RECORDS OF RADIO AURORA AT SYOWA STATION, ANTARCTICA IN 1986

Kiyoshi IGARASHI, Hideo MAENO and Akira SUZUKI

(Radio Research Laboratory, Koganei-shi, Tokyo)

1. Introduction

Observation of ionospheric irregularities has been carried out at Syowa Station, Antarctica, by means of an auroral radar since March 1966. A report has been prepared which includes the periods of radio auroral echoes detected in 1986 and characteristic examples of echo intensity-time variation.

Inquiries about details of the data should be addressed to:

Radio Research Laboratory

Ministry of Posts and Telecommunications

2-1, Nukui-Kitamachi 4-chome, Koganei-shi

Tokyo 184, Japan.

Three kinds of data are available: a) 35 mm film records of radio auroral echo intensity with range (A-scope) and range-time intensity (A'-scope), b) chart records of the time variation of echo intensity, and c) digital magnetic tape records of the intensity and doppler velocity of auroral radar echoes.

2. Location

Syowa Station			
Geographic		Geomagnetic	
Latitude	Longitude	Latitude	Longitude
69° 00' S	39° 35' E	-70.0°	80.2 °

3. Observer

Akira SUZUKI (Radio Research Laboratory)

4. Method of Measurement

The newly developed auroral doppler radars at the frequencies of 50 and 112 MHz were installed at Syowa Station in 1982 and 1983, respectively. Each of the two radars has two antenna beams, one directed toward the geomagnetic south (GMS) and the other 32.8° west from the geomagnetic south (GGS). The radar beams were switched every 13 seconds by turns.

The A-scope record was taken every 5 minutes, while A'-scope record and the chart record of the echo intensity were made continuously throughout the day.

The radars were designed to measure the one dimensional distributions of intensities and doppler velocities of radio auroras generated by 3- and 1.34-m irregularities appearing in the disturbed E-region. The intensities and doppler frequency spectra of backscattered signals were stored on digital magnetic tapes after being processed by a mini-computer.

Characteristics of the radar system are as follows:

Frequency	: 50 MHz and 112 MHz
Peak power	: 15 kW
Pulse width	: 100 μs
Pulse repetition frequency	: 50 Hz (333 Hz for spectrum observation)
Antenna	: Three 14-element coaxial collinear (two-way)
Antenna gain	: 25 dB
Antenna beamwidth	: 4° (half power) in horizontal plane
Receiver bandwidth	: 10 kHz
Receiver noise figure	: less than 4 dB
Display and recorder	: A-scope display, A'-scope display, pen and 6-channel dot recorder

5. Explanation of Diagrams Contained in the Report

Figures 1(1-12) show the periods of radio auroras and operation status of the auroral radar. Time in use is 45° EMT (= UT + 3 h). Symbols used in the figures are as follows:

———————	: occurrence of radio aurora
←—— C ——→	: no observation
Blank	: no radar echo

Figures 2(1-43) show typical examples of compiled data for 50 MHz radio aurora. In each figure, time variations of the echo range (RTI), half-power width of doppler spectrum (V) at a fixed range (300 km) and echo power (P) at 300 km range are displayed for both the GGS (geographic south direction) and GMS (geomagnetic south direction) antenna beams. Also shown in the figure are the geomagnetic H-component and 30 MHz CNA obtained at Syowa Station. The CNA level is calibrated 1-dB step at 5h UT with a few exceptional cases. The beginning and ending times of the observation are indicated on the top in each figure.

Bibliography relevant to

RECORDS OF RADIO AURORA AT SYOWA STATION, ANTARCTICA (1)

Observing Period	Observers	Literature JARE Data Reports		
		Volume	Pages	Year
Mar. 1966 - Jan. 1968	Ose, M. Hasegawa, S. Takeuchi, T. Nishimuta, I. Isobe, T.	5 (Ionosphere 2)	64	1969
Apr. 1970 - Feb. 1971	Shiro, I. Sakamoto, T.	15 (Ionosphere 6)	34	1972
Feb. 1972 - Dec. 1972	Isozaki, S. Miyazaki, S.	23 (Ionosphere 10)	22	1974
Feb. 1973 - Jan. 1974	Nishimuta, I. Yabuuma, H.	26 (Ionosphere 12)	23	1975
Mar. 1974 - Dec. 1974	Shiro, I. Yamazaki, I.	33 (Ionosphere 14)	89	1976
1975	Shiro, I. Sugiuchi, H. Komiya, N.	37 (Ionosphere 16)	105	1977
1976	Shiro, I. Yamakoshi, A. Sasaki, T.	42 (Ionosphere 18)	105	1978
Apr. 1978 - Dec. 1978	Igarashi, K. Tsuzurahara, S.	53 (Ionosphere 21)	23	1980
Jan. 1979 - Dec. 1979	Igarashi, K. Ojima, S. Komiya, N.	58 (Ionosphere 23)	28	1980
1980	Igarashi, K. Nozaki, K.	68 (Ionosphere 24)	28	1982
1981	Ose, M. Kurihara, N.	81 (Ionosphere 28)	28	1983
1982	Igarashi, K. Kuratani, Y.	88 (Ionosphere 30)	28	1984
1983	Igarashi, K. Tanaka, T. Yamazaki, I.	100 (Ionosphere 32)	64	1985
1984	Igarashi, K. Tanaka, T. Yamamoto, S.	113 (Ionosphere 34)	33	1986
1985	Igarashi, K. Maeno, H. Ogawa, T.	123 (Ionosphere 36)	56	1987

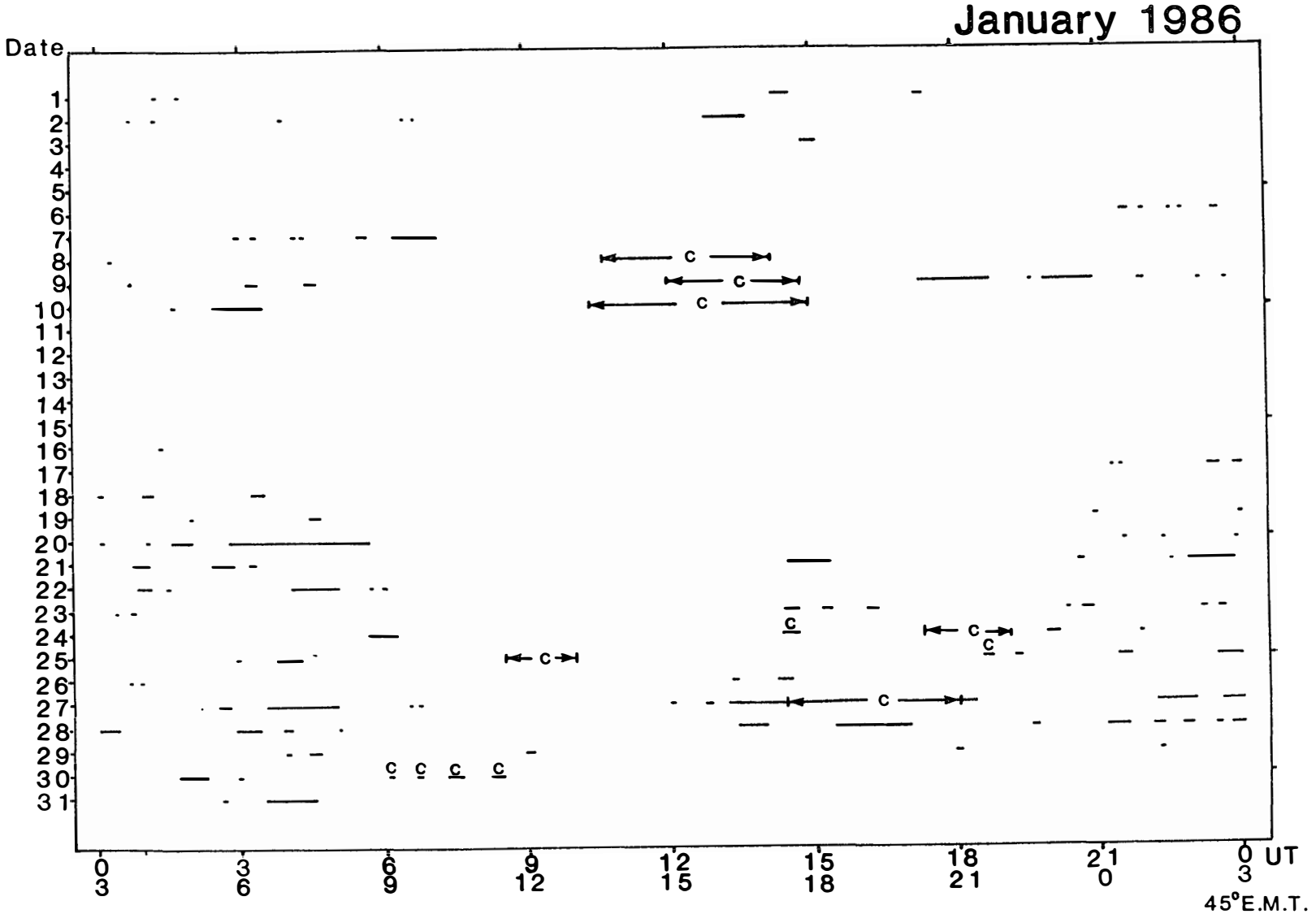
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Fig.1 (1).

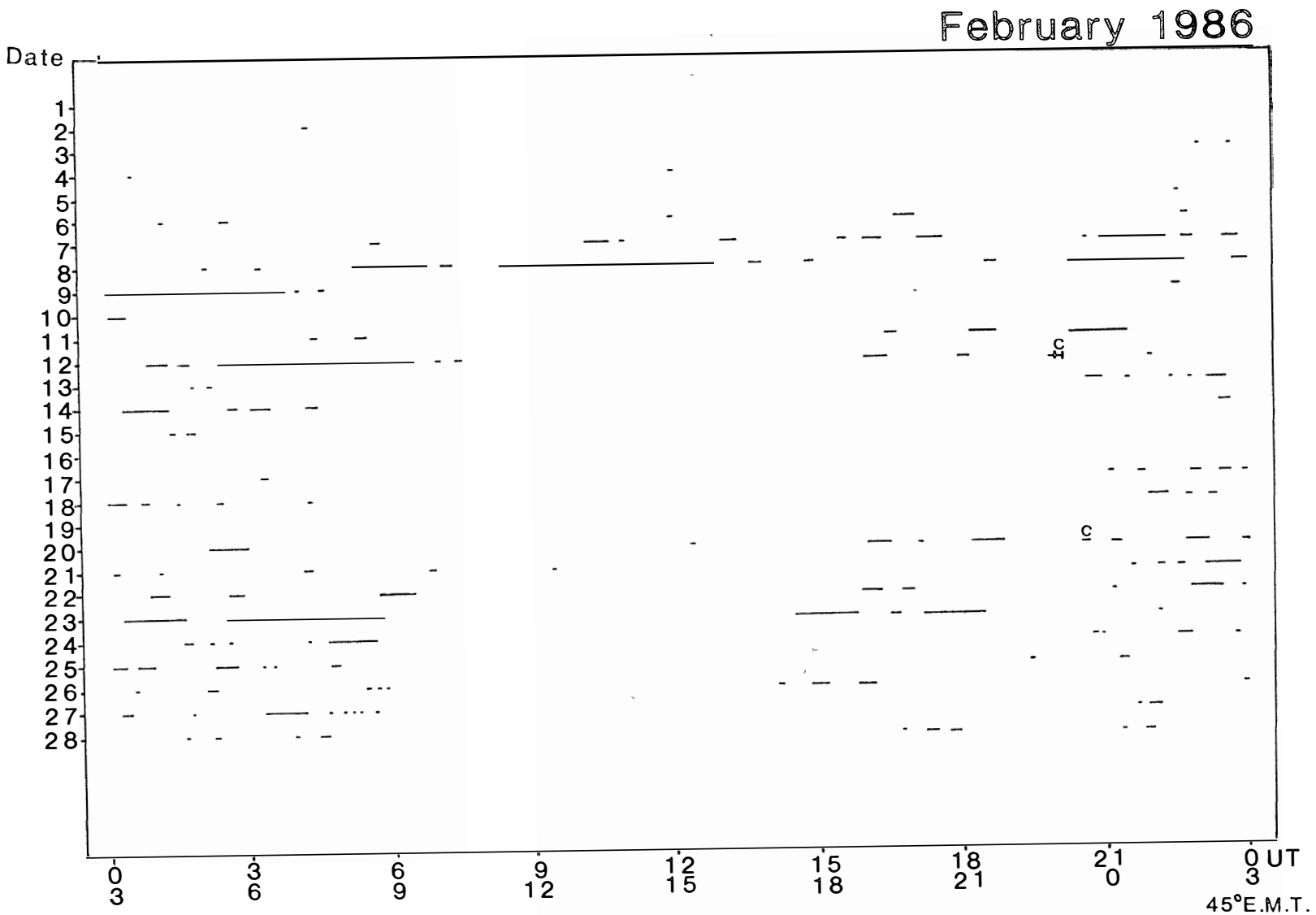
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Fig.1 (2).

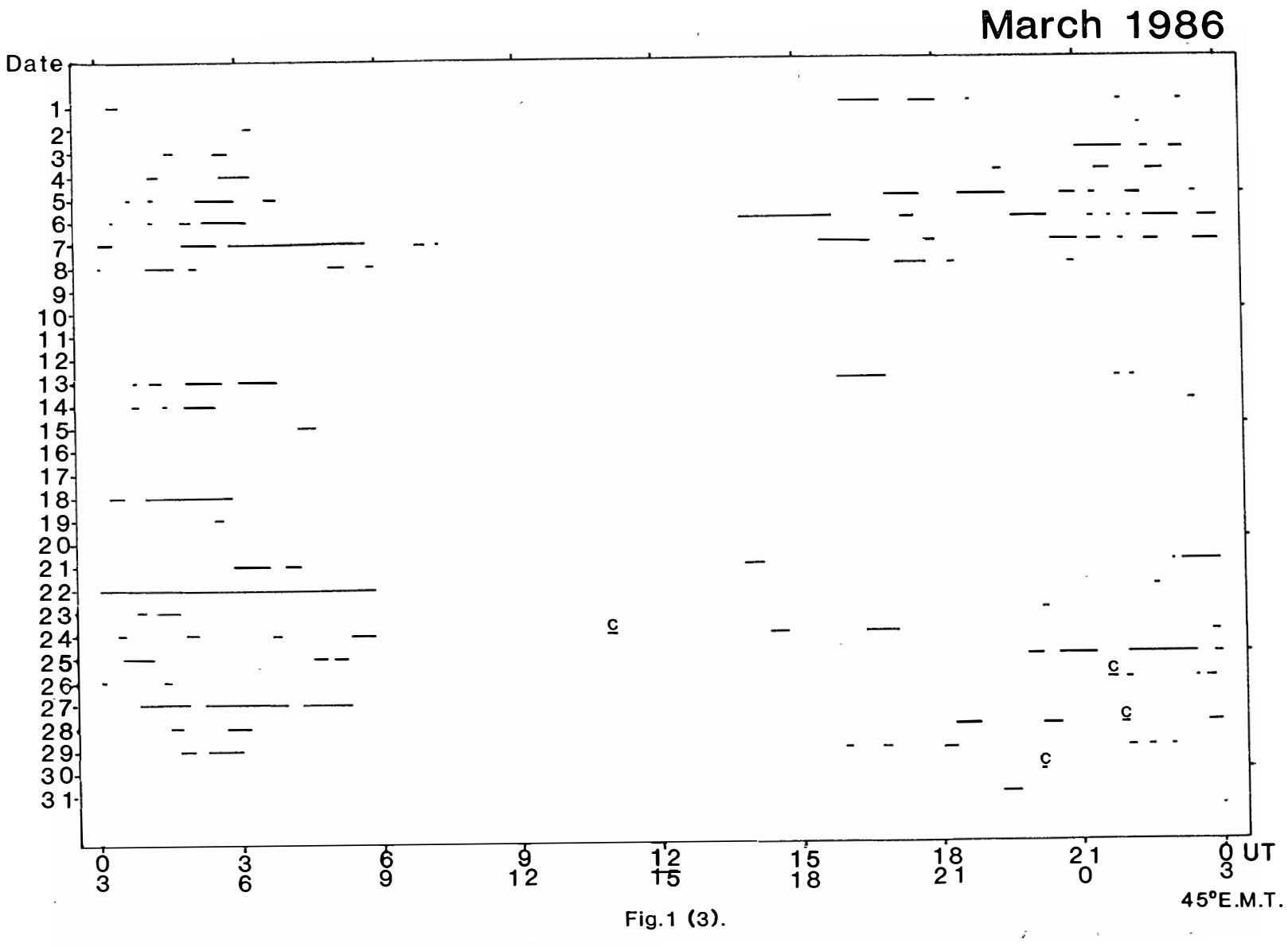
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Fig.1 (3).

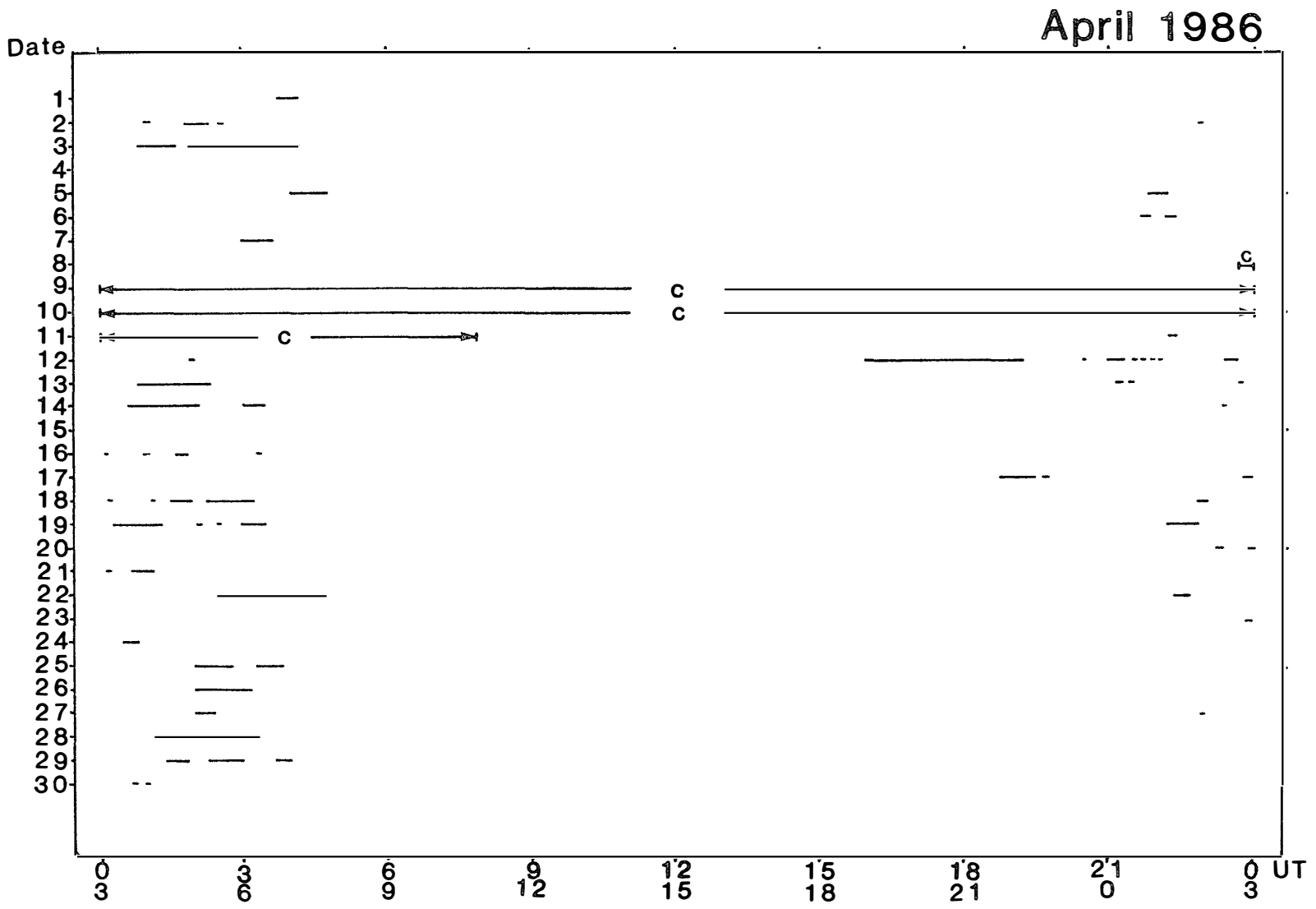
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Fig.1 (4).

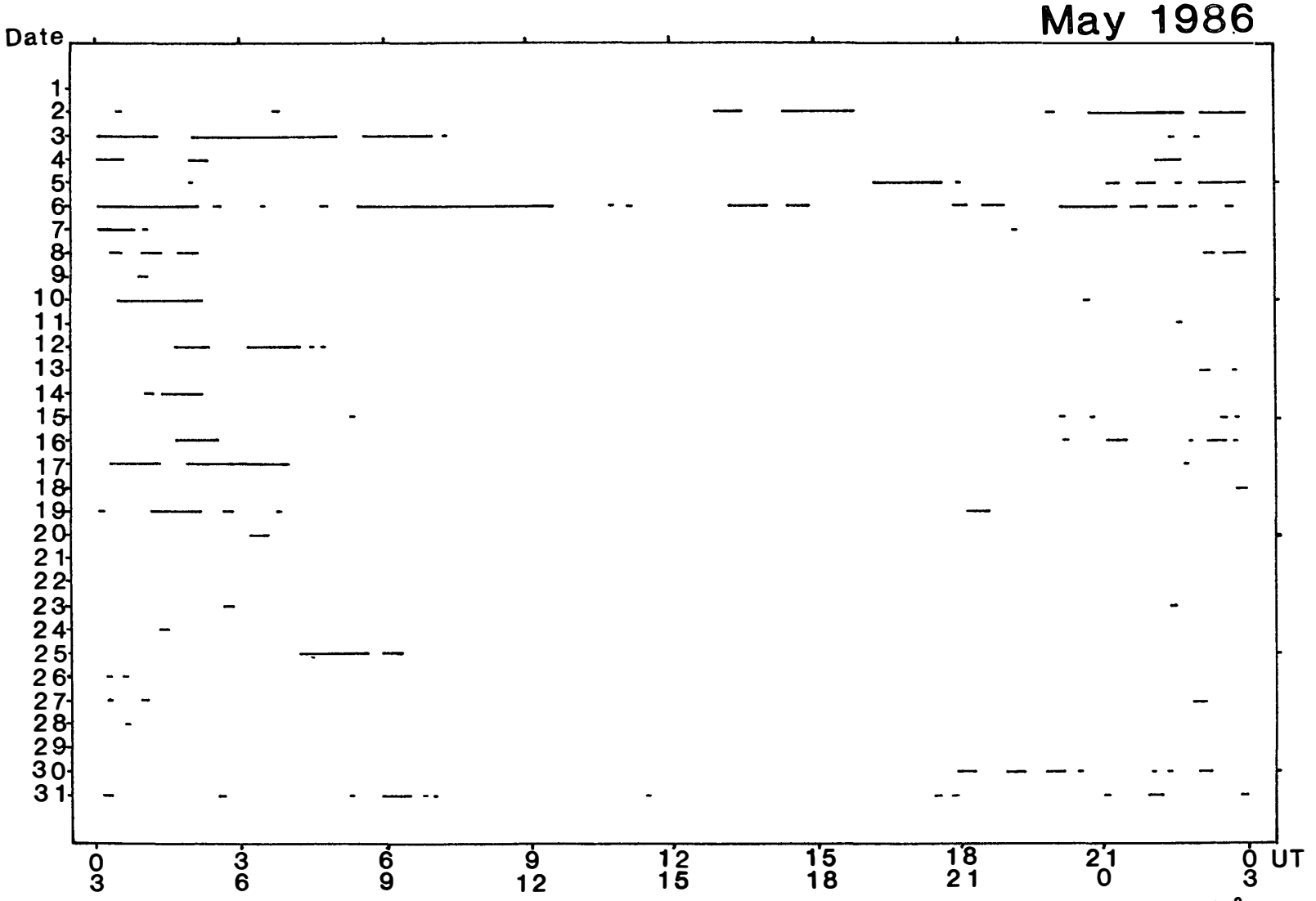
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Fig.1 (5).

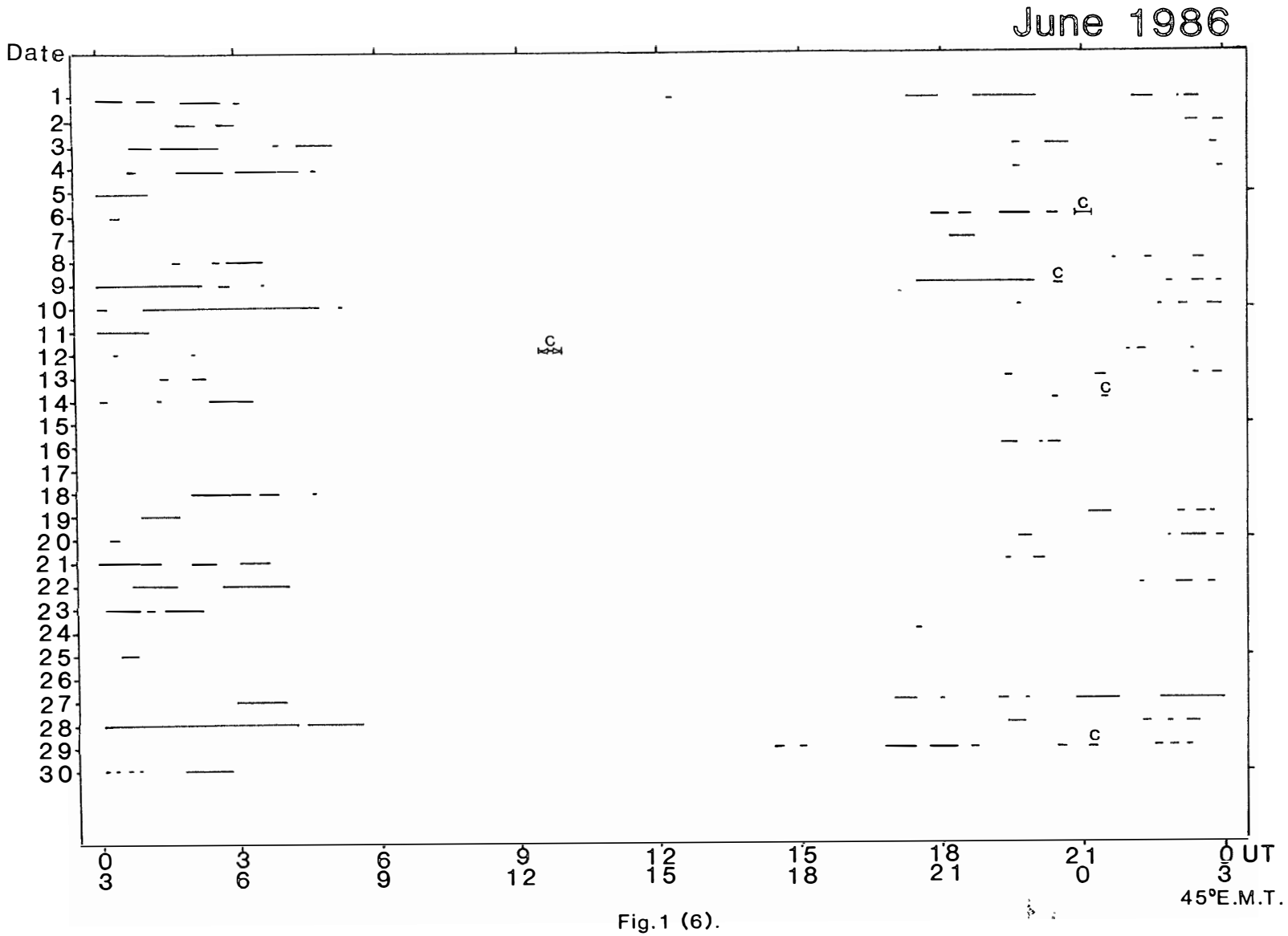
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Fig.1 (6).

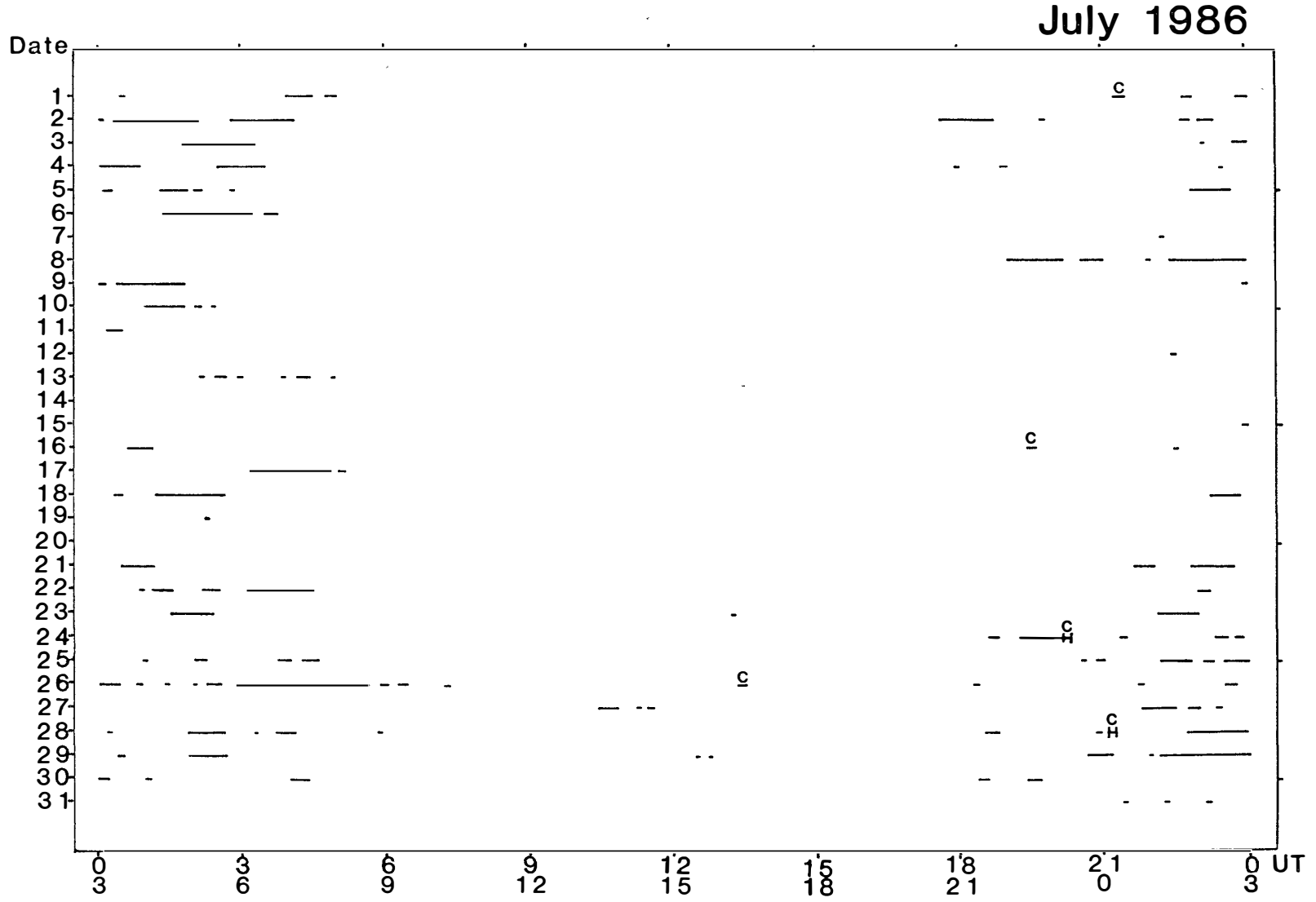
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Fig.1 (7).

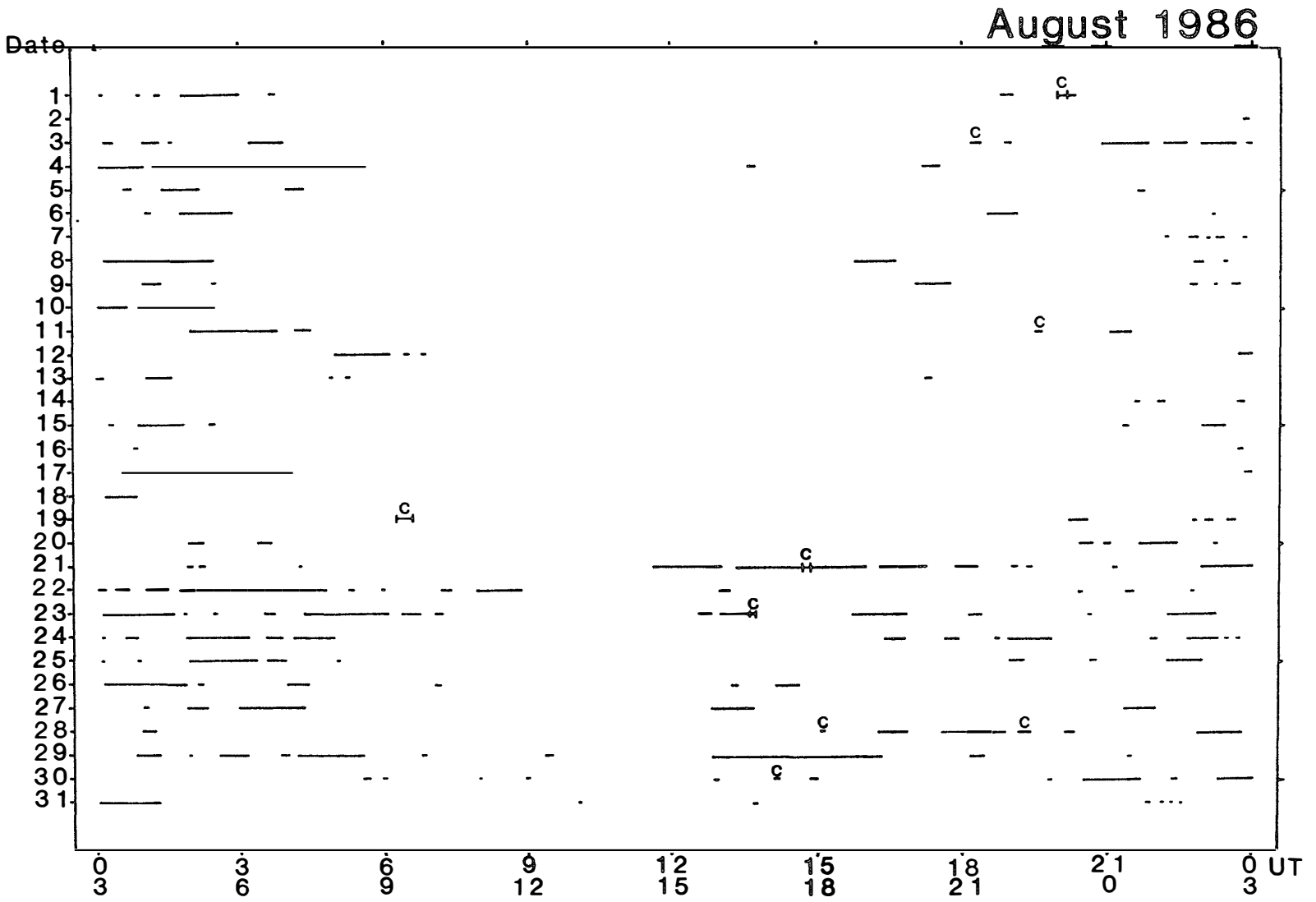
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Fig.1 (8).

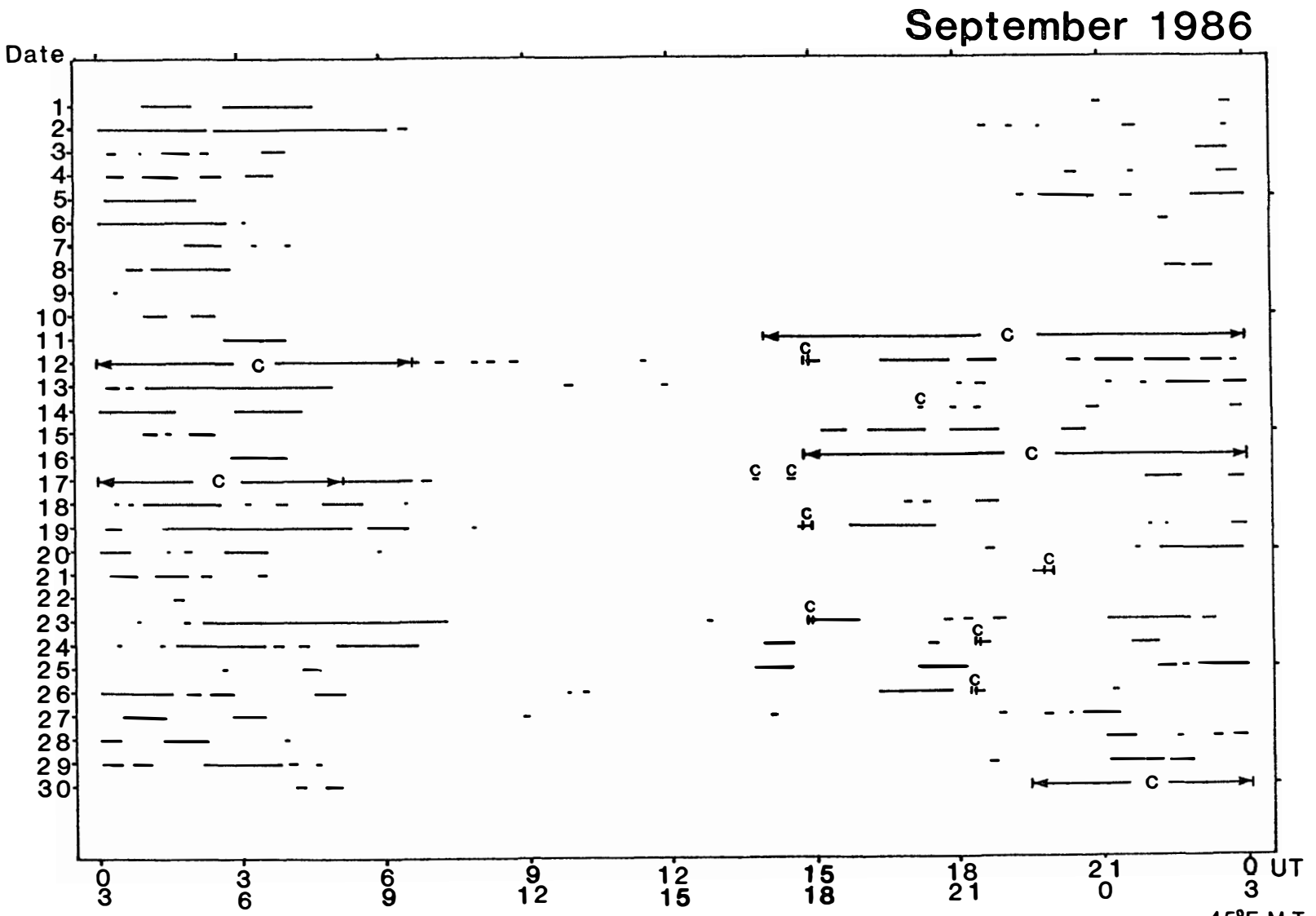
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Fig.1 (9).

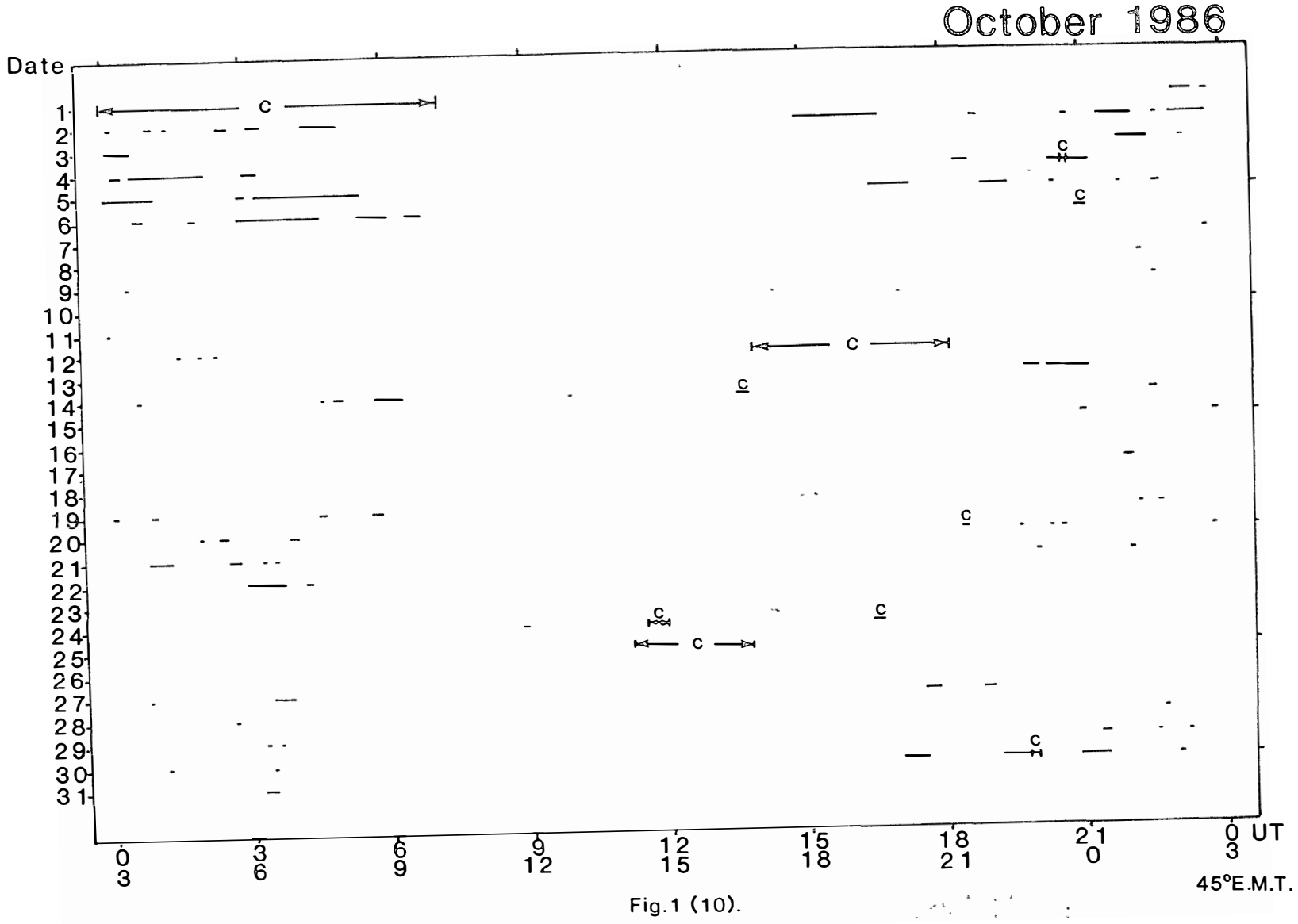
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Fig.1 (10).

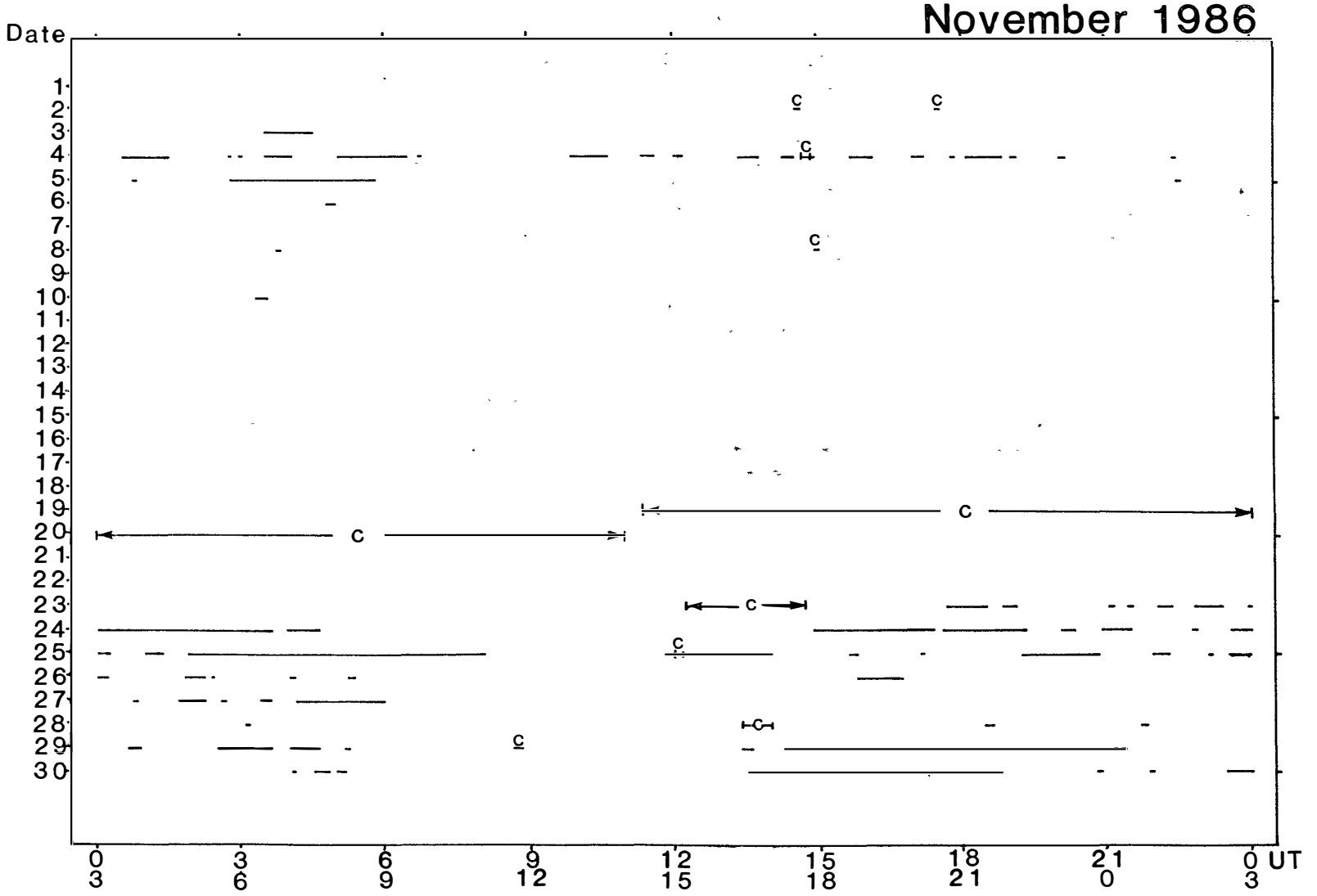
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Fig.1 (11).

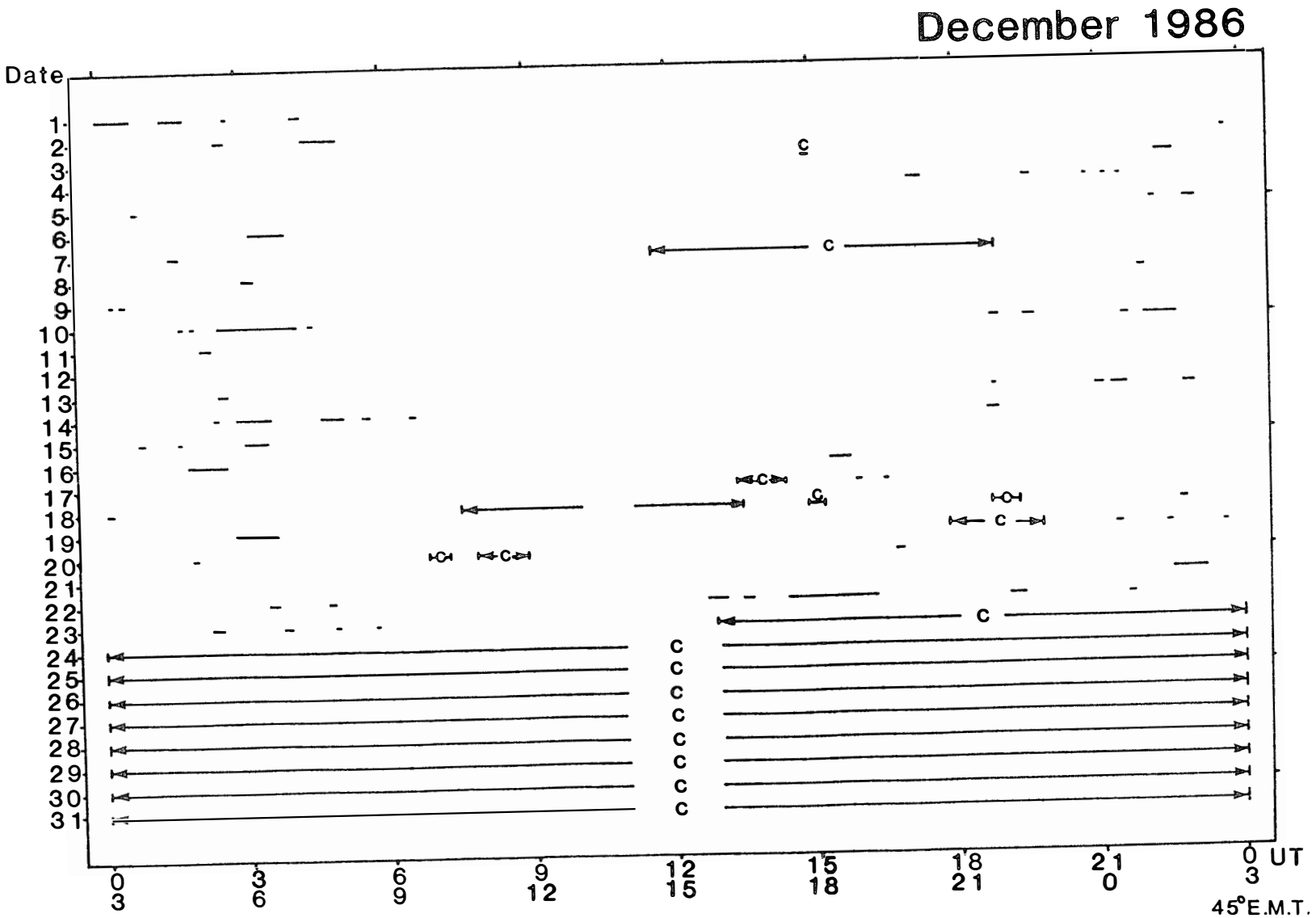
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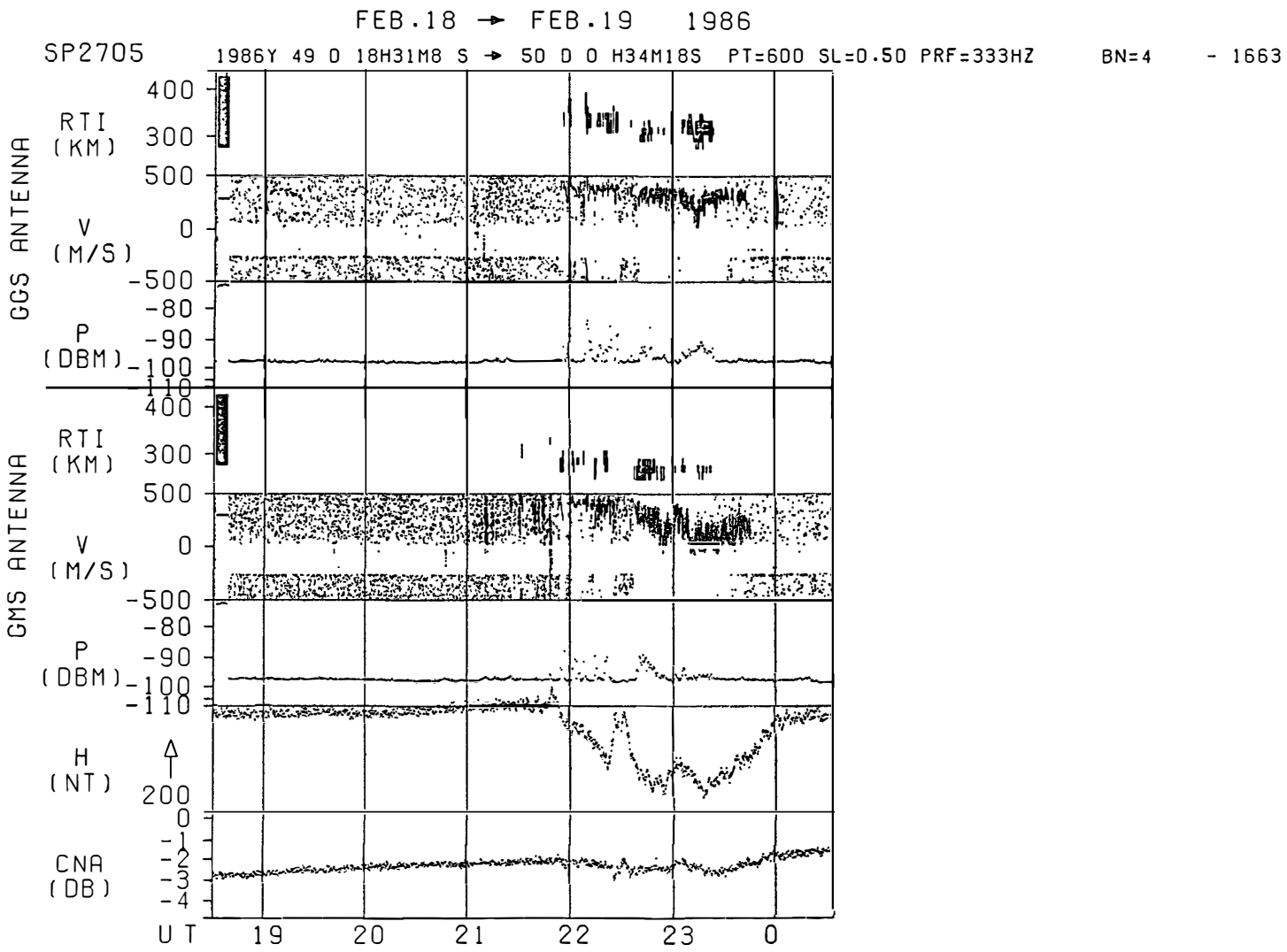
Fig.1 (12).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P (DBM)
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CNA (DB)
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Fig. 2(1)

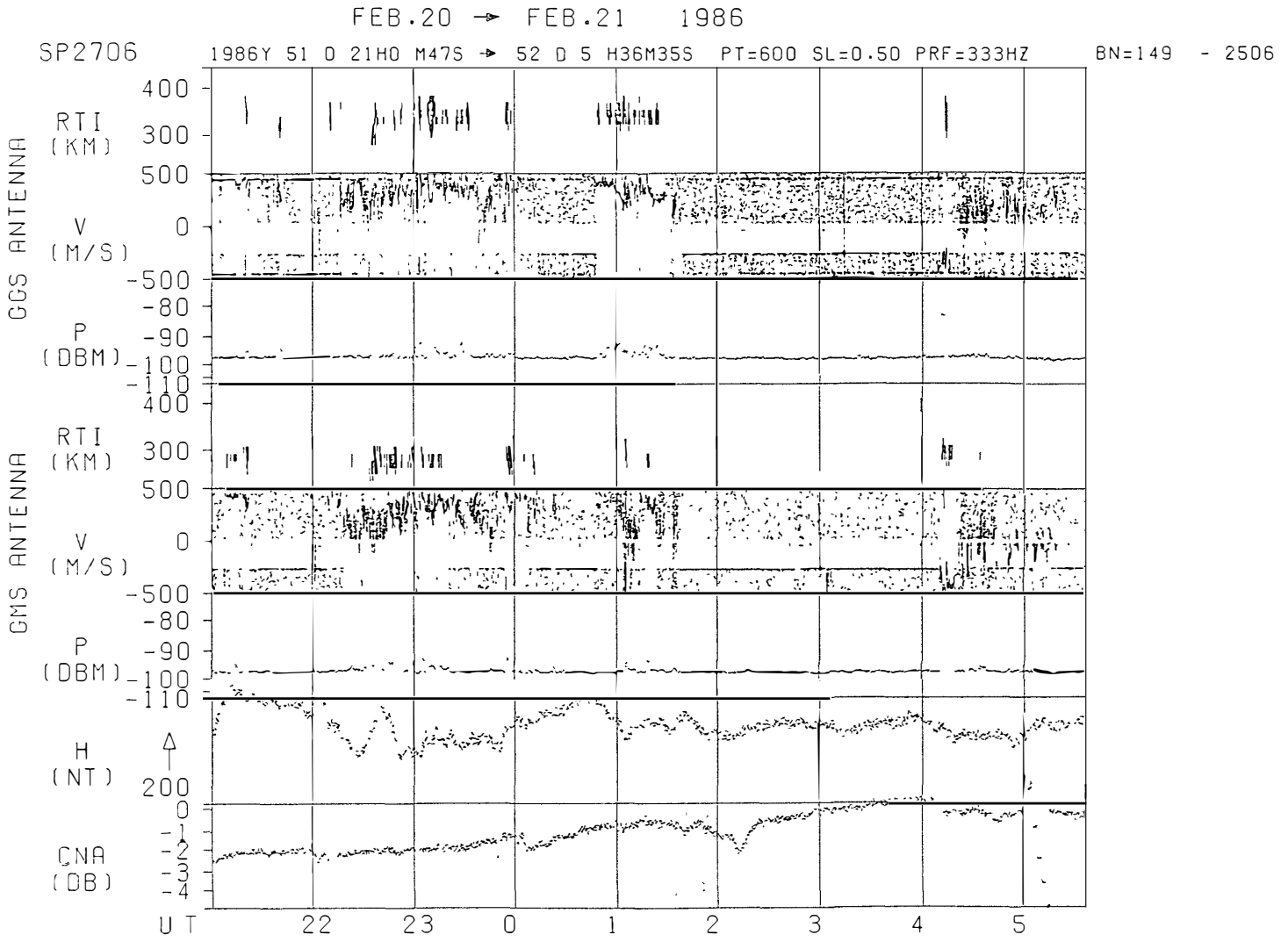
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Fig. 2(2)

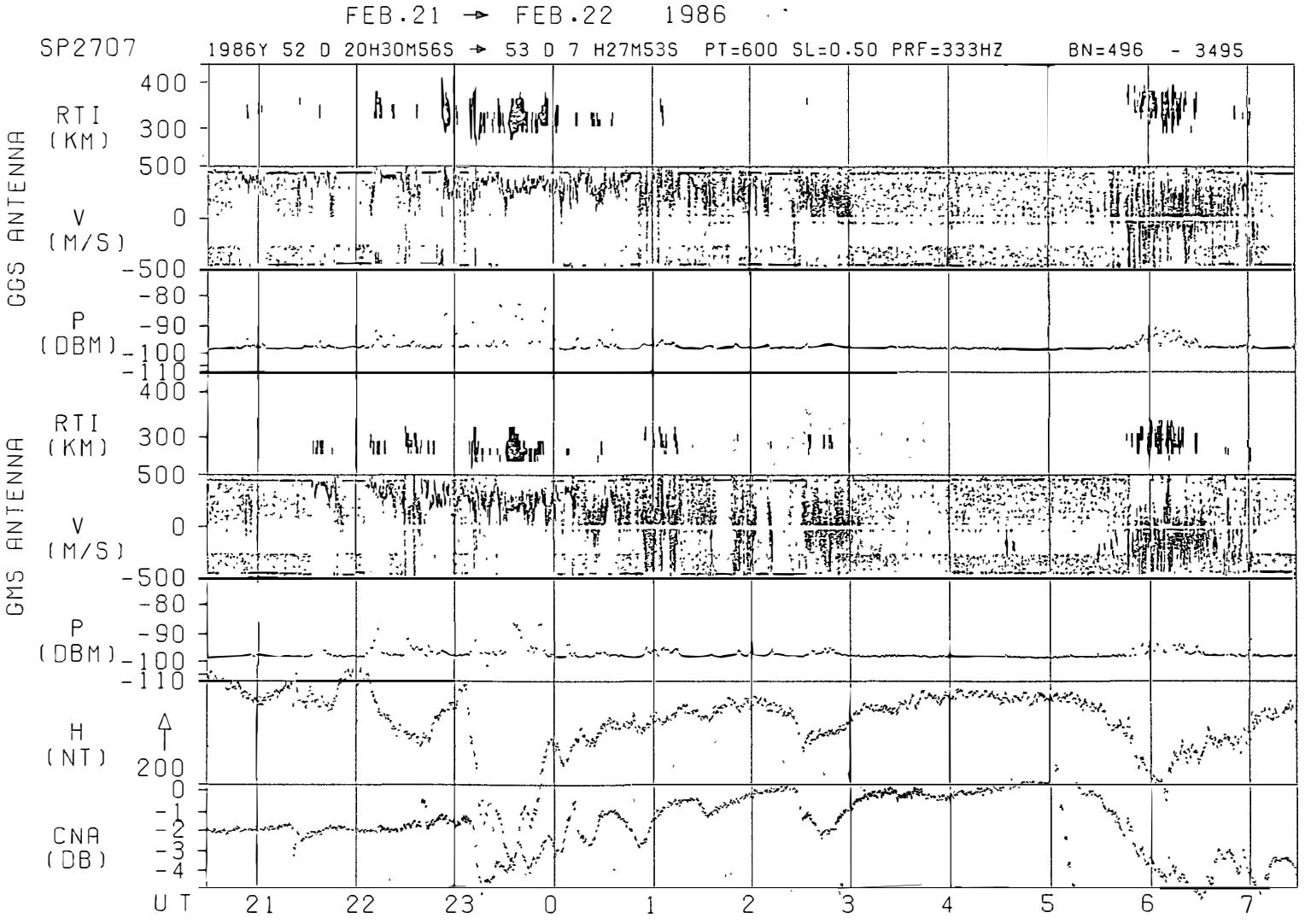
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Fig. 2(3)

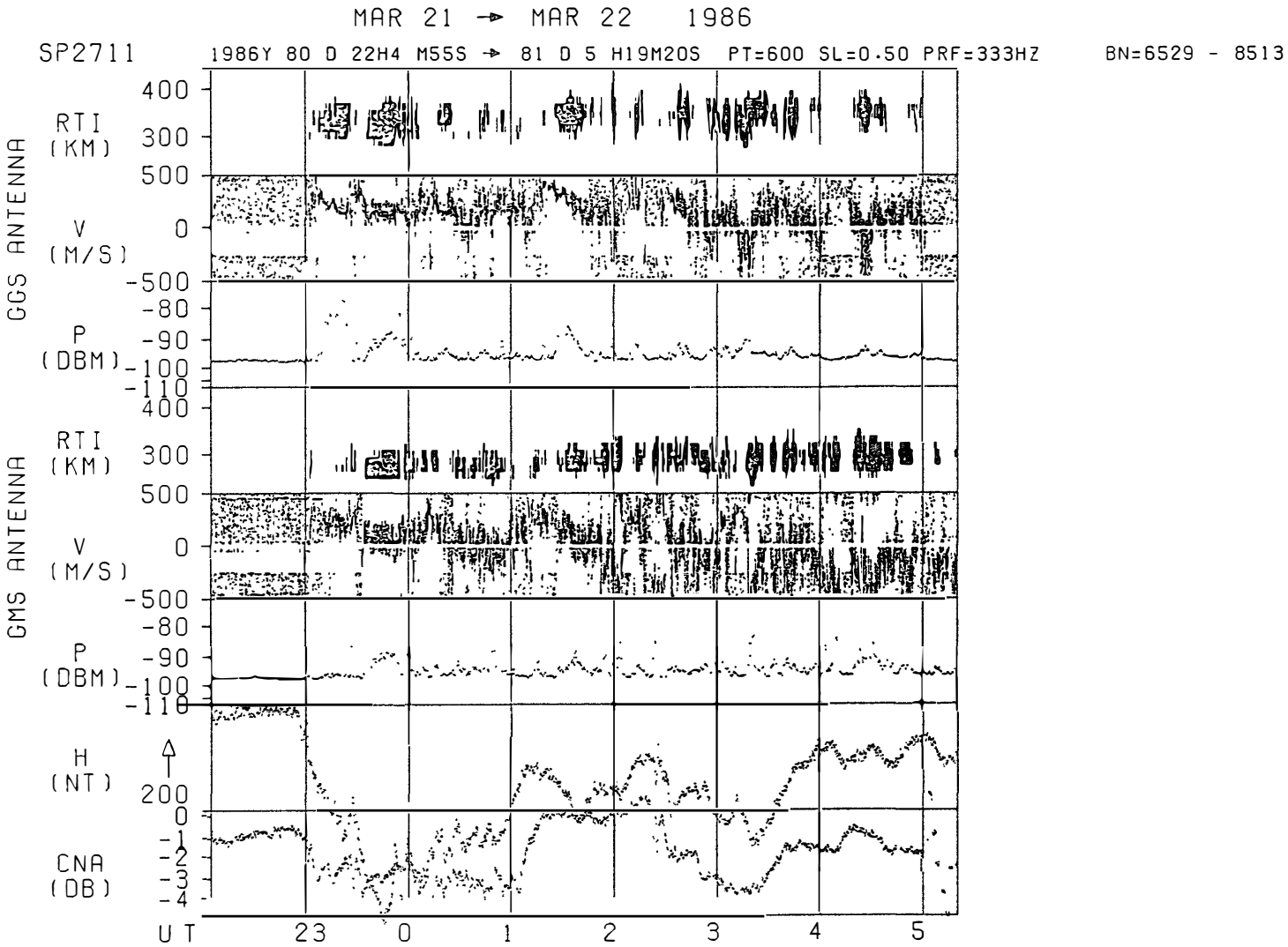
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Fig. 2(4)

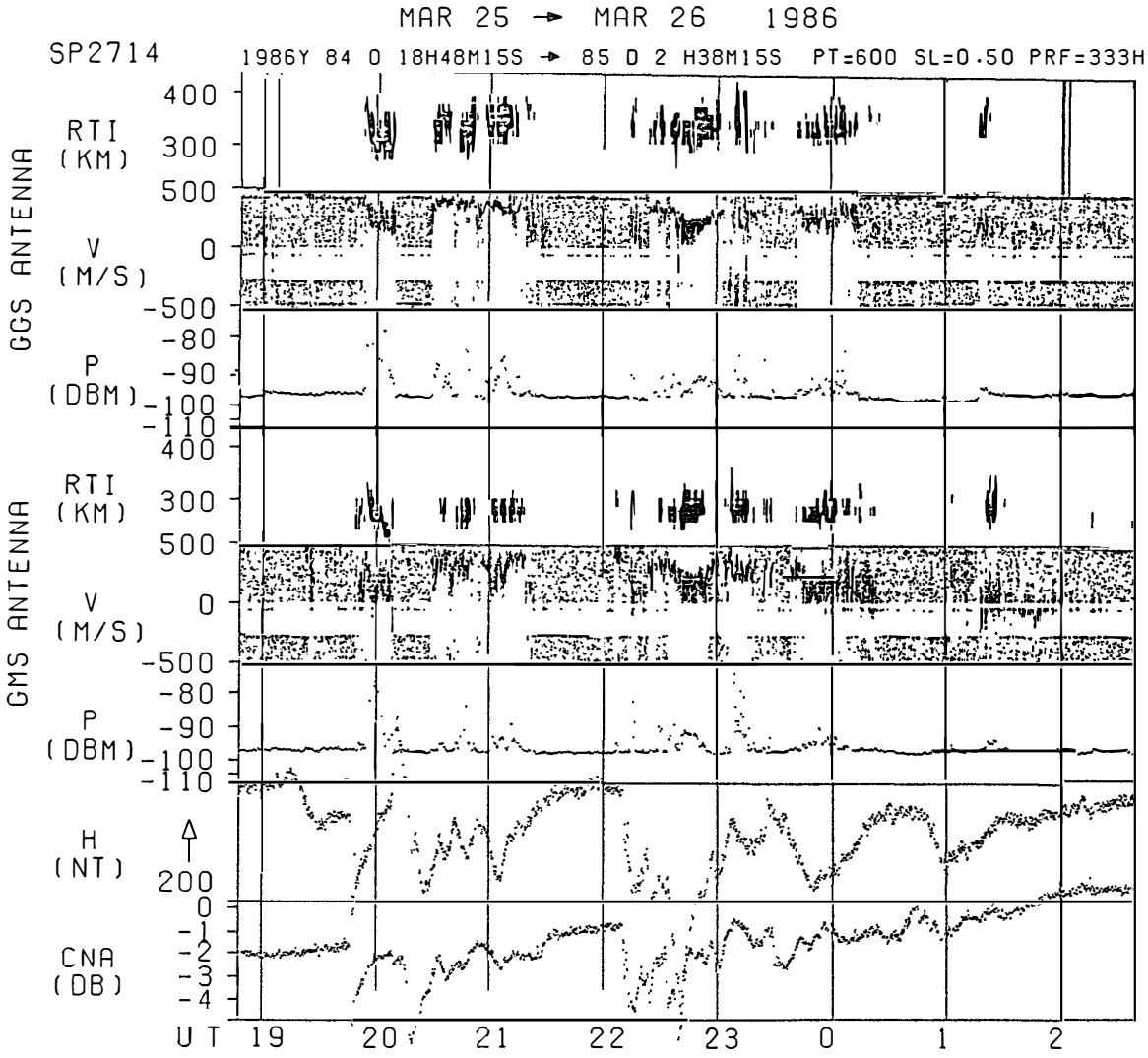
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Fig. 2(5)

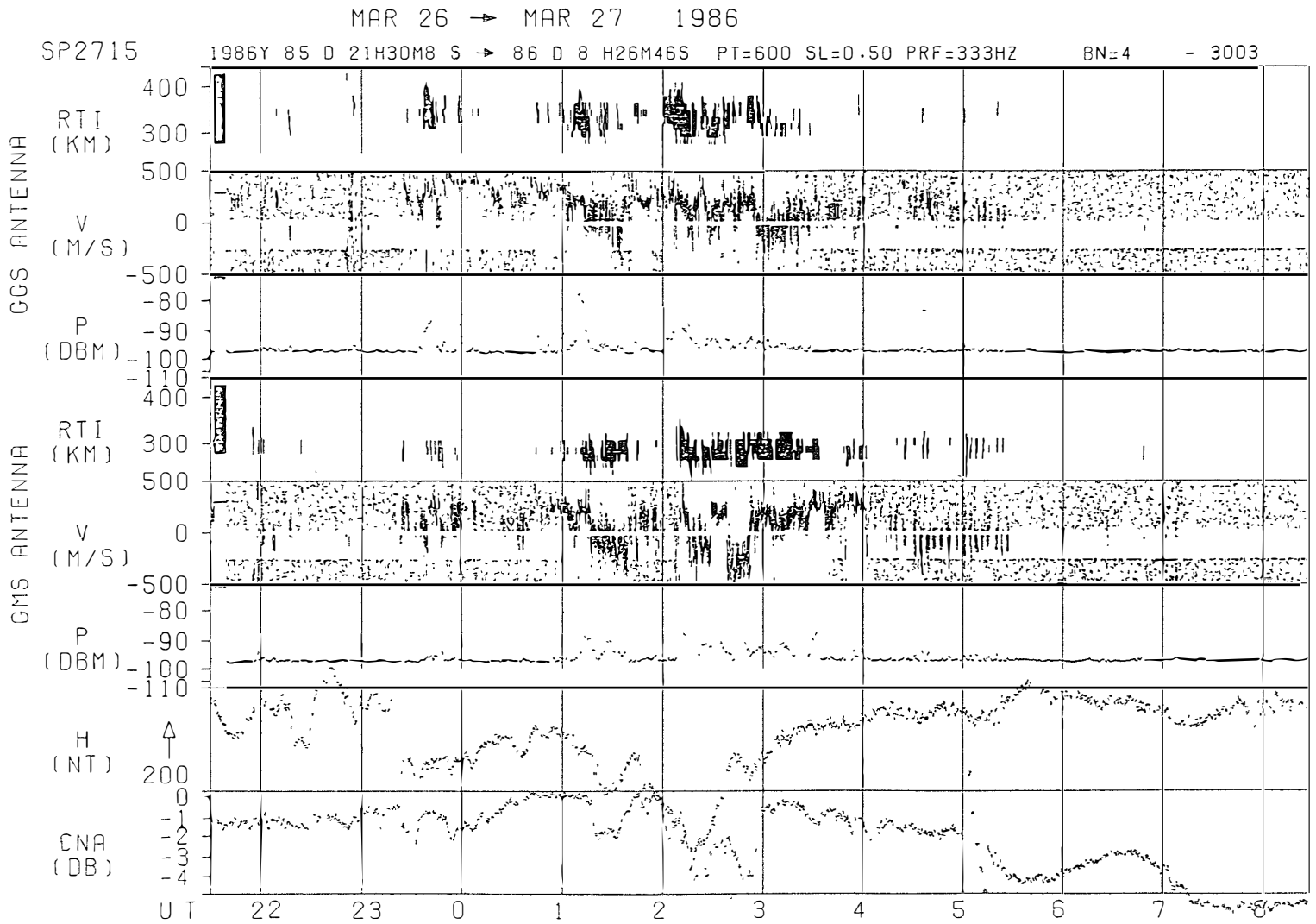
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Fig. 2(6)

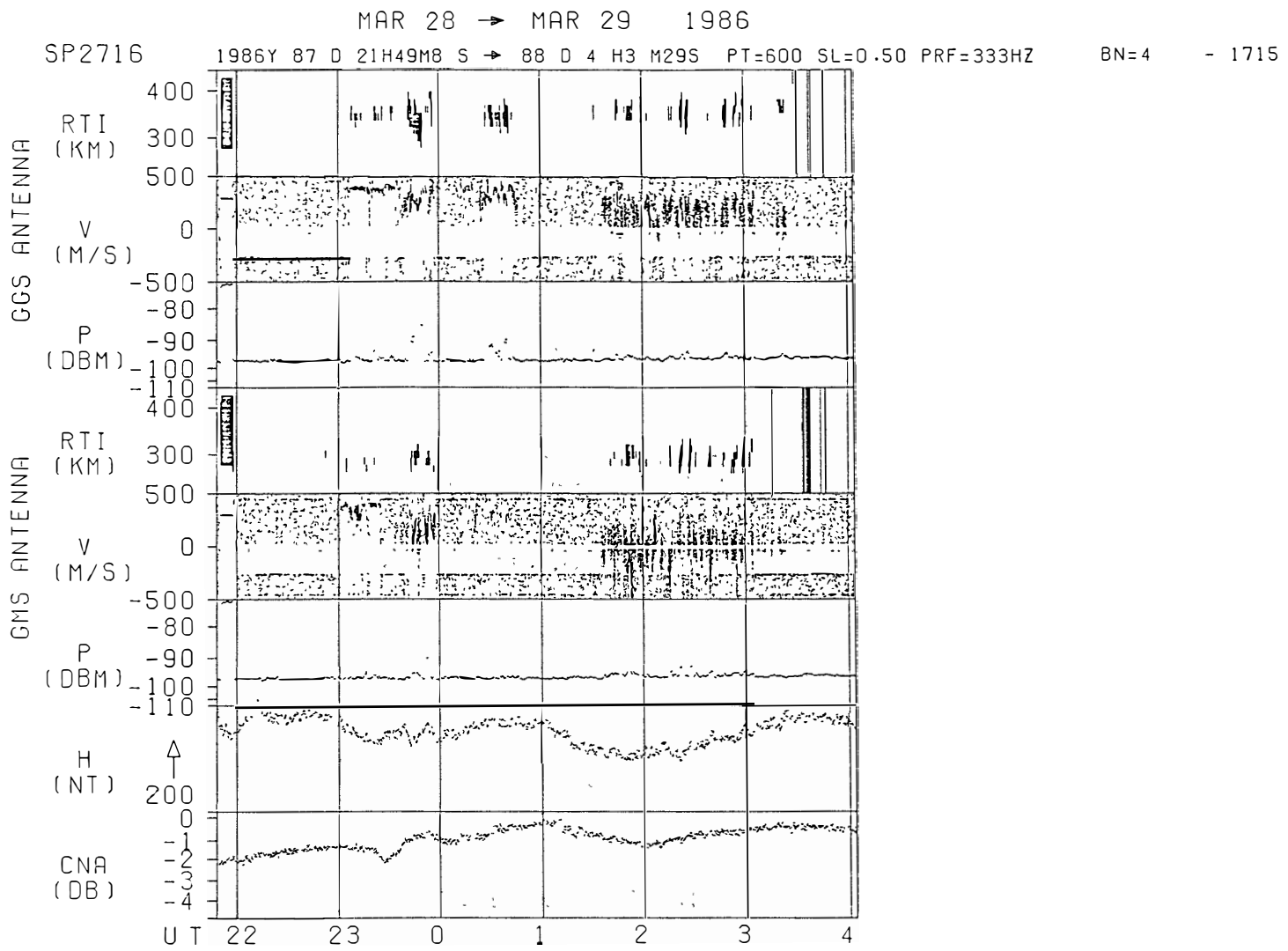
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Fig. 2(7)

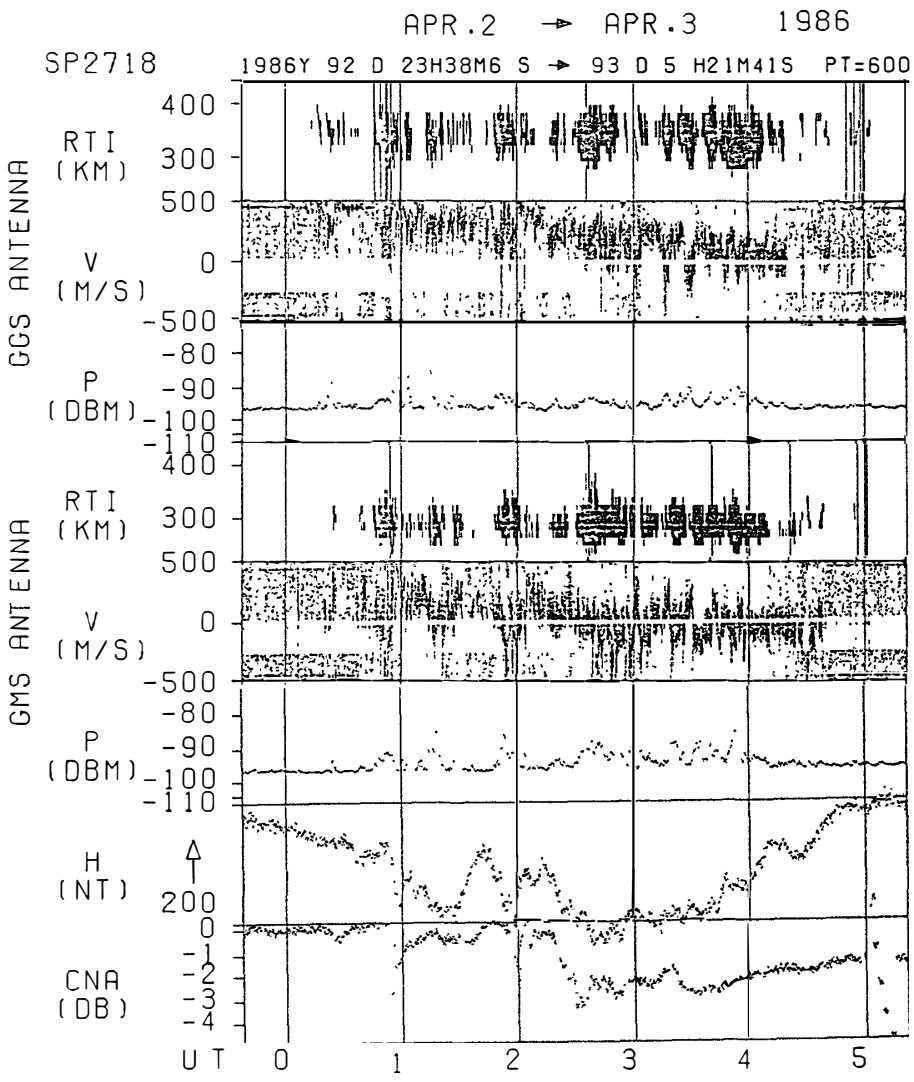
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Fig. 2(8)

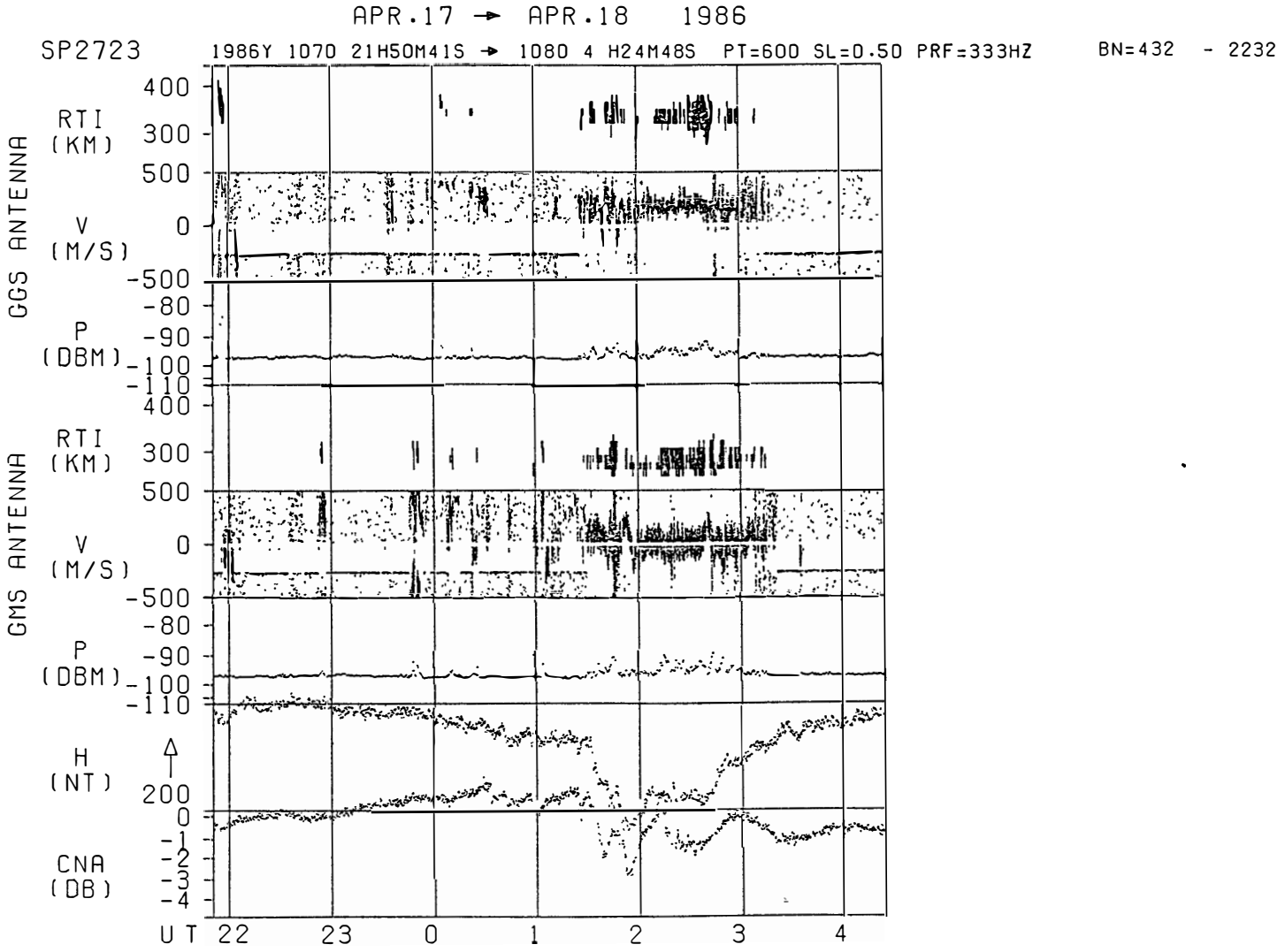
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Fig. 2(9)

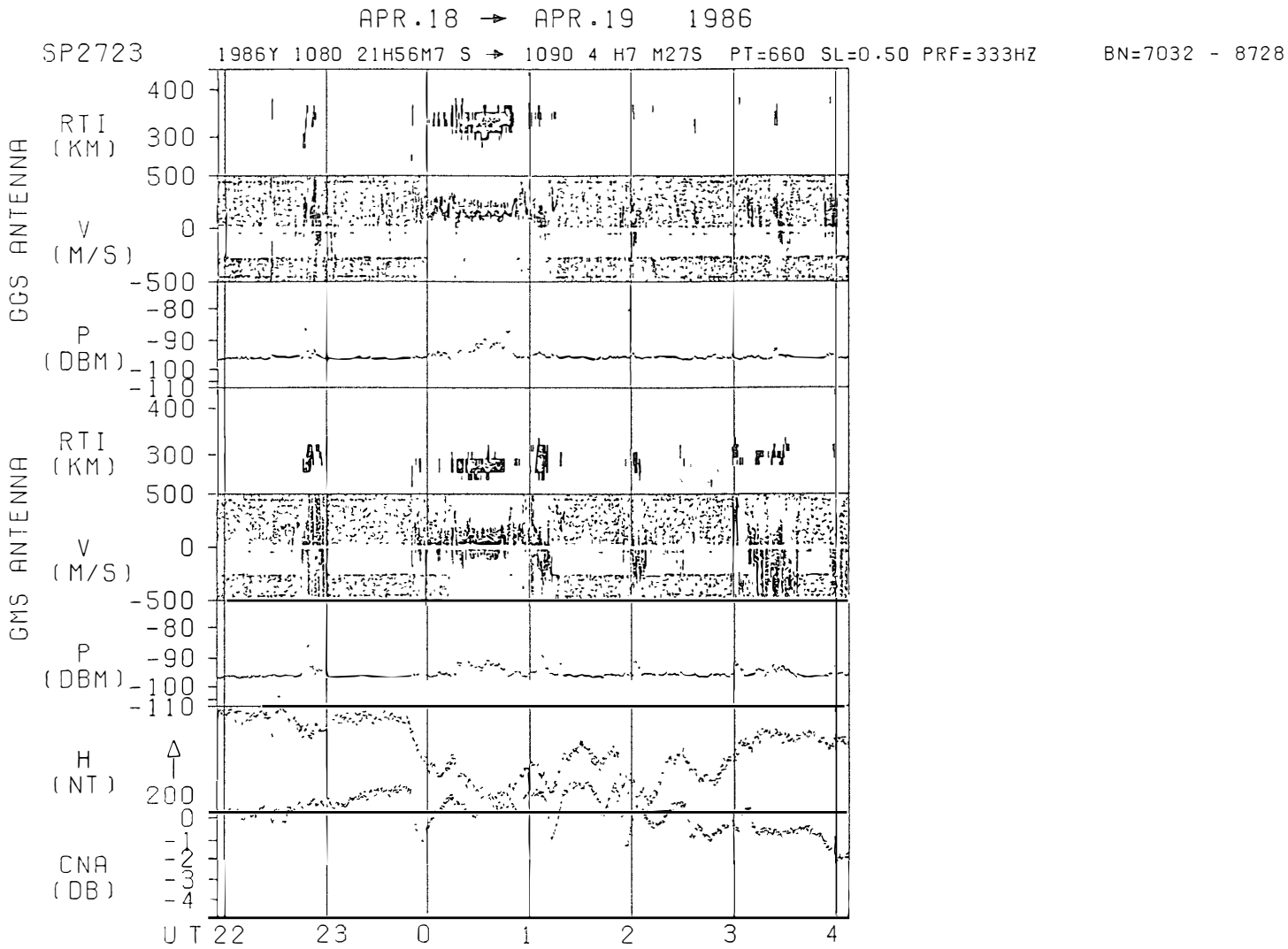
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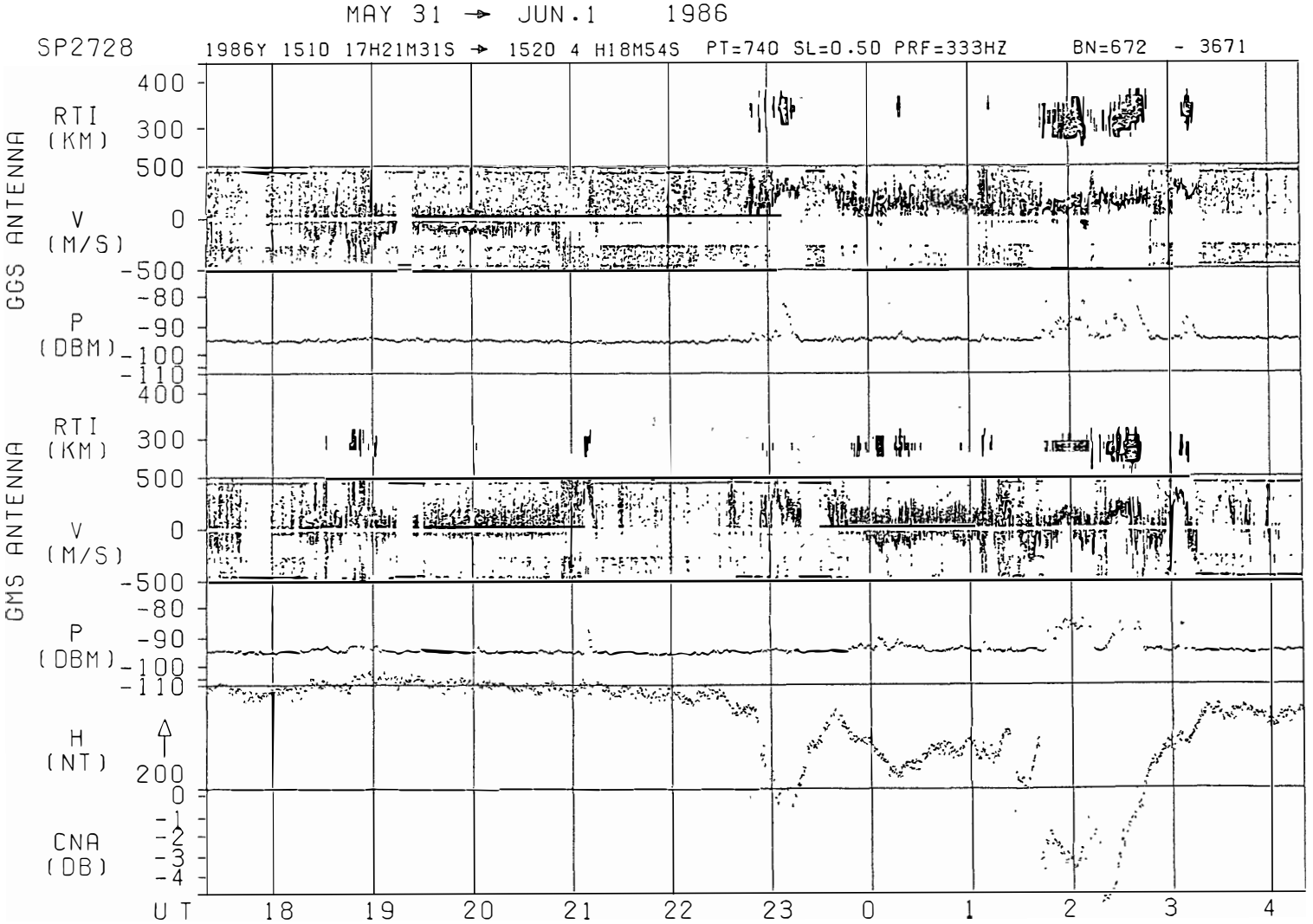
Fig. 2(10)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-2
-3
-4
UT
18
19
20
21
22
23
0
1
2
3
4

Fig. 2(11)

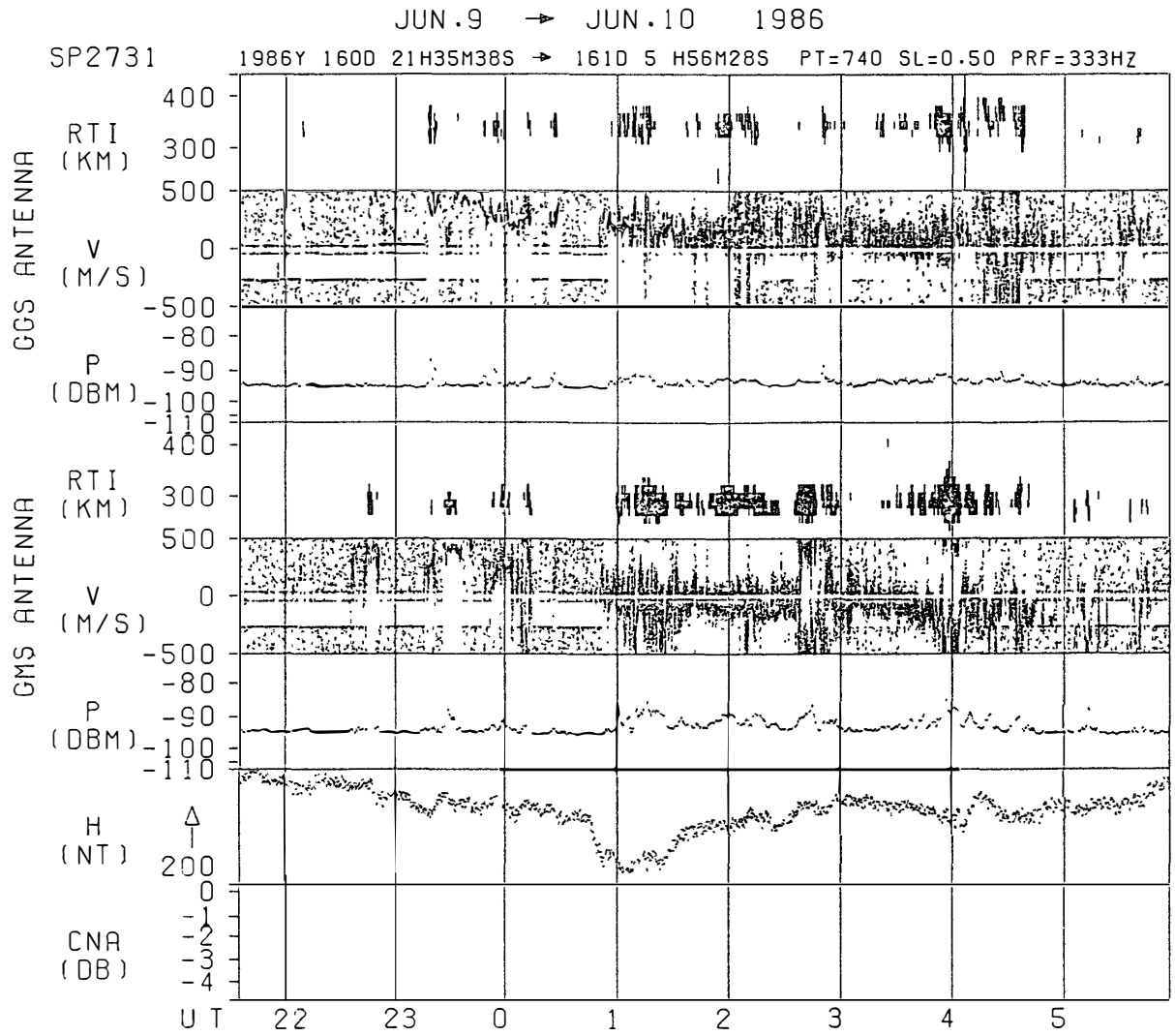
JUN.9 → JUN.10 1986
SP2731
1986Y 160D 21H35M38S → 161D 5 H56M28S PT=740 SL=0.50 PRF=333HZ
BN=321 - 2606
GCS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
22
23
0
1
2
3
4
5

Fig. 2(12)

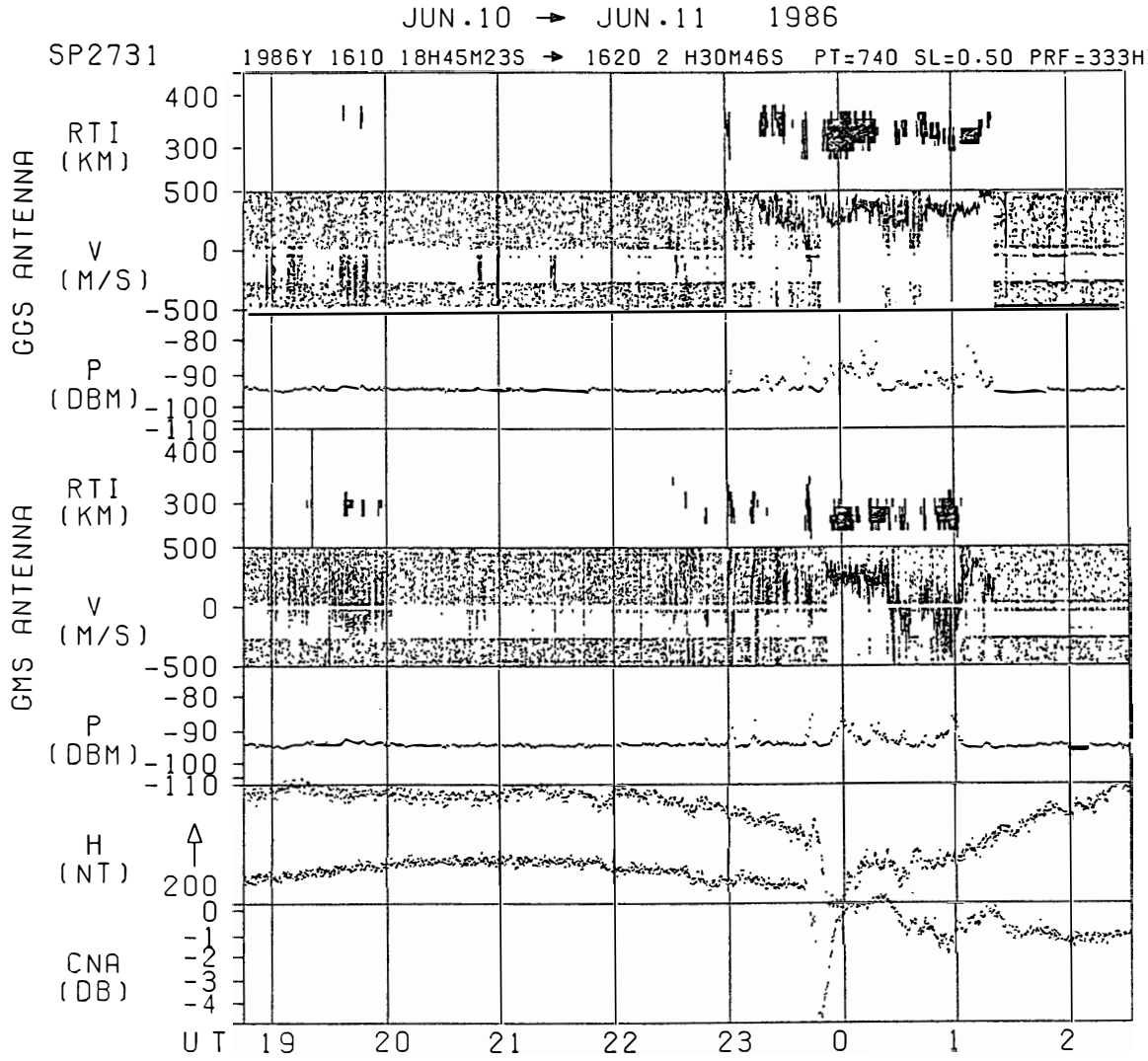
JUN.10 → JUN.11 1986
SP2731
1986Y 1610 18H45M23S → 1620 2 H30M46S PT=740 SL=0.50 PRF=333HZ
BN=6113 - 8236
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
19
20
21
22
23
0
1
2

Fig. 2(13)

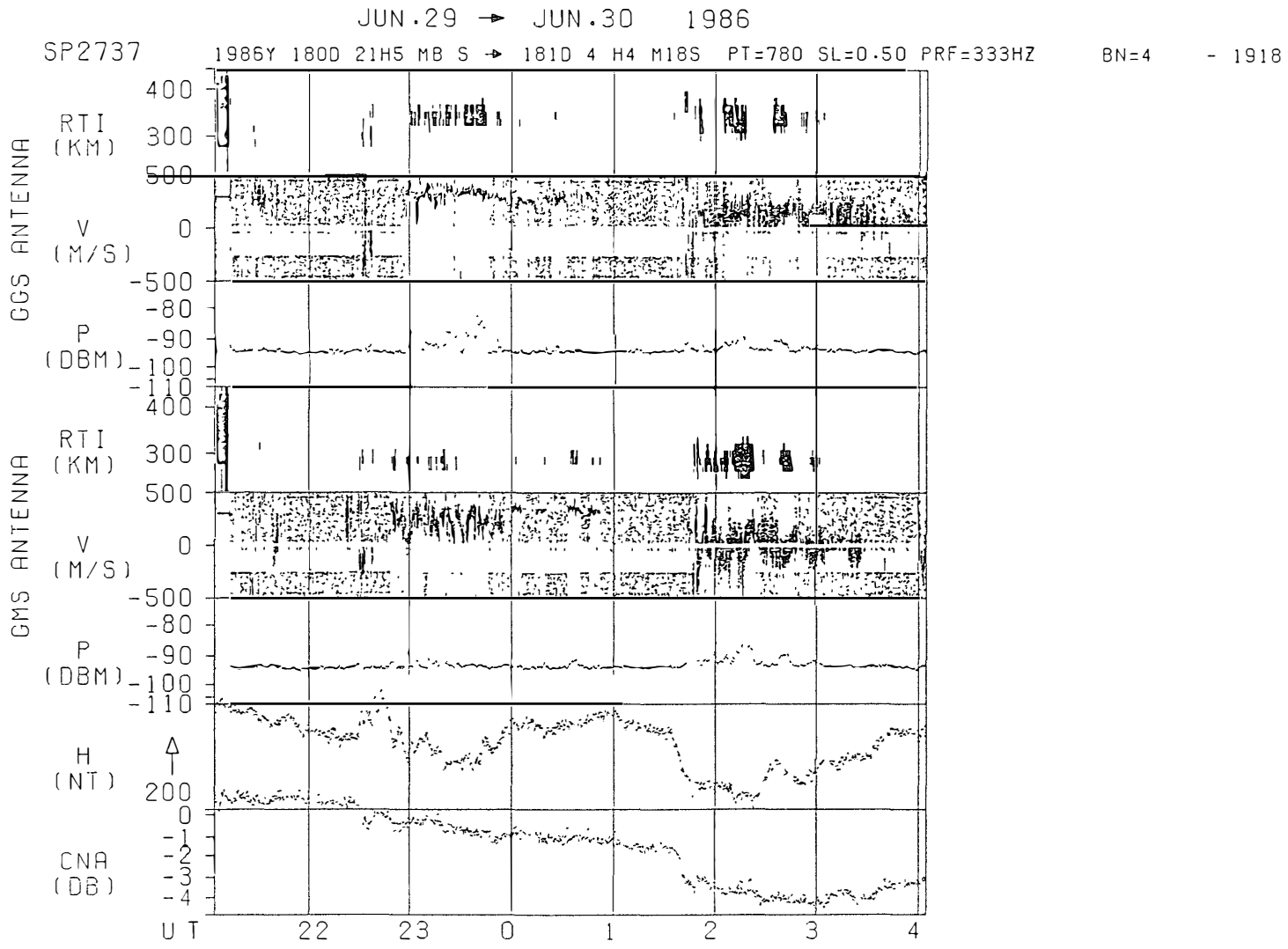
JUN.29 → JUN.30 1986
SP2737
1986Y 180D 21H5 MB S → 181D 4 H4 M18S PT=780 SL=0.50 PRF=333HZ
BN=4
- 1918
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
22
23
0
1
2
3
4

Fig. 2(14)

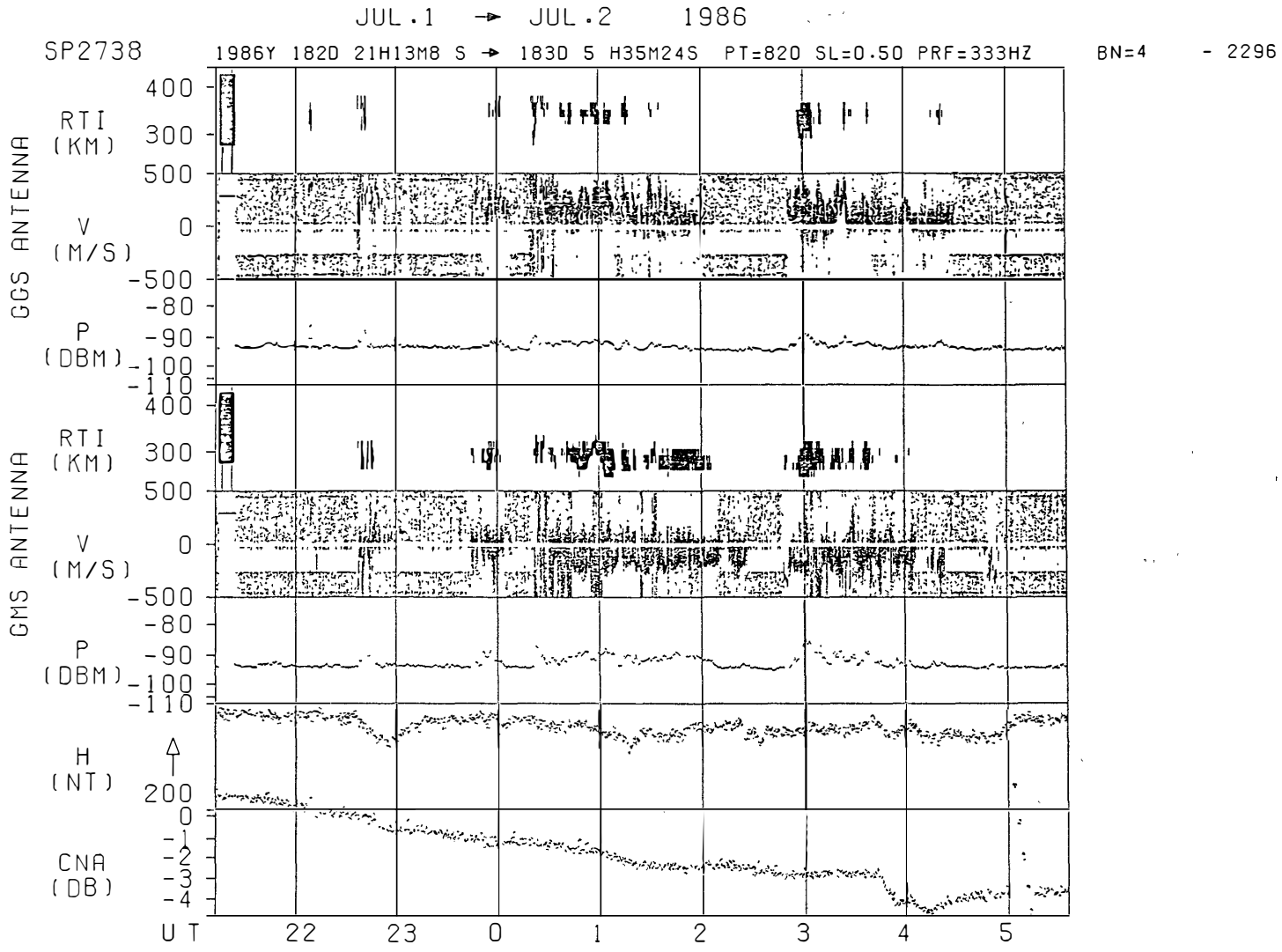
JUL.1 → JUL.2 1986
SP2738
1986Y 182D 21H13M8 S → 183D 5 H35M24S PT=820 SL=0.50 PRF=333HZ
BN=4 - 2296
GCS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
22
23
0
1
2
3
4
5

Fig. 2(15)

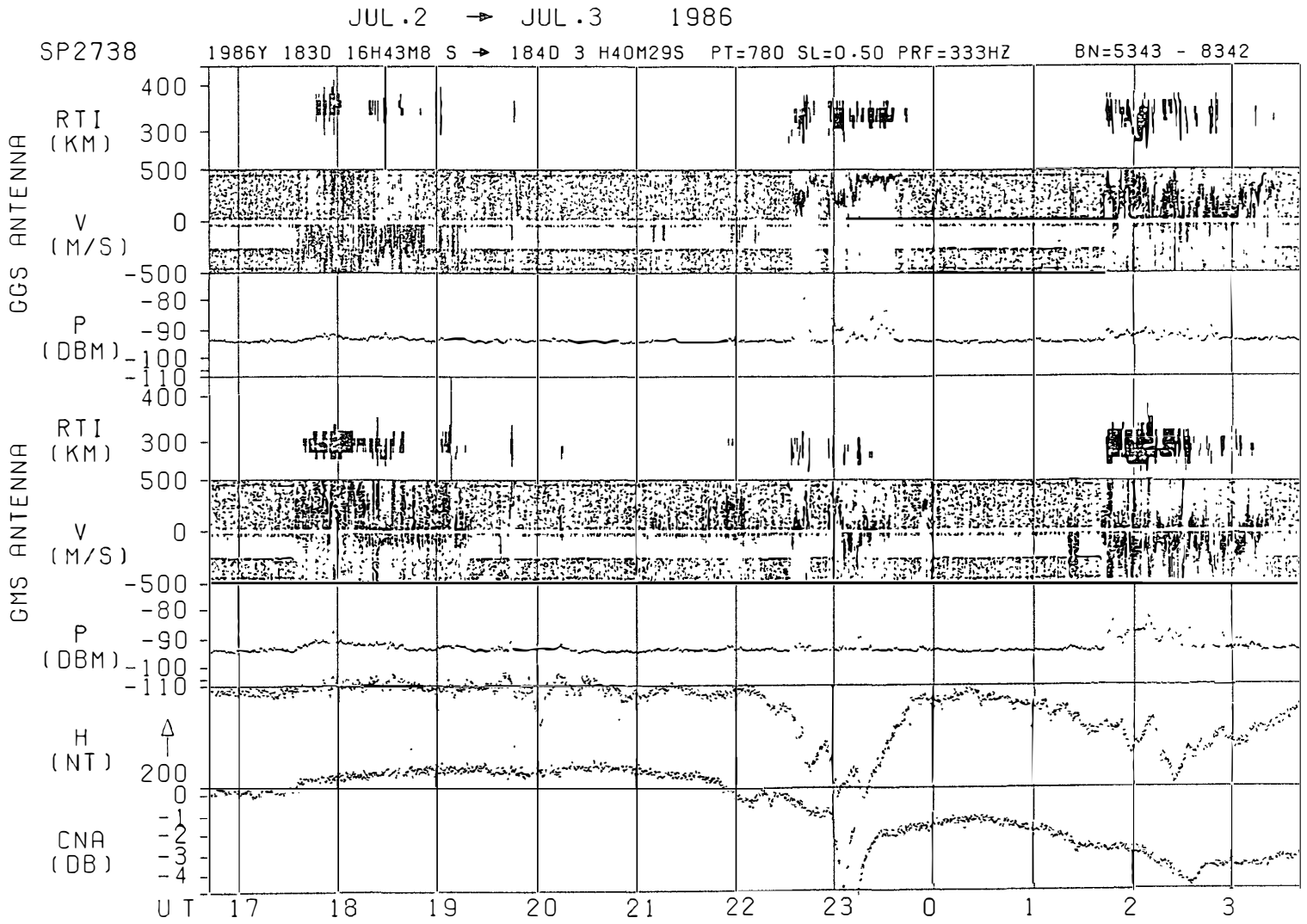
JUL.2 → JUL.3 1986
SP2738
1986Y 183D 16H43M8 S → 184D 3 H40M29S PT=780 SL=0.50 PRF=333HZ
BN=5343 - 8342
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
17
18
19
20
21
22
23
0
1
2
3

Fig. 2(16)

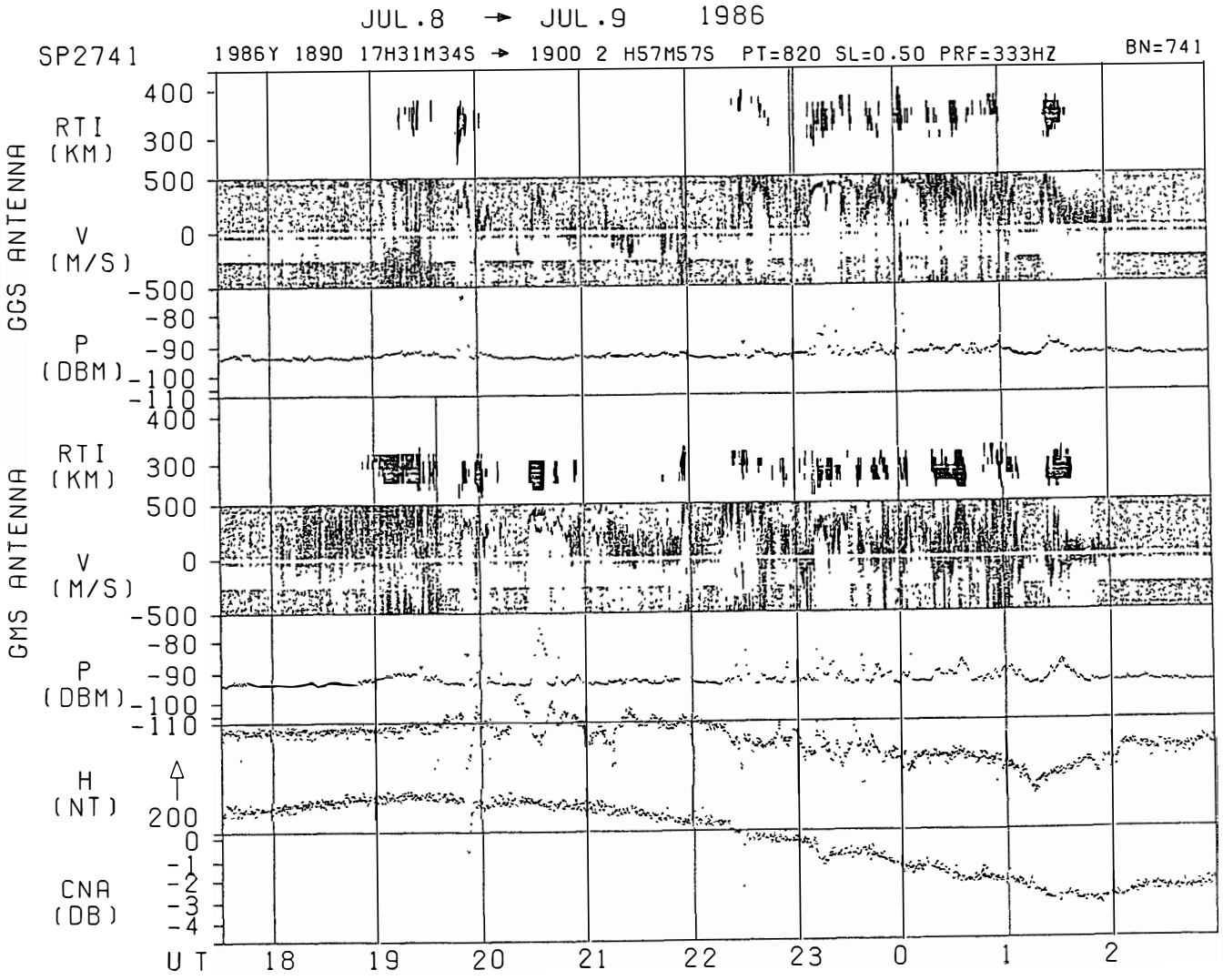
JUL.8 → JUL.9 1986
SP2741
1986Y 189D 17H31M34S → 190D 2 H57M57S PT=820 SL=0.50 PRF=333HZ
BN=741 - 3326
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
18
19
20
21
22
23
0
1
2

Fig. 2(17)

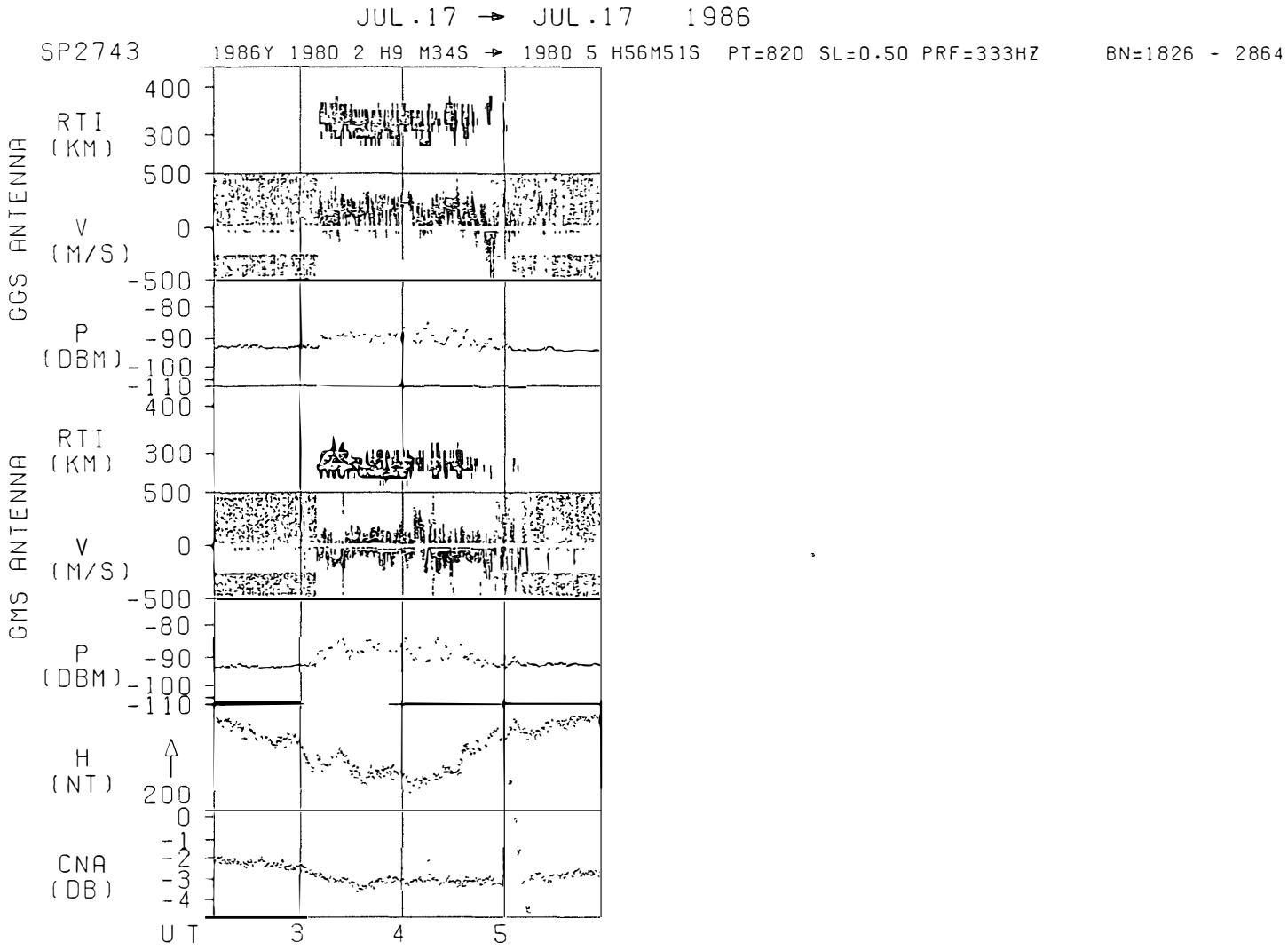
JUL.17 → JUL.17 1986
SP2743
1986Y 198D 2 H9 M34S → 198D 5 H56M51S PT=82D SL=0.50 PRF=333HZ
BN=1826 - 2864
GGS ANTENNA
RTI (KM)
400
300
V (M/S)
500
0
-500
P (DBM)
-80
-90
-100
-110
GMS ANTENNA
RTI (KM)
400
300
V (M/S)
500
0
-500
P (DBM)
-80
-90
-100
-110
H (NT)
200
CNA (DB)
0
-1
-2
-3
-4
UT
3
4
5

Fig. 2(18)

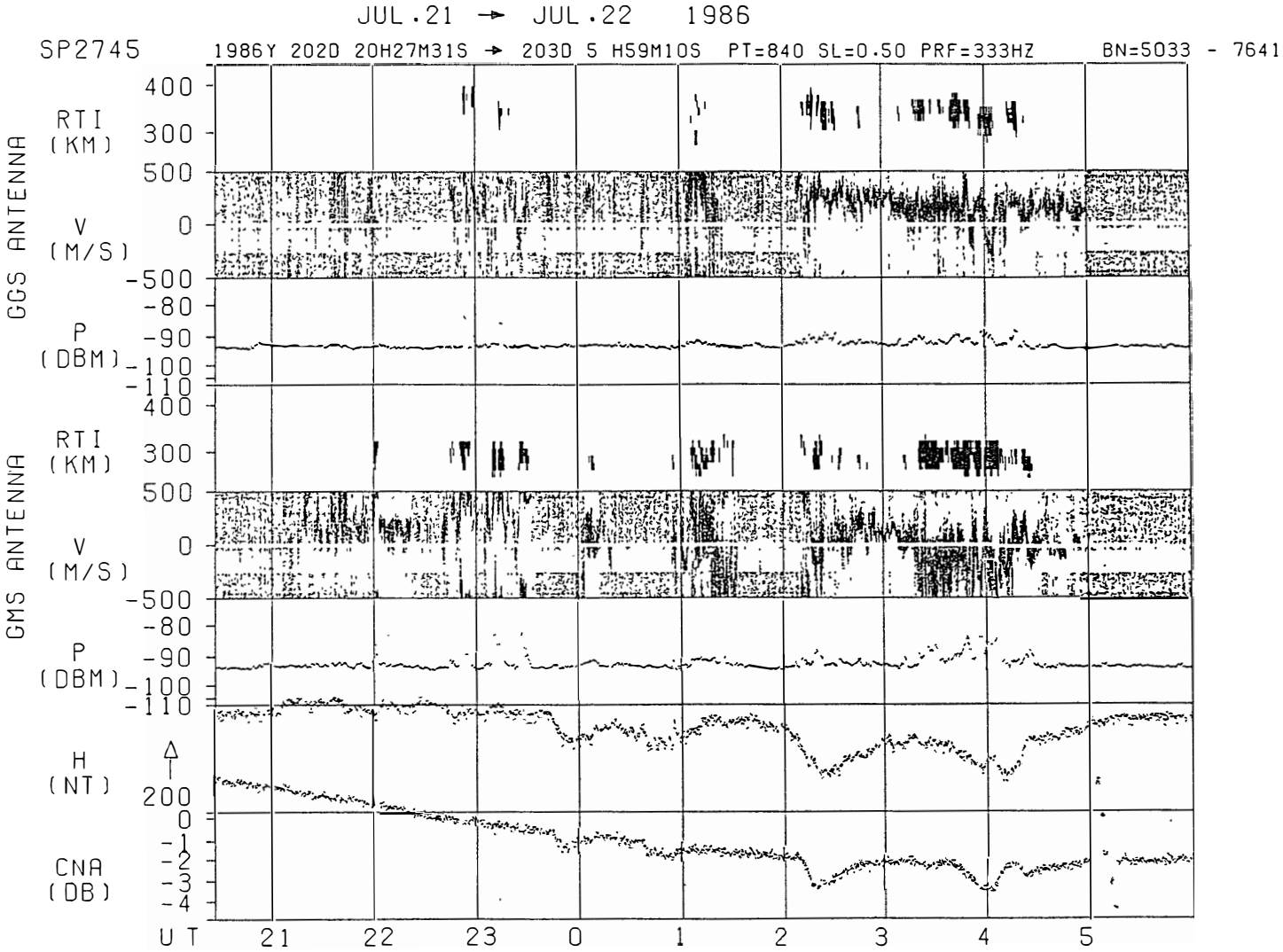
JUL.21 → JUL.22 1986
SP2745
1986Y 202D 20H27M31S → 203D 5 H59M10S PT=840 SL=0.50 PRF=333HZ
BN=5033 - 7641
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
21
22
23
0
1
2
3
4
5

Fig. 2(19)

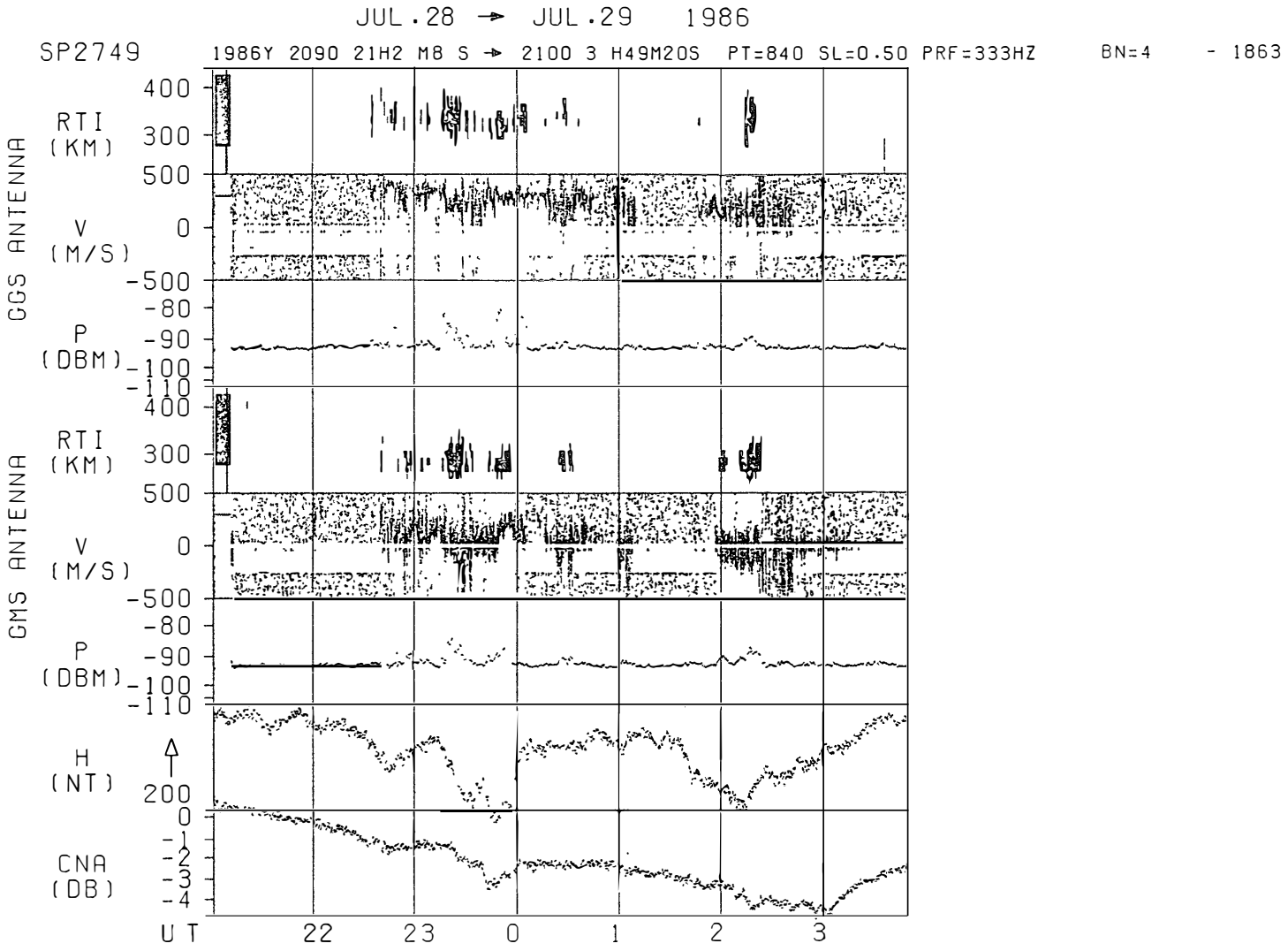
JUL.28 → JUL.29 1986
SP2749
1986Y 2090 21H2 M8 S → 2100 3 H49M20S PT=840 SL=0.50 PRF=333HZ
BN=4
- 1863
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
22
23
0
1
2
3

Fig. 2(20)

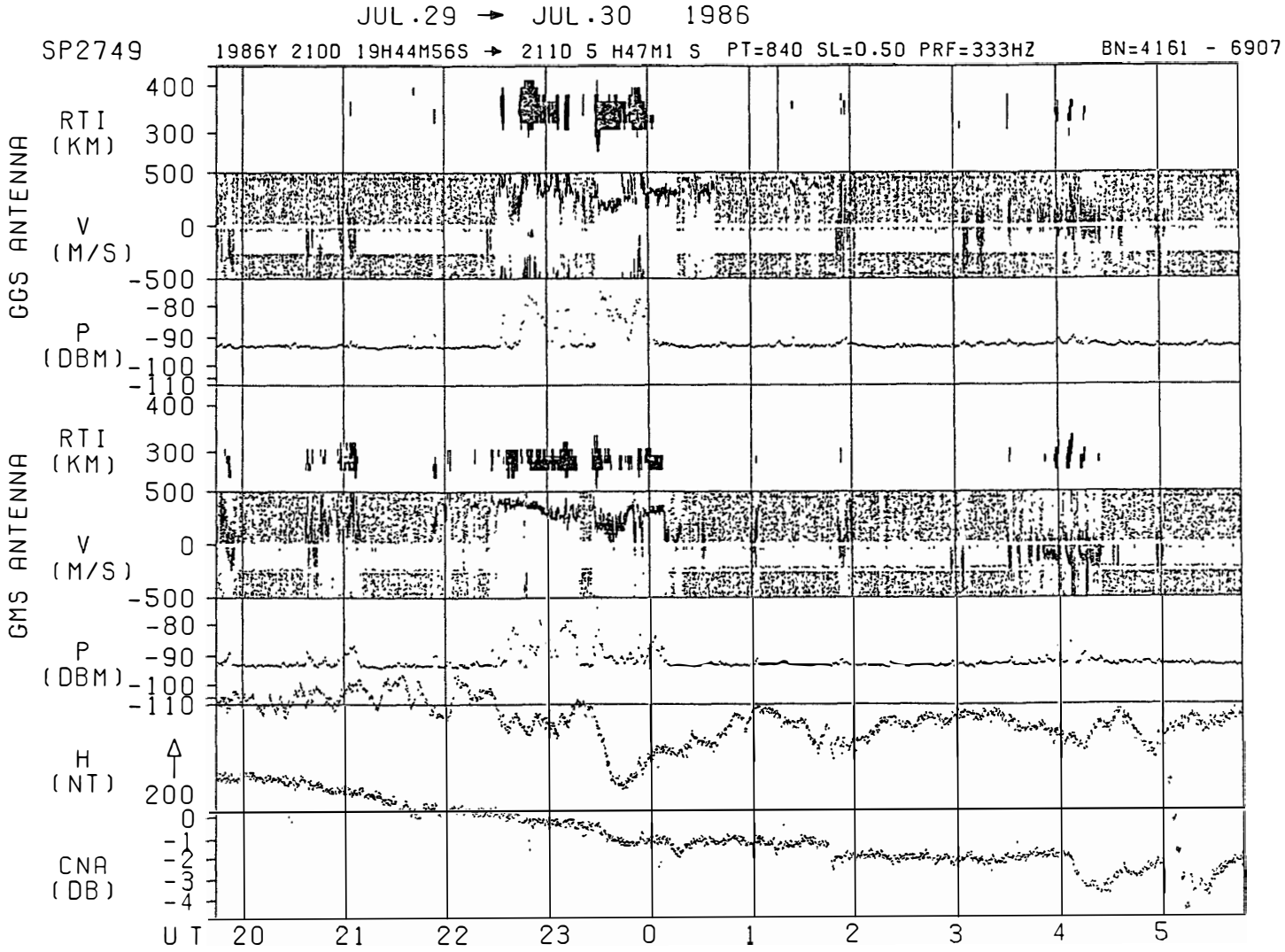
JUL.29 → JUL.30 1986
SP2749
1986Y 210D 19H44M56S → 211D 5 H47M1 S PT=840 SL=0.50 PRF=333HZ
BN=4161 - 6907
GCS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
20
21
22
23
0
1
2
3
4
5

Fig. 2(21)

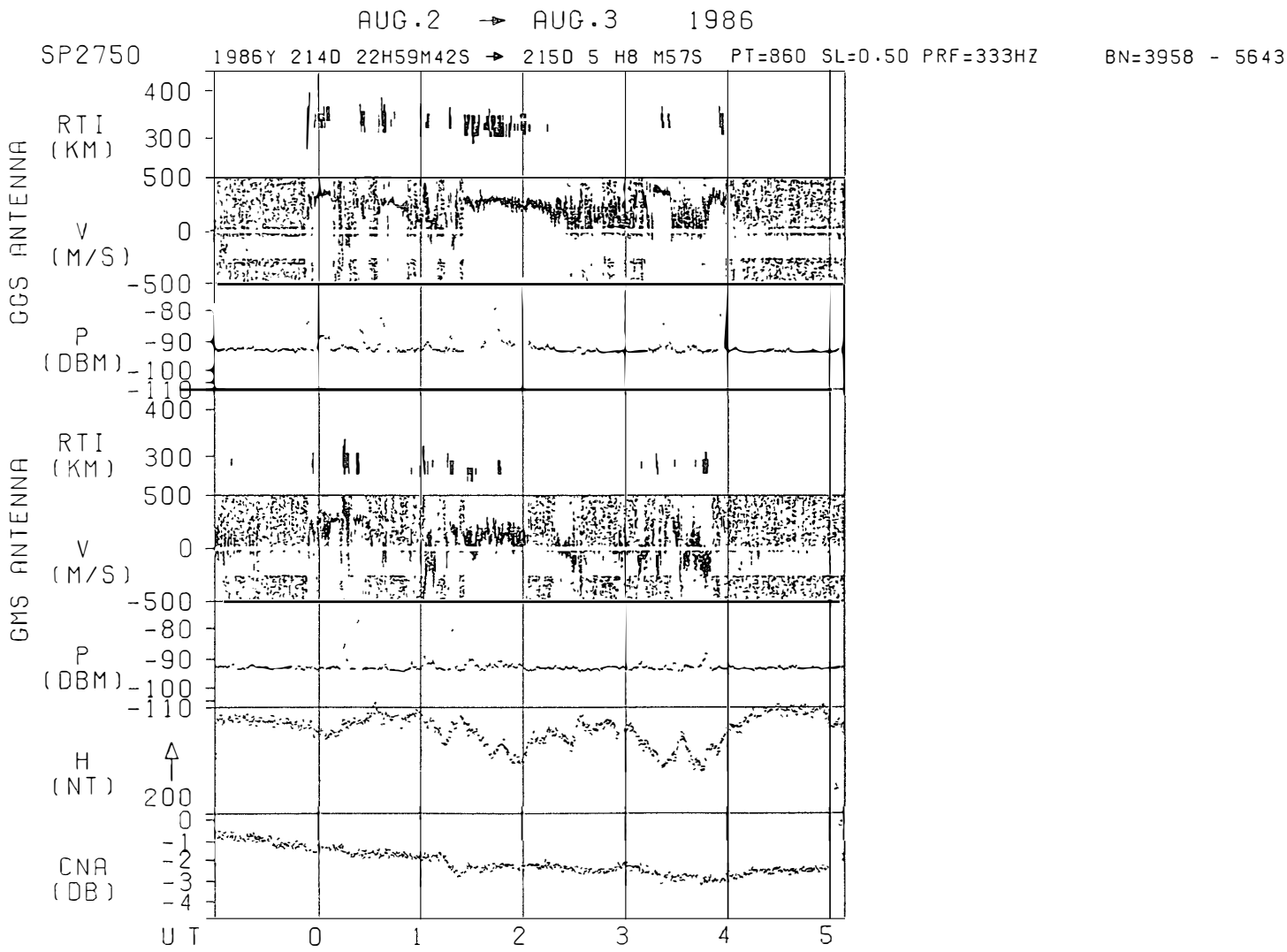
AUG.2 → AUG.3 1986
SP2750
1986Y 214D 22H59M42S → 215D 5 H8 M57S PT=860 SL=0.50 PRF=333HZ
BN=3958 - 5643
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
0
1
2
3
4
5

Fig. 2(22)

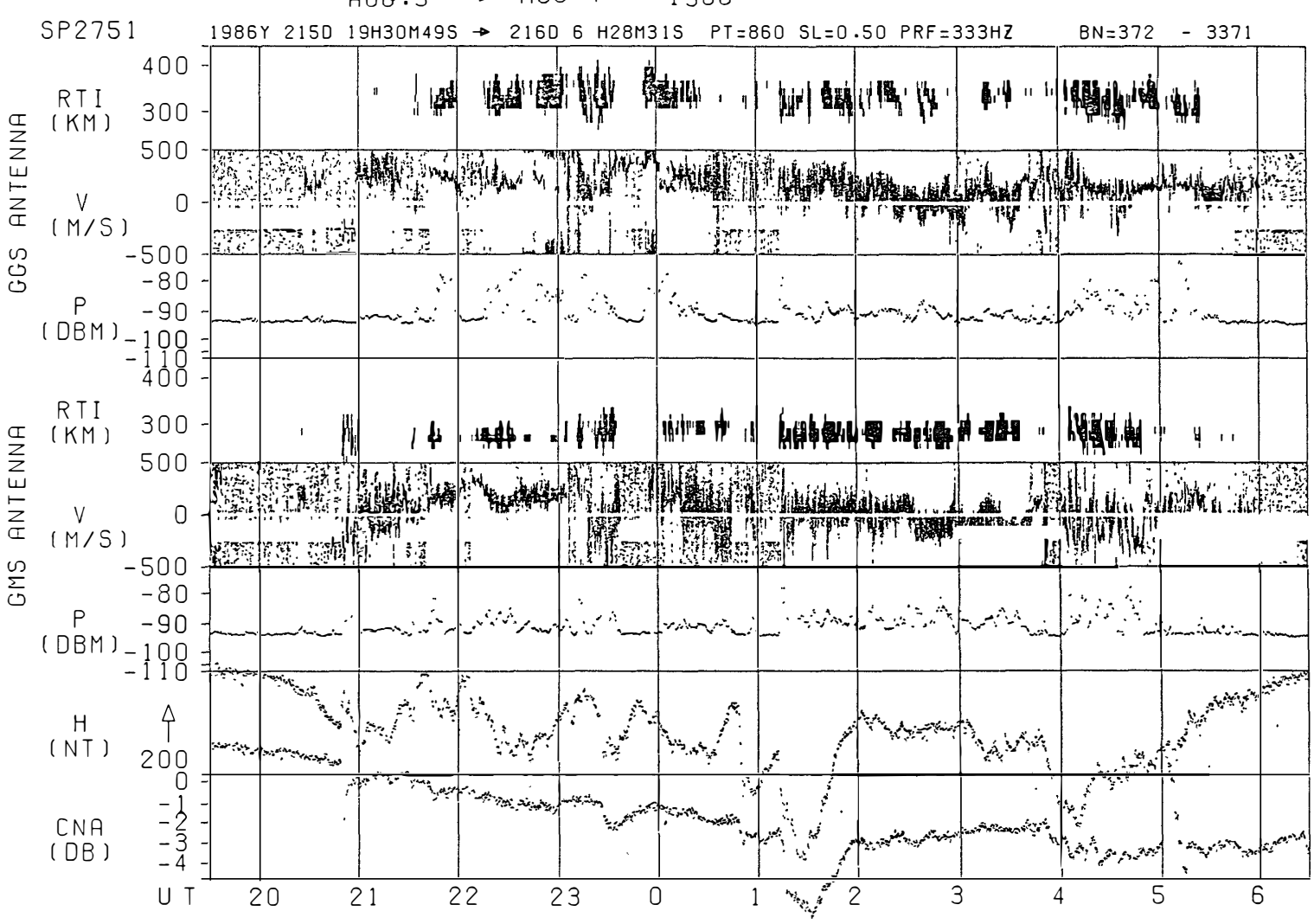
AUG.3 → AUG.4 1986
SP2751
1986Y 215D 19H30M49S → 216D 6 H28M31S PT=860 SL=0.50 PRF=333HZ BN=372 - 3371
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
20
21
22
23
0
1
2
3
4
5
6

Fig. 2(23)

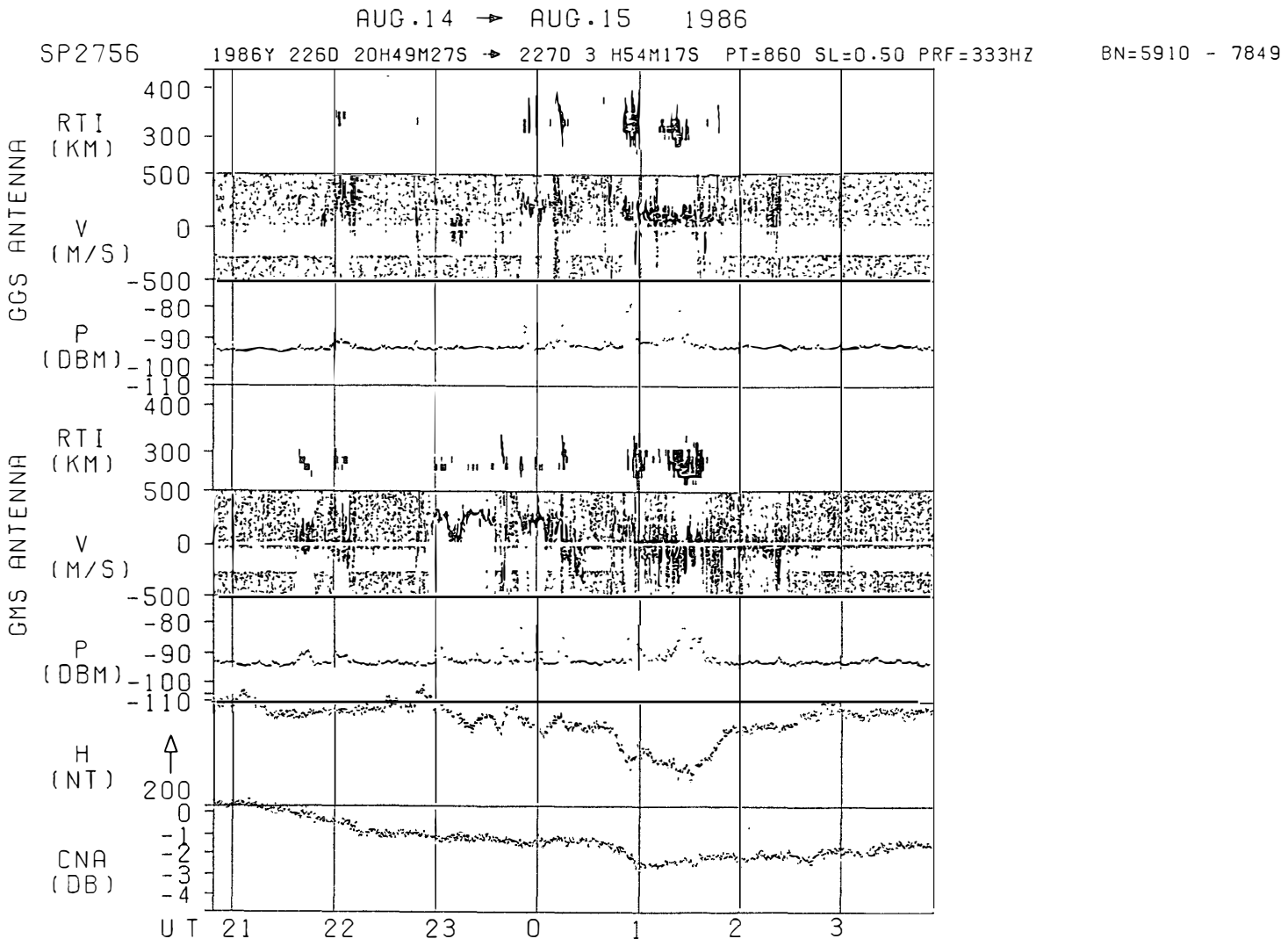
AUG.14 → AUG.15 1986
SP2756
1986Y 226D 20H49M27S → 227D 3 H54M17S PT=860 SL=0.50 PRF=333HZ
BN=5910 - 7849
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 21 22 23 0 1 2 3

Fig. 2(24)

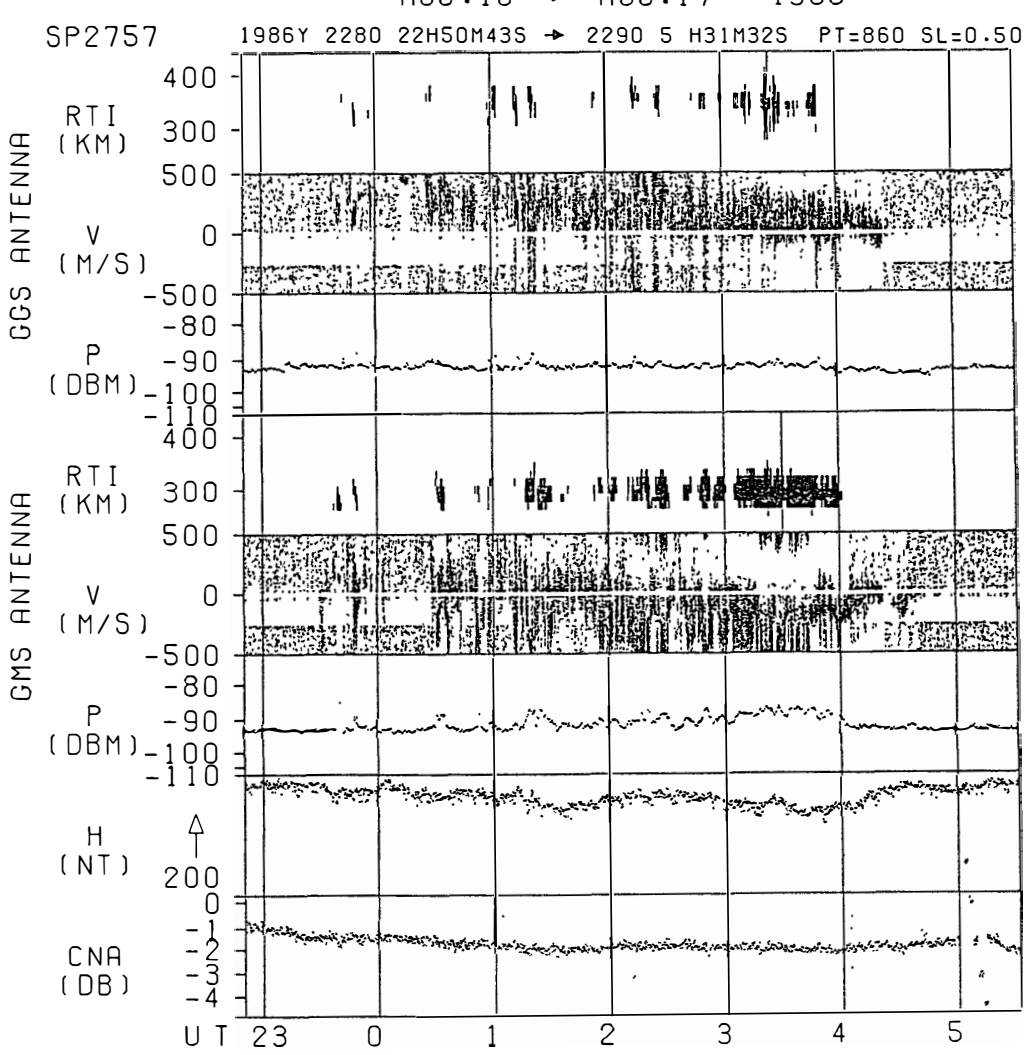
AUG.16 → AUG.17 1986
SP2757
1986Y 2280 22H50M43S → 2290 5 H31M32S PT=860 SL=0.50 PRF=333HZ
BN=6316 - 8146
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 23 0 1 2 3 4 5

Fig. 2(25)

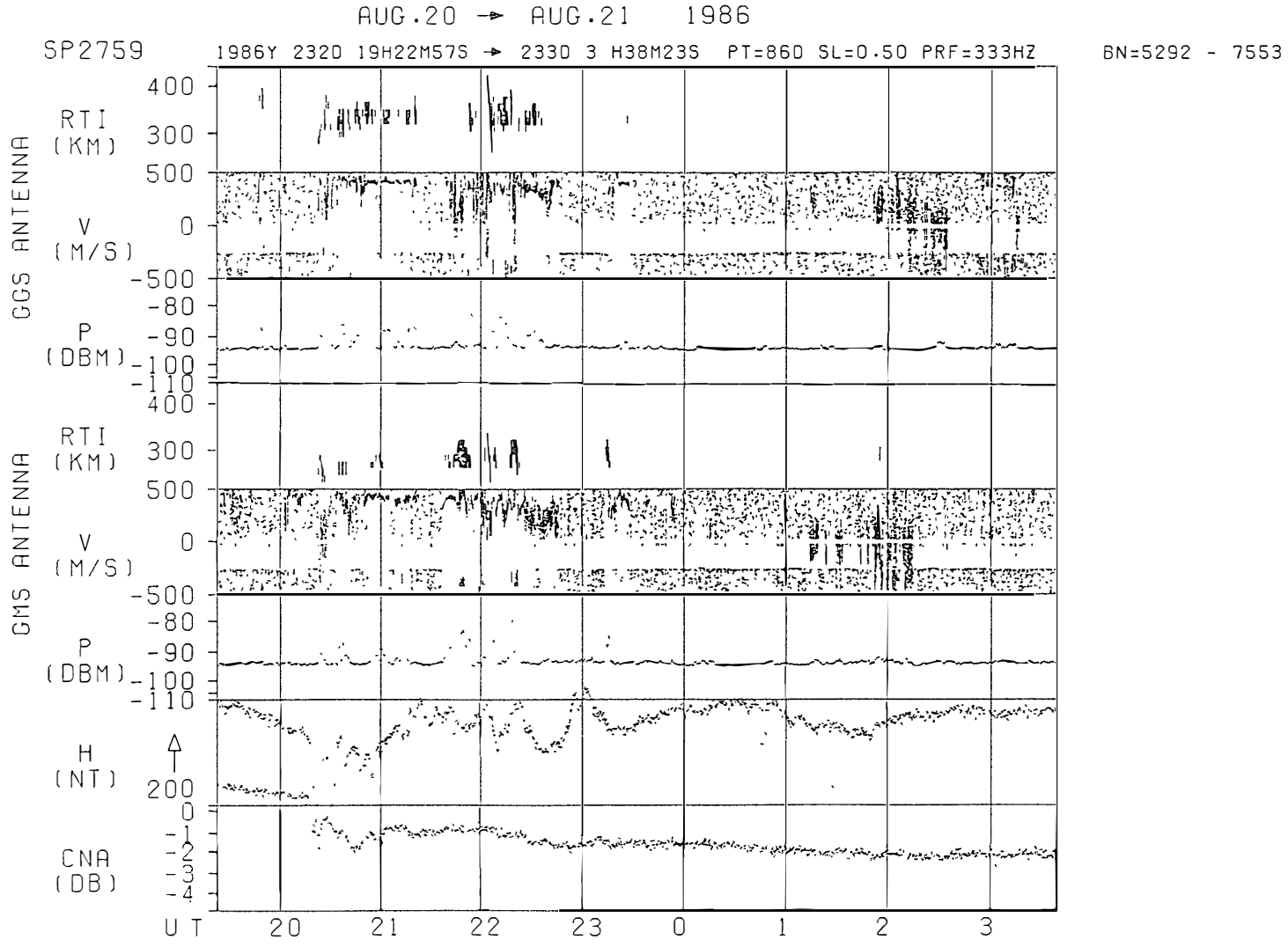
AUG.20 → AUG.21 1986
SP2759
1986Y 232D 19H22M57S → 233D 3 H38M23S PT=86D SL=0.50 PRF=333HZ
BN=5292 - 7553
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
20
21
22
23
0
1
2
3

Fig. 2(26)

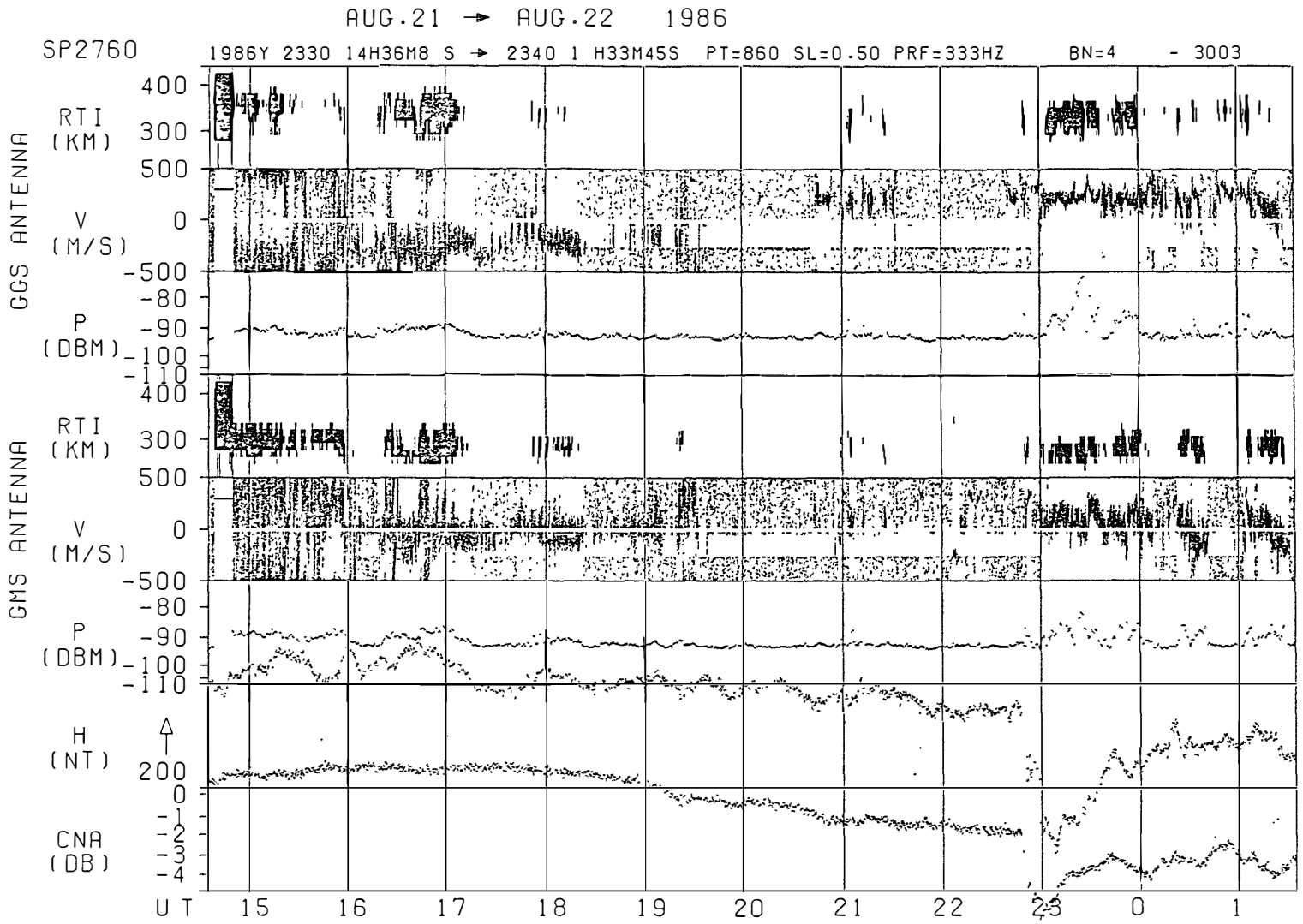
AUG.21 → AUG.22 1986
SP2760
1986Y 2330 14H36M8 S → 2340 1 H33M45S PT=860 SL=0.50 PRF=333HZ BN=4 - 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
15
16
17
18
19
20
21
22
23
0
1

Fig. 2(27)

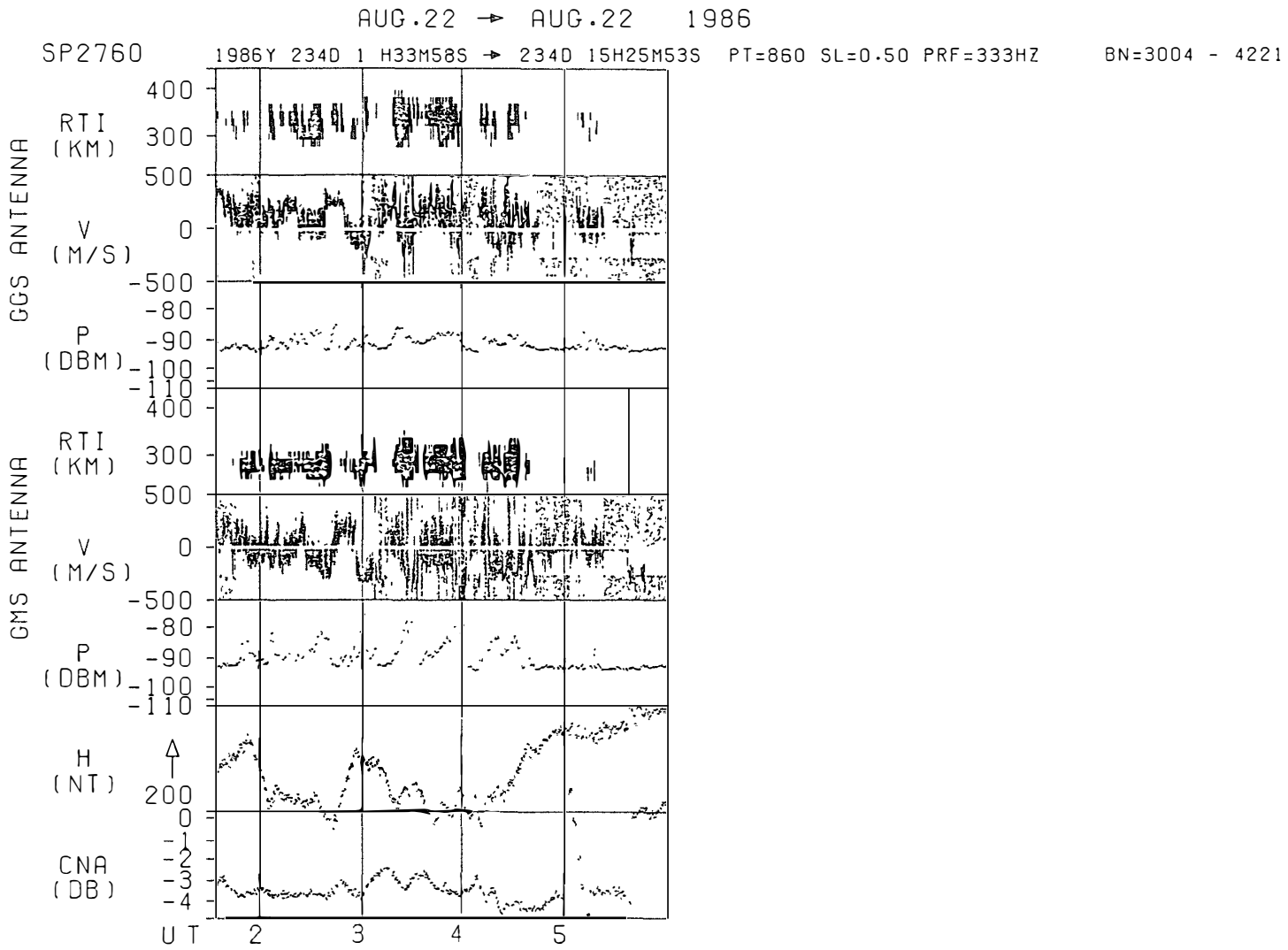
AUG.22 → AUG.22 1986
SP2760
1986Y 234D 1 H33M58S → 234D 15H25M53S PT=860 SL=0.50 PRF=333HZ
BN=3004 - 4221
GGS ANTENNA
RTI (KM)
400
300
V (M/S)
500
0
-500
P (DBM)
-80
-90
-100
-110
CMS ANTENNA
RTI (KM)
400
300
V (M/S)
500
0
-500
P (DBM)
-80
-90
-100
-110
H (NT)
200
0
CNA (DB)
-1
-2
-3
-4
UT
2
3
4
5

Fig. 2(28)

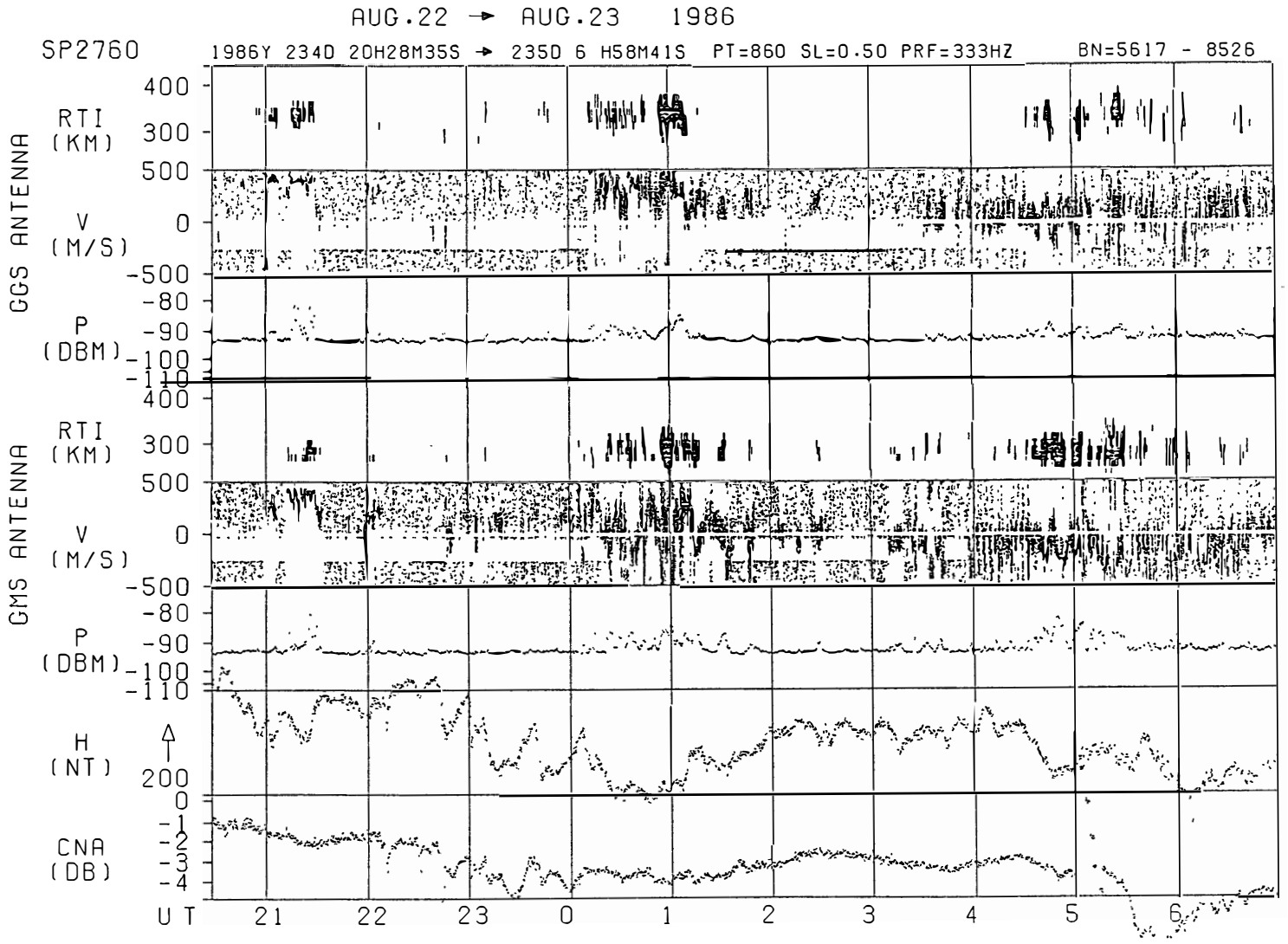
AUG.22 → AUG.23 1986
SP2760
1986Y 234D 20H28M35S → 235D 6 H58M41S PT=860 SL=0.50 PRF=333HZ
BN=5617 - 8526
GGS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
UT
21
22
23
0
1
2
3
4
5
6

Fig. 2(29)

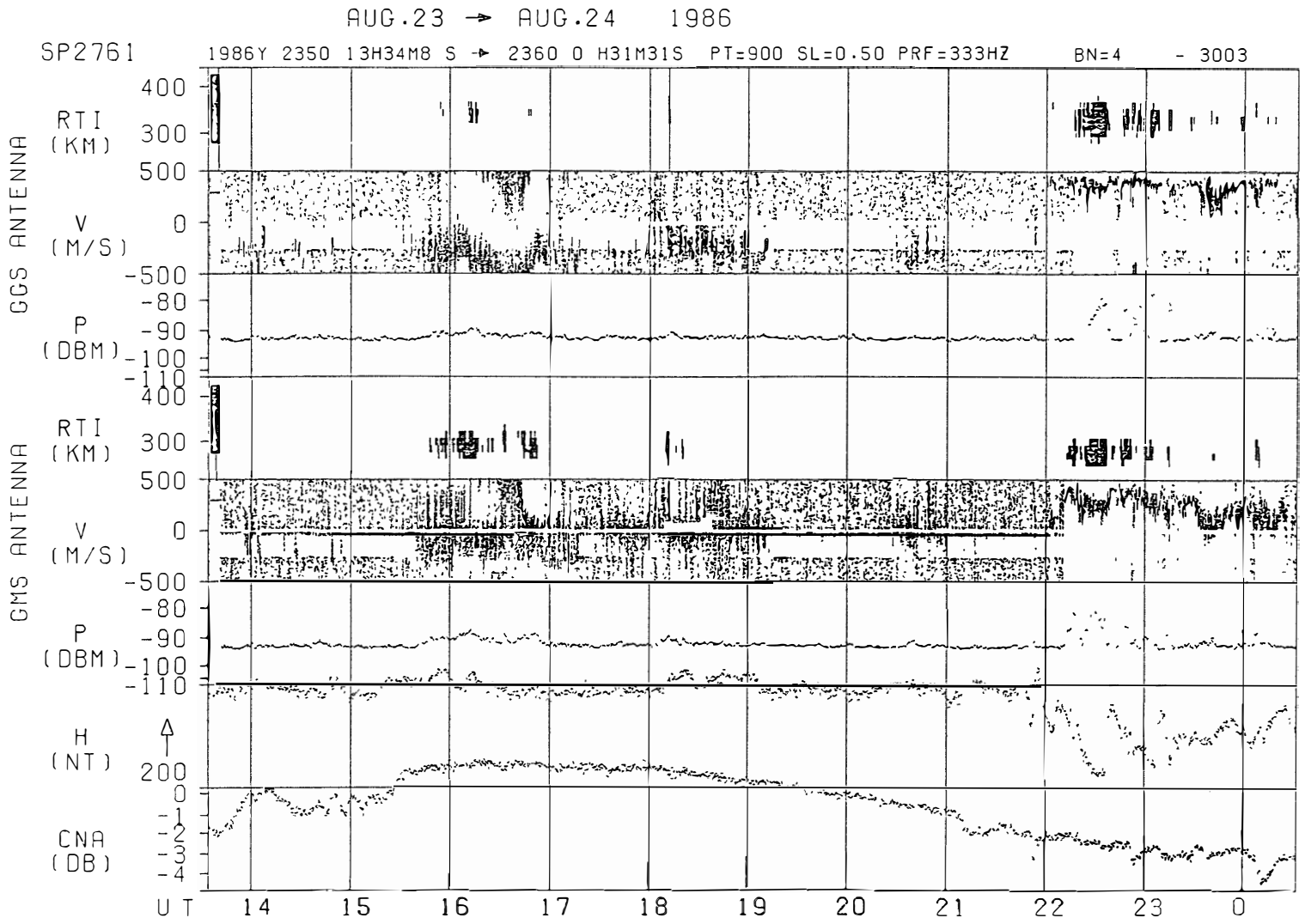
AUG.23 → AUG.24 1986
SP2761
1986Y 2350 13H34M8 S → 2360 0 H31M31S PT=900 SL=0.50 PRF=333HZ
BN=4
- 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
14
15
16
17
18
19
20
21
22
23
0

Fig. 2(30)

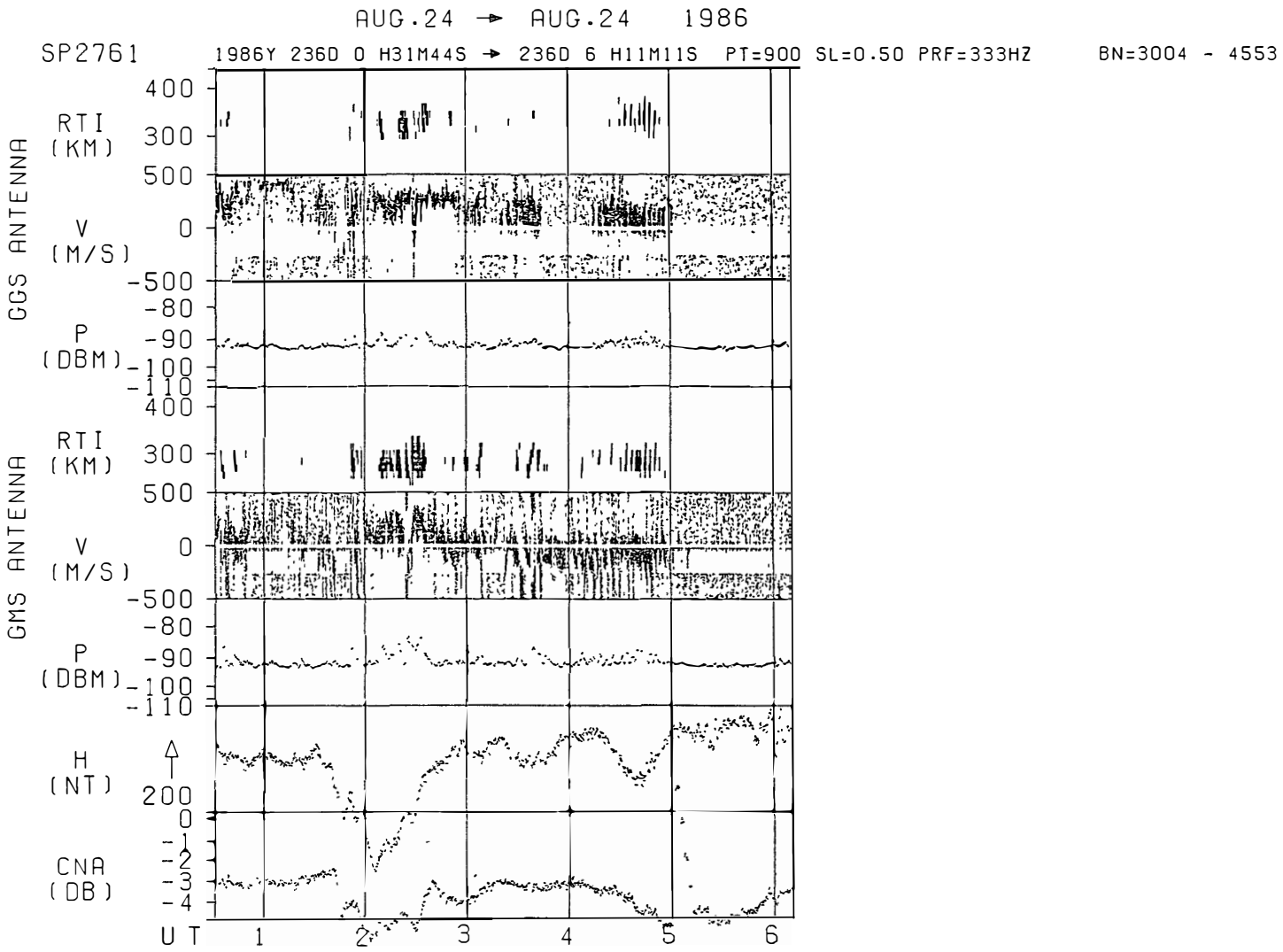
AUG.24 → AUG.24 1986
SP2761
1986Y 236D 0 H31M44S → 236D 6 H11M11S PT=900 SL=0.50 PRF=333HZ
BN=3004 - 4553
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
1
2
3
4
5
6

Fig. 2(31)

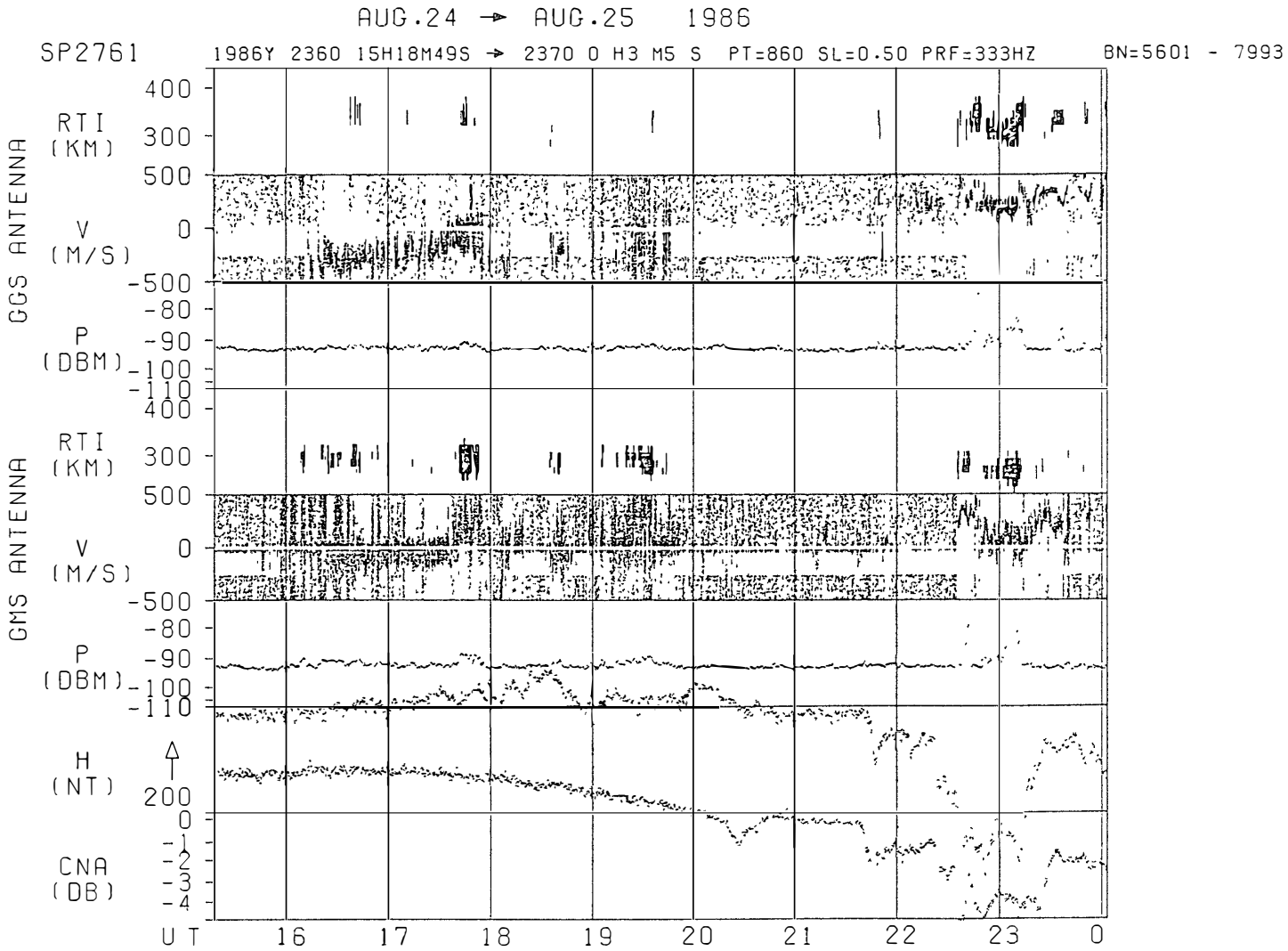
AUG.24 → AUG.25 1986
SP2761
1986Y 2360 15H18M49S → 2370 0 H3 M5 S PT=860 SL=0.50 PRF=333HZ
BN=5601 - 7993
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
16
17
18
19
20
21
22
23
0

Fig. 2(32)

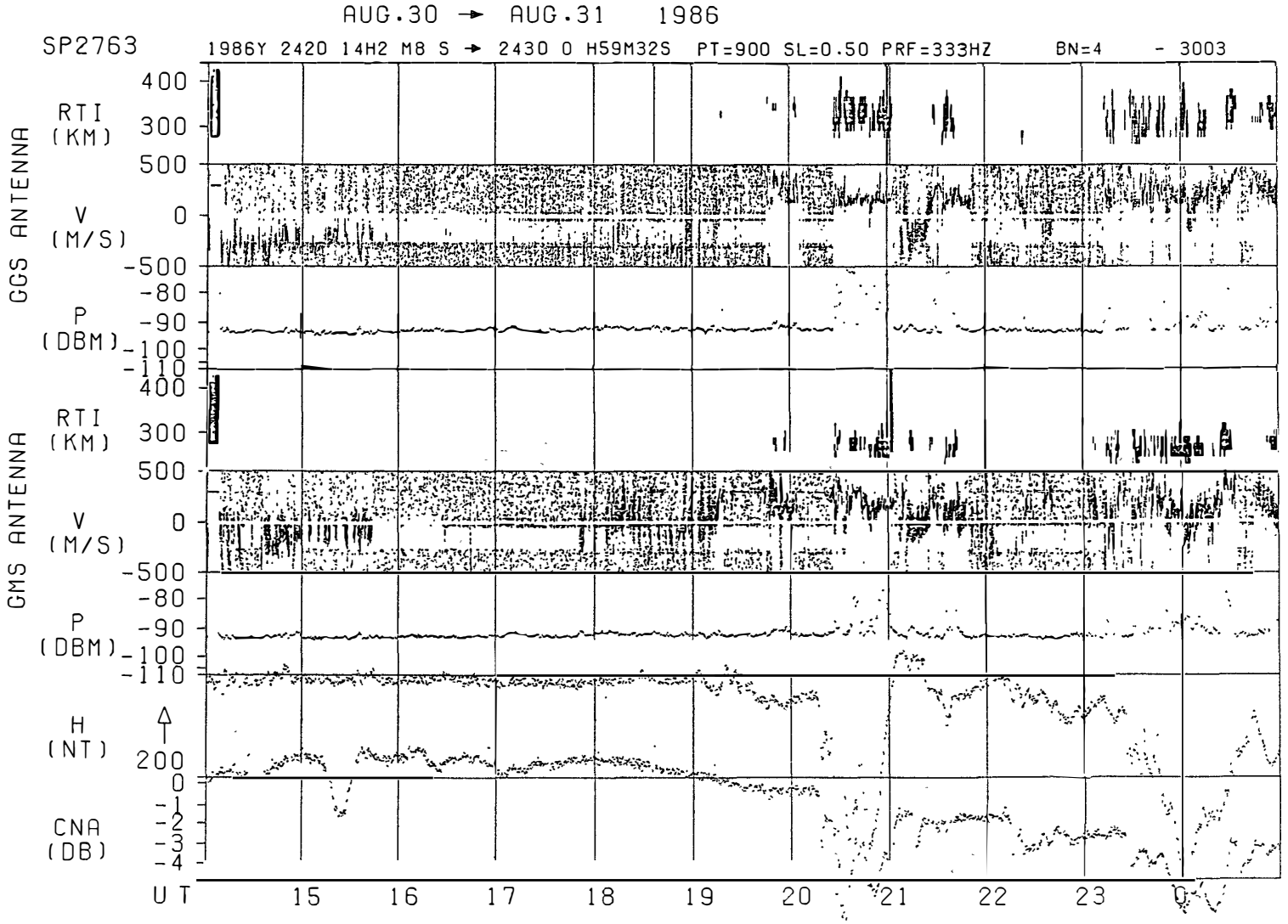
AUG.30 → AUG.31 1986
SP2763
1986Y 2420 14H2 M8 S → 2430 0 H59M32S PT=900 SL=0.50 PRF=333HZ BN=4 - 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
15
16
17
18
19
20
21
22
23
0

Fig. 2(33)

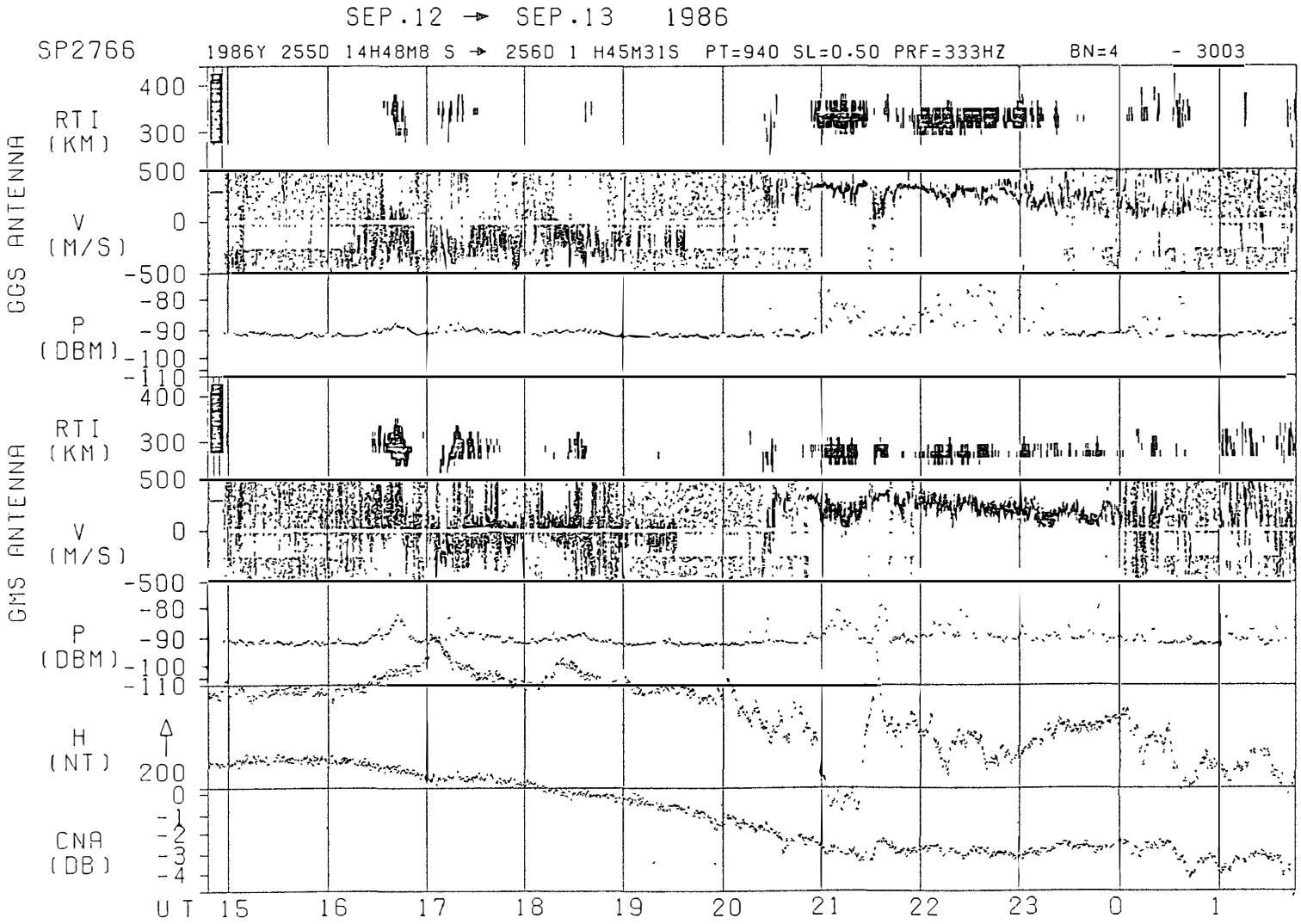
SEP.12 → SEP.13 1986
SP2766
1986Y 255D 14H48M8 S → 256D 1 H45M31S PT=940 SL=0.50 PRF=333HZ
BN=4
- 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
15
16
17
18
19
20
21
22
23
0
1

Fig. 2(34)

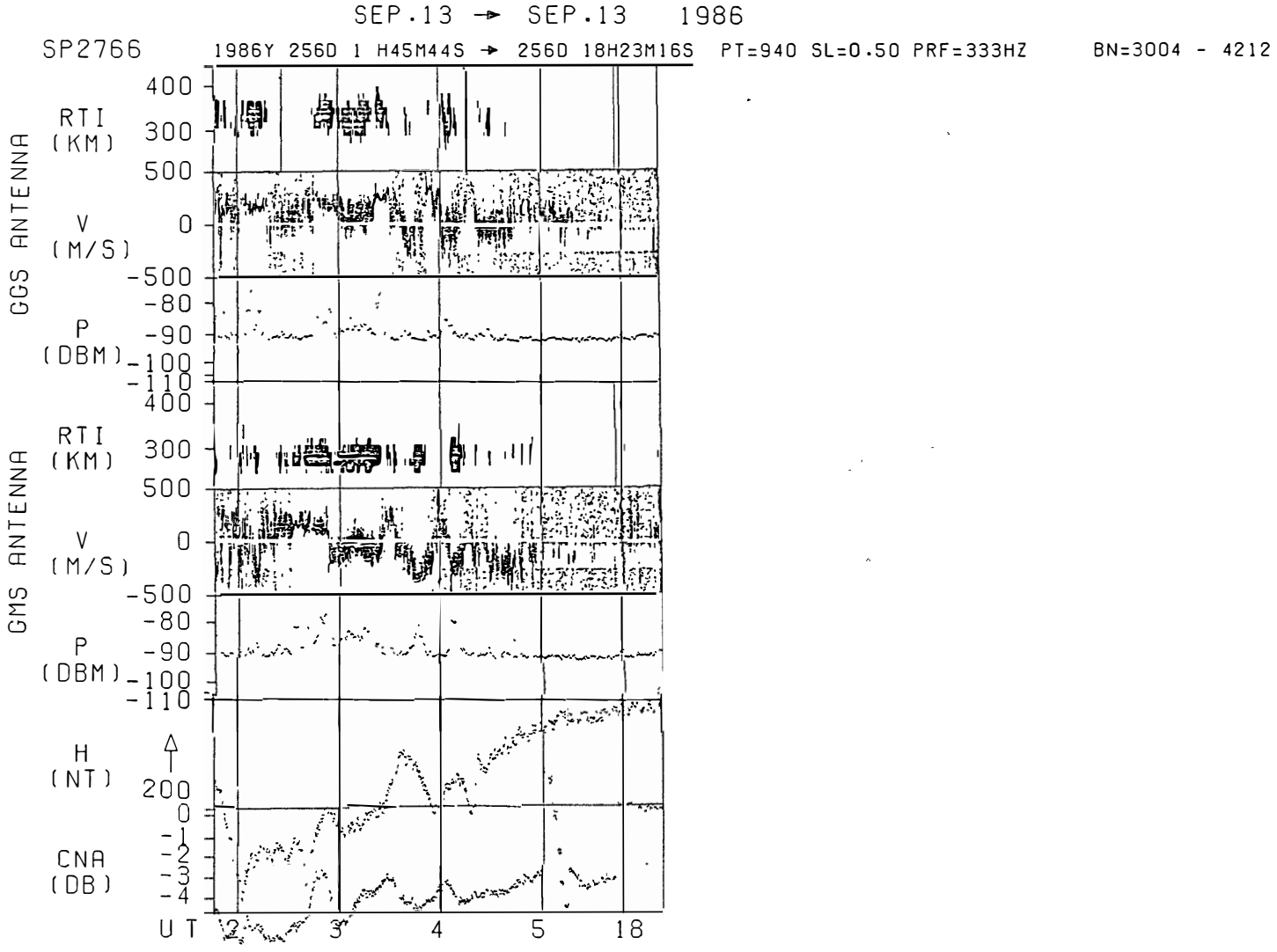
SEP.13 → SEP.13 1986
SP2766
1986Y 256D 1 H45M44S → 256D 18H23M16S PT=940 SL=0.50 PRF=333HZ
BN=3004 - 4212
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
2
3
4
5
18

Fig. 2(35)

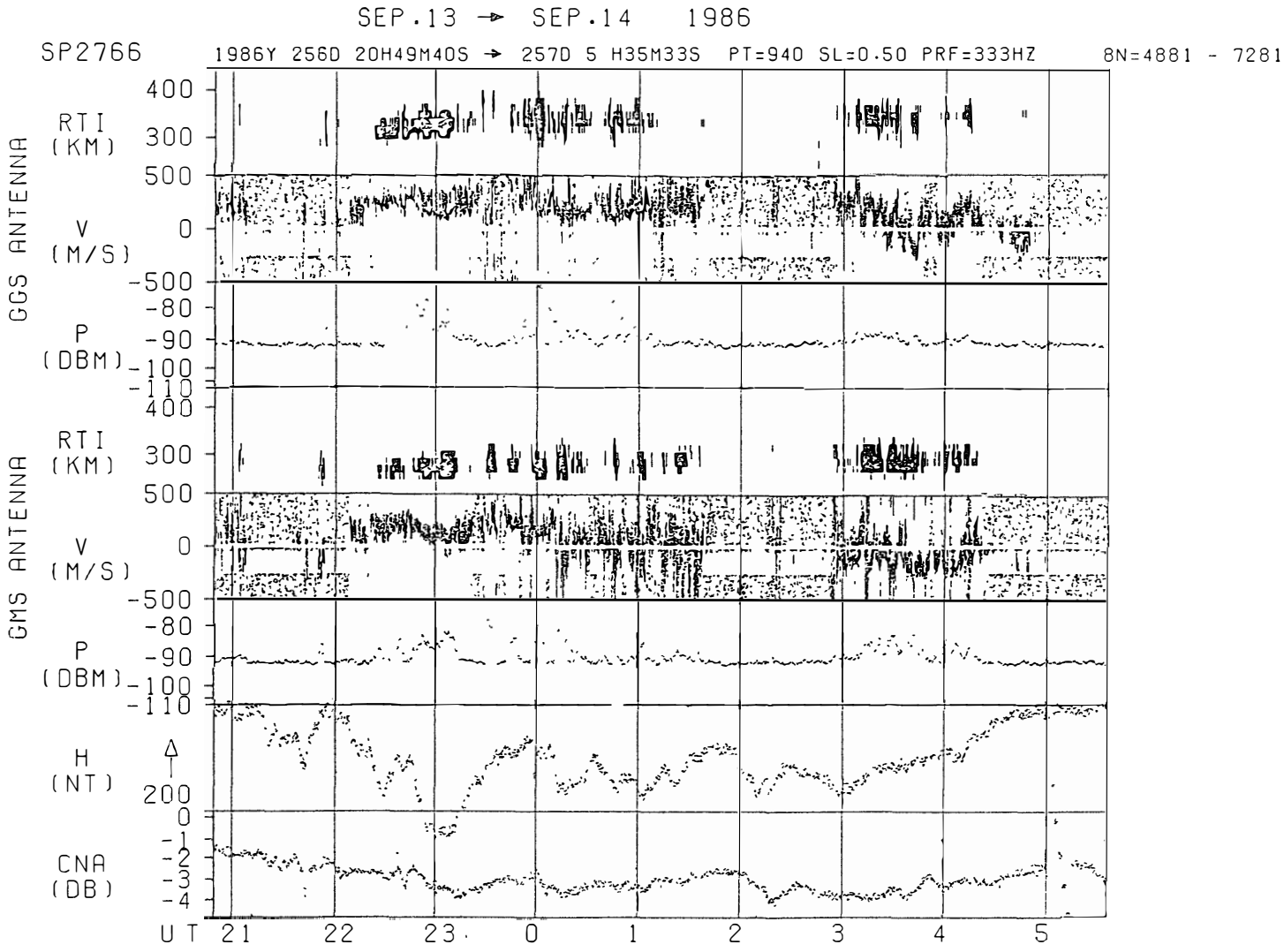
SEP.13 → SEP.14 1986
SP2766
1986Y 256D 20H49M40S → 257D 5 H35M33S PT=940 SL=0.50 PRF=333HZ
8N=4881 - 7281
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 21 22 23 0 1 2 3 4 5

Fig. 2(36)

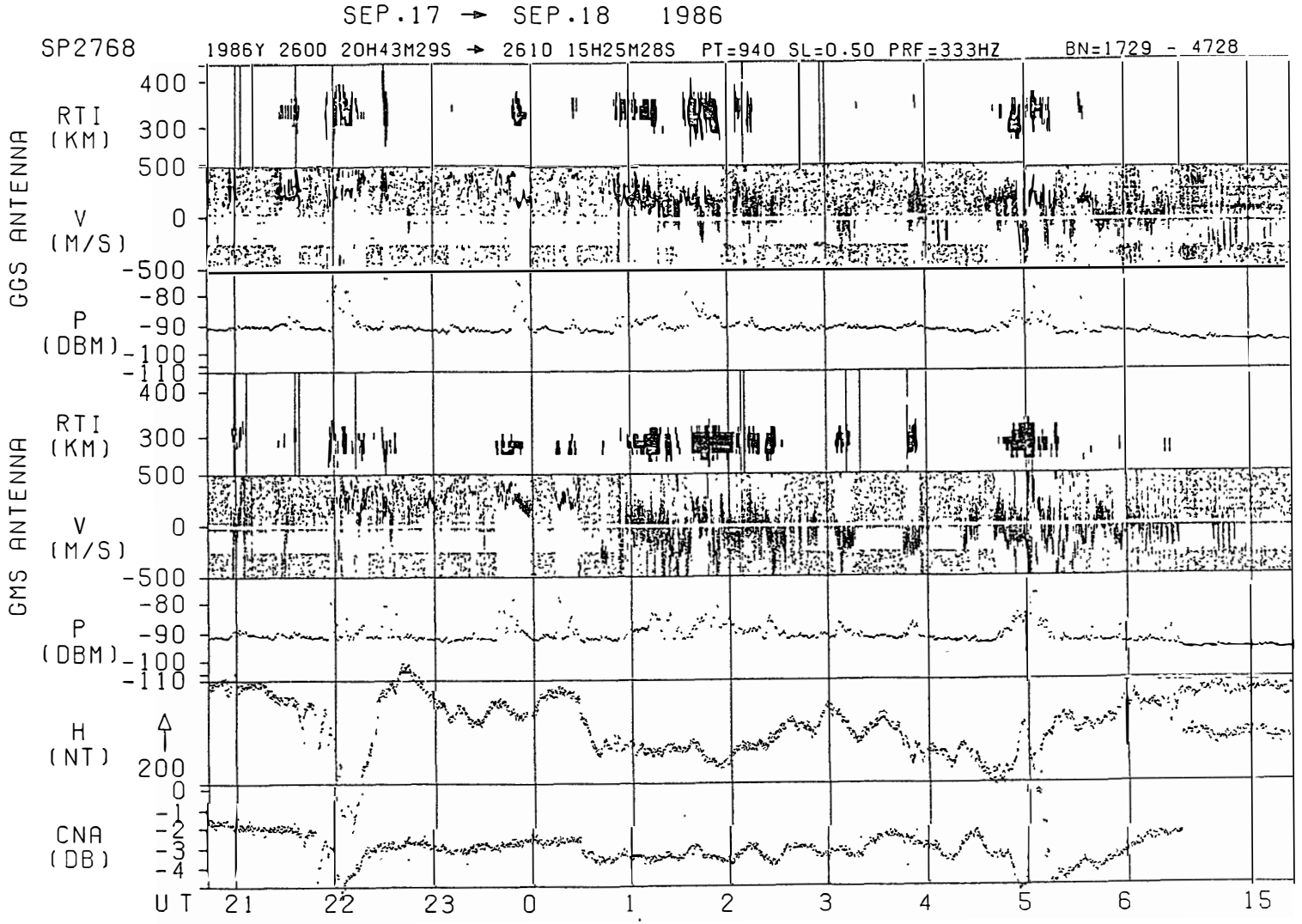
SEP.17 → SEP.18 1986
SP2768
1986Y 260D 20H43M29S → 261D 15H25M28S PT=940 SL=0.50 PRF=333HZ
BN=1729 - 4728
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
21
22
23
0
1
2
3
4
5
6
15

Fig. 2(37)

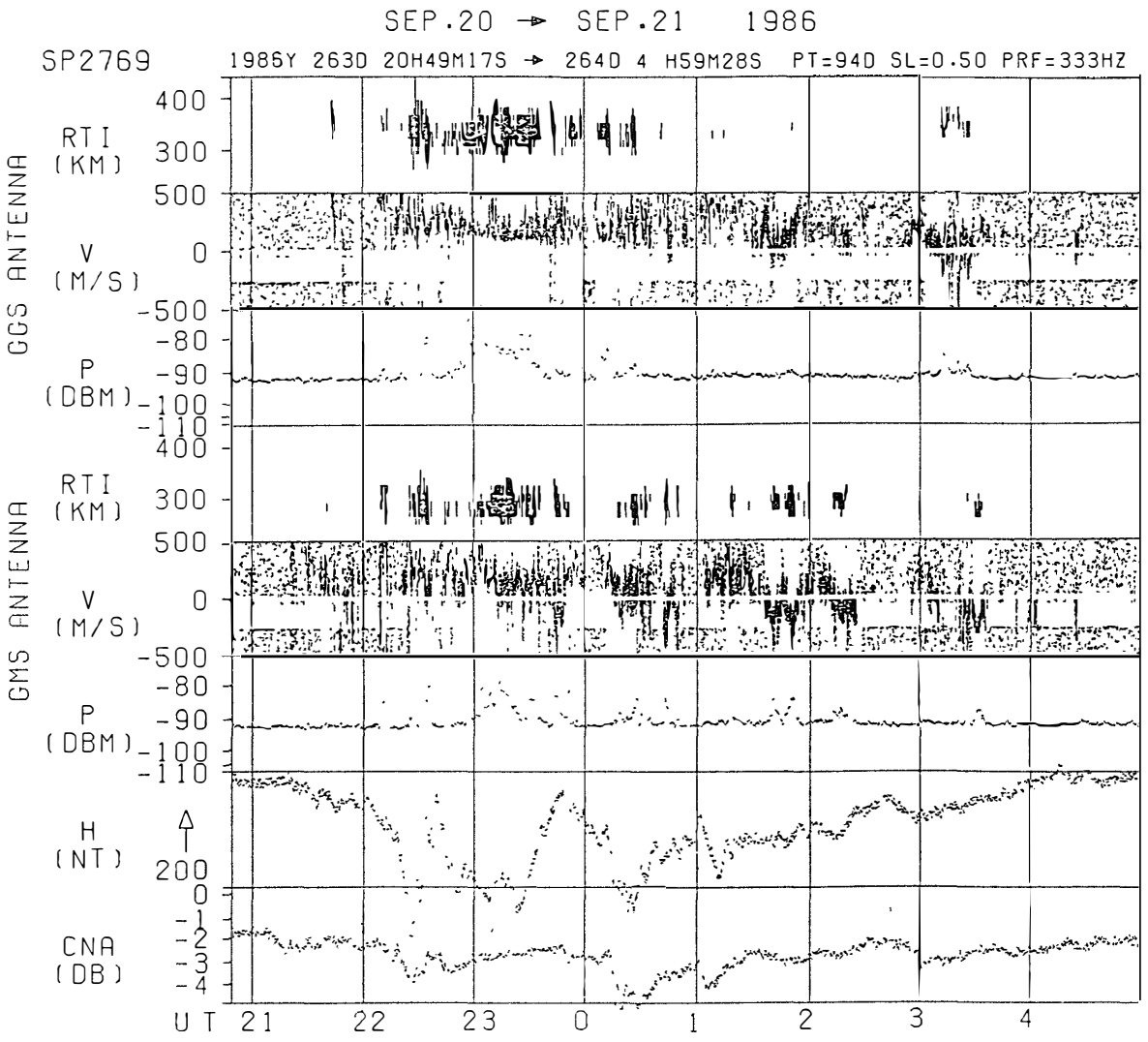
SEP.20 → SEP.21 1986
SP2769
1986Y 263D 20H49M17S → 264D 4 H59M28S PT=94D SL=0.50 PRF=333HZ
BN=5763 - 8001
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 21 22 23 0 1 2 3 4

Fig. 2(38)

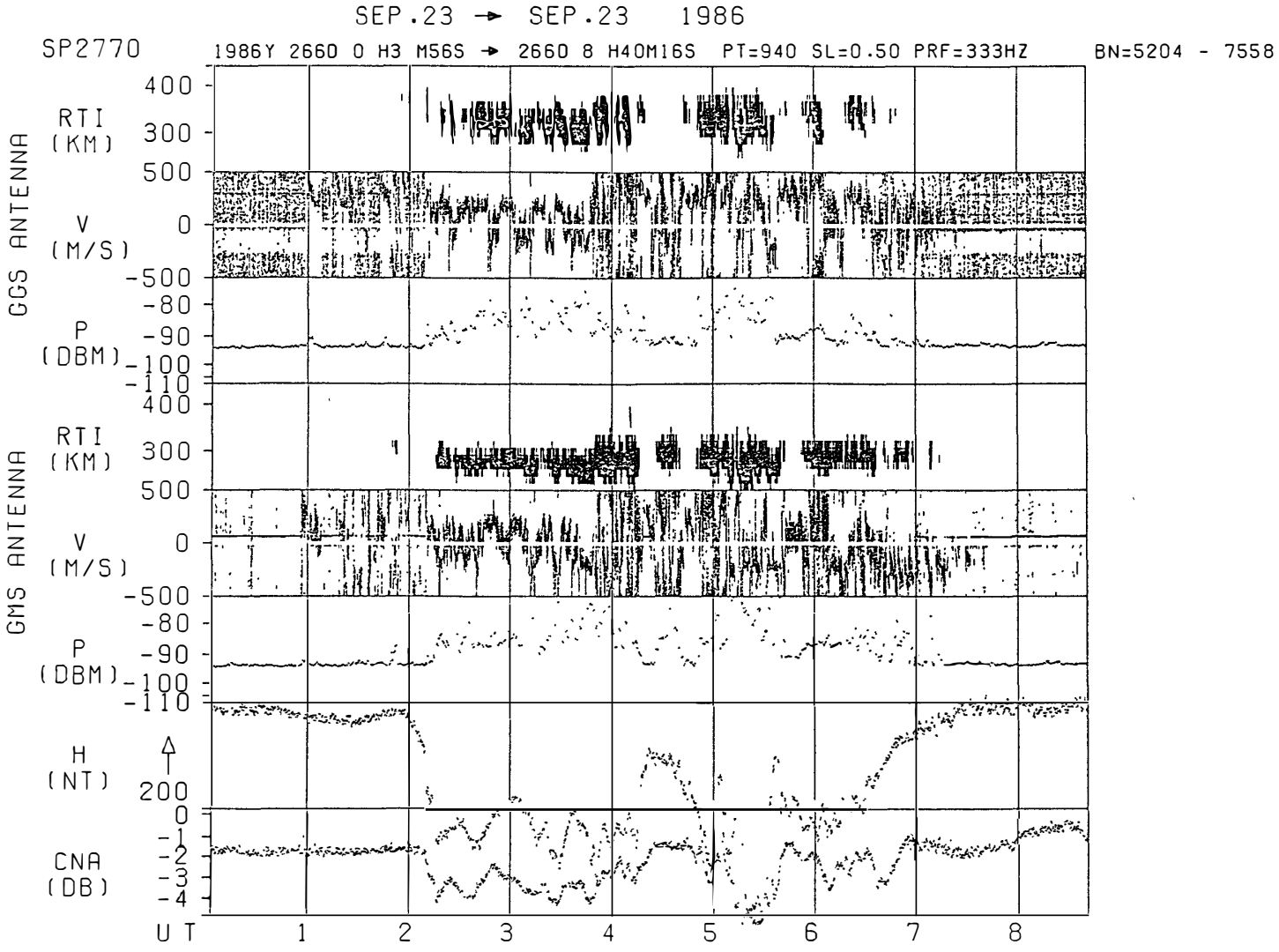
SEP.23 → SEP.23 1986
SP2770
1986Y 266D 0 H3 M56S → 266D 8 H40M16S PT=940 SL=0.50 PRF=333HZ
BN=5204 - 7558
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
1
2
3
4
5
6
7
8

Fig. 2(39)

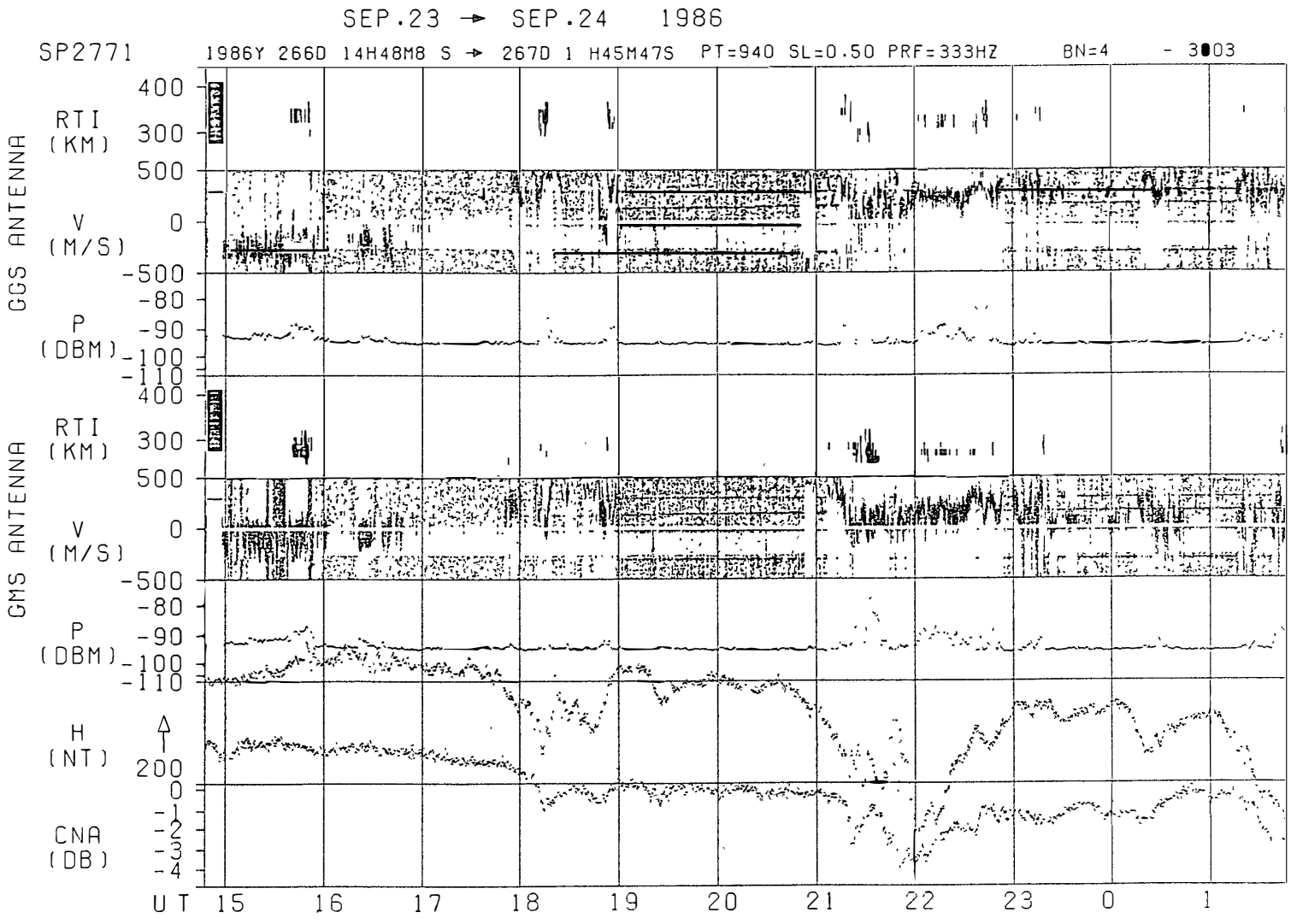
SEP.23 → SEP.24 1986
SP2771
1986Y 266D 14H48M8 S → 267D 1 H45M47S PT=940 SL=0.50 PRF=333HZ
BN=4
- 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 15 16 17 18 19 20 21 22 23 0 1

Fig. 2(40)

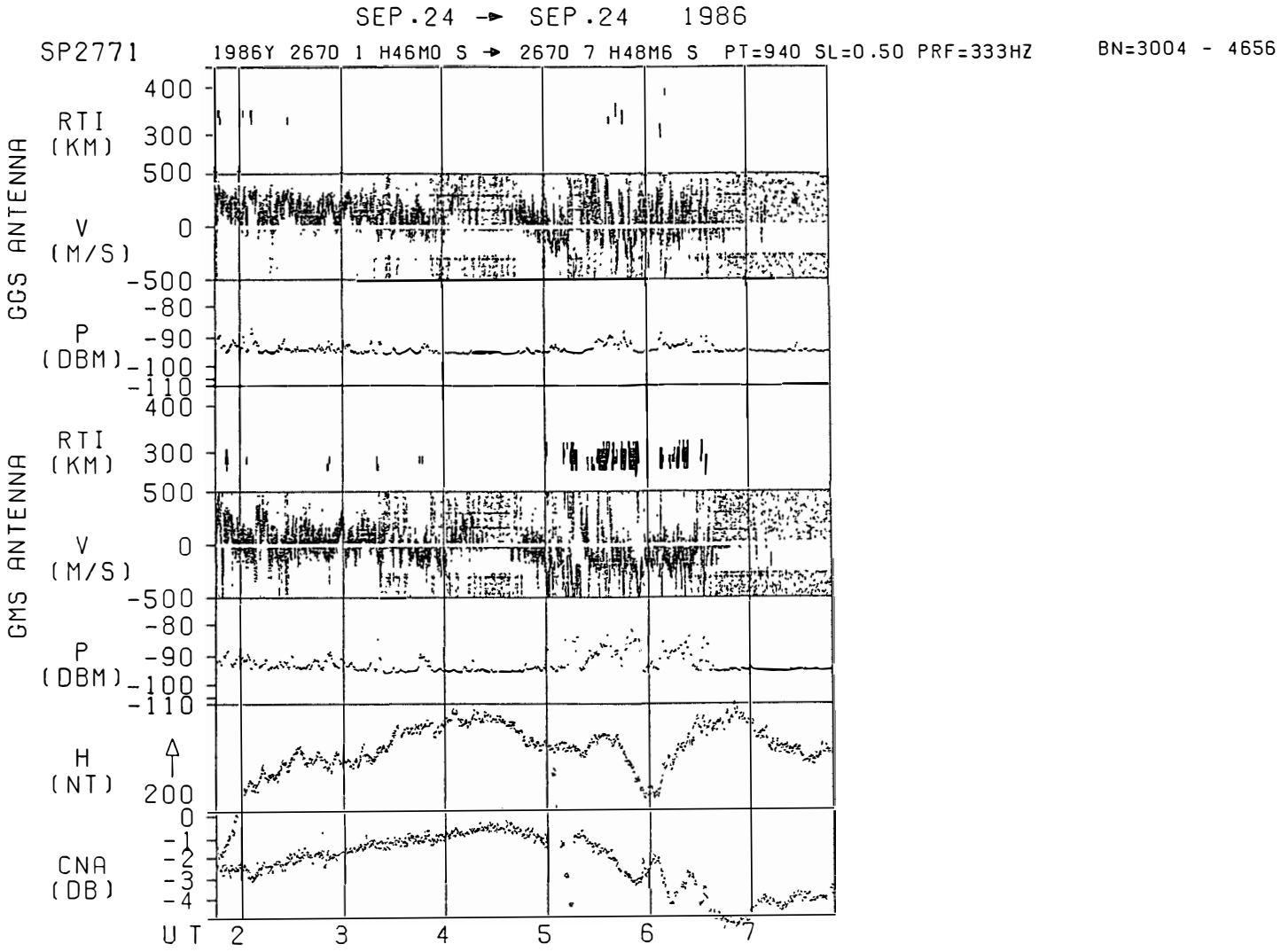
SEP.24 → SEP.24 1986
SP2771
1986Y 267D 1 H46M0 S → 267D 7 H48M6 S PT=940 SL=0.50 PRF=333HZ
BN=3004 - 4656
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
2
3
4
5
6
7

Fig. 2(41)

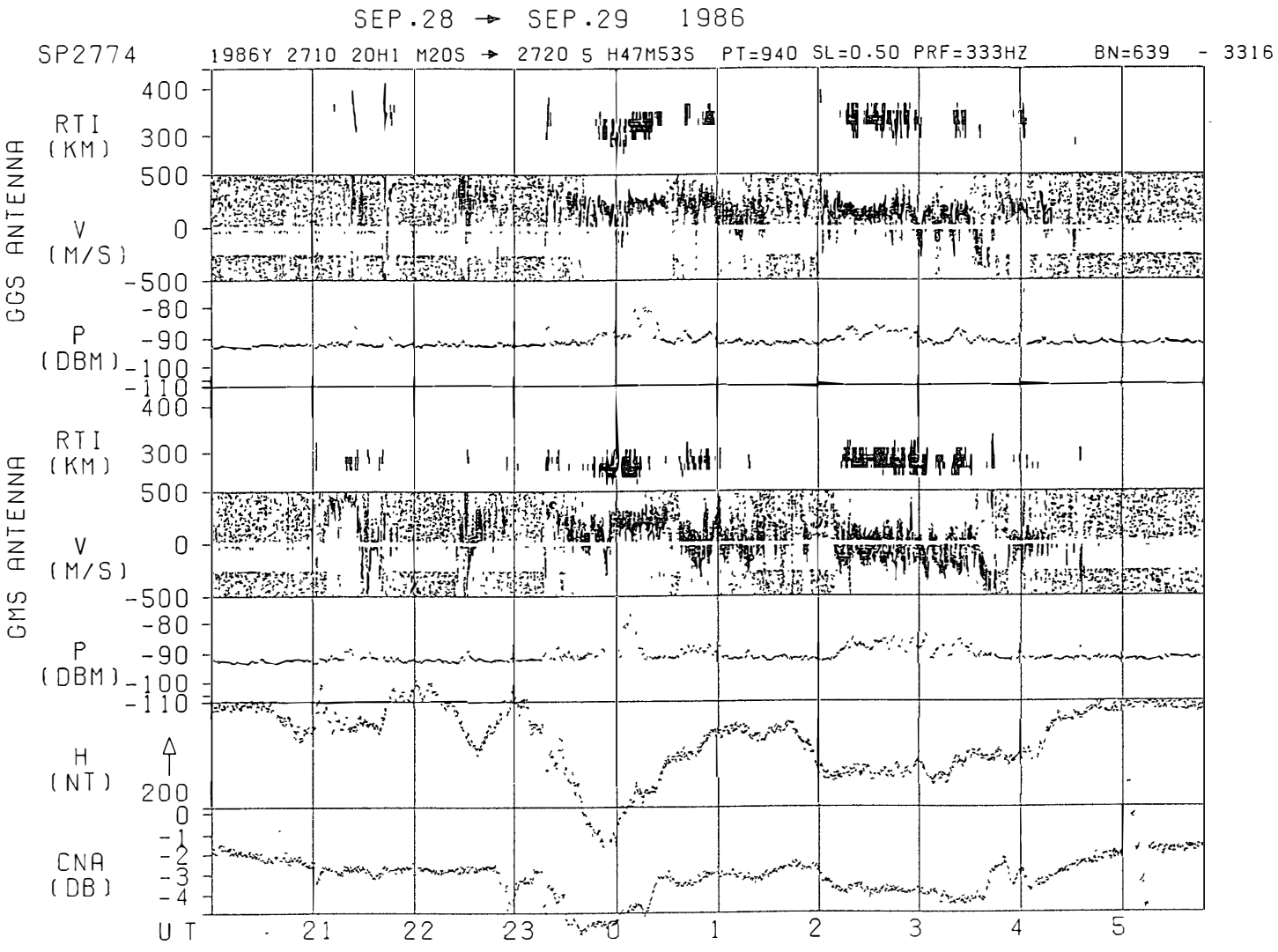
SEP.28 → SEP.29 1986
SP2774
1986Y 2710 20H1 M20S → 2720 5 H47M53S PT=940 SL=0.50 PRF=333HZ
BN=639 - 3316
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT
21
22
23
0
1
2
3
4
5

Fig. 2(42)

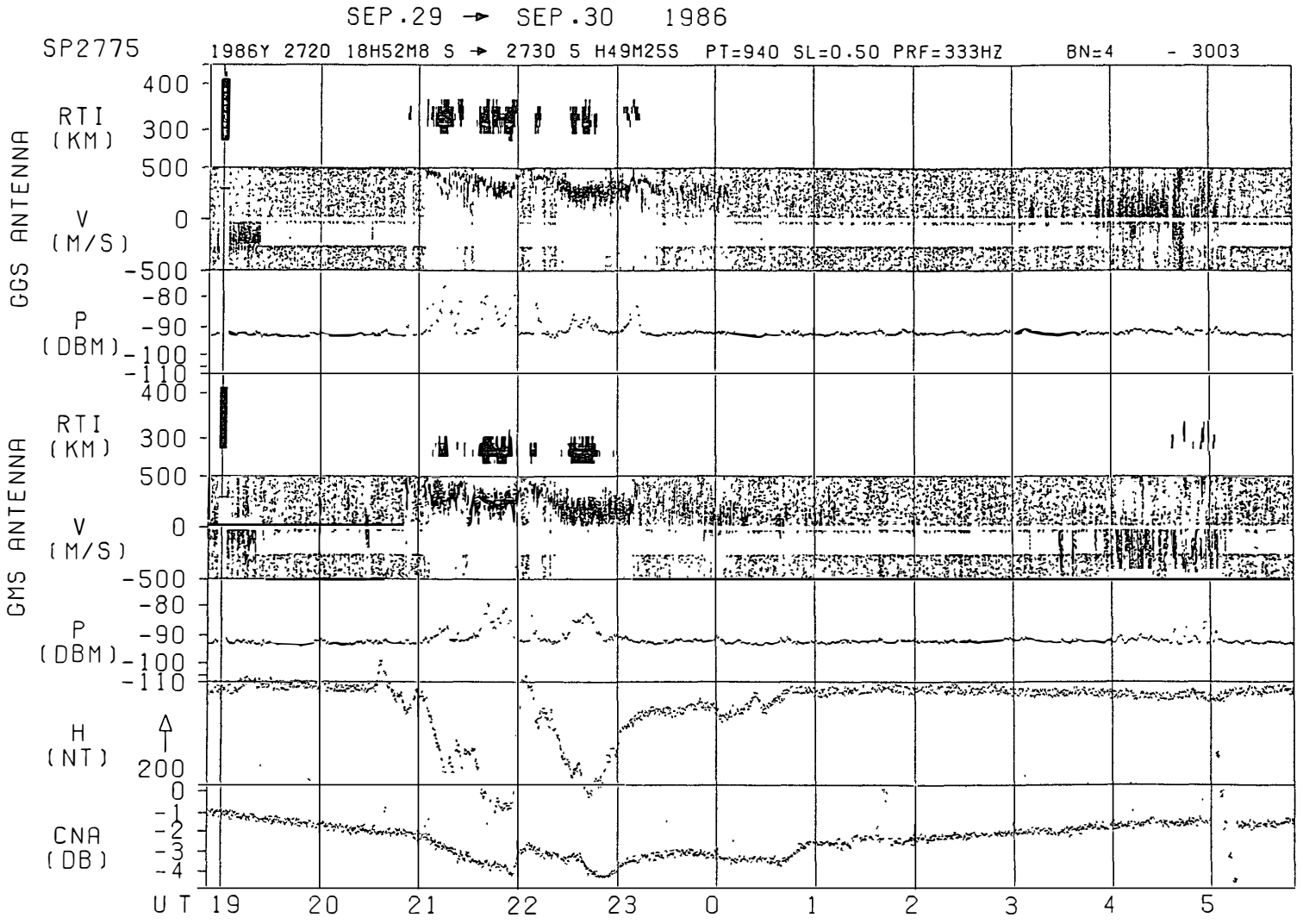
SEP.29 → SEP.30 1986
SP2775
1986Y 2720 18H52M8 S → 2730 5 H49M25S PT=940 SL=0.50 PRF=333HZ BN=4 - 3003
GGS ANTENNA
GMS ANTENNA
RTI (KM)
V (M/S)
P (DBM)
H (NT)
CNA (DB)
400
300
500
0
-500
-80
-90
-100
-110
200
-1
-2
-3
-4
UT 19 20 21 22 23 0 1 2 3 4 5

Fig. 2(43)