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IONOSPHERIC DATA IN JAPAN

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CONTENTS

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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)
Akita	39°43.5'N	140°08.0'E	29.5°N	205.9°	" (I)
Kokubunji	35°42.4'N	139°29.3'E	25.5°N	205.8°	" (I)
Yamagawa	31°12.1'N	130°37.1'E	20.4°N	198.3°	" (I)
Okinawa	26°16.9'N	127°48.4'E	15.3°N	196.0°	" (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°	" (P)

A. IONOSPHERE

Ionospheric observations are carried out at the above five 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 descriptive letter 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 1-4, 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 transmission 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 normal *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 100, 200 and 500 MHz are carried out at Hiraiso. The observation equipment consists of two parabolic antennas, one with 10-meter diameter for 100 and 200 MHz measurements and one with 6-meter diameter for 500 MHz measurements, each being equipped with a pair of crossed doublet antennas as a primary radiator, and three appropriate receivers. Each pair of the crossed doublet antennas is used as a polarimeter. 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 at the base-level are tabulated separately for 200 and 500 MHz measurements. Here, the base-level intensity is defined as the intensity recorded during the time when no radio emission burst is taking place. 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 Hiraiso 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.

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 660 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 in 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	influenced 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.

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 per hour from JJY (Japan Standard Wave) station. The conditions are denoted as follows:

N	normal,
U	unstable,
W	disturbed.

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

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 ($\triangle\phi$) 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

MAR. 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		38	46	40	32		40	90	90	101	114	107	90	92	90	90	87	81	70	55	59	44	38	36
2	36	34	43	48	26		38	61	87	100	108	106	107	105	93	90	94	88	66	64	54	43	38	40
3	42	40	38	37	35	37	52	63	88	86	100	108	111	111	106	101	101	90	68	63	63	63	60	60
4	52	54	60	57	37	37	47	64	105	98	120	118	126	111	110	110	102	86	67	66	72	72	66	66
5	62	67	53	55	54	51	92	100	82	97	118	117	118	112	107	107	90	87	77	67	66	63	63	72
6	62	63	62	57	52	58	72	81	87	102	C	C	C	C	103	88	87	90	67	63	58	52	61	54
7	52	53	53	55	54	51	61	84	101	118	117	118	116	116	113	111	114	107	87	66	51	50	52	53
8	60	54	52	42	46	40	66	83	88	107	120	121	118	117	112	104	96	84	80	66	61	64	61	60
9	53	54	54	55	52	56	62	94	108	108	90	141	118	130	108	105	97	87	74	72	72	58	61	66
10	52	52	54	54	54	52	64	80	86	131	137	134	118	120	113	104	90	81	84	64	62	61	54	61
11	54	54	54	61	53	52	66	77	90	101	110	96	122	118	107	90	106	88	84	87	74	74	66	63
12	57	53	33	30	30	44	62	64	66	90	61	111	112	116	102	87	79	83	82	74	64	61	54	52
13	53	53	48	48	48	42	60	77	88	N	111	103	112	115	108	111	90	88	90	71	64	61	58	58
14	55	63	54	52	44	33	60	73	88	87	108	104	121	121	114	110	90	86	82	66	64	54	A	52
15	54	53	54	51	50	50	52	74	88	89	89	91	104	100	101	96	96	87	90	87	84	73	60	62
16	62	53	50	48	51	72	58								66	62	56	62	62	63	58	49	31	32
17	35	34		38			53	60	72	74	66	86	87	90	87	87	78	88	73	58	63	60	58	54
18	50	58	52	49	48	54	66	74	87	88	86	102	98	85	91	90	85	88	82	64	66	61	58	53
19	51	60	58	62	54	54	58	84	87	99	106	106	103	92	98	88	88	86	87	78	71	64	90	62
20	63	62	58	56	52	61	72	80	88	104	116	112	108	103	90	91	88	89	N	81	62	C	C	C
21	C	C	53	48	50	44	66	87	93	88	88	108	106	91	91	87	90	86	90	64	58	57	52	53
22	54	52	46	50	46	43	64	84	86	110	116	106	114	112	100	92	87	87	86	77	72	66	63	63
23	63	60	55	52	48	50	64	93	90	112	120	91	108	107	90	90	94	86	86	73	65	64	64	62
24	63	62	54	55	50	53	88	78	90	101	104	108	117	112	113	110	94	90	87	87	88	61	74	66
25	63	54	67	58	42	43	90	88	106	121	126	122	122	110	110	106	96	110	102	83	76	61	50	47
26	52	51	46	43	42	52	62	74	76	84	87	88	91	90	96	86	89	90	80	73	63	60	61	62
27	61	60	58	60	54	54	54	70	84	99	97	96	90	87	110	87	90	88	86	84	C	C	C	C
28	C	C	C	C	C	C	66	89	87	105	91	107	115	110	86	87	90	87	86	77	66	63	61	58
29	65	74	60	53	49	C	C	78	91			C	106	90	105	108	110	105	86	66	55	61	64	60
30	67	59	66	62	52	52	70	87	103	120	120		114	106	90	104	98	97	90	84	64	72	62	75
31	62	57	61	55	52	66	78	72	86	91	88	111	110	110	110	90	90	84	87	75	77	65	70	66
	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	30	29	26	30	30	30	28	28	27	29	29	31	31	31	31	30	31	30	29	28	29
MED	54	54	54	52	50	52	63	79	88	100	108	107	112	110	103	91	90	87	84	71	64	61	61	60
U Q	62	60	58	56	52	54	66	87	90	107	117	117	118	115	110	106	96	90	87	78	72	64	63	63
L Q	52	52	49	48	43	43	58	73	86	89	89	102	105	92	91	88	88	86	74	64	61	57	54	53

HOURLY VALUES OF FES AT WAKKANAI

MAR. 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	G	24	30	G	30	G	G	G	40	48	62	G	G	G	G	G	38	G	G	G	G	G	G	24
2	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	G	28	G	G	G	G	G
3	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	34	33	28	G	G	G	G	G
4	G	G	29	G	G	G	G	G	G	G	39	G	G	G	G	G	G	G	25	G	G	G	G	G
5	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	35	G	G	G	G	G	G
6	G	G	G	G	G	G	G	G	G	G	C	C	C	C	G	G	G	G	G	G	G	G	G	G
7	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
8	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
9	G	G	G	G	G	G	G	G	G	G	G	G	41	G	G	G	G	G	G	G	G	G	27	G
10	G	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	24	G	G	G	G	G
11	G	G	G	G	G	G	G	G	G	G	G	G	G	52	G	G	G	G	G	G	G	G	G	G
12	G	23	G	G	G	G	G	G	G	40	50	G	G	G	G	G	G	G	G	G	G	G	G	G
13	G	G	25	G	G	G	G	39	44	G	G	G	G	84	G	G	G	G	G	26	25	26	G	G
14	G	G	G	G	G	G	G	G	55	G	G	G	G	G	G	G	G	G	G	G	G	40	27	26
15	24	G	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	33	G	G	G	G
16	G	G	G	G	G	G	G	G						G	G	G	G	G	G	G	G	G	G	G
17	G	G	G	G	G	G	G	G	G	G	G	G	46	G	G	G	G	G	G	G	G	G	G	G
18	G	G	G	G	30	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	29	G
19	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
20	G	G	30	28	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	C	C	G
21	G	G	G	G	G	G	G	G	G	G	44	G	G	G	G	G	37	G	28	28	24	G	24	G
22	G	G	G	24	24	G	G	G	G	39	G	G	G	G	G	G	G	G	G	G	G	G	G	G
23	G	G	G	28	24	30	G	G	G	G	G	G	G	G	G	G	G	G	G	26	G	G	G	G
24	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
25	G	32	32	28	G	G	G	G	G	G	G	G	G	G	G	G	35	G	G	G	G	G	G	G
26	G	G	G	29	G	G	G	38	39	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
27	G	G	27	G	G	G	G	G	G	G	47	G	G	G	G	G	36	G	G	G	G	G	C	G
28	C	C	G	C	C	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
29	G	G	G	G	G	G	G	G	G			C	G	G	G	G	G	G	G	29	G	G	G	G
30	G	G	G	G	G	G	G	G	G	G	G		G	G	G	42	G	37	G	G	G	23	G	G
31	G	G	G	G	G	G	G	33	G	G	G	G	G	G	G	G	51	G	G	24	G	G	G	G
	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	31	30	30	31	31	31	30	29	28	27	29	30	31	31	31	31	31	31	31	30	29	31
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
U 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
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 WAKKANAI

MAR. 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	17	16	14	15	15	17	22	24	20	20	23	22	23	27	18	20	20	23	16	16	17	15	18	17
2	20	16	15	15	16		20	29	29	21	21	46	18	21	46	18	17	23	16	16	16	16	16	15
3	21	16	15	16	15	16	17	28	33	38	44	44	48	24	46	32	17	20	18	15	15	15	17	15
4	21	15	16	15	15	23	18	27	29	26	26	46	48	43	35	30	27	24	17	18	16	16	15	17
5	17	17	16	15	15	15	20	28	30	39	48	46	43	46	35	22	29	18	17	16	17	16	16	17
6	16	16	14	14	14	15	18	26	32	32	C	C	C	C	44	32	28	23	16	16	16	16	15	15
7	15	16	15	15	15	16	22	27	30	34	24	42	46	43	46	30	27	21	15	16	15	15	16	16
8	16	16	15	15	15	15	20	27	30	42	46	45	46	49	43	32	18	24	16	15	16	15	16	16
9	16	15	15	15	14	15	20	26	20	21	22	47	28	23	23	20	29	23	18	16	16	15	17	16
10	15	15	16	15	15	15	18	17	24	42	46	48	46	48	33	32	17	23	17	16	16	15	16	17
11	16	16	15	15	15	15	18	27	17	47	21	46	47	46	49	23	18	26	16	15	15	16	16	16
12	17	17				16	18	43	26	28	27	27	48	45	45	32	20	24	16	16	16	16	16	16
13	16	17	15	15	15	16	21	24	28	28	28	28	52	22	44	17	29	26	16	17	16	17	17	15
14	16	15	15	15	15	17	21	18	18	23	24	50	24	48	36	30	20	23	17	16	16	16	23	18
15	16	17	15	15	14	16	21	27	33	34	46	45	27	49	45	32	28	24	16	16	17	16	16	16
16	16	15	15	15	15	18	24	29						52	45	32	29	24	16	16	15	17	17	16
17	16	16	16	14	16	17	21	27	18	34	45	47	27	23	33	30	27	23	15	16	16	16	15	16
18	16	16	15	15	15	17	21	28	18	46	49	48	27	27	33	21	20	23	16	16	17	16	15	16
19	15	16	15	15	15	15	21	27	20	33	48	26	29	24	24	22	18	23	16	15	16	15	16	16
20	16	16	15	15	15	15	26	29	18	24	46	48	48	48	46	24	20	24	16	15	16	C	C	C
21	C	C	15	15	14	15	21	29	21	26	28	24	42	50	46	18	17	22	18	16	15	16	15	17
22	18	15	15	15	15	15	21	26	22	28	27	48	47	48	44	22	28	26	16	15	16	16	17	16
23	16	16	15	15	16	15	23	28	26	21	22	50	28	46	27	22	29	24	16	15	18	17	15	15
24	15	15	15	15	15	16	23	29	22	45	49	48	45	47	47	41	29	23	18	16	15	15	15	15
25	15	16	15	15	14	17	22	28	29	27	28	26	28	45	23	21	18	24	16	15	15	15	15	15
26	16	15	15	16	15	16	22	24	28	47	48	30	47	44	48	23	29	23	16	15	15	15	16	16
27	16	15	15	14	15	15	24	28	21	42	23	28	28	46	24	32	29	24	17	15	C	C	C	C
28	C	C	C	C	C	C	24	18	20	45	27	48	49	29	46	33	18	24	17	16	16	16	16	15
29	15	16	14	15	14	C	C	29	33			C	45	45	45	33	18	27	17	15	15	16	15	15
30	15	17	14	14	15	15	24	29	17	21	24		23	26	20	17	18	20	16	15	15	16	16	15
31	16	15	15	15	15	15	24	18	22	23	30	28	29	28	47	20	16	26	18	16	15	15	16	15
	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	29	28	30	31	30	29	28	27	29	30	31	31	31	31	31	31	30	29	29	29
MED	16	16	15	15	15	16	21	27	23	32	28	46	43	45	44	24	20	23	16	16	16	16	16	16
U Q	16	16	15	15	15	16	23	29	29	42	46	48	47	48	46	32	29	24	17	16	16	16	16	16
L Q	15	15	15	15	15	15	20	26	20	23	24	28	27	27	33	21	18	23	16	15	15	15	15	15

HOURLY VALUES OF FOF2 AT AKITA

MAR. 1993

LAT. 39.7N LON. 140.1E 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	48	44	43	51	22	29	36	78	102	111	116	111	100	94	92	90	90	86	71	51	52	46	44	A
2	22	37	A	48	A	A	41	70	88	108	120	118	112	115	105	100	92	86	72	59		50	42	38
3		43	42	41	36	34	48	78	84	103	108	118	118	108	108	105	106	91	81	59	57	60	54	50
4	50		56	56	35	40	44	82	90	90	126	121	131	115	112	116								
5																								
6																								
7																								
8																								
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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																								

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

Note: Station "Akita" closed March 4, 1993.

HOURLY VALUES OF FES AT AKITA

MAR. 1993

LAT. 39.7N LON. 140.1E 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	26	24	G	G	G	40	G	G	G	50	43	51	36	33	40	28	G	29	30	27
2	G	28	46	64	59	32	30	57	65	G	49	48	G	41	41	48	61	G	G	31		25	G	G
3		G	G	G	G	G	25	G	36	G	G	G	42	42	G	38	34	G	28	27	28	G	G	G
4	23		G	G	G	G	G	G	G	G	G	54	G	83	53	43								
5																								
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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																								
MED																								
U Q																								
L Q																								

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

Note: Station "Akita" closed March 4, 1993.

HOURLY VALUES OF FMIN AT AKITA

MAR. 1993

LAT. 39.7N LON. 140.1E 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	17	16	18	16	15	16	16	23	16	17	17	18	17	16	17	16	16	17	16	17	17	16	16	16
2	21	17	15	14	15	16	16	15	16	16	16	17	18	20	17	17	16	17	18	17		16	20	18
3		17	17	16	16	16	17	17	20	23	24	27	23	21	20	18	16	20	16	17	16	16	17	18
4	16		17	16	16	16	17	21	17	16	17	18	27	20	17	17								
5																								
6																								
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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																								
MED																								
U Q																								
L Q																								

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

Note: Station "Akita" closed March 4, 1993.

HOURLY VALUES OF FOF2 AT KOKUBUNJI

MAR. 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	55	56	50	56	48	37	38	83	98	113	118	118	118	98	91	97	97	90	76	66	50	51	46	48
2	43	40	43	46	37	A	44	73	92	114	116	130	115	121	124	104	98	91	78	58	60	54	A	48
3	44	46	46	38	42	44	45	78	85	113	122	128	125	121	116	114	108	97	83	66	58	61	56	49
4	55	57	54	60	41	38	41	86	95	100	124	132	130	117	114	114	110	98	61	60	66	67	62	67
5	69	55	51	50	52	51	60	78	90	97	116	125	128	125	118	110	100	86	75	66	58	61	63	65
6	67	58	54	51	46	45	52	82	85	95	106	108	108	115	110	98	98	92	83	62	52	55	57	60
7	58	57	54	56	44	42	57	78	105	108	118	120	133	132	126	127	118	104	90	68	58	56	52	56
8	57	56	60	42	38	42	52	90	111	101	108	122	112	120	123	114	97	91	86	78	67	58	56	60
9	54	52	56	51	57	51	63	101	116	106	122	124	141	135		111	97	105	87	92	70	62	55	52
10	56	47	49	50	47	47	60	94	120	122	126	130	126	118	125	123	107	92	90	71	66	58	56	51
11	53	51	48	56	51	44	57	84	105	114	111	108	112	121	118	106	106	98	81	77	80	68	60	60
12	67	51	54	46	45	40	60	83	117															
13																								
14																					66	64	60	51
15	52	48	53	60	50	47	63	94				127	128	131	117	102	102	103	98	92	84	63	72	70
16	67	69	67	57	61	54	67	74	52	62	64	87	79											
17																								
18																								
19																								
20																								
21																								
22																								
23											126	121	120	113	110	100	111	105	84	63	62	55		69
24	63	60	61	56	57	47	67	93	104	96	96	117	122	119	117	114	106	100	102	87	83	74	46	72
25	73	58	58	73	51	44	70	91	106	102	110		130	127	122	124	120	122	127	102	67	54	54	54
26	56	57	55	46	40	46	62	76	93	94	120	128	127	120	111	103	100	101	94	51	50	54	54	51
27	56	53	54	51	46	48	58	70	80	93	107	117	114	117	110	111	112	100	98	80	73	58	57	53
28	50	50	58	57	43	48	57	76	82	92	111	116	121	120	104	97	91	100	102	51	61	61	58	60
29	58	52	58	57	44	44	68	83	83	106	120	102	122	118	103	107	117	123	102	60	57	52	62	57
30	55	60	61	62	47	50	68	85	101	110	116	124	128	131	124	112	114	102	102	88	82	73	61	69
31	56	48	67	61	66	57	69	74	74	91	114	124	124	125	120	105	93	97	104	97	70	68	67	61
	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	22	22	22	21	22	22	21	20	21	21	22	21	20	21	21	21	21	21	22	22	20	22
MED	56	54	54	56	46	46	60	83	95	102	116	122	123	120	117	110	106	100	90	68	66	60	57	58
U Q	63	57	58	57	51	49	67	90	105	111	121	127	128	126	122	114	111	103	102	87	70	64	61	65
L Q	54	50	51	50	43	43	52	76	84	94	109	116	115	117	110	102	97	92	82	61	58	55	54	51

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

MAR. 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	G	G	G	G	G	27	G	G	G	46	54	66	54	51	43	40	42	G	31	38	30	23	23	23
2	G	G	G	30	G	29	23	G	G	G	G	51	52	42	47	43	36	G	G	28	30	65	41	G
3	G	G	G	G	G	G	26	G	G	G	G	56	55	G	42	G	36	G	51	41	34	25	27	G
4	G	G	G	G	G	G	G	G	G	G	G	44	43	44	G	G	35	G	25	G	G	G	26	24
5	G	G	24	G	G	G	G	G	G	G	G	G	G	G	G	38	36	G	G	G	G	G	G	G
6	G	G	G	G	G	G	G	52	G	G	G	G	G	G	G	38	G	G	G	G	G	G	53	G
7	G	G	G	G	G	G	25	G	G	G	G	G	G	G	42	40	35	G	G	G	G	G	G	G
8	G	G	G	G	G	G	26	G	G	G	G	50	53	51	G	G	50	35	G	G	G	G	G	G
9	G	G	G	G	G	29	25	G	G	G	G	G	G	G	G	G	41	31	G	G	G	G	39	G
10	G	G	G	G	G	G	G	47	G	G	G	G	G	G	41	G	43	34	35	G	G	G	G	G
11	G	G	G	G	G	G	G	G	G	G	G	G	42	G	G	65	71	66	56	24	G	G	G	G
12	G	G	G	G	G	G	25	G	44															
13																								
14																					G	G	G	G
15	G	G	G	25	G	G	G	G			G	47	G	G	G	G	44	37	37	44	51	G	G	G
16	G	G	G	25	G	G	26	G	G	G	G	43	G											
17																								
18																								
19																								
20																								
21																								
22																								
23											46	G	G	G	G	G	G	30	29	G	G	G	G	G
24	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
25	G	G	G	G	G	24	G	G	40	41	G		54	60	72	49	G	G	G	G	G	G	G	G
26	G	G	G	G	G	G	G	G	37	G	G	G	44	G	G	G	44	G	G	G	G	G	G	G
27	G	G	G	G	G	G	G	G	37	40	47	52	48	48	46	43	G	39	29	G	G	37	26	G
28	G	G	G	G	G	G	G	G	37	40	43	G	45	53	48	G	G	G	G	G	G	G	G	G
29	G	G	G	G	G	G	G	G	G	G	G	G	G	G	49	61	54	37	37	44	24	G	G	G
30	G	G	G	G	G	G	G	G	G	G	G	52	G	G	G	G	G	38	24	G	G	G	G	G
31	G	G	42	32	27	39	27	G	40	42	G	44	G	G	G	G	G	G	G	G	G	24	G	G
	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	22	22	22	22	22	22	21	20	22	21	22	21	21	21	21	21	21	21	22	22	22	22
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	36	G	G	G	G	G	G	G
U Q	G	G	G	G	G	G	25	G	37	20	G	50	48	46	44	41	43	36	33	26	G	G	26	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 KOKUBUNJI

MAR. 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	15	15	15	14	15	15	15	15	15	15	16	17	17	18	16	16	14	27	15	15	15	15	15	15
2	15	16	16	15	15	15	15	15	14	15	16	17	18	20	17	17	15	26	16	15	15	15	15	16
3	15	15	14	15	15	15	16	18	21	35	27	28	24	28	21	20	16	22	18	15	15	15	15	15
4	15	15	14	15	16	16	17	15	15	16	18	20	21	24	20	17	16	22	15	15	15	15	15	15
5	15	14	15	14	15	15	16	15	14	15	17	17	37	21	21	18	15	26	15	15	16	15	15	15
6	15	15	14	14	15	16	16	15	16	17	23	20	20	26	18	16	16	24	16	16	15	15	15	15
7	15	15	14	15	15	15	18	16	16	18	17	38	18	21	17	15	16	24	16	16	15	15	15	15
8	15	15	15	16	15	15	17	15	14	17	17	21	17	23	20	17	14	16	16	15	15	15	15	15
9	15	15	15	14	15	15	17	15	17	16	36	38	32	23		18	16	16	16	15	15	16	15	15
10	15	15	17	14	15	15	16	15	16	17	17	20	21	20	16	20	15	16	14	15	15	15	15	15
11	15	15	15	14	15	15	17	15	15	15	16	18	30	39	21	17	16	17	15	15	15	15	15	15
12	15	15	15			15	18	32	20															
13																								
14																					15	15	15	15
15	15	16	15	14	15	15	20	15			14	20	24	18	15	14	16	16	15	15	15	15	15	15
16	15	16	15	14	15	15	17	18	20	23	23	21	42											
17																								
18																								
19																								
20																								
21																								
22																								
23											22		42	40	37	18	16	15	15	15	16	15	17	16
24	16	16	15	15	16	16	22	14	16	23	38	42	38	21	36	21	20	15	17	15	15	16	15	15
25	15	16	15	15	14	16	21	15	15	16	23		33	23	18	18	18	27	17	16	14	15	15	15
26	15	15	16	15	15	15	22	15	16	18	23	42	32	38	36	36	16	15	18	15	16	15	15	15
27	16	15	15	15	15	16	21	14	15	21	21	32	32	34	23	20	15	24	16	16	15	15	17	16
28	15	15	15	15	16	15	15	16	17	20	27	45	24	20	26	35	14	16	18	15	16	18	15	15
29	16	14	14	16	15	17	23	15	18	26	39	40	50	39	39	20	17	16	15	14	15	16	15	16
30	16	15	15	15	20	16	23	15	16	21	24	23	45	39	20	20	16	16	16	15	15	15	16	16
31	15	16	15	15	14	15	14	15	16	18	41	30	24	45	20	20	18	16	14	15	15	16	15	15
	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	22	21	21	22	22	22	21	20	22	20	22	21	20	21	21	21	21	21	22	22	22	22
MED	15	15	15	15	15	15	17	15	16	18	22	22	27	23	20	18	16	16	16	15	15	15	15	15
U Q	15	16	15	15	15	16	21	15	17	21	27	38	37	38	24	20	16	24	16	15	15	15	15	15
L Q	15	15	15	14	15	15	16	15	15	16	17	20	21	20	17	17	15	16	15	15	15	15	15	15

HOURLY VALUES OF FOF2 AT YAMAGAWA

MAR. 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	52	55	54	58	52	A	34	52	86	104	114	120	122	124	106	102	105	102	97	78	62	66		42
2	38	38	53	50		35	30	62	80		126	115	132	136	138	126	111	108	96	74	78	78	32	64
3	66	31	50	43	42	50	37	63	87	126	124	124	124	135	130	125	126	114	106	98	73	61		53
4			54	54				66	87	106	120	140	133	134	122	124	130		91	83	80	78	66	78
5	87				44	43	38	65	78	92	115	131	136	138	137	138	127	108	96	86	79		64	65
6	66		61	51	44	43	43	79	88	90	102	116		132	122	111		105	90	71	53	61		66
7	70	59	54	56	52	40	43	70	105	105	111	130	153	163	161	144	130	117	104	86	83	70	77	66
8	66	65	51				34	82	104	92	102	116	125	122	126	127	113	97	108	97	81	77	62	61
9	64		52	78	42	46	53	84	105	97	124	128	162	144	131	120	105	108	122	110	87		67	
10	55	52		60	70	36	40	67	111	122	121	127	130	131	135	142	127	107	105	107			79	66
11	61	54	47	60	58				87	111	104	112	117	122	126	120	120	110	101	82		78		62
12			48	40	42	37	38	84	104	114	136	118	138	132	137	146	131	120			75	83		
13	58	59	52	60	52	43		66	87		117	128	125	135	141	132	132	121	111	100	83		66	68
14	60	59	62	52	47		48	66	80	108	132	142	141	137	144	140	137	124	110	104	87		78	66
15	62	54		66	40	52	53	82	88	97	110	115	137	134	137	128	120	126	120		106	90		
16		85	82	66	66	66	85	97	90	90	108	131	108	90	84	98	88	85	96		60	52		A
17	A	52	59	40	40		47	66	74	90		118	124	127	126	109	110	105	105	80			72	63
18	58	62		43	40	32	45		82	94	106	104	110	120	128	111	105	103	97	87	72	68	70	77
19	63			64	52	46	46	82	92	92			116	115	110	101	110	106	97	91	78	66	62	
20	64	54		59	58	46	54	78	97	116	110	118	117	122	125	122	112	111	105	87	87	77	79	80
21		91	66	64		50	52	80	86	92	120	141	140	136	122	111	104	100	105	87	66	63		77
22	80	78	50	55	58	54		87	101	106	101	120	131	131	127	122	118	118	110	87	84	78	77	87
23	75	77	52	56	40	47	52	66	88	112	132		125	132	131	122	121	114	107	84	65	67	66	
24		66		70	47	51	44	78	85	97	91	106	127	133	124	117	122	113		97		87	72	
25	71	76	66	66		26	53	84	97	97	107	126	137	138	134	128	134	141	150	121	78			91
26			84	52		37	51	71		98	121	132	140	140	133	127	122	114	102	80		91	52	51
27	66	52	53	50	40	46	51	77	85	97	107	111	122	131	132	130	131	123	111		88	63	62	66
28		60	66	62	41	37	46		80		100	121	124	122	122	111	105	108	110	90	64	62	62	63
29	63	57		53	43	43	52	72	80	97	118	112	128	135	121	116	120	137	111	80	79	66		66
30		62	68	71	51	53	42	66	85	97	105	118	136	135	131	122	118	118	108	110	107	83	77	78
31	71		77	79	66	52	54	76	84	97	105	122	132	131	123	111	105	105	107	111	84	76	73	74
	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	23	23	29	25	25	27	28	30	28	29	29	30	31	31	31	30	30	29	27	26	24	21	24
MED	64	59	54	58	47	46	46	74	87	97	111	120	129	132	128	122	120	110	105	87	79	73	67	66
U Q	70	66	66	65	55	50	52	82	97	107	121	129	137	136	135	128	127	118	110	100	84	78	77	77
L Q	60	54	52	51	41	37	40	66	84	93	105	115	124	124	122	111	110	105	97	82	72	64	62	63

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT YAMAGAWA

MAR. 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	G	24	29	G	G	G	G	G	G	G	G	43	44	40	G	G	24	25	23		G
2	G	G	G	24		G	G	G	G	G	G	53	65	48	G	G	45	G	G	G	G	G	34	24
3	25	24	G	G	G	G	23	32	G	G	G	G	G	G	G	G	G	G	G	G	G	G		28
4			G	G				G	G	G	G	G	43	G	G	G	G		34	25	24	29	G	G
5	G				G	G	G	G	G	40	G	G	G	G	G	G	38	G	G	G	28		G	G
6	G		G	G	G	G	G	30	G	G	G	G	G	G	G	G		G	G	G	G	G		G
7	G	32	G	G	G	G	G	28	G	39	42	G	G	G	G	G	38	G	G	G	G	G	G	G
8	G	G	G				G	G	G	G	60	G	48	G	G	42	40	G	G	G	G	G	G	G
9	G		23	G	24	G	25	G	G	G	G	G	G	G	G	G	59	35	G	G	G		G	
10	G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	44	40	G	25			G	G
11	G	G	G	G	G				G	G	G	G	G	G	G	G	G	G	G	G		G		G
12			G	G	G	G	G	G	41	G	49	G	G	54	G	42	42	47			26	G		
13	59	58	34	26	G	G		G	G		G	G	G	G	G	G	G	38	G	31	G		G	G
14	G	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G	44	51	G	G	G	G	G
15	G	G		G	G	G	G	G	G	38	G	G	44	44	G	G	41	G	32		34	G		G
16	24	31	G	G	G	38	26	G	G	G	G	G	G	G	G	G	44	46	40	G	37	34		38
17	33	24	G	46	G		G	G	G	G		G	G	G	G	G	G	G	41	34			27	G
18	G	G		G	G	G	G		G	G	G	G	G	G	G	G	G	51	42	G	G	G	G	G
19	G			G	G	G	G	G	G	38			G	44	48	G	42	G	G	G	G	G	33	
20	G	G		G	G	G	G	G	G	38	G	G	G	G	G	G	G	G	G	25	G	G	G	G
21		G	G	G		G	G	30	55	G	G	G	G	G	46	G	G	G	G	33	44	25		G
22	G	G	G	G	G	G		G	G	39	G	50	G	G	G	44	41	36	30	30	G	G	G	G
23	G	G	G	G	G	G	G	G	G	G	G	G	G	G	55	48	44	50	30	G	24	G	G	
24		G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G		26	G	G	G	
25	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G		G	G
26		G	G	G		G	G	G	G	40	47	47	60	G	G	G	73	66	55	45		G	G	G
27	G	G	G	G	G	G	G	G	G	40	G	G	G	G	57	G	43	G	33		G	G	G	G
28		G	G	G	G	G	G		G		43	44	G	44	51	41	G	G	39	G	G	G	G	G
29	G	G		G	G	G	G	G	G	G	G	G	50	47	53	G	G	G	30	G	G	G		32
30		27	G	G	G	G	G	G	55	G	G	G	G	43	G	G	43	G	31	G	G	G	G	G
31	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	33	G	G	G	G	G
	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	24	24	23	29	25	26	27	28	31	29	29	30	31	31	31	31	30	30	29	28	27	25	22	26
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	38	G	G	G	G	G	G	G
U Q	G	12	G	G	G	G	G	G	G	38	G	G	G	G	G	G	43	38	33	25	24	G	G	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

MAR. 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	15	15	15	15	15	15	15	18	15			22	17		18	17	16		15	15	16	15		15
2	15	15	15	15		15	15	15	16		17	18	36	36			15		17	15	15	15	15	15
3	15	15	15	15	15	15	15	16	18	35	36	44	39	42	30	24		16		15	15	15		15
4			15	15				15	15	17	17	36	34	44	38	38	16		15	15	15	15	15	15
5	15				15	15	15	15	15	16		38	38	39	39		17	16	20	15	15		15	15
6	15		15	15	15	15	15	16	15	16	22	39			38				18	15	15	15		16
7	15	15	15	15	15	15	15	16	16	16	18	39		44			16	15	20	15	15	17	15	15
8	15	15	15				15	15	17	33	20	39	41		33	34	18		20	15	16	15	15	15
9	15		15	15	15	16	15	22		17	18	42	44	39			17	16	17		15		15	
10	15	15		15	15	15	15	21	16		35	39		42	20	35	17	16		15			15	15
11	15	15	15	15	15				15			40		42	42	22	18	16		15		15		15
12			15		15	15	15	20	16	17	21	39	46	38	43	27	16	16			15	15		
13	15	15	15	15	15	15		15	16		20		42	40	38	35	34	16	15	15	15		15	15
14	15	16	15	15	15		15	20	15	16		38	39	40	43			16	15		15	15	15	15
15	15	15		15	15	15	15	20	16	17			44	44		18	16	15	16		15	15		15
16	16	15	15	15	15	15	15	15	18	21	38		40	38	38	18	18	16	15		15	15		15
17	16	15	15	15	15		15	15	15	17		36	44					16	15	15			15	15
18	16	15		15	15	15	15		16	17		39	38	45	43		34	15	15	15	15	15	16	15
19	15			15	15	15	15	16	15	17			39	33	34		18	17	22	15	15	16	15	
20	15	15		15	15	15	15	18	16	16	43		46	43		35	18		16	15	15	15	15	15
21		15	15	15		15	15	17	16	17	38	39	45	44	30	35			15	15	15	15		15
22	15	15	15	15	15	15		18	16	17	38	39	42	42		32	15	15	15	15	15	15	15	15
23	15	15	15	15	16	15	15	16	16				50	46	34	30	18	16	15	15	15	16	15	
24		15		15	15	15	15	15	16	36	38	44	48	42		40	18			15		15	15	
25	15	15	15	15		15	15	15	16	18	36	43	45	40	38	35		15		16	15		15	15
26			15	15		15	15	18		18	38	36	30			20	16	16	15	16		16	15	15
27	15	15	15	15	16	15	15	24	15	17		29	46	43	30		15	16	15		16	16	15	15
28		15	15	16	15	16	16		16		28	30	45	42	29	27	39	16	15	15	15	15	15	15
29	15	15		15	17	15	15	20	16	17	39	46	46	39	37	38	17	16	15	15	15	15		15
30		15	15	15	15	16	15	16	16	16	42	45		42	38	38	20		15	16	15	15	15	16
31	15		15	15	15	15	16	15	16		38	42	47	44		38	17	16	15		15	15	15	15
	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	24	23	23	28	25	26	27	28	29	23	21	25	26	26	21	21	25	23	25	24	26	25	22	26
MED	15	15	15	15	15	15	15	16	16	17	36	39	43	42	38	34	17	16	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	19	16	18	38	42	46	44	38	36	18	16	17	15	15	15	15	15
L Q	15	15	15	15	15	15	15	15	15	16	20	36	39	39	30	23	16	16	15	15	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT OKINAWA

MAR. 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	80	66	53	62	54	32	30	53	85	90	105	120	121	126	122	120	120	122	105	109	87	90	87	76
2	42	31	53	53	35	28	34	54	77	106	122	111	124	158	165	159	146	140	121	108	111	108	87	66
3	52	54	54	52	35	34	34	52	88	122	148	111	121	142	141	141	144	131	143	122	108	87	83	52
4	34	54	53	43	28	26	32	55	85	105	111	138	122	141	127	140	120	121	121	108	106	87	83	76
5	78	66	52	54	40	35		55	82	90	110	137	146	158	167	184	170	166	160	146	146	122	108	108
6	108	88	66	54	44	36	42	66	88	90	105	121	140	150	145	144	142	123	110	105	90	87	86	84
7	83	66	63	58	43	34	37	61	104	105	112	122	170	187	170	168	164	146	140	111	108	108	108	87
8	84	86	66	40	34	37	34	66	88	90	103	107	132	121	121	127	112	110	121	110	108	87	83	73
9	66	53	60	54	44	37	53	85	87	90	120	146	171	165	140	142	121	111	162	146	108	78	76	60
10	43	41	53	54	41	A	32	62	107	108	111	142	125	166	171	171	170	161	145	162	146	110	106	84
11																								
12	78	62	34	35	35	31	37	83	101	149	146	112	140	146	147	156	157	146	126	108	104	105	88	78
13	66	67	66	66	51	40	37	62	85	90	111	125	137	144	154	146	144	145	139	110	90	84	78	86
14	80	62	58	60	14	36	37	61	76	105	137	145	154	150		165	170	165	162	145	109		87	88
15	86	77	66	72	48	55	37	80	86	100	111	120	144	156	146	146	156	161	146	127	146	131	154	127
16	108	86	87	86	86	88	87	80	88	94	124	141	138	95	103	108	94	88	94	106	74	60	63	60
17	60	66	62	54	44	34	36	66	76	88	110	124	140	146	141	130	131	112	110	90	87	87	88	78
18	66	66	76	42	35	32	37	64	86	92	105	106	111	121	143	121	112	110	107	87	83	74	73	66
19	66	66	66	66	53	38	37	66	106	104	N	105	118	122	128	122	120	117	105	88	89	84	78	78
20	74	58	52	53	55	36	37	66	91	111	118	118	118	139	146	146	122	121	107	105	87		90	86
21	87	87	81	66	53	37	38	65	78	90	111	146	146	145	146	141	120	112	105	90	81	81	87	87
22	86	87	54	54	53	44	54	82	103	95	101	111	145	144	153	146	145	145	130	138	111	110	108	88
23	106	88	85	54	34	42	42	65	82	105	122	117	121	146	162	153	130	122	111	104	87	90	87	87
24	84	87	85	80	44	34	34	66	88	90	92	105	130	146	136	143	144	122	110	108	90	107	66	65
25	74	80	66	66	58	42	35	70	88	105												143	144	145
26	110	110	120	71	43	34	37	62	85	90	112	141	143	157	162	145	146	137	111	102	87	87	83	86
27	85	84	62	53	35	34	34	66	86	103	107	105	122	146	157	165	169	165	162	146	108	103	94	89
28	86	86	87	83	32	34	37	66	81	90	105	111	121	134	136	121	120	120	111	85	71	83	72	62
29	66	74	66	44	42	37	43	66	73	103	A	151	145	172	167	160	154	175	131	106	104	97	78	86
30		86	100	99	51	38	40	76	94	111	118	132	154	168	162	146	144	143	131	132	131	128	106	105
31	101	94	101	105	84	64		91	104	111		132	170	174	148	145	142	133	131	131	104	94	95	103
	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	30	30	30	30	29	28	30	30	30	26	29	29	29	28	29	29	29	29	29	29	28	30	30
MED	80	70	66	54	44	36	37	66	86	102	111	121	138	146	146	145	144	131	121	108	104	90	87	85
U Q	86	86	81	66	53	39	39	70	91	105	120	139	145	158	162	157	155	146	141	131	108	108	95	88
L Q	66	62	54	53	35	34	34	62	82	90	105	111	121	140	138	135	120	118	110	104	87	85	78	73

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT OKINAWA

MAR. 1993

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC 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	27	25	24	G	G	G	G	32	G	G	40	G	G	49	47	43	42	38	28	G	G	30	22	G
2	G	26	G	G	26	G	G	G	G	G	G	G	G	57	55	48	47	42	32	G	G	G	G	G
3	G	G	G	G	26	G	G	29	34	39	47	53	53	49	45	42	40	35	G	G	G	G	G	G
4	G	G	G	25	G	G	G	G	G	G	G	42	51	50	48	G	44	38	30	28	G	G	G	G
5	G	G	30	G	G	G	G	G	G	G	G	G	48	47	G	48	43	36	G	23	G	G	G	G
6	G	G	G	G	G	G	G	G	33	38	41	G	G	63	48	46	44	G	G	28	40	32	G	G
7	32	32	29	25	G	G	G	28	32	G	G	G	G	G	G	G	G	G	G	G	24	30	G	G
8	G	G	G	G	G	G	G	29	G	G	G	G	G	54	G	G	40	36	G	G	G	G	G	G
9	G	G	G	G	G	G	G	G	G	38	40	G	G	50	54	50	51	44	32	25	G	25	G	24
10	G	G	G	G	G	33	G	G	G	G	G	G	G	G	G	79	42	40	37	28	G	G	G	G
11																								
12	G	G	G	G	G	G	G	G	34	G	G	G	G	G	G	53	42	40	G	G	G	G	G	G
13	G	G	58	60	G	G	G	G	G	G	45	G	44	54	57	G	51	58	31	G	G	G	G	G
14	G	G	G	G	26	G	G	G	G	G	G	48	50	G		51	46	41	37	41	40	G	32	G
15	G	G	G	G	G	G	G	G	G	G	G	43	G	44	G	G	G	35	30	24	G	G	26	34
16	G	G	G	G	G	28	26	30	46	50	83	54	G	44	54	47	45	42	36	34	28	28	24	G
17	G	G	G	G	G	28	32	39	G	G	G	50	51	52	G	52	50	52	40	28	G	G	G	G
18	G	G	G	G	G	G	G	G	41	G	G	50	G	G	G	49	45	47	46	32	G	G	G	G
19	G	G	G	G	G	G	G	G	34	39	41	43	46	60	50	G	40	46	37	25	82	40	46	G
20	G	G	G	G	G	G	G	29	G	38	G	G	G	G	G	G	59	G	30	26	G	G	G	G
21	G	G	G	G	G	G	G	G	G	G	42	G	G	G	G	G	G	G	36	24	G	G	G	G
22	G	G	G	G	G	G	G	28	34	40	G	G	G	G	G	42	41	G	29	G	G	G	G	G
23	G	G	G	G	G	G	G	29	G	38	42	G	G	G	G	G	G	G	34	24	G	G	G	G
24	G	G	G	G	G	G	G	29	G	38	G	44	G	44	G	G	G	38	32	G	G	G	G	G
25	G	G	G	G	G	G	G	28	G	G												G	25	24
26	G	G	G	G	G	G	G	31	37	G	64	68	63	G	G	G	48	56	46	37	G	24	24	G
27	G	G	G	G	G	G	32	G	G	39	42	G	G	G	G	45	40	40	46	27	24	G	G	G
28	G	G	G	G	G	G	G	37	G	39	G	G	45	G	G	G	61	36	34	27	G	32	G	G
29	G	G	G	G	G	G	G	45	G	G	43	57	54	49	N	45	G	40	32	G	G	26	G	G
30	G	G	G	G	G	G	G	35	38	44	G	G	59	52	G	G	44	40	33	G	G	G	G	G
31	G	G	G	G	G	G		34	39	49		47	51	51	44	G	42	38	40	35	G	G	G	G
	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	29	30	30	30	28	29	29	29	27	29	29	29	29	29	29	30	30	30
MED	G	G	G	G	G	G	G	28	G	G	G	G	G	44	G	42	42	38	32	24	G	G	G	G
U Q	G	G	G	G	G	G	G	30	34	39	42	47	50	51	48	48	46	42	37	28	G	25	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	40	35	28	G	G	G	G	G

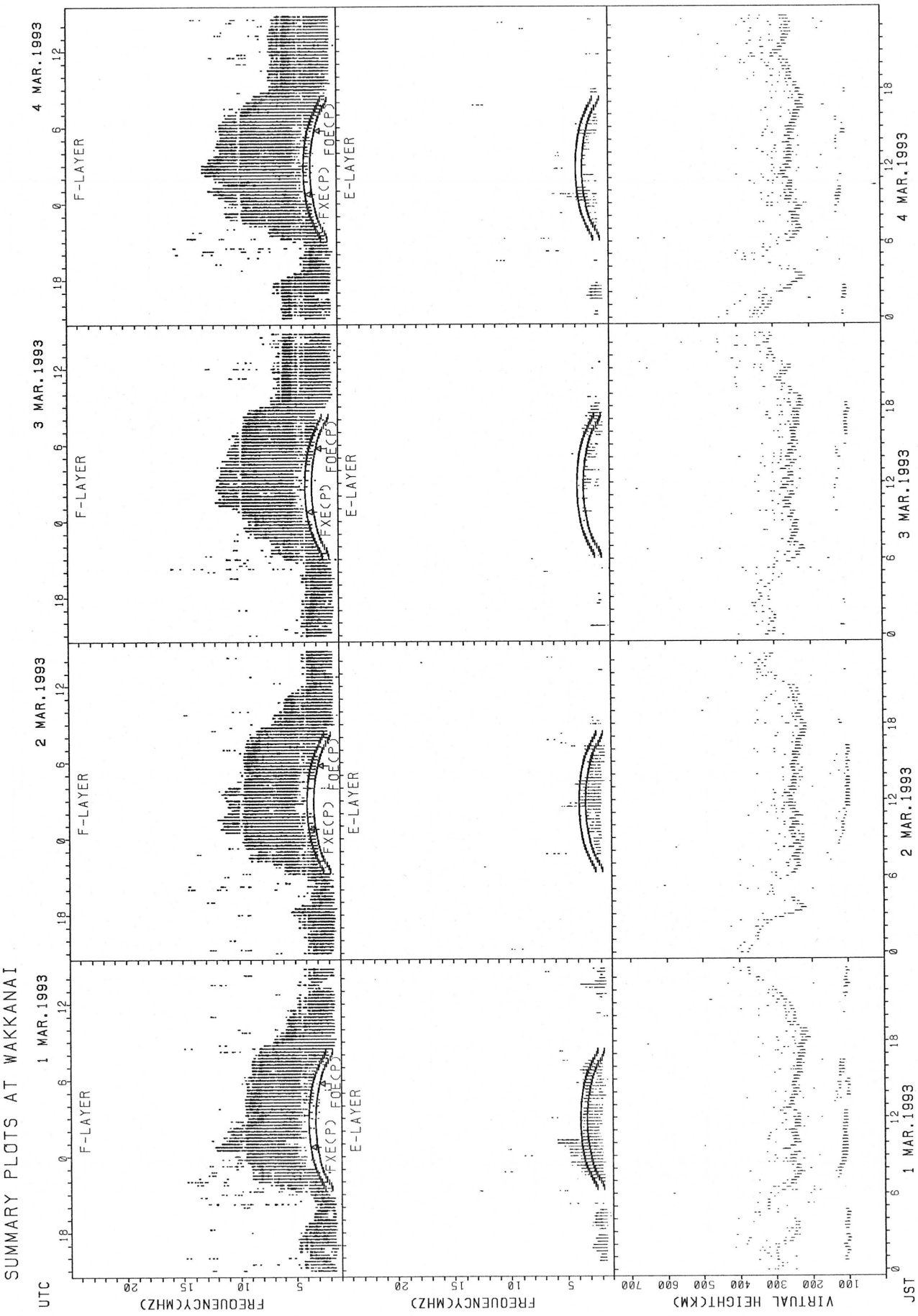
COMMUNICATIONS RESEARCH LABORATORY, JAPAN

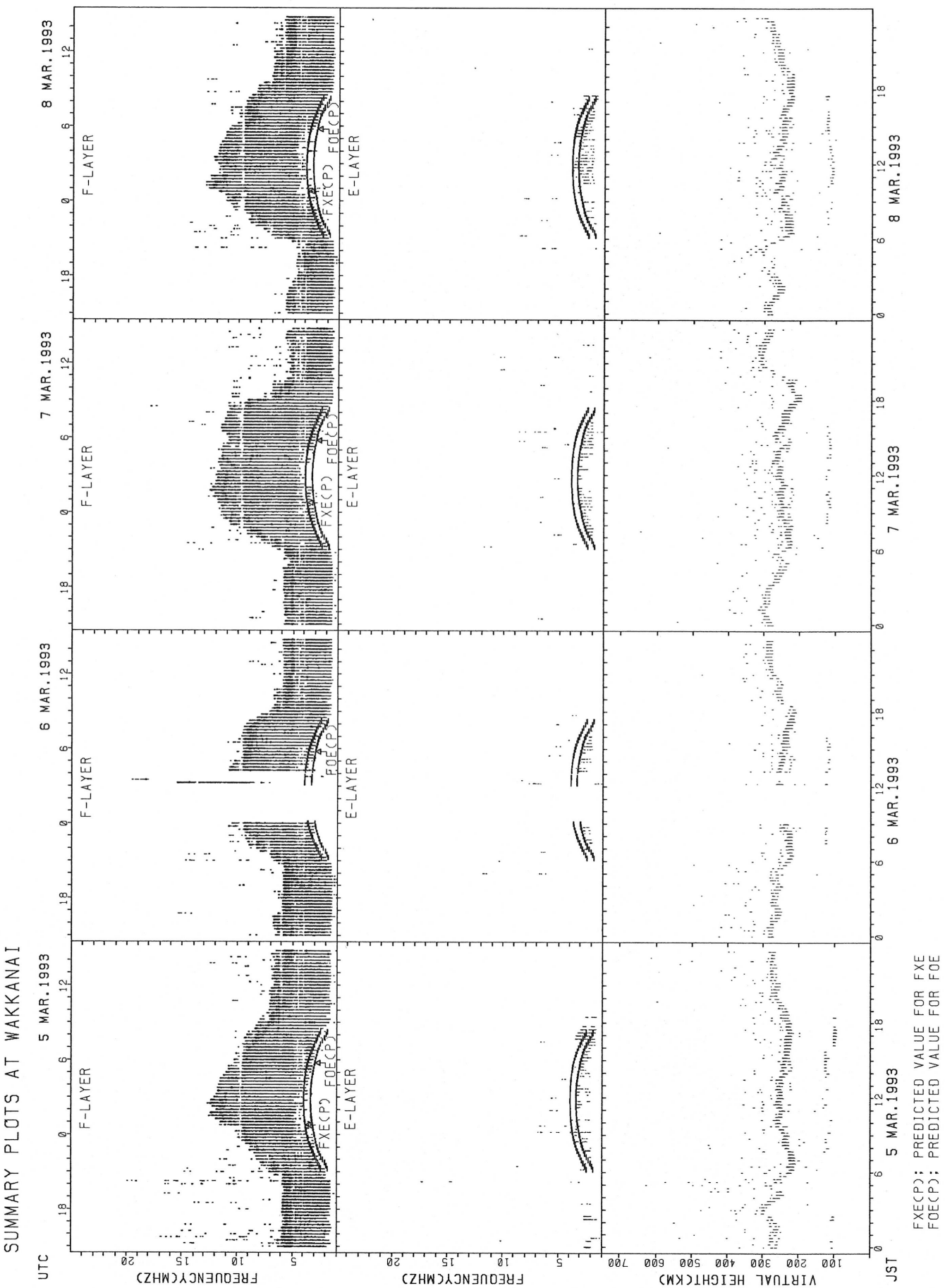
HOURLY VALUES OF FMIN AT OKINAWA

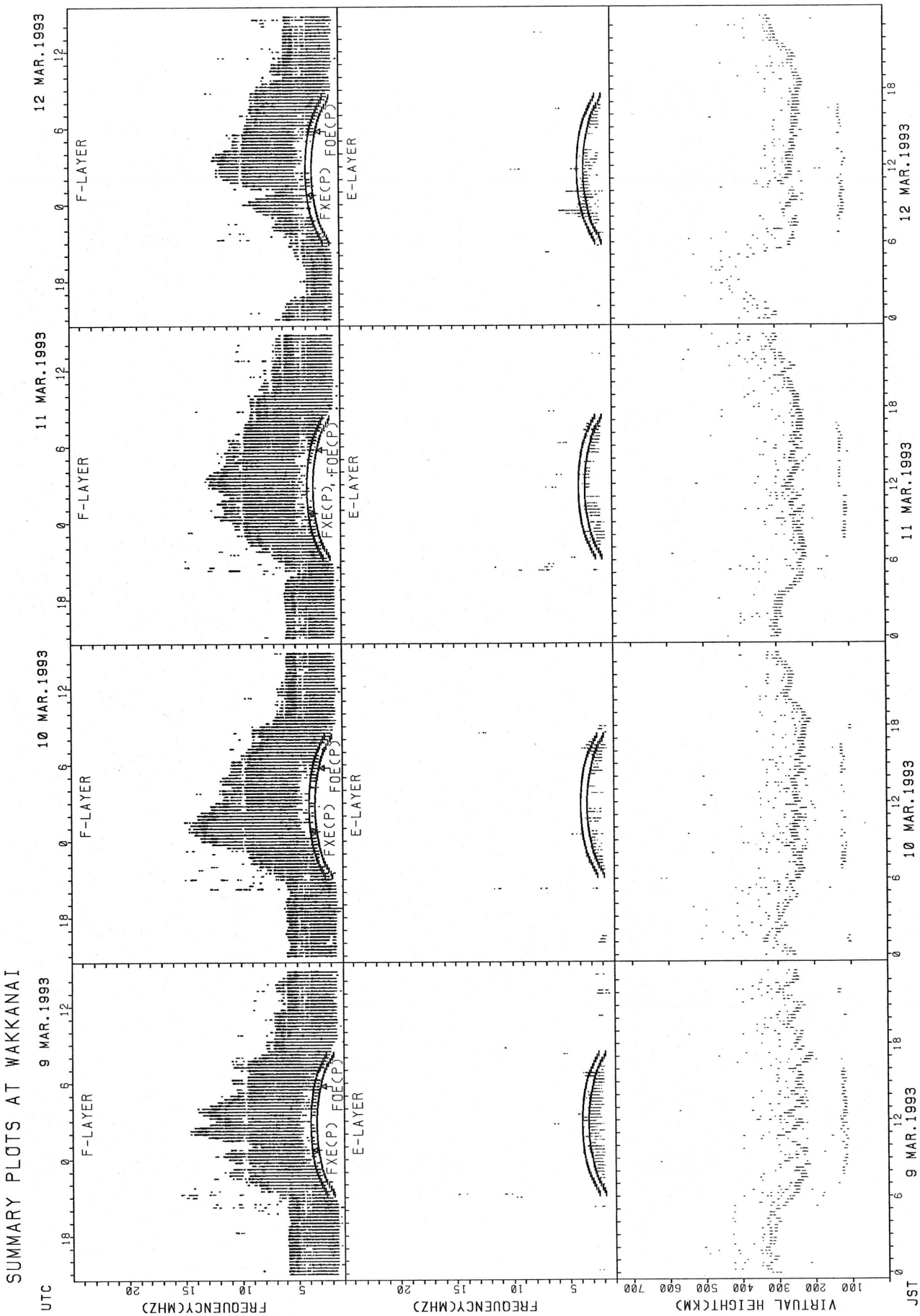
MAR. 1993

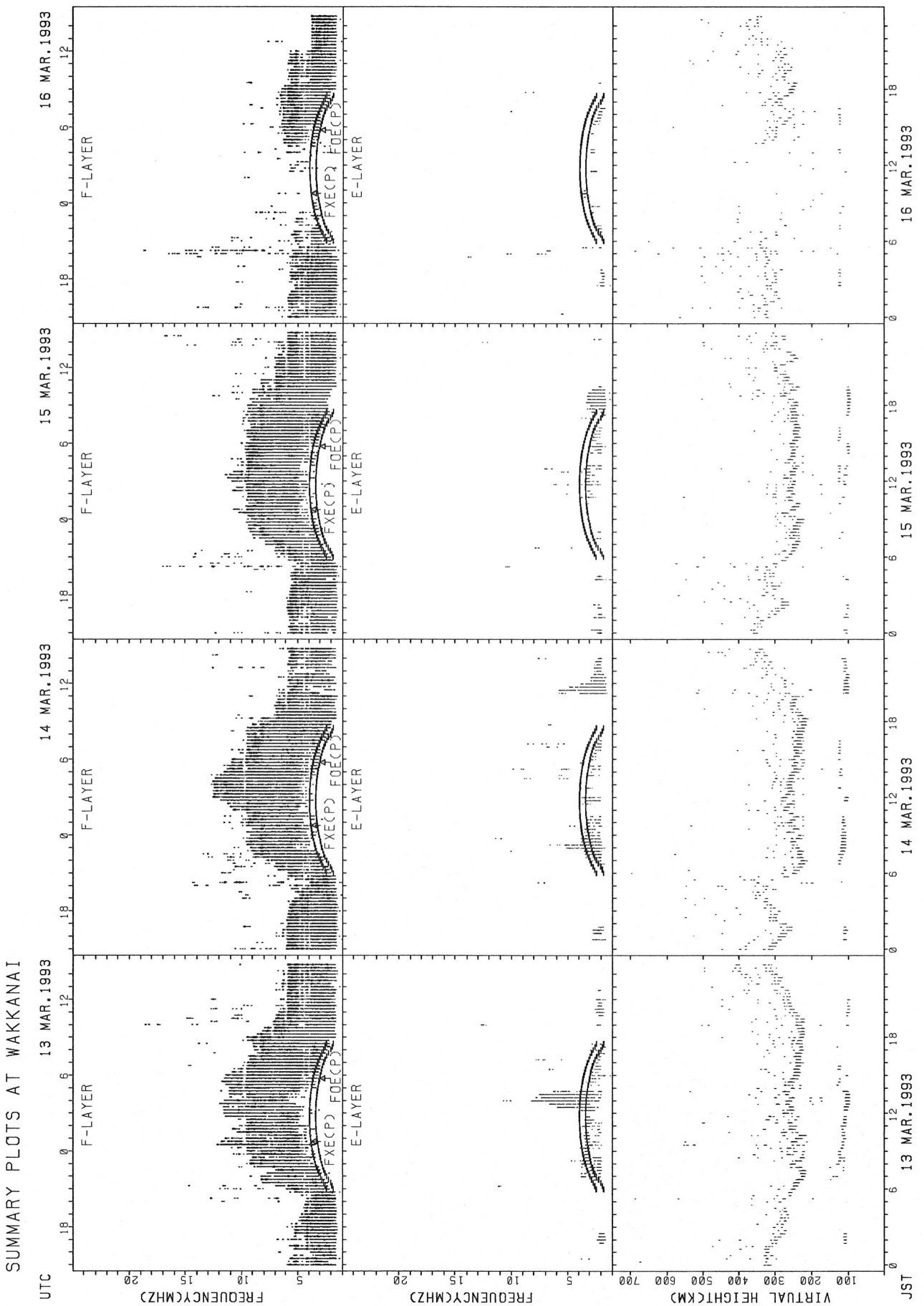
LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

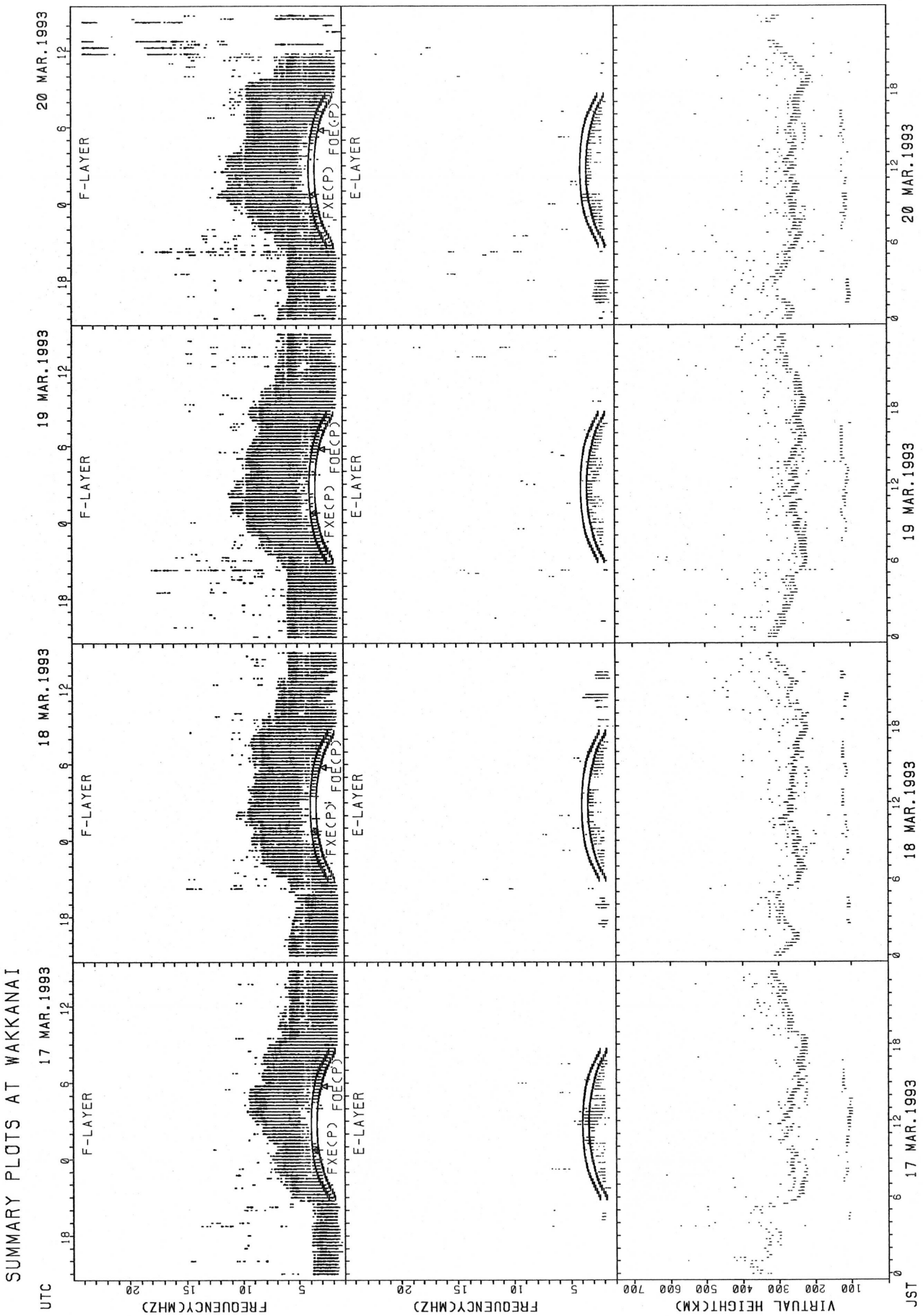
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	15	15	15	15	15	16	14	15	16	22	22	22	23	22	22	16	14	14	15	15	15	15
2	15	15	15	15	14	15	15	18	16	14	20	21	23	24	27	20	16	15	15	15	18	15	15	15
3	15	15	15	15	15	15	15	15	17	23	24	27	27	27	26	21	21	15	17	14	15	15	15	15
4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


SUMMARY PLOTS AT WAKKANAI
UTC
1 MAR.1993
2 MAR.1993
3 MAR.1993
4 MAR.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

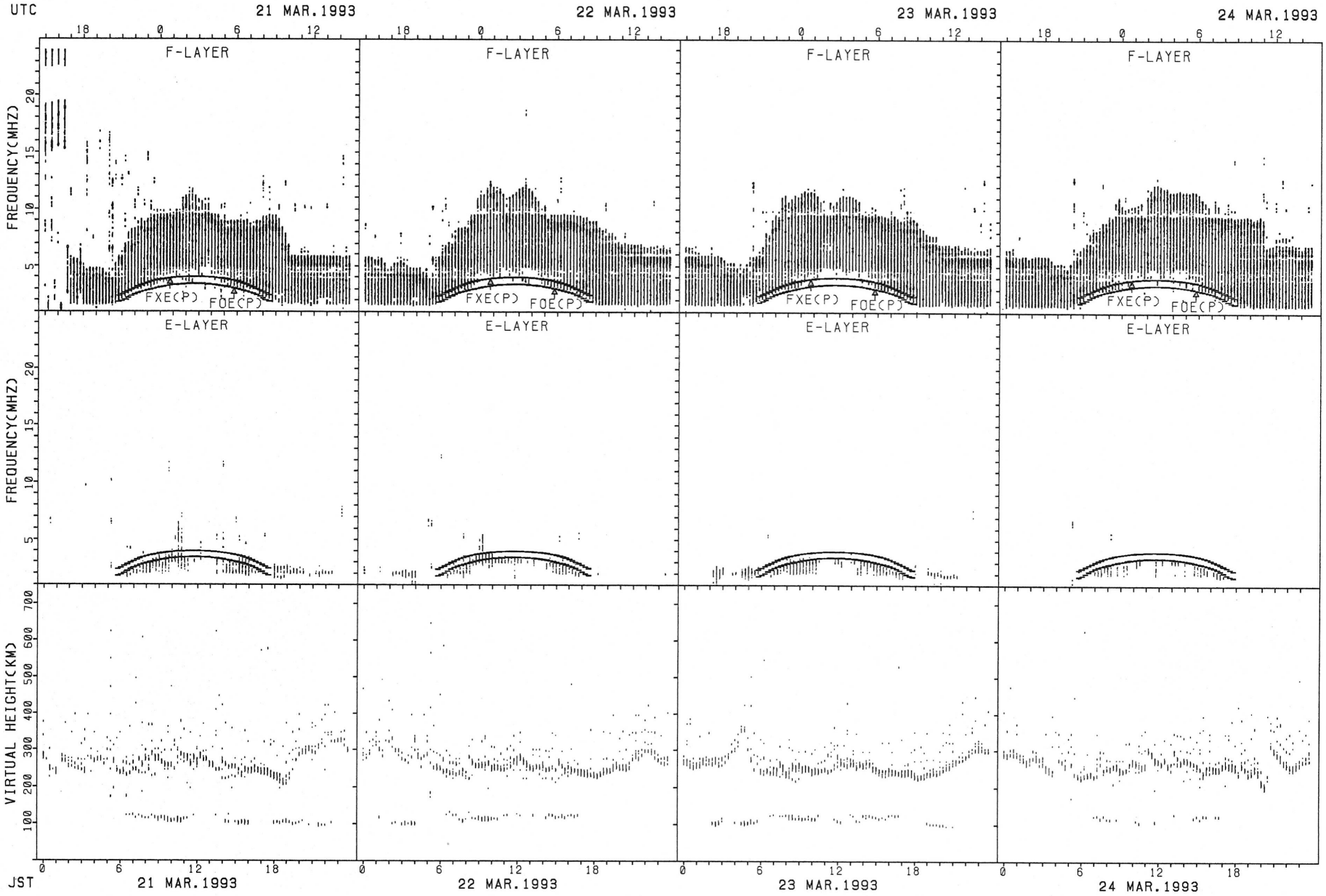

SUMMARY PLOTS AT WAKKANAI
UTC
5 MAR.1993
6 MAR.1993
7 MAR.1993
8 MAR.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
9 MAR.1993
10 MAR.1993
11 MAR.1993
12 MAR.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

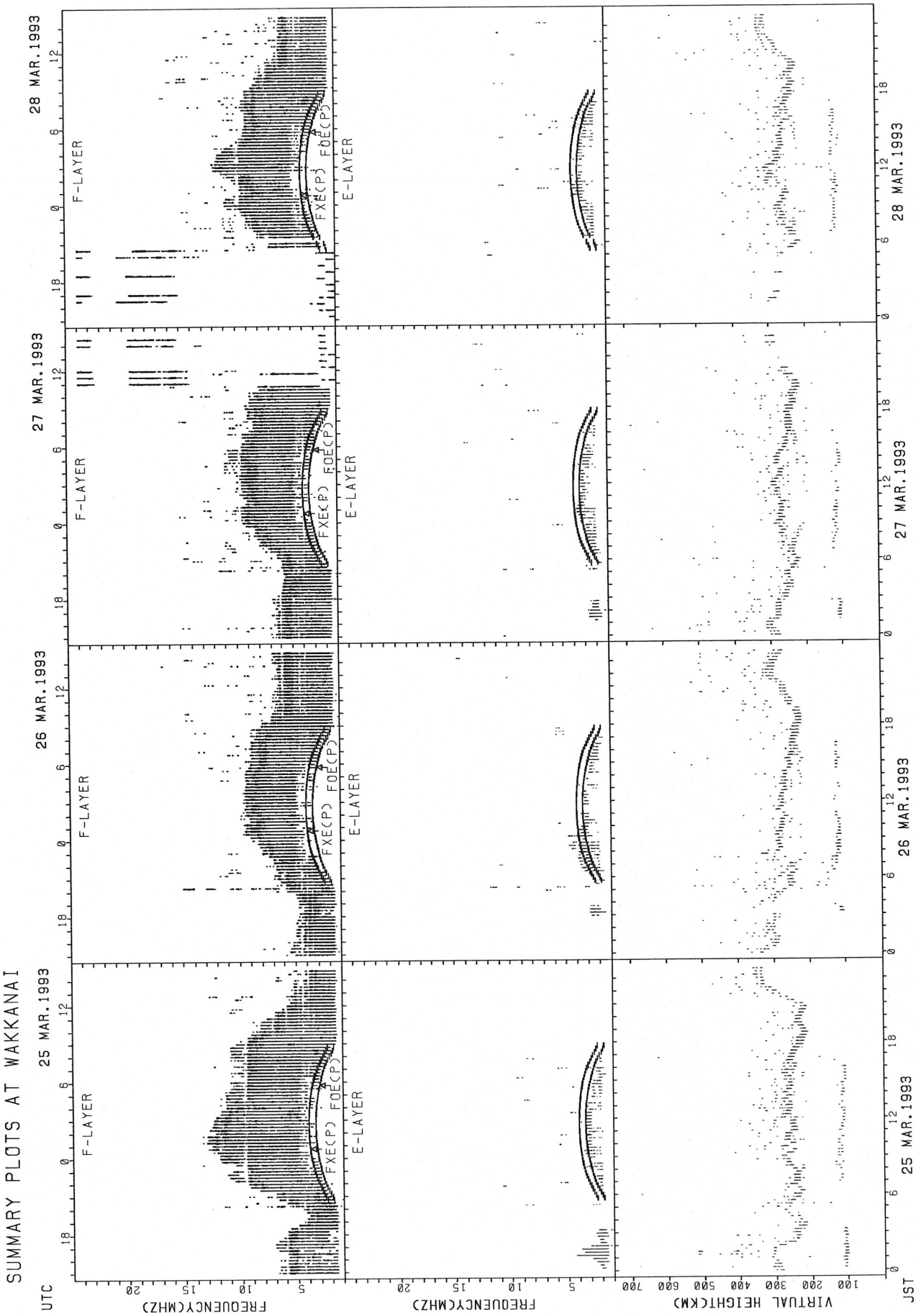

SUMMARY PLOTS AT WAKKANAI
UTC
13 MAR.1993
14 MAR.1993
15 MAR.1993
16 MAR.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

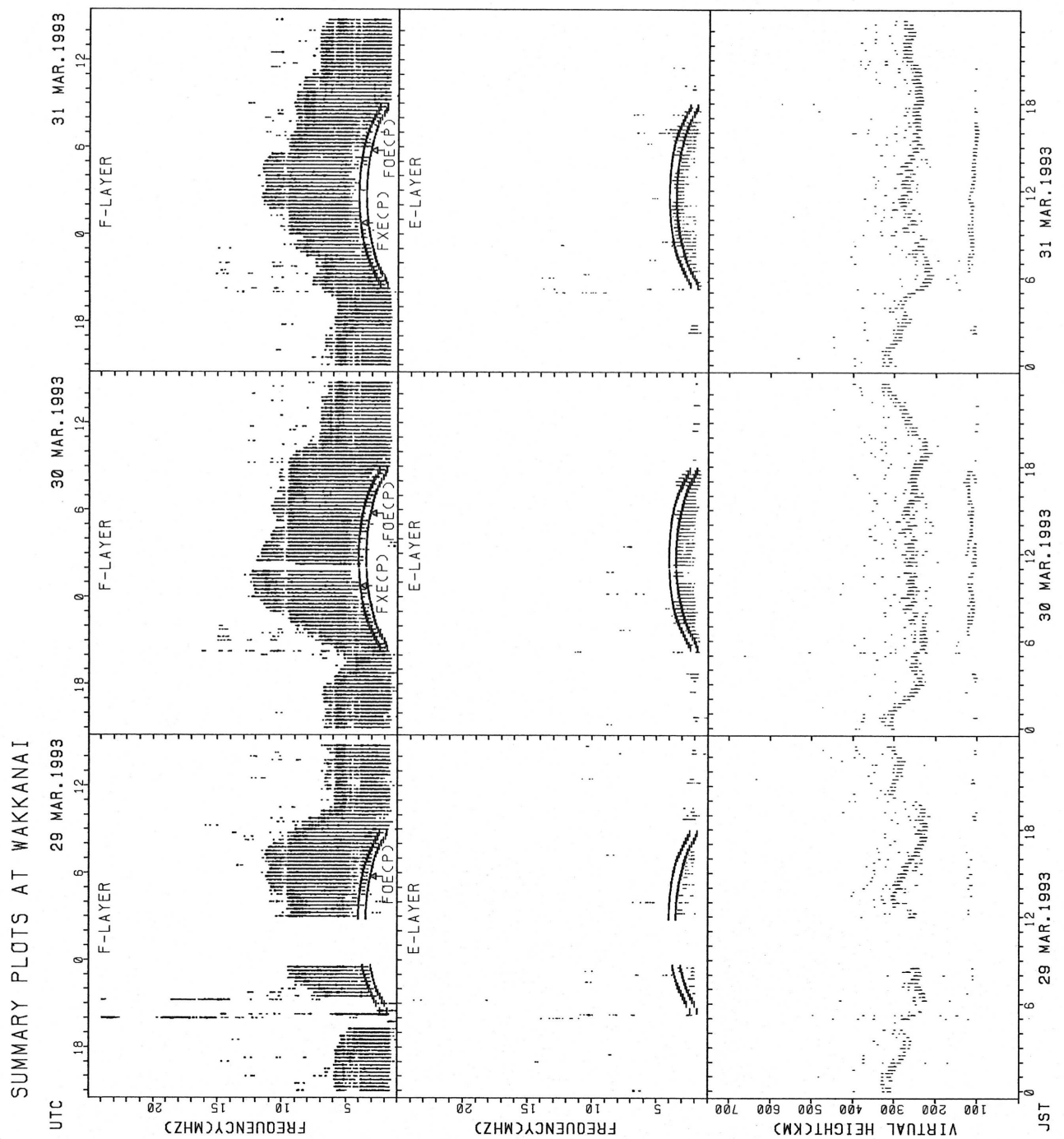

SUMMARY PLOTS AT WAKKANAI
17 MAR.1993
18 MAR.1993
19 MAR.1993
20 MAR.1993
UTC
JST
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

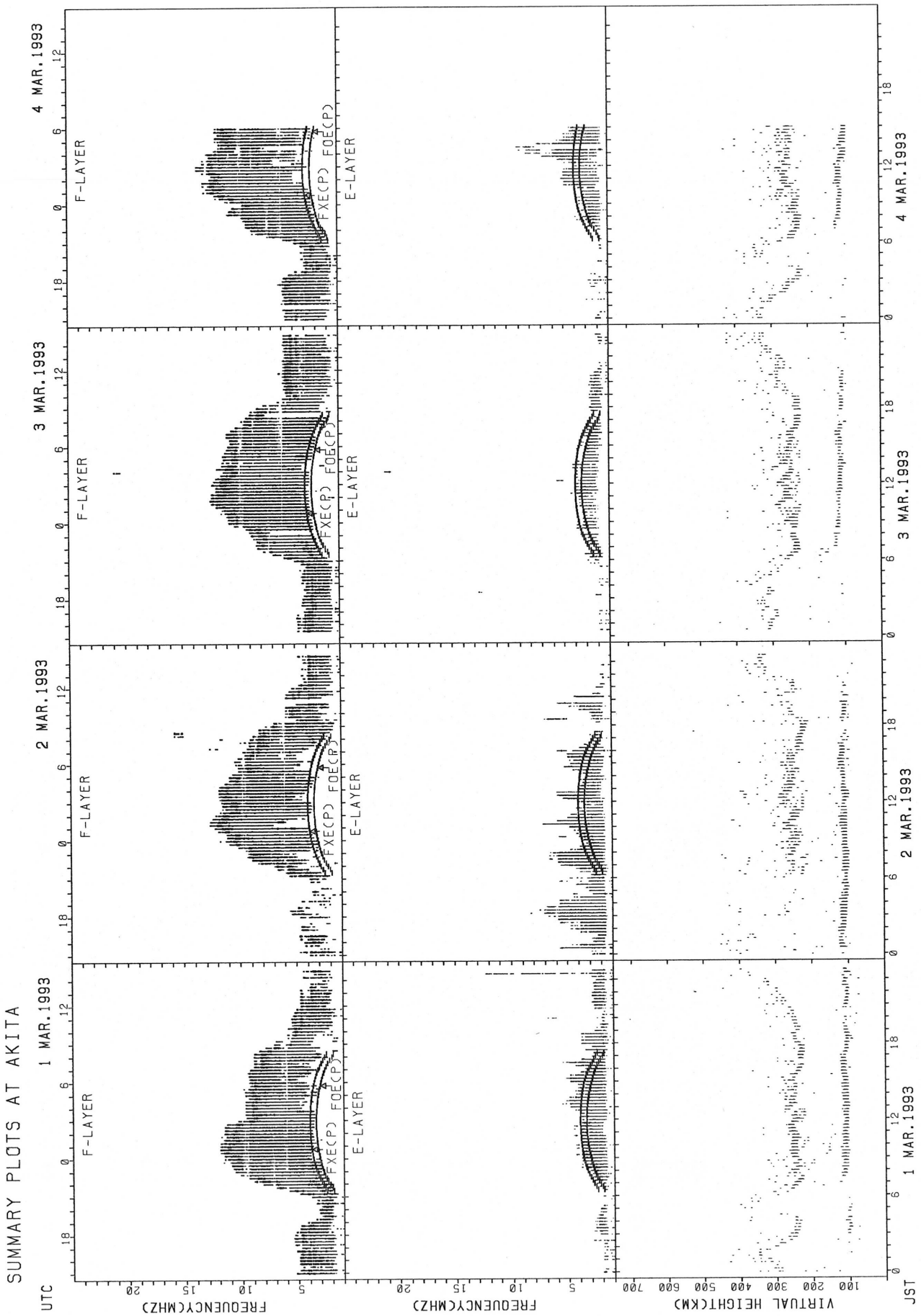
SUMMARY PLOTS AT WAKKANAI

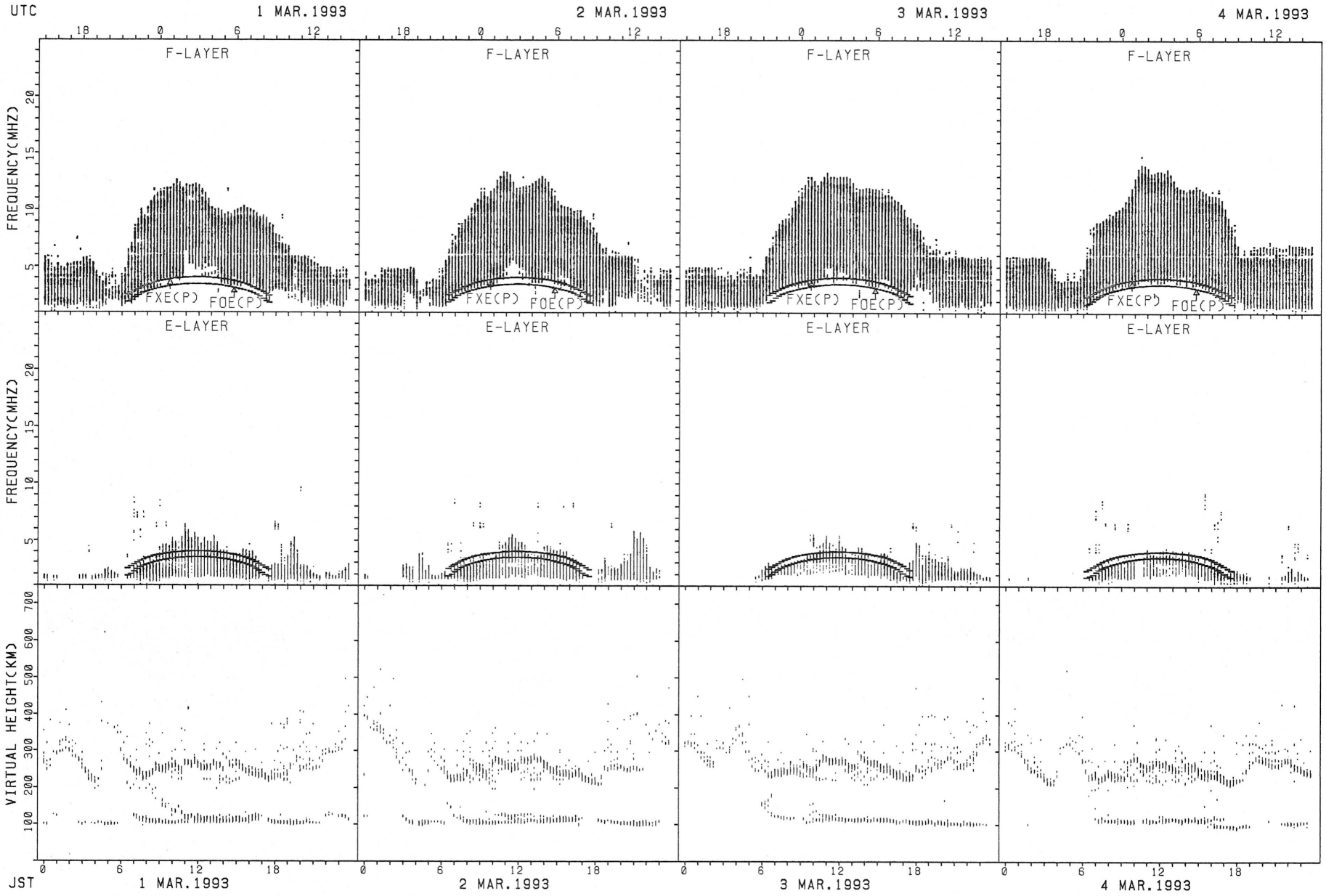


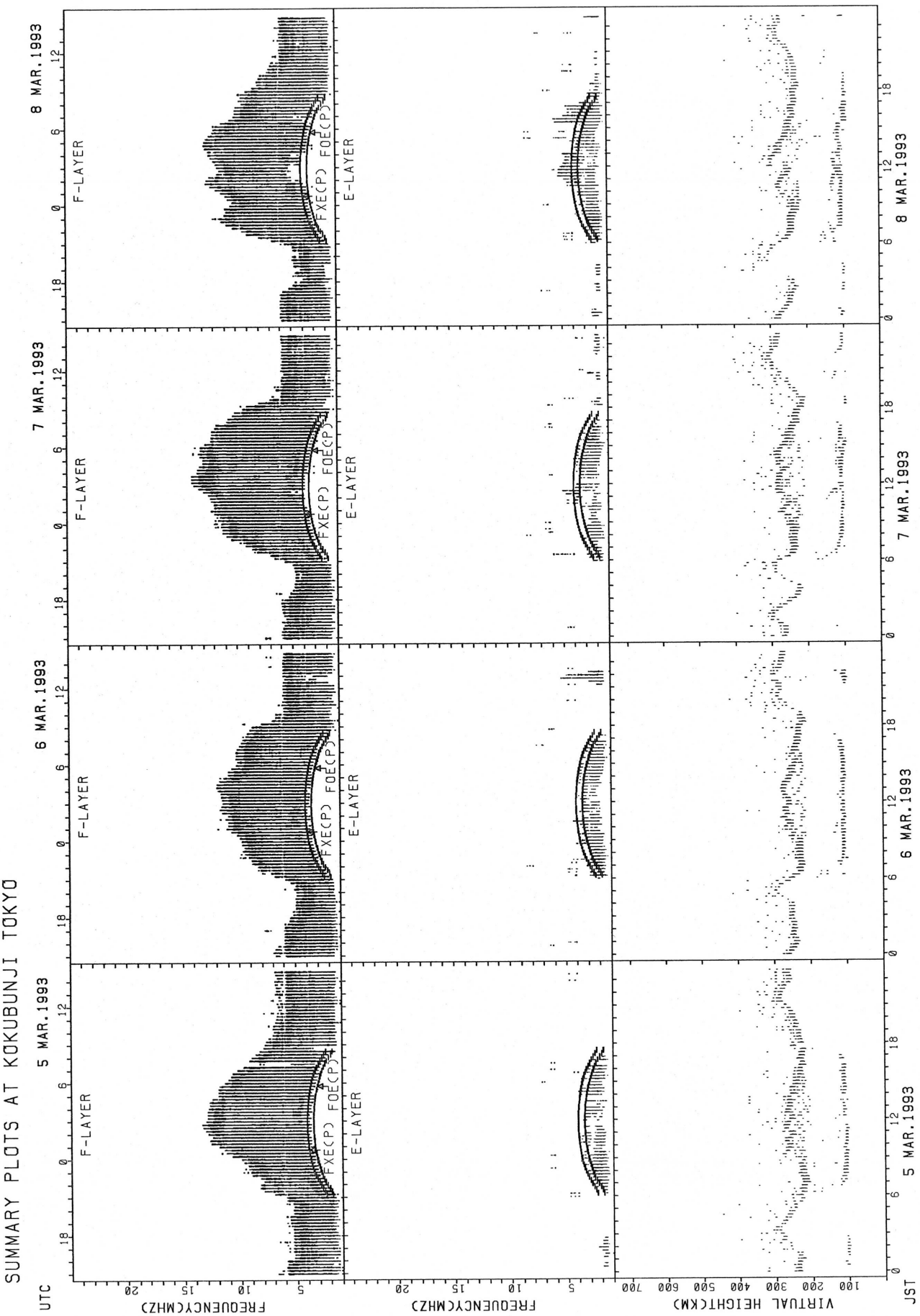
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
JST
25 MAR.1993
26 MAR.1993
27 MAR.1993
28 MAR.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

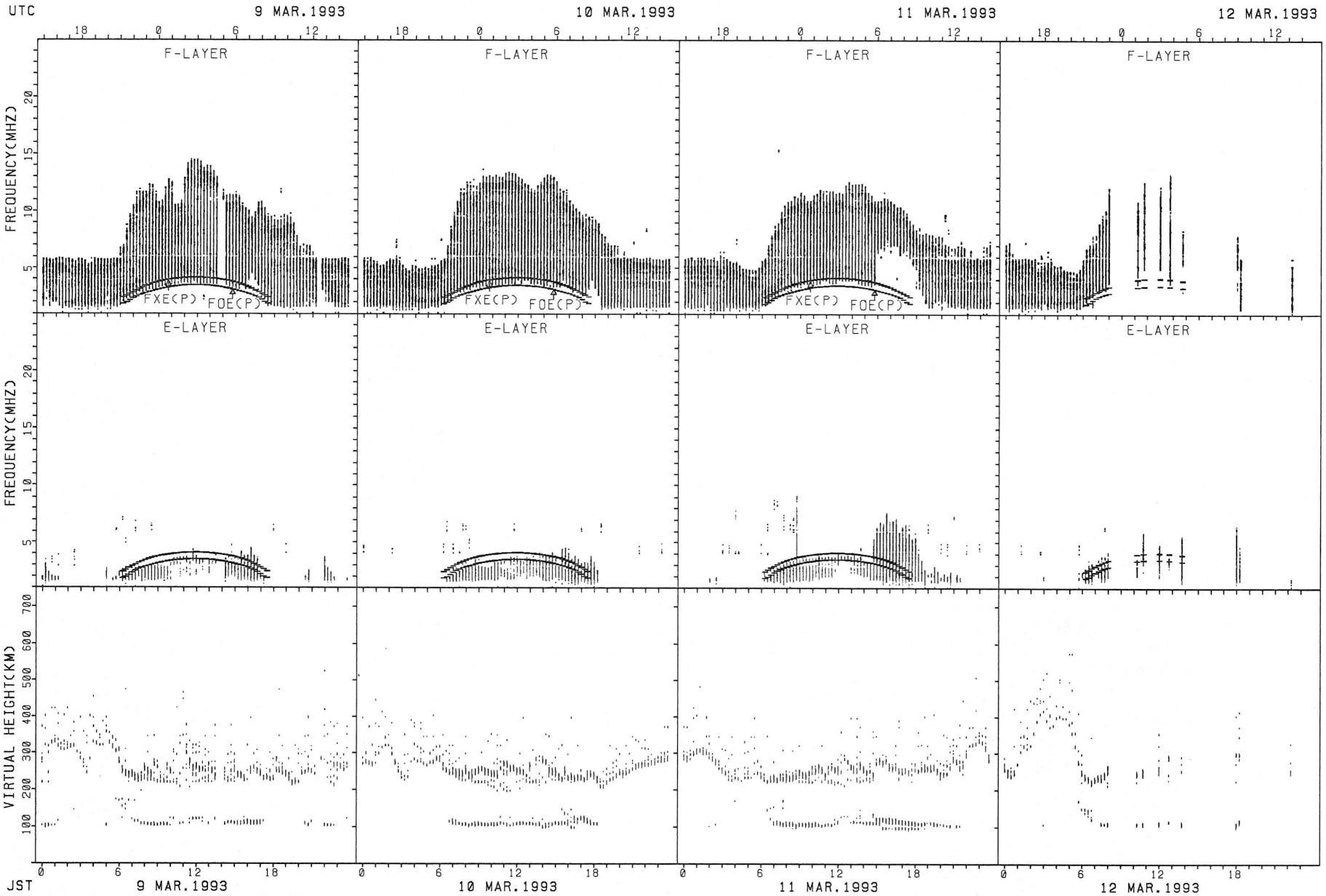

SUMMARY PLOTS AT WAKKANAI
UTC
29 MAR.1993
30 MAR.1993
31 MAR.1993
F-LAYER
E-LAYER
FOE(P)
FXE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
1 MAR.1993
2 MAR.1993
3 MAR.1993
4 MAR.1993
UTC
JST
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE
Note: Station "Akita" closed March 4, 1993.

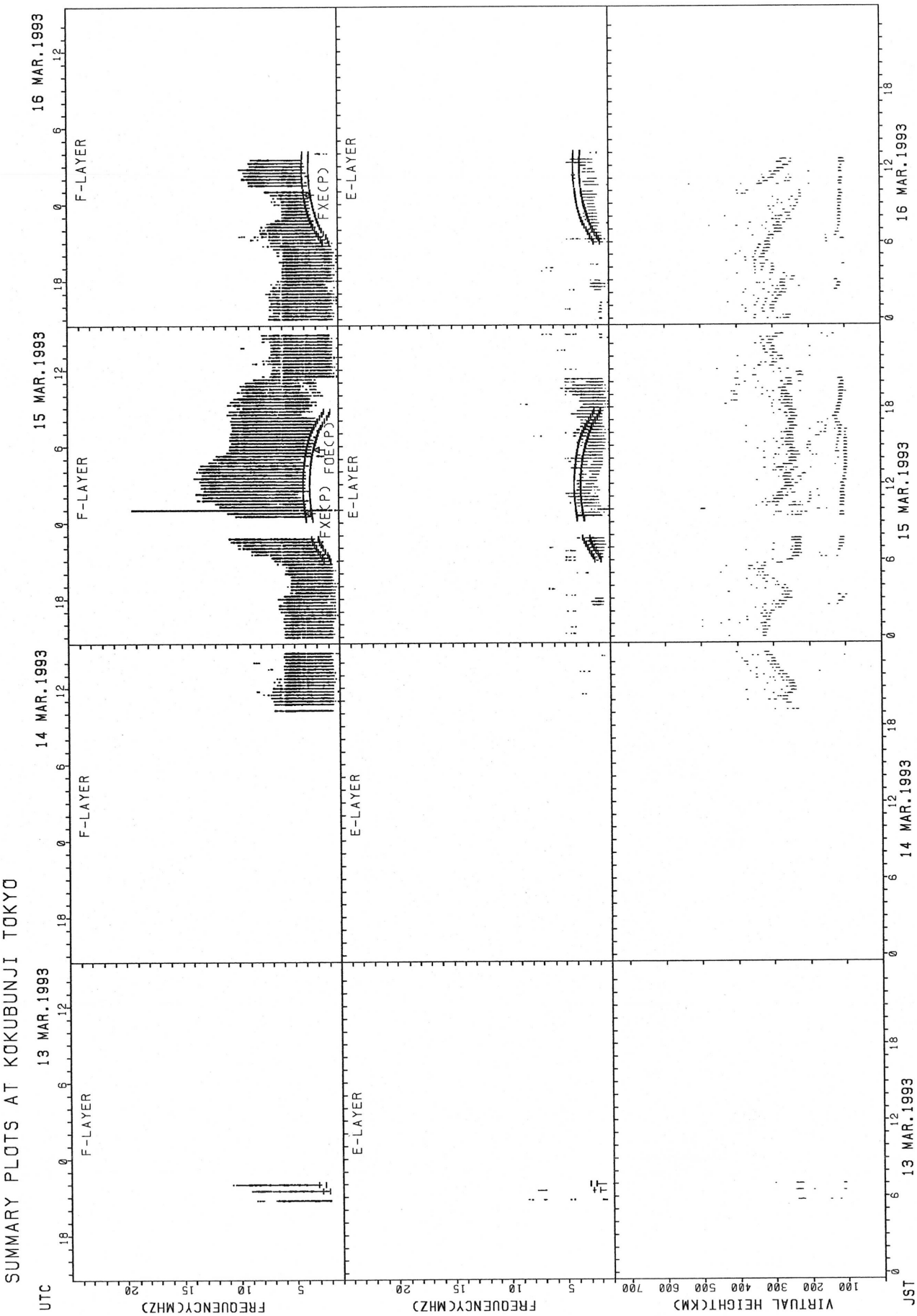

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
1 MAR.1993
2 MAR.1993
3 MAR.1993
4 MAR.1993
F-LAYER
FXE(P)
FOE(P)
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
5 MAR.1993
6 MAR.1993
7 MAR.1993
8 MAR.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

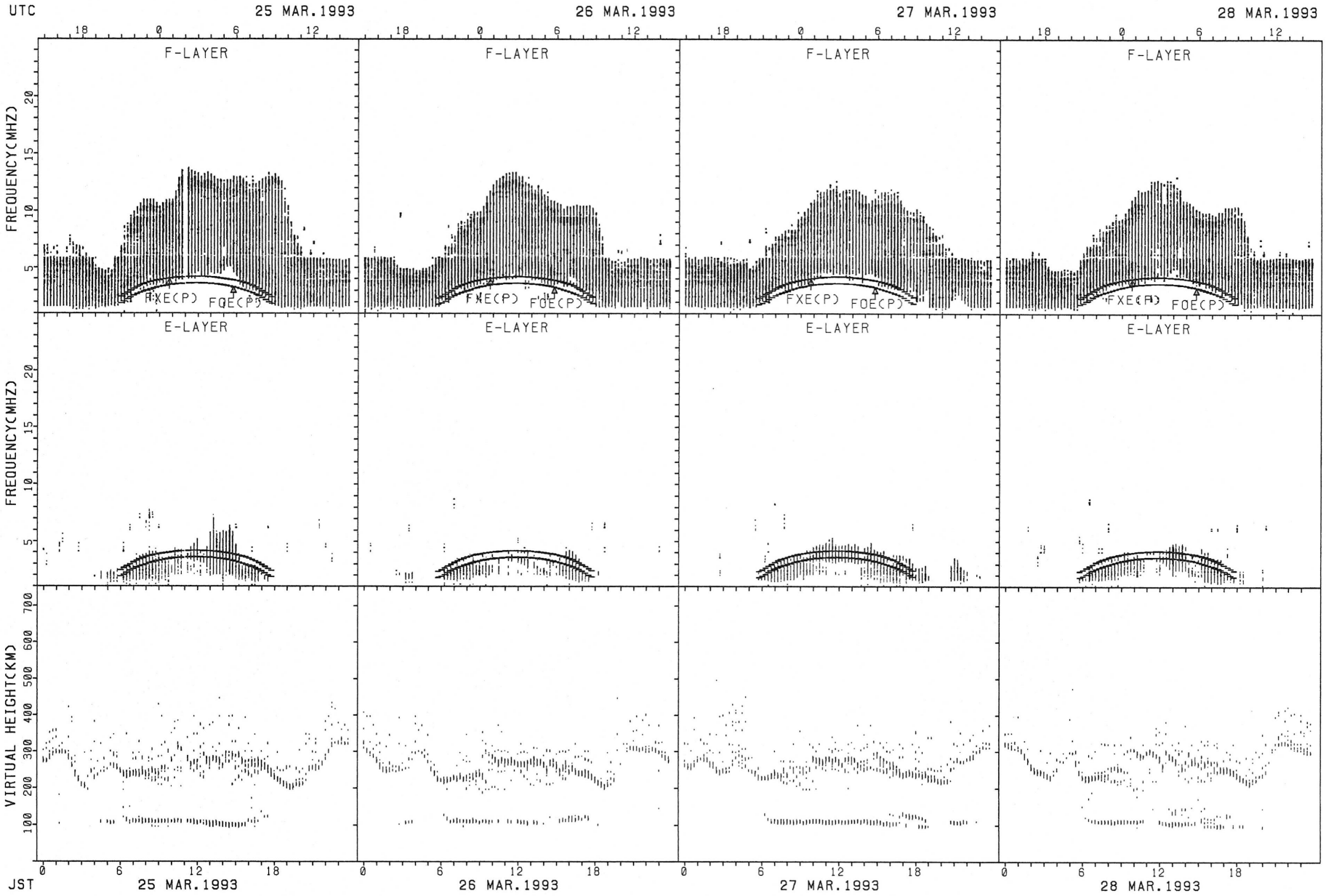
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

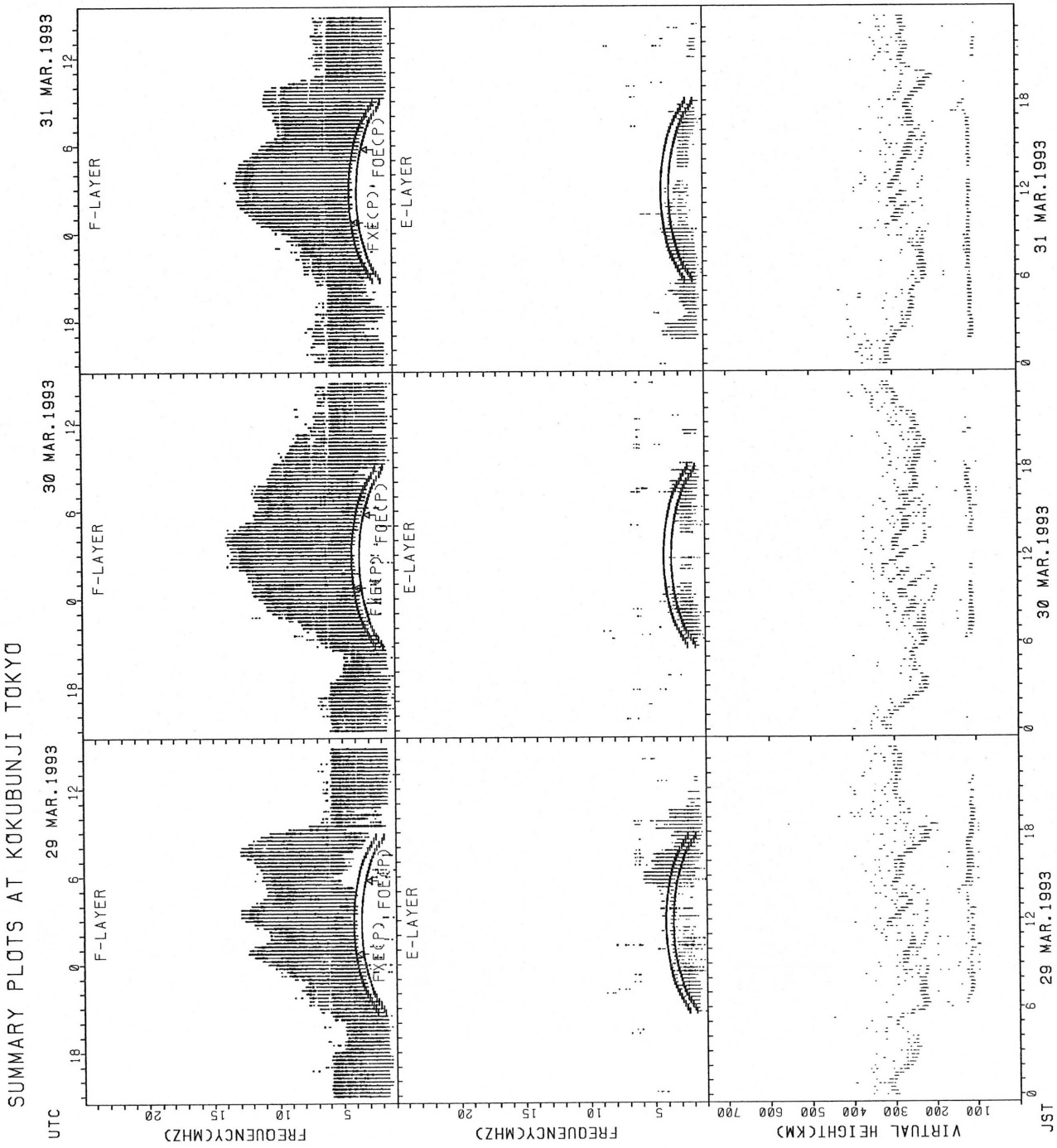

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
13 MAR.1993
14 MAR.1993
15 MAR.1993
16 MAR.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO

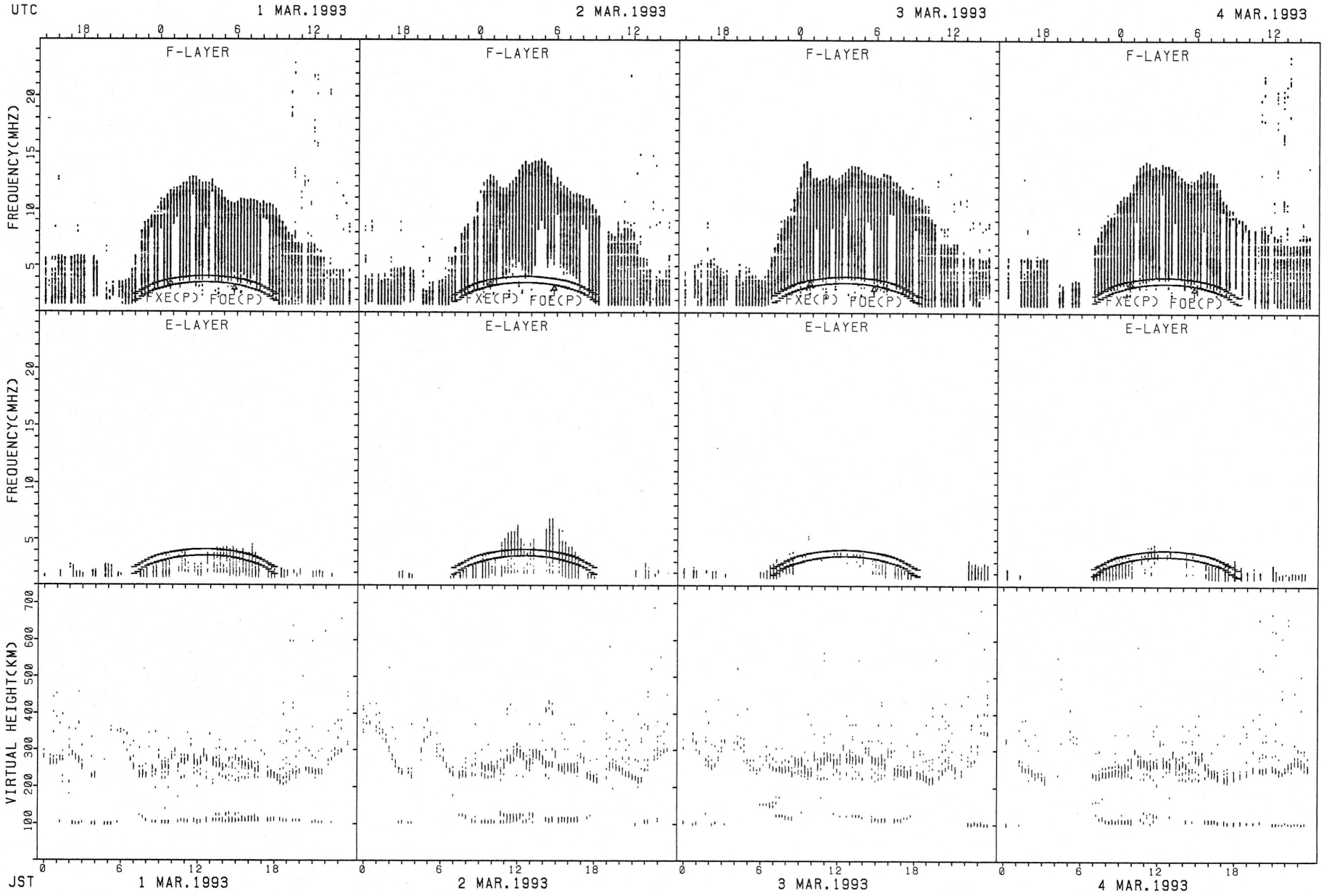


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

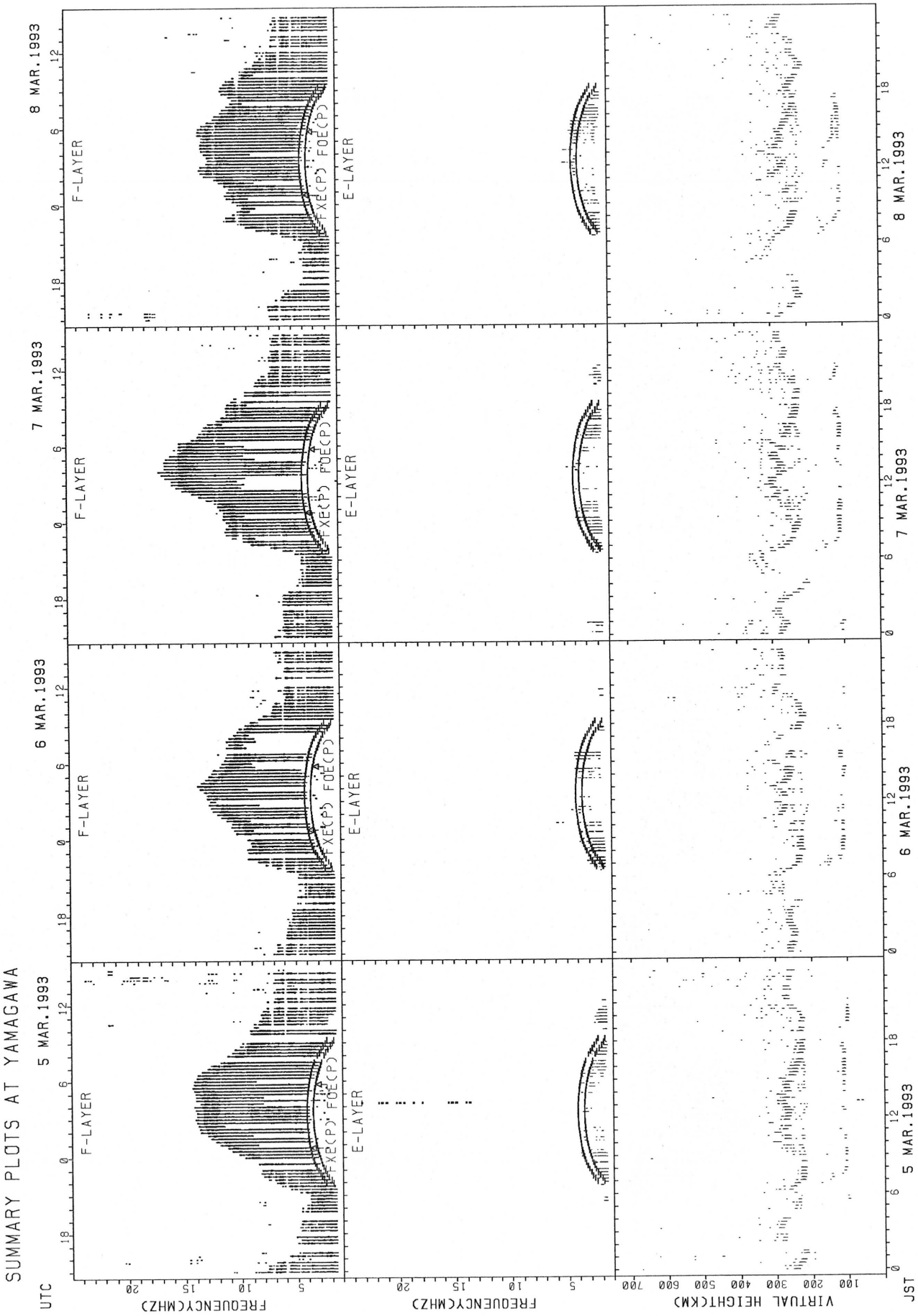
Note: No records were collected at Kokubunji from March 17 to March 24, due to a problem with the power supply.


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
29 MAR.1993
30 MAR.1993
31 MAR.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

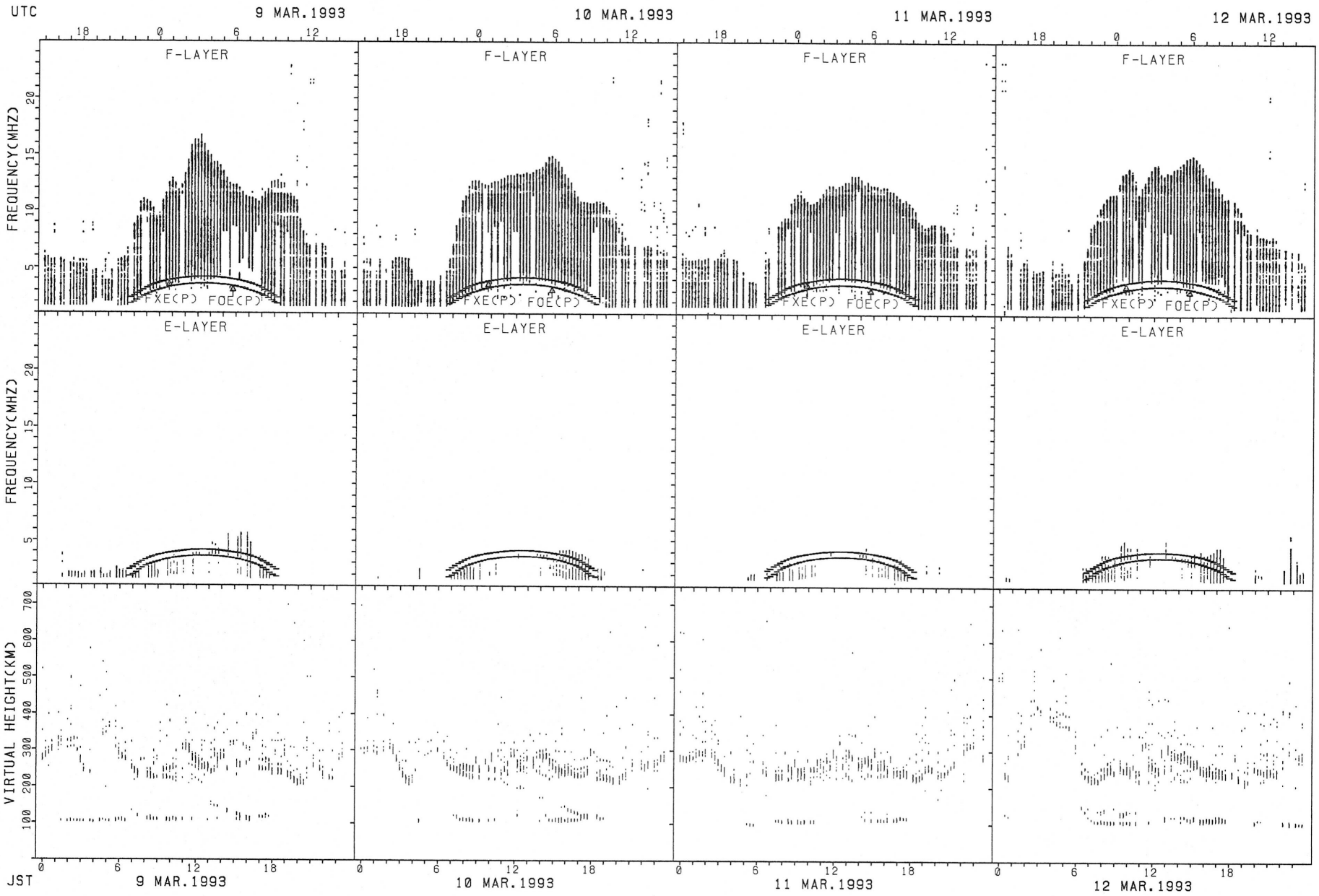
SUMMARY PLOTS AT YAMAGAWA



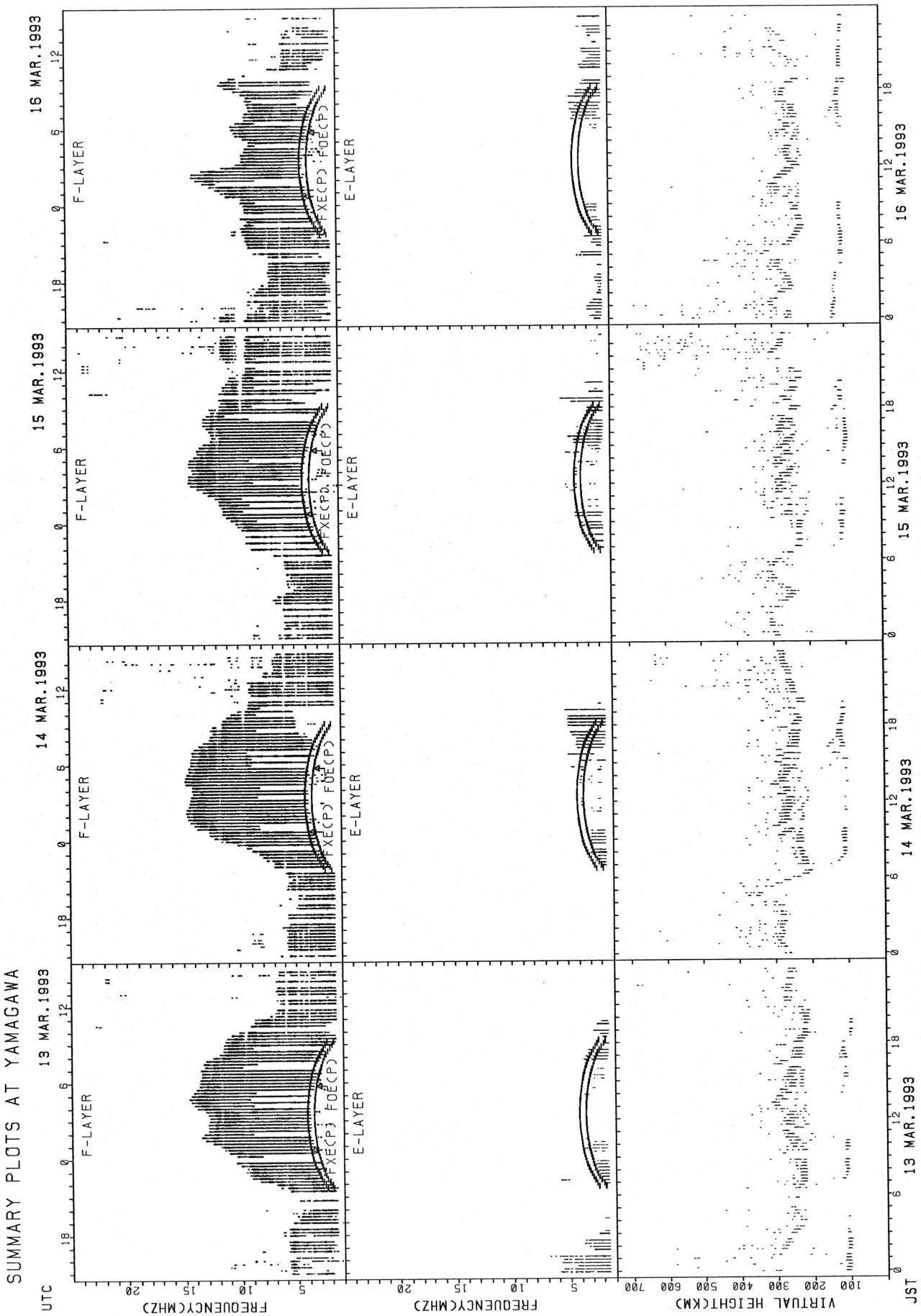
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

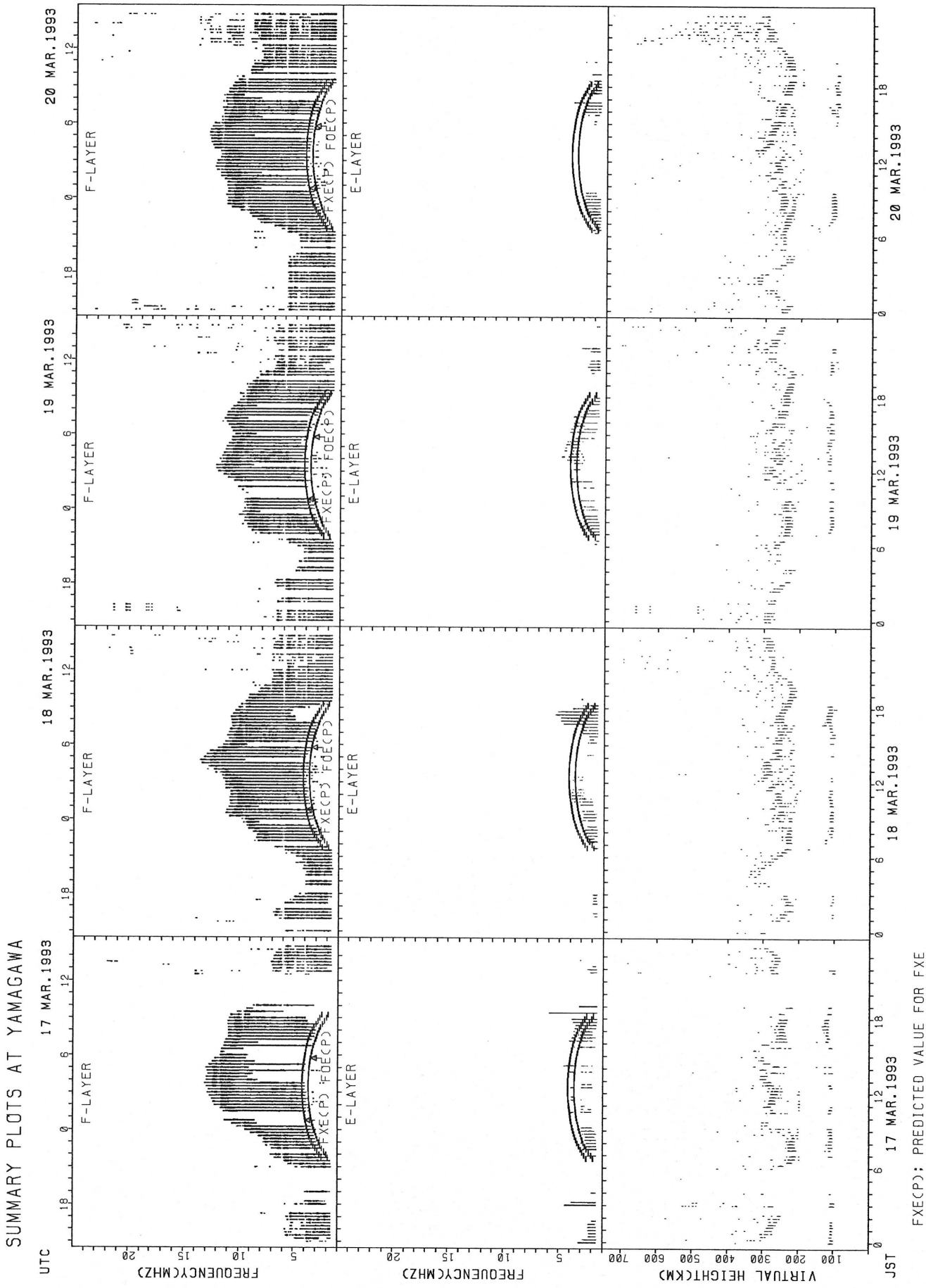

SUMMARY PLOTS AT YAMAGAWA
5 MAR.1993
6 MAR.1993
7 MAR.1993
8 MAR.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

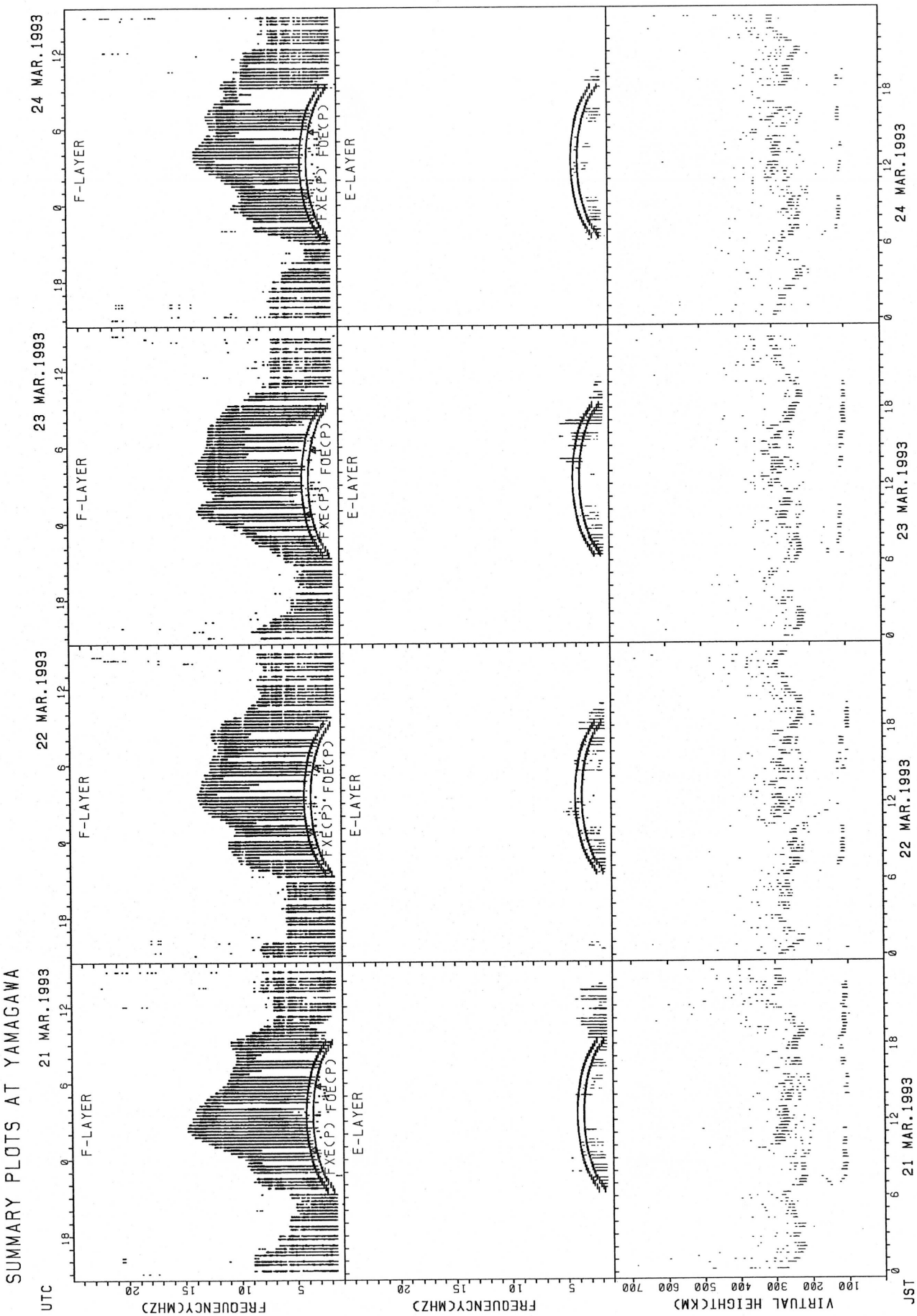
SUMMARY PLOTS AT YAMAGAWA

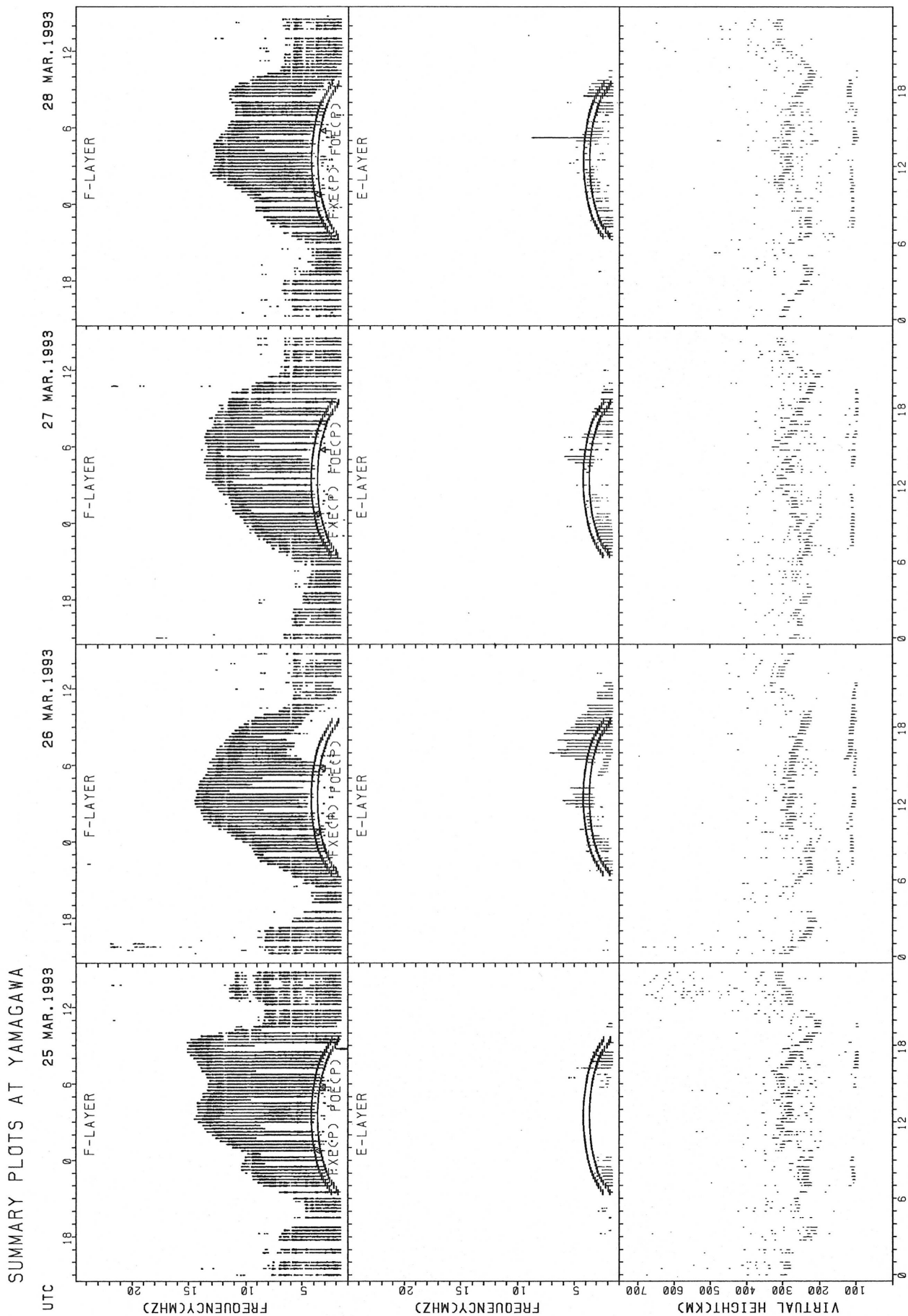


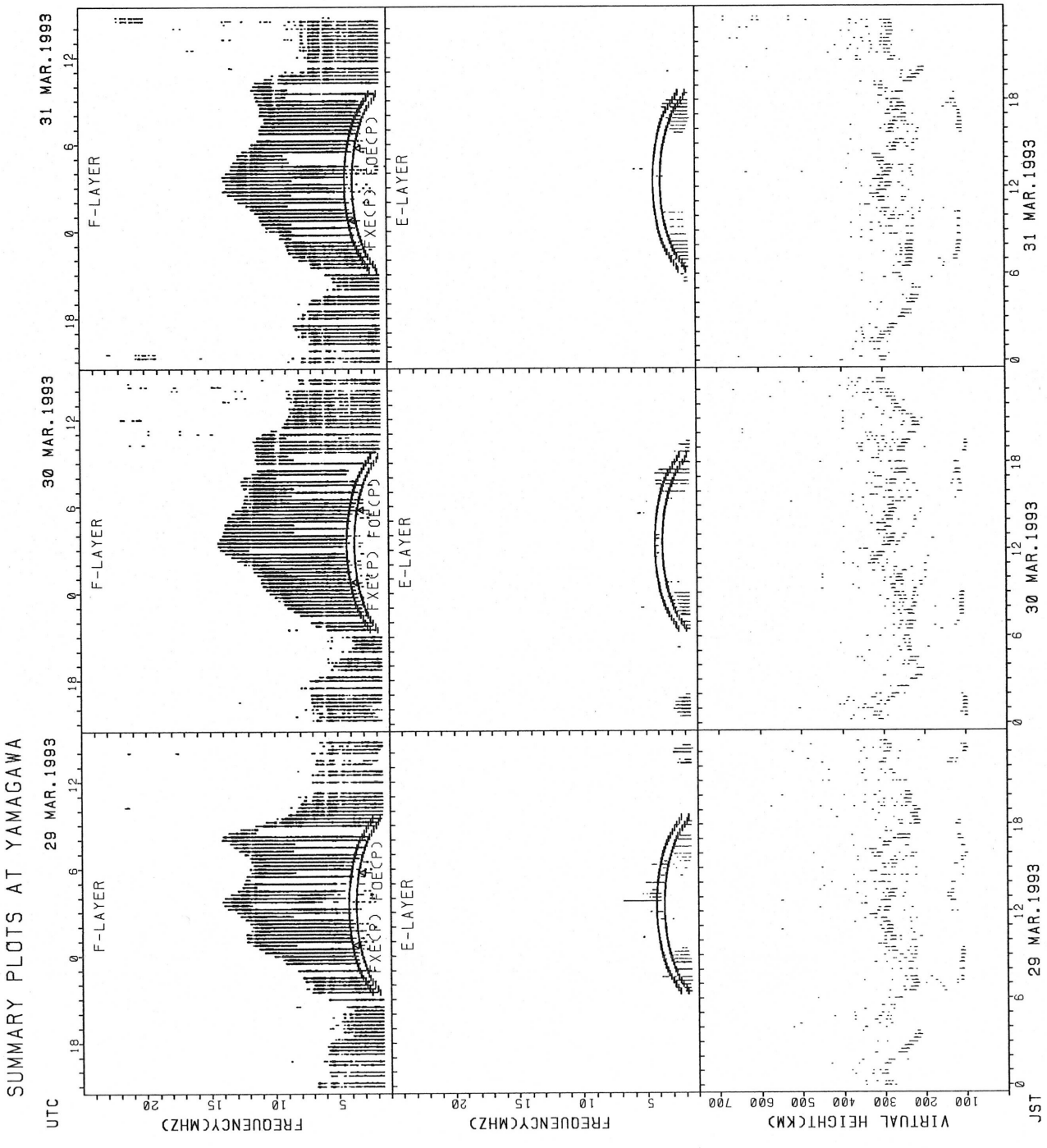
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
13 MAR.1993
14 MAR.1993
15 MAR.1993
16 MAR.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

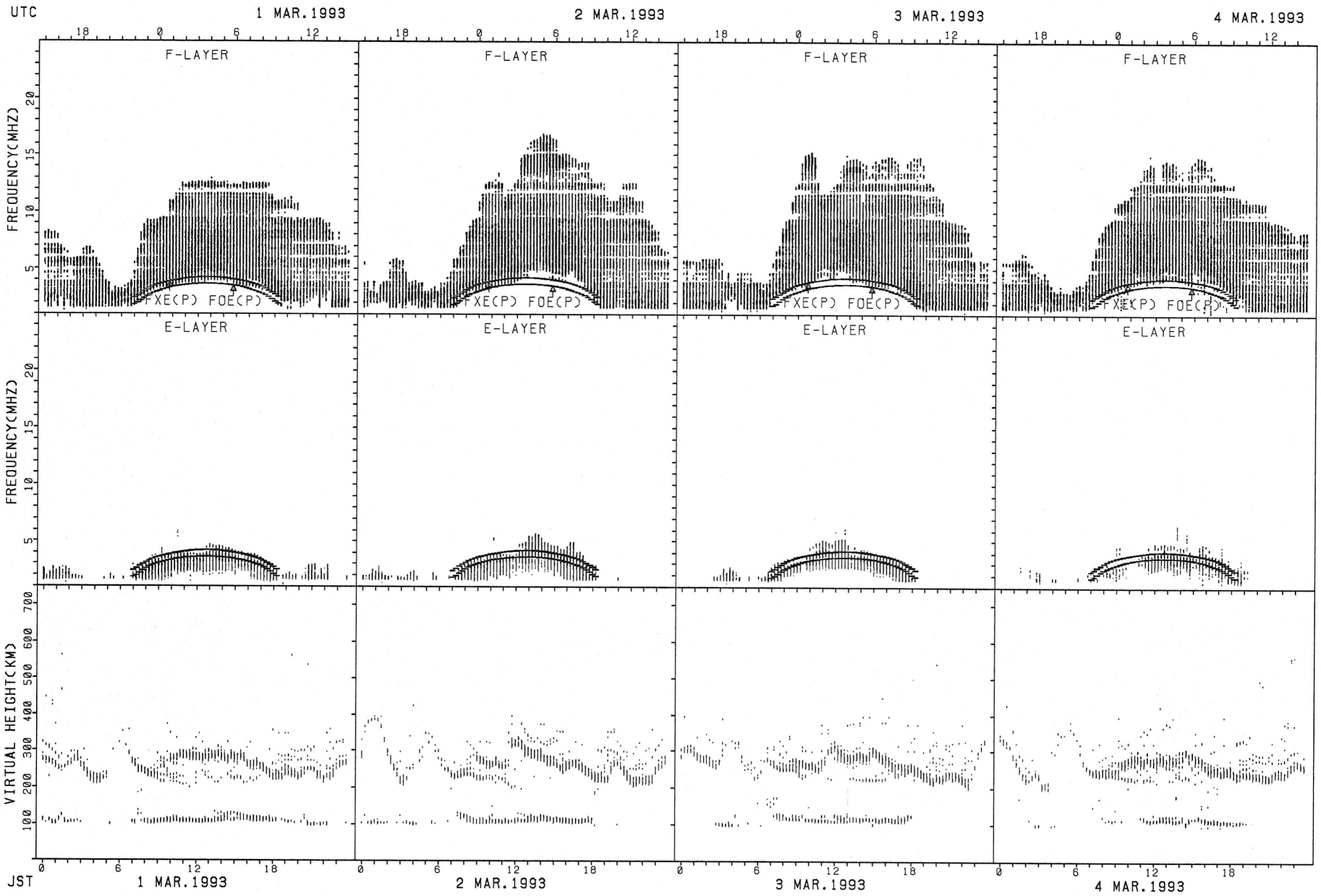

SUMMARY PLOTS AT YAMAGAWA
17 MAR.1993
18 MAR.1993
19 MAR.1993
20 MAR.1993
F-LAYER
E-LAYER
FXE(P); FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
21 MAR.1993
22 MAR.1993
23 MAR.1993
24 MAR.1993
UTC
JST
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
25 MAR.1993
26 MAR.1993
27 MAR.1993
28 MAR.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

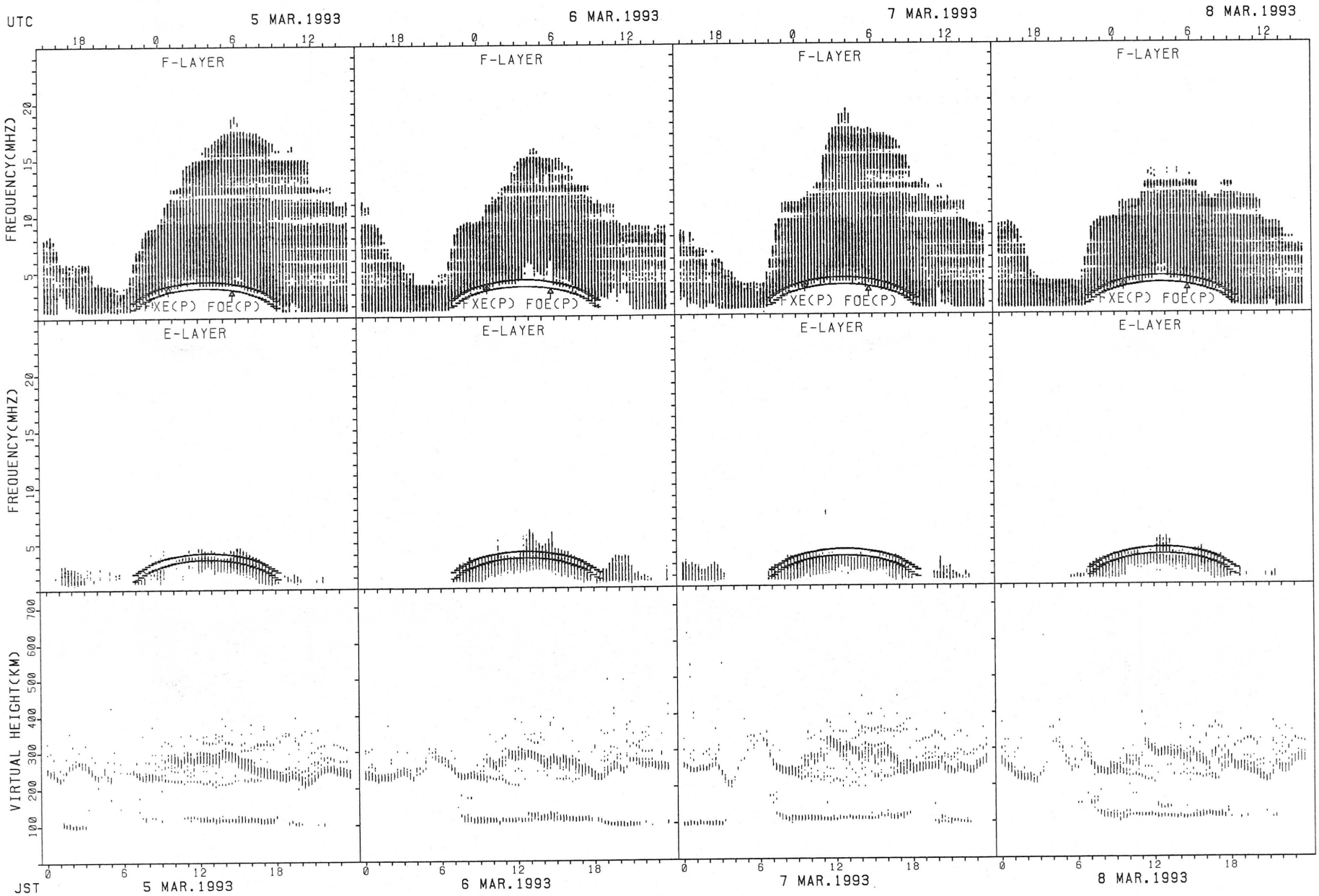

SUMMARY PLOTS AT YAMAGAWA
29 MAR.1993
30 MAR.1993
31 MAR.1993
UTC
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



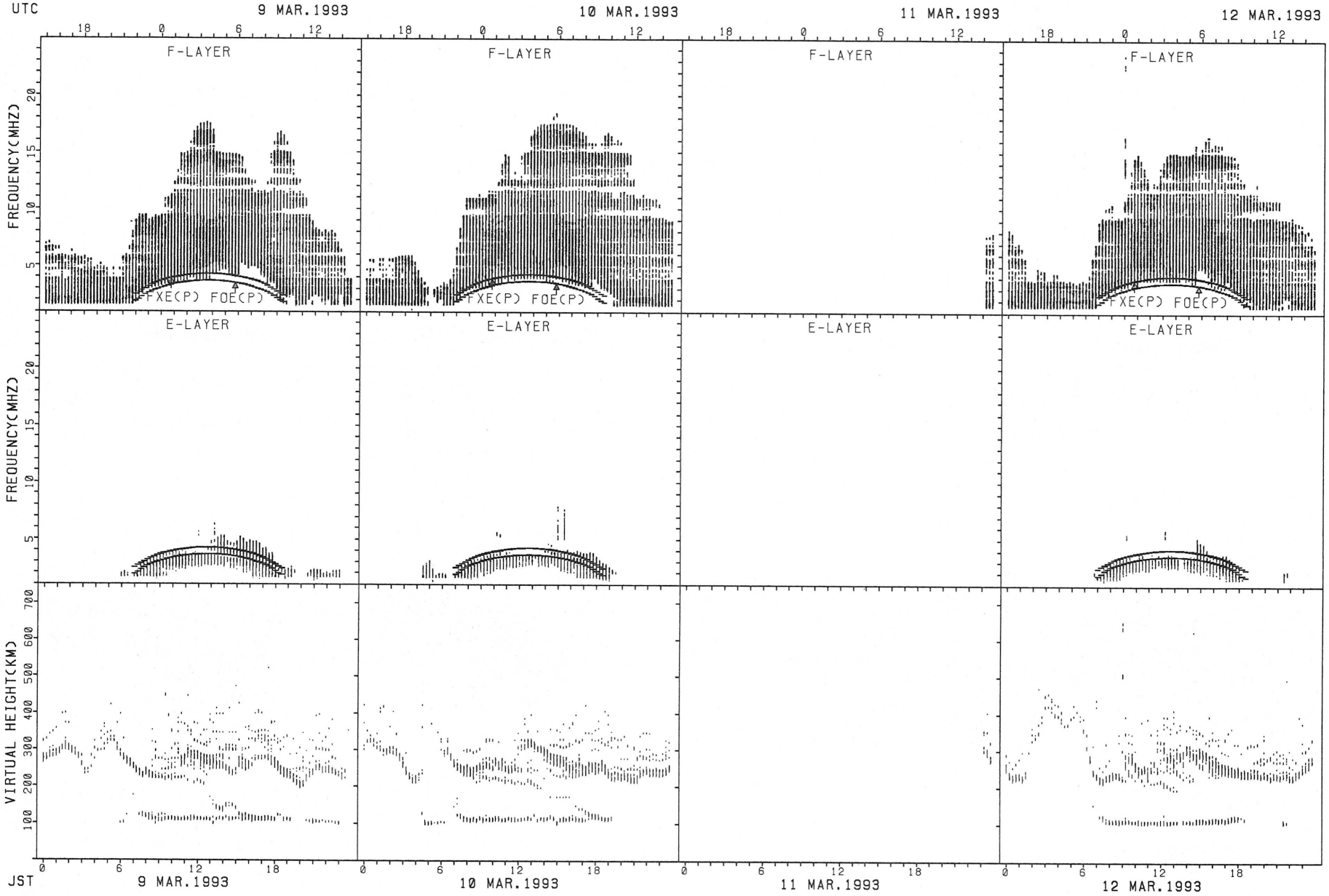
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA

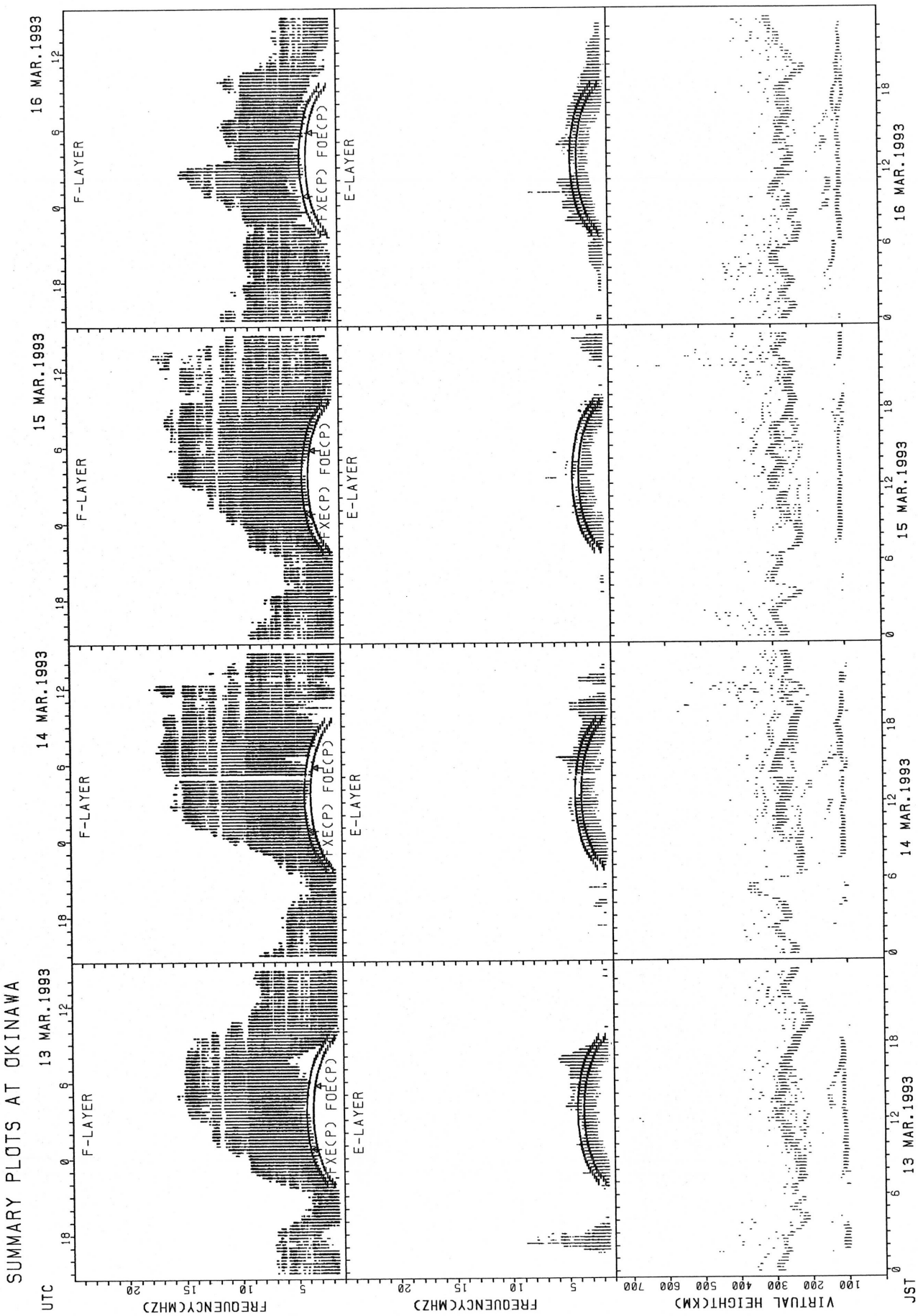


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

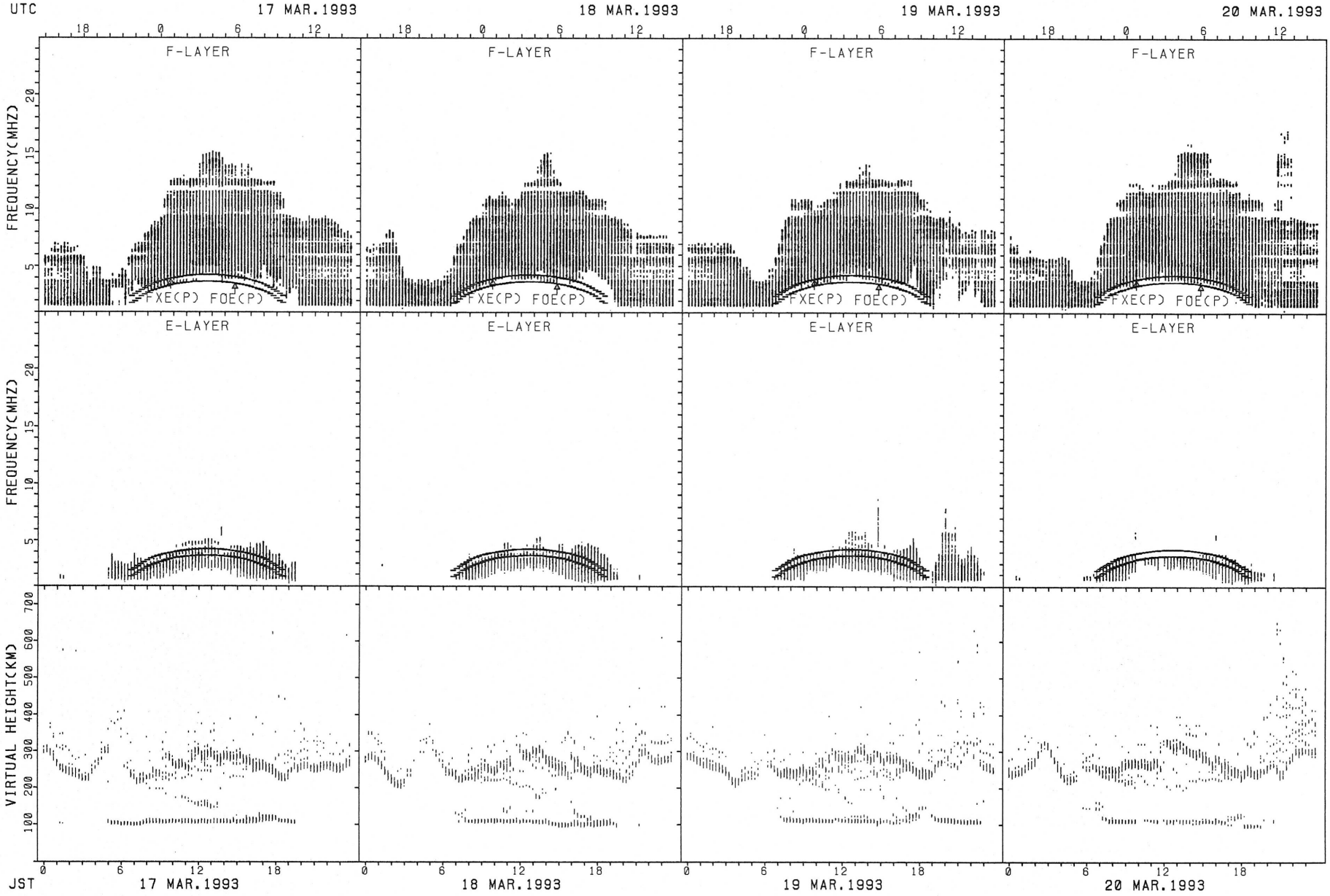
SUMMARY PLOTS AT OKINAWA



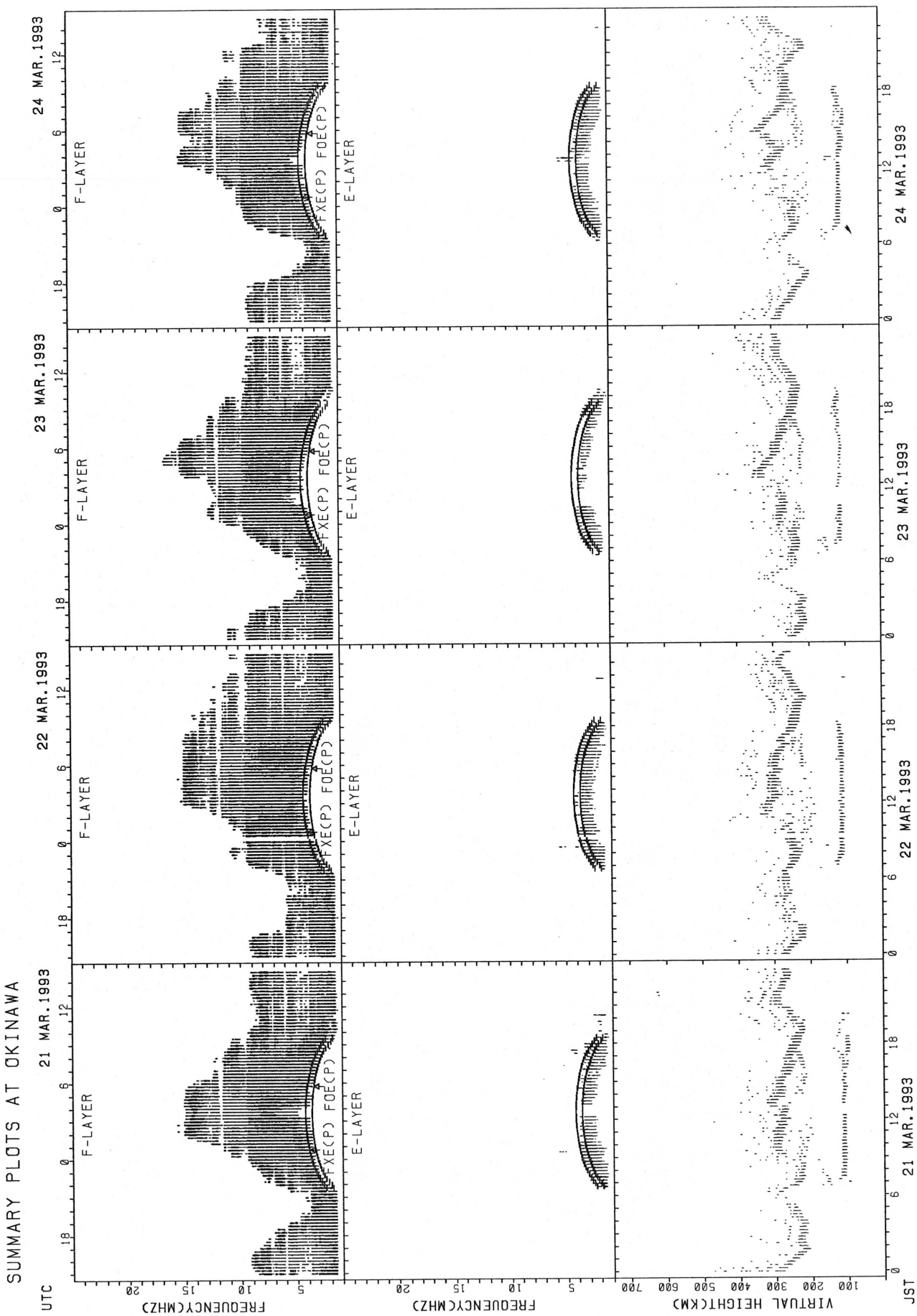
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
13 MAR.1993
14 MAR.1993
15 MAR.1993
16 MAR.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

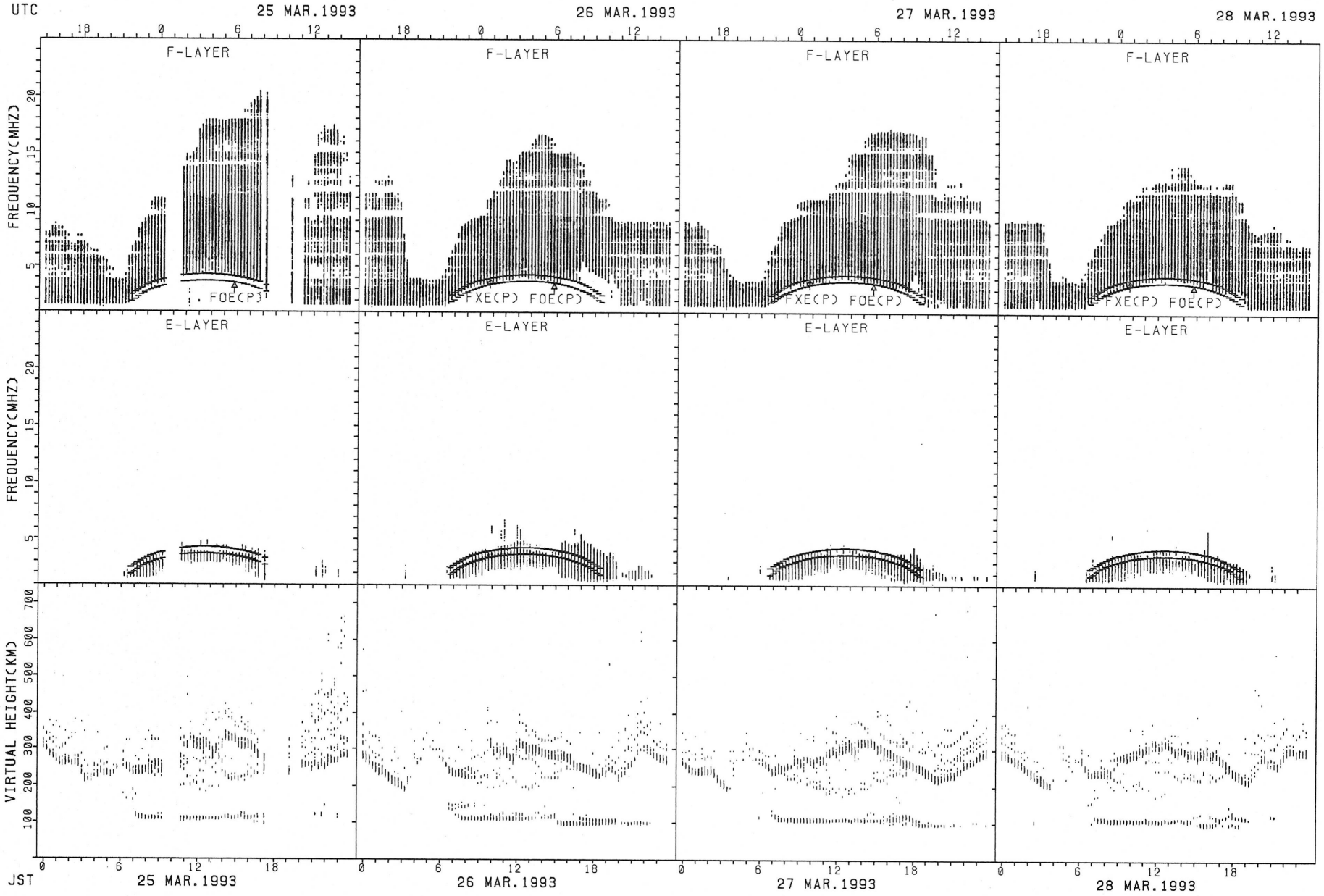
SUMMARY PLOTS AT OKINAWA



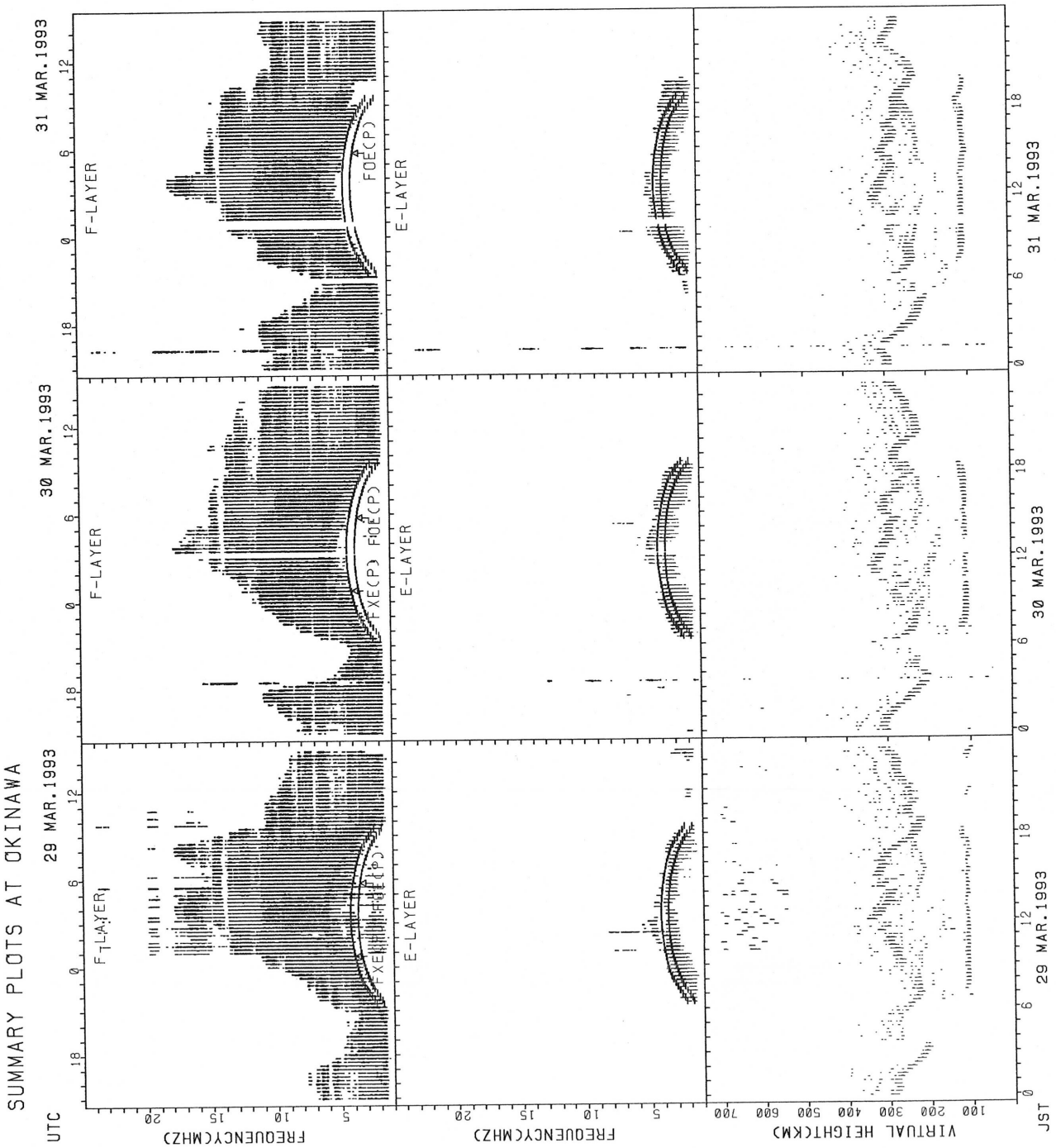
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
21 MAR.1993
22 MAR.1993
23 MAR.1993
24 MAR.1993
UTC
JST
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
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


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

MONTHLY MEDIANS OF H'F AND H'ES

MAR. 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								25	29	20						31	30	30	25	10				
MED								258	250	248						254	255	250	256	284				
U Q								274	269	257						270	262	260	265	292				
L Q								244	245	242						248	246	240	250	276				

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																								
MED																								
U Q																								
L Q																								

H'F STATION AKITA LAT. 39.7N LON. 140.1E

	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																	10							
MED																	113							
U Q																	240							
L Q																	105							

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									10								13							
MED									125								113							
U Q									244								182							
L Q									121								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								21	22	12						21	25	21	18					
MED								248	248	246						262	252	250	257					
U Q								258	260	253						281	267	264	266					
L Q								242	240	240						249	242	240	240					

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								11	16			10	10			19	23	19	18					
MED								246	239			116	116			244	125	236	124					
U Q								248	246			125	119			260	248	246	240					
L Q								236	113			115	113			113	119	119	111					

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

Note: Station "Akita" closed March 4, 1993.

MONTHLY MEDIANS OF H'F AND H'ES

MAR. 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								21	29	26							30	25	26	24	14			
MED								258	252	259							270	254	248	267	271			
U Q								269	264	270							282	271	256	289	302			
L Q								241	237	244							252	243	242	258	254			

H'ES

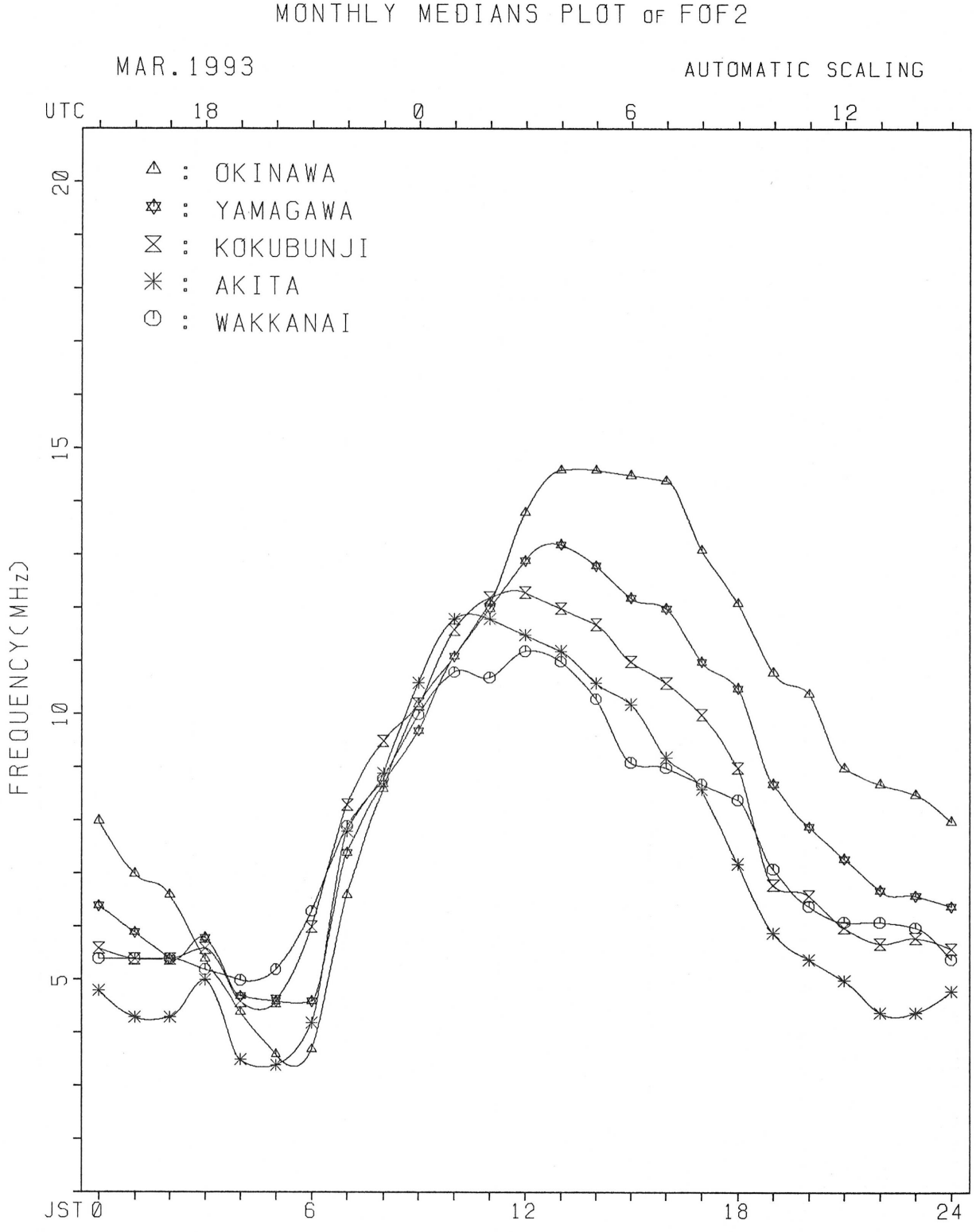
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																	15	10	14	10				
MED																	115	119	116	110				
U Q																	119	121	119	113				
L Q																	113	115	107	101				

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	14	16	10					14	29	28	13						30	30	30	29	26	23	23	18
MED	299	283	280					262	252	264	258						272	256	244	256	269	284	288	310
U Q	334	325	288					268	261	278	272						284	266	252	266	282	300	328	334
L Q	286	263	254					248	242	254	253						260	252	238	244	252	268	270	292

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								16	12	14	14	12	12	17	10	15	25	25	25	20		10		
MED								152	117	116	113	125	130	129	118	117	117	119	121	112		108		
U Q								167	125	125	121	142	158	171	125	131	139	131	125	119		111		
L Q								117	113	111	113	114	120	118	115	113	115	113	111	105		101		


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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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 59	X 54	X 54	X 58	X 47	X 36													X 81	X 70	X 61	X 55	X 50	X 49
2	X 44	X 46	X 48	X 50	X 41	X 39													X 83	X 65	X 64	X 59	X 48	X 47
3	X 48	X 49	X 50	X 45	X 43	X 47													X 88	X 70	X 64	X 66	X 61	X 59
4	X 59	X 59	X 60	X 60	X 39	X 42													X 73	X 66	X 70	X 69	X 73	X 74
5	X 69	X 61	X 56	X 55	X 56	X 55													X 80	X 73	X 69	X 67	X 69	X 69
6	X 70	X 63	X 59	X 56	X 53	X 50													X 88	X 65	X 63	X 65	X 63	X 64
7	X 63	X 57	X 60	X 58	X 51	X 48													X 98	X 70	X 63	X 59	X 60	X 61
8	X 61	X 62	X 60	X 46	X 47	X 47													X 92	X 79	X 70	X 65	X 64	X 66
9	X 62	X 60	X 59	X 60	X 58	X 59													X 94	X 98	X 75	X 67	X 61	X 64
10	X 58	X 55	X 58	X 54	X 53	X 52														X 75	X 68	X 64	X 62	X 61
11	X 60	X 59	X 59	X 60	X 56	X 49														X 83	X 80	X 73	X 66	X 66
12	X 74	X 62	X 61	X 58	X 55	X 48														X 73	X 71	X 68	X 63	X 63
13	X 63	X 62	X 61	X 63	X 56	X 50														C	C	C	C	C
14	C	C	C	C	C	C														X 72	X 71	X 70	X 64	X 64
15	X 60	X 59	X 62	X 64	X 56	X 56														X 99	X 94	X 71	X 76	X 76
16	X 75	X 71	X 73	X 65	X 65	X 66		76			74	96								C	C	C	C	C
17	C	C	C	C	C	C	C													C	C	C	C	C
18	C	C	C	C	C	C	C													C	C	C	C	C
19	C	C	C	C	C	C														C	C	C	C	C
20	C	C	C	C	C	C														C	C	C	C	C
21	C	C	C	C	C	C														C	C	C	C	C
22	C	C	C	C	C	C														C	C	C	C	C
23	C	C	C	C	C	C														X 73	X 66	X 66	X 69	X 69
24	X 68	X 65	X 68	X 62	X 56	X 50														X 99	X 96	X 78	X 79	X 79
25	X 79	X 74	X 72	X 70	X 55	X 49														X 108	X 70	X 68	X 62	X 60
26	X 60	X 63	X 59	X 53	X 50	X 53														X 62	X 56	X 61	X 60	X 62
27	X 63	X 59	X 60	X 55	56	X 52														X 91	X 78	X 65	X 61	X 59
28	X 59	X 60	X 64	X 58	X 49	X 47														X 73	X 64	X 64	X 64	X 65
29	X 64	X 64	X 64	X 60	X 54	X 54														X 66	X 65	X 65	X 68	X 68
30	X 65	X 67	X 70	X 66	X 53	X 48														X 100	X 91	X 79	X 71	X 76
31	X 71	X 68	X 77	X 71	X 68	X 64														X 102	X 71	X 76	X 74	X 73
	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	23	23	23	23	23		1			1	1							9	23	23	23	23	23
MED	X 63	X 61	X 60	X 58	X 54	X 50		76			74	96							X 88	X 73	X 70	X 66	X 64	X 64
U Q	X 69	X 64	X 64	X 63	X 56	X 54													X 93	X 98	X 75	X 70	X 69	X 69
L Q	X 59	X 59	X 59	X 55	X 49	X 47													X 80	X 70	X 64	X 64	X 61	X 61

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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	53	48	48	52	41	30	35	81	97	111	117	118	118	97	91	96	95	88	75	64	55	49	44	43
2	38	40	42	44	35	33	42	70	91	111	115	129	115	119	122	102	96	90	77	59	58	53	42	41
3	42	43	44	39	37	41	44	77	90	112	121	129	125	119	116	113	107	96	82	64	58	60	55	53
4	53	53	54	54	33	36	42	84	93	98	124	132	131	122	114	113	108	98	67	60	64	63	68	68
5	63	55	50	49	51	49	59	76	85	97	115	123	126	123	117	110	98	85	74	67	63	61	62	63
6	64	57	53	50	47	44	56	79	89	93	106	108	111	114	109	97	98	92	82	59	57	59	57	58
7	57	51	54	52	45	42	53	80	104	109	118	119	132	131	125	126	117	107	92	64	57	53	54	55
8	55	56	54	40	41	41	50	90	109	100	108	121	112	119	122	114	96	91	86	73	64	59	58	60
9	56	54	53	54	52	53	62	101	115	104	121	126	R 149	135	113	110	96	105	88	91	69	61	55	58
10	52	49	53	48	47	46	53	93	119	120	126	128	125	117	124	121	105	92	88	69	62	58	56	55
11	54	53	53	53	50	43	52	81	103	112	111	111	112	119	I 109	C 105	105	98	80	77	74	67	60	60
12	68	55	55	52	49	42	55	75	99	118	121	113	121	117	128	119	111	96	75	67	65	62	57	57
13	57	56	55	57	50	44	53	87	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	110	94	66	65	64	58	58
15	54	53	56	58	50	50	62	89	C	C	103	121	127	127	112	101	100	101	97	93	88	65	70	70
16	69	65	67	59	59	60	64	F 68	56	57	67	F 88	84	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	121	120	C	C	C	C	C	C	89	68	60	60	63	63
24	62	59	62	56	50	44	62	88	103	95	96	116	122	125	118	113	106	99	101	93	90	72	R 73	73
25	73	68	66	64	49	43	70	94	107	100	109	131	129	127	121	124	119	122	130	102	64	62	56	55
26	54	57	53	47	44	47	61	S 75	89	95	118	128	126	117	110	102	98	99	93	56	50	55	54	56
27	57	53	54	49	F 47	46	58	75	79	91	106	116	116	116	108	R 111	111	99	98	65	72	59	55	53
28	53	54	58	52	43	41	61	75	83	92	110	115	120	119	105	96	91	98	101	S 67	58	58	58	59
29	58	58	58	54	48	48	69	80	83	105	119	101	122	117	103	107	116	124	101	60	59	59	62	62
30	59	61	64	60	47	42	62	77	100	111	116	126	131	136	124	112	114	105	100	94	86	74	65	69
31	65	62	71	65	62	58	69	75	79	91	114	124	125	124	119	104	92	96	104	96	65	70	68	67
	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	23	23	23	23	23	23	23	21	21	23	23	22	21	21	21	21	22	23	23	23	23	23	23
MED	57	55	54	52	47	44	58	80	93	100	115	121	124	119	116	110	105	98	89	67	64	60	58	58
U Q	63	58	58	57	50	48	62	88	104	111	121	128	127	126	122	114	111	105	100	91	69	64	63	63
L Q	53	53	53	49	43	41	52	75	84	94	108	115	116	117	109	102	96	92	80	64	58	58	55	55

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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

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	L	L	L	L							
2									L	L	L	L	L	L	L	L	L							
3										L	L	U L 550	L	L	L	L	L							
4										L	L	L	L	L	L	L	L							
5									L	L	L	L	L	L	L	L								
6										L	L	U L 480	L	U L 530	L	L	L							
7										L	L	L	L	L 500	L	L	L							
8									L	L	L	L	L	L	L	L								
9								L	L	L	L	L	L	L		L								
10								L	L	L	L	L	L	L	L	L								
11									L	L	L	L	L	L										
12										L	L	L	U L 510	L	L		L							
13									C	C	C	C	C	C	C	C	C	C	C					
14							C	C	C	C	C	C	C	C	C	C	C							
15									C	C	U L 530	L	L	L	L		L							
16							L	U L 350	L 420	U L 430	500	510	U L 490	C	C	C	C	C	C					
17																								
18																								
19																								
20																								
21																								
22																								
23											L	L												
24									L	L	U L 560	L	L	U L 560	L	L								
25									L	L	U L 500	U L 600	L	L		L	L	L						
26								L	L	U L 460	U L 590	L	L	U L 520	U L 520	U L 490								
27								L	L	L	U L 550	L	L 520	U L 510	L	L	L							
28									L	U L 480	U L 570	L 540	L	L 500	L	L	L	L						
29										L	L	L	U L 600	U L 520	L			L						
30									L	L	U L 500	L	L 510	L 570	U L 540	U L 550	U L 480	L						
31										L	U L 570	L	L	L	U L 520	L	L							
	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								1	1	3	9	5	5	8	3	2	1							
MED								U L 350	L 420	U L 460	U L 550	U L 540	U L 510	U L 520	U L 520	U L 520	U L 480							
U O										U L 480	U L 570	U L 575	L 560	U L 545	U L 540									
L O										U L 430	U L 500	495	L 500	L 505	U L 520									

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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	200	270	H 335	340	350	A 355	U A 345	335	310	270	205						
2							B	210	280	315	340	355	360	350	345	315	A	A						
3							B	260	320	340	365	A 370	A	360	A	315	A	205						
4							B	215	270	320	340	A	365	A	340	320	280	200						
5							B	H 230	290	325	350	370	360	355	340	325	280	220						
6							B	220	290	335	355	360	360	355	340	315	275	185						
7							140	255	R 285	335	U R 345	365	365	355	345	315	265	205						
8							B	220	290	325	345	355	A 365	355	350	330	A	A						
9							B	220	280	315	345	350	360	345	B	A	A	A						
10							B	220	280	R 315	340	350	365	355	340	310	270	200	B					
11							H 145	240	285	320	345	350	365	365	I C 355	335	290	A 225	B					
12							B	B 300		A	340	A	A	A	A	335	285	205	B					
13							B	235	C	C	C	C	C	C	C	C	C	C	C					
14							C	C	C	C	C	C	C	C	C	C	C	210	B					
15							B	230	C	C	R	A	370	360	355	325	295	H 220	B					
16							B	255	R 310	340	R	355	R	C	C	C	C	C	C					
17							C	C	C	C	C	C	C	C	C	C	C	C	C					
18							C	C	C	C	C	C	C	C	C	C	C	C	C					
19							C	C	C	C	C	C	C	C	C	C	C	C	C					
20							C	C	C	C	C	C	C	C	C	C	C	C	C					
21							C	C	C	C	C	C	C	C	C	C	C	C	C					
22							C	C	C	C	C	C	C	C	C	C	C	C	C					
23							C	C	C	C	U A 340	B	C	C	C	C	C	C	B					
24							175	250	295	R 330	U R 350	B	370	370	350	335	285	230	B					
25							170	250	300	A	A 340	A	A	A	A	A	275	230	B					
26							170	250	R 295	335	350	R 365	R	360	345	330	285	225	B					
27							165	255	295	340	A	A	A	A	A	A	305	240	B					
28							H 200	H 270	310	335	370	R	A	A	A 350	330	295	245	B					
29							H 205	255	305	U S 340	U S 360	355	A	A	360	335	295	225	A					
30							180	255	315	335	R	R 365	B	375	R 350	340	305	235	B					
31							210	265	A	345	R	A	R	B	U R 340	R 330	290	235	A					
	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							10	22	20	19	18	14	12	14	16	18	17	19						
MED							172	245	292	335	345	355	365	355	345	328	285	220						
U Q							H 200	255	302	340	350	365	365	360	350	335	295	230						
L Q							165	220	282	320	340	350	360	355	340	315	275	205						

MAR. 1993 FOE (0.01MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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

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	19	18	17	20	19	26	E B 14	G	G	39	J A 47	J A 59	J A 48	43	36	33	36	G	J A 25	36	28	21	22	21
2	20	22	19	J A 22	E B 13	J A 21	21	G	G	G 23	37	43	45	37	40	36	J A 29	20	E B 15	J A 22	J A 24	J A 54	J A 41	J A 19
3	E B 13	E B 14	E B 14	E B 13	E B 14	E B 14	18	29	G	G	G	J A 50	J A 50	G	39	G	29	G 19	J A 44	J A 35	J A 28	23	26	21
4	E B 14	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	G	G	G	G	J A 39	42	38	G 33	G	G	G 15	24	20	20	19	25	J A 17
5	E B 14	19	J A 19	E B 13	E B 14	E B 13	E B 14	G	G	35	38	G	G	G	G	G	G	G	E B 13	E B 14	E B 14	E B 15	E B 16	E B 13
6	E B 14	E B 14	E B 14	E B 13	E B 13	E B 13	E B 15	G	G 25	35	G	G	G	G	G	G	G	23	E B 14	20	E B 13	E B 13	J A 47	E B 13
7	E B 13	E B 14	E B 13	E B 13	E B 14	E B 13	G	G	G	G	G	40	40	G	G	G 22	29	G	E B 16	E B 15	E B 14	E B 14	E B 14	20
8	E B 14	E B 13	20	20	21	E B 14	J A 20	G	31	G 29	G 30	42	J A 46	43	37	G	41	32	21	20	E B 14	J A 15	E B 13	E B 13
9	21	20	E B 13	E B 13	E B 13	J A 22	J A 19	G	G	G	G	38	G	G	39	32	34	23	E B 15	E B 15	E B 14	J A 18	J A 32	E B 14
10	E B 14	E B 13	E B 16	E B 13	E B 13	18	E B 15	G	G	G	G	G	39	38	G 25	33	35	27	J A 28	E B 13	E B 14	E B 15	E B 14	E B 14
11	E B 13	E B 14	18	E B 13	E B 13	E B 14	G	G	G 26	35	G 30	39	G 35	G	C	64	J A 65	65	55	23	21	20	E B 15	E B 15
12	E B 15	E B 14	E B 13	22	E B 13	E B 13	18	E B 31	35	43	37	J A 40	J A 54	J A 40	37	G	32	29	55	J A 127	28	30	28	J A 37
13	J A 41	20	18	E B 14	E B 13	E B 15	E B 17	G	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	28	J A 32	20	E B 15	E B 14	E B 14	E B 14
15	E B 15	E B 15	E B 13	J A 17	E B 14	E B 15	E B 17	G	C	C	G	38	40	G 27	40	42	36	29	36	42	J A 45	E B 14	E B 13	E B 15
16	E B 14	E B 13	E B 13	22	E B 14	E B 14	E B 14	29	33	G	G	41	G 34	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	38	E B 49	C	C	C	C	C	C	J A 23	20	E B 15	E B 14	E B 14	E B 14
24	E B 14	E B 15	E B 14	E B 13	E B 13	E B 13	G	28	G	G	G 26	E B 38	G	G 26	G 24	G 22	G	G	E B 16	E B 13	E B 13	E B 14	E B 14	E B 13
25	E B 14	E B 13	E B 14	E B 13	E B 13	J A 17	G	G	J A 33	38	37	39	J A 47	J A 53	J A 54	48	G	G	E B 15	E B 14	E B 13	E B 13	E B 14	E B 15
26	E B 13	E B 14	E B 14	19	E B 13	E B 13	G	G 25	G	G	G	G	G 37	G 28	G 25	G	37	25	E B 13	E B 13	E B 14	E B 14	E B 13	E B 13
27	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	G	G	G	G 32	39	J A 45	J A 42	46	39	J A 35	32	32	J A 22	20	E B 13	J A 30	J A 18	20
28	E B 14	E B 13	E B 14	E B 13	E B 14	20	G	G	G	G	G	G 35	J A 40	J A 46	41	36	G 19	G 21	E B 17	E B 15	20	E B 14	E B 14	E B 13
29	E B 15	E B 13	E B 13	E B 15	E B 13	E B 15	G	G	G	G	G	39	40	39	40	59	J A 47	30	J A 31	J A 37	22	20	E B 13	E B 14
30	E B 13	E B 14	E B 13	E B 15	E B 15	E B 13	G	G	33	37	G 32	G	E B 38	39	G	G	G	31	23	E B 15	E B 14	E B 13	E B 14	E B 13
31	E B 14	E B 15	J A 36	J A 24	J A 20	J A 31	G 19	G 25	J A 35	G	38	38	G 33	E B 40	G	G	G	28	19	E B 13	E B 14	22	20	E B 13
	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	23	23	23	23	23	23	23	21	21	23	23	22	21	20	21	21	22	23	23	23	23	23	23
MED	E B 14	E B 14	E B 14	E B 14	E B 13	E B 14	G	G	G	G	G	39	40	38	36	G	29	24	22	20	E B 14	E B 15	E B 14	E B 14
U Q	15	15	18	20	14	18	G	G	32	35	37	42	J A 45	42	40	36	36	29	31	23	22	21	25	19
L Q	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	E B 15	G	G	G	G	G	G	G	G	G	G	G	E B 15	E B 14	E B 14	E B 14	E B 14	E B 13

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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

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	E B 14	E B 14	E B 13	E B 13	E B 14	18	E B 14	G	G	38	41	57	41	38	G	33	32	G	21	27	19	E B 13	E B 13	E B 14
2	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	G	G	G 20	G	41	41	G	38	34	29	20	E B 15	E B 14	20	32	21	E B 15
3	E B 13	E B 14	E B 14	E B 13	E B 14	E B 14	17	29	G	G	G	40	40	G	35	G	27	G 18	41	16	E B 13	E B 13	E B 13	E B 15
4	E B 14	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	G	G	G	G	38	G 31	36	G 33	G	G	G 15	16	E B 13	E B 14	E B 14	17	E B 13
5	E B 14	E B 13	E B 13	E B 13	E B 14	E B 13	E B 14	G	G	34	37	G	G	G	G	G	G	G	E B 13	E B 14	E B 14	E B 15	E B 16	E B 13
6	E B 14	E B 14	E B 14	E B 13	E B 13	E B 13	E B 15	G	G 23	35	G	G	G	G	G	G	G	23	E B 14	E B 14	E B 13	E B 13	16	E B 13
7	E B 13	E B 14	E B 13	E B 13	E B 14	E B 13	G	G	G	G	G	38	39	G	G	G 19	28	G	E B 16	E B 15	E B 14	E B 14	E B 14	E B 14
8	E B 14	E B 13	E B 13	E B 15	E B 15	E B 14	E B 16	G	30	G 28	G 30	39	40	40	36	G	29	30	E B 15	E B 14	E B 14	E B 13	E B 13	E B 13
9	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	G	G	G	G	37	G	G	U Y 39	32	29	23	E B 15	E B 15	E B 14	16	29	E B 14
10	E B 14	E B 13	E B 16	E B 13	E B 13	E B 13	E B 15	G	G	G	G	G	39	38	G 22	33	34	26	25	E B 13	E B 14	E B 15	E B 14	E B 14
11	E B 13	E B 14	E B 13	E B 13	E B 13	E B 14	G	G	G 23	34	G 30	37	G 34	G	C	56	52	59	44	E B 15	E B 13	E B 15	E B 15	E B 15
12	E B 15	E B 14	E B 13	E B 14	E B 13	E B 13	17	E B 31	34	37	36	37	40	37	36	G	30	27	42	18	15	20	E B 13	18
13	27	E B 14	E B 13	E B 14	E B 13	E B 15	E B 17	G	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	27	29	16	E B 15	E B 14	E B 14	E B 14
15	E B 15	E B 15	E B 13	E B 13	E B 14	E B 15	E B 17	G	C	C	G	36	39	G 24	38	40	35	28	28	32	26	E B 14	E B 13	E B 15
16	E B 14	E B 13	E B 13	E B 14	E B 14	E B 14	E B 14	28	33	G	G	40	U G 34	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	36	E B 49	C	C	C	C	C	C	18	E B 15	E B 15	E B 14	E B 14	E B 14
24	E B 14	E B 15	E B 14	E B 13	E B 13	E B 13	G	27	G	G	G 24	E B 38	G	G 26	G 24	G 21	G	G	E B 16	E B 13	E B 13	E B 14	E B 14	E B 13
25	E B 14	E B 13	E B 14	E B 13	E B 13	E B 14	G	G	32	35	U Y 37	37	45	45	49	42	G	G	E B 15	E B 14	E B 13	E B 13	E B 14	E B 15
26	E B 13	E B 14	E B 14	15	E B 13	E B 13	G	G 23	G	G	G	G	U G 37	U G 28	G 25	G	34	G	E B 13	E B 13	E B 14	E B 14	E B 13	E B 13
27	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	G	G	G	G 32	36	44	40	37	37	35	32	30	17	16	E B 13	28	16	E B 14
28	E B 14	E B 13	E B 14	E B 13	E B 14	E B 14	G	G	G	G	G	U G 35	37	42	38	35	G 18	G 19	E B 17	E B 15	E B 14	E B 14	E B 14	E B 13
29	E B 15	E B 13	E B 13	E B 15	E B 13	E B 15	G	G	G	G	G	U Y 38	39	38	39	55	45	30	30	30	E B 14	E B 13	E B 13	E B 14
30	E B 13	E B 14	E B 13	E B 15	E B 15	E B 13	G	G	32	36	G 32	G	E B 38	39	G	G	G	27	17	E B 15	E B 14	E B 13	E B 14	E B 13
31	E B 14	E B 15	22	20	16	24	G 17	G 23	33	G	37	38	U G 33	E B 40	G	G	G	27	19	E B 13	E B 14	16	E B 14	E B 13
	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	23	23	23	23	23	23	23	21	21	23	23	22	21	20	21	21	22	23	23	23	23	23	23
MED	E B 14	E B 14	E B 13	E B 13	E B 13	E B 14	17	G	G	G	G	38	38	E G 36	G	G	29	23	17	E B 15	E B 14	E B 14	E B 14	E B 14
U Q	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	G	G	31	34	36	40	40	38	38	35	33	27	28	16	15	15	16	E B 15
L Q	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	G	G	G	G	G	G	G	G	G	G	G	E B 15	E B 14	E B 13	E B 13	E B 13	E B 13

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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	14	14	13	13	14	14	14	14	14	13	14	17	18	18	17	16	14	16	13	13	13	13	13	14
2	14	13	13	13	13	14	14	14	13	14	17	17	19	20	18	17	15	15	15	14	13	16	13	15
3	13	14	14	13	14	14	13	18	20	21	22	22	21	23	18	20	15	15	20	13	13	13	13	15
4	14	14	13	14	13	13	13	15	13	17	18	18	18	23	20	17	16	13	14	13	14	14	15	13
5	14	13	13	13	14	13	14	14	13	15	18	16	32	19	19	19	14	14	13	14	14	15	16	13
6	14	14	14	13	13	13	15	14	16	17	22	20	20	23	19	17	16	16	14	14	13	13	15	13
7	13	14	13	13	14	13	13	15	14	17	18	19	17	19	18	14	17	14	16	15	14	14	14	14
8	14	13	13	15	15	14	16	14	13	18	17	20	18	18	19	17	14	16	15	14	14	13	13	13
9	14	13	13	13	13	14	14	13	18	16	17	19	22	22	36	19	16	15	15	15	14	13	15	14
10	14	13	16	13	13	13	15	14	16	16	17	19	20	18	17	18	14	15	13	13	14	15	14	14
11	13	14	13	13	13	14	13	14	14	16	16	18	27	25	C	17	16	13	14	15	13	15	15	15
12	15	14	13	14	13	13	13	31	16	17	18	20	31	22	21	17	16	17	13	13	13	14	13	14
13	14	14	13	14	13	15	17	15	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	13	16	15	15	14	14	14
15	15	15	13	13	14	15	17	14	C	C	18	20	22	18	16	14	16	16	15	13	14	14	13	15
16	14	13	13	14	14	14	14	16	20	22	23	19	30	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	20	49	C	C	C	C	C	C	14	15	15	14	14	14
24	14	15	14	13	13	13	15	13	16	20	20	38	24	21	20	17	17	13	16	13	13	14	14	13
25	14	13	14	13	13	14	14	13	14	16	22	20	23	18	20	16	17	16	15	14	13	13	14	15
26	13	14	14	13	13	13	15	15	15	17	22	34	22	23	21	20	16	14	13	13	14	14	13	13
27	14	13	14	13	13	13	13	13	15	20	20	21	21	33	21	17	15	20	15	15	13	13	13	14
28	14	13	14	13	14	14	14	15	16	18	21	31	21	20	25	17	15	15	17	15	14	14	14	13
29	15	13	13	15	13	15	14	15	16	25	27	22	24	22	28	21	16	15	14	13	14	13	13	14
30	13	14	13	15	15	13	13	13	15	22	21	22	38	22	20	20	16	14	14	15	14	13	14	13
31	14	15	14	14	13	15	13	14	15	18	22	26	19	40	20	16	17	15	13	13	14	13	14	13
	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	23	23	23	23	23	23	23	21	21	23	23	22	21	20	21	21	22	23	23	23	23	23	23
MED	14	14	13	13	13	14	14	14	15	17	20	20	22	22	20	17	16	15	14	14	14	14	14	14
U Q	14	14	14	14	14	14	15	15	16	20	22	22	24	23	21	19	16	16	15	15	14	14	14	14
L Q	14	13	13	13	13	13	13	14	14	16	17	19	19	18	18	16	15	14	13	13	13	13	13	13

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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

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	295	275	275	305	345	270	280	330	315	320	315	320	325	325	315	315	325	340	325	315	305	295	280	285
2	250	260	270	305	345	280	305	335	320	320	305	325	300	300	320	320	320	330	325	290	305	300	285	265
3	270	280	305	270	265	285	300	335	310	315	315	315	300	310	305	315	315	325	315	295	285	295	290	
4	275	275	295	330	295	275	300	355	335	310	300	320	310	310	300	310	315	335	320	275	290	285	290	320
5	320	305	275	285	290	295	325	360	335	310	310	305	315	305	305	310	325	325	310	295	295	275	285	300
6	305	310	315	295	275	285	320	350	340	325	325	315	305	305	315	315	320	325	330	290	275	275	275	290
7	305	280	280	310	270	275	295	330	325	315	315	300	300	305	290	305	305	310	315	290	290	270	280	285
8	285	305	320	290	265	270	305	330	340	325	295	310	295	295	300	310	315	320	315	300	300	290	280	280
9	285	260	270	270	255	260	290	325	325	290	300	260	R 300	295	Y 290	295	295	305	285	310	290	295	275	285
10	280	280	270	305	270	285	285	320	325	315	305	315	305	300	295	315	315	320	320	305	305	280	295	285
11	285	270	285	295	310	310	315	335	335	330	310	305	300	300	I C 300	305	320	330	305	295	300	270	265	255
12	300	265	250	225	235	240	315	330	330	325	300	275	305	290	305	310	325	335	310	295	295	305	275	260
13	270	275	285	305	285	270	315	330	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	320	325	300	280	305	280	270
15	265	265	270	310	270	260	310	330	C	C	305	305	305	305	310	310	315	310	300	305	310	255	280	265
16	285	270	275	270	270	260	285	F 310	340	315	275	F 310	330	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	310	300	C	C	C	C	C	C	335	310	285	280	275	275
24	285	280	295	300	300	280	325	330	340	310	280	285	285	295	290	295	300	305	290	275	280	280	R 290	290
25	290	275	285	315	305	290	325	330	320	310	285	295	300	300	290	295	295	310	335	345	320	295	275	260
26	265	290	305	275	270	280	335	S 340	325	295	300	305	310	305	315	315	320	335	355	310	275	270	275	285
27	300	280	295	295	F 290	300	350	340	325	310	300	300	305	300	300	R 295	305	315	305	315	320	295	280	270
28	270	280	310	315	285	280	335	340	320	300	290	295	290	300	295	305	310	315	330	S 340	275	265	265	270
29	275	275	295	290	270	280	345	350	310	300	320	295	295	305	285	285	290	320	335	270	265	270	275	280
30	265	270	310	320	300	305	340	320	305	290	285	280	295	300	295	295	300	310	300	300	295	290	280	275
31	270	280	290	295	295	290	330	330	320	295	295	295	290	295	300	305	300	305	310	325	280	285	280	290
	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	23	23	23	23	23	23	23	21	21	23	23	22	21	21	21	21	22	23	23	23	23	23	22
MED	285	275	285	295	285	280	315	330	325	310	300	305	300	300	300	310	315	320	315	300	290	285	280	280
U Q	295	280	305	310	300	290	330	340	335	320	310	315	305	305	308	315	320	330	330	310	305	295	285	285
L Q	270	270	275	285	270	270	300	330	320	300	295	295	295	298	292	295	300	310	305	290	280	270	275	270

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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	A	L	L	L	L	L							
2									L	L	L	L	L	L	L	L	L							
3										L	L	U L 350	L	L	L	L	L							
4										L	L	L	L	L	L	L	L							
5									L	L	L	L	L	L	L	L								
6										L	L	U L 395	L	U L 355	L	L	L							
7										L	L	L	L	L 370	L	L	L							
8									L	L	L	L	L	L	L	L								
9								L	L	L	L	L	L	L		L								
10								L	L	L	L	L	L	L	L	L								
11									L	L	L	L	L	L	C	A		A						
12										L	L	L	U L 380	L	L		L							
13									C	C	C	C	C	C	C	C	C	C	C					
14							C	C	C	C	C	C	C	C	C	C	C							
15									C	C	U L 355	L	L	L	L		L							
16							L	U L 355	L 355	U L 385	350	350	U L 355	C	C	C	C	C	C					
17							C	C	C	C	C	C	C	C	C	C	C	C	C					
18							C	C	C	C	C	C	C	C	C	C	C	C	C					
19							C	C	C	C	C	C	C	C	C	C	C	C	C					
20							C	C	C	C	C	C	C	C	C	C	C	C	C					
21							C	C	C	C	C	C	C	C	C	C	C	C	C					
22							C	C	C	C	C	C	C	C	C	C	C	C	C					
23							C	C	C	C	L	L	C	C	C	C	C	C						
24									L	L	U L 350	L	L	U L 350	L	L								
25									L	L	U L 385	U L 335	L	L		L	L	L						
26								L	L	U L 390	U L 335	L	L	U L 365	U L 350	U L 345								
27								L	L	L	U L 360	L	L 360	U L 370	L	L	L							
28									L	U L 385	U L 340	L 365	L	L 380	L	L	L	L						
29										L	L	L	U L 320	U L 365	L	A		L						
30									L	L	U L 370	L	L 370	L 340	U L 350	U L 335	U L 360	L						
31										L	U L 340	L	L	L	U L 360	L	L							
	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								1	1	3	9	5	5	8	3	2	1							
MED								U L 355	L 355	U L 385	U L 350	U L 350	U L 360	U L 365	U L 350	U L 340	U L 360							
U Q										U L 390	U L 365	L 380	L 375	L 370	U L 360									
L Q										U L 385	U L 340	342	U L 338	U L 352	U L 350									

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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										250	260	265	260	260	255	265	245							
2									245	260	270	260	260	275	260	245	240							
3										255	255	280	270	260	275	265	245							
4										270	280	250	265	255	260	250	240							
5									225	250	260	255	260	265	250	245								
6										235	270	260	260	275	255	250	255							
7										245	270	265	285	270	280	265	255							
8									240	240	L 280	270	300	285	270	250								
9								245	260	270	255	325	270	270		L 275								
10								260	255	255	250	275	260	265	285	250								
11									250	250	265	250	265	270	I C 275	265		A 250						
12										255	250	245	250	L 300	285		250							
13									C	C	C	C	C	C	C	C	C	C	C					
14							C	C	C	C	C	C	C	C	C	C	C							
15									C	C	260	285	255	L 290	245		260							
16							315	275	280	280	370	300	260	C	C	C	C	C	C					
17							C	C	C	C	C	C	C	C	C	C	C	C	C					
18							C	C	C	C	C	C	C	C	C	C	C	C	C					
19							C	C	C	C	C	C	C	C	C	C	C	C	C					
20							C	C	C	C	C	C	C	C	C	C	C	C	C					
21							C	C	C	C	C	C	C	C	C	C	C	C	C					
22							C	C	C	C	C	C	C	C	C	C	C	C	C					
23							C	C	C	C	260	290	C	C	C	C	C	C						
24									250	235	315	305	300	280	280	290								
25									240	250	280	305	275	280		295	265	265						
26								230	250	240	285	275	265	270	265	260								
27								245	240	260	280	280	270	275	275	300	260							
28									L 265	255	310	295	280	280	275	270	270	260						
29										280	260	300	305	260	305	A 285		250						
30									265	280	H 255	L 335	280	295	270	285	270	250						
31										L 275	300	300	305	285	270	260	300							
	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							1	5	13	21	23	23	22	21	19	19	13	5						
MED							315	245	250	255	270	280	268	275	270	265	255	250						
U Q								268	262	270	280	300	280	282	280	285	268	262						
L Q								238	240	248	260	260	260	265	260	250	245	250						

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

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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	270	295	300	255	210	360	305	245	H 225	235	230	A	A	220	220	225	240	235	225	245	250	250	280	305
2	375	360	325	255	215	300	255	225	220	225	H 200	A	240	220	230	230	230	225	215	250	250	E A 280	285	335
3	320	300	265	310	330	280	260	240	245	235	235	230	230	235	210	235	240	230	A 245	230	260	270	265	310
4	305	300	245	225	230	325	275	230	H 205	H 210	210	225	220	225	215	235	230	220	220	260	275	260	270	250
5	235	225	260	285	270	250	230	210	220	210	H 205	220	H 215	210	225	220	230	225	225	235	250	270	285	260
6	260	235	245	250	250	295	245	220	H 225	220	H 210	220	215	210	230	220	235	235	225	225	280	285	295	275
7	265	275	290	240	225	285	275	235	235	235	215	215	H 205	215	H 215	H 220	245	230	215	225	255	285	305	285
8	280	255	240	235	330	310	270	240	235	225	225	240	230	235	H 210	H 215	235	230	230	230	235	255	280	285
9	280	320	315	290	335	335	280	240	235	225	225	210	220	230	Y 255	230	235	250	235	250	220	250	A 295	270
10	275	275	320	245	290	270	285	250	230	220	215	205	220	220	210	235	235	235	235	220	250	260	270	280
11	290	305	295	255	240	240	245	230	235	225	220	220	220	230	I C 225	A	A 250	A	A 255	260	240	285	300	340
12	265	275	325	410	400	380	250	230	235	A 245	225	225	225	230	220	240	240	230	A 240	245	250	260	270	335
13	325	300	280	250	250	270	H 225	235	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	240	225	215	270	240	270	295
15	330	320	305	255	275	330	250	230	C	C	210	H 200	240	H 220	245	255	255	250	250	260	245	260	280	310
16	265	300	270	255	300	325	310	285	255	235	H 225	245	240	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	210	E B 250	C	C	C	C	C	C	220	220	250	290	280	290
24	285	280	265	235	235	255	240	235	225	200	190	H 190	H 215	220	H 210	235	240	250	265	250	250	235	270	290
25	275	295	285	210	230	260	250	240	230	215	210	H 205	A 255	A	E A 260	A 250	240	255	230	205	210	260	285	330
26	315	270	250	255	295	275	225	225	H 205	195	H 190	H 190	H 205	215	210	215	245	240	225	210	265	310	305	295
27	270	275	265	245	260	250	230	235	215	210	H 190	A 250	205	200	H 205	210	230	240	240	230	220	270	280	305
28	320	310	255	240	255	305	230	235	230	215	H 200	190	H 230	220	220	230	230	250	235	215	240	315	320	310
29	300	305	265	255	250	295	230	235	230	215	240	220	220	220	230	A	E A 280	A	220	A 280	285	305	295	290
30	315	310	260	220	240	255	225	230	225	210	200	H 205	210	225	220	220	230	240	250	240	240	245	280	300
31	315	315	295	265	250	240	220	225	230	220	210	H 200	225	230	230	215	H 215	255	255	220	225	280	270	270
	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	23	23	23	23	23	23	23	21	21	23	21	21	20	21	19	21	20	23	23	23	23	23	23
MED	285	300	270	255	250	285	250	235	230	220	210	218	220	220	220	230	235	238	230	230	250	265	280	295
U Q	315	310	300	255	295	325	275	240	235	230	225	228	230	230	230	235	242	250	245	250	260	285	295	310
L Q	270	275	260	240	235	255	230	230	222	210	H 200	H 202	215	218	210	220	230	230	225	220	240	255	270	280

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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 120		115	115	110	110	115	110	120	A	115	120						
2							B 130		120	120	120	110	110	115	115	115	115	A						
3							B 130		125	120	120	120	120	120	A	115	A	E A 140						
4							B 120		115	115	110	110	115	A	A 130	110	110	120						
5							B 120		110	110	110	110	E B 140	115	115	120	120	120						
6							B 120		A 130	110	115	110	110	115	110	110	115	120						
7							E B 160	120	115	110	110	120	115	115	110	110	115	120						
8							B 120		A 120	E A 130	A 125	110	110	110	115	115	A	A						
9							B 120		115	110	110	115	120	120	B	A	115	A						
10							B 115		110	110	110	115	115	115	120	115	115	120	B					
11							B 115		A 135	A	A 135	A 125	A 130	125	I C 120	115	115	A 125	B					
12							B	B 110	110	110	A	A	A	A	A	115	115	125	B					
13							B 115		C	C	C	C	C	C	C	C	C	C	C					
14							C	C	C	C	C	C	C	C	C	C	C	130	B					
15							B 115		C	C	110	A	E A 140	120	115	A 120	120	125	B					
16							B 120		120	120	115	115	A	C	C	C	C	C	C					
17							C	C	C	C	C	C	C	C	C	C	C	C	C					
18							C	C	C	C	C	C	C	C	C	C	C	C	C					
19							C	C	C	C	C	C	C	C	C	C	C	C	C					
20							C	C	C	C	C	C	C	C	C	C	C	C	C					
21							C	C	C	C	C	C	C	C	C	C	C	C	C					
22							C	C	C	C	C	C	C	C	C	C	C	C	C					
23							C	C	C	C	115	B	C	C	C	C	C	C	B					
24							E B 180	115	110	110	A 125	B	110	120	120	120	115	120	B					
25							B 180	115	110	110	110	110	A	A	A	A	120	120	B					
26							140	A	115	115	110	E B 135	A	130	120	120	115	115	B					
27							B 140	115	110	A 130	110	A	A	A	110	A	110	B 130	B					
28							155	120	115	110	110	A	A	A	A	115	115	125	B					
29							155	120	115	115	120	115	115	115	125	120	120	120	A					
30							150	115	115	115	A 130	115	B	120	115	115	115	120	B					
31							E A 165	A 130	A	120	115	A	A	B	115	115	115	120	A					
	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							9	21	20	20	23	16	14	15	16	17	19	19						
MED							148	120	115	114	110	114	115	115	115	115	115	120						
U Q							E B 172	120	120	120	A 120	118	120	120	120	120	115	125						
L Q							145	115	110	110	110	110	110	115	115	115	115	120						

MAR. 1993 H'E (KM)

IONOSPHERIC DATA STATION KOKUBUNJI

MAR. 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

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	105	125	110	105	105	105	B	G	G	165	140	120	120	120	E G 170	160	130	G	110	110	110	110	130	125
2	125	130	120	120	B	110	110	G	G	110	160	125	120	150	130	120	125	120	B	120	110	105	105	110
3	B	B	B	B	B	B	155	180	G	G	G	125	120	G	115	G	115	110	105	110	105	105	105	105
4	B	B	B	B	B	B	B	G	G	G	G	120	120	115	115	G	G	100	100	105	115	110	105	110
5	B	110	100	B	B	B	B	G	G	185	E G 180	G	G	G	G	G	G	G	B	B	B	B	B	B
6	B	B	B	B	B	B	B	G	110	150	G	G	G	G	G	G	G	150	B	105	B	B	105	B
7	B	B	B	B	B	B	G	G	G	G	G	140	140	G	G	105	E G 190	G	B	B	B	B	B	110
8	B	B	110	105	100	B	120	G	E G 180	110	110	120	120	120	140	G	95	95	105	100	B	140	B	B
9	110	110	B	B	B	110	180	G	G	G	G	145	G	G	125	115	120	115	B	B	B	120	110	B
10	B	B	B	B	B	115	B	G	G	G	G	G	E G 190	E G 200	105	150	135	125	115	B	B	B	B	B
11	B	B	110	B	B	B	G	G	110	E G 195	110	135	115	G	C	125	120	115	110	120	115	115	B	B
12	B	B	B	115	B	B	145	B	130	115	125	115	110	110	120	G	140	125	110	110	120	110	110	110
13	110	110	120	B	B	B	B	G	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	135	120	100	B	B	B	B
15	B	B	B	110	B	B	B	G	C	C	G	110	175	105	170	190	160	150	120	115	125	B	B	B
16	B	B	B	130	B	B	B	150	140	G	G	180	110	C	C	C	C	C	C	C	C	C	C	C
17	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
21	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
23	C	C	C	C	C	C	C	C	C	C	120	B	C	C	C	C	C	C	100	105	B	B	B	B
24	B	B	B	B	B	B	G	E G 205	G	G	110	B	G	105	105	110	G	G	B	B	B	B	B	B
25	B	B	B	B	B	110	G	G	120	120	120	115	110	100	105	105	G	G	B	B	B	B	B	B
26	B	B	B	115	B	B	G	115	G	G	G	G	115	110	110	G	125	130	B	B	B	B	B	B
27	B	B	B	B	B	B	G	G	G	115	115	110	110	115	115	110	E G 170	130	125	100	B	110	115	115
28	B	B	B	B	B	120	G	G	G	G	G	115	115	140	140	170	105	105	B	B	100	B	B	B
29	B	B	B	B	B	B	G	G	G	G	G	125	120	120	145	120	120	125	120	110	120	120	B	B
30	B	B	B	B	B	B	G	G	145	130	115	G	B	E G 170	G	G	G	120	120	B	B	B	B	B
31	B	B	110	110	110	110	110	115	115	G	130	120	115	B	G	G	G	165	130	B	B	105	105	B
	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	4	5	7	8	3	7	6	5	8	10	12	16	17	14	15	12	14	17	14	13	9	11	9	7
MED	110	110	110	112	105	110	132	U 132	122	122	119	120	118	115	118	120	122	125	112	110	115	110	105	110
U Q	118	128	120	118	110	115	155	192	142	165	135	130	120	140	140	155	140	132	120	112	120	120	112	115
L Q	108	110	110	108	100	110	110	115	112	115	112	115	112	110	110	110	120	112	105	102	108	105	105	110

IONOSPHERIC DATA STATION KOKUBUNJI

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

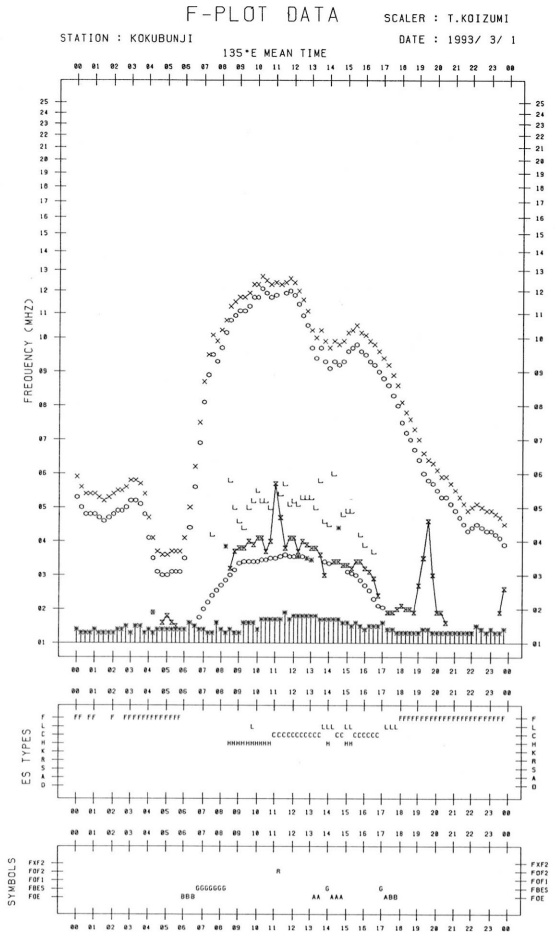
LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

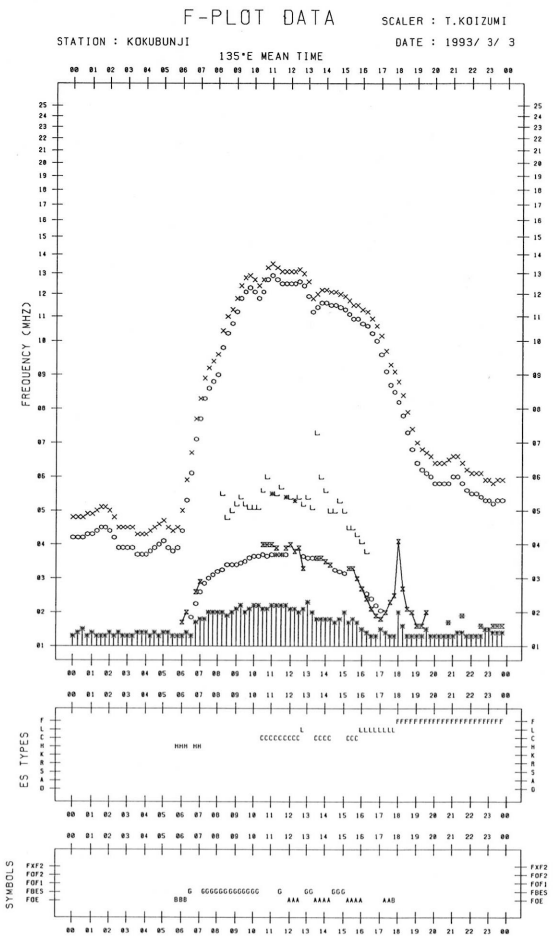
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	F 2	F 2	F 1	F 2	F 1	F 3				H 2	H 1	C 2	C 2	C 2	HL 11	HL 11	C 2		F 4	F 4	F 3	F 2	F 2	F 2
2	F 2	F 1	F 1	F 1		F 2	L 2			L 1	HL 11	C 2	C 1	H 1	C 2	C 1	C 1	L 2		F 2	F 3	F 5	F 5	F 1
3							H 1	H 1				C 1	C 1		C 1		L 2	L 1	F 3	F 1	F 2	F 2	F 2	F 2
4												C 1	L 1	L 1	L 1			L 1	L 2	F 1	F 1	F 1	F 2	F 2
5		F 1	F 2							HH 11	H 1													
6									L 1	H 1								H 1		F 1			F 2	
7												HL 11	HL 11			L 1	H 1							F 1
8			F 1	F 1	F 2		LH 11		HL 12	L 1	L 1	C 1	C 1	C 1	H 1		L 3	L 3	F 2	F 1		F 1		
9	F 2	F 2				F 1	H 1					H 1			C 1	L 1	C 1	C 2				F 1	F 6	
10						F 1							H 1	H 1	L 1	H 1	H 2	C 2	C 4					
11			F 2						L 2	HL 11	L 1	HL 11	L 1			C 3	C 4	CL 41	CL 42	F 2	F 1	F 2		
12				F 1			C 1		H 1	C 2	C 1	C 1	L 1	L 1	L 1		C 1	C 2	C 5	F 3	F 4	F 3	F 2	F 2
13	F 4	F 2	F 1																					
14																		CL 21	CL 52	F 1				
15				F 1								L 1	HL 11	L 1	HL 12	HL 22	H 2	H 3	C 6	F 6	FF 15			
16				F 1				H 1	H 1			H 1	L 1											
17																								
18																								
19																								
20																								
21																								
22																								
23											C 1								L 2	F 1				
24								H 1			L 1			L 1	L 2	L 1								
25						F 2			C 1	C 1	C 1	C 1	L 2	L 2	L 3	L 3								
26				F 1				L 2					L 1	L 1	L 1		C 1	C 1						
27										L 1	C 1	C 2	L 1	L 1	L 1	L 1	HL 12	C 2	C 3	F 1		F 4	F 1	F 1
28						F 1						L 1	L 1	HL 13	HL 21	H 1	L 2	L 2			F 1			
29												C 1	C 1	C 1	H 1	C 3	C 3	C 2	C 1	F 5	F 1	F 1		
30									H 1	H 1	L 1			H 1				C 2	C 1					
31			F 3	F 3	F 2	F 4	L 2	L 1	L 1		C 1	L 1	L 1					H 1	C 2			F 1	F 1	
	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																								

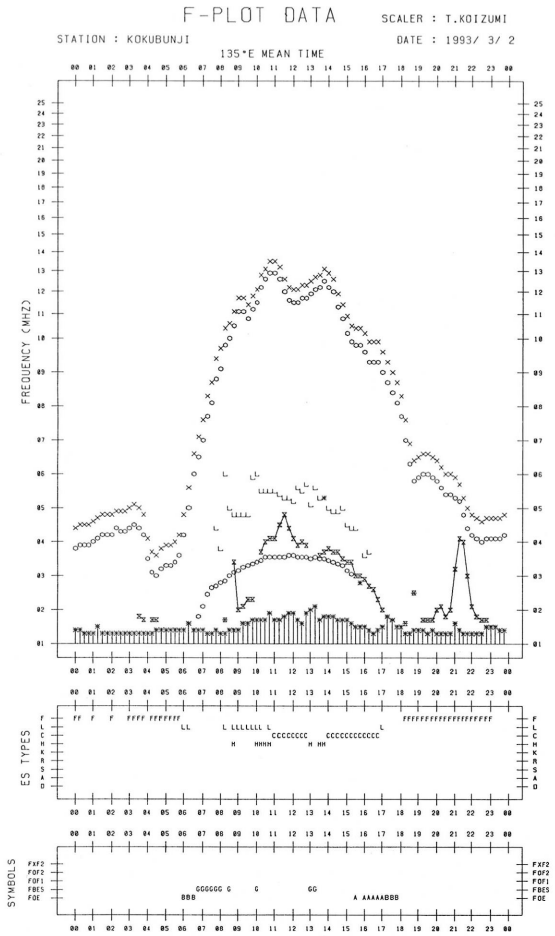
MAR. 1993 TYPES OF ES COMMUNICATIONS RESEARCH LABORATORY, JAPAN

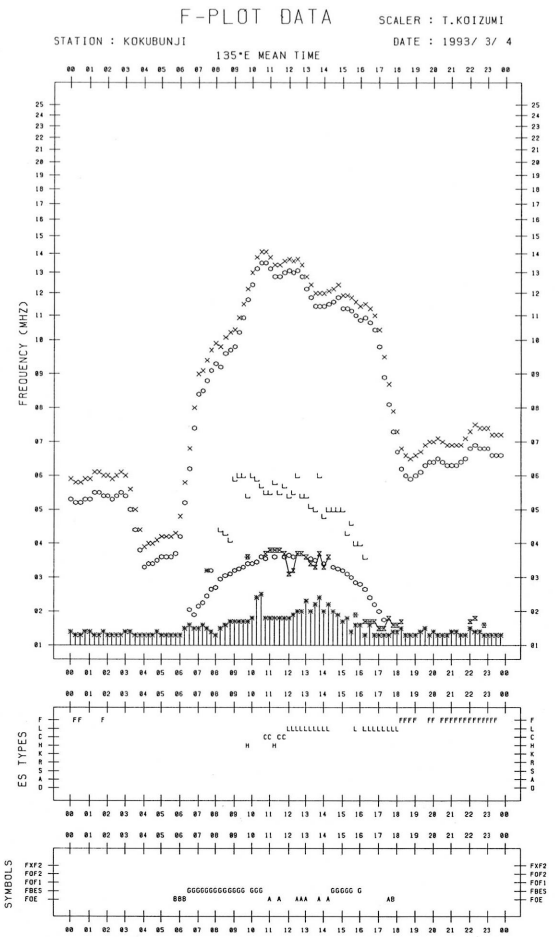
f-PLOTS OF IONOSPHERIC DATA

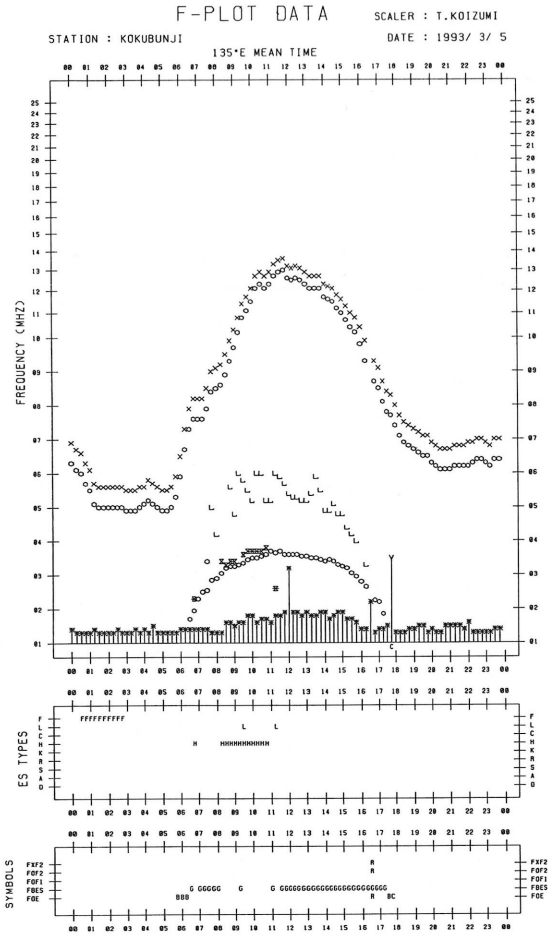
KEY OF F-PLOT	
I	SPREAD
⬡	FOF2, FOF1, FOE
×	FXF2
✳	DOUBTFUL FOF2, FOF1, FOE
⧖	FBES
⌊	ESTIMATED FOF1
⫯, Y	FMIN
∧	GREATER THAN
∨	LESS THAN

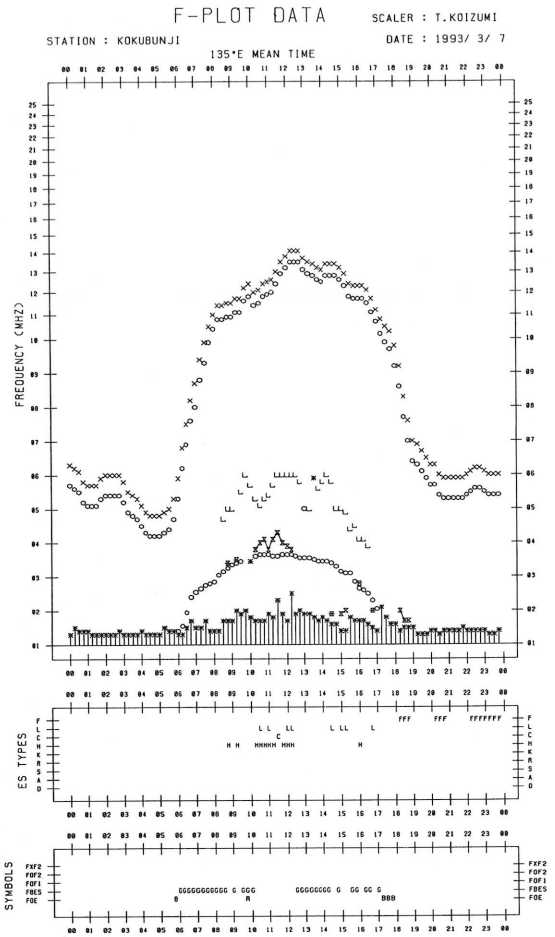

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 1
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

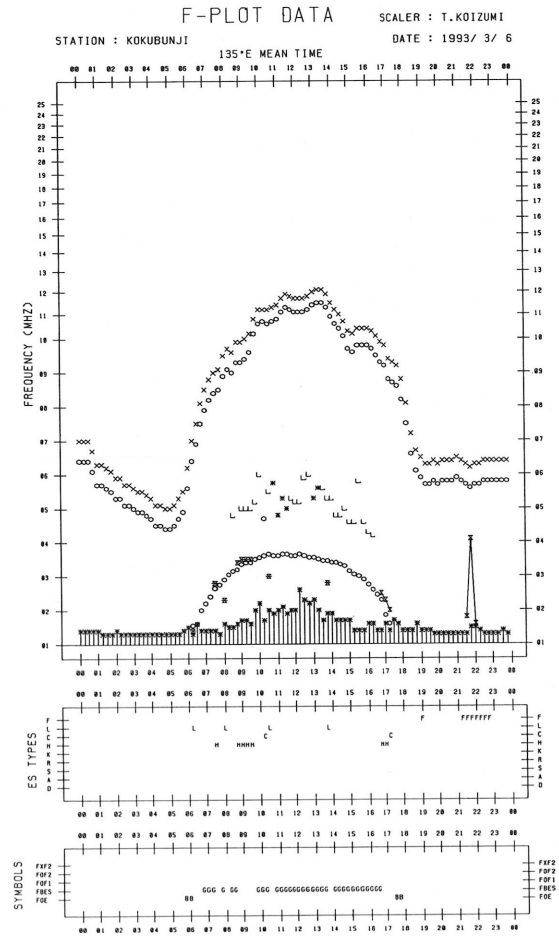

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 3
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

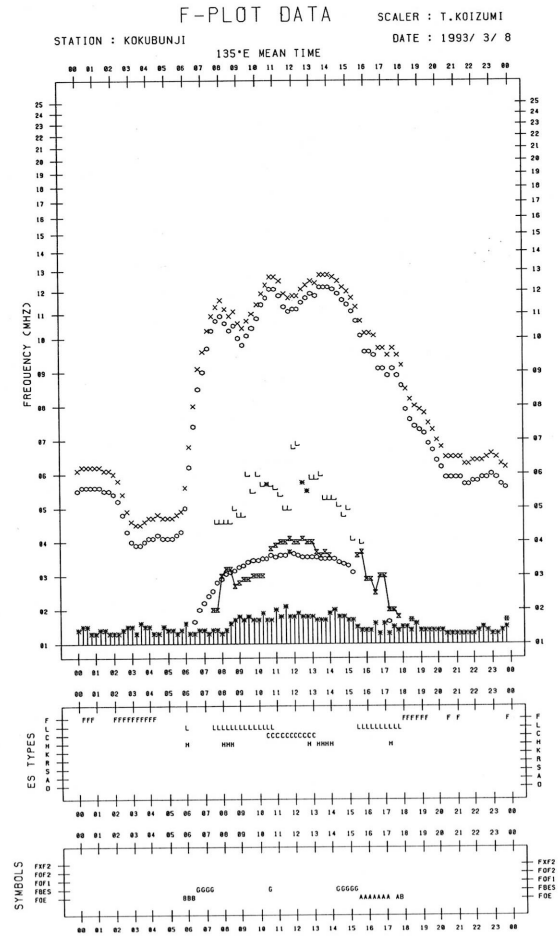

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 2
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 4
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 5
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FOES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 7
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FOES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 6
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FOES
FOE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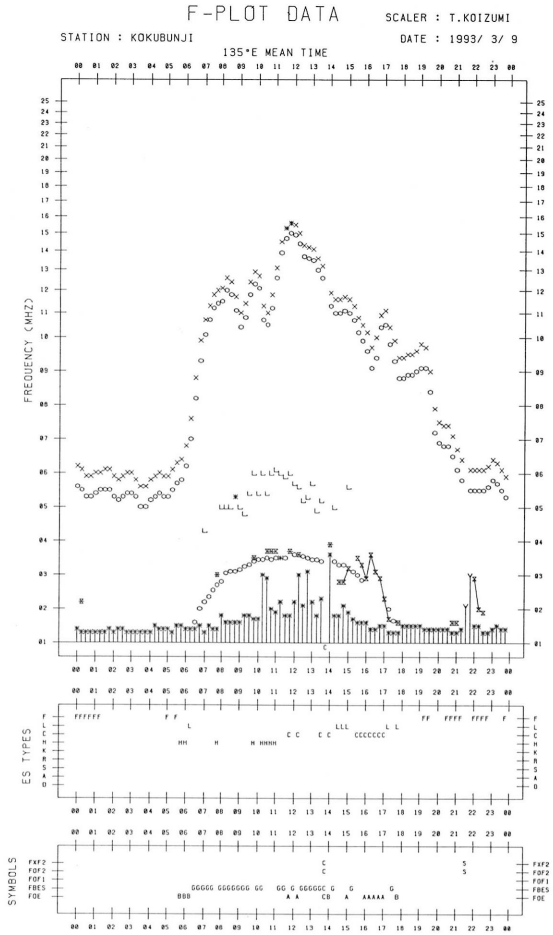
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/ 8
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FOES
FOE


F-PLOT DATA
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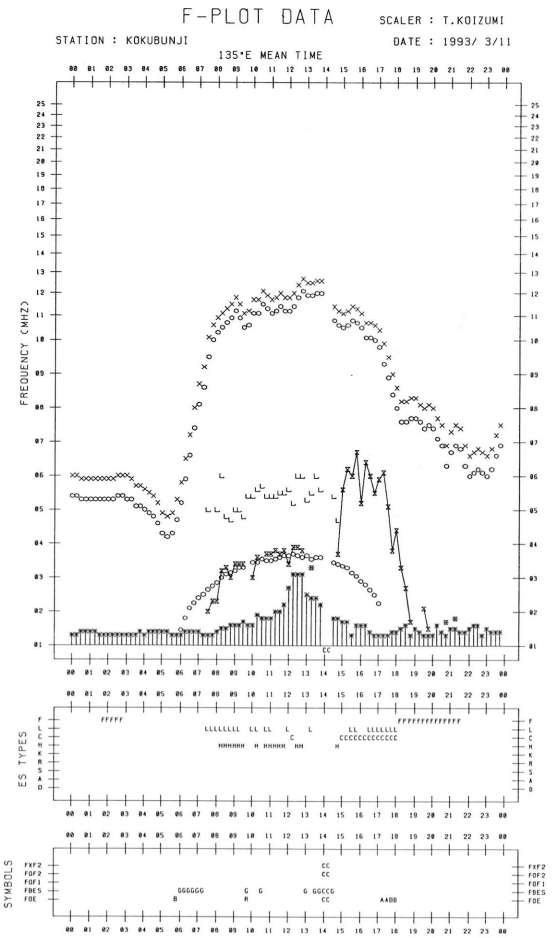
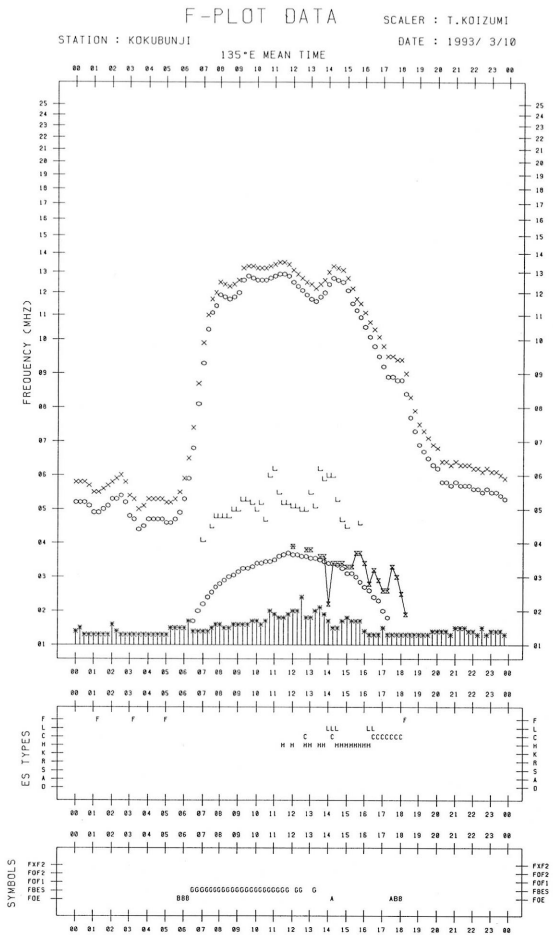
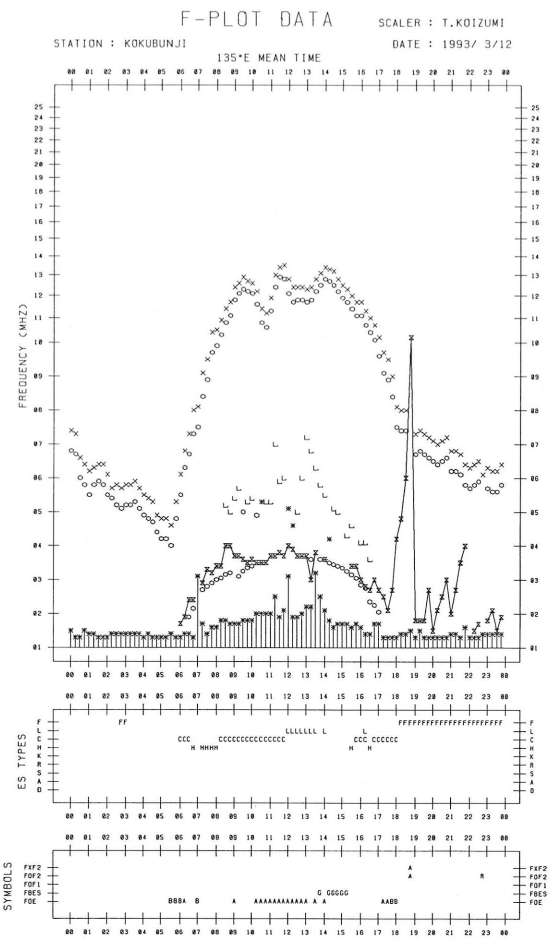
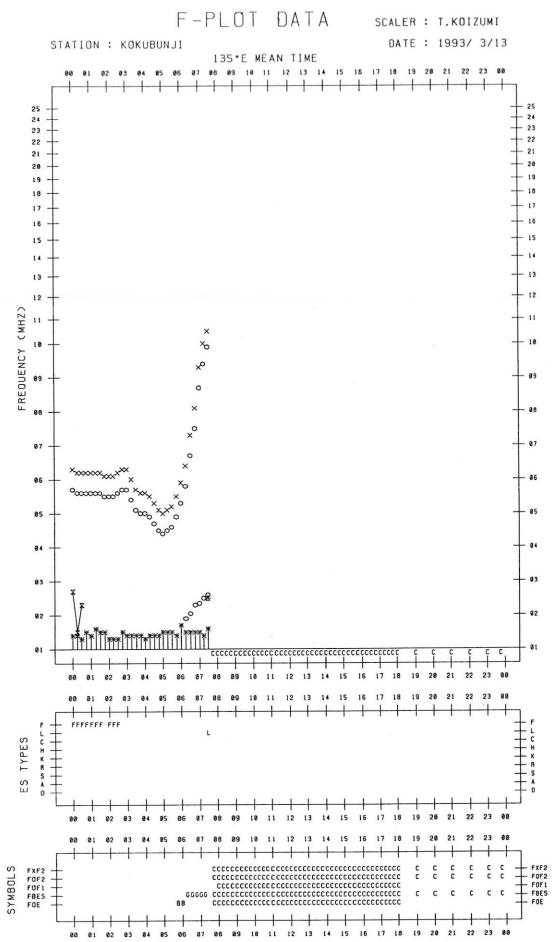
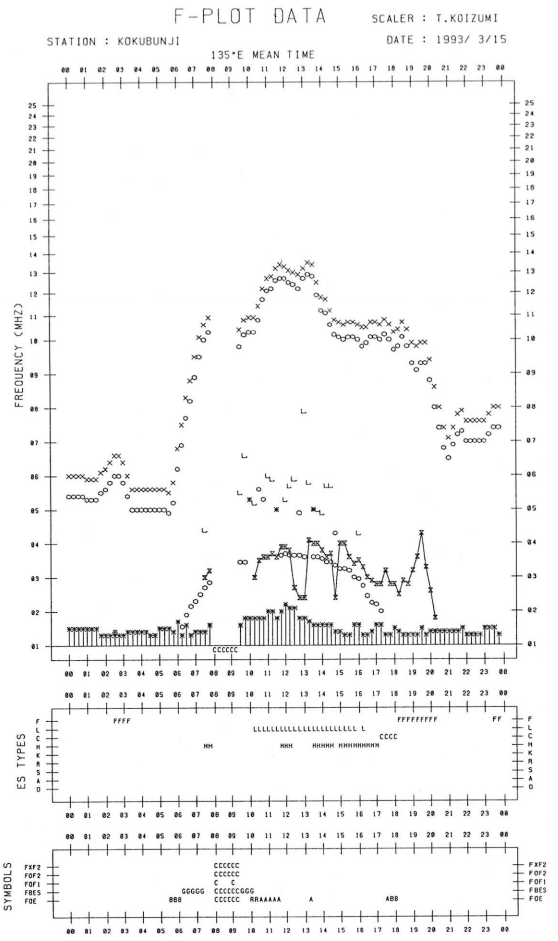
STATION : KOKUBUNJI
DATE : 1993/ 3/ 9
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

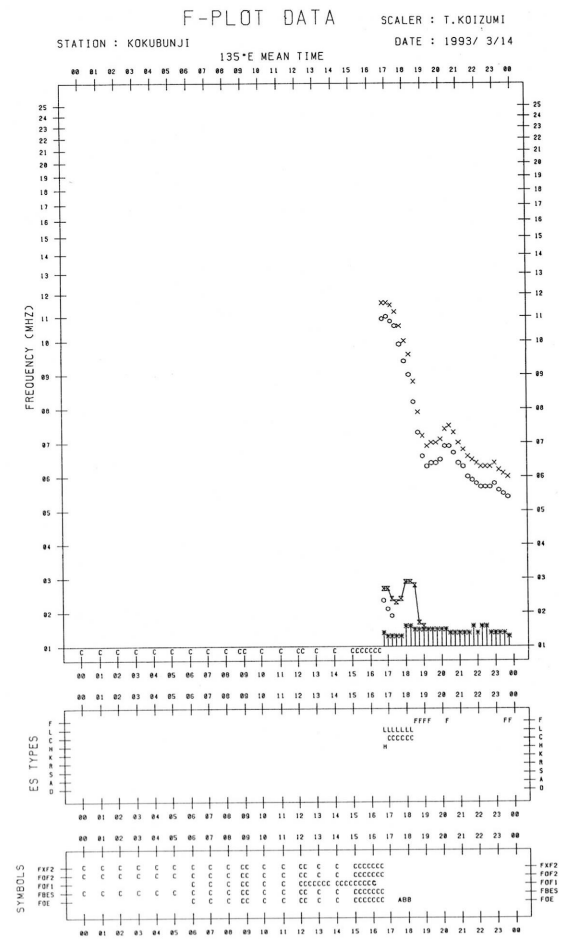

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/11
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

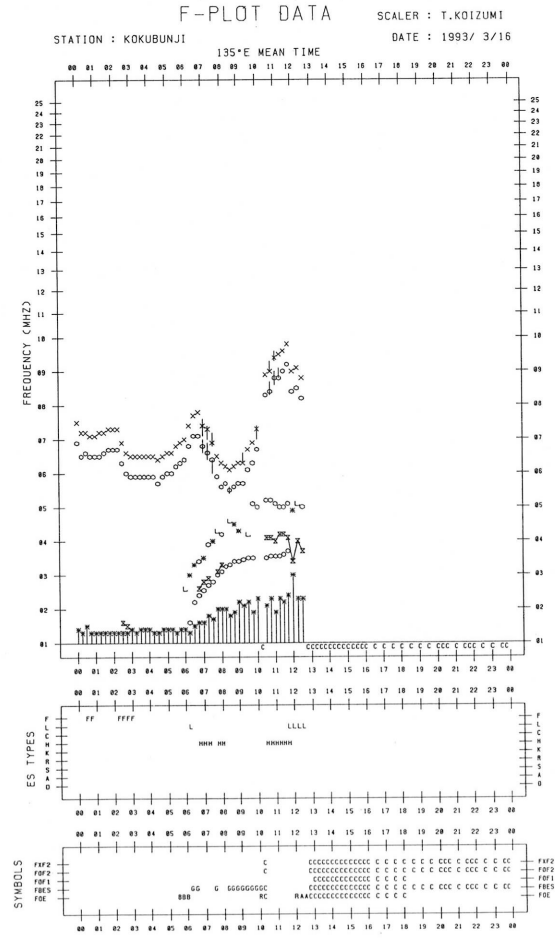

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/10
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

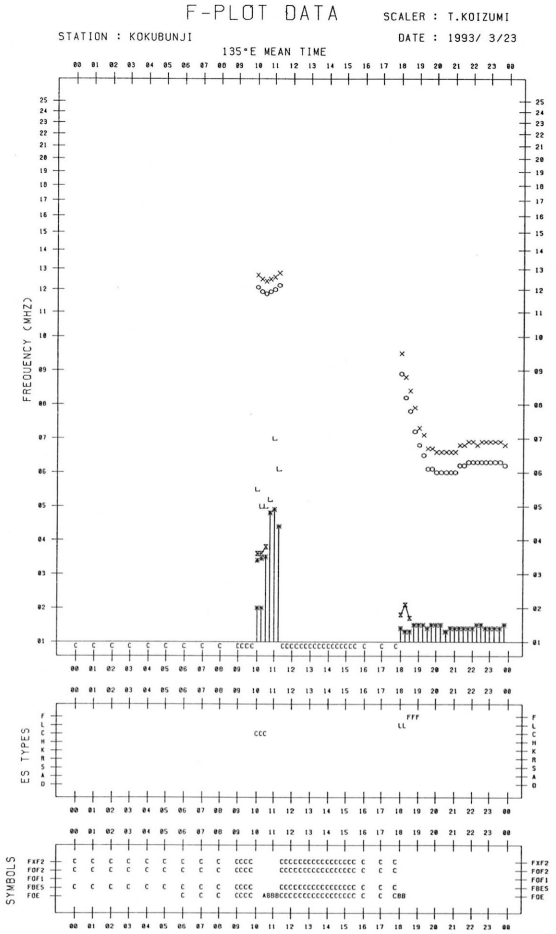

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/12
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

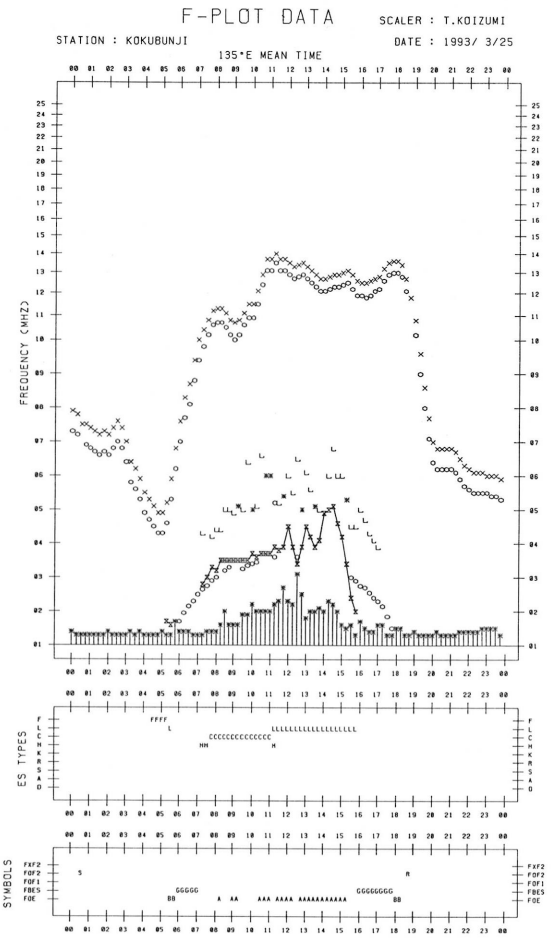

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

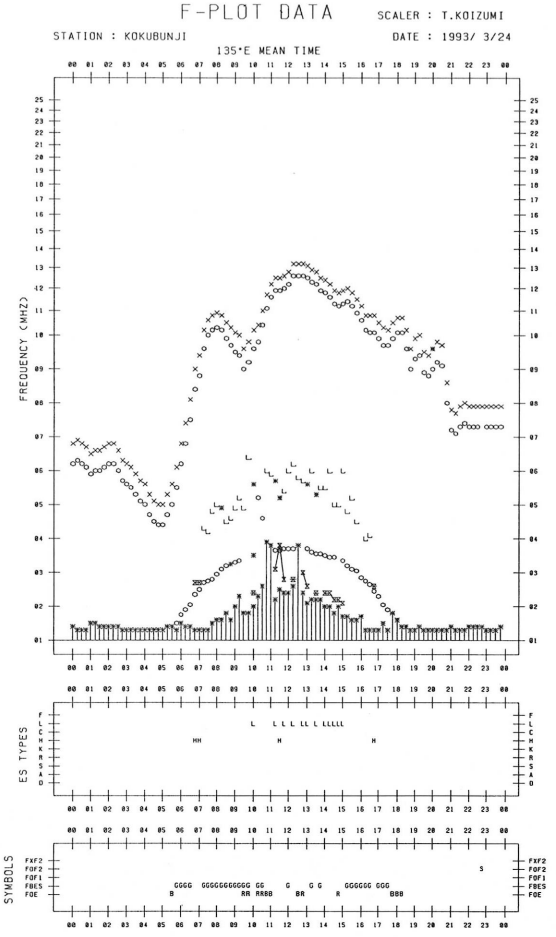

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

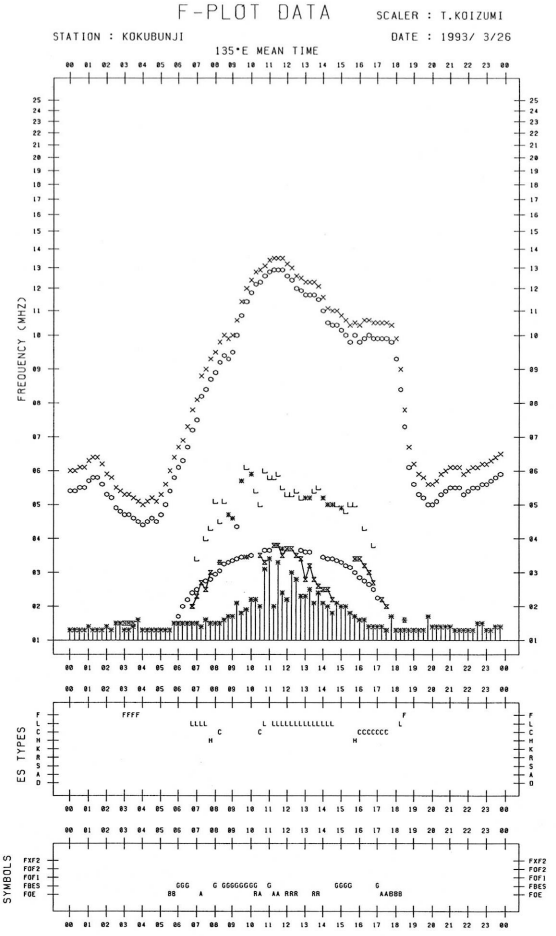

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

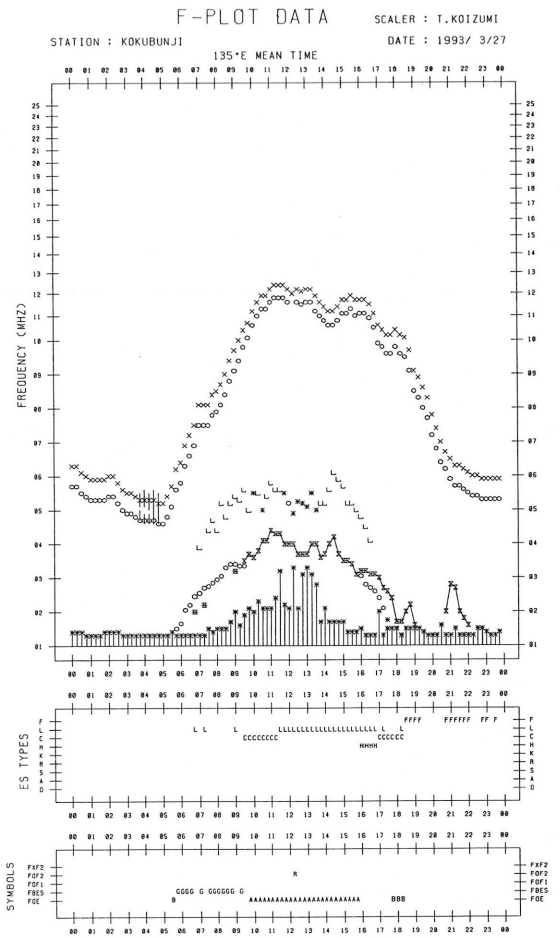


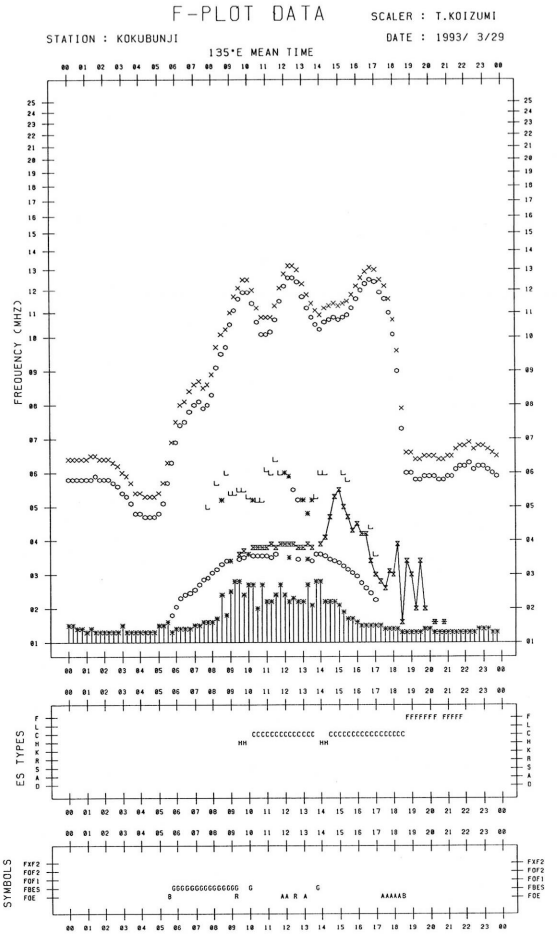


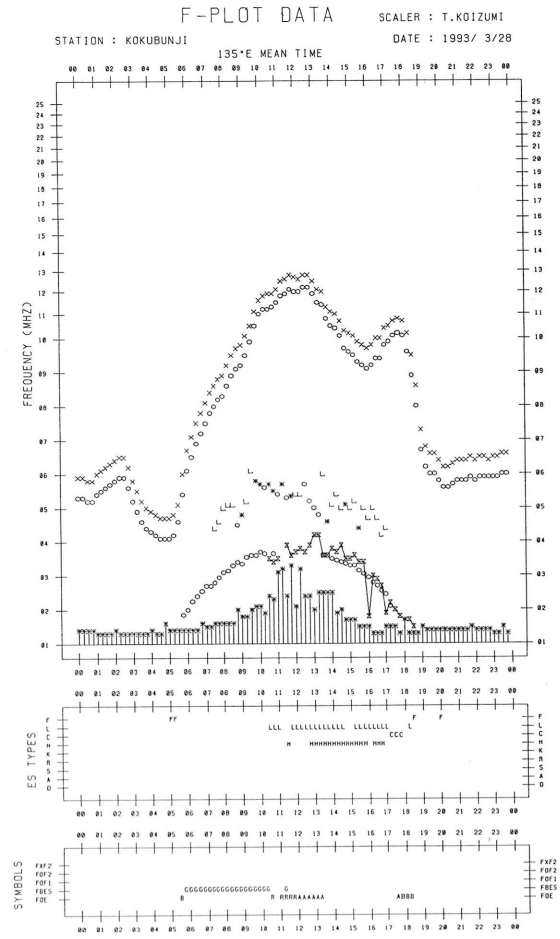
Note: No records were collected at Kokubunji from March 17 to March 22, due to a problem with the power supply.

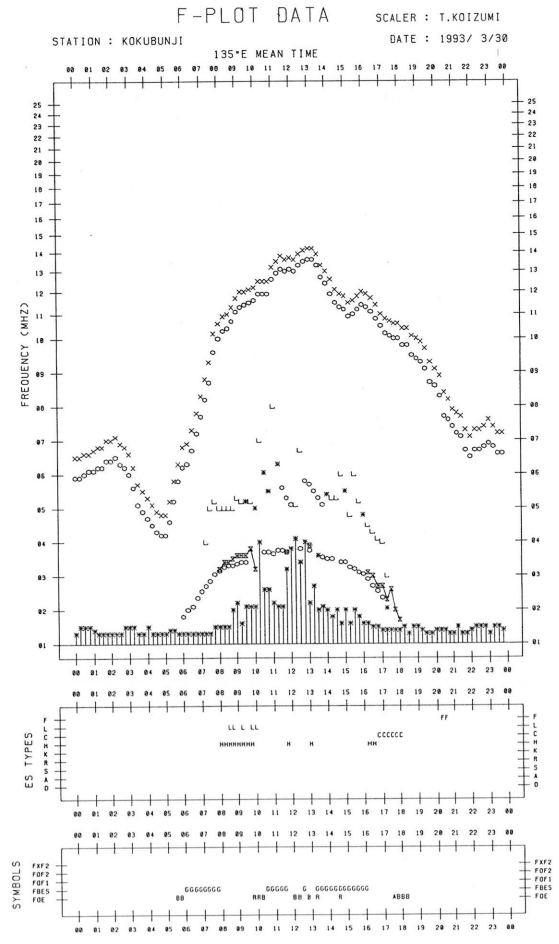


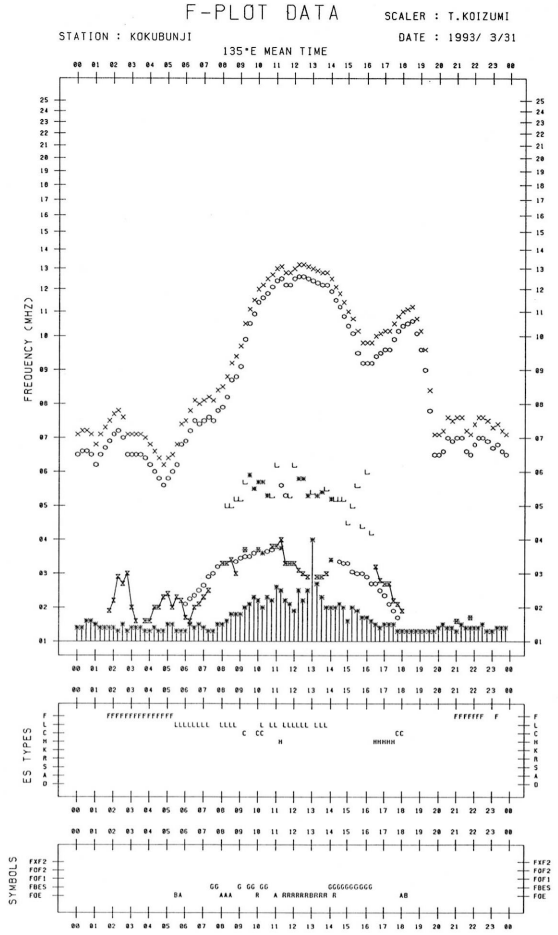



F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/27
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/29
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/28
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/30
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 3/31
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

B. Solar Radio Emission

B1. Daily Data at Hiraiso

200 MHz

Hiraiso March 1993

Single-frequency total flux observations at 200 MHz

UT Date	Flux density: 10^{-22}Wm^{-2}Hz^{-1}					Variability: 0 to 3				
	00-03	03-06	06-09	21-24	Day	00-03	03-06	06-09	21-24	Day
1	10	10	10	*	10	0	0	0	*	0
2	10	B	10	*	10	0	1	0	*	0
3	10	9	10	*	10	0	0	0	*	0
4	*	*	*	*	*	*	*	*	*	*
5	*	*	*	*	*	*	*	*	*	*
6	*	*	*	*	*	*	*	*	*	*
7	*	*	*	-	*	*	*	*	-	*
8	B	B	B	B	B	3	3	3	2	3
9	B	B	B	*	B	2	2	2	*	2
10	B	B	B	B	B	1	1	1	3	1
11	B	B	B	*	B	3	3	3	*	3
12	B	B	B	*	B	1	1	1	*	1
13	*	*	*	*	*	*	*	*	*	*
14	B	B	B	*	B	2	1	1	*	1
15	*	*	*	*	*	*	*	*	*	*
16	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-

Notes: No observations during the following periods.

7th 2100 - 8th 0008 16th 0000 - 31st 2400

No observations for 500 MHz due to equipment failure by lightning.

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso March 1993

Single-frequency observations

Normal observing period: 2100 - 0845 U.T. (sunrise to sunset)

MAR. 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
2	100	43 NS	0300	0545	300D	50	10	0
	200	43 NS	0307	0408	127	30	15	0
	200	46 C	0457	0511.2	17	40	10	0
	100	46 C	0602.3	0602.6	3.0	1000D	-	-
	200	46 C	0602.5	0603.0	3.0	230	40	WL
8	200	44 NS	0010E	0046	510D	250	150	SL
	100	44 NS	0010E	0623	510D	1000	700	SL
	100	44 NS	2100E	2355	690D	600	350	SL
	200	44 NS	2100E	0356	690D	80	50	SL
9	200	44 NS	2100E	0630	690D	70	40	SL
10	200	44 NS	2100E	0240	690D	300	150	SL
	100	44 NS	2100E	0454	690D	500	100	SL
11	200	44 NS	2100E	0250	690D	50	25	ML
	200	46 C	2158.0	2158.0	2.7	2500	800	0
	100	46 C	2158.0	-	8.0	1000D	-	-
14	200	44 NS	0000E	0103	180D	140	60	WL
15	200	46 C	2111.0	2117	18	300	60	0
	100	46 C	2116	2120.0	18	900	200	WL

C. RADIO PROPAGATION

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

MAR 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	-8	2	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	8	ES -26	ES -26	-11	-4	-11
2	-8	-11	0	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26
3	ES -26	ES -26	-1	-8	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-2	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-17	-17
4	-17	ES -26	-3	-4	ES -26	ES -26	ES -26	19	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	0	-3	ES -26	ES -26	ES -26	-11	-17	ES -26
5	-11	-7	-11	-6	ES -26	ES -26	ES -26	ES -26	ES -26	ES -17	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-3	-8	-8	ES -26	ES -26	ES -26	ES -26
6	-11	-3	-11	-8	2	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	2	-11	1	6	-7	ES -26	ES -26	ES -26	ES -26
7	-8	-5	ES -26	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -5	-8	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-14	-3	-13
8	-11	1	0	-1	11	ES -26	ES -26	ES -26	-22	ES -26	ES -26	ES -26	ES -26	ES -26	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-2	0
9	-7	0	-6	0	-1	ES -26	ES -26	ES -26	ES -26	ES -11	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	2	-5	-7
10	ES -11	-5	-22	-1	1	-8	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-3
11	-8	-4	-17	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-5	8	-4	ES -26	ES -26	ES -26	ES -26	ES -26	-4	ES -5	-5
12	-4	-14	-13	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26
13	ES -26	ES -26	ES -26	-14	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-13	-13	
14	-13	-13	-6	0	13	ES -26	ES -26	ES -26	ES -26	ES -5	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES 0	ES -26
15	ES -26	ES -26	ES -26	-8	4	ES -26	ES -26	ES -26	ES -26	ES -11	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26
16	ES -26	ES -26	ES -26	-4	ES -26	ES -26	ES -26	ES -26	ES -26	ES 0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-22
17	ES -26	ES -26	ES -26	-8	-14	-5	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-17	ES -26	ES -26	ES -26	-17	-6	ES 0	ES -26
18	-23	ES -27	-23	-12	1	ES -27	ES -27	ES -27	ES -27	ES -6	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-21	-2	-6	-9	ES -27	-13	-8	ES -27
19	ES -27	ES -27	-12	-6	1	-1	ES -27	-23	ES -27	ES -6	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-23	-9	ES -6	-12
20	-12	ES -27	-8	-1	-6	-1	ES -27	-23	ES -27	ES -6	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-8	-3	-6	-12
21	-1	-12	-1	-1	-1	-3	ES -27	-23	-23	ES -12	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-6	-3	-8
22	-12	-14	-14	-8	-3	-18	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -9	-3	ES -18	ES -27	ES -27	7	ES -27	ES -27	-1	-3	ES -3	-12
23	-18	-18	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -6	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-6	-3	-18	-18	-12	-8	-6	-12
24	-12	-12	-6	-4	3	7	6	ES -27	ES -27	ES -12	-23	ES -27	ES -27	ES -27	ES -27	ES -27	-1	-9	11	ES -27	ES -27	ES -27	ES -12	-18
25	-23	-18	ES -27	ES -27	-12	ES -27	ES -27	ES -27	ES -27	ES -6	ES -27	ES -27	ES -12	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-7	-8	-9	-7
26	-3	-3	-12	2	-1	ES -27	ES -27	ES -27	ES -27	ES -27	-18	ES -27	ES -27	ES -27	ES -27	ES -27	7	3	-9	ES -27	-14	-2	ES -6	-9
27	-7	-12	-1	-2	-3	-4	ES -27	ES -27	ES -27	ES -12	ES -12	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-1	ES -27	ES -27	ES -27	ES -27	ES -6	-12
28	ES -26	-11	-11	-4	3	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	7	0	ES -26	-2	0	0	-11
29	-22	ES -26	-11	-1	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-17	ES -26	ES -26	ES -26	ES -26	ES -26	-11
30	-11	ES -26	-1	-7	0	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-22	ES -26	-22	10	-1	5	ES -26	ES -26	-2	-11	ES -3	ES -26
31	ES -26	-17	-8	-11	-11	ES -26	ES -26	ES -26	ES -26	ES -11	ES -26	ES -26	ES -26	ES -26	-6	ES -26	0	2	0	-17	-5	-3	ES -2	-7
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	US -12	-14	-11	-6	-3	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-13	ES -6	-12
UD	-4	0	0	0	4	-1	ES -26	-23	ES -26	ES -5	ES -18	ES -26	ES -22	ES -26	-2	-4	0	5	6	-9	-2	-2	ES 0	-5
LD	ES -26	ES -27	ES -26	ES -26	ES -26	ES -27	ES -27	ES -27	ES -27	ES -26	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -26	ES -26	ES -26

C. RADIO PROPAGATION

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

MAR 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	-3	4	11	12	13	19	13	7	4	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	11	ES -26	7	10	7	1
2	0	-1	2	10	12	11	18	20	12	7	18	1	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26
3	ES -26	-2	-5	2	11	17	10	14	6	-22	-22	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	7	10	1	1
4	-4	-1	0	6	11	19	21	21	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	0	7	9	-8	0
5	-20	-3	2	6	10	17	18	ES -26	24	11	2	13	15	1	ES -26	ES -26	ES -26	19	8	3	4	2	4	1
6	0	-1	2	6	9	12	15	14	4	6	-8	-11	-22	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	6	ES -26	-20	-2	-3
7	0	4	-2	0	17	12	15	12	19	12	-3	-11	10	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-3	0	5	2	5
8	-1	0	2	10	11	17	22	9	14	1	4	9	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	10	10	6	-4
9	6	-1	0	5	15	16	19	22	ES -5	20	15	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	8	8	5	3	-1
10	-3	2	-1	10	11	15	17	19	6	-3	ES -26	-17	ES -26	ES -26	ES -26	ES -26	ES -26	-17	ES -26	-3	10	13	5	0
11	3	0	-4	-1	10	15	13	10	10	-7	-2	16	ES -26	ES -26	-6	ES -26	ES -26	ES -26	ES -26	ES -26	-5	-2	-11	-3
12	-13	-4	4	7	7	16	11	10	8	-13	15	-9	-8	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	1	-2	-3	-12
13	-17	-6	4	-2	12	13	15	16	12	10	-9	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	0	ES -26	ES -26	8	8	-2	-2
14	3	-2	1	5	14	10	18	20	20	12	-13	-11	ES -26	ES -26	ES -26	ES -26	ES -26	14	ES -26	ES -26	4	3	-1	-9
15	-6	-2	0	5	14	14	20	14	23	20	22	14	16	20	15	10	19	21	11	0	-13	ES -26	ES -26	ES -26
16	ES -26	-11	-5	5	8	15	20	21	11	16	11	3	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-2	-22	-22	-22
17	-3	-5	7	9	13	18	15	15	-1	-11	-17	-17	-6	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-1	8	15	0	5
18	-3	-2	4	11	20	19	17	14	17	9	13	-12	ES -27	-21	ES -27	ES -27	ES -27	26	10	6	2	2	-1	-6
19	-7	-3	-3	4	17	17	17	17	-2	-3	7	8	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	2	4	9	-3	-8
20	-9	ES -27	ES -27	-1	9	16	17	19	19	17	7	-18	ES -27	ES -27	ES -27	ES -27	ES -27	17	ES -27	1	8	0	2	-3
21	-3	-3	-3	ES -27	7	14	17	3	19	19	-21	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	3	2	12	-3	-3
22	-8	-3	-3	7	7	17	17	12	17	17	16	8	-9	-12	-23	ES -27	ES -27	ES -27	ES -27	-2	2	-3	-1	-3
23	-9	ES -27	-12	1	8	18	14	9	19	17	18	4	8	ES -27	ES -27	ES -27	ES -27	17	17	7	9	-1	-3	-8
24	-6	-6	3	4	9	19	15	17	18	21	21	14	17	18	4	-18	ES -27	18	8	4	-2	2	7	-2
25	-3	-3	-3	7	13	17	21	19	16	18	3	-7	-14	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	8	7	3	0	-4
26	-3	1	-1	8	9	13	18	13	-6	-6	2	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	-8	-9	3	7	-3	-3	-2
27	-3	-2	-2	1	4	14	18	9	14	20	17	15	-12	ES -27	ES -27	ES -27	-23	-21	ES -27	8	0	-1	-2	-1
28	-11	-6	2	6	11	11	20	17	5	-8	-11	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-17	-11	1	3	-5	-7	-7
29	-11	-7	-2	4	10	14	15	14	19	5	ES -26	-11	0	11	ES -26	ES -26	ES -26	20	ES -26	15	12	6	-2	-5
30	-5	0	-1	4	10	17	21	17	20	20	17	8	14	-8	-22	-22	-6	19	12	5	8	6	-2	-2
31	-5	-1	1	6	12	17	18	12	26	15	8	1	5	4	ES -26	ES -26	ES -26	19	-3	10	5	4	-5	-5
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	-4	-2	0	5	11	16	17	14	14	10	3	-11	US -26	ES -26	ES -26	ES -26	ES -26	US -26	ES -26	1	4	3	-2	-3
UD	3	1	4	10	17	19	21	21	23	20	18	14	15	11	-6	-22	-23	20	11	8	10	12	6	1
LD	-20	-11	-5	-1	7	11	13	9	ES -5	-13	ES -26	ES -26	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -26	-13	-22	-22	-22

C. Radio Propagation

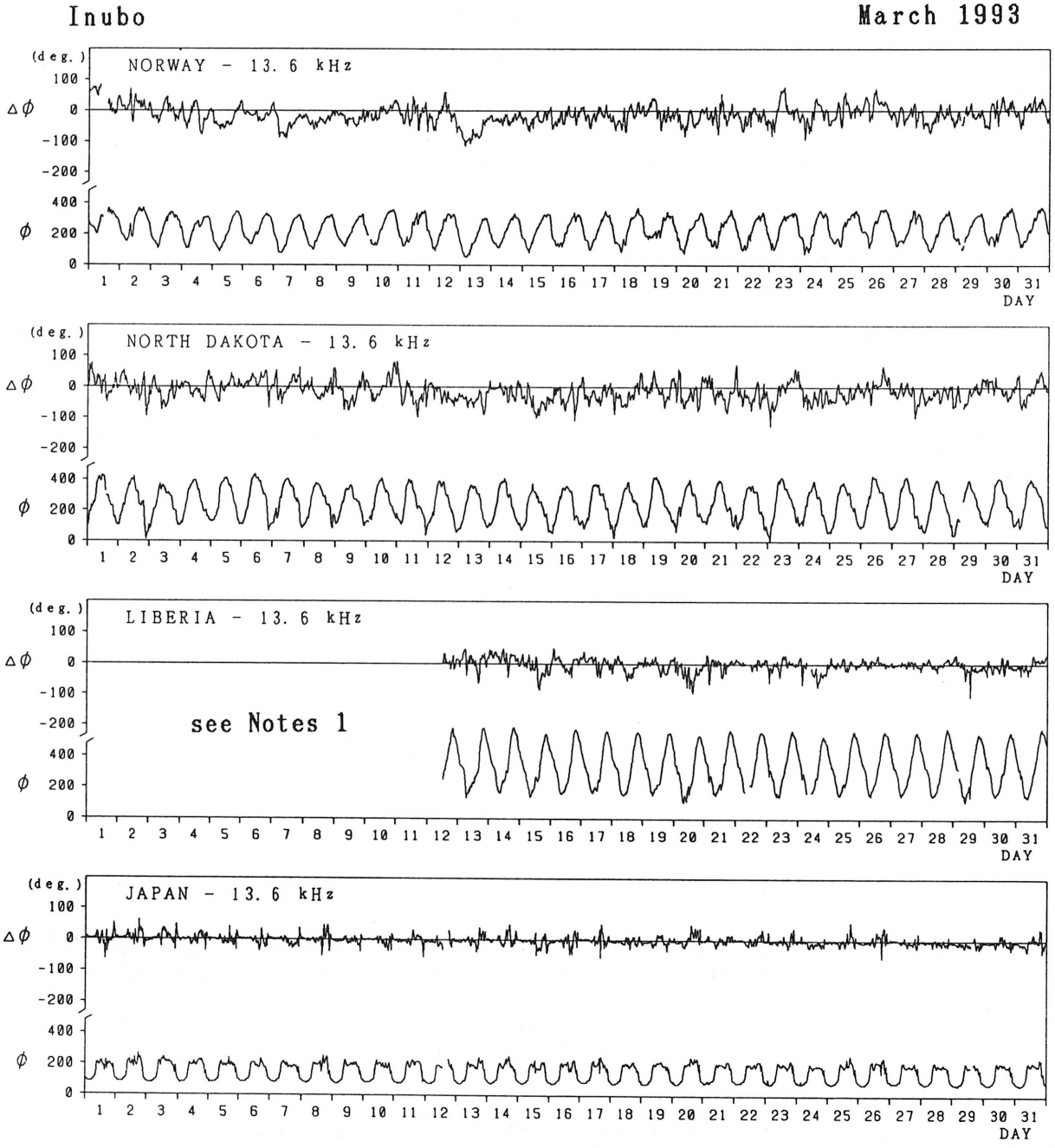
C2. Radio Propagation Quality Figures at Hiraiso

Hiraiso — Time in U.T.

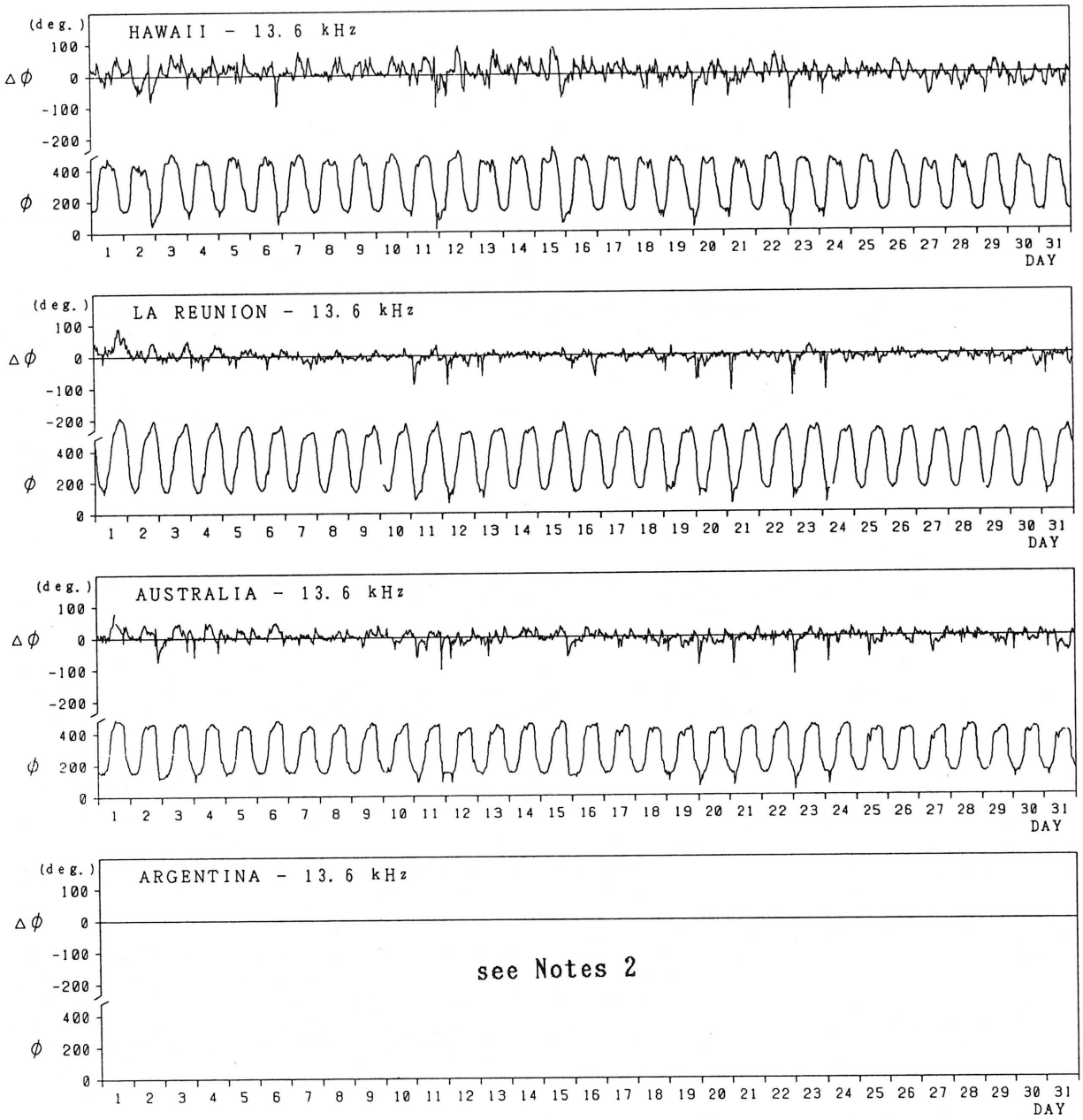
Mar. 1993	Whole Day Figur	W W V 00 06 12 18 / 06 12 18 24	W W V H 00 06 12 18 / 06 12 18 24	Conditions 00 06 12 18 / 06 12 18 24	Principal Geomagnetic Storms Start h m	End h	Range nT
1	4-	4u - - 4u	4 3 4u 4	n n n n			
2	3+	4 - - 3u	4 4 - 1u	n n n n			
3	3+	4u - - 3u	3 3 - 4	n n n n			
4	4-	3u - 5u 4u	4 3 - 4	n n n n			
5	4o	4 - 5u 3u	4 4 5u 4	n n n n			
6	4-	4 - 5u 3u	4 4 - 3	n n n n			
7	4o	4u - - 4u	4 4 - 4	n n n n			
8	4+	5 - - 4u	4 4 - 4	n n n n	2138	--	177
9	4-	4 - - 4u	4 3 - 4	n n n n	--	--	
10	4o	4 - - 4u	4 3 4u 5	n n n n	--	17	ssc
11	4o	3u - 5u 5u	4 4 4u 3	n n n n	0641	--	111
12	3+	3u - - 3u	4 4 - 3	n n n n	--	--	
13	4-	3u - - 4u	4 4 - 4	n n n n	--	22	ssc
14	4-	4 - - 3u	4 4 4u 3	n n n n			
15	4-	3u - - 3u	4 5 5u 3u	n n n n	0526	--	125
16	3+	3u - - 3u	3 5 - 2	u u u u	--	20	ssc
17	4-	3u - - 4u	4 3 - 4	u u u u			
18	4o	3 - 5u 3u	4 4 4u 4	n n n n			
19	4o	4u - - 4u	4 4 - 4	n n n n			
20	4o	4 - - 5u	3 4 4u 4	n n n n			
21	4-	4 4u - 4u	4 3 - 4	n n n n			
22	4+	4 - - 4u	4 5 5u 4	n n n n			
23	4o	3u - 5u 4u	3 4 5u 4	n n n n	2155	--	131
24	4+	4 4u 5u 3u	4 5 5u 4	n n n n	--	--	
25	4-	3u - - 4u	4 4 - 4	n n n n	--	01	ssc
26	4+	5 - 5u 4u	4 3 5u 4	n n n n			
27	4-	4 - - 3u	4 4 4u 4	n n n n			
28	4o	4 - 5u 4u	4 3 4u 4	n n n n			
29	4o	3u - - 4u	4 4 5u 4	n n n n			
30	4+	4 - 5u 4u	4 5 5u 4	n n n n			
31	4+	3 - 5u 5u	4 5 5u 4	n n n n			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo



Inubo March 1993



Notes 1: As for LIBERIA-13.6kHz, no record during 18 October 1992 - 11 March 1993, due to the maintenance of transmitter.

Notes 2: As for ARGENTINA-13.6kHz, no record during 1 March - 31 March, due to the maintenance of transmitter.

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

Start (U.T.)	End (U.T.)	Max. (U.T.)	Max. Phase Deviation (negative value, deg.)
Mar. 4/1255	Mar. 5/1620	Mar. 4/1410	76
Mar. 7/0300	Mar. 8/2330	Mar. 7/0500	54
Mar.12/2010	Mar.14/0000	Mar.13/0340	90

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

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

Hiraiso — Time in U.T.

Mar. 1993	S W F								Correspondence	
	Drop-out Intensities(dB)					Start	Dur.	Type	Imp.	Solar * Flare	Solar Burst
	CO	HA	AUS	MOS	BBC						
4	x	>38	24			0104	36	3	2	x	
5			13			0038	29	2	1	x	
6					13	1035	25	1	1	x	
11		x	6			0210	14	2	1-	x	
11		x	16			0233	106	3	1+	x	
11	x	x	27			2154	17	2	2	x	x
12			14			0003	64	3	1	-	
12			6			0416	44	2	1-	x	
13		x	12			0329	21	2	1	x	
16			14			0242	25	2	1	x	c
19	x	12	15			0219	26	1	1	x	c
20	>25	>30	37			0050	34	3	3	x	c
20			6			0124 E	10	2	1-	x	c
20			10			0134 E	26	2	1-	x	c
20			18			0200 E	65	3	1+	x	c
21	>23	>45	>15			0326	51	2	1	x	c
23	x	>32	>41			0114	74	3	3+	x	c
24			20			0321	22	2	2-	x	c
29		42		x	6	1252	13	1	1-	x	c
30		>30	>34			0101	22	1	3-	x	c
30			15			0112	11	1	1	x	c
31	12	8	8			0347	26	2	1-	x	c

NOTE CO:Colorado(WWV) HA:Hawaii(WWVH) Aus:Australia Mos:Moscow BBC:London

* Optical and X-ray Flares

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Mar. 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	Max.
1		—	35	14			0622	0720	0632
1		—		5	7		2330	2350	2336
2		—	7	5			0316	0336	0320
2		—	17	11			0502	0538D	0514
2		—	12	4			0538E	0606	0542
2		—			90		2040	2106D	2054
2		—		90	122	88	2106E	0242	2144
3		—	23	13	9		0346	0412	0352
3		—	24	7			0706	0730	0712
3		—	5				1046	1106	1052
4	24	—	40	65	67	36	0104	0210	0120
4		—	14	5			0446	0520	0500
4		—	47				1008	1104	1024
5	23	—	25	50	53	31	0040	0134	0048
5		—	18	5			0622	0648D	0628
5		—	7				0648E	0706	0654
5		—	31				1124	1154	1132
6		—		4	3		0136	0202	0148
6		—	8				1008	1020	1012
6		—	94				1034	1126	1042
6		—			133		2018	2220	2046
6		—	9	25	31		2226	2300	2232
7		—	7				0734	0744	0738
7		—		5	5		2336	0002	2346
8		—		—	—		0018	0052	—
9		—	14	12	8		0214	0240	0220
9		—	14	4			0530	0610	0542
11		—	9	11	8		0211	0230D	0220
11		—	76	69	51		0230E	0552	0316
11		—	5				0712	0730	0716
11		—	32				0756	0830	0804
11	42	—	27	140	141	110	2154	2312	2203
11		—		7	7		2346	0006	2356
12		—	16	9	4		0400	0416D	0406
12	29	—	81	65	29	31	0416E	0522	0429
12		—	36	12			0710	0754	0716
12					9		2034	2048	2038
12				12	15		2158	2222	2201
13		28	48	32	22		0330	0430	0342
13		69	48	15			0638	0748	0700

Inubo

Mar. 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	Max.
13		42	52				0901	0928	0910
13		22					1512	1550	1526
15			9	9			0306	0356	0320
15			14				1000	1022	1006
15					45		1908	1934	1912
15				54	72		2040	0022	2132
16	13	30	52	37	26	24	0244	0330	0252
16		24	35	22	12		0411	0452	0416
16			6	4			0602	0624	0608
16			7				0658	0712	0704
16			8				0752	0810	0758
17				6	4		0002	0026	0008
17			12	6	5		0413	0438	0418
18				5	5		0052	0108	0058
18				9	11		0110	0138	0116
18	22		7	33	32	22	2254	2314D	2300
18				27	29		2314E	2346	2318
19				40	35	27	0010	0140	0022
19	22*	37*	83*	60*	53*	37*	0219	0320	0238
19				6	6		2230	2240	2234
20				6	6		0030	0046	0034
20	45	54	66*	104*	117*	86	0050	0242D	0108
20	27	30	68	50	54	42	0240E	0334	0248
20		31	47	17			0705	0742	0710
20		24	31				0746	0818	0754
20		57	19				0954	1046	1014
20		61	5				1206	1250	1222
20				6	12		2144	2206	2152
21				11	9		0104	0124D	0108
21				17	15		0124E	0158	0132
21	68	122	171	130	89	83	0320	0508	0340
21				8	7		2340	2356	2346
22			24	28	28		0100	0148	0110
22				6	4		0158	0216	0204
22			6				0446	0502	0452
22			16				0752	0822	0801
23			14	24	20		0012	0042	0020
23	47	59	140	127	106	76	0120	0324	0150
23		36	42	30	14		0344	0430	0402
23		24	32	17	12		0446	0522	0452

Inubo

Mar. 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	Max.
23		—	9				0734	0756	0742
23		—	37				0814	0834	0820
23					14		2147	2210	2156
23			18	34	33		2348	0024	2358
24				7	8		0044	0106	0056
24	14		23	30	22	24	0140	0218	0146
24	50	62	112	81	60	57	0322	0432	0329
24		—	4				0816	0834	0822
25				5	5		0050	0116	0058
28				8	6		0036	0052	0042
28			12				0825	0840	0832
29				8	9		0046	0116	0050
29			17				0815	0828	0818
29	32	87	93				0832	0904	0836
29		102	5				1253	1330	1302
30	68	80	104	138	120	107	0101	0220	0108
30			22	12	7		0329	0402	0334
30				7	9		2230	2254	2236
31				9	8		0028	0052	0036
31	25	39	60	36	22	23	0346	0454	0356
31			11	4			0610	0626	0616
31		57	65				0905	0930	0914

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