ISSN 0021–0382

F—537

IONOSPHERIC DATA IN JAPAN

FOR SEPTEMBER 1993

VOL. 45 NO. 9

CONTENTS

COMMUNICATIONS RESEARCH LABORATORY
MINISTRY OF POSTS AND TELECOMMUNICATIONS
TOKYO, JAPAN

INTRODUCTION

This Series contains data on ionosphere (I) , solar radio emission (S) and radio propagation (P) obtained at the following stations under the Communications Research Laboratory, Ministry of Posts and Telecommunications of Japan.

Station	Geographic		Geomagnetic		Technical Method
	Latitude	Longitude	Latitude	Longitude	
Wakkanai	45°23.5′N	141°41.2′E	35.3°N	206.5°	Vertical Sounding (I)
Kokubunji	35°42.4′N	139°29.3′E	25.5°N	205.8°	Vertical Sounding (I)
Yamagawa	31°12.1′N	130°37.1′E	20.4°N	198.3°	Vertical Sounding (I)
Okinawa	26°16.9′N	127°48.4′E	15.3°N	196.0°	Vertical Sounding (I)
Hiraiso	36°22.0′N	140°37.5′E	26.3°N	206.8°	Radio Receiving (S,P)
Inubo	35°42.2′N	140°51.5′E	25.6°N	207.0°	Radio Receiving (P)

A. IONOSPHERE

Ionospheic observations are carried out at the above four stations in Japan by means of vertical sounding using ionosondes.The ionosonde produces ionograms,which are recorded digitally on computer storage medium as well as graphically on 35 mm photographic film. The digitally-recorded ionograms are collected from each station by the central computer and reduced to numerical values and Summary Plots by the automatic processing system. The ionograms obtained at Kokubunji are manually scaled as well by experienced specialists to supplement automatically-scaled parameters.

A1. Automatic Scaling

Digital ionograms are automatically scaled by the pattern recognition method. The following five factors of ionospheric characteristics are published for the present. The reliability of these factors has been ascertained by comparison of the automatically-scaled parameters with the manually-scaled values of large amounts of test ionograms.

The published data consist of tabulations of hourly values of three factors (*foF2, fEs, fmin*) and monthly medians of two factors (*h′Es, h′F*) , daily Summary Plots and monthly medians plot of *foF2*.

a. Characteristics of Ionosphere

foF2	Ordinary wave critical frequency for the *F2* layer
fEs	Highest frequency of the *Es* layer whether it may be ordinary or extraordinary
fmin	Lowest frequency which shows vertical ionospheric reflections
h′Es *h′F*	Minimum virtual height on the ordinary wave for the *Es* and *F* layers, respectively

b. Descriptive Letters

The following descriptive letters are used in the tables.

A Impossible measurement because of the presence of a lower thin layer,for example *Es* (for *foF2*).

B Impossible measurement because of absorption in the vicinity of *fmin*.

C Impossible measurement because of any failure in observation.

G Impossible automatic scaling because of too small ionization density of the layer (for *fEs*).

N Impossible automatic scaling because of complex echoes.

Blank No digital record because of trouble in the automatic data processing system, but existence of film record.

c. Definitions of the CNT,MED,UQ and LQ

Median count (CNT) is the number of numerical values from which the median has been computed. In addition to numerical values, the count may include a descriptivel etter G.

Median (MED) is defined as the middle value when the numerical values are arranged in order of magnitude, or the average of the two middle values if there is an even number of values.

Upper quartile (UQ) is the median value of the upper half of the values when they are ranked according to magnitude; the *lower quartile* (LQ) is the median value of the lower half.

If CNT is less than 10, there are blank spaces left.

d. Reliability of Automatic Scaling

The results of the comparison between automatically-scaled values and manually-scaled ones showed that hourly values of *foF2* , *fEs* and *fmin* were scaled within a difference of 1 MHz from about 90 , 90 and 99% , respectively of the test ionograms.

e. Summary Plot

Daily Summary Plots which are made from quarter-hourly digital ionograms are published to present general ionosphere conditions. The upper and middle parts of a Summary Plot show the diurnal variation of the frequency range of the echoes reflected from the *F* and *E* regions, respectively. The two solid arcing lines indicate the predicted values of *fxE* and *foE* calculated by the method described in the CCIR report 340. The lower part shows the diurnal variation of the virtual height where the echo traces become horizontal.

A2. Manual Scaling

The published data consist of tabulations of hourly values of the ionospheric characteristics and figures of daily *f*-plot.

All symbols and terminology in the tables or figures of ionospheric data are used in accordance with the "URSI Handbook of Ionogram Interpretation and Reduction (Second Edition) 1972 " and its revision of chapters I-4, published in July 1978.

a. Characteristics of Ionosphere

fxI	Top frequency of spread *F* trace
foF2 *foF1* *foE* *foEs*	Ordinary wave critical frequency for the *F2,F1, E* and *Es* including particle *E* layers, respectively
fbEs	Blanketing frequency of the *Es* layer, e.g. the lowest ordinary wave frequency visible through *Es*
fmin	Lowest frequency which shows vertical ionospheric reflections
M(3000)F2 *M(3000)F1*	Maximum usable frequency factor for a path of 3000 km for transmisson by *F2* and *F1* layers, respectively
h′F2 *h′F* *h′E* *h′Es*	Minimum virtual height on the ordinary wave for the *F2*, whole *F, E* and *Es* layers,respectively
Types of *Es*	See below b.(iii)

b. Symbols

(i) Descriptive Letters

The following letters are entered after, or used to replaced a numerical value on the monthly tabulation sheets, if necessary.

A Measurement influenced by, or impossible because of, the presence of a lower thin layer,for example *Es*.

B Measurement influenced by, or impossible because of, absorption in the vicinity of *fmin*.

C Measurement influenced by, or impossible because of, any non-ionospheric reason.

D Measurement influenced by, or impossible because of, the upper limit of the normal frequency range in use.

E Measurement influenced by, or impossible because of, the lower limit of the normal frequency range in use.

F Measurement influenced by, or impossible because of, the presence of spread echoes.

G Measurement influenced or impossible because the ionization density of the layer is too small to enable it to be made accurately.

H Measurement influenced by, or impossible because of, the presence of a stratification.

K Presence of particle *E* layer.

L Measurement influenced or impossible because the trace has no sufficiently definite cusp between layers.

M Interpretation of measurement questionable because the ordinary and extraordinary components are not distinguishable.

N Conditions are such that the measurement cannot be interpreted.

O Measurement refers to the ordinary component.

P Man-made perturbations of the observed parameter; or spur type spread *F* present.

Q Range spread present.

R Measurement influenced by, or impossible because of, attenuation in the vicinity of a critical frequency.

S Measurement influenced by, or impossible because of, interference or atmospherics.

T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.

V Forked trace which may influence the measurement.

W Measurement influenced or impossible because the echo lies outside the height range recorded.

X Measurement refers to the extraordinary component.

Y Lacuna phenomena, severe layer tilt.

Z Third magneto-electronic component present.

(ii) Qualifying Letters

The following letters are entered in the first column before a numerical value on the monthly tabulation sheets, if necessary.

A Less than. Used only when *fbEs* is deduced from *foEs* because total blanketing of higher layer is present.

D Greater than.

E Less than.

I Missing value has been replaced by an interpolated value.

J Ordinary component characteristic deduced from the extraordinary component.

M Mode interpretation uncertain.

O Extraordinary component characteristic deduced from the ordinary component. (Used for x-characteristics only.)

T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.

U Uncertain or doubtful numerical value.

Z Measurement deduced from the third magneto-electronic component.

(iii) Description of Types of *Es*

When more than one type of *Es* trace are present on the ionogram, the type for the trace used to determine *foEs* must be written first. The number of multiple trace is indicated after the type letter.

The types are:

f An *Es* trace which shows no appreciable increase of height with frequency.

l A flat *Es* trace at or below the normal *E* layer minimum virtual height or below the particle *E* layer minimum virtual height.

c An *Es* trace showing a relatively symmetrical cusp at or below *foE*. (Usually a daytime type.)

h An *Es* trace showing a discontinuity in height with the normal *E* layer trace at or above *foE*. The cusp is not symmetrical, the low frequency end of the *Es* trace lying clearly above the high frequency end of the normnal *E* trace. (Usually a daytime type.)

q An *Es* trace which is diffuse and non-blanketing over a wide frequency range.

r An *Es* trace showing an increase in virtual height at the high frequency end similar to group retardation.

a An *Es* trace having a well-defined flat or gradually rising lower edge with stratified and diffuse traces present above it.

s A diffuse *Es* trace which rises steadily with frequency and usually emerges from another type *Es* trace.

d A weak diffuse trace at heights below 95 km associated with high absorption and large *fmin*.

n The designation 'n' is used to denote an *Es* trace which cannot be classified into one of the standard types.

k The designation 'k' is used to show the presence of particle *E*. When *foEs* > *foE* (particle *E*) the *Es* type precedes k.

c. Definitions of the CNT, MED, UQ and LQ

Median count (CND) is the number of values from which the median has been computed. In addition to numerical values, the count may include certain descriptive letters.

Median (MED) is the middle value when the numerical values are arranged in order of magnitude, or the average of the two middle values if there is an even number of values.

Upper quartile (UQ) is the median value of the upper half of the values when they are ranked according to magnitude; *the lower quartile* (LQ) is the median value of the lower half.

B. SOLAR RADIO EMISSION

Solar radio observations at 200, 500 and 2800 MHz are carried out at Hiraiso. The observation equipment consists of two parabolic antennas, one with 10-meter diameter for 200 MHz measurements and one with 2-meter diameter for 500 and 2800 MHz measurements, Observations are continuously carried out almost from sunrise to sunset.

B1. Daily Data at Hiraiso

The three-hourly mean and daily mean values of the solar radio emission intensities are tabulated separately for 200 and 500 MHz measurements. The intensities are expressed by the flux density in 10^{-22} Wm^{-2} Hz^{-1} unit.

The table for 200 MHz measurements also presents the variability indices defined by the number of impulsive radio bursts within the three-hour intervals as follows:

0 quiet or no burst,

1 a few bursts,

2 many bursts,

3 very many bursts.

The daily variability index is defined as the daily mean of three-hourly indices.

The following symbols are used in the tables, when interference or radio bursts prevented measuring the base-level flux densities or determining the variability indices:

* Measurement impossible because of interference.

B Measurement impossible because of bursts.

Daily data within parentheses mean that the observation time does not exceed one third of the period.

B2. Outstanding Occurrences at Hiraiso

The table is a list of outstanding occurrences of solar radio emission bursts observed at 200, 500 and 2800 MHz during a month.

Listed in the table are the date, frequencies, the type of event, the start time and the time of maximum, both in U.T. expressed in hours, minutes and tenths of a minute, the duration in minutes, the peak and mean flux densities in 10^{-22} Wm^{-2} Hz^{-1} unit, and the polarization.

The type of event is expressed by a combination of a numerical code and a letter symbol in accordance with the " Descriptive Text of Solar Geophysical Data, NOAA " as defined by H. Tanaka in the " Instruction Manual for Monthly Report of Solar Radio Emission, WDC-C2 " in January 1975:

SGD Code	Letter Symbol	Morphological Classification
1	S	Simple 1
2	S/F	Simple 1F
3	S	Simple 2
4	S/F	Simple 2F
5	S	Simple
6	S	Minor
7	C	Minor+
8	S	Spike
20	GRF	Simple 3
21	GRF	Simple 3A
22	GRF	Simple 3F
23	GRF	Simple 3AF
24	R	Rise
25	R	Rise A
26	FAL	Fall
27	RF	Rise and Fall
28	PRE	Precursor
29	PBI	Post Burst Increase
30	PBI	Post Burst Increase A
31	ABS	Post Burst Decrease
32	ABS	Absorption
40	F	Fluctuations
41	F	Group of Bursts
42	SER	Series of Bursts
43	NS	Onset of Noise Storm
44	NS	Noise Storm in progress
45	C	Complex
46	C	Complex F
47	GB	Great Burst
48	C	Major
49	GB	Major+

The polarization is expressed by the polarization degree and sense as follows:

R or L	right- or left-handed polarization,
W,M or S	weak,moderate or strong polarization,
0	almost zero or unable to detect polarization due to small increase of flux,
00	polarization degree of less than 1 percent.

One of the following symbols may be attached after numerical values, if necessary.

D	greater than, or later than,
E	less than or earlier than,
U	approximate, or uncertain.

B3. Summary Plots of $F_{10.7}$ at Hiraiso

The 10.7 cm solar radio flux at Hiraiso is plotted over a one month period. The 10.7 cm flux ($F_{10.7}$) is determined by adjusting the 10.7 cm radio flux measured at Hiraiso to the Pentincton 10.7 cm radio flux. The figure on the right-hand side shows the $F_{10.7}$ index estimated at Hiraiso.

C. RADIO PROPAGATION

C1. H.F. Field Strength at Hiraiso

Field strength observation of 15 MHz standard waves transmitted from WWV and WWVH stations which are located respectively at Fort Collins, Colorado and Kauai, Hawaii, is carried out at Hiraiso. In order to avoid interference among the same frequency waves, the upper sideband of WWV or WWVH with the audio tone 600 Hz is picked up by the use of a narrow band-pass filter with 80 Hz bandwidth.Particulars of the transmitters and the receiver are summarized in the following table.

The tabulated *field strength* expressed in dB above one microvolt per meter is the average of quasi-peak values of the incident upper sideband field intensity for 45 seconds after the universal time indicated on the table. Abbreviated symbols are as follows:

CNT	number of observed values,
MED	median,
UD	value of the uppermost decile when they are ranked according to magnitude,
LD	value of the lowest decile when they are ranked according to magnitude,
U	uncertain,
E	less than,
C	innuenced by, or impossible because of, any artificial accident,
S	influenced by, or impossible because of, interferences or atmospherics.

C2. Radio Propagation Quality Figures at Hiraiso

The tabulated six-hourly quality figures are calculated for standard waves WWV transmitted from Fort Collins and WWVH transmitted from Kauai.

Quality figures expressing radio propagation conditions range over five grades as follows:

1	very poor(very disturbed),
2	poor(disturbed),
3	rather poor(unstable),
4	normal,
5	good.

Whole day quality figure ranged in grades of 1o, 1+, 2-, 2o, 2+, 3-, 3o, 3+, 4-, 4o, 4+, 5-, 5o stands for an average of six-hourly quality figures of the two circuits. Abbreviated symbols are as follows:

C	artificial accident,
S	propagational accident,
U	inaccurate.

Characteristics	Transmitter		Receiver
Station Call	WWV	WWVH	
Location	Fort Collins, Colorado	Kauai, Hawaii	Hiraiso, Ibaraki
latitude	40°41′N	22°00′N	36°22′N
longitude	105°02′W	159°46′W	140°38′E
Distance	9150 km	5910 km	--
Carrier Power	10 kW	10 kW	--
Power in each sideband	625 W	625 W	--
Modulation	50 %	50 %	--
Antenna	λ / 2 vertical	λ / 2 vertical	4.5 m vertical rod
Bandwidth	--	--	80 Hz for upper sideband
Calibration	--	--	Every hour

The column of conditions presents a record of the forecast of *radio propagation conditions* which is applicable to forthcoming 12 hours and broadcast six times par hour from JJY (Japan Standard Wave) staion. The conditions are denoted as follows:

N normal,
U unstable,
W disturbed.

Data on *geomagnetic storms* which are often correlated with radio propagation disturbances are tabulated based on reports from observation at Kakioka Magnetic Observatory, Japan Meteorological Agency. *Time* (U.T.) is expressed in hours and minutes (or tenths of an hour) , and *range* in nanotesla. When they are uncertain quantitatively, /'s are used to replace the numerical values. Continuation of a geomagnetic storm is denoted by ---.

C3. Phase Variation in OMEGA Radio Waves at Inubo

The phase values of eight OMEGA radio signals as received at Inubo are depicted for an interval of one month, along with the phase deviation defined as a deviation from a value averaged over the six quietest day within the month. Particulars of the received signals are given in the table below.

In each of the four panels of the figure, the phase (ϕ) is shown in the lower part and the phase deviation ($\Delta\phi$) is shown in the upper part. The phase data are sampled every 30 min, so the curves of the phase and phase deviation are composed of 48 data points per day. The phase delay is measured as a positive value.

The polar cap phase anomaly (PCPA) caused by the solar protons are well detected on the Norway signal. The start, end and maximum times of the PCPA are listed in the table next to the figure, where the times are expressed as day / hour & minute in U.T.. The maximum phase deviation in the list is defined as a phase advance (negative values in the figure) in degrees.

C4. Sudden Ionospheric Disturbances

a. Short Wave Fade-out (SWF) at Hiraiso

The table of short wave fade-out (SWF) is prepared from the record of field intensities measured at Hiraiso.

Drop-out intensities of the 10 MHz, the 20 MHz. and the 25 MHz waves are respectively distinguished by marks ′, ″, and ‴ from those of the 15 MHz wave for WWV and WWVH. Values of *start, duration, type,* and *importance* are obtained from data of the circuit whose drop-out intensity in dB is underlined as xx. When these quantities could not be determined accurately, they are accompanied by one of the following symbols.

D greater than,
E less than,
U uncertain or doubtful.

Types of fade-out are as follows:

S sudden drop-out and gradual recovery,
SL slow drop-out taking 5 to 15 minutes and gradual recovery,
G gradual and irregular in both drop-out and recovery.

Importance of fade-out is scaled according to its amplitude into nine ascending grades as 1-, 1, 1+, 2-, 2, 2+, 3-, 3, 3+.

Correspondence of solar optical and X-ray flares, and solar radio burst to SWF is marked by X, being determined with data from interchange messages of IUWDS and observations at Hiraiso.

In table (a) SWF, *date* indicates the day to which the *start-time* of the event belongs.

b. Sudden Phase Anomaly (SPA) at Inubo

Data of sudden phase anomaly (SPA) are prepared from the records of phase measurement of VLF radio waves received at Inubo. The transmitting stations are listed in the following table.

Phase advance is shown in unit of degree at its maximum stage. No transmission or no reception during the period is indicated by -, an indistinguishable record is spaced out, and a multi-peak event is marked by *. The most remarkable or distinct phase advance is underlined and listed in the column of *Time*.

In table (b) SPA, *date* indicates the day to which the *start-time* of the event belongs.

The following letters may be attached to the value, if necessary.

D greater than,
E less than,
U uncertain or doubtful.

Transmitting Stations

Name	Location (Geographic Coordinates)		Call Sign	Frequency (kHz)	Radiation Power (kW)	Arc Distance from Inubo (km)
Norway	66°25′N	013°08′E	Ω / N	13.6	10	7820
Liberia	06°18′N	010°40′W	Ω / L	13.6	10	14480
Hawaii	21°24′N	157°50′W	Ω / H	13.6	10	6100
North Dakota	46°22′N	098°20′W	Ω / ND	13.6	10	9140
La Reunion	20°58′S	055°17′E	Ω / LR	13.6	10	10970
Argentina	43°03′S	065°11′W	Ω / AR	13.6	10	17640
Australia	38°29′S	146°56′E	Ω / AU	13.6	10	8270
Japan	34°37′N	129°27′E	Ω / J	13.6	10	1040
North West Cape	21°49′S	114°10′E	NWC	22.3	1000	6990

HOURLY VALUES OF FOF2 AT WAKKANAI

SEP. 1993

LAT. 45.4N LON. 141.7E SWEEP .1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	50	50	48	51	52	54	72	73	75	65	66	67			61	70	66	72	75	78	N	56	19	38
2	46	43	43	18	34	44	67	64	66	71	76	67	70	66	64	71	69	67	72	78	66	65	58	51
3	54	51	47	47	48	51	50	60	77	74	61	66	70	86	62	70	71	52	64	73	N	51	A	35
4	34	40	29	30	A	A	A	A										A	52	A	50	46	34	34
5	29	43	35	50	50	52	53	A		56				57		56		53	63	54	54	55	44	37
6	32	35	40	43	43	52	A	58	58	67	56	53	58		60	48	59	56	60	62	52	55	52	40
7	43	42	40	40	40	A	53	78	74	60	66				61	60	65	66	74	66	54	49	49	
8	43	42	43	43	44	40	50	62	59	65	62	62	62	67	67	65	92	57	74	N	54	58	54	75
9	52	60		52	44	44	50	58	63	63	75	60	61	61	70	62	51	69	67	61	60	58	54	51
10	37	35	43	48	40	38			56	57		67	62	69		64	A	61	52	63	60	60	57	51
11	26	A	48	50	44	A		53		56	51	61	67		52	68	77	63	59	58	51	79	56	54
12	50	48	48	46	46	48	58	A	46	61	61	A		65	64	62	48	53	58	67	72	64	38	48
13	42	48	47	44	43	A	A	54	54	57	A	A	66	72	56	66	74	78	77	77	73		36	A
14	30	A	A	A	A	45	A										A	48	54	58	31	46	34	26
15	N		A	N	N	32	47		49	45	58	53		51		56	61	62	67	54	43	40	37	35
16	34	34	34	32	26		51	A	55	N	60	56	57	57	50	65	61	63	64	55	52	48	44	38
17	35	41	38	40	38	A	52	51	62	66	76	62	60	64	69	61	66	55	52	54	54	53	44	42
18	38	42	38	40	32	34	71		61	70	78	57	56	64	52	62	61	62	61	59	60	55	51	34
19	35	43	29	43			29	63	72								81	50	60	56	54	53	49	38
20	43	44	46	46	43	40	53	58	67	70	72	72	71	63	67	69	67	62	78	66	60	53	49	49
21	49	48	43	43	40	41	61	51	58	64	A	79	70	72	77	67	73	61	66	58	60	53	49	50
22	A	46	43	47	43	44	52	53		61	53	80	70	68	60	64	72	72	71	58	58	52	29	34
23																								
24	40	37	42	50	52	52	53	57	76	70	88	70	63	72	60	80	67	78	65	58	58	54	47	28
25	43	44	22	43	34	A	60	58	66	85	80	90	50	66	72	77	82	77	72	54	52	50	44	43
26	43	42	42	40	35	35	54	61	56	76	67	70	71	72	71	66	72	85	84	54	43	82	40	47
27	31	34	38	37	37	79	63	58	66	83	72	92	84	71	78	89	67	75	65	61	51	54	38	37
28	37	38	37	37	35	40	52	65	72	80	80	75	80	66	70	71	71	73	54	53	54	53	52	49
29	26	49	48	47	40	43	62	62	64	81	71	71	78	81	76	70	65	82	85	32	58	54	49	49
30	34	41	46	47	43	37		A	55	66	65	79	90	75	74	65	65	77	52	43	44	52	54	53
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	26	26	27	25	21	22	20	24	25	22	22	21	22	23	26	25	28	29	27	27	28	28	27
MED	38	42	42	43	43	44	53	58	62	66	66	67	67	66	64	66	67	63	65	58	54	54	48	42
U Q	43	48	46	47	44	51	61	62	69	72	76	75	71	72	71	70	72	74	73	66	60	57	52	50
L Q	34	40	38	40	36	39	51	55	56	60	61	61	60	64	60	62	63	56	58	54	51	51	38	35

HOURLY VALUES OF FES AT WAKKANAI

SEP. 1993

LAT. 45.4N LON. 141.7E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

DAY \ HOUR	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	26	G	32	38	31
2	25	G	26	33	31	G	G	G	G	G	53	G	G	G	G	G	56	51	54	G	50	33	32	G
3	G	26	G	G	G	26	38	59	56	G	G	G	G	50	G	G	G	40	34	33	36	70	59	35
4	33	32	34	31	28	28	50	66	G				G	G		G	G	53	51	45	37	36	28	27
5	30	G	23	25	28	32	G	34		G	G			G		G	G	31	36	32	G	40	143	30
6	G	G	24	24	24	G	34	G	G	G	G	G	G		G	G	G	G	G	26	G	G	25	24
7	G	G	G	G	G	40	G	G	G	G	G	G		G	G	G	G	52	28	25	G	G	G	G
8	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	24	G	G	G	G
9	G	G	G	G	27	G	G	37	G	G	G	G	G	G	G	G	G	33	G	26	23	G	38	32
10	34	26	24	G	G	G	G	G	G	G	G	G	50	G	G	59	38	G	41	37	150	36	56	33
11	29	48	36	35	29	147	G	G	G	G	G	G	G		G	G	46	36	33	28	36	26	27	G
12	94	26	28	30	G	G	32	36	55	63	G	53	G	G	G	G	G	29	32	G	G	G	40	42
13	31	36	G	G	G	29	39	G	G	G	60	48	G	G	G	G	45	G	G	G	G	G	26	26
14	29	27	29	24	28	28	33		G	G	G		G	G		G	38	G	G	G	33	28	G	G
15	G		23	22	23	28	30	G	G	G	G	G		G	G	G	G	38	29	25	G	G	G	G
16	G	G	G	G	23	27	32	35	36	G	G	G	G	G	G	G	G	32	26	G	G	G	G	G
17	G	G	G	G	G	36	G	G	G	G	G	G	G	G	G	G	G	G	32	37	28	G	G	G
18	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	48	G	29	36	32
19	28	G	G	G	G	G	G	G	G		G	G				G	G	32	36	G	G	26	36	G
20	G	G	G	G	32	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
21	G	G	G	G	G	G	28	35	36	51	68	G	G	G	51	56	50	45	38	41	35	27	28	40
22	66	G	G	G	G	G	30	G	G	G	54	G	52	58	G	G	G	G	26	26	25	35	33	37
23																								
24	G	G	G	G	G	28	G	G	G	G	G	G	G	G	G	G	G	34	29	39	30	40	32	37
25	G	G	28	24	33	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	29	30	G	G
26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	34	35	25	28	G	G	G
27	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	36	32	36	36	43	G	G
28	G	G	G	G	G	G	36	G	G	58	G	G	G	G	G	G	G	35	33	34	40	G	G	G
29	31	G	G	G	G	G	G	G	37	39	G	G	G	G	G	G	G	32	37	42	106	28	26	G
30	38	G	G	G	33	34	G	34	G	40	G	G	G	G	G	G	G	33	32	34	28	39	33	G
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	28	29	29	29	29	29	28	28	27	28	26	25	26	25	29	29	29	29	29	29	29	29	29
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	32	26	28	27	27	G
U Q	30	13	24	24	28	28	32	34	G	G	G	G	G	G	G	G	G	36	35	36	36	35	36	32
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	13	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT WAKKANAI

SEP. 1993

LAT. 45.4N LON. 141.7E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	15	14	14	17	16	17	26	27	30	47	26	26	24	23	21	26	20	15	15	15	15	15
2	15	14	16	14	15	16	22	18	28	29	27	49	49	51	46	34	20	17	16	16	15	15	15	16
3	15	15	15	14	14	16	17	16	18	21	29	53	48	23	42	44	16	18	16	15	15	15	15	15
4	14	14	14	15	14	17	16	20	18							20	18	17	17	16	14	15	16	14
5	15	14	14	16	15	16	22	17		44	46			48		18	18	17	16	16	16	16	15	16
6	15	15	15	15	15	18	16	18	46	46	48	49	48		46	30	18	21	20	15	15	15	16	15
7	15	15	15	15	14	15	18	45	20	26	28	48			30	45	42	18	16	15	15	15	15	16
8	15	15	15	14	15	15	22	17	22	22	48	49	49	48	46	46	18	23	16	15	15	23	22	16
9	15	15	18	15	15	16	17	18	18	23	48	47	47	48	26	44	18	18	17	15	15	15	15	14
10	16	17	17	16	15	17	27	46	42	34	32	46	32	54		22	18	23	16	16	15	15	17	15
11	16	15	15	15	15	18		24	24	27	28	46	27		46	18	20	17	16	15	15	16	15	15
12	16	16	16	15	15	15	16	18	23	20	46	18	27	47	20	17	18	17	18	15	18	15	16	15
13	16	15	15	15	16	16	16	21	28	30	28	28	27	33	30	20	24	17	21	15	15	27	15	17
14	14	14	14	17	15	16	20		20	20	23		21	22		30	21	22	17	15	15	16	15	16
15	17		17	17	16	16	16	18	21	52	47	45		46	49	31	26	16	18	15	15	16	16	15
16	16	15	15	14	17	16	16	18	24	45	47	46	47	47	45	41	27	16	15	15	15	18	15	15
17	15	15	15	15	16	15	20	28	20	20	18	48	48	48	46	44	28	23	18	15	16	15	14	15
18	15	16	15	15	15	16	23	28	46	47	18	46	48	22	20	31	27	17	20	16	15	16	15	15
19	17	15	18	15	17	22	23	28	45		56					20	27	16	23	16	16	15	16	15
20	15	15	14	15	15	16	26	27	17	45	45	44	50	47	48	47	27	24	17	14	17	16	15	15
21	15	15	14	15	16	16	18	18	26	21	21	50	21	20	17	18	17	22	17	15	16	16	16	15
22	15	15	15	15	15	16	17	30	29	52	36	49	47	46	49	42	46	17	17	15	15	15	14	14
23																								
24	15	15	15	14	14	16	21	16	16	48	48	45	46	18	44	45	27	16	17	15	22	15	15	15
25	15	15	16	16	14	16	23	17	20	20	22	20	44	18	46	45	20	18	16	15	15	16	16	16
26	16	15	15	15	15	17	22	27	17	45	45	47	46	46	44	18	21	17	16	15	15	17	16	17
27	15	15	16	17	14	16	16	27	45	44	45	46	45	45	46	49	27	17	16	15	15	15	15	15
28	15	15	15	16	14	15	16	27	50	46	30	48	46	45	44	46	27	16	16	14	22	21	16	16
29	14	15	15	16	15	15	20	18	27	30	30	47	46	28	24	45	18	15	15	16	17	17	18	20
30	16	17	16	15	14	14	15	24	50	29	46	46	50	46	45	44	27	17	16	15	15	15	15	15
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	28	29	29	29	29	28	28	28	27	28	25	24	24	24	29	29	29	29	29	29	29	29	29
MED	15	15	15	15	15	16	18	19	24	30	34	47	46	46	44	34	21	17	17	15	15	15	15	15
U 0	16	15	16	16	15	16	22	27	35	45	46	48	48	47	46	45	27	21	18	15	16	16	16	16
L 0	15	15	15	15	14	15	16	18	20	22	28	45	29	24	28	20	18	17	16	15	15	15	15	15

HOURLY VALUES OF FOF2 AT KOKUBUNJI

SEP. 1993

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	A	51	A	45	44	A	76	87	76	74	72	72	70	75	86	92	83	72	83	84	72	64	72	62
2	56	59	57	56	33	58	58	80	73	76	55	62	76	74	81	80	92	92	71	82	67	54	58	51
3	56	56	40	41			84	76	86	92	A	73	72	73	77	71	74	74	86	84	79	A	A	A
4	A	A	48	A	44		A	57	A	A	A				A		52	62	A	A	A	A	A	38
5	43	A	A	47	41	60	57	60	61	45	73	77	84	60	69	58	76	58	59	57	60	66	59	59
6	53	38	40	36	37		60	78	74	60	51			70	75	59	66	52	62	66	51	85	65	44
7	61	58	49	59	33	60	53	83	73	58	63	74	55	56	66	76	75	73	93	86	62	49	54	A
8	58	58	43	55	59		62	68	83	75	77	70	51	67	73	73	66	70	78	86	84	70	47	
9	32	57	60	54	40	64	76	76	72	70	61	65	70	72	73	66	61	67	90	85	90	68	65	66
10	59	56	60	44	44		64	86	75	66	72	57	71	A	66	68	70	94	89	88	58	A	A	62
11	55	43	52	46	46	A	64	79	54	63	58	71	74	71	77	71	66	64	84	66	A	61	50	54
12	54	50	47	54	42	46	51	79	67	62	61	68	73	76	74	72	59	72	64	88	82	62	58	53
13	60	A	55	46	43	57	57	85	85	58	66	58	82	74	56	71			82	A	79	64	65	34
14	56	47	48	43	54	43	47	54					55		49	58	63	55	79	A	A	A	A	A
15	A				A	56	60	62	67	54	52	66	55		59	74	83	70	67	68	A	71	76	61
16	31	44	55	49		38	60	78	80	49	71	72	66	42	73	74	76	74	83	83	62	60	71	A
17	54		60	58	N		57	84	76	84	60	69	A	73	70	61	61	66	67	65	51	A	44	55
18	56	50	60	40	31	43	61	70	78	66	66	72	70	64	63	62	66	78	80	66	63	53	56	58
19	47	45	48	56	41	43	48	73	75	76	65	73	77	75	66	68	64	80	84	66	58	59	49	48
20	43	48	48	50	66	32	56	76	72	70	70	74	72	68	74	71	72	85	95	73	A	A	A	A
21	A	A	42	40	32	38	74	67	66	62	74	84	91	87	83	81	71	81	85	82	58	A	54	48
22																								
23																								
24	41	46	32	44	40	42	57	77	78	95	76	82	68	67	69	73	82	90	83	68	49	48	46	46
25	41	59	46	47	37	A	58	83	67	86	93	101	114	90	75	83	83	93	83	54	35	46	46	46
26	48	41	42	43	43	47	57	84	78	72	75	78	70	70	74	81	87	91	91	64	37	56	51	49
27	A			44		50	63	88	80	72	70	85	84	86	75	74	80	83	88	62	64	69	52	60
28	44	43	47	58	29	60	88	98	68	74	80	87	86	78	72	75	78	92	99	66	49	35	52	53
29	53	52	60	50	42	52	90	92	93		74	84	84	86	82	90	86	94	A	A	42	42	A	50
30	43	48	48	42	45	30	51	69	72	95	97	81	92	98	87	75	83	82	75	53	44	47	39	53
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	23	21	24	26	23	19	27	28	26	25	25	25	25	24	27	27	27	27	26	24	23	21	22	22
MED	53	50	48	46	42	47	60	78	74	70	70	73	72	73	73	73	74	74	83	68	60	60	54	53
U Q	56	56	56	54	44	58	64	84	78	76	74	81	84	77	77	76	83	90	88	84	72	67	65	59
L Q	43	44	44	43	37	42	57	69	68	61	61	68	69	67	66	68	66	67	75	65	49	48	49	48

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

SEP. 1993

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

HD	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	41	41	86	46	44	34	28	37	G	G	43	G	47	45	G	G	G	G	G	G	40	28	30	34
2	40	30	33	26	57	40	29	48	G	G	G	G	G	G	G	G	G	G	36	58	48	71	58	50
3	40	40	34	28		G	G	58	66	73	85	52	45	49	53	55	44	60	60	64	70	95	66	66
4	70	60	104	61	41	G	59	39	44	51	46	G			46	G	G	64	92	126	89	53	57	54
5	45	48	26	24	26	30	40	62	G	45	G	G	G	52	G	G	G	G	G	G	25	56	40	G
6	G	G	G	G	G	G	30	43	G	G	G	G	G	G	G	G	G	G	30	40	G	G	38	G
7	G	G	G	G	G	G	G	46	G	G	G	G	G	G	G	48	81	47	80	36	26	40	26	25
8	G	G	G	G	G	G	71	40	G	G	G	43	G	G	G	56	G	36	43	59	29	G	G	G
9	G	G	G	G	G	G	31	40	44	G	G	G	G	60	60	G	G	34	55	33	41	59	48	45
10	G	G	G	G	G	G	G	41	55	45	48	52	50	58	G	G	46	34	G	33	48	54	51	50
11	46	38	42	34	26	24	47	56	62	44	50	55	57	46	G	62	52	51	51	35	90	64	40	58
12	36	29	30	G	26	31	G	G	G	G	59	45	G	43	G	G	G	34	G	26	23	G	26	23
13	22	35	G	G	G	G	29	56	42	40	G	46	46	G	G	47	G	36	58	70	98	60	44	G
14	G	25	30	G	G	27	38	37	G	G	G		G	G	49	44	58	40	65	118	58	48	43	35
15	28				24	26	33	41	43	G	G	G	G	G	G	G	G	35	32	48	66	26	48	43
16	G	G	41	G	44	G	58	37	40	G	44	G	G	G	42	G	G	56	49	70	54	G	G	28
17	29	G	24	G	G	G	32	76	46	G	G	G	62	59	60	64	48	62	65	107	104	51	G	G
18	G	G	G	25	G	G	G	G	G	G	G	G	G	G	G	G	G	33	34	34	29	G	30	G
19	G	G	G	G	G	G	G	33	G	G	G	G	G	G	G	G	G	G	32	29	30	30	28	G
20	G	G	G	G	G	G	60	G	G	42	G	G	G	G	G	G	34	35	26	44	58	70	59	55
21	47	52	38	26	G	G	G	40	44	54	G	48	G	G	50	G	41	34	26	59	30	95	48	36
22																								
23																								
24	G	G	G	G	G	26	28	33	40	G	G	G	G	G	G	G	G	30	24	G	G	28	25	G
25	24	G	G	G	27	44	58	G	40	G	G	G	G	G	G	G	33	35	44	33	38	G	28	G
26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	38	30	G	G	G	G	G	G
27	44			G		G	30	G	G	G	G	G	G	G	G	G	47	40	48	G	44	G	28	26
28	G	G	G	G	G	G	G	47	G	G	G	G	G	G	G	G	37	35	30	28	36	33	33	29
29	G	32	G	G	G	47	48	66	55		68	53	55	47	G	G	41	95	108	60	40	30	33	G
30	G	G	G	G	23	G	G	41	40	43	G	G	G	G	G	G	G	G	G	26	33	28	G	G
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	26	26	27	26	28	28	28	28	27	28	27	27	27	28	28	28	28	28	28	28	28	28	28
MED	G	G	G	G	G	G	30	40	20	G	G	G	G	G	G	G	G	35	35	36	40	32	33	26
U Q	40	35	33	25	26	26	43	47	44	43	43	45	45	46	21	22	42	43	56	59	58	57	48	44
L Q	G	G	G	G	G	G	G	33	G	G	G	G	G	G	G	G	G	30	25	27	29	G	26	G

HOURLY VALUES OF FMIN AT KOKUBUNJI

SEP. 1993

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	14	14	14	14	14	15	14	15	34	30	32	22	21	43	48	45	33	18	17	15	14	15	15	16
2	14	16	14	14	14	15	14	15	20	43	43	44	49	45	44	40	36	20	15	16	16	15	15	15
3	15	15	15	14		15	20	22	29	22	20	30	33	32	30	29	18	14	15	14	14	15	15	14
4	15	14	14	14	14	15	15	16	27	32	30	38			28	40	23	16	14	15	15	16	15	14
5	14	14	15	14	15	15	16	18	26	22	48	50	26	24	39	39	18	15	16	15	16	15	14	15
6	17	16	14	15	15	15	17	15	20	43	26	46	46	24	18	17	14	14	14	14	16	14	15	16
7	17	14	14	15	15	14	17	14	39	43	36	43	50	46	34	32	14	14	15	15	15	15	14	15
8	15	15	15	15	15	18	15	22	32	36	20	22	42	22	21	15	16	16	15	15	15	17	15	16
9	16	16	16	14	15	15	20	14	28	35	40	46	43	22	24	18	18	17	14	15	14	15	14	15
10	16	15	15	14	15	22	22	15	18	35	30	30	32	29	44	37	16	14	15	14	15	15	15	15
11	15	14	15	15	16	15	15	16	24	34	33	34	32	38	44	26	17	14	14	15	16	15	15	14
12	15	16	15	15	14	15	22	14	15	21	20	22	40	18	18	32	26	24	15	15	15	14	15	15
13	15	14	15	14	14	15	15	15	26	29	42	35	33	42	44	18	14	14	14	15	16	14	15	20
14	15	15	14	14	16	15	14	14	16	20			46	18	20	18	15	14	14	14	15	14	14	15
15	15				16	15	15	15	16	34	21	46	42	46	36	38	34	15	14	15	15	14	15	15
16	15	15	15	14	14	15	14	15	16	40	42	52	40	44	21	16	16	16	14	15	15	15	15	15
17	15	18	17	15	15	15	17	15	16	35	21	26	27	22	17	16	15	14	15	15	15	14	14	15
18	15	15	15	14	15	15	15	29	17	23	43	44	44	16	41	42	16	14	15	14	14	15	15	16
19	15	15	15	14	14	15	14	15	17	17	45	45	26	44	21	16	18	16	14	14	15	15	14	15
20	15	15	14	14	14	16	15	14	32	39	35	43	44	37	36	17	15	15	14	14	14	14	14	15
21	15	14	14	15	14	15	14	15	15	21	36	20	41	38	18	35	16	14	14	14	15	15	15	15
22																								
23																								
24	17	16	15	14	15	14	14	17	16	34	34	43	26	23	21	15	18	14	15	15	15	15	15	16
25	15	15	14	16	14	14	14	14	15	18	42	36	44	41	34	14	14	15	15	14	15	15	14	17
26	15	15	16	14	14	15	20	14	16	18	43	43	43	42	34	20	14	14	14	16	15	16	15	15
27	15			15		15	16	29	21	34	44	40	43	42	35	15	14	15	14	18	15	14	14	15
28	17	14	15	15	14	15	16	14	20	20	18	44	44	35	34	18	15	14	15	14	15	15	15	14
29	15	14	15	14	15	15	14	15	18		32	32	28	33	38	20	17	15	15	15	14	14	15	15
30	16	15	15	16	15	15	20	15	18	41	40	44	43	42	35	18	16	18	14	15	15	15	14	15
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	26	26	27	26	28	28	28	28	27	27	27	27	27	28	28	28	28	28	28	28	28	28	28
MED	15	15	15	14	15	15	15	15	19	34	35	43	42	37	34	19	16	15	14	15	15	15	15	15
U Q	15	15	15	15	15	15	17	16	26	36	42	44	44	42	38	36	18	16	15	15	15	15	15	15
L Q	15	14	14	14	14	15	14	14	16	21	26	30	32	23	21	16	15	14	14	14	15	14	14	15

HOURLY VALUES OF FOF2 AT YAMAGAWA

SEP. 1993

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	62	54	57	52	44		45	71	70	76	A	80	A		102	102	97	97	87	88	66	52	60	60
2	54	53	47	52	35		A	71	80	67	61	65		87	85	100	97		82	77	A	A	88	62
3	A	A	58	A		59	46	64	88	95	74	A		76	78	76	82	78	78	77	A	80	67	
4	66	63															A	A	66	62		A		53
5		A				A	A	54	55	62	63	73	84	86	81	67	66	65	61		64			
6				N	30	36	64		66	66	58	64	70	68	62	61	60	59	57	88				
7				25	34		41	66	63	63	57	68	71	70		72	73	69	84					
8															72	67	67		78	87	65			
9				75	66		43	72	68	67	75	80	73	77	75	72	66	66	68	87	89			
10													71	78	75	77	83	91	87	87			A	A
11	A			A			47		66	71		75	87	86	90		62	70	81	88	80	49	A	
12	A			55	40		34	64	61															
13												68	86	75	66	77	111	111	80		79	49		57
14				49				66	62	52	70	78	81	71	80	80	61	67	77	88	90	A		34
15				79			43	57	76	70	64	65		66	76		84		A	A	A	A		96
16					69		79	64	83	71	74	72	65	76	75	66	66	77		96	89			
17											68	67	80	85	85	72	66	75	78	73	51	A	A	A
18	A	96	53	79				62	78	82	A	82												
19																								
20																								
21																								
22																								
23							65	54	76	74		74	73	75	71	65	75	91			64			
24							79	66	74	82	73	77	74	78	82	84	84	87	108	105	58			
25				38				88	82		87	105	117	97	87	90	77	83	79	67				
26																								
27																			84					
28								66	66	77	87		90	94	94	77	84	112	111	89				
29	A							84	76	84	78	84	87	95	94	95	105	111	87	A		A	A	
30								66	77	102	105	90	100	121	126	111	101	87	89	A	A			
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT							11	17	19	17	15	18	16	19	20	19	21	18	20	15	11			
MED							46	66	74	71	73	74	80	78	80	77	77	80	80	87	66			
U Q							65	71	78	82	78	80	87	87	88	90	90	91	87	88	89			
L Q							43	63	66	66	63	68	72	75	75	67	66	69	77	77	64			

HOURLY VALUES OF FES AT YAMAGAWA

SEP. 1993

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	24	G	G	34	43	36	44	62	80	109		72	55	44	49	43	G	80	43	33	G
2	49	55	G	G	35	G	52	40	43	40	60	G	G	60	61	67	42		73	37	80	92	58	50
3	72	41	30	30	G	30	G	39	48	58	58	79		50	G	48	55	50	40	86	90	58	G	G
4	G	G															74	81	48	41	G	32	G	G
5	G	30	G		G	28	30	G	48	40	G	G	45	G	G	G	G	G	G		G	G	G	G
6				G	G	G	G		G	G	G	G	G	G	G	G	G	39	32	37	32	G	G	
7		G		G	G		G	38	48	G	G	G	G	84		76	82	69	62					
8															G	G	G		36	G	G	G	G	G
9	G	G	G	G	G		G	G	42	G	G	G	G	43	G	G	G	G	34	29	29	G	G	G
10													G	G	G	G	G	G	34	31	31	G	29	40
11	40	G	G		G	G	G		44	49	G	49	60	48	82		G	38	32	G	G	G		G
12	40	G	G	G	G	G	G	G	G															
13												G	44	G	G	G	G	38	33	G	G	G	32	G
14	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	51	51	G	38	G	G	48		G
15		G		G	G	G	G	46	37	G	G	G		G	G		53	160	163	132	134	44		G
16		G		G	G	G	G	36	G	44	49	G	G	G	G	G	G	G		38	G	G	G	
17											G	G	G	G	G	G	G	G	49	81	G	91	58	77
18	85	G	G	G	G	G	G	G	G	G	79	G	G											
19																								
20																								
21																								
22																								
23	G	G	G	G	G	G	G	G	36	G	G	43	59	60	58	G	46	32	32		38	G	G	G
24	G	G	G	G	G	G	G	31	G	44	52	44	G	G	G	G	G	G	G	G	G	G	G	
25	G	G	G	G	G			40	38	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
26	G																							
27																		G	G	G				
28	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	44	40	39	G	G	G	G	G
29	35	G	G		G	G	G	34	60	49	G	48	54	G	60	G	G	36	G	39	G	32	33	G
30	G	G	G	G	G	G		40	60	70	61	G	G	G	G	G	G	G	G	61	45	G	G	G
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	17	19	15	16	19	16	17	17	19	18	19	20	19	19	20	19	22	21	22	20	21	21	18	18
MED	G	G	G	G	G	G	G	34	37	20	G	G	G	G	G	G	G	32	34	30	G	G	G	G
U Q	40	G	G	G	G	G	G	40	48	44	58	43	45	48	29	48	46	44	43	40	41	43	32	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT YAMAGAWA

SEP. 1993

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	27	23	15	16	15		15	15	15	16	30	30	33		30	28	16	16	30		16	15	15	
2	28	16	15	28	16		15	23	16	17	29	32		28	28	17	16		16	15	38	15	16	24
3	15	23	15	21		15	15	20	16	26	30	33		33	32	30	24	17	32	22	22	20	21	
4	39	22															29	33	17	17	20		28	22
5	22	29			26	18	24	38	29	28	44	48	36	49	48	45	39	27	16		24			
6				18	18	18	33		39	46	43	45	49	49	44	22	48	26	17	18	23			
7		28		20	17		17	21	20	24	27	46	48	34		27	23	20	16					
8															44	45	44		27		21	22		66
9		24	18	18			18	26	27	26	44	45	46	28	26	26	20	39	16	18	22			26
10													45	49	44	44	40	18	16	17	18		20	22
11	18	24	22				17		23	28		34	29	28	45		18	18	16	16	46	34		
12	20	22		22	21		21	39	35															
13												27	47	44	45	44	42	18	16		48	45	18	23
14				21		22			46	38	49	43	54	44	44	33	28	49	17			26		18
15				22			18	18	23	28	29	45		50	48		30	22	24	23	21	17		22
16				21	22		18	16	40	23	27	45	46	49	27	24	54	38		18	22			
17											44	45	46	46	45	44	34	18	16	17	17	20	17	18
18	21	17	18	18	27			27	38	44	38	46												
19																								
20																								
21																								
22																								
23				22			24	24	22	34		36	28	28	26	20	23	20	22		21			
24							24	26	21	26	24	27	38	46	44	42	30	26	18	24	44			
25				22				18	24		24	45	45	44	43	42	30	42	18	23				
26																								
27																								
28				22			23	17	34	32	39		45	59	43	33	30	22	17	22				66
29	17		27					18	23	27	42	33	34	44	35	38	30	20	43	20		20	20	66
30		21			20			27	39	29	32	44	43	42	40	40	44		26	30	22	39		
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT		11		14			14	16	19	17	17	19	17	19	20	19	22	19	21	15	17	11		11
MED		23		21			18	22	24	28	32	44	45	44	44	33	30	22	17	18	22	20		23
U Q		24		22			24	26	38	33	43	45	46	49	44	44	40	33	25	23	31	34		66
L Q		21		18			17	18	21	25	28	33	35	33	31	26	23	18	16	17	20	17		22

HOURLY VALUES OF FOF2 AT OKINAWA

SEP. 1993

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1			34	55	35	34	38	66	69	72	78	80	86	91	104	A	A	91	119	90	66	58	52	54
2	56	48	51	37	A	A	32	65	77	62		74	90	89	N	93	92	92						
3										70	66	68	80	88	89	87	91	91	80	A	72	62	54	59
4	A	53	43	A	A	35	N	79	A	A	65	A	91	90	A	81	64	74	75	66	53	42	40	A
5	51	38	36	A	A	A	A	53	60	66	65	70	87	94	93	90	78	82	77	84	64	58	42	42
6	38	38		42	35	29	35	56	63	73	62		75	77	71	61	66	63	80	88	50	38	38	34
7	35	34	35	29		29	37	66	60	66	62	76	80	87	91	75	82	86	88	71	54	42	40	A
8	42	A	31	29	A	A	30	60	80	81	59	71	75	87	78	74	74	76	85	82	76	54	40	38
9	40	35	38	40	35	28	34	62	71	66	71	90	85	80	88	91	77	77	87	87	88	52	35	34
10	A	34	34	35	35	28	32	62	70	64	66		70	88	88	81	93	75	91	86	73	A	A	A
11	A	A	A	A		A	30	56	67	81	76	88	74	76	93	91	82	89	91	90	66	43	36	42
12	38	40	43	51	N		30	65	65	66	66	82	78	90	91	86	88	94	90	86	55	37	28	A
13		29		30	31	31	37	77	66	58		82	85	87	87	91	109	107	78	72	82	42	34	42
14	A	30	N	34			29	61	61	66	70	82	87	87	90	88	78	88	81	85	54	A	31	A
15	34	34	35		A		31	61	78	81	67	85	90	88	90	N	112	122	A	A	A	A	A	35
16	35	34	34	35			30	66	80	85	75	77	92	92	91	77	77	86	90	87	A	32	A	38
17	A	35	43	A	A	A	28	63	84	82	69	84	82	79	142	121	122	109	104	A	A	A	A	A
18	34	A	38	45			26	63	76	91	83	92	119	123	95	107	94	92	86	59	74	43	41	53
19	41	54	53	48	30		30	60	61	72	85	109	112	124	90	112	94	116	90	81	37	42	44	34
20	41	42	34	35			26	59	72	78	74	77	84	91	91	86	90	92	78	88	74	A	A	41
21	41	36	35	37		36	44	61	71	70	81	94	86	90	88	91	92	104	78	74	87	A	38	
22	40	42	43	36	34	29	31	60	75	65	64	72	85	75	108	90	75	N	90	73	N	A	A	A
23																								
24	A	A	A	36	N	N	28	66	87	78	70	77	80	91	95	95	94	90	107	90	64	34	38	34
25	37	38	45	44	N		N	61	81	75	92	111	116	118	105	88	90	67	66	80	53	37	43	37
26	38	42	41	44	35	28	34	67	82	68	76	82	91	90	88	101	101	90	76	64	62	53	35	42
27	42	40	42	40	34	35	20	66	75	86	80	95	103	104	95	95	111	105	89	90	73	42	37	42
28	42	32	38	37	36	35	38	34	66	76	103	94	107	111	107	103	108	136	122	51	52	18	34	34
29	34	34	35	34	N	28	32	68	77	85	85	94	98	104	107	111	121	137	86	66	53	26	58	32
30	38	54	41	35	35	34	36	66	77	101	107	104	122	161	176	171	161	145	104	87	76	A	A	52
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	20	23	23	23	11	14	25	28	27	28	27	26	29	29	27	27	28	28	27	25	24	20	21	20
MED	39	38	38	37	35	30	31	62	72	72	71	82	86	90	91	91	92	91	87	84	65	42	38	40
U Q	41	42	43	44	35	35	35	66	78	81	81	94	95	99	104	101	104	106	91	87	74	52	42	42
L Q	36	34	35	35	34	28	29	60	66	66	66	77	80	87	88	86	78	84	78	71	53	37	35	34

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT OKINAWA

SEP. 1993

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	G	G	G	40	G	72	G	74	54	91	114	93	80	64	61	25	G	G	30
2	34	31	G	31	36	46	29	G	46	G	G	G	G	G	70	G	G	42						
3										45	53	57	G	77	68	83	58	52	58	71	60	72	40	48
4	59	40	40	45	34	G	25	90	86	92	58	80	G	78	99	G	G	G	29	G	30	28	G	60
5	39	33	29	80	31	40	35	44	48	48	43	G	G	G	G	G	G	G	G	G	G	G	G	G
6	G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	38	28	G	G	G	G
7	G	G	G	G		G	26	32	42	G	G	G	G	G	43	G	41	51	57	48	44	38	38	34
8	40	42	46	34	37	26	24	G	38	50	68	G	G	43	G	G	G	40	42	38	28	G	G	G
9	G	G	G	G	G	G	G	32	G	G	42	G	G	G	G	G	G	G	31	35	36	G	G	G
10	27	25	G	G	G	G	G	33	40	39	G	G	G	G	G	70	G	50	51	33	44	40	55	32
11	33	30	32	34	G	34	G	31	41	52	54	48	G	G	G	G	40	41	36	31	G	G	G	G
12	G	G	G	G	G		G	32	36	G	G	G	G	G	G	G	G	45	39	36	44	G	G	26
13		G		G	G	G	G	33	37	G		G	G	G	G	G	38	40	31	G	G	G	36	30
14	28	G	G	G		G	G	G	G	G	G	58	G	G	46	53	54	48	51	39	36	35	40	45
15	G	G	G		26		23	34	53	60	G	G	G	G	G	52	61	82	113	92	84	82	68	40
16	34	G	G	G			26	48	44	40	G	G	G	G	G	G	G	59	41	93	88	80	94	32
17	41	33	26	28	31	25	G	31	41	43	G	G	G	G	82	51	G	G	90	107	92	94	78	44
18	G	38	34	G	G		32	G	G	50	46	G	G	G	G	G	G	45	51	59	G	G	G	G
19	G	G	25	G	G		G	G	G	G	G	G	G	G	G	G	50	66	44	42	G	G	G	G
20	G	G	G	G			G	G	39	G	G	G	G	G	G	51	71	88	58	62	65	68	33	32
21	G	G	25	G	G	28	25	34	38	G	G	G	G	G	42	40	42	66	83	32	32	39	28	G
22	32	25	24	G	37	25	24	29	G	47	57	44	45	46	G	G	G	46	47	37	33	40	36	40
23																								
24	33	28	25	G	G	G	G	33	36	48	G	59	46	G	G	G	G	G	26	G	G	G	G	G
25	G	G	G	G	G		G	30	36	68	46	49	52	G	G	G	G	34	G	G	G	G	28	G
26	G	G	G	G	G	G	G	38	44	44	G	77	G	G	G	G	40	36	26	G	G	G	G	24
27	G	G	G	G	G	26	26	32	37	41	42	G	G	47	57	40	44	43	41	33	24	24	G	28
28	G	G	G	G	G	G	24	39	G	G	G	G	G	56	69	G	G	39	30	30	32	30	28	30
29	25	25	25	26	G	G	G	38	43	48	46	44	44	47	G	66	44	44	31	41	28	32	40	32
30	25	G	G	G	G	G	22	33	48	44	46	60	G	G	46	43	40	34	28	33	33	40	41	30
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	28	26	27	24	21	28	28	28	29	28	29	29	29	29	29	29	29	28	28	28	28	28	28
MED	G	G	G	G	G	G	G	32	38	41	G	G	G	G	G	G	G	43	41	36	31	26	28	30
U Q	33	29	25	26	28	26	25	34	43	48	46	48	G	44	51	51	44	51	54	53	44	40	40	33
L Q	G	G	G	G	G	G	G	G	18	G	G	G	G	G	G	G	G	34	30	29	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT OKINAWA

SEP. 1993

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	29		20	22	20	26	16	28	22	50	33	52	49	36	35	28	23	22	14	16	22	24	17	24
2	17	15	15	15	16	14	14	15	17	28		53	28	29	35	58	35	27						
3										30	33	36	58	48	32	29	28	21	16	16	15	17	15	15
4	16	16	15	15	14	16	14	15	22	28	32	62	59	32	33	49	30	26	15	17	16	15	21	16
5	15	21	16	17		15	15	17	26	27	30	29	55	53	49	50	26	27	23	18	17	16	17	15
6	27	16		16	14	21	15	15	20	34	50		52	52	56	45	40	29	16	15	16	27	15	16
7	16	16	16	15		16	15	18	18	23	29	53	50	52	35	34	29	21	16	14	15	16	15	16
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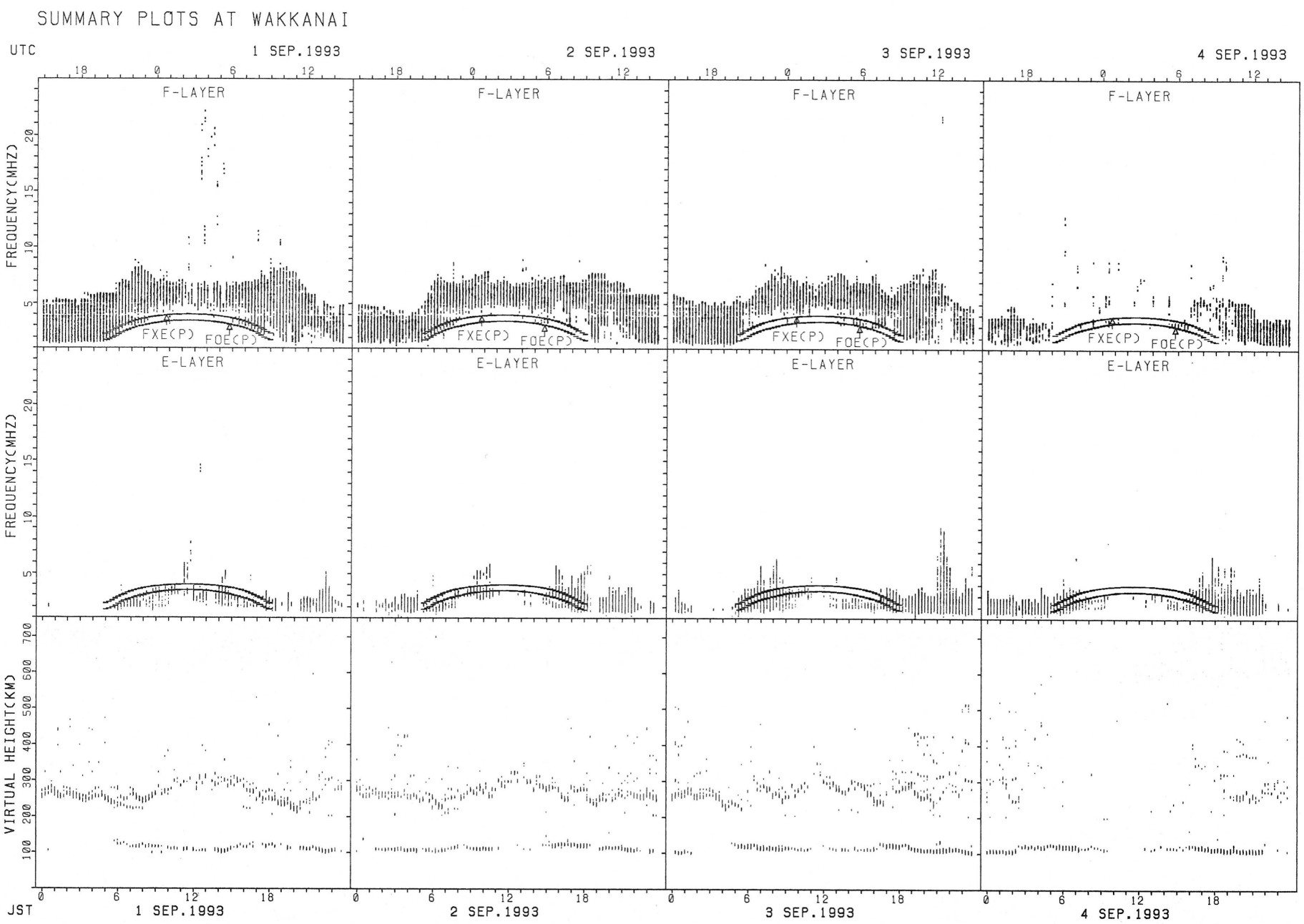
COMMUNICATIONS RESEARCH LABORATORY, JAPAN


SUMMARY PLOTS AT WAKKANAI
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E-LAYER
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FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
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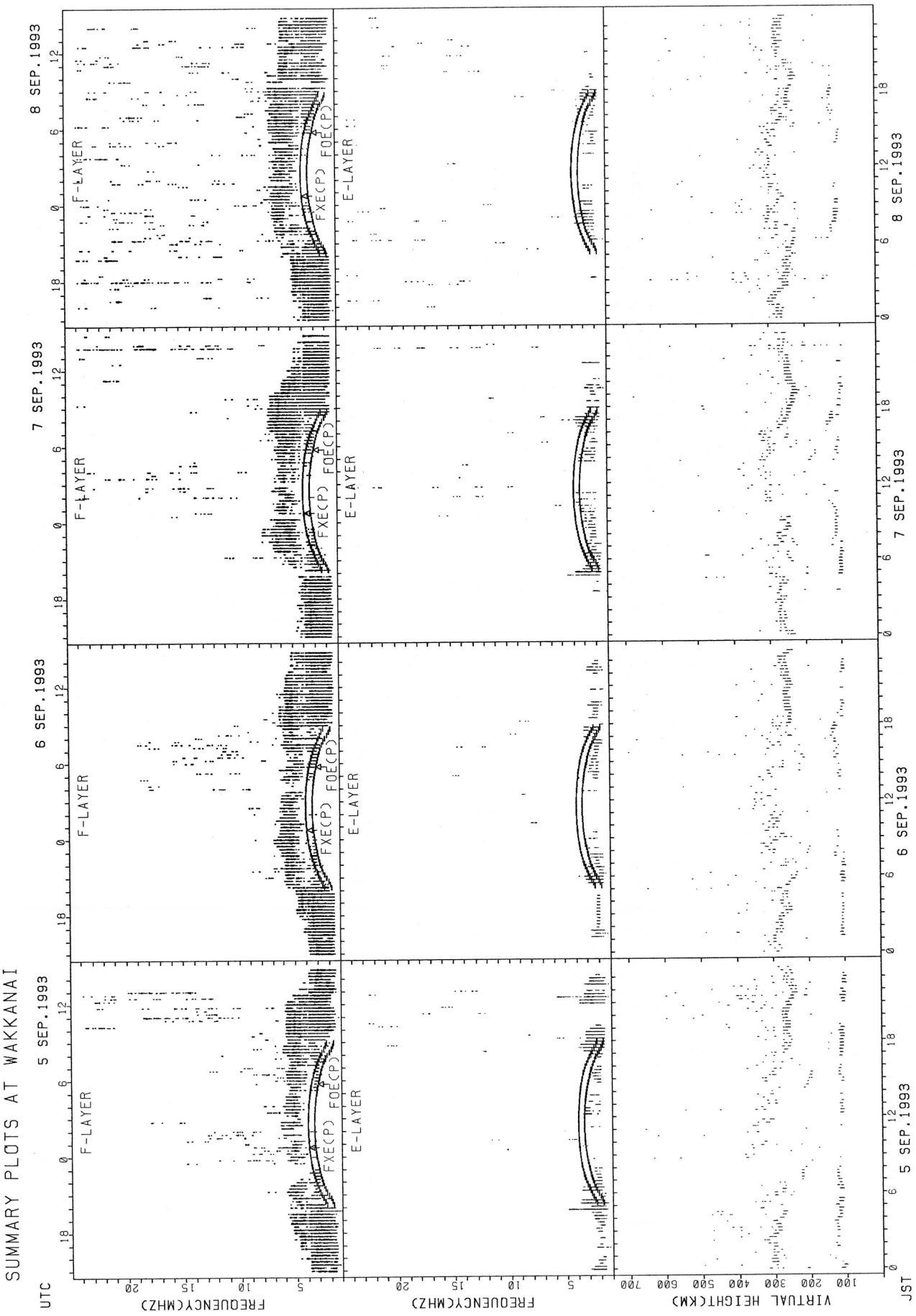
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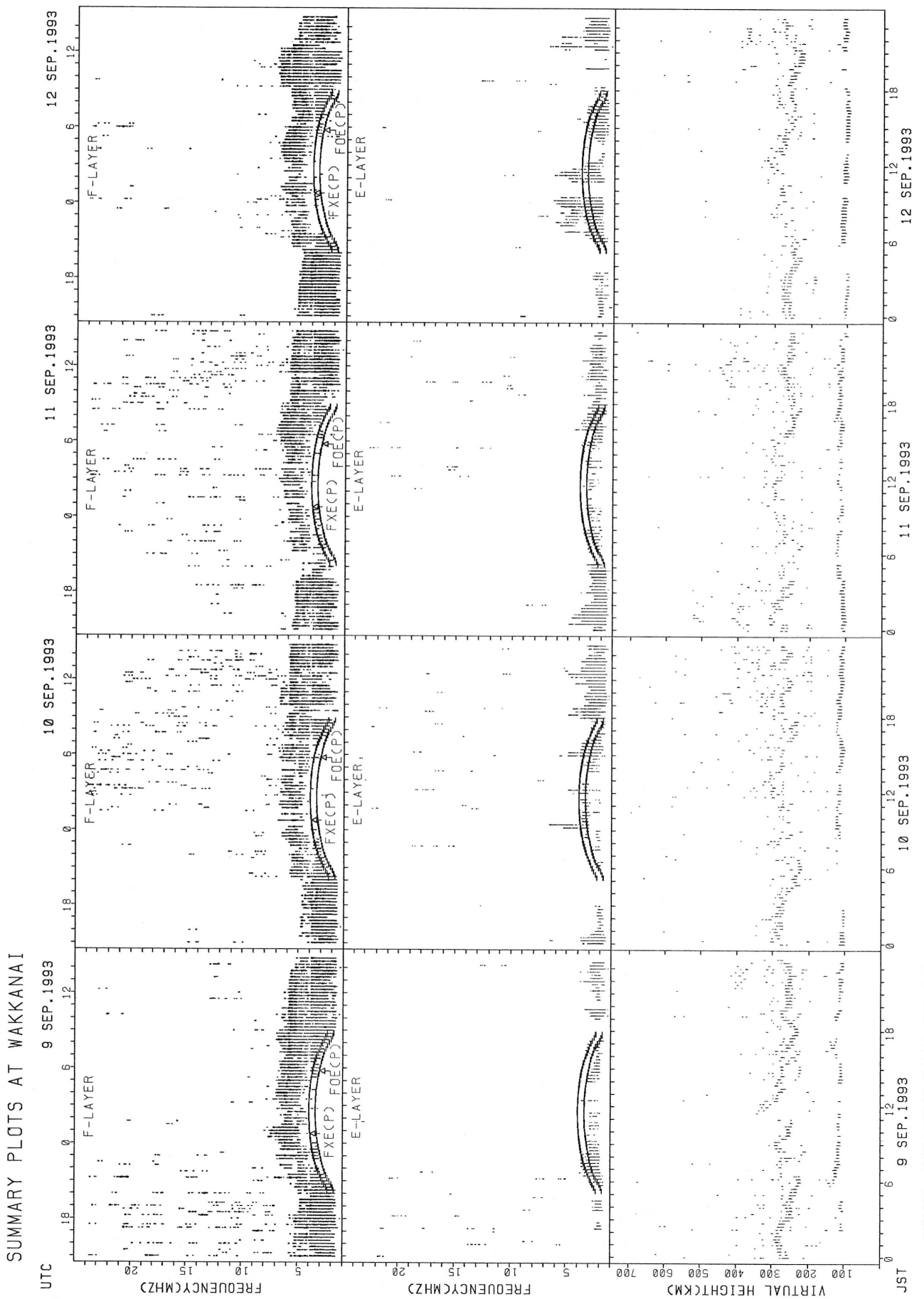
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E-LAYER
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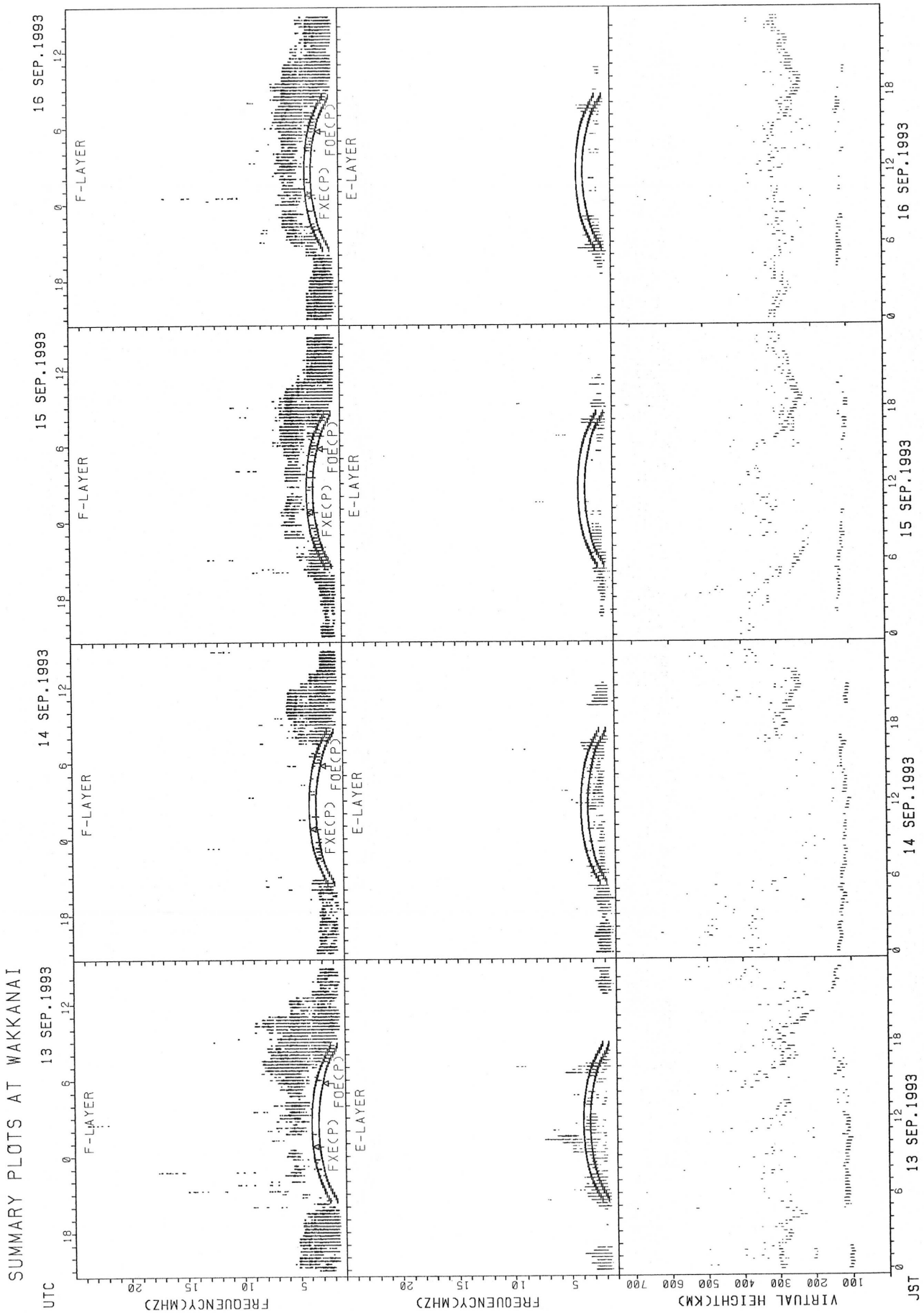
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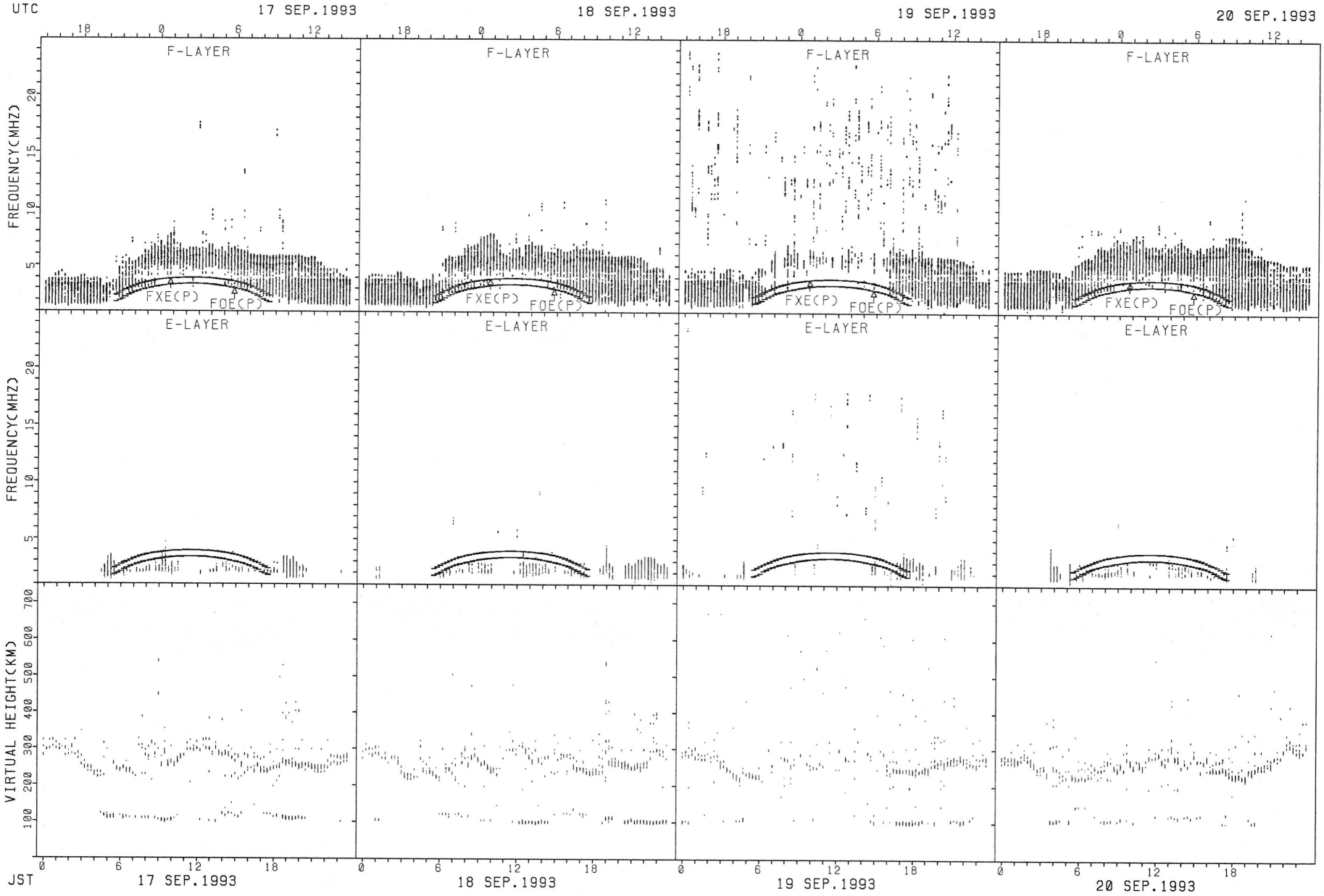
SUMMARY PLOTS AT WAKKANAI



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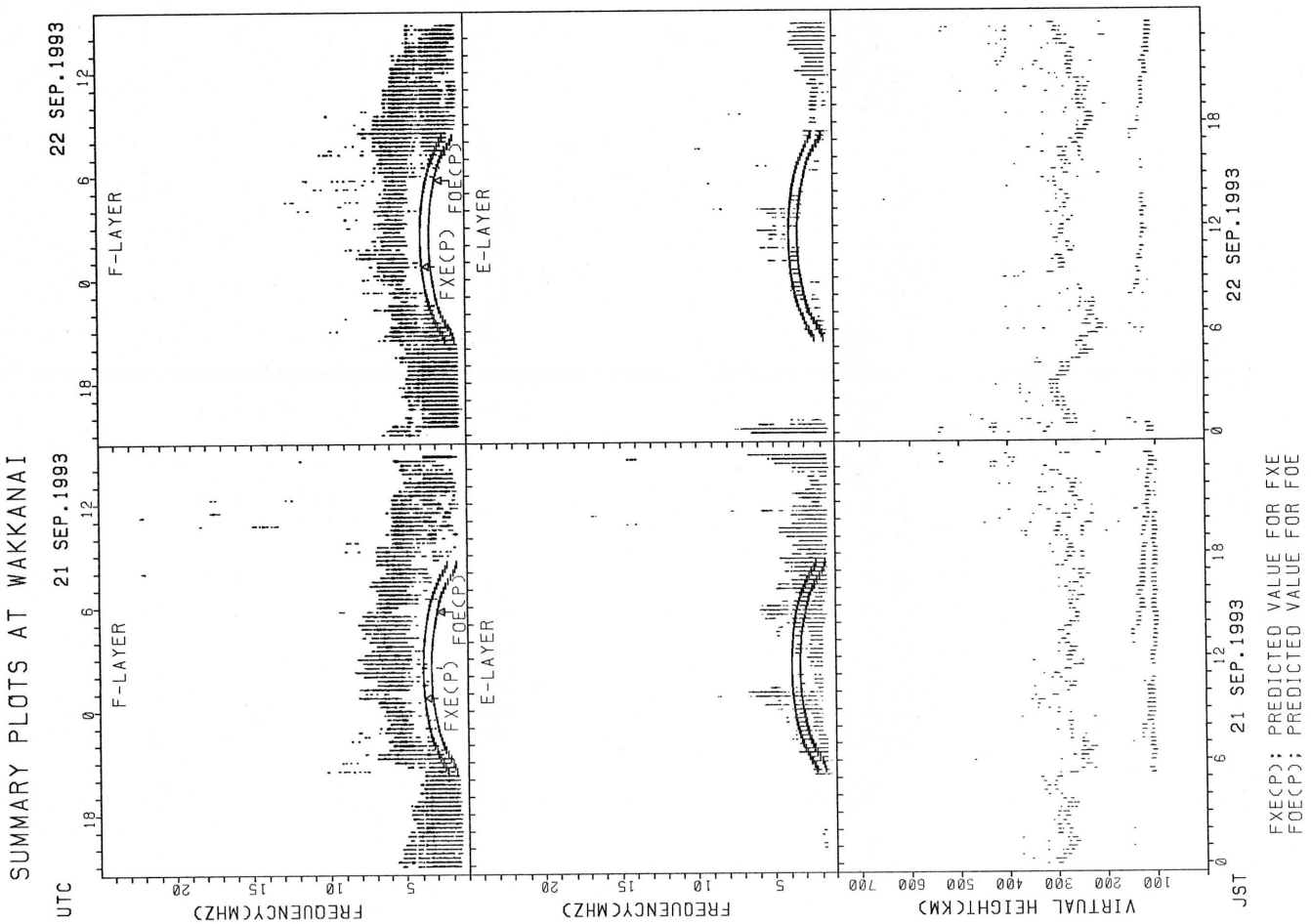
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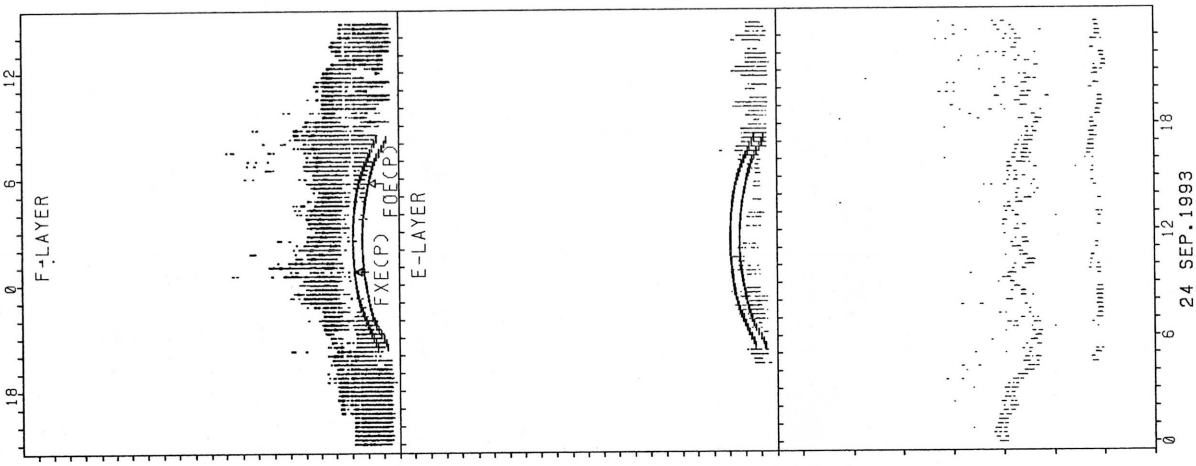
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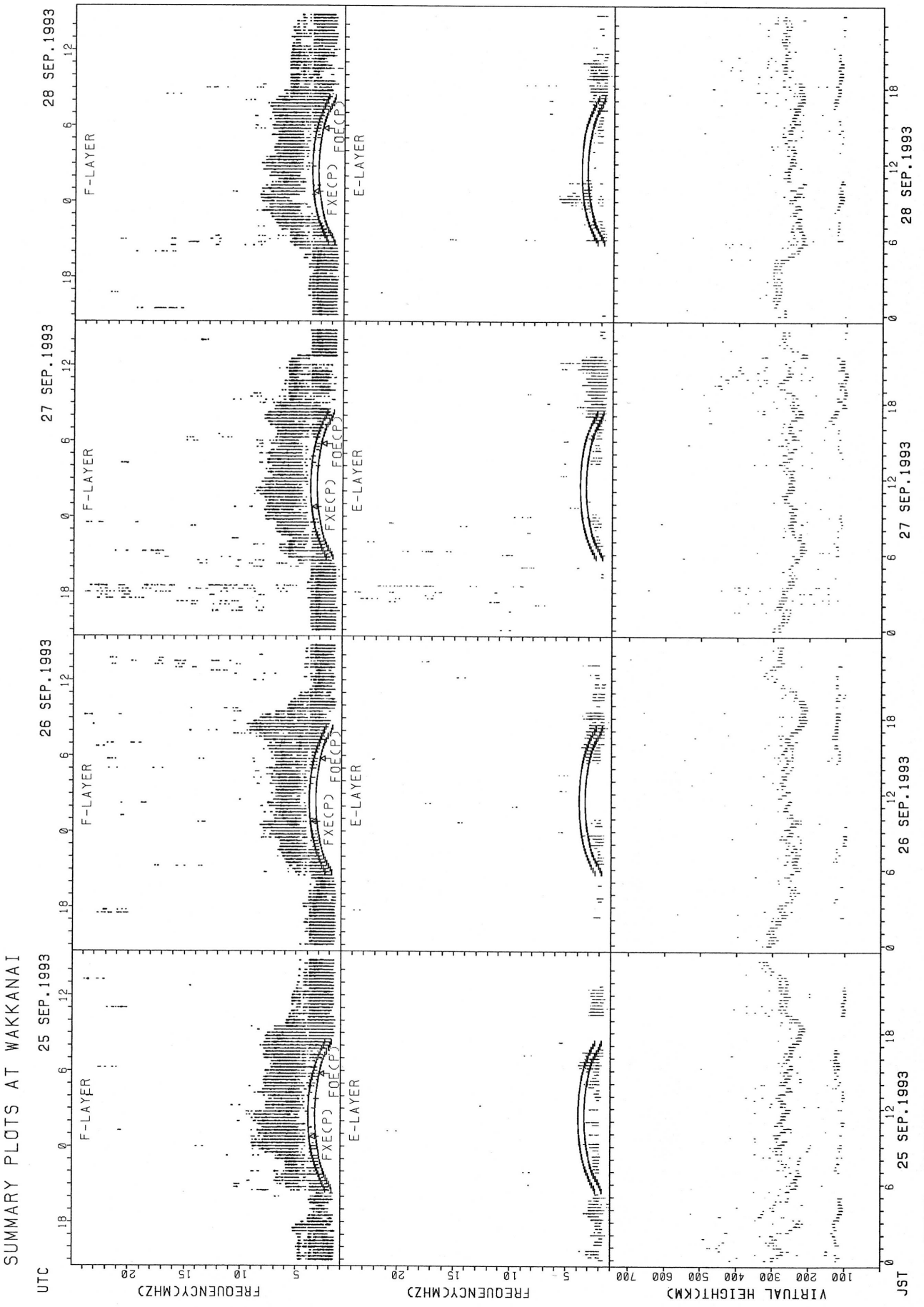
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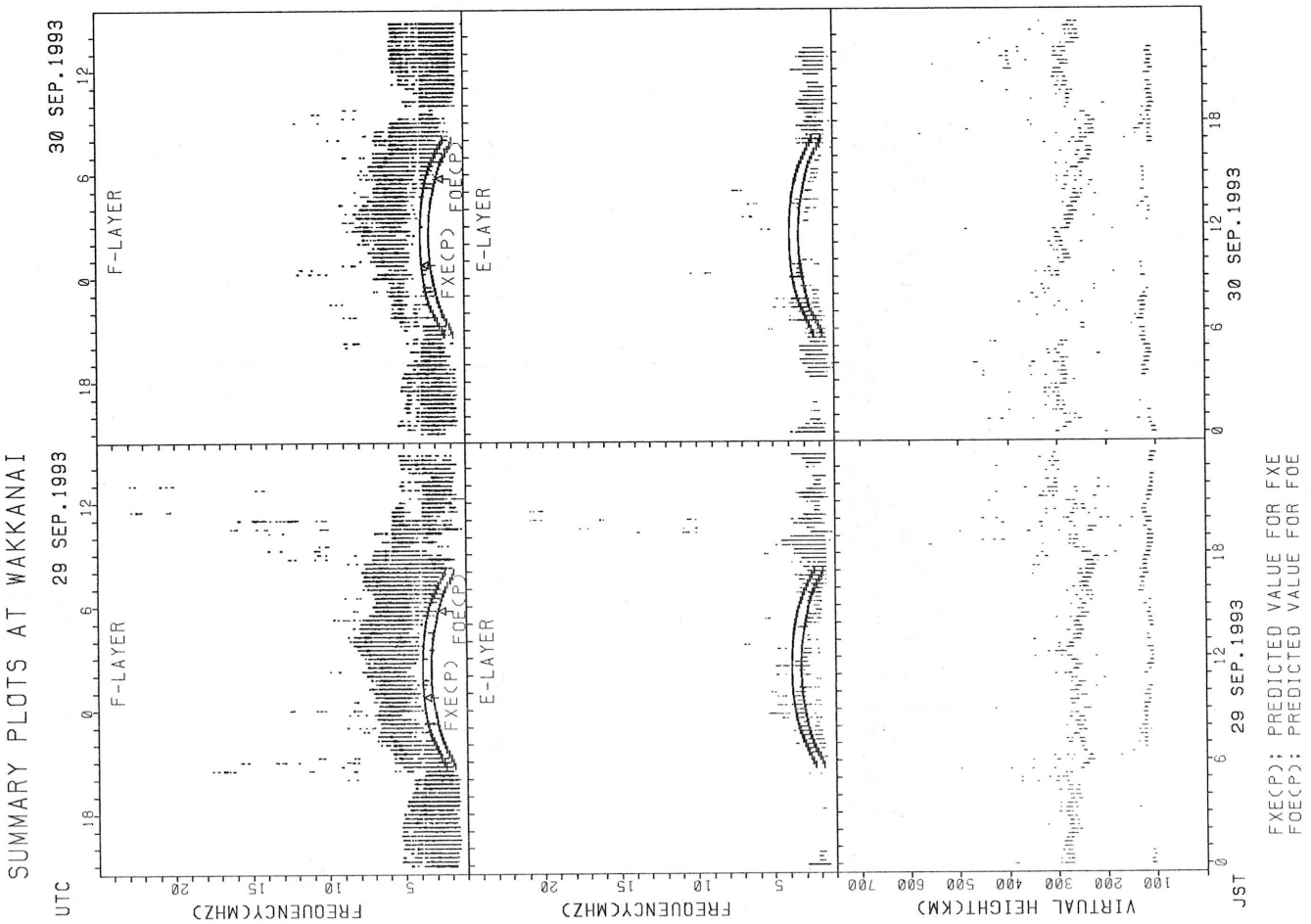
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FOE(P)
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VIRTUAL HEIGHT(KM)
JST
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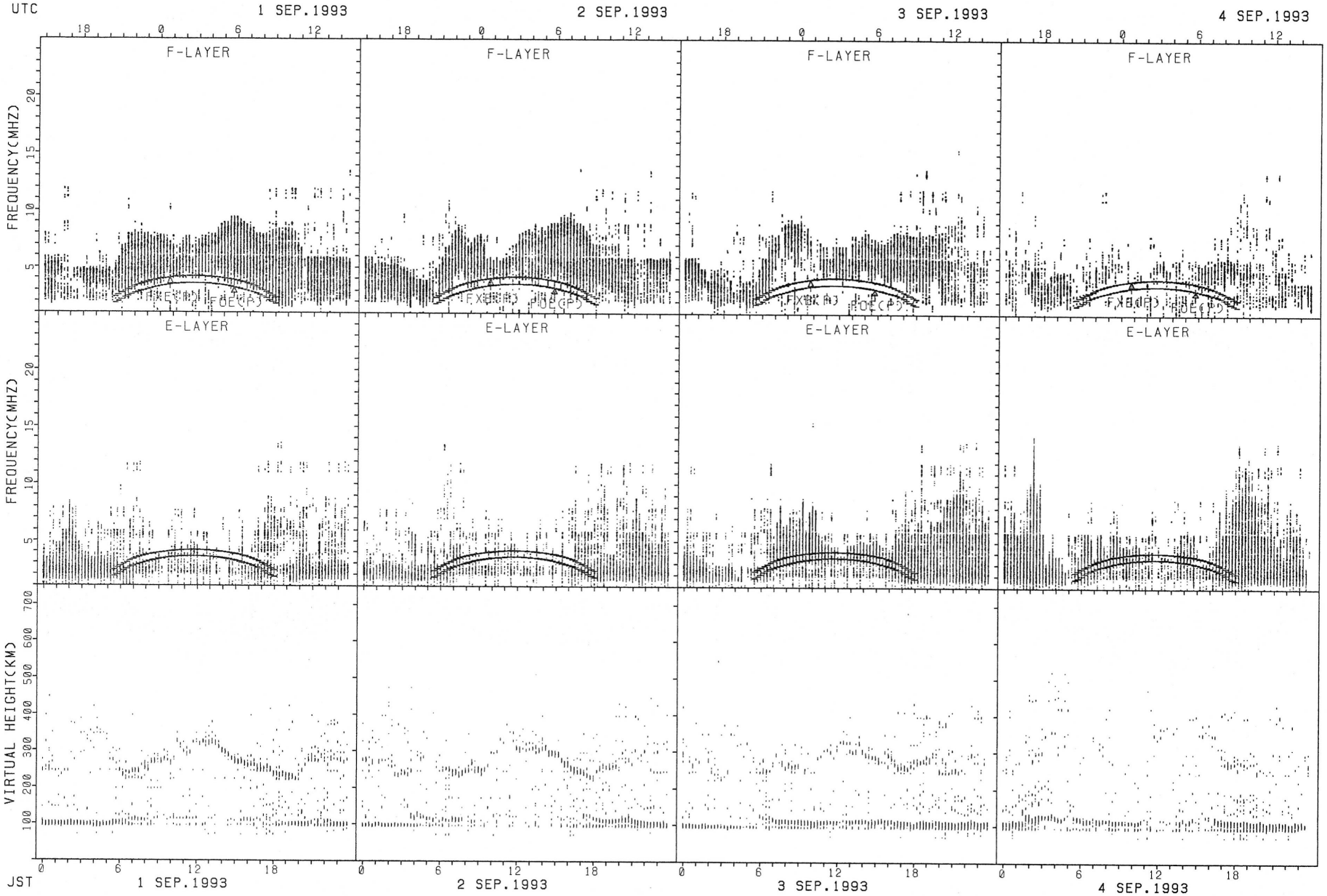
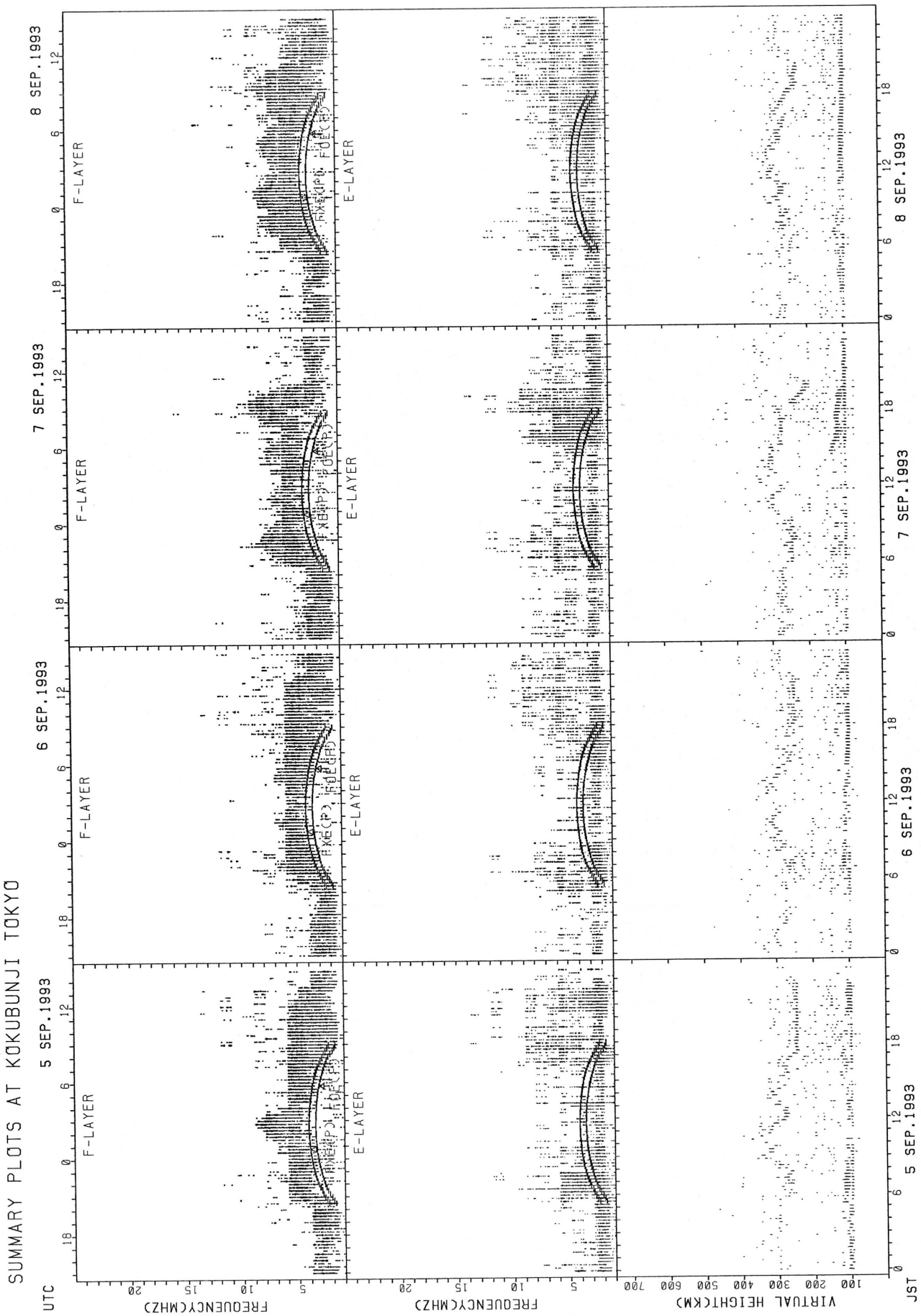
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO




SUMMARY PLOTS AT KOKUBUNJI TOKYO
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E-LAYER
FREQUENCY(MHZ)
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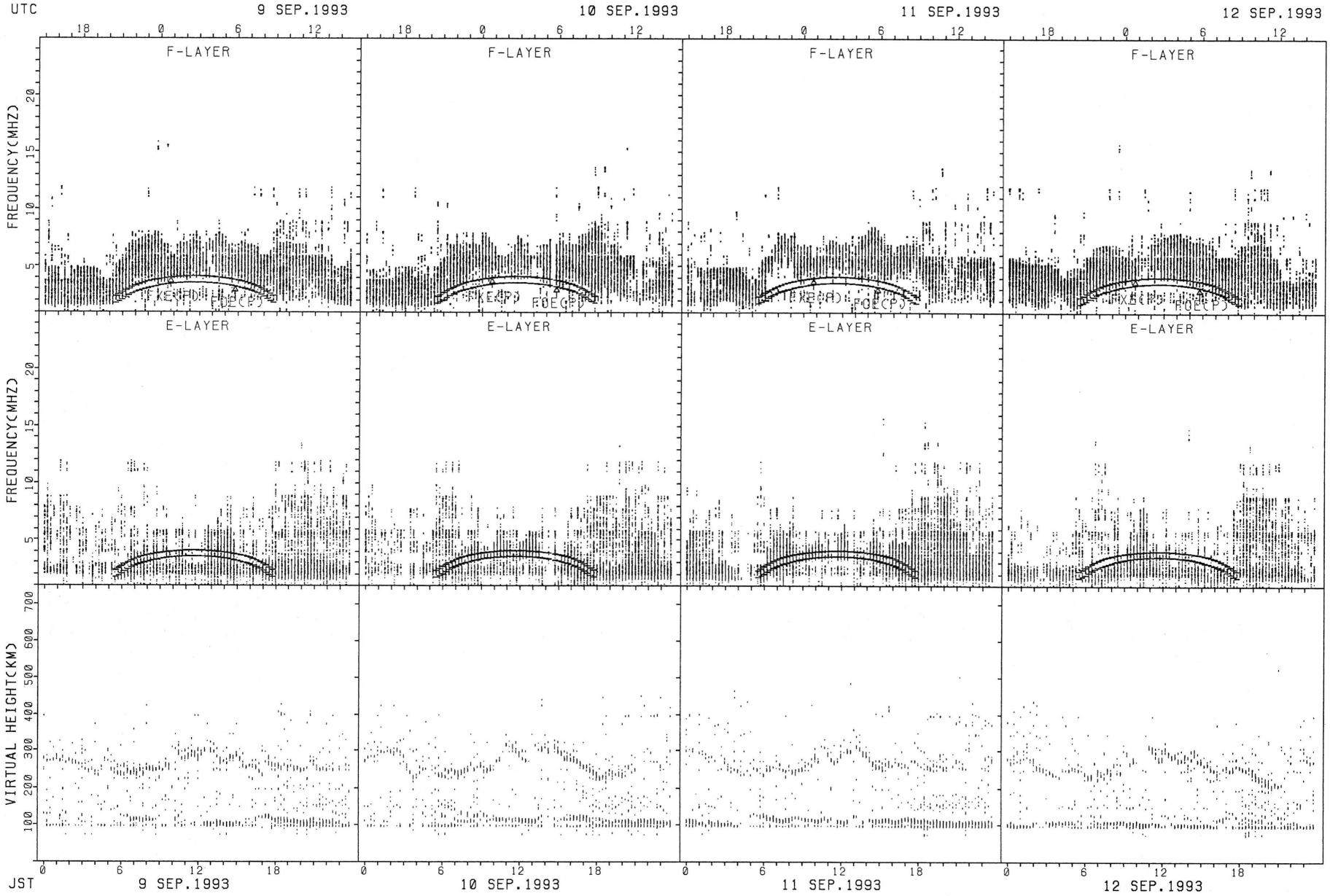
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO



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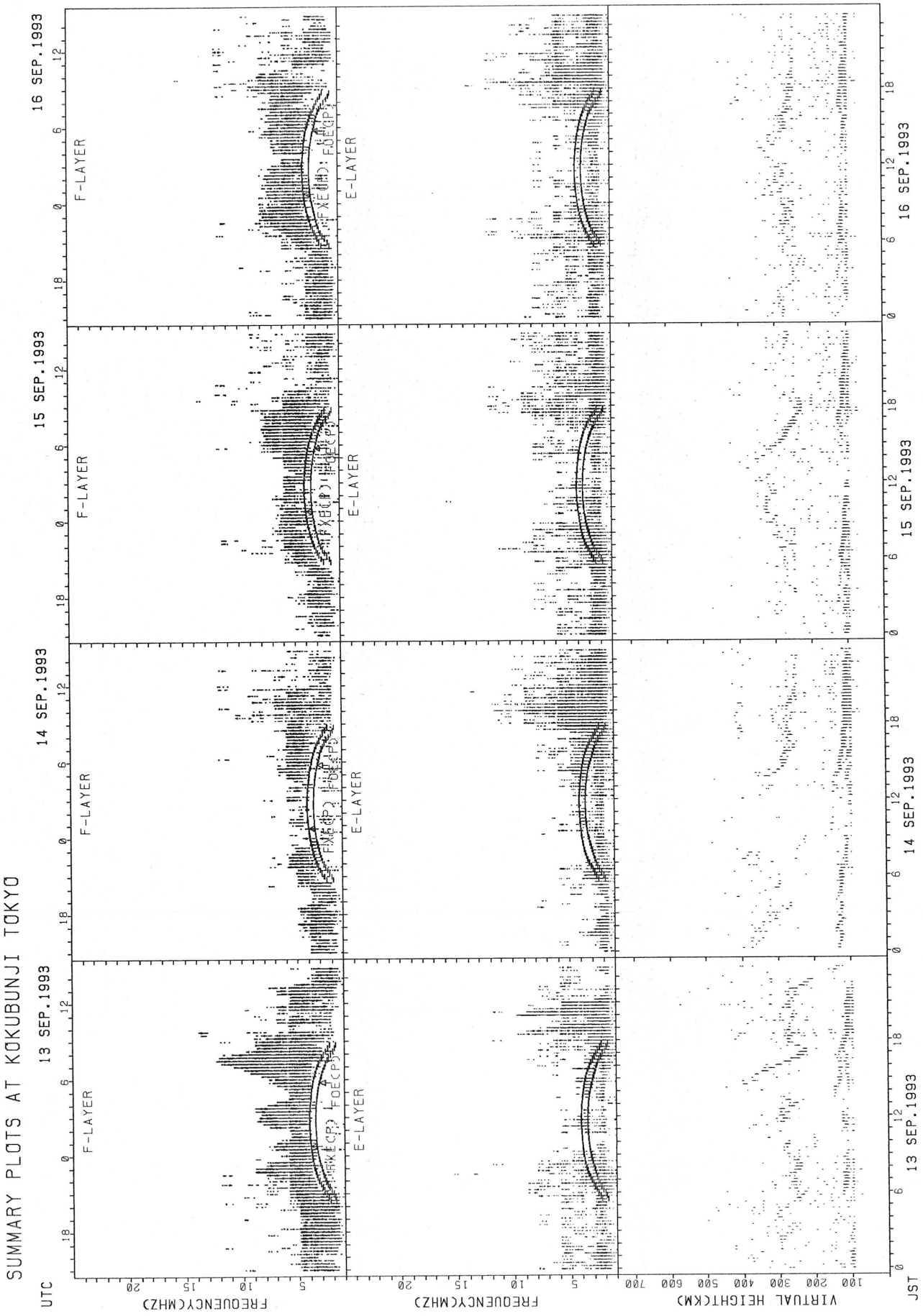
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F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
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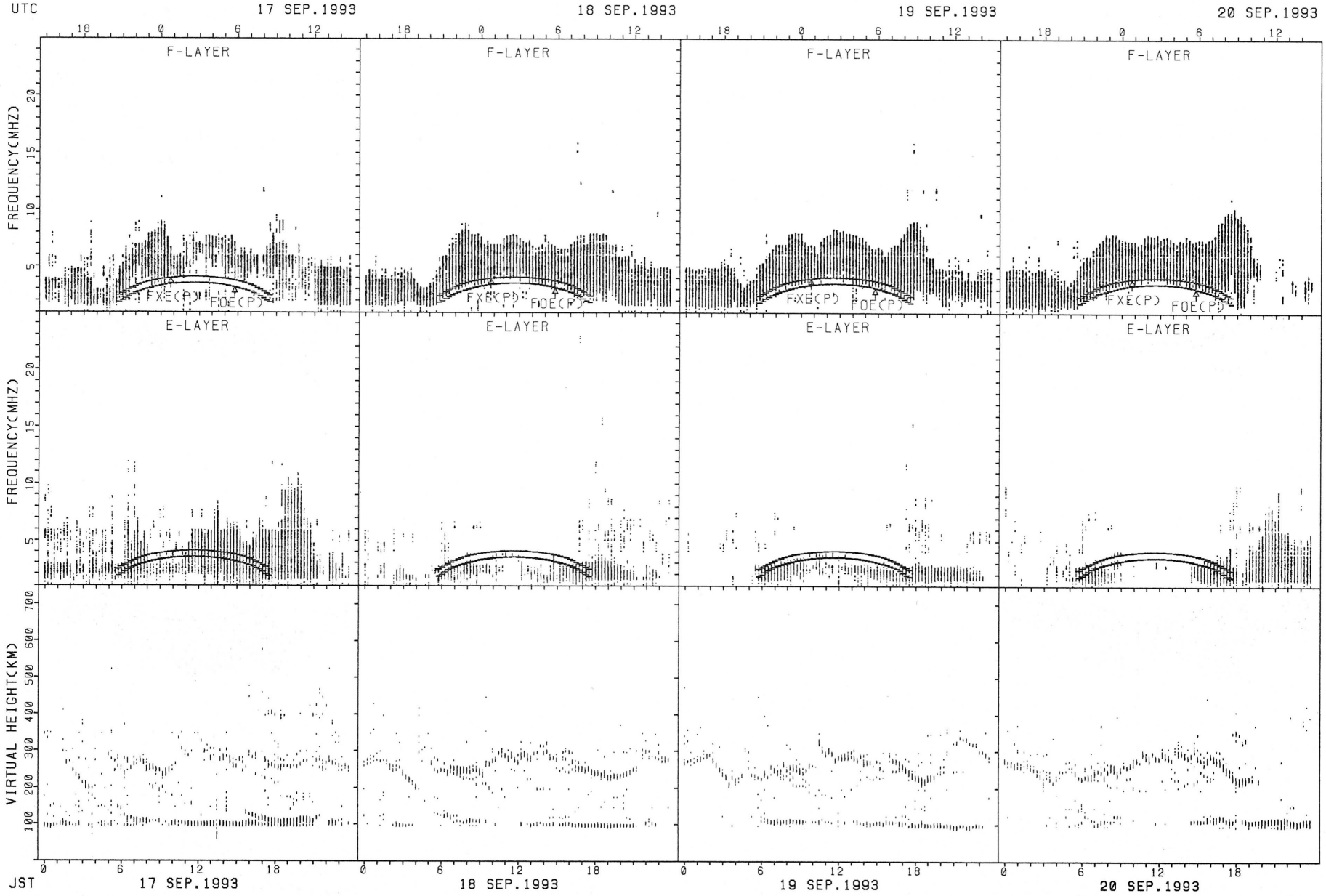
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO



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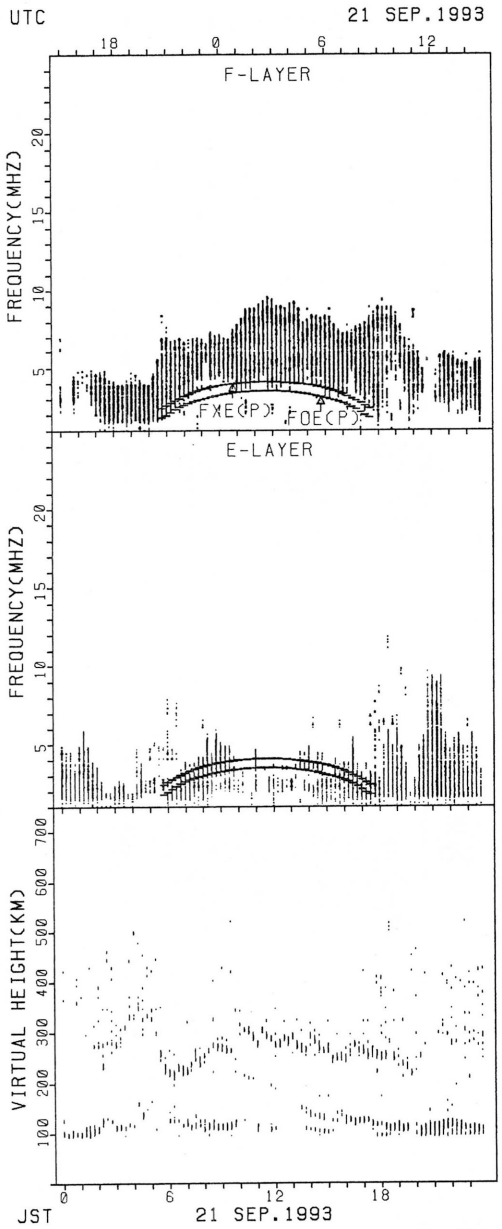
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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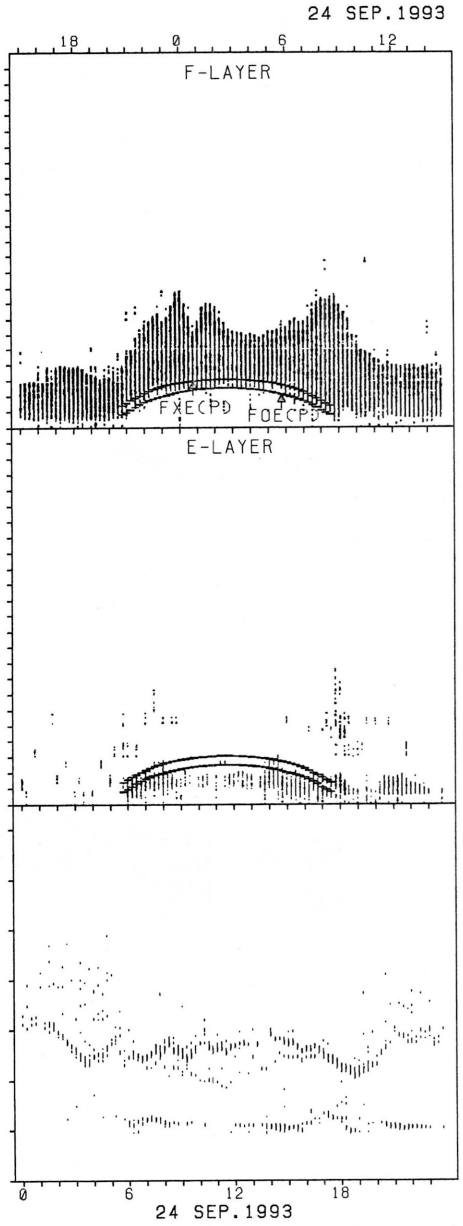

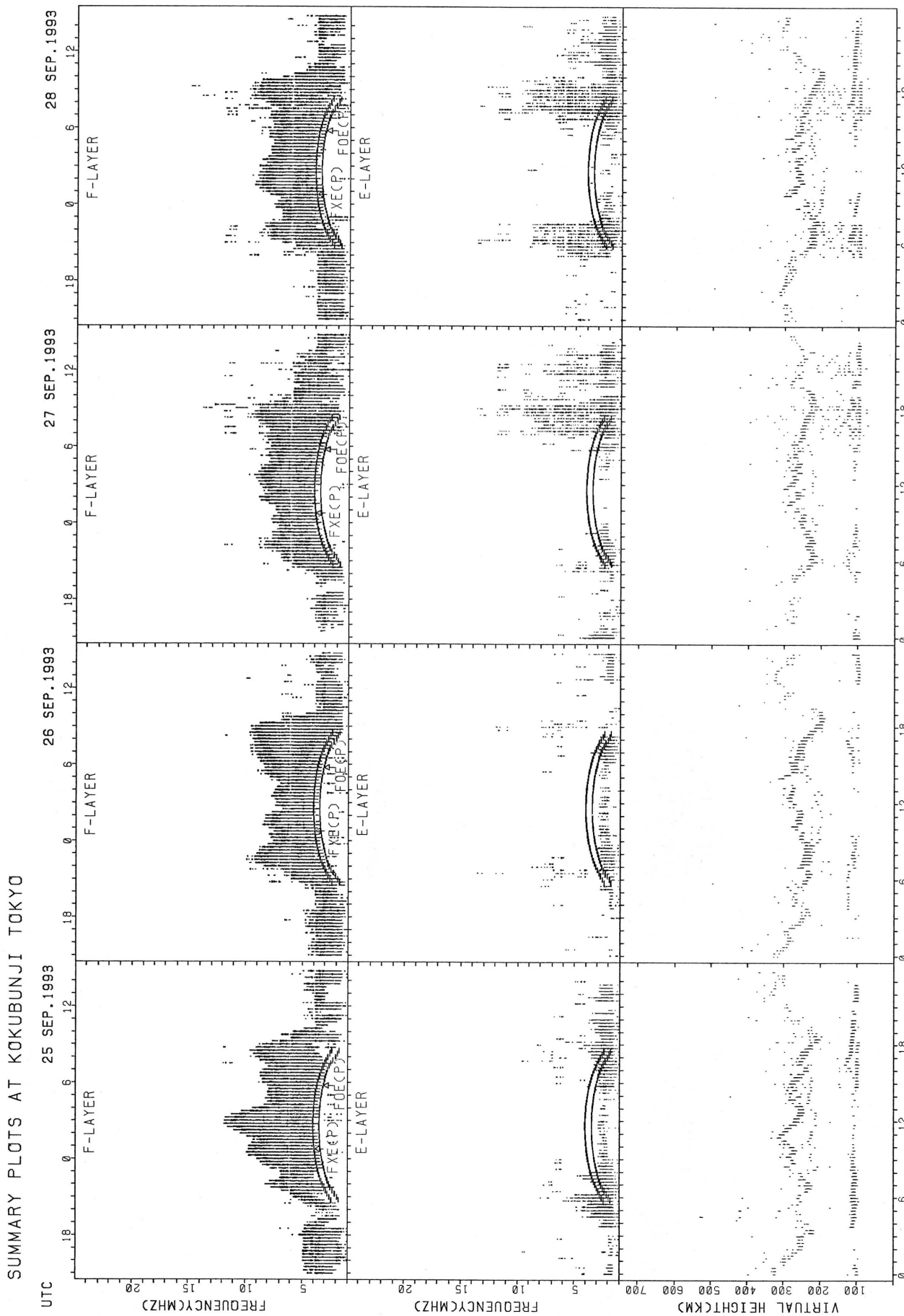
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VIRTUAL HEIGHT(KM)
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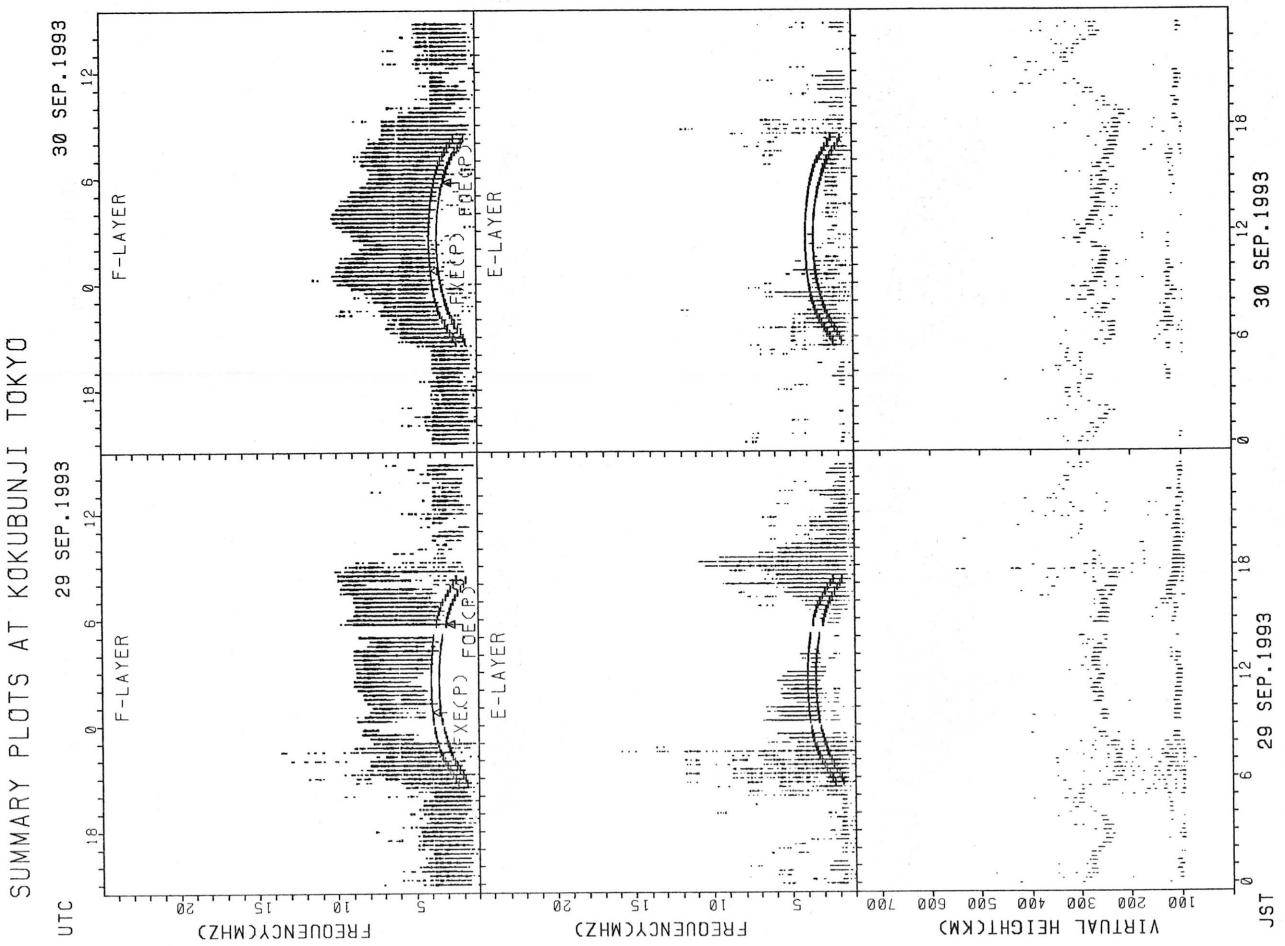
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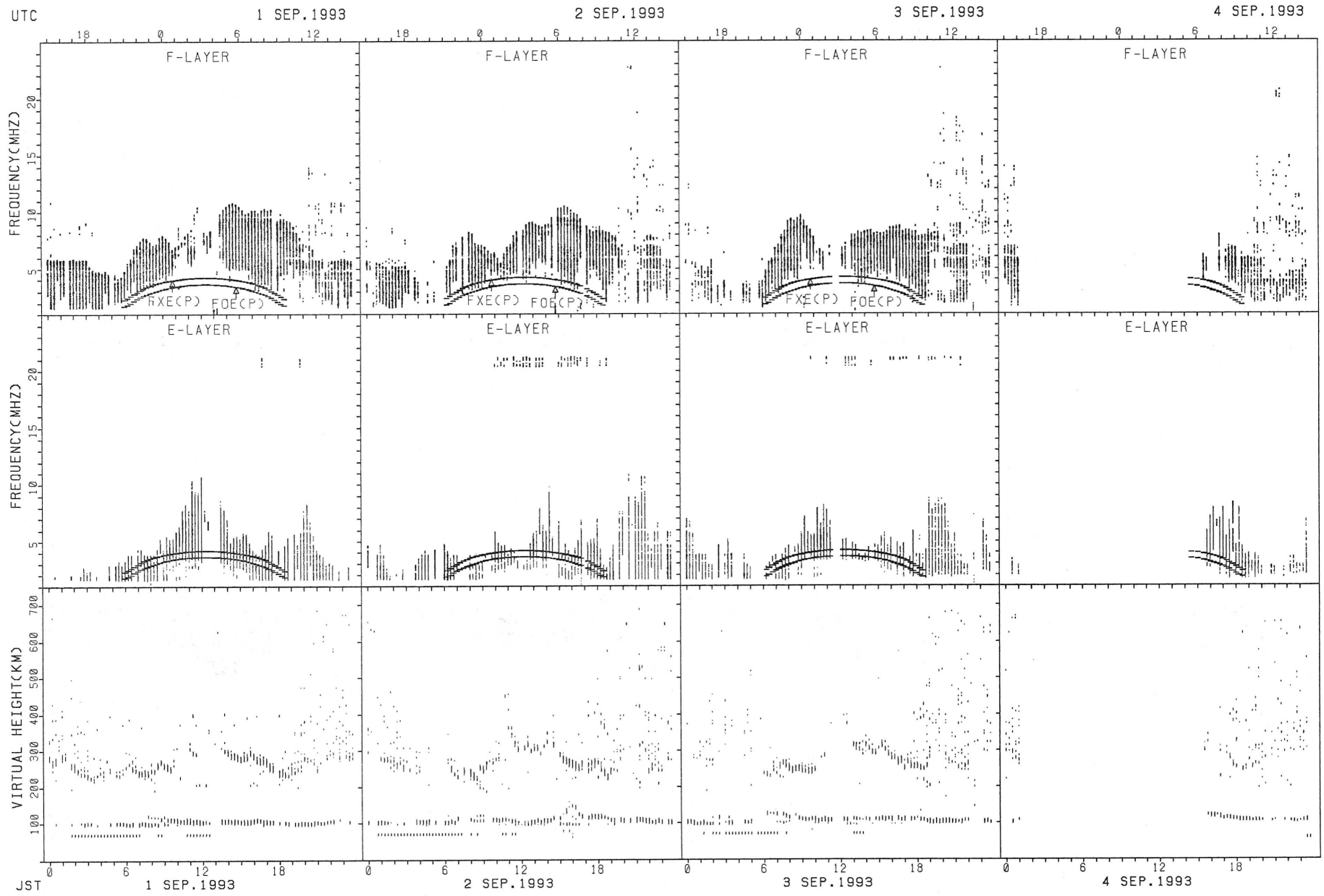
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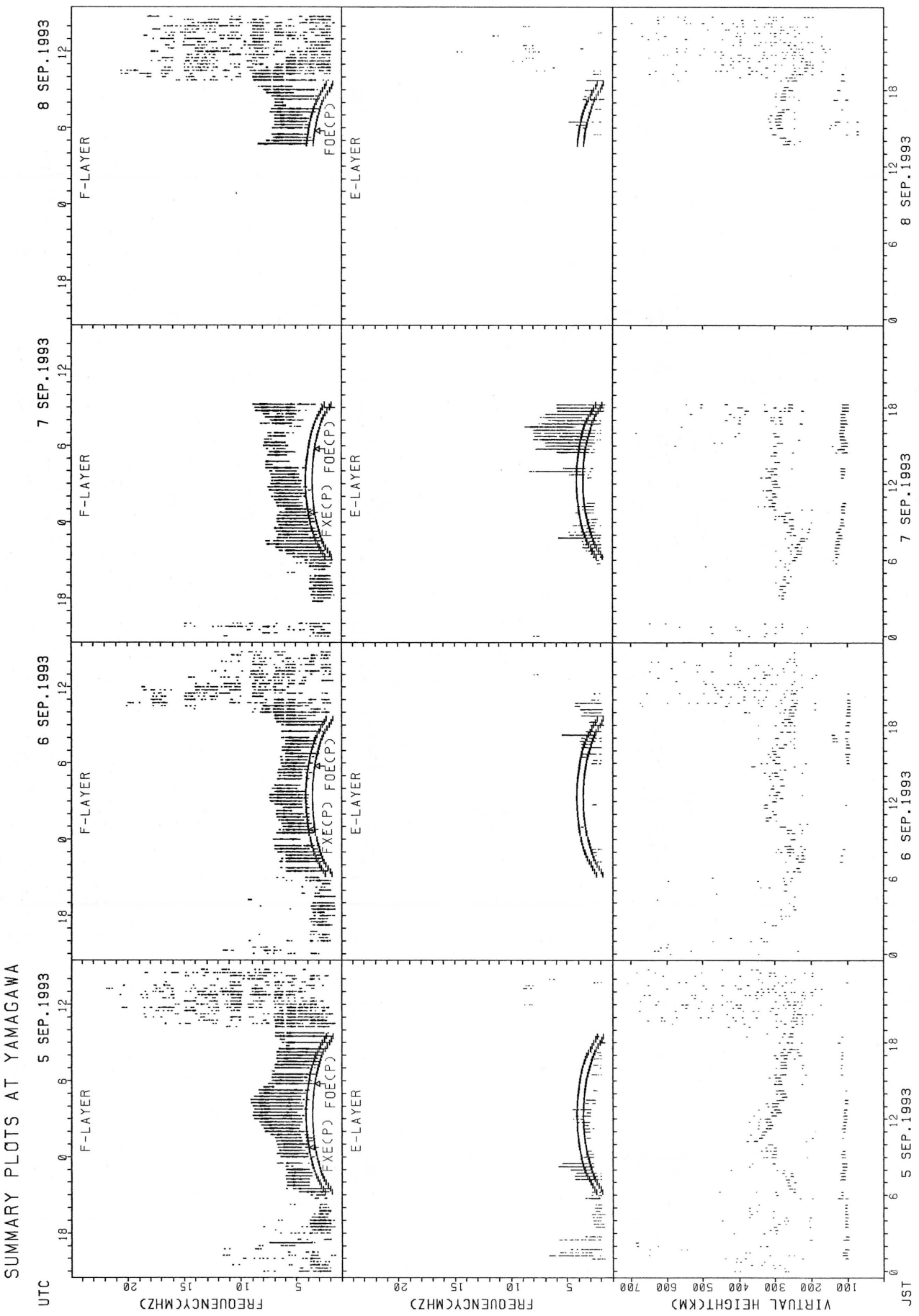
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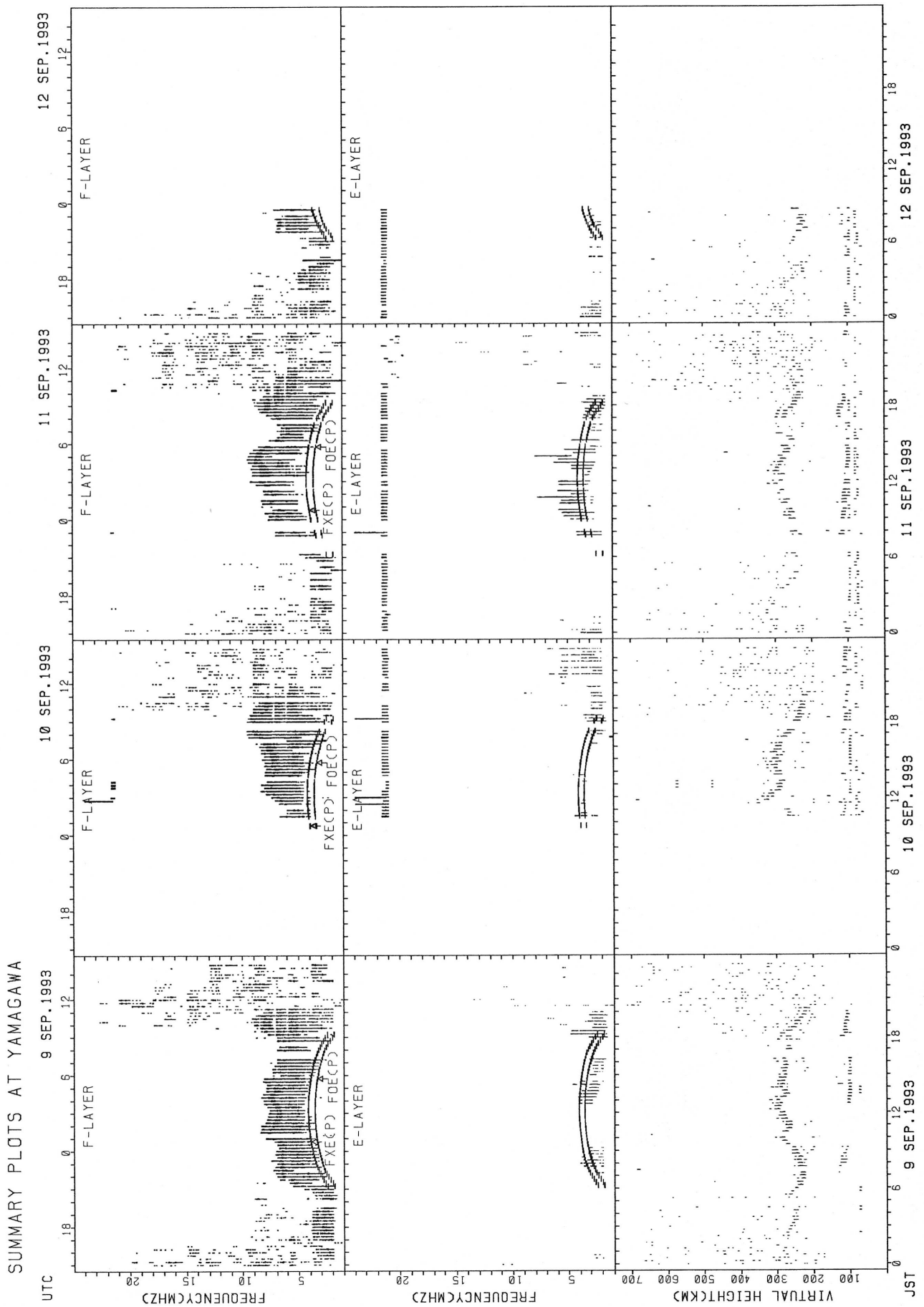
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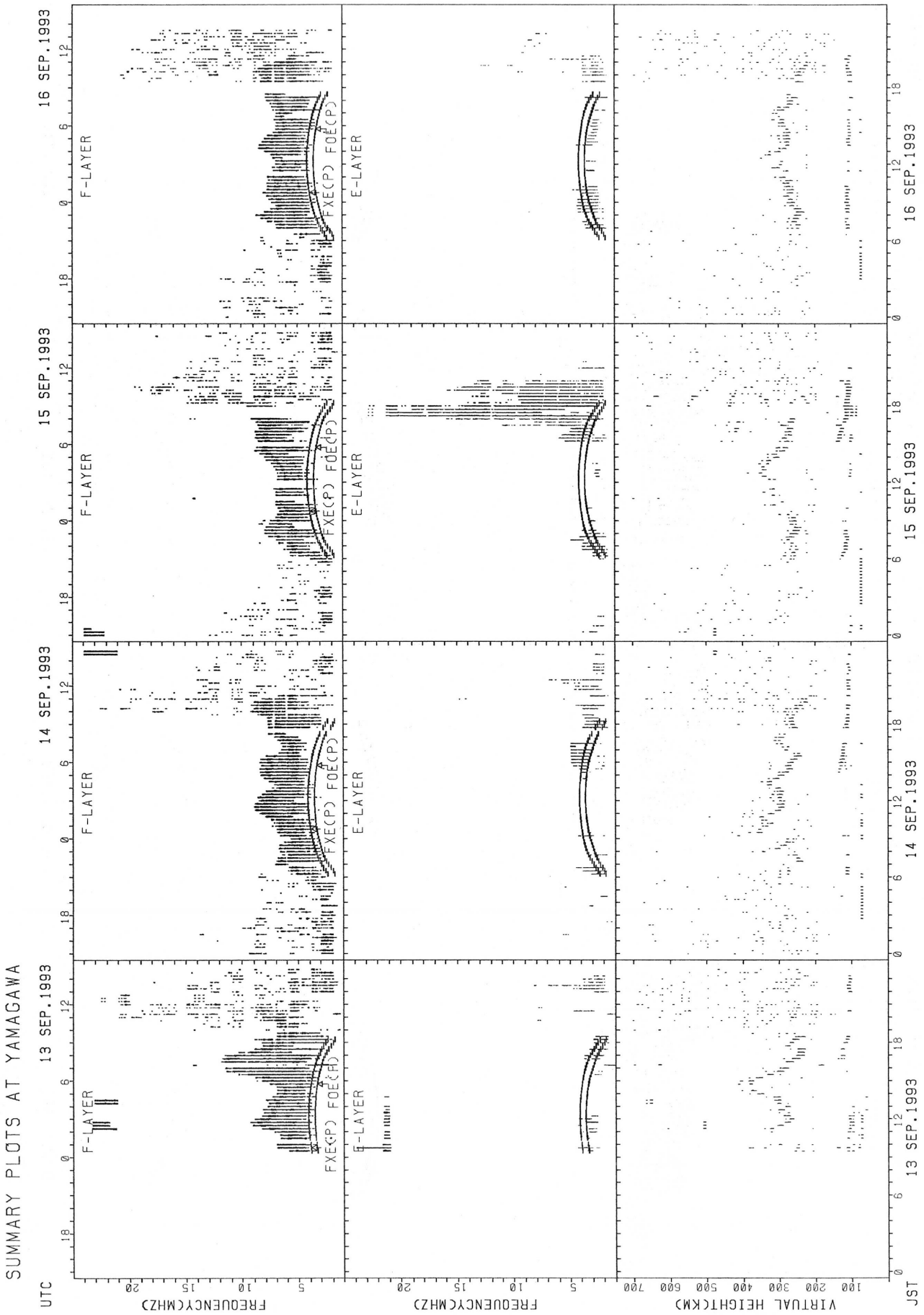
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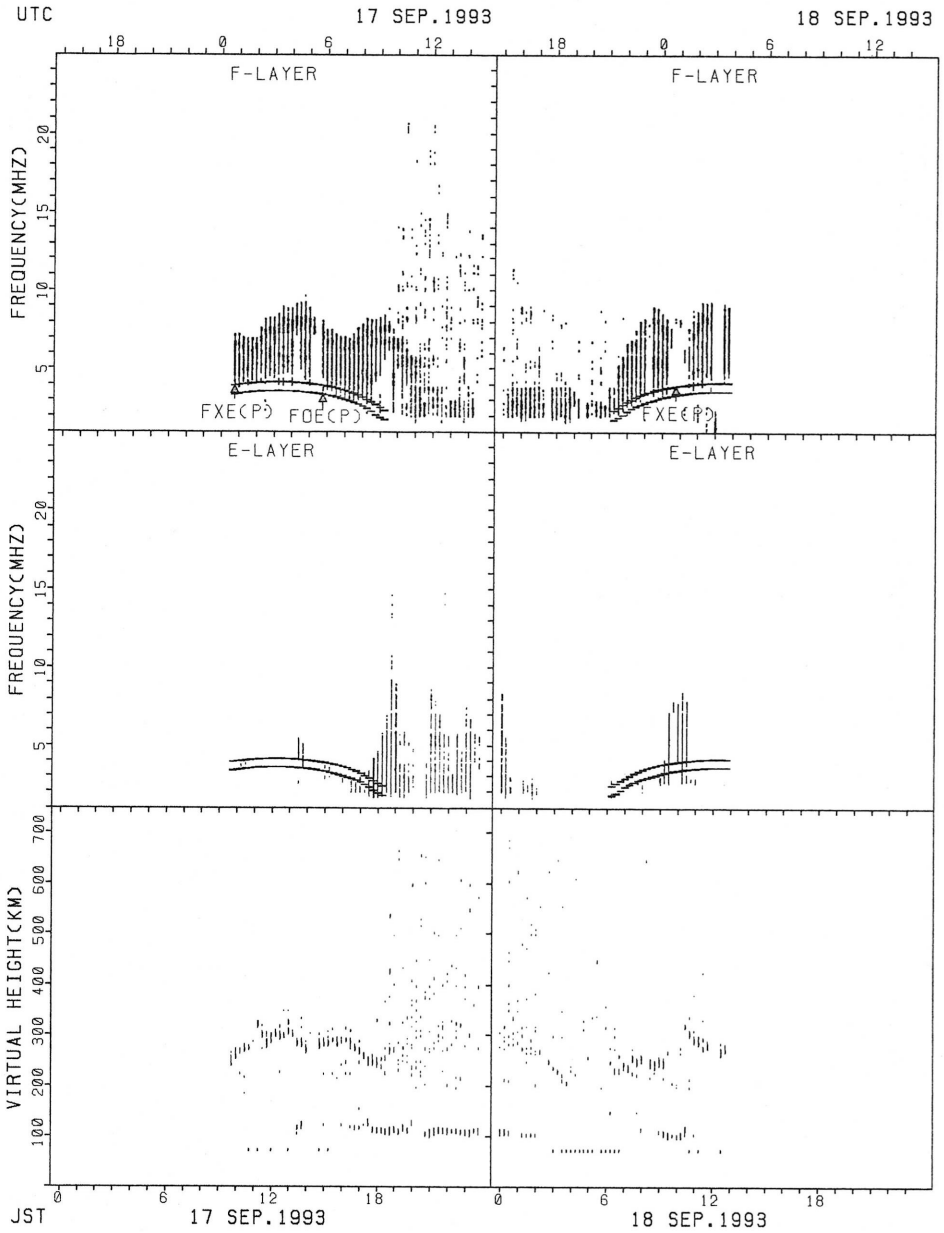
SUMMARY PLOTS AT YAMAGAWA



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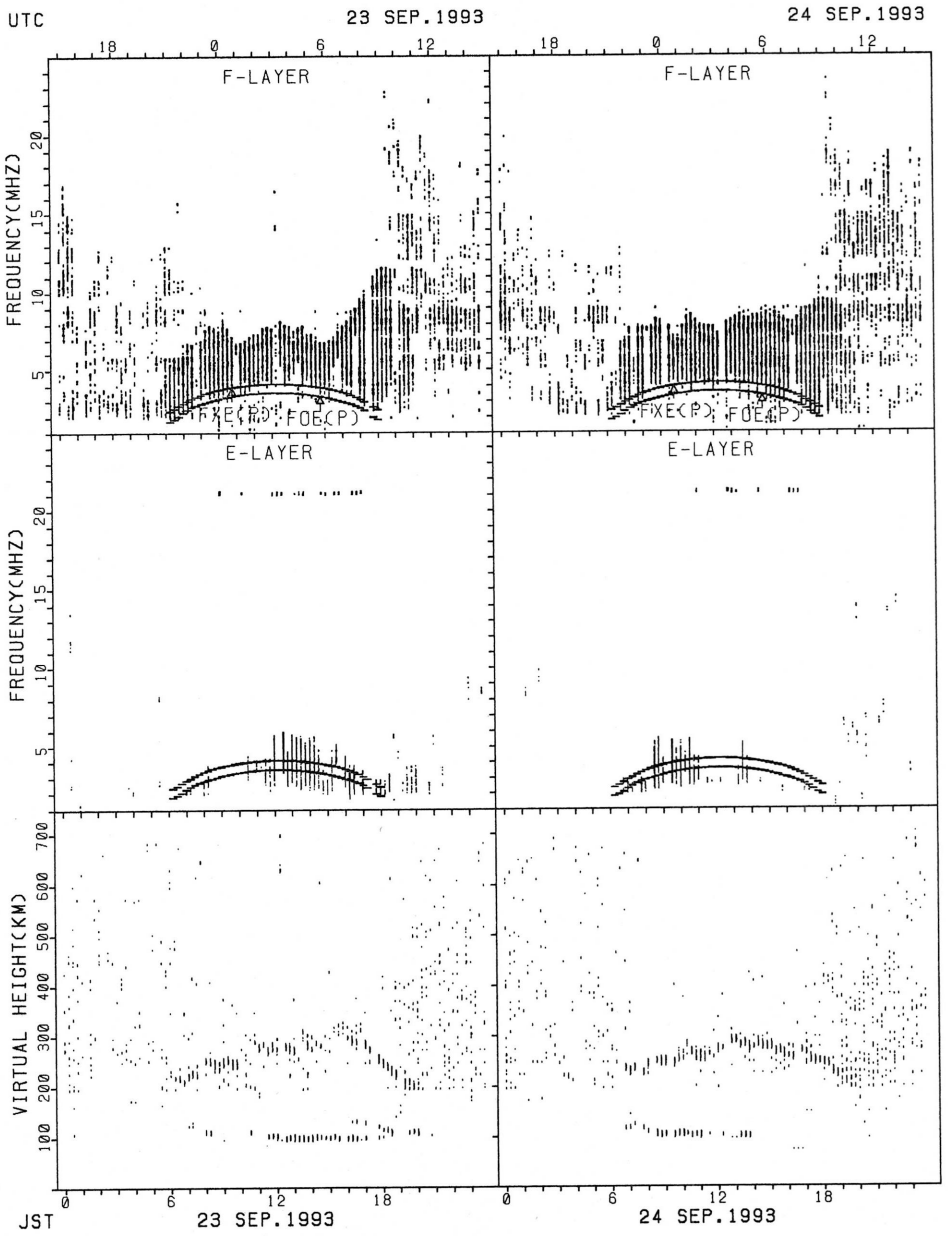
SUMMARY PLOTS AT YAMAGAWA



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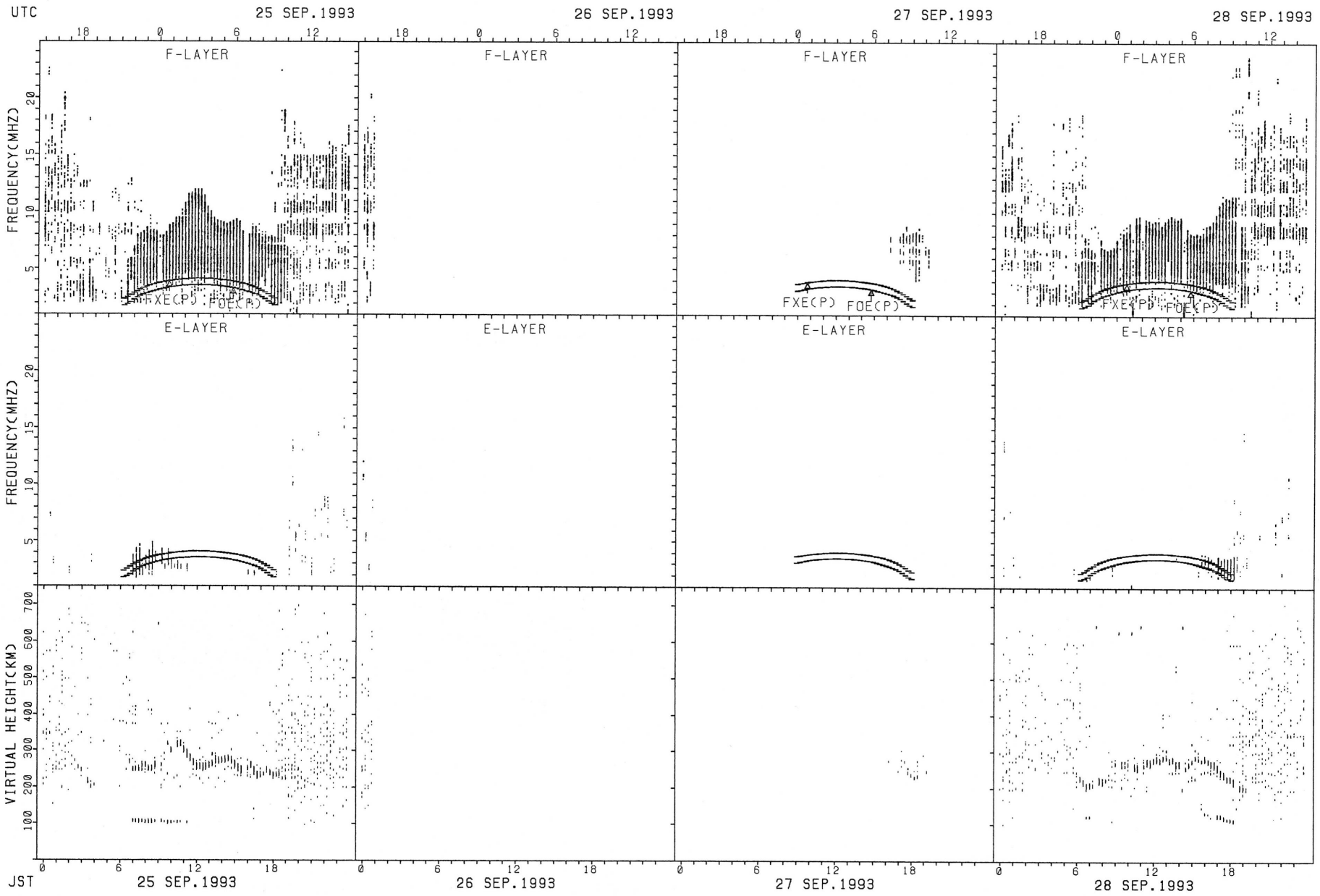

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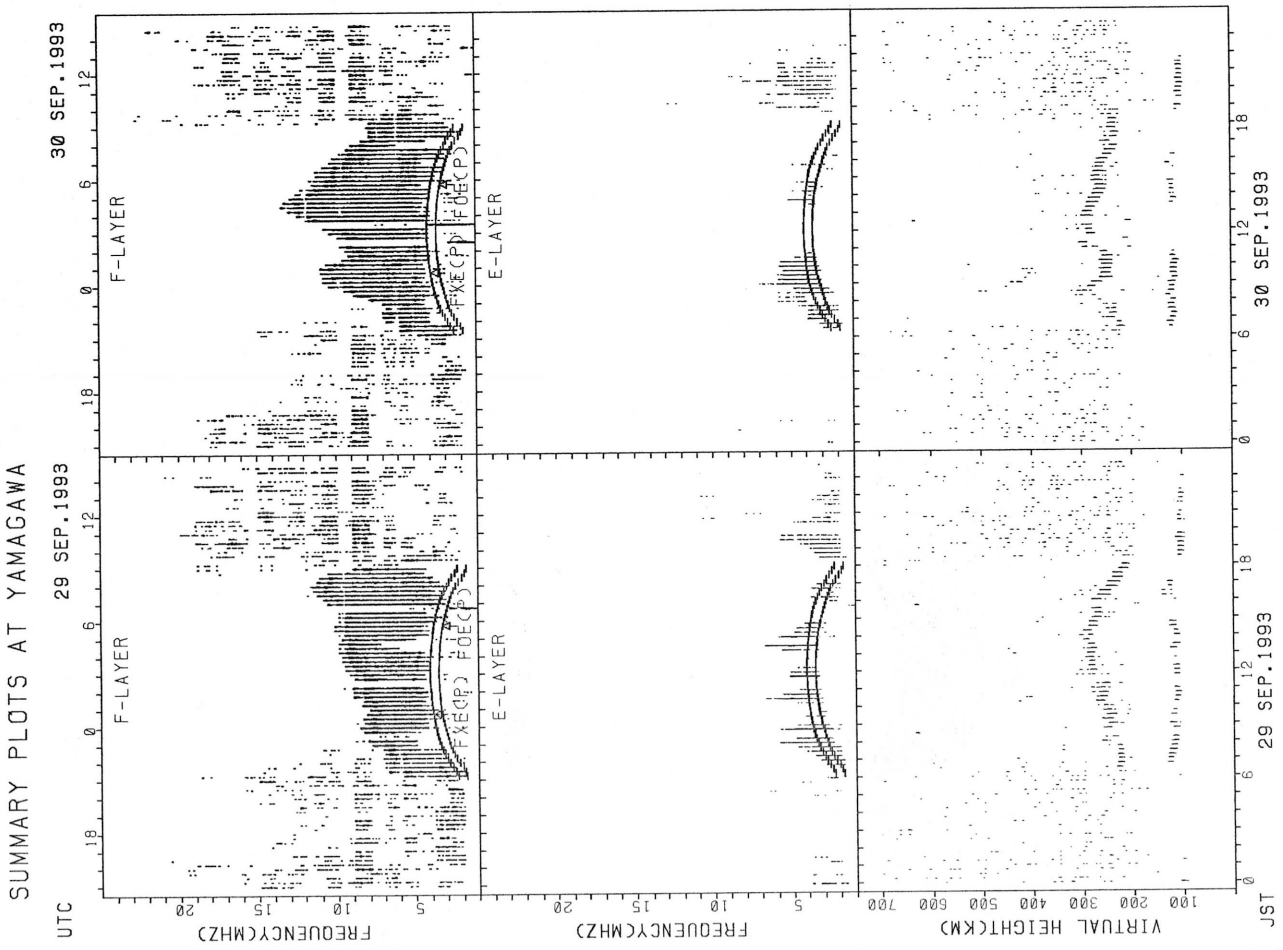
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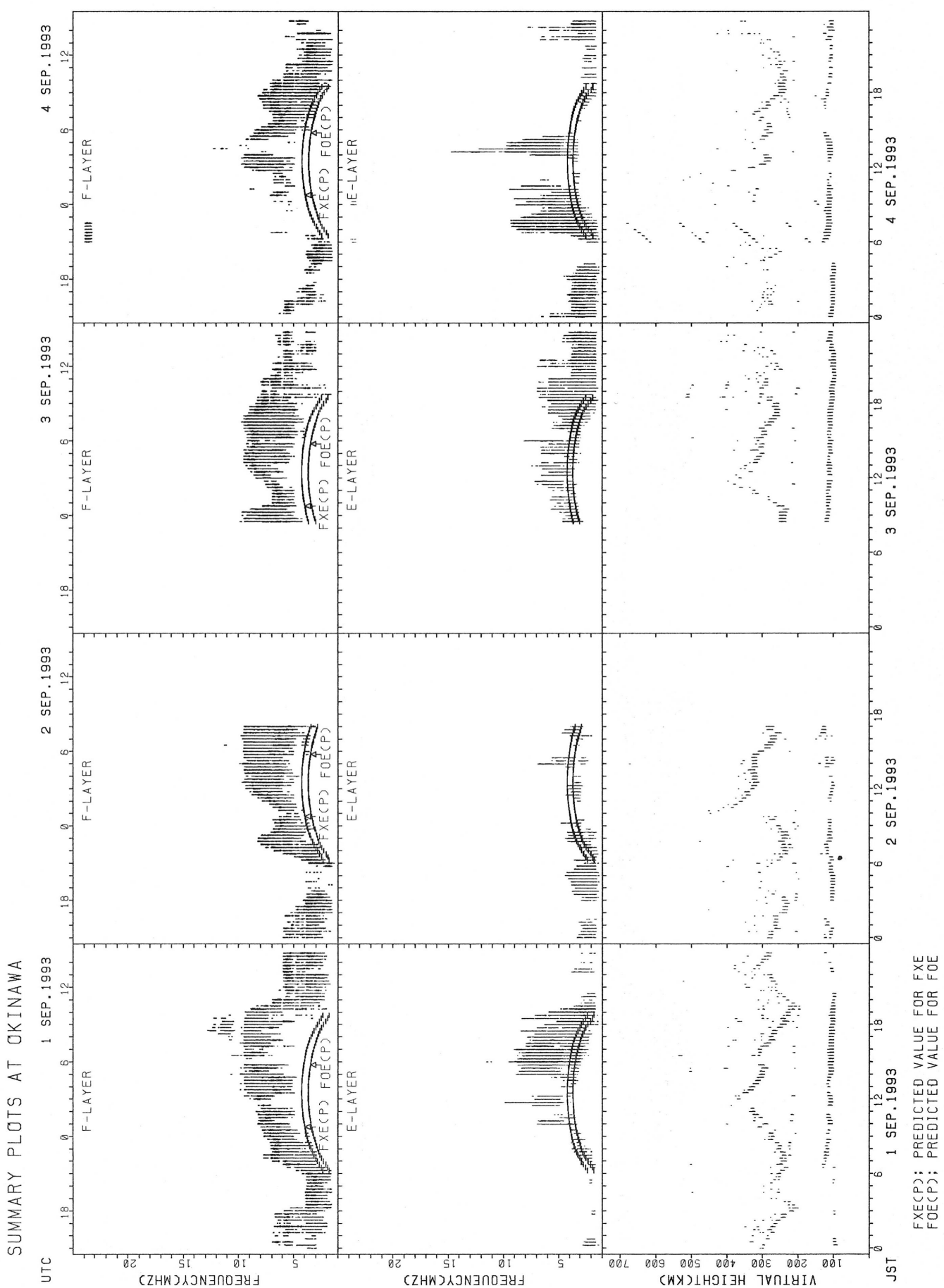
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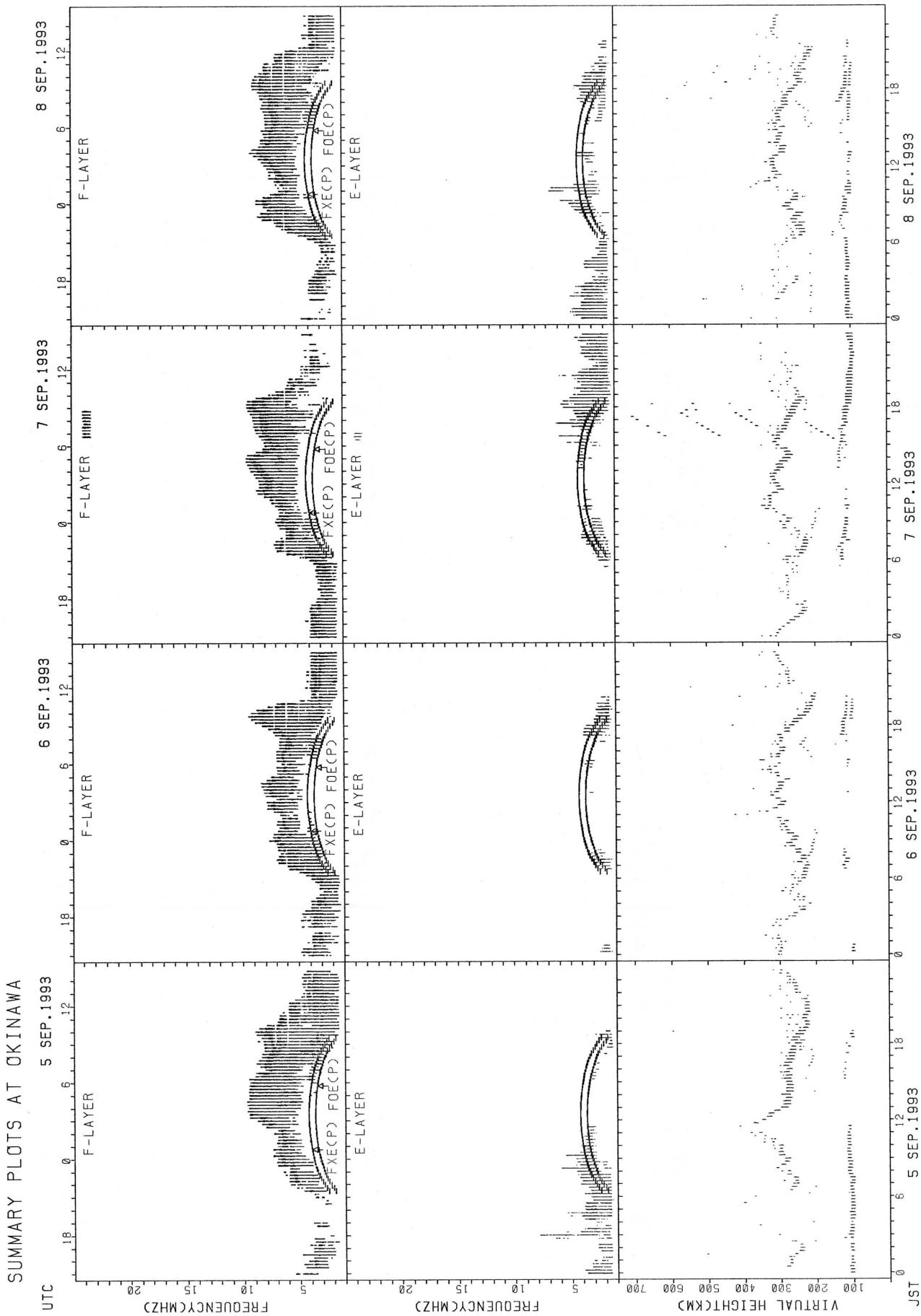
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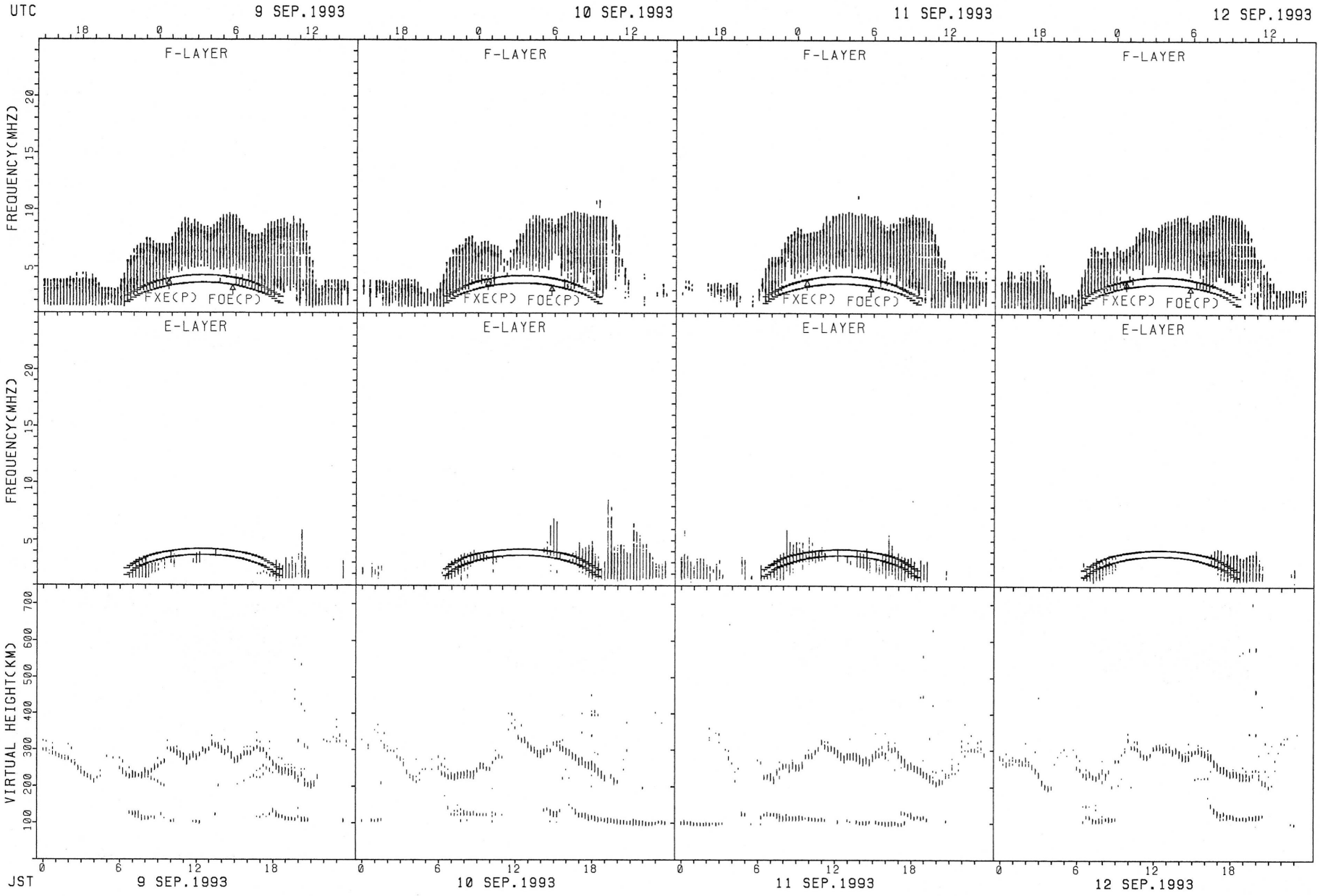
SUMMARY PLOTS AT OKINAWA



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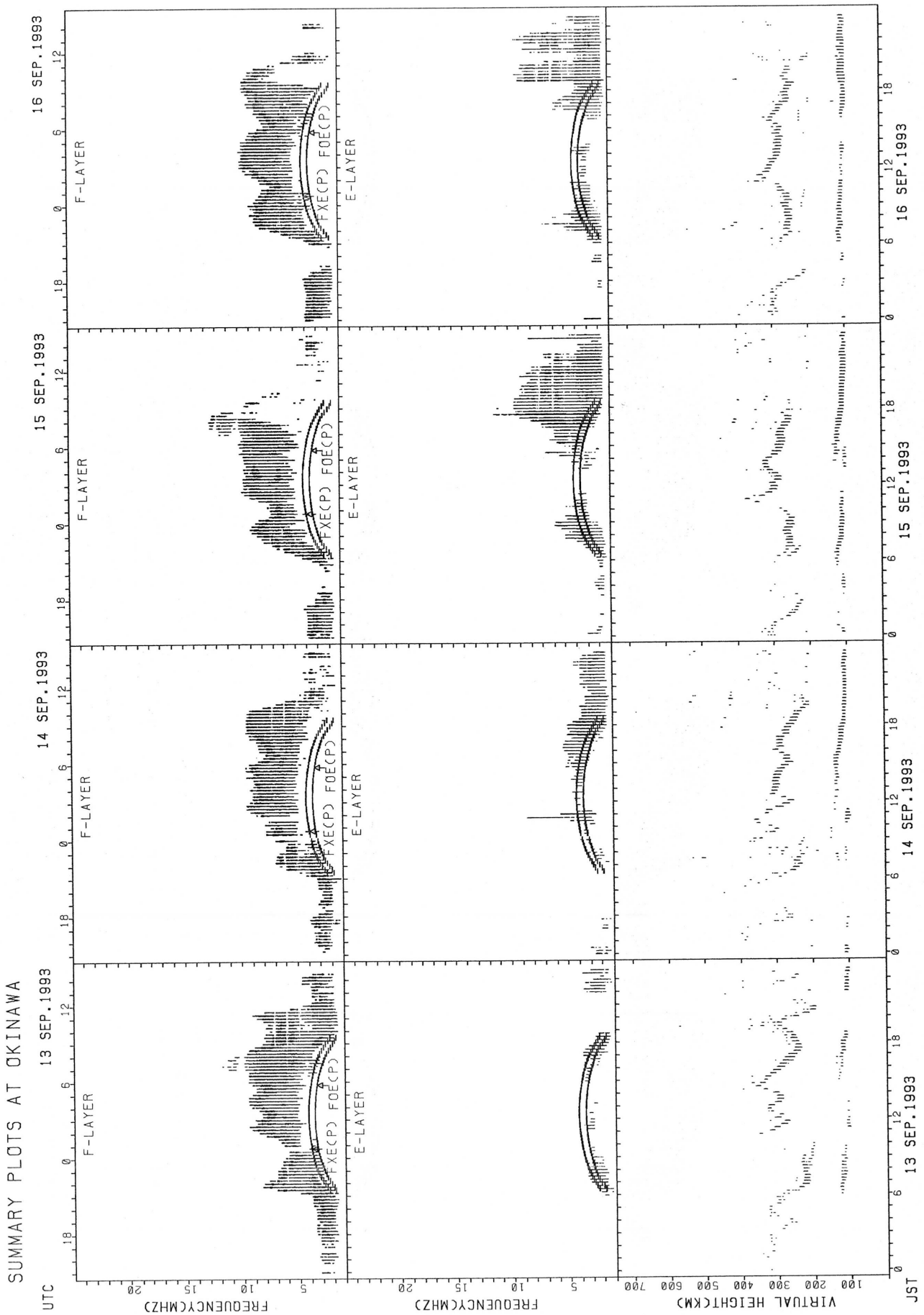
SUMMARY PLOTS AT OKINAWA
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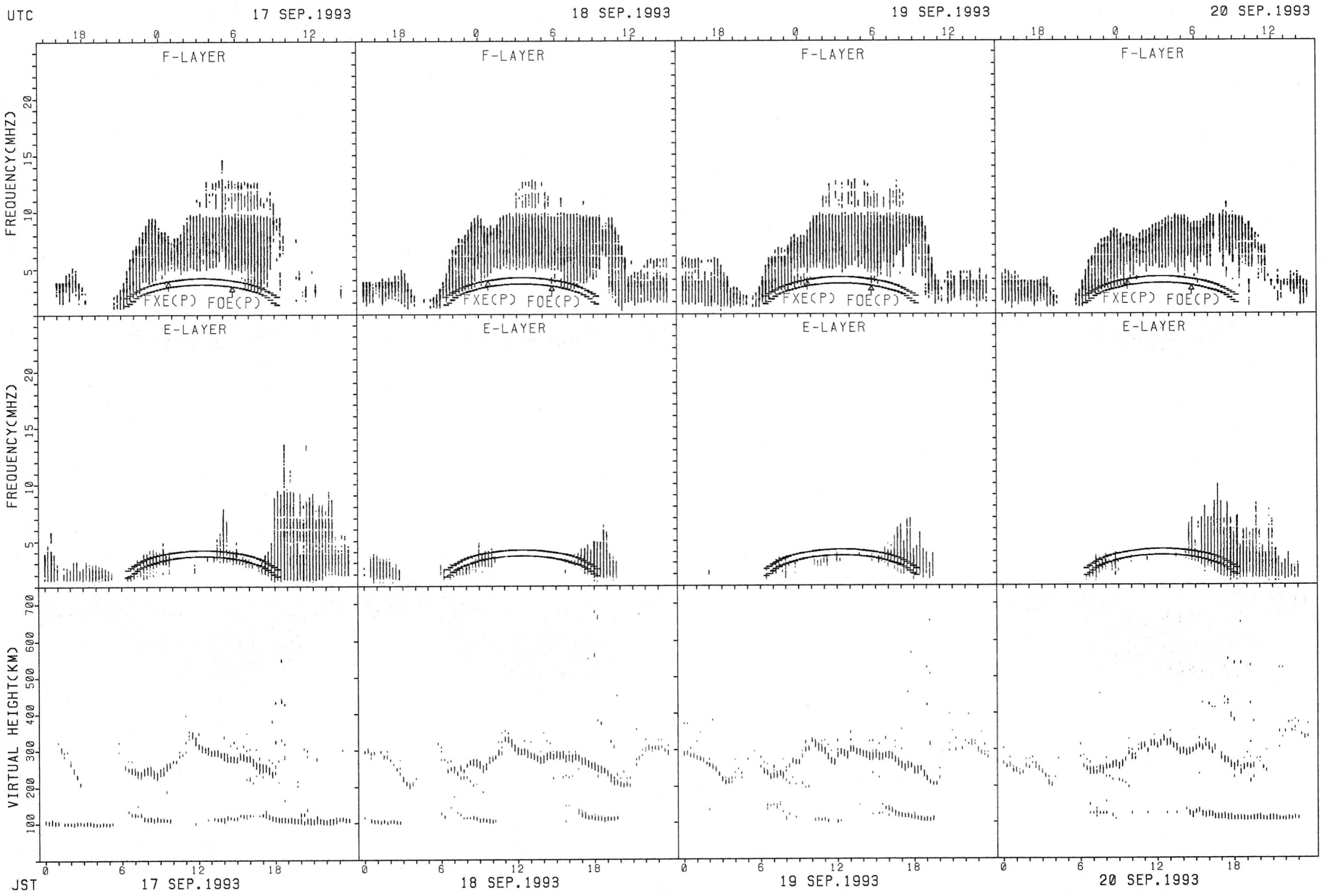
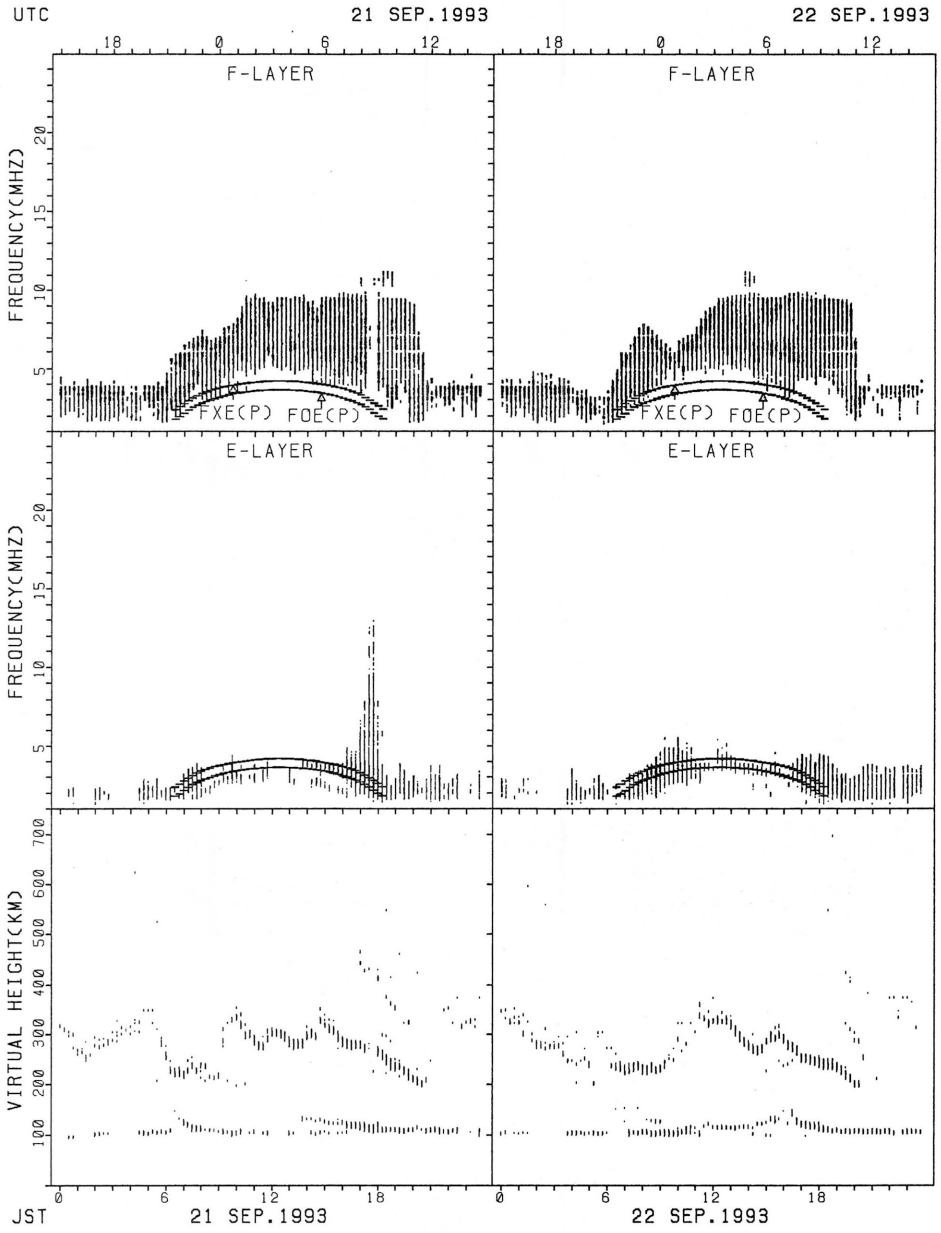
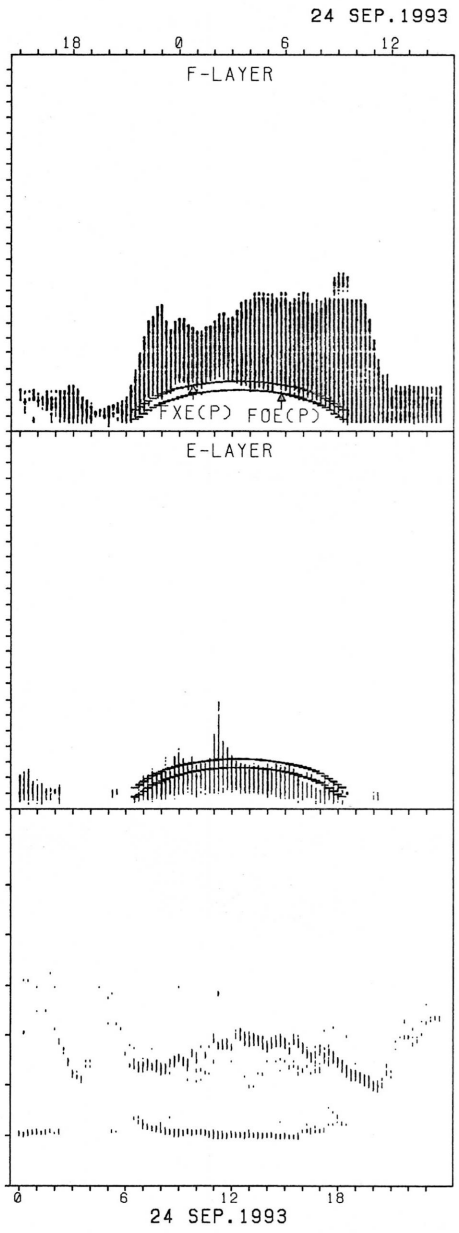
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

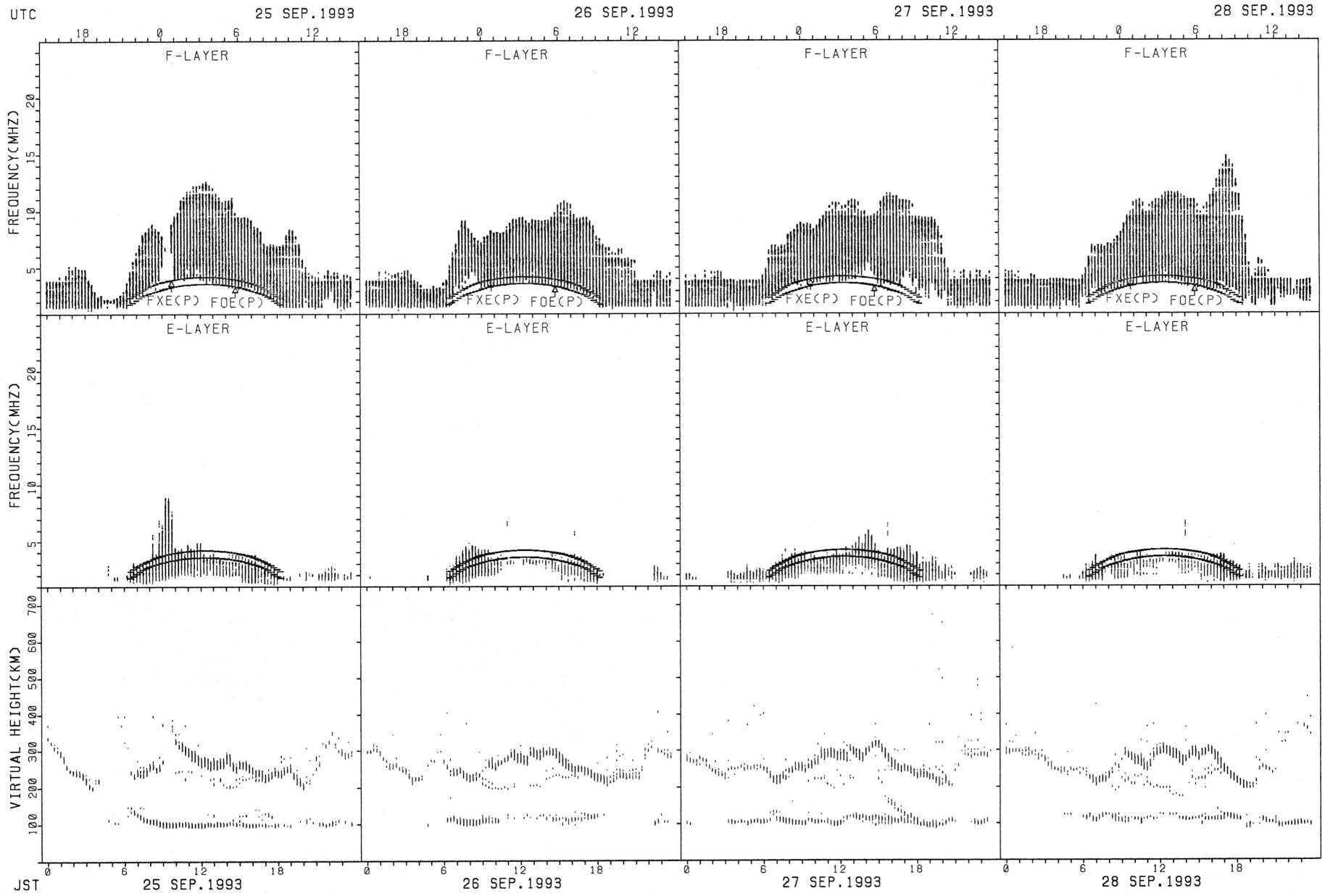

SUMMARY PLOTS AT OKINAWA
UTC
17 SEP.1993
18 SEP.1993
19 SEP.1993
20 SEP.1993
F-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
E-LAYER
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA

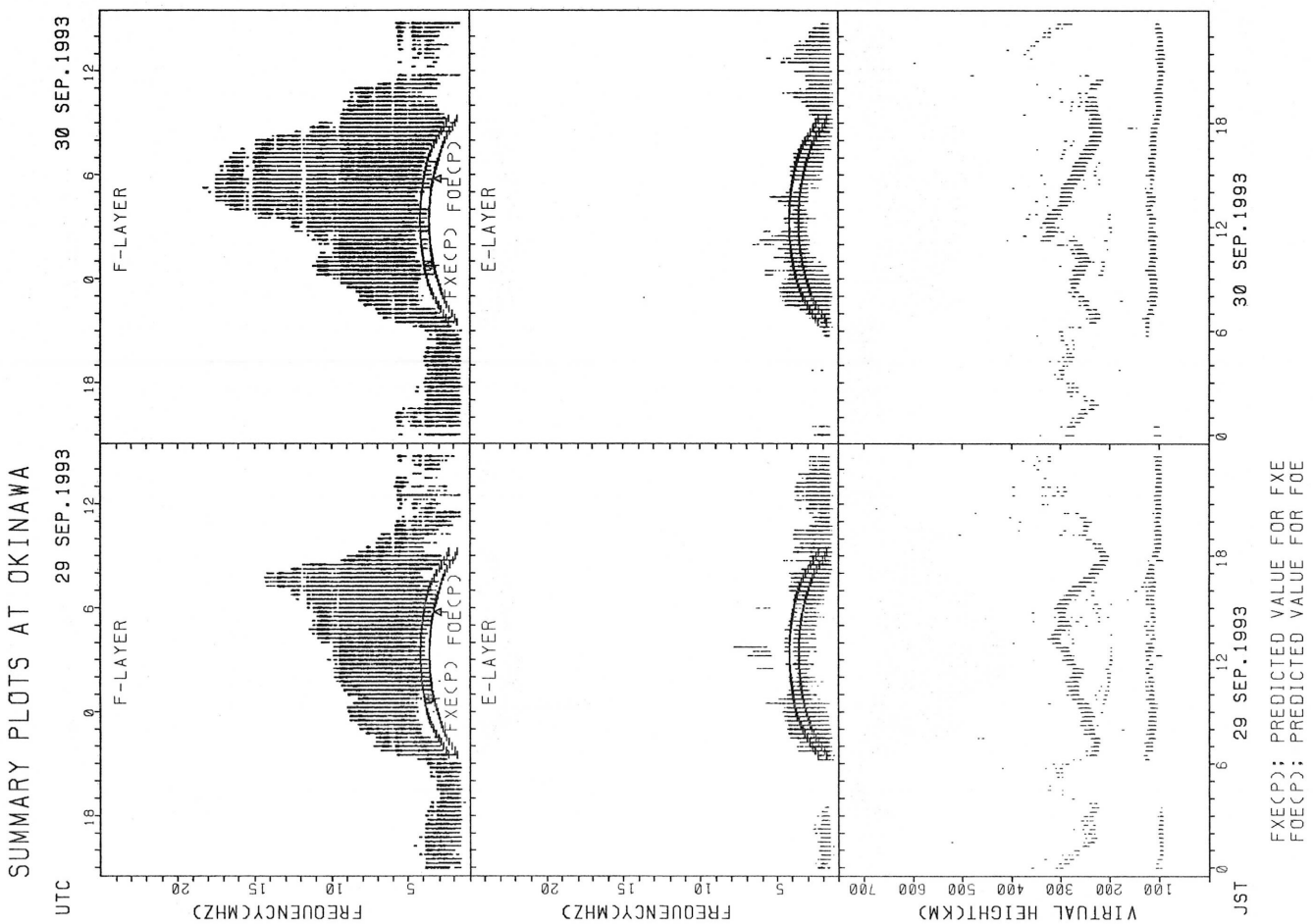




FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE



FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
29 SEP.1993
30 SEP.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

MONTHLY MEDIANS OF H'F AND H'ES

SEP. 1993 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

H'F STATION WAKKANAI LAT. 45.4N LON. 141.7E

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									16							13	20	14	11					
MED									280							288	284	261	258					
U Q									298							301	293	276	276					
L Q									264							267	270	250	230					

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	13		11	10	13	14	12	10										20	24	22	18	18	19	14
MED	107		111	115	113	121	119	121										122	118	113	117	110	109	109
U Q	111		133	131	122	129	123	149										129	123	125	131	117	115	113
L Q	106		107	109	109	113	113	117										117	113	109	109	107	107	105

H'F STATION KOKUBUNJI LAT. 35.7N LON. 139.5E

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								20	20							18	20	22	21	20				
MED								252	255							283	271	264	254	249				
U Q								266	269							298	297	272	286	283				
L Q								238	246							270	262	250	223	220				

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	14	12	12		11	11	20	25	17	10				10		10	16	25	25	26	26	21	24	17
MED	104	105	105		115	111	118	115	117	116				113		121	119	119	107	111	108	105	107	101
U Q	105	107	120		125	129	136	126	123	125				125		280	137	126	115	115	111	112	107	103
L Q	101	99	100		107	107	112	112	109	113				109		109	114	114	101	107	103	102	103	96

MONTHLY MEDIANS OF H'F AND H'ES
SEP. 1993 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

H'F STATION YAMAGAWA LAT. 31.2N LON. 130.6E

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								26	22	12							23	24	27	22	17	10	10	
MED								230	242	244							276	253	246	241	224	106	107	
U Q								262	256	258							290	276	266	264	257	250	290	
L Q								117	121	121							127	124	111	111	109	105	107	

H'ES

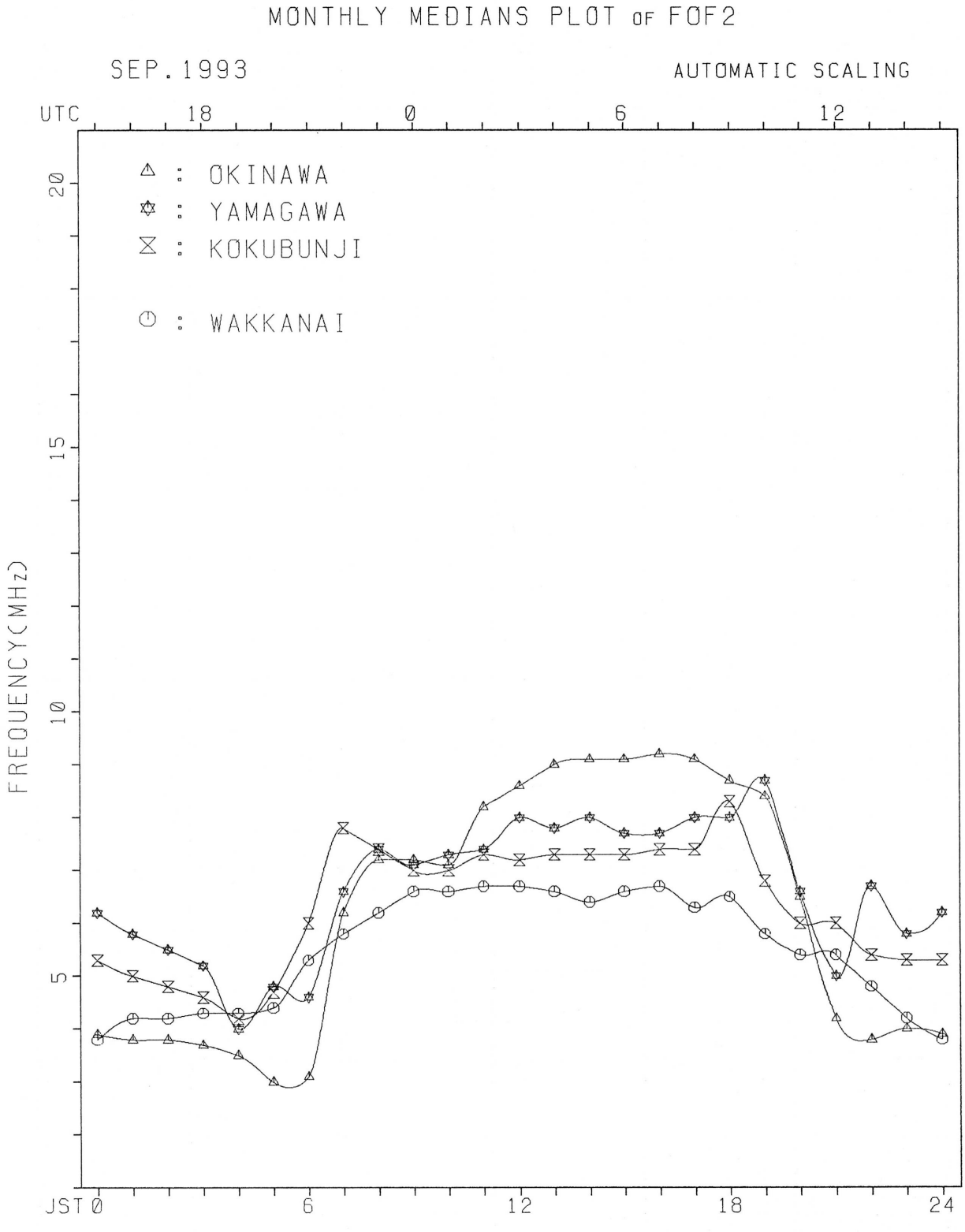
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								22	22	15							17	19	25	19	16	11		
MED								123	117	115							137	125	119	115	109	109		
U Q								242	242	121							277	254	246	240	111	113		
L Q								113	113	113							118	115	113	107	107	105		

H'F STATION OKINAWA LAT. 26.3N LON. 127.8E

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								18	25	25							29	29	28	23	14			
MED								257	248	258							282	258	250	240	244			
U Q								264	258	274							293	272	262	252	272			
L Q								240	236	248							265	247	237	234	220			

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	14	12	12				14	22	23	19	14	11			12	12	16	25	28	24	21	16	16	19
MED	107	108	107				116	123	113	113	114	115			116	118	127	121	115	111	109	108	106	107
U Q	111	109	112				129	137	121	115	115	123			128	129	139	127	121	114	118	112	110	111
L Q	103	104	103				109	117	111	111	107	103			109	114	117	115	110	103	104	103	100	103


MONTHLY MEDIANS PLOT OF FOF2
SEP. 1993
AUTOMATIC SCALING
UTC
18
0
6
12
△ : OKINAWA
✡ : YAMAGAWA
⧖ : KOKUBUNJI
◷ : WAKKANAI
FREQUENCY(MHz)
20
15
10
5
JST 0
6
12
18
24

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FXI (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	X 62	56	I A 46	X 50	X 48															X 86	X 71	X 66	X 66	66
2	X 61	X 57	54	X 50	X 41															X 73	X 69	62	65	65
3	63	X 53	X 46	X 44	X 37															X 82	X 85	A	X 64	57
4	A	A	64	A	50															X 60	X 51	51	X 47	X 45
5	X 41	X 39	X 37	X 38	X 39															X 63	X 62	X 59	X 52	X 45
6	X 42	X 39	X 39	X 38	X 36															X 67	X 62	X 61	X 51	X 49
7	X 49	X 47	X 44	X 40	X 41	X 40														X 84	X 46	X 41	X 42	X 44
8	X 44	X 44	X 41	X 42	X 37	X 40														X 80	X 65	X 56	X 54	X 53
9	X 54	X 52	X 49	X 48	X 48	X 44														X 76	X 74	X 63	60	X 53
10	X 51	X 49	X 48	X 48	X 45	X 43														X 72	X 67	A	56	55
11	58	52	X 49	51	X 48	X 44														X 67	X 58	X 59	59	60
12	57	55	X 53	X 52	X 45	44														X 80	X 77	X 49	X 43	X 46
13	X 48	X 49	X 48	X 50	X 47	50														A	X 74	X 64	X 69	X 39
14	X 41	X 45	X 46	X 46	X 39	X 43														X 67	X 73	X 44	A	X 34
15	X 34	X 39	O X 38	X 43	X 37	X 39													X 68	X 57	X 40	X 41	X 44	X 43
16	X 41	X 40	X 40	X 39	X 38	X 36													X 76	X 81	51	X 48	X 47	X 44
17	X 45	X 44	X 47	X 48	X 30	X 31													X 73	X 69	X 51	50	52	X 52
18	X 49	X 46	X 48	X 48	X 36	X 36													X 81	X 75	X 63	X 56	X 54	X 54
19	X 53	X 49	X 49	X 52	X 42	X 38													X 87	X 64	X 47	X 49	X 48	X 48
20	X 49	X 49	X 47	X 48	X 39	X 38													X 98	X 77	X 51	A	X 45	O X 44
21	45	45	48	43	43	43													X 89	X 84	X 61	O X 54	X 57	X 52
22	51	50	50	50	51	52													X 86	X 90	X 54	X 40	X 41	X 44
23	X 45	X 47	X 48	X 48	X 50	X 49													X 97	X 90	X 64	X 47	X 43	X 43
24	X 42	X 40	49	49	44	43													X 90	X 69	X 54	X 52	X 51	X 51
25	X 48	X 51	X 49	X 53	X 40	X 39													X 84	X 58	X 45	X 46	X 47	X 46
26	X 45	X 46	X 46	X 46	X 40	X 40													X 93	X 49	X 40	X 42	X 42	X 45
27	X 44	X 43	X 42	X 42	X 39	X 42													X 90	X 67	X 58	X 58	X 54	X 42
28	X 40	X 39	X 40	X 40	X 40	X 42													X 93	X 74	X 46	X 46	X 45	X 46
29	X 48	X 48	X 48	X 49	X 47	X 46													X 87	X 48	X 45	X 45	46	X 46
30	X 45	X 46	X 39	X 40	X 38	X 41													X 74	X 49	X 45	X 48	X 48	X 50
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	29	30	29	30	24													16	29	30	27	29	30
MED	X 48	X 47	X 48	X 48	X 40	X 42													X 87	X 72	X 58	X 50	X 51	X 46
U Q	X 52	50	X 49	X 50	X 47	X 44													X 92	X 80	X 67	X 59	56	53
L Q	X 43	X 44	X 42	X 42	X 38	X 39													X 78	X 64	X 47	X 46	X 45	X 44

SEP. 1993 FXI (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FOF2 (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	56	F 48	A	44	42	42	64	73	74	73	66	72	69	73	84	90	80	74	77	80	65	Z 61	61	58
2	55	51	F 45	44	35	34	57	78	71	75	J R 54	59	75	78	79	85	92	82	66	67	63	F 54	F 55	F 55
3	F 55	47	40	38	31	34	54	70	83	87	I A 69	64	65	72	76	70	72	77	75	76	79	I A 70	58	F 48
4	I A 44	I A 45	43	I A 34	F 41	28	I A 28	51	48	A	Y	E G 43	59	E G 43	48	49	51	56	I A 52	54	45	F 40	41	39
5	35	33	31	32	33	34	49	59	58	61	63	75	83	65	61	56	55	57	57	57	56	53	46	39
6	36	33	33	33	30	31	49	61	58	59	J R 62	J R 65	55	61	64	61	54	55	60	61	56	55	45	43
7	43	41	38	34	35	34	55	72	72	62	60	68	60	64	R 64	69	I R 66	70	80	78	40	35	36	38
8	38	38	35	36	31	34	51	62	71	72	77	67	64	69	73	67	61	68	80	74	59	50	48	47
9	48	46	43	42	42	38	53	66	70	69	60	69	67	69	69	63	62	57	65	70	68	57	50	47
10	45	43	42	42	39	37	55	66	70	71	62	62	69	R 61	64	67	68	73	82	66	61	I A 51	48	F 46
11	F 46	F 44	43	42	42	38	54	67	69	64	J R 63	70	67	65	77	72	62	66	64	61	53	53	F 48	F 52
12	F 50	F 47	47	46	39	F 36	52	60	63	59	61	68	70	75	69	68	60	54	66	R 74	71	43	37	40
13	42	43	42	44	41	F 41	50	61	81	59	64	63	V 80	73	56	72	102	104	81	I A 68	68	58	63	H 33
14	35	39	40	40	33	37	43	54	48	Y	51	R 49	53	52	62	57	59	57	57	61	67	38	I A 30	28
15	28	33	32	37	31	33	47	59	61	59	60	62	57	55	63	70	72	71	62	51	34	35	38	37
16	35	34	34	33	32	30	45	59	73	63	69	69	64	61	64	66	68	66	70	75	F 42	42	41	39
17	Z 40	38	41	42	24	25	48	64	72	83	57	67	67	72	67	60	57	60	67	63	45	F 42	F 43	46
18	43	40	42	42	30	30	53	68	76	71	65	71	70	63	64	60	64	71	75	69	57	50	48	48
19	47	43	43	46	36	32	V 47	67	72	74	63	72	77	73	68	62	62	75	81	58	41	43	42	42
20	43	43	41	42	33	32	50	63	72	67	68	74	70	67	72	70	70	90	92	71	45	I A 42	39	S 38
21	F 37	F 36	F 40	F 34	F 33	32	68	61	R 65	68	73	83	89	86	77	79	69	72	83	78	55	R 48	51	46
22	F 44	F 43	41	F 41	F 44	F 45	50	56	56	65	77	72	68	84	94	81	72	67	80	84	48	35	35	38
23	39	41	42	42	44	43	51	V 62	65	70	65	63	74	69	62	59	69	80	91	84	58	41	37	37
24	36	34	F 38	F 38	F 36	34	50	72	73	94	75	80	67	66	68	71	74	88	84	63	48	46	45	45
25	42	45	43	47	34	34	52	76	64	85	91	100	113	88	73	79	78	86	78	52	39	40	41	40
26	39	40	40	40	34	34	55	80	84	71	76	77	69	69	73	79	86	90	87	43	34	36	36	39
27	38	37	36	36	33	36	61	75	71	71	70	84	83	84	73	73	74	84	84	61	52	52	48	36
28	34	33	34	34	34	36	69	75	65	71	78	85	85	73	72	72	74	78	87	69	40	40	39	40
29	42	42	43	43	41	40	63	70	73	I C 79	72	82	82	85	83	88	84	93	81	42	39	39	F 36	40
30	39	40	34	34	32	35	52	60	70	94	95	79	90	97	86	73	78	73	68	43	39	42	42	44
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	30	30	30	30	30	28	29	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	42	41	41	40	34	34	52	65	70	71	65	70	69	69	69	70	69	72	78	66	52	43	42	40
U Q	45	44	43	42	41	37	55	72	73	74	74	77	80	75	76	73	74	82	82	74	61	53	48	46
L Q	37	37	36	34	32	32	49	60	64	64	62	64	65	64	64	62	62	66	66	58	41	40	38	38

SEP. 1993 FOF2 (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FOF1 (0.01MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

H / D	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								L L	L 440	470	460	480	480	L 490	480	420	410	U L 360						
2								L U L 400	U L 440	440	U L 490	U L 470	460	480	450	450	L 420	U L 340						
3								L				470	L 470	L 460	450		U L 440							
4								360	U A 380			430	440	430		410	400							
5								L	U L 420	450	L 460	450	450	460	L 460	L	U L 400	L						
6								L L 390	420	440	450	450	470	450	430	420	U L 400							
7								L	L 410	L 440	U L 500	470	L	450	440	420								
8								L	U L 420	460	450	460	460	470	L 450	420	L 410	L						
9								L	U L 430	L 440	U L 450	460	460	430		440	U L 385	L						
10								L	U L 430	430	L 450	U L 480	460		L 460	430	U L 410	L						
11										U L 440	470	460	460	U L 510	450	L 430								
12								U L 365	L 410	U L 500	L	470	470	460	L 450	L 440	U L 390	L						
13								L	U L 430	L	U L 430	U L 500	L 470	450	460	U L 480	L 410							
14								360	400	420	450	430	440	430	440	L 420	U L 400							
15								U L 370	L 430	430	460	460	460	L 480	450	430	L 410	L						
16								L	U L 430	450	460	480	L 460	L 470	450	L 420	U L 400							
17									430	420	U L 420	470		450	U L 450	L	L							
18								L	430	440	440	480	460	470	U L 500	L 450	L 410	L						
19									L 420	450	L 460	480	470	470	450	U L 430	L	L						
20								L	U L 420	L 430	470	480	460	L 460	430	U L 460	L 420	L						
21									L		L 500	U L 480	L 470	480	L	U L 430								
22								L	L	U L 470	L 450	U L 460	L	470	460	L 430	340							
23								L	U L 420	430	L 470	U L 480	460	450	U L 460	U L 470	L	L						
24								L L	L 450	450	U L 470	L 450	L 460	U L 500	L 460	L	U L 400	L						
25								L	L	U L 470	U L 480	500	470	440	U L 440	L 430	U L 400							
26								L	U L 430	U L 440	L 450	L 460	L 470	L 450	L 460	U L 440	U L 410	L						
27								L	L	U L 460	L 450	L 470	L	440	U L 500	L	L							
28								L	L	U L 430	L 460	480	470	L	L	L	L							
29									L			L	L	L	U L 500	L	L							
30									L 450	440	L 460	U L 480	U L 500	U L 500	U L 440	U L 410								
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								6	22	25	26	29	25	27	26	23	20	2						
MED								L 368	L 430	440	L 460	470	460	460	450	L 430	U L 405	U L 350						
U Q								L 390	L 430	U L 455	U L 470	U L 480	L 470	L 480	U L 460	U L 440	L 410							
L Q								360	420	430	450	460	460	450	450	420	U L 400							

SEP. 1993 FOF1 (0.01MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FOE (0.01MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1							B 215	A	R 315	A	A	A	A	A	A	280	A	220	B					
2							B	A	A	A 340		B	B	B	B	B	B	R 245	215	A				
3							B 200	255		A	A	A	A	A	A	A	A	A	A					
4							B	A	A	A	A	A	B	A	A	A	320	A	A	A				
5							B	A	A	A	A	B	B	R	A	R 345	R	R 255	230	B				
6							B 200	A	295		B	R	365	350		R	U R 330	290	A	A 215	A			
7								200	265	285		B	A	B	B	B	B	310	265	A	B			
8								180	255		A	B	R	R	A	A	A 330	A	A	A	B			
9								195	250		A	A	B	R	B	A	A	R	265	215	B			
10								190	265	305		A	A	A	A	A	R 330	315	A	A	B			
11							A	A 260	A	A	A	A	A	A	R	A	A	A	A					
12							155	A	R 305	A	A	A	B	R 345	R 320	R 300	245	200	B					
13							A	A	U A 285	U A 305	A	A	A	B	335	300	255	205	B					
14							A	235	285	R	U R 360	345	R 345	340	315	300	250	U A 190	B					
15		B					A	A	A	A	A	B	B	B	B	R	R 260	A						
16							A	A	A	R	R	R	R	B	A	A	260	A						
17							175	A	A	R	R 335	A	A	A	A	A	275	A						
18							A	250	A 275	R	B	R	U R 345	R	R	B	260	A						
19							205	A	A 285	A	R	R	R	335	R	290	250	205						
20							190	260	R	A	R	R	U R 345	A	A	295	275	A						
21							190	255	290	305	R 340	U A 340	U R 340	R	325	290	255	190						
22							185	265	285	315	335	A	R	R	305	270	250	195						
23							U R 180	A	275	A	A	A	R	R	R	U R 285	250	185						
24							A	A	A 290	U R 325	R	R	U R 335	325	A	R 295	250	185						
25							A	245	A	A	R	U R 335	R	R	R 320	285	245	U A 170						
26							175	250	295	R	U R 335	U R 340	R	R	R 315	305	250	A						
27							180	R	R	320	R	B	R	R 335	325	A	235	A						
28							A	A	R	U R 325	U R 335	B	B	R	315	305	265	A						
29							185	270	295	C	A	A	A	A	340	300	255	A						
30							175	A 265	300	A 320	R 340	U R 345	R	R	R	R 290	240	B						
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT							18	15	16	8	7	6	6	5	14	19	23	14						
MED							188	255	290	320	R 335	U 342	U R 345	335	325	295	255	202						
U Q							200	265	298	U R 325	R 340	345	345	342	330	305	260	215						
L Q							180	250	285	310	335	U 340	U R 340	330	315	290	250	190						

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FOES (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	J A 33	J A 33	J A 78	J A 42	J A 35	J A 29	J A 23	32	G 30	37	38	41	41	35	36	30	27	G	E B 18	E B 12	J A 24	J A 22	J A 24	J A 28
2	J A 25	30	J A 26	J A 20	J A 51	J A 34	22	J A 42	33	G	E B 36	E B 38	41	E B 37	E B 37	E B 38	G	28	J A 30	J A 34	J A 26	J A 52	J A 51	J A 42
3	J A 34	J A 33	J A 19	J A 21	22	E B 12	25	J A 42	65	J A 66	84	J A 45	J A 42	J A 43	J A 46	53	J A 39	54	J A 52	J A 54	J A 55	93	58	J A 58
4	J A 63	59	J A 98	61	J A 33	E B 14	43	32	45	50	41	E B 35	42	J A 36	45	G	J A 39	J A 56	91	J A 122	J A 86	51	54	J A 44
5	J A 21	26	24	21	J A 18	21	J A 26	J A 53	34	36	41	E B 36	45	J A 44	G	G 30	G	G 20	E B 13	E B 12	J A 20	J A 44	J A 30	E B 13
6	E B 14	E B 14	19	E B 14	E B 12	E B 12	24	27	G 27	E B 35	G 31	39	40	G 34	G 27	G 23	33	28	J A 23	19	E B 13	E B 14	J A 30	E B 13
7	E B 14	E B 12	E B 12	E B 13	J A 14	20	23	29	33	43	39	E B 38	E B 36	E B 41	39	40	J A 75	J A 42	63	J A 26	25	27	21	22
8	19	E B 12	18	J A 17	21	20	22	30	33	E B 34	G 32	G 32	37	41	37	J A 35	31	32	26	41	J A 21	E B 15	E B 14	E B 14
9	E B 14	E B 13	E B 13	27	E B 12	E B 13	22	32	37	33	E B 35	G	E B 37	J A 52	J A 54	G 27	30	28	39	30	28	J A 48	J A 32	23
10	E B 11	E B 13	E B 12	E B 12	E B 14	E B 13	22	33	38	38	41	J A 44	42	J A 50	G	G	J A 37	J A 28	J A 20	J A 26	25	J A 56	J A 44	J A 25
11	J A 32	36	J A 36	J A 27	19	22	23	J A 48	J A 55	J A 38	J A 43	J A 51	J A 50	J A 42	G 32	J A 44	51	J A 44	48	J A 27	J A 92	J A 60	J A 35	J A 44
12	J A 28	J A 22	J A 22	E B 13	J A 19	J A 20	G	27	G	37	J A 51	44	E B 38	G 29	G 28	G 21	G 20	G	E B 14	J A 18	21	E B 13	J A 18	21
13	19	J A 29	E B 12	E B 12	E B 13	E B 13	20	J A 35	35	35	37	39	40	E B 34	40	41	31	28	J A 41	70	J A 93	J A 55	21	E B 12
14	16	J A 18	J A 23	19	18	J A 20	J A 32	30	31	G	41	41	38	41	41	39	J A 39	J A 34	J A 49	J A 111	J A 52	J A 40	42	J A 26
15	27	E B 16	21	22	22	25	J A 28	J A 32	J A 38	J A 34	36	E B 41	E B 37	42	E B 34	G	G	J A 28	J A 24	J A 32	J A 49	24	J A 21	19
16	19	E B 14	24	E B 13	20	J A 19	J A 34	J A 32	32	G	G 32	G	G	E B 37	42	35	30	J A 48	J A 28	60	34	19	E B 14	27
17	J A 21	E B 13	23	E B 14	E B 12	18	24	J A 52	J A 41	G	G 27	39	62	J A 53	J A 54	60	J A 41	J A 53	J A 54	J A 100	95	J A 47	E B 13	E B 12
18	E B 13	E B 15	E B 14	24	17	E B 14	20	28	32	G 29	E B 35	G	38	G 24	G 23	E B 33	G 22	32	33	J A 27	J A 23	22	J A 23	E B 13
19	E B 13	E B 15	E B 12	E B 12	E B 14	E B 14	G 18	25	32	36	G 30	G 33	G 30	G	G 27	G 25	G	22	30	J A 21	J A 26	J A 26	J A 21	20
20	E B 14	E B 14	E B 12	17	E B 13	18	21	27	32	35	G	G	G 32	41	35	34	G	J A 29	J A 20	J A 36	J A 56	J A 64	J A 53	J A 50
21	J A 48	J A 46	J A 30	24	23	E B 12	21	34	38	J A 48	G	42	G	G 29	43	33	34	26	25	J A 52	J A 24	J A 89	J A 44	32
22	J A 103	J A 53	J A 84	J A 41	J A 31	22	G	G 24	33	37	39	40	35	G	G 20	G	G 18	G	J A 15	J A 23	20	J A 25	J A 18	J A 20
23	21	19	J A 22	J A 21	J A 43	J A 24	G	27	G 25	J A 43	J A 39	34	G 32	G 24	G 24	G 21	31	25	J A 23	J A 23	20	E B 13	E B 13	J A 21
24	E B 14	E B 13	E B 14	E B 13	17	18	21	27	36	G	G	G 29	G	G	J A 33	G 24	28	22	J A 18	E B 13	E B 13	J A 22	J A 19	20
25	J A 17	E B 13	18	E B 12	J A 21	J A 47	J A 53	27	J A 32	33	G 26	G 27	G	G	G	34	30	27	43	J A 26	J A 33	E B 14	J A 22	22
26	E B 13	E B 14	E B 13	17	20	20	G	G	G	G 23	G 23	G	G	G 21	G	G	30	22	E B 14	E B 13	E B 13	E B 13	21	21
27	J A 44	21	E B 17	18	E B 13	20	22	27	G 26	G	G 28	E B 35	G	G	G	J A 32	G	24	J A 22	E B 18	J A 27	E B 13	J A 23	24
28	E B 16	J A 20	E B 12	E B 14	E B 13	E B 14	20	28	G	G 26	G 26	E B 36	E B 35	G	35	G	31	J A 29	28	23	J A 31	J A 26	J A 27	J A 21
29	21	J A 25	E B 15	20	19	20	23	J A 43	36	C	J A 63	J A 49	54	40	38	33	36	J A 89	J A 102	J A 55	J A 30	J A 24	J A 27	20
30	19	E B 14	E B 15	E B 13	J A 16	E B 11	20	36	J A 39	38	G	G	G	G	G	G	28	E B 17	E B 13	J A 20	J A 25	J A 22	E B 11	E B 12
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	19	17	18	18	18	20	22	31	33	35	36	36	37	E G 36	34	E G 31	30	28	27	J A 26	J A 26	J A 26	J A 23	21
U Q	J A 28	J A 29	J A 24	22	J A 22	21	J A 24	J A 35	38	38	41	41	41	J A 41	40	35	J A 36	J A 34	43	J A 52	J A 49	J A 51	J A 35	J A 27
L Q	E B 14	E B 14	E B 13	E B 13	E B 14	E B 14	G 20	27	G 31	G	G 32	G	G	G	G	G	G	22	E B 20	E B 20	21	E B 19	E B 19	E B 19

SEP. 1993 FOES (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FBES (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35° 42.4'N LON.139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

HD	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	26	27	A A 78	23	19	26	G 20	27	G 27	35	37	41	41	U Y 35	36	G 25	U Y 27	G	E B 18	E B 12	17	19	19	20
2	22	29	21	17	22	21	22	35	32	G	E B 36	E B 38	39	E B 37	E B 37	E B 38	G	26	22	32	18	16	35	38
3	20	22	17	16	20	E B 12	23	41	59	65	A A 84	41	40	40	42	46	35	37	30	34	17	A A 93	44	20
4	A A 63	A A 59	25	A A 61	20	E B 14	A A 43	28	38	A A 50	U Y 41	E B 35	41	36	42	G	31	34	A A 91	45	35	29	30	20
5	18	19	16	E B 13	15	15	23	29	32	34	40	E B 36	40	39	G	U G 30	G	G 18	E B 13	E B 12	E B 13	22	24	E B 13
6	E B 14	E B 14	E B 14	E B 14	E B 12	E B 12	G	26	G 26	E B 35	G 31	E B 36	39	U G 34	G 26	G 22	30	25	19	16	E B 13	E B 14	19	E B 13
7	E B 14	E B 12	E B 12	E B 13	E B 11	14	22	29	30	40	38	E B 38	E B 36	E B 41	E B 36	37	43	34	62	20	E B 14	17	E B 14	E B 13
8	16	E B 12	E B 12	14	15	E B 14	21	29	32	E B 34	U G 32	U G 32	37	38	36	32	29	31	18	24	18	E B 15	E B 14	E B 14
9	E B 14	E B 13	E B 13	E B 13	E B 12	E B 13	22	31	34	33	E B 35	G	E B 37	40	45	U G 27	29	26	28	19	20	24	20	E B 12
10	E B 11	E B 13	E B 12	E B 12	E B 14	E B 13	21	31	37	36	40	42	41	47	G	G	33	26	15	22	16	A A 56	30	17
11	16	20	16	20	16	E B 13	23	45	45	35	42	42	40	38	U G 32	39	44	42	40	18	45	31	21	36
12	21	18	16	E B 13	14	E B 12	G	26	G	34	41	40	E B 38	G 27	G 26	G 20	G 19	G	E B 14	16	E B 13	E B 13	E B 13	15
13	E B 13	23	E B 12	E B 12	E B 13	E B 13	20	29	34	35	35	37	40	E B 34	38	37	29	27	29	A A 70	48	29	20	E B 12
14	15	16	17	E B 13	E B 13	16	26	30	31	G	39	41	U Y 38	39	37	34	35	30	43	44	40	24	A A 42	16
15	17	E B 16	20	17	16	17	23	29	37	34	35	E B 41	E B 37	E B 34	E B 34	G	G	26	22	25	17	18	19	E B 12
16	E B 13	E B 14	E B 15	E B 13	E B 13	E B 13	31	29	30	G	G 32	G	G	E B 37	34	33	30	30	23	21	16	E B 14	E B 14	20
17	18	E B 13	17	E B 14	E B 12	E B 13	23	44	38	G	G 27	39	54	43	39	36	36	49	44	46	29	29	E B 13	E B 12
18	E B 13	E B 15	E B 14	16	E B 13	E B 14	20	28	32	U G 29	E B 35	G	37	G 24	G 21	E B 33	G 21	23	25	18	16	E B 13	18	E B 13
19	E B 13	E B 15	E B 12	E B 12	E B 14	E B 14	G 16	25	32	34	G 29	G 33	G 30	G	G 25	G 25	G	21	23	17	16	17	16	E B 12
20	E B 14	E B 14	E B 12	E B 13	E B 13	E B 13	21	27	31	34	G	G	G 31	36	33	31	G	21	E B 12	28	41	A A 64	20	31
21	23	28	18	15	E B 12	E B 12	20	33	35	42	G	41	G	G 29	40	32	29	25	E B 14	31	16	31	23	21
22	15	32	15	23	21	E B 13	G	G 23	33	36	38	40	35	G	G 17	G	G 16	G	E B 13	18	E B 13	21	16	E B 13
23	E B 14	E B 13	19	E B 10	27	17	G	27	G 24	38	38	34	U G 32	U G 24	G 24	G 21	30	23	20	17	E B 12	E B 13	E B 13	16
24	E B 14	E B 13	E B 14	E B 13	E B 12	E B 13	19	25	34	G	G	G 28	G	G	33	G 24	27	21	E B 13	E B 13	E B 13	17	15	E B 12
25	15	E B 13	14	E B 12	19	28	27	27	29	33	G 26	G 27	G	G	G	32	28	25	34	20	14	E B 14	19	E B 13
26	E B 13	E B 14	E B 13	13	E B 11	E B 14	G	G	G	G 22	G 21	G	G	G 21	G	G	28	20	E B 14	E B 13	E B 13	E B 13	E B 13	15
27	29	E B 14	E B 17	E B 13	E B 13	E B 13	21	26	G 26	G	G 28	E B 35	G	G	G	31	G	21	19	E B 18	20	E B 13	17	16
28	E B 16	E B 14	E B 12	E B 14	E B 13	E B 14	18	26	G	G 25	G 25	E B 36	E B 35	G	34	G	30	27	19	17	17	E B 14	20	19
29	E B 11	17	E B 15	E B 12	E B 15	E B 13	20	35	35	C	47	43	46	39	36	33	34	81	60	27	16	17	16	E B 12
30	E B 13	E B 14	E B 15	E B 13	16	E B 11	19	32	33	34	G	G	G	G	G	G	27	E B 17	E B 13	17	16	20	E B 11	E B 12
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	14	E B 14	E B 15	E B 13	E B 14	E B 13	21	29	32	34	35	36	37	G	E G 34	G	29	26	21	20	16	18	19	14
U Q	18	20	17	16	16	14	23	31	35	36	39	41	40	39	37	33	31	30	30	28	20	29	21	20
L Q	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	G	26	G 29	G	G 32	G	G	G 34	G	G 30	G	21	E B 14	17	E B 14	E B 14	E B 14	E B 12

SEP. 1993 FBES (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 FMIN (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	13	11	14	13	14	15	15	13	15	28	33	23	31	30	32	16	14	13	18	12	13	14	13	13
2	13	13	14	12	14	12	13	14	18	23	36	38	37	37	37	38	14	15	12	14	14	14	12	13
3	12	12	13	14	14	12	14	15	26	21	25	30	29	27	30	25	18	12	13	14	13	13	14	13
4	15	13	13	15	13	14	12	16	20	23	24	35	30	26	27	21	21	17	14	14	13	13	13	13
5	14	12	13	13	12	11	13	14	20	28	39	36	23	22	20	27	19	14	13	12	13	13	12	13
6	14	14	14	14	12	12	14	12	14	35	23	36	23	25	20	17	13	12	12	13	13	14	13	13
7	14	12	12	13	11	12	13	13	25	36	30	38	36	41	36	19	13	14	15	14	14	13	14	13
8	13	12	12	12	12	14	14	13	16	34	22	21	23	19	20	13	13	13	14	13	13	15	14	14
9	14	13	13	13	12	13	13	14	18	27	35	26	37	20	21	19	14	13	12	14	12	11	12	12
10	11	13	12	12	14	13	13	15	14	20	22	27	21	24	27	24	16	12	13	12	12	12	12	13
11	13	13	12	12	12	13	13	13	17	31	31	24	26	32	22	19	16	13	11	12	13	12	13	12
12	12	12	13	13	11	12	14	13	15	19	18	22	38	19	18	13	12	12	14	12	13	13	13	13
13	13	13	12	12	13	13	13	13	15	21	21	33	25	34	20	15	13	12	14	12	14	12	11	12
14	13	14	12	13	13	14	13	13	15	24	32	30	23	19	20	18	13	11	12	14	14	14	12	14
15	13	16	16	13	12	13	12	13	13	20	21	41	37	34	34	21	18	13	13	14	13	13	13	12
16	13	14	15	13	13	13	13	13	13	20	22	25	28	37	19	16	15	15	15	14	13	14	14	16
17	12	13	13	14	12	13	13	13	14	18	20	26	22	23	15	12	14	13	15	15	13	13	13	12
18	13	15	14	13	13	14	13	15	14	21	35	30	30	16	15	33	14	11	14	13	13	13	12	13
19	13	15	12	12	14	14	13	14	16	17	25	26	22	30	21	15	15	13	13	13	12	12	12	12
20	14	14	12	13	13	13	14	12	14	13	25	29	24	28	22	14	14	14	12	12	14	11	13	13
21	13	13	13	12	12	12	13	15	14	21	29	20	20	22	19	13	14	13	14	14	13	14	12	14
22	11	13	12	13	14	13	13	14	16	14	23	20	21	25	15	13	13	13	13	11	13	13	12	13
23	14	13	12	10	12	14	14	13	13	13	19	21	21	20	16	13	13	13	14	13	12	13	13	12
24	14	13	14	13	12	13	13	13	16	26	27	25	22	21	14	13	15	12	13	13	13	12	13	12
25	12	13	12	12	12	14	13	13	13	14	20	22	30	22	20	13	12	13	13	13	13	14	15	13
26	13	14	13	11	11	14	13	13	14	19	20	20	26	19	21	19	13	13	14	13	13	13	13	12
27	14	14	17	13	13	13	14	15	20	21	22	35	27	28	17	15	14	13	14	18	13	13	13	13
28	16	14	12	14	13	14	13	13	18	16	17	36	35	24	21	14	15	14	13	13	14	14	14	13
29	11	13	15	12	15	13	15	14	13	C	31	19	30	21	25	14	13	13	14	13	13	13	13	12
30	13	14	15	13	12	11	14	15	17	23	29	27	24	27	22	19	14	17	13	13	11	14	11	12
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	13	13	13	13	12	13	13	13	15	21	24	26	26	24	20	16	14	13	13	13	13	13	13	13
U 0	14	14	14	13	13	14	14	14	18	26	31	35	30	30	25	19	15	14	14	14	13	14	13	13
L 0	13	13	12	12	12	12	13	13	14	18	21	22	23	21	19	13	13	12	13	12	13	13	12	12

SEP. 1993 FMIN (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 M(3000)F2 (0.01) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	310	F 300	A	290	305	305	340	350	350	335	350	325	305	310	310	330	330	330	325	320	330	Z 300	300	300
2	300	305	F 320	335	305	325	335	355	350	355	J R 330	310	315	300	300	310	330	345	340	325	320	F 305	F 310	F 315
3	F 305	300	305	345	295	290	320	325	330	345	A	310	315	310	315	320	315	330	320	295	310	A	305	F 290
4	A	A	325	A	F 280	270	A	295	295	A	Y	G	310	G	280	300	300	315	A	320	300	F 285	310	310
5	305	280	295	295	300	290	330	330	325	305	295	290	325	330	325	320	330	335	325	305	310	315	325	300
6	295	295	310	310	315	325	335	355	325	320	J R 325	J R 330	310	330	335	350	340	325	325	315	310	310	300	300
7	300	305	310	305	310	315	330	345	350	350	325	325	300	325	R 315	345	R	325	325	350	345	305	285	295
8	315	310	305	335	330	320	325	340	335	320	335	325	330	320	325	340	325	325	325	345	350	295	295	285
9	295	300	305	320	320	310	340	345	340	355	310	340	335	320	335	315	335	320	315	310	330	320	325	310
10	300	285	290	310	295	310	350	370	365	355	355	320	335	R 315	320	315	325	330	335	335	340	A	F 290	310
11	F 295	F 305	305	330	335	310	345	350	360	360	J R 340	330	325	310	325	345	330	345	345	315	A	315	F 275	F 305
12	F 315	F 305	310	330	350	F 330	345	370	365	320	310	315	325	335	340	340	340	335	310	R 340	360	360	285	300
13	300	295	295	295	285	F 300	330	320	355	320	315	270	V 310	345	300	260	300	350	300	A	300	320	340	H 260
14	260	265	270	295	255	290	305	305	290	Y	270	R 265	300	335	325	340	350	335	305	295	335	345	A	295
15	315	300	295	325	315	335	335	345	325	320	315	335	315	295	315	330	335	345	350	345	305	300	285	315
16	310	300	310	320	340	325	350	330	320	365	335	335	350	315	330	335	335	340	320	345	F 310	315	290	310
17	Z 295	285	310	340	345	320	330	340	345	365	350	340	315	335	325	340	330	330	345	340	320	F 295	F 305	300
18	300	290	305	335	390	305	335	350	355	365	335	330	335	340	320	325	320	335	335	345	325	305	285	295
19	300	300	300	330	350	330	V 340	350	355	365	335	320	325	320	345	340	320	330	355	340	300	295	285	285
20	305	305	320	335	330	310	365	355	345	345	340	330	330	320	330	320	315	325	350	370	A	A	S 280	270
21	F 285	F 300	F 320	F 320	F 280	275	365	365	R 335	335	300	300	320	325	310	335	320	320	325	345	315	R 275	305	295
22	F 305	F 295	295	F 285	F 335	F 325	355	370	335	325	330	340	300	320	320	330	340	325	325	360	350	275	295	305
23	310	305	300	315	340	330	360	V 355	365	355	325	325	330	335	325	315	325	320	335	365	380	310	290	295
24	290	295	F 310	F 325	F 310	300	325	345	330	345	305	325	340	320	325	325	330	335	345	335	310	280	290	290
25	270	290	305	320	355	A	345	355	305	305	315	305	330	350	335	330	345	340	355	345	295	290	280	280
26	275	290	300	325	305	320	345	345	365	340	320	350	330	325	315	325	340	335	360	355	285	290	295	300
27	305	290	310	305	320	325	365	360	380	350	330	340	320	335	320	325	335	335	350	335	290	320	320	310
28	295	305	290	300	300	325	365	365	375	355	325	340	335	320	320	330	340	340	350	370	310	280	290	290
29	290	295	320	325	280	285	355	360	I C 350	345	335	330	320	325	315	340	340	355	370	375	285	285	F 275	285
30	285	310	305	285	280	280	350	325	320	325	340	325	315	320	325	335	335	345	345	330	305	275	275	305
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	29	29	29	30	29	29	30	30	28	28	30	30	30	30	30	29	30	29	29	28	27	29	30
MED	300	300	305	320	312	310	340	350	345	345	328	325	322	320	322	330	330	335	335	340	310	300	290	300
U Q	305	305	310	330	335	325	352	355	355	355	335	335	330	335	325	340	340	340	350	348	332	315	305	305
L Q	292	290	298	302	295	295	330	340	325	322	315	310	315	315	315	320	322	325	325	320	302	285	285	290

SEP. 1993 M(3000)F2 (0.01) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 M(3000)F1 (0.01) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D/H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								L L	L 370	380	395	385	370	L 325	350	380	365	U L 375						
2								L U L 385	U L 380	395	U L 365	U L 380	385	365	370	355	L 365	U L 390						
3								L A	A	A	A	385	L 370	L 370	A 340	A	U L 340	A						
4								A 345	A	A	Y	390	A	380	A	340	345	A	A					
5								L	U L 390	370	L 385	385	380	380	L 365	L	U L 365	L						
6								L L 375	380	390	390	380	365	355	370	365	U L 365							
7								L	L 375	L 390	U L 365	370	L	370	380	390	A	A						
8								L	U L 380	370	405	385	370	365	L 365	365	L 355	L						
9								L	U L 380	L 390	U L 395	395	395	A 330	A	365	U L 370	L						
10								L	U L 380	395	L 405	U L 340	A 365	A	L 355	345	U L 355	L						
11									A	U L 380	A 370	A 370	A 370	U L 335	355	L 390	A							
12								U L 380	L 395	U L 350	L	390	355	380	L 370	L 350	U L 370	L						
13								L	U L 365	L	U L 385	U L 330	L 345	370	350	U L 300	L 330							
14								A 340	350	375	380	385	365	375	A 335	L 375	U L 370	A						
15								U L 375	L 355	395	380	B 360	360	L 345	H 350	H 340	L 345	L						
16								L	U L 375	370	370	375	L 360	L 365	370	L 360	U L 350							
17								A	385	410	U L 435	370	A	A	U L 370	L	L							
18								L	385	380	415	H 400	410	385	U L 335	L 360	L 360	L						
19									L 370	385	L 410	395	375	365	360	U L 375	L	L						
20								L	U L 385	L 390	385	375	370	L 380	385	U L 345	L 365	L						
21									L	A	L 340	U L 365	L 375	H 350	L	U L 360								
22								L	L	U L 350	L 365	U L 370	L	370	345	L 370	390							
23								L	U L 370	410	L 370	U L 365	380	380	U L 370	U L 345	L	L						
24								L L	L 375	380	U L 365	L 395	L 370	U L 360	L 340	L	U L 360	L						
25								L	L	U L 370	U L 355	350	355	365	U L 380	L 355	U L 365							
26								L	U L 385	U L 395	L 400	L 380	L 375	L 370	350	L 360	L	L						
27								L	L	U L 385	L 400	L 365	L	390	U L 375	L	L							
28								L	L	U L 390	L 395	365	385	L	L	L	L							
29									L	C	A	L	L	L	U L 335	L	L	A						
30									L 355	380	L 370	U L 370	U L 350	U L 350	U L 380	U L 380								
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								6	21	25	26	29	24	26	26	23	19	2						
MED								L 375	L 380	385	L 385	375	370	368	362	L 360	U L 365	U L 382						
U O								U L 380	L 385	392	L 400	385	378	380	U L 370	L 375	U L 365							
L O								345	L 370	372	U L 370	L 365	362	L 355	350	345	L 350							

SEP. 1993 M(3000)F1 (0.01) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 H'F2 (KM) 135° E MEAN TIME (G.M.T. + 9H)

LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1							255	245	255	275	265	300	330	325	305	270	260	255						
2							275	240	250	250	305	320	305	315	310	295	265	245						
3							290	260	A 255	A 260	A	310	310	305	305	285	295	260						
4							A	345	390	A	Y	G	350	G	E A 445	385	365	295	A					
5								255	285	345	335	320	280	305	315	315	280	260						
6							L 280	255	295	305	305	290	360	310	295	260	280							
7								265	240	265	300	300	335	305	305	280	270	270						
8								265	265	300	270	305	295	310	275	270	290	265						
9								245	255	255	280	285	280	305	275	290	265	255						
10								245	250	260	255	320	295	330	310	300	280	260						
11									250	250	285	290	285	340	290	255	255							
12								240	245	315	L 330	310	285	285	270	270	255	260						
13								260	250	275	280	390	295	255	350	380	300							
14								320	395	Y	460	460	395	320	315	285	255	265						
15								250	295	310	325	305	340	375	330	290	265	250						
16								270	265	250	280	285	265	325	295	270	265							
17								265	250	250	255	295	310	280	280	260	280							
18								255	245	245	275	285	270	275	300	280	305	255						
19									245	245	265	295	280	285	270	275	295	260						
20								250	245	245	265	285	280	275	290	285	290	255						
21									250	265	315	280	275	290	300	265								
22								240	L 275	285	275	260	L 335	295	285	260	250							
23								235	245	255	280	285	285	265	265	310	280	265						
24							300	250	270	250	275	265	270	300	300	275	260	255						
25								240	260	280	275	305	260	245	255	270	240							
26								255	235	240	265	255	275	280	305	270	255	245						
27								235	230	255	265	265	285	260	300	275	255							
28								225	225	250	280	260	270	L 295	275	260	255							
29									235	I C 245	260	275	270	265	300	260	255	A						
30									295	270	255	260	290	265	255	260								
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT							5	25	30	28	28	30	30	30	30	30	28	18						
MED							280	250	250	258	278	292	285	298	299	275	265	260						
U Q							295	262	270	278	302	310	310	315	305	290	285	265						
L Q							265	240	245	250	265	280	275	275	275	265	255	255						

SEP. 1993 H'F2 (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 H'F (KM) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	265	A 310	A	290	285	295	240	225	230	205	215	215	230	255	245	225	220	225	240	235	210	280	275	275
2	275	A 280	265	235	E A 310	A 285	235	E A 245	215	200	230	210	220	215	235	B 245	H 205	240	235	260	245	265	305	E A 310
3	295	270	275	225	345	285	245	A	A	A	A	225	220	A 245	A	A	A 265	A	260	280	240	A	E A 305	A 290
4	A	A	A 280	A	350	355	A	255	A	A	Y	215	A	215	A	250	235	A	A	A	E A 335	315	A 315	270
5	280	315	315	305	300	300	A 250	235	225	205	215	195	220	225	225	240	220	245	245	245	255	265	A 250	260
6	280	305	290	260	275	270	240	215	215	215	195	215	235	215	225	235	225	260	250	250	235	250	250	290
7	275	260	255	265	265	275	245	225	210	235	225	215	225	240	225	A 250	A	A	A	220	205	280	295	290
8	265	265	280	235	270	265	245	225	230	205	195	205	220	235	220	215	220	A	245	230	225	275	285	285
9	285	280	275	260	H 240	275	235	235	230	225	205	205	210	A	A	230	225	225	260	250	240	260	245	255
10	265	295	295	280	230	255	235	235	235	215	230	E A 260	E A 260	A	225	215	245	240	235	235	225	A	310	270
11	265	310	285	270	250	245	235	A 255	A	215	E A 255	A	E A 265	240	230	A	A	A 250	A 255	245	A	275	310	E A 320
12	280	275	275	235	215	255	235	225	225	210	A 245	225	B 255	215	225	220	225	235	255	235	215	210	275	285
13	270	315	295	265	300	280	230	A 235	230	215	205	240	A 250	230	240	E A 290	270	230	265	A	A	245	255	H 215
14	365	345	345	300	H 275	305	A 260	E A 265	245	225	230	E A 255	240	235	E A 255	250	A	A	A	A	245	240	A	335
15	335	315	A 350	250	275	260	245	240	A 255	210	200	E B 265	215	205	H 235	H 225	H 235	A 245	225	235	265	285	300	275
16	275	285	290	235	245	255	A 255	225	215	205	225	210	220	210	215	225	H 220	245	250	230	235	245	275	305
17	330	315	265	215	255	290	255	A	235	205	180	225	A	A	A 250	A 250	A	A	A 250	245	A 265	A 320	255	255
18	260	280	260	245	205	275	250	240	225	200	195	H 170	205	205	200	235	240	245	240	225	230	255	295	280
19	270	285	280	240	220	260	225	245	235	210	205	185	180	200	215	235	235	255	225	215	240	285	325	290
20	275	260	255	215	215	255	225	230	215	210	H 205	190	215	235	210	215	220	260	220	A 225	A	A	335	A
21	A 365	A 355	275	275	330	325	220	225	225	A	220	240	190	H 185	265	230	245	265	245	235	220	E A 320	280	285
22	275	E A 335	310	A 325	260	245	210	225	215	220	245	A 245	205	190	240	230	225	245	240	220	215	A 290	310	275
23	270	275	285	265	250	245	220	225	225	220	215	200	190	215	225	H 220	250	250	240	220	205	250	255	290
24	310	310	295	255	250	270	235	225	230	215	205	200	190	210	220	245	235	250	225	210	225	290	280	290
25	305	295	255	245	230	A	245	225	210	215	215	220	225	220	230	225	230	250	225	210	255	285	315	300
26	310	285	290	250	250	255	240	235	225	215	205	205	210	210	230	240	250	245	205	200	310	285	315	285
27	A	280	270	265	265	265	215	235	225	215	210	205	220	215	215	230	240	245	220	225	285	240	245	265
28	290	285	305	295	280	275	230	225	225	205	205	195	195	220	225	240	A 250	245	220	205	230	275	315	315
29	295	285	260	250	265	305	225	225	225	I C 245	A	A 255	A	E A 250	245	250	A 255	A	A 235	215	285	305	325	315
30	285	265	245	300	290	300	235	240	235	220	220	205	235	230	230	225	250	230	220	225	275	330	315	255
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	29	29	29	30	29	29	28	27	27	27	29	27	27	27	28	26	23	27	27	27	27	29	29
MED	280	285	280	260	264	275	235	228	225	215	212	210	220	215	225	231	235	245	240	230	238	275	295	285
U Q	300	312	295	278	285	292	245	240	230	220	225	232	235	235	240	245	250	250	250	245	265	290	315	295
L Q	270	278	265	238	245	255	228	225	215	205	205	202	205	210	220	225	225	240	225	220	225	250	265	270

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 H'E (KM) 135°E MEAN TIME (G.M.T. + 9H)

LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1							B 115	115	E A 145	120	A	A	A	A	A	A 130	A	115	B					
2							B	A 115	A	115	B	B	B	B	B	B	110	120	A					
3							B 125	115	115	110	A	A	A	A	A	110	A	A	A					
4							B	A 115	A	A	A	B	A	A	A	115	A	A	A					
5							B	A 115	120	A	B	B	115	A	110	A	120	115	B					
6							B 120	A	A 130	B	A	E B 160	110	A	A 120	120	A	A	A					
7							130	120	125	B	A	B	B	B	B	115	110	120	B					
8							135	120	115	B	A	A	A	A	A	A	A	A	B					
9							130	115	115	A	B	115	B	A	A	A	110	120	B					
10							130	115	A 125	115	110	110	110	A	120	120	120	A	B					
11							A	115	115	A	A	A	A	A	A	110	A	A	A					
12							120	A	110	A	A	A	B	E A 135	A 120	120	A 115	120	B					
13							A	120	115	115	110	A	115	B	115	115	115	120	B					
14							125	115	110	115	120	B 135	120	125	115	110	115	110	B					
15		B					A	110	A	A	A	B	B	B	B	120	120	A						
16							A	A	A	115	A	120	120	B	A	A	115	125						
17							130	110	A	115	120	A	A	A	A	A	A 120	A						
18							A	A 120	A	A	B	B 125	E B 140	120	120	B	A 120	A						
19							E A 155	A	A	A	A 120	A	A	120	A 120	A 120	115	130						
20							135	115	A 120	110	120	115	125	A	A	115	115	A						
21							125	115	110	110	B 120	110	115	A	110	120	120	120						
22							145	125	A 125	110	120	A	115	115	120	110	115	120						
23							125	110	A 125	A	A	A	A	A	A	115	A 125	125						
24							A	A	115	115	120	A 120	115	115	A	A 120	115	130						
25							A	A 125	A	A	A 120	120	120	110	115	A 115	110	130						
26							130	120	110	120	110	110	120	125	110	115	115	A						
27							130	A	A	115	E A 130	B	120	B 130	110	A	115	140						
28							A	115	120	120	120	B	B	115	115	120	115	A						
29							130	120	110	I C 110	A	110	A	A	120	115	115	A						
30							130	120	115	115	120	120	115	115	120	115	120	B						
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT							19	24	21	17	14	13	15	11	16	22	24	16						
MED							130	115	115	115	120	118	115	118	118	115	115	120						
U Q							130	120	A 125	115	A 120	B 122	120	125	A 120	120	120	128						
L Q							125	115	112	110	120	110	115	115	112	115	115	120						

SEP. 1993 H'E (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 H'ES (KM) 135°E MEAN TIME (G.M.T. + 9H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	105	105	95	105	110	100	110	115	115	120	120	115	115	120	120	115	110	G	B	B	105	105	110	100
2	100	105	100	100	115	120	110	115	115	G	B	B	180	B	B	B	G	130	120	110	110	115	105	105
3	100	100	100	100	100	B	160	120	110	110	110	110	110	115	115	110	110	105	110	105	110	100	105	105
4	110	110	130	130	125	B	120	120	115	115	110	B	145	120	120	G	130	110	110	110	110	105	105	105
5	105	105	105	110	120	105	115	110	115	115	110	B	135	110	G	115	G	115	B	B	110	100	105	B
6	B	B	105	B	B	B	160	110	110	B	110	110	175	110	105	105	140	135	95	95	B	B	115	B
7	B	B	B	B	115	115	150	135	125	110	120	B	B	B	150	130	120	120	115	115	100	100	100	105
8	100	B	115	110	110	115	150	120	120	B	110	110	110	105	140	100	100	120	100	100	100	B	B	B
9	B	B	B	110	B	B	165	120	120	120	B	G	B	100	100	110	150	130	115	115	110	105	110	105
10	B	B	B	B	B	B	160	140	125	130	120	115	110	110	G	G	130	120	115	110	110	105	110	110
11	110	105	105	100	100	125	125	115	115	120	110	115	110	120	115	110	110	115	110	110	105	105	110	105
12	100	100	105	B	110	110	G	110	G	110	110	100	B	100	105	100	100	G	B	120	115	B	105	100
13	100	100	B	B	B	B	120	115	115	115	120	120	115	B	145	130	135	130	120	110	105	110	110	B
14	130	125	135	135	140	130	120	125	135	G	145	140	150	140	135	125	120	115	110	110	110	110	110	110
15	105	B	110	120	120	120	120	115	110	110	110	B	B	120	B	G	G	120	115	110	115	110	110	110
16	140	B	105	B	120	105	110	115	115	G	115	G	G	B	110	105	135	110	110	110	105	100	B	100
17	100	B	105	B	B	125	145	110	110	G	105	105	100	100	100	100	120	115	110	105	105	110	B	B
18	B	B	B	100	100	B	130	125	120	110	B	G	160	105	105	B	100	100	95	95	95	105	105	B
19	B	B	B	B	B	B	115	110	165	110	110	110	110	G	105	105	G	125	100	105	100	95	95	100
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21	125	120	110	115	115	B	155	125	120	110	G	115	G	105	135	150	130	120	120	110	115	110	115	110
22	115	110	115	105	105	110	G	105	140	125	120	115	125	G	105	G	105	G	130	120	110	110	120	115
23	115	115	110	115	105	105	G	120	110	105	105	105	105	105	105	105	140	130	110	110	115	B	B	110
24	B	B	B	B	105	120	115	120	120	G	G	110	G	G	110	105	150	145	120	B	B	110	105	105
25	105	B	105	B	110	110	105	160	105	110	110	110	G	G	G	140	135	120	115	115	110	B	100	105
26	B	B	B	105	125	120	G	G	G	110	100	G	G	105	G	G	130	125	B	B	B	B	100	105
27	105	130	B	110	B	110	130	125	105	G	110	B	G	G	G	125	G	140	115	B	110	B	100	100
28	B	105	B	B	B	B	135	115	G	110	105	B	B	G	175	G	150	125	115	115	115	110	110	110
29	110	105	B	100	125	130	150	135	130	C	110	110	110	115	170	160	130	115	110	110	110	110	105	110
30	110	B	B	B	125	B	160	130	125	120	G	G	G	G	G	G	120	B	B	110	110	110	B	B
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	20	15	17	18	21	19	26	29	27	21	23	17	18	19	22	21	24	26	25	25	27	23	25	23
MED	105	105	105	110	115	115	130	120	115	110	110	110	115	110	115	110	130	120	115	110	110	110	105	105
U Q	112	115	112	115	122	120	150	125	125	120	120	115	145	120	135	128	135	130	115	112	110	110	110	110
L Q	100	105	105	100	105	105	115	115	110	110	110	110	110	105	105	105	110	115	110	108	105	105	105	105

SEP. 1993 H'ES (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

SEP. 1993 TYPES OF ES 135°E MEAN TIME (G.M.T. + 9H)

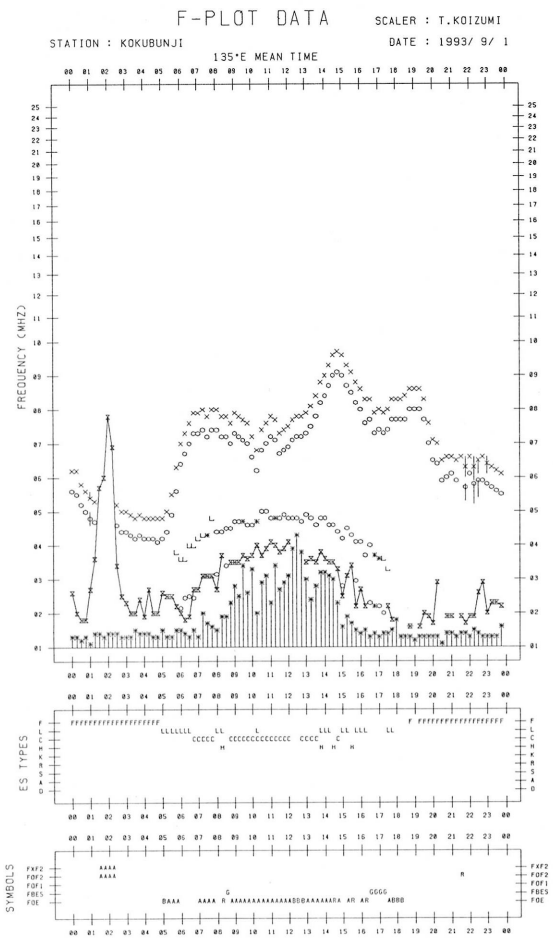
LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

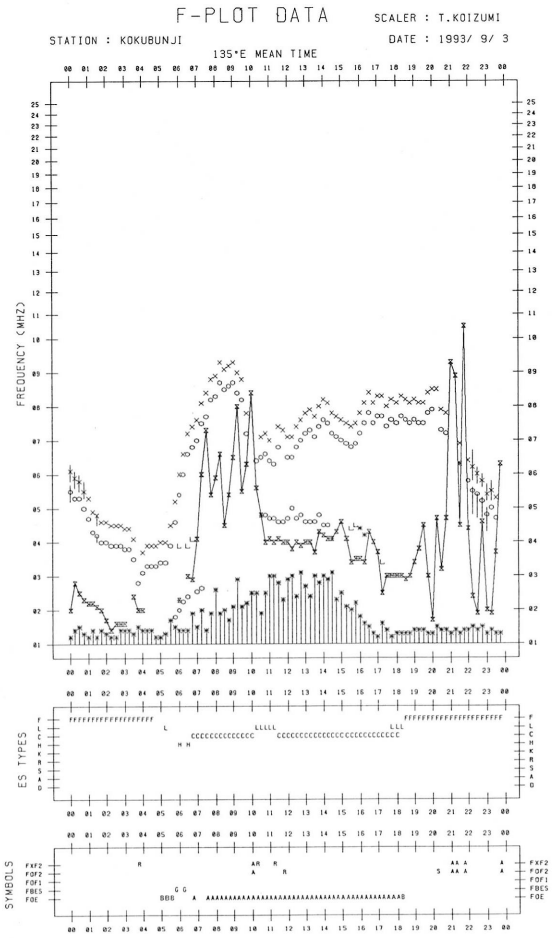
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	F 2	F 3	F 4	F 3	FF 22	L 2	L 1	C 1	L 1	C 1	C 1	C 1	C 1	C 1	L 1	L 1	L 1				F 2	F 2	F 2	F 3
2	F 2	F 2	F 2	F 2	FF 22	C 2	C 2	C 2	C 1				H 1					H 1	C 1	F 3	F 2	F 2	F 4	F 4
3	F 2	F 3	F 2	F 1	F 1		H 1	C 2	C 3	C 2	C 3	L 2	C 1	C 1	C 2	C 2	C 2	C 3	CL 22	F 3	F 2	F 4	F 2	F 3
4	F 4	F 4	FF 43	F 3	F 3		C 1	C 2	C 1	C 2	C 2		HL 11	C 1	C 1		C 1	C 3	C 3	F 3	F 3	F 3	F 2	F 2
5	F 2	F 4	F 2	F 1	F 2	L 2	C 2	C 2	C 1	C 1	C 1		H 1	L 2		L 1		L 1			F 1	F 2	F 2	
6			F 1				H 1	C 1	L 1		L 1	L 1	H 1	L 1	L 1	L 1	HL 12	HL 12	L 1	F 2			F 2	
7					F 1	F 1	H 1	H 1	C 1	C 1	C 1				H 1	C 1	C 2	C 2	C 4	F 2	F 1	F 2	F 2	F 1
8	F 1		F 1	F 1	F 2	F 1	H 1	C 1	C 1		L 1	L 1	L 1	L 2	HL 11	L 2	L 1	CL 12	L 2	F 2	F 1			
9				F 2			H 1	C 1	C 1	C 1				L 2	L 2	L 1	H 1	C 1	C 2	F 4	F 4	F 3	F 2	F 2
10							H 1	H 1	CL 11	C 1	C 1	C 2	C 1	C 2			C 1	C 1	C 2	F 3	F 1	F 3	F 4	F 3
11	F 2	F 4	F 2	F 3	F 1	F 1	C 1	C 3	C 2	C 1	C 1	C 2	C 2	C 1	L 1	C 2	C 3	C 3	C 3	F 3	F 4	F 3	F 2	F 4
12	F 3	F 1	F 1		F 1	F 2		L 1		L 1	CL 11	L 1		L 1	L 1	L 1	L 1			F 1	F 1		F 1	F 2
13	F 1	F 3					C 1	C 2	C 1	C 1	C 1	C 1	C 1		H 1	H 2	H 2	H 2	C 3	F 6	F 3	F 3	F 3	
14	F 2	F 2	F 2	F 1	F 1	F 2	C 3	C 1	H 1		H 1	H 1	H 1	HL 11	H 1	H 1	C 2	C 2	C 4	F 3	F 3	F 4	F 4	F 2
15	F 2	K 1	F 1	FF 22	FF 11	FF 12	C 2	C 2	C 2	L 1	L 1			C 1				C 1	F 2	F 3	F 2	F 2	F 2	F 1
16	F 1		F 1		F 1	F 1	C 3	C 2	C 2		L 1				L 1	L 2	H 1	C 2	FF 31	F 3	F 2	F 1		F 2
17	F 3		F 1			F 1	H 1	C 2	C 2		L 1	L 1	L 3	L 2	L 2	L 2	CL 22	CL 32	F 4	F 3	F 4	F 3		
18				F 3	F 1		C 1	CL 21	CL 11	L 1			H 1	L 1	L 1		L 2	L 3	F 3	F 3	F 2	F 1	F 2	
19							L 1	L 2	HL 12	L 1	L 1	L 1	L 1		L 1	L 2		CL 11	F 3	F 3	F 2	F 2	F 3	F 2
20				F 1		F 1	H 2	HL 11	HL 11	C 1			L 1	CL 11	CL 11	C 1		C 2	F 1	F 4	F 3	F 4	F 2	F 3
21	FF 13	FF 23	F 3	F 2	F 1		H 1	C 1	C 2	C 2		C 1		L 1	H 1	HL 11	C 1	C 1	F 1	F 4	F 1	FF 31	F 3	F 3
22	FF 21	FF 41	FF 22	F 4	F 3	F 2		L 2	HL 11	H 1	C 1	C 1	C 1		L 1		L 1		F 1	F 3	F 1	FF 32	F 2	F 2
23	F 2	F 1	F 2	F 2	F 3	F 3		C 1	L 1	L 2	L 2	L 1	L 1	L 1	L 1	L 1	HL 11	C 2	F 3	F 3	F 1			F 2
24					F 1	F 1	C 2	L 1	C 1			L 1			L 2	L 2	H 1	H 1	FF 11			F 2	F 2	F 1
25	F 2		F 1		F 3	F 5	L 3	HL 12	L 2	L 1	L 1	L 1				HL 11	HL 11	C 2	FF 32	F 3	F 2		F 2	F 1
26				F 1	F 1	F 1				L 1	L 1			L 1			H 1	C 1					F 1	F 2
27	F 3	F 1		F 1		F 1	H 1	CL 11	L 1		L 1					CL 11		C 1	F 3		F 3		F 2	F 1
28		F 1					C 1	C 1		L 1	L 1				H 1		H 1	C 2	F 2	F 1	F 2	F 2	F 2	F 2
29	F 2	F 2		F 1	F 1	F 1	H 1	H 2	H 2		C 2	C 2	C 2	CL 11	H 1	H 1	H 2	C 5	F 4	F 3	F 2	F 2	F 2	F 2
30	F 1				F 2		H 1	C 2	C 1	C 1							C 1			F 2	F 1	F 2		
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
U Q																								
L Q																								

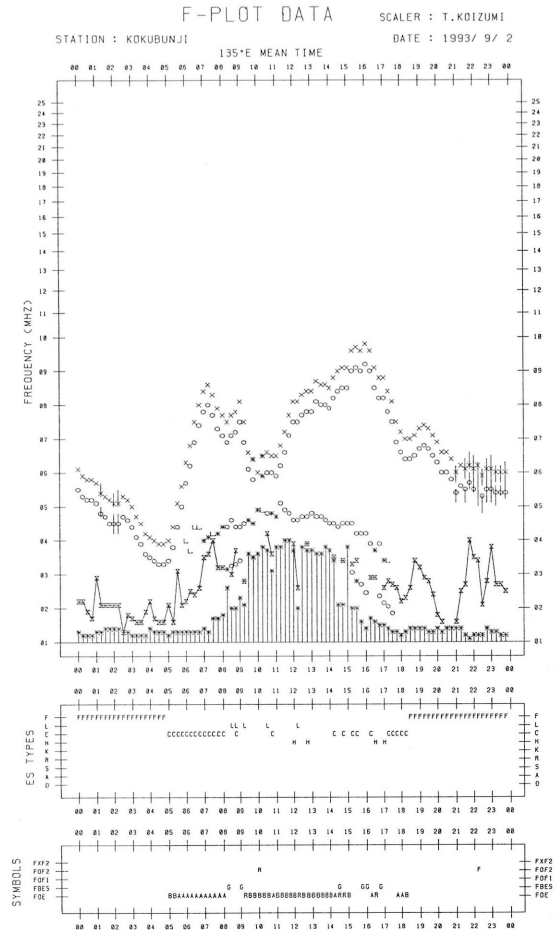
SEP. 1993 TYPES OF ES COMMUNICATIONS RESEARCH LABORATORY, JAPAN

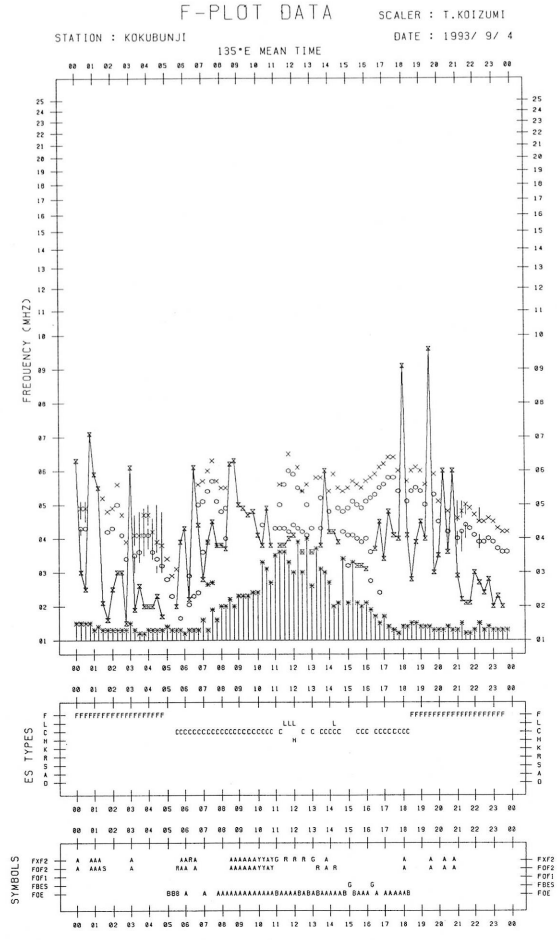
f-PLOTS OF IONOSPHERIC DATA

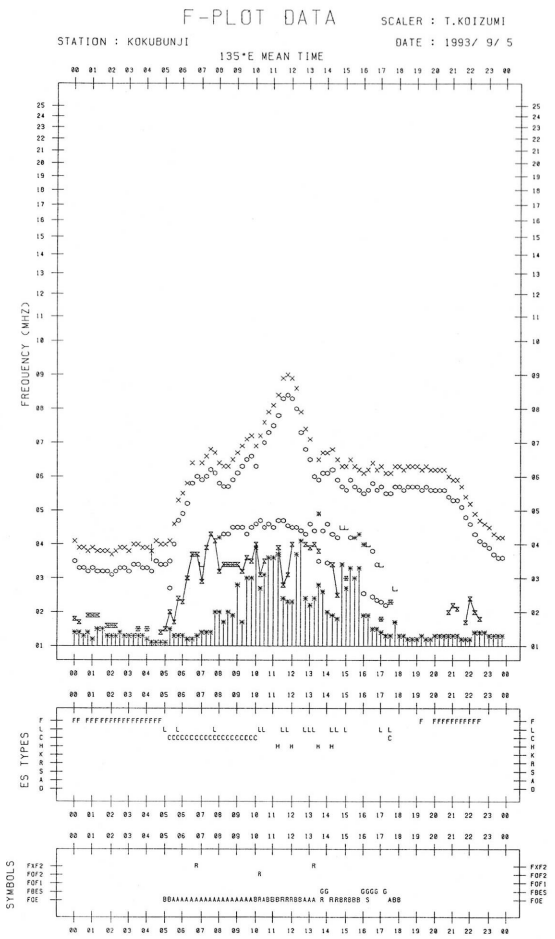
KEY OF F-PLOT	
I	SPREAD
⬡	FOF2, FOF1, FOE
×	FXF2
✳	DOUBTFUL FOF2, FOF1, FOE
⧖	FBES
⌊	ESTIMATED FOF1
↑, Y	FMIN
∧	GREATER THAN
∨	LESS THAN

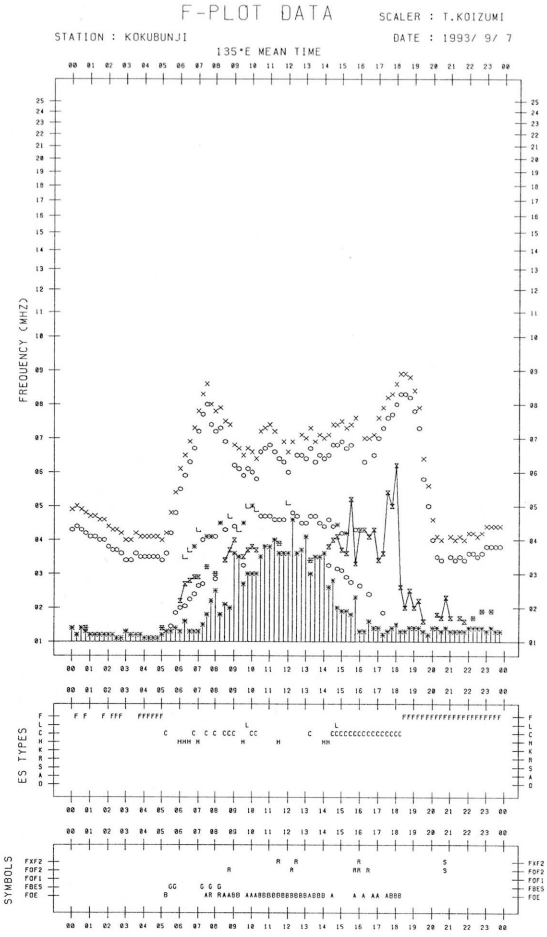

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 1
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 3
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 2
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 4
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 5
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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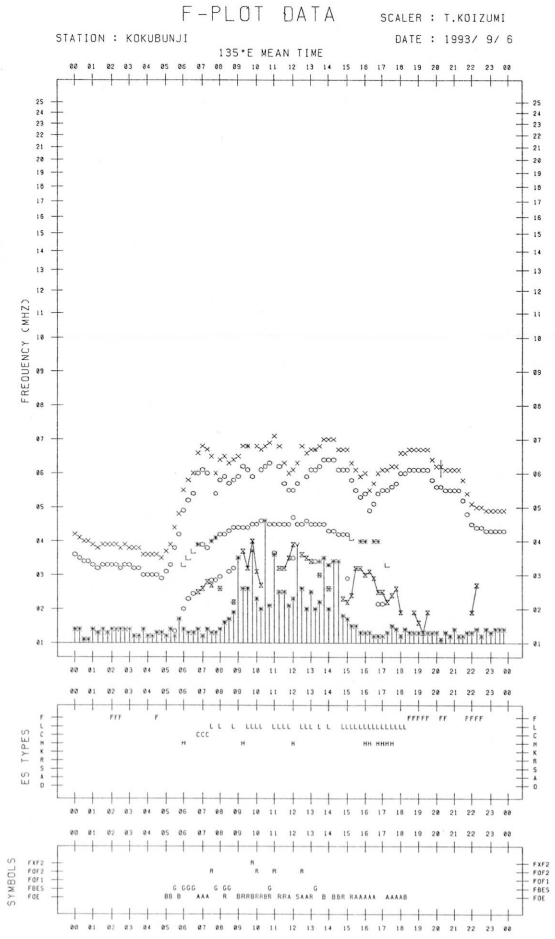
STATION : KOKUBUNJI
DATE : 1993/ 9/ 7
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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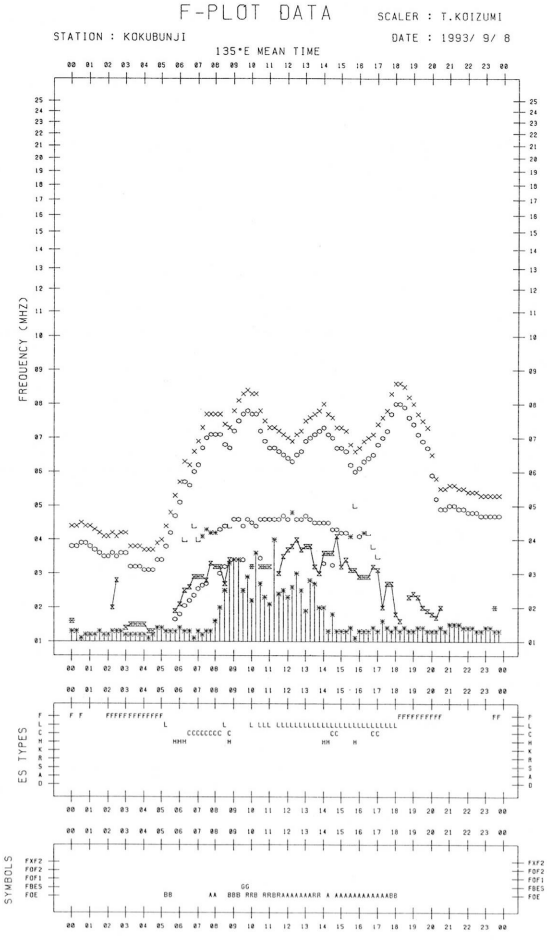
STATION : KOKUBUNJI
DATE : 1993/ 9/ 6
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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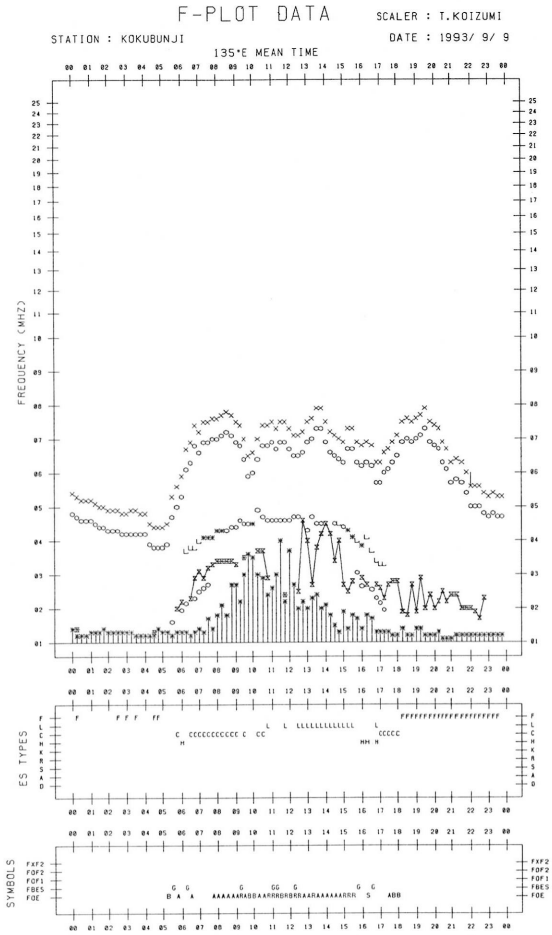
STATION : KOKUBUNJI
DATE : 1993/ 9/ 8
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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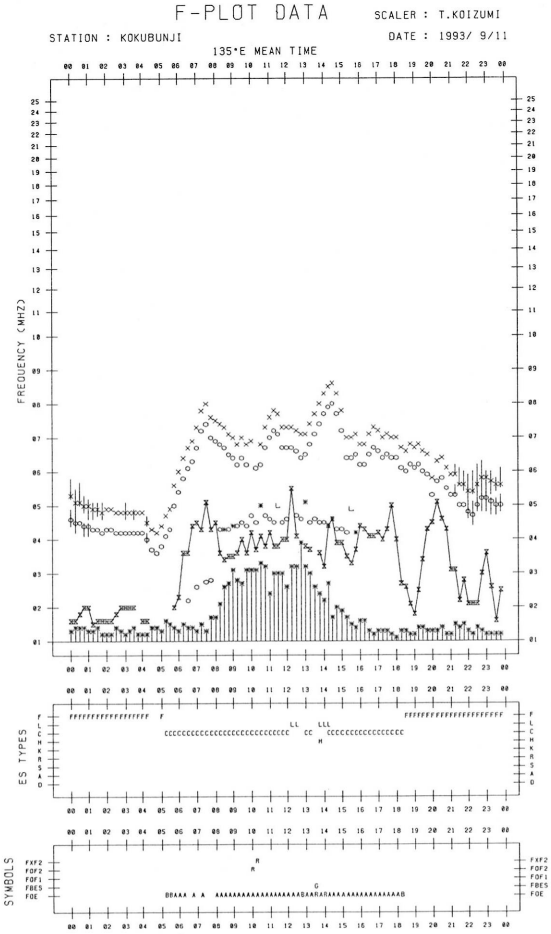
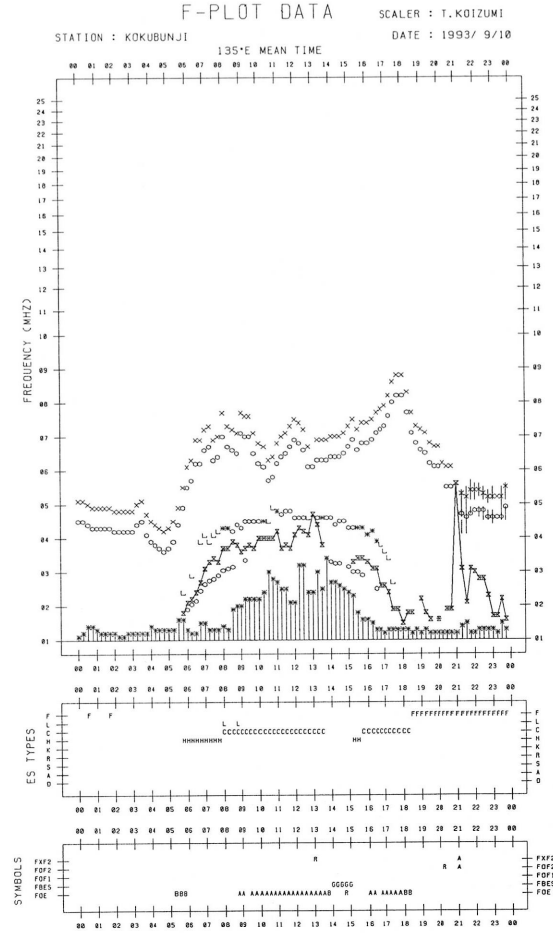
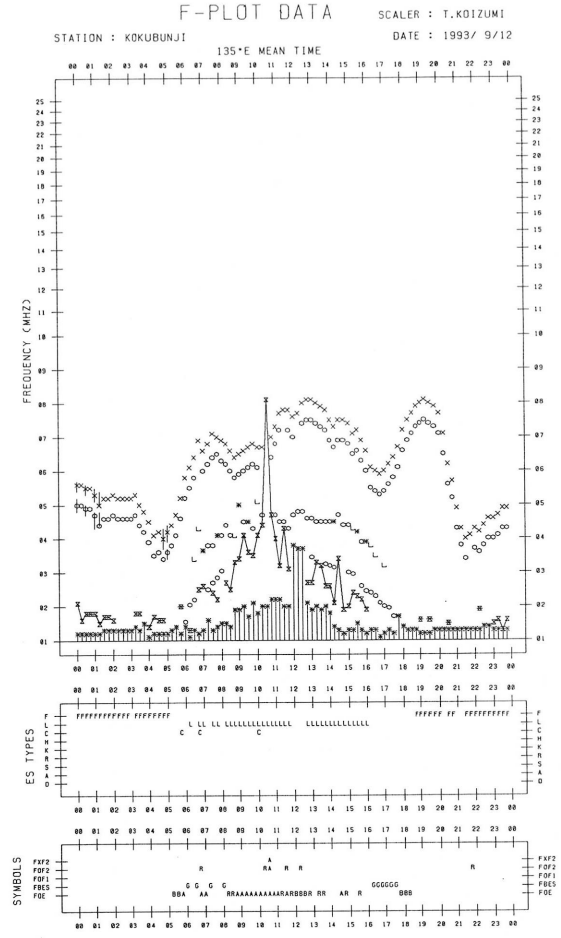
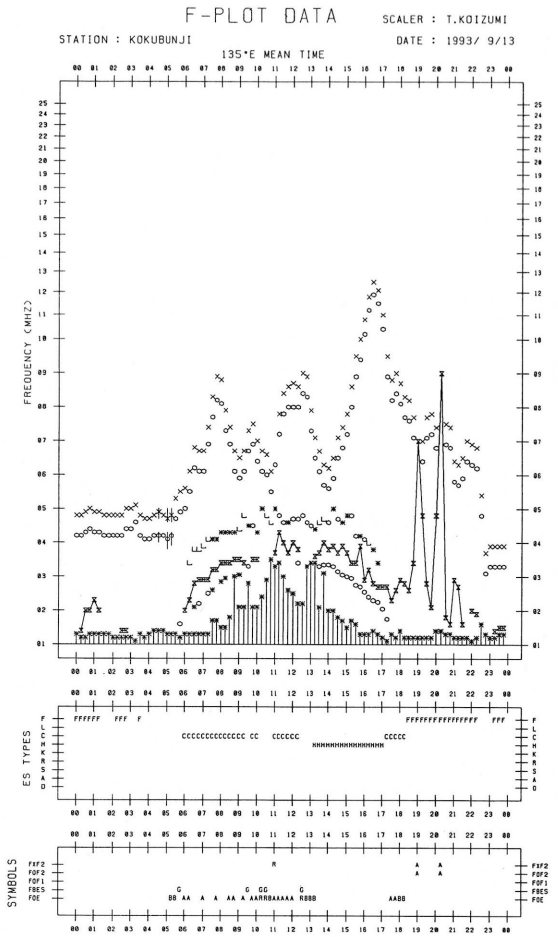
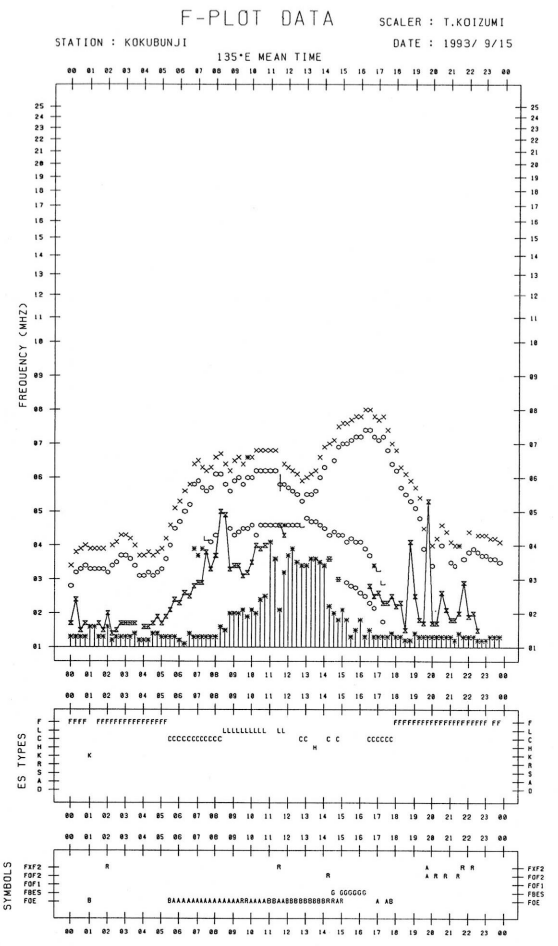
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/ 9
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

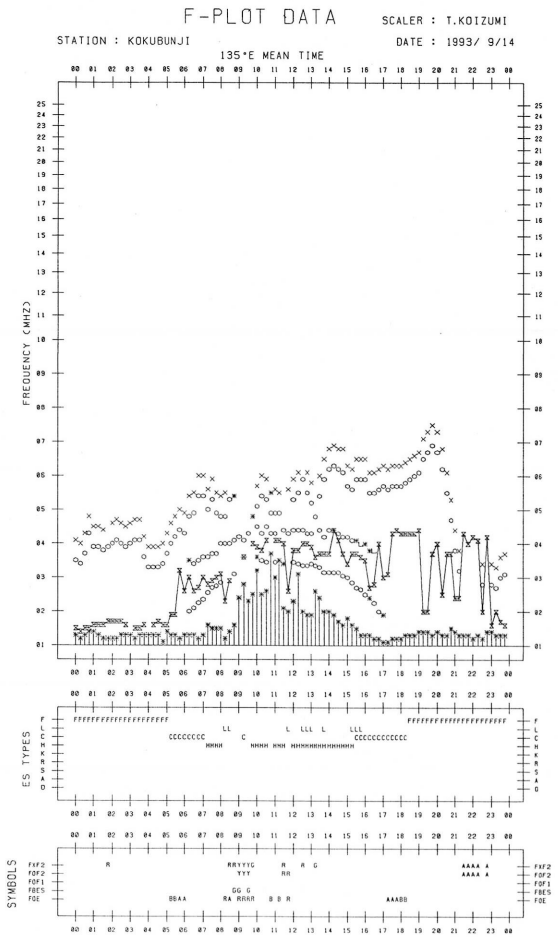

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/11
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/10
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/12
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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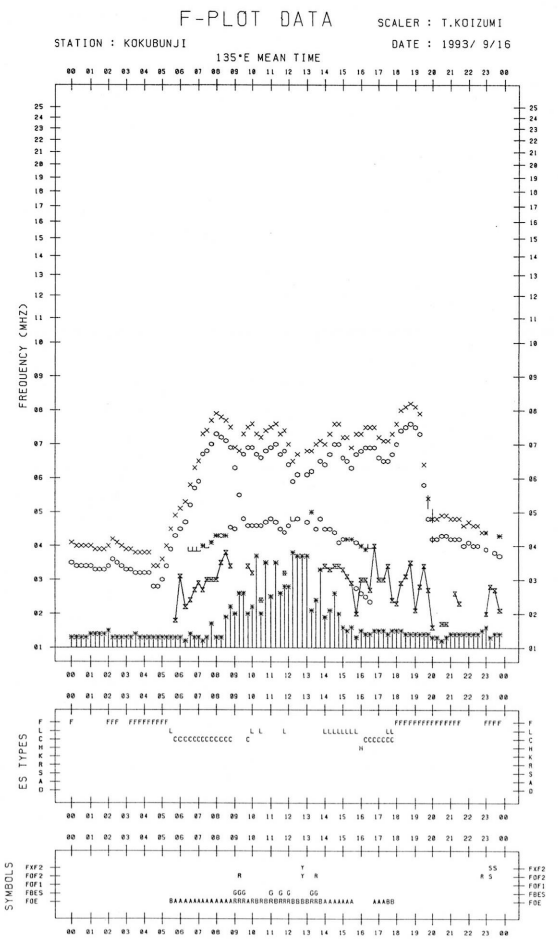
STATION : KOKUBUNJI
DATE : 1993/ 9/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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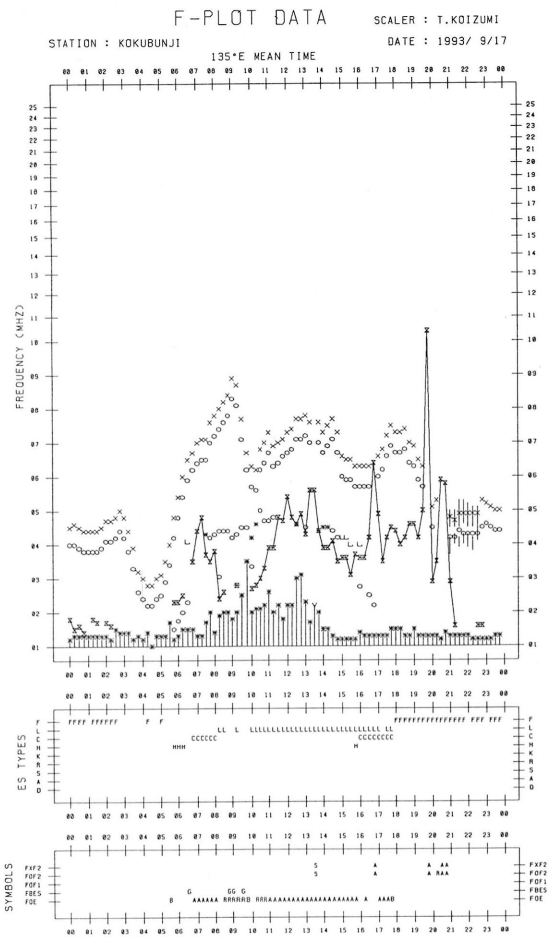
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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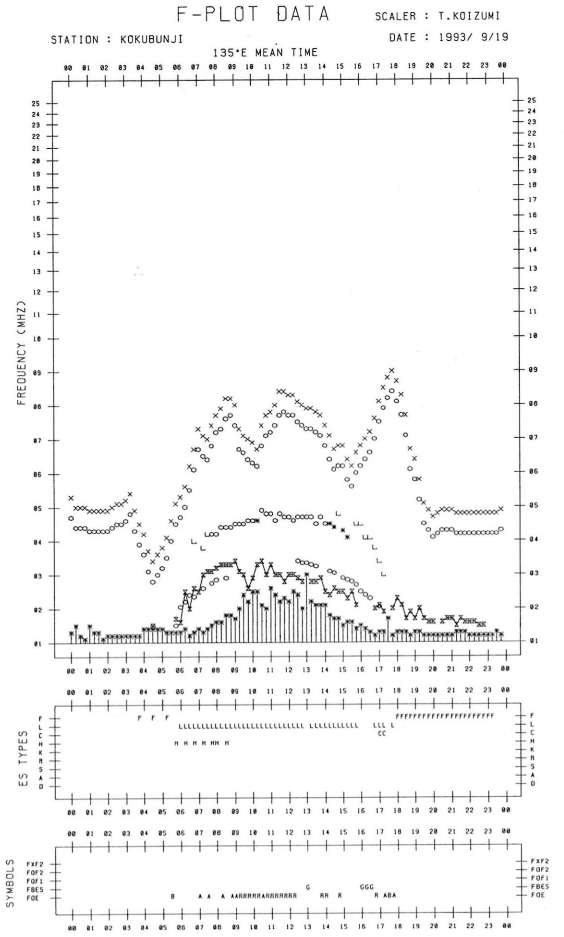
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/17
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
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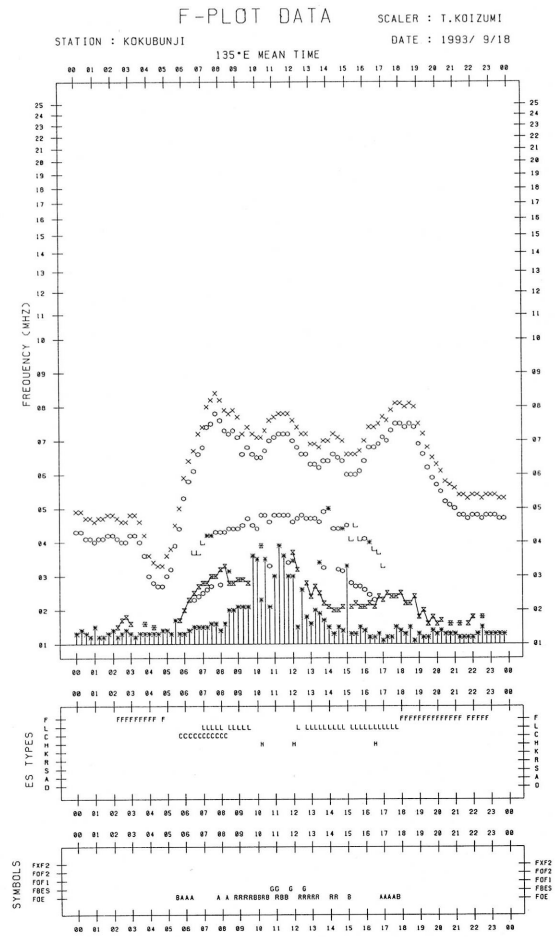
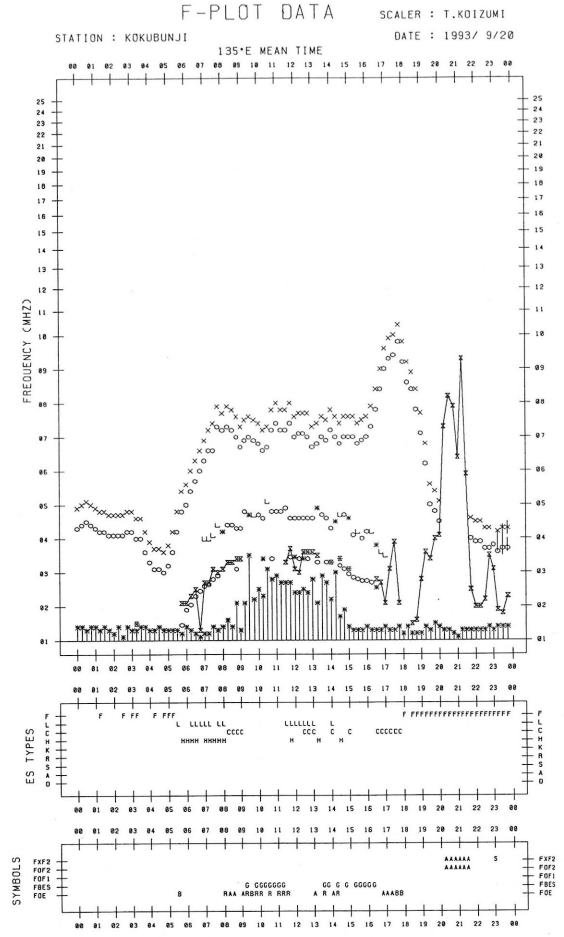
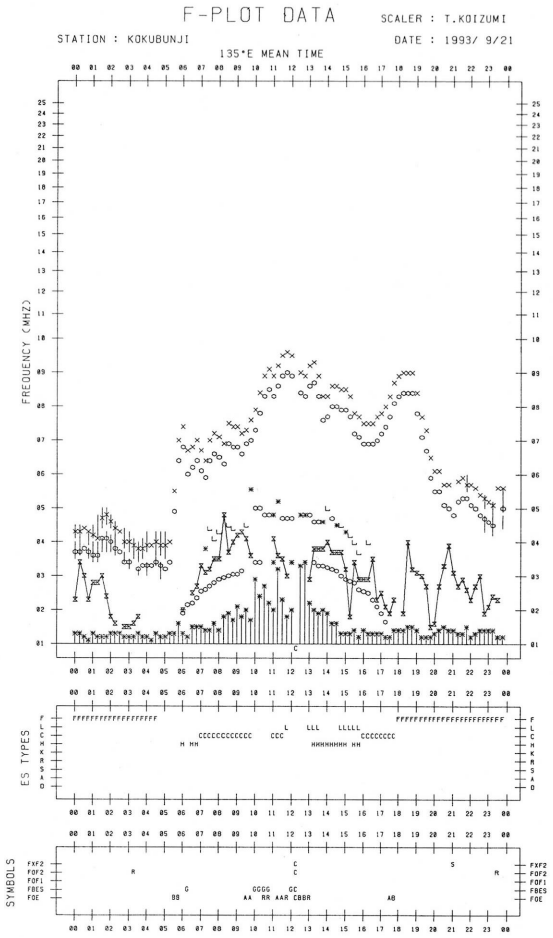
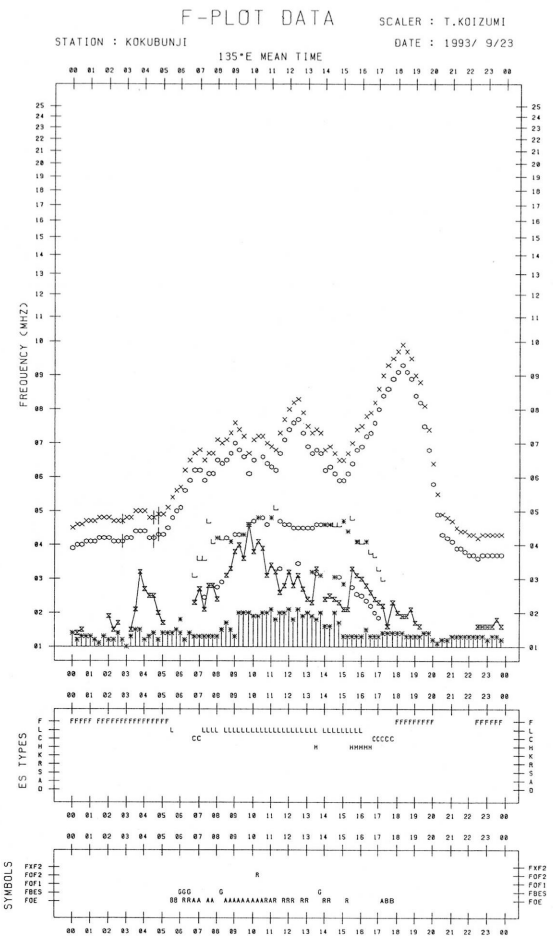
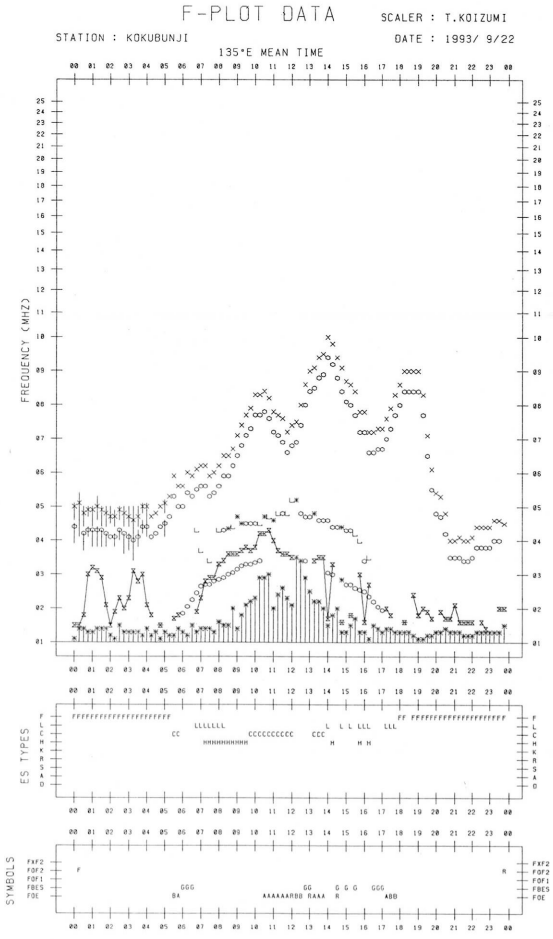
STATION : KOKUBUNJI
DATE : 1993/ 9/19
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

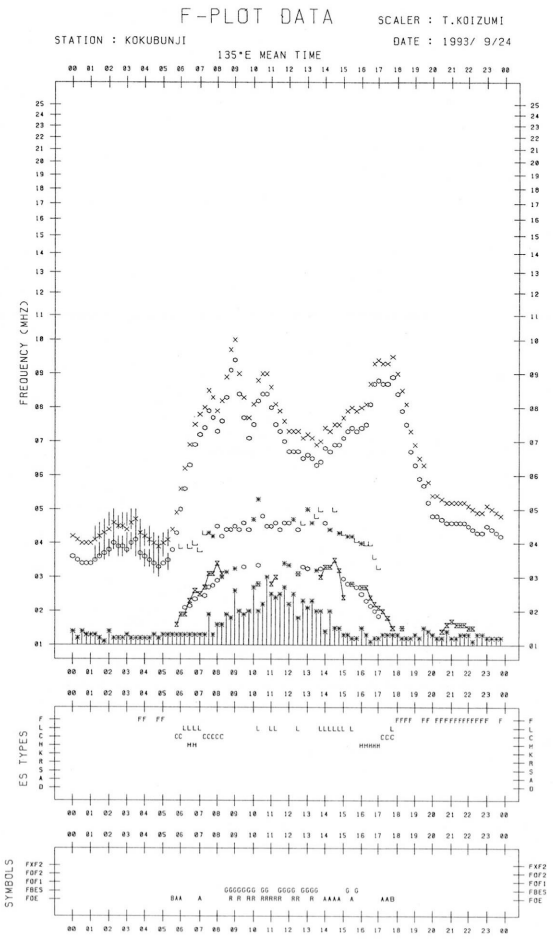

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/18
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

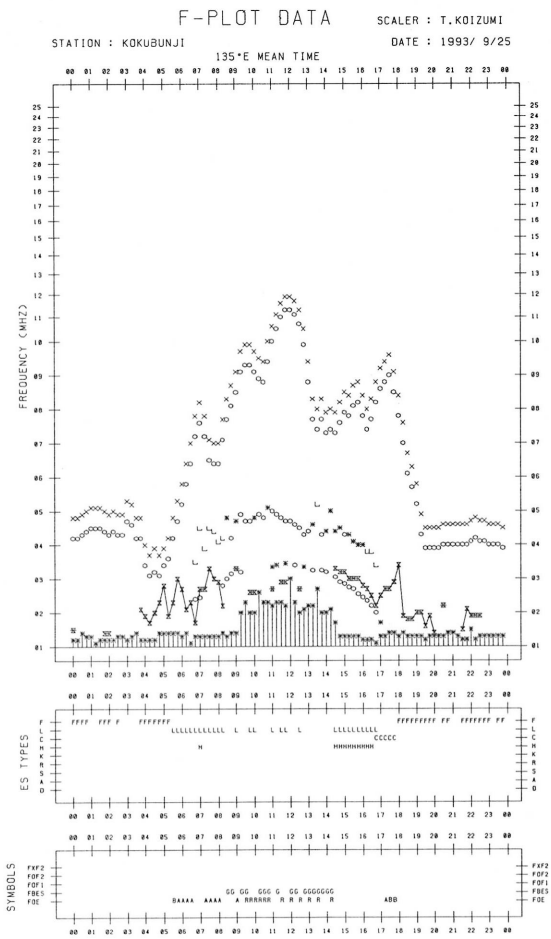

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/20
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

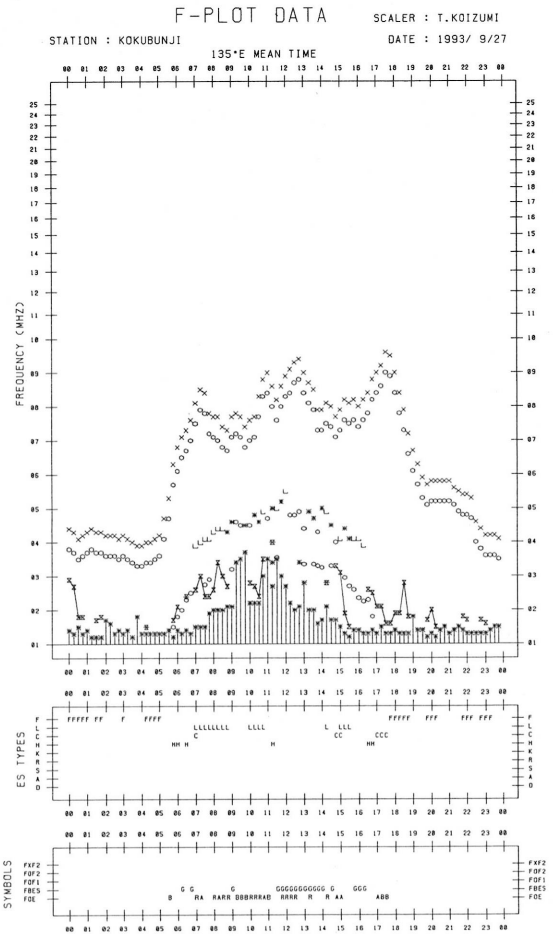

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/21
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

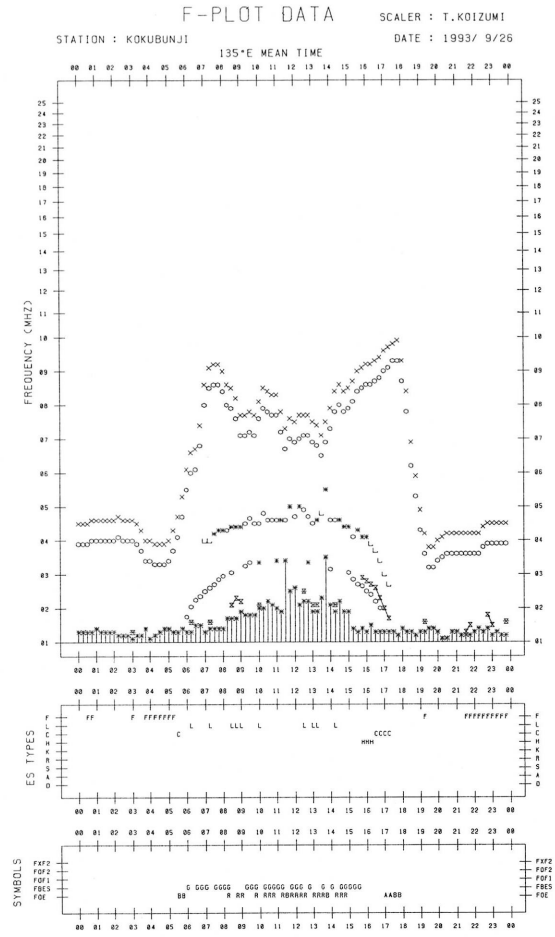

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/23
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

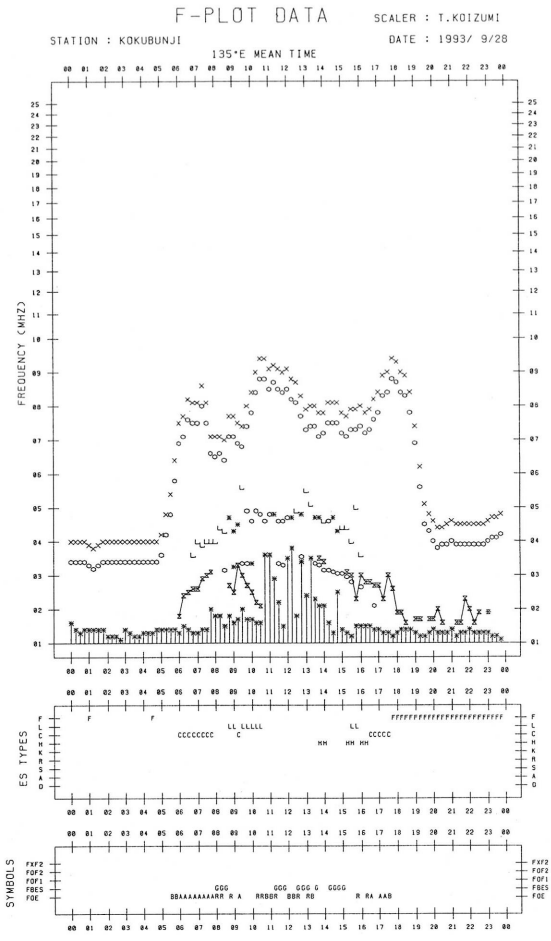

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/22
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

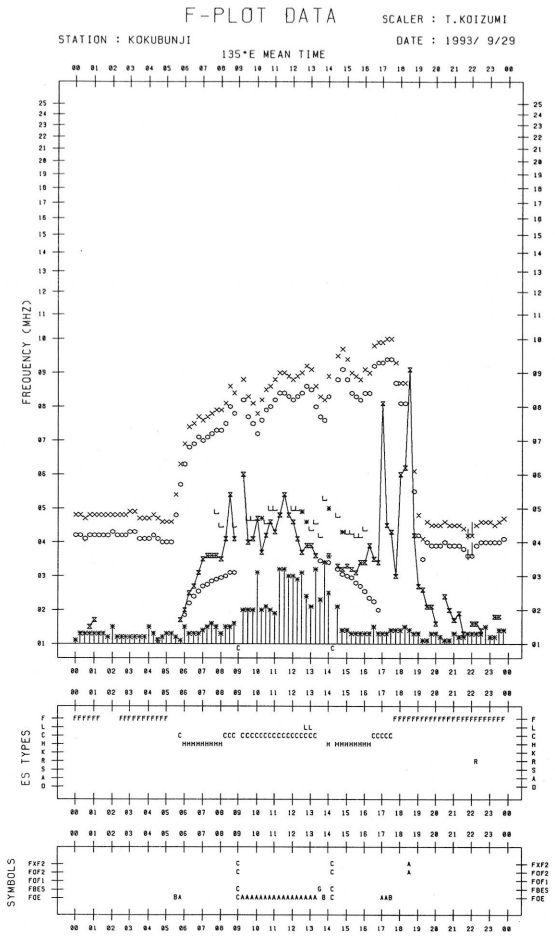

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/24
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

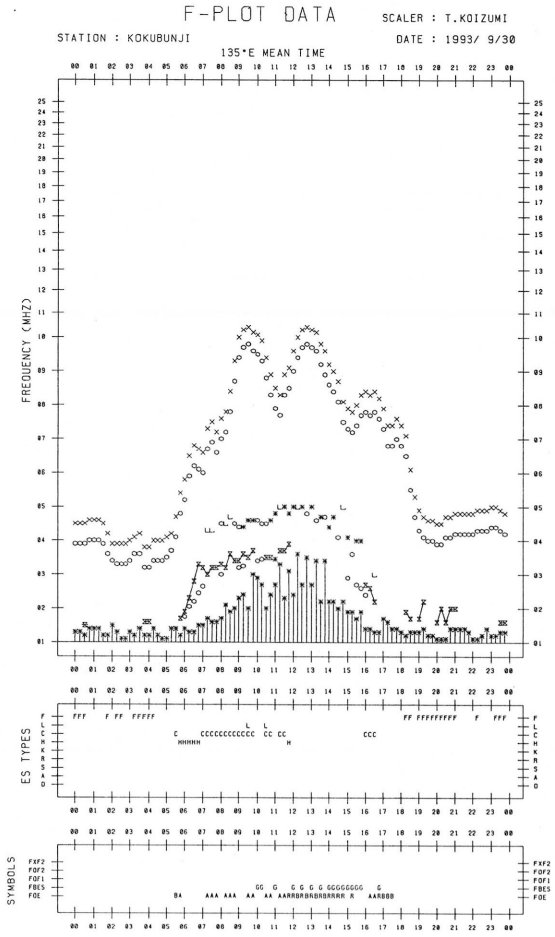

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/25
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/27
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/26
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/28
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/29
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 9/30
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

B. Solar Radio Emission

B1. Daily Data at Hiraiso

200,500 MHz

Not available until system improvement is completed.

B2. Outstanding Occurrences at Hiraiso

Hiraiso September 1993

Single-frequency observations

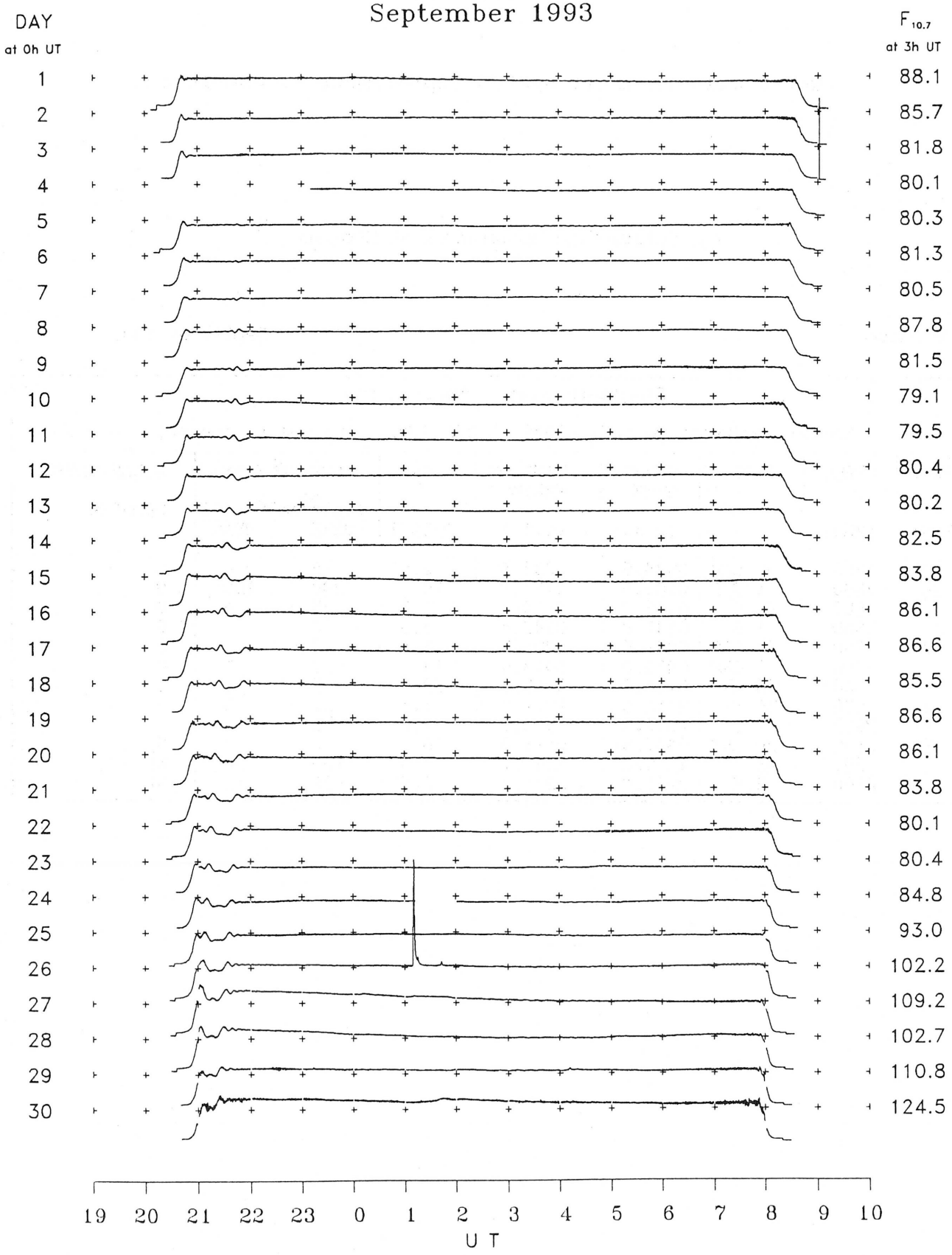
Normal observing period: 2025 - 0845 U.T. (sunrise to sunset)

SEP. 1993	FREQ. (MHz)	TYPE	START TIME (U.T.)	TIME OF MAXIMUM (U.T.)	DUR. (MIN.)	FLUX DENSITY (10^{-22}Wm^{-2}Hz^{-1}) PEAK	FLUX DENSITY (10^{-22}Wm^{-2}Hz^{-1}) MEAN	POLARIZATION REMARKS
5	500	42 SER	0034.6	0036.4	2.5	15	-	0
26	2800	4 S/F	0109.6	0111.1	10	280	100	0
	500	46 C	0109.7	0110.8	7.5	25	5	0
	2800	1 S	0141.8	0142.7	3.0	10	7	0
27	500	42 SER	0001.5	0004.2	3.5	15	-	0
	2800	20 GRF	0010.0	0013.0	14.	3	1	0
	2800	20 GRF	0106.2	0110.5	50	5	2	0
28	500	46 C	2312.5	2312.9	1.5	30	5	0
	2800	1 S	2312.5	2313.0	2.0	5	3	0
29	2800	20 GRF	0407.5	0411.0	18	7	2	0
30	500	46 C	2240.6	2241.1	2.0	185	50	WL
	2800	3 S	2241.0	2241.3	2.5	26	13	WL

B. Solar Radio Emission

B3. Summary Plots of $F_{10.7}$ at Hiraiso

September 1993



Note: A vertical grid space corresponds to a 100 sfu.
Elevation angle range ≧ 6°.

C. RADIO PROPAGATION

C1. H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWV)

SEP 1993 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 17M	01H 17M	02H 17M	03H 17M	04H 17M	05H 17M	06H 17M	07H 17M	08H 17M	09H 17M	10H 17M	11H 17M	12H 17M	13H 17M	14H 17M	15H 17M	16H 17M	17H 17M	18H 17M	19H 17M	20H 17M	21H 17M	22H 17M	23H 17M
1	-4	-1	1	-2	9	9	ES -25	ES -25	ES -25	ES -7	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-2	2	1	-4
2	ES -25	-1	2	3	-1	5	-2	-7	-7	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	4	-4	-3	2	-2	-4	-4
3	ES -25	-2	-4	ES -25	ES -25	-4	-10	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25
4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-7	ES -25
5	ES -25	ES -25	-10	-4	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-7	-7	ES -4	ES -25
6	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	8	ES 1	-7
7	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	-12	ES -25	-12
8	-3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-3	1	-1	-2
9	1	-1	3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-1	US -3	-4
10	-4	-4	-5	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-7	3	-6	-6
11	-7	ES -25	3	-3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	2	5	-2
12	-3	-4	-6	6	-4	ES -25	ES -25	ES -25	ES -25	ES 1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	7	1	-12
13	ES -25	ES -25	-5	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25
14	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25
15	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-6	1	2	ES -24
16	-2	ES -23	ES -23	-8	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-5	-3
17	-7	2	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-1	-2	7	-2
18	-1	-1	ES -25	5	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-5	ES -25	ES -25	5	-2	1
19	-4	2	-1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-5	-10	2	2	5	6
20	-2	-2	-4	ES -25	-7	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	-2	-10
21	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-10	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25
22	ES -25	ES -25	-4	2	6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-2	6	3	4
23	-3	ES -25	1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	2	2	6	5
24	5	3	-4	1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -10	ES -25
25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -10	-2
26	-10	ES -25	-12	2	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	3	1	ES -25	-4
27	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-7	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-2	-3	-1	-12
28	-1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-1	-2	2	-2
29	3	-2	2	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	5	-1
30	-1	-2	-10	-10	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-1	1	3
CNT	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	-4	US -25	-10	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	US -16	-2	US -2	-4
UD	1	2	2	3	-1	-4	ES -23	ES -25	ES -23	ES -4	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-5	ES -24	2	6	5	4
LD	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25

C. RADIO PROPAGATION

C1. H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWVH)

SEP 1993 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 46M	01H 46M	02H 46M	03H 46M	04H 46M	05H 46M	06H 46M	07H 46M	08H 46M	09H 46M	10H 46M	11H 46M	12H 46M	13H 46M	14H 46M	15H 46M	16H 46M	17H 46M	18H 46M	19H 46M	20H 46M	21H 46M	22H 46M	23H 46M
1	1	4	ES -25	5	12	29	18	23	14	8	-2	18	ES -25	ES -25	ES -25	ES -25	ES -25	-10	ES -25	10	6	6	3	3
2	-2	-2	6	11	16	21	21	16	8	8	10	8	ES -25	ES -25	4	ES -25	ES -25	-2	-2	3	10	8	6	3
3	4	3	-1	10	10	16	20	18	18	21	22	15	13	19	6	-3	ES -25	ES -25	ES -25	-7	-10	-7	-4	-1
4	ES -25	ES -25	-2	-1	3	8	ES -25	3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	3	4	4	1	1
5	1	-2	4	7	7	4	14	-12	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	8	-2	8	6	-3
6	3	-4	1	8	4	16	14	-1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	5	4	3	8	3
7	-4	-4	1	11	9	13	10	8	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	17	1	1	-4	14
8	11	-4	11	3	10	18	15	11	9	4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-3	3	-1	3	-2
9	3	-5	13	13	19	20	14	14	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	3	-3	-1	1	3
10	1	-4	1	9	10	14	17	18	4	4	-2	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	3	2	6	6	2	3
11	1	4	4	6	13	11	16	-1	ES -25	ES -25	ES -25	-6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	11	11	15	2	2
12	-1	6	9	11	13	13	14	6	2	3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	13	3	4	-2	6
13	8	0	9	11	7	10	22	18	15	11	17	10	3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-6	ES -25	-10
14	ES -25	ES -25	-10	-6	-4	12	-1	6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	13	-1	1	-10
15	ES -25	3	5	-4	9	2	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-3	0	3	5	5
16	-4	3	5	8	13	14	17	7	0	0	ES -23	ES -23	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-5	7	12	6	3
17	-2	-2	0	15	15	21	16	ES -25	ES -25	ES -25	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-9	-6	4	1	7
18	2	4	3	3	5	11	20	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	11	ES -25	13	6	7	11	1
19	7	6	7	2	21	11	13	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	0	9	1	5	5
20	-2	-4	5	19	13	13	8	-6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	4	9	-2	3
21	7	17	-4	4	ES -25	2	-12	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	4	ES -25	-10	-4	1	-1	3	ES -25	ES -25	ES -25	-2
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23	5	10	0	5	6	19	20	5	ES -25	ES -25	1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	5	11	7	6	7
24	4	10	7	19	20	10	20	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	5	13	6	6	5	9	-1
25	12	8	7	16	18	14	5	-1	0	2	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-3	12	5	5	4
26	5	-12	6	12	12	6	7	1	11	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	14	7	6	-6	-12
27	ES -25	5	5	12	19	16	15	18	10	7	ES -25	9	17	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	1	10	5	ES -25	ES -25
28	ES -25	3	5	6	12	6	16	-2	ES -25	0	-3	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-8	-12	ES -25	-4	7	-3	-3
29	5	-1	4	7	15	16	16	13	1	-1	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	5	3	0	-1
30	1	4	1	14	12	22	11	-7	11	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	5	-1	6	2	-1
CNT	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
MED	1	2	4	8	12	13	14	4	US -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	3	4	5	2	2
UD	8	10	9	16	19	21	20	18	14	8	10	10	3	ES -24	ES -24	ES -24	ES -24	4	3	13	12	9	8	7
LD	ES -25	-12	-4	-1	3	4	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-10	-6	ES -25	-10

C. Radio Propagation

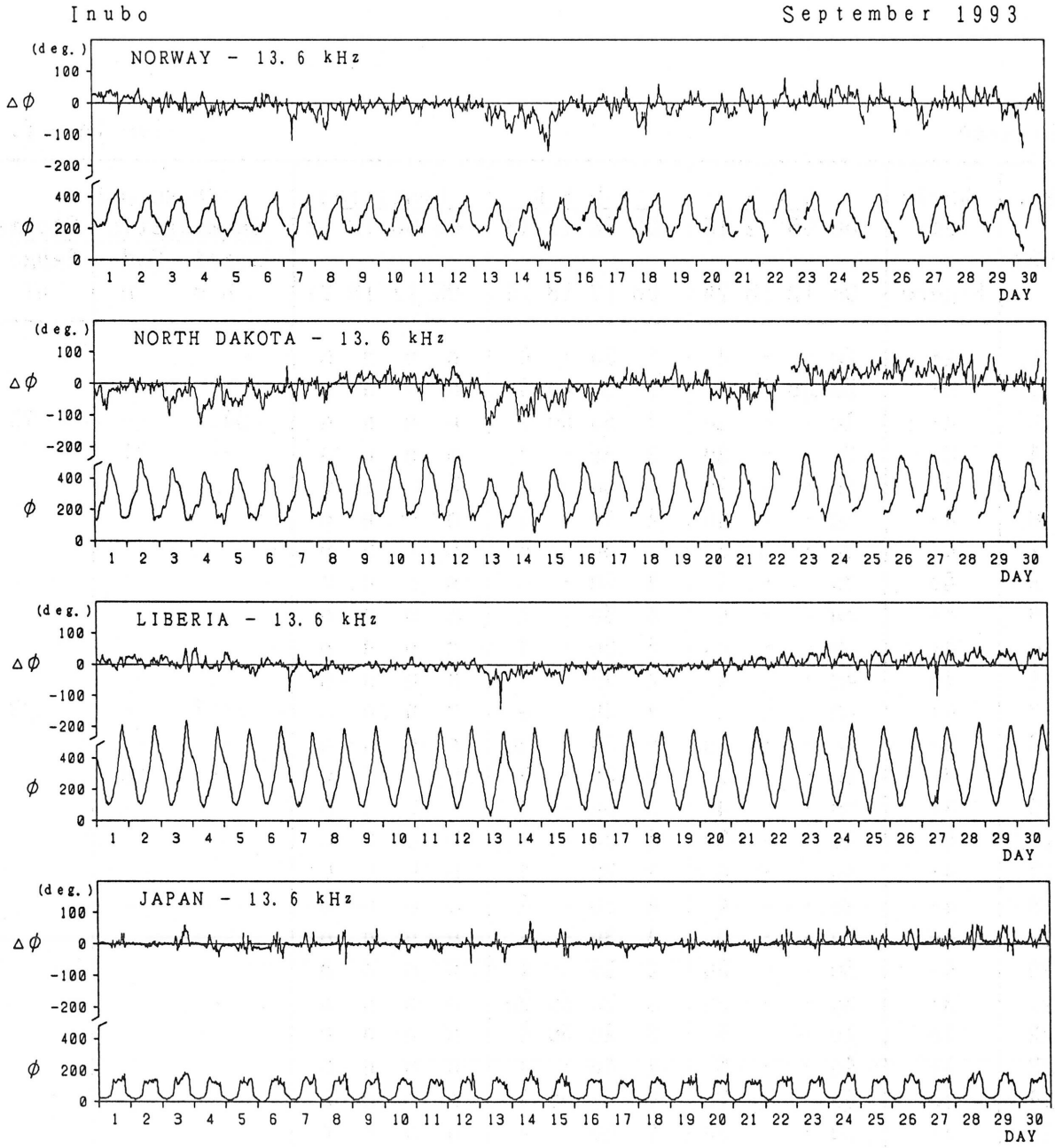
C2. Radio Propagation Quality Figures at Hiraiso

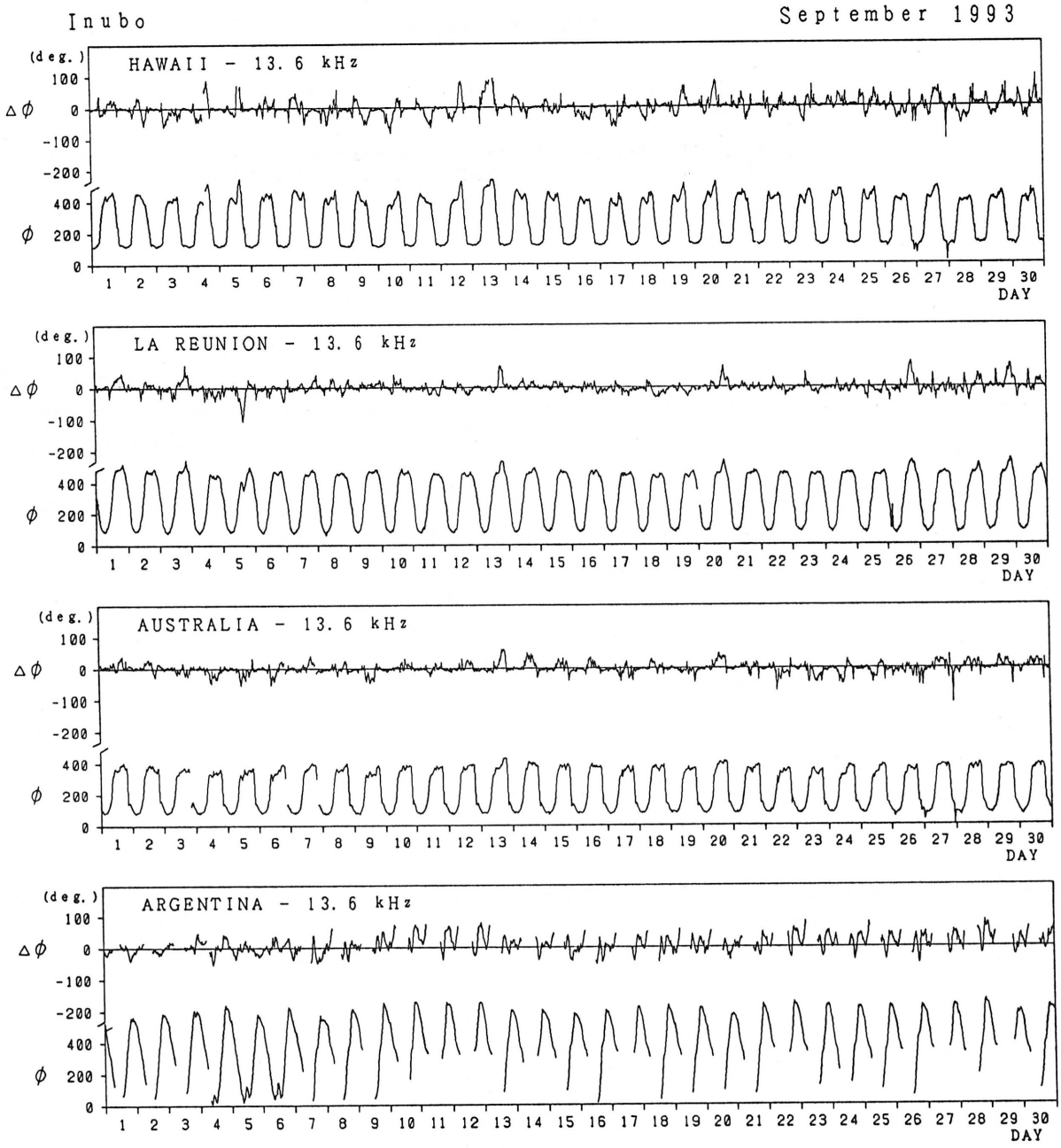
Hiraiso — Time in U.T.

Sep. 1993	Whole Day Figure	W W V 00 06 12 18 / 06 12 18 24	W W V H 00 06 12 18 / 06 12 18 24	Condition 00 06 12 18 / 06 12 18 24	Principal Geomagnetic Storms Start h m	End h	Range nT
1	4+	5u - - 4	4 5u - 4	n n n n			
2	5-	5u 5u 5u 4	4 5u 5u 4	n n n n			
3	4-	4u - - 2u	4 5u 5u 3	n n n n	04.1	--	73
4	3-	3u - - 2u	2 3u - 4	n n n n	--	21	
5	4-	4u - - 4u	4 3u - 4	U U U U			
6	4-	3u - - 4u	4 4u - 4	n n n n			
7	4-	3u - - 3	4 4u - 4	n n n n			
8	4o	3u - - 4	4 5u - 4	n n n n			
9	4+	5u - - 4	4 5u - 4	n n n n			
10	4+	4u - - 4	4 5u - 4	n n n n			
11	4o	4u - - 4	4 4u - 4	n n n n			
12	4+	5u - - 4	4 4u - 4	n n n n	11.7	--	223
13	3+	3u - - 2u	4 5u - 2u	n n n n	--	--	
14	3-	3u - - 2u	2 3u - 3	U U U U	--	18	
15	3+	3u - - 4	3 3u - 4	U U U U			
16	4-	4u - - 3u	4 4u - 4	U U U U			
17	4-	4u - - 4	4 3u - 4	U U U U			
18	4-	4u - - 4	4 3u - 4	U U U U			
19	4+	5u - - 5	4 3u - 4	n n n n			
20	4-	5u - - 3u	4 3u - 4	n n n n			
21	3-	3u - - 2u	3 2u 5u 2u	n n n n			
22	4o	4u - - 5	3 4u 5u 4	n n n n			
23	4+	4u - - 5	4 4u - 4	n n n n			
24	4o	5u - - 2u	4 4u 5u 4	n n n n			
25	4-	3u - - 3u	4 4u - 4	n n n n			
26	4-	4u - - 3u	4 4u - 3	n n n n			
27	4-	3u - - 4	4 5u - 3	n n n n			
28	4-	3u - - 4	3 4u 5u 3	n n n n			
29	4+	5u - - 4	4 5u - 4	n n n n			
30	4o	4u - - 4u	4 4u - 4	n n n n			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo





Polar Cap Phase Anomaly (PCPA) on Norway-Inubo Circuit

NONE

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

(a) Short Wave Fade-out (SWF) at Hiraiso

Hiraiso — Time in U.T.

SEP. 1993	S W F								Correspondence	
	Drop-out Intensities(dB)					Start	Dur.	Type	Imp.	Solar * Flare	Solar Burst
	CO	HA	AUS	MOS	BBC						
26					18	1018	47	G	1+	x	C
27		x	14			0013	17	SL	1	x	C
27			11			0303	24	SL	1-	x	C
27					9	1208	19	SL	1-	x	C
27	>30	>32	>28			2235	41	SL	2+	x	C
28		x	18			0255	33	SL	1+	x	C

NOTE CO:Colorade(WWV) HA:Hawaii(WWVH) AUS:Australia MOS:Moscow BBC:London
* Optical and X-ray Flares

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Sep. 1993	S P A								
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	Ω/AU	Ω/H	Ω/ND	Start	End	Maximum
24			9	9			0514	0542	0521
25		27	23*	11			0723	0804	0739
25					15		2033	2143	2045
26			46	28	20		0126	0228D	0156
26			25	19	9		0228E	0342	0238
26			11	9	6		0439	0523	0444
26			18	17			0542	0624	0555
26		71	32				1018	1137	1042
26				44	54	38	2134	2332	2202
26			13	28	23	17	2336	0015D	2344
27	37	25	23	72	61	32	0015E	0056D	0024
27		20		32	17	24	0056E	0136D	0102
27	18		18	23	13		0136E	0233	0141
27			16	14	9		0251	0330	0300
27			14	10			0457	0551	0515
27			9				0848	0916	0906
27		94	28				1051	1149	1111
27		123	40				1206	1319	1221
27		37					1338	1422	1351
27				15	15	16	2130	2200	2134
27	36	27	30	136	110	84	2230	0020	2252
28				12	9		0035	0109	0041
28			23	17	11		0140	0157D	0146
28			21	13	8		0157E	0230	0204
28	38	24	72	70	40	32	0257	0341D	0311
28	16		22	29			0342E	0447	0351
28			10				1100	1136	1109
28				14	12		2312	2347	2320
29				7	5		0032	0057	0039
29			8	5	6		0410	0450	0419
30			27	32	24	26	0120	0333	0206
30				13	14		2242	2316	2248

IONOSPHERIC DATA IN JAPAN FOR SEPTEMBER 1993
F-537 Vol.45 No.9 (Not for Sale)

電離層月報 (1993年9月)
第45巻 第9号 (非売品)
1993年12月20日 印刷
1993年12月25日 発行
編集兼 郵政省通信総合研究所
発行所 〒184 東京都小金井市貫井北町4丁目2－1
☎ (0423) (21) 1211(代)

Queries about "Ionospheric Data in Japan" should be forwarded to:
Communications Research Laboratory, Ministry of Posts and Telecommunications,
2-1 Nukui-Kitamachi 4-chome, Koganei-shi, Tokyo 184 JAPAN.