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CRPL-F 243 PART A

FOR OFFICIAL USE

PART A
IONOSPHERIC DATA

ISSUED
NOVEMBER 1964

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
BOULDER, COLORADO

CRPL-F 243
PART A

NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY
BOULDER, COLORADO

Issued
30 Nov. 1964

IONOSPHERIC DATA

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IONOSPHERIC DATA

The CRPL-F series bulletins are issued as part of the responsibility of the Central Radio Propagation Laboratory for the exchange and distribution of ionospheric and related geophysical data. Part A, "Ionospheric Data," and Part B, "Solar-Geophysical Data," of the CRPL-F series present a variety of data collected by CRPL in the course of its research and service activities. Through the CRPL-F series, as part of the general exchange of scientific information, these data are made available for use by others in research on radio propagation and the ionosphere, and in other geophysical applications.

In the CRPL-F series, Part A, tables of monthly median values of vertical-incidence ionospheric data are presented accompanied by graphs of critical frequencies and M(3000)F2. The tables include the number of values entering into the median determination (count). When available, the upper and lower quartile values (indicated by UQ and LQ) are listed for foF2, foF1, foEs, M(3000)F2, h'F2 and h'F. Space limitations do not permit inclusion of quartile values for the other characteristics. The tables are prepared by machine methods and the graphs are plotted automatically.

The tables and graphs present the ionospheric data as received from the originating laboratory. Responsibility for the accuracy and reliability of the data rests entirely with the originator. Medians of data for the U.S. stations are computed by CRPL in accordance with the recommendations of the World-Wide Soundings Committee.

Data will appear in the F-series, Part A, only when the complete daily-hourly tabulations have been received by the CRPL or the World Data Center A for Airglow and Ionosphere. In general, priority of publication is given to the most current data. Data received too long after the month of observation may experience an indefinitely prolonged delay before finding space in the F series, Part A.

Information on symbols, terminology and conventions may be found in the "URSI Handbook of Ionogram Interpretation and Reduction of the World-Wide Soundings Committee," edited by W. R. Piggott and K. Rawer (Elsevier, 1961), which supersedes previous documents. A list of symbols is available from CRPL on request.

Units and Abbreviations of Ionospheric Data Tables

foF2, foEs - - - Tenths of a megacycle	MED - Median
foF1, foE - - - Hundredths of a megacycle	CNT - Count
h'F2, h'F, h'E - Kilometers	UQ - Upper Quartile
M(3000)F2 - - - Hundredths	LQ - Lower Quartile

Key to Points of Ionospheric Data Graphs

foF2: x foE : ⊙ M(3000)F2 : ◇
foF1: Δ foEs: +

< Less-than value indicated. > Greater-than value indicated.

- - - Interpolated value indicated.

The following table contains the latest available information on twelve-month smoothed average of observed Zurich relative sunspot numbers, beginning with the minimum of April 1954. Final numbers are listed through June 1963, the succeeding values being based on provisional data.

Smoothed Observed Zurich Relative Sunspot Number

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1954				3	4	4	5	7	8	8	10	12
1955	14	16	19	23	29	35	40	46	55	64	73	81
1956	89	98	109	119	127	137	146	150	151	156	160	164
1957	170	172	174	181	186	188	191	194	197	200	201	200
1958	199	201	201	197	191	187	185	185	184	182	181	180
1959	179	177	174	169	165	161	156	151	146	141	137	132
1960	129	125	122	120	117	114	109	102	98	93	88	84
1961	80	75	69	64	60	56	53	52	52	51	50	49
1962	45	42	40	39	39	38	37	35	33	31	30	30
1963	29	30	30	29	29	28	28	27	27	26	23	21
1964	19	17	15	12								

NOTICE OF CHANGE OF FORMAT

Beginning with this issue, tables and graphs of ionospheric data will appear on the same page side by side, with two station months of data summary tables and their corresponding graphs on a single page. The same number of station months of data will appear per issue. The change in proportion of the graphs permits somewhat larger printing for the tabulated data, resulting in more legible tables. We believe that most readers will also find the new arrangement more convenient to use.

WORLD - WIDE SOURCES OF IONOSPHERIC DATA

THE IONOSPHERIC DATA PRESENTED IN THE 100 TABLES AND GRAPHS OF THIS ISSUE WERE ASSEMBLED BY THE CENTRAL RADIO PROPAGATION LABORATORY FOR ANALYSIS, CORRELATION, AND DISTRIBUTION. THE FOLLOWING ARE THE SOURCES OF THE DATA.

AUSTRALIAN DEFENCE SCIENTIFIC SERVICE
WEAPONS RESEARCH ESTABLISHMENT, DEPARTMENT OF SUPPLY.
WOOMERA, AUSTRALIA

BELGIAN ROYAL METEOROLOGICAL INSTITUTE.
DOURBES, BELGIUM

BRITISH DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH,
RADIO RESEARCH BOARD.
SINGAPORE, MALAYSIA
SLOUGH, ENGLAND

DEFENCE RESEARCH BOARD, CANADA.
CHURCHILL, CANADA
OTTAWA, CANADA
RESOLUTE BAY, CANADA
ST. JOHNS, NEWFOUNDLAND
KENORA, CANADA

UNIVERSIDAD DE CONCEPCION.
CONCEPCION, CHILE

RADIO WAVE RESEARCH LABORATORIES, DIRECTORATE GENERAL OF
TELECOMMUNICATIONS, MINISTRY OF COMMUNICATIONS,
TAIPEI, HSIAN, TAIWAN, REPUBLIC OF CHINA,
TAIPEI (TAIWAN), CHINA

INSTITUTO GEOFISICO DE LOS ANDES COLOMBIANOS.
BOGOTA, COLOMBIA

METEOROLOGICAL SERVICE OF CONGO
LEOPOLDVILLE, CONGO

CZECHOSLOVAK ACADEMY OF SCIENCES.
PRUHONICE, CZECHOSLOVAKIA

DANISH NATIONAL COMMITTEE OF URSI.
GODHAVN, GREENLAND
NARSSARSSUAQ, GREENLAND

GENERAL DIRECTION OF POSTS AND TELEGRAPHS, HELSINKI, FINLAND.
NURMIJARVI, FINLAND

THE FINNISH ACADEMY OF SCIENCES AND LETTERS.
SODANKYLA, FINLAND

HEINRICH HERTZ INSTITUTE, GERMAN ACADEMY OF SCIENCES,
BERLIN, GERMANY.
JULIUSRUH/RUGEN, GERMANY

INSTITUTE FOR IONOSPHERIC RESEARCH, LINDAU UBER NORTHEIM,
HANNOVER, GERMANY.
LINDAU/HARZ, GERMANY

IONOSPHERE INSTITUTE, NATIONAL OBSERVATORY OF ATHENS.
ATHENS (SCARAMANGA), GREECE

ICELANDIC POST AND TELEGRAPH ADMINISTRATION.
REYKJAVIK, ICELAND

INDIAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH,
RADIO RESEARCH COMMITTEE, NEW DELHI, INDIA.
HYDERABAD, INDIA (DEFENCE ELECTRONICS RESEARCH LABORATORY)

MINISTRY OF POSTS AND TELECOMMUNICATIONS, RADIO RESEARCH
LABORATORIES, TOKYO, JAPAN.
AKITA, JAPAN
KOKUBUNJI, TOKYO, JAPAN
WAKKANAI, JAPAN
YAMAGAWA, JAPAN

THE ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE.
DE BILT, NETHERLANDS
PARAMARIBO, SURINAM

CHRISTCHURCH GEOPHYSICAL OBSERVATORY, NEW ZEALAND DEPARTMENT OF
SCIENTIFIC AND INDUSTRIAL RESEARCH.
CAMPBELL I.
CAPE HALLETT (ADARE), ANTARCTICA
GODLEY HEAD (CHRISTCHURCH), N.Z.

MANILA OBSERVATORY, PHILIPPINES.
MANILA, LUZON

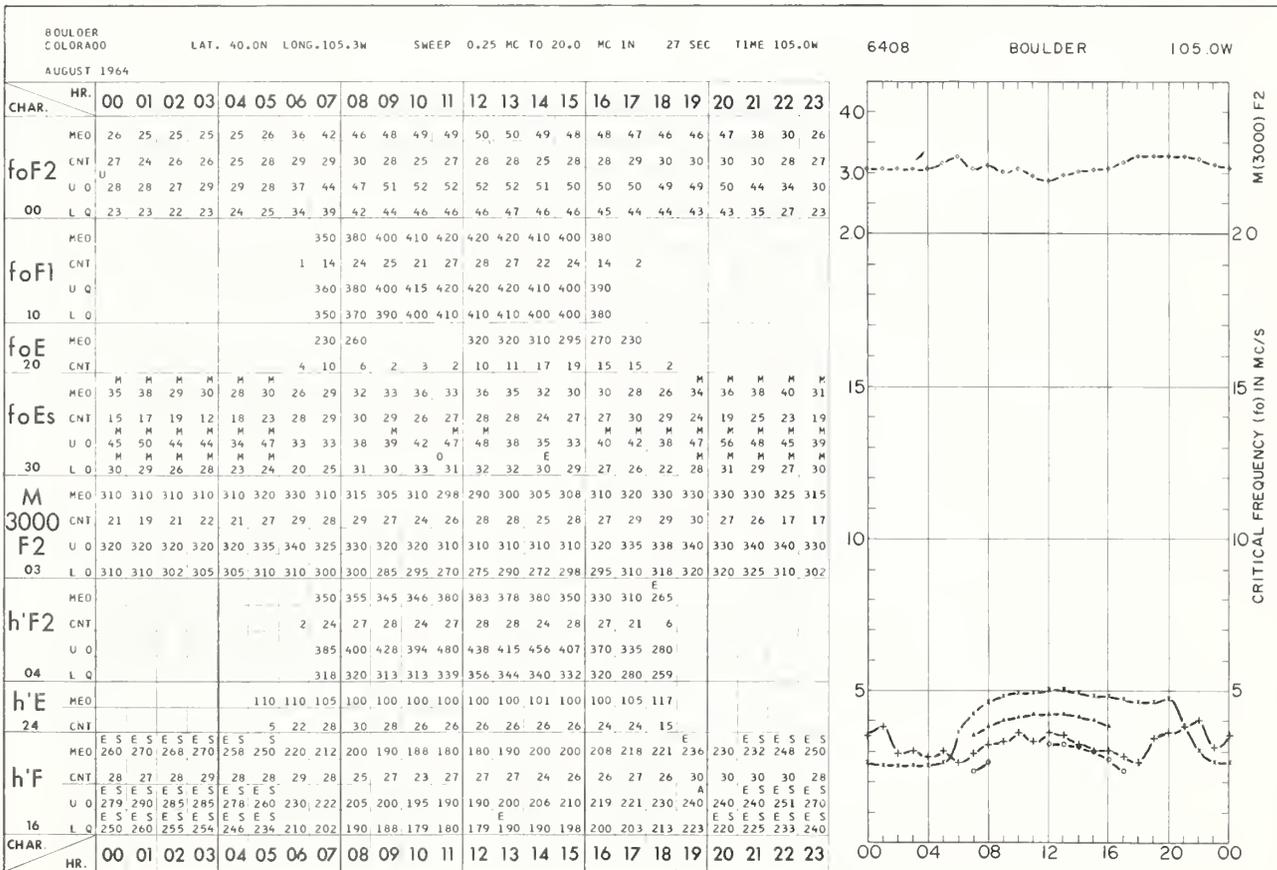
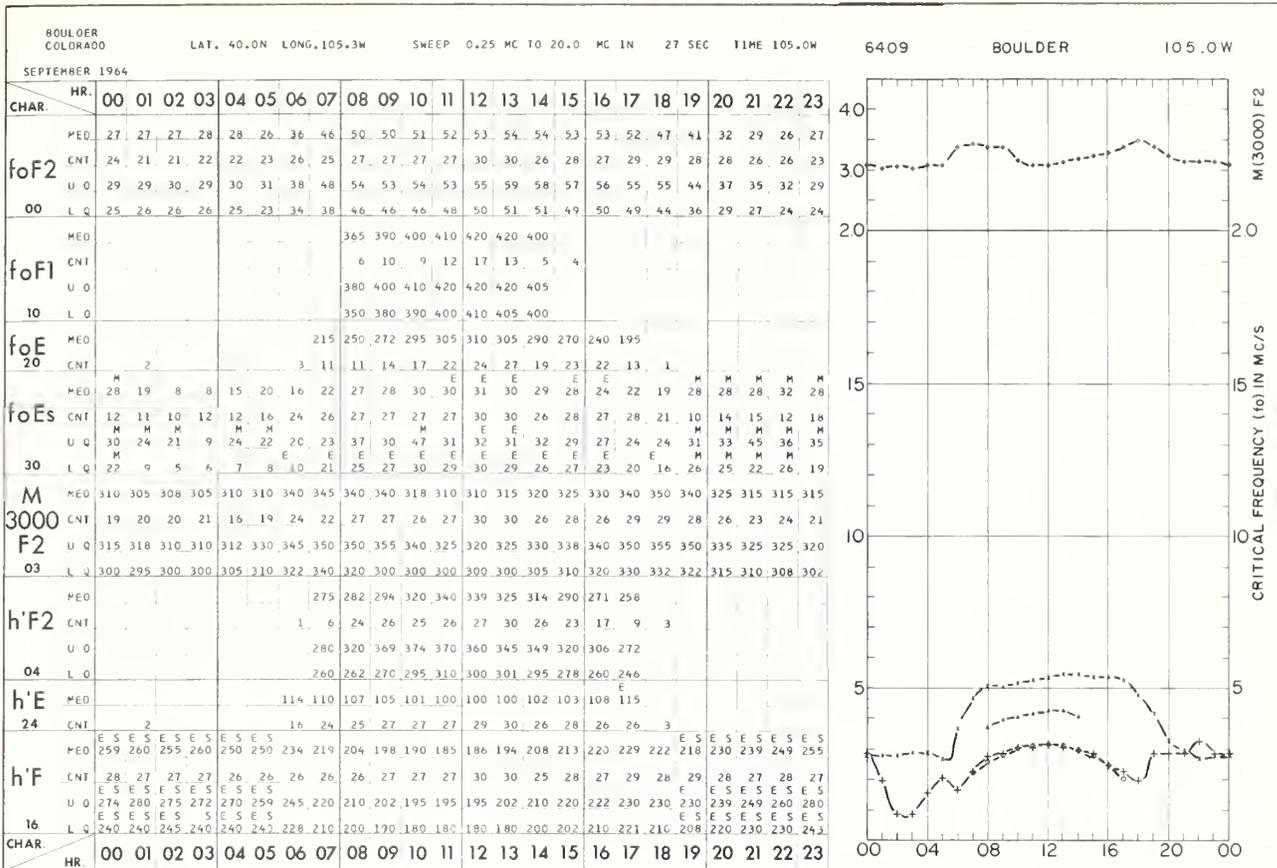
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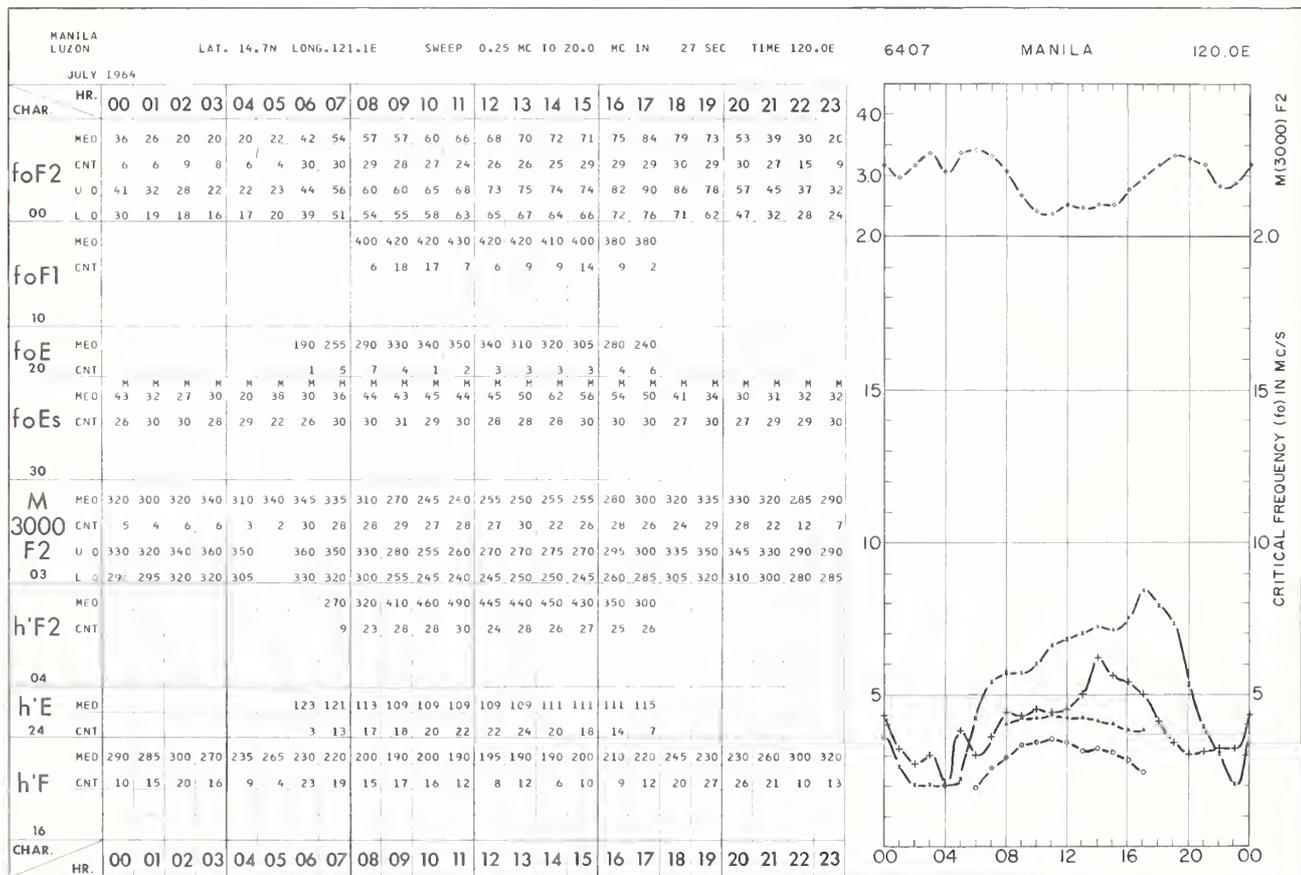
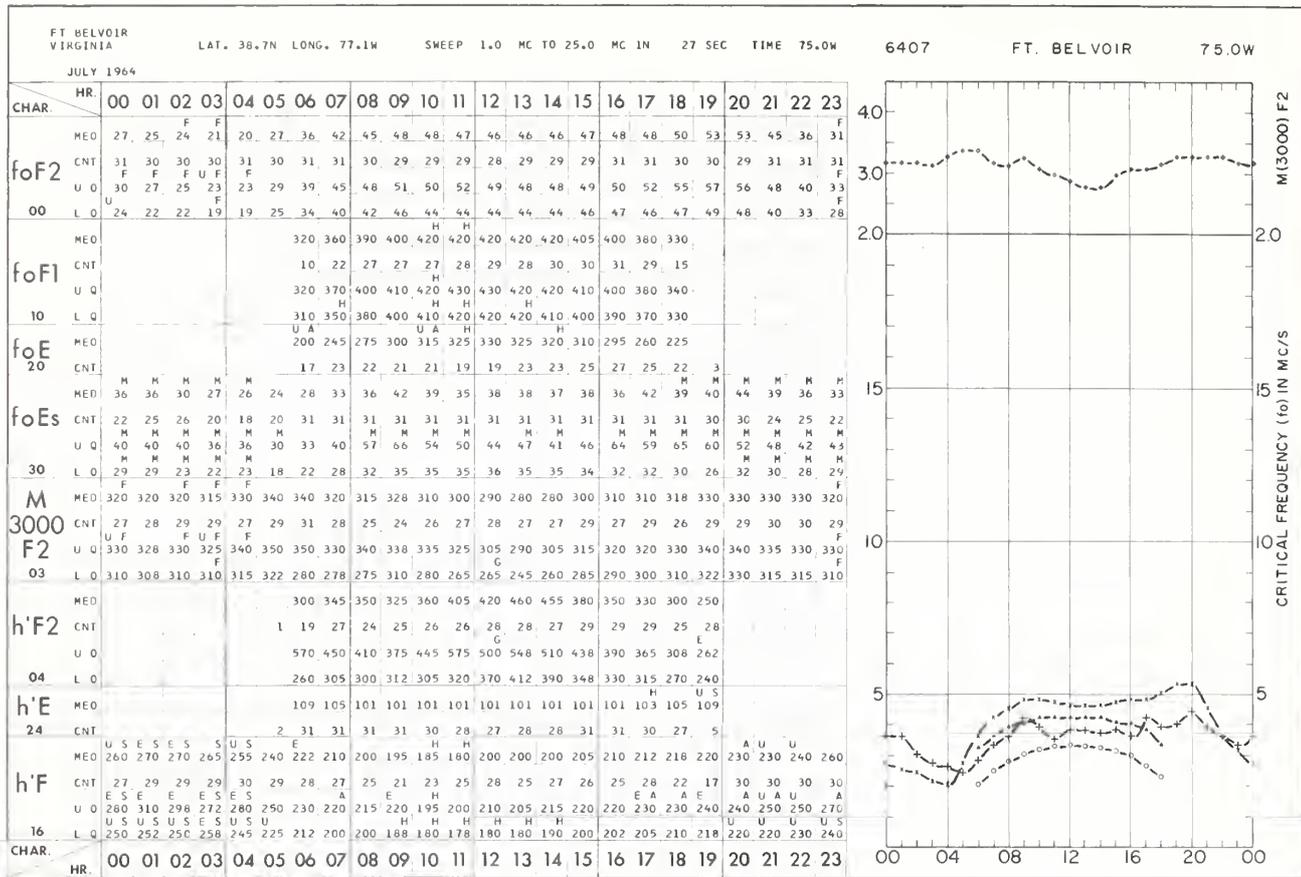
UNITED STATES ARMY SIGNAL CORPS., UNITED STATES OF AMERICA.
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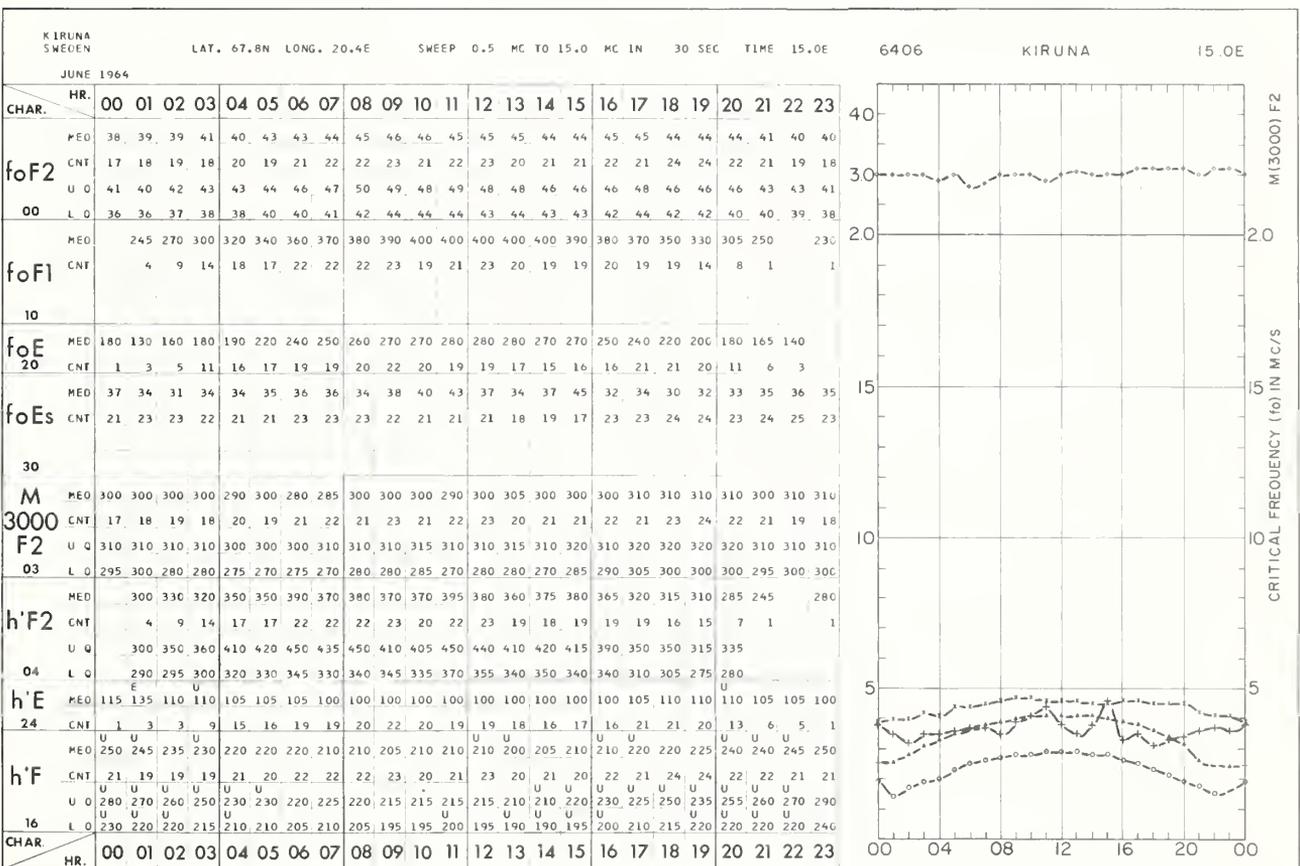
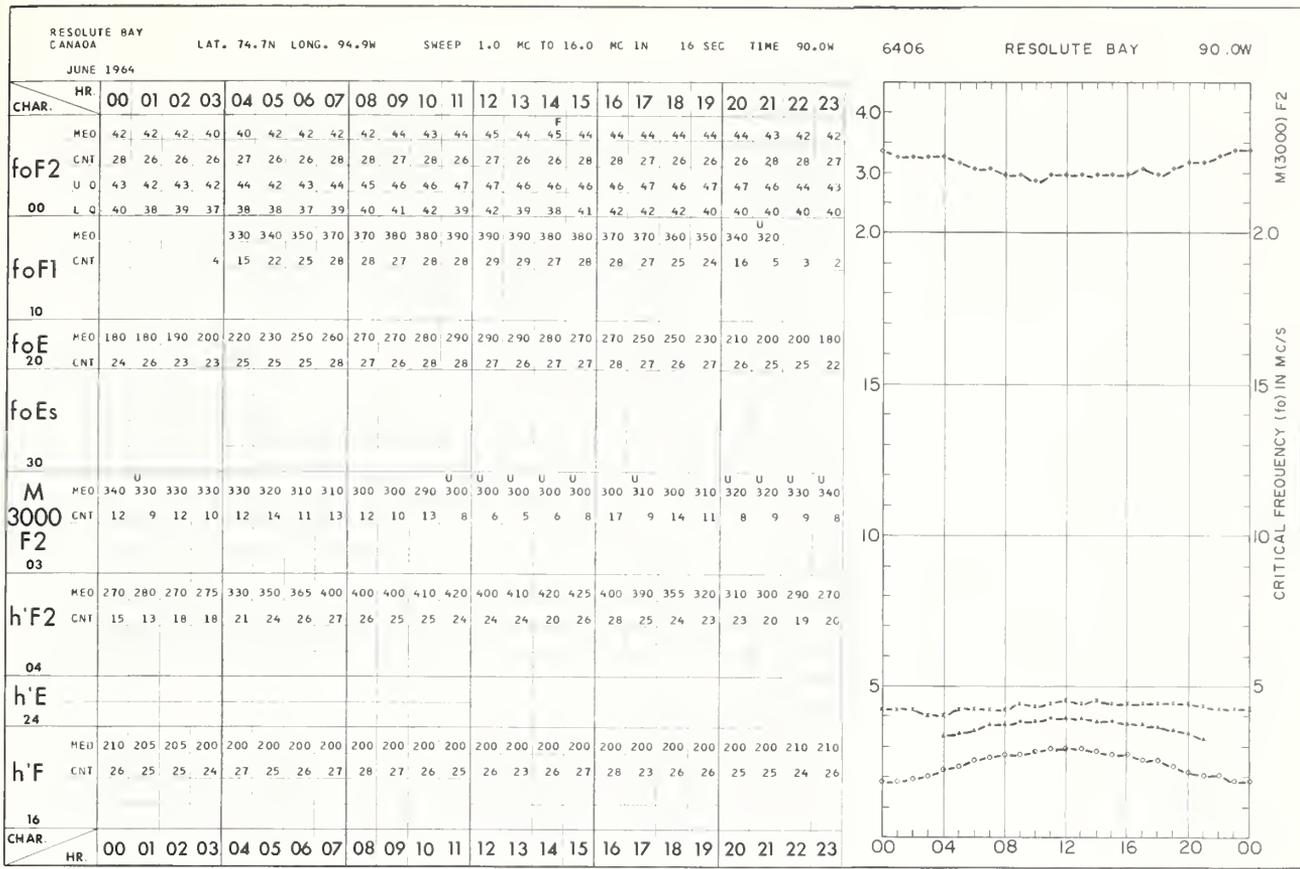
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BOULDER, COLORADO
BYRD STATION, ANTARCTICA
FT. BELVOIR, VIRGINIA
HUANCAYO, PERU (INSTITUTO GEOFISICO DEL PERU)
MAUI, HAWAII
POLE STATION, ANTARCTICA
TALARA, PERU (INSTITUTO GEOFISICO DEL PERU)

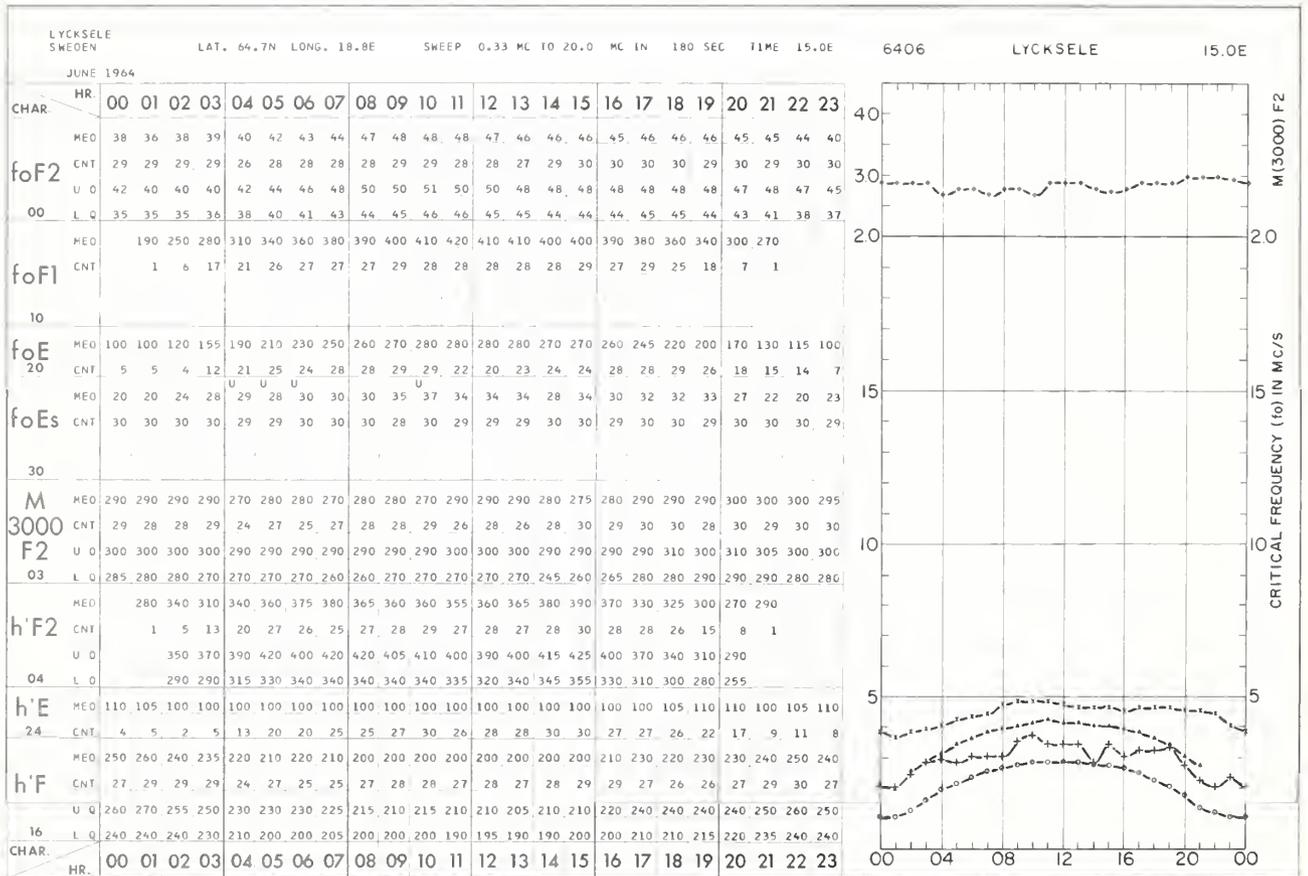
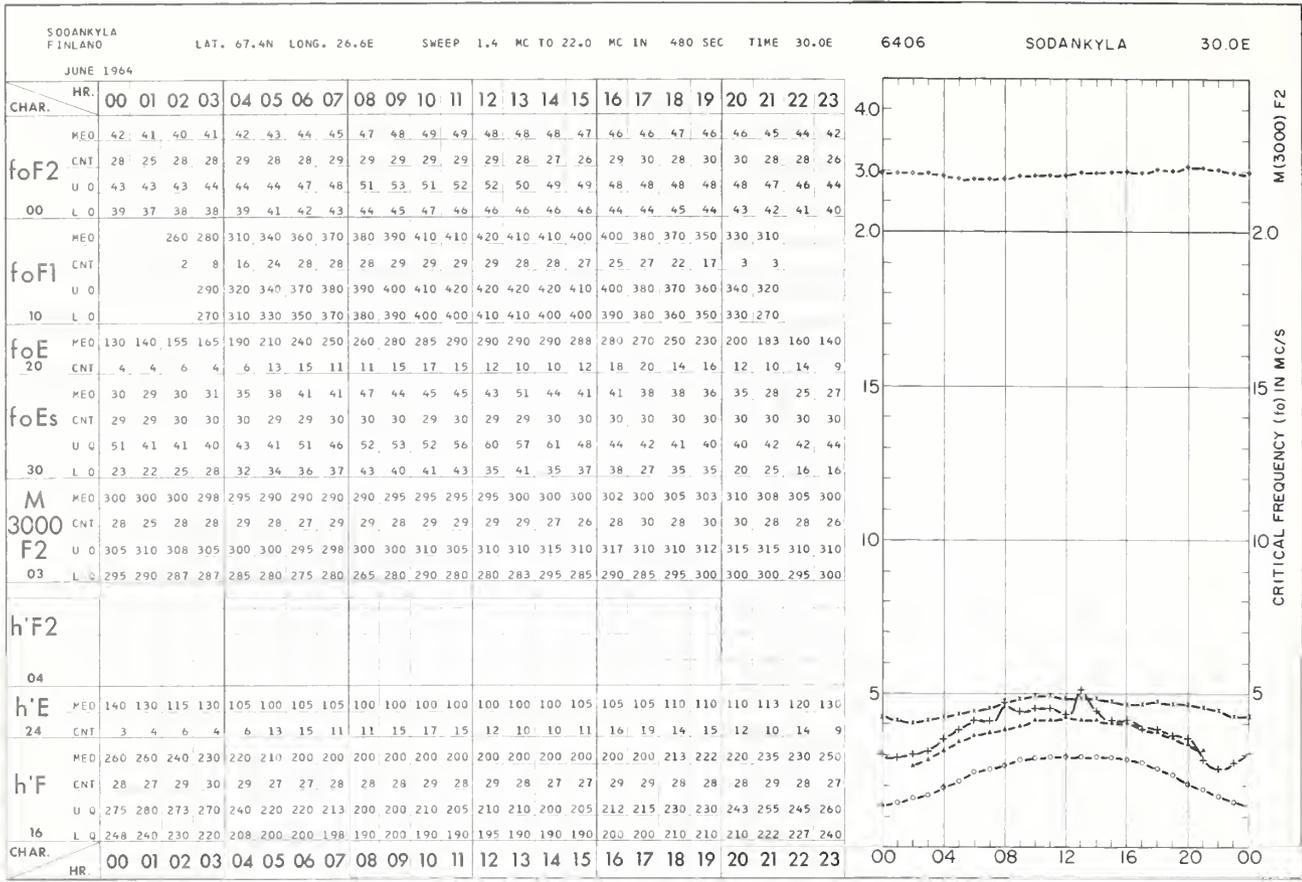
TABLES AND GRAPHS OF IONOSPHERIC DATA

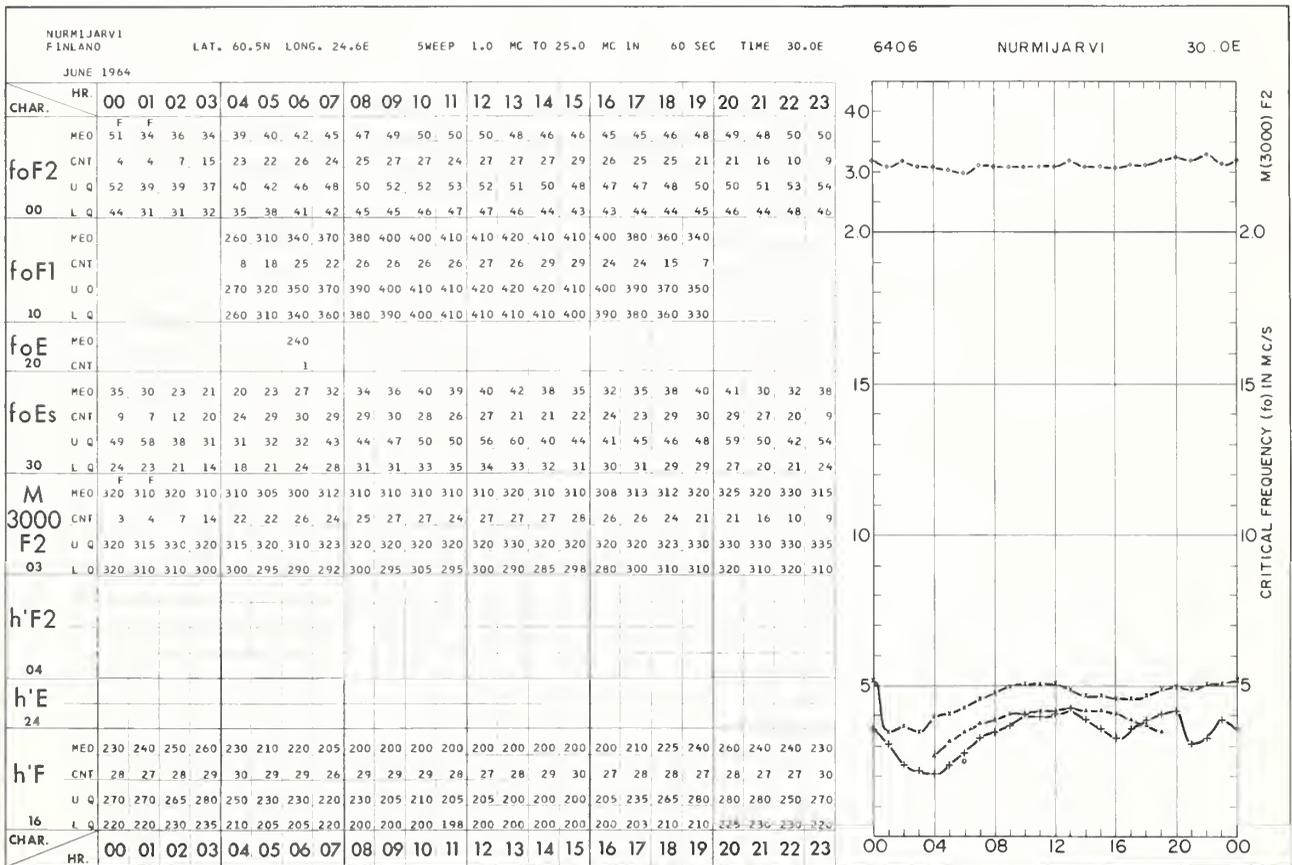
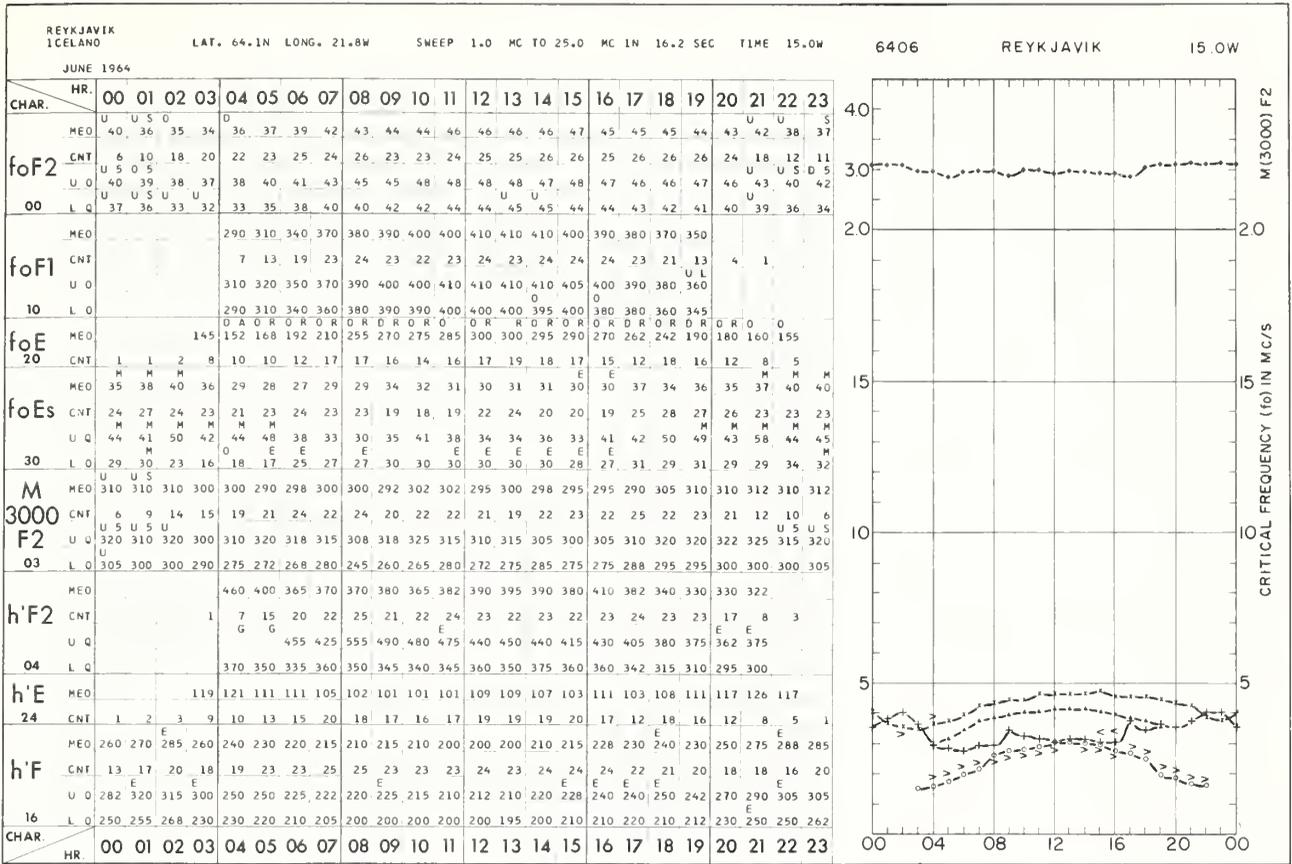
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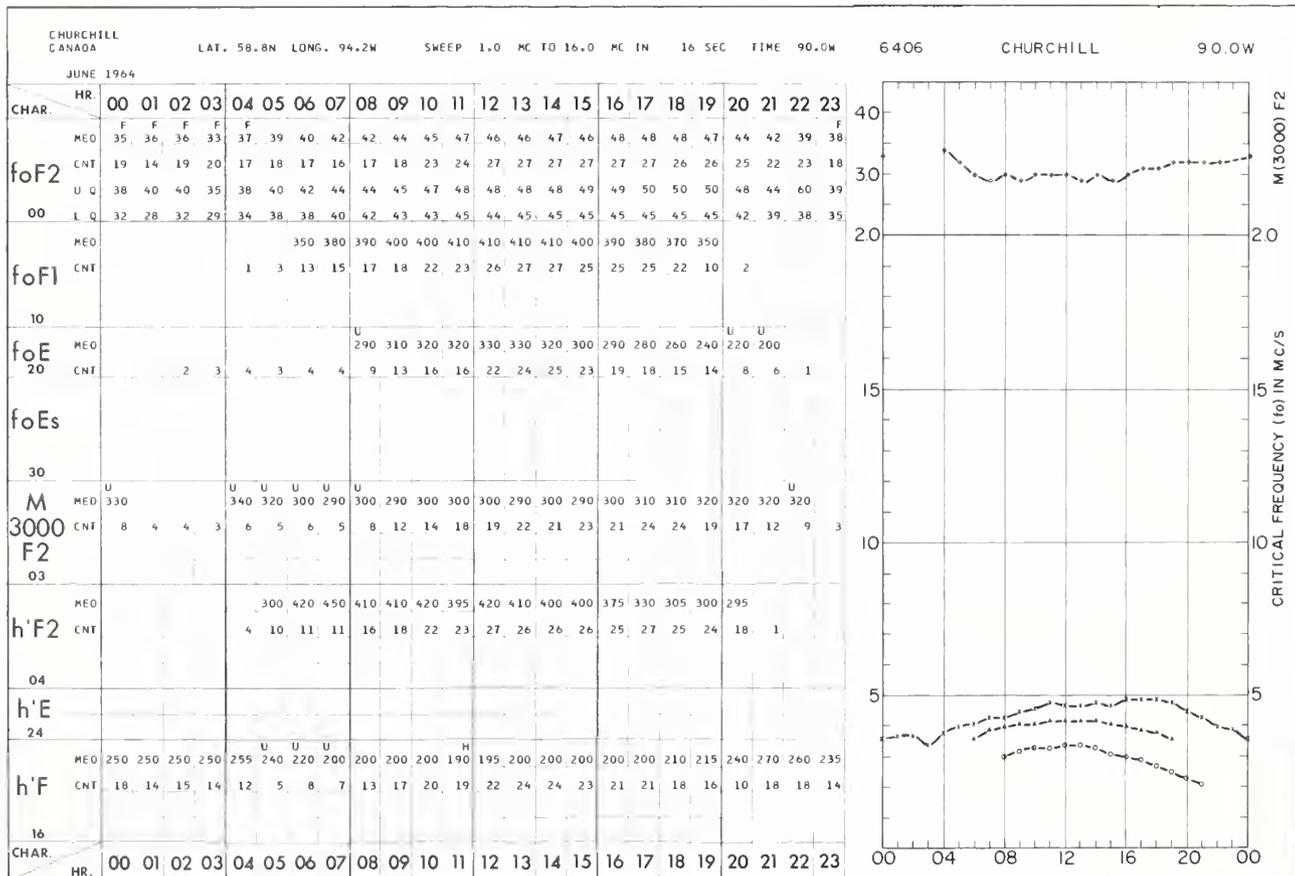
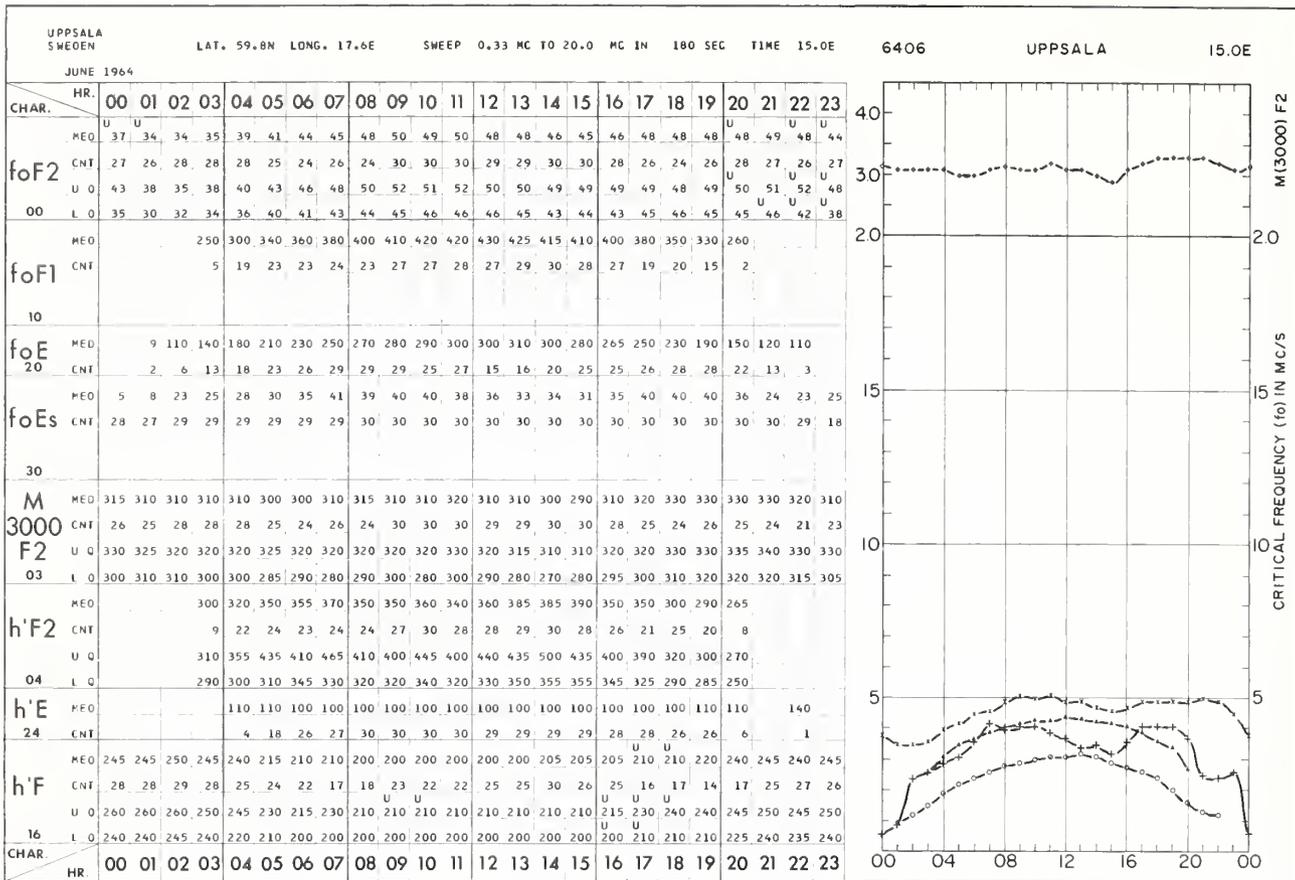


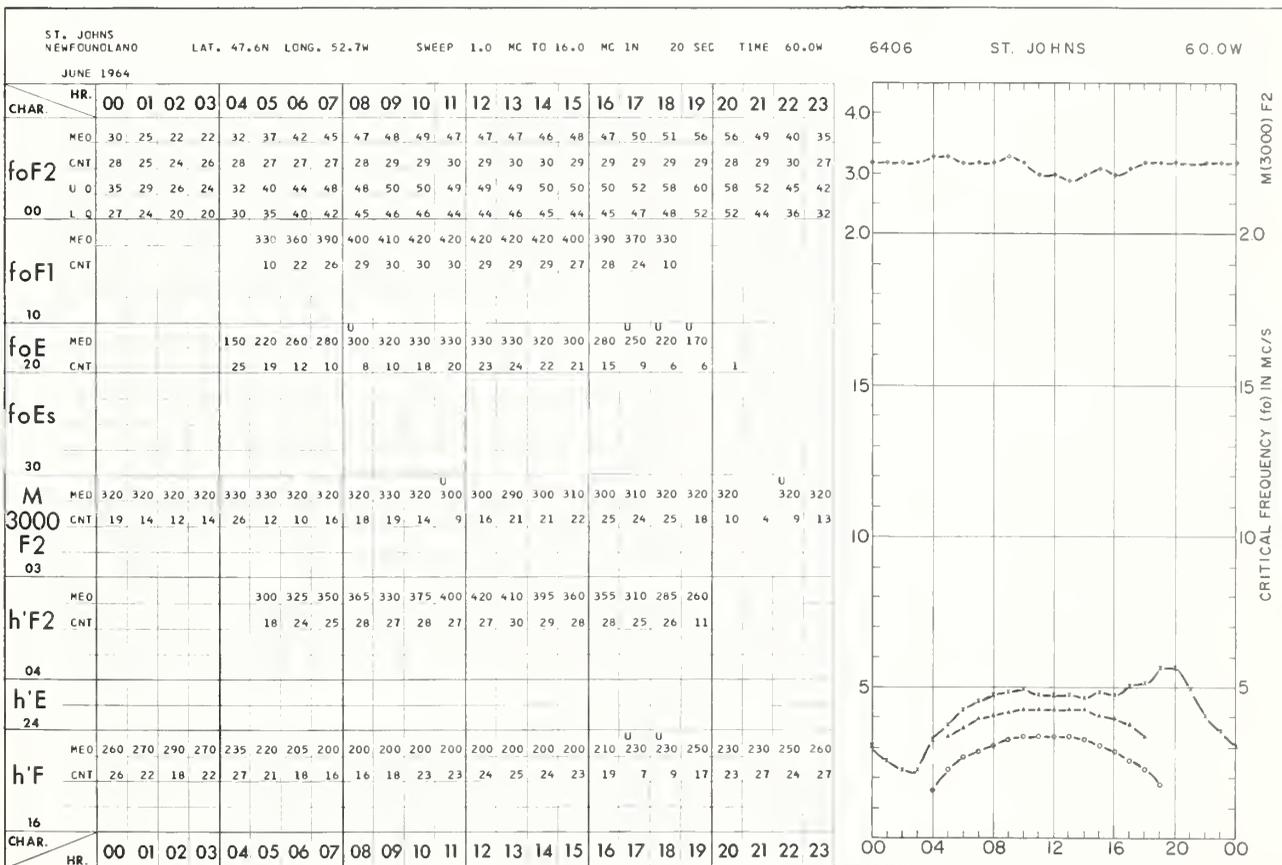
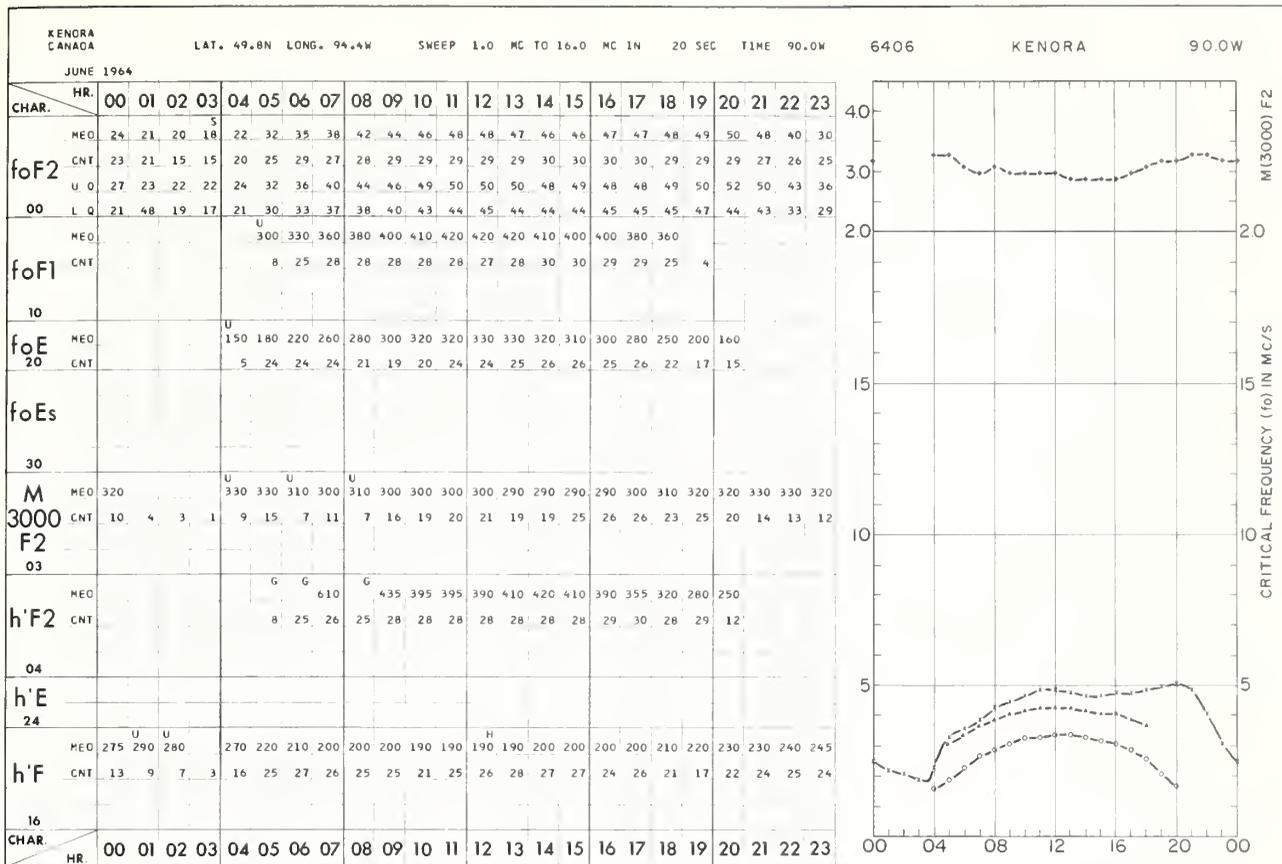


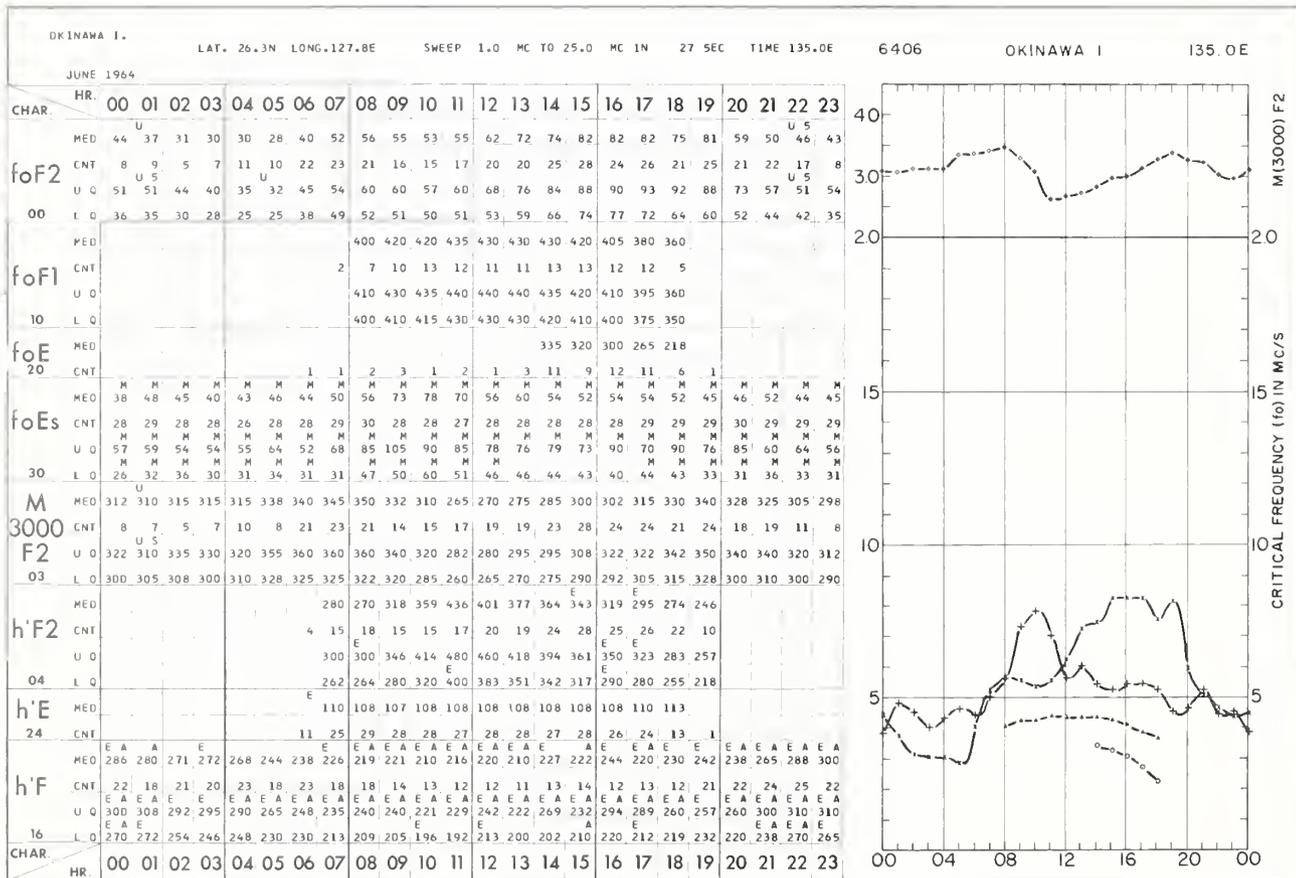
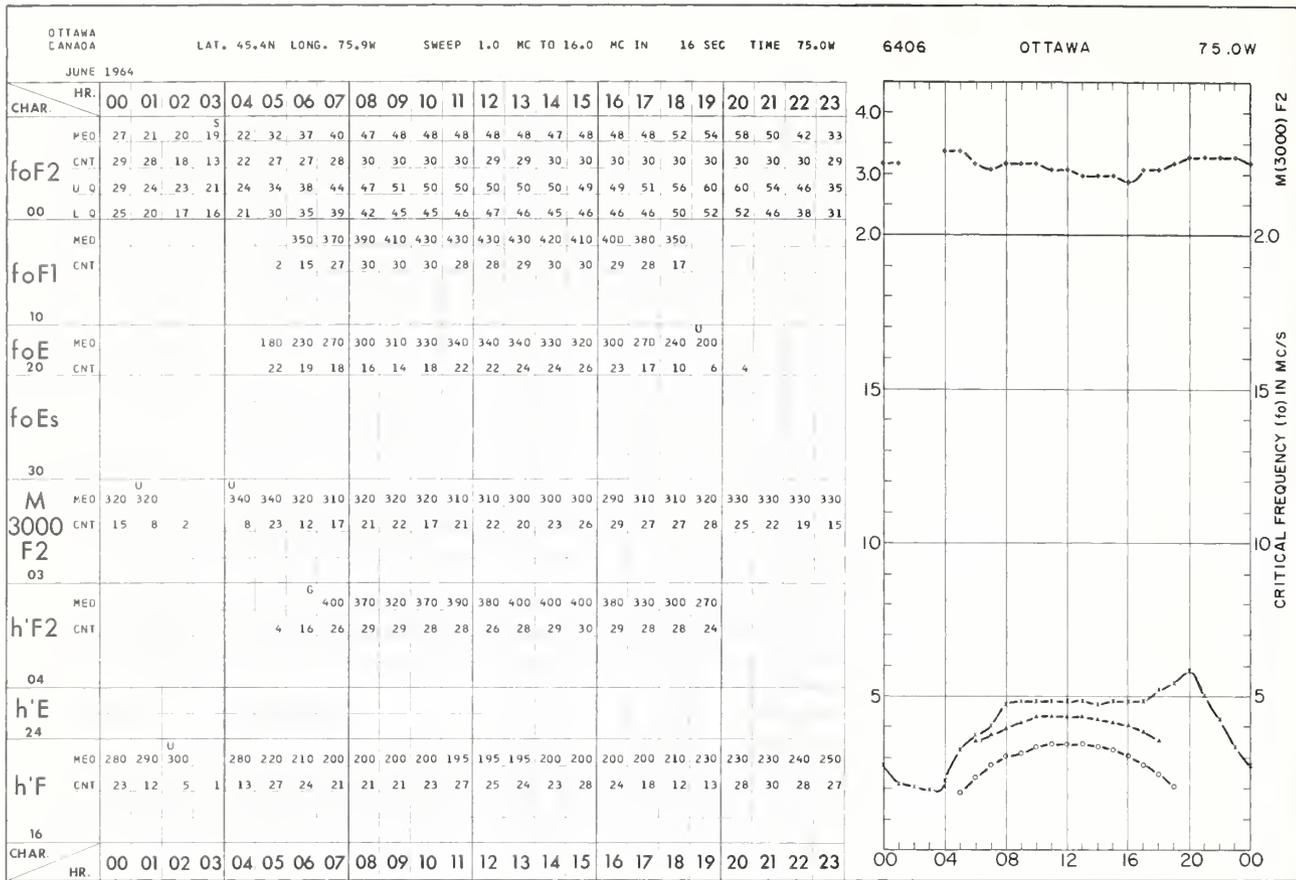


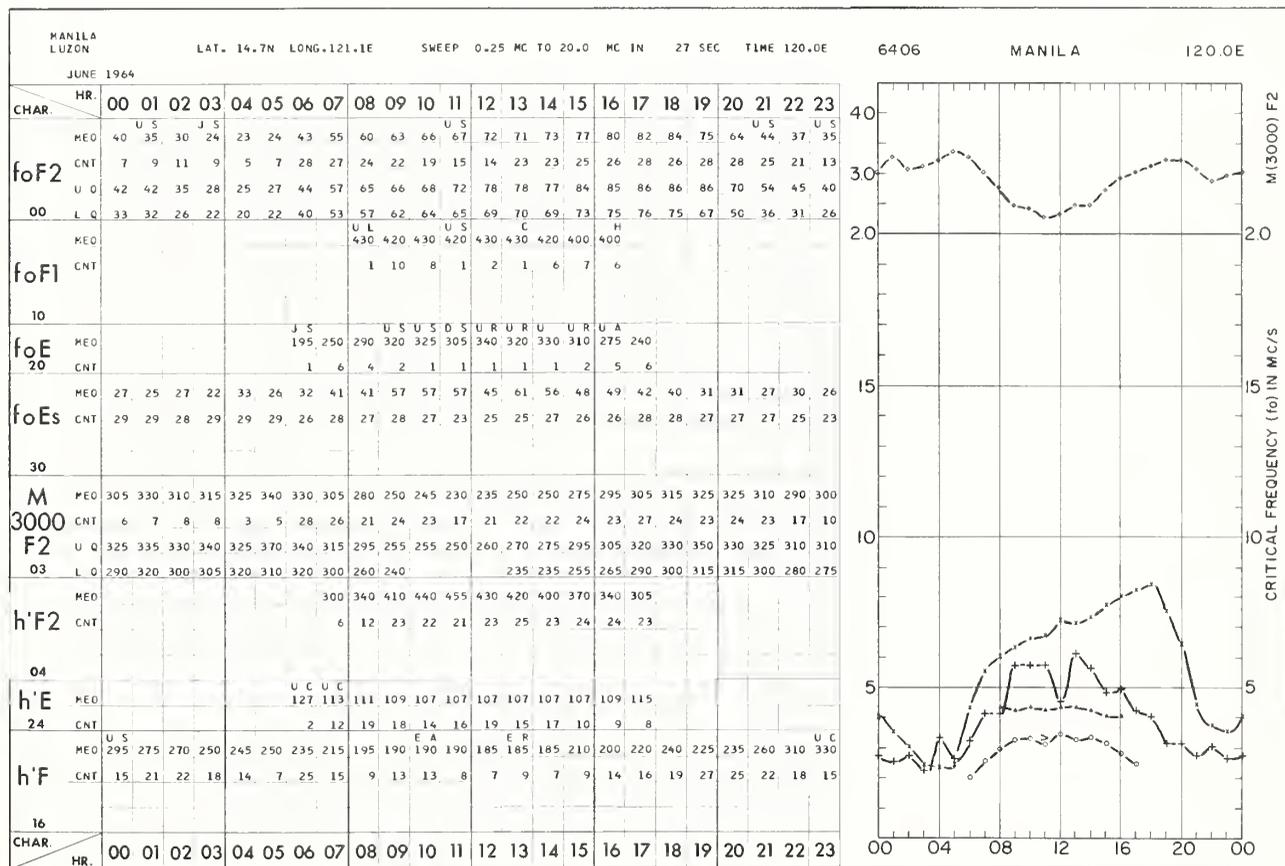
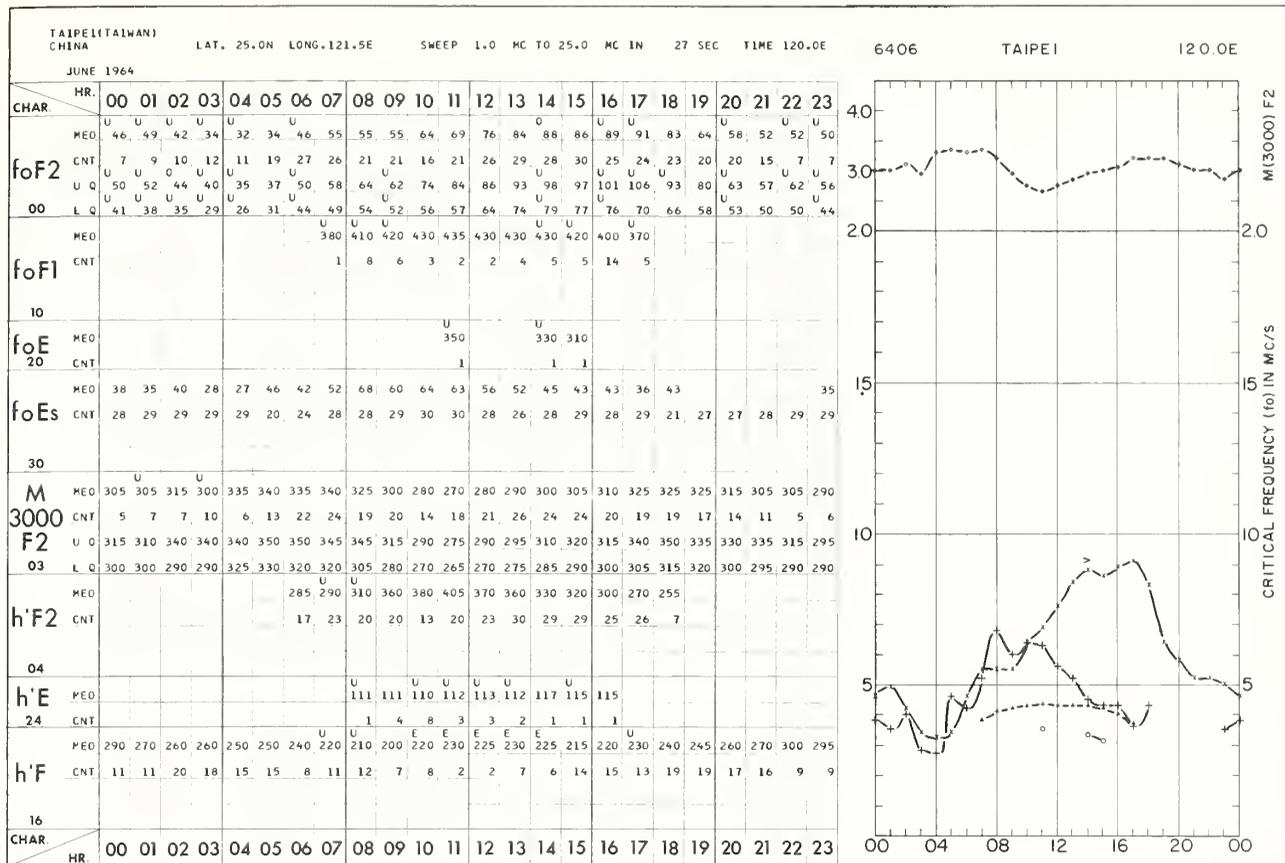


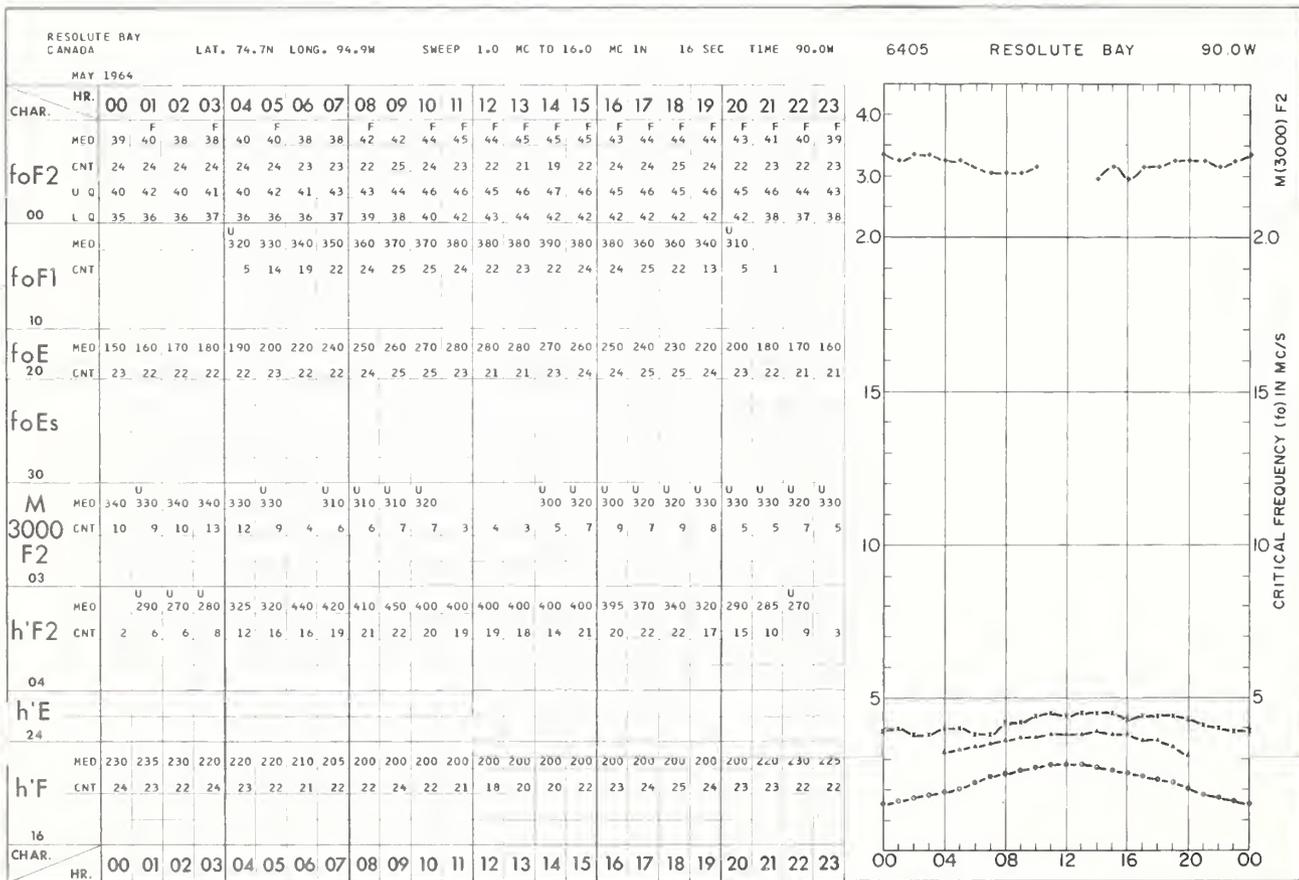
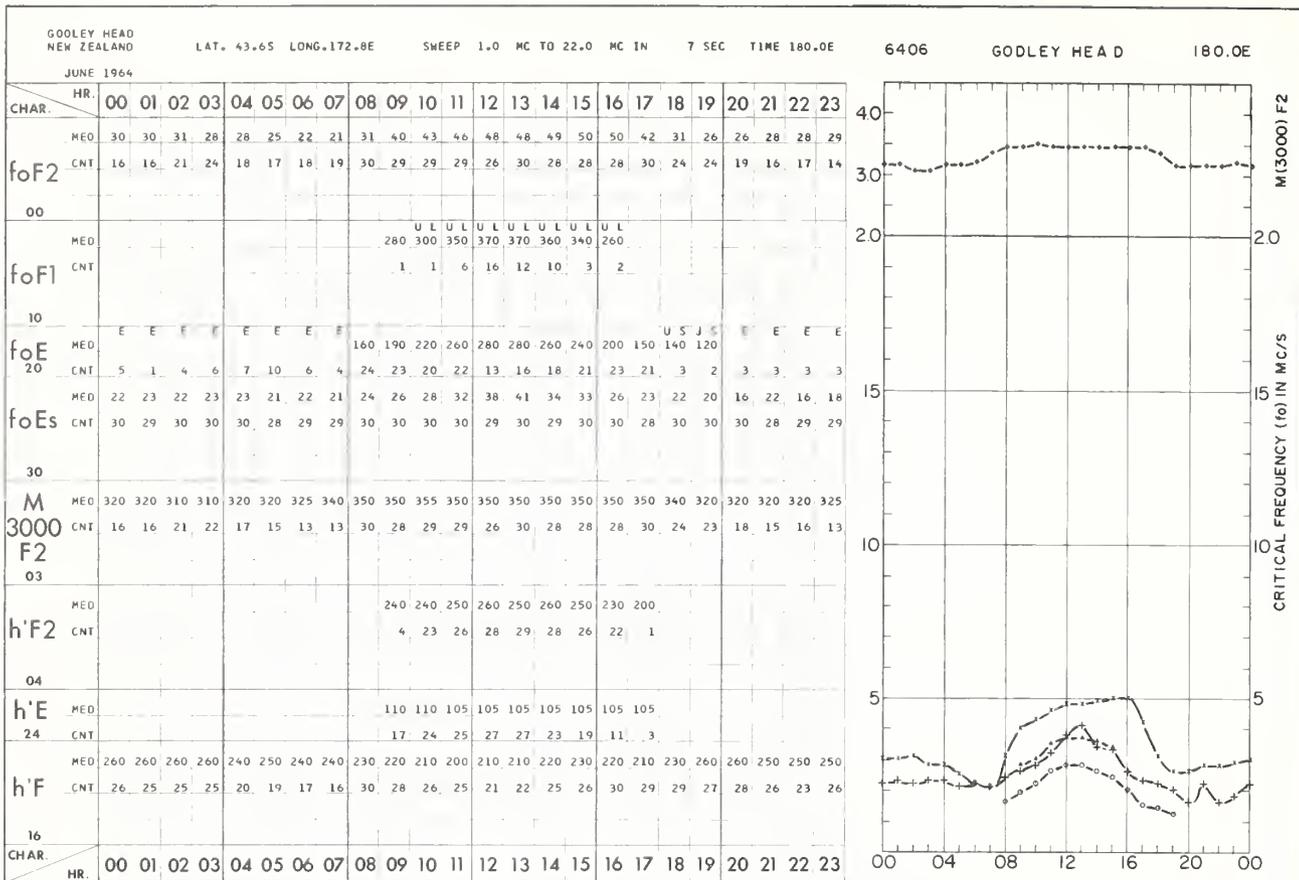


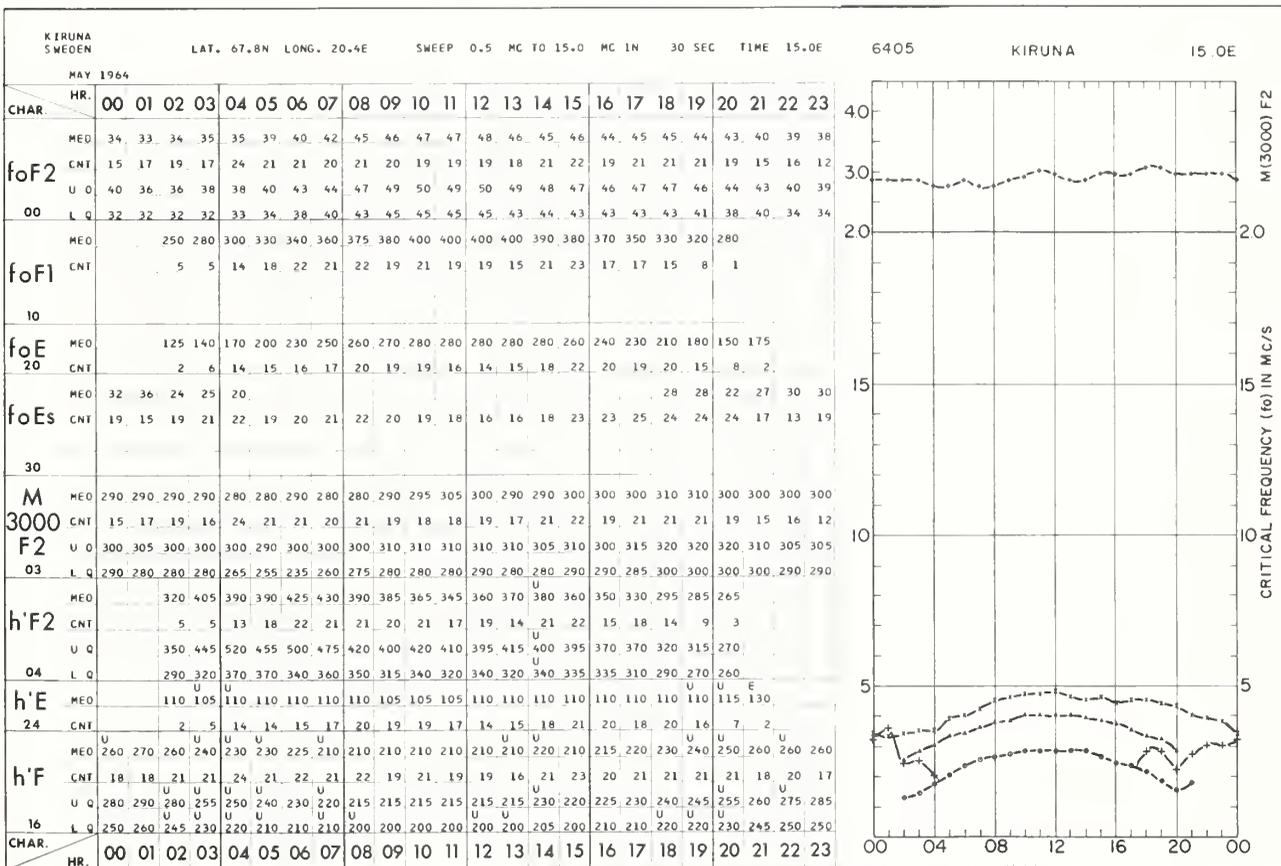
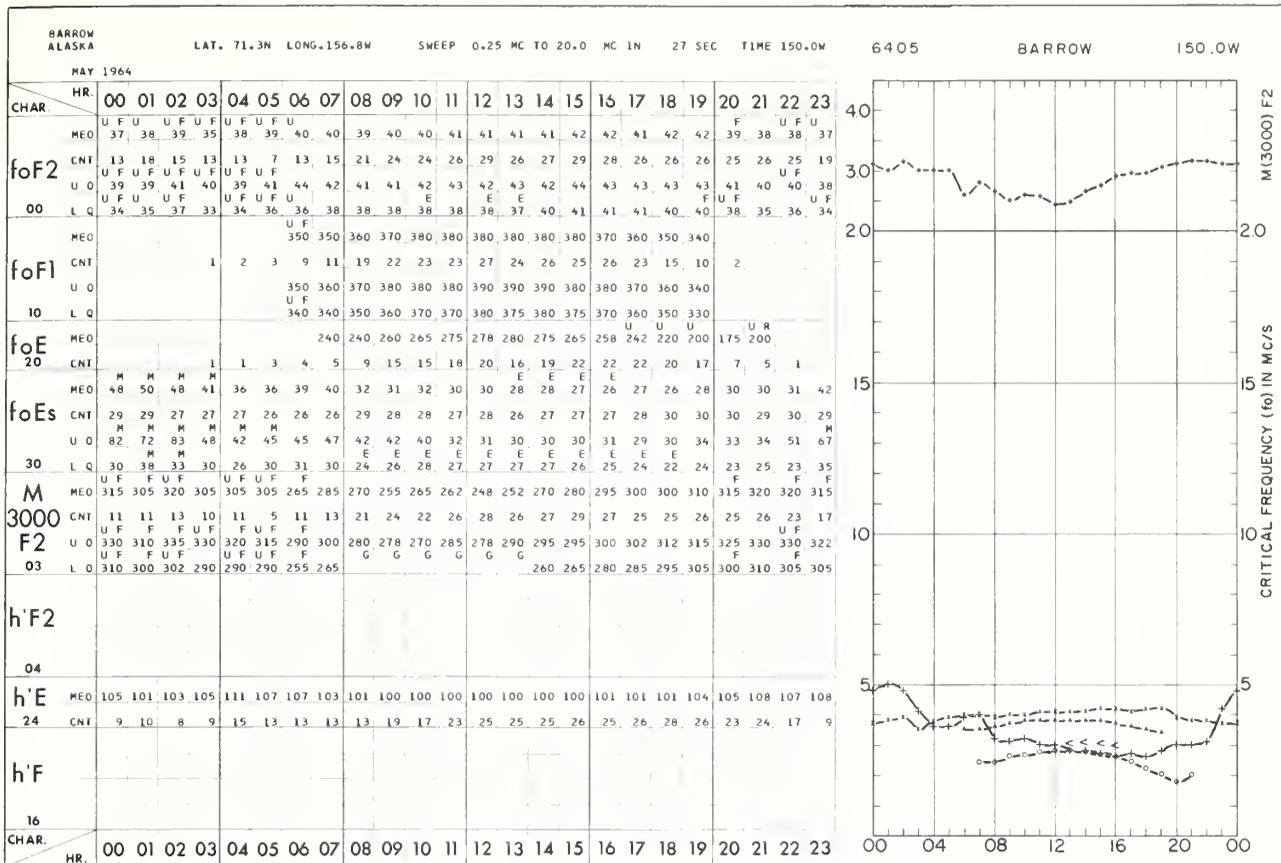


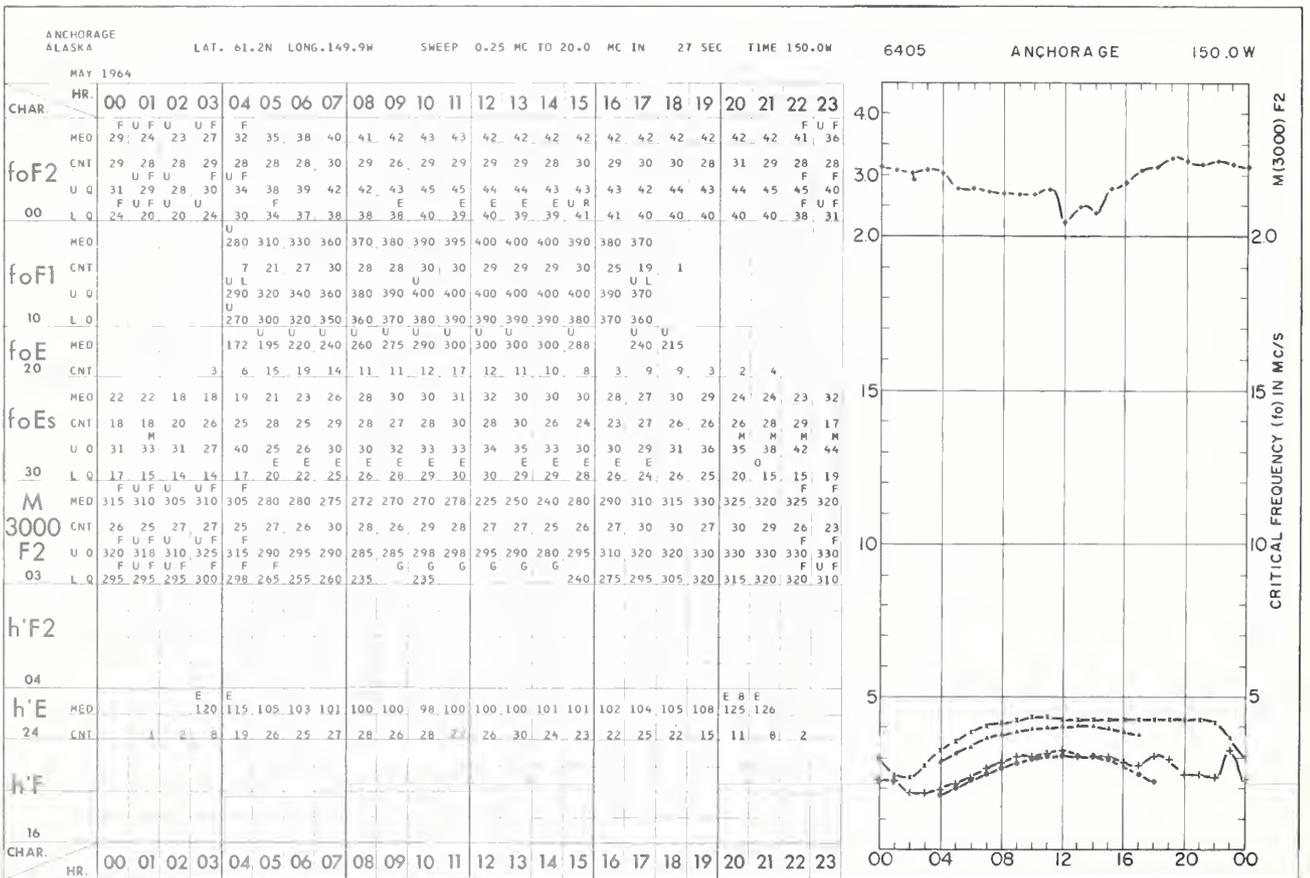
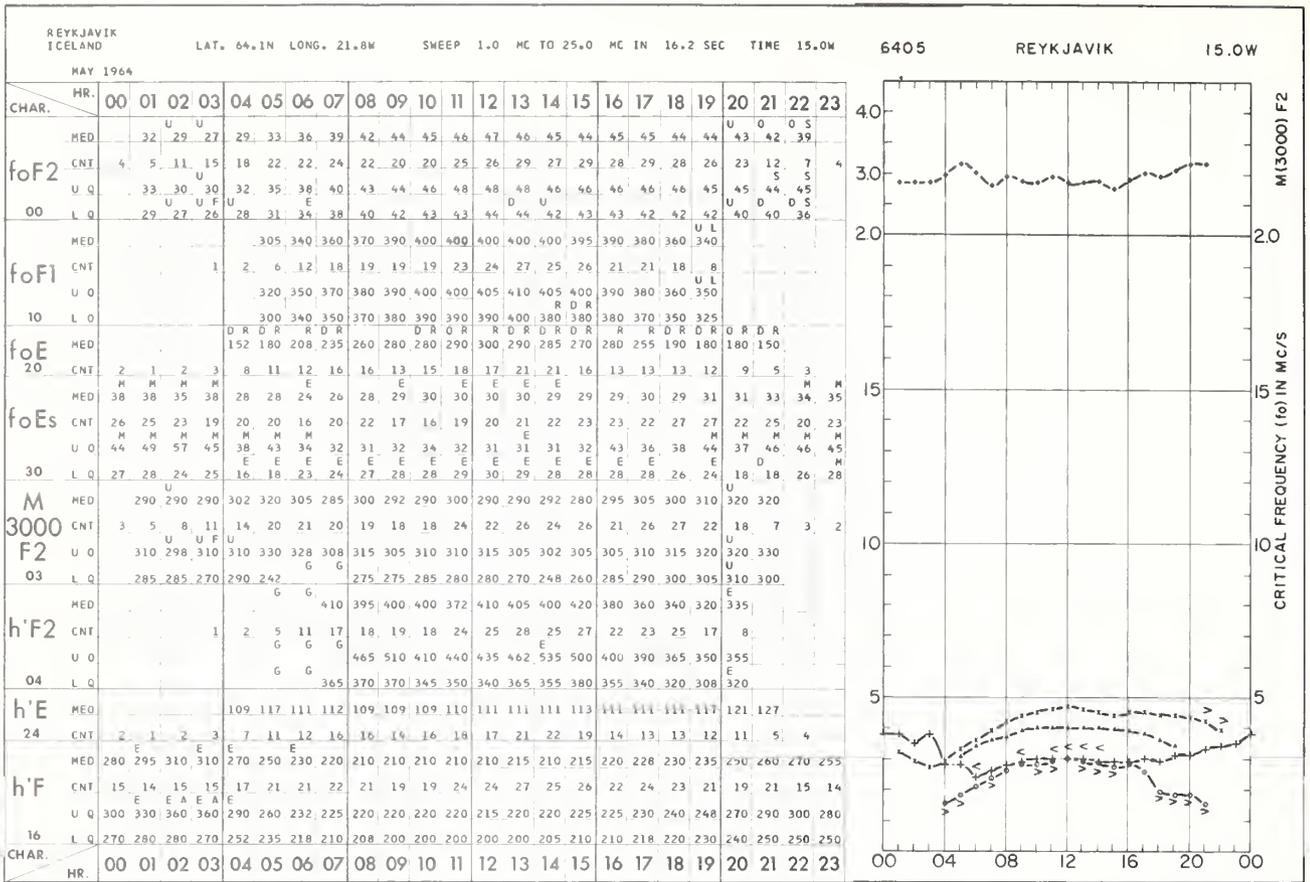


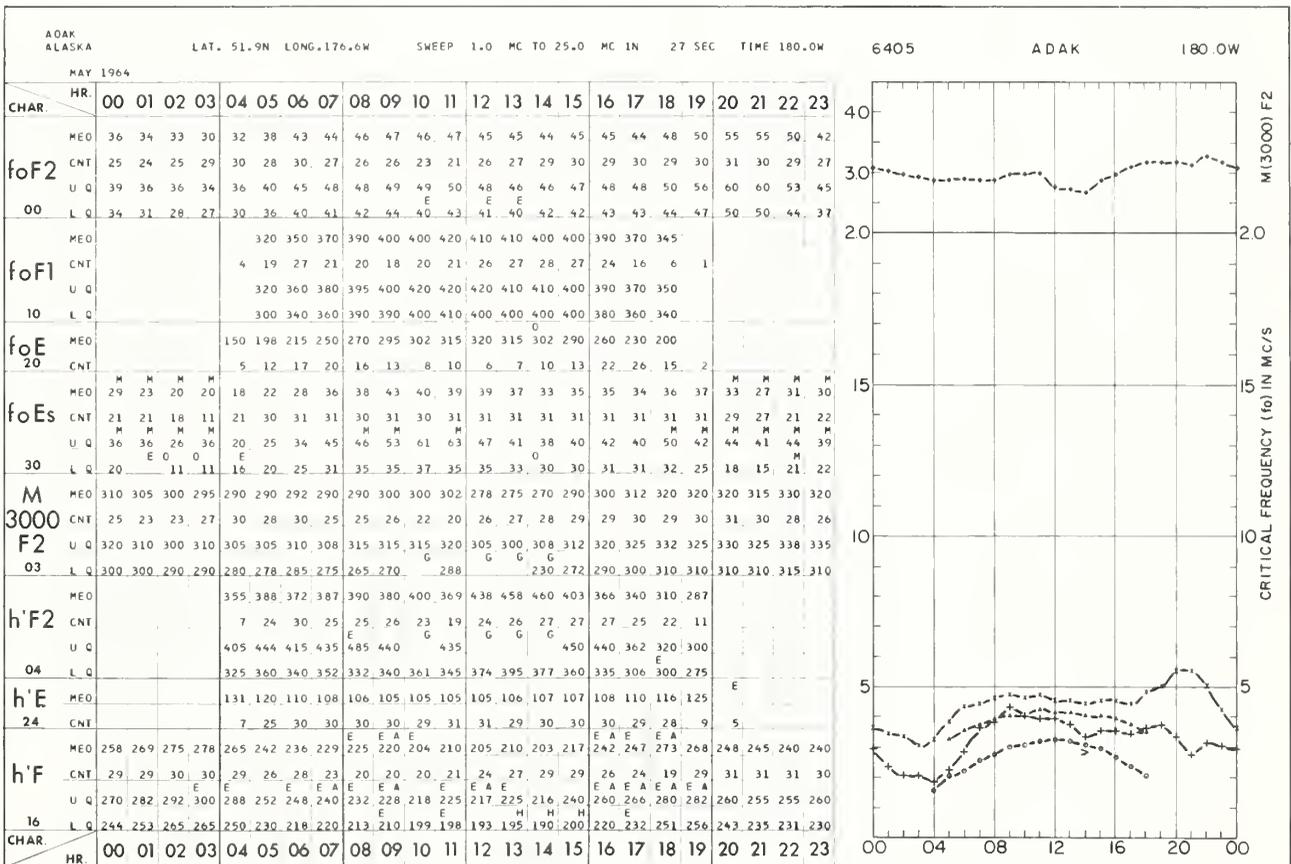
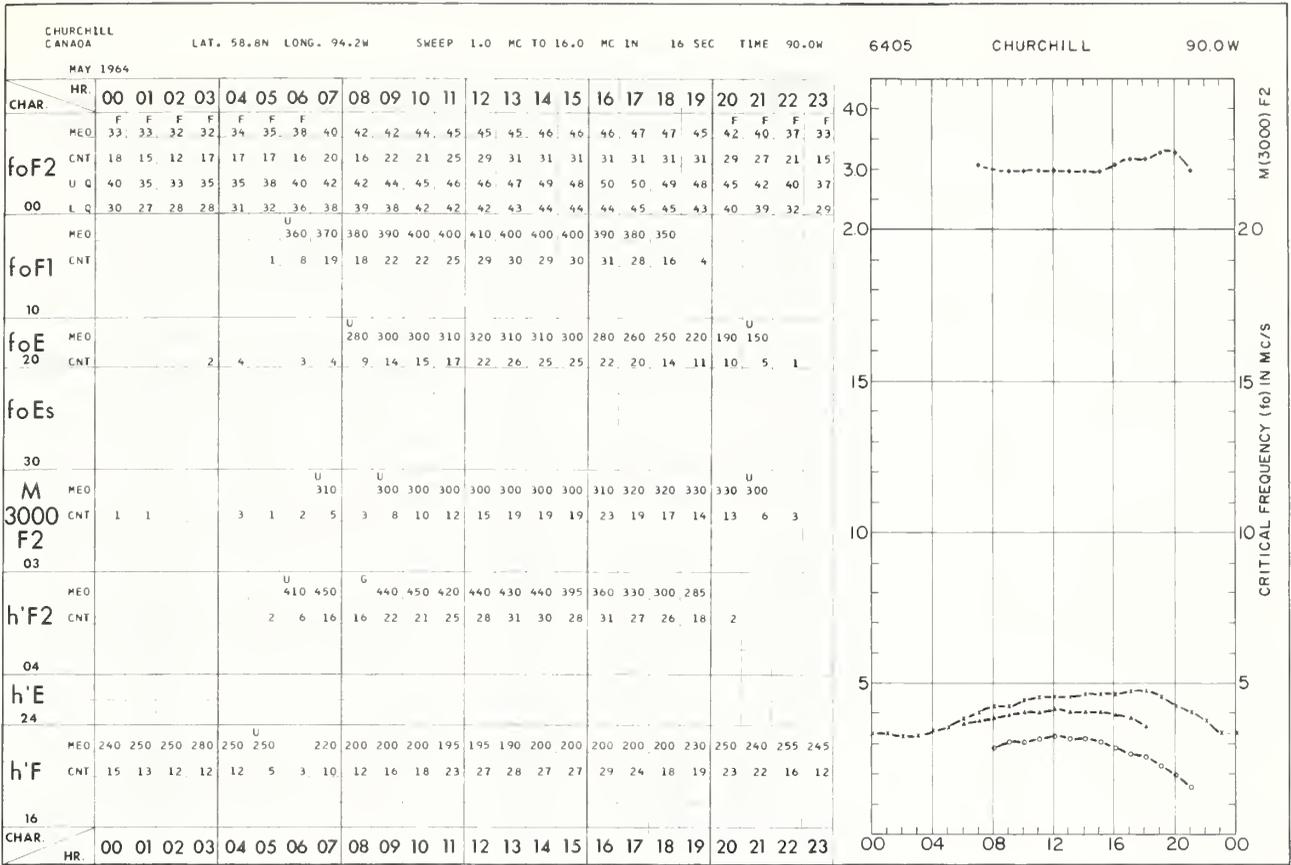


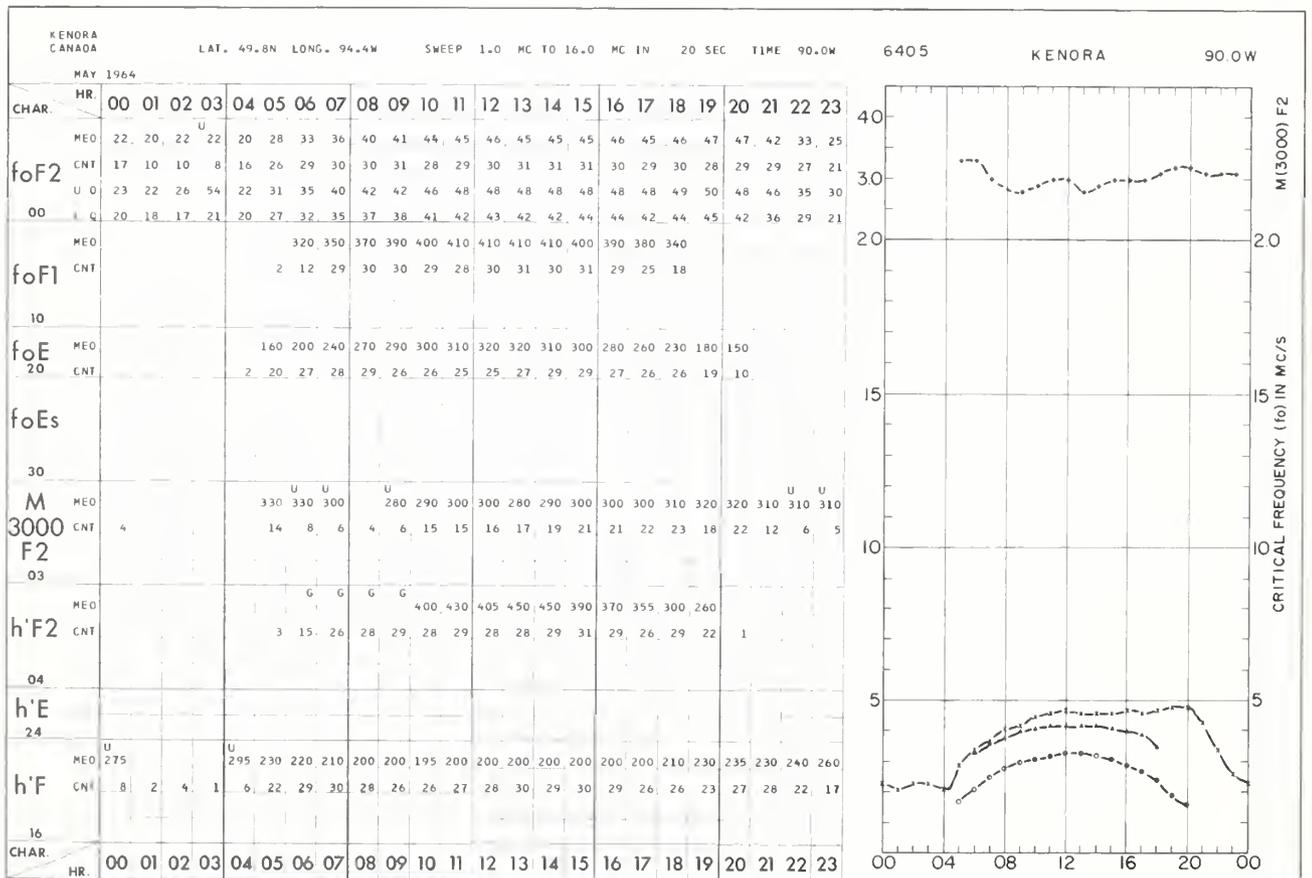
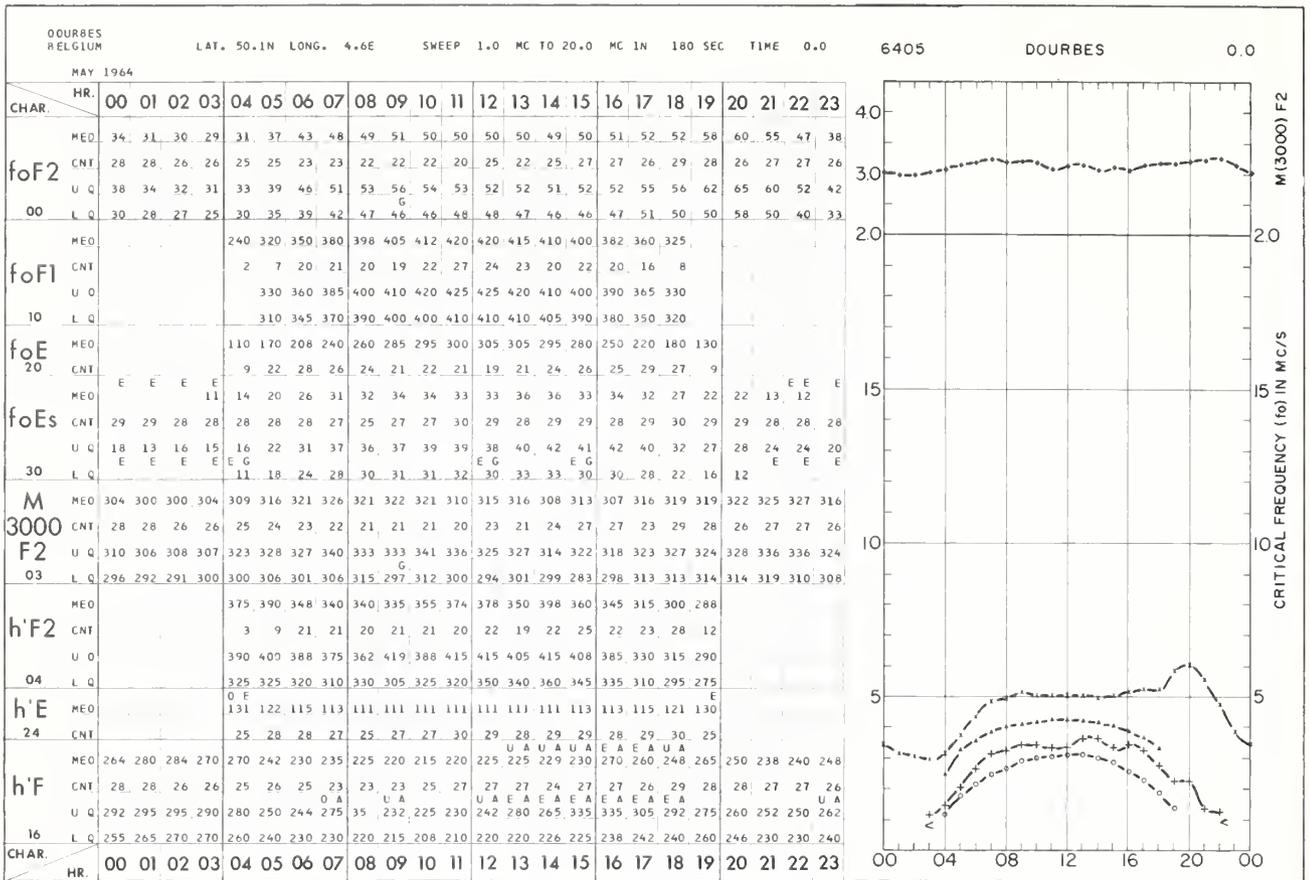


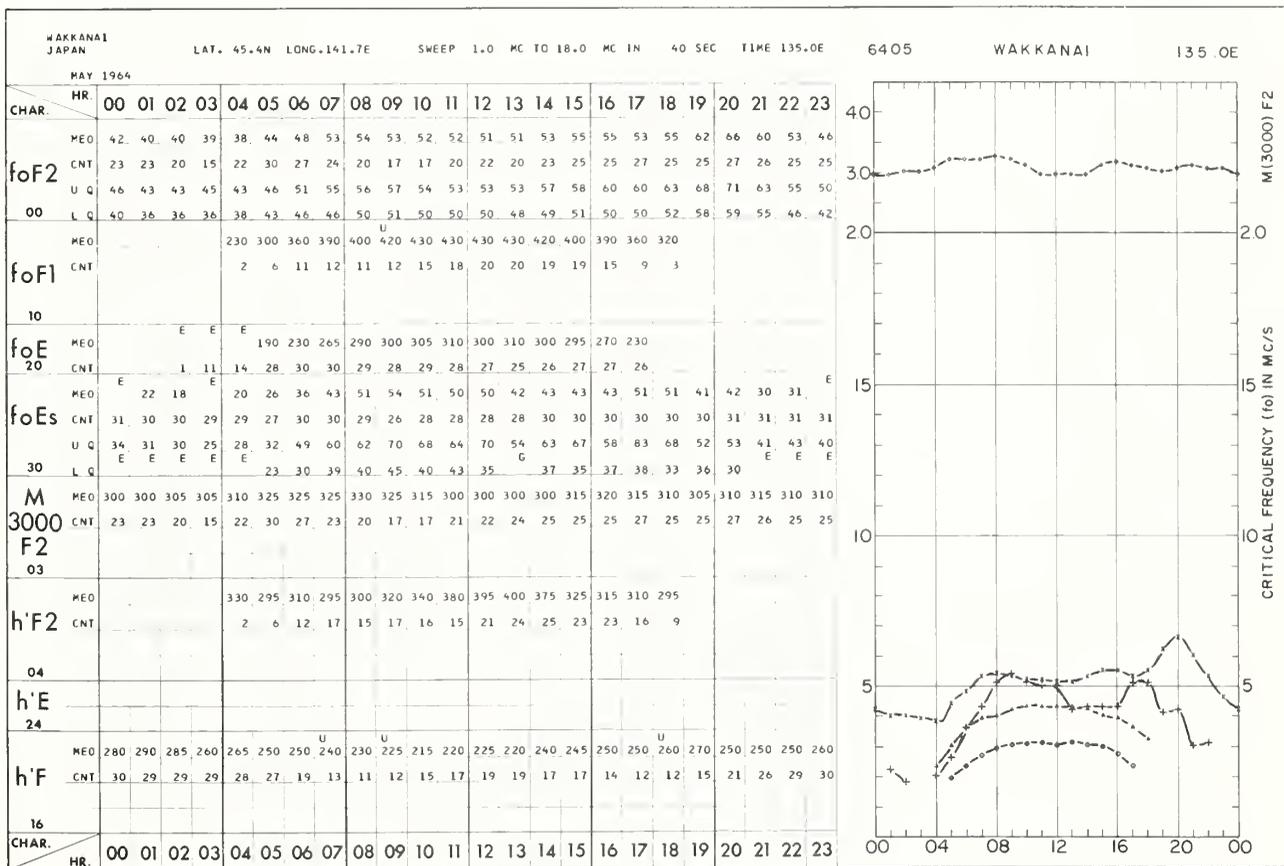
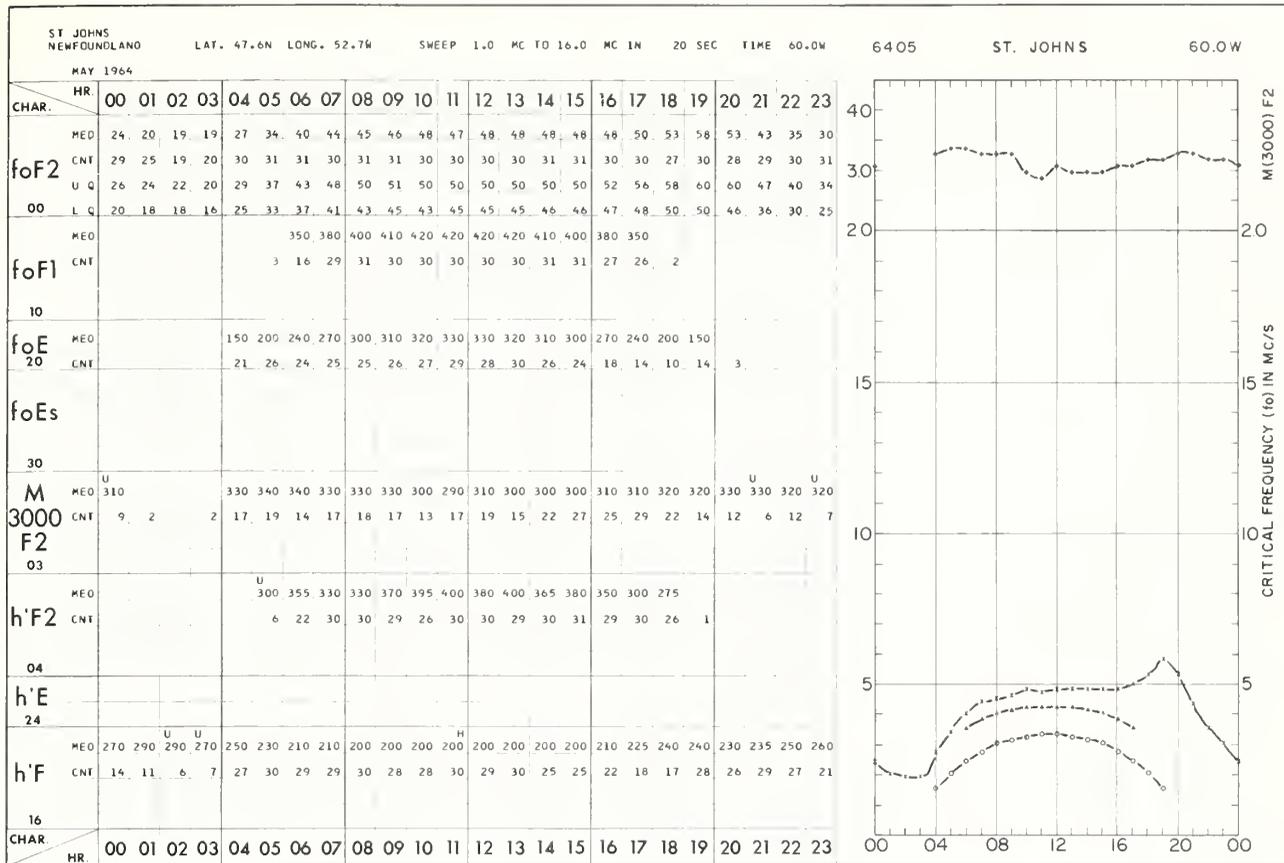


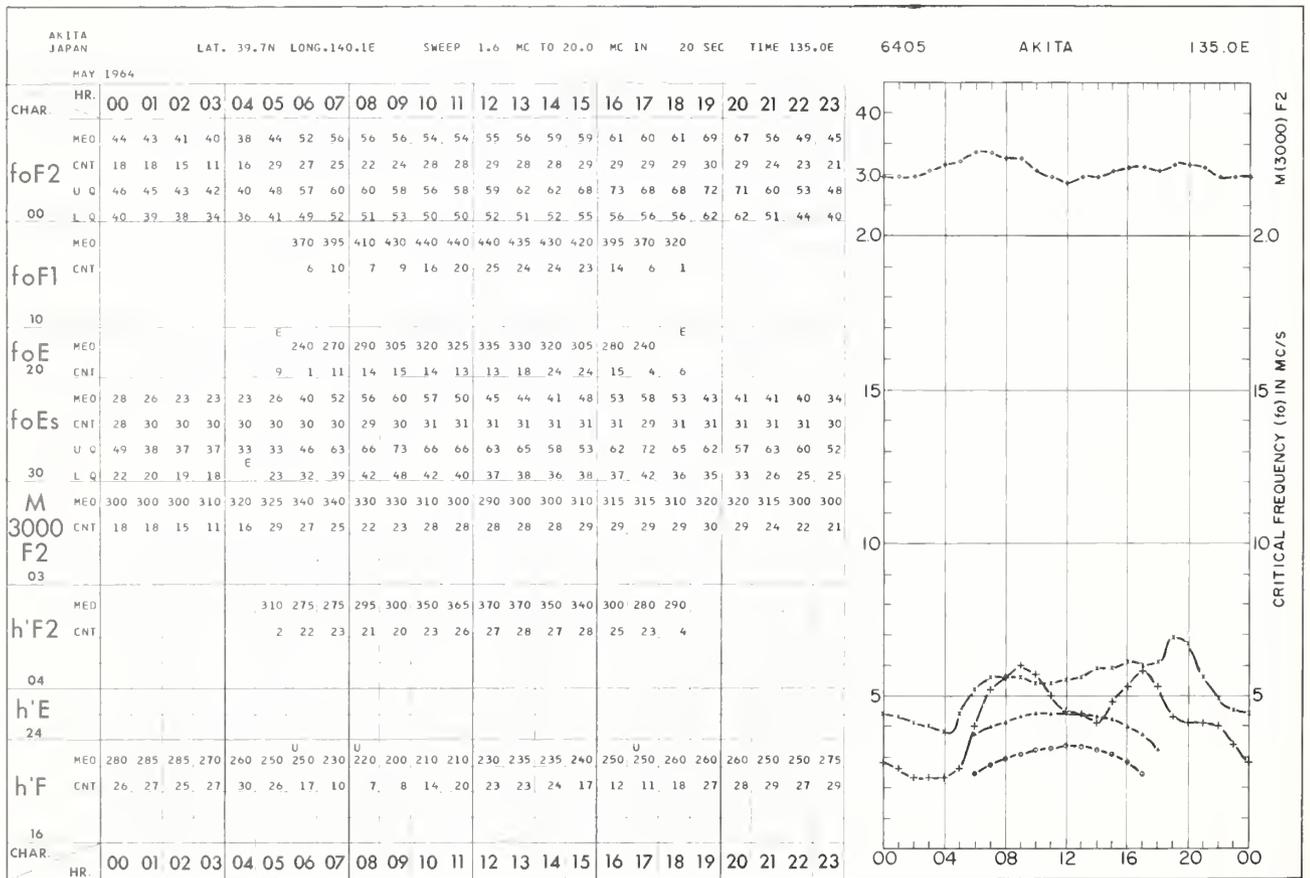
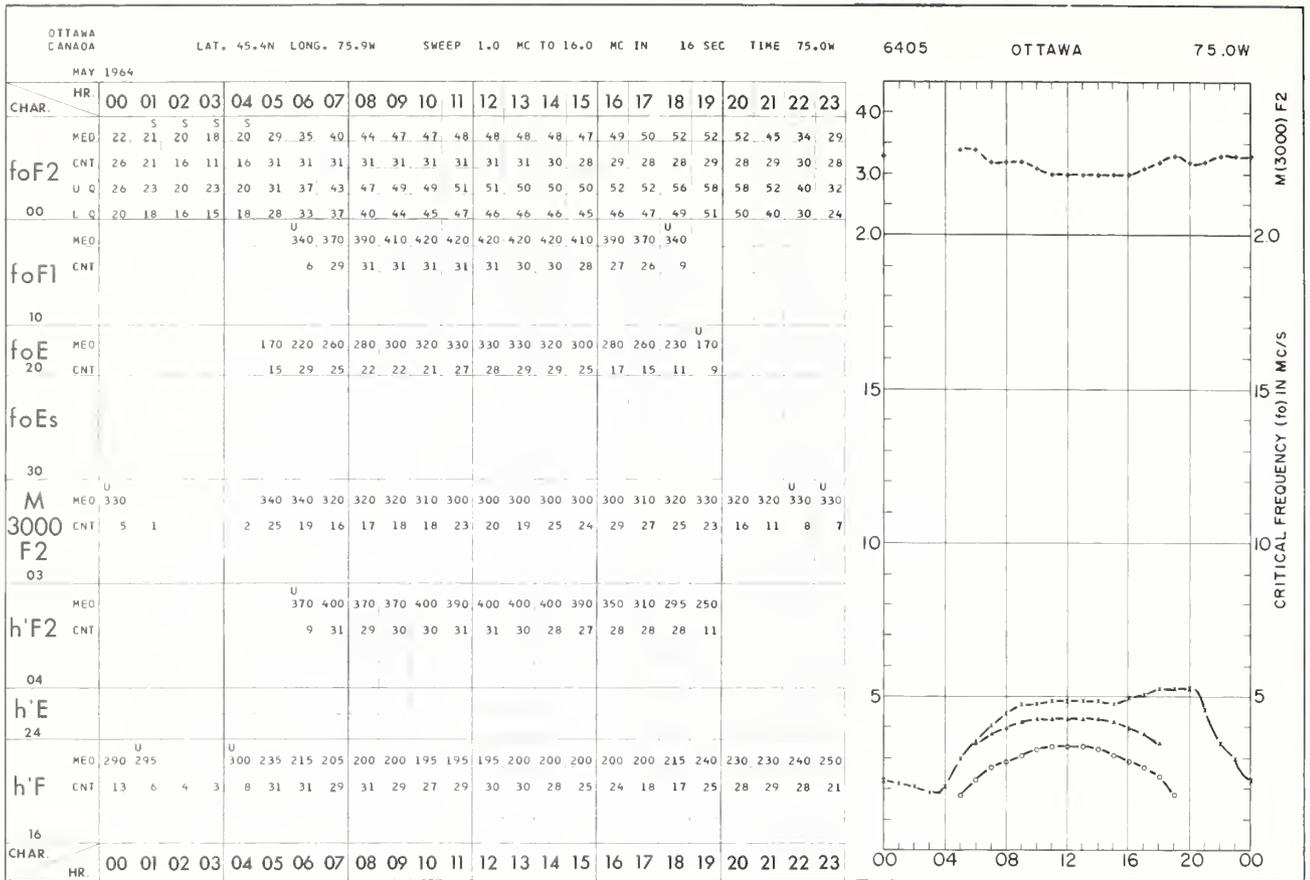


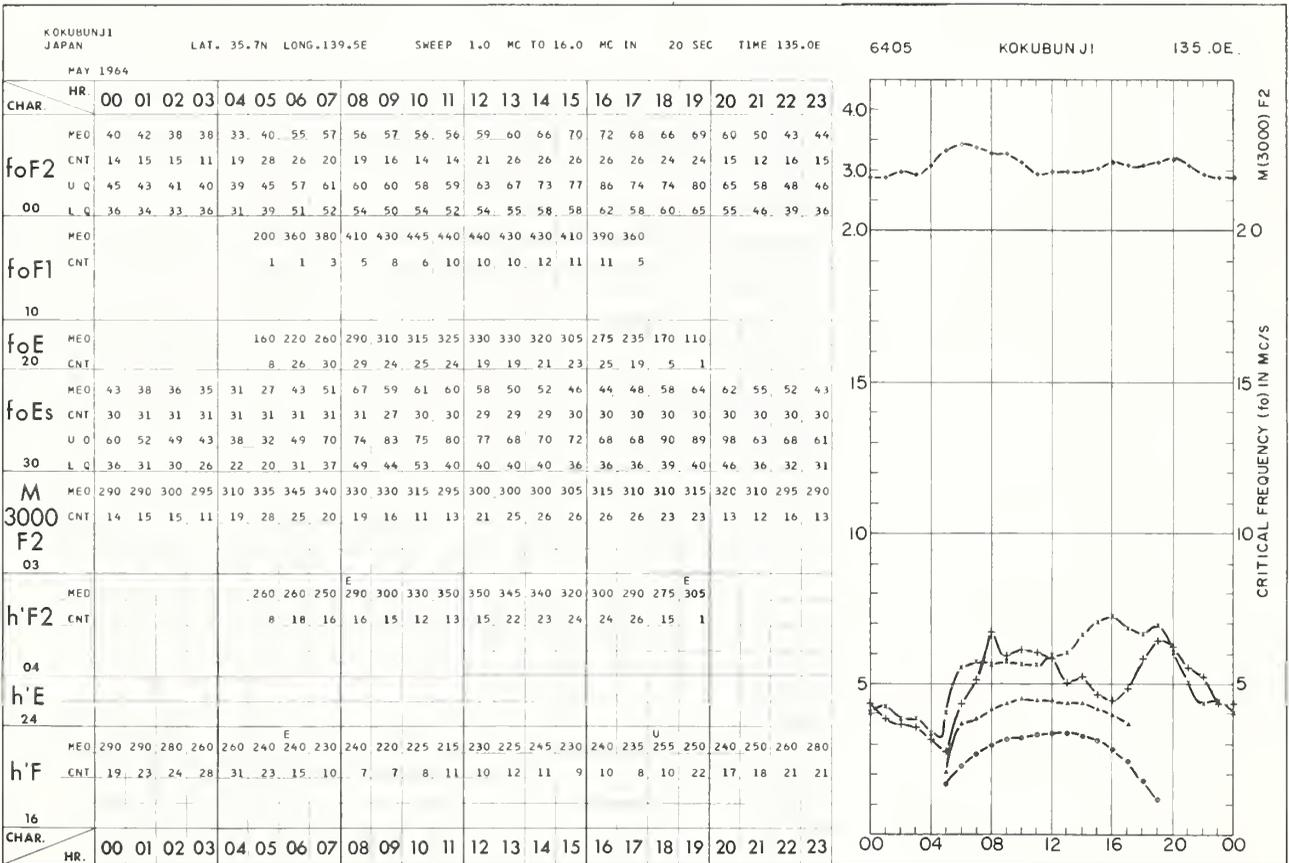
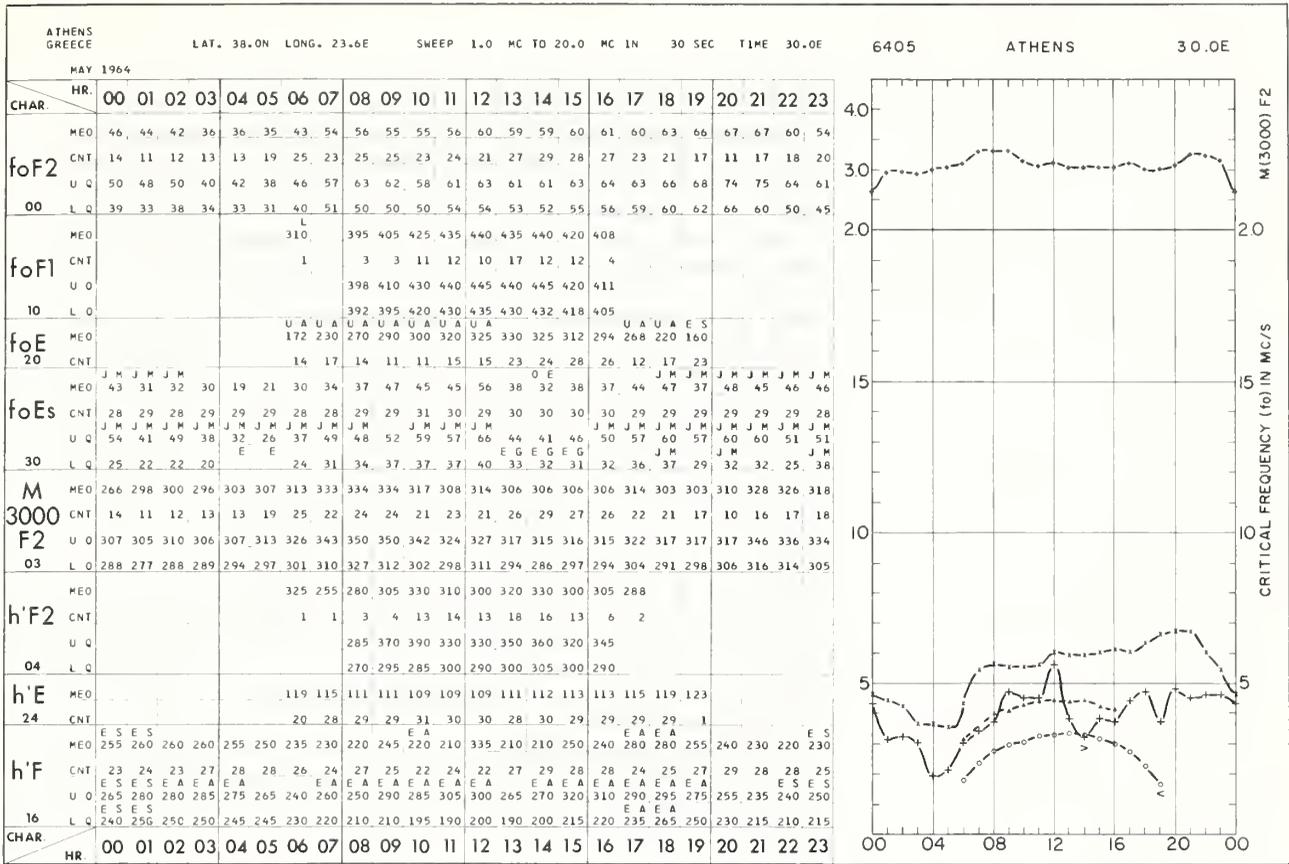


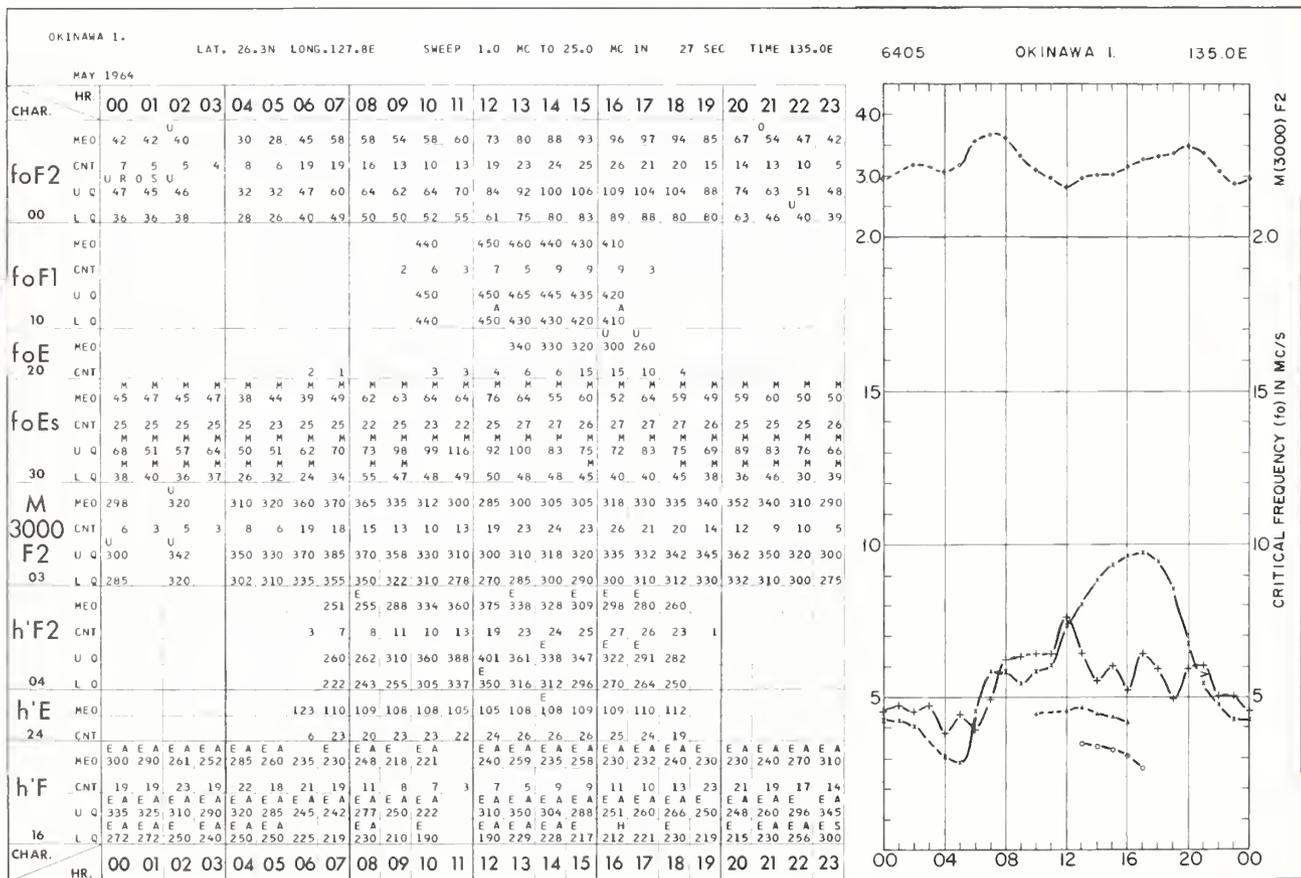
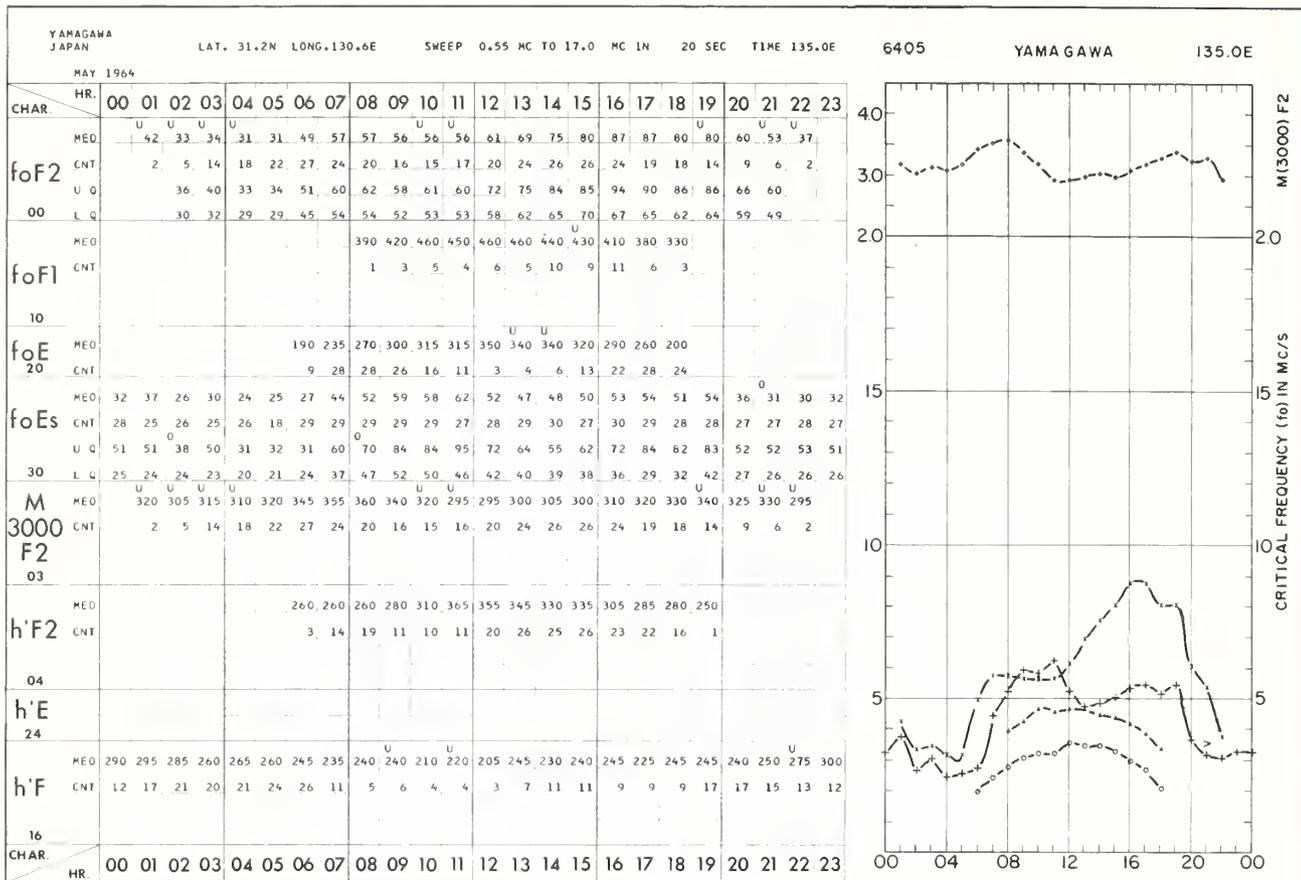


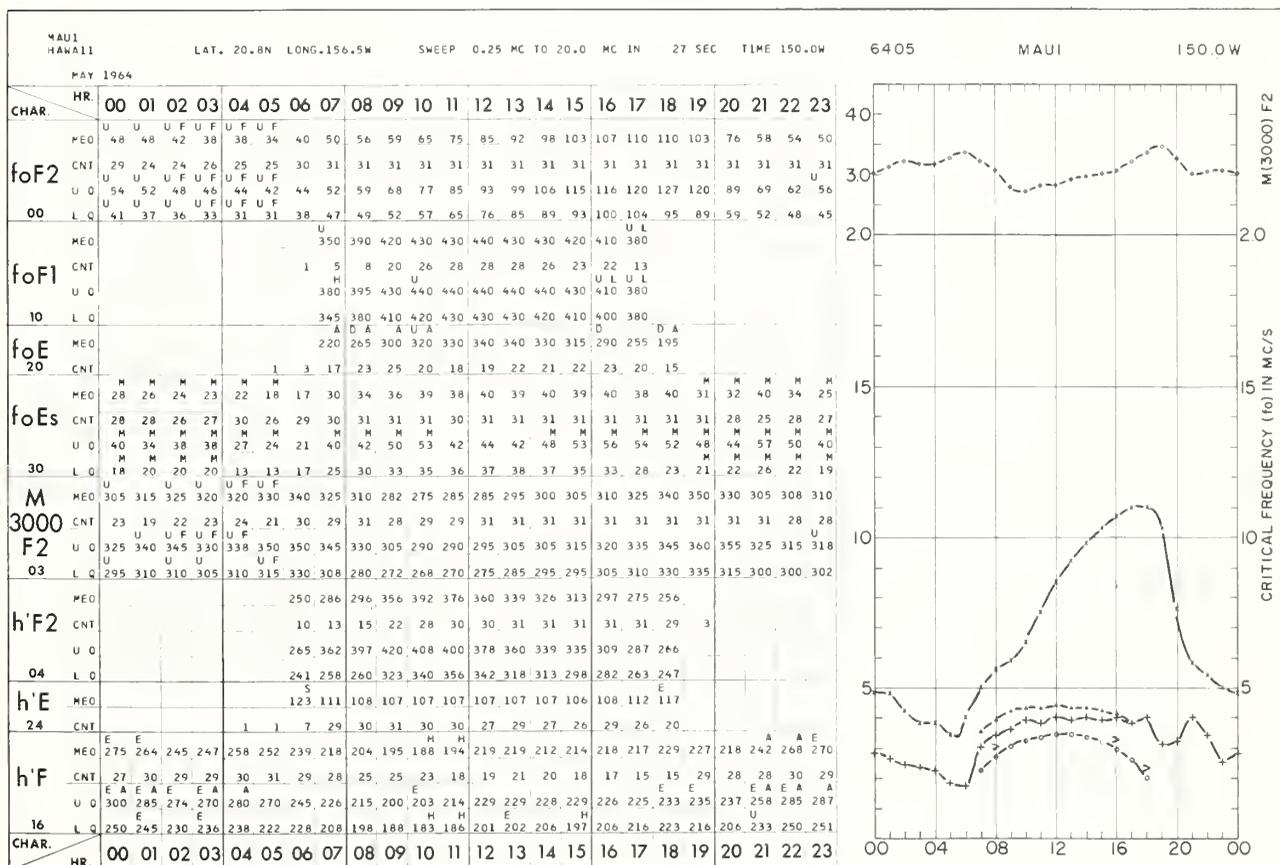
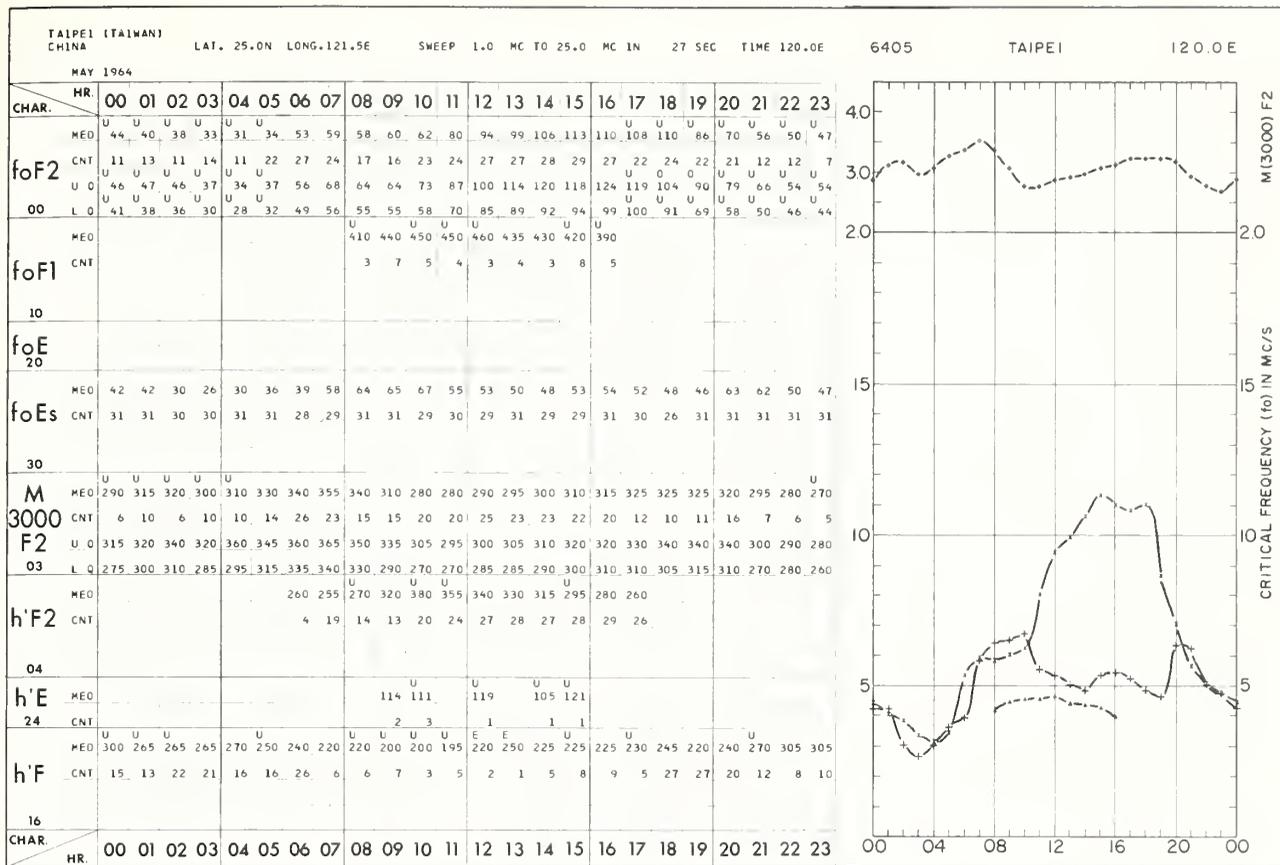


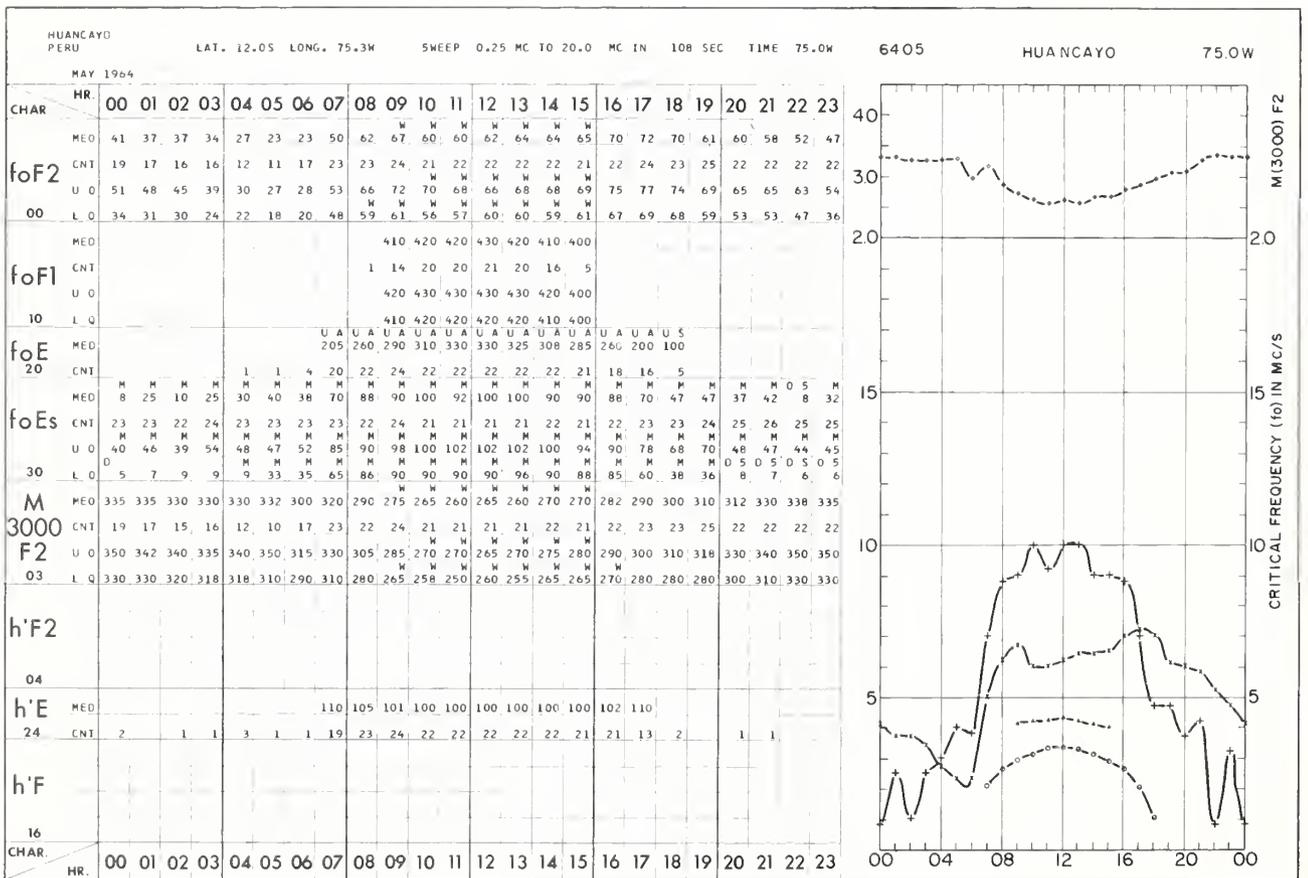
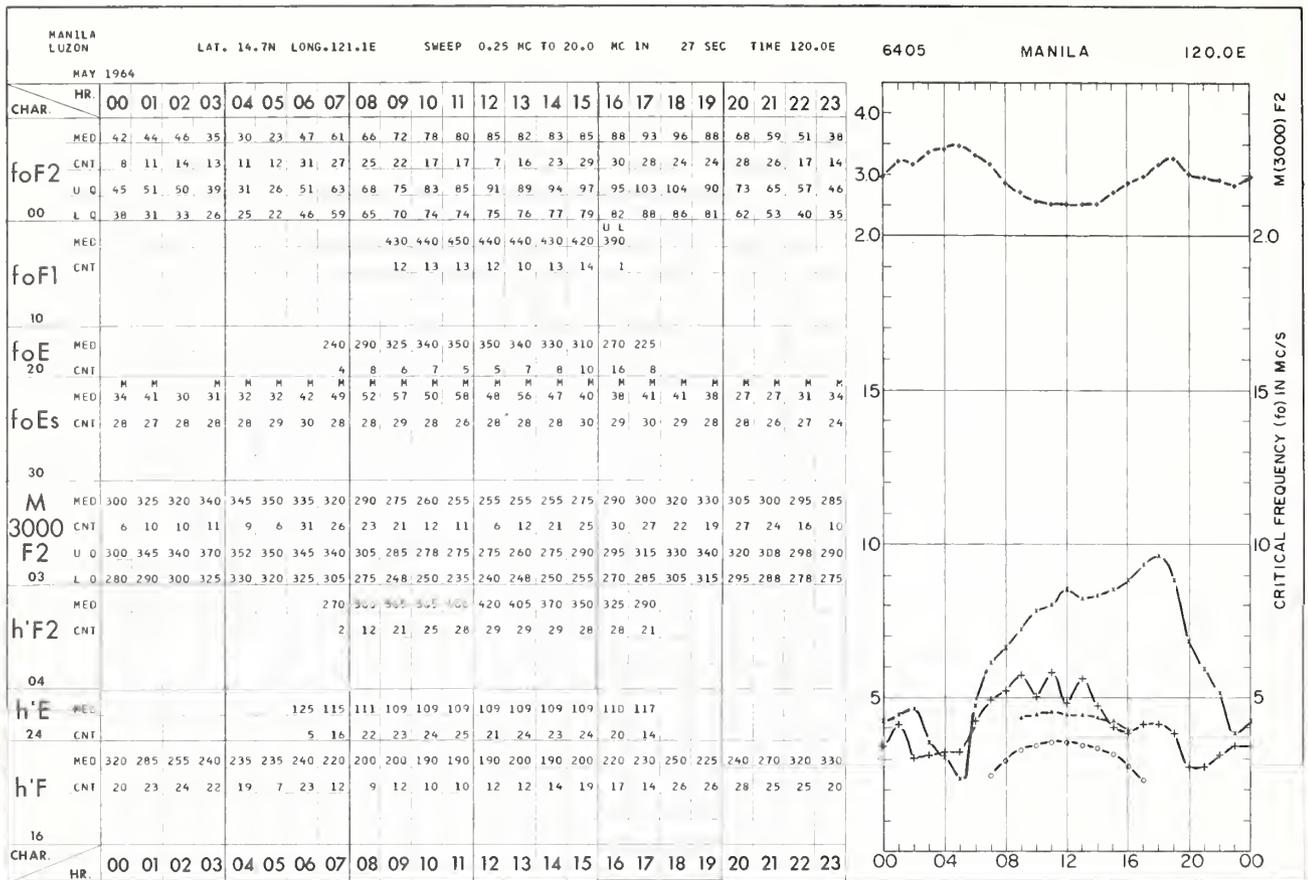


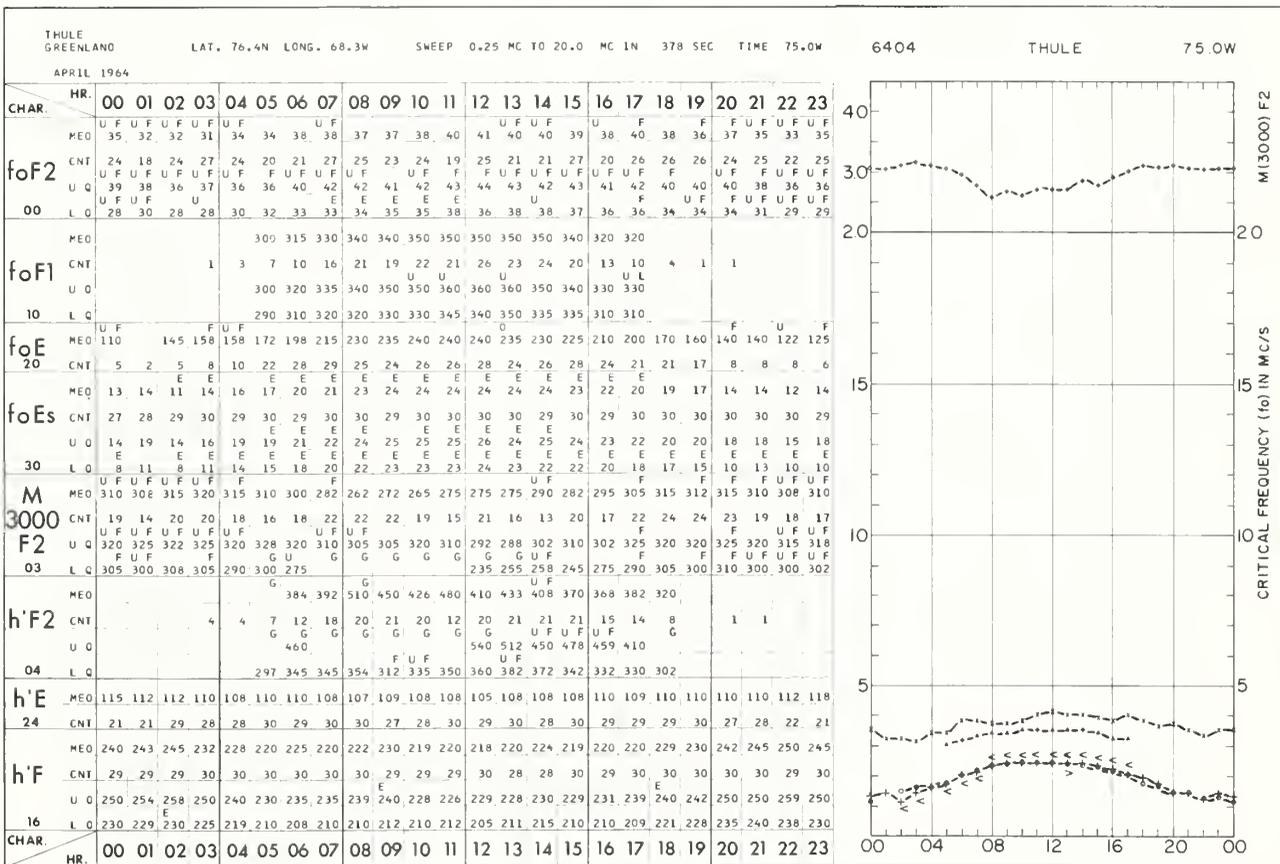
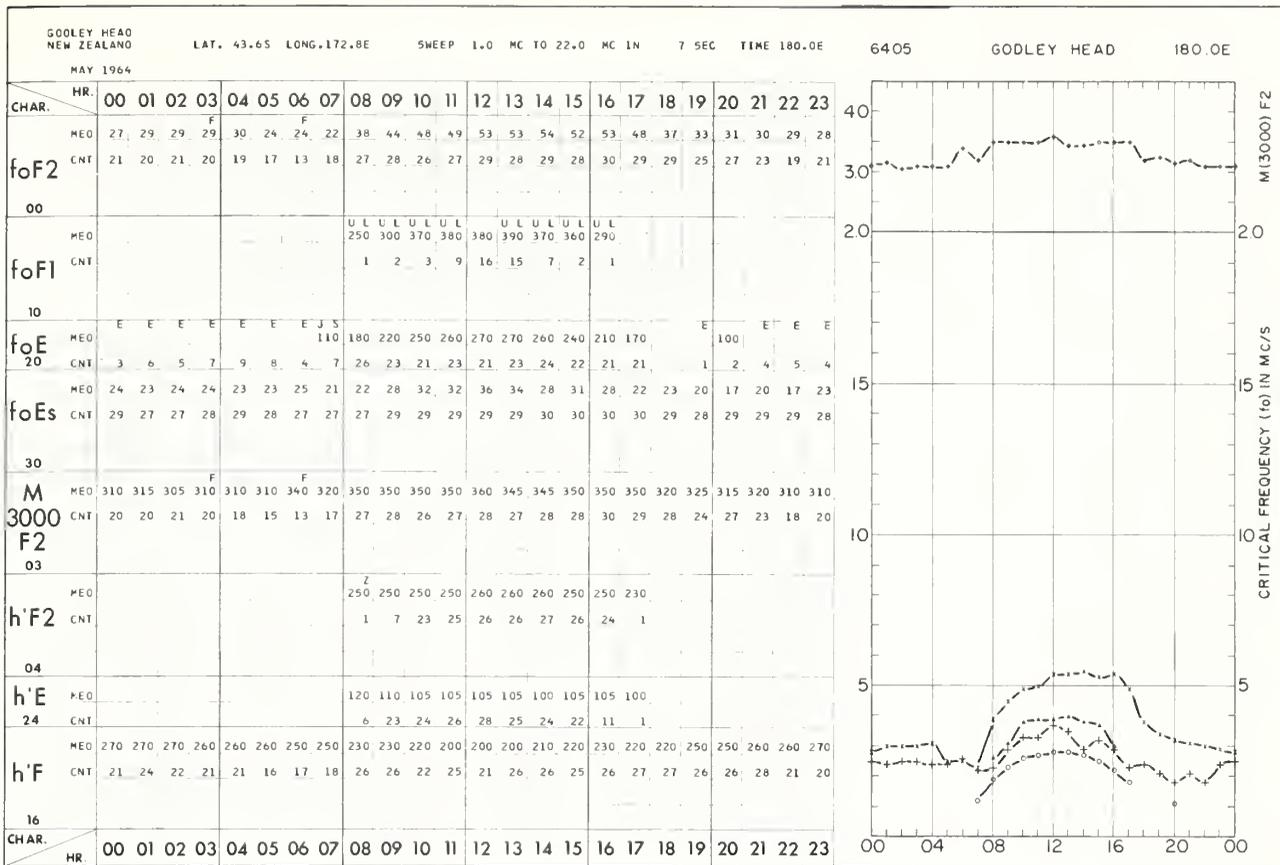


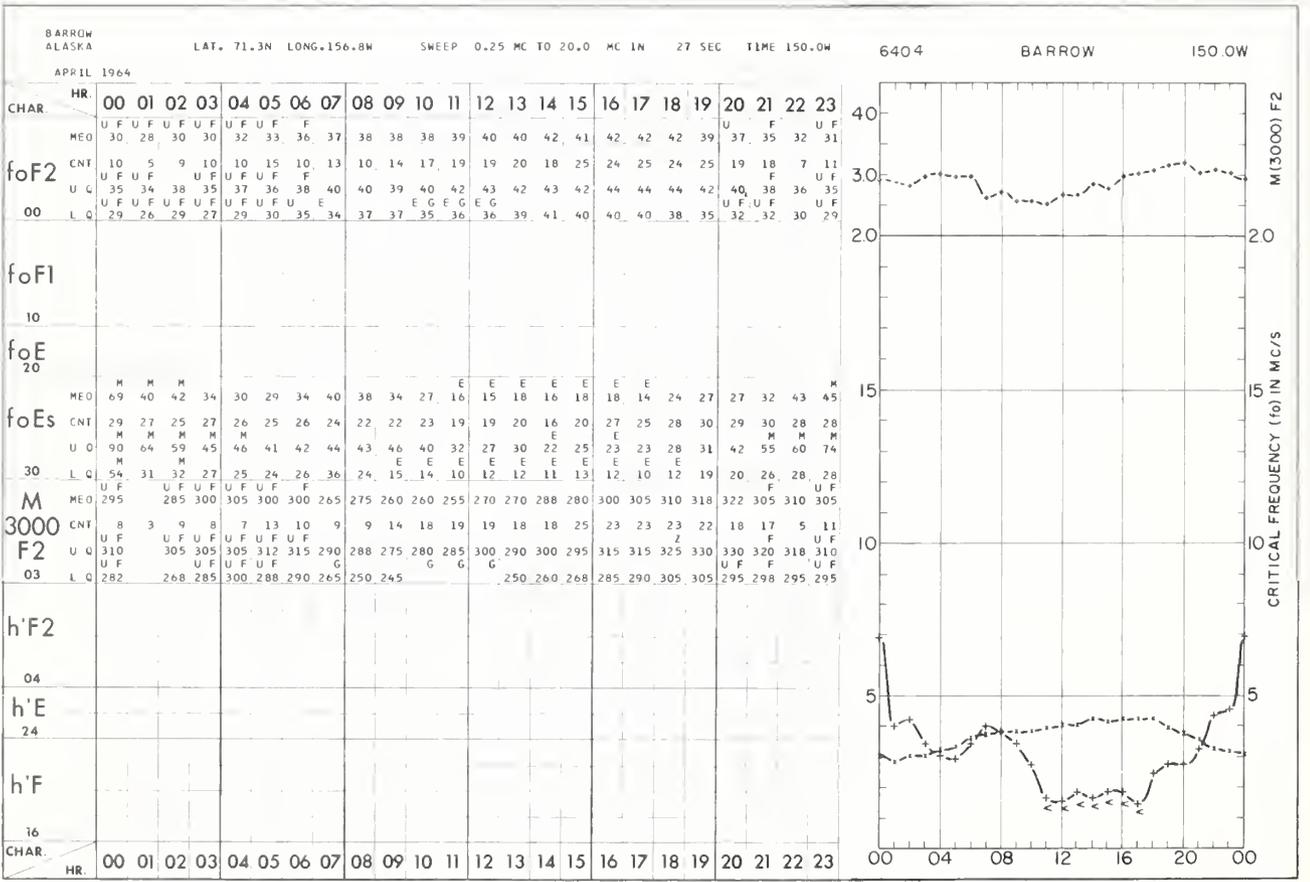
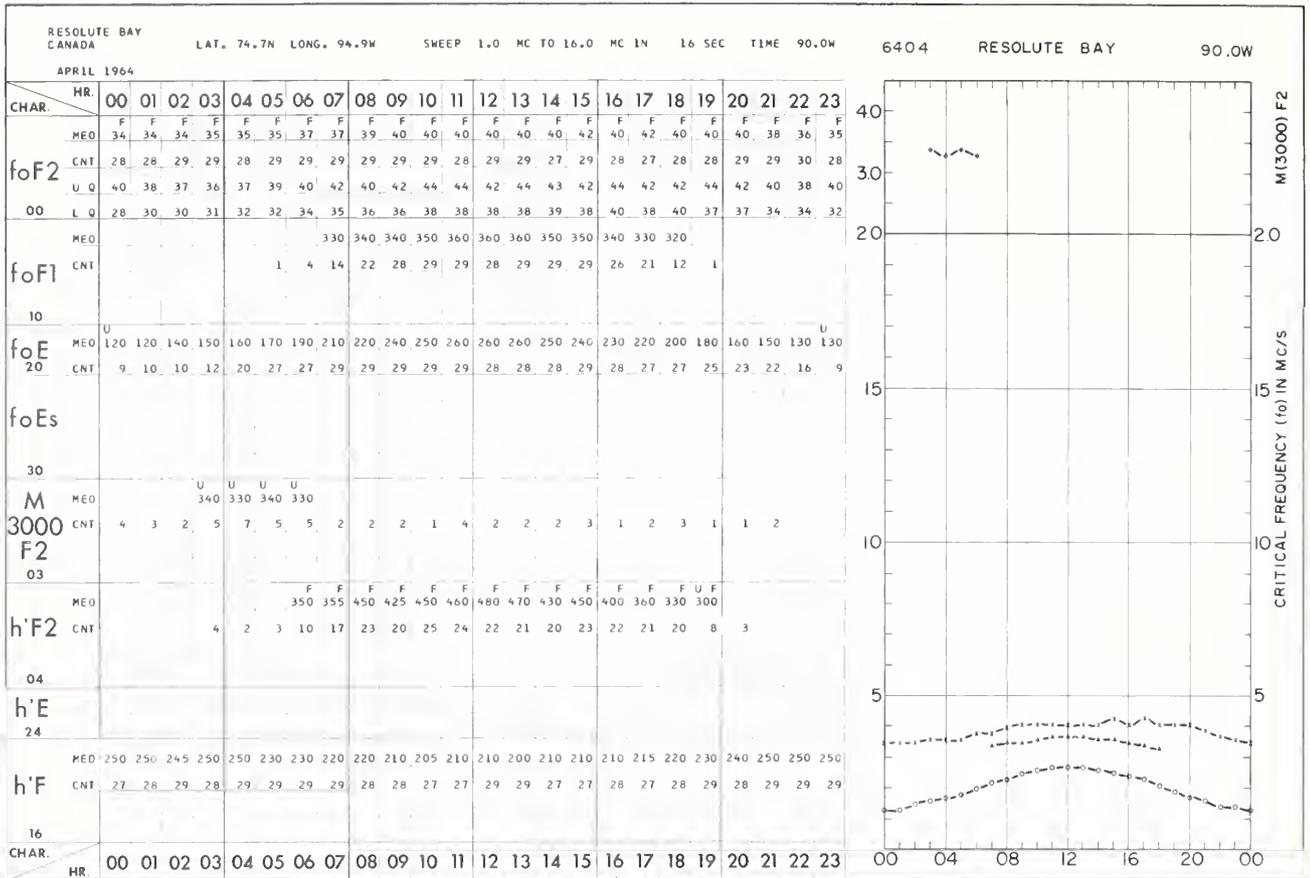


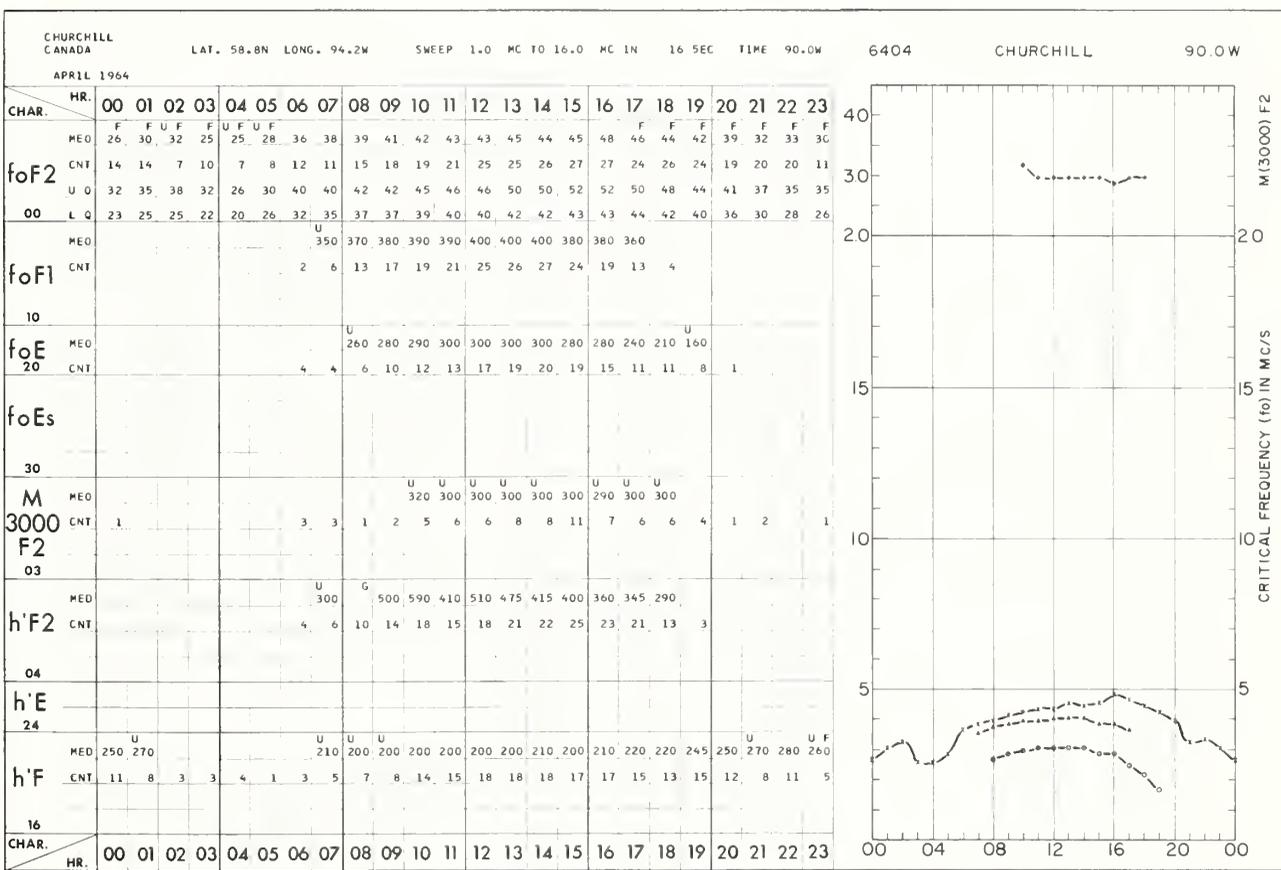
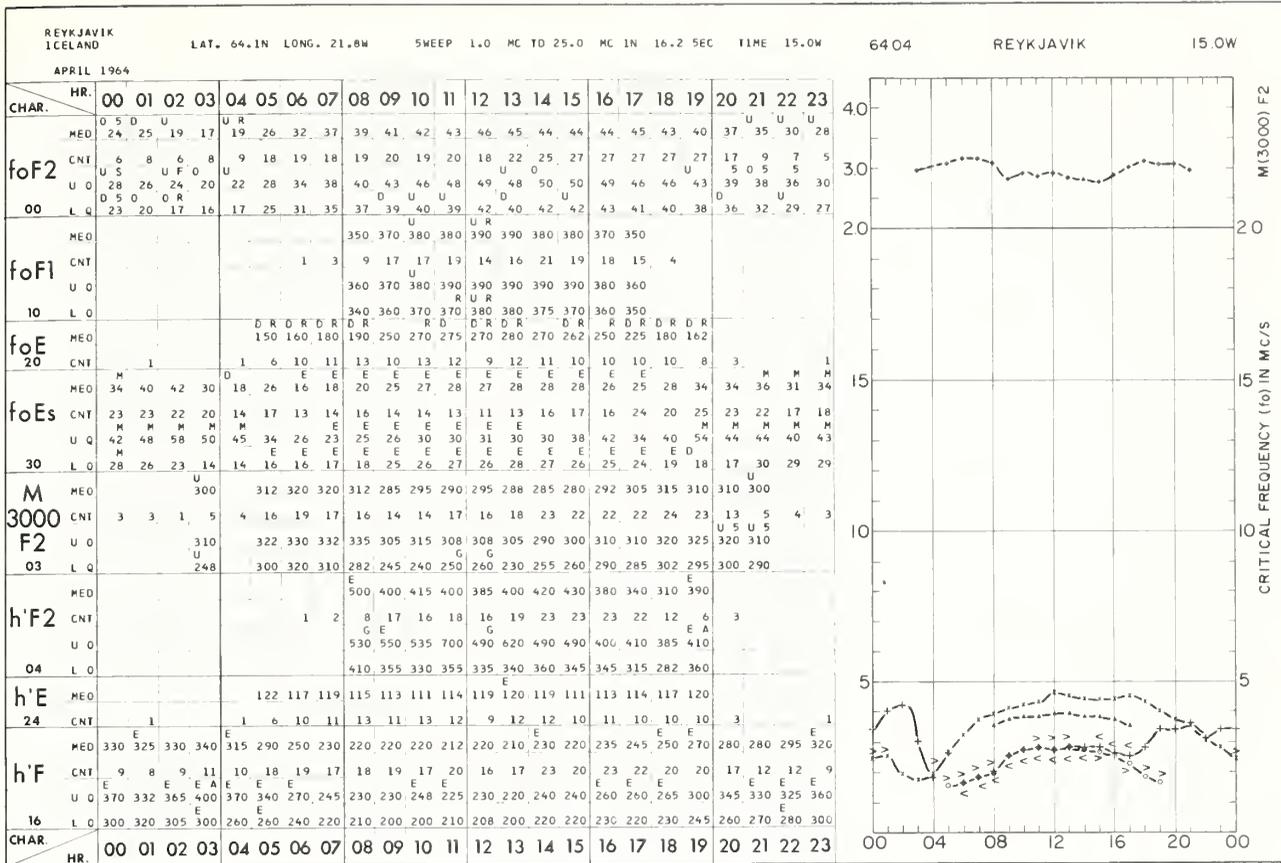


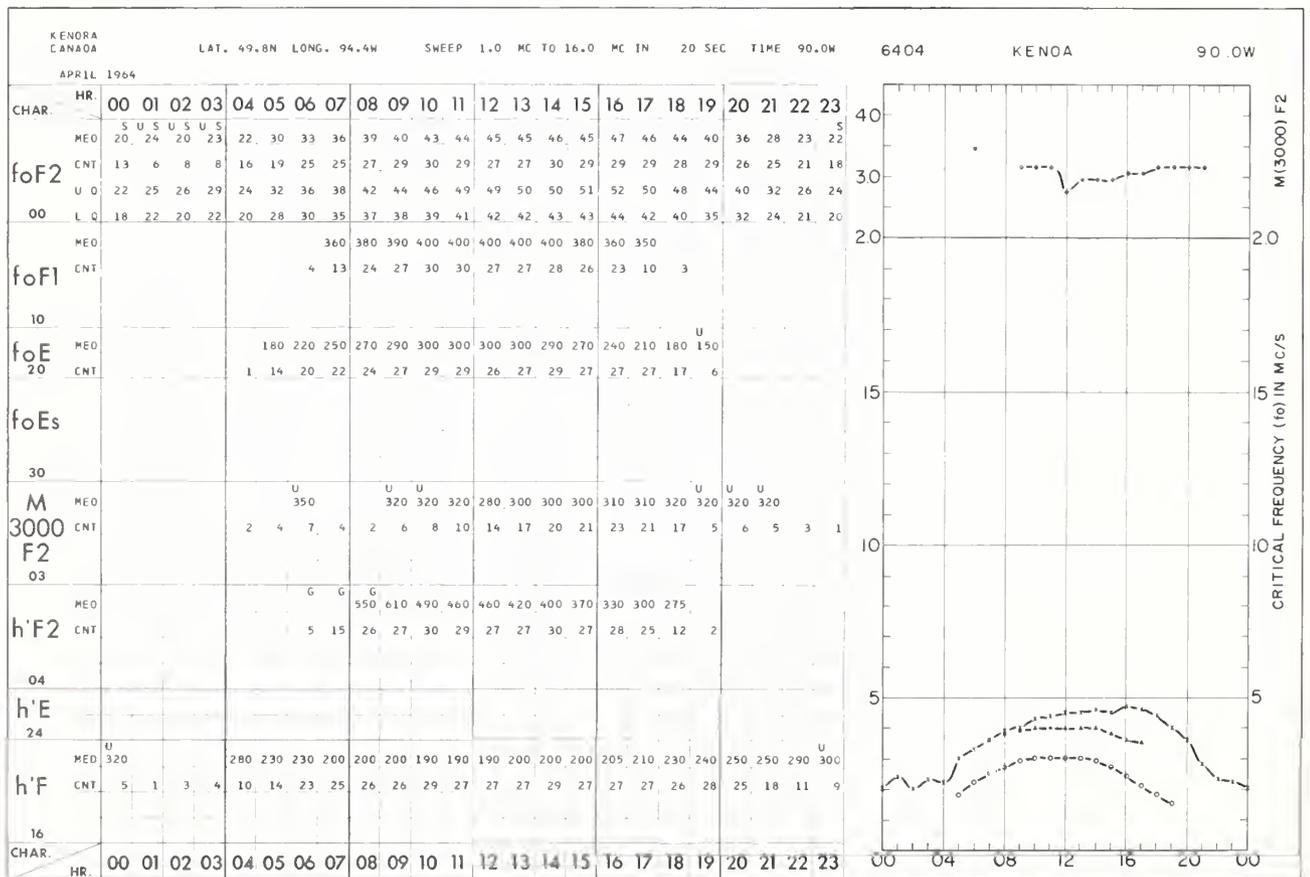
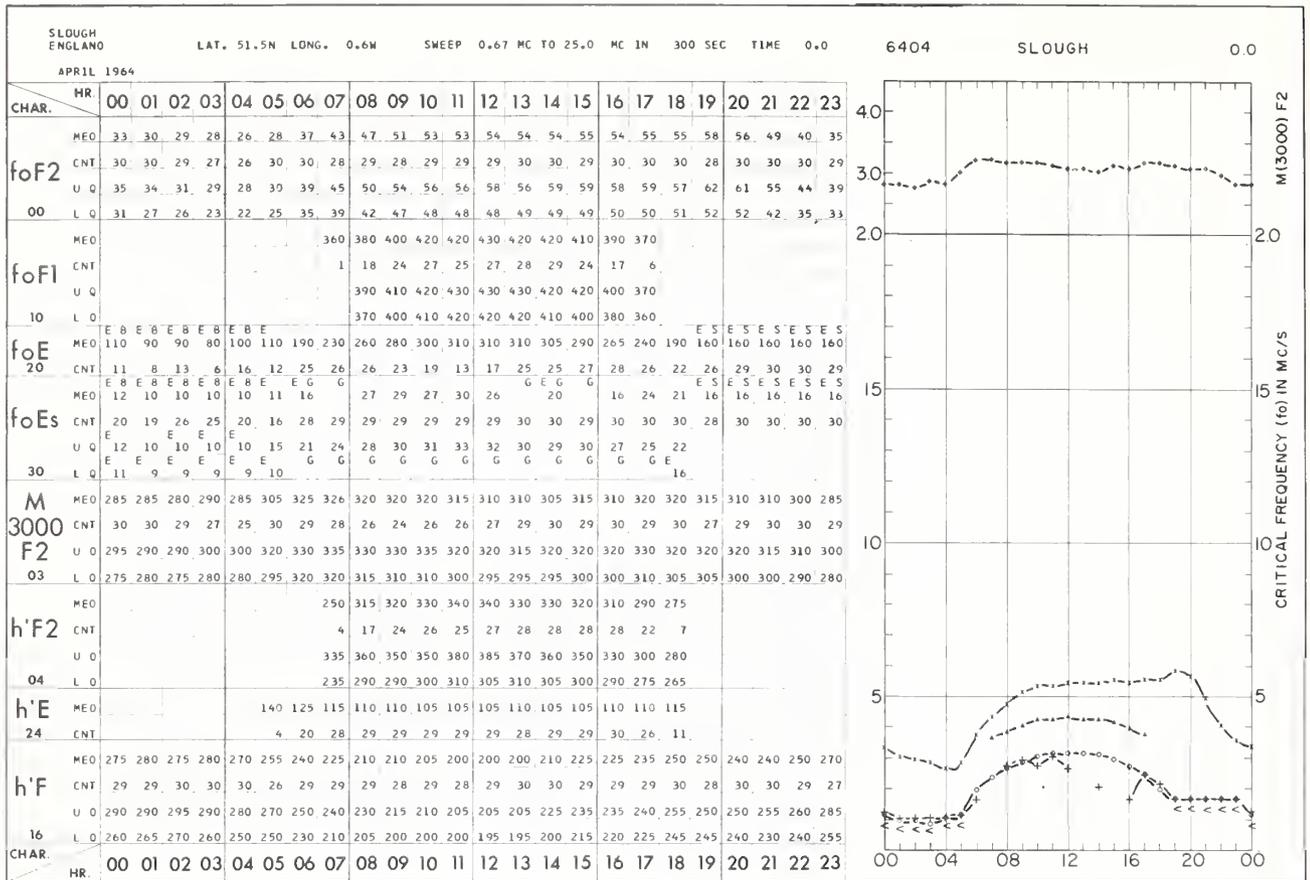


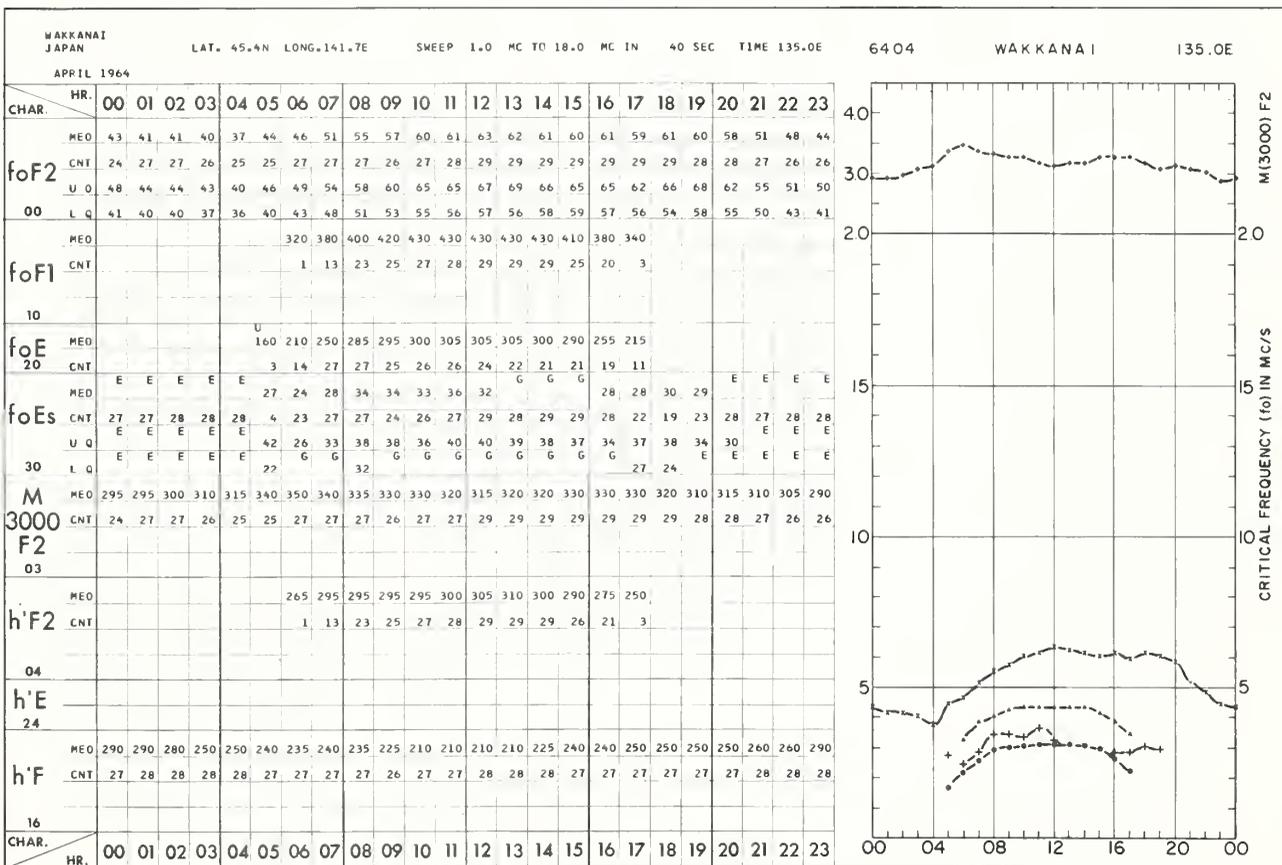
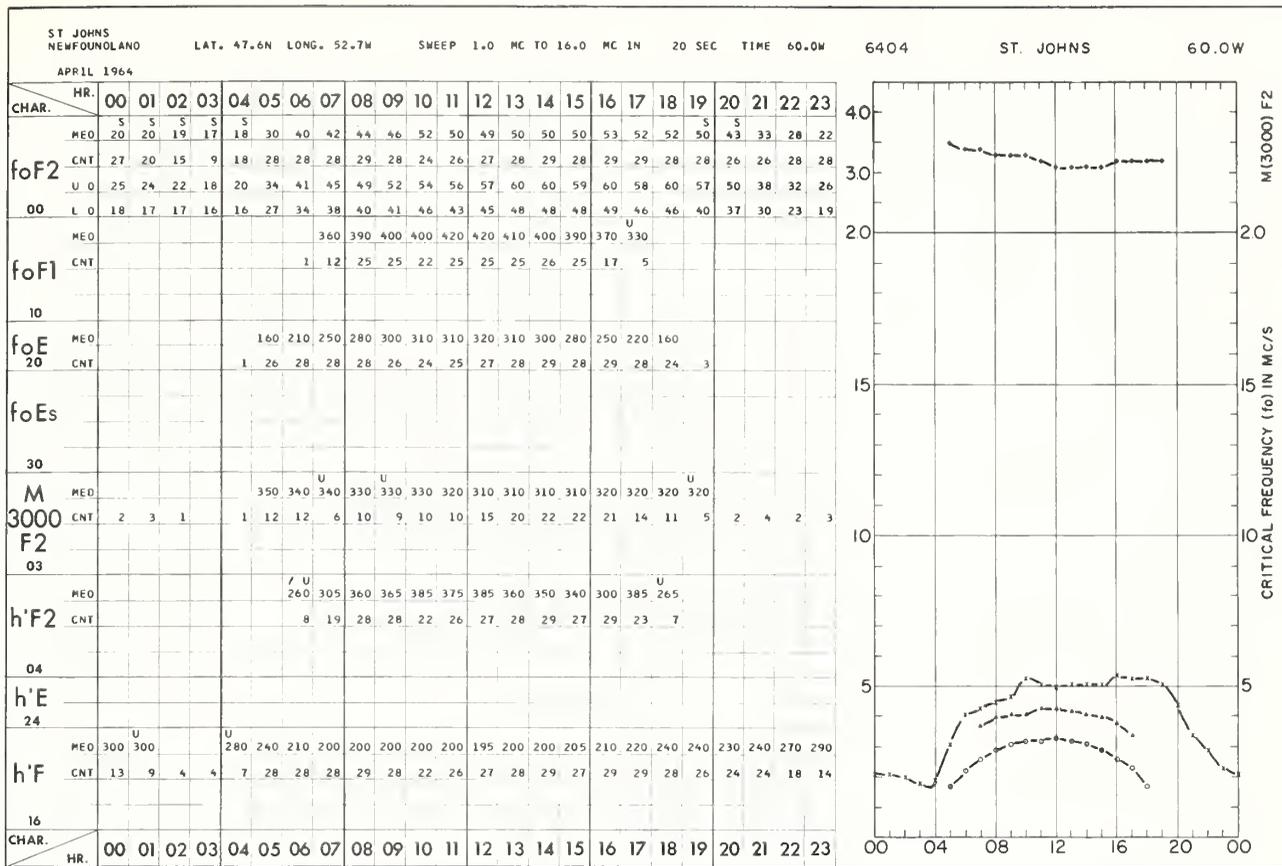


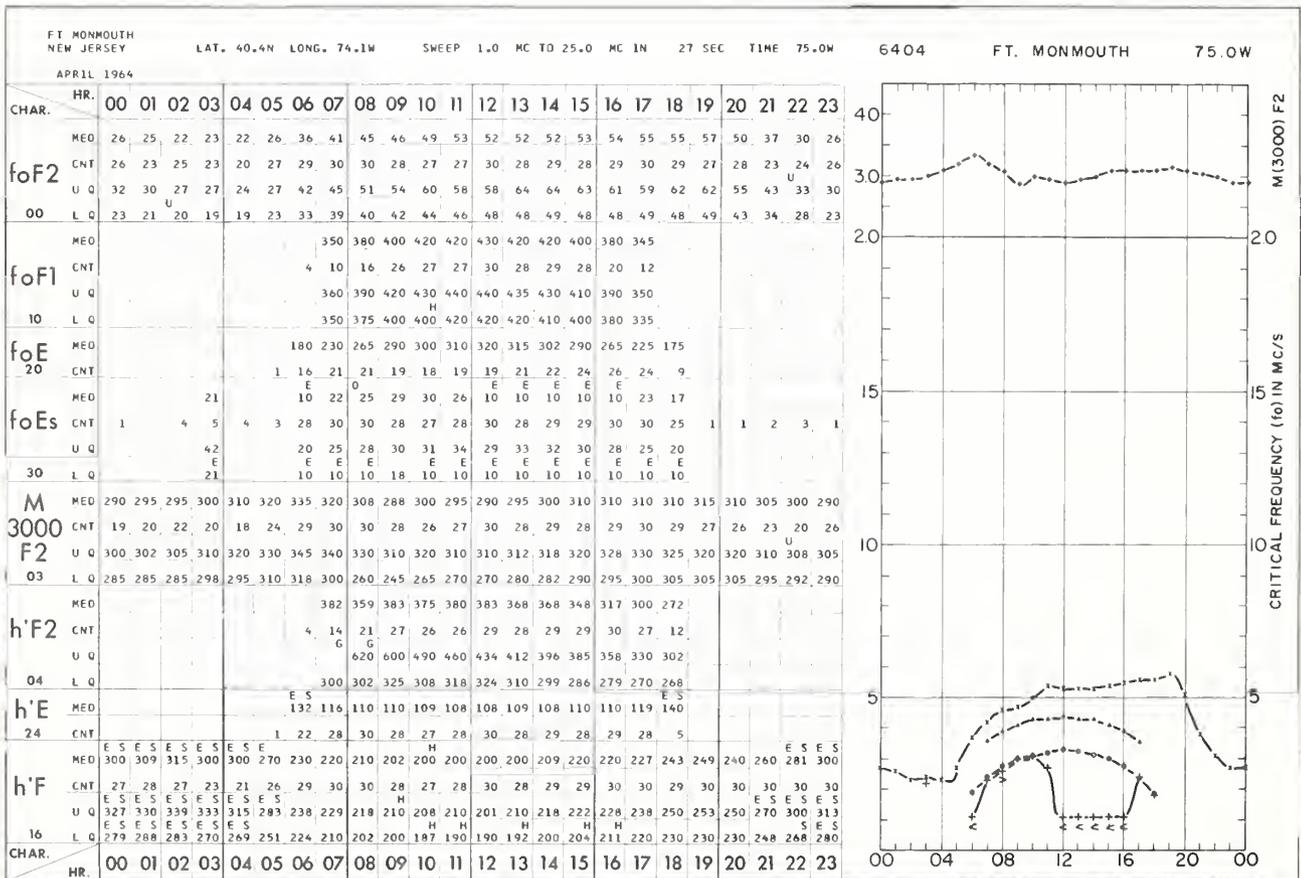
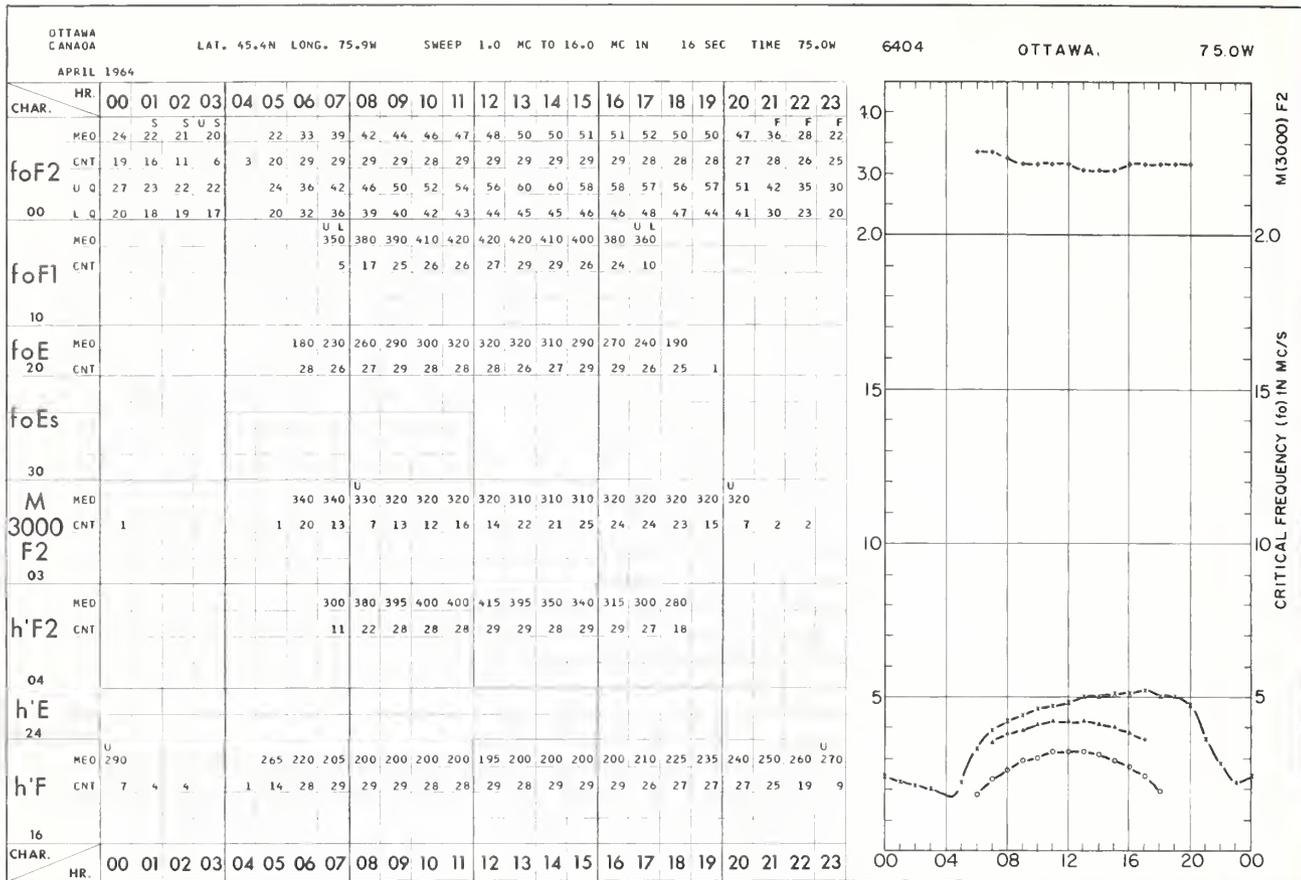


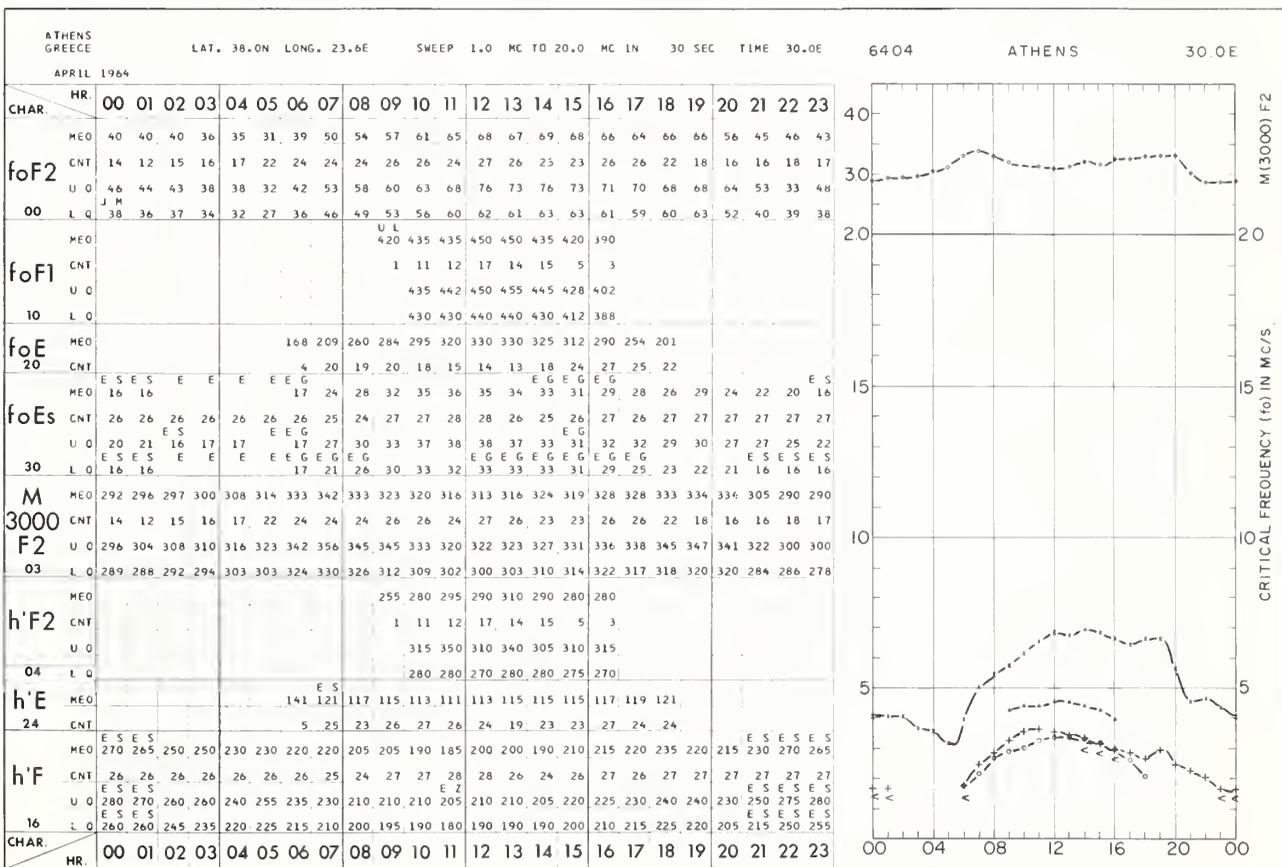
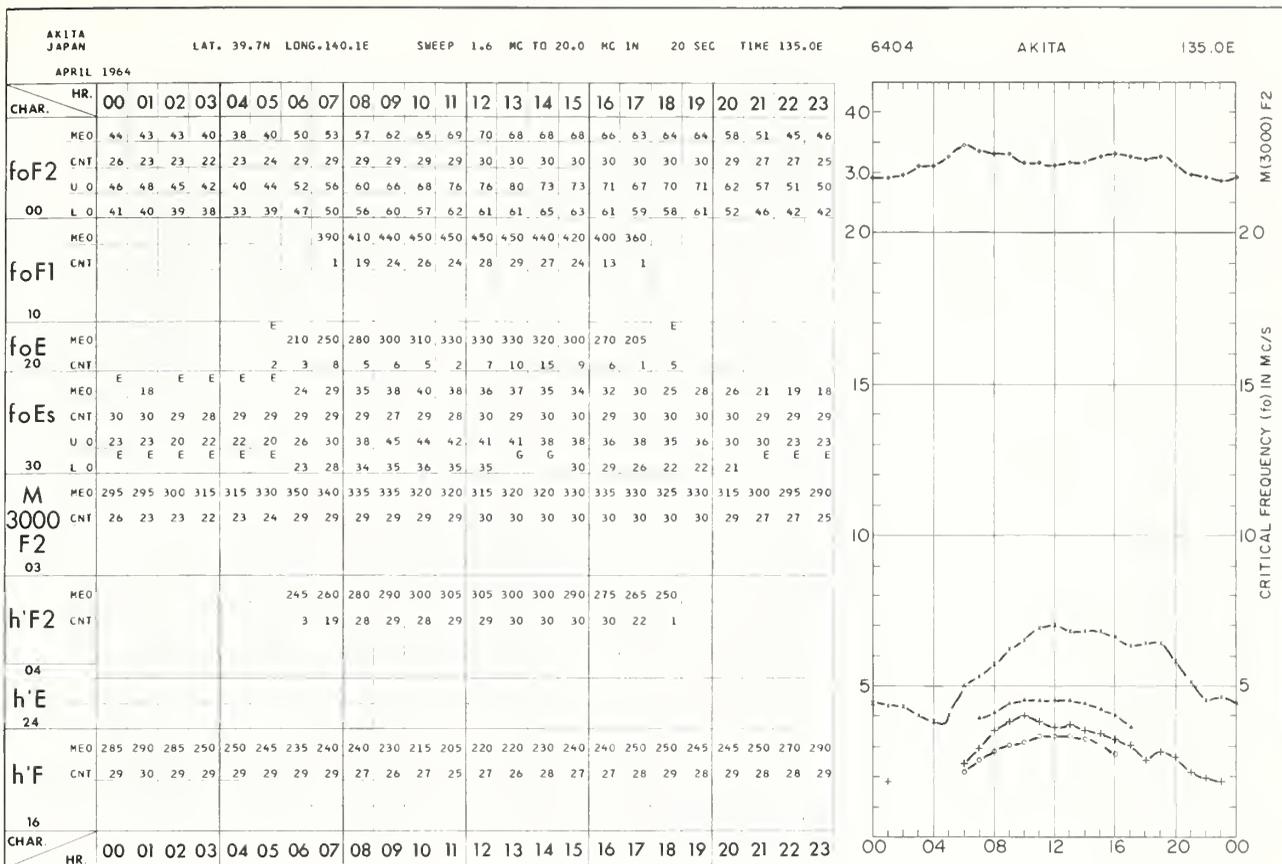


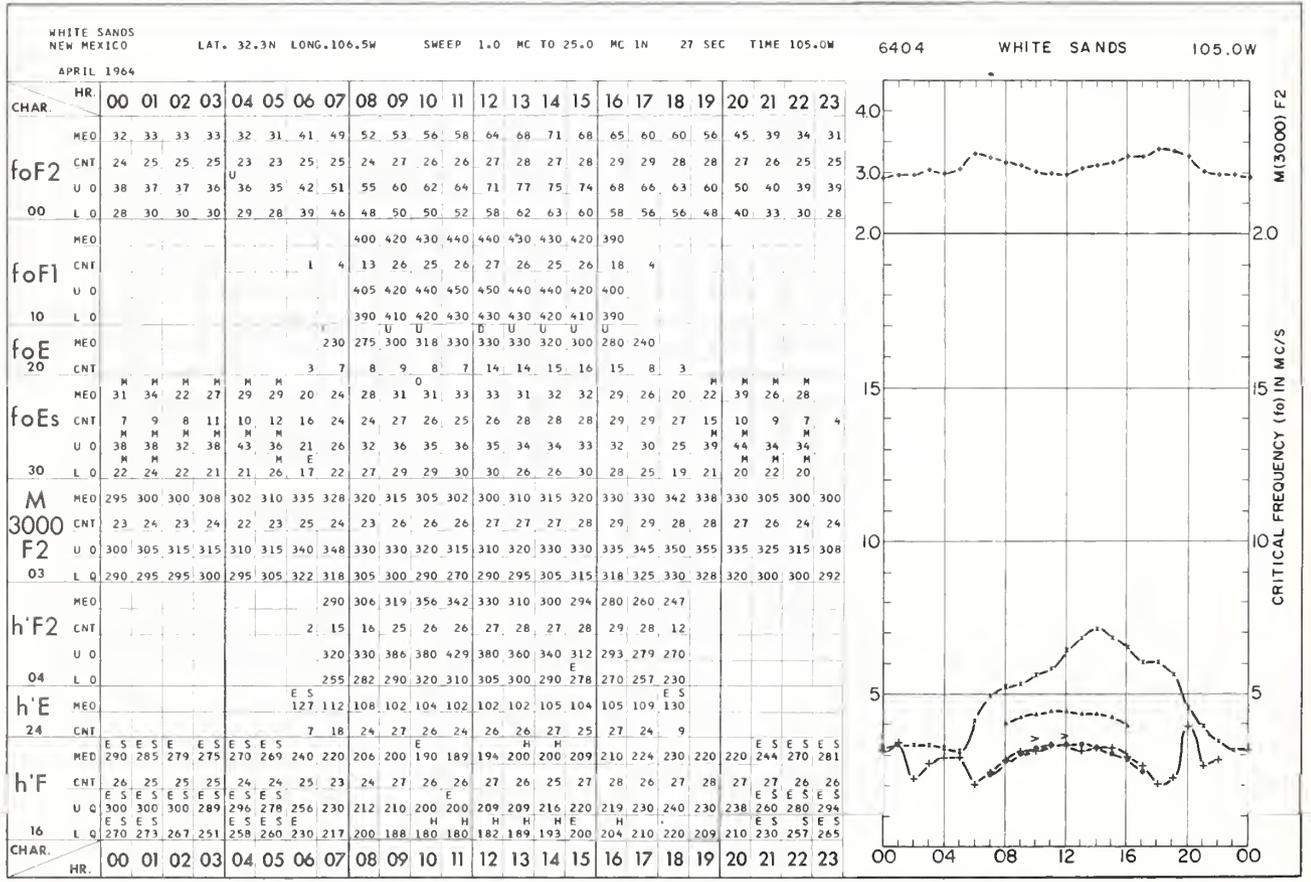
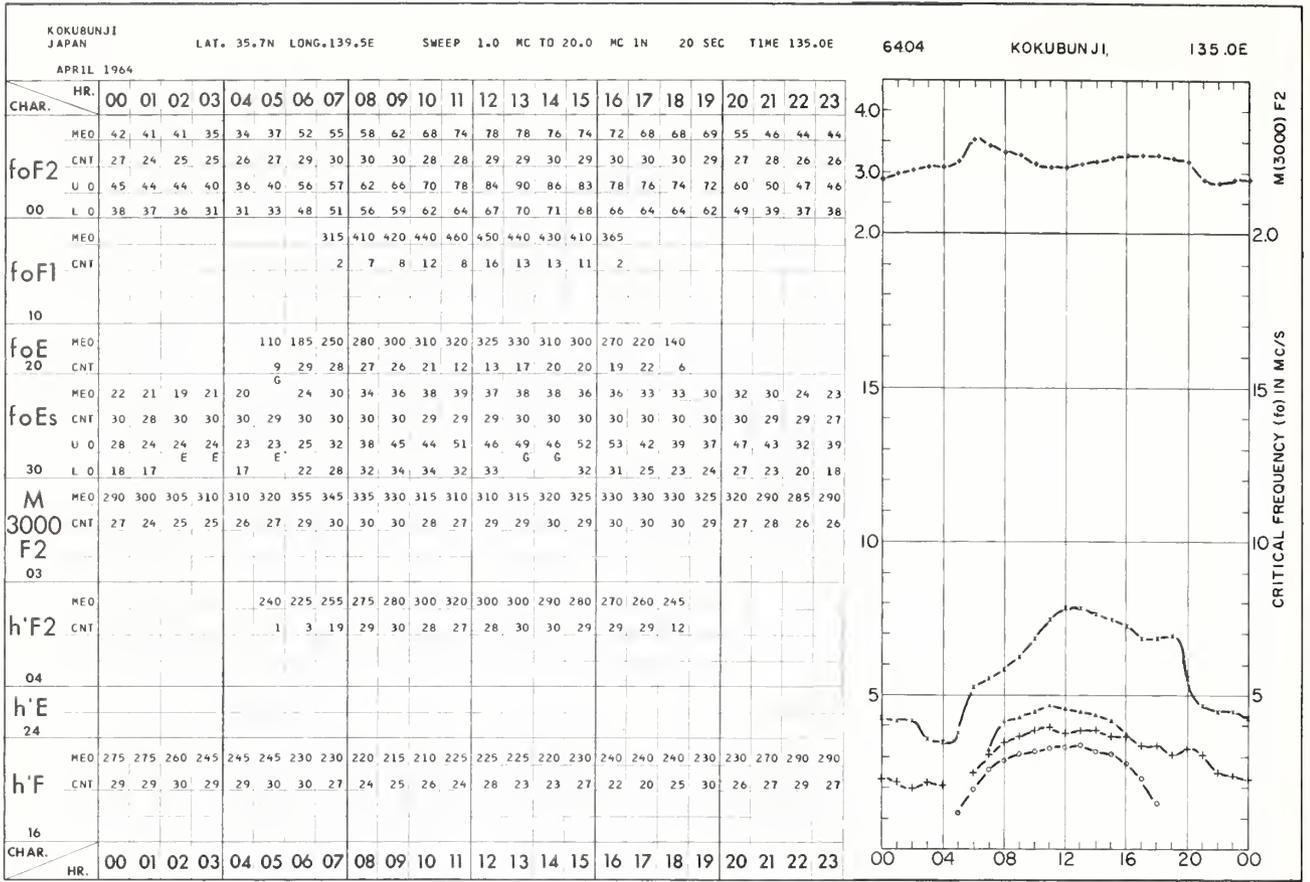








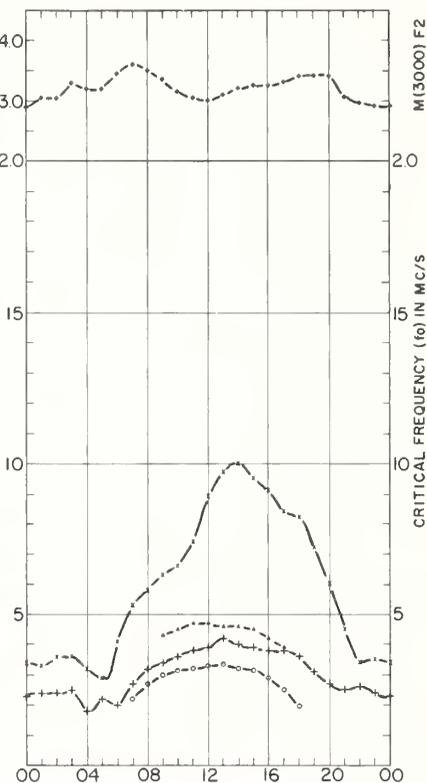




YAMAGAWA JAPAN
 APRIL 1964
 LAT. 31.2N LONG.130.6E SWEEP 0.55 MC TO 17.0 MC IN 20 SEC TIME 135.0E

CHAR.	HR.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
foF2	MED	34	33	36	36	32	29	41	53	58	63	66	74	89	97	100	95	91	84	82	72	60	45	34	35
	CNT	6	9	8	12	20	23	24	25	26	27	29	29	29	29	27	27	27	24	15	13	13	11	8	5
	U Q	36	40	42	40	35	33	43	58	62	66	72	84	92	105	106	98	93	92	86	81	64	51	36	36
foF1	MED									430	450	470	470	460	460	450	420	390							
	CNT									7	16	24	25	24	22	19	8	1							
	10																								
foE	MED								220	270	300	315	320	330	335	320	315	290	250	195					
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foEs	MED	23	24	24	25	18	22	20	27	32	34	36	38	39	42	40	39	38	38	36	31	27	25	26	24
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	03																								
h'F2	MED								255	255	280	305	320	310	300	295	280	275	260	250					
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	04																								
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	24																								
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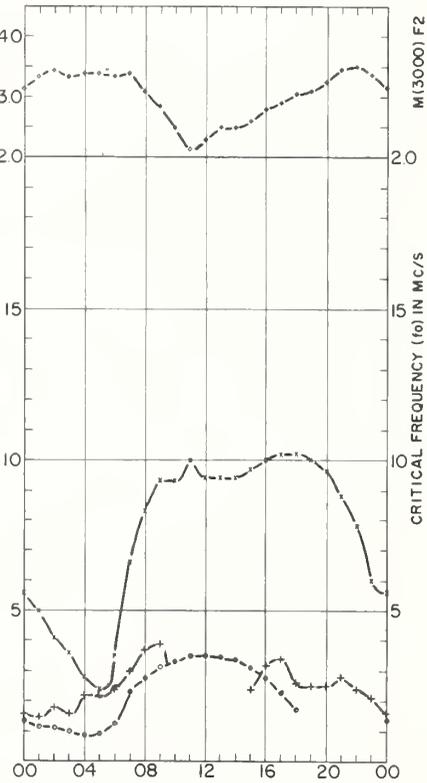
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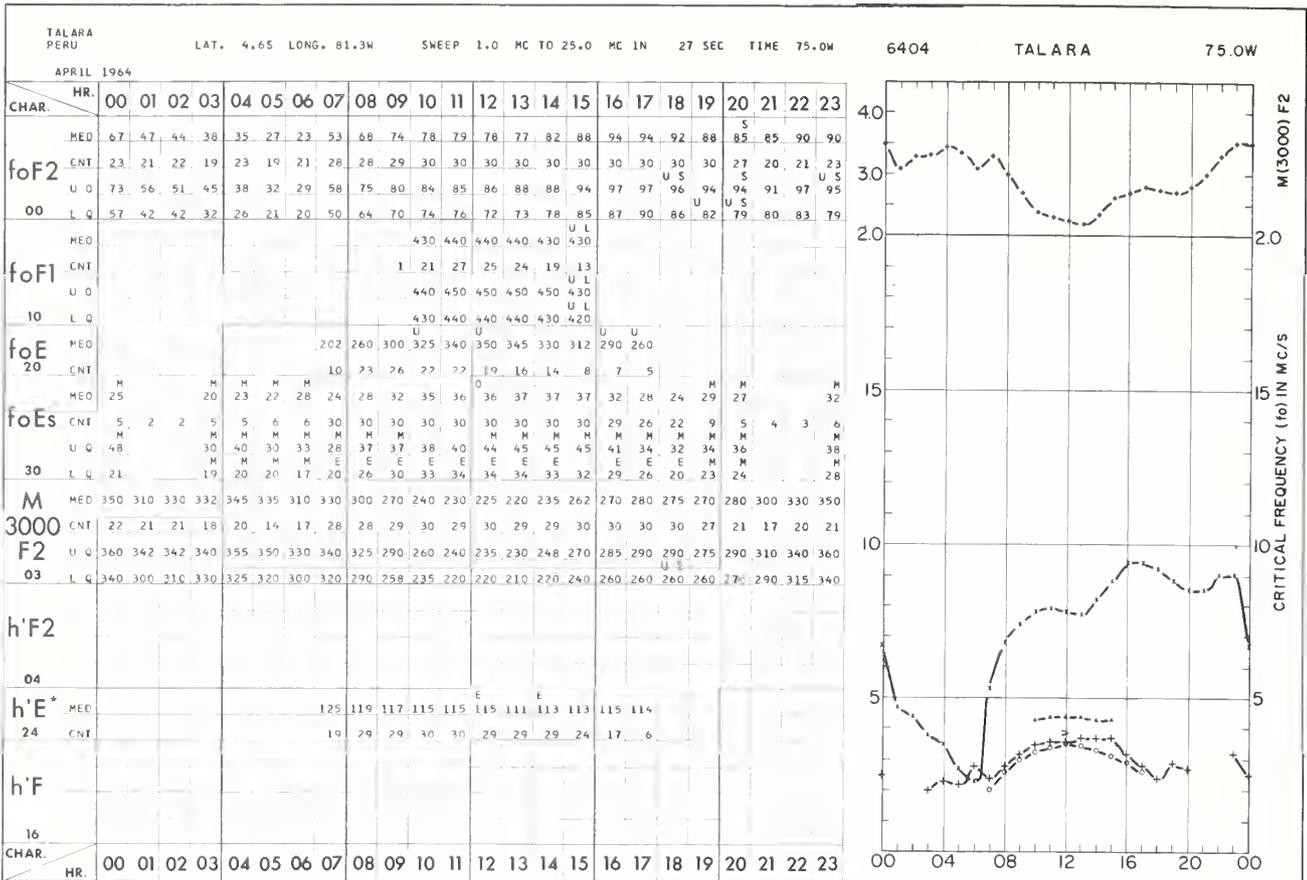


SINGAPORE MALAYSIA
 APRIL 1964
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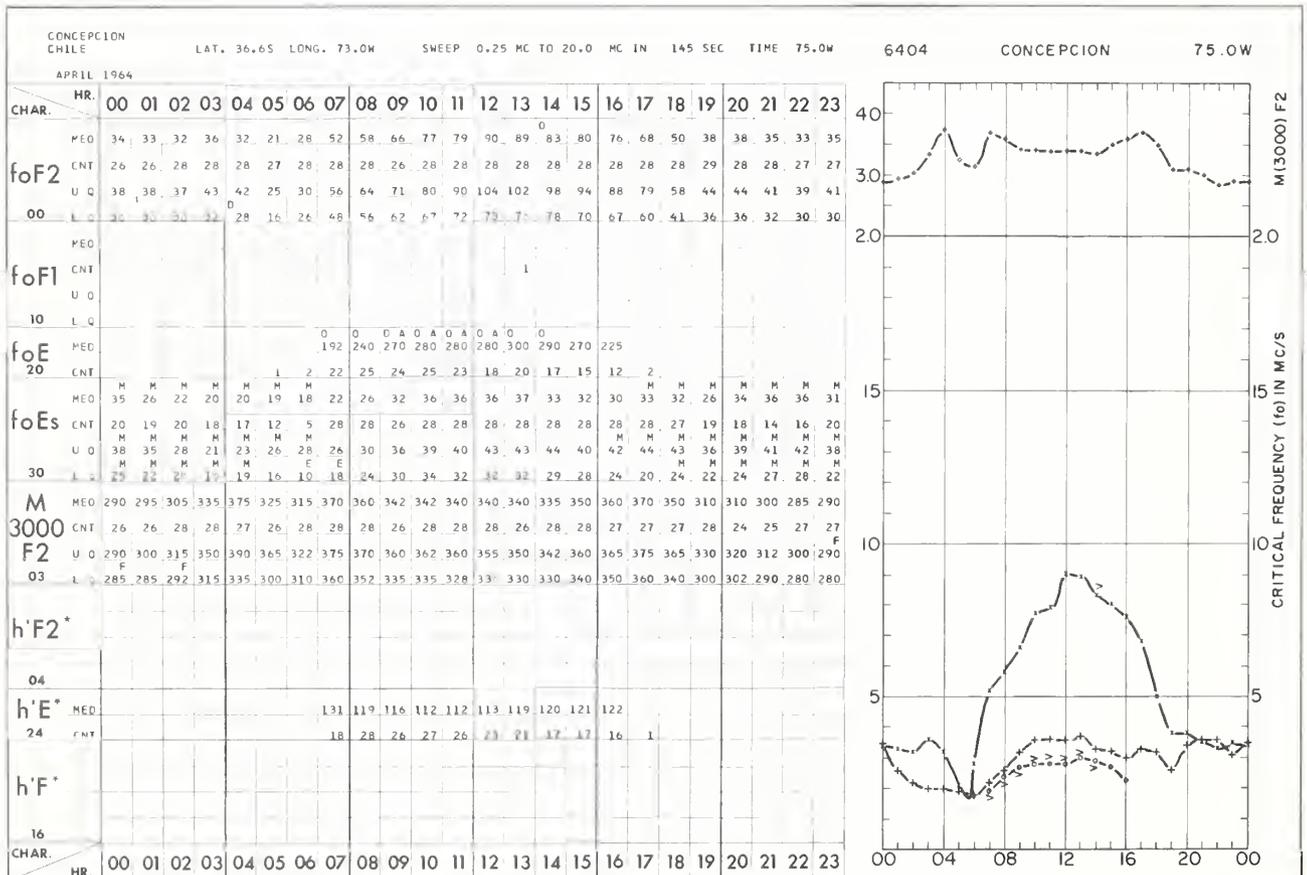
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	00																								
foF1	MED																								
	CNT																								
	10																								
foE	MED	135	115	110	100	85	90	125	230	275	310	330	350	350	345	335	310	275	225	170					
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	30																								
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	03																								
h'F2	MED																								
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h'E	MED	300	290	275	250	250	255	240	230	230	220	205	210	220	210	230	225	240	250	250	235	230	255	315	305
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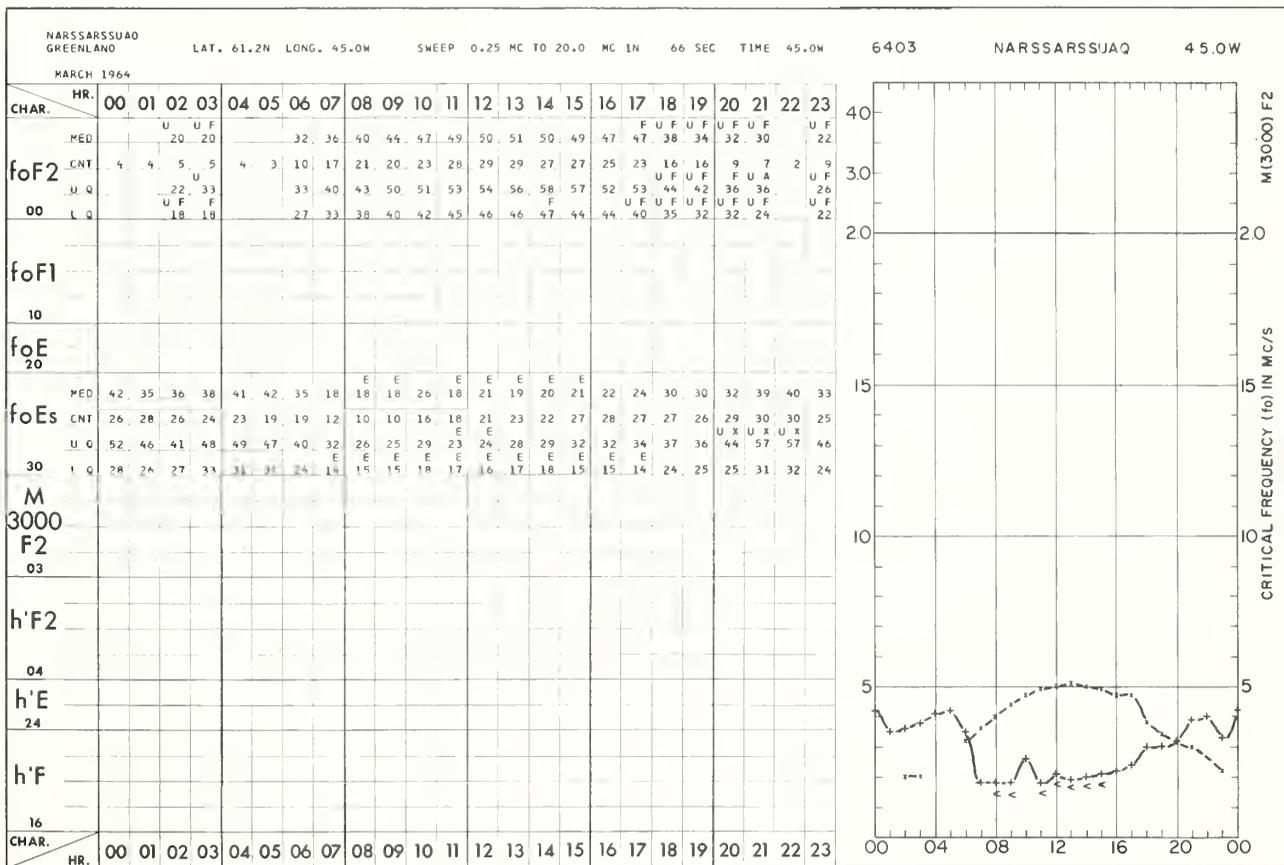
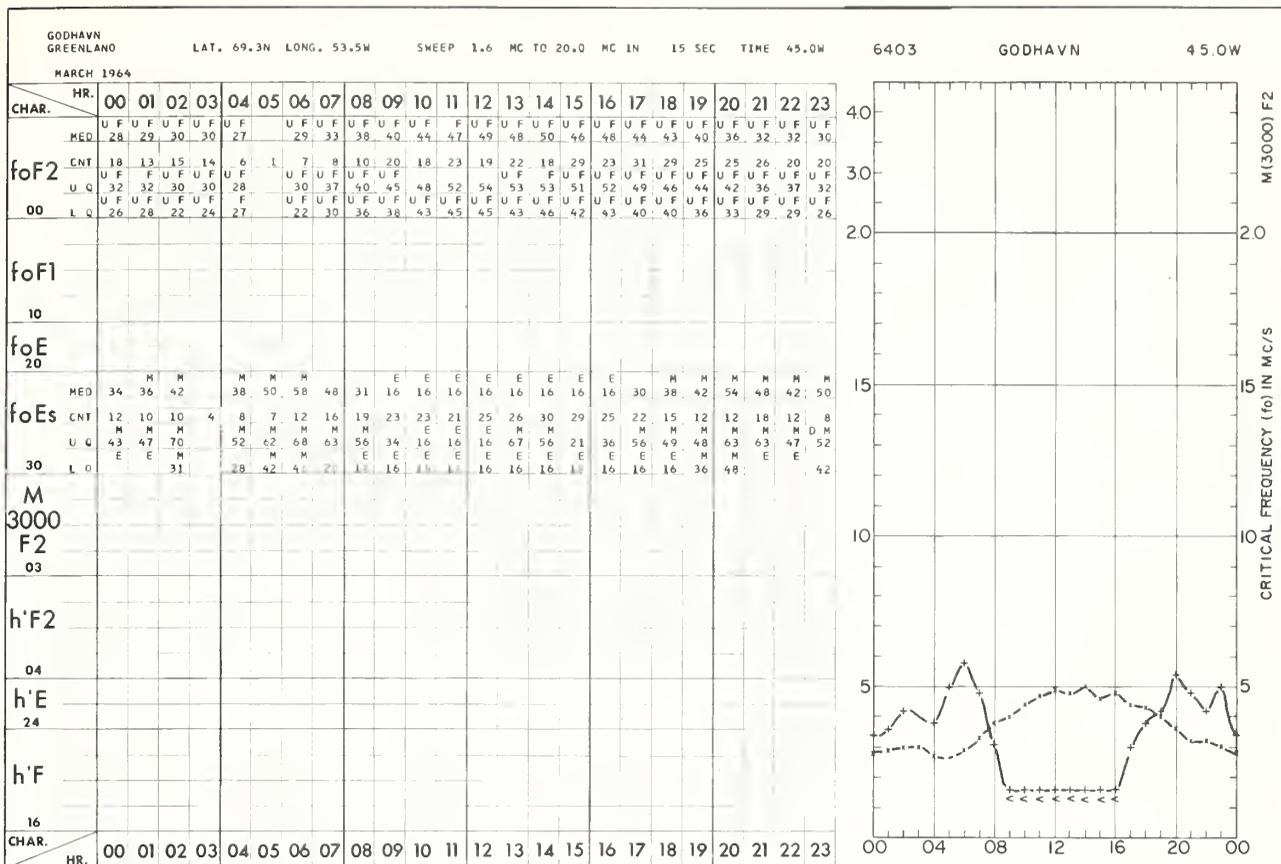


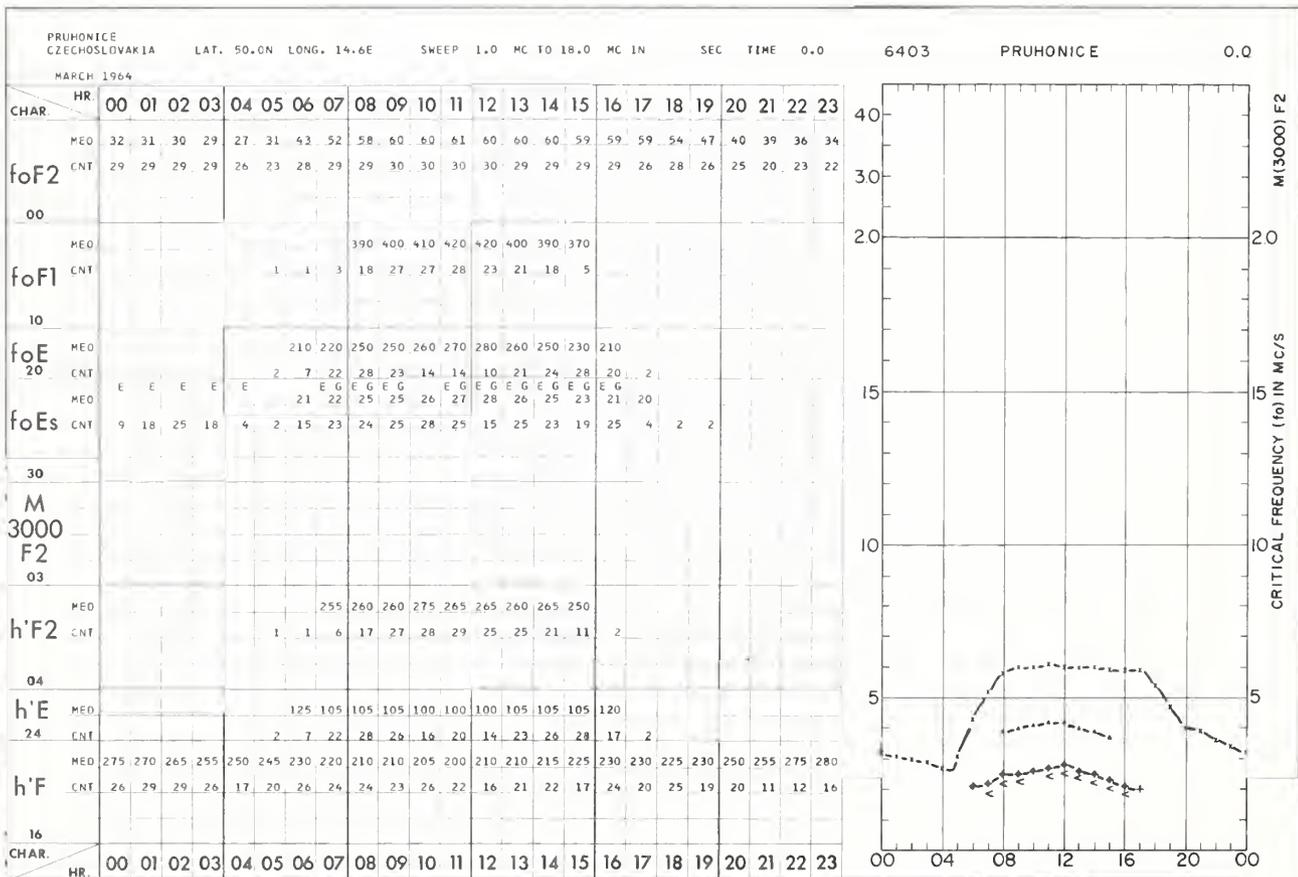
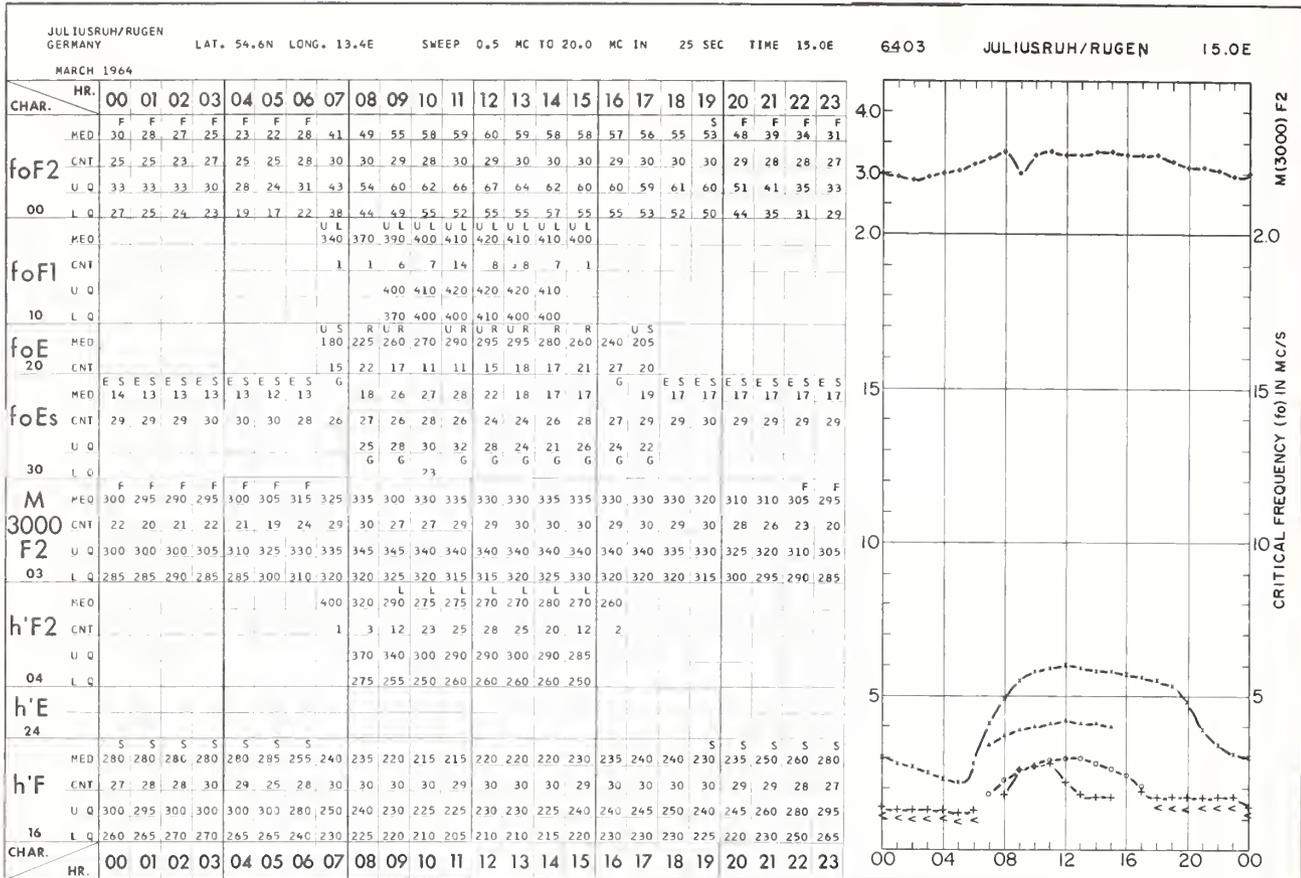


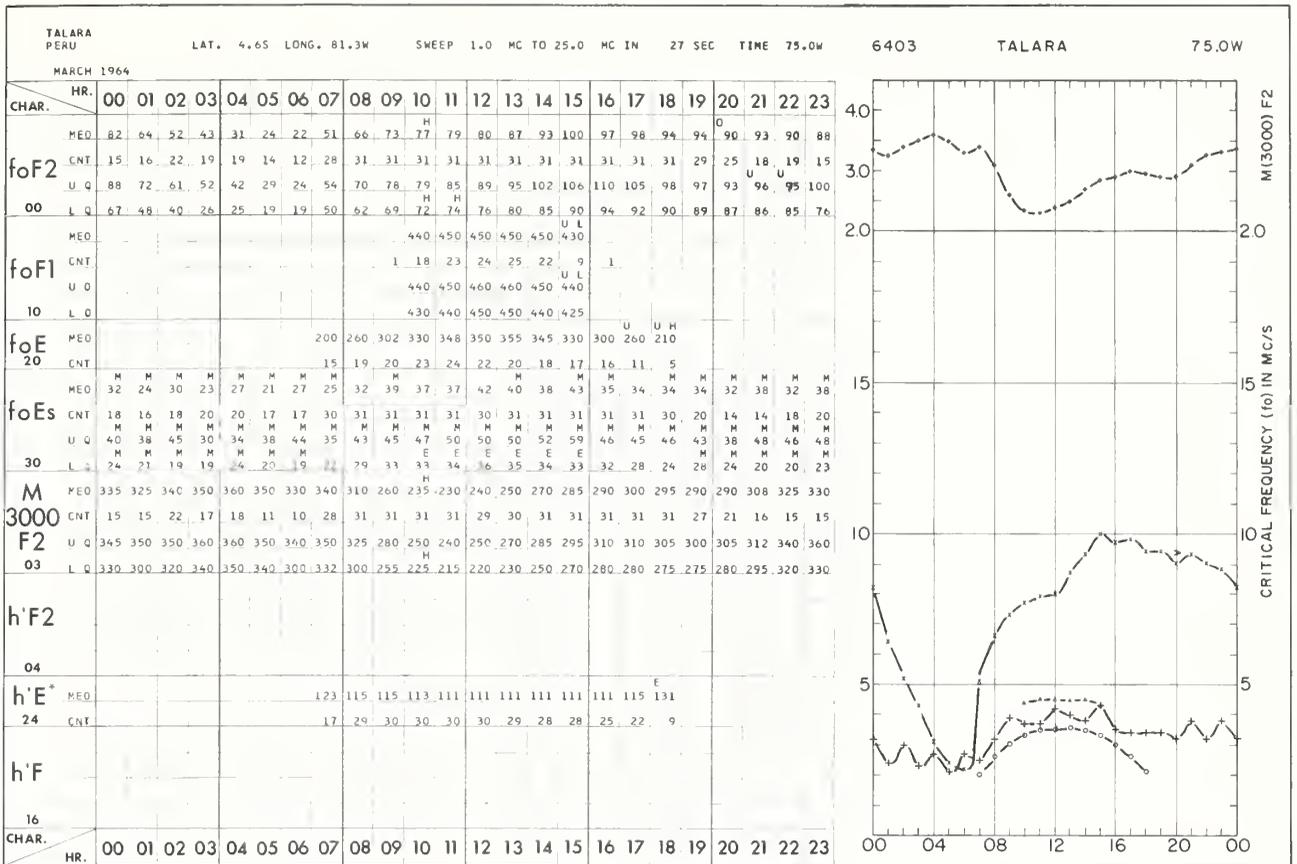
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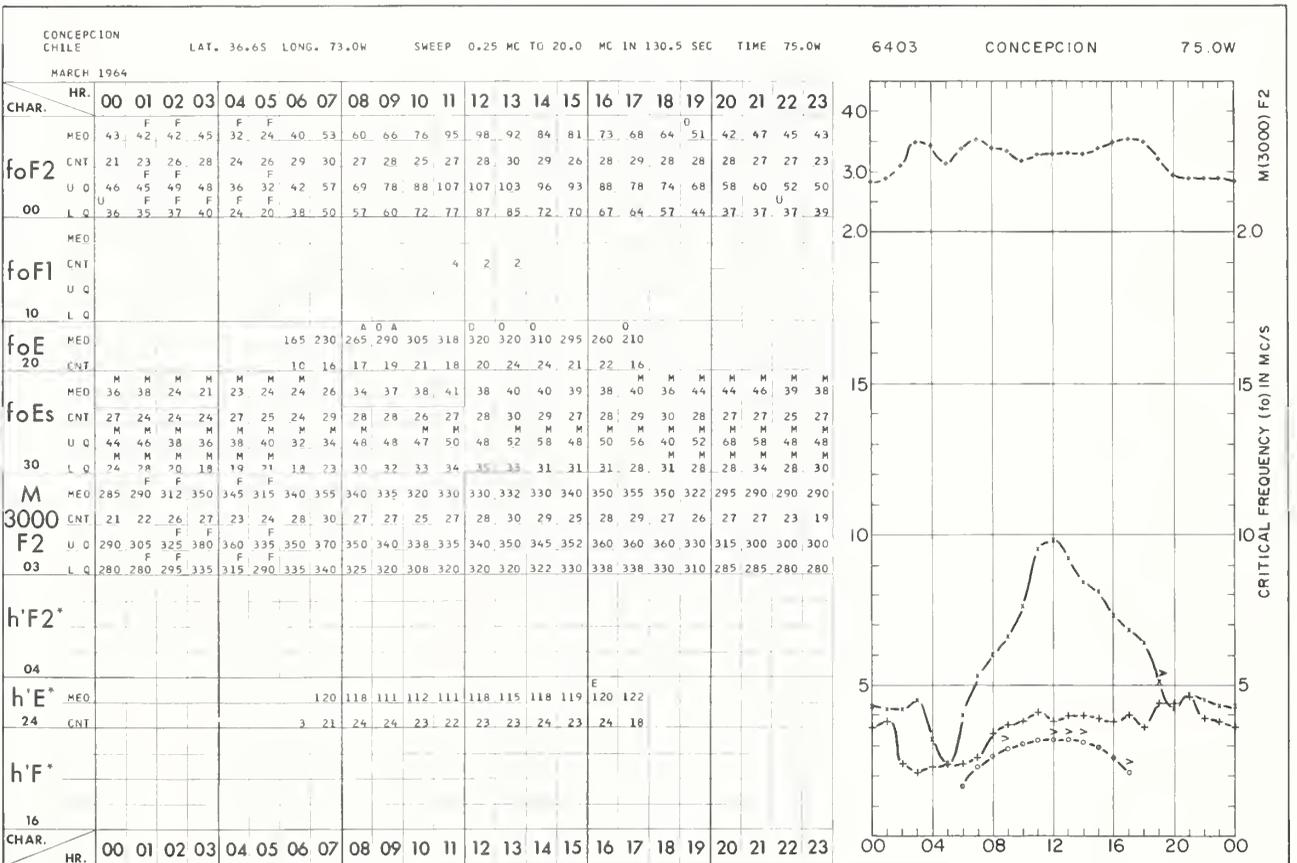
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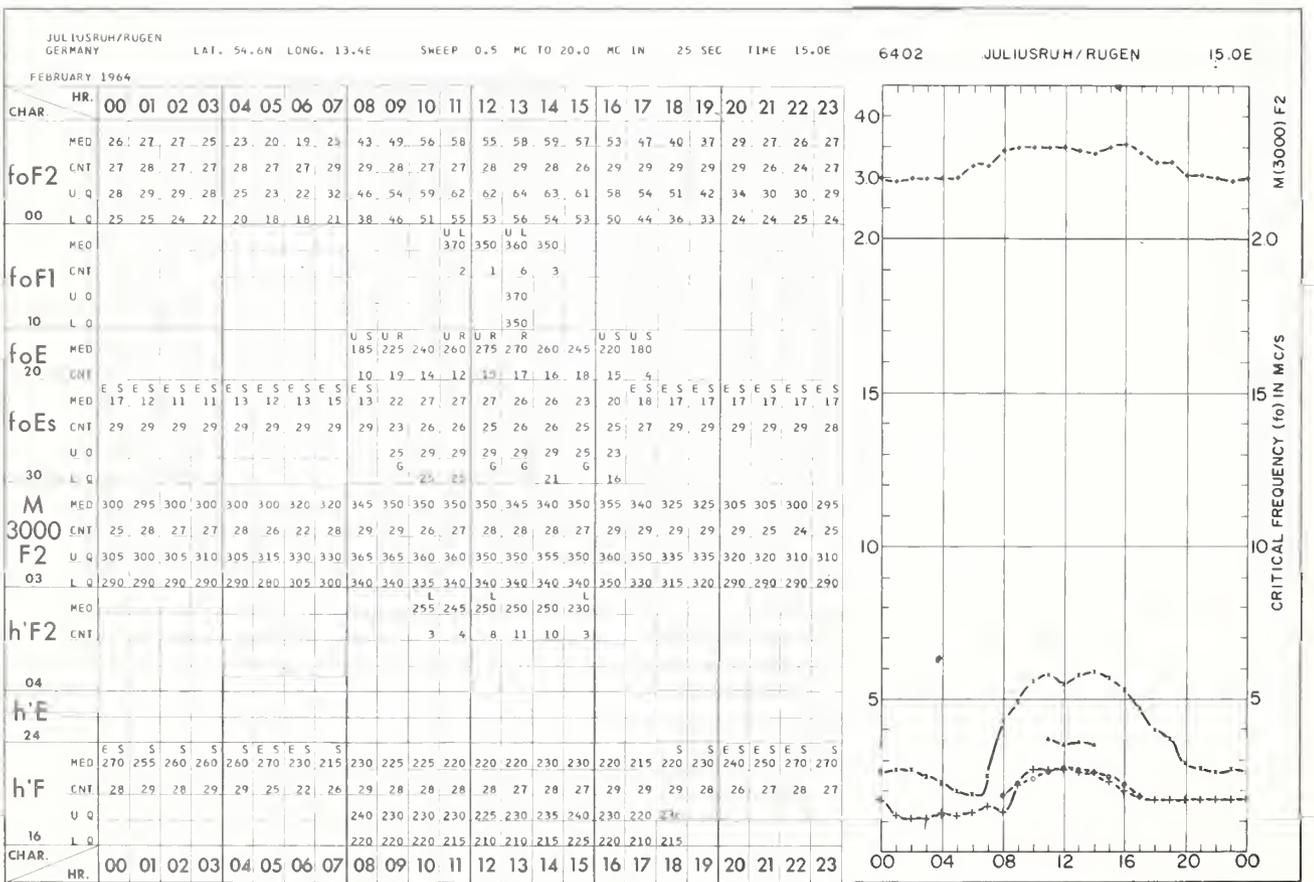
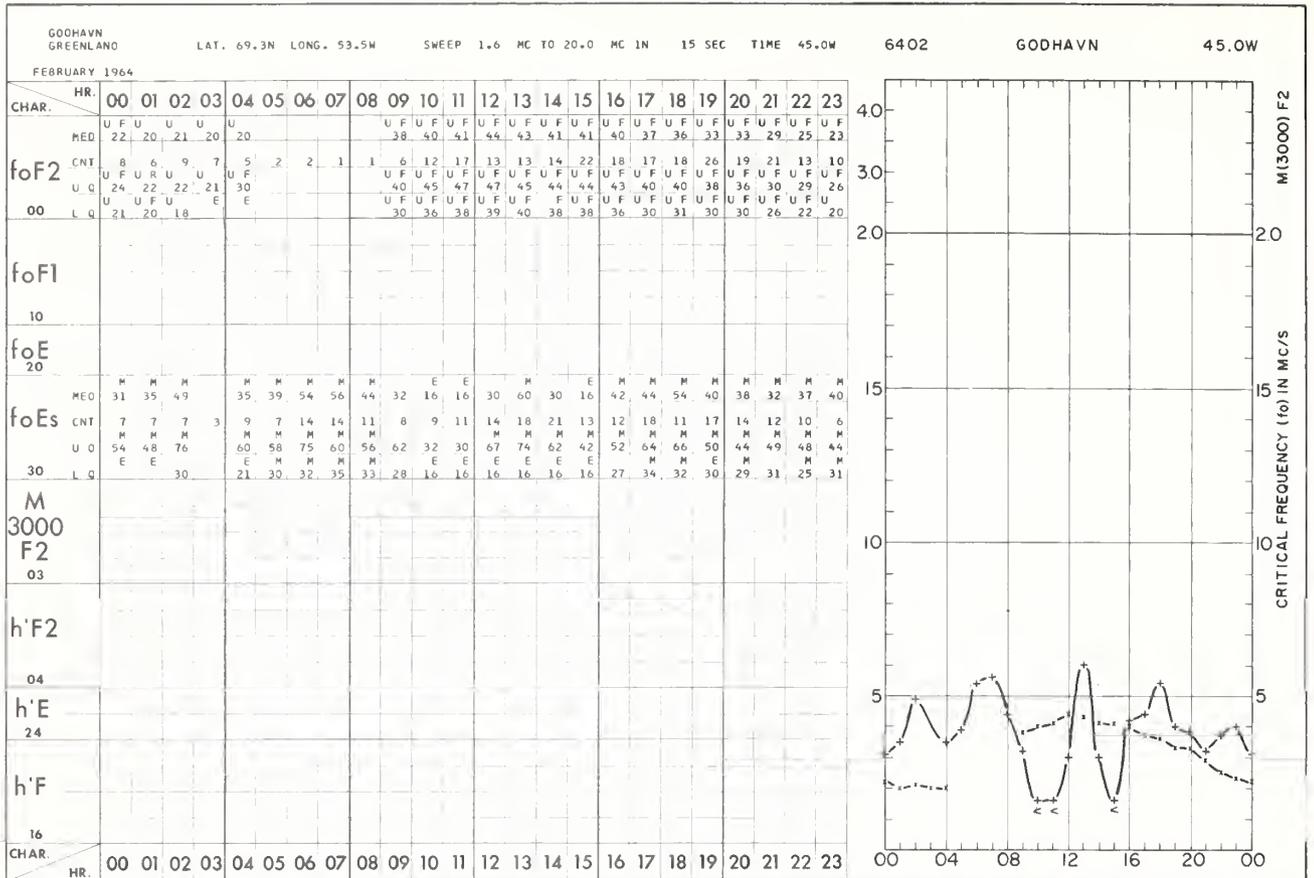


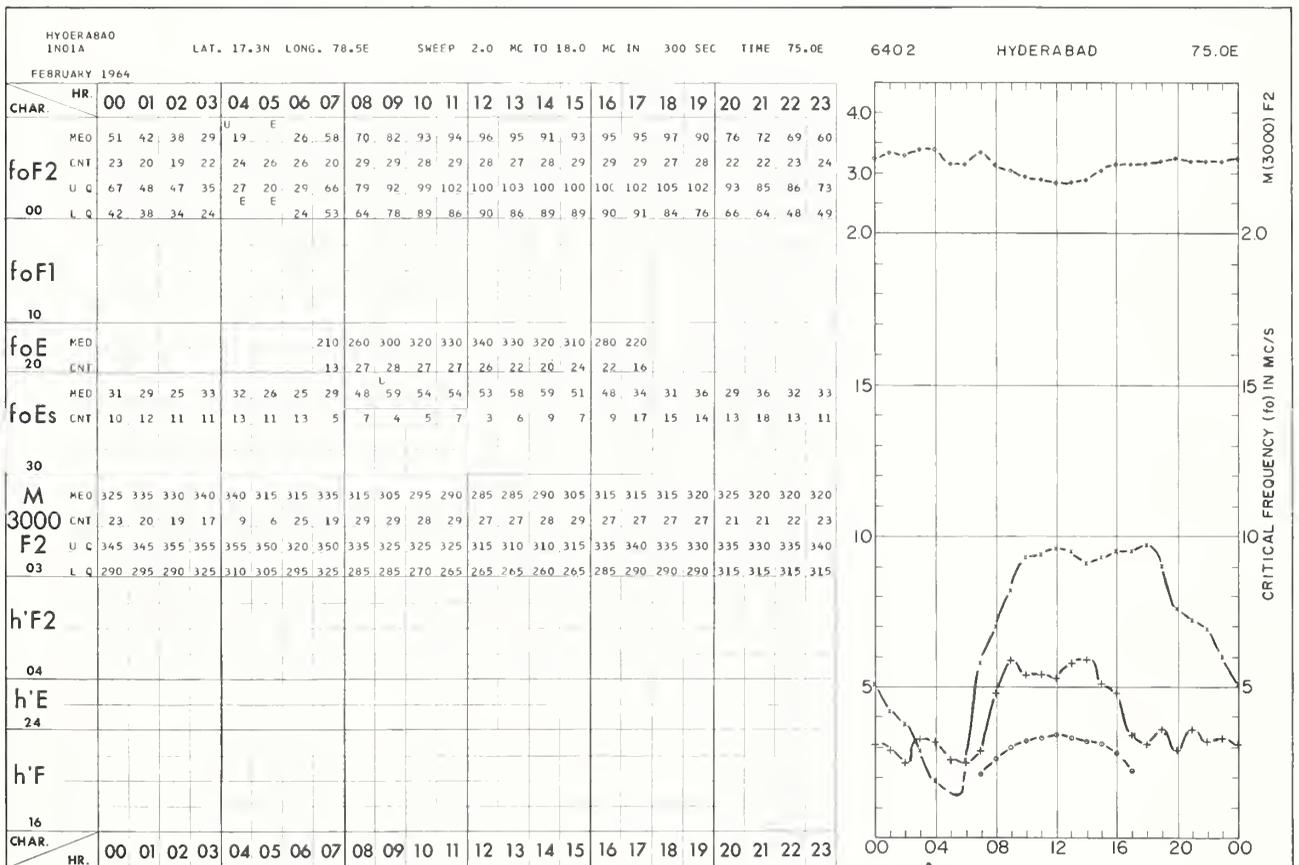
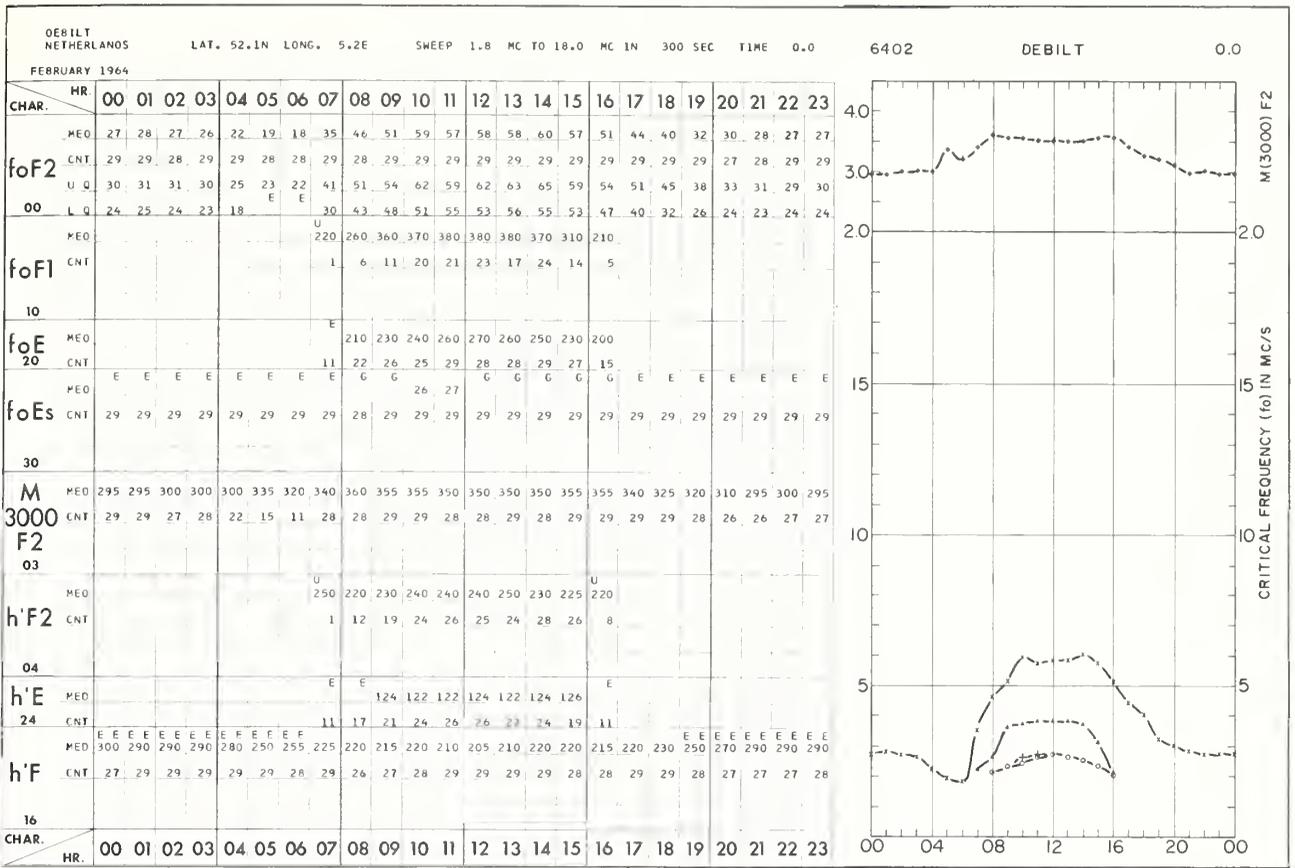


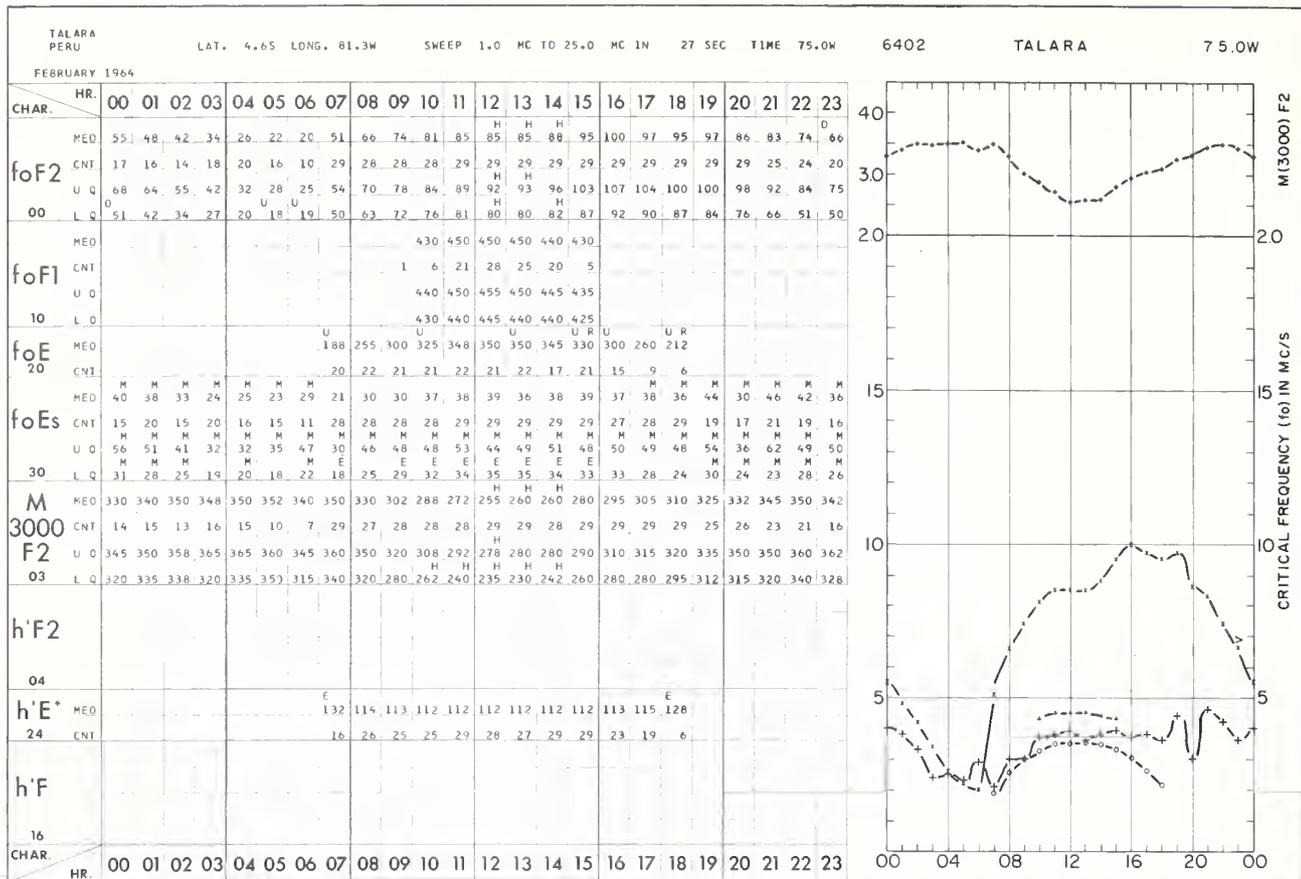
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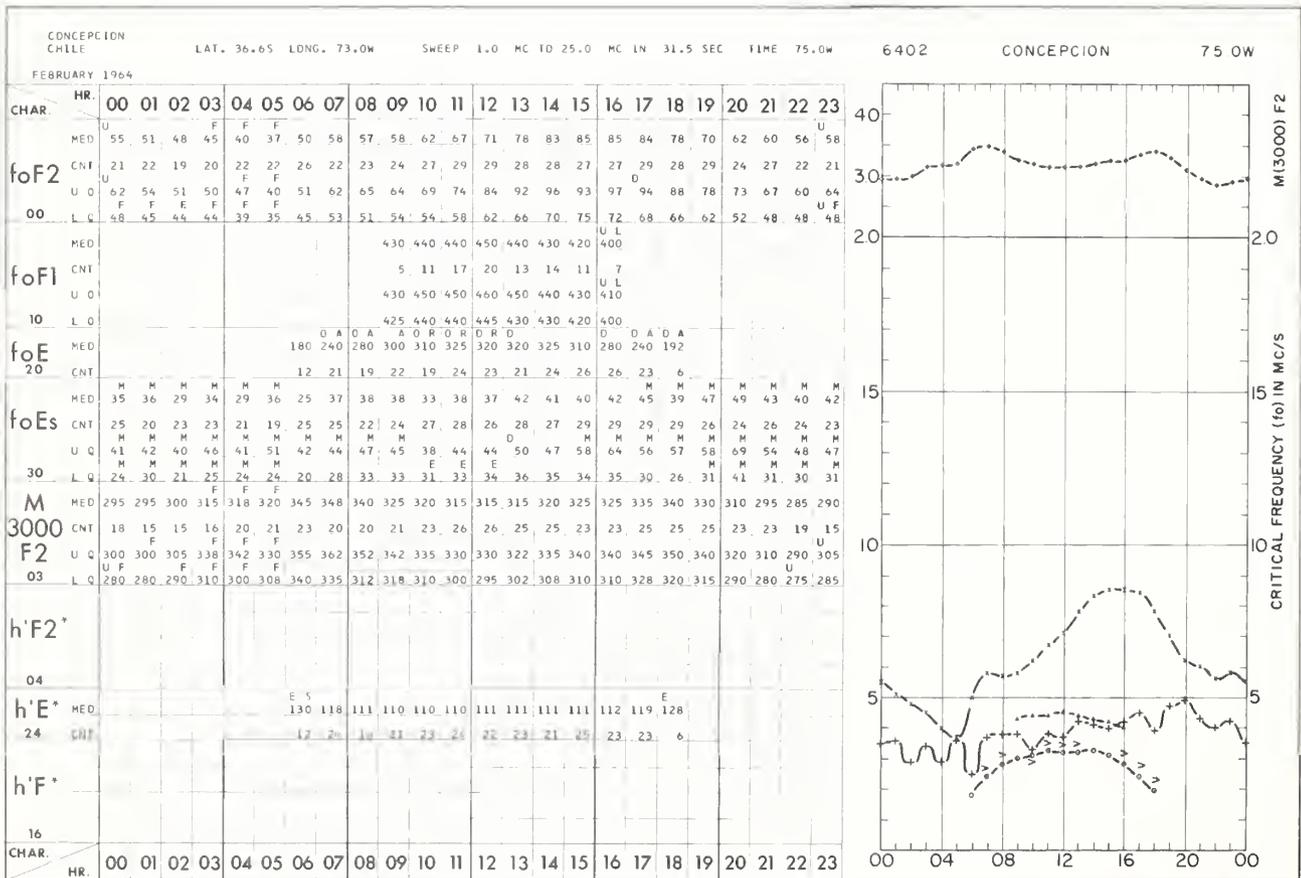
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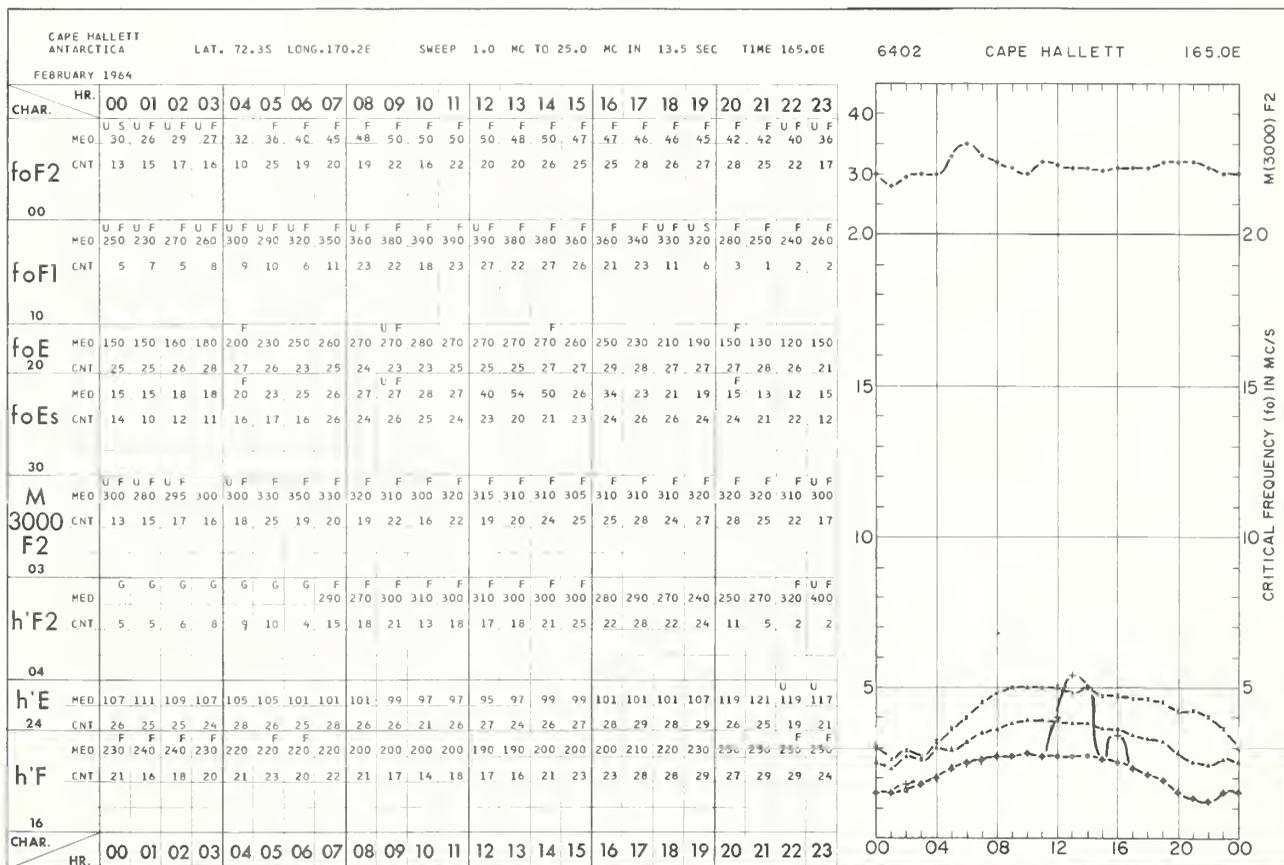
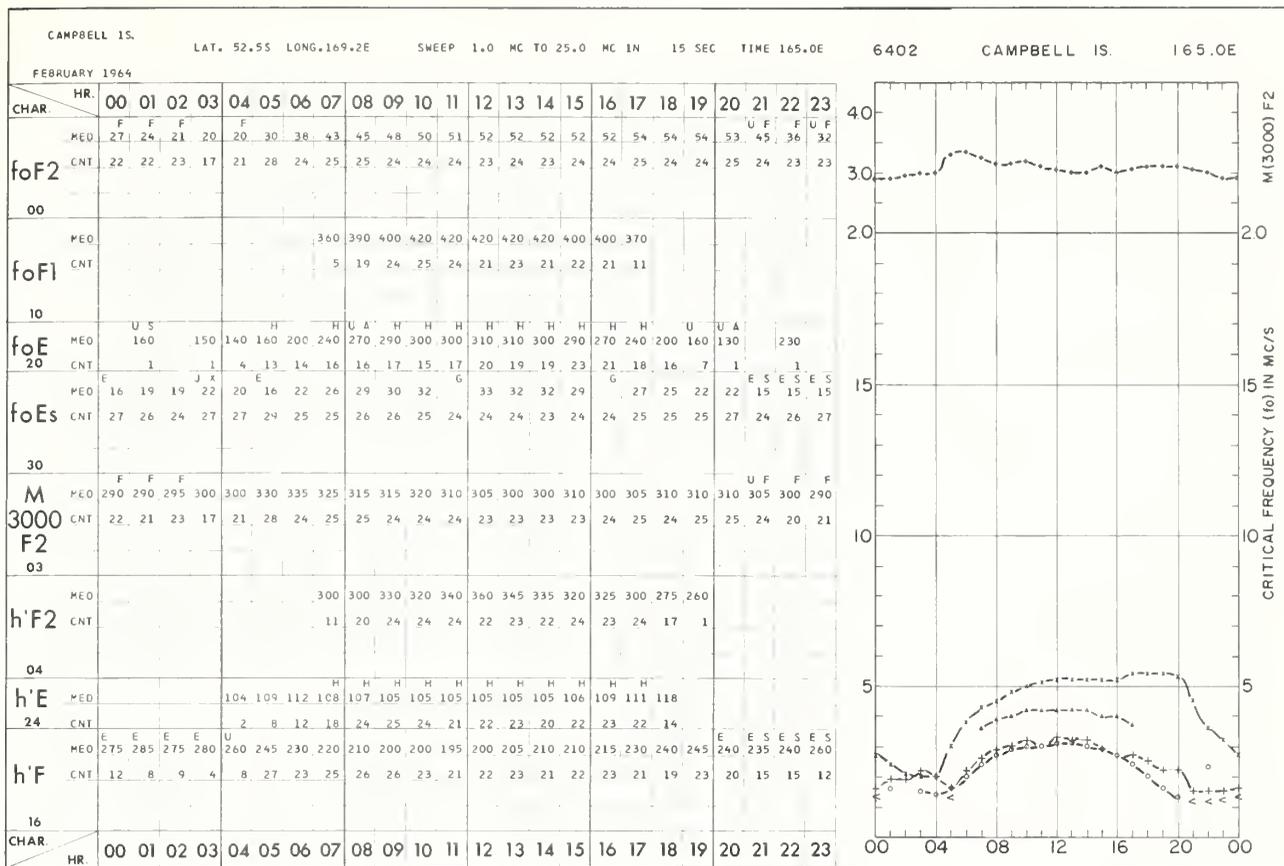


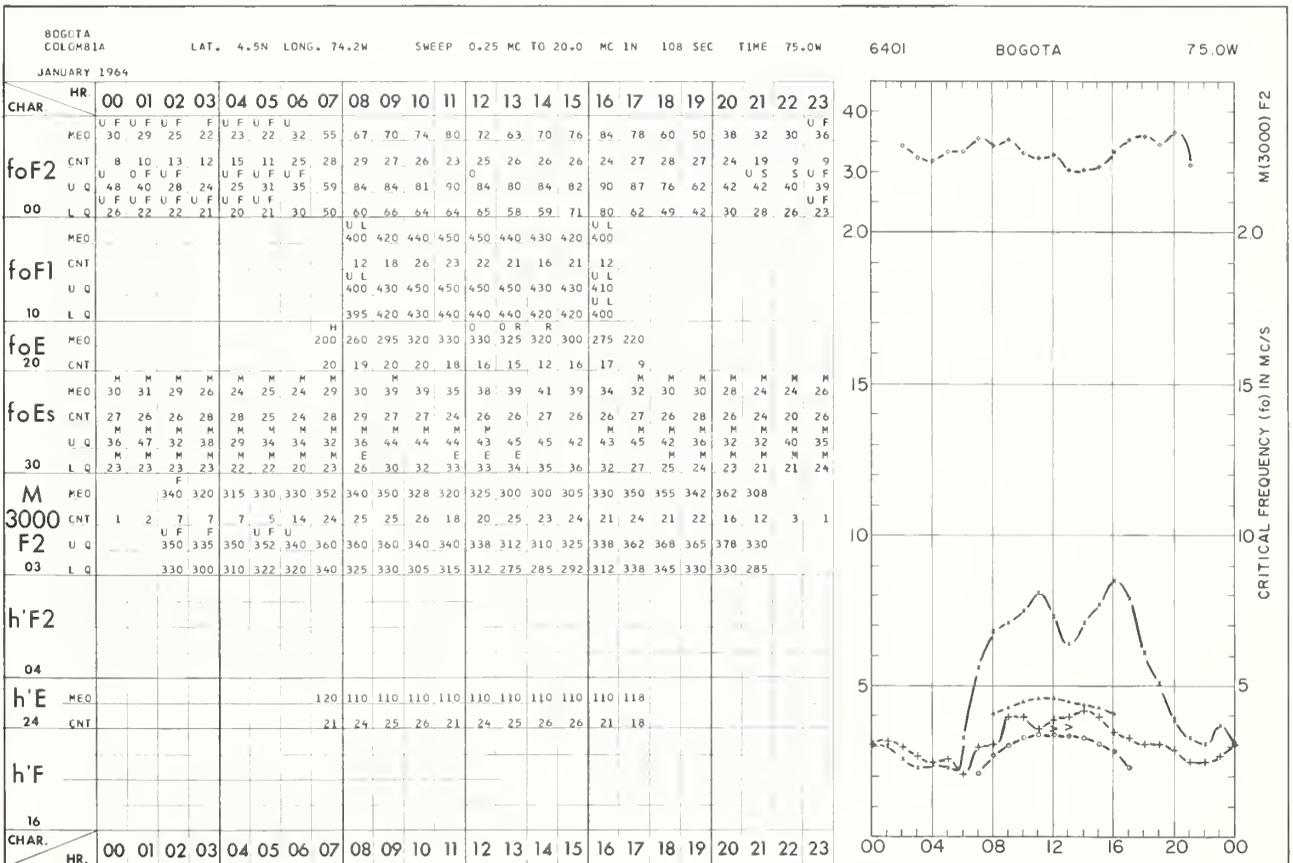
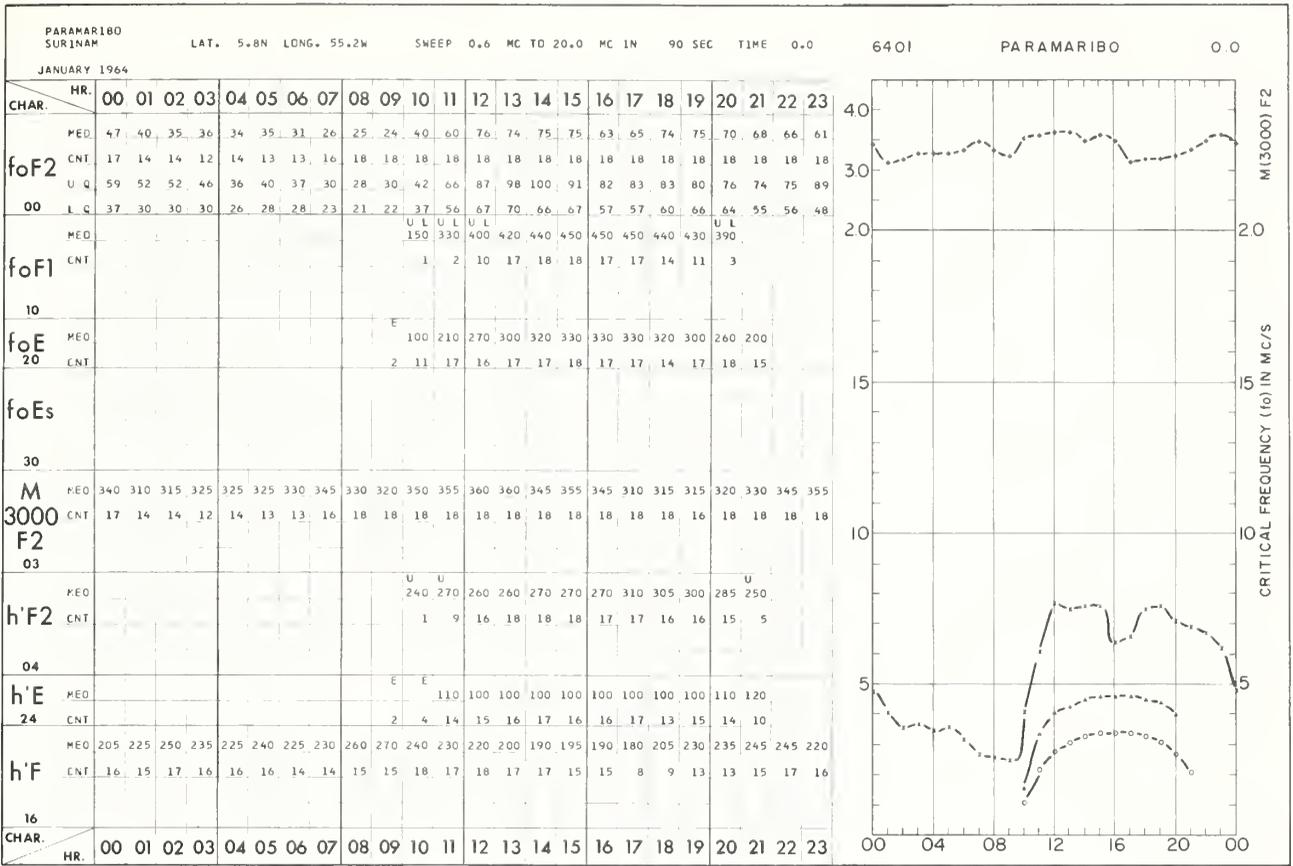


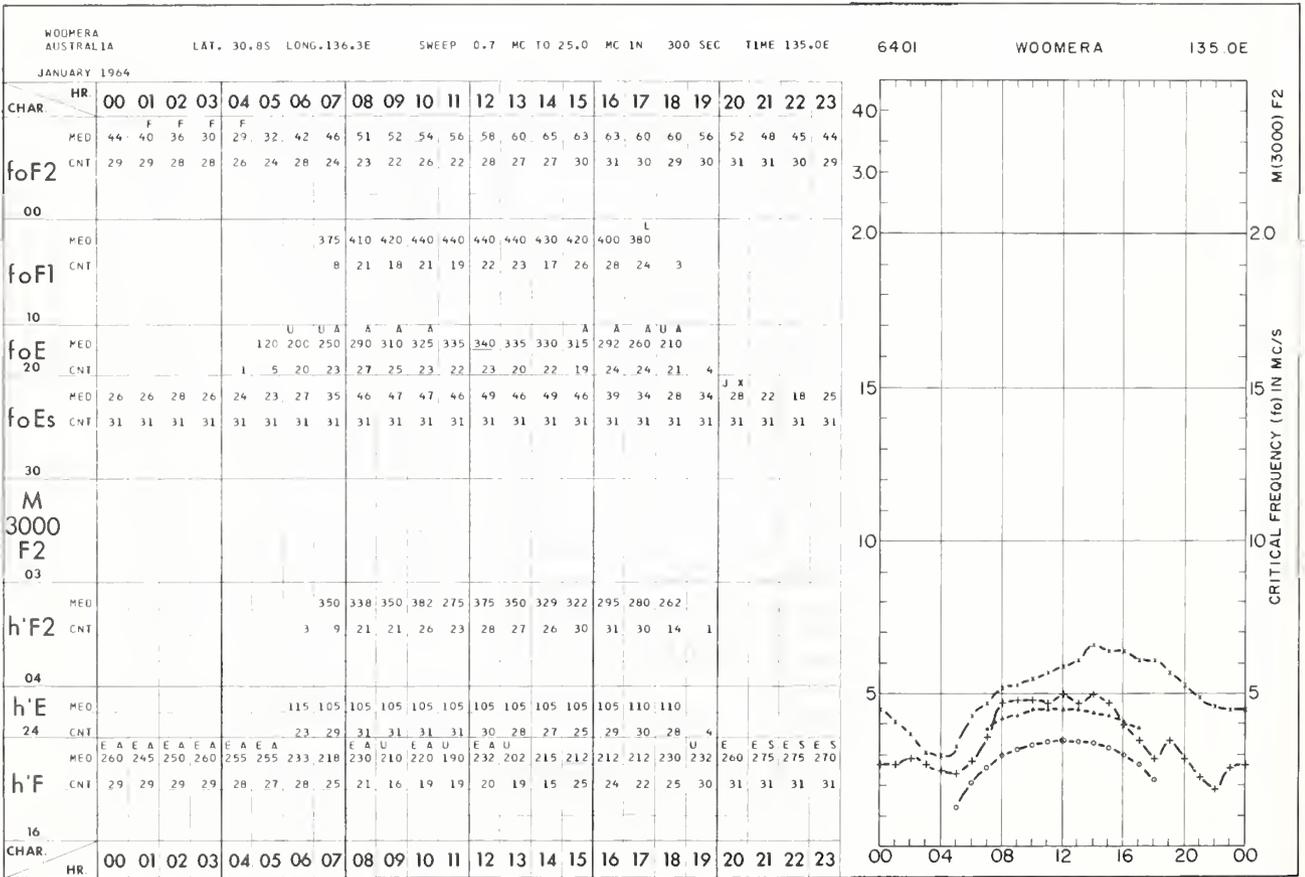
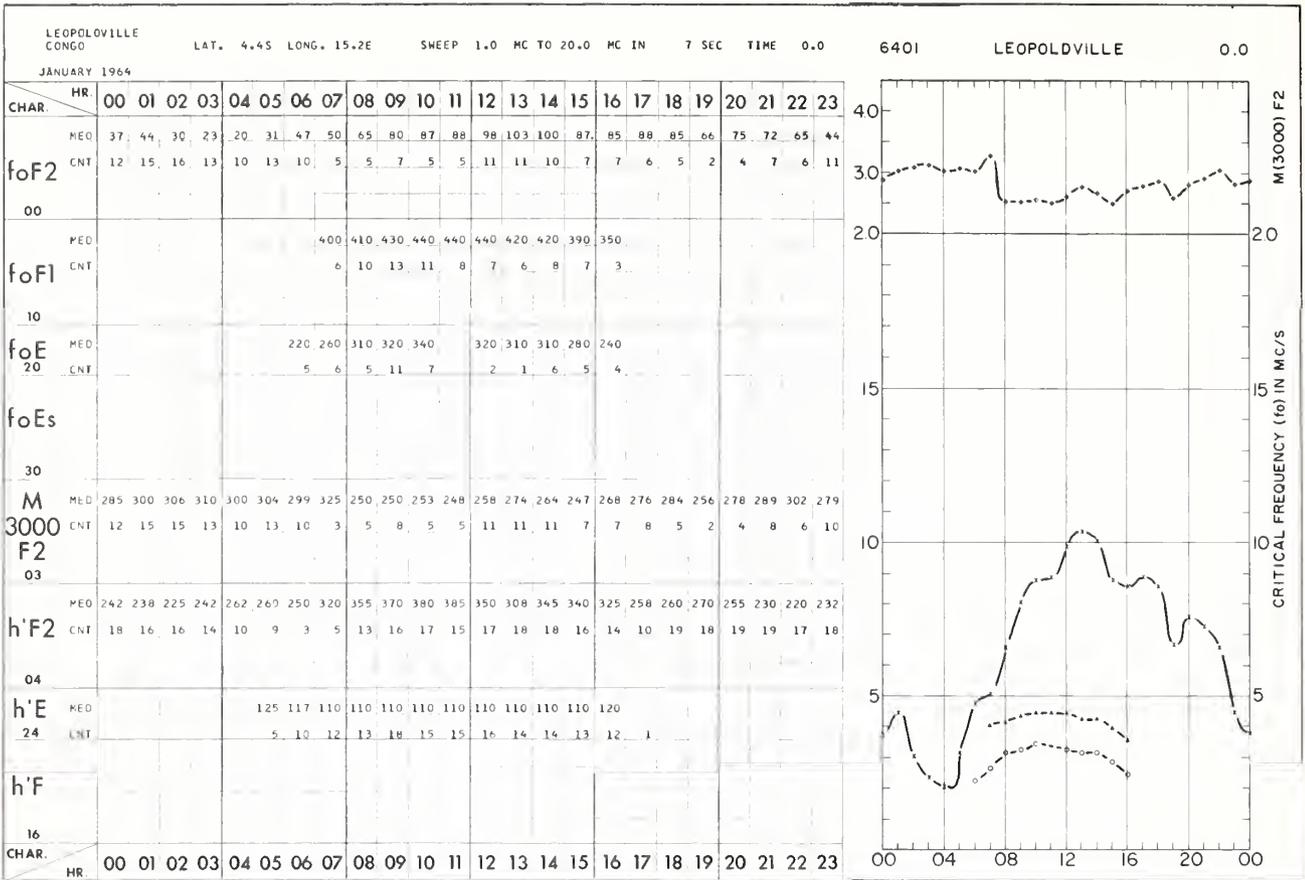
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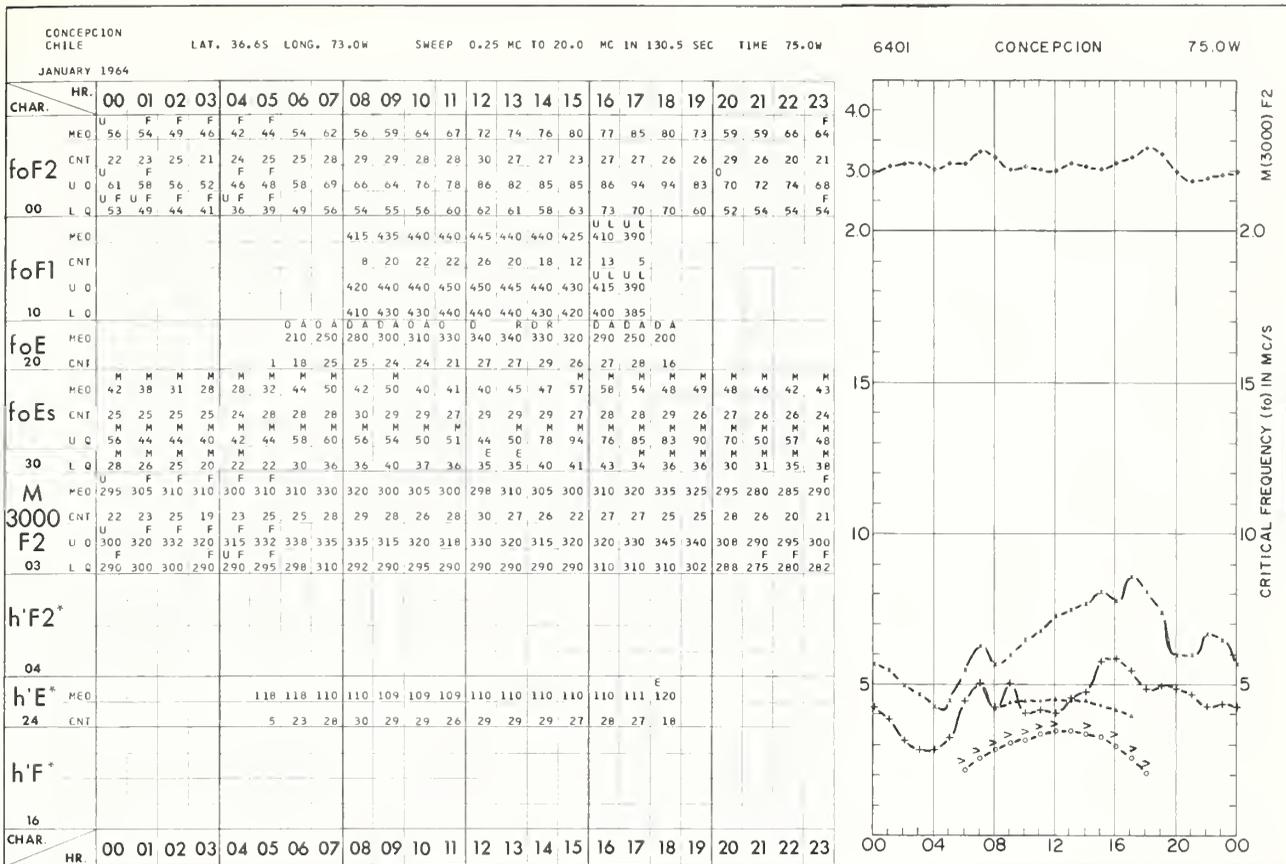


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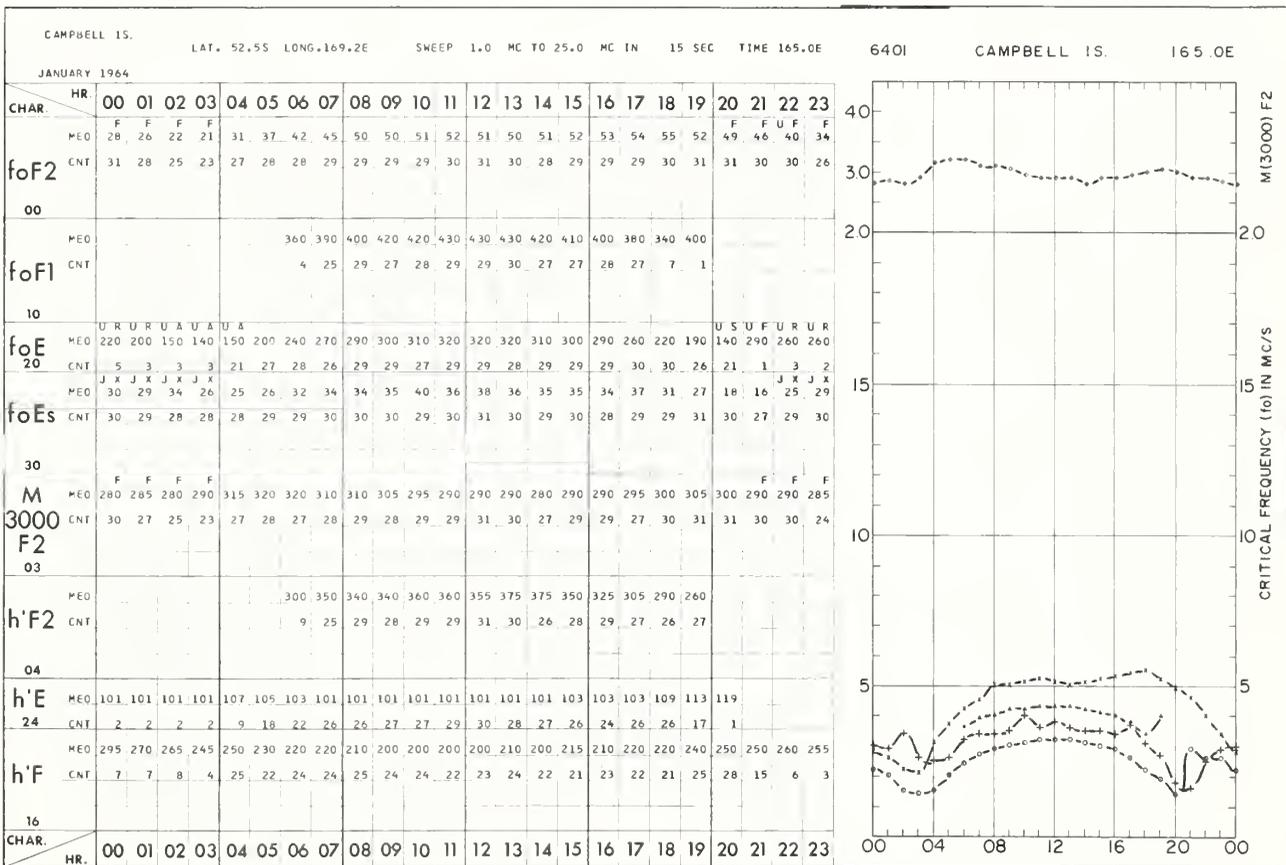


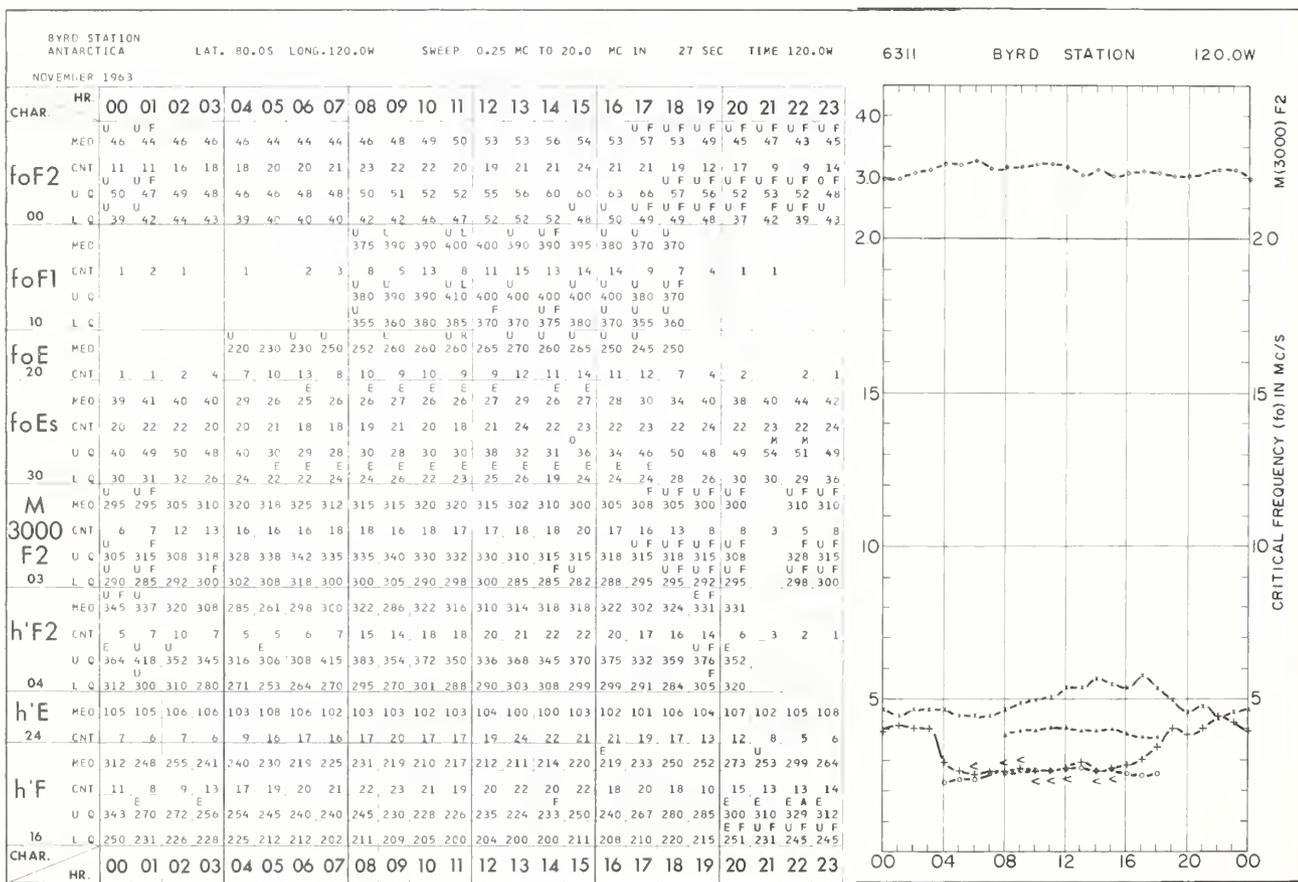
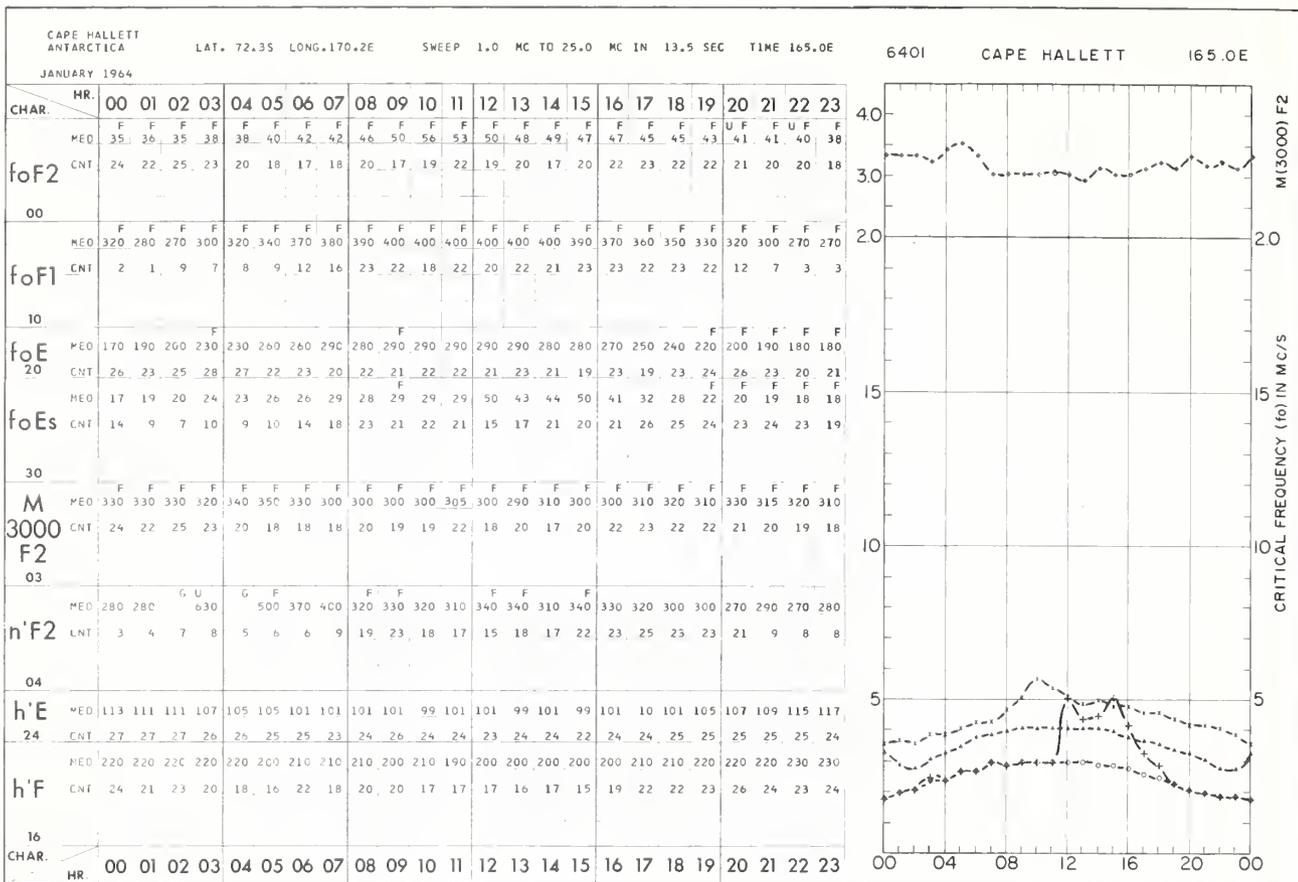


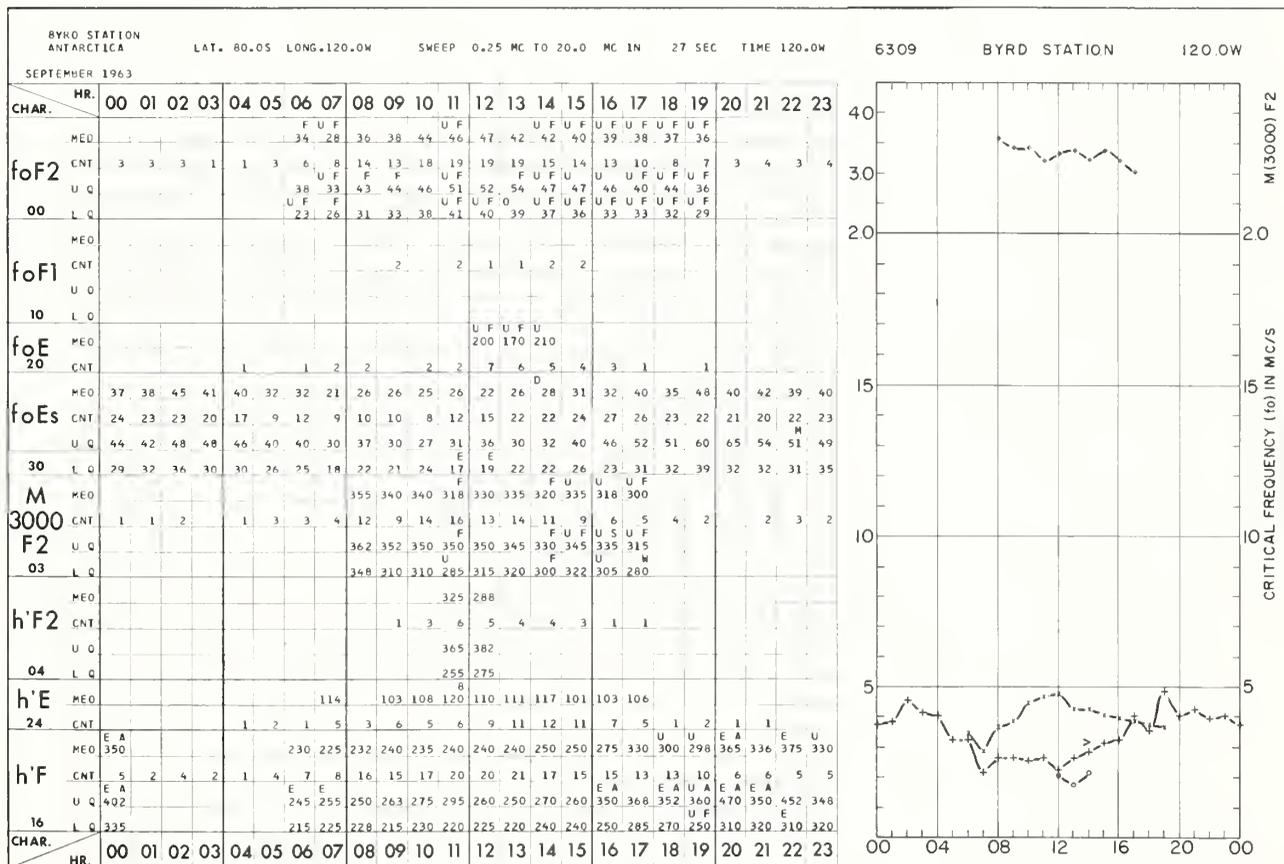
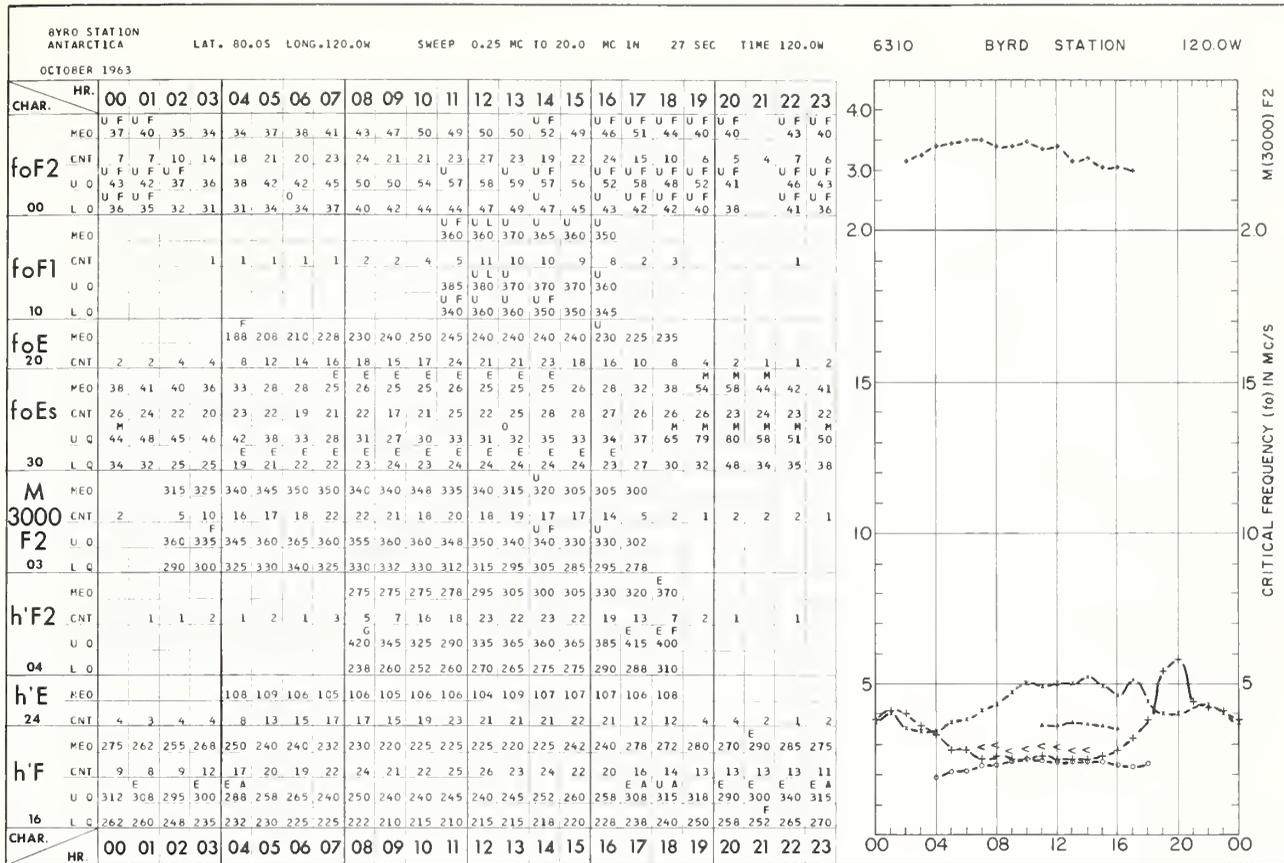


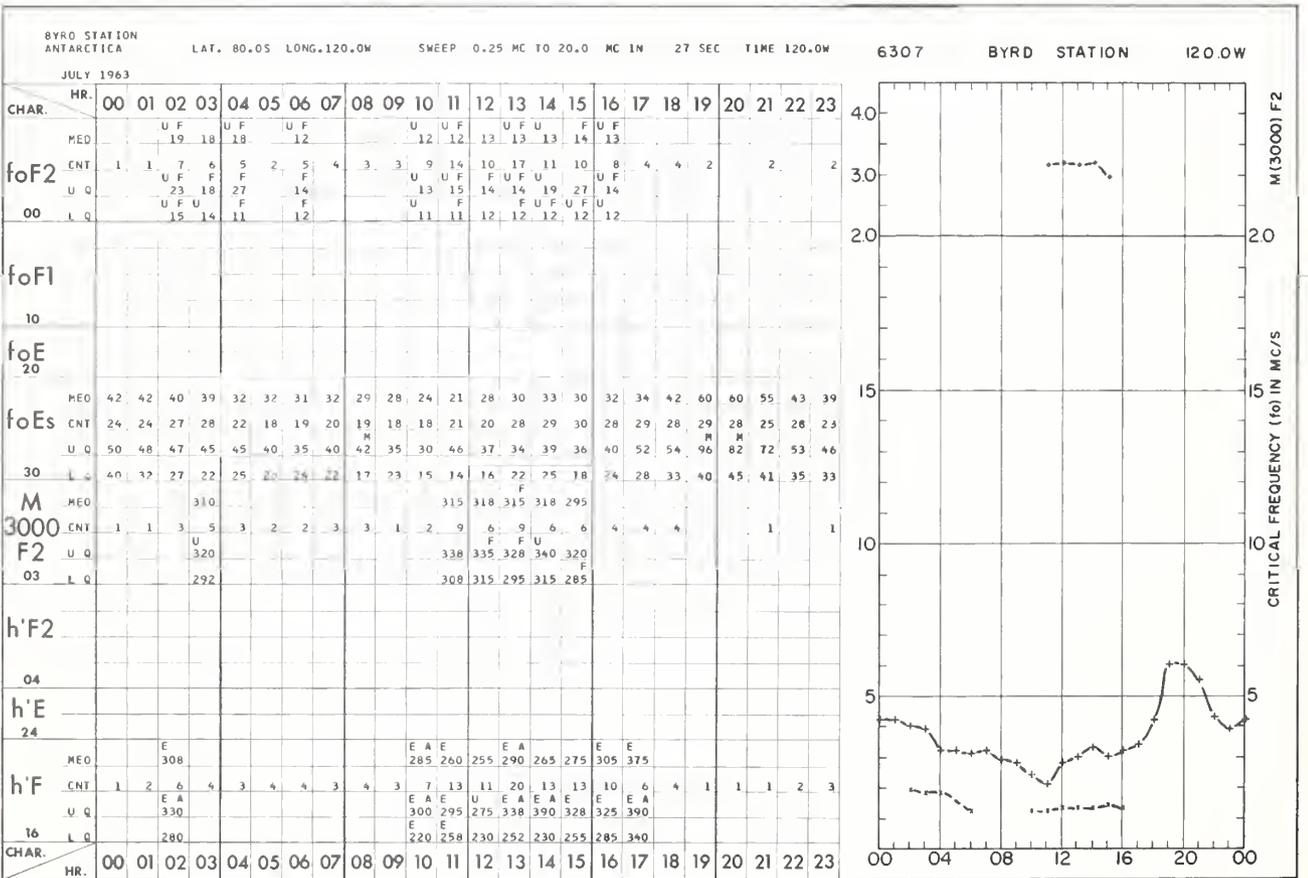
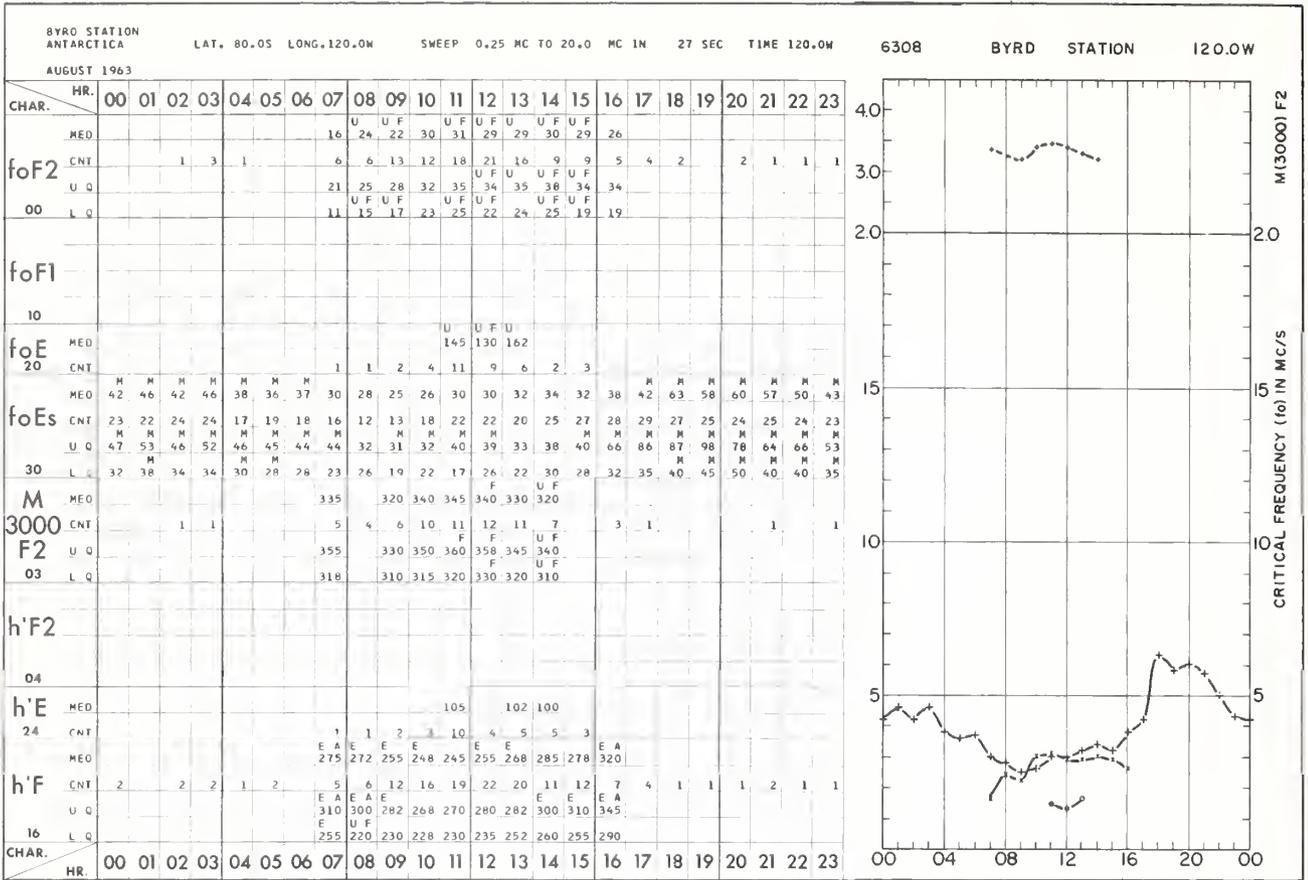


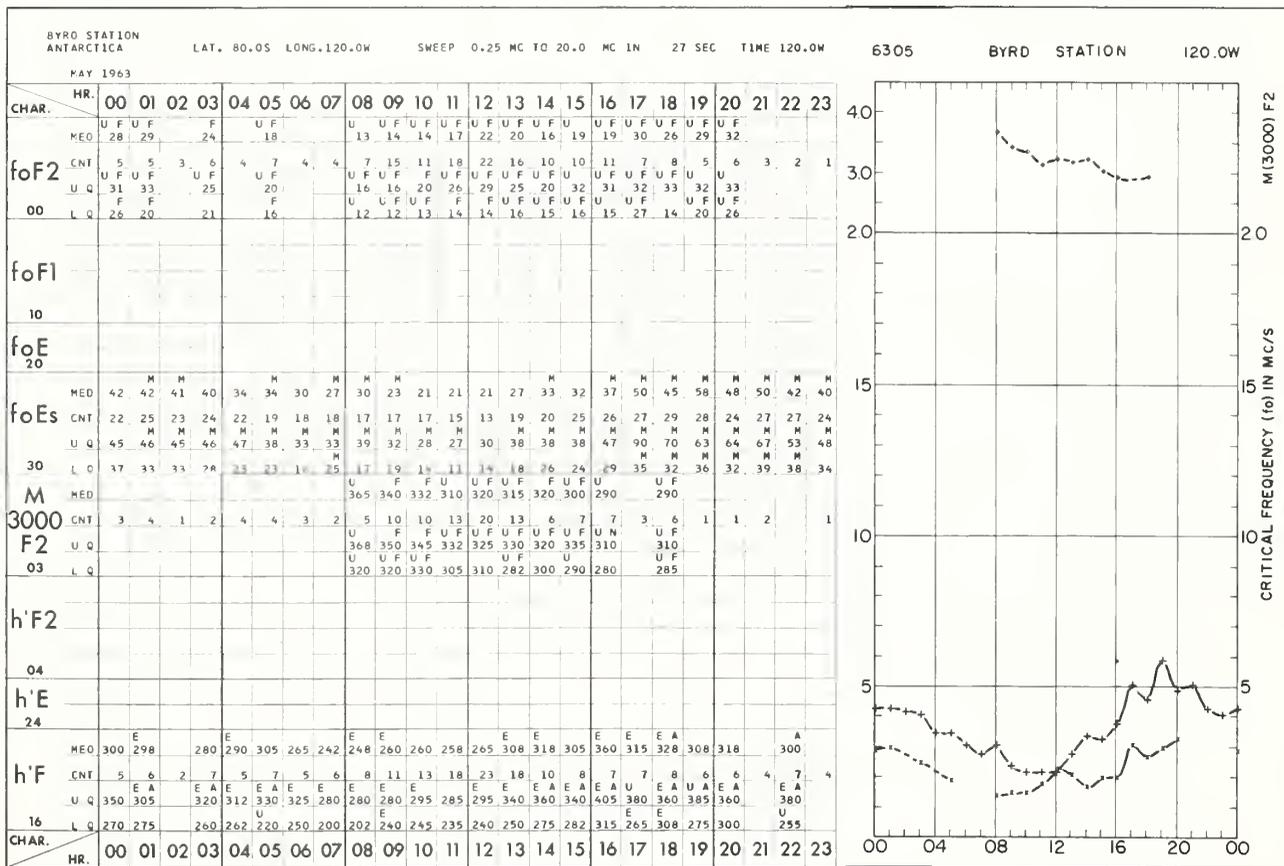
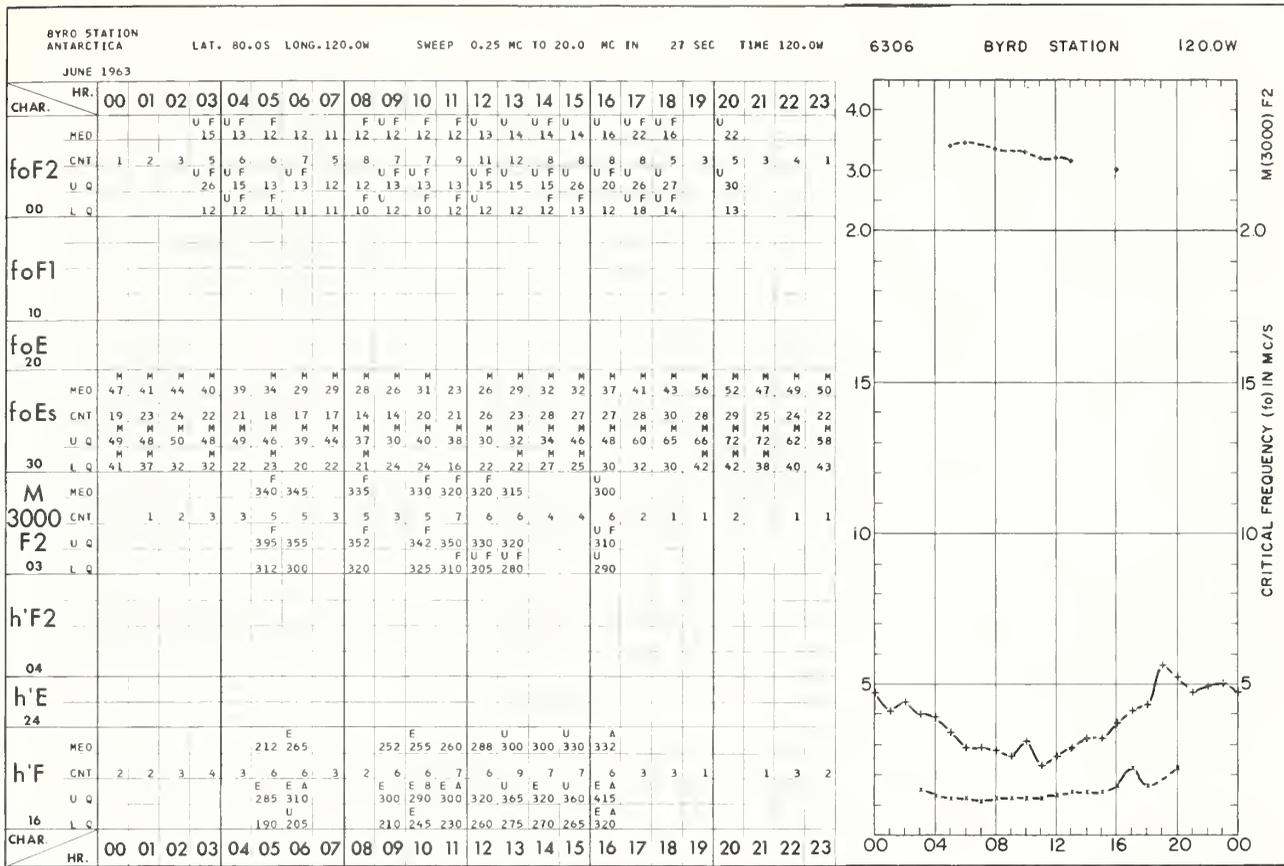
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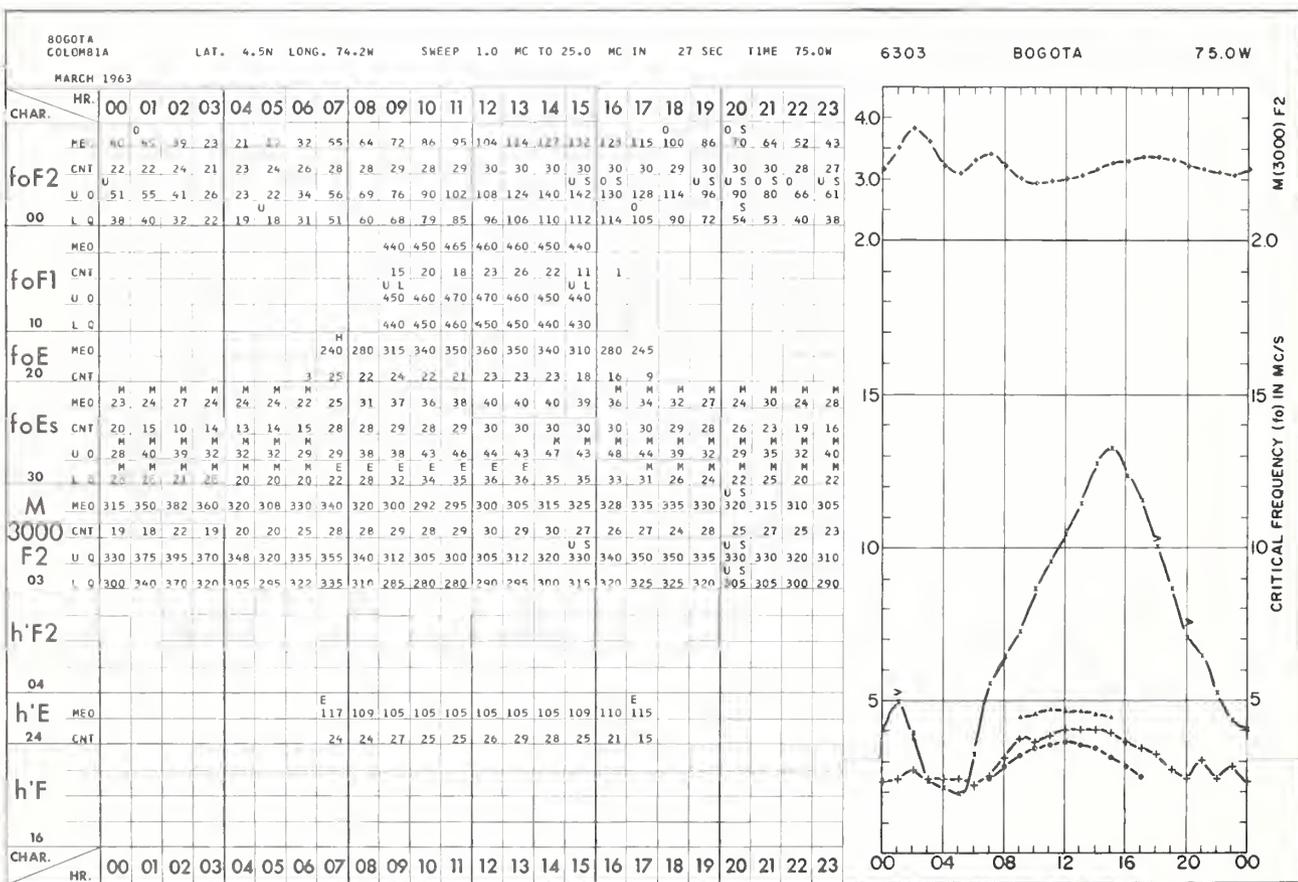
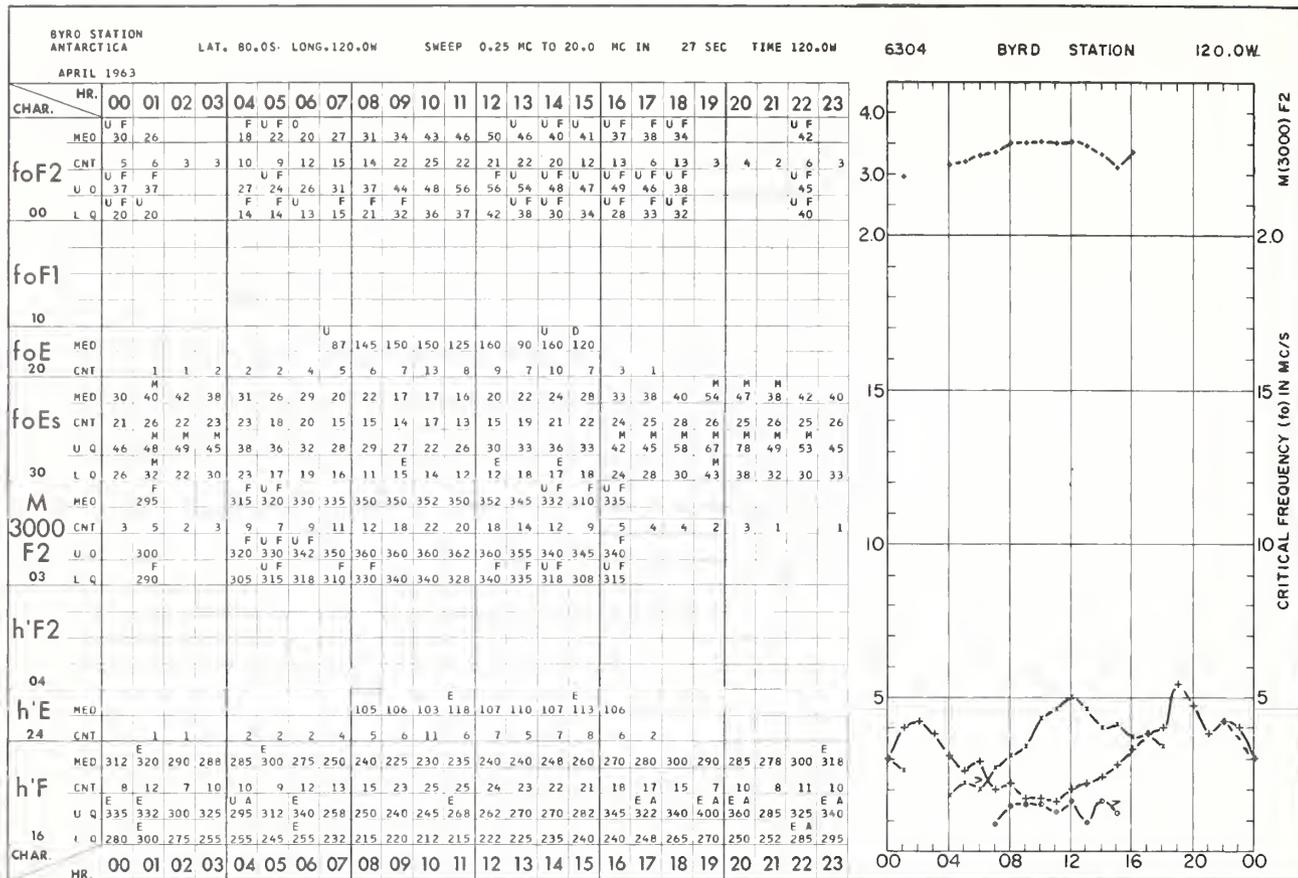


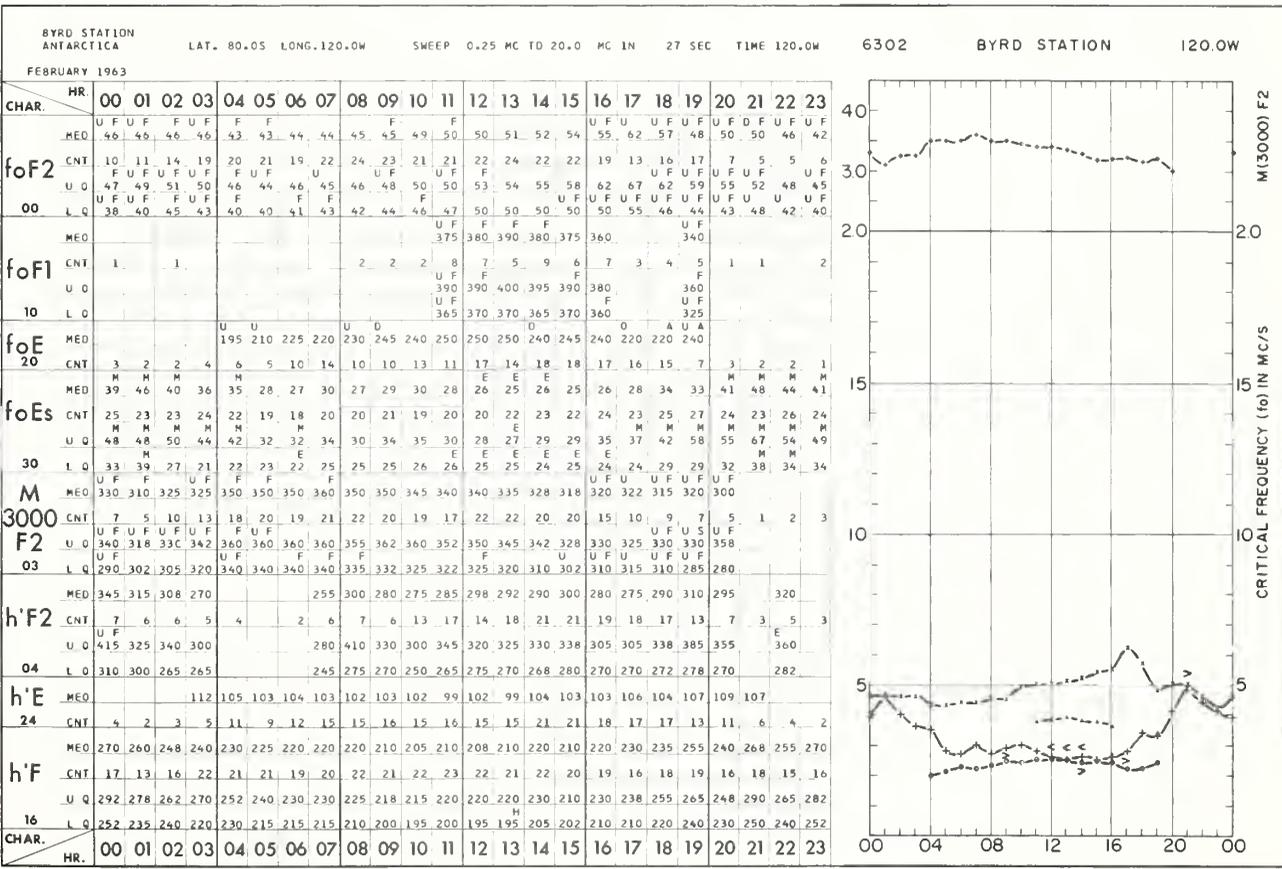
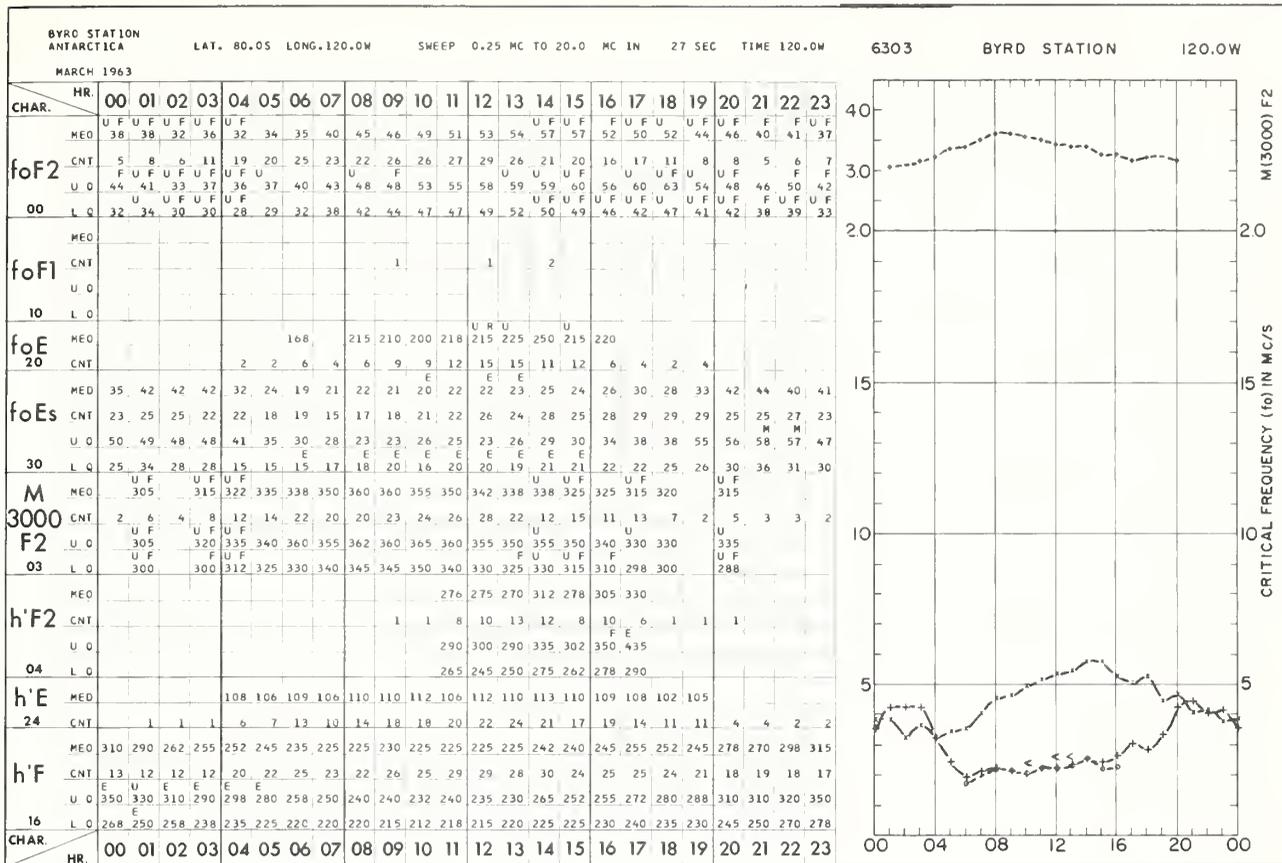


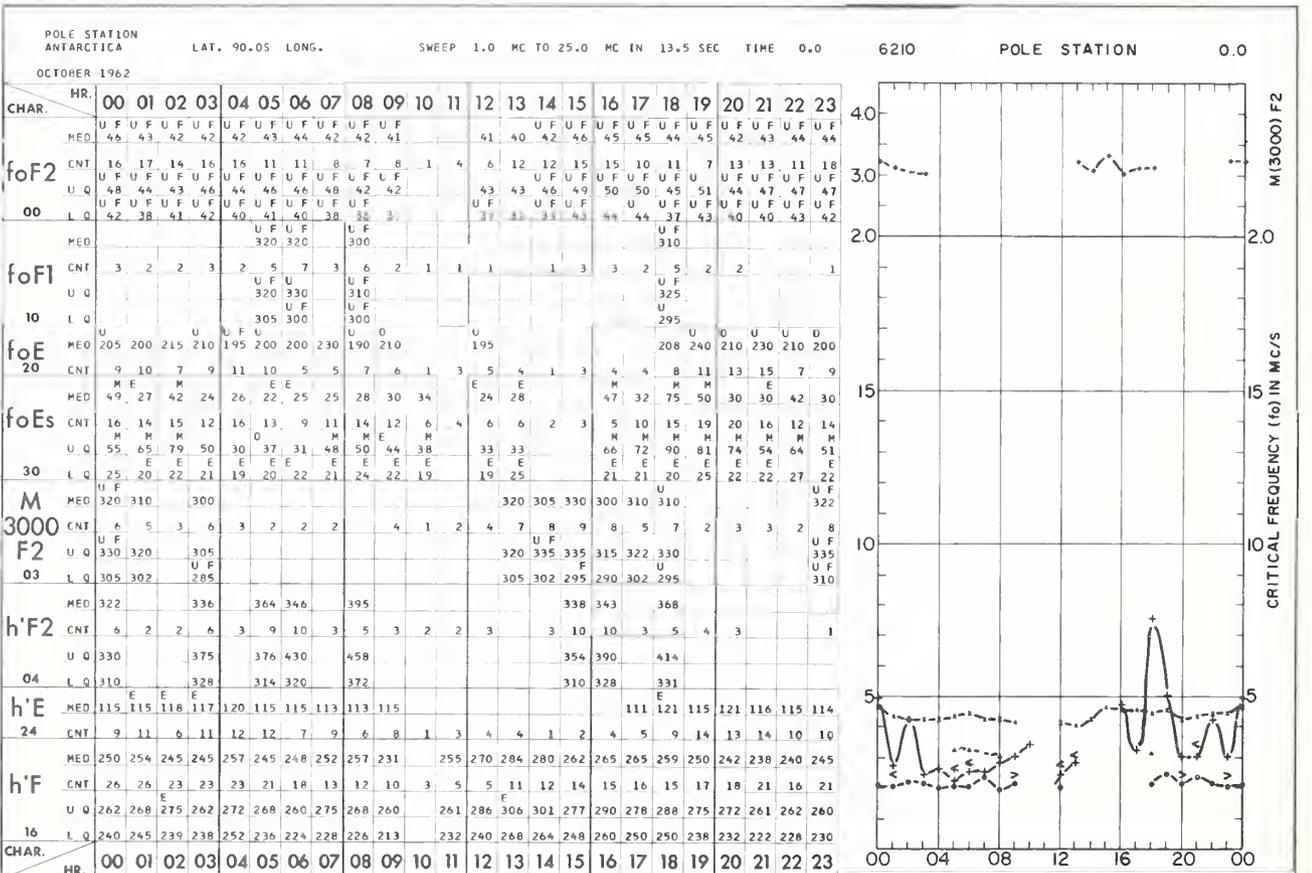
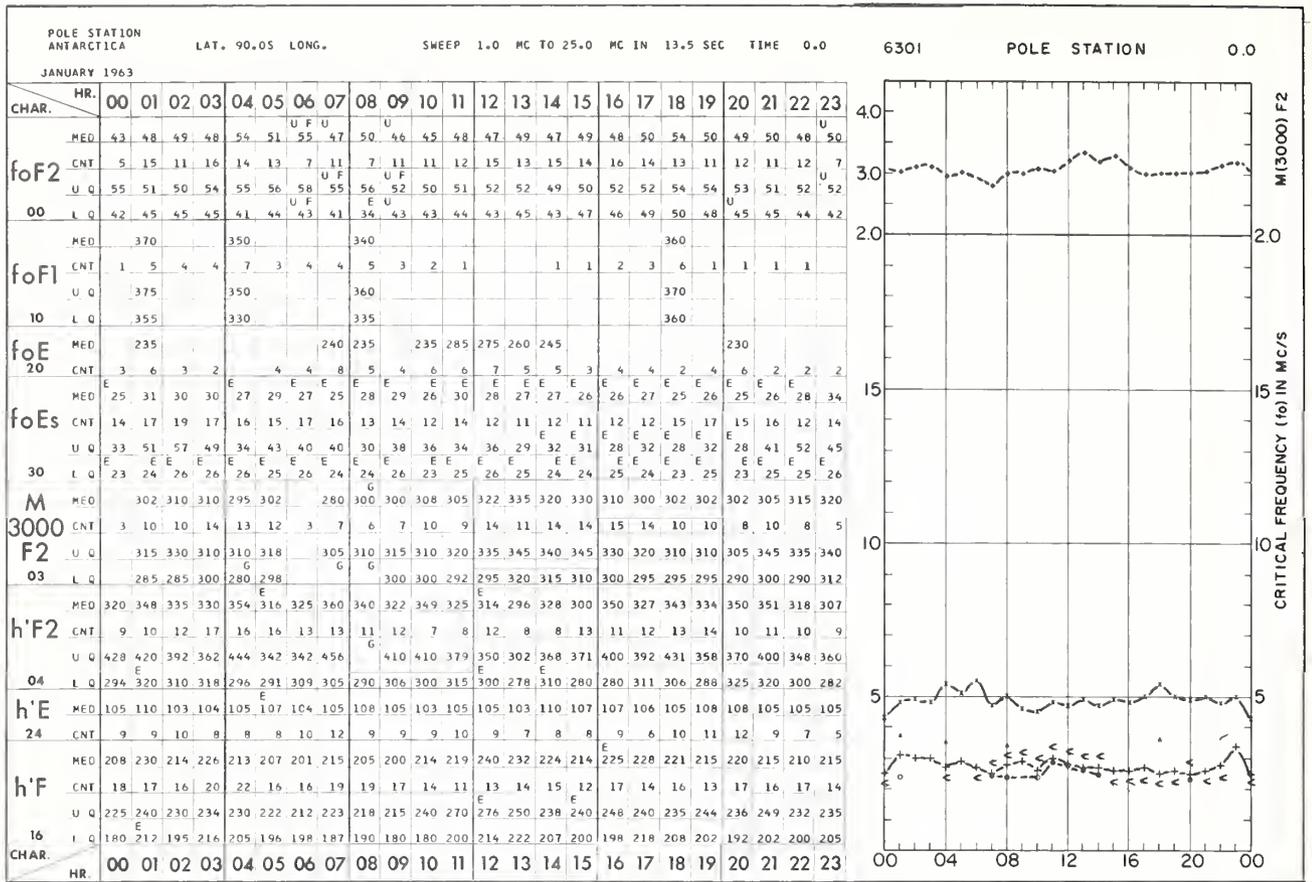


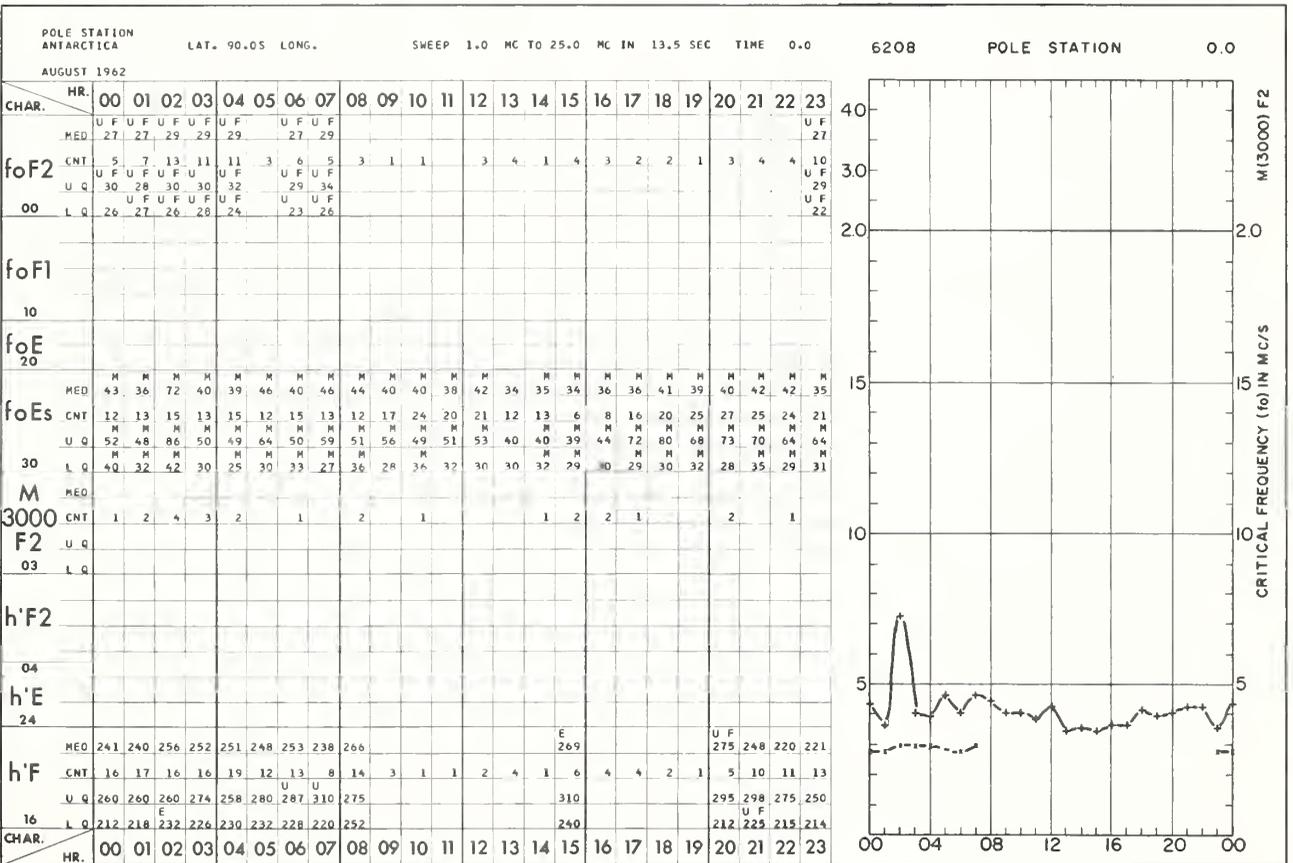
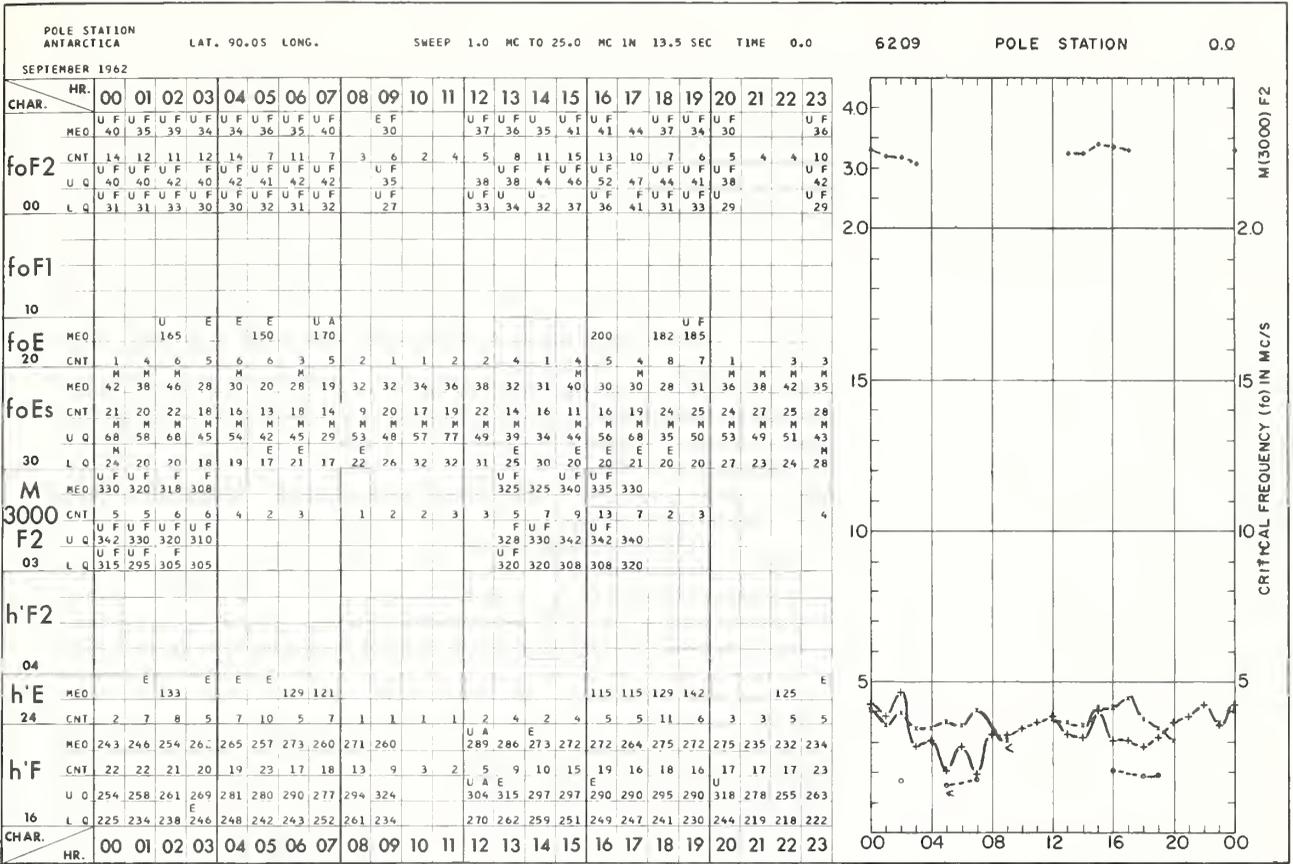


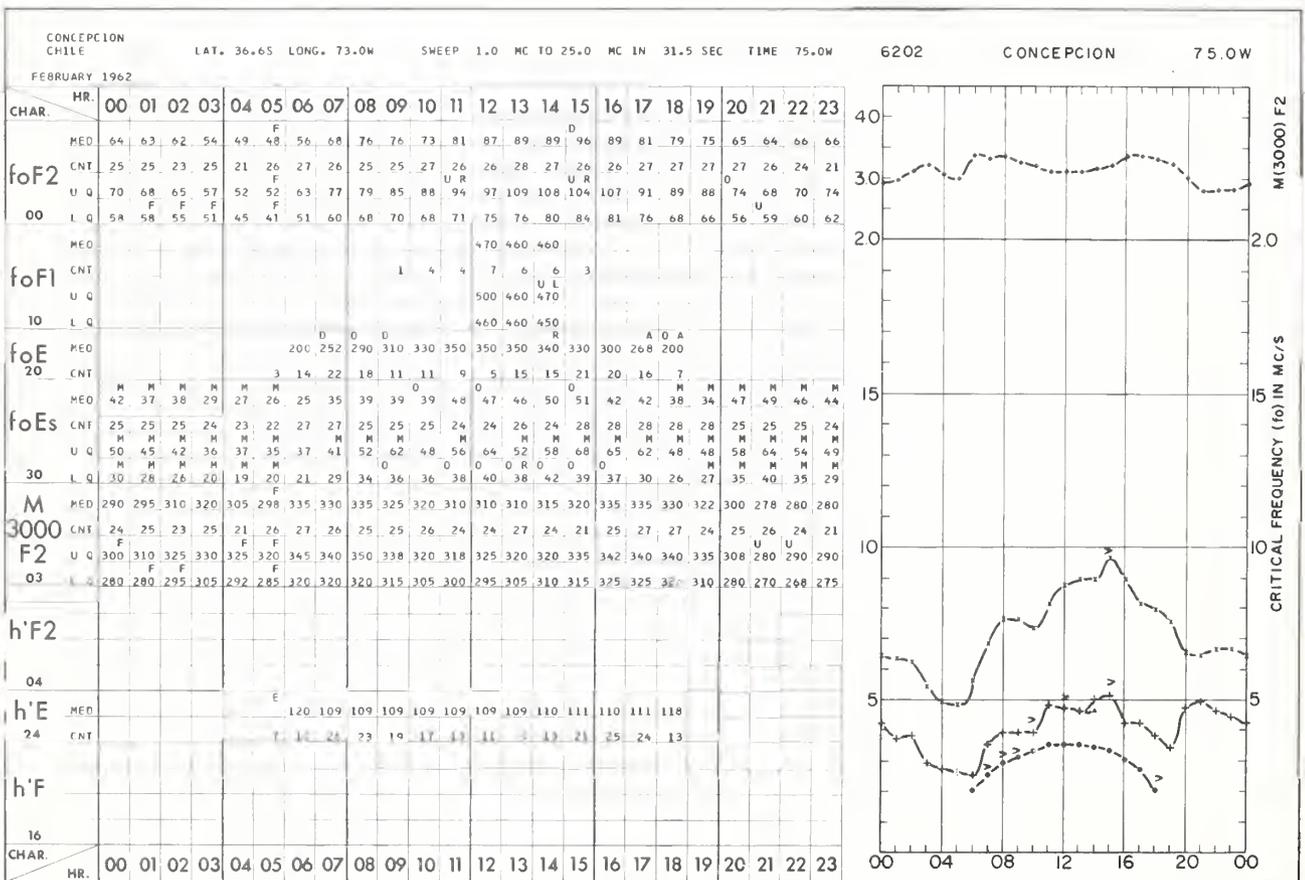
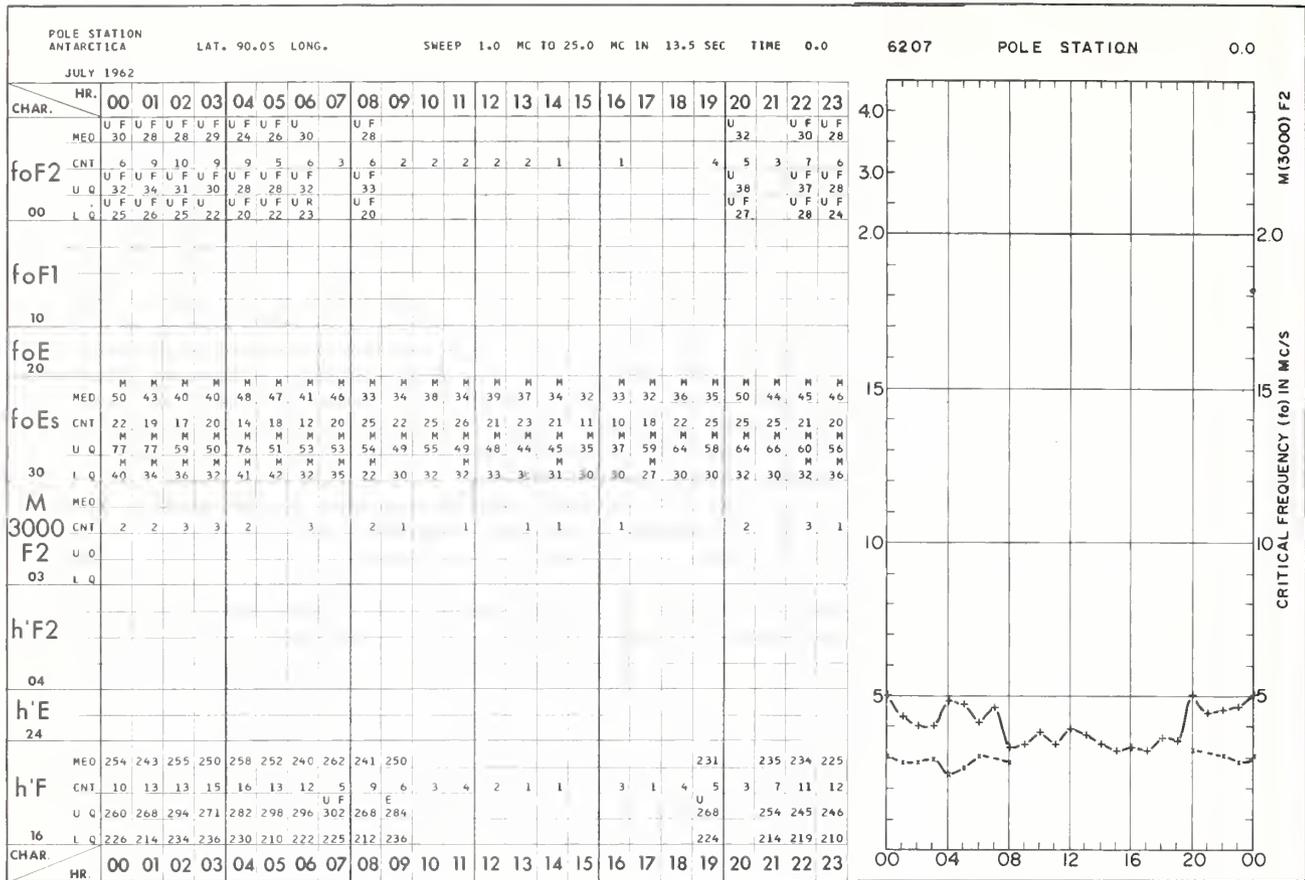












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Catalog of Data.

A catalog of records and data on file at the U.S. IGY World Data Center A for Airglow and Ionosphere, Boulder Laboratories, National Bureau of Standards, Boulder, Colorado, which includes a fee schedule to cover the cost of supplying copies, is available upon request.

CRPL-F (Part A), "Ionospheric Data."

CRPL-F (Part B), "Solar Geophysical Data."

These monthly bulletins have limited distribution and are sent, in general, only to those individuals and scientific organizations that collaborate in the exchange of ionospheric, solar, geomagnetic, or other radio propagation data of interest to the CRPL. Others may purchase copies of the same data from the U.S. IGY World Data Center A for Airglow and Ionosphere, National Bureau of Standards, Boulder, Colorado.

"Ionospheric Predictions."

This series of publications is issued monthly, three months in advance, as an aid in determining the best sky-wave frequencies for high frequency communications over any transmission path, at any time of day for average conditions for the month.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price 15 cents. Annual subscription (12 issues) \$1.50 (50 cents additional for foreign mailing).

(NOTE: Tested sets of punched cards of the predicted numerical coefficients of numerical maps of the Ionospheric Predictions, for use with electronic computers, may be purchased by arrangement with the Prediction Services Section, CRPL, Boulder Laboratories, Boulder, Colorado.)

National Bureau of Standards Handbook 90, "Handbook for CRPL Ionospheric Predictions Based on Numerical Methods of Mapping." Price 40 cents.

National Bureau of Standards Circular 462, "Ionospheric Radio Propagation." Price \$1.25.

NBS Handbook 90 and NBS Circular 462 for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.

