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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 flare, solar radio burst, and geomagnetic crochet 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

DEC. 1989

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	50	53	43	52	53	50	40	72	120	165	148	157	148	144	134	126	109	93	87	71	60	55	53	43
2	45	38	36	44	37	38	35	102	141	158	164	171	163	165	159	147	130	110	82	74	72	64	64	57
3	52	53	51	43	60	59	62	125	128	164	162	160	157	148	147	143	131	130	88	83	61	52	59	32
4	56	42	46	44	55	43	37	66	118	147	160	160	151	147	148	138	133	113	90	70	60	58	60	44
5	38	38	43	43	39	38	44	72	112	144	139	147	144	147	144	130	127	97	88	66	62	53	49	38
6	40	38	42	40	42	42	30	91	122	145	144	139	138	138	139	127	120	89	68	54	46	30	38	30
7	44	46	43	40	38	38	39	84	120	137	144	150	147	140	130	122	100	94	72	58	51	38	38	39
8	44	36	40	42	44	38	36	62	128	158	161	144	152	150	140	134	128	96	82	64	60	53	46	42
9	41	38	37	43	46	48	40	73	120	139	160	160	146	159	142	126	120	68	86	86	53	53	62	65
10	43	39	43	50	43	65	44	88	109	128	136	131	120	134	126	107	122	87	72	54		40	40	35
11	37	43	44	44	43	42	41	62	94	132	141	136	120	122	122	96	96	86	62	46		34	34	30
12	42	30	32	29	31	32	35	70	117	144	130	139	132	124	122	116	103	65	66	53	50	38	32	37
13	38	38	34	38	34	30	28	63	82	145	157	158	157	146	143	124	112	73	62	55	35	40	42	40
14	34	33	38	38	34	30	36	65	110	121	144	147	126	120	101	118	100	53	48	44	32	32	31	34
15	N	30	30	30	31	30	32	67	104	138	148	142	127	121	125	120	107	70	58	38	37	34	37	33
16	36	35	38	35	31	30	41	62	109	118	144	136	118	123	116	105	82	76	65	40	29	A	26	N
17	26	29	33		28	30	35	26	117	128	136	136	138	134	138	120	90	75	47	43	25	31	25	A
18	A	31	35	31	30	31	28	58	105	102	141	136	121	122	113	125	84	62	64	50	34	30	31	37
19	34	A	42	33	35	35	26	57	88	110	127	131	122	118	118	111	97	72	59	50	37	31	36	30
20	34	38	38	35	36	38	32	60	89	121	134	136	124	118	123	104	91	74	60	39	28	A	31	33
21	37	36	A	35	30	40	42	60	80	102	131	134	101	118	116	105	84	68	57	51	35	35	35	A
22	38	41	38	38	38	38	36	66	90	125	140	139	121	121	131	119	88	66	66	55	37	A	30	28
23	28	28	54		N		A	62	121	128	140	141	133	128	133	118	116	86	61	42	42	39	45	47
24	37	38	37	40	38	36	30	62	101		150	148	143	131	116	110	100	89	78	62	A	37	43	43
25	43	38	32	35	31	N	A	57	106	127		146	140	131	128	126	112	68	76	63	44	42	49	N
26	42	42	42	48	37	37	30	62	106	119	133	132	121	118	107	109	96	85	74	52	44	40	38	37
27	32	37	34	37	44	39	A	56	92	111	124	120	117	118	112	108	100	85	80	64	41	43	49	37
28		38		39	38	36	44	57	88	119	124	128	129	131	122	111	93	80	73	68	49	38	38	44
29	32	41	42	52	40	42	37	63	94	109	110	110	114	113	111	99	90	77	63	56	44	35	34	
30	28	30	27		44	46		41	99	120	119	134	119	114	105	100	97	96	65	66	51		A	31
31	37	38		34	30	27	30	58	89	117	126	138	127	122	123	108	118	96	78	63	56	59	58	53
	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	30	28	28	30	29	27	31	31	30	30	31	31	31	31	31	31	31	31	31	28	27	30	26
MED	38	38	38	40	38	38	36	62	106	128	140	139	129	128	125	118	100	85	68	55	44	39	38	37
U Q	43	41	43	43	43	42	41	72	120	144	148	148	146	144	139	126	120	94	80	66	54	53	49	43
L Q	34	35	34	35	31	31	30	58	92	119	131	134	121	120	116	108	93	70	62	50	36	34	34	33

HOURLY VALUES OF FES AT WAKKANAI

DEC. 1989

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	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
2	G	G	G	G	G	G	G	G	37	G	G	G	G	G	G	G	G	G	G	G	G	35	G	27
3	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	26	G
4	G	G	G	G	G	G	G	23	G	G	G	G	G	G	G	31	G	G	G	33	24	G	G	G
5	G	G	G	G	G	G	G	G	G	63	G	G	G	G	41	37	G	36	27	G	G	30	G	G
6	G	G	27	G	30	37	32	G	G	G	G	G	G	G	36	33	32	G	G	26	32	27	G	G
7	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	25	G	G	G	G	23
8	26	30	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	G	G	G	G	G	32	G	G	G	G	G	G
10	G	G	G	G	G	G	G	G	34	G	G	G	G	G	G	G	G	G	G	G		26	G	G
11	G	G	G	G	G	28	31	G	G	70	G	42	G	G	G	G	G	G	G	G		26	G	G
12	G	G	G	G	G	G	G	G	G	48	G	G	G	G	G	G	G	G	G	G	G	G	G	G
13	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28	G	G
14	G	G	G	G	G	G	G	G	48	42	G	G	G	G	G	G	G	28	G	G	G	G	G	G
15	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	G	31	G	G	G	G	28	G
16	G	G	G	G	30	32	G	G	G	G	44	G	G	G	G	34	G	44	33	31	29	31	G	G
17	G	G	G		G	G	G	G	32	38	G	G	G	G	G	G	G	G	G	G	G	G	56	34
18	28	32	34	G	G	G	G	G	45	G	G	G	G	G	G	G	G	28	G	G	G	G	G	G
19	G	29	G	G	G	G	32	37	35	G	40	G	G	G	G	G	G	11	G	G	G	G	G	G
20	29	G	G	G	G	G	G	G	42	G	G	46	48	G	G	G	G	G	G	G	G	29	G	29
21	G	31	32	27	G	G	G	G	32	59	G	G	G	G	G	G	G	G	G	G	G	G	26	58
22	37	27	32	28	G	G	G	29	G	G	G	G	41	G	G	G	G	G	G	G	35	41	G	G
23	G	G	G		G		26	G	G	42	44	G	41	G	G	36	G	G	G	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	65	G	G	G
25	G	G	G	G	G	G	47	G	31	G		G	G	G	G	G	G	G	G	G	G	G	G	G
26	29	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	34	40	G	G	G	G
27	G	G	G	G	27	G	32	32	G	G	G	G	G	G	G	32	40	G	G	G	G	G	G	G
28	G	G	G	G	G	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	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
30	G	G	G		G	G	G	G	G	37	G	G	G	G	G	G	G	57	60	G	32	G	26	28
31	G	G	G	G	G	G	33	G	48	45	G	G	G	40	67	59	G	35	37	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	31	31	31	28	31	30	31	31	31	31	30	31	31	31	31	31	31	31	31	31	29	31	31	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	32	38	G	G	G	G	G	31	G	28	G	G	G	26	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

DEC. 1989

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	16	15	15	16	15	15	15	22	26	35	26	27	33	30	29	26	18	17	15	16	15	15	15	14
2	15	16	16	16	15	15	15	23	18	23	23	24	33	33	22	26	18	16	15	15	15	16	15	15
3	15	15	15	14	14	15	15	24	18	20	32	30	37	24	20	18	20	17	15	16	15	15	16	16
4	16	15	17	15	14	16	15	15	28	20	23	22	34	23	20	26	18	15	15	15	15	16	15	17
5	15	16	15	15	15	15	15	20	26	27	32	20	22	22	17	17	18	16	15	15	15	16	16	17
6	15	15	15	15	15	15	15	22	18	20	26	34	23	20	21	17	17	15	15	16	16	16	17	17
7	16	15	16	16	15	15	15	21	17	22	22	26	34	30	30	28	20	17	15	15	20	15	16	16
8	16	16	15	16	16	15	16	21	27	22	36	27	38	34	30	26	21	17	17	15	15	15	16	17
9	17	16	15	16	16	15	15	26	22	30	33	28	27	35	29	26	17	17	16	18	18	18	18	17
10	16	17	16	16	16	16	16	20	20	29	22	34	27	33	28	27	18	17	15	16		15	16	15
11	15	15	15	15	14	16	16	17	28	24	26	26	33	30	29	27	18	15	15	16		16	15	18
12	15	15	15	15	18	17	16	20	26	29	33	30	32	33	30	26	18	17	15	15	26	16	17	15
13	15	16	16	15	16	15	15	18	26	29	21	24	22	32	18	24	17	15	15	15	15	15	18	15
14	15	15	15	15	15	15	15	17	26	17	18	21	21	24	29	26	27	20	17	16	16	N	15	16
15	15	15	15	17	15	14	16	17	24	17	18	18	33	30	17	18	18	18	16	15	15	16	18	18
16	18	17	16	14	15	16	15	17	26	18	33	24	24	22	18	17	17	16	16	17	15	17	17	N
17	N	15	16		N	15	15	16	17	20	27	34	24	30	22	26	16	16	15	15	15	16	15	16
18	17	15	15	16	15	15	15	17	26	17	32	21	22	22	28	24	17	15	21	16	16	15	16	18
19	20	16	15	15	15	15	16	16	17	21	22	32	26	30	29	26	18	17	16	18	15	16	16	17
20	15	16	15	15	15	15	15	17	26	21	23	24	23	26	21	17	18	14	15	15	15	15	16	16
21	15	15	16	16	15	15	15	17	16	20	24	24	26	38	30	26	18	17	15	15	15	16	15	16
22	17	16	15	16	15	17	15	17	26	28	23	35	24	26	23	18	18	15	16	15	16	16	N	N
23	N	16	14		N		18	18	18	23	23	26	24	34	29	23	18	15	17	15	15	15	15	17
24	18	16	16	15	15	15	15	17	27	22	23	26	26	26	30	22	18	16	17	15	17	17	15	16
25	16	17	15	15	16	17	16	18	17	32		28	26	36	30	27	17	18	15	15	15	18	24	18
26	17	15	18	15	17	15	18	18	17	23	22	24	24	27	29	28	21	15	16	17	16	17	15	15
27	16	15	N	15	15	15	17	18	18	20	30	34	27	24	23	21	16	15	15	15	16	18	21	15
28	N	N	N	26	21	23	15	16	27	23	24	34	27	43	24	27	20	17	17	23	15	16	26	26
29	18	15	16	22	16	16	15	17	17	28	33	26	36	33	32	28	21	22	15	15	16	N	N	N
30	N	16	N				N	18	27	28	29	28	28	39	34	35	22	16	23	24	16	N	16	17
31	16	20	N	15	N	N	14	18	18	23	28	35	28	30	24	20	20	16	15	16	16	17	16	17
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	30	27	28	27	28	30	31	31	31	30	31	31	31	31	31	31	31	31	31	29	28	29	28
MED	16	16	15	15	15	15	15	18	24	23	25	26	27	30	28	26	18	16	15	15	15	16	16	16
U Q	17	16	16	16	16	16	16	20	26	28	32	32	33	33	30	27	20	17	16	16	16	16	17	17
L Q	15	15	15	15	15	15	15	17	18	20	23	24	24	24	21	20	17	15	15	15	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT AKITA

DEC. 1989

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	53	38	40	38	41	44	35	85	114	137	141	140	138	137	124	116	114	100	91	88	68	52	52	54
2	47	41	48	40	31	37	44	110	152	160	143	164	162	137	138	138	130	121						
3											160													
4										146	148	138	137	135	137	134	131	120	84	80	62	57	63	49
5		38	42	44	36	40	44	88	111	132	146	136	138	141	138	131	113	112	87	66	69	58	55	47
6	A	A	A	42	46	56	A	78	116	140	137	137	134	138	138	C	118	84	84	67	28	A	44	45
7	28	47	42	43	39	43	50	86	118	138	137	138	136	138	134	136	113	100	84	64	53	35	41	46
8	42	40	44	42	40	42	38	77	116	143	140	138	132	137	137	134	124	111	86	73	54	48	25	46
9	N	48	46	50	49	52	51	81	122	142	144	138	136	140	140	131	110	110	94	67	57	44	52	44
10	38	39	41	43	41	44	54	72	99	126	143	135	120	120	121	117	90	94	86	62	38	32	37	32
11	35	A	43	38	42	39	48	69	88	108	125	130	121	111	116	128	88	89	84	53	32	35	42	38
12	31	31	31	35	38	36	40	77	118	138	138	108	119	116	124	119	99	88	66	54	30	30	43	40
13	44	34	37	38	33	30	34	76	88	140	163	156	134	137	136	130	110	77	63	71	44	40	28	43
14	42	A	30	35		31	38	79	110	121	141	138	132	130	110	98	112	70	46	44	25	32	36	A
15	38	A	A	30	30	31	32	74	108	112	141	137	133	121	110	122	102	78	52	52	46	34	30	38
16	32	35	42	28	32	35	40	69	105	106	134	138	124	118	115	110	91	71	66	56	35	31	31	27
17	31	34	30		30	32	43	66	108	121	136	137	131	135	126	115	109	77	60	53	34	32	31	35
18		34	35		31	32	34	62	102	120	125	138	120	120		115	109	73	64	62	46		35	28
19	32	31	33	30	32	34	34	66	88	N	126	131	120	114	116	110	99	76	65	62	41	31	31	31
20	34	34	A		27		30	69	88	104	N	130	137	96	117	118	103	74	64	60	A	31	A	30
21	38	28	26	32	31	35	42	66	100	117	126	122	121	108	116	114	91	72	63	52	43	32	35	41
22	40	36	37	36	40	42	44	76	119	120	120	133	130	110	118	116	87	82	77	A	46	33	30	31
23	26	32	57	A				69	132	134	137	140	136	120	127	131	113	86	66	54	48	32	28	48
24	46	30	40	40	43	37	26	64	110	121	141	138	137	130	116	112	97	88	86	74	36	42	42	
25	42	45	40	39	47	32	27	63	105	126	138	139	134	126	130	119	115	84	75	76	58	49	44	45
26	40	47	44	48	36	37	41	67	94	116	121	131	115	117	114	107	102	84	87	64	50	42	43	44
27	41	38	35	40	42	38		67	88	107	114	122	111	110	107	102	98	86	75	71	49	48	48	50
28	43	42	48	42	42	40	52	66	88	115	132	132	135	118	114	108	90	87	72	67	60	47	47	42
29	42	A	42	42	42	43	44	68	86	111	108	116	123	111	113	107	88	86	73	63	57	42	46	38
30	42	48	37	30	46		50	63	108	136	120	130	117	112	90	103	99	109	88	70	58	47	44	45
31	A	43	43	41	40	43	41	62	109	114	134	137	126	120	117	111	109	104	87	73	52	63	51	50
	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	26	25	27	26	26	29	29	29	30	30	30	30	29	29	30	30	29	28	28	27	28	27
MED	40	38	40	40	40	38	41	69	108	121	137	137	132	120	118	116	106	86	75	64	47	40	42	43
U Q	42	42	43	42	42	43	44	77	116	138	141	138	136	137	135	130	113	100	86	71	57	48	46	46
L Q	33	34	35	35	32	34	34	66	91	114	126	131	121	114	114	110	97	77	64	55	37	32	31	35

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT AKITA

DEC. 1989

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	G	G	G	30	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
2	G	G	G	23	G	G	G	G	G	G	G	G	G	59	G	G	G	G						
3											54													
4										G	G	G	G	43	39	G	G	G	G	24	70	36	29	G
5		G	G	G	G	G	G	G	G	G	G	G	G	G	38	G	G	33	29	28	G	G	37	91
6	82	67	74	G	35	34	32	34	35	47	G	G	G	G	G	G	G	G	25	42	30	35	G	G
7	G	G	G	G	G	G	G	G	G	40	G	G	G	G	G	37	G	G	28	31	30	24	G	30
8	G	G	G	31	G	G	G	G	G	G	54	48	G	G	G	G	G	G	G	G	G	G	33	G
9	G	G	G	34	31	G	G	G	39	49	G	G	G	51	G	G	G	G	G	G	G	G	G	G
10	G	G	G	G	G	G	G	G	34	38	G	58	G	G	39	G	G	G	G	26	G	G	G	G
11	G	27	G	G	G	G	G	G	G	G	46	64	89	G	G	G	G	G	G	G	G	26	G	G
12	30	G	G	G	31	G	G	G	49	G	G	G	G	G	G	G	G	G	G	G	27	G	G	G
13	G	G	G	G	G	G	G	G	G	G	G	G	G	51	39	G	G	G	G	G	G	G	G	G
14	31	31	G	G		G	G	G	G	38	94	50	G	G	G	G	G	26	G	G	26	G	G	46
15	32	32	32	32	G	G	G	G	G	G	G	G	G	G	G	40	G	26	36	G	24	25	G	G
16	G	G	G	G	27	G	G	G	G	G	41	56	G	G	G	G	G	26	G	G	G	G	G	G
17	G	G	G		G	G	G	G	G	39	45	68	G	G	G	G	31	29	G	G	G	G	G	G
18	G	G	G		G	G	G	G	35	38	G	G	G	G		G	G	36	G	G	G		G	26
19	G	G	G	G	G	G	G	G	34	41	42	G	G	G	G	G	30	28	G	G	G	G	G	G
20	G	G	29	G	G	G	G	G	G	48	41	G	G	G	G	G	35	G	32	33	49	24	29	28
21	26	25	G	G	G	G	G	26	G	43	59	G	G	G	G	G	G	G	G	G	G	G	G	30
22	28	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	58	G	24	36	G	G	G	G
23	G	G	G	24				G	G	54	93	74	73	G	G	G	30	G	G	G	G	G	G	G
24	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	29	G	G	G	G	G	G	
25	G	G	G	G	G	G	G	G	G	G	G	61	G	G	G	G	G	28	30	31	31	26	G	G
26	G	29	32	29	G	G	G	32	G	G	G	G	52	G	G	G	G	G	G	G	G	G	G	G
27	G	G	G	G	G	G		G	40	53	50	G	G	G	G	46	44	G	G	G	25	29	G	27
28	G	G	G	G	G	G	G	G	G	G	G	G	51	G	G	G	G	G	G	G	G	G	G	G
29	G	33	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
30	G	G	G	G	G	G	G	28	G	G	G	G	G	G	G	G	G	25	39	48	G	58	58	G
31	26	G	G	G	24	G	G	G	G	G	74	45	G	G	48	53	G	32	G	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	28	29	29	27	27	28	27	29	29	30	31	30	30	30	29	30	30	30	29	29	29	28	29	28
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	13	13	G	G	G	G	G	G	17	40	46	48	G	G	G	G	G	26	24	27	25	24	G	13
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

HOURLY VALUES OF FMIN AT AKITA

DEC. 1989

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	16	15	18	16	16	16	16	17	18	20	21	23	20	16	16	20	22	17	16	16	17	16	16	16
2	17	15	15	15	20	N	16	24	28	21	20	22	22	21	16	20	22	16						
3											20													
4										16	20	21	21	22	20	16	22	16	16	16	16	16	16	16
5		18	16	18	16	18	16	21	18	16	17	20	22	21	17	17	21	15	15	16	16	16	16	16
6	15	15	14	15	15	15	16	15	16	20	21	20	21	20	21	C	21	16	16	16	16	16	16	16
7	15	16	15	15	17	17	16	22	17	22	22	23	23	21	22	18	21	17	16	18	16	17	16	16
8	16	15	16	15	16	16	16	22	16	18	22	22	24	26	22	20	22	16	15	16	16	16	17	17
9	20	15	15	15	15	16	17	21	21	21	21	24	27	20	20	30	21	16	16	16	16	16	18	16
10	21	15	15	15	15	16	18	23	17	16	17	20	22	20	18	18	22	15	16	17	18	17	16	16
11	18	16	15	15	15	16	16	21	16	18	20	20	20	20	20	17	21	16	16	16	16	17	17	15
12	16	15	15	15	15	18	16	21	17	20	20	20	21	20	18	16	22	17	18	17	18	20	20	16
13	17	15	15	16	15	18	16	20	16	20	18	17	17	18	16	16	21	17	16	16	16	18	20	16
14	16	15	16	16		18	16	20	16	16	18	20	18	17	18	17	16	16	15	17	16	20	16	15
15	16	15	15	15	16	16	18	20	16	16	16	18	18	18	18	16	22	17	16	17	16	17	18	16
16	16	15	15	15	15	16	16	20	15	16	15	16	18	17	18	16	22	20	16	17	16	18	17	17
17	17	18	15		N	18	18	20	15	16	17	20	18	18	16	18	18	17	16	16	16	16	18	17
18	18	15	18		17	15	16	20	16	16	18	20	18	18		18	22	17	16	16	17		20	17
19	16	16	16	16	16	17	16	20	17	22	20	20	21	22	20	18	23	18	16	17	18	18	17	16
20	16	15	16	16	18	21	16	20	27	20	20	21	24	22	22	29	16	20	16	16	16	16	17	18
21	17	16	16	15	16	16	17	20	17	18	18	20	22	22	21	29	22	16	16	16	16	18	20	16
22	17	16	15	15	15	16	16	21	17	18	21	22	23	21	20	20	16	16	17	16	16	16	N	N
23	N	15	15	15				20	17	18	23	24	23	21	21	32	20	18	16	16	16	16	18	16
24	18	16	16	15	15	16	17	21	18	21	20	21	22	24	23	23	23	17	20	18	16	21	16	
25	18	20	15	15	15	17	N	20	26	20	36	27	36	26	23	32	22	17	17	17	17	20	18	17
26	18	15	15	15	16	17	16	17	18	20	22	27	23	45	26	34	22	18	18	17	16	21	18	17
27	21	15	15	15	16	17		21	17	18	21	27	26	22	21	22	20	16	18	16	17	17	17	16
28	18	15	15	15	15	17	16	21	18	22	22	23	23	43	23	33	26	18	16	17	17	16	17	17
29	17	15	15	16	15	16	16	18	17	21	22	22	22	23	23	22	24	16	17	17	16	17	17	16
30	16	18	15	N	15	16	17	16	16	23	26	43	24	22	23	21	22	16	15	15	17	16	16	16
31	16	16	18	20	16	15	20	20	17	21	22	26	23	26	24	17	23	16	15	16	16	18	15	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	27	29	29	26	26	27	26	29	29	30	31	30	30	30	29	29	30	30	29	29	29	28	28	27
MED	17	15	15	15	16	16	16	20	17	20	20	21	22	21	20	20	22	16	16	16	16	17	17	16
U Q	18	16	16	16	16	17	17	21	18	21	22	23	23	22	22	26	22	17	16	17	17	18	18	17
L Q	16	15	15	15	15	16	16	20	16	16	18	20	20	20	18	17	21	16	16	16	16	16	16	16

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT KOKUBUNJI

DEC. 1989

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	72	37	32	64	41	49	44	82	40	142	152	N	146	137	126	120	124	114	101	82	70	51	57	67
2	48	44	42	37	32	31	48	115	145	146	148	169	154	145	147	153	145	135	110	97	94	76	57	49
3	50	51	53	60	53	56	64	94	131	150	145	145	143	140	141	146	140	123	108	84	83	66	54	70
4	52	42	47	41	47	53	46	83	118	154	154	137	138	134	134	138	137	123	102	86	85	66	76	71
5	50	46	40	C	36	30	42	92	117	131	148	134	140	141	137	130	123	127	108	92	76	71	A	A
6	A	48	42	44	42	42	48	86	130	142	151	152	115	144	146	144	126	113	92	81	58	45	49	46
7	49	44	42	44	47	44	50	94	123	138	150	145	145	144	144	148	122	106	101	79	60	44	42	49
8	48		39	42	40	43	42	84	108	142	165	139	132	143	145	141	134	127	110	64	62	45	A	A
9	A	45	44	49	53	46	54	86	121	141	144	146	136	138	146	146	127	109	113	83	63	50	50	47
10	46	39	56	36	40	36	44	78	107	121	140	137	137	128	131	131	121	104	90	86	52	54	38	38
11	37	29	42	49	31	34	44	84	100	109	152	128	129	122	125	138	117	85	90	70	56	56	56	54
12	54	32	36	34	33	37	46	92	115	135	163	127	125	118	124	124	106	90	69	57	51	38	48	50
13	58	44	38	45	36	33	49	84	117	146	148	153	142	140	139	134	116	94	62	77	64	47	48	53
14	43	31	63	32	36	A	46	85		117	150	151	137	138	121	98	105	93		53	50	56	42	52
15	44	30	42	32	A	31	46	71	113	132	132		133	128		125		80	65	67	56	46	46	39
16	38	38	31	38	35	35	42	75	101	114	125	138	132	117	107	118	101	76	71	55	45	32	47	36
17	32	36	43	55	31	40	47		104	144	142	132	133	145	136	126	112	88	84	71	49	46	38	47
18	40	34	32	32	31	42	37		104	122	121	130	132	128	122	128	122	78	69	72	65	47	42	38
19	39	29	32	32	31	28		74	94		116		140	121	119	121	116	90	80	77	66	46	38	35
20	A	30	38	30	36	32	32	62	105	111	128	133	140	124	127	133	110	94	73	68	58	56	40	46
21	47	37	38	38	31	31	42	69	104	116	122	121	148	120	128	118	94	88	71	64	54	57	41	36
22	36	A	A	38	36	40	42	82	123	134	132	128	134	138	121	121	85	89	79	72	58	41	33	31
23	34	53	75	38			28	80	121	145	145	141	137	128	128	127	114	88	78	64	53	50	44	42
24	40	42	37	42	45	31	32	68	110	141	145	140	138		124	118		88	90	77	43	50	45	44
25	47	48	44	45	40	34	31	78	110	120	150	145	136	131	131	119	113	104	74	83	74	52	46	45
26	48	55	42	47		35	38	73	104	114	131	120	126	120	120	110	119	105	99	92	63	52	47	50
27		42	40	50	50	34	30	71		95	114		122	115	114	103	97	93	85	70	55	53	48	50
28	45	44		40	40	33	50	76	97		127		129	126	118	116		94	69	70	66	51	45	
29	46	51	52	50	42	36	46	74	104	122	120	123	120	115	124	117	100	91	75	76	76	57	51	52
30	52	53	51		54	65	49	66	112	141	130	118		121	112	109	108	108	97	76	66	54	56	48
31	47	46	48	42	48	38	30	68	110	116	138	132	127	121	122	114	109	110	95	74		65	60	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	29	29	29	28	29	30	29	29	29	31	26	30	30	30	31	28	31	30	31	30	31	29	27
MED	47	42	42	42	40	36	44	80	110	134	144	137	136	128	126	125	116	94	88	76	61	51	47	47
U Q	50	47	47	48	46	42	48	85	119	142	150	145	140	140	137	138	123	110	101	83	66	56	52	52
L Q	40	35	38	36	34	32	38	72	104	116	128	128	129	121	121	118	107	88	73	68	54	46	42	39

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

DEC. 1989

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	G	G	G	G	40	46	52	G	62	G	G	31	30	25	G	26	G	G	G
2	G	G	G	G	28	G	G	G	48	43	46	G	G	51	50	39	32	25	G	32	G	G	G	G
3	G	G	G	G	G	G	G	G	G	G	44	58	45	46	47	G	G	G	G	G	G	G	G	G
4	26	40	28	G	31	G	G	38	38	43	49	47	48	44	41	G	G	G	G	24	58	29	49	40
5	28	24	G	C	G	G	G	G	G	40	G	43	46	43	G	G	G	G	41	48	56	37	60	55
6	51	28	46	G	G	G	59	52	48	41	43	G	G	G	G	G	G	G	25	G	G	G	29	24
7	26	G	G	G	G	G	G	G	38	44	57	52	44	49	G	37	31	28	34	G	G	22	G	G
8	G		G	30	G	G	G	45	G	G	43	61	45	44	G	G	G	G	G	G	G	30	53	44
9	33	G	G	29	G	G	G	G	G	69	48	44	G	G	G	G	G	G	G	G	G	G	G	G
10	G	G	G	G	G	G	G	G	G	62	44	G	49	G	42	G	G	G	G	G	25	G	30	G
11	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	48	28	G	G	G	G	G	28
12	26	G	30	27	G	G	G	G	G	G	43	G	G	G	G	G	54	31	G	28	29	G	33	G
13	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
14	G	G	24	36	25	30	23	G	G	40	G	80	51	G	G	G	G	G	G	G	G	G	G	G
15	25	32	25	G	27	26	G	G	G	G	G		G	G		G		29	28	G	G	G	25	G
16	G	G	G	G	G	G	G	G	G	48	G	44	G	43	43	G	30	24	G	31	27	23	G	G
17	G	G	G	G	G	24	G		38	58	62	46	44	50	G	G	G	G	G	G	G	G	G	25
18	G	G	G	G	G	G	G		G	40	56	G	G	G	G	48	G	G	G	G	G	G	G	G
19	G	G	G	G	G	G		G	38		47		G	G	G	G	G	G	G	G	G	G	G	G
20	33	25	G	G	G	G	G	G	G	G	G	G	G	G	G	46	G	25	G	G	G	G	G	31
21	29	49	28	28	G	G	G	G	34	43	48	46	G	G	G	G	G	G	G	G	G	G	G	G
22	G	34	30	G	G	G	G	G	G	G	42	G	G	G	G	G	32	31	G	G	G	G	G	G
23	G	G	G	G	G		G	G	G	G	71	G	50	G	G	G	G	33	27	29	G	G	G	G
24	G	G	G	G	G	G	G	G	G	G	42	G	G		53	G	G	38	38	30	31	G	G	G
25	57	32	G	G	G	G	G	G	41	G	G	61	G	G	G	G	G	40	26	G	G	G	G	G
26	G	G	G	G		G	G	G	G	G	G	G	G	43	G	G	G	28	G	G	G	G	G	G
27		G	G	G	G	G	G	G	G	G	47	G	G	48	G	44	34	G	G	G	G	31	32	30
28	29	G		G	G	G	G	G	G		44		G	G	G	G	G	G	G	G	G	G	G	
29	G	G	G	G	G	G	G	G	G	41	43	G	54	48	G	G	G	G	G	G	G	G	G	G
30	G	G	G		G	G	G	29	G	G	G	G	G	G	55	G	G	G	G	25	35	33	G	54
31	25	G	G	G	G	G	G	G	G	G	G	43	58	G	51	G	G	26	29	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	29	30	30	30	29	31	29	31	28	31	30	30	31	30	31	31	31	30	31	31	29
MED	G	G	G	G	G	G	G	G	G	G	43	G	G	G	G	G	G	G	G	G	G	G	G	G
U Q	26	24	G	G	G	G	G	G	34	43	47	46	45	44	41	G	30	28	25	24	25	G	25	26
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

DEC. 1989

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	14	15	14	14	15	15	16	15	16	15	20	21	21	20	17	17	15	15	15	14	15	14	15	15
2	16	15	15	14	16	N	15	16	16	16	17	23	22	21	18	16	15	15	15	15	15	14	15	15
3	16	15	14	14	14	14	14	22	16	15	17	23	20	17	17	18	20	15	14	15	15	15	15	15
4	14	15	15	14	15	14	15	16	14	14	17	17	18	21	20	17	15	15	14	15	15	15	15	15
5	15	14	14	C	14	18	15	23	15	16	17	18	18	20	18	17	17	15	15	14	15	15	15	15
6	14	14	14	15	14	16	15	15	15	15	16	16	20	18	17	16	18	15	15	15	14	15	14	15
7	14	14	14	15	14	15	15	22	15	16	18	21	22	20	18	16	18	14	15	15	15	20	15	15
8	15		18	17	14	15	15	23	15	16	18	18	23	20	18	16	15	14	15	14	15	16	15	15
9	15	15	15	15	15	15	14	18	15	16	20	20	22	21	17	17	17	14	15	14	16	15	15	14
10	15	14	15	15	15	14	15	22	16	16	16	22	18	22	17	15	15	14	14	15	14	14	15	15
11	15	15	14	14	14	15	15	22	15	17	16	18	18	17	16	14	17	15	15	16	14	15	15	16
12	15	16	14	14	14	15	15	20	15	16	16	17	17	18	16	14	14	14	15	15	16	15	14	15
13	15	16	14	15	15	15	15	15	16	15	17	18	18	18	18	17	15	15	14	15	15	15	15	15
14	14	14	16	14	15	15	15	15	15	14	15	15	20	16	17	16	15	15	14	14	14	15	14	15
15	14	14	14	15	15	16	15	15	15	16	17		18	18		16		15	15	15	15	15	15	15
16	15	14	14	14	14	15	15	15	15	14	15	16	16	16	17	15	14	15	15	15	15	16	15	15
17	15	14	14	14	15	15	15		14	14	16	16	16	16	16	16	17	15	15	14	15	15	14	15
18	14	14	15	14	15	15	15		15	16	16	17	18	20	17	17	15	15	16	15	16	15	16	14
19	16	15	15	16	15	16		16	15	20	21		20	20	18	18	16	15	16	16	15	16	17	15
20	15	17	16	16	15	15	16	22	16	18	20	20	20	23	21	16	23	16	15	15	15	15	15	15
21	15	15	14	15	17	15	15	21	16	17	18	20	21	26	22	21	18	15	15	15	16	15	15	15
22	15	14	14	15	14	14	15	21	16	17	20	22	22	23	18	17	16	16	16	15	15	15	16	N
23	N	15	14	14	N		18	22	16	21	22	38	23	21	21	18	17	15	16	16	15	15	15	15
24	15	16	16	15	16	18	20	21	17	20	21	23	20		17	17	14	16	16	17	16	17	15	15
25	15	15	15	16	15	14	17	21	18	18	38	23	23	38	29	20	18	16	18	15	16	15	15	16
26	16	15	16	15		21	14	22	22	22	22	31	28	29	24	26	14	15	17	16	16	21	18	16
27		17	16	16	15	16	20	21	14	23	23	14	23	39	35	18	17	20	15	17	15	15	15	16
28	16	15		15	14	15	15	22	17		24		40	39	38	33	14	16	15	15	15	15	15	
29	15	15	14	15	14	15	14	15	17	21	21	27	24	24	21	20	26	16	15	17	14	15	15	15
30	16	15	14		16	16	15	16	18	22	39	39	32	27	22	21	24	16	15	15	14	15	16	15
31	14	16	15	15	15	14	14	17	17	18	38	23	23	27	21	21	23	16	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	29	30	30	29	29	29	30	29	31	30	31	28	31	30	30	31	30	31	31	31	30	31	31	28
MED	15	15	14	15	15	15	15	21	16	16	18	20	20	20	18	17	16	15	15	15	15	15	15	15
U Q	15	15	15	15	15	16	15	22	16	18	21	23	23	24	21	18	18	16	15	15	15	15	15	15
L Q	14	14	14	14	14	15	15	15	15	15	16	17	18	18	17	16	15	15	15	15	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT YAMAGAWA

DEC. 1989

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	68	51	35	40	29	25	40	67	103	132	148	144	146	142	125	125		138	114	90	87	79	63	65
2	52	40	44	41	31		38	71	110	117	145	167	161	152	148	147	146	145	132	127	113	85	59	58
3	53	52	53	57	51	54	49	70	122	140	137	127	132	130	144	149	145	136	132	123	120	88	87	87
4	76	36	35	50	38	38	37	66	108	138	162	137	125	141	145	142	145	136	127	126	121	103	84	79
5	62	42	42	55	37	N	34	86	104	111	147	146	140	141	142	137	140	141	129	110	107	80	76	63
6	A	34	38	41	57	36	N	71	112	131	149	148	153	150	156	164	153	146	133	122	109	81	59	63
7	63	34	46	47	38	38	43	78	129	131	142	162	146	146	160	163	156	140	131	132	84	80	66	64
8	63	57	39	38	52	A	42	71	102	128	145	142	136	138	145	148	146	139	132	111	96	77	63	62
9	52	51	53	53	46	70	47	72	103	123	137	135	136	139	145	153		134	136	130	90	84	55	63
10	53	35	35	36	44	40	36	66	111	120	130	141	140	138	137	144	145	144	135	111	86	74	65	58
11	54	52	46	43	50		25	64	106	122	116	135	138	133	134	134	142	124	103	88	88	82	68	67
12	54	36	A	32	34		N	60	121	114	137			133	135	133	132	115	88	87	83	62	54	54
13	54	35	46	48	37		32	54	112	130	146	150	143	143	150	146	131	126	108	87	N	86	66	30
14	49	A	A	42	34		28	62	127	145	138	146	125	151	148	140	119	133	117		80	84	51	63
15	53	24	28	28	31		24	54	107	135	137	132	132	141	135	126	123	118	106	96	80	78	62	47
16	37	43	39	39	37	31	26	60	102	127	129	130	132	130	131	128	126	100	85	70	77	63	52	46
17	41	29		43	47	44	54	77	102	153	146	144	146	164	160	147	136	114	106	97	80	66	38	31
18	33	A	36	30			28	60	101	125	134		136	145	143	136	143	140	109	108	110	106	63	34
19	31	37	32	29	32	70	32	64	101	111	120	120	137	141	139	147	146	136	128	116	118	86	62	36
20	52	48	44	28	37	63	31	52	100	122	124	130	145	132	134		146	142	126	110	110	106	84	61
21	46	42	42	35	40	35	28	53	86	127	133	116	134	134	145	143	128	124	109	86	81	78	63	52
22	32	42	32	31	43	25	32	60	112	124	132	127	142	148	140	133	130	118	104	83	85	83	57	
23	45	76	85	31		N	24	71	110	146	145	138	143	158	147	139	135	112	103	86	78	84	59	37
24	40	42	A	41	47	70		52	103	133	153	143	122		125	124	115	108	87	86	78	66	73	45
25	32	51	54	31	43	67	26	61	104	122		153	144	130	131	126	122	113	101	86	87	76	58	52
26	52	66	62	34	30		N	57	88	112	137	123	120	121	122	124	120	119	118	105	88	86	78	66
27	60	60	29	64	56	26		42	116	91	105	124	132	120	114	111	110	107	92	86	79	76	73	60
28	35	52	66	54	33		34	72	97	109	135	128	117	117	114	116	111	103	87	66	86	77	64	59
29	59	68	66	53	43	38	34	53	102	126	141	130	127	122	122	130	123	113	108	108	104	85	68	76
30	66	66	76	64	65	65	53	32	92	124	114	110	138	124	113	112	120	121	112	102	82	88	81	78
31	58	66	69	52	48		40	54	86	111	129	118	136	116	121	120	113	121	113	108	88	86	78	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	30	29	27	31	29	18	26	31	31	31	30	29	30	30	31	30	29	31	31	30	30	31	31	30
MED	52	43	44	41	40	39	34	62	104	125	137	135	136	138	139	136	132	124	112	104	87	82	63	60
U Q	59	54	54	52	47	65	40	71	112	132	145	145	143	145	145	147	145	139	129	111	107	86	73	65
L Q	41	36	35	32	34	35	28	54	101	117	130	127	132	130	125	126	121	114	103	86	81	77	59	47

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT YAMAGAWA

DEC. 1989

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	G	G	G	G	G	G	G	G	47	G	46	50		G	29	24	43	24	G	G
2	G	G	G	G	G		G	G	45	G	G	49	48	58	46	44	39	32	G	G	G	G	G	G
3	G	G	G	G	G	G	G	G	G	G	G	G	G	47	47	51	38	G	G	25	G	G	G	43
4	G	36	G	G	G	G	G	G	G	G	G	G	45	48	51	51	39	G	23	26	23	G	G	23
5	G	G	G	G	G	G	G	G	G	41	42	44	46	46	46	43	43	G	26	25	G	G	25	28
6	44	25	G	G	G	G	G	G	G	39	51	G	52	54	51	G	G	G	26	30	G	G	G	G
7	G	G	G	G	G	G	G	G	33	40	42	49	52	G	G	G	G	G	24	24	32	G	G	G
8	G	G	G	G	G	30	G	25	G	G	47	62	50	G	G	G	G	G	G	G	G	G	G	G
9	G	G	G	G	G	G	G	G	G	42	44	G	47	G	60	G		G	G	G	G	G	G	G
10	G	G	G	G	G	G	G	G	G	G	48	G	G	51	G	G	G	G	G	27	G	G	G	G
11	G	G	G	G	G		G	G	G	G	G	44	G	54	G	G	G	G	G	G	G	G	G	G
12	G	G	33	25	G	G	G	G	G	G	G		G	G	G	50	61	38	23	G	G	G	G	G
13	G	G	G	G	G		G	G	G	G	G	G	51	47	49	51	G	G	G	34	24	G	G	G
14	G	45	29	31	G		G	G	G	G	G	G	G	G	G	55	35	32	34	29	G	G	G	G
15	G	G	G	G	G		G	G	G	G	G	G	G	47	G	G	G	G	G	G	G	G	G	G
16	G	G	G	G	G	G	G	G	G	G	G	G	G	48	44	43	G	G	37	G	G	G	G	G
17	G	G	G	G	G	G	G	G	G	G	48	62	54	G	59	54	G	31	32	G	G	G	G	G
18	G	27	G	G			G	G	G	G	G	G	G	G	G	G	G	G	28	G	G	G	G	G
19	G	G	G	G	G	G	G	G	G	G	G	49	50	45	G	G	G	44	40	38	29	G	32	G
20	G	G	G	G	G	G	G	G	G	G	46	52	48	G	G	46	G	G	24	G	G	G	G	G
21	G	G	G	G	25	G	G	G	G	38	46	45	44	G	43	G	51	43	35	25	G	G	G	G
22	G	G	G	G	G	G	G	G	G	38	G	G	G	G	G	G	G	G	34	30	G	G	G	G
23	G	G	G	G		G	G	G	G	G	48	G	59	G	G	40	44	58	53	G	G	G	G	G
24	G	40	40	G	G	G		G	G	G	G	G	G	G	G	45	44	38	32	G	G	G	G	G
25	G	G	G	G	G	G	G	G	G	G		G	60	G	60	41	G	G	G	G	G	G	G	G
26	G	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
27	G	G	G	G	G	G		G	G	G	G	G	G	G	G	50	G	G	G	G	G	G	G	G
28	G	G	23	G	G	G	G	G	G	G	42	G	49	G	G	G	G	41	30	G	G	G	G	G
29	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	46	G	G	G	G	G	G	G
30	G	G	G	G	G	G	G	24	G	G	G	G	66	G	50	49	G	G	G	G	G	32	G	G
31	G	G	34	G	G		G	G	G	40	45	48	G	49	54	43	G	G	G	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	31	31	31	31	29	23	29	31	31	31	30	30	31	31	31	31	29	31	31	31	31	31	31	31
MED	G	G	G	G	G	G	G	G	G	G	G	G	45	G	G	41	G	G	23	G	G	G	G	G
U Q	G	G	G	G	G	G	G	G	G	G	45	45	50	47	49	50	39	32	32	25	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 YAMAGAWA

DEC. 1989

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

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT OKINAWA

DEC. 1989

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	86	66	54	66	52	30	42	76	108	138	146	132	141	137	112	124	142	145	120	104	104	90	84	76
2	87	65	52	42	30		53	63	108	122	142	151	157	148	147	151	162	163	168	161	146	108	84	75
3	80	81	66	43	40	36		63	122	136	128	120	134	144	157	170	164	164	178	175	171	170	168	143
4	108	74	54	71	52	42	44	63	112	140	145	134	127	A	147	146	146	164	171	178	186	177	146	122
5	108	87	67	80	45	22	44	89	111	108	144	146	142	148	149	145	165	171	164	166	162	131	108	108
6	84	58	60	68	60	38	38	78	126	137	132		162	170	N	176	187	192	182	177	186	169	144	109
7	89	80	66	58	60	34	37	85	127	134	146	156	154	162	164	181	184	188	178	187	174	146	139	85
8	90	80	60	66	59	24		80	127	138	132	136	145	145	147		160	158	161	170	163	127	88	87
9	86	85	80	90	90	54	50	83	111	120	138	130	136	147	146	163	168	177	177	187	177	174	127	88
10	84	76	62	67	73	66	32	74	121	140	134	141	144	156	162	171	183	199	164	171	182	169	145	86
11	87	85	77	62	38	30	A	61	121	147	126	127	142	146	147	156	162	165	165	162	169	167	164	87
12	66	53	47	46	46			62	121	146	145	136	144	144	147	144	150	145	138	124	108		84	79
13	56	51	53	52	40			55	122	134	151	120	145	154	156	153	145	147	147	138	108	99	105	74
14	52	55	62	51	41	30	34	66	122	159	166	137	161	170	175	172	162	161	170	140	108	121	108	86
15	66	51	34	30	45			54	110	145	146	127	134	151	160		141	158	144	108	110	143	90	87
16	54	80	87	78	64	53	52	66	118	143	141	126	138	147	155	146	143	136	120	87	90	89	86	66
17	53		N	52	54	53	62	86	140	162	158	136	151	177	177	171	171	172	144	141	148	108	84	67
18	41	61	32	51	54	36		66	120	138	143	138	146	159	177	188	187	196	177	N	176	160	128	86
19	86	72	57	52		39	44	66	108	119	143	126	137	156	169	177	180	177	182	171	183	172	147	88
20	66	66	65	56	46	38	37	54	102	122	137	120	136	147	154	168	177	188	182	174	187	187	157	90
21	71	57	58	48	40	32	31	55	103	128	142	122	121	138	157	168	168	172	169	162	162	145	108	88
22	58	50	59	54	61	30		66	108	132	142	124	144	151	162	N	156	158		108	108	108	91	107
23	84	143	142	53			25	89	109	150	164	148	147	138	165	N	170	158	145	145	108	128	88	40
24	34	52	67	76	59		31	54	106	146	158	145	121	121	137	131	128	122	103	86	90	88	89	62
25	N	66	77	52	42		A	66	123	136	145	158	143	141	152	146	144	145	143	139	128	126	97	87
26	84	104	104	52	41	27	43	58	105	130		133	118	131	135	140	142		145	135	145	166	147	109
27	88	87	85	88	86	41	27		109	108	109	121	134	121	118	120	122	113	119	90	108	140	147	87
28	78	83	88	66	32	34	36	78	108	131	145	136	121	128	137	136	124	120	105	88	94	108	88	96
29	84	88	84	79	62	42	37	54	104	136	144	139	137	128	134	141	137	136	119	107	145	145	144	138
30	105	80	39	82	63	85	66	62	88	131	104	107	137	118	105	112	115	130	119	88	108	143	145	120
31	87	88	82	67	52	44	38	66	66	121	122	137	137	121	127	141	120	142	146	146	145	142	107	82
	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	31	29	24	22	30	31	31	30	30	31	30	30	27	31	30	30	30	31	30	31	31
MED	84	75	64	58	52	37	38	66	111	136	143	135	141	146	150	151	160	160	154	143	145	142	108	87
U Q	87	85	80	71	60	43	44	78	122	143	146	139	145	154	162	171	170	172	171	171	174	167	145	107
L Q	66	58	54	52	41	30	34	61	108	128	134	126	134	137	137	141	142	145	138	108	108	108	88	79

HOURLY VALUES OF FES AT OKINAWA

DEC. 1989

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	G	G	G	34	G	43	G	G	51	52	45	40	31	25	G	G	G	G	G
2	G	G	G	G	G		G	G	G	44	48	52	51	50	53	67	50	48	G	23	33	24	G	G
3	G	G	G	G	G	G	G	G	G	41	46	50	50	81	64	62	44	32	33	G	G	G	G	G
4	26	26	32	G	G	G	G	G	G	40	46	G	51	49	62	58	49	45	32	33	30	32	G	G
5	G	33	92	G	G	G	G	G	G	G	50	47	46	46	45	42	G	G	32	G	G	G	23	24
6	G	48	36	32	41	G	G	G	G	G	58		49	56	45	44	44	G	38	59	38	25	G	G
7	G	G	G	G	G	G	G	G	G	40	43	64	48	45	46	44	44	37	G	G	G	31	23	G
8	G	G	G	G	G	G		26	G	G	43	59	76	68	50	68	43	31	33	G	G	G	G	G
9	33	G	G	G	G	G	G	G	35	41	44	62	45	68	46	79	40	41	40	32	G	G	G	G
10	G	G	G	G	G	G	G	G	G	G	G	46	G	G	44	69	G	38	40	32	G	G	G	G
11	G	G	G	G	G	G	24	G	G	G	43	G	55	47	69	47	43	49	37	25	26	28	28	G
12	26	G	G	G	G			G	G	G	G	G	58	48	44	G	48	32	G	G	G		G	G
13	G	G	G	G	G		G	G	G	G	G	G	48	45	G	G	G	G	G	G	36	37	G	G
14	G	G	G	G	G	G	G	G	G	G	G	G	50	56	50	56	40	33	25	24	G	26	G	24
15	25	G	G	G	G			G	G	G	44	G	55	46	G		G	G	29	30	32	G	G	G
16	G	G	G	G	G	G	G	G	33	G	G	G	49	49	G	G	G	G	31	G	33	G	G	G
17	G	G	G	G	G	G	G	G	G	39	55	61	74	G	G	G	G	G	G	G	G	G	G	G
18	26	G	27	26	G	G	G	159	G	41	44	52	60	51	60	68	G	44	50	30	G	G	G	25
19	26	27	G	G	G	G	G	G	G	G	G	51	90	48	51	43	38	47	43	43	32	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	48	48	G	84	54	G	G	G	G	G	G	G	G
21	G	G	G	G	G	G	G	G	G	G	G	G	54	G	45	61	67	58	56	40	30	24	G	G
22	G	G	G	G	G	G		G	G	G	42	45	46	G	G	G	G	G		28	G	G	32	24
23	G	G	G	G	G	G	G	G	G	G	G	53	G	G	G	66	70	46	25	G	G	G	G	G
24	G	G	53	37	27		G	24	G	G	G	46	48	G	G	G	38	G	32	29	32	32	25	G
25	G	G	G	G	G		33	G	G	38	G	44	G	G	G	G	62	58	47	39	G	G	G	G
26	G	G	G	G	G	G	G	G	G	39		G	G	G	G	72	61	40	41	39	26	G	26	G
27	G	G	G	G	G	G	G		G	39	G	G	G	G	G	G	G	34	G	G	G	G	G	G
28	G	G	G	G	G	G	G	G	G	38	67	68	G	50	G	68	64	G	G	G	G	G	G	G
29	G	G	G	G	G	G	G	G	G	G	G	44	G	66	G	G	G	48	43	38	G	G	G	G
30	G	G	G	G	G	G	G	24	G	G	G	G	G	G	G	50	G	G	32	G	G	G	G	G
31	G	G	39	29	G	G	G	G	32	40	G	G	86	49	49	44	G	G	28	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	31	31	31	31	31	25	27	30	31	31	30	30	31	31	31	30	31	31	30	31	31	30	31	31
MED	G	G	G	G	G	G	G	G	G	G	22	44	48	47	45	46	40	32	32	23	G	G	G	G
U Q	G	G	G	G	G	G	G	G	G	39	44	52	55	51	51	66	48	45	40	32	30	24	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

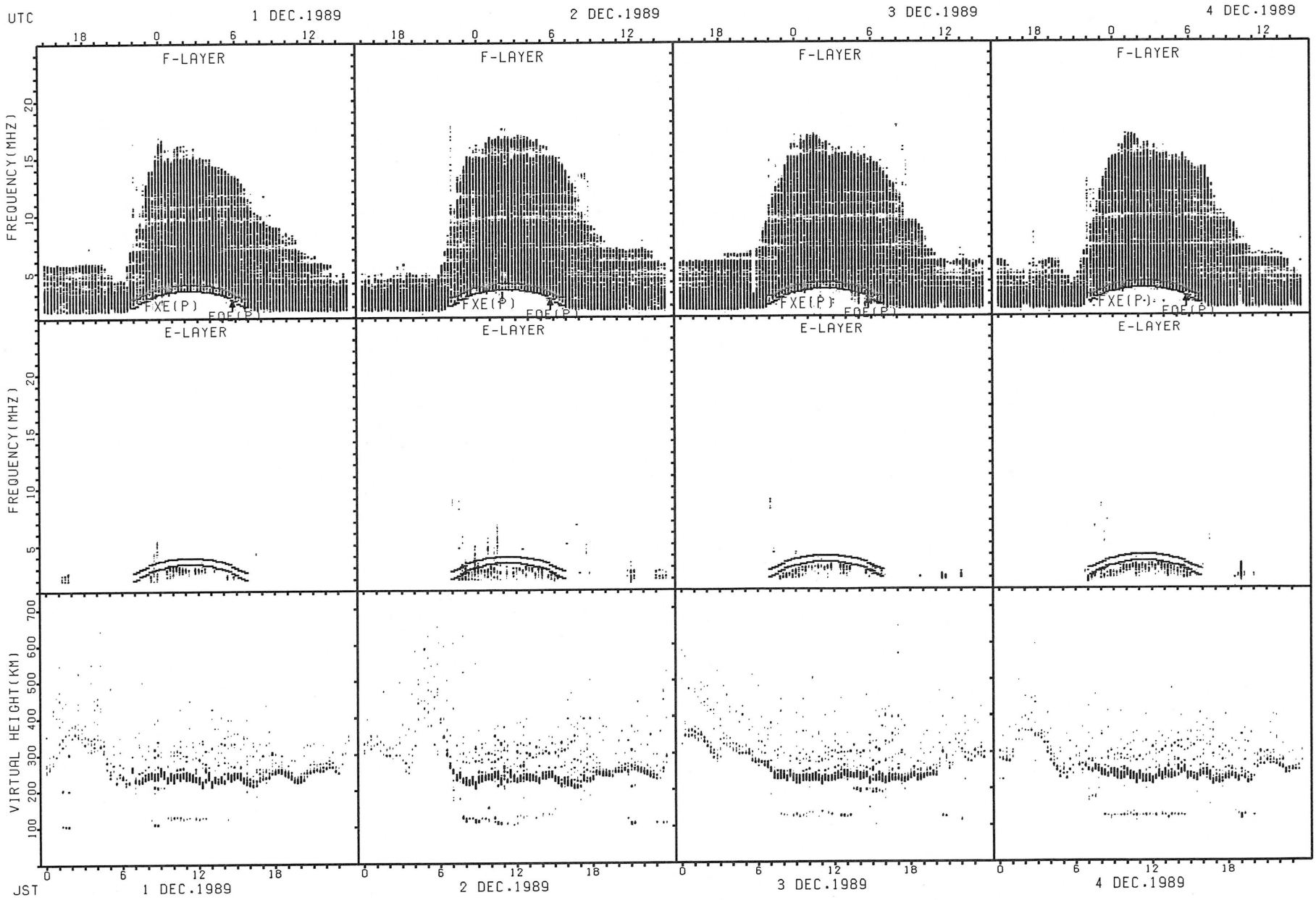
HOURLY VALUES OF FMIN AT OKINAWA

DEC. 1989

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

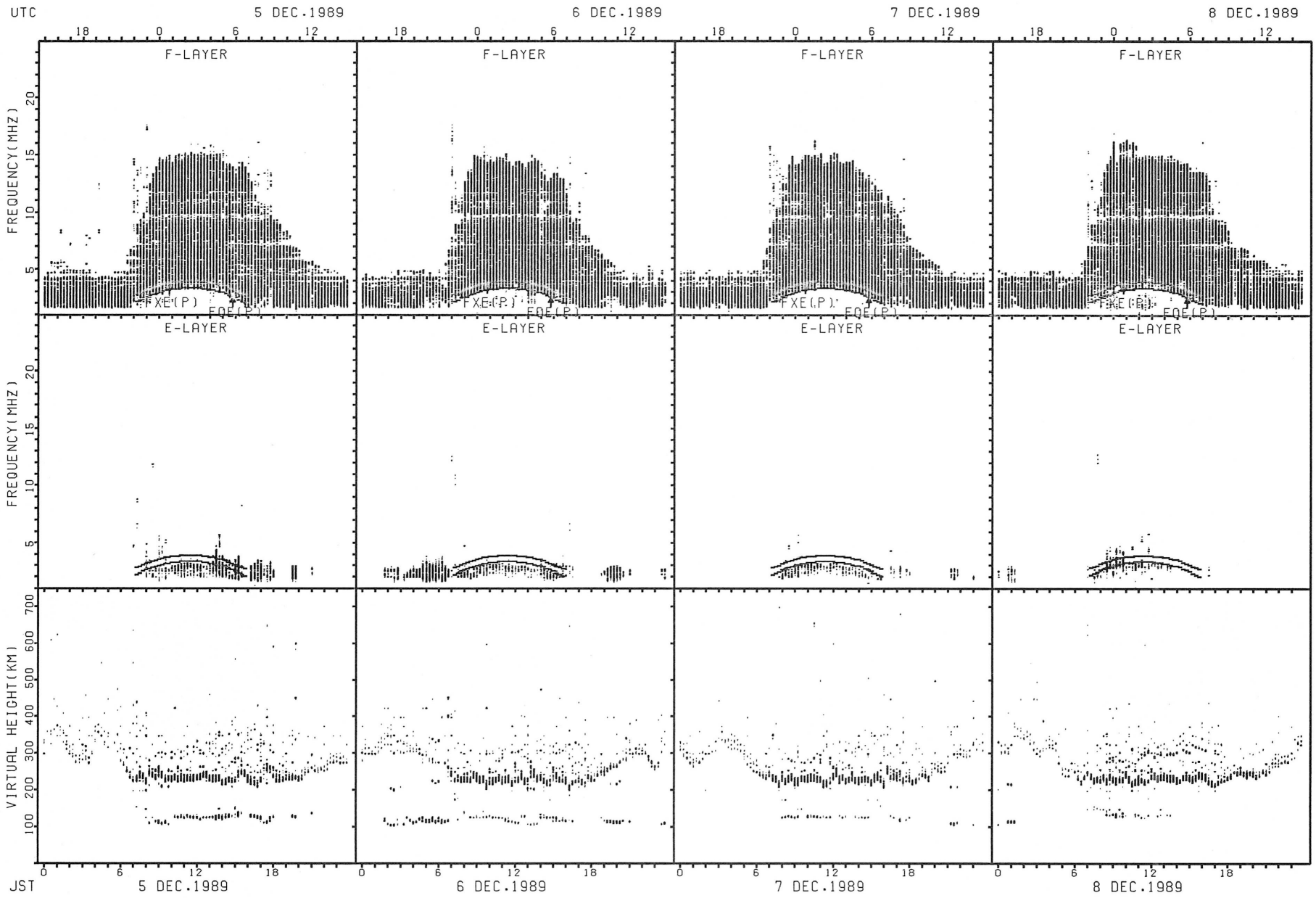
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	15	16	15	15	15	15	18	26	20	26	26	27	27	27	26	21	15	15	15	15	15	15	15
2	15	17	17	16	16		15	20	18	15	26	26	27	28	28	28	20	15	15	14	14	15	15	15
3	15	15	15	15	15	15		26	26	18	23	26	28	27	26	18	15	15	14	15	15	15	15	15
4	15	15	15	15	14	15	15	18	18	17	18	28	23	27	28	26	17	15	15	14	15	14	15	15
5	15	15	14	15	15	N	15	20	15	14	15	17	26	26	18	16	17	15	15	15	15	15	15	15
6	15	15	15	15	15	16	15	20	15	16	17		26	26	18	21	17	27	14	15	14	16	15	15
7	15	15	15	15	15	15	15	18	18	18	20	28	27	27	27	23	21	16	16	15	16	15	15	15
8	15	15	15	15	15	15		14	18	17	27	26	24	27	27	22	21	17	15	15	15	16	15	15
9	15	15	15	15	15	15	15	18	20	23	23	24	27	26	26	21	15	14	14	15	15	17	17	15
10	15	14	15	16	16	16	15	18	17	22	21	22	26	26	23	15	15	14	14	15	15	15	15	15
11	15	15	15	15	15	16	16	18	27	20	22	26	27	28	26	18	14	14	14	15	15	14	15	15
12	15	16	15	14	15			17	27	16	16	26	26	22	24	18	16	17	15	16	15		15	16
13	15	15	15	15	15		16	16	16	15	17	28	28	28	26	20	15	15	15	15	15	15	21	15
14	15	15	15	15	15		15	15	15	15	16	26	29	28	27	21	16	15	14	15	15	15	15	15
15	15	15	15	15	15			17	18	16	21	23	26	26	27		14	14	14	15	15	15	15	15
16	15	16	15	14	15	15	16	17	15	18	22	26	27	23	26	14	14	14	15	15	15	15	15	15
17	15	16	15	15	16	17	20	17	27	14	23	17	26	26	23	15	16	15	15	18	15	15	15	15
18	15	15	15	15	15	21	28	22	15	15	15	22	27	27	20	21	15	15	15	15	15	15	15	15
19	15	15	15	15	15	15	15	17	14	18	15	18	27	29	26	27	16	15	15	14	15	15	15	15
20	15	15	15	15	14	15	15	15	15	17	18	28	26	26	23	21	16	15	15	16	16	15	15	15
21	15	15	15	15	15	15	15	16	17	16	21	21	22	24	21	15	14	14	14	15	15	15	15	15
22	16	15	15	15	15	15		16	15	15	17	26	28	29	24	28	21	15		15	16	15	15	15
23	16	15	15	15	N	15	N	16	18	22	22	38	26	27	22	16	15	14	15	15	15	15	15	15
24	15	15	15	15	16		18	15	16	16	27	24	21	27	24	21	18	17	15	14	15	15	15	15
25	15	15	16	15	14		15	17	28	20	27	26	22	23	22	20	17	20	15	14	15	16	15	15
26	16	16	17	16	17	17	16	15	17	22		26	24	24	24	26	26	18	14	16	18	21	17	17
27	16	17	15	15	15	15	N		16	18	20	28	29	28	28	27	18	20	16	15	15	15	15	16
28	15	16	15	15	15	15	15	16	17	22	22	27	42	38	30	23	20	28	20	20	15	15	15	15
29	15	16	16	17	17	16	16	16	27	22	26	24	26	41	27	27	24	16	14	15	15	15	15	15
30	15	15	24	16	16	16	16	16	28	34	28	41	33	27	29	28	28	18	15	15	15	15	15	15
31	15	16	16	15	15	15	15	15	18	22	26	27	27	27	26	28	23	17	15	18	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	31	31	31	31	30	23	24	30	31	31	30	30	31	31	31	30	31	31	30	31	31	30	31	31
MED	15	15	15	15	15	15	15	17	18	18	22	26	27	27	26	21	17	15	15	15	15	15	15	15
U Q	15	16	15	15	15	16	16	18	26	22	26	27	27	28	27	26	21	17	15	15	15	15	15	15
L Q	15	15	15	15	15	15	15	16	15	16	17	24	26	26	23	18	15	15	14	15	15	15	15	15

SUMMARY PLOTS AT WAKKANAI

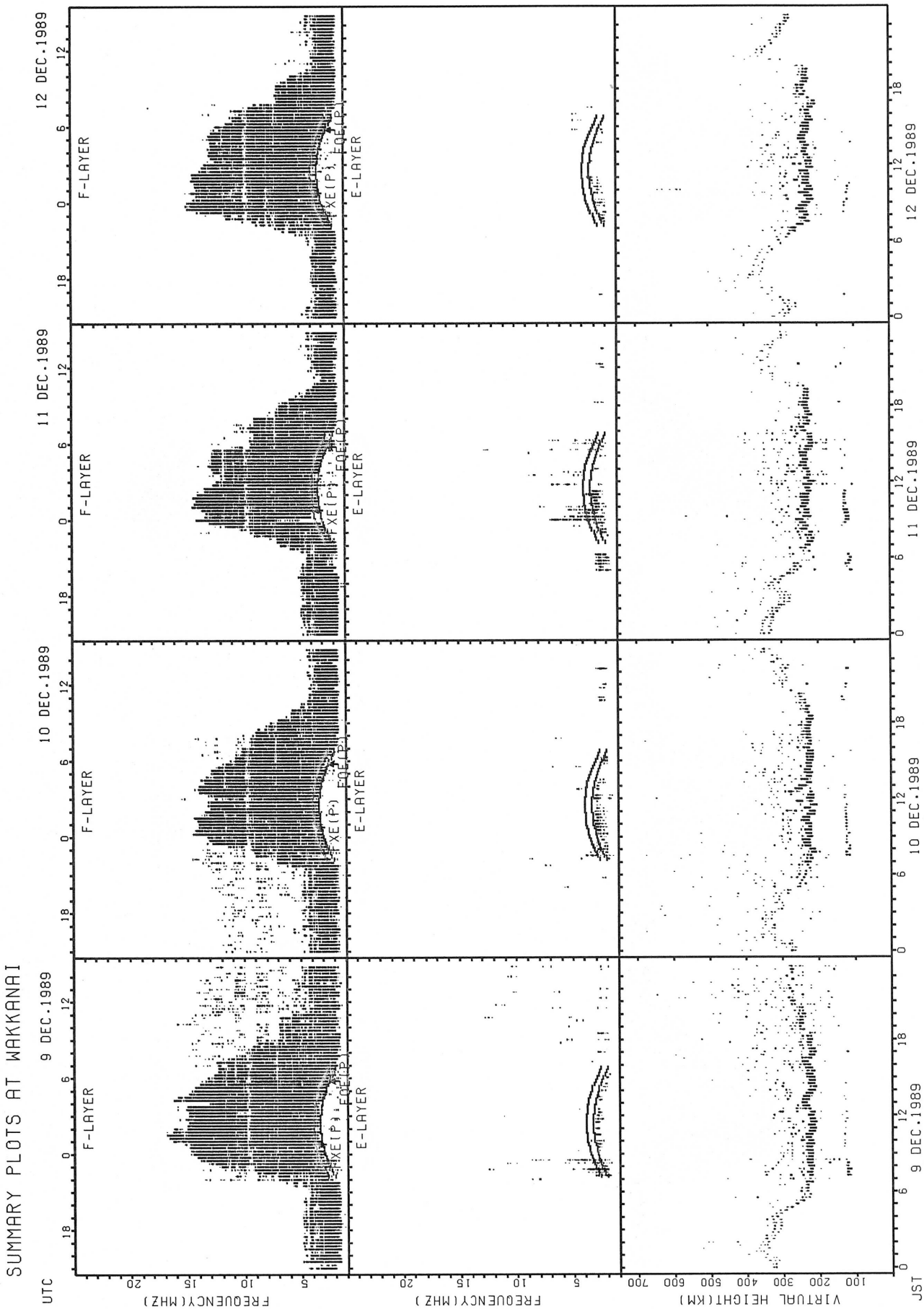


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

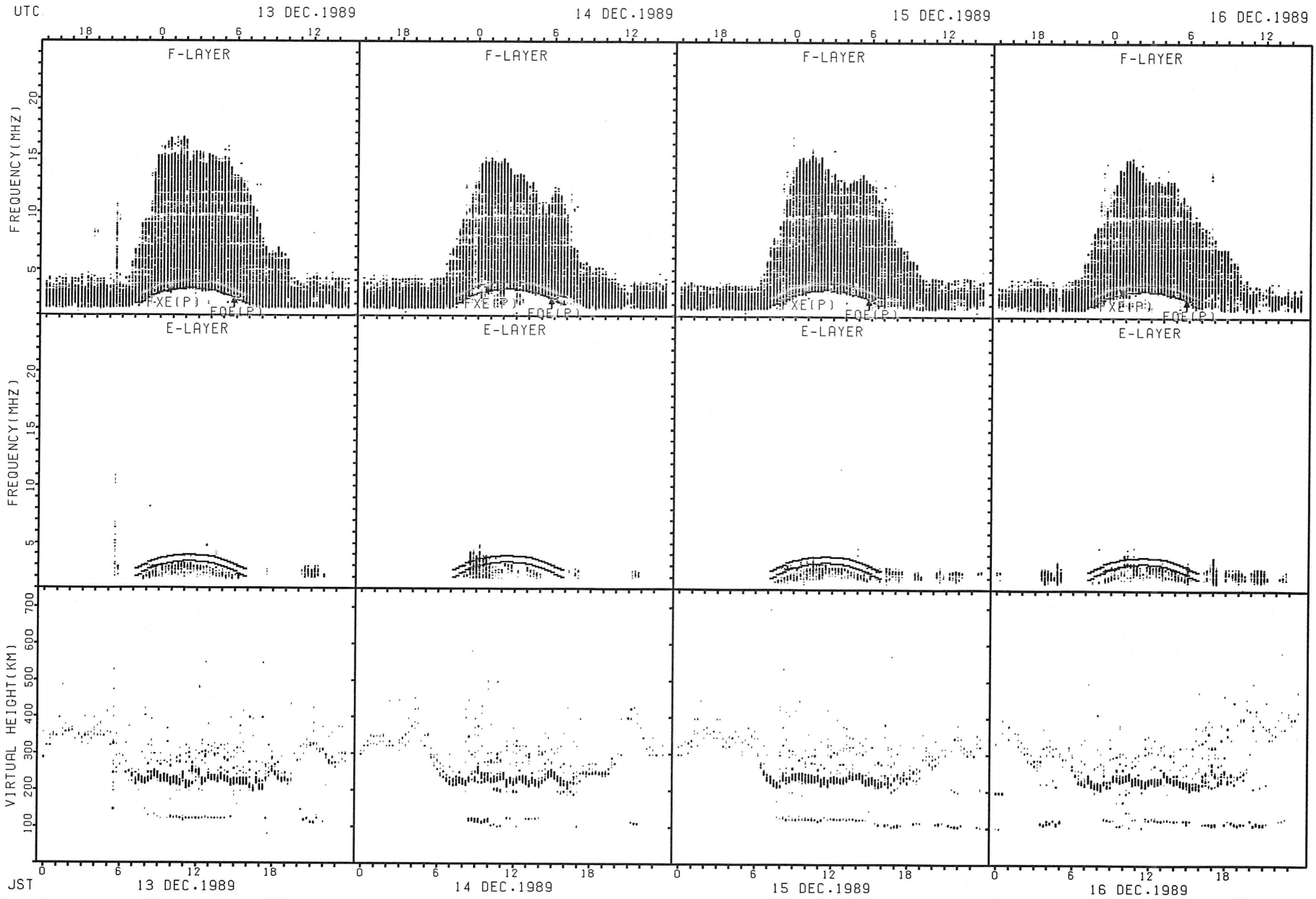
SUMMARY PLOTS AT WAKKANAI



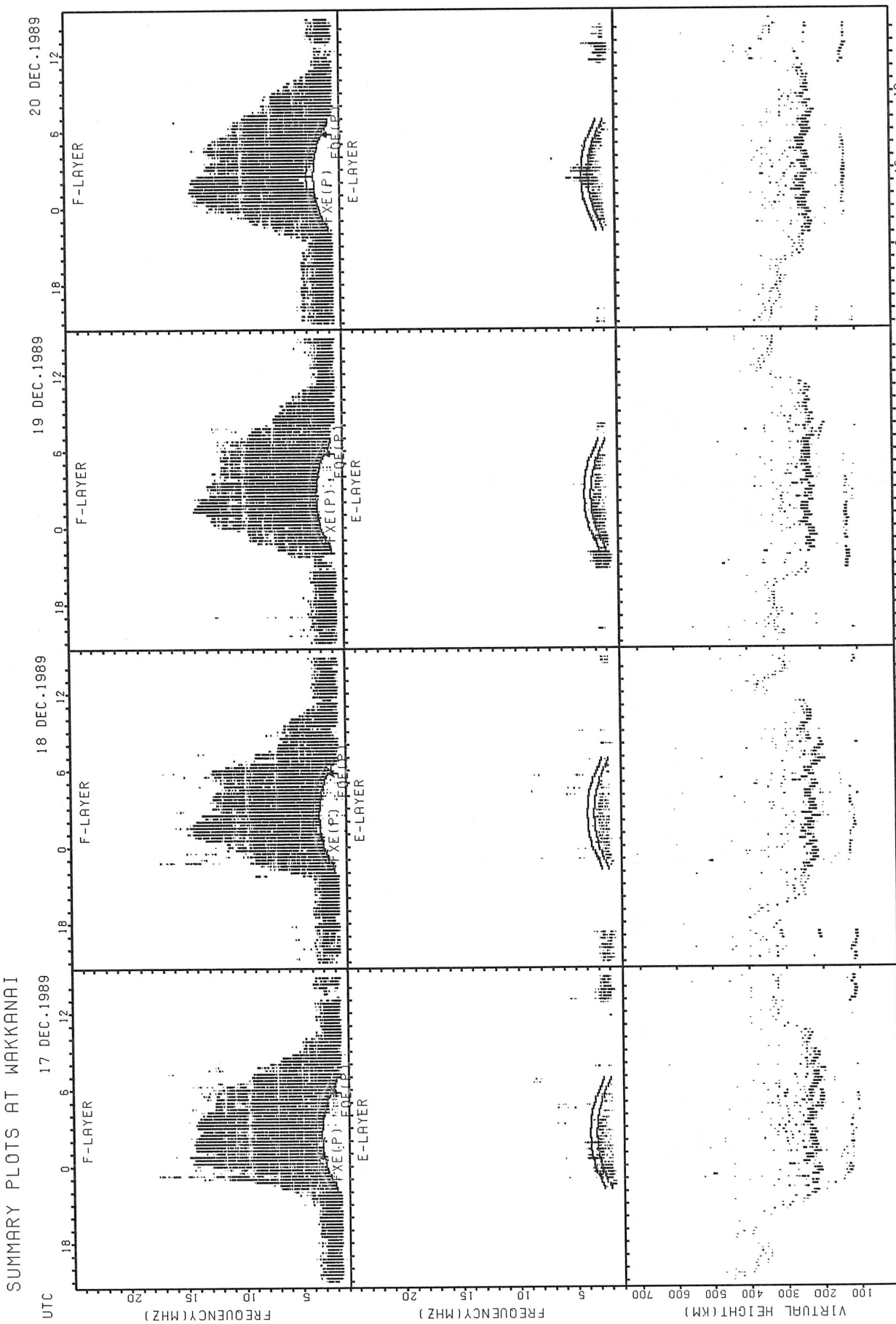
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
JST
9 DEC.1989
10 DEC.1989
11 DEC.1989
12 DEC.1989
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

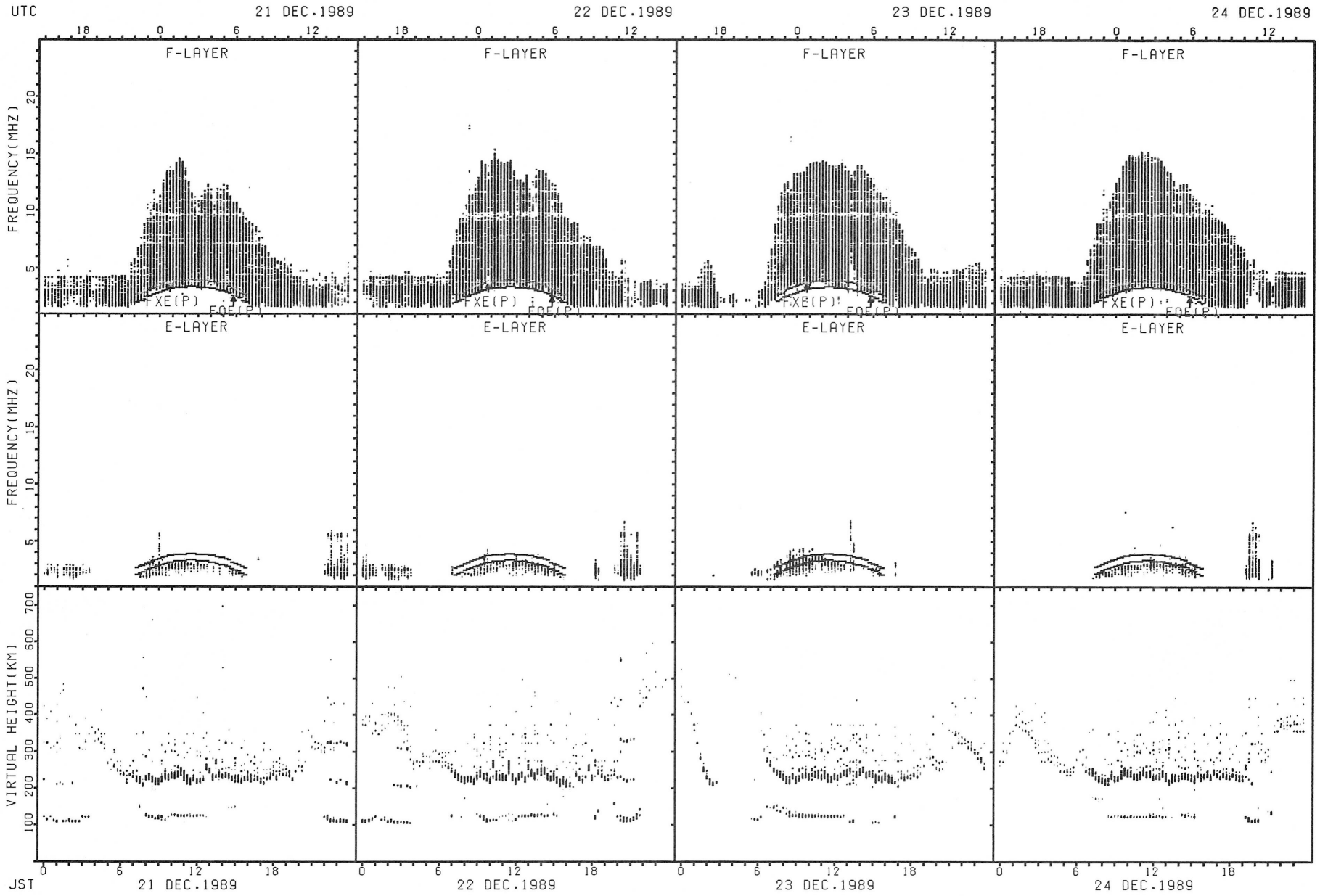
SUMMARY PLOTS AT WAKKANAI



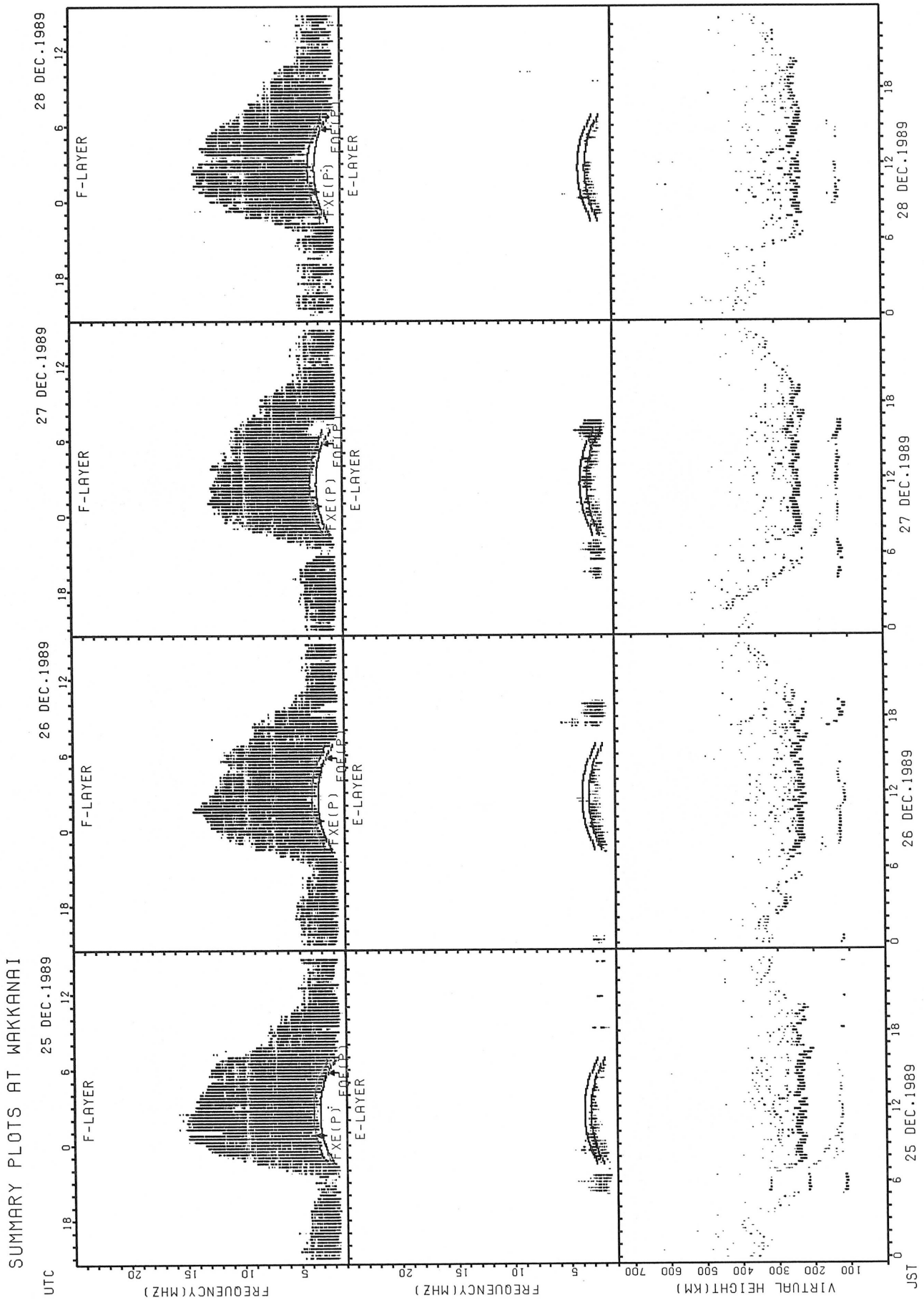
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
17 DEC.1989
18 DEC.1989
19 DEC.1989
20 DEC.1989
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

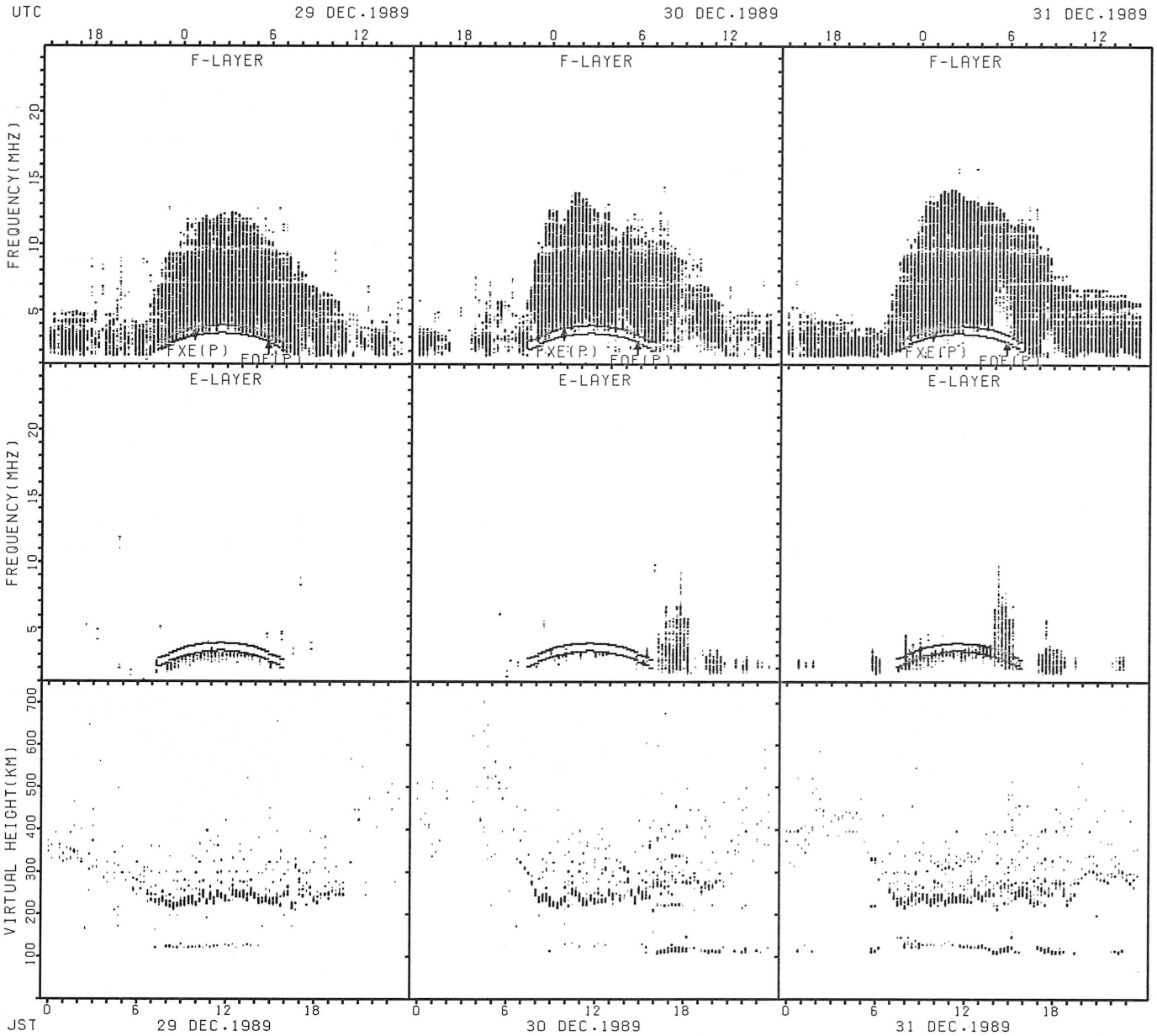
SUMMARY PLOTS AT WAKKANAI



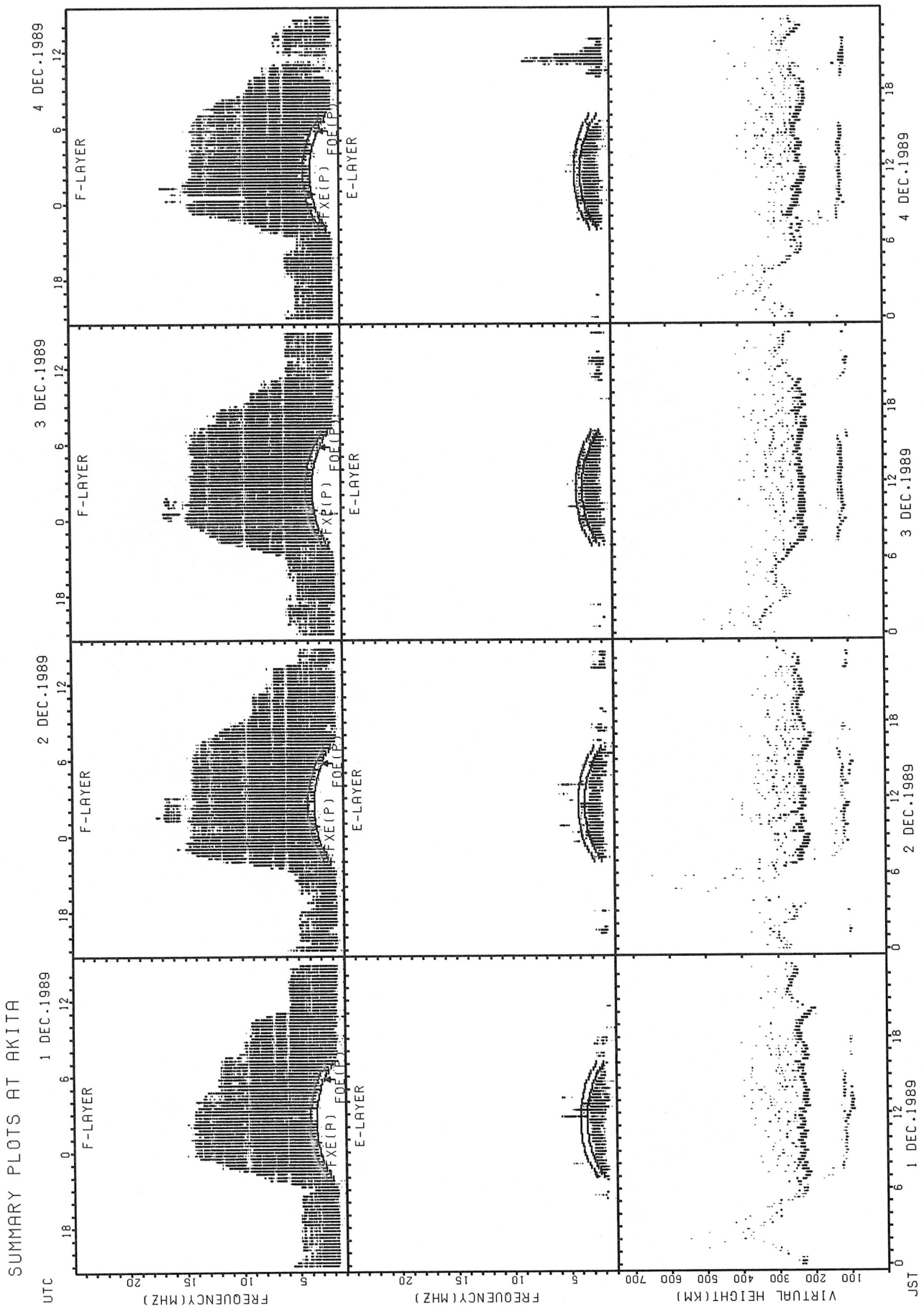
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
25 DEC.1989
26 DEC.1989
27 DEC.1989
28 DEC.1989
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

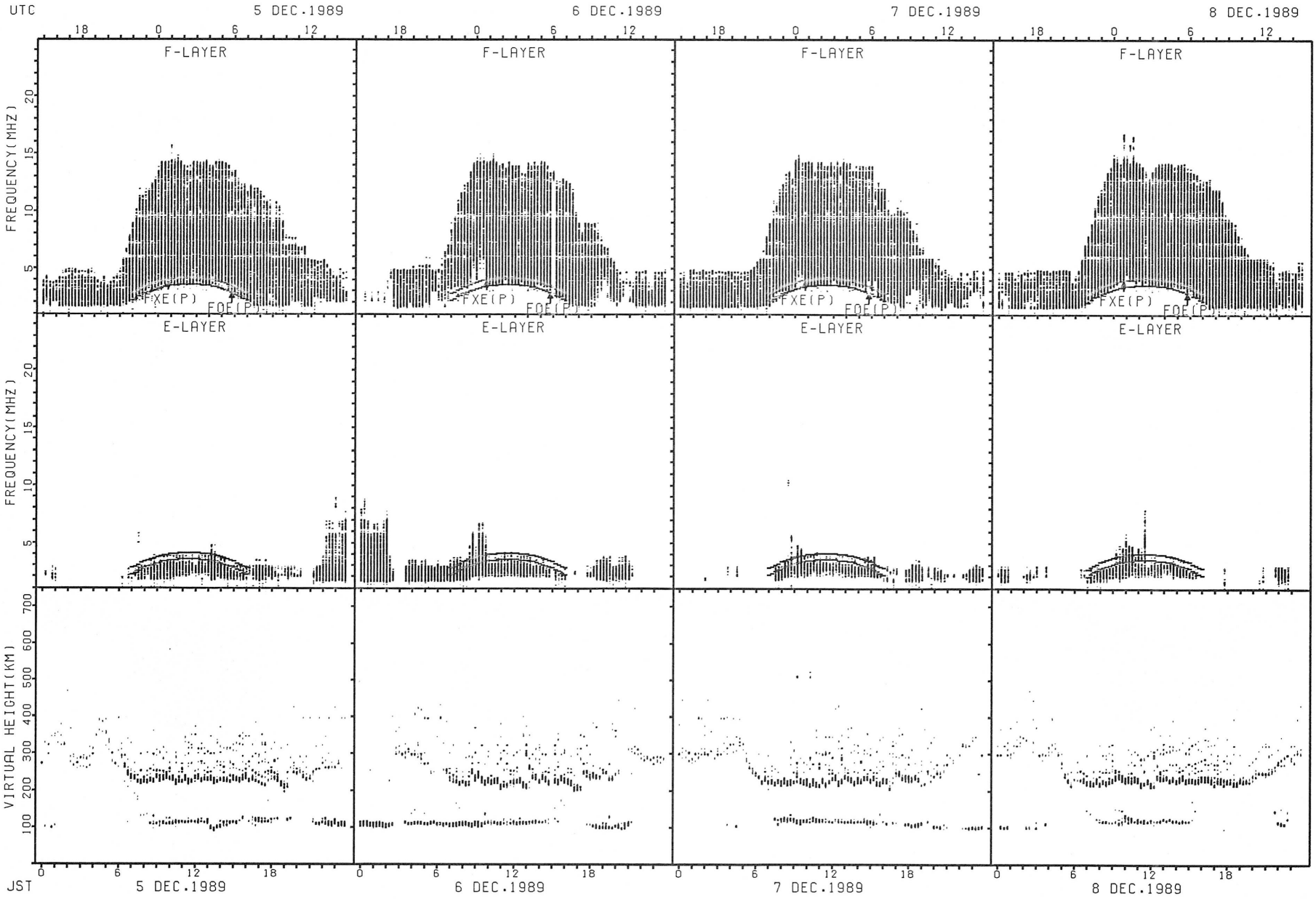
SUMMARY PLOTS AT WAKKANAI



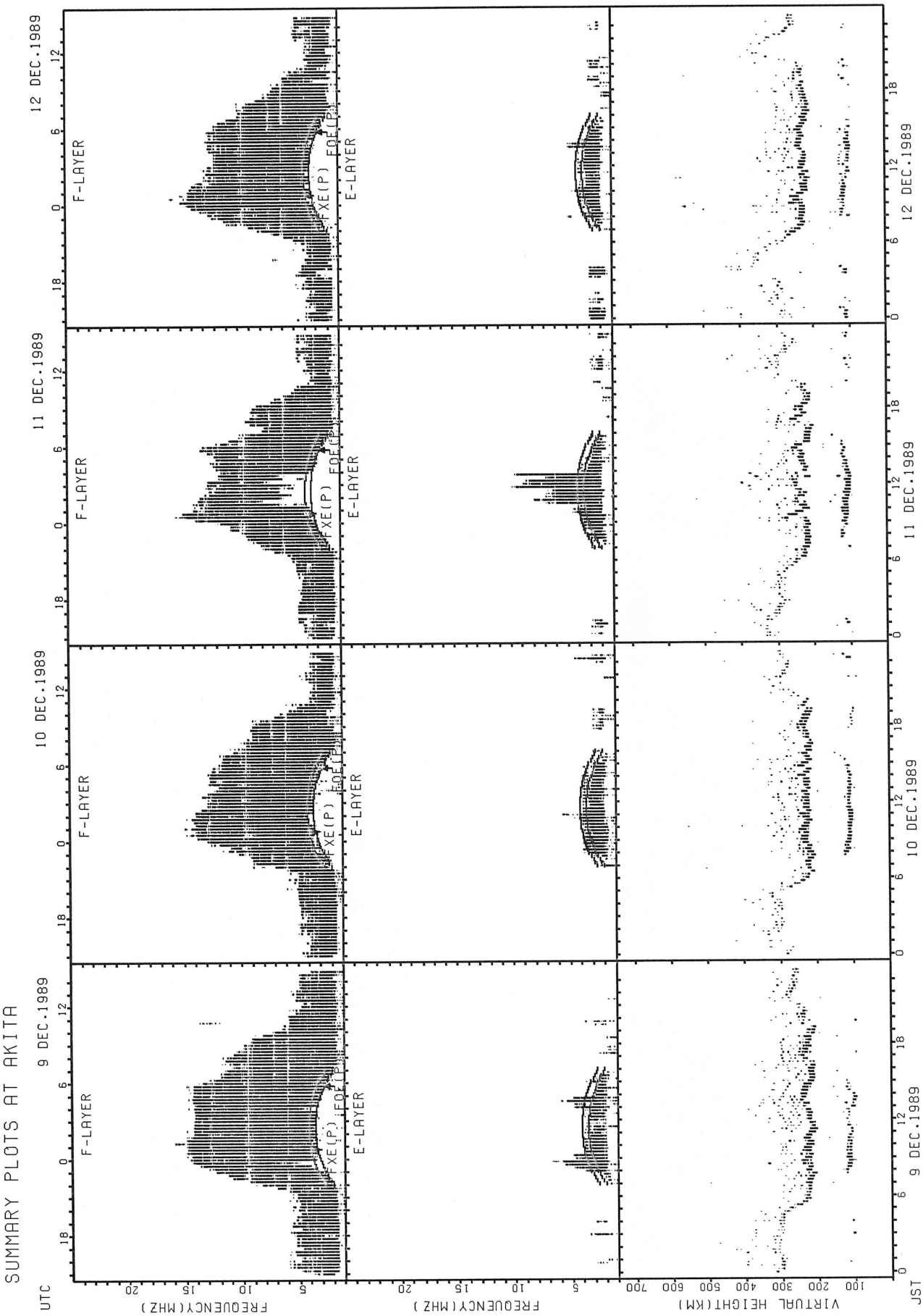
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
1 DEC.1989
2 DEC.1989
3 DEC.1989
4 DEC.1989
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

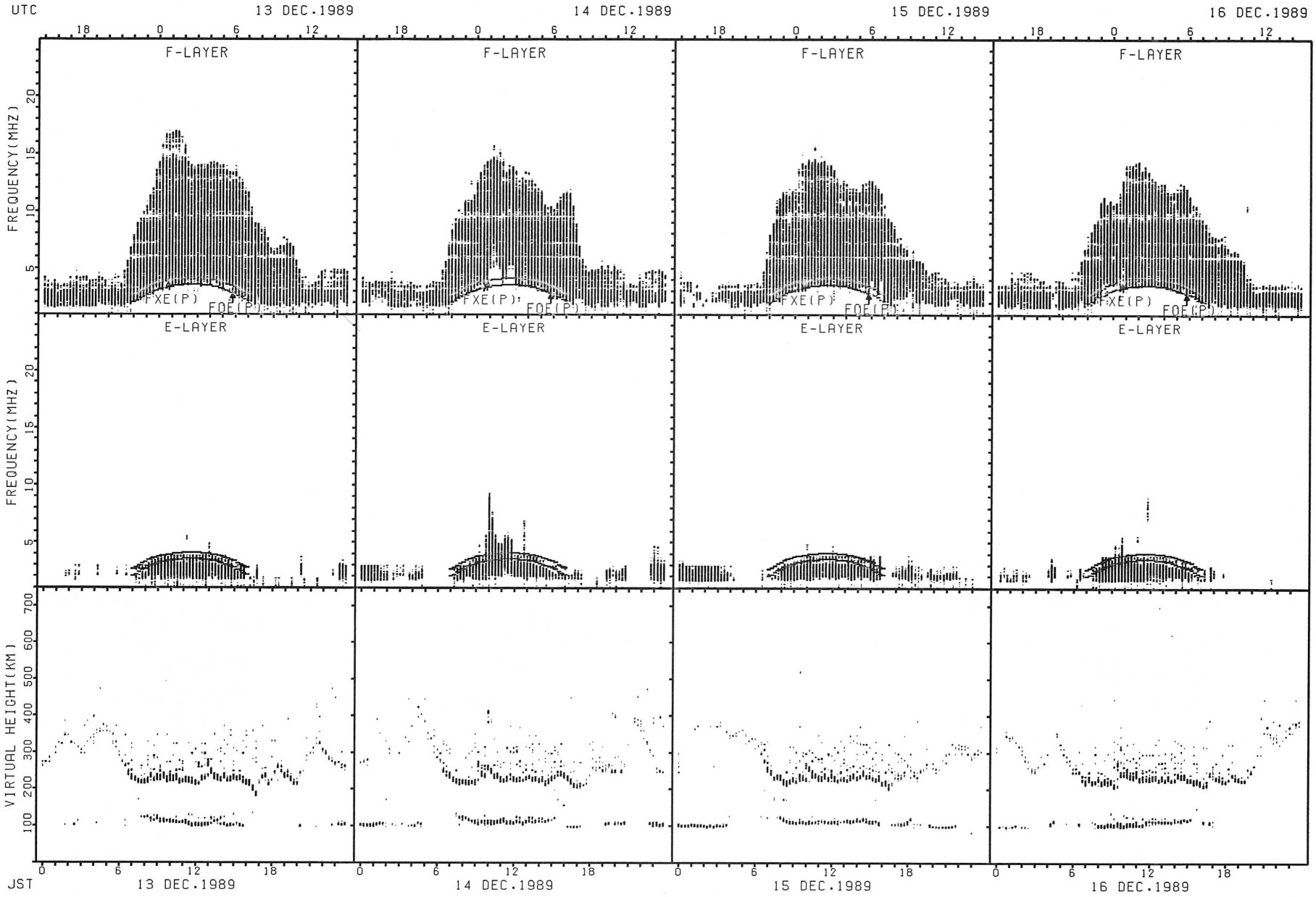
SUMMARY PLOTS AT AKITA



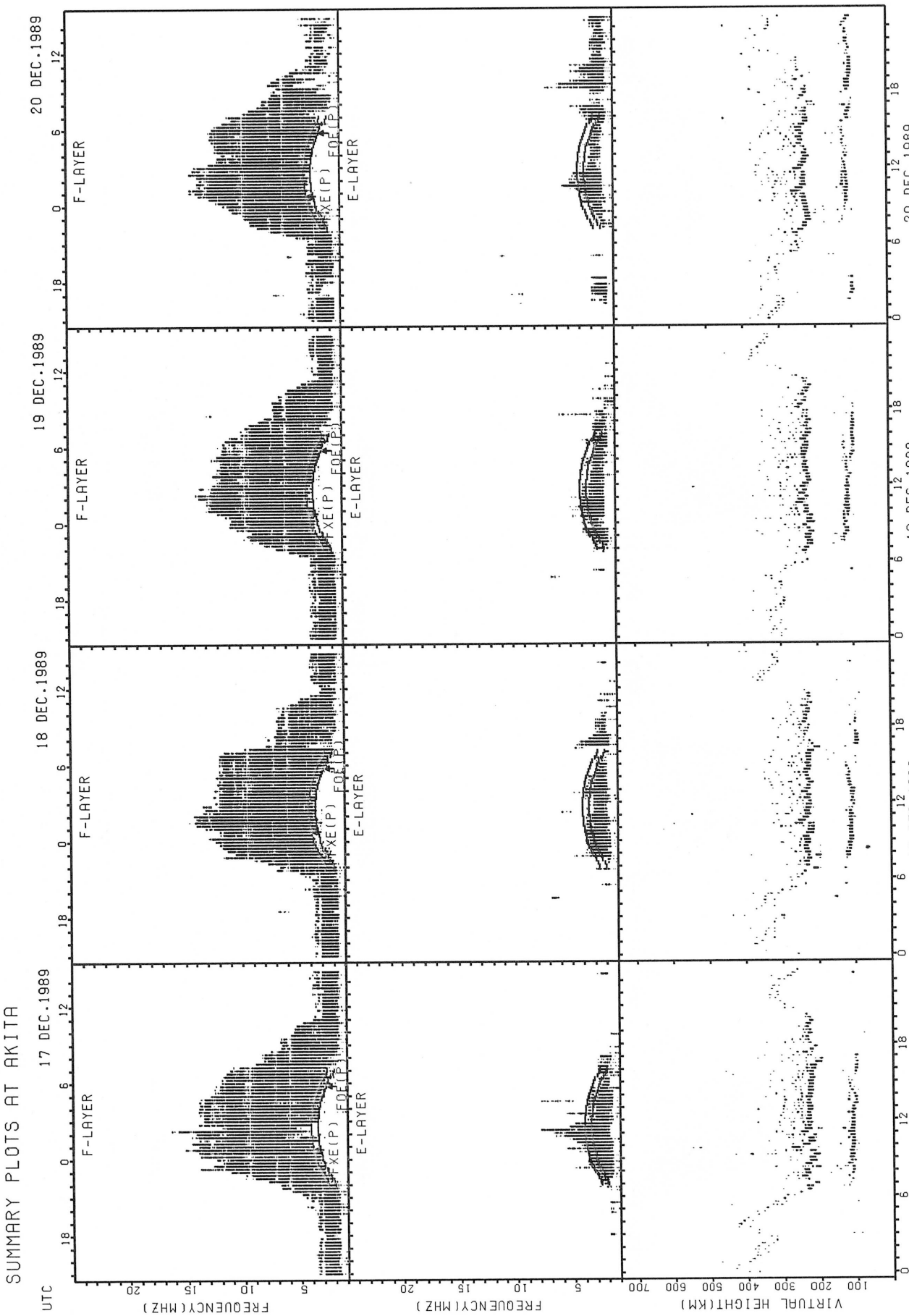
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

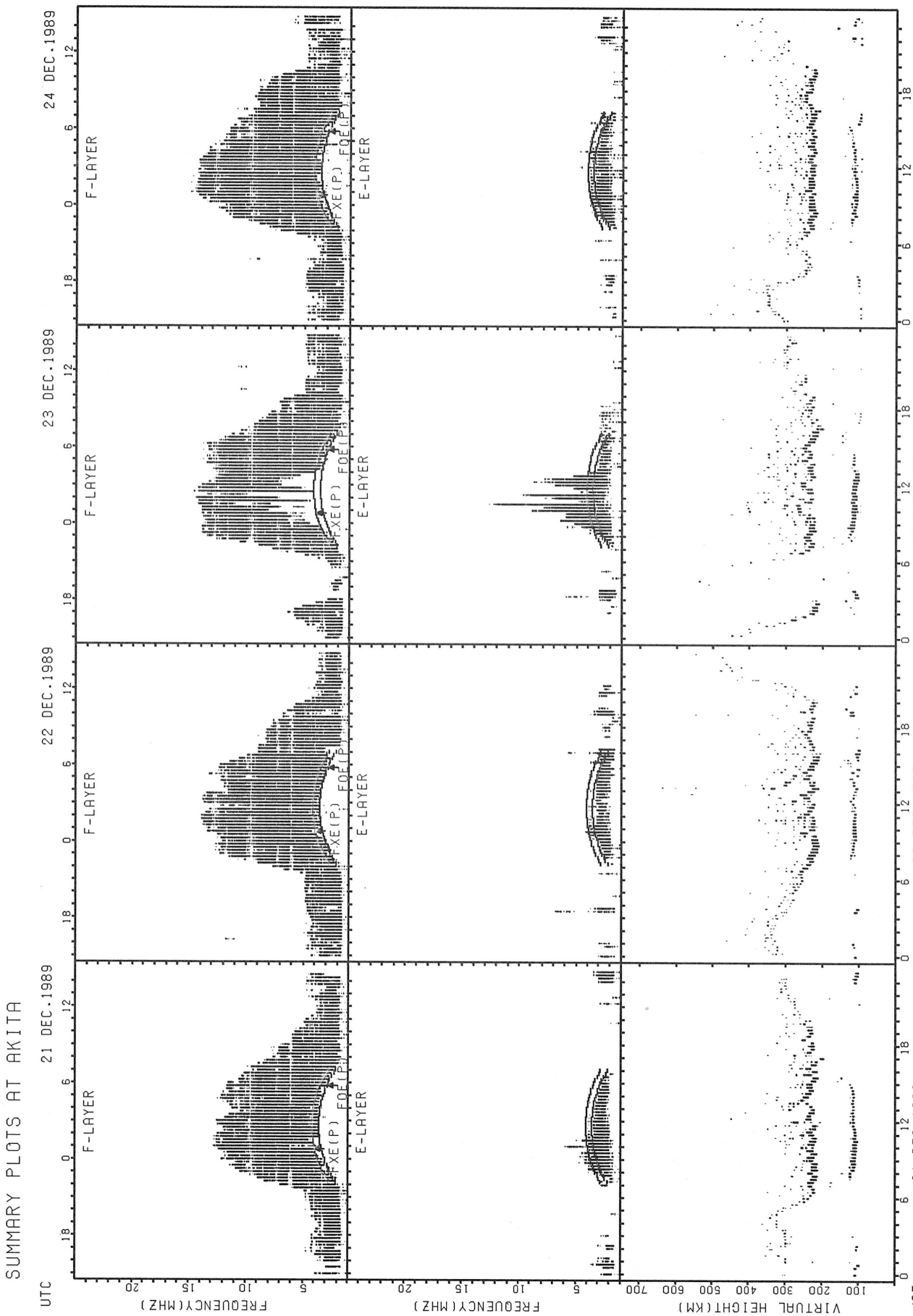

SUMMARY PLOTS AT AKITA
UTC
JST
9 DEC.1989
10 DEC.1989
11 DEC.1989
12 DEC.1989
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

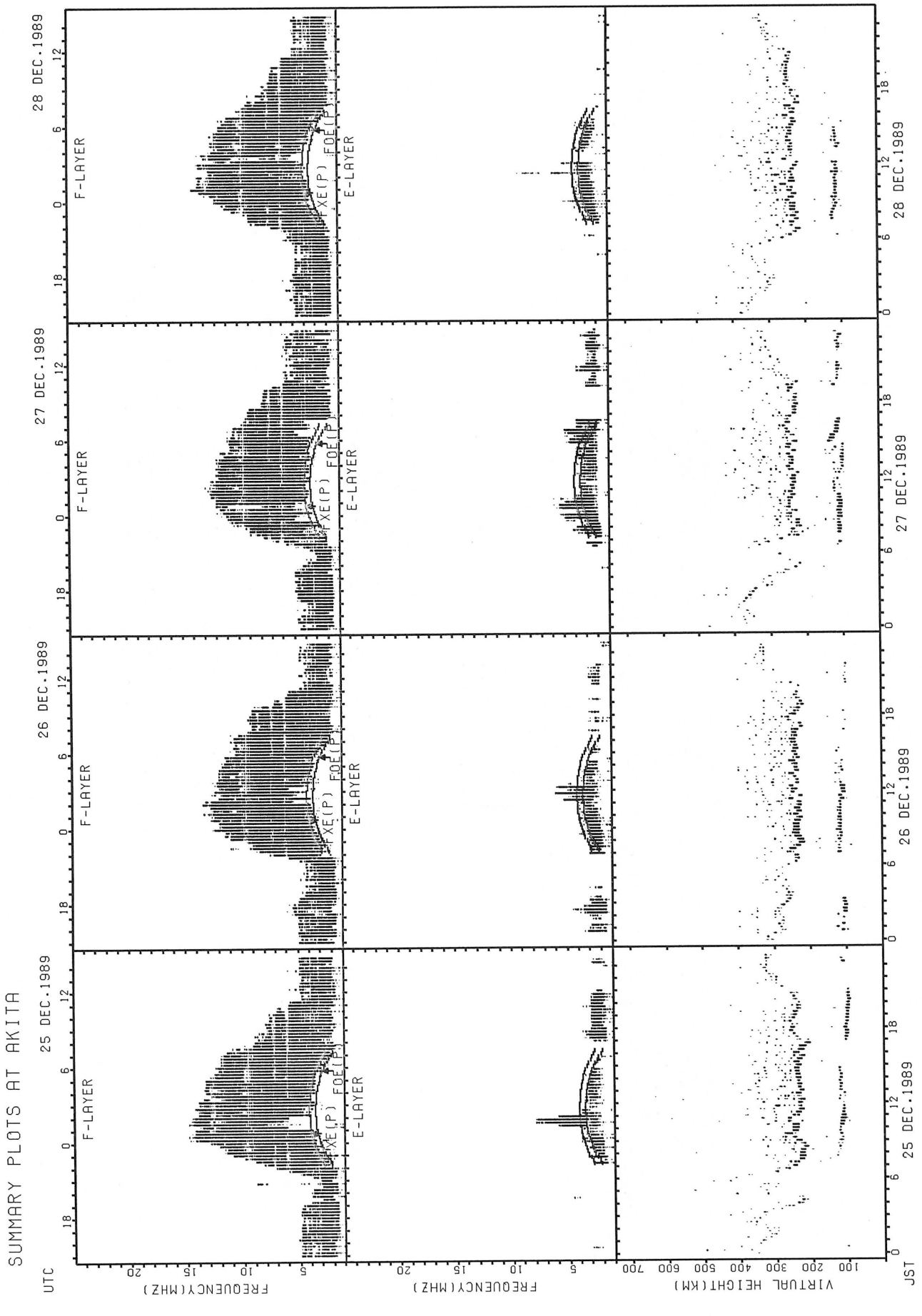
SUMMARY PLOTS AT AKITA



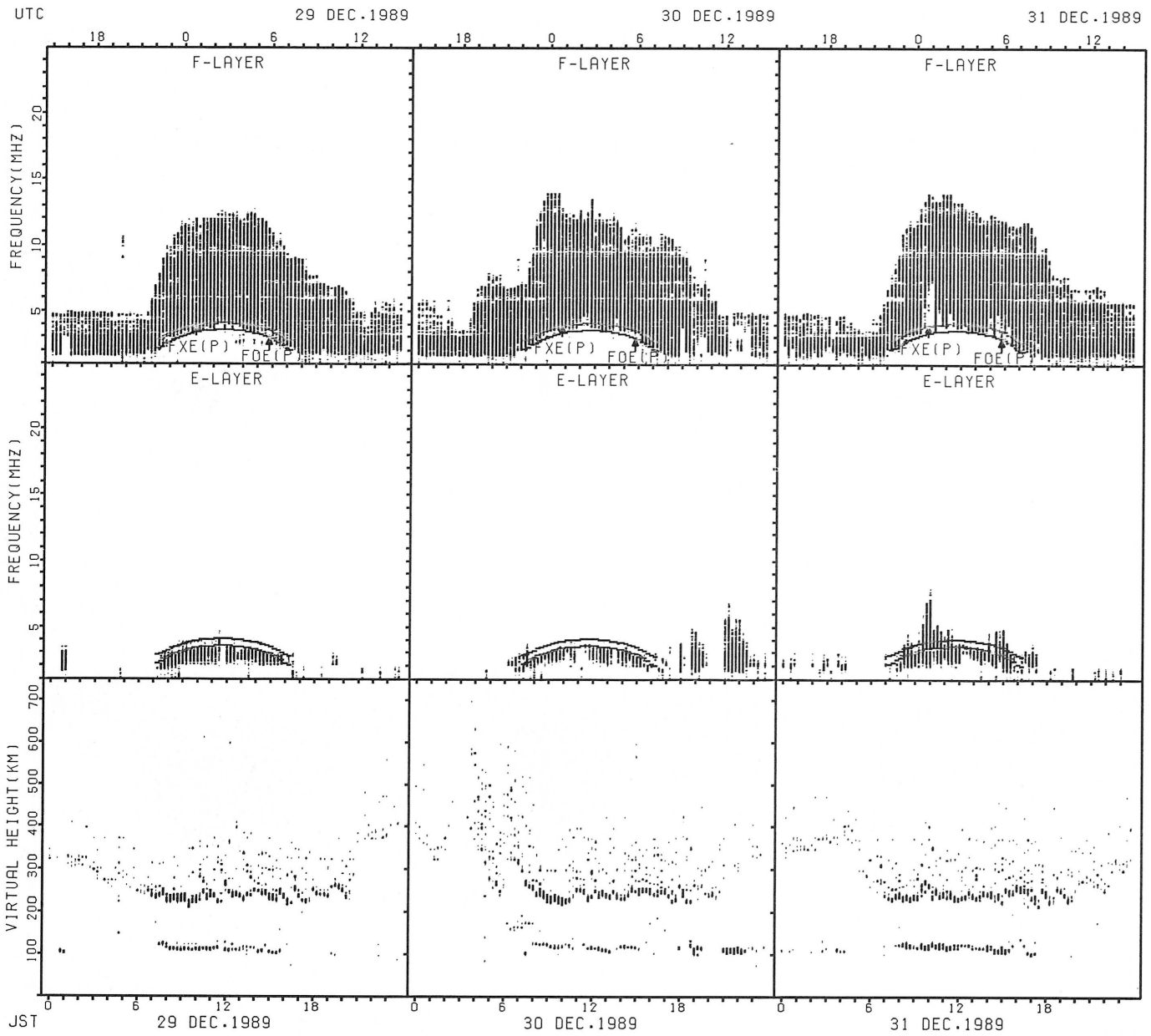
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
17 DEC.1989
18 DEC.1989
19 DEC.1989
20 DEC.1989
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

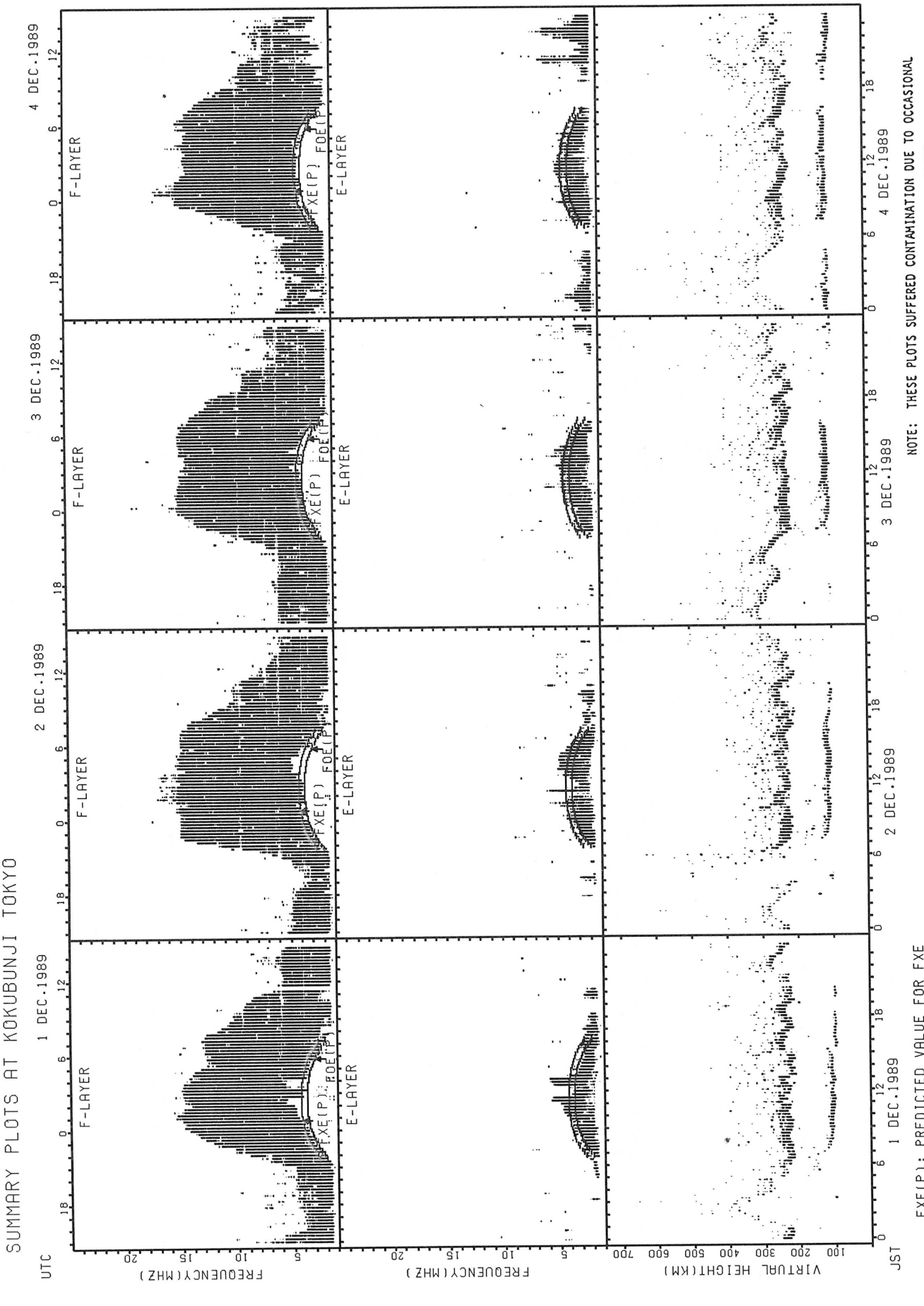

SUMMARY PLOTS AT AKITA
UTC
21 DEC.1989
22 DEC.1989
23 DEC.1989
24 DEC.1989
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
JST
25 DEC.1989
26 DEC.1989
27 DEC.1989
28 DEC.1989
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

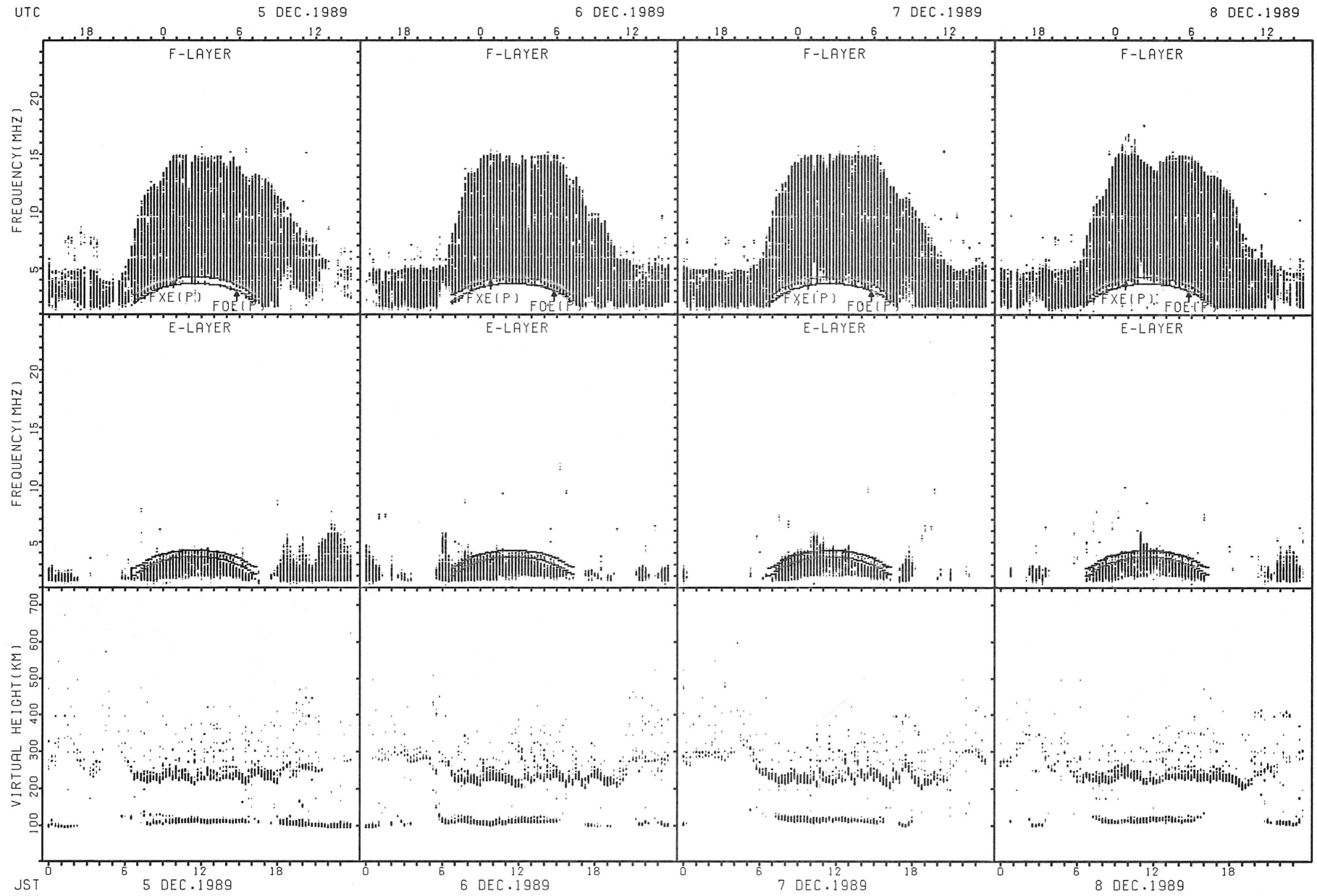
SUMMARY PLOTS AT AKITA



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


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
1 DEC.1989
2 DEC.1989
3 DEC.1989
4 DEC.1989
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
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL
MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

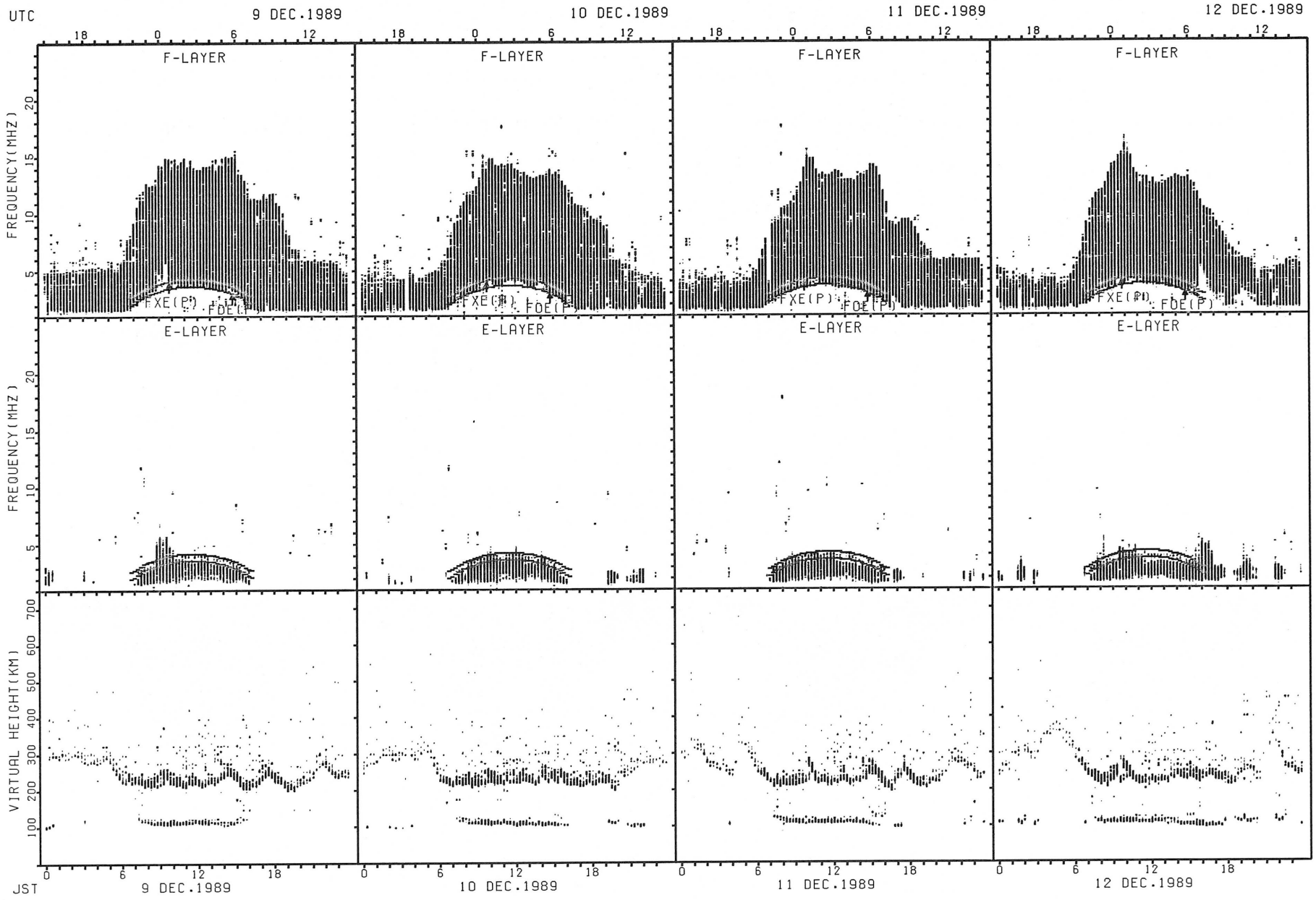
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

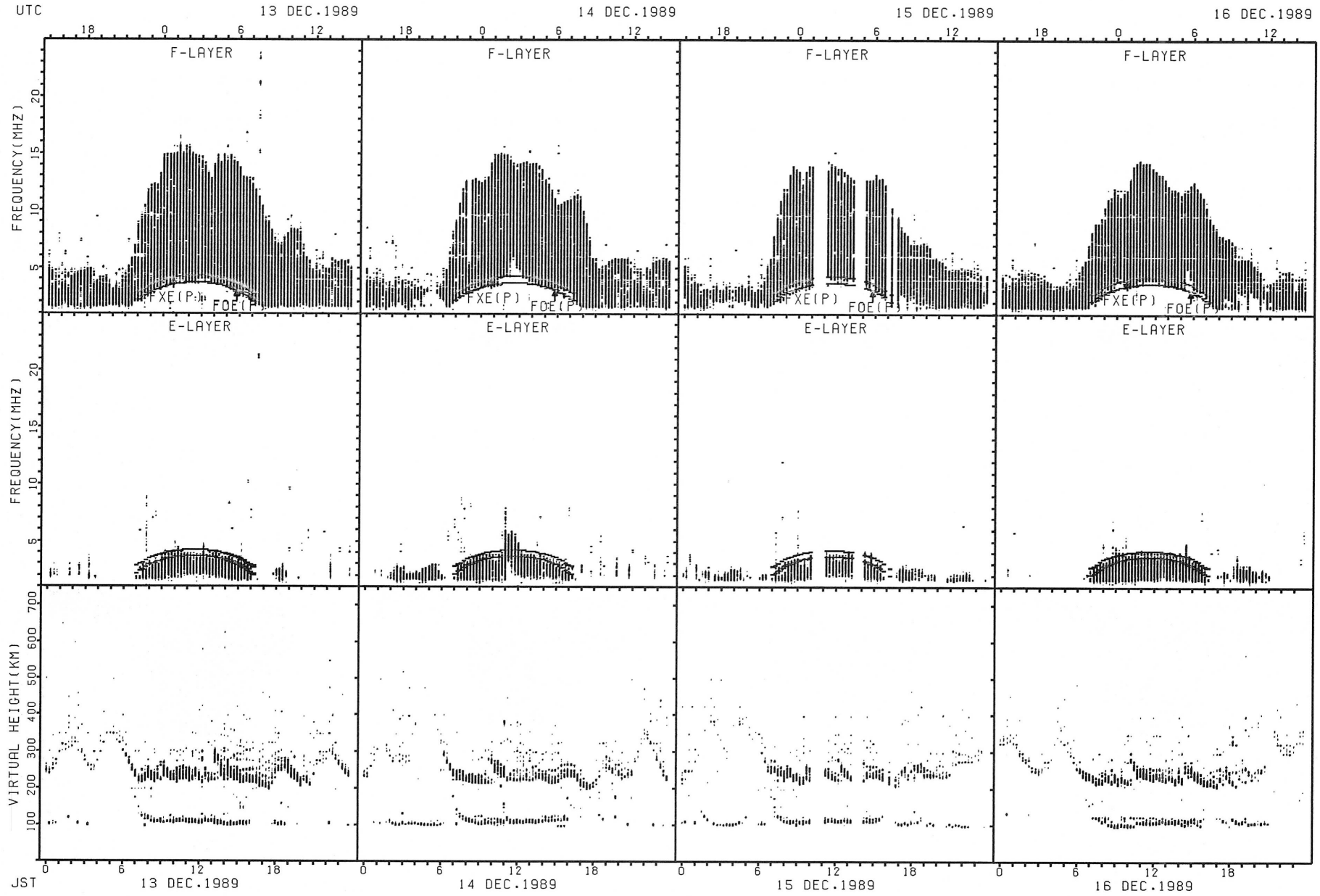
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

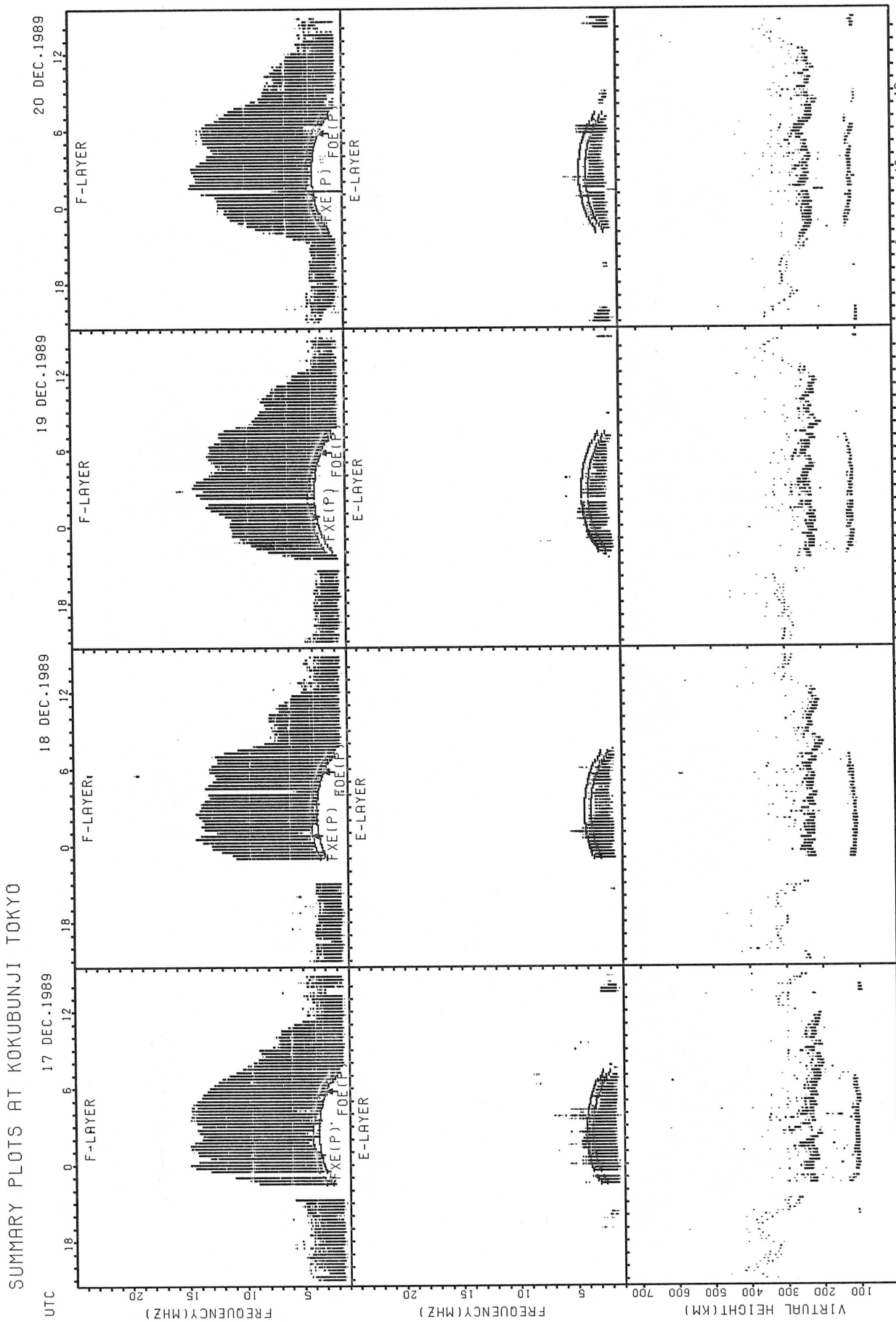
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT KOKUBUNJI TOKYO

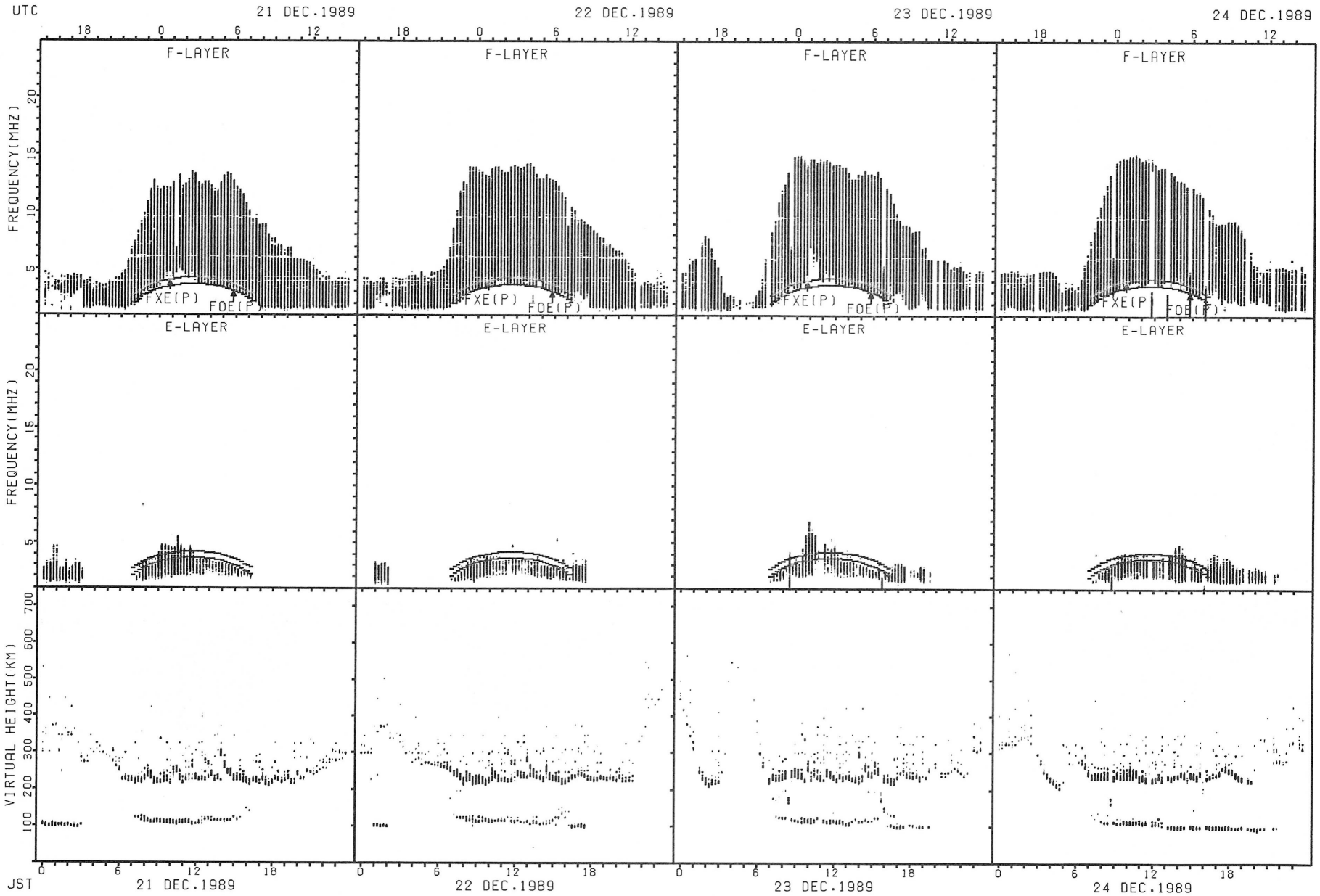


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

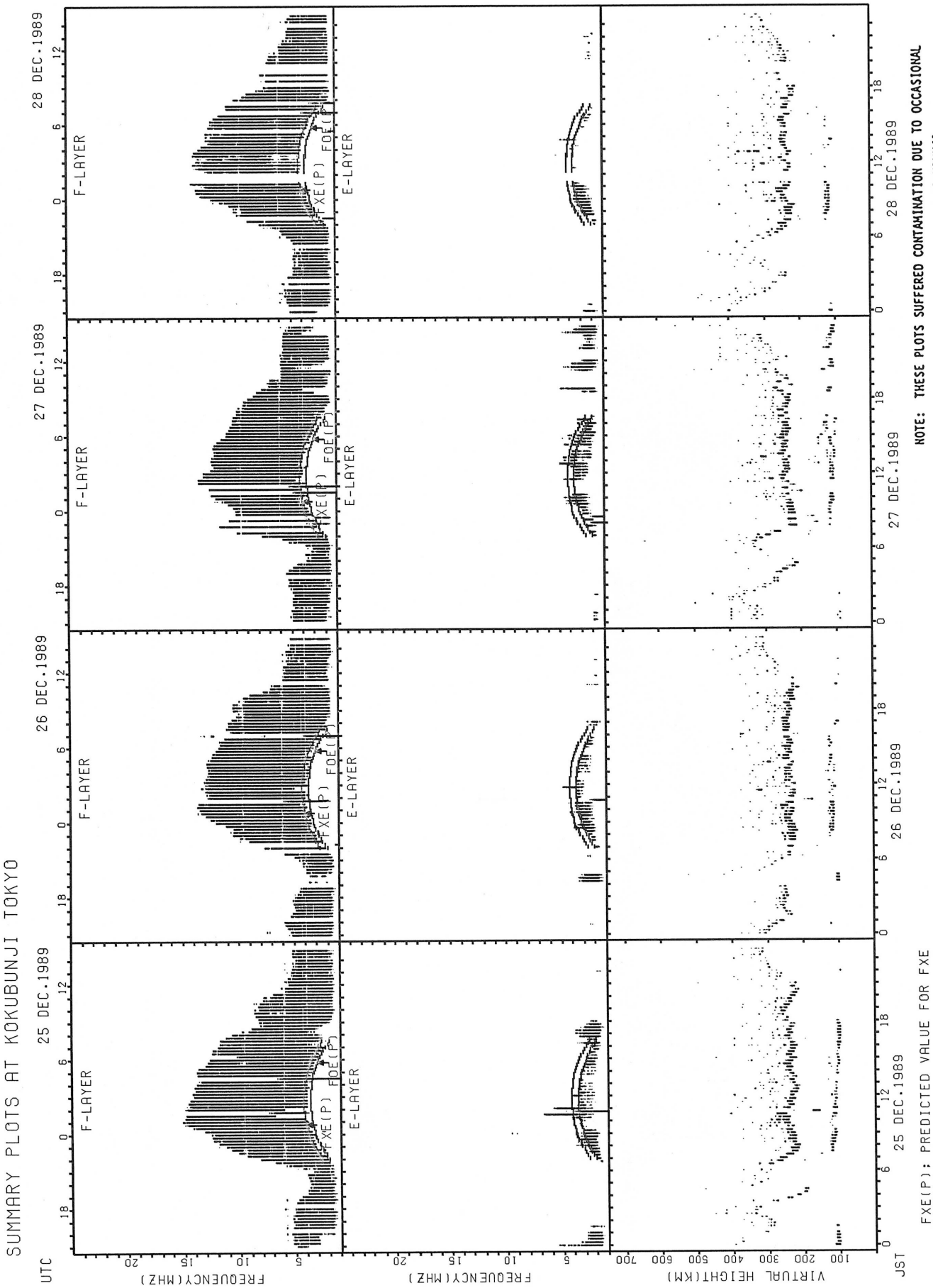

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
17 DEC.1989
18 DEC.1989
19 DEC.1989
20 DEC.1989
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL
MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT KOKUBUNJI TOKYO

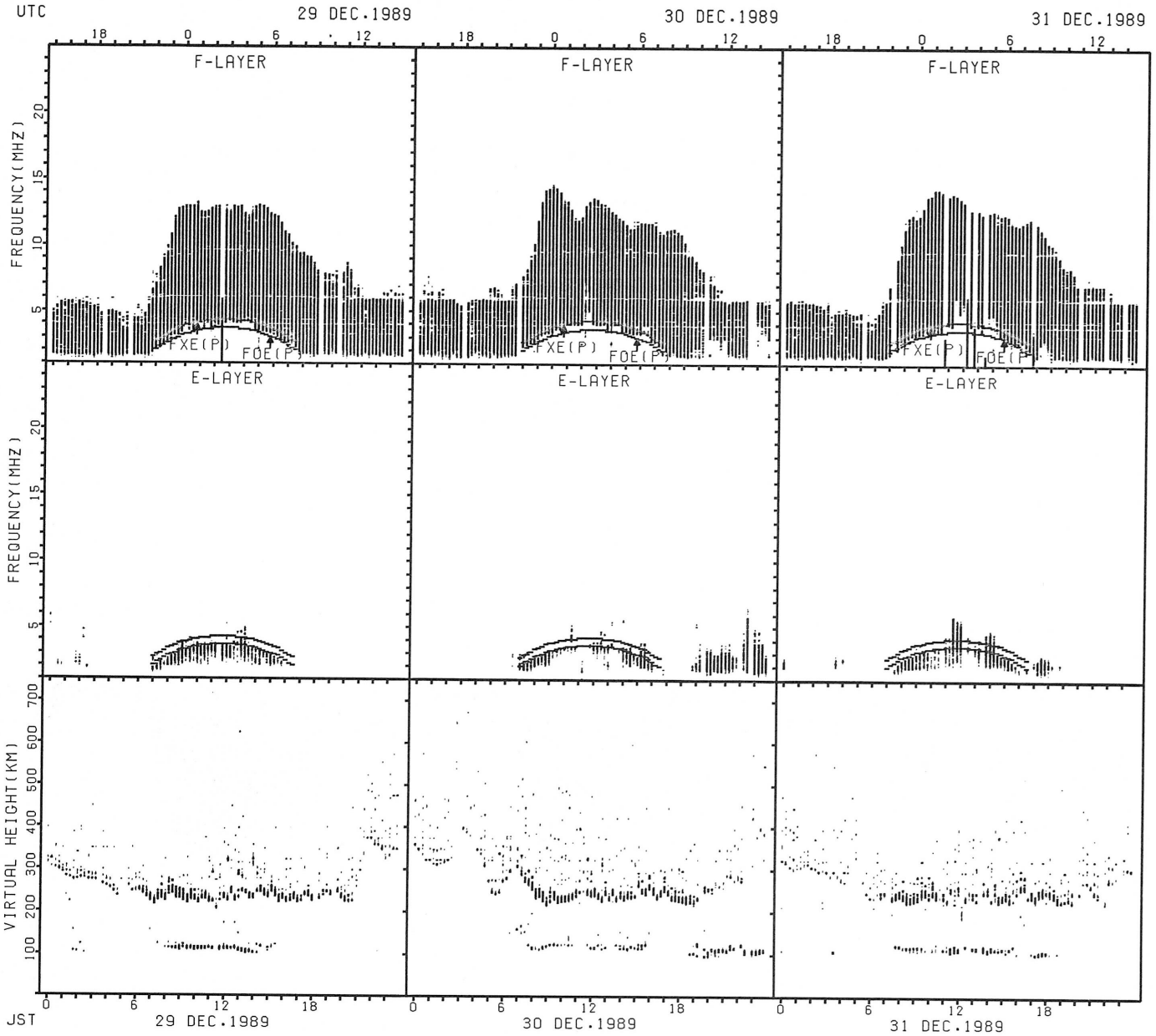


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
25 DEC.1989
26 DEC.1989
27 DEC.1989
28 DEC.1989
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
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL
MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

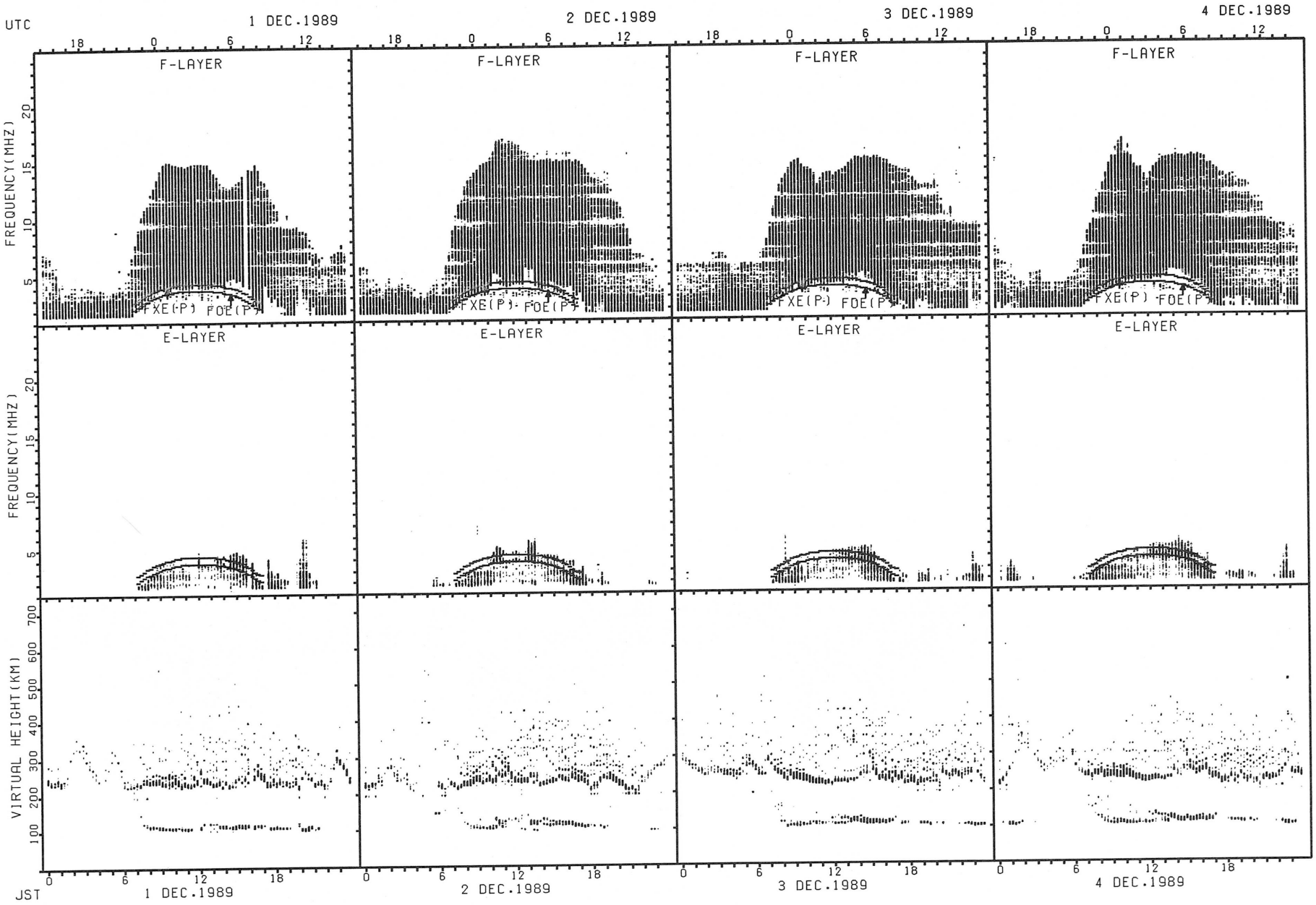
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

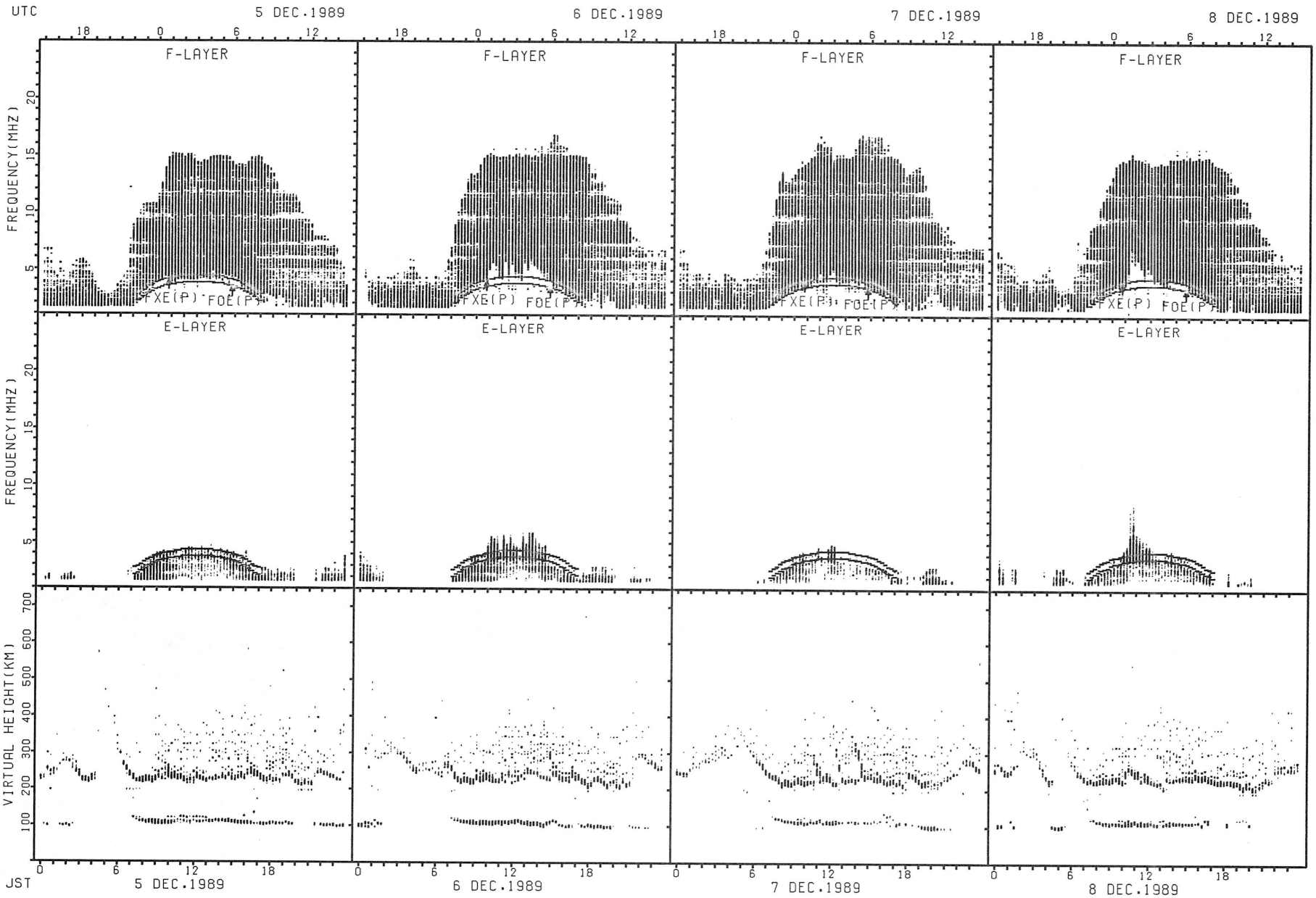
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT YAMAGAWA

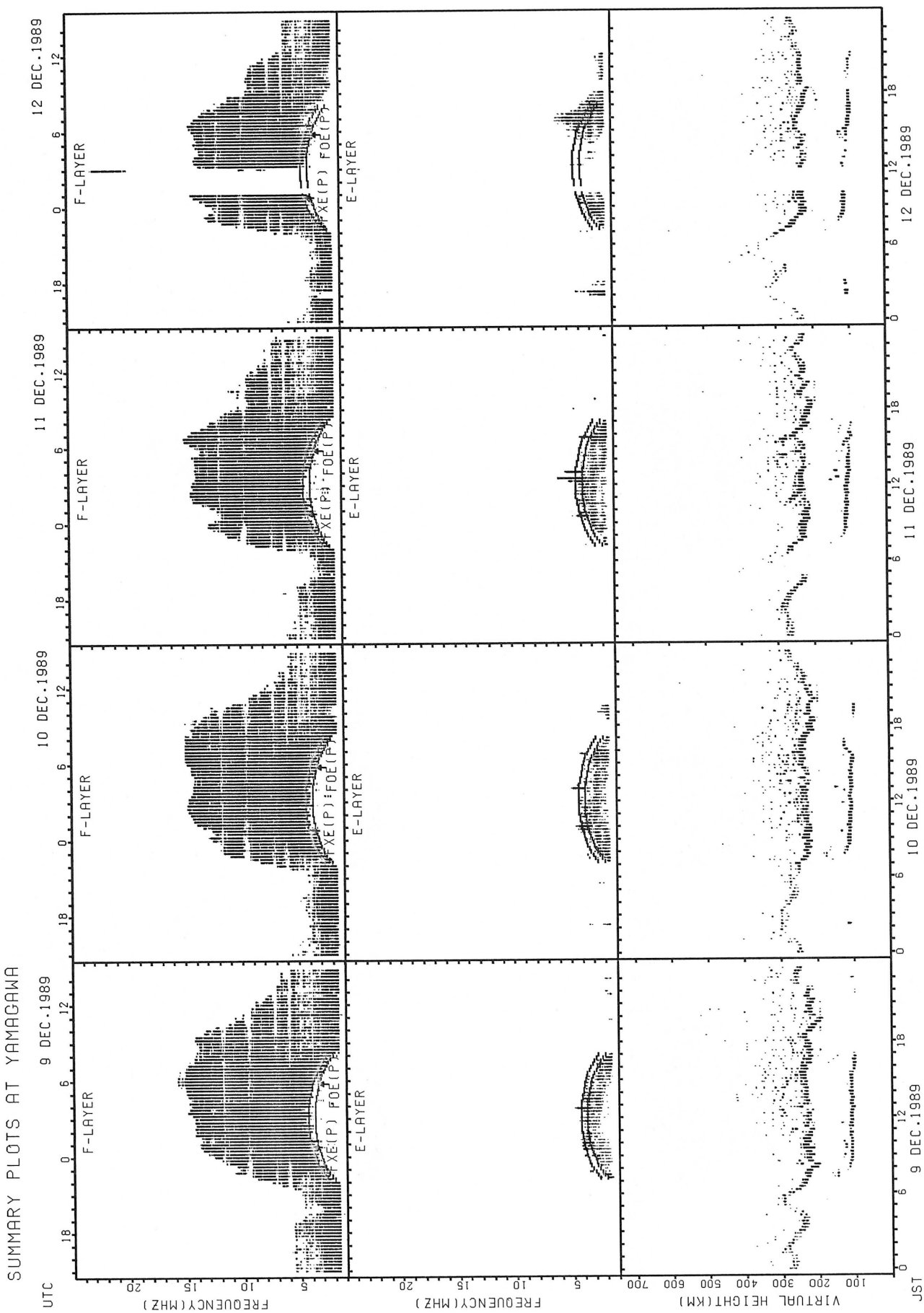


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

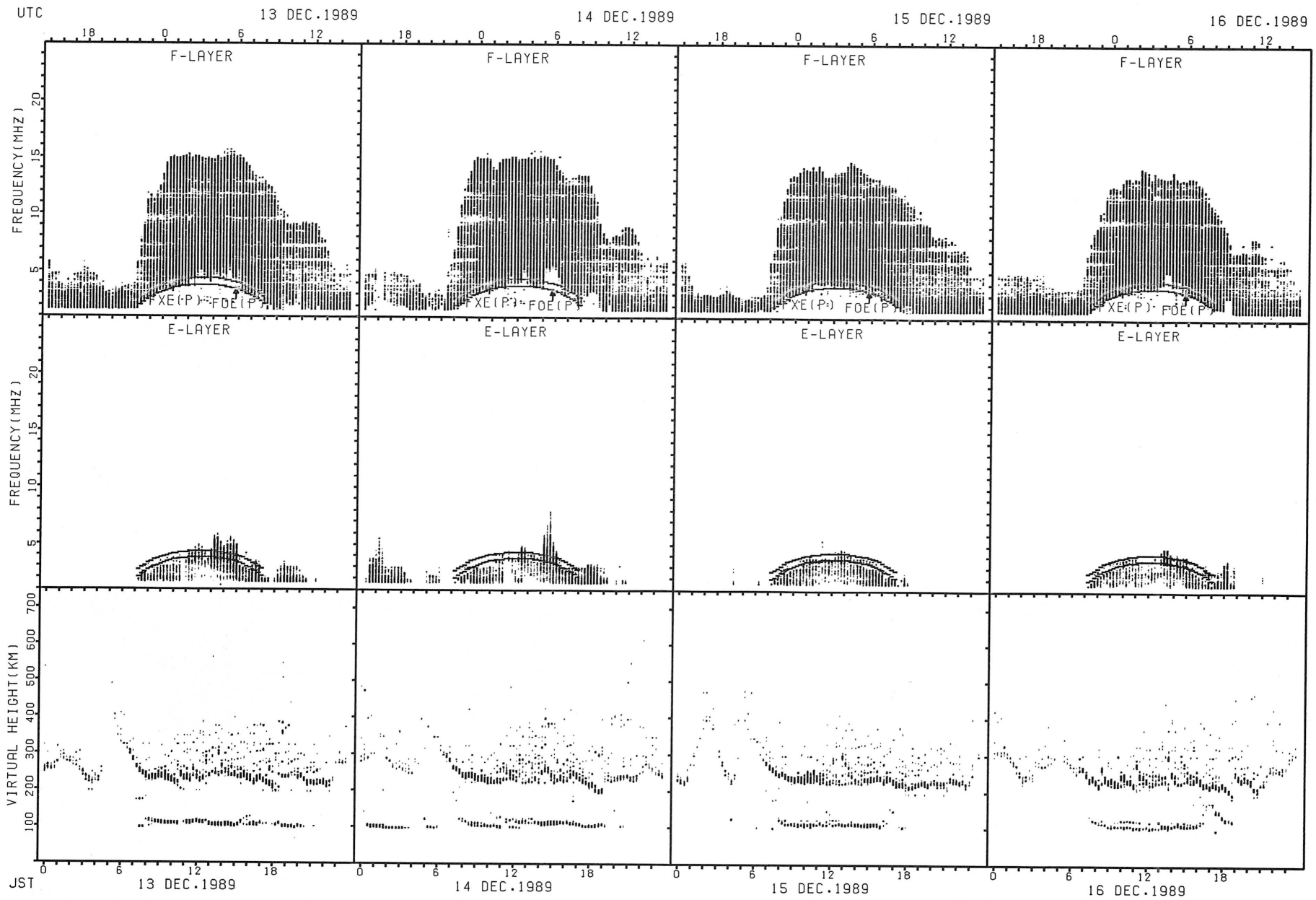
SUMMARY PLOTS AT YAMAGAWA



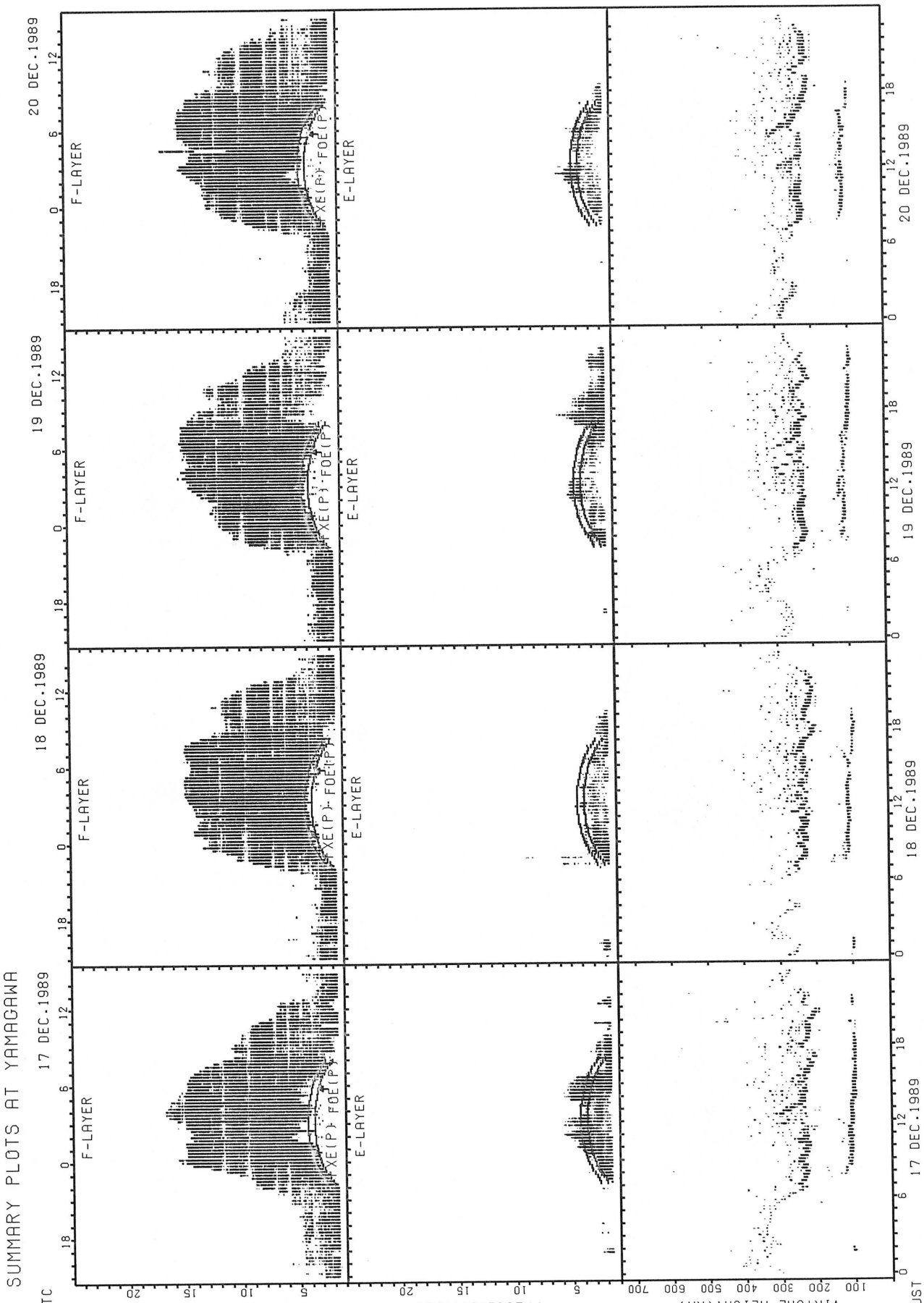
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
9 DEC.1989
10 DEC.1989
11 DEC.1989
12 DEC.1989
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

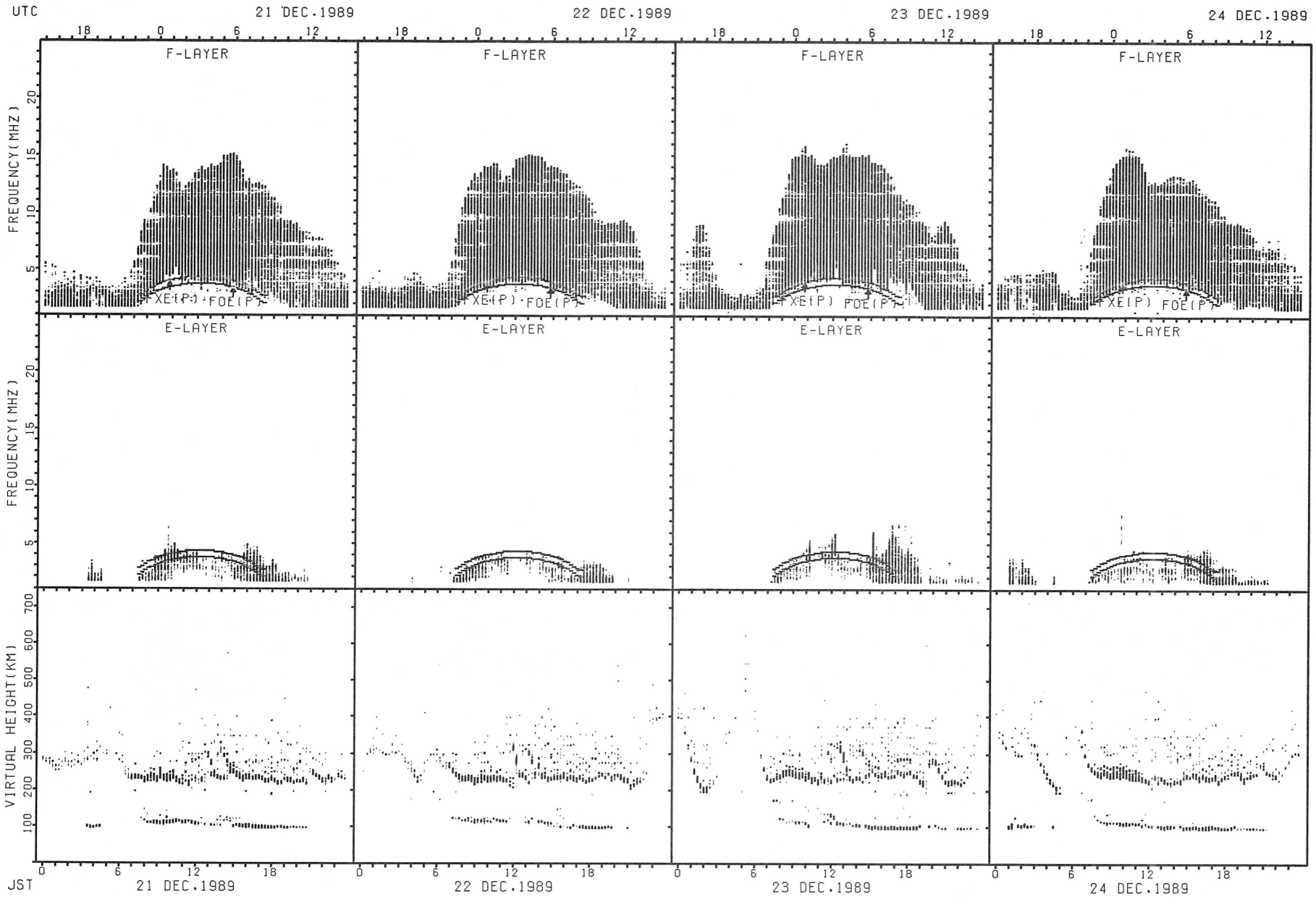
SUMMARY PLOTS AT YAMAGAWA



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

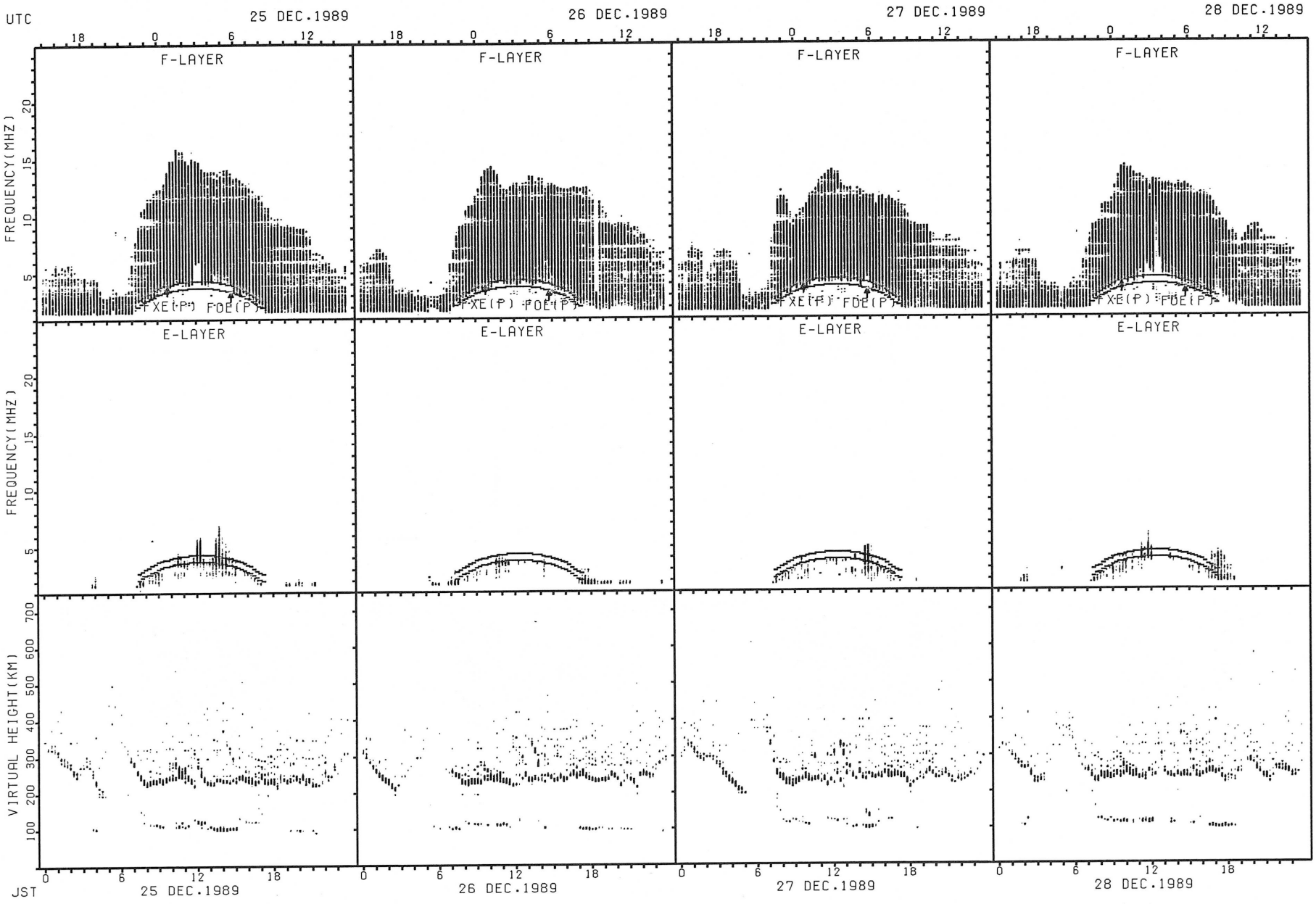

SUMMARY PLOTS AT YAMAGAWA
17 DEC.1989
18 DEC.1989
19 DEC.1989
20 DEC.1989
F-LAYER
E-LAYER
FXE(P)-FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA



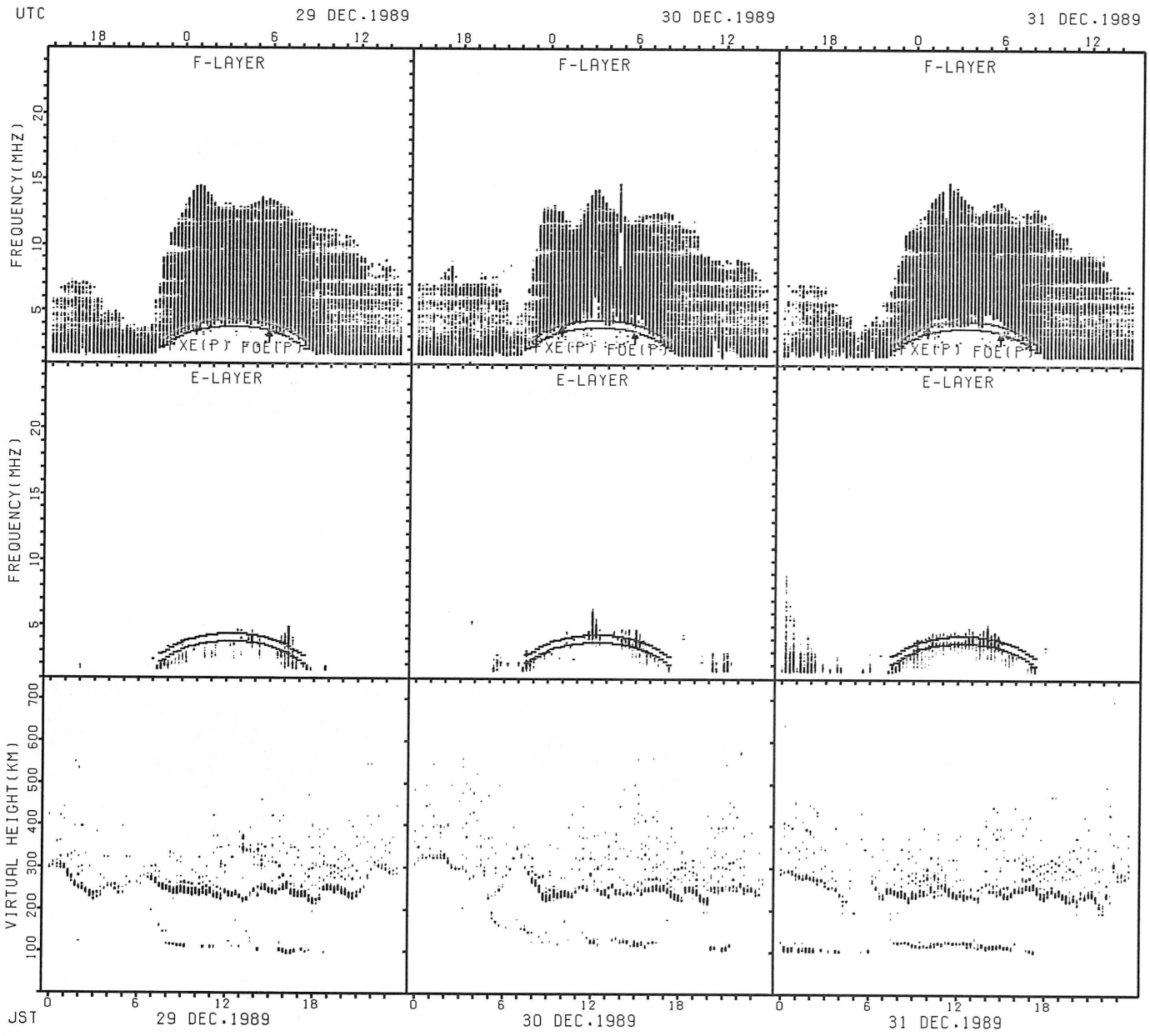
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA



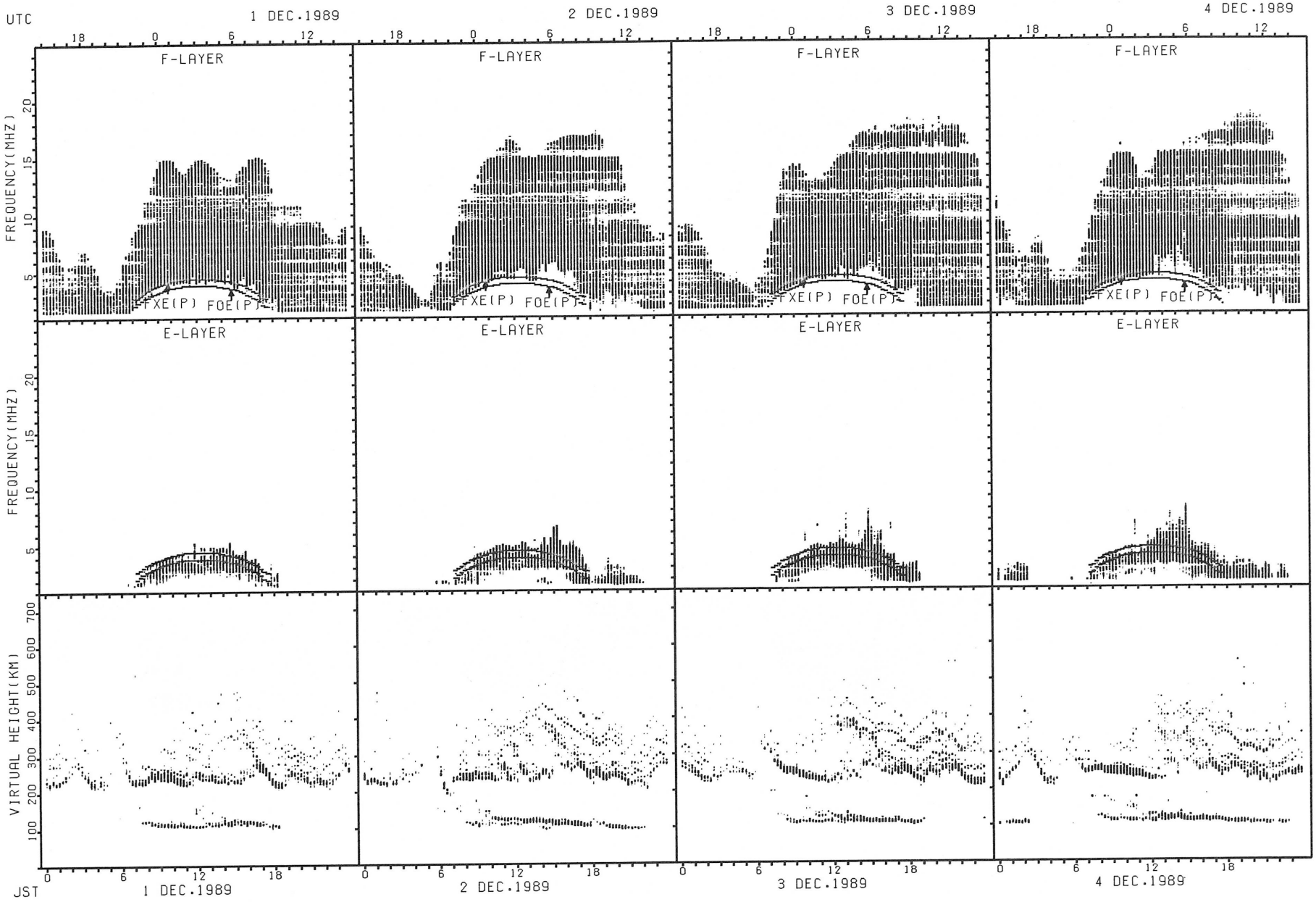
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA



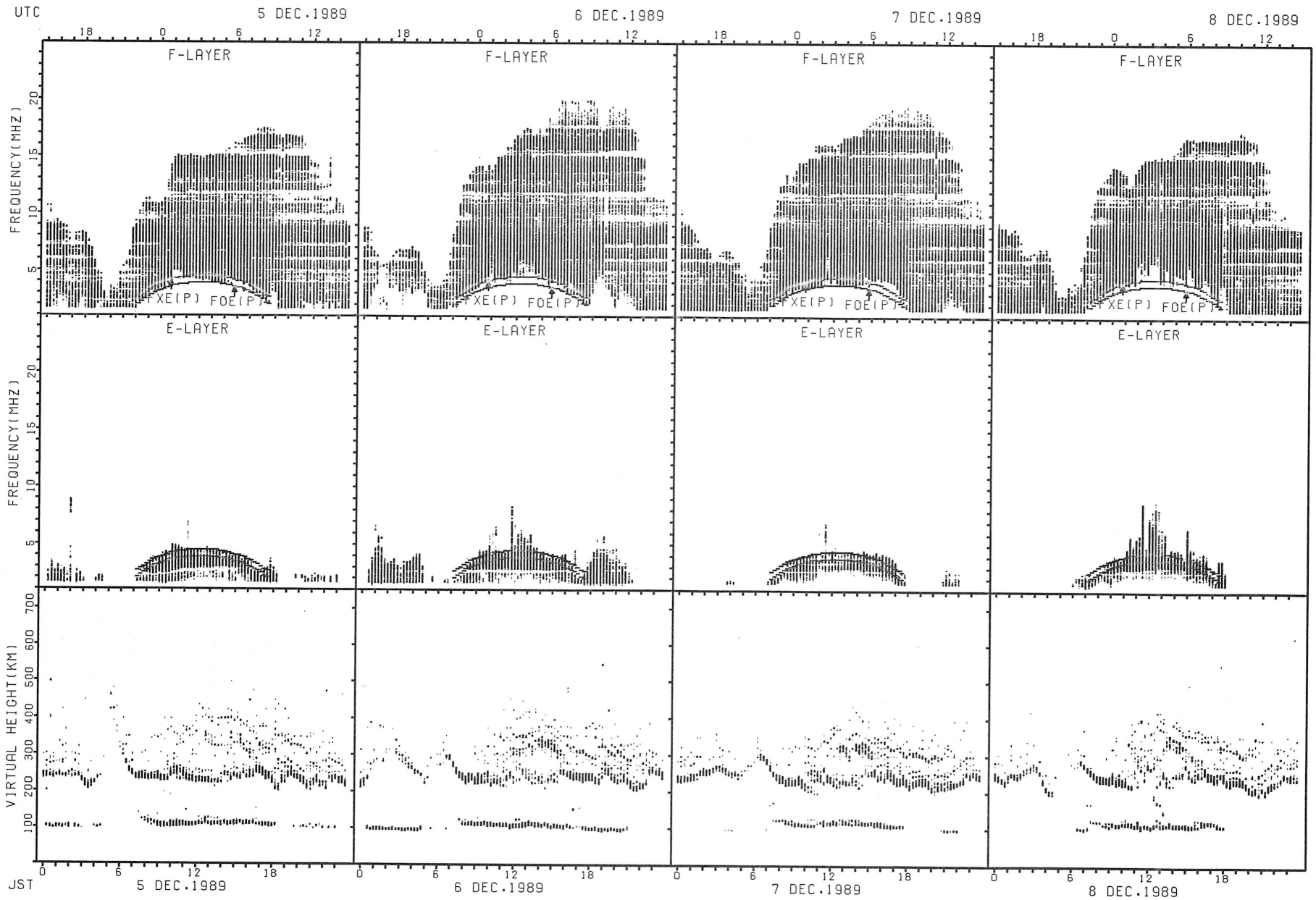
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA

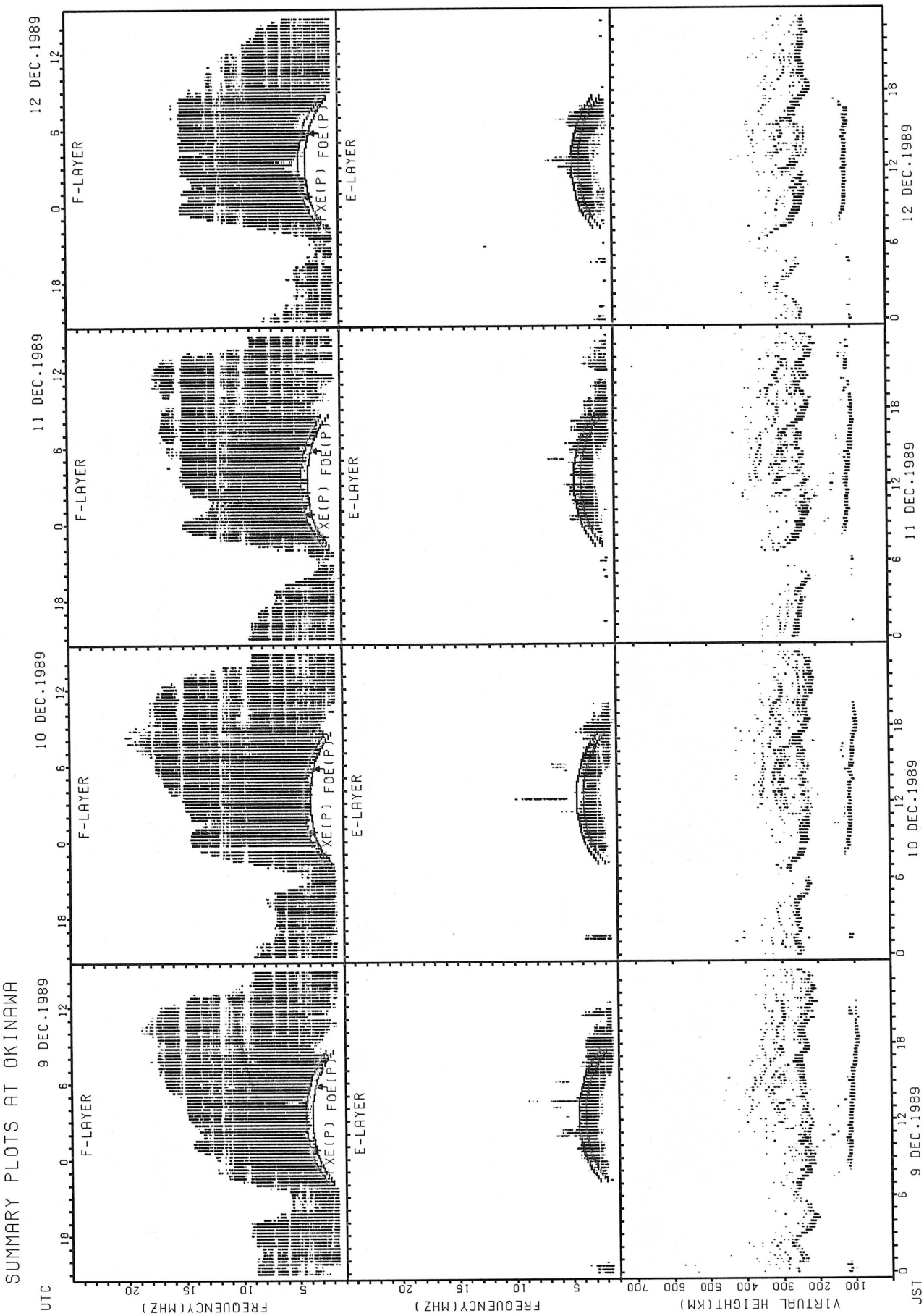


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

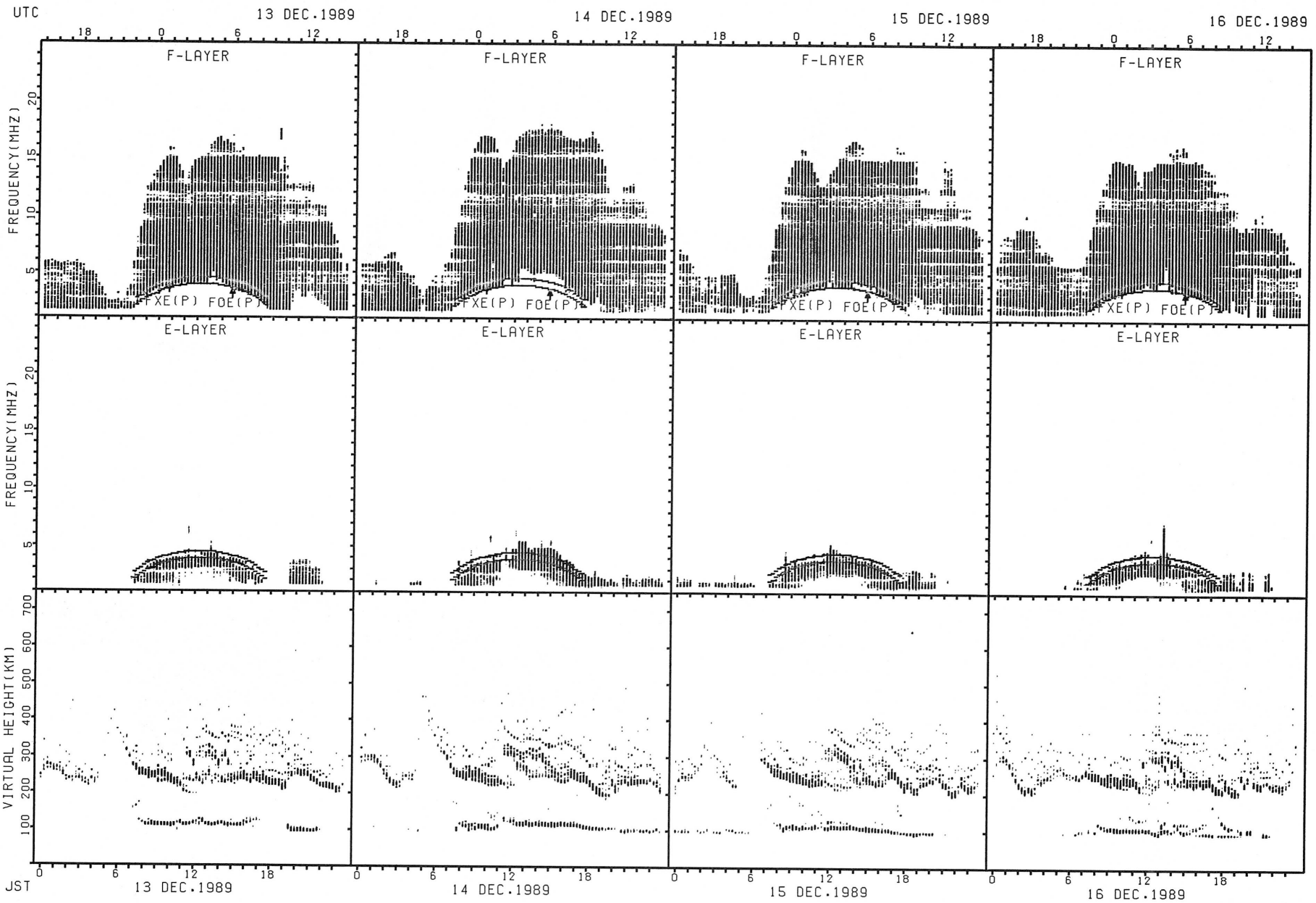
SUMMARY PLOTS AT OKINAWA



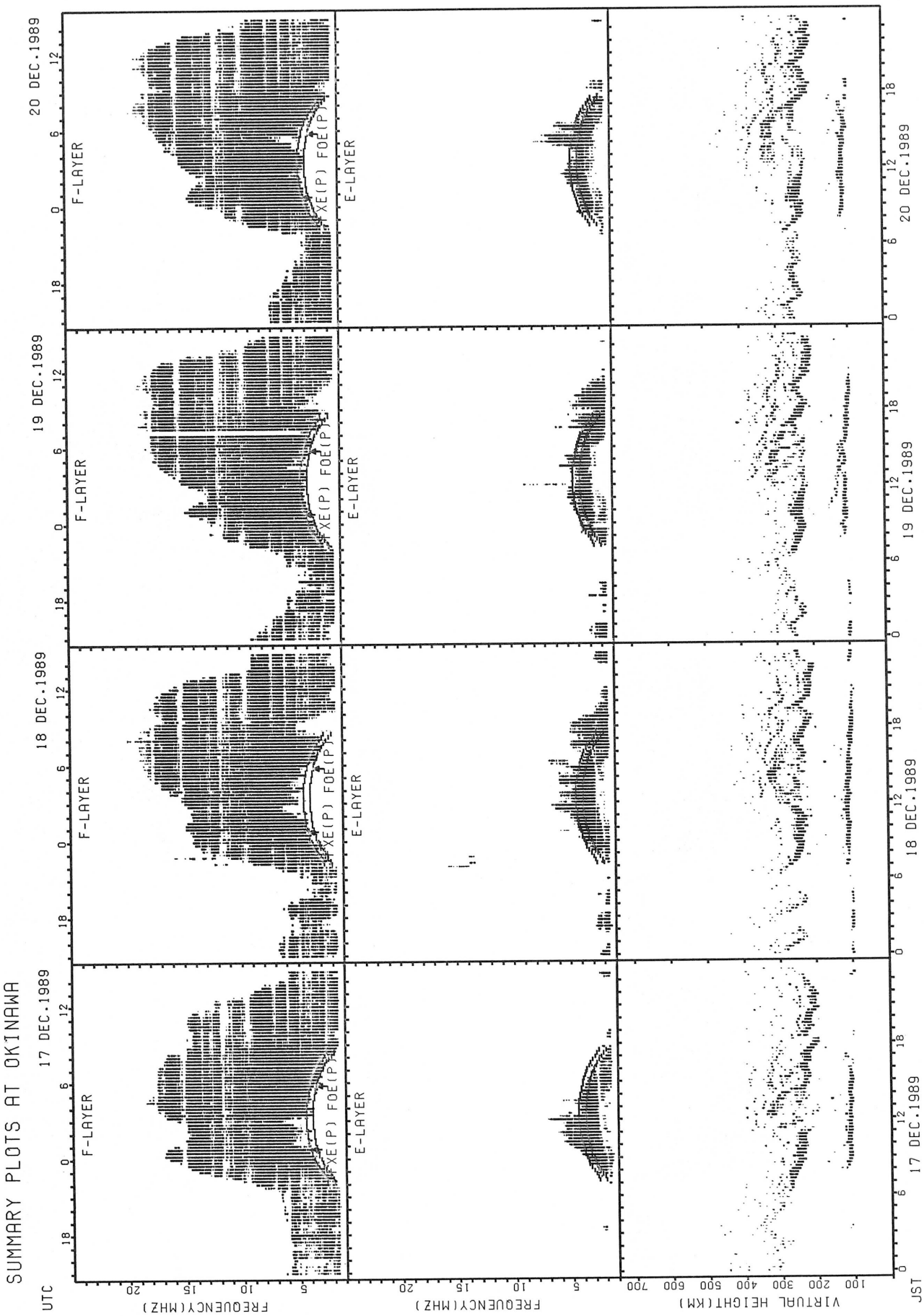
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
JST
9 DEC.1989
10 DEC.1989
11 DEC.1989
12 DEC.1989
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

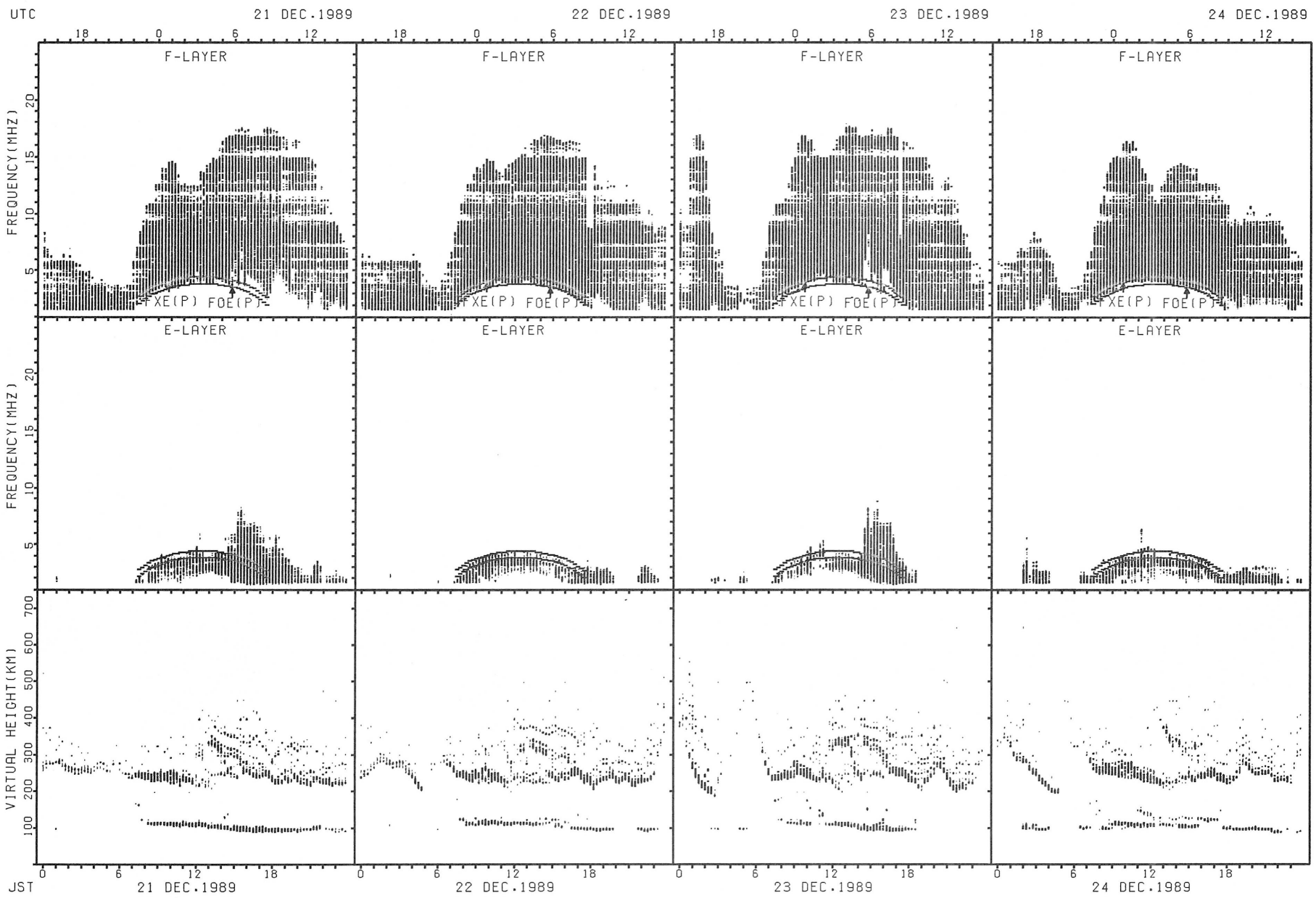
SUMMARY PLOTS AT OKINAWA



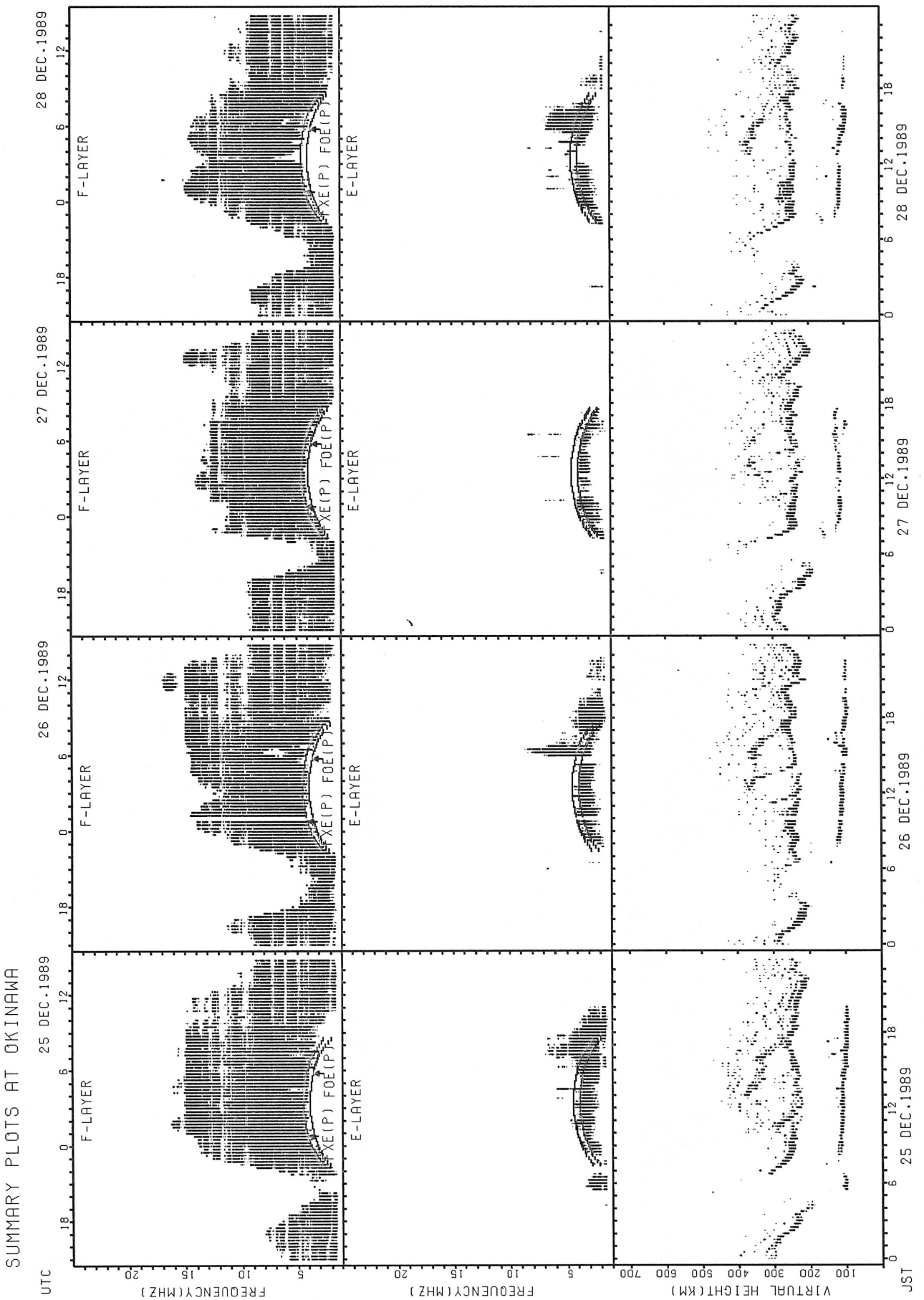
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
17 DEC.1989
18 DEC.1989
19 DEC.1989
20 DEC.1989
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

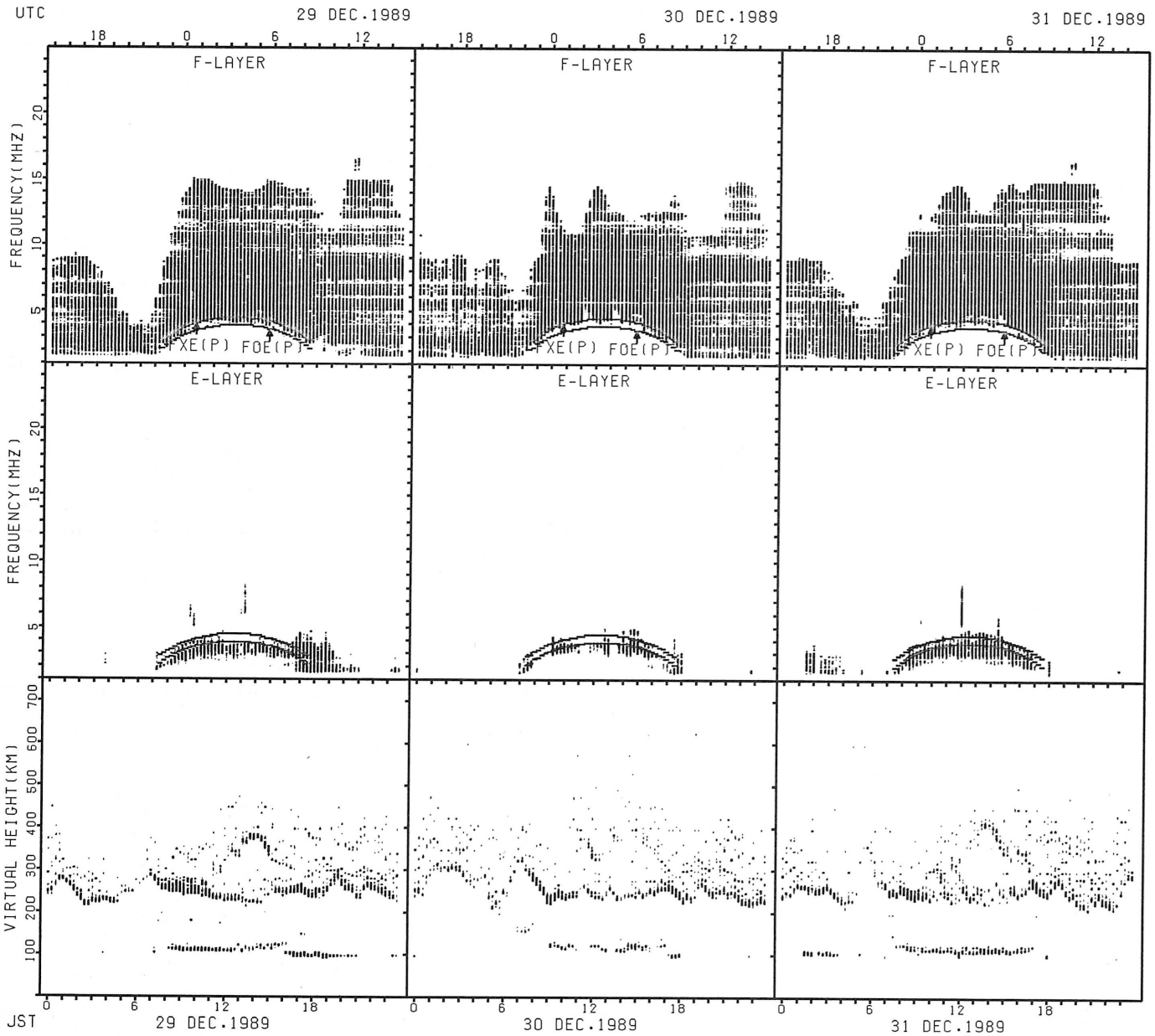
SUMMARY PLOTS AT OKINAWA



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


SUMMARY PLOTS AT OKINAWA
UTC
JST
25 DEC.1989
26 DEC.1989
27 DEC.1989
28 DEC.1989
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

MONTHLY MEDIANS OF H'F AND H'ES
DEC.1989 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								11	31	31	31	31	31	31	31	31	31	23	15					
MED								264	240	238	232	230	238	238	246	242	260	278	286					
U Q								286	248	244	240	240	242	248	256	258	270	302	300					
L Q								262	232	228	226	222	224	236	238	234	250	266	270					

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															
MED									134															
U Q									175															
L Q									127															

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								14	29	30	31	30	30	29	29	29	30	27	11					
MED								263	240	242	236	238	246	252	254	254	255	282	270					
U Q								268	246	246	254	252	256	263	263	264	262	294	282					
L Q								254	233	230	226	230	236	242	245	244	240	274	264					

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										13	12	10						10						
MED										115	113	119						105						
U Q										120	118	123						109						
L Q										111	110	113						99						

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								22	29	31	31	28	30	30	30	31	27	29	22	18				
MED								257	236	236	246	233	239	249	260	254	240	264	266	278				
U Q								270	247	244	266	241	250	282	282	272	266	291	294	300				
L Q								242	224	228	234	225	234	234	242	242	234	253	254	264				

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	12									15	20	16	11	12				14						
MED	107									119	117	118	115	118				104						
U Q	111									131	119	141	119	120				111						
L Q	102									113	114	114	111	112				101						

MONTHLY MEDIANS OF H'F AND H'ES
DEC.1989 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									31	31	30	29	31	31	30	29	29	31	30	28	25	17		
MED									240	238	237	240	250	248	262	278	254	252	260	284	274	282		
U Q									254	246	248	254	270	266	290	302	275	268	282	299	289	302		
L Q									232	228	230	233	238	240	250	254	245	242	246	266	259	258		

H'ES

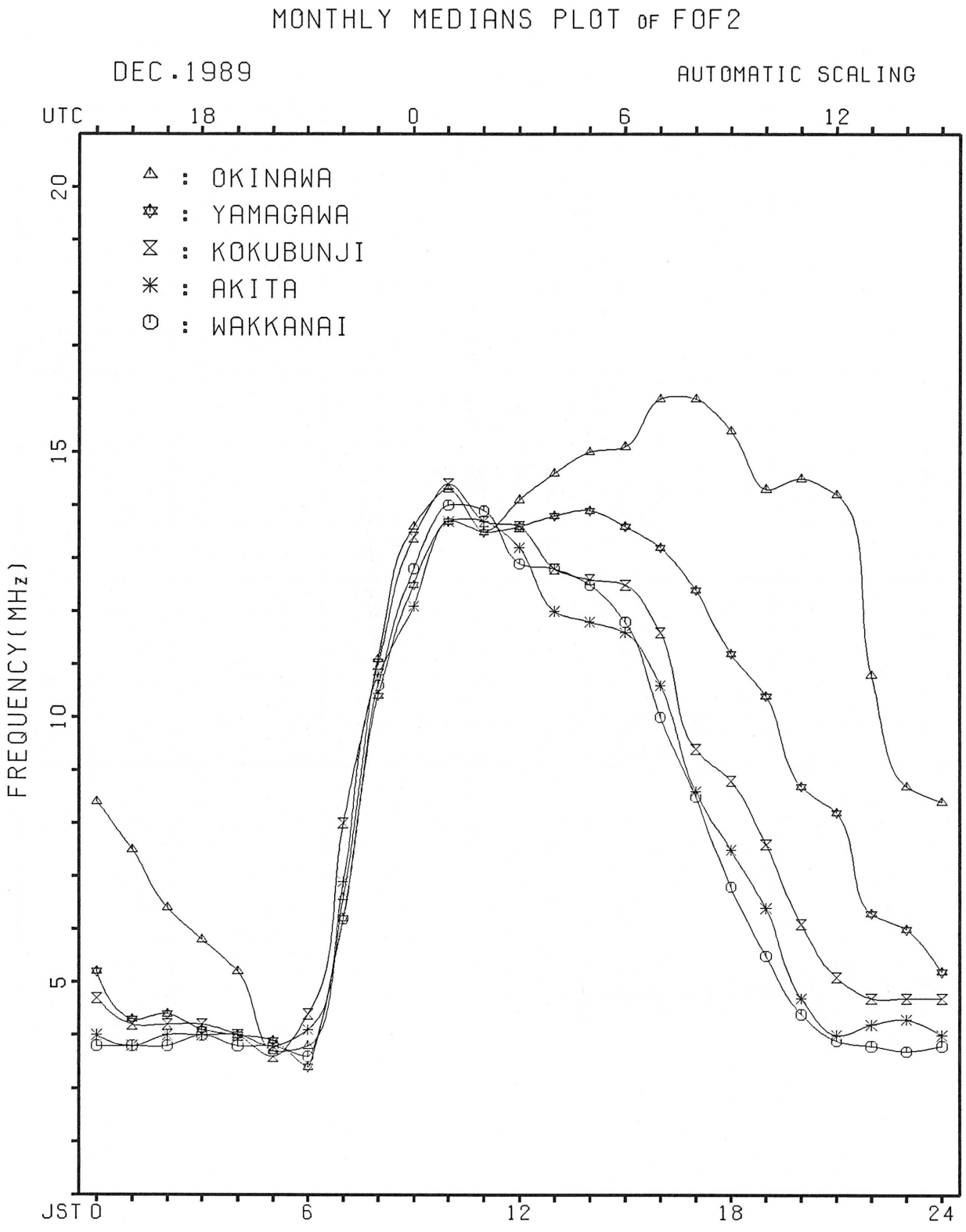
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT											12	10	17	12	14	17	10		17	12				
MED											118	118	119	120	114	113	108		99	106				
U Q											122	121	125	122	121	118	115		110	111				
L Q											113	115	115	115	107	106	99		98	100				

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	15	14						13	31	31	31	29	31	29	30	30	31	31	31	31	31	30	31	23
MED	288	299						294	254	246	242	240	274	328	314	314	304	258	244	260	270	257	252	280
U Q	302	328						319	270	256	252	249	344	357	348	338	334	276	264	290	298	272	268	288
L Q	264	292						276	238	232	234	235	246	294	284	288	278	248	236	250	250	244	240	262

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										12	16	18	22	20	18	21	18	19	23	16	11	10		
MED										115	120	119	116	116	116	117	113	107	101	97	101	100		
U Q										140	131	137	121	126	119	120	119	117	109	101	107	103		
L Q										112	114	115	113	113	111	108	107	99	99	96	97	97		


MONTHLY MEDIANS PLOT OF FOF2
DEC.1989
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

DEC. 1989 | FXI (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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	70	41	44	45	48	49	50											123	105	95	79	60	64	66
2	55	50	49	46	39	37	56											141	115	103	101	79	65	57
3	57	60	60	65	58	64	72											131	123	94	91	69	64	72
4	61	52	50	46	56	56	49											129	108	93	90	74	80	73
5	51	47	49	51	42	41	50											133	115	102	81	72	61	54
6	50	49	49	53	52	51	54											120	100	82	64	55	53	55
7	53	52	49	49	47	50	58											112	108	88	66	53	49	53
8	52	50	48	49	48	50	47											133	117	85	70	59	A	50
9	54	53	52	53	53	56	57											117	119	88	67	58	60	55
10	47	46	47	44	46	47	53											108	99	89	61	52	47	44
11	42	43	46	43	37	43	50											90	97	78	64	60	61	62
12	52	46	44	37	42	42	43											93	76	66	57	46	52	56
13	54	43	46	48	43	40	46											99	74	85	68	53	52	58
14	51	40	42	39	36	36	42											101	56	57	61	52	53	60
15	51	38	35	37	35	36	37					C			C		C	87	74	71	57	49	49	47
16	45	45	47	42	36	39	46											81	76	61	50	41	48	43
17	43	46	46	41	42	46	51											95	88	75	59	45	46	47
18	40	38	39	36	37	37	42											83	77	79	70	52	47	45
19	43	38	38	37	37	35	39											96	85	85	71	53	39	43
20	44	42	43	39	40	39	40											99	79	76	70	56	46	47
21	46	45	44	47	39	41	47											91	77	70	62	55	46	44
22	43	43	43	44	46	47	51											96	86	76	66	49	42	39
23	47	62	79	45	25	24	34											94	86	71	61	57	52	49
24	48	48	47	48	49	36	37											95	96	81	55	53	55	54
25	55	55	53	51	45	39	39											108	84	87	77	58	54	53
26	53	61	51	50	43	41	45											110	107	97	71	60	57	56
27	52	52	51	54	55	38	36											102	90	76	62	61	57	58
28	53	55	57	51	48	47	55											103	77	77	73	61	55	55
29	55	57	56	53	50	45	45											97	84	81	86	64	61	65
30	68	65	63	56	63	71	64	81			135							116	105	84	72	61	63	59
31	57	57	57	53	52	48	47											119	104	85	72	76	67	63
	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	31	31	31	31	31	31	31	1			1							31	31	31	31	31	30	31
MED	52	48	48	47	45	42	47	81			135							102	90	82	68	57	54	55
UQ	54	54	52	51	50	48	52											118	106	88	72	61	61	58
LQ	46	43	44	42	39	38	42											96	78	76	62	52	48	47

DEC. 1989 | FXI (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FOF2 (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	64	35	38	39	42	43	44	84	117	142	159	149R	152	143	129	124	127	115	100	90	73	54	58	60
2	48	44	44	40	34	31	49H	114R	148	149	156	171	165RU	158S	154	151	148	134	110	96	95	73	59	51
3	51	54	54	59	51	58	66	94	131	154R	155	147	144	143	146	151	141	125	116	88	85	64	58	65
4	55	46	45	41	49	51	44	83	117	156R	163R	141	139	139	138	145	137	123	102	87	82	67	74S	66
5	45	42	43	45	36	35	44	93	117	130	151	143	144	145	140	134	126	126	110	94	75	66	55	47
6	44	43	43	47	47	45	48	84	130	142	156	149	143	143	152	147	123	114	94	74	57	48	47S	48
7	46	46	43	43	41	44	52	96	122	140	151	148	146	148	149	151	125	106	103	81	61	47	43	47
8	46	44	42	43	42	45	42	85	109	144	166R	144	133	145	149	144	132	126	112	78	64S	54	A	44
9	47	47	46	47	47	50	52	87	122	141	151	147	137	141	152	148	116	111	112	81	61	52	54	49
10	42S	40	40	38	42	42	48	74	106	120	144	139	136	130	130	129	118	102	93	83	57	46	40	38
11	35	37S	40	37	32	38	45	82	99	112	157R	131	129	125H	127	137	114	84	91	73	57	55	56	55
12	46	41	39	31	36	36	42	86	112	138	163	130	125	121	128	126	105	92	70	60	51	40	46	51
13	48	37	41	43	37	35S	41	83	119	144	163JR	159	144	141	145	133	117	92	67	78	62	45	45	52
14	44S	35	36US	32	30	31S	36	92	123	120	149	152	137	138	126	101	107	94	50	51S	55	45S	47	54
15	44	32	30	31	30	30	32	74	117	131	137	140IC	135	127	124IC	127	112IC	81	67	65	52	42	42	41
16	39	39	40	37	31	34	41	77	97S	111	126	139	131	119	110	121	98	76	70	54	44	35	41	38
17	36	39	40	35	36	40	44	93H	105	146	144	134	135	146	133	127	110	90	82	65	53	38	40	42
18	34	33	33	31	31	32	35	71	101	125	127	134	133	128	122	126	121	76	71	74	64	46	39	39
19	36	34	33	31	31	30	33	73	94	107	116	124	138	124	121	122	115	90	79	77	64	45	34	36
20	38	36	37	33	34	33	33	70	103	113	131	133	139	123	126	129	111	91	74	69	64	49H	39	41S
21	38	38	38	41S	33	35	41	71	105	114	124	121	122	118	128	116	95	85	70	64	56	46	39	38
22	37	38	37	38	40	41	45	81	121	131	134	131	135	139	125	122	104	91	80	69	60	42	36	34S
23	42	55F	69F	31UF	20	19	28	79	120	147	142	142	138	131	130	130	116	89	80	64	56	50	45	43
24	43	42	41	42	43	31H	31	70	111	140	152	148	139	133	126	117	103	89	91	75	43H	47	48	47
25	48	48	47	45	41	33	34	78	109	123	153	148	140	135	135	123	114	102	79	81	70	53	48	47
26	48	55	45	44	36	34	39	74S	101	116	131	123	128	122	120	112	107	103	100	91	64	56	51	51
27	45	46	45	48	49	34	30	73S	104	97	113	124	122	118	116	105	98	94	84	69	57	56	51	52
28	47	49	51	45	42	41	49	77	98	117	129	129UR	132	129	123	118	107	95	71	71	63	55	49	49
29	48	51	50	46	44	40	39	70	102	124	120	125	124	126H	126	118	102	91	77	74	81R	58V	55	58
30	60	59	56	50	57	64	50	69F	113	142	122F	121	132	122	112	114	111	110	99	78	67	56	57	54
31	51	51	51	47	46	42	40	68	109	118	140	134	130	124	123	119	113	112	98	79	68	69	60	57
	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	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	30	31
MED	45	42	42	41	40	36	42	79	111	131	144	139	136	131	128	126	114	94	84	75	62	50	48	48
UQ	48	48	46	45	44	42	46	86	120	142	156	148	140	142	139	136	122	112	100	81	68	56	55	53
LQ	40	38	38	36	34	33	36	78	104	118	130	130	132	124	124	118	107	90	72	69	56	46	41	42

DEC. 1989 | FOF2 (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FOF1 (0.01 MHZ)

135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											L	L	L			L								
2										L	L			L	L	L								
3										L			L	L	L									
4													L	L										
5													L	L										
6													L	L	L									
7											L		L		L									
8									L	L	L	L	L	L										
9										L		L	L	L										
10												L	L											
11											L				L									
12										L	L		L	L										
13										L	L			L		L								
14											L	L	L	L										
15											L	C			C		C							
16										L	L				L									
17											L	L	L	L										
18														L										
19													L		L									
20											L		L	L	L									
21											L	L		L	0 L 510									
22											L	L	L	L										
23											L		L		L 560									
24										L	L			L	L									
25									L		L	L	L	L		L								
26											L	L	L		L									
27											L	L	L	L										
28														L	L									
29												L	L	L	L									
30										L		L	L	L		L								
31											L			L	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															2									
MED															L 535									
UQ																								
LQ																								

DEC. 1989 | FOF1 (0.01 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FOE (0.01 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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								220	285	335	A	A	365	A	330	275	A							
2								230	H 290	320	330	360	360	A	A	A	A							
3								H 200	275	315	335	A	A	A	A	A	200							
4								205	280	A	U A 350	365	360	A	A	A	A 180							
5								205	270	315	A	A	A	A	315	265	185							
6								195	A	315	350	355	360	350	325	H 285	H 220							
7								195	A	U A 325	A	A	360	A	320	285	215							
8								H 210	275	330	360	A	A	355	330	270	215							
9								200	275	A	A	355	380	355	330	265	190							
10								185	260	315	A	355	350	345	A	285	215							
11								H 190	265	325	350	360	355	345	310	285	H 210							
12								185	260	320	355	355	350	340	325	230	A							
13								160	265	315	A	345	355	345	305	270	R							
14								190	270	300	A	A	A	335	315	280	U A 200							
15								190	H 270	H 315	A	I C 345	350	U A 330	I C 300	265	I C 195							
16								175	260	A	A	A	345	345	A	270	200							
17								190	A 270	310	345	A	A	340	310	270	200							
18								190	265	A	A	345	345	335	315	275	H 210							
19								165	270	A	A	A	350	340	315	285	210							
20								195	270	310	335	355	355	345	335	A	200							
21								170	265	A	A	350	350	345	320	275	180							
22								H 175	265	315	A	350	365	350	315	275	A							
23								200	H 285	330	350	365	365	340	320	275	A							
24								180	260	320	U A 340	355	355	340	A	285	A							
25								205	280	335	370	A	370	360	340	295	A							
26								B	265	325	A	A	365	355	335	305	230							
27								H 200	285	320	A	365	375	360	330	290	205							
28								165	270	U A 335	345	370	385	385	R 355	285	215							
29								H 195	270	A	A	370	375	355	340	290	210							
30								B	255	335	370	390	380	355	340	300	225							
31								H 180	265	305	345	380	A	375	A	300	220							
	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	24	15	20	25	25	24	27	23							
MED								190	270	320	350	355	360	345	322	280	210							
UQ								200	275	328	352	365	365	355	332	285	215							
LQ								180	265	315	342	352	350	340	315	272	200							

DEC. 1989 | FOE (0.01 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FOES (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	E B 13	J A 20	E B 13	E B 13	E B 13	E B 13	E B 14	G	G	G	40	J A 49	G 33	J A 56	G	G	30	J A 20	J A 22	E B 13	J A 21	E B 13	E B 13	E B 14
2	E B 15	E B 13	E B 12	E B 12	J A 22	J A 18	E B 13	G	G	37	42	G	G	J A 45	J A 45	32	25	J A 19	J A 16	J A 25	E B 15	E B 14	E B 13	18
3	E B 16	19	19	E B 13	E B 13	E B 14	J A 19	G	G	G	37	J A 53	40	J A 43	J A 43	J A 30	G	E B 13	J A 15	E B 13	13	E B 13	J A 19	18
4	24	J A 34	J A 23	20	J A 26	E B 13	E B 13	G	G 18	J A 38	J A 43	40	42	39	J A 35	30	19	E B 14	E B 13	J A 19	J A 51	28	J A 43	J A 33
5	J A 22	J A 20	J A 20	E B 13	E B 13	E S 18	J A 21	G	30	G 26	J A 36	J A 37	J A 39	37	32	G 26	G 18	J A 15	J A 21	J A 42	J A 50	J A 32	J A 53	J A 51
6	J A 46	J A 24	31	24	E B 13	E B 13	J A 53	J A 26	J A 42	J A 41	J A 37	G	G	G	G	G	G	E B 13	J A 18	J A 18	E B 12	E B 13	J A 23	J A 20
7	24	E B 13	E B 13	E B 12	E B 14	E B 13	E B 12	G	J A 33	39	36	J A 45	G	J A 43	G	31	G	21	J A 33	E B 13	E B 13	E S 16	E B 13	E B 13
8	E B 15	J A 23	E S 17	J A 24	E B 12	E B 13	E B 14	G	G	G	G	J A 55	39	J A 45	G	G	G	E B 13	E B 14	E B 13	E B 13	J A 24	J A 50	J A 39
9	J A 28	E B 14	E B 13	J A 23	E B 13	E B 13	E B 13	G	G	J A 53	J A 42	G	G	G	G 23	G	G	E B 14	E B 14	E B 13	E B 16	E B 13	E B 13	E B 14
10	E B 13	E B 14	J A 22	18	21	E B 13	E B 13	G	G	G	J A 40	G	J A 43	G	J A 35	J A 28	G 20	E B 14	E B 13	E B 15	J A 19	J A 17	J A 22	E B 14
11	E B 15	E B 13	E B 12	J A 52	E B 12	E B 13	E B 14	G	G	G	37	G	G	G	G	G 19	G	J A 21	E B 14	E B 15	E B 13	E B 14	E B 14	E B 15
12	25	E B 13	J A 23	J A 23	E B 12	E B 14	E B 13	G	G 25	G	39	G	G	G	G 26	J A 24	J A 46	J A 28	E B 15	J A 22	J A 22	J A 17	J A 28	E B 14
13	E B 14	J A 22	21	J A 17	J A 20	E B 14	E B 14	J A 21	G	J A 30	J A 36	G	36	G	G 27	29	21	E B 13	J A 20	J A 16	E B 13	E B 15	E B 14	E B 13
14	E B 13	J A 22	J A 21	J A 23	J A 19	J A 26	22	G	G	39	35	J A 40	J A 49	G 30	G	G 26	22	E B 13	E B 13	20	E B 14	E B 14	J A 15	J A 17
15	23	J A 27	J A 20	21	J A 22	J A 21	21	G	G	J A 52	J A 37	C	38	38	C	G	C	J A 22	J A 22	J A 19	J A 18	J A 18	J A 18	J A 16
16	17	E B 12	E B 13	E B 13	J A 20	E B 14	E B 13	G	J A 47	47	36	39	38	G	36	G	J A 21	J A 16	20	J A 25	J A 22	22	E B 14	E B 14
17	E B 13	E B 13	E B 13	E B 13	E B 13	J A 17	E B 13	J A 23	G	J A 53	J A 42	39	J A 38	G	G	G	G	E B 13	E B 14	E B 13	E B 14	E B 13	E B 13	23
18	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	J A 24	G	J A 36	J A 50	38	G	36	34	G	G	E B 13	E B 14	E B 14	E B 13	E B 14	E B 14	E B 14
19	E B 15	E B 14	E B 14	E B 13	E B 14	E B 14	E B 13	J A 23	J A 31	J A 37	J A 40	36	40	G	G	G	28	E B 14	20	20	E B 14	E B 14	E B 14	E B 14
20	J A 25	J A 20	J A 16	E B 14	J A 16	E B 14	E B 13	G	G	G	37	G	G 34	G 32	G	J A 40	G	J A 21	J A 20	E B 13	E B 14	E B 15	E B 13	J A 27
21	J A 26	J A 42	J A 20	J A 22	E B 13	E B 13	E B 13	G	G	J A 40	J A 42	J A 40	G 30	G	G	G	G	E B 13	E B 13	E B 12	E B 14	E B 13	E B 13	E B 13
22	E B 14	J A 29	J A 23	E B 13	E B 13	E B 12	E B 13	G	G	G	J A 37	G 34	G	G	G	31	23	J A 27	E B 15	E B 13	E B 13	18	E B 13	E B 14
23	E B 14	E B 13	E B 12	E B 13	E B 13	E B 15	E B 13	G	G	G	J A 65	G	43	J A 42	G	G	26	33	J A 20	J A 23	E B 14	E B 13	E B 13	E B 12
24	E B 13	E B 14	E B 14	E B 13	E B 13	E B 12	E B 13	G	G	G	39	G	G	G 30	J A 51	J A 36	J A 35	J A 34	J A 32	J A 31	J A 28	J A 17	17	E B 14
25	J A 51	J A 26	E B 13	E B 13	E B 13	E B 13	E B 15	G	J A 36	G	G	J A 55	43	G 28	G 27	G 28	J A 23	J A 36	J A 23	22	E B 14	E B 13	20	23
26	E B 14	E B 13	J A 16	E B 14	J A 30	J A 22	E B 13	E B 15	G	G	38	38	G 33	G	G	G	G	J A 22	E B 16	J A 19	J A 21	J A 20	20	J A 15
27	E B 14	J A 17	E B 14	E B 13	E B 14	E B 13	E B 13	G	G	G	J A 43	40	G	41	36	39	27	21	E B 14	20	E B 13	J A 25	J A 26	J A 23
28	J A 24	E B 12	E B 13	E B 13	E B 12	E B 13	E B 13	G	G	35	37	G 36	G	G	G	G	G	E B 15	E B 14	E B 13	E B 14	E B 14	J A 22	E B 13
29	E B 13	E B 14	E B 13	E B 13	E B 12	E B 13	E B 13	G	G	J A 42	J A 41	G	G	41	G 28	G	G	E B 15	E B 13	E B 13	E B 13	E B 13	E B 16	E B 14
30	E B 13	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	E B 17	J A 28	G	G	G	G	39	38	34	G	E B 14	E B 14	J A 23	J A 30	J A 32	J A 21	J A 34
31	J A 22	E B 14	E B 13	E B 13	E B 13	E B 13	E B 12	G	G	G	G	G	J A 53	G	J A 46	G	G	J A 21	J A 23	E B 14	E B 13	E B 14	E B 14	E B 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	31	31	31	31	31	31	31	31	31	31	31	30	31	31	30	31	30	31	31	31	31	31	31	31
MED	E B 15	E B 14	E B 14	E B 13	E B 13	E B 13	E B 13	G	G	G 26	37	36	G 33	G 30	G 24	G 19	E G 18	15	E B 15	16	E B 14	E B 14	E B 15	E B 15
UQ	24	J A 22	J A 20	20	18	E B 14	E B 14	G	G 22	J A 39	J A 42	J A 40	40	40	35	30	23	J A 21	J A 20	J A 21	J A 20	J A 18	J A 22	J A 22
LQ	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	G	G	G	36	G	G	G	G	G	G	E B 14	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14

DEC. 1989 | FOES (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FBES (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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 13	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	G	G	G	37	39	G 31	39	G	G	24	16	15	E B 13	14	E B 13	E B 13	E B 14
2	E B 15	E B 13	E B 12	E B 12	E B 12	E B 14	E B 13	G	G	34	38	G	G	40	40	32	23	E B 14	E B 13	19	E B 15	E B 14	E B 13	E B 13
3	E B 16	E B 13	E B 13	E B 13	E B 13	E B 14	E B 12	G	G	G	36	37	38	36	34	28	G	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13
4	E B 13	15	15	E B 13	E B 13	E B 13	E B 13	G	G 18	33	G 35	38	40	36	33	29	G 17	E B 14	E B 13	E B 14	17	20	32	24
5	E B 13	16	E B 13	E B 13	E B 13	E S 18	E B 14	G	G 18	G 21	34	36	36	36	G 30	G 24	G 16	E B 13	E B 13	25	21	21	43	28
6	20	E B 13	E B 12	E B 13	E B 13	E B 13	18	G 16	27	G 27	G 28	G	G	G	G	G	G	E B 13	E B 13	E B 13	E B 12	E B 13	E B 13	E B 13
7	18	E B 13	E B 13	E B 12	E B 14	E B 13	E B 12	G	28	G 32	35	38	G	37	G	G 26	G	E B 13	E B 13	E B 13	E B 13	E S 16	E B 13	E B 13
8	E B 15	14	E S 17	18	E B 12	E B 13	E B 14	G	G	G	G	38	36	G	G	G	G	E B 13	E B 14	E B 13	E B 13	16	A A 50	39
9	19	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	G	G	35	36	G	G	G	G 23	G	G	E B 14	E B 14	E B 13	E B 16	E B 13	E B 13	E B 14
10	E B 13	E B 14	15	E B 13	E B 13	E B 13	E B 13	G	G	G	34	G	G 30	G	33	G 24	G 17	E B 14	E B 13	E B 15	E B 13	E B 13	16	E B 14
11	E B 15	E B 13	E B 12	E B 12	E B 12	E B 13	E B 14	G	G	G	36	G	G	G	G	G 19	G	16	E B 14	E B 15	E B 13	E B 14	E B 14	E B 15
12	21	E B 13	E B 12	E B 12	E B 12	E B 14	E B 13	G	G 22	G	G	G	G	G	G 20	G 22	22	17	E B 15	19	19	E B 13	14	E B 14
13	E B 14	E B 13	E B 14	E B 13	E B 14	E B 14	E B 14	G	G	G 21	35	G	G 30	G	G 25	28	U R 20	E B 13	E B 13	E B 12	E B 13	E B 15	E B 14	E B 13
14	E B 13	E B 13	E B 15	14	E B 13	21	E B 13	G	G	G	35	31	36	G 29	G	G 25	G 19	E B 13	E B 13	E B 14	E B 14	E B 14	E B 14	E B 13
15	E B 13	E B 13	E B 13	E B 14	17	E B 13	E B 14	G	G	G	35	C	36	36	C	G	C	E B 12	E B 12	E B 12	E B 12	16	14	15
16	E B 14	E B 12	E B 13	E B 13	E B 12	E B 14	E B 13	G	G	G 33	34	37	37	G	32	G	G	E B 14	E B 13	19	E B 18	E B 13	E B 14	E B 14
17	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	E B 13	G	G	34	G	36	35	G	G	G	G	E B 13	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13
18	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	G 14	G	31	34	G 28	G	35	34	G	G	E B 13	E B 14	E B 14	E B 13	E B 14	E B 14	E B 14
19	E B 15	E B 14	E B 14	E B 13	E B 14	E B 14	E B 13	E B 13	G 20	34	35	35	G	G	G	G	G	E B 14	E B 13	E B 13	E B 14	14	E B 14	E B 14
20	18	17	E B 13	E B 14	E B 13	E B 14	E B 13	G	G	G	36	G	G 32	G 30	G	31	G	E B 15	E B 13	E B 13	E B 14	E B 15	E B 13	16
21	17	19	E B 12	E B 13	E B 13	E B 13	E B 13	G	G	34	37	G 32	G 29	G	G	G	G	E B 13	E B 13	E B 12	E B 14	E B 13	E B 13	E B 13
22	E B 14	19	19	E B 13	E B 13	E B 12	E B 13	G	G	G	34	G 32	G	G	G	30	23	19	E B 15	E B 13	E B 13	E B 13	E B 13	E B 14
23	E B 14	E B 13	E B 12	E B 13	E B 13	E B 15	E B 13	G	G	G	44	G	38	G 28	G	G	23	22	E B 13	21	E B 14	E B 13	E B 13	E B 12
24	E B 13	E B 14	E B 14	E B 13	E B 13	E B 12	E B 13	G	G	G	G 34	G	G	G 26	33	G 26	25	24	21	19	20	17	E B 14	E B 14
25	18	15	E B 13	E B 13	E B 13	E B 13	E B 15	G	G 24	G	G	46	39	G 28	G 27	G 25	23	20	18	E B 13	E B 14	E B 13	E B 13	E B 13
26	E B 14	E B 13	E B 13	E B 14	E B 13	E B 13	E B 13	E B 13	G	G	36	36	G 33	G	G	G	G	19	E B 16	17	16	19	E B 15	E B 13
27	E B 14	E B 14	E B 14	E B 13	E B 14	E B 13	E B 13	G	G	G	36	G 33	G	39	35	32	25	19	E B 14	18	E B 13	18	E B 13	16
28	17	E B 12	E B 13	E B 13	E B 12	E B 13	E B 13	G	G	G 33	G 28	G 33	G	G	G	G	G	E B 15	E B 14	E B 13	E B 14	E B 14	E B 14	E B 13
29	E B 13	E B 14	E B 13	E B 13	E B 12	E B 13	E B 13	G	G	33	36	G	G	39	G 28	G	G	E B 15	E B 13	E B 13	E B 13	E B 13	E B 16	E B 14
30	E B 13	E B 14	E B 13	E B 14	E B 13	E B 13	E B 13	E B 17	G 22	G	G	G	G	37	35	33	G	E B 14	E B 14	E B 12	24	16	E B 13	25
31	E B 13	E B 14	E B 13	E B 13	E B 13	E B 13	E B 12	G	G	G	G	G	40	G	37	G	G	15	E B 13	E B 14	E B 13	E B 14	E B 14	E B 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	31	31	31	31	31	31	31	31	31	31	31	30	31	31	30	31	30	31	31	31	31	31	31	31
MED	E B 14	E B 14	E B 13	E B 13	E B 13	E B 13	E B 13	G	G	G	35	G 32	G 30	G 26	G 22	G 19	G	E B 14	E B 13	E B 13	E B 14	E B 14	E B 14	E B 14
UQ	16	E B 14	E B 14	E B 13	E B 13	E B 14	E B 14	G	E G 18	33	36	36	36	36	33	27	22	16	E B 14	16	16	16	E B 14	E B 15
LQ	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	G	G	G	G 31	G	G	G	G	G	G	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13

DEC. 1989 | FBES (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1989 | FMIN (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	13	14	13	13	13	13	14	15	15	13	18	19	19	17	17	17	13	13	13	13	13	13	13	14
2	15	13	12	12	12	14	13	17	16	15	17	20	21	20	17	15	14	14	13	13	15	14	13	13
3	16	13	13	13	13	14	12	16	16	14	16	22	18	17	18	15	13	13	13	13	13	13	13	13
4	13	13	13	13	13	13	13	14	13	13	16	13	17	17	19	16	13	14	13	14	13	12	14	13
5	13	14	13	13	13	E S 18	14	16	14	14	15	16	16	18	16	17	13	14	13	12	13	14	14	15
6	13	13	12	13	13	13	13	14	14	14	14	14	17	18	17	17	15	13	13	13	12	13	13	13
7	13	13	13	12	14	13	12	14	13	15	18	19	18	18	20	17	16	13	13	13	13	E S 16	13	13
8	15	13	E S 17	13	12	13	14	13	14	16	16	18	21	18	18	15	14	13	14	13	13	13	15	14
9	14	14	13	13	13	13	13	15	15	15	18	19	19	19	17	14	13	14	14	13	16	13	13	14
10	13	14	13	13	13	13	13	14	14	14	18	16	17	20	17	16	14	14	13	15	13	13	14	14
11	15	13	12	12	12	13	14	14	15	15	17	17	21	18	15	13	14	13	14	15	13	14	14	15
12	13	13	12	12	12	14	13	17	13	16	18	16	17	18	16	14	13	13	15	12	14	13	13	14
13	14	13	14	13	14	14	14	13	14	14	17	18	20	19	18	17	14	13	13	12	13	15	14	13
14	13	13	15	13	13	14	13	14	13	13	14	13	18	17	16	16	14	13	13	14	14	14	14	13
15	13	13	13	14	13	13	14	14	14	15	17	C	19	18	C	17	C	12	12	12	12	13	13	13
16	14	12	13	13	12	14	13	13	13	12	13	16	15	15	17	14	13	14	13	14	13	13	14	14
17	13	13	13	13	13	14	13	13	14	14	16	15	16	15	16	15	15	13	14	13	14	13	13	13
18	14	13	13	13	13	13	13	14	15	14	15	16	16	17	16	16	14	13	14	14	13	14	14	14
19	15	14	14	13	14	14	13	12	14	19	19	19	20	18	18	17	15	14	13	13	14	14	14	14
20	13	13	13	14	13	14	13	14	16	17	18	17	16	21	18	15	17	15	13	13	14	15	13	13
21	15	13	12	13	13	13	13	14	16	16	17	18	20	21	19	20	14	13	13	12	14	13	13	13
22	14	13	13	13	13	12	13	13	17	18	18	21	22	22	18	16	18	15	15	13	13	13	13	14
23	14	13	12	13	13	15	13	14	14	20	20	23	20	19	21	16	13	13	13	13	14	13	13	12
24	13	14	14	13	13	12	13	14	16	18	19	16	18	19	14	15	15	14	14	14	16	15	14	14
25	12	13	13	13	13	13	15	16	18	18	24	22	20	21	20	19	16	14	14	13	14	13	13	13
26	14	13	13	14	13	13	13	13	18	21	19	25	26	24	21	22	18	13	16	14	13	13	15	13
27	14	14	14	13	14	13	13	15	18	20	22	25	23	23	20	16	13	14	14	15	13	13	13	13
28	13	12	13	13	12	13	13	14	17	18	22	27	33	32	25	22	17	15	14	13	14	14	14	13
29	13	14	13	13	12	13	13	13	16	20	20	24	21	23	20	18	16	15	13	13	13	13	16	14
30	13	14	13	14	13	13	13	17	17	19	27	31	22	22	20	18	15	14	14	12	13	13	13	13
31	13	14	13	13	13	13	12	14	16	17	18	21	21	20	20	18	16	13	13	14	13	14	14	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	31	31	31	31	31	31	31	31	31	31	31	30	31	31	30	31	30	31	31	31	31	31	31	31
MED	13	13	13	13	13	13	13	14	15	15	18	18	19	19	18	16	14	13	13	13	13	13	13	13
UQ	14	14	13	13	13	14	13	15	16	18	19	22	21	21	20	17	16	14	14	14	14	14	14	14
LQ	13	13	13	13	13	13	13	14	14	14	16	16	17	18	17	15	13	13	13	13	13	13	13	13

DEC. 1989 | FMIN (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1989 | M(3000)F2 (0.01) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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	340	300	250	255	275	295	340	320	315	305	305	295R	280	275	280	275	285	295	295	310	315	310	285	310
2	310	280	280	290	255	245	250	315R	315	295	295	285	280RD	280S	280	275	285	295	295	295	315	300	295	270
3	255	275	275	300	285	280	310	315	325	320R	305	295	290	275	275	285	295	285	305	300	300	280	260	290
4	320	275	260	270	270	295	305	335	310	320R	310R	295	285	275	270	290	290	290	290	290	300	270	300S	320
5	295	260	280	310	315	255	275	330	320	305	300	295	280	280	280	290	280	295	290	315	305	325	305	295
6	290	280	275	290	275	285	325	320	335	305	320	305	290	285	290	305	300	315C	310	335	305	280	250S	290
7	295	285	285	290	265	270	325	335	330	320	315	305	285	285	285	290	295	285	315	315	310	275	265	285
8	305	285	255	280	310	280	330	330	320	305	310R	305	285	285	285	295	295	300	320	295	295S	315	A	A
9	275	280	265	275	280	290	315	325	340	310	310	305	285	280	285	300	300	295	320	325	300	280	300	305
10	280S	280	280	280	280	275	305	335	330	315	320	305	305	305	300	300	305	295	310	335	265	290	290	300
11	285	285S	300	310	310	265	310	355	345	325	315R	310	300	285H	285	305	320	295	325	335	300	270	280	295
12	295	275	285	295	250	270	295	330	335	320	325	310	300	295	300	310	310	315	330	310	315	265	280	305
13	315	275	260	280	280	270S	280	330	330	315	315JR	310	295	275	285	300	305	305	310	320	340	275	270	305
14	330S	275	300US	310	270	255S	280	345	340	320	310	315	290	295	305	295	305	340	320	305S	320	310S	245	285
15	335	305	260	275	270	265	275	310	325	330	305	300IC	295	300	300IC	300	300IC	300	300	320	300	235	235	285
16	270	275	305	315	280	275	305	340	330S	330	290	305	300	305	300	315	335	305	325	315	330	255	270	270
17	270	255	255	255	250	270	295	315H	320	330	305	305	295	295	300	305	315	305	335	325	340	285	270	285
18	320	275	280	290	275	290	325	340	335	340	320	310	300	295	305	305	320	320	320	330	345	315	275	280
19	295	300	305	285	295	290	320	340	345	350	310	305	305	295	290	305	300	305	320	325	340	300	260	270
20	285	290	310	290	295	295	330	330	330	330	295	305	300	290	290	295	300	320	310	305	310	295H	270	275S
21	295	280	275	320S	275	285	320	335	330	325	300	290	295	305	290	305	320	310	305	310	310	300	310	290
22	295	270	265	260	275	285	310	310	315	320	300	300	295	295	275	295	310	300	305	310	310	310	255	240S
23	220	265F	340F	330UF	245	255	260	315	320	325	315	290	285	290	280	280	305	290	305	300	280	270	300	285
24	270	275	255	280	345	285H	290	310	305	310	295	295	280	280	280	295	300	290	300	320	265H	270	275	265
25	270	280	265	270	350	275	270	320	315	295	305	285	280	275	275	275	285	295	280	295	315	265	275	265
26	270	310	300	310	305	265	305	325S	330	305	300	285	280	280	285	280	285	295	290	315	290	265	255	265
27	270	260	230	280	305	300	265	290S	320	305	290	280	275	275	275	280	280	295	300	285	275	270	270	270
28	240	245	275	270	240	240	285	315	315	285	280	300UR	275	275	265	275	285	310	275	290	300	290	270	265
29	270	280	280	285	290	270	300	315	305	310	295	285	265	260H	275	285	290	285	295	295	290R	250V	235	250
30	240	245	260	220	235	275	285	260F	295	295	285F	255	270	265	270	270	280	285	300	295	295	265	270	250
31	250	255	260	255	260	250	265	295	310	300	295	280	280	270	265	275	270	285	285	275	260	275	280	265
	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	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	30	30
MED	285	275	275	285	275	275	305	325	325	315	305	300	285	285	285	295	300	295	305	310	305	280	275	285
UQ	300	282	285	298	295	285	318	335	330	325	312	305	295	295	290	302	305	305	320	320	315	300	285	295
LQ	270	272	260	272	268	265	280	315	315	305	295	290	280	275	275	280	285	292	295	295	295	270	270	265

DEC. 1989 | M(3000)F2 (0.01)

IONOSPHERIC DATA

DEC. 1989 | M(3000)F1 (0.01)

135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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								
2										L	L			L	L	L								
3										L			L	L	L									
4													L	L										
5													L	L										
6													L	L	L									
7											L		L		L									
8									L	L	L	L	L	L										
9										L		L	L	L										
10												L	L											
11											L				L									
12										L	L		L	L										
13										L	L			L		L								
14											L	L	L	L										
15											L	C			C		C							
16										L	L				L									
17											L	L	L	L										
18														L										
19													L		L									
20											L		L	L	L									
21											L	L		L	0 L 365									
22											L	L	L	L										
23											L		L		L 365									
24										L	L			L	L									
25									L		L	L	L	L		L								
26											L	L	L		L									
27											L	L	L	L										
28														L	L									
29												L	L	L	L									
30										L		L	L	L		L								
31											L			L	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															2									
MED															L 365									
UQ																								
LQ																								

DEC. 1989 | M(3000)F1 (0.01)

IONOSPHERIC DATA

DEC. 1989 | H'F2 (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											265	265	310			290								
2										305	260			315	280	300								
3										250			305	330L	L									
4													290L	L										
5													315	295L										
6													310	305	290									
7											255		260		260									
8									255	255	250	230	310L	260										
9										260		290	310L	315										
10												260	265											
11											270				305L									
12										255	255		255	L										
13										265	230			340		255								
14											275	240	300L	280										
15											255	250 L			L		L							
16										225	295L				255									
17											255	220	255	255										
18														300										
19													260		285									
20											290		260	280	300									
21											260L	320L		280	295									
22											270	305	280	285										
23											265		315		305									
24										265	260			310	320L									
25									260		275	L	310L	300		310L								
26											260	260	310L		285									
27											305	310	315L	335										
28														285	L									
29												315	355L	305	315									
30										265		355	305	355		320								
31											290			345	355L	305								
	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									2	9	20	13	21	20	13	6								
MED									258	260	262	265	305	302	295	302								
UQ										265	275	310	310L	322	305	310								
LQ										255	255	250	265	282	285	290								

DEC. 1989 | H'F2 (KM)

IONOSPHERIC DATA

DEC. 1989 | H'F (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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	235	230	355	340	275	250	230	225	235	230	230	230	230	235	230	220	250	220	230	230	220	235	285	250
2	230	275	265	225	240	405	H 250	235	225	215	230	H 230	230	230	235	230	225	225	225	250	225	225	220	250
3	300	305	285	250	255	290	260	225	220	220	225	225	225	230	230	240	225	215	230	210	235	285	270	265
4	225	280	325	300	300	250	235	235	235	240	230	220	220	230	220	255	230	220	210	220	230	A 235	A 280	245
5	255	310	300	250	255	S 385	255	230	220	225	230	230	225	230	230	230	235	225	215	230	240	240	A	E A 290
6	280	280	295	290	280	270	250	220	220	210	225	220	210	220	220	235	220	210	235	210	215	280	270	275
7	275	290	285	275	300	310	245	230	215	215	220	225	220	245	235	225	210	215	225	215	215	260	295	300
8	265	290	345	315	255	300	220	225	225	225	235	230	220	230	235	230	230	230	225	205	240	240	A	A
9	305	290	305	280	275	285	230	235	220	220	225	215	230	230	240	230	210	235	230	205	220	230	270	240
10	255	285	305	295	285	310	230	215	220	215	230	225	220	230	230	230	220	215	220	225	220	260	280	275
11	285	320	280	255	250	325	250	225	220	215	230	220	H 220	H 225	220	245	210	220	230	215	225	265	275	250
12	240	270	300	285	355	340	285	240	215	220	230	215	220	220	235	240	215	220	215	230	235	305	310	260
13	240	280	315	270	270	340	305	235	230	220	220	230	225	220	230	225	215	205	230	255	205	235	285	270
14	235	290	290	265	320	E A 425	310	240	225	H 220	215	235	225	220	230	220	240	215	210	260	240	240	340	275
15	220	275	345	315	E A 330	350	320	250	225	230	230	I C 240	225	235	I C 225	235	I C 225	205	220	235	240	240	275	280
16	315	325	270	240	260	320	255	230	220	225	215	240	225	225	225	240	215	210	225	250	235	295	315	310
17	335	365	325	330	380	335	275	215	235	235	215	220	H 210	235	230	220	210	205	230	225	215	280	300	290
18	240	310	315	285	310	300	240	240	220	230	225	220	220	215	225	235	230	200	235	230	215	220	280	290
19	285	270	280	290	300	310	250	240	220	220	215	220	H 220	235	225	235	220	200	230	230	215	240	290	340
20	A 315	295	265	290	285	275	230	230	225	225	230	230	230	220	230	245	220	205	230	215	220	225	300	320
21	290	A 325	310	270	290	290	255	225	230	220	220	215	225	230	225	225	220	220	215	225	240	245	260	280
22	300	A 330	A 360	330	275	270	270	255	215	220	220	220	215	235	235	230	225	230	230	230	225	225	345	430
23	450	315	220	225	E B 455	E B 560	355	220	230	245	A 240	230	230	230	H 220	240	230	230	240	H 230	265	250	250	310
24	315	320	340	300	230	H 205	290	250	235	230	235	230	225	230	230	240	220	240	250	230	235	305	280	330
25	325	310	300	330	215	325	300	255	220	230	255	240	235	235	245	230	230	230	250	260	230	220	280	315
26	310	260	260	250	265	320	265	235	230	235	230	230	230	235	240	240	240	255	230	230	210	270	275	310
27	310	315	370	290	260	210	290	290	220	220	230	240	240	240	245	240	240	255	235	220	265	255	285	315
28	360	350	275	235	300	355	280	240	230	240	230	240	235	235	240	240	245	230	215	260	235	250	270	305
29	315	295	280	280	265	270	255	225	225	235	235	225	235	230	235	240	235	225	225	245	235	260	370	330
30	355	315	320	410	360	270	270	310	255	215	230	240	240	240	240	240	255	255	230	220	A 250	255	275	330
31	315	305	305	300	275	330	235	255	240	230	240	235	230	240	240	235	250	240	230	230	230	260	H 220	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	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	29	30
MED	290	295	300	285	275	305	255	235	225	225	230	230	225	230	230	235	225	220	230	230	230	250	280	290
UQ	315	315	322	300	300	333	282	240	230	230	230	232	230	235	235	240	235	230	230	232	238	262	295	315
LQ	248	280	280	260	260	272	242	225	220	220	222	220	220	228	225	230	220	212	222	220	220	235	270	268

DEC. 1989 | H'F (KM)

IONOSPHERIC DATA

DEC. 1989 | H'E (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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								135	115	110	110	110	A 125	A	115	115	A							
2								E B 160	115	110	110	115	115	A	110	115	A							
3								130	115	110	110	110	110	110	110	A	125							
4								E B 150	A 125	A	A	110	110	110	A	A	A							
5								170	A 120	A 115	A	A	A	110	A	E A 145	E A 150							
6								A	A	E A 135	E A 130	110	115	110	115	110	130							
7								125	A	A	115	110	115	115	115	E A 155	135							
8								135	115	110	110	110	120	115	115	115	130							
9								135	115	A	115	120	115	115	A 120	115	150							
10								E B 170	120	115	A	115	E A 130	115	A	E A 135	E A 170							
11								140	115	115	110	115	115	115	110	A 120	125							
12								E B 160	A 130	110	105	110	115	110	E A 115	E A 120	A							
13								E B 165	115	E A 130		115	E A 125	110	E A 125	E A 130	A							
14								E B 170	120	A 125	110	A	A	A 125	120	E A 135	A							
15								E B 175	115	115	110	I C 135	E A 140	C	C	115	C							
16								E B 155	115	A		110	110	110	110	115	120							
17								E B 140	115	115	115	110	A	110	110	110	130							
18								E A 165	110	A	A	E A 120	110	115	115	120	130							
19								E B 150	A 135	A	A	A	115	115	115	120	130							
20								E B 160	120	115	115	115	E A 140	E A 130	120	A	125							
21								E B 155	115	120	A 115	E A 135	E A 125	115	115	120	120							
22								E B 160	120	115	A	E A 135	115	120	110	115	A							
23								E B 175	120	120	120	120	120	A 120	115	120	A							
24								E B 130	115	115	115	115	110	A 115	A	E A 150	A							
25								E B 155	A	115	120	115	115	A 130	A 125	A 125	A							
26								B	125	115	115	A	E A 130	120	120	120	E B 130							
27								E B 170	130	120	A	A 120	115	115	A 120	A 120	E A 130							
28								E B 175	120	A	125	E A 130	B 130	B 125	115	120	130							
29								155	115	A	A	115	110	E A 135	E A 120	110	130							
30								B	A 160	120	125	120	120	115	110	115	125							
31								130	115	110	115	115	110	120	120	120	110							
	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	28	23	21	27	28	28	26	28	20							
MED								E B 158	115	115	115	115	115	115	115	118	128							
UQ								E B 170	120	118	115	118	120	119	120	A 121	130							
LQ								134	115	112	110	110	112	110	110	115	124							

DEC. 1989 | H'E (KM)

IONOSPHERIC DATA

DEC. 1989 | H'ES (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	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	B	B	B	B	B	G	G	G	110	110	110	110	G	G	100	105	105	B	100	B	B	B
2	B	B	B	B	110	110	B	G	G	135	115	G	G	105	105	115	115	110	110	105	B	B	B	105
3	B	105	105	B	B	B	110	G	G	G	125	120	115	115	110	120	G	B	120	B	115	B	105	105
4	110	105	110	110	110	B	B	G	110	115	120	130	130	120	110	110	110	B	B	110	115	100	105	100
5	100	100	100	B	B	S	130	G	105	105	110	120	110	110	115	115	115	110	110	120	110	105	95	100
6	100	105	105	100	B	B	110	110	110	105	105	G	G	G	S	G	G	B	105	105	B	B	110	110
7	105	B	B	B	B	B	B	G	115	115	115	110	G	110	G	110	G	105	115	B	B	S	B	B
8	B	105	S	105	B	B	B	G	G	G	G	115	115	110	G	G	G	B	B	B	B	115	110	105
9	105	B	B	115	B	B	B	G	G	115	120	G	G	G	105	G	G	B	B	B	B	B	B	B
10	B	B	105	100	100	B	B	G	G	G	110	G	105	G	110	105	110	B	B	B	120	105	110	B
11	B	B	B	110	B	B	B	G	G	G	E G 200	G	G	G	G	105	G	95	B	B	B	B	B	B
12	110	B	115	115	B	B	B	G	110	G	120	G	G	G	105	100	100	100	B	110	110	105	110	B
13	B	115	110	110	110	B	B	110	G	110	115	G	105	G	105	E G 180	105	B	110	110	B	B	B	B
14	B	110	115	105	110	105	105	G	G	125	120	110	110	115	G	120	120	B	B	115	B	B	110	110
15	110	110	115	105	105	120	110	G	G	105	115	C	E G 170	150	C	G	C	105	110	110	110	105	100	105
16	100	B	B	B	100	B	B	G	110	100	120	120	E G 160	G	115	G	105	125	105	110	110	110	B	B
17	B	B	B	B	B	110	B	120	G	145	140	110	110	G	G	G	G	B	B	B	B	B	B	105
18	B	B	B	B	B	B	B	120	G	110	110	110	G	E G 160	E G 145	G	G	B	B	B	B	B	B	B
19	B	B	B	B	B	B	B	120	110	120	115	115	125	G	G	G	140	B	105	105	B	B	B	B
20	100	100	100	B	105	B	B	G	G	G	E G 155	G	110	115	G	110	G	105	105	B	B	B	B	105
21	110	100	105	105	B	B	B	G	G	120	115	110	105	G	G	G	G	B	B	B	B	B	B	B
22	B	105	100	B	B	B	B	G	G	G	115	115	G	G	G	E G 165	145	100	B	B	B	100	B	B
23	B	B	B	B	B	B	B	G	G	G	115	G	130	105	G	G	150	100	110	105	B	B	B	B
24	B	B	B	B	B	B	B	G	G	G	120	G	G	105	105	105	105	100	100	100	100	95	100	B
25	110	110	B	B	B	B	B	G	120	G	G	115	130	115	110	110	110	110	110	110	B	B	100	100
26	B	B	110	B	110	115	B	B	G	G	120	120	115	G	G	G	G	105	B	105	105	100	100	100
27	B	100	B	B	B	B	B	G	G	G	110	E G 165	G	E G 160	E G 170	140	130	115	B	120	B	110	120	115
28	110	B	B	B	B	B	B	G	G	115	115	115	G	G	G	G	G	B	B	B	B	B	100	B
29	B	B	B	B	B	B	B	G	G	115	110	G	G	E G 145	105	G	G	B	B	B	B	B	B	B
30	B	B	B	B	B	B	B	B	110	G	G	G	G	E G 155	E G 155	145	G	B	B	120	105	110	120	105
31	110	B	B	B	B	B	B	G	G	G	G	G	115	G	110	G	G	110	110	B	B	B	B	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	13	14	13	11	9	5	5	5	9	16	27	17	18	17	16	16	15	16	15	16	11	12	15	14
MED	110	105	105	105	110	110	110	120	110	115	115	115	112	112	108	111	110	105	110	110	110	105	105	105
UQ	110	110	110	110	110	115	110	120	110	120	120	120	U 122	U 130	112	124	125	110	110	112	112	110	110	105
LQ	100	100	105	105	105	110	110	110	110	108	112	110	110	110	105	108	105	100	105	105	105	100	100	100

DEC. 1989 | H'ES (KM)

IONOSPHERIC DATA

DEC. 1989 | TYPES OF ES | 135° E Mean Time (G.M.T. + 9 h)

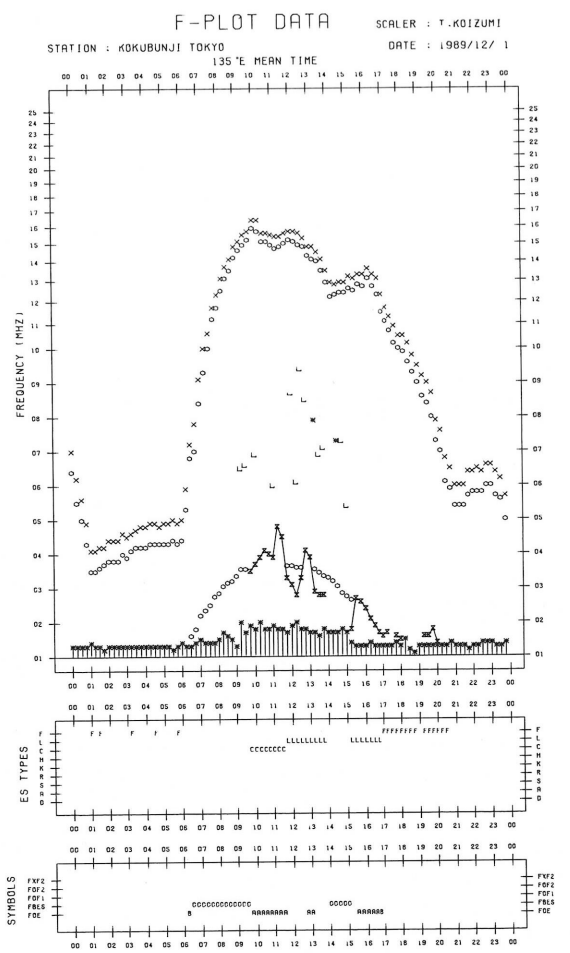
Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

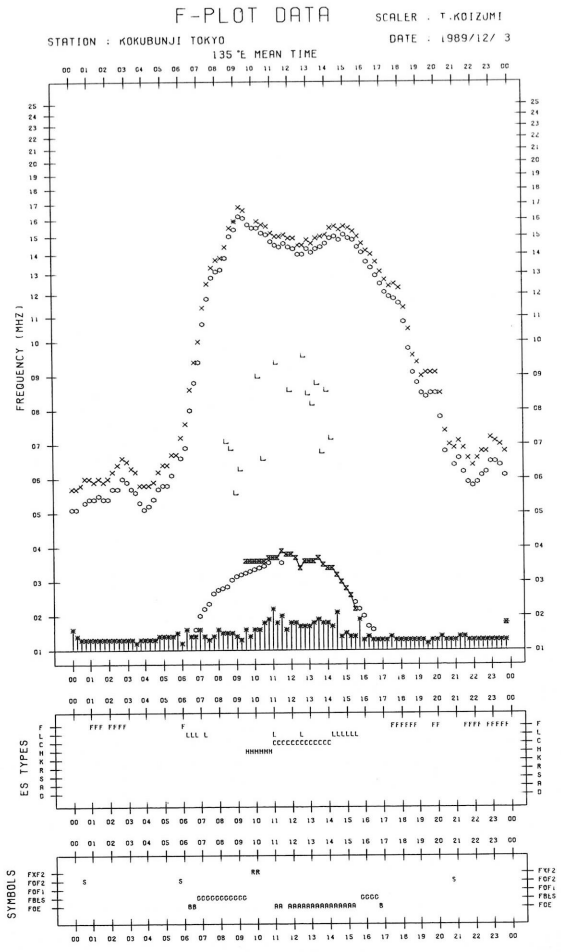
Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		F 1									C 2	C 3	L 1	L 3			L 3	F 2	F 1		F 3			
2					F 1	F 1				H 1	C 1			L 2	L 2	C 2	C 2	F 1	F 1	F 2				F 1
3		F 1	F 1				F 1				H 1	CL 11	C 1	C 2	C 2	L 2			F 1		F 1		F 1	F 1
4	F 2	F 2	F 2	F 2	F 2				L 1	CL 11	C 1	H 1	H 2	C 1	C 1	L 2	L 1			F 1	FF 32	F 5	F 6	F 4
5	F 3	F 2	F 2				F 1		L 1	L 1	C 2	C 2	C 2	C 2	L 2	L 3	L 1	F 1	F 1	FF 14	FF 24	F 3	F 5	F 4
6	F 4	F 1	F 1	F 1			F 3	F 1	L 2	L 2	L 1								F 1	F 1			F 2	F 2
7	F 2								L 2	R 2	C 2	C 1		C 1		L 2		F 1	F 1					
8		F 1		F 2								C 1	C 1	L 1								F 2	F 4	F 4
9	F 2			F 1						L 2	C 2				L 1									
10			F 1	F 1	F 1						L 1		L 1		L 2	L 2	L 1				F 1	F 1	F 3	
11				F 1							H 1					L 1		L 2						
12	F 3		F 2	F 2					L 2		C 1				L 1	L 2	L 3	F 3		F 2	F 2	F 1	F 2	
13		F 1	F 1	F 1	F 1			L 1		L 1	C 1		L 2		L 2	HL 12	L 2		F 1	F 1				
14		F 1	F 1	F 2	F 2	F 5	F 2			CL 12	C 2	CL 11	L 2	L 2		L 2	L 2			F 1			F 1	F 1
15	F 1	F 1	F 2	F 2	F 2	F 1	F 1			L 1	L 2		AL 11	AL 12				F 1	F 1	F 1	F 1	F 2	F 2	F 1
16	F 1				F 1				L 1	L 3	CL 11	C 1	H 1		C 1		L 2	F 1	F 1	F 3	F 3	F 1		
17						F 1		L 1		H 1	H 1	C 2	L 2											F 2
18								L 1		C 2	L 2	L 1		A 1	A 1									
19								L 1	L 1	L 1	L 1	C 1	C 1				H 1		F 1	F 1				
20	F 2	F 3	F 1		F 1						H 1		L 1	L 1		L 2		F 1	F 1					F 2
21	F 2	F 4	C 3	F 1						C 1	C 2	L 2	L 1											
22		F 3	F 3								C 1	L 1				H 1	HL 11	F 1				F 1		
23											C 4		A 1	L 1			HL 11	F 2	F 1	F 2				
24											C 1			L 1	L 2	L 1	L 1	F 2	F 2	F 2	F 2	F 1	F 1	
25	F 3	F 1							L 1			C 2	H 1	L 1	L 1	L 1	L 2	F 2	F 1	F 1			F 1	F 1
26			F 1		L 2	F 1					C 1	C 1	L 1					F 1		F 1	F 1	F 1	F 1	F 1
27		F 1									L 1	AL 11		H 1	AL 11	AL 11	AL 21	FF 11		F 1		F 3	F 1	F 1
28	F 1									R 1	L 1	L 1											F 1	
29										L 1	L 1			AL 11	L 1									
30									L 1					H 1	H 1	H 1				FF 11	F 3	F 2	F 1	F 3
31	F 1												C 1		C 2			F 2	F 2					
	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																								
UQ																								
LQ																								

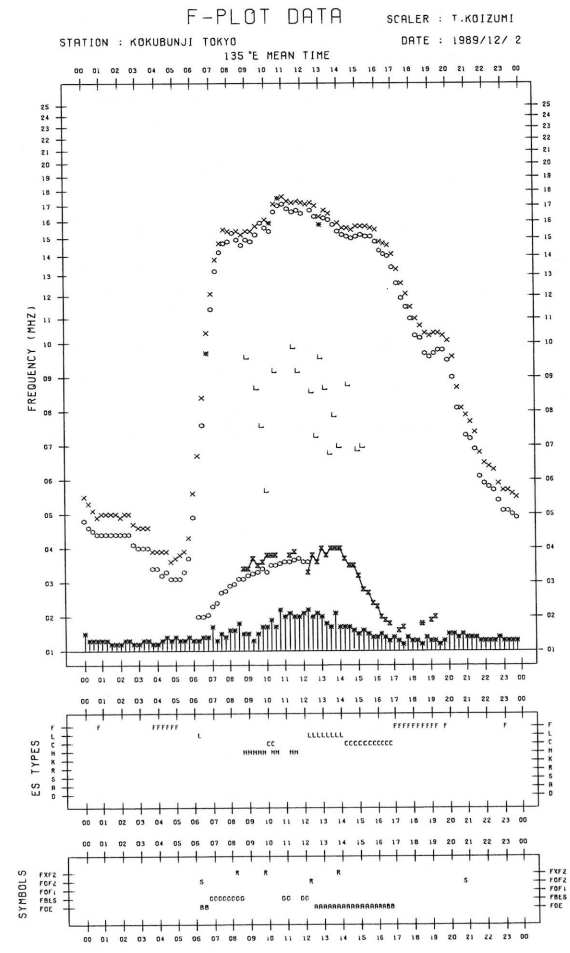
DEC. 1989 | TYPES OF ES

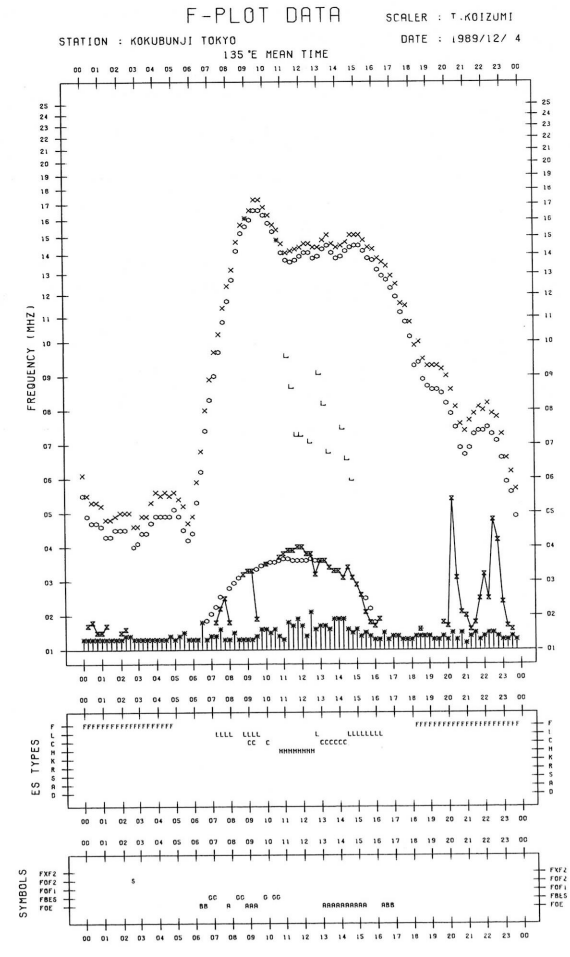
f-PLOTS OF IONOSPHERIC DATA

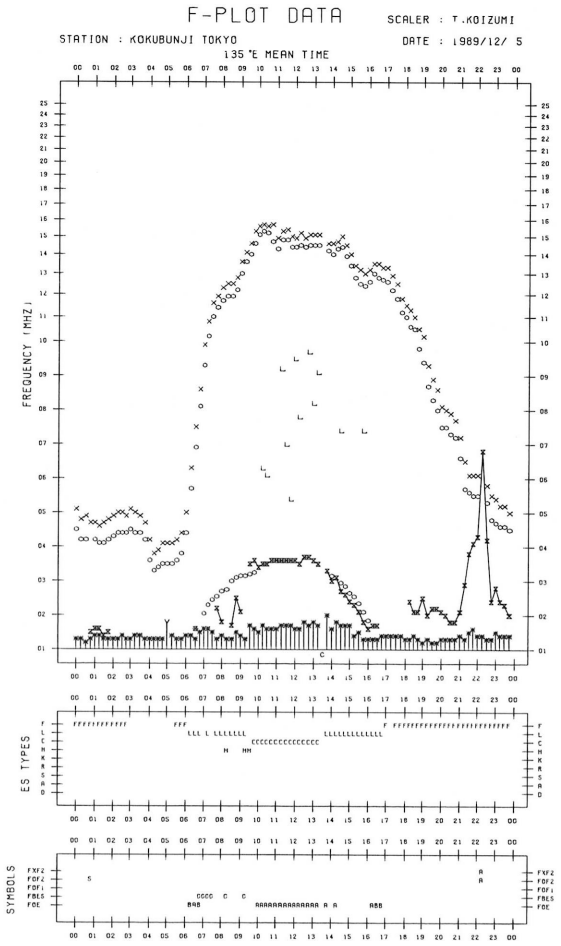
KEY OF F-PLOT	
!	SPREAD
⬡	FOF2,FOF1,FOE
X	FXF2
✳	DOUBTFUL FOF2,FOF1,FOE
⧖	FBES
L	ESTIMATED FOF1
↑,Y	FMIN
∧	GREATER THAN
V	LESS THAN

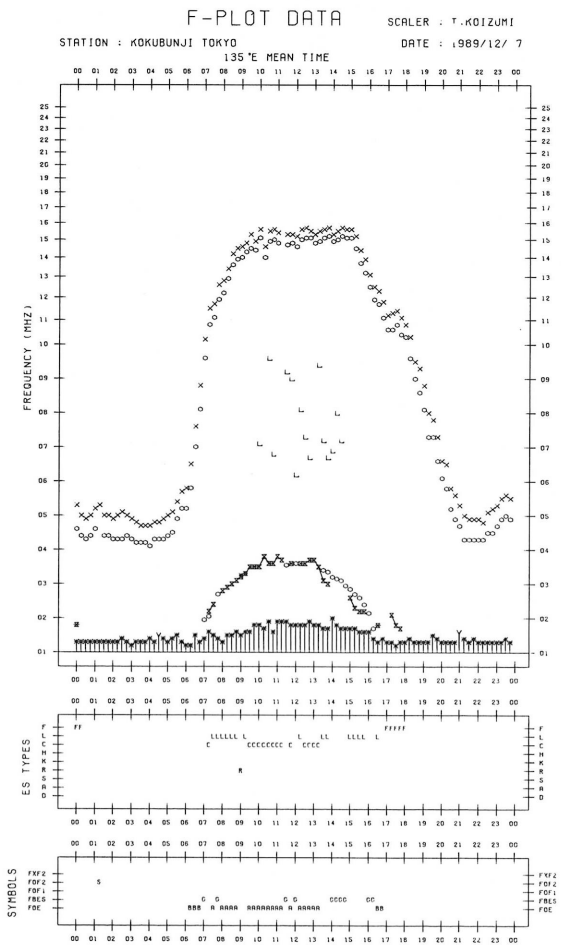

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 1
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBLS
FOE

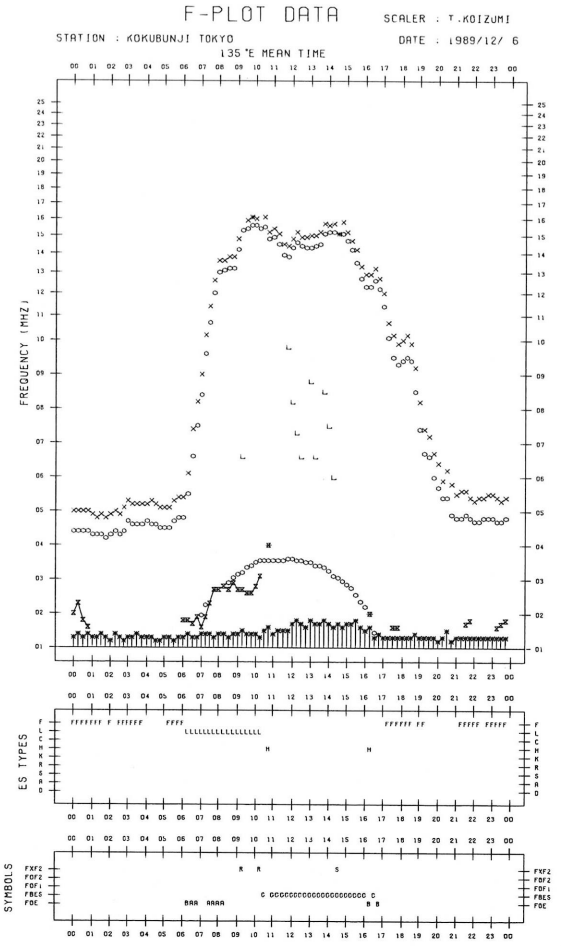

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 3
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBLS
FOE

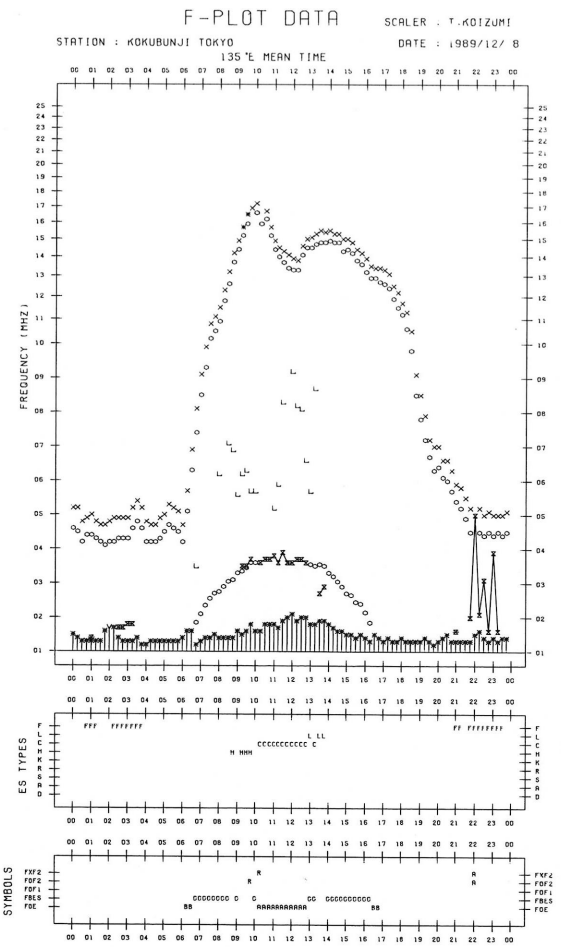

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 2
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBLS
FOE

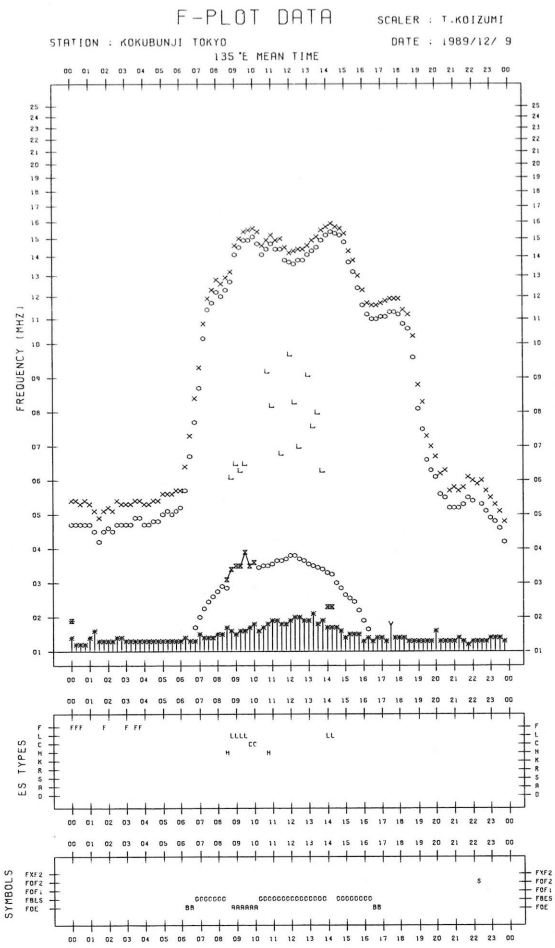

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 4
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBLS
FOE

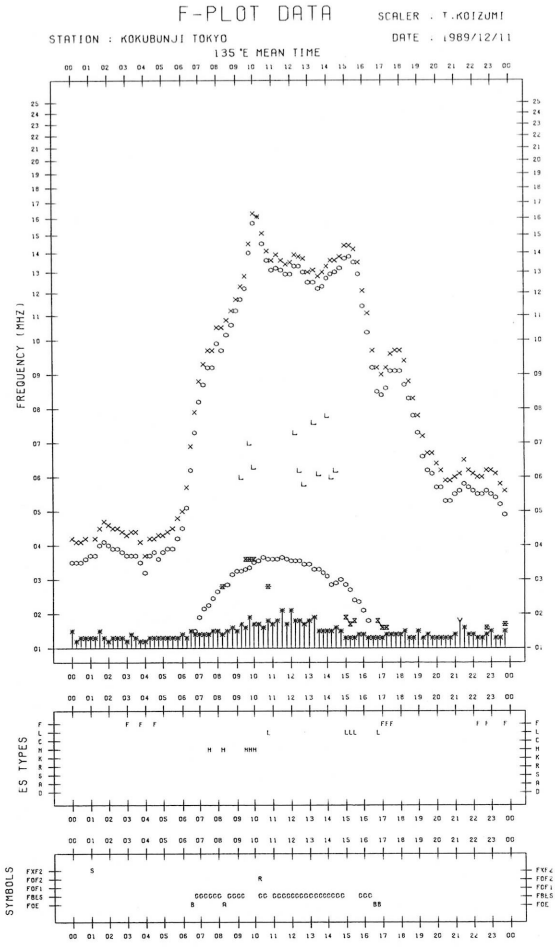

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 5
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FDF2
FDF1
FBES
FOE

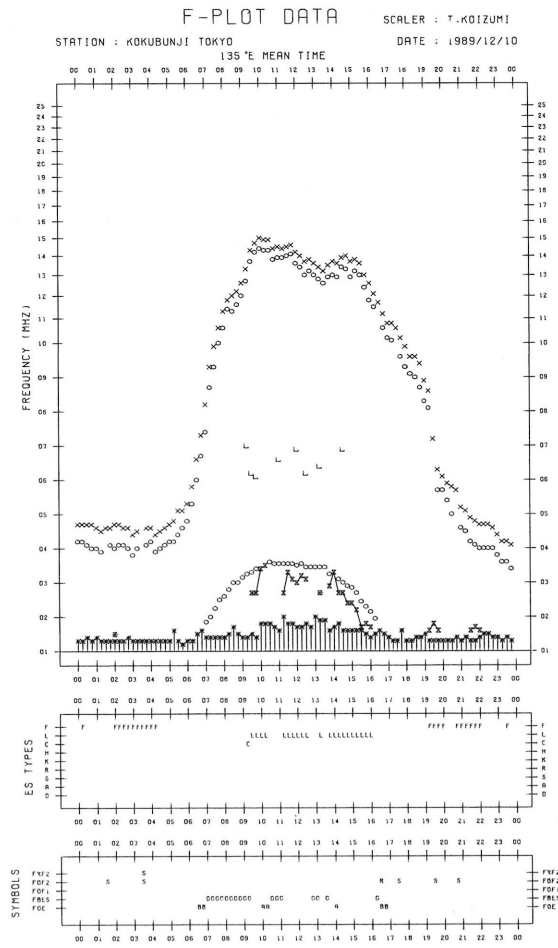

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 7
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FDF2
FDF1
FBES
FOE

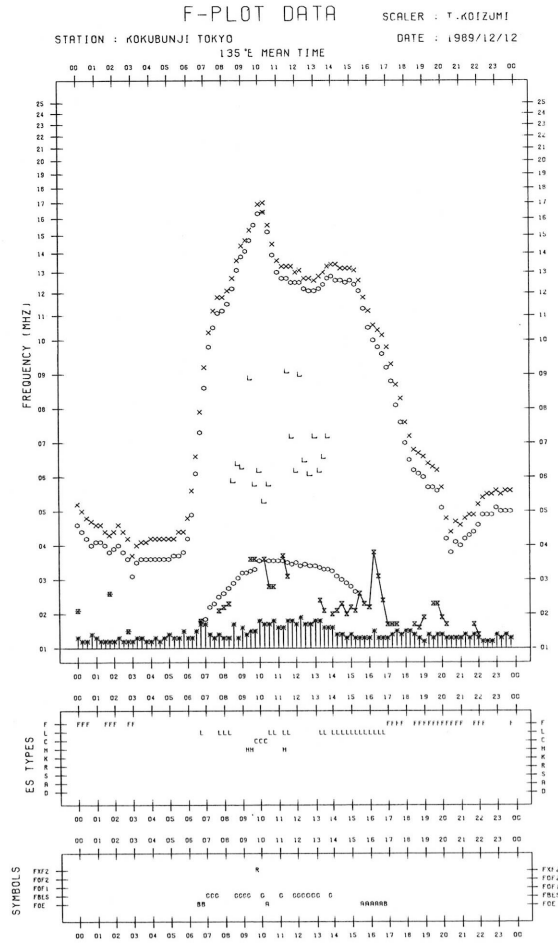

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 6
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FDF2
FDF1
FBES
FOE

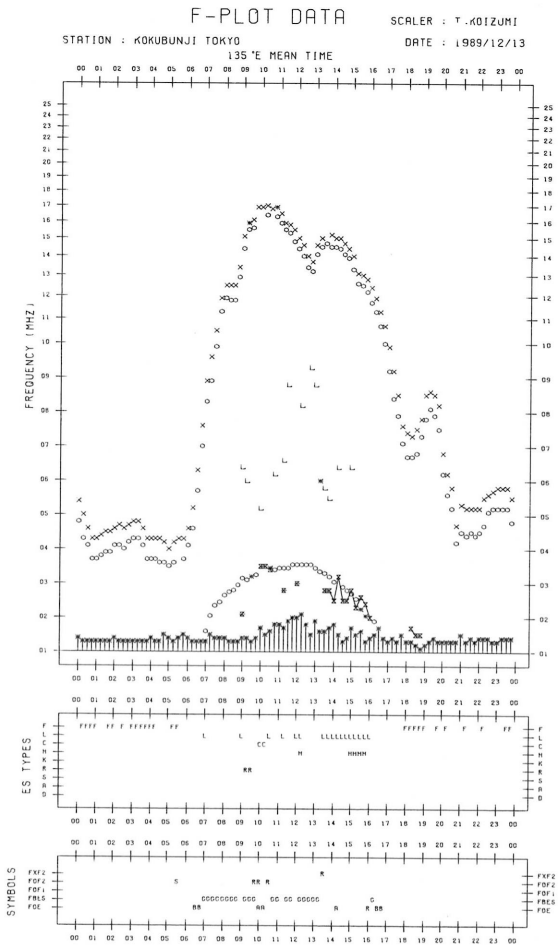

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 8
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FDF2
FDF1
FBES
FOE

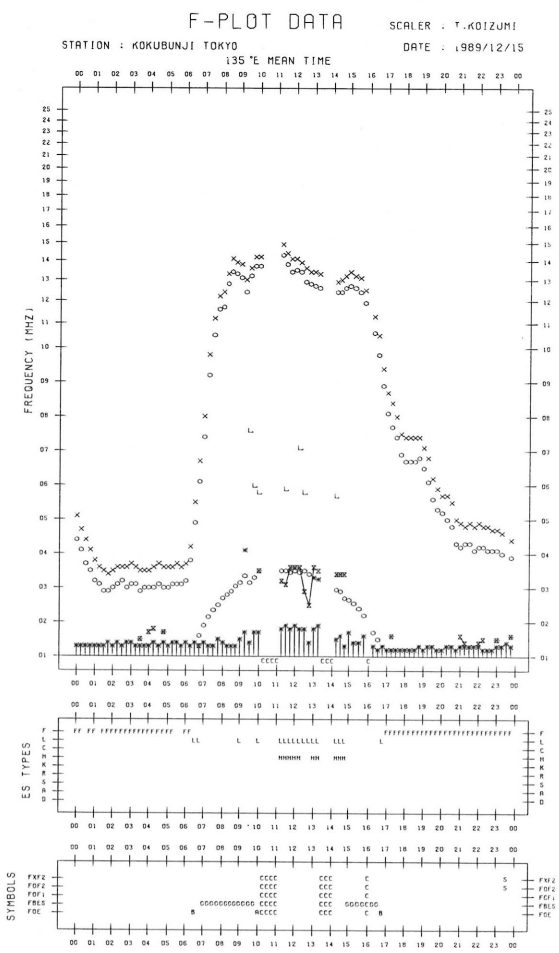

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/ 9
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

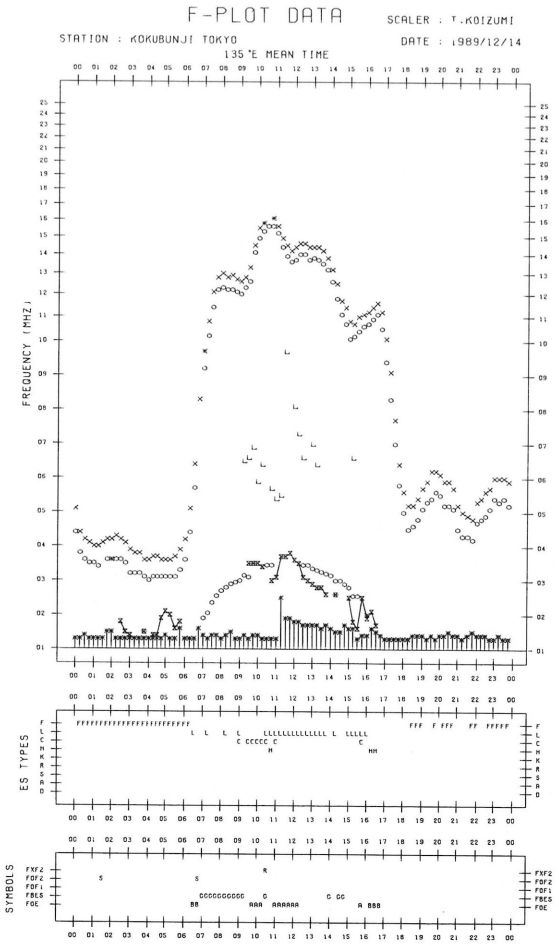

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/11
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

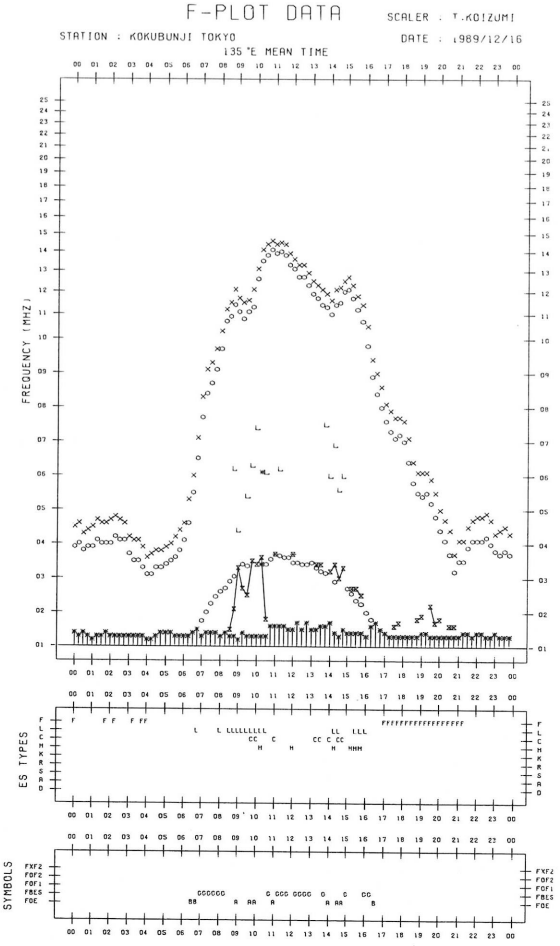

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/10
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

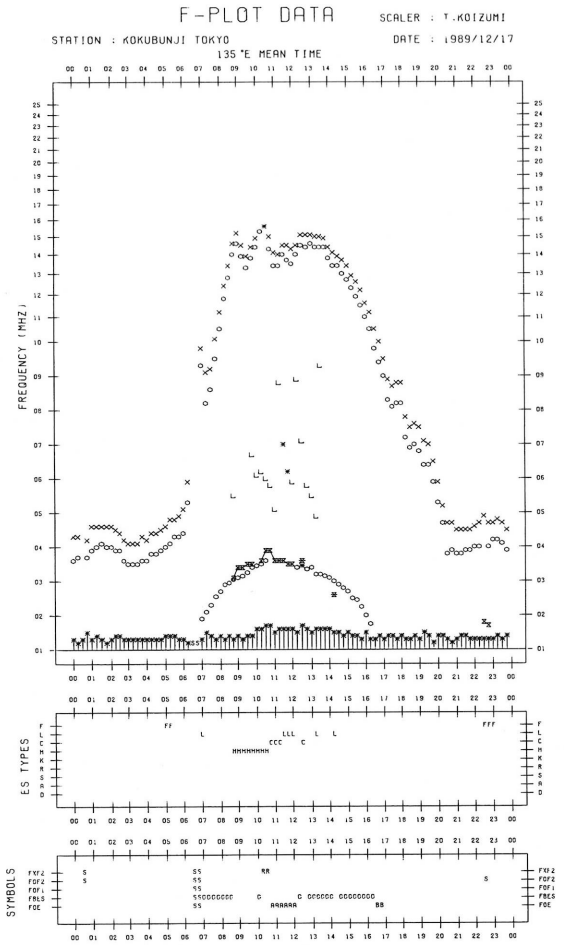

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/12
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

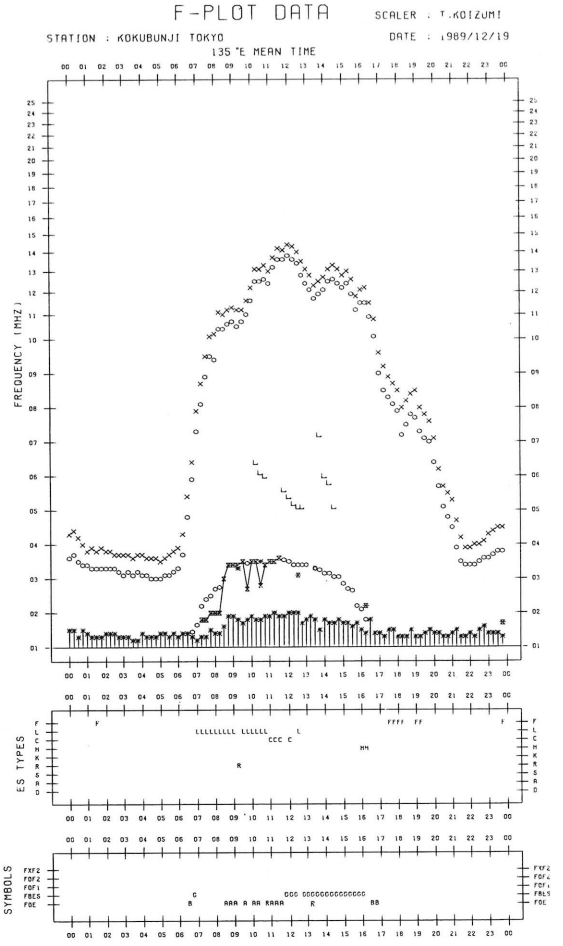

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

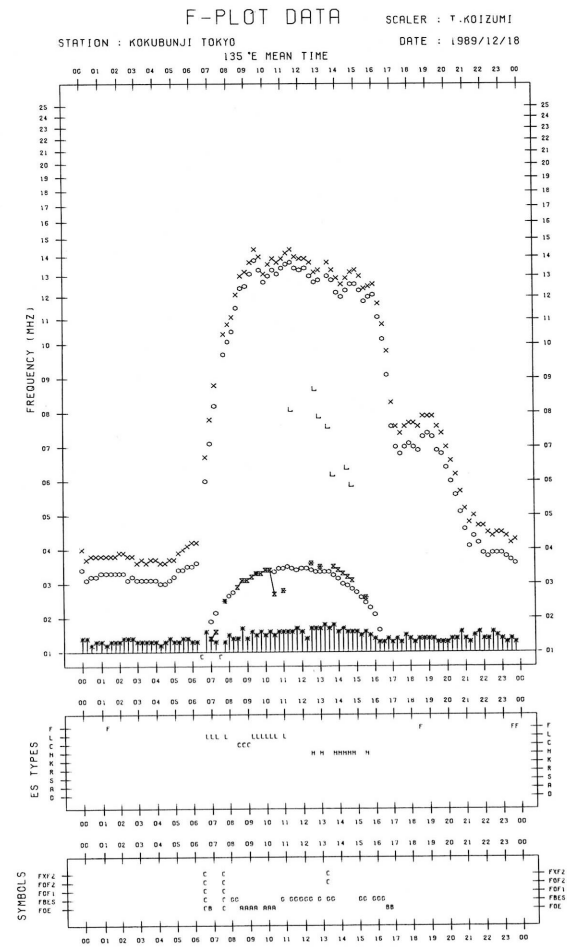

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

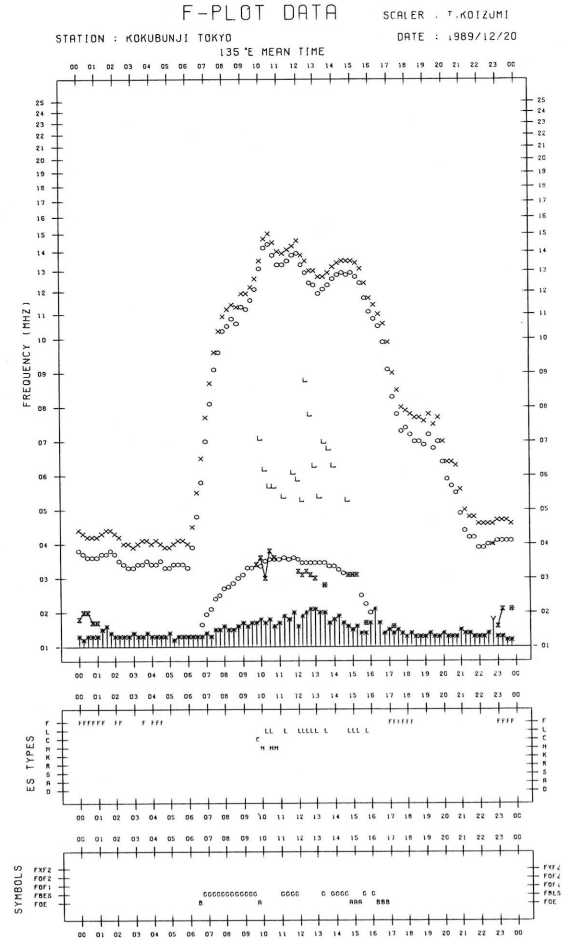

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

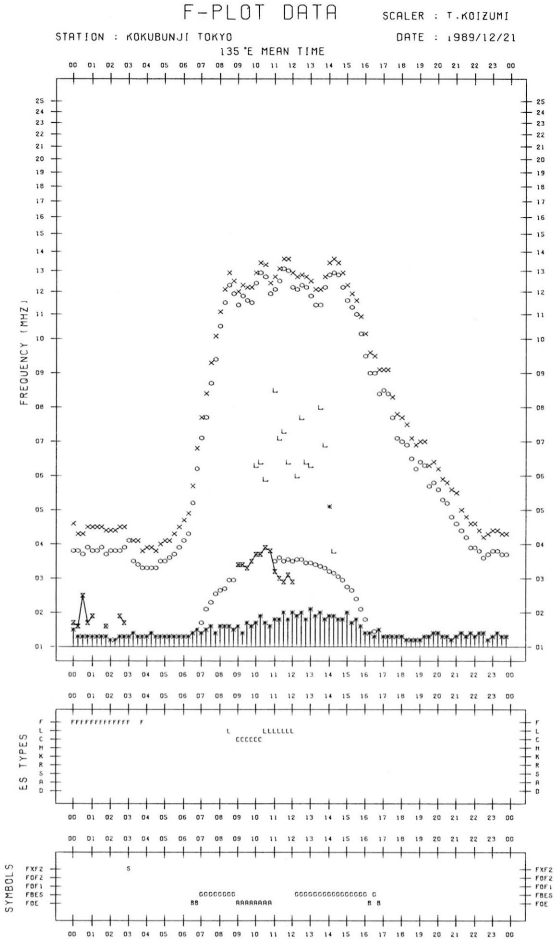

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

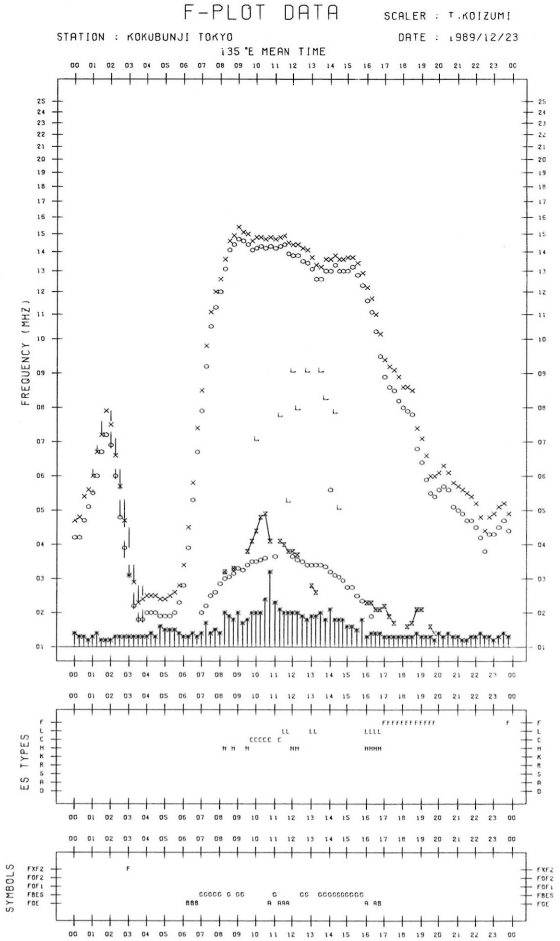

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/17
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

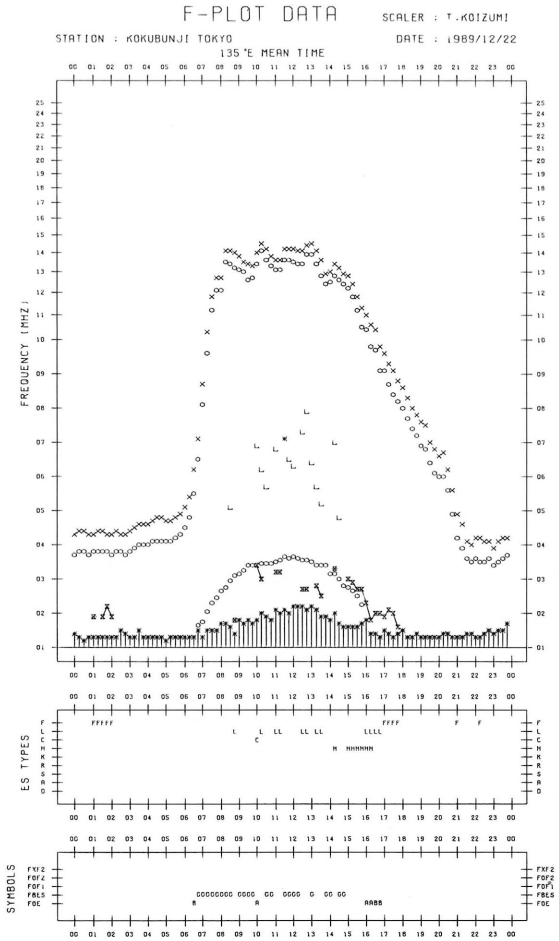

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/19
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

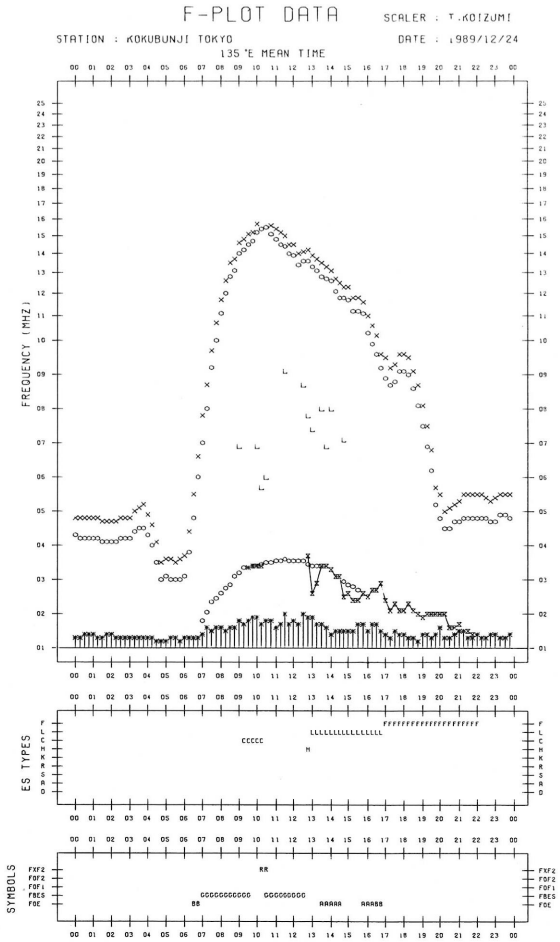

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/18
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

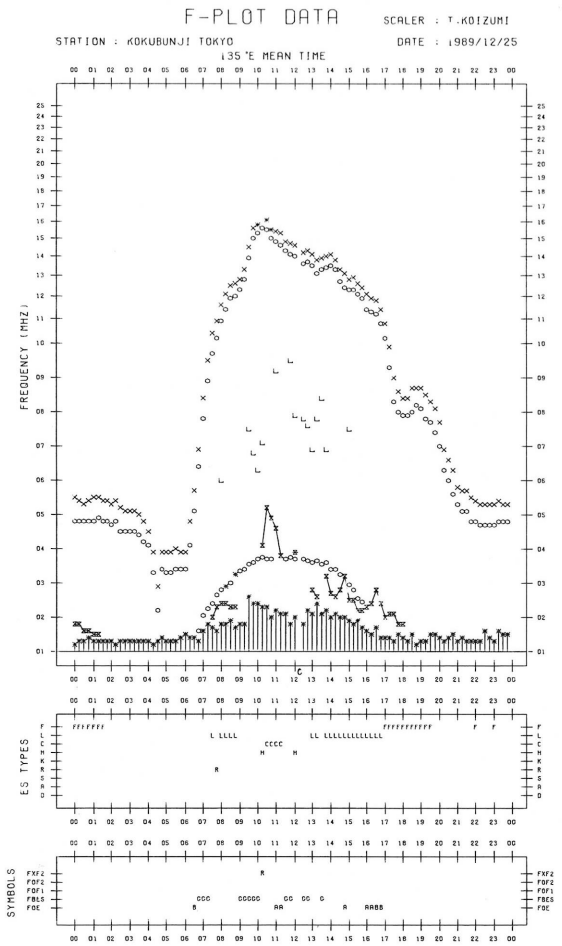

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/20
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

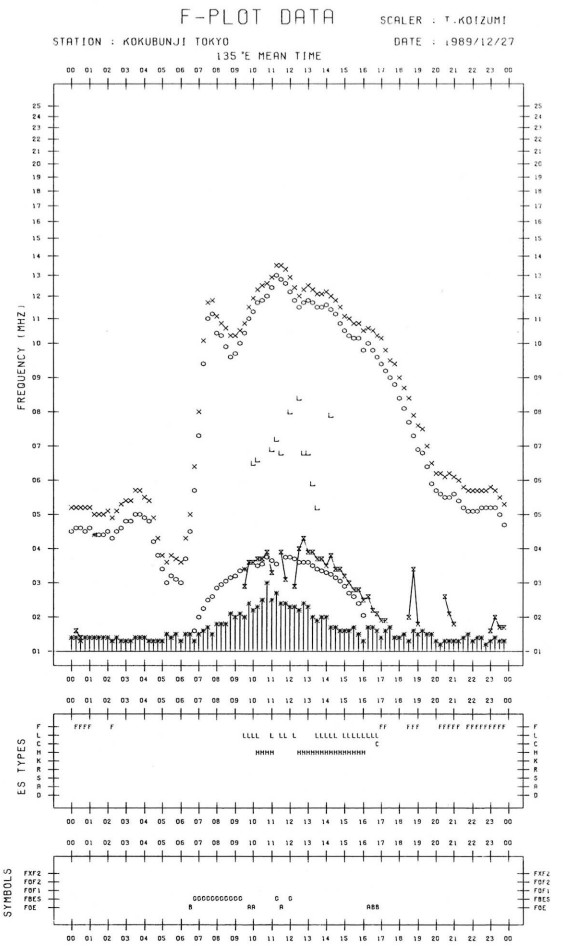

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/21
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

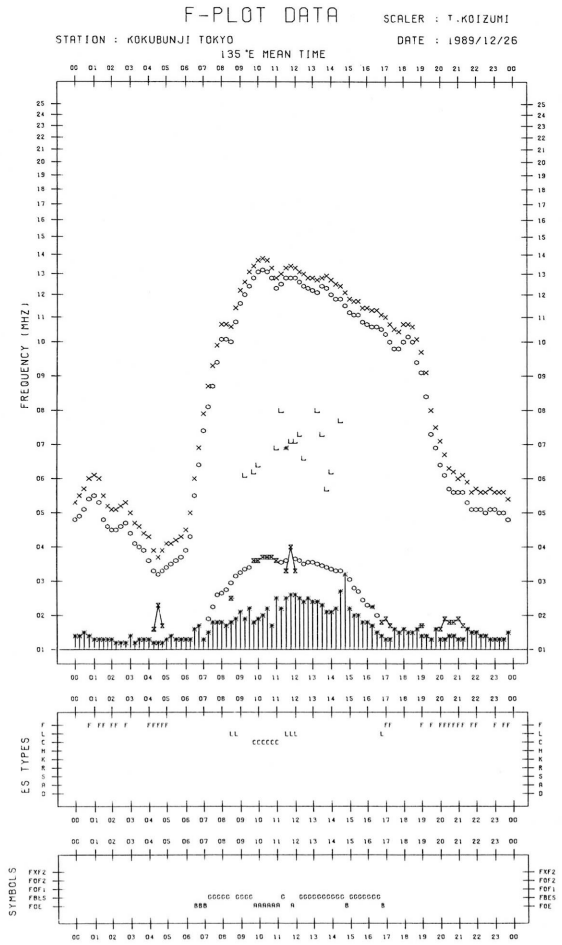

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/23
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

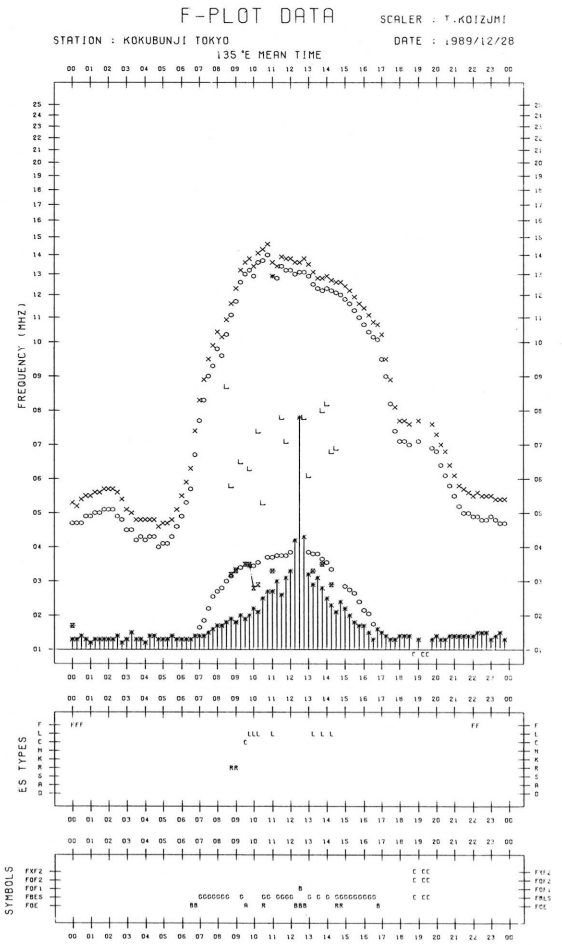

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/22
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

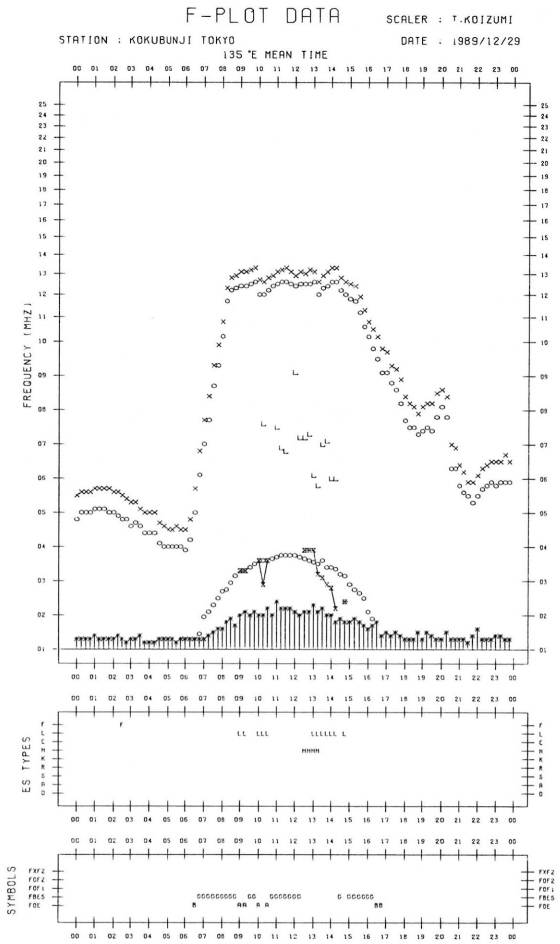

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/24
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

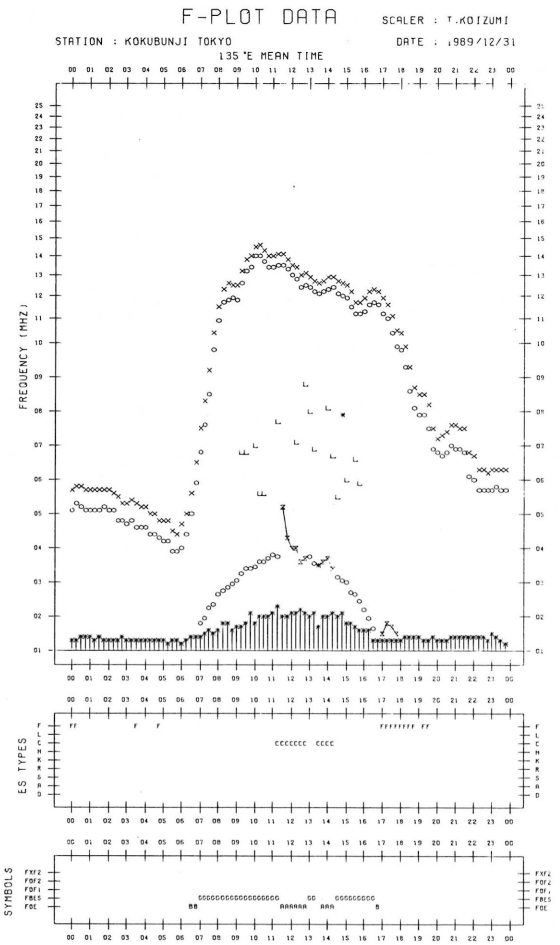

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/25
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

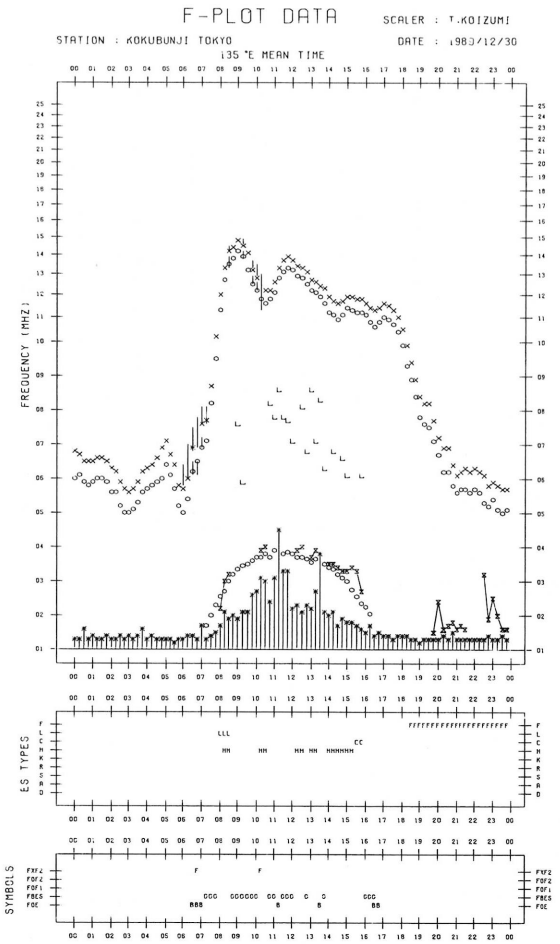

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/27
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/26
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/28
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/29
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/31
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1989/12/30
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

B.Solar Radio Emission

B1.Daily Data at Hiraiso

200 MHz

Hiraiso December 1989

Single-frequency total flux observations at 200 MHz										
	FLUX DENSITY: $10^{-22}Wm^{-2}Hz^{-1}$					VARIABILITY: 0 TO 3				
UT	00-03	03-06	06-09	21-24	DAY	00-03	03-06	06-09	21-24	DAY
DATE										
1	B	B	(B)	B	B	3	3	(3)	2	3
2	B	B	(B)	B	B	2	2	(2)	3	2
3	B	B	(B)	B	B	3	3	(3)	3	3
4	B	B	(B)	B	B	3	3	(3)	3	3
5	B	B	(B)	B	B	3	2	(2)	3	2
6	B	B	(B)	B	B	3	3	(3)	3	3
7	B	B	(B)	B	B	3	3	(2)	2	3
8	B	B	(B)	B	B	2	2	(2)	3	2
9	B	B	(B)	B	B	3	1	(1)	(3)	2
10	B	B	(B)	B	B	3	2	(3)	3	3
11	B	B	(B)	11	B	3	3	(2)	1	3
12	11	12	(12)	11	11	1	1	(1)	0	1
13	11	11	(12)	11	11	0	0	(0)	0	0
14	11	11	(11)	11	11	0	0	(0)	0	0
15	11	12	(12)	12	12	0	0	(0)	0	0
16	12	12	(12)	13	12	0	0	(0)	0	0
17	13	13	(13)	B	13	0	0	(0)	1	0
18	B	B	(B)	B	B	1	2	(1)	2	1
19	B	B	(B)	B	B	1	2	(1)	2	2
20	B	B	(B)	13	B	2	3	(2)	1	2
21	12	B	(13)	-	B	0	3	(2)	-	2
22	12	B	(B)	13	13	2	2	(3)	1	2
23	13	(12)	(*)	(12)	13	0	(0)	(*)	(0)	0
24	12	12	(*)	13	12	0	0	(*)	1	0
25	13	*	(*)	B	13	1	*	(*)	2	1
26	B	B	(B)	B	B	2	2	(2)	2	2
27	B	B	(B)	B	B	1	3	(1)	2	2
28	B	B	(B)	B	B	2	2	(1)	2	2
29	B	B	(B)	B	B	3	3	(3)	3	3
30	B	B	(B)	B	B	2	2	(3)	2	3
31	B	B	(B)	B	B	2	2	(2)	2	2

Note: No observations during the following periods.

21st 2140 - 2350.

B.Solar Radio Emission

B1.Daily Data at Hiraiso

500 MHz

Hiraiso December 1989

Single-frequency total flux observations at 500 MHz					
FLUX DENSITY: 10^{-22}Wm^{-2}Hz^{-1}					
UT	00-03	03-06	06-09	21-24	DAY
DATE					
1	61	61	(60)	57	61
2	57	56	(55)	55	56
3	56	57	(56)	55	56
4	57	57	(55)	54	56
5	55	53	(52)	58	54
6	58	-	-	-	(58)
7	58	57	(56)	63	57
8	63	61	(59)	58	61
9	59	57	(56)	57	57
10	57	56	(54)	56	56
11	B	56	(56)	-	57
12	56	56	(55)	-	55
13	54	55	(54)	54	55
14	55	55	(55)	53	55
15	54	54	(54)	B	54
16	55	54	(54)	-	54
17	(54)	55	(54)	54	54
18	57	59	(56)	59	57
19	66	63	(60)	53	62
20	57	66	(62)	57	59
21	57	B	(59)	-	59
22	58	57	(55)	58	57
23	59	59	(59)	59	59
24	59	56	(55)	58	57
25	59	59	(58)	66	58
26	66	67	(B)	62	B
27	63	66	(66)	-	64
28	64	B	(63)	67	64
29	B	B	(65)	63	B
30	B	65	(61)	-	64
31	-	(63)	(61)	63	(62)

Note: No observations during the following periods:

6TH 0210 - 0722. 2132 - 2350
11th 2137 - 2352. 12th 2137 - 2335
16th 2145 - 17th 0153. 21ST 2145 - 2350
27TH 2145 - 2350 30th 2150 - 31st 0450

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso December 1989

Single-frequency observations

Normal observing period: 2145 - 0730 U.T. (sunrise to sunset)

DEC 1989	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
1	200	44 NS	2130E	0600	590D	9	6	0
2	500	8 S	0410.8	0411.3	0.6	140	-	0
	500	41 F	0628.3	0630.0	3.3	23	-	0
	200	44 NS	2130E	0207	590D	19	11	0
	100	41 F	2233.7	2241.9	15.2	1700	-	0
	200	46 C	2236.0	2247.9	16.5	1480	105	0
	500	42 SER	2237.0	2251.0	22	150	-	0
3	500	42 SER	0048.3	0048.5	24.7	1500	-	WL
	500	42 SER	0137.5	0143.6	28.0	354	-	0
	200	46 C	0142.9	0143.1	1.3	370	-	0
	500	42 SER	0317.0	0322.3	13.5	4000	-	0
	200	46 C	0321.5	0322.4	2.4	1080	-	0
	500	42 SER	0428.0	0435.0	18.0	184	-	0
	200	8 S	0446.2	0446.6	0.7	2100	-	0
	100	46 C	0446.2	0446.9	1.3	1600	-	0
	200	44 NS	2132E	0446	590D	15	11	WL
	100	46 C	2205.9	2207.3	1.6	1400	-	0
	500	46 C	2254.3	2254.8	1.6	66	-	0
	500	21 GRF	2328	0012	90	7	3	WL
	200	45 C	2335.1	2335.4	1.2	1300	-	0
4	500	41 F	0258.7	0304.3	8.5	46	-	0
	500	42 SER	0320.0	0325.5	11.5	172	-	0
	100	42 SER	0320.5	0333.2	27	1000	-	-
	200	44 NS	2132E	0100	590D	8	5	ML
5	200	46 C	0357.2	0358.5	2.6	450	-	0
	100	46 C	0357.6	0359.0	4.6	1000D	-	-
	500	4 S/F	0358.0	0359.5	5.5	7	-	0
	100	44 NS	2132E	0049	590D	370	80	-
	200	44 NS	2132E	0109	590D	40	26	ML
6	100	44 NS	2134E	2213	590D	85	18	-
	200	44 NS	2134E	0138	590D	45	29	SL
7	100	44 NS	2134E	0400	590D	150	42	-
	200	44 NS	2134E	0607	590D	50	30	ML
8	200	44 NS	2135E	2300	590D	46	18	SL
	100	44 NS	2135E	2300	590D	360	49	-
9	200	44 NS	2135E	2230	585D	19	5	0
	100	44 NS	2135E	0525	585D	34	13	-
10	200	42 SER	0308.0	0312.1	14.5	235	-	WR
	200	44 NS	2138E	0007	585D	5	2	WL
	500	21 GRF	2310	0000	105	7	3	WL
11	200	8 S	0113.9	0114.1	0.5	1300	-	0
	200	46 C	0515.2	0515.8	2.0	1450	-	0
	500	4 S/F	0515.5	0516.5	10.0	17	-	0
13	200	46 C	2227.0	2227.9	1.3	285	-	0
14	500	46 C	0210.5	0216.5	22	45	-	0
	200	46 C	0212.3	0213.9	13.2	230	25	0
	100	42 SER	0213.0	0222.4	26.4	485	-	-
15	200	41 F	0611.2	0612.3	3.8	36	-	0
	500	27 RF	2214	2224.5	35	15	7	0
	500	45 C	2230.3	2231.5	3.0	50	-	WR
	100	46 C	2230.4	2230.8	2.5	620	-	-
	200	46 C	2230.4	2231.0	2.2	405	-	0
17	200	44 NS	2144E	0447	580D	36	10	MR

DEC 1989	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
18	100	43 NS	0100	0523	360	240	43	-
	200	46 C	0400.7	0403.8	4.6	45	-	MR
	100	45 C	0408.2	0408.3	1.3	2500	-	WR
	200	8 S	0408.3	0408.6	0.8	1300	-	WR
	200	8 S	0624.6	0625.0	0.9	280	-	WR
	200	44 NS	2144E	0253	580D	40	17	WL
	500	42 SER	2336.5	0024.3	84	830	-	0
	200	48 C	2336.7	2340.7	17.2	5400	300	0
	100	46 C	2338.3	2339.6	25.7	2300	-	WR
19	200	46 C	0021.1	0024.9	13.9	50	-	WL
	100	42 SER	0107.7	0146.2	40.6	3500	-	WR
	200	8 S	0108.4	0109.0	0.9	3200	-	0
	500	42 SER	0108.5	0148.0	40.5	2300	-	SR
	200	42 SER	0113.9	0146.2	35.0	1760	-	0
	200	41 F	0258.0	0310.6	32	130	-	ML
	100	42 SER	0352.8	0407.3	21	3300	-	WR
	200	42 SER	0353.8	0407.5	17.2	1080	-	ML
	500	42 SER	0355.0	0408.5	16.5	240	-	SR
	100	41 F	0454.8	0454.8	4.0	940	-	-
	100	46 C	0524.4	0529.4	10.6	3100	-	WR
	200	46 C	0524.4	0530.6	21.8	1300	80	0
	500	46 C	0525.7	0531.8	20.5	230	-	MR
	200	44 NS	2144E	0333	580D	16	6	WR
20	200	41 F	0021.1	0023.8	5.9	705	-	WR
	100	41 F	0021.8	0023.8	6.7	900	-	WR
	500	41 F	0022.3	0023.6	4.5	86	-	MR
21	200	42 SER	0200	0207.3	10.6	135	-	0
	500	27 RF	0308	0404	130	11	5	WR
	200	43 NS	0314	0403	158	33	7	MR
22	200	43 NS	0123	0455	400D	6	3	WR
24	100	46 C	2209.2	2211.9	7.9	940	-	0
	200	46 C	2210.3	2211.5	3.3	355	-	0
25	500	46 C	0009.3	0021.5	42.5	73	-	0
				0012.7		48		0
	200	42 SER	0011.5	0012.5	28.4	435	-	0
	200	41 F	0222.8	0225.0	6.6	525	-	0
	500	41 F	0327.3	0328.4	2.3	80	-	WR
	500	46 C	0430.4	0431.3	15.0	42	-	WR
	200	44 NS	2147E	0307	580D	40	8	WL
26	100	43 NS	0130	0400	350D	47	15	-
	500	41 F	0532.0	0543.0	31.5	276	-	SR
	500	46 C	0603.5	0638.0	68D	230	70	ML SUNSET
	200	46 C	0603.9	0626.0	75D	83	34	WL SUNSET
	200	44 NS	2147E	0500	580D	57	14	ML
	100	41 F	2209.2	2215.8	8.6	2000	-	0
27	200	42 SER	0609.9	0614.5	16.7	375	-	0
	200	44 NS	2147E	0328	580D	67	22	MR
	100	44 NS	2147E	0200	580D	74	20	-
28	500	46 C	0125.5	0135.5	30	46	-	WR
	500	27 RF	0250	0331	43	7	-	WR
	200	44 NS	2147E	0135	580D	92	55	WR
	100	44 NS	2147E	0142	580D	140	36	-
29	500	20 GRF	0038	0344	216	18	7	WL
	200	8 S	0516.9	0517.2	0.7	4000	-	0
	200	44 NS	2147E	0000	580D	62	13	0
	500	46 C	2250.5	2305.3	20.3	83	-	MR
	200	42 SER	2258.7	2303.1	8.1	3100	-	0
30	500	22 GRF	0028	0130	175	12	4	WR
	500	46 C	0416.7	0417.0	22.0	4500	175	0
				0423.5		436		MR
	200	8 S	0416.8	0417.2	0.5	4500	-	0
	200	46 C	0652.1	0656.1	6.6	485	-	0
	200	44 NS	2147E	2343	580D	22	6	MR
31	200	46 C	0209.2	0210.6	2.9	130	-	0

C. RADIO PROPAGATION

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

DEC 1989 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

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

C. RADIO PROPAGATION

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

DEC 1989 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 45M	01H 45M	02H 45M	03H 45M	04H 45M	05H 45M	06H 45M	07H 45M	08H 45M	09H 45M	10H 45M	11H 45M	12H 45M	13H 45M	14H 45M	15H 45M	16H 45M	17H 45M	18H 45M	19H 45M	20H 45M	21H 45M	22H 45M	23H 45M
1	2	8	13	20	20	27	30	33	18	23	23	11	-12	ES -21	ES -21	ES -12	ES -21	ES -21	ES -21	ES -21	10	11	3	10
2	1	5	9	17	20	30	20	20	26	23	23	24	24	17	ES -21	ES -21	ES -21	15	5	24	13	9	-9	-1
3	0	7	10	18	21	25	26	30	25	17	12	-4	-6	6	-6	ES -21	ES -21	ES -21	-1	12	11	9	8	5
4	3	12	12	17	23	25	29	36	27	33	25	20	-6	-9	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	10	13	-2	9
5	5	6	13	18	19	27	27	27	28	23	25	15	10	1	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	12	8	4	4
6	5	5	9	21	16	19	21	24	24	19	22	2	-6	ES -21	-6	ES -21	ES -21	ES -21	ES -21	-3	9	11	6	5
7	3	-1	7	12	17	17	24	27	29	27	22	2	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	22	13	0	11	8
8	1	3	12	16	20	24	29	29	27	30	17	9	-6	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	-3	8	6	6	6
9	6	6	13	15	18	24	30	24	21	18	1	-10	-8	-8	ES -21	ES -21	ES -21	ES -21	ES -21	1	11	10	8	6
10	2	5	8	15	21	23	27	24	25	10	-1	-12	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	-12	10	13	11	4
11	3	6	8	15	20	20	22	20	24	17	5	-3	-3	0	-6	ES -21	ES -21	ES -21	ES -21	ES -21	2	11	9	5
12	7	6	12	17	19	14	22	19	14	8	-6	-9	-12	-12	-12	ES -21	ES -21	ES -21	ES -21	ES -21	15	15	13	14
13	8	6	12	16	18	24	23	15	24	15	15	-6	-9	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	21	16	5	9
14	5	9	8	19	21	20	24	21	19	2	4	-9	ES -21	-6	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	18	8	10	8
15	11	12	13	18	23	26	27	21	22	24	3	1	-4	-9	ES -21	ES -21	ES -21	8	-6	11	6	18	11	10
16	9	10	14	15	24	21	20	12	14	13	-4	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	9	15	13	9
17	7	9	13	17	20	21	24	20	18	6	0	-3	-4	-6	-12	ES -21	ES -21	ES -21	ES -21	ES -21	2	6	9	6
18	9	11	14	17	22	22	22	19	13	16	-3	-6	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	10	8	5	ES -21
19	5	6	19	14	17	19	19	18	28	8	-3	-6	-12	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	9	10	10	6
20	4	8	9	14	18	22	28	26	13	11	-2	1	-6	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	6	8	6	5
21	5	5	8	16	21	19	20	18	14	7	-6	-6	-6	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	1	7	6	6
22	2	5	8	12	17	21	24	24	22	3	5	-4	ES -21	ES -21	ES -21	ES -21	5	ES -21	ES -21	ES -21	0	9	3	-2
23	-1	-6	6	13	18	25	26	27	17	10	10	5	11	16	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	4	12	10	3
24	4	5	8	15	18	21	23	26	19	19	1	-7	-9	-9	-9	ES -22	ES -22	ES -22	ES -22	-3	2	8	6	5
25	-7	2	7	8	14	18	21	26	23	11	5	0	-7	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	5	7	6	4
26	0	11	8	17	23	21	25	23	23	25	10	22	14	-7	-7	ES -22	ES -22	-9	ES -22	ES -22	-7	16	2	-1
27	1	-7	3	10	11	28	25	27	19	26	-4	-3	9	14	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	1	10	6	1
28	3	4	4	-2	13	19	22	22	20	13	ES -22	-10	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	17	2	0	4
29	-2	3	6	12	17	22	19	24	22	18	28	21	13	0	-2	ES -22	-5	-8	ES -22	-8	-2	4	5	-9
30	-9	-7	2	10	23	18	25	22	24	18	18	ES -22	ES -22	-9	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	7	12	4	8
31	4	10	10	19	18	19	25	28	26	22	25	21	24	-1	-8	23	9	18	ES -21	ES -21	10	9	8	4
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	3	6	9	16	19	21	24	24	22	17	5	-3	-6	-9	ES -21	ES -21	ES -21	ES -21	ES -21	ES -21	9	9	6	5
UD	9	11	14	19	23	27	29	30	28	27	25	21	14	14	-6	ES -21	-5	8	-6	12	17	16	11	10
LD	-2	-6	4	10	14	18	20	18	14	6	-6	-12	ES -21	ES -21	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	0	4	0	-2

C. Radio Propagation

c2. Radio Propagation Quality Figures at Hiraiso

Hiraiso — Time in U.T

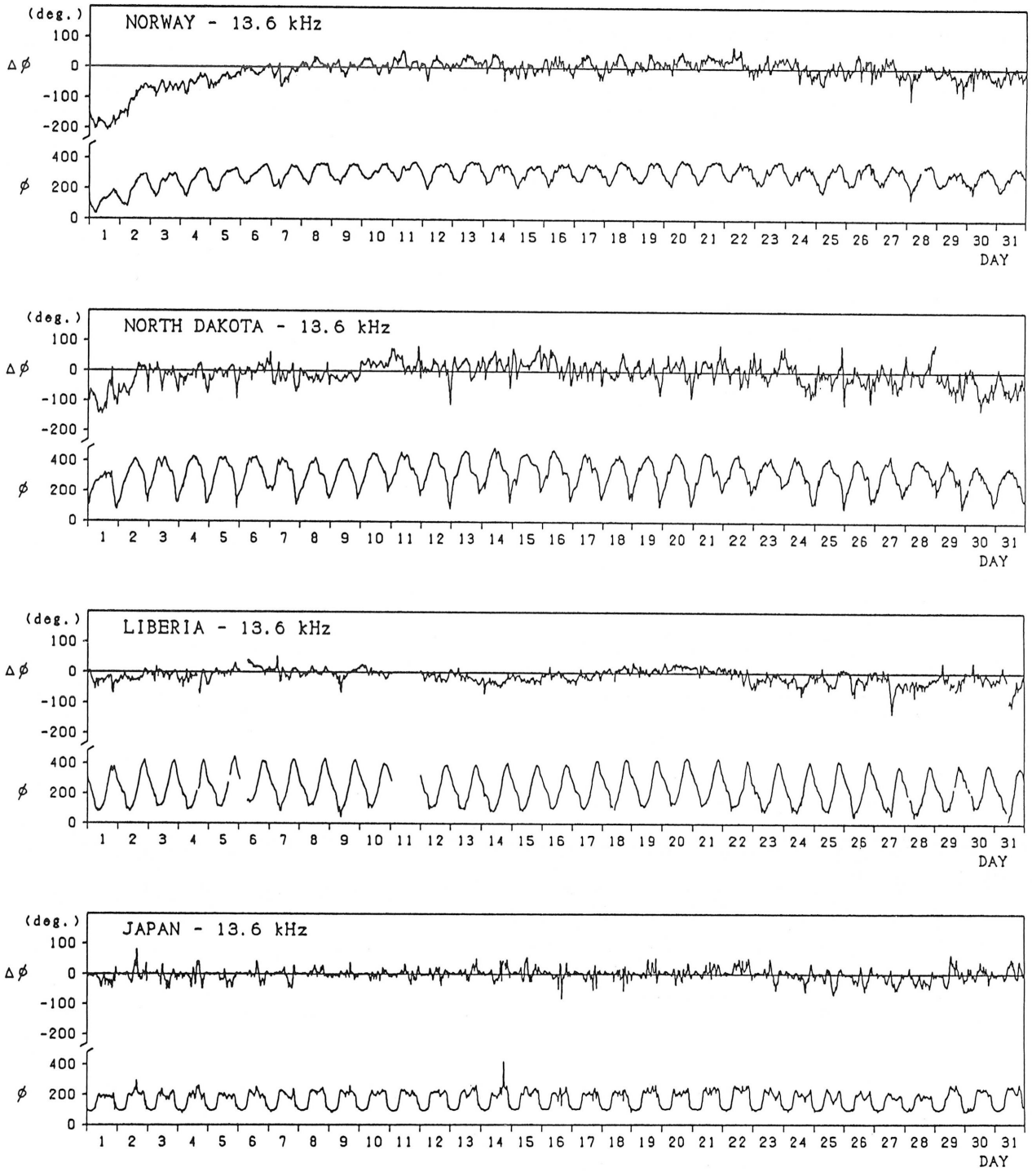
Dec. 1989	Whole Day Figure	W W V 00-06	W W V 06-12	W W V 12-18	W W V 18-24	W W V H 00-06	W W V H 06-12	W W V H 12-18	W W V H 18-24	Conditions 00-06	Conditions 06-12	Conditions 12-18	Conditions 18-24	Principal Geomagnetic Storms Start h m	Principal Geomagnetic Storms End h	Principal Geomagnetic Storms Range nT
1	4o	4	S	5U	4	4	5	3U	4	N	N	N	N			
2	4+	4	5U	5U	4	4	5	5U	4	N	N	N	N			
3	4+	4	5U	5U	2U	4	4	5U	5	N	N	N	N			
4	4o	4	5U	S	2U	4	5	4U	4	N	N	N	N			
5	4o	4	S	S	2U	4	5	5U	4	N	N	N	N			
6	3+	3	S	S	2U	4	4	4U	4	N	N	N	N			
7	3+	3U	S	S	3U	4	4	2U	4	N	N	N	N			
8	3+	4	S	S	2U	4	4	3U	4	N	N	N	N			
9	4o	4	S	S	4U	4	4	4U	4	N	N	N	N			
10	3+	3	S	S	4	4	3	2U	4	N	N	N	N			
11	4-	3	S	S	3	4	4	5U	4	N	N	N	N			
12	4-	3U	S	S	4	4	3	4U	5	N	N	N	N			
13	4-	4	S	S	4	4	4	3U	4	N	N	N	N			
14	3+	3	S	S	4	4	3	3U	4	N	N	N	N			
15	4o	4	S	S	5	4	4	3U	4	N	N	N	N			
16	4-	4	S	S	5	4	3	2U	5	N	N	N	N			
17	4o	4	5U	S	4	4	4	4U	4	N	N	N	N			
18	3+	3	S	S	4	4	3	2U	4	N	N	N	N			
19	4-	4	S	S	4	4	3	3U	4	N	N	N	N			
20	4-	3	S	S	4	4	4	3U	4	N	N	N	N			
21	4-	4	S	S	4	4	3	3U	4	N	N	N	N			
22	4o	4	5U	S	4	4	4	3U	4	N	N	N	N	0022	---	121
23	4+	4	5U	S	4	4	4	5U	4	N	N	N	N	---	18	
24	4o	4	S	S	4	4	4	4U	4	N	N	N	N			
25	4o	4	S	S	4	4	4	4U	4	N	N	N	N			
26	4o	4	S	S	3	4	4	5U	4	N	N	N	N			
27	4o	4	S	S	4	4	4	5U	4	N	N	N	N			
28	3+	4	S	S	4	3	3	3U	4	N	N	N	N			
29	4o	4	5U	S	3U	4	4	5U	4	N	N	N	N	0655	---	147
30	4-	3U	5U	S	3U	3	4	3U	4	N	N	N	N	---	---	
31	4o	3U	5U	5U	3U	4	4	5U	4	N	N	N	N	---	21	

C. Radio Propagation

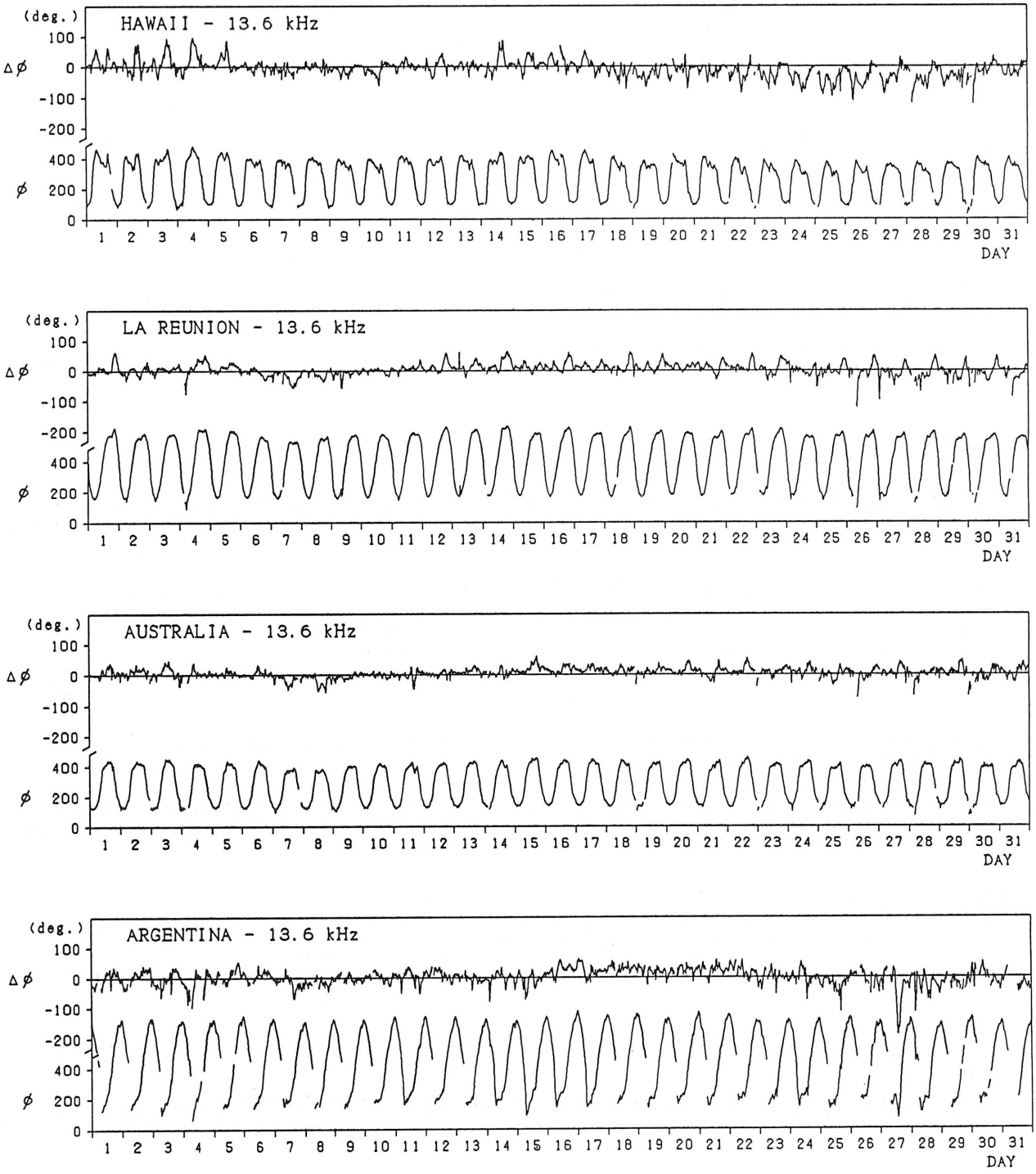
C3. Phase Variations in OMEGA Radio Waves at Inubo

Inubo

December 1989



Inubo December 1989



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

NONE

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

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

Hiraiso

Time in U.T.

Dec. 1989	S W F									Correspondence	
	Drop-out Intensities(dB)					Start	Duration	Type	Imp.	Solar Flare	Solar Noise
	CO	HA	1)	2)	3)						
2	x	21				2232	40	SL	2+	x	x
4	12	12	15			0322	22	SL	1+		x
7			20			0057	18	SL	2-		
7		37				2058	58	SL	3+	x	
14	23	14	12	x		0207	49	SL	2	x	x
18	25	31				2336	38	S	3	x	x
19			13			0529	30	SL	1	x	x
23			18			0120	13	SL	1+		
23			17			0133	30	SL	1+		x
23			15			0212	22	SL	1		x
24			15			0317	28	SL	1	x	x
25	29	29	28			0002	80	G	2+	x	
25			8			0433	23	SL	1-	x	x
26			39		11	0522	48	G	3	x	x
27	27	30	12			0134	48	S	3	x	x
27					11	1210	25	SL	1-	x	x
28			11	x		0143	24	SL	1-	x	x
28			14			0234	25	S	1		x
28	35	30	28			0259	11	SL	2+	x	x
28	x	x	25			0310	50	SL	2	x	x
28	6	8	8			0400	32	SL	1-		
30			13			0202	28	SL	1		
30			20			0407	38	SL	2	x	
31			22		10	0937	28	SL	1-	x	

NOTES CO: Colorado(WWV) HA: Hawaii(WWVH) 1): Australia 2): Moscow 3): Londn

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Dec. 1989	S			P			A		
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
1				6	5		0107	0154	0113
1				9			0442	0524	0452
1		18	13	7			0705	0737	0714
1		26	16	10			0744	0801	0751
1		15		25	22		2310	2334D	2316
1				16	13		2334E	0002D	2338
2	13	17	36	54	41	31	0002E	0048D	0007
2				14		15	0048E	0126	0051
2			9	7			0226	0255	0236
2			27	26	10		0337	0436	0345
2			10	8			0457	0524	0501
2			34	20			0612	0707D	0634
2		23	52	36			0707E	0757	0713
2			21				0851	0944	0859
2		21					1230	1258D	1235
2		16					1258E	1333	1305
2	14		25	100	98	68	2237	0012	2252
3	15			21	12	15	0028	0144	0056
3	10		13	17	8	11	0253	0348	0305
3	23	30	40	33*			0419	0607	0451
3		15					1438	1518	1450
3				43	44	24*	2241	0018	2305
4		10	23	—	22	9*	0026	0140	0036
4	19	35	96	—	37	25	0323	0421D	0330
4	32	18	95	—	40	19	0421E	0652	0449
4			10	—			0721	0810	0734
4		67					1438	1634D	1500
4		29					1634E	1723	1637
5				10			0359	0432	0406
5		23	9				1228	1306	1234
5		80					1530	1730	1542
5					15		2144	2222D	2157
5					17		2222E	2318	2234
6		20	11	12			0744	0815	0747
7		18	49	55	31	23	0154	0340	0209
7			7	7			0407	0435	0413
7			15	6			0603	0718D	0611
7			13				0718E	0804	0737
7		164	148	77			0826	1023	0838
7		27					1557	1633	1605
7					116	50	2056	2239D	2118
7				10	15	16	2239E	2342	2255
8			9	11	6		0203	0231	0207
8			11	5			0528	0610	0534
8				26	34	42	2247	0015	2310
9		15	29	29	14		0144	0218	0152
9		9	22	21	13	7	0241	0351	0248
9			15	7			0507	0556	0519
9		93	92	48			0823	1017	0847
11		—	25	—			0516	0616	0524
12			10	6			0337	0412	0346
12					20		2123	2201	2129
12				14	13		2338	0013	2343
13		31	20				1026	1122	1043
13		24					1238	1338	1249
13				16	32		2225	2336	2236
14	47	45	154	115	83	50	0208	0419	0219
14				22	18	23	2336	0025	2341
15			11				0746	0818	0755
15		12					1359	1437	1406
16			30	22			0457	0616	0504
16			15	8			0640	0741	0655
17					26		2135	2158D	2147
17					35		2158E	2340	2211
18			20	—			0349	0457	0409

Inubo

Dec.	S				P		A		
1989	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
18			22	—			0522	0639	0540
18		108	113	75			0827	1035	0854
18	25	23	43	126	96	63	2337	0126	2349
19			25	—	12		0300	0402	0311
19			15	14			0409	0429	0415
19		30	74	61			0527	0706	0542
19		17					1255	1345	1311
19				10	9		2303	2331	2309
20			7				0340	0420	0345
20	17	16	5				0613	0633	0622
20		18	12	6			0635	0659	0649
20				8	8*		2321	0009	2335
21			28	26			0328	0502	0408
21			9	6			0509	0544	0517
21			14	5			0609	0652	0618
21				6			2302	2328	2309
22				12	8		0027	0058D	0042
22				18	11		0058E	0200	0111
22			12	10	6		0205	0241	0213
22		17	62	56	27		0305	0426	0318
22			8				0601	0630	0609
22		19	20	8			0821	0915	0830
22					23		2018	2051	2025
22	18	15	32	125	121	75	2302	0039D	2311
23				39	30		0039E	0120D	0049
23	27	36	87	96	67	32	0120E	0137D	0132
23	32	51	129	120	95	46	0137E	0217D	0147
23	17	35	67	80	54	31	0217E	0353	0221
23		37	33	14			0808	0848D	0819
23		34	46	14			0848E	0936D	0859
23		38	51				0936E	1005	0944
23		33	20				1043	1127	1052
23		36					1307	1435	1326
24		18	65	56	28	35	0323	0442	0333
24			17	14			0717	0751	0725
24			12				0835	0924	0839
24			22				0941	1030	1009
24		57					1331	1433	1343
24		31					1438	1551	1507
24					14		2215	2241	2219
24				10	9		2302	2347	2308
25	21	24		106	79	44	0013	0147D	0047
25			11	55	31		0147E	0201D	0151
25	29		26	62	33		0201E	0421	0211
25		15	67	54			0431	0514D	0440
25			32	26			0514E	0626	0519
25			12	10			0721	0752	0732
25			15	10			0800	0917	0808
25		24	22				1043	1101	1050
25		29	23				1118	1211	1124
25		18					1637	1719	1644
25					42	30	2013	2104D	2030
25					19		2104E	2208	2117
25					9		2218	2319	2239
25				14*	15		2344	0120	0013
26			26*	39*	19*		0153	0318	0211
26			27	26	17		0332	0437	0345
26	61	87	256	173	40	30	0523	0744D	0543
26		51	112	120			0744E	0850	0751
26		22					1523	1645	1554
26		8				28	1810	1843	1816
26				6	8		2332	0025	2340
27	19	31	98	—	68	38	0132	0343	0151
27			9	—			0454	0532	0458
27			22	—			0612	0703	0619
27		36	10				1154	1256D	1217
27		89					1256E	1438	1336
27					42		2147	2255	2159
27				11	10		2338	0005D	2345
28				21	17		0005E	0109	0011
28			32	32	18	19	0134	0235D	0142
28			23	30	8		0235E	0259D	0242
28	93	92	265	188	130	109	0257E	0405D	0334
28	66	39	158	110	71	62	0405E	0503D	0410
28			58	8			0503E	0559D	0514
28	26		30	6			0559E	0658D	0605
28			26	12			0658E	0723	0708
28		33	51				0726	0751D	0737
28		63	70	50			0751E	0856	0759
28		75	68				0957	1128	1007
28		38	8				1301	1358	1318
28					115	52	2106	2246	2118
28				14	24		2306	0022D	2322
29	23			52	45		0028	0210	0044
29			13	10			0357	0422	0401
29			28	8			0636	0700	0643
29			40	22			0748	0905	0758
29			15				0929	1020	0942
29		180	137				1058	1245	1113
29		42					1533	1628	1553
29	30	23		78	94	52	2252	2349D	2315
29				46	68		2349E	0122D	2359
30			49	26	47		0122E	0203D	0131
30	42	57	190	107	106	67	0203E	0410D	0217
30	77	97	255	161	86	80	0410E	0652	0423
30		35	50	29			0720	0815	0728
31				10	4		0059	0121	0103
31				10	8		0211	0232	0216
31			18	10			0539	0625D	0556
31		32	34	18		26	0625E	0744	0648
31		12	7				0836	0903	0841
31			257	101			0925	1238	0944

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