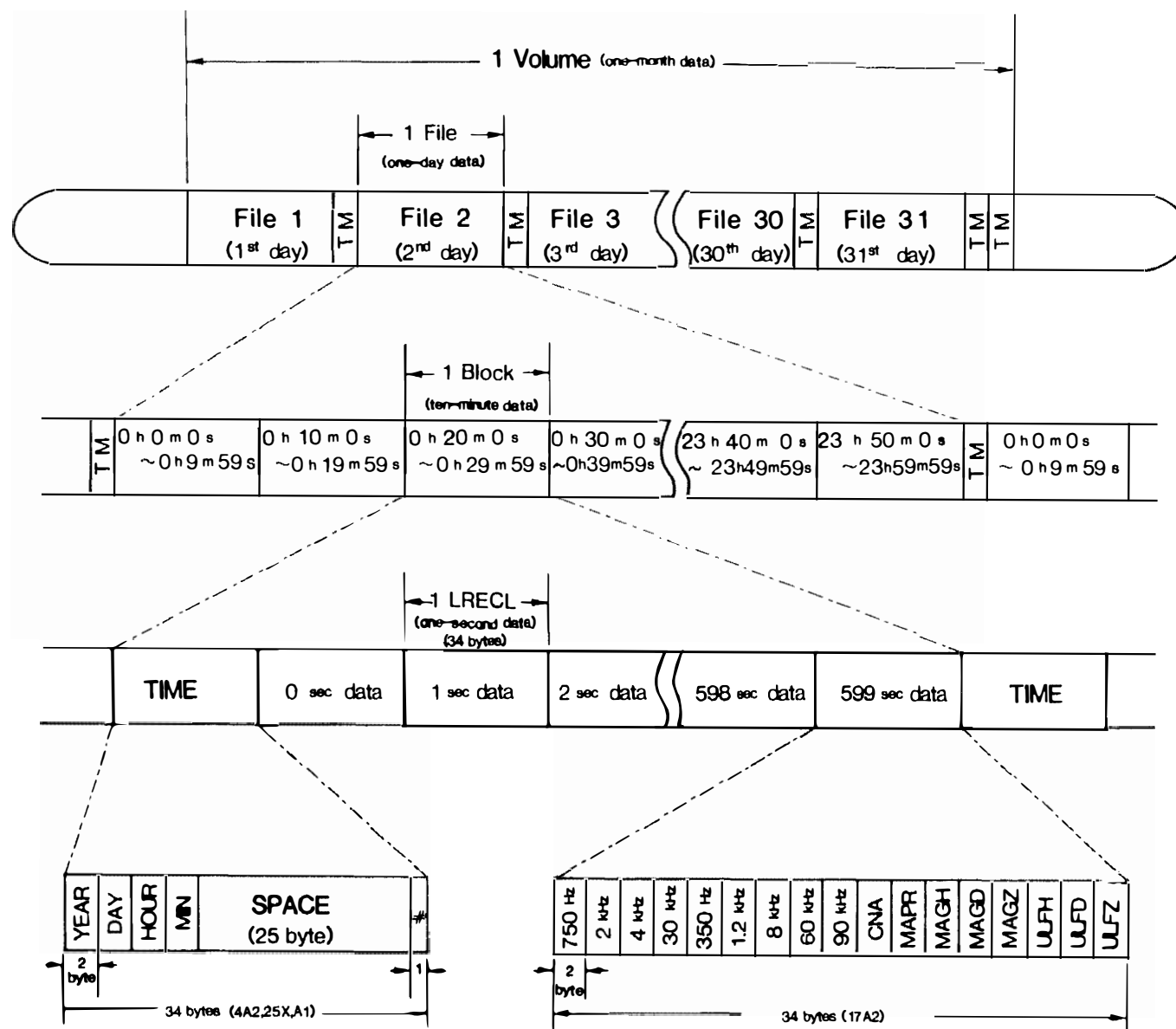
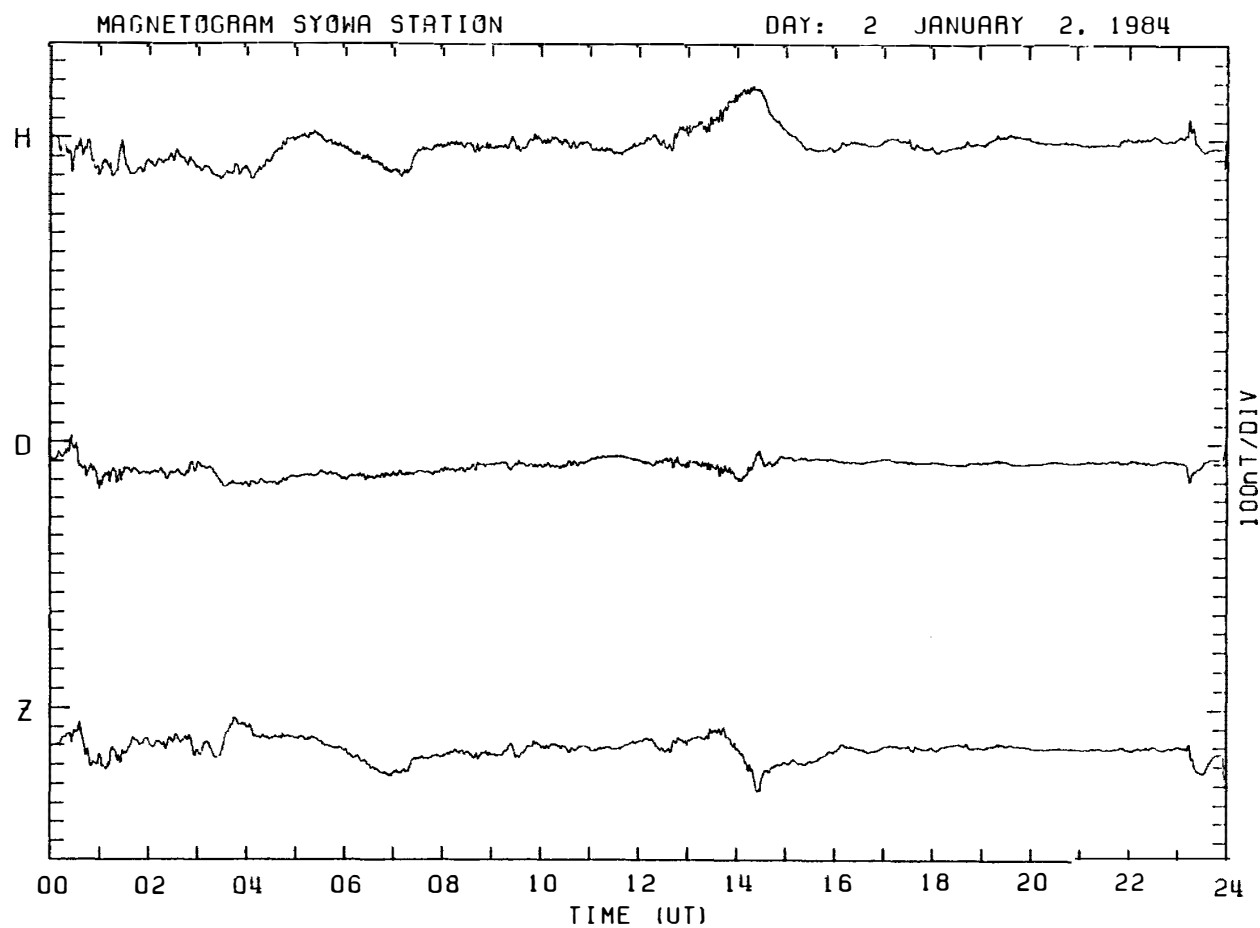
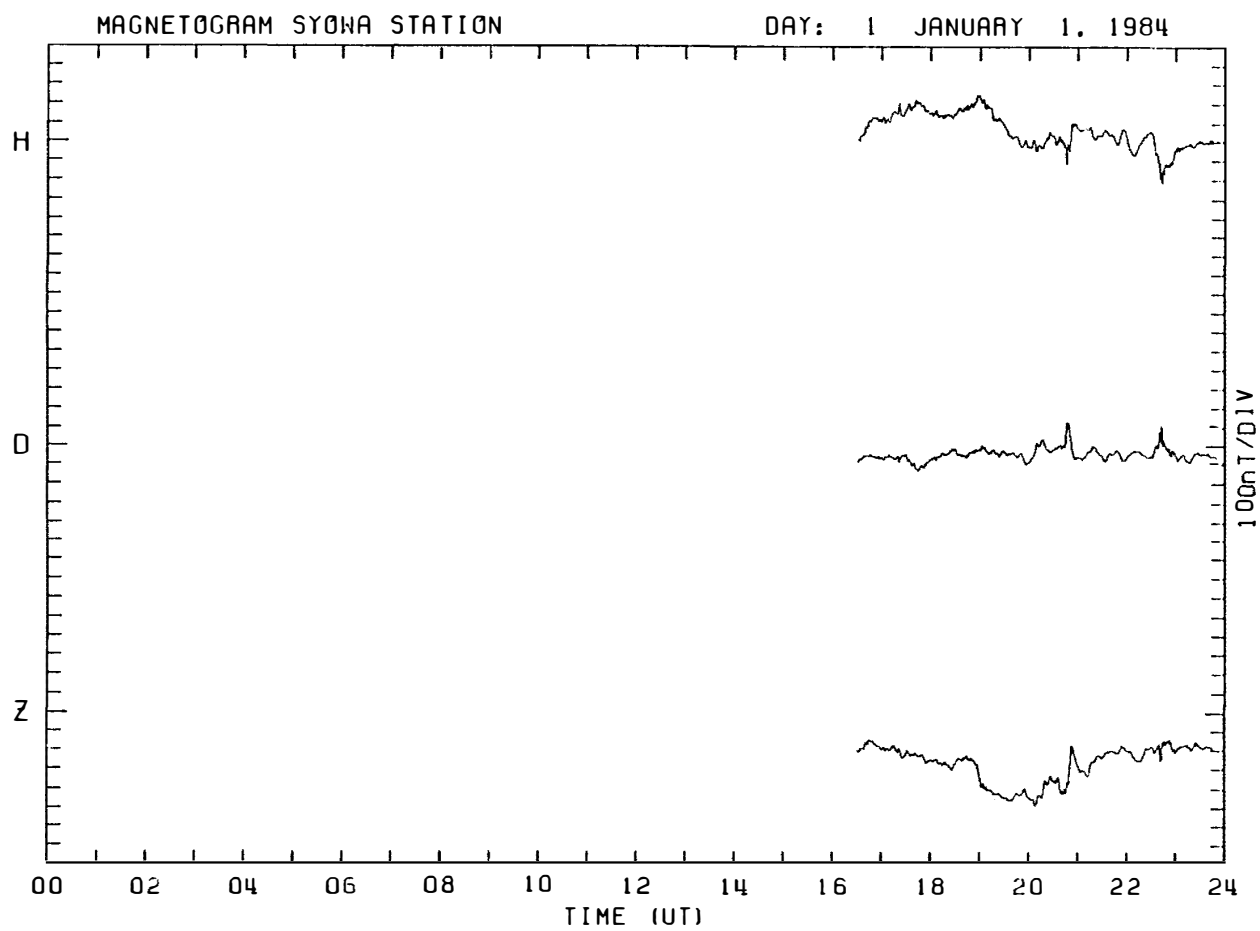


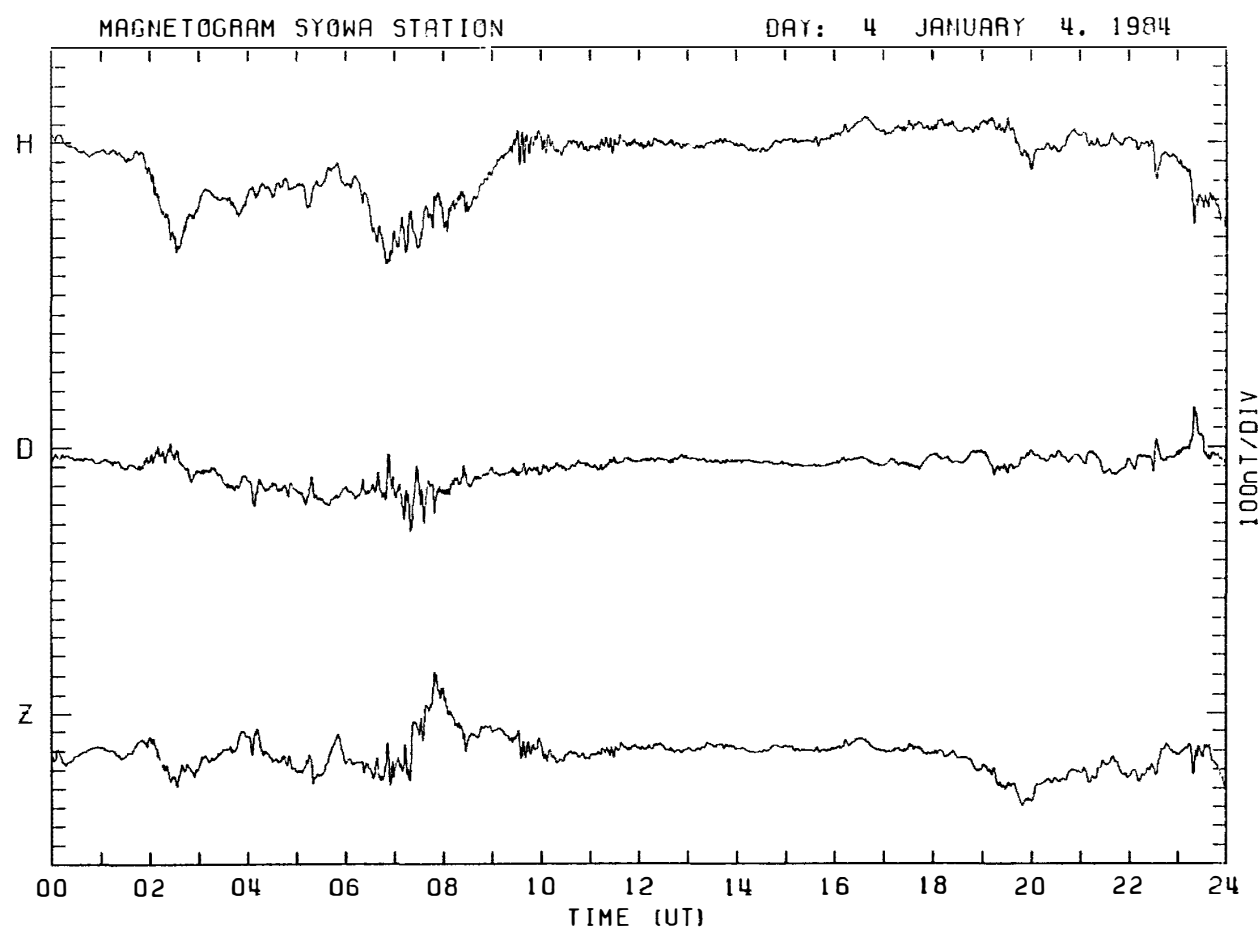
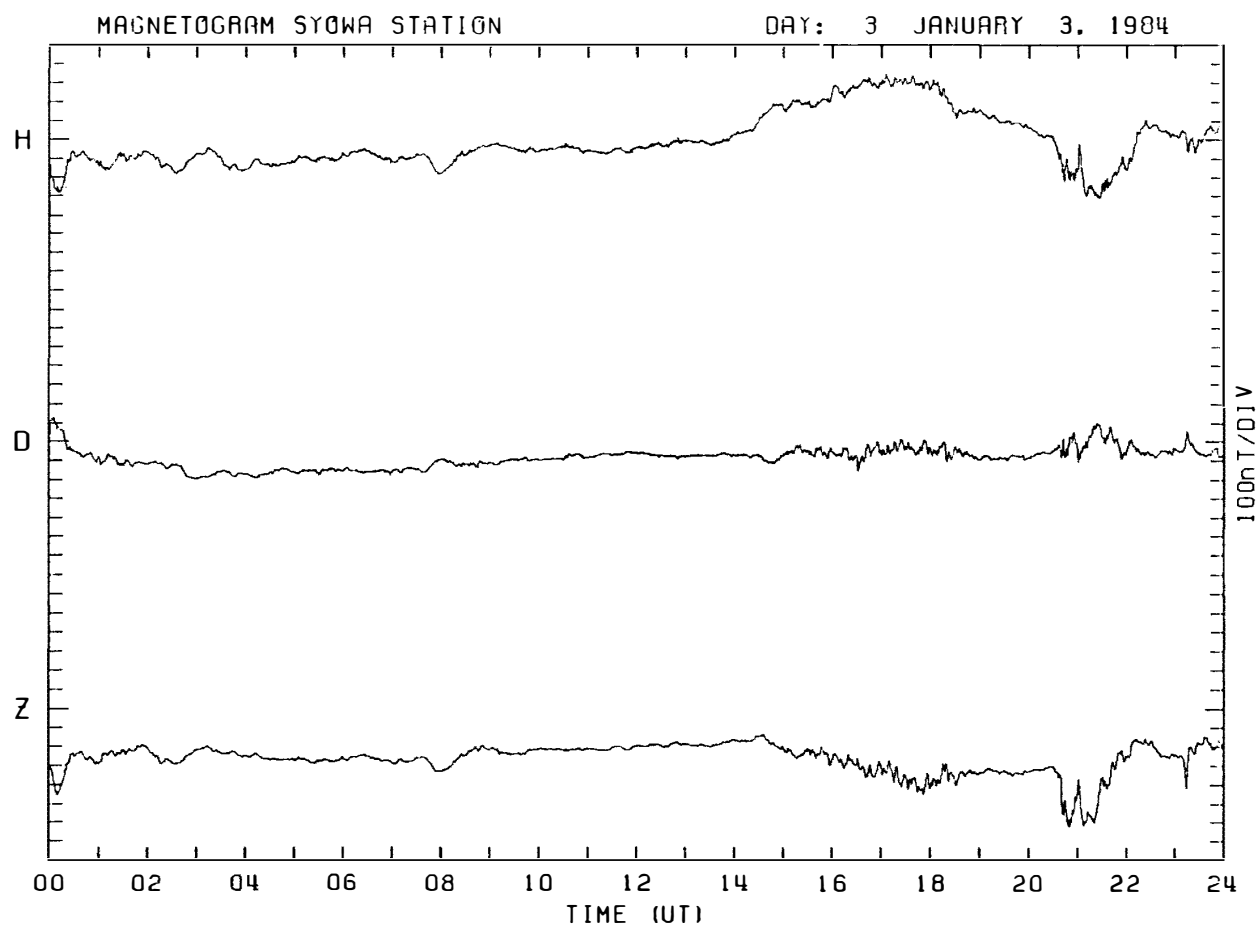
Fig. 4. The structure of the compiled digital tape format.

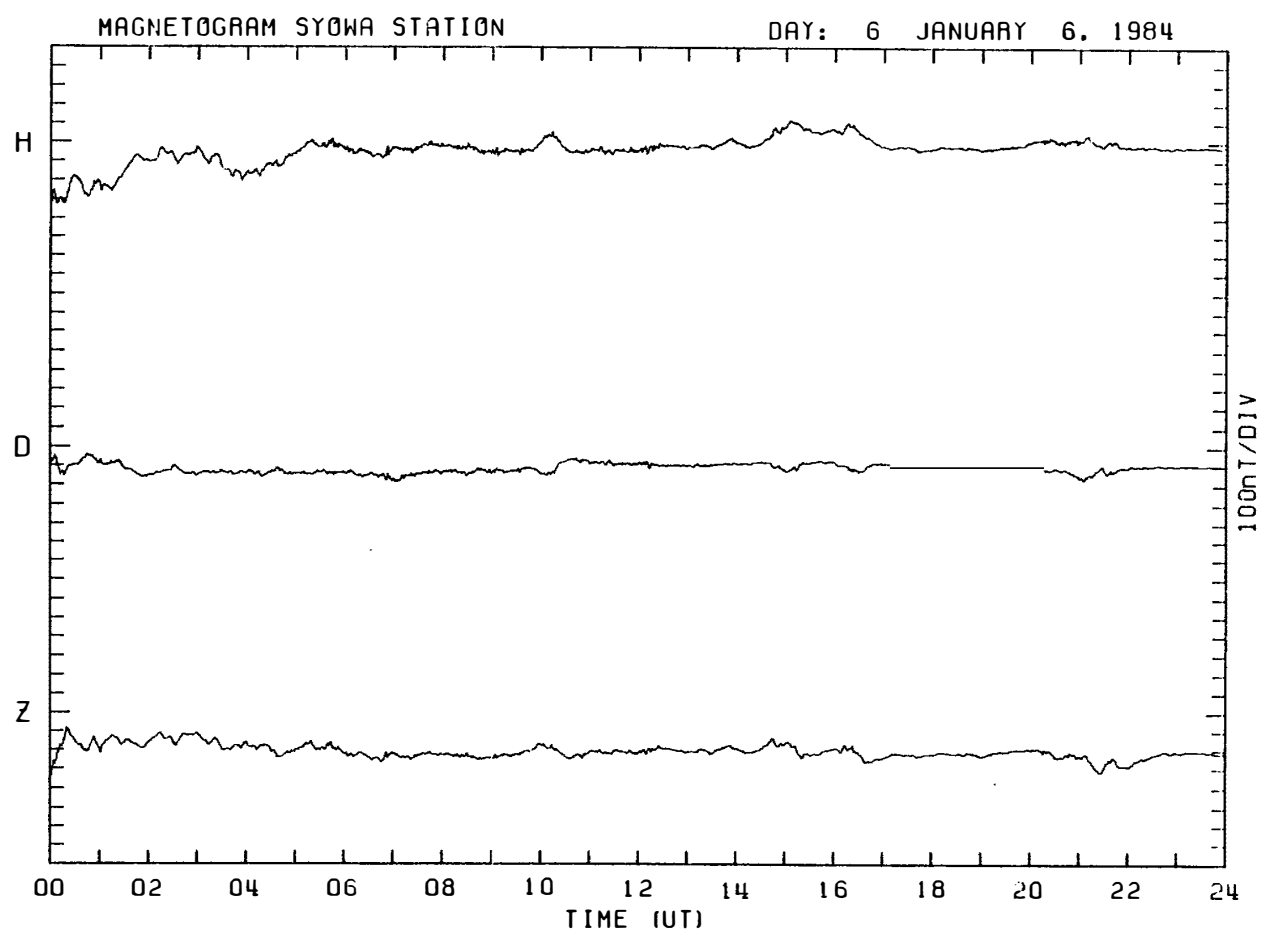
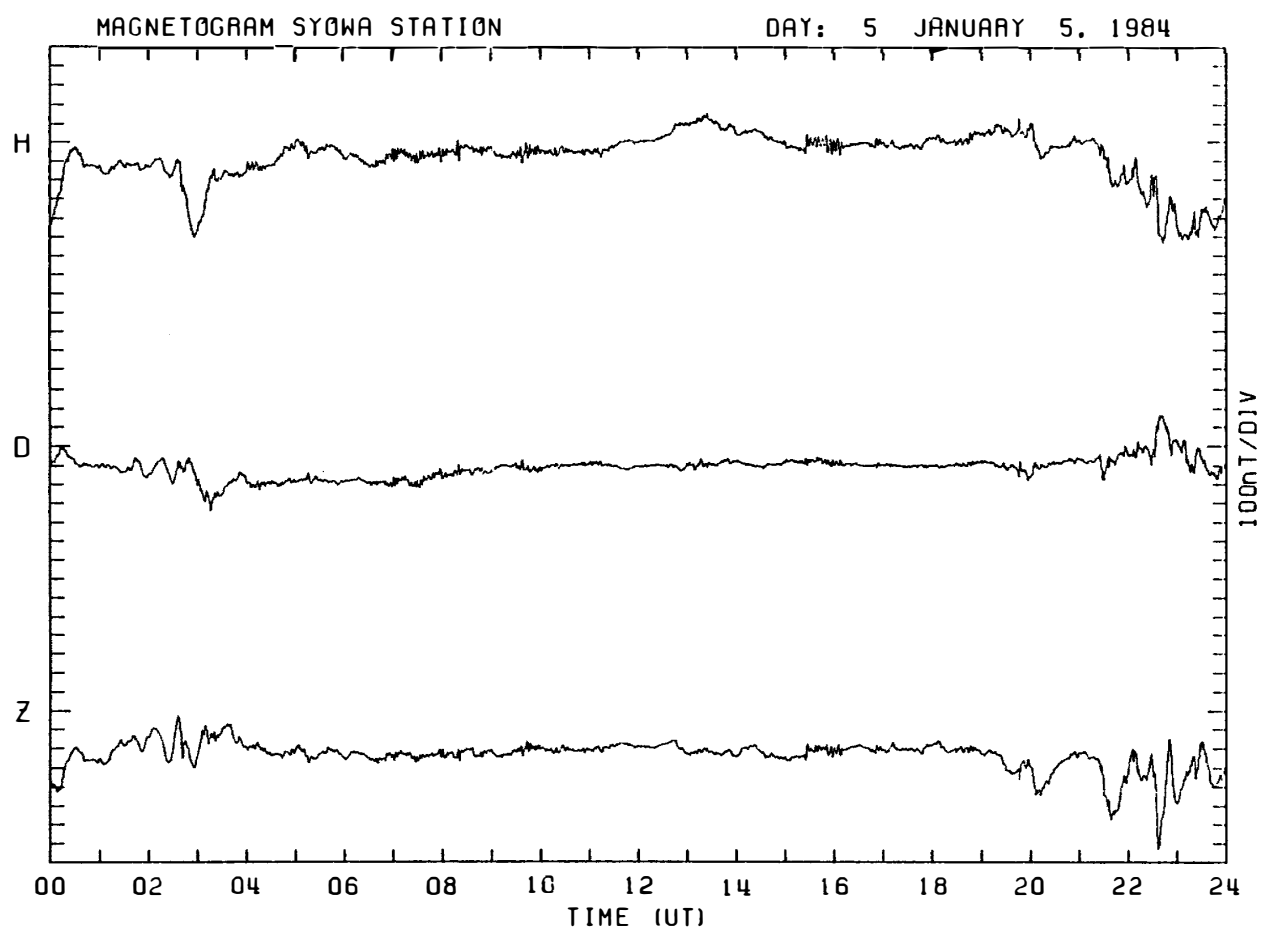
## Appendix 1

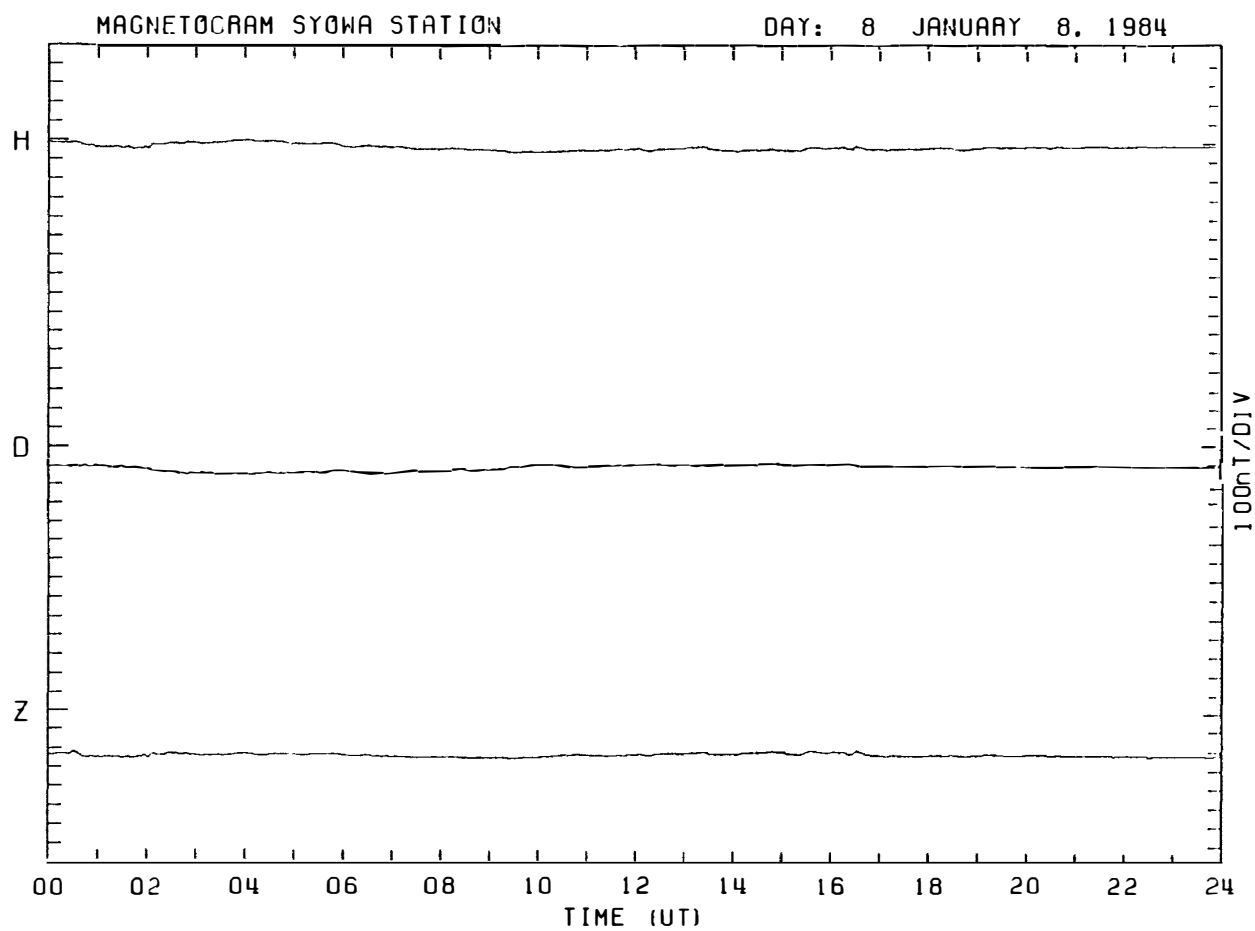
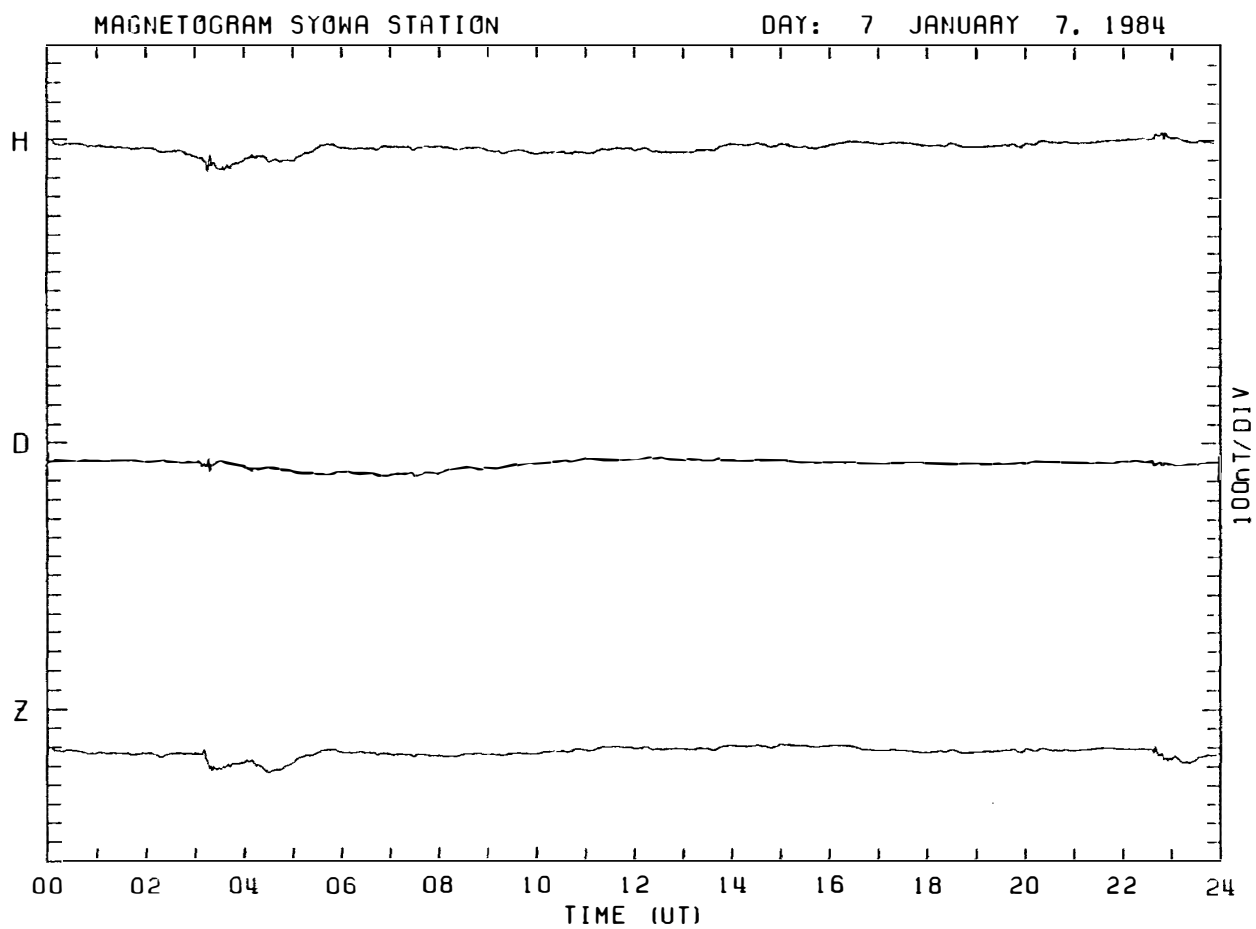
Continuous computer plots of magnetogram in 1984

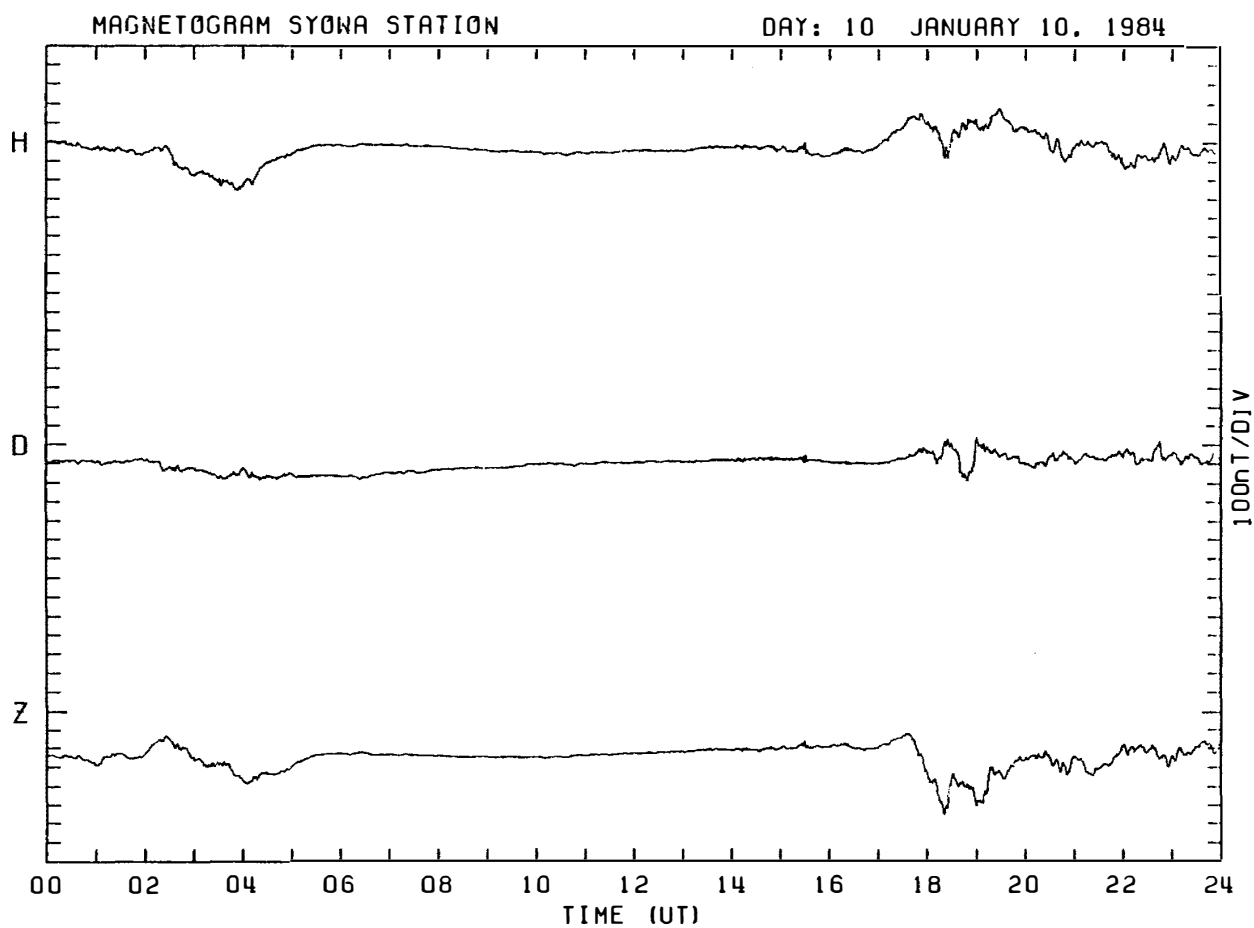
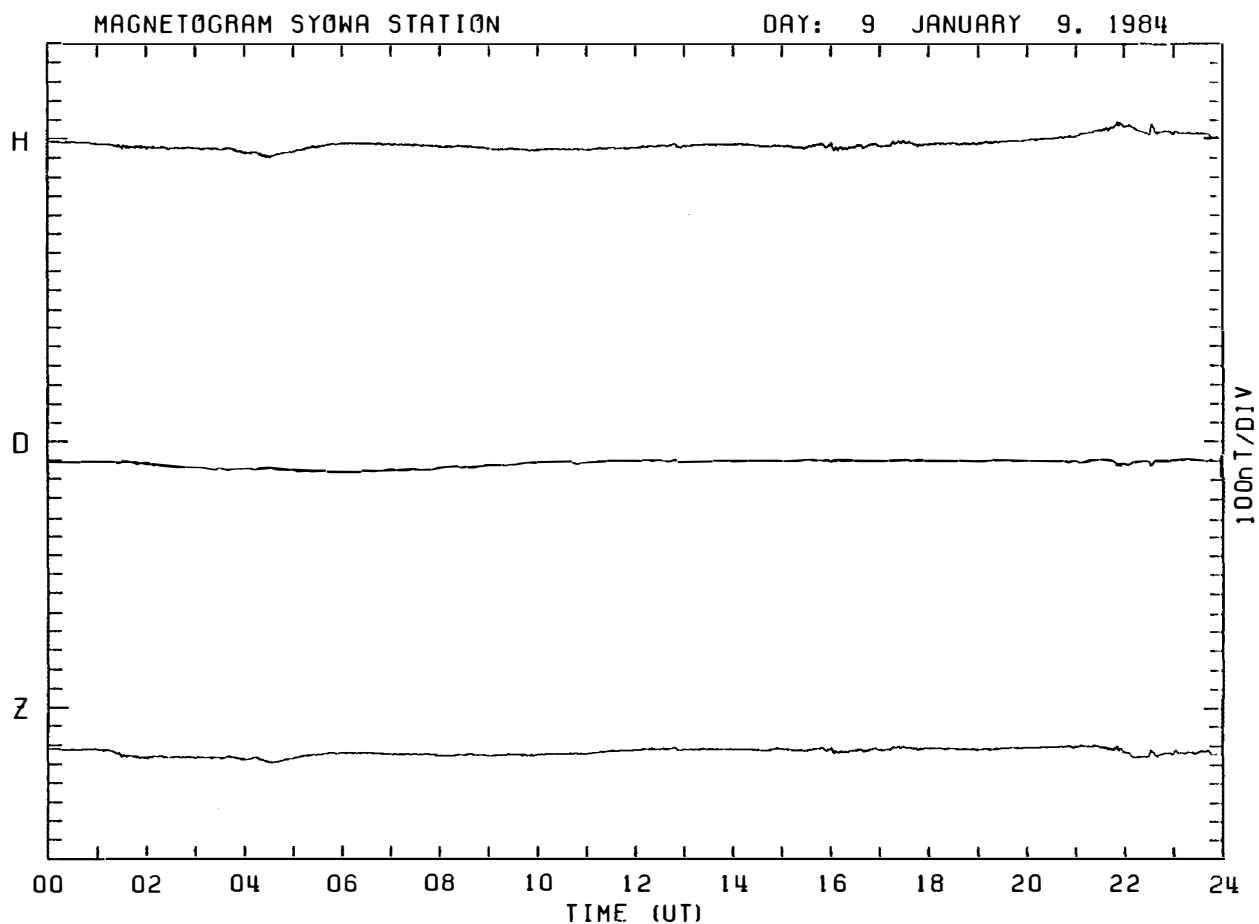


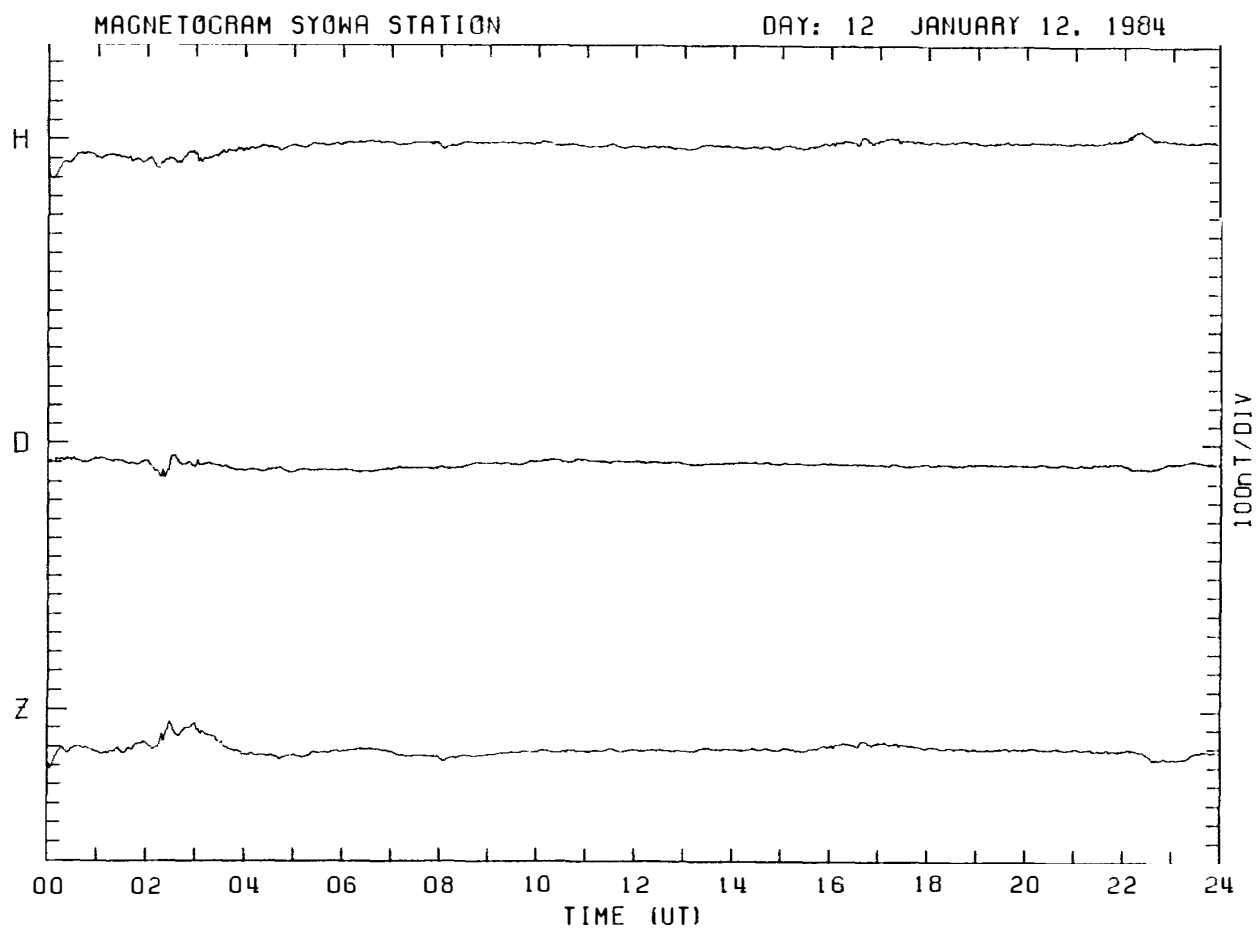
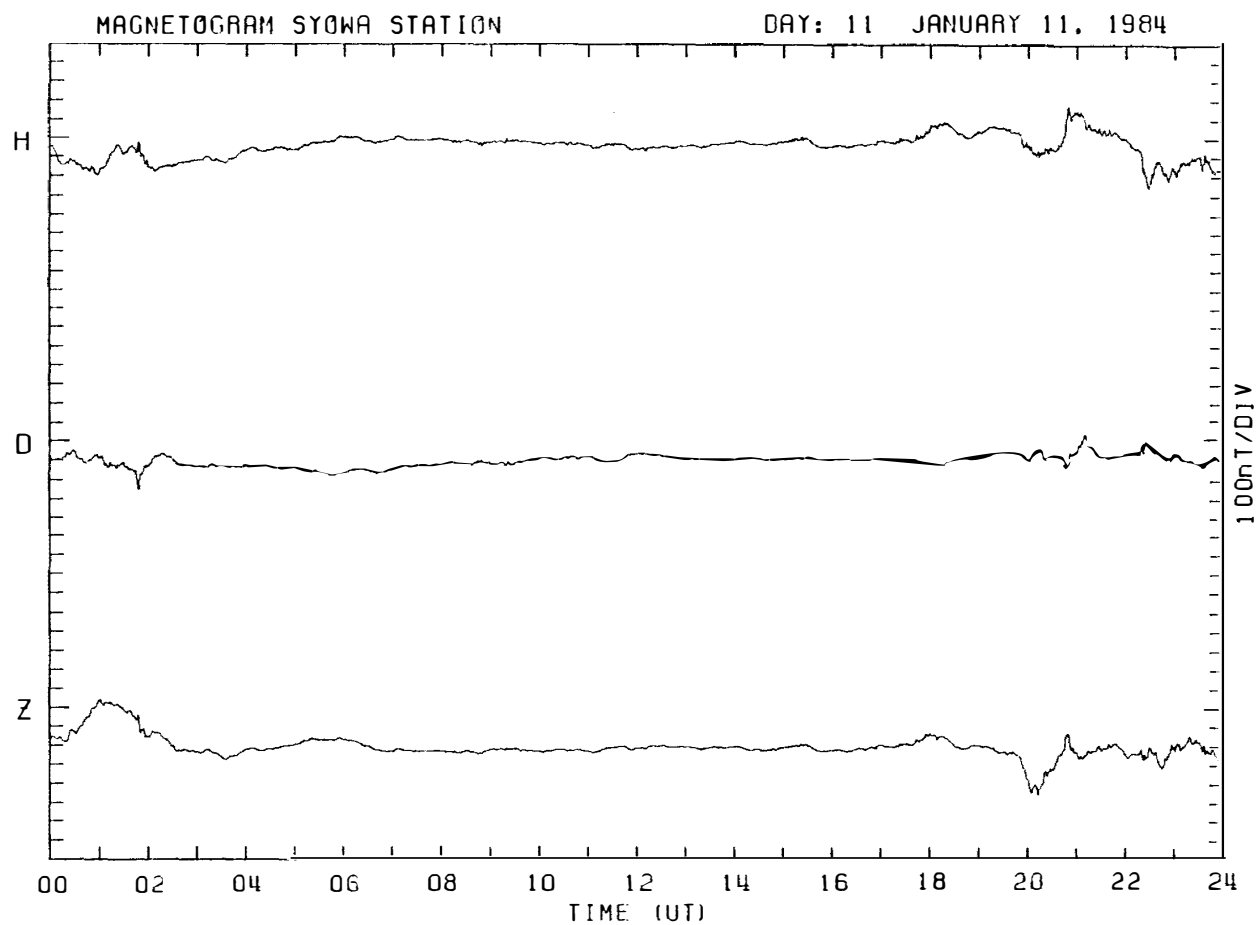


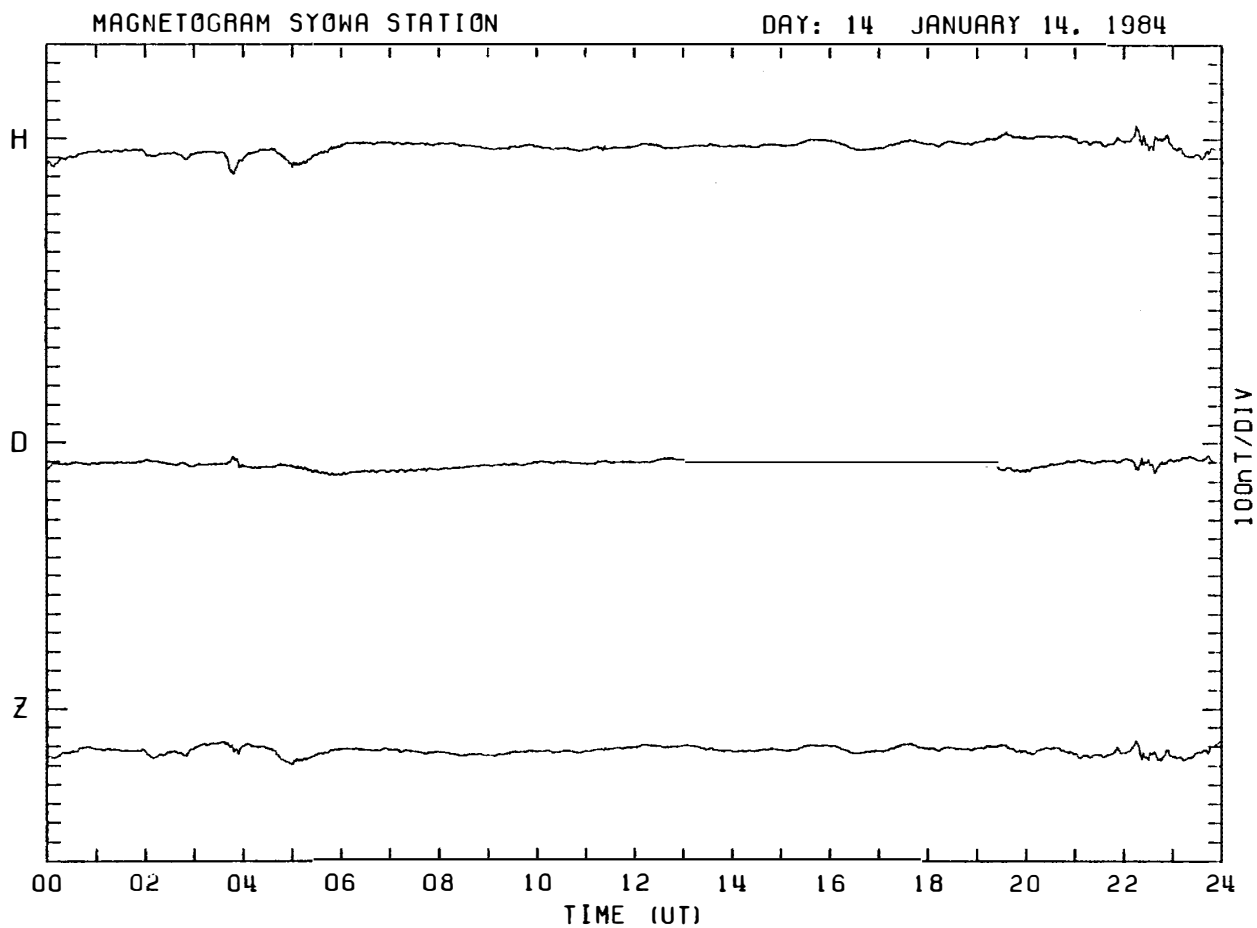
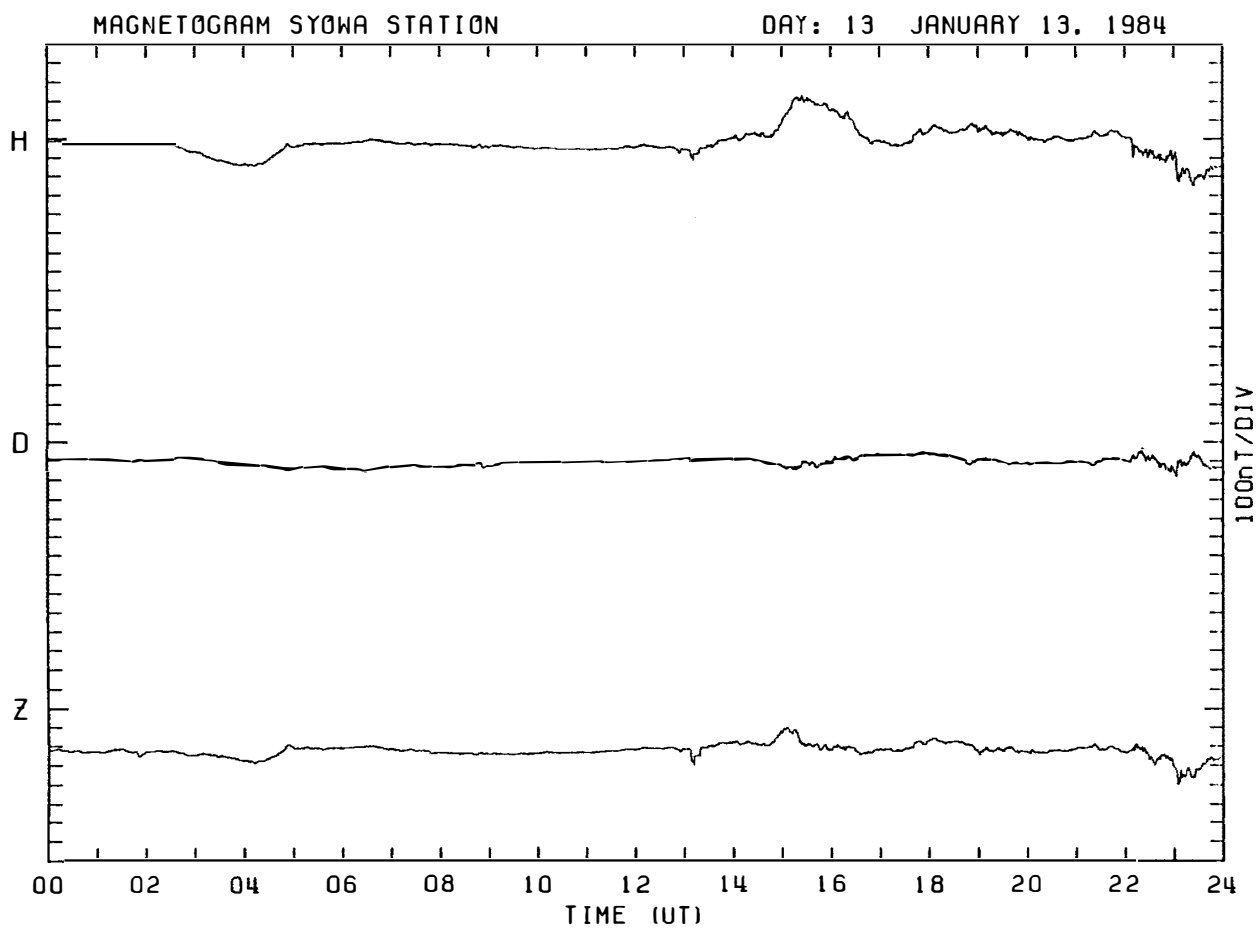






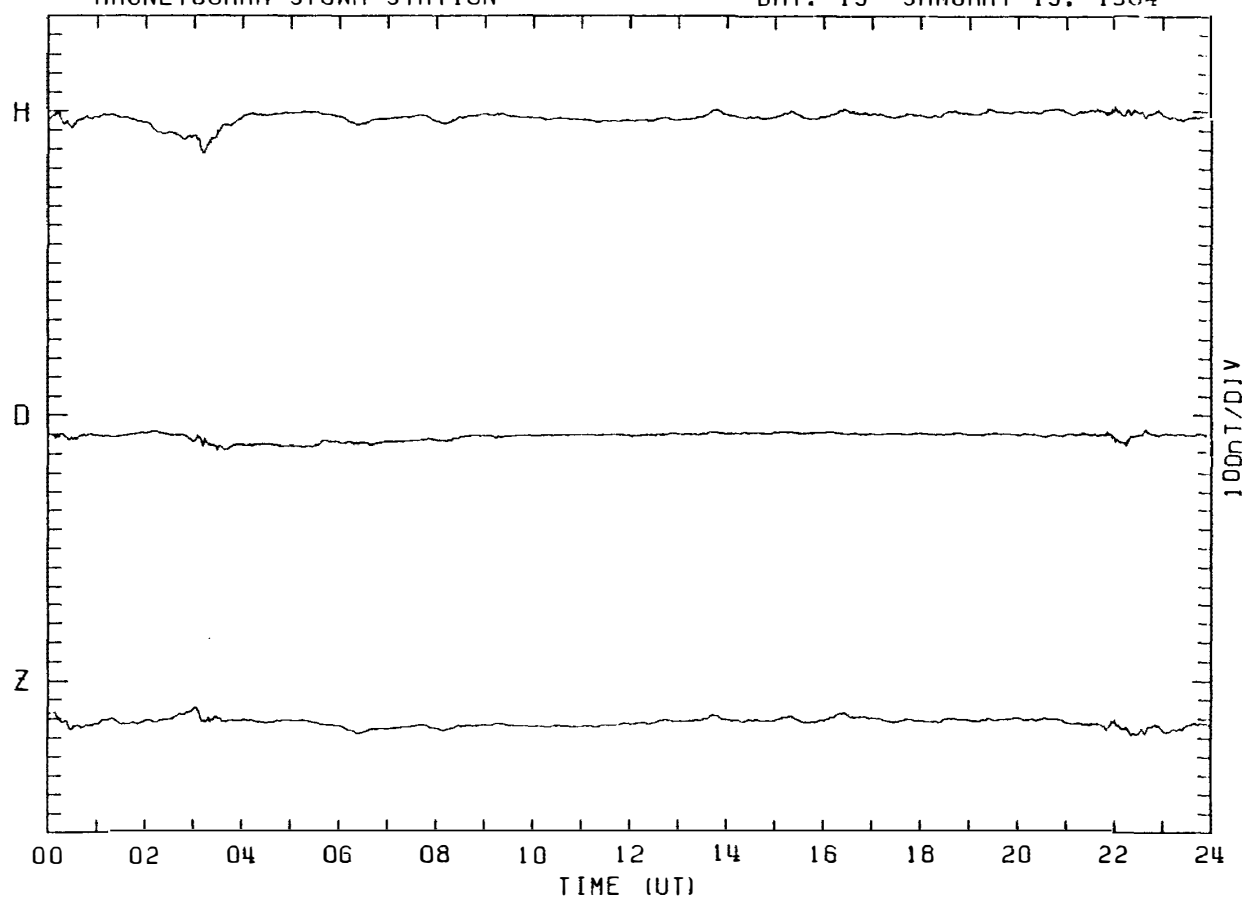






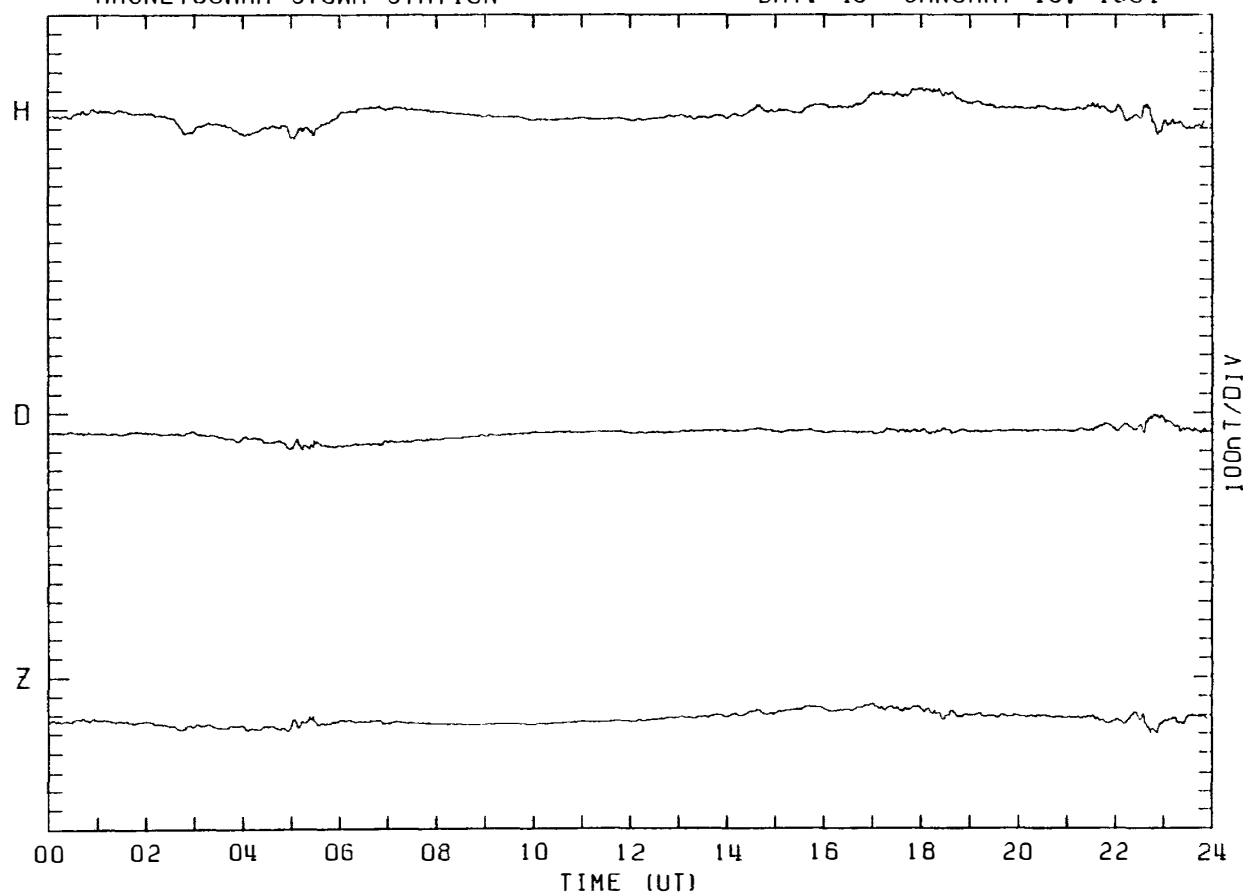
MAGNETOGRAM SYOWA STATION

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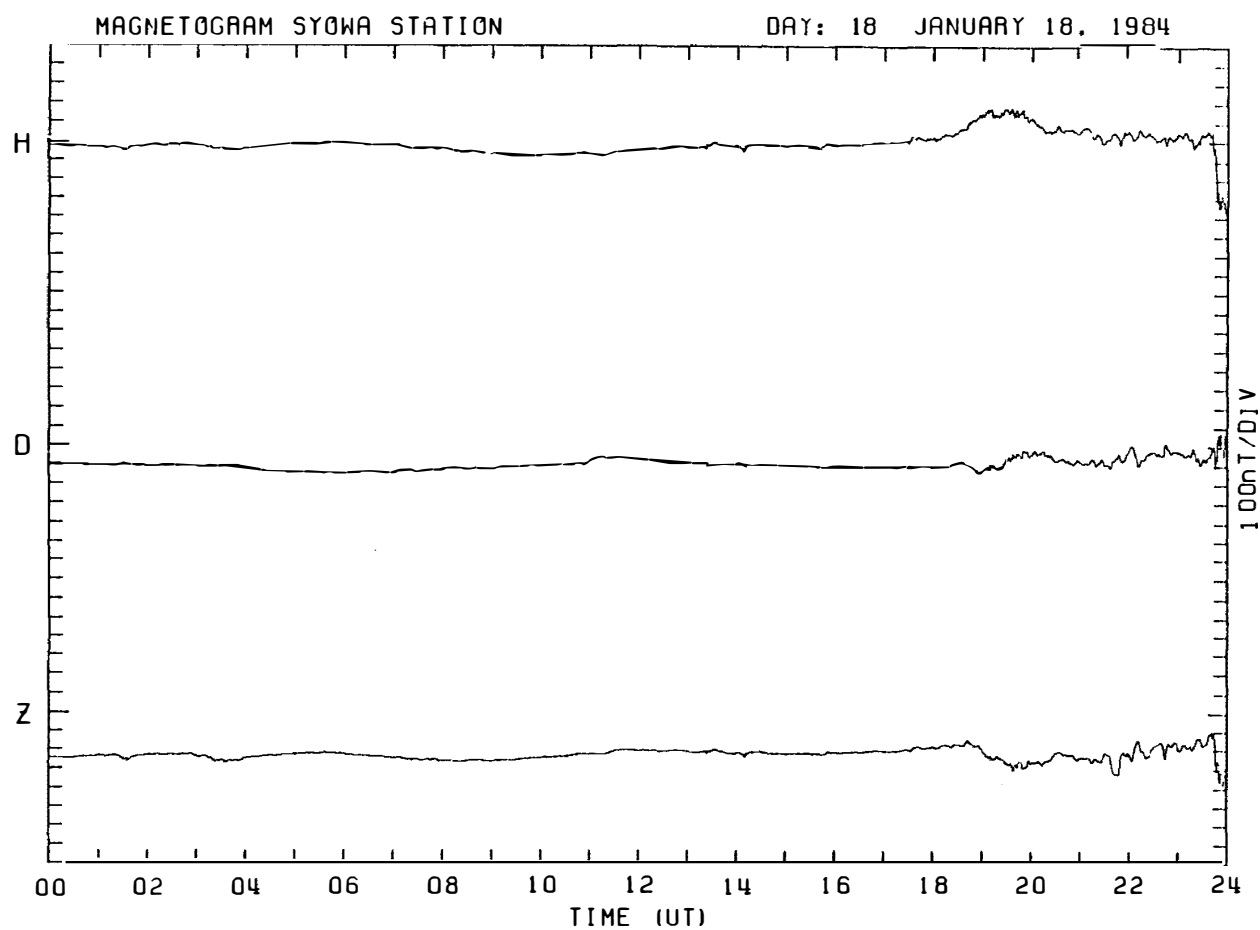
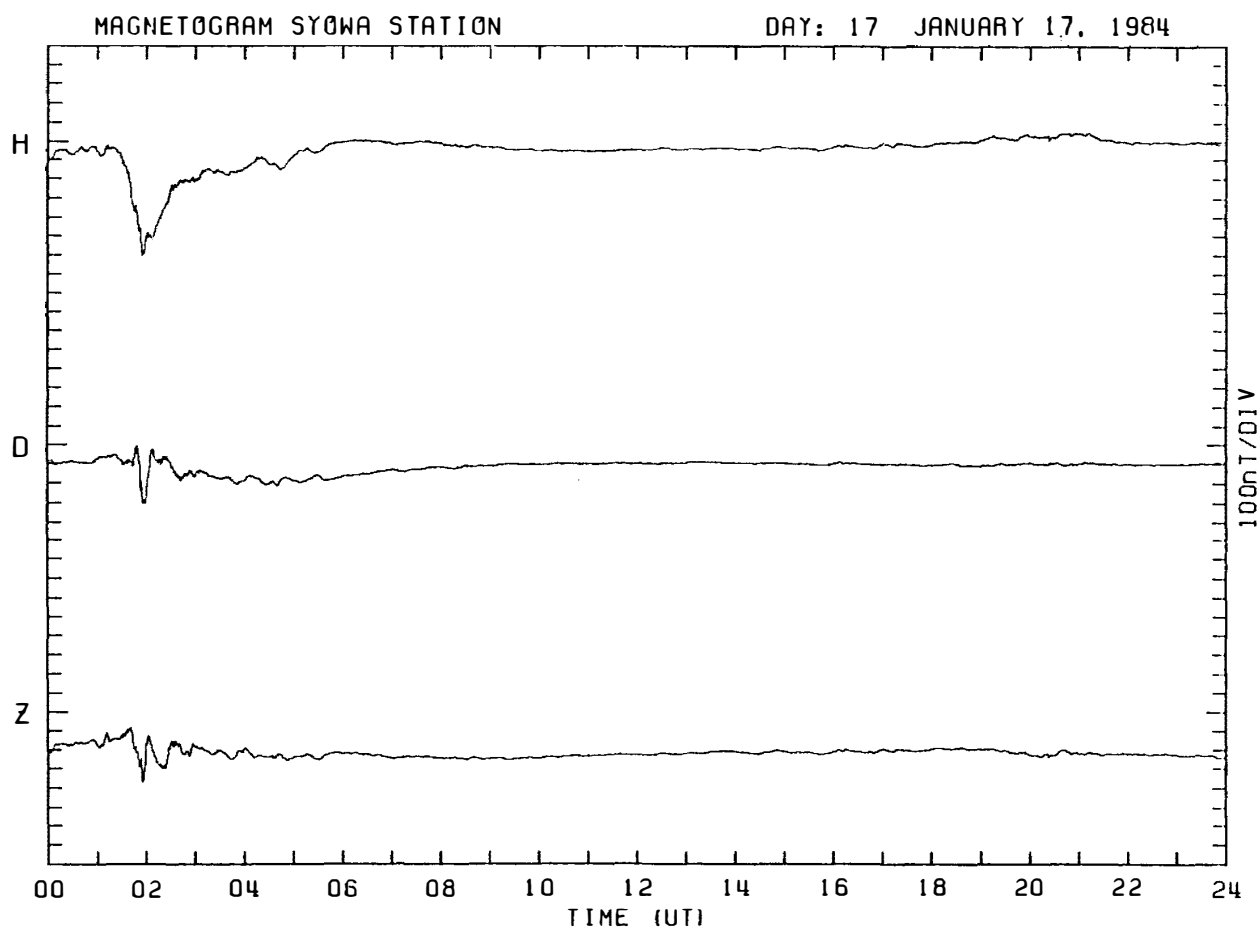


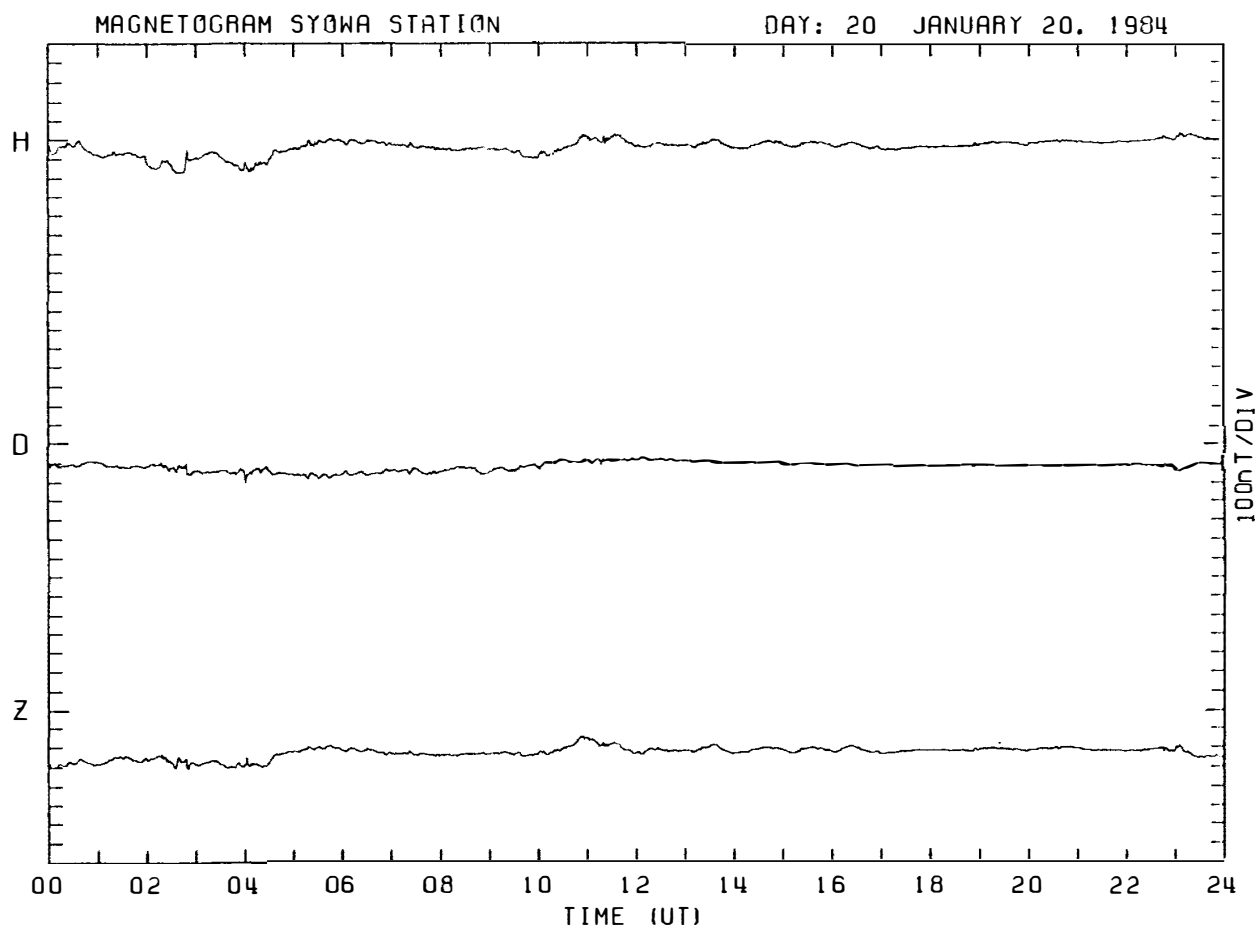
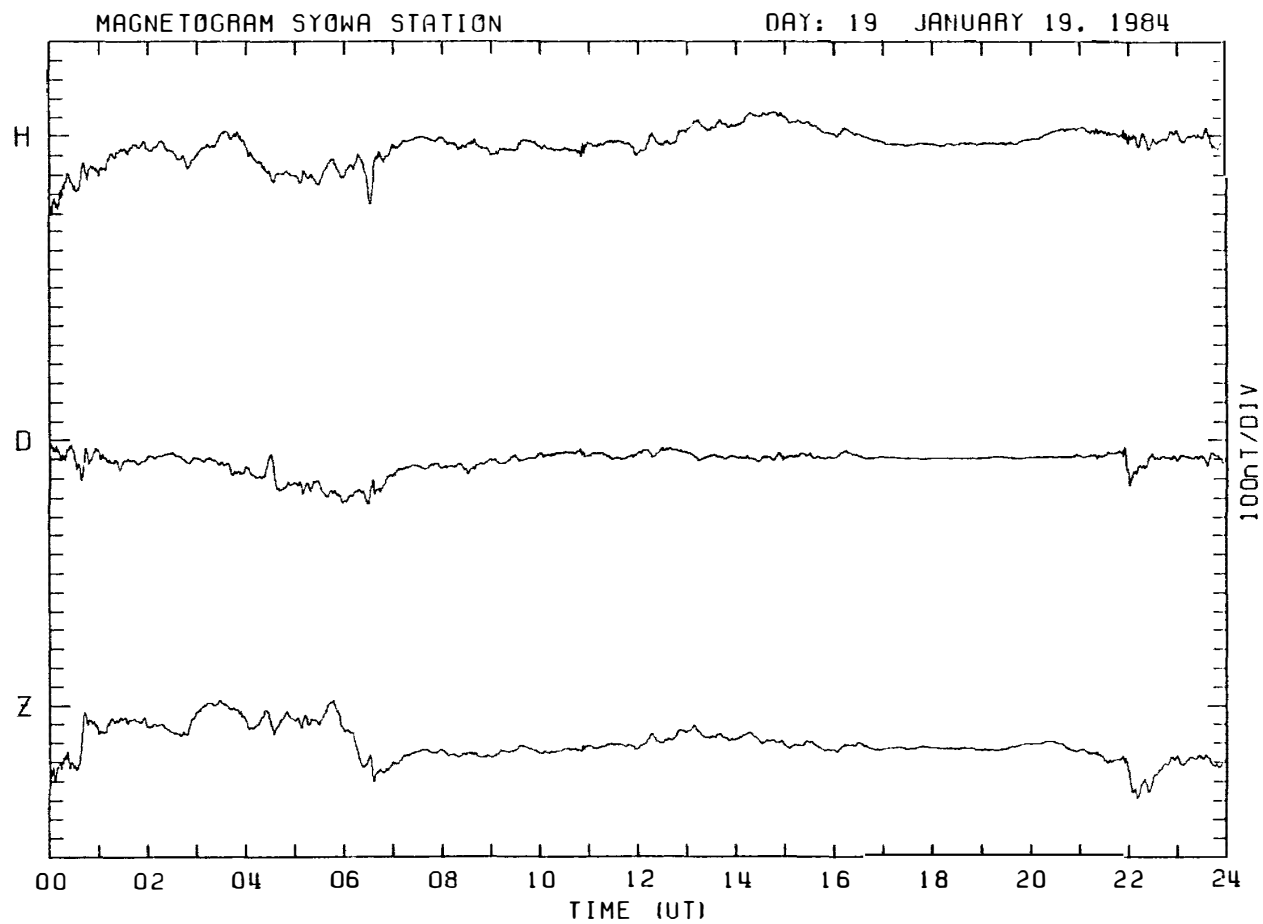
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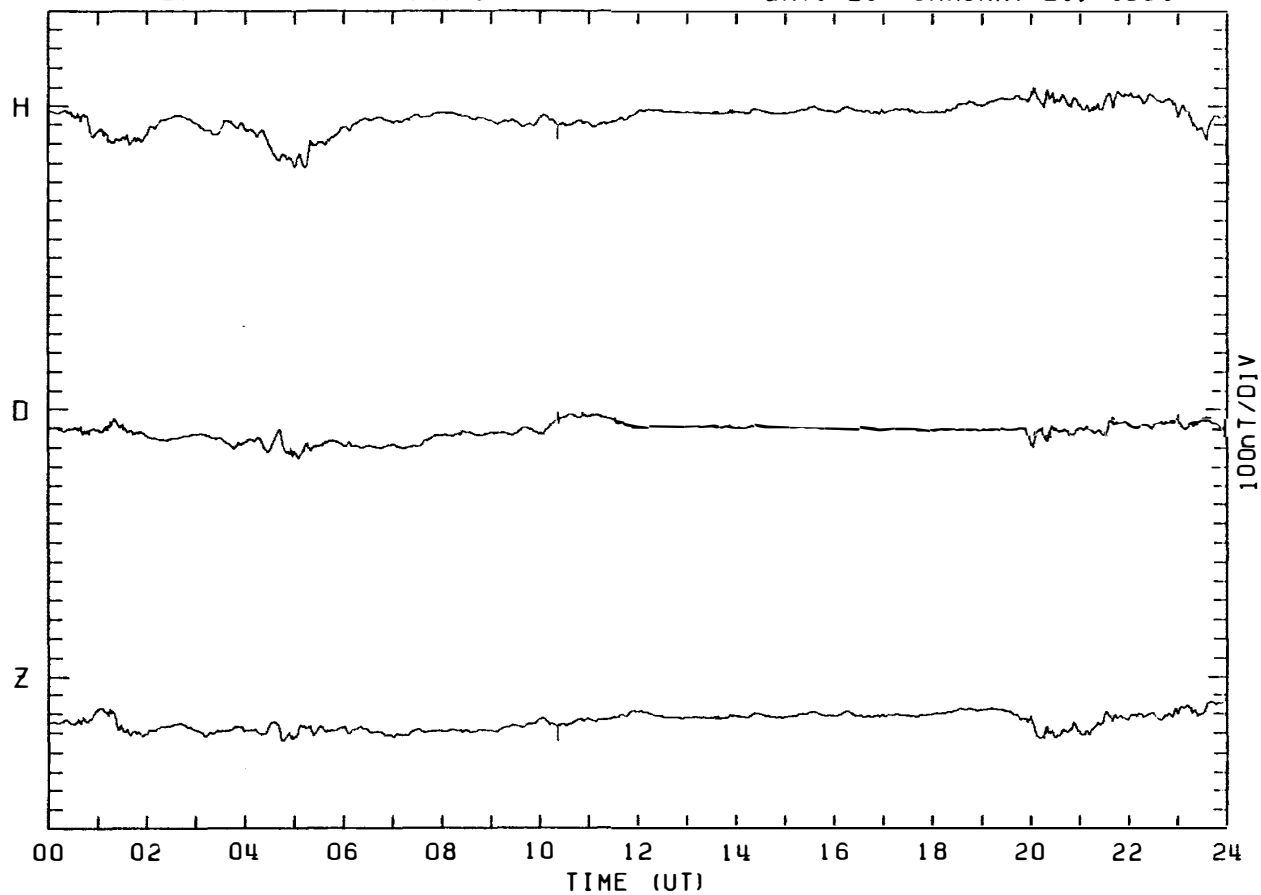






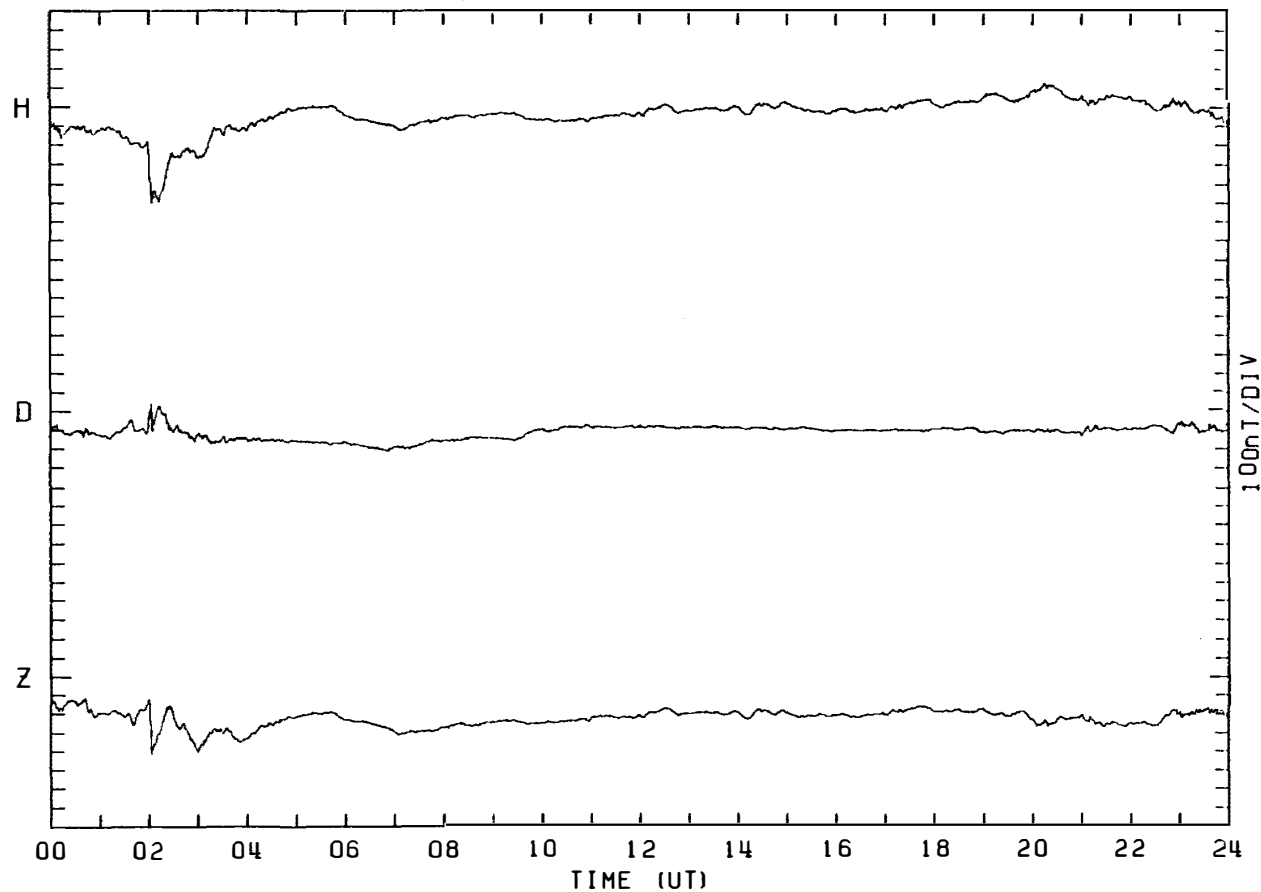
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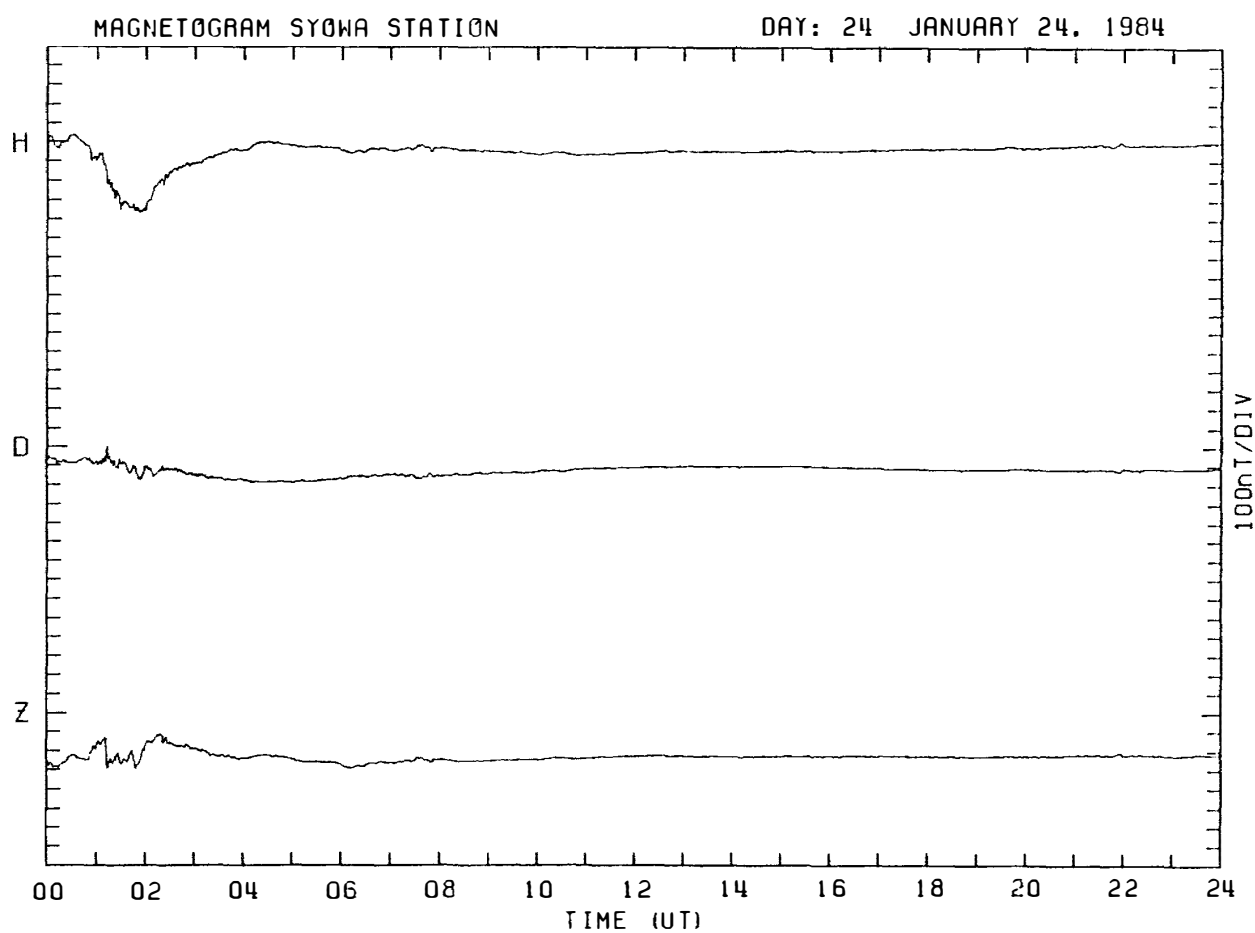
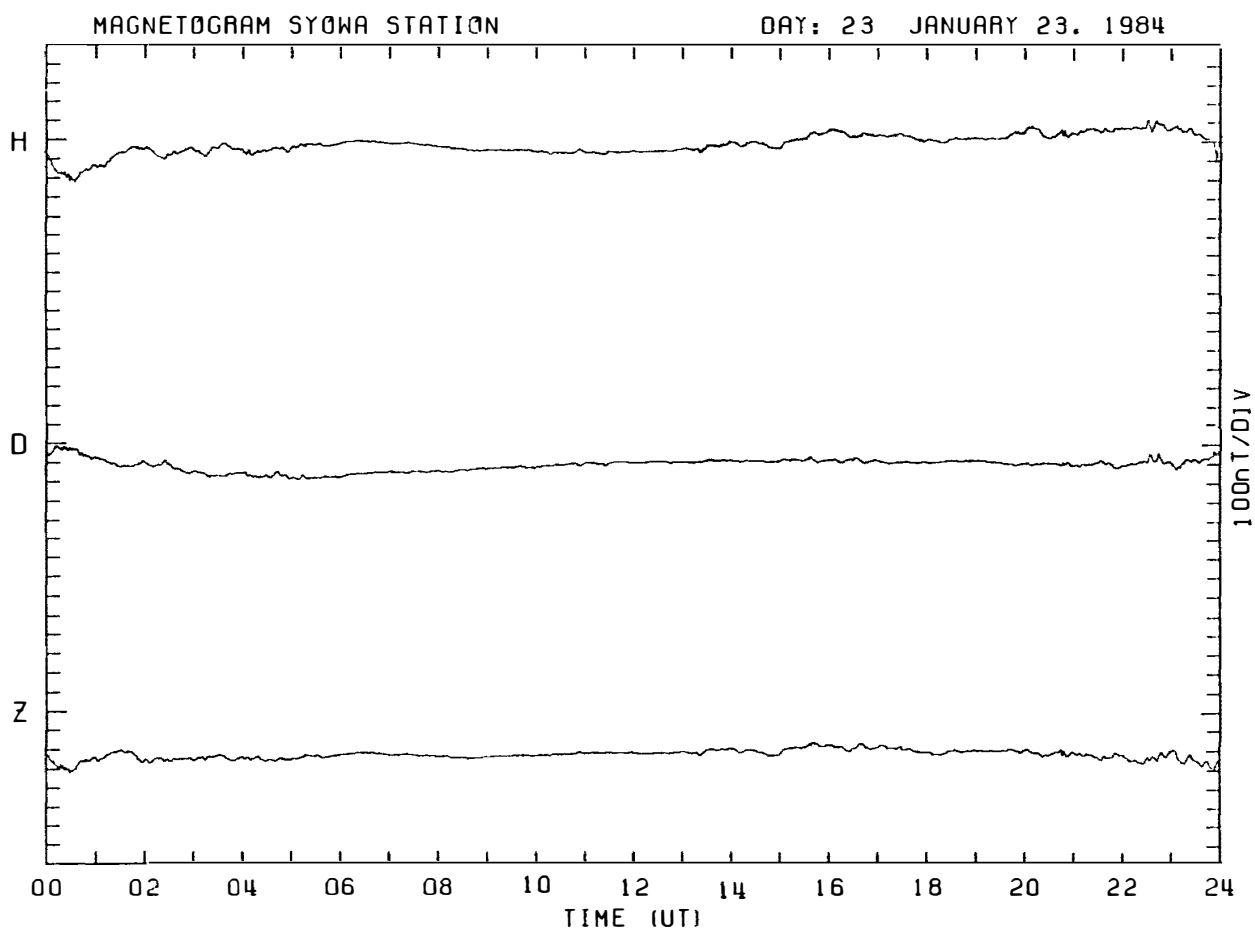
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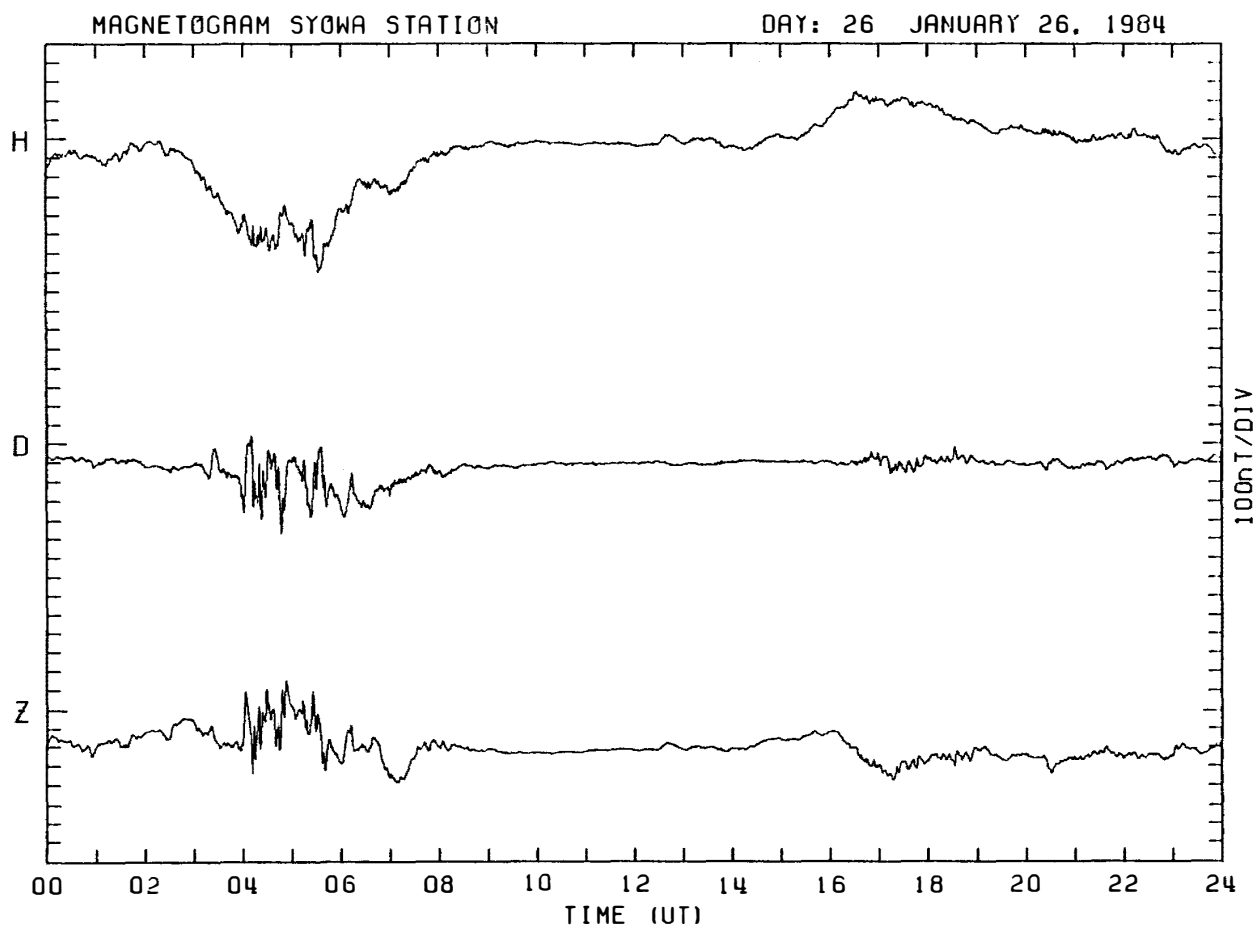
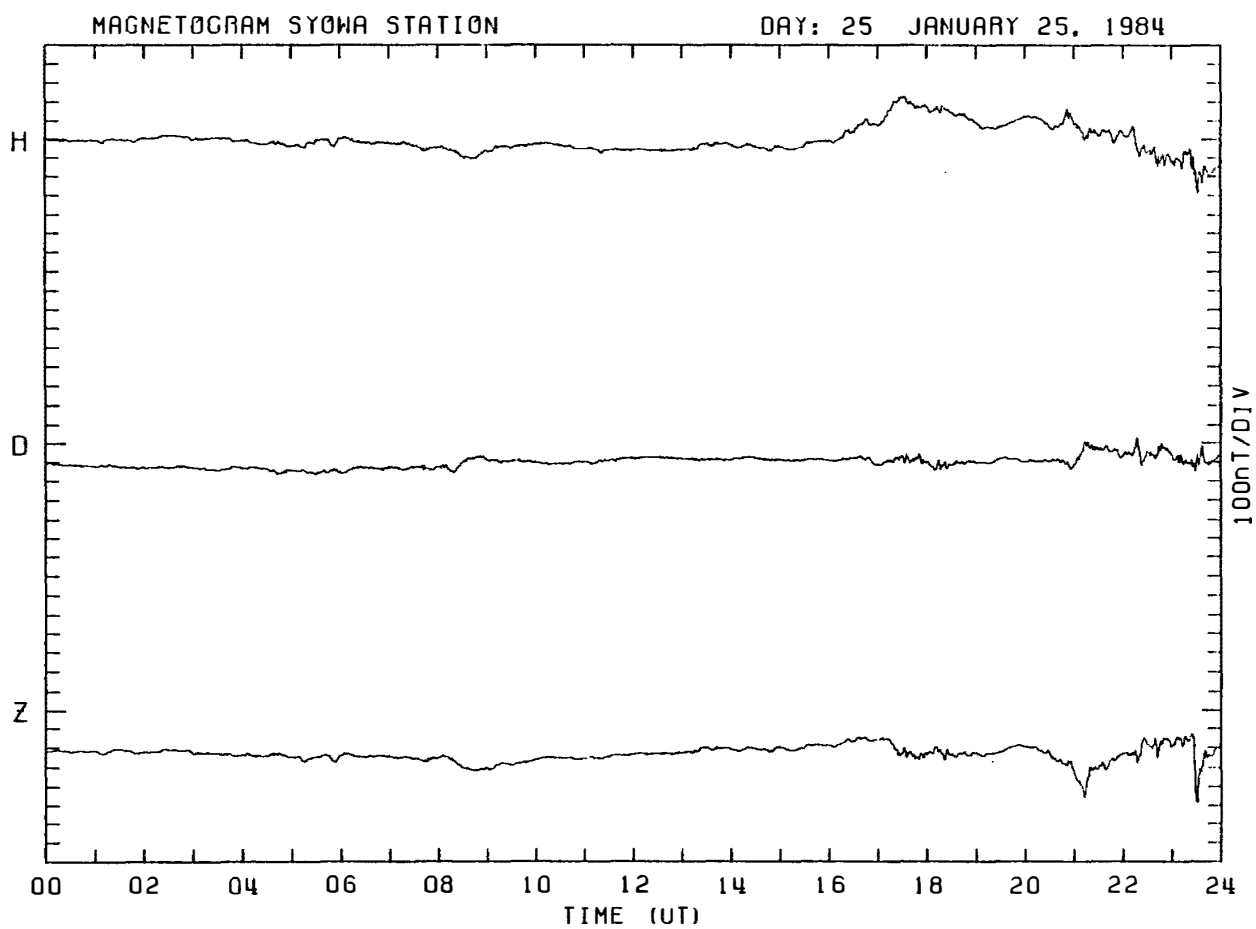


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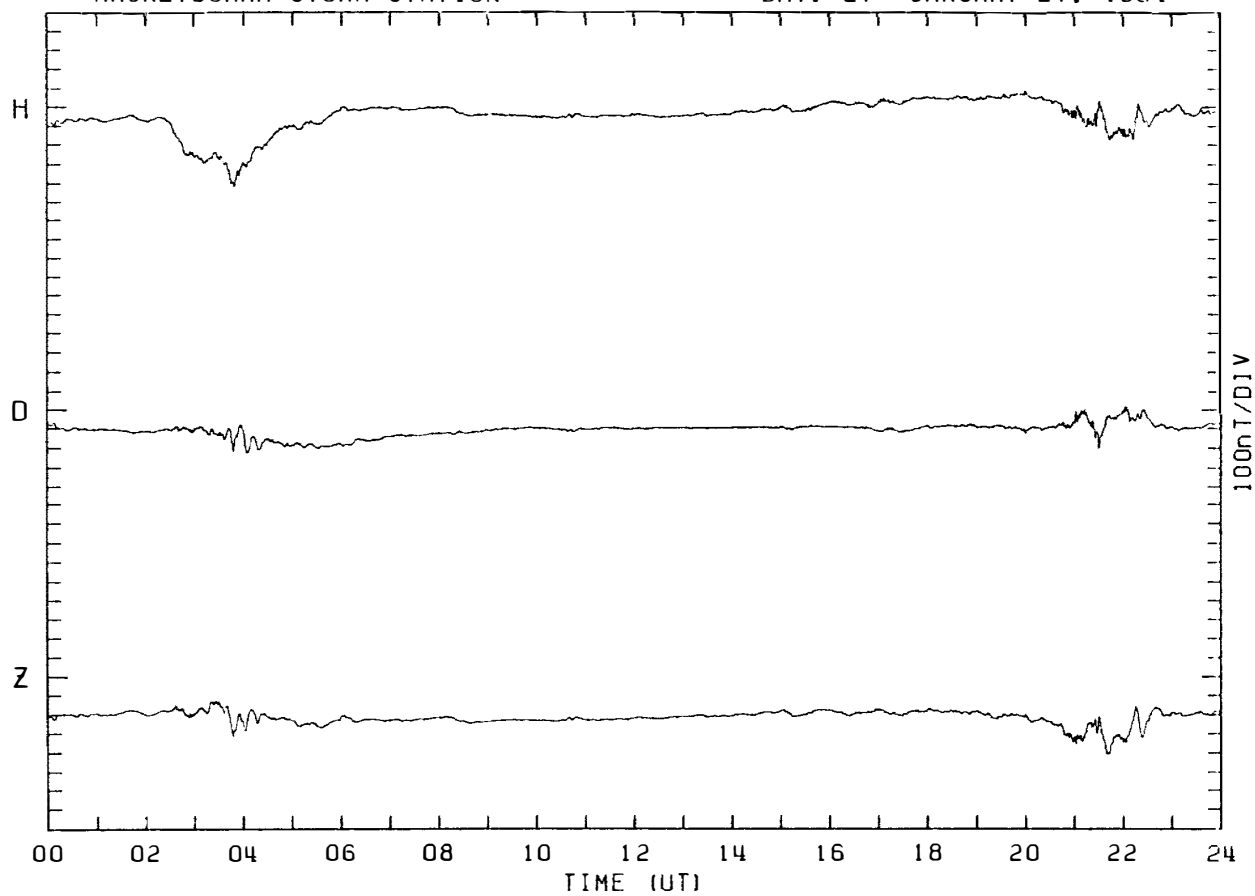






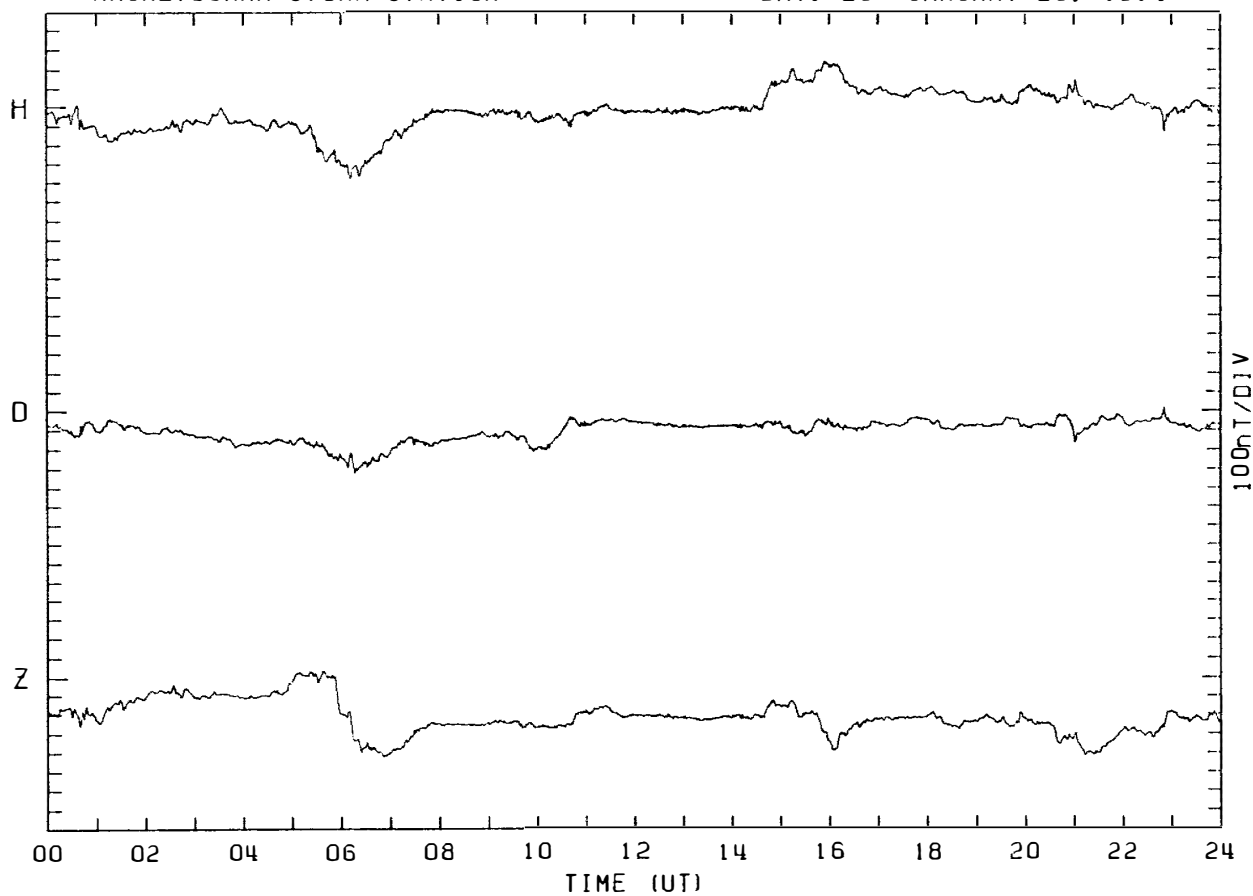
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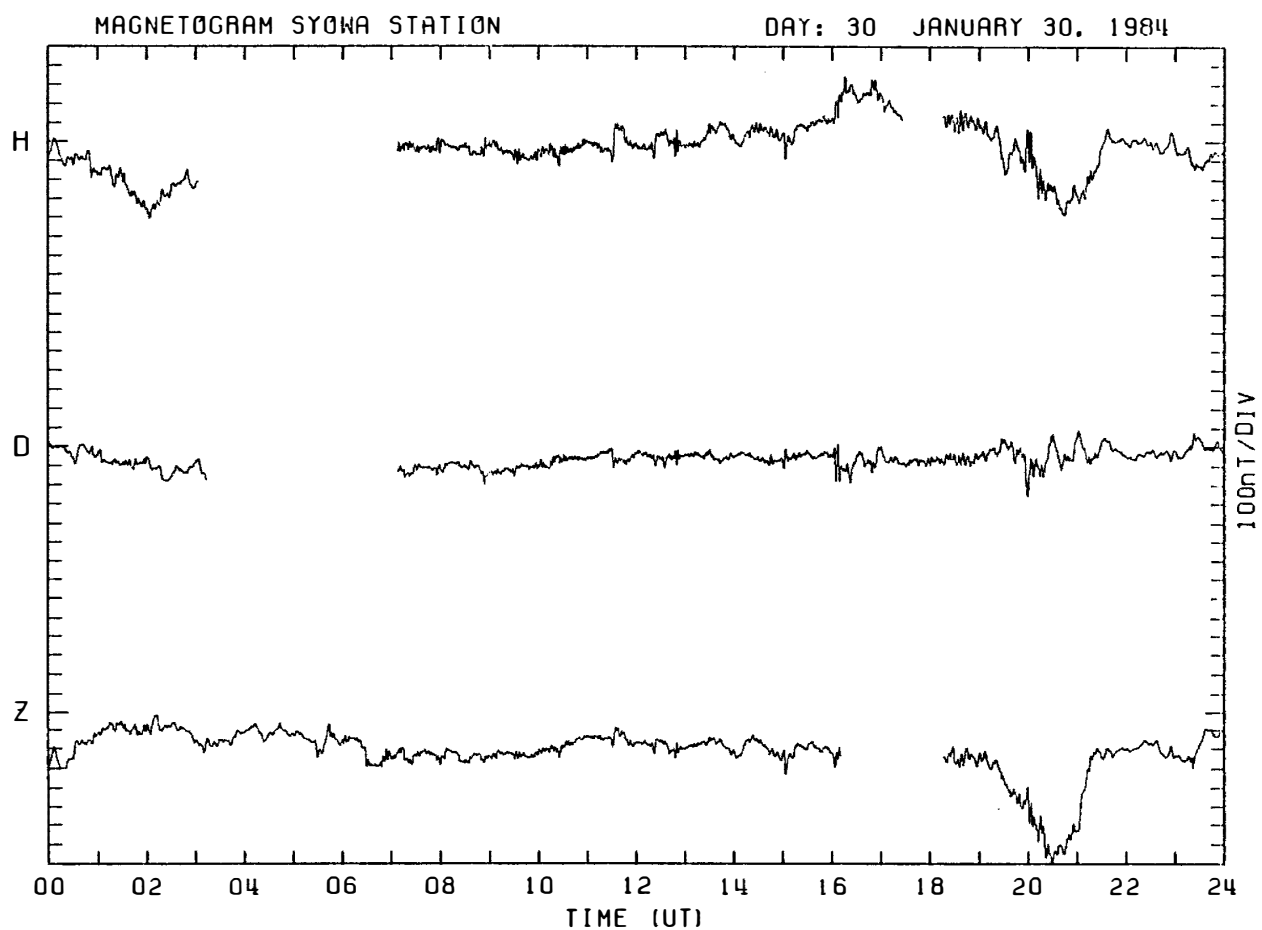
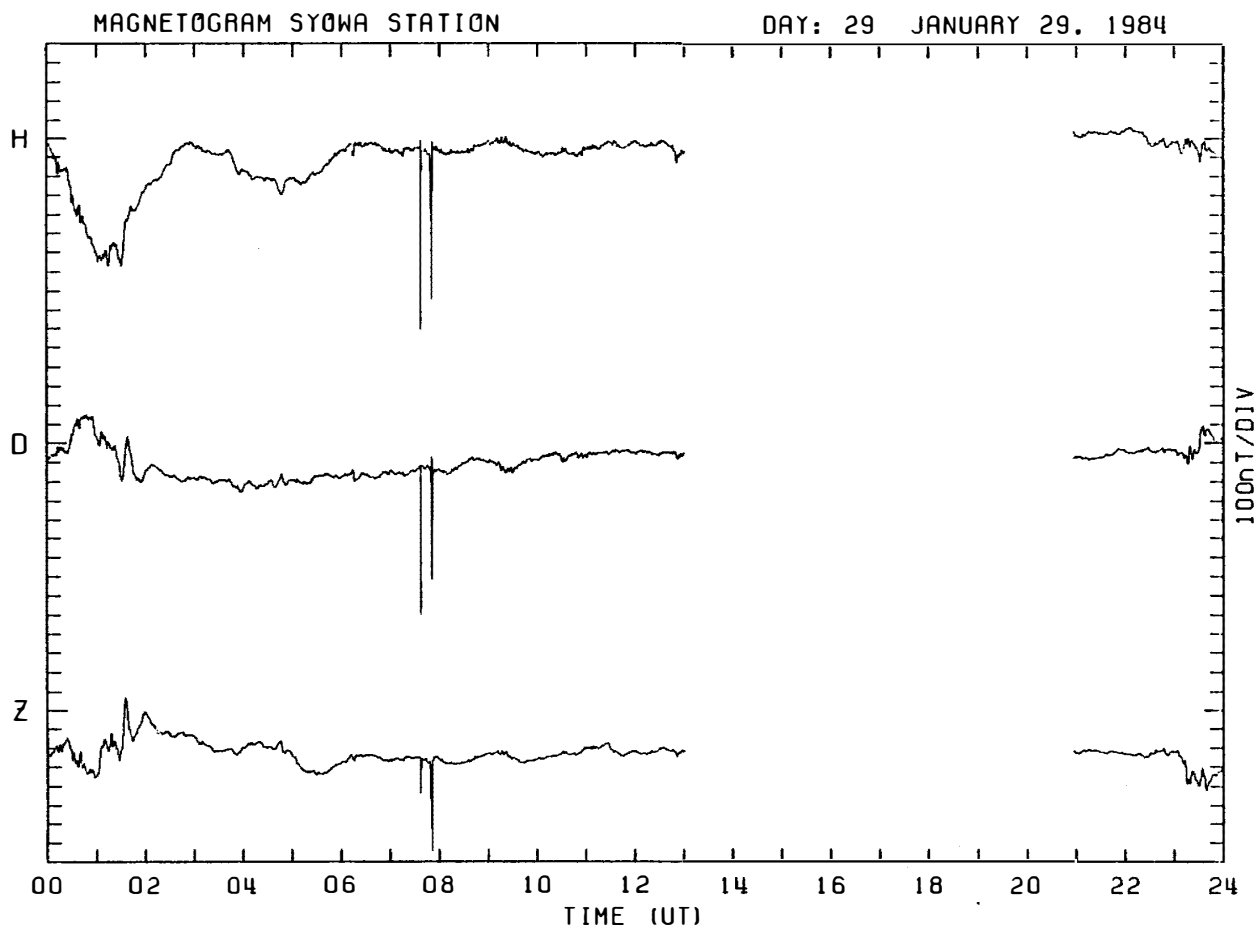
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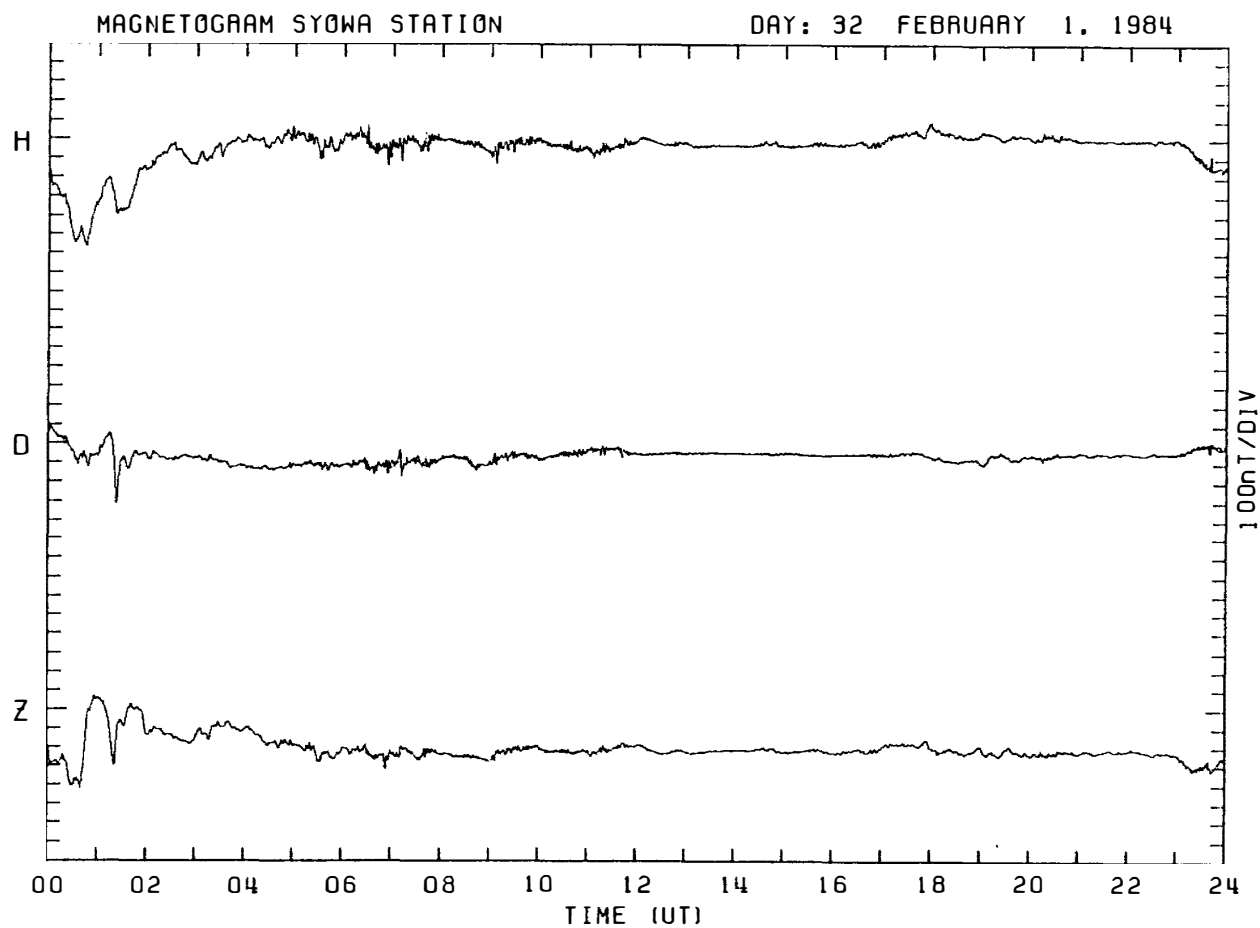
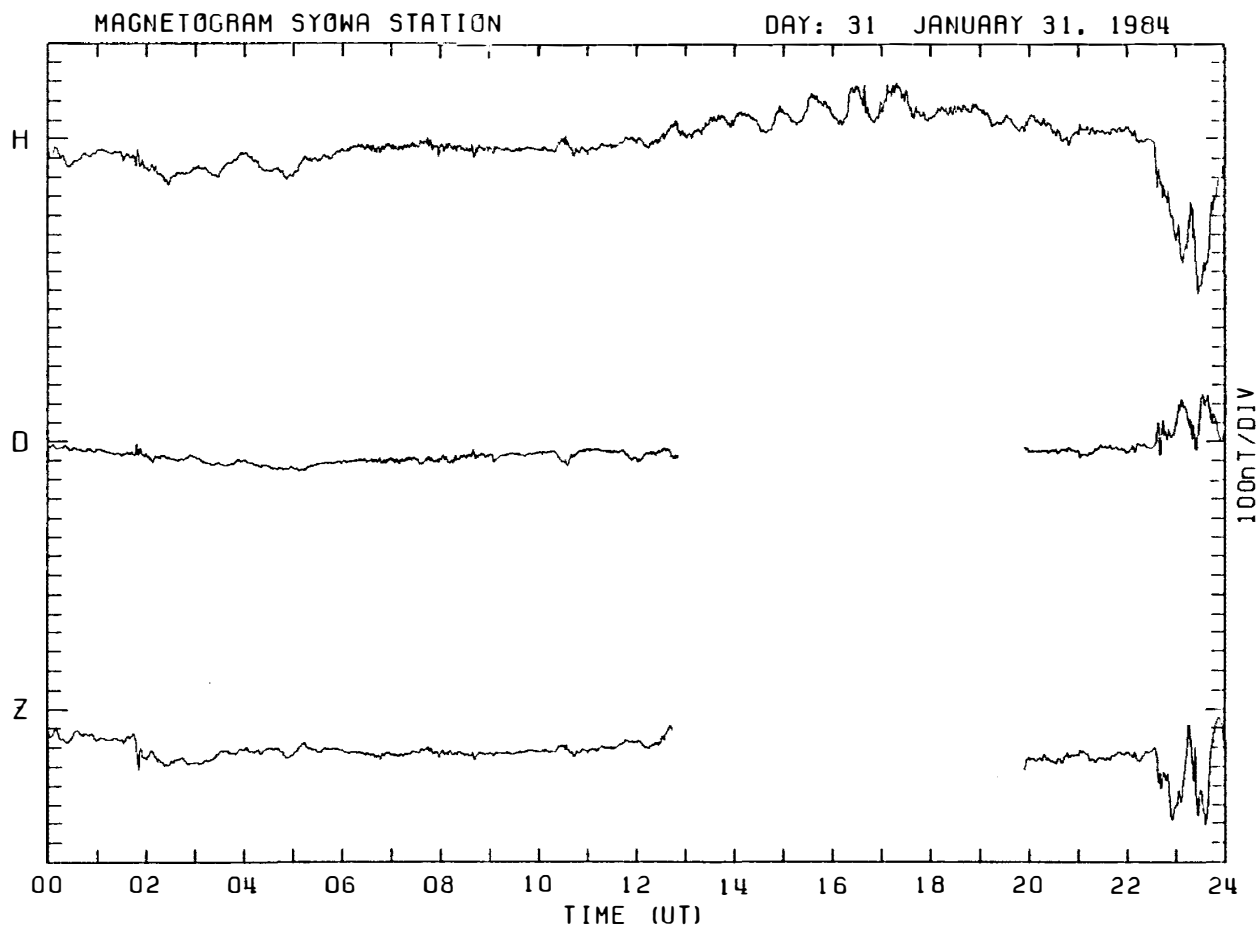


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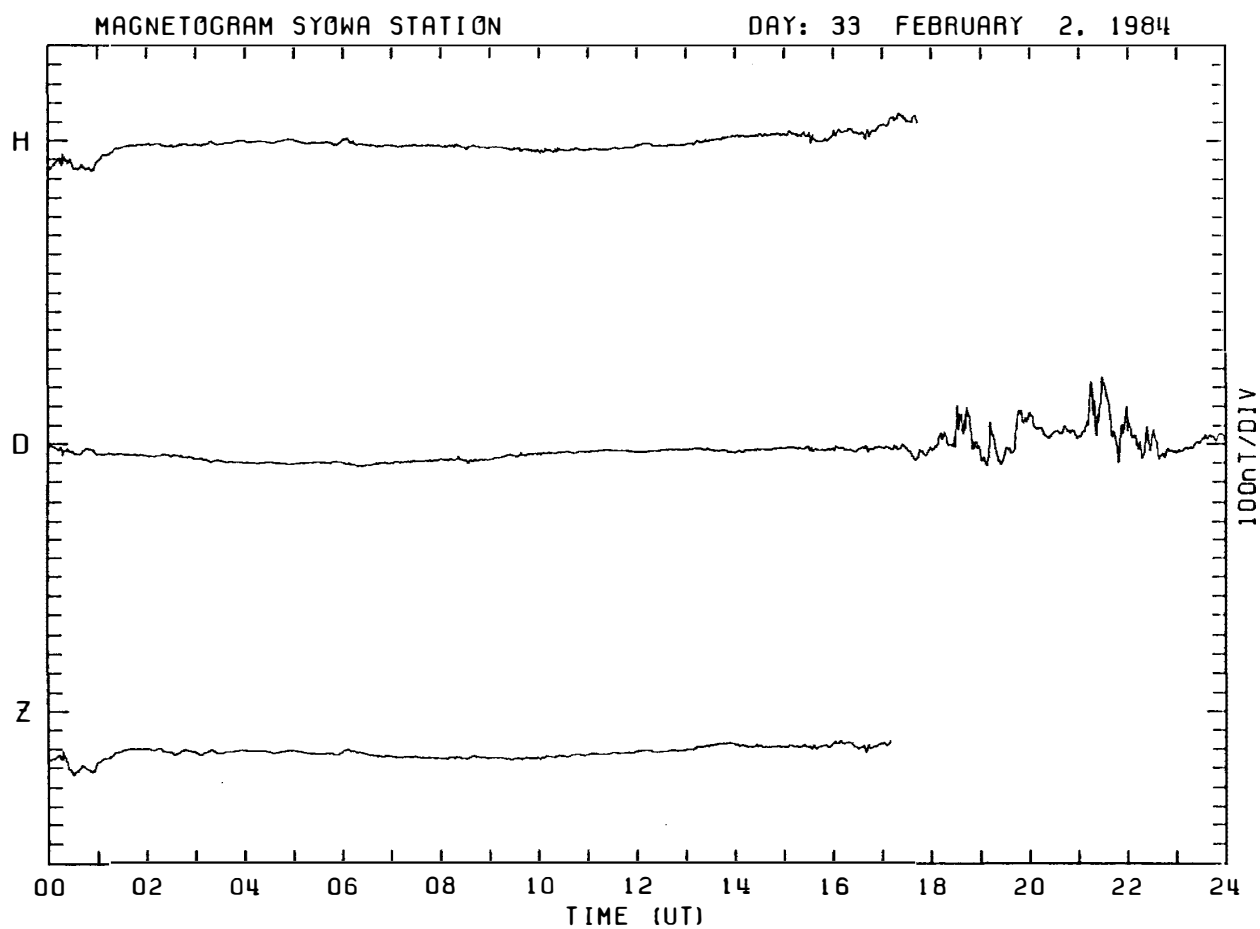
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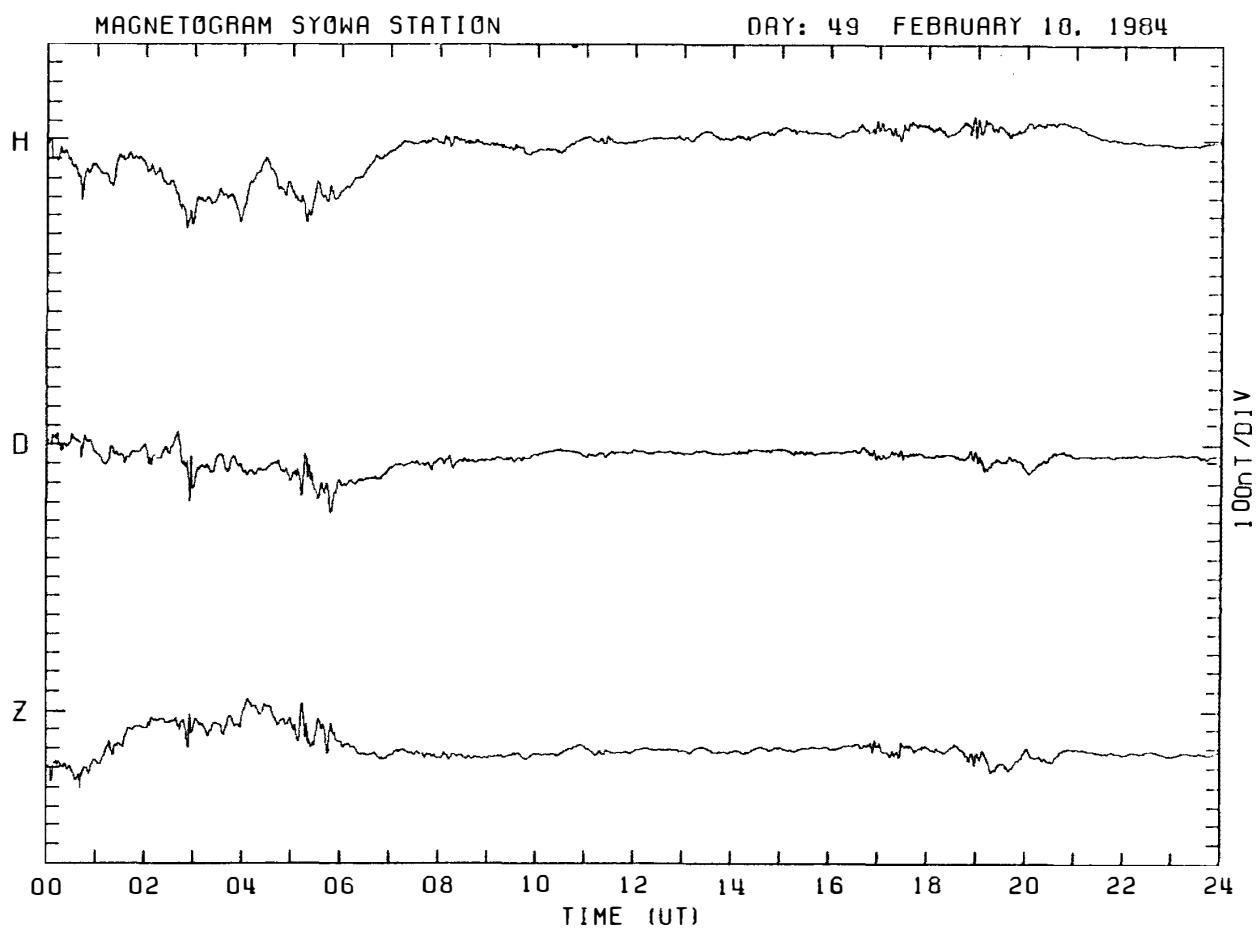
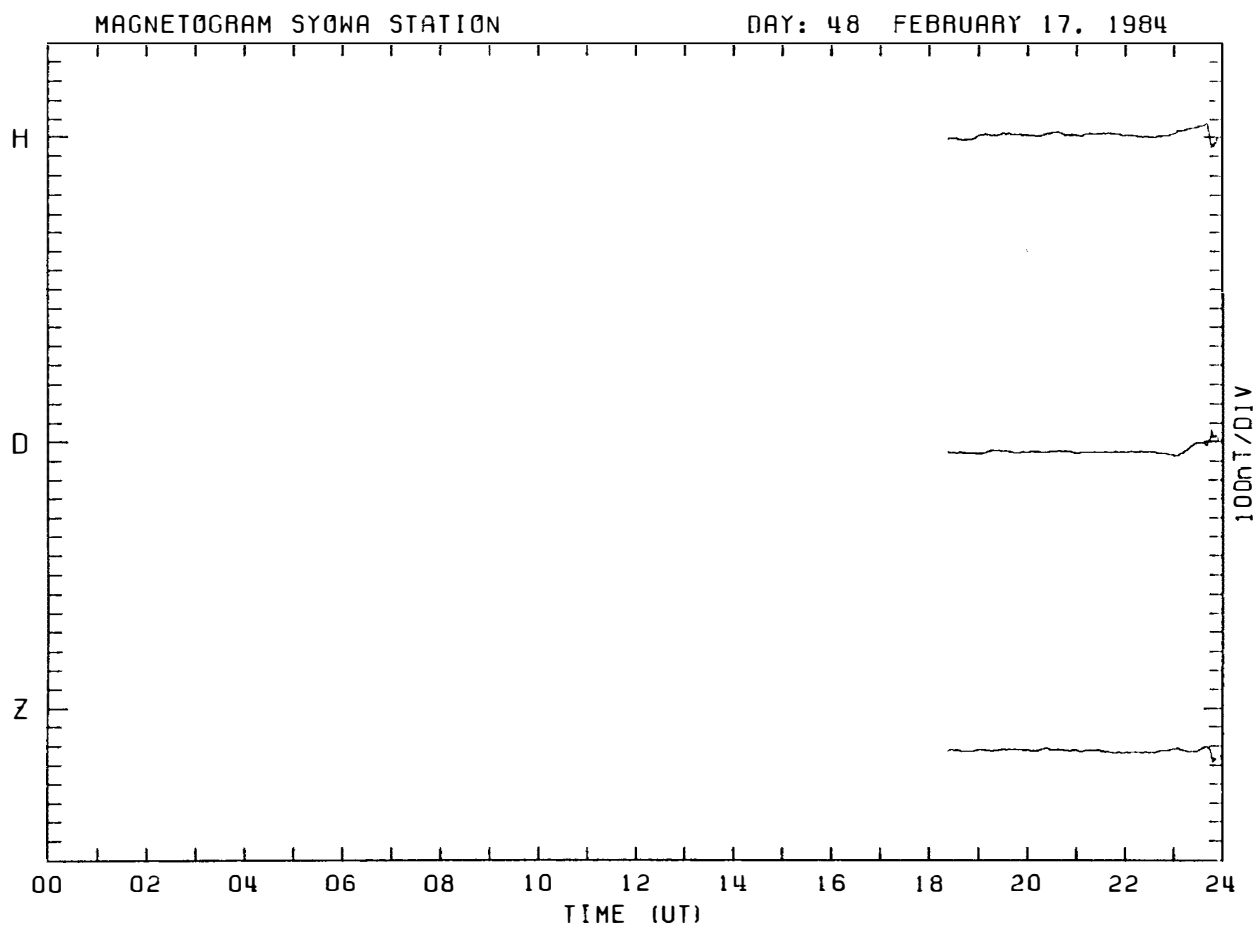


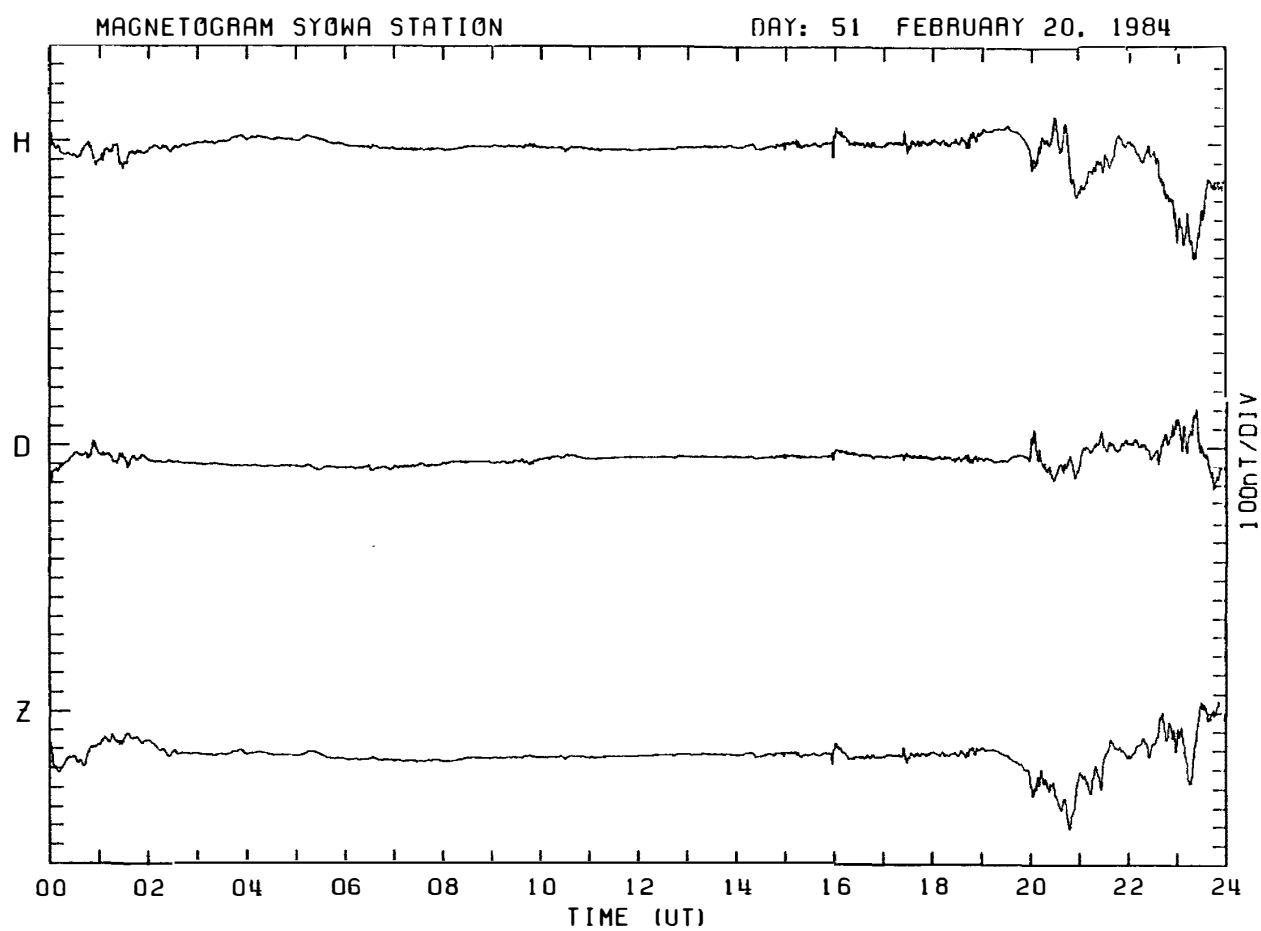
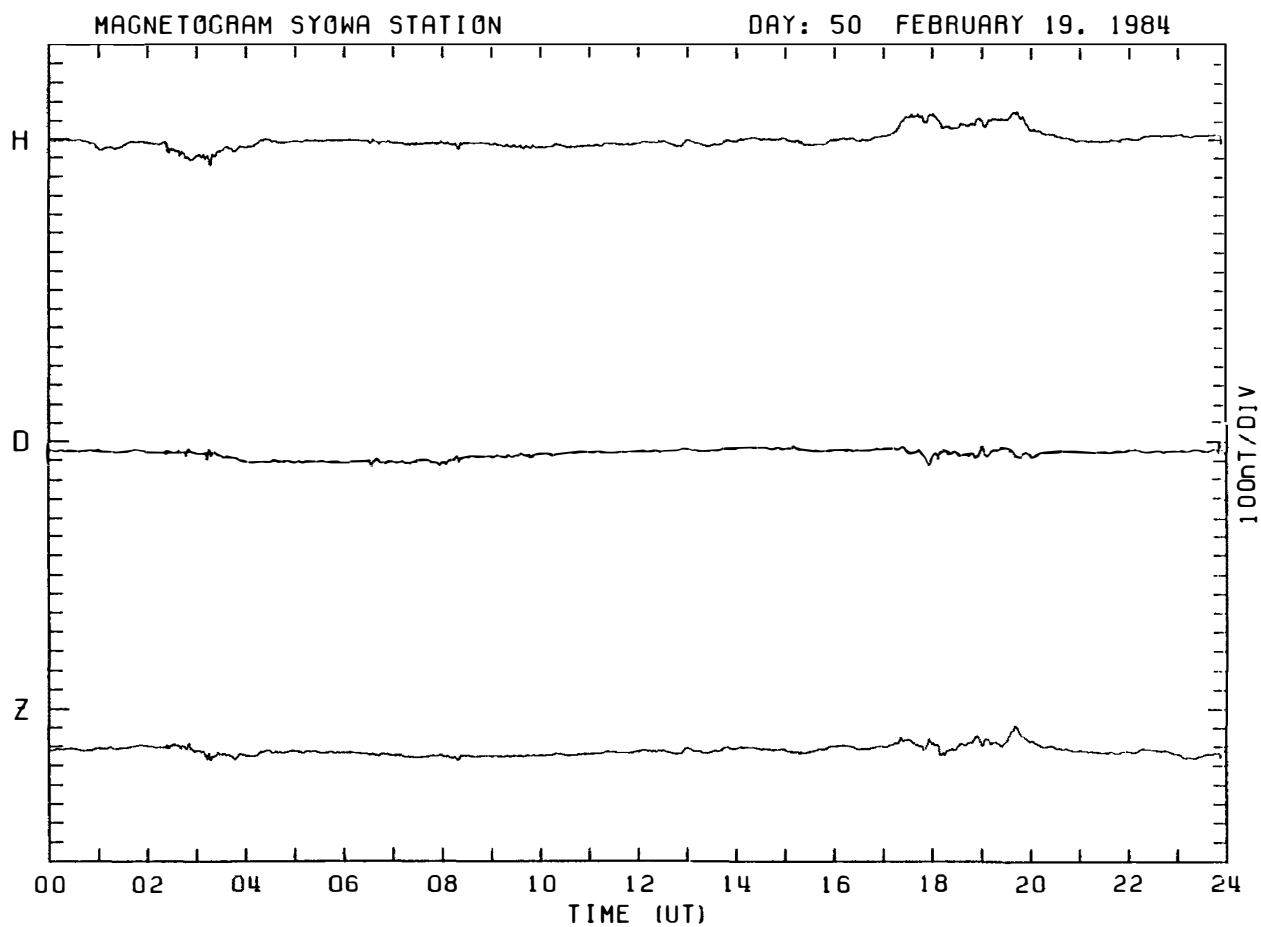


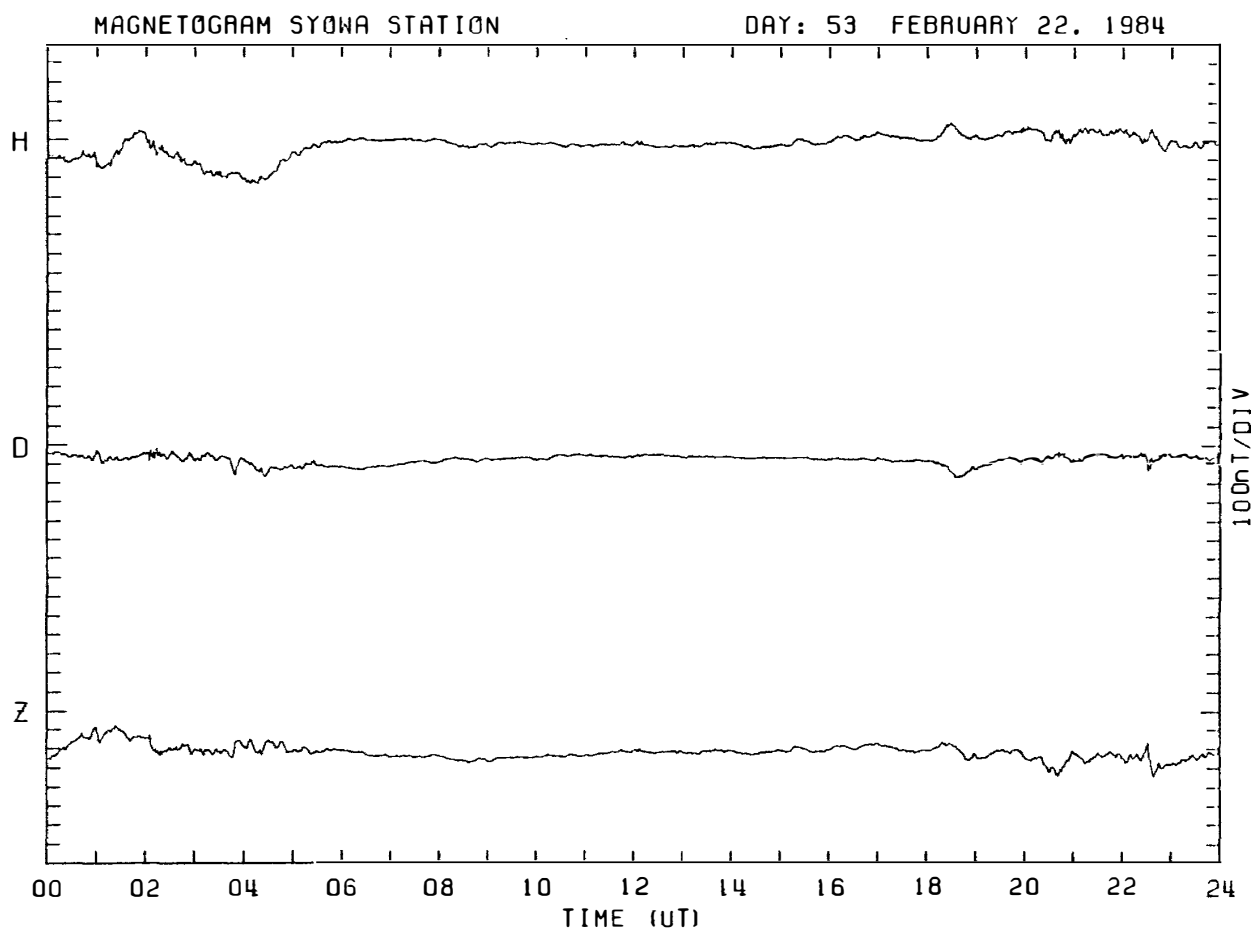
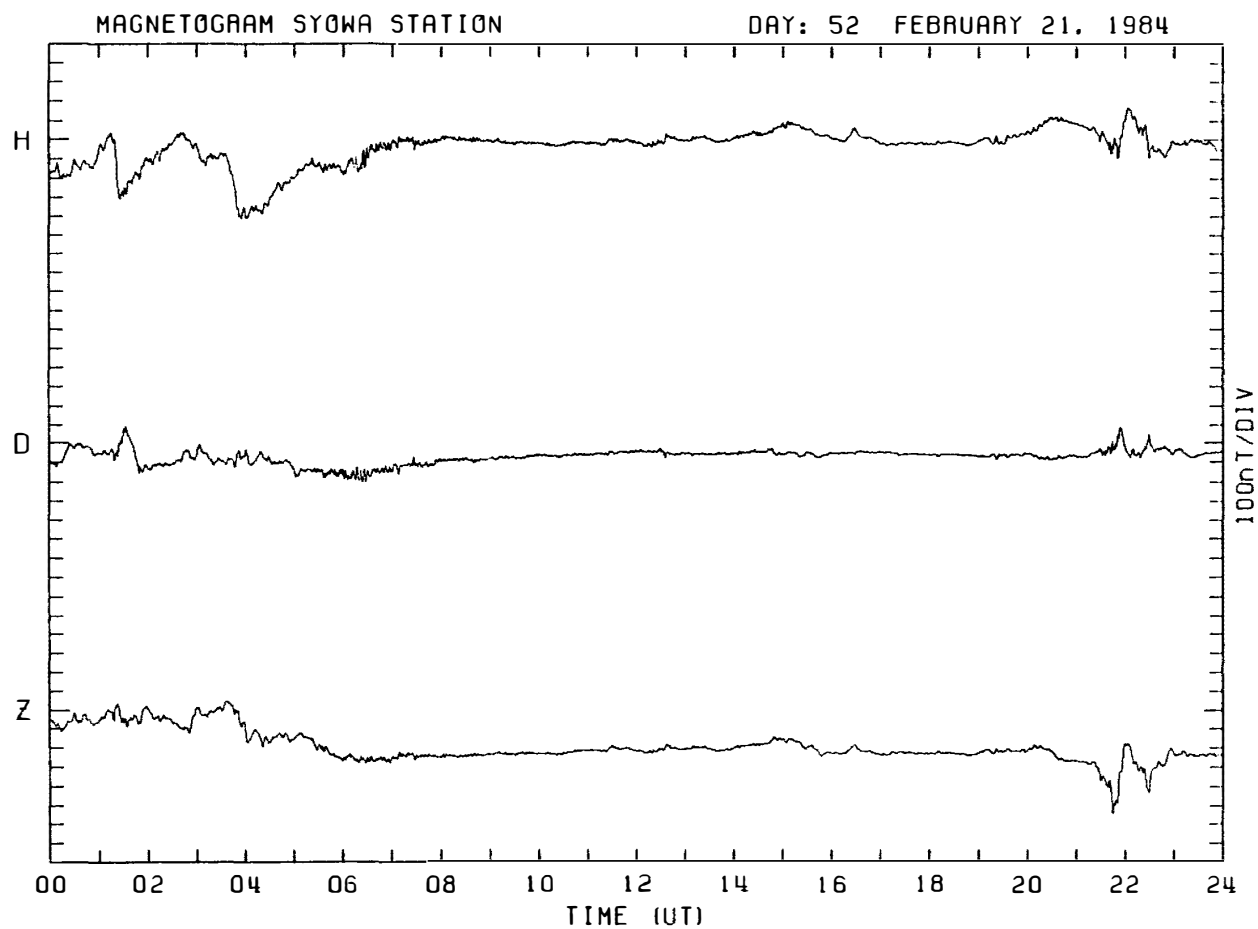


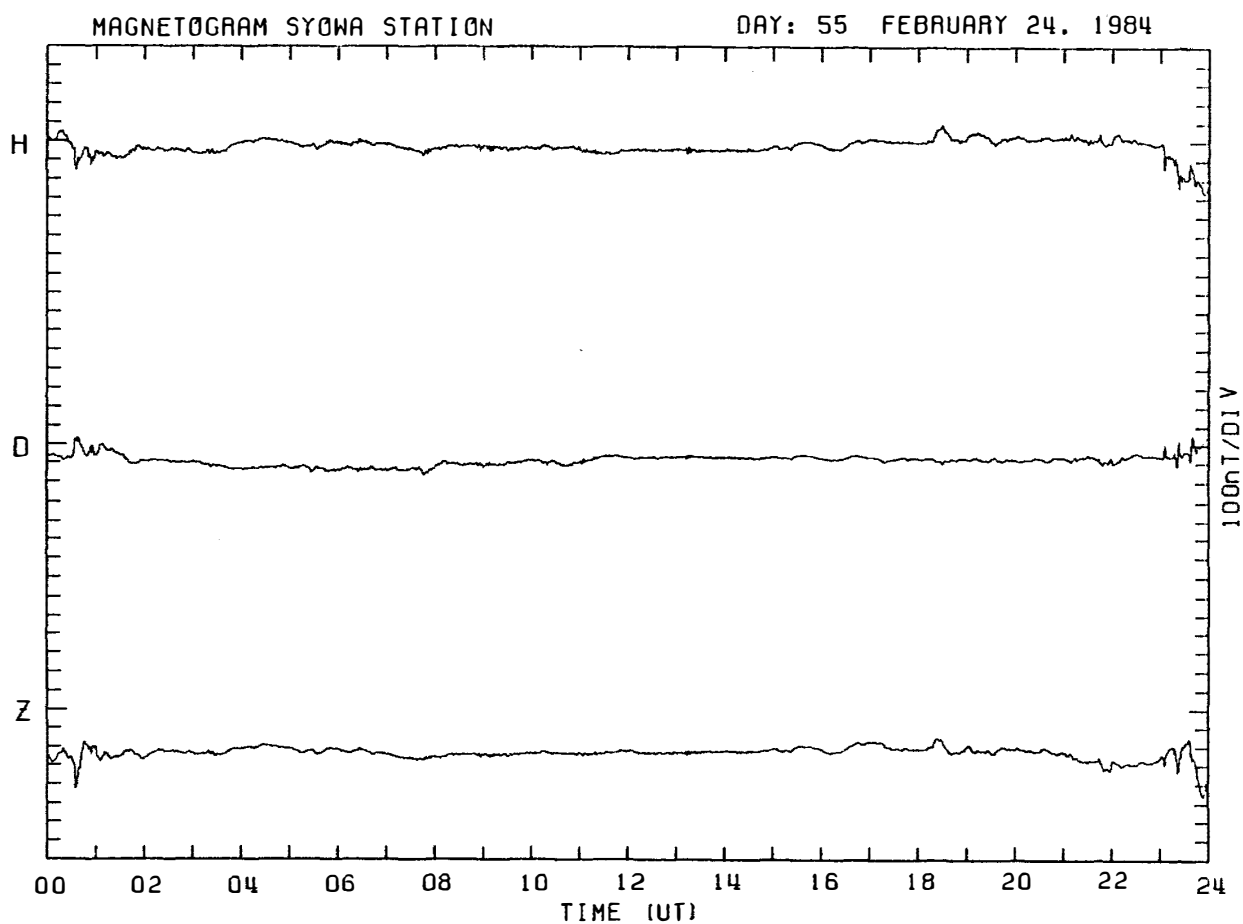
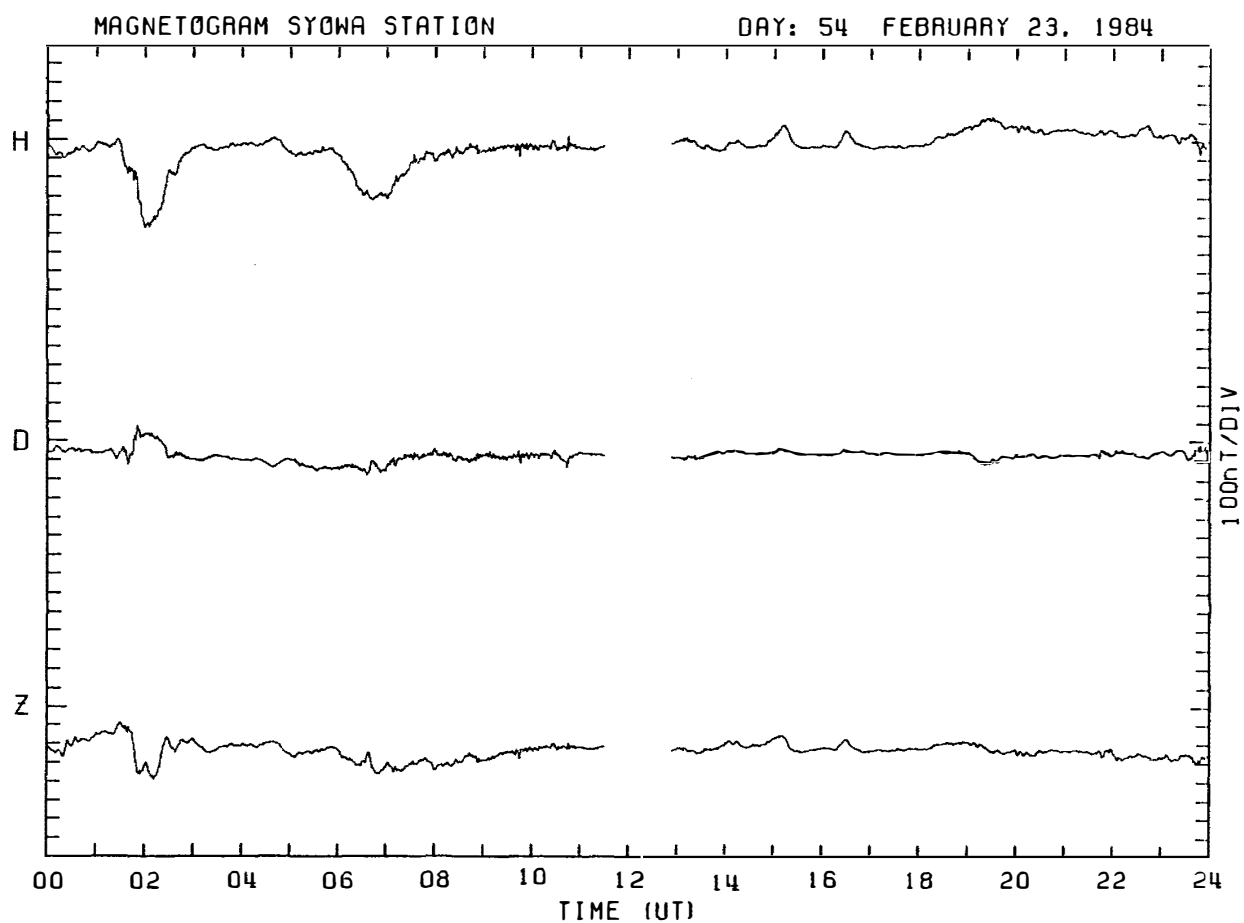


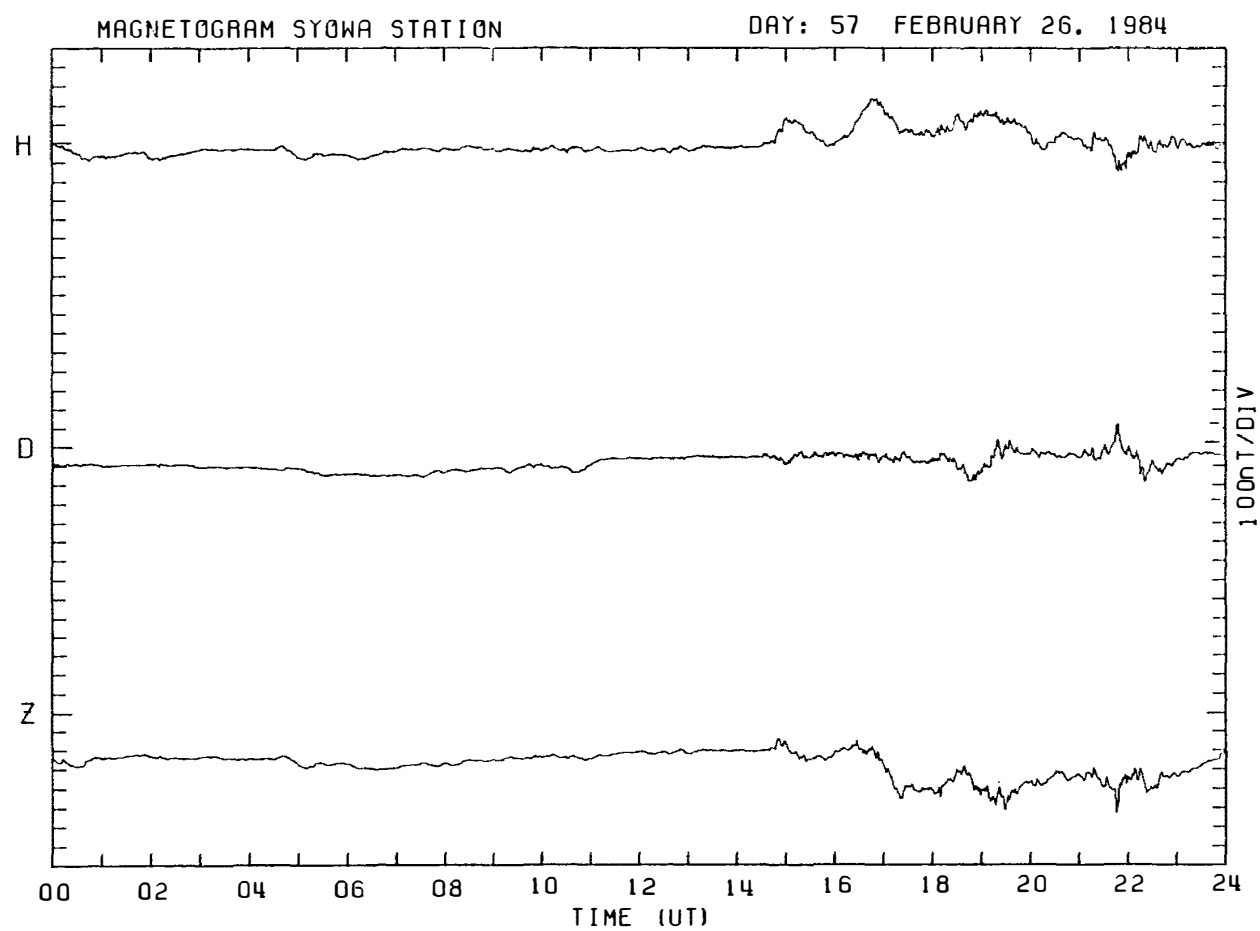
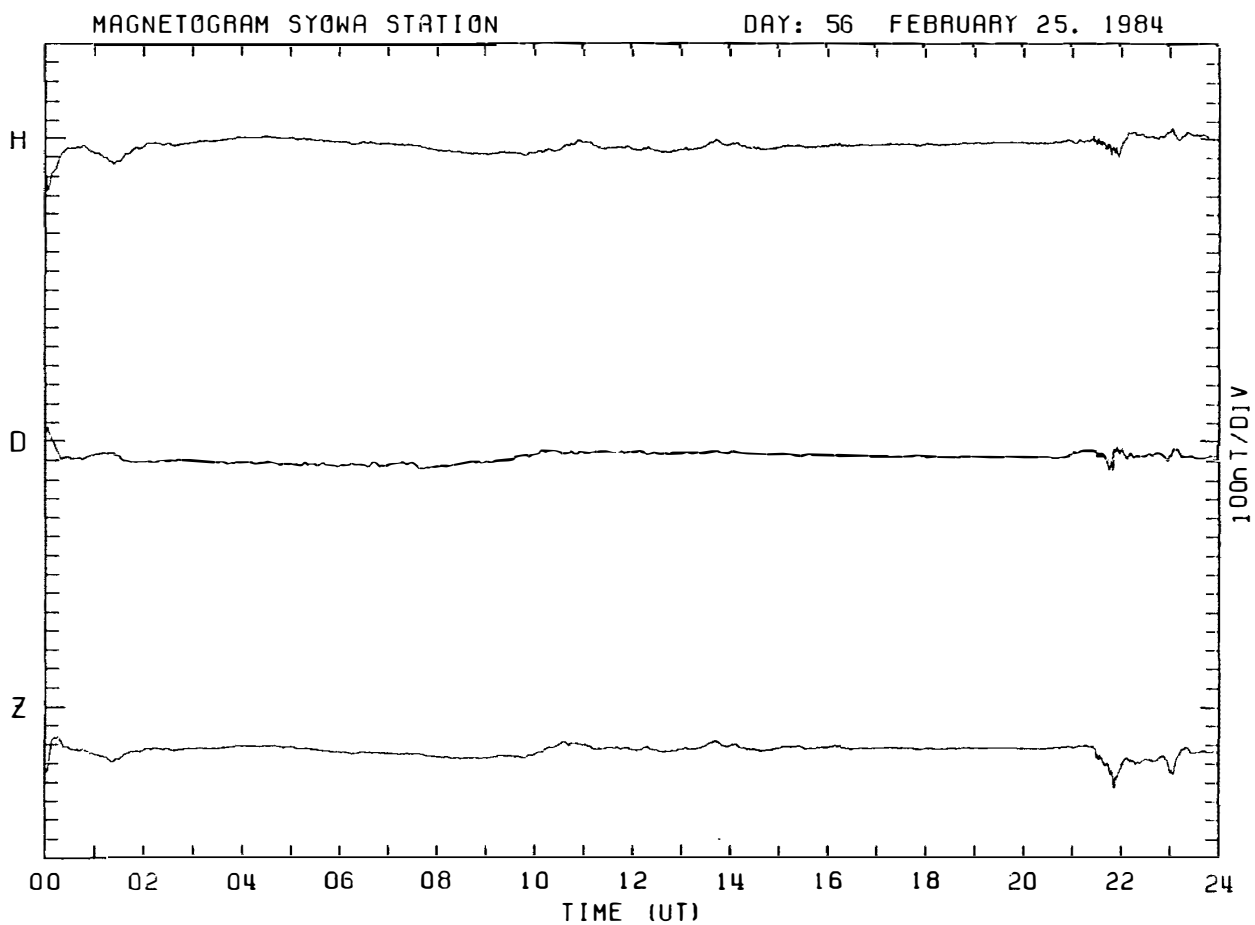
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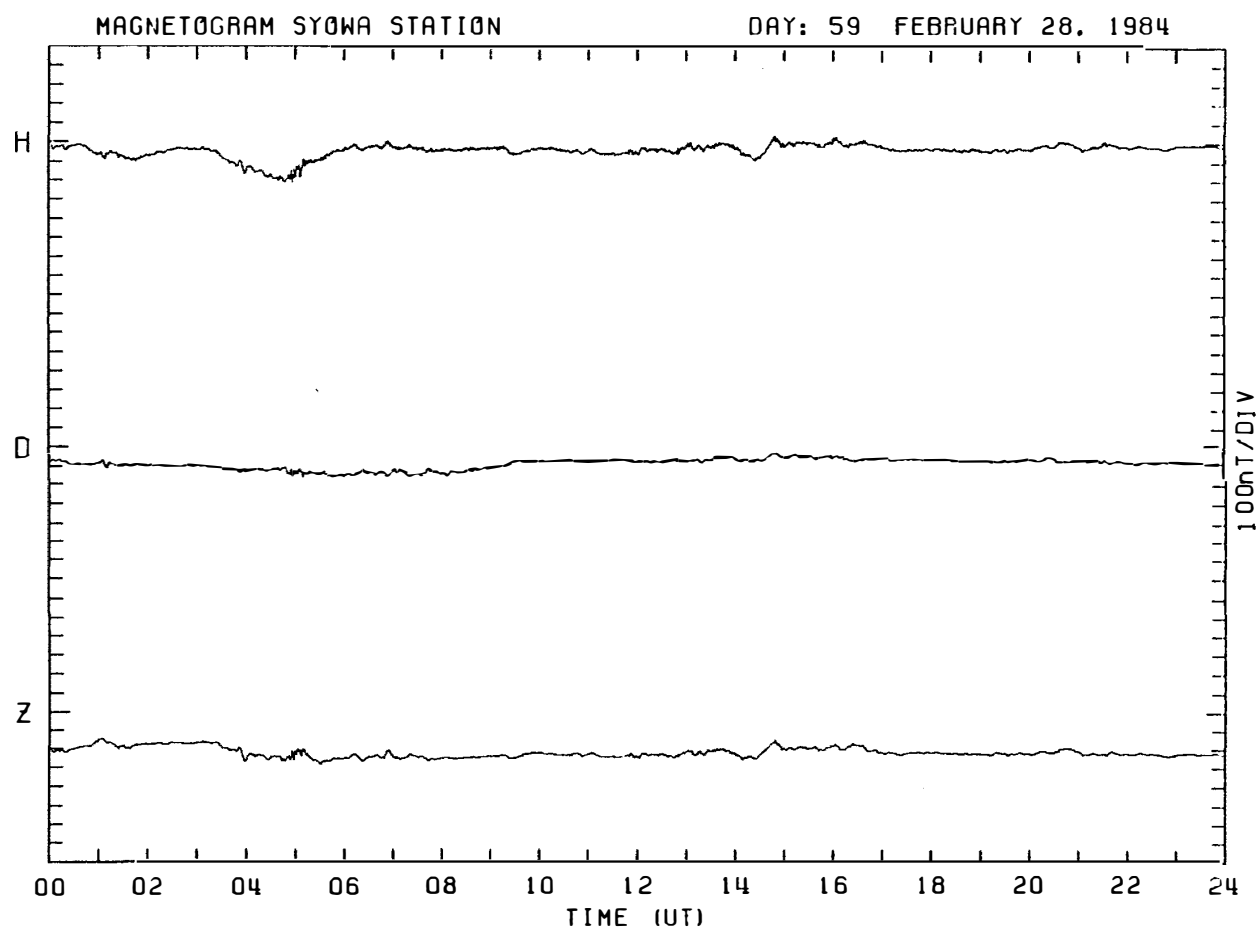
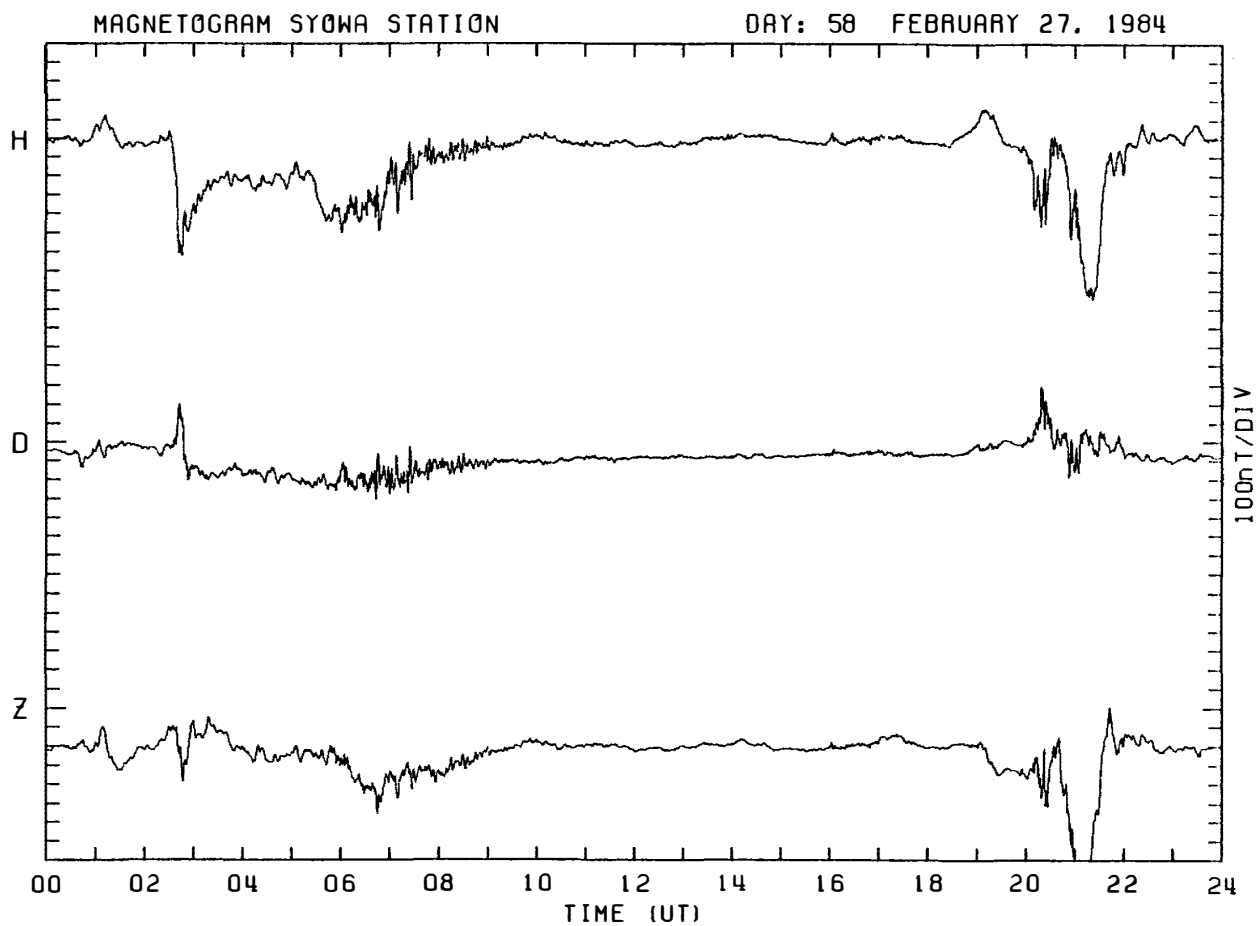


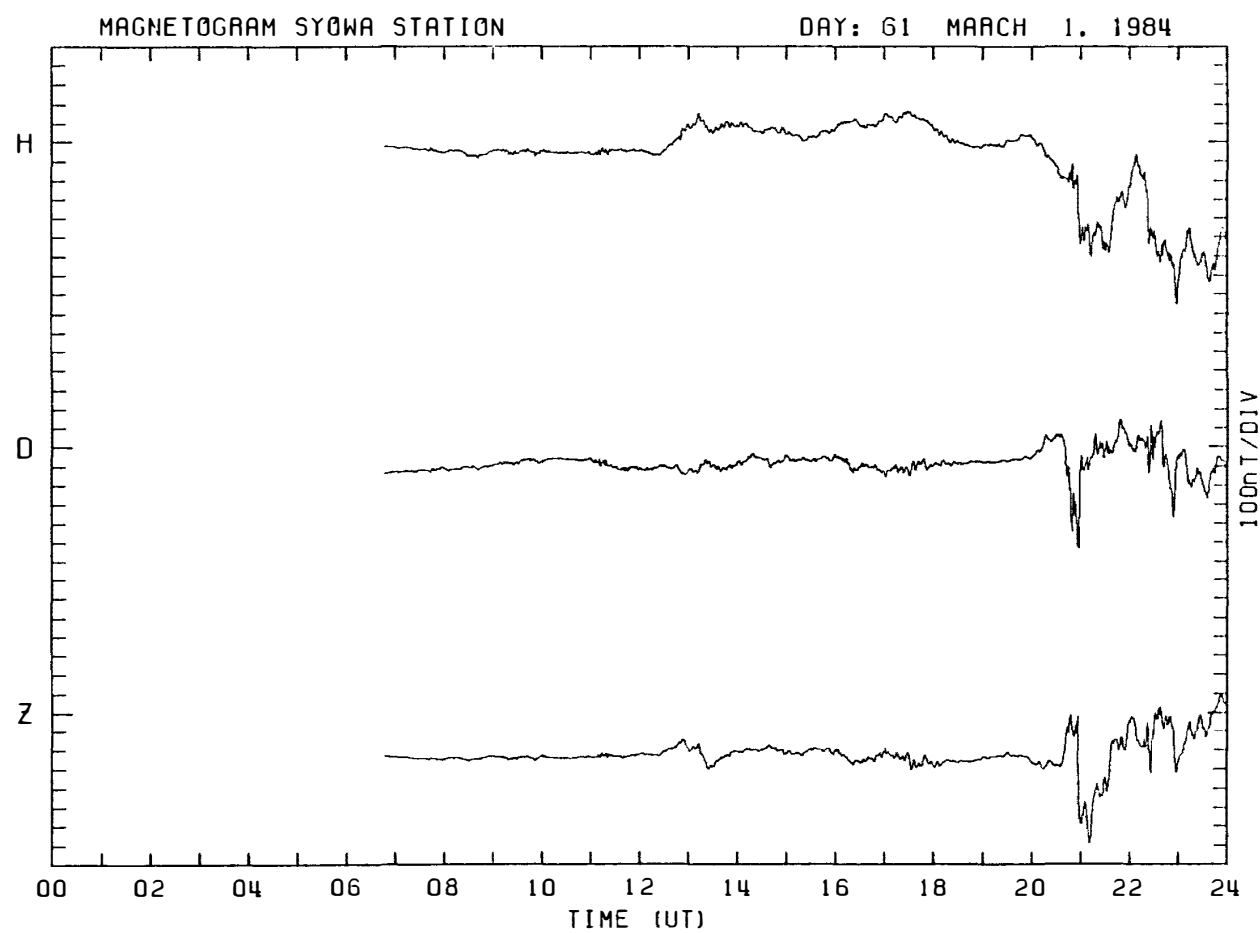
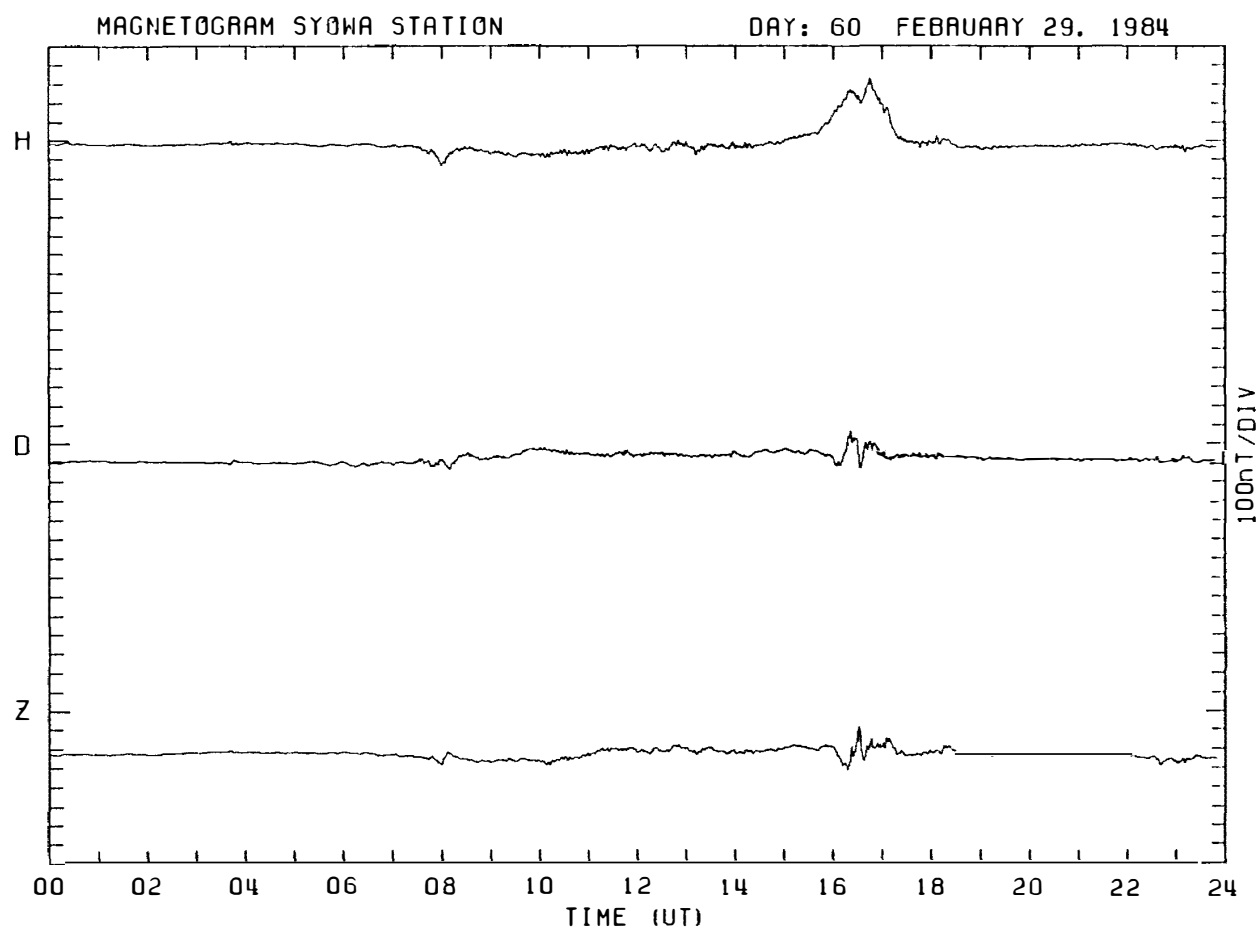




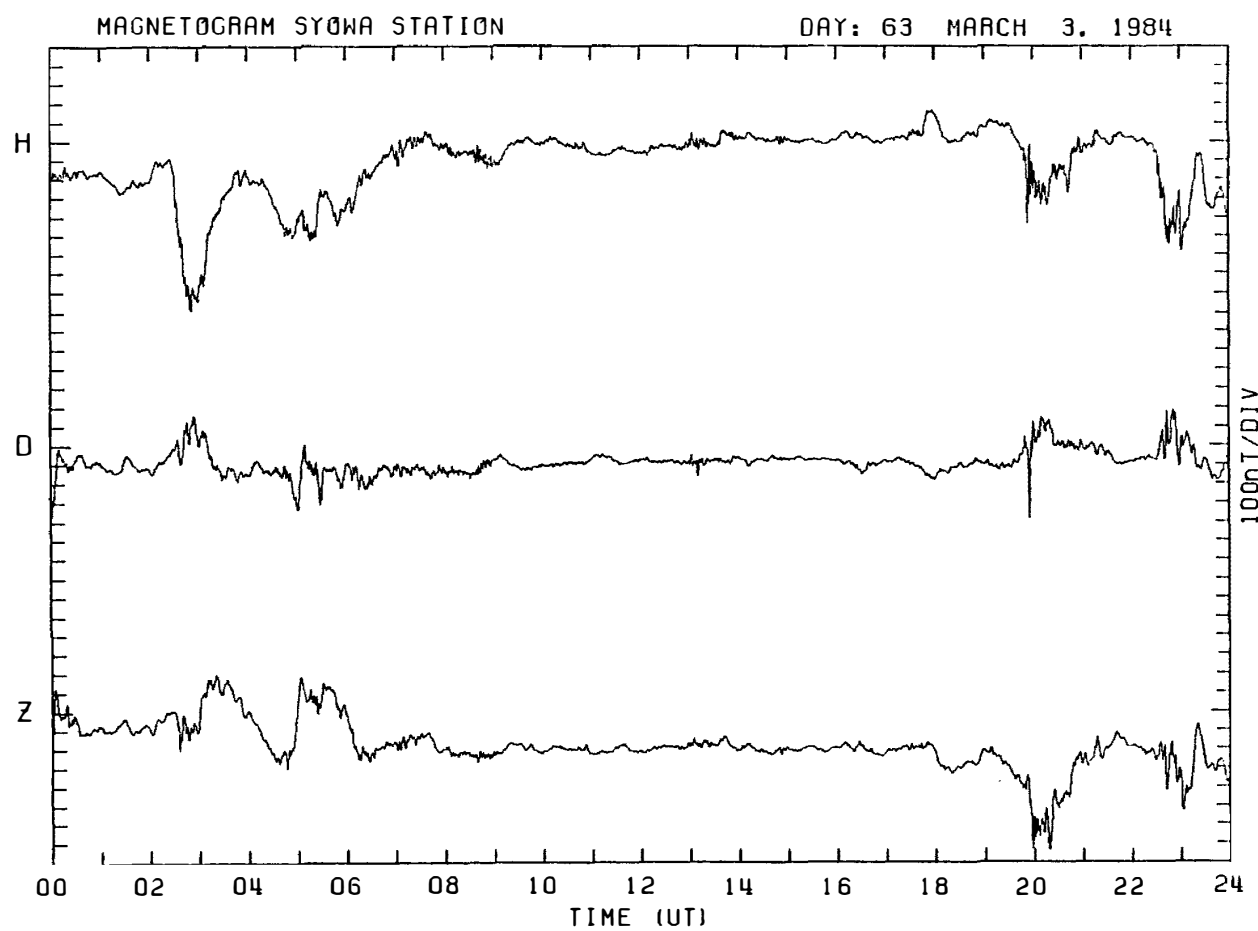
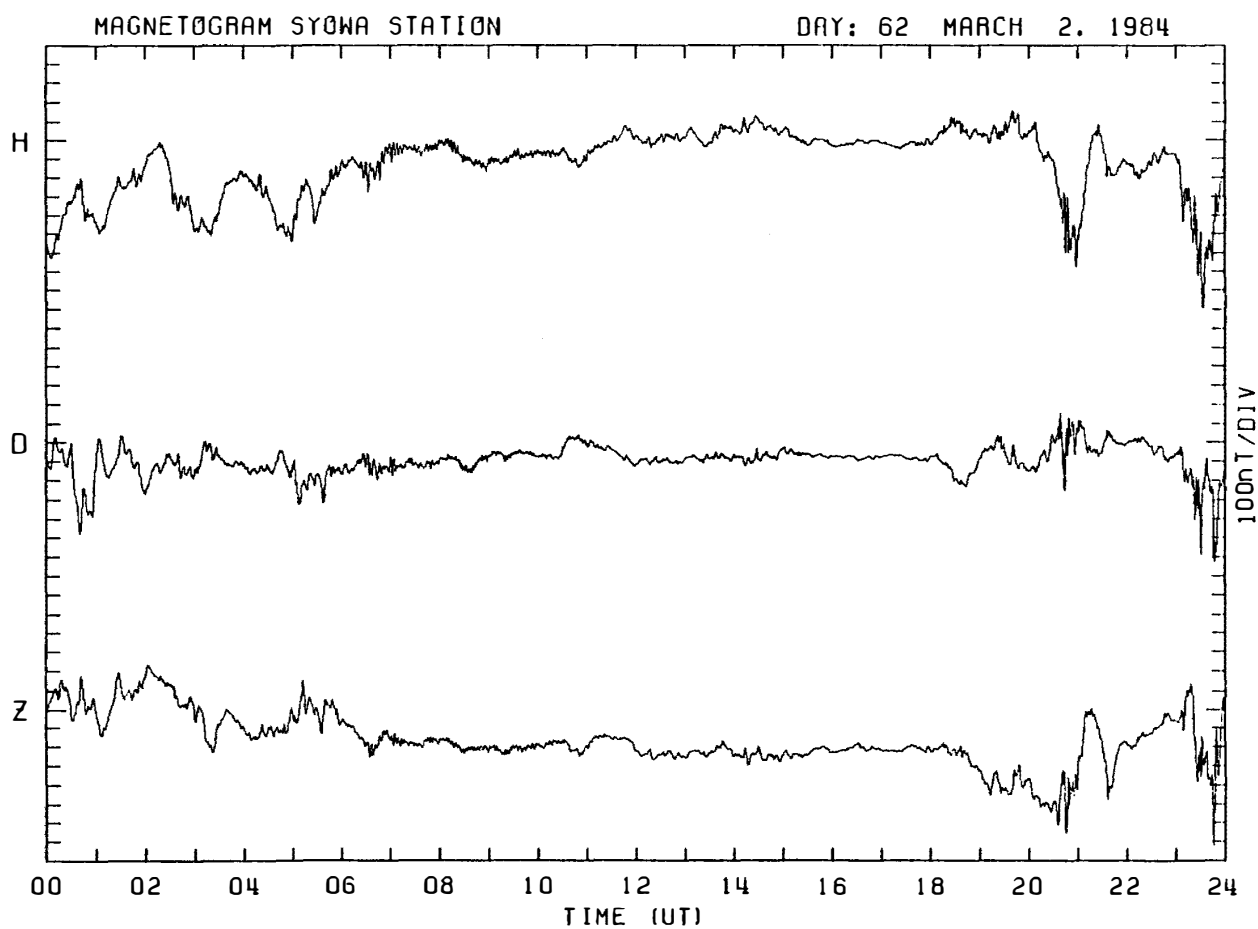


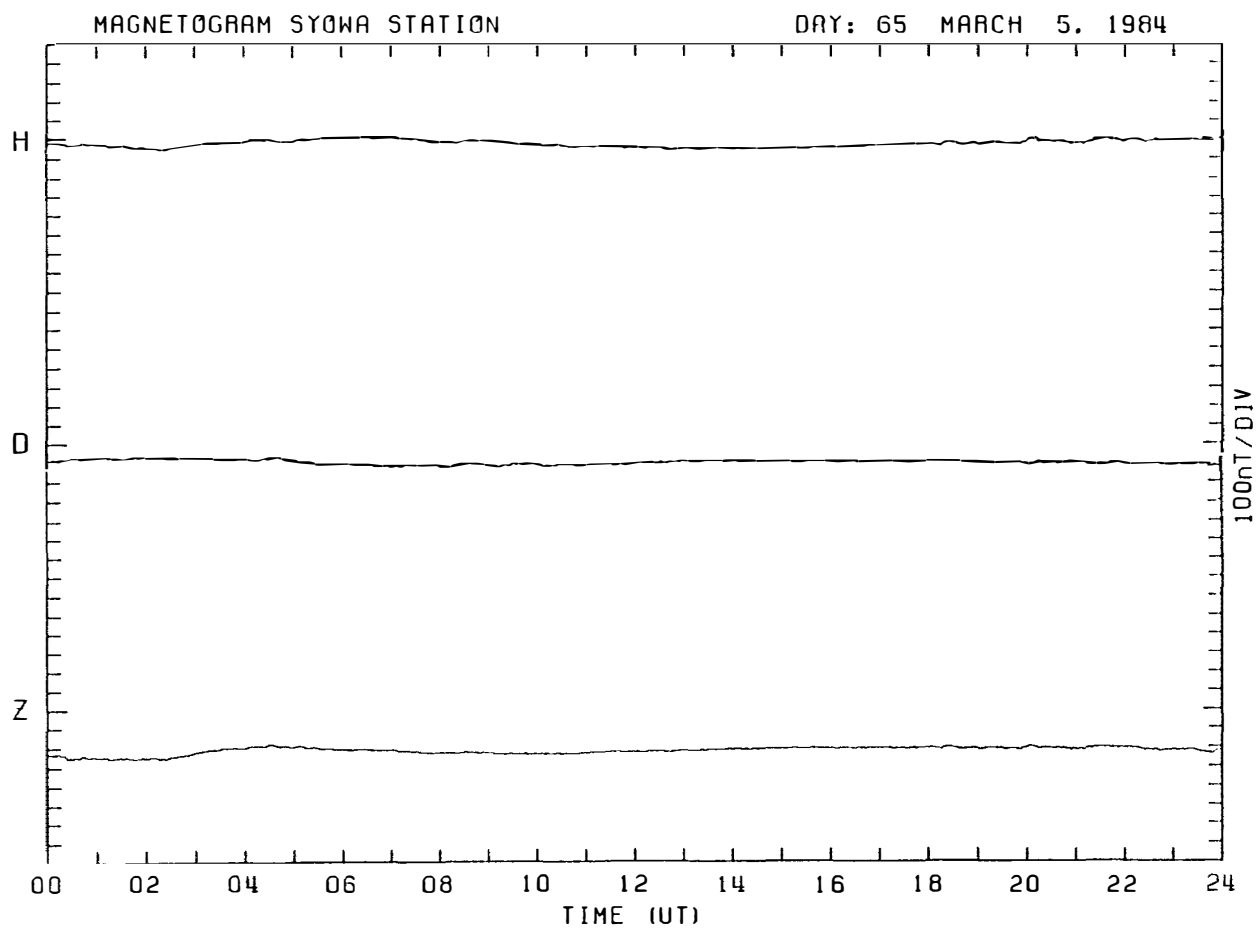
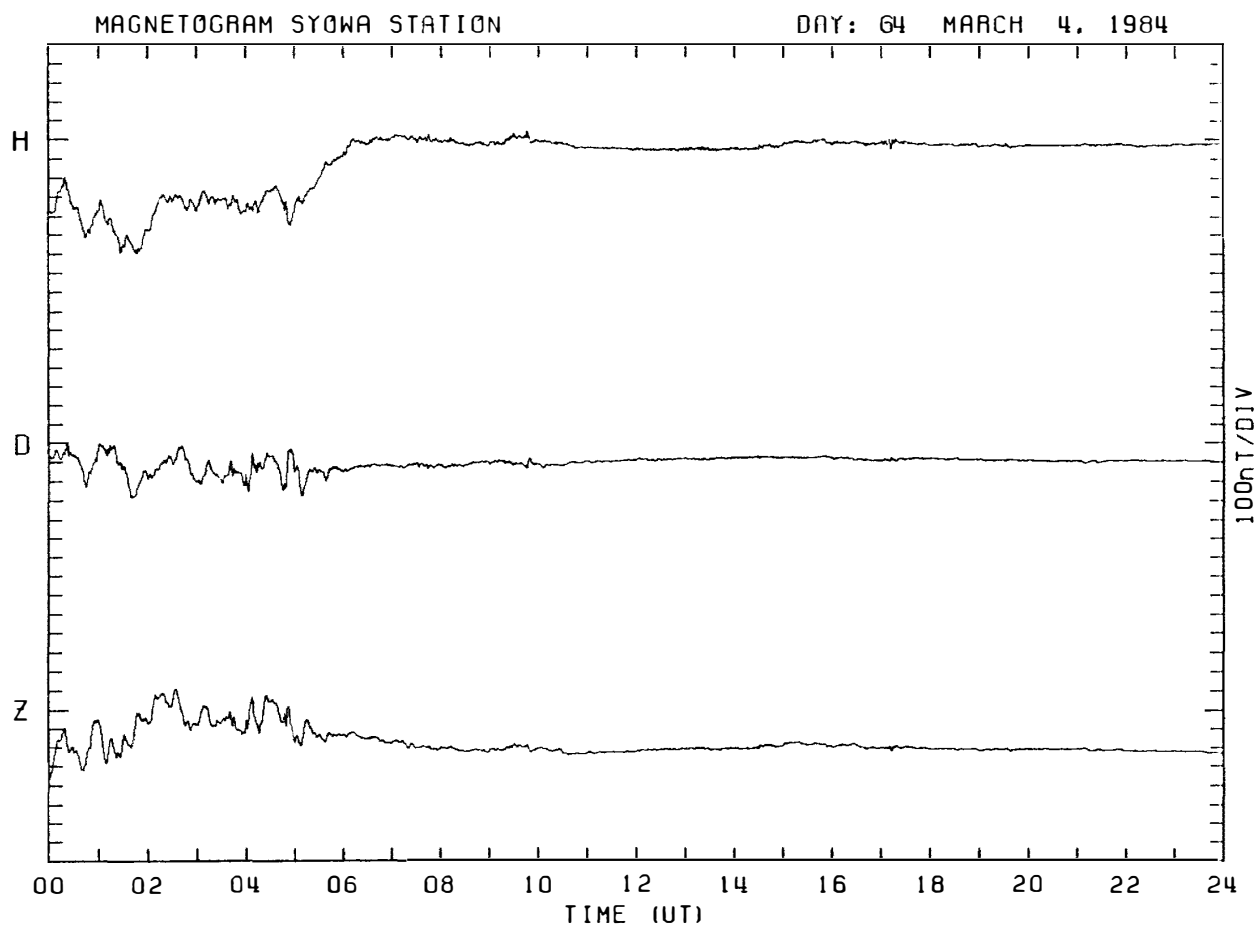






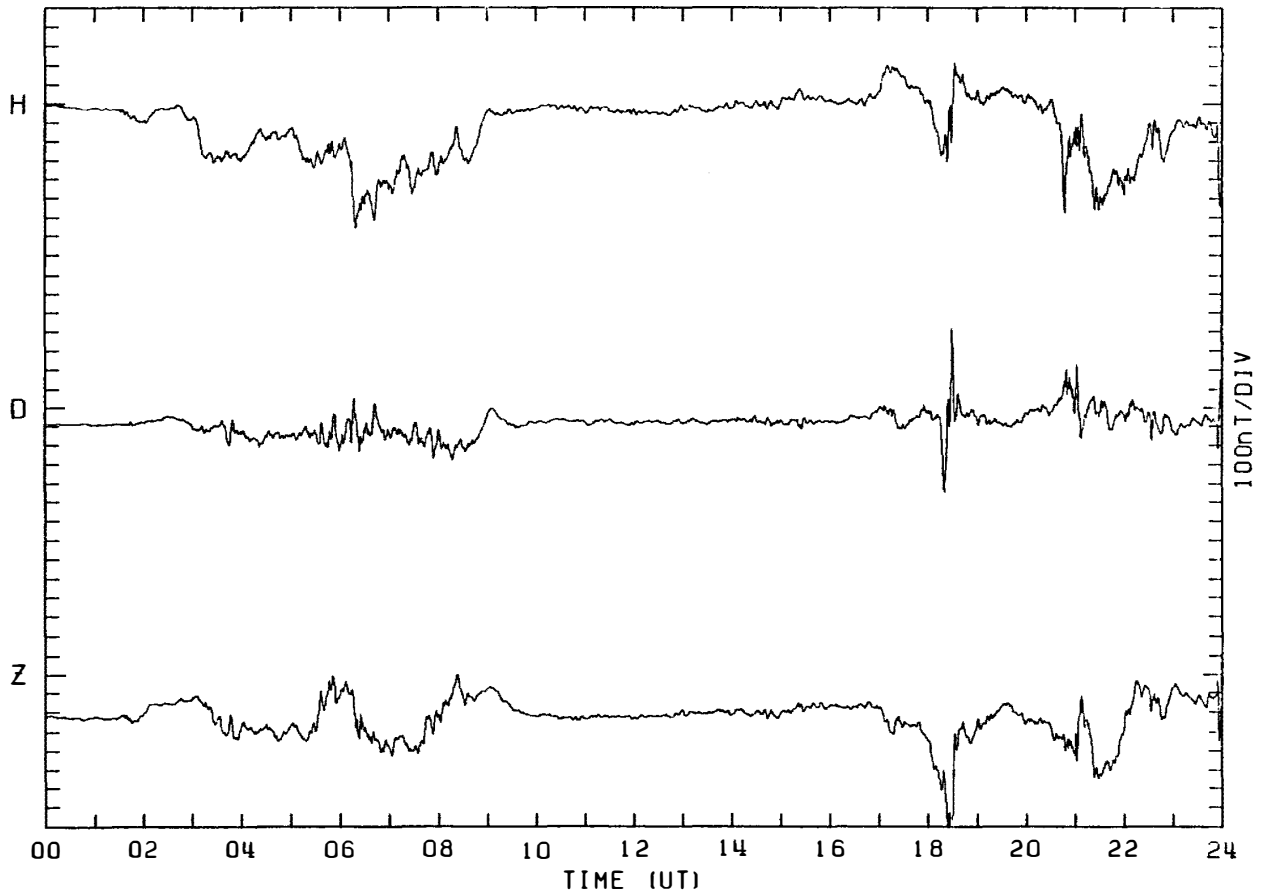






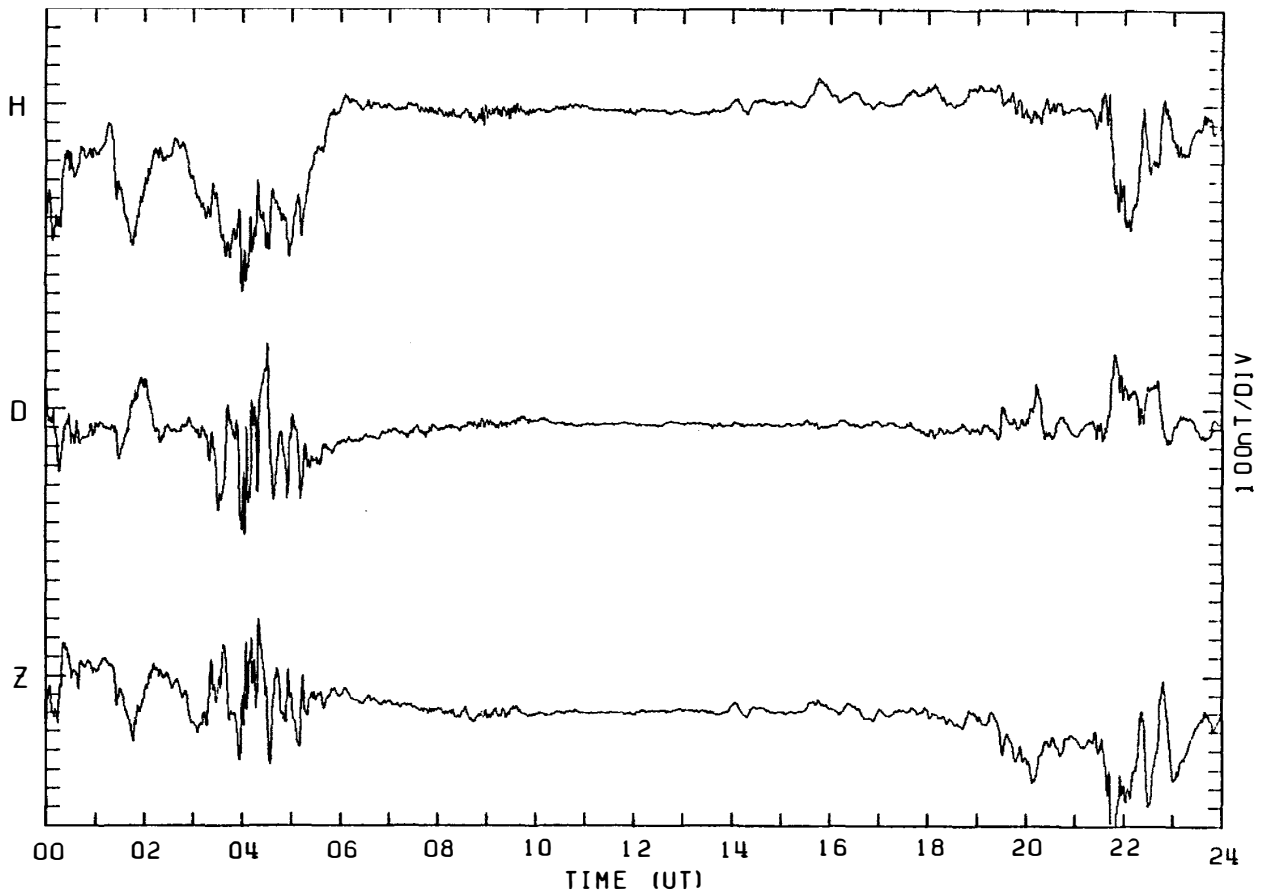
MAGNETOGRAM SYOWA STATION

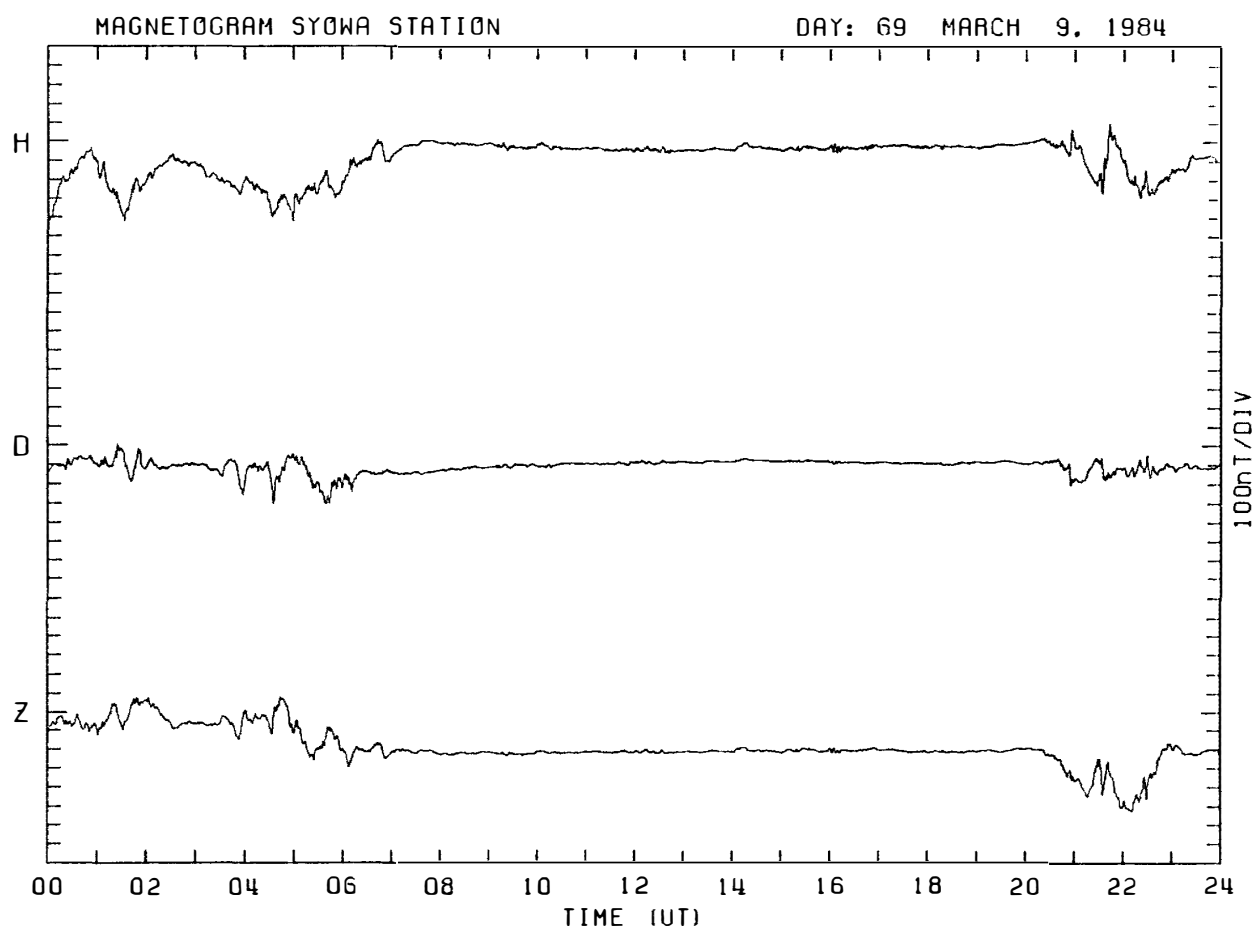
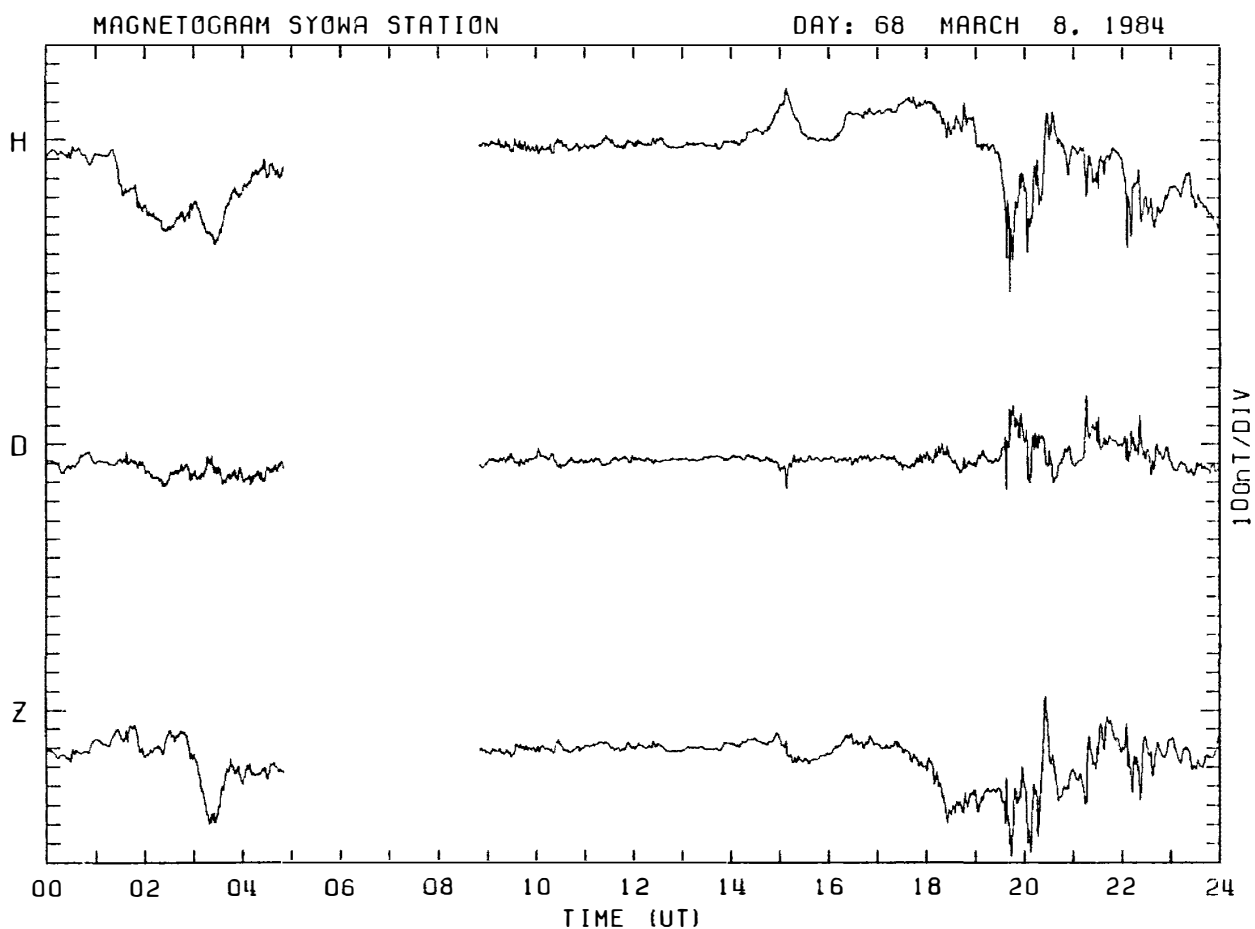
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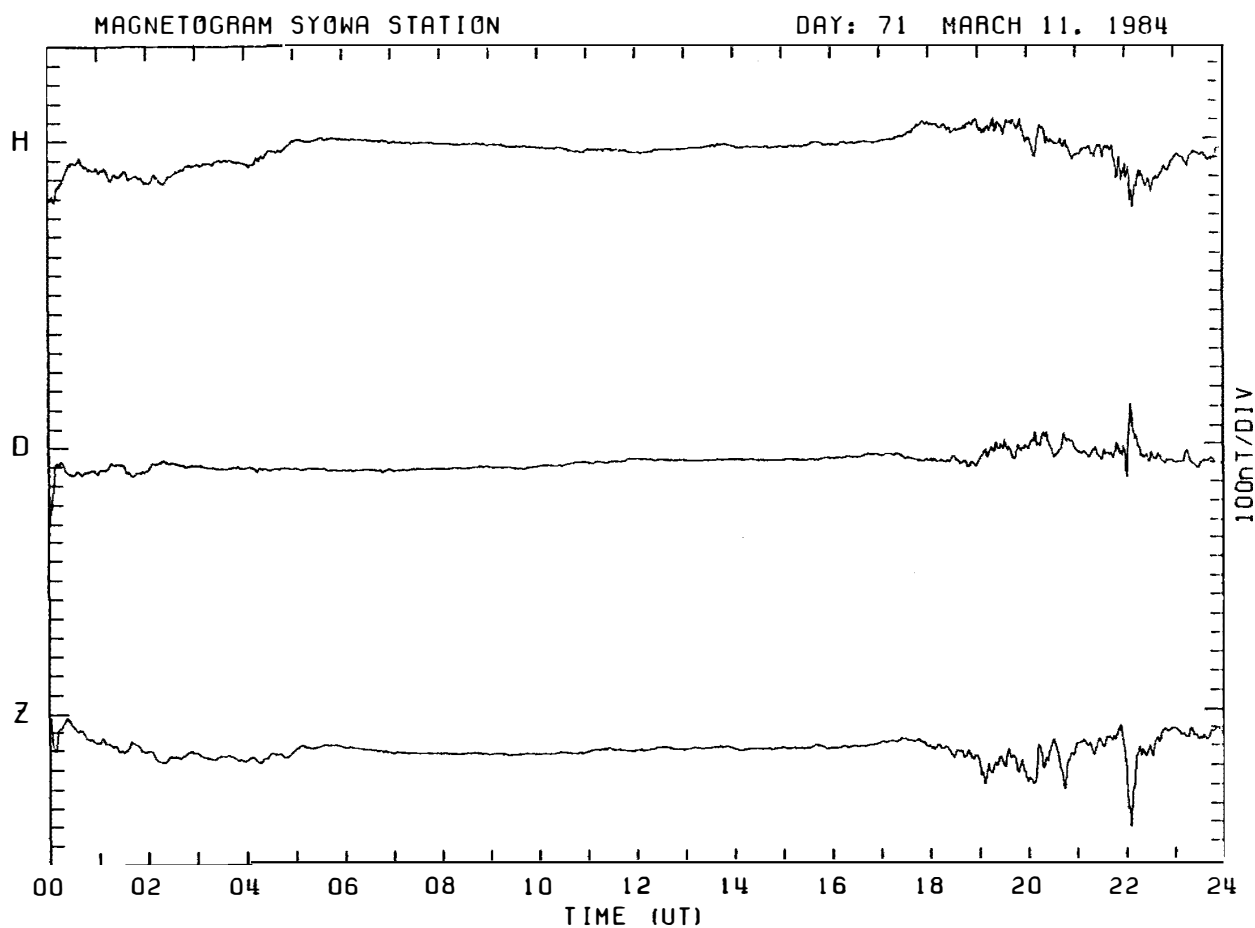
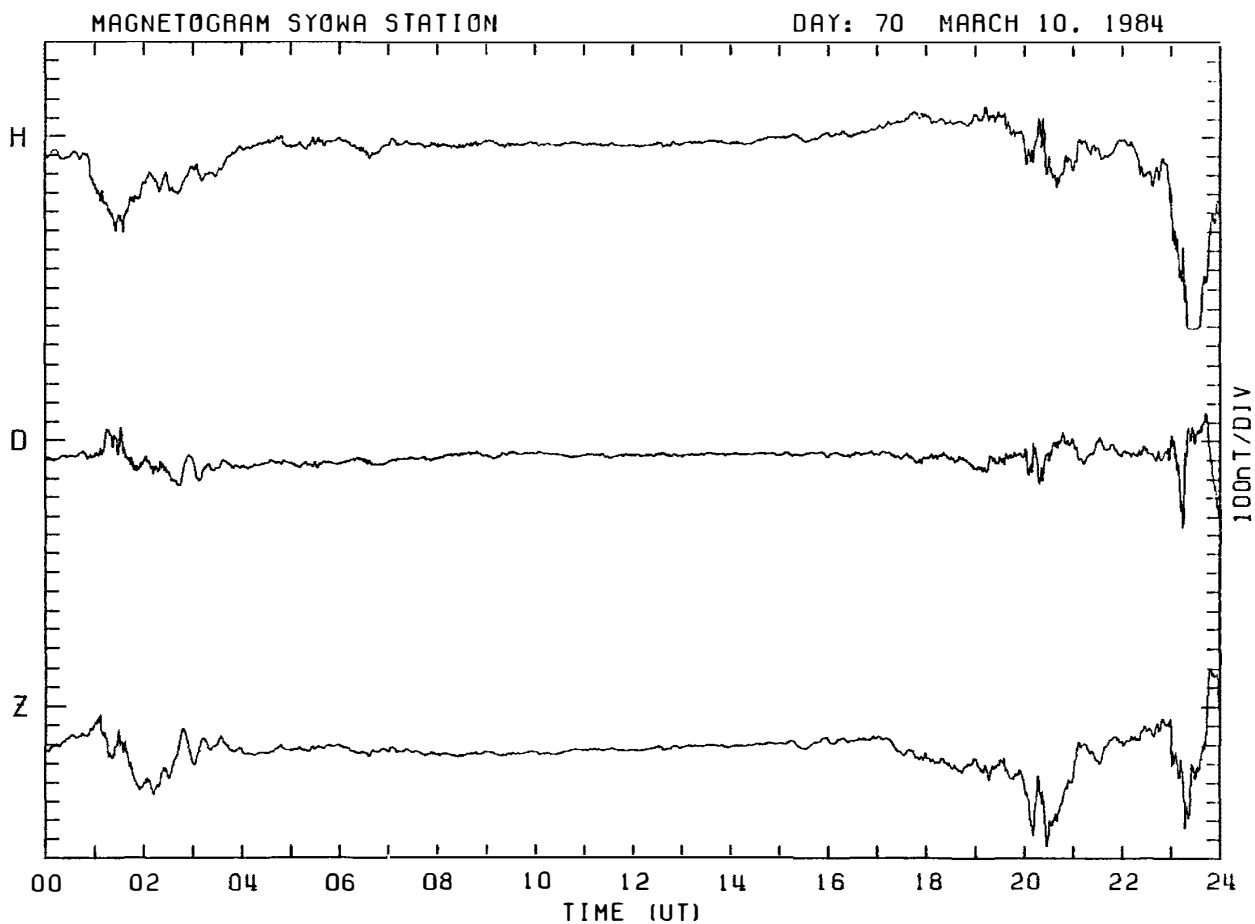


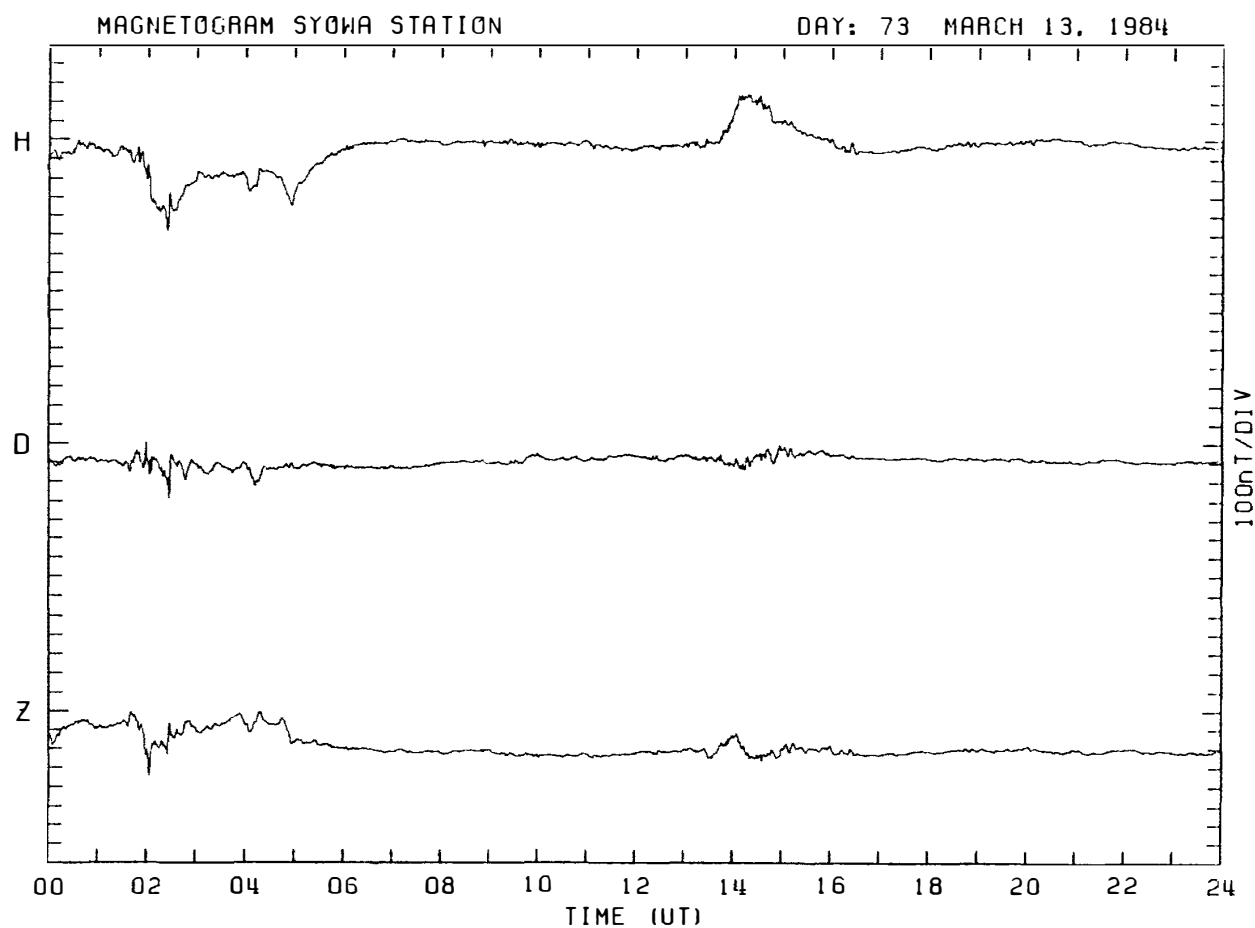
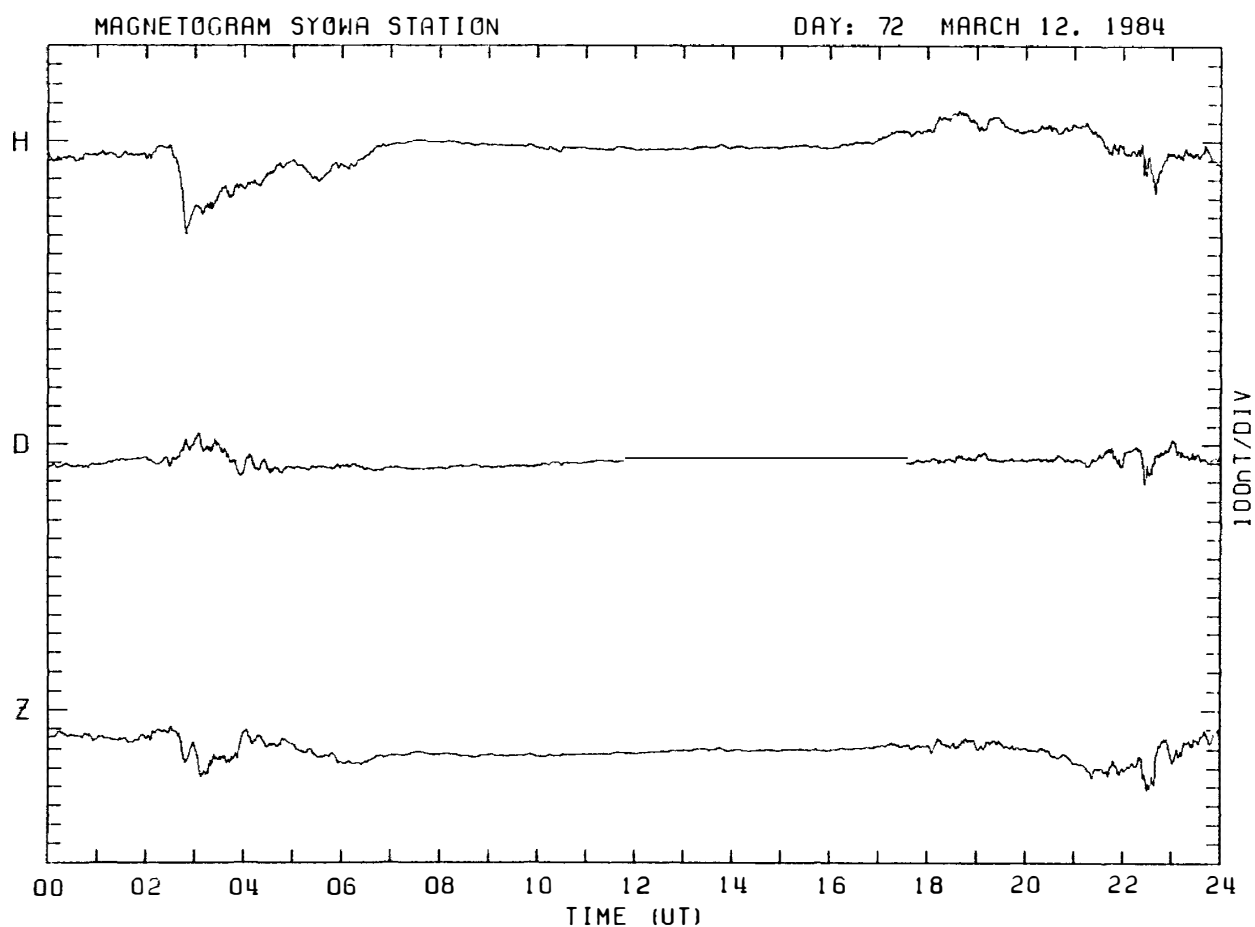
MAGNETOGRAM SYOWA STATION

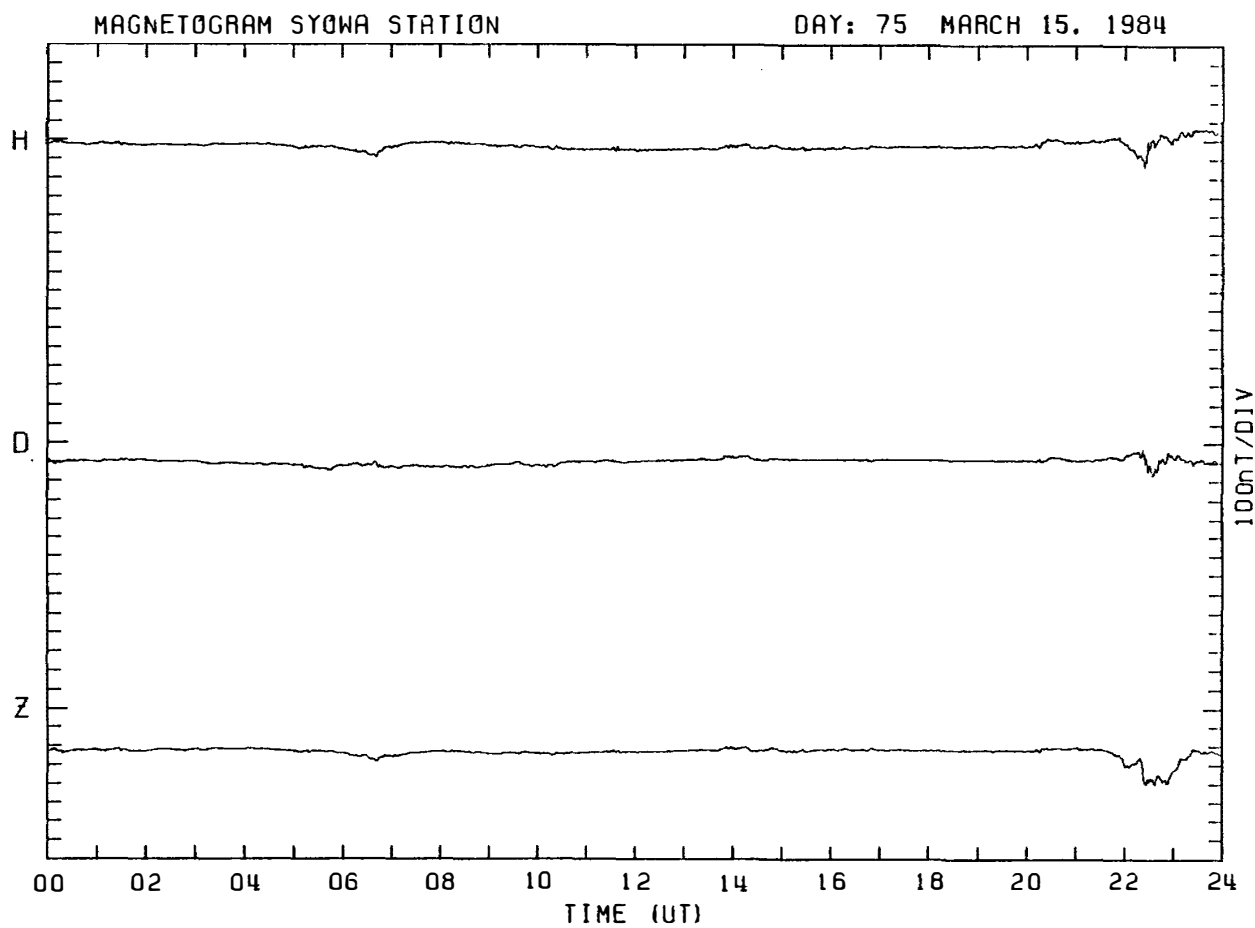
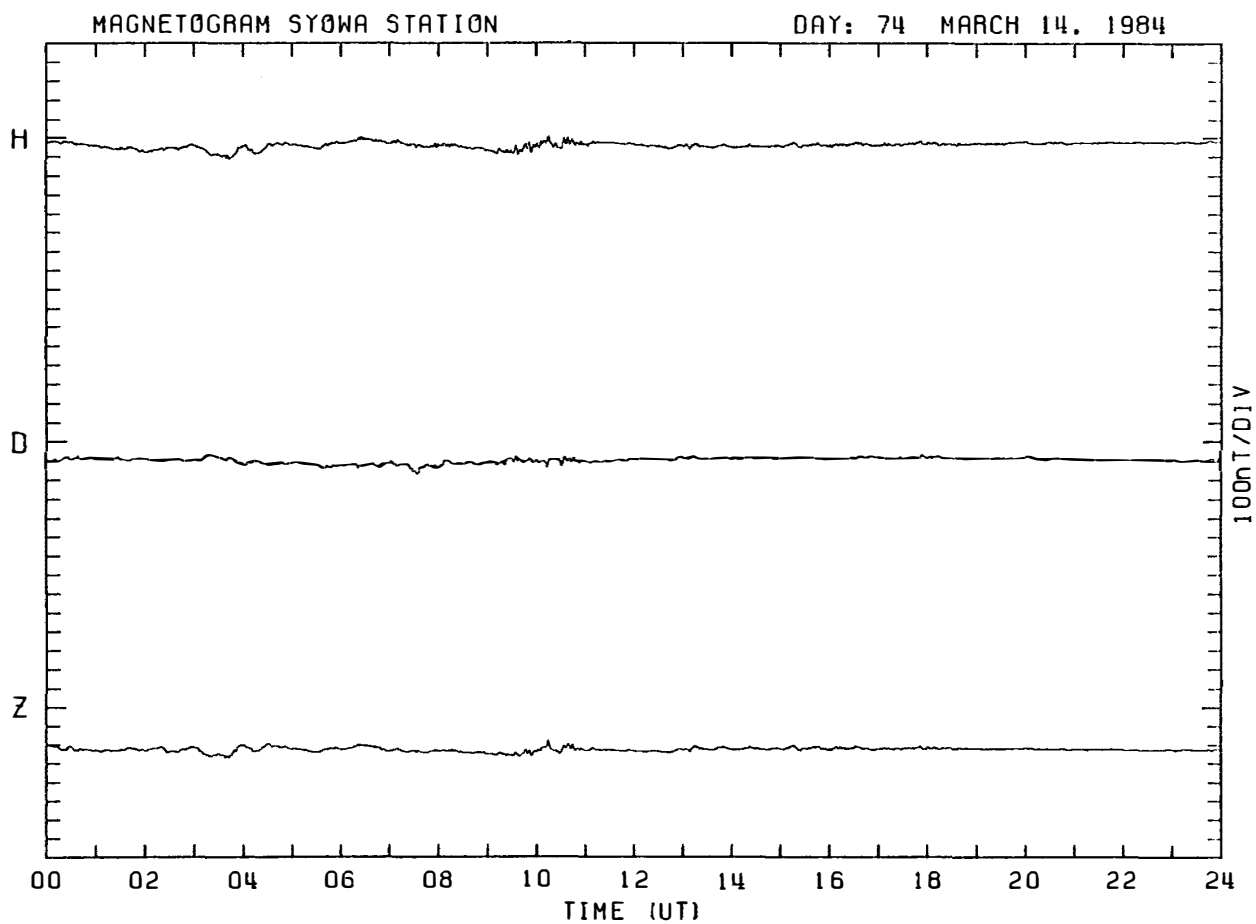
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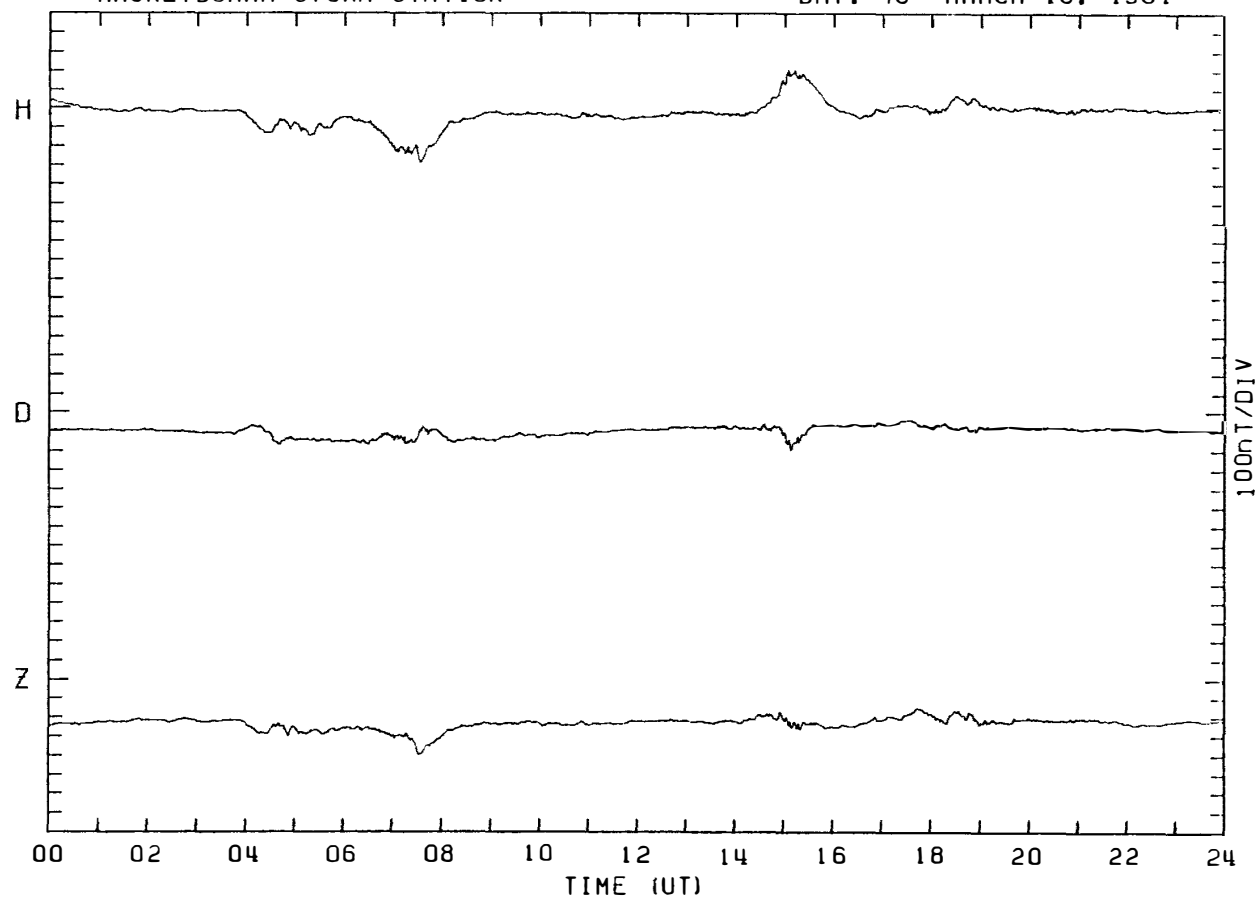






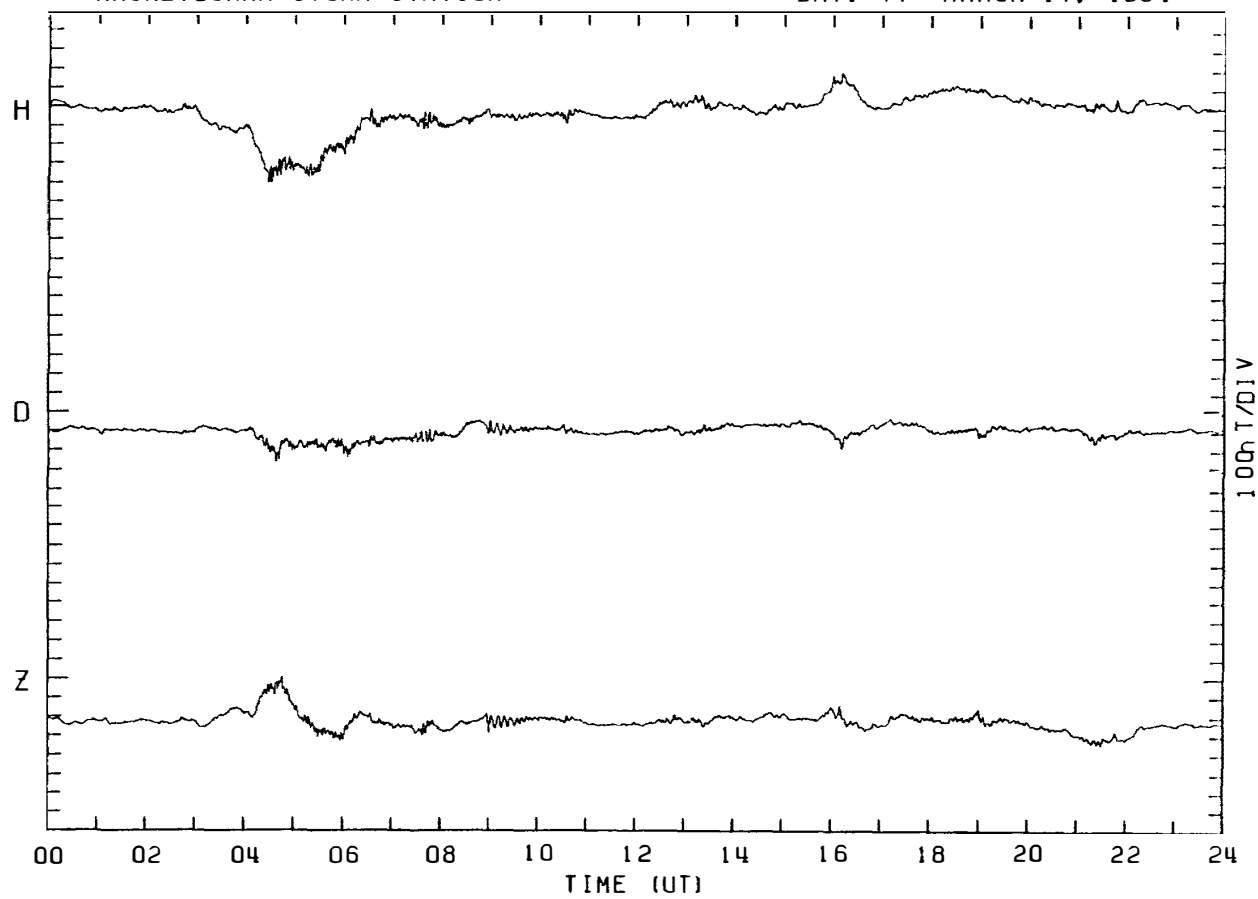
MAGNETOGRAM SYOWA STATION

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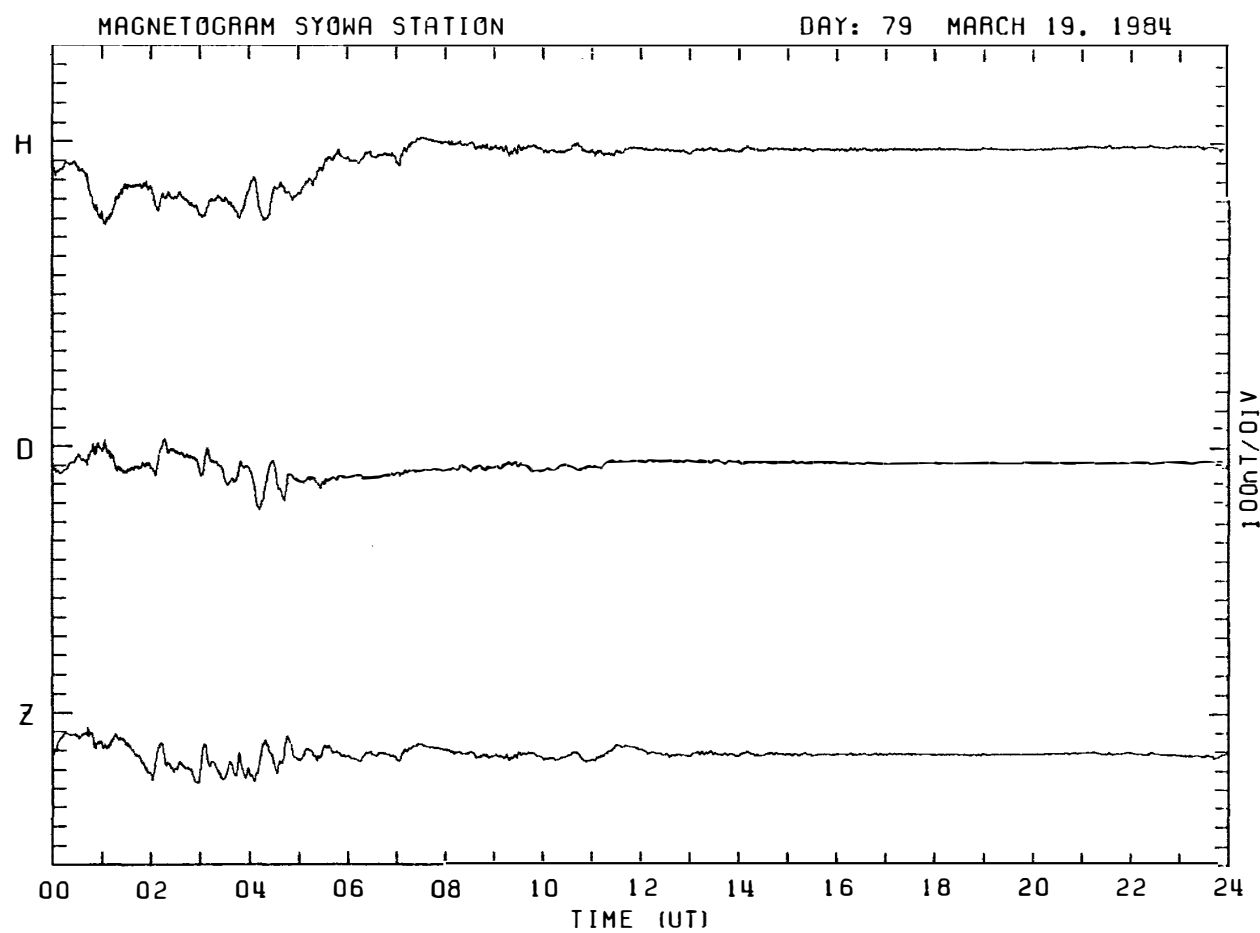
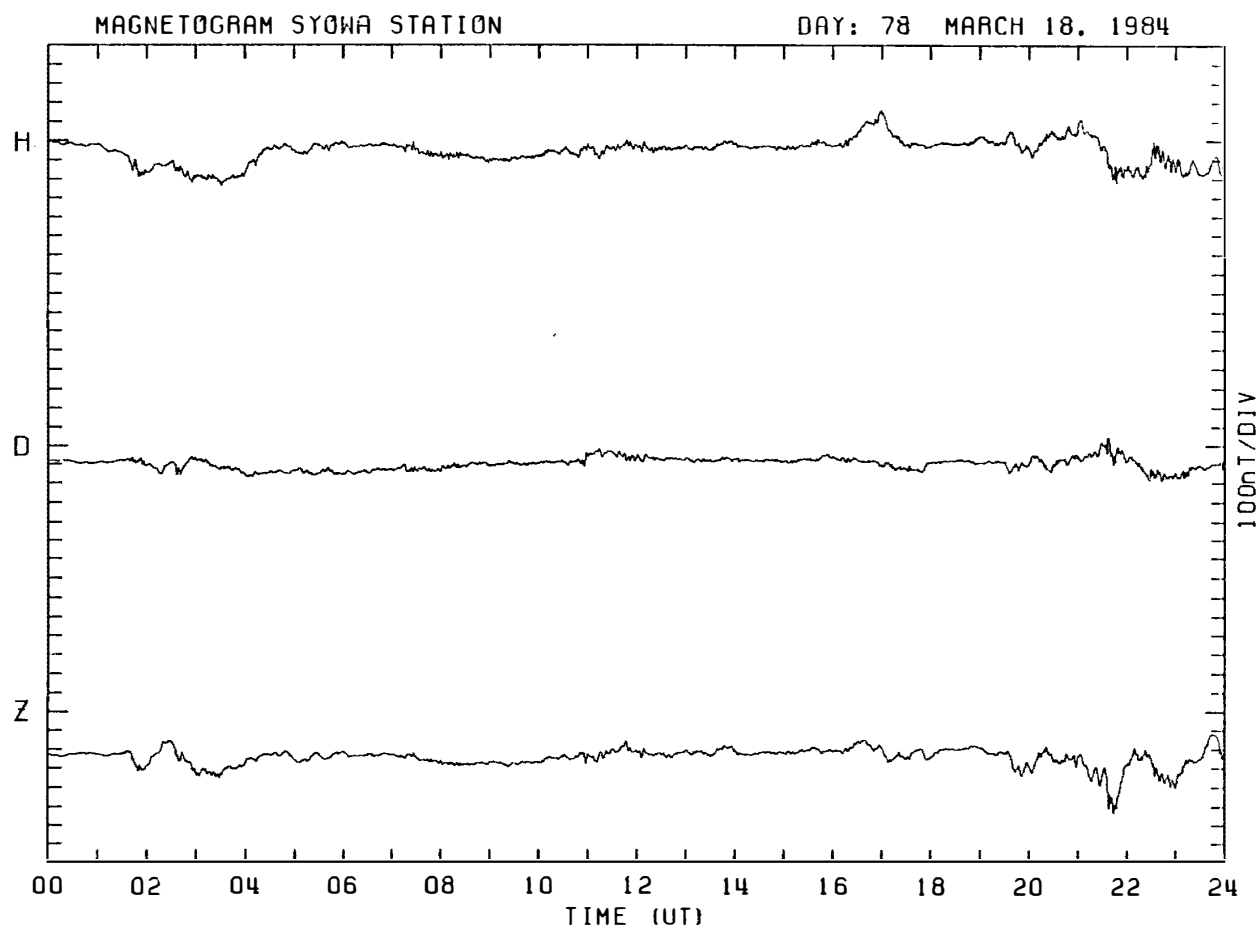


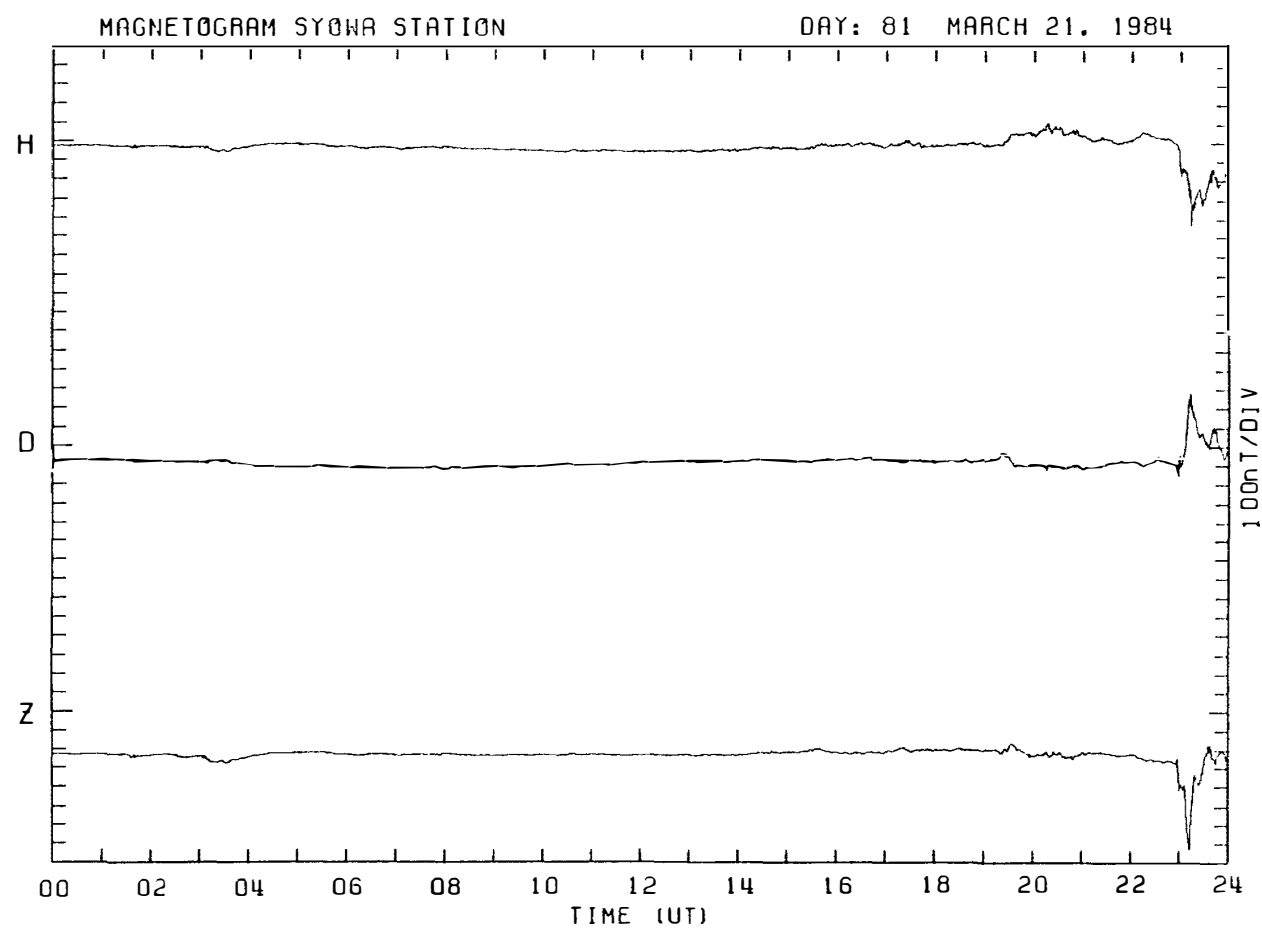
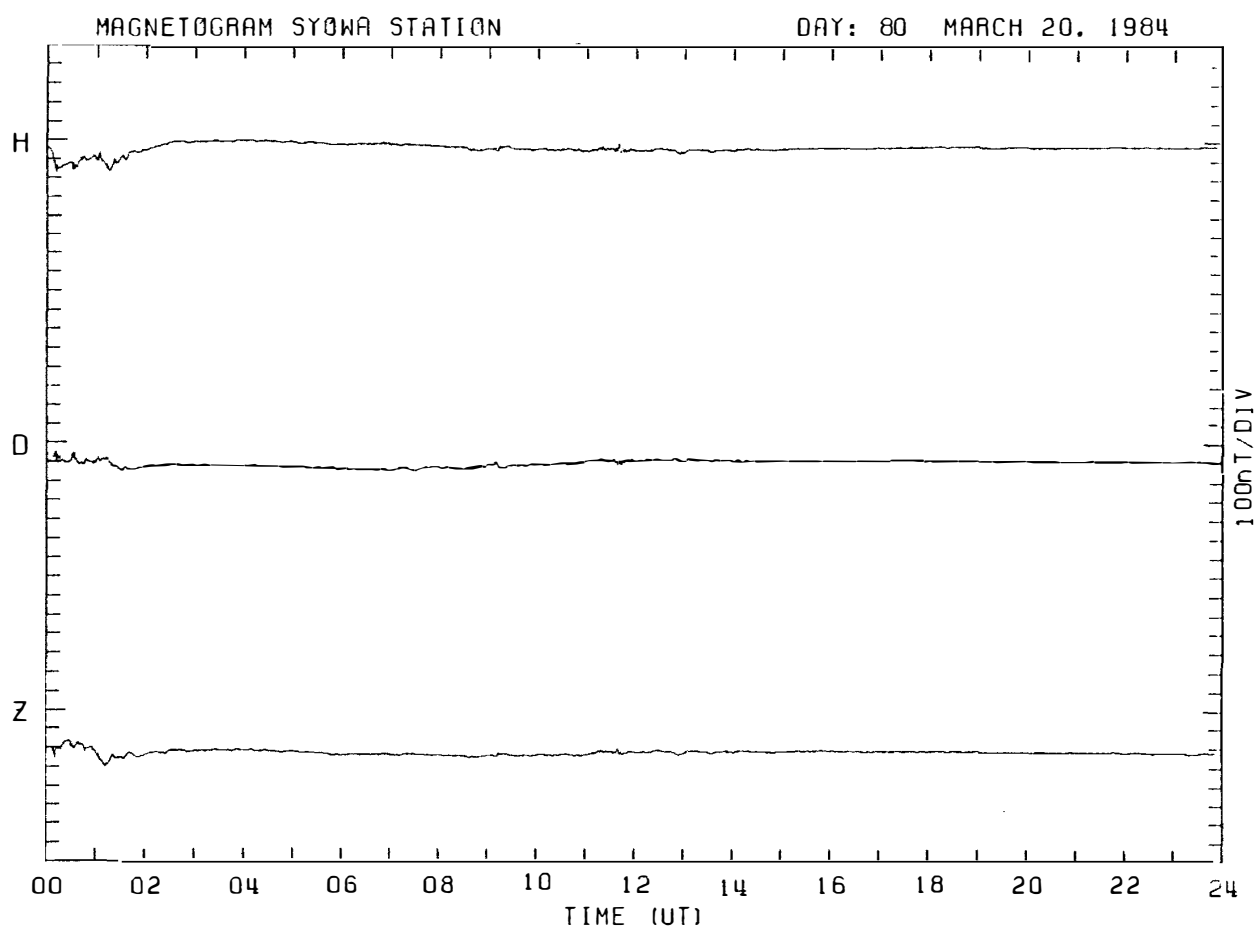
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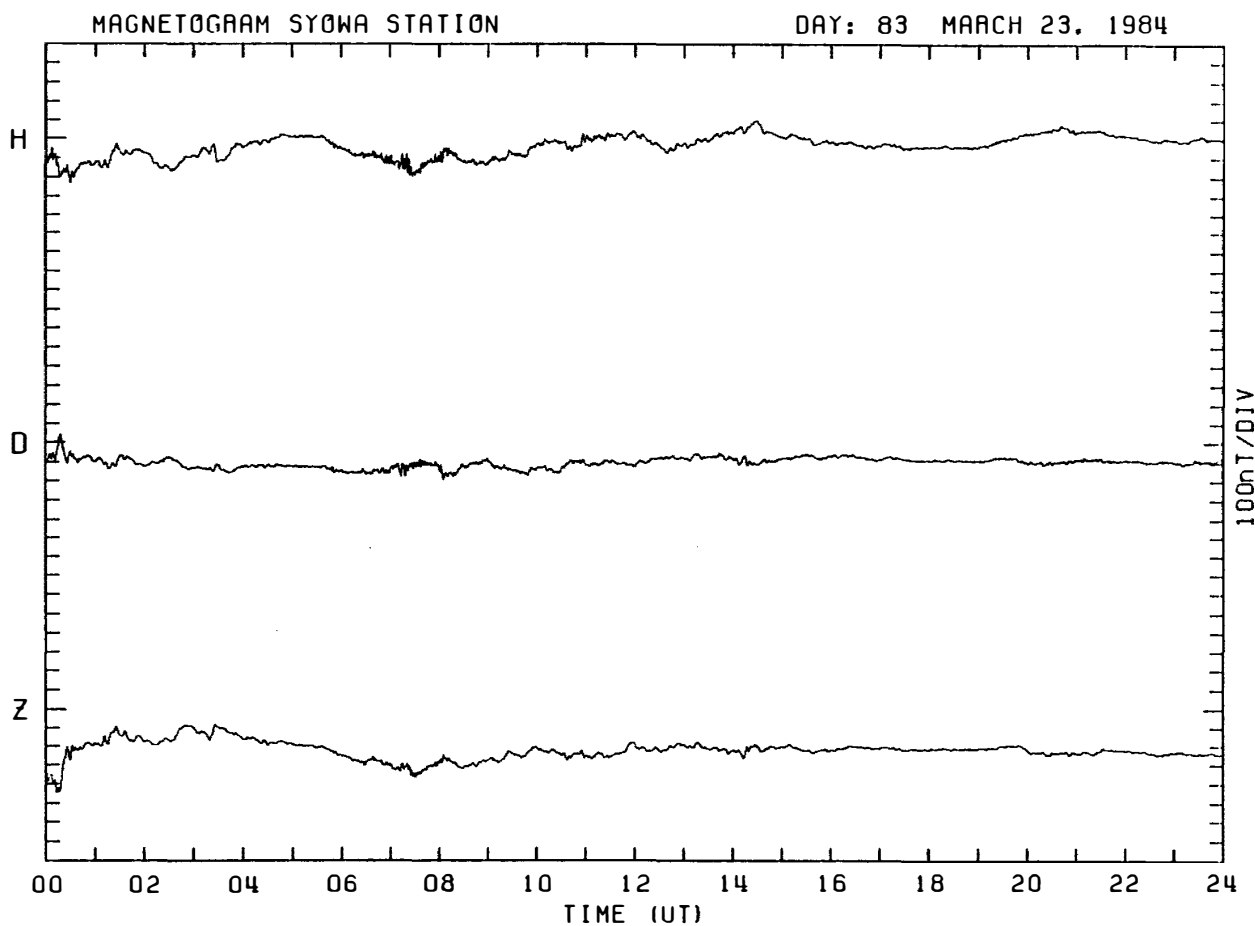
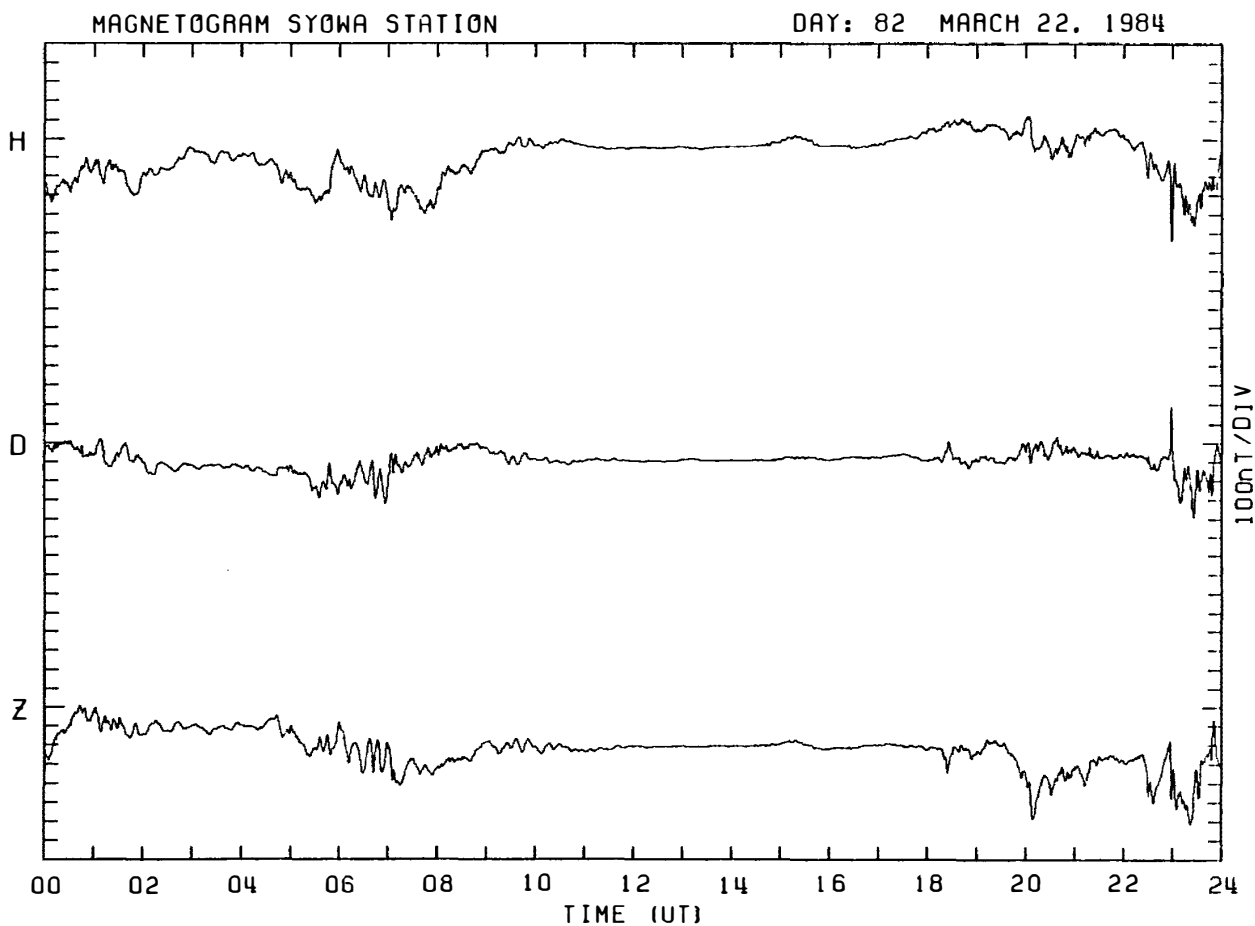
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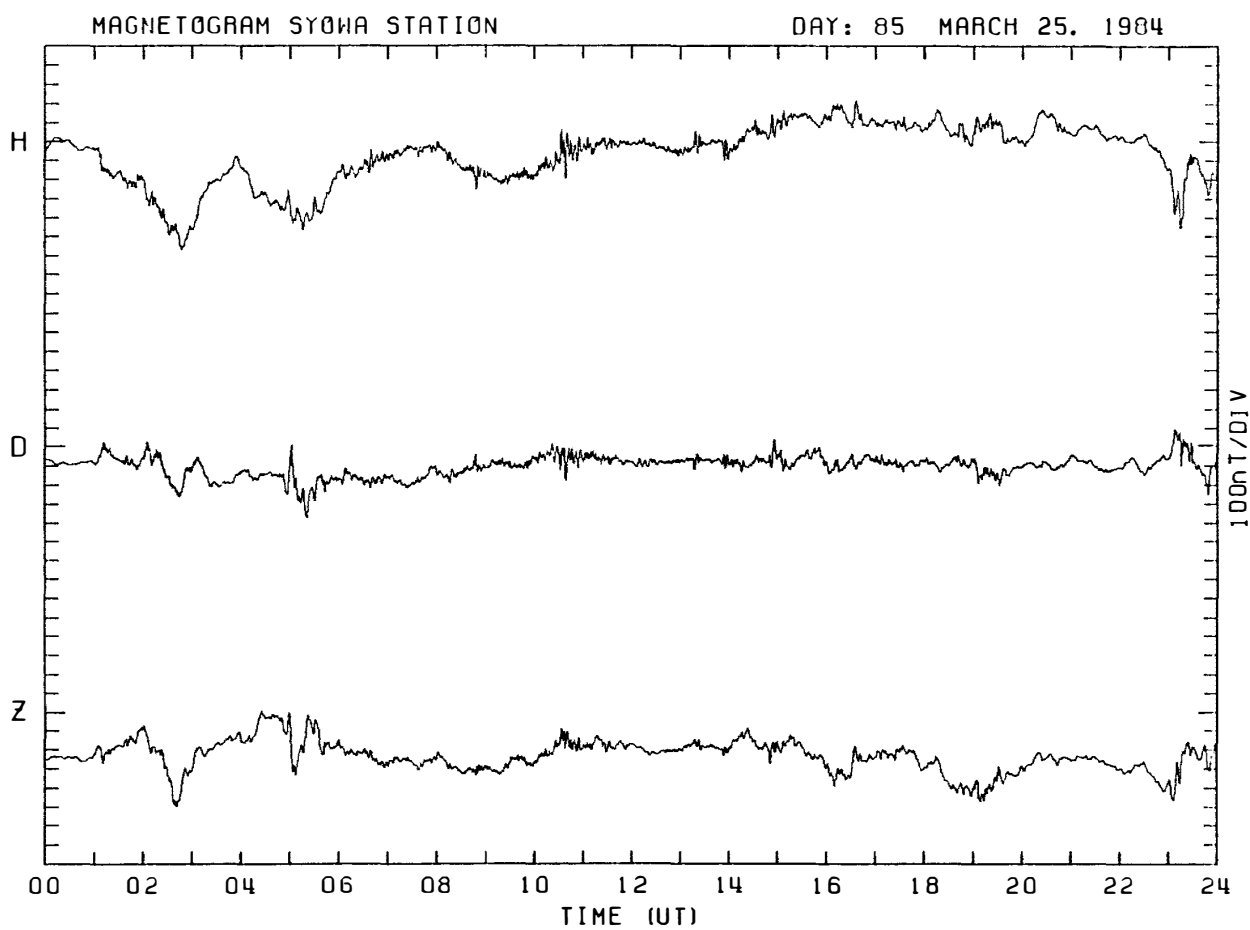
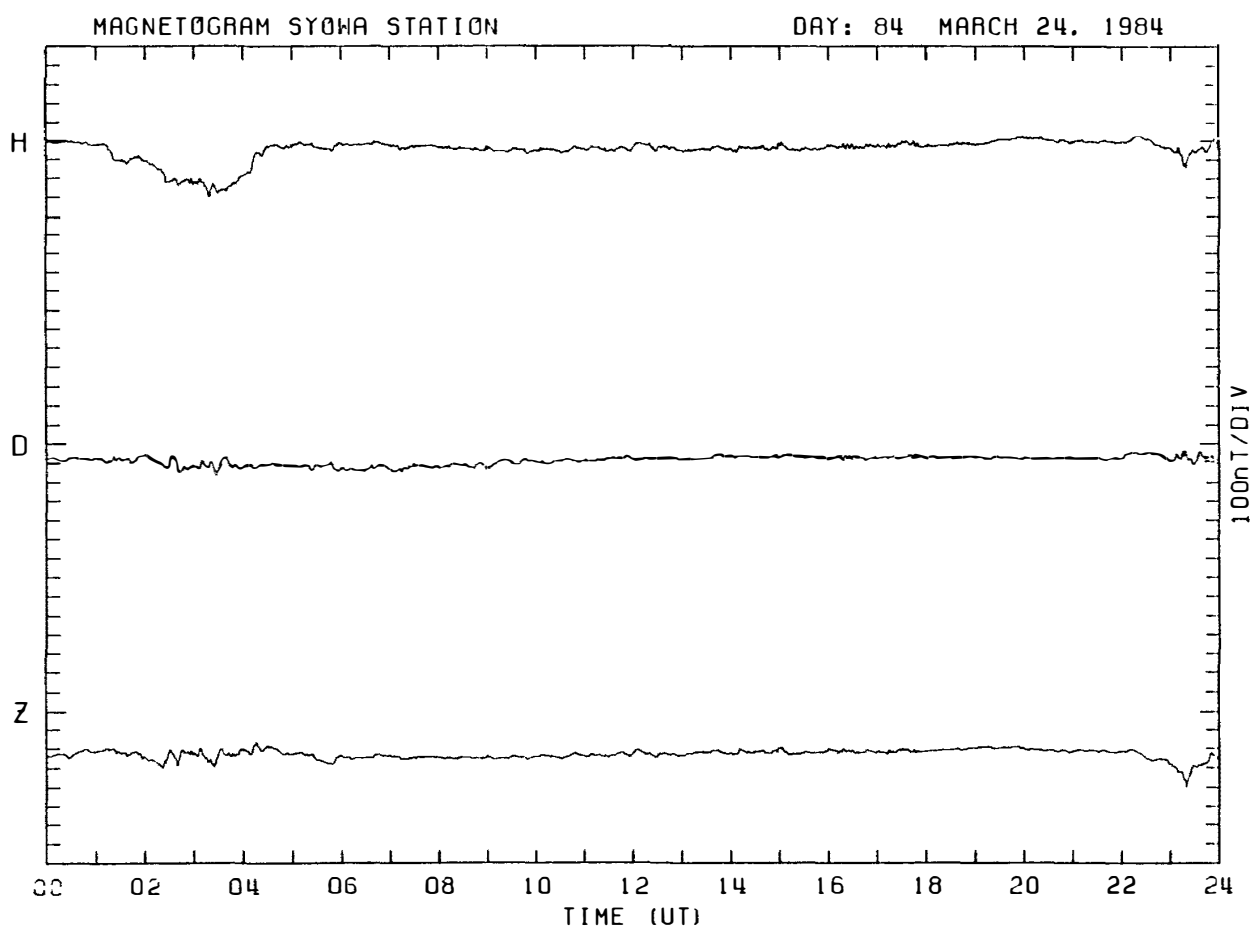


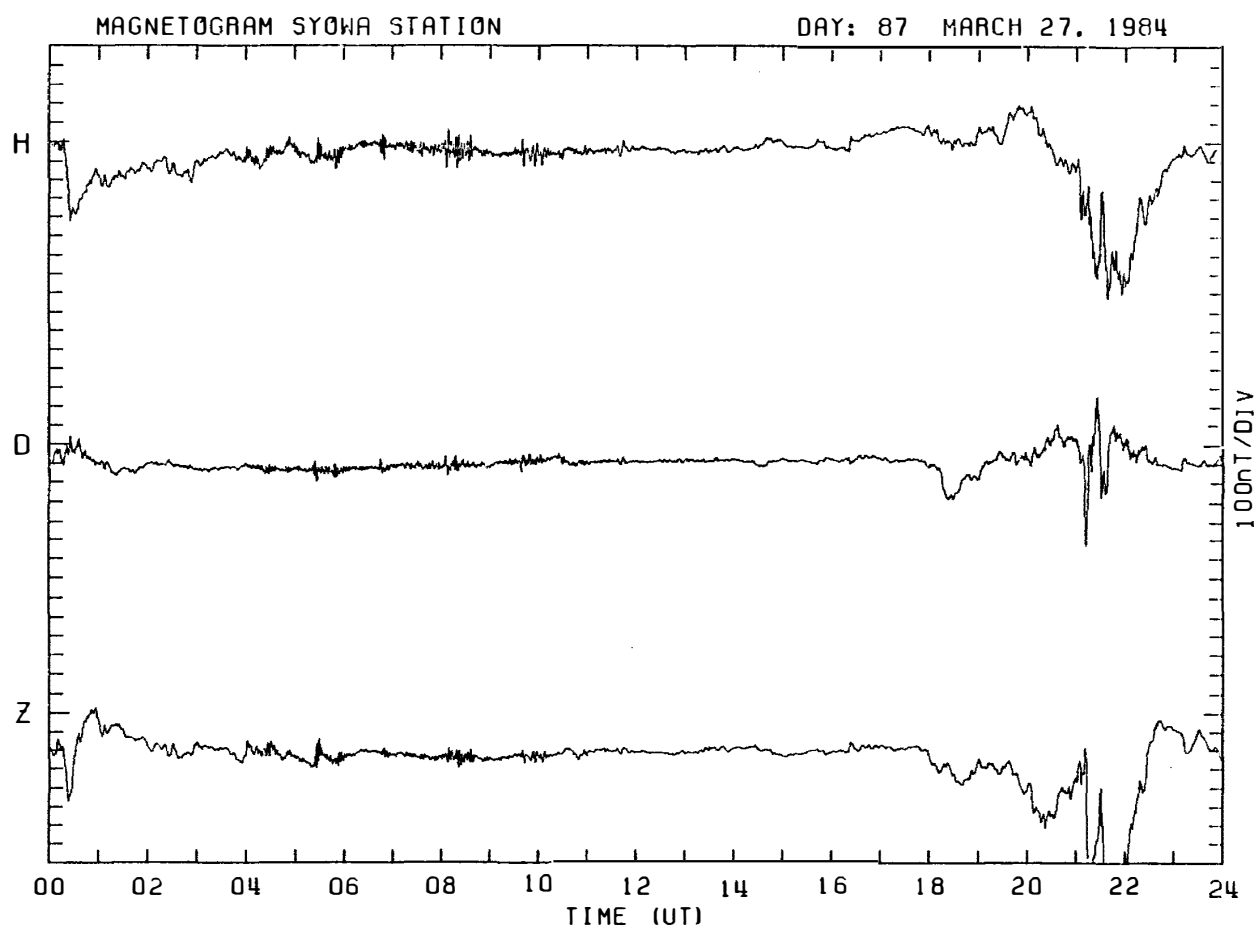
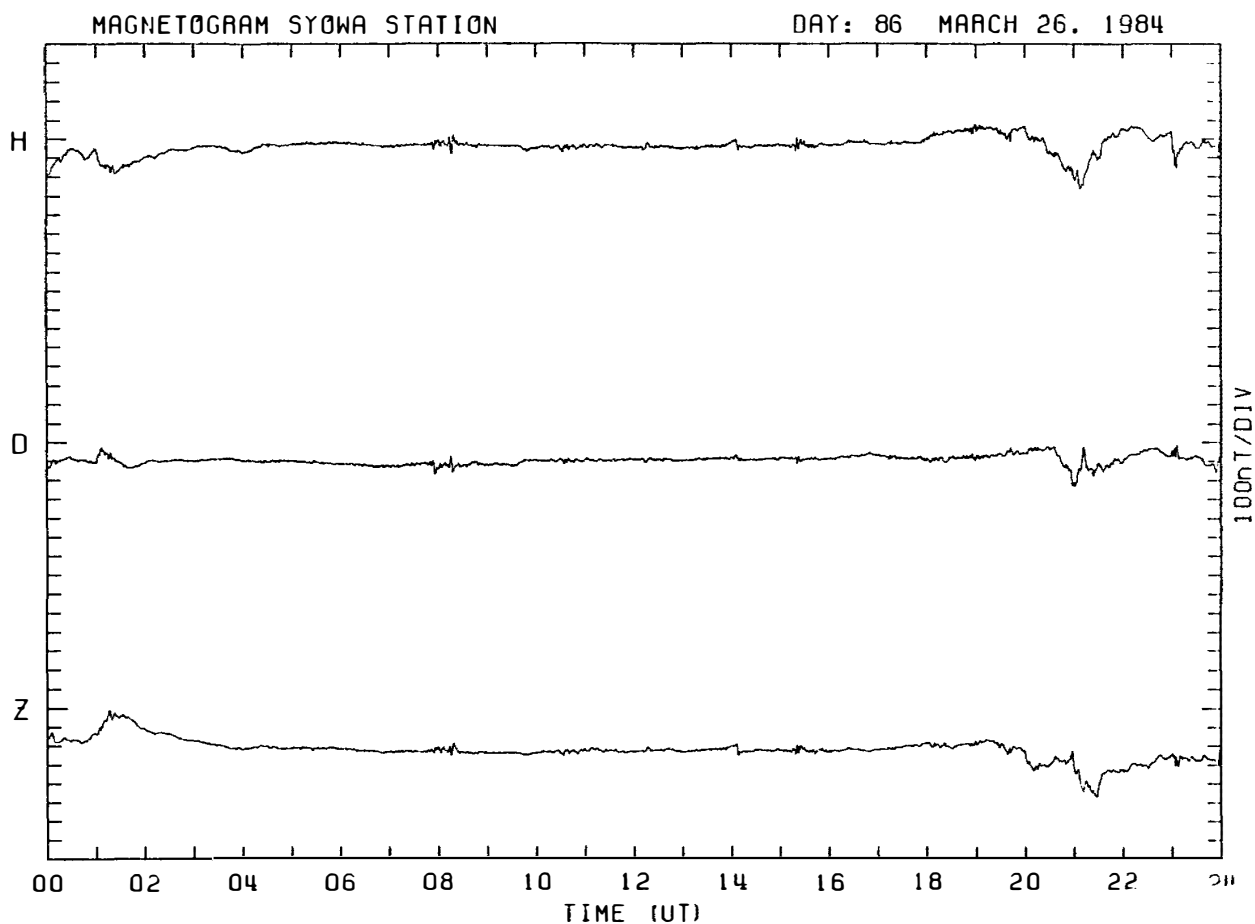






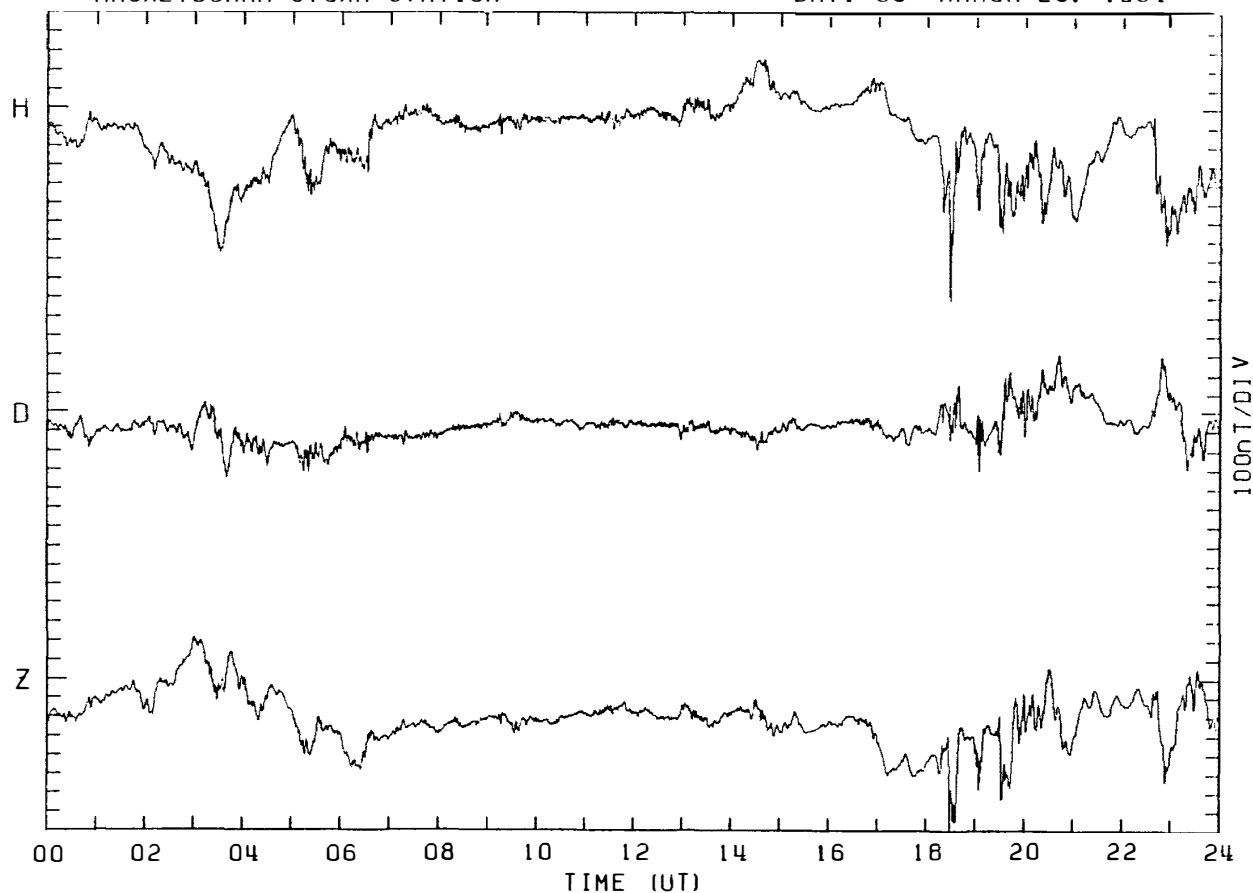






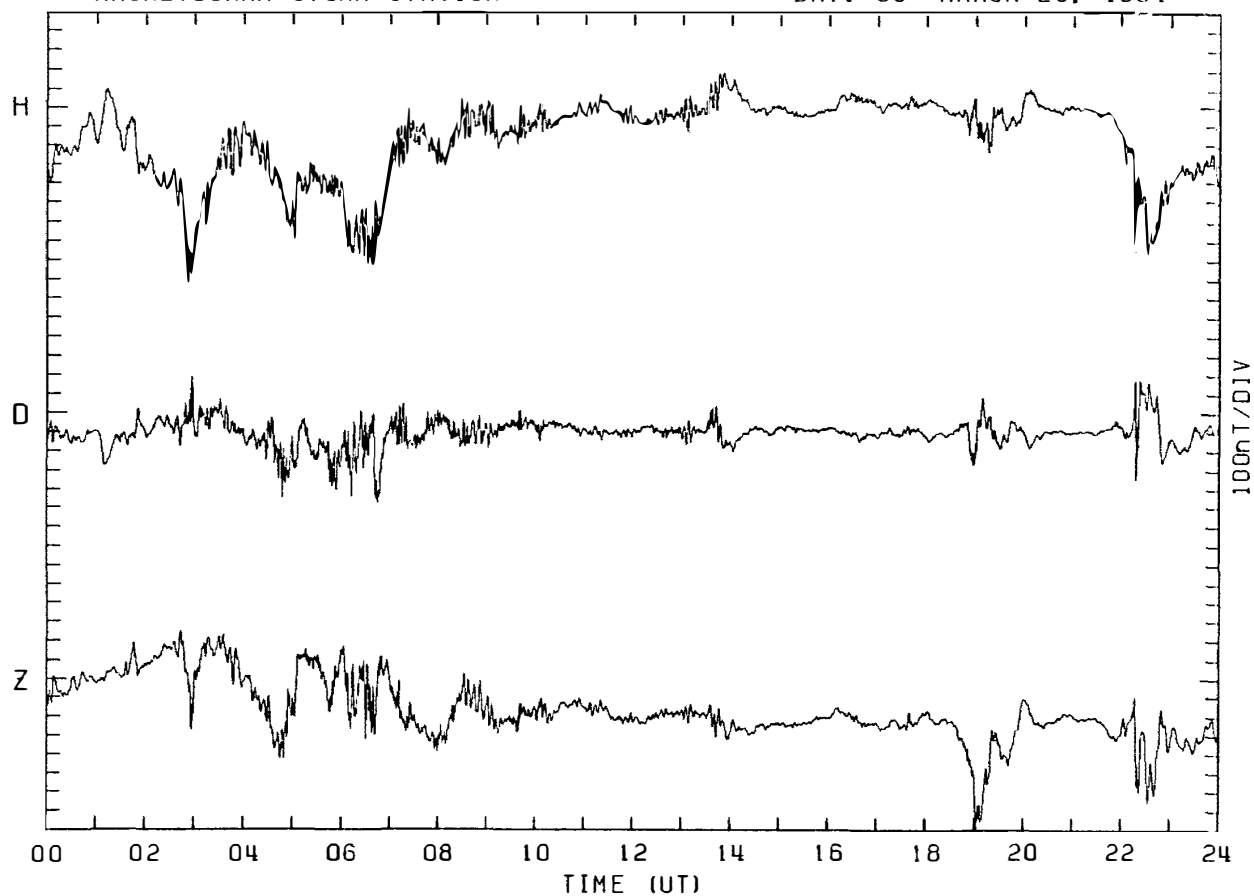
MAGNETOGRAM SYOWA STATION

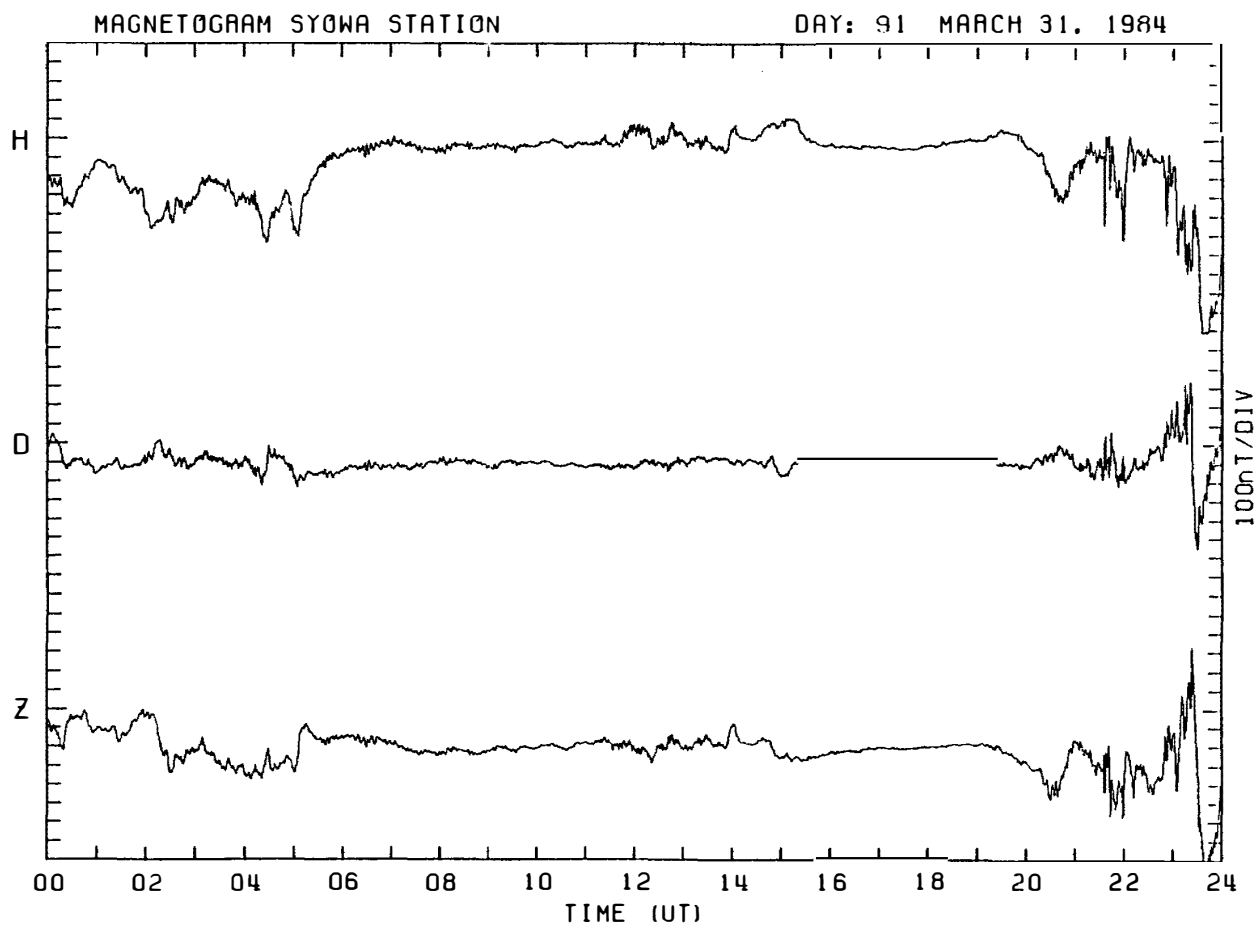
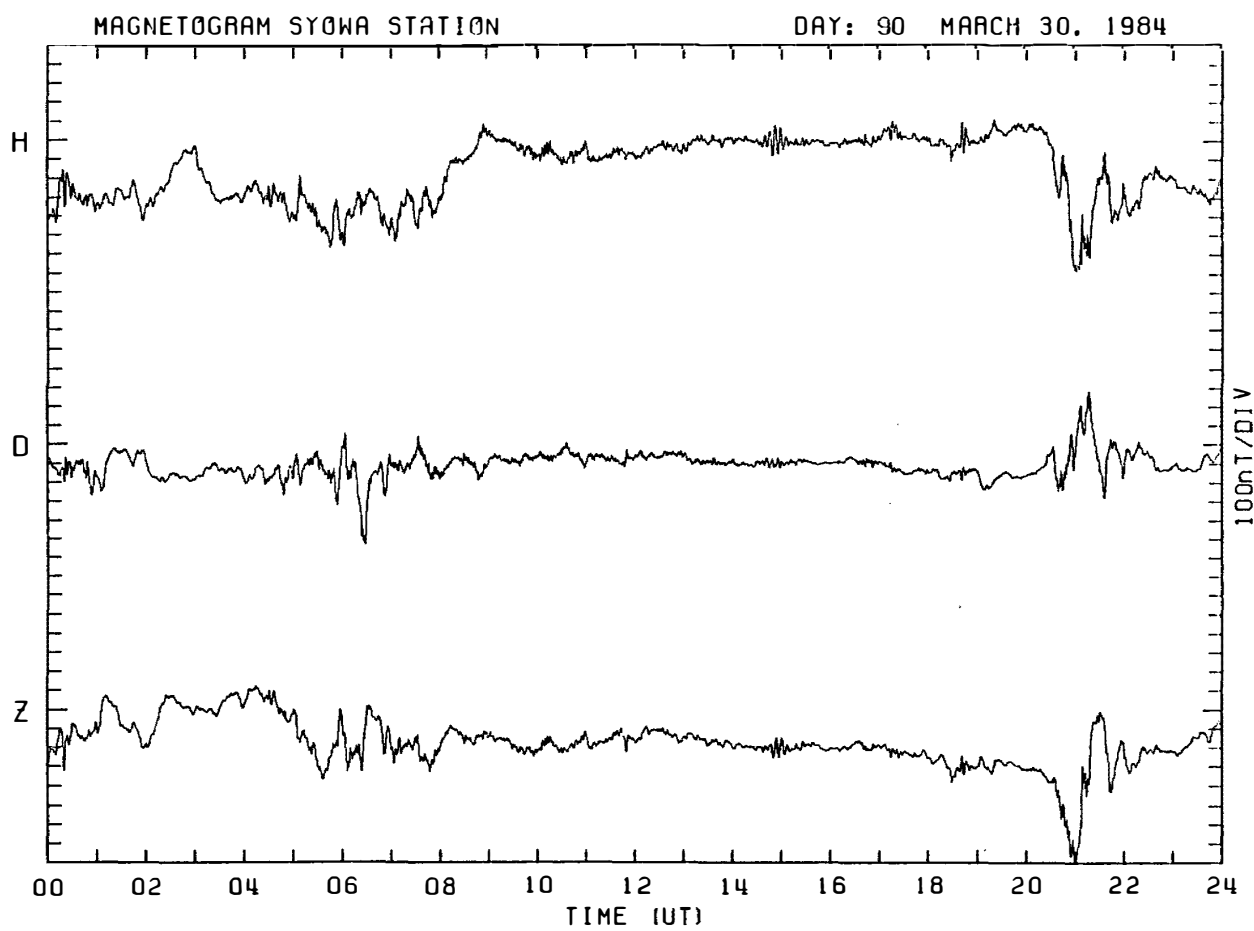
DAY: 88 MARCH 28, 1984

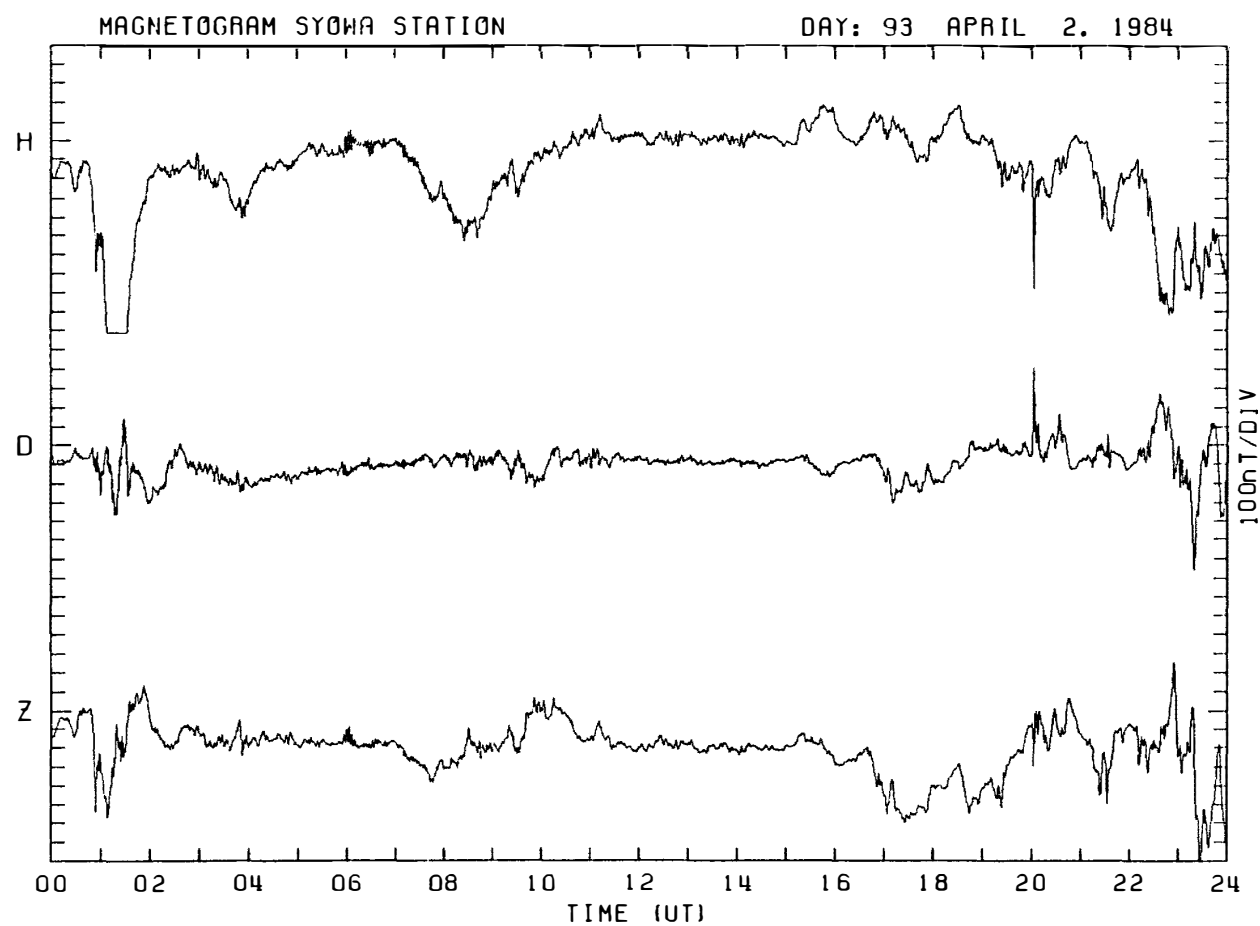
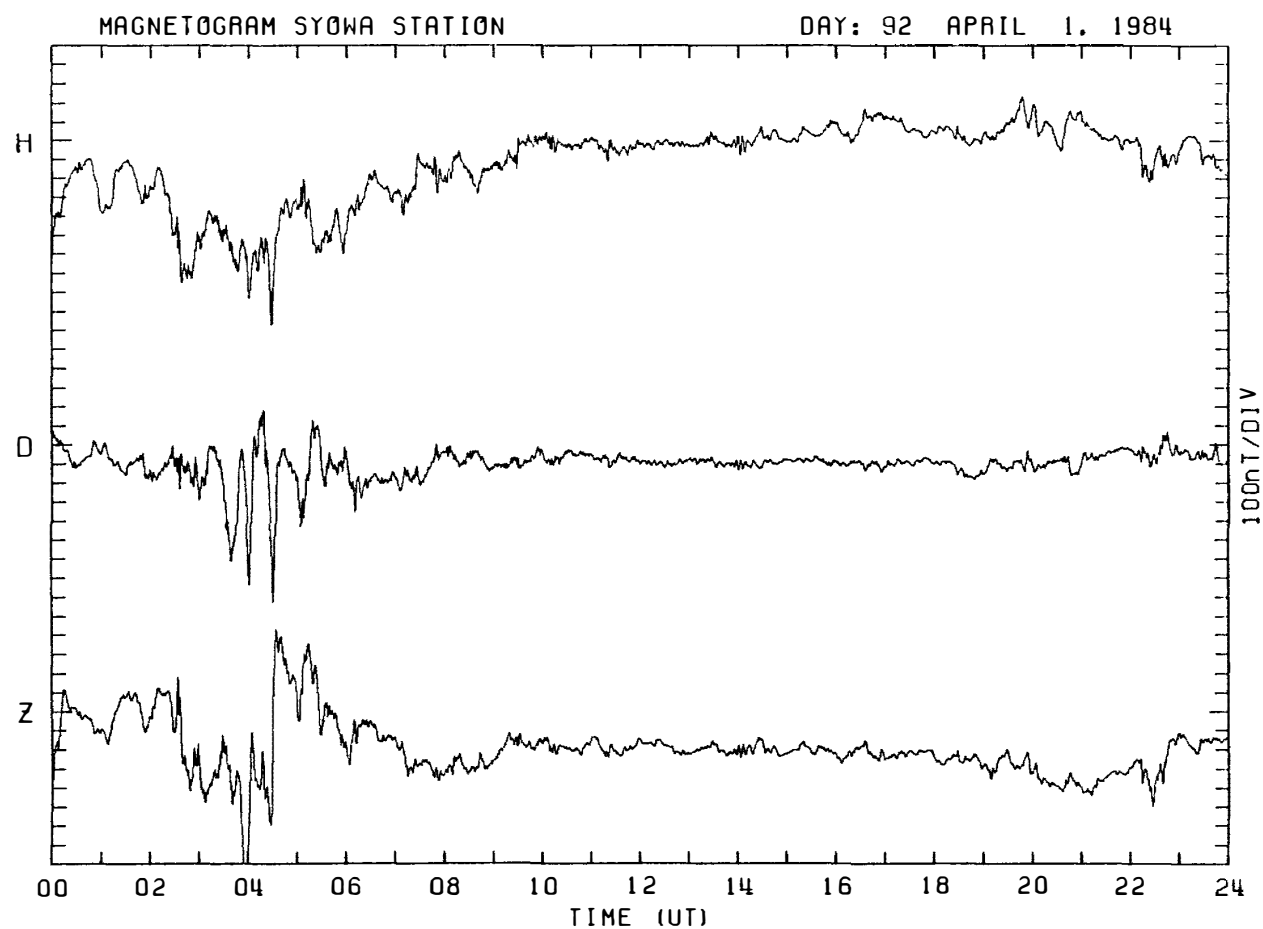


MAGNETOGRAM SYOWA STATION

DAY: 89 MARCH 29, 1984



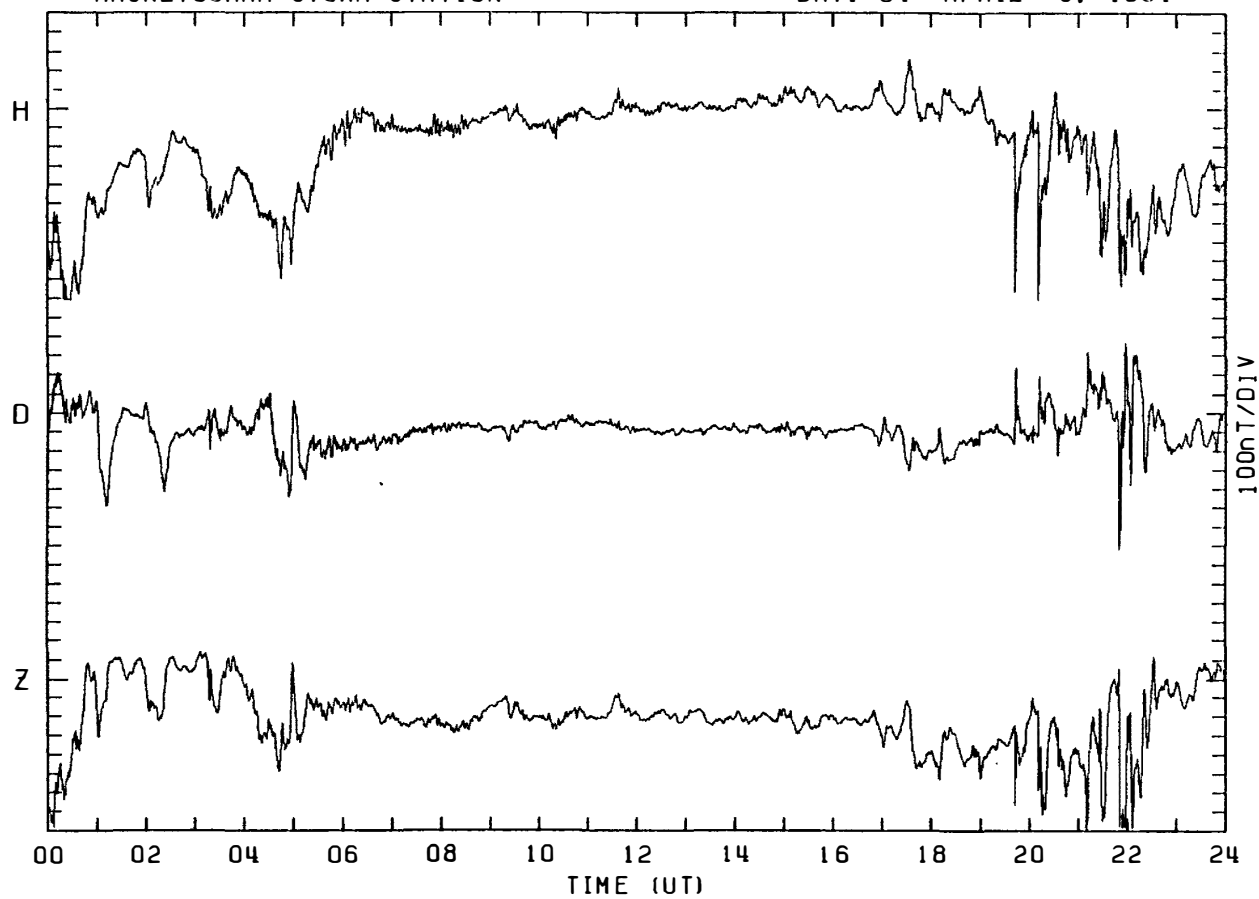






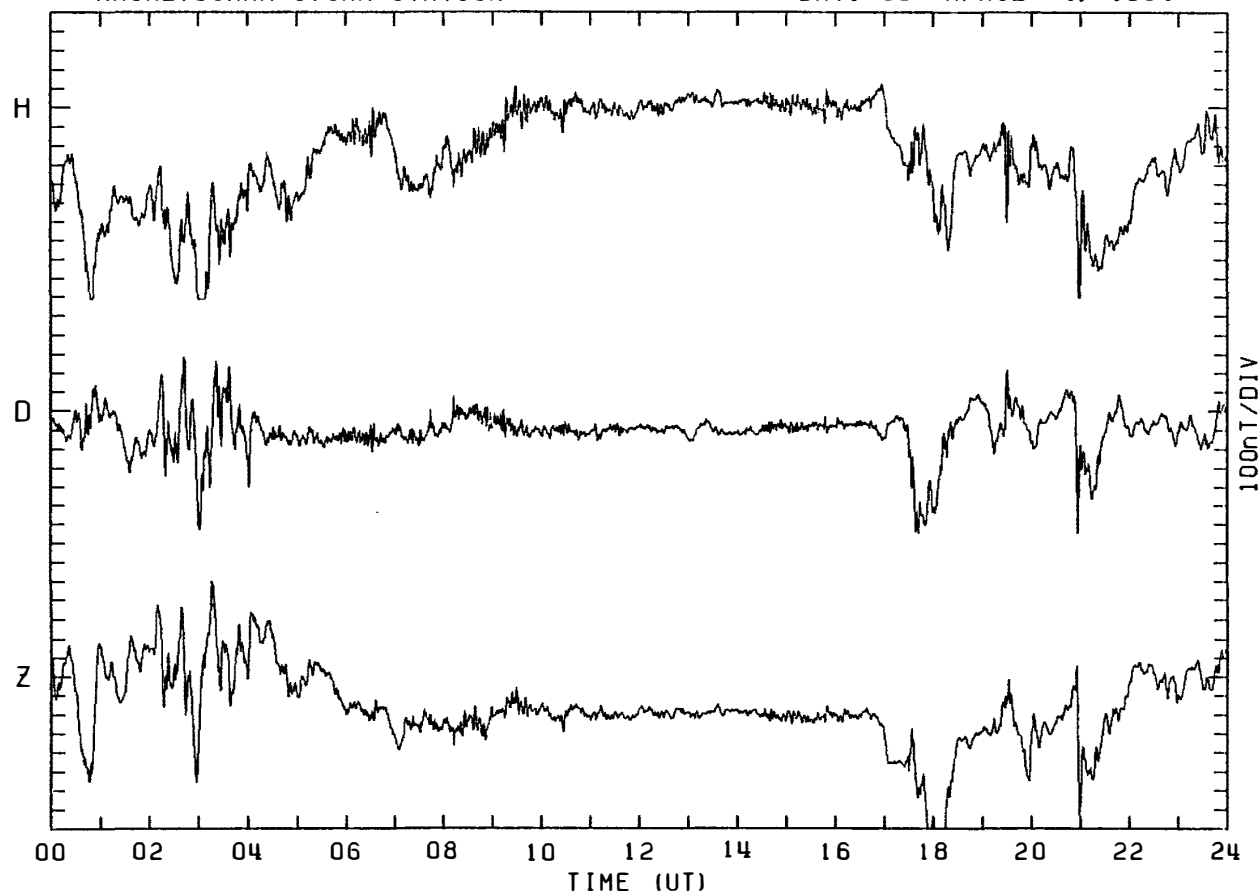
MAGNETOGRAM SYOWA STATION

DAY: 94 APRIL 3. 1984



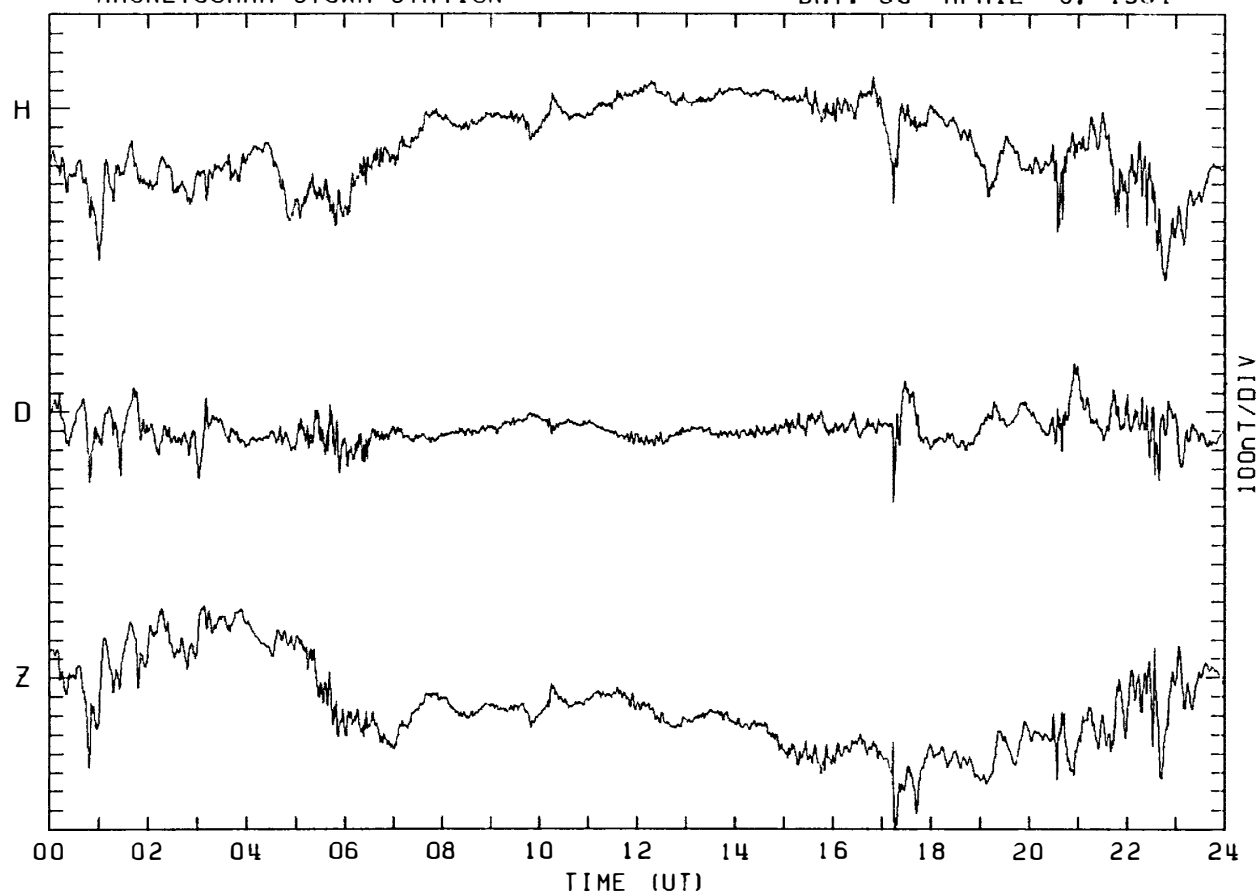
MAGNETOGRAM SYOWA STATION

DAY: 95 APRIL 4. 1984



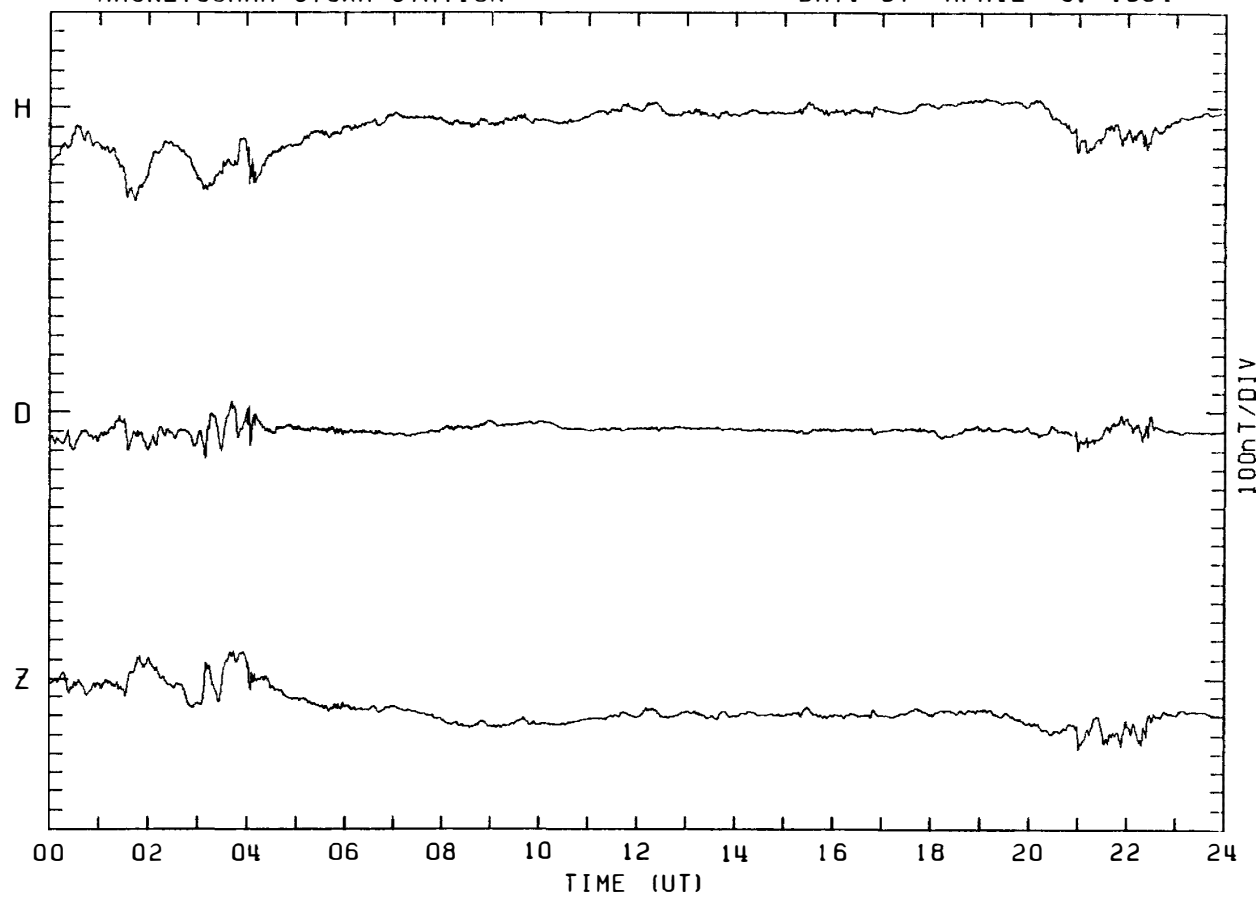
MAGNETOGRAM SYOWA STATION

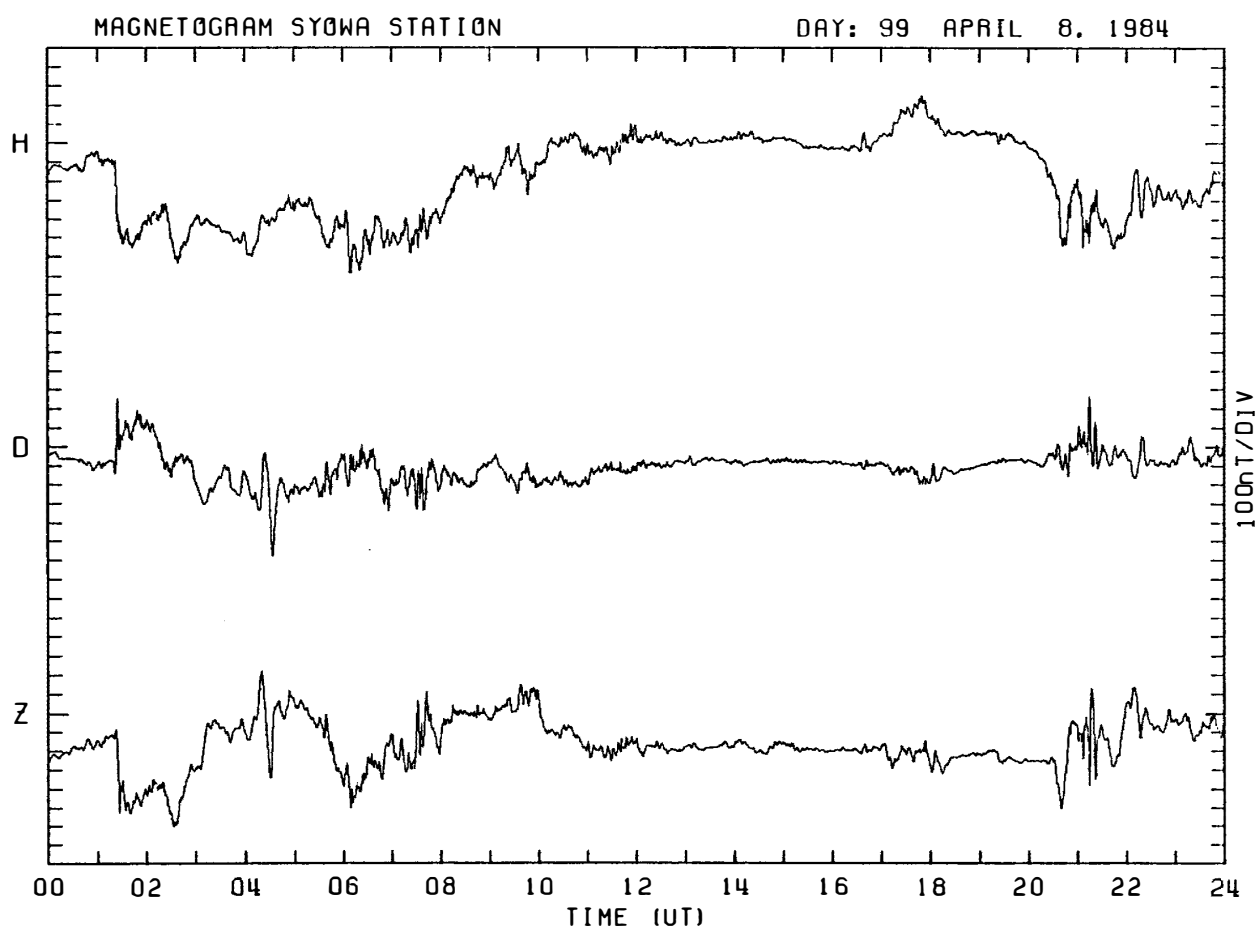
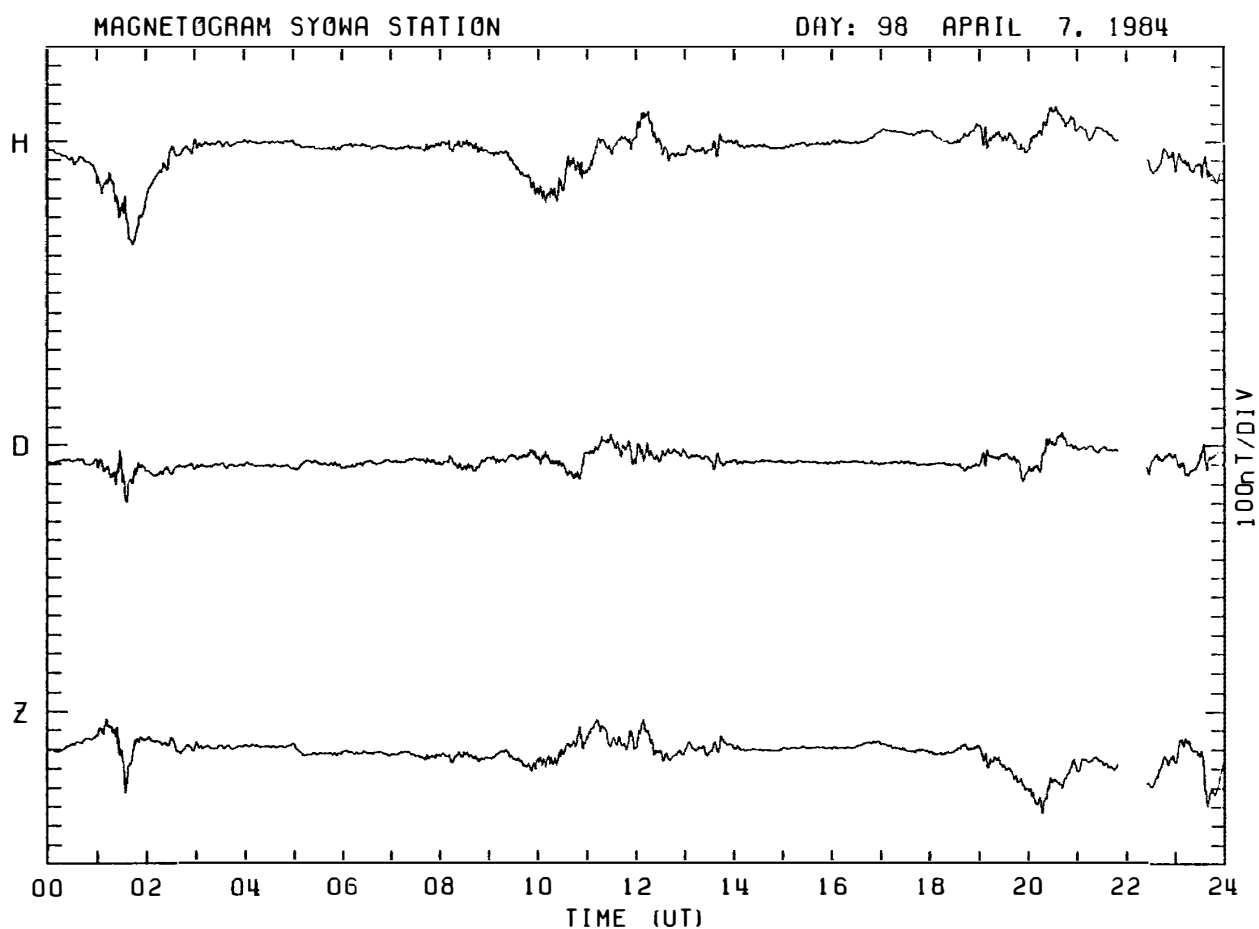
DAY: 96 APRIL 5. 1984

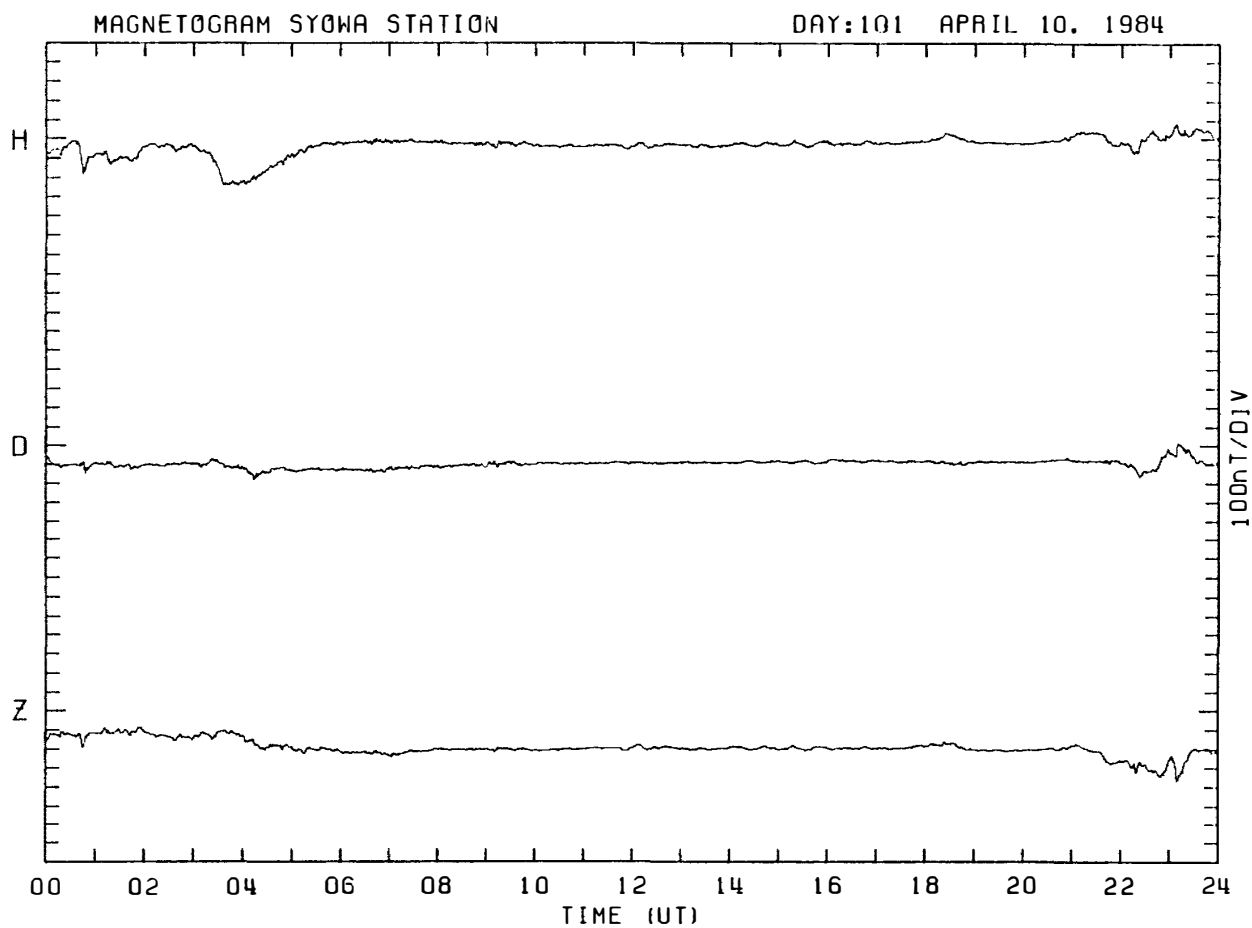
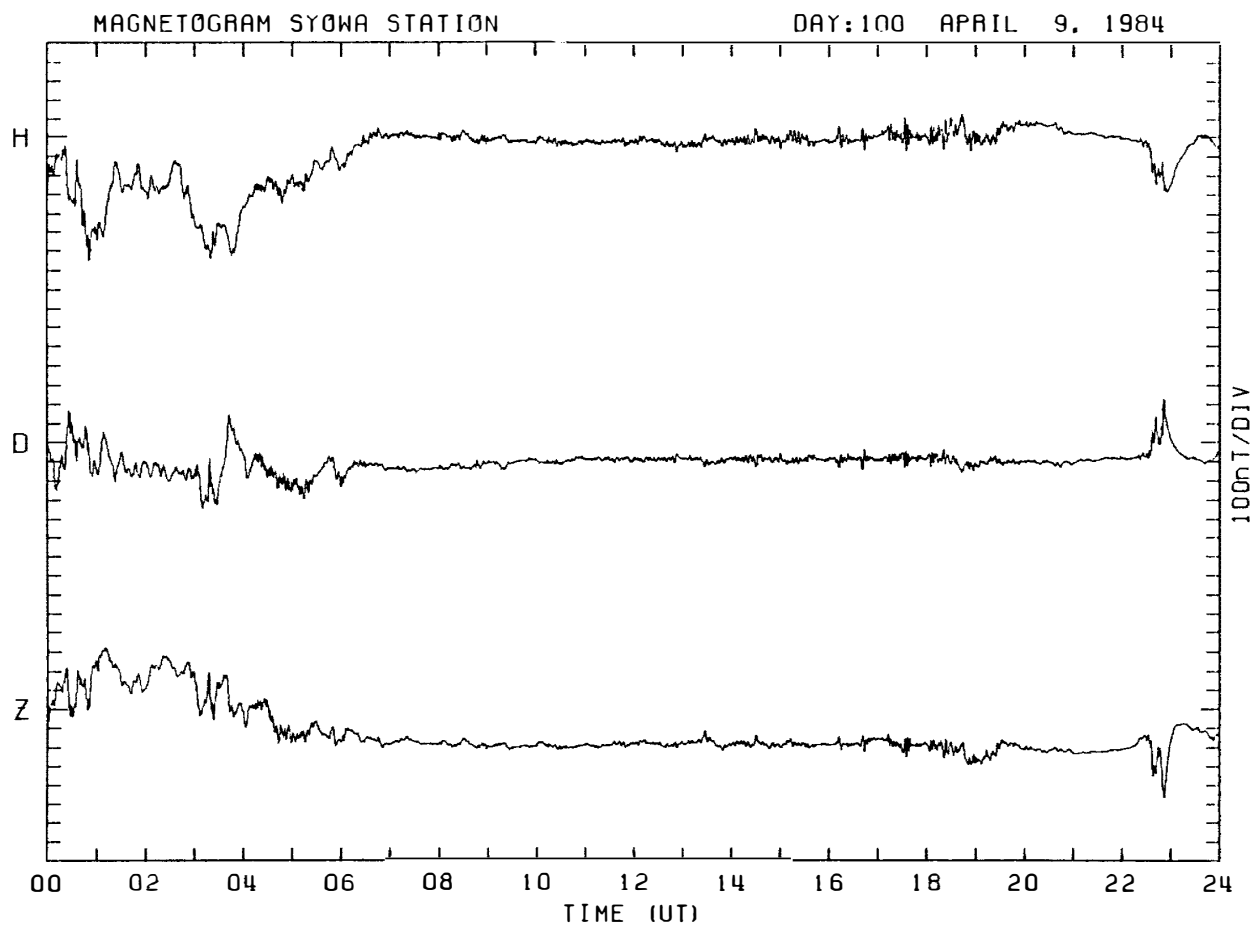


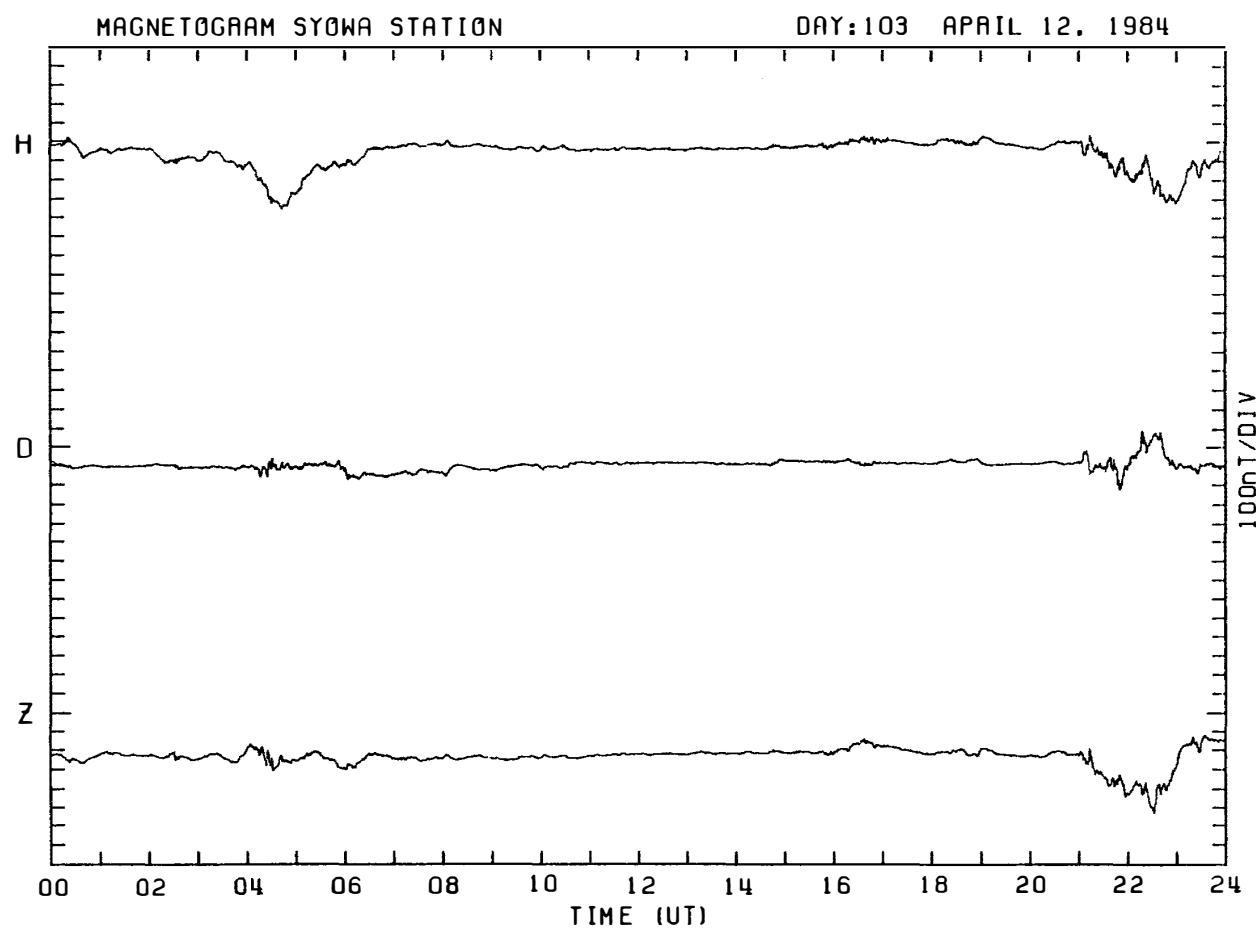
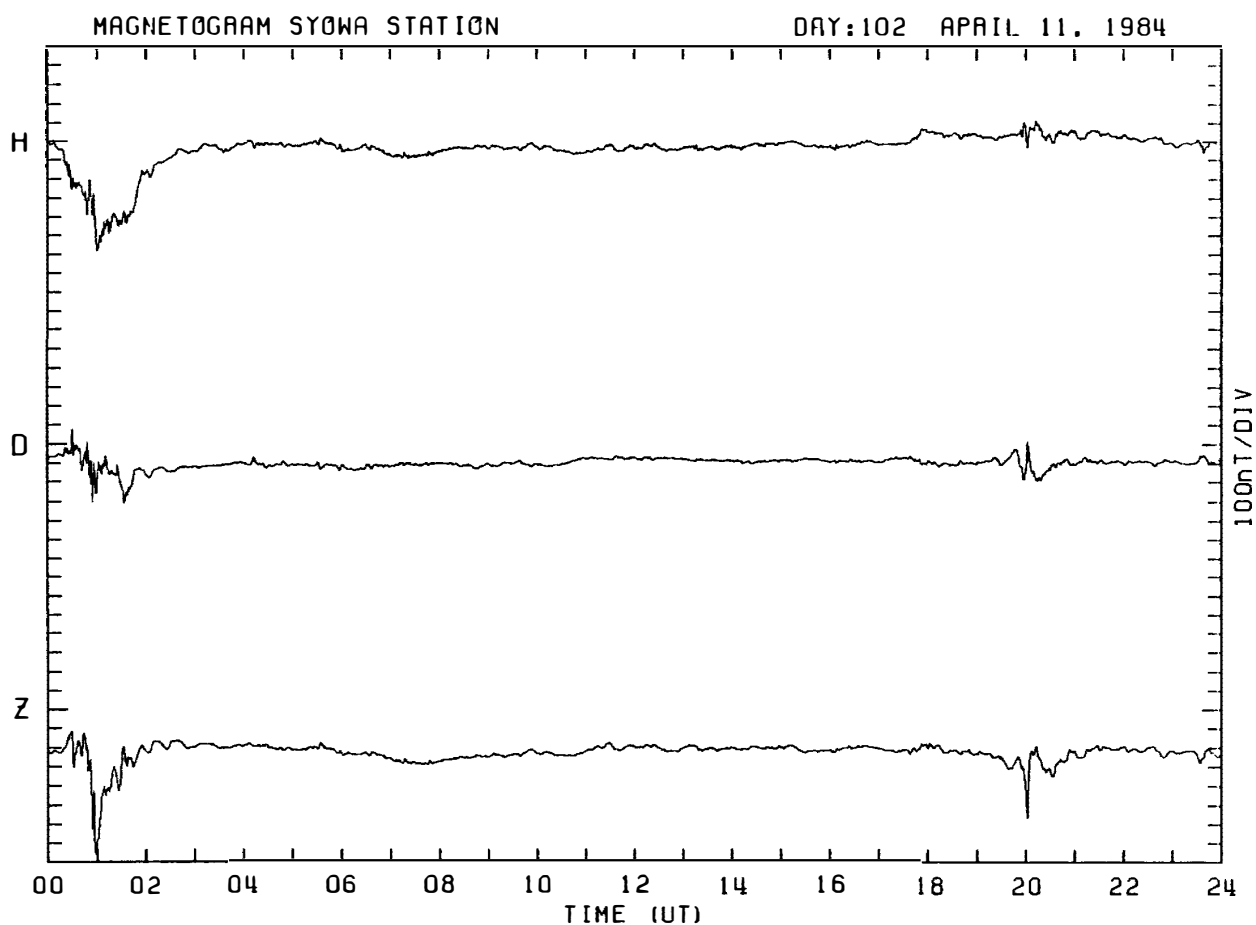
MAGNETOGRAM SYOWA STATION

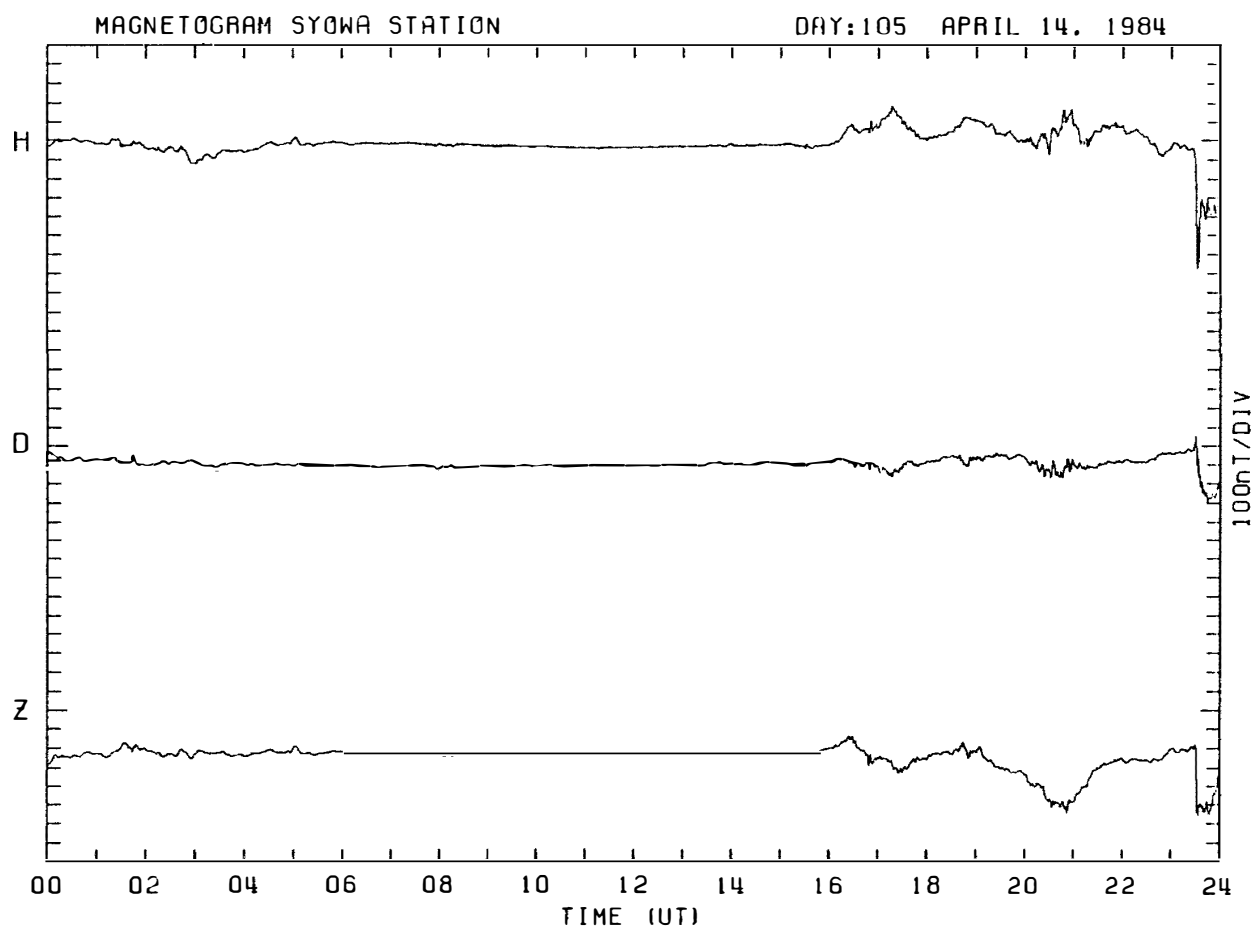
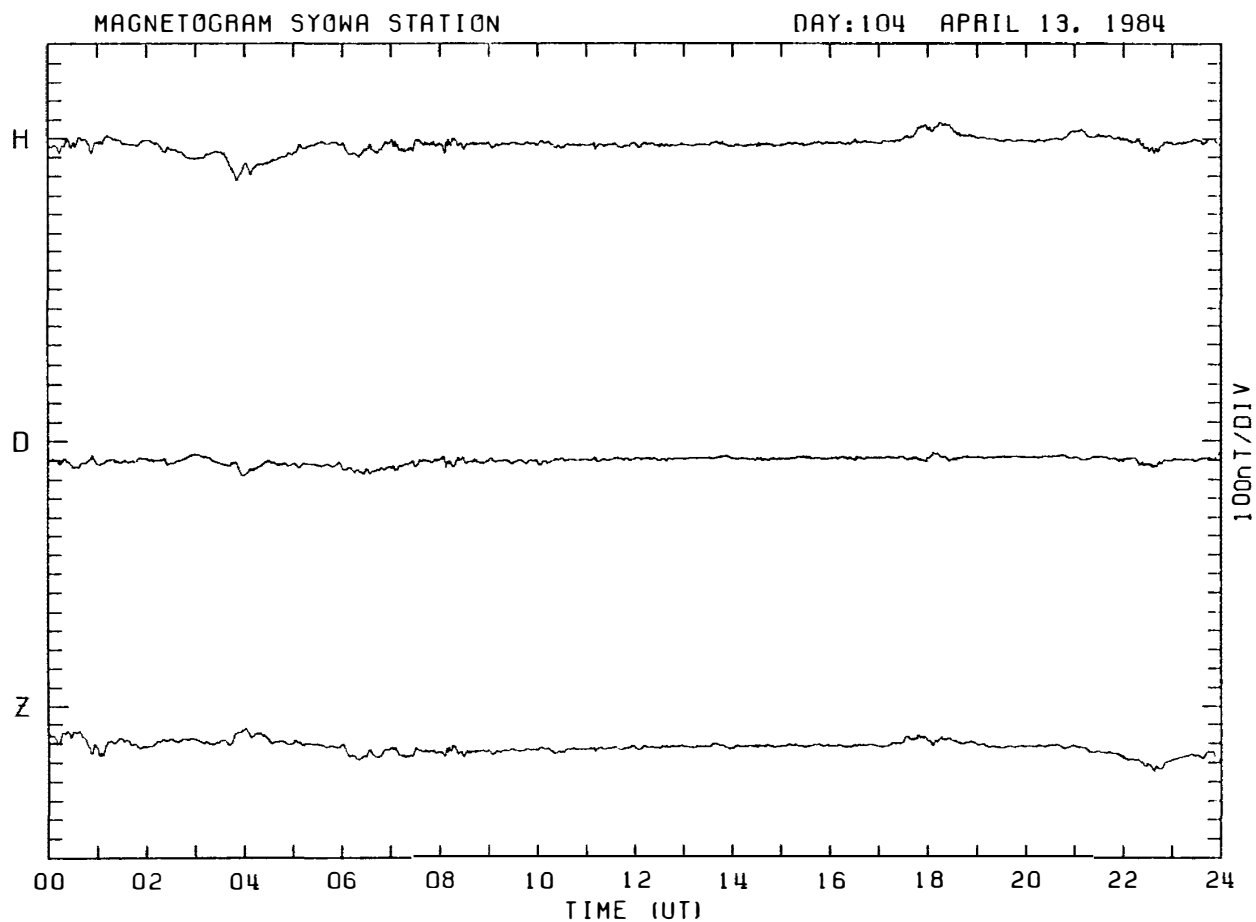
DAY: 97 APRIL 6. 1984

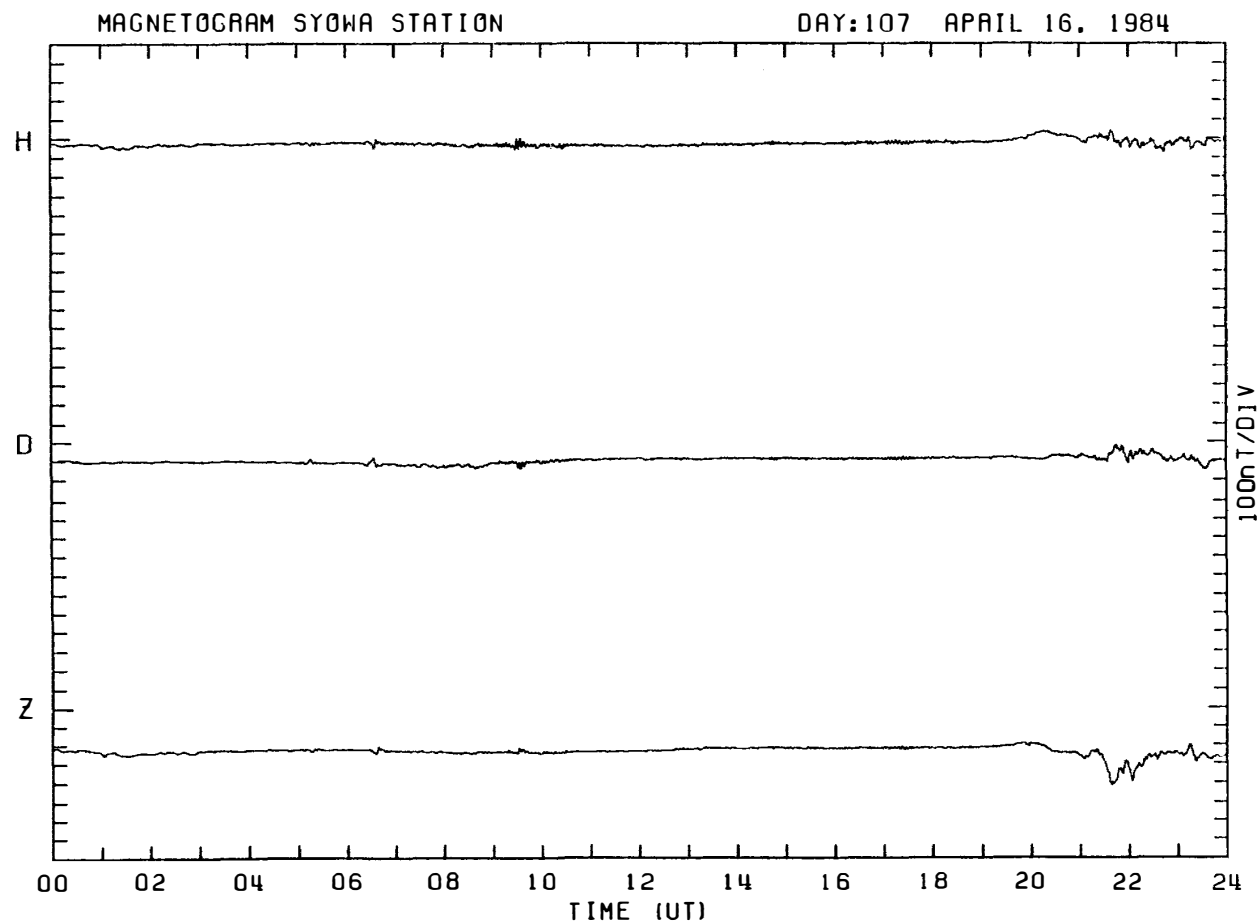
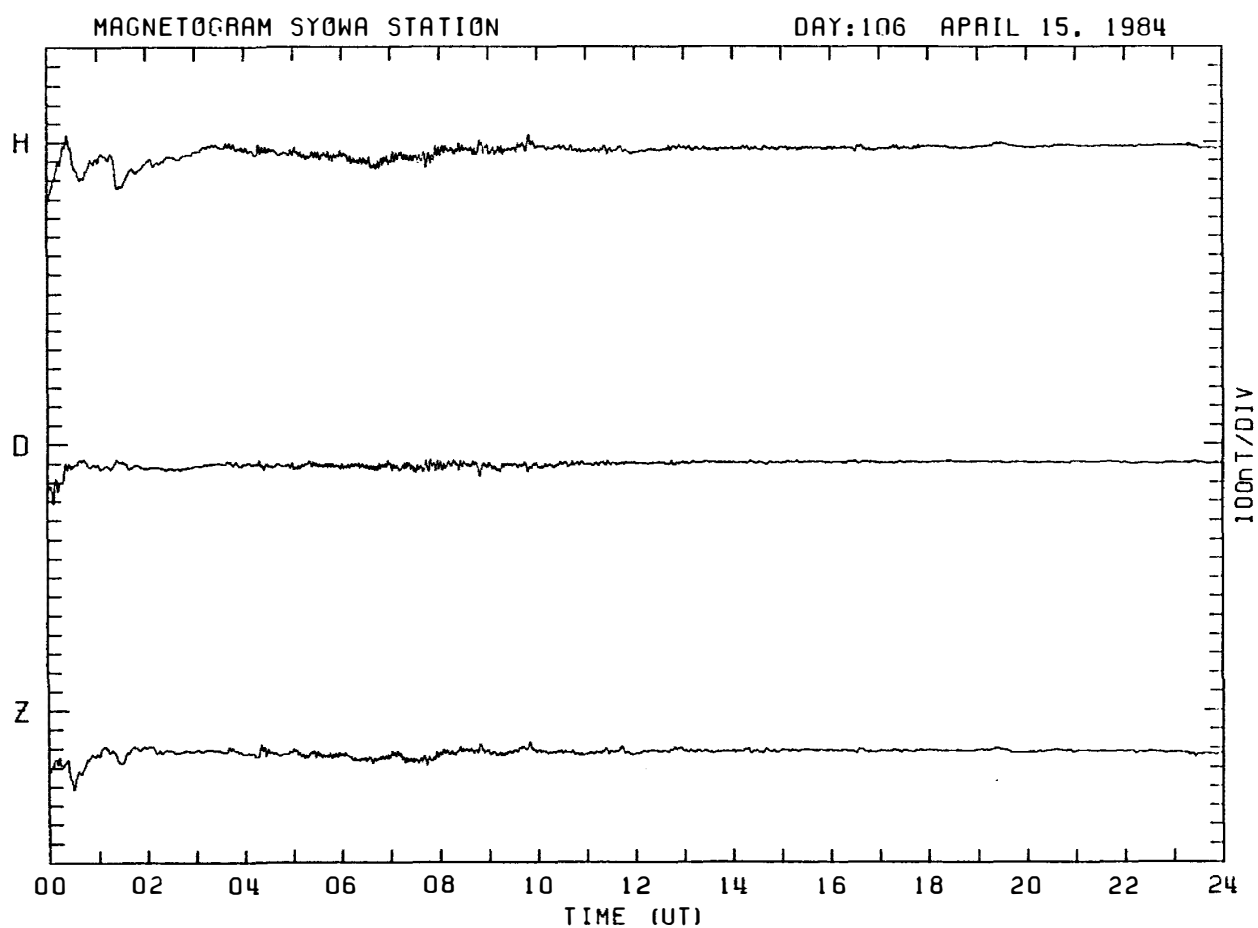






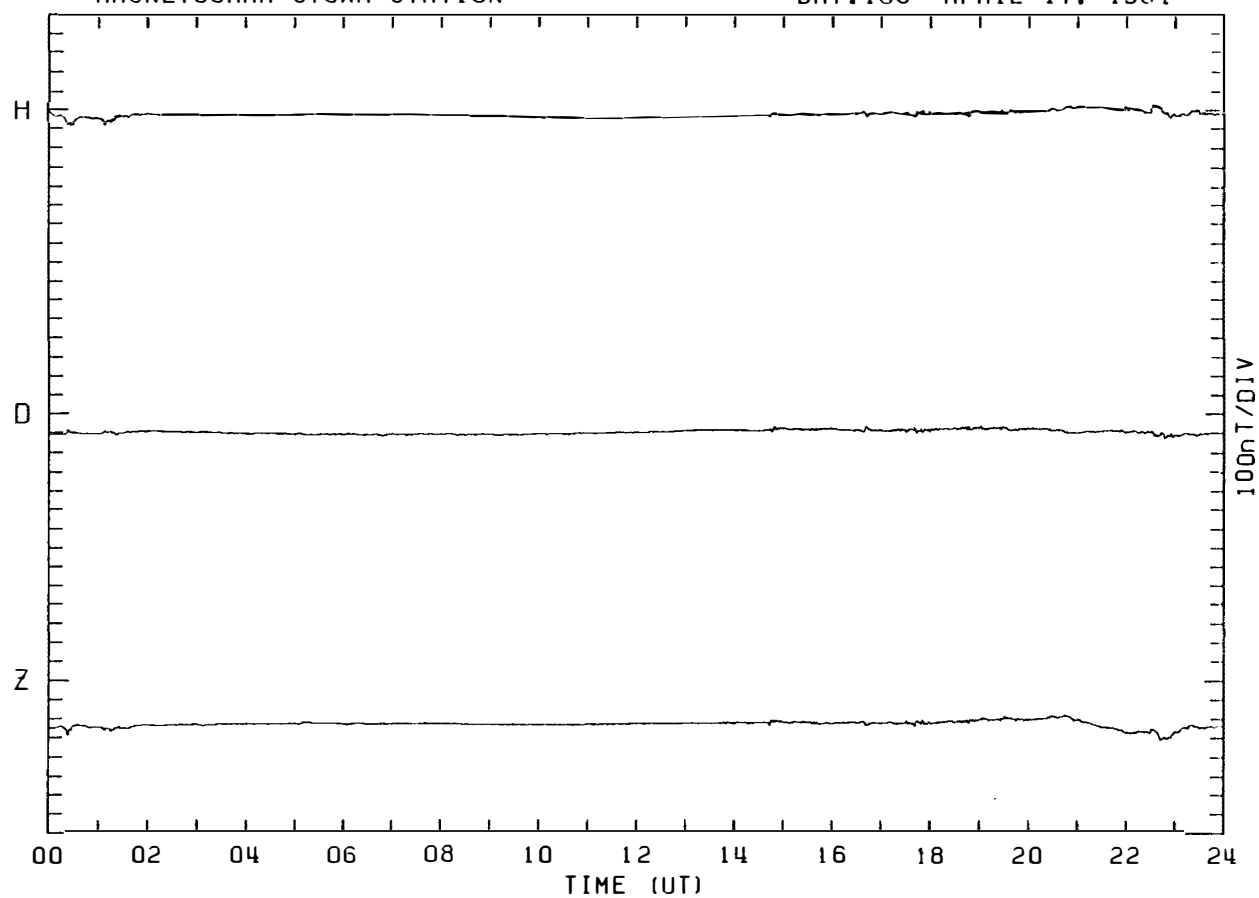






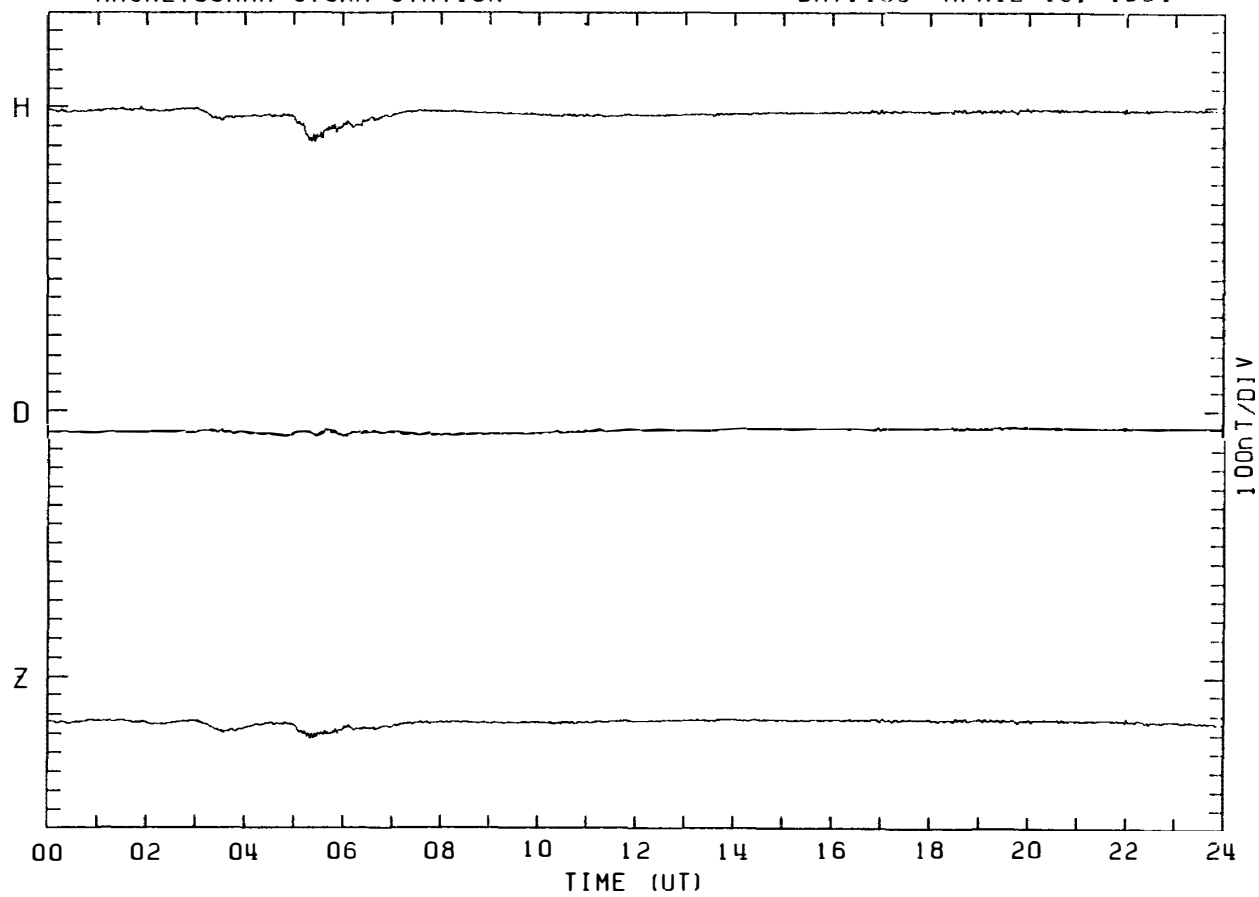
MAGNETOGRAM SYOWA STATION

DAY:108 APRIL 17, 1984

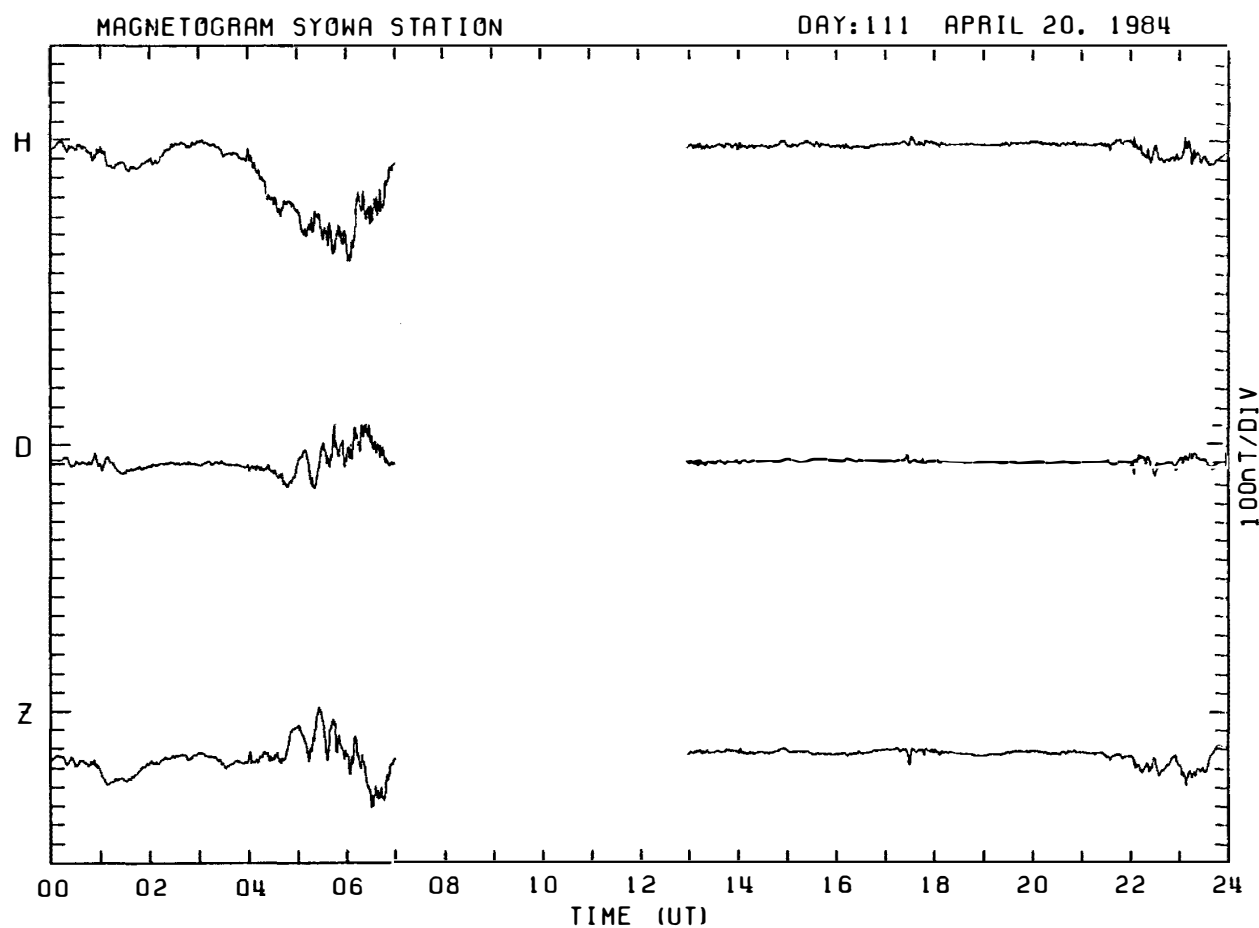
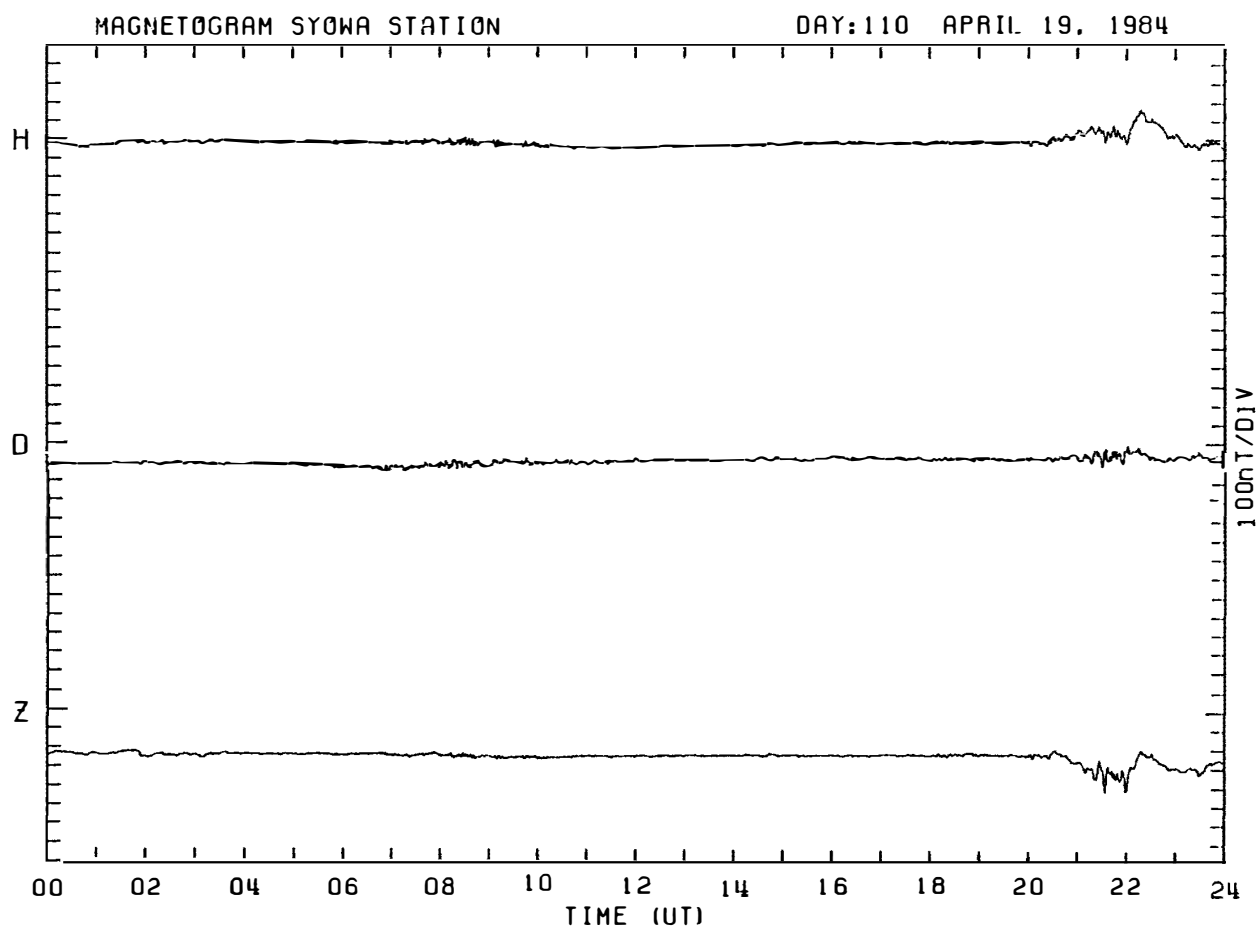


MAGNETOGRAM SYOWA STATION

DAY:109 APRIL 18, 1984

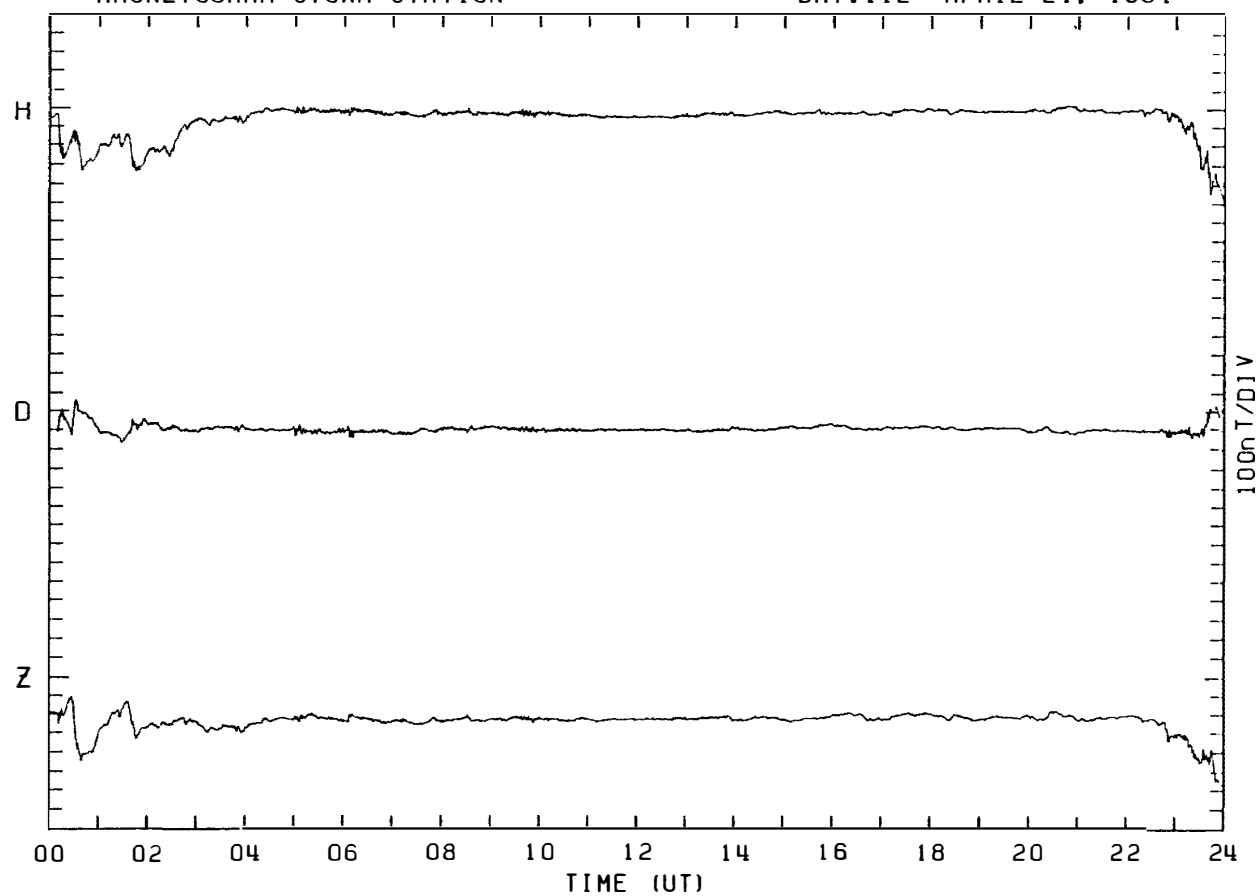






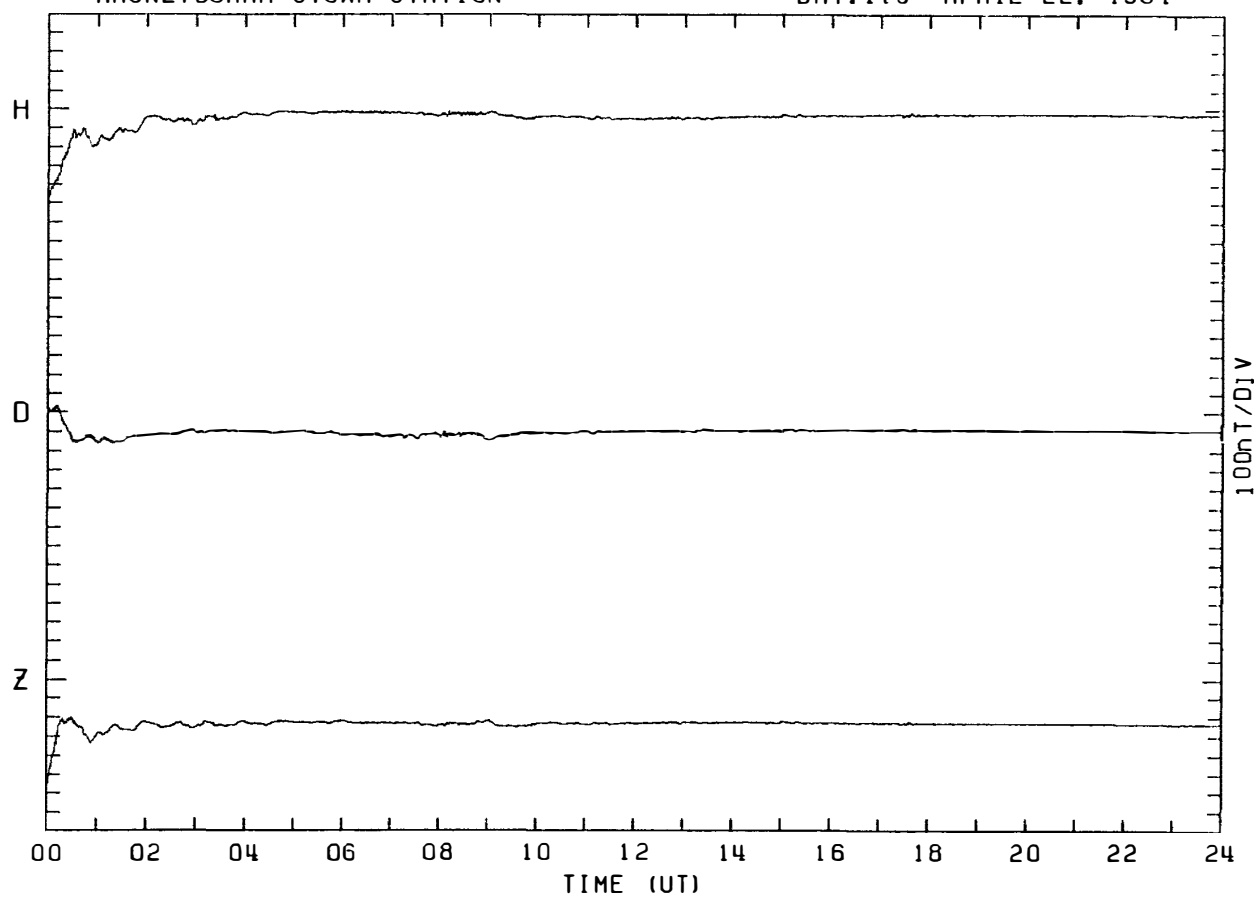
MAGNETOGRAM SYOWA STATION

DAY:112 APRIL 21, 1984



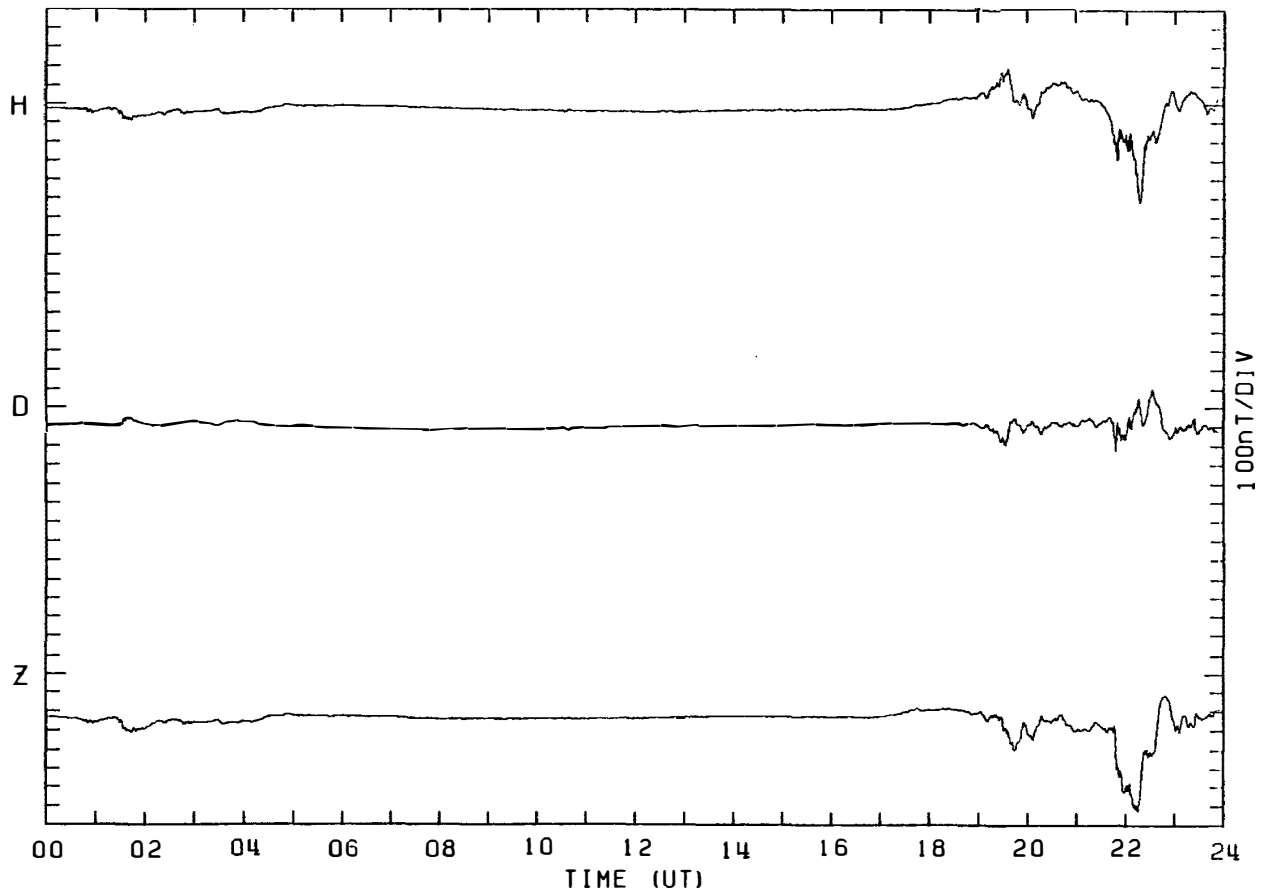
MAGNETOGRAM SYOWA STATION

DAY:113 APRIL 22, 1984



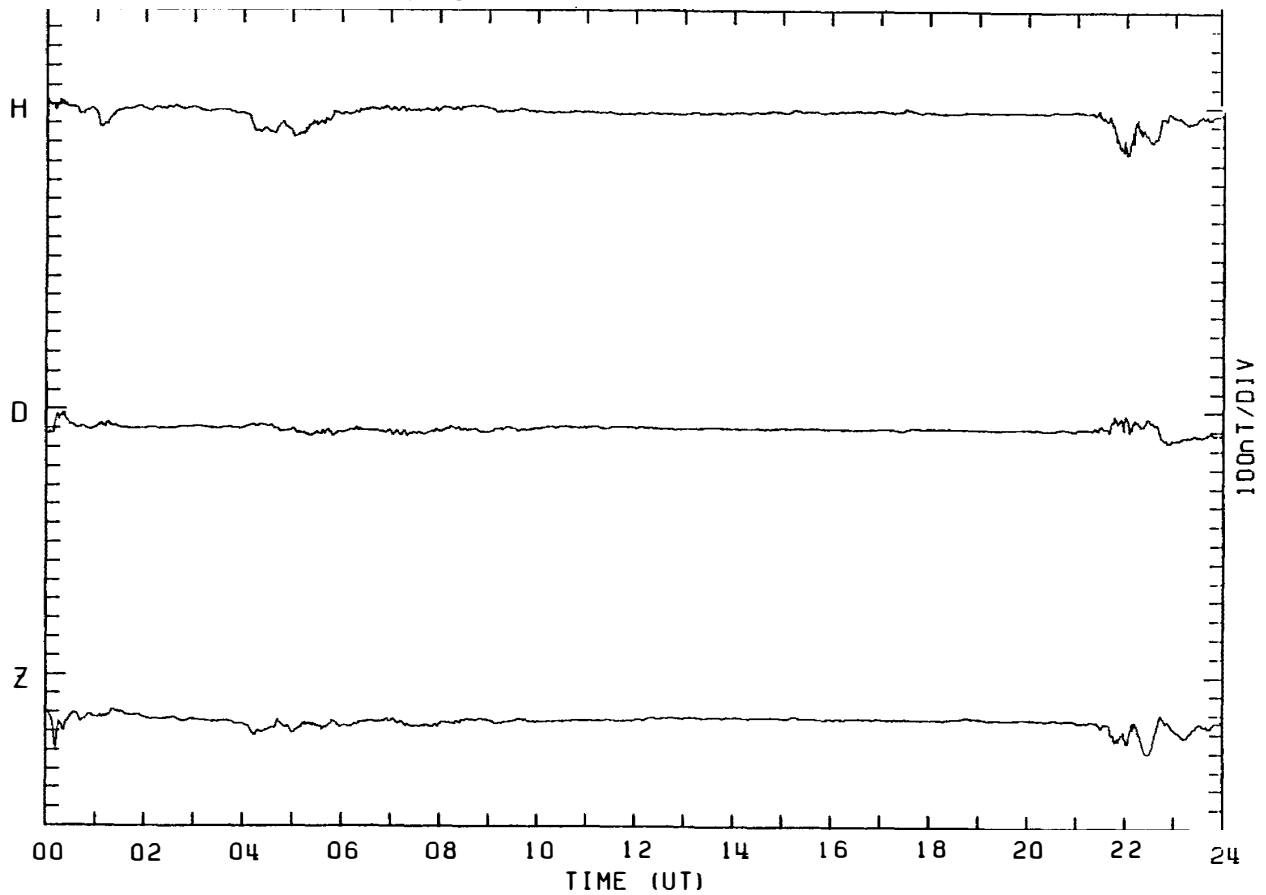
MAGNETOGRAM SYOWA STATION

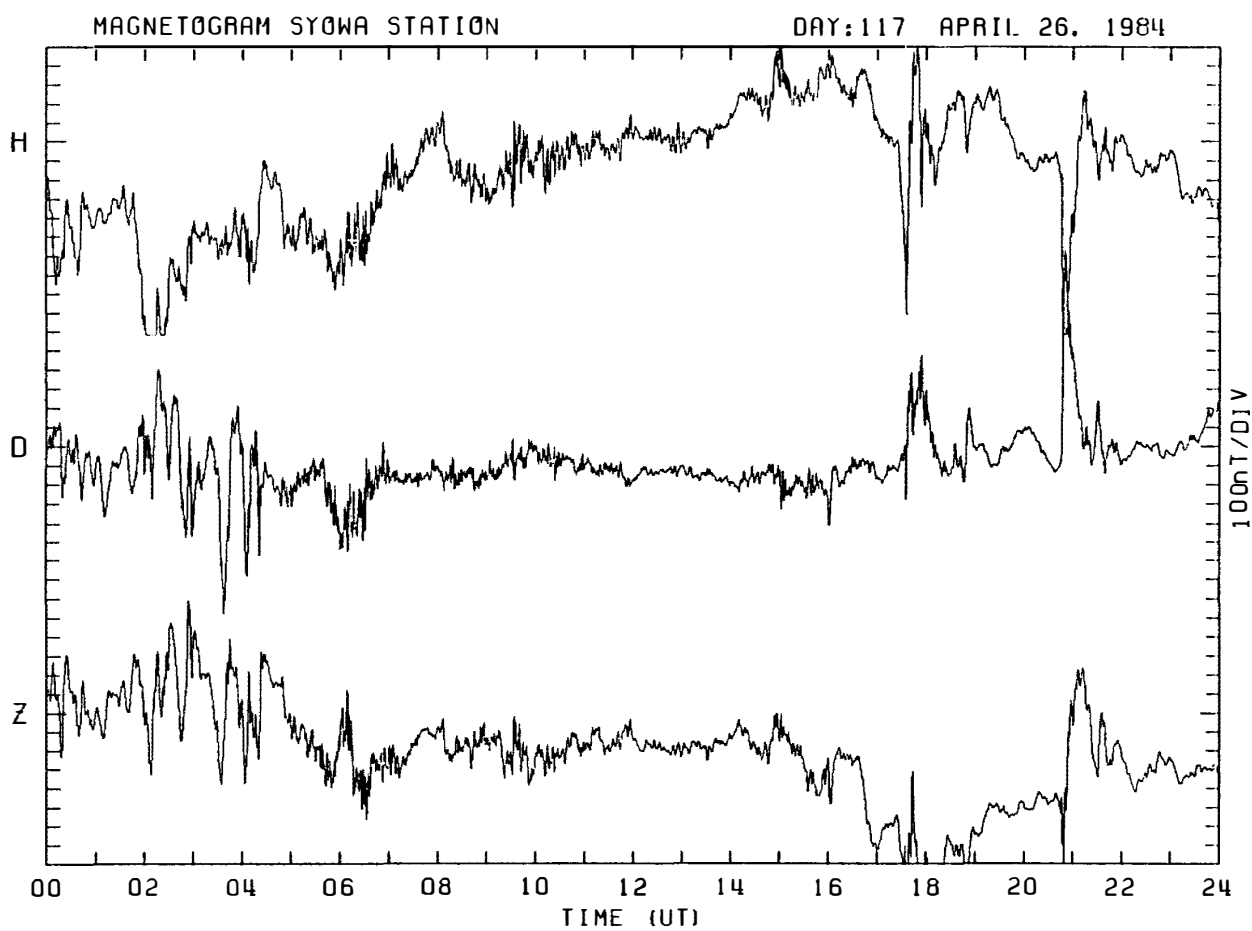
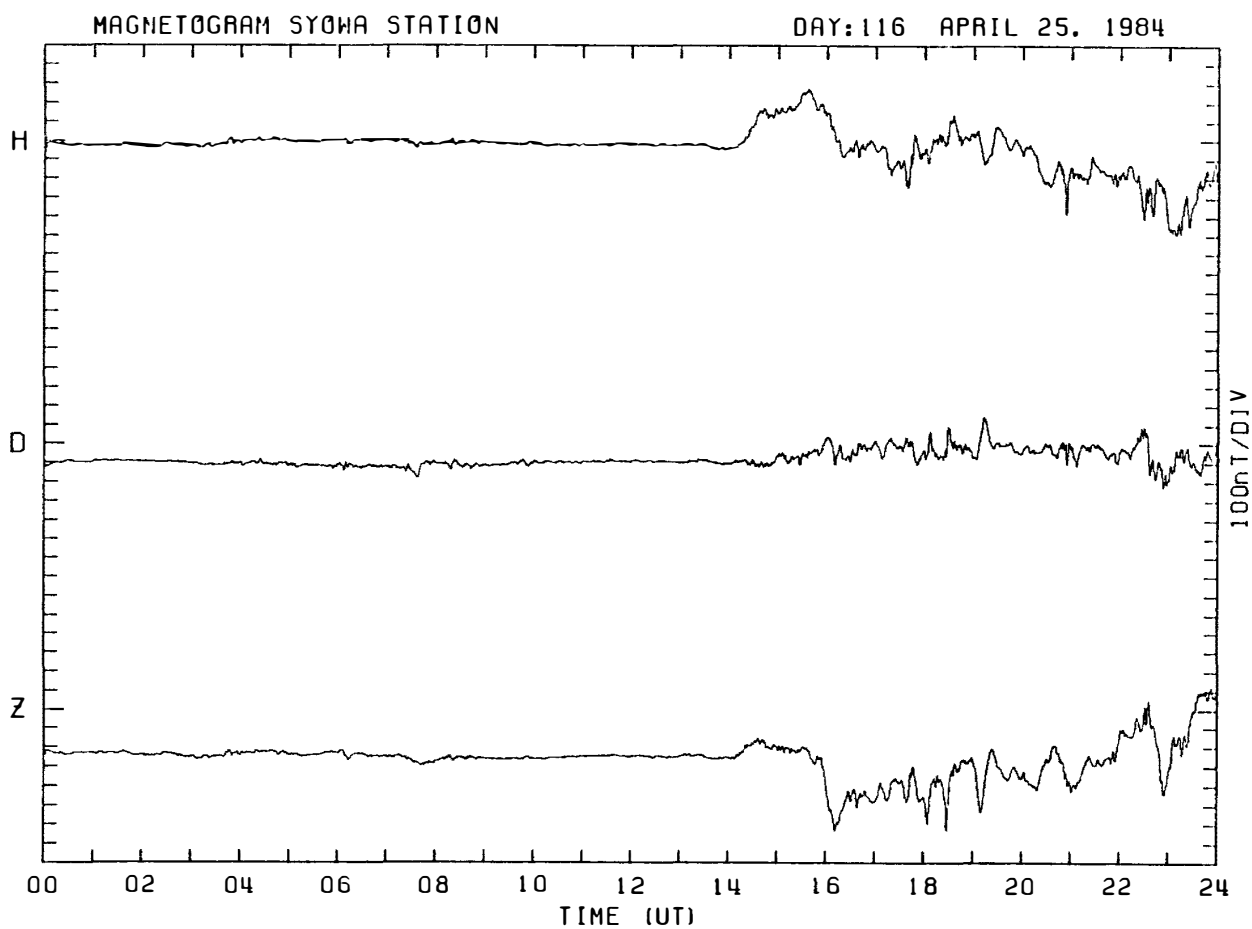
DAY:114 APRIL 23, 1984

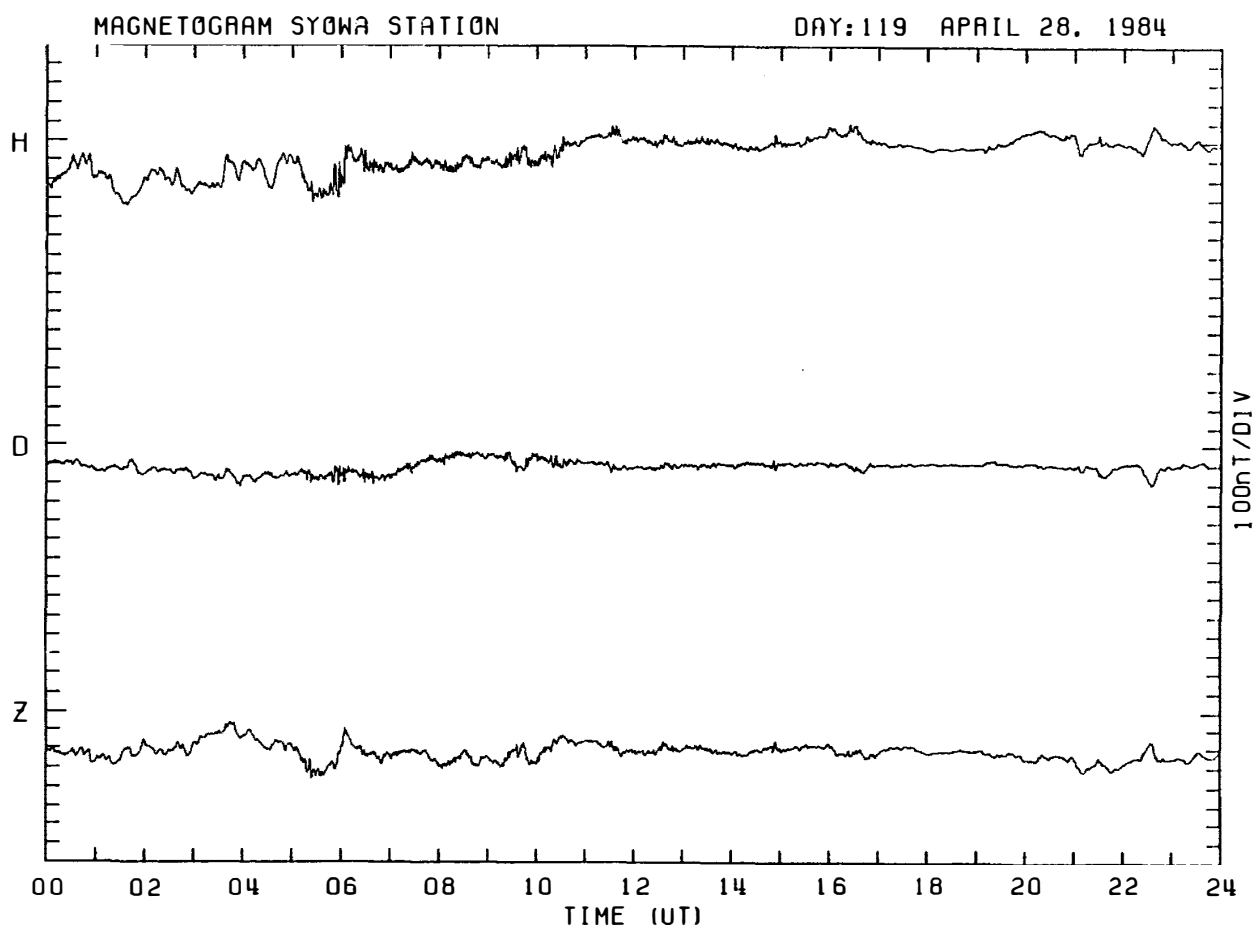
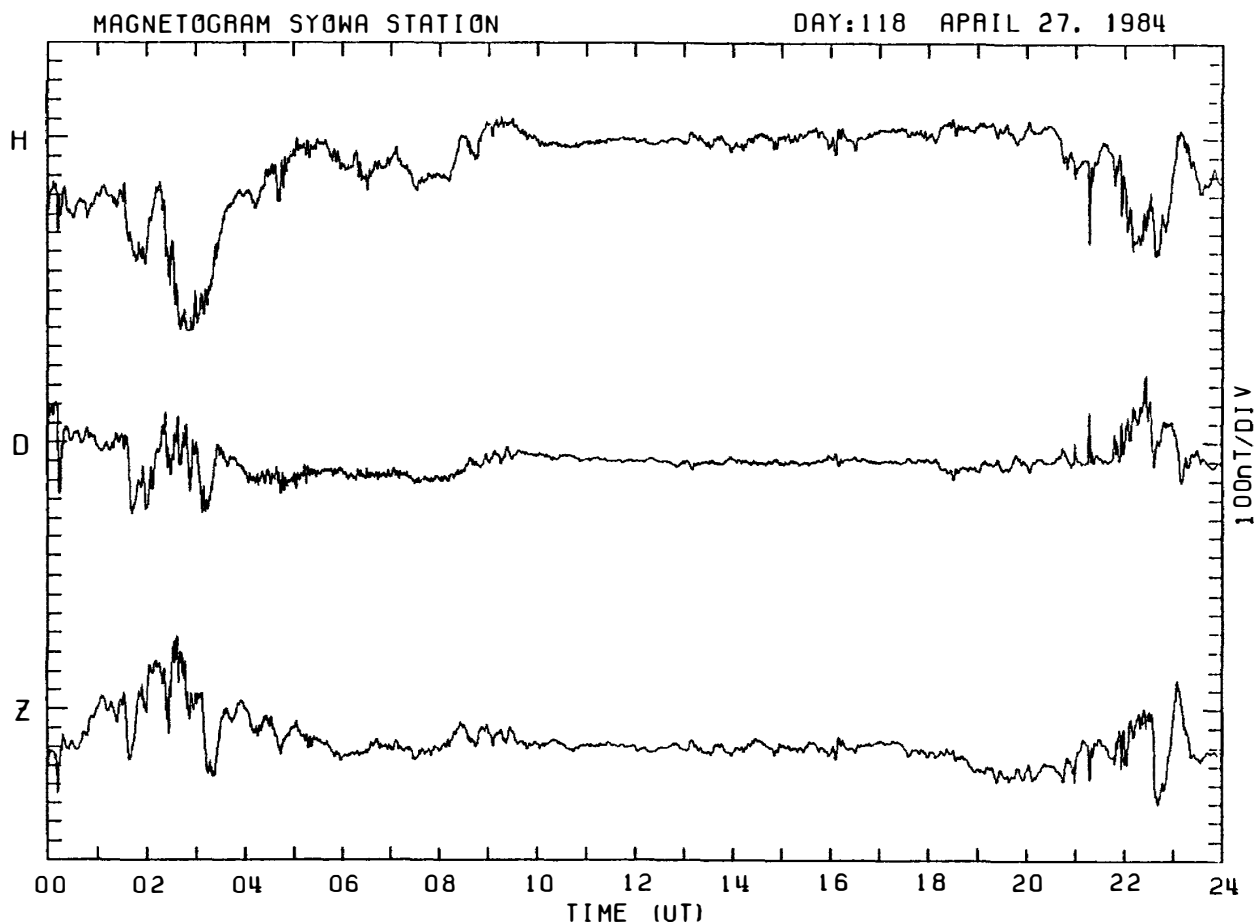


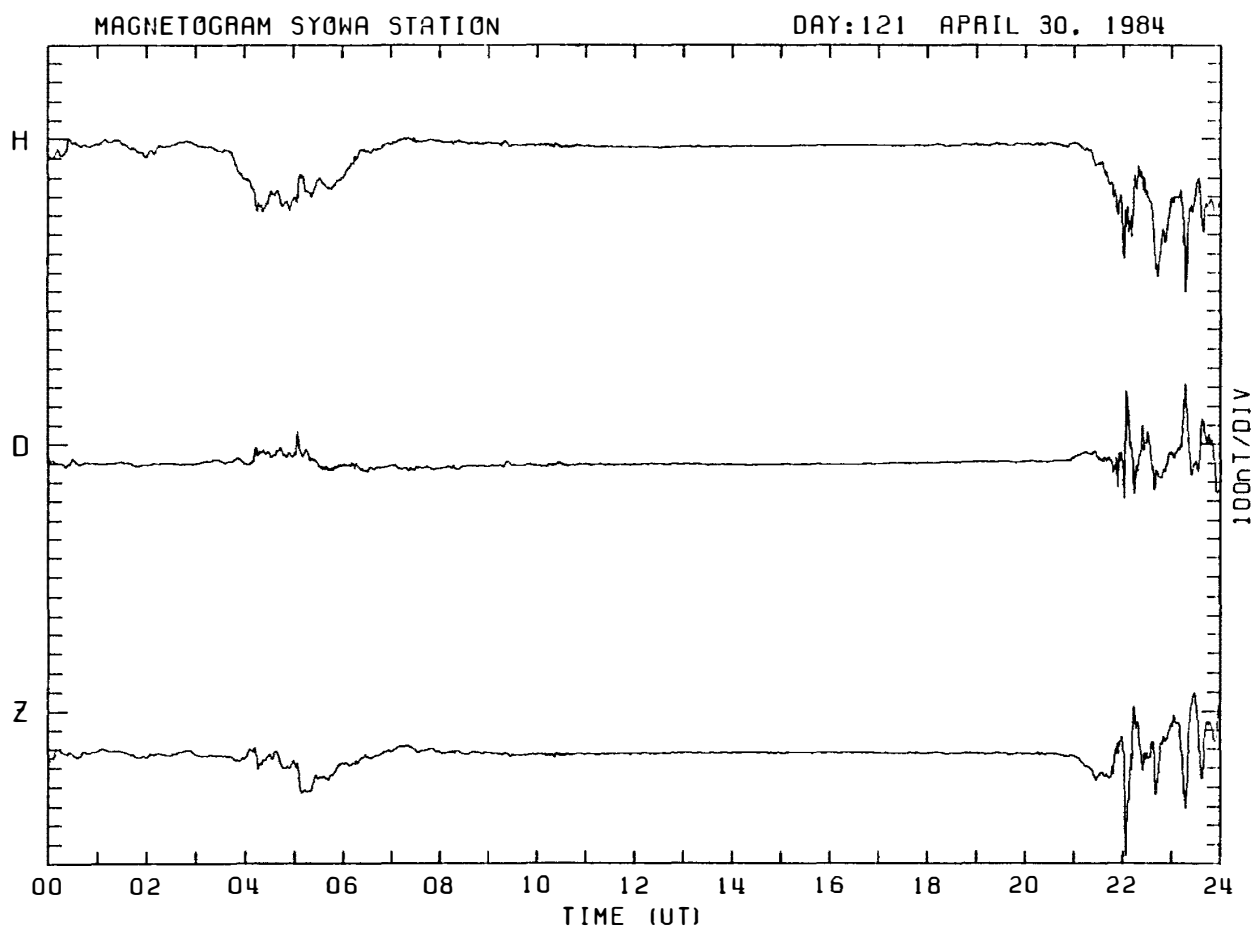
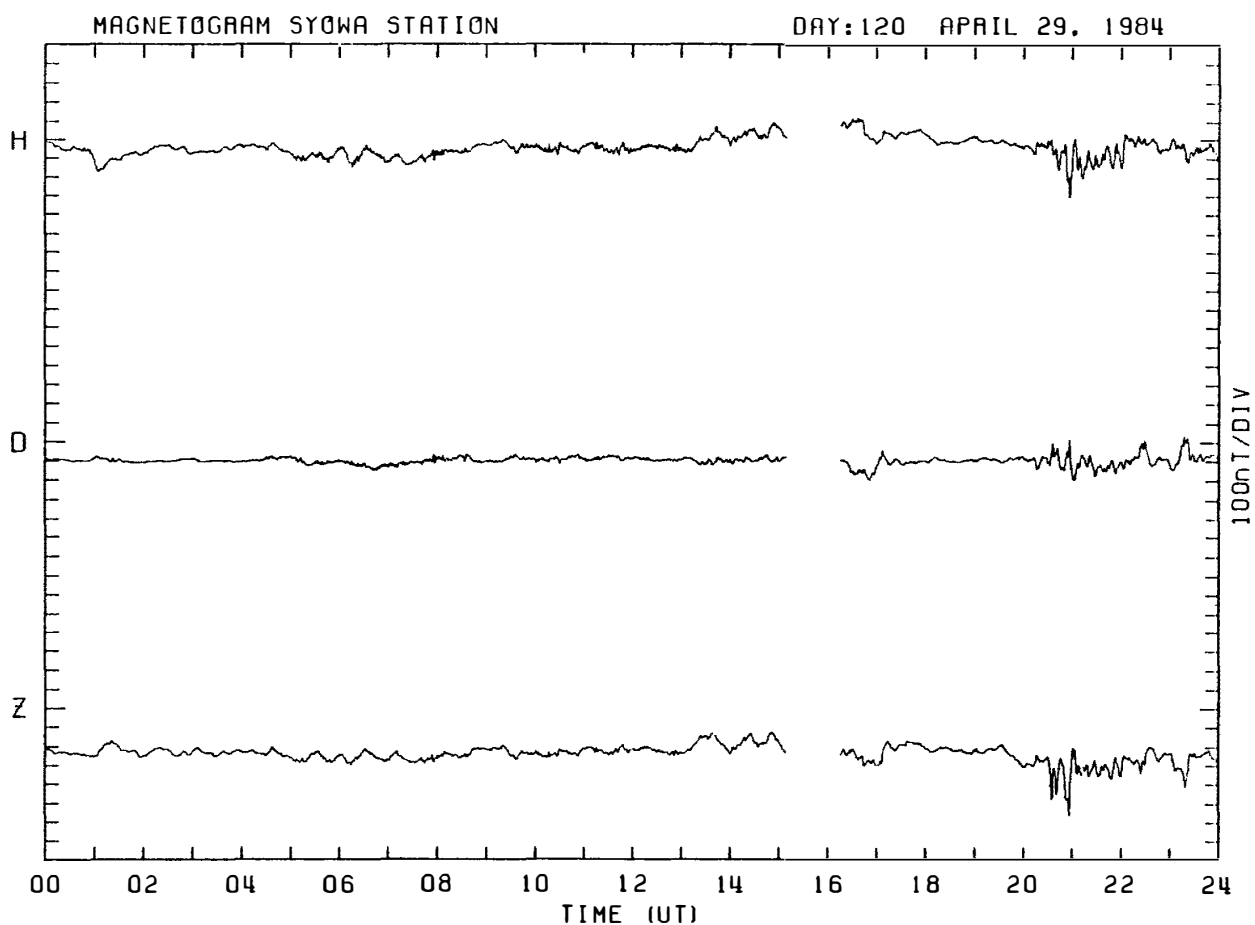
MAGNETOGRAM SYOWA STATION

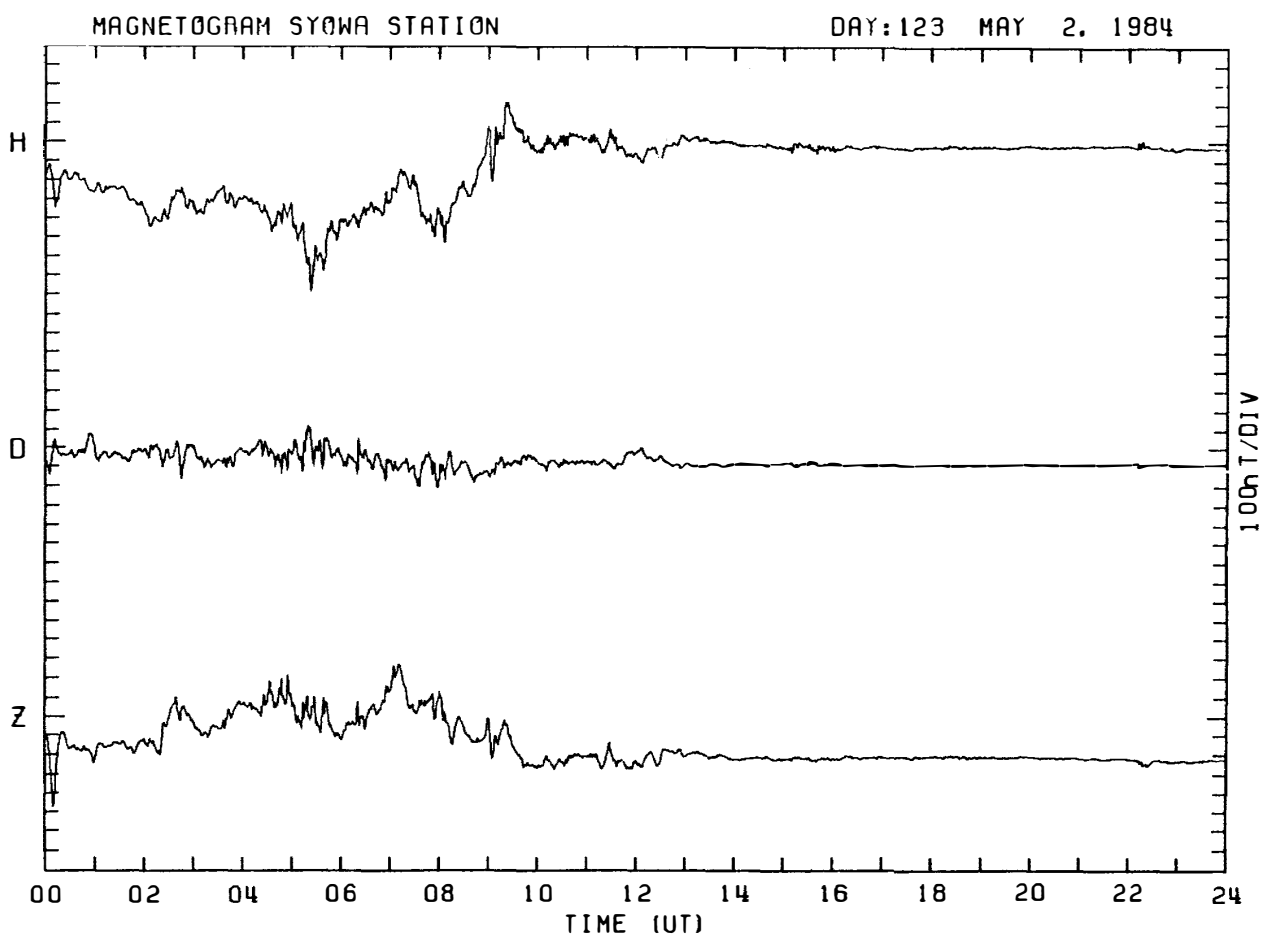
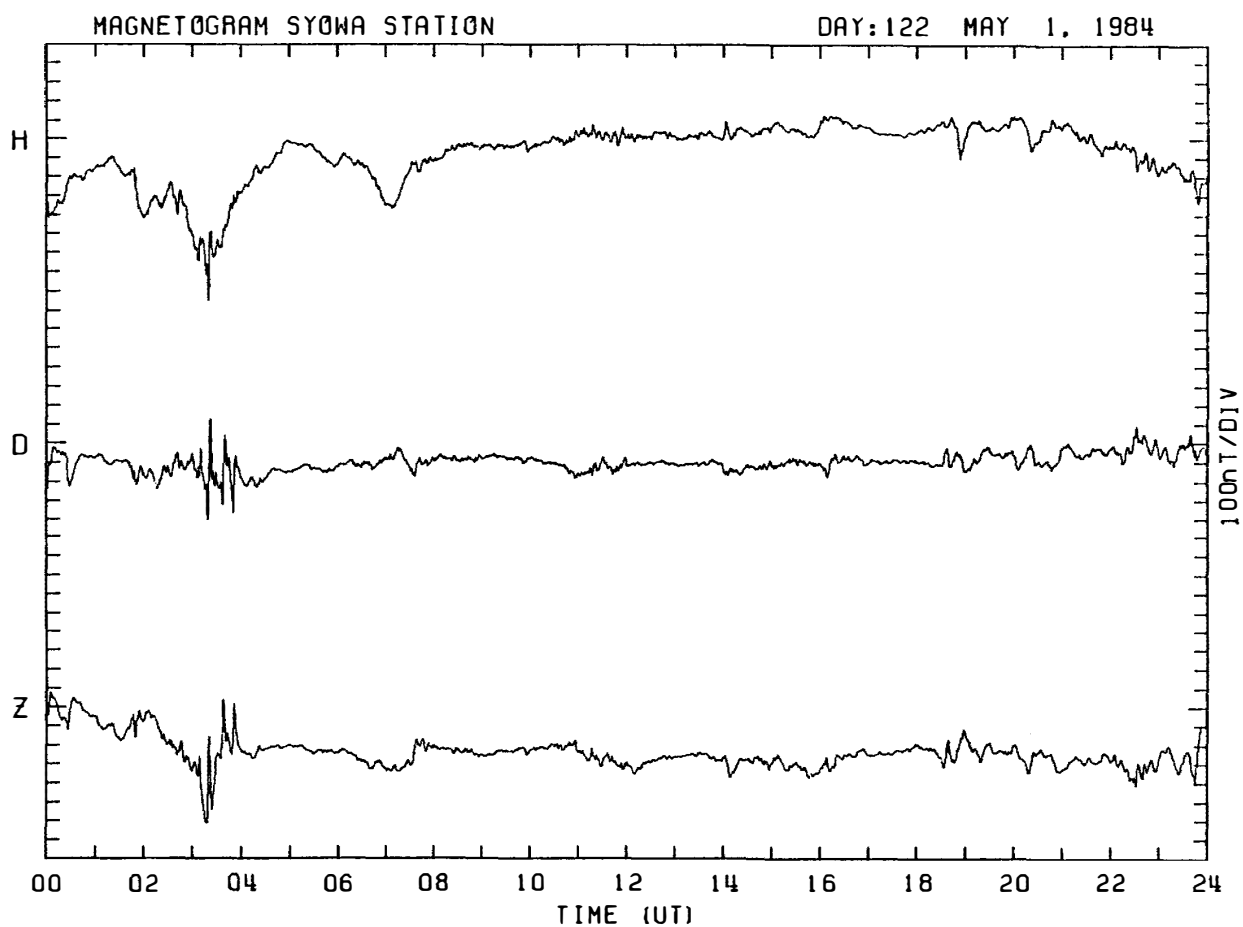
DAY:115 APRIL 24, 1984





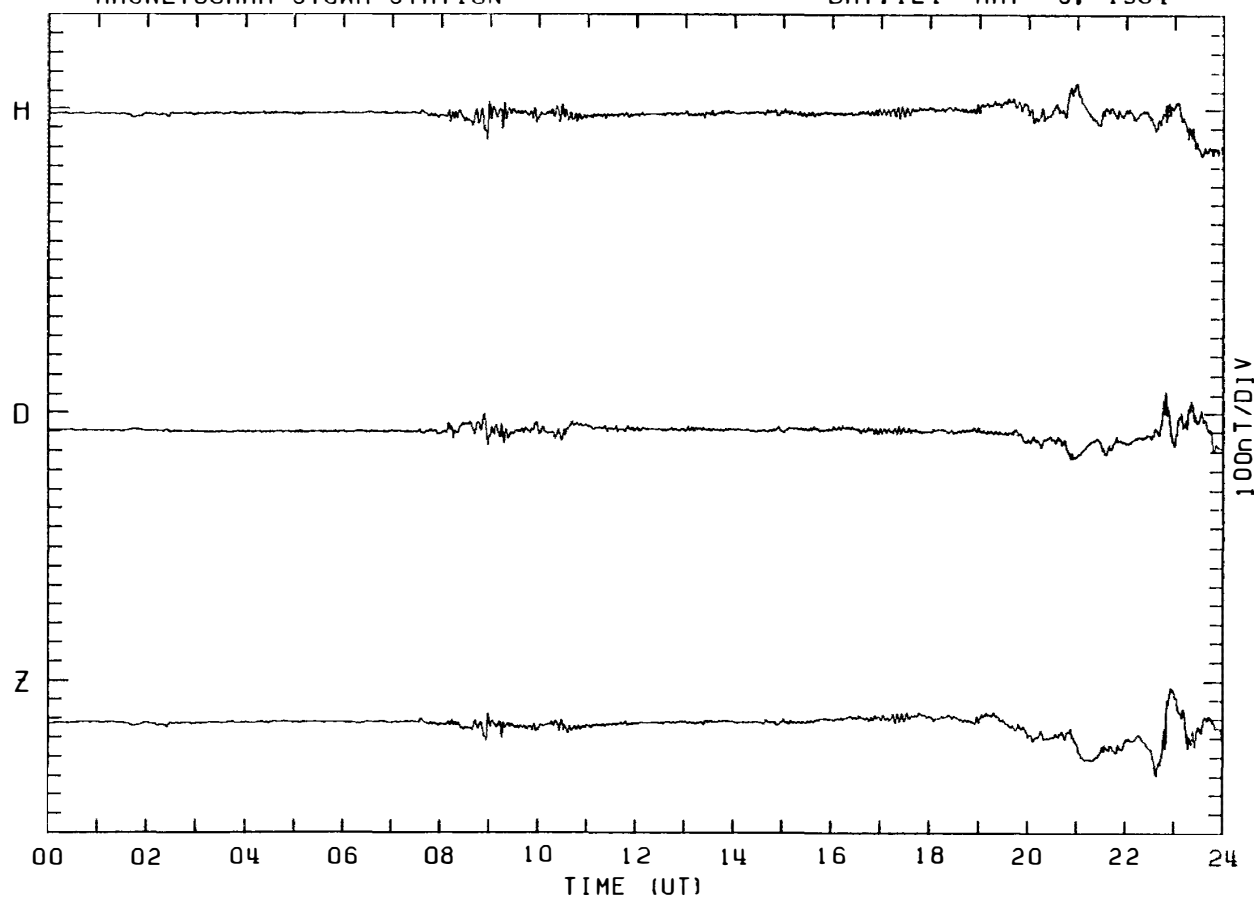






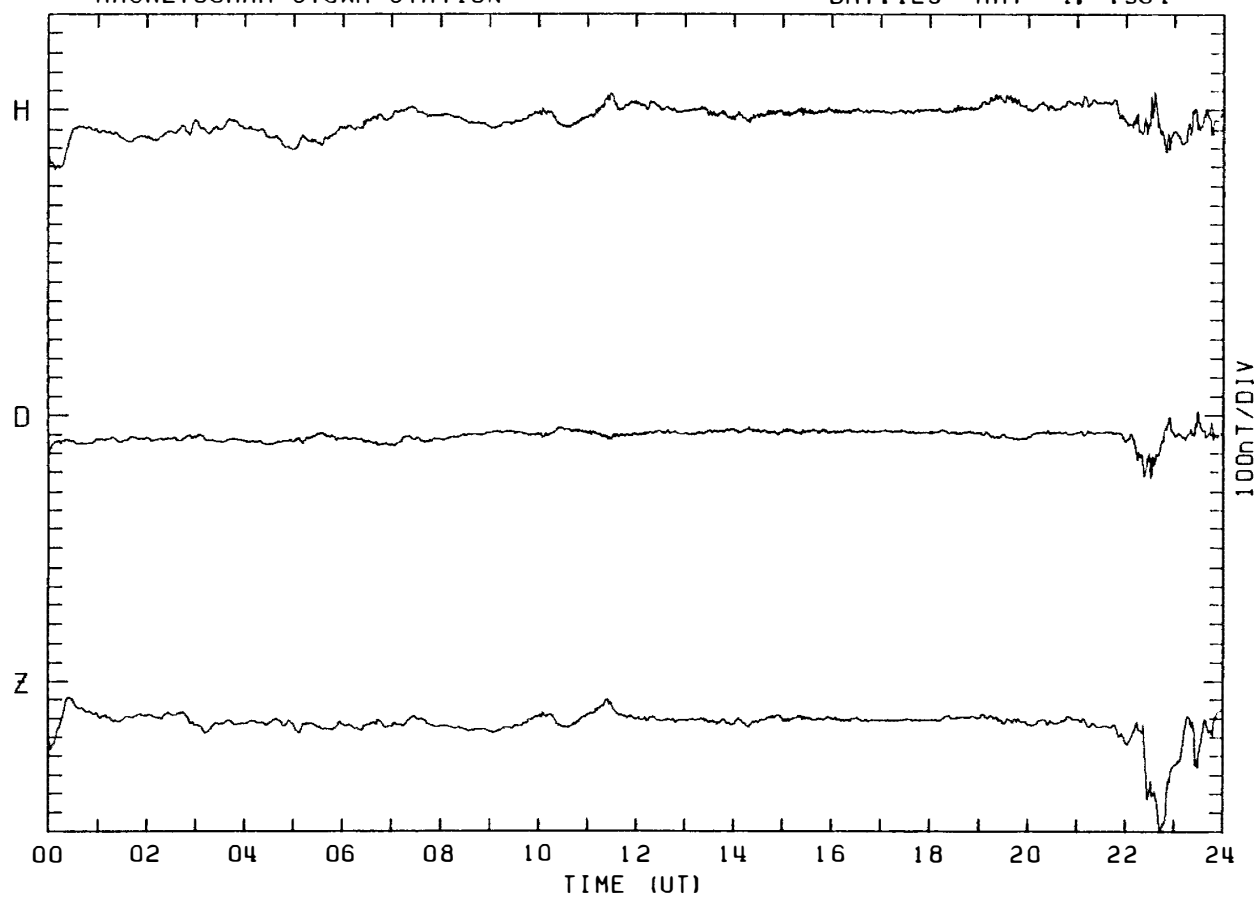
## MAGNETOGRAM SYOWA STATION

DAY:124 MAY 3, 1984



## MAGNETOGRAM SYOWA STATION

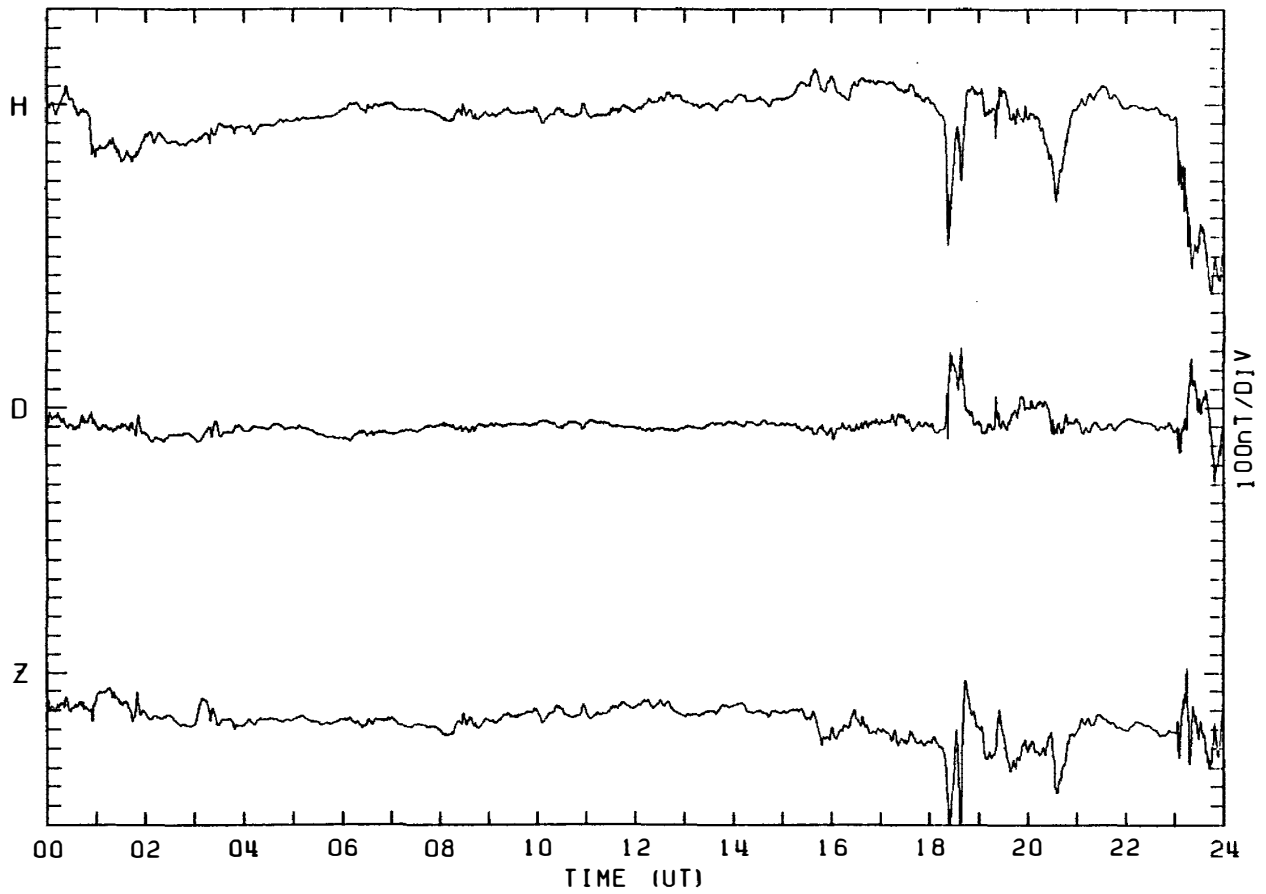
DAY:125 MAY 4, 1984





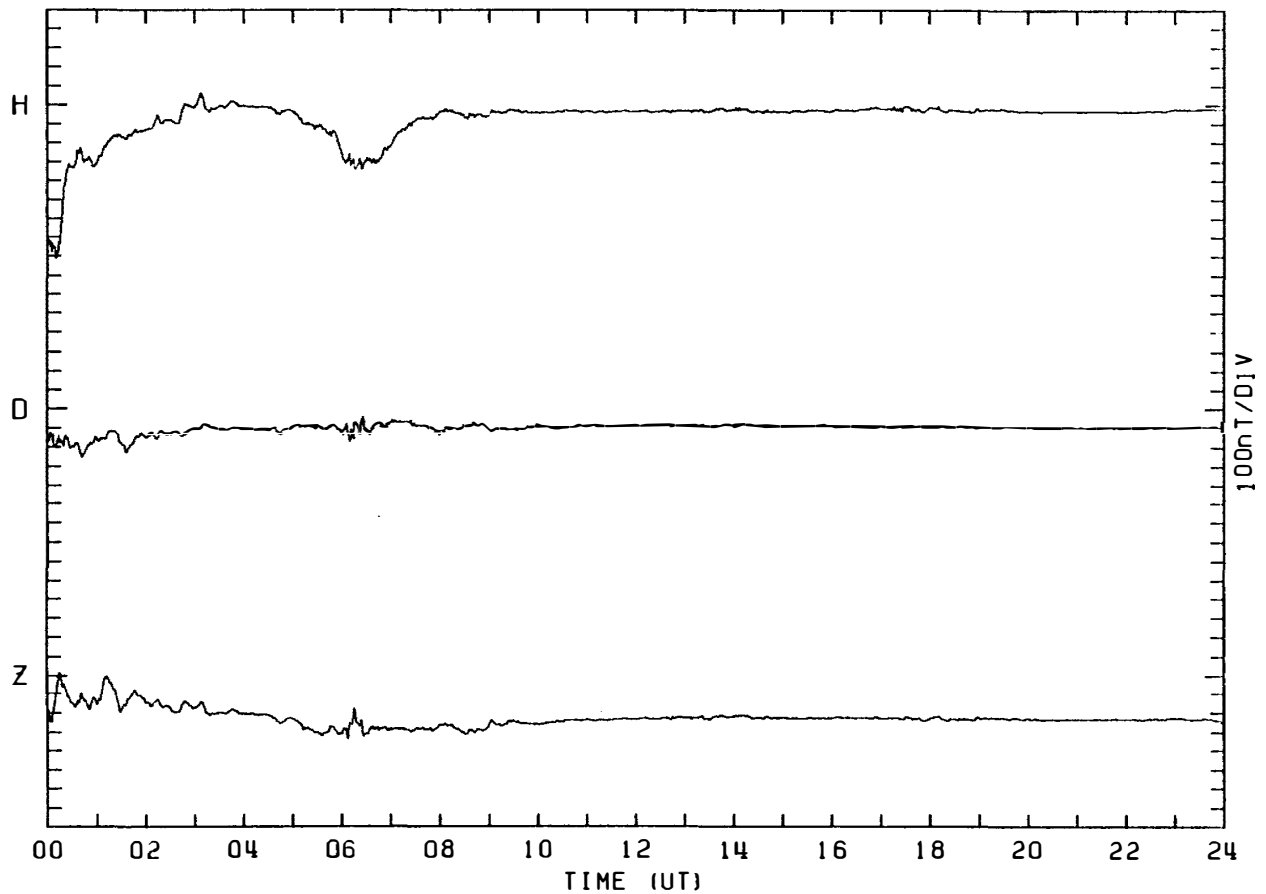
MAGNETOGRAM SYOWA STATION

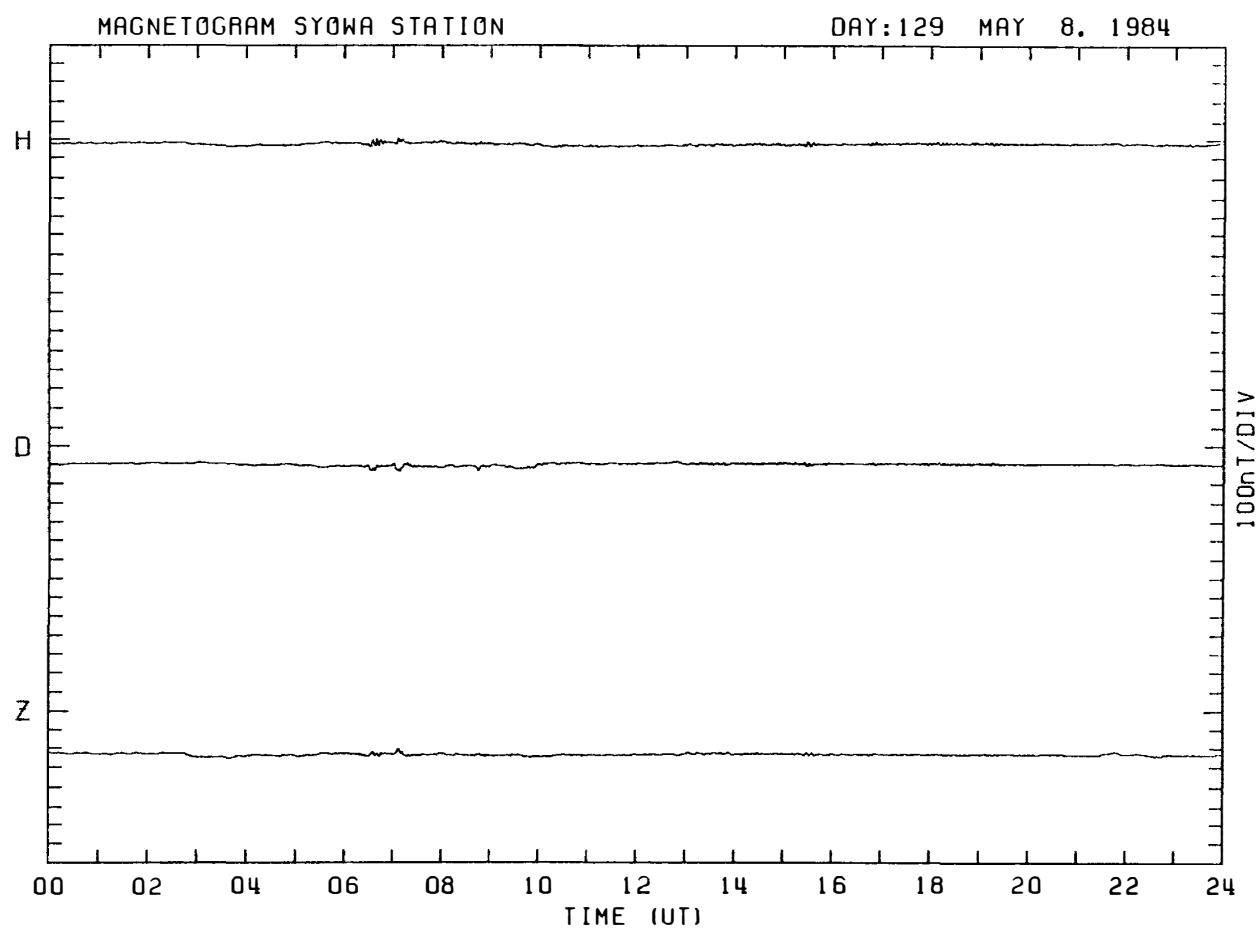
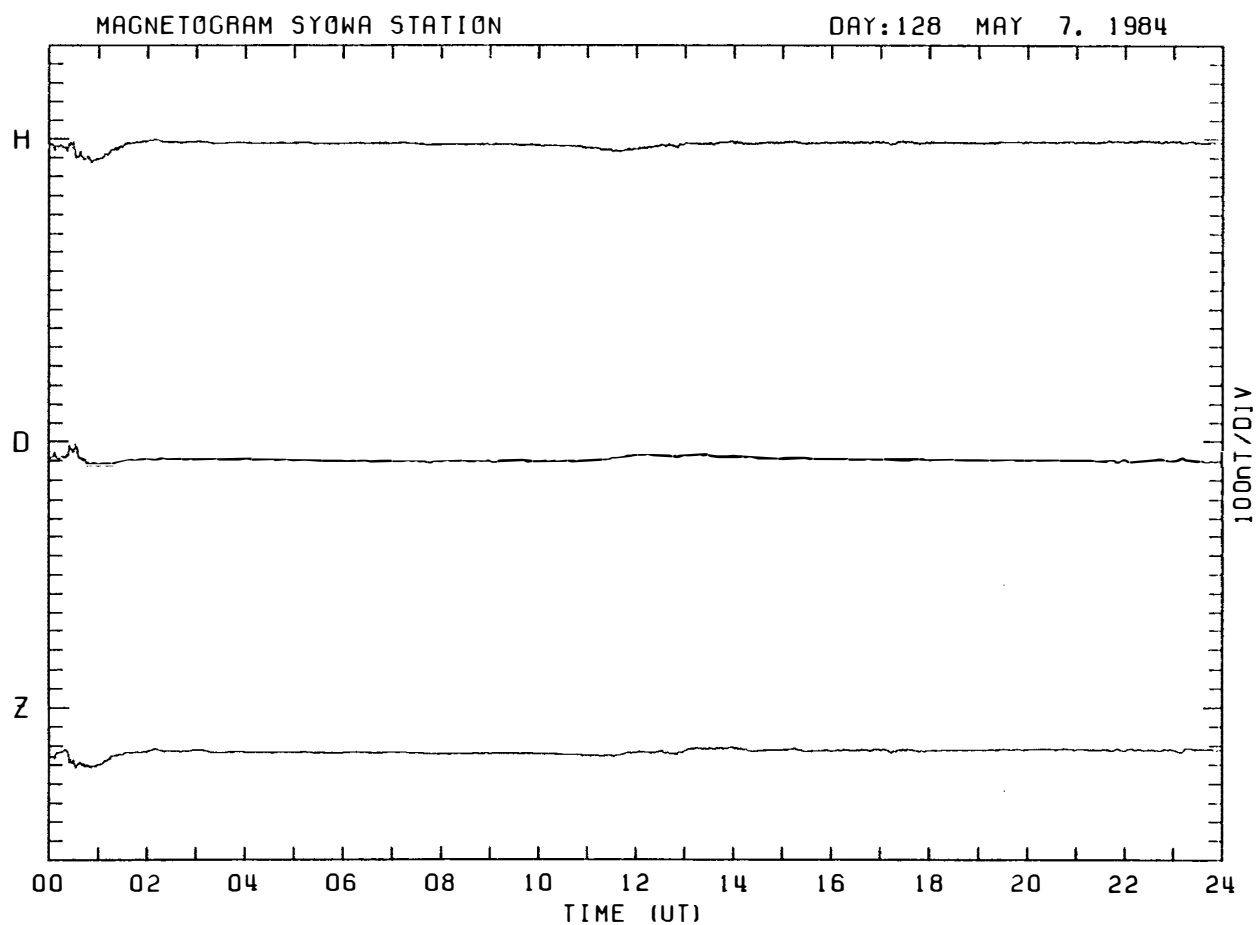
DAY:126 MAY 5. 1984

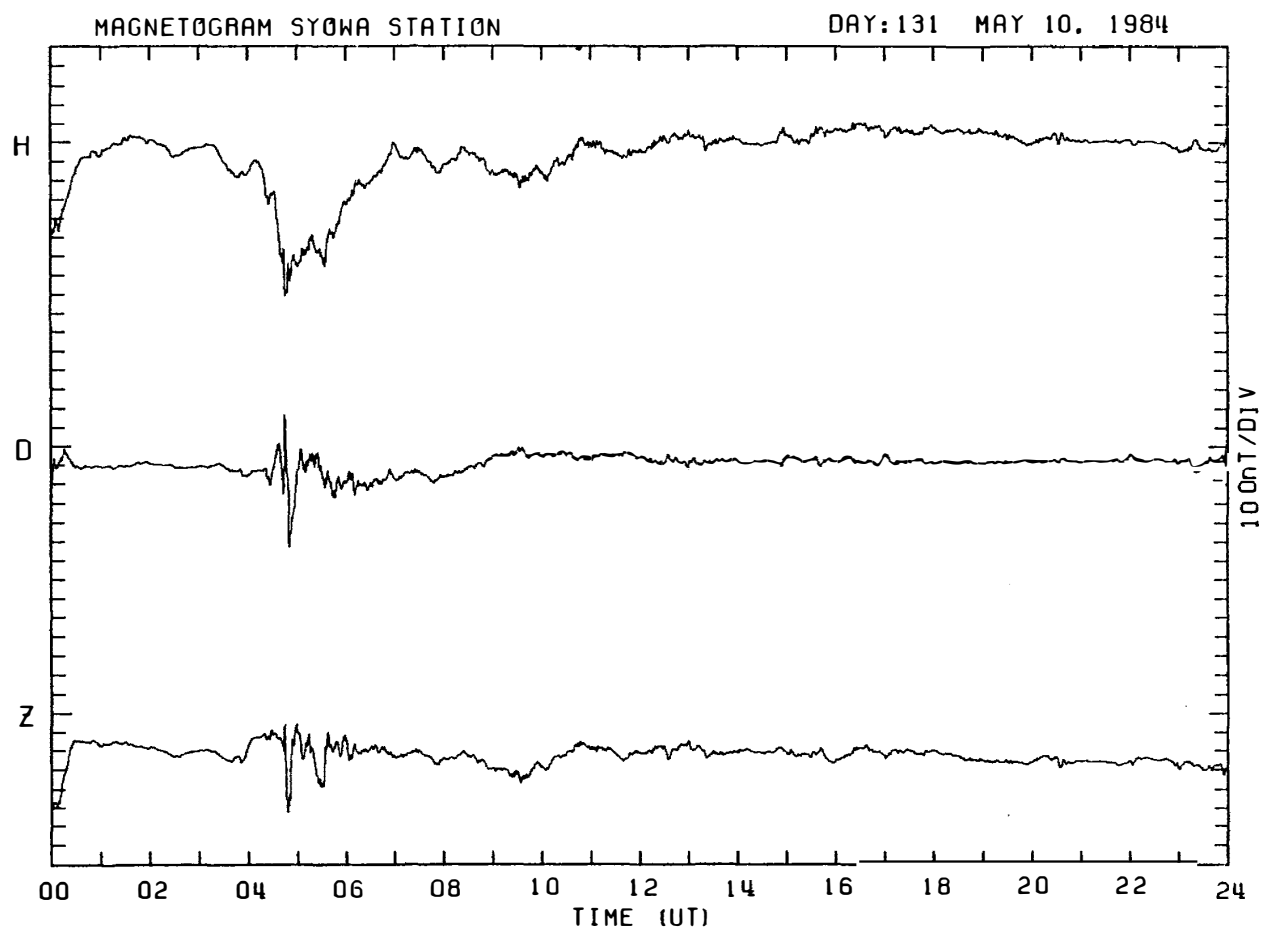
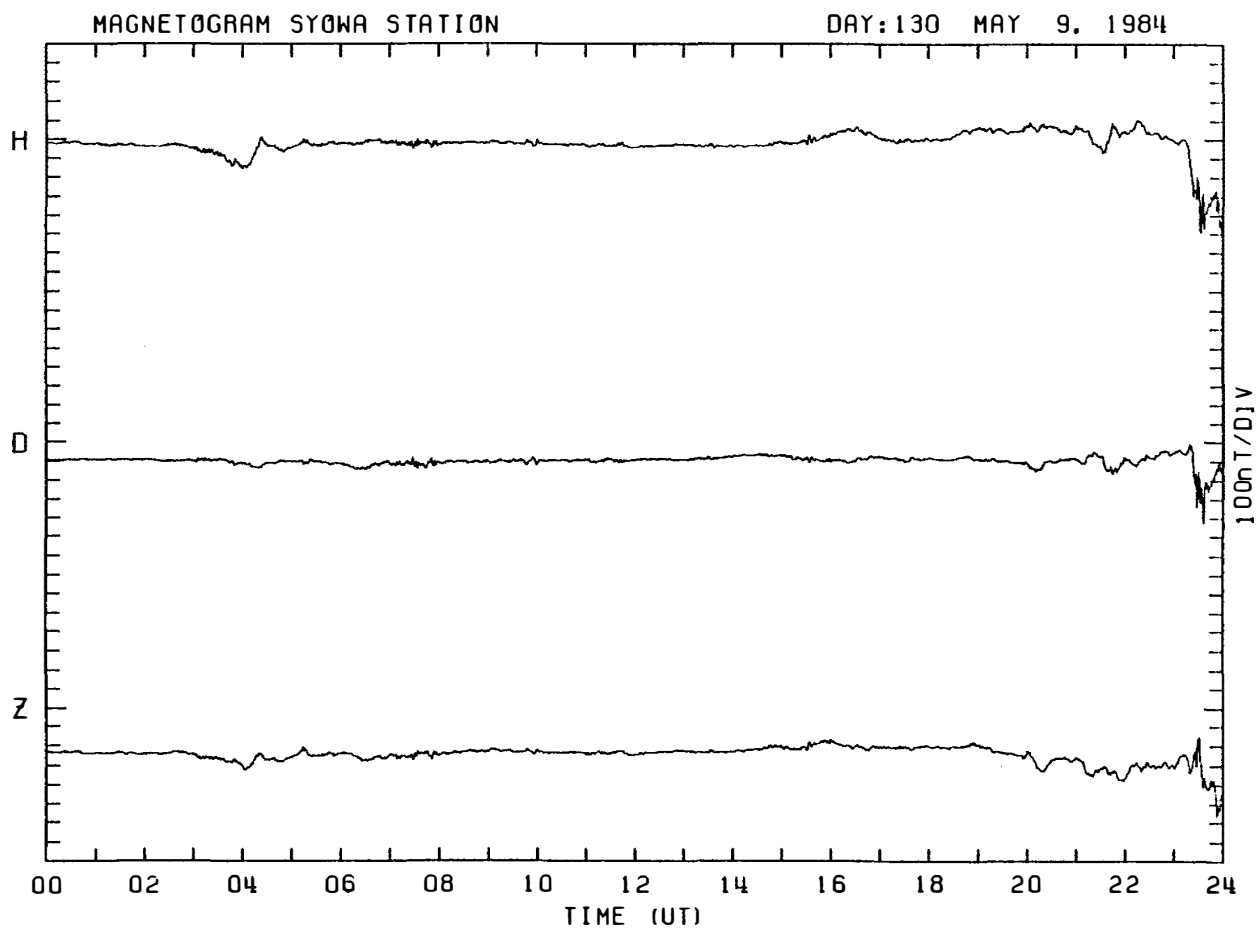


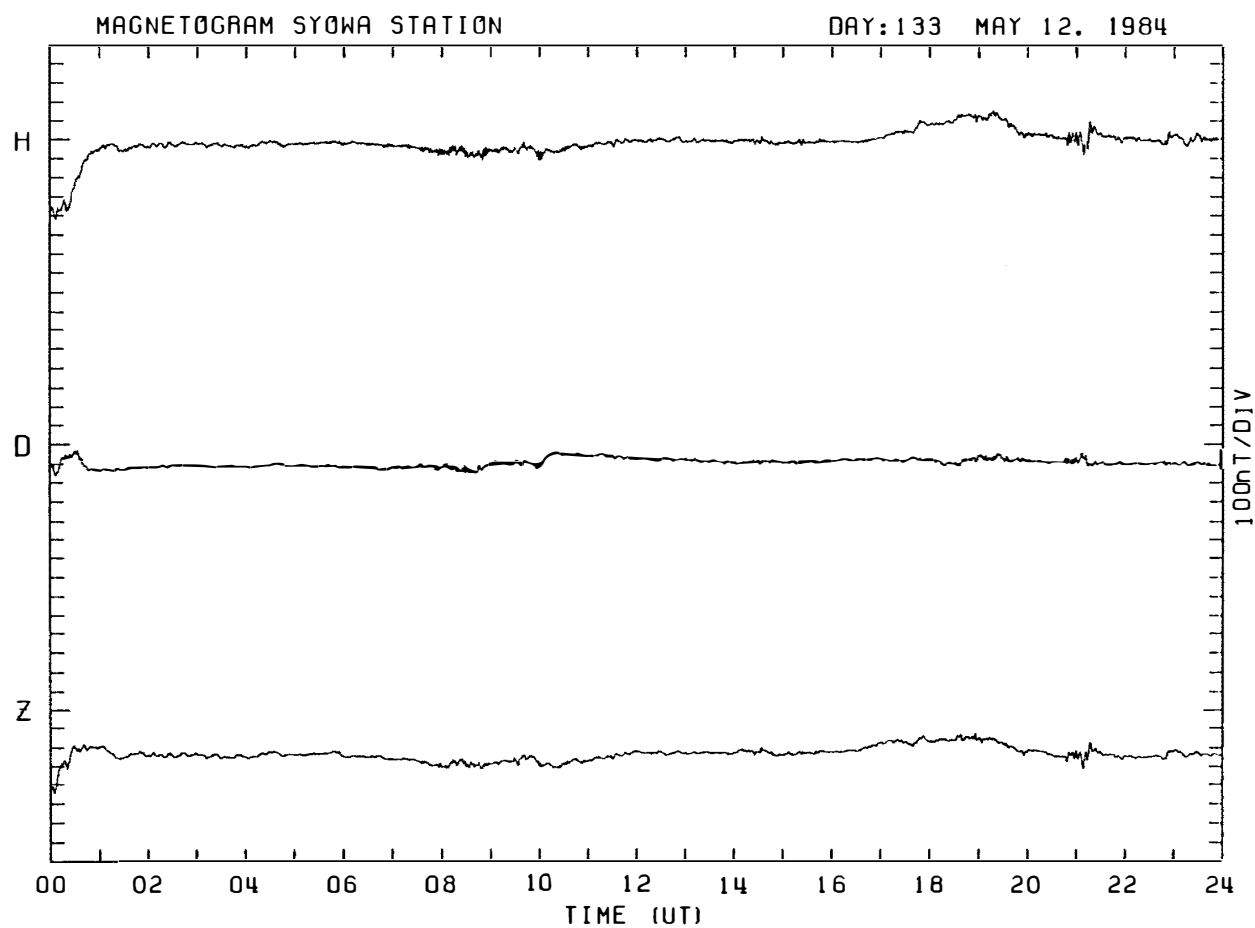
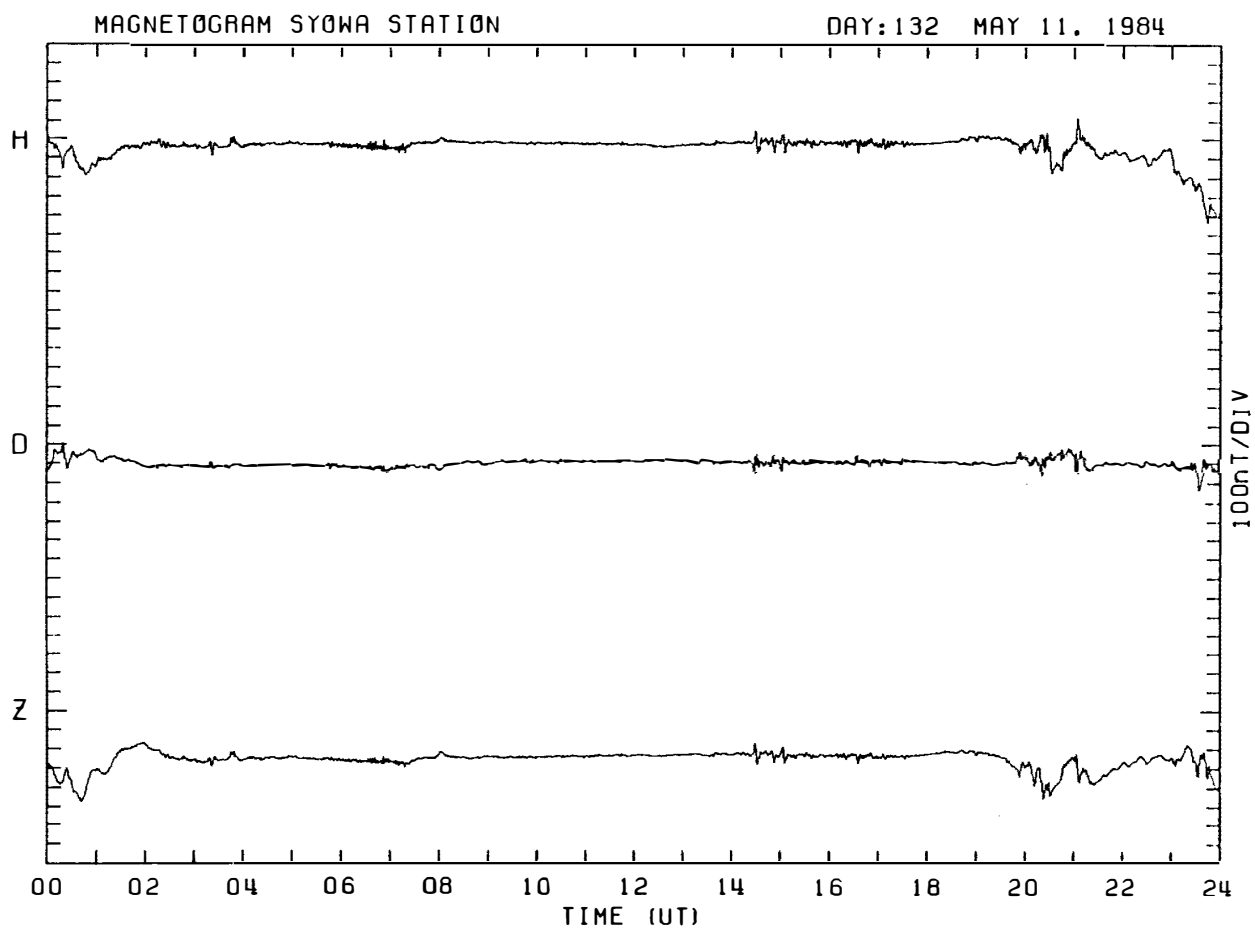
MAGNETOGRAM SYOWA STATION

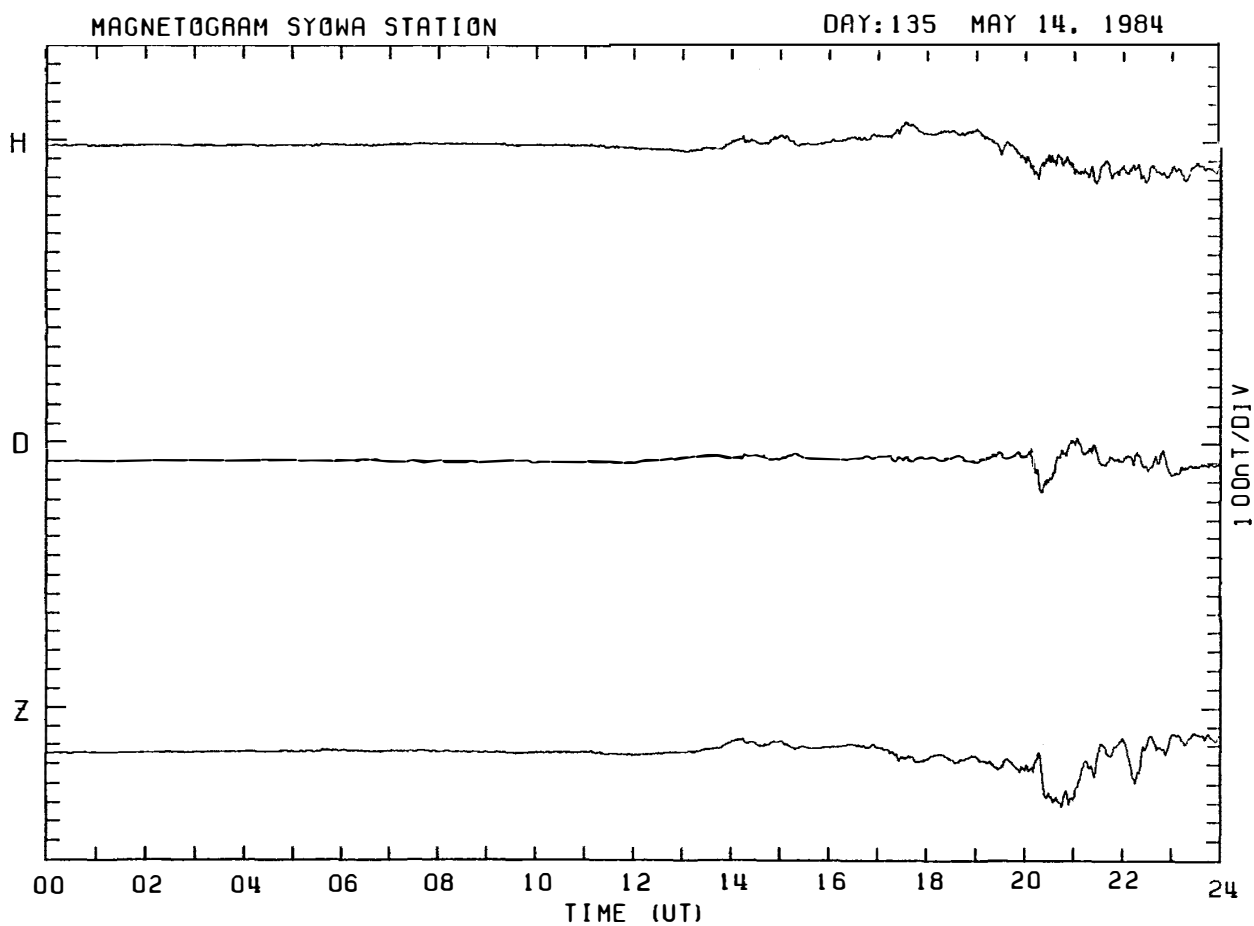
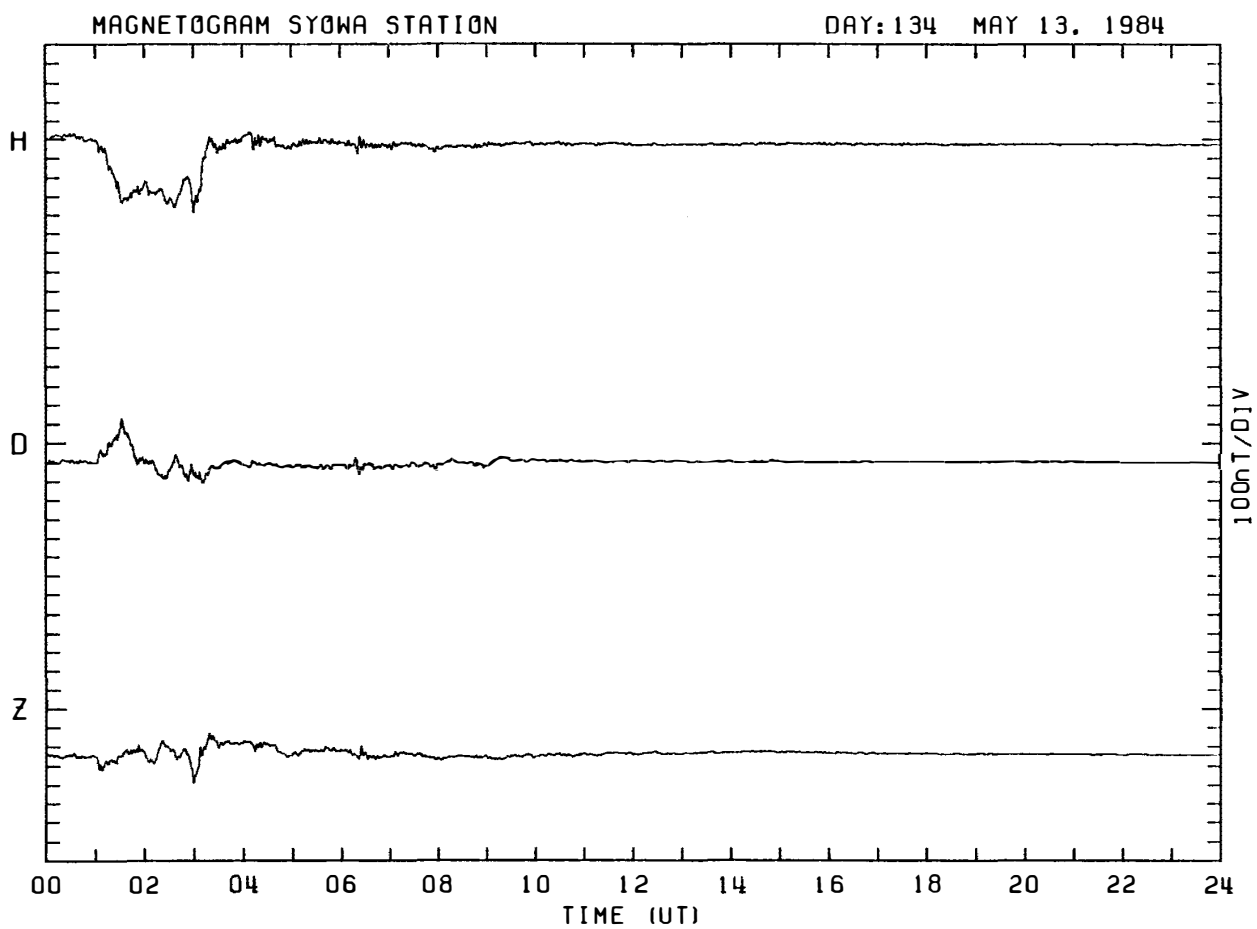
DAY:127 MAY 6. 1984

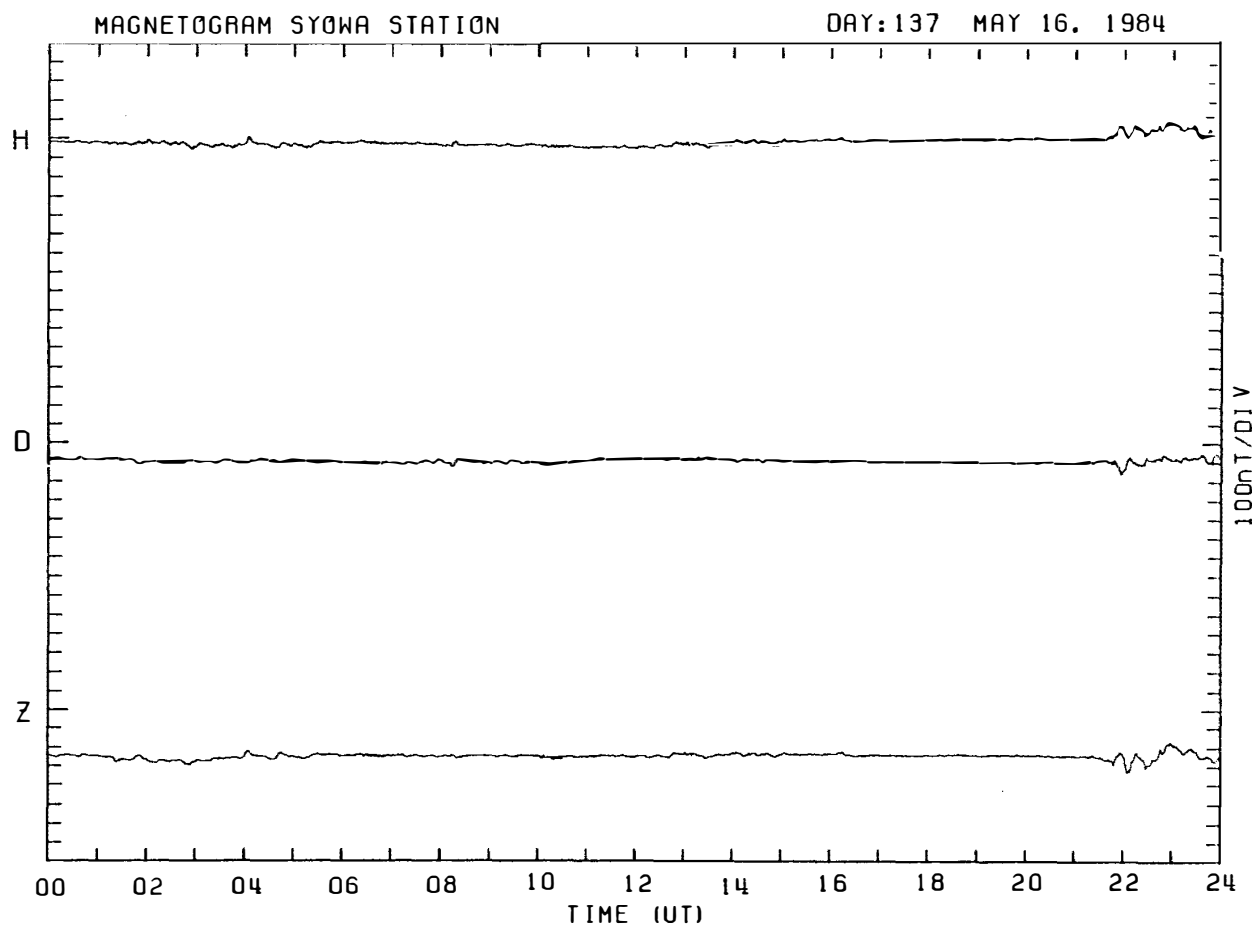
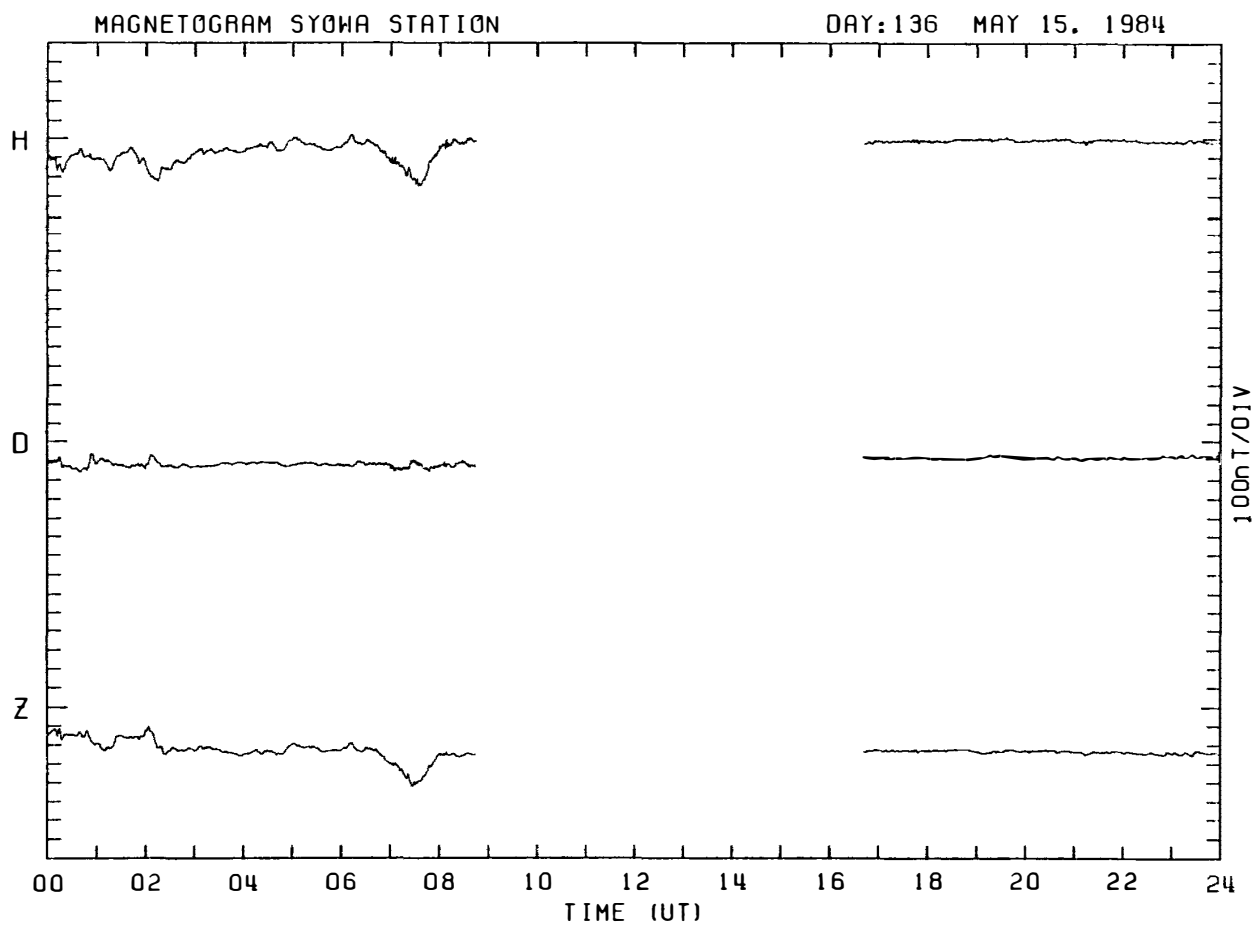


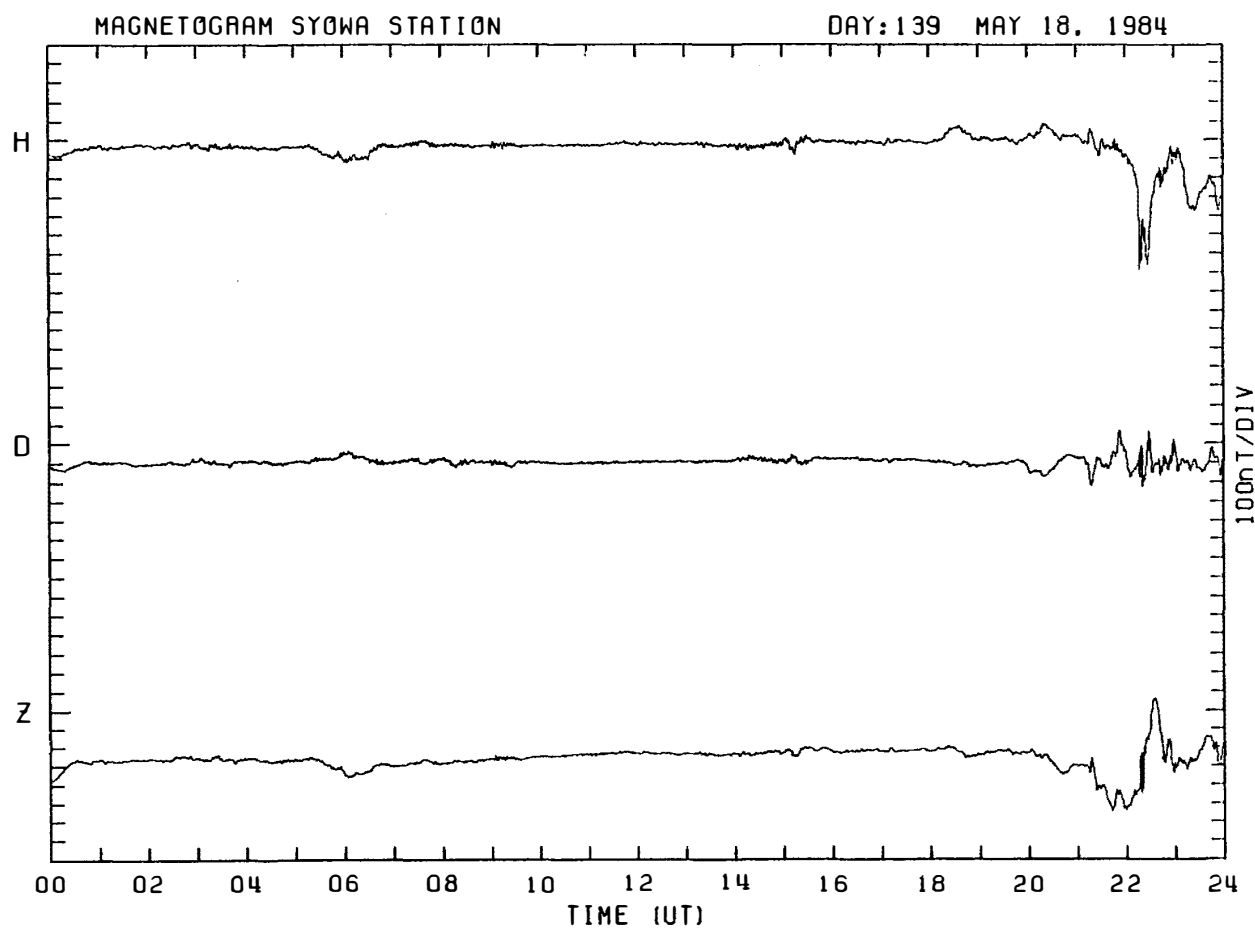
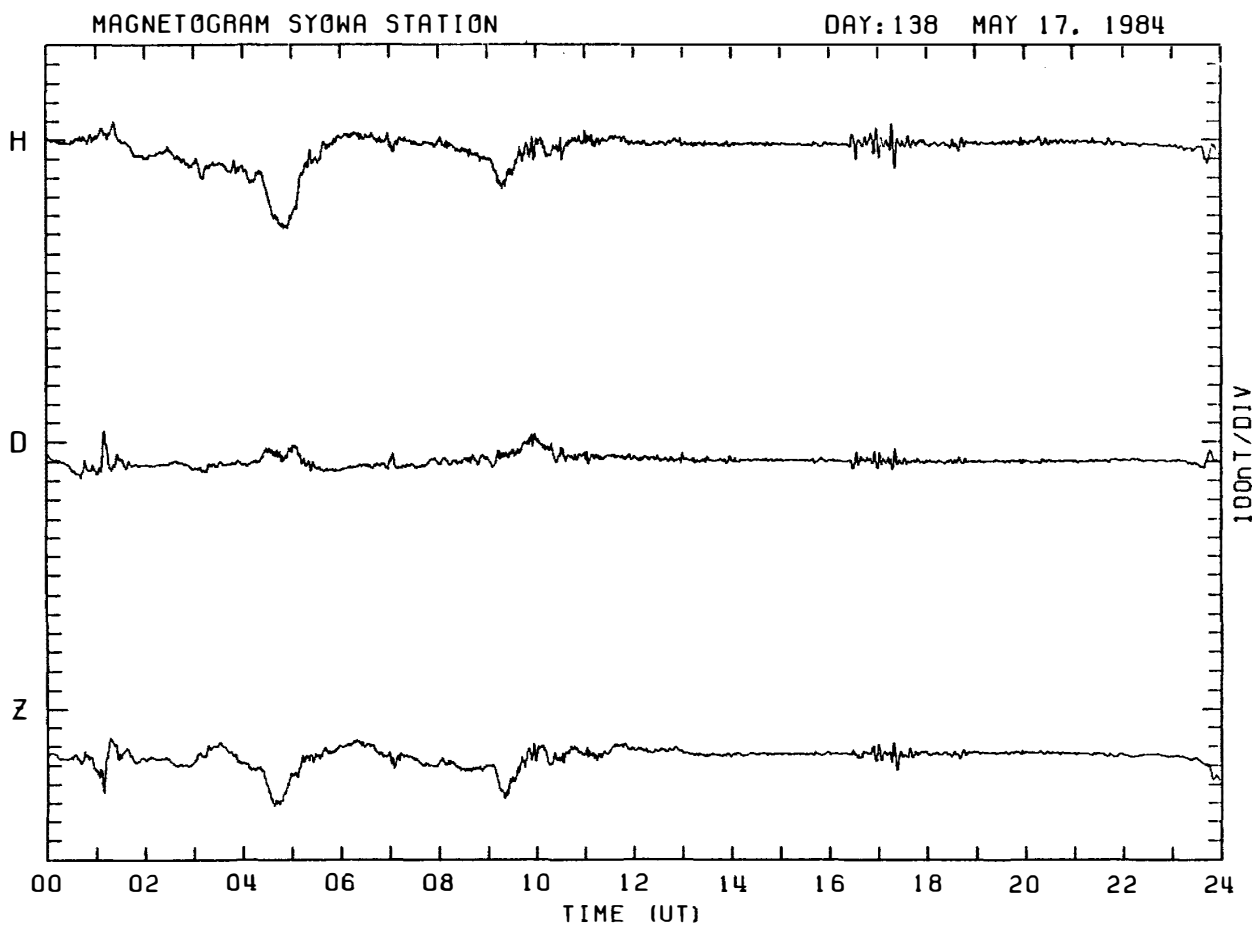


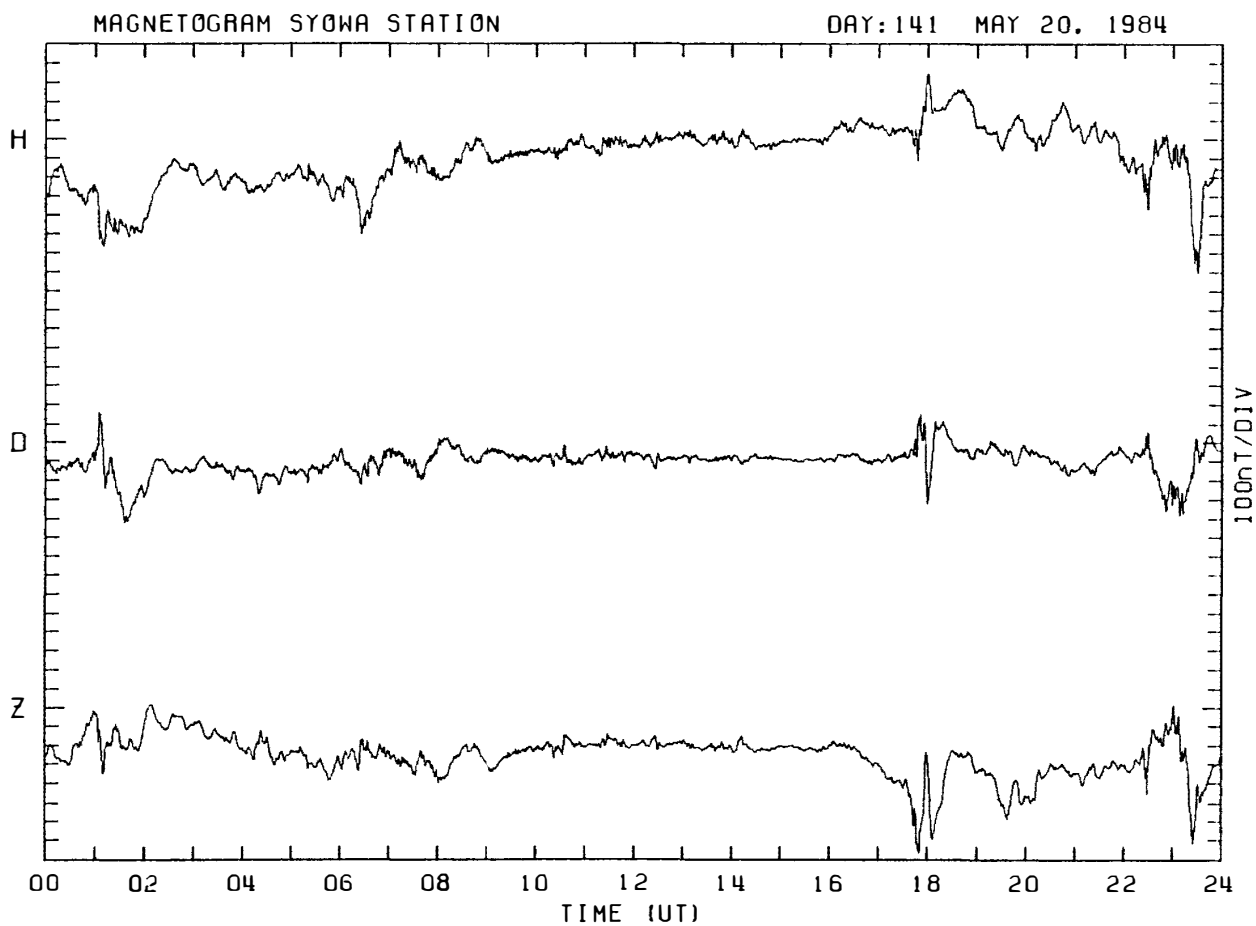
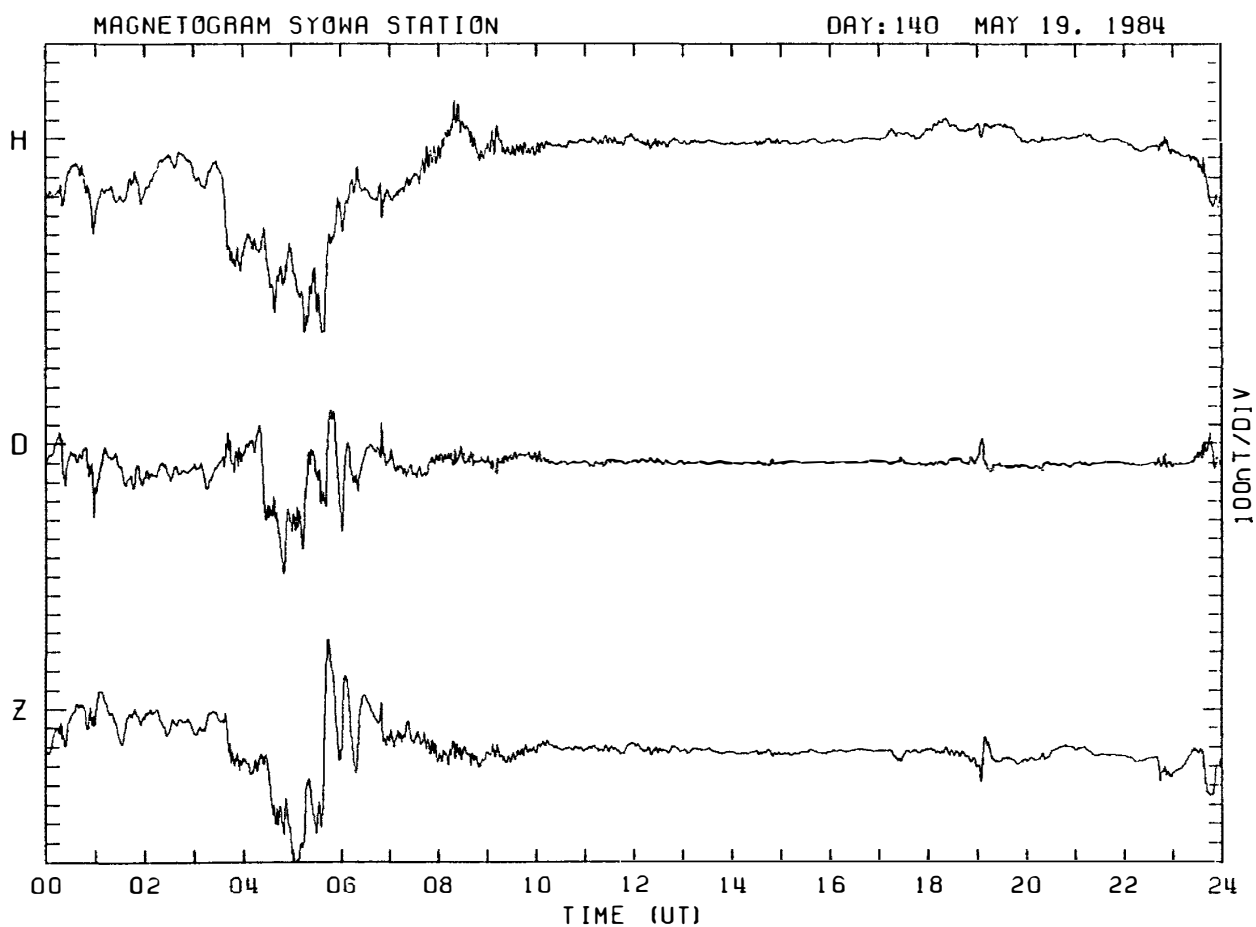




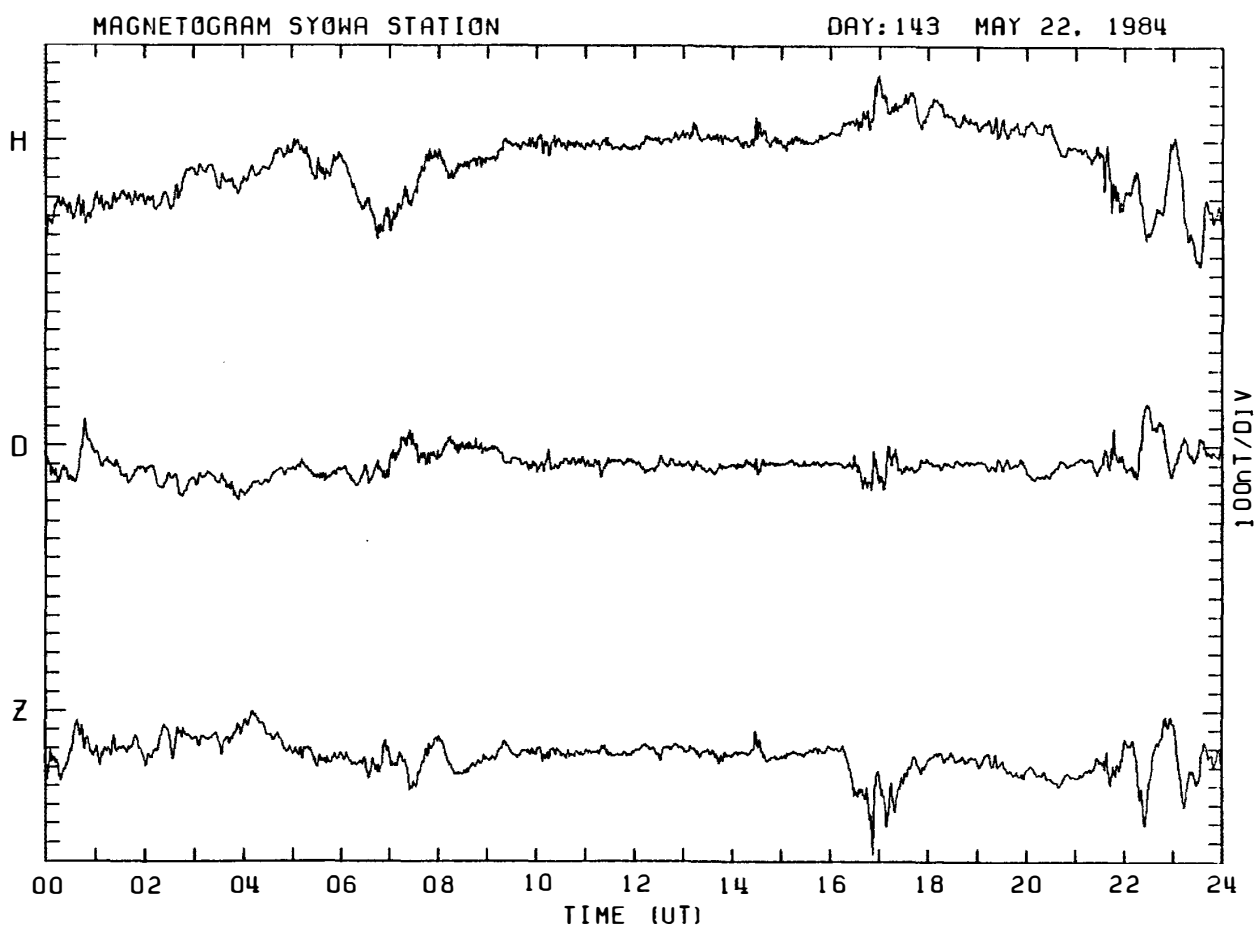
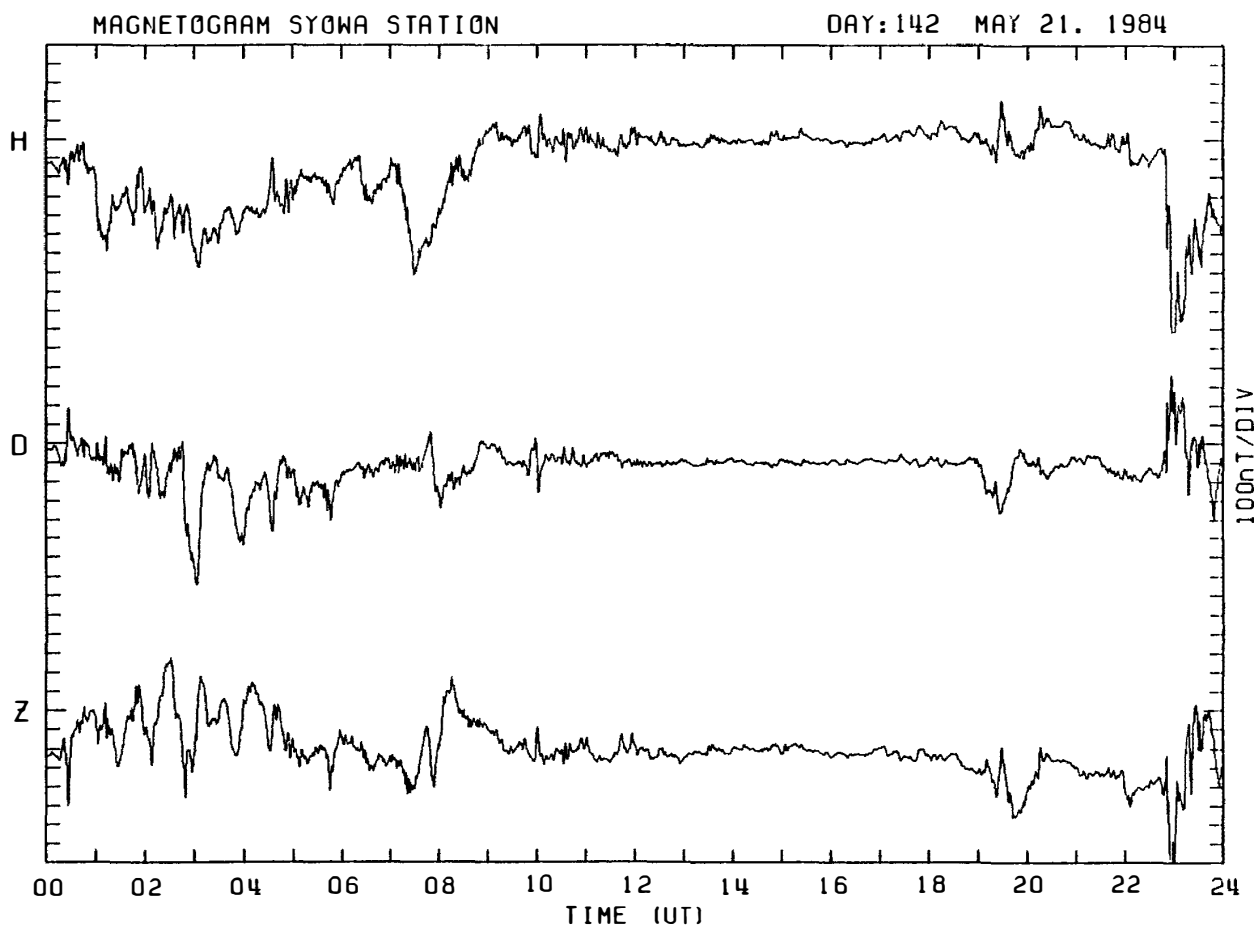






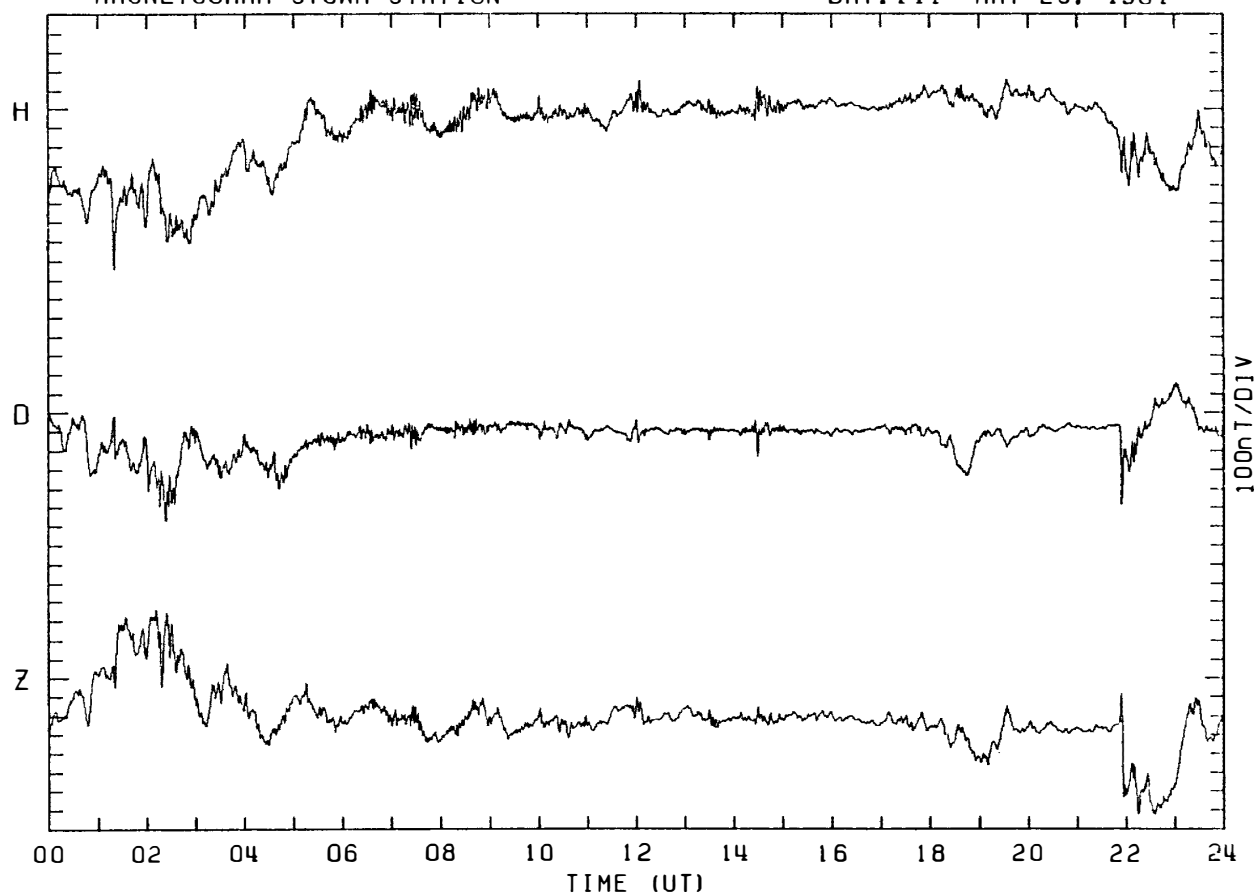






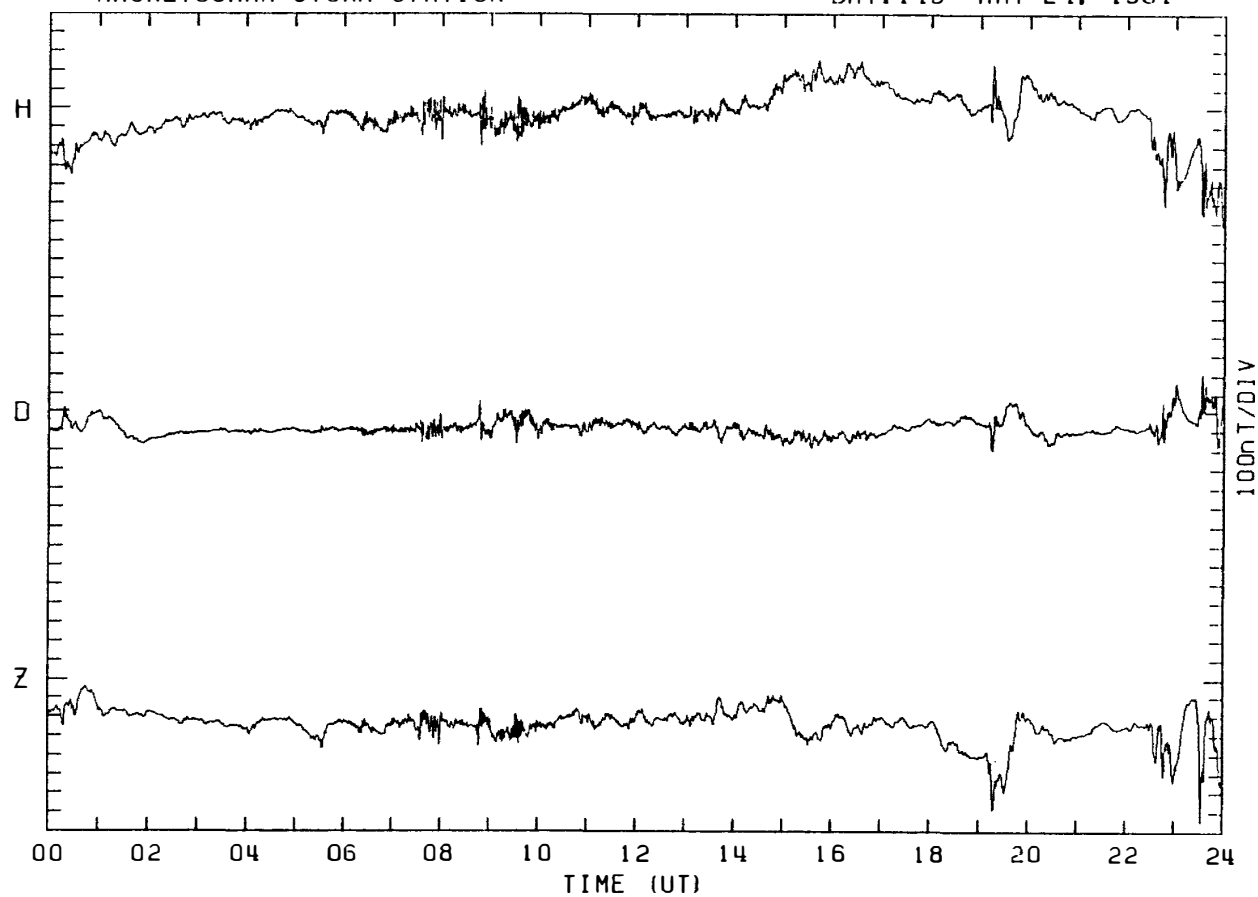
MAGNETOGRAM SYOWA STATION

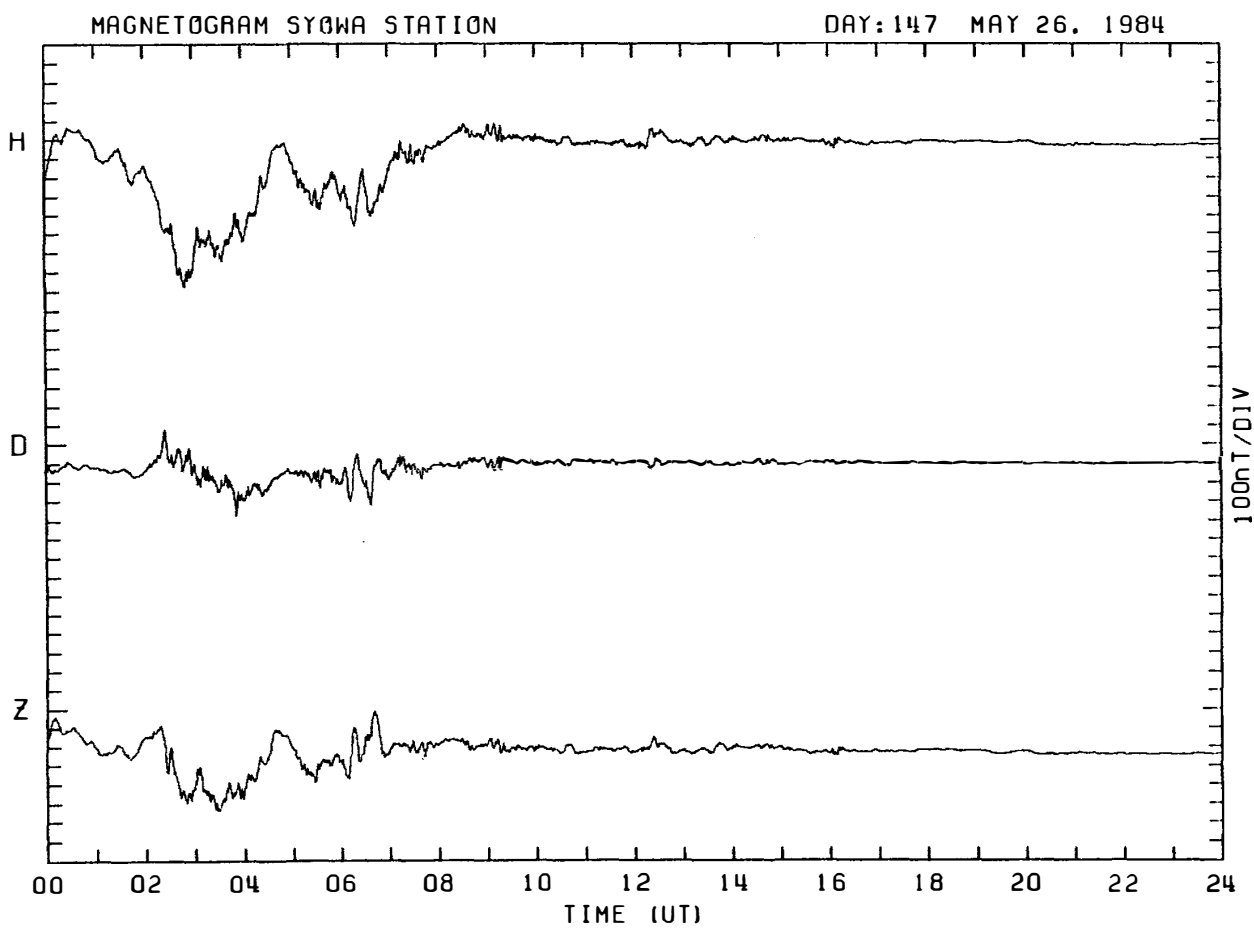
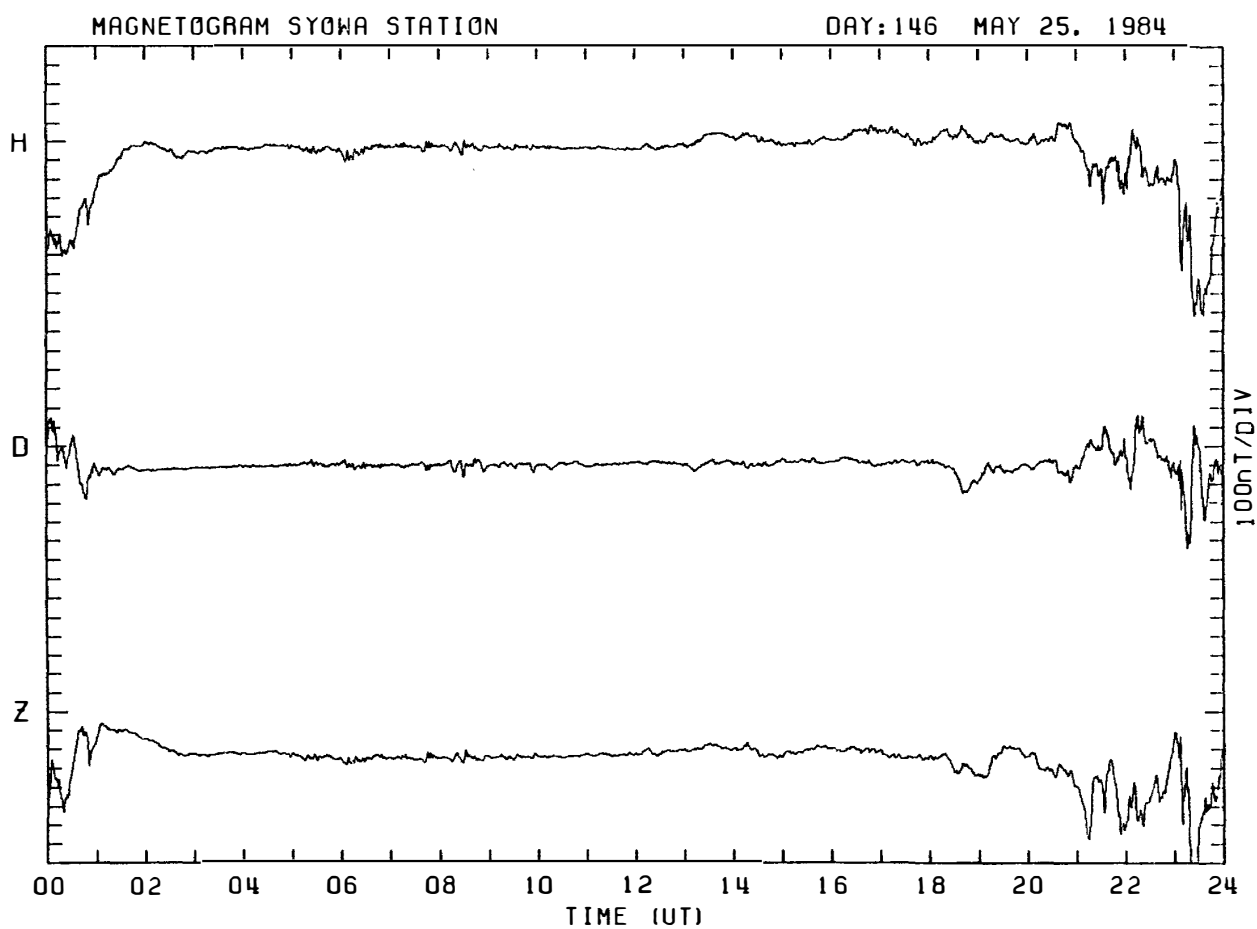
DAY: 144 MAY 23, 1984

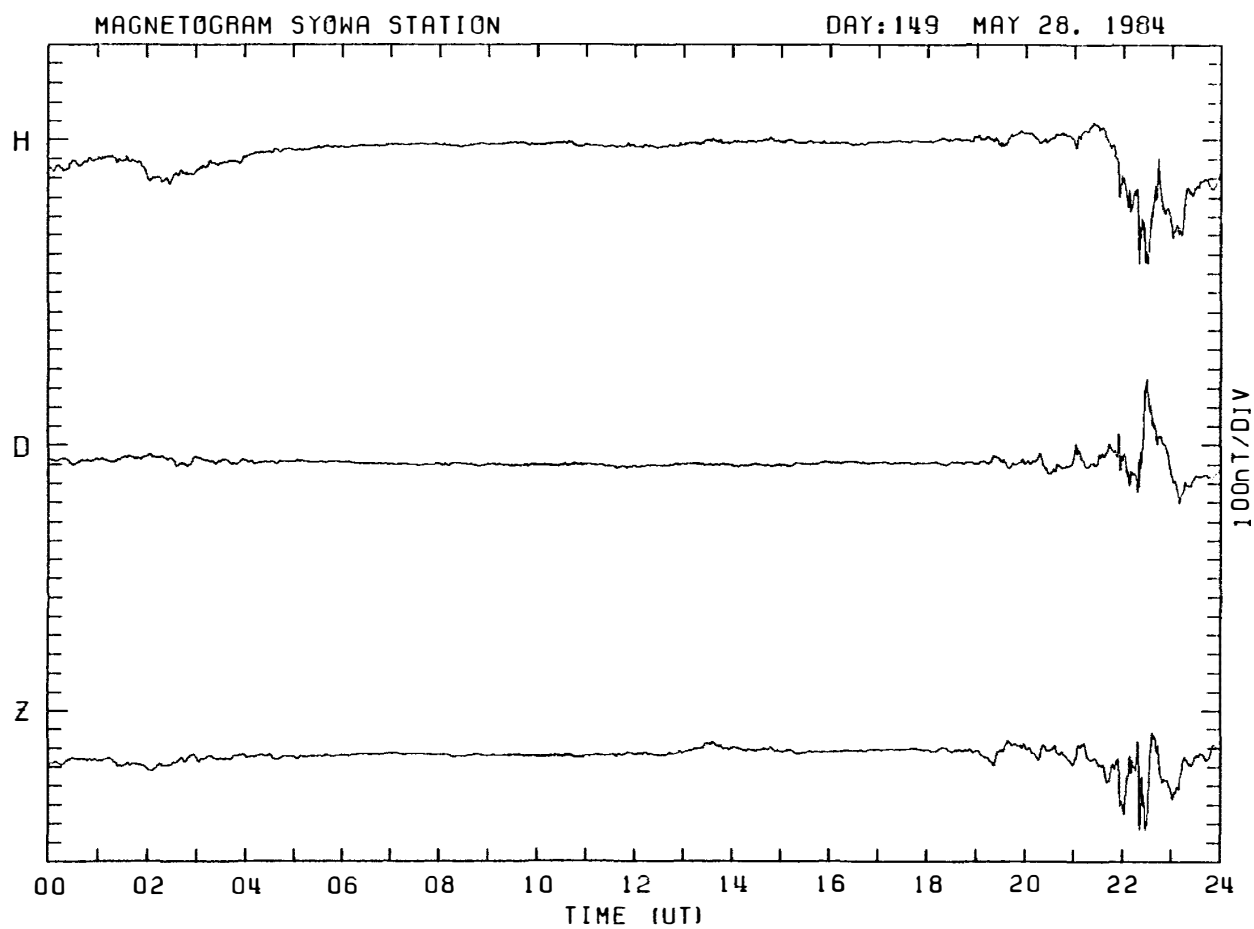
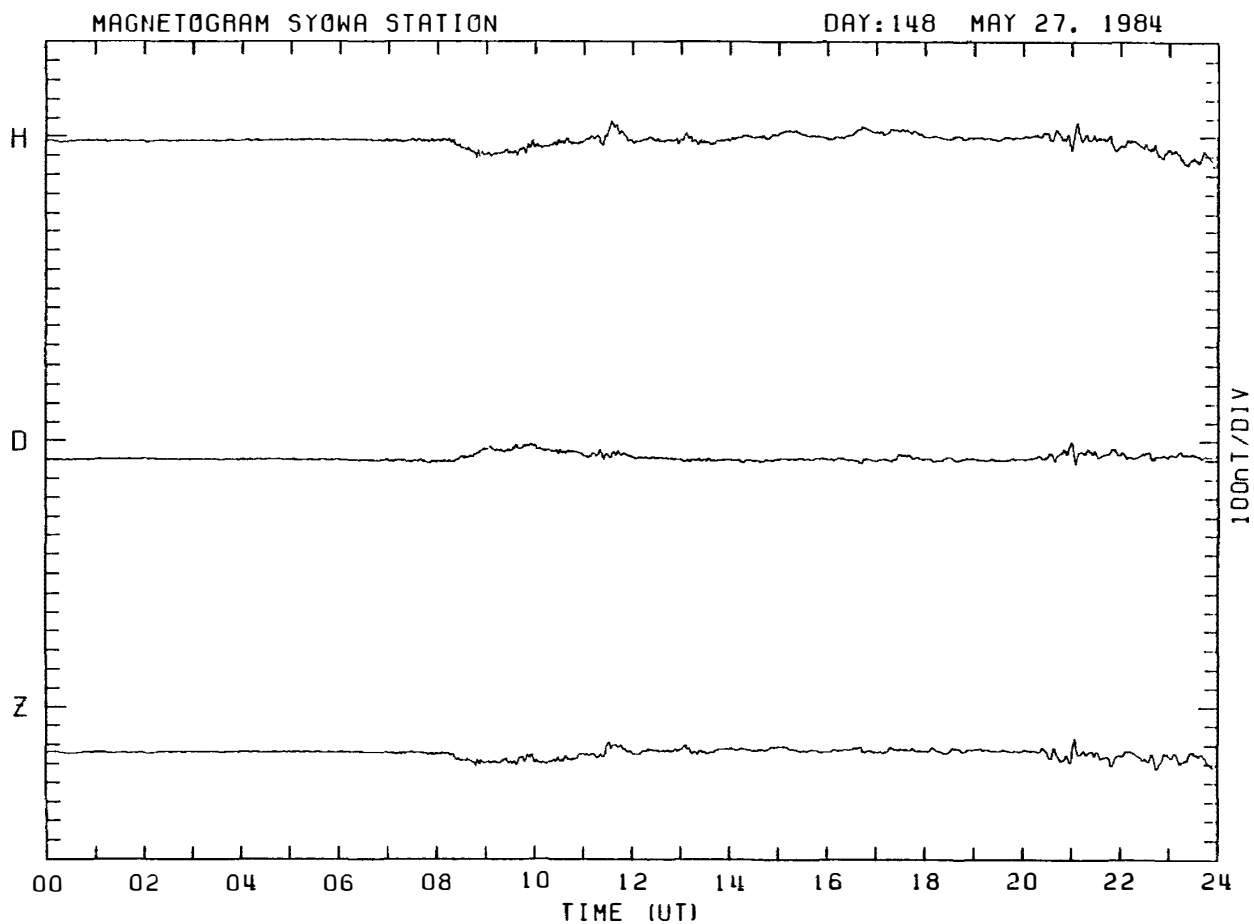


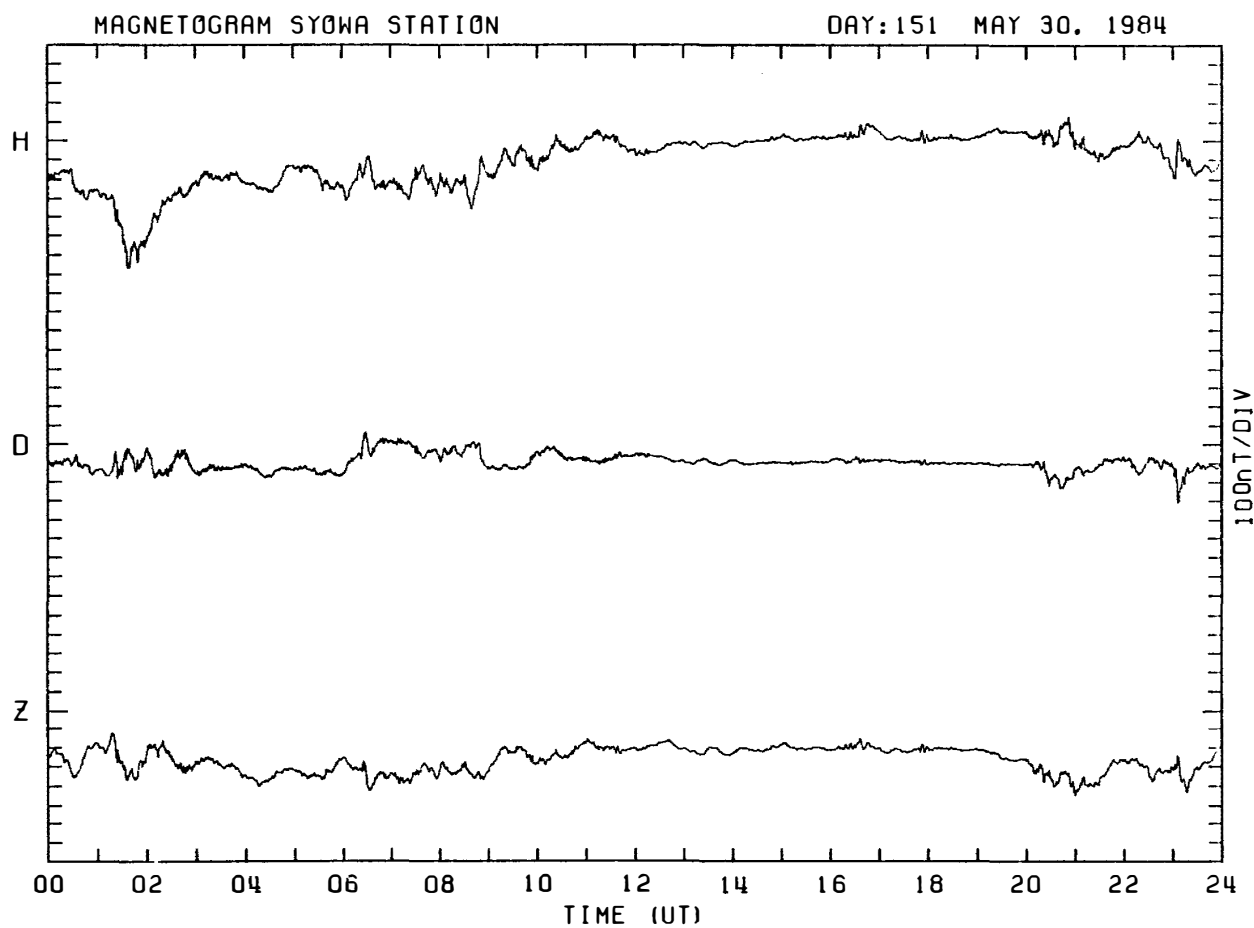
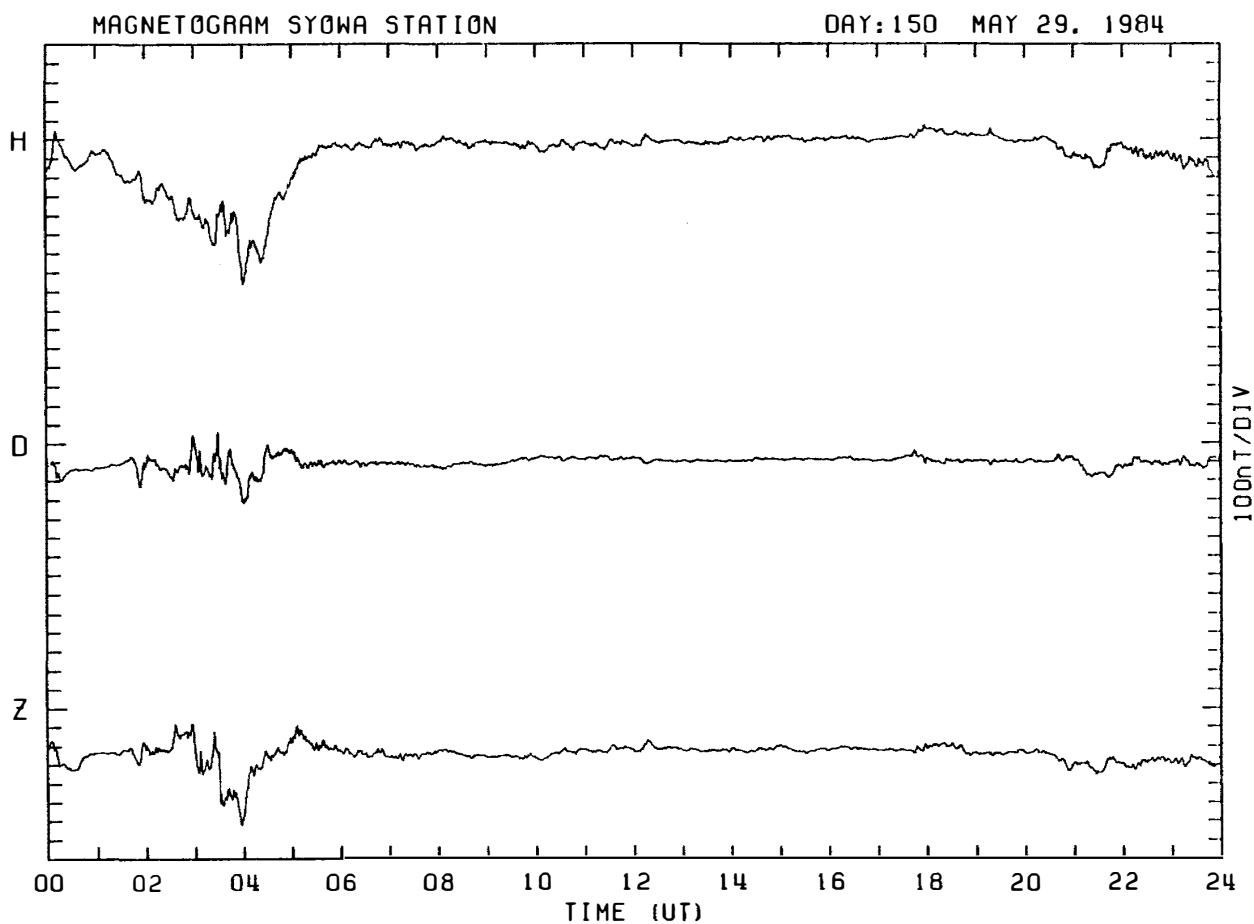
MAGNETOGRAM SYOWA STATION

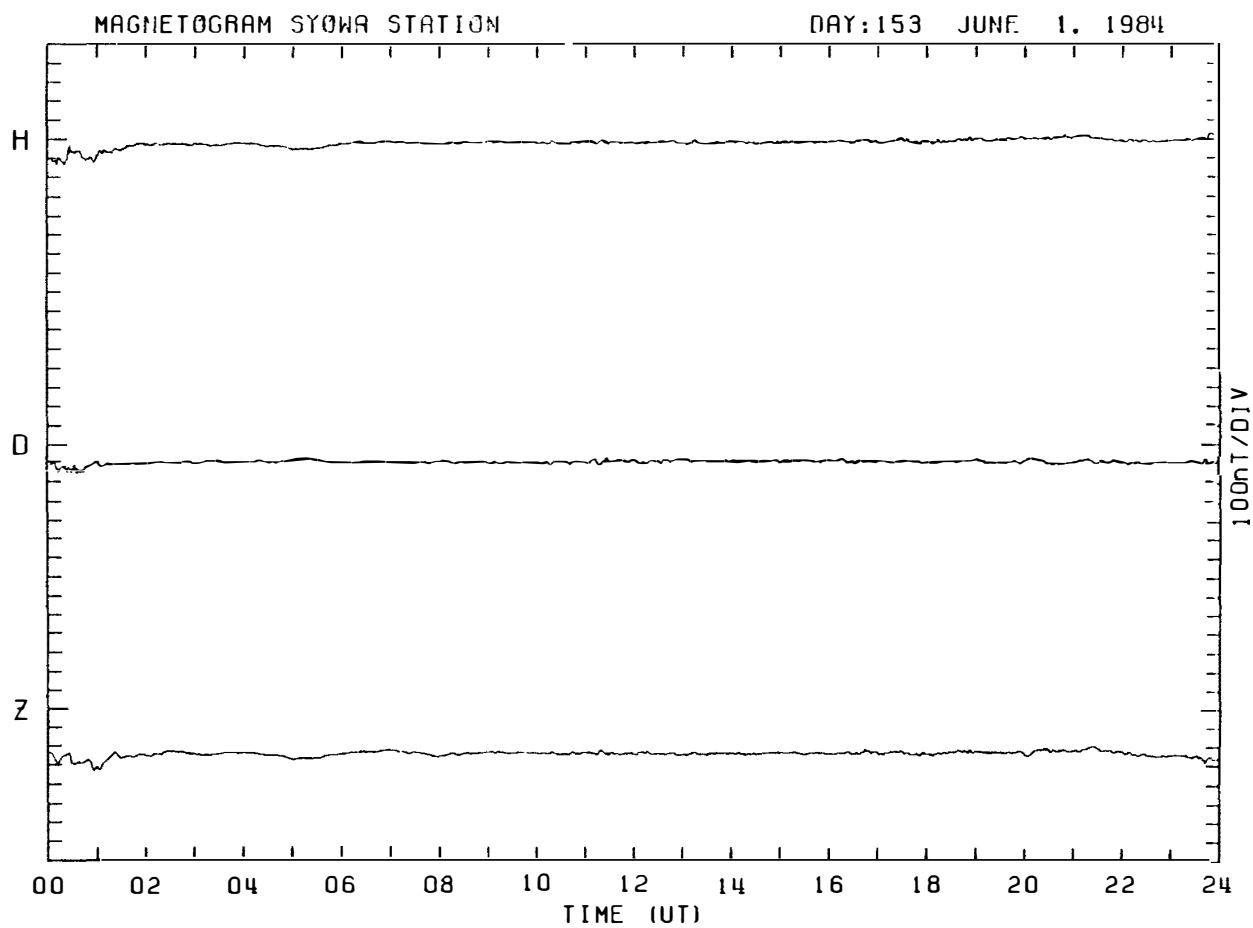
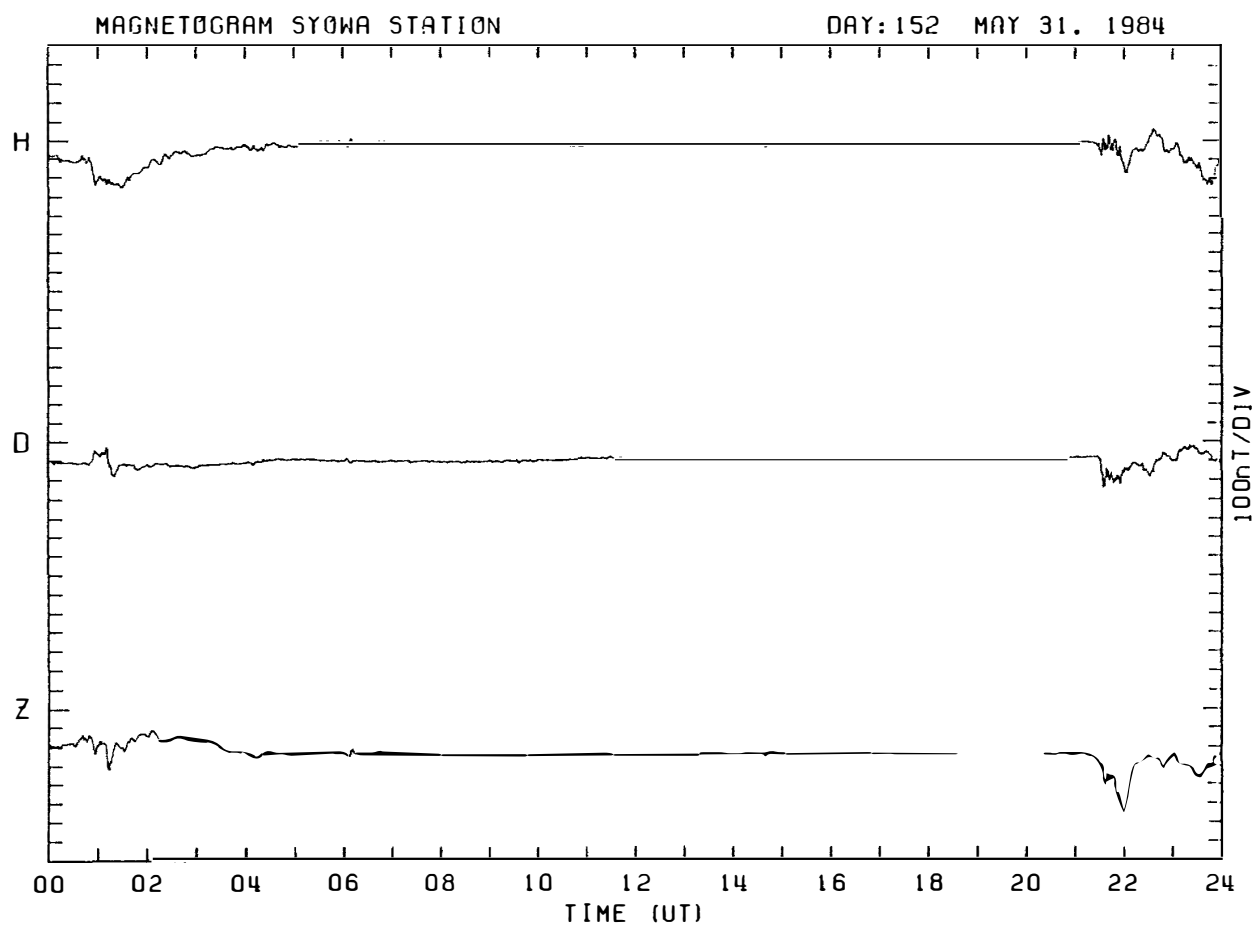
DAY: 145 MAY 24, 1984

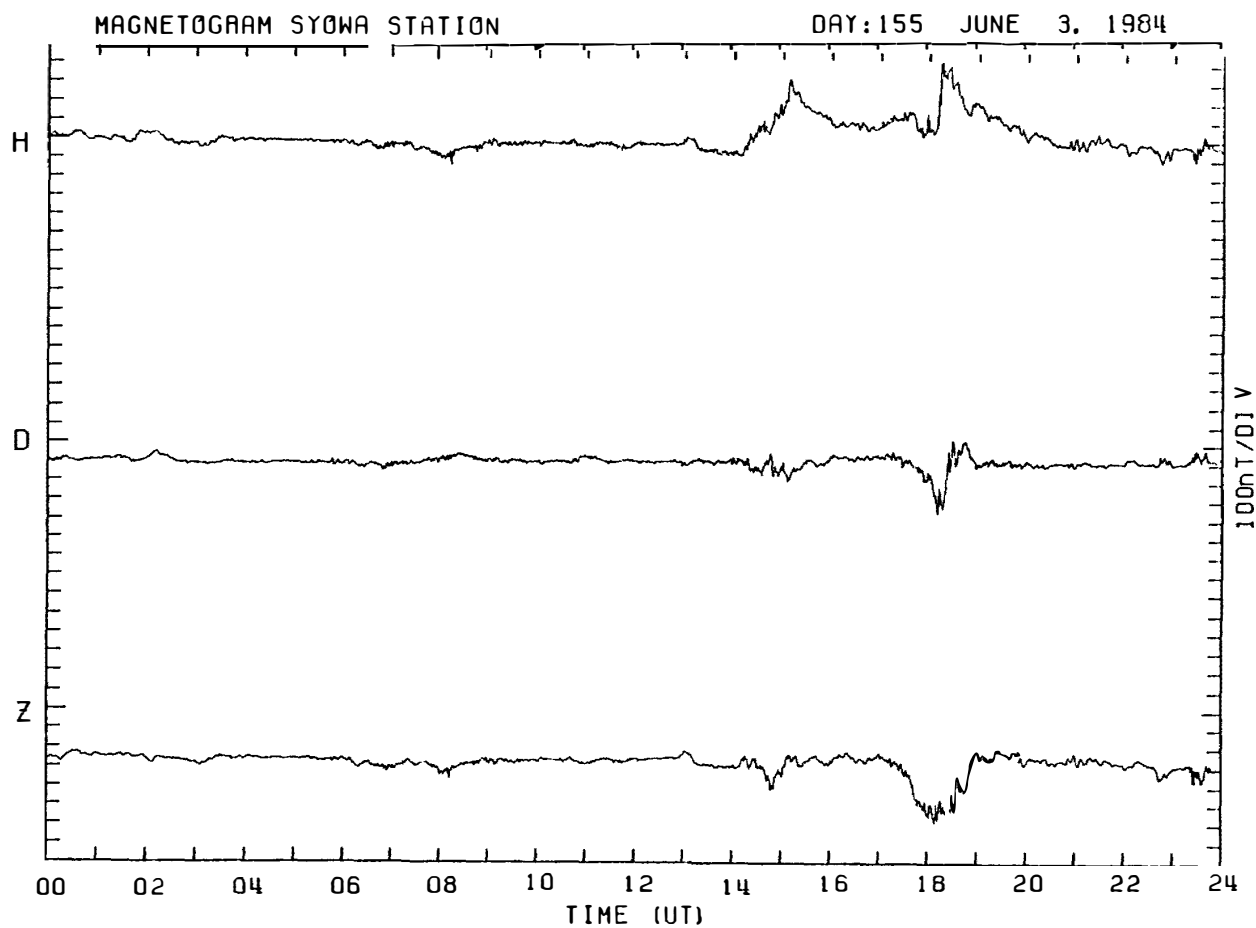
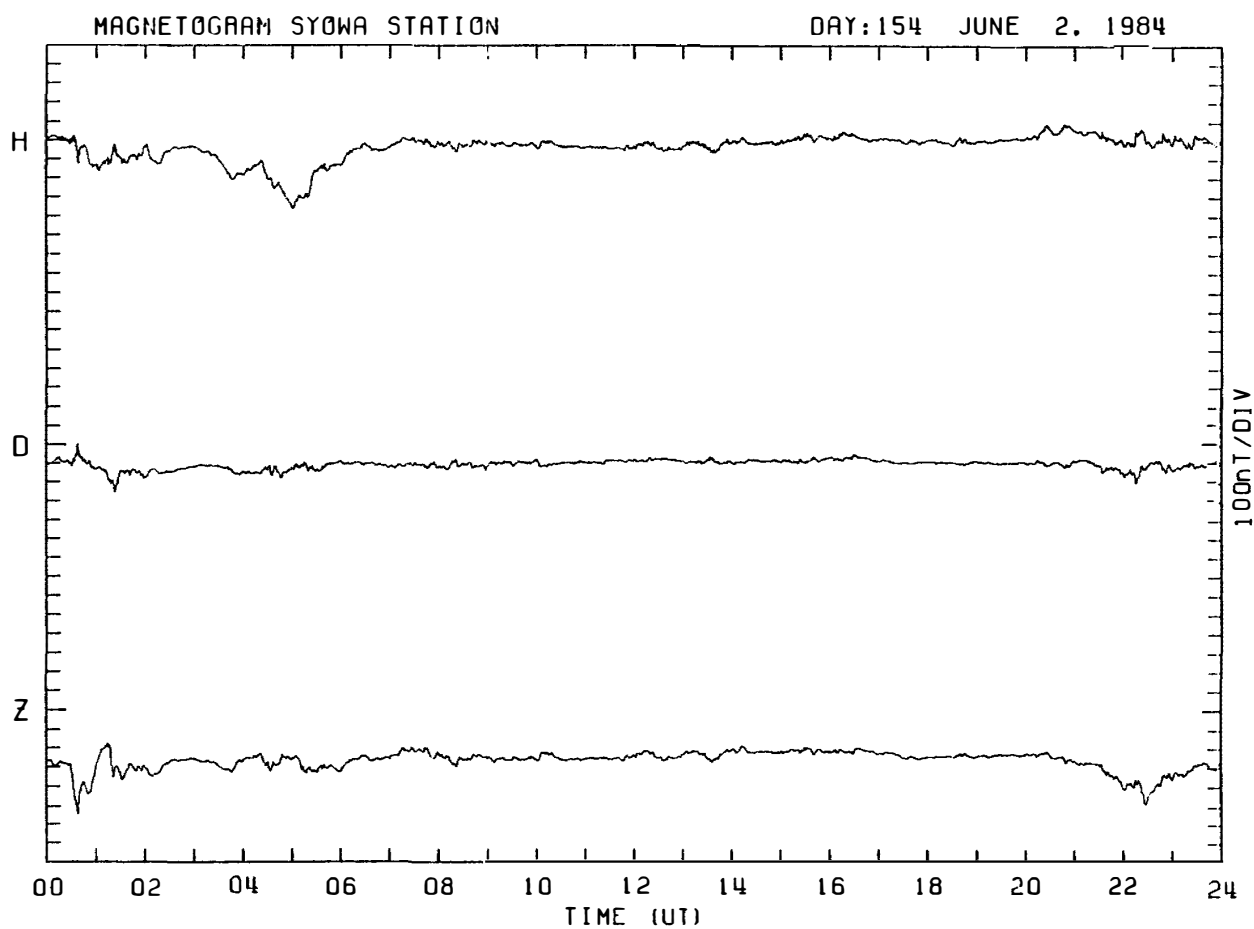


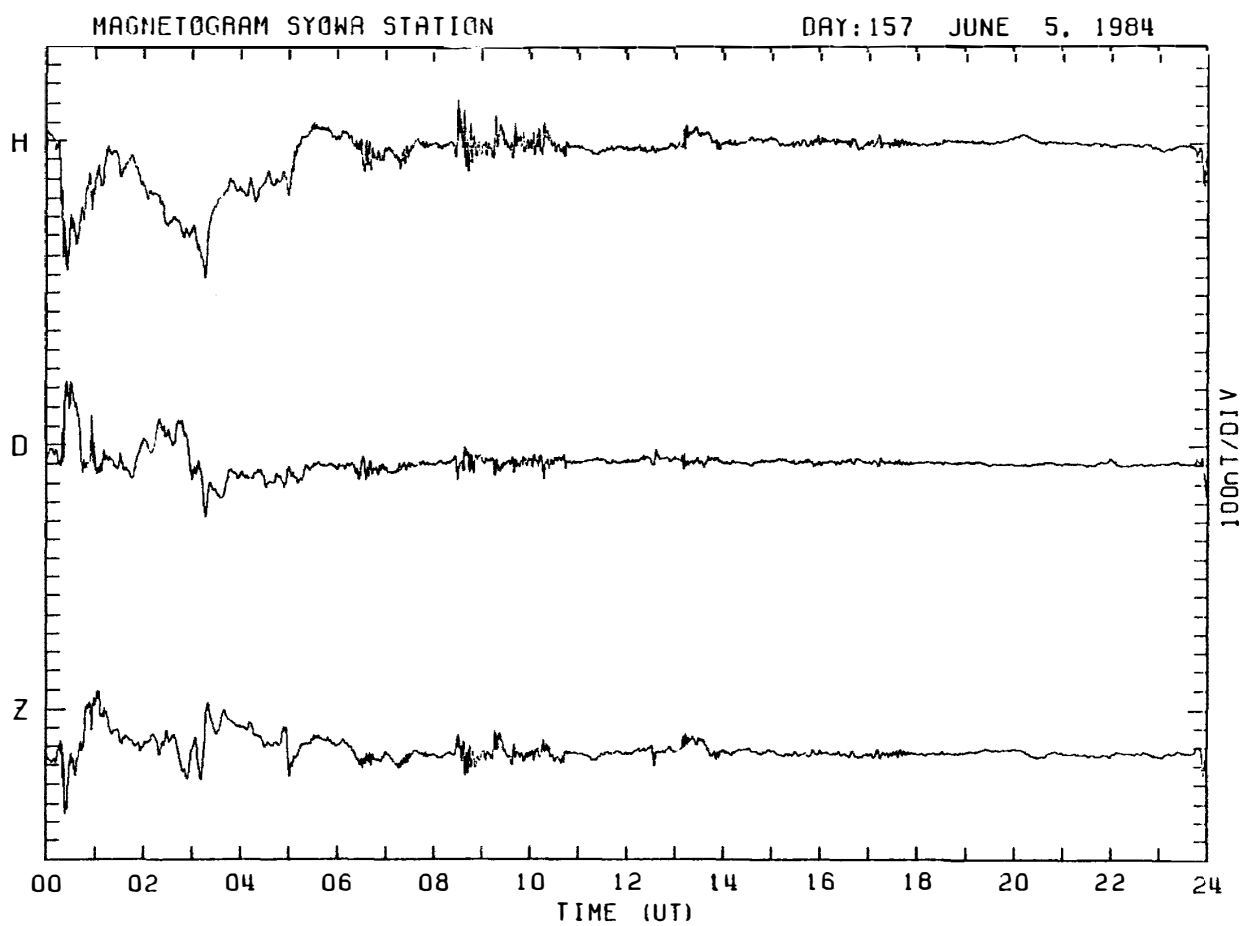
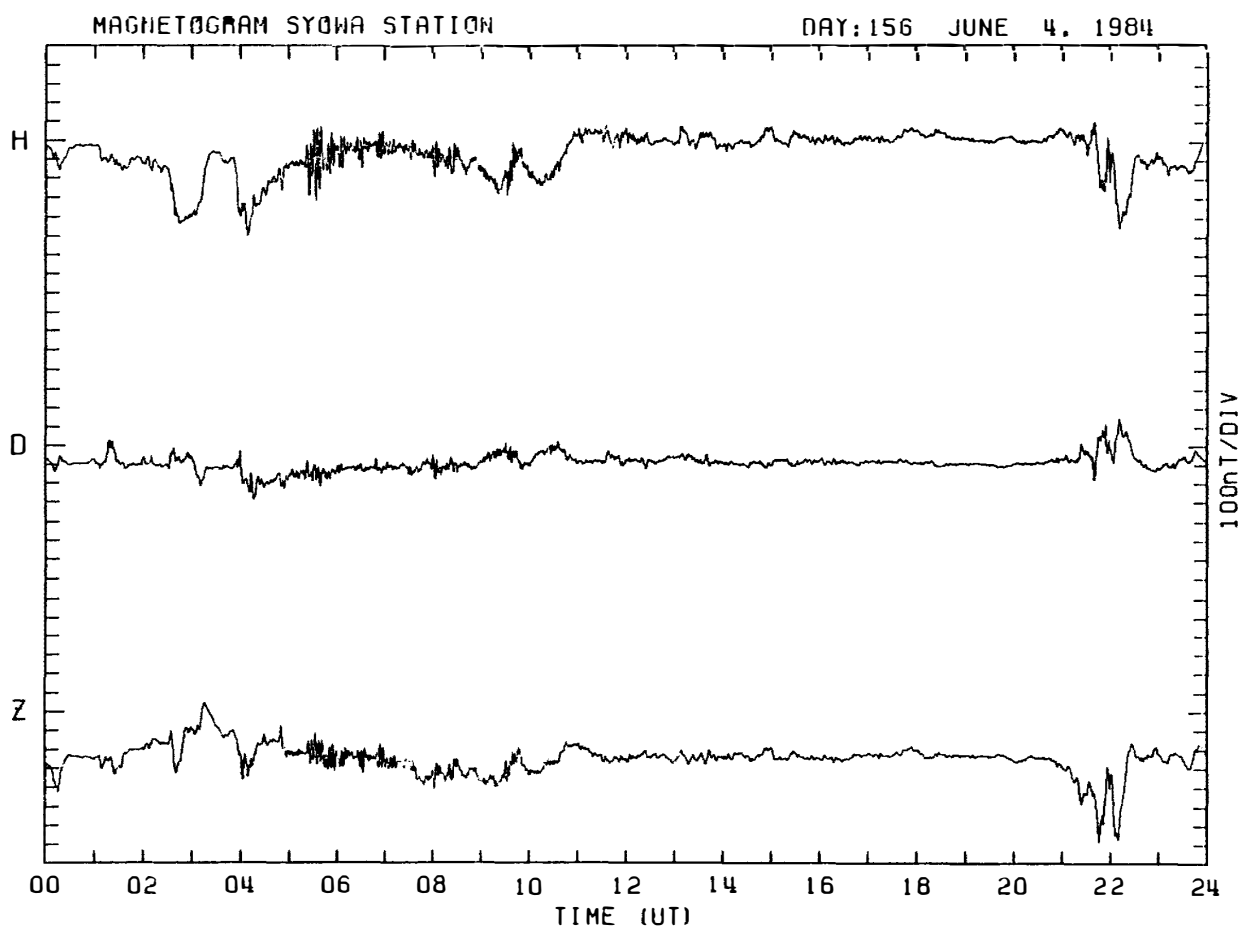




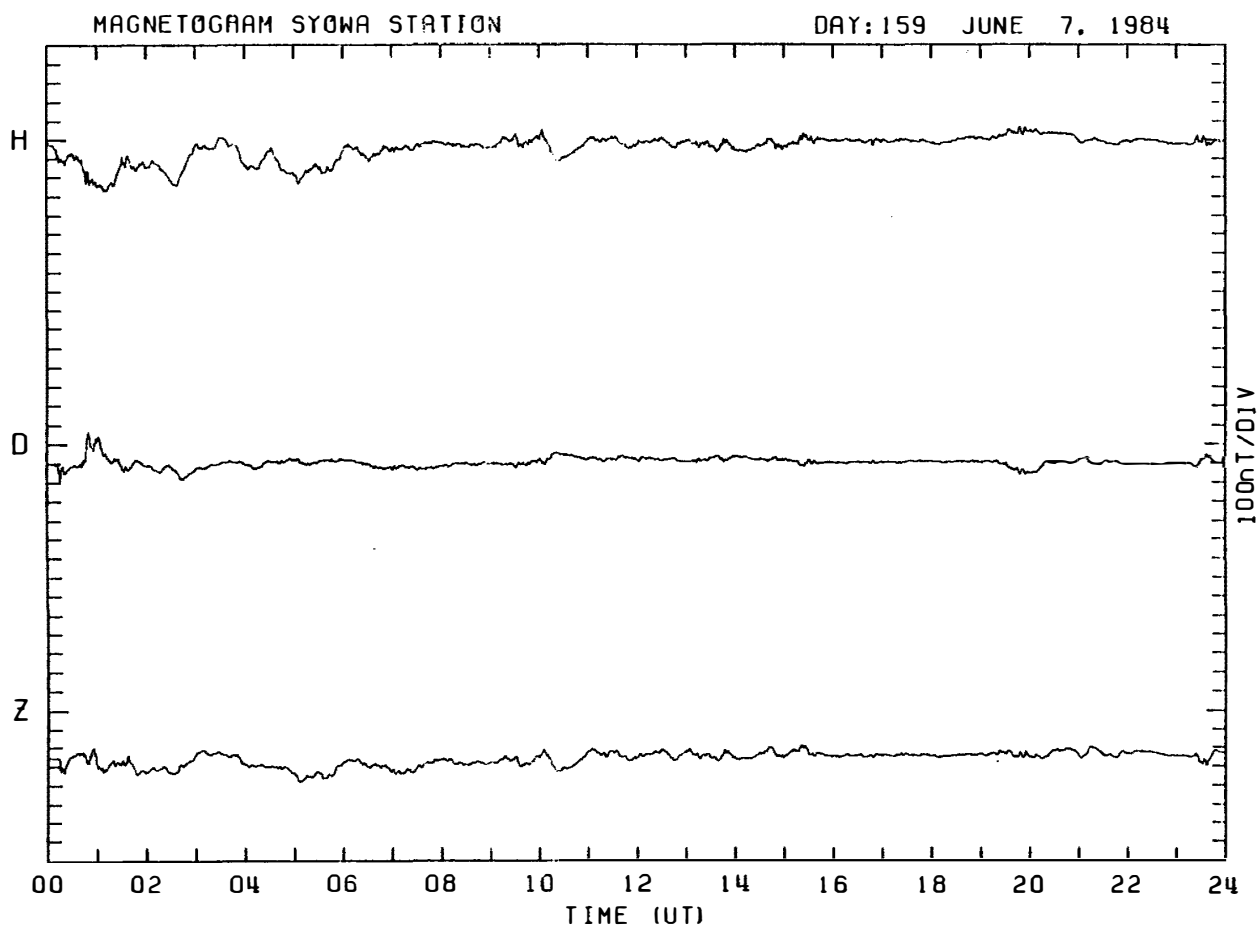
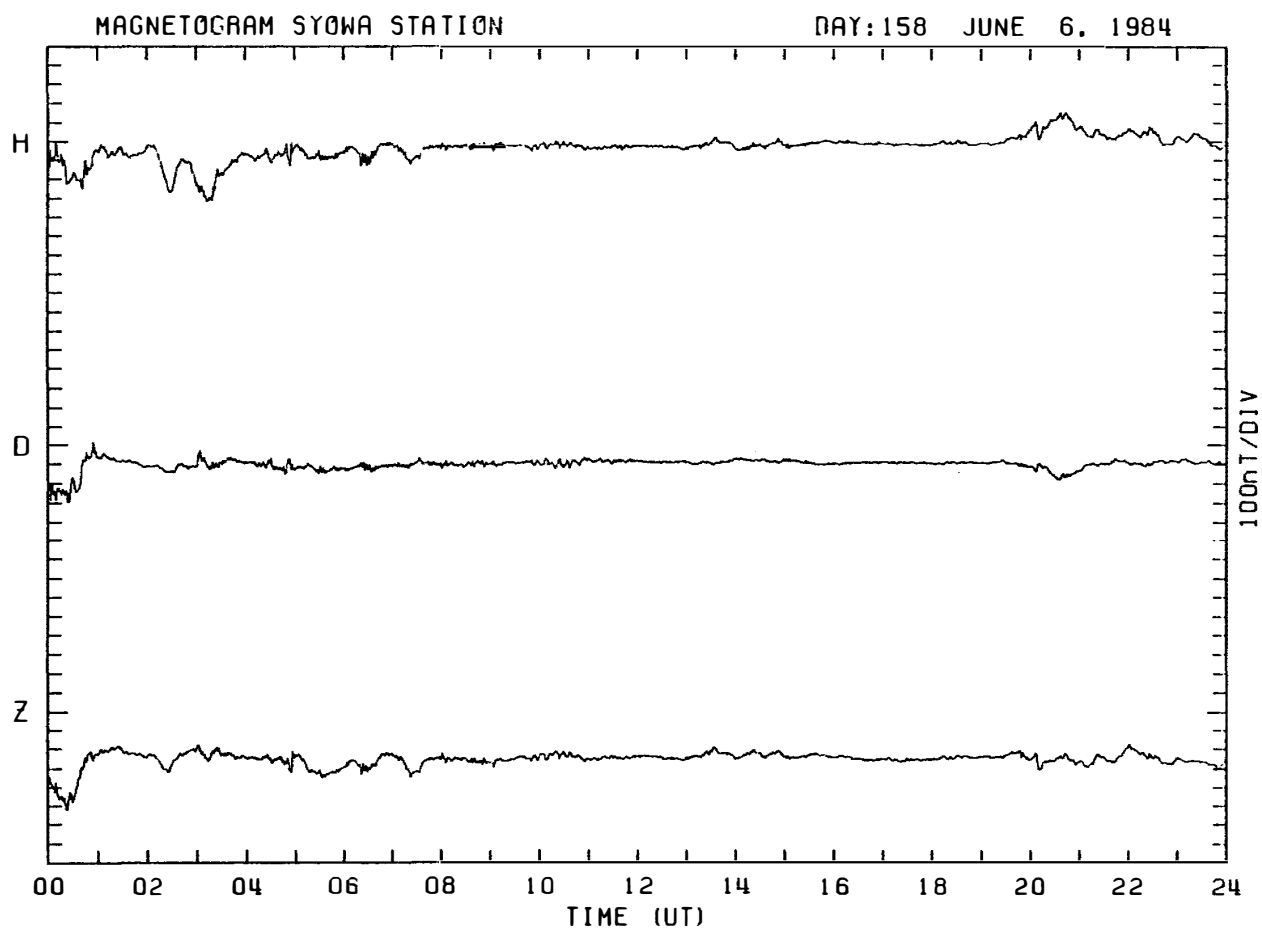


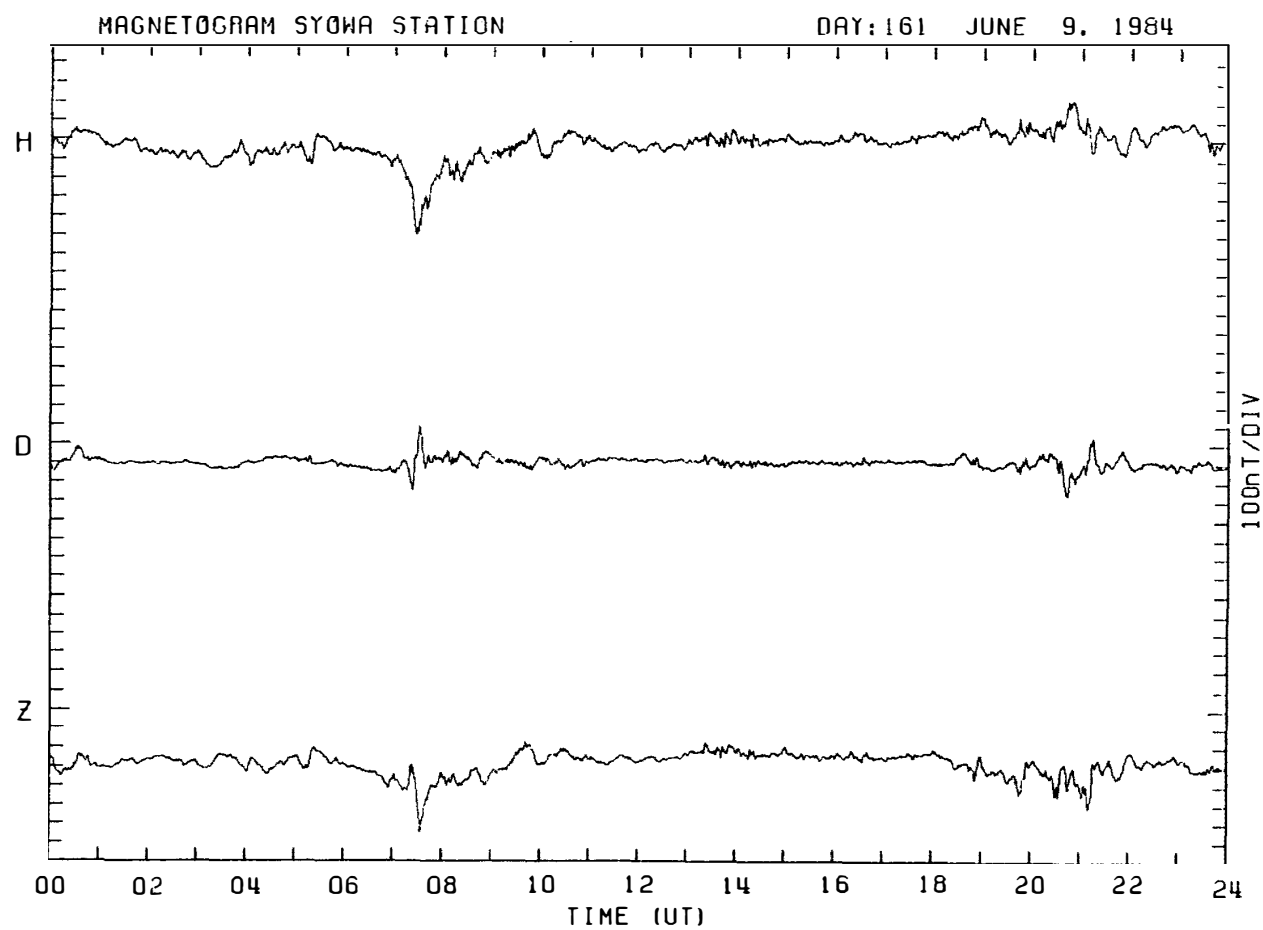
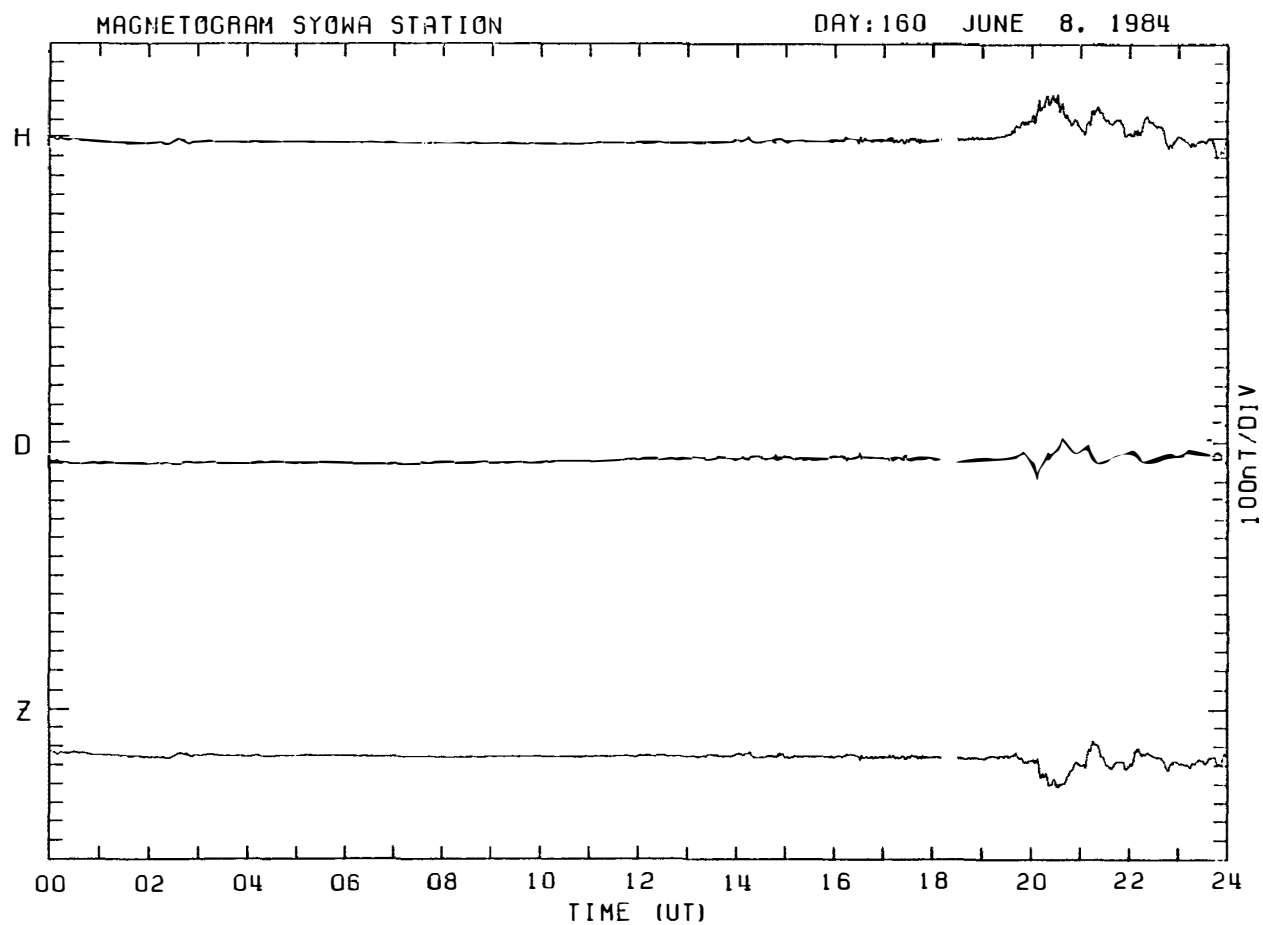


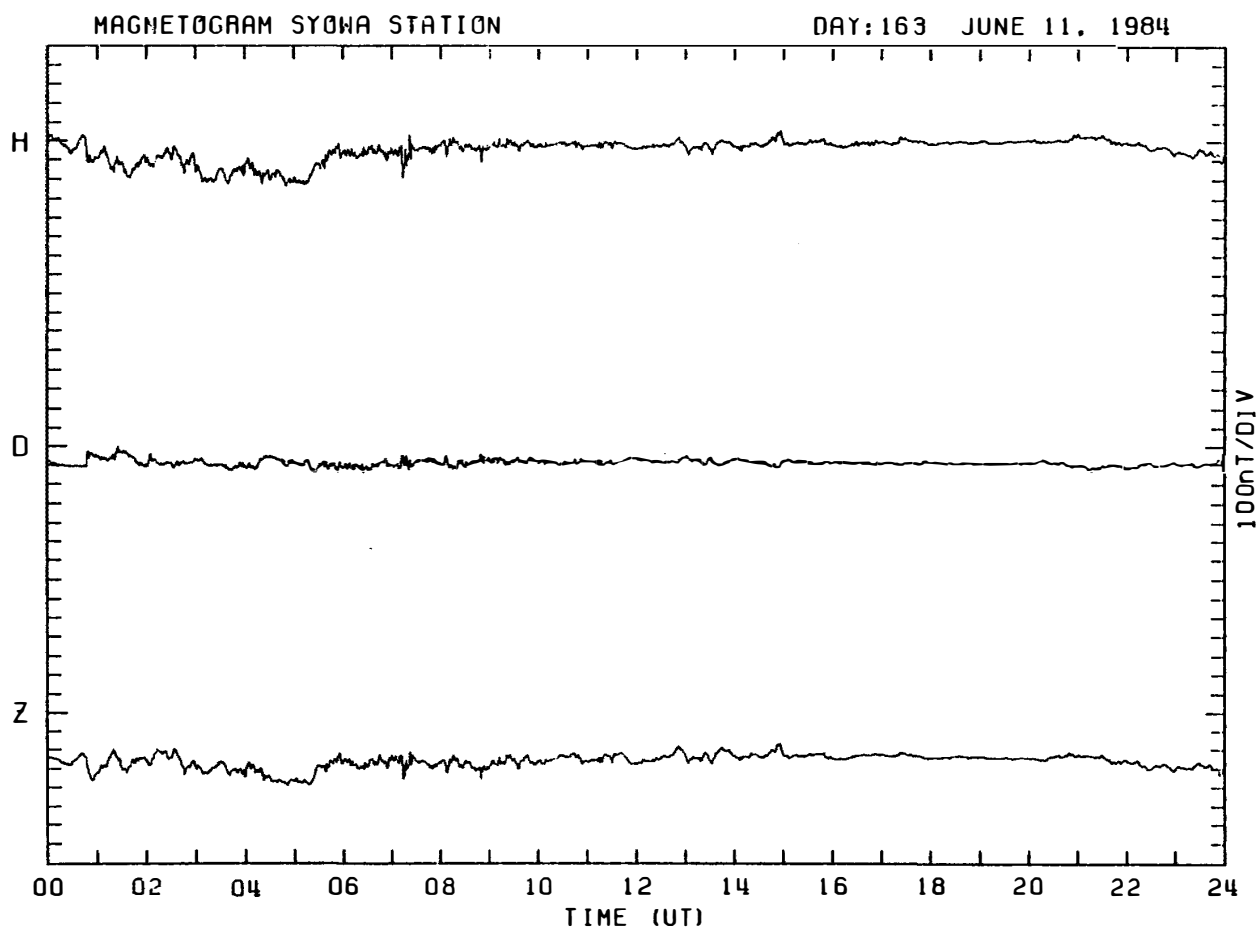
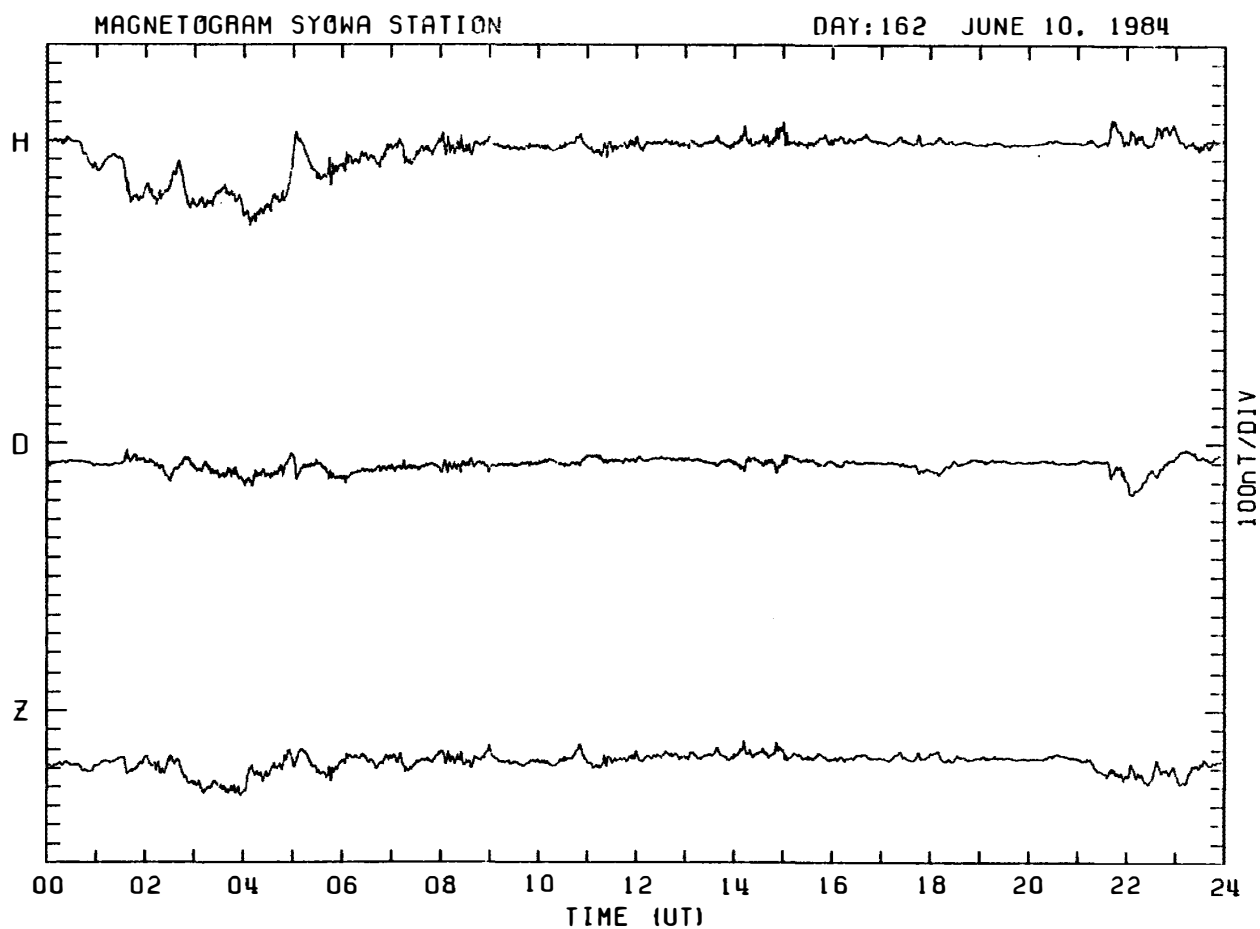


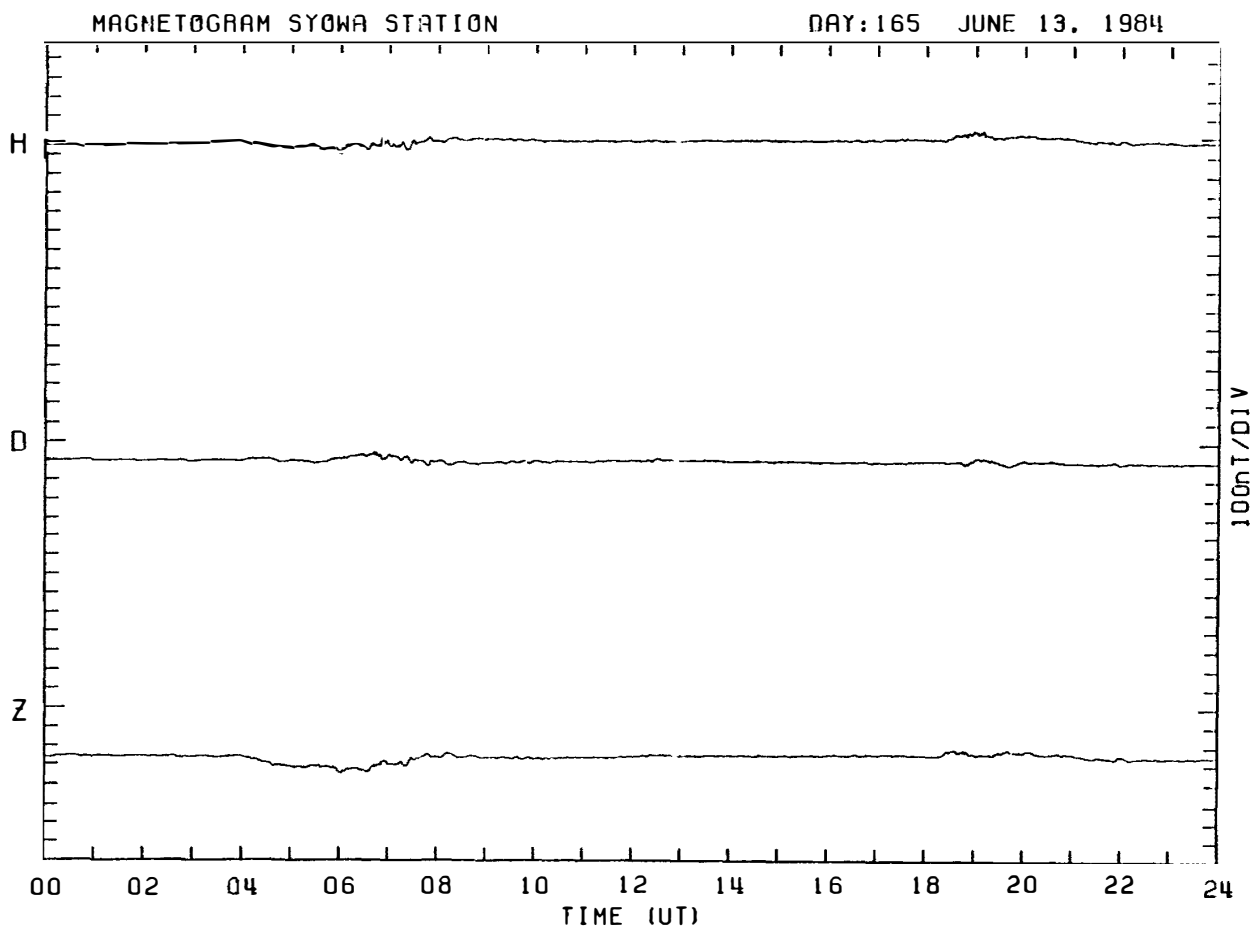
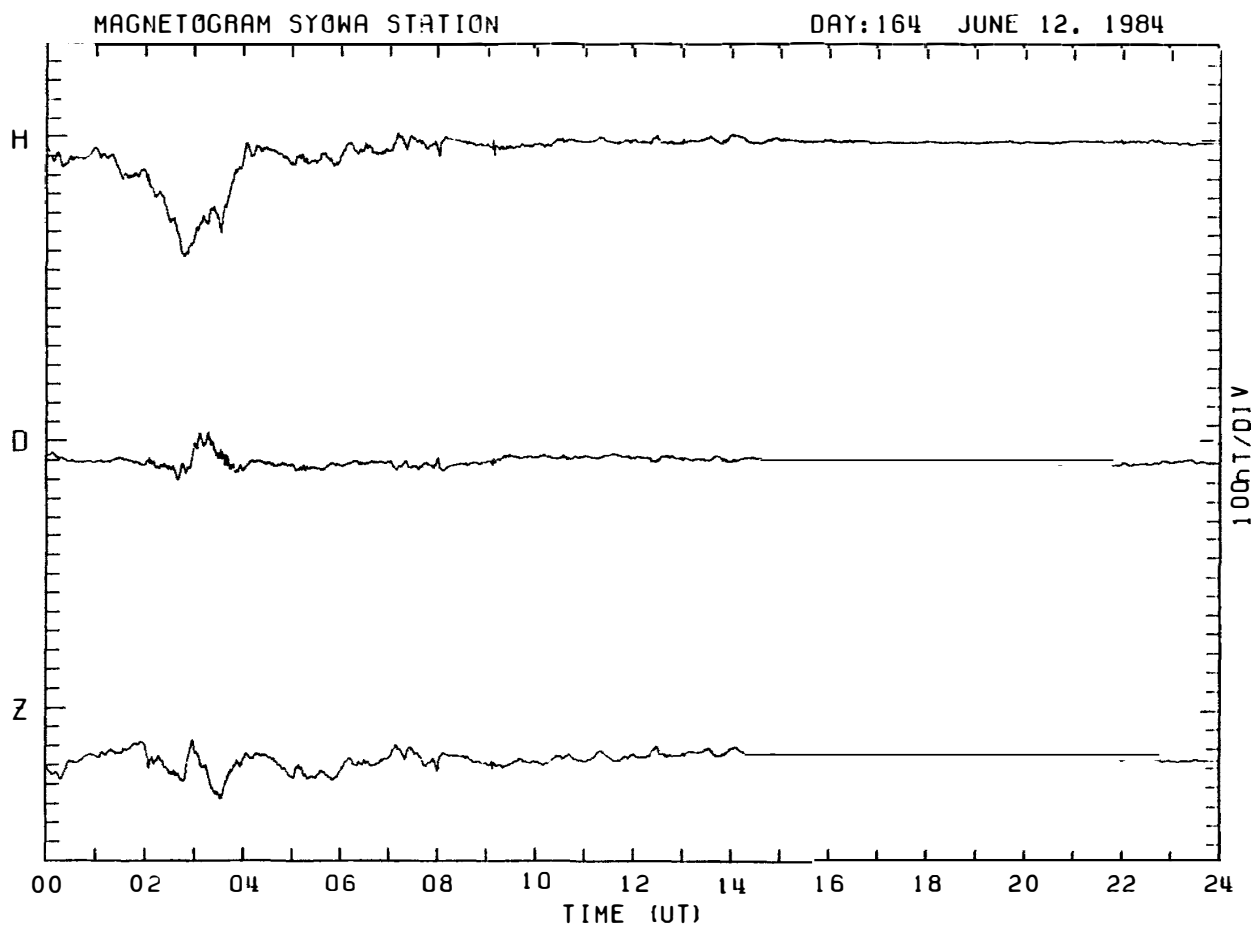


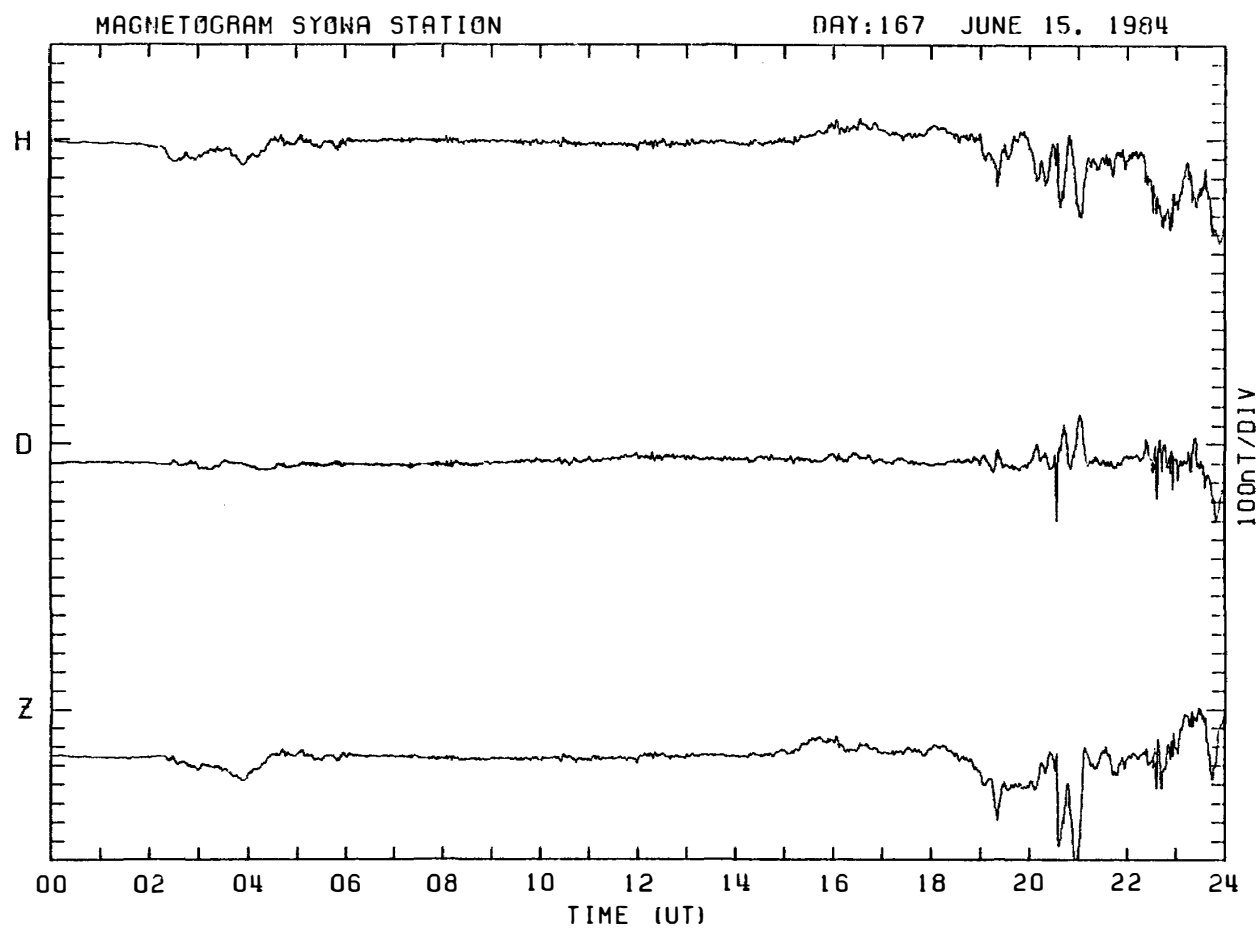
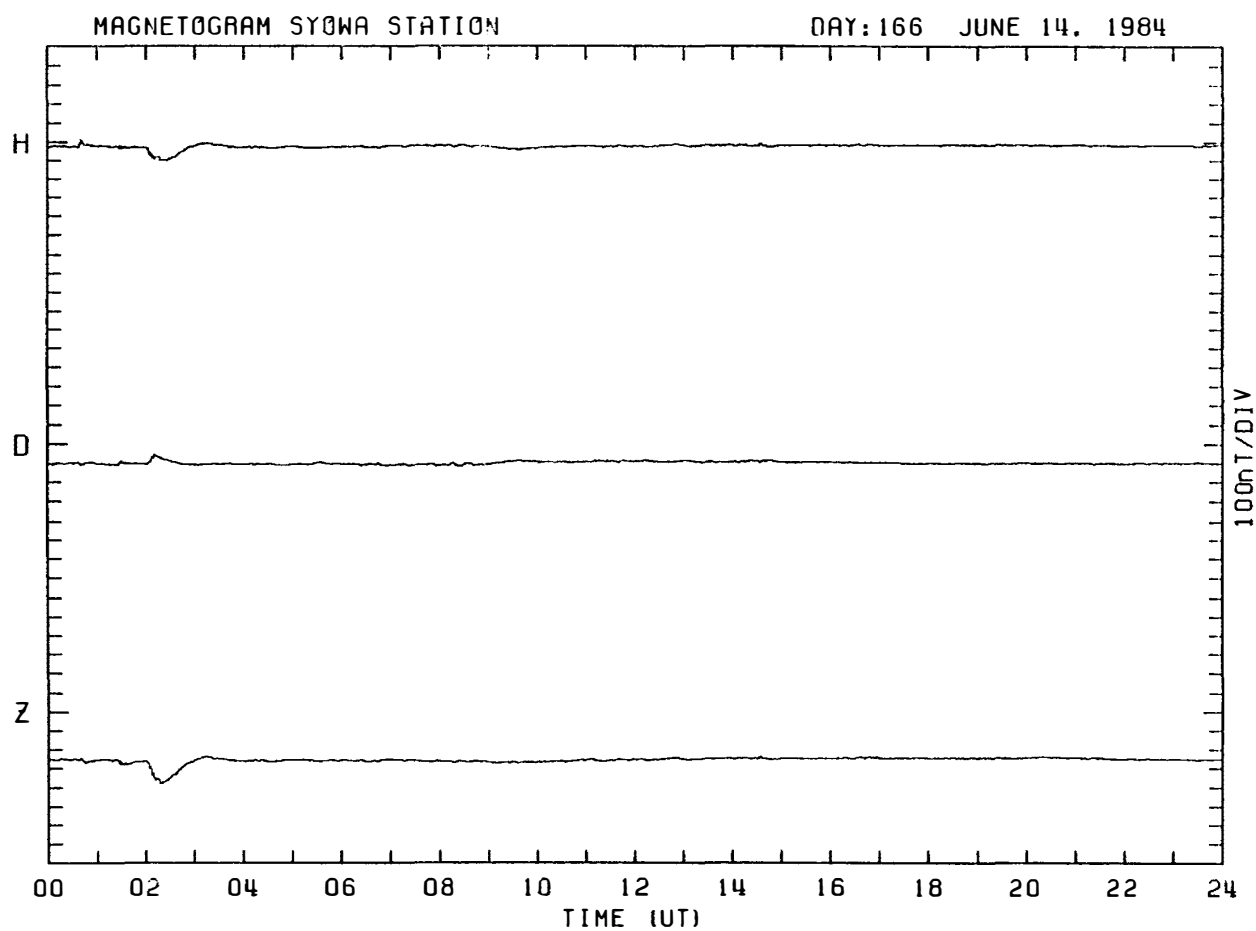


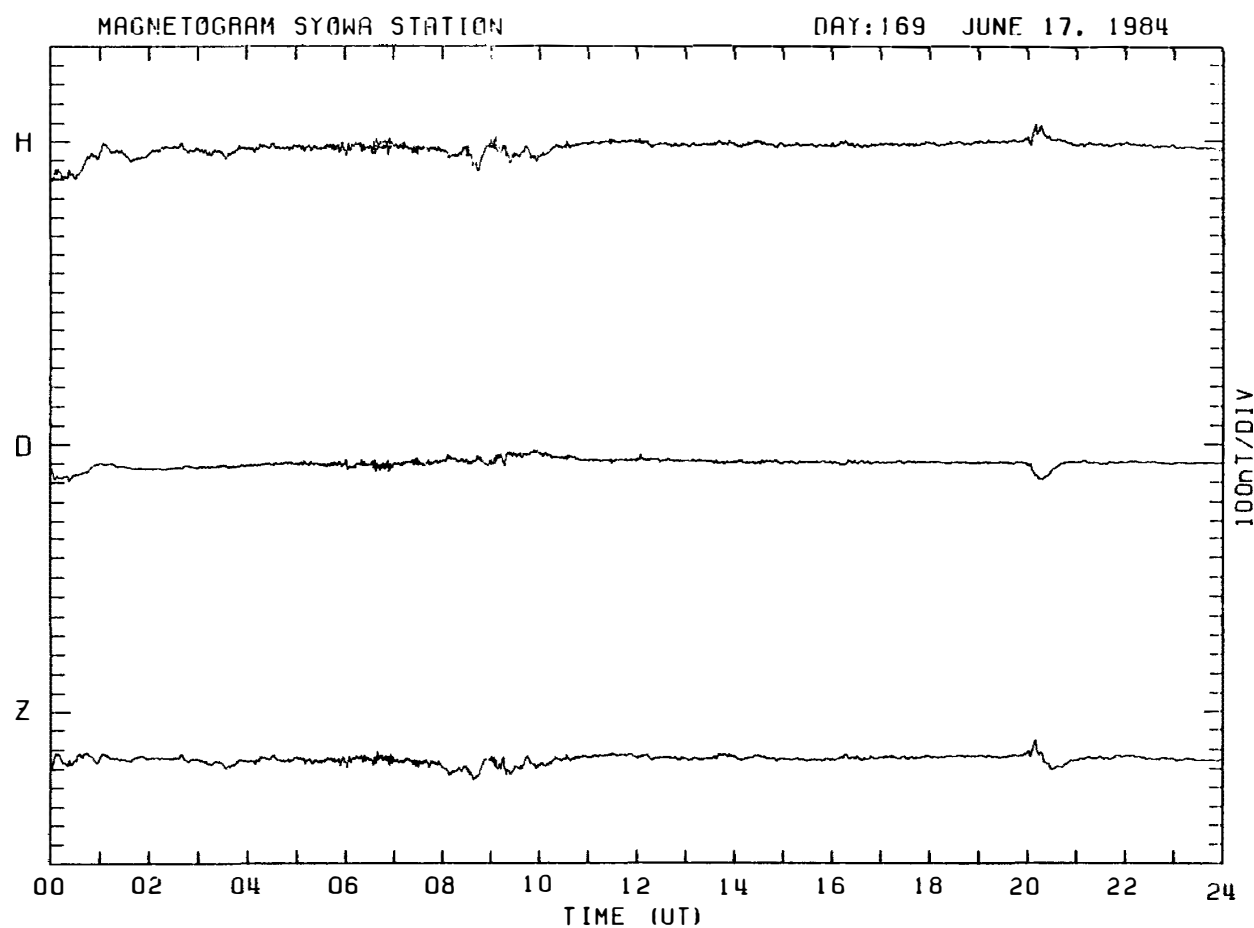
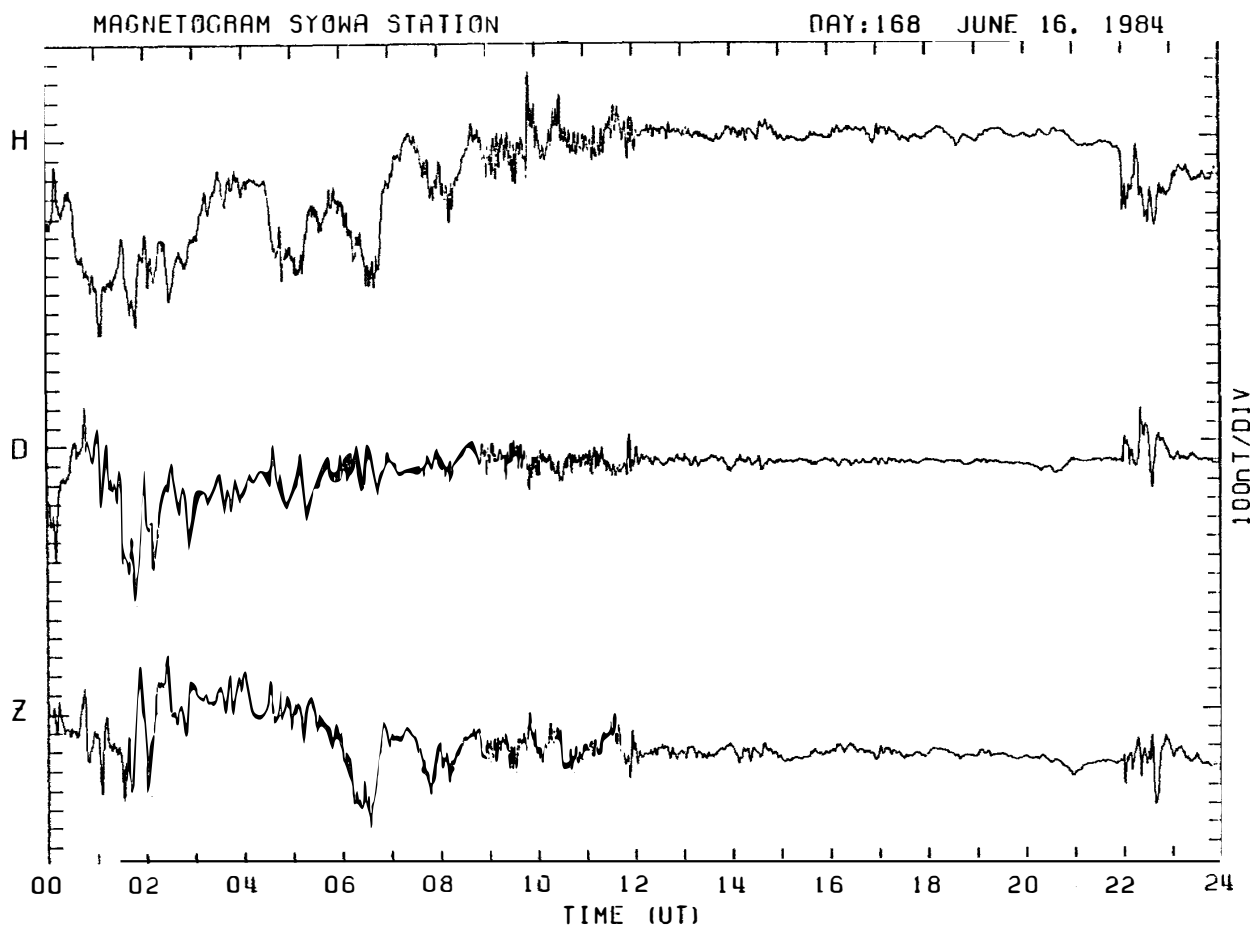


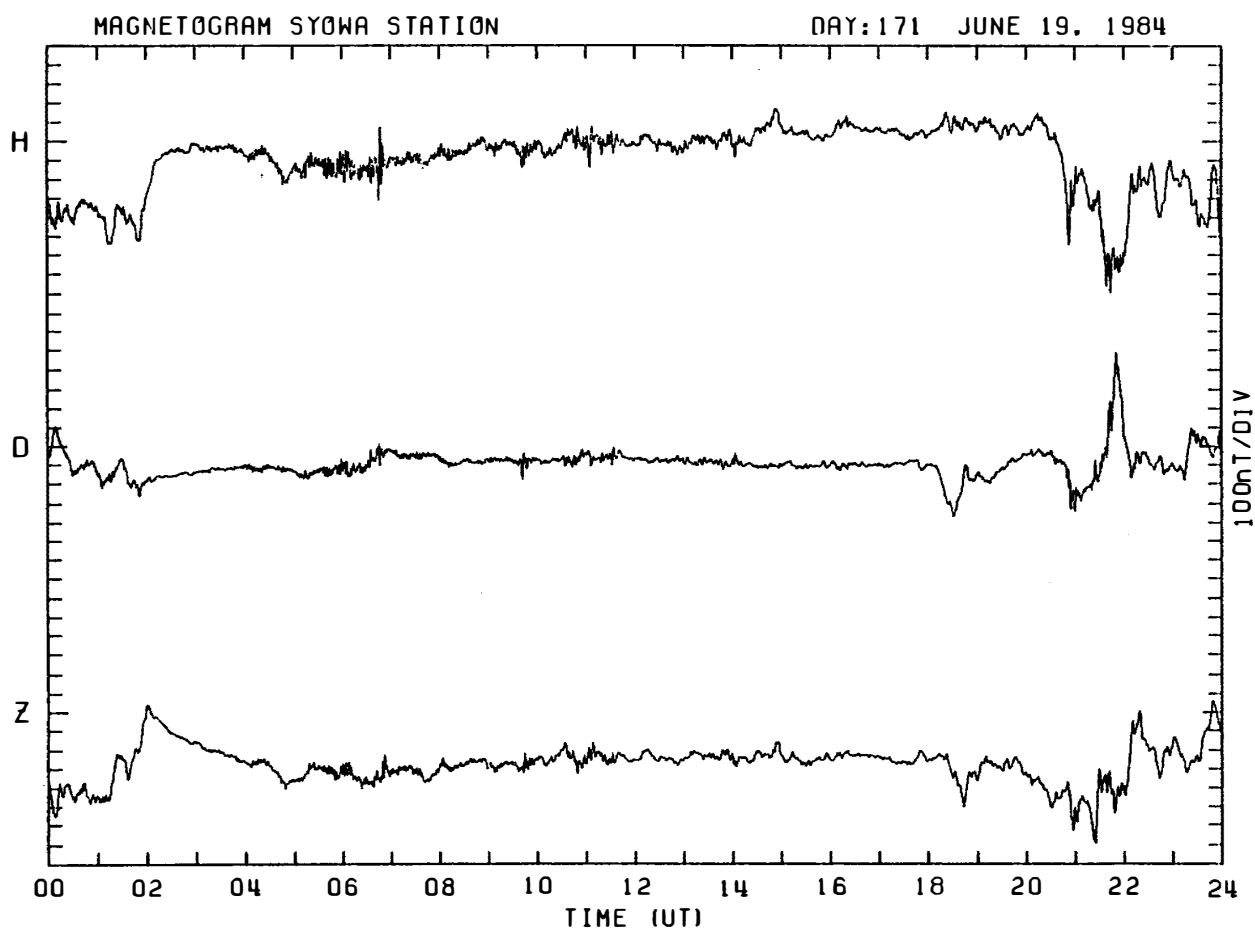
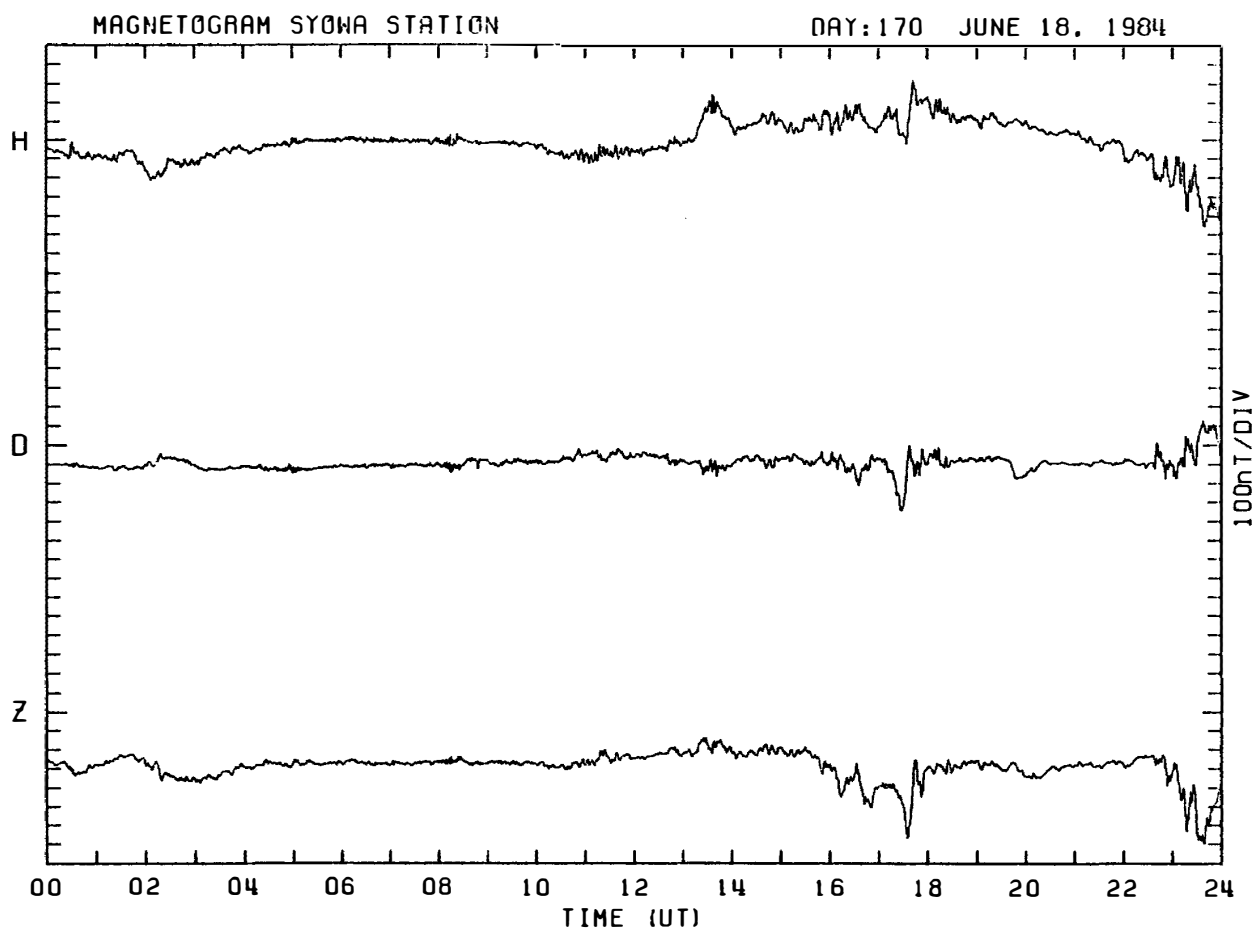


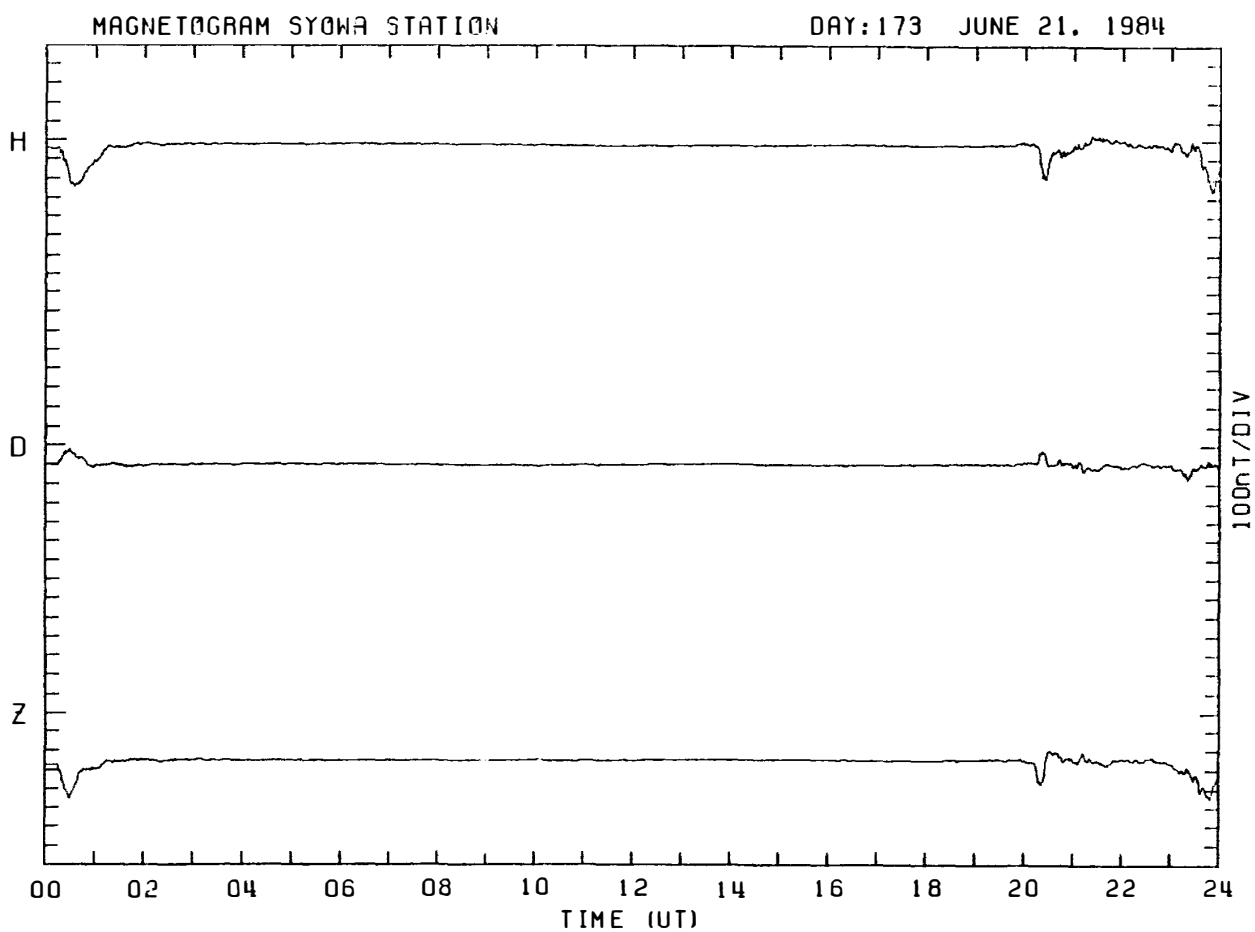
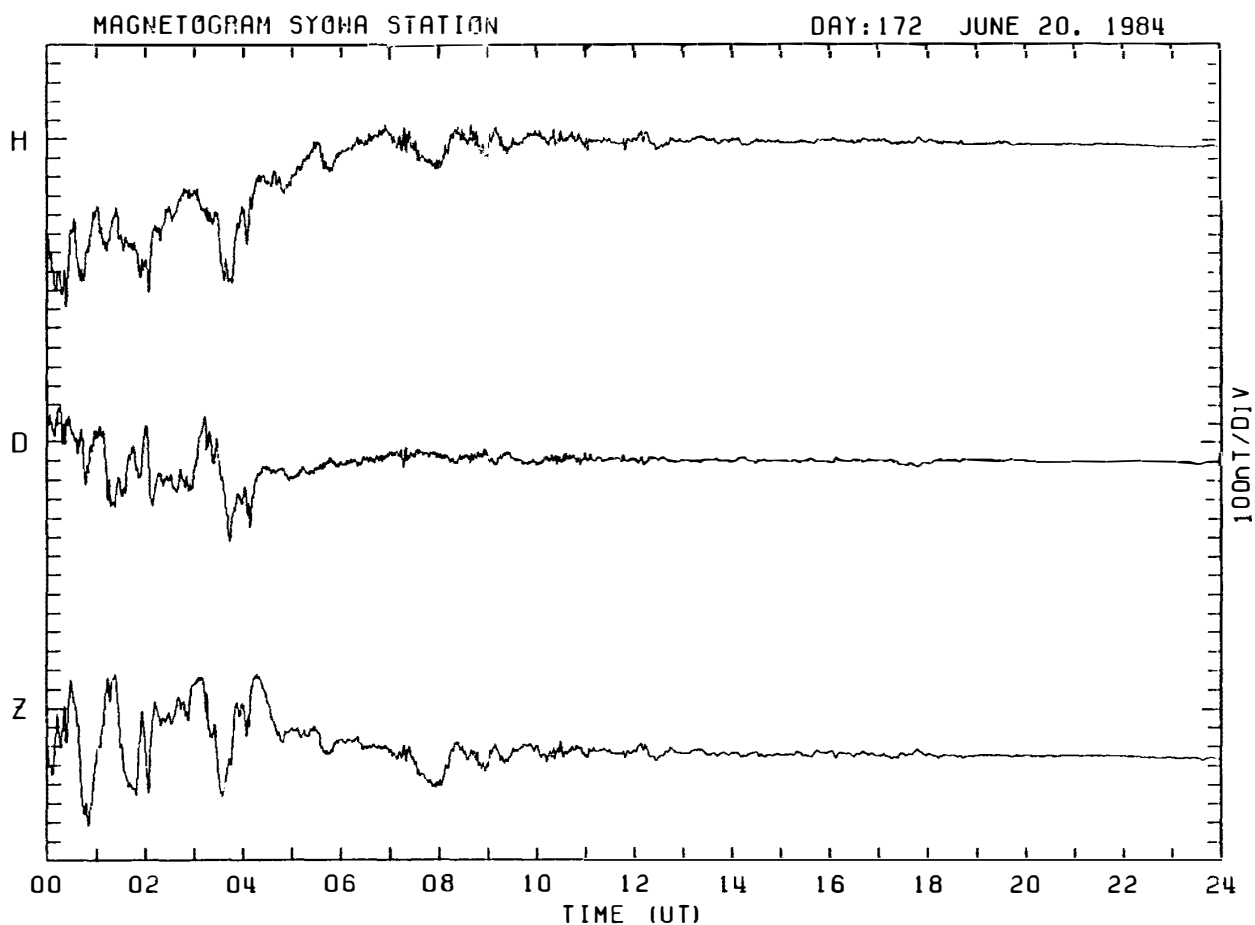




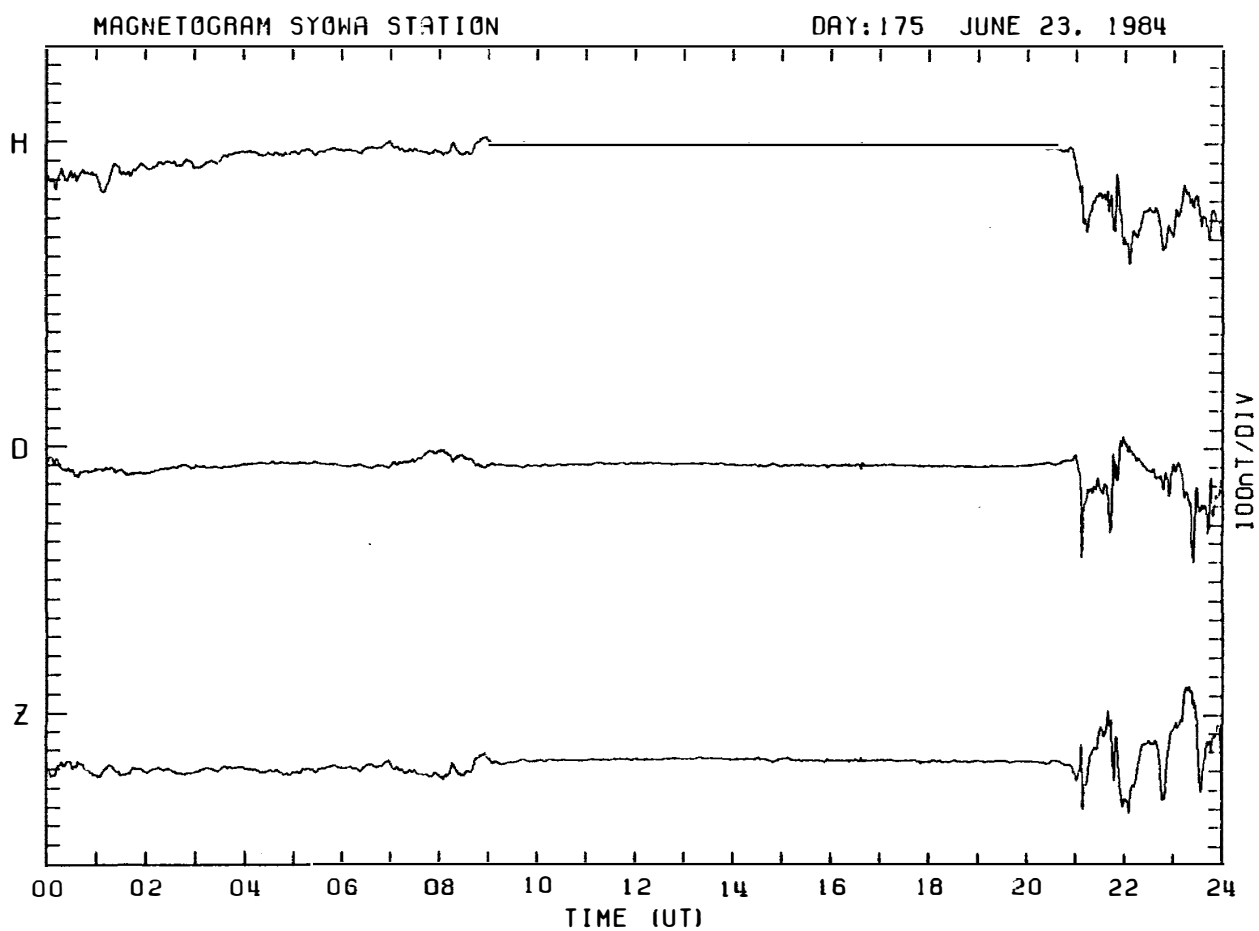
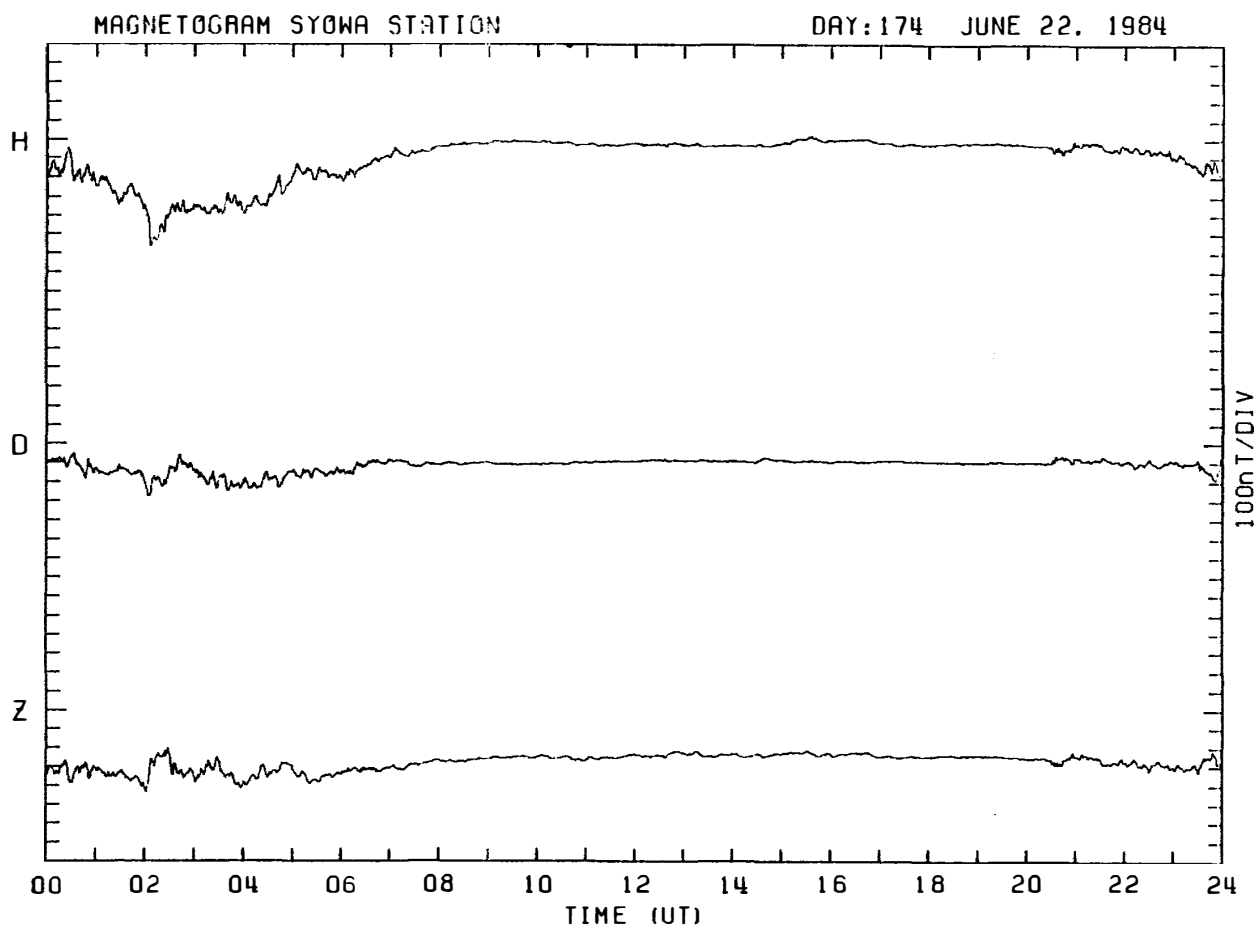


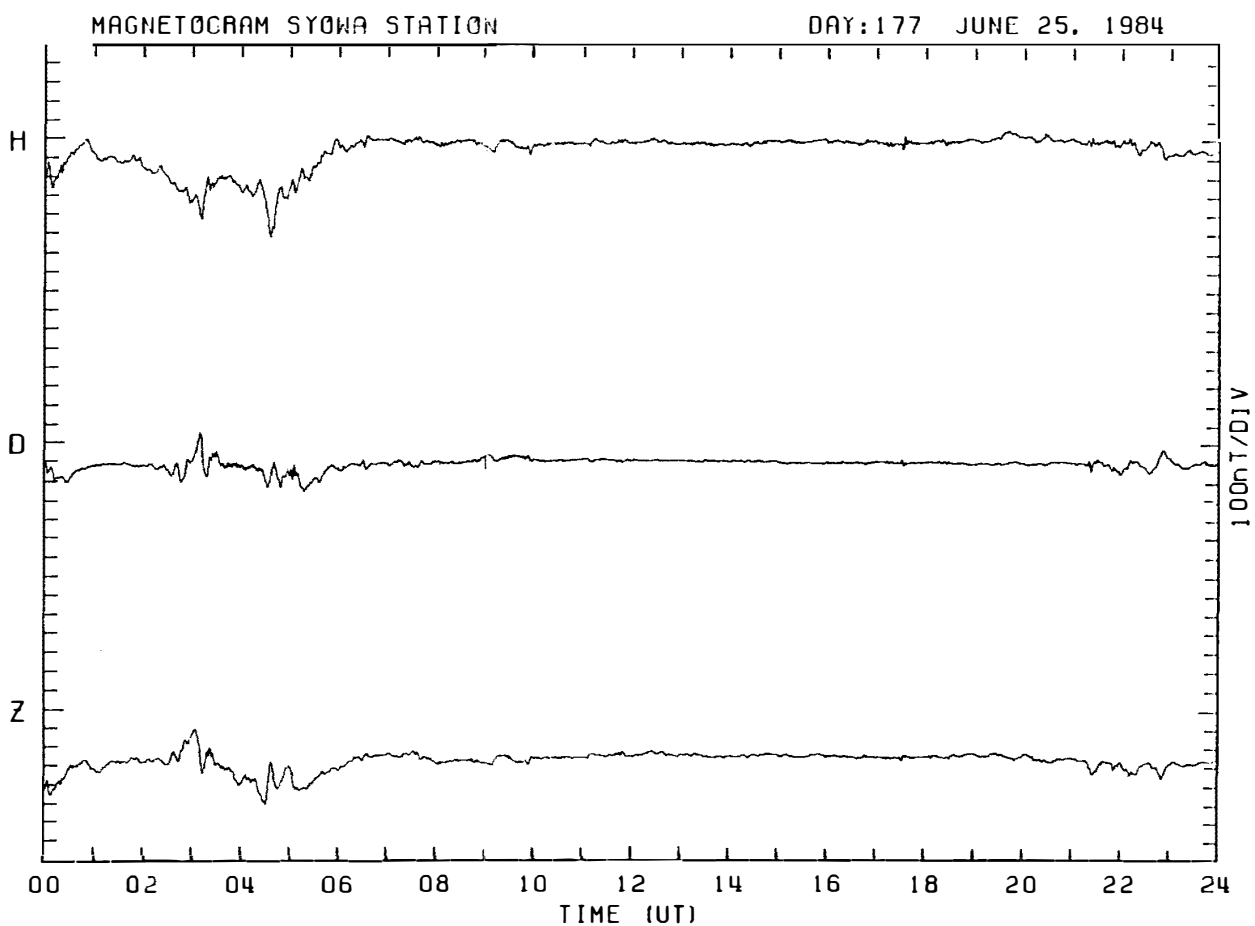
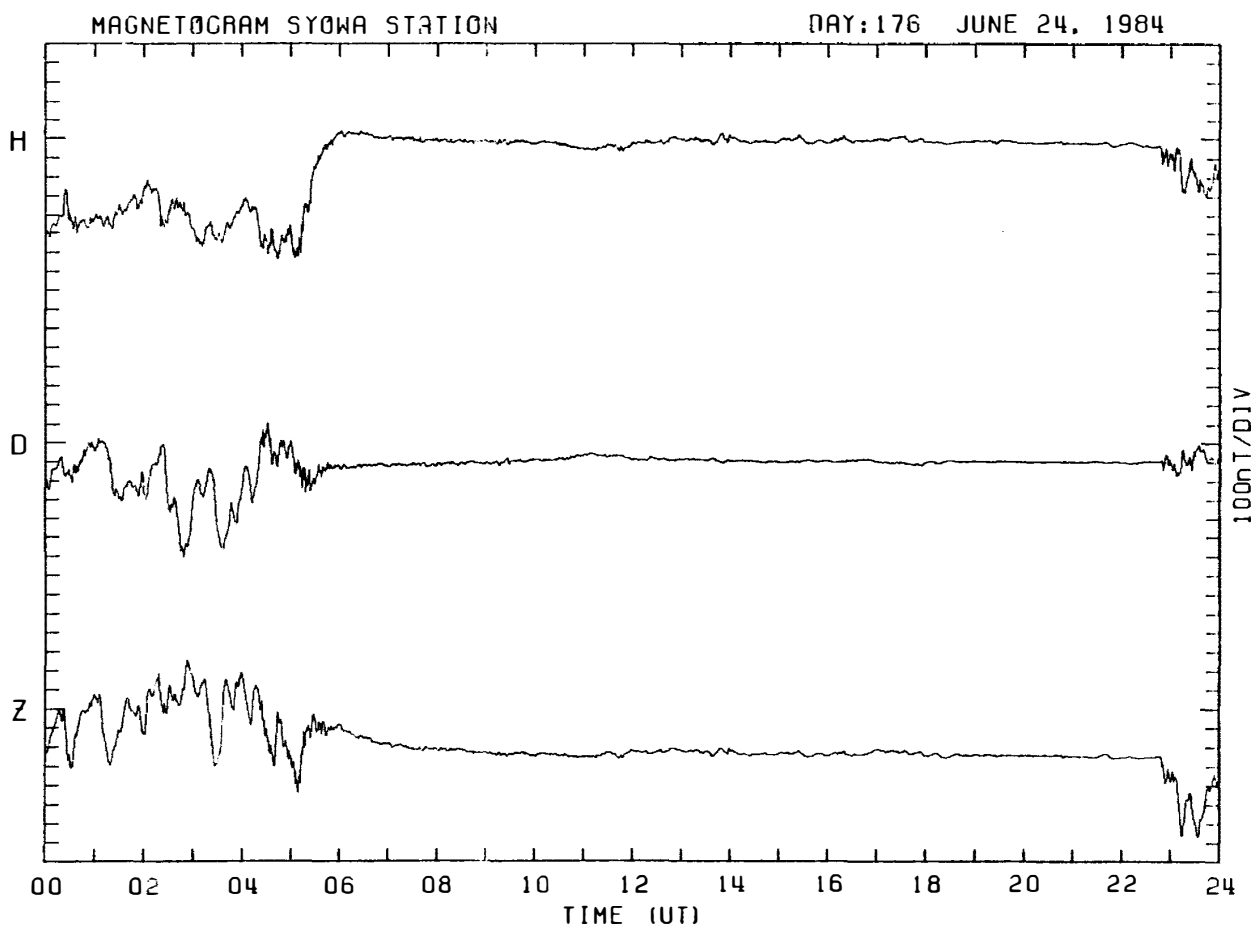


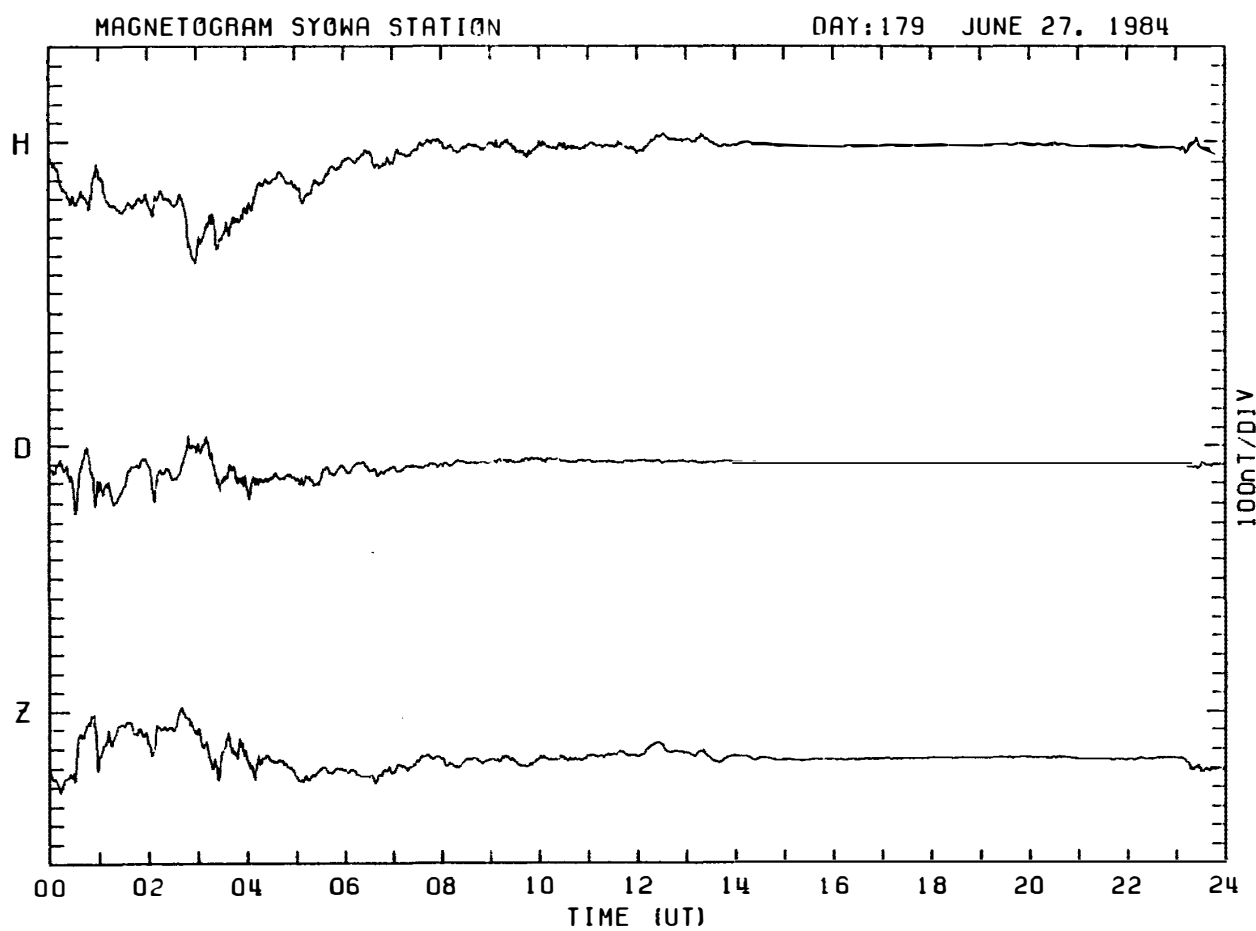
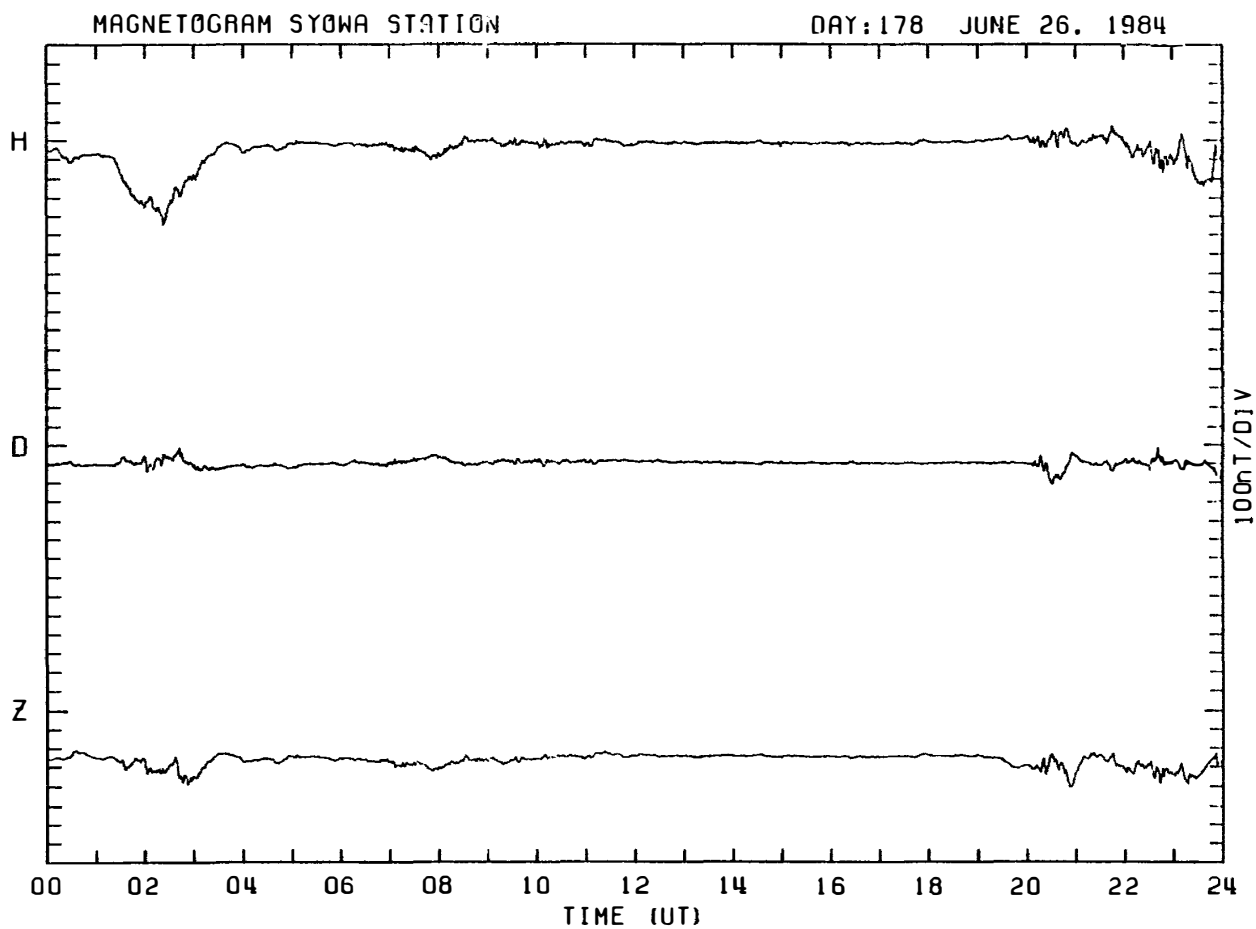






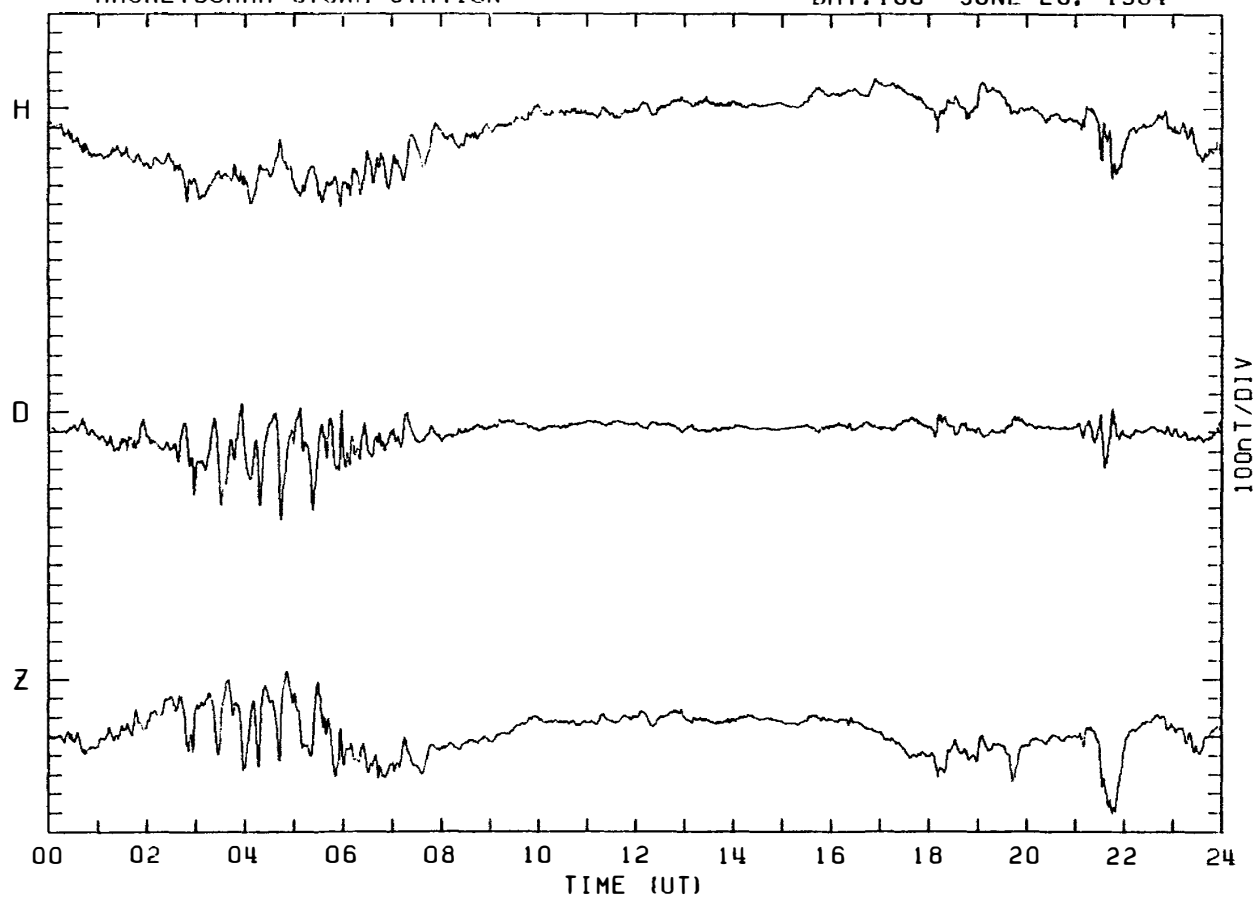






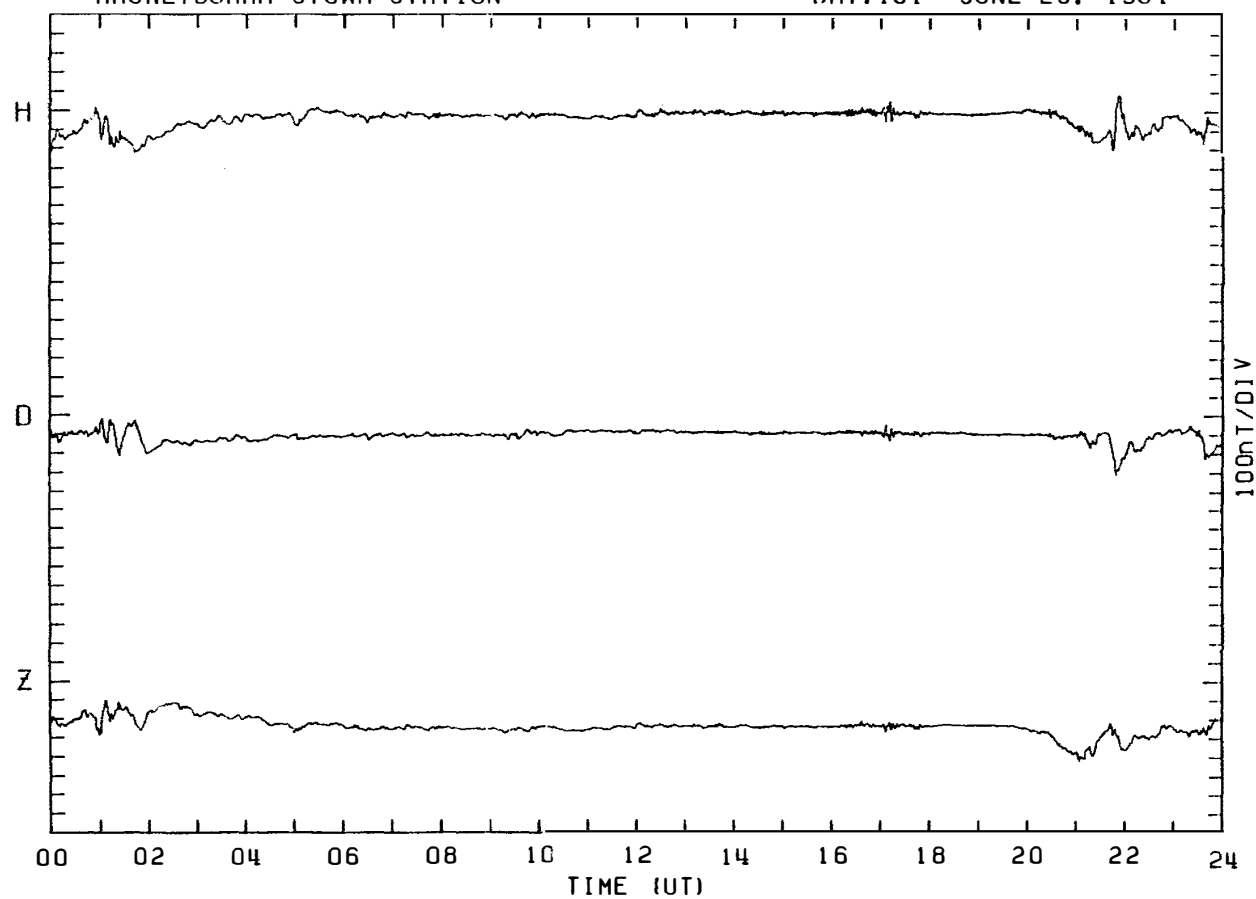
MAGNETOGRAM SYOWA STATION

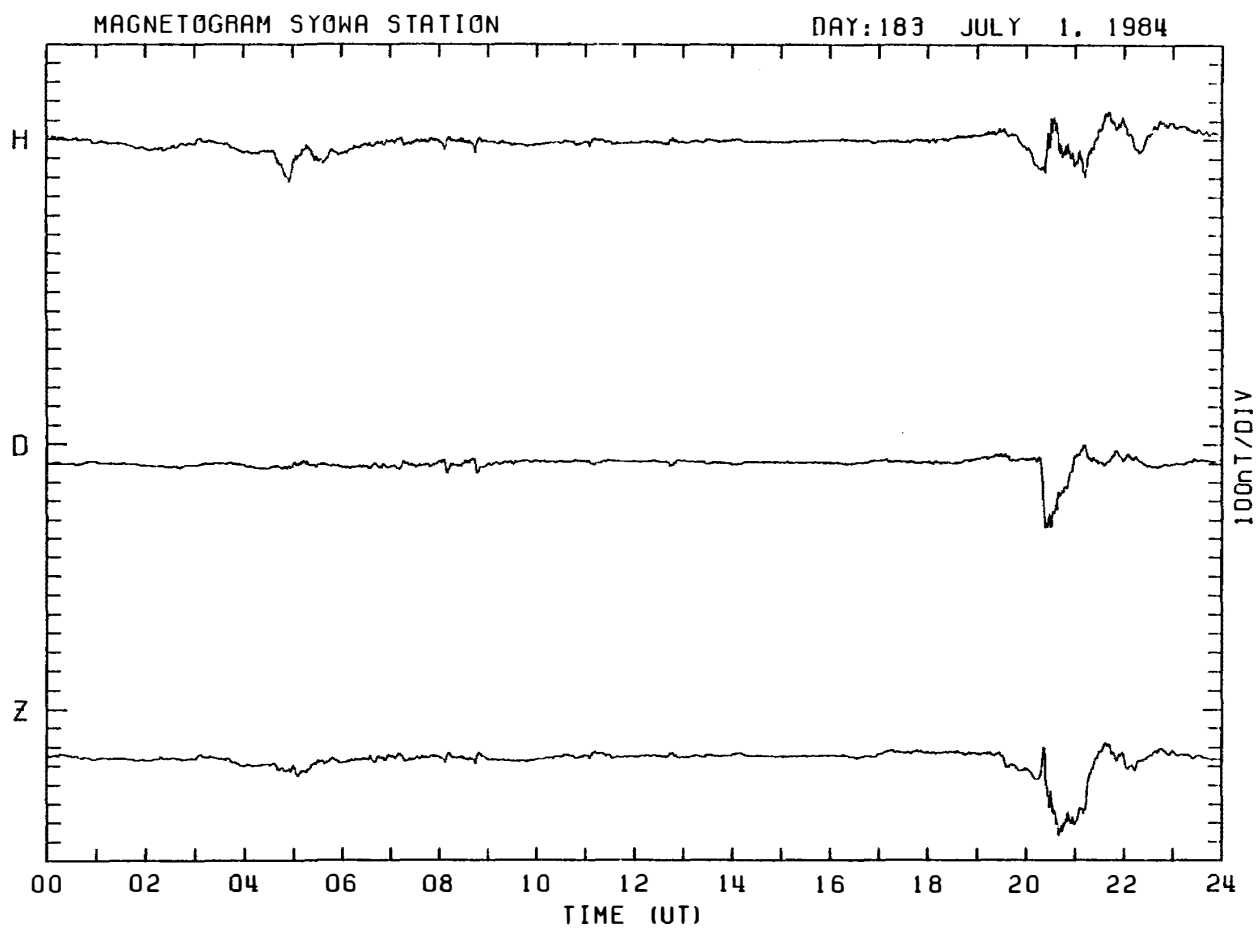
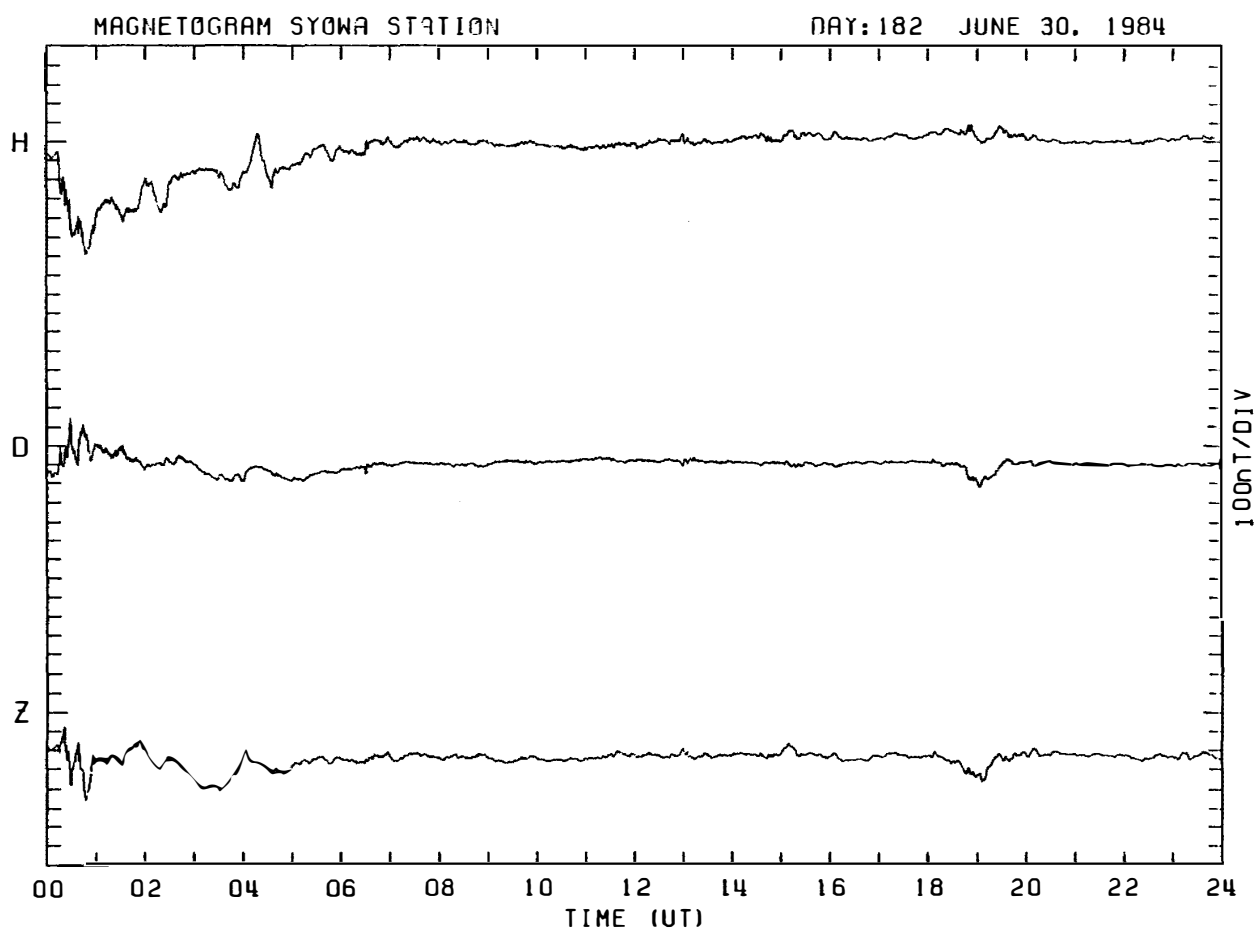
DAY:180 JUNE 28. 1984



MAGNETOGRAM SYOWA STATION

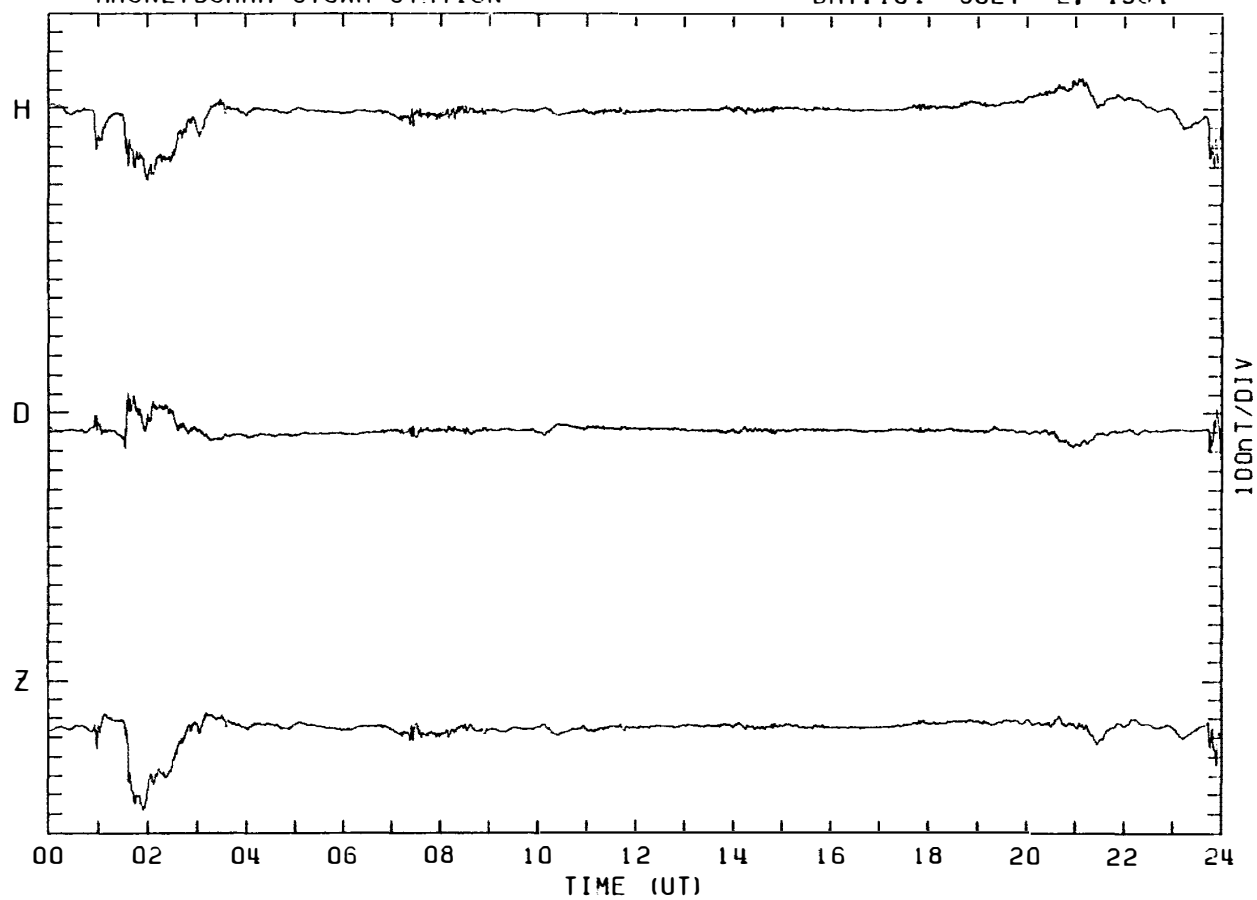
DAY:181 JUNE 29. 1984





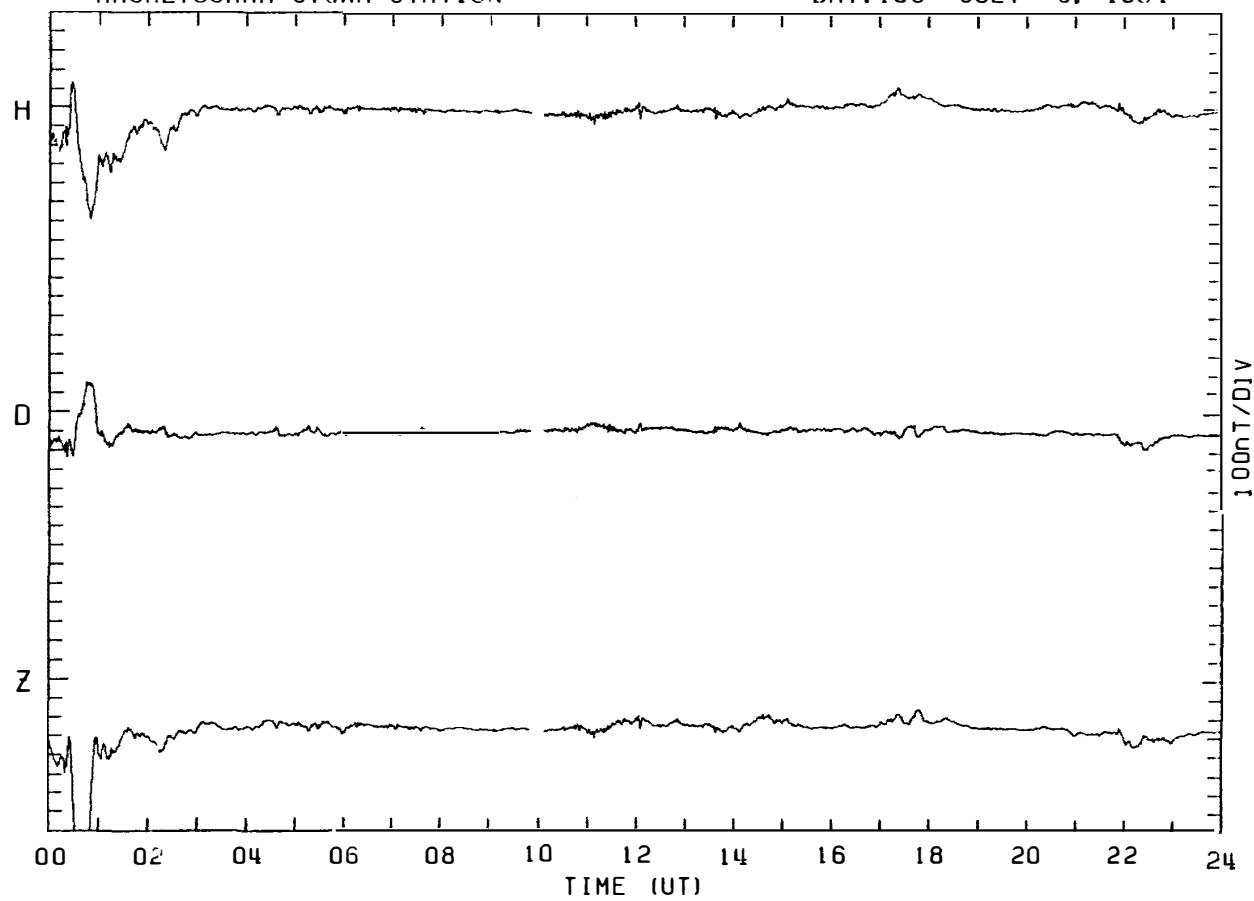
MAGNETOGRAM SYOWA STATION

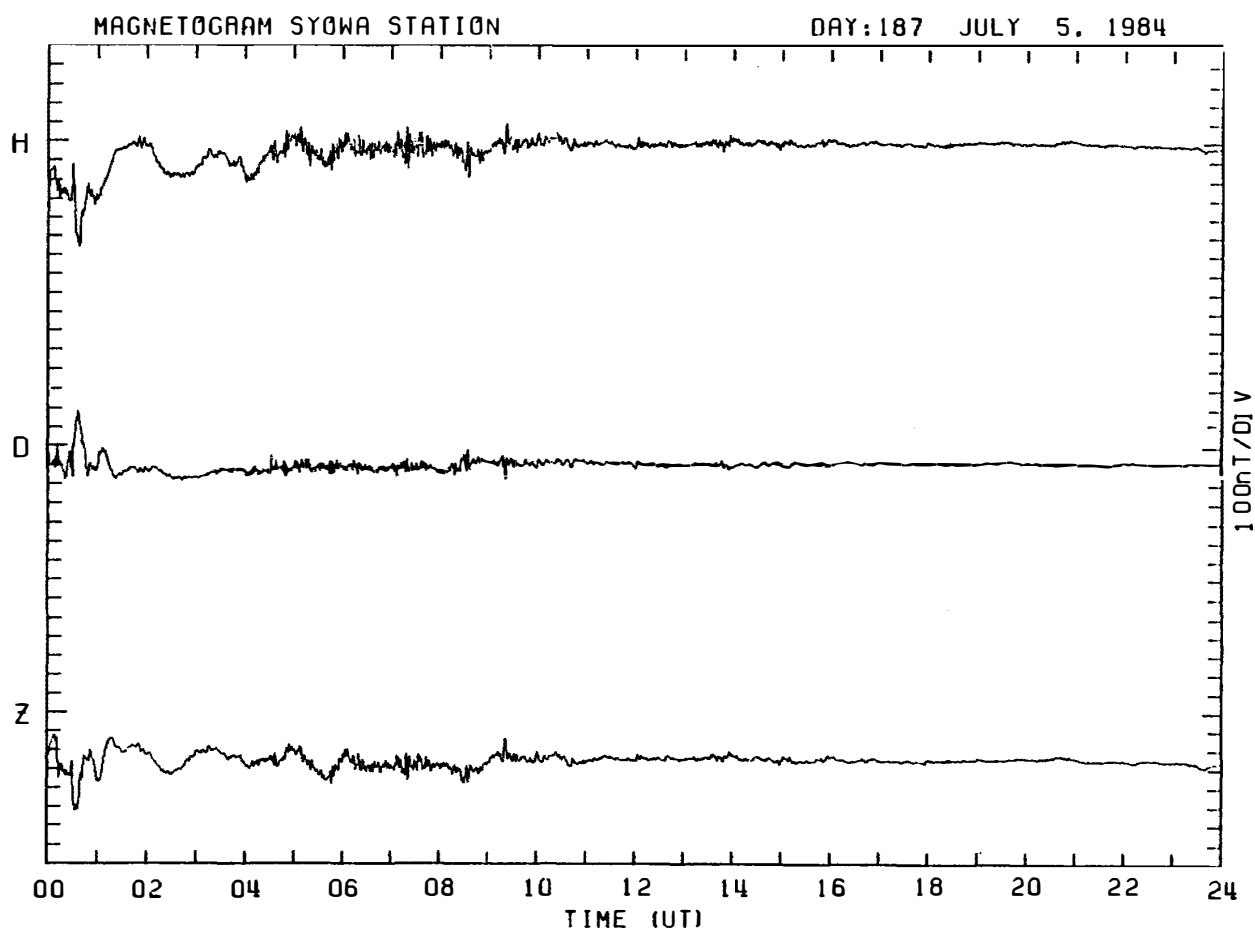
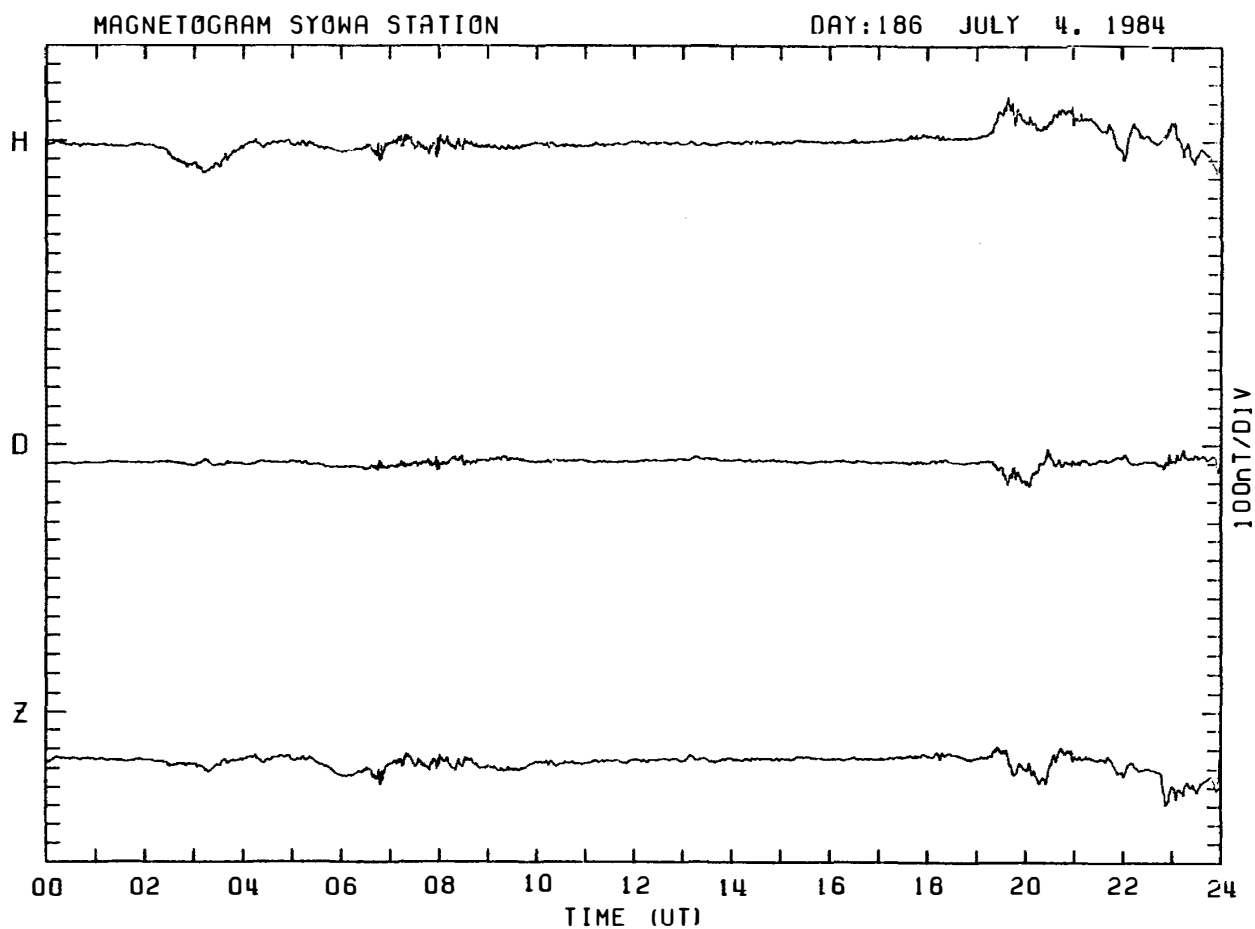
DAY:184 JULY 2, 1984

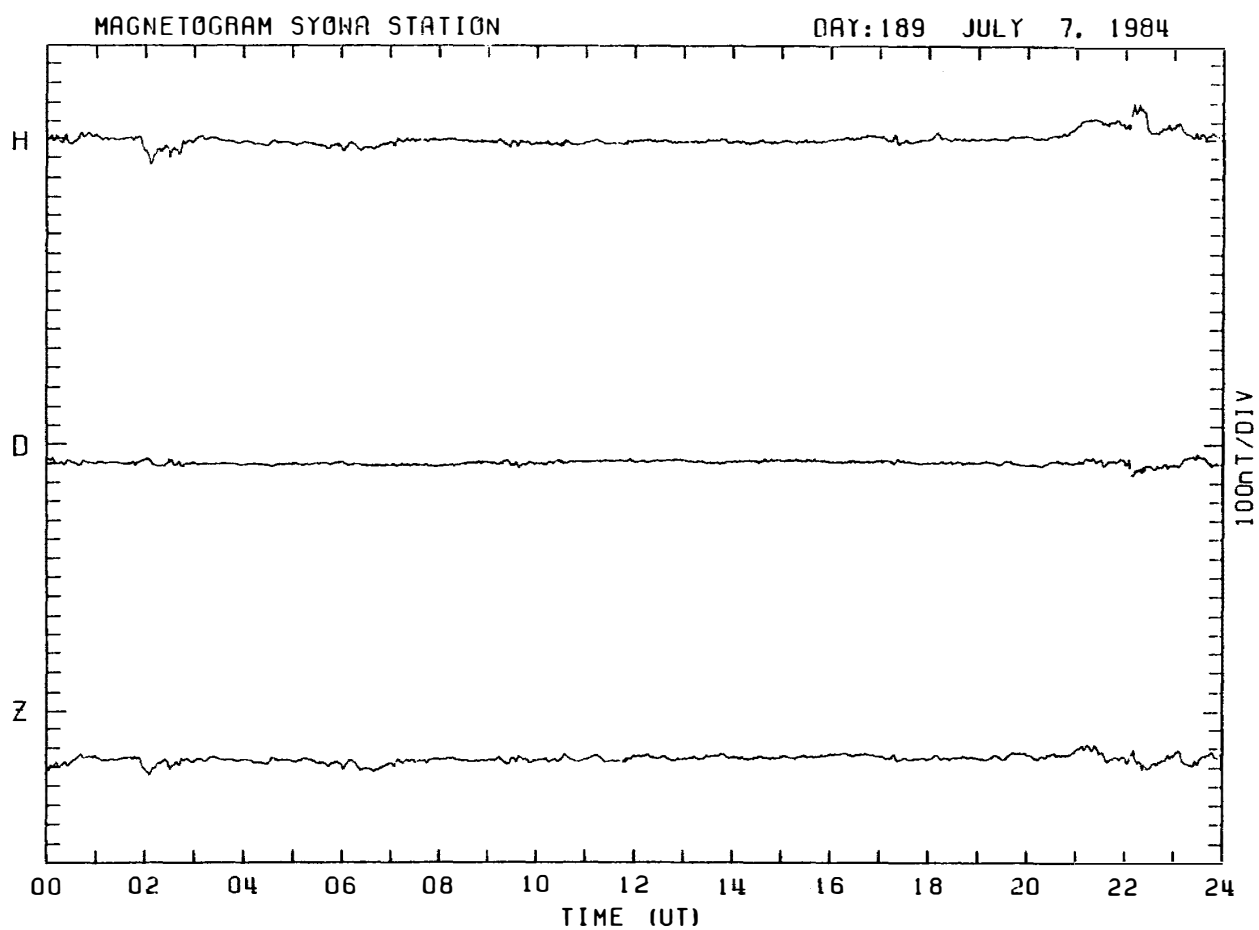
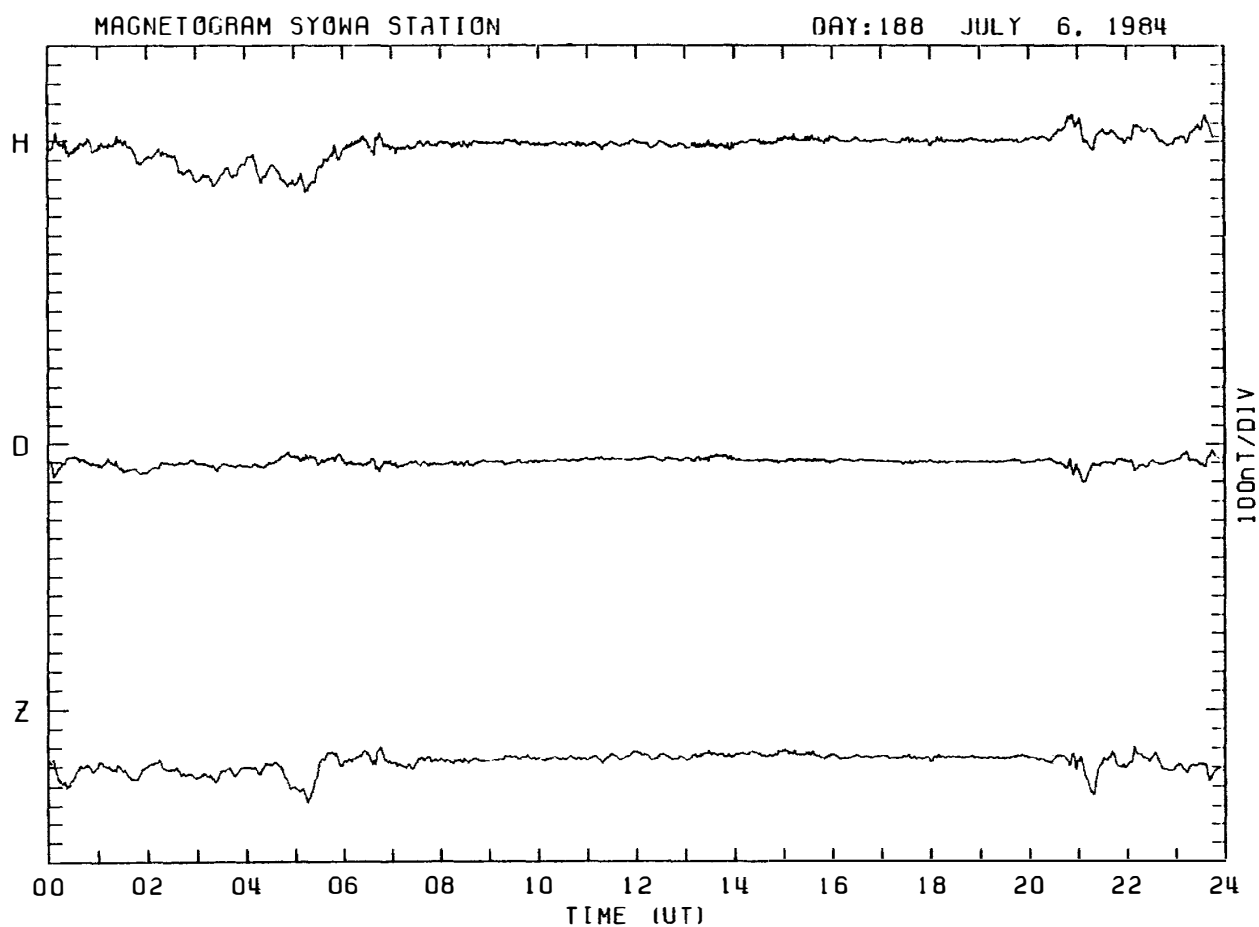


MAGNETOGRAM SYOWA STATION

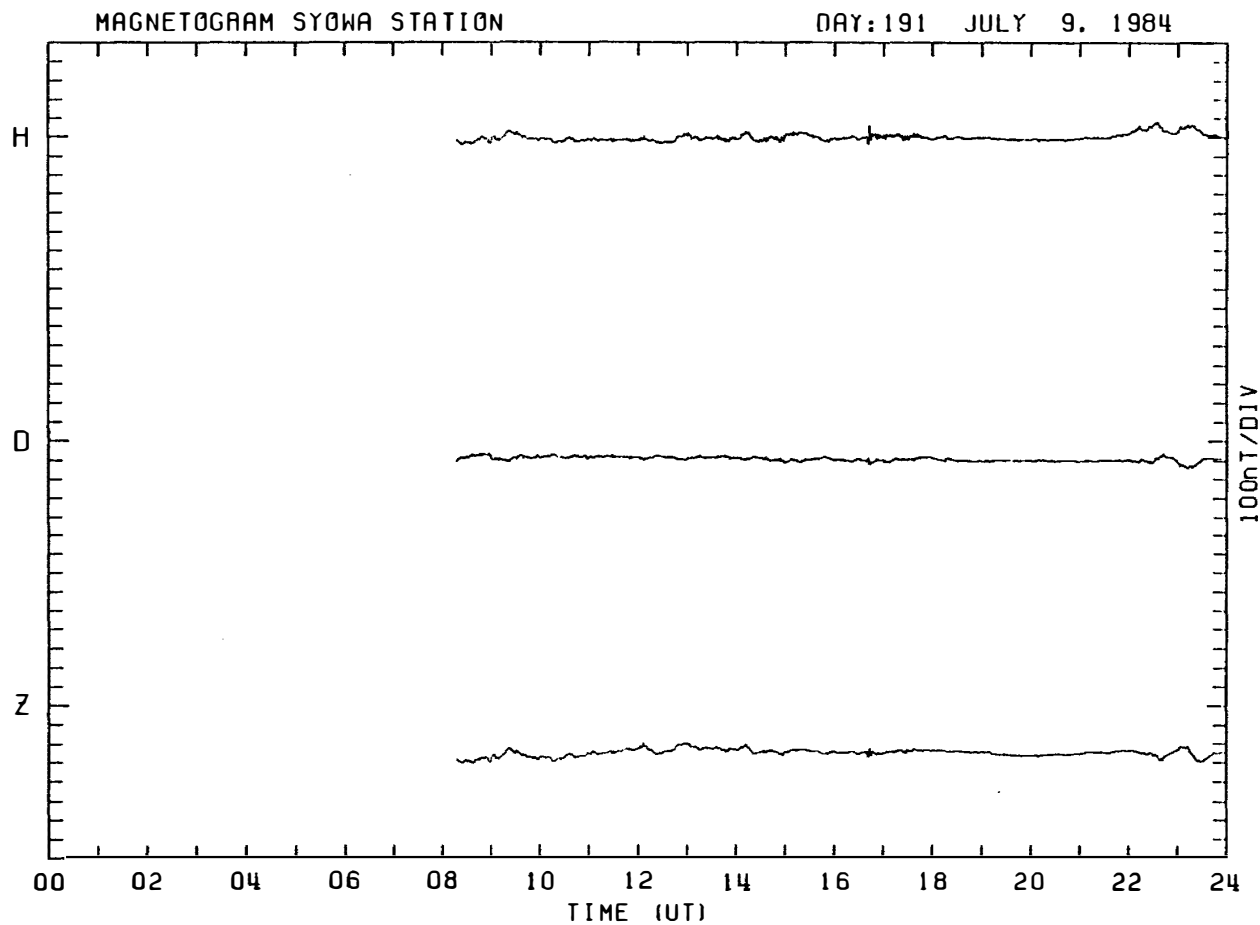
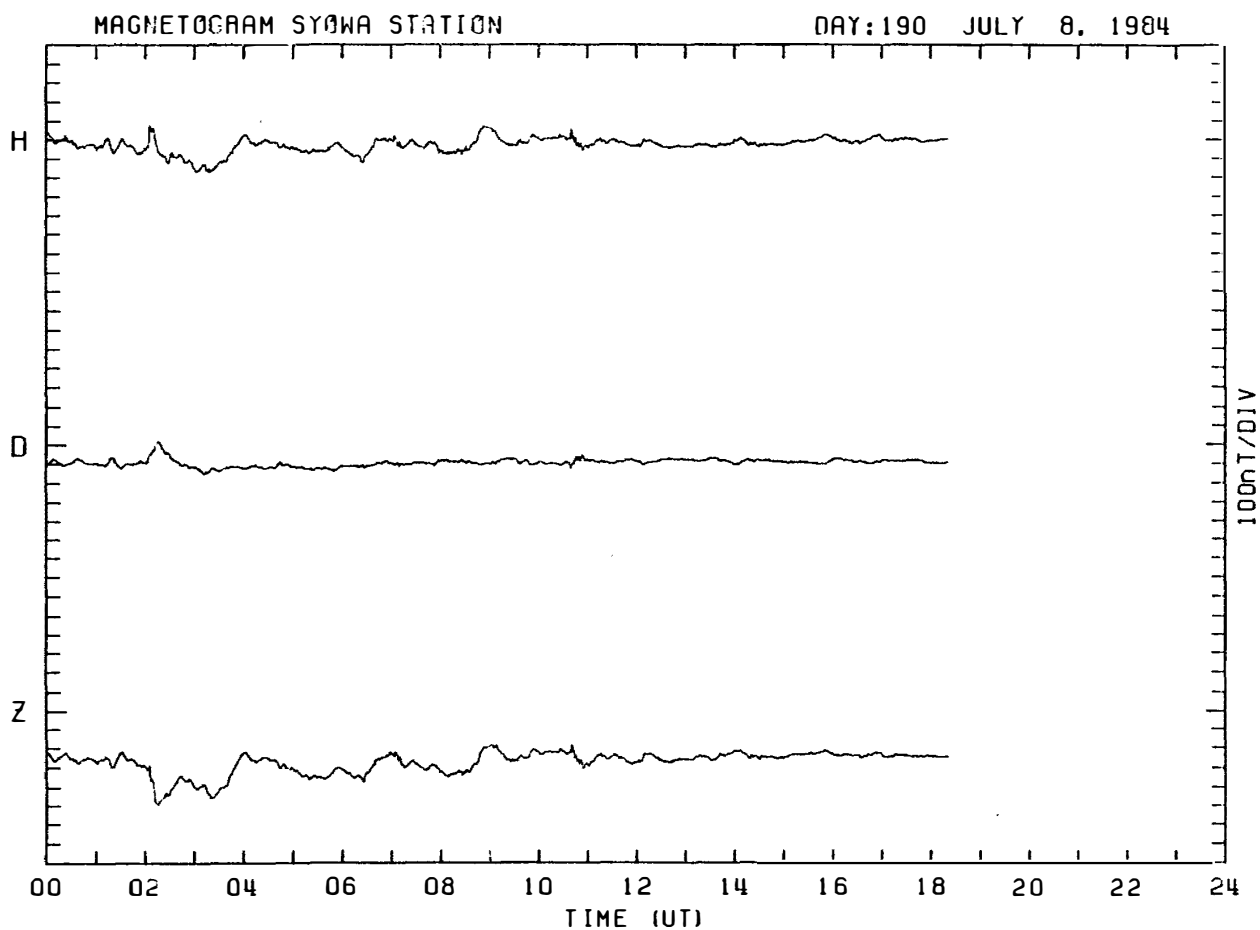
DAY:185 JULY 3, 1984

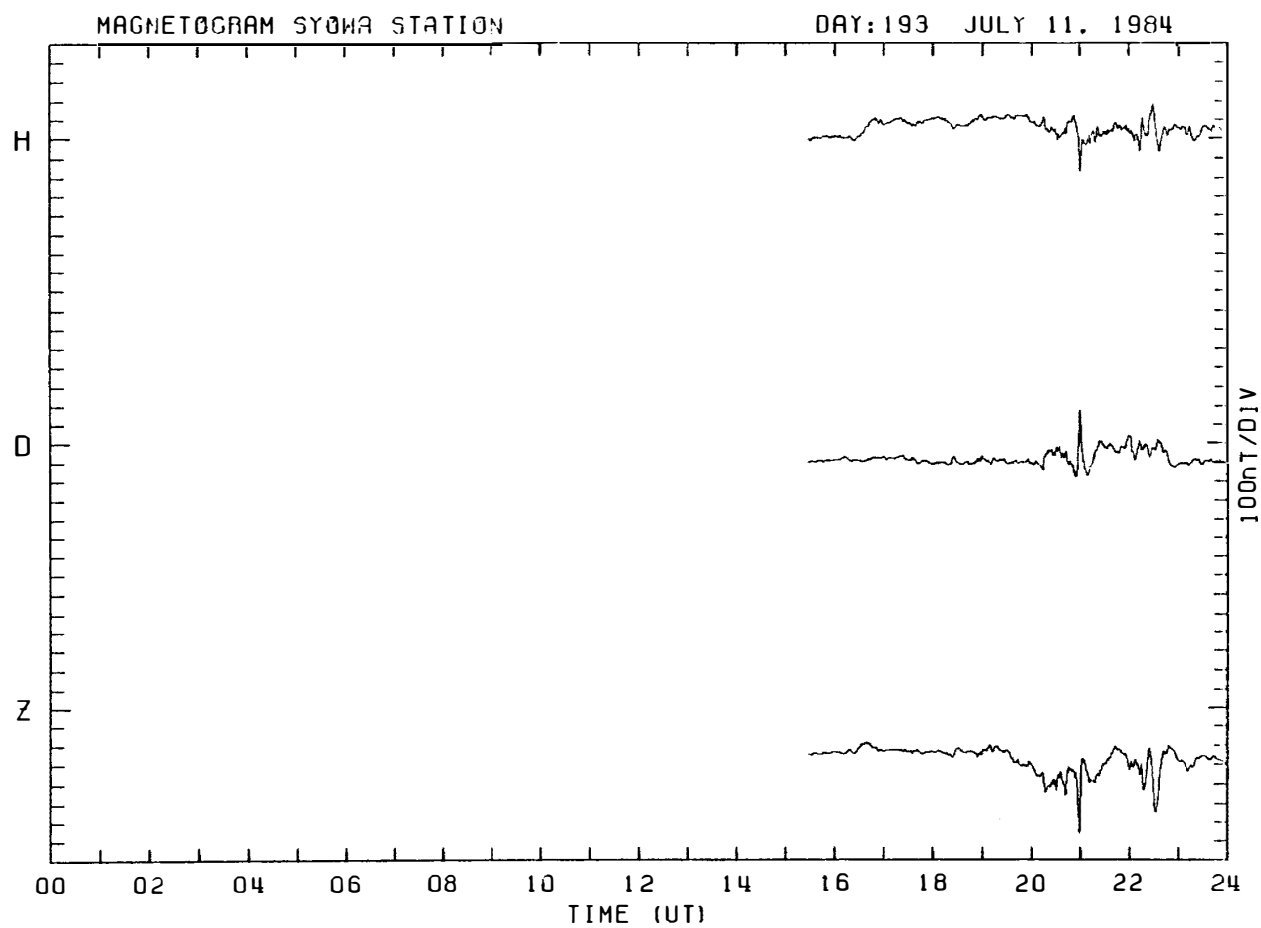
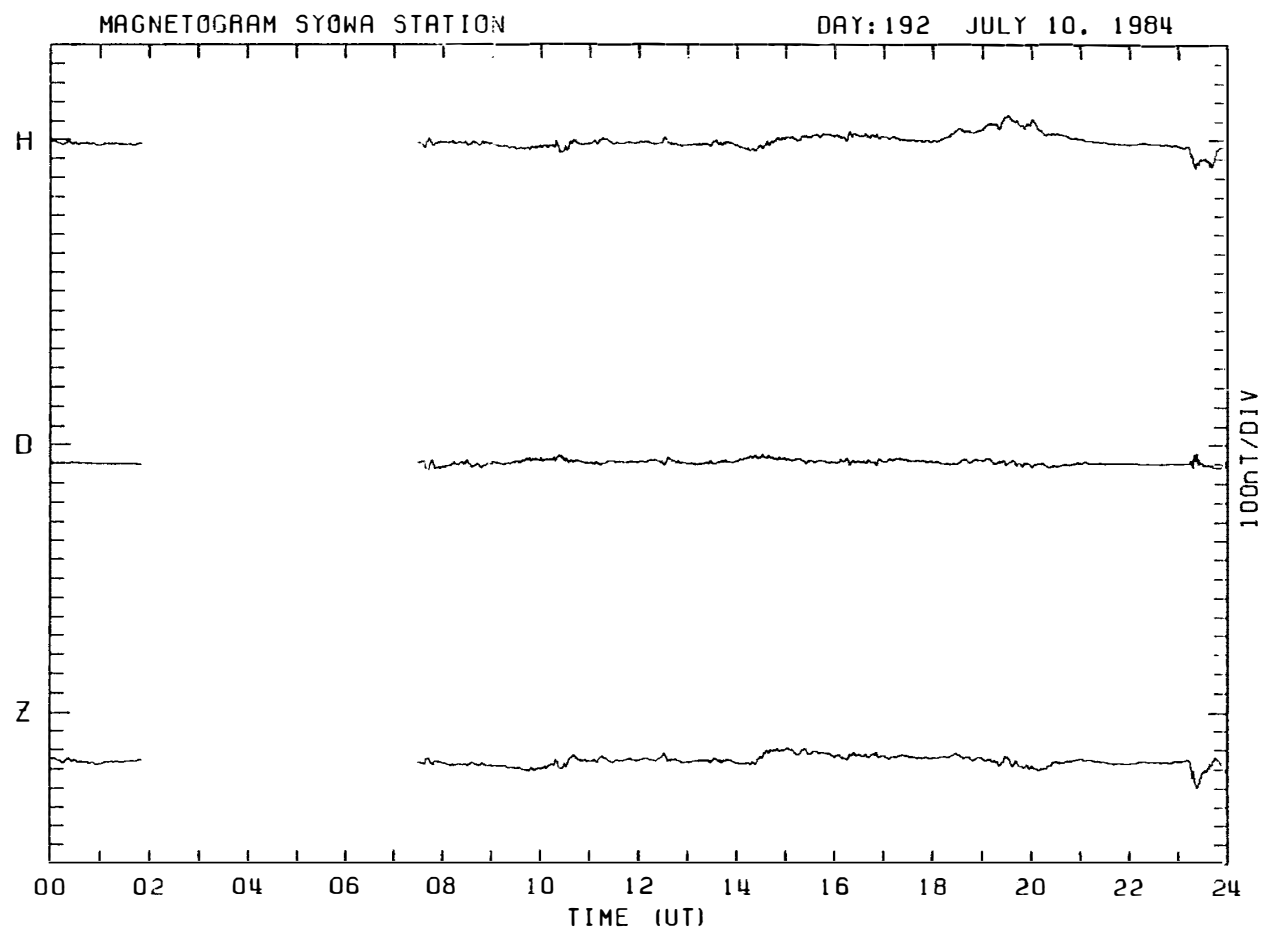


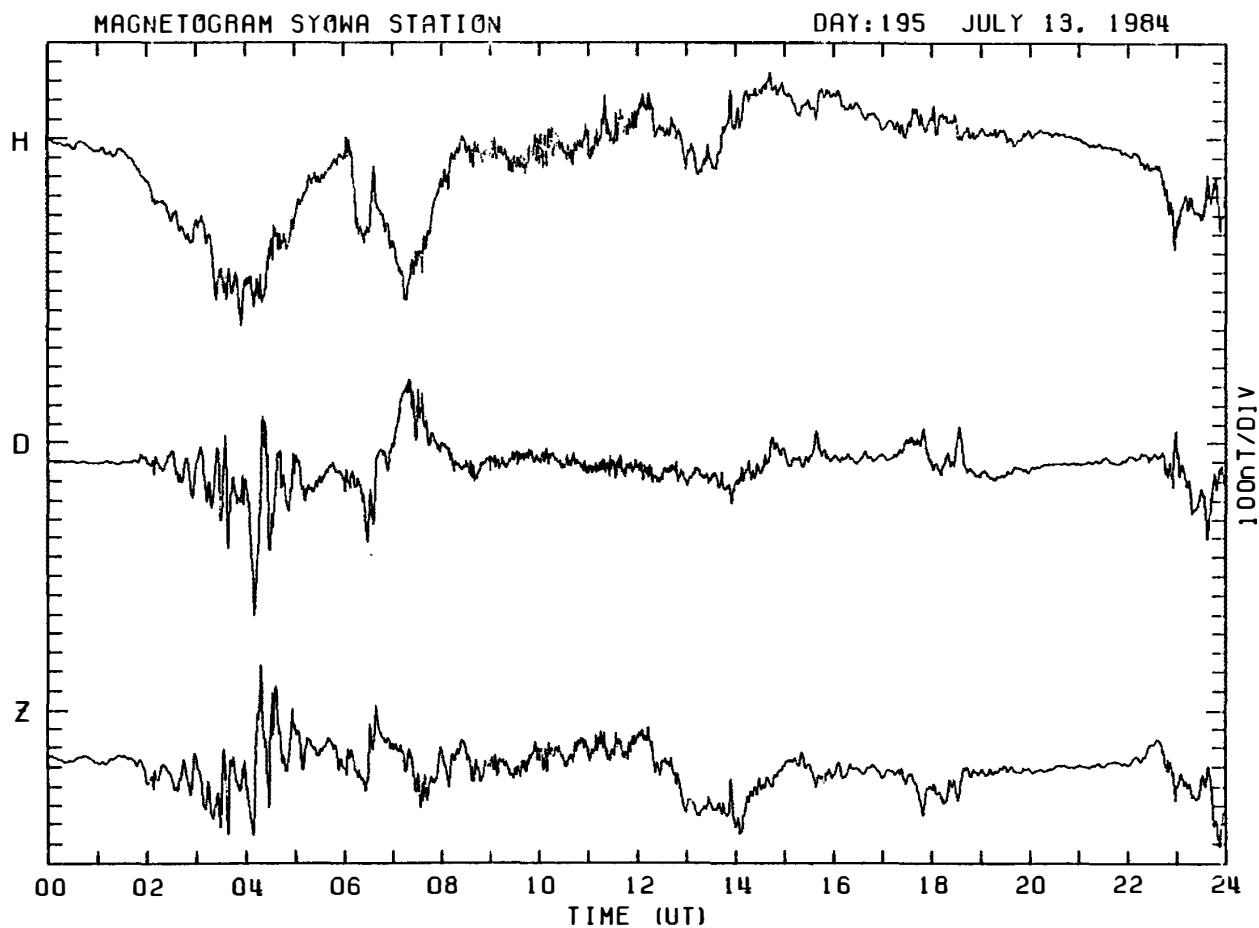
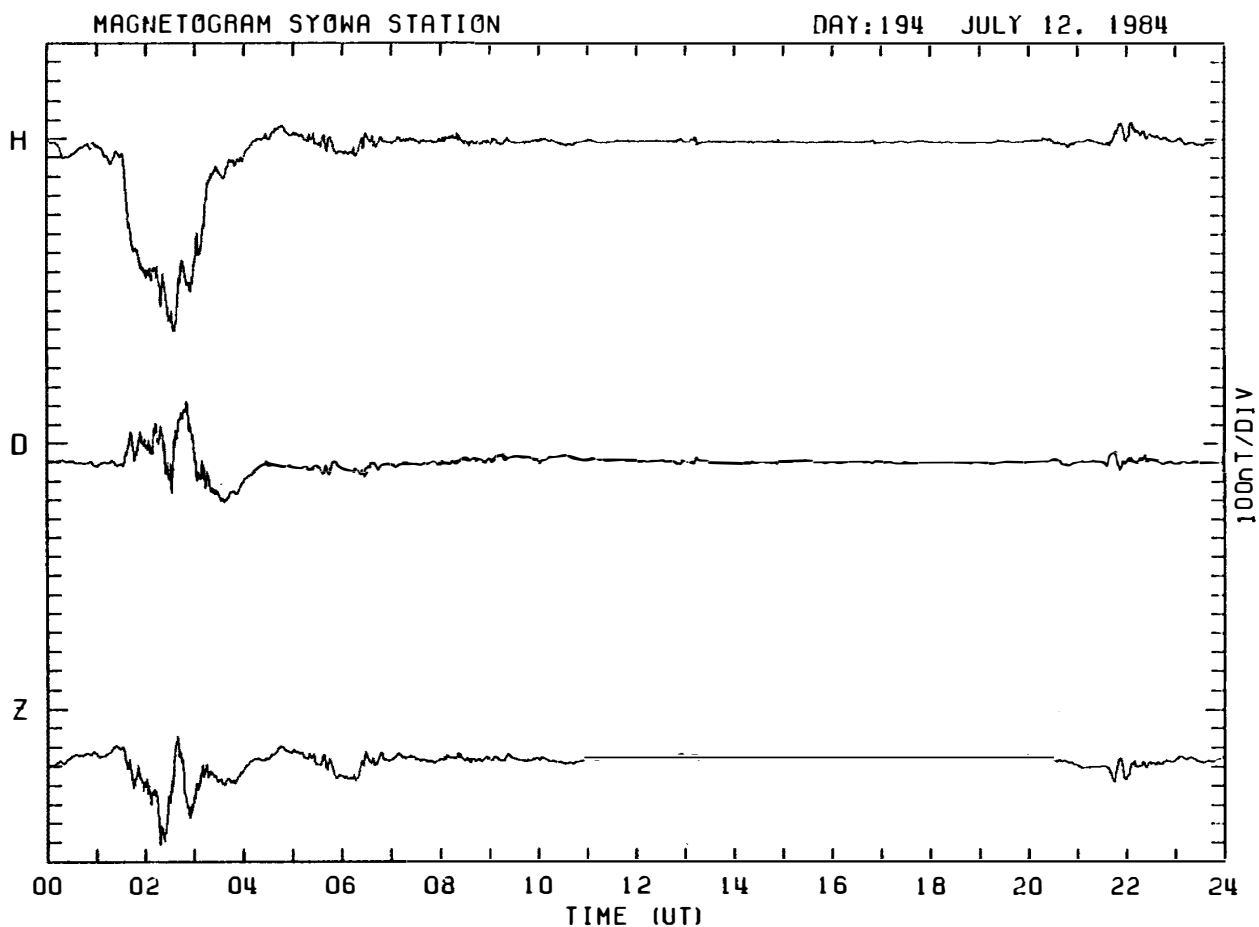






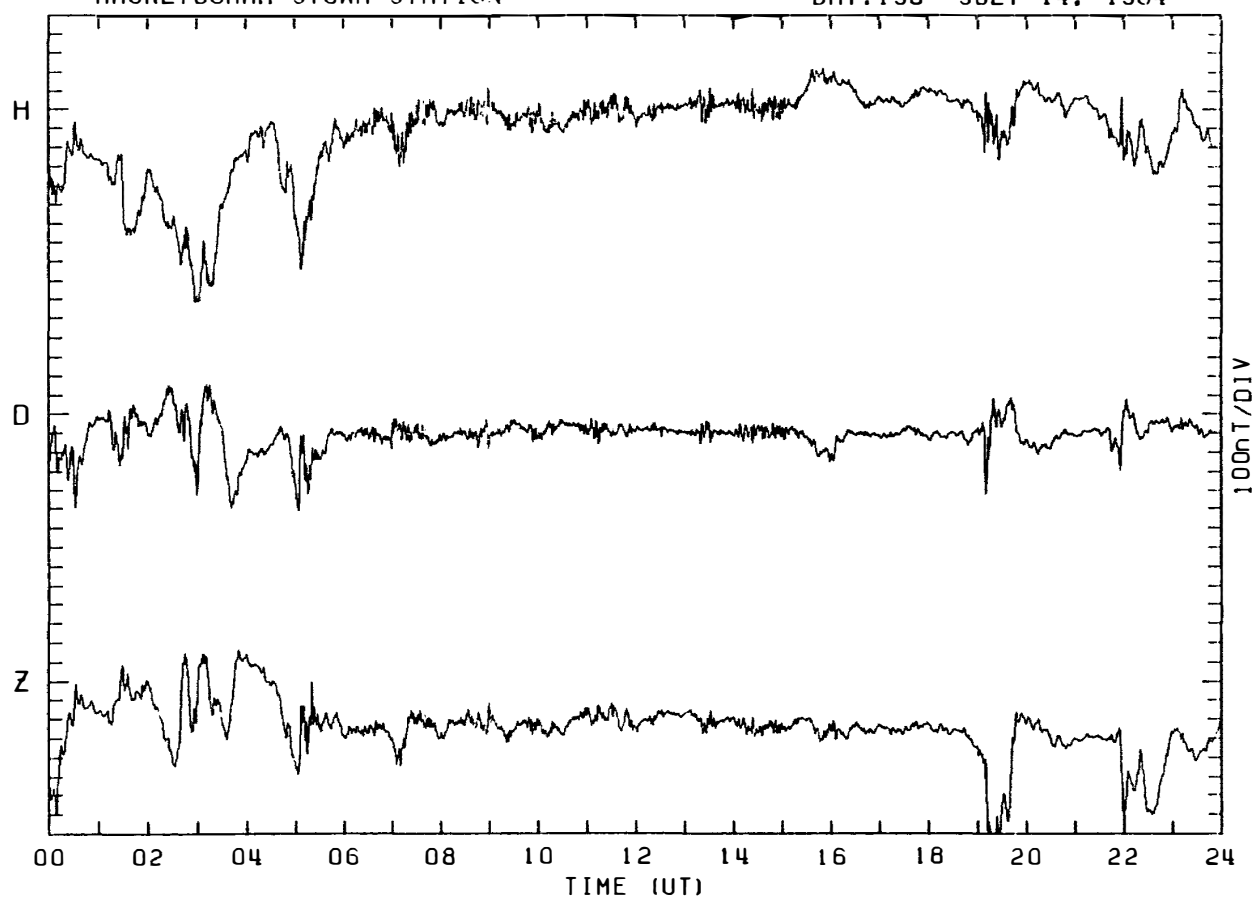






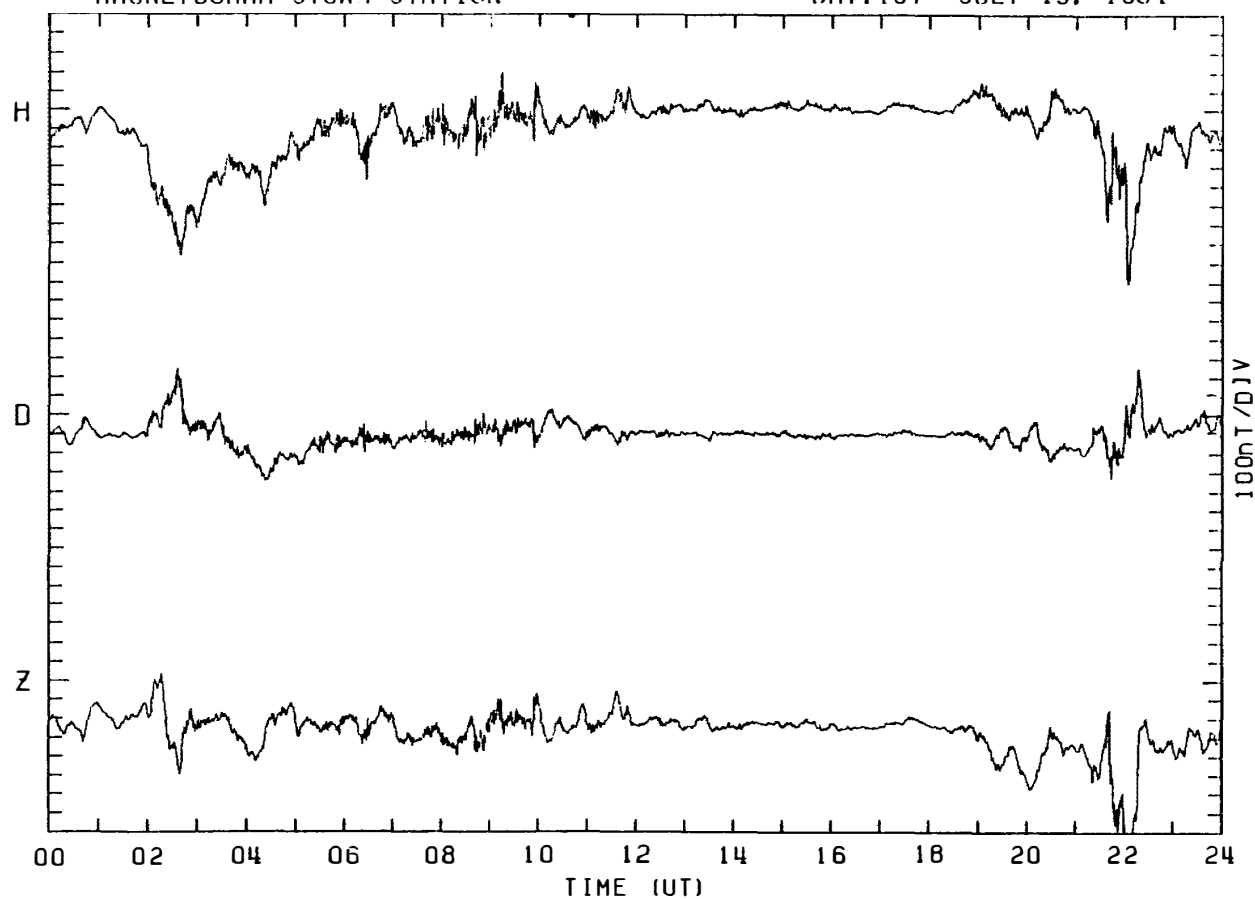
MAGNETOGRAM SYOWA STATION

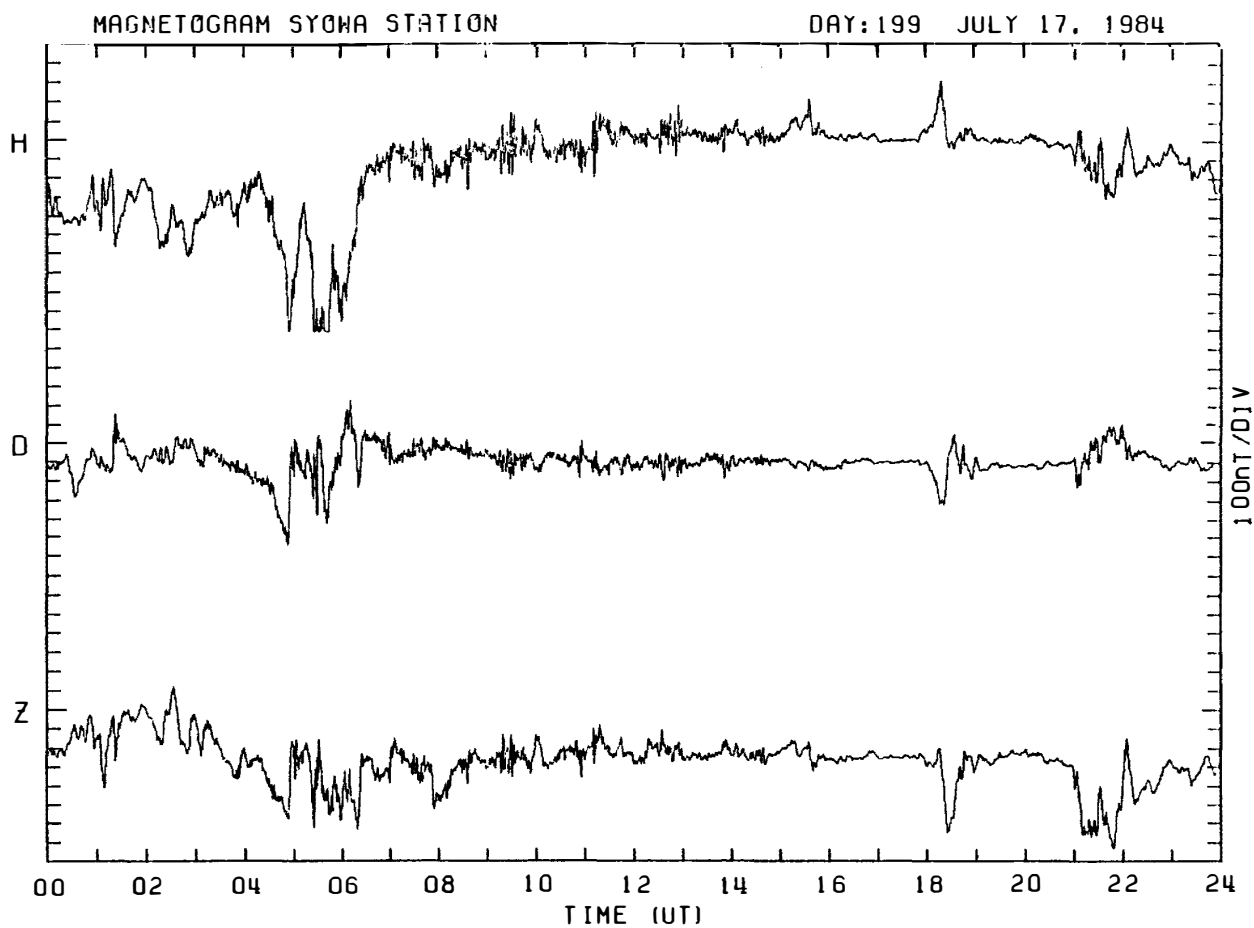
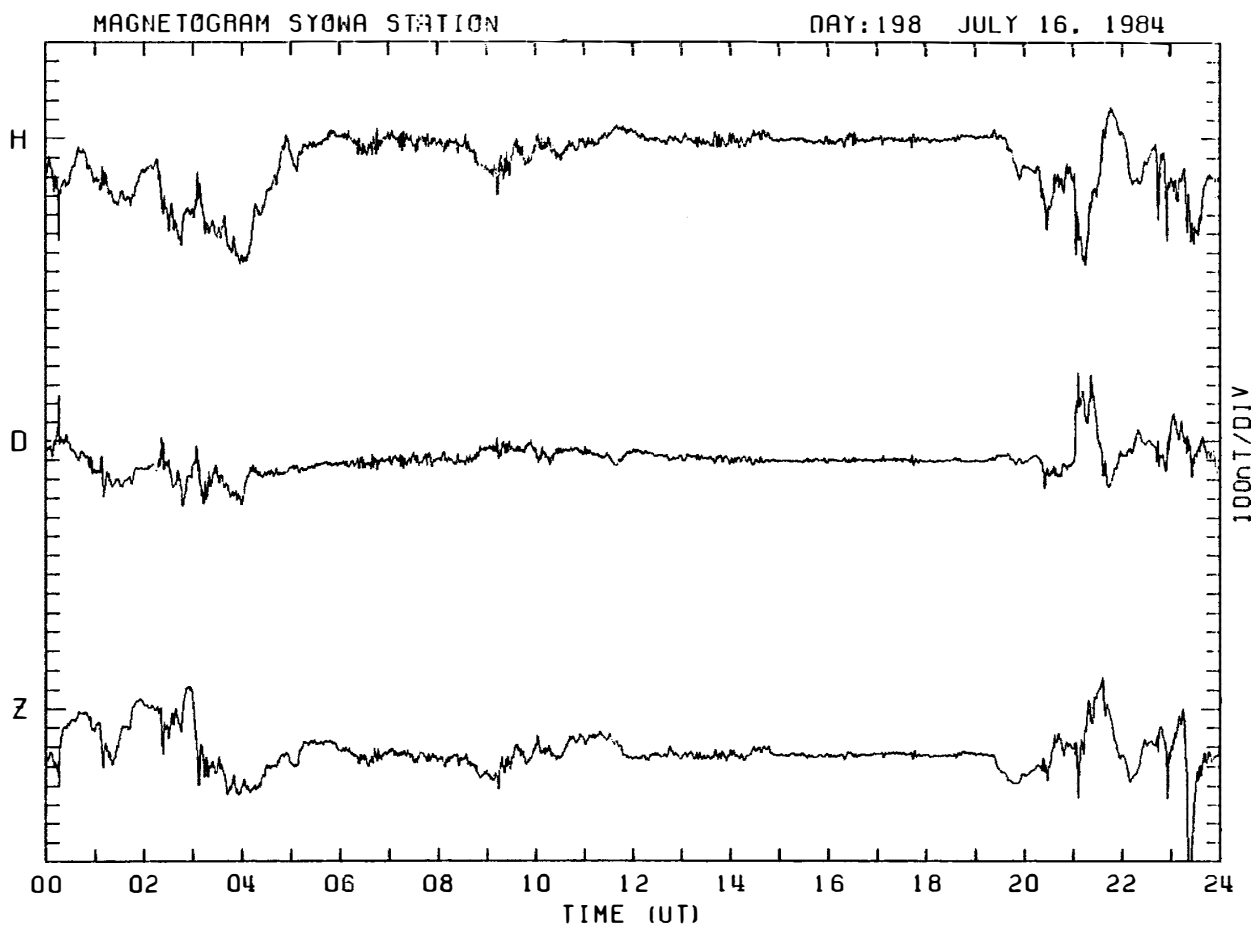
DAY:196 JULY 14. 1984



MAGNETOGRAM SYOWA STATION

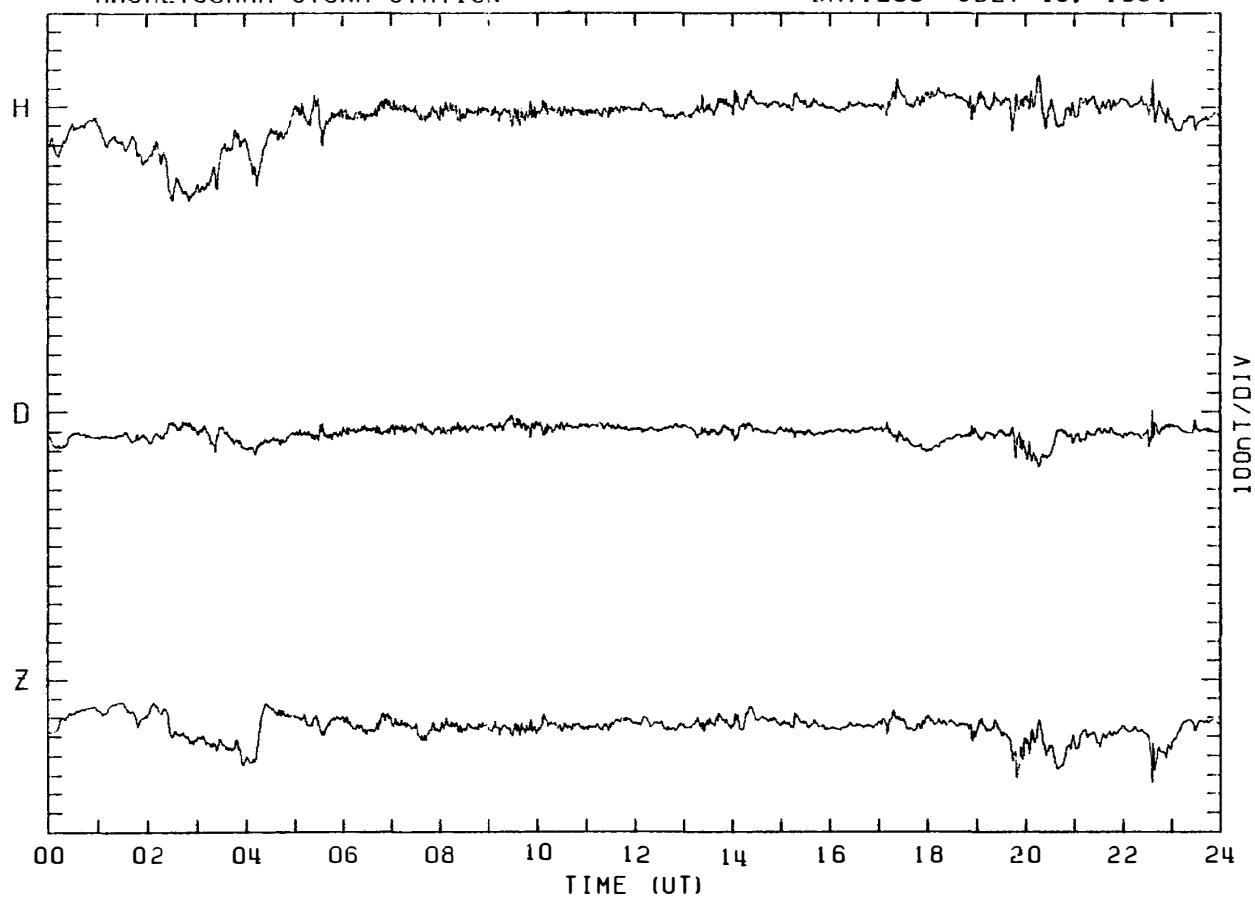
DAY:197 JULY 15. 1984





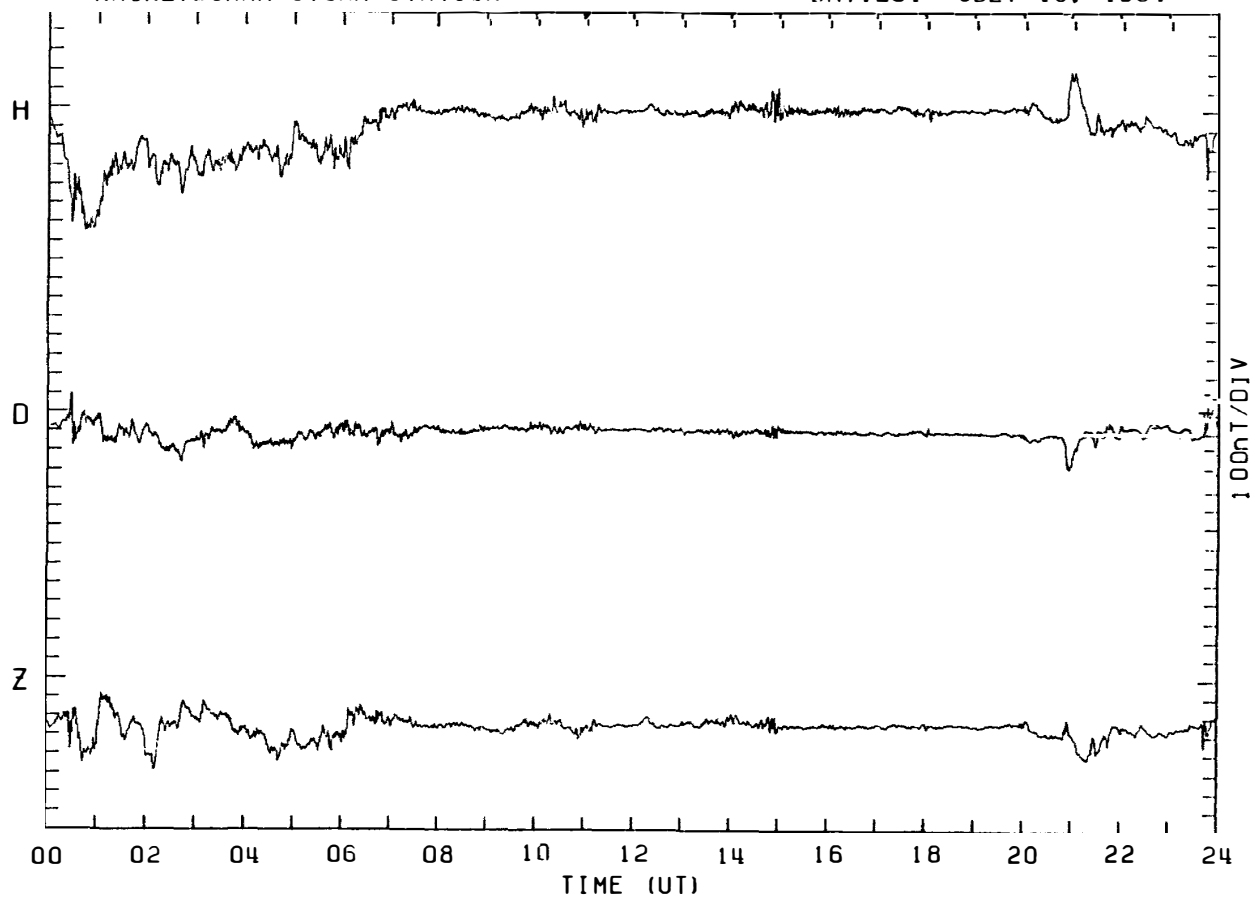
MAGNETOGRAM SYOWA STATION

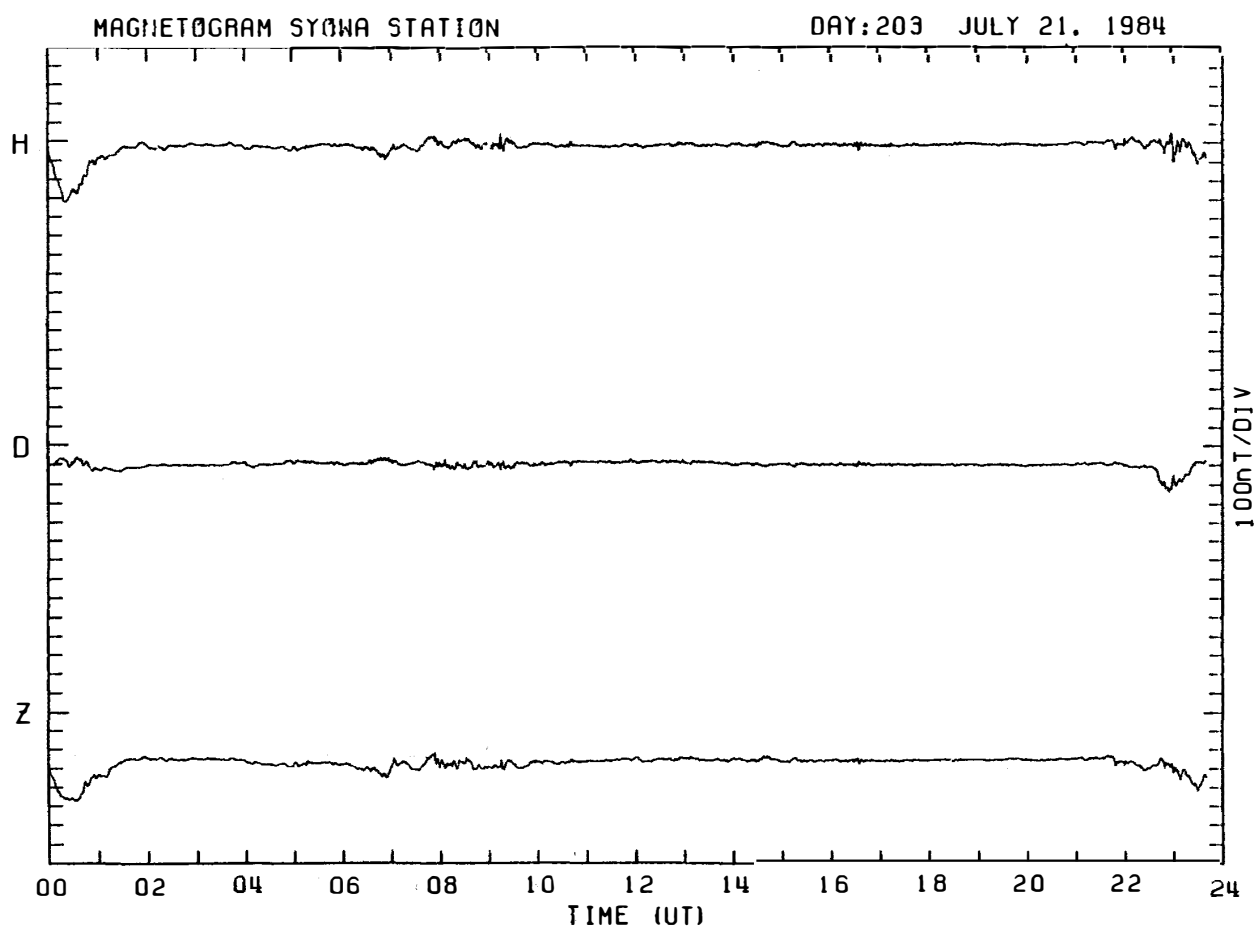
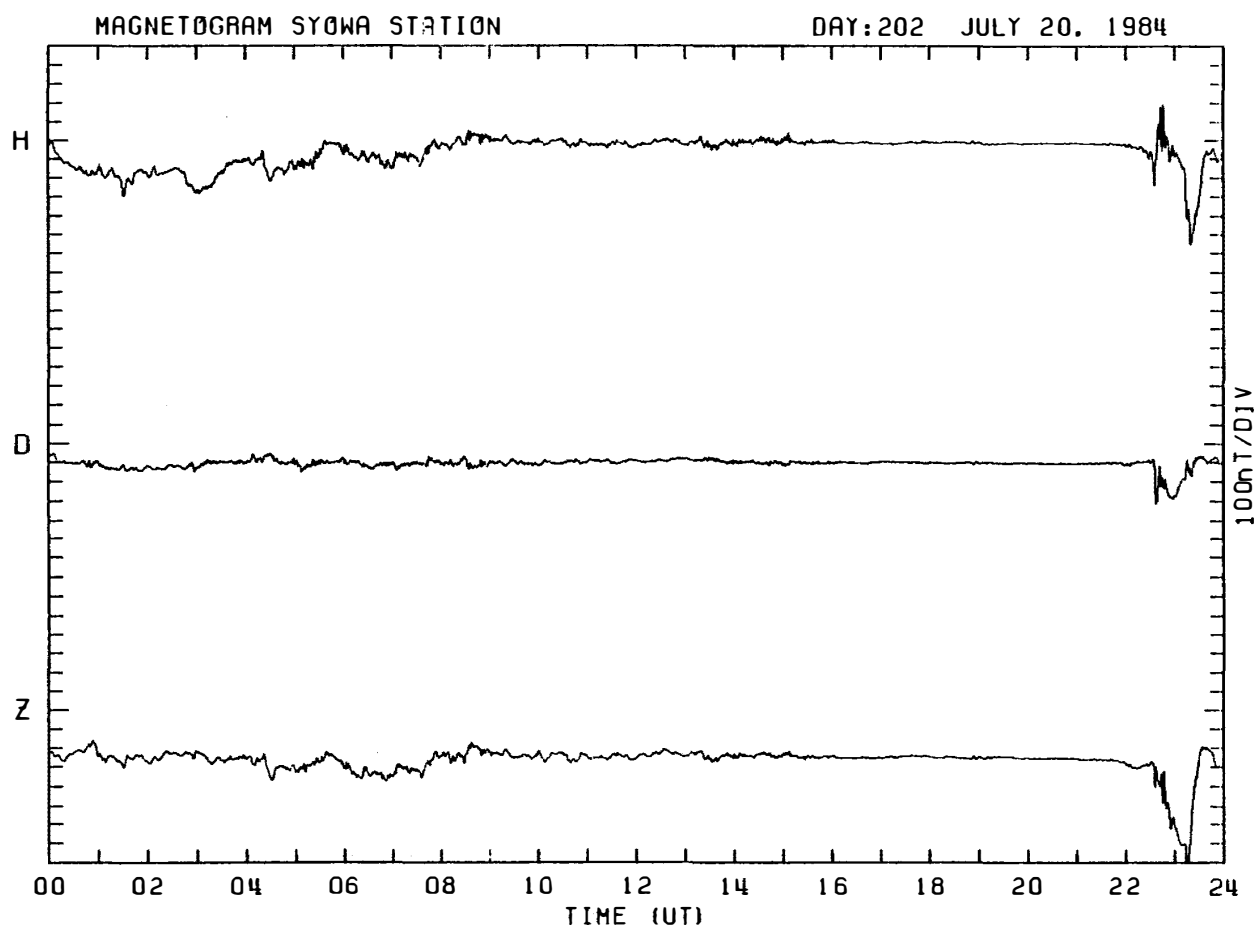
DAY:200 JULY 18. 1984

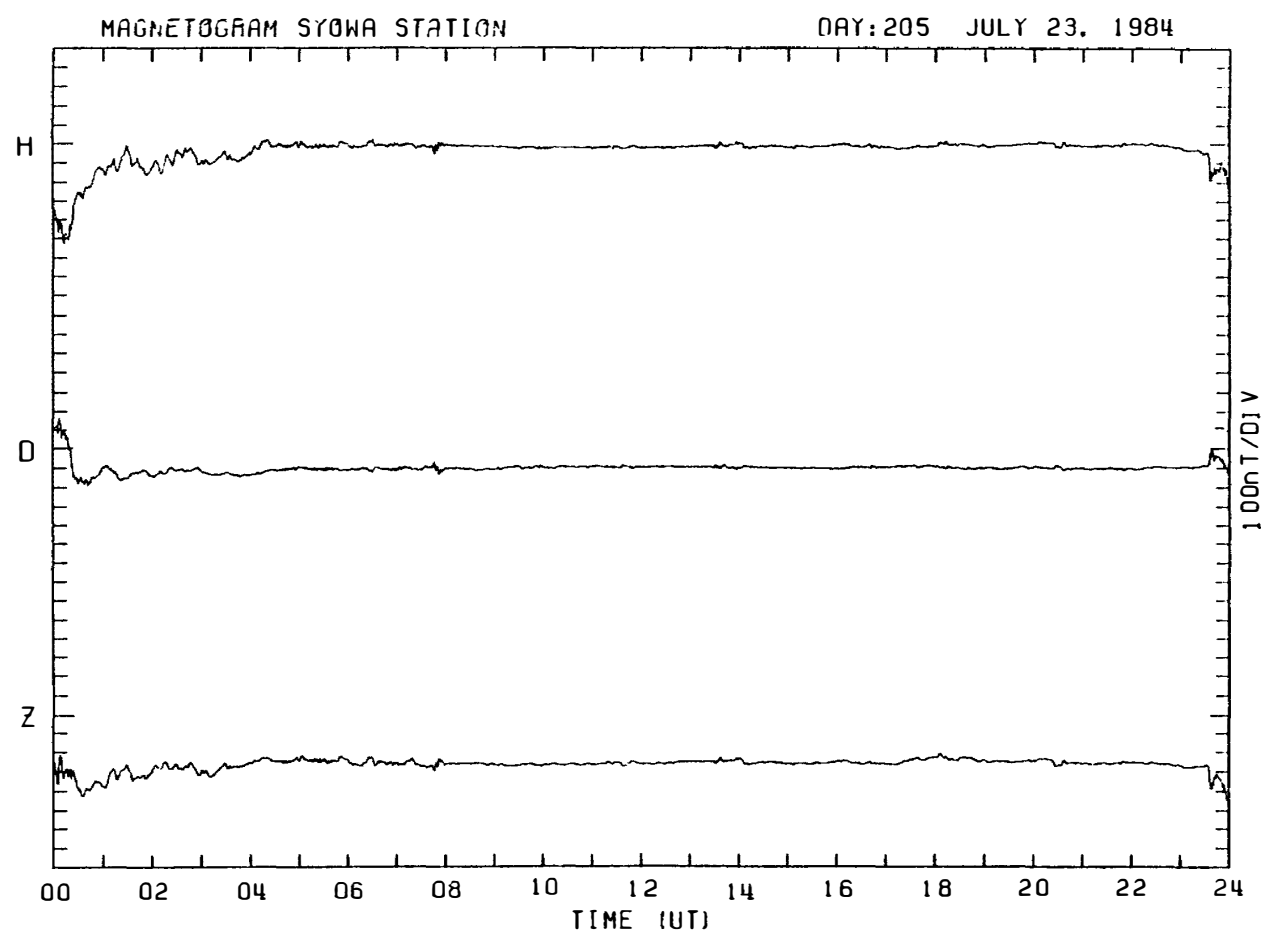
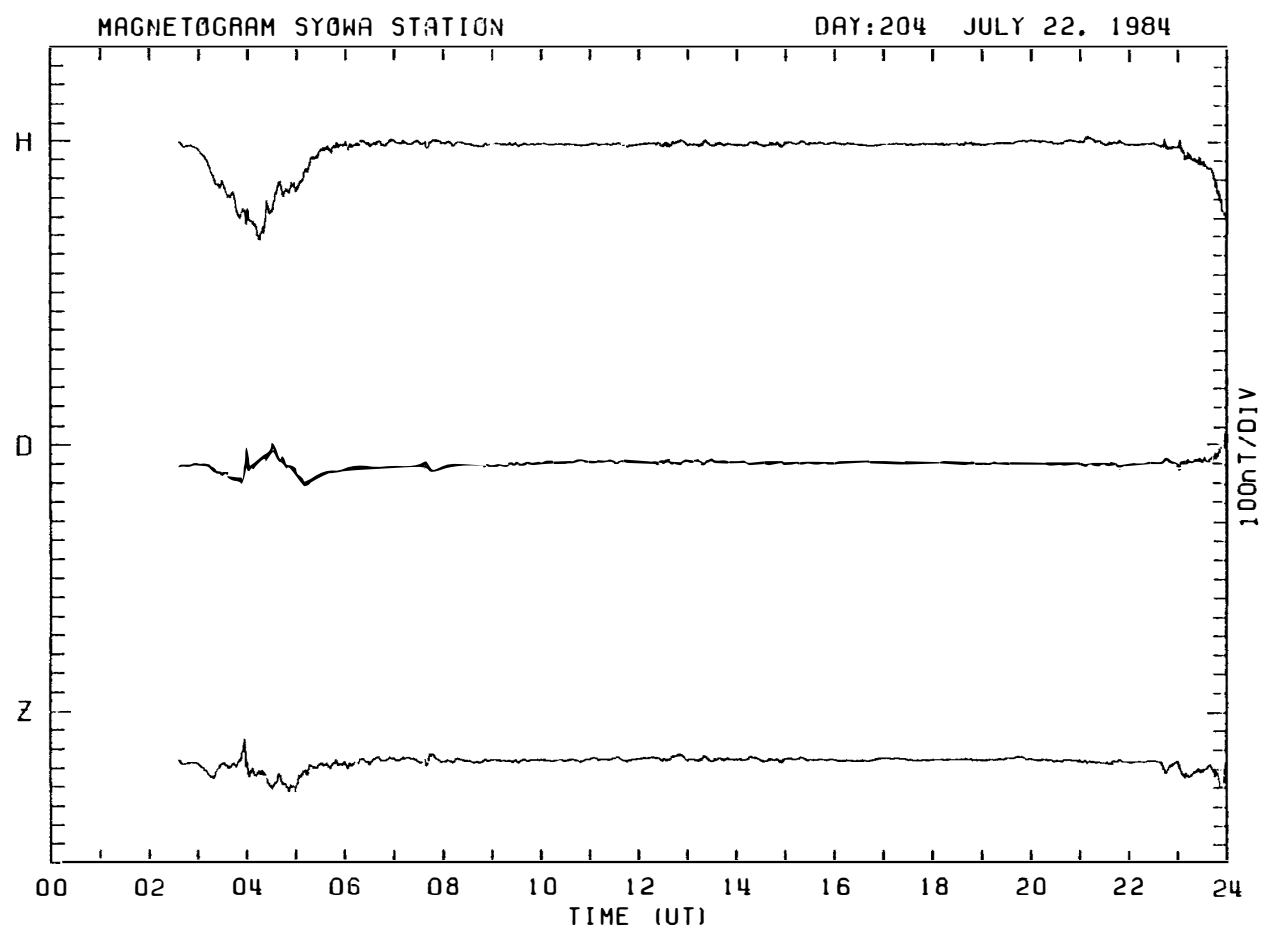


MAGNETOGRAM SYOWA STATION

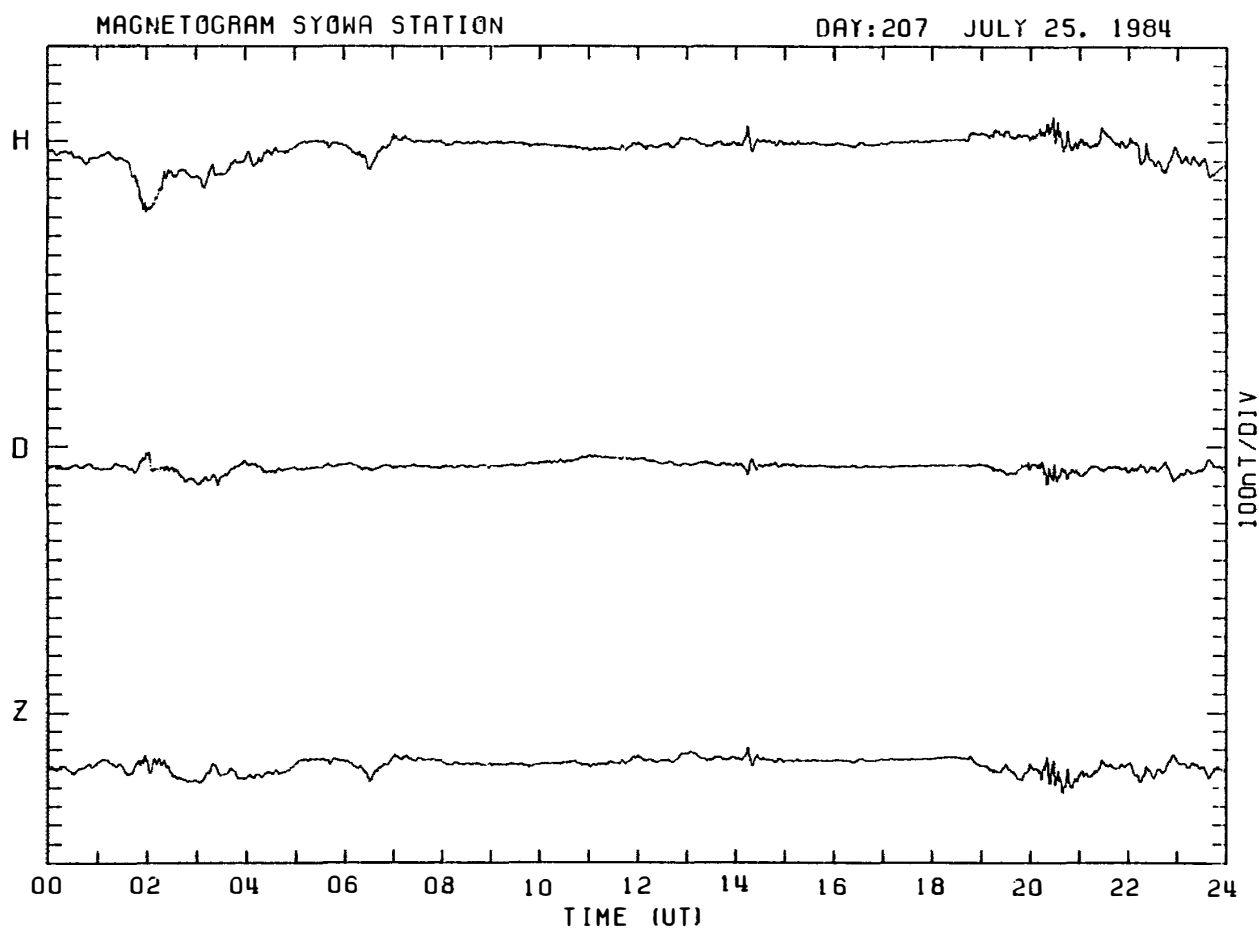
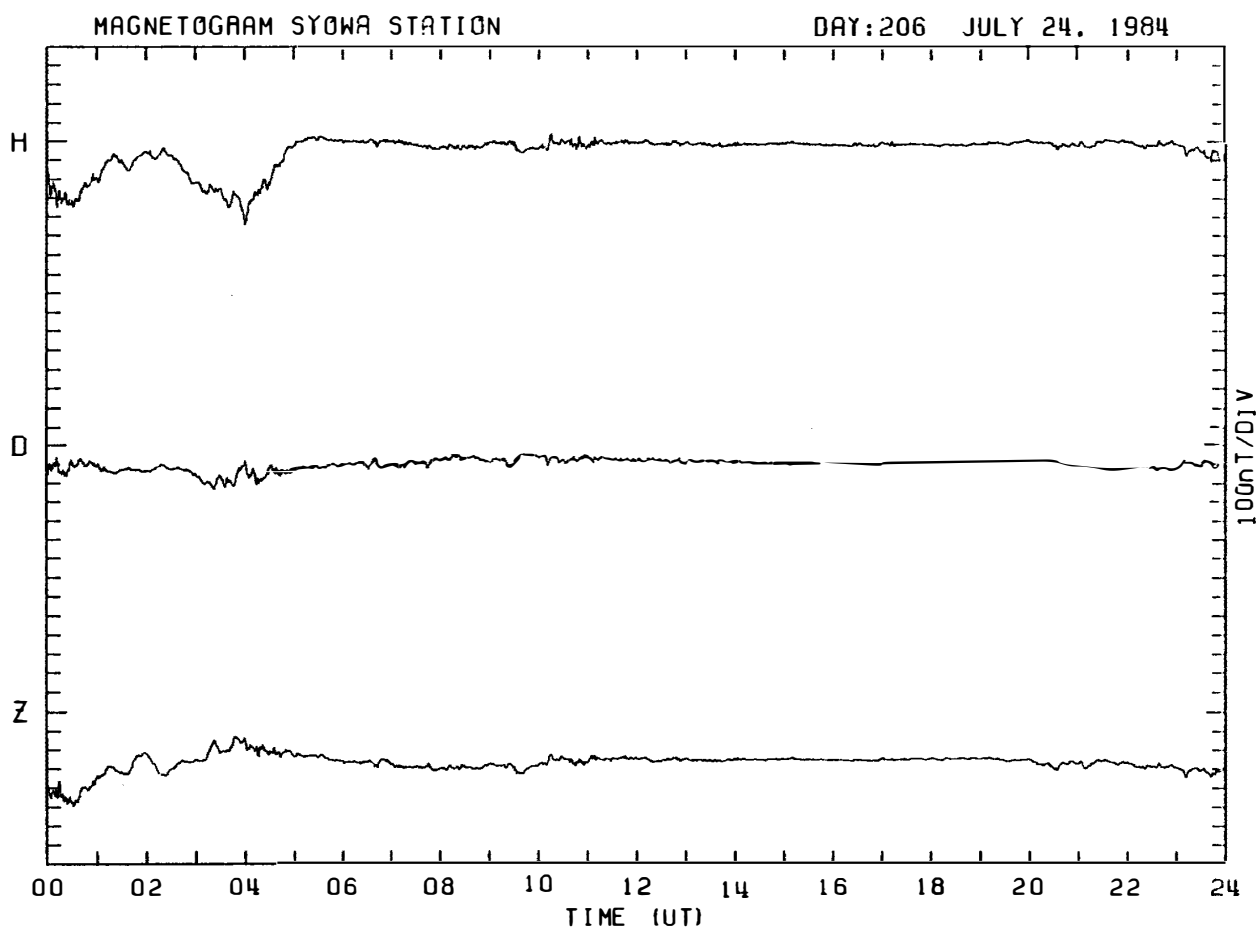
DAY:201 JULY 19. 1984





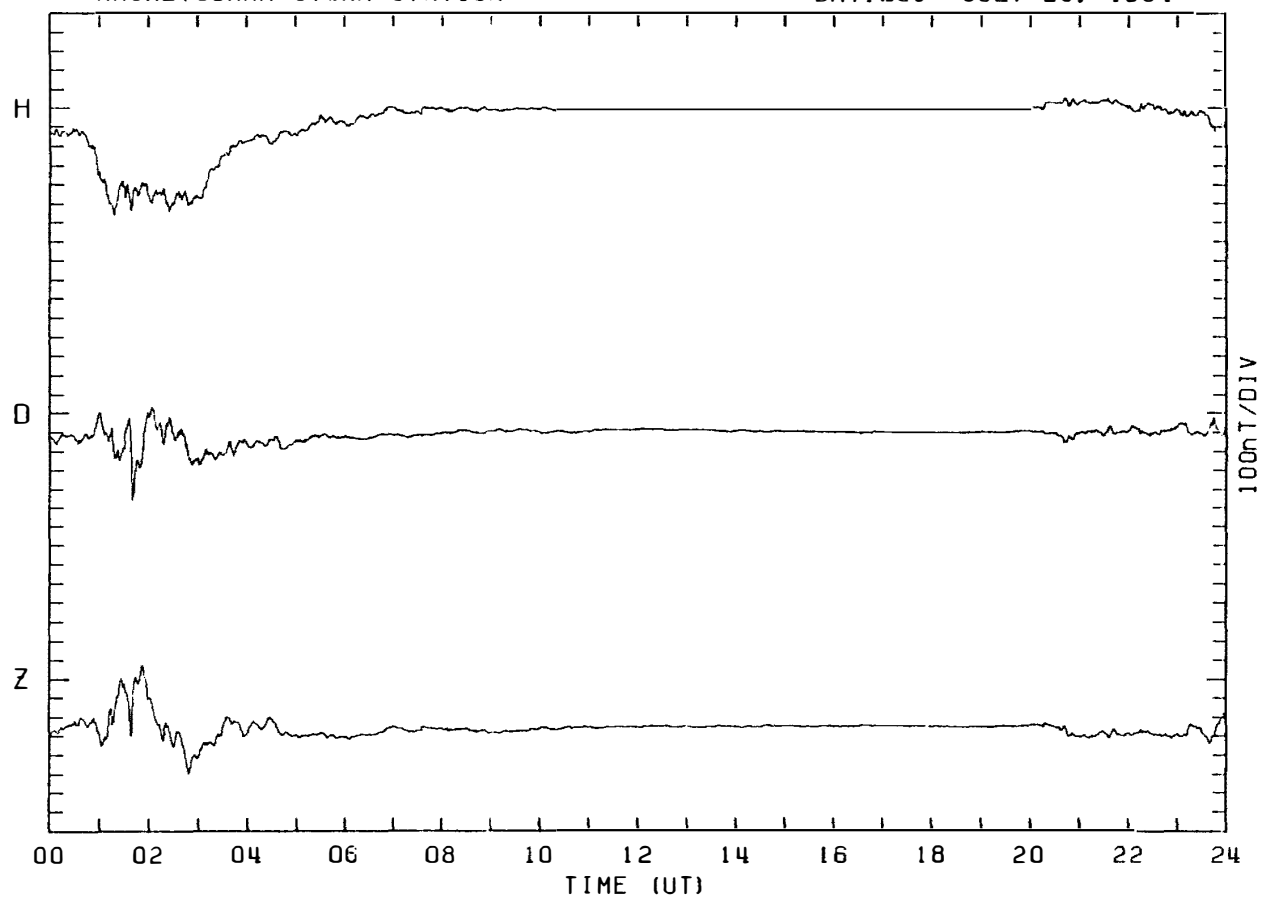






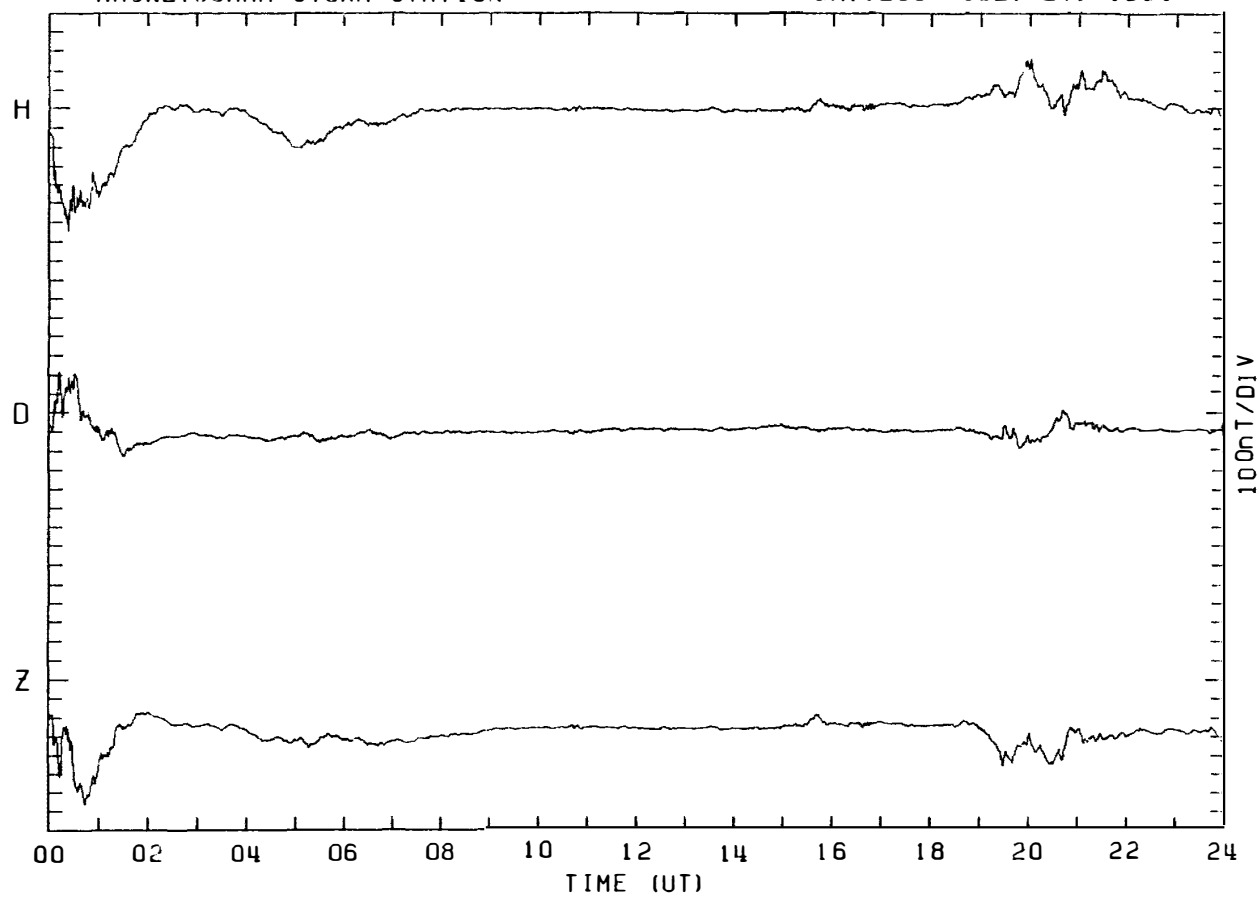
MAGNETOGRAM SYOWA STATION

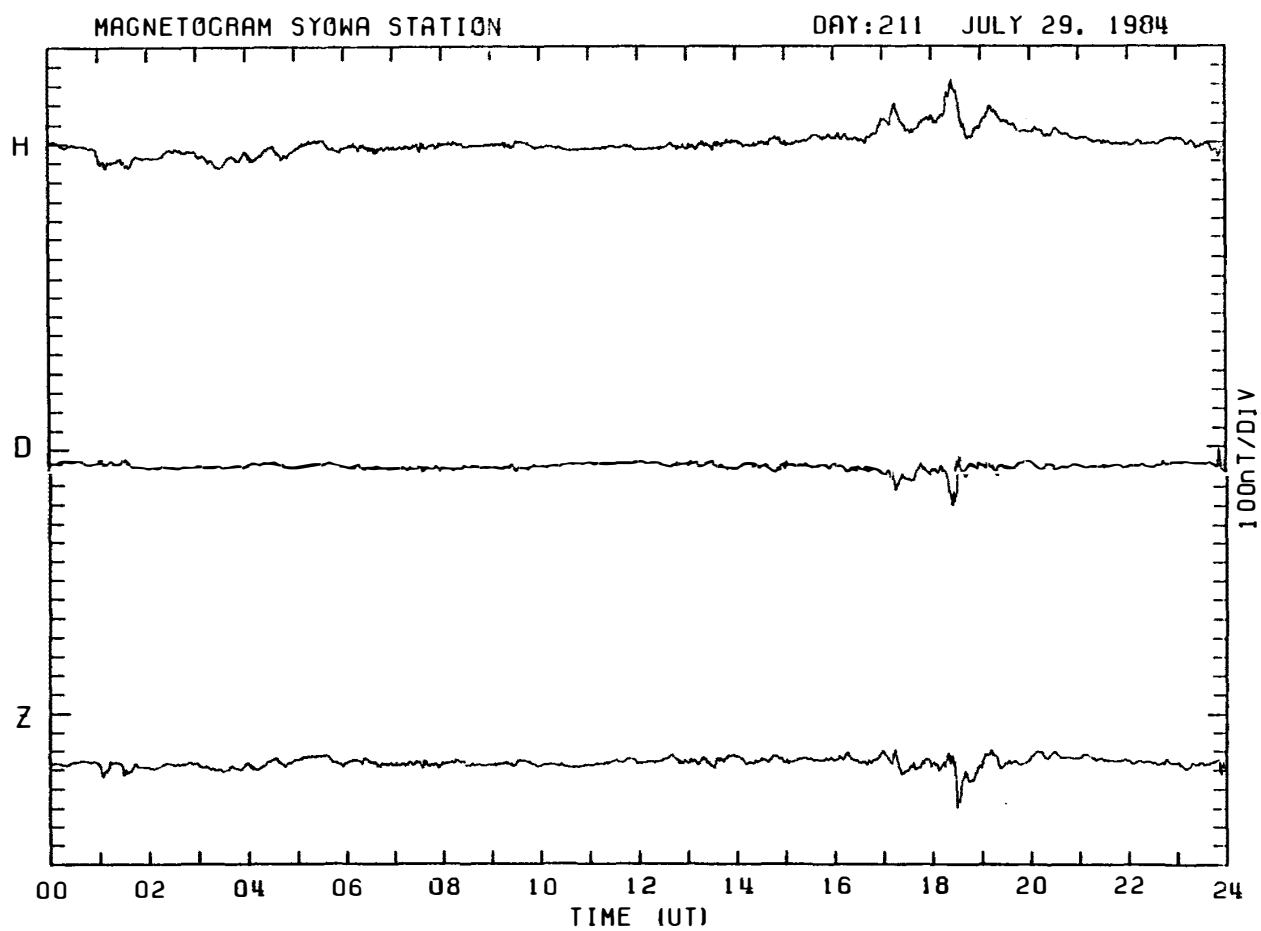
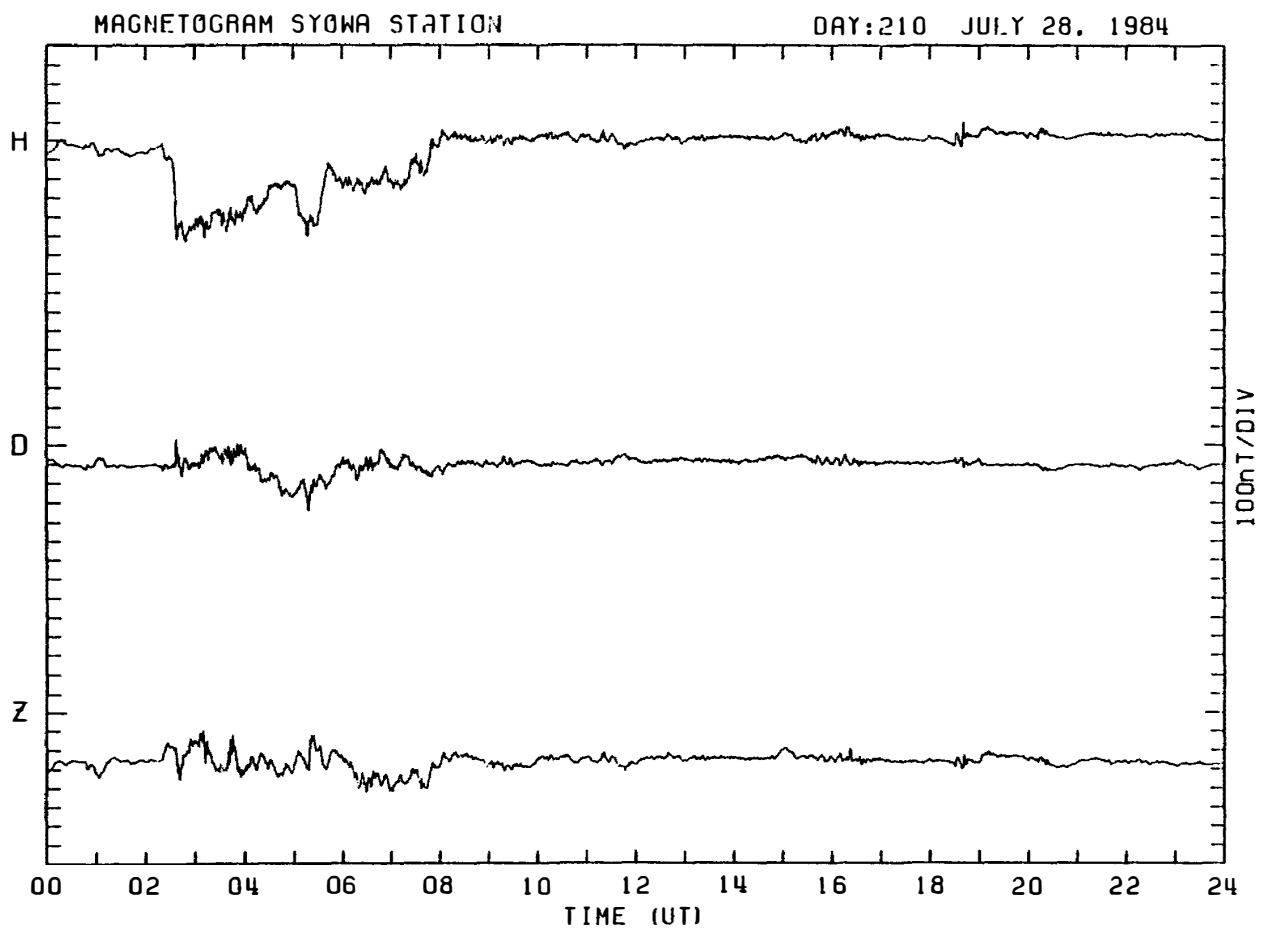
DAY:208 JULY 26. 1984

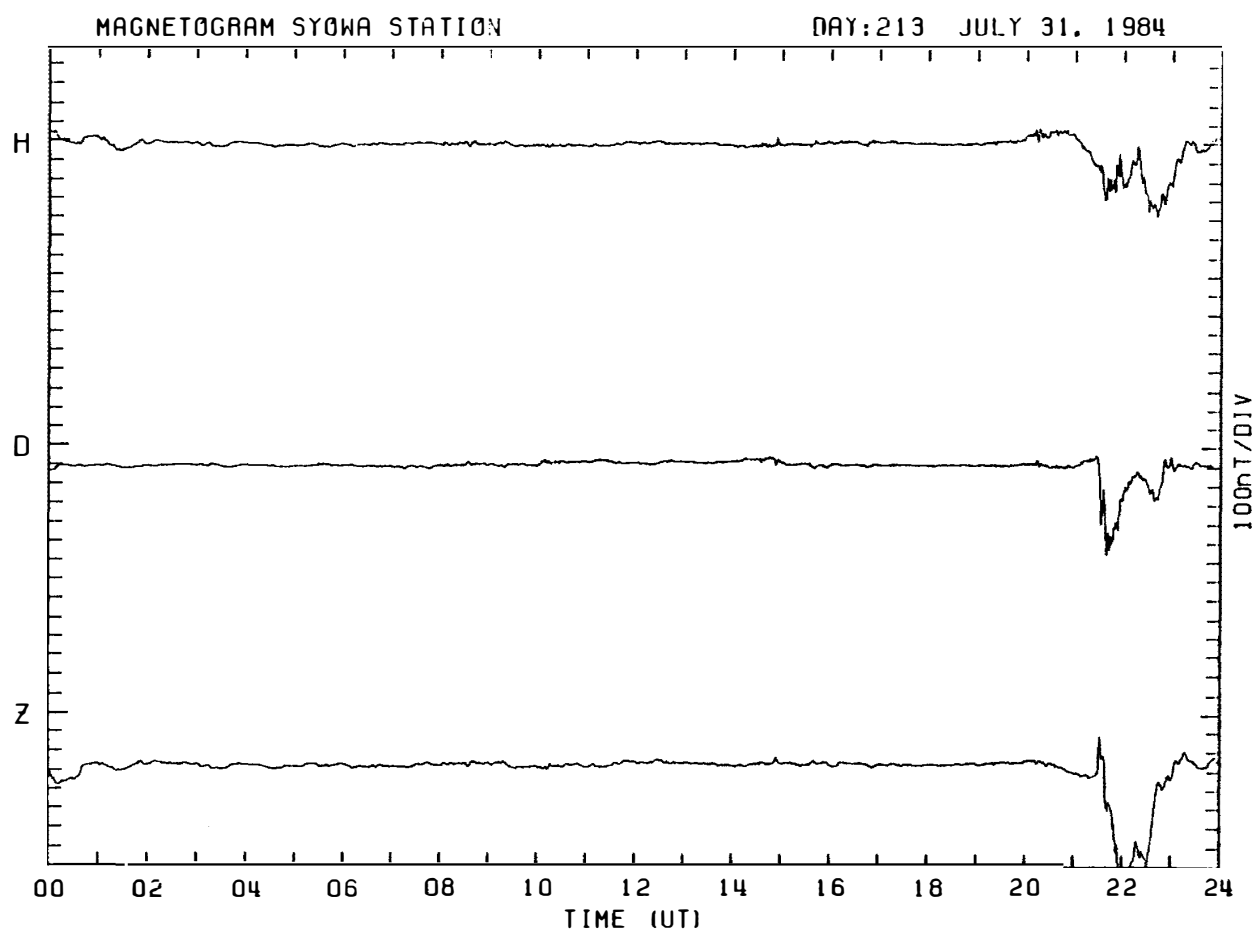
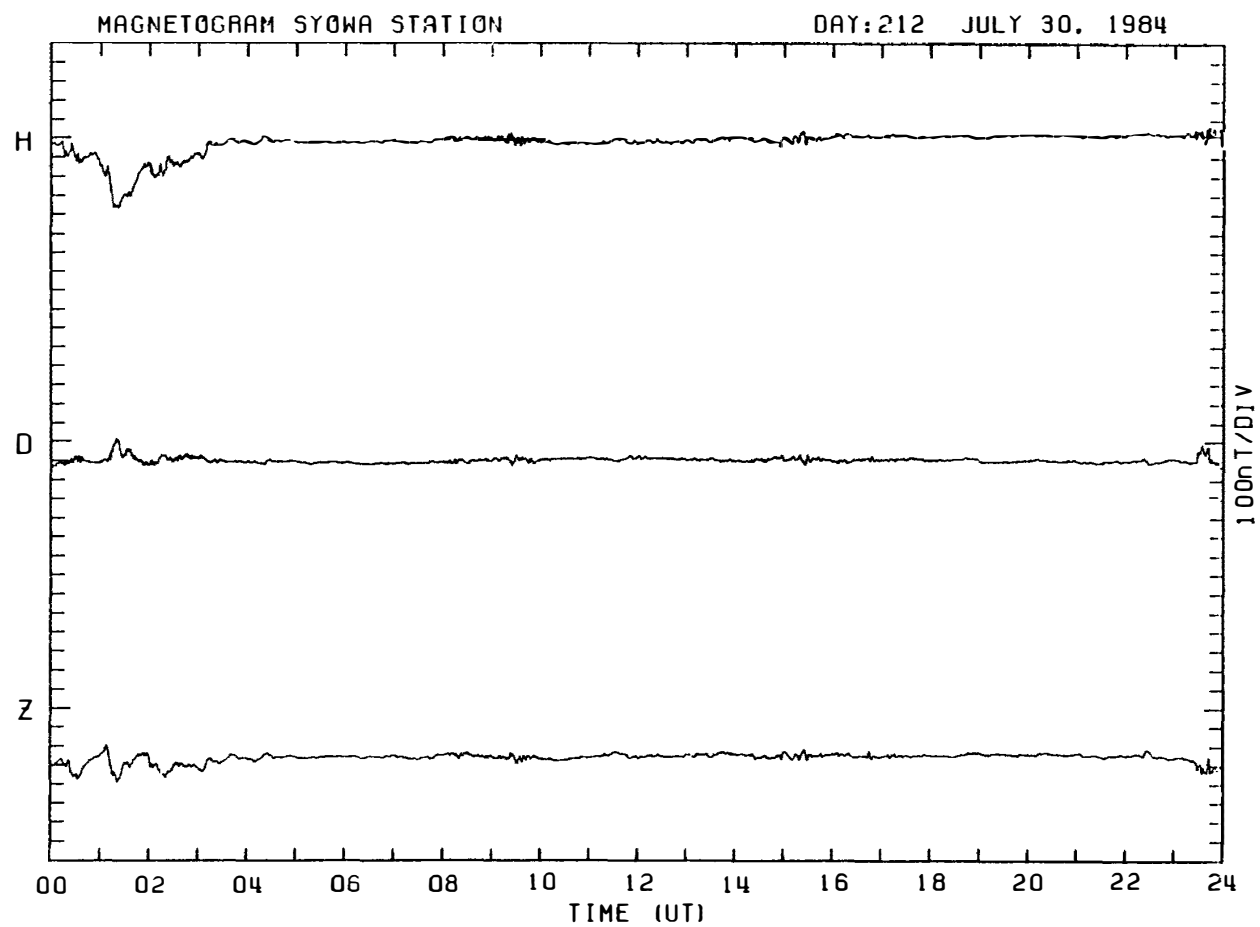


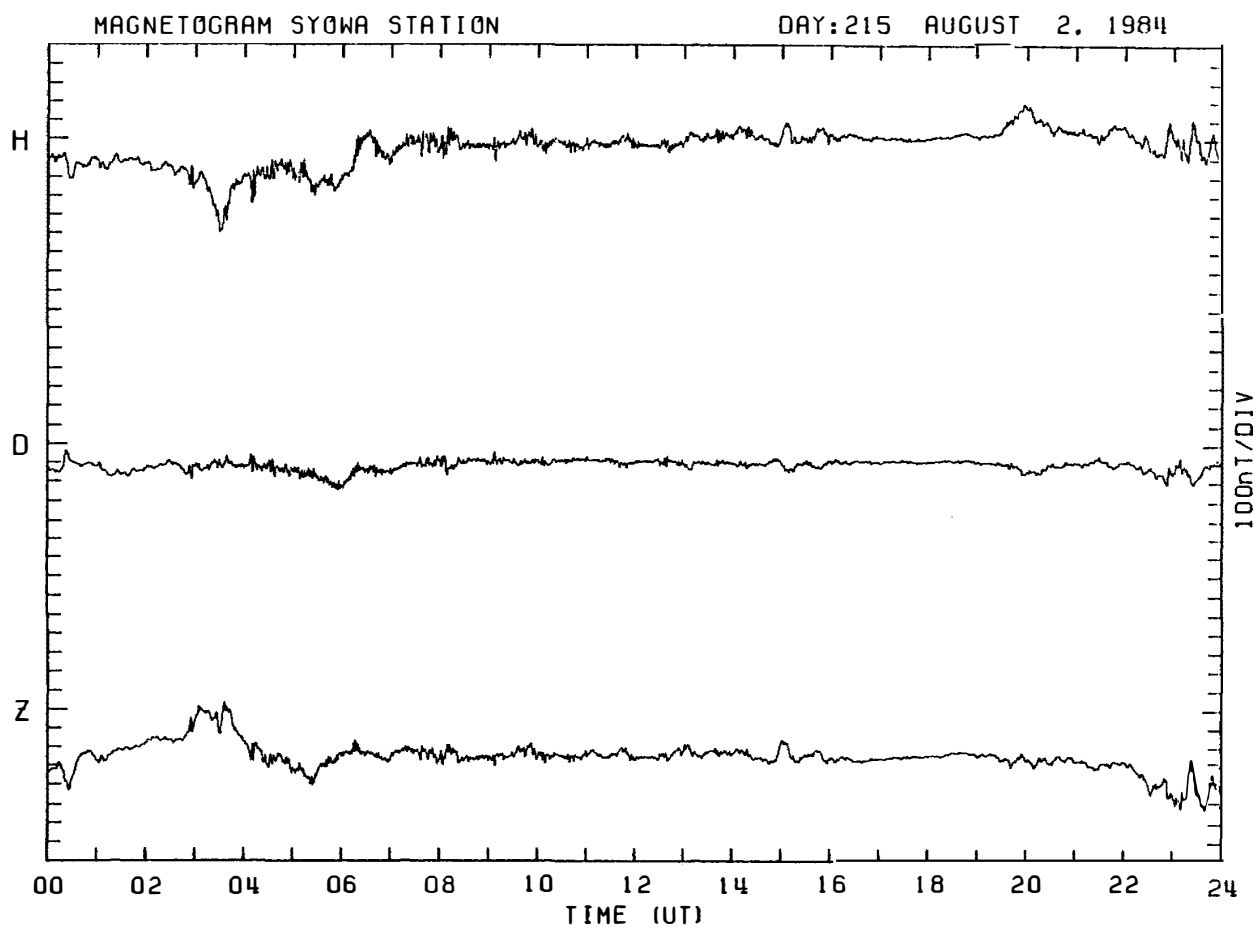
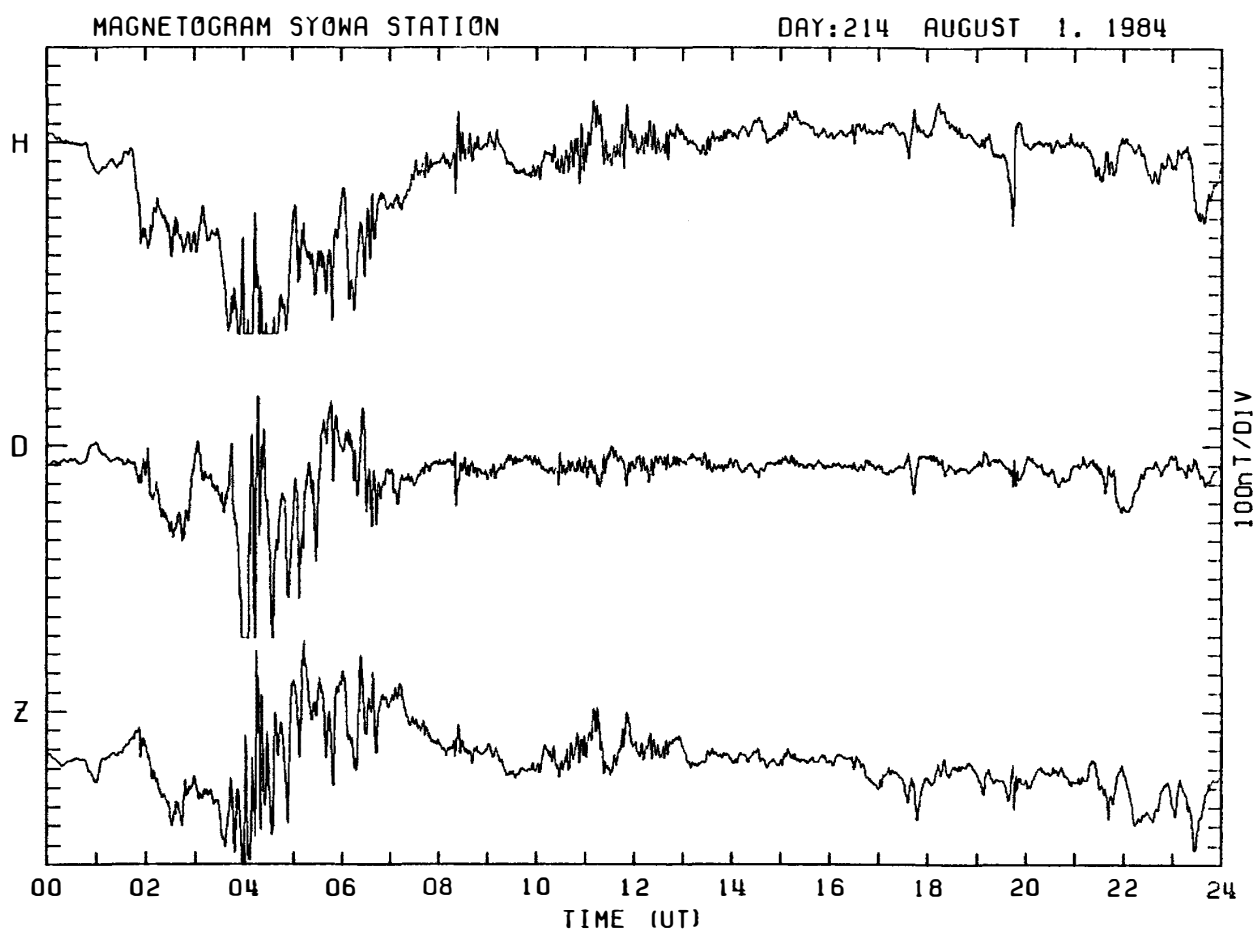
MAGNETOGRAM SYOWA STATION

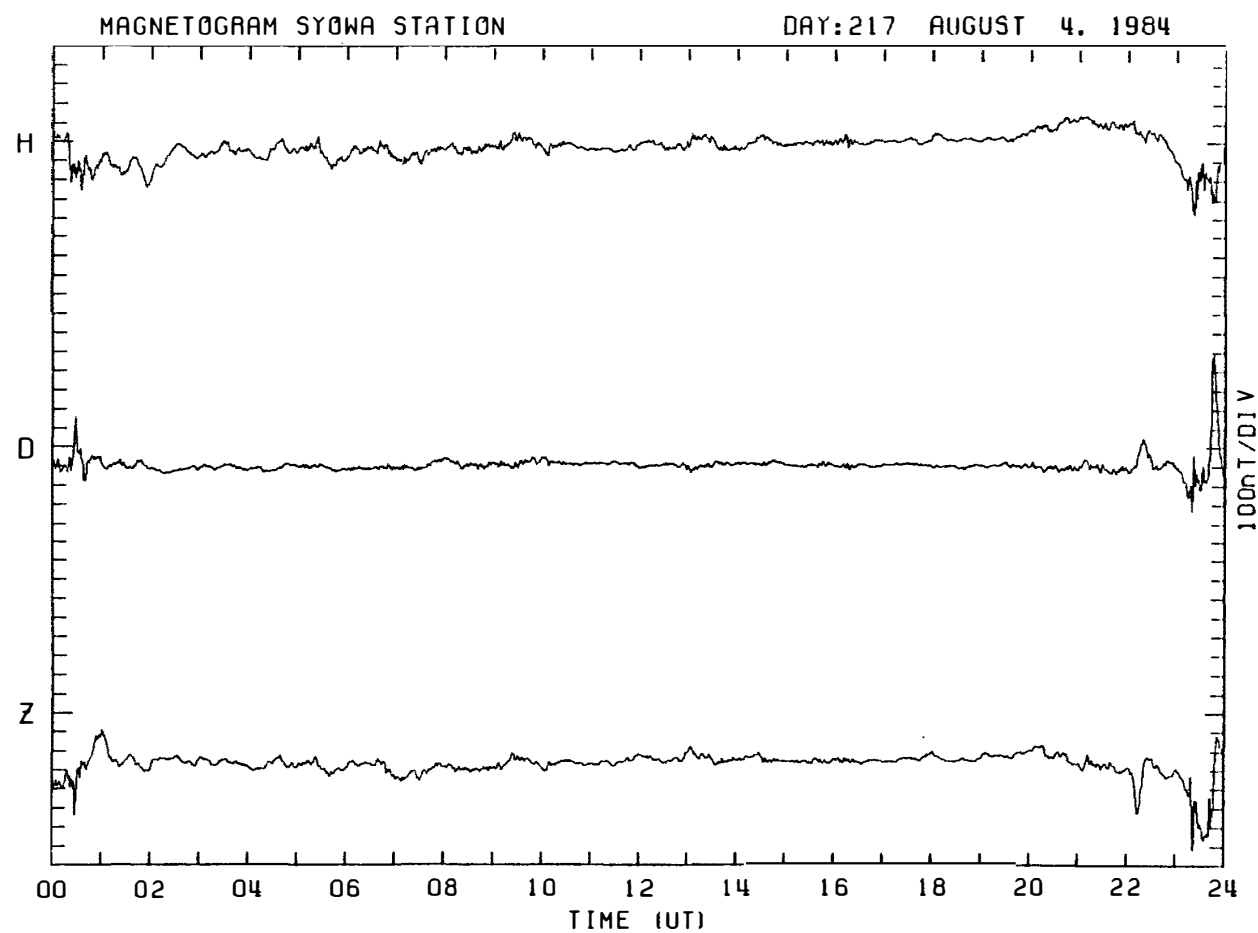
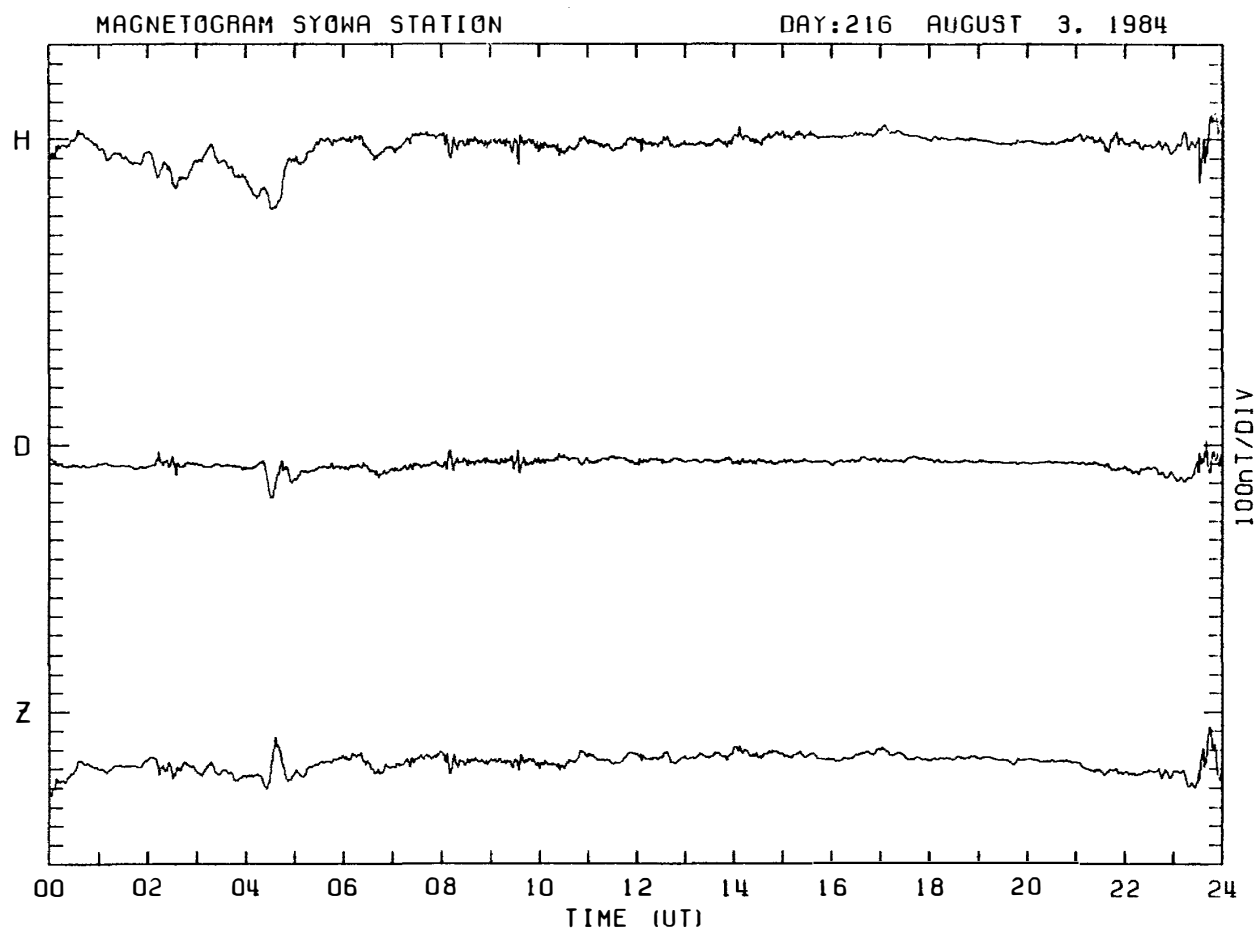
DAY:209 JULY 27. 1984

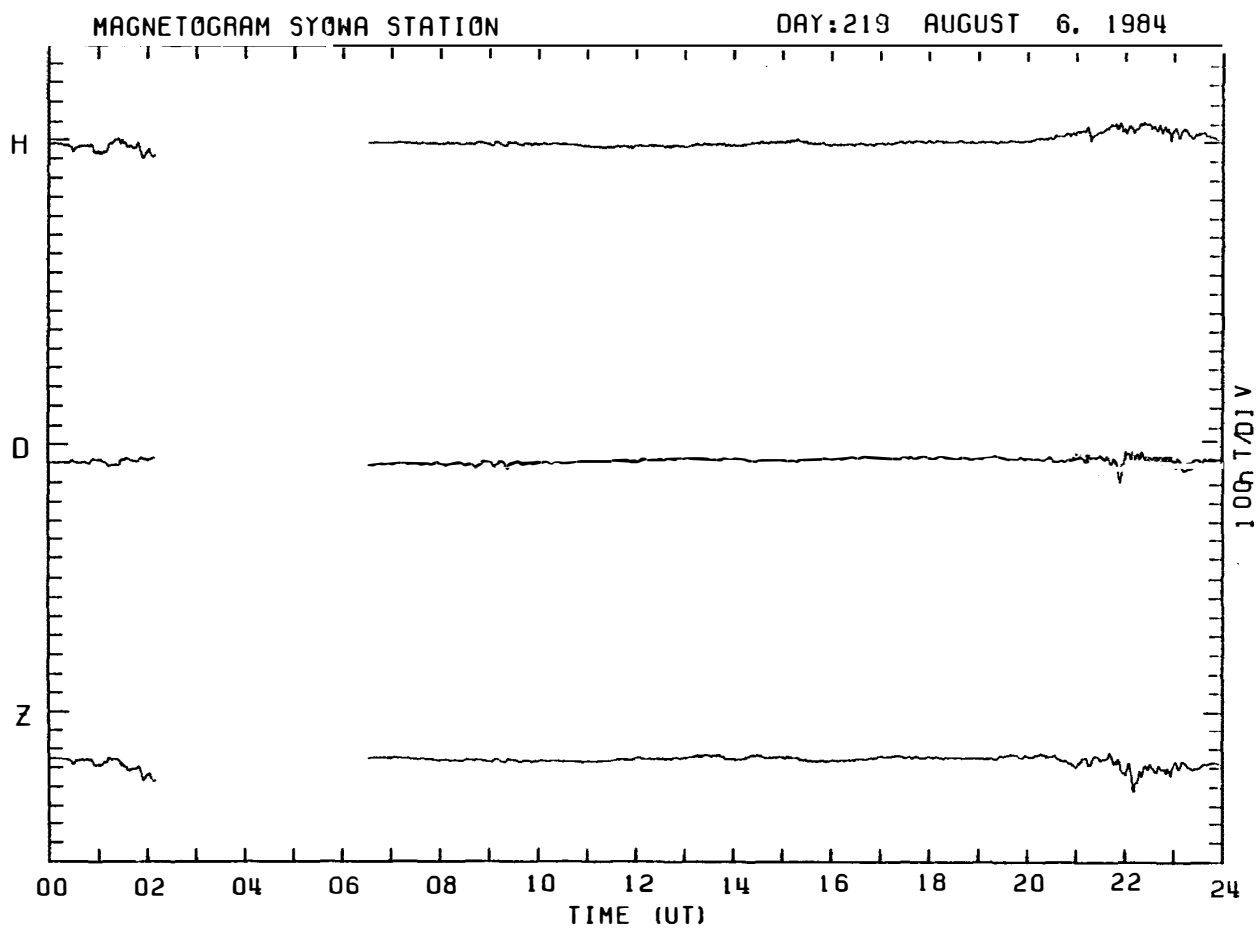
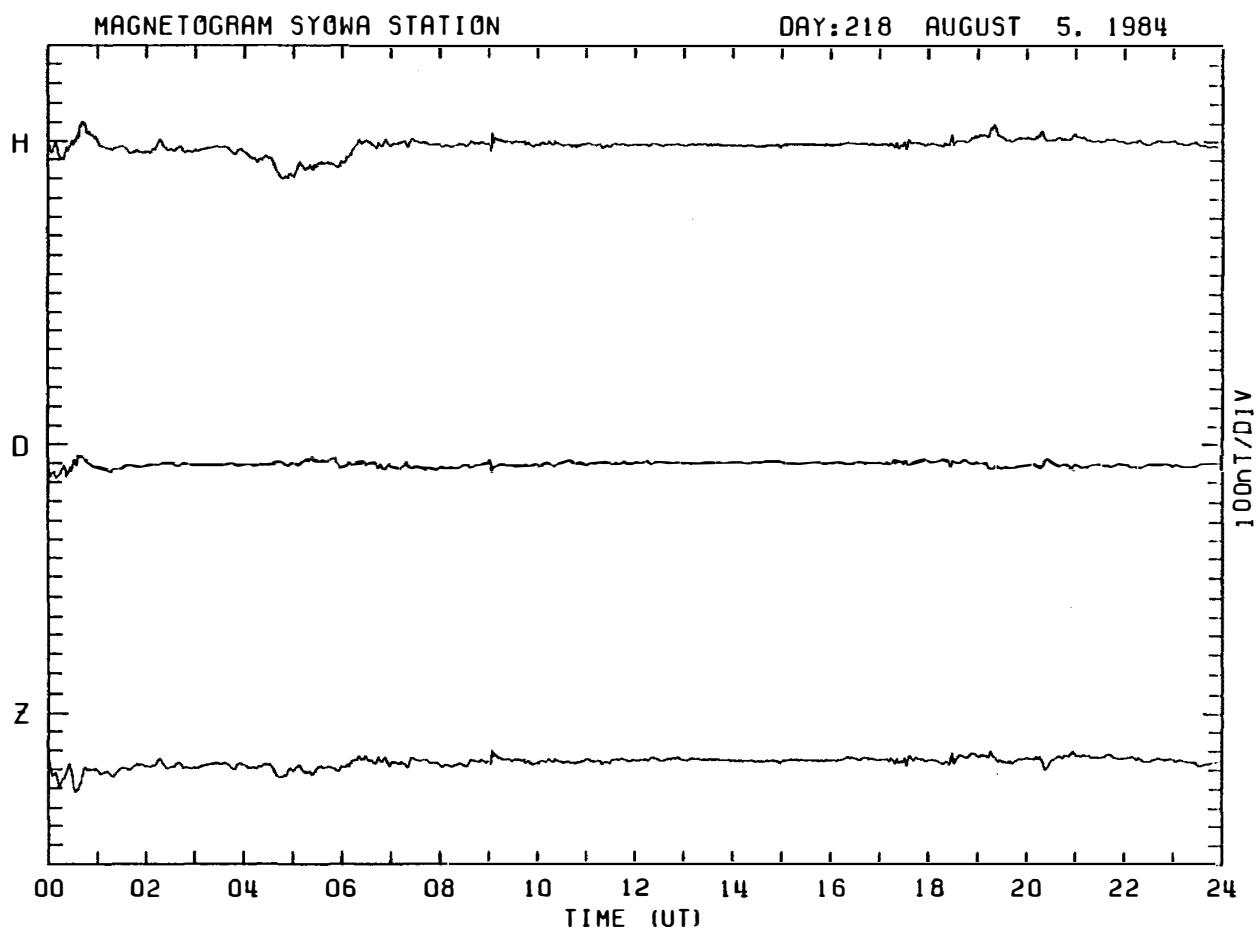


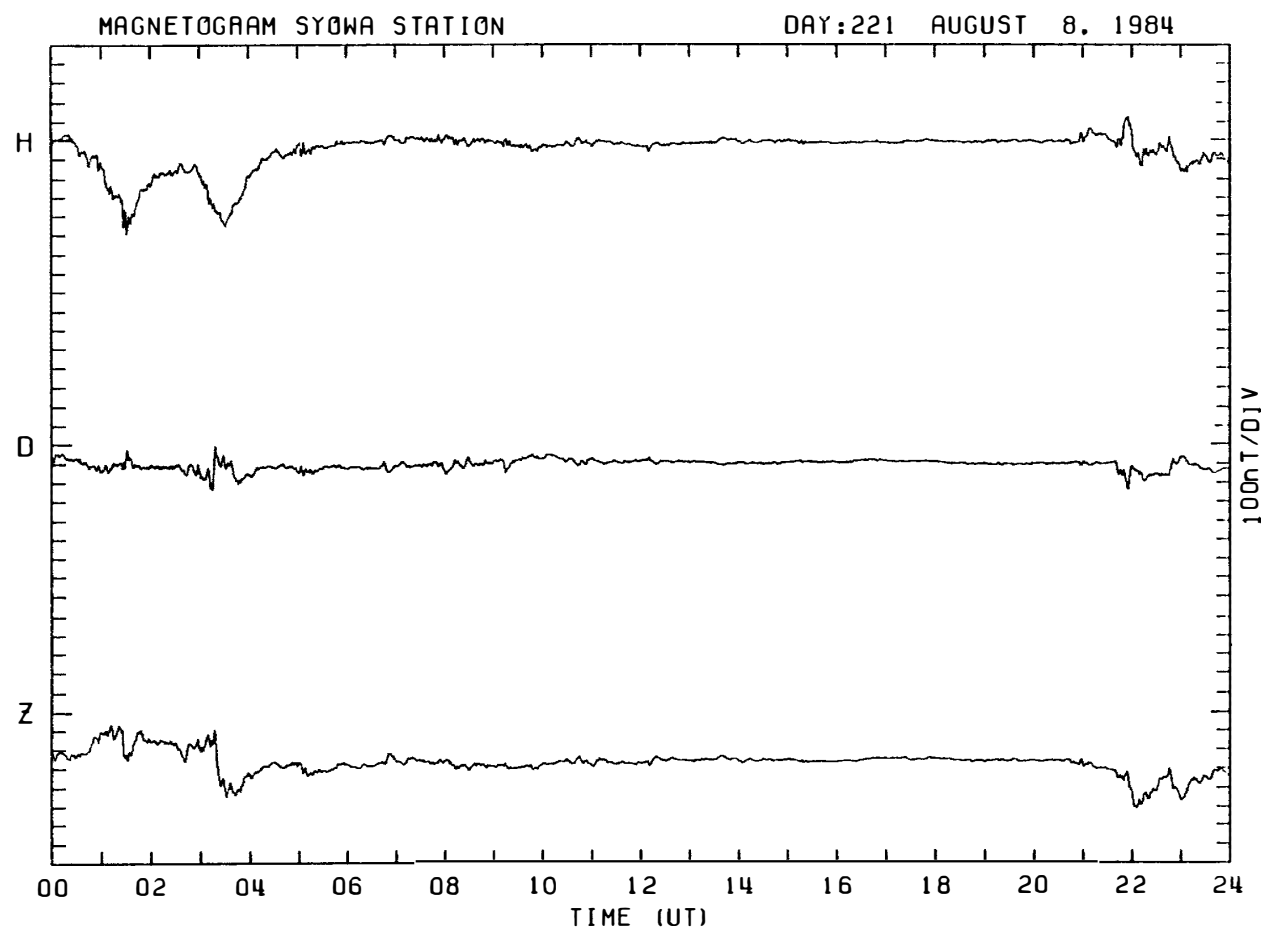
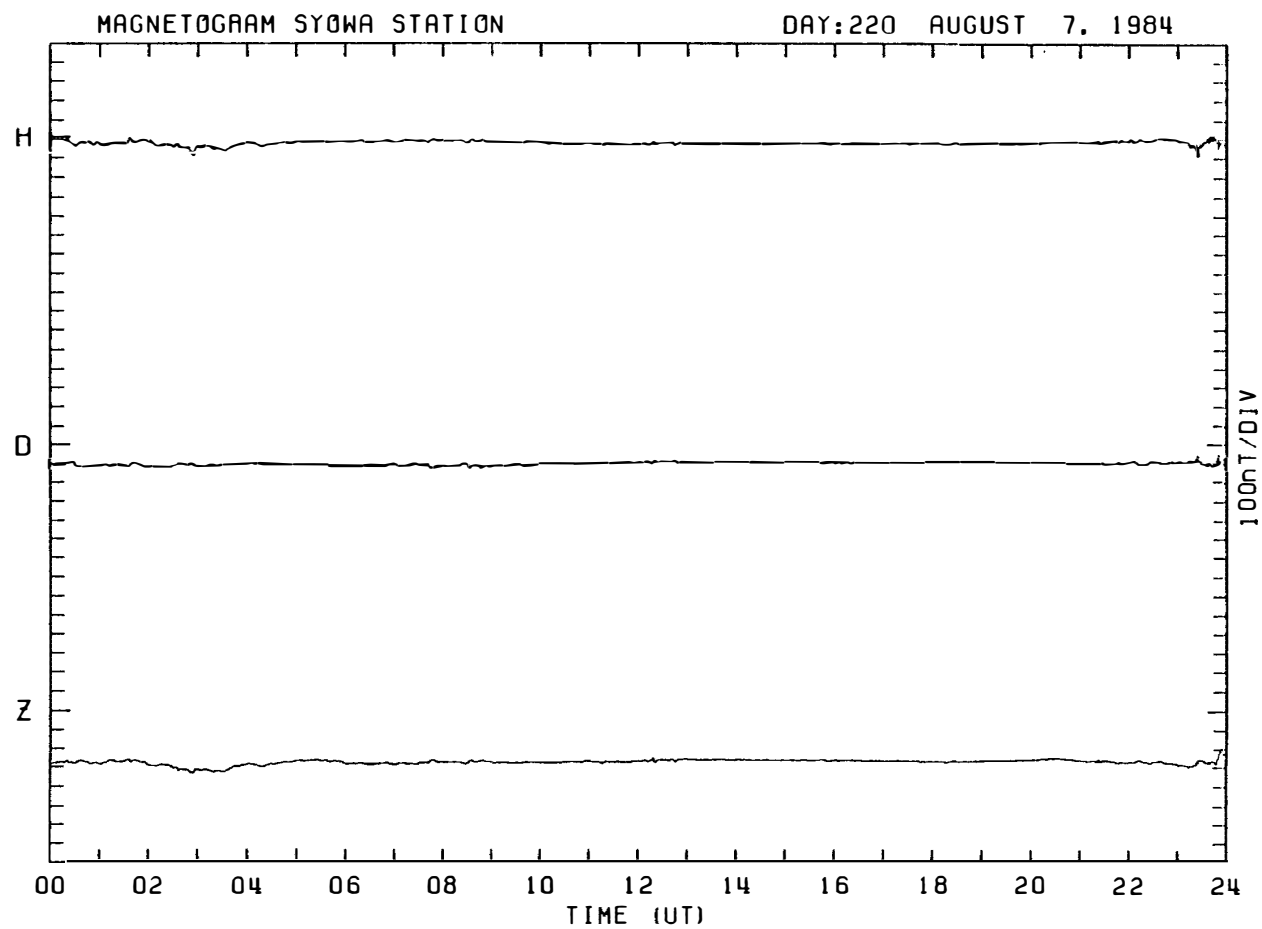








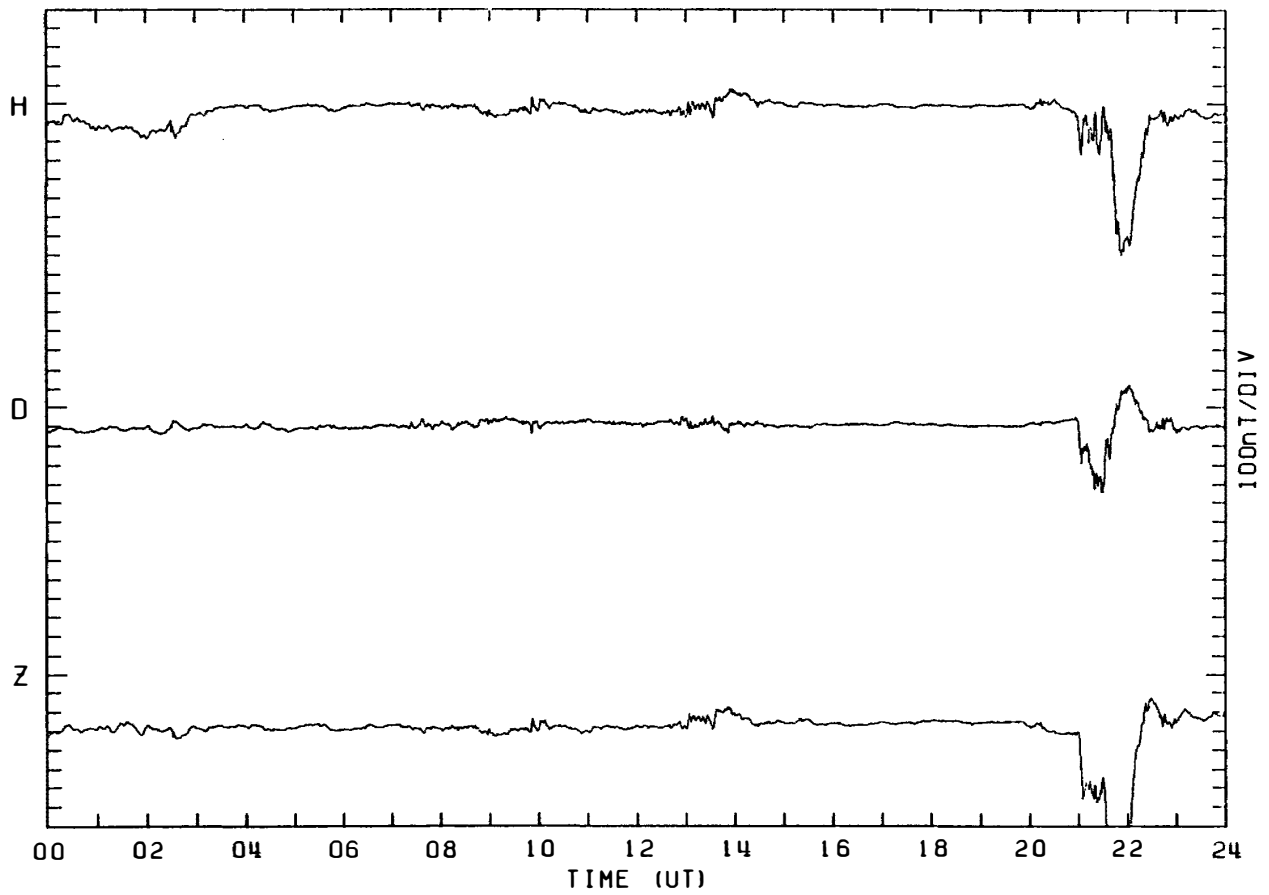






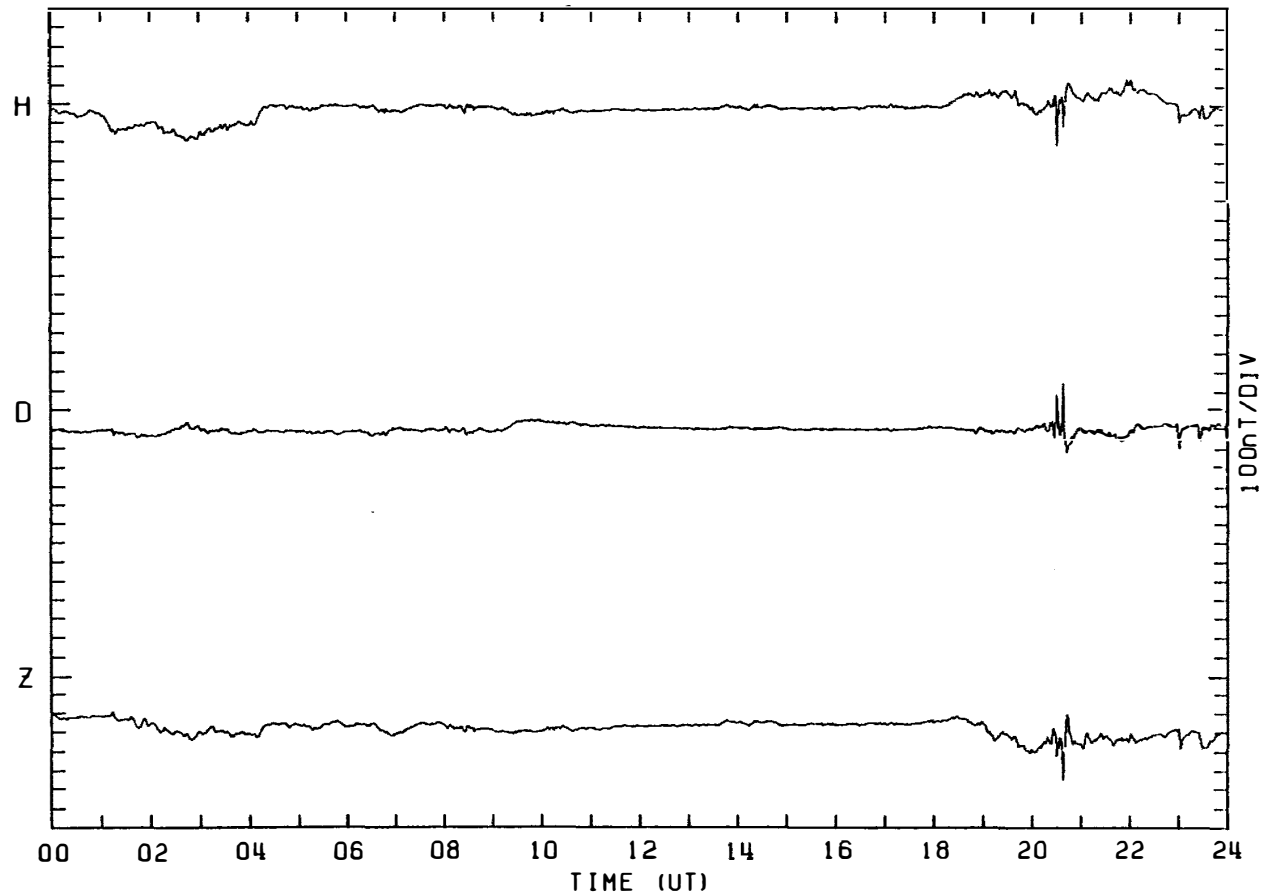
MAGNETOGRAM SYOWA STATION

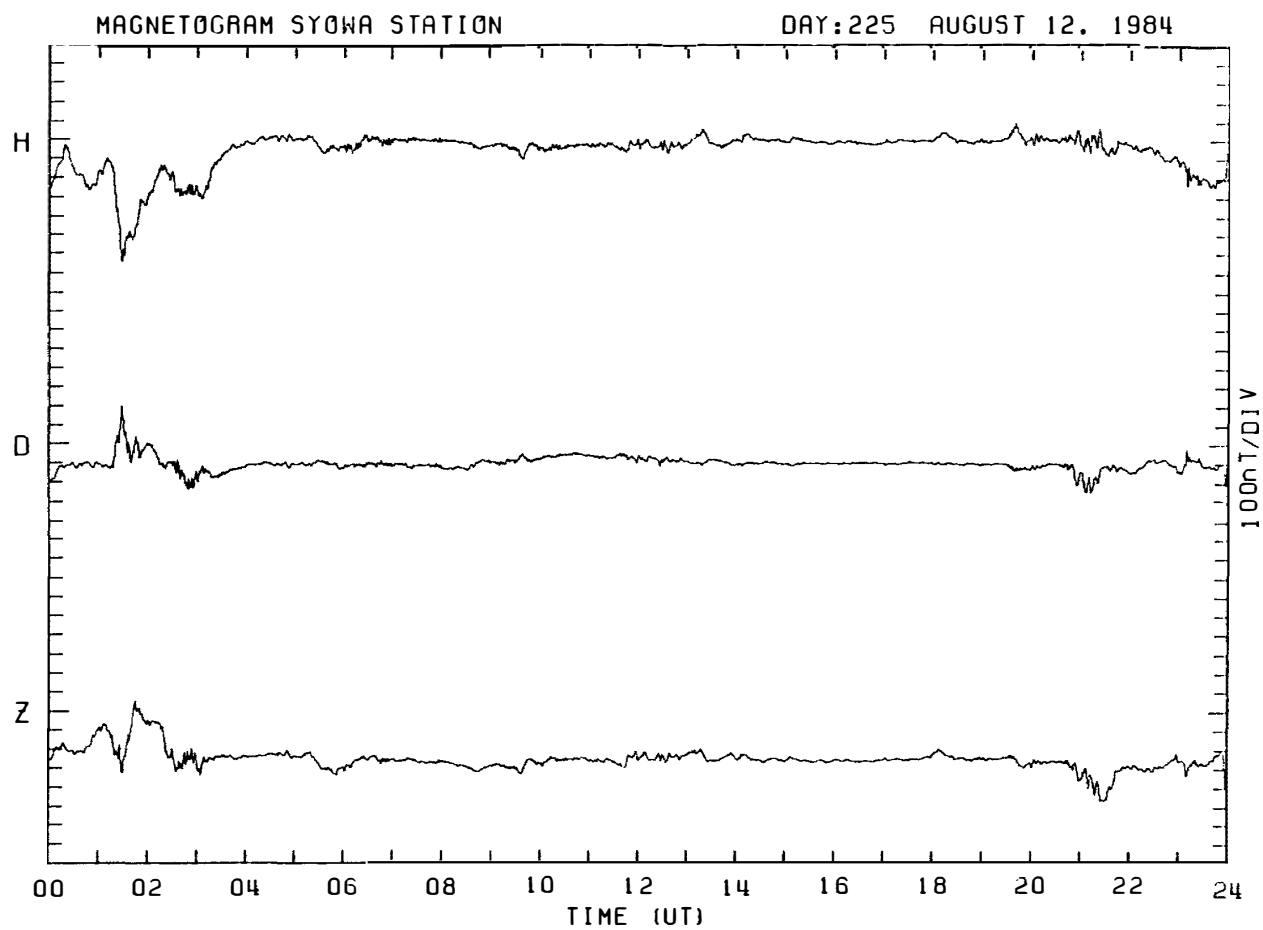
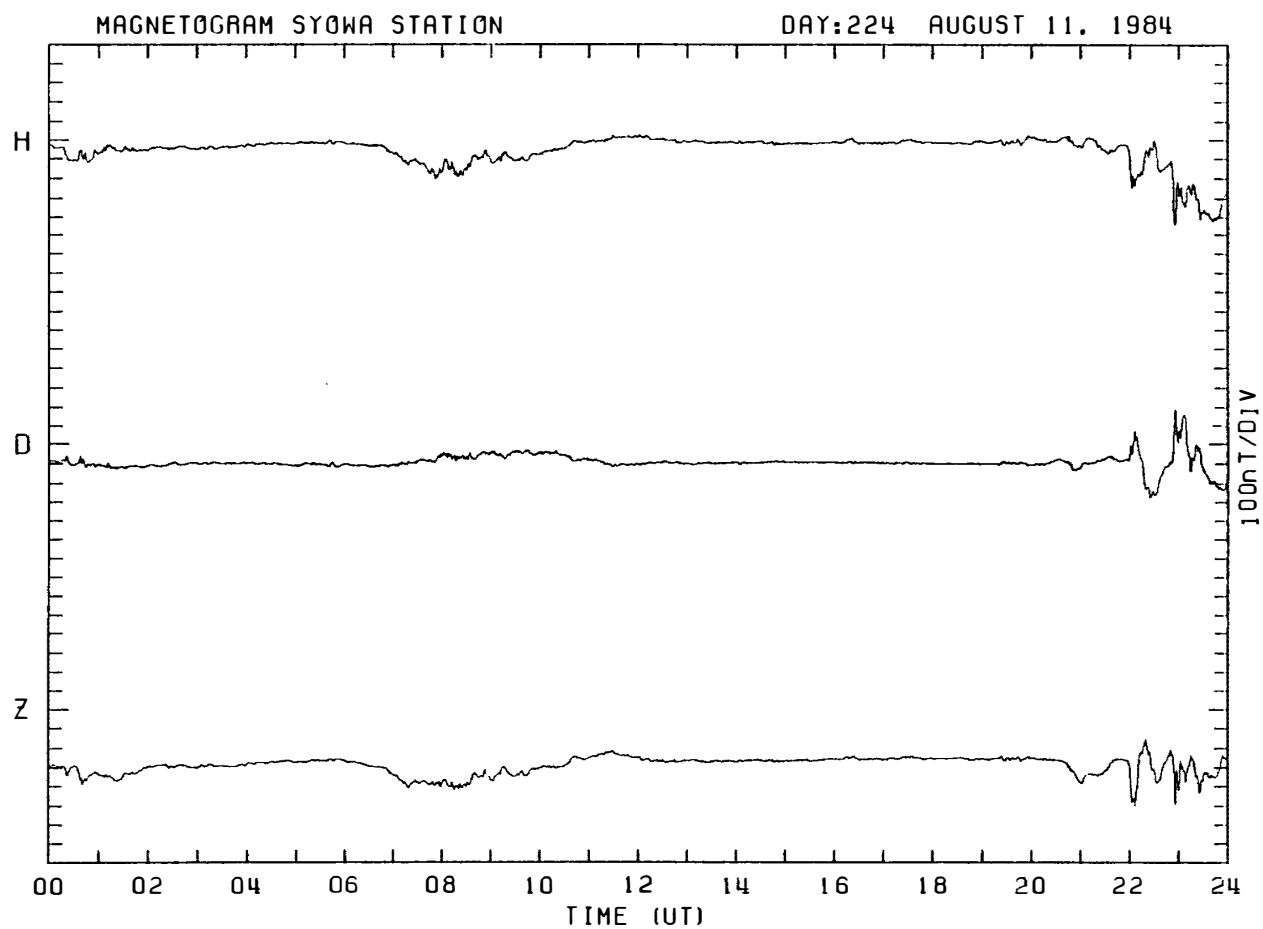
DAY:222 AUGUST 9. 1984



MAGNETOGRAM SYOWA STATION

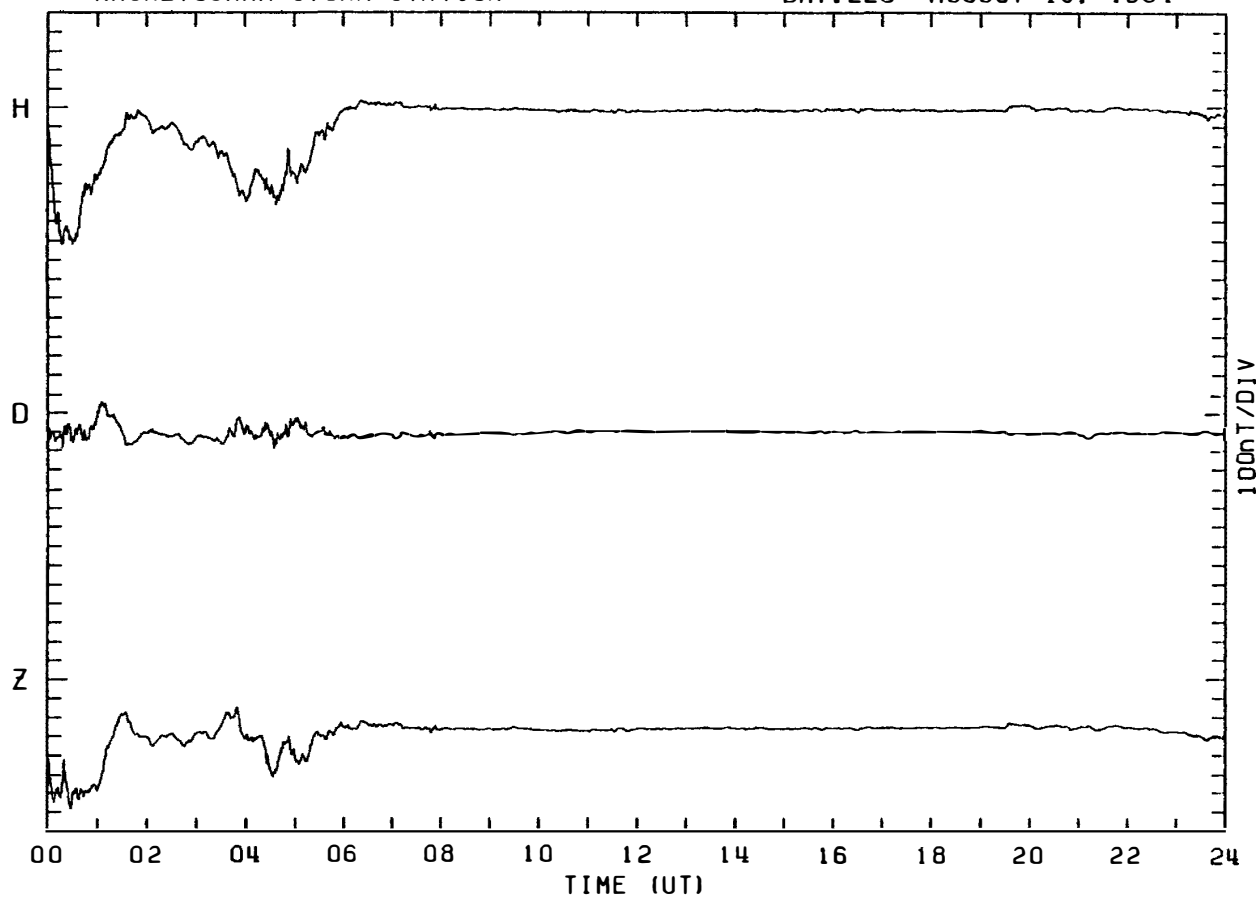
DAY:223 AUGUST 10. 1984





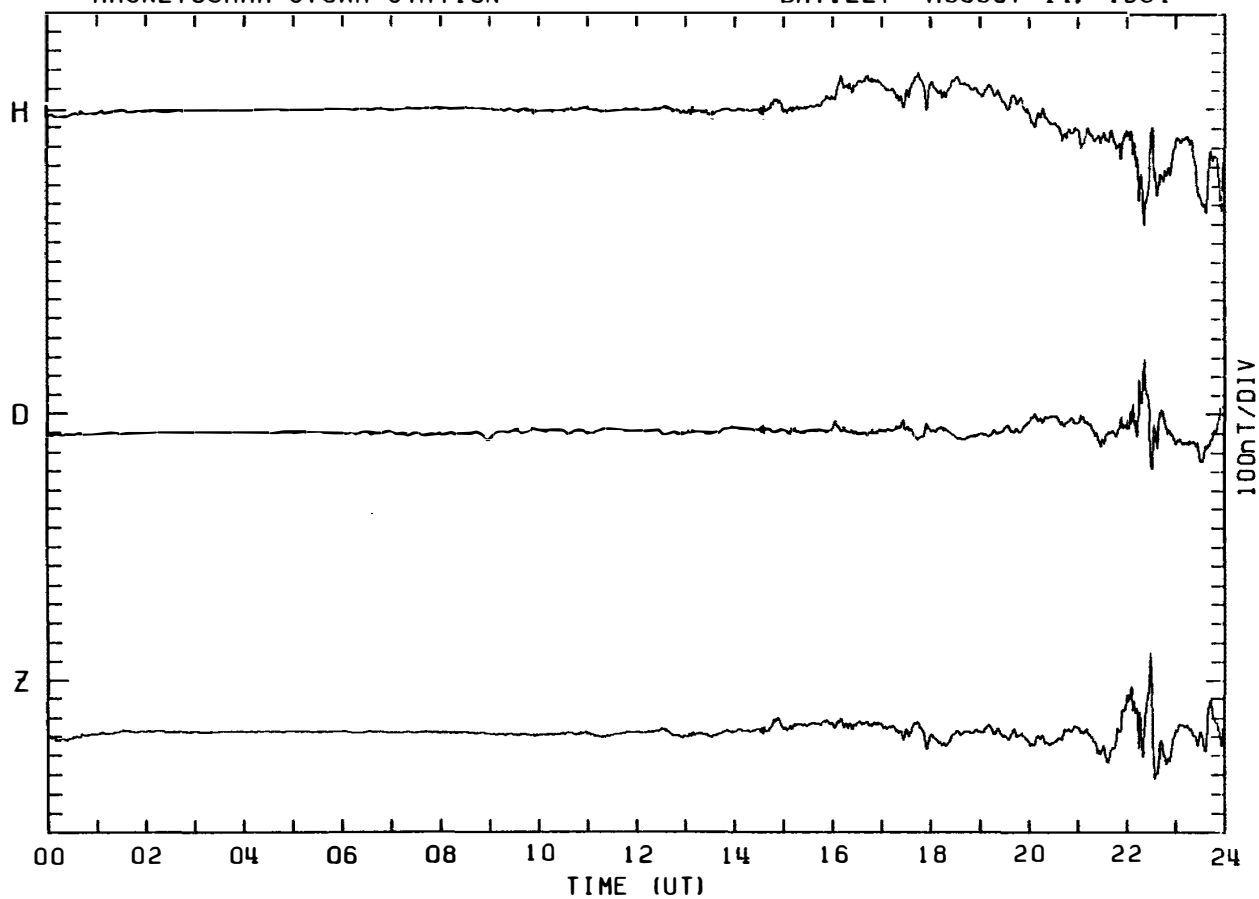
MAGNETOGRAM SYOWA STATION

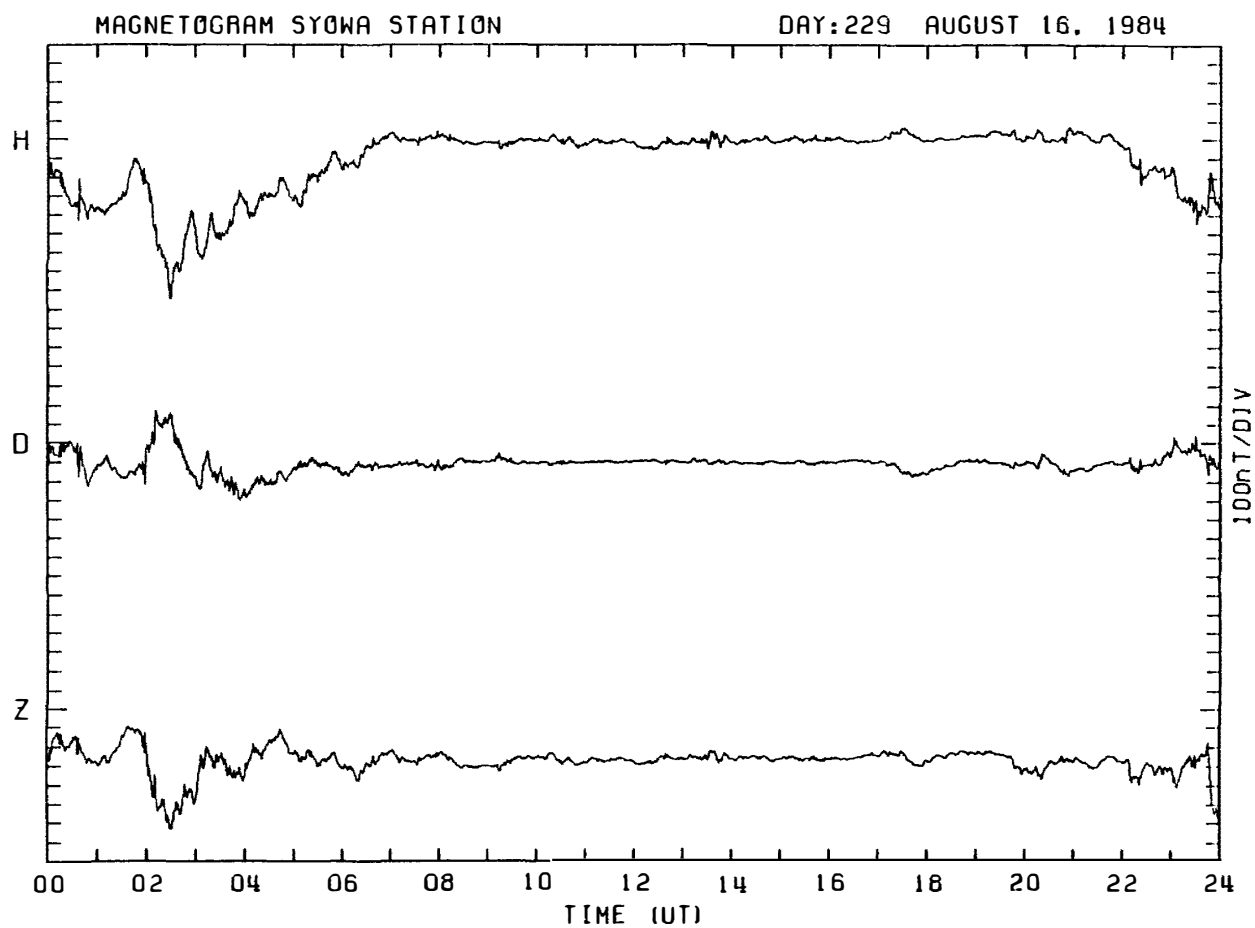
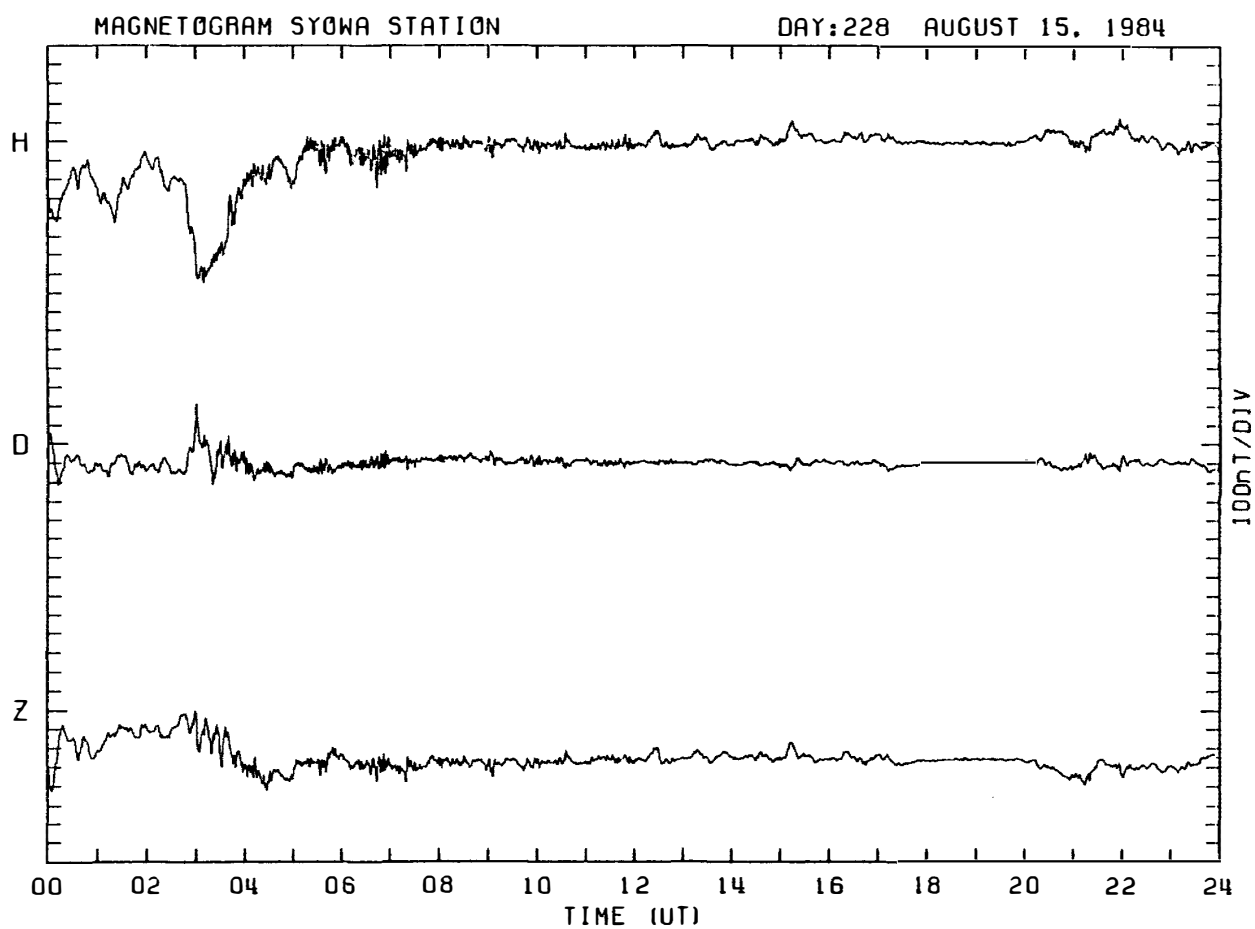
DAY:226 AUGUST 13. 1984

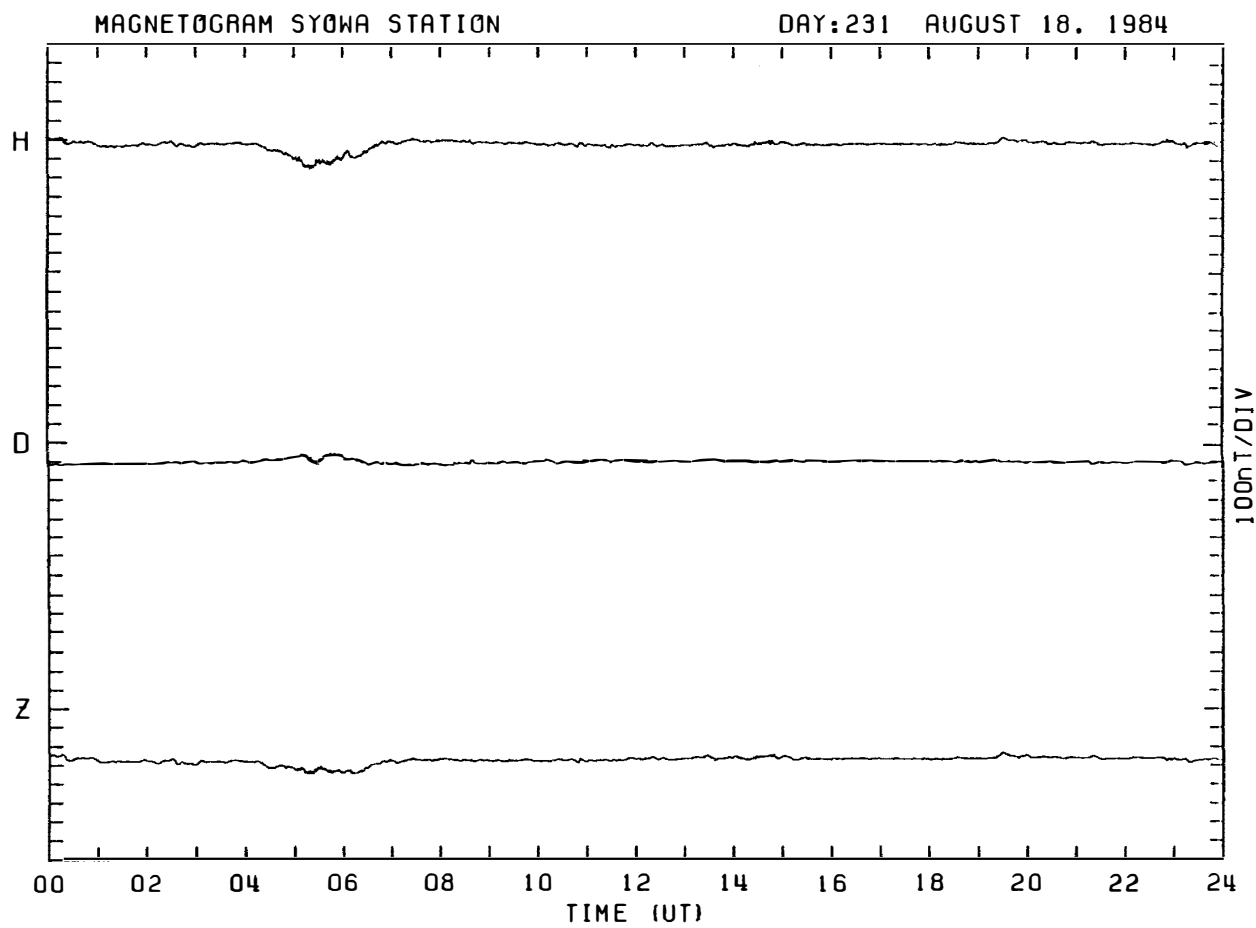
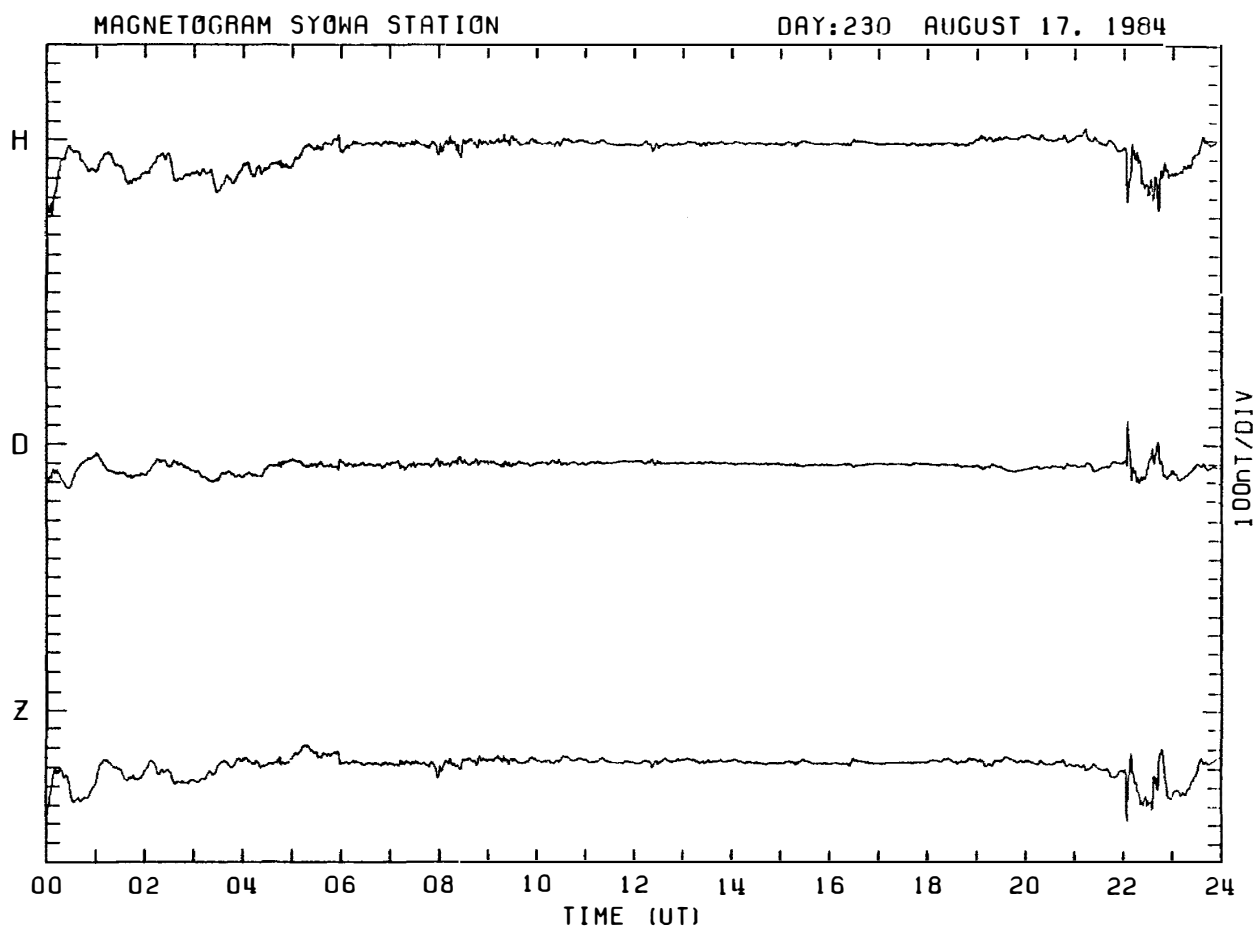


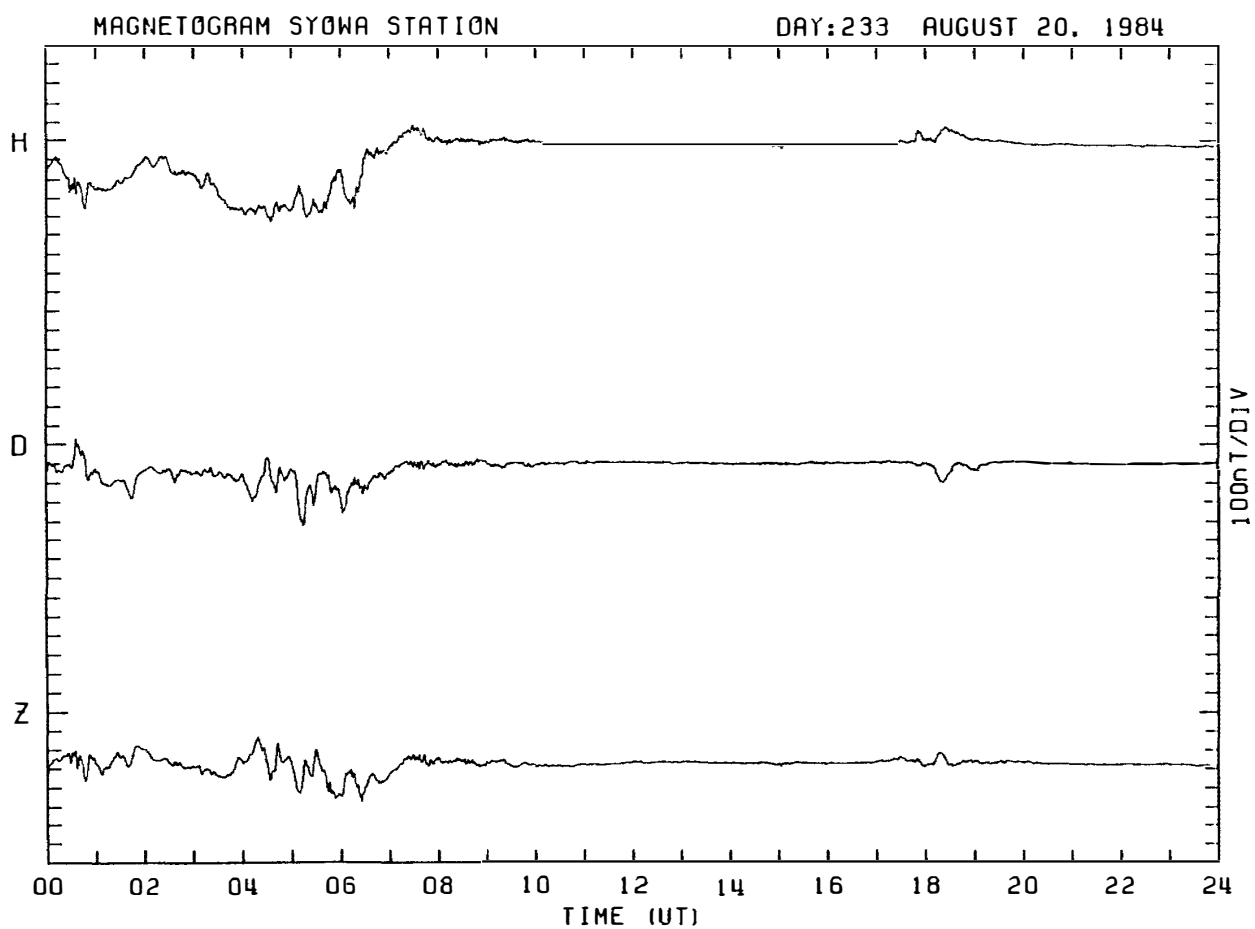
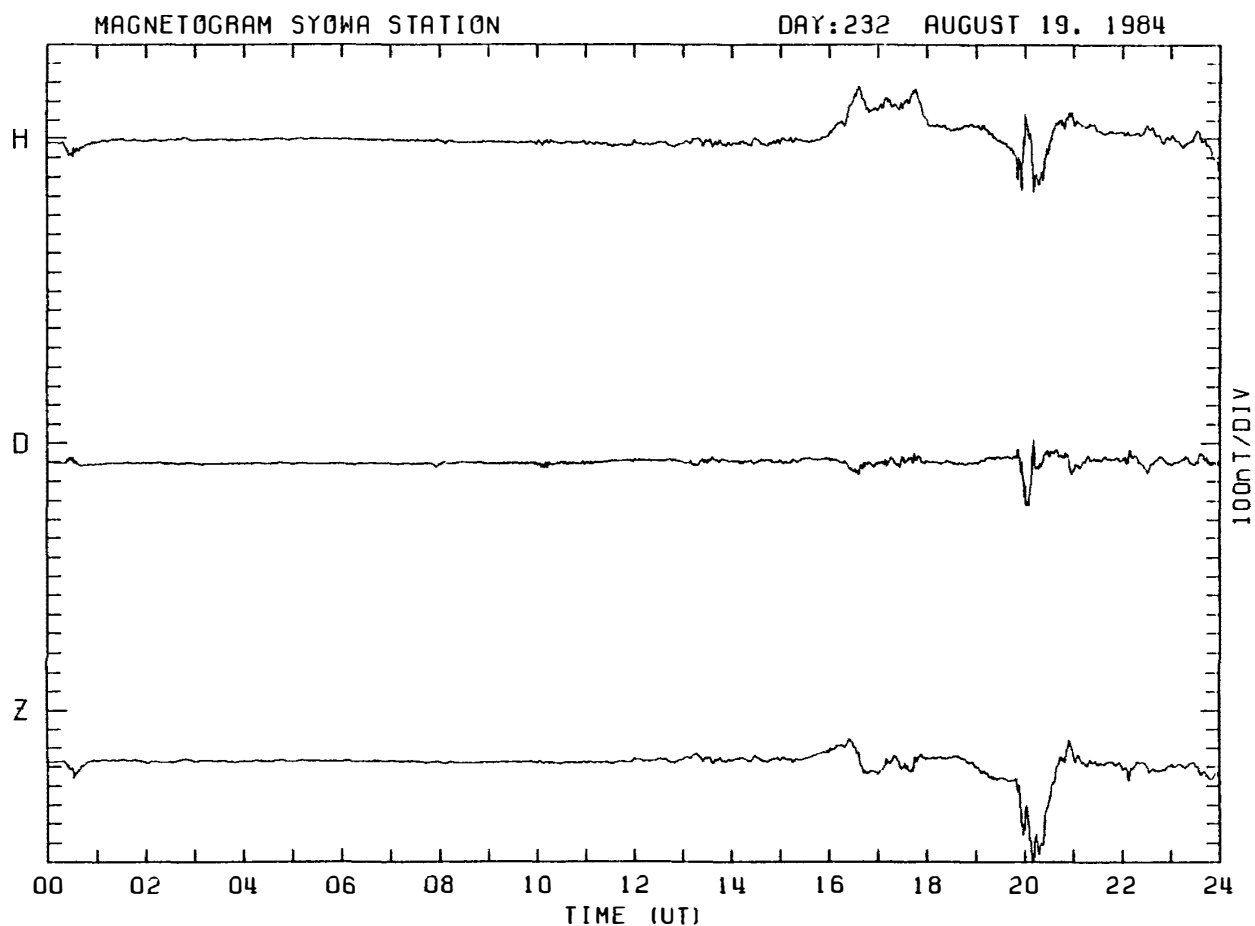
MAGNETOGRAM SYOWA STATION

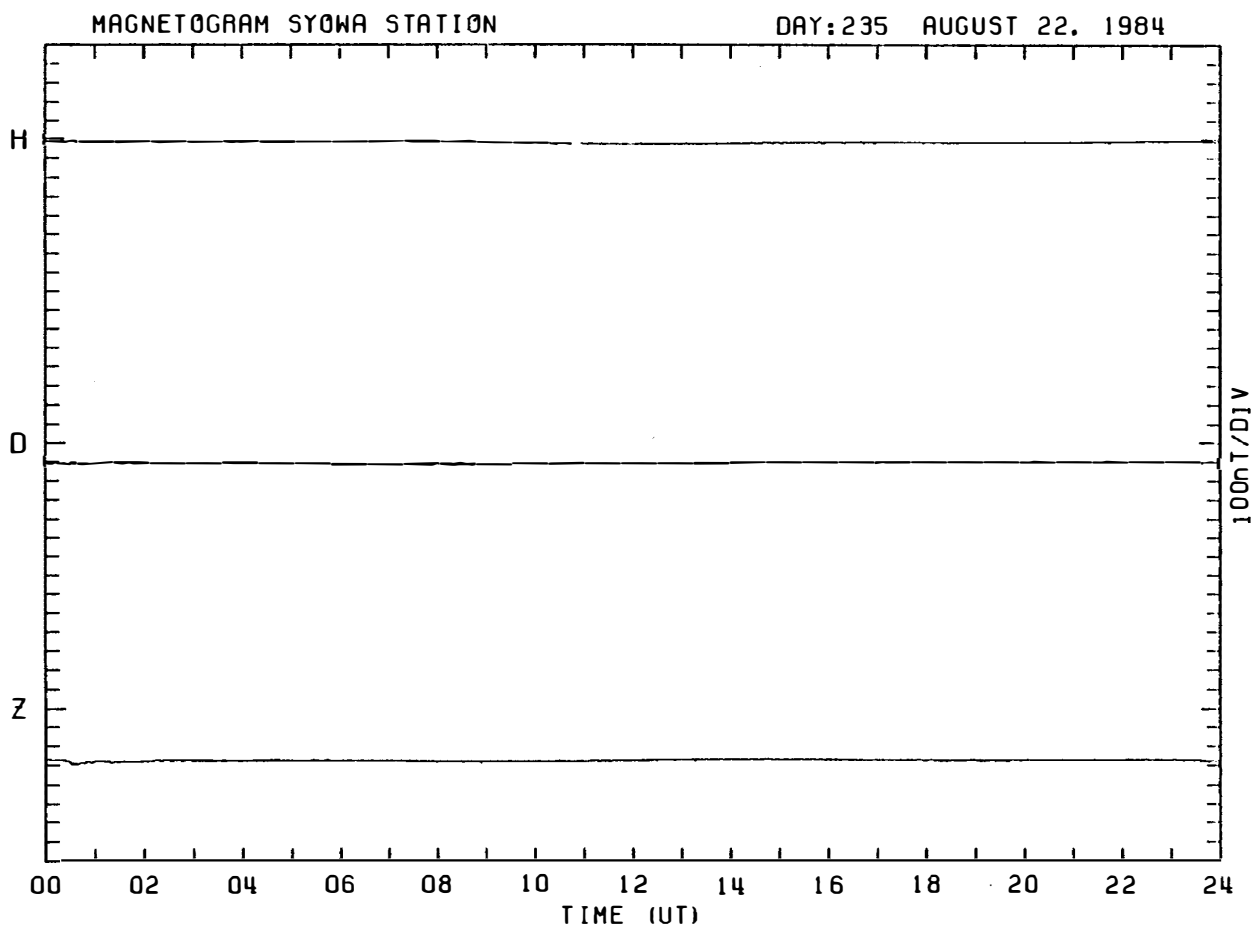
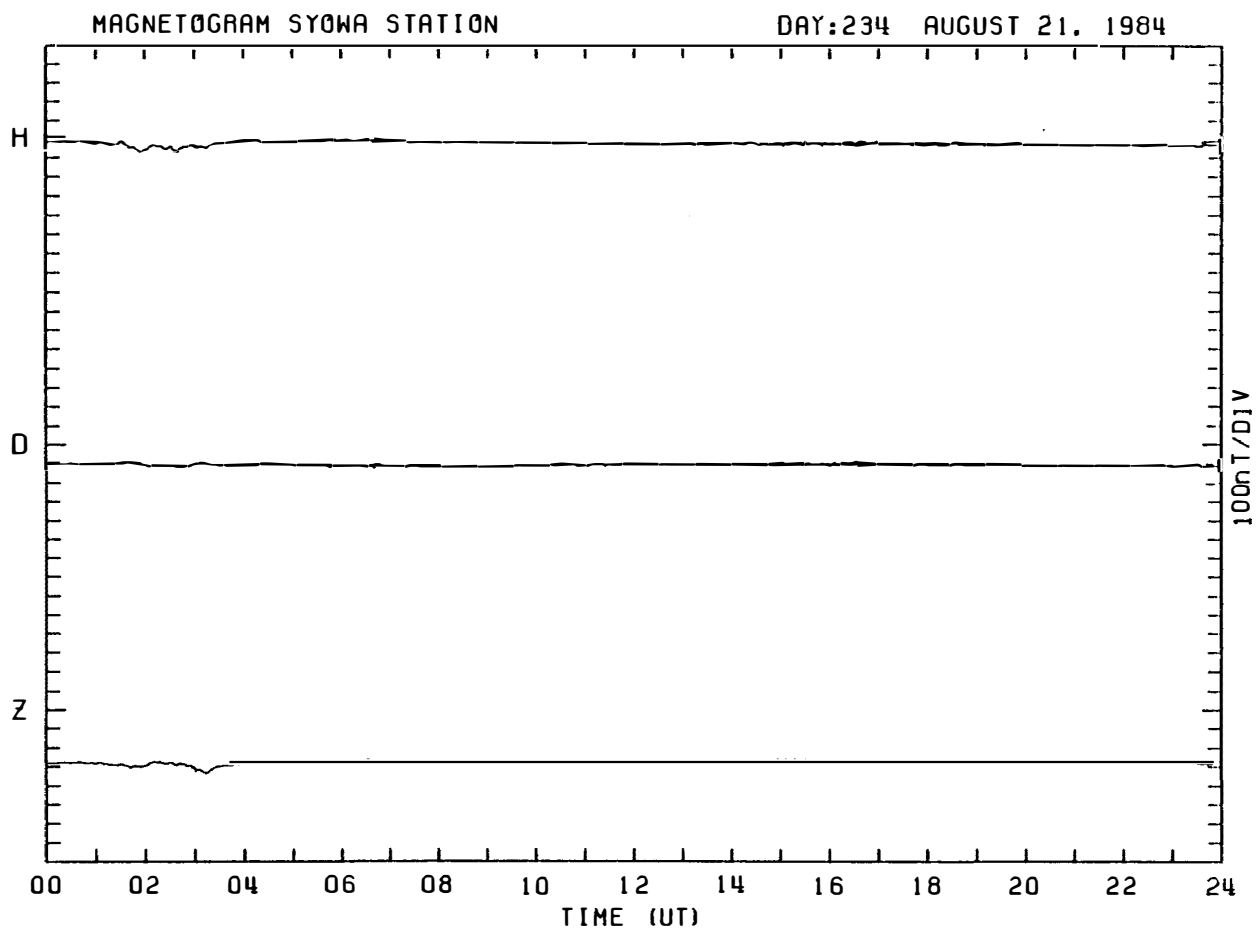
DAY:227 AUGUST 14. 1984





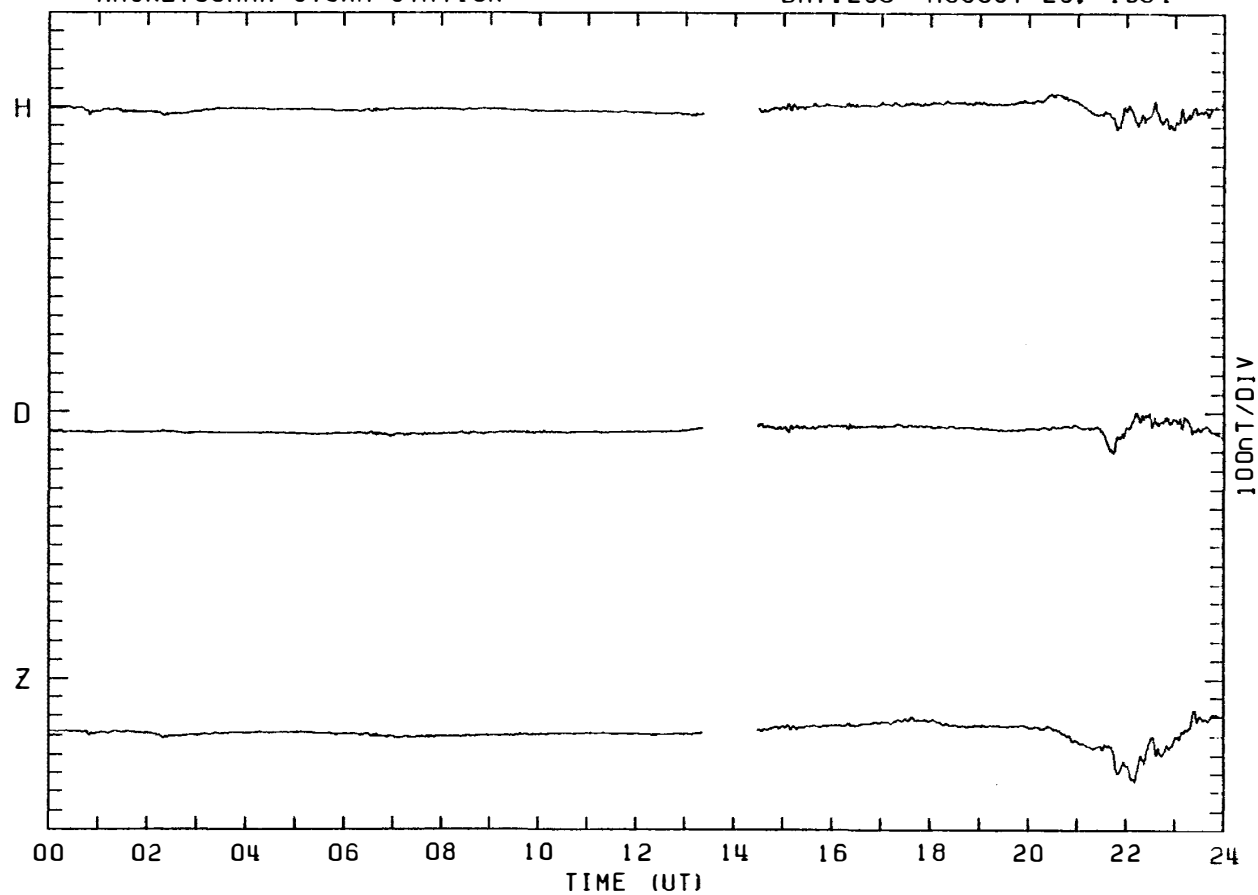






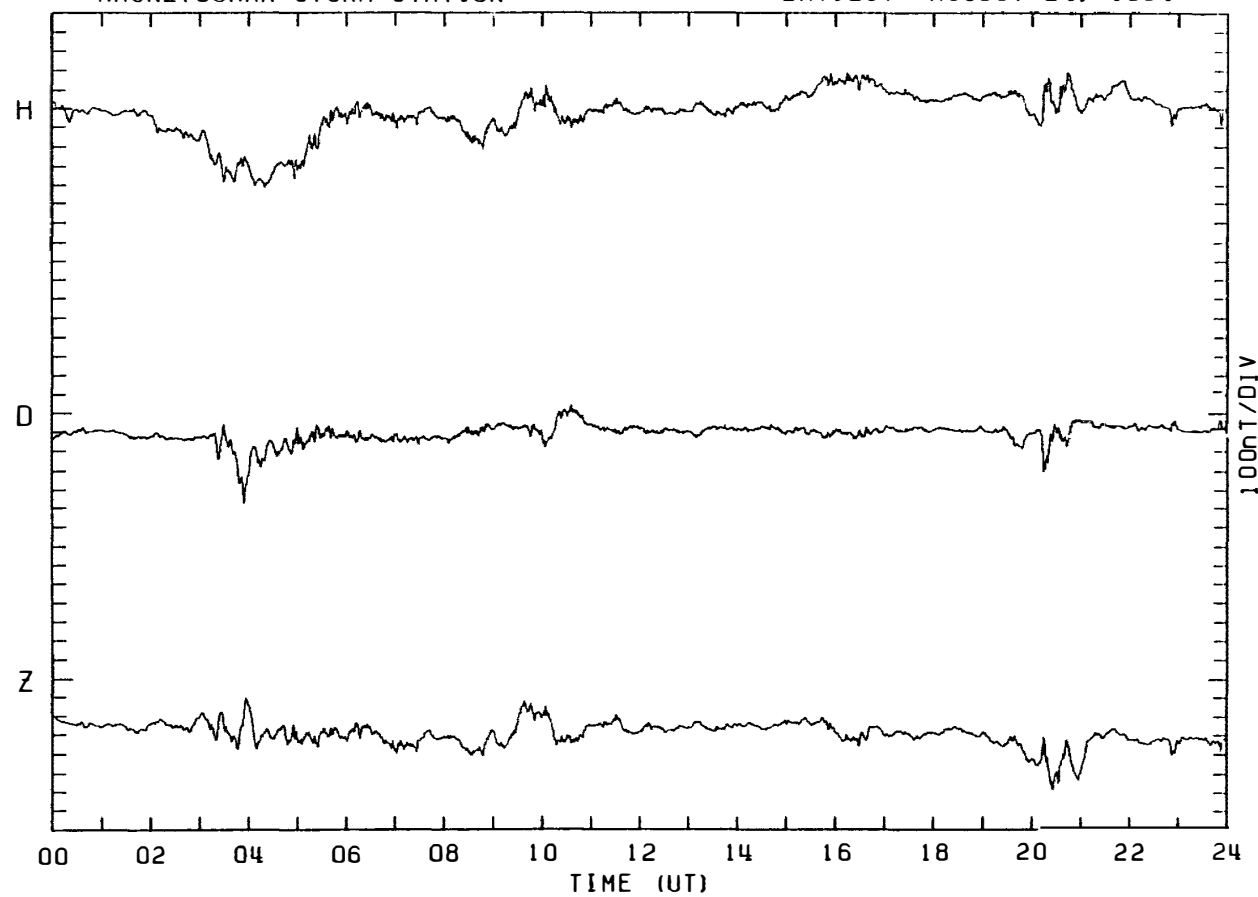
MAGNETOGRAM SYOWA STATION

DAY:236 AUGUST 23, 1984

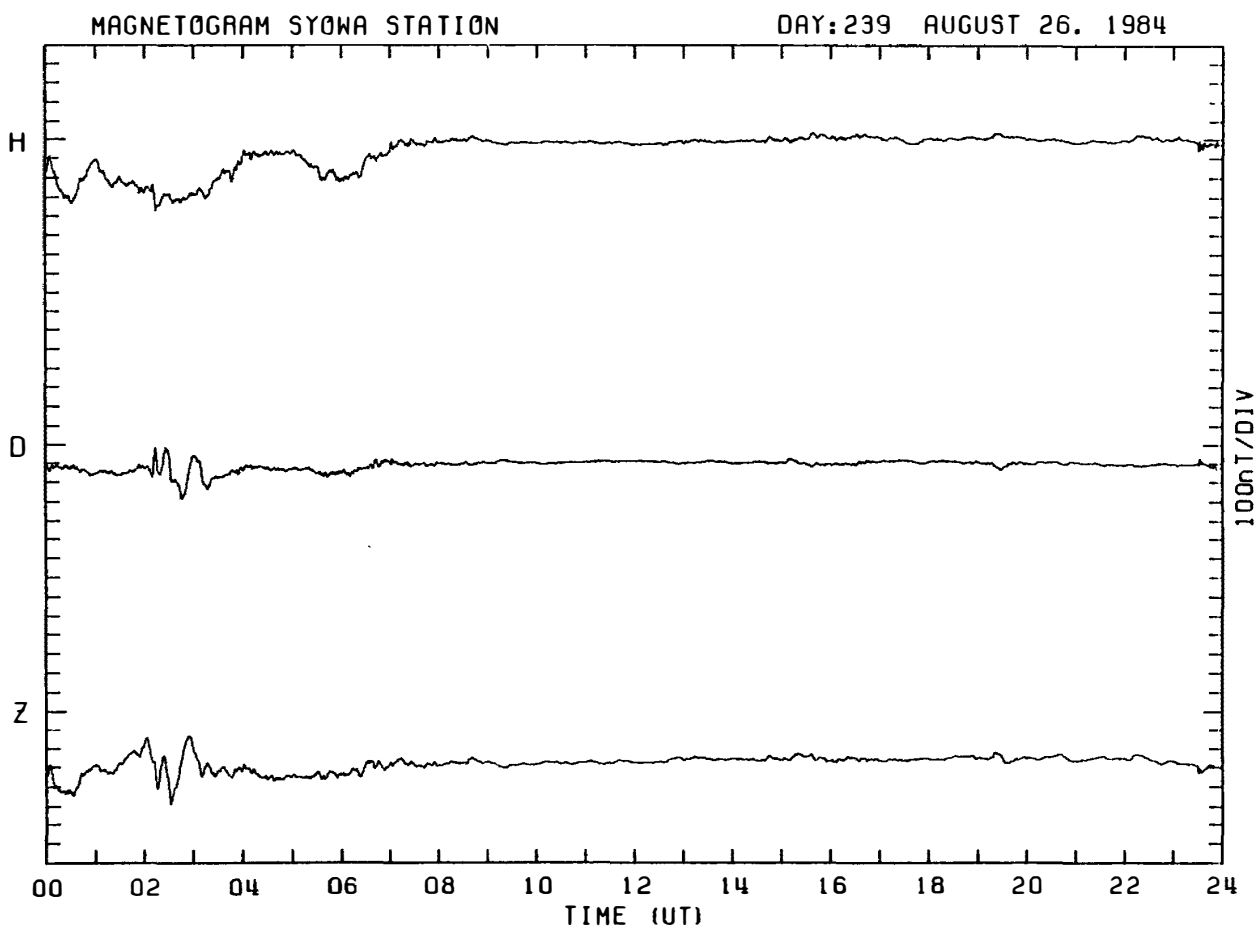
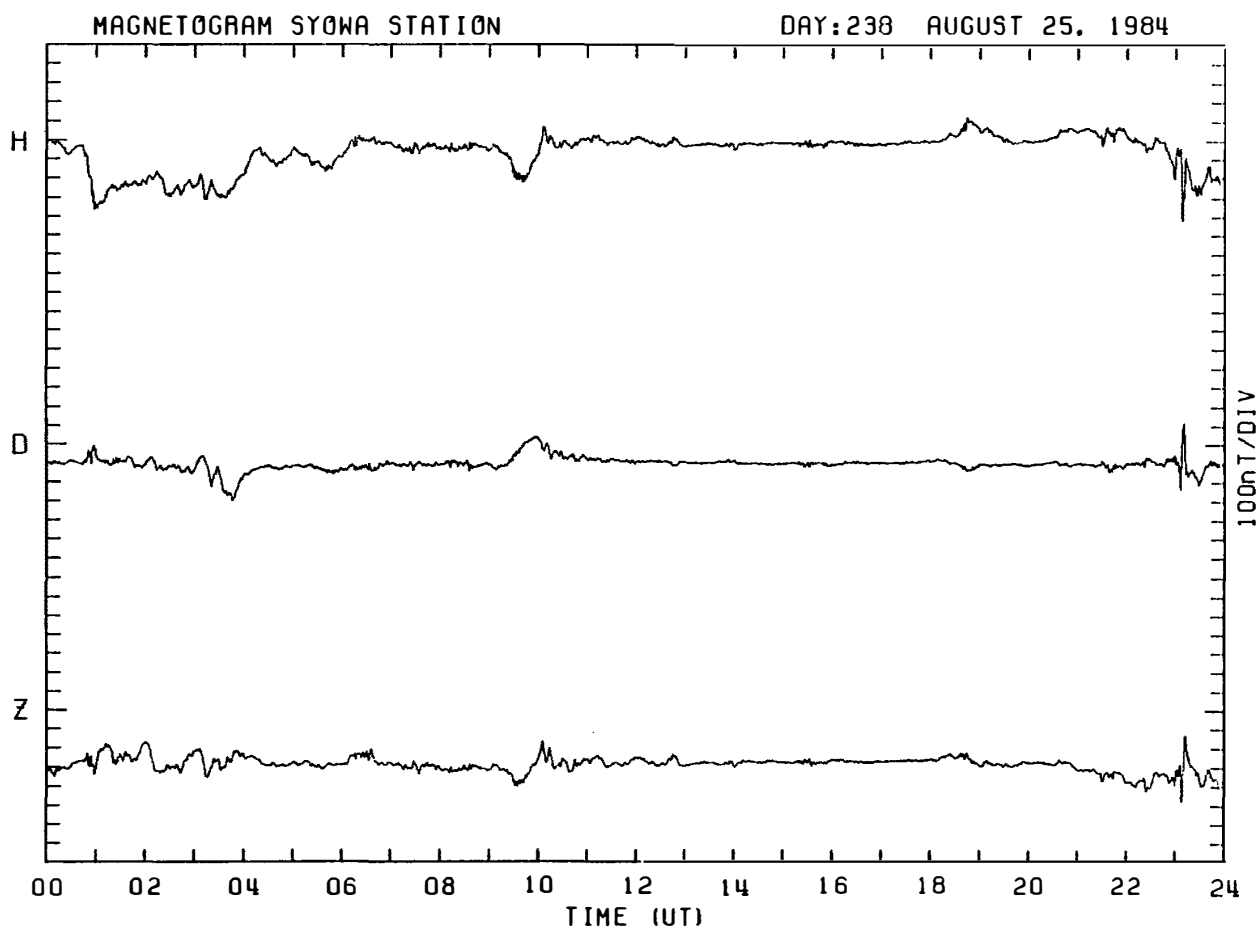


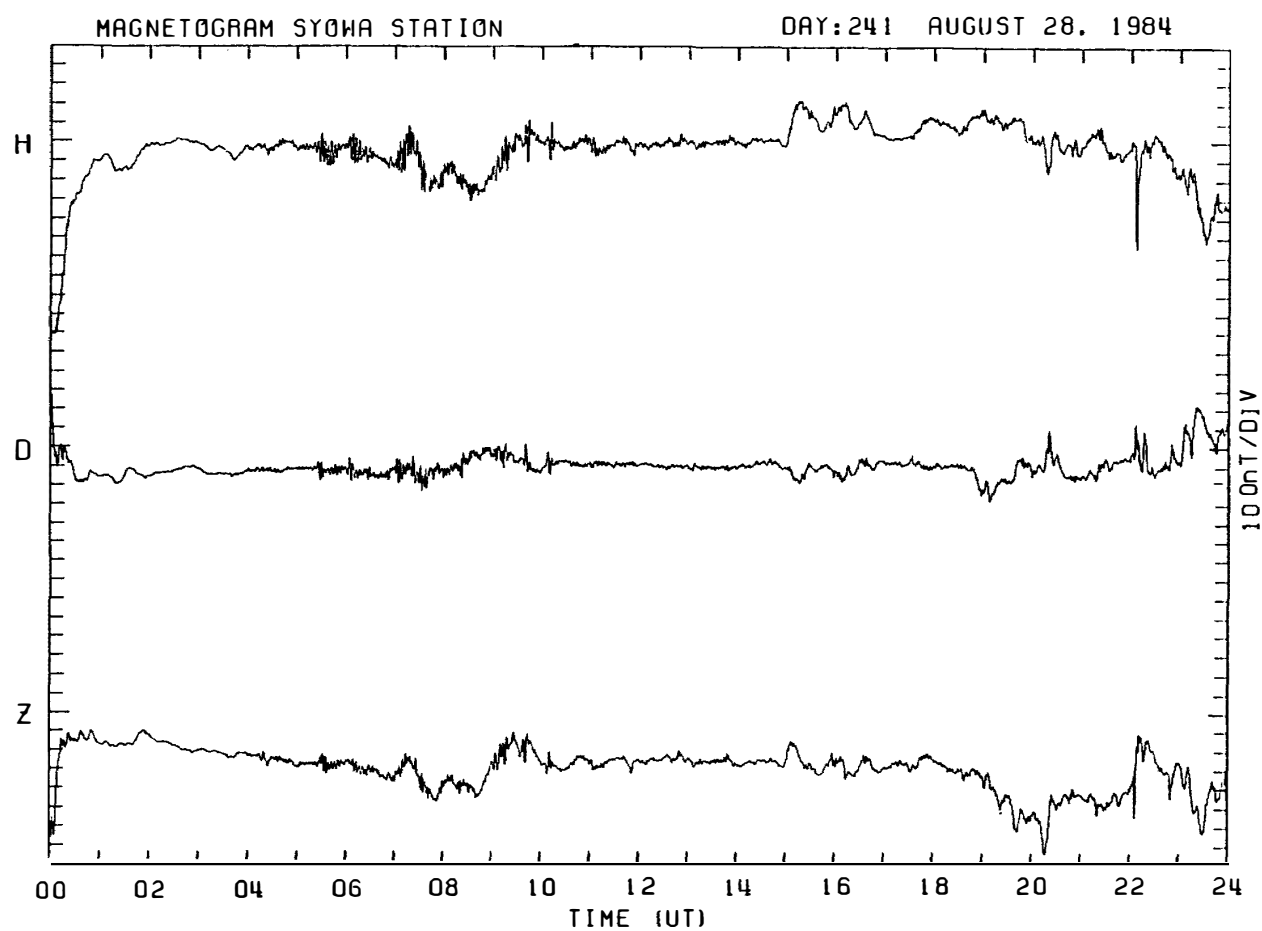
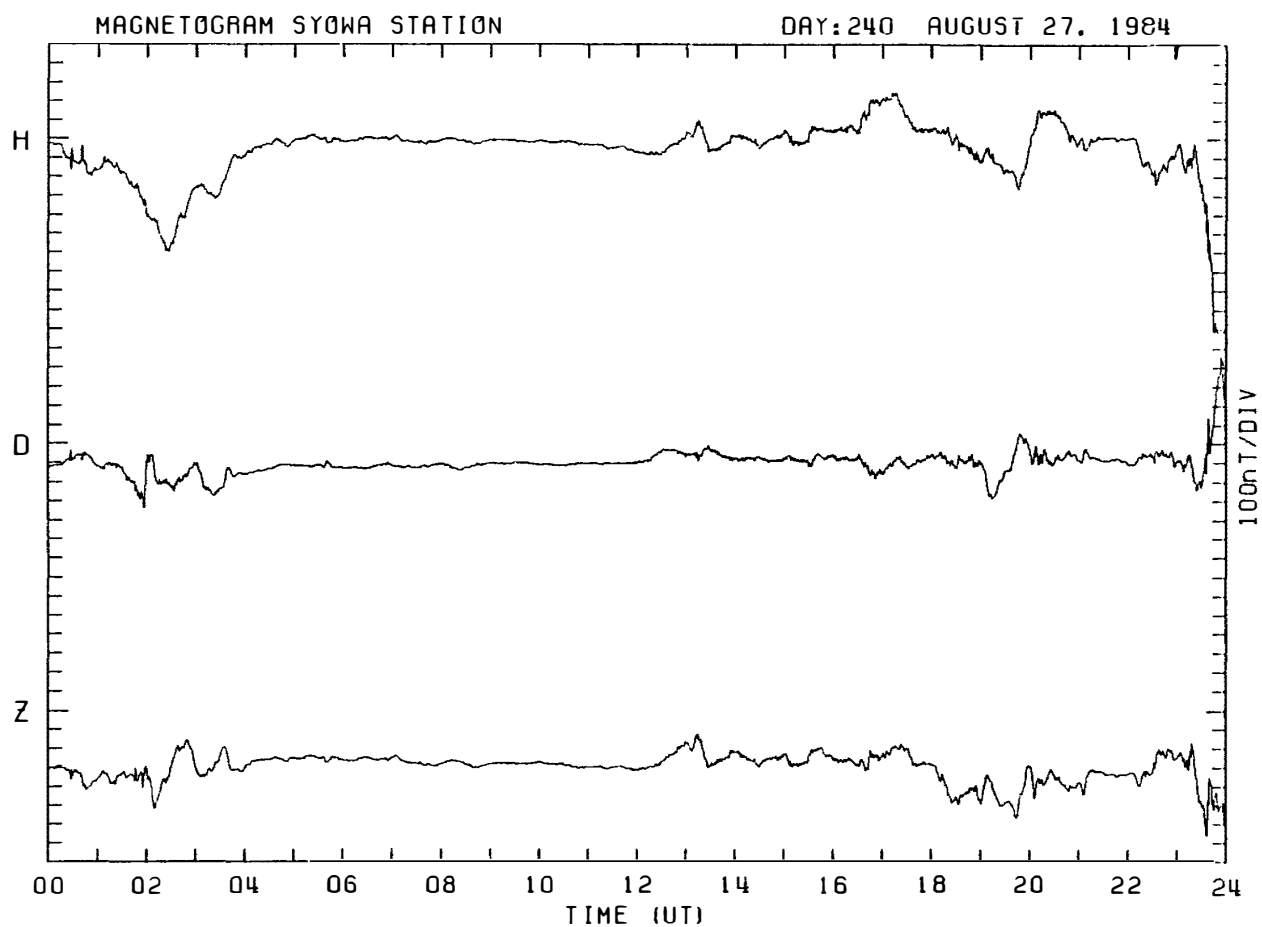
MAGNETOGRAM SYOWA STATION

DAY:237 AUGUST 24, 1984



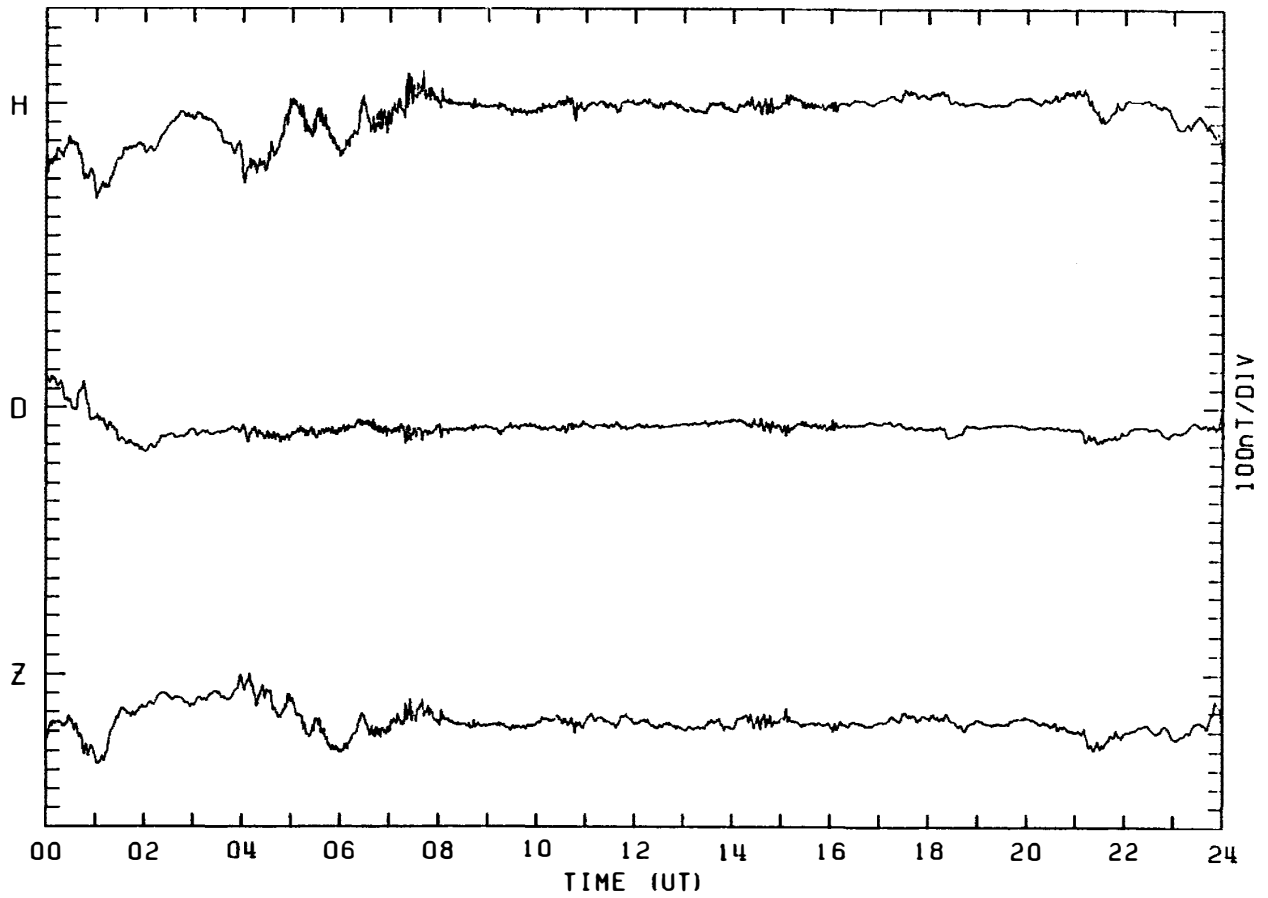






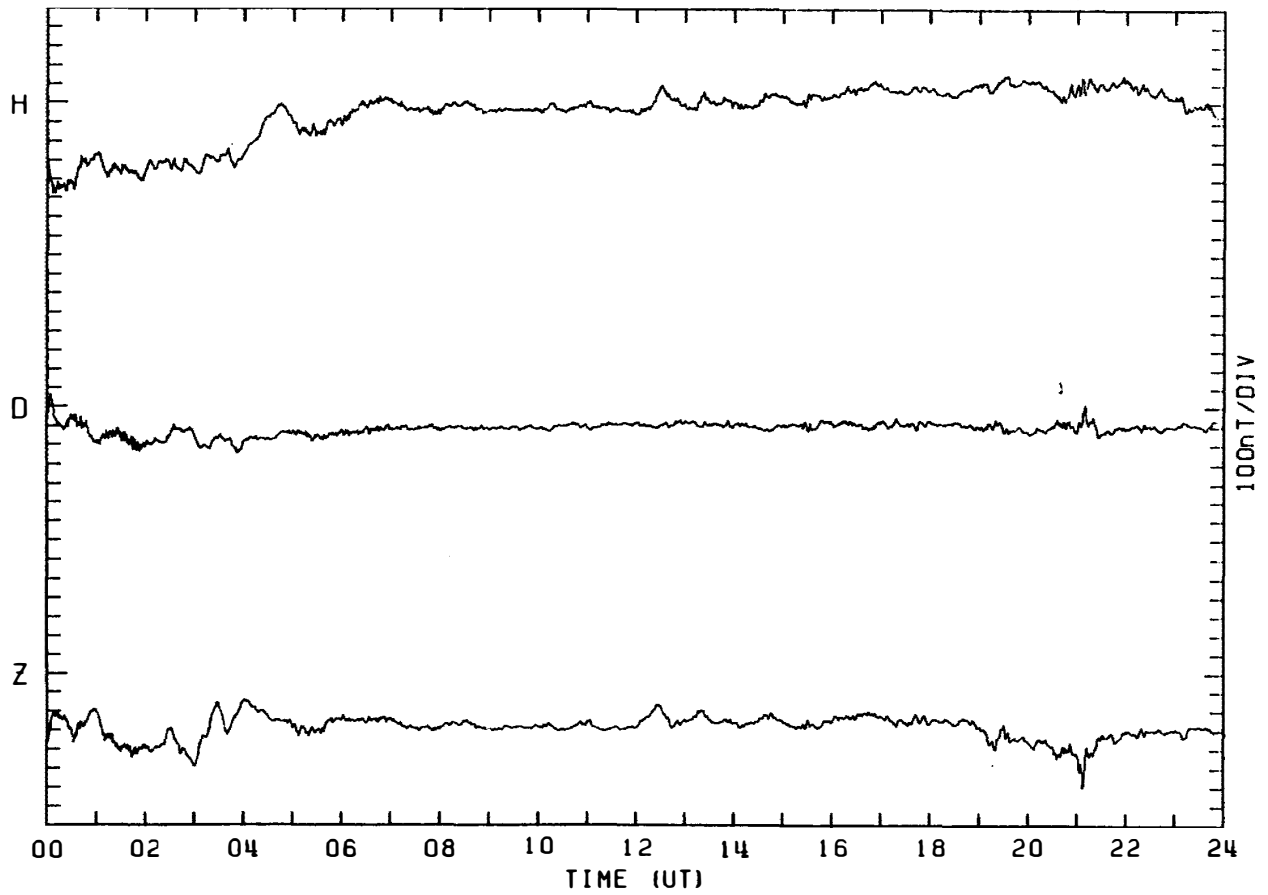
MAGNETOGRAM SYOWA STATION

DAY:242 AUGUST 29, 1984



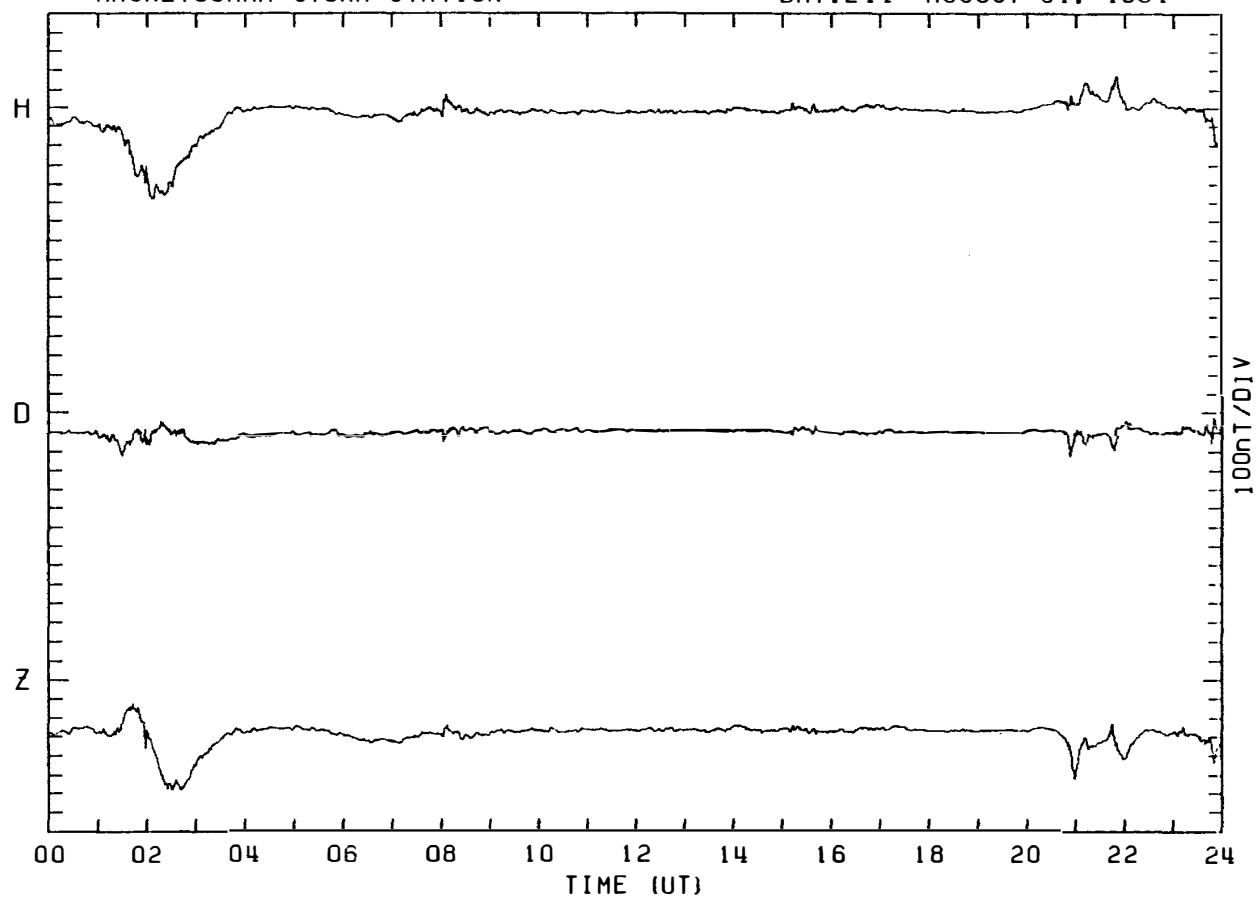
MAGNETOGRAM SYOWA STATION

DAY:243 AUGUST 30, 1984



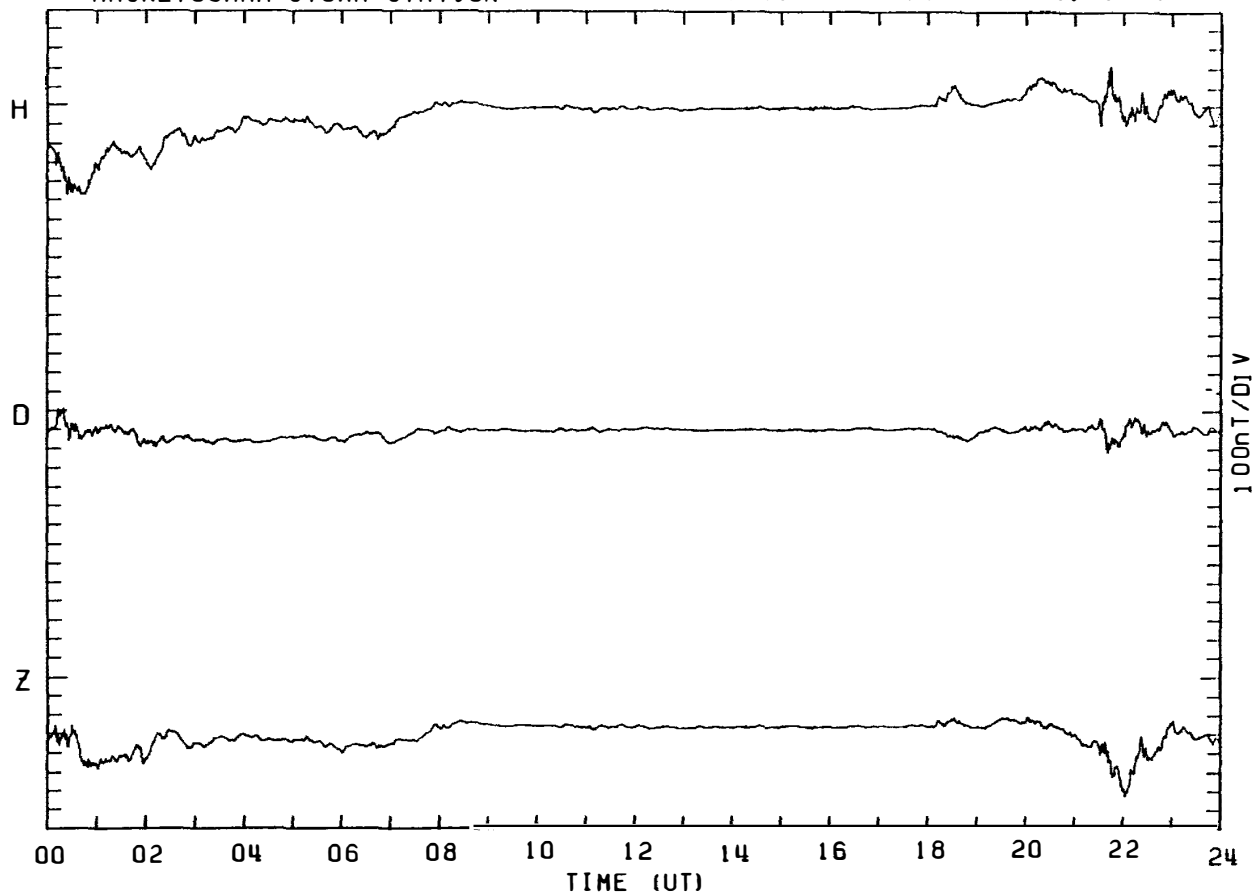
MAGNETOGRAM SYOWA STATION

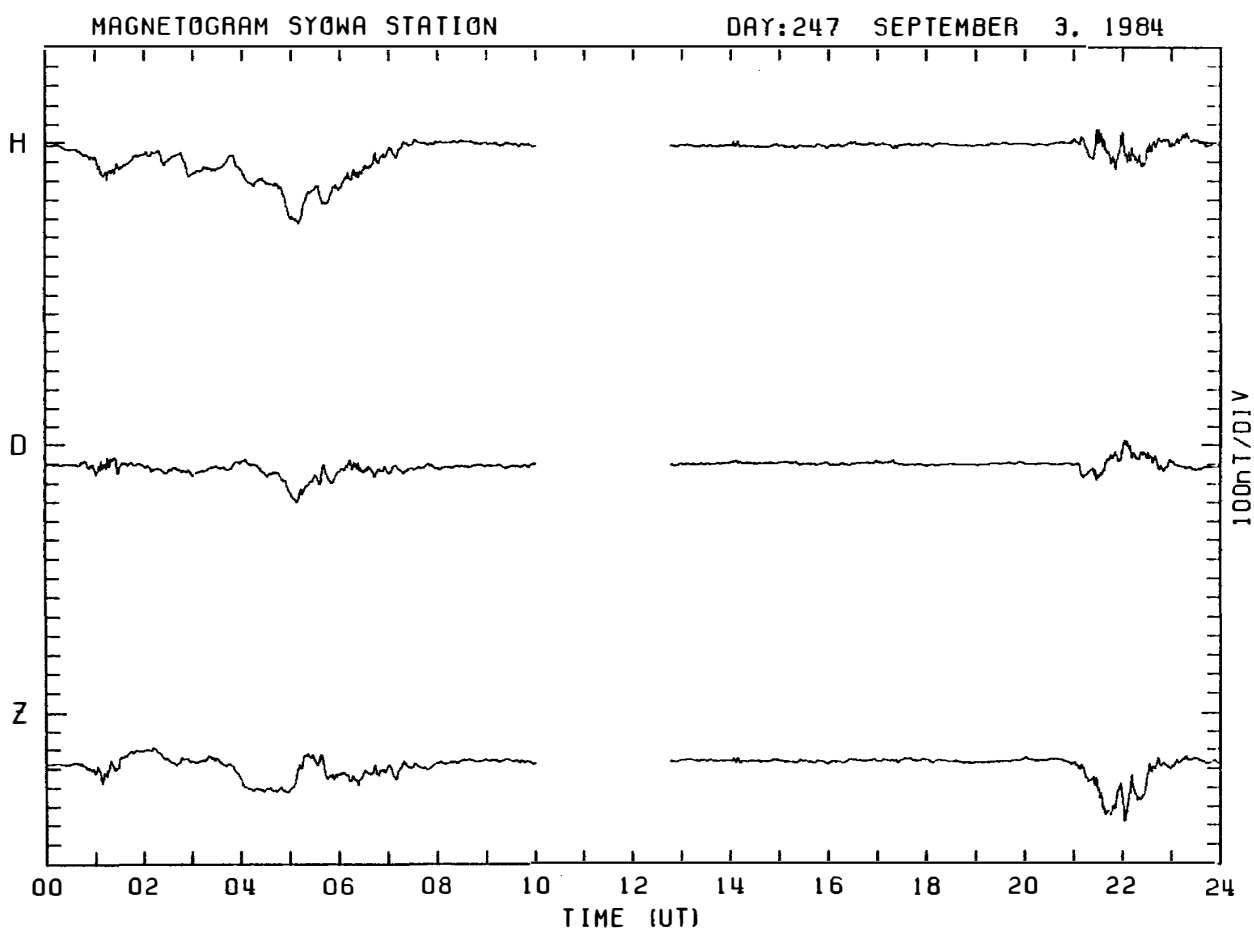
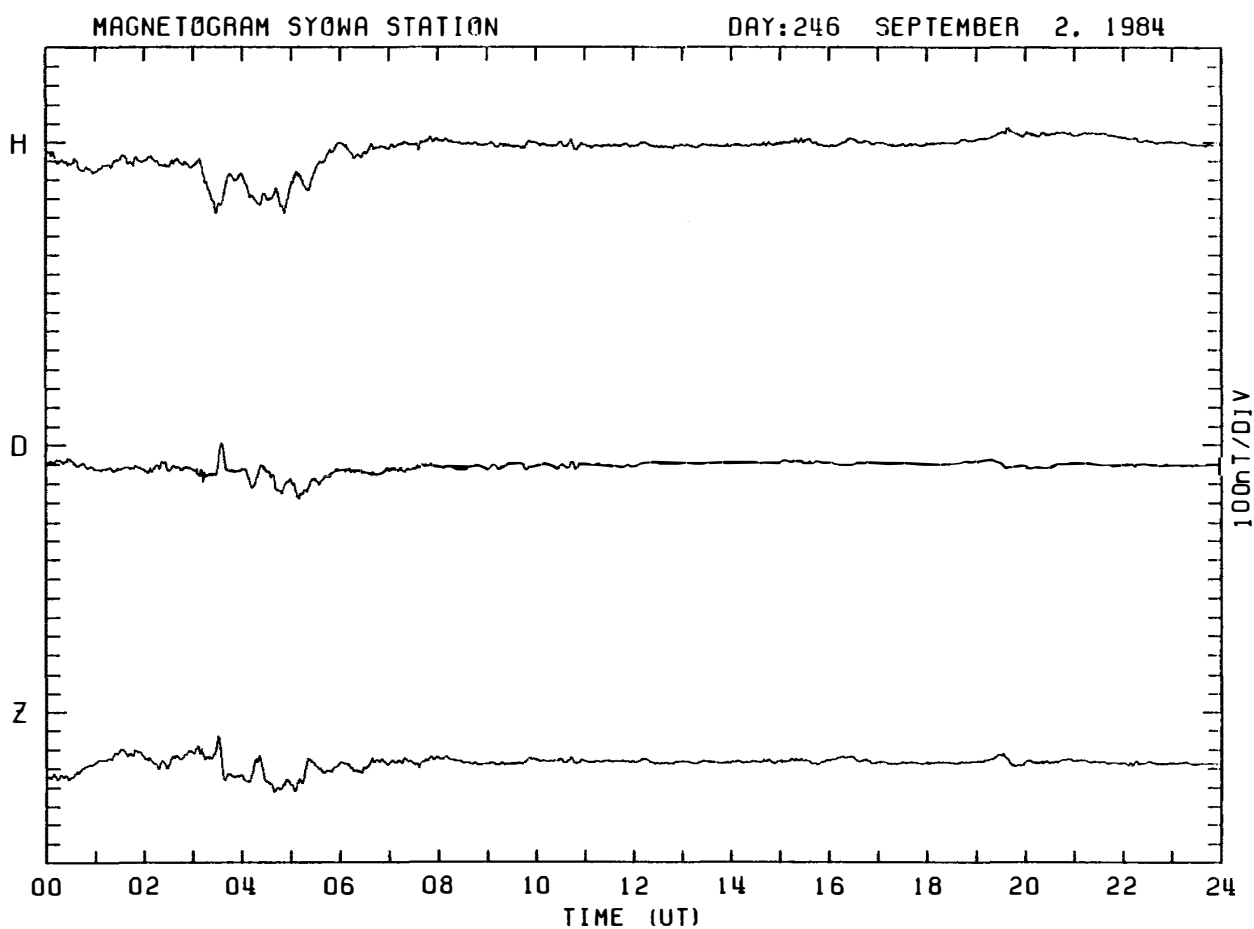
DAY:244 AUGUST 31, 1984

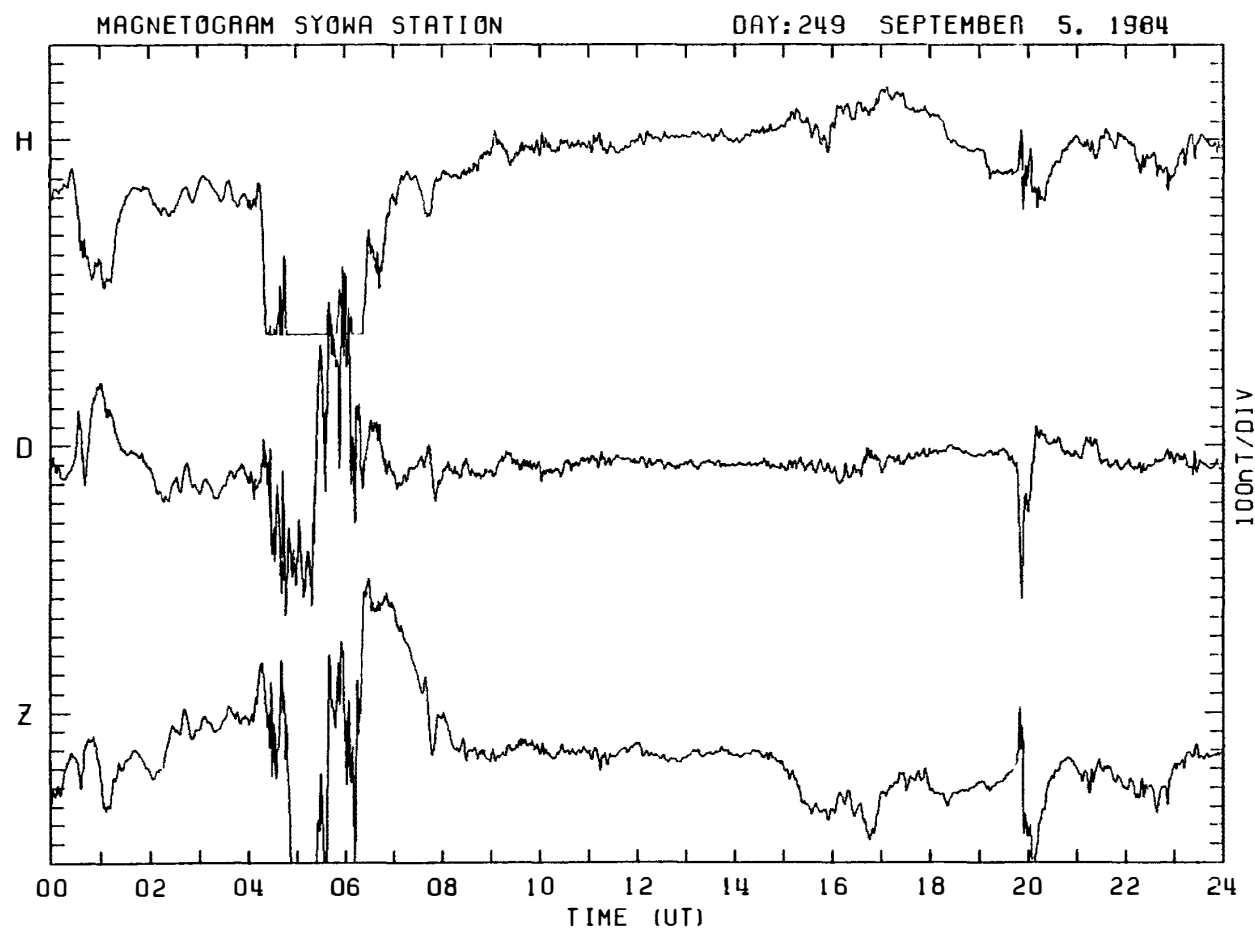
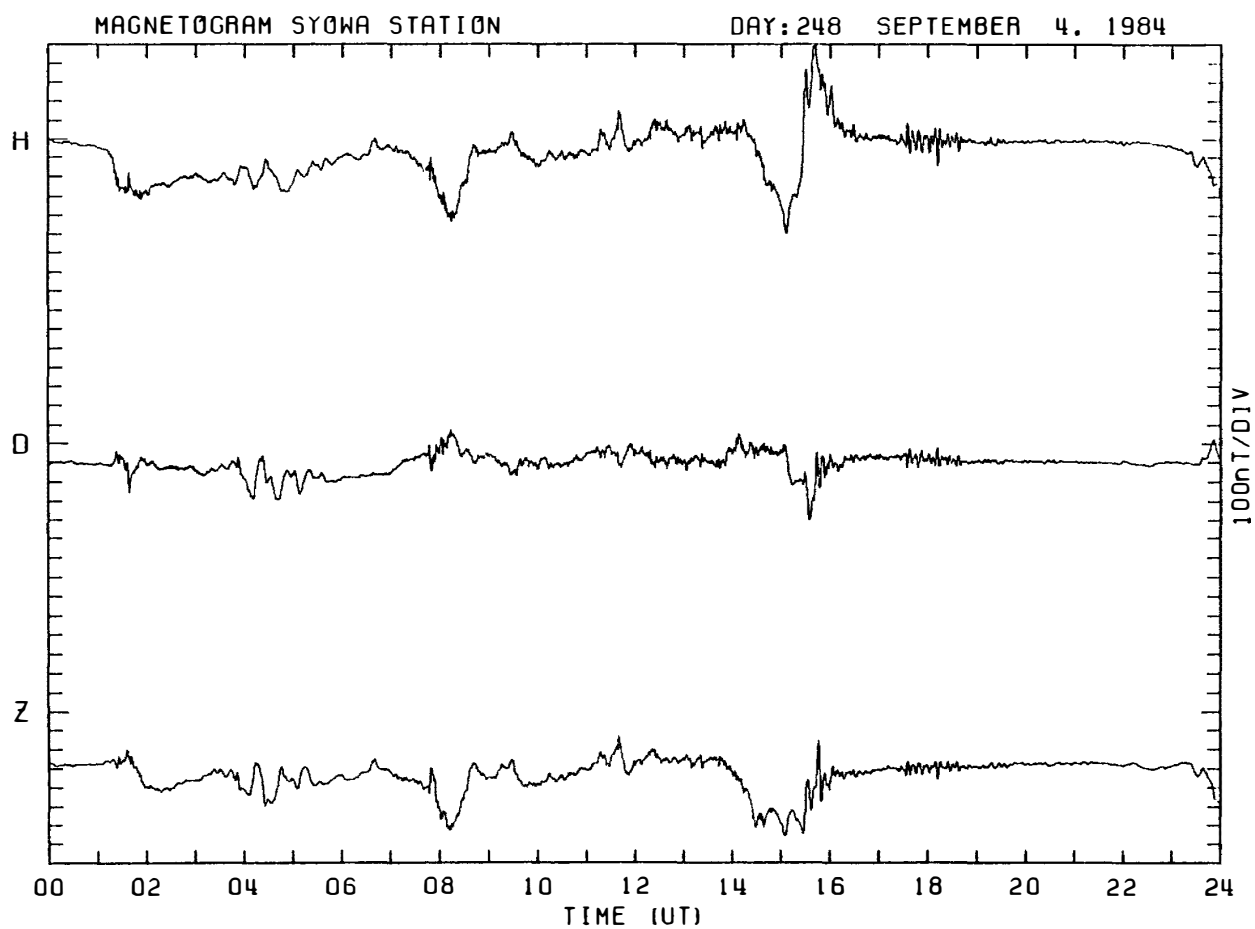


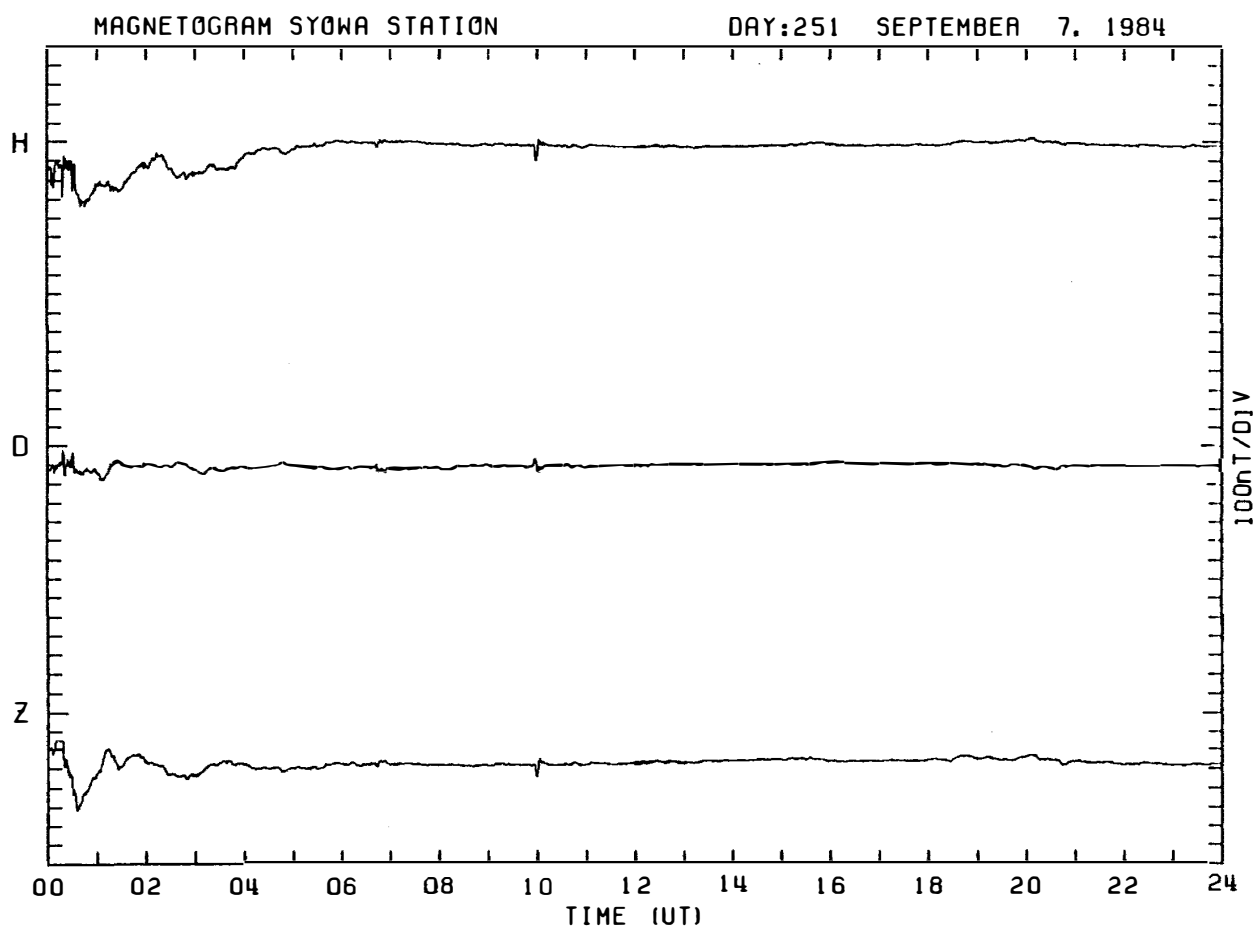
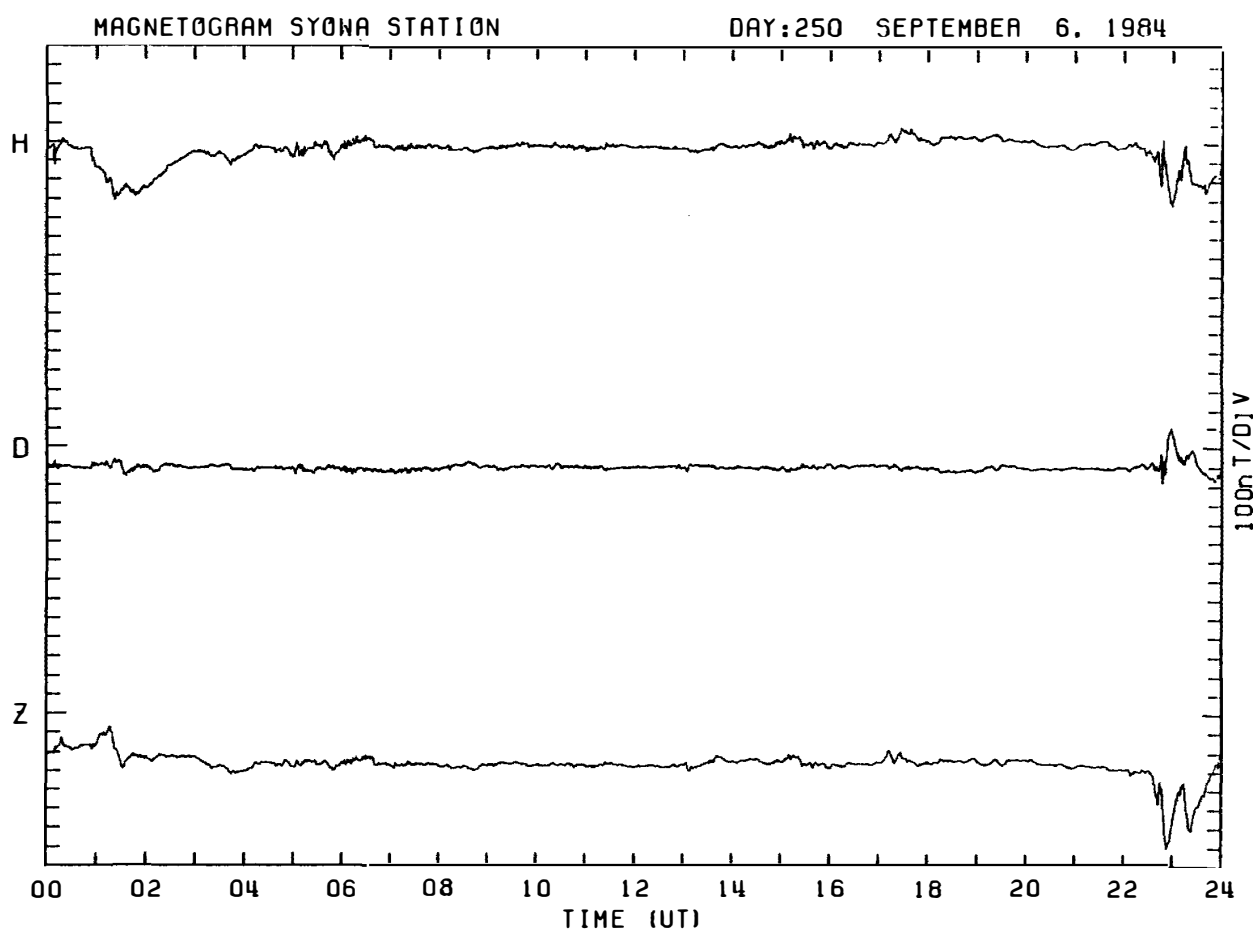
MAGNETOGRAM SYOWA STATION

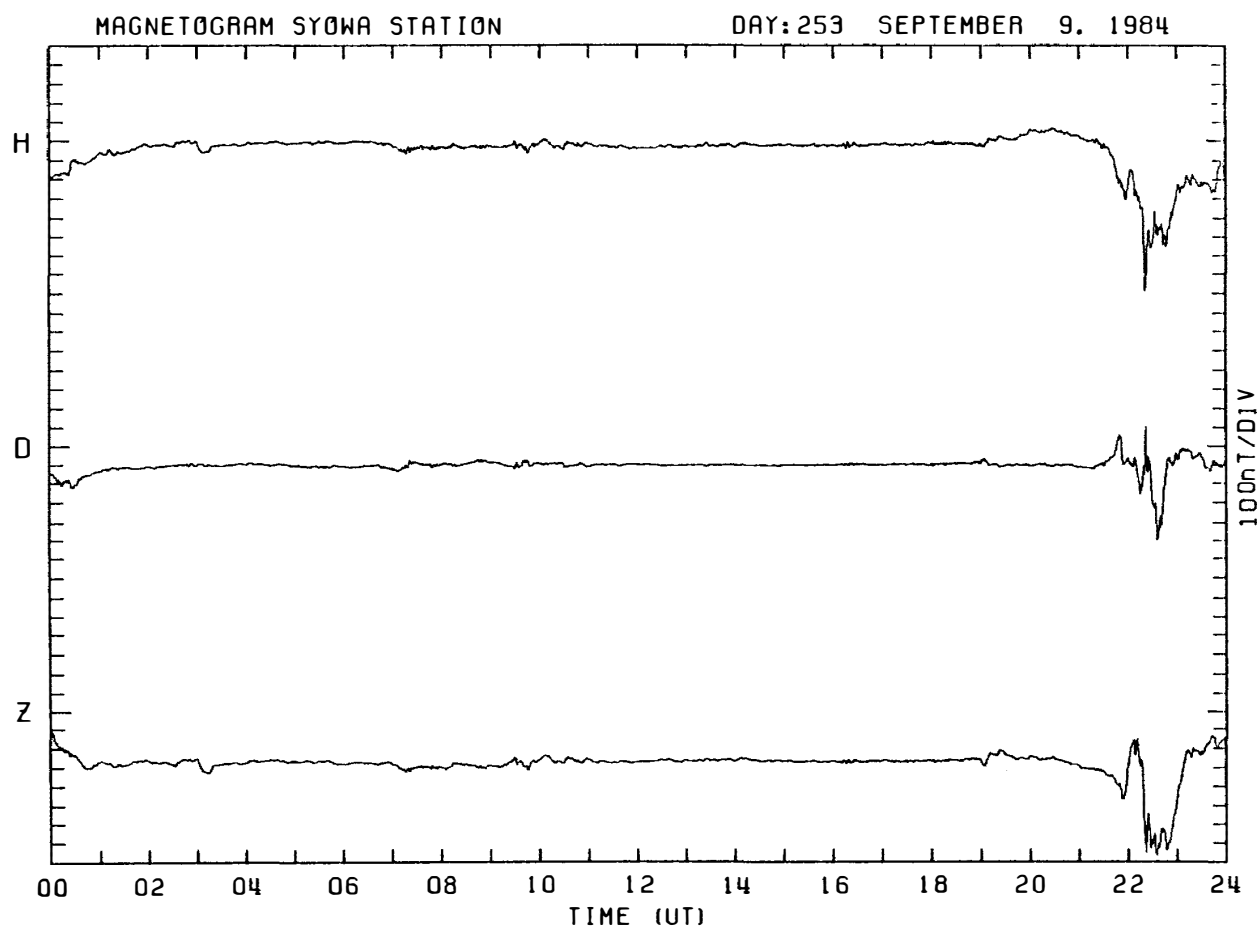
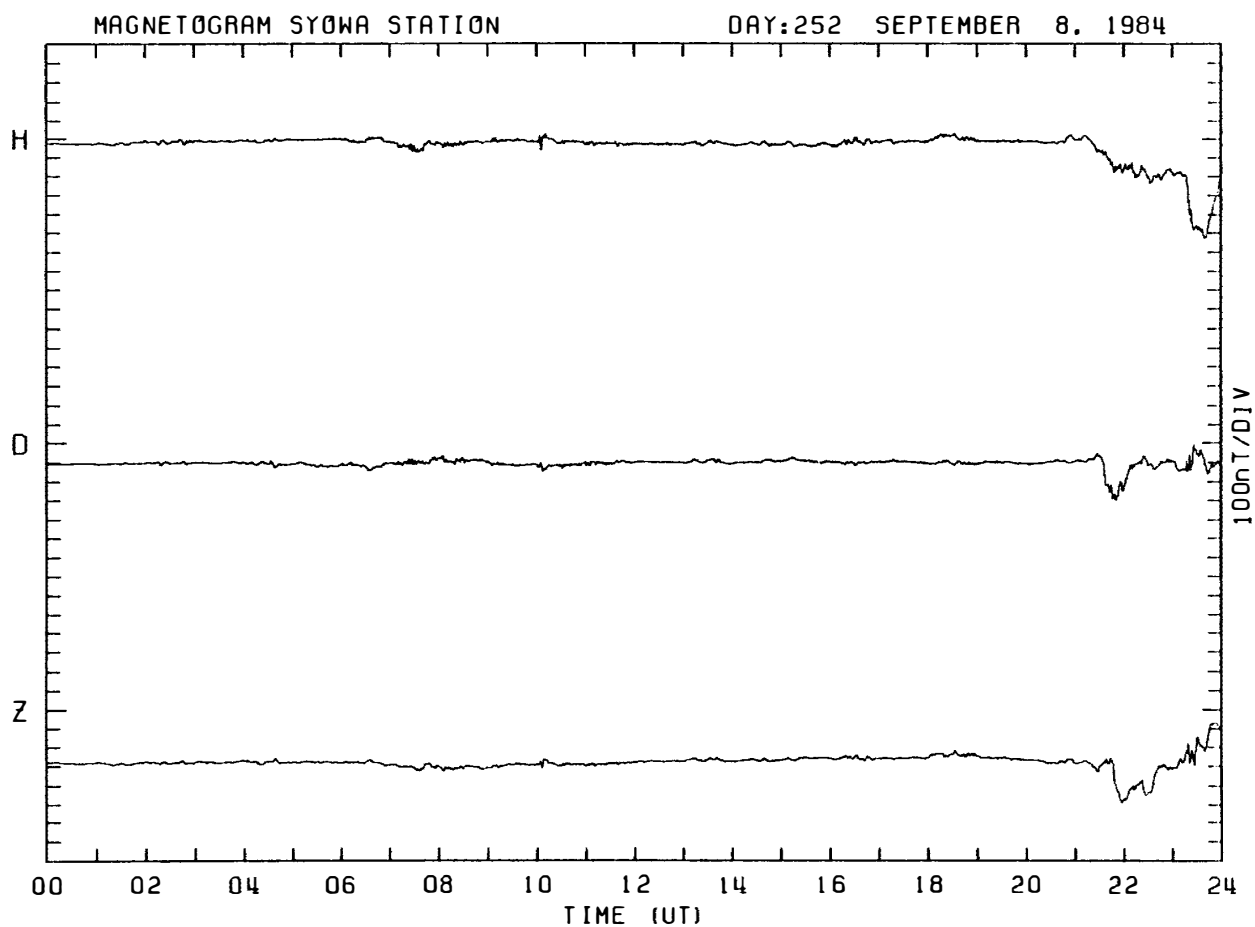
DAY:245 SEPTEMBER 1, 1984



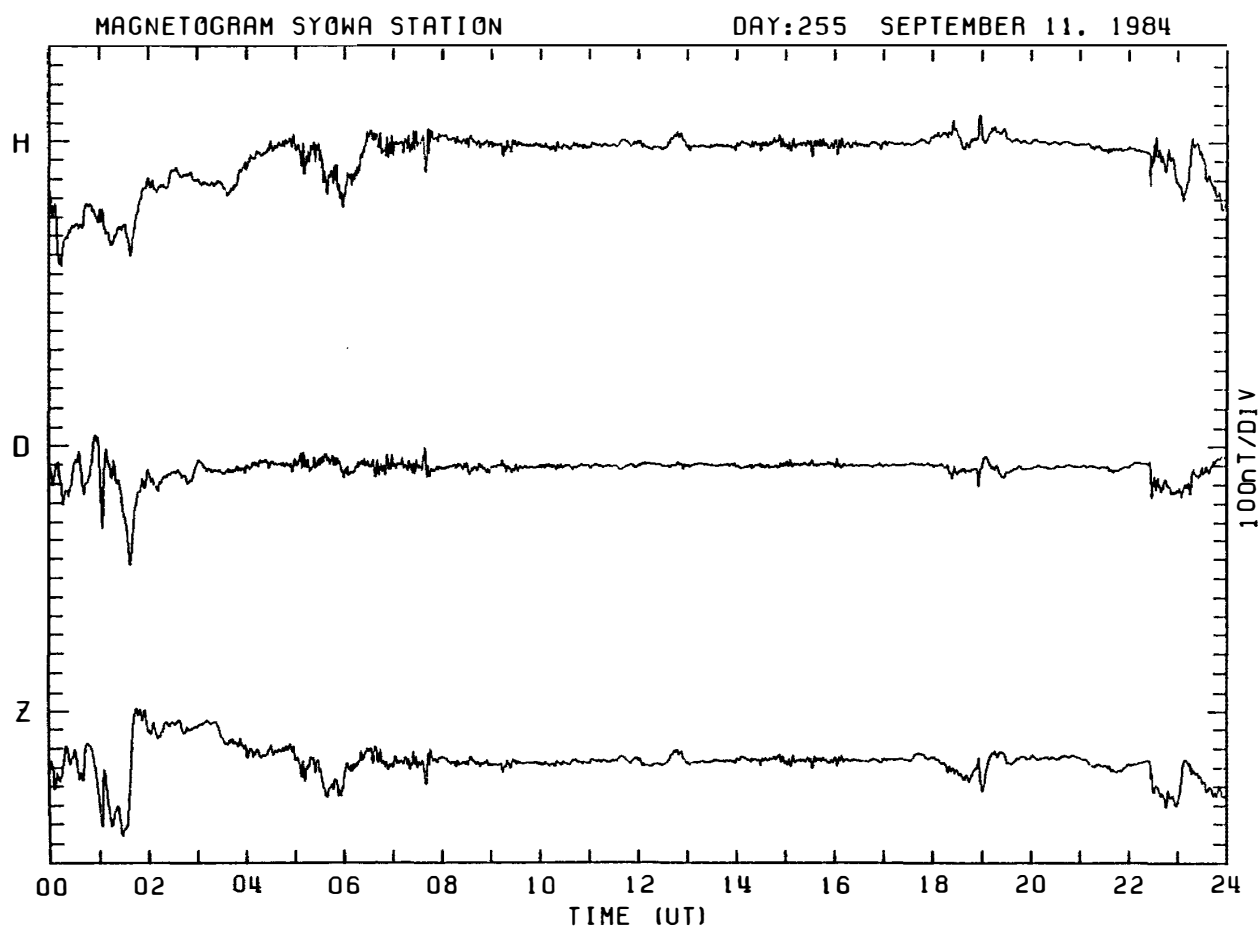
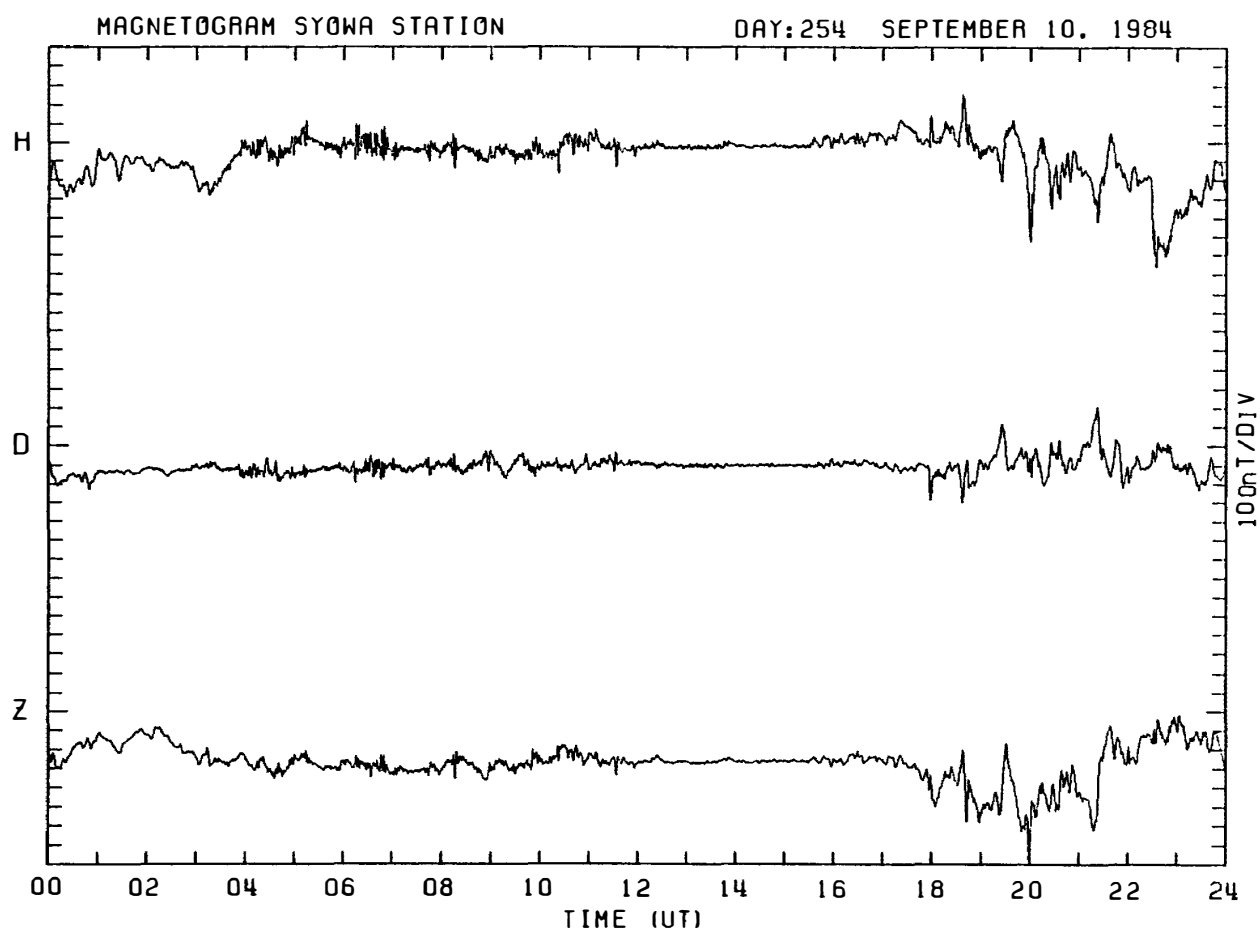


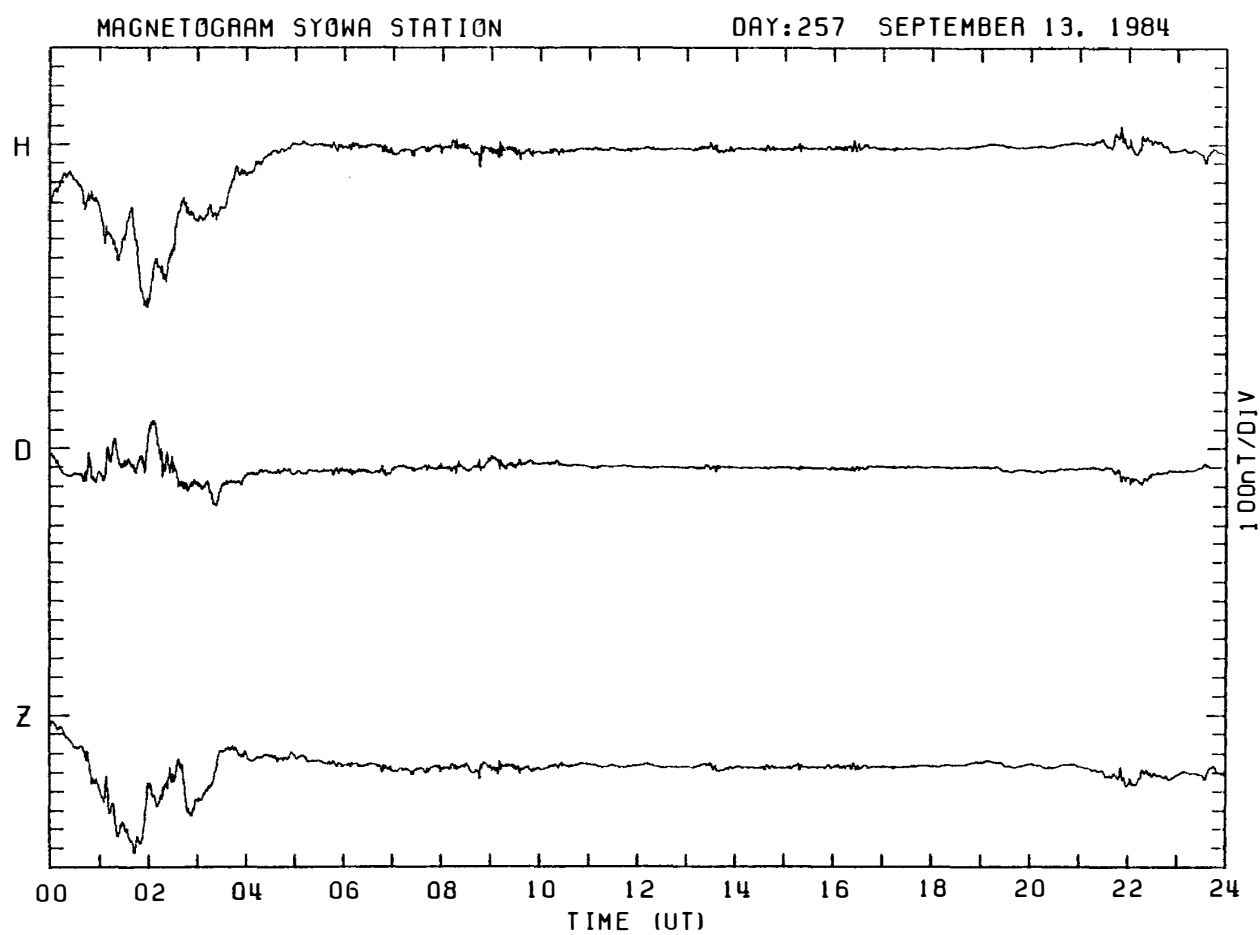
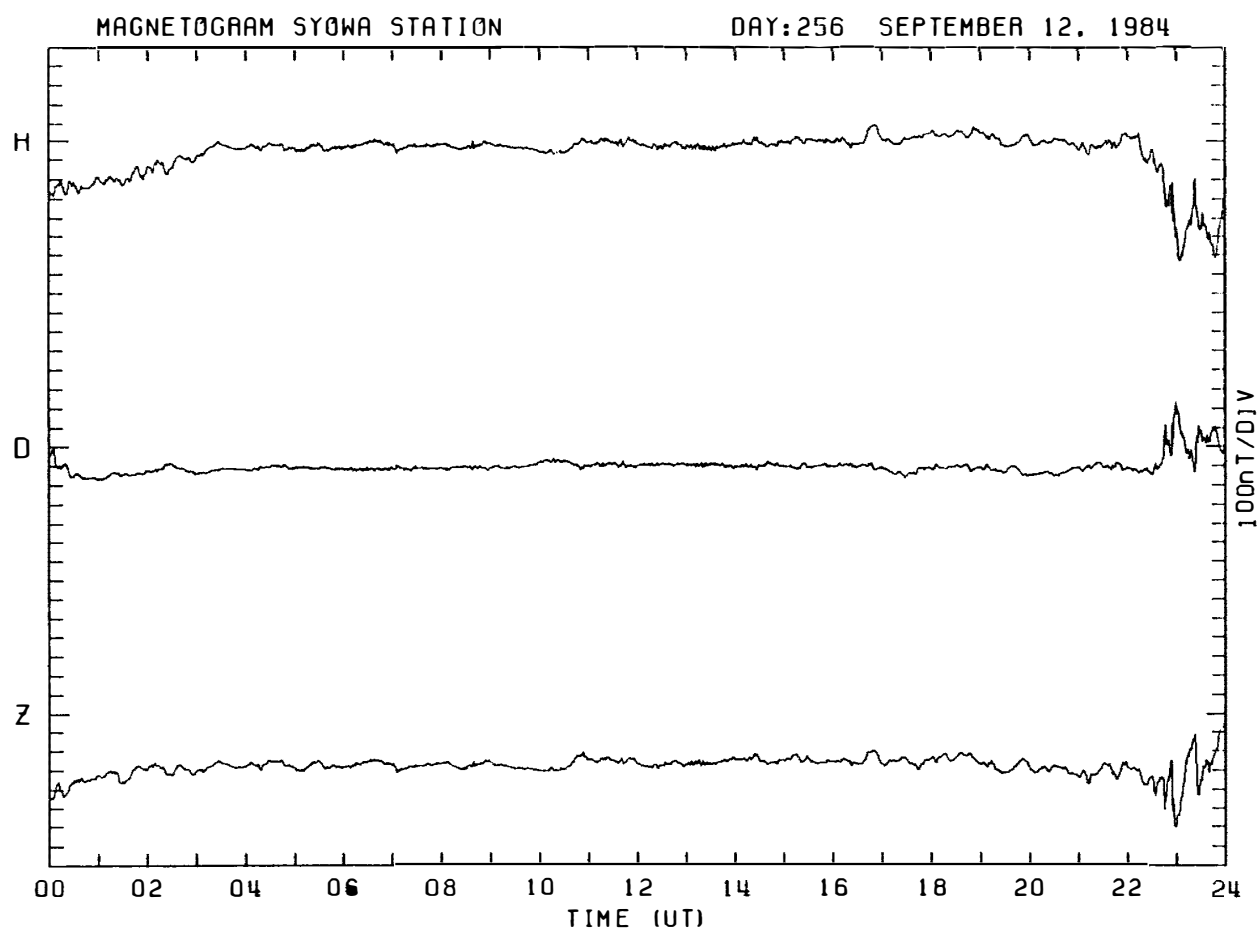


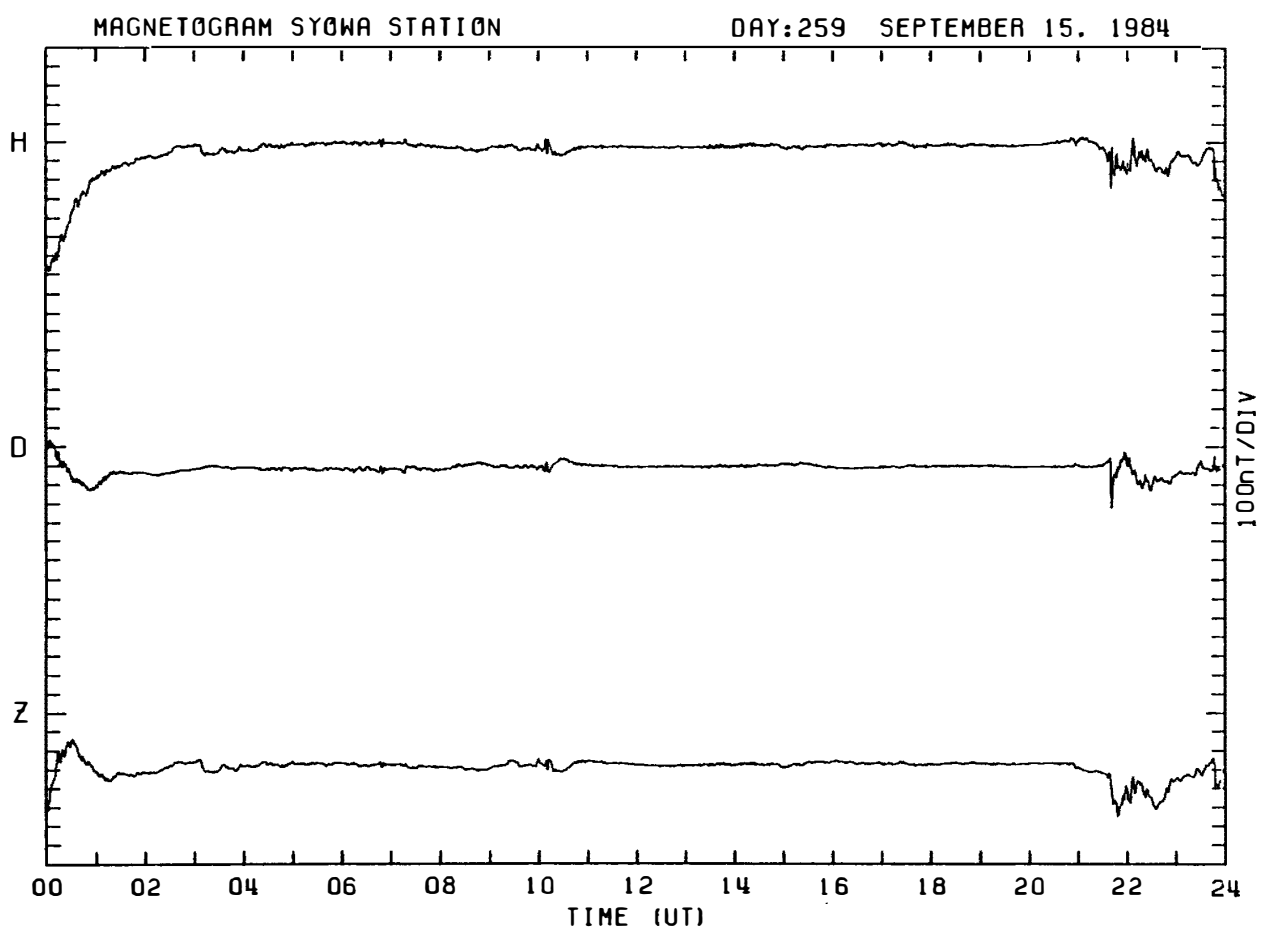
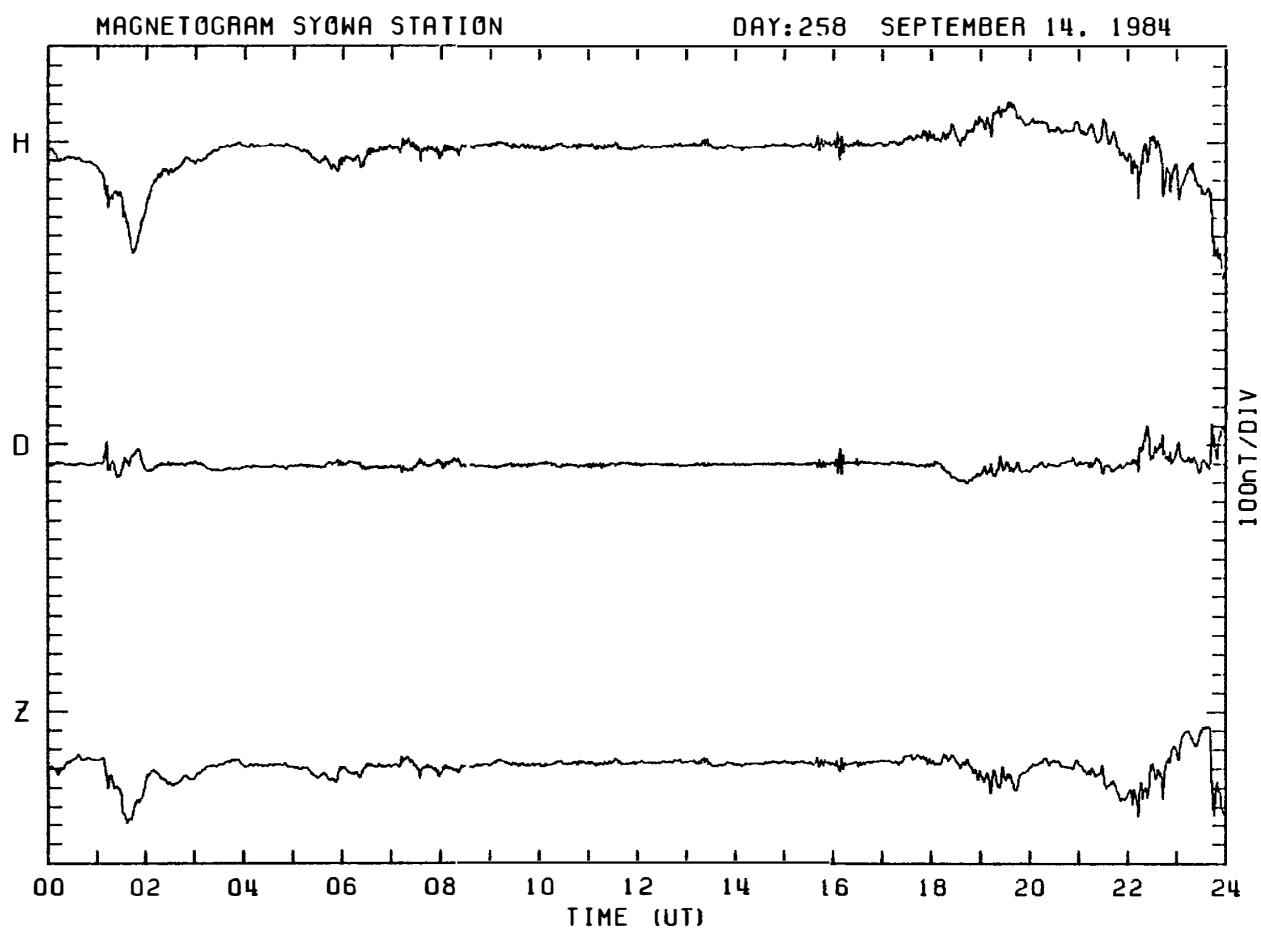


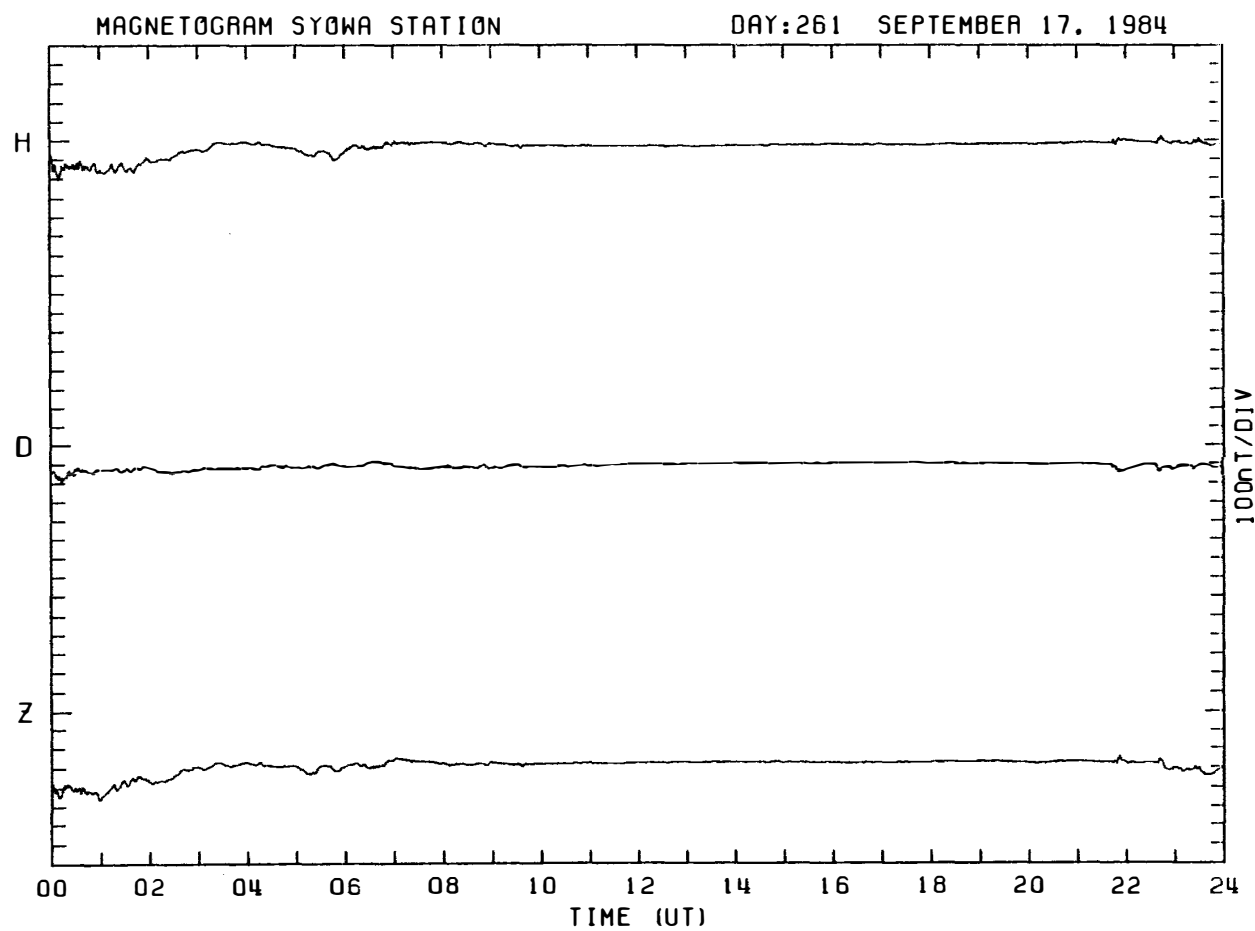
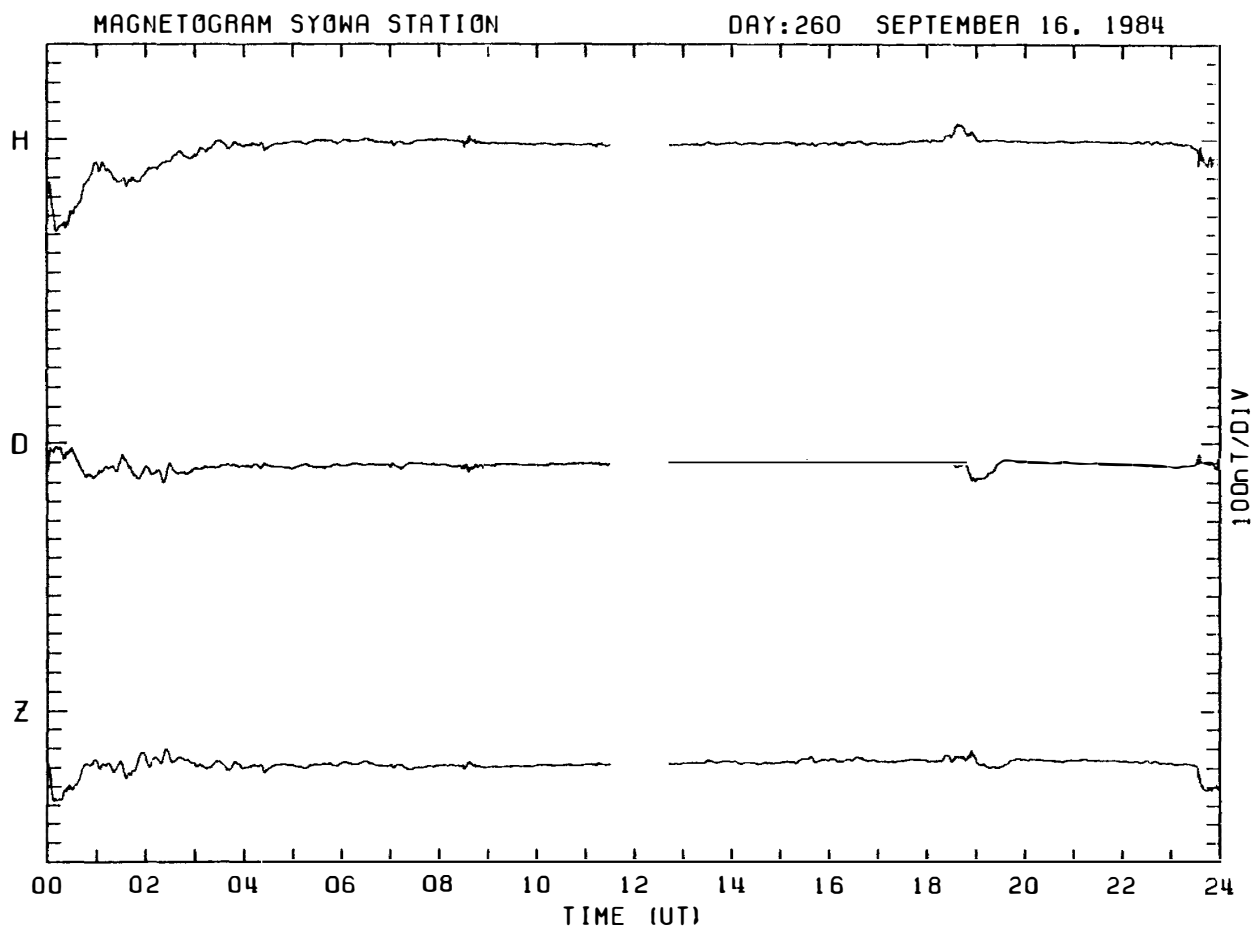


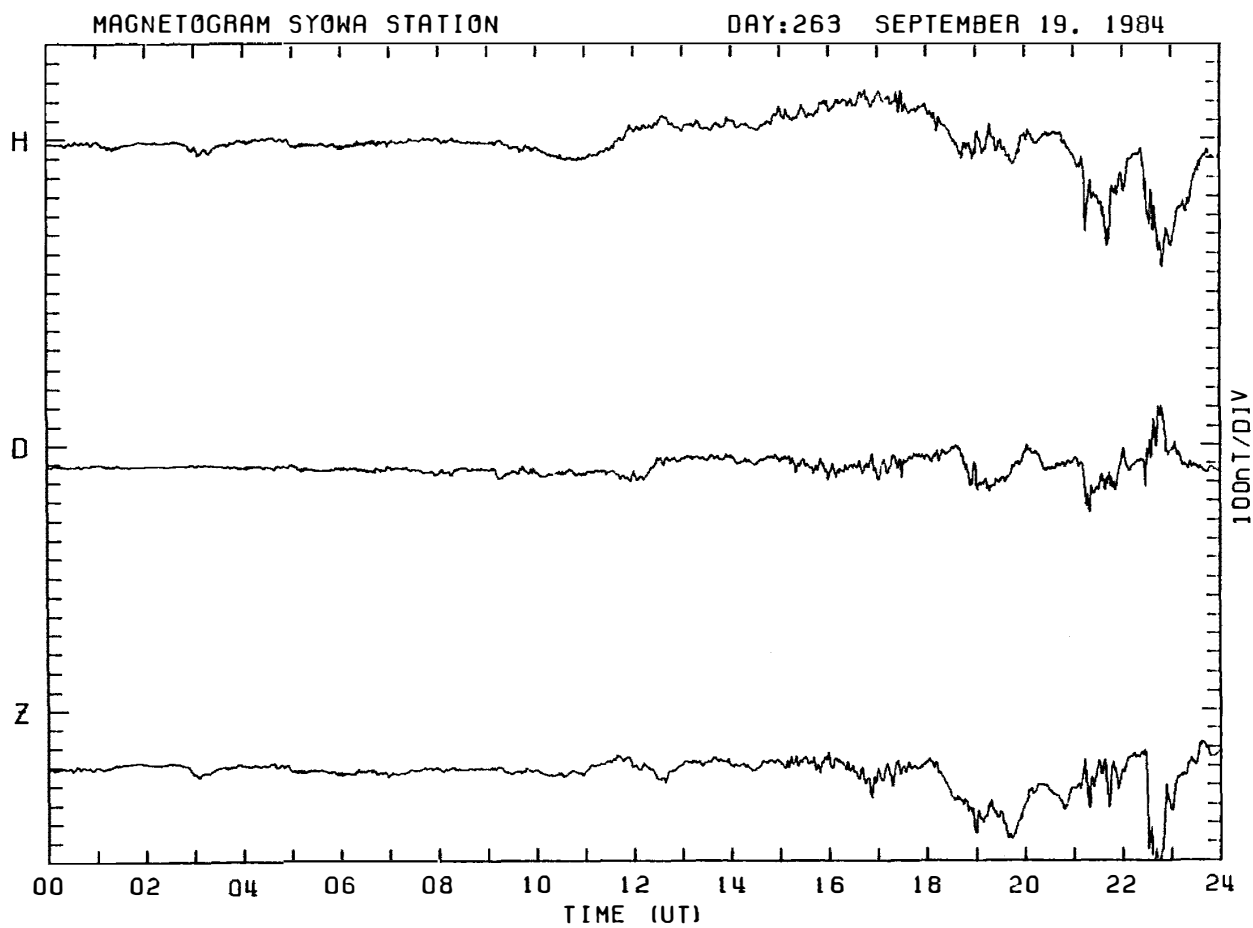
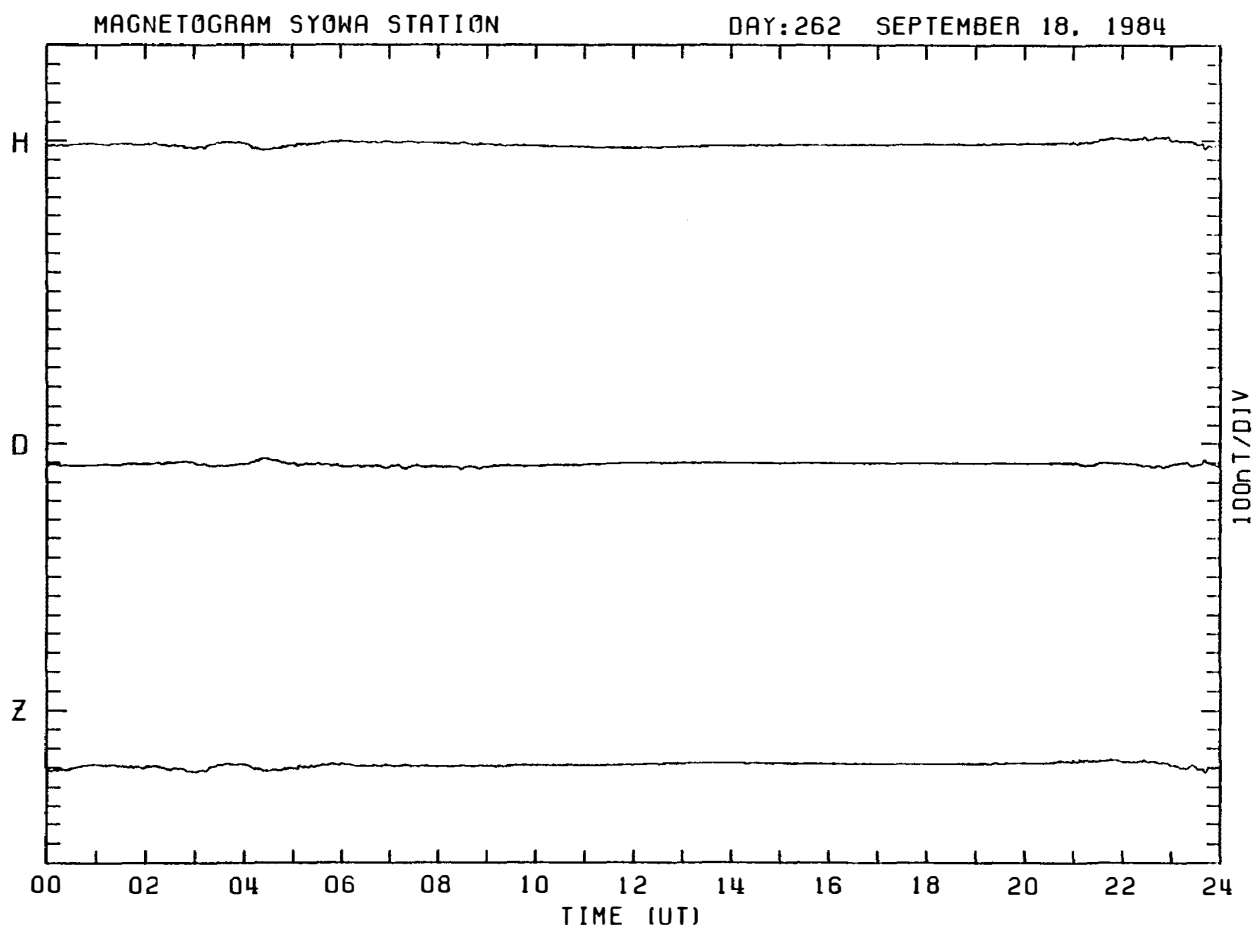


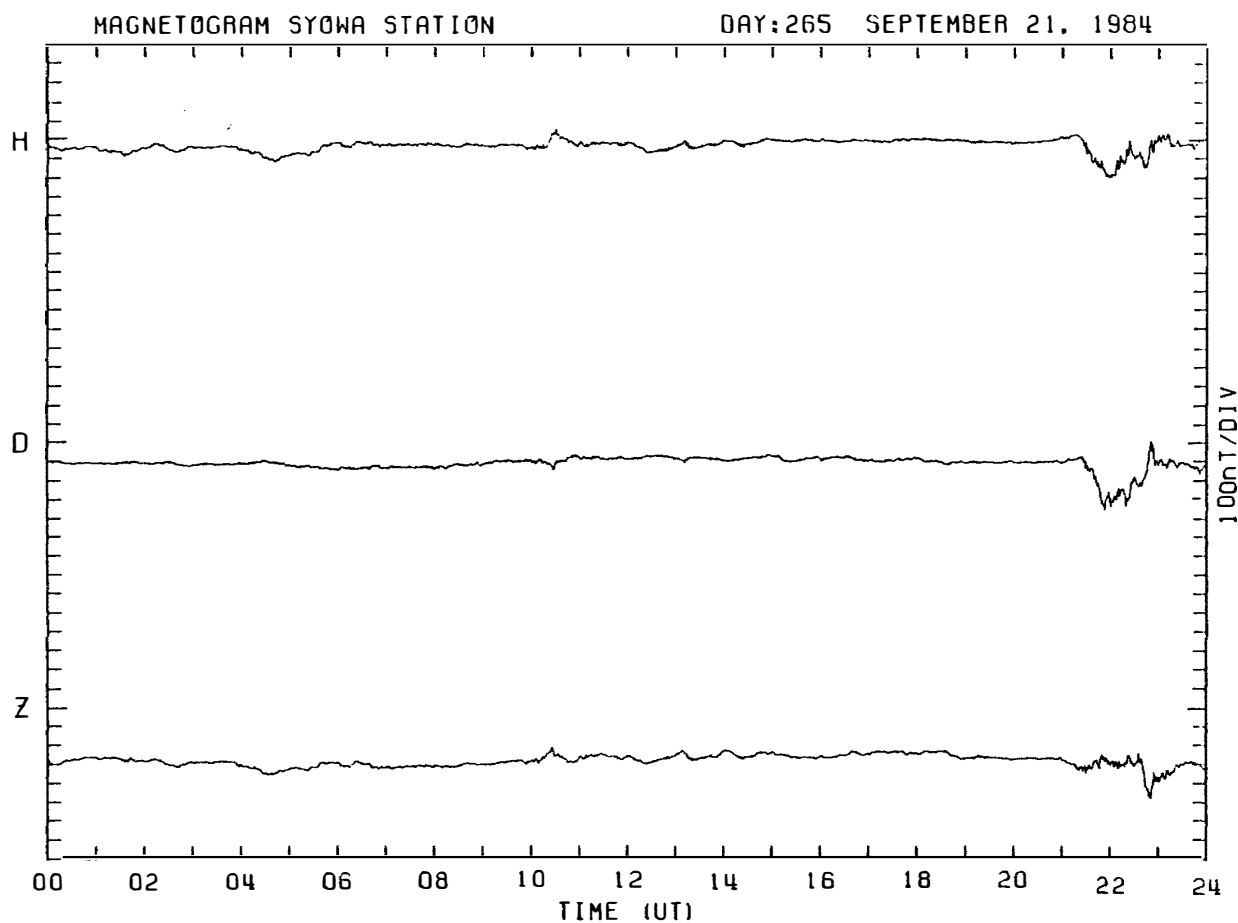
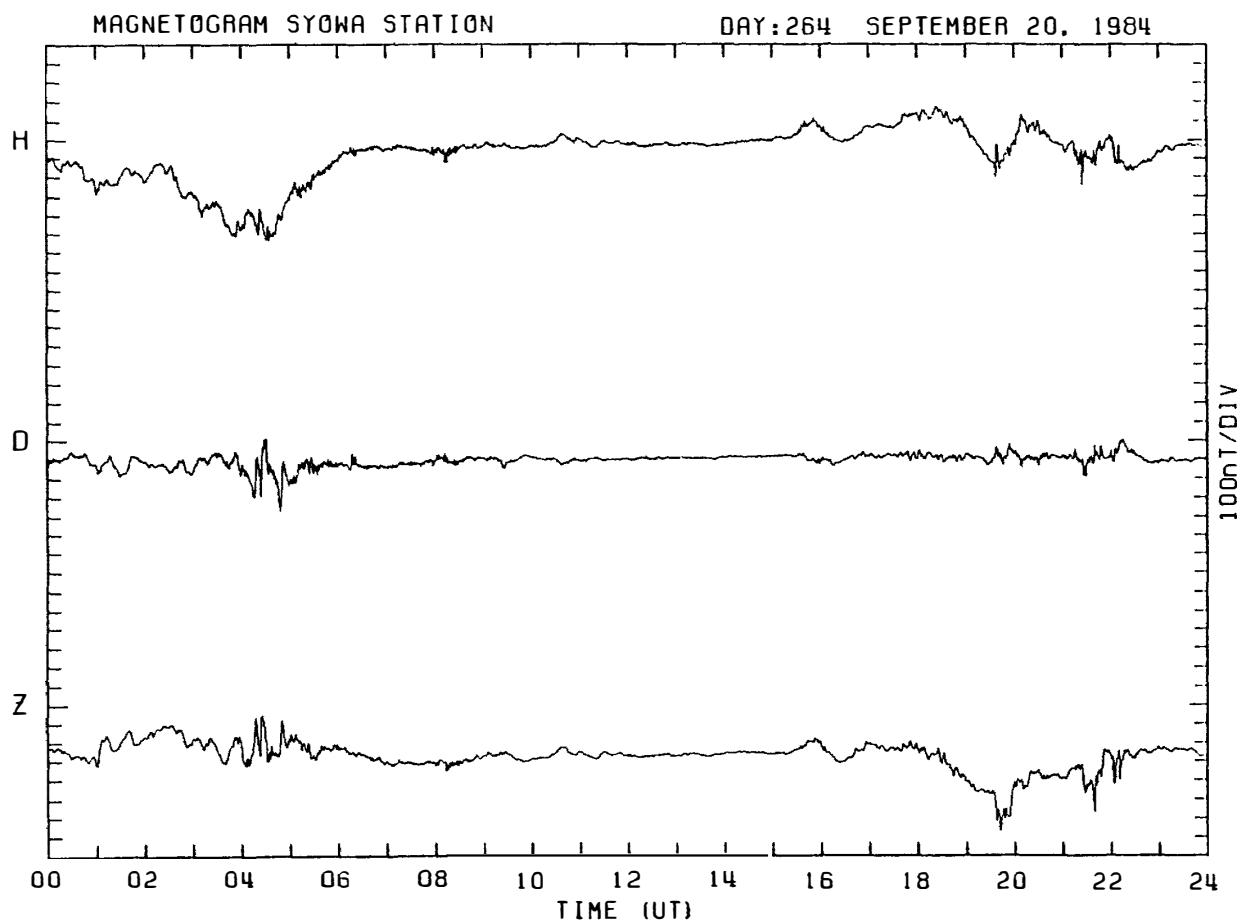


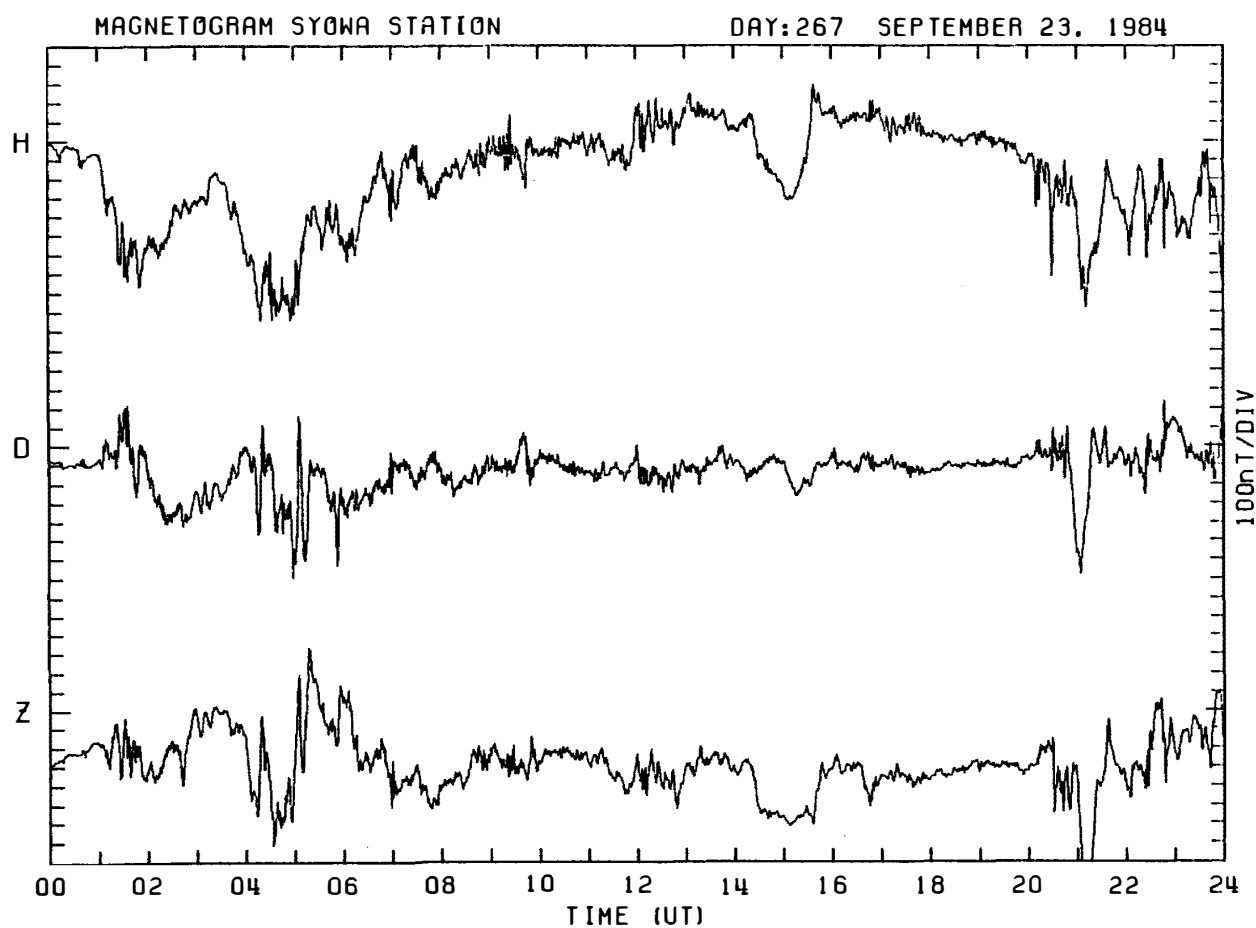
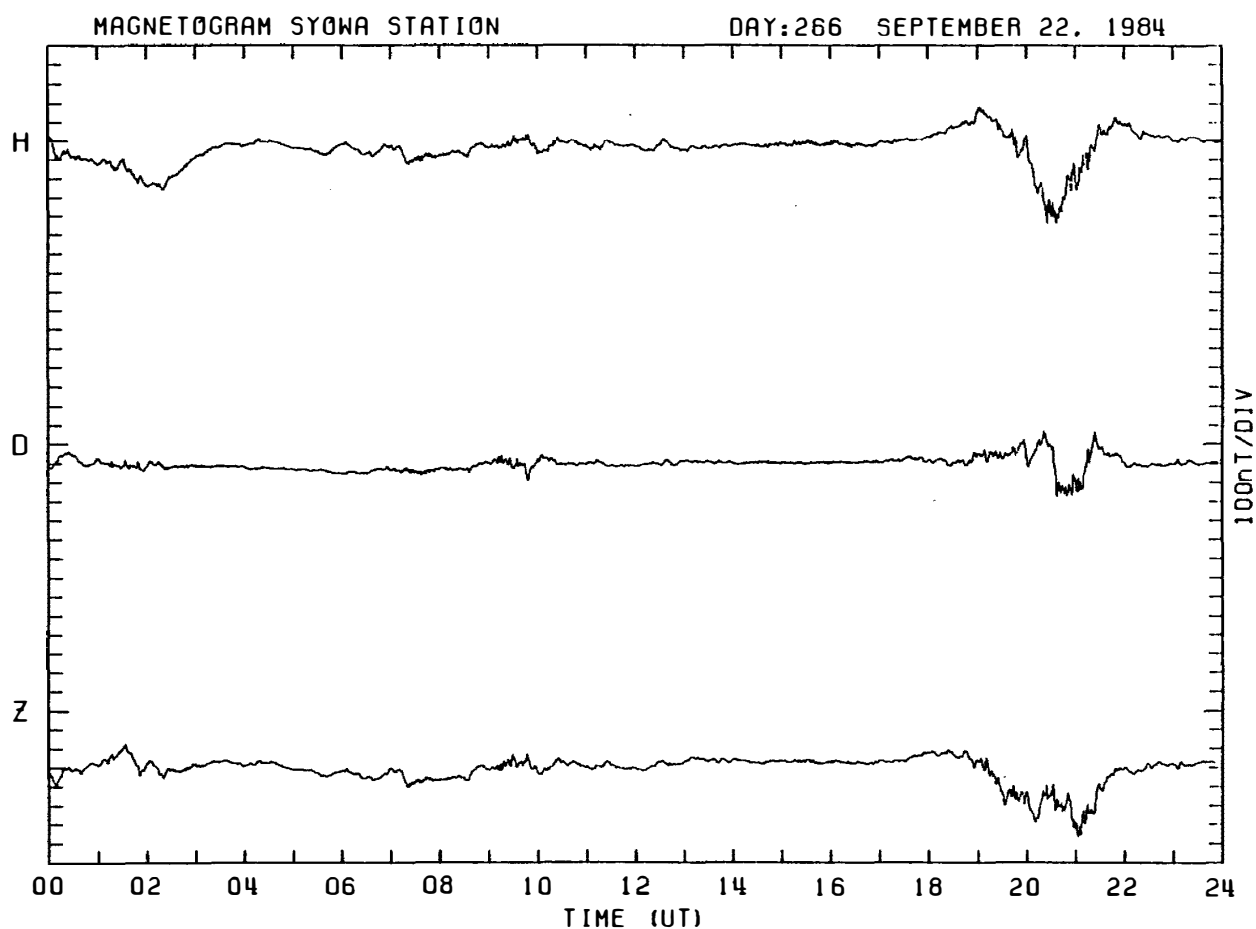






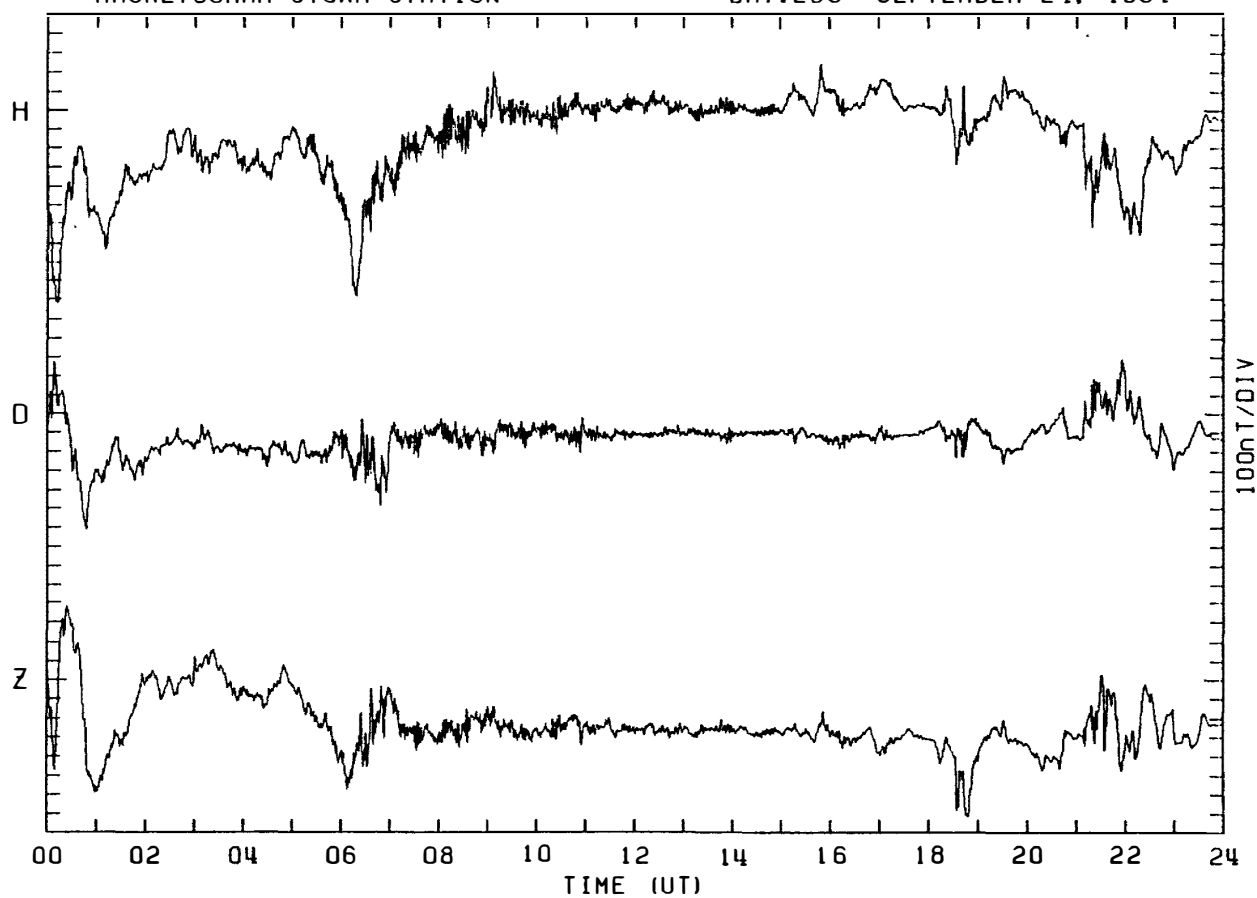






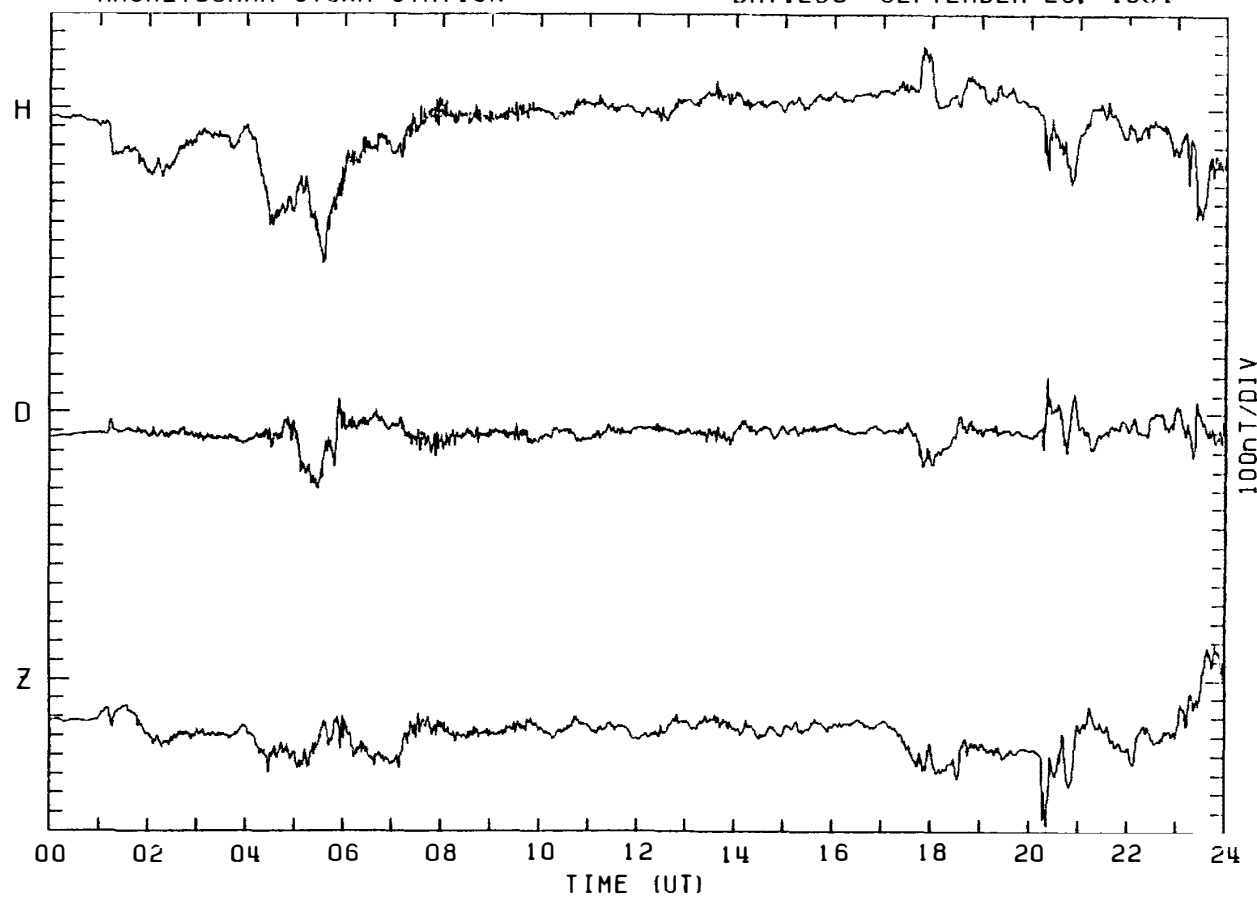
MAGNETOGRAM SYOWA STATION

DAY:268 SEPTEMBER 24, 1984

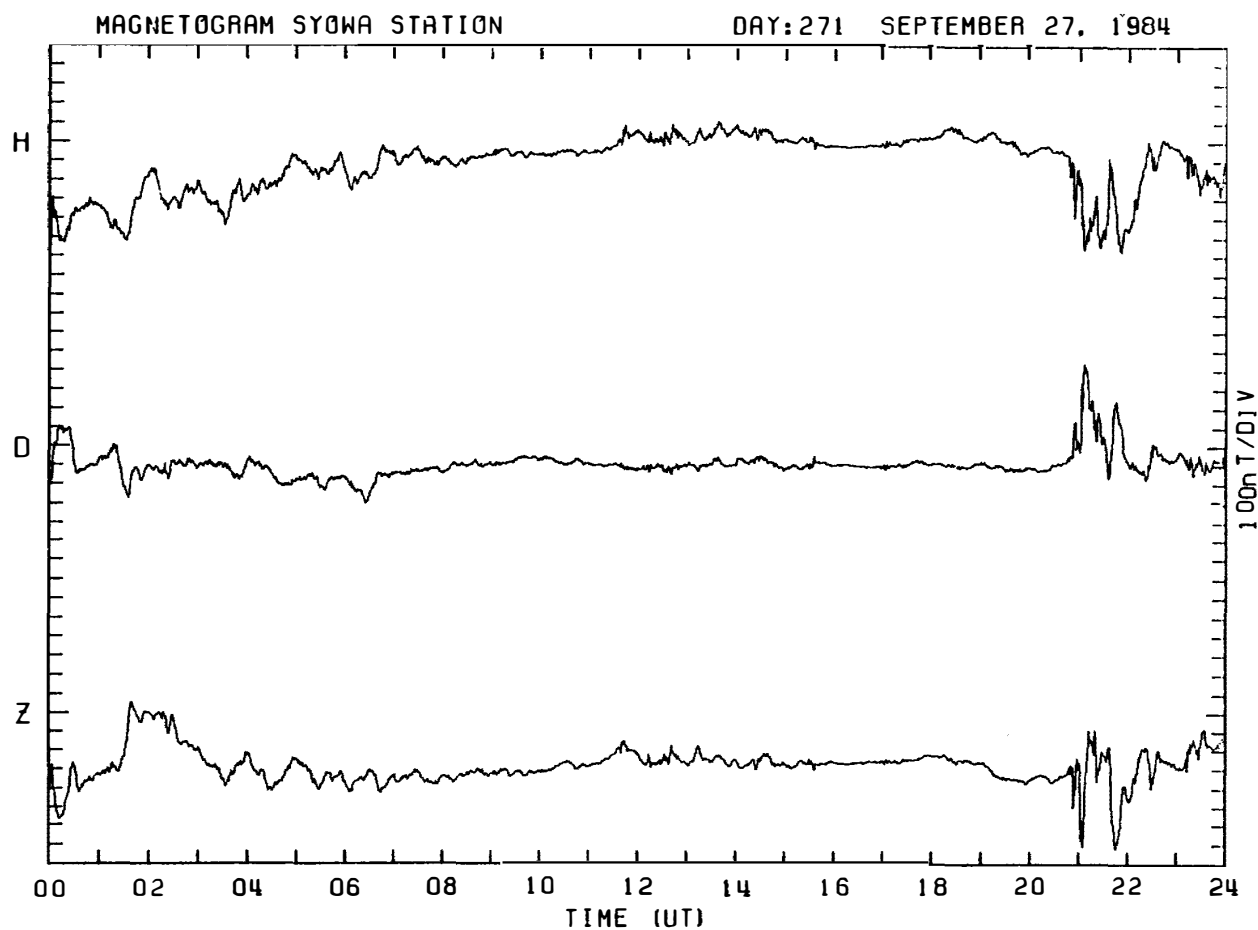
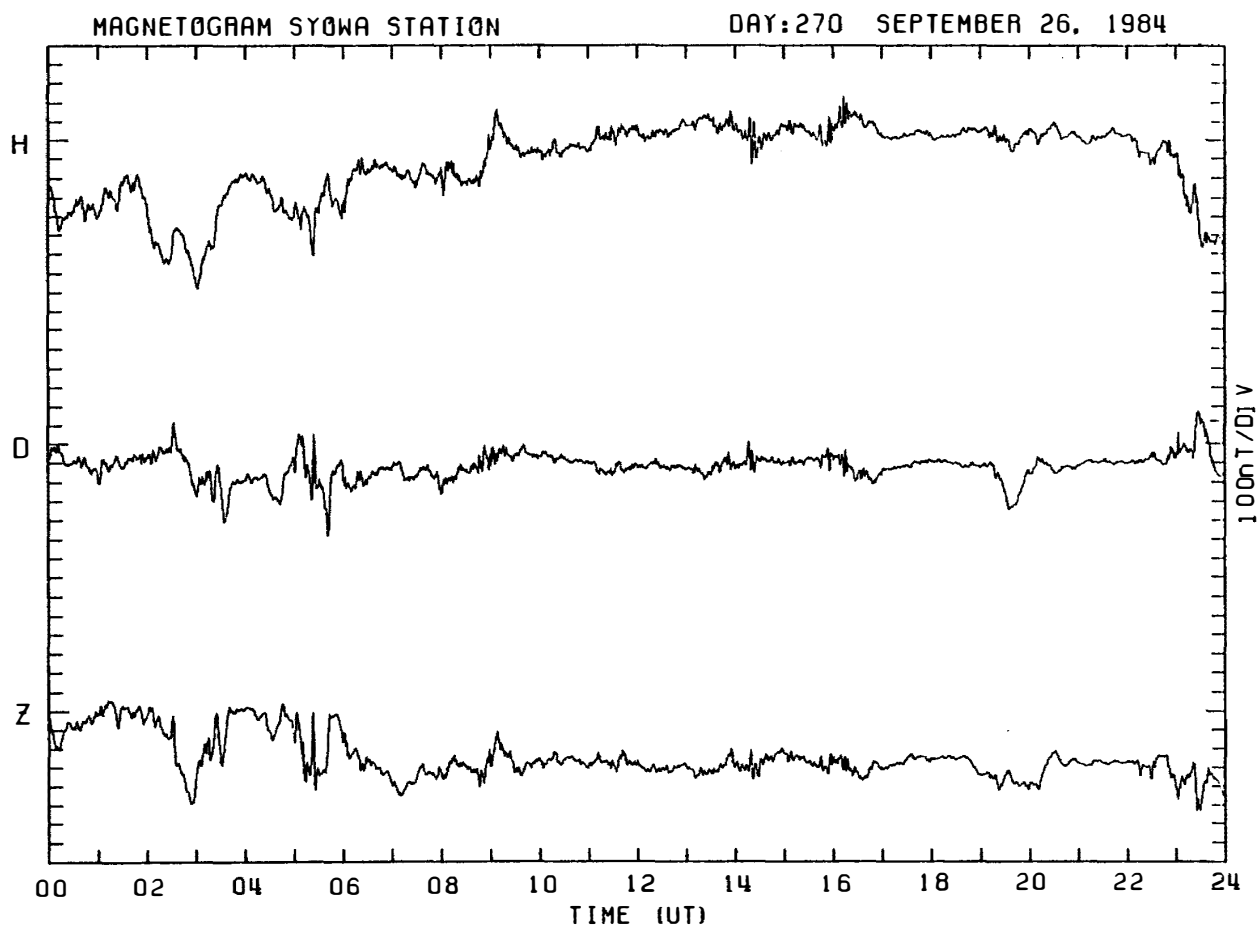


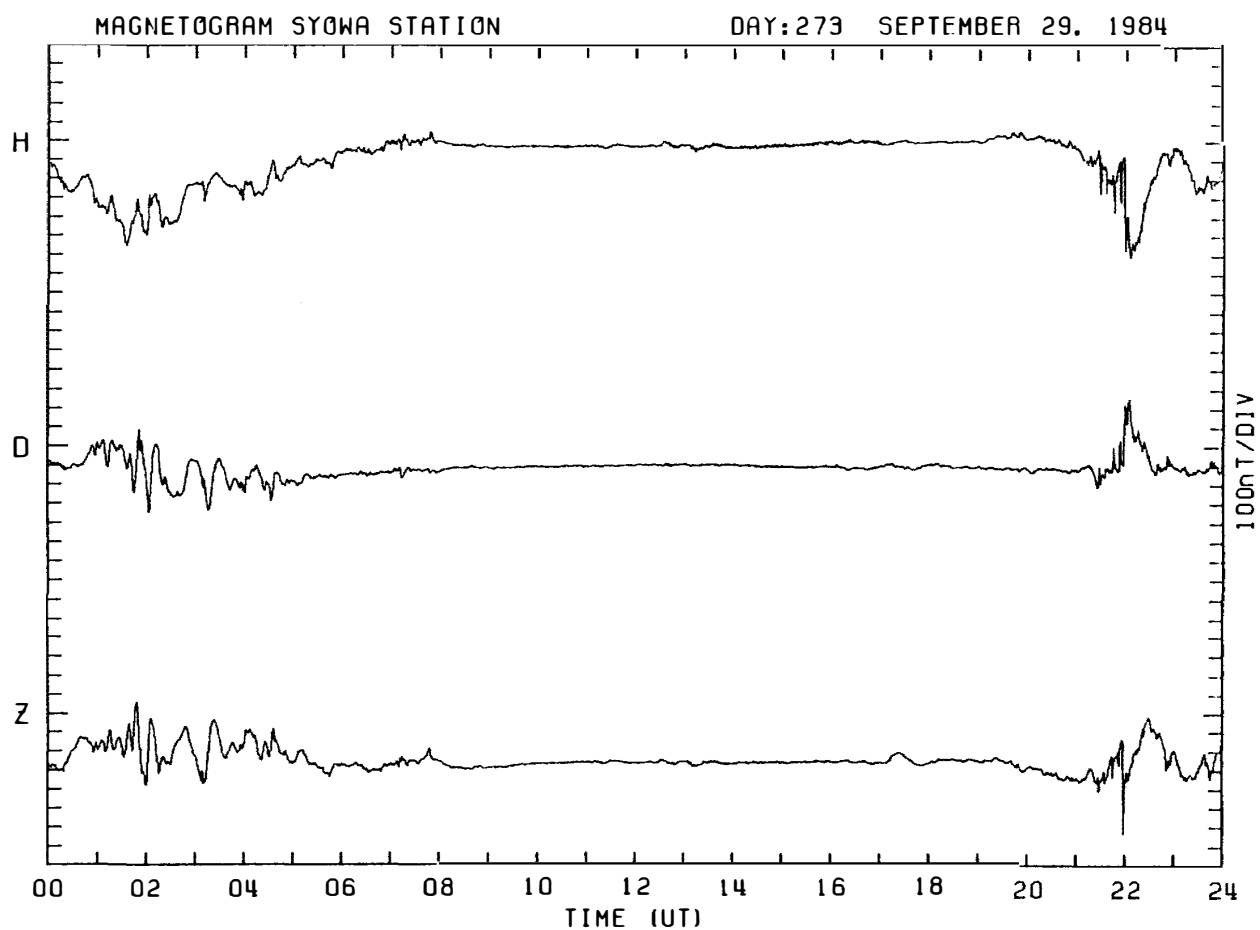
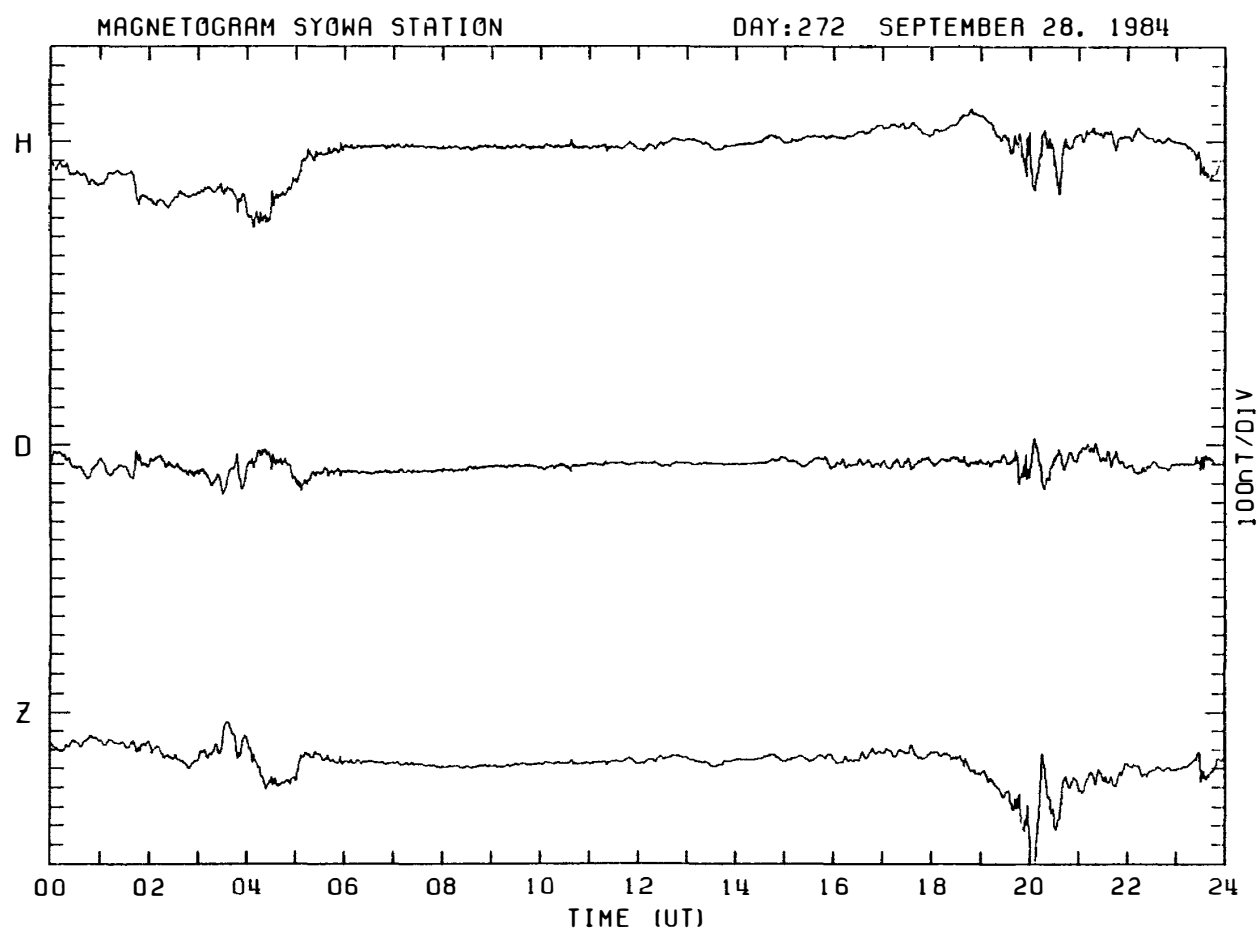
MAGNETOGRAM SYOWA STATION

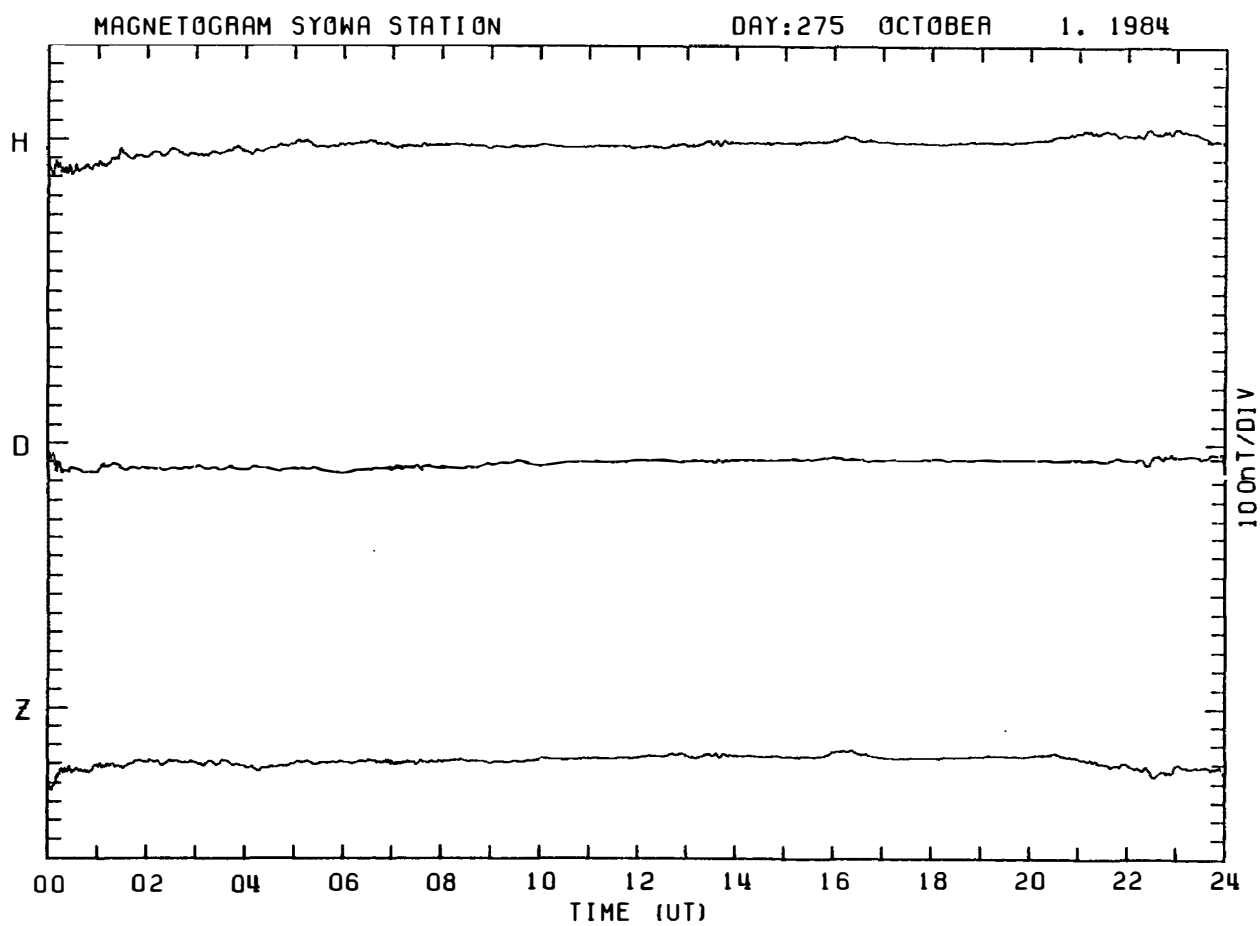
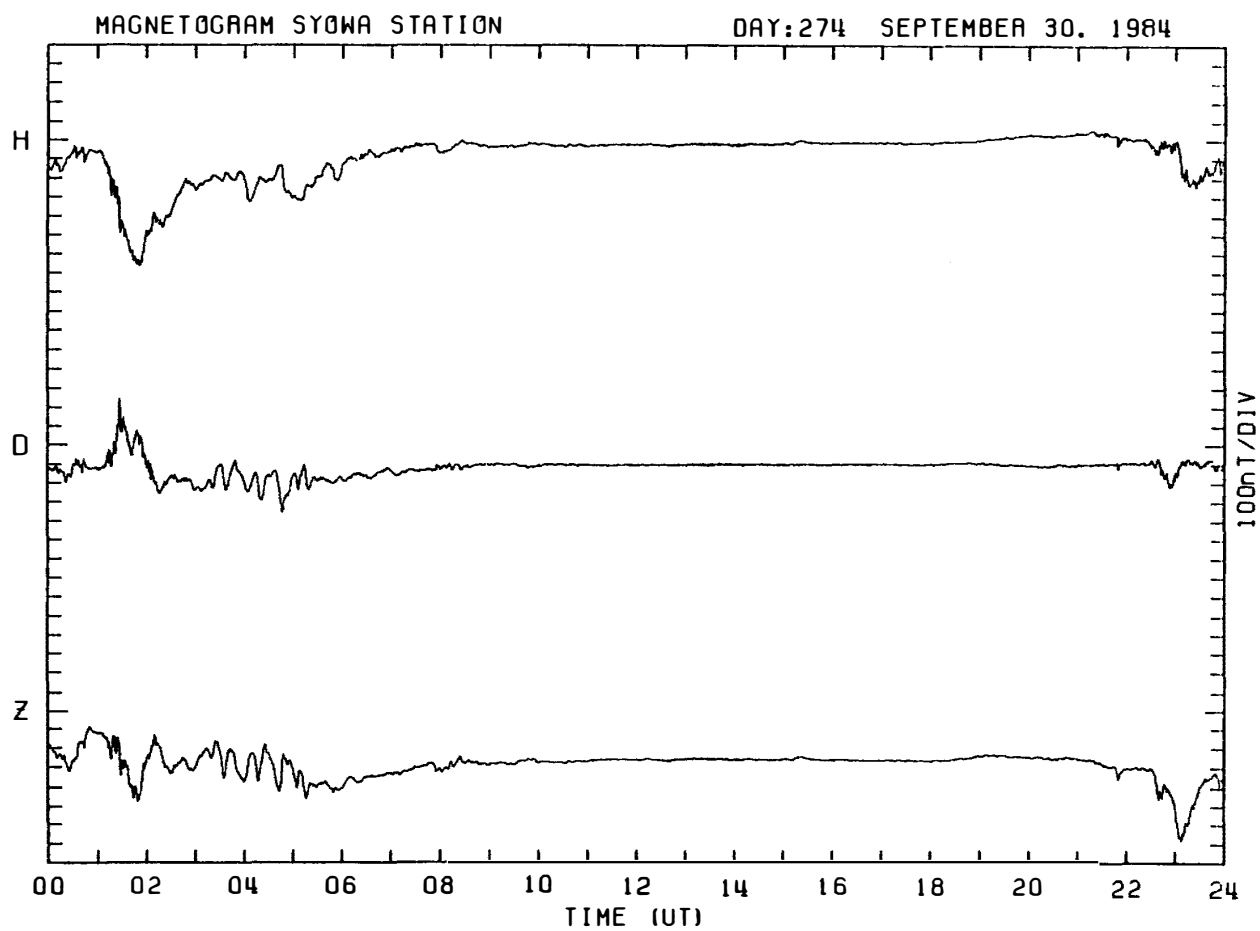
DAY:269 SEPTEMBER 25, 1984

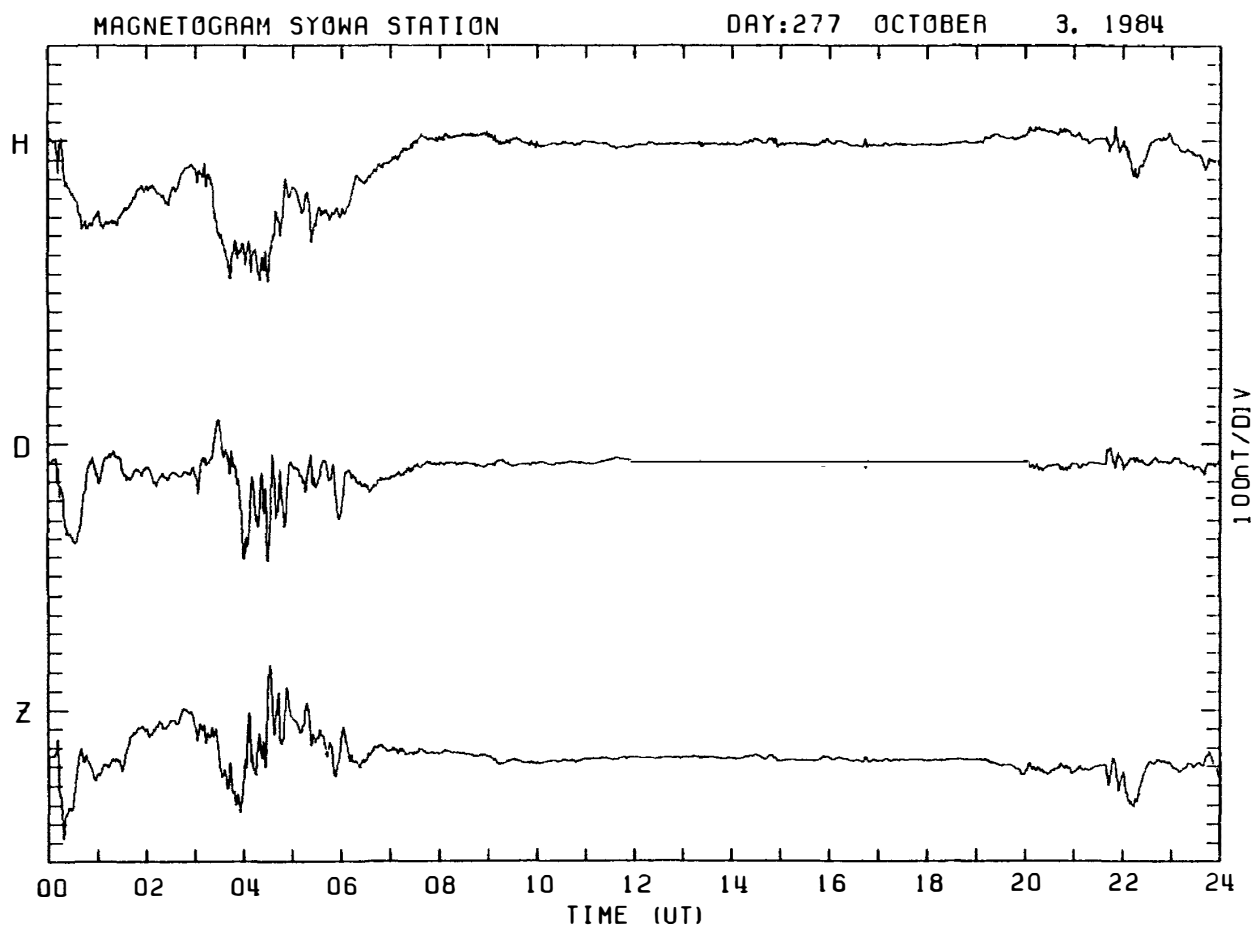
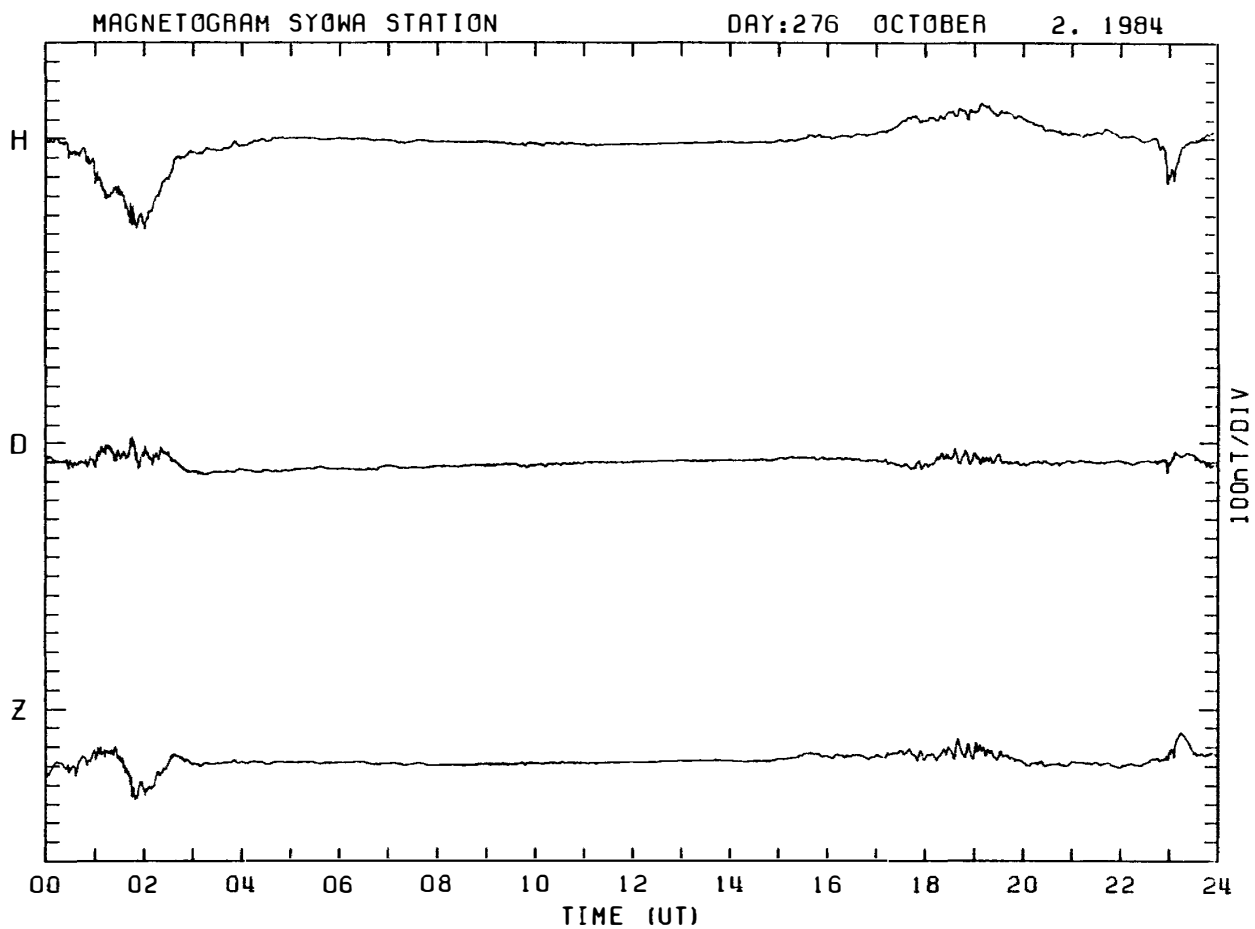






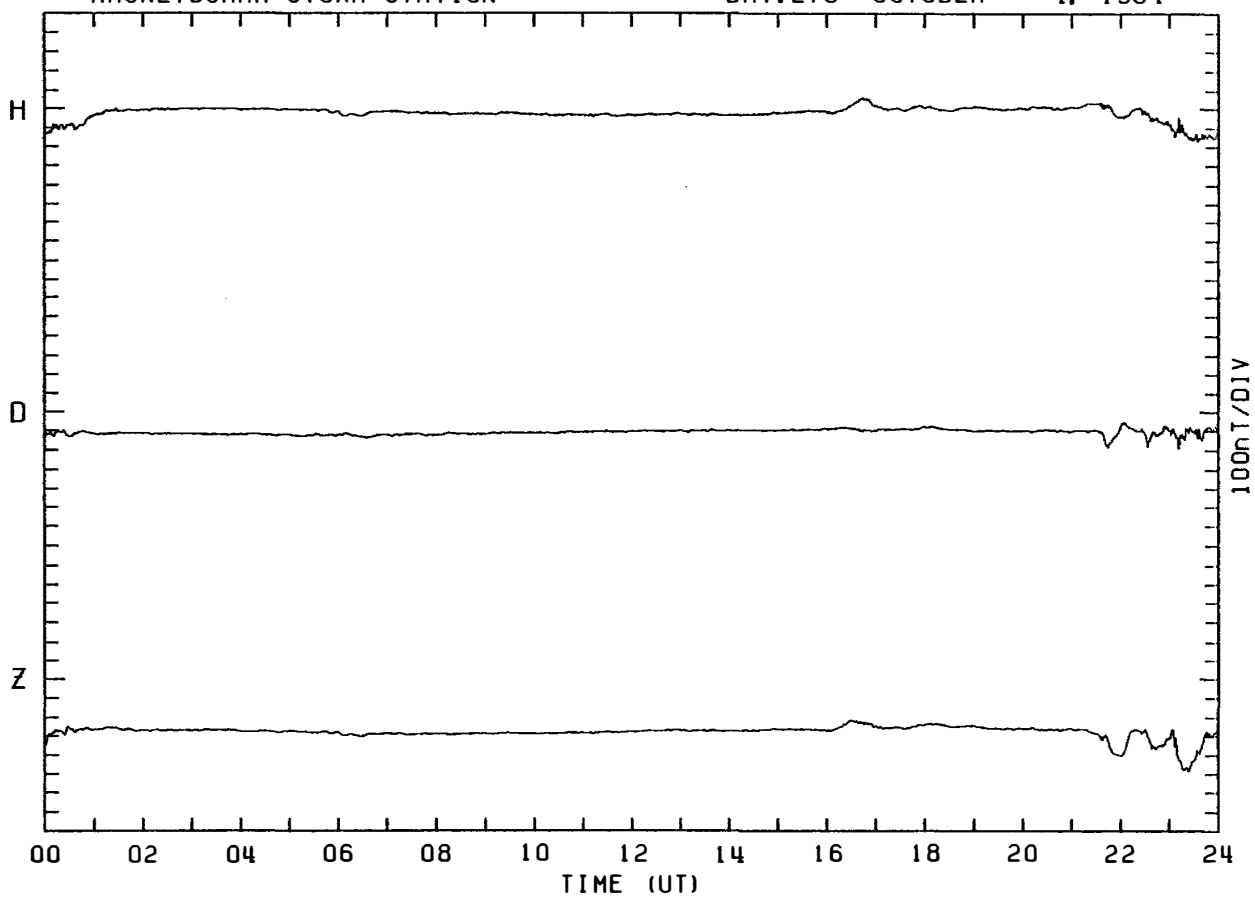






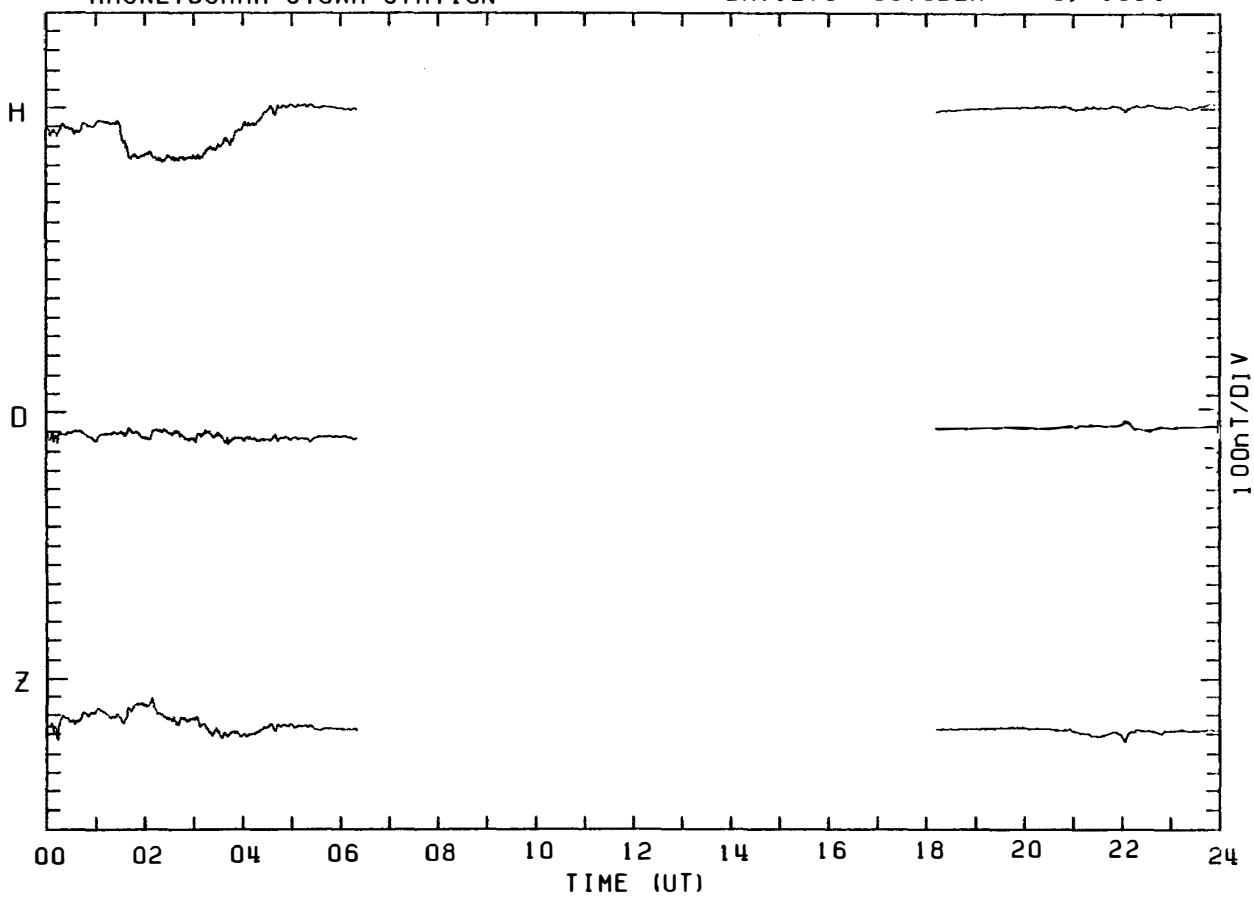
MAGNETOGRAM SYOWA STATION

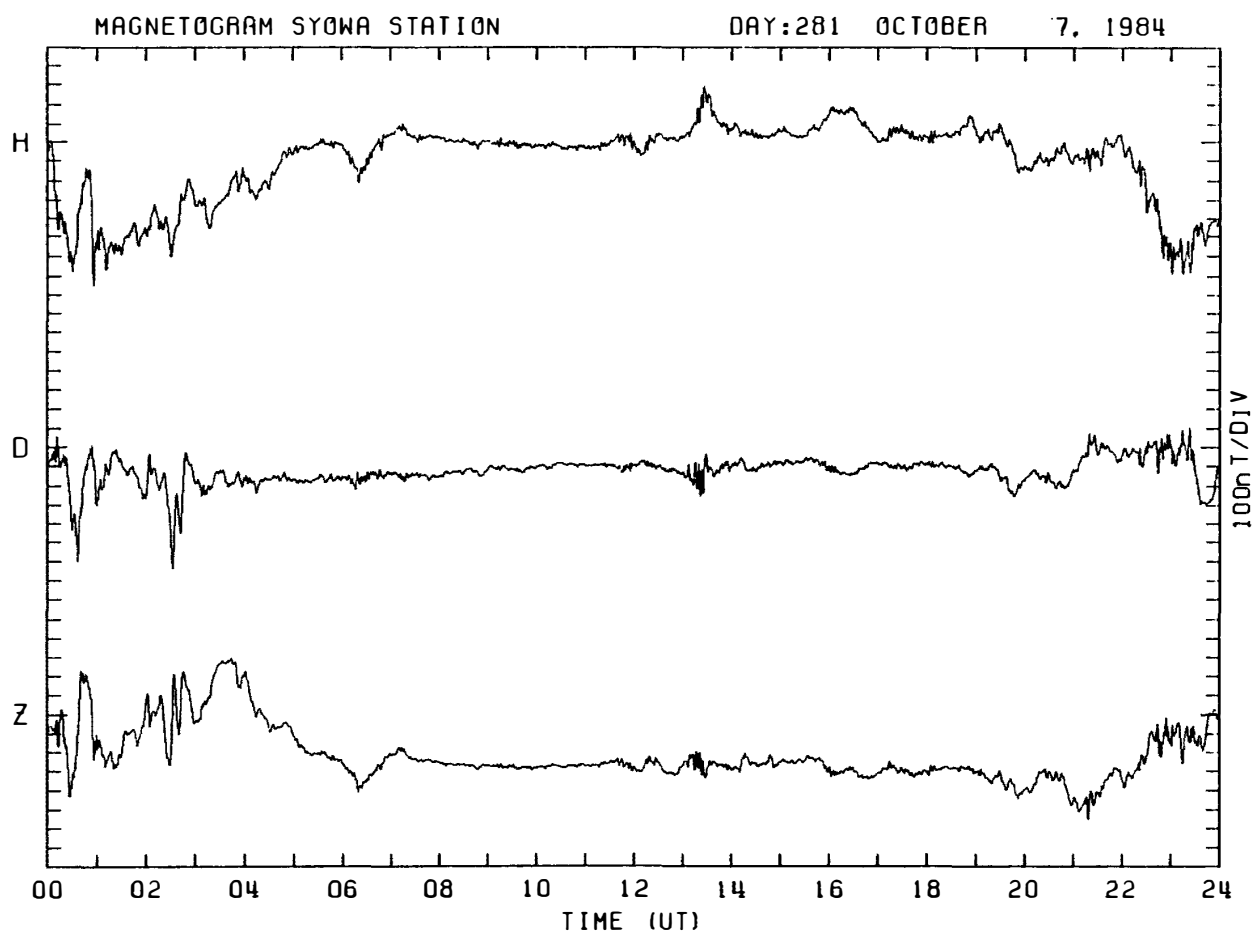
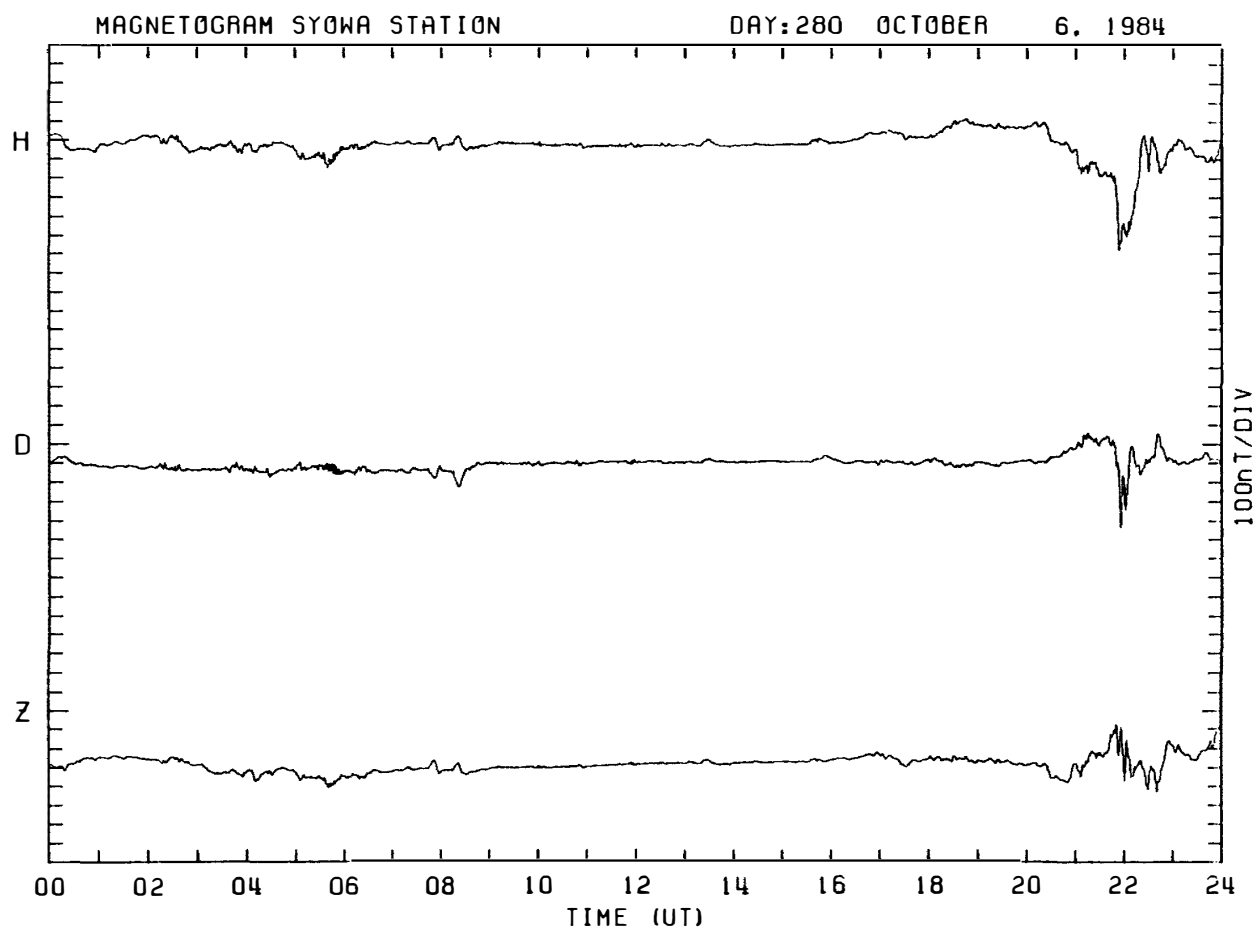
DAY:278 OCTOBER 4. 1984



MAGNETOGRAM SYOWA STATION

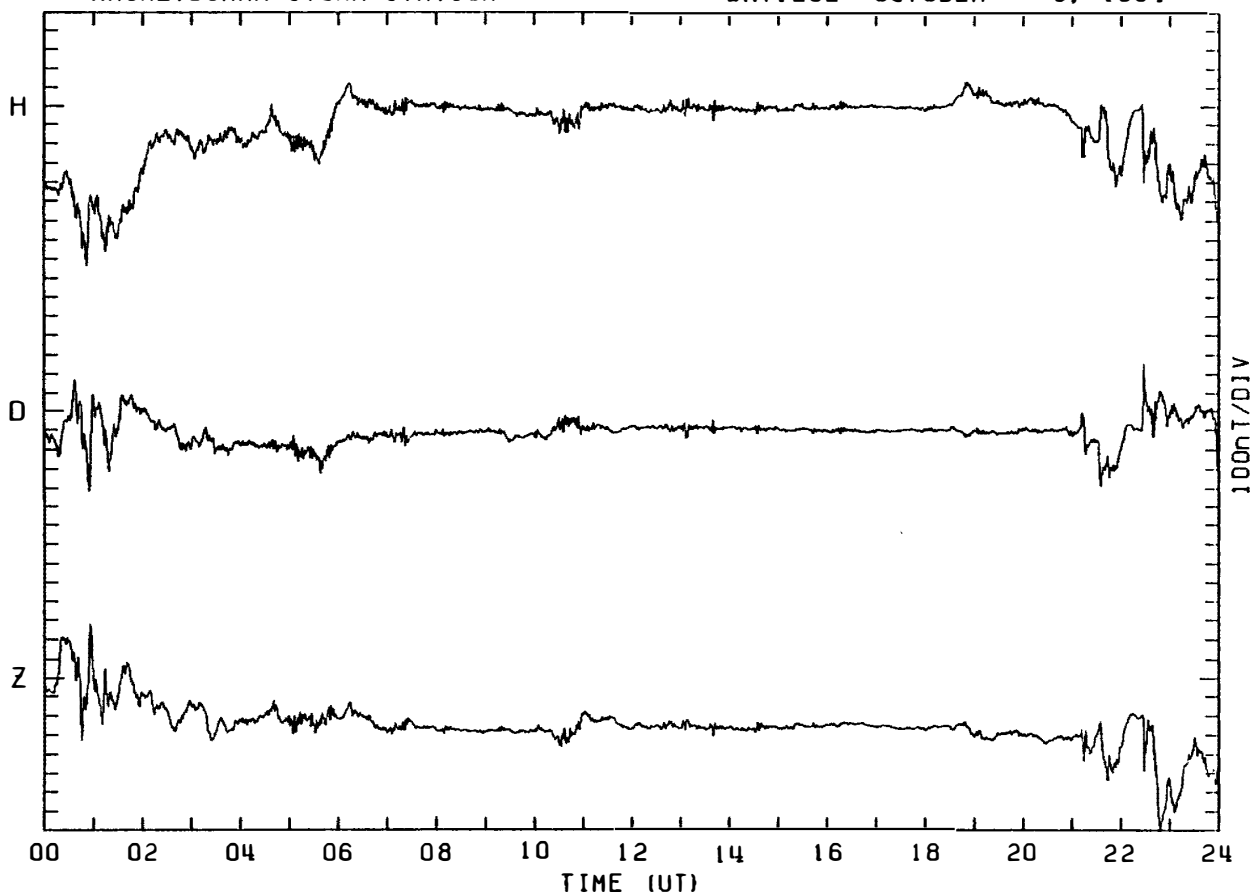
DAY:279 OCTOBER 5. 1984





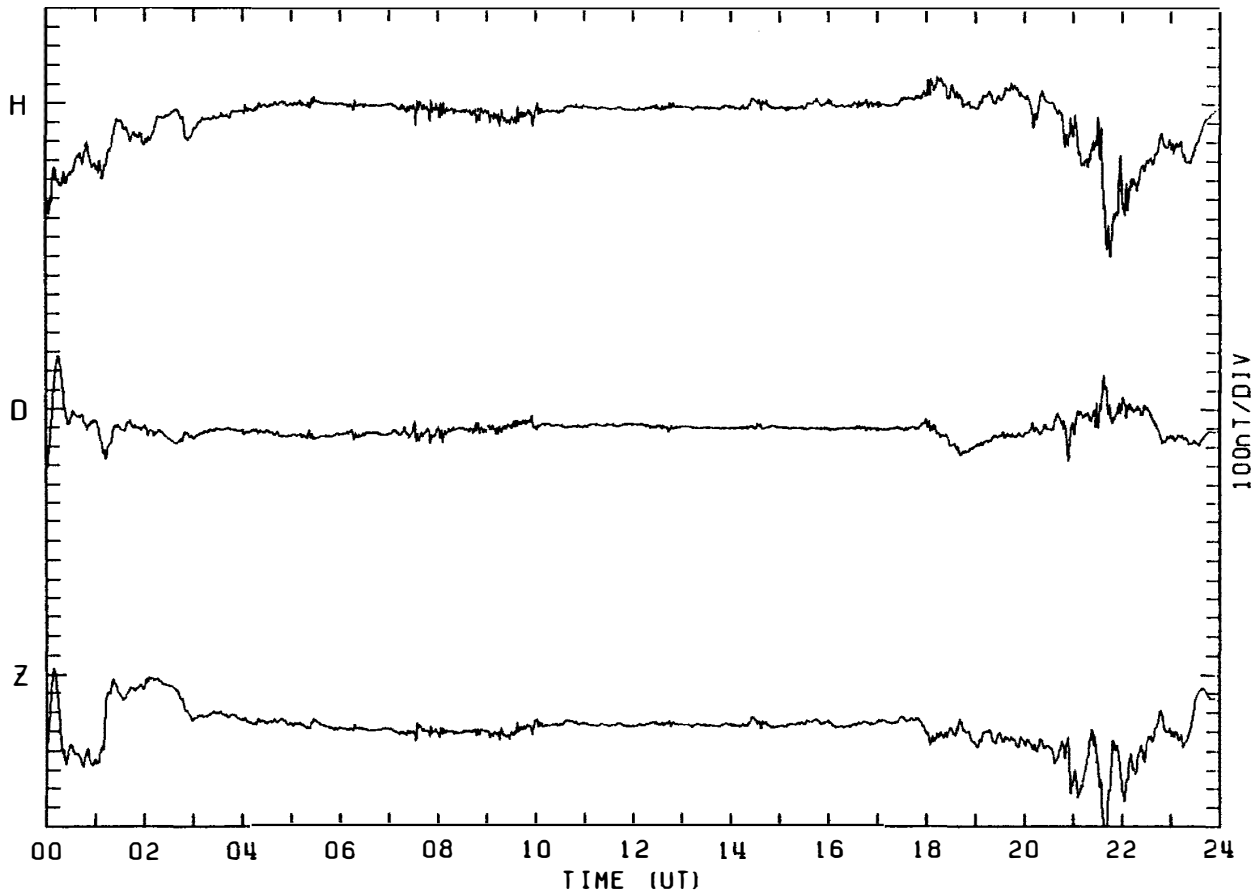
MAGNETOGRAM SYOWA STATION

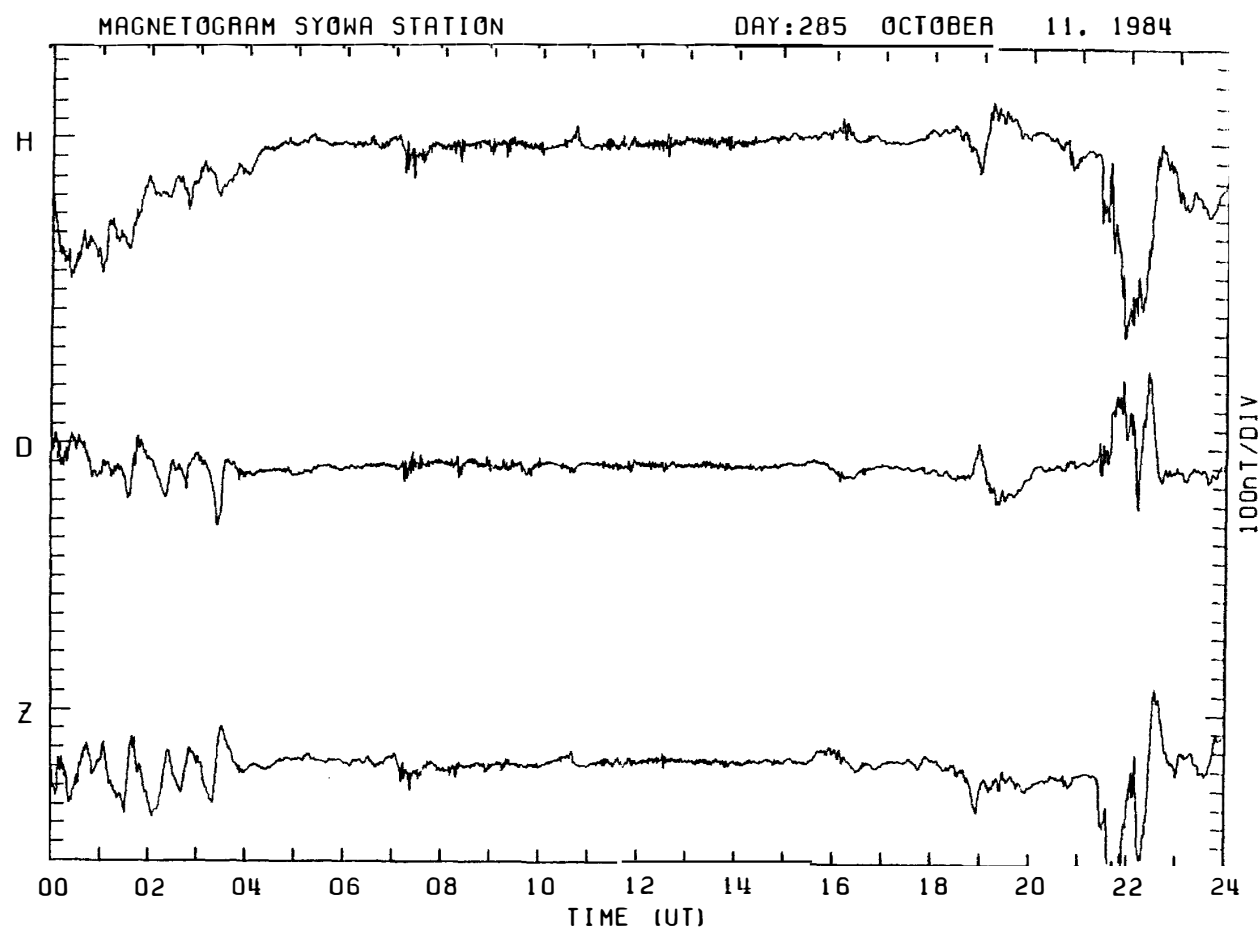
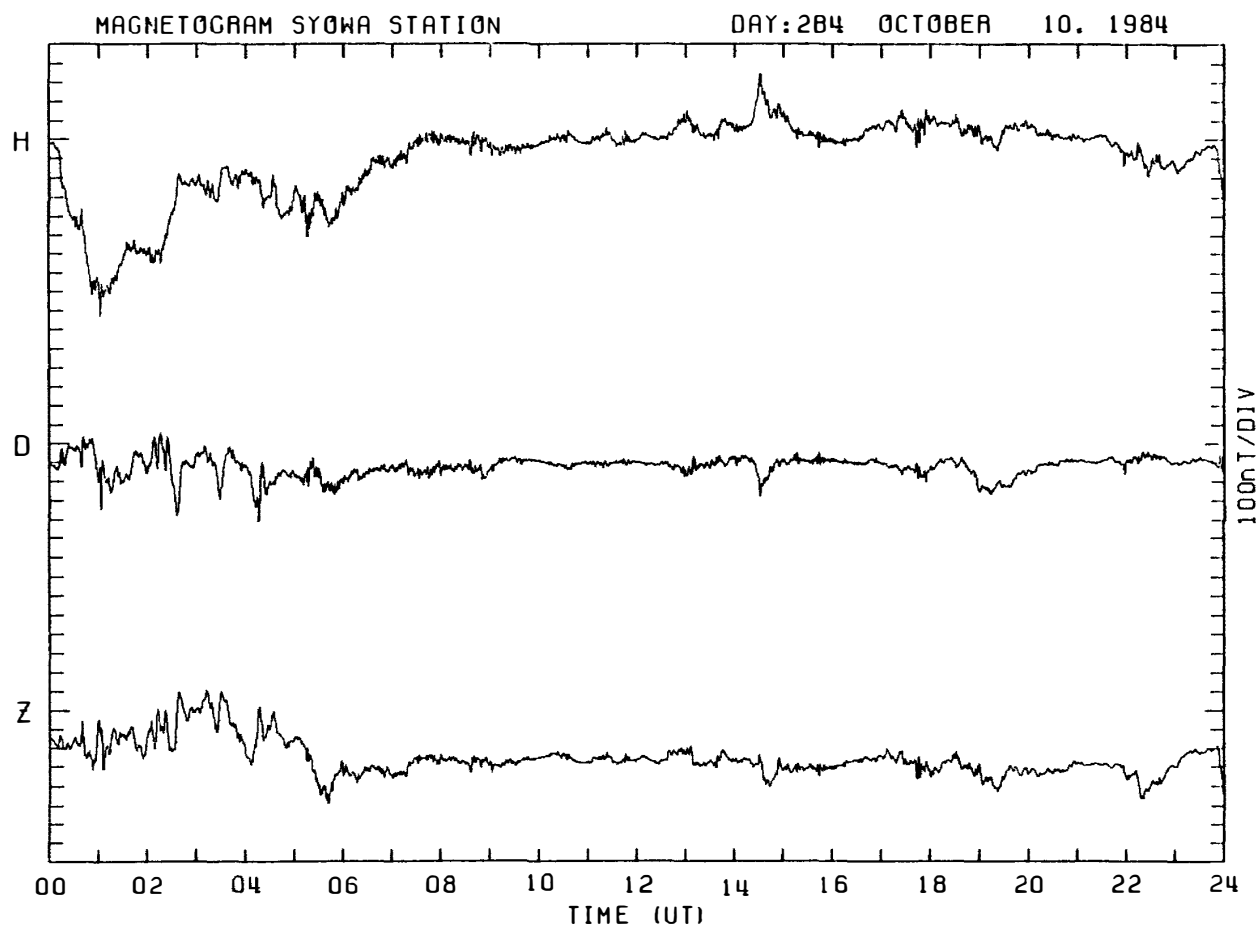
DAY:282 OCTOBER 8, 1984



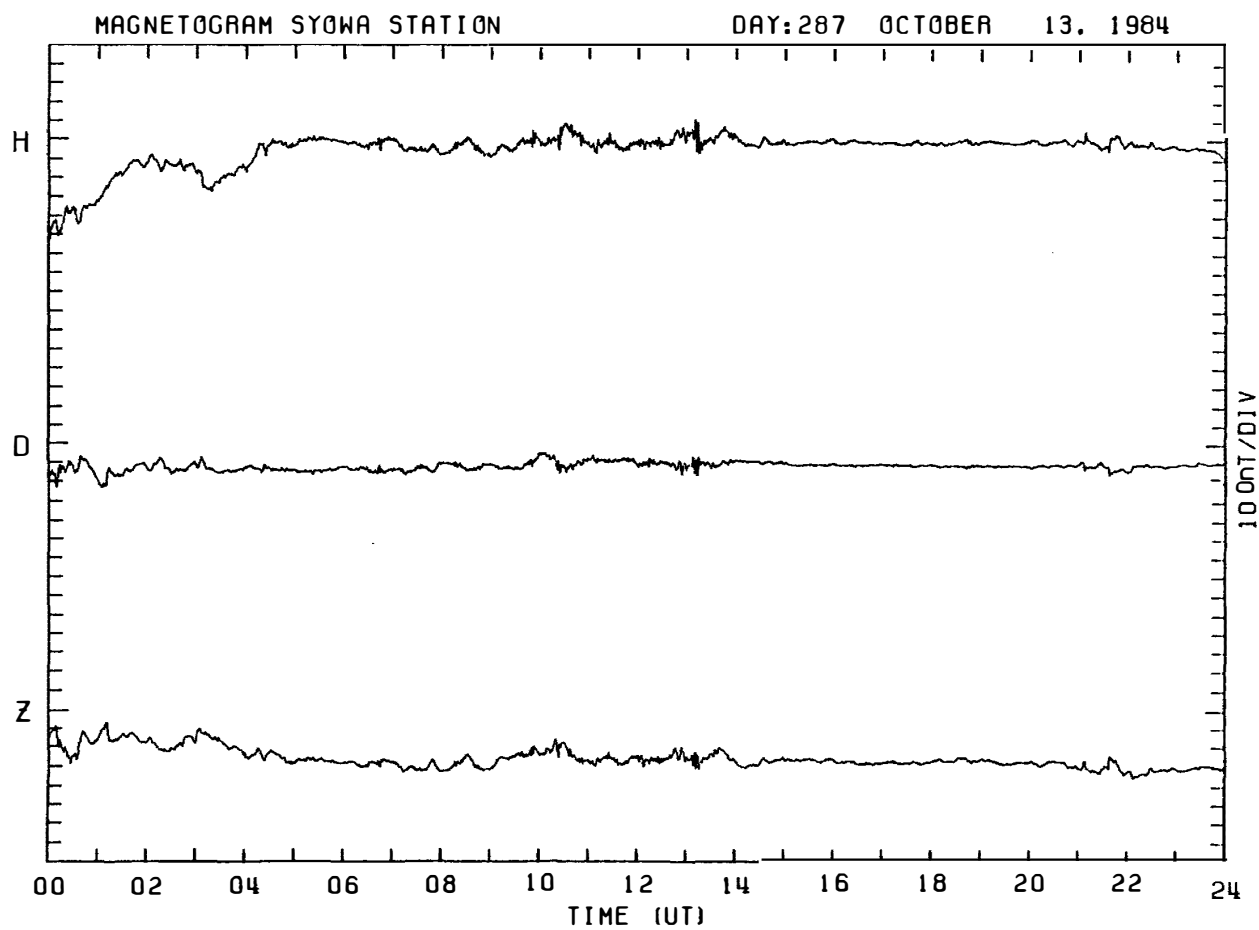
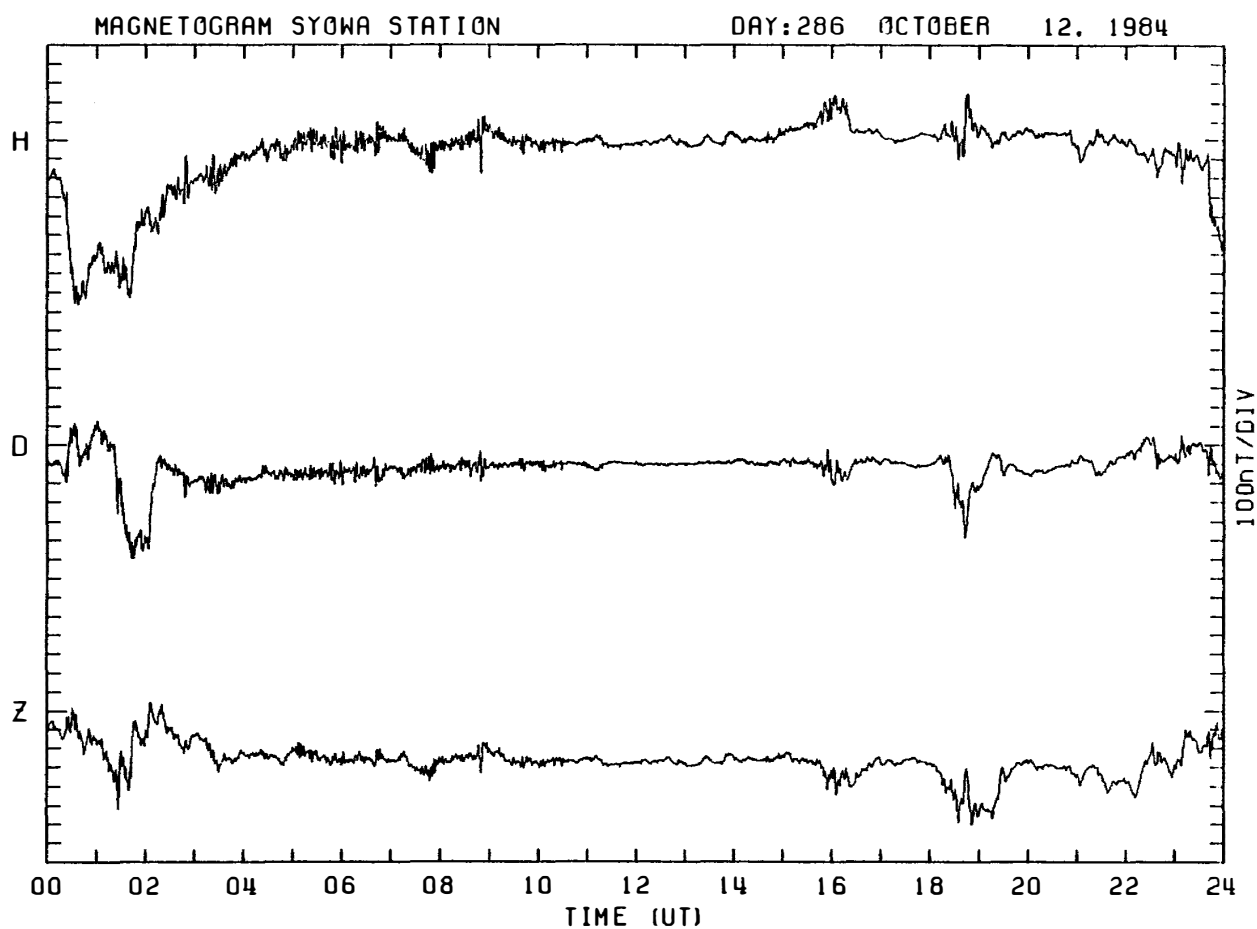
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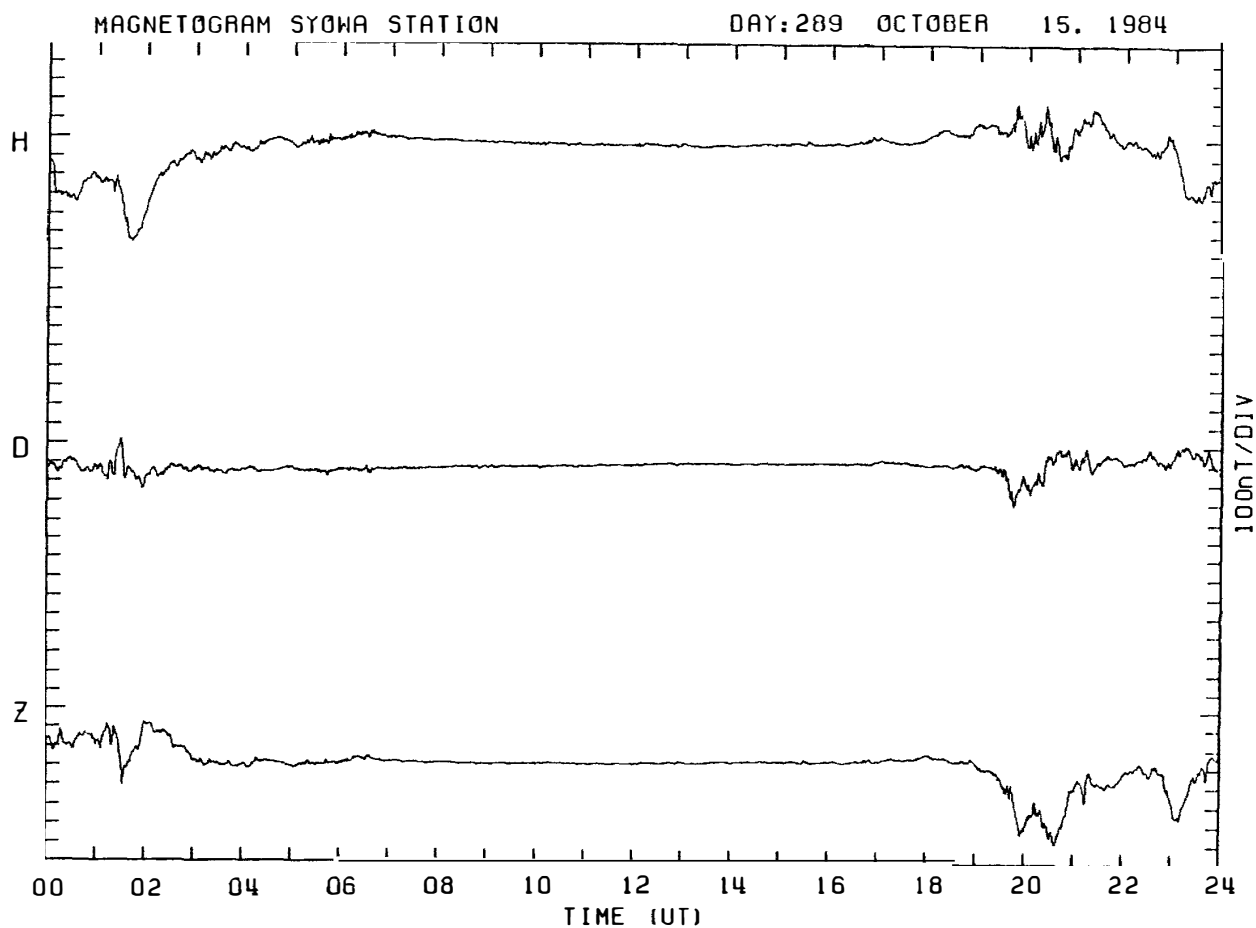
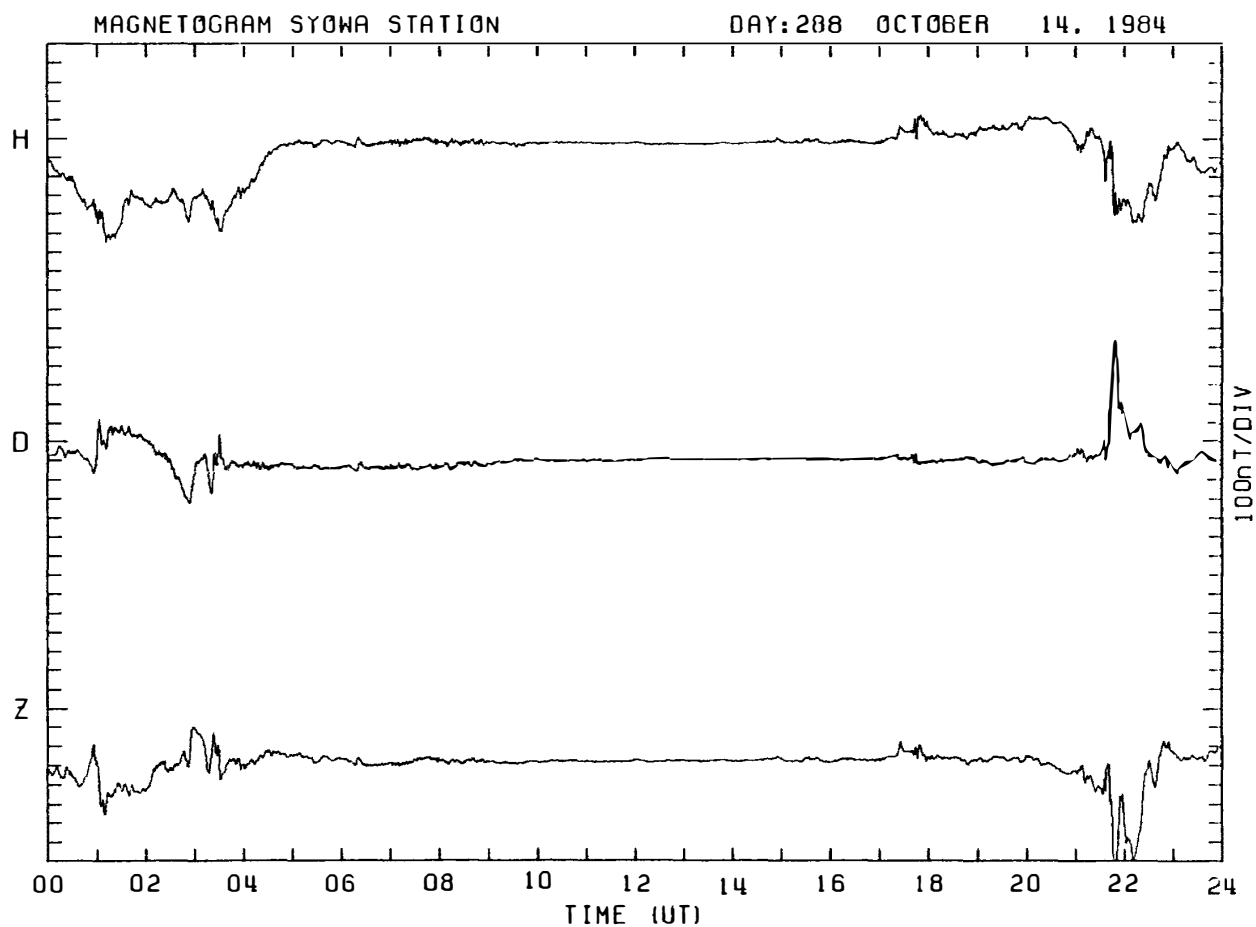
DAY:283 OCTOBER 9, 1984

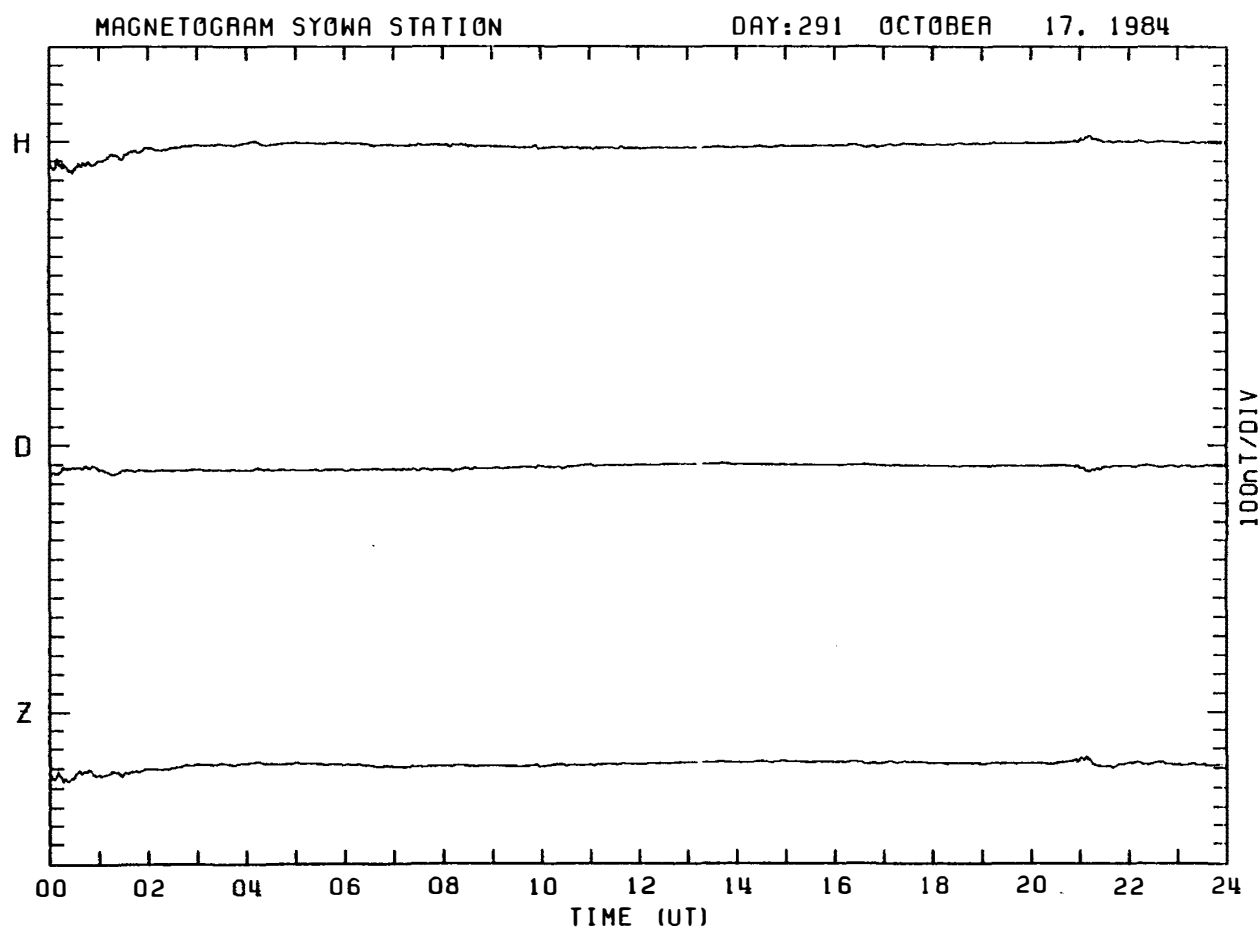
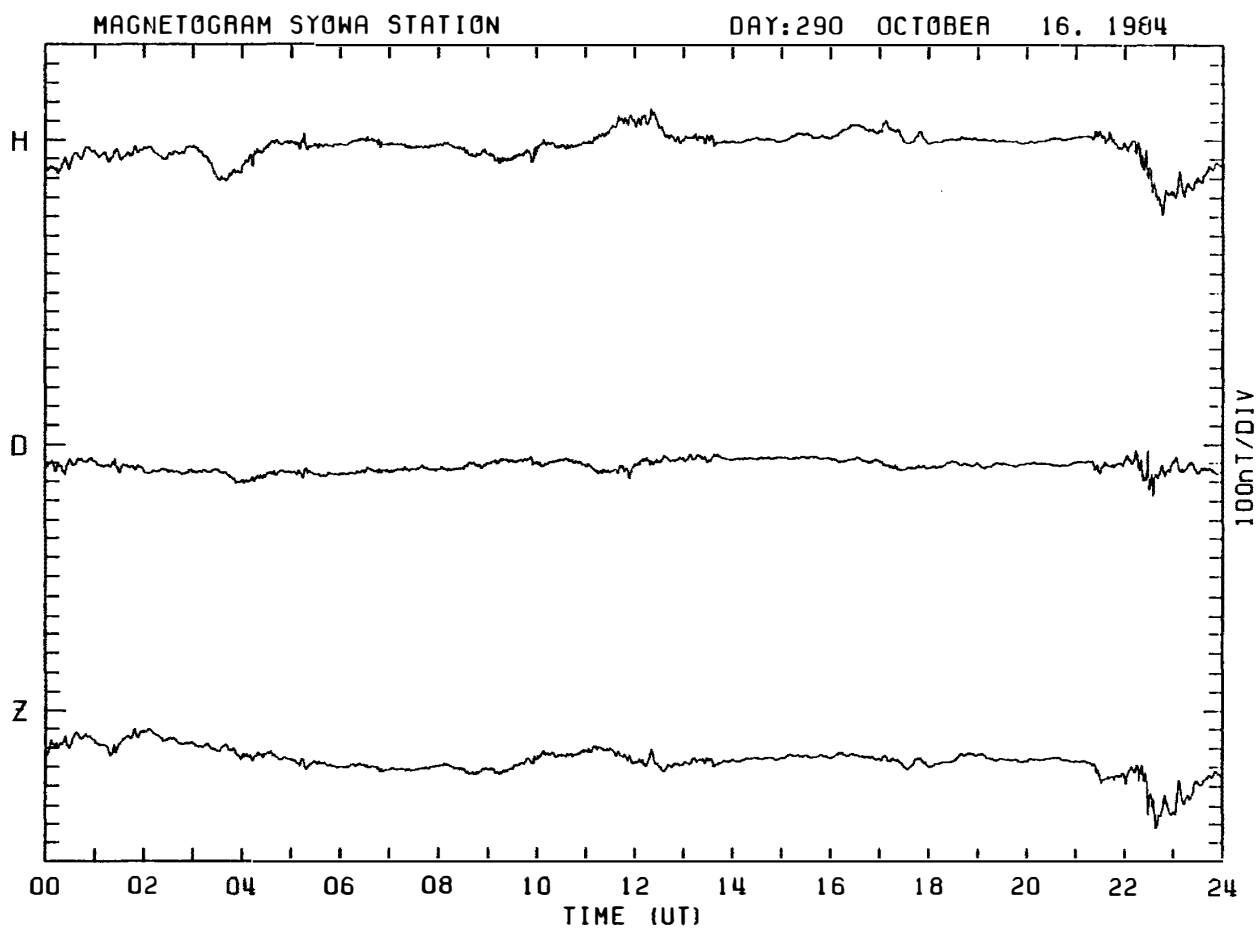


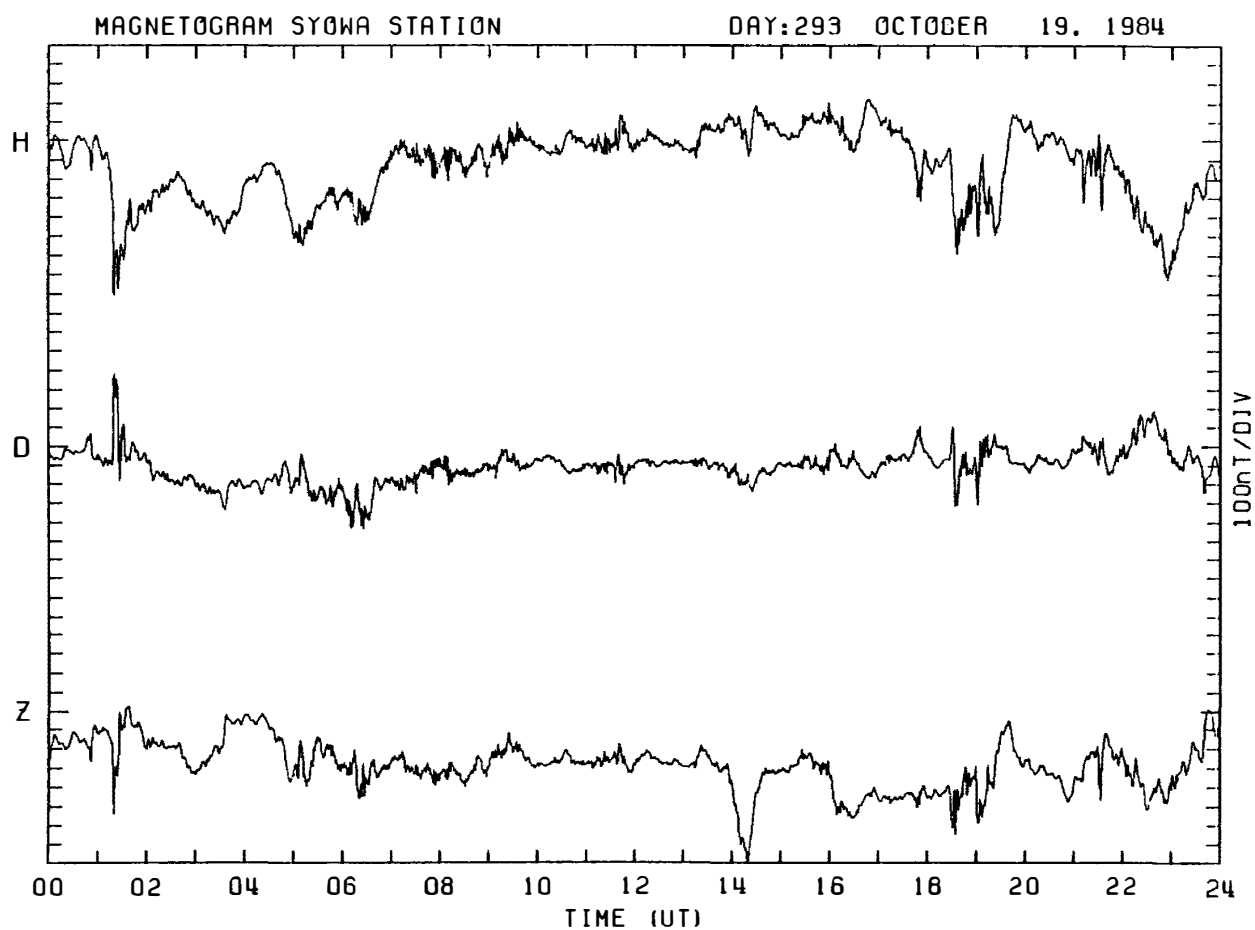
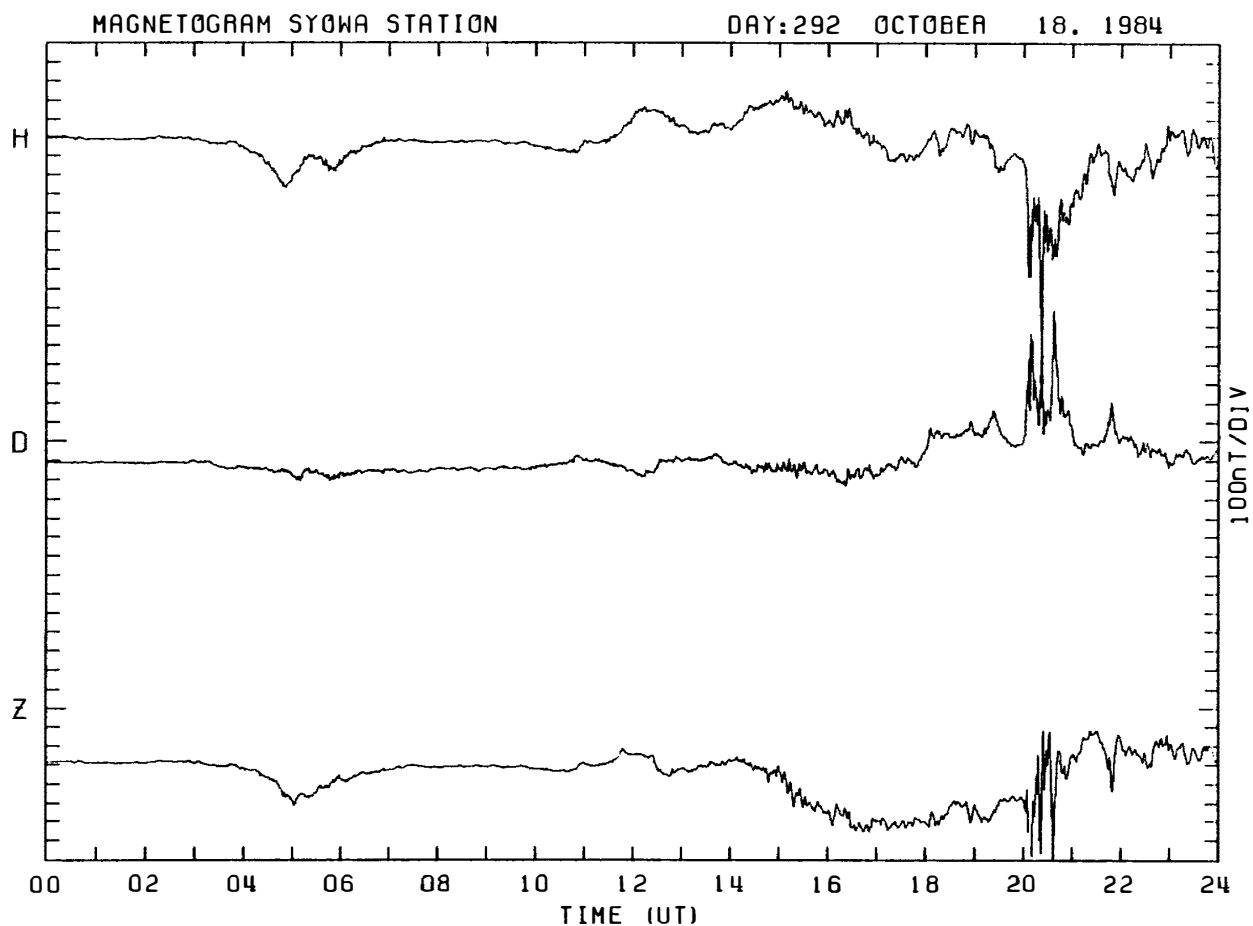


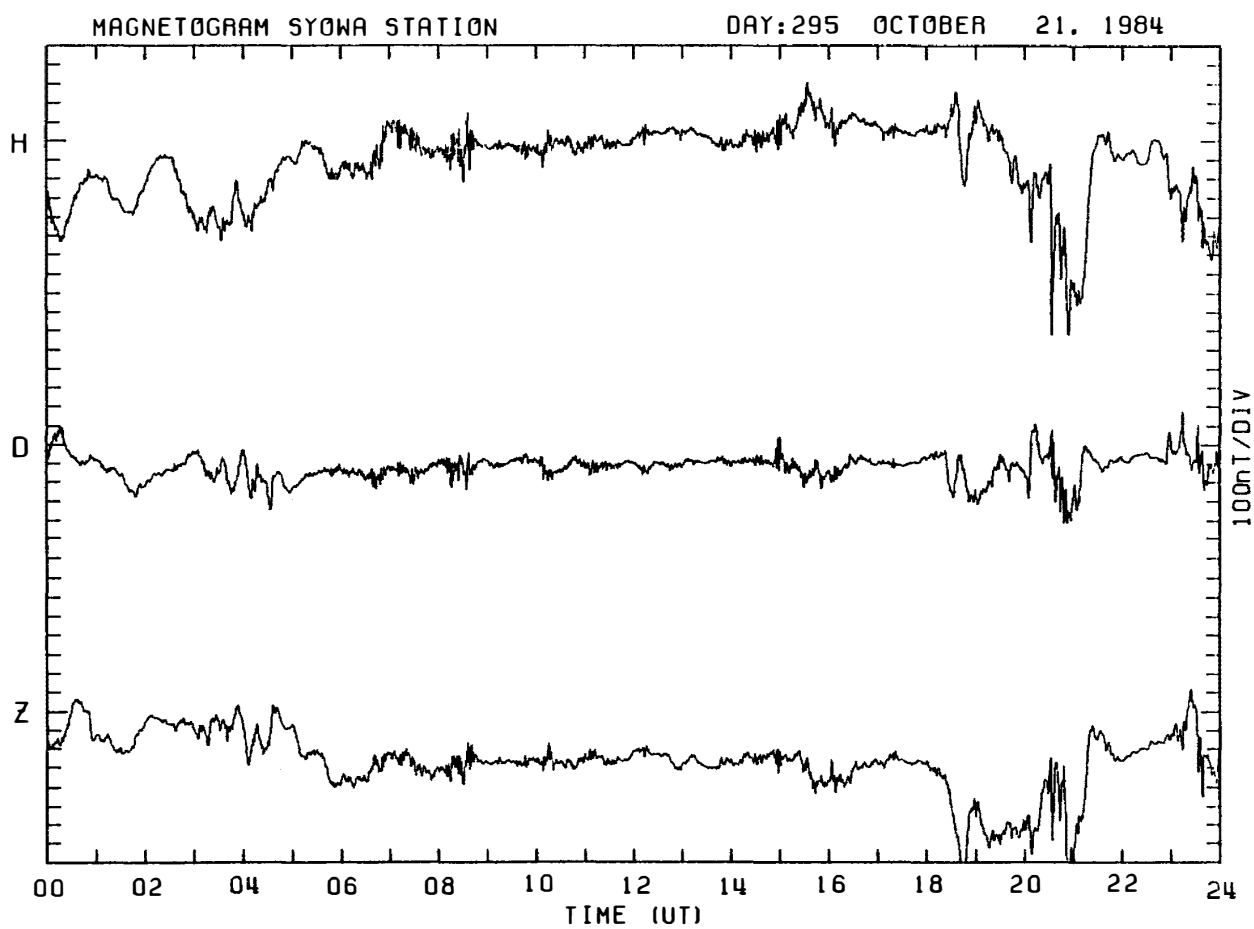
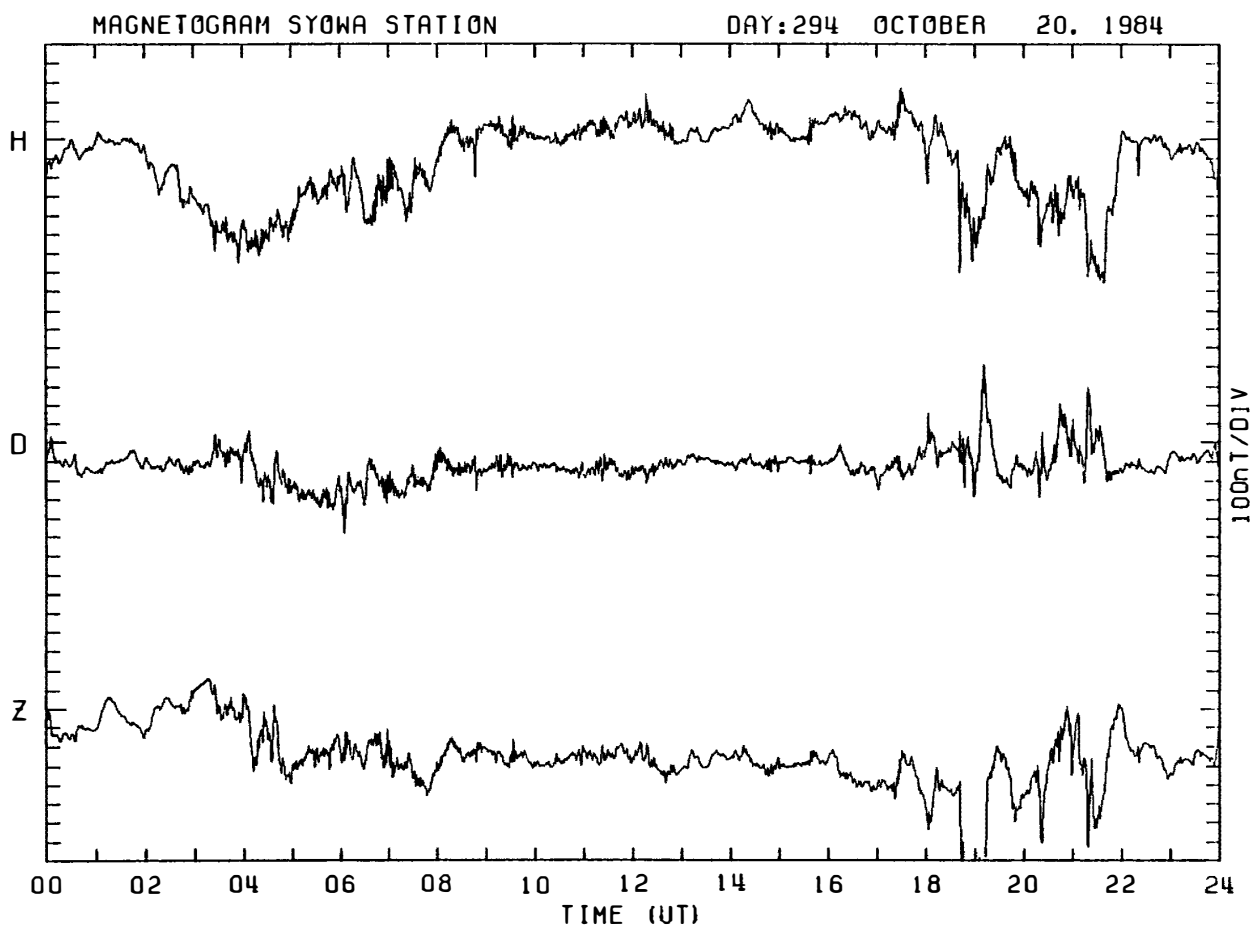


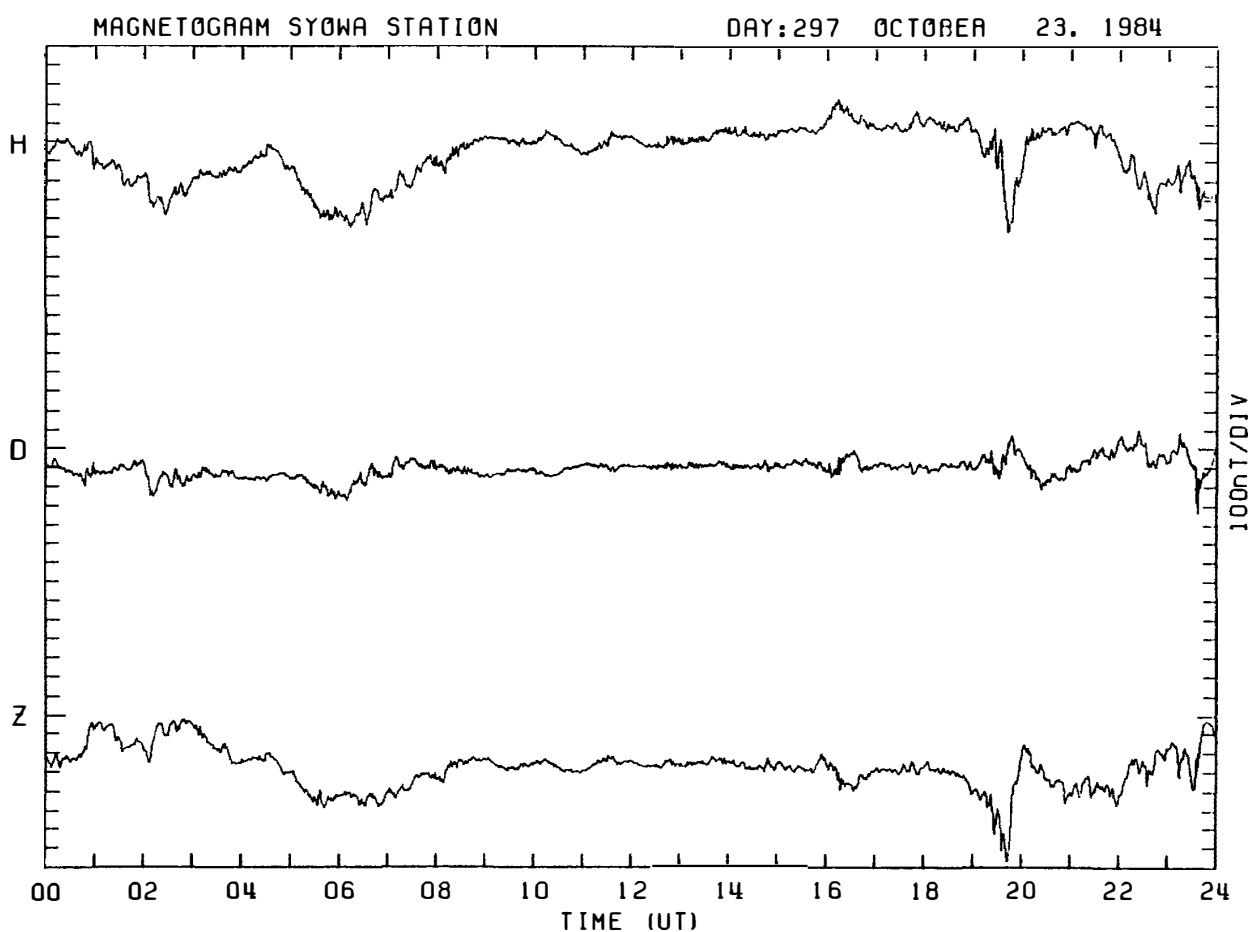
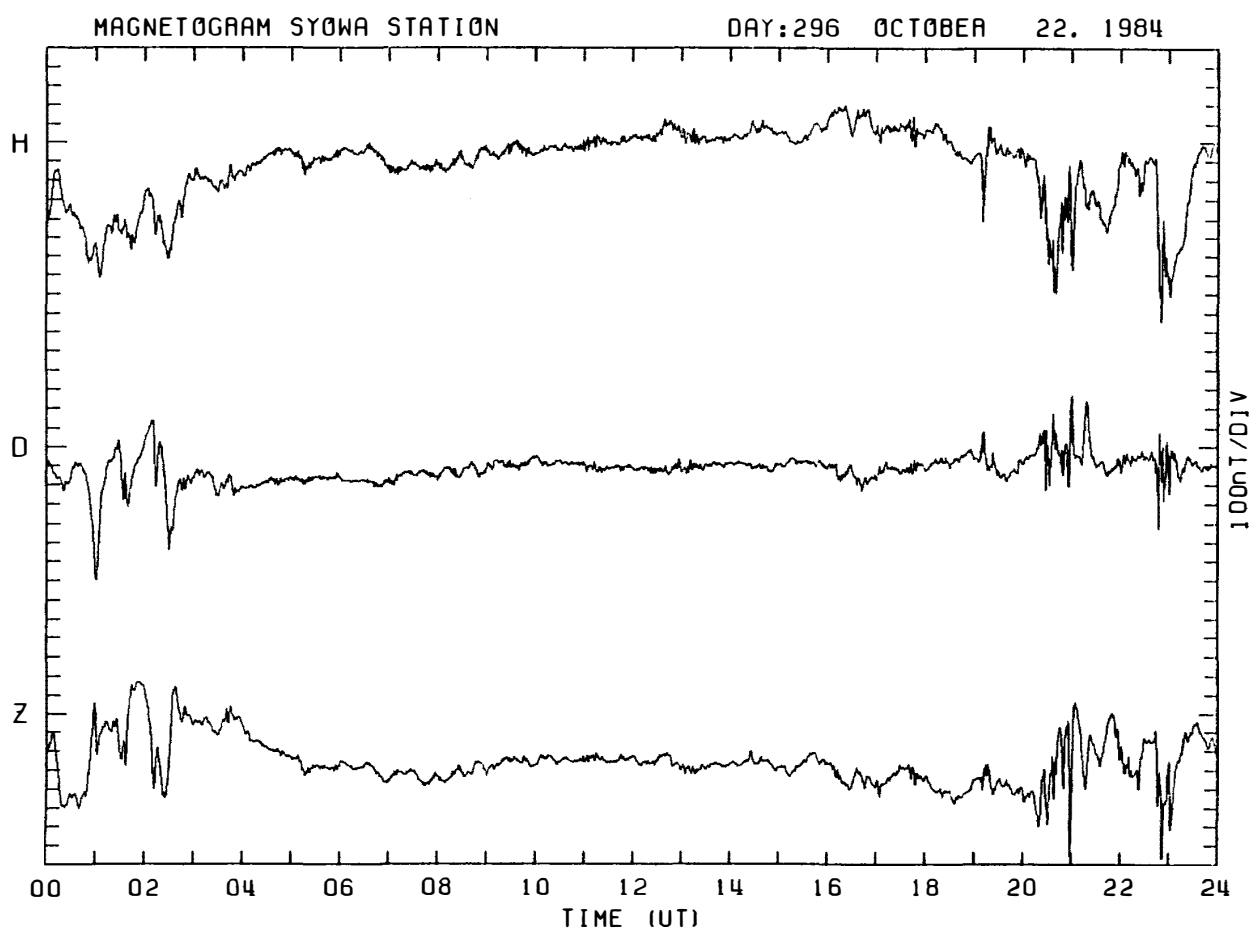


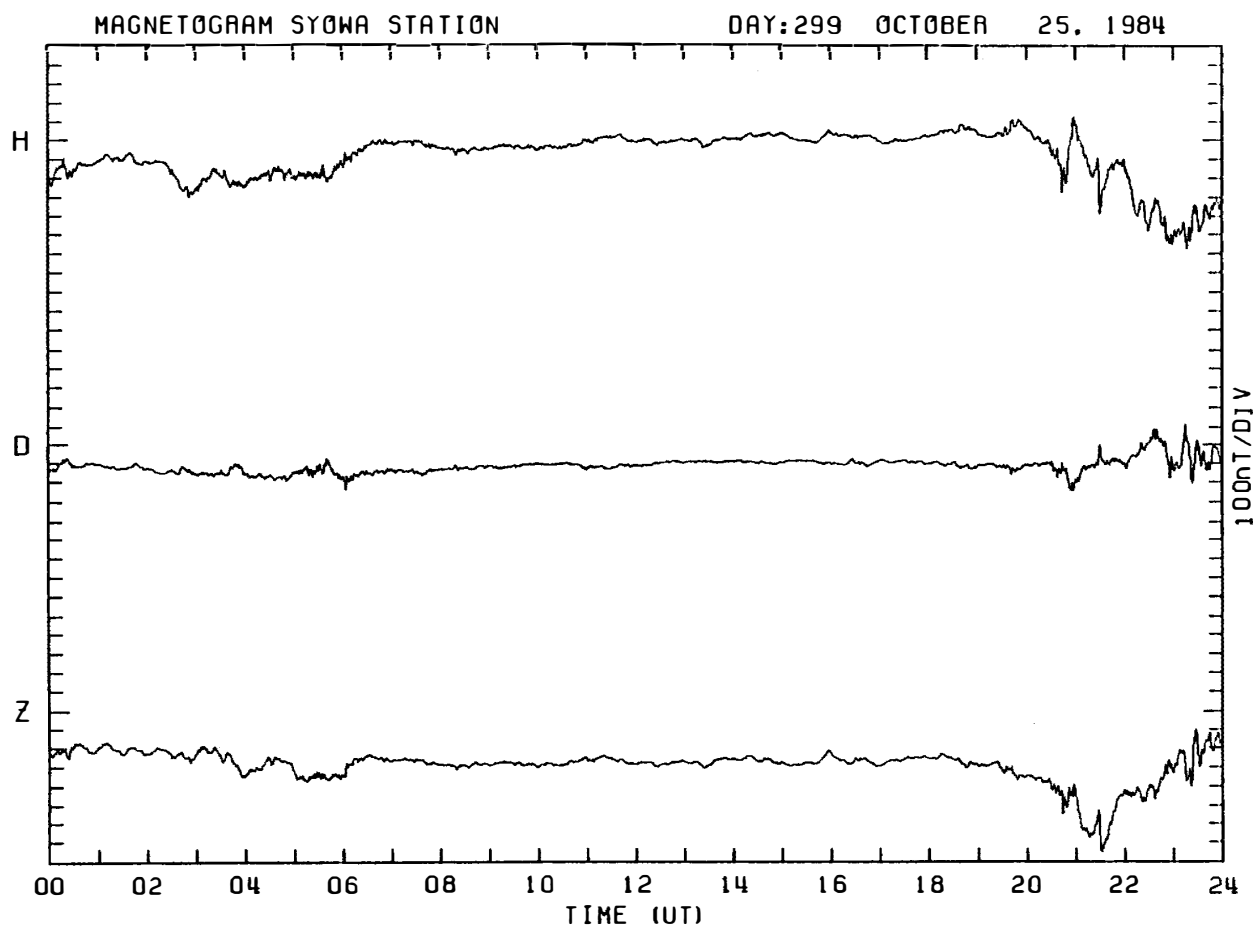
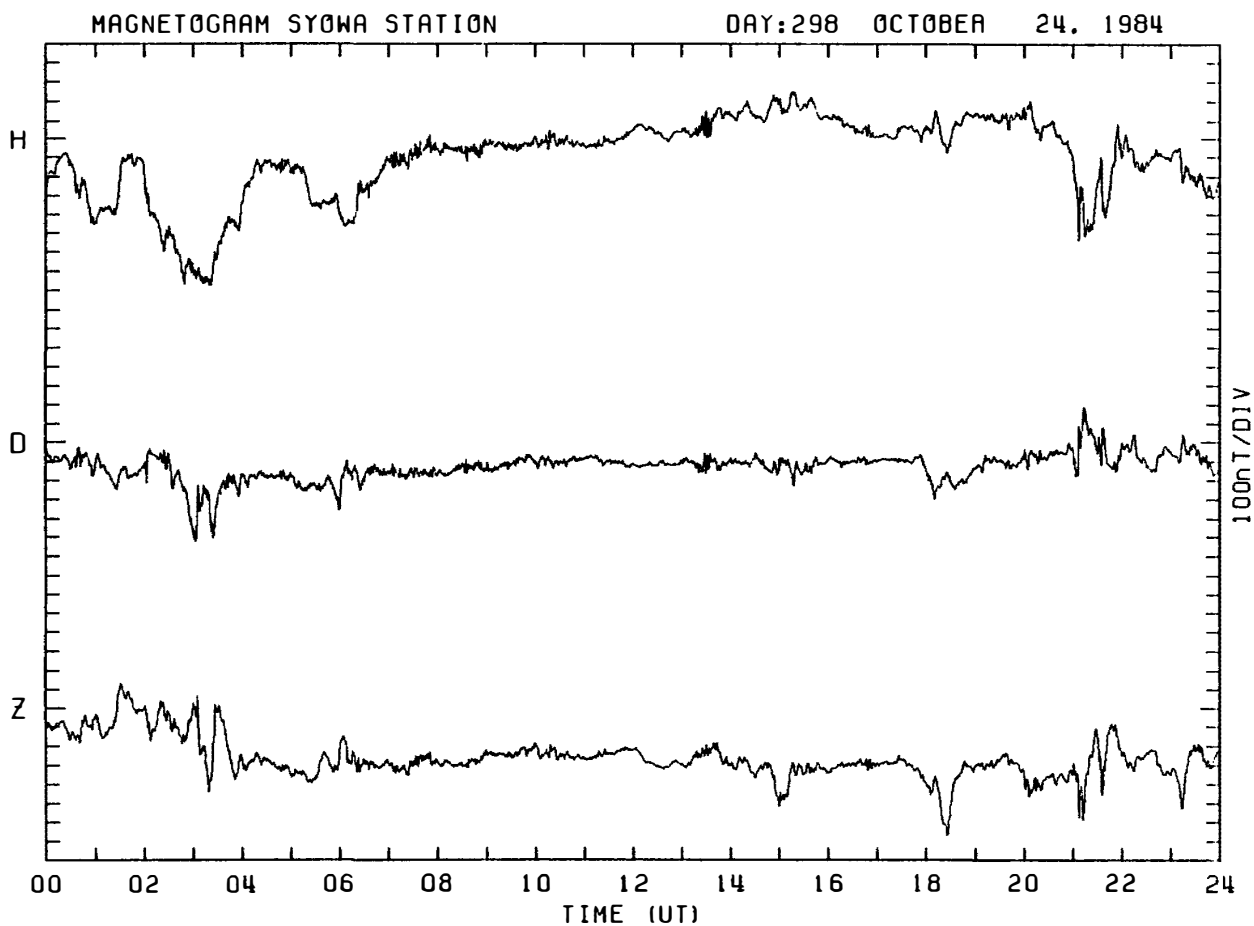


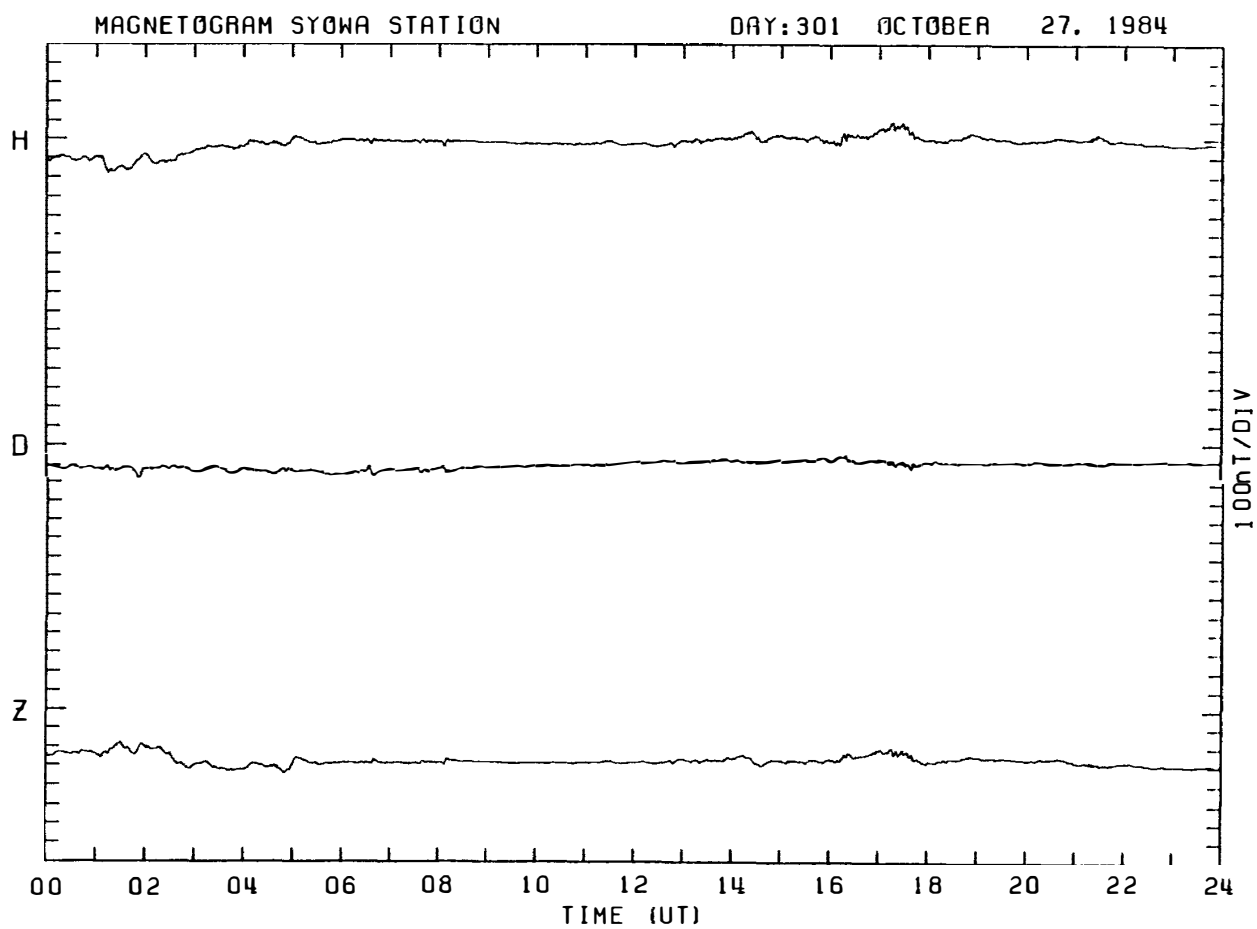
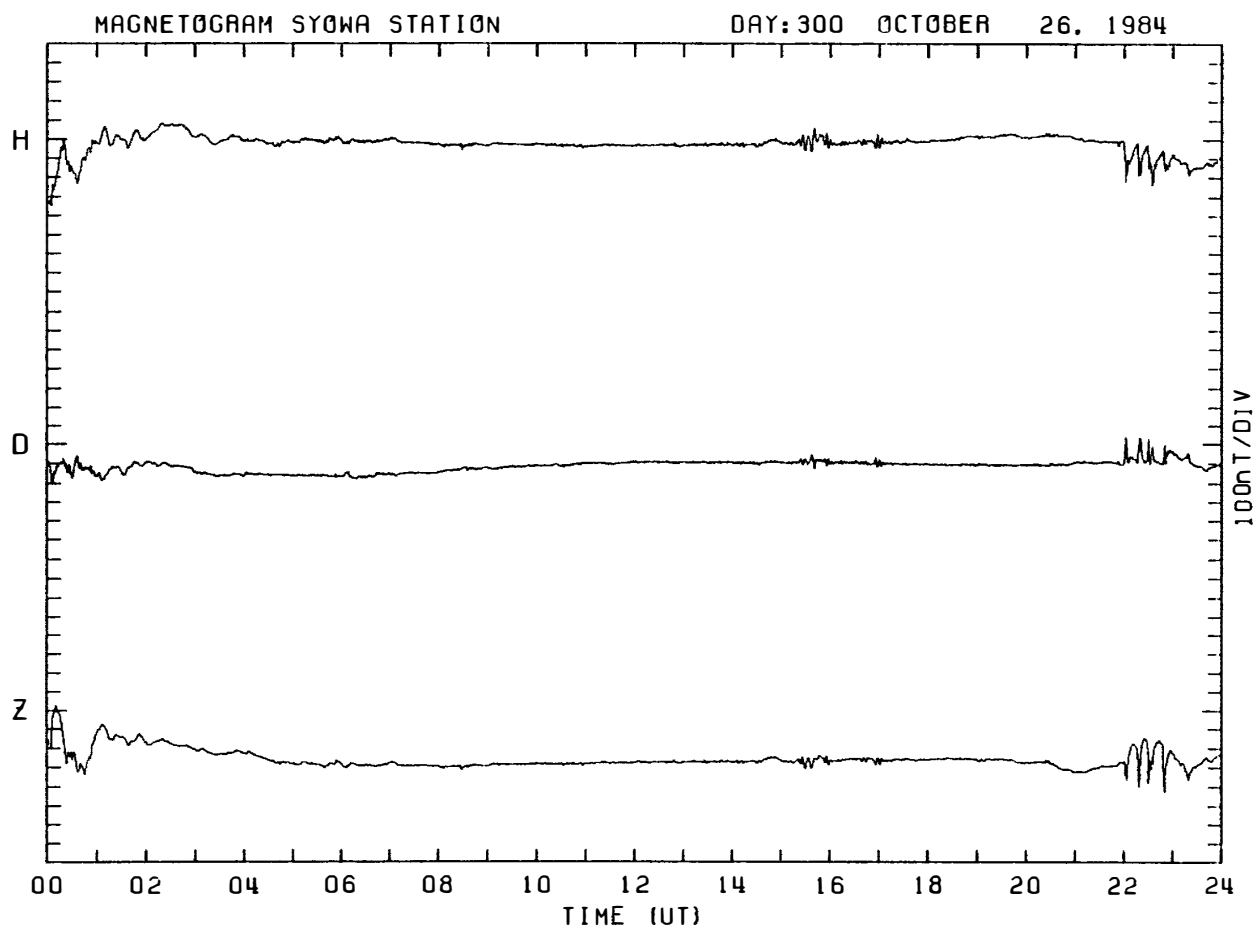




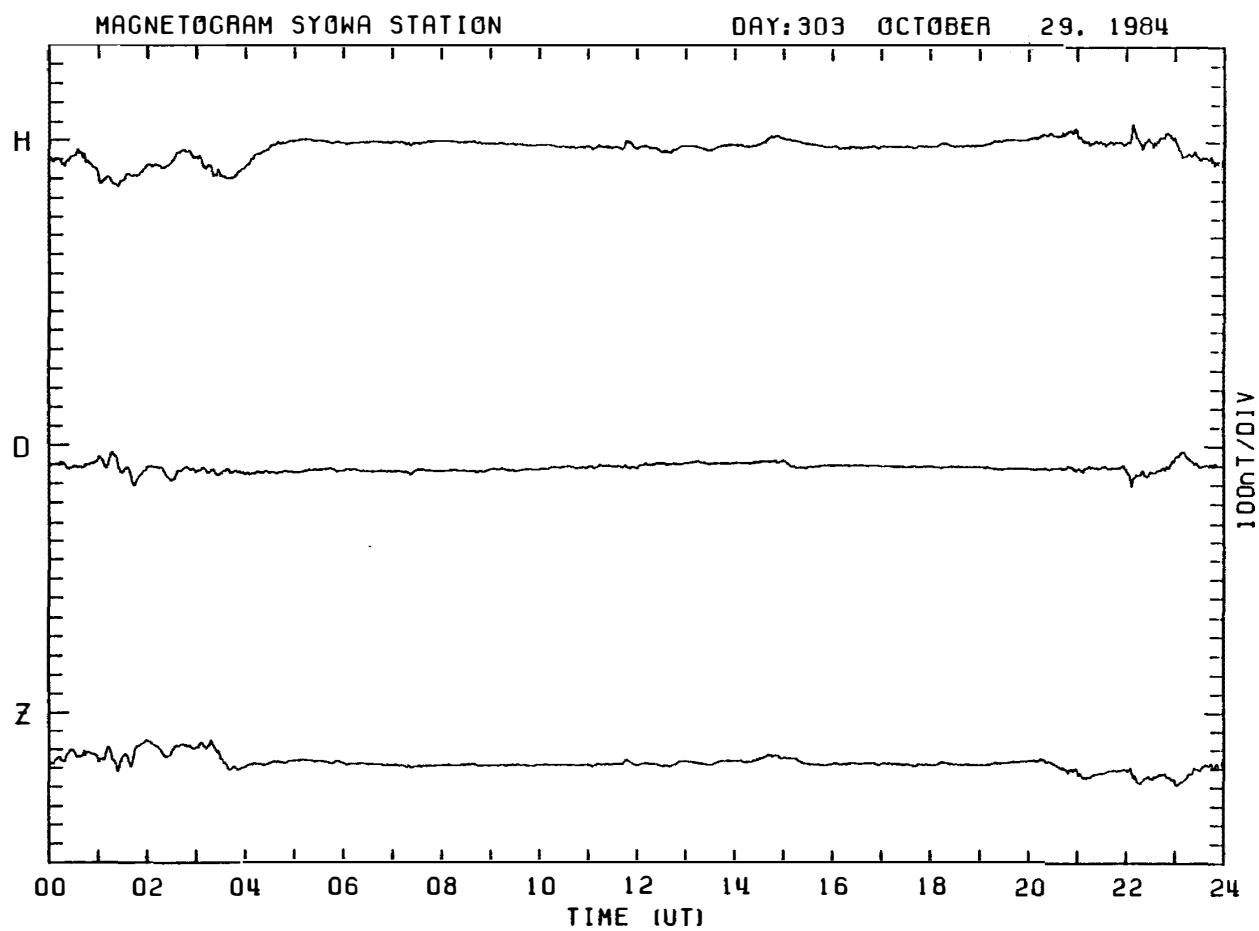
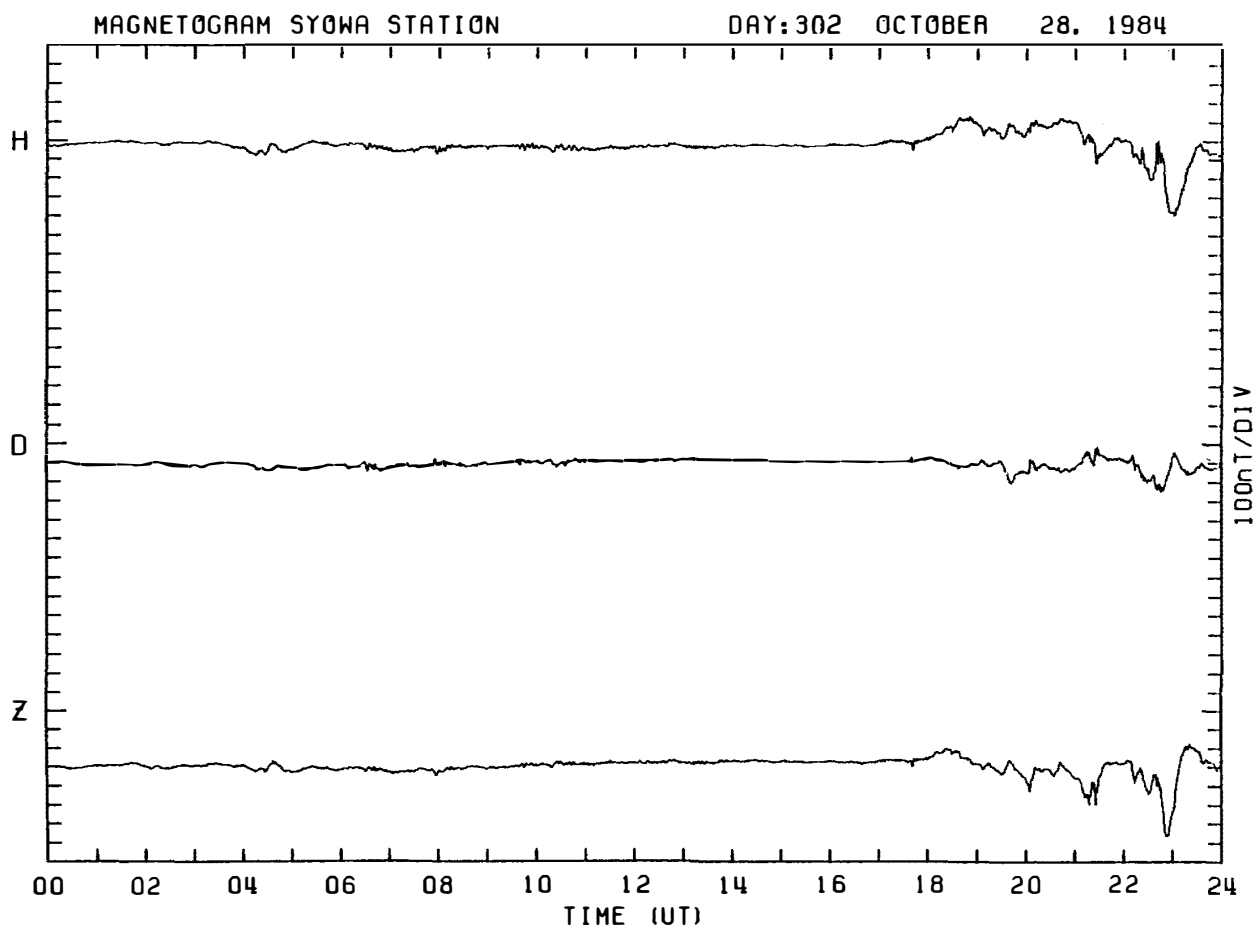


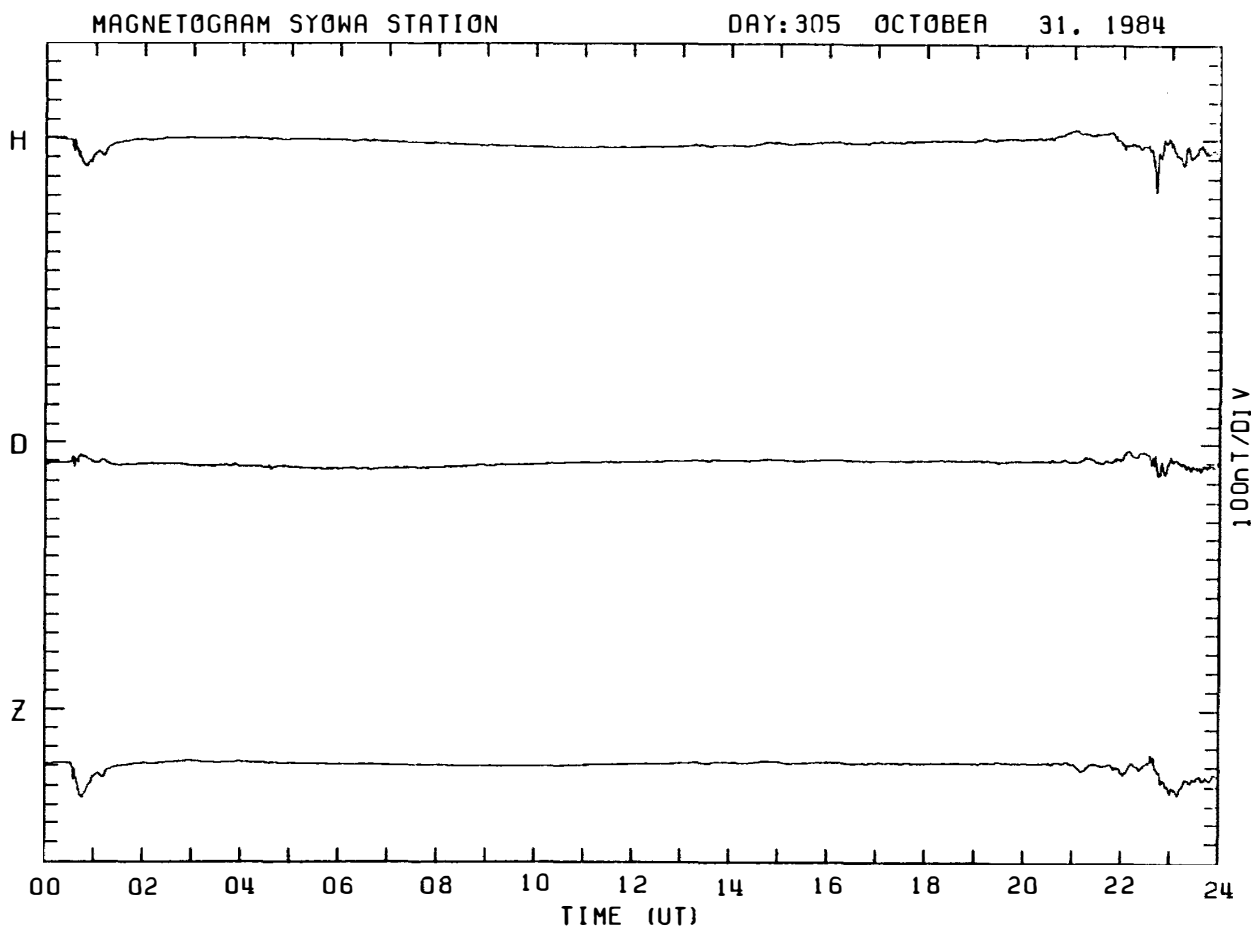
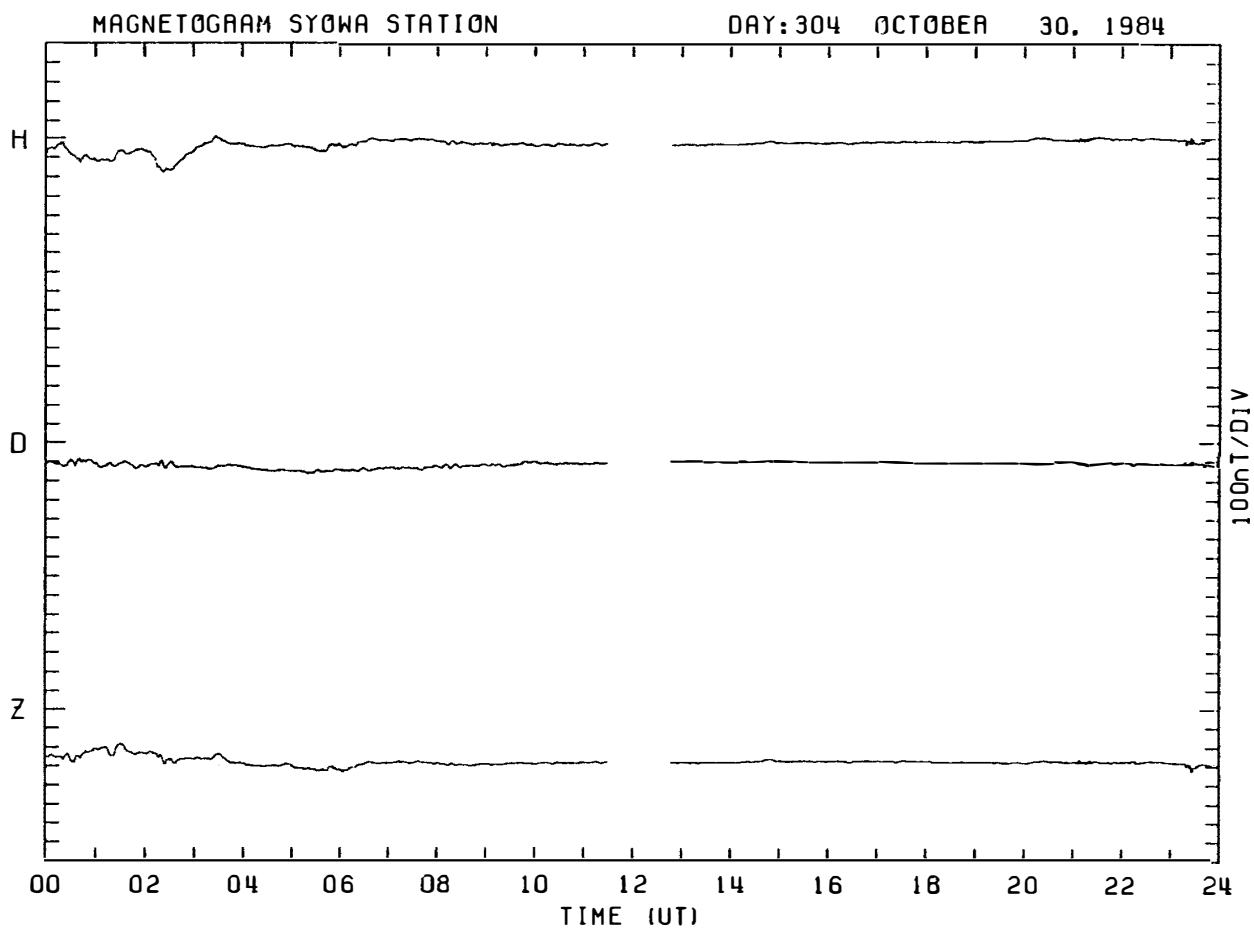


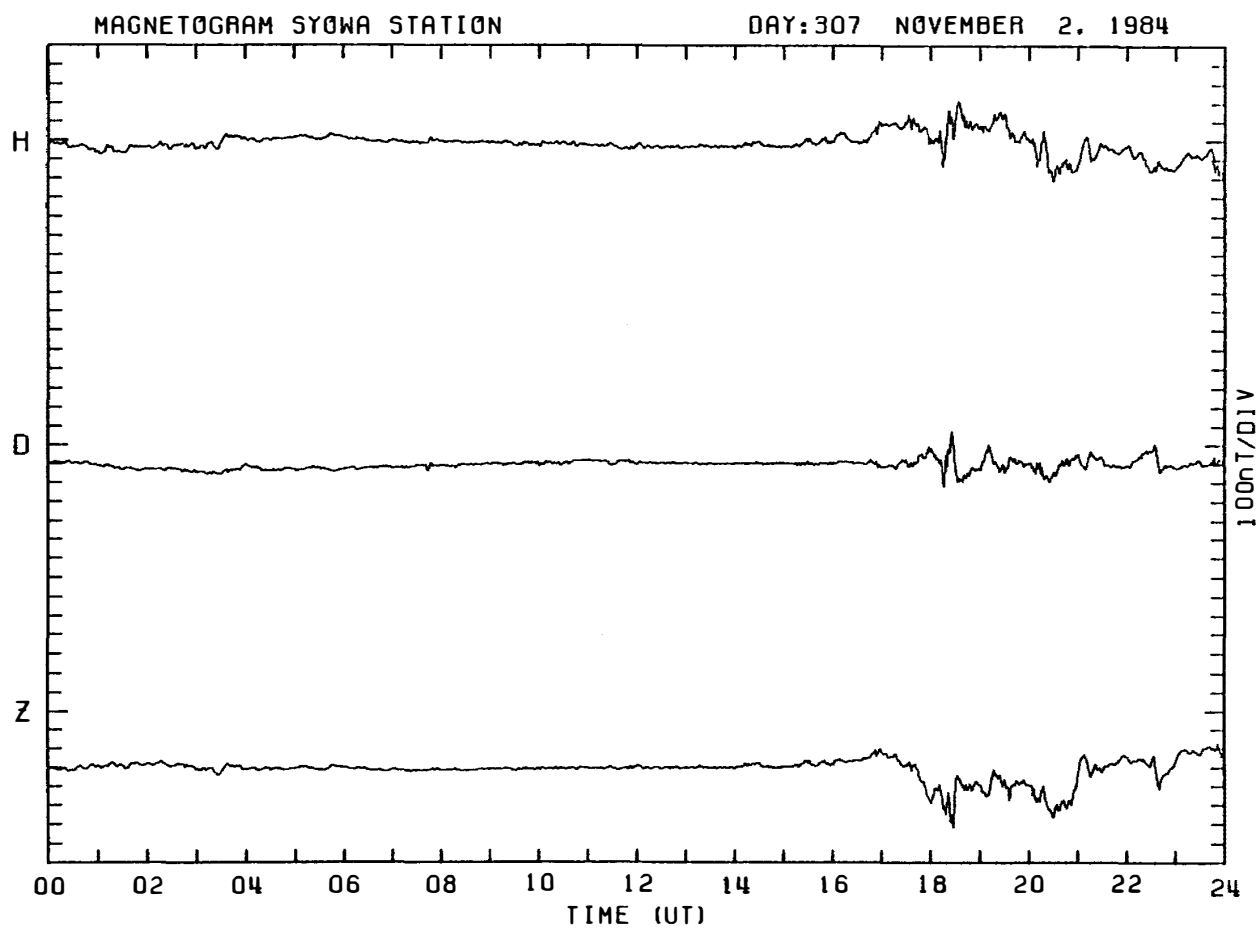
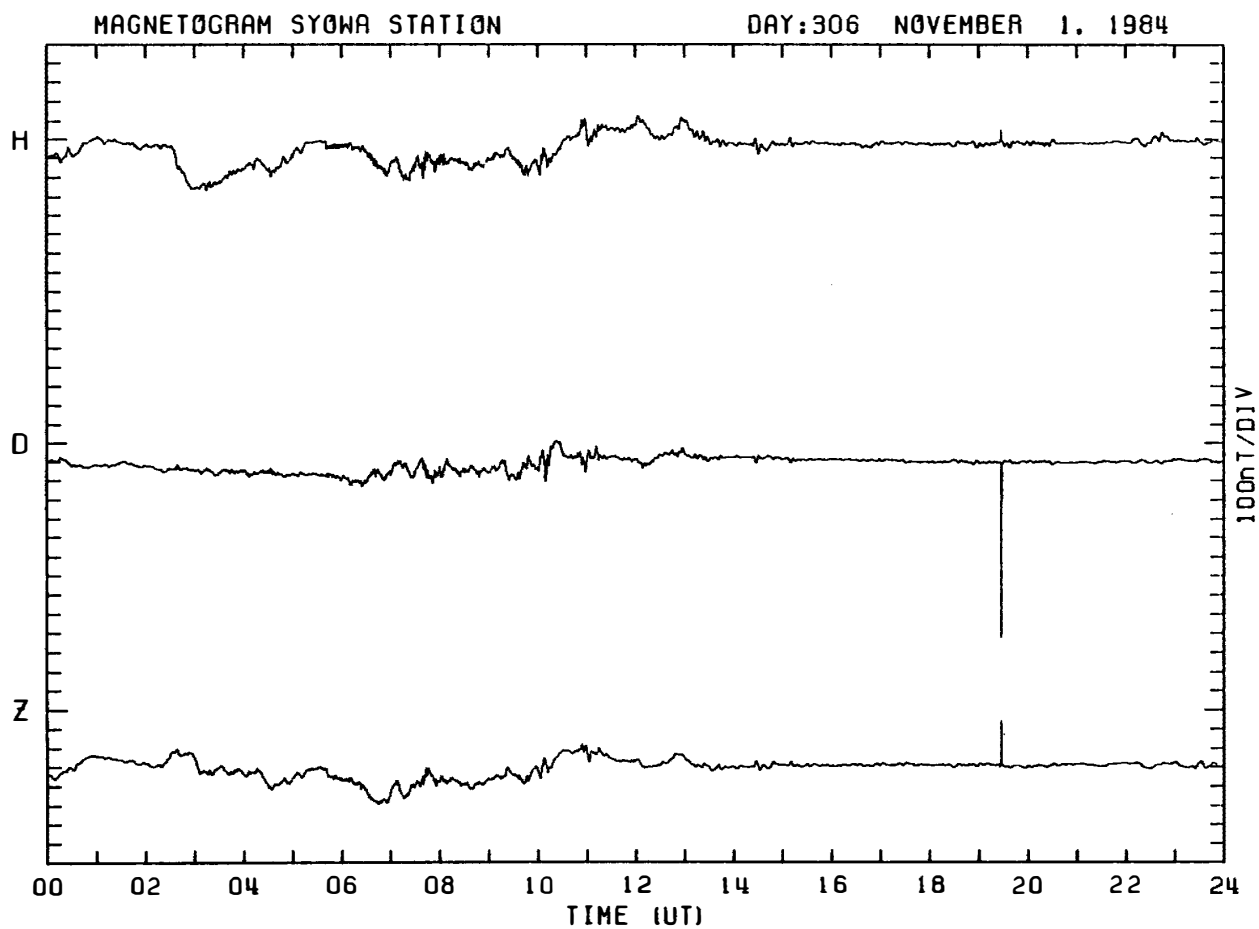


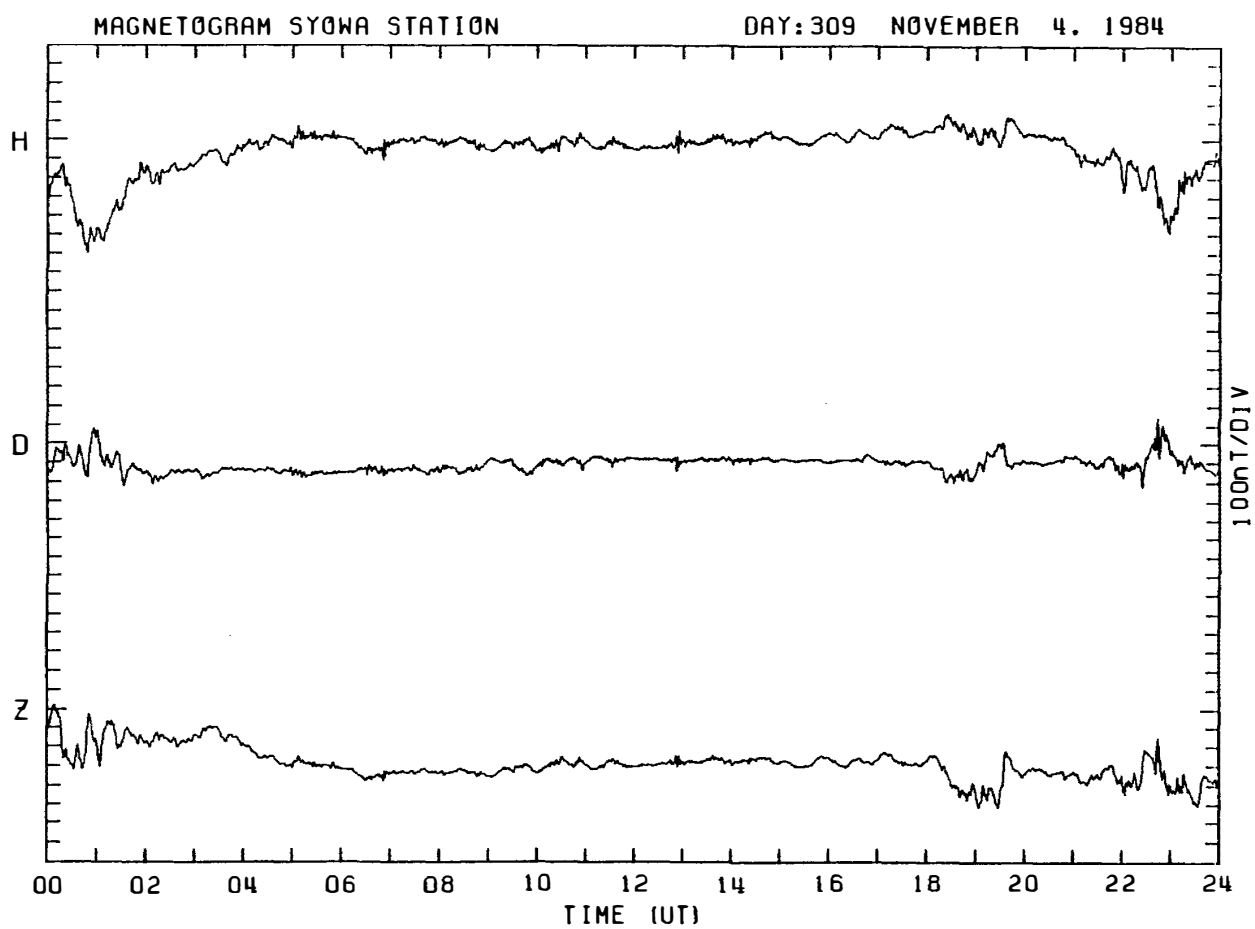
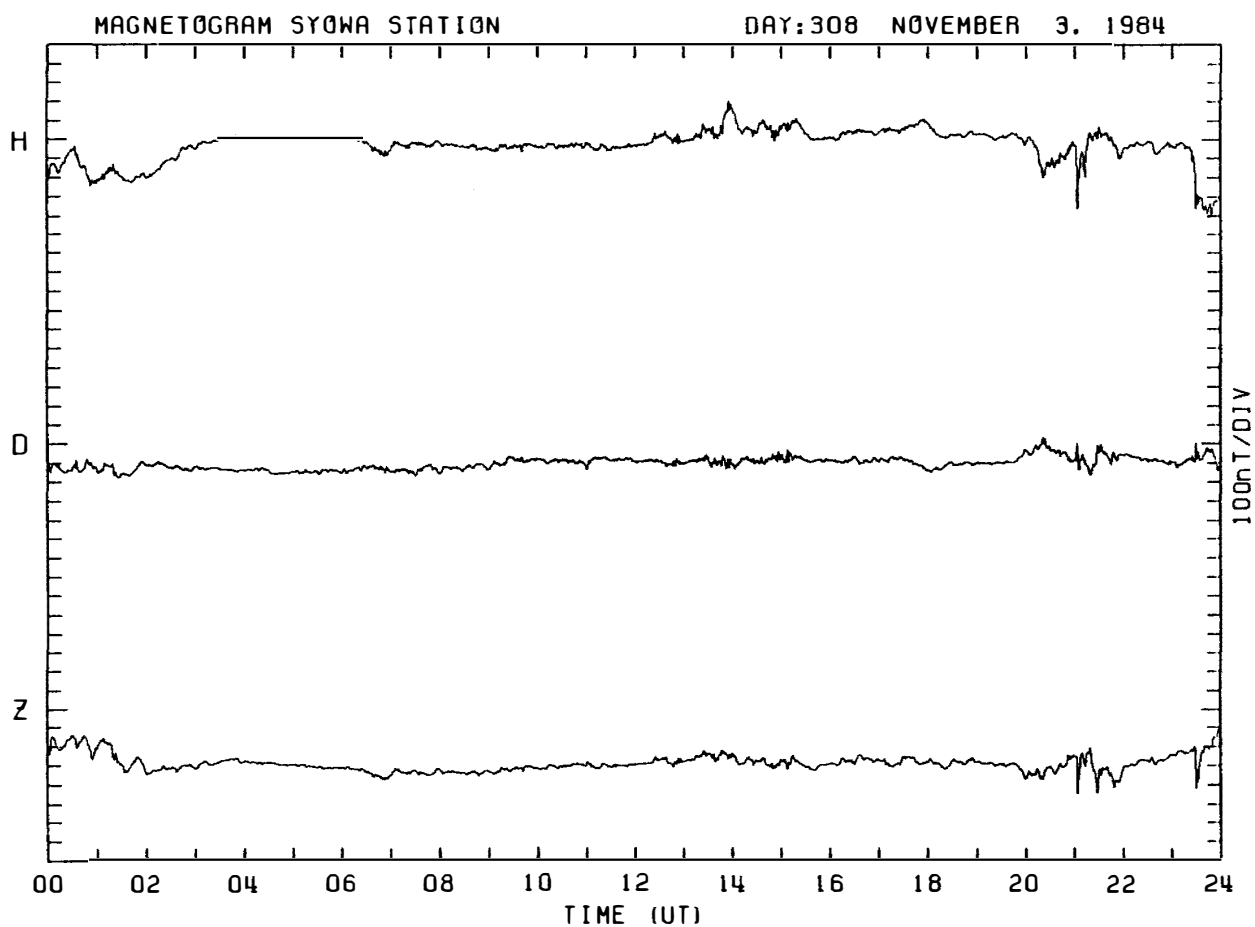


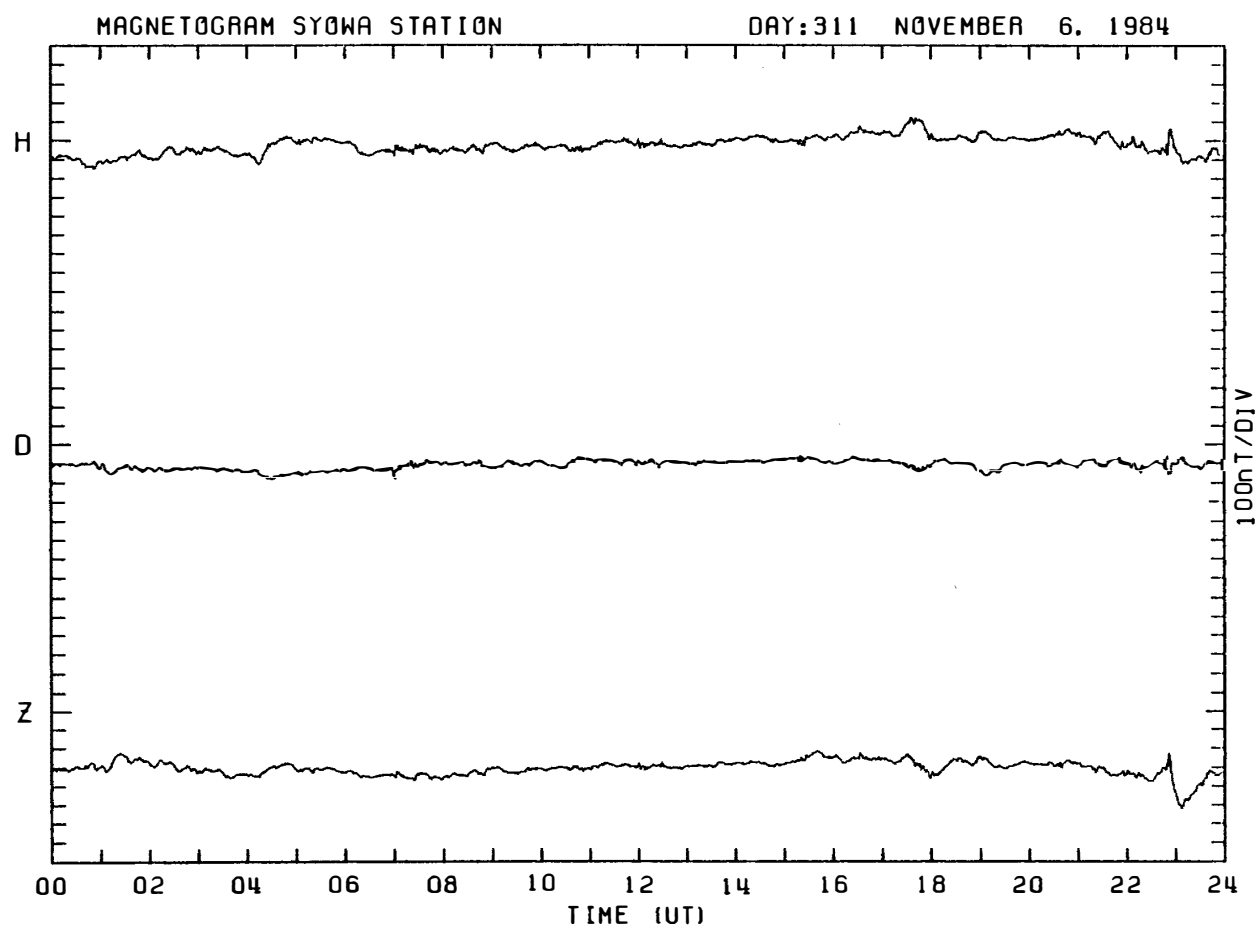
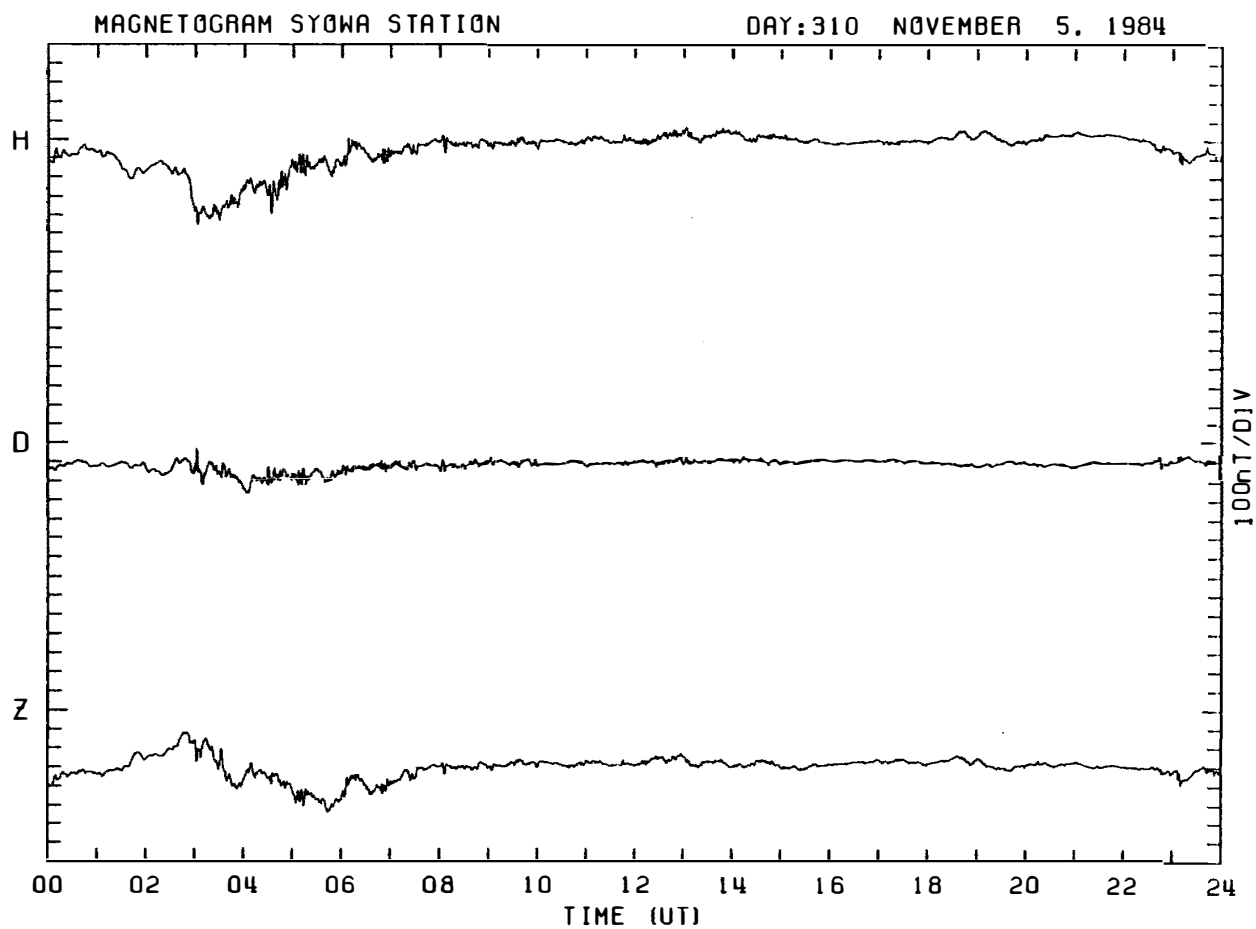


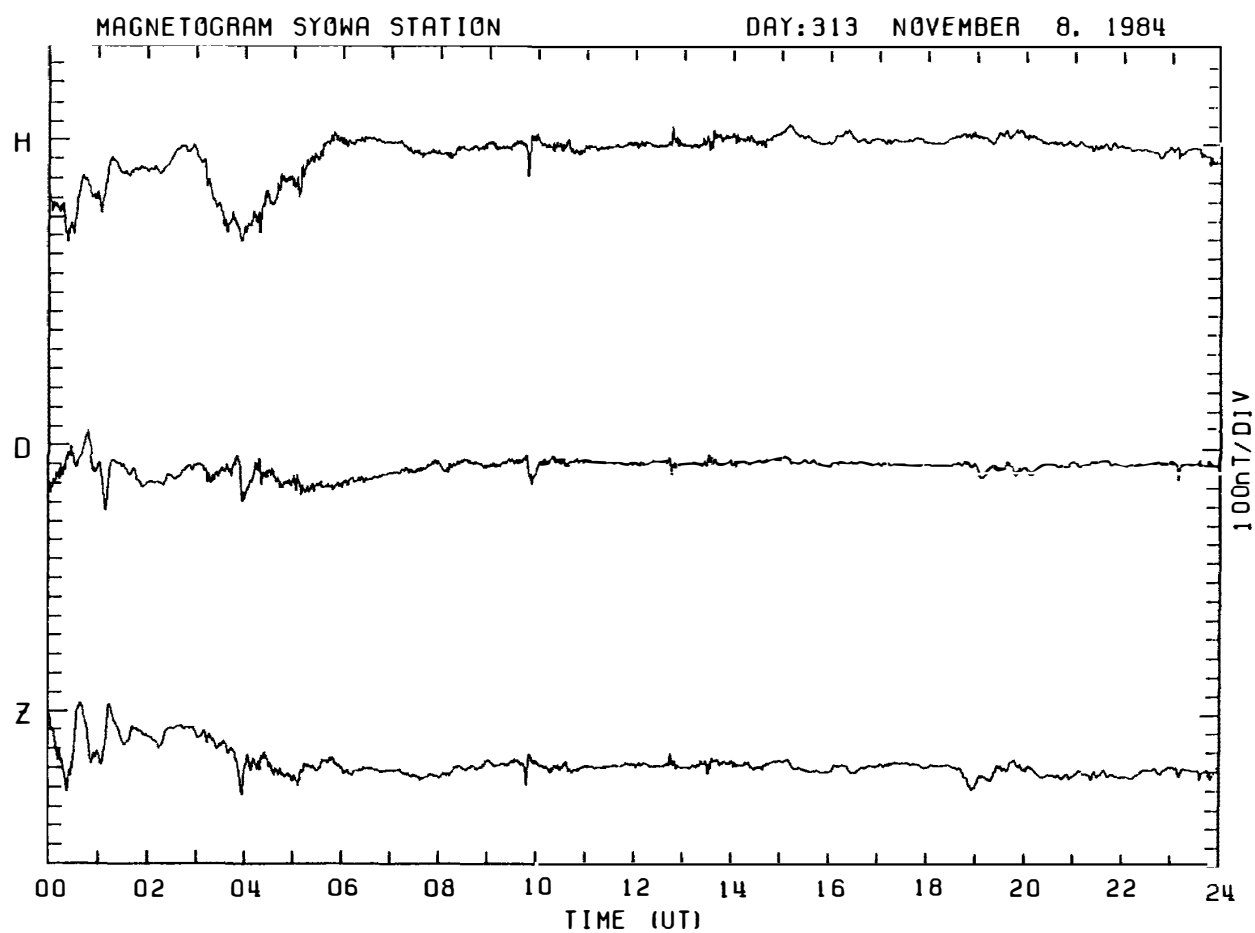
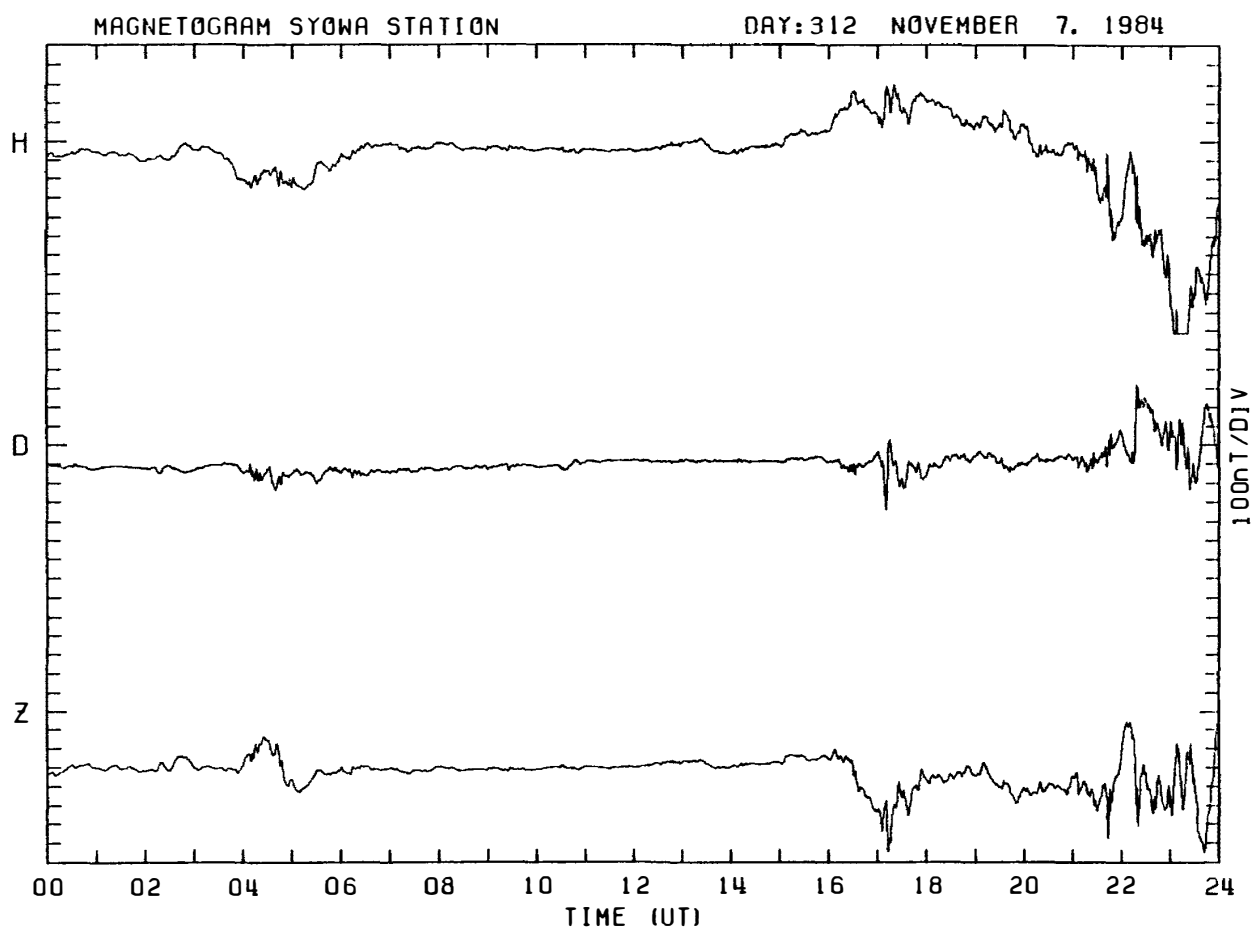






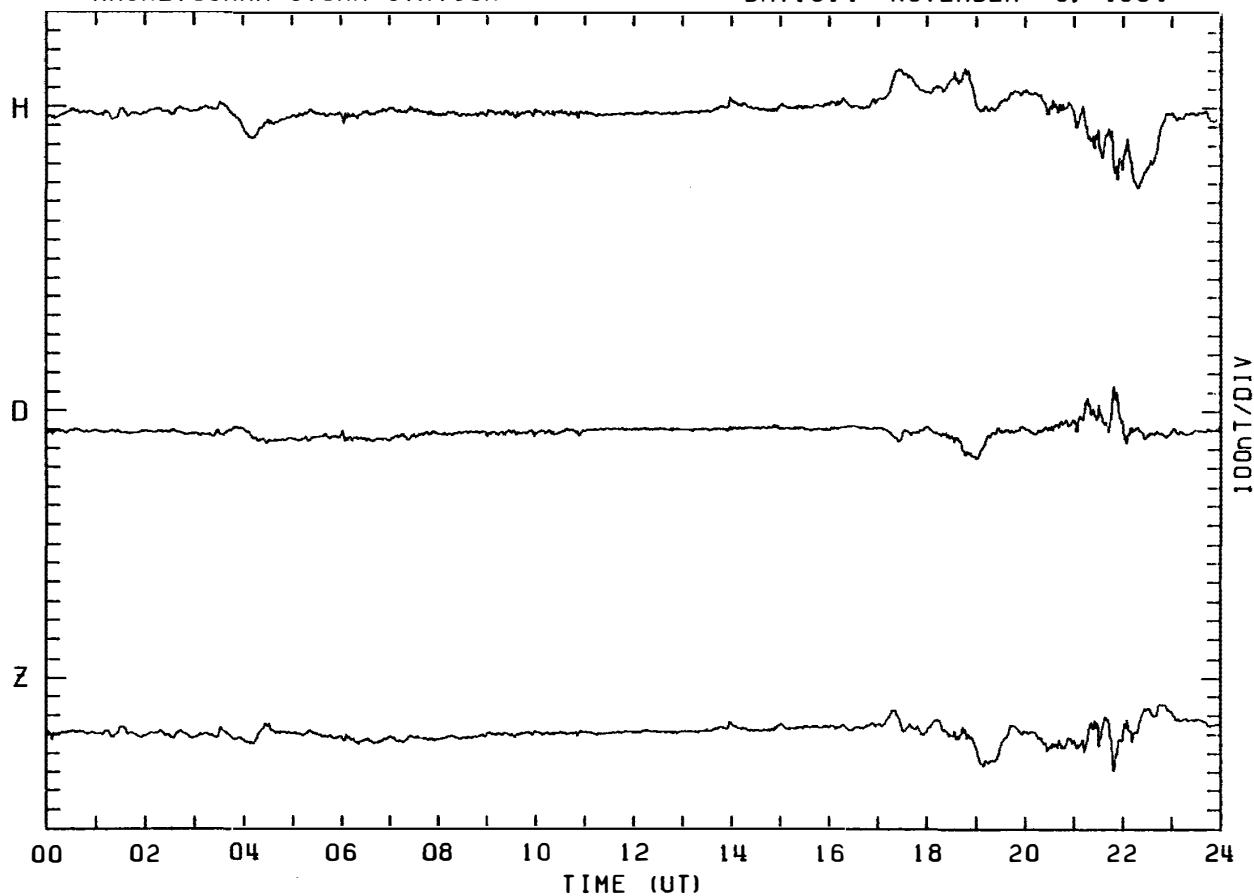






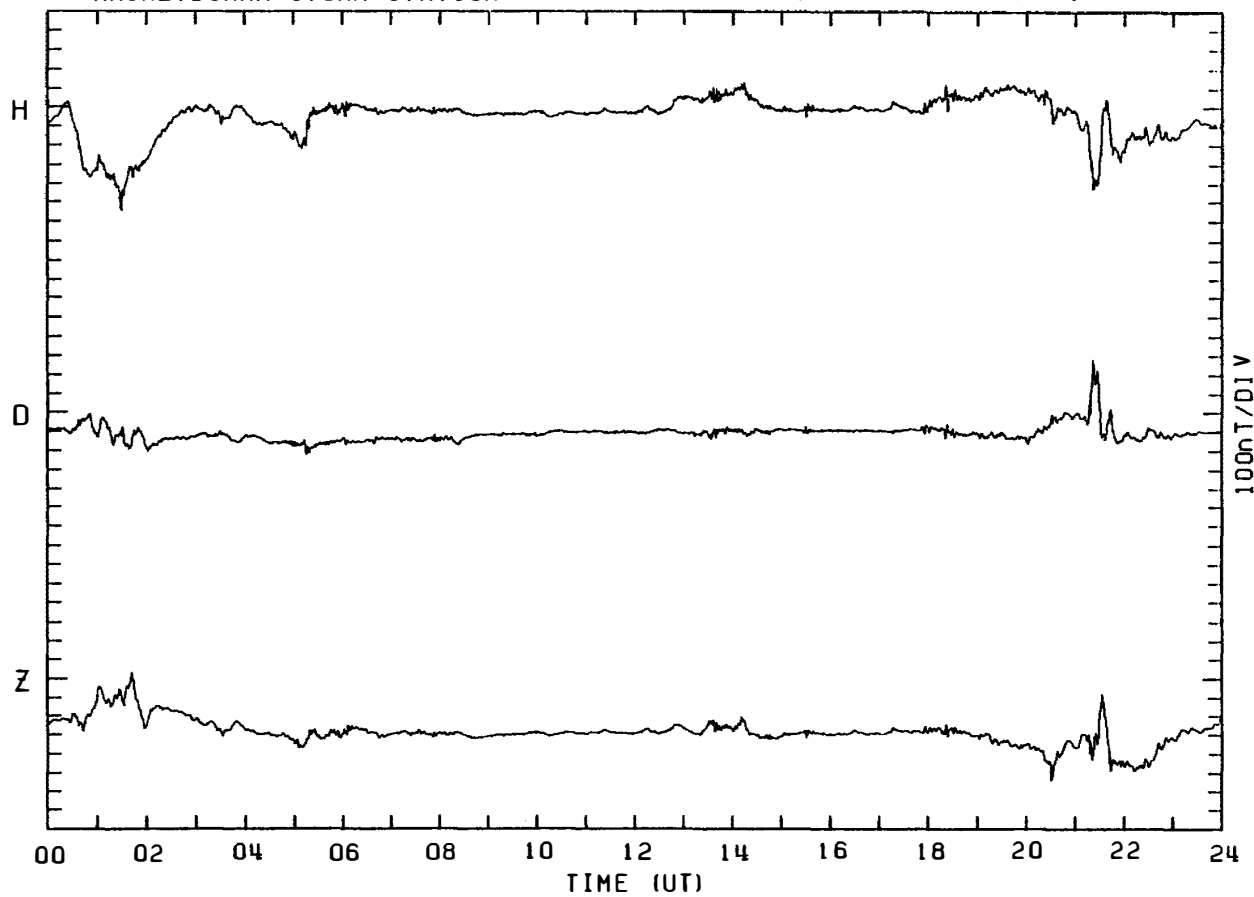
MAGNETOGRAM SYOWA STATION

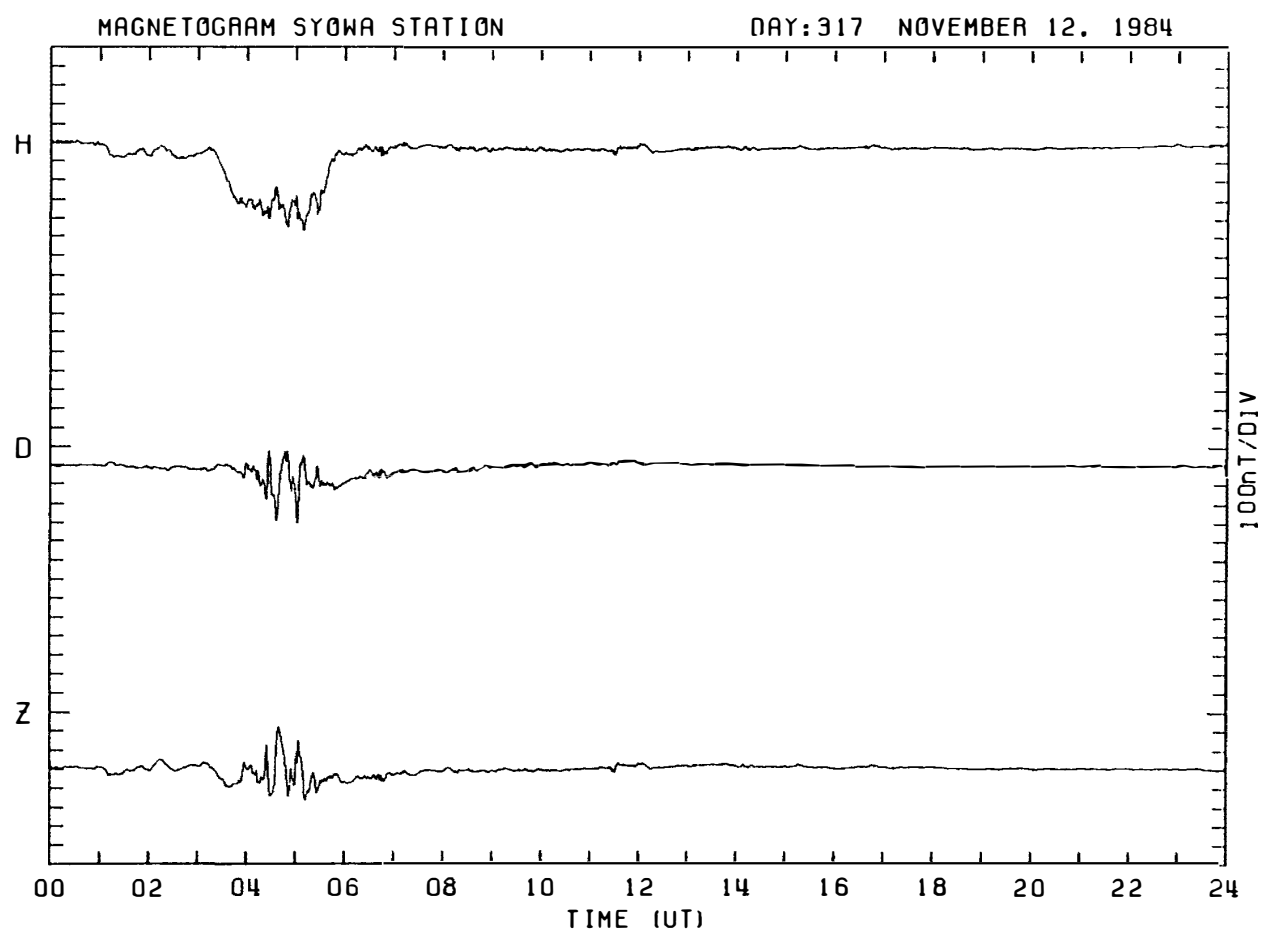
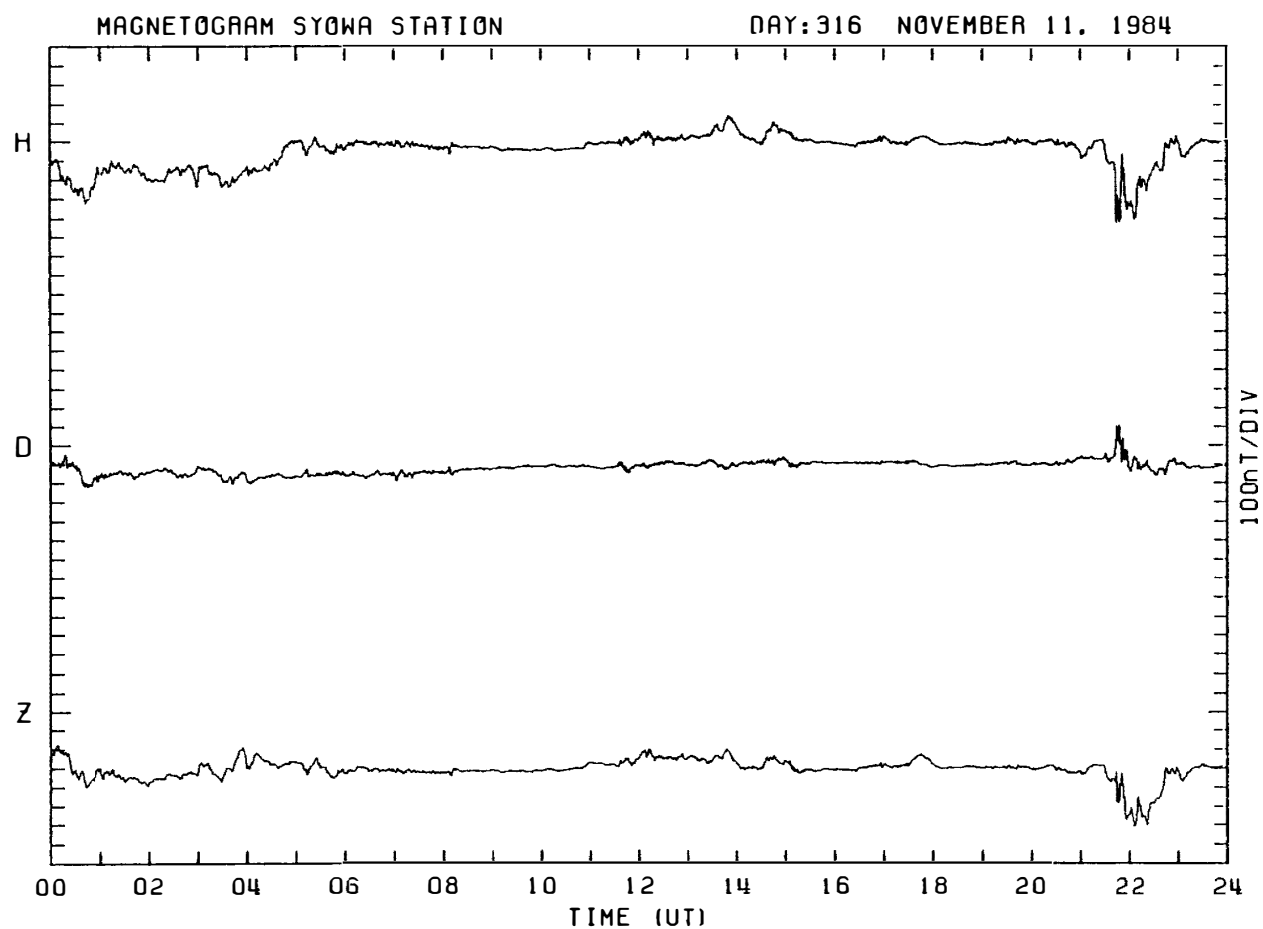
DAY:314 NOVEMBER 9. 1984



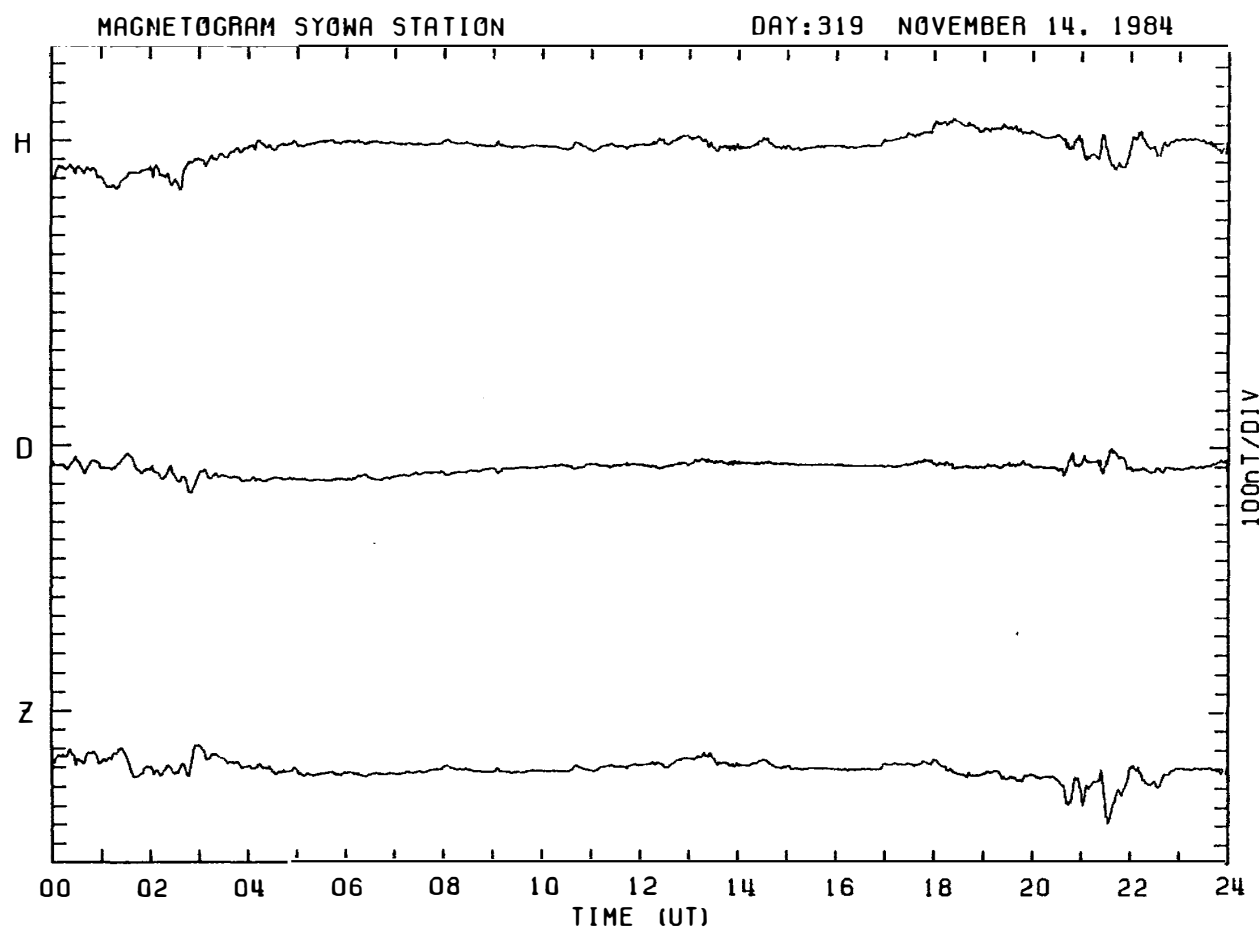
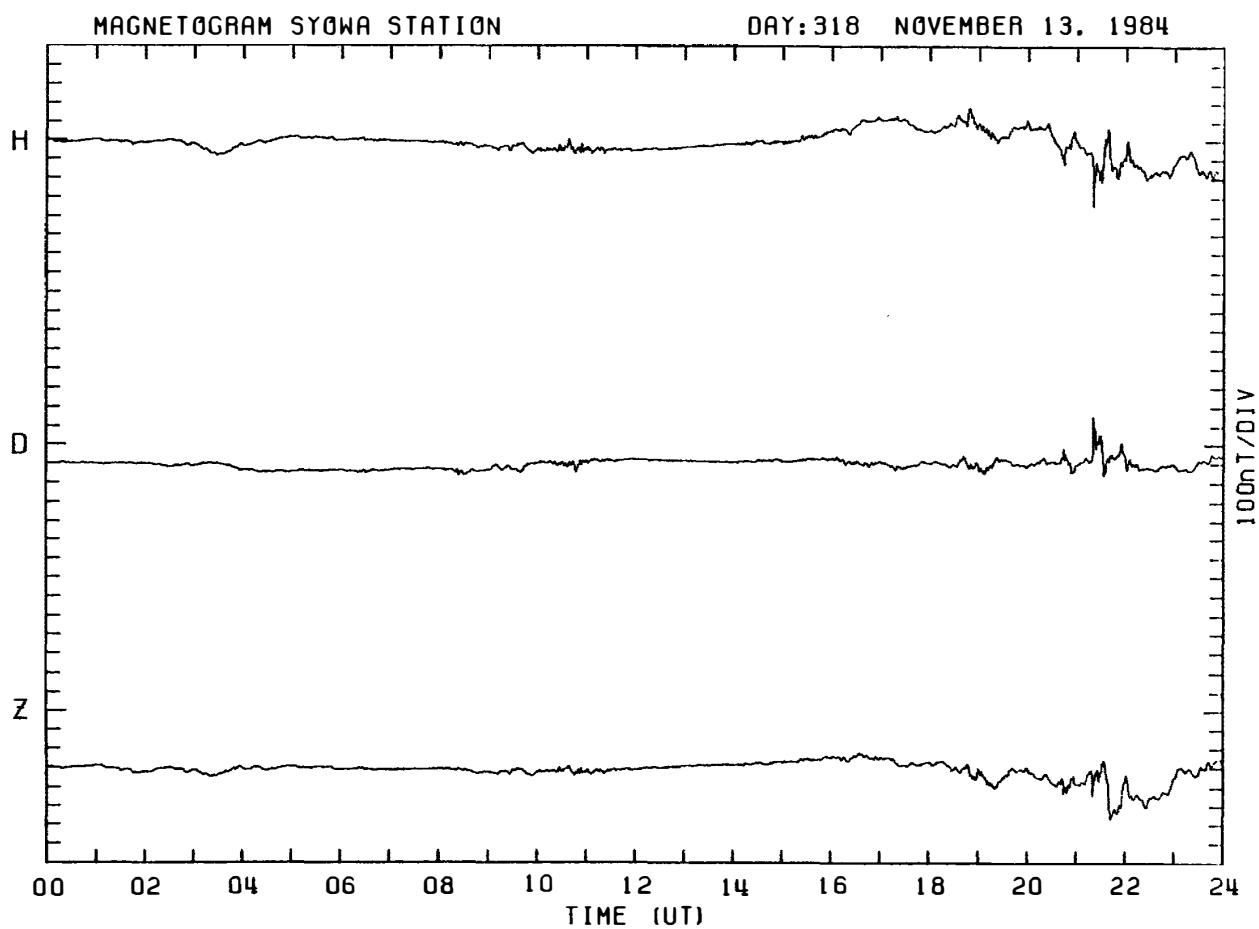
MAGNETOGRAM SYOWA STATION

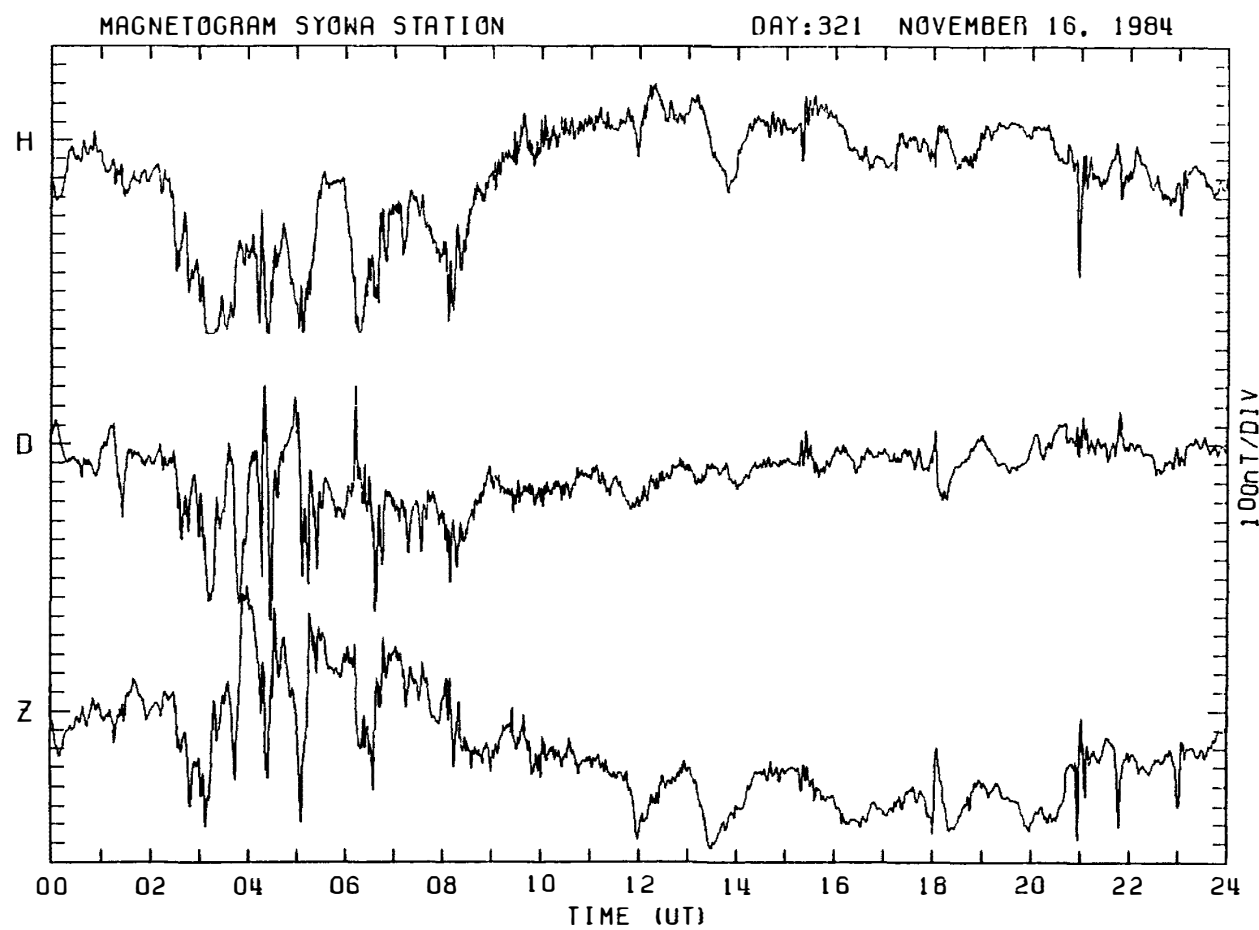
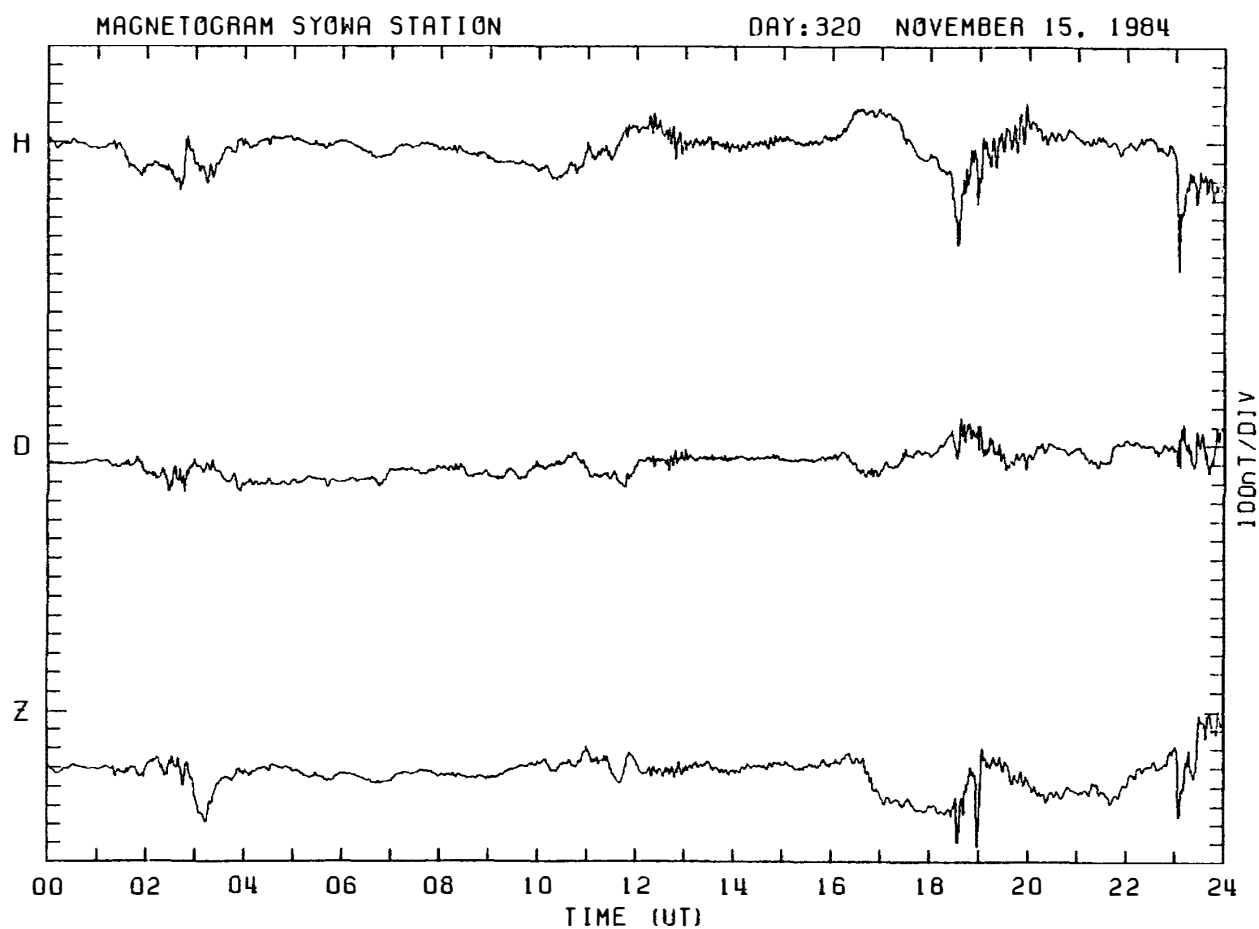
DAY:315 NOVEMBER 10. 1984





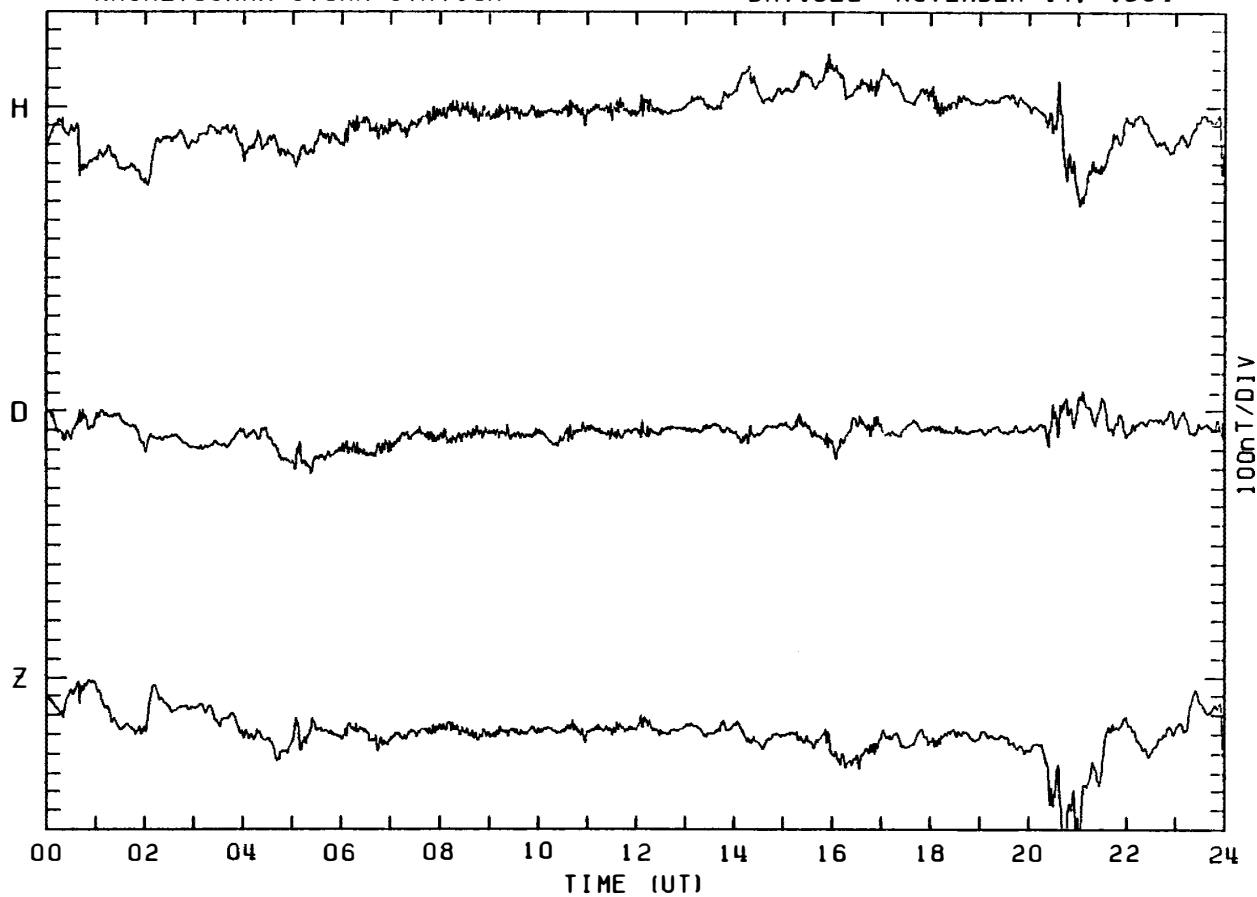






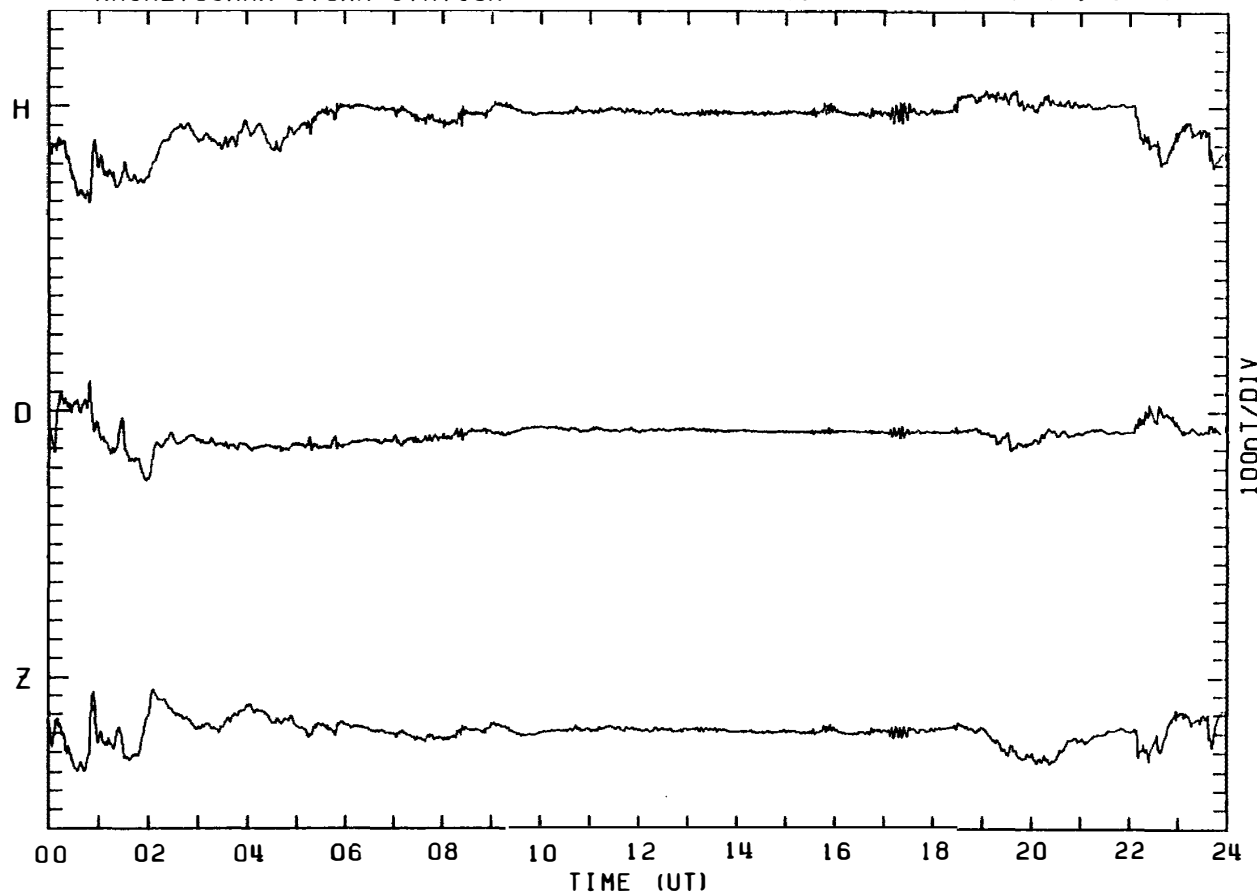
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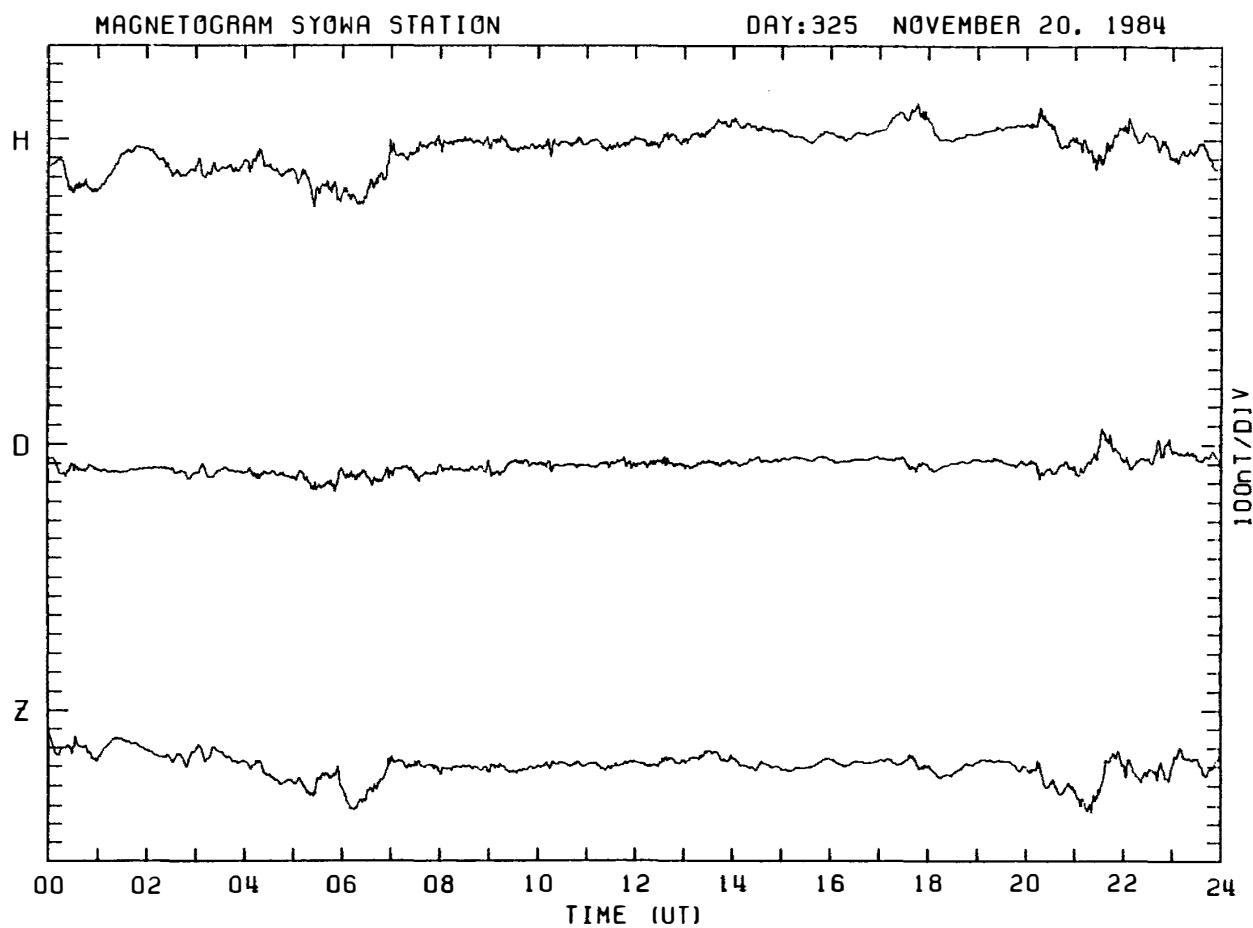
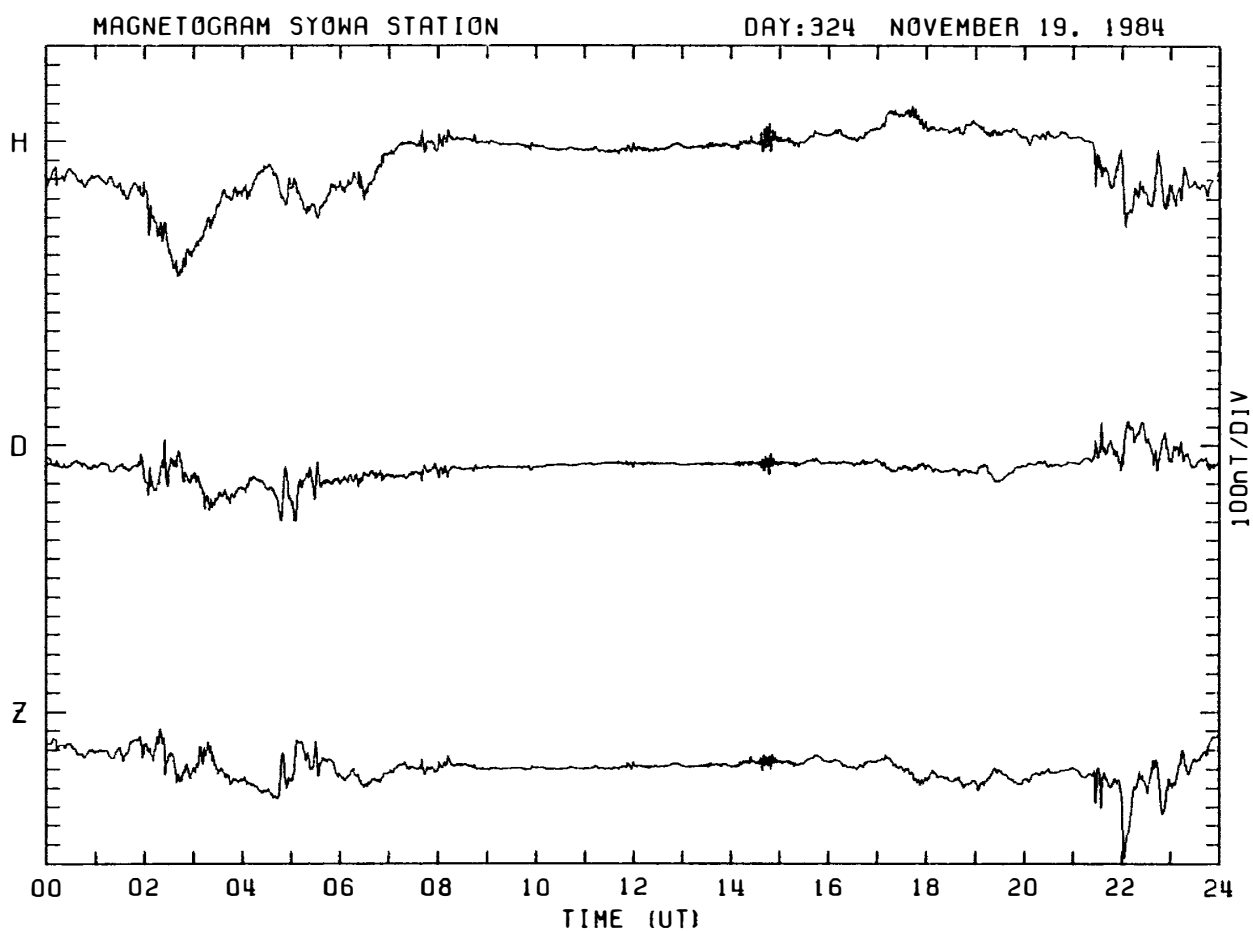
DAY:322 NOVEMBER 17. 1984



MAGNETOGRAM SYOWA STATION

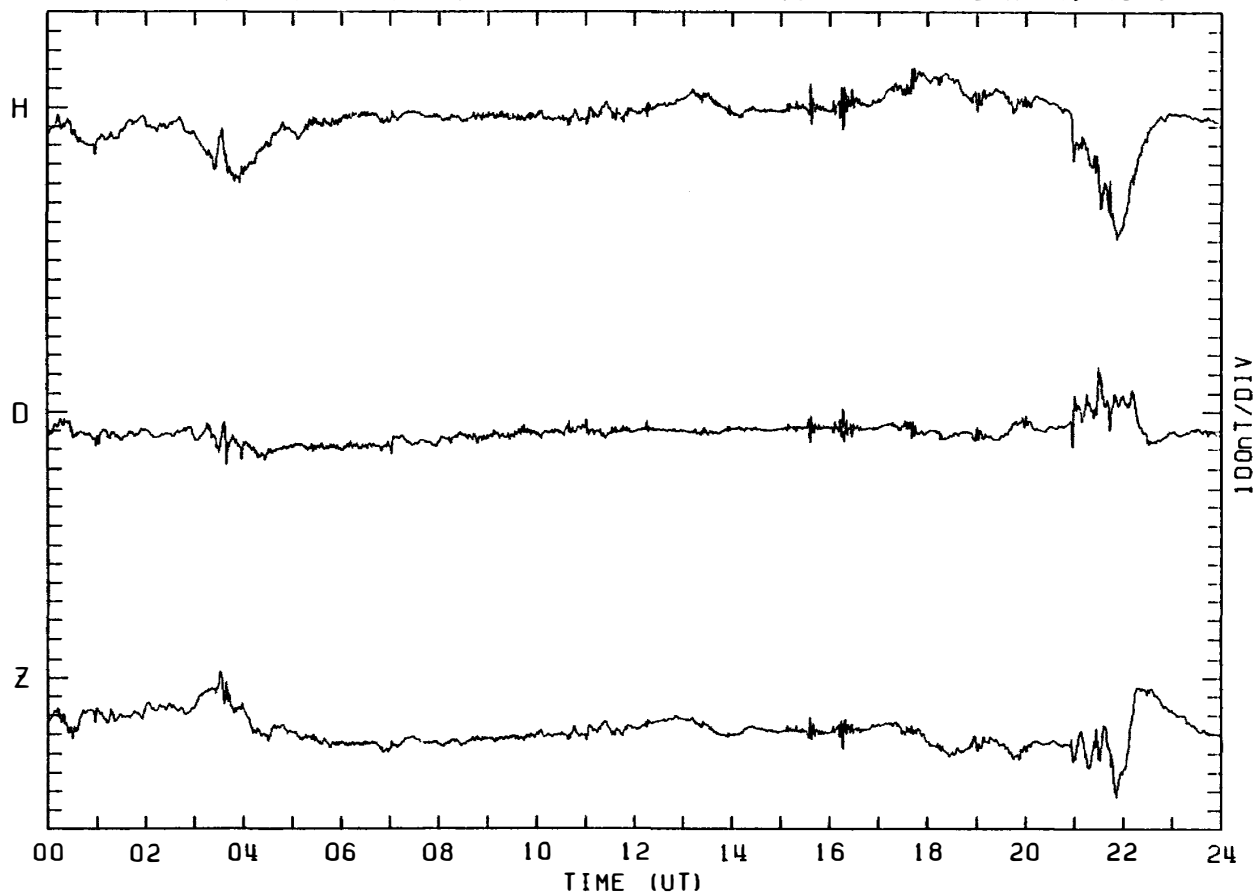
DAY:323 NOVEMBER 18. 1984





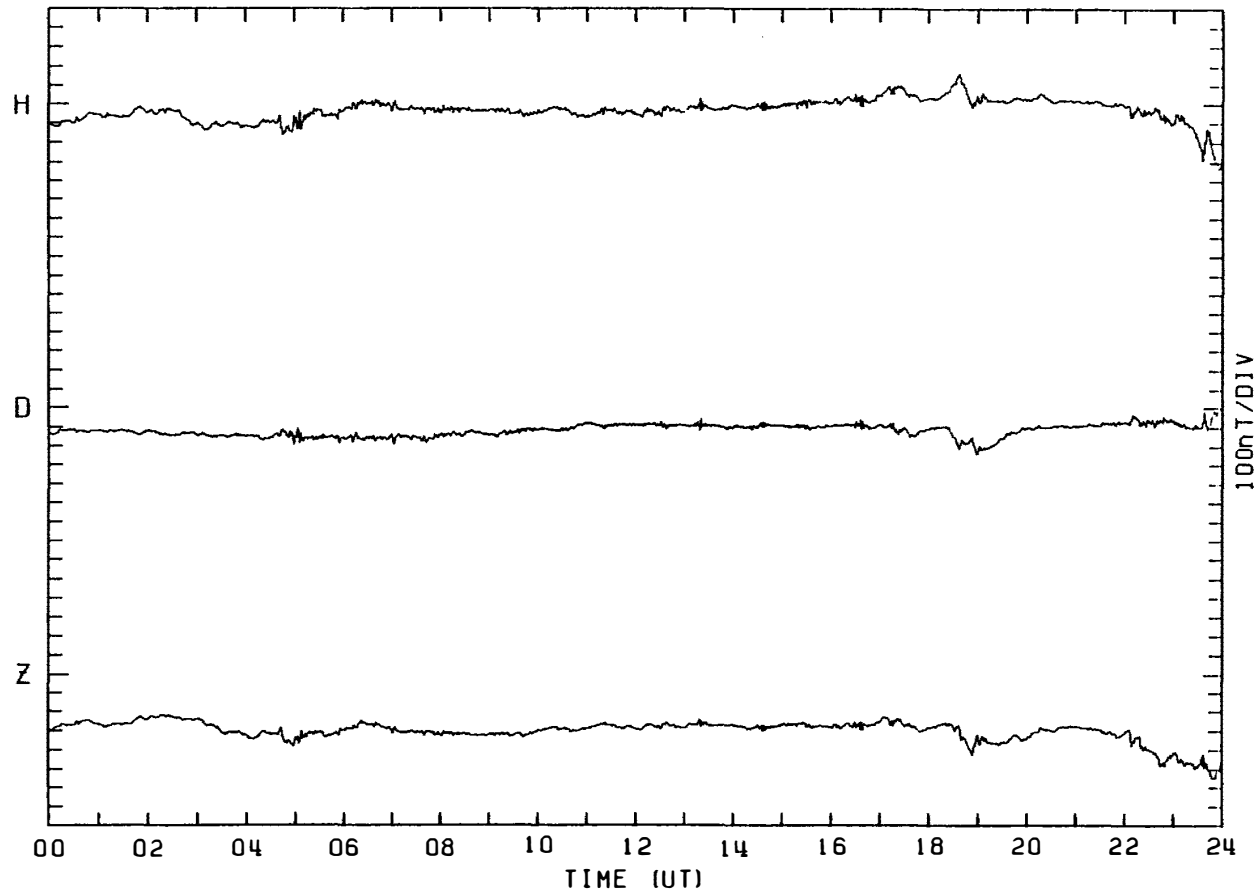
MAGNETOGRAM SYOWA STATION

DAY:326 NOVEMBER 21, 1984



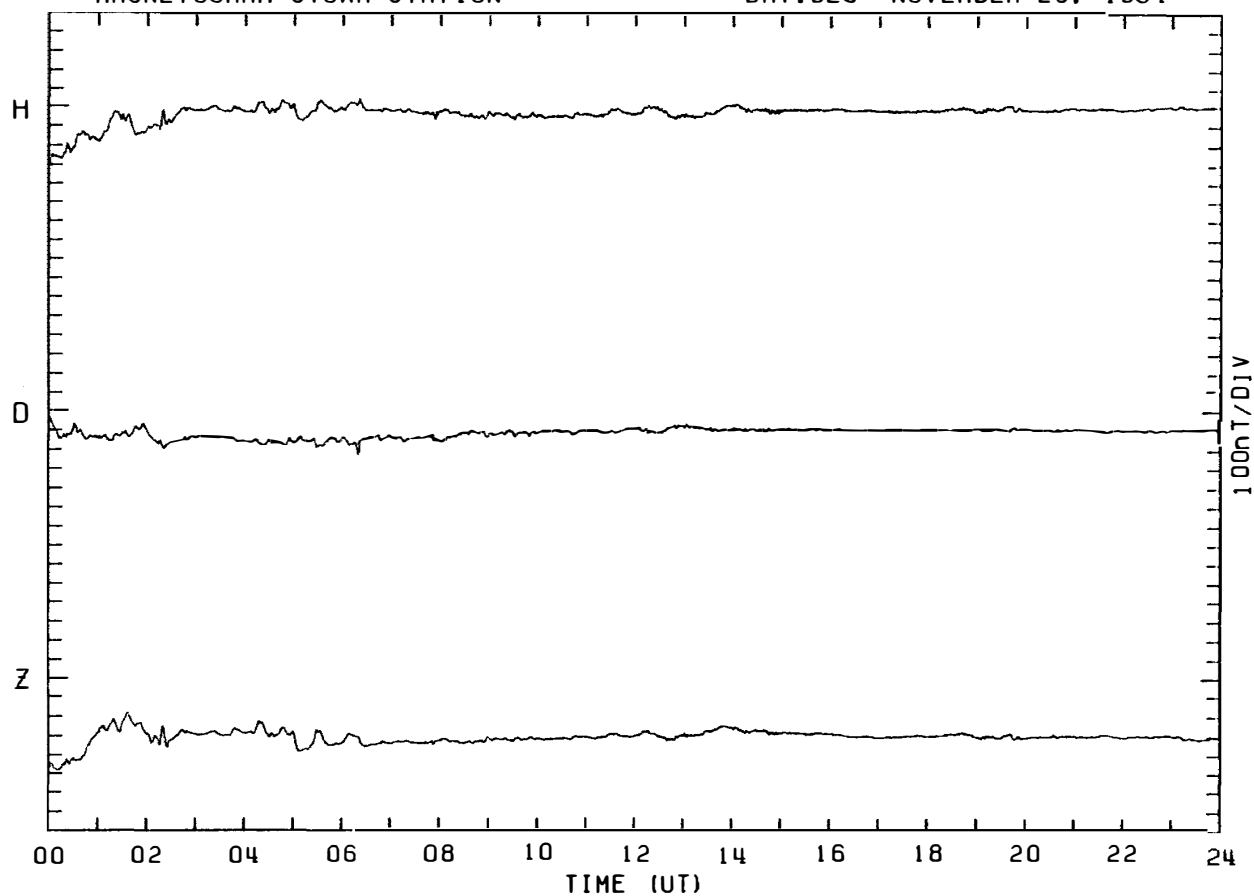
MAGNETOGRAM SYOWA STATION

DAY:327 NOVEMBER 22, 1984



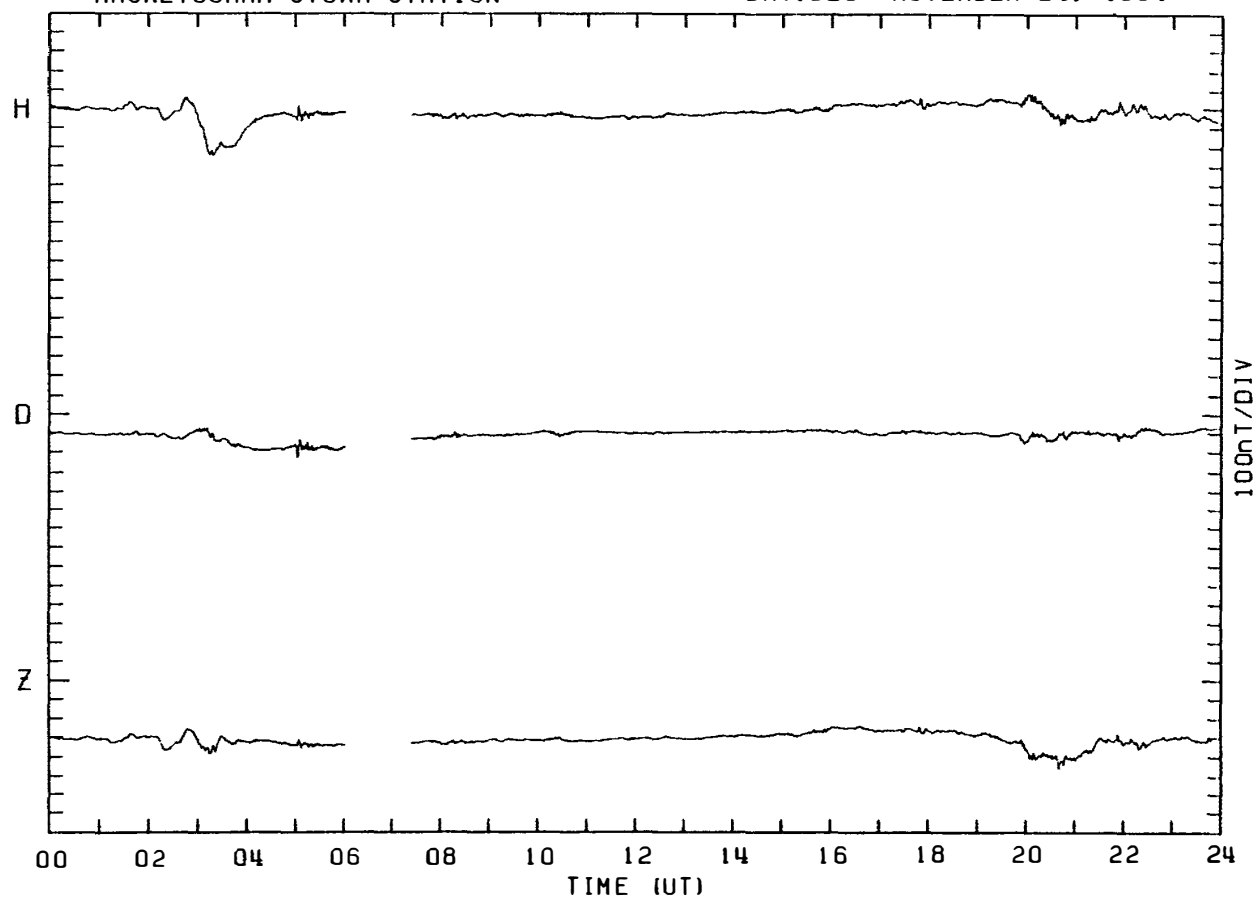
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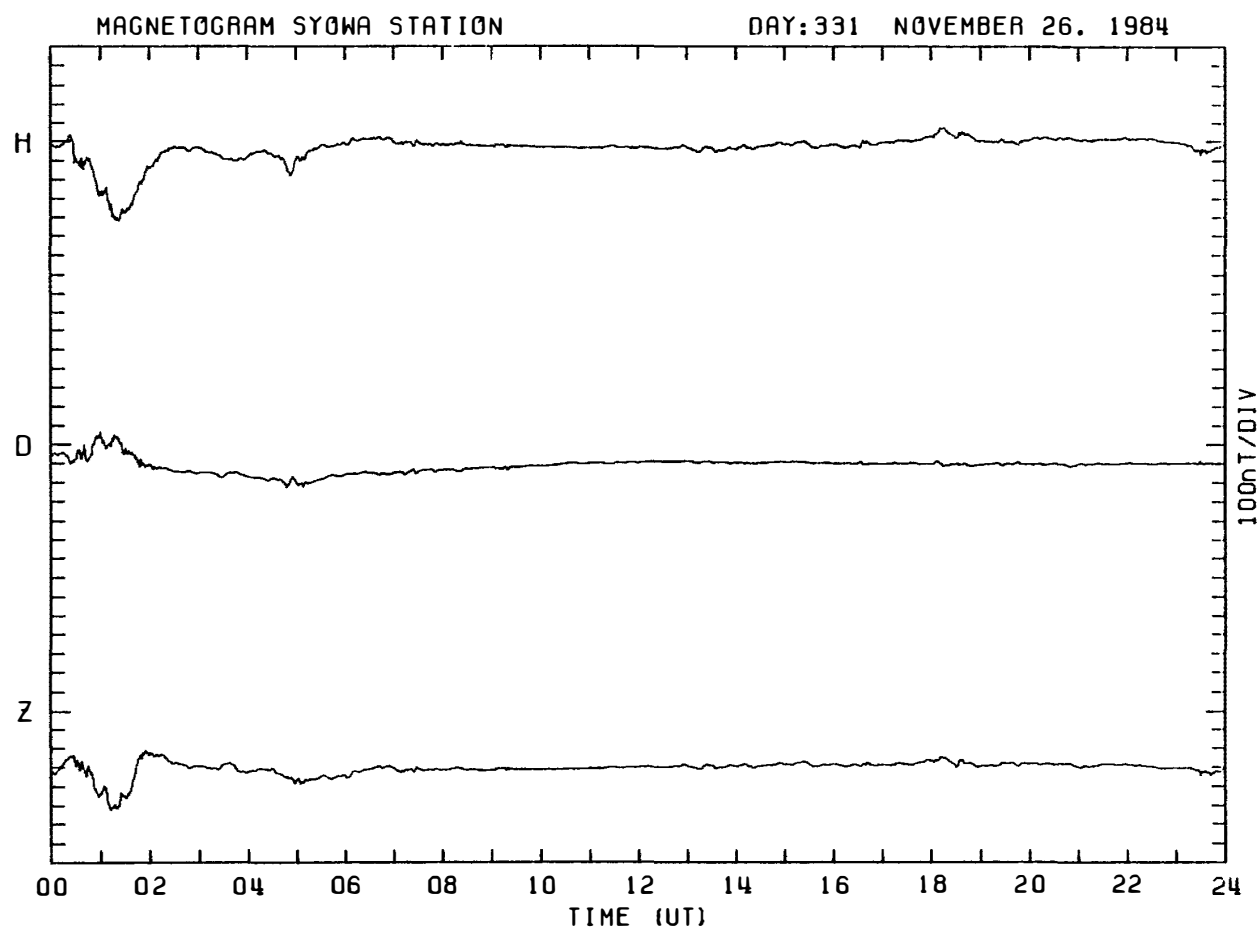
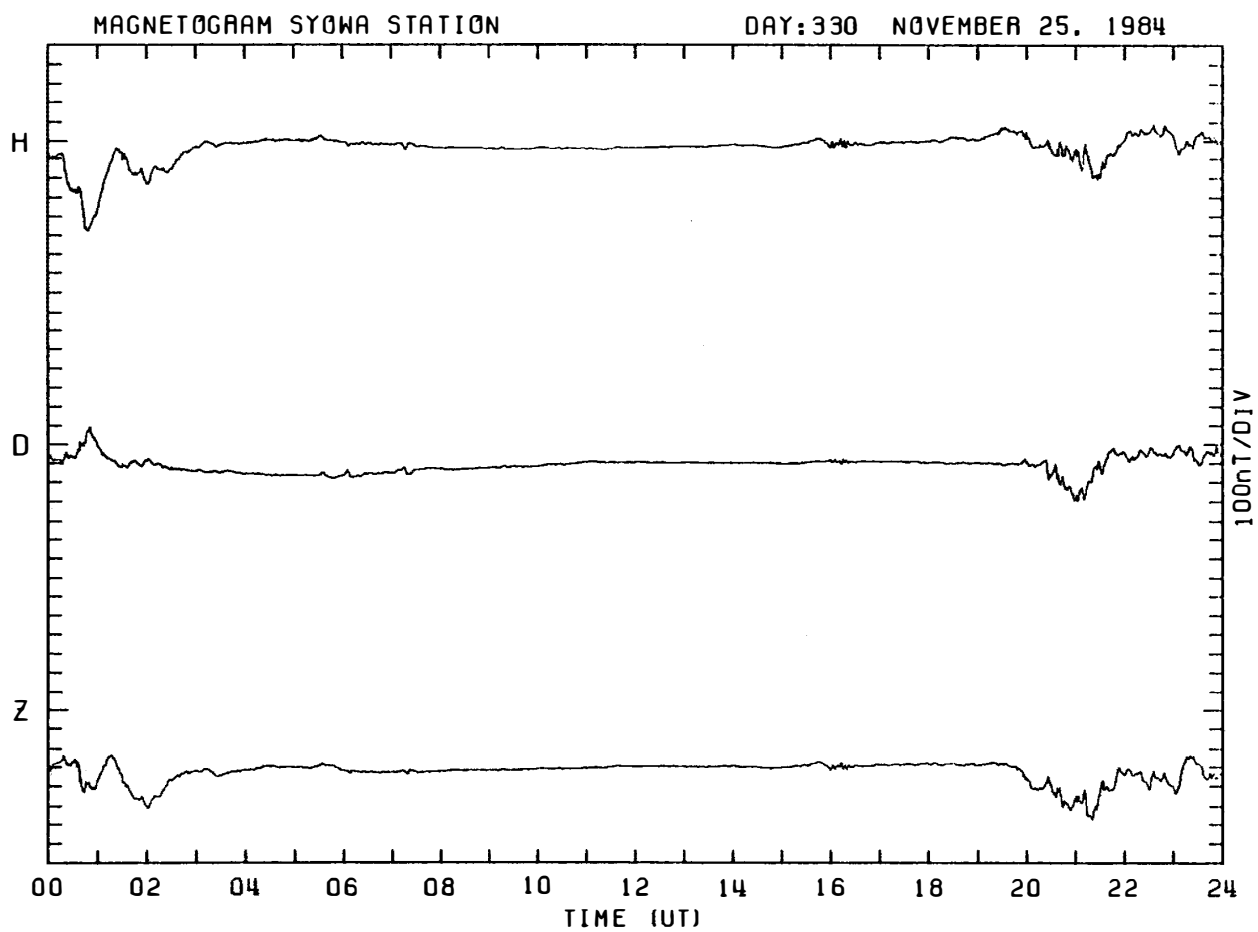
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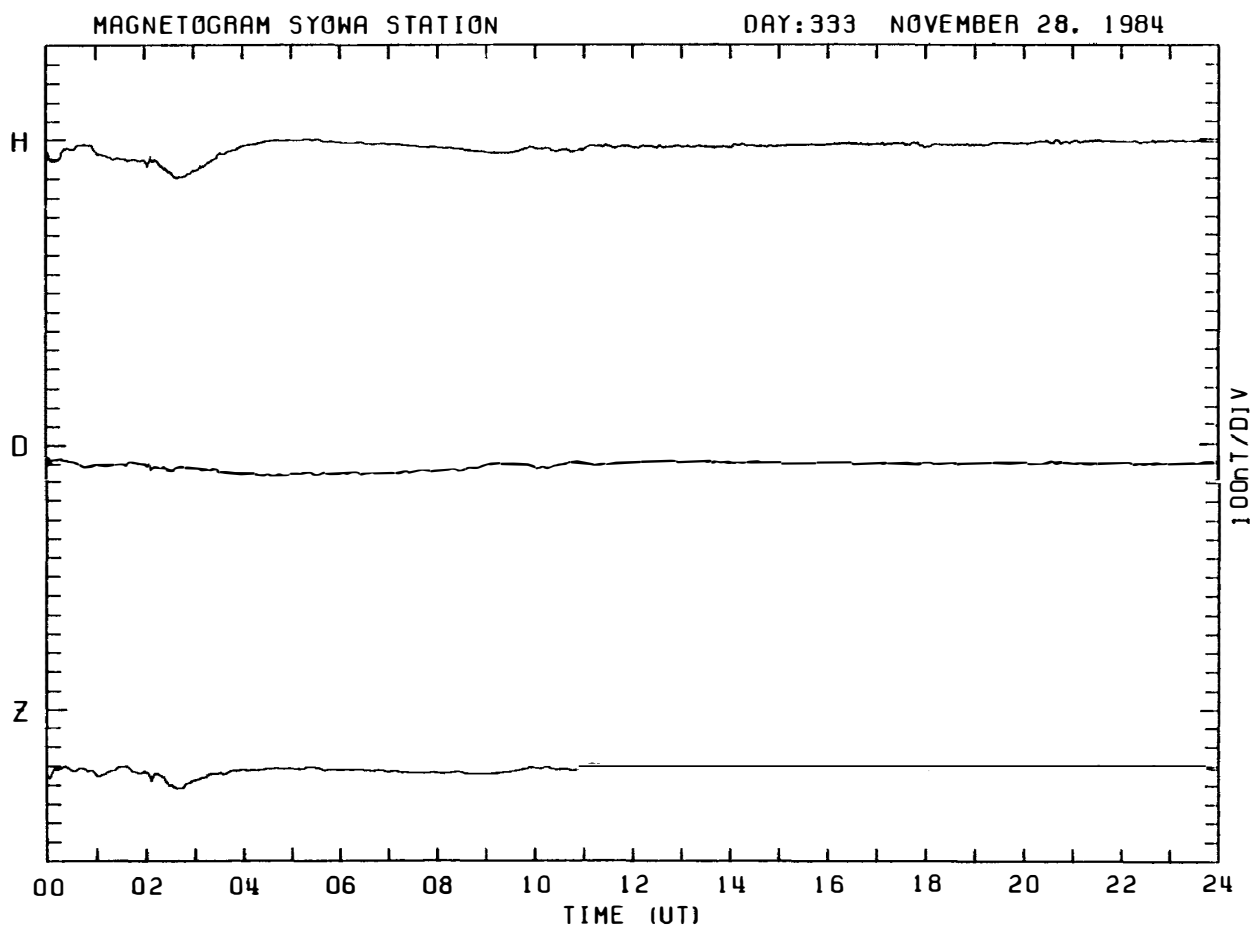
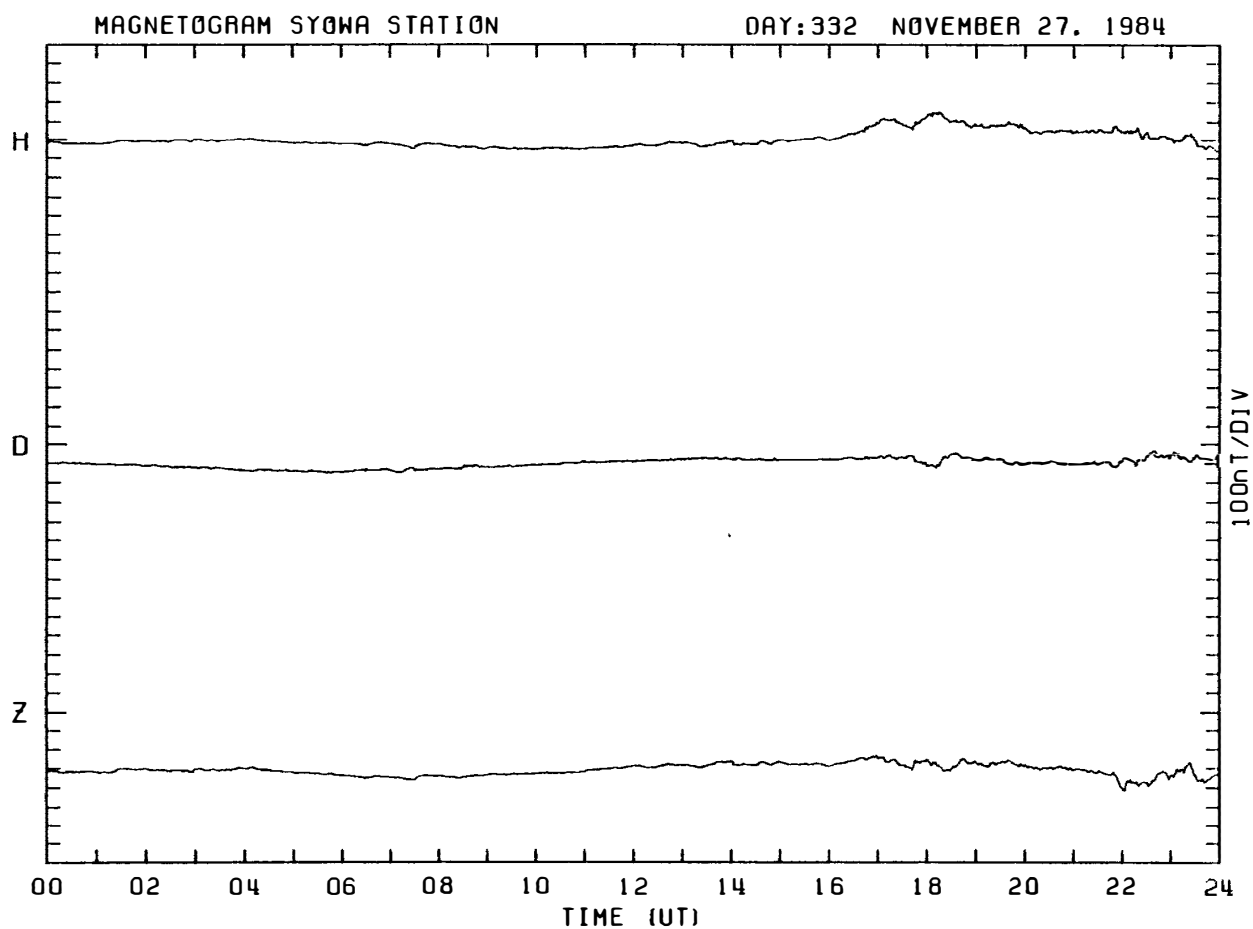


MAGNETOGRAM SYOWA STATION

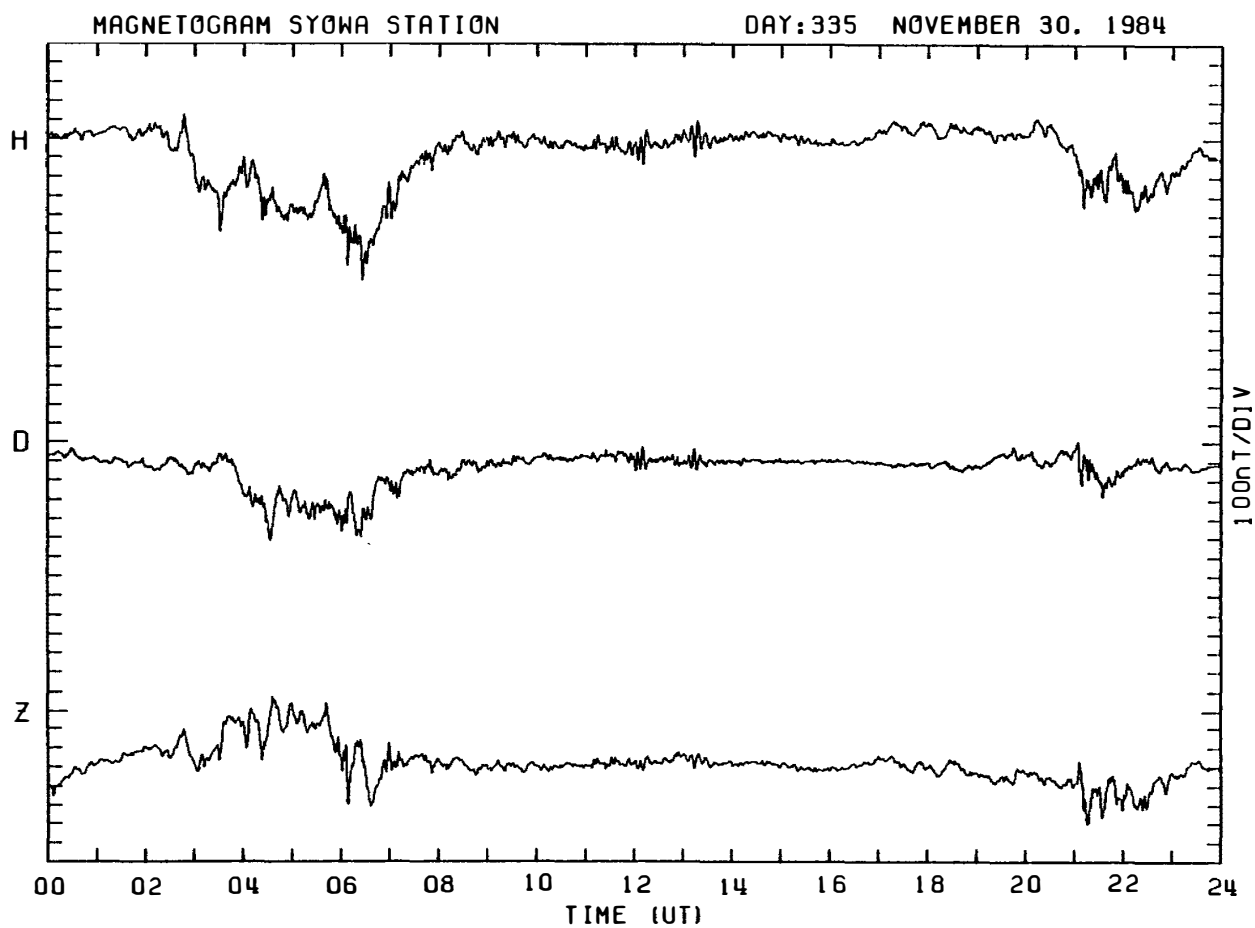
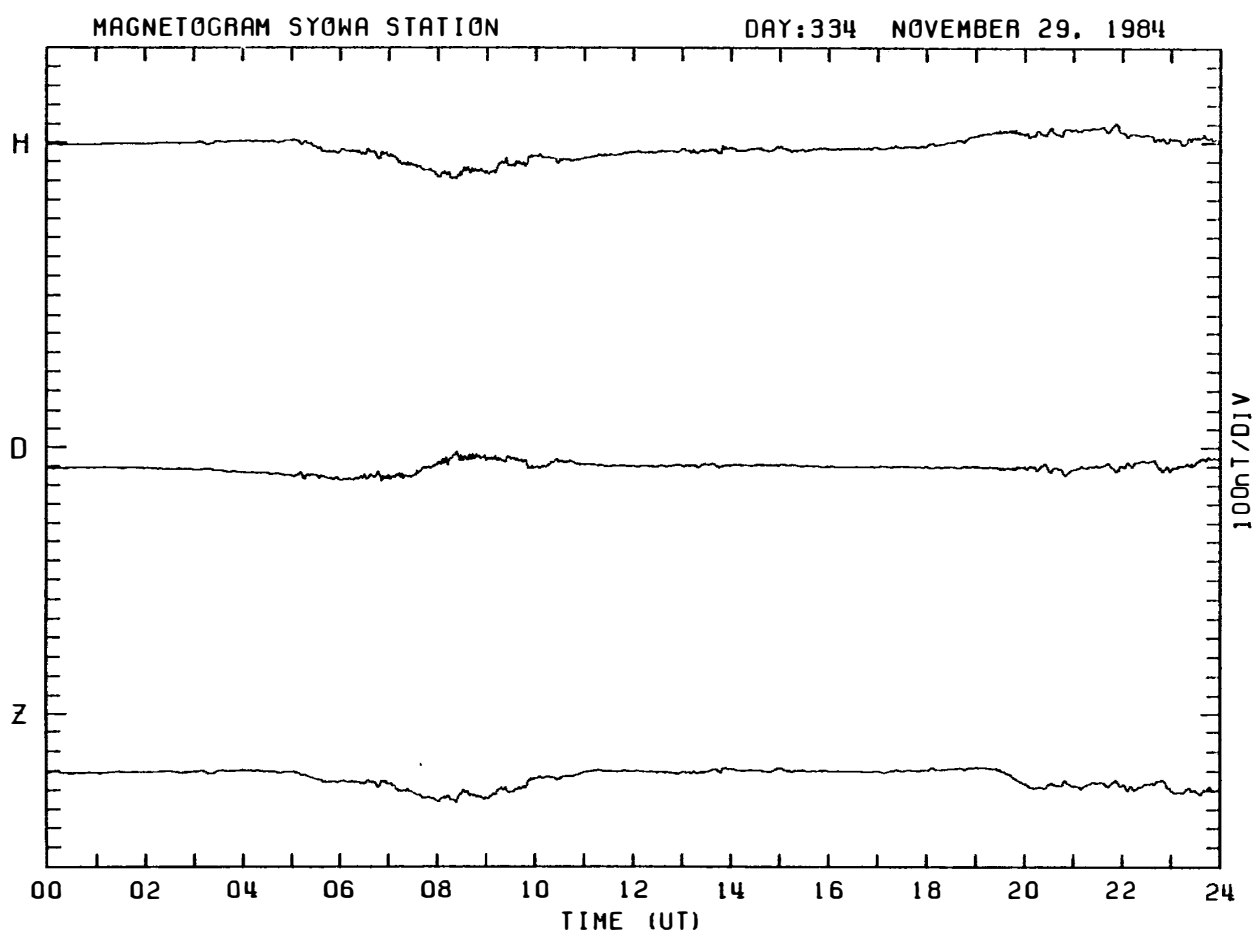
DAY:329 NOVEMBER 24, 1984

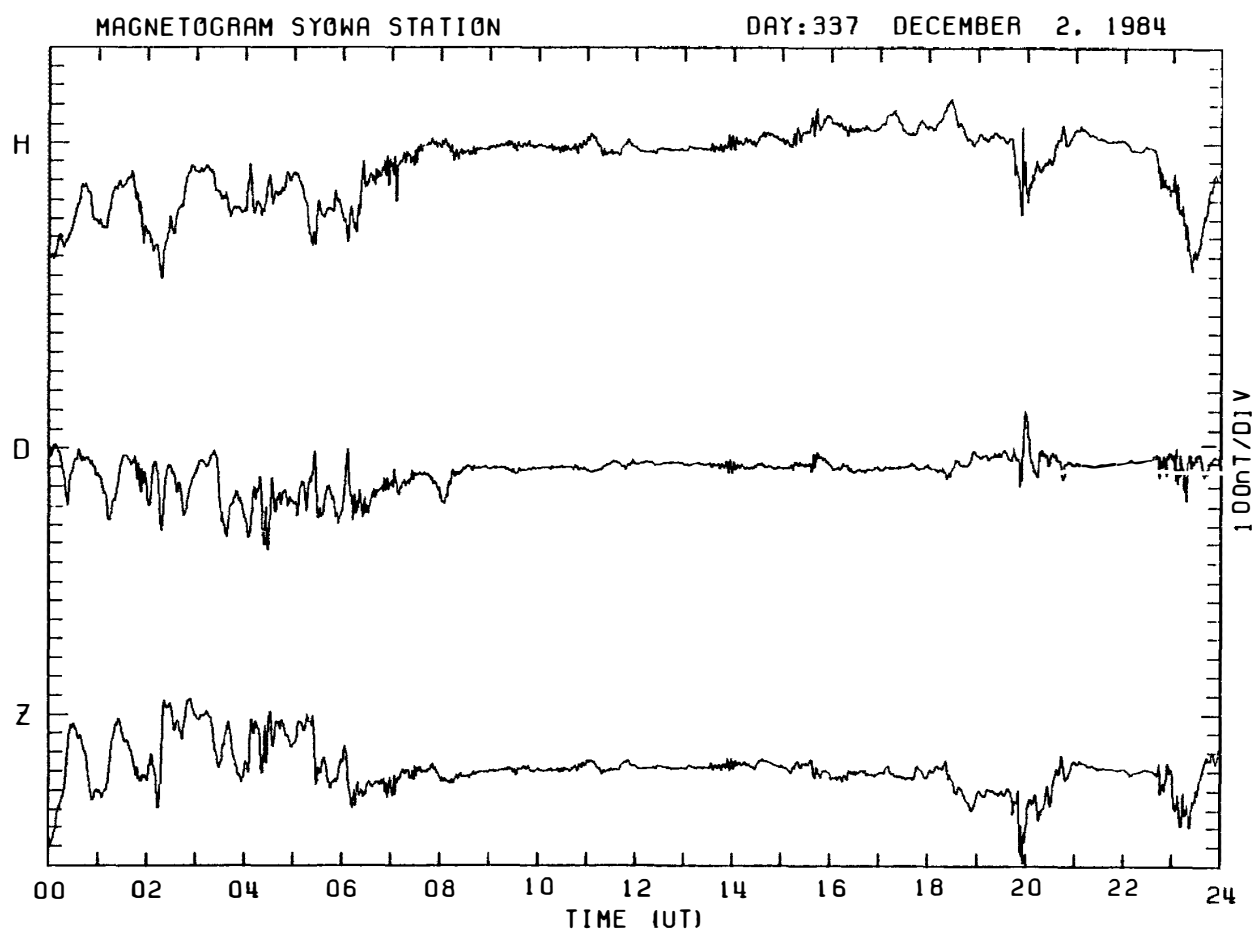
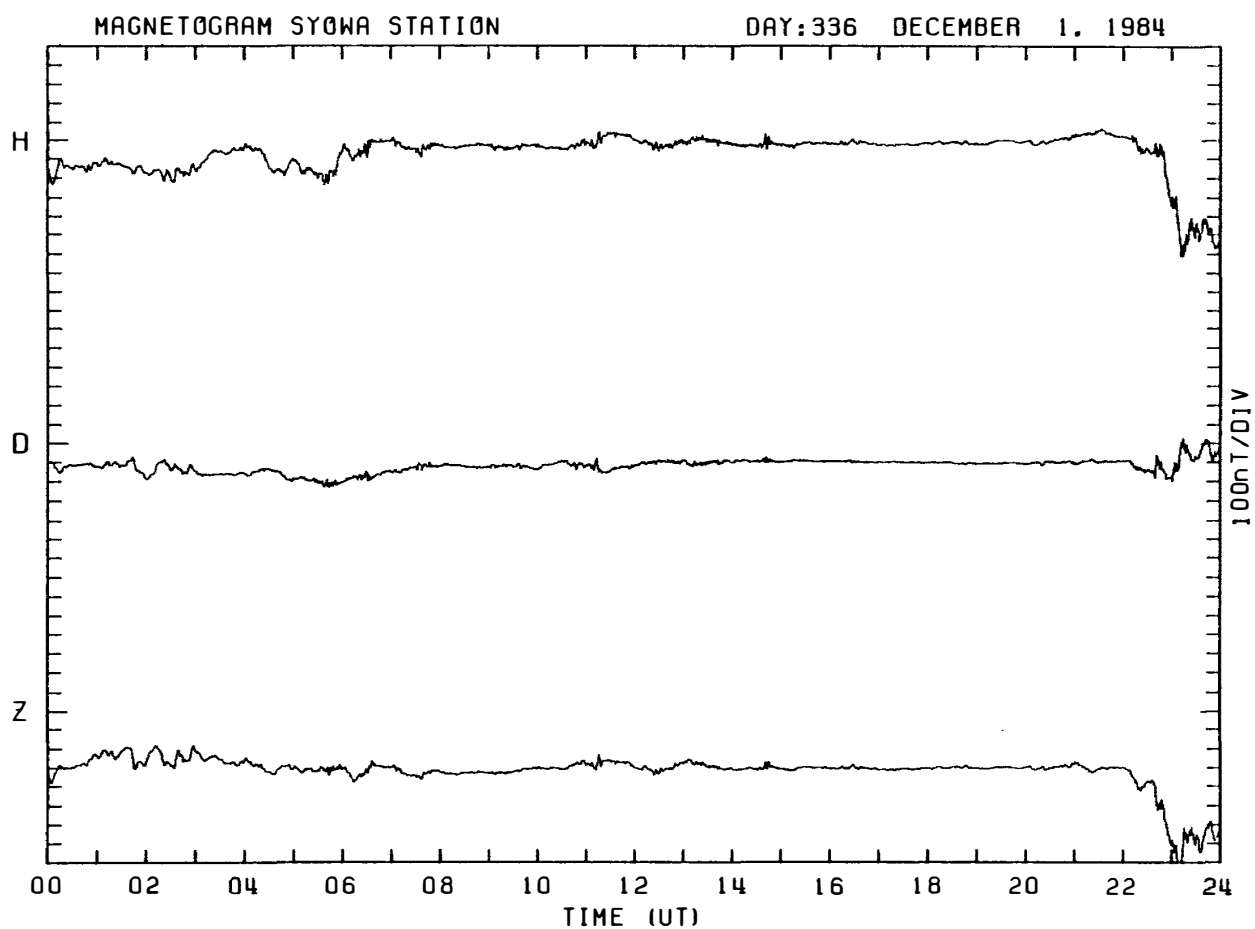


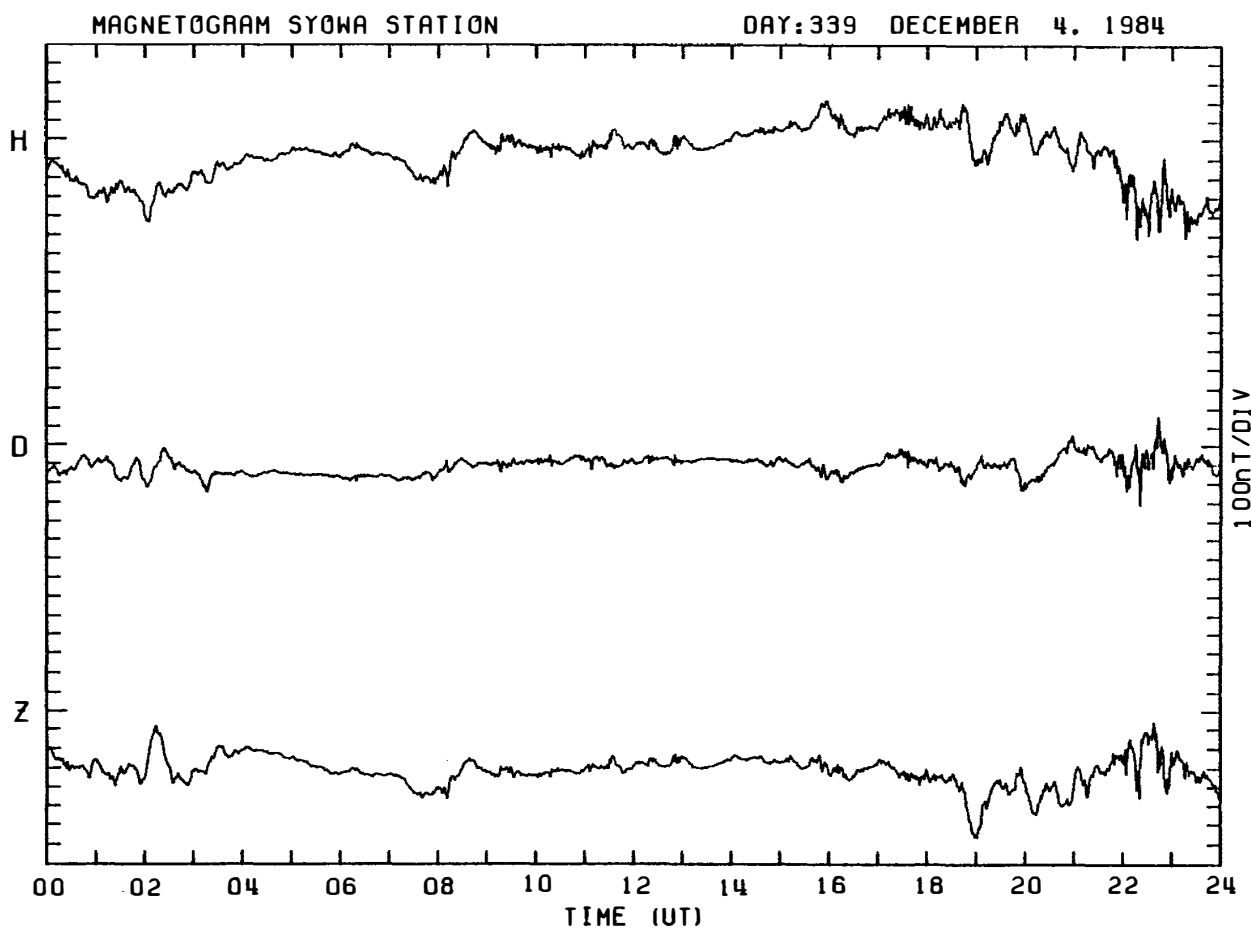
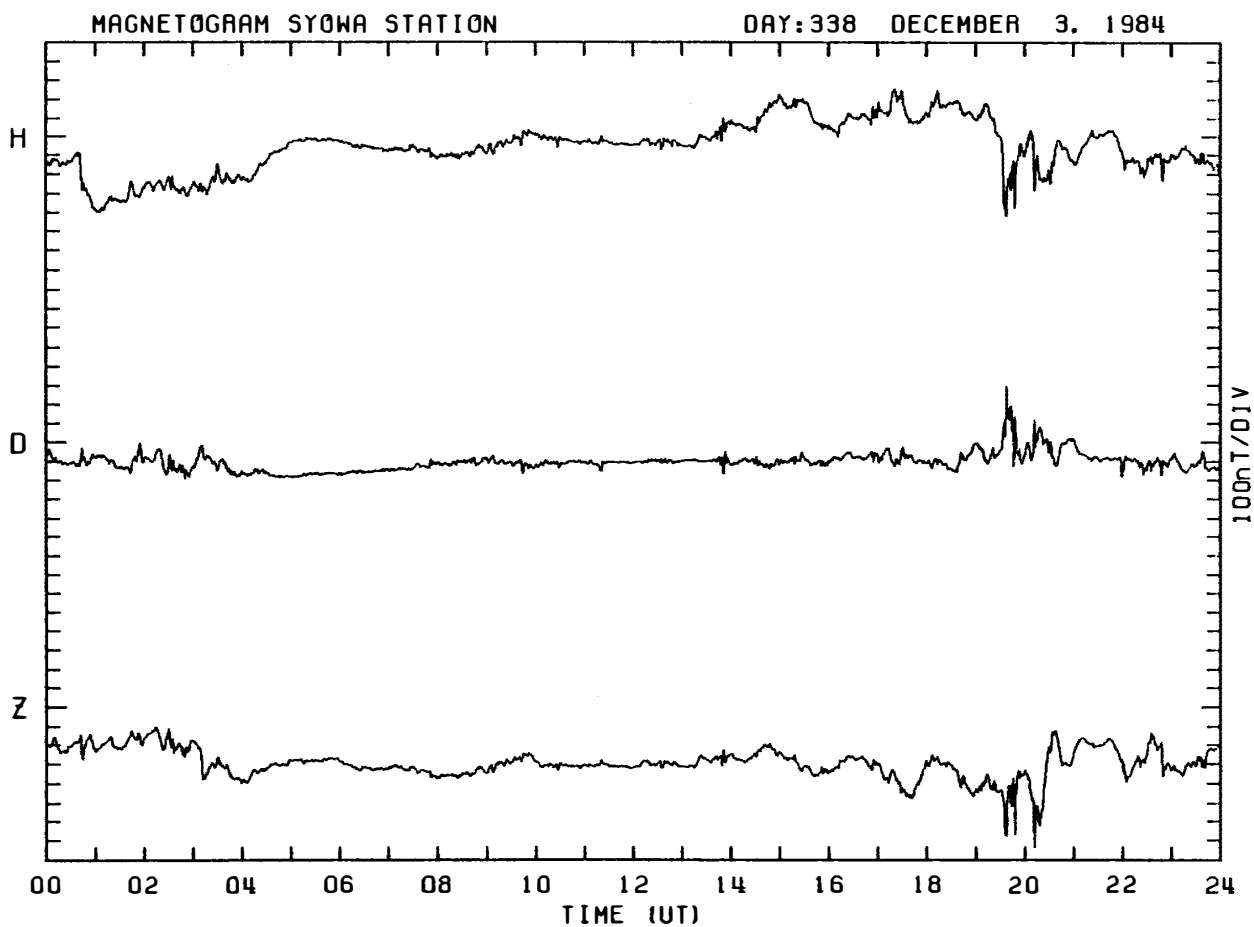






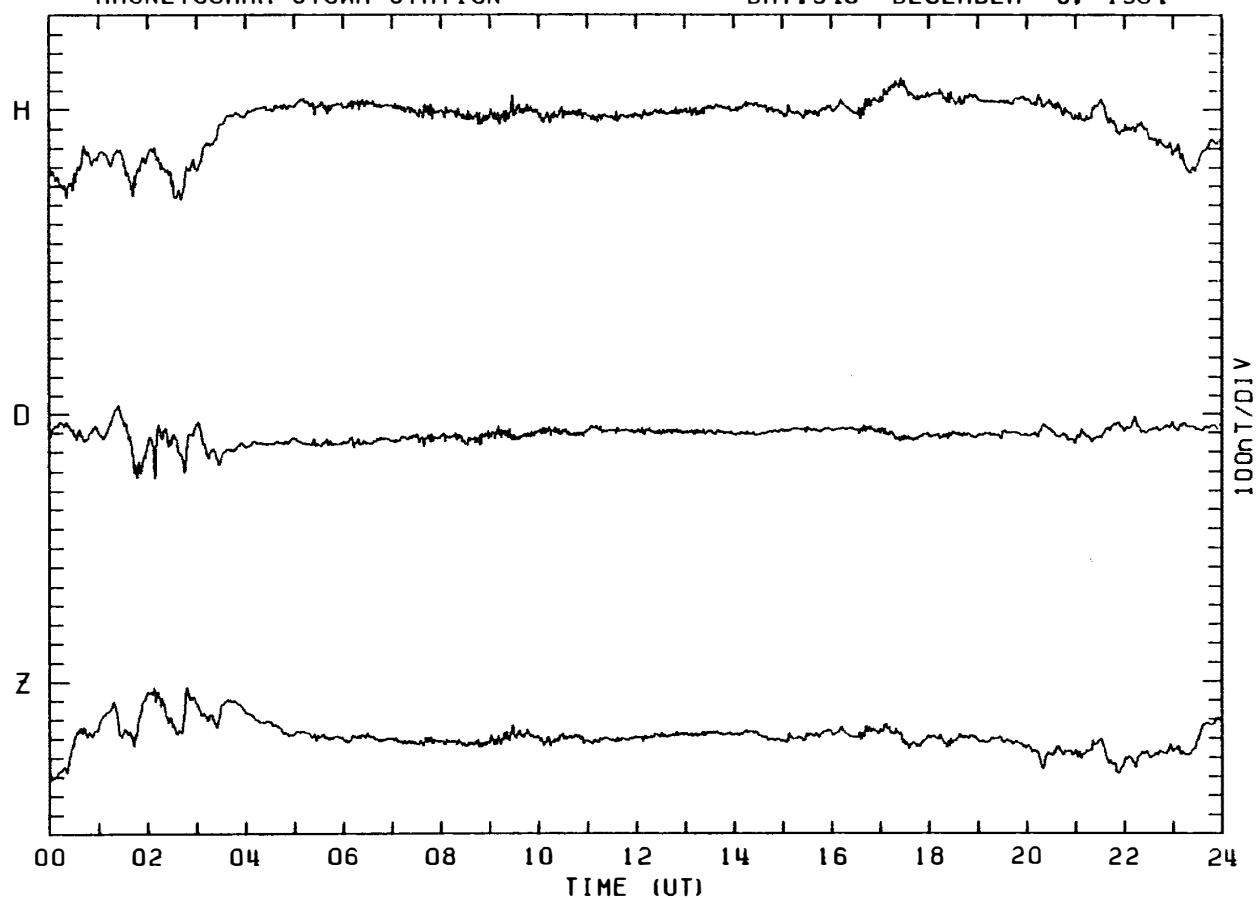






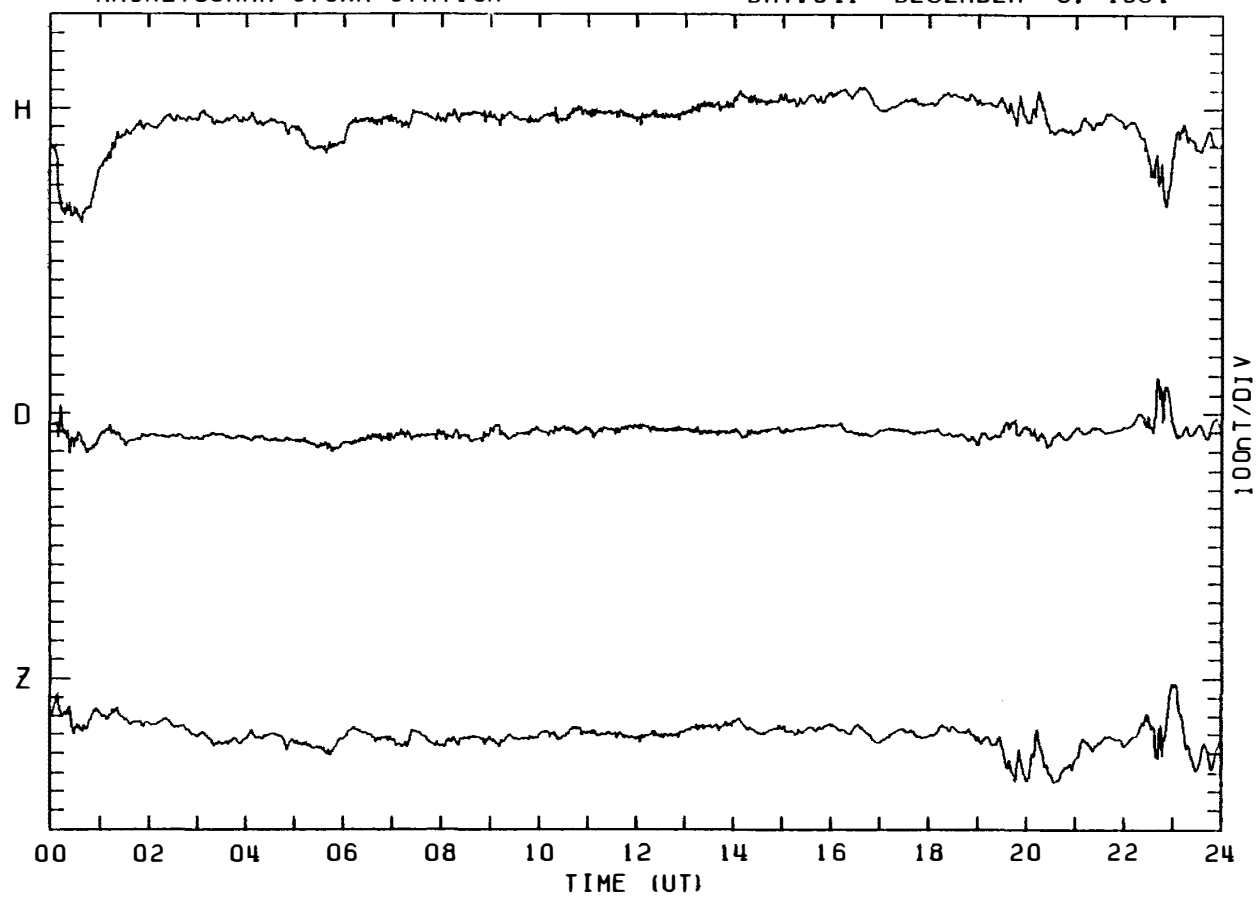
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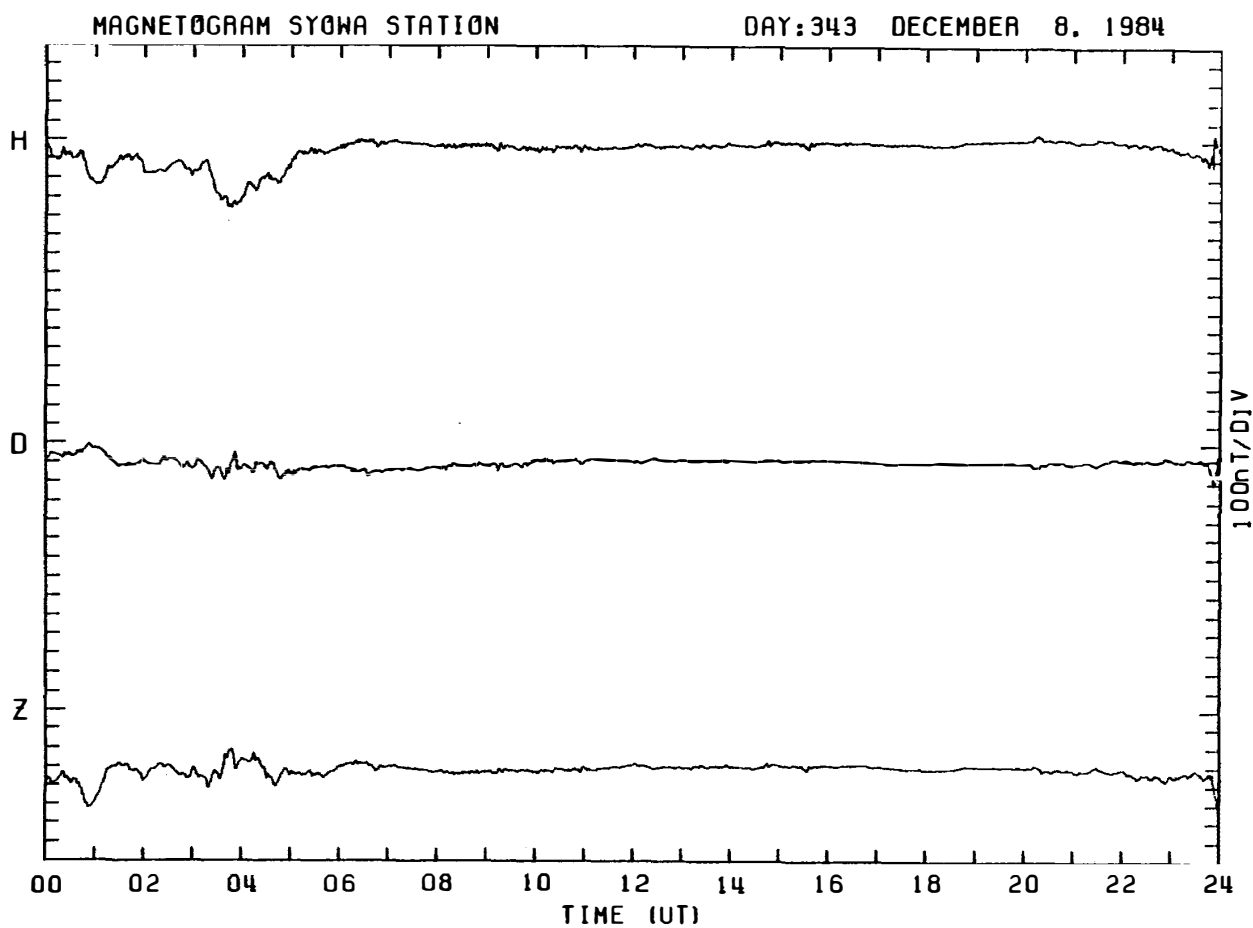
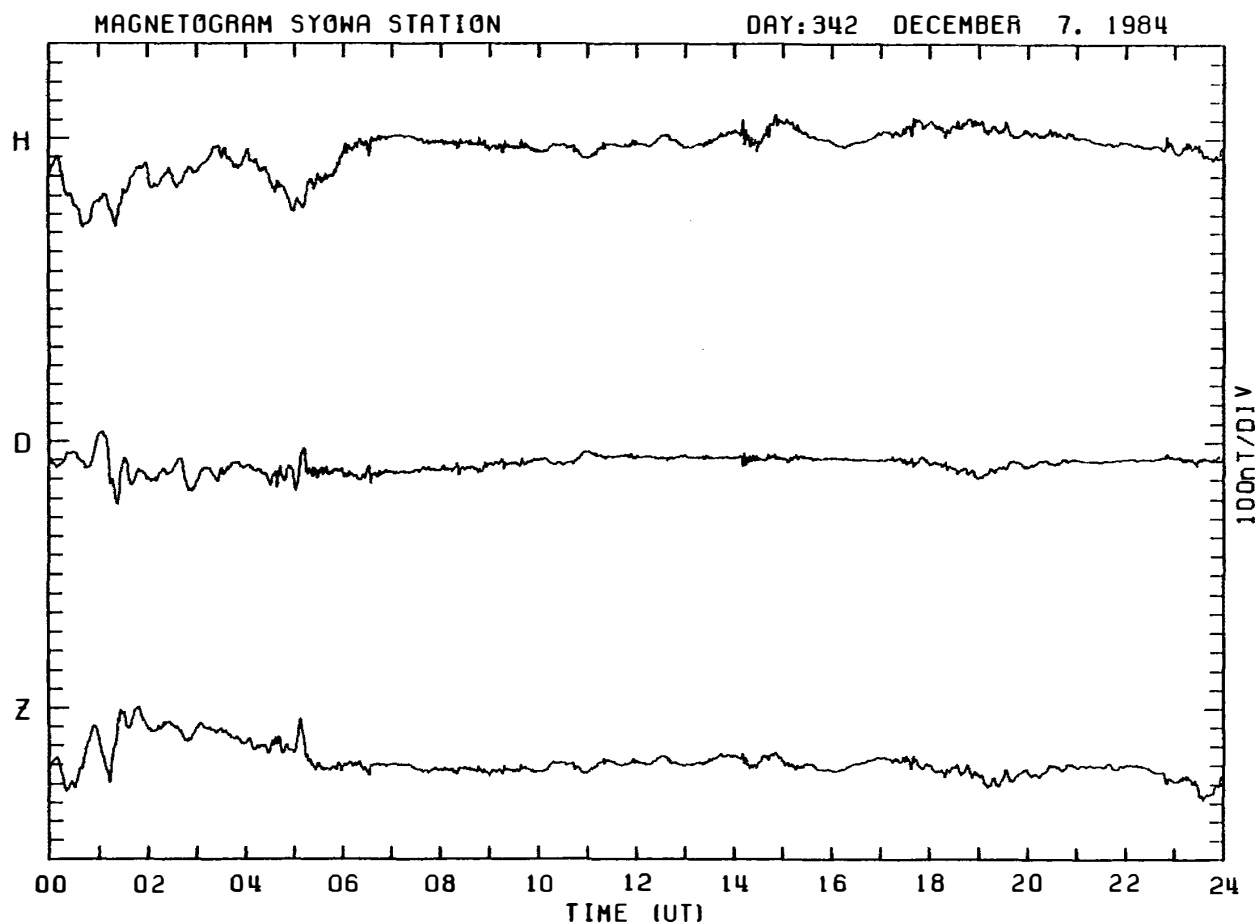
DAY:340 DECEMBER 5, 1984

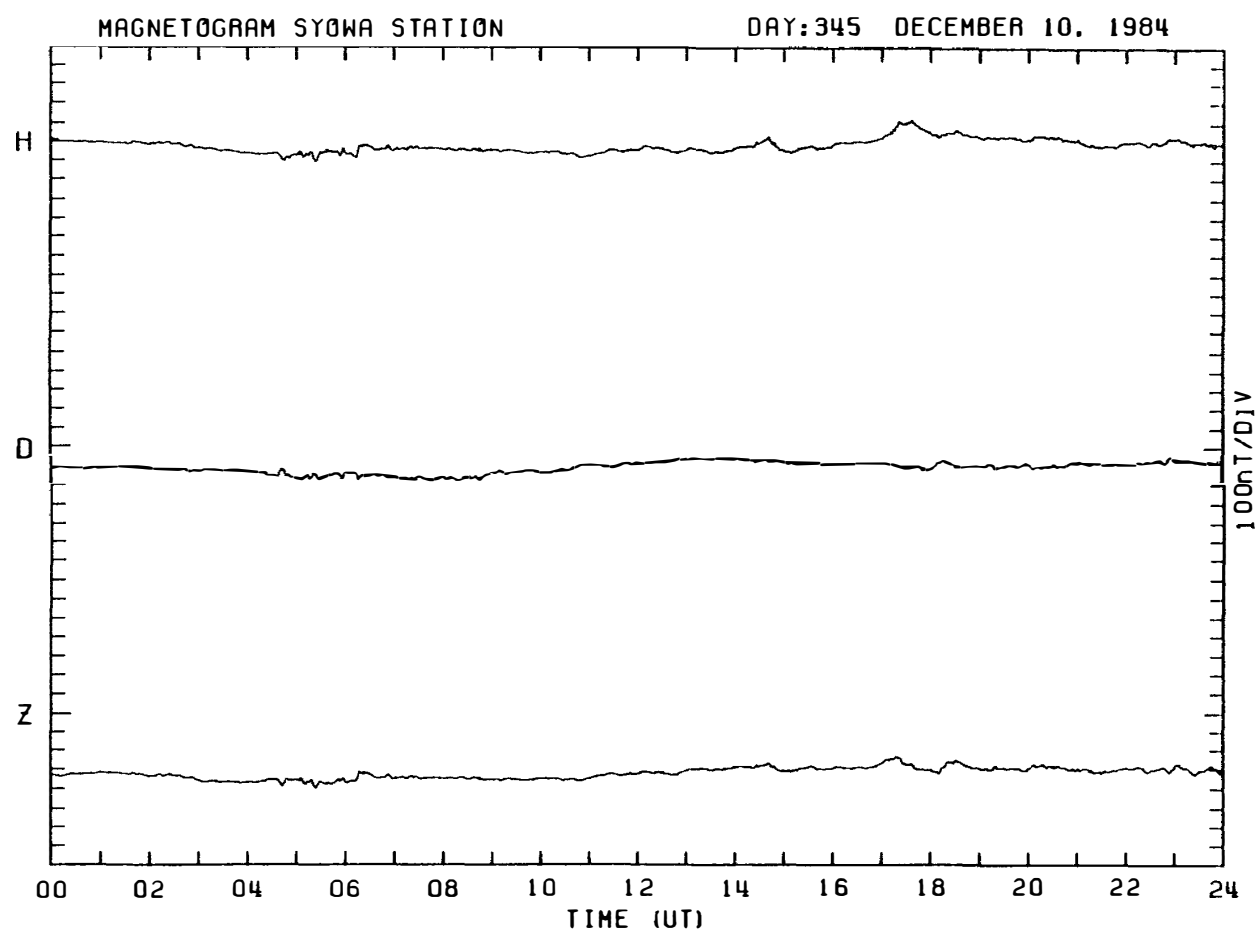
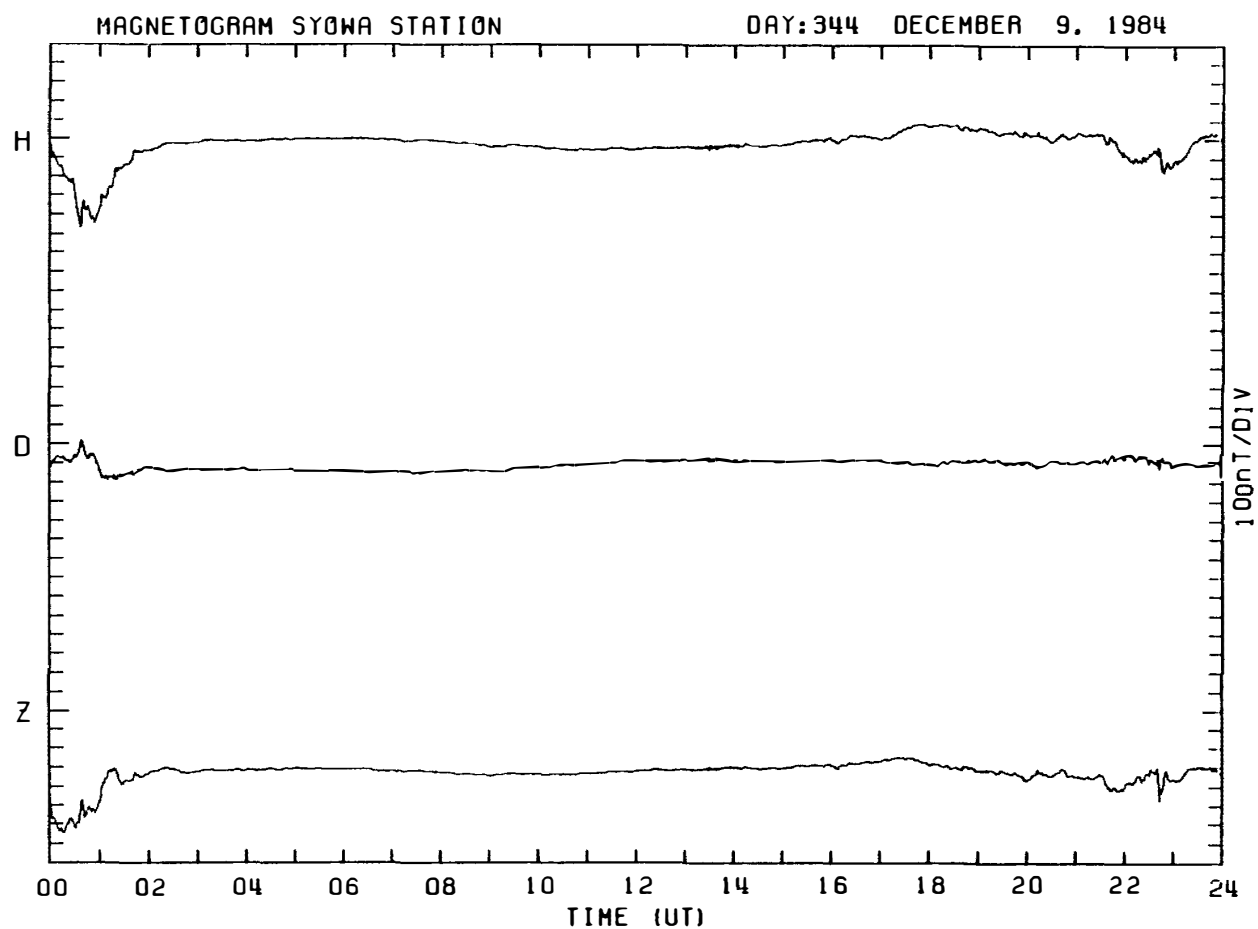


MAGNETOGRAM SYOWA STATION

DAY:341 DECEMBER 6, 1984

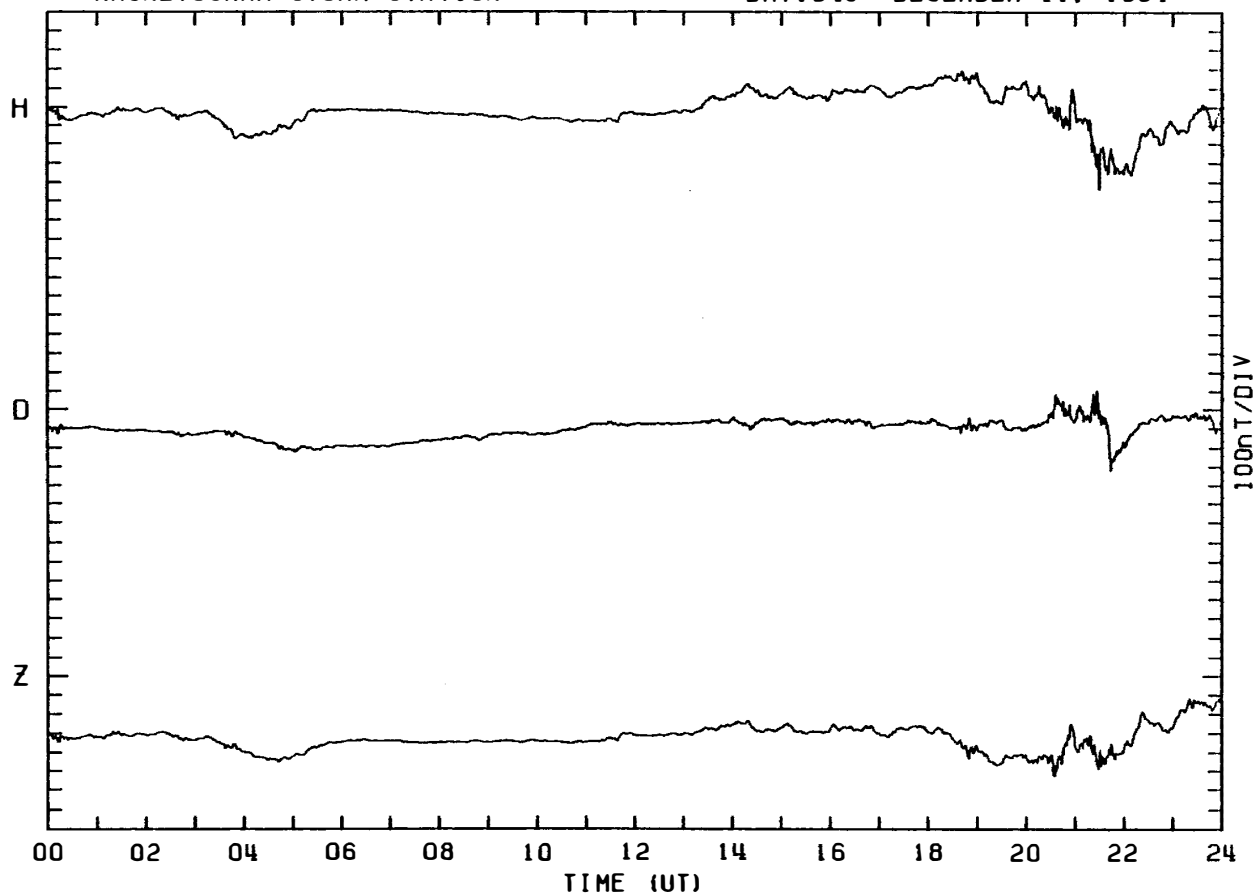






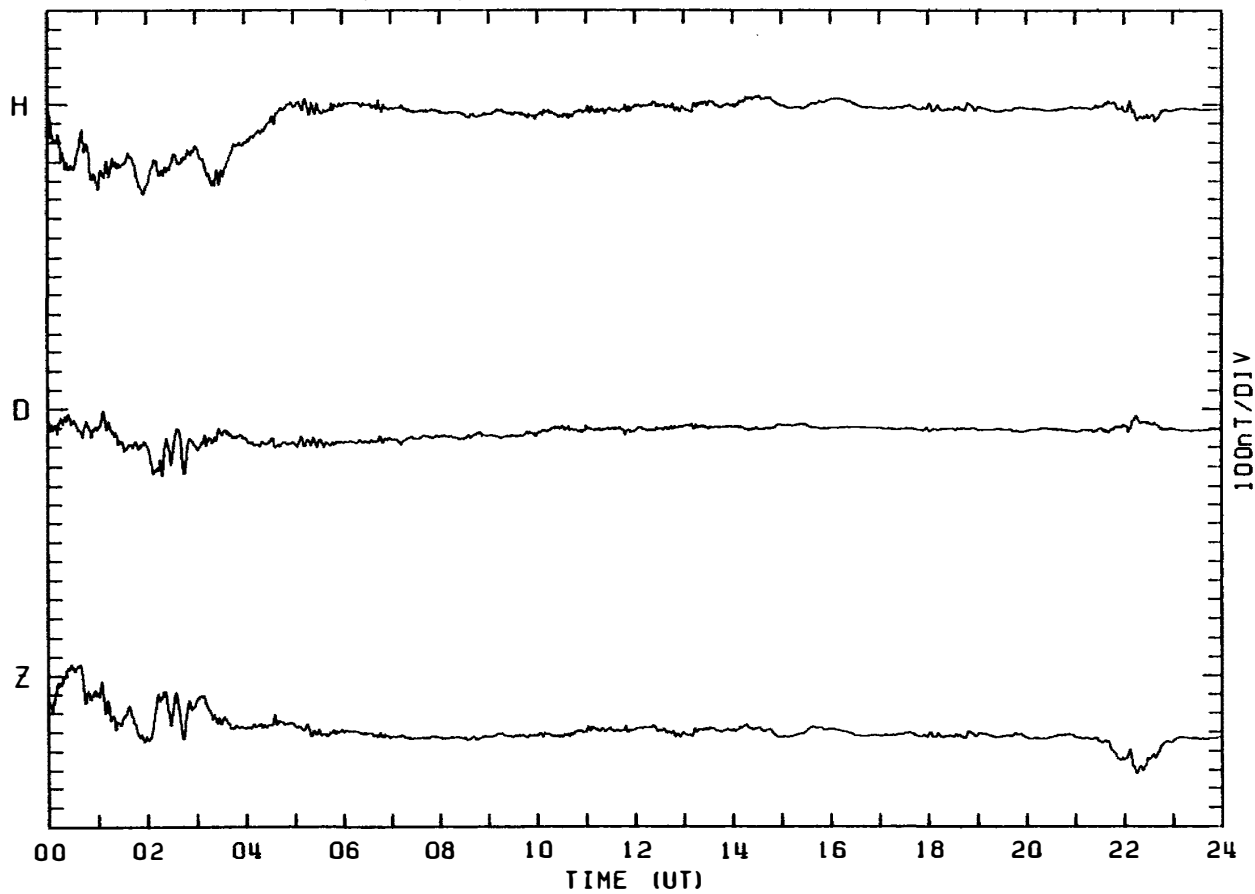
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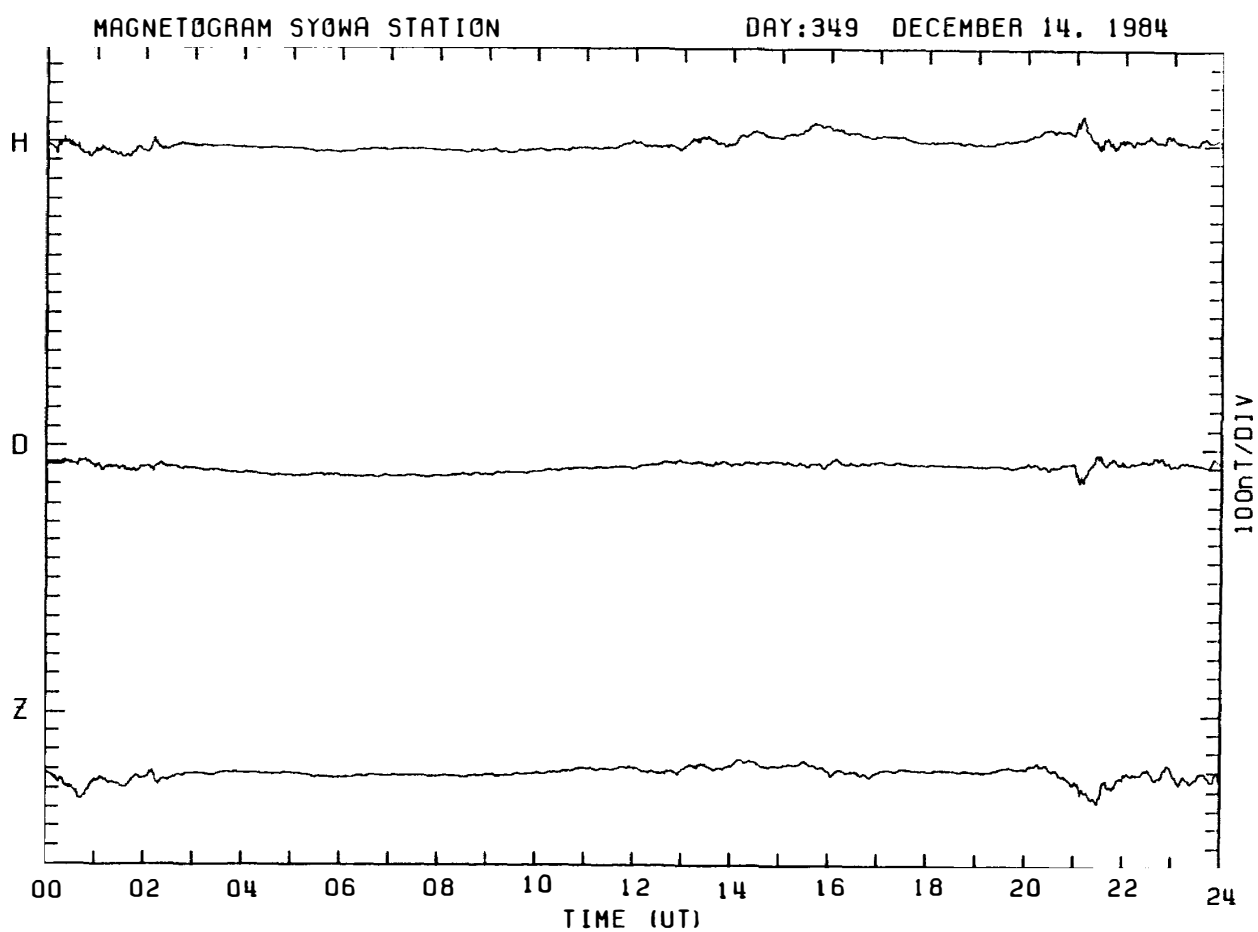
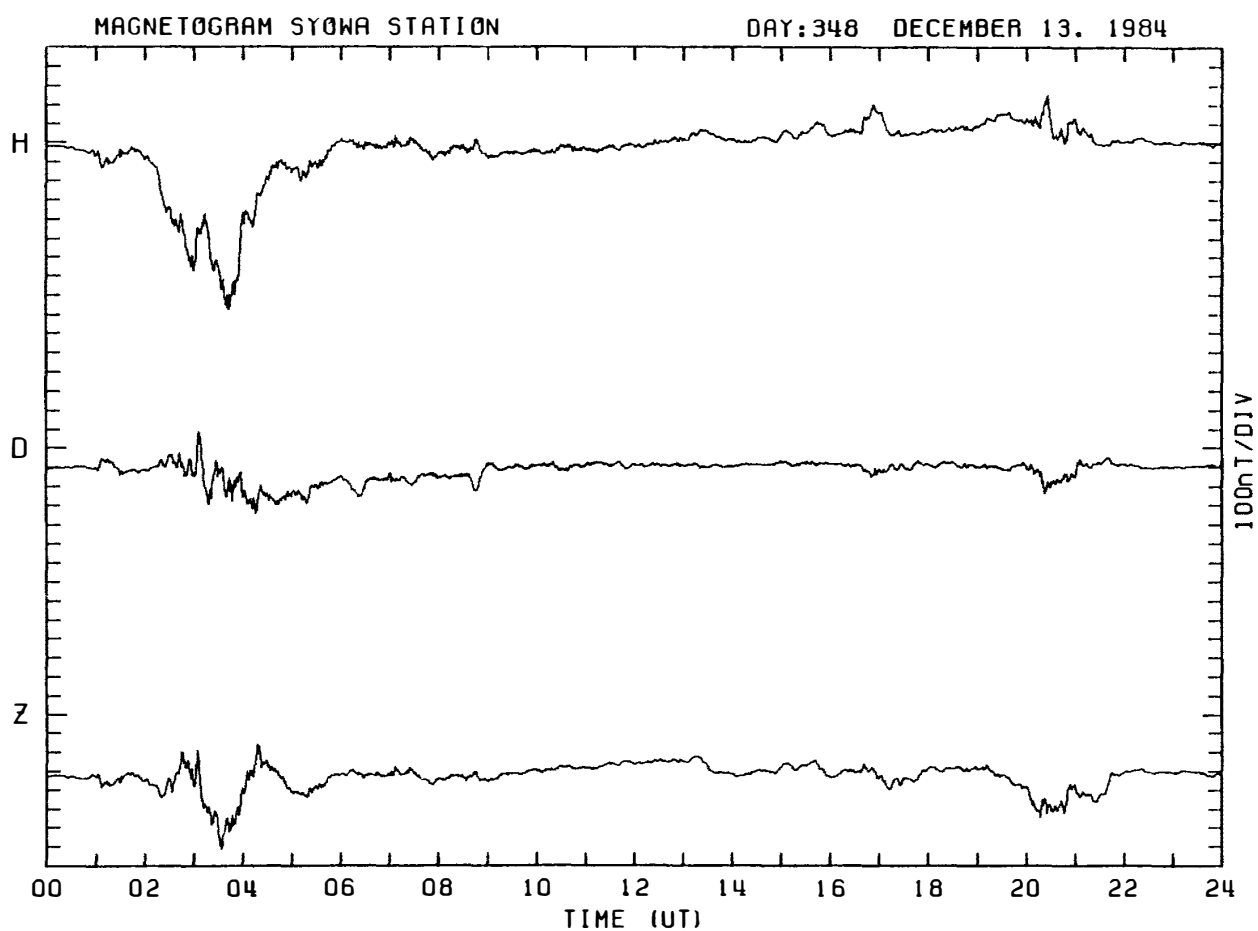
DAY:346 DECEMBER 11. 1984



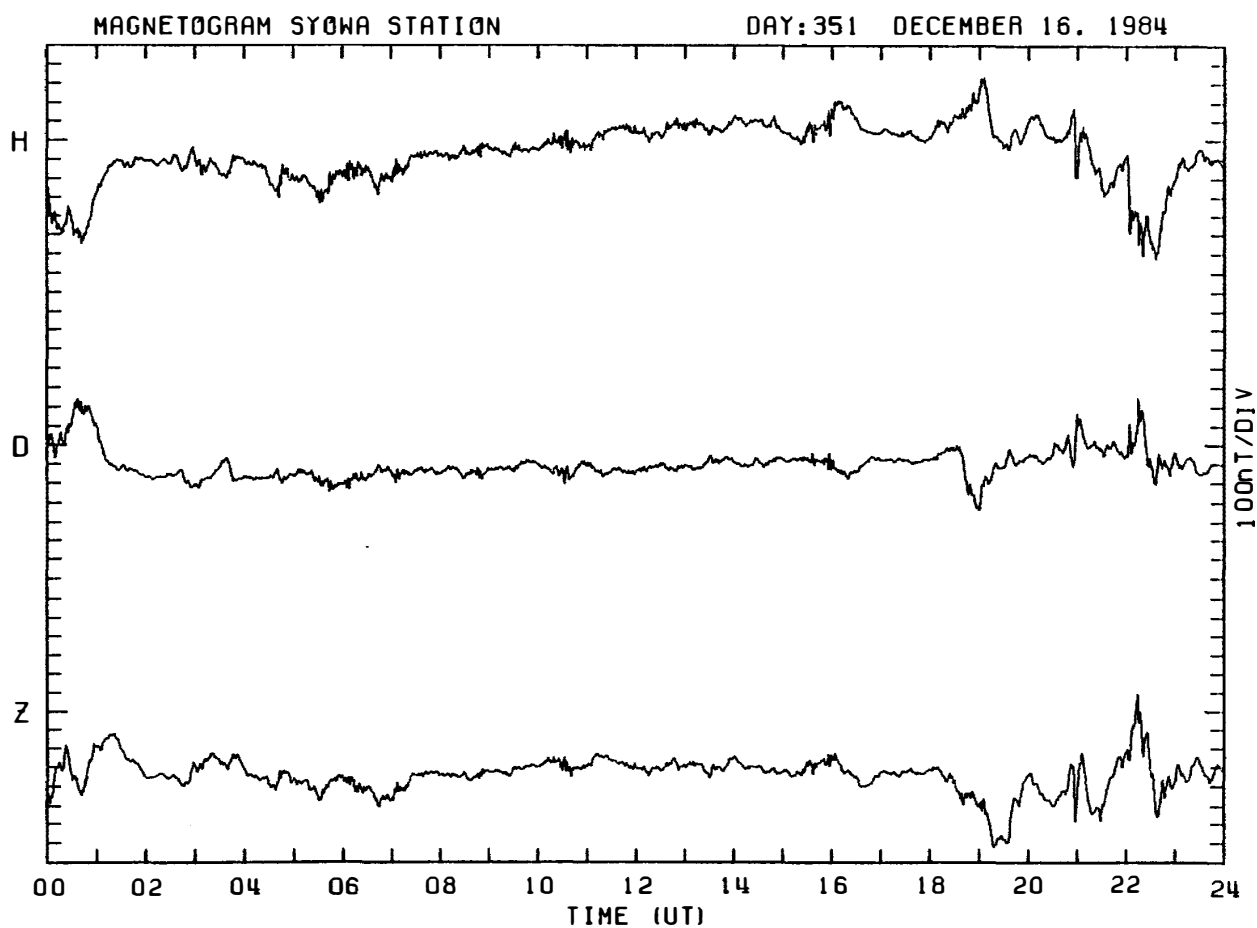
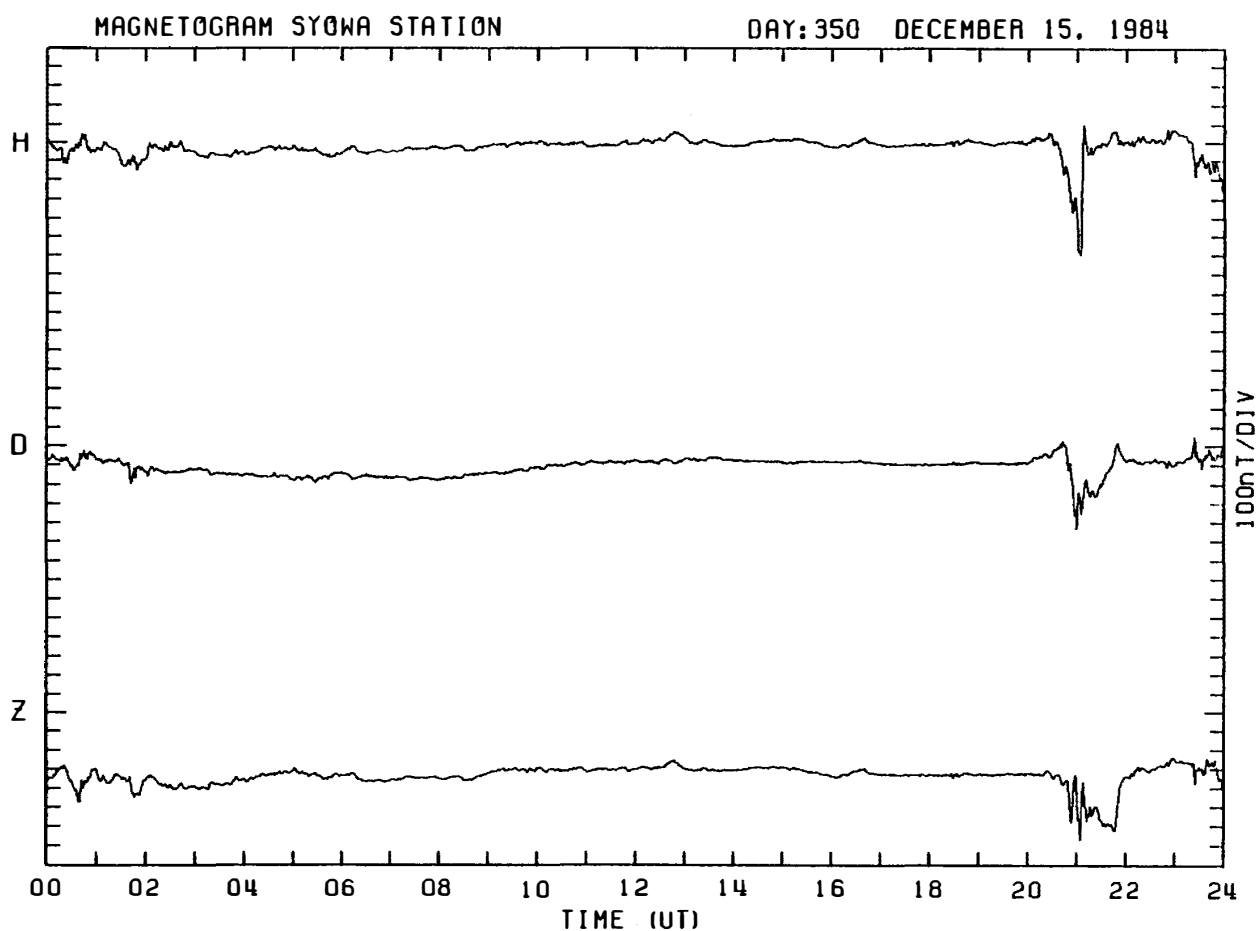
MAGNETOGRAM SYOWA STATION

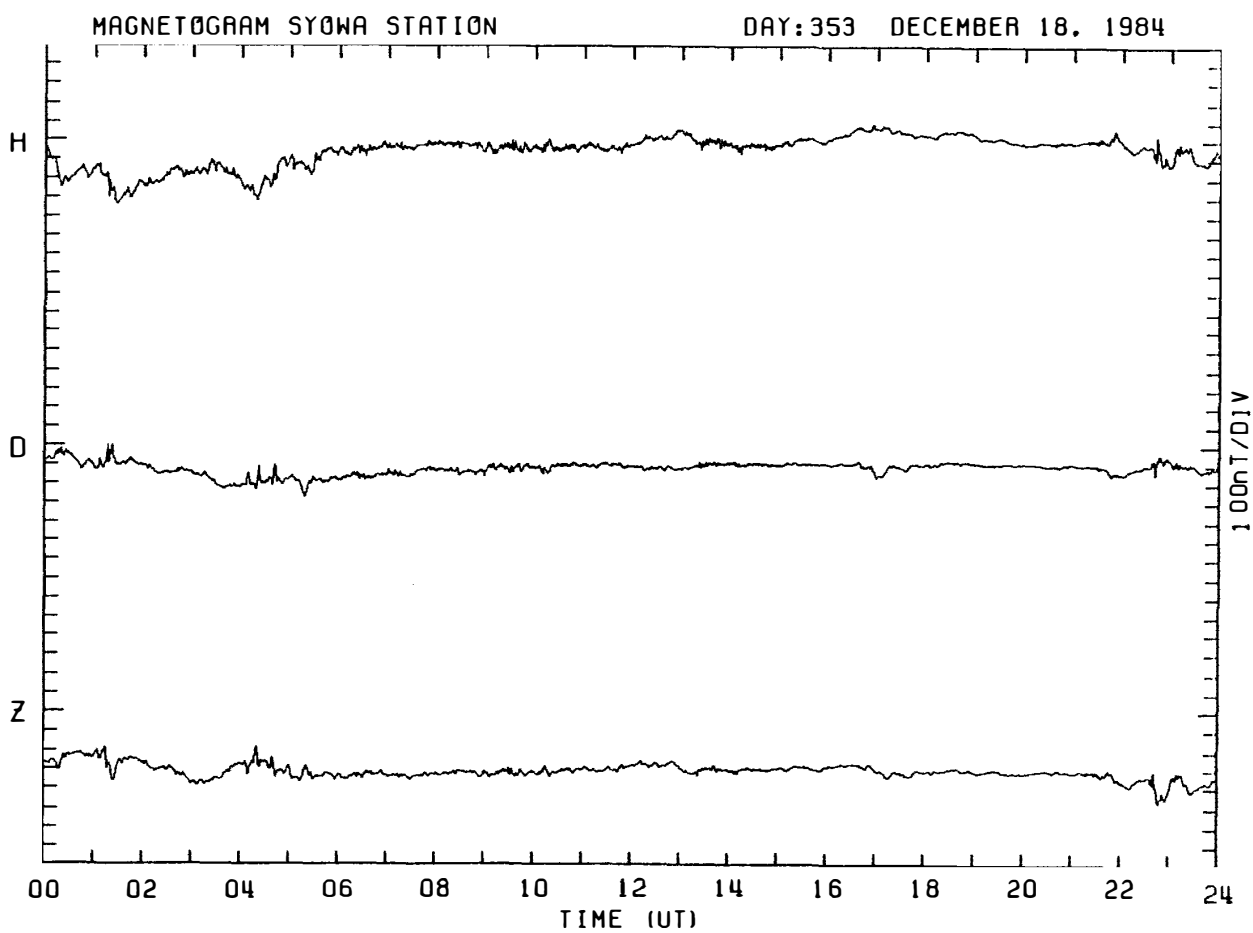
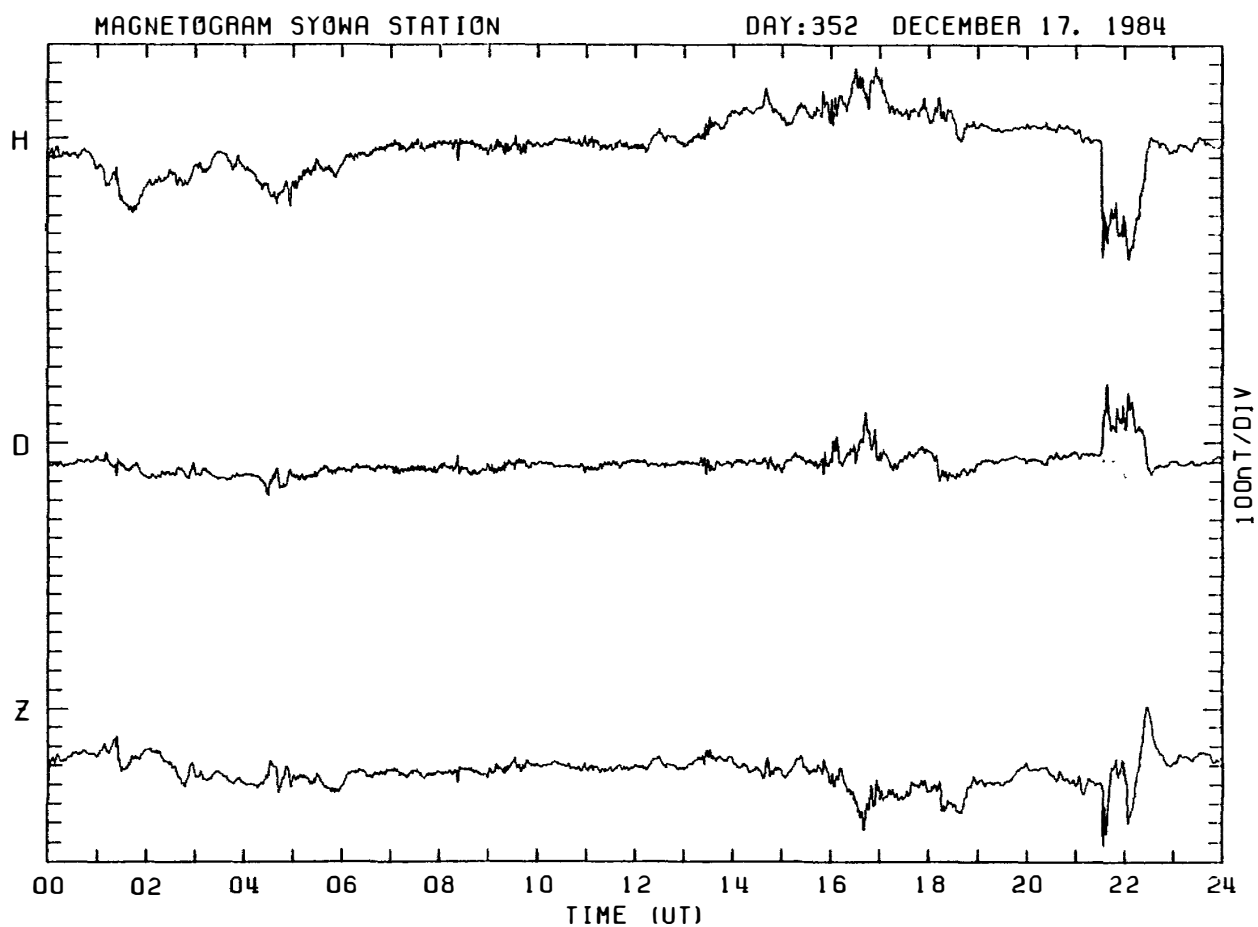
DAY:347 DECEMBER 12. 1984

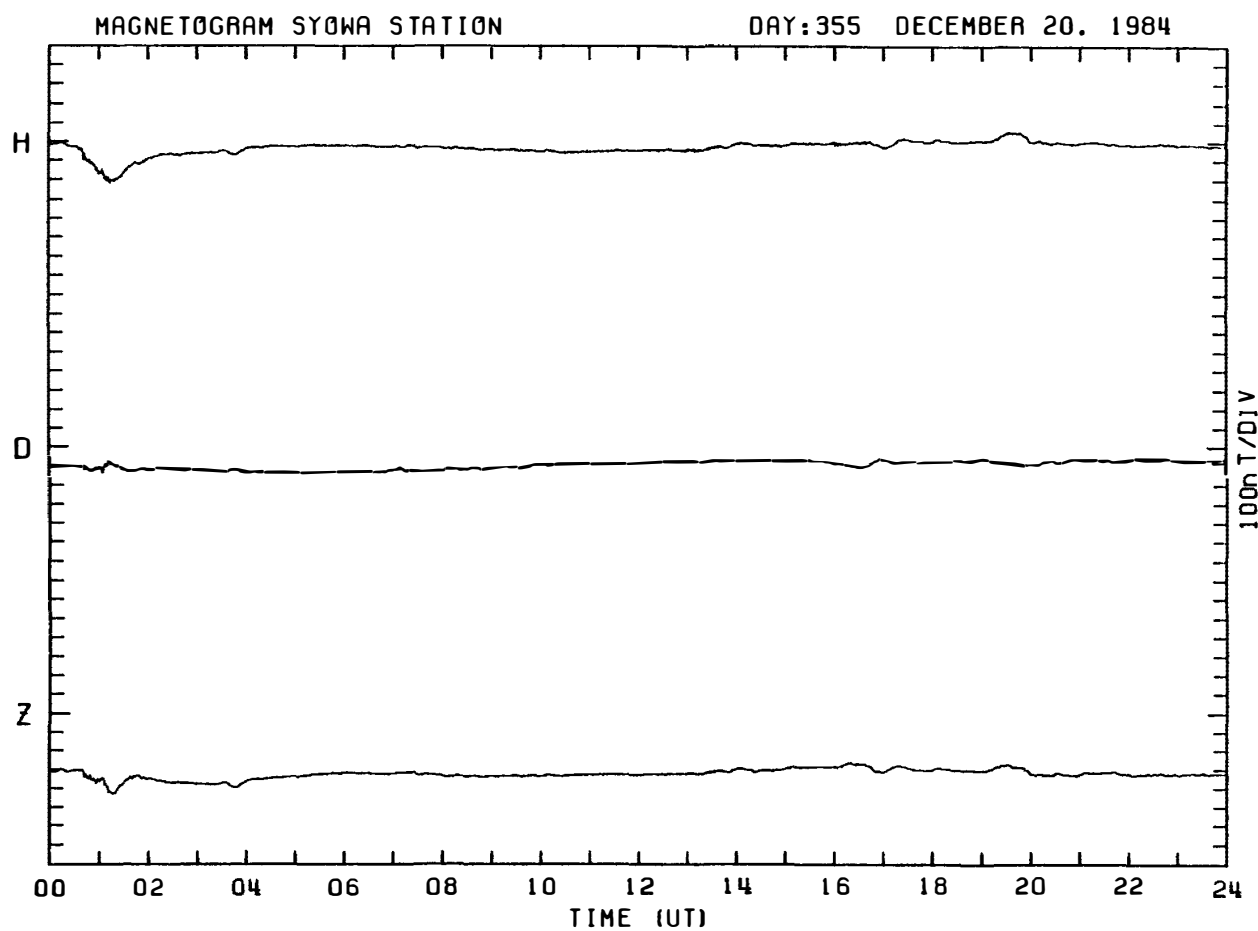
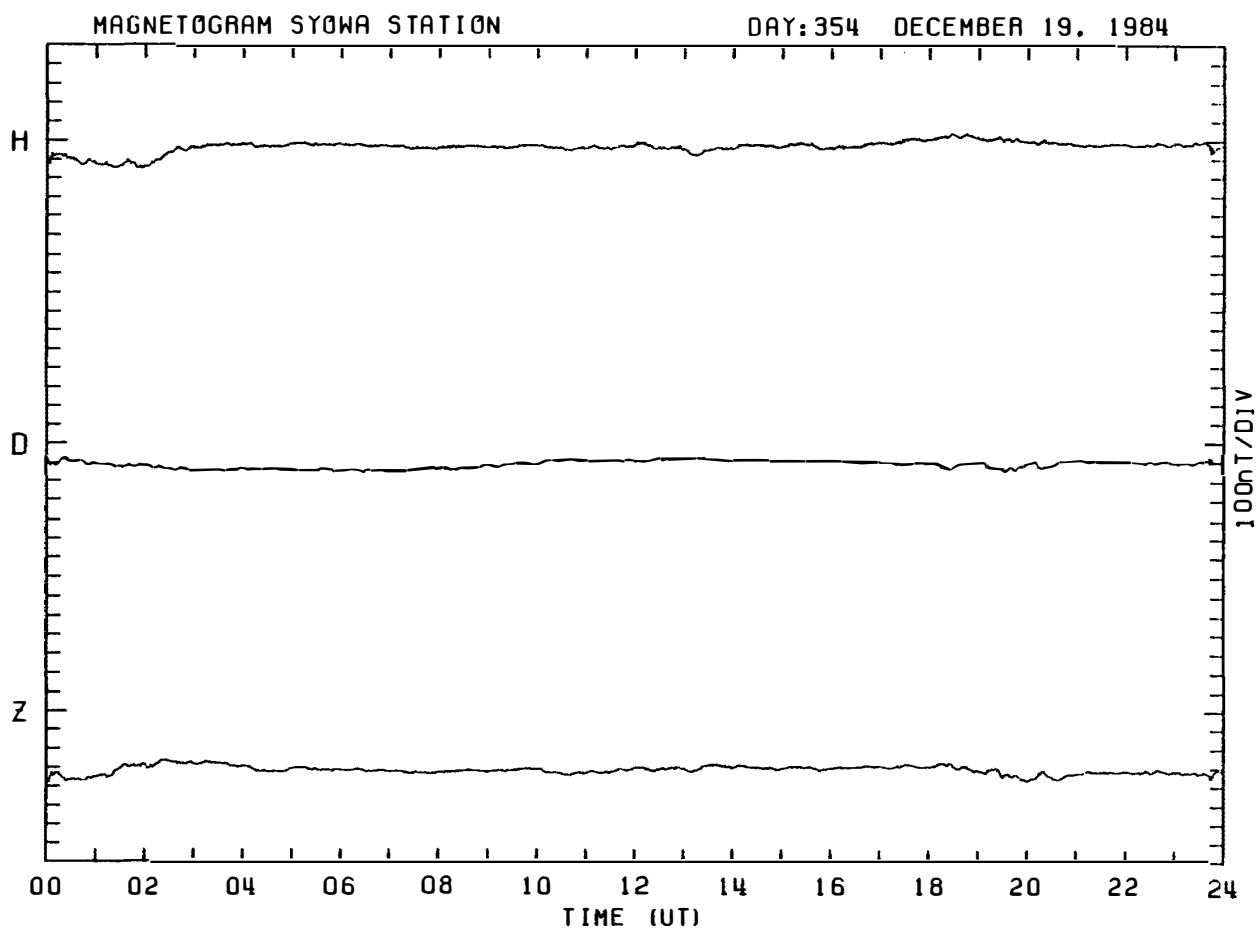


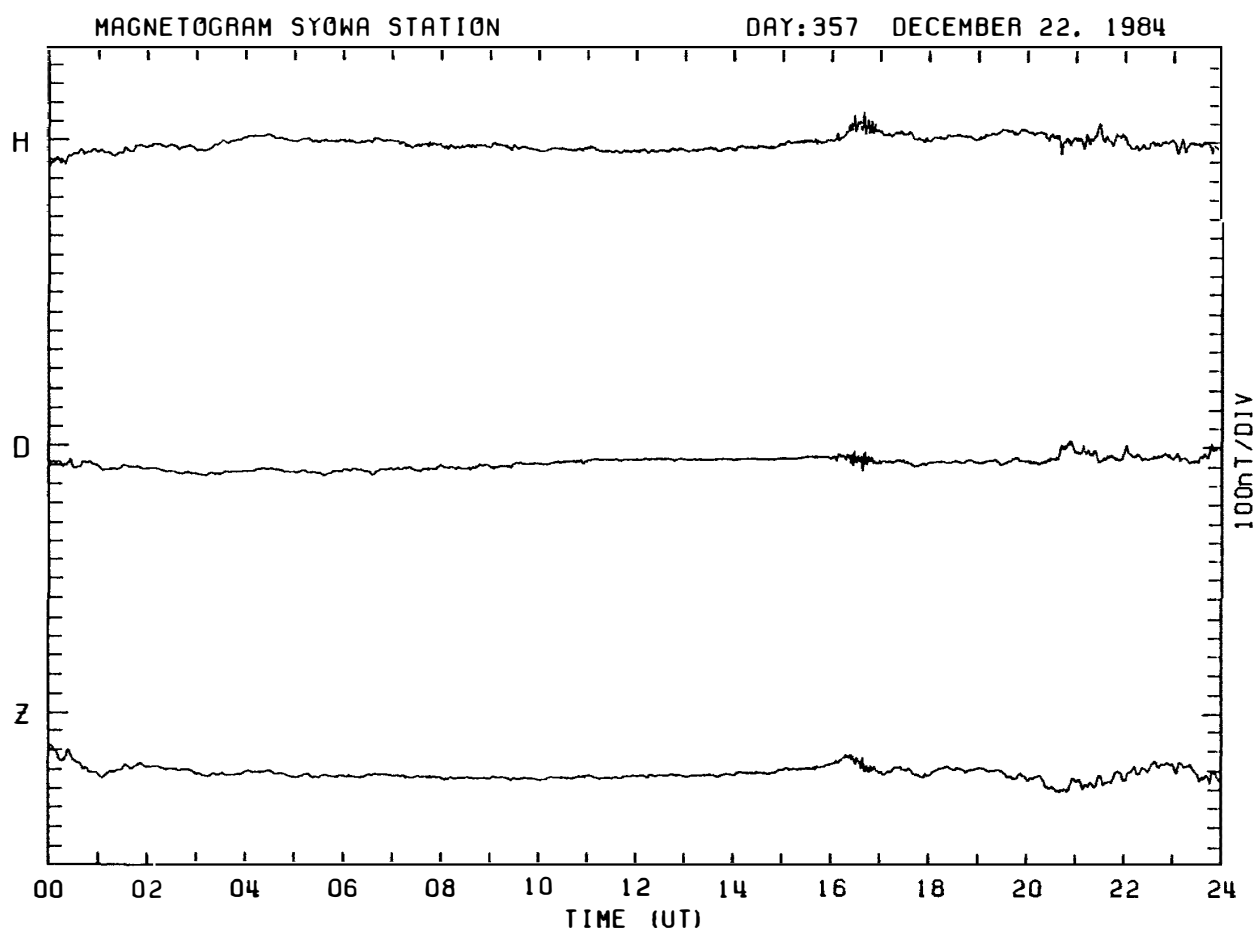
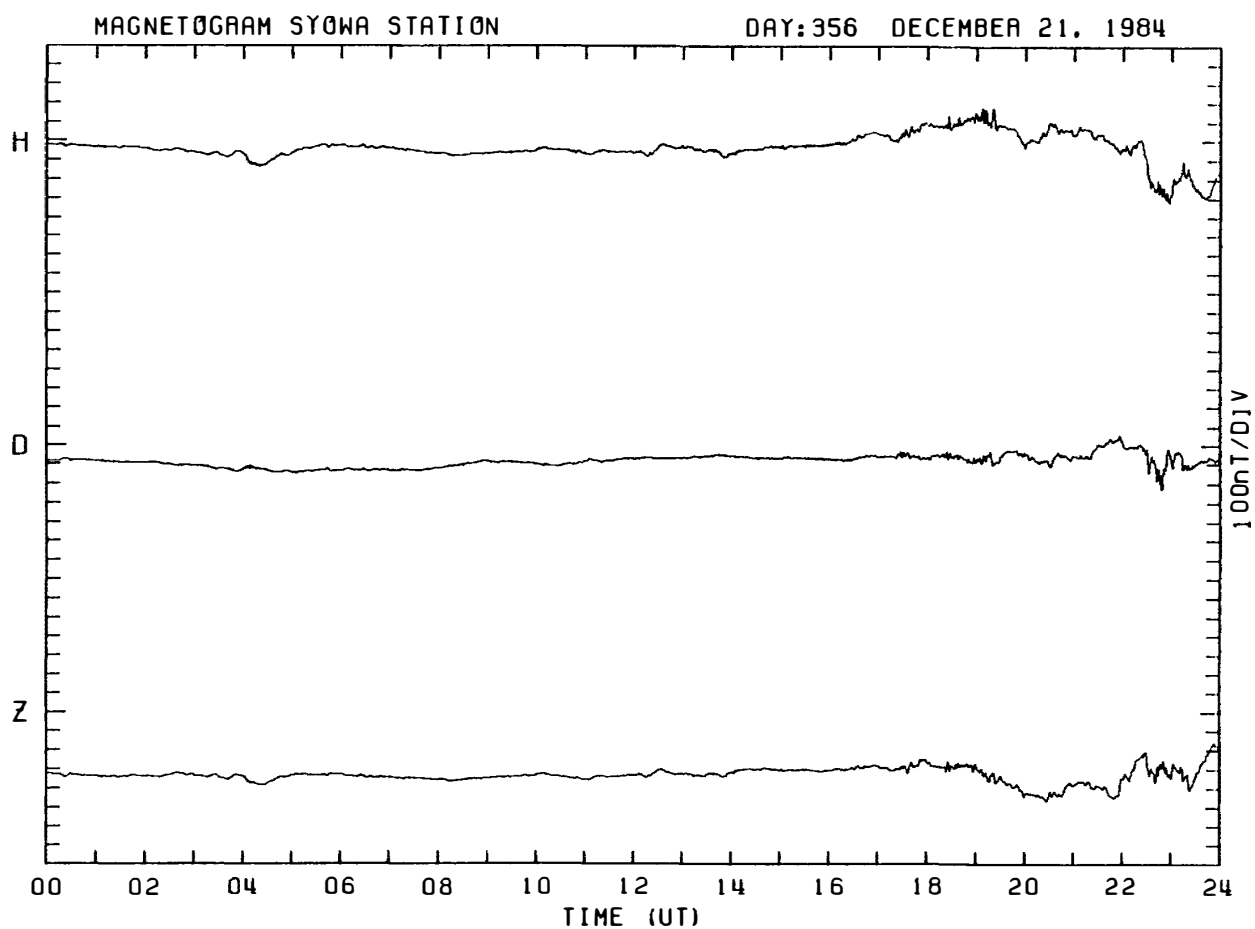


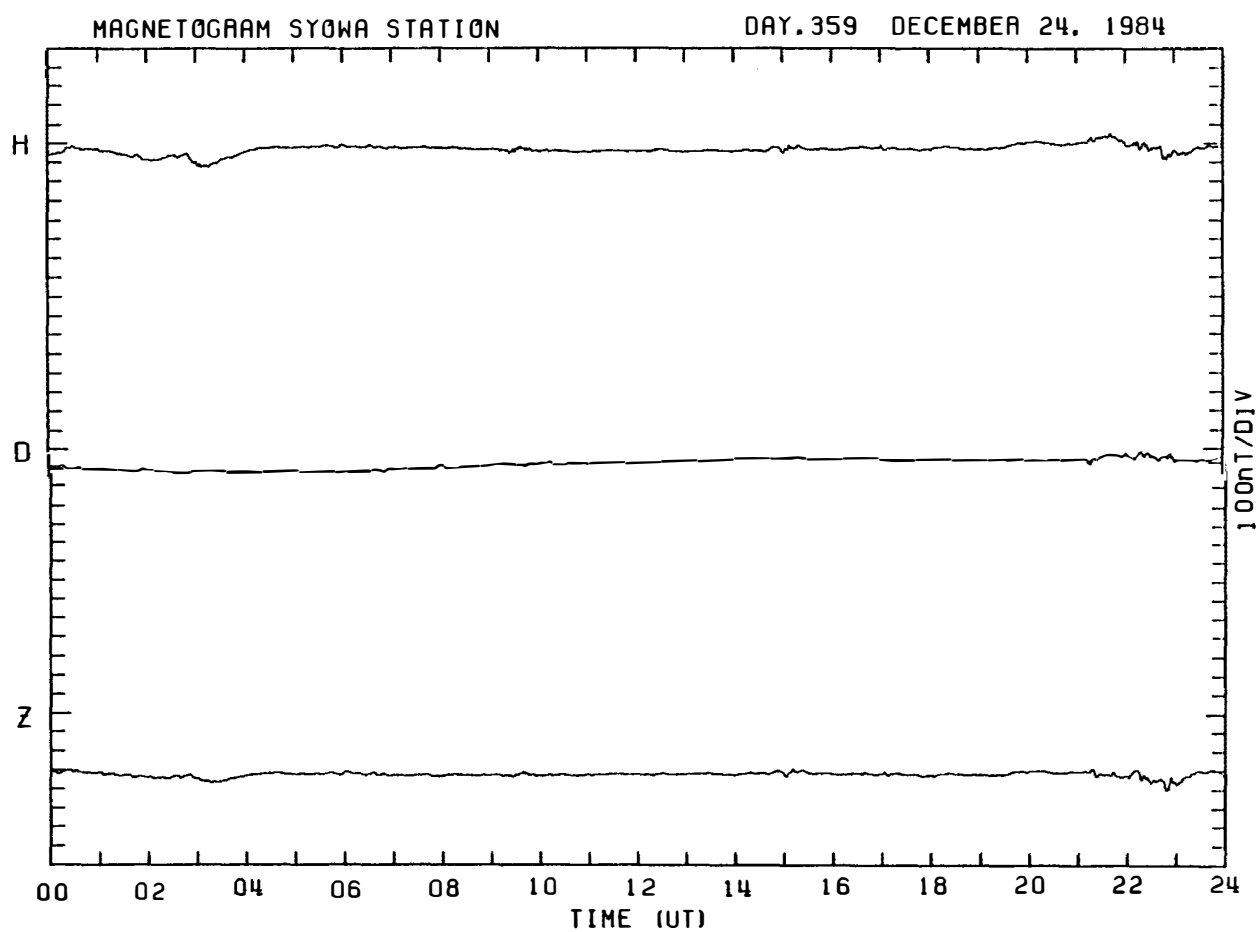
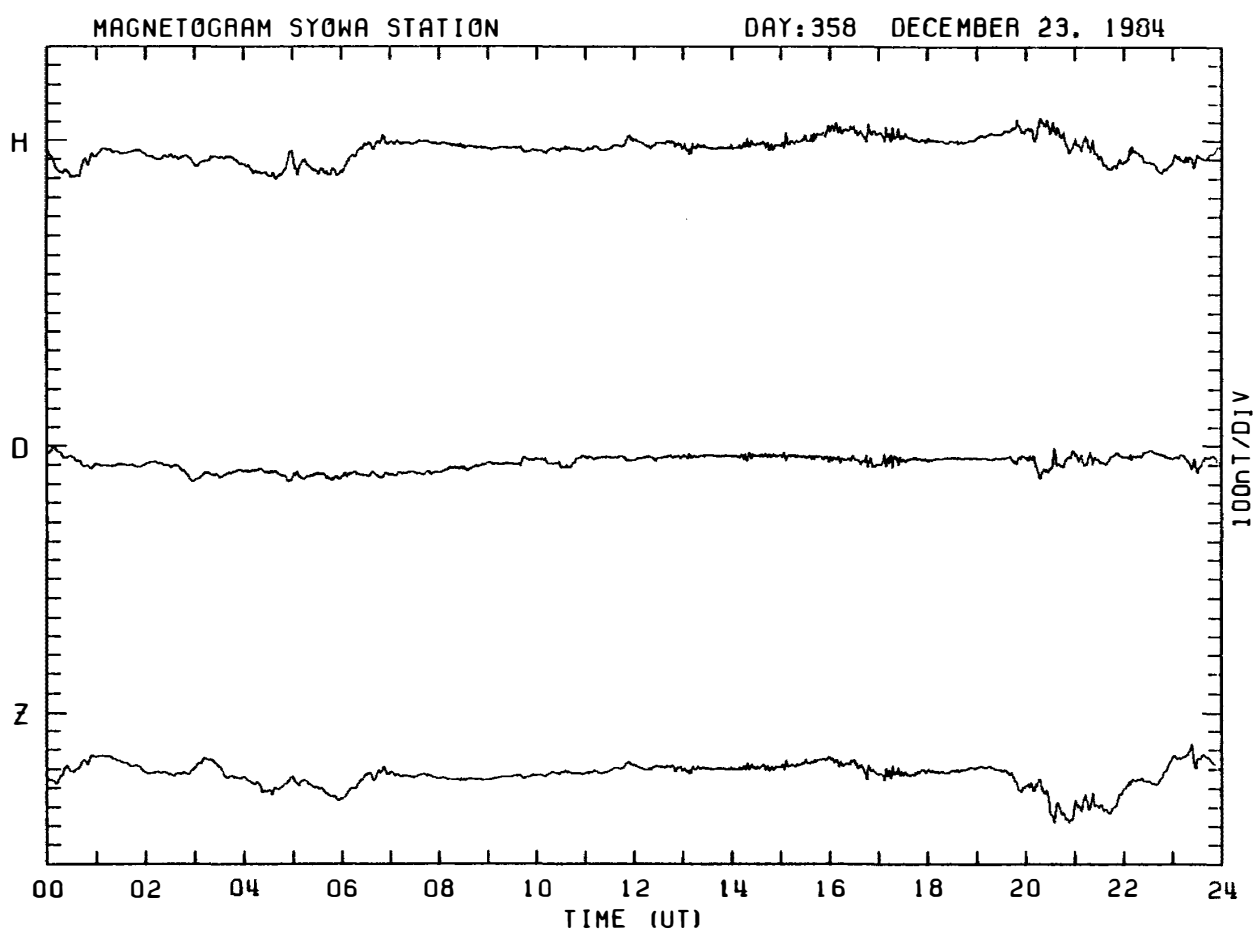


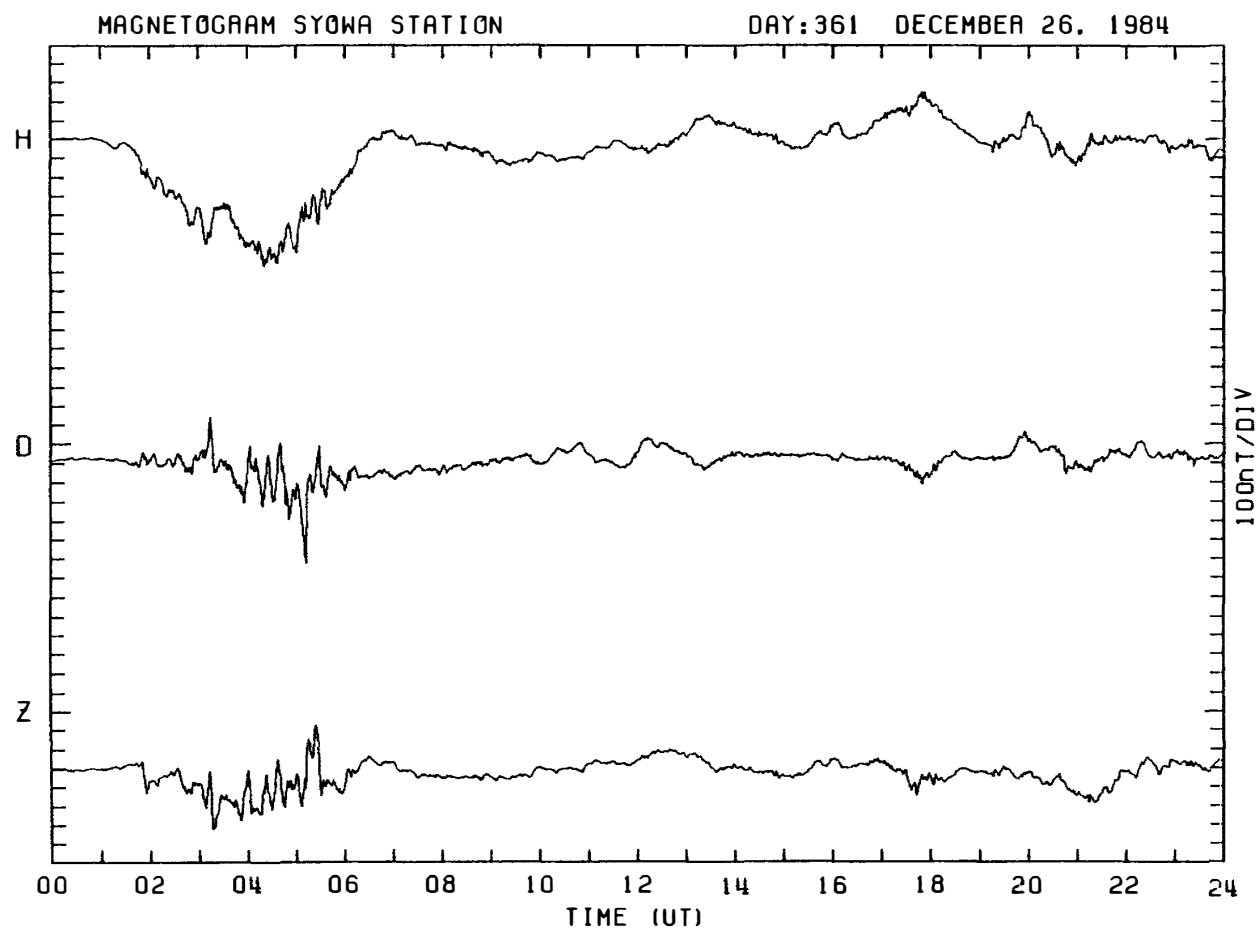
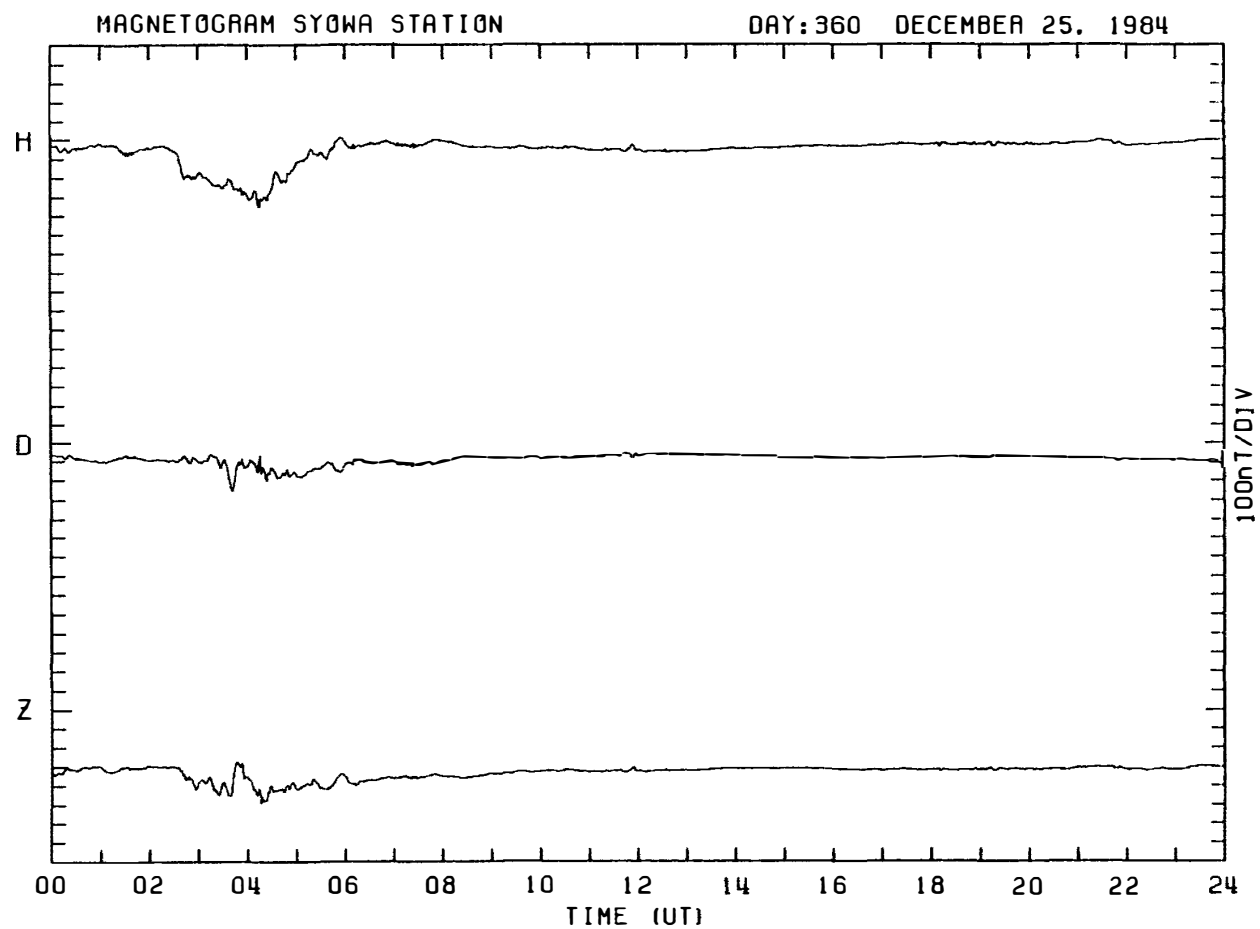


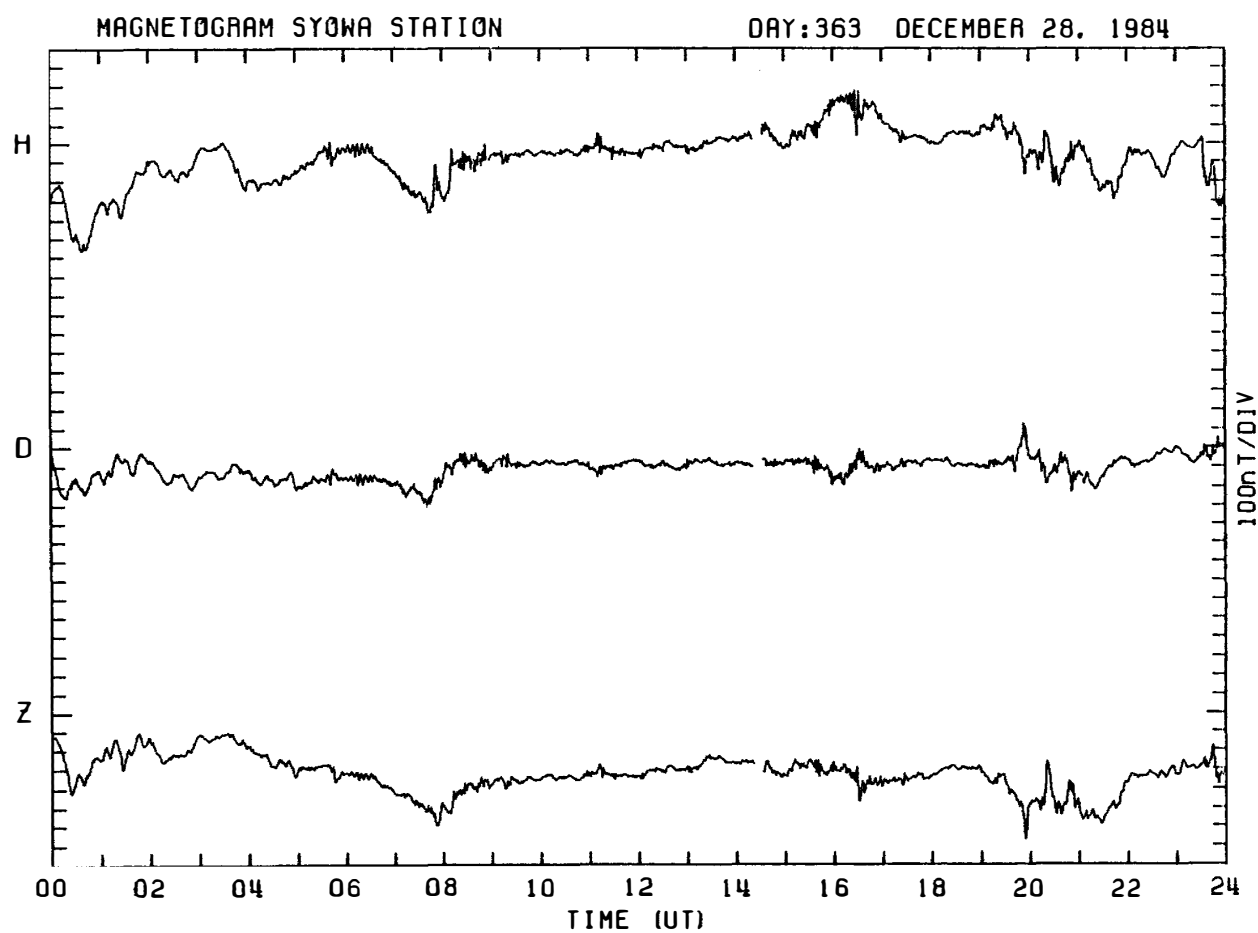
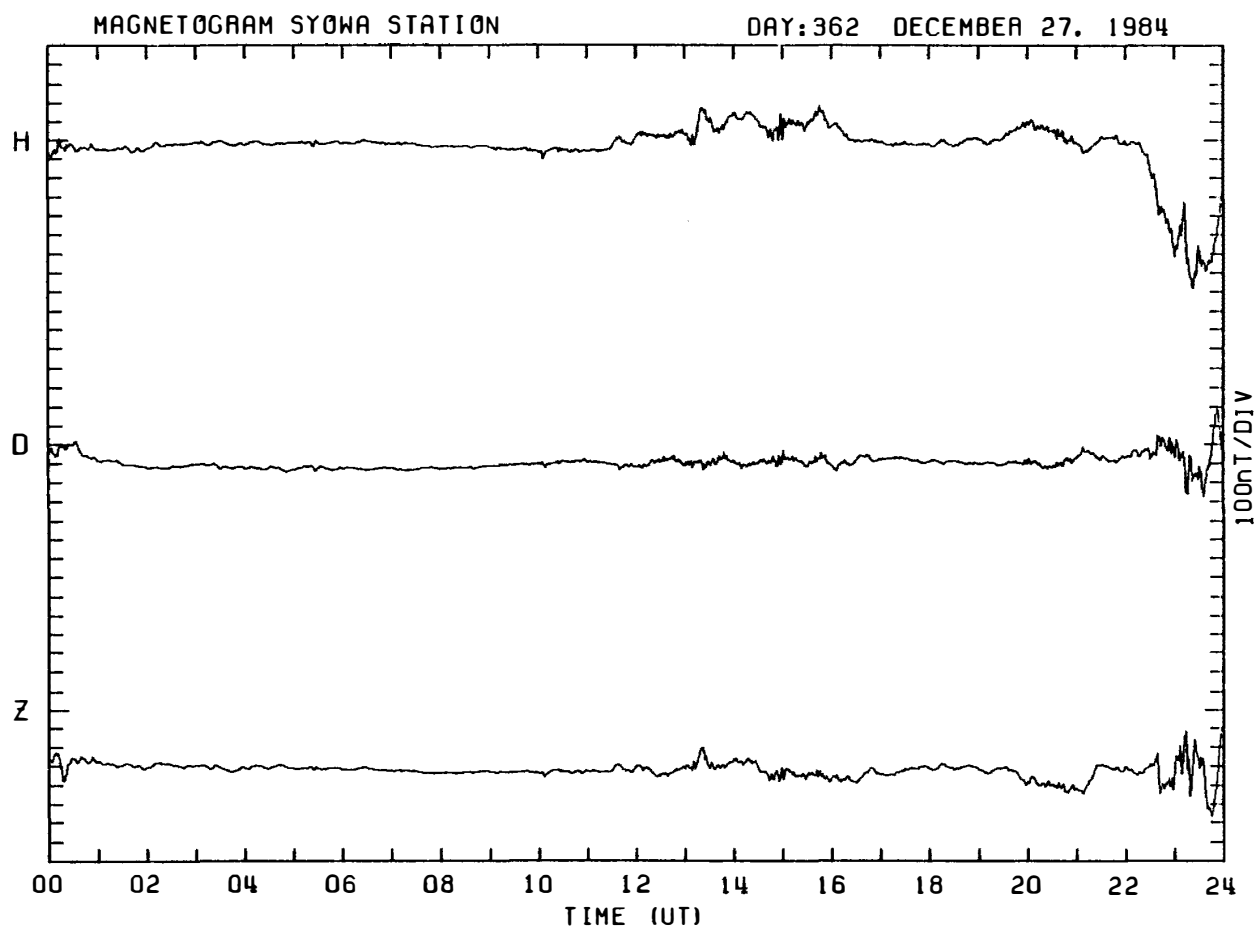


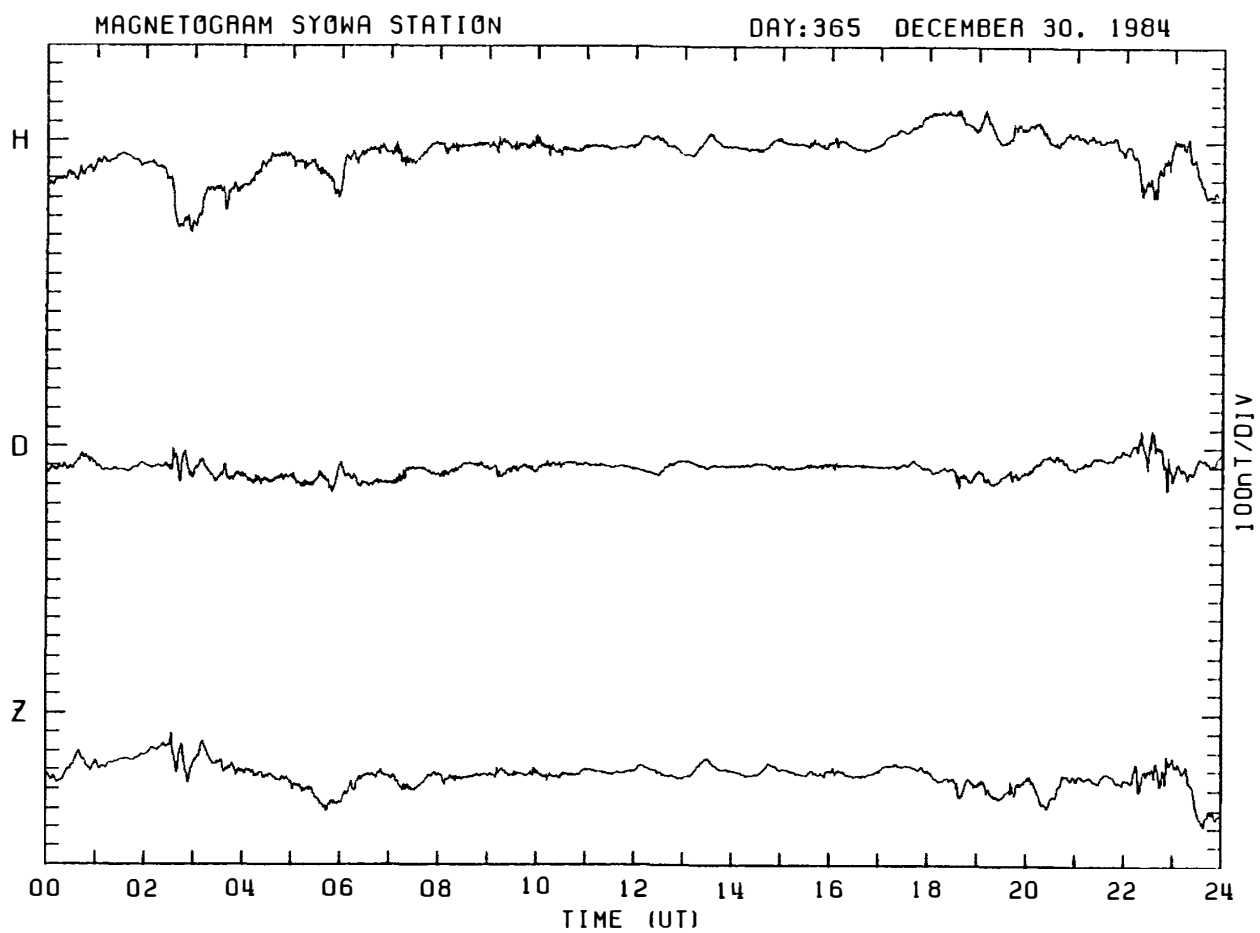
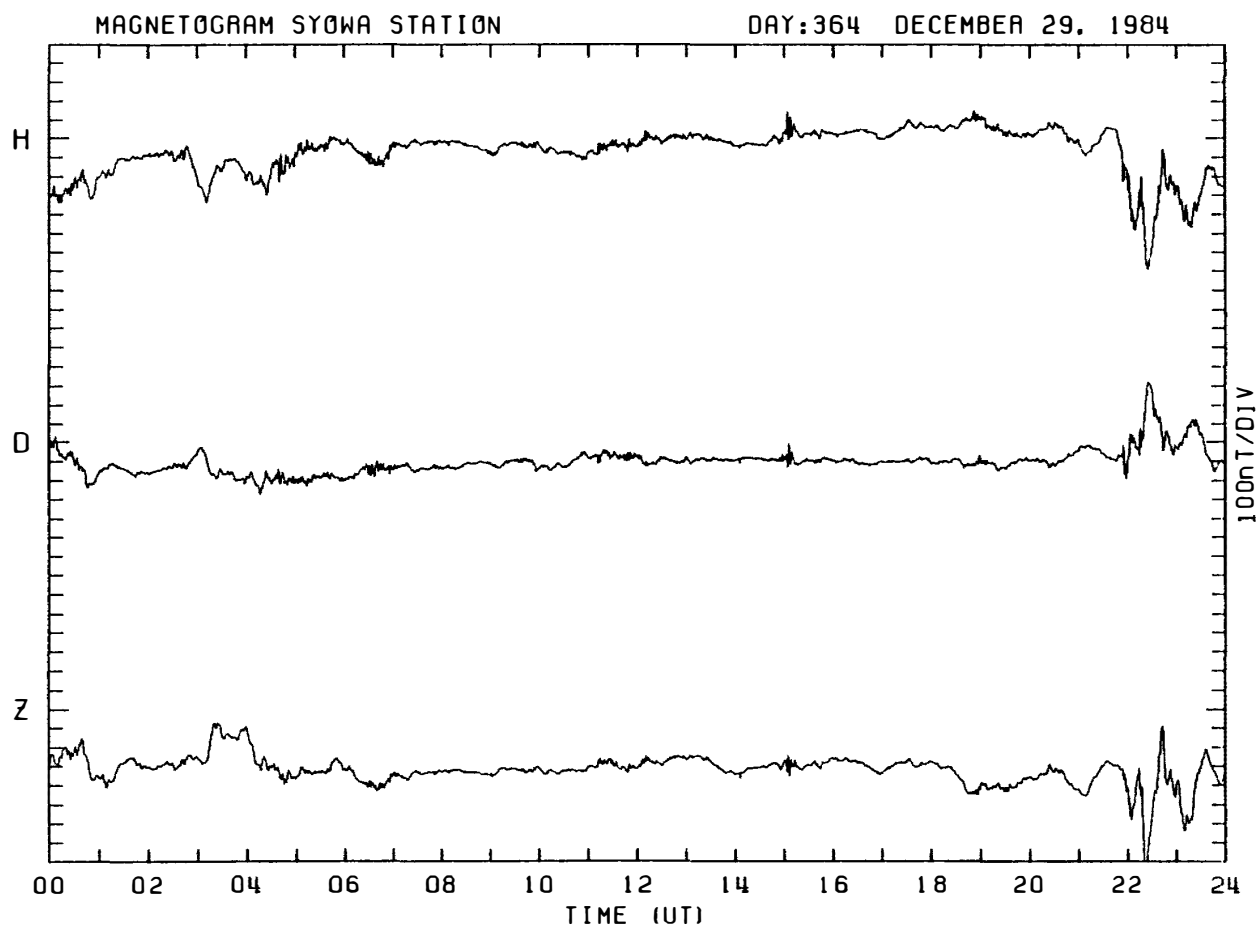




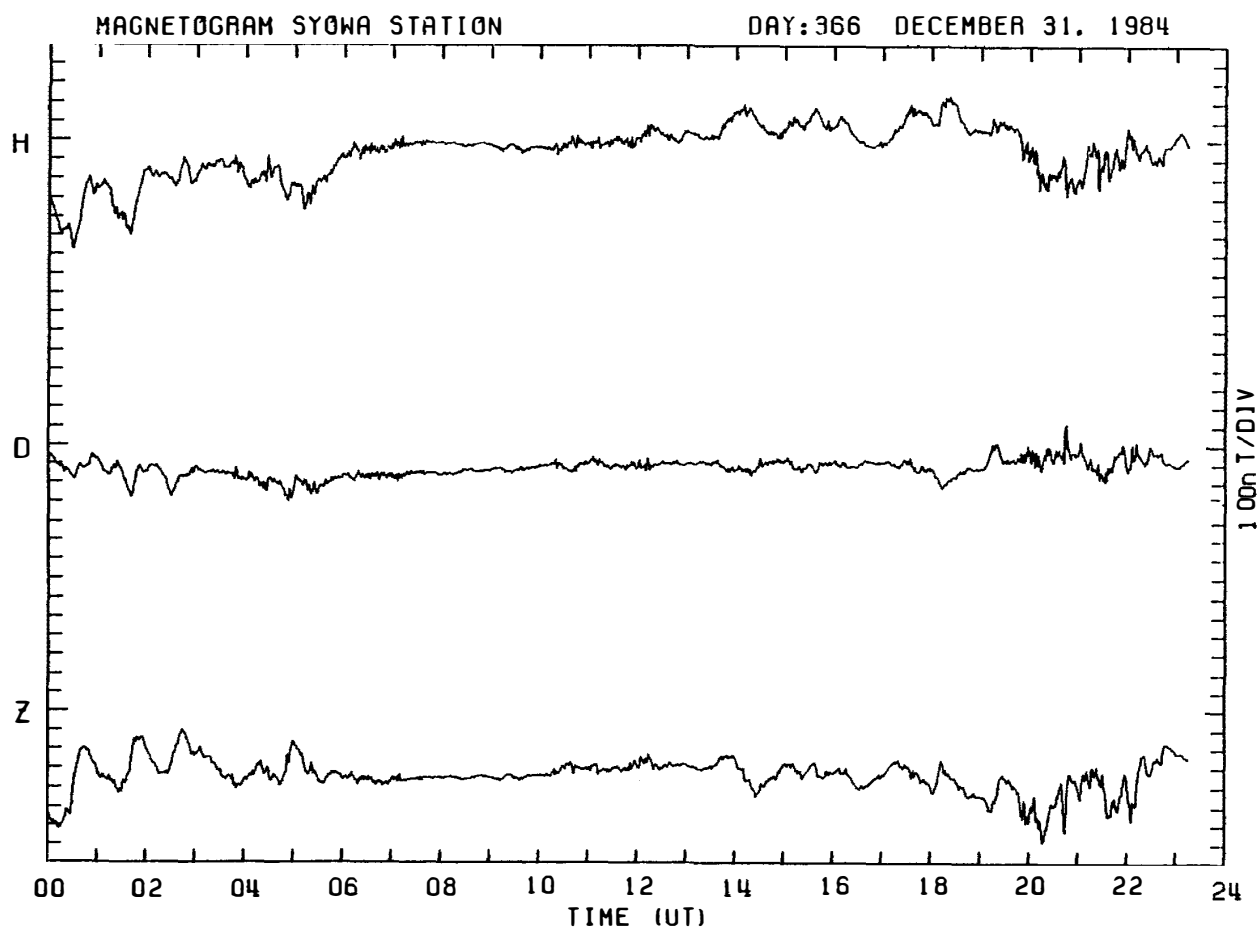








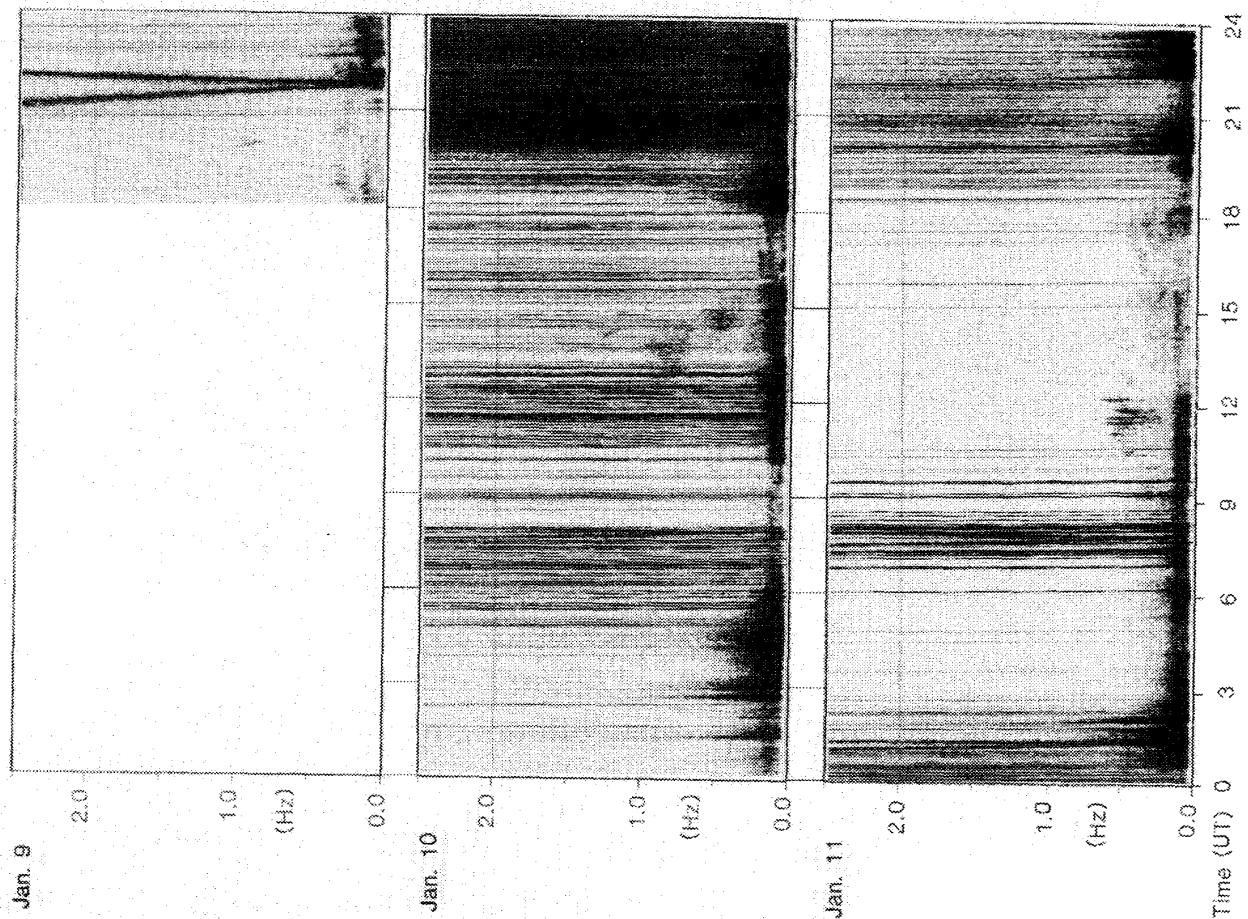




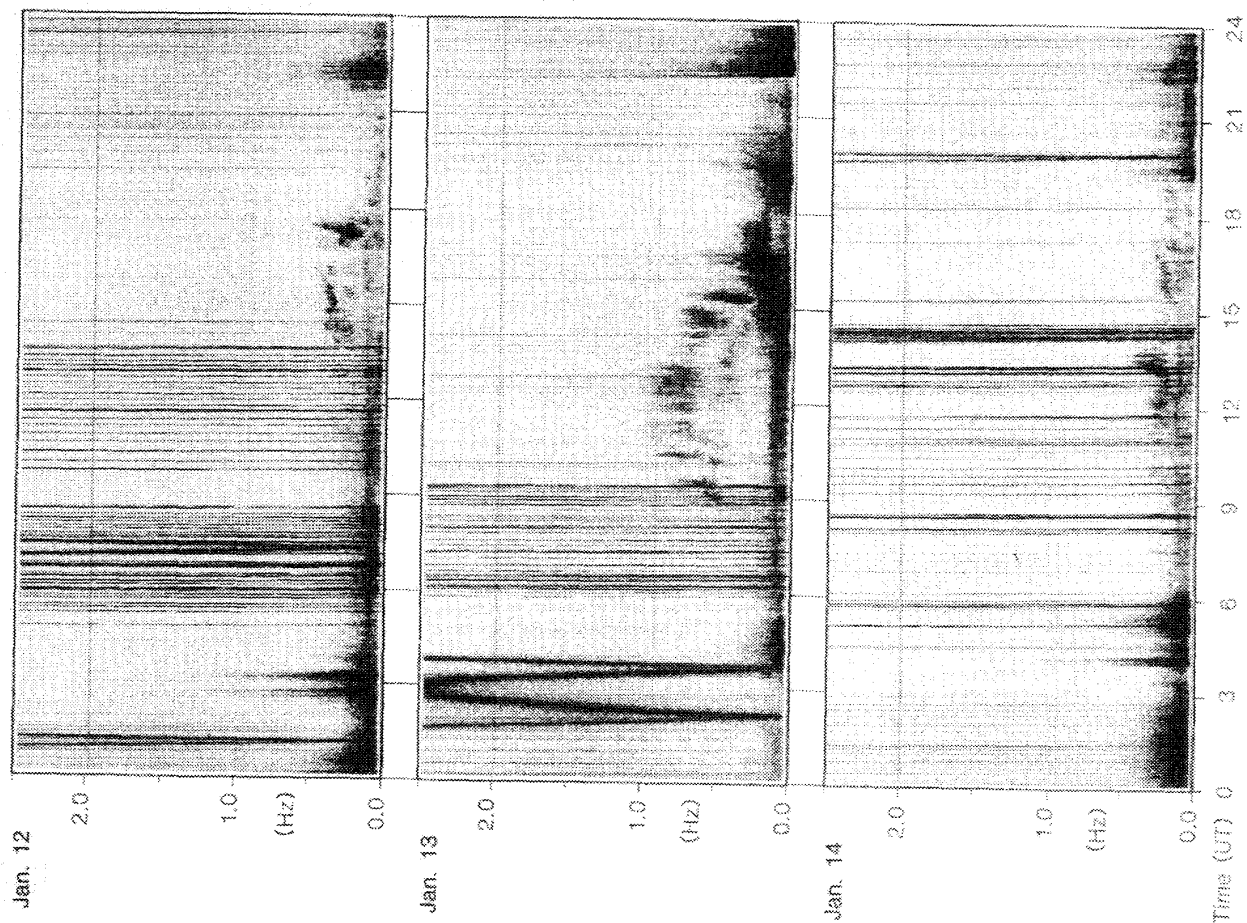
## Appendix 2

Frequency-time spectra of the H component of  
magnetic pulsations in 1984

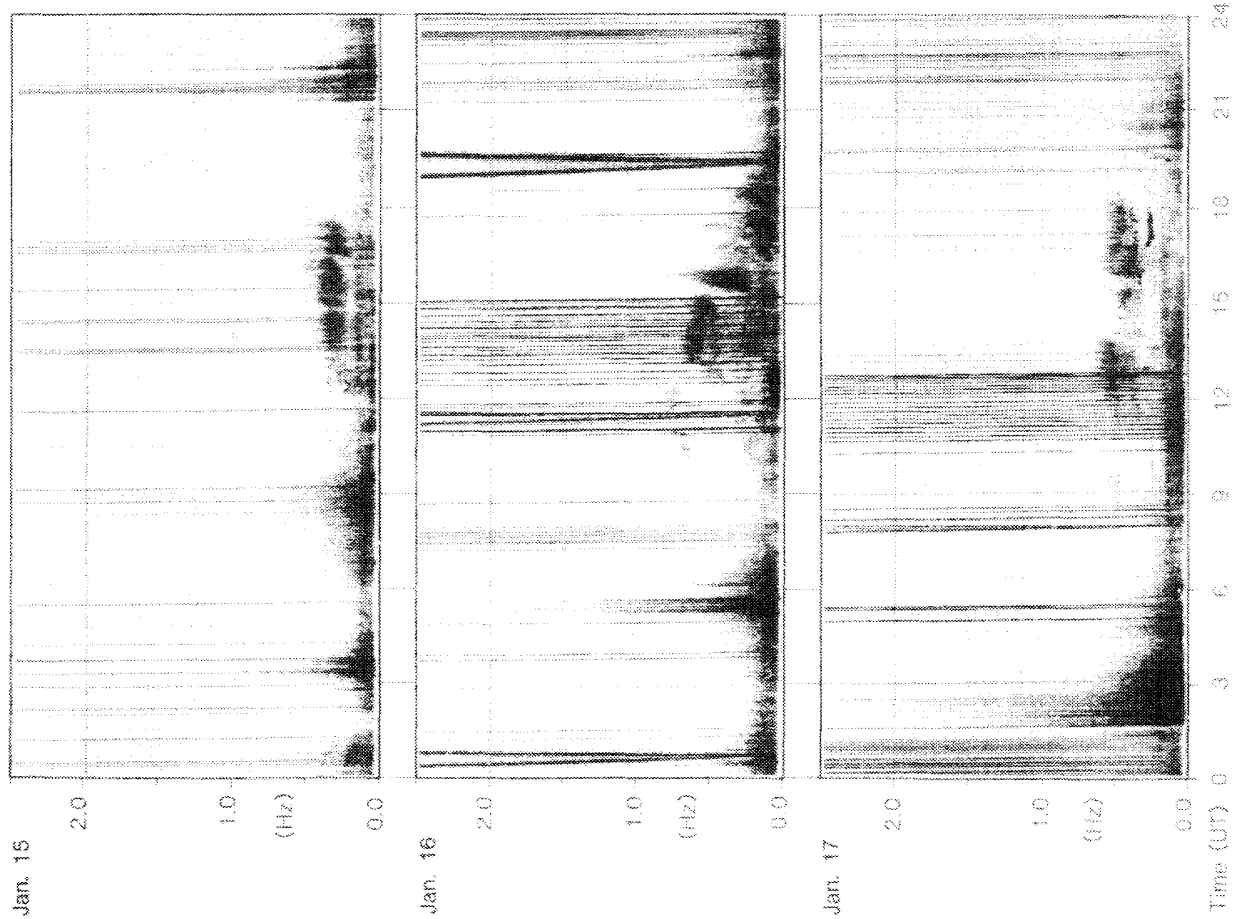
Syowa Station, 1984



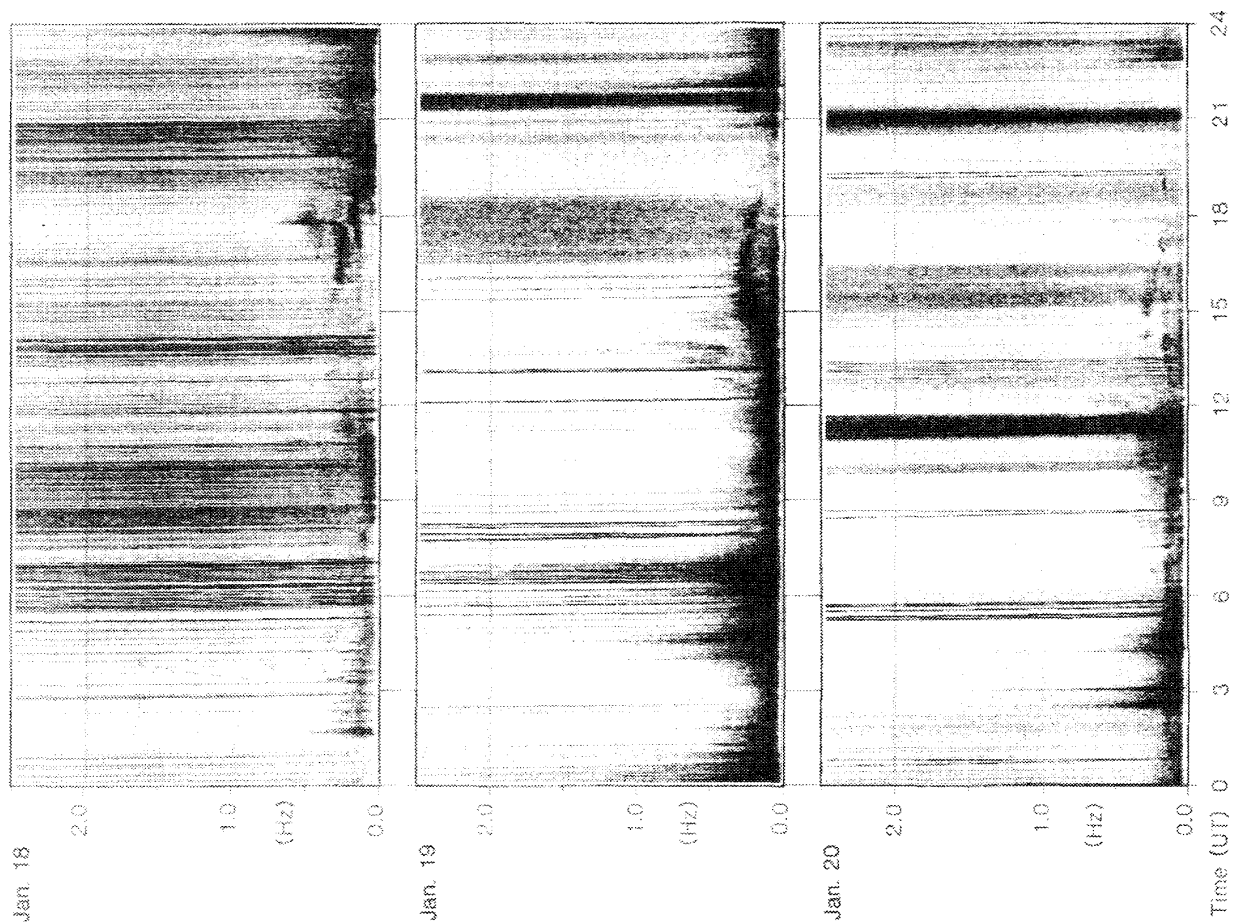
Syowa Station, 1984



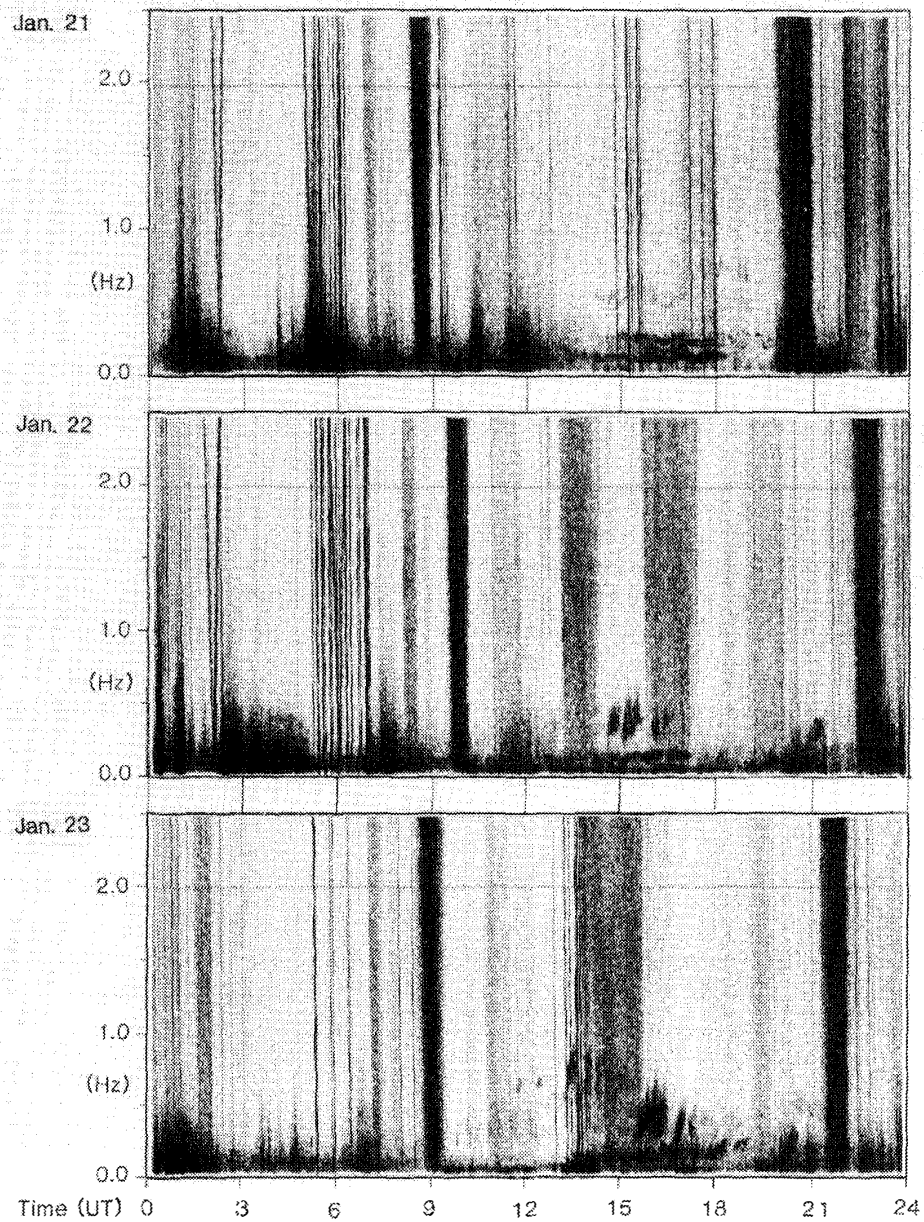
Syowa Station, 1984



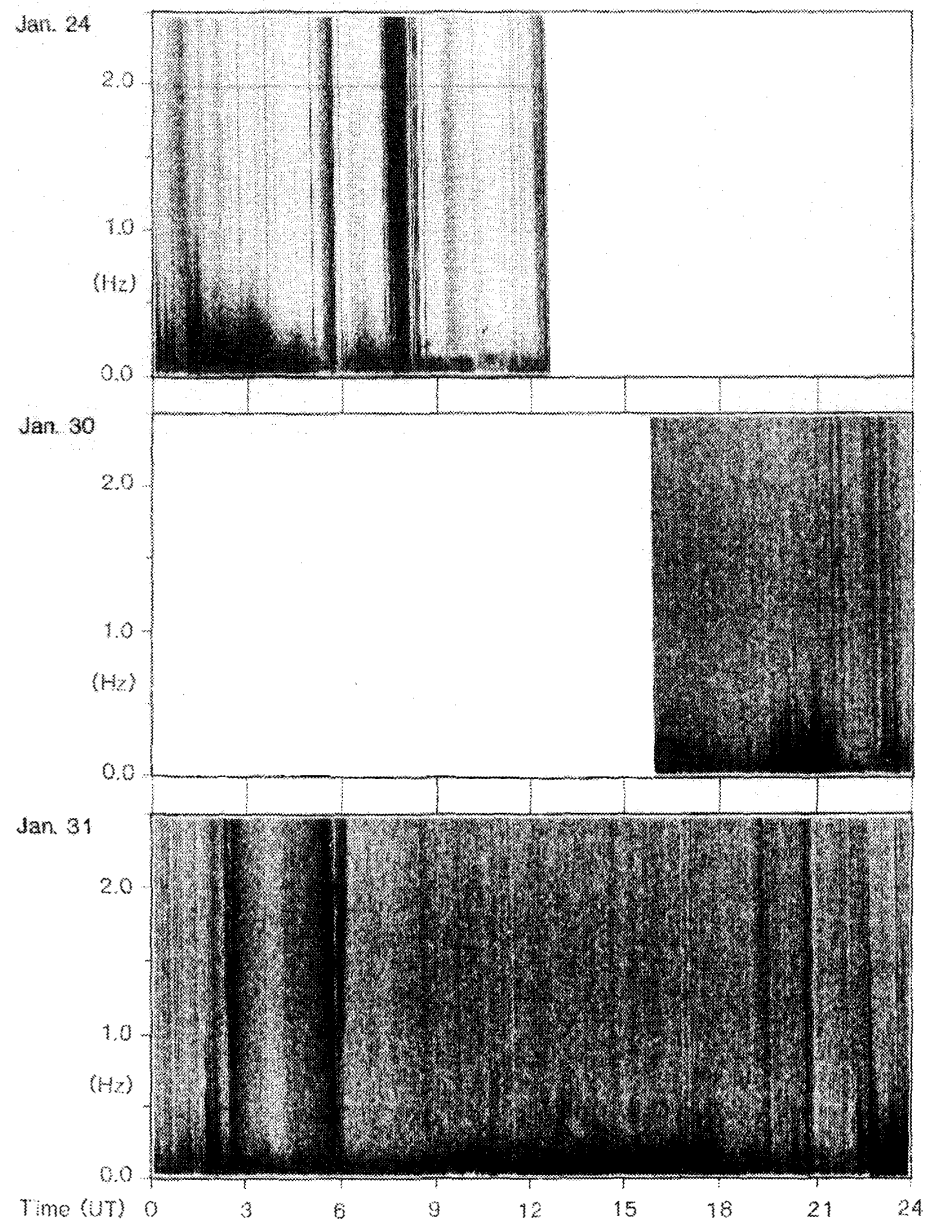
Syowa Station, 1984



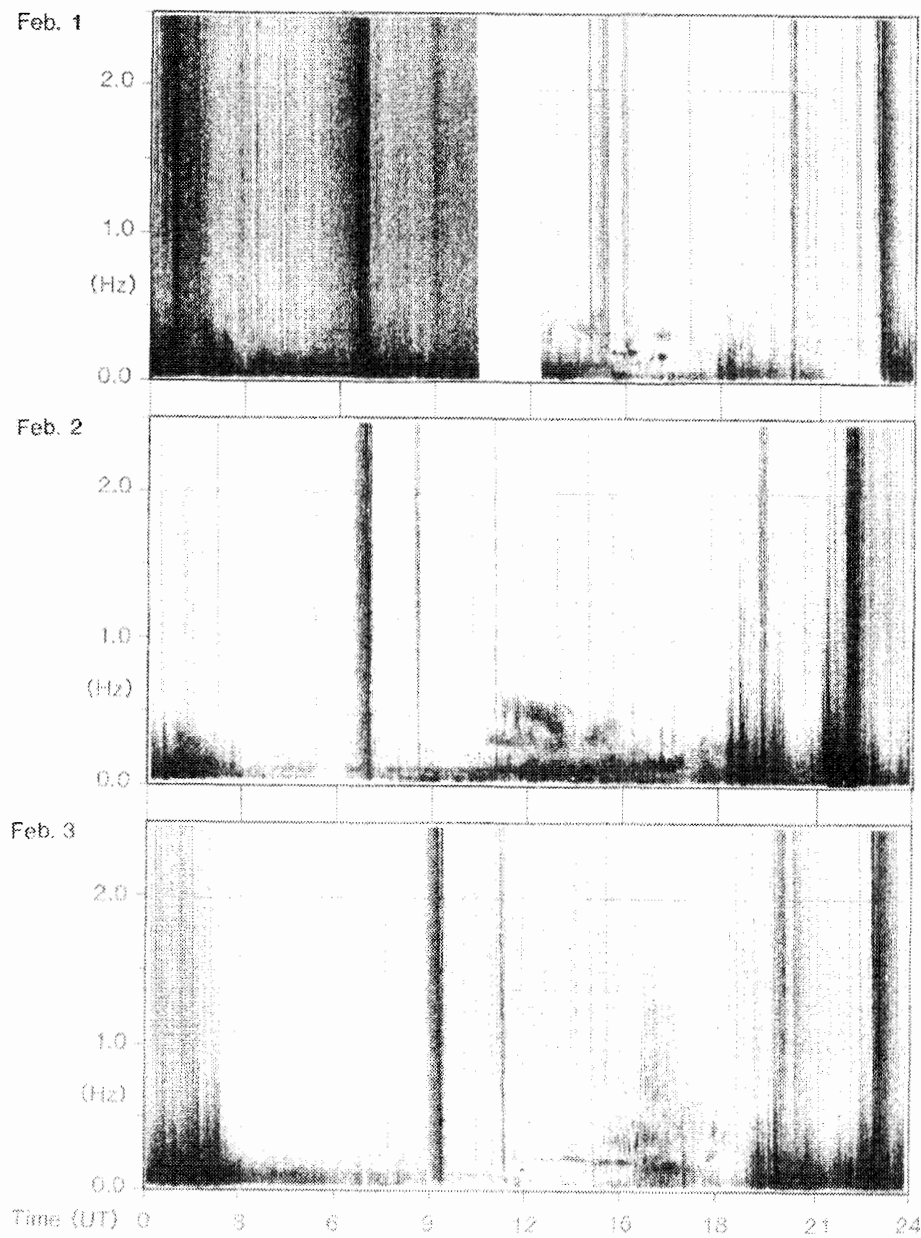
# Syowa Station, 1984



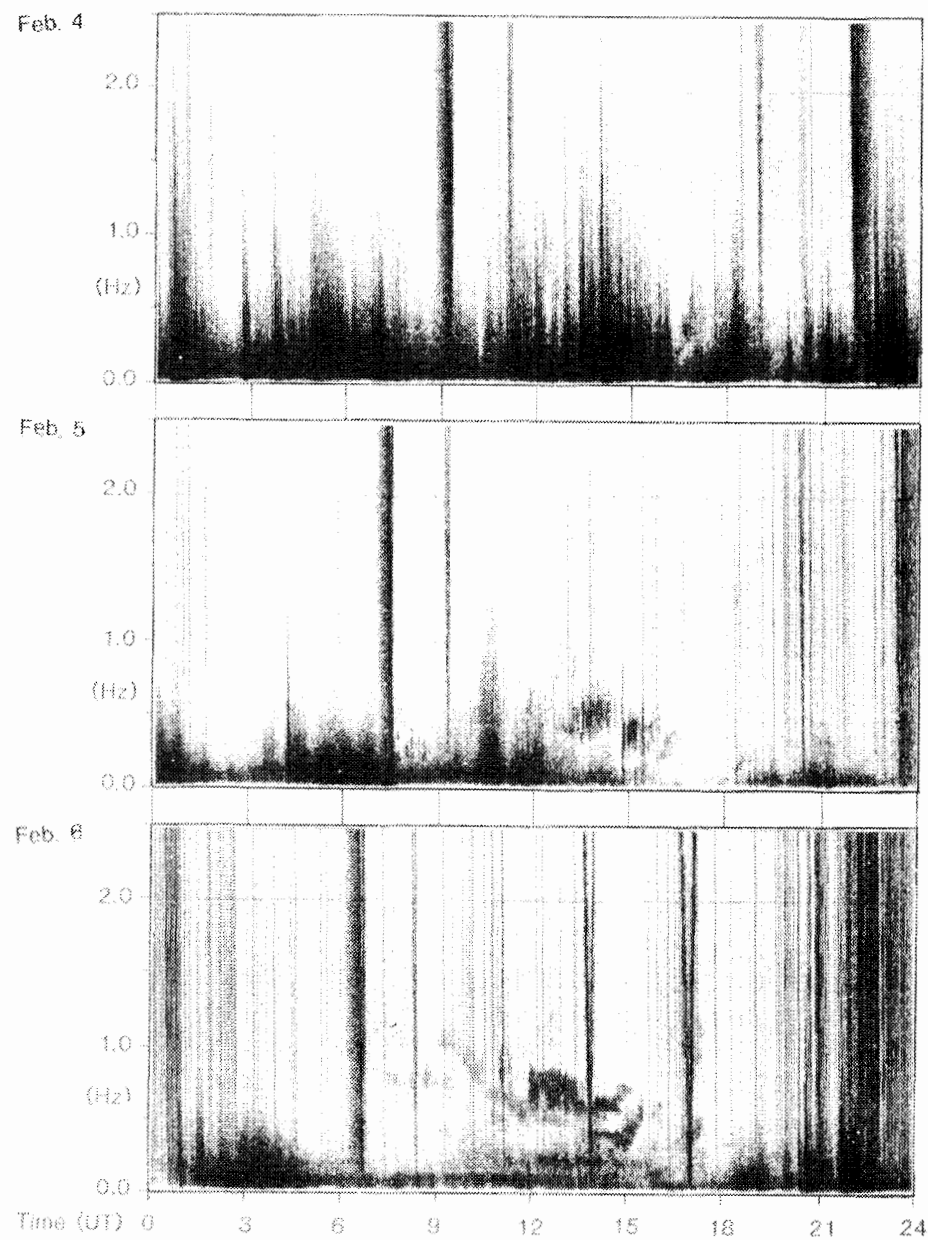
# Syowa Station, 1984



# Syowa Station, 1984

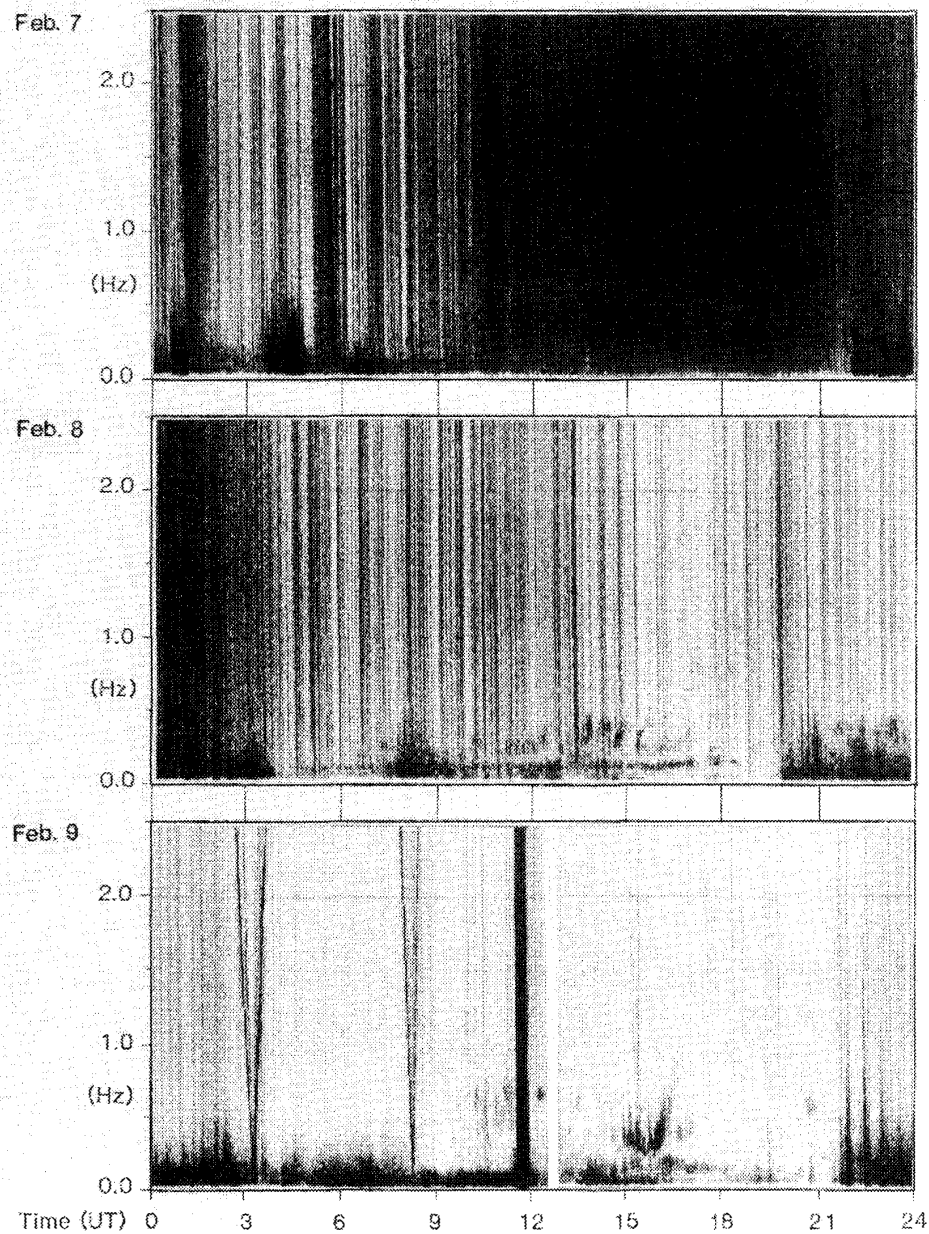


# Syowa Station, 1984

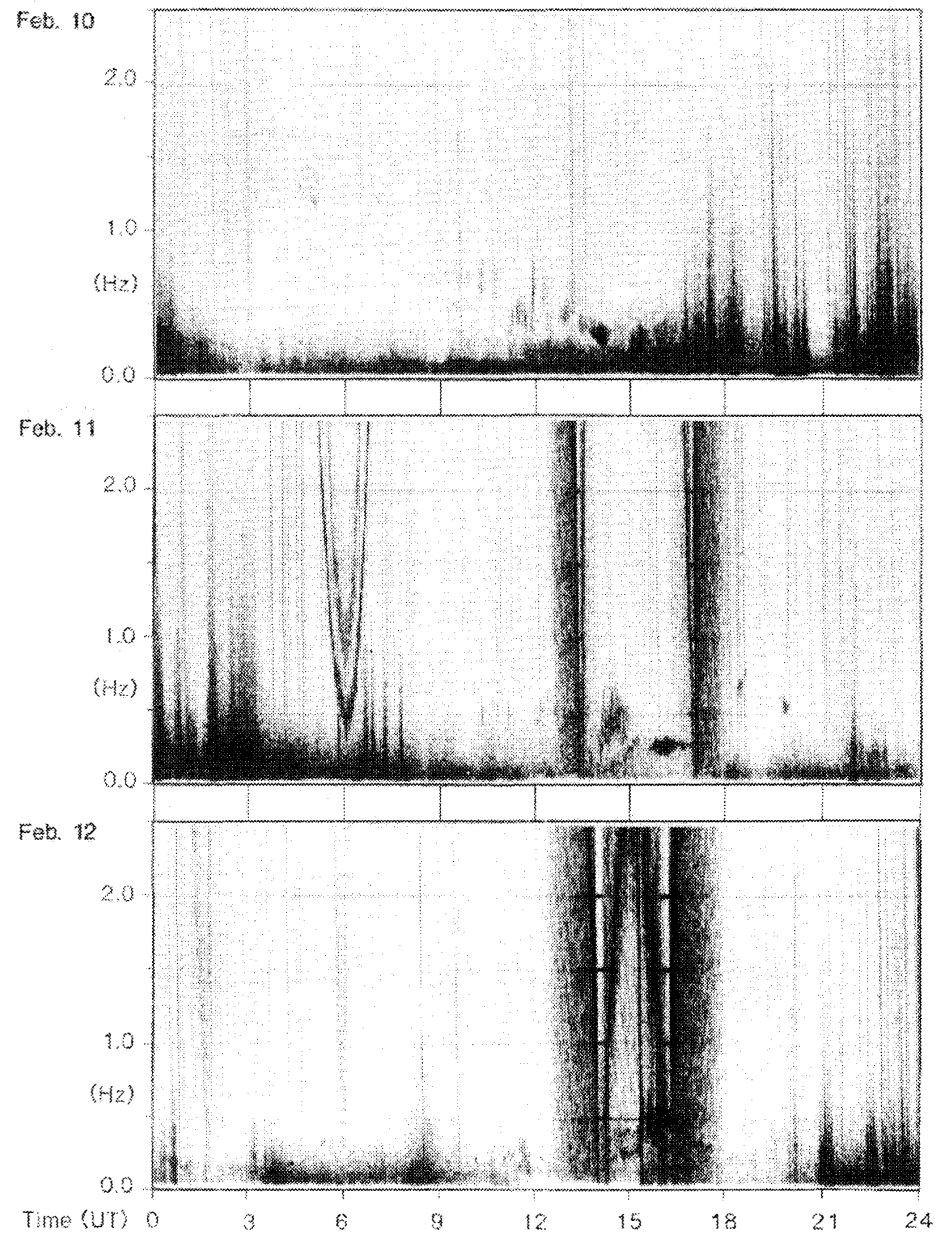




# Syowa Station, 1984

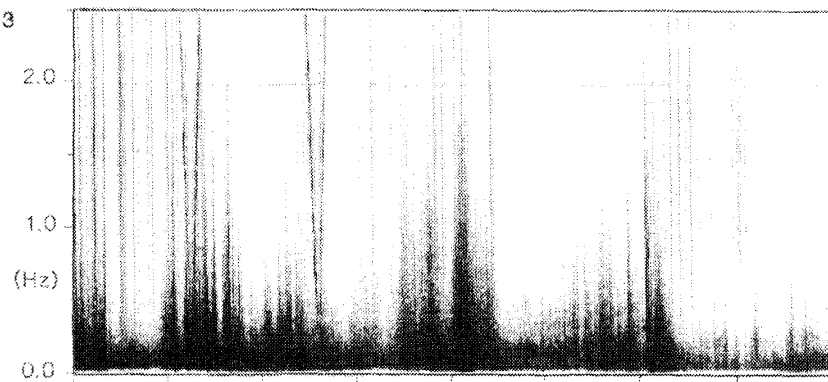


# Syowa Station, 1984

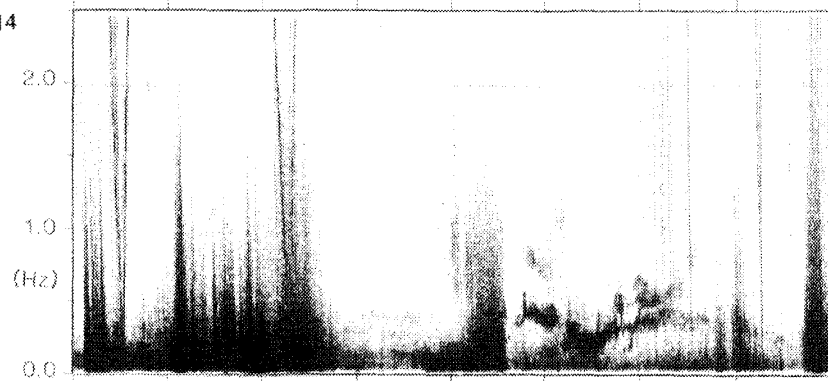


# Syowa Station, 1984

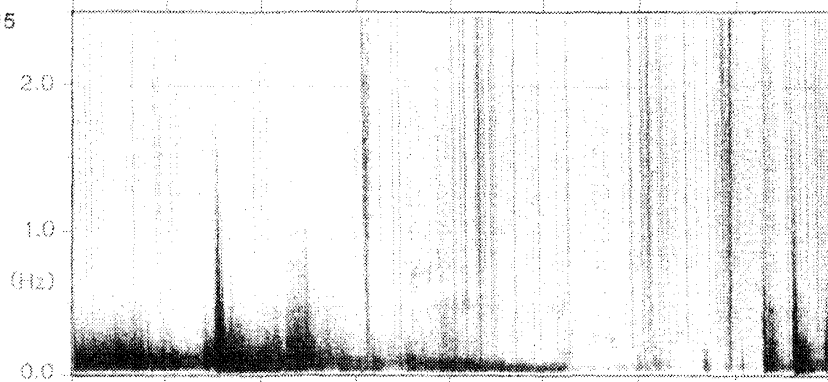
Feb. 13



Feb. 14



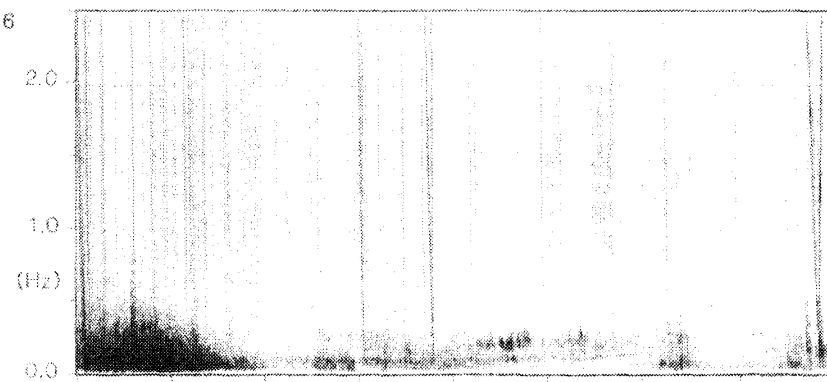
Feb. 15



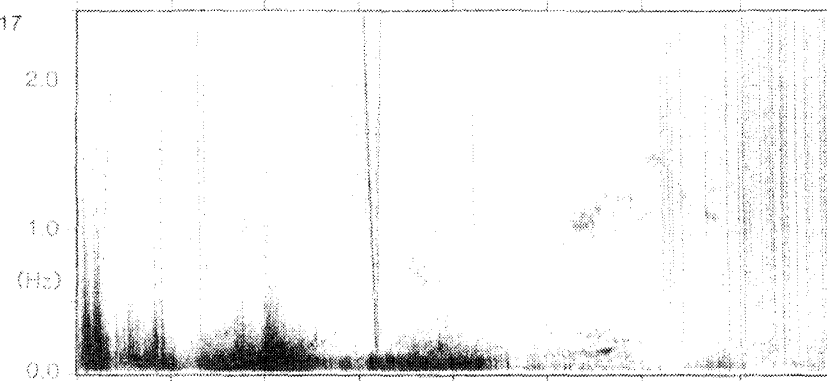
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

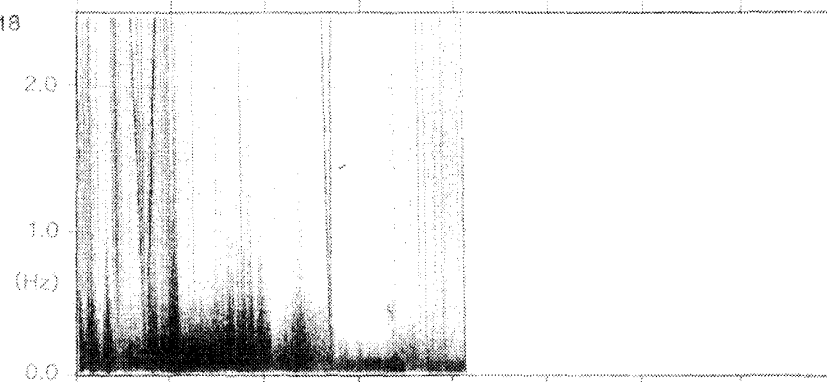
Feb. 16



Feb. 17



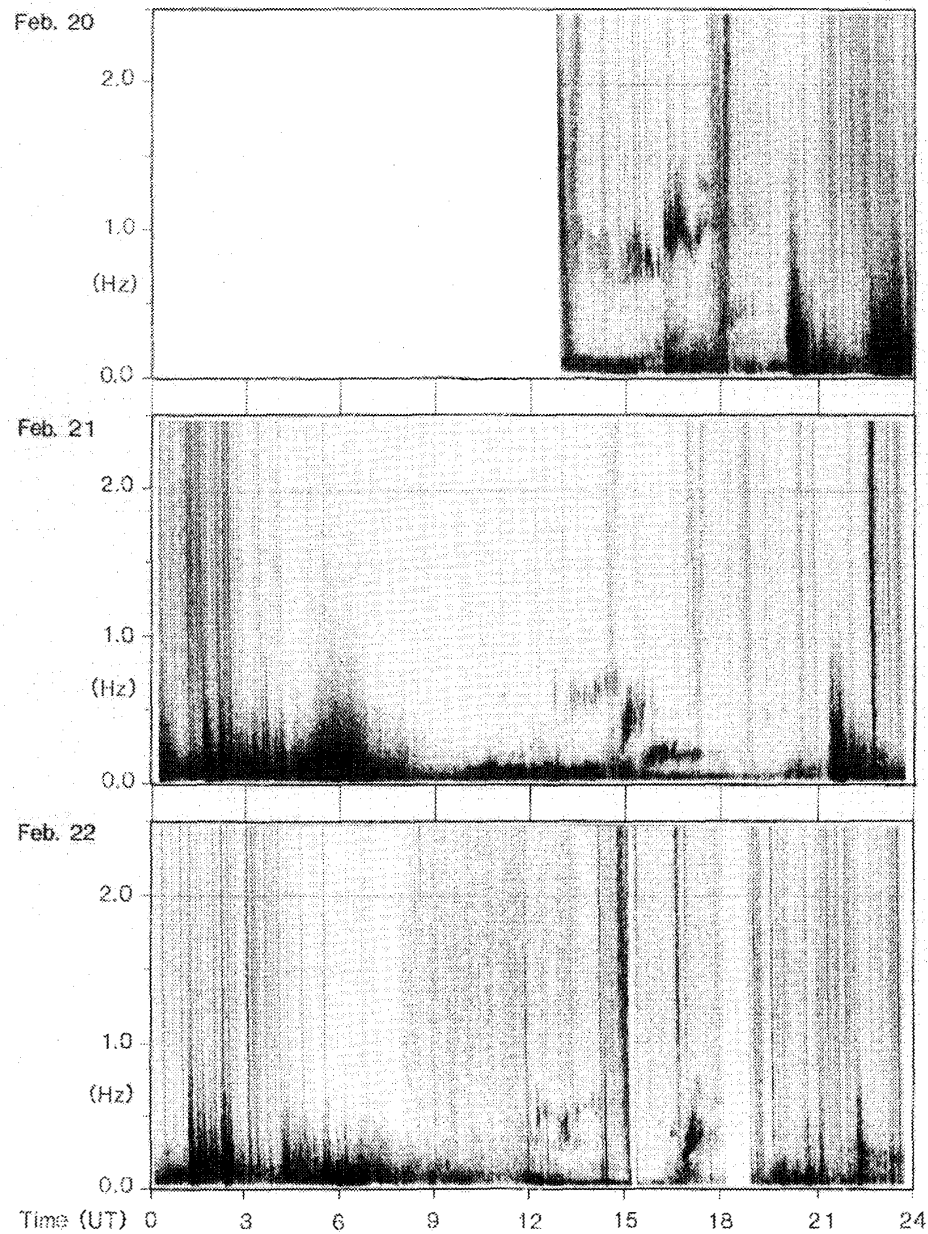
Feb. 18



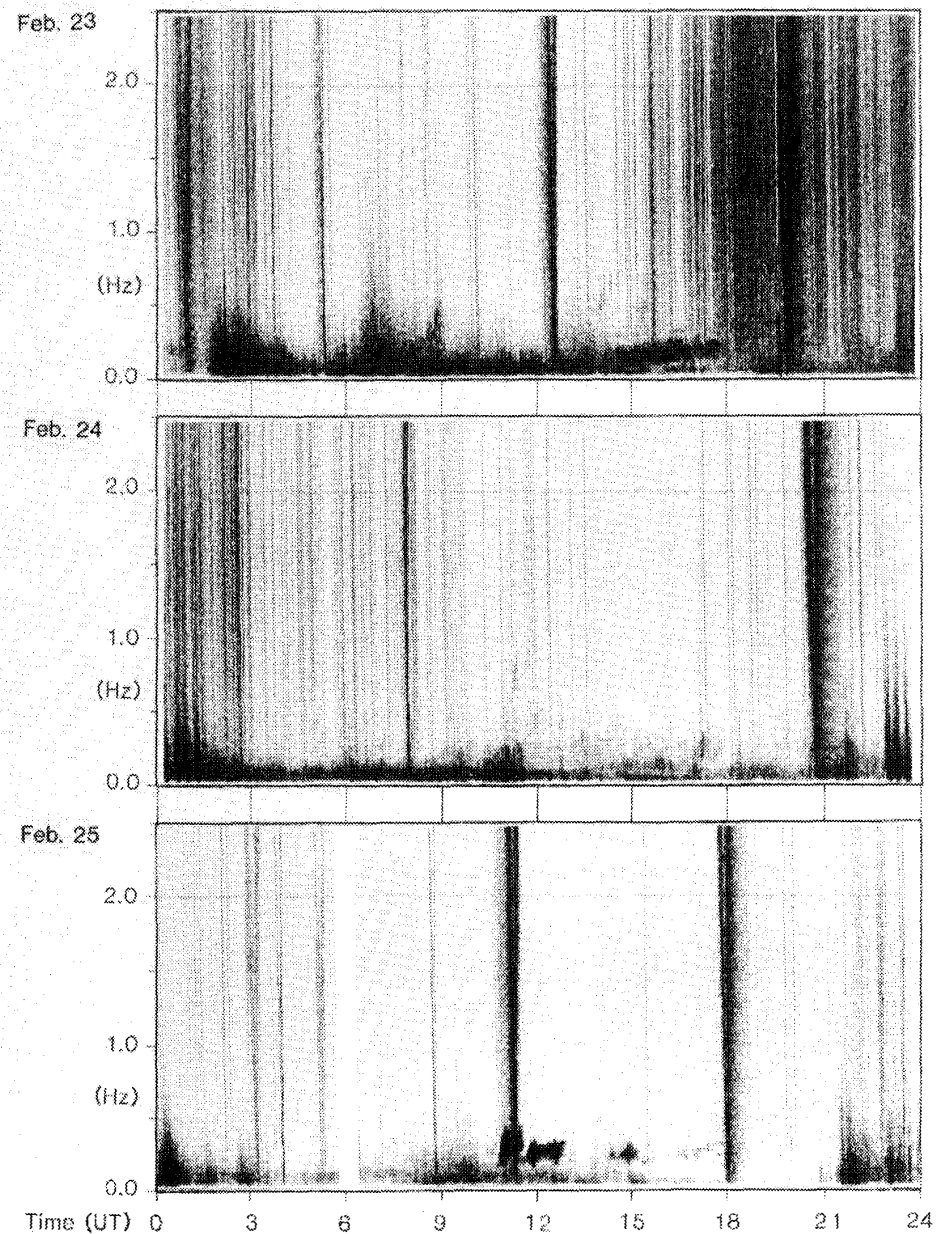
Time (UT) 0 3 6 9 12 15 18 21 24



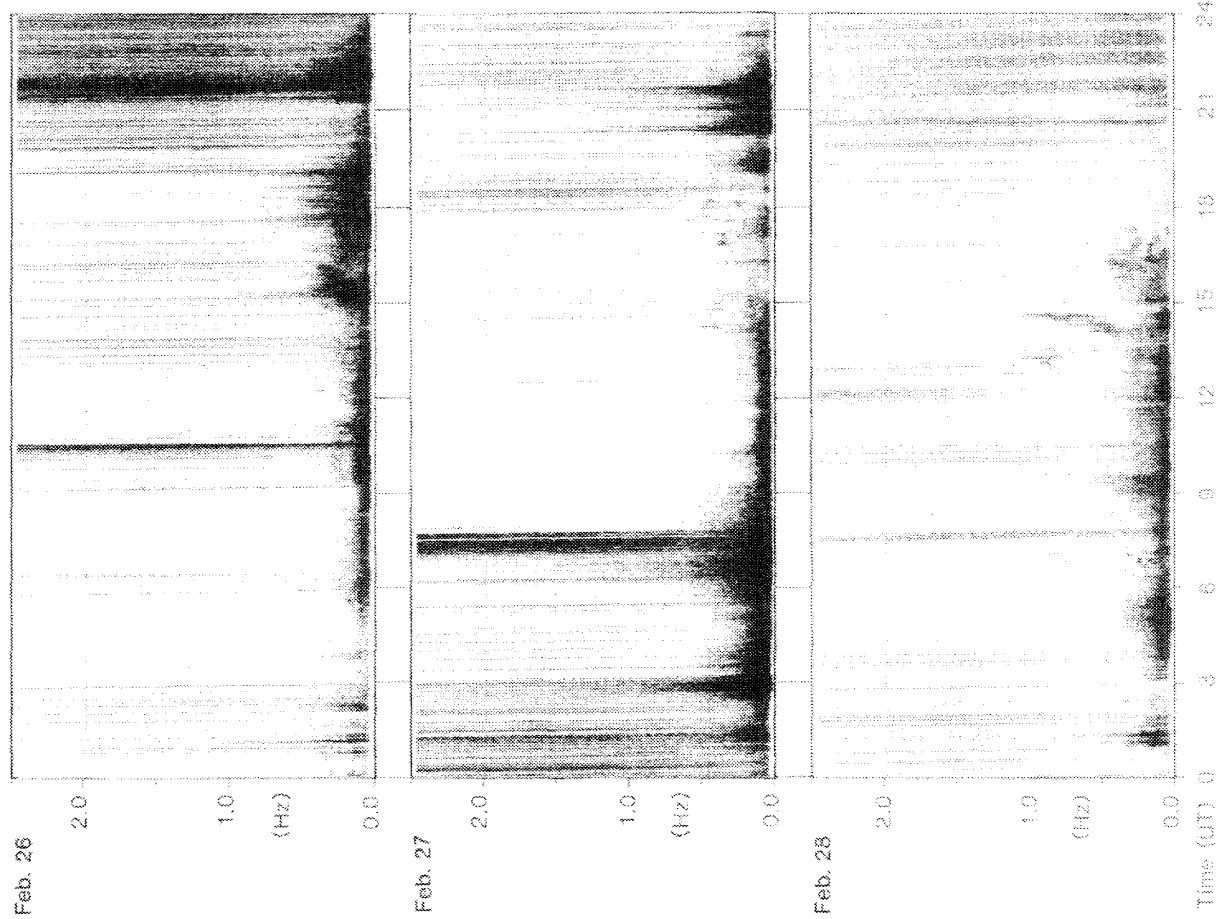
# Syowa Station, 1984



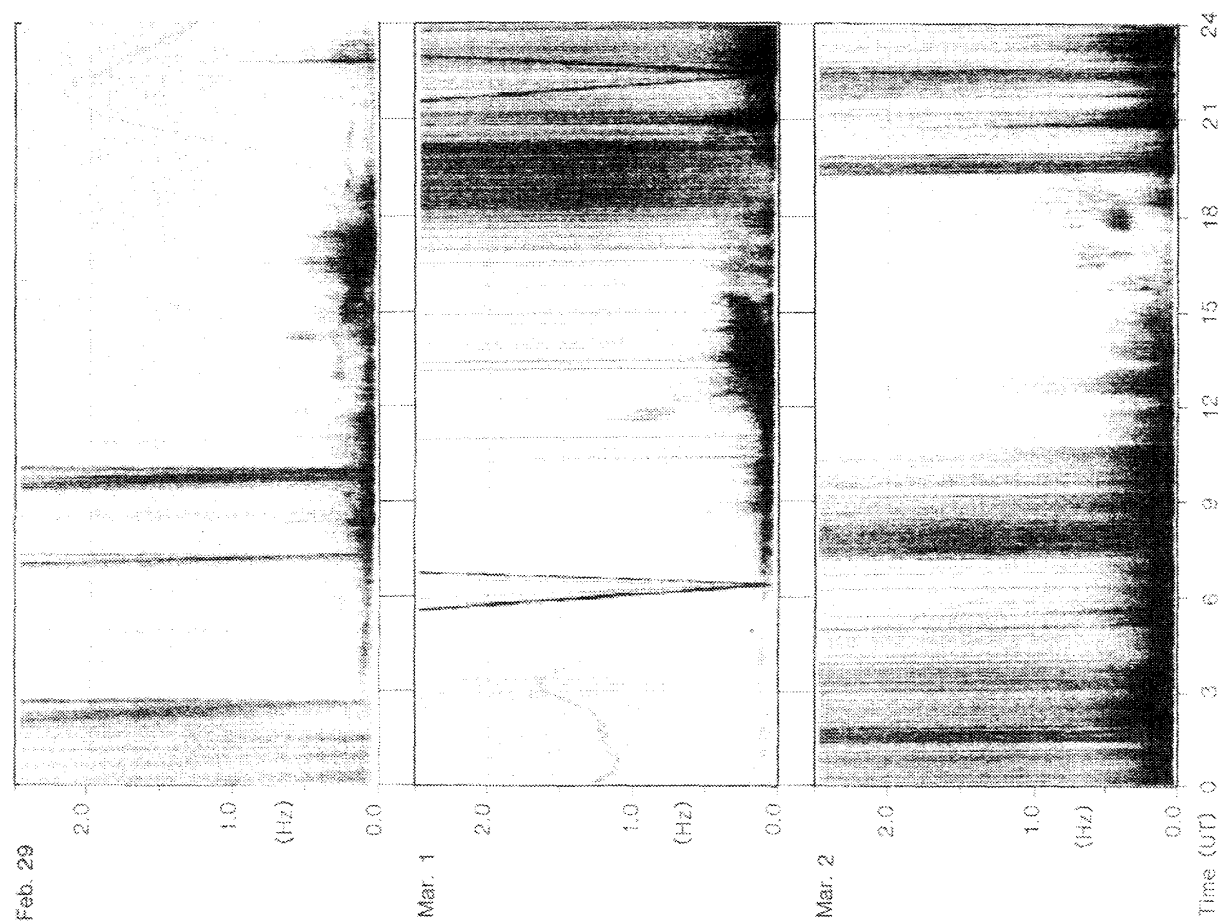
# Syowa Station, 1984



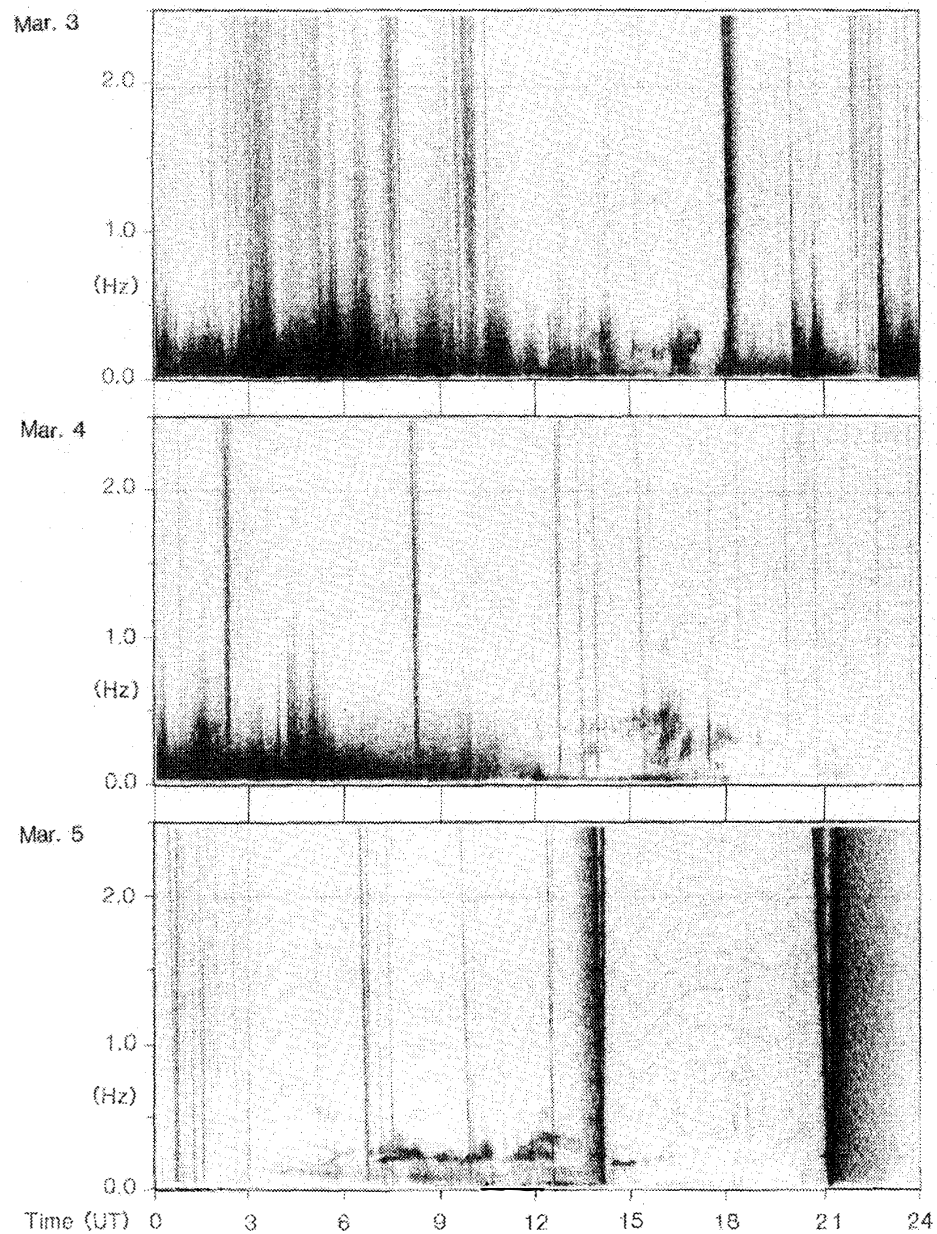
Syowa Station, 1984



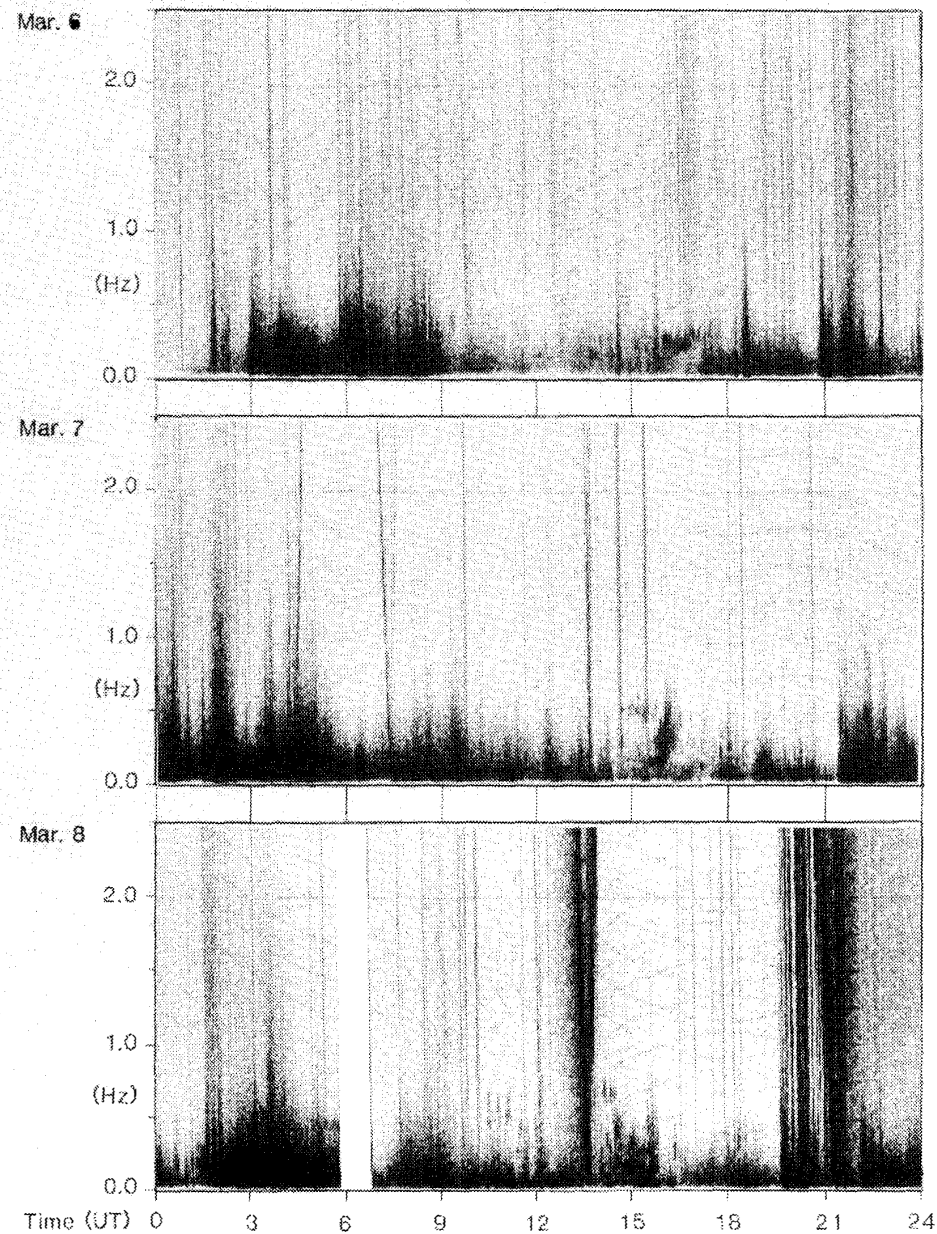
Syowa Station, 1984



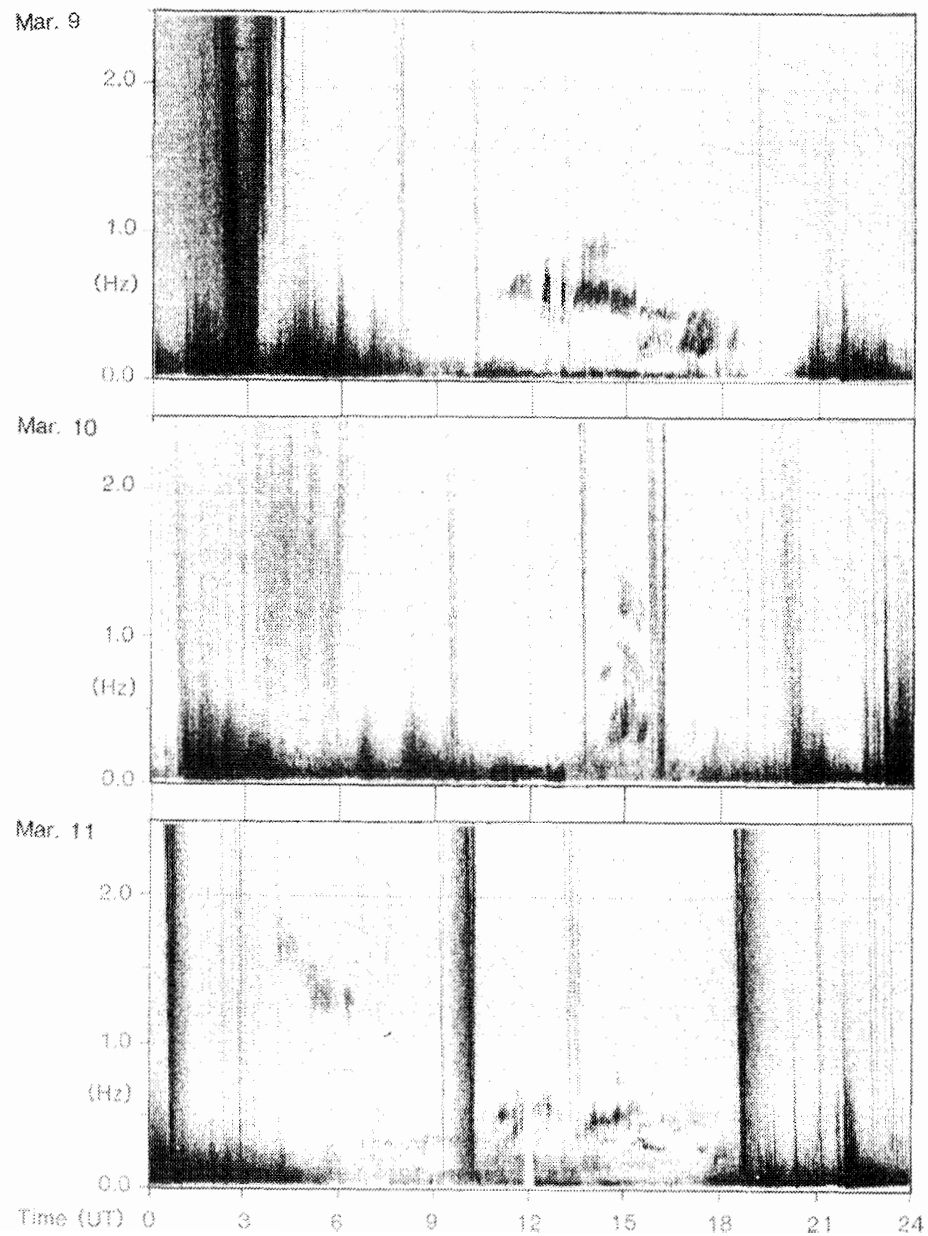
# Syowa Station, 1984



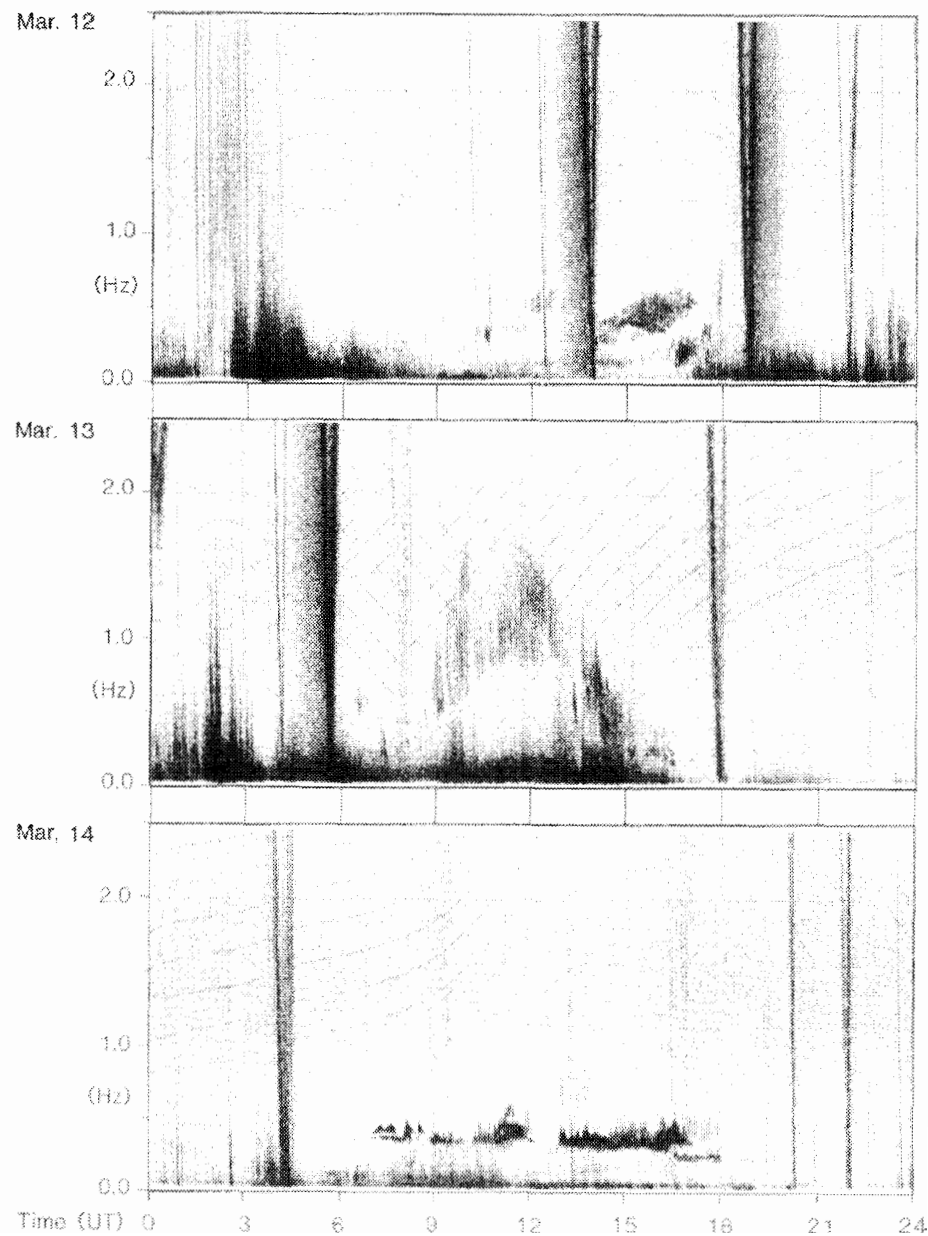
# Syowa Station, 1984



# Syowa Station, 1984

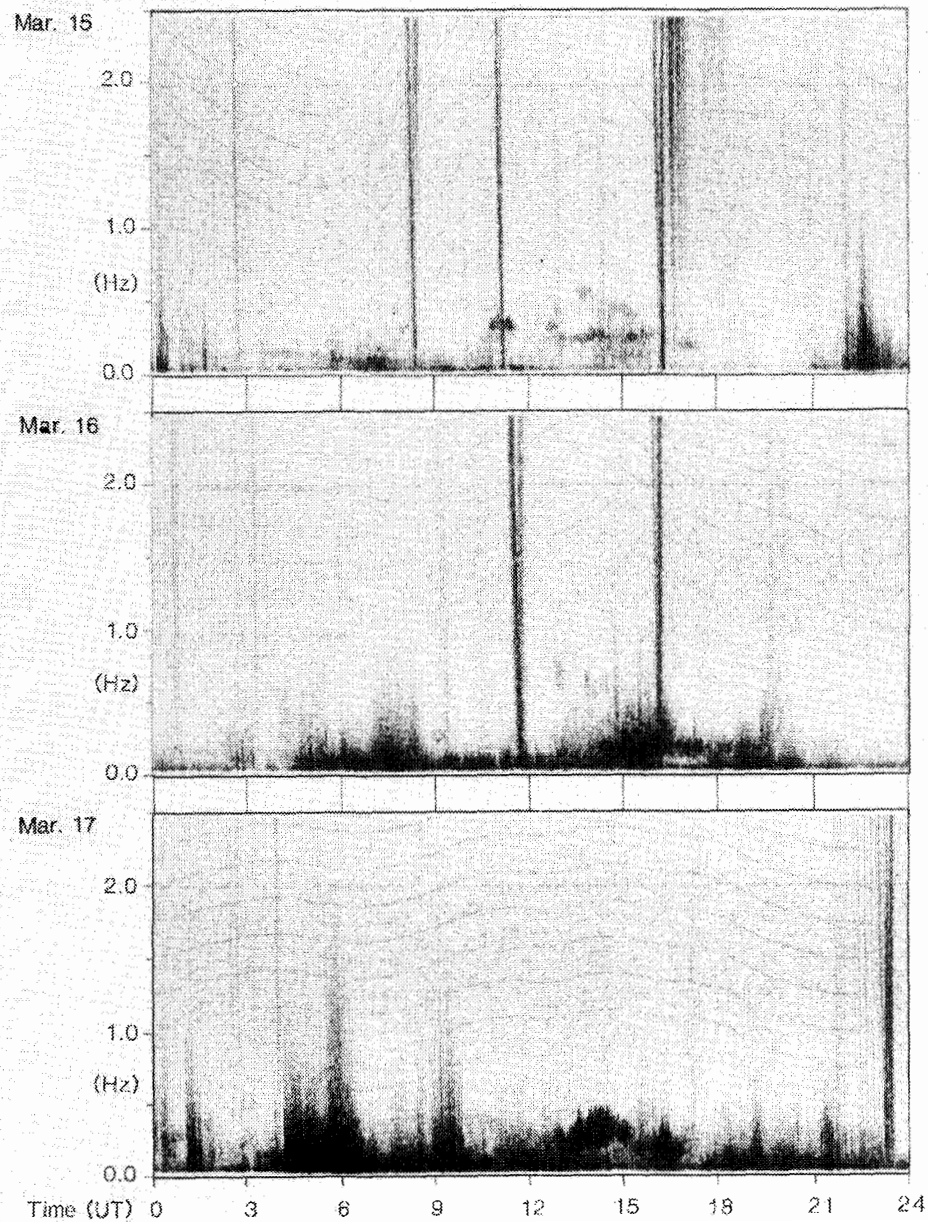


# Syowa Station, 1984

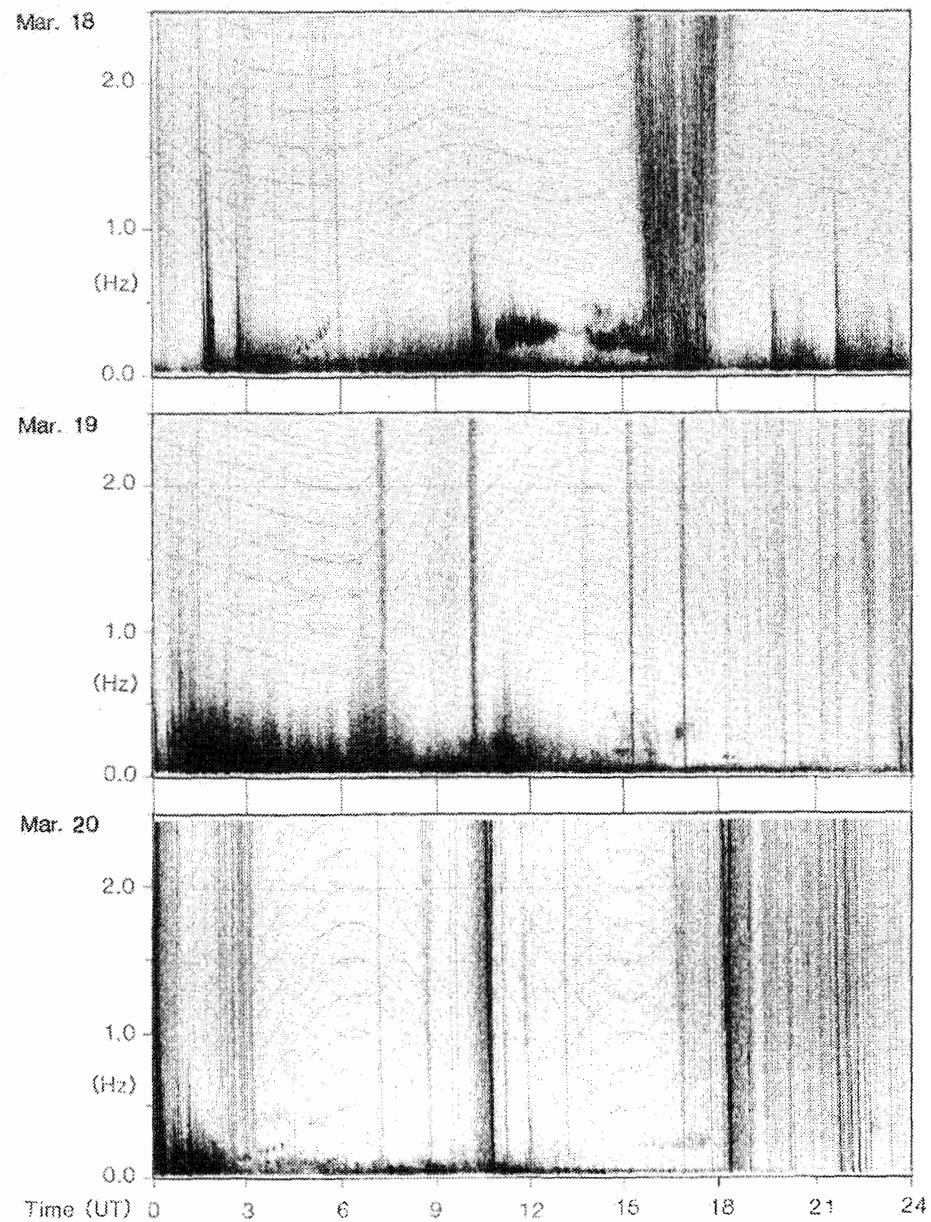




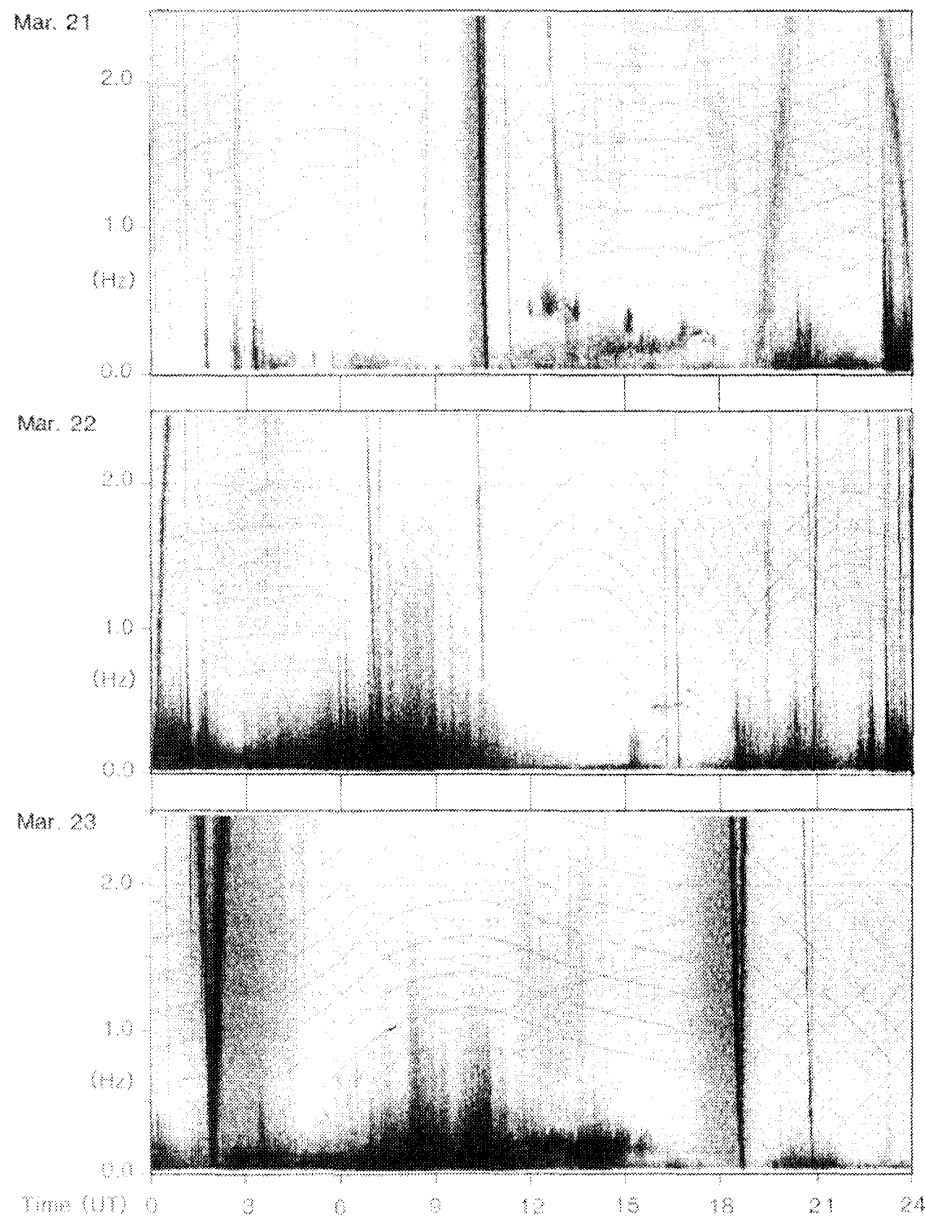
# Syowa Station, 1984



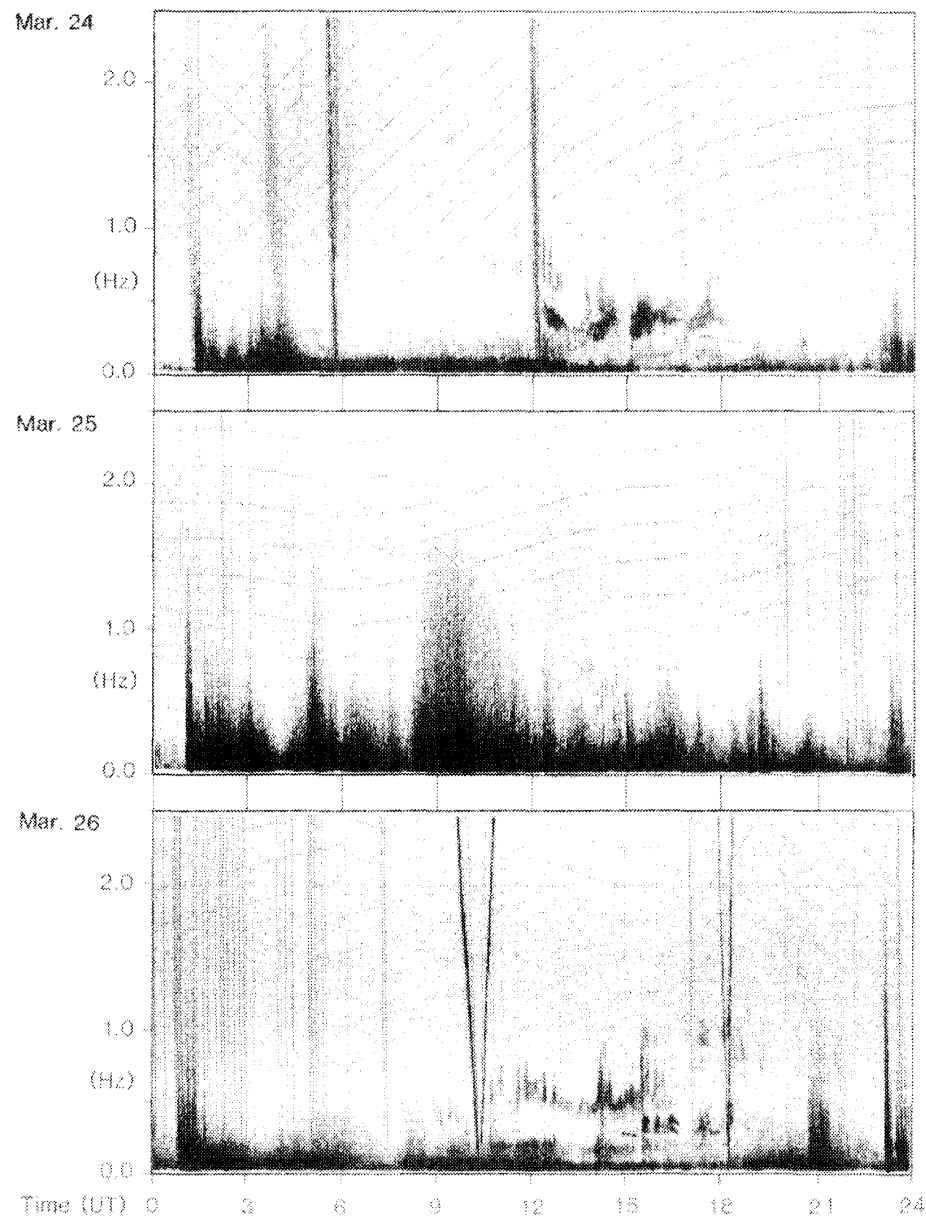
# Syowa Station, 1984



# Syowa Station, 1984

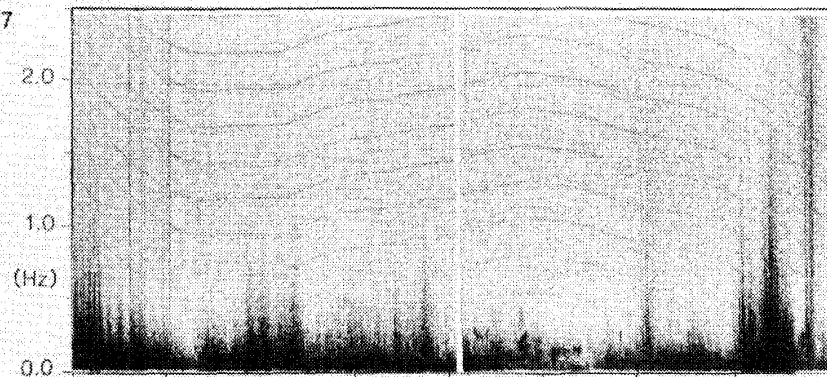


# Syowa Station, 1984

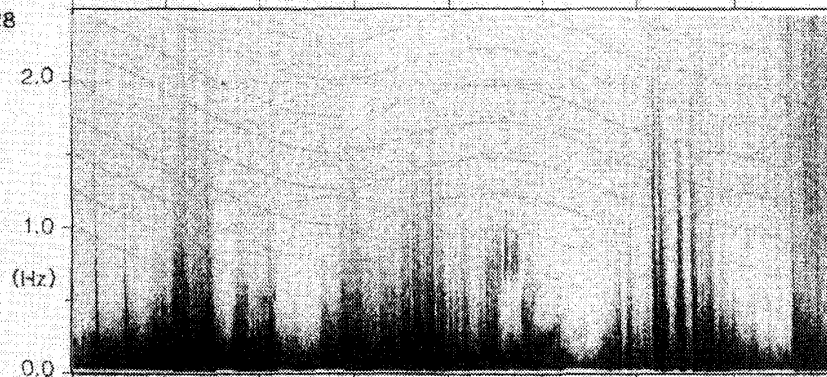


# Syowa Station, 1984

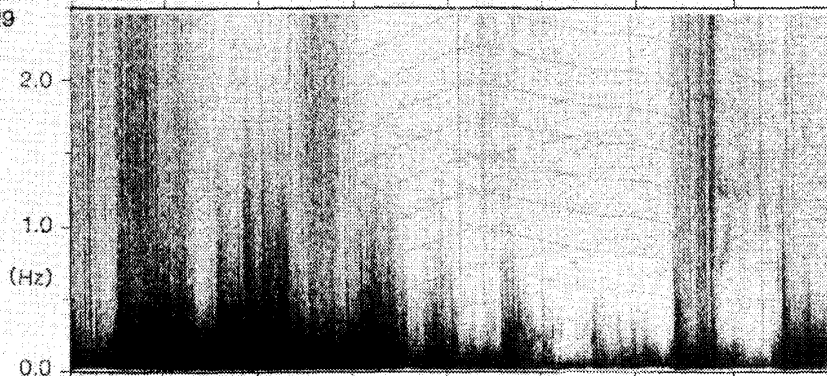
Mar. 27



Mar. 28



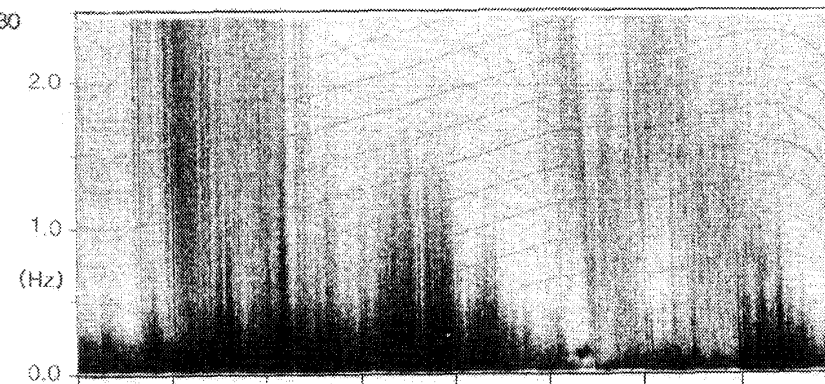
Mar. 29



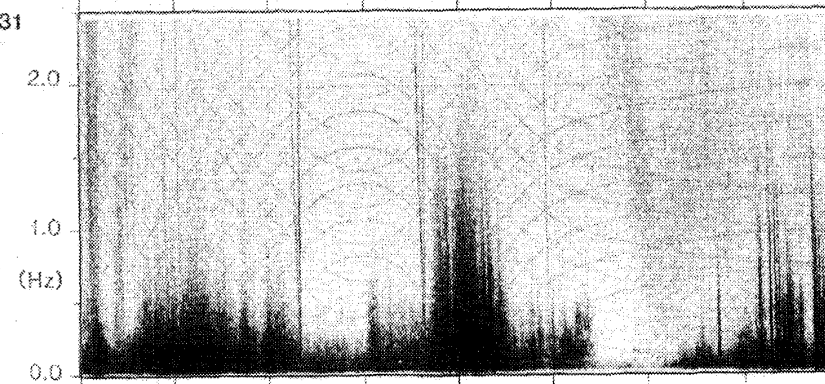
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

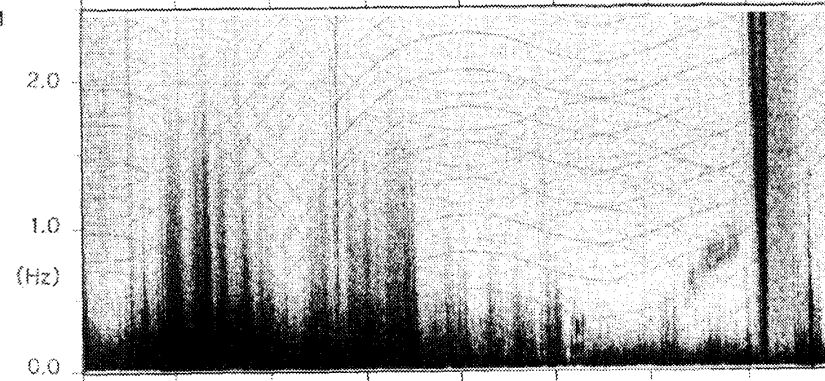
Mar. 30



Mar. 31

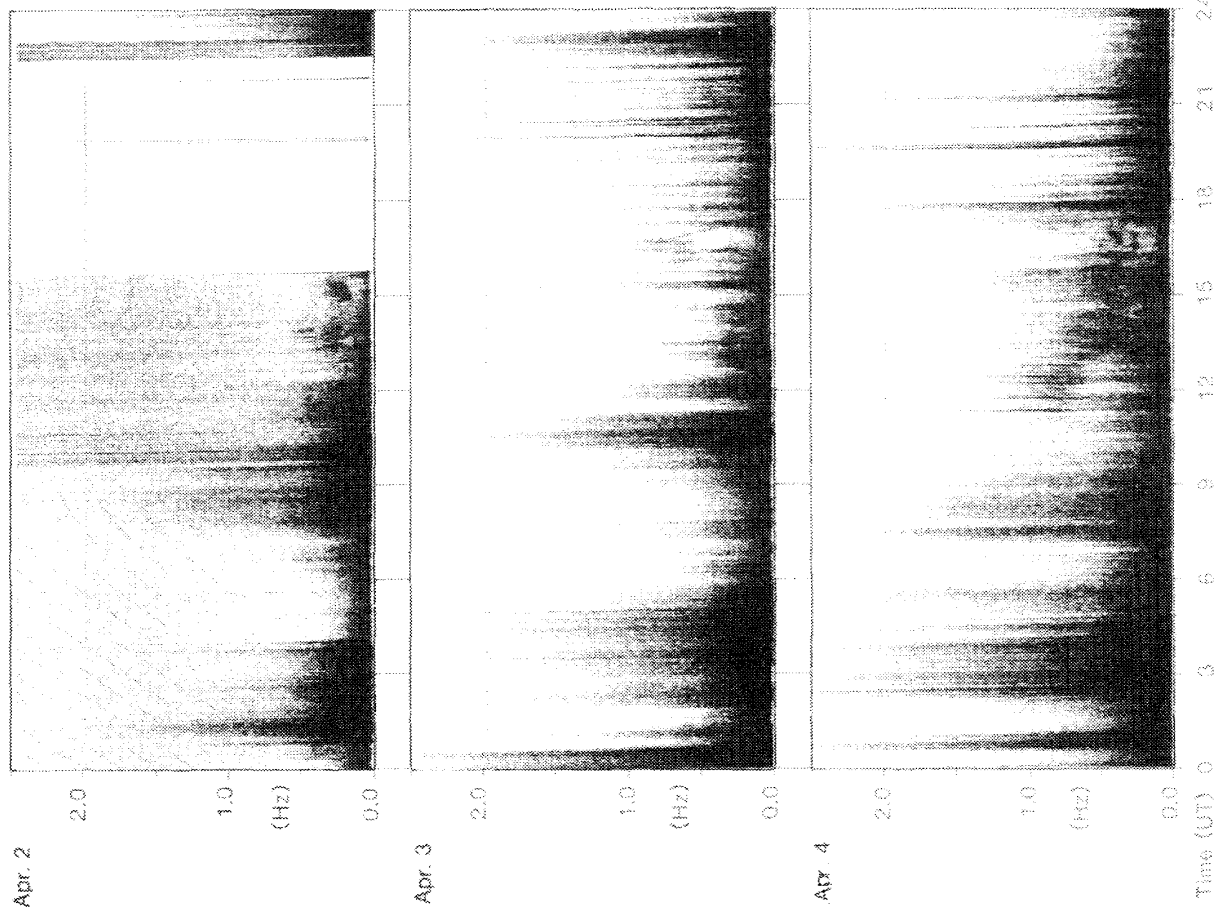


Apr. 1

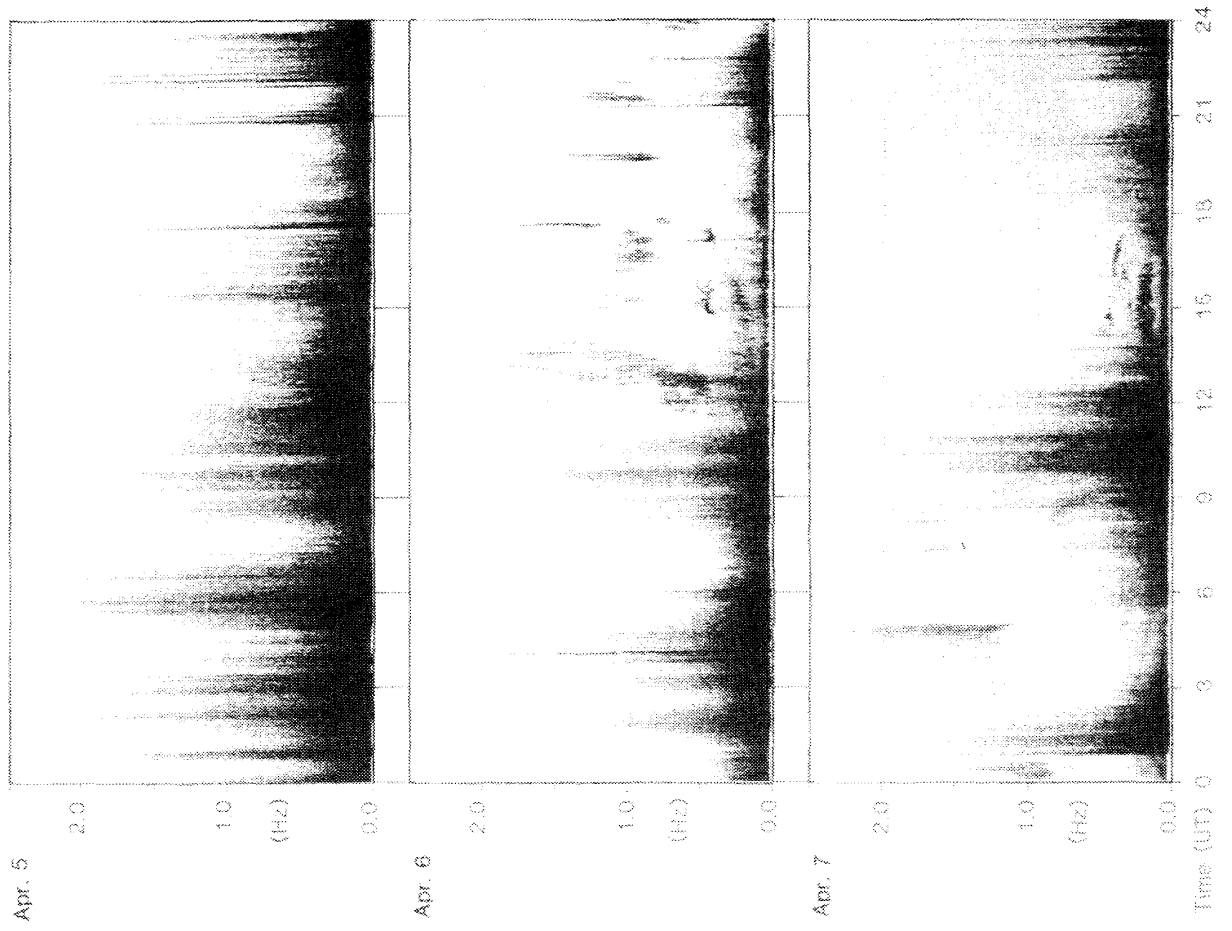


Time (UT) 0 3 6 9 12 15 18 21 24

Syowa Station, 1984

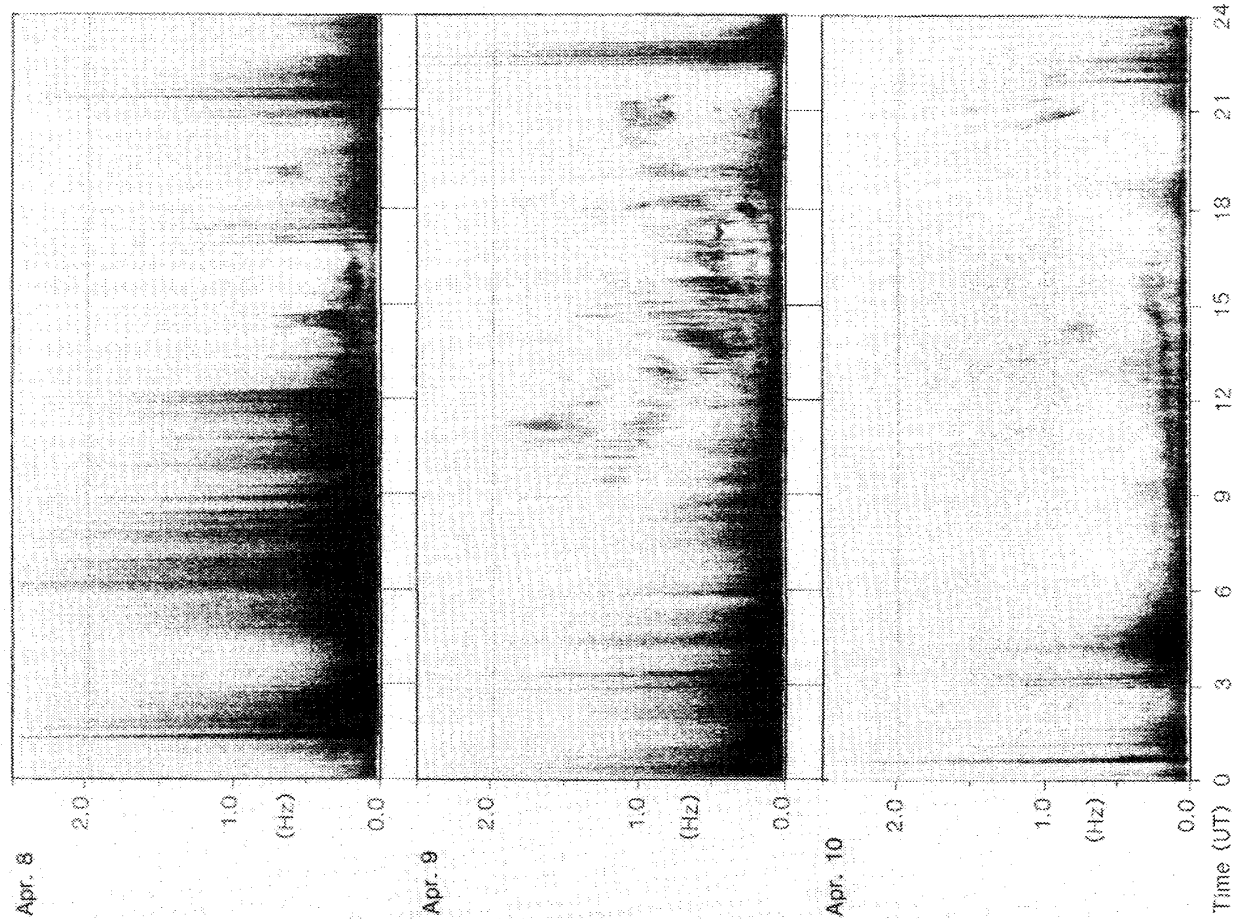


Syowa Station, 1984

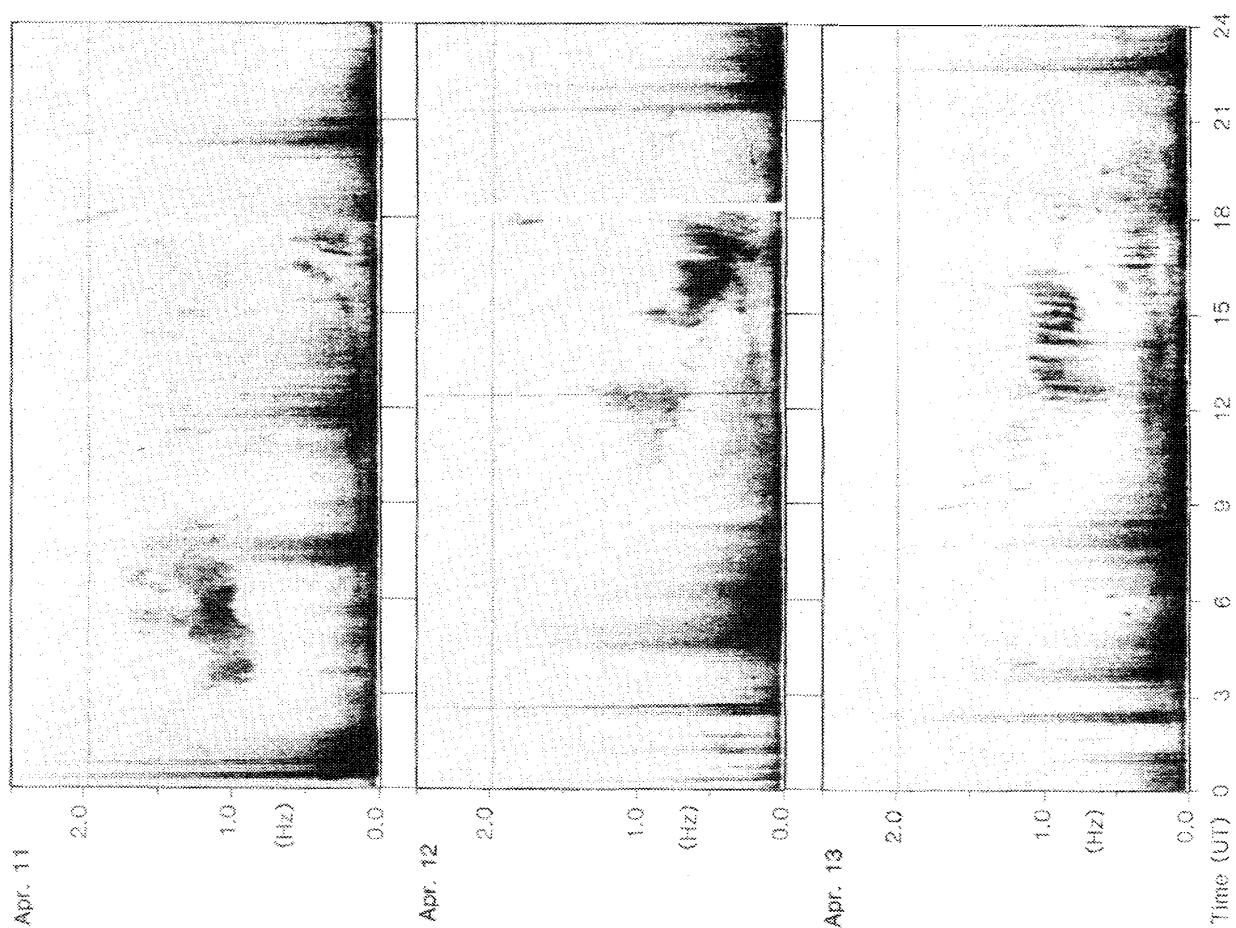




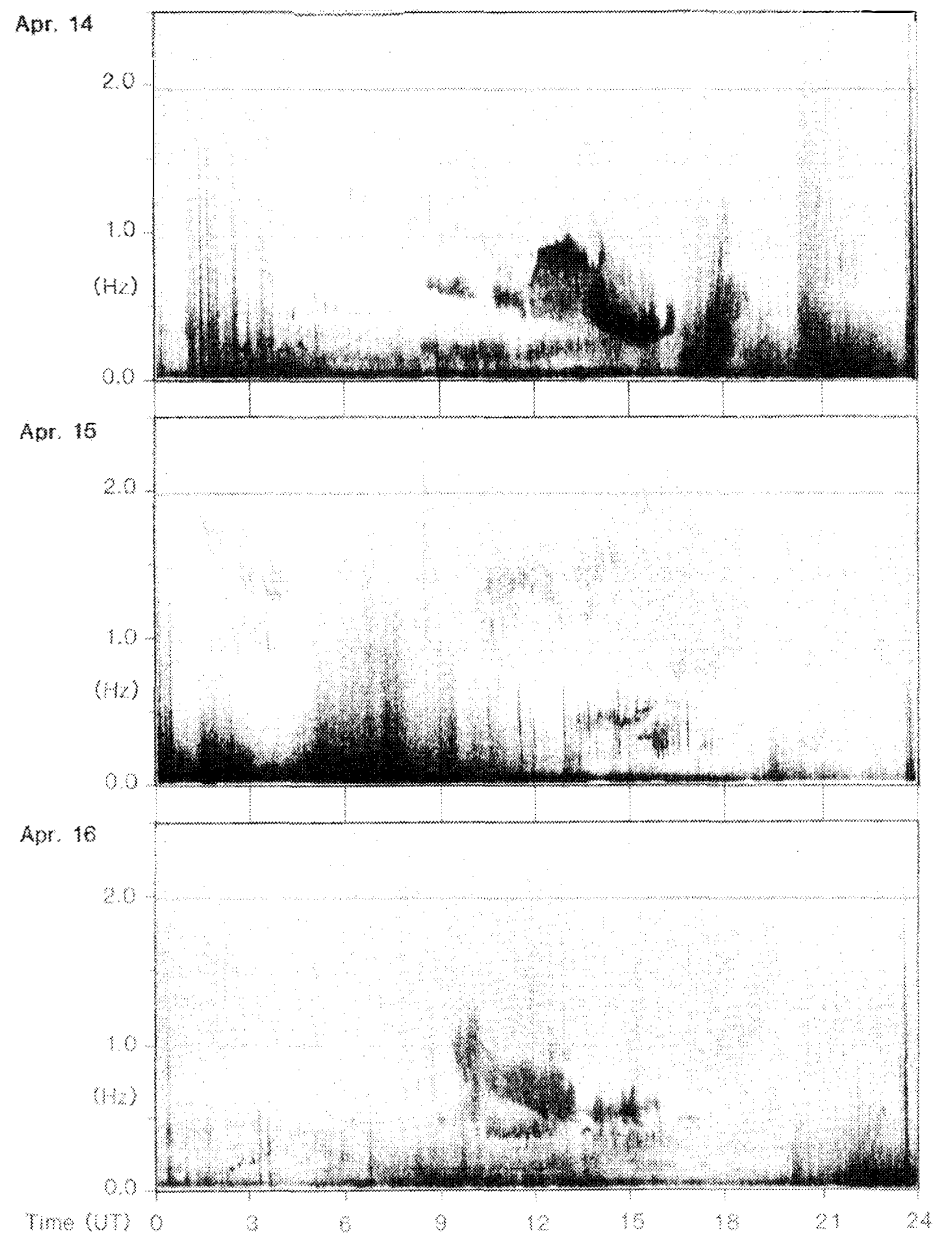
Syowa Station, 1984



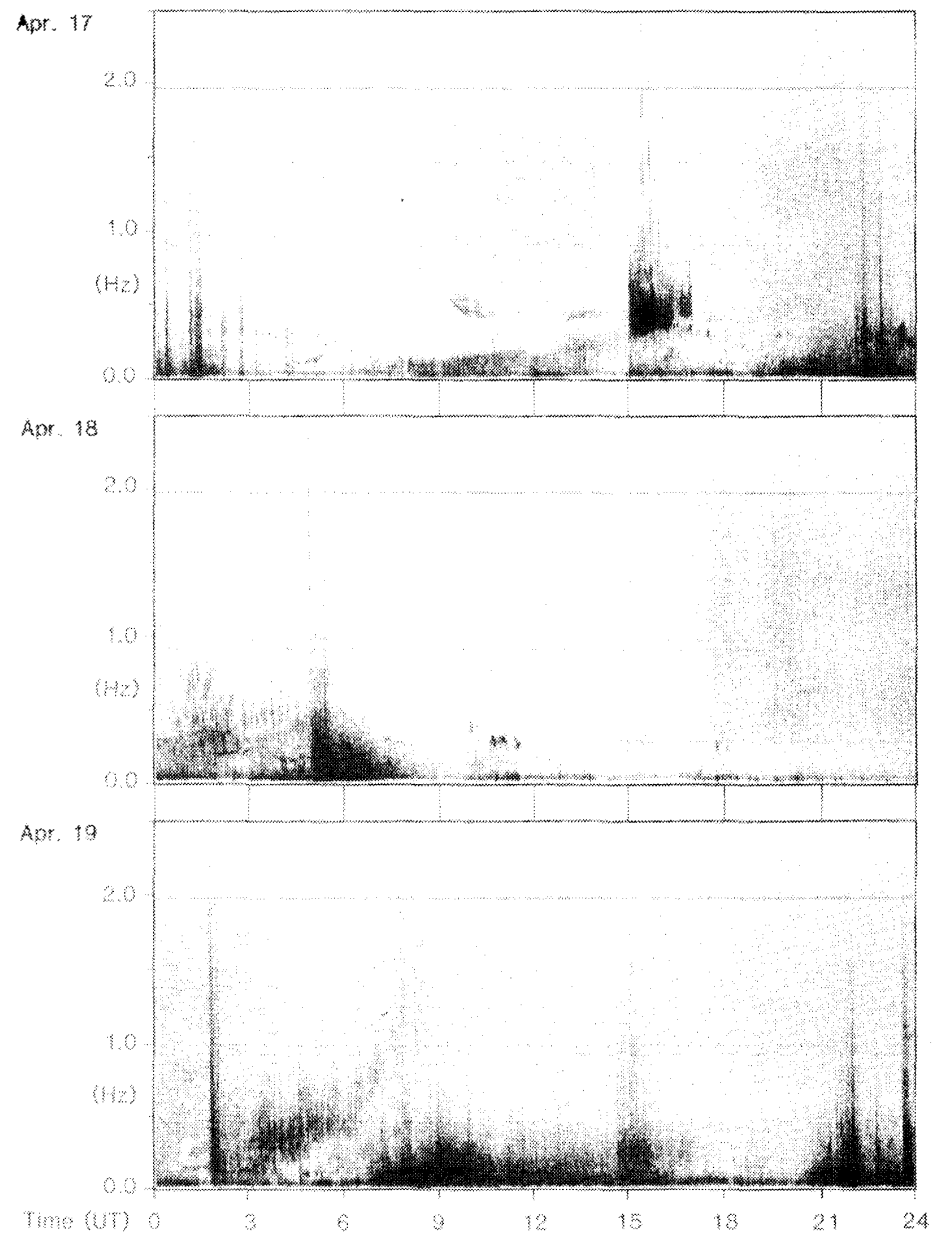
Syowa Station, 1984



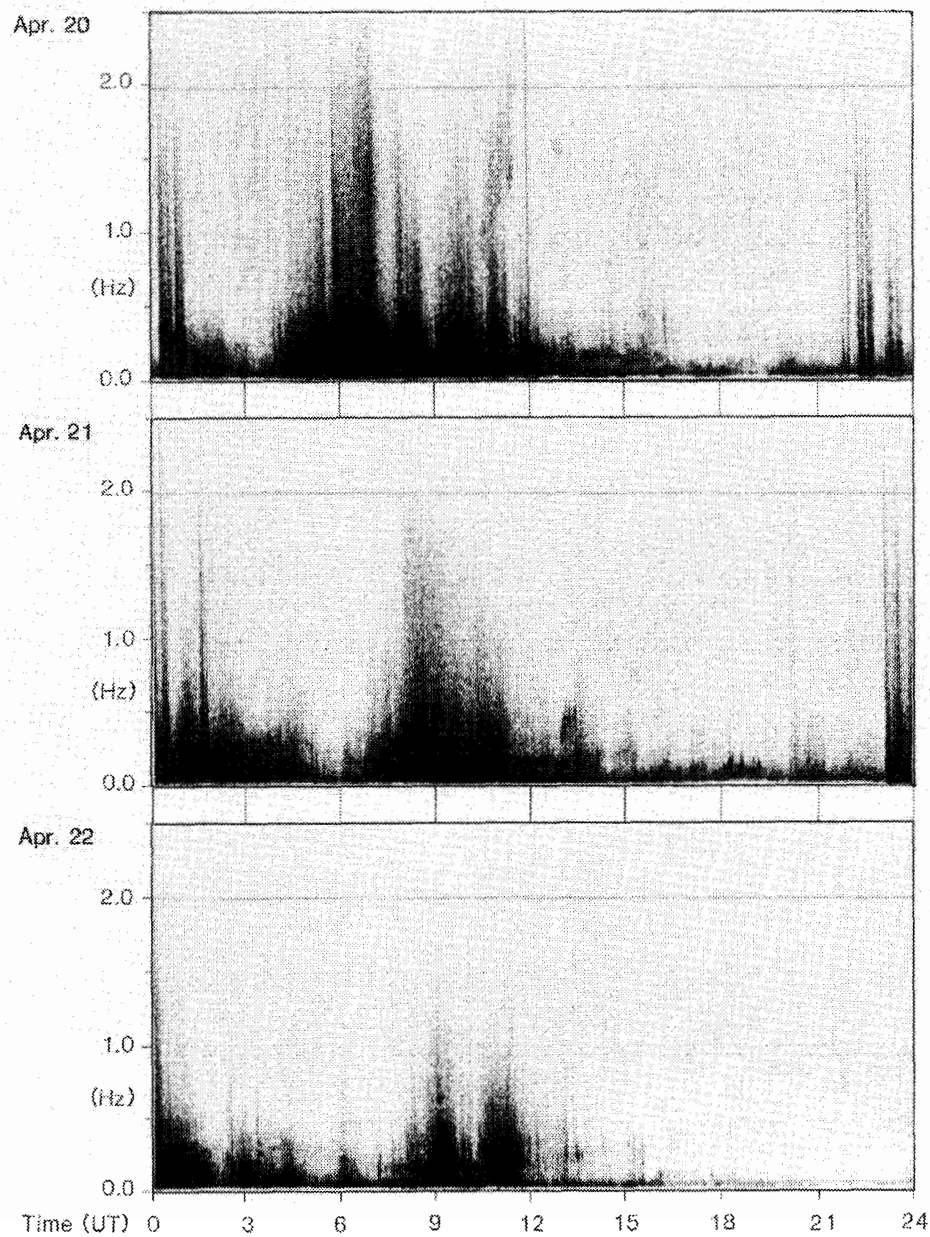
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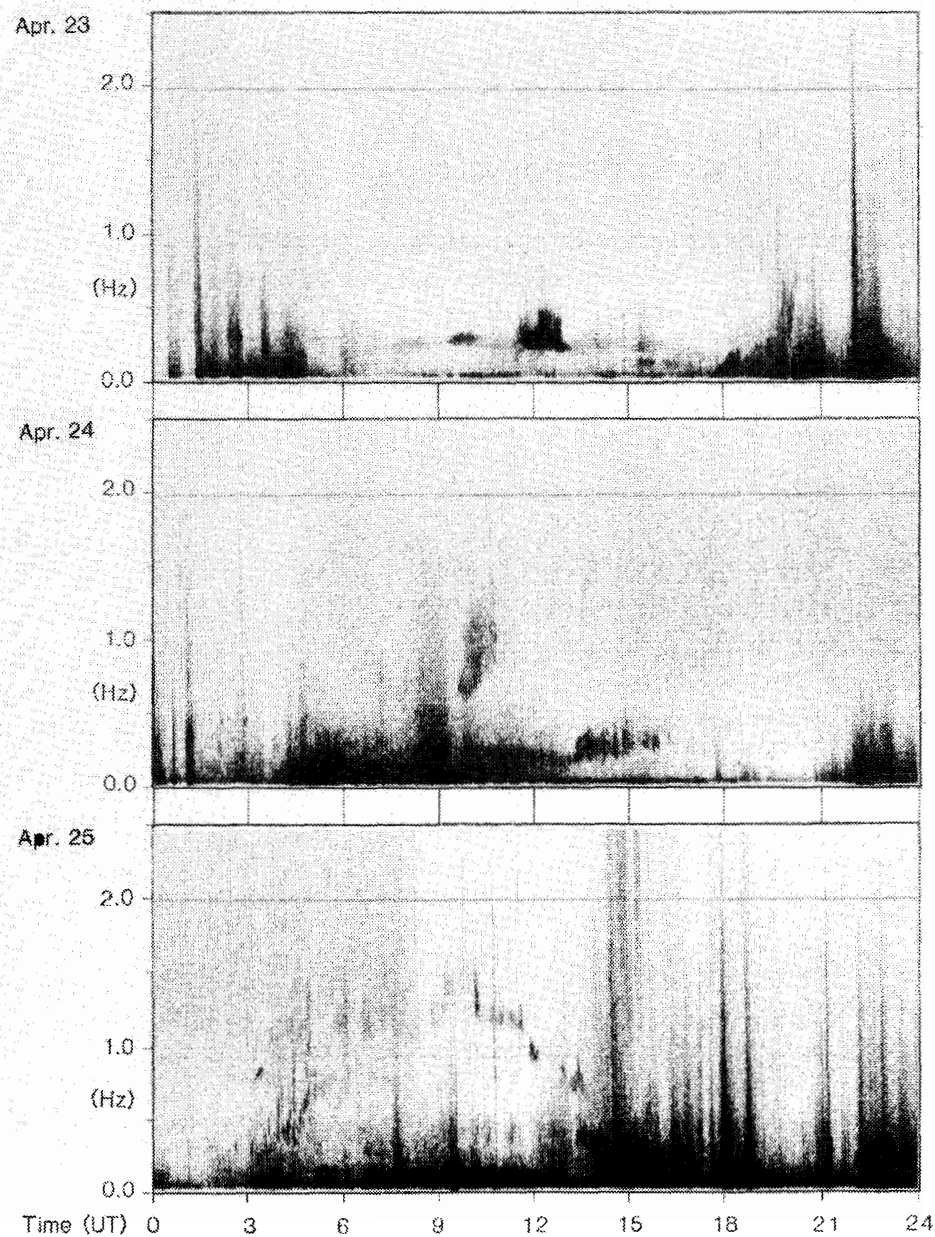
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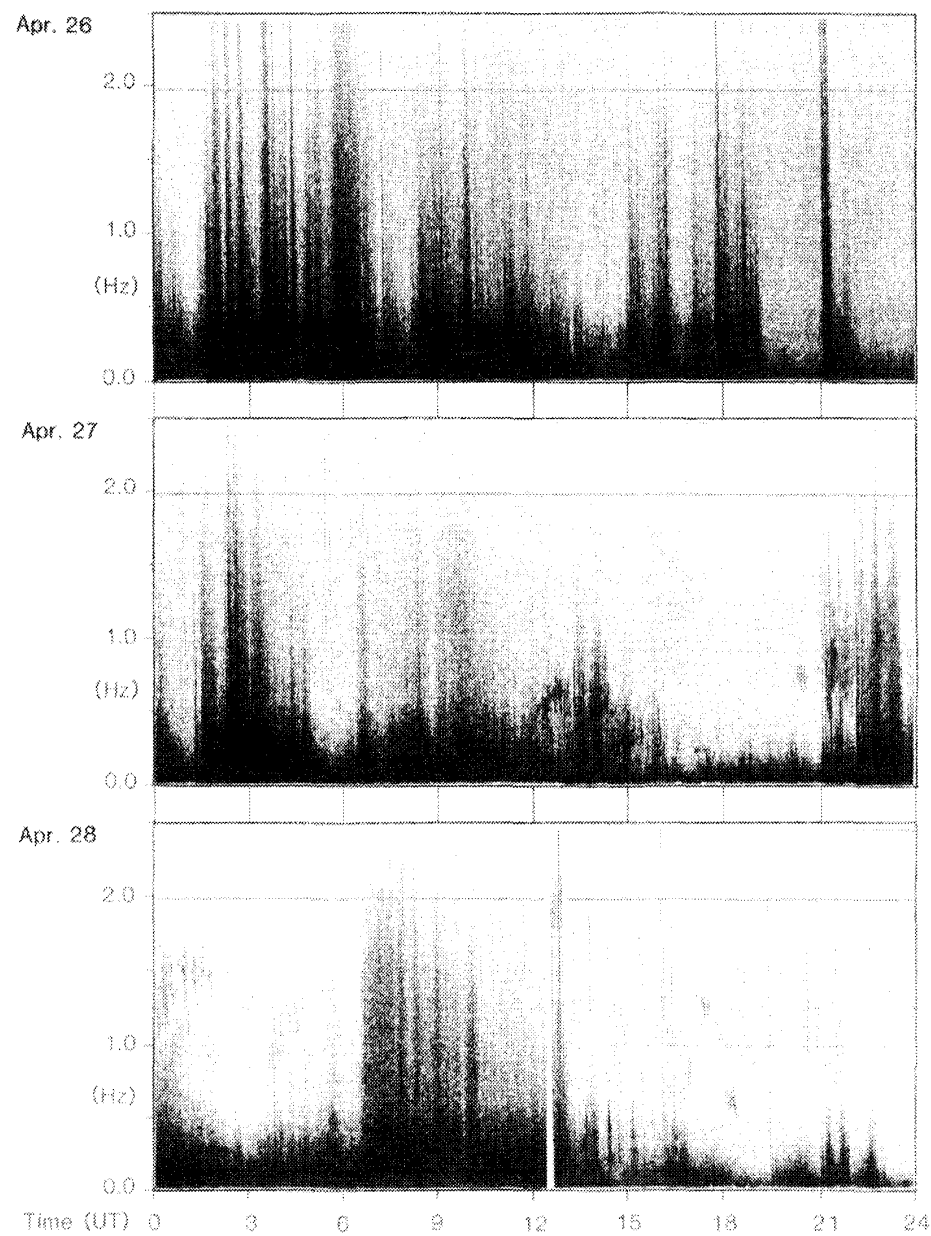
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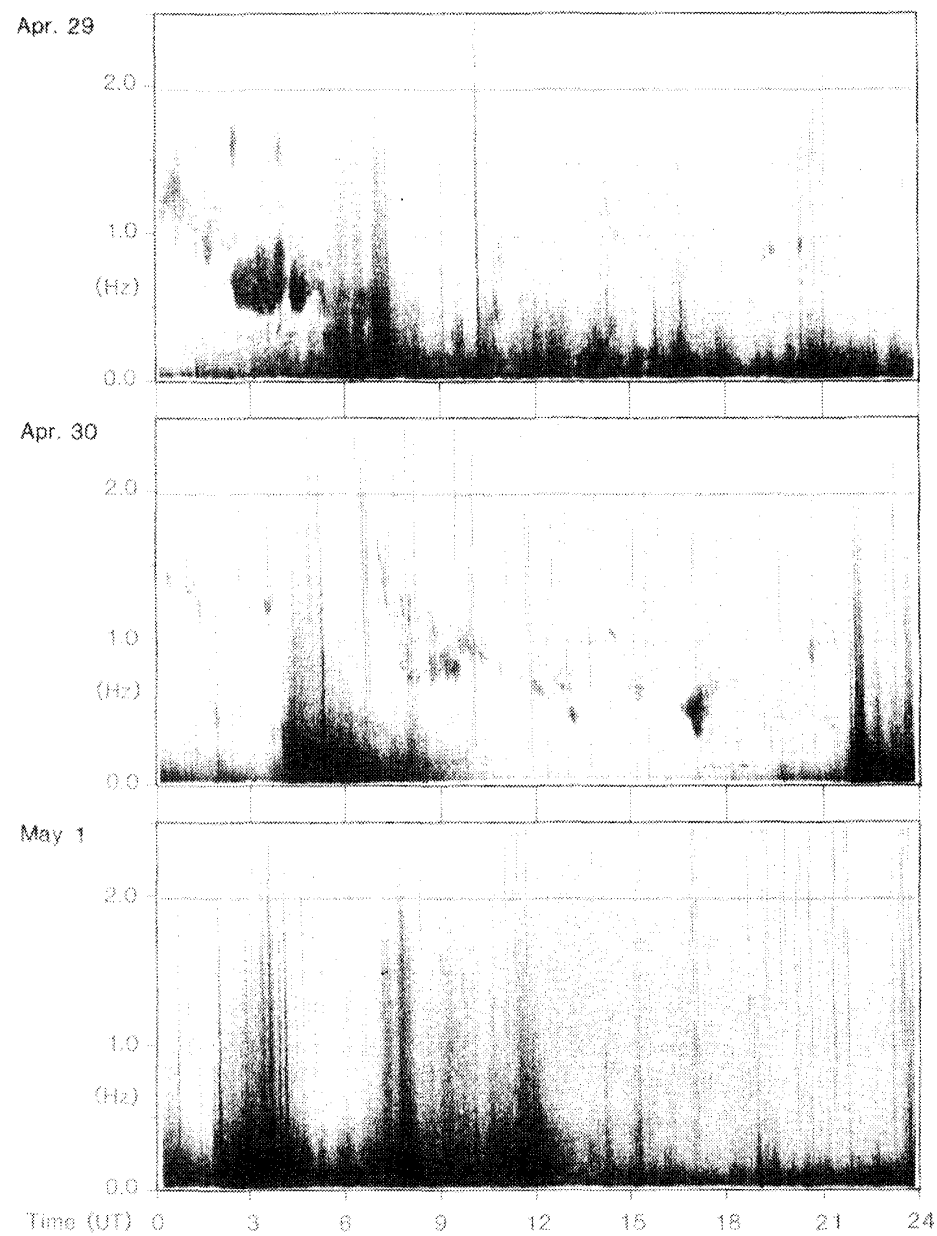
# Syowa Station, 1984



# Syowa Station, 1984



# Syowa Station, 1984



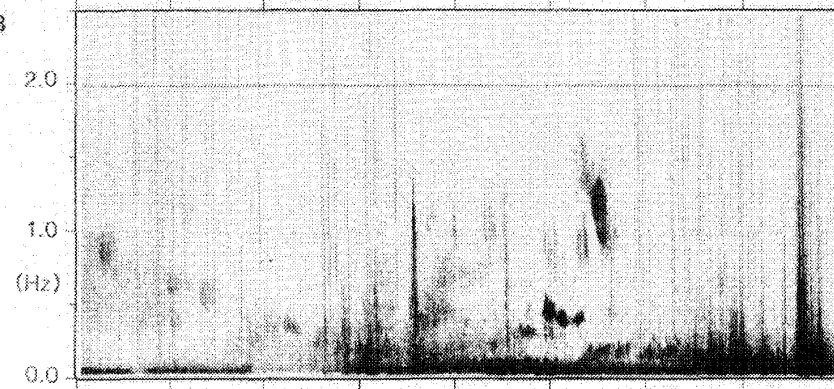


# Syowa Station, 1984

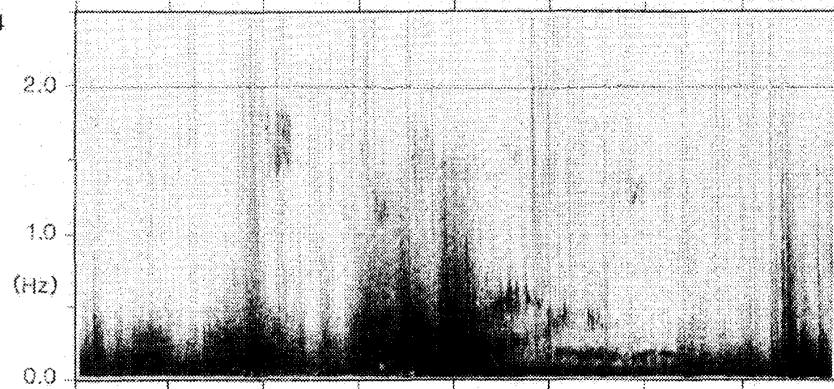
May 2



May 3



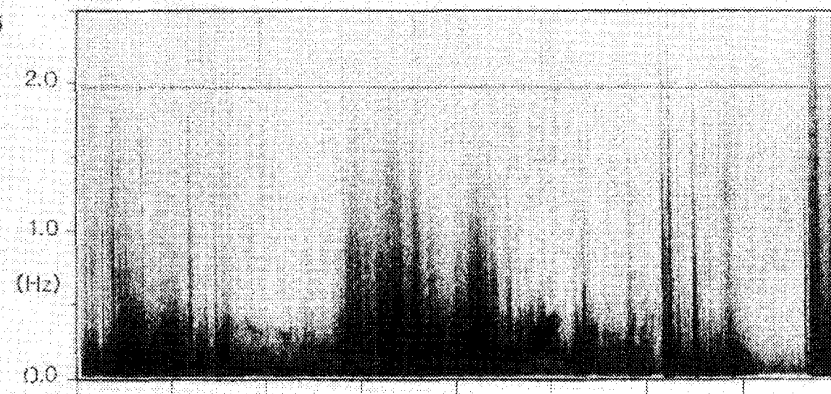
May 4



Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

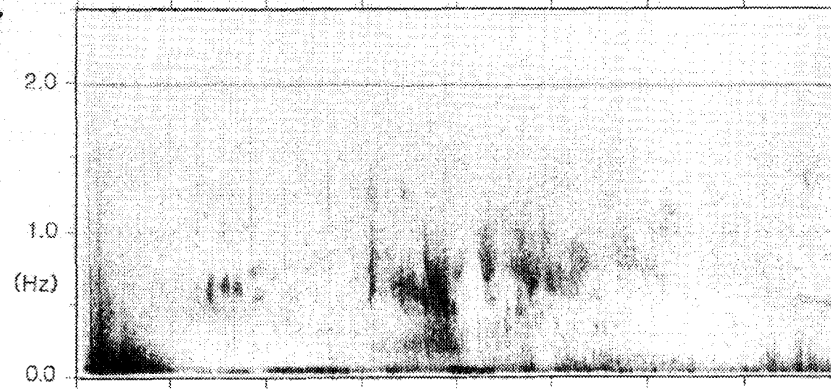
May 5



May 6

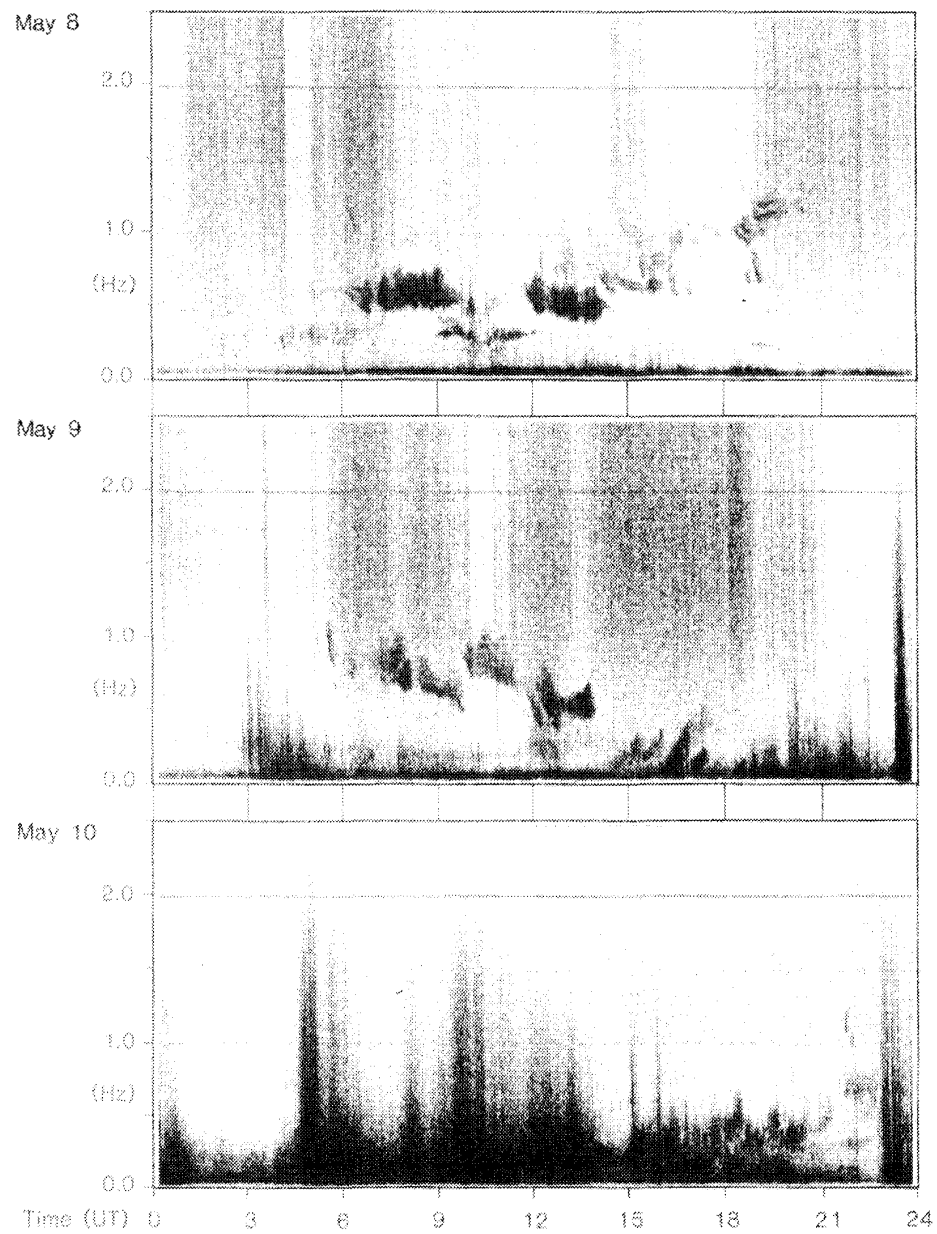


May 7

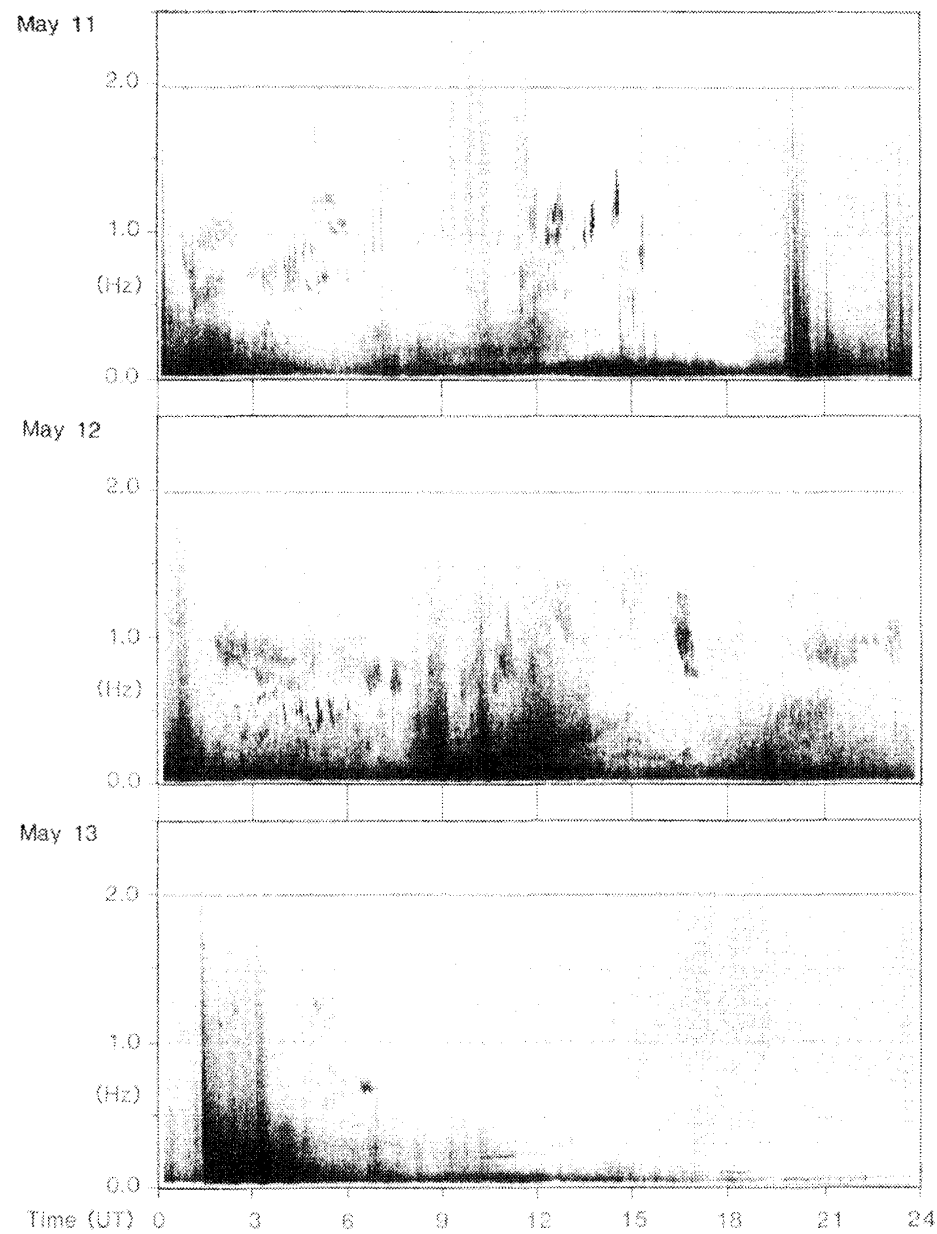


Time (UT) 0 3 6 9 12 15 18 21 24

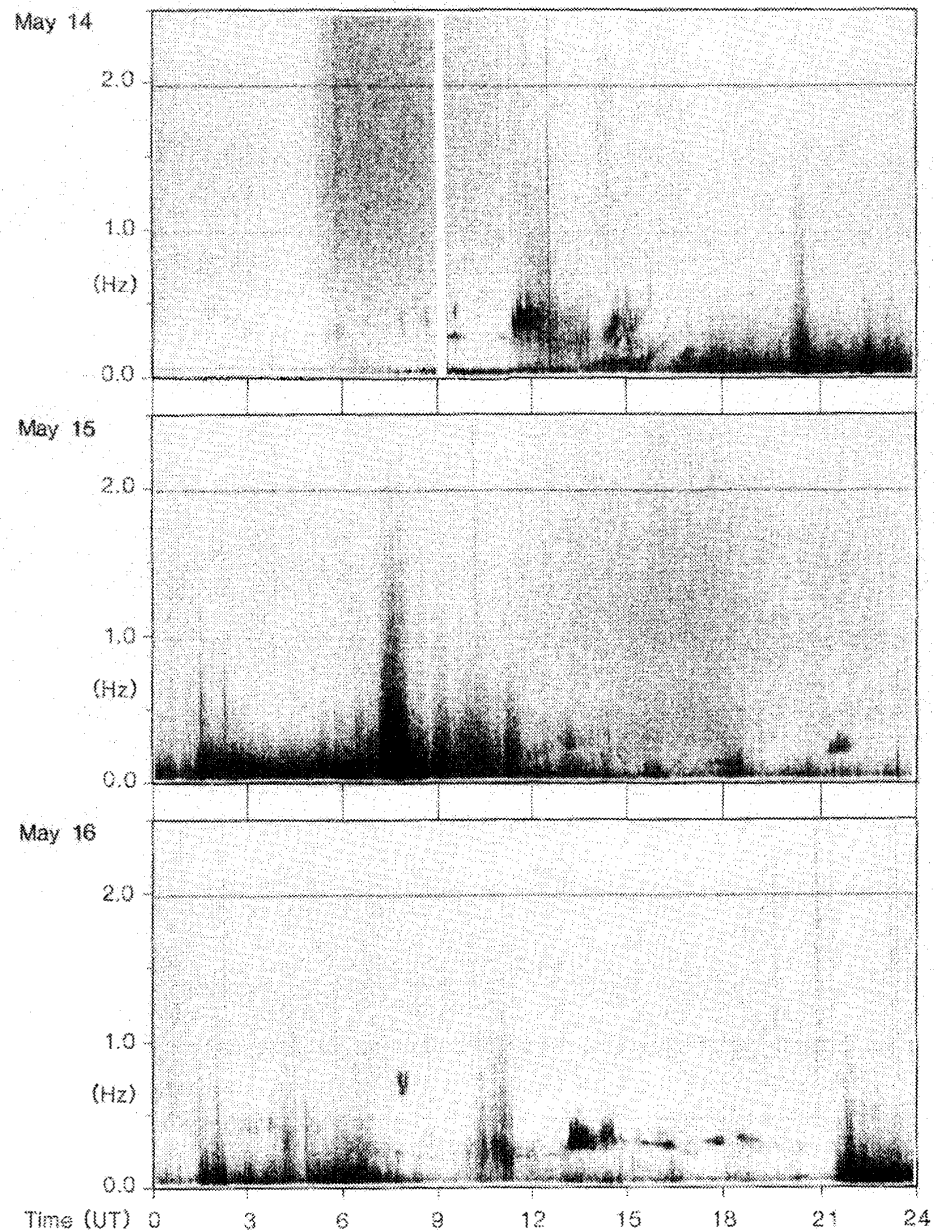
# Syowa Station, 1984



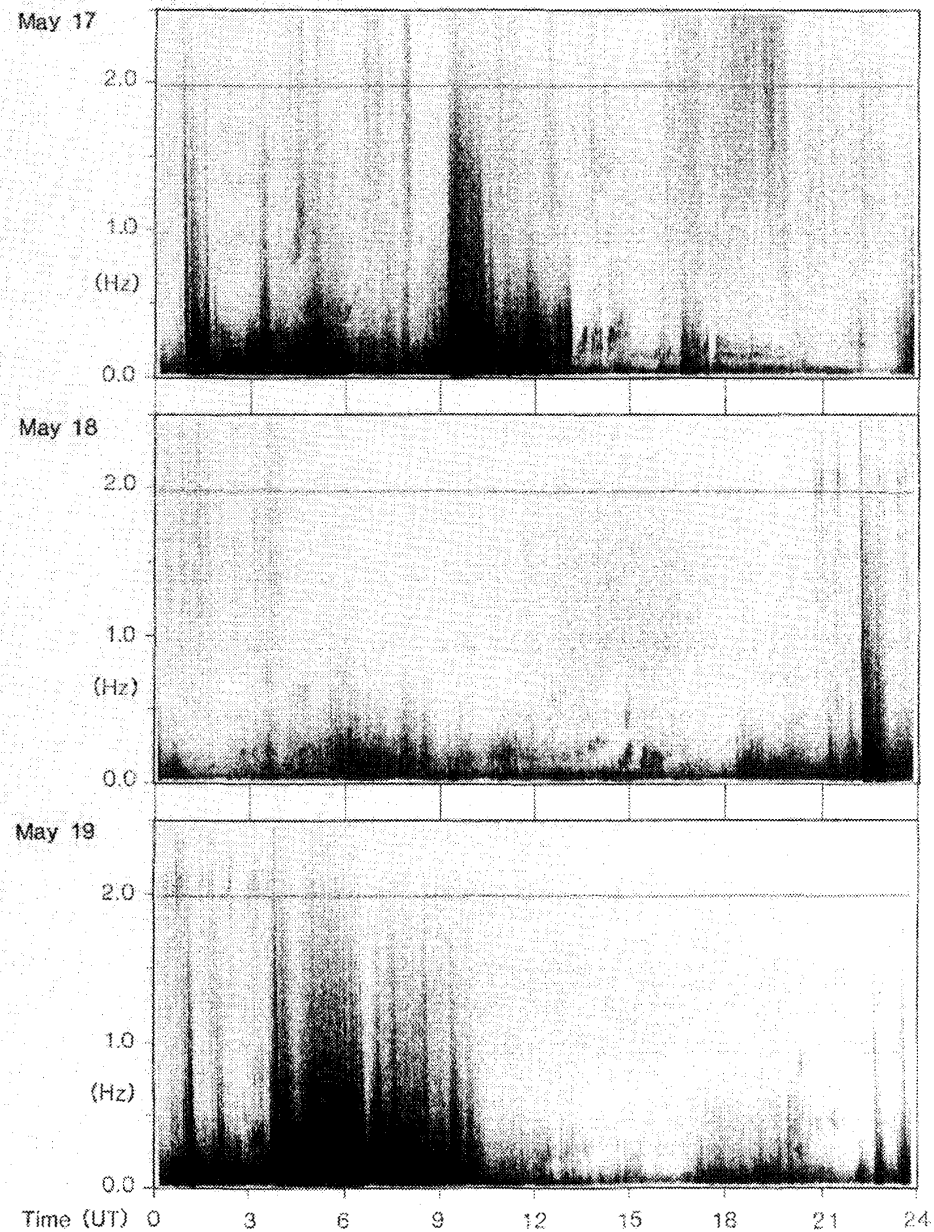
# Syowa Station, 1984



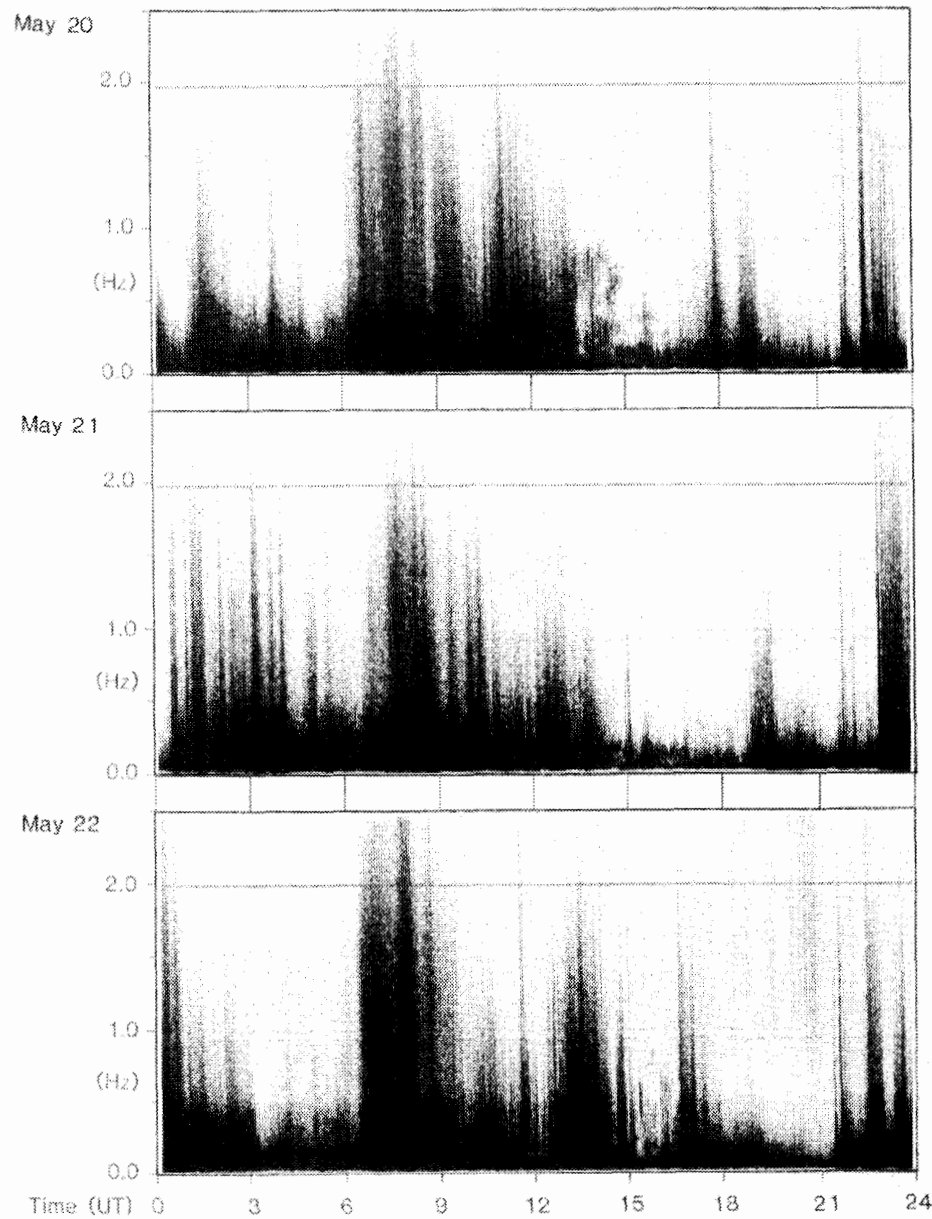
# Syowa Station, 1984



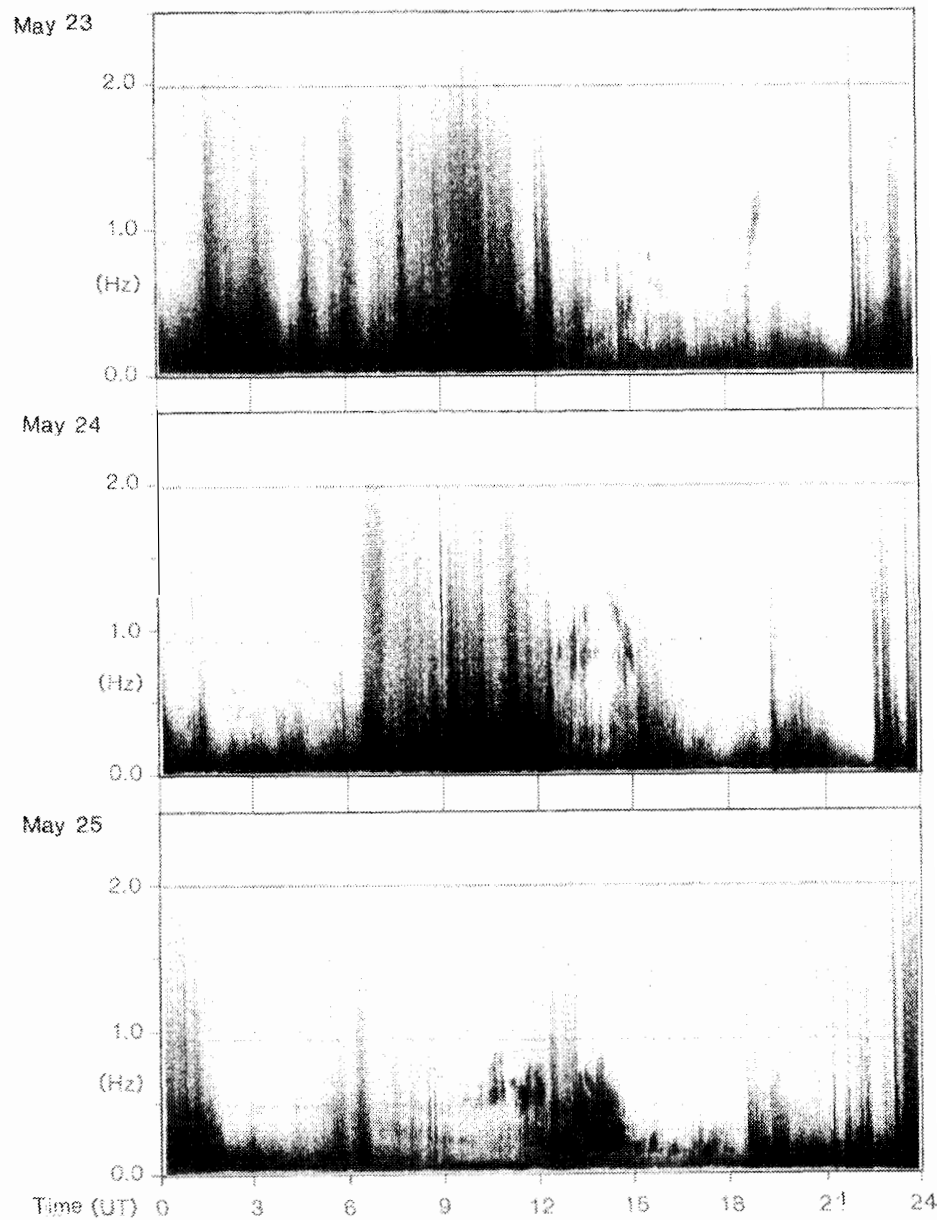
# Syowa Station, 1984



Syowa Station, 1984



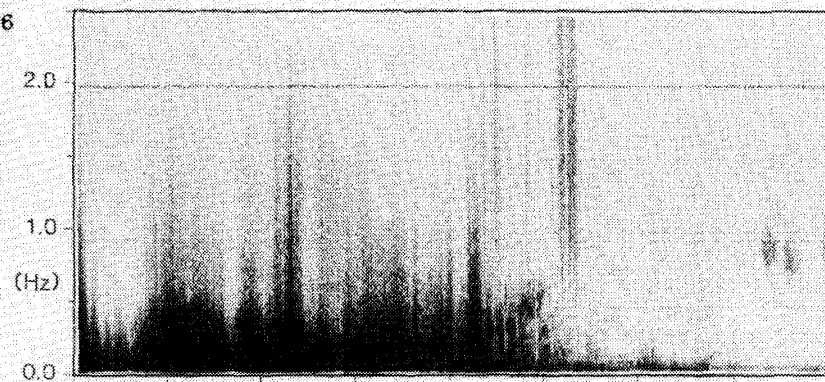
Syowa Station, 1984



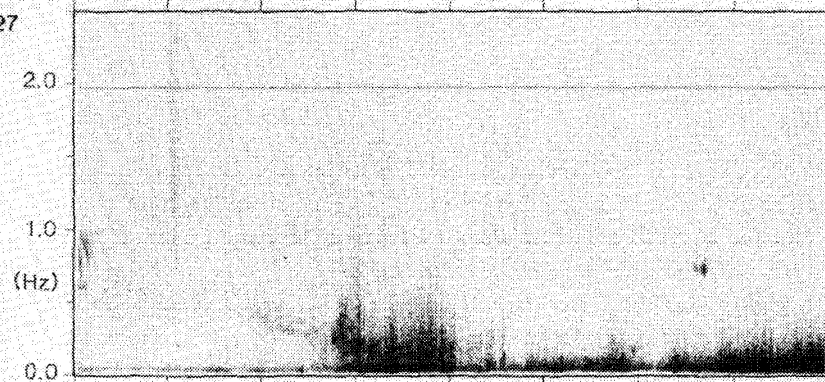


# Syowa Station, 1984

May 26



May 27

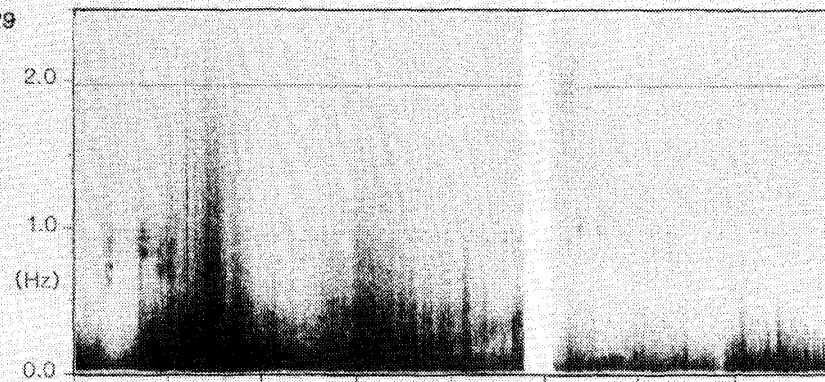


May 28

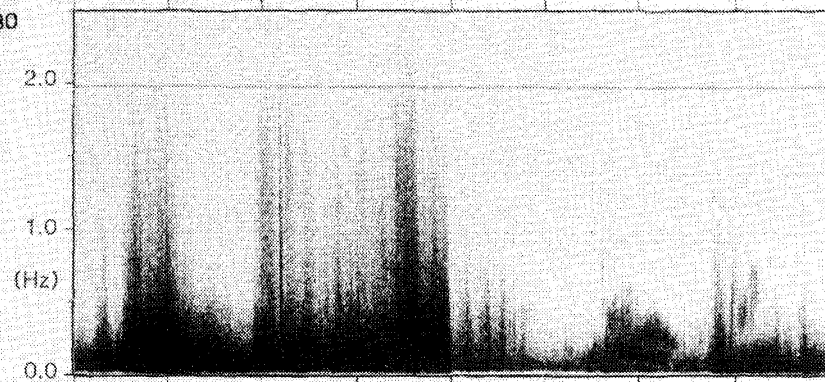


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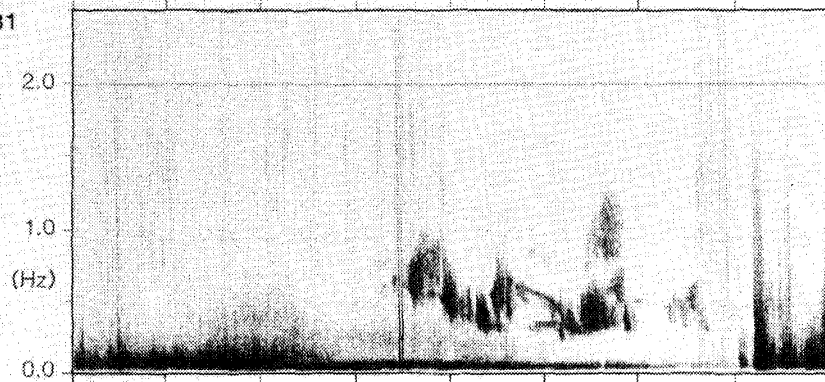
May 29



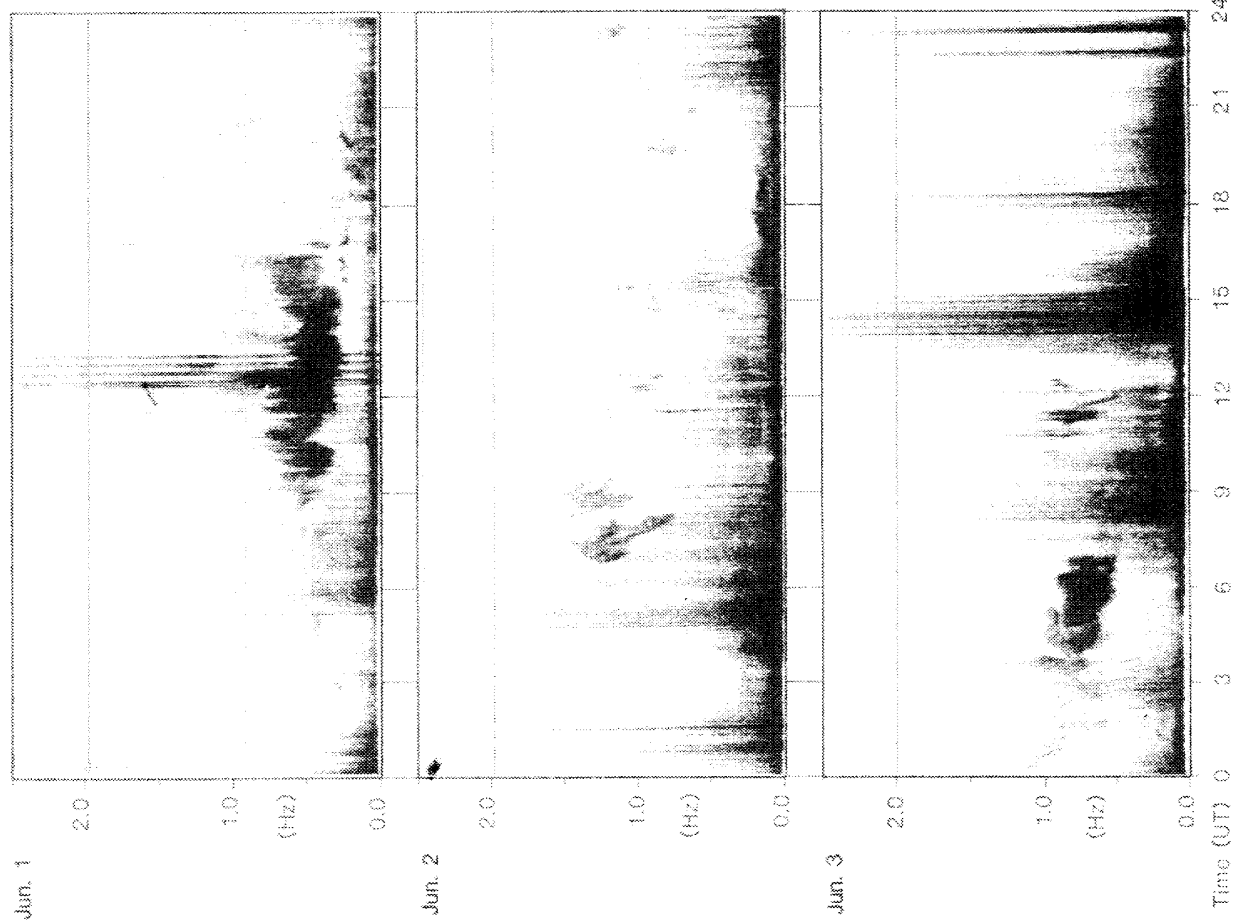
May 30



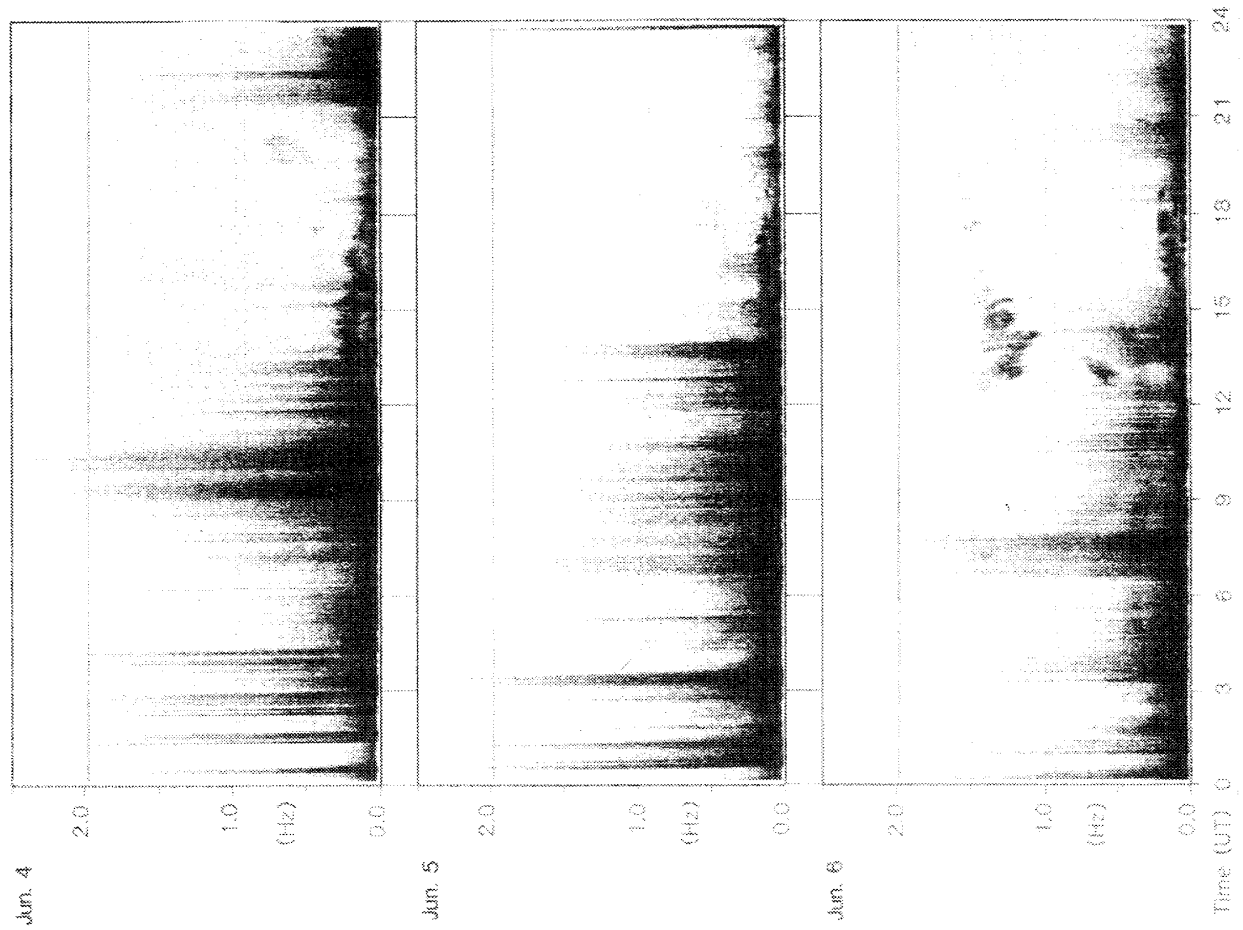
May 31



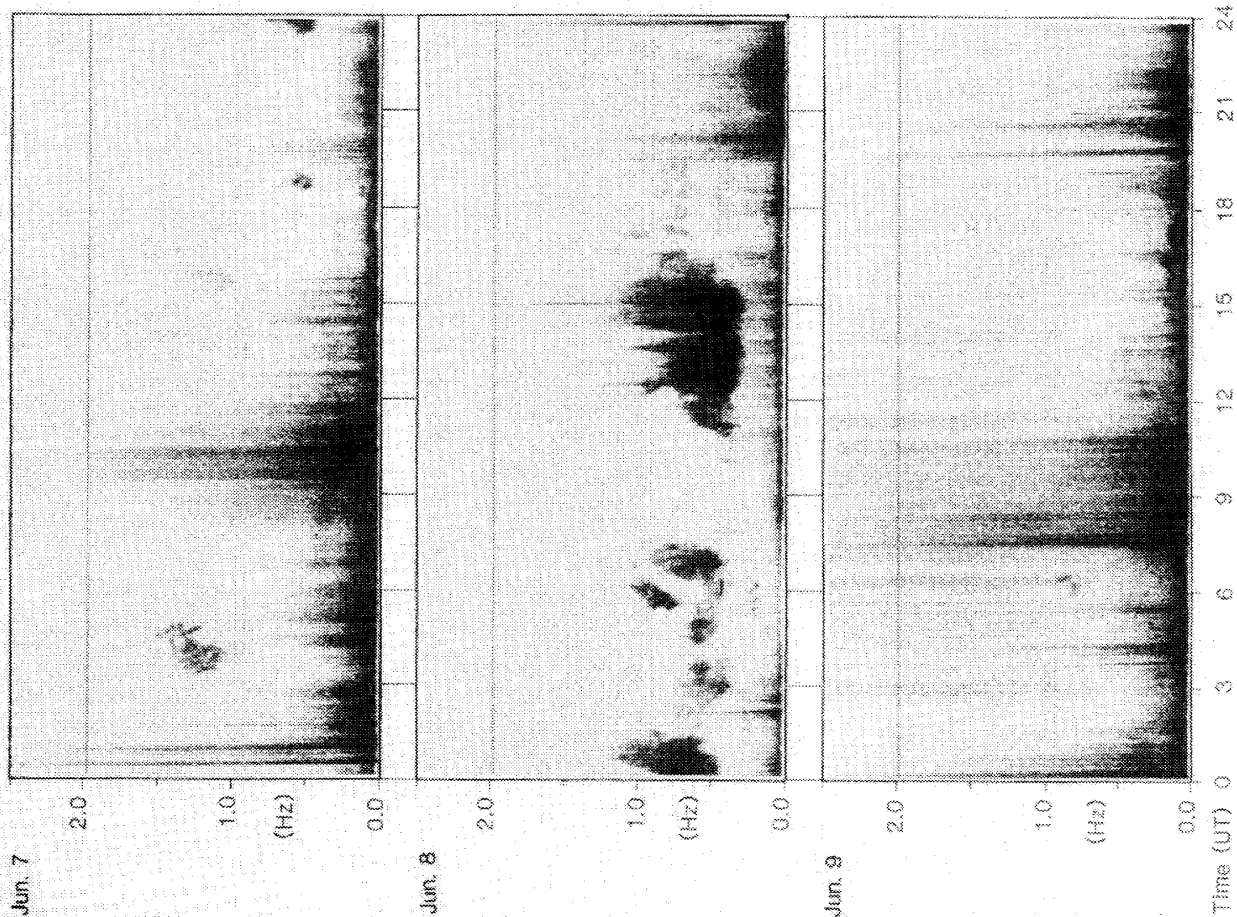
Syowa Station, 1984



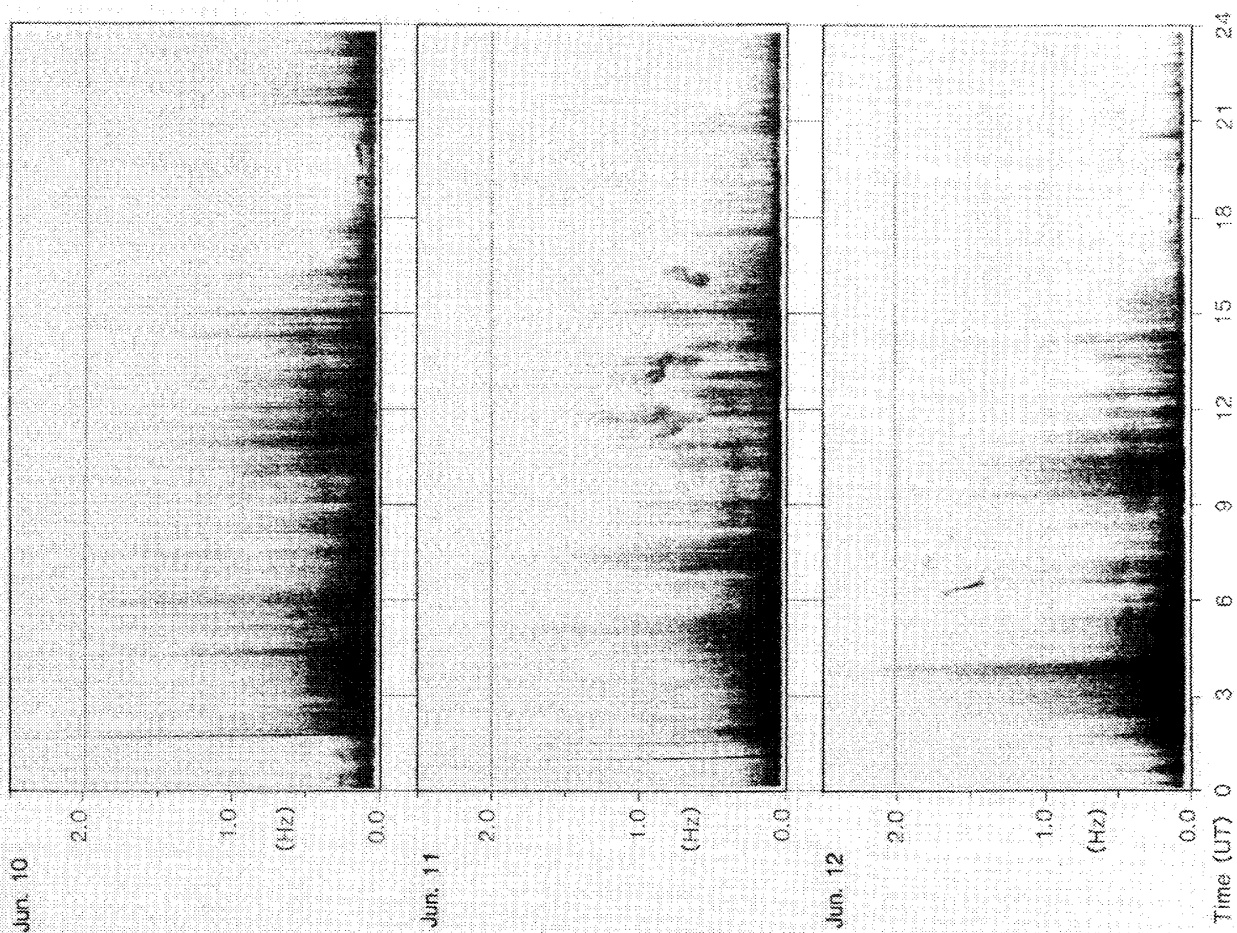
Syowa Station, 1984



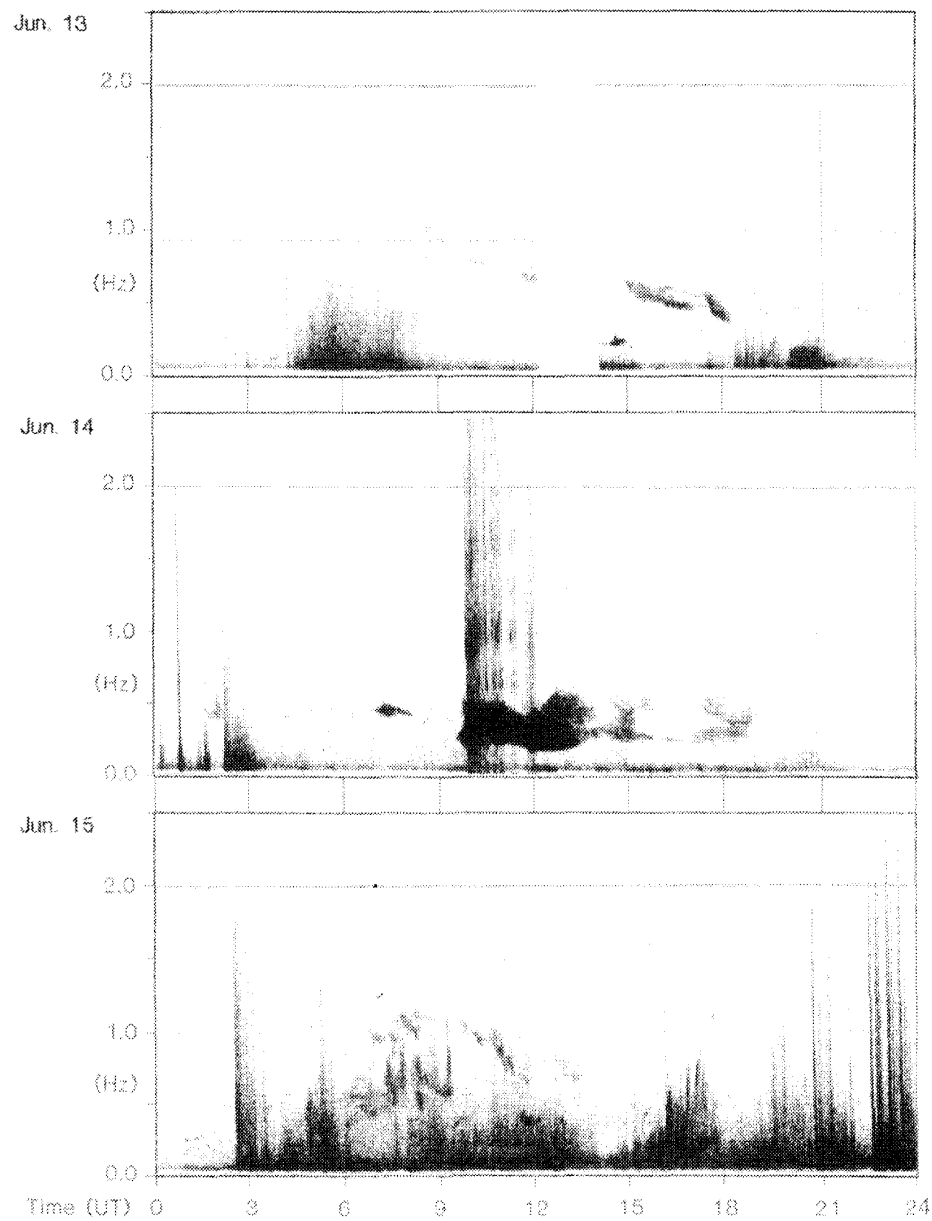
Syowa Station, 1984



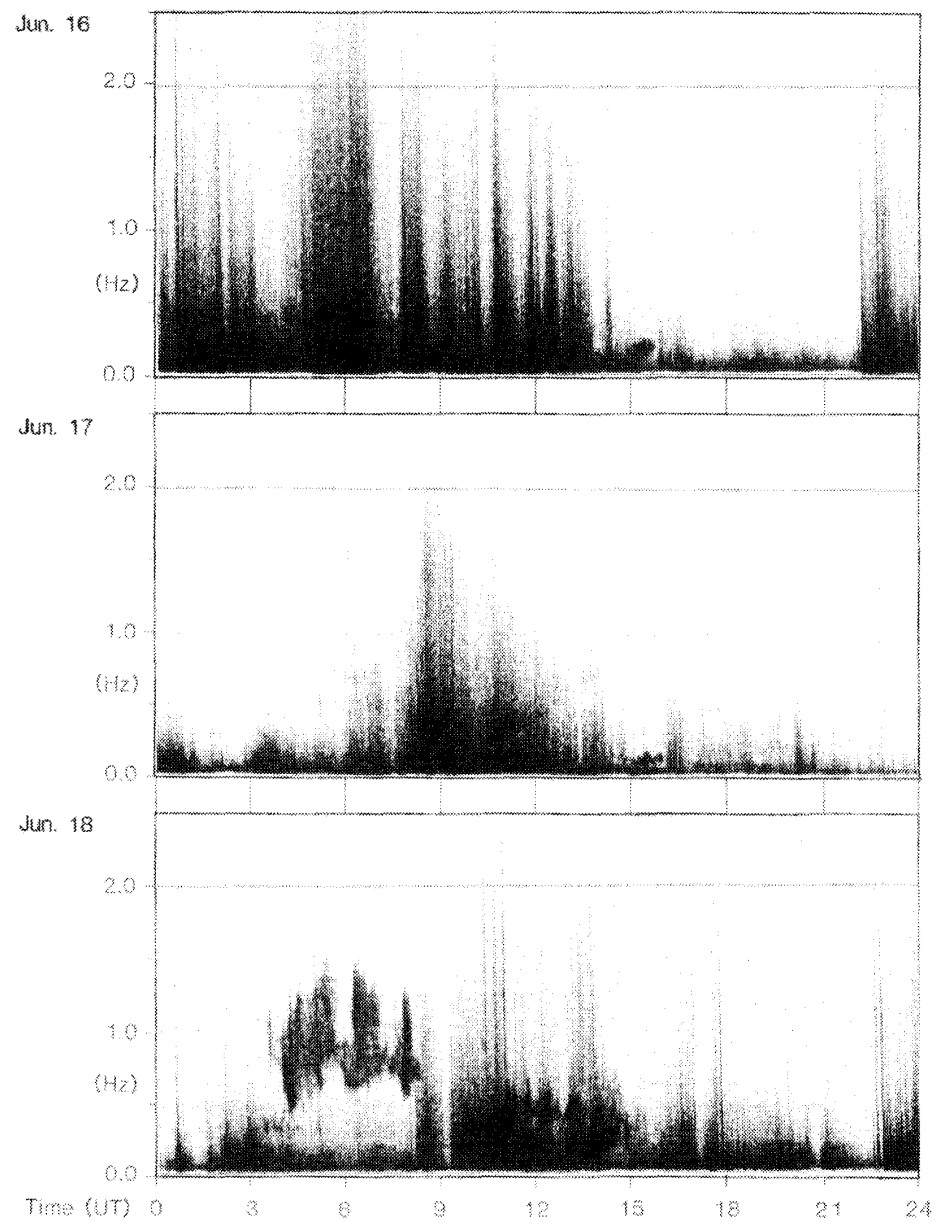
Syowa Station, 1984



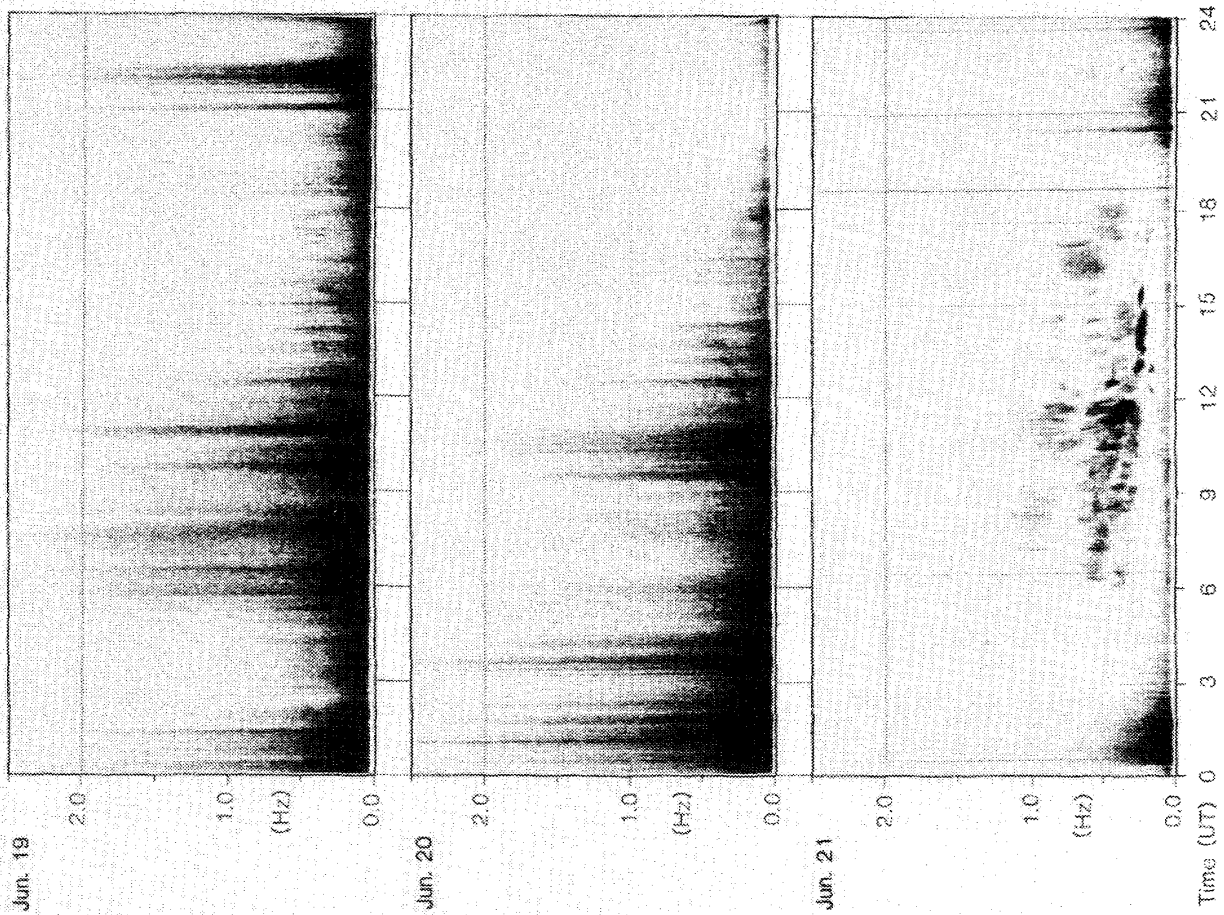
# Syowa Station, 1984



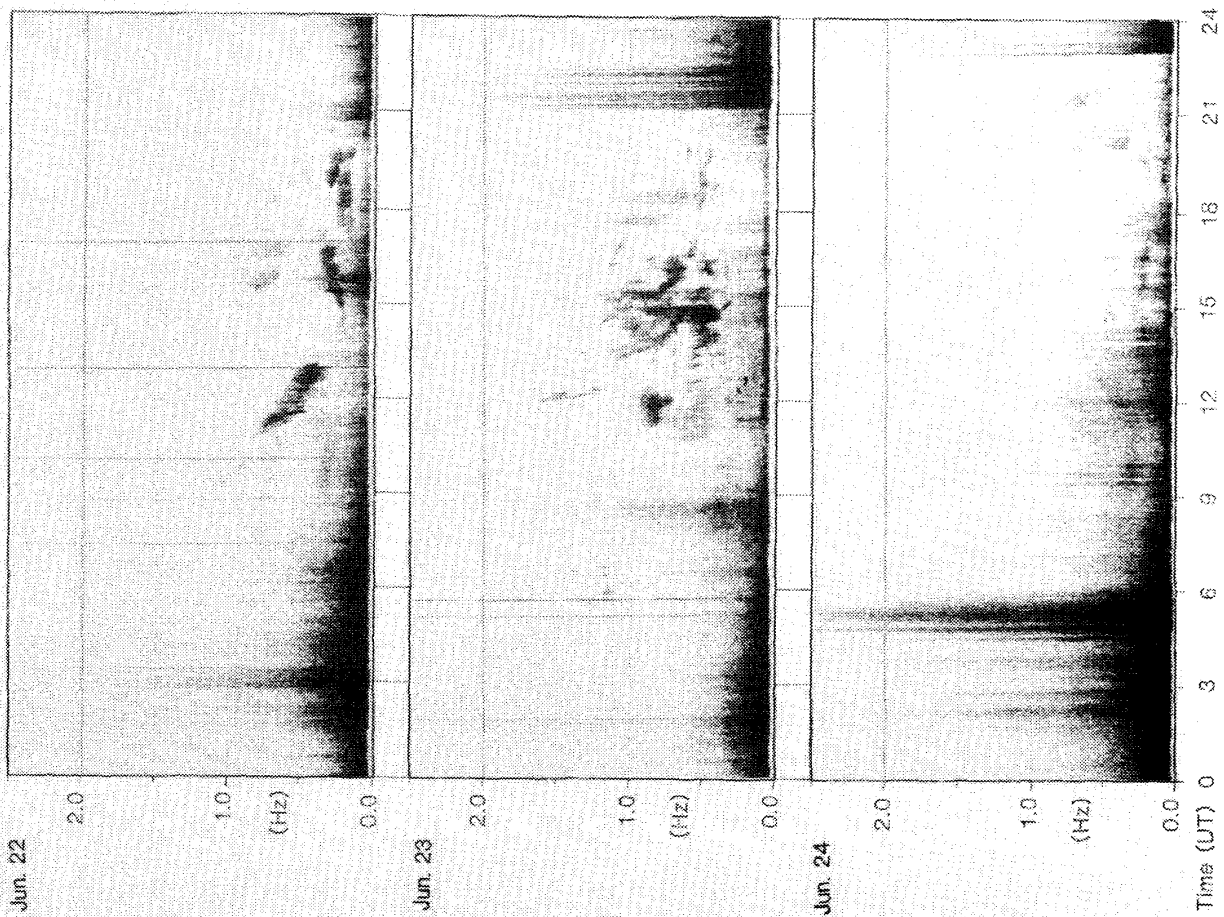
# Syowa Station, 1984



Syowa Station, 1984

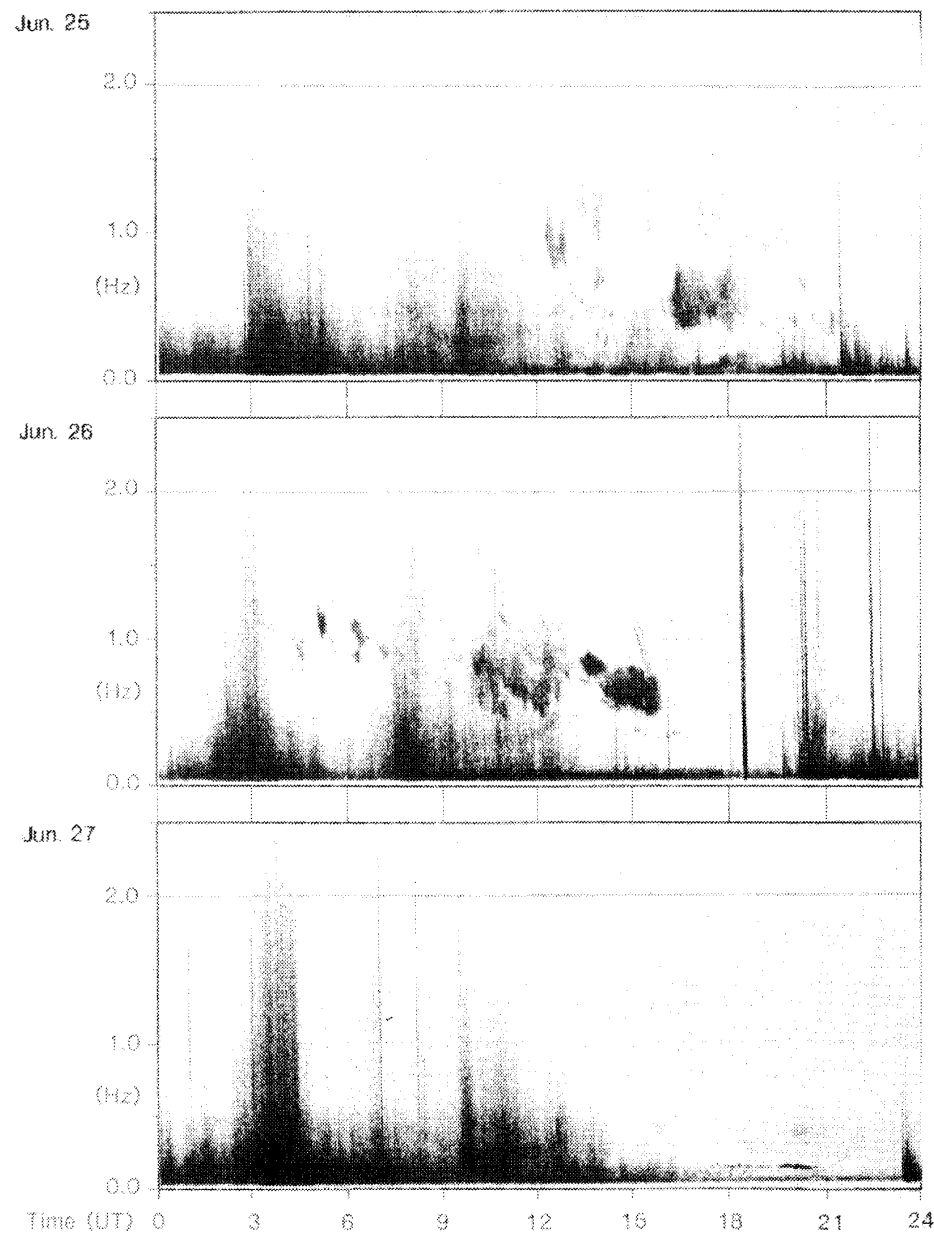


Syowa Station, 1984

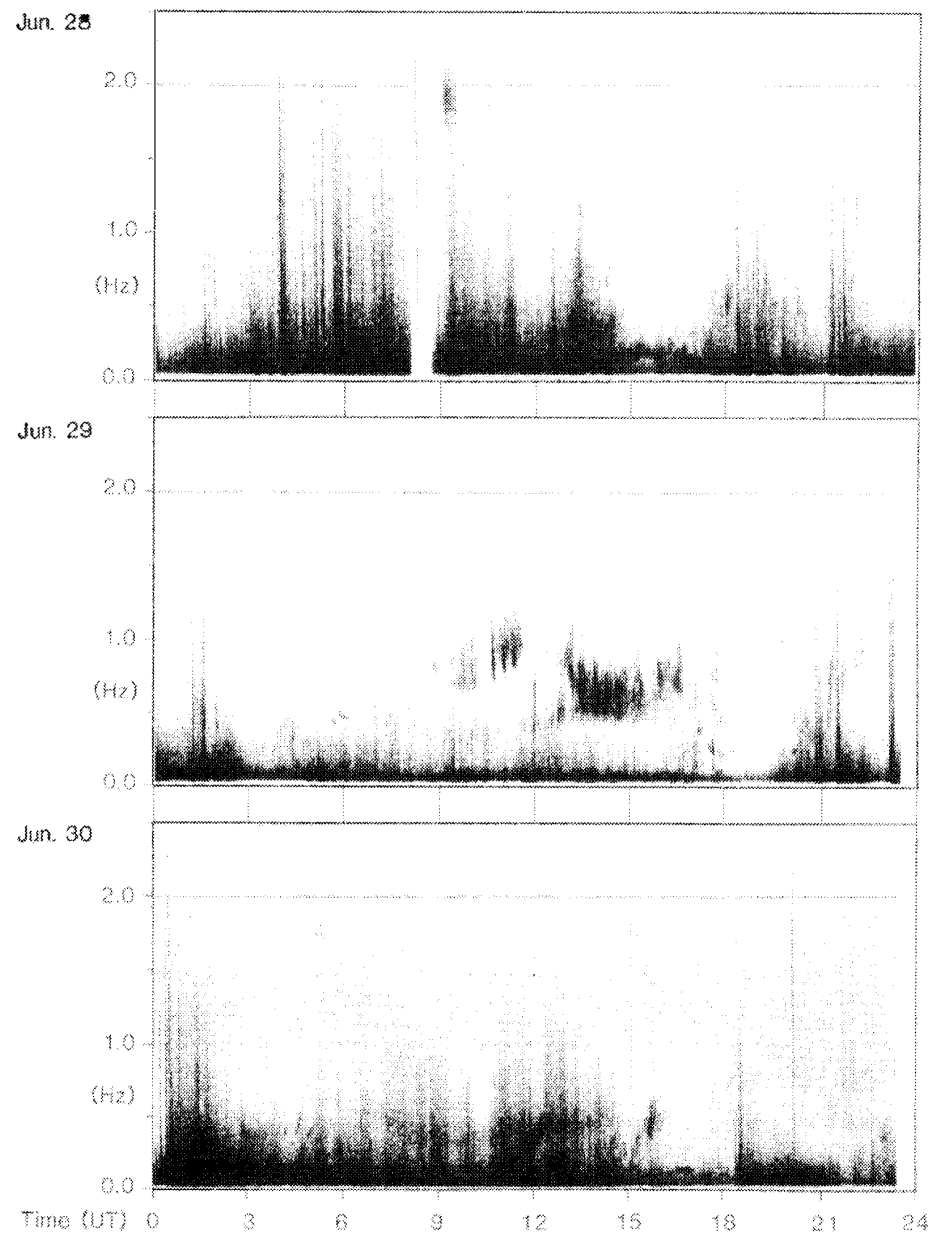




# Syowa Station, 1984



# Syowa Station, 1984



# Syowa Station, 1984

Jul. 1

2.0

1.0

(Hz)

0.0

Jul. 2

2.0

1.0

(Hz)

0.0

Jul. 3

2.0

1.0

(Hz)

0.0

Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

Jul. 4

2.0

1.0

(Hz)

0.0

Jul. 5

2.0

1.0

(Hz)

0.0

Jul. 6

2.0

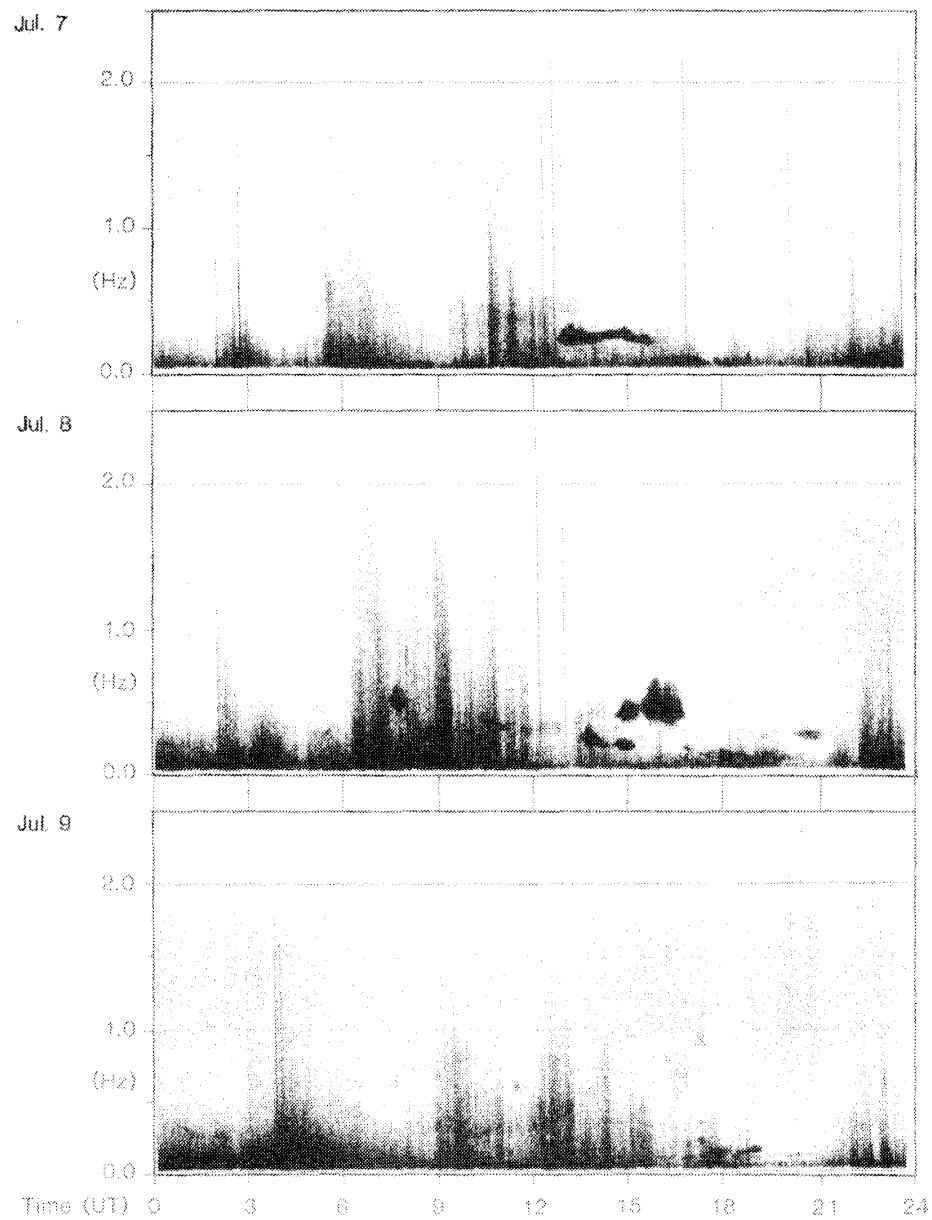
1.0

(Hz)

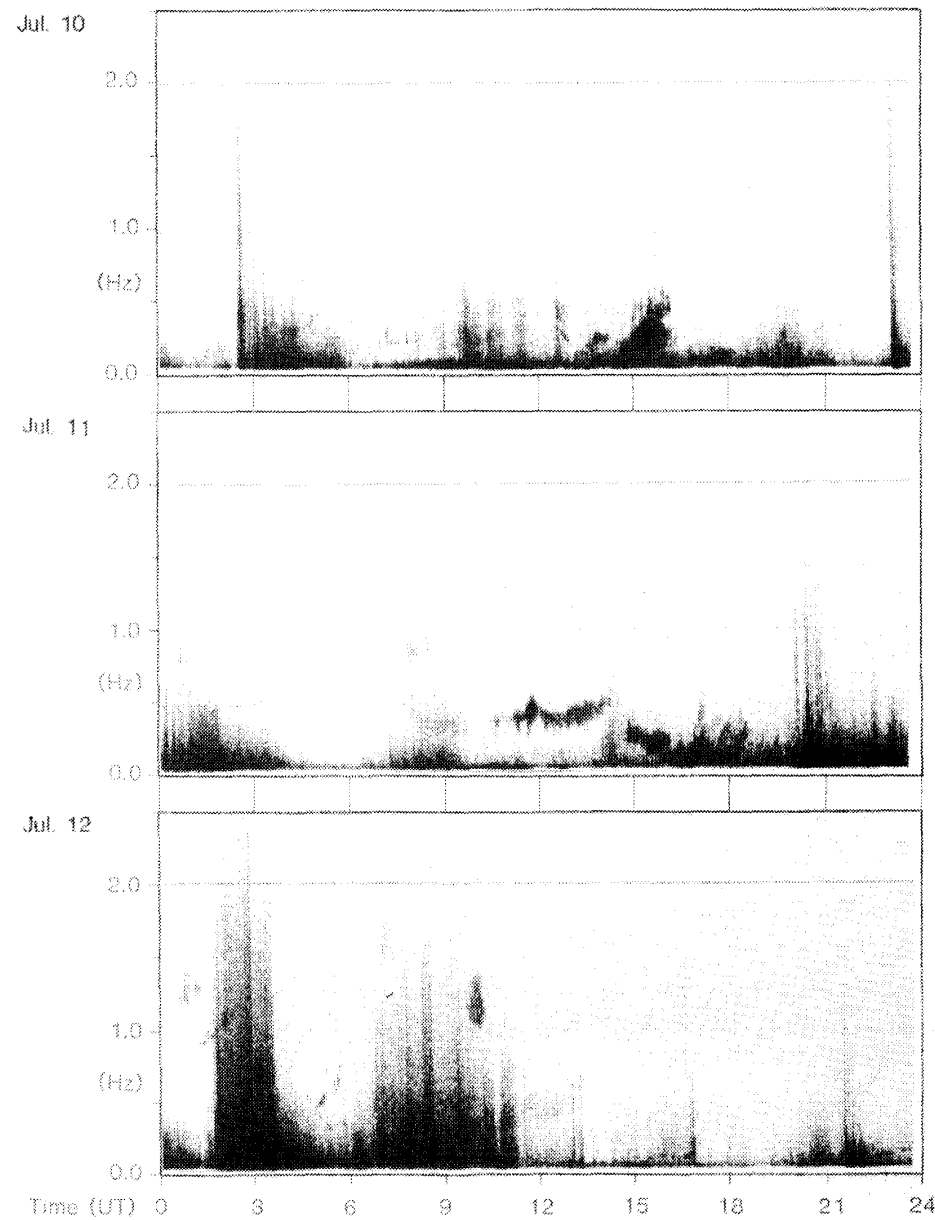
0.0

Time (UT) 0 3 6 9 12 15 18 21 24

Syowa Station, 1984

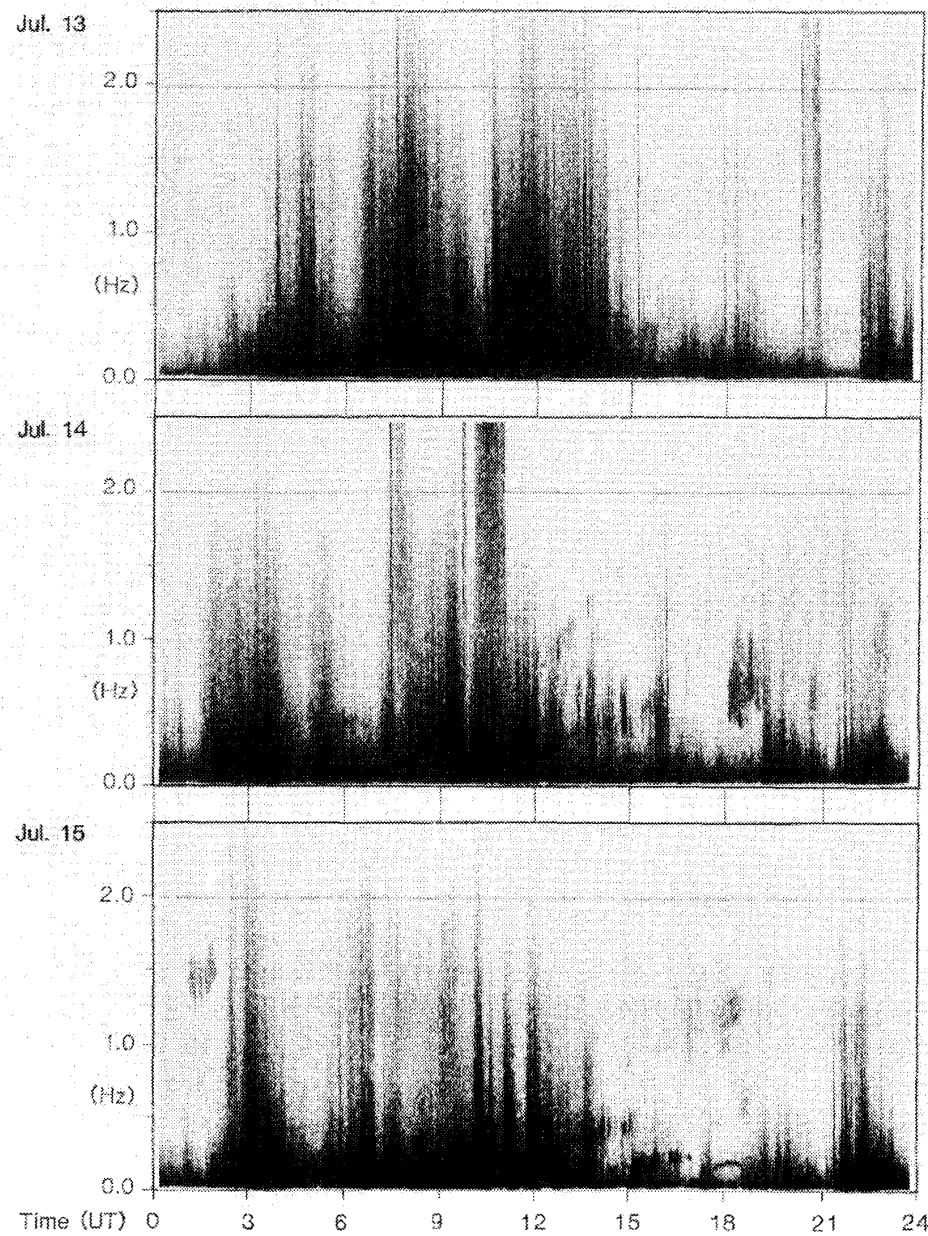


Syowa Station, 1984

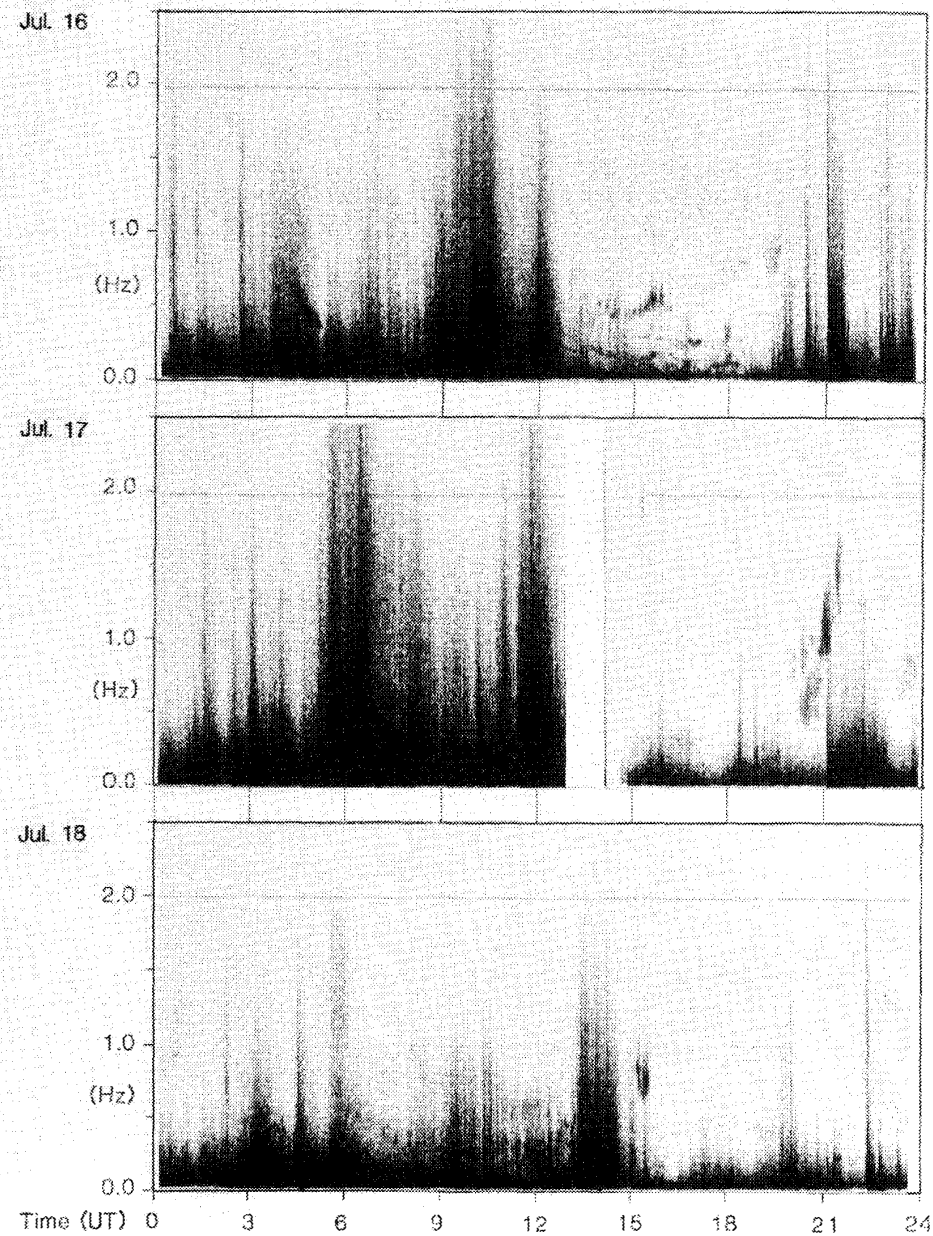




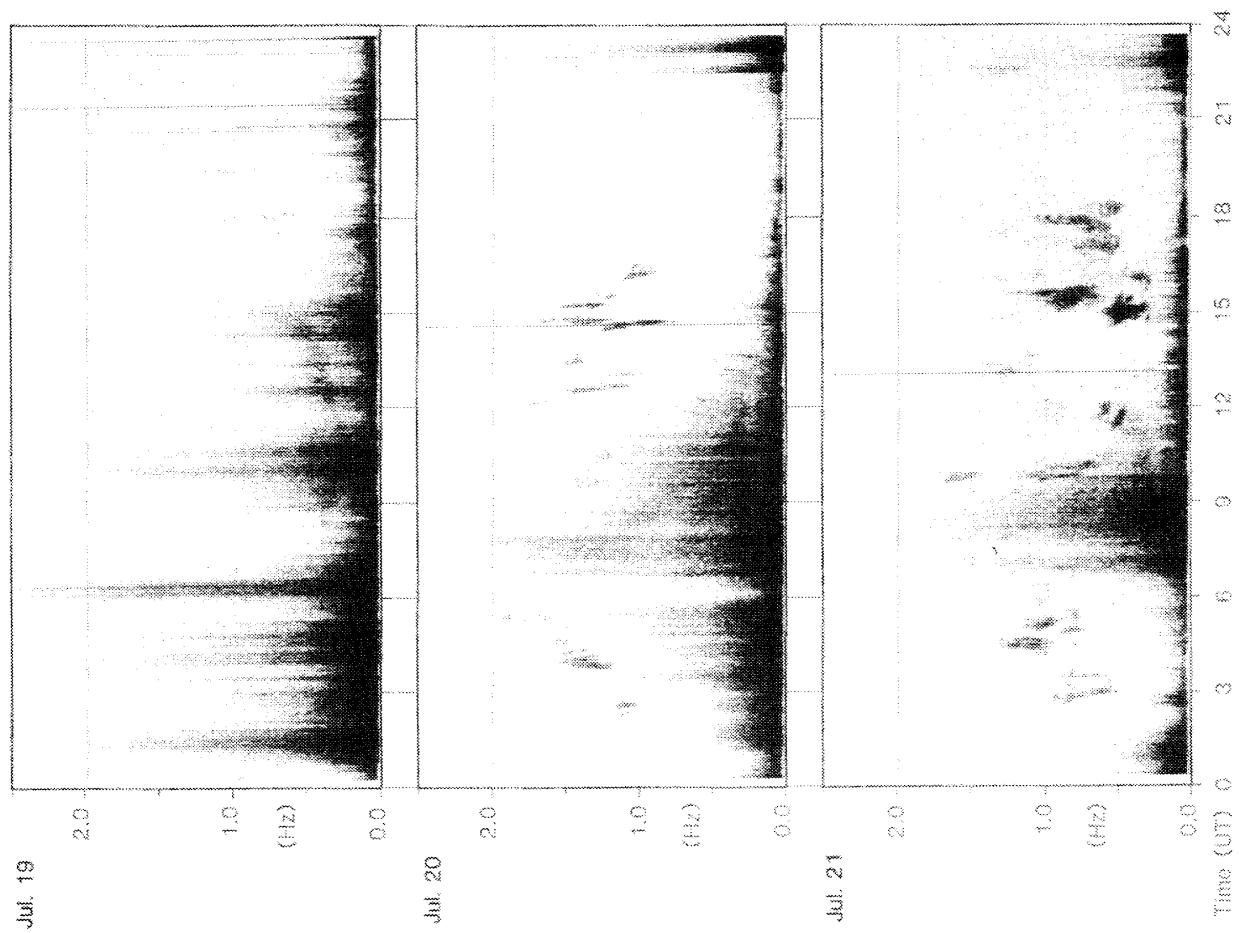
# Syowa Station, 1984



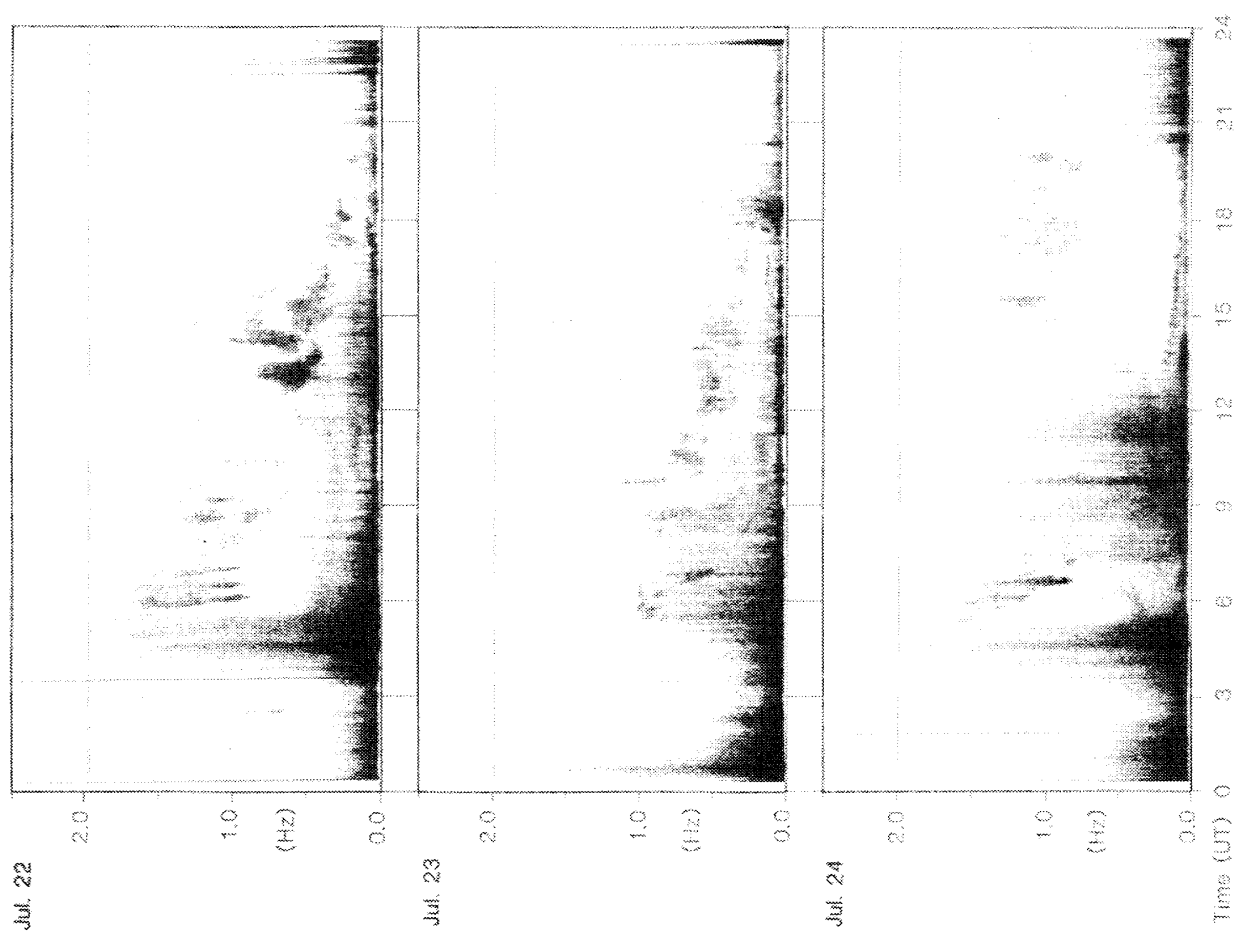
# Syowa Station, 1984



Syowa Station, 1984



Syowa Station, 1984

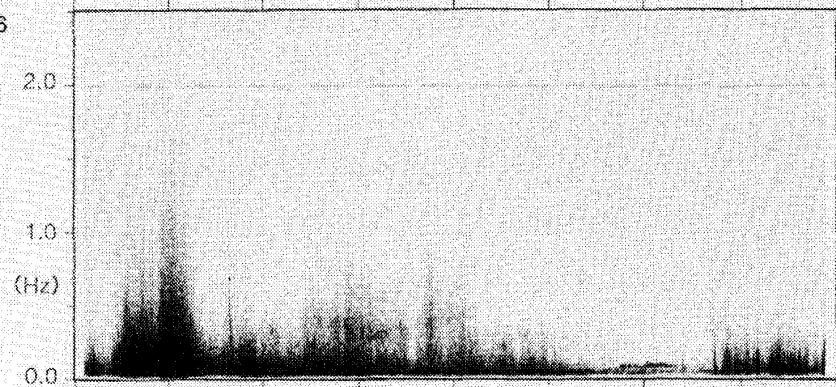


# Syowa Station, 1984

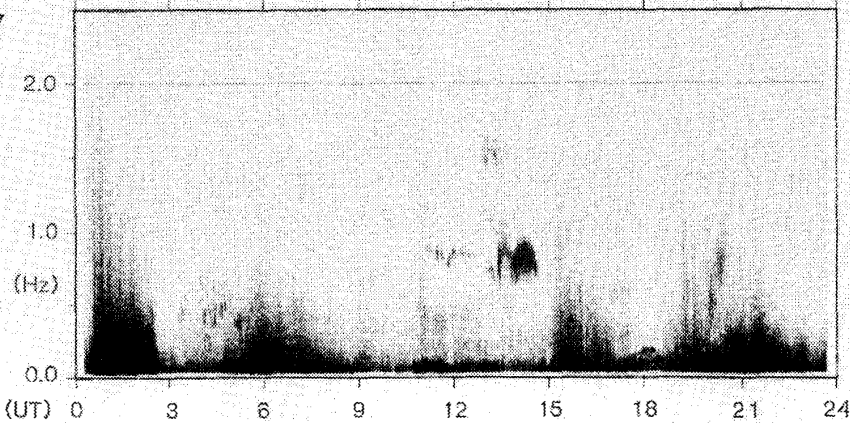
Jul. 25



Jul. 26



Jul. 27

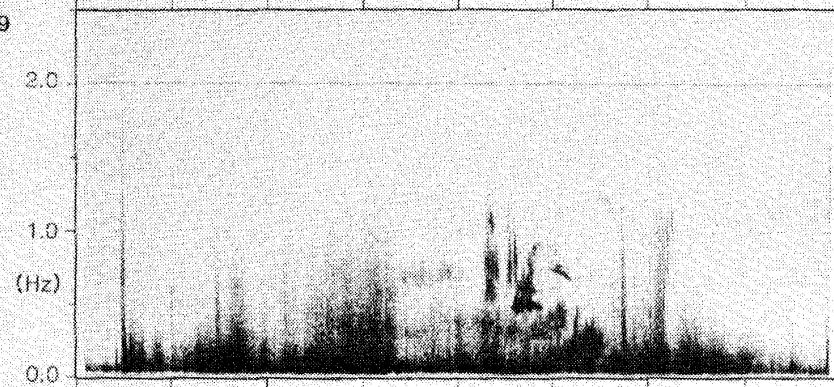


# Syowa Station, 1984

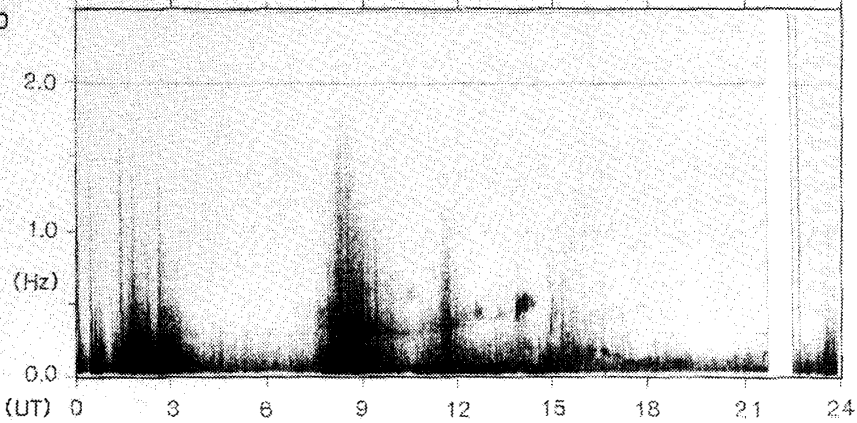
Jul. 28



Jul. 29

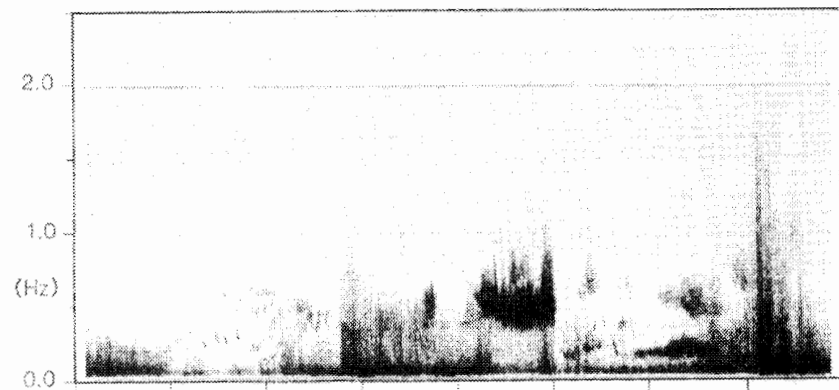


Jul. 30

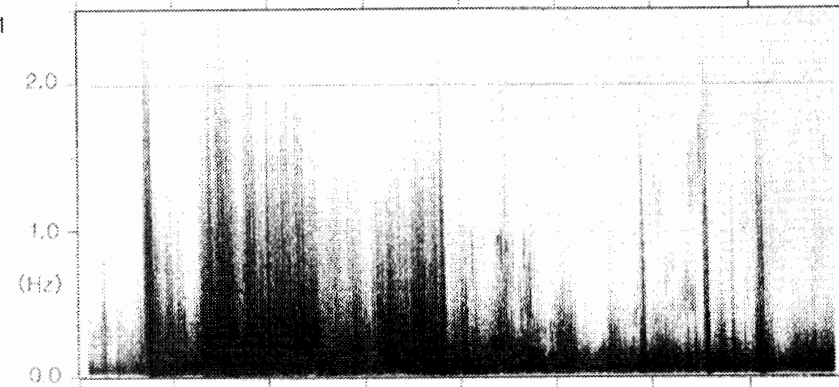


# Syowa Station, 1984

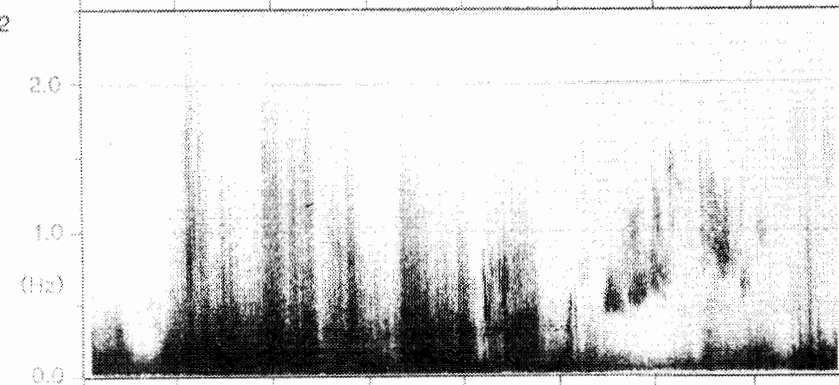
Jul. 31



Aug. 1



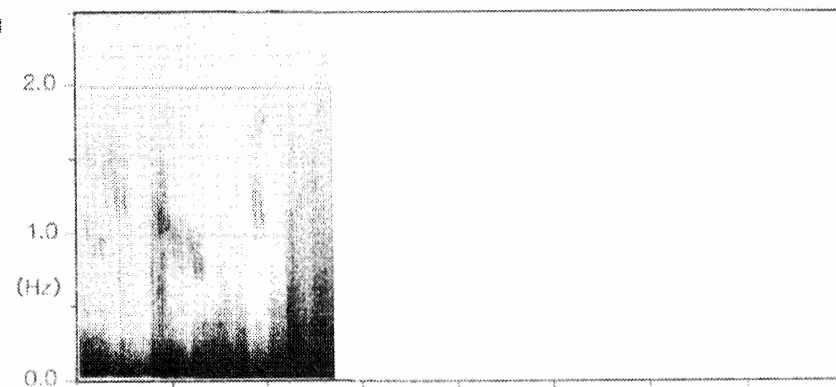
Aug. 2



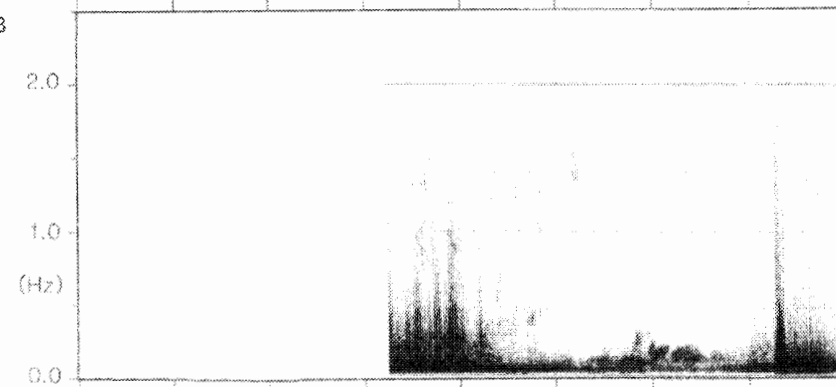
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

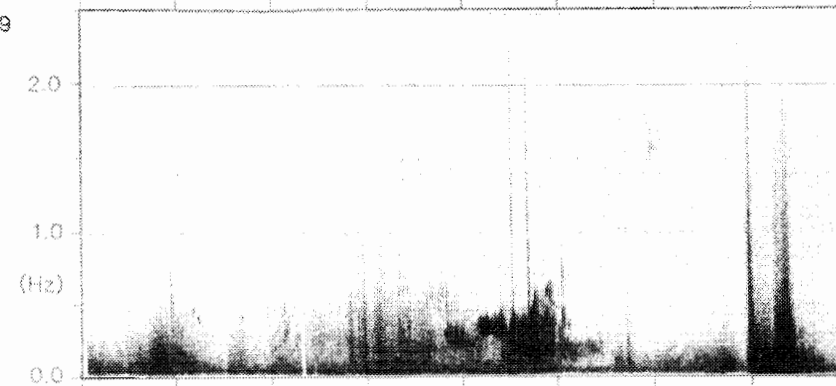
Aug. 3



Aug. 8

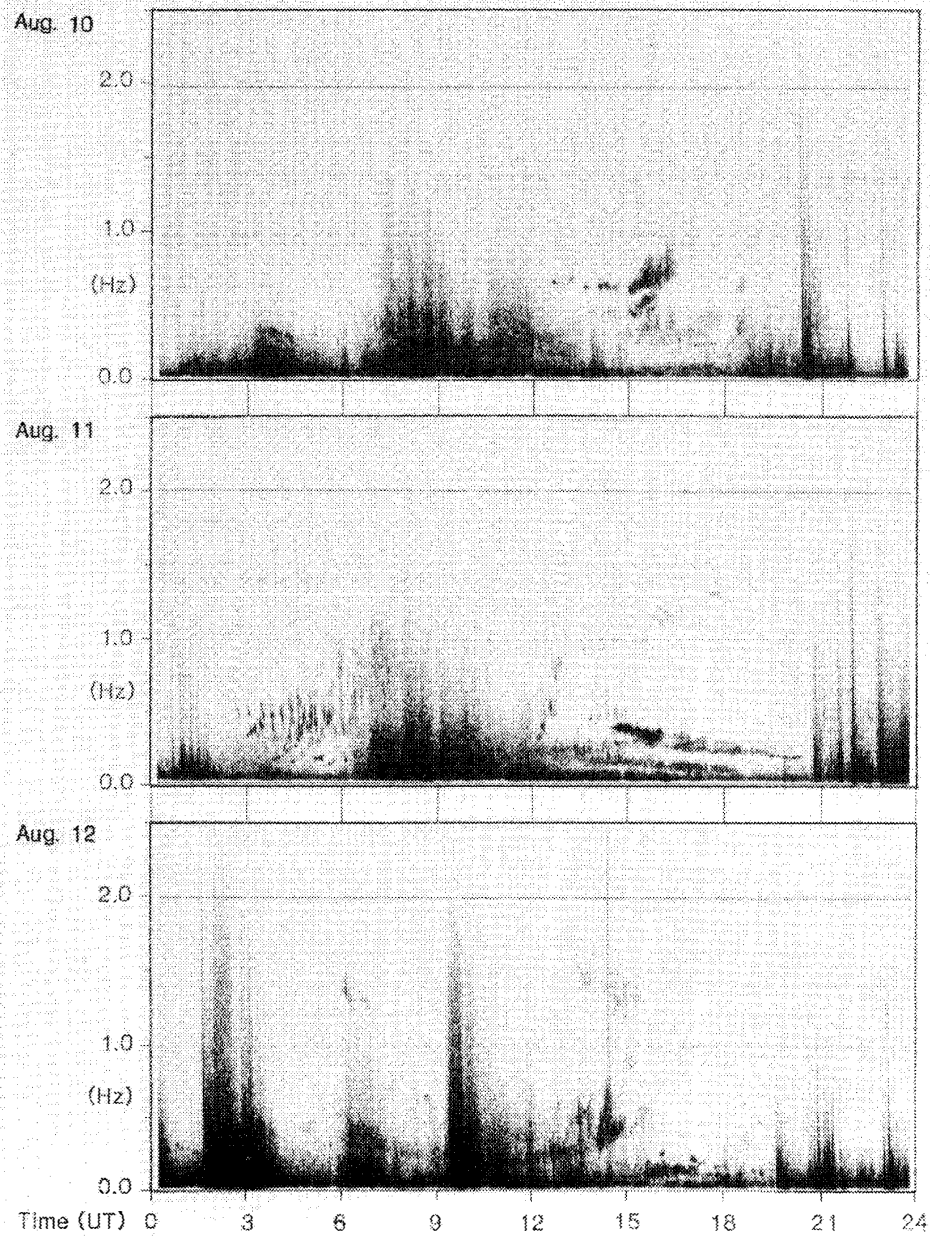


Aug. 9

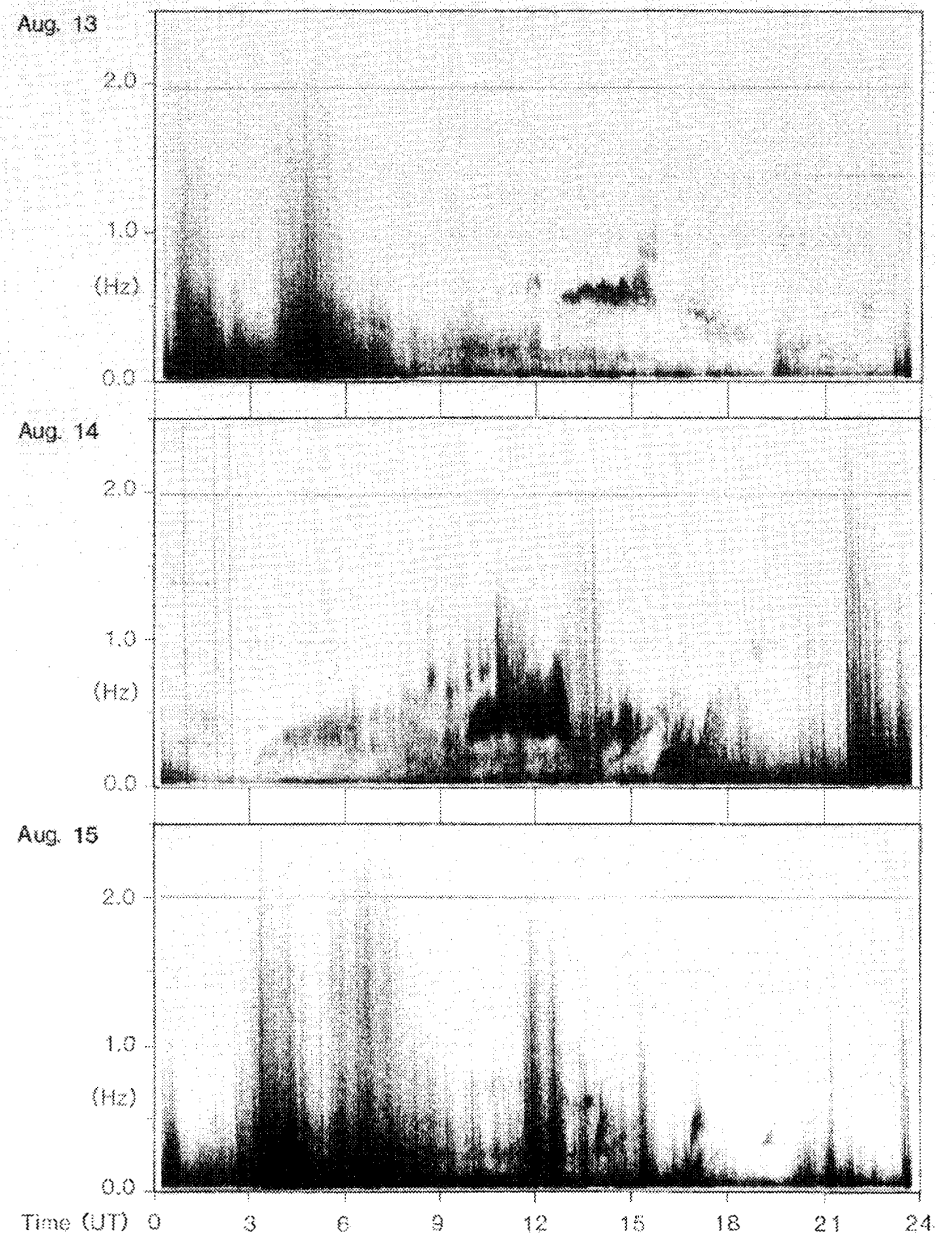


Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

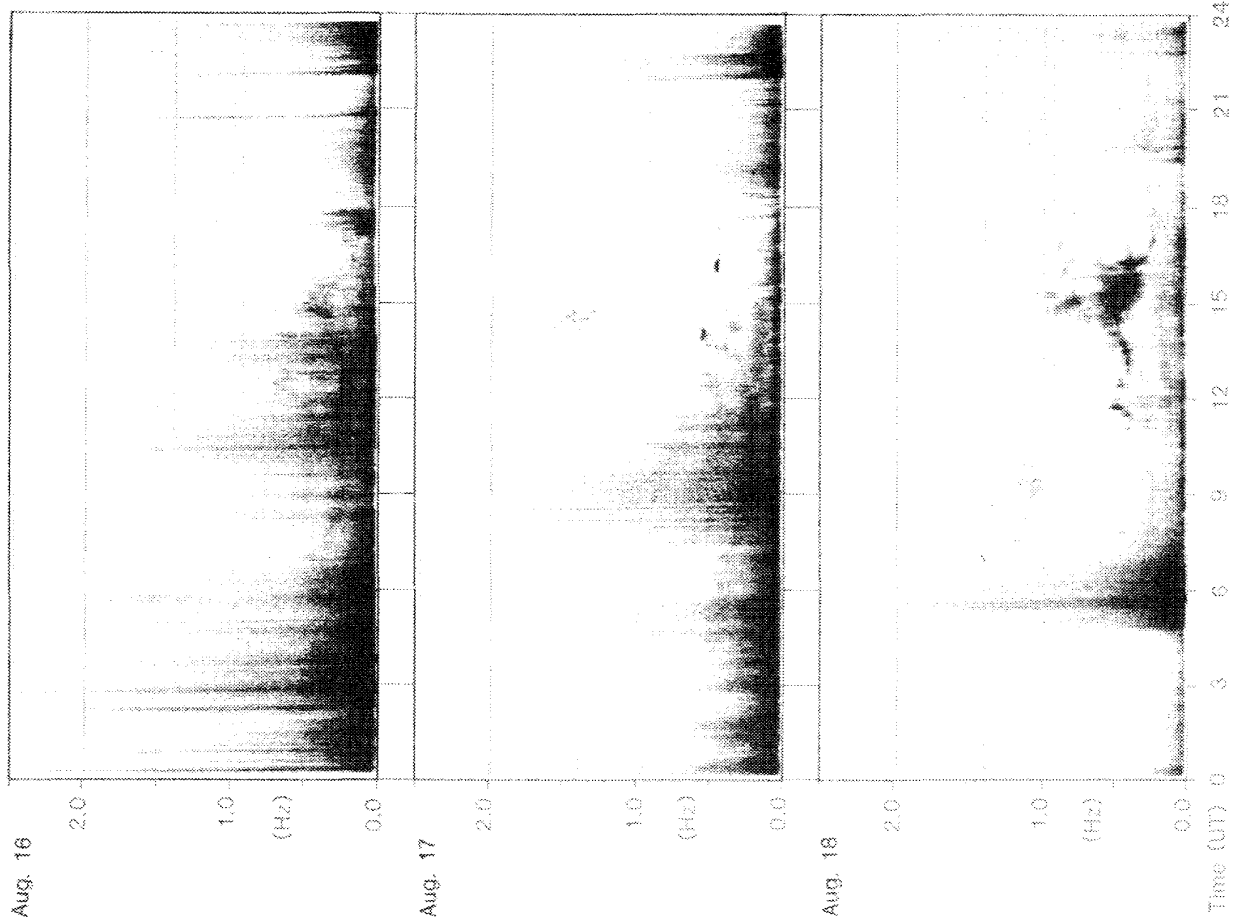


# Syowa Station, 1984

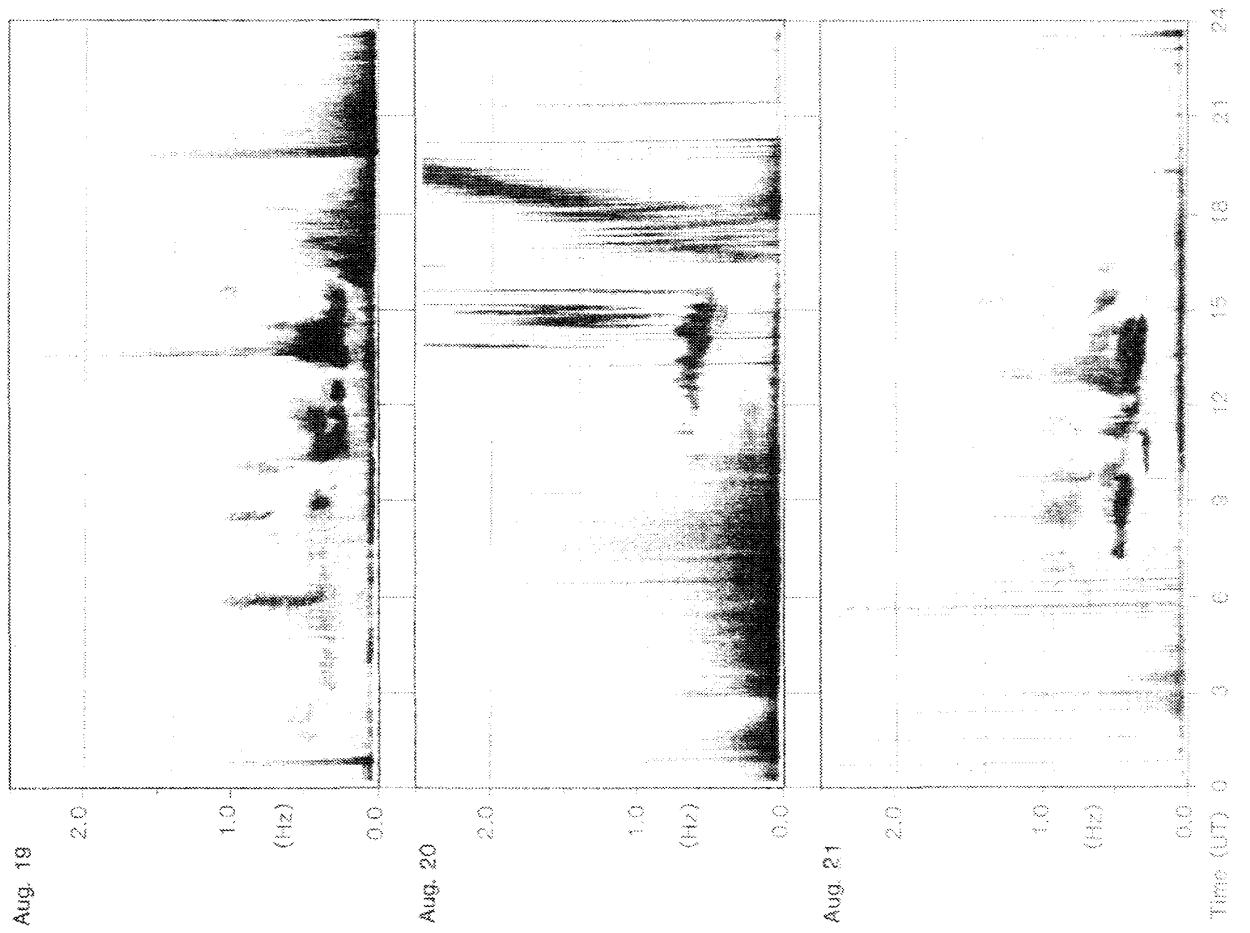




Syowa Station, 1984

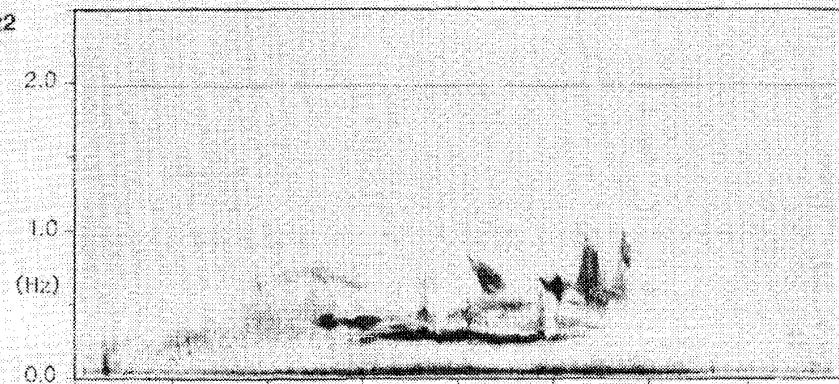


Syowa Station, 1984



# Syowa Station, 1984

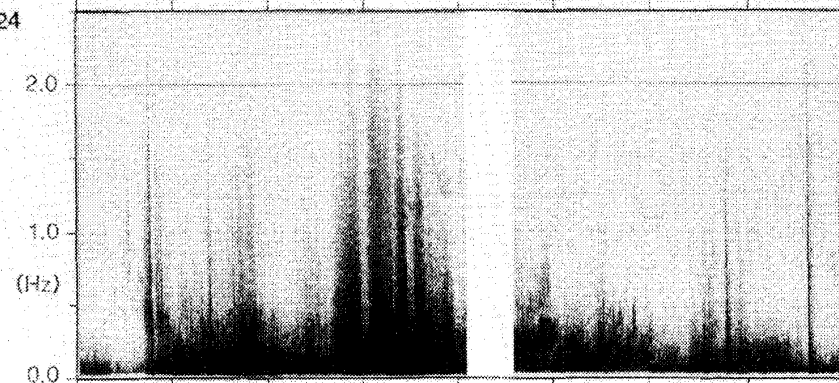
Aug. 22



Aug. 23



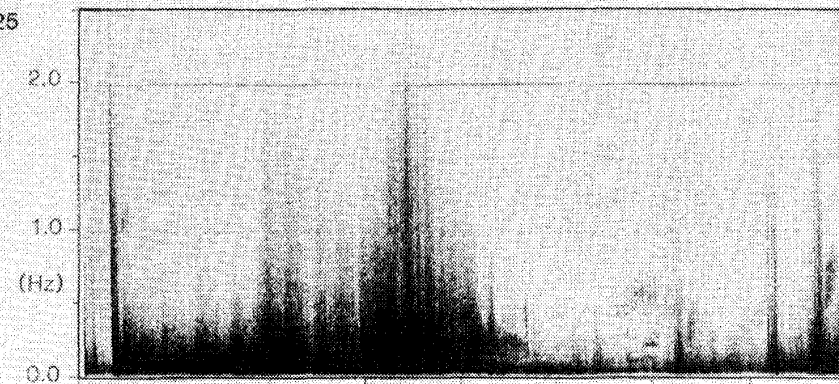
Aug. 24



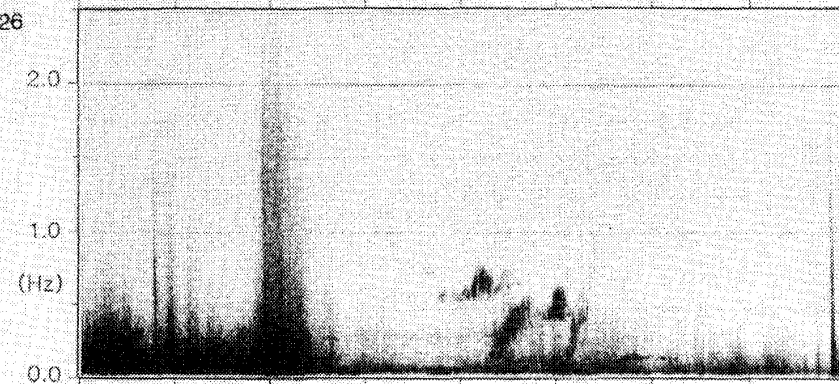
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

Aug. 25



Aug. 26

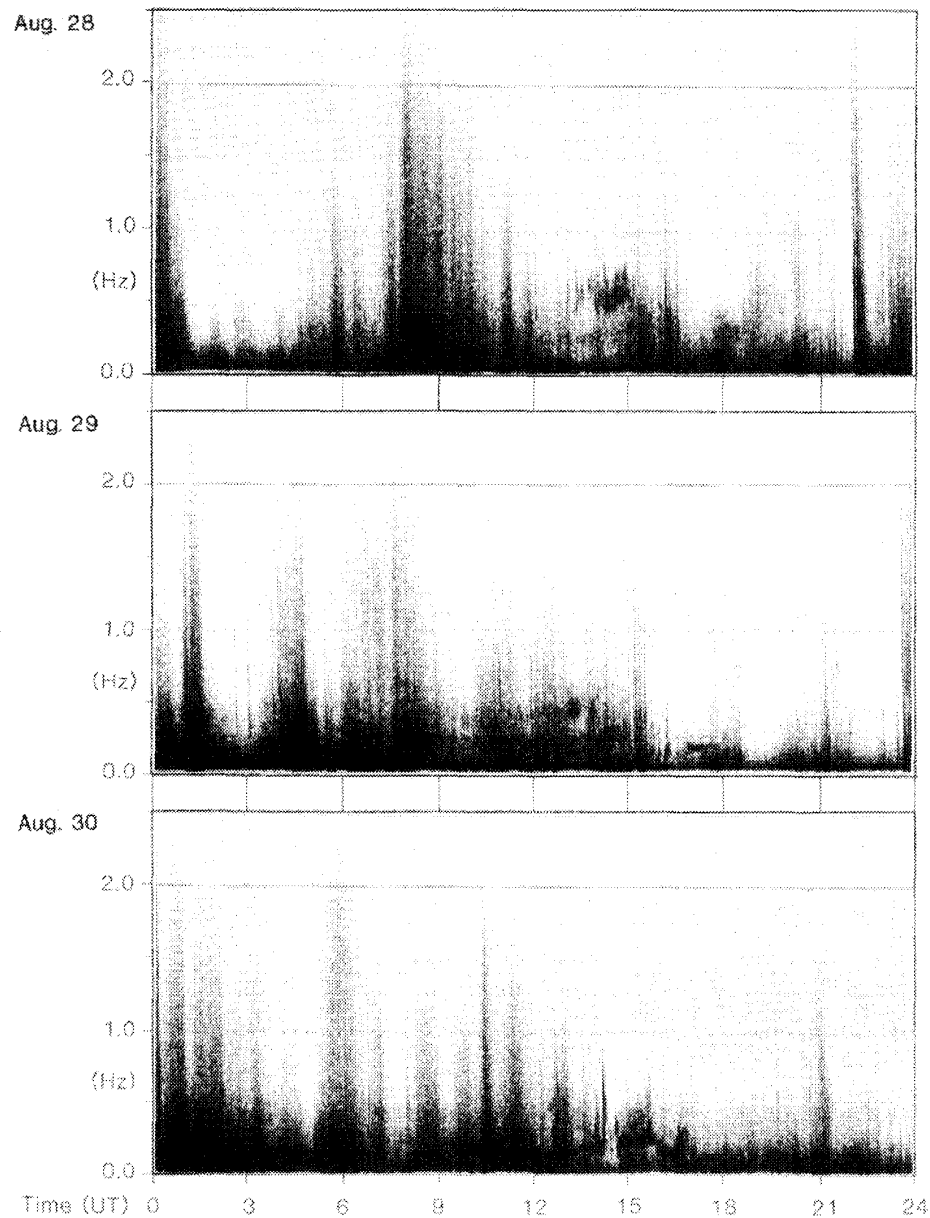


Aug. 27

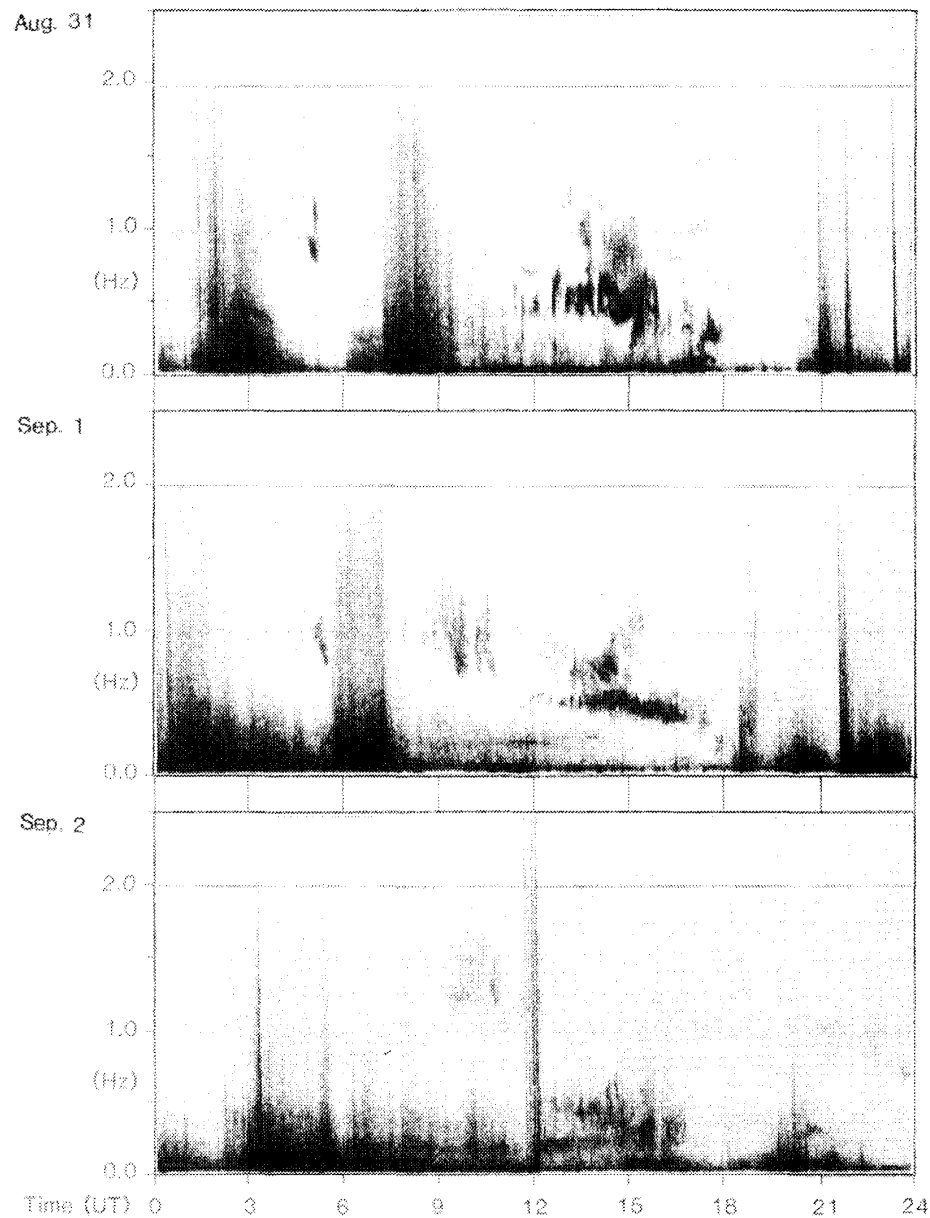


Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

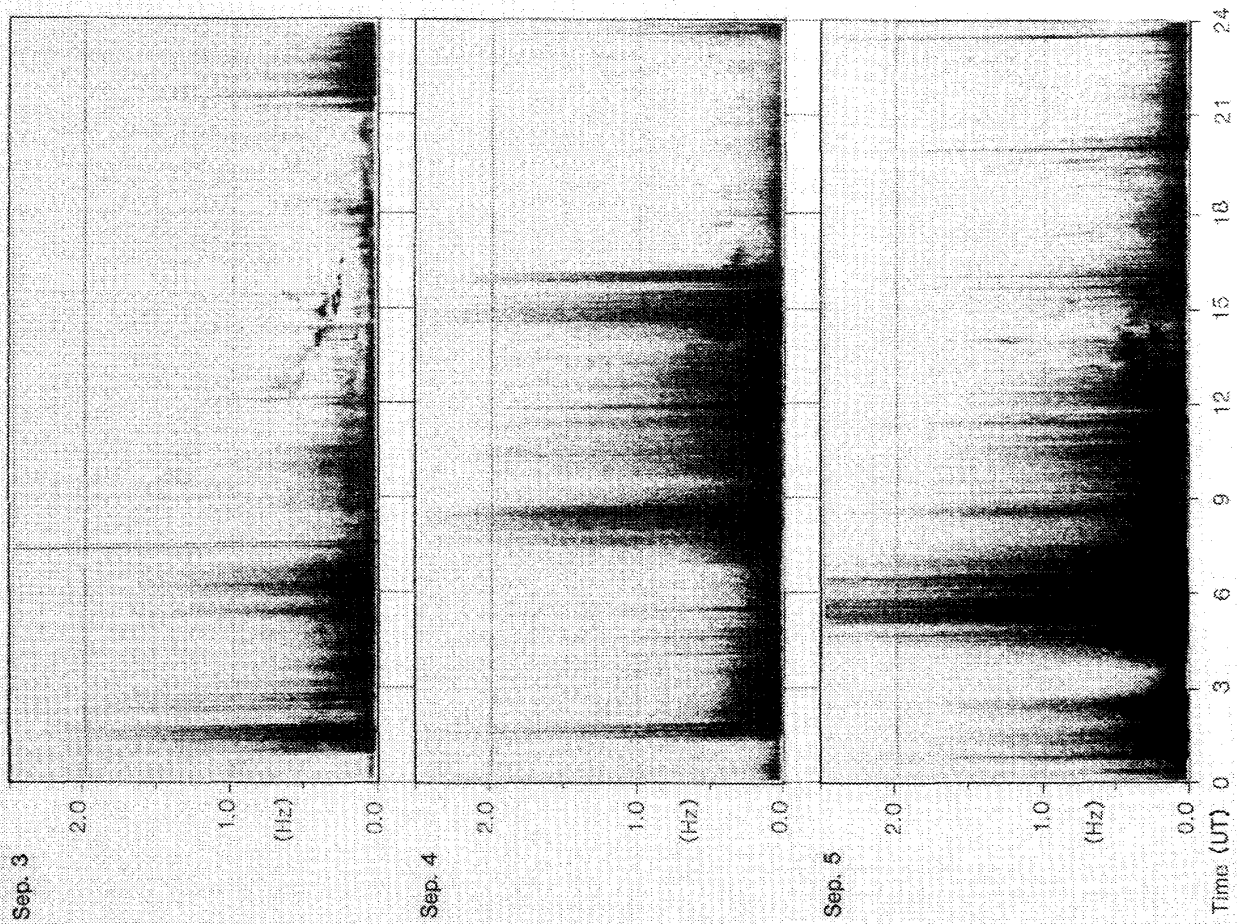


# Syowa Station, 1984

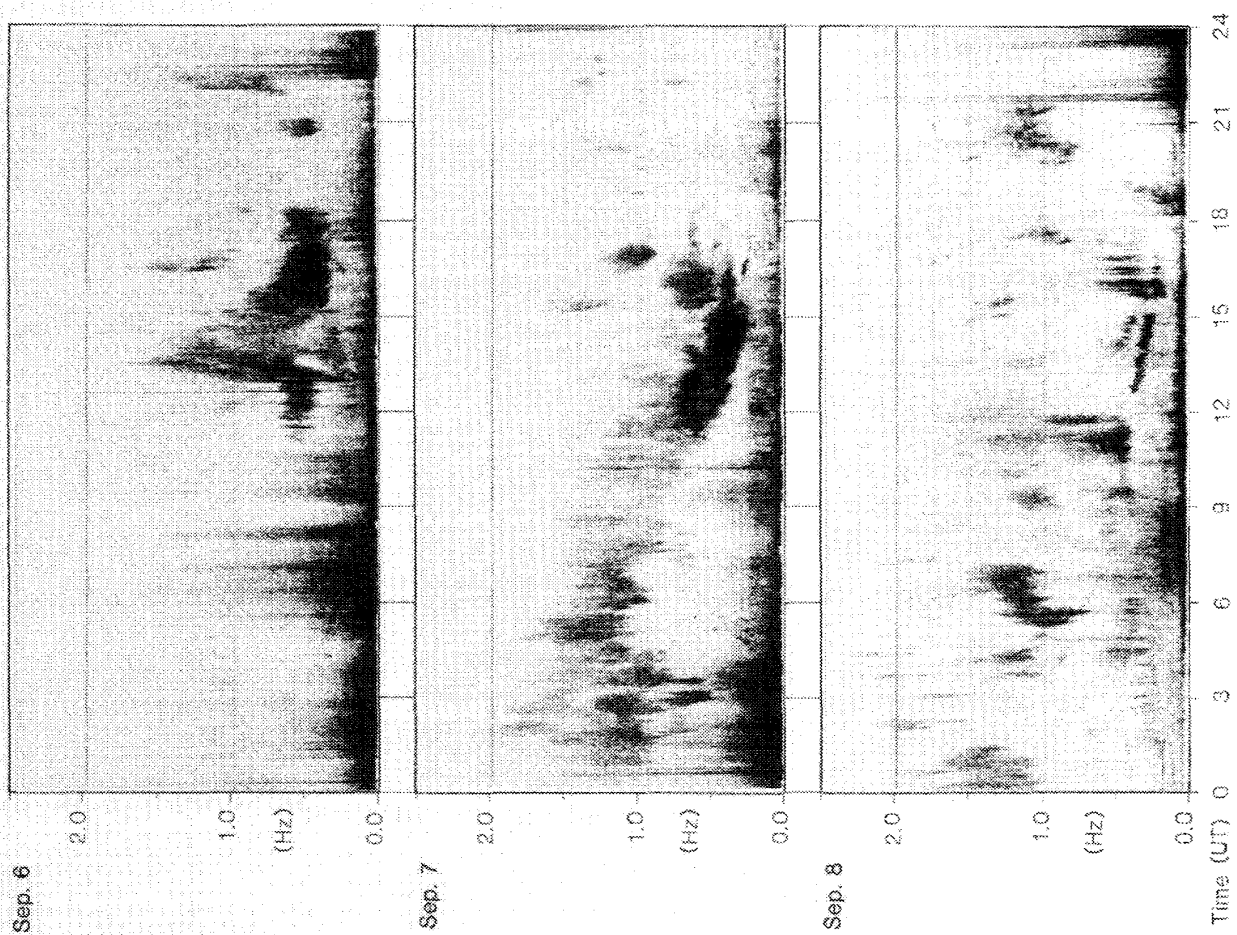




Syowa Station, 1984

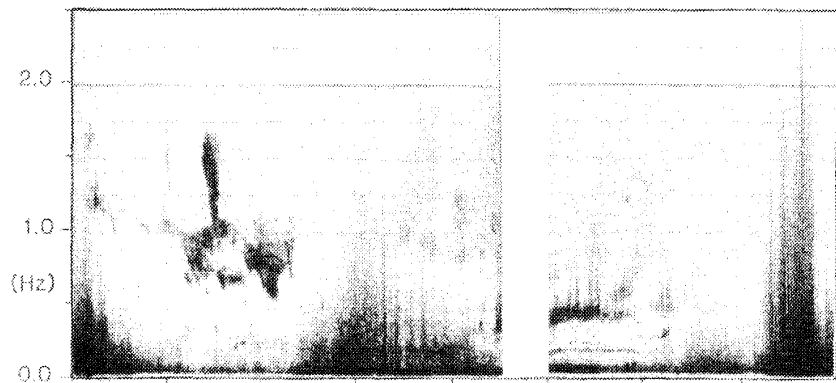


Syowa Station, 1984

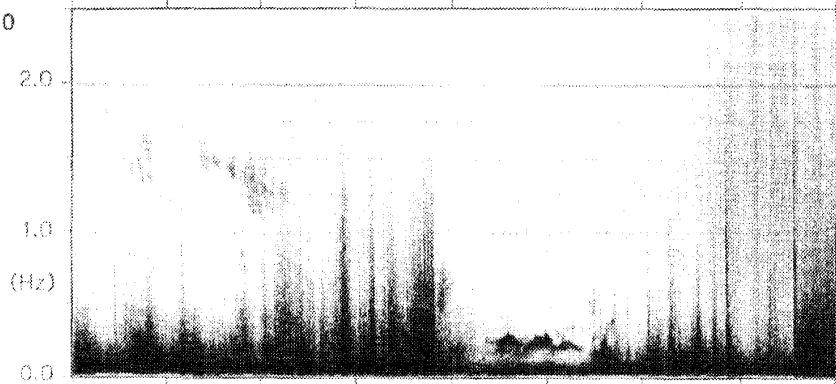


# Syowa Station, 1984

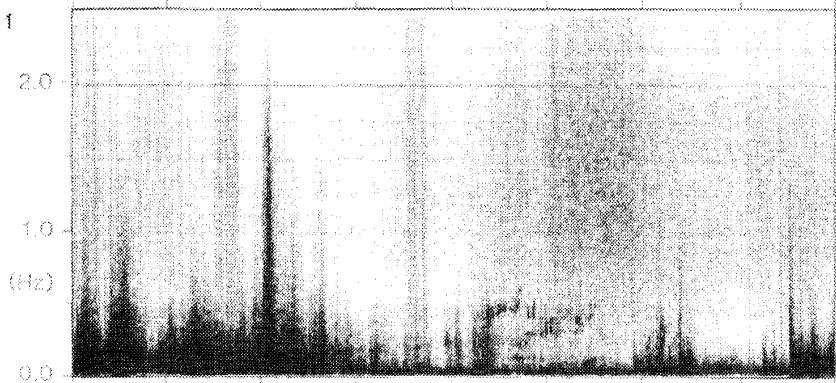
Sep. 9



Sep. 10



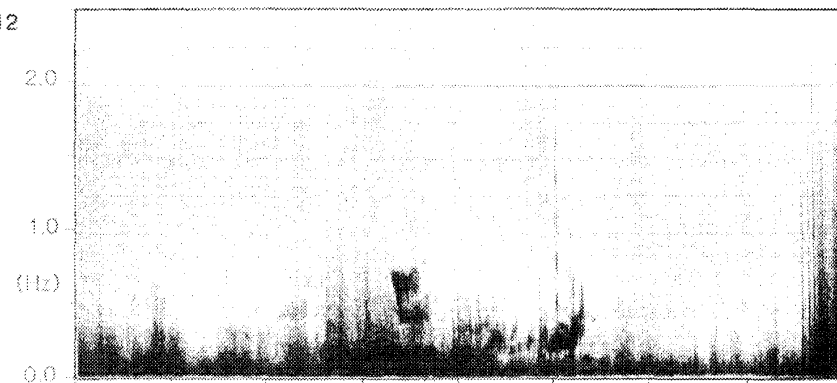
Sep. 11



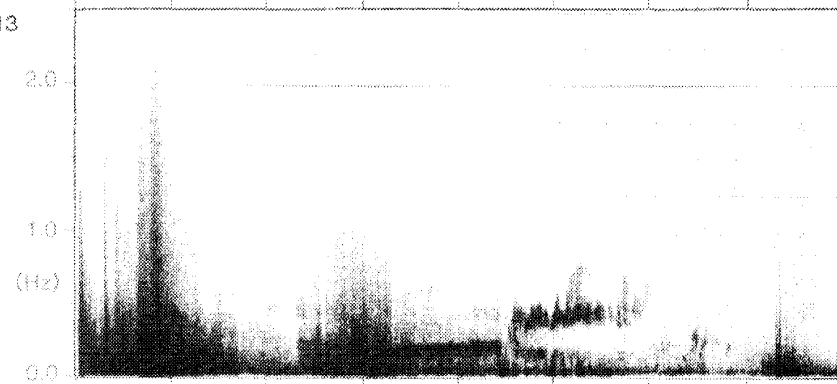
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

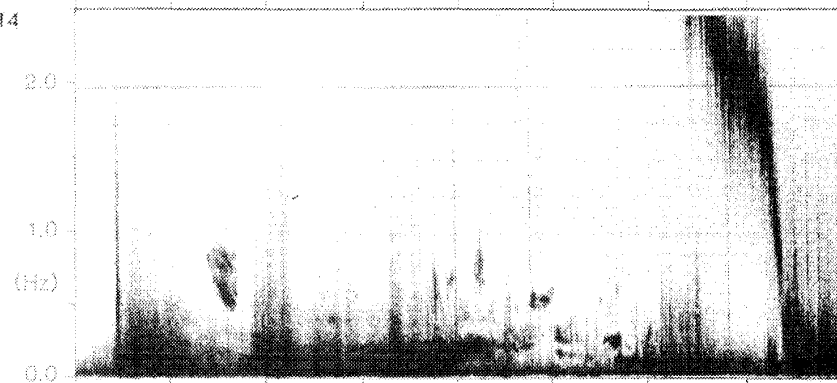
Sep. 12



Sep. 13

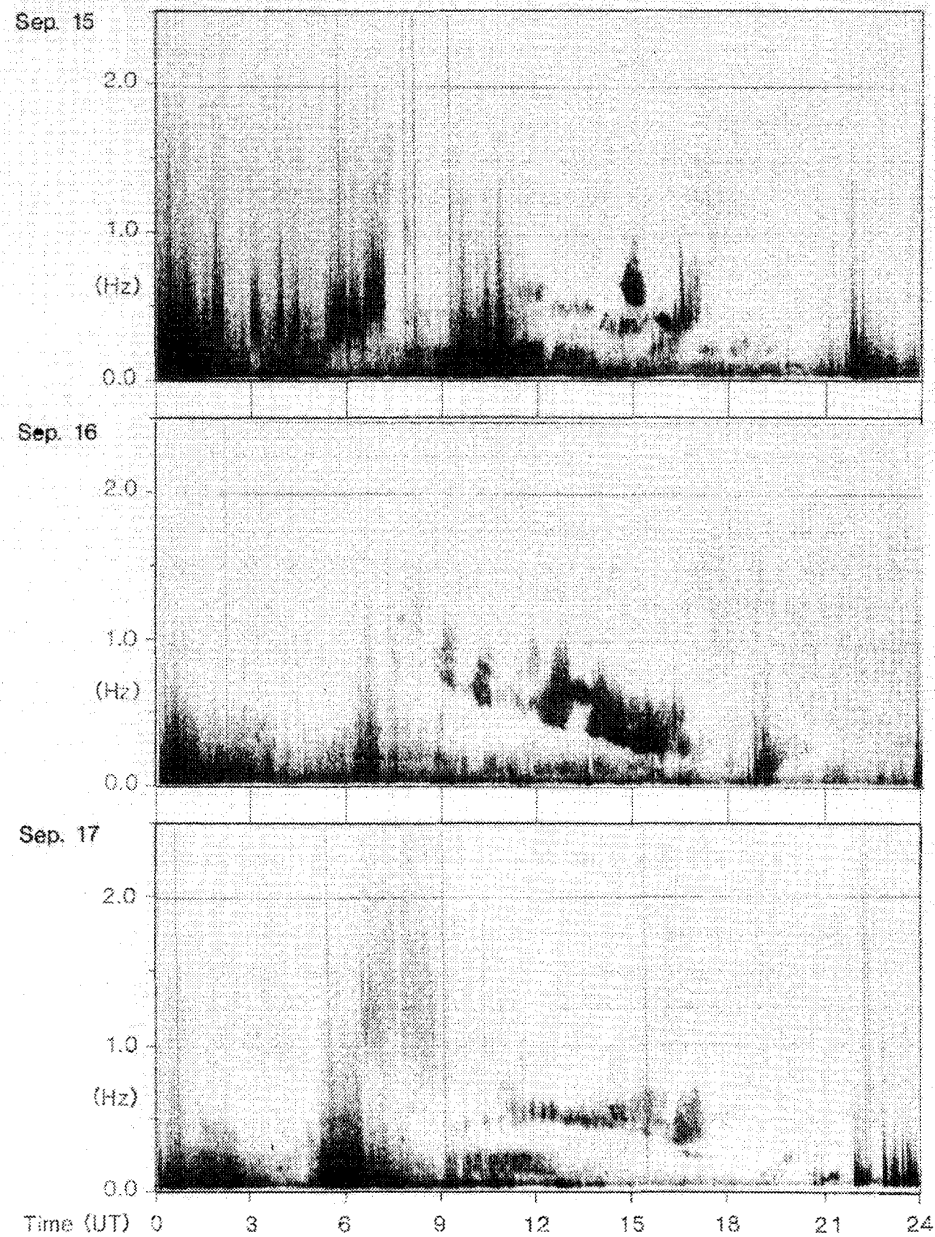


Sep. 14

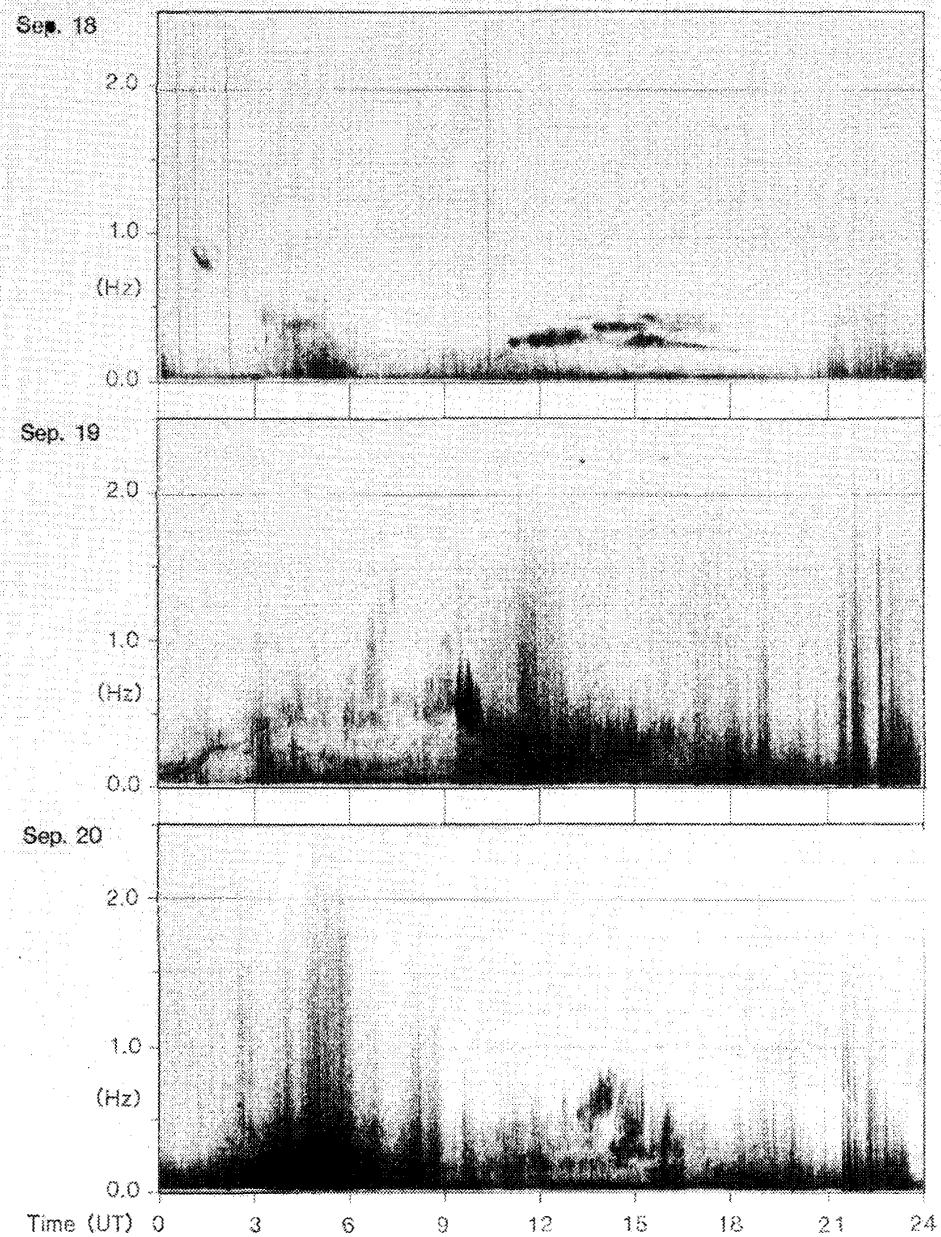


Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

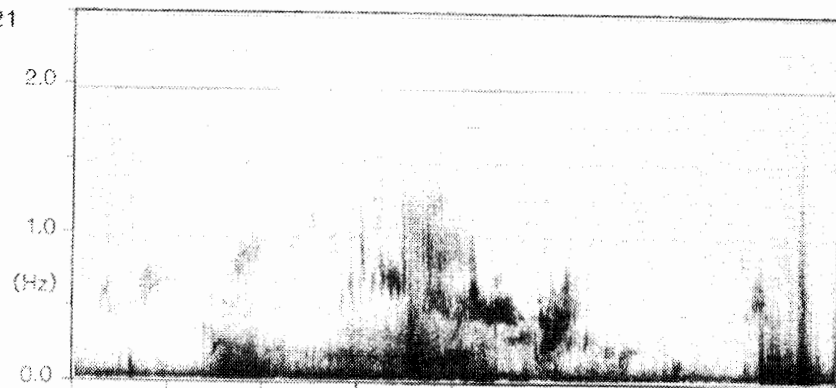


# Syowa Station, 1984

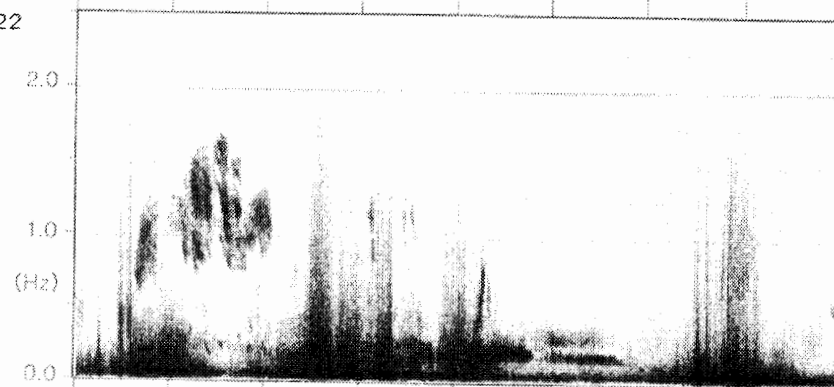


# Syowa Station, 1984

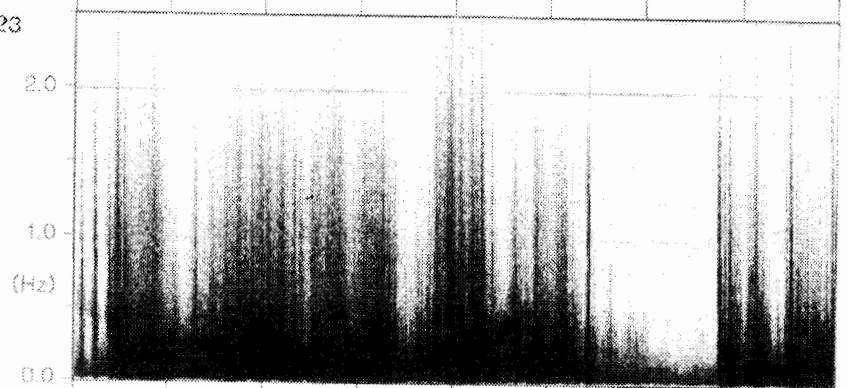
Sep. 21



Sep. 22



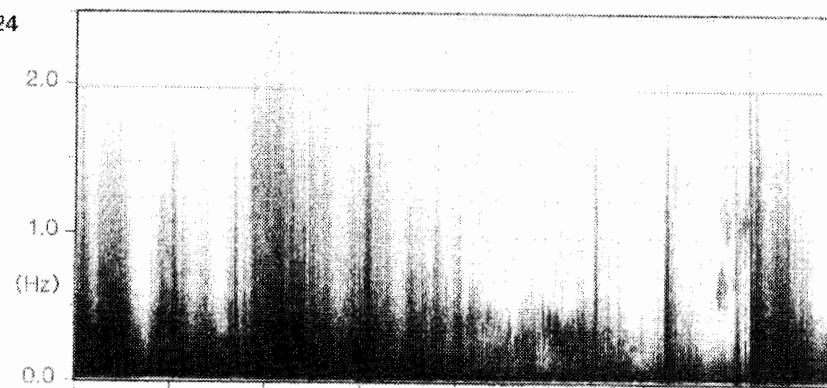
Sep. 23



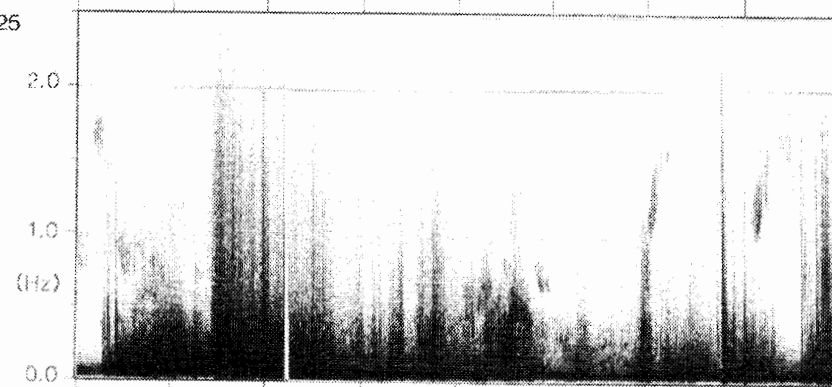
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

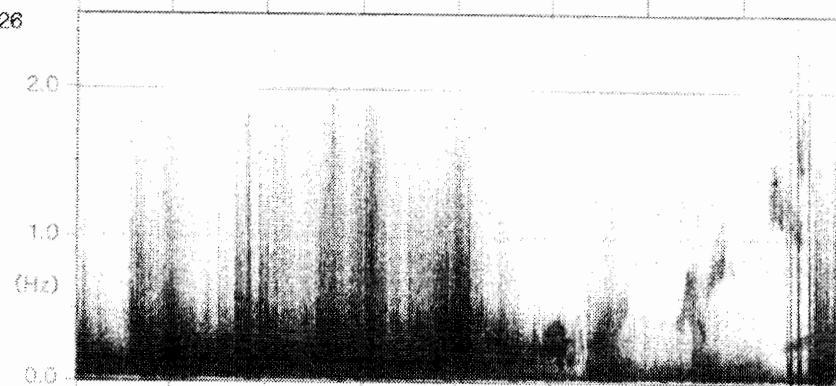
Sep. 24



Sep. 25



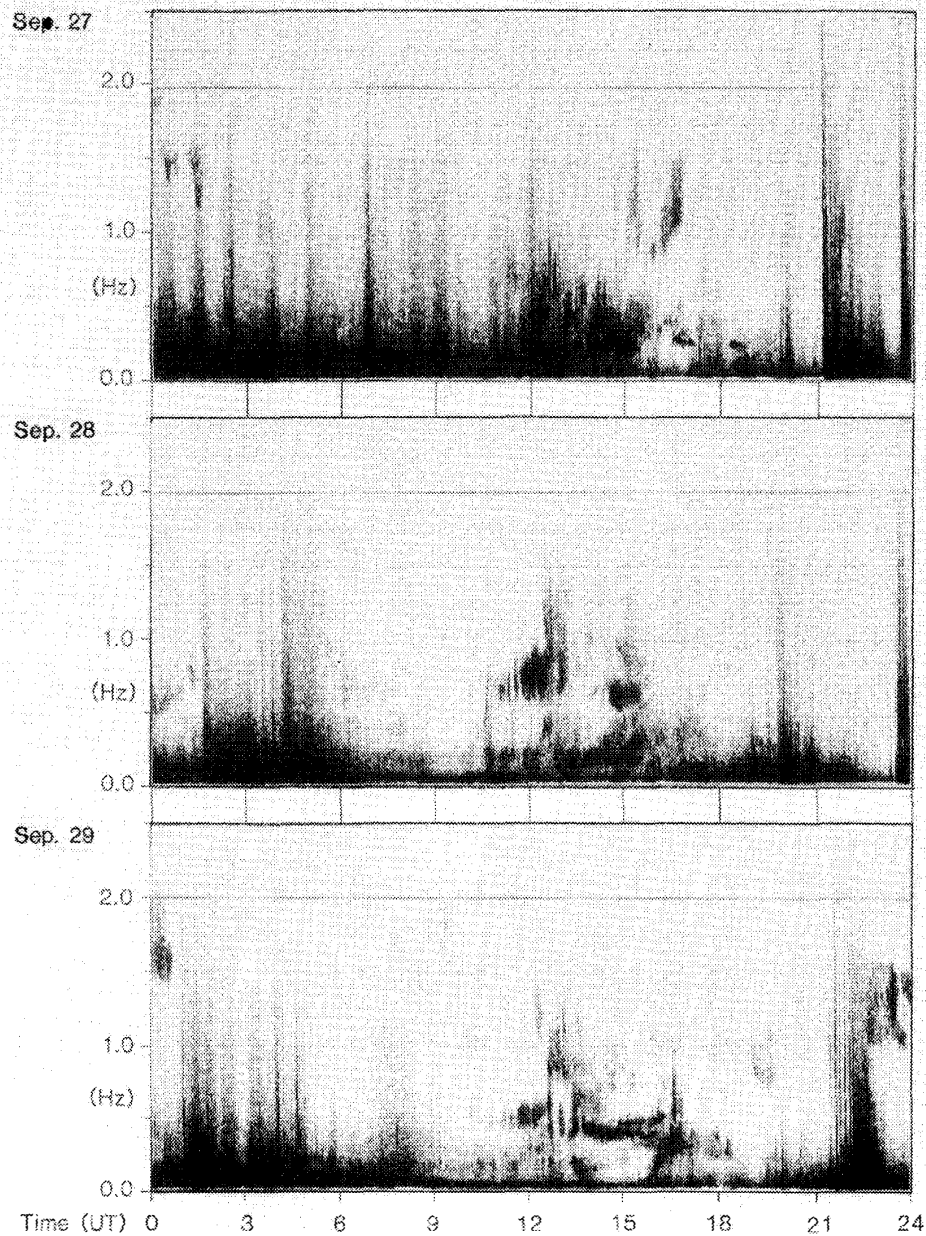
Sep. 26



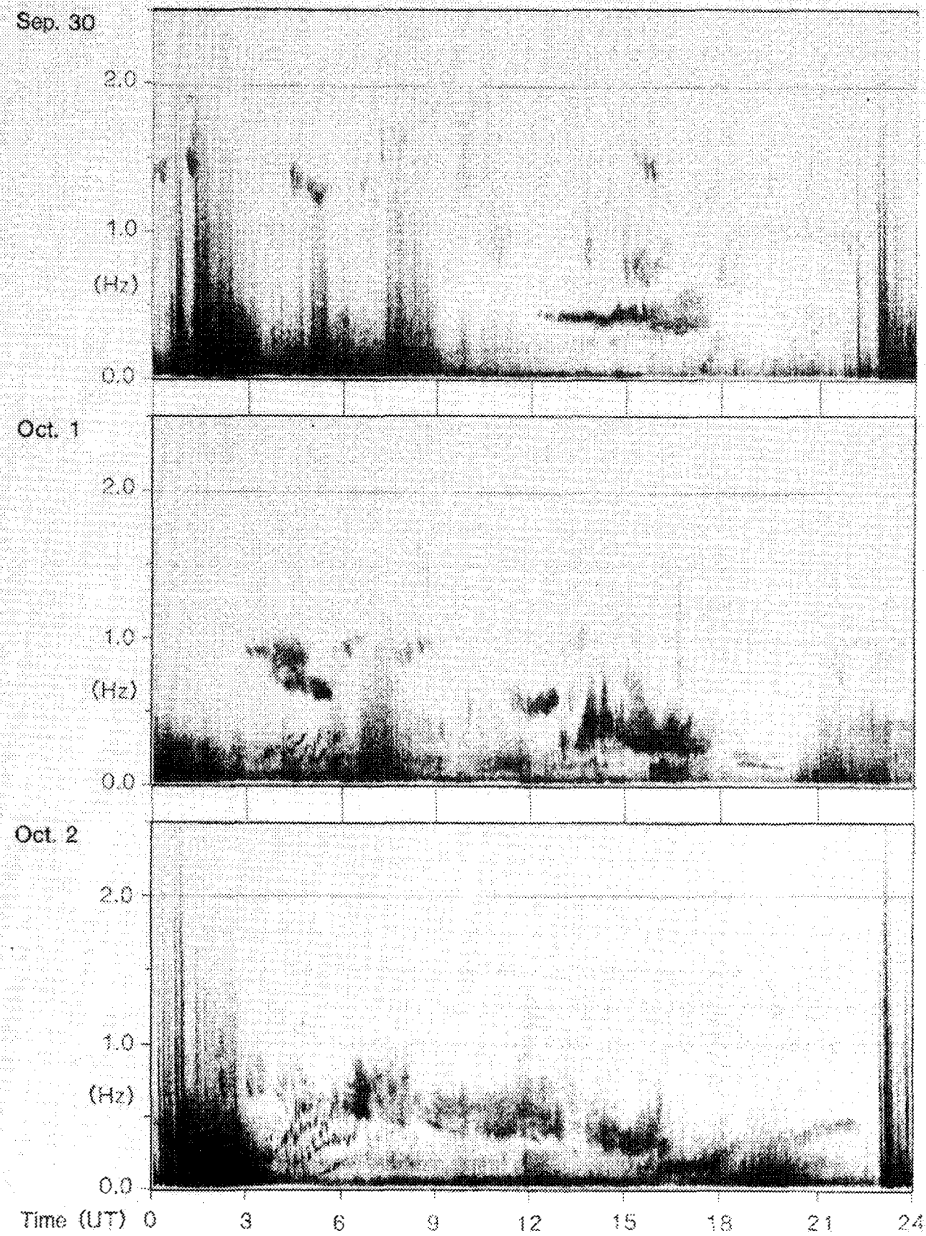
Time (UT) 0 3 6 9 12 15 18 21 24



# Syowa Station, 1984

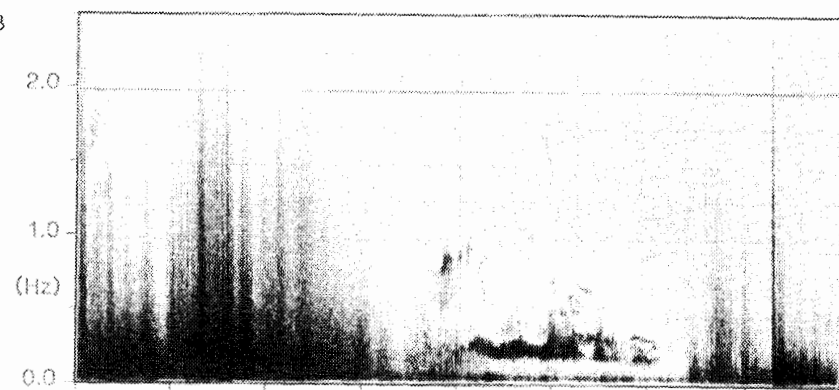


# Syowa Station, 1984

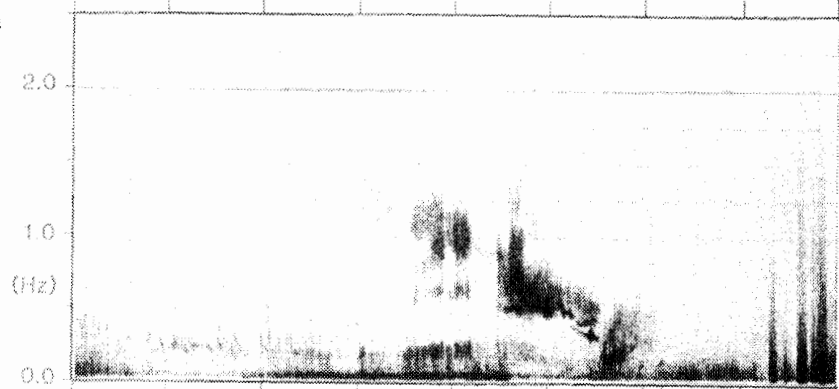


# Syowa Station, 1984

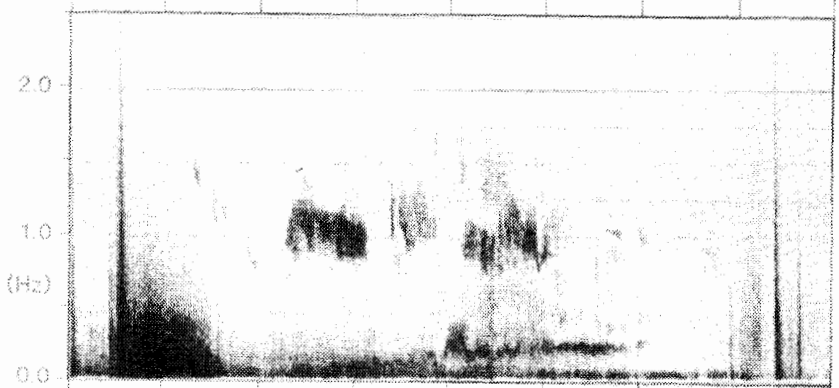
Oct. 3



Oct. 4



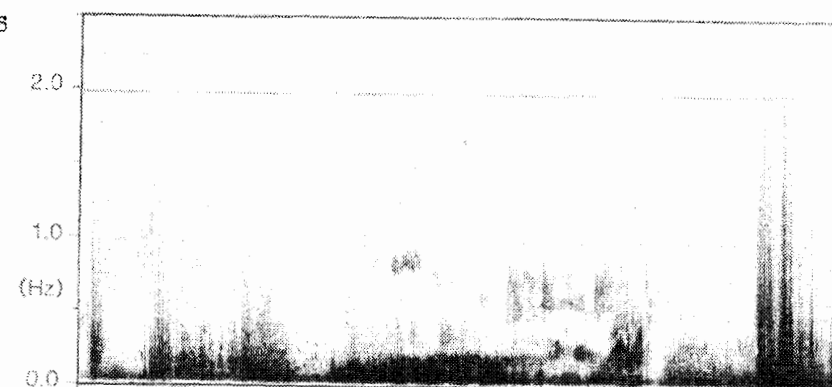
Oct. 5



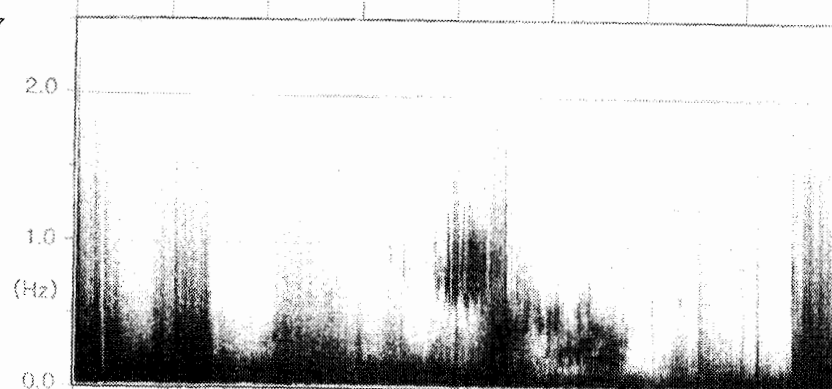
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

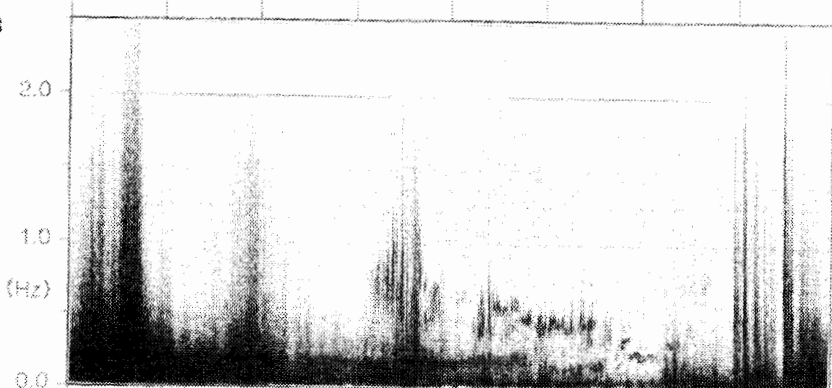
● Oct. 6



Oct. 7

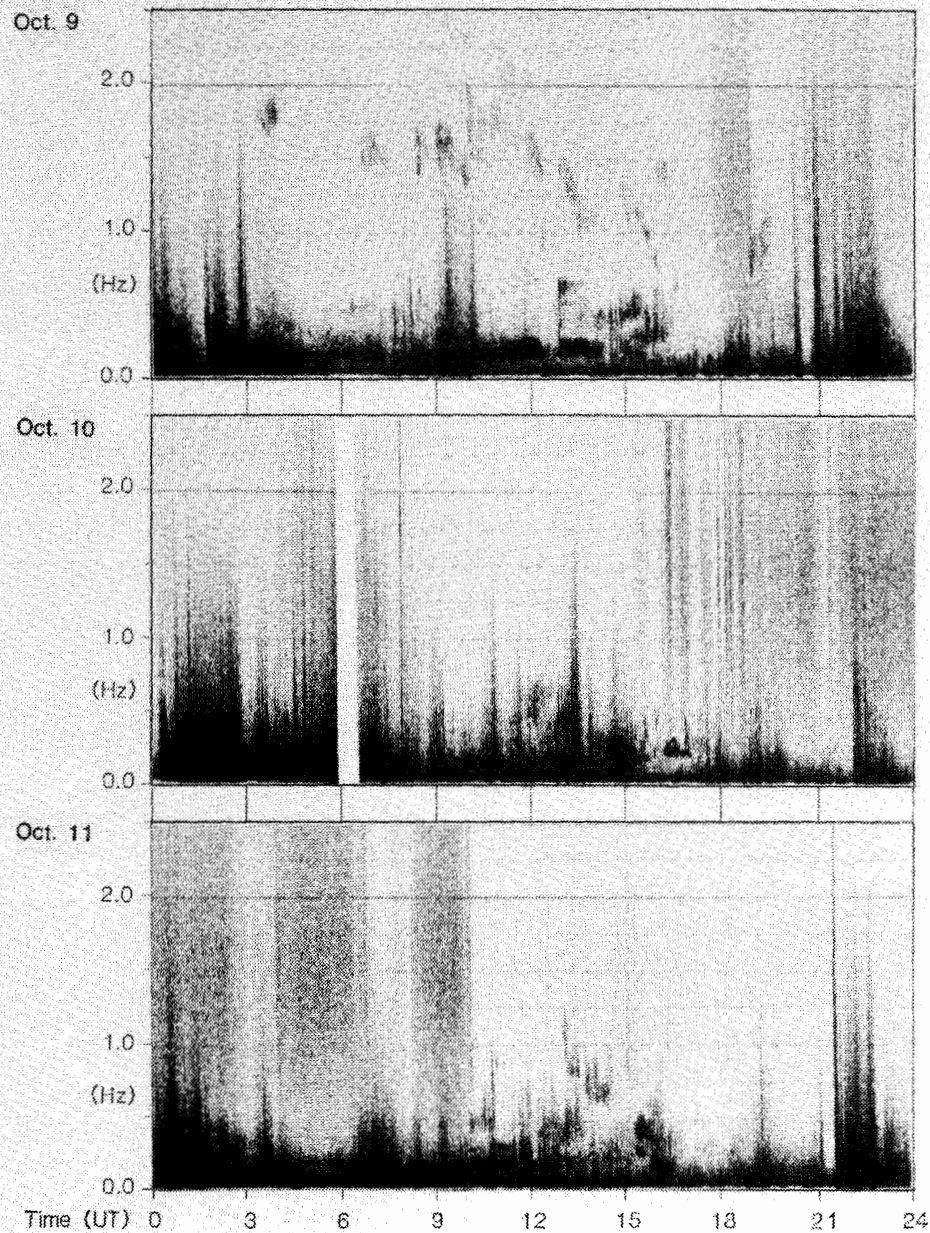


Oct. 8

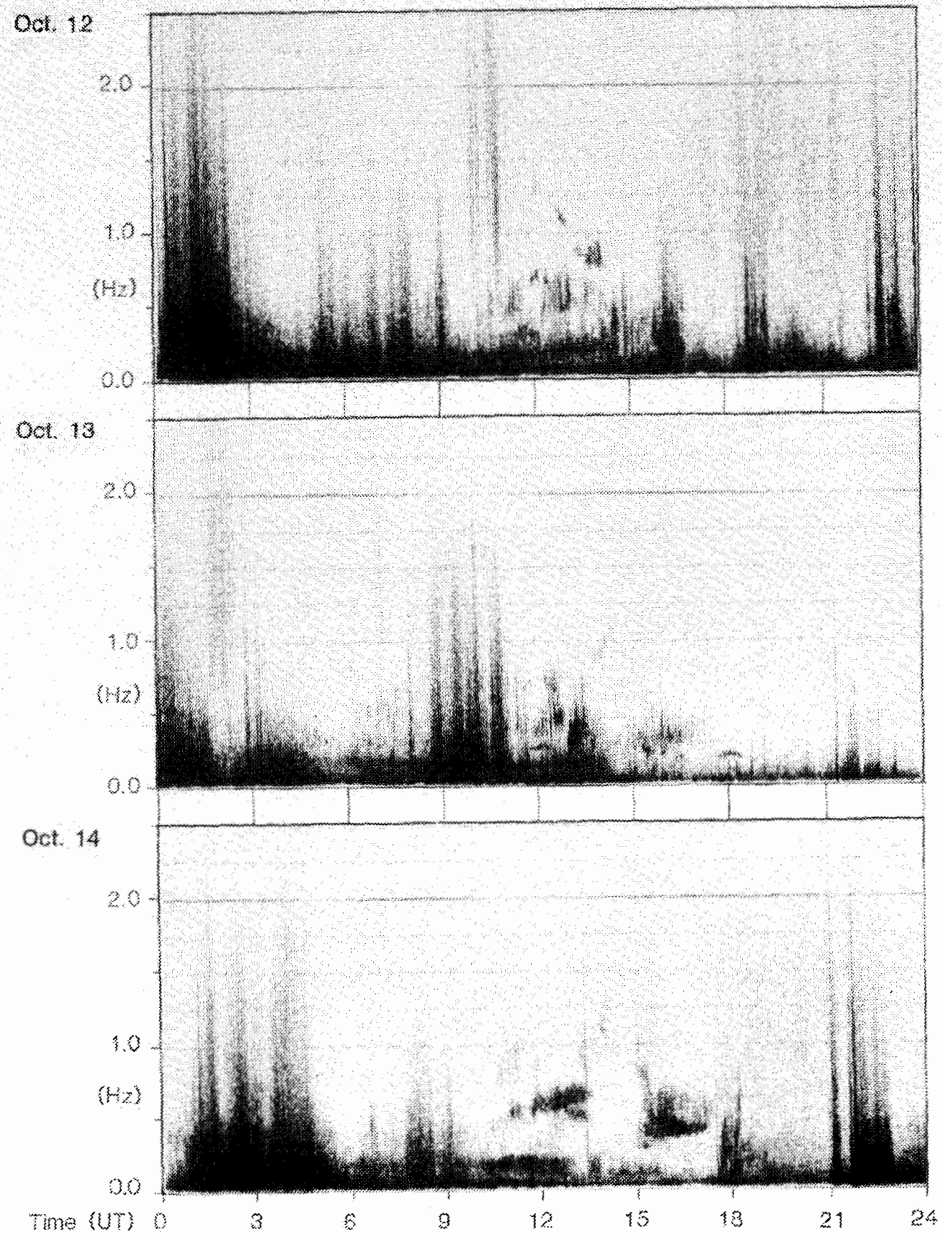


Time (UT) 0 3 6 9 12 15 18 21 24

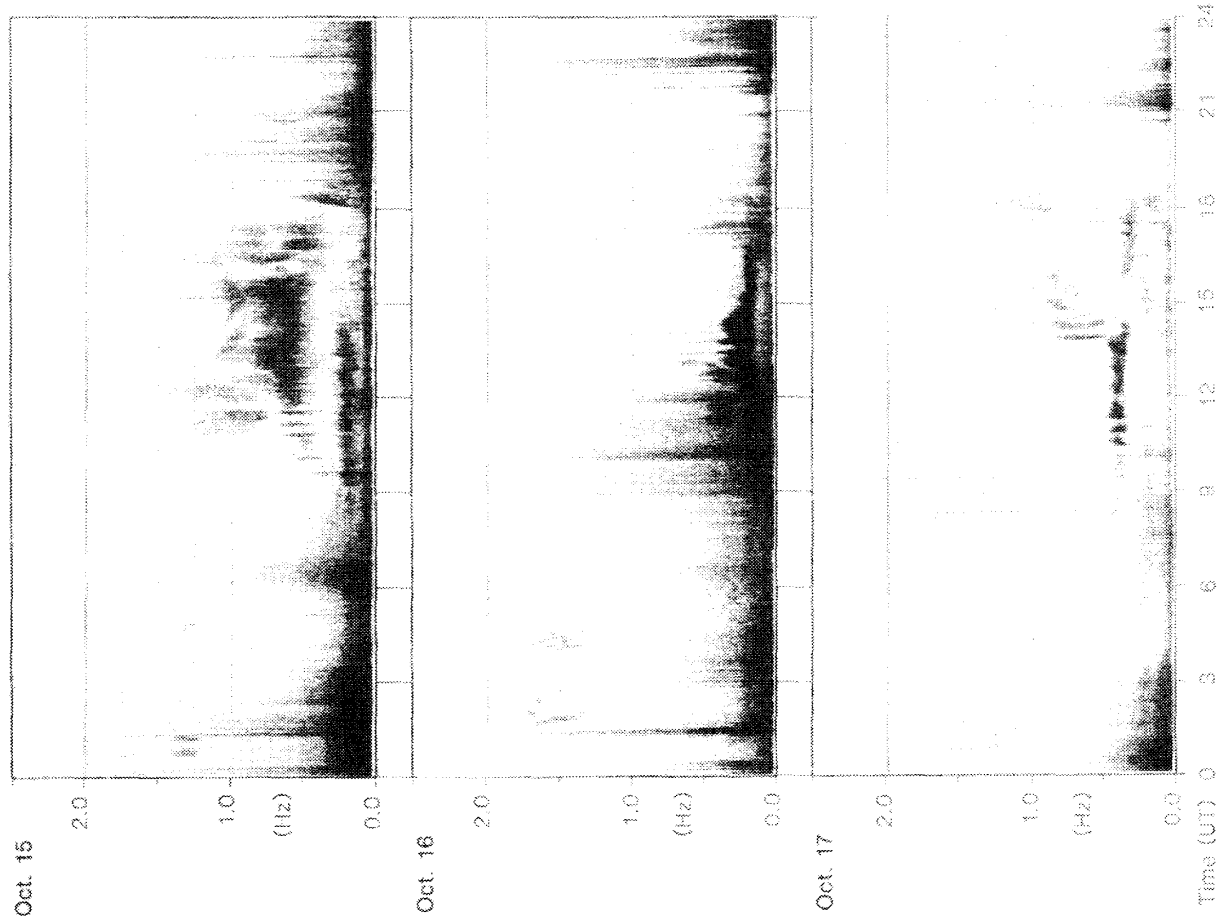
# Syowa Station, 1984



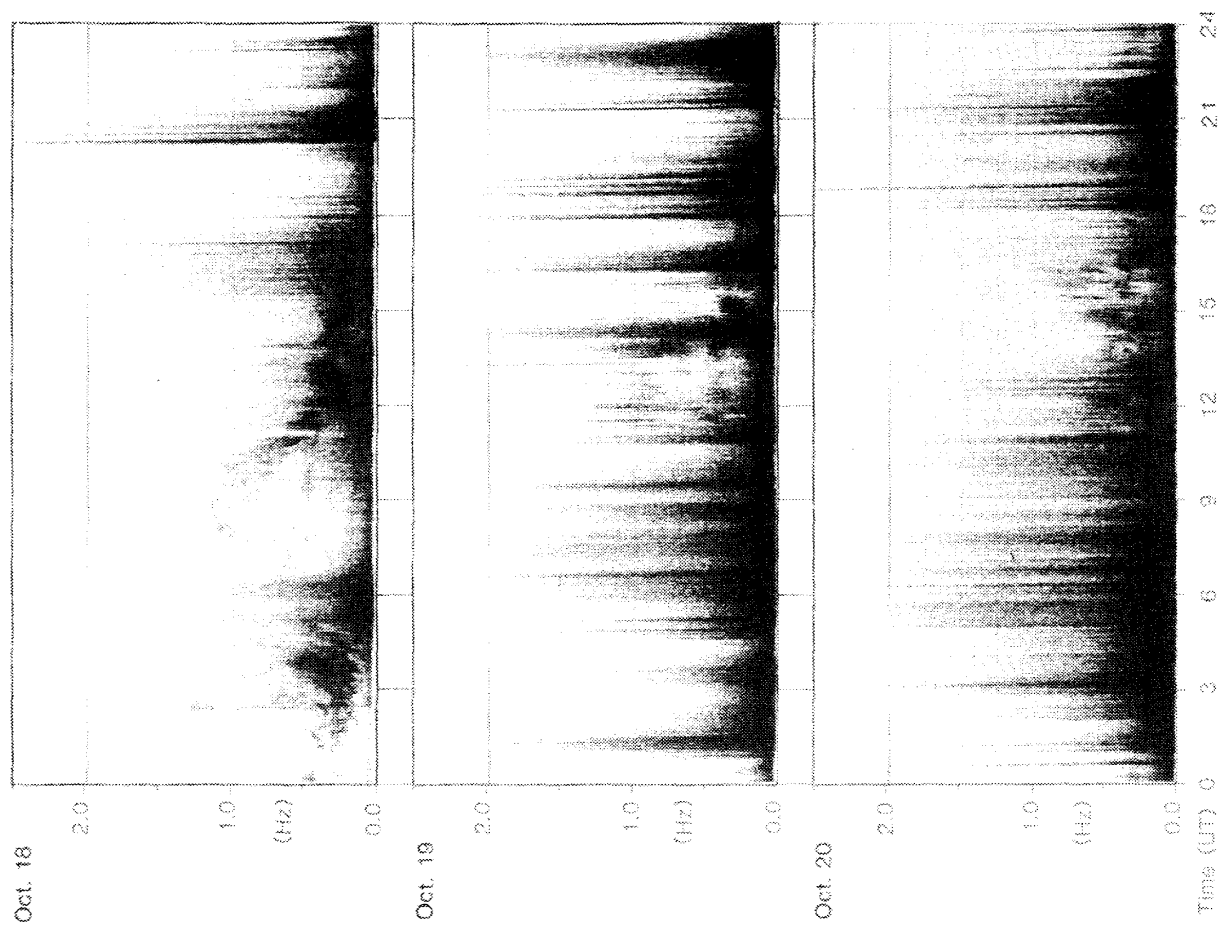
# Syowa Station, 1984



Syowa Station, 1984

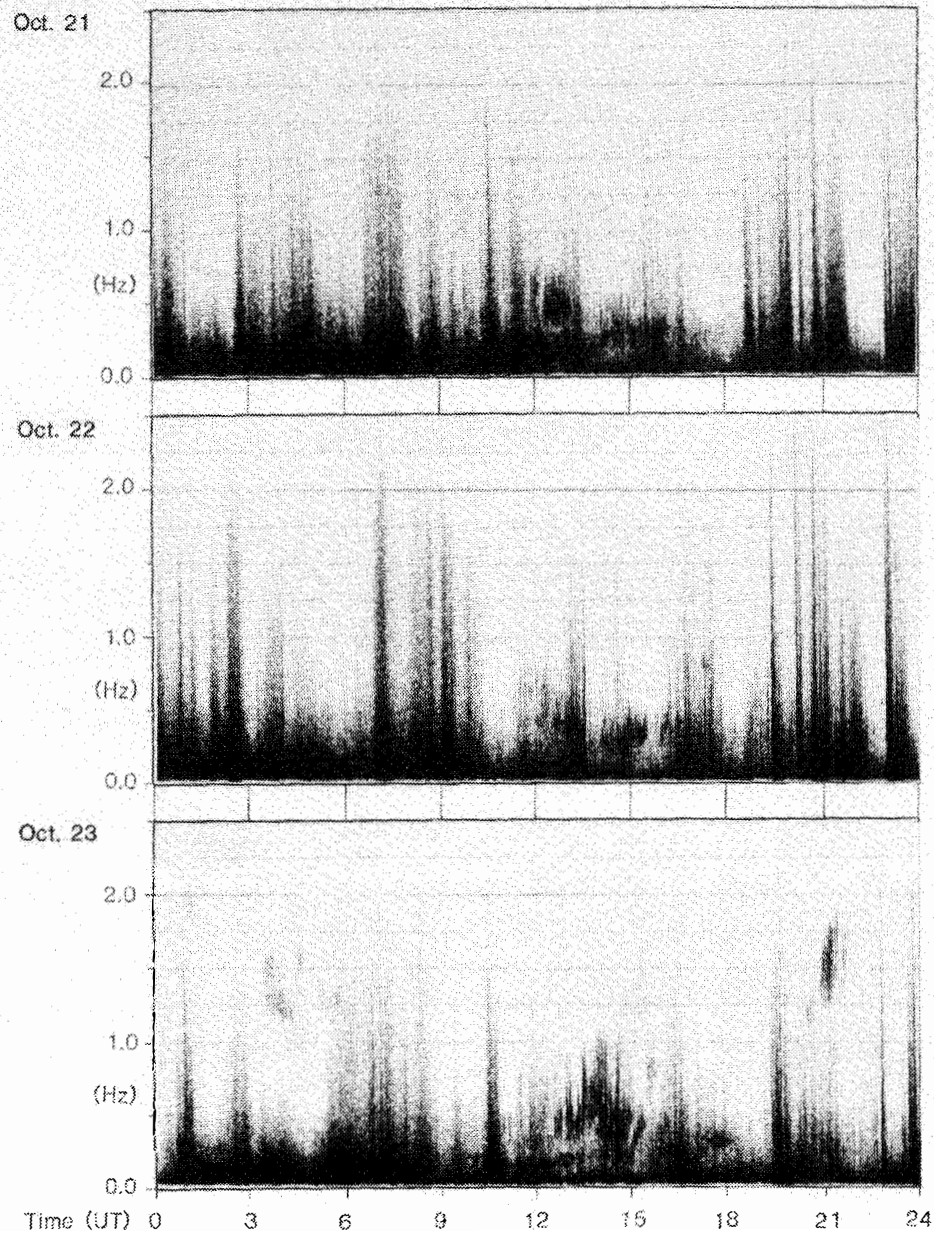


Syowa Station, 1984

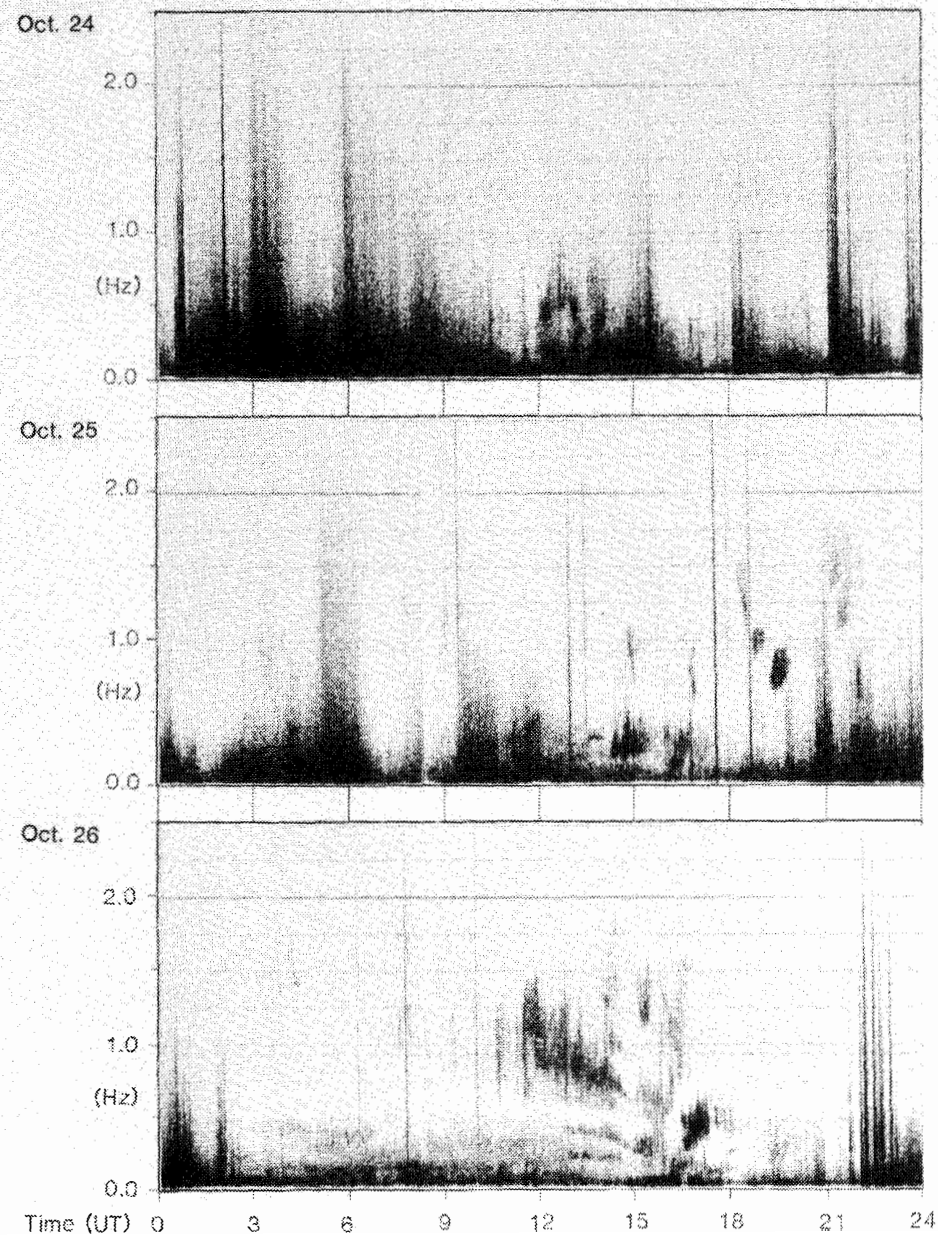




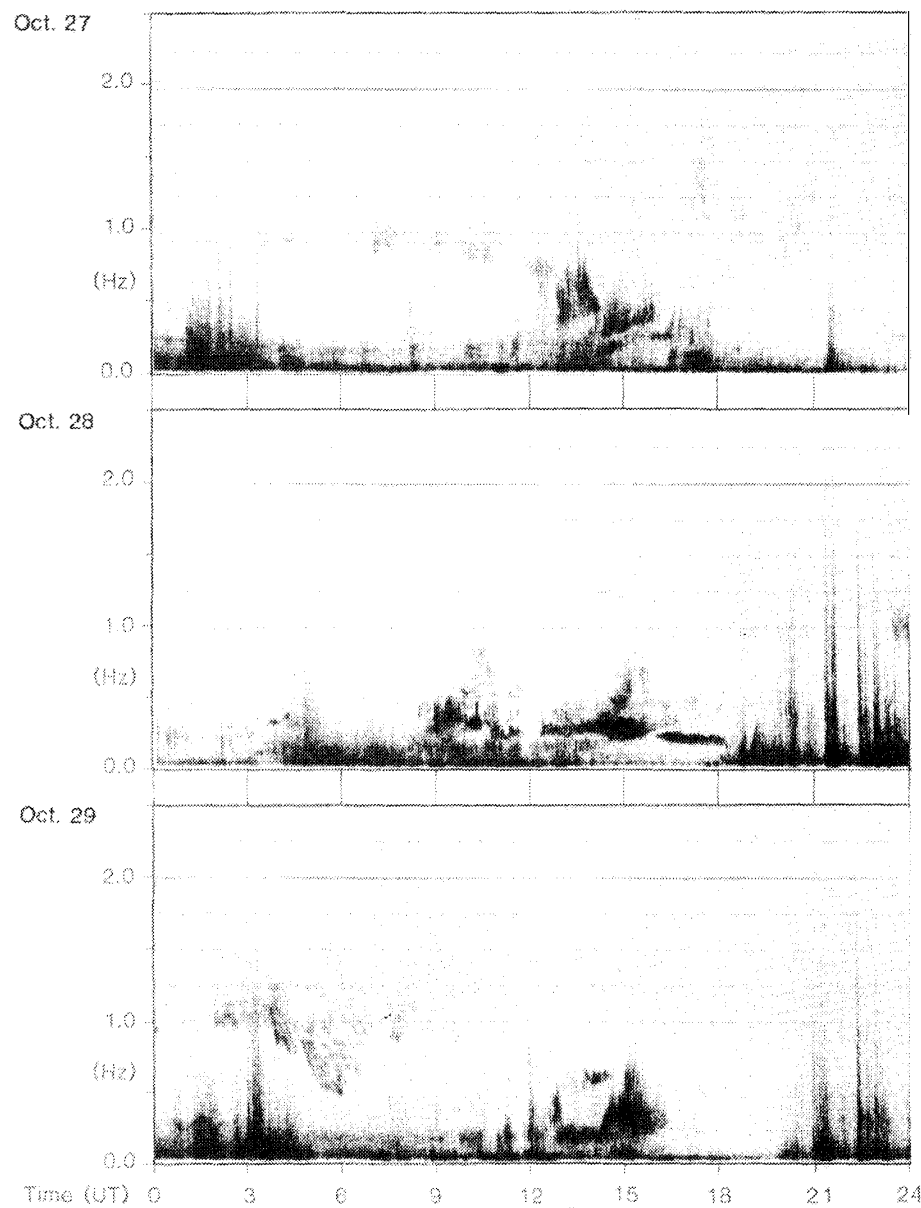
# Syowa Station, 1984



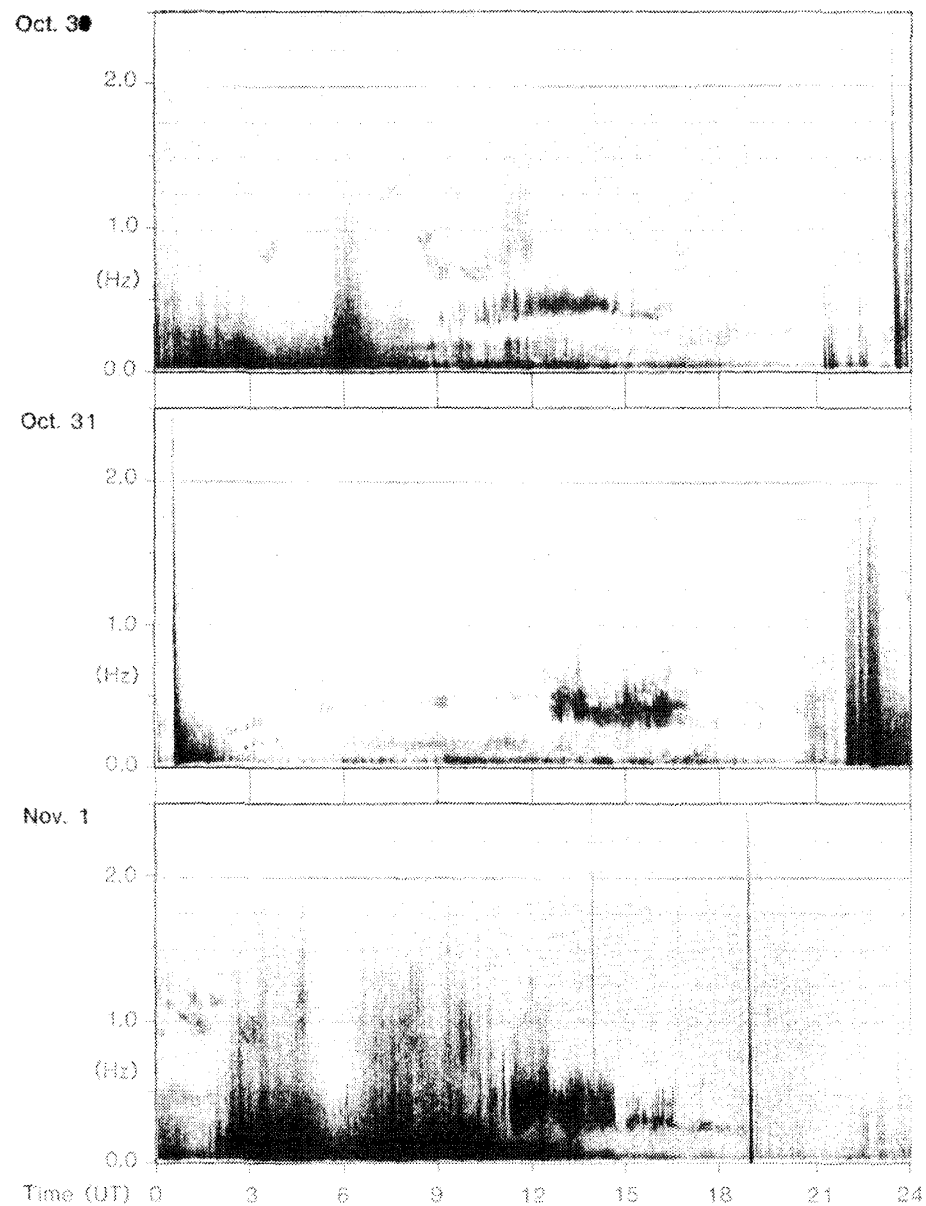
# Syowa Station, 1984



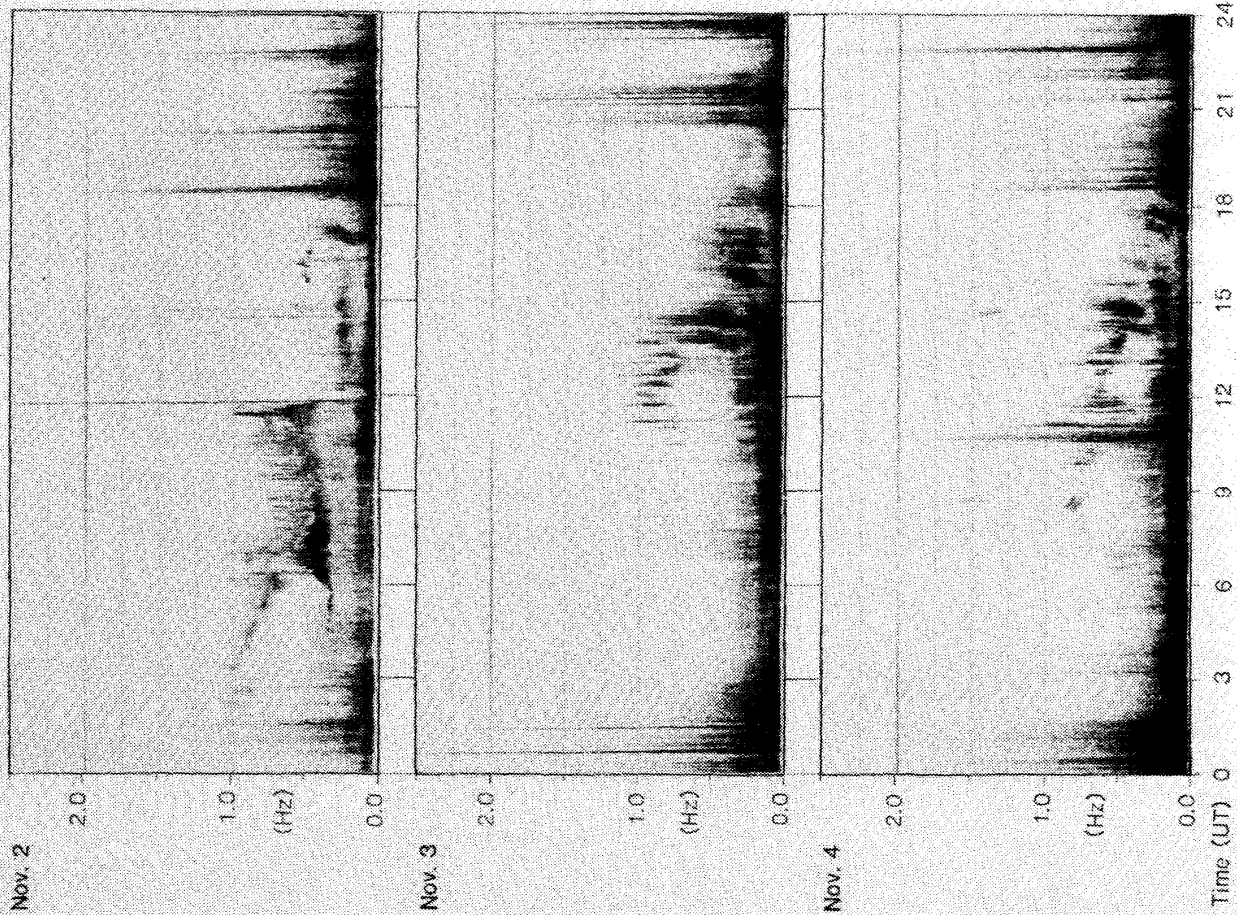
# Syowa Station, 1984



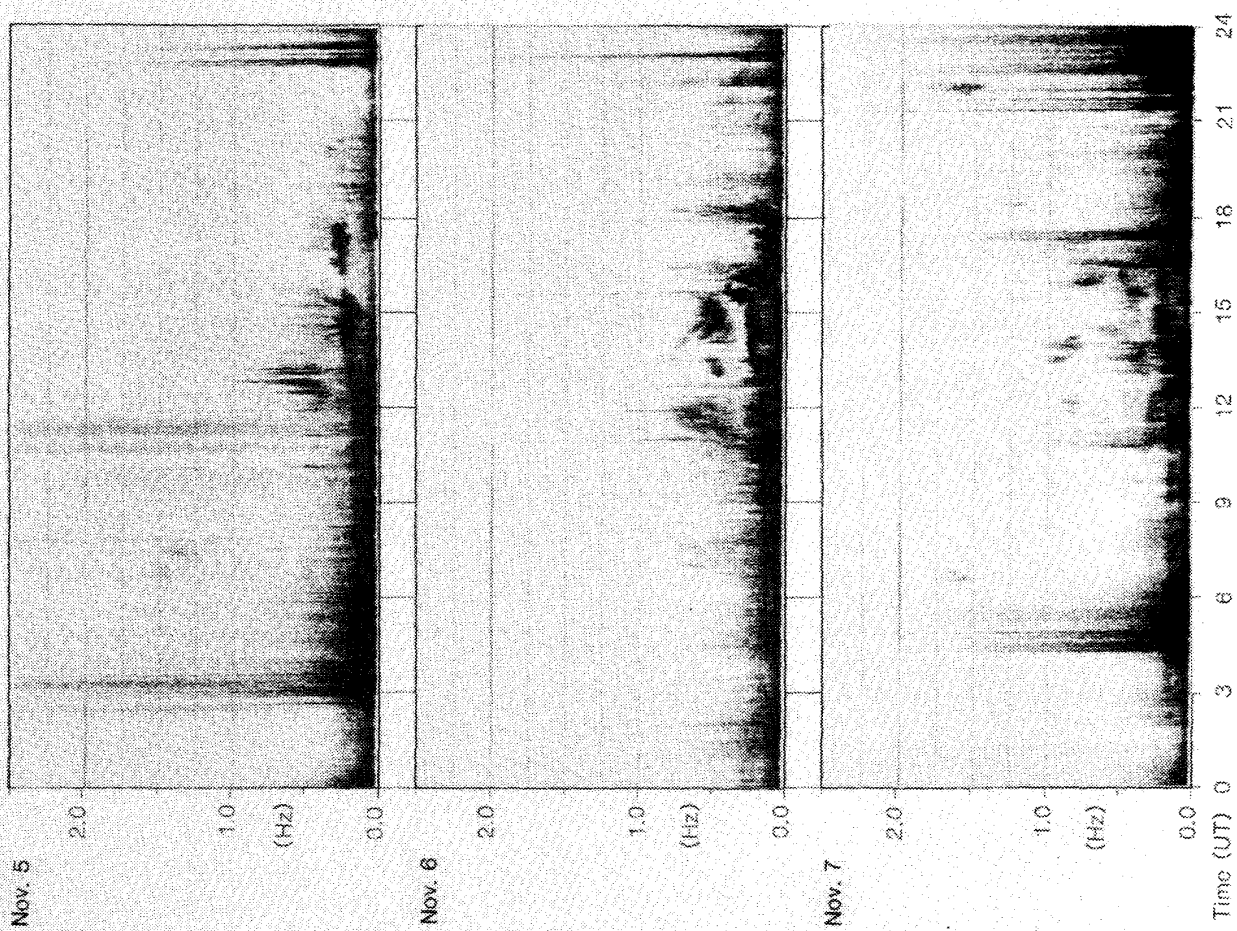
# Syowa Station, 1984



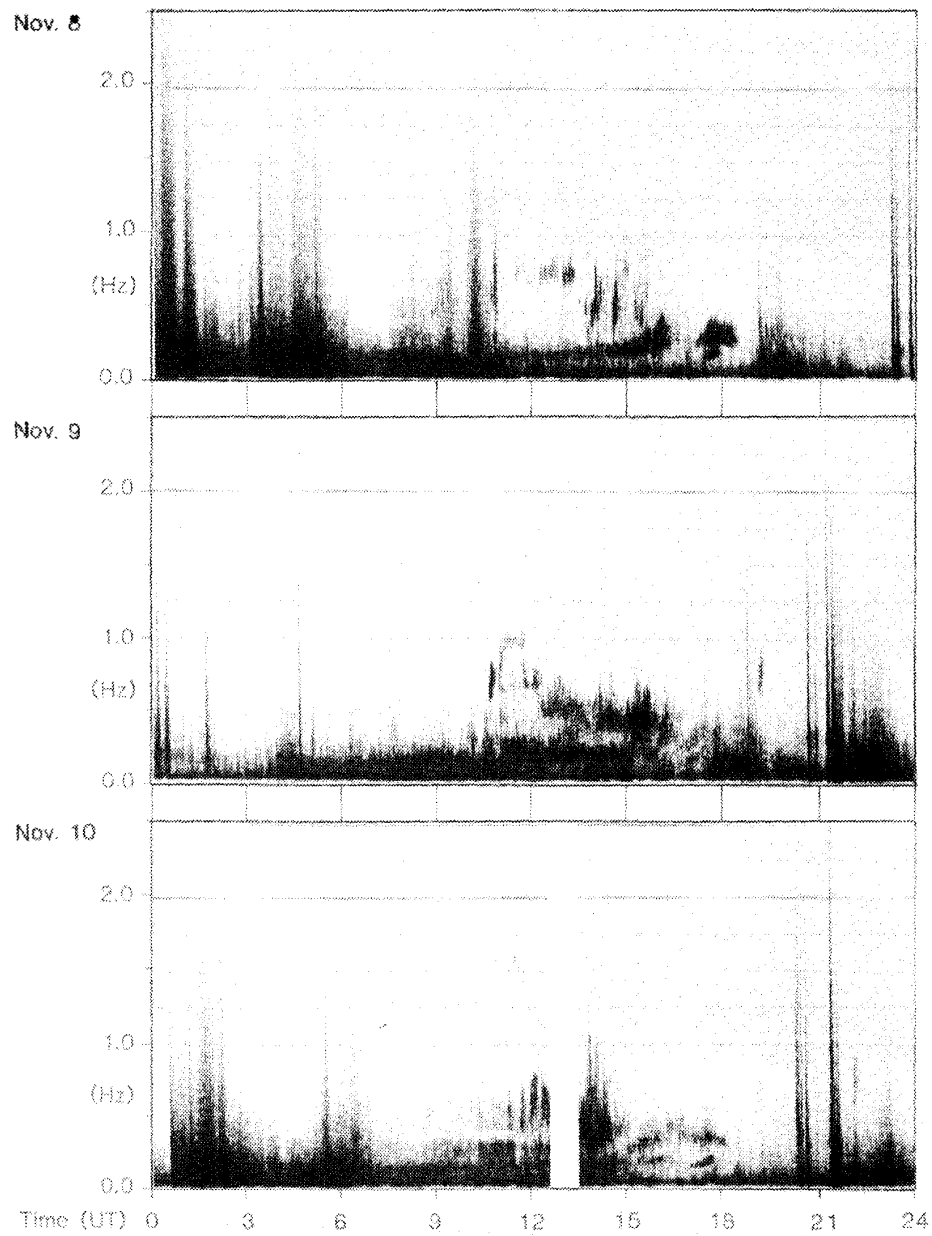
Syowa Station, 1984



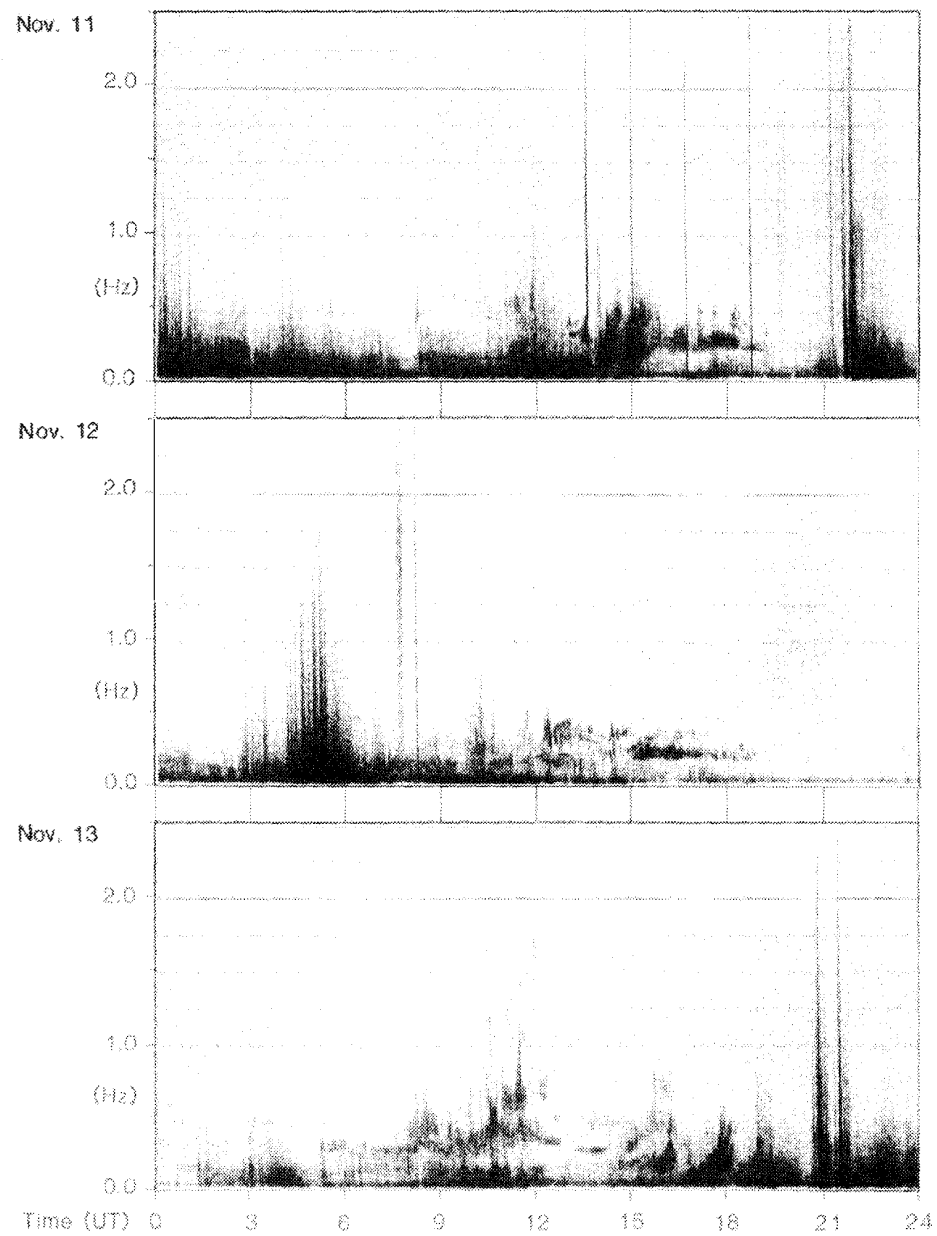
Syowa Station, 1984



# Syowa Station, 1984

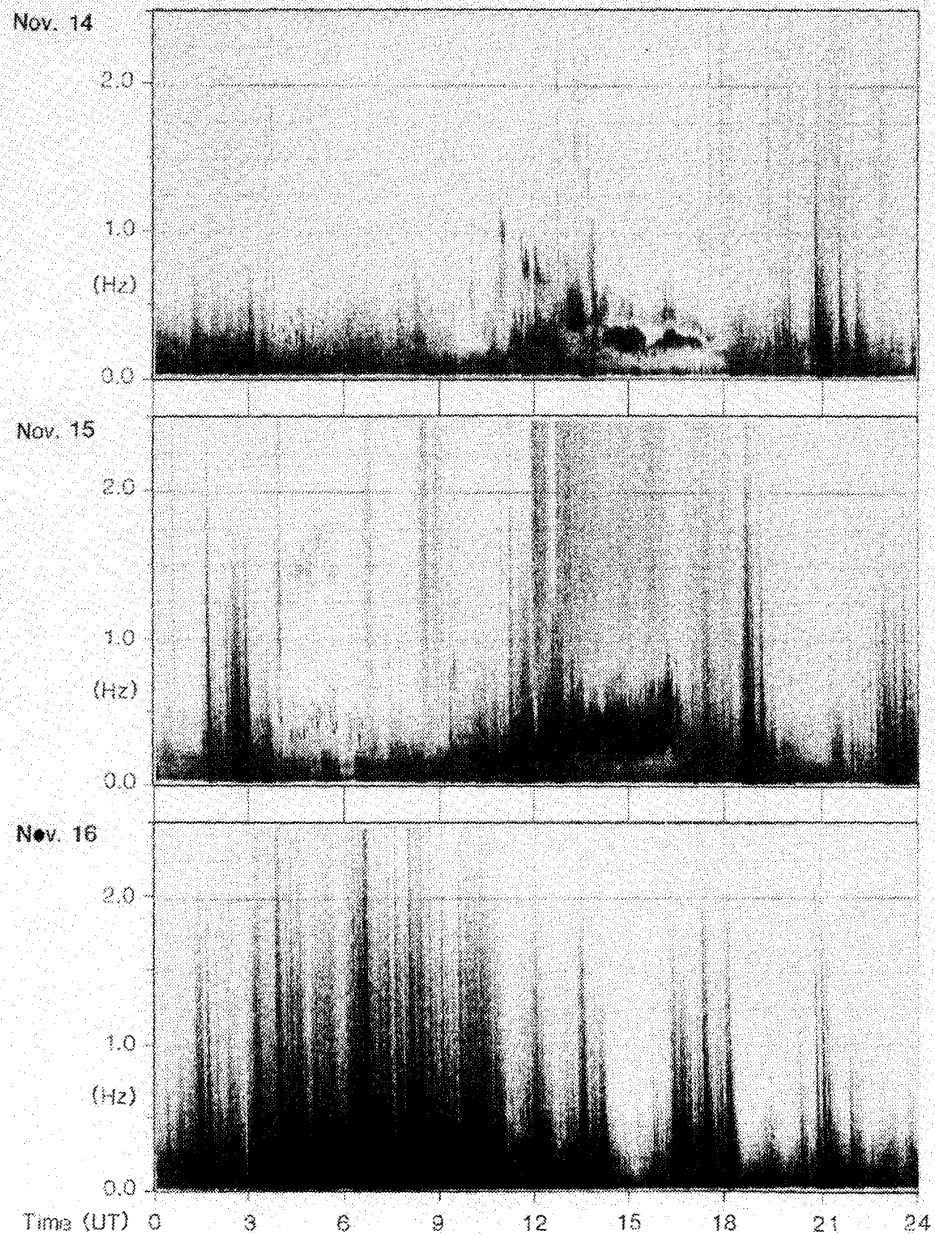


# Syowa Station, 1984

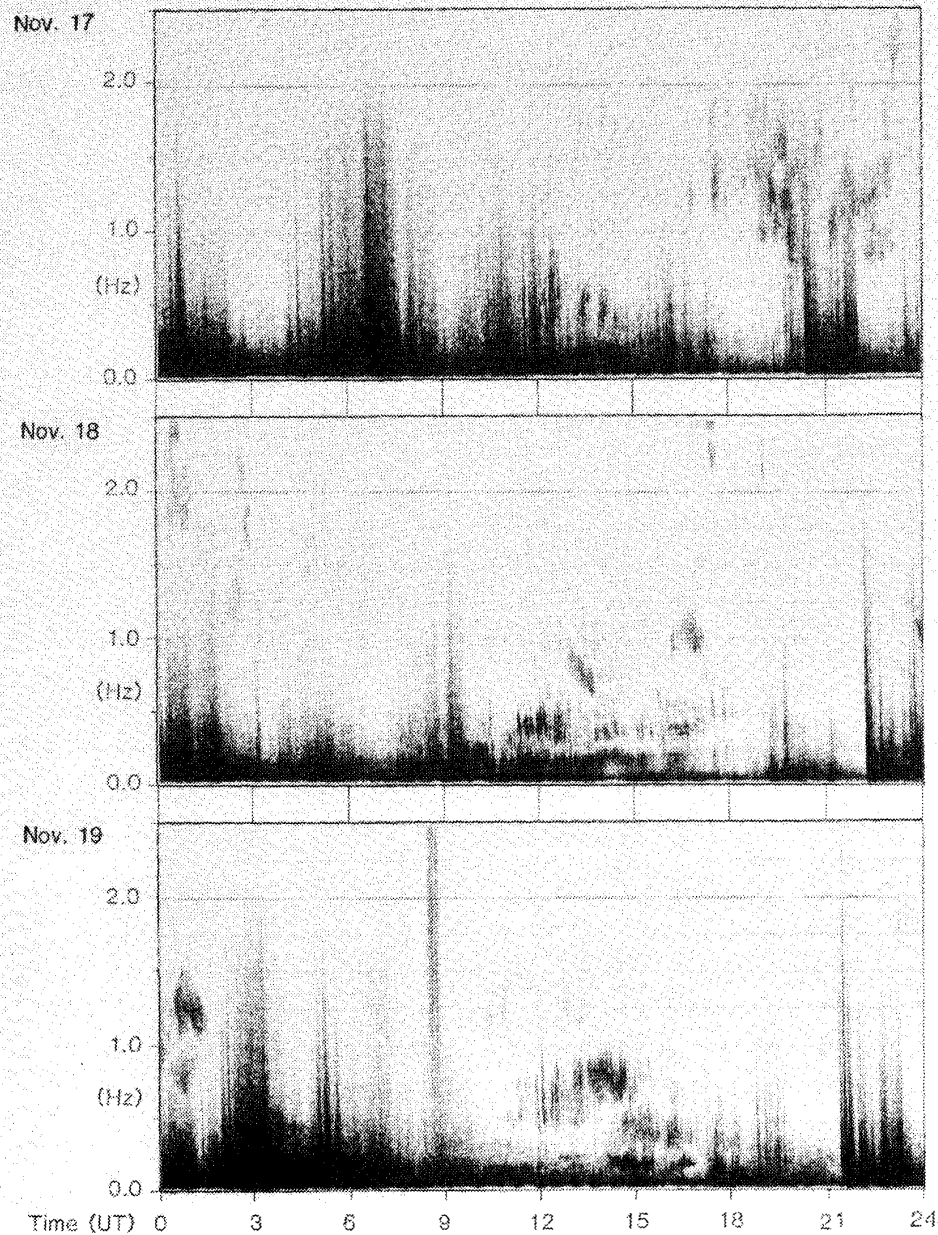




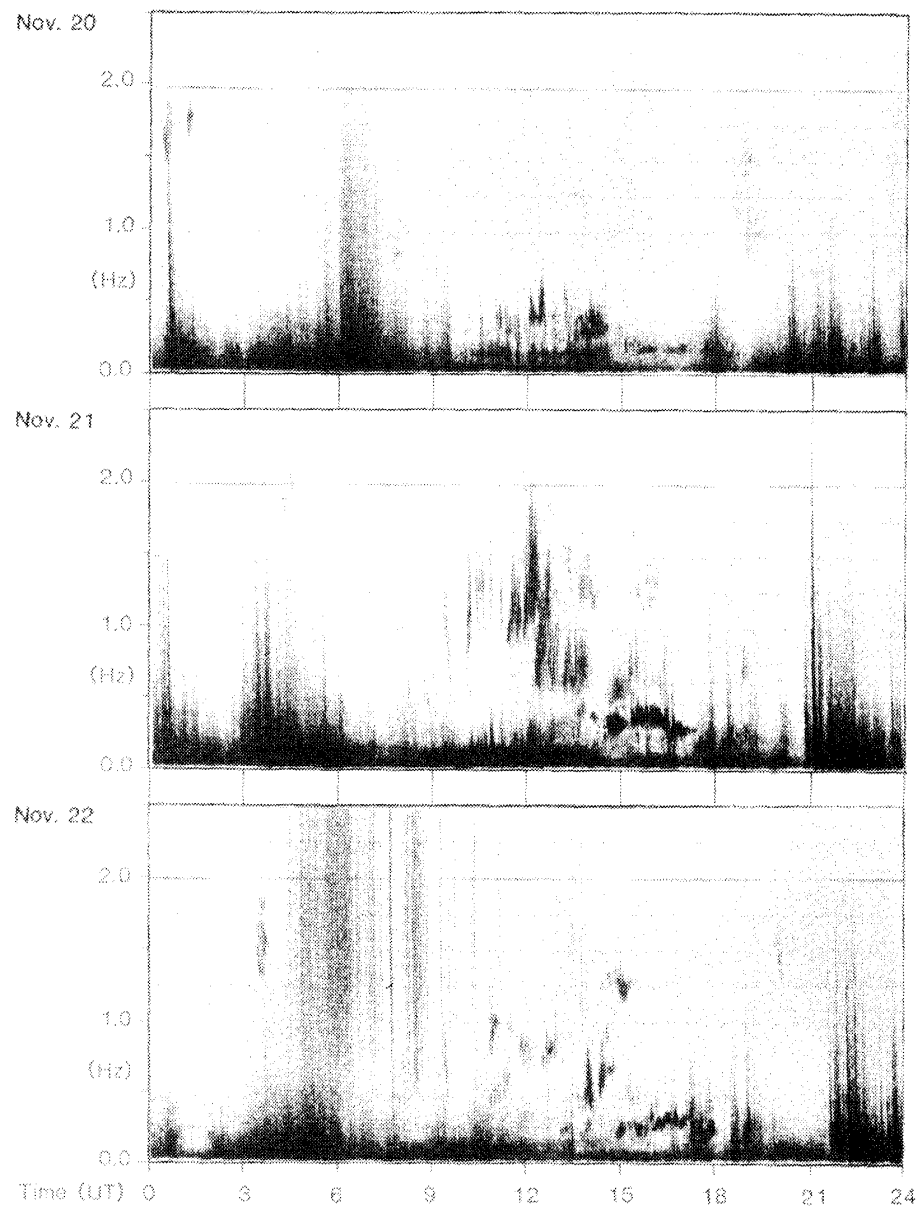
# Syowa Station, 1984



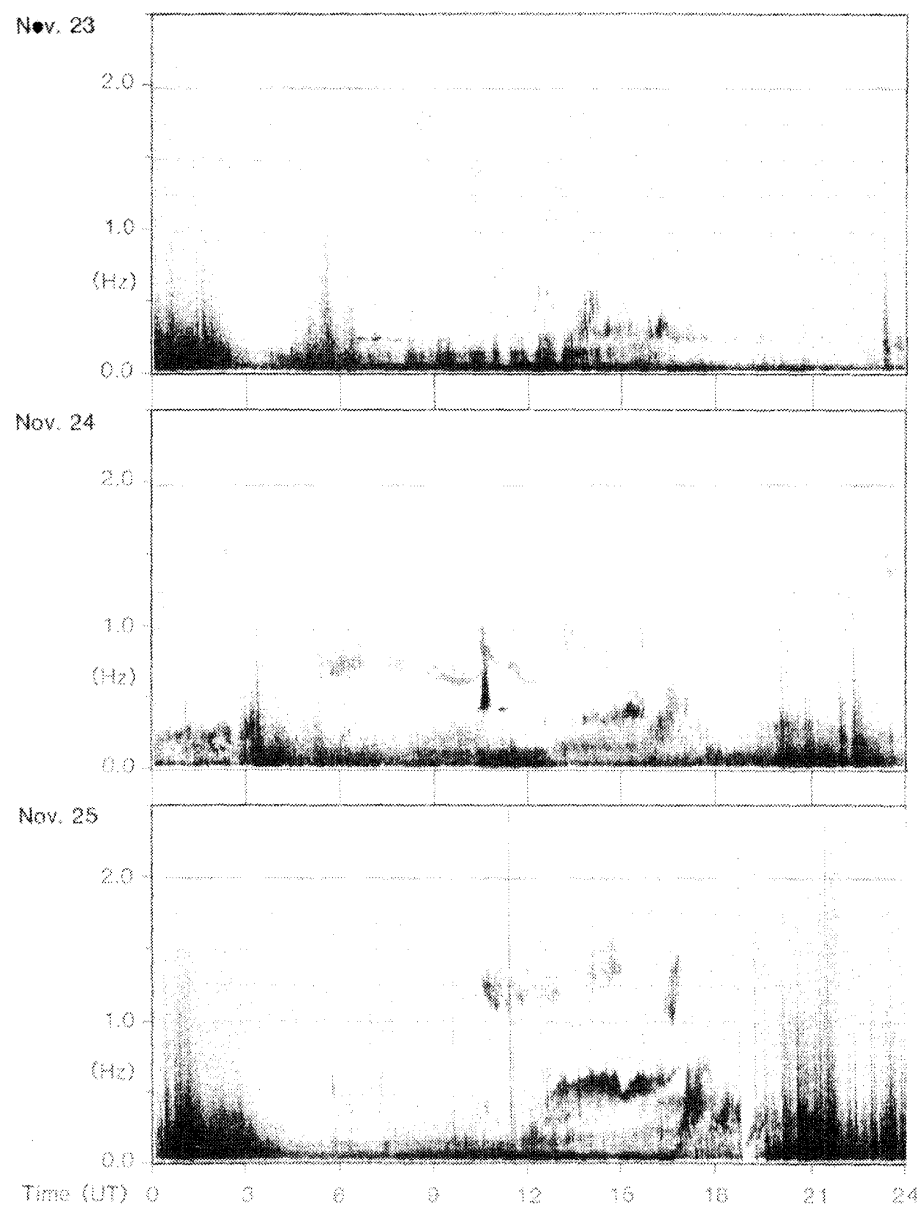
# Syowa Station, 1984



# Syowa Station, 1984



# Syowa Station, 1984



# Syowa Station, 1984

Nov. 26

2.0

1.0

(Hz)

0.0

Nov. 27

2.0

1.0

(Hz)

0.0

Nov. 28

2.0

1.0

(Hz)

0.0

Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

Nov. 29

2.0

1.0

(Hz)

0.0

Nov. 30

2.0

1.0

(Hz)

0.0

Dec. 1

2.0

1.0

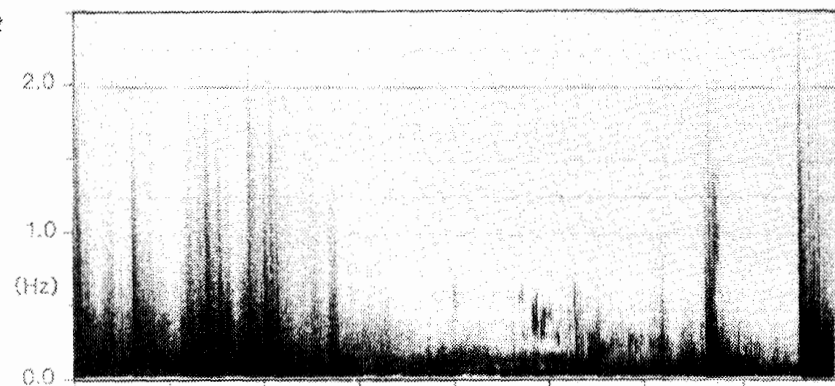
(Hz)

0.0

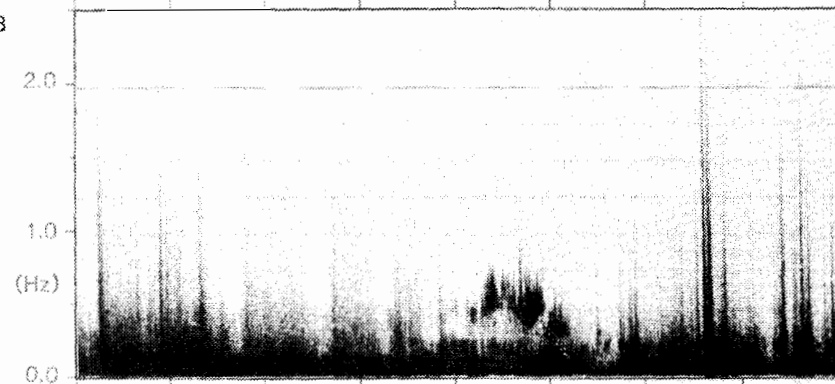
Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

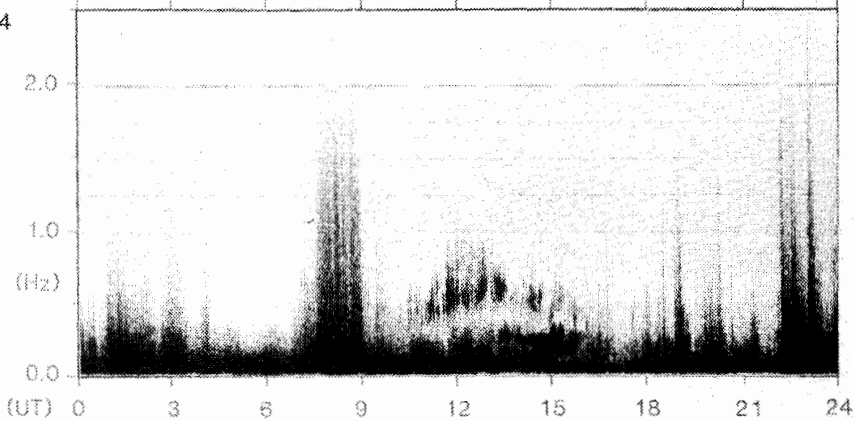
Dec. 2



Dec. 3

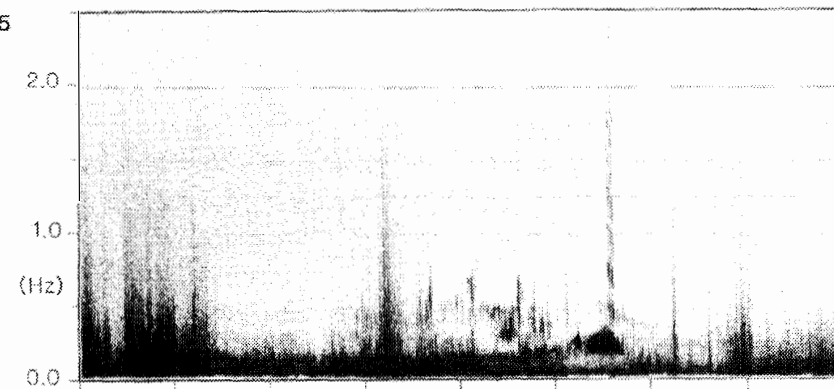


Dec. 4

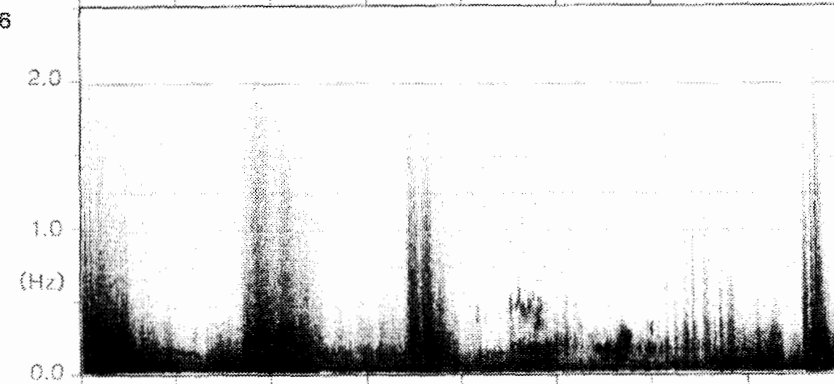


# Syowa Station, 1984

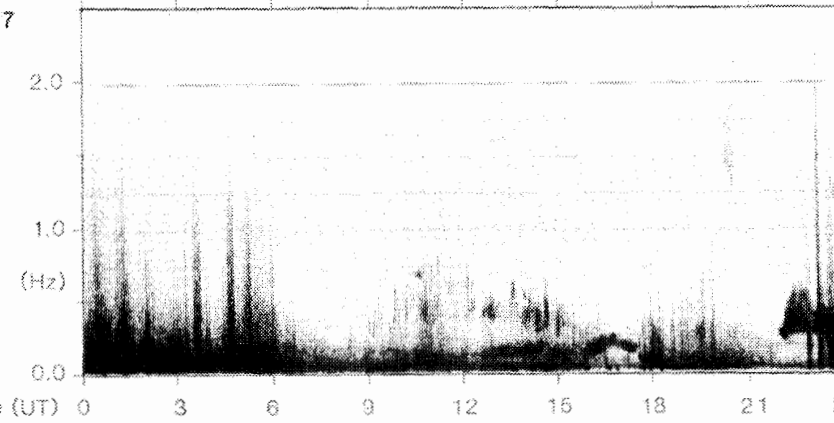
Dec. 5



Dec. 6

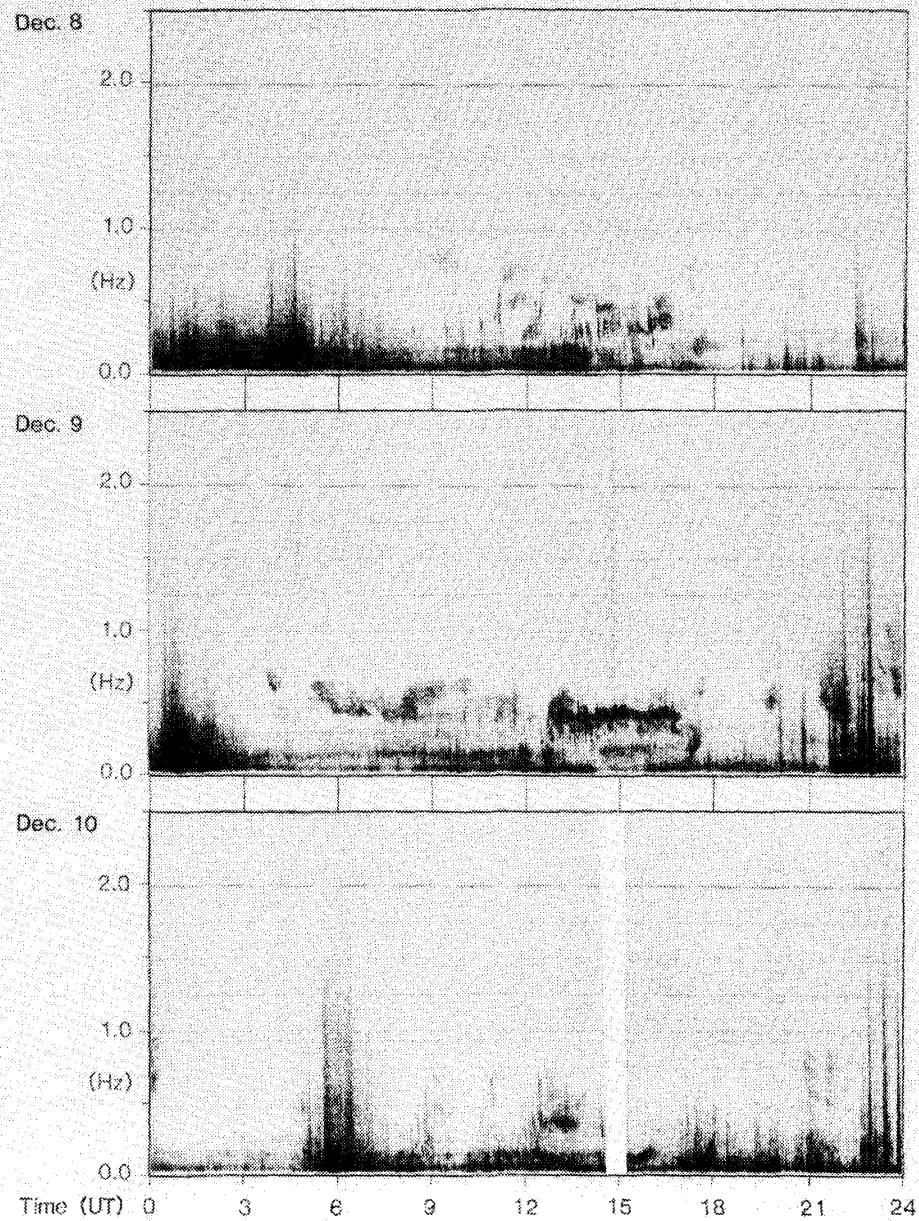


Dec. 7

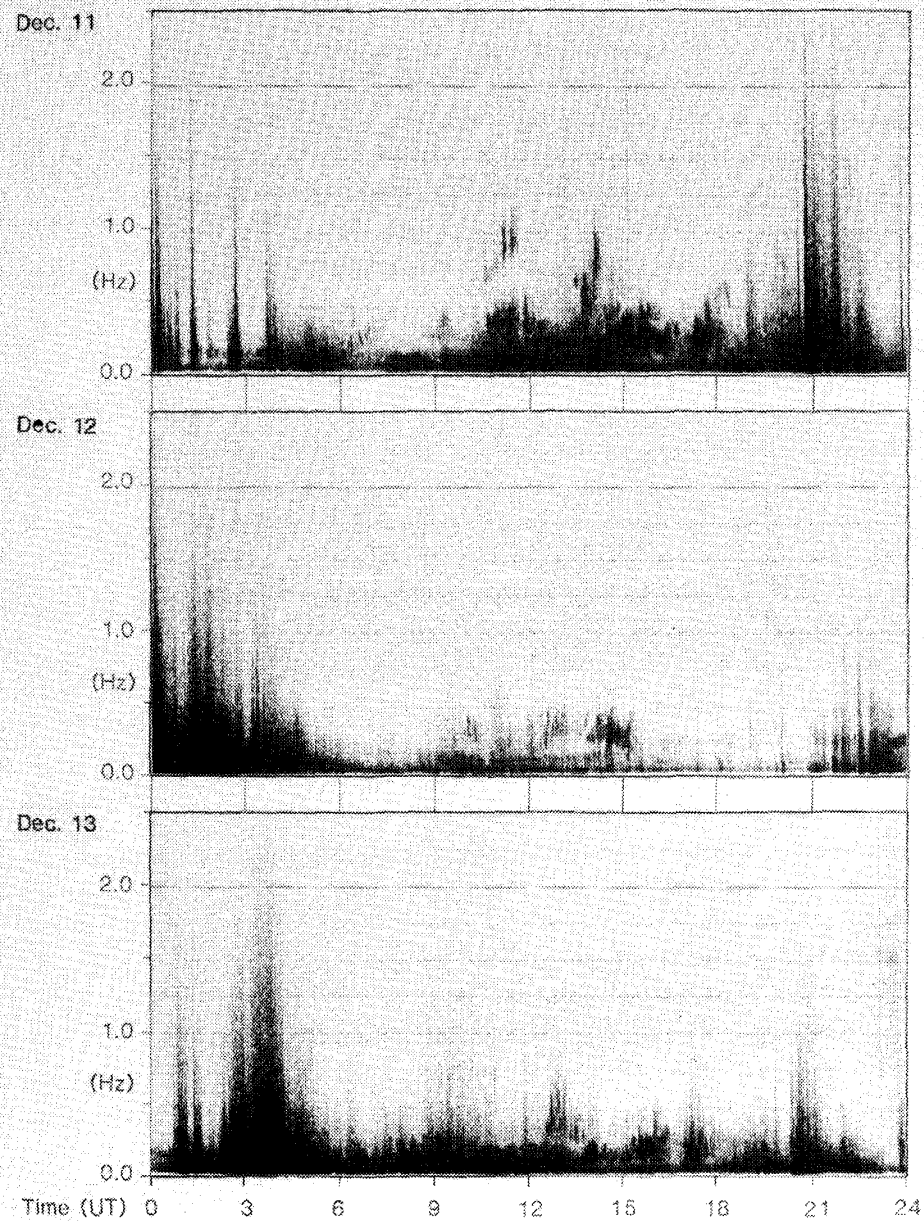




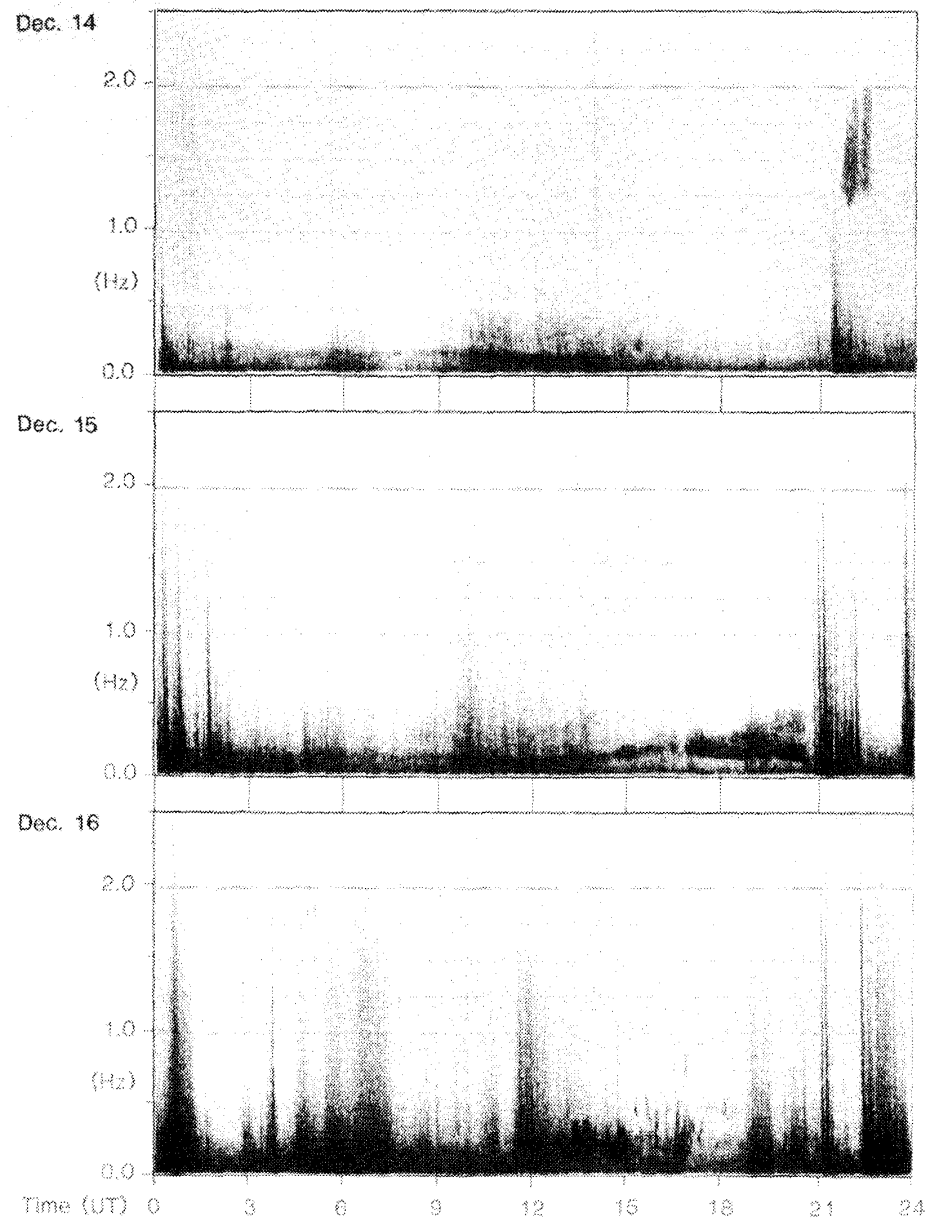
# Syowa Station, 1984



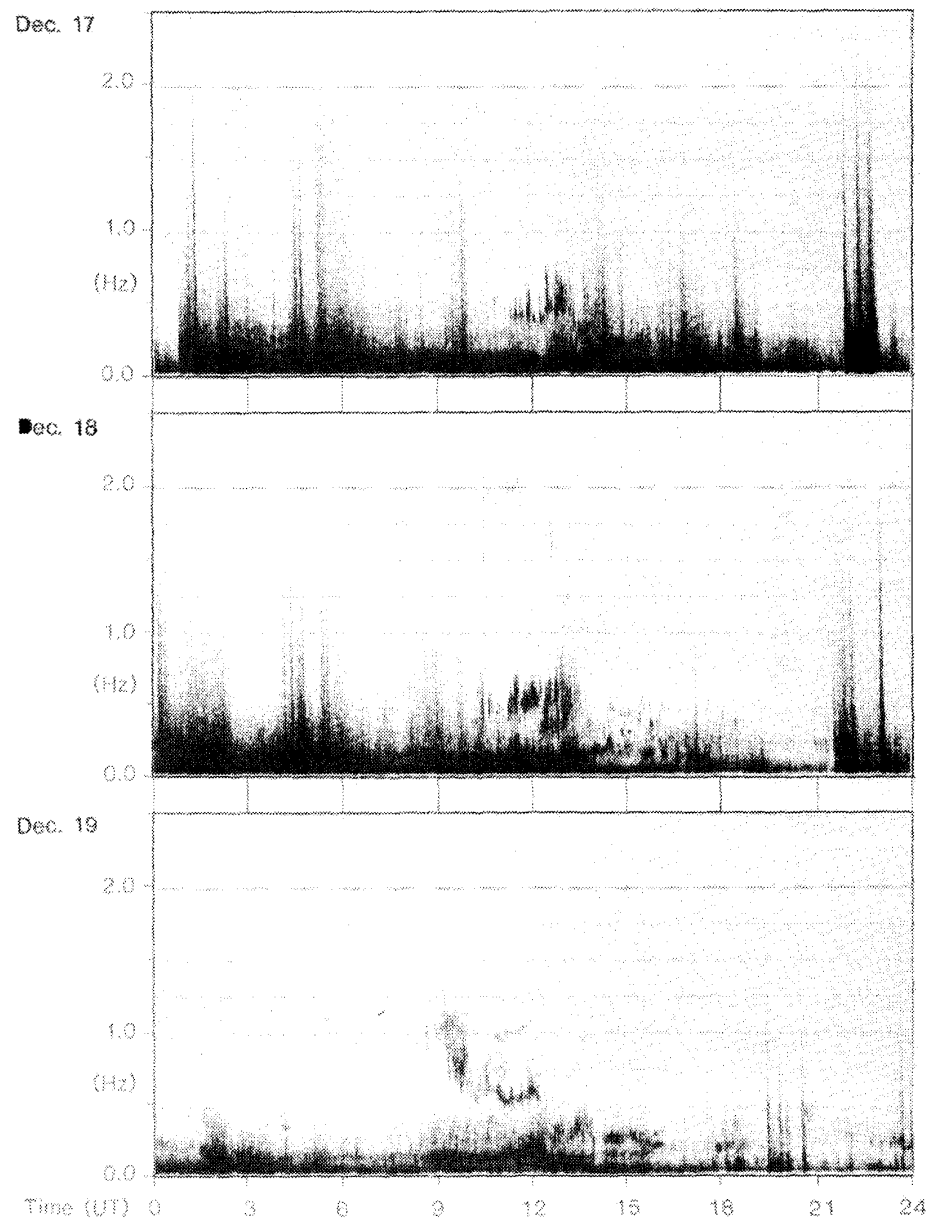
# Syowa Station, 1984



# Syowa Station, 1984

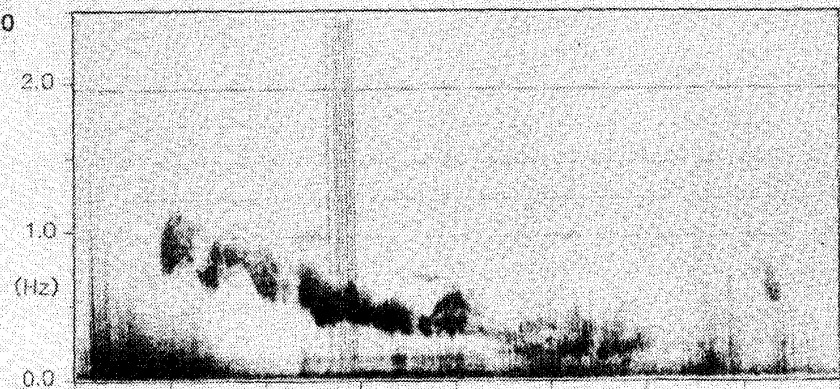


# Syowa Station, 1984



# Syowa Station, 1984

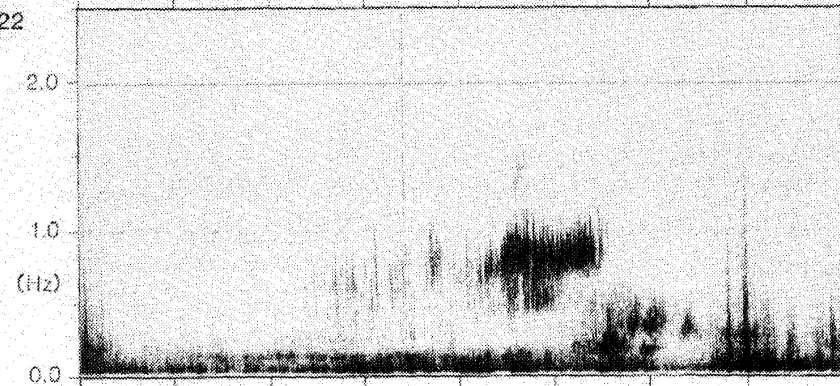
Dec. 20



Dec. 21



Dec. 22



Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984

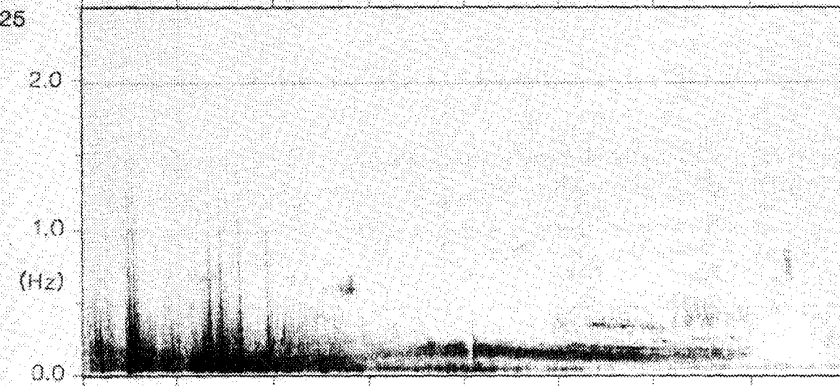
Dec. 23



Dec. 24

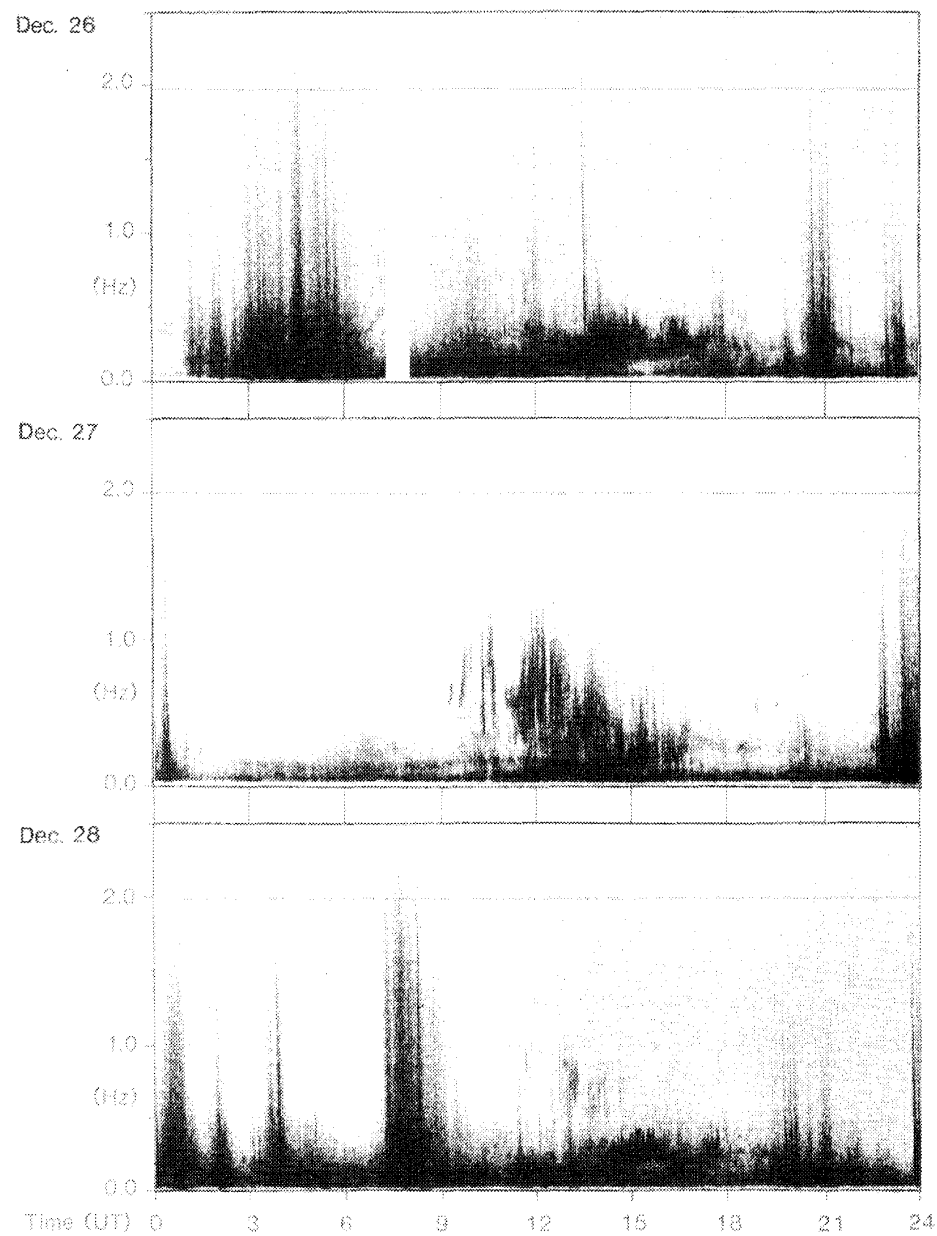


Dec. 25



Time (UT) 0 3 6 9 12 15 18 21 24

# Syowa Station, 1984



# Syowa Station, 1984

