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Central Radio Propagation Laboratory

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IONOSPHERIC PREDICTIONS

for
December
1965

IMPORTANT
NOTICE

SEE
INTRODUCTION PAGE

TB 11-499-33/TO 31-3-28



U.S. DEPARTMENT of COMMERCE
National Bureau of Standards
Number 33/Issued September 1965

U.S. DEPARTMENT OF COMMERCE

John T. Connor, Secretary

NATIONAL BUREAU OF STANDARDS

A. V. Astin, Director

Central Radio Propagation Laboratory

Ionospheric Predictions

for December 1965

Number 33

Issued

September 1965

The CRPL Ionospheric Predictions are issued monthly as an aid in determining the best sky-wave frequencies over any transmission path, at any time of day, for average conditions for the month. Issued three months in advance, each issue provides tables

of numerical coefficients that define the functions describing the predicted worldwide distribution of f_oF_2 and $M(3000)F_2$ and maps for each even hour of universal time of $MUF(Zero)F_2$ and $MUF(4000)F_2$.

NOTE: Department of Defense personnel see back cover.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget (June 19, 1961).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price 25 cents.

Annual subscription (12 issues) \$2.50 (75 cents additional for foreign mailing).

National Bureau of Standards

The National Bureau of Standards serves as a principal focal point within the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. The Bureau is organized into four institutes as follows: The Institute for Basic Standards provides the central basis within the United States for a complete and consistent system of physical measurement; its responsibilities include administration of the National Standard Reference Data System. The Institute for Materials Research conducts a broad range of programs to provide a better understanding of the

basic properties and behavior of materials and to make available reliable quantitative data on their performance; it distributes a wide variety of carefully characterized reference materials to science and industry. The Institute for Applied Technology develops criteria for the evaluation of the performance of technological products and services, provides specialized information services to meet the needs of industry, and studies problems of technological innovation. The fourth institute, the Central Radio Propagation Laboratory, is described below.

The Central Radio Propagation Laboratory

The Central Radio Propagation Laboratory is the central agency of the Federal Government for obtaining and disseminating information on the propagation of electromagnetic waves, on the electromagnetic properties of man's environment, on the nature of electromagnetic noise and interference, and on methods for the more efficient use of the electromagnetic spectrum for telecommunication purposes. In carrying out these responsibilities, the Central Radio Propagation Laboratory:

1. Acts as the primary agency of the Federal Government for the conduct of *basic and applied research* in these fields;

2. Acts as the *central repository* for data, reports, and information in these fields;

3. *Furnishes advisory and consultative services* in these fields to industry and to other government and non-government organizations;

4. *Performs scientific liaison* with other countries to advance knowledge in these fields, including that liaison required by international responsibilities and agreements;

5. *Prepares and issues predictions* of electromagnetic wave propagation conditions, and warnings of disturbances in these conditions.

NOTICE

TRIAL PERIOD FOR POLAR MAPS EXTENDED

The trial period for the polar prediction maps has been extended six months in order to permit more time to evaluate their utility. Some favorable comments have been received, but the response has been insufficient to justify the expense and effort required to publish them. Therefore, please send your comments as soon as possible if you wish these to continue.

ANNOUNCEMENT OF PUBLICATION OF NBS MONOGRAPH 80

IONOSPHERIC RADIO PROPAGATION

By Kenneth Davies of the Central Radio Propagation Laboratory, Boulder, Colorado.

This new textbook provides an authoritative and comprehensive digest of current information on the ionosphere. Emphasis is placed on the physics of the ionosphere and theoretical developments required for an understanding of ionospheric radio propagation.

Orders, accompanied by \$2.75 remittance, should be sent to: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402.

INTRODUCTION

Tables 1 and 2, presenting predicted coefficients defining the numerical map functions for the worldwide variation of foF2 and M(3000)F2, provide the basic prediction or F2-layer propagation. With additional auxiliary information, these coefficients may be used as input data for electronic computer programs solving specific high-frequency propagation problems. The graphical maps, which are derived from the basic predictions, are provided for those unable to make use of an electronic computer. Instructions for use of these maps, figures 1 through 24, may be found in National Bureau of Standards Handbook 90, "Handbook for CRPL Ionospheric Predictions Based on Numerical Methods of Mapping," which also includes required additional data, nomographs and graphical aids, and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C., 20402, price 40 cents. The predicted sunspot number used for this month is shown in table A, which also lists previous observed and predicted Zurich smoothed relative sunspot numbers. Figure A shows the recent trend of solar activity, with both predicted and observed Zurich smoothed relative sunspot numbers.

The basic numerical mapping equations, their interpretation, and methods of using numerical maps are described in papers by W. B. Jones and R. M. Gallet, "The Representation of Diurnal and Geographic Variations of Ionospheric Data by Numerical Mapping," vol. 66D, No. 4, July-Aug. 1962, pages 419-438, and "Methods for Applying Numerical Maps of Ionospheric Characteristics," vol. 66D, No. 6, Nov.-Dec. 1962, pages 649-662, both in the Journal of Research of the National Bureau of Standards, Section D, Radio Propagation. The predicted numerical map coefficients of tables 1 and 2 may be purchased in the form of a tested set of punched cards. Write to the Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado, 80301, to arrange for

purchase of the punched cards, and for information and advice on the application of computer methods and numerical prediction maps to specific propagation problems.

Members of the U.S. Army, Navy, or Air Force desiring Handbook 90 and the monthly issues of Ionospheric Prediction should send requests to the proper service address; for Navy: The Director, Naval Communications, Department of the Navy, Washington, D.C., 20350; for Air Force: Directorate of Command Control and Communications, Headquarters, United States Air Force, Washington, D.C., 20330. ATTN: AFOCCAA. Army personnel should requisition these through normal publication channels, and should refer to Handbook 90 as TM 11-499 and to the monthly ionospheric predictions as TB 11-499-(), with the serial number of the desired monthly predictions booklet inserted in the parenthesis. (For example, for Ionospheric Predictions Number 33, issued September 1965 and containing predictions for December 1965, the Army number would be TB 11-499-(33).)

Information on the physics of the ionosphere and the theory of radio wave propagation, including such problems as absorption, field intensity, etc., may be found in National Bureau of Standards Monograph 80, "Ionospheric Radio Propagation," by Kenneth Davies, which may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, price \$2.75. Additional information on radio noise may be found in C.C.I.R. Report Number 322, "Revision of Atmospheric Noise Data," International Telecommunications Union, Geneva, 1964.

Reports to this Laboratory of experience with these predictions would be appreciated. Correspondence should be addressed to the Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado, 80301.

Table A

Observed and Predicted Zurich Smoothed Relative
Sunspot Numbers

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1954	6 (14)	6 (12)	4 (11)	3 (10)	4 (10)	4 (9)	5 (8)	7 (8)	8 (8)	8 (10)	10 (10)	12 (11)
1955	14 (12)	16 (14)	20 (14)	23 (13)	29 (16)	35 (18)	40 (22)	46 (27)	55 (30)	64 (31)	73 (35)	81 (42)
1956	89 (48)	98 (53)	109 (60)	119 (68)	127 (77)	137 (89)	146 (95)	150 (105)	151 (119)	156 (135)	160 (147)	164 (150)
1957	170 (150)	172 (150)	174 (150)	181 (150)	186 (150)	188 (150)	191 (150)	194 (150)	197 (150)	200 (150)	201 (150)	200 (150)
1958	199 (150)	201 (150)	201 (150)	197 (150)	191 (150)	187 (150)	185 (150)	185 (150)	184 (150)	182 (150)	181 (150)	180 (150)
1959	179 (150)	177 (150)	174 (150)	169 (150)	165 (146)	161 (143)	156 (141)	151 (142)	146 (141)	141 (139)	137 (137)	132 (137)
1960	129 (136)	125 (135)	122 (133)	120 (130)	117 (125)	114 (120)	109 (118)	102 (115)	98 (110)	93 (108)	88 (105)	84 (100)
1961	80 (100)	75 (90)	69 (90)	64 (90)	60 (85)	56 (85)	53 (80)	52 (75)	52 (70)	51 (70)	50 (65)	49 (60)
1962	45 (60)	42 (50)	40 (48)	39 (45)	39 (42)	38 (37)	37 (34)	35 (31)	33 (29)	31 (28)	30 (27)	30 (34)
1963	29 (31)	30 (28)	30 (26)	29 (25)	29 (25)	28 (25)	28 (23)	27 (21)	27 (20)	26 (18)	24 (18)	21 (17)
1964	20 (17)	18 (17)	15 (17)	13 (17)	11 (17)	10 (17)	10 (17)	10 (17)	10 (17.5)	10 (17.3)	10 (17.0)	11 (17.0)
1965	(15.0)	(16.0)	(16.0)	(16.0)	(15.0)	(17.0)	(21.0)	(28.9)	(22.0)	(22.0)	(26.0)	(29.0)*
1966												

Note: Final numbers are listed through June 1964, the succeeding values being based on provisional data. The predicted numbers are in parentheses.

* Number used for predictions in this issue.

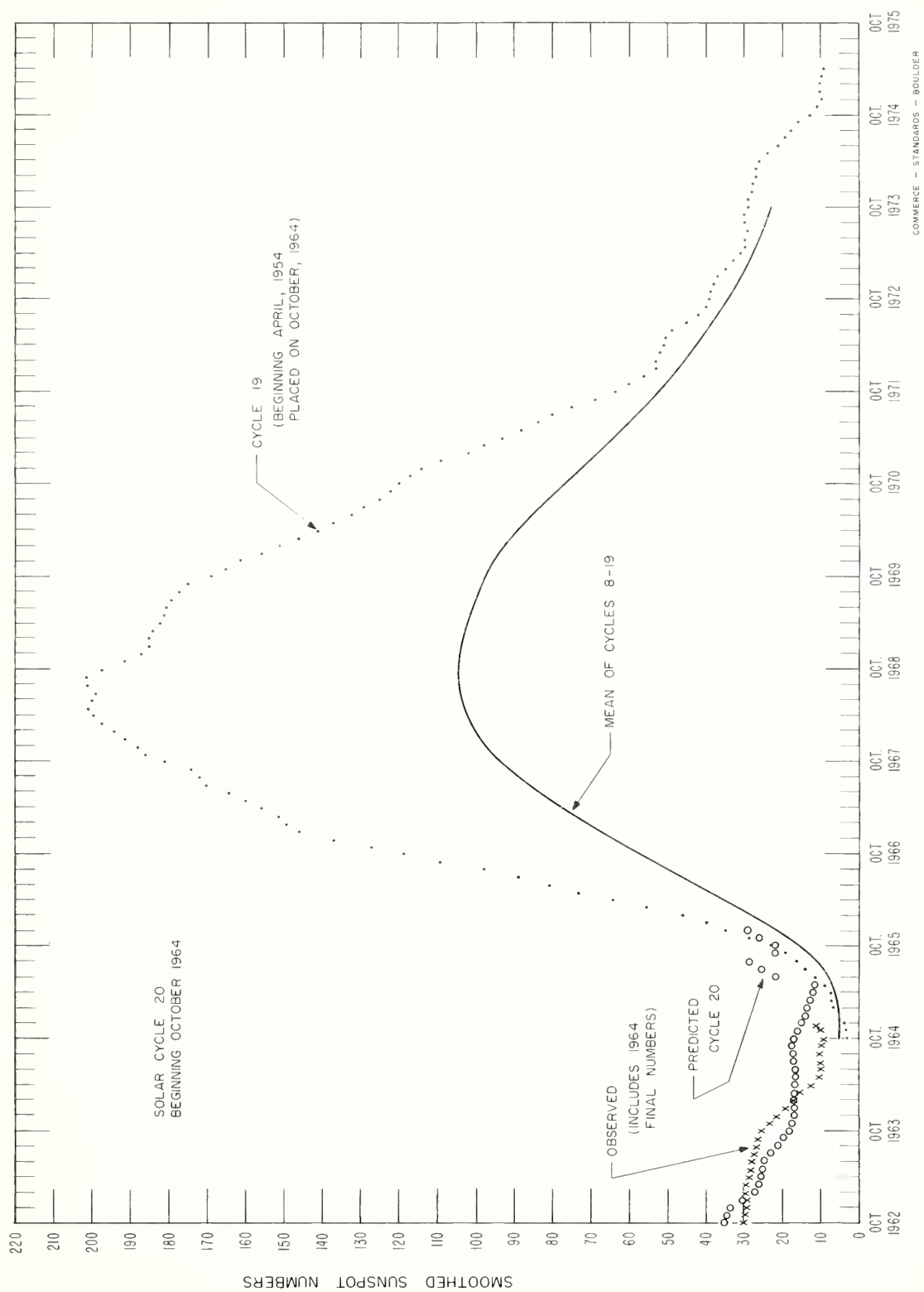


FIG. A PREDICTED AND OBSERVED SUNSPOT NUMBERS

TABLE I

TIME VARIATION

Harmonic	0		1		2		3		4		5		6		7		8	
	K	S	K	S	K	S	K	S	K	S	K	S	K	S	K	S	K	S
I	0	7.1654524+000	1.9272244+000	1.8470676+000	-6.4318023+001	2.4417016+001	-1.3264170+001	-4.8568493+001	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000
	1	-2.7457674+000	-1.4774336+000	7.4362854+001	-4.2132724+000	-5.3071534+001	-1.3264170+001	-4.8568493+001	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000
	2	5.7874769+000	-1.4832595+001	6.9415224+000	4.2132724+000	-5.3071534+001	-1.3264170+001	-4.8568493+001	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000	-1.3961431+001	-1.5539994+000
	3	-1.5539994+000	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001	-2.2814776+001	1.9389346+001
	4	-9.3849433+001	-5.5511244+001	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001	-1.5024282+000	-3.0012512+001
	5	-7.6850277+000	-1.5351186+001	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001	-7.6850277+000	-1.5351186+001
	6	3.7621263+002	2.7032370+002	3.0705731+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002	7.7221639+001	1.4954474+002
	7	-5.2396688+002	-1.8894000+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002	-5.2396688+002	-1.8894000+002
	8	-1.8685575+002	-2.5990344+002	-3.1849759+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002	-6.7300548+001	-1.8778170+002
	9	1.7574975+002	6.4049492+001	-2.6816402+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002	-6.2530110+002	1.2675877+002
	10	7.2394943+001	9.0451400+001	1.1485741+002	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001	2.2241485+001	6.7090009+001
	11	-1.0151654+002	-2.4815548+000	1.1358254+002	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001	5.5110544+001	-3.0654027+001
II	13	-1.6663824+002	-1.0404448+001	-5.8230219+002	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001	6.3624048+003	1.5596734+001
	14	-1.0664915+001	-2.4582492+002	-1.5861901+001	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002
	15	-4.2131314+001	-1.6204400+000	-1.5861901+001	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002	1.8264796+001	-4.9481692+002
	16	-2.6340342+000	3.5208460+001	-2.2424387+001	-3.5208460+001	3.5208460+001	-2.2424387+001	-3.5208460+001	3.5208460+001	-2.2424387+001	-3.5208460+001	3.5208460+001	-2.2424387+001	-3.5208460+001	3.5208460+001	-2.2424387+001	-3.5208460+001	3.5208460+001
	17	-3.0204233+001	5.3044233+001	-2.5653474+000	-5.3044233+001	5.3044233+001	-2.5653474+000	-5.3044233+001	5.3044233+001	-2.5653474+000	-5.3044233+001	5.3044233+001	-2.5653474+000	-5.3044233+001	5.3044233+001	-2.5653474+000	-5.3044233+001	5.3044233+001
	18	-2.2374904+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001	3.4061534+001	-1.1229291+001
	19	-3.4826594+001	3.3202435+001	5.1248427+001	2.8173445+001	2.9150336+000	5.1248427+001	2.8173445+001	2.9150336+000	5.1248427+001	2.8173445+001	2.9150336+000	5.1248427+001	2.8173445+001	2.9150336+000	5.1248427+001	2.8173445+001	2.9150336+000
	20	6.4526594+001	1.8182516+001	3.7743010+001	-1.2201204+001	5.7012005+000	3.7743010+001	-1.2201204+001	5.7012005+000	3.7743010+001	-1.2201204+001	5.7012005+000	3.7743010+001	-1.2201204+001	5.7012005+000	3.7743010+001	-1.2201204+001	5.7012005+000
	21	-3.5394712+001	-1.5901311+002	9.7354564+001	-3.2452466+001	-7.7831045+001	-1.5901311+002	9.7354564+001	-3.2452466+001	-7.7831045+001	-1.5901311+002	9.7354564+001	-3.2452466+001	-7.7831045+001	-1.5901311+002	9.7354564+001	-3.2452466+001	-7.7831045+001
	22	-2.1500326+002	-1.4549486+002	-3.9768087+001	-1.4614709+001	-3.1214263+001	-1.4549486+002	-3.9768087+001	-1.4614709+001	-3.1214263+001	-1.4549486+002	-3.9768087+001	-1.4614709+001	-3.1214263+001	-1.4549486+002	-3.9768087+001	-1.4614709+001	-3.1214263+001
	23	-3.5350137+002	-1.7268494+002	-2.4382132+002	-1.1085009+002	-1.1695950+002	-3.5350137+002	-1.7268494+002	-2.4382132+002	-1.1085009+002	-1.1695950+002	-3.5350137+002	-1.7268494+002	-2.4382132+002	-1.1085009+002	-1.1695950+002	-3.5350137+002	-1.7268494+002
	24	-1.4614611+002	6.0057245+002	-5.6865600+001	1.4631402+002	3.3817762+002	-1.4614611+002	6.0057245+002	-5.6865600+001	1.4631402+002	3.3817762+002	-1.4614611+002	6.0057245+002	-5.6865600+001	1.4631402+002	3.3817762+002	-1.4614611+002	6.0057245+002
25	9.8994506+002	3.4845411+002	6.2641552+001	-1.4839567+001	6.2641552+001	3.4845411+002	6.2641552+001	-1.4839567+001	6.2641552+001	3.4845411+002	6.2641552+001	-1.4839567+001	6.2641552+001	3.4845411+002	6.2641552+001	-1.4839567+001	6.2641552+001	
26	5.1450516+002	3.0431041+002	4.3716153+002	1.4020256+002	2.6571300+002	5.1450516+002	3.0431041+002	4.3716153+002	1.4020256+002	2.6571300+002	5.1450516+002	3.0431041+002	4.3716153+002	1.4020256+002	2.6571300+002	5.1450516+002	3.0431041+002	
27	-2.5194477+002	-1.7691322+003	-7.6295689+001	-2.5194477+002	-1.7691322+003	-7.6295689+001	-2.5194477+002	-1.7691322+003	-7.6295689+001	-2.5194477+002	-1.7691322+003	-7.6295689+001	-2.5194477+002	-1.7691322+003	-7.6295689+001	-2.5194477+002	-1.7691322+003	
28	-1.7974837+003	-3.7132208+001	-3.7132208+001	-1.7974837+003	-3.7132208+001	-3.7132208+001	-1.7974837+003	-3.7132208+001	-3.7132208+001	-1.7974837+003	-3.7132208+001	-3.7132208+001	-1.7974837+003	-3.7132208+001	-3.7132208+001	-1.7974837+003	-3.7132208+001	
29	-5.425517+002	-2.774466+002	-3.3337611+002	-4.4884840+002	2.6075284+002	-5.425517+002	-2.774466+002	-3.3337611+002	-4.4884840+002	2.6075284+002	-5.425517+002	-2.774466+002	-3.3337611+002	-4.4884840+002	2.6075284+002	-5.425517+002	-2.774466+002	
30	-9.9531264+002	-2.3415763+002	-1.2111495+002	-4.8054617+002	2.6589157+002	-9.9531264+002	-2.3415763+002	-1.2111495+002	-4.8054617+002	2.6589157+002	-9.9531264+002	-2.3415763+002	-1.2111495+002	-4.8054617+002	2.6589157+002	-9.9531264+002	-2.3415763+002	
31	1.5500228+003	1.5125243+002	4.8021017+000	5.3529940+002	6.4173264+002	1.5500228+003	1.5125243+002	4.8021017+000	5.3529940+002	6.4173264+002	1.5500228+003	1.5125243+002	4.8021017+000	5.3529940+002	6.4173264+002	1.5500228+003	1.5125243+002	
32	-2.1050428+002	1.4660481+002	-8.4138422+001	4.6170973+001	7.3999112+000	-2.1050428+002	1.4660481+002	-8.4138422+001	4.6170973+001	7.3999112+000	-2.1050428+002	1.4660481+002	-8.4138422+001	4.6170973+001	7.3999112+000	-2.1050428+002	1.4660481+002	
33	2.5025028+002	2.0053167+001	2.0053167+001	2.5025028+002	2.0053167+001	2.0053167+001	2.5025028+002	2.0053167+001	2.0053167+001	2.5025028+002	2.0053167+001	2.0053167+001	2.5025028+002	2.0053167+001	2.0053167+001	2.5025028+002	2.0053167+001	
34	-5.1174610+002	-6.0531324+002	-1.5266638+002	-2.0721835+002	-2.2866496+002	-5.1174610+002	-6.0531324+002	-1.5266638+002	-2.0721835+002	-2.2866496+002	-5.1174610+002	-6.0531324+002	-1.5266638+002	-2.0721835+002	-2.2866496+002	-5.1174610+002	-6.0531324+002	
III	39	2.5538357+001	1.1743264+001	-2.8259213+001	4.1374821+002	-6.6319700+003	2.5538357+001	1.1743264+001	-2.8259213+001	4.1374821+002	-6.6319700+003	2.5538357+001	1.1743264+001	-2.8259213+001	4.1374821+002	-6.6319700+003	2.5538357+001	1.1743264+001
	40	1.3802409+0																

TABLE 2

TIME VARIATION

Harmonic	S		I		2		3		4		5		6	
	K	S	I	S	2	S	3	S	4	S	5	S	6	S
I	0	2.9609492+000	-1.1518072-001	-2.5875627-001	3.1987022-002	-8.6739163-002	3.7845231-002	-2.6608199-002	-4.689992-001	-1.9063824-002	-2.4689992-001	-3.3325290-001	-7.0687904-001	-7.0687904-001
	1	4.7815945-001	7.9946952-002	-4.3840902-002	-4.0502352-002	3.1330415-002	-2.4689992-001	-3.3325290-001	-7.0687904-001	-7.0687904-001	-7.0687904-001	-7.0687904-001	-7.0687904-001	-7.0687904-001
	2	1.7201184+000	1.1216356+000	2.2237499-000	1.4697806-001	-1.3890912-001	1.0144405-000	1.577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002
	3	-5.9019278-001	-4.2388331-000	1.3233660-000	-1.0534673-001	3.3007125-001	-1.0144405-000	1.577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002
	4	-4.7360885+000	3.2488914+000	4.5300070-000	-1.2218424+000	3.3007125-001	-1.0144405-000	1.577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002	2.6968938-000	1.4577857-002
	5	-1.1566182-001	8.7449402-001	-2.0199740-000	2.3263604+000	6.1229310-001	-1.4657821+000	-1.8354845+000	-1.4657821+000	-1.8354845+000	-1.4657821+000	-1.8354845+000	-1.4657821+000	-1.8354845+000
	6	4.2400712+000	4.0711167+000	4.0711167+000	2.0306600+000	1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001	-1.3053105-001
	7	2.8418311-001	-4.9553299-001	7.9043593-001	-2.0957851-001	-4.1562606-001	7.0348290-001	-1.3083585-001	7.0348290-001	-1.3083585-001	7.0348290-001	-1.3083585-001	7.0348290-001	-1.3083585-001
	8	-1.6302349+000	-1.9524998+000	-1.4928978+000	-9.8861676-001	-8.4278232-002	1.5578050+000	7.5470544-001	1.5578050+000	7.5470544-001	1.5578050+000	7.5470544-001	1.5578050+000	7.5470544-001
II	9	-1.2159618-002	-1.9053345-002	3.9519591-002	-1.8471990-002	1.8531863-002	7.0407792-003	-1.2112353-003	7.0407792-003	-1.2112353-003	7.0407792-003	-1.2112353-003	7.0407792-003	-1.2112353-003
	10	-1.3554896-001	-3.8539766-002	-4.2669069-002	7.8667976-003	-4.7368702-005	7.5220260-002	8.3167679-003	7.5220260-002	8.3167679-003	7.5220260-002	8.3167679-003	7.5220260-002	8.3167679-003
	11	7.7421609-002	-1.5400704-001	-2.7720754-002	5.9464856-002	1.4180615-001	4.4564843-002	-2.2672382-003	4.4564843-002	-2.2672382-003	4.4564843-002	-2.2672382-003	4.4564843-002	-2.2672382-003
	12	-2.9632451-001	-2.9817585-001	-9.0332110-001	1.1413748-001	-1.4641413-001	1.8416109-001	1.0683333-001	1.8416109-001	1.0683333-001	1.8416109-001	1.0683333-001	1.8416109-001	1.0683333-001
	13	-1.0397559-001	-1.2480417-001	-4.9514301-001	2.6929599-001	-1.6731503-001	-1.5237817-001	3.3144861-001	-1.5237817-001	3.3144861-001	-1.5237817-001	3.3144861-001	-1.5237817-001	3.3144861-001
	14	-1.0397559-001	6.9801046-001	1.4709428-001	-1.9565698-001	-1.0709192-001	-1.1671076+000	-7.3875476-002	-1.1671076+000	-7.3875476-002	-1.1671076+000	-7.3875476-002	-1.1671076+000	-7.3875476-002
	15	-1.4698387-001	7.9410524-001	3.5173777-001	-5.6035425-001	-7.5961943-001	-3.0647543-001	-9.555817-002	-3.0647543-001	-9.555817-002	-3.0647543-001	-9.555817-002	-3.0647543-001	-9.555817-002
	16	-1.6467404+000	1.9239512+000	5.6595075+000	-8.0010099-001	6.343330-001	-1.0699165+000	-8.3113072-001	-8.0010099-001	6.343330-001	-1.0699165+000	-8.3113072-001	-8.0010099-001	6.343330-001
	17	-1.0973647+000	1.7841870+000	1.3595750+000	-7.9568645-001	1.8812101-001	7.9382339-001	1.4271290+000	7.9382339-001	1.4271290+000	7.9382339-001	1.4271290+000	7.9382339-001	1.4271290+000
III	18	-5.3421112+000	-3.0240147+000	4.3931981-001	-1.0071317-001	7.1522690-001	4.9834140+000	1.0042816+000	7.1522690-001	4.9834140+000	1.0042816+000	7.1522690-001	4.9834140+000	1.0042816+000
	19	-3.0946229+000	-1.6345293+000	-5.9433594-001	1.1878610+000	1.3244654+000	5.4926647+001	1.8249095+000	1.1878610+000	1.3244654+000	5.4926647+001	1.8249095+000	1.1878610+000	1.3244654+000
	20	-2.4317210+000	-4.1845815+000	-1.3091757+000	9.9400481-001	3.9623773-001	-1.3741141+000	1.8442907+000	-1.3741141+000	1.8442907+000	-1.3741141+000	1.8442907+000	-1.3741141+000	1.8442907+000
	21	-2.4317210+000	4.7592251+000	-2.0017292+000	1.2207799+000	-1.4711344+000	-1.6099177+000	-2.3106206+000	1.2207799+000	-1.4711344+000	-1.6099177+000	-2.3106206+000	1.2207799+000	-1.4711344+000
	22	7.1020730+000	8.7355060-001	1.11999393-001	-7.1485161-001	7.1305820-001	-2.6116730-001	-3.3285853-001	7.1305820-001	-2.6116730-001	-3.3285853-001	-2.6116730-001	-3.3285853-001	-2.6116730-001
	23	4.4567242+003	2.2661012+000	6.0920761+000	-1.1338074-001	6.556390-001	-9.5398966-001	-8.5274642-001	-1.1338074-001	6.556390-001	-9.5398966-001	-8.5274642-001	-1.1338074-001	6.556390-001
	24	1.8119601+000	2.7309876+000	5.8254248-001	-3.5040494-001	-4.9324697-001	7.5502894-001	-7.3451397-001	-3.5040494-001	-4.9324697-001	7.5502894-001	-7.3451397-001	-3.5040494-001	-4.9324697-001
	25	1.5328269+000	-2.7309876+000	1.5264349+000	-9.4747112-001	9.4905173-001	3.7733741+000	1.4304664+000	1.5264349+000	-2.7309876+000	1.5264349+000	-2.7309876+000	1.5264349+000	-2.7309876+000
	26	-3.3580390+000	-2.4397349+000	1.5264349+000	-9.4747112-001	9.4905173-001	3.7733741+000	1.4304664+000	-2.4397349+000	1.5264349+000	-2.4397349+000	1.5264349+000	-2.4397349+000	1.5264349+000
IV	27	-5.5284135-002	-2.1281664-002	-2.3189565-002	1.0180583-002	3.0473636-003	2.4983424-002	7.3880297-003	1.0180583-002	3.0473636-003	2.4983424-002	7.3880297-003	1.0180583-002	3.0473636-003
	28	-1.4392042-002	5.2164488-003	-5.6409375-003	-8.8558392-004	-1.3475322-003	6.3568351-003	5.5271105-003	-8.8558392-004	-1.3475322-003	6.3568351-003	5.5271105-003	-8.8558392-004	-1.3475322-003
	29	-2.2997200-002	-5.9029195-002	-1.3811852-001	3.5844363-002	-4.3385055-002	2.3219240-005	1.4780805-002	-5.9029195-002	-1.3811852-001	3.5844363-002	2.3219240-005	1.4780805-002	-5.9029195-002
	30	6.4420430-003	-3.6743356-002	-2.6334860-002	5.0691930-003	-8.5682744-002	6.1550478-002	2.701183-002	-3.6743356-002	-2.6334860-002	5.0691930-003	6.1550478-002	2.701183-002	-3.6743356-002
	31	1.9710370-001	6.5767308-002	1.6400704-001	-2.2184453-002	-1.8247719-002	-3.9283418-001	-1.4418326-001	6.5767308-002	1.6400704-001	-2.2184453-002	-1.8247719-002	-3.9283418-001	-1.4418326-001
	32	-1.3031575-001	-4.6021559-002	4.6021559-002	-6.6126042-003	3.557277-003	-3.2340051-002	4.1602921-002	-4.6021559-002	4.6021559-002	-6.6126042-003	3.557277-003	-3.2340051-002	4.1602921-002
	33	1.9781237-001	3.3055394-001	3.3055394-001	-1.3475531-002	9.6160204-002	1.0578546-002	-2.828205-002	3.3055394-001	3.3055394-001	-1.3475531-002	9.6160204-002	1.0578546-002	-2.828205-002
	34	1.0849493-001	-5.2941049-003	-5.2941049-003	-3.4559204-003	1.9052047-001	-7.9339449-002	-5.2553279-002	1.0849493-001	-5.2941049-003	-5.2941049-003	-3.4559204-003	1.9052047-001	-7.9339449-002
	35	-1.2456157-001	4.7108067-002	4.7108067-002	2.5440015-002	-3.2004572-002	2.4993310-001	2.0022775-001	-1.2456157-001	4.7108067-002	4.7108067-002	2.5440015-002	-3.2004572-002	-3.2004572-002
	36	3.8332148-001	-2.1281664-002	-2.3189565-002	1.0180583-002	3.0473636-003	2.4983424-002	7.3880297-003	3.8332148-001	-2.1281664-002	-2.3189565-002	1.0180583-002	3.0473636-003	2.4983424-002

GEOGRAPHICAL
VARIATION

I - Main latitudinal variation. Mixed latitudinal and longitudinal variation: II - First order in longitude, III - Second order in longitude.

Notation: For each entry the number given by the first eight digits and sign is multiplied by the power of ten defined by the last three digits and sign.

PREDICTED COEFFICIENTS D_{SK} DEFINING THE FUNCTION $\Gamma(\lambda, \theta, t)$ FOR MONTHLY MEDIAN $M(3000)F2$

DECEMBER 1965

DECEMBER 1965 UT=00

LONGITUDE

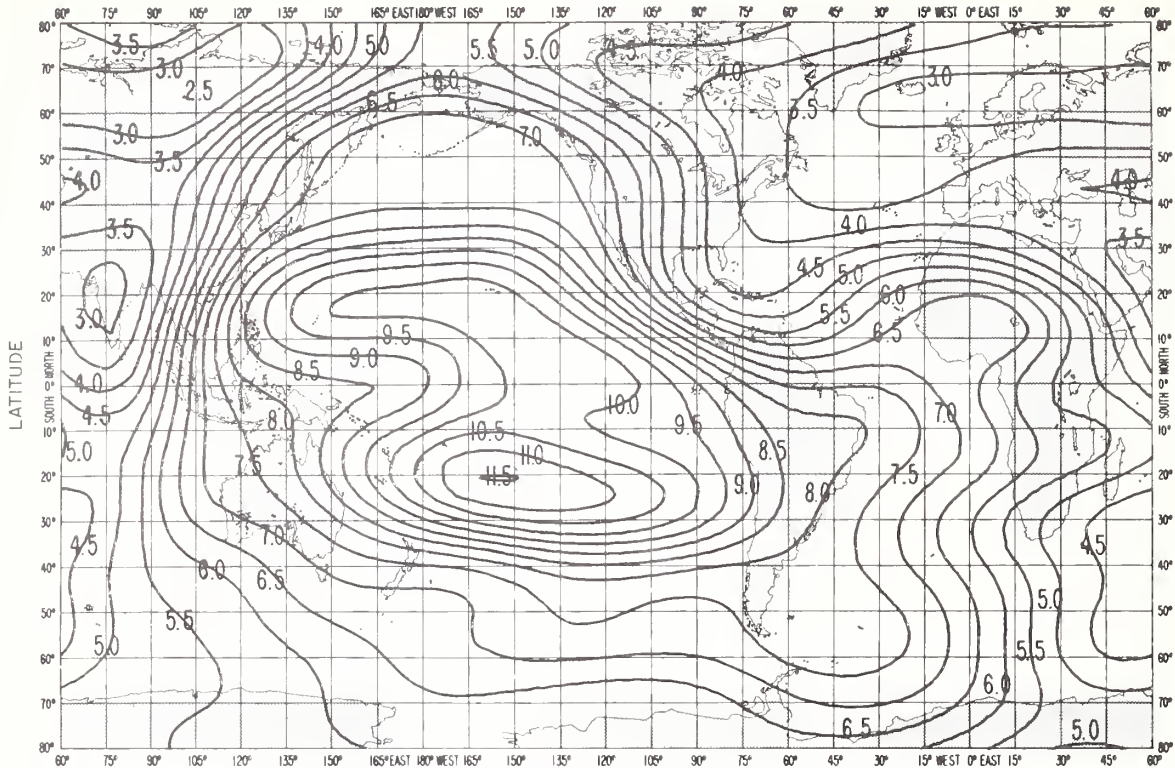


FIG. 1 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

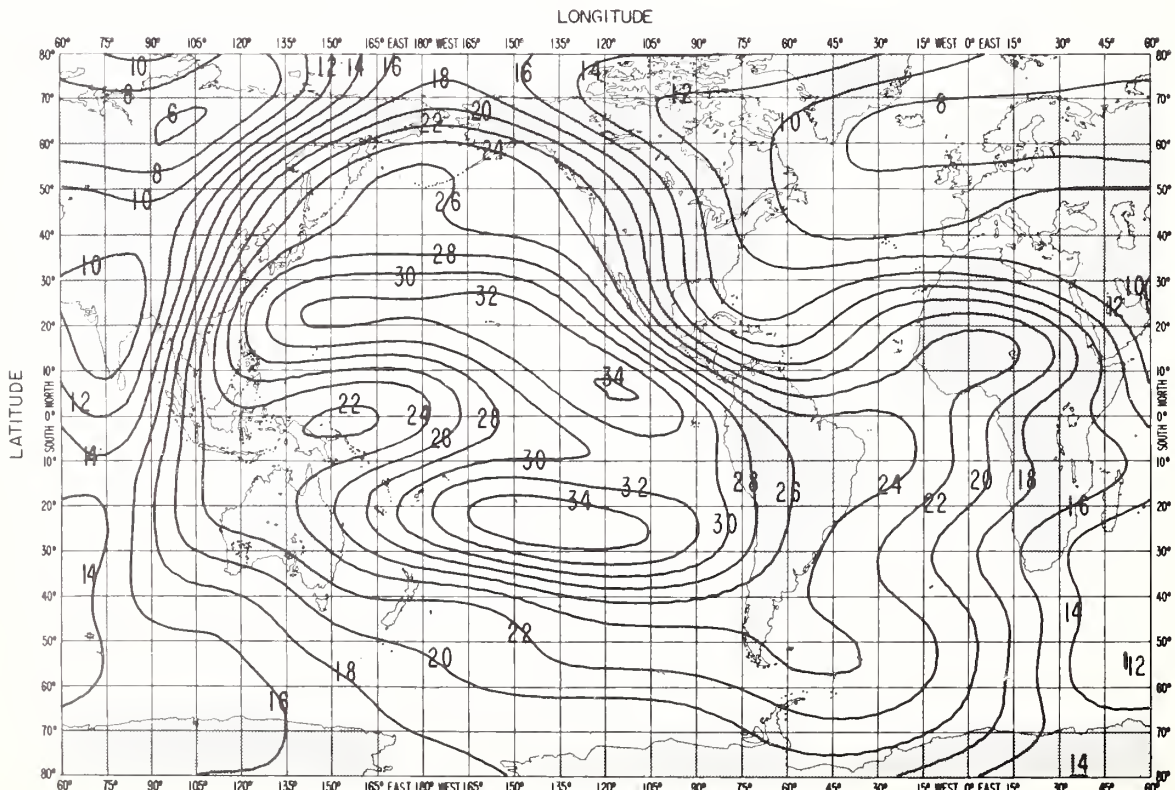


FIG. 1 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT=02

LONGITUDE

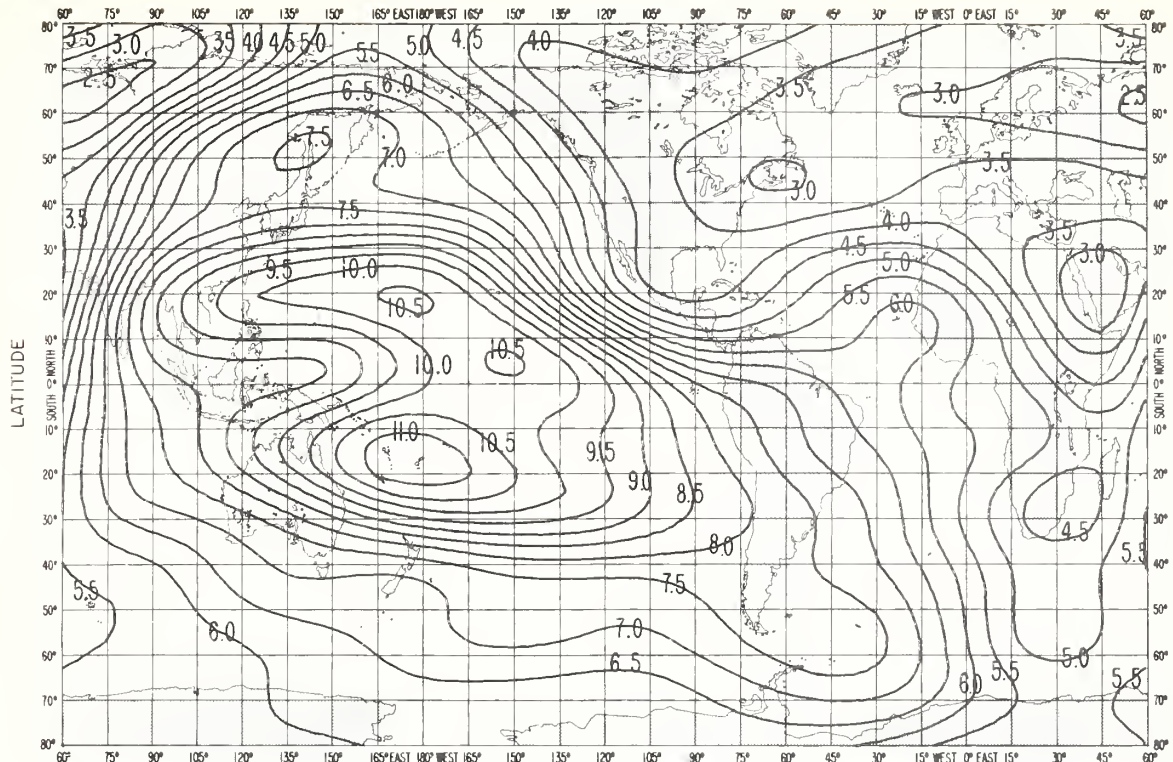


FIG. 2 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

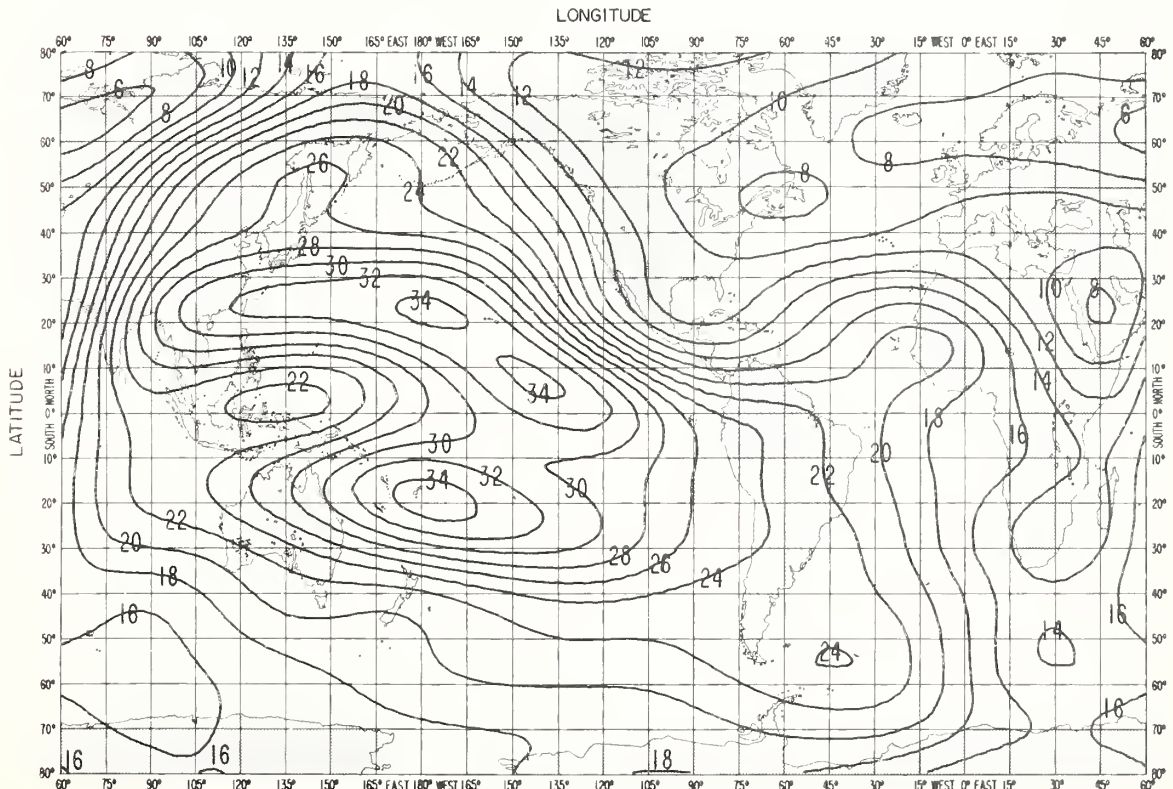


FIG. 2 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

LONGITUDE

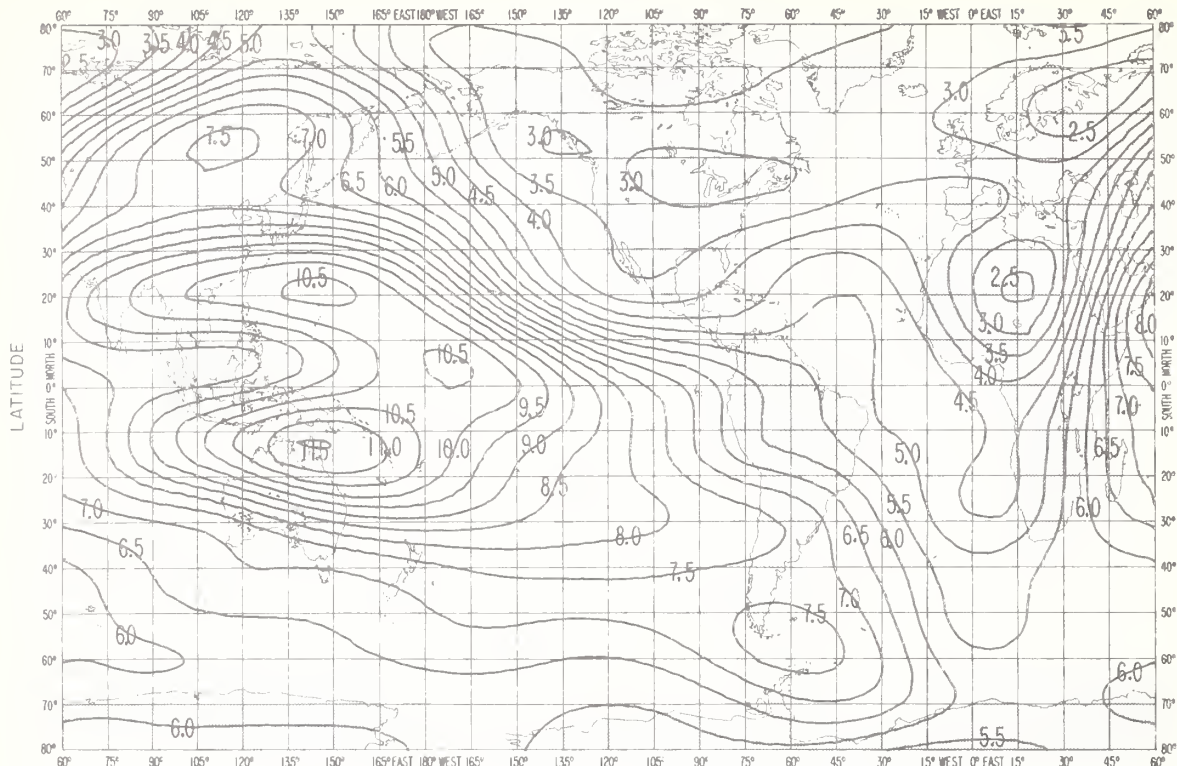


FIG. 3 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

LONGITUDE

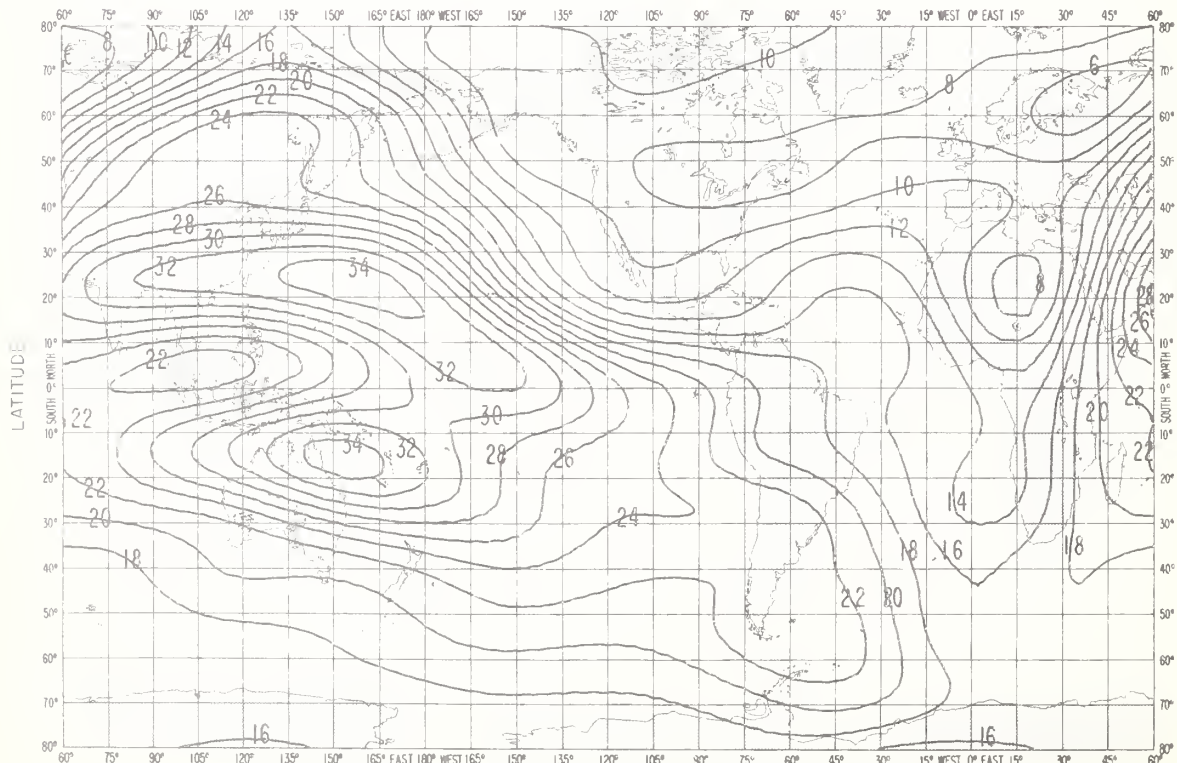


FIG. 3 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT = 06

LONGITUDE

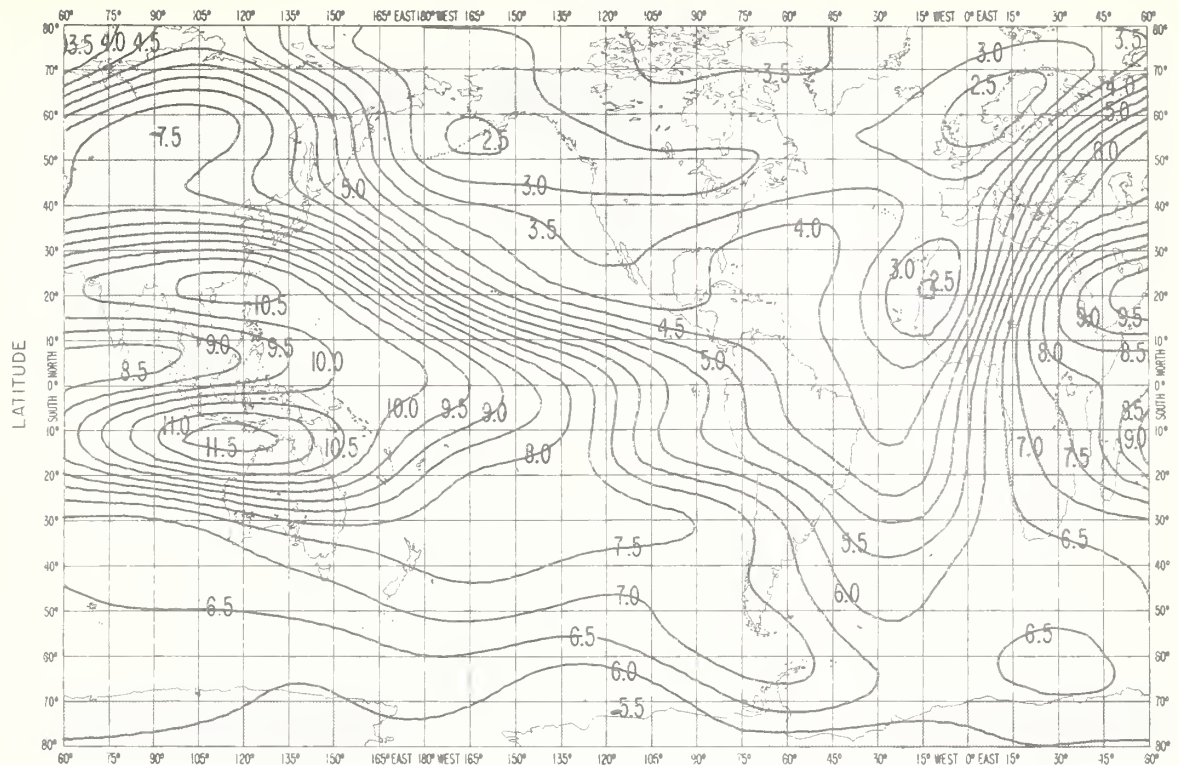


FIG. 4 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

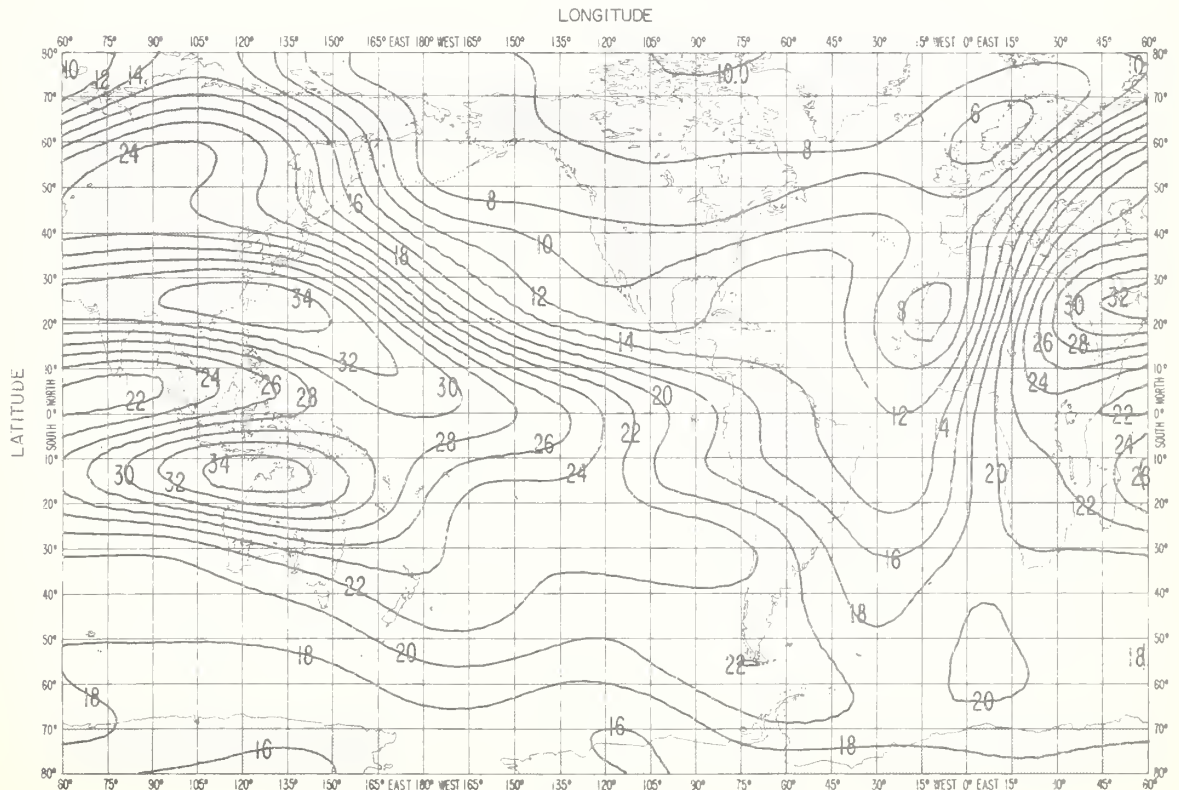


FIG. 4 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT = 08

LONGITUDE

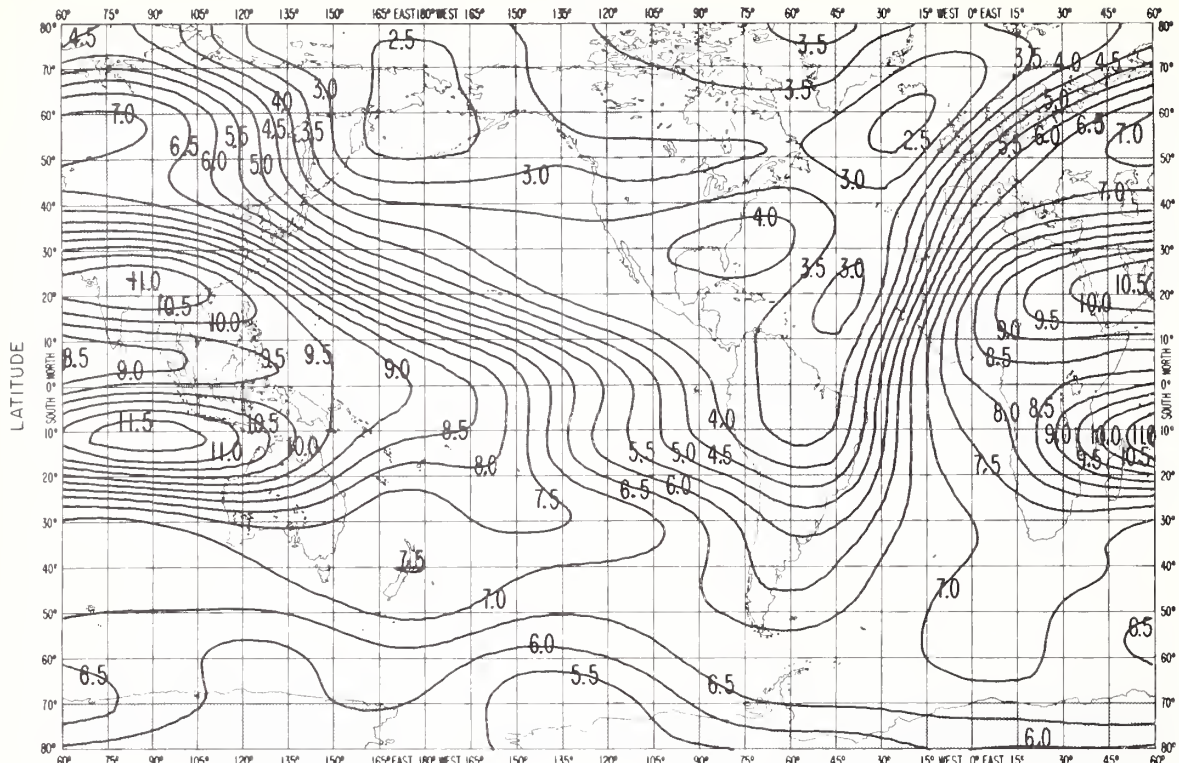


FIG. 5 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

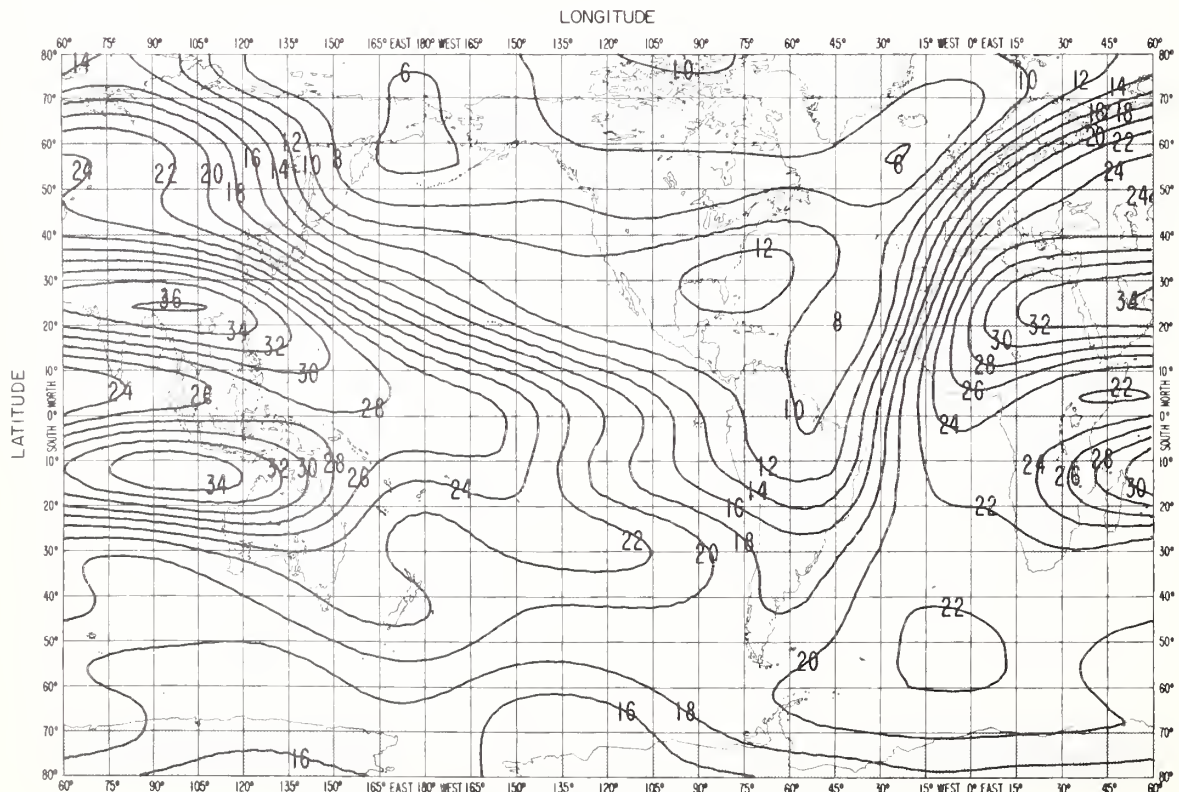


FIG. 5 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT=10

LONGITUDE

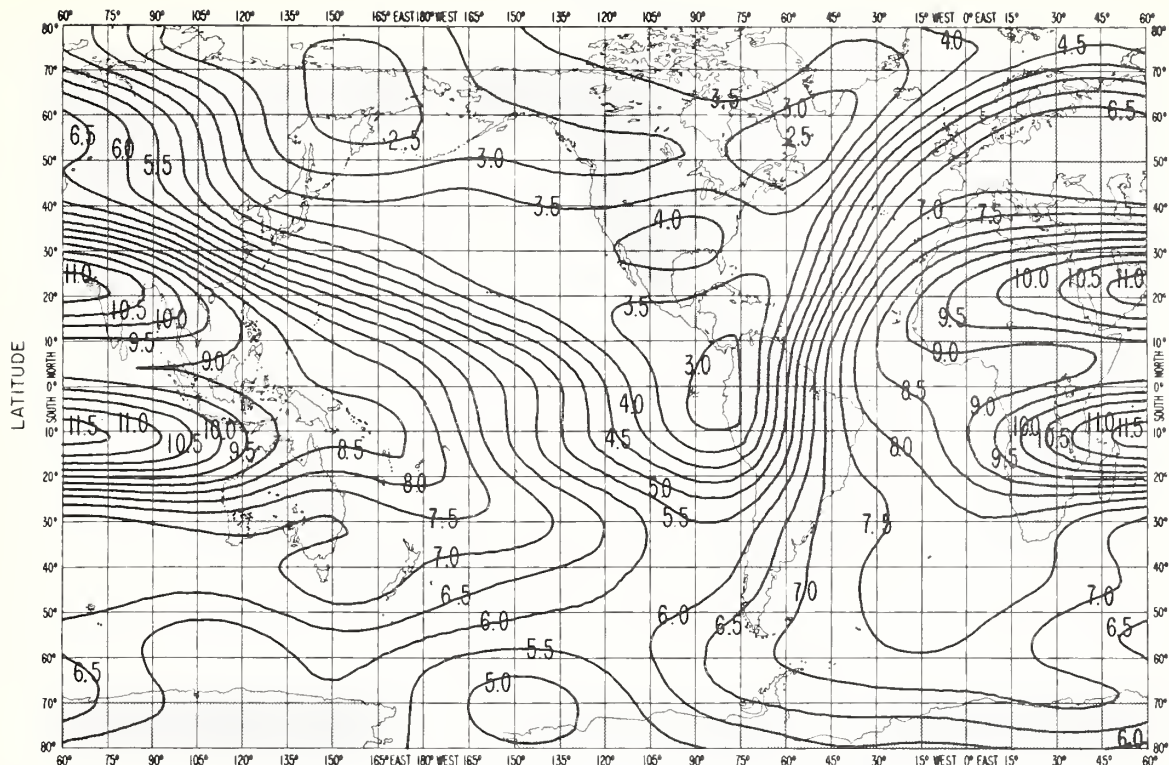


FIG. 6 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

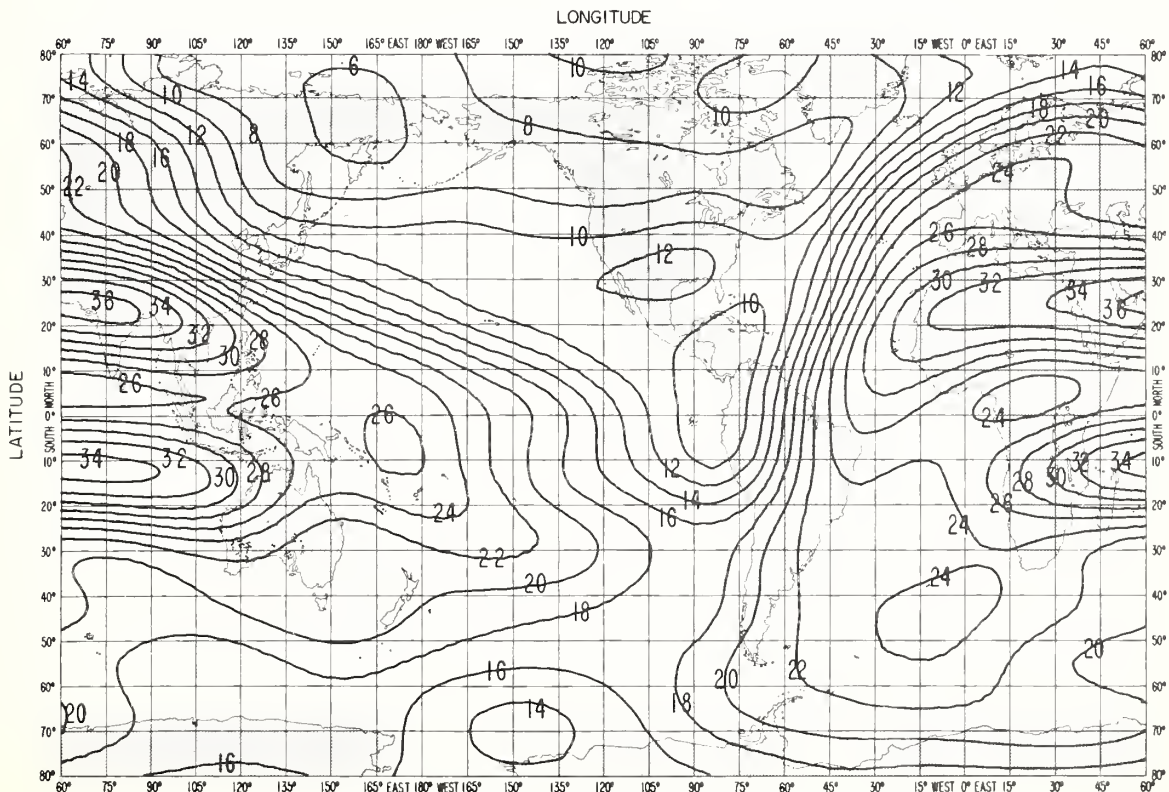


FIG. 6 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT = 12

LONGITUDE

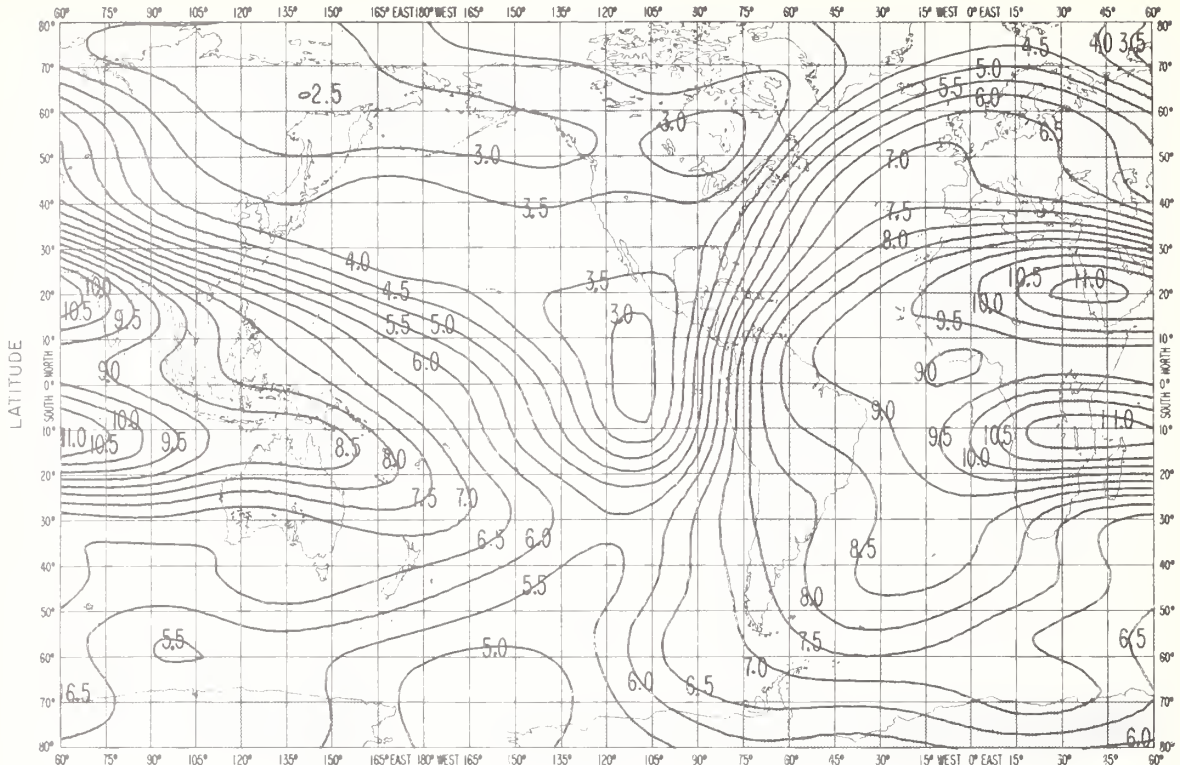


FIG. 7 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

LONGITUDE

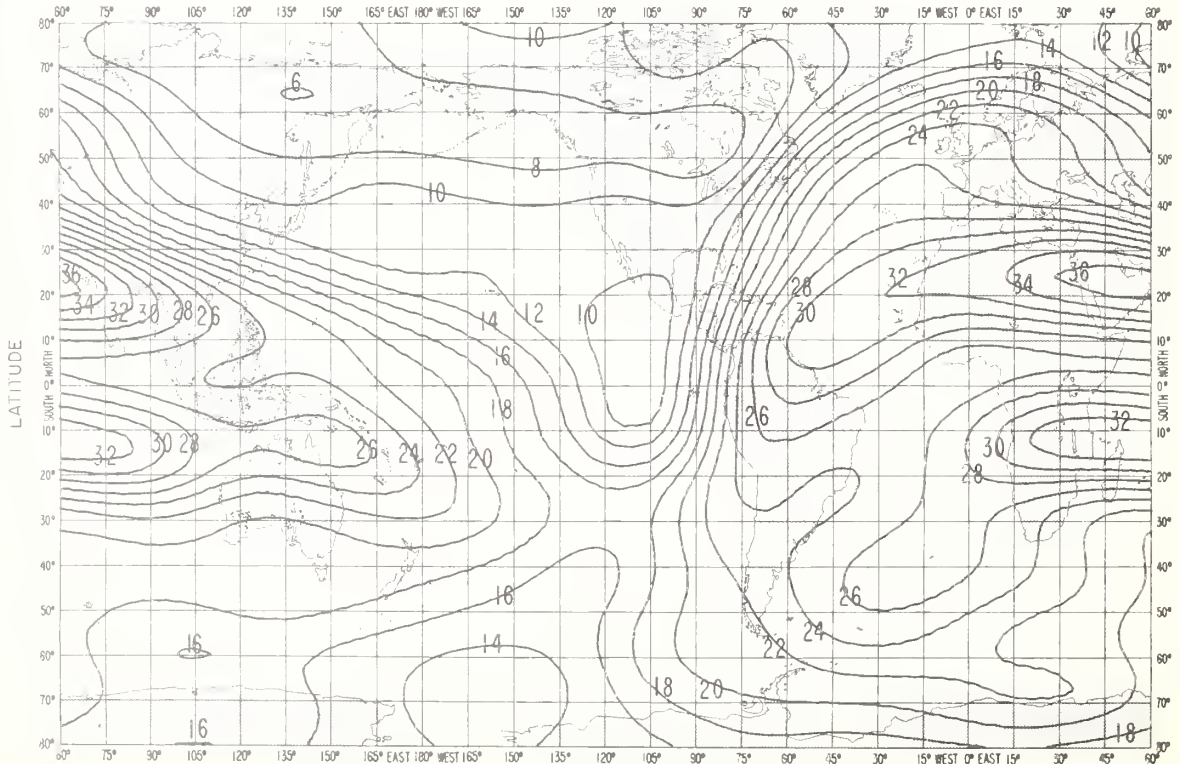


FIG. 7 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT=14

LONGITUDE

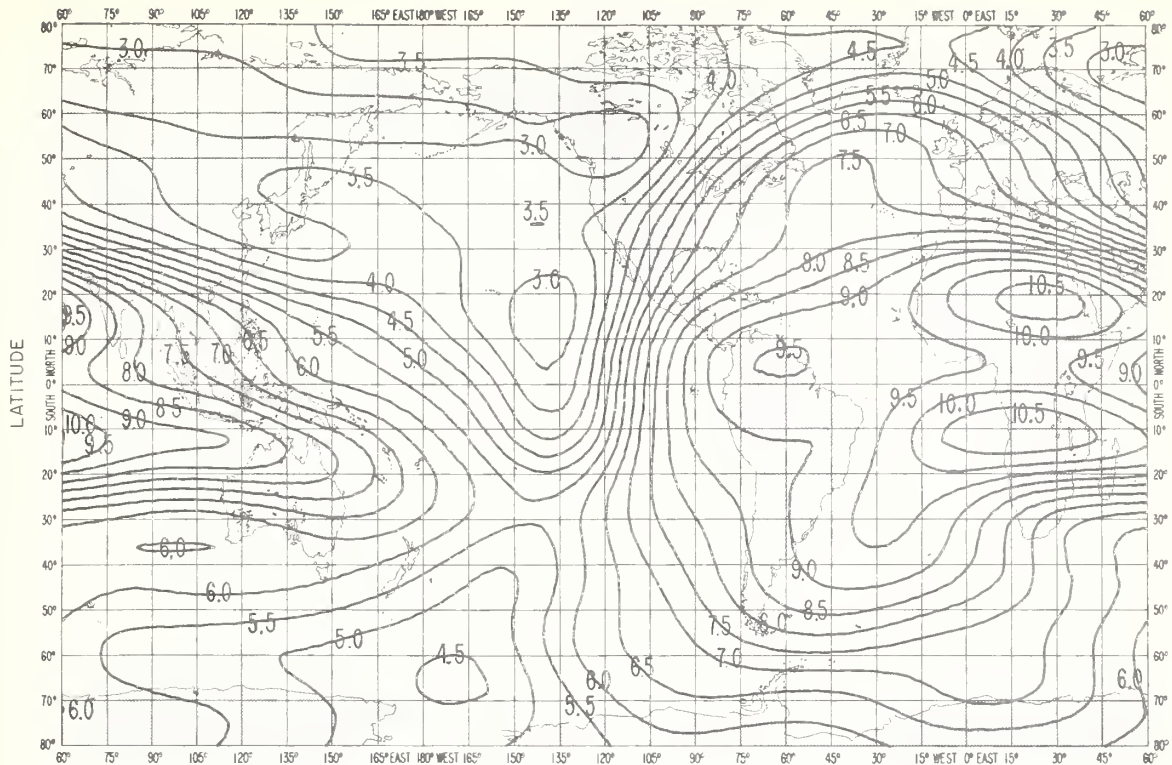


FIG. 8 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

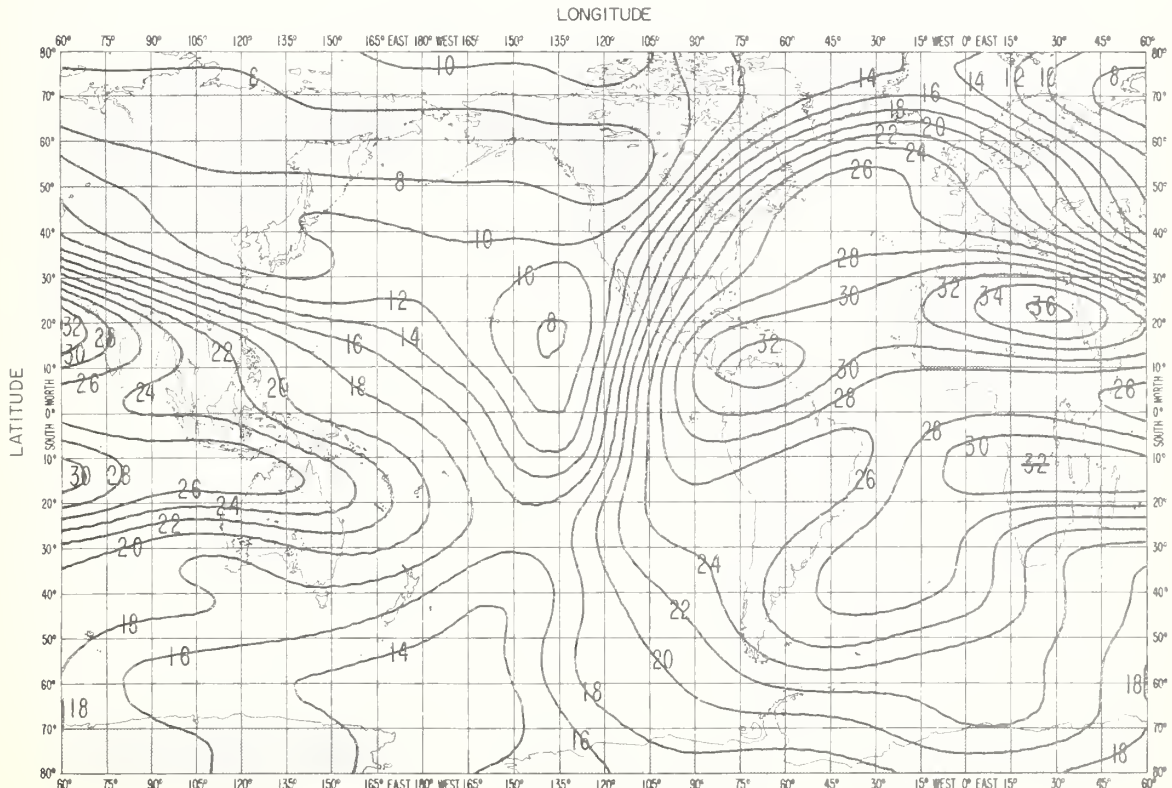


FIG. 8 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT=16

LONGITUDE

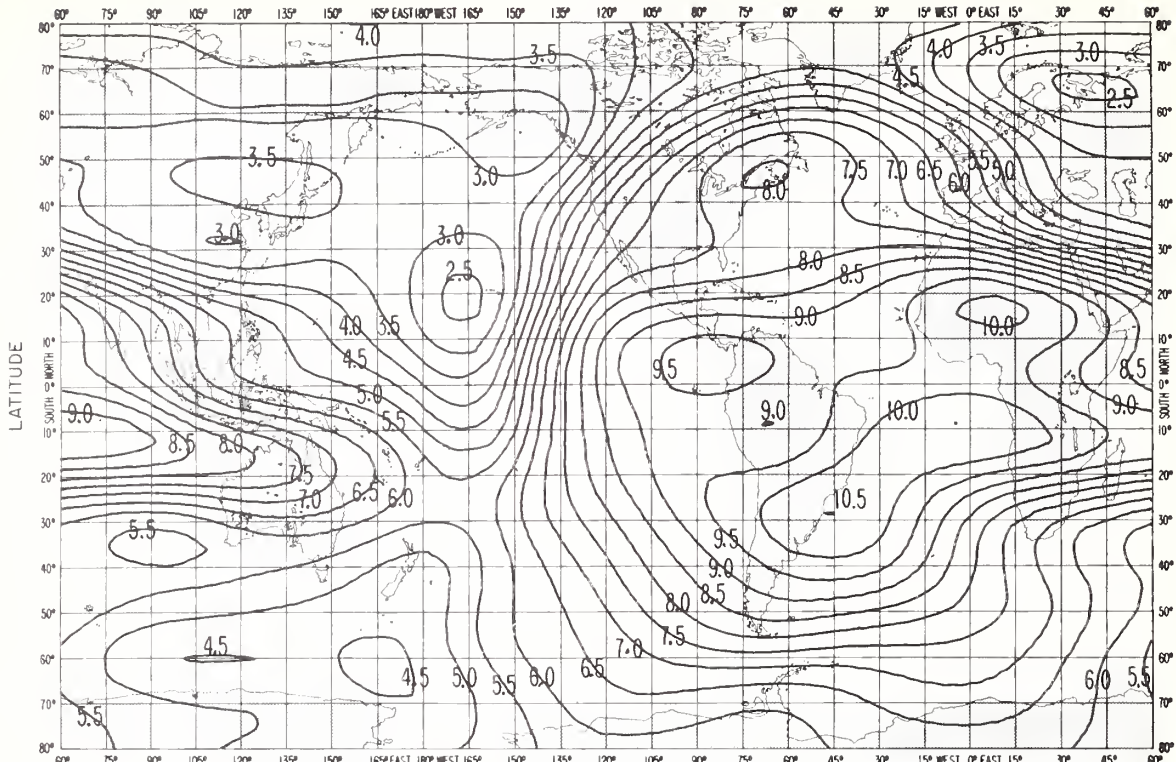


FIG. 9 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

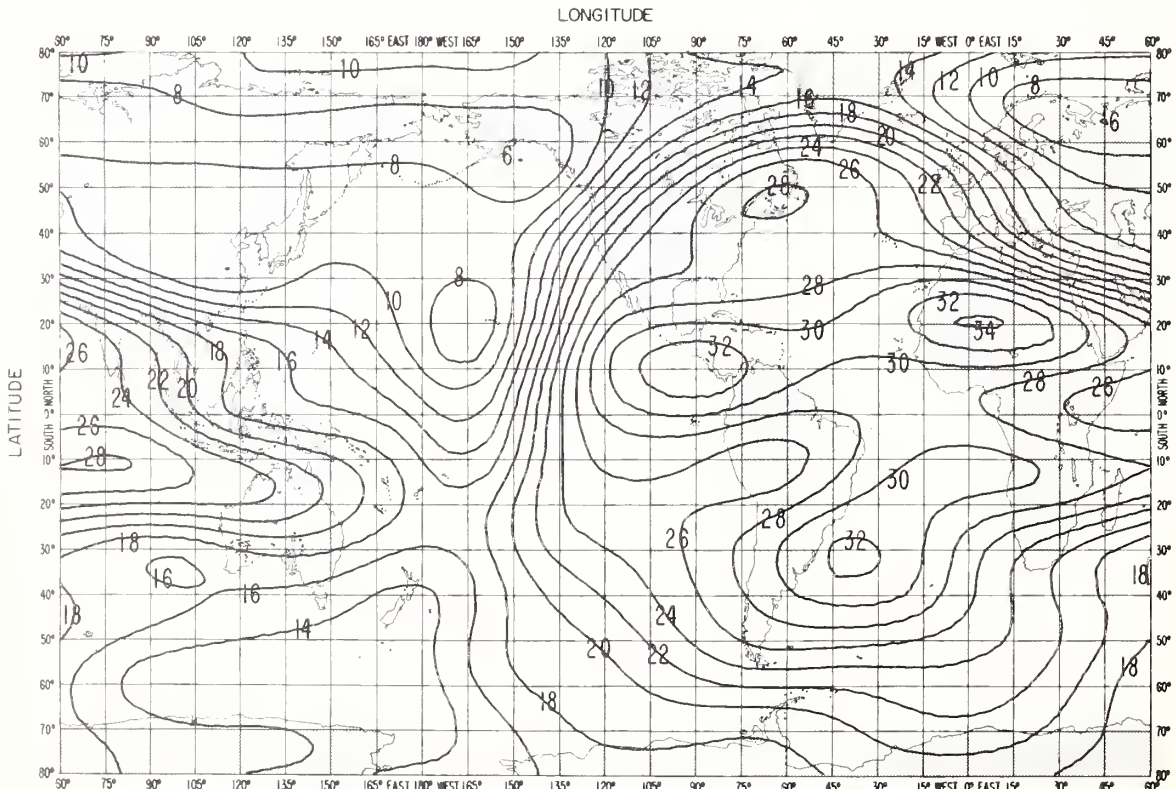


FIG. 9 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

UT = 18

LONGITUDE



FIG.10 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)



FIG.10 B. PREDICTED MEDIAN MUF (4000)F2 (Mc/s)

DECEMBER 1965 UT=20

LONGITUDE

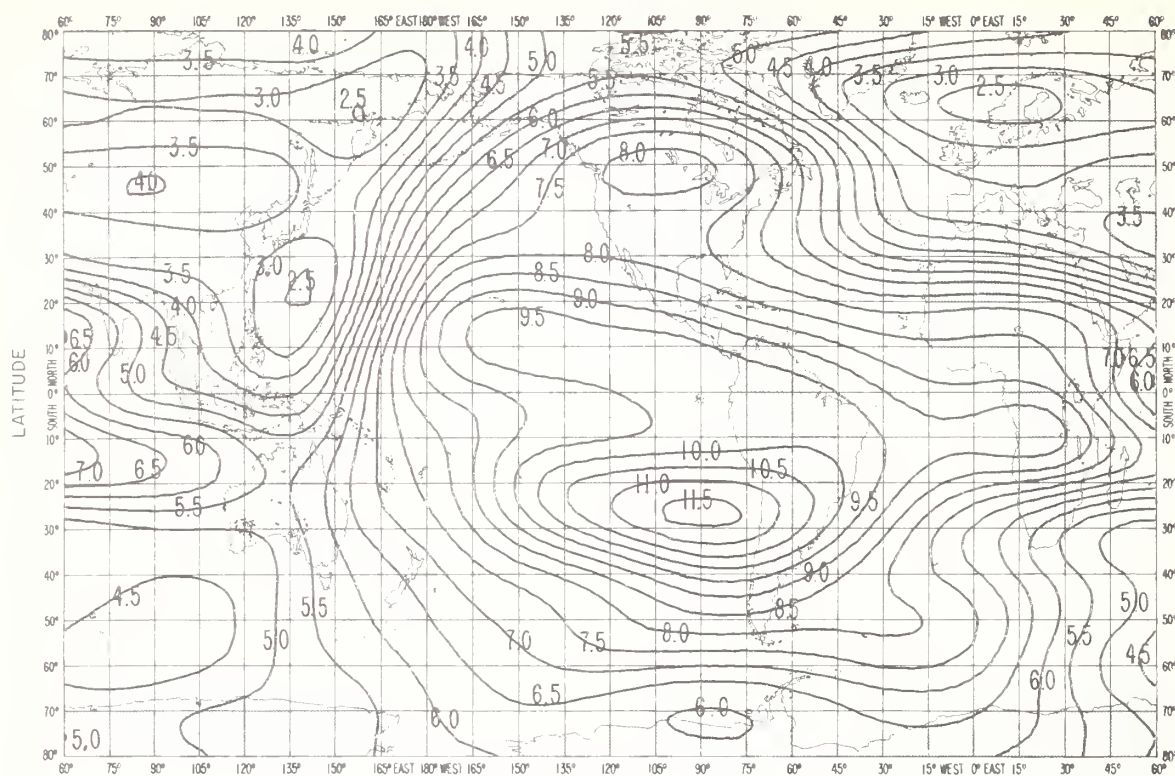


FIG.11 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

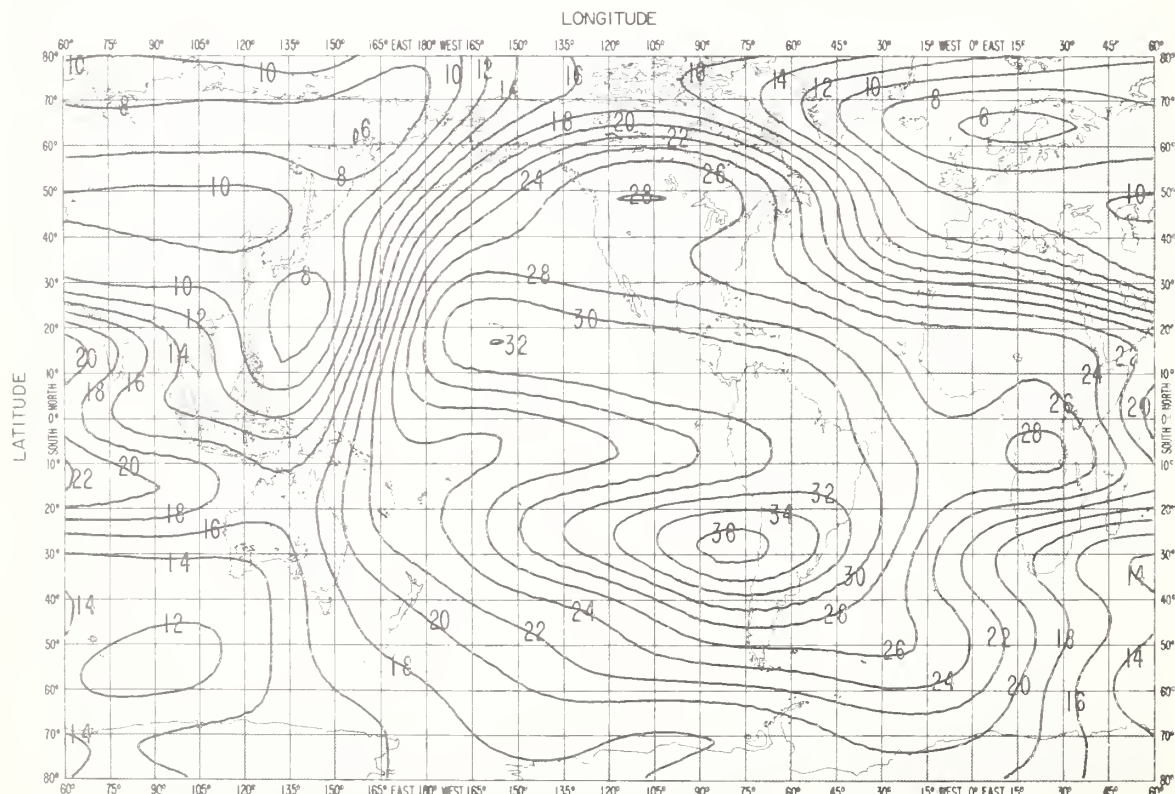


FIG.11 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT= 22

LONGITUDE

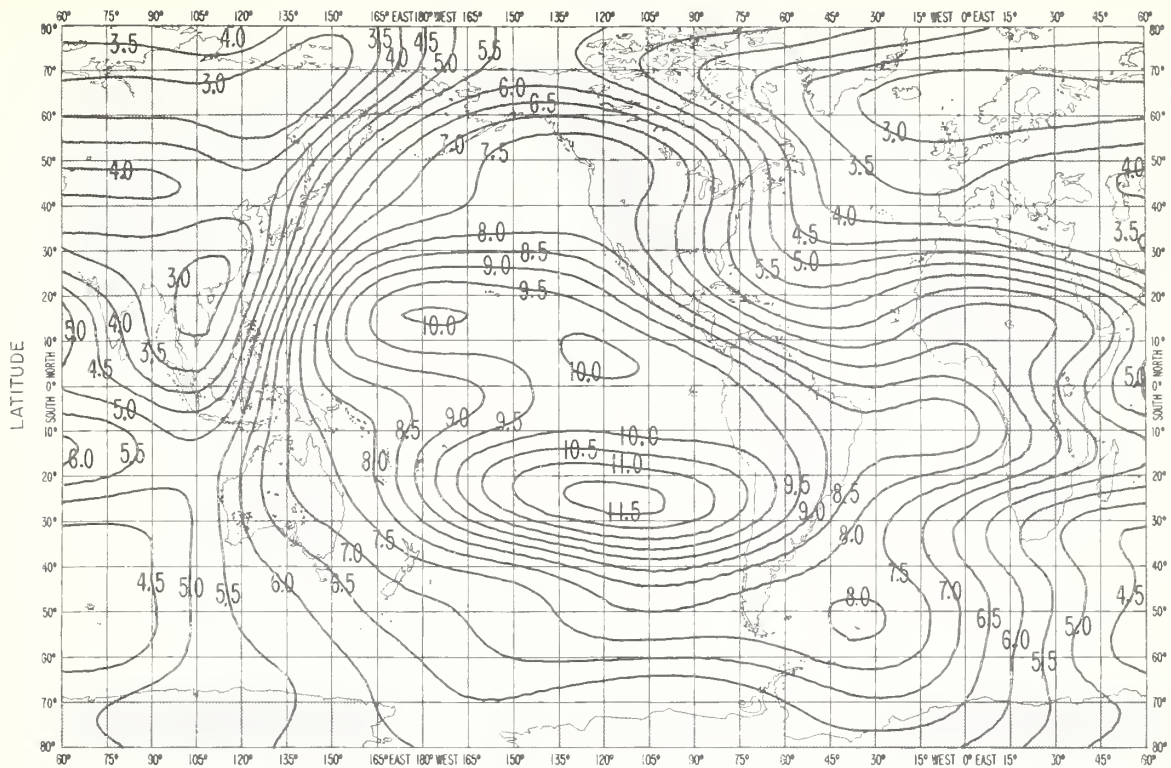


FIG.12 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

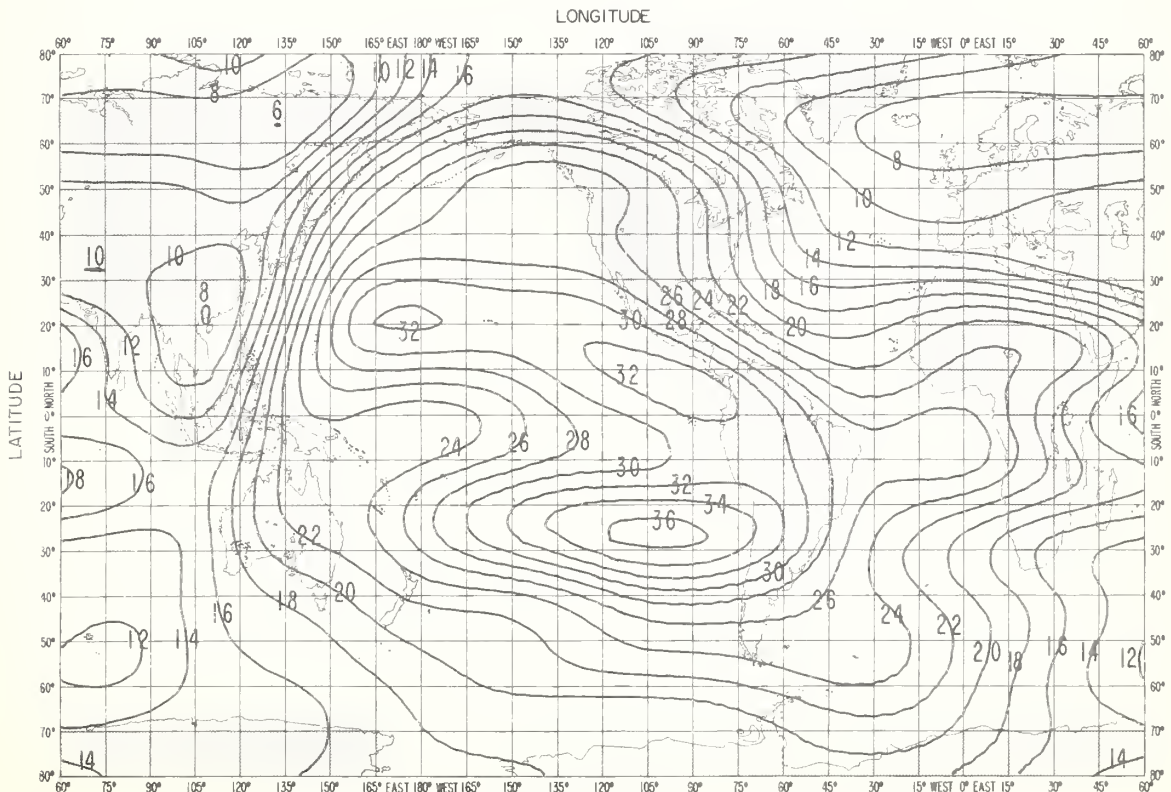


FIG.12 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

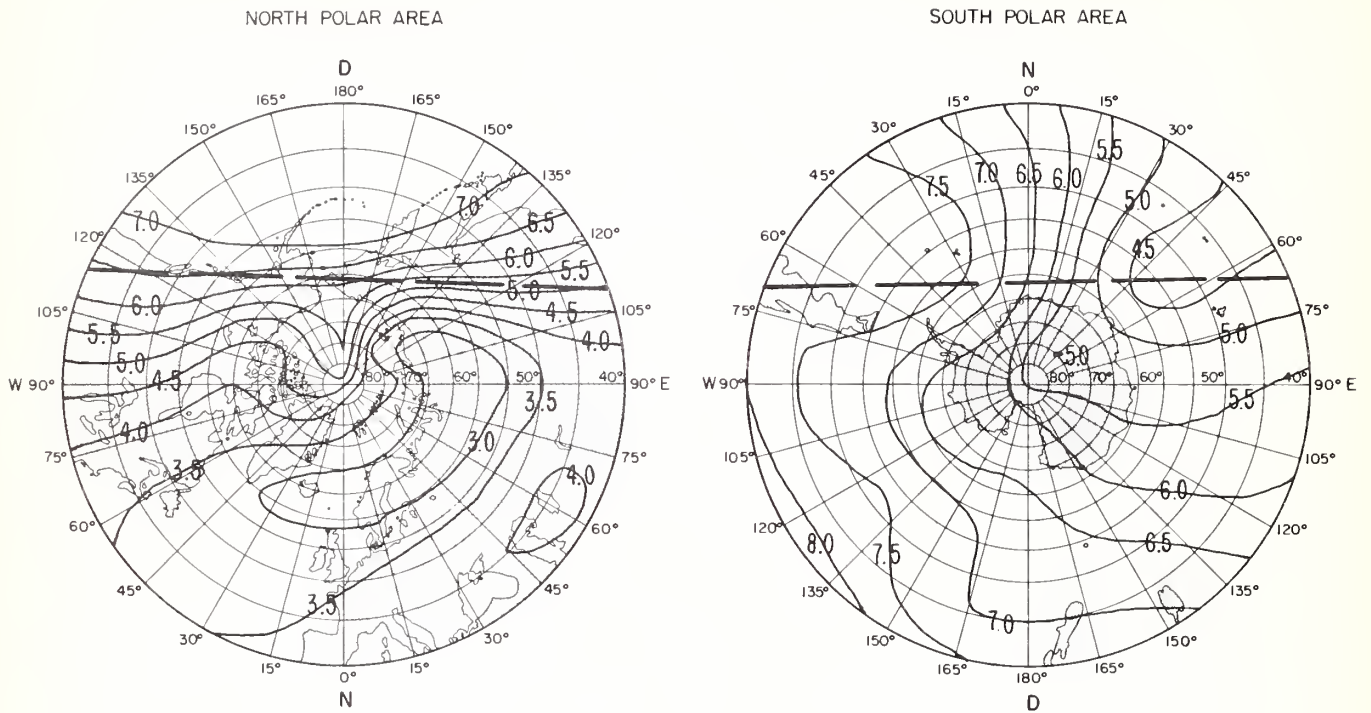


FIG.13 A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

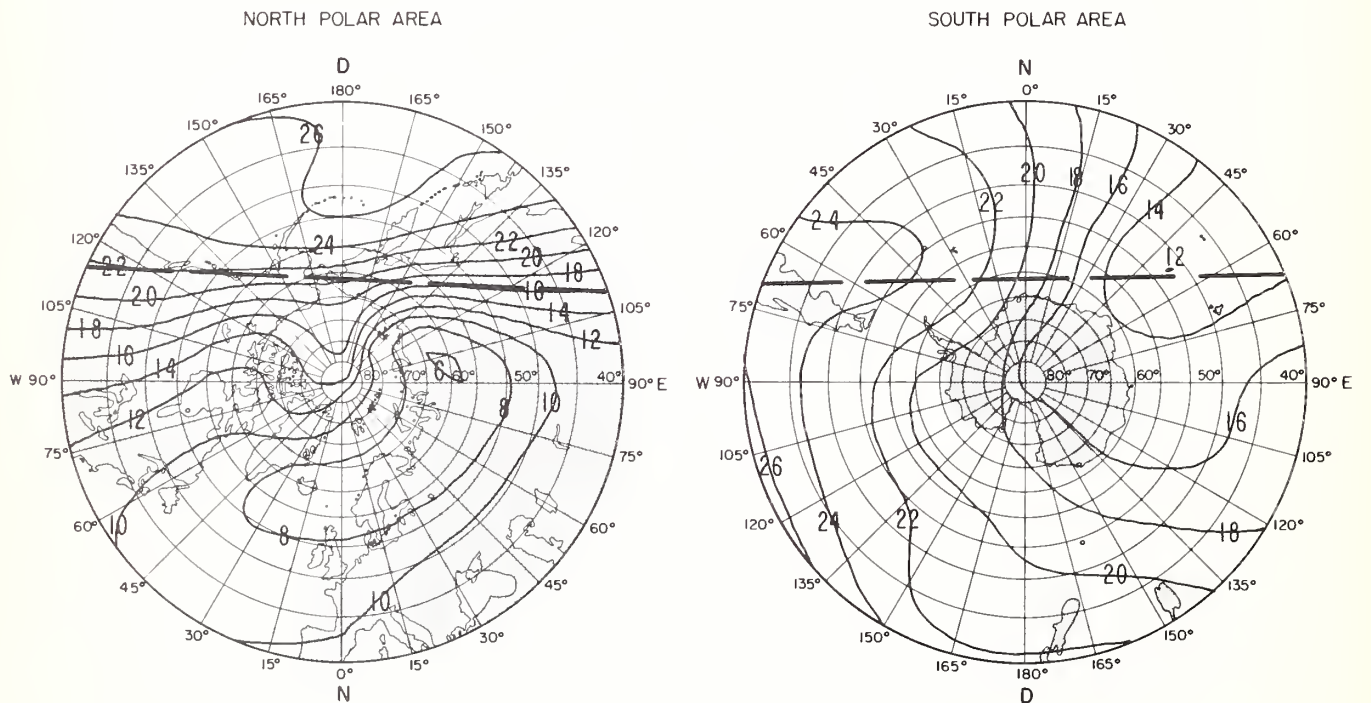
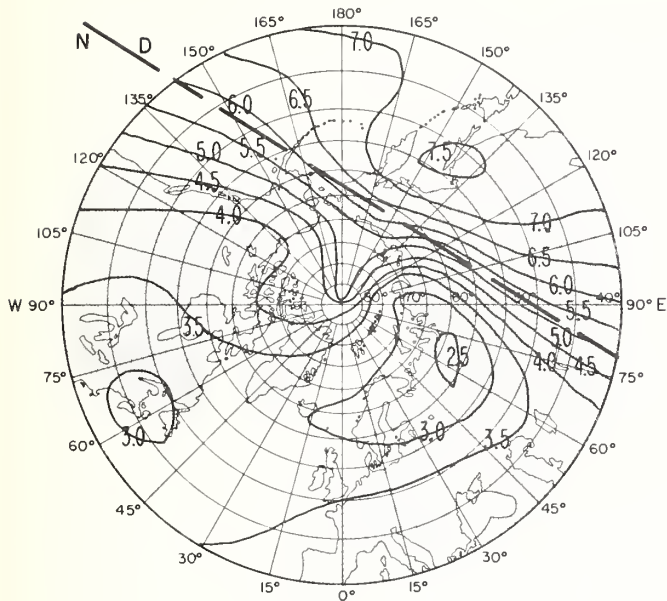


FIG.13 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

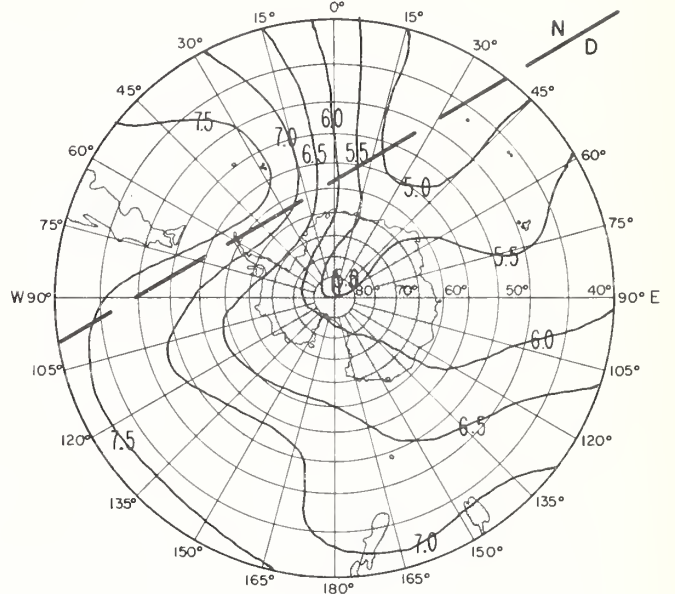
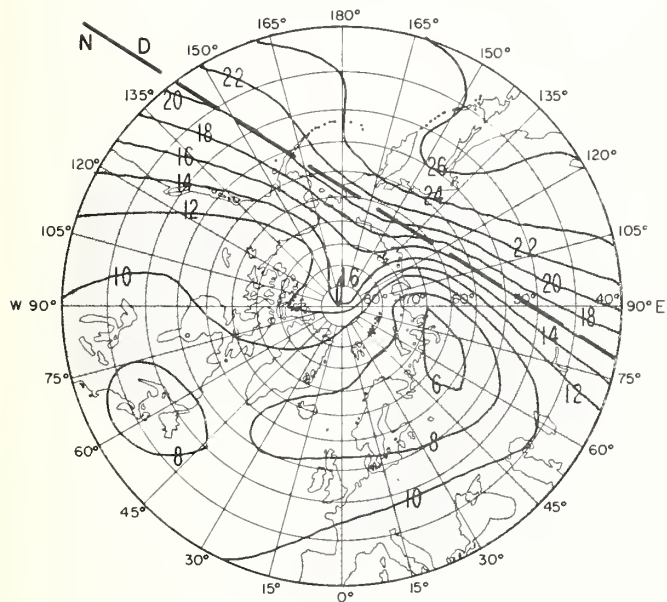


FIG.14A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

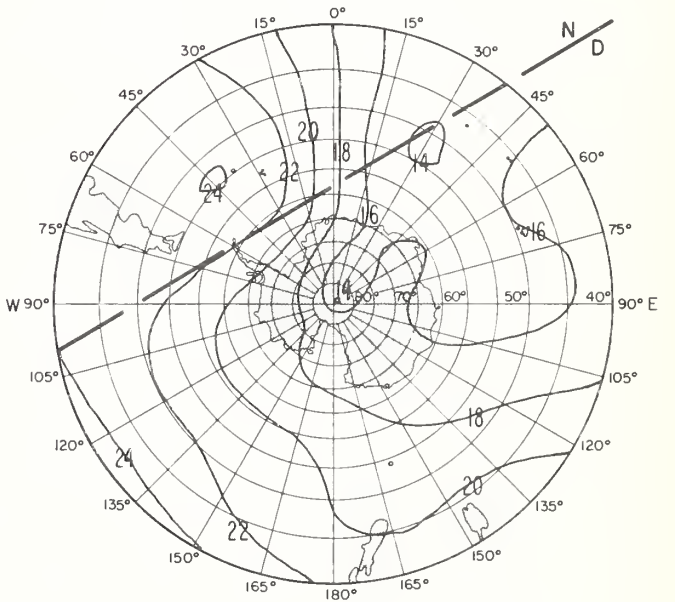


FIG.14B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965

UT=04

NORTH POLAR AREA

SOUTH POLAR AREA

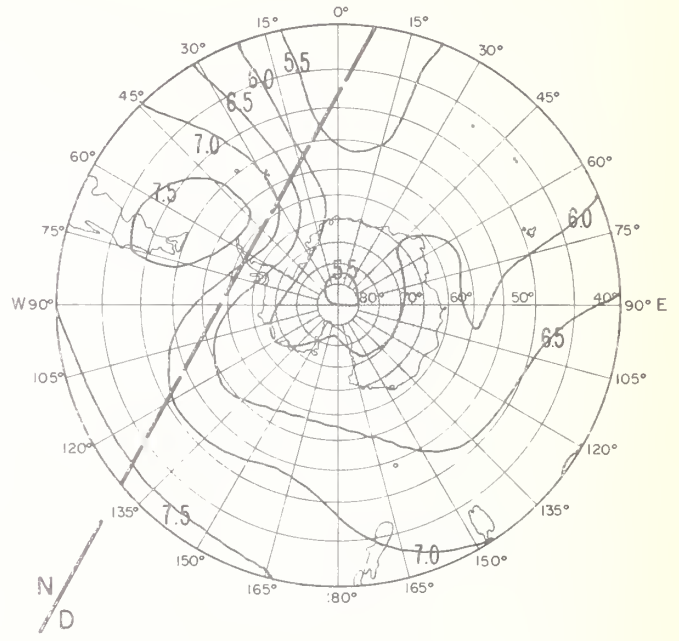
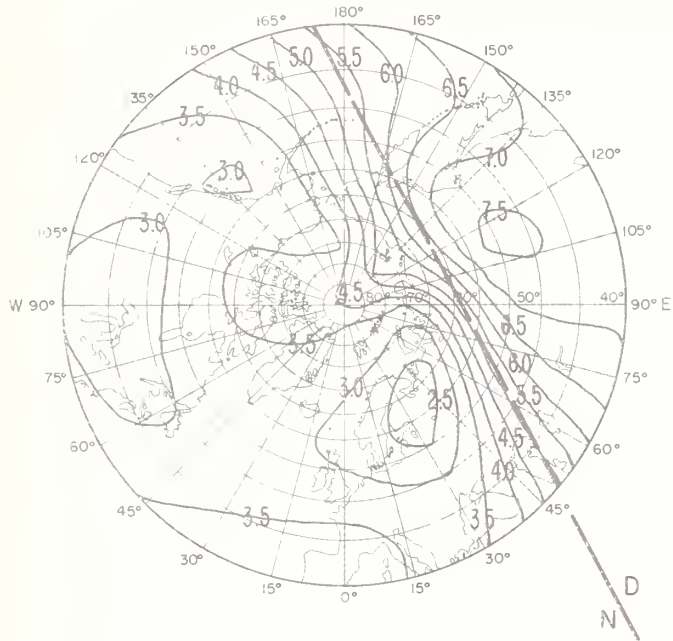


FIG.15A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

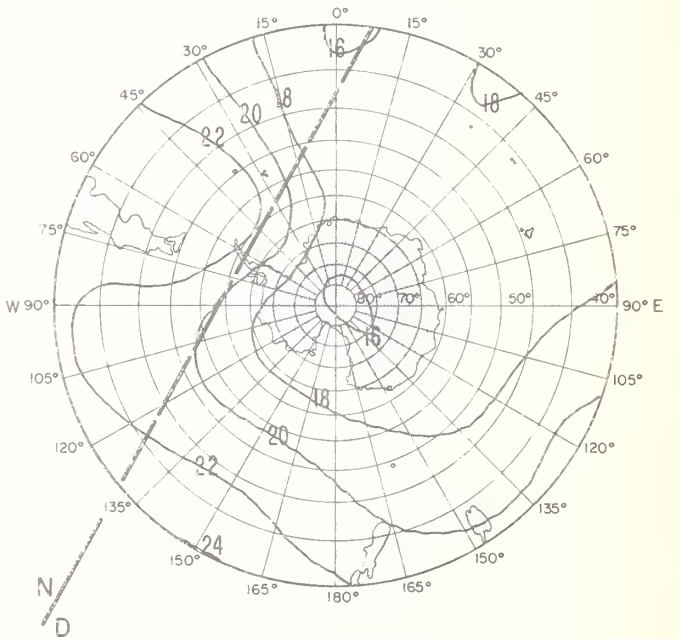
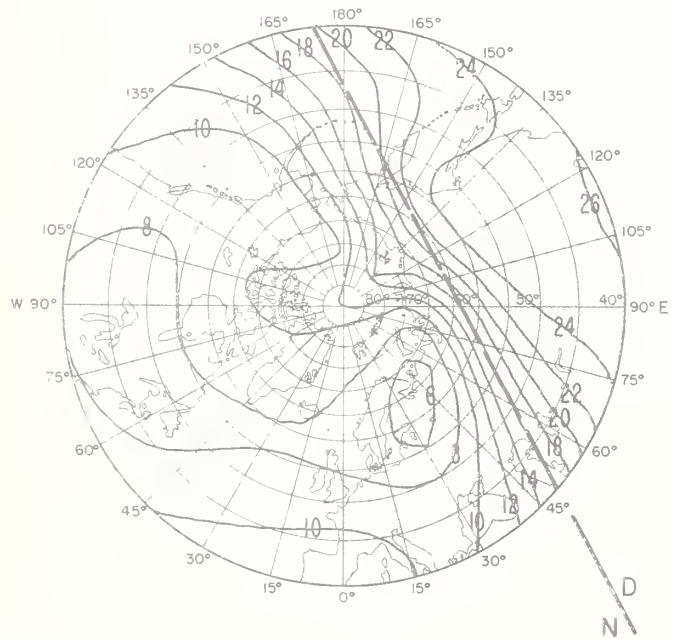


FIG.15B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

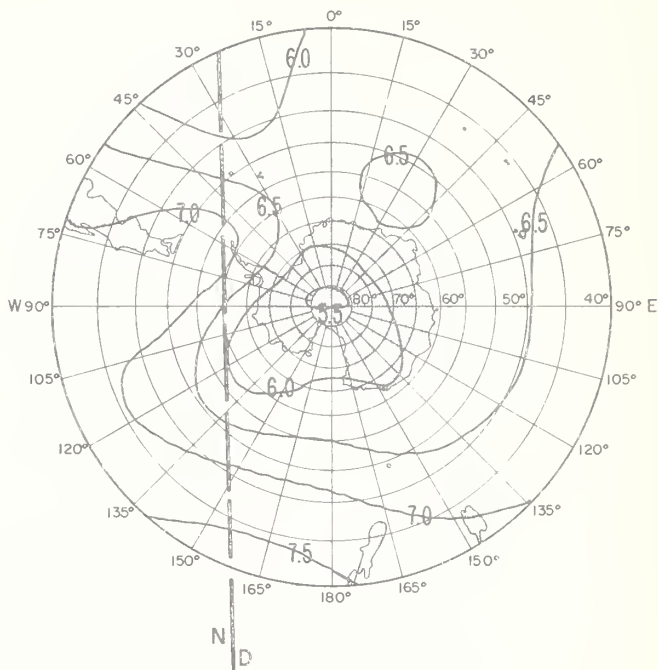
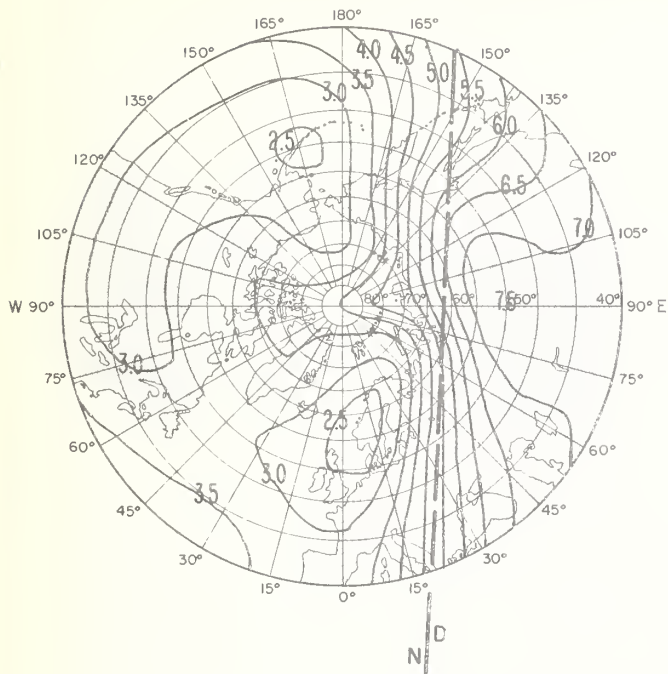


FIG. 16 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

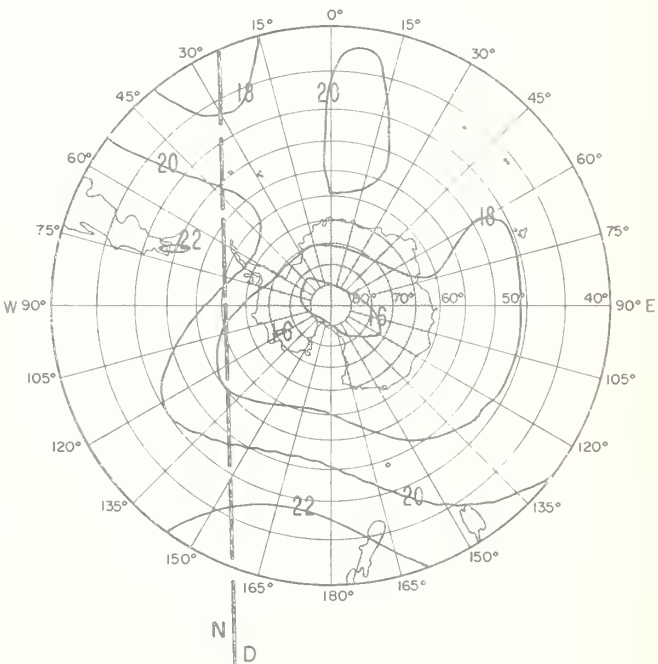
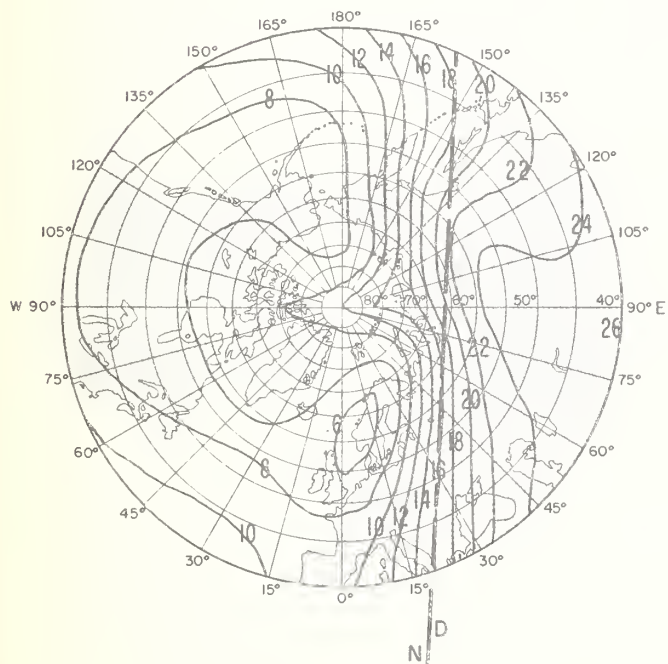
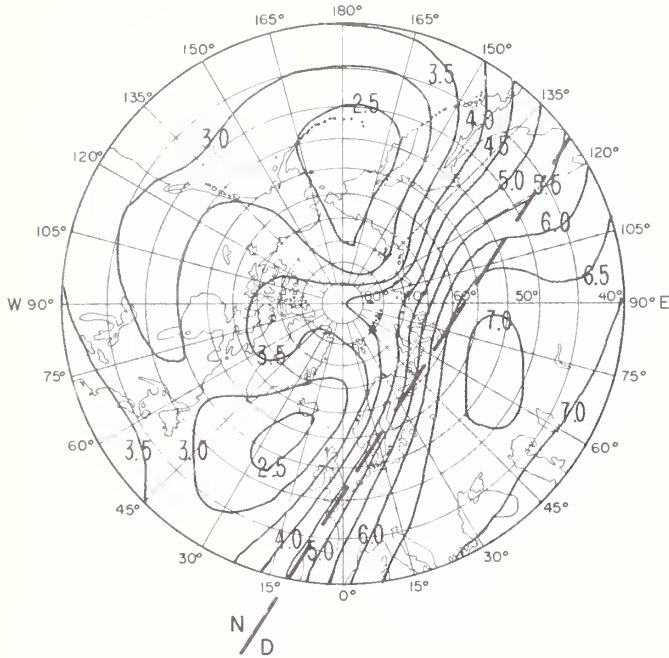


FIG. 16 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

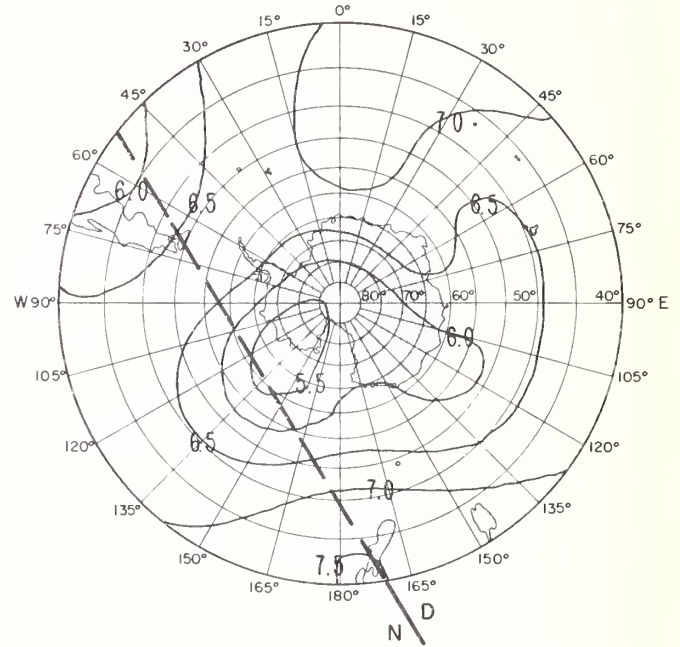
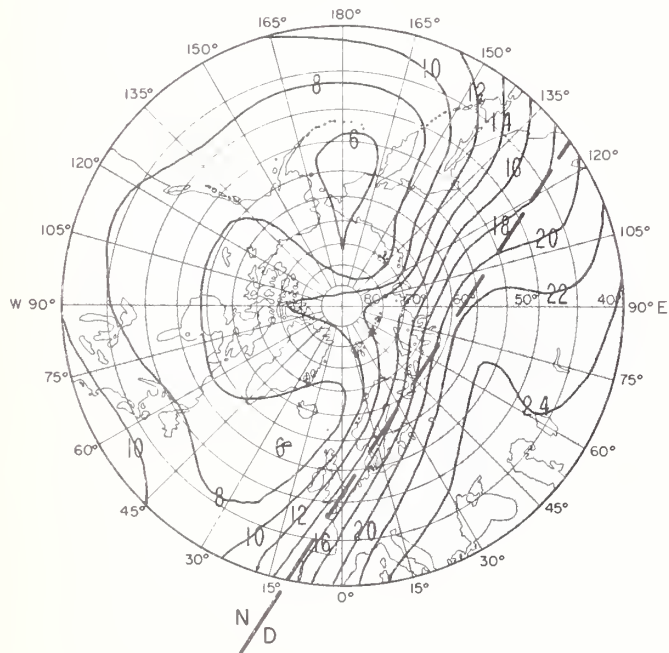


FIG. 17A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

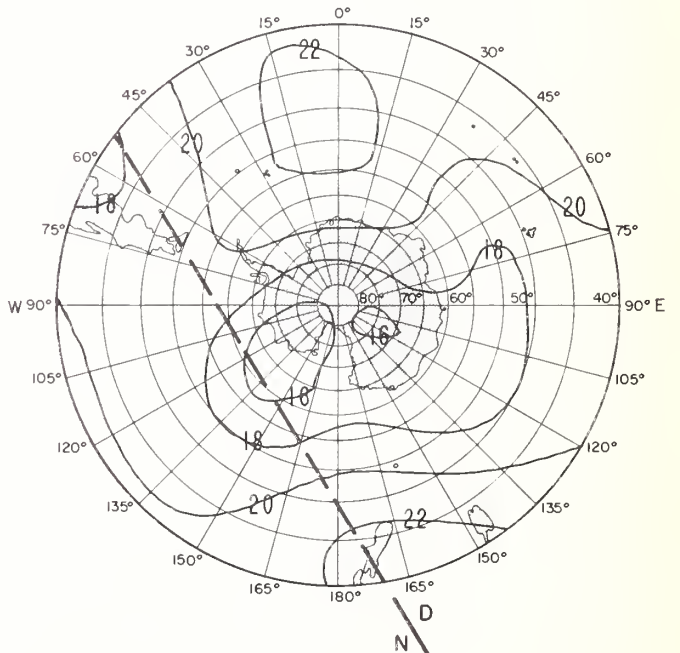
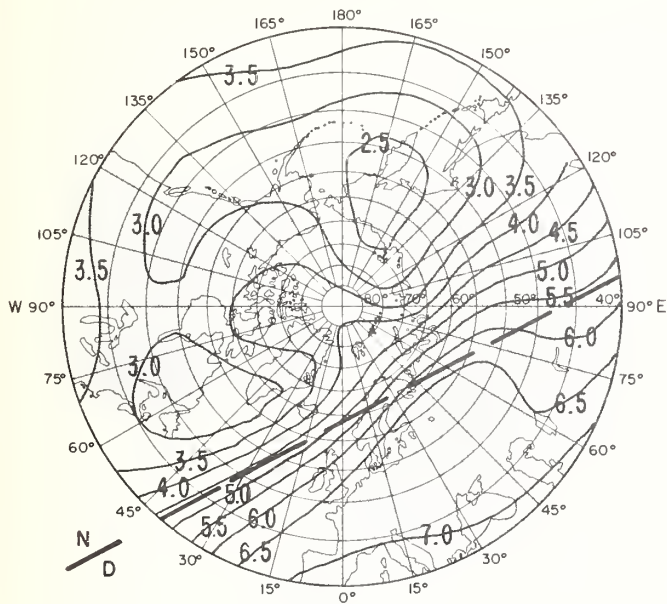


FIG. 17B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

DECEMBER 1965 UT = 10

NORTH POLAR AREA



SOUTH POLAR AREA

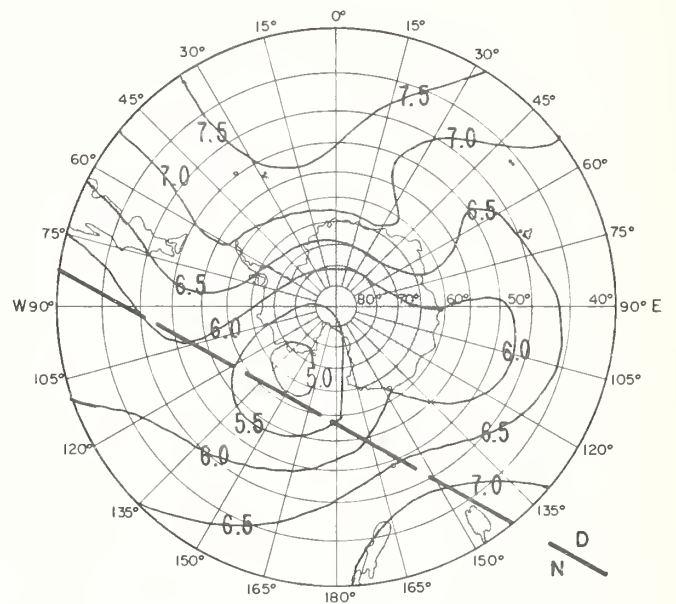
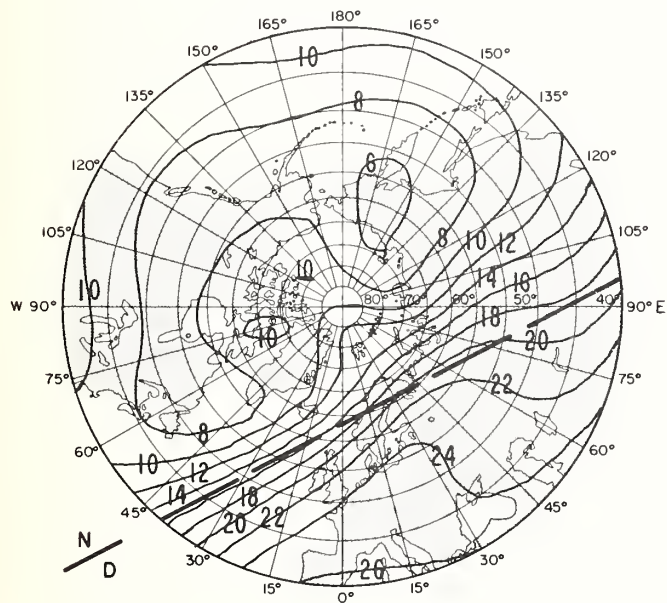


FIG.18A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

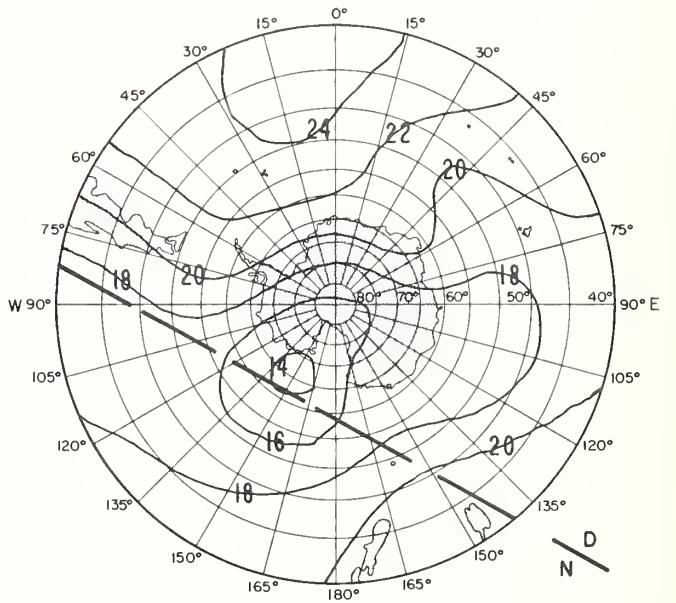


FIG.18B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

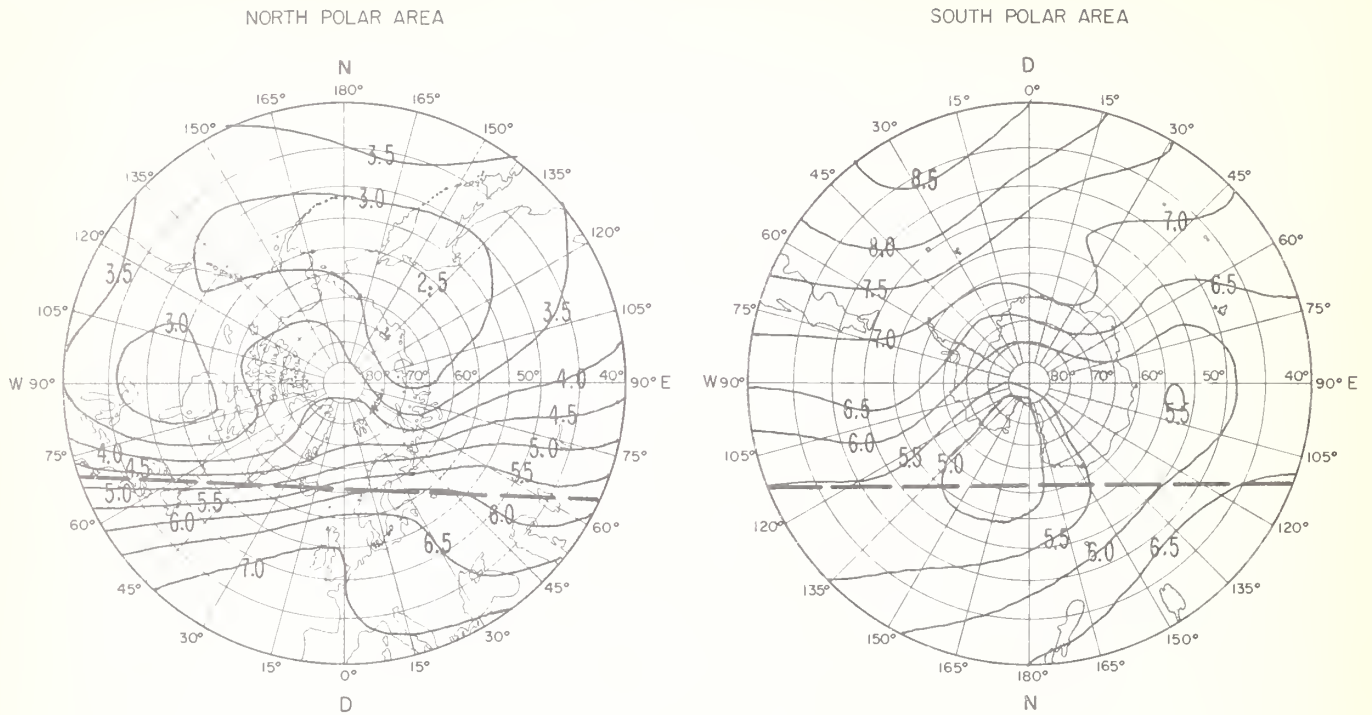


FIG. 19A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

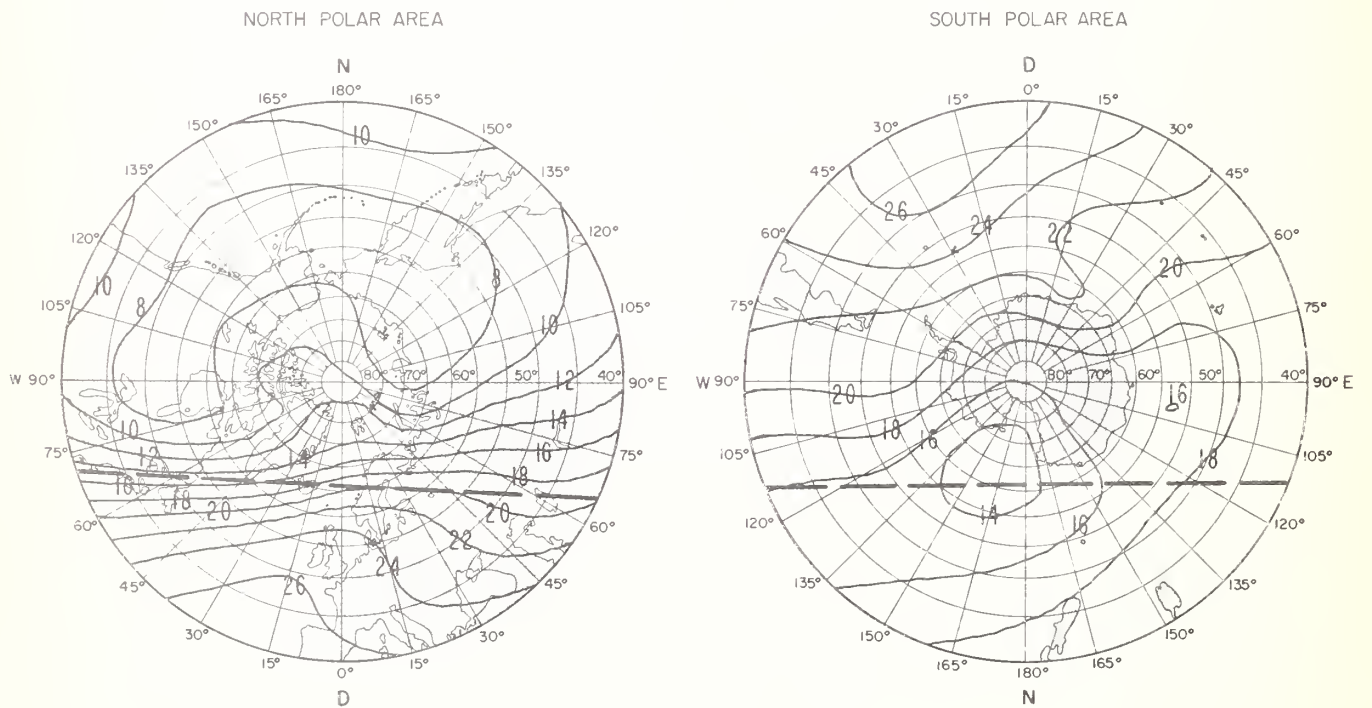
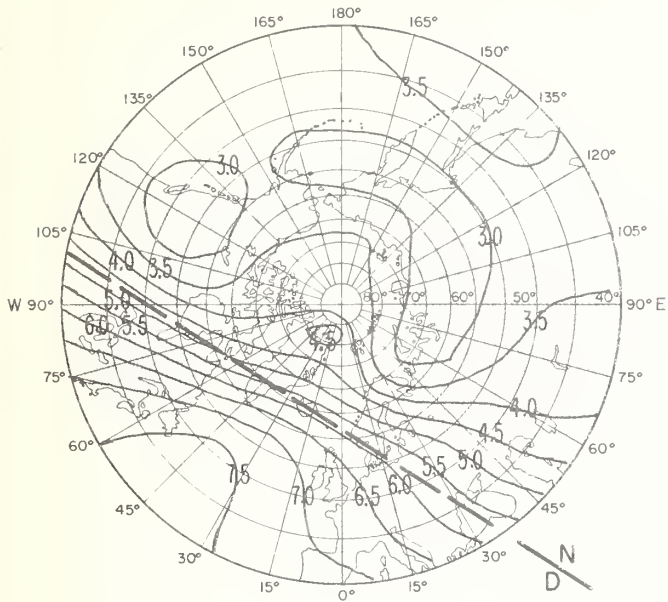


FIG. 19B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

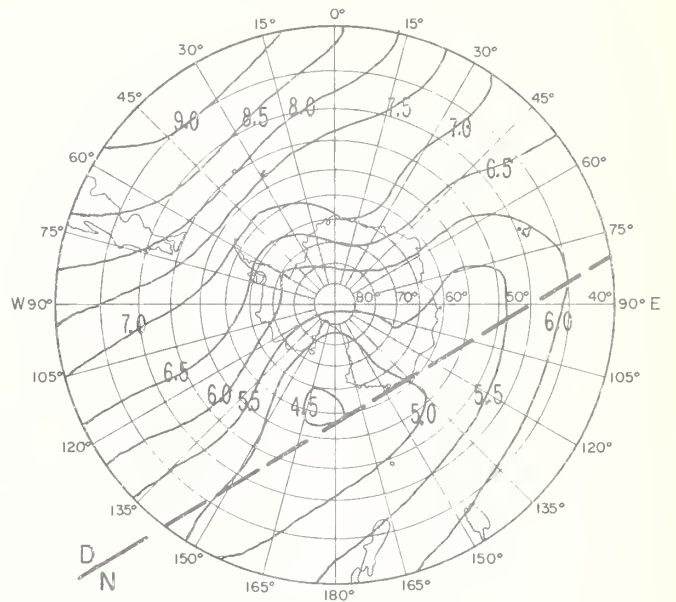
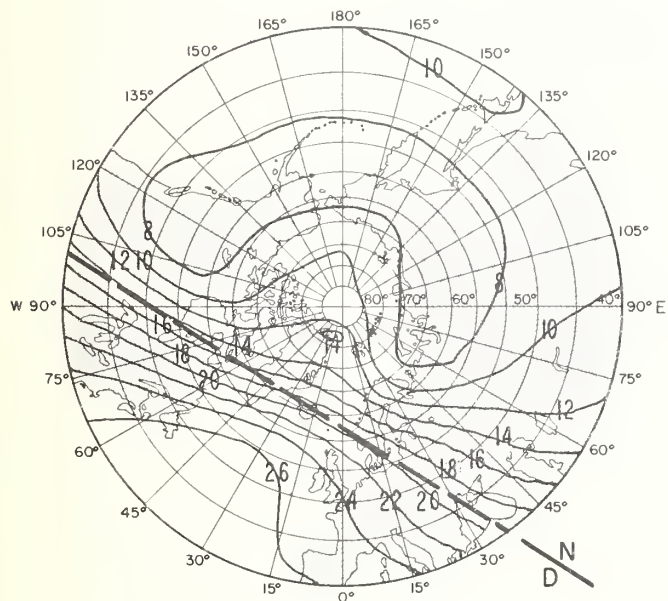


FIG.20A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

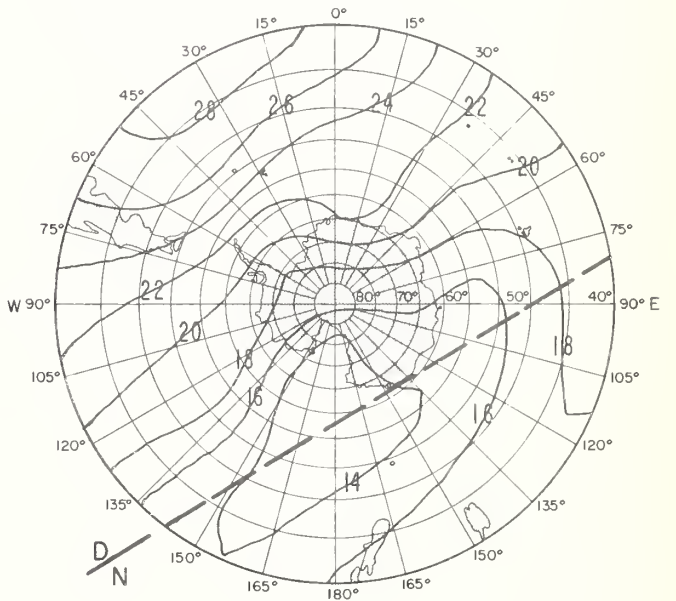
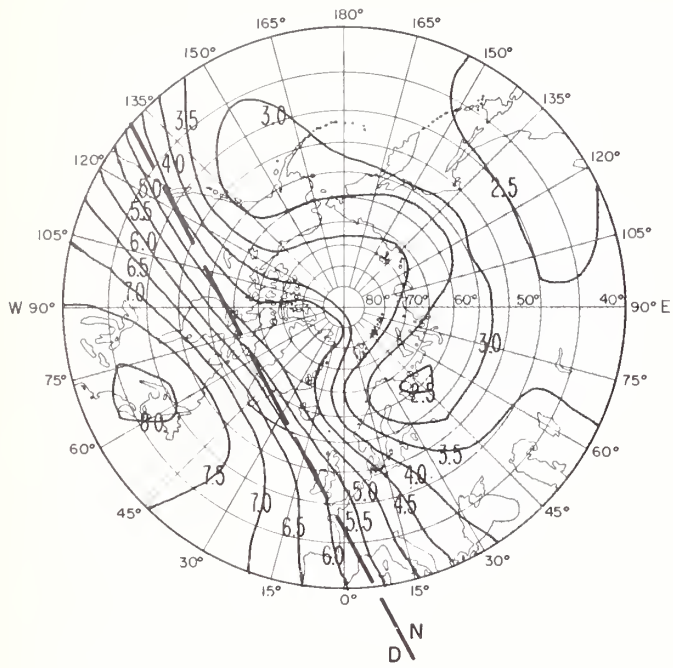


FIG.20B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

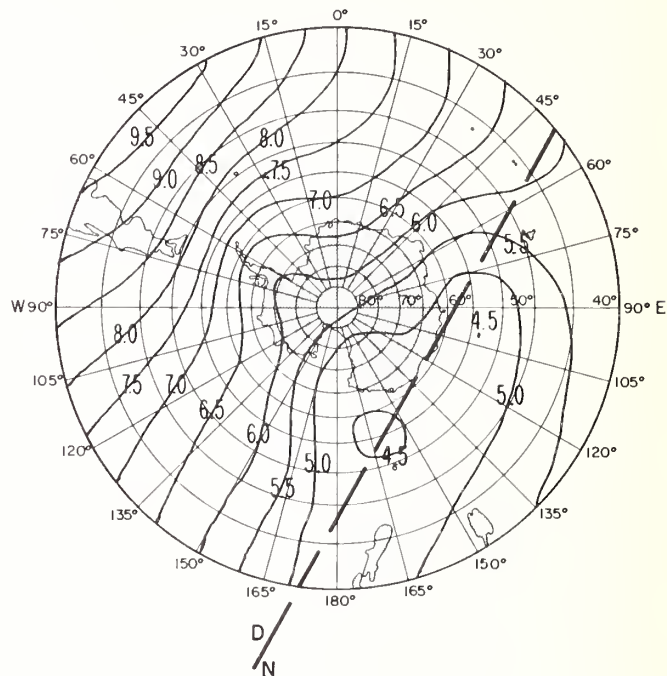
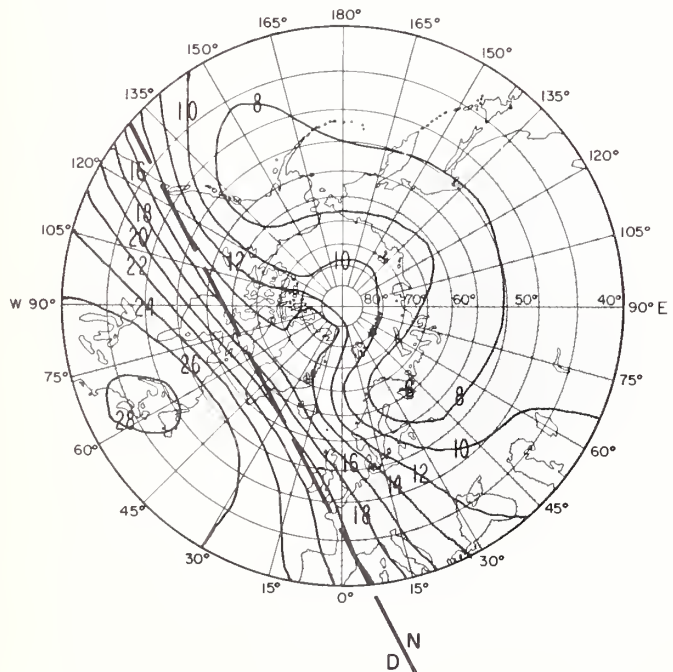


FIG.2 I A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

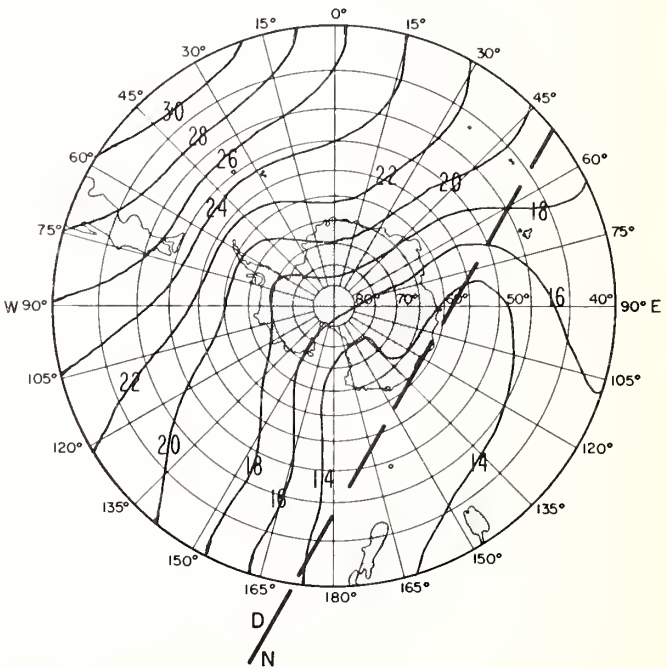


FIG.2 I B. PREDICTED MEDIAN MUF (4000)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

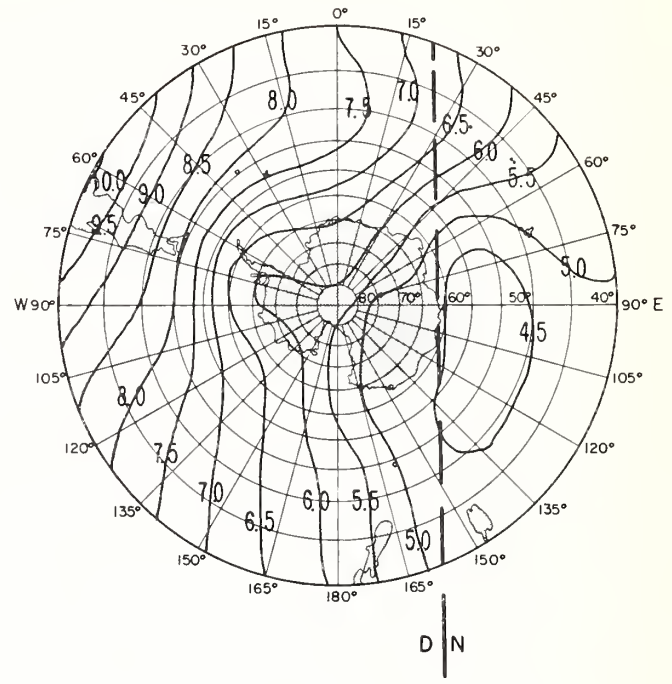
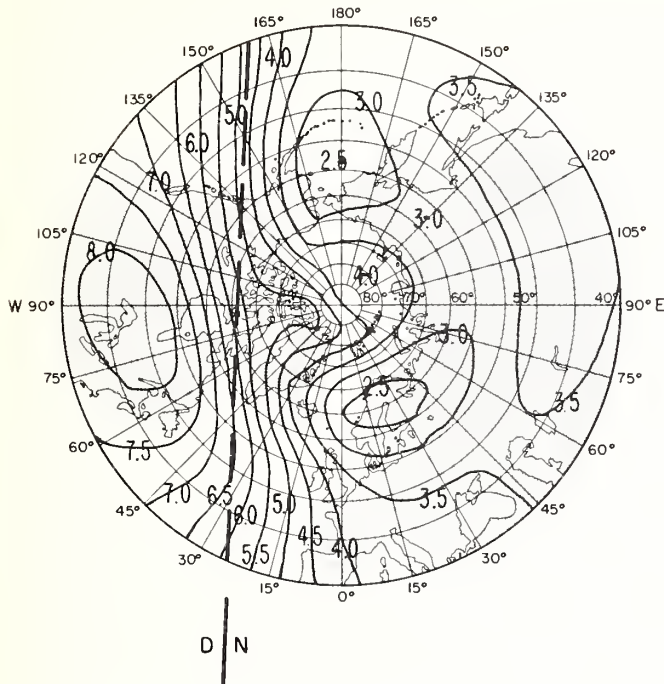


FIG. 2 2A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

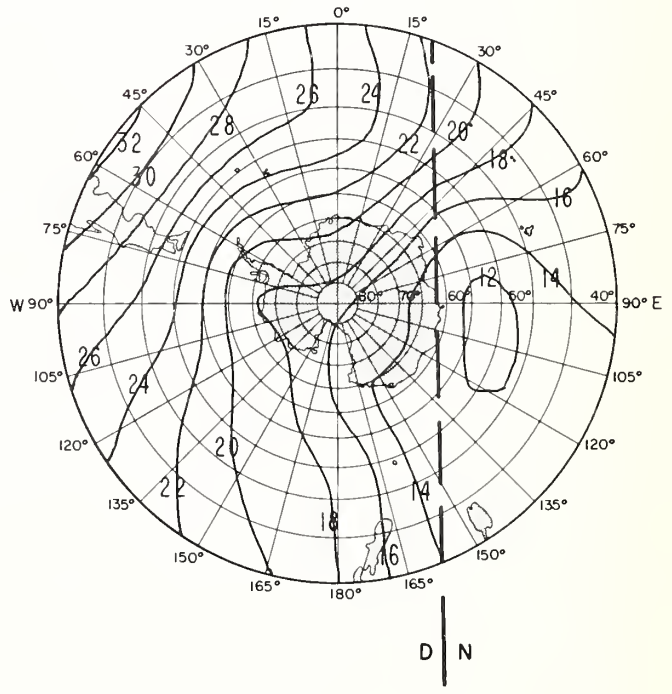
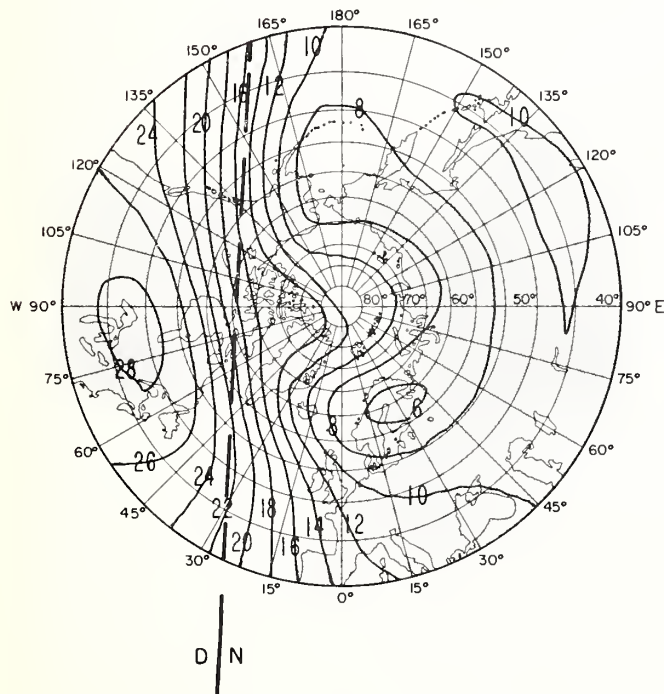
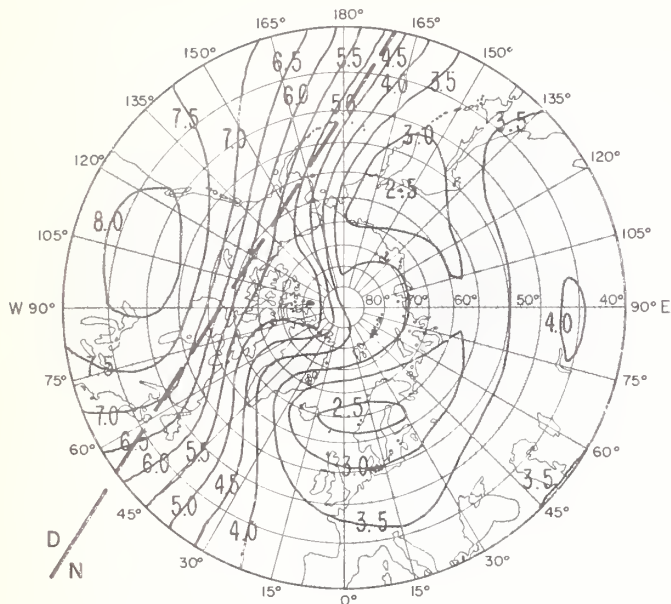


FIG. 2 2B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

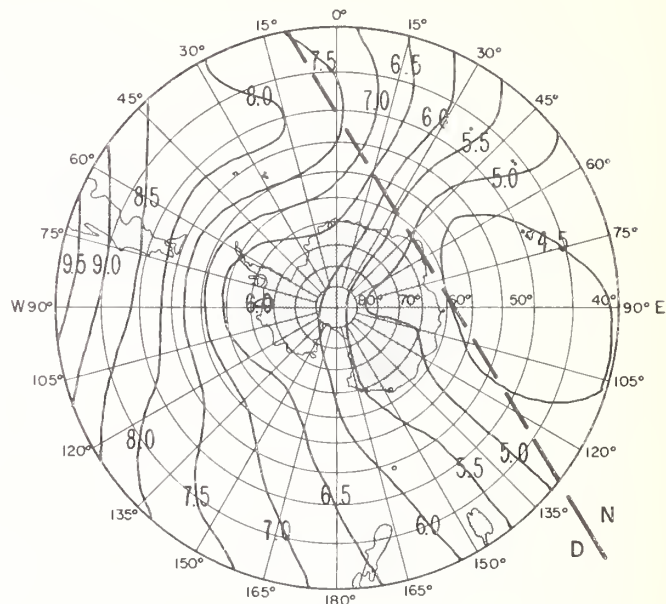
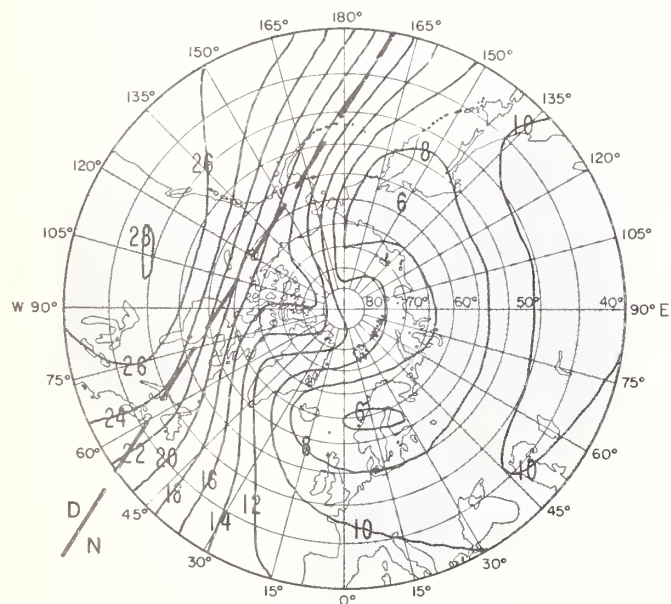


FIG.23A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA



SOUTH POLAR AREA

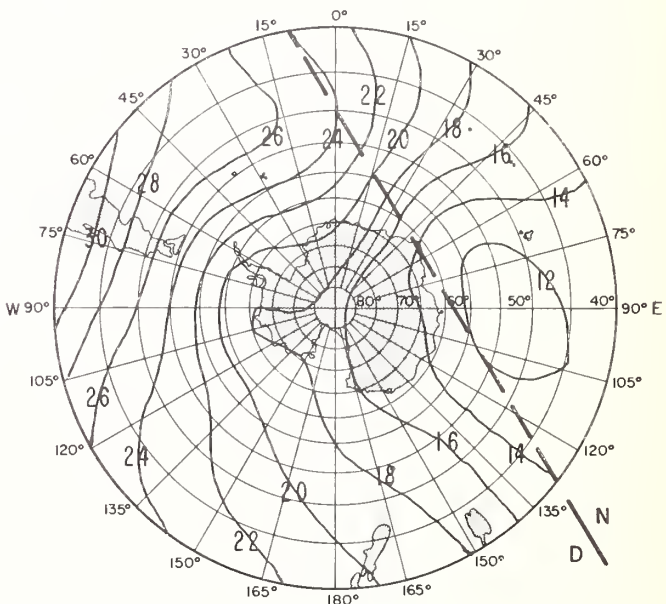


FIG.23B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

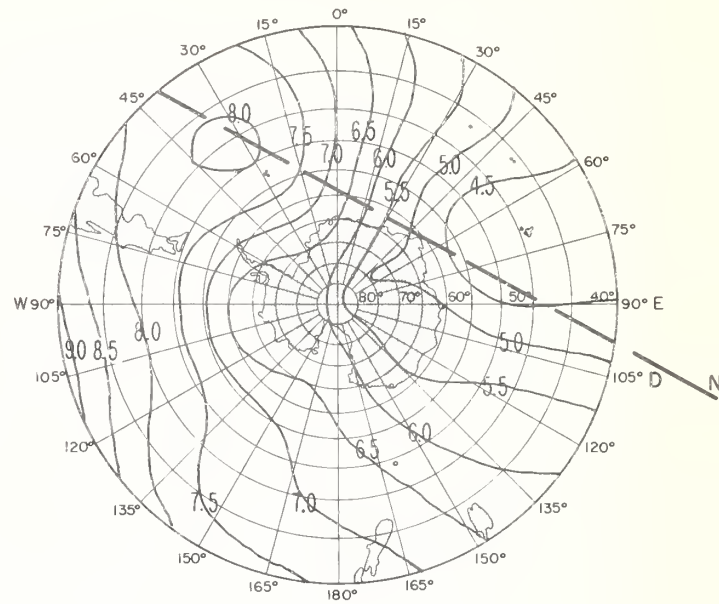
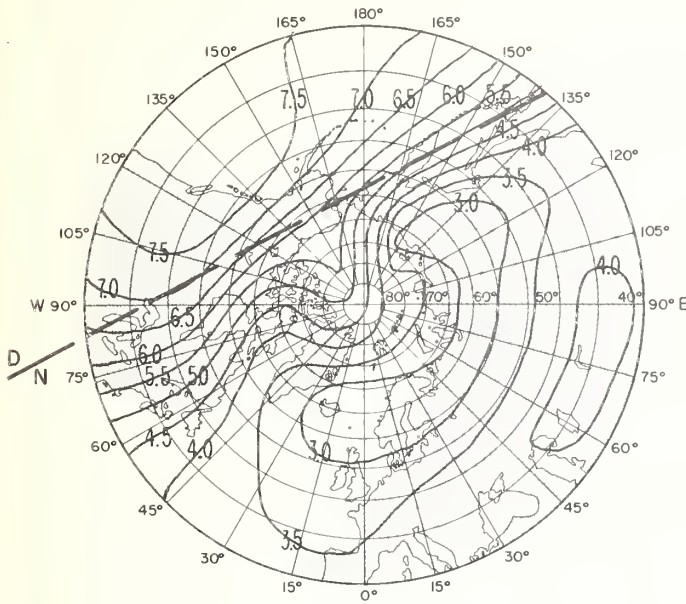


FIG. 24A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

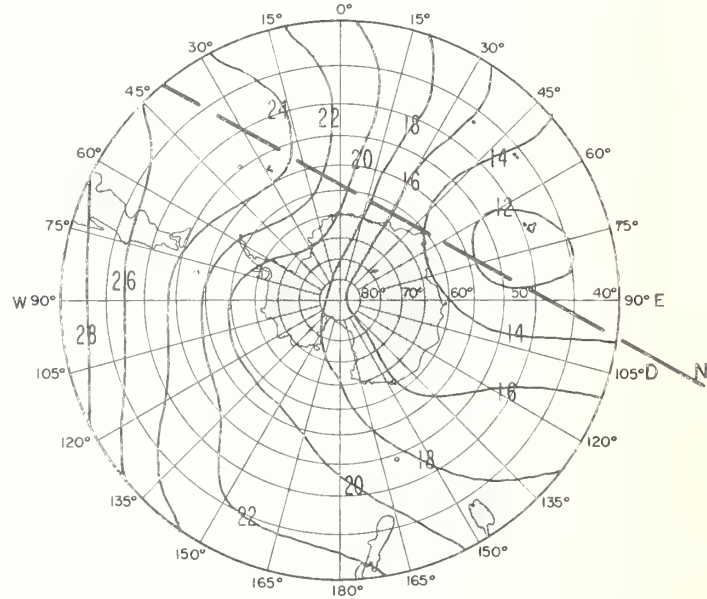
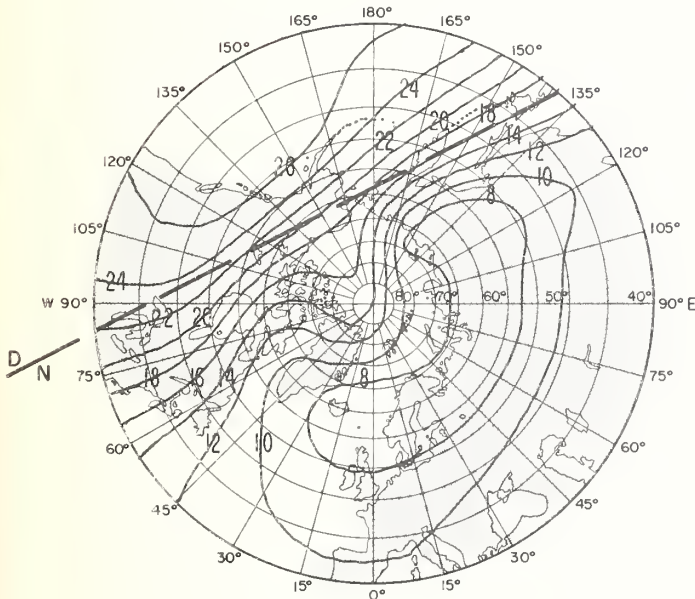


FIG. 24B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

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NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.