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THE SUNSPOT OBSERVATIONS MADE IN 1996

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Abstract

In the photospheric observations made at the Istanbul University Observatory, observable sunspots and faculae are drawn on a projected disk of the Sun and the heliographic coordinates of the sunspots are determined from these drawings.

This paper gives the heliographic coordinates for the sunspot groups observed in 1996 and some other results.

The photosphere of the Sun is observed on every clear day at the Istanbul University Observatory. A refracting telescope is used for this purpose; the aperture of the objective and focal length are 13 cm., and 200 cm. respectively. Sunspots and faculae are drawn on a projection disk of a diameter of 25 cm. The heliographic coordinates of the sunspot groups are determined by using the Astronomical Almanac for which the Position Angle of the Sun's axis P_o, Heliographic Latitude B_o, Longitude L_o are calculated for the time that observation was made. Each sunspot group is observed for a single rotation of the Sun and the results obtained during the period are given in Tables and in Figures.

In this paper, columns in Table I give the following : (1): Current numbers of the groups; (2) and (3): The mean latitude and longitude of each group respectively; (4) and (5): First and last observations of the groups respectively; (6): Evolution of the groups which are classified according to McIntosh Sunspot Group Classification (Solar-Geophysical Data, 1984). The first upper case letter in column gives "Modified Zurich Class". The second upper case letter gives the penumbra of the largest spot. The third upper case letter in the column gives the sunspot distribution. The Figures after these letters give the number of umbrae in each group. The sign "?" denotes a group which was observed at the edge of the disk and could not be identified in the McIntosh Classification. The sign "X" is used to express that the group probably could not be observed on that day, and "-" that no observation was done on that day because of weather conditions or other reasons.

In 1996, 52 groups were observed; none of them have a latitude of 0°, 29 of them have an average latitude of +10.1° in the North Hemisphere and remained 23 groups have an average latitude -11.8° in the South Hemisphere. The distribution of the groups according to their latitudes is as follows (see Fig.1).

In Table II, number of groups and umbrae are given by decimal numbers for each day; the integer part of these numbers denote the numbers of the groups and the fractional part numbers of umbrae. Letters across these numbers are the abbreviations of the observers' names; the complete names are given at the end of the Table II.

Latitude Intervals		North Hemisphere	South Hemisphere
From	0° to 05°	8	3
From	6° to 10°	11	9
From	11° to 15°	6	7
From	16° to 20°	1	1
From	21° to 25°	0	0
From	26° to 30°	2	3
From	31° to 35°	1	0
TOTAL		**29**	**23**

Table III and Table IV give the relative Wolf Numbers for the Istanbul University Observatory and the distribution of the groups in types, respectively. Data in Table IV are summarized in Figure 2.

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Table I

Current Number	Heliographic Coordinates		First Observation	Last Observation	Evolution of the groups					
	Latitude	Longitude								
1	13	187	08.I.96	08.I.96	CKI-5					
2	04	155	08.I.96	09.I.96	CAI-14,	HS-4				
3	09	127	08.I.96	08.I.96	AX-1					
4	10	193	25.I.96	25.I.96	AX-1					
5	09	223	02.II.96	02.II.96	?-2					
6	-09	195	03.II.96	03.II.96	AX-1					
7	03	203	20.II.96	24.II.96	CAO-4,	BXO-5,	–,	–,	AR-1	
8	-14	288	21.II.96	21.II.96	AX-2					
9	08	233	24.II.96	24.II.96	DRO-3					
10	12	122	04.III.96	04.III.96	AX-1					
11	-04	322	11.III.96	19.III.96	CRI-15, –,	DAI-10, –,	–, ?-1	CAO-5,	–,	CAO-2
12	08	204	25.III.96	28.III.96	DSO-8,	–,	HA-1,	HA-3		
13	02	185	27.III.96	28.III.96	CSO-5,	AX-2				
14	02	121	02.IV.96	04.IV.96	DAO-3,	X,	AX-1			
15	-06	257	12.IV.96	12.IV.96	CRO-3					
16	03	261	13.IV.96	13.IV.96	AX-2					
17	-10	266	19.IV.96	19.IV.96	DRO-3					
18	-07	245	21.IV.96	21.IV.96	DAI-8					
19	-07	259	07.V.96	17.V.96	DSO-3, DSO-8,	DSO-5, DSC-10,	DSO-4, –,	DSO-11, BXO-7,	DSO-14, HR-1	DSO-9,
20	35	328	01.VI.96	01.VI.96	AX-1					
21	01	290	04.VI.96	12.VI.96	HR-1, DAO-7,	CRO-2, HA-1,	CAO-4, ?-1	DAI-23,	DAO-16,	DAO-16,
22	08	344	05.VI.96	05.VI.96	AX-3					
23	-10	365	06.VI.96	06.VI.96	AX-3					
24	-07	261	09.VI.96	09.VI.96	BXO-2					
25	-09	044	19.VI.96	01.VII.96	?-1, HS-1, ?-1	HS-1, HS-1,	HS-1, HS-1,	HS-2, HS-1,	HS-1, HS-1,	HS-4, HS-1,
26	12	357	23.VI.96	30.VI.96	AX-2, HR-2,	AX-3, HR-3	AX-2,	HR-3,	HR-2,	HS-4,

Table I (Cont.)

27	08	050	24.VI.96	24.VI.96	AX-1					
28	03	286	02.VII.96	02.VII.96	AX-2					
29	-11	247	05.VII.96	13.VII.96	AX-1, --,	X, --,	BXI-7, ?-2	DRI-32,	EAC-49,	EKC-19,
30	-10	259	27.VII.96	08.VIII.96	?-1, ESC-20, ?-1	DSO-5, EHC-24,	DSO-8, ESO-26,	DKI-20, HS-4,	EHD-27, HS-2,	ESC-29, HS-2,
31	-11	248	01.VIII.96	02.VIII.96	BXI-16,	AX-2				
32	10	166	06.VIII.96	14.VIII.96	AX-1, DRI-14,	AX-4, DAO-6,	X, CRO-2	BXI-17,	--,	CRI-25,
33	28	071	14.VIII.96	17.VIII.96	CRO-3,	CAO-4,	HR-1,	DRO-3		
34	10	045	23.VIII.96	24.VIII.96	BXO-4,	AX-1				
35	-12	256	24.VIII.96	03.IX.96	HS-1, DSO-3,	HS-2, CSO-3,	CSO-5, CSO-2,	CSO-6, AX-3,	CAO-11, AX-1	HS-1,
36	-11	263	27.VIII.96	27.VIII.96	AX-1					
37	14	273	28.VIII.96	28.VIII.96	AX-1					
38	17	185	31.VIII.96	31.VIII.96	AX-1					
39	-26	135	07.IX.96	07.IX.96	AX-6					
40	-13	238	27.X.96	27.X.96	BXO-2					
41	-01	287	14.XI.96	16.XI.96	HR-1,	HR-2,	HR-3			
42	30	288	15.XI.96	16.XI.96	CRO-4,	HR-2				
43	08	245	16.XI.96	21.XI.96	HR-2,	AX-2,	--,	X,	HR-2,	HS-3
44	-15	246	16.XI.96	16.XI.96	HR-1					
45	13	249	19.XI.96	19.XI.96	AX-3					
46	11	236	19.XI.96	19.XI.96	AX-5					
47	-04	168	21.XI.96	30.XI.96	AX-1, --,	DSO-4, EHC-39,	DAI-10, EKC-29,	DAI-25, EKC-17	EKC-20,	EKI-44,
48	04	243	22.XI.96	26.XI.96	HR-6,	DAO-11,	DSO-8,	DAO-7,	EAI-14	
49	-16	236	26.XI.96	26.XI.96	BXO-7					
50	-29	360	13.XII.96	14.XII.96	EAI-15,	EAI-13				
51	05	252	13.XII.96	20.XII.96	HS-2, CRO-15,	HS-1, HA-4	--,	HS-5,	--,	HS-14,
52	-29	225	18.XII.96	18.XII.96	CRO-13					

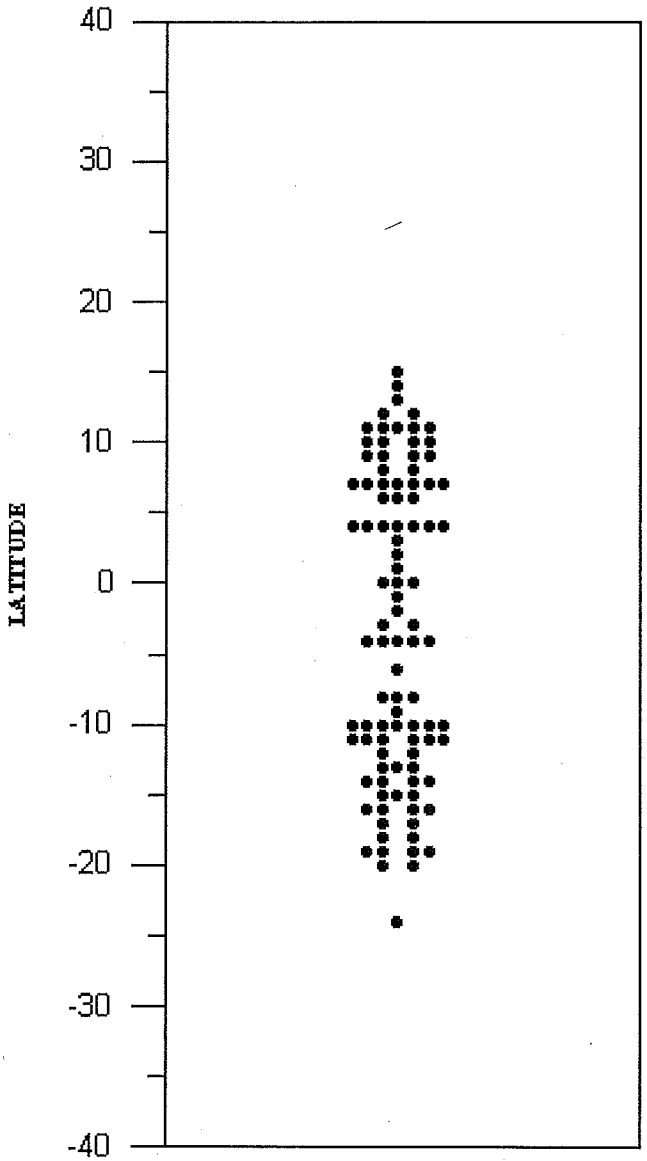

Fig. 1 - Distribution of the groups according to their latitudes.

TABLE II

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	0.0 TÖ	------	------	0.0 İH	0.0 AÖ	1.1 TÖ	1.1 İH	2.45 MS	2.2 TA	0.0 SB	0.0 TÇ	------
2	------	1.2 TÇ	0.0 HE	1.3 SB	0.0 MS	0.0 TA	1.2 SB	2.22 MS	1.3 İH	------	0.0 MB	------
3	------	1.1 HE	0.0 TA	0.0 SGA	0.0 TÇ	0.0 İH	0.0 TÇ	1.24 MB	1.1 SB	0.0 SGA	0.0 TÖ	------
4	------	0.0 MB	1.1 İH	1.1 MS	0.0 TA	1.1 SB	0.0 MS	1.26 TA	------	0.0 TÇ	0.0 SGA	------
5	------	------	------	------	0.0 TÖ	2.5 MS	1.1 TÇ	1.4 İH	------	0.0 HE	0.0 TK	------
6	------	------	------	------	0.0 İH	2.7 MS	0.0 MB	2.3 SB	0.0 SB	------	0.0 İH	------
7	------	------	------	------	1.3 SB	1.23 TÇ	1.7 TA	2.6 SGA	1.6 TÖ	------	0.0 SB	------
8	3.20 TÇ	------	------	------	1.5 SGA	1.16 HE	1.32 İH	1.1 MS	------	------	0.0 TÇ	------
9	1.4 MS	------	------	0.0 SB	1.4 MS	2.18 MB	1.49 SB	1.17 TÇ	0.0 SB	0.0 SGA	0.0 HE	------
10	------	------	------	------	1.11 TÇ	1.7 İH	1.19 MS	------	0.0 SB	------	0.0 MB	------
11	------	------	1.15 TÇ	0.0 MS	1.14 TÖ	1.1 SB	------	1.25 TA	0.0 TA	------	0.0 SGA	------
12	0.0 TÇ	------	1.10 SB	1.3 TÇ	1.9 HE	1.1 HÇ	------	1.14 İH	0.0 MS	------	0.0 TK	------
13	0.0 MB	0.0 SB	------	1.2 TÖ	1.8 İH	0.0 MS	1.2 HE	1.6 SB	------	------	------	2.17 TÖ
14	------	0.0 İH	1.5 MS	0.0 TÖ	1.10 SB	0.0 TÇ	0.0 TÖ	2.5 SGA	0.0 TA	0.0 İH	1.1 SB	2.14 TÖ
15	------	------	------	------	------	------	0.0 MS	1.4 MS	0.0 TA	0.0 SGA	2.6 TÇ	------
16	------	------	1.2 TÖ	0.0 SB	1.7 MS	------	0.0 AÖ	1.1 TÇ	0.0 TÖ	0.0 TÇ	4.8 HB	1.5 SGA
17	------	------	------	------	1.1 TÇ	------	0.0 TÇ	1.3 HE	0.0 MB	0.0 SB	1.2 TÖ	------
18	------	------	------	------	0.0 HE	0.0 SB	0.0 TÇ	0.0 MB	0.0 HÇ	0.0 TK	------	2.17 İH
19	0.0 TÇ	0.0 TA	1.1 SB	1.3 TÇ	0.0 MB	1.1 İH	0.0 HÇ	0.0 İH	------	0.0 TÖ	2.8 TK	1.15 SB
20	------	1.4 YK	0.0 SGA	------	0.0 İH	1.1 MS	0.0 HE	0.0 SB	0.0 TA	0.0 TÇ	1.2 İH	1.4 TÇ
21	------	2.7 MB	------	1.8 MB	0.0 SB	1.1 TÇ	0.0 HE	0.0 HÇ	0.0 MB	0.0 SGA	2.4 SB	------
22	------	------	------	------	0.0 SGA	1.2 MB	0.0 TK	0.0 MS	0.0 TÖ	0.0 TK	2.10 TÇ	------
23	------	------	------	0.0 TÖ	0.0 MS	2.3 TA	------	1.4 TÇ	------	0.0 İH	2.21 HE	------
24	0.0 SB	2.4 YK	------	------	0.0 TÇ	3.8 İH	0.0 TK	2.2 TÇ	0.0 SB	0.0 SB	2.33 TÖ	------
25	1.1 HÇ	------	1.8 SB	0.0 MS	0.0 HE	2.3 SH	0.0 TÖ	1.2 TA	------	------	2.27 SGA	------
26	------	------	------	0.0 TÇ	0.0 HE	2.4 SE	0.0 TK	1.5 İH	0.0 MB	------	3.65 TK	------
27	------	------	2.6 HÇ	0.0 MB	0.0 TÖ	2.3 MS	1.1 IIE	2.7 SB	------	1.2 TA	------	------
28	------	------	2.5 MS	0.0 TÖ	0.0 SB	2.5 SB	1.5 TÖ	2.12 HÇ	------	------	1.39 TÖ	------
29	------	------	------	0.0 TÖ	------	2.3 HE	1.8 SGA	1.1 MS	0.0 TÖ	0.0 HE	1.29 TÇ	------
30	------		0.0 HE	0.0 MB	0.0 SGA	2.4 TO	1.20 İH	1.3 HE	------	0.0 İH	1.17 TÖ	------
31	------		0.0 YK		------		1.27 TÇ	2.4 TA		------		------

Observers :

HÇ : Hülya Çalışkan
HE : Hasan Esenoğlu
MB : Mevlana Başal
YK : Yüksel Karataş
SGA : Serap Güngör Ak
TA : Tansel Ak
TK : Tuba Koktay
TÖ : Tuncay Özıştk
TÇ : Taşkın Çay
İH : İpek Hamami
MS : Melihat Sırma
SB : Selçuk Bilir
AÖ : Adnan Ökten

TABLE III

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	0	--	--	0	0	11	11	65	22	0	0	--
2	--	12	0	13	0	0	12	42	13	--	0	--
3	--	11	0	0	0	0	0	34	11	0	0	--
4	--	0	11	11	0	11	0	36	--	0	0	--
5	--	--	--	--	0	25	11	14	--	0	0	--
6	--	--	--	--	0	27	0	23	0	--	0	--
7	--	--	--	--	13	33	17	26	16	--	0	--
8	50	--	--	--	15	26	42	11	--	--	0	--
9	14	--	--	0	14	38	59	27	0	0	0	--
10	--	--	--	--	21	17	29	--	0	--	0	--
11	--	--	25	0	24	11	--	35	0	--	0	--
12	0	--	20	13	19	11	--	24	0	--	0	--
13	0	0	--	12	18	0	12	16	--	--	--	37
14	--	0	15	0	20	0	0	25	0	0	11	34
15	--	--	--	--	--	--	0	14	0	0	26	--
16	--	--	12	0	17	--	0	11	0	0	48	15
17	--	--	--	--	11	--	0	13	0	0	12	--
18	--	--	--	--	0	0	0	0	0	0	--	37
19	0	0	11	13	0	11	0	0	--	0	28	25
20	--	14	0	--	0	11	0	0	0	0	12	14
21	--	27	--	18	0	11	0	0	0	0	24	--
22	--	--	--	--	0	12	0	0	0	0	30	--
23	--	--	--	0	0	23	--	14	--	0	41	--
24	0	24	--	--	0	38	0	22	0	0	53	--
25	11	--	18	0	0	23	0	12	--	--	47	--
26	--	--	--	0	0	24	0	15	0	--	95	--
27	--	--	26	0	0	23	11	27	--	12	--	--
28	--	--	25	0	0	25	15	32	--	--	49	--
29	--	--	--	0	--	23	18	11	0	0	39	--
30	--		0	0	0	24	30	13	--	0	27	--
31	--		0		--		37	24		--		--
Mean	9	10	12	4	6	17	11	20	3	1	20	27

TABLE IV

Evolution Type	A	B	C	D	E	F	H	?	Total
Number of Groups	33	9	22	32	15	0	43	8	162
Percentage of Numbers	20,4	5,6	13,6	19,8	9,3	0	26,5	4,9	100

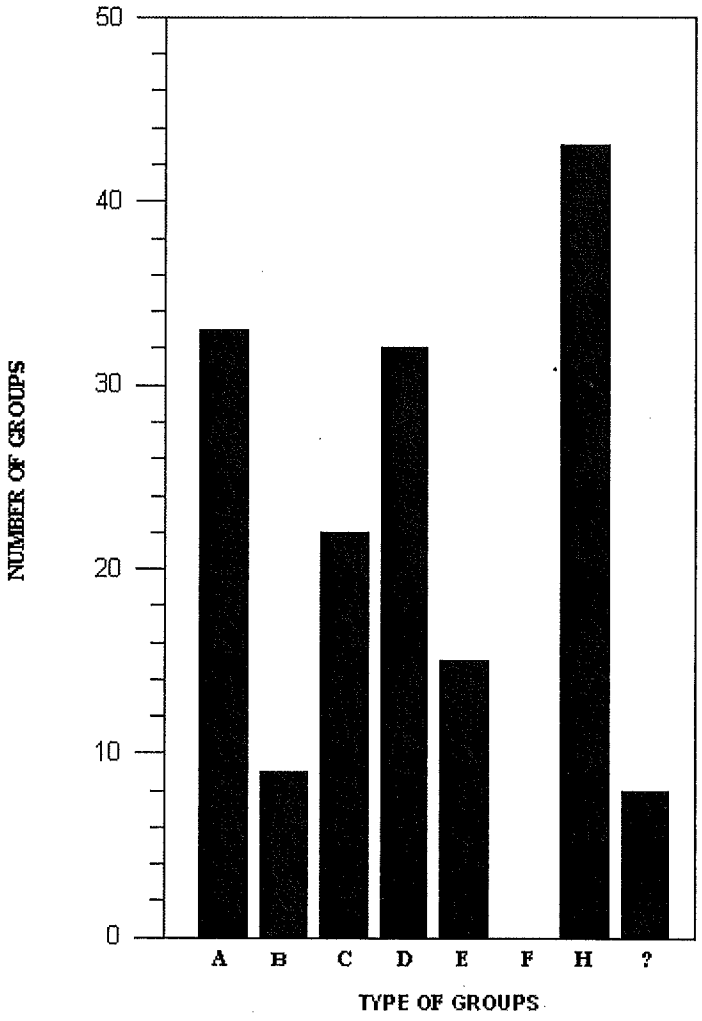

Fig. 2 - Distribution of the groups in types