目　　录

1997 年 8 月

CONTENTS

AUGUST 1997

《太阳地球物理资料》各表表头内容说明

注：各表按目录顺序依次说明，若各表内容有相同的则只作一次说明。

太阳黑子相对数与面积数表

Day：	每天观测日期
Gro：	每天在日面上的黑子群总数
Relative—Num—bers：	每天的黑子相对数值
N. H. ：	每天北半球的黑子相对数
S. H. ：	每天南半球的黑子相对数
Sum：	南、北半球黑子相对数的总和
Sunspot Areas：	太阳黑子面积数值
Drawing：	手描的
Photographic：	照相的
N. H. ：	每天北半球黑子面积
S. H. ：	每天南半球黑子面积
Sum：	南、北半球黑子面积的总和

太阳黑子观测表

Group：	在日面上的黑子群号
CMP	黑子群过日面中心经圈日期，
Mo—Day：	用月—日表示。
Lat：	黑子群在日面上的纬度
L：	黑子群在日面上的卡林顿经度
CMD：	黑子群在日面上的中经距
Type：	黑子群的 McIntosh 类型
r/R：	黑子群在日面上的日心距(以太阳半径为 1)
Corre. Area Sd whole Max：	黑子群在日面上所占的面积(Sd 为视面积，Whole 为校正后的全群面积，Max 为校正后的最大黑子的面积。)
See：	观测时大气视宁静度
Remarks：	备注(空白表示云南天文台的观测资料，注明 PLAT 的为北京天文馆资料，PURP 为南京紫金山天文台资料。)

太阳黑子相对数的平滑值预报表

Time：	预报的时间
R′：	月平滑黑子相对数的预报值
E′：	预报误差

Hα 太阳耀斑表

Sta：	台站
Start (UT)：	耀斑开始时间(UT 为世界时，其中"E"为小于此时间。)
Max (UT)：	耀斑的极大时间("U"为接近此时间，不确定。)
End (UT)：	耀斑的结束时间("D"为大于此时间。)
Cen Dist：	日心距，即 r/R。
Area Measurement Appar Corr (sd) (sq)：	耀斑极大时的面积(Sd 为视面积，单位为太阳圆面积的 10^{-6}；Sq 为校正面积，以平方度为单位。)
Imp：	耀斑的级别
Obs Type：	耀斑资料类型
A. R. ：	耀斑所在活动区的黑子群号
Rem：	备注(记录耀斑发生时的形态)

Hα 耀斑巡视时间表

From：	耀斑照相巡视开始时间
To：	耀斑照相巡视的结束时间

太阳活动区磁场和速度场的观测表

L_0：	每天的日面中心经度
Huairou Region ：	北京天文台怀柔观测站的活动区编号
Data：	取得的磁场资料类型

太阳射电辐射流量表

BEIJ 2840 ：	每天的太阳在 2840 MHz 的流量密度(北台 0400 UT 测量，以 10^{-22} · 瓦 · 米$^{-2}$ · 赫$^{-1}$(s. f. u.)为单位。)
PURP 2700 ：	每天的太阳在 2700 MHz 的流量密度(紫台 0400 UT 测)

URUM	每天的太阳在 9375 MHz 的
9375：	流量密度(乌站 0500 UT 测)
YUNN	每天的太阳在 2840 MHz 的
2840：	流量密度(云台 0500 UT 测)

太阳射电辐射显著事件表

Freq：	观测频率
Type：	射电爆发的型别
Duration：	射电爆发的持续时间(以分钟为单位)
Flux Density：	射电爆发的流量密度
Peak：	射电爆发流量的峰值增值
Rel：	射电爆发峰值流量与爆发前流量之比值
Mean：	流量密度的增值对时间求积分再除以爆发持续时间

太阳射电辐射巡视时间表

BEIJ	北京天文台 2840 MHz 频率
From To	巡视时间
2840：	
PURP	紫金山天文台 2700 MHz 频率
From To	巡视时间
2700：	
URUM	新疆乌鲁木齐天文站频率为
From To	9375 MHz 巡视时间
9375：	
YUNN	云南天文台 2840 MHz 频率
From To	巡视时间
2840：	

宇宙线强度表

这部分共有三个表和宇宙线强度图。其中第 1 个表是“中子堆数据表”,它给出的值是记数率与 1500 的差;第 2 个表是“μ 介子垂直分量表”它给出的值是记数率与 3000 的差;第 3 个表是“μ 介子数据表”,它列出的是相对强度与 1000 的差。这三个表的第一行数据是 1—24 小时。

详细说明请见每年第一期。

Explanation of data reports can be found in the first issue of the year.

Mean：	日均值
N：	记录的小时数
Day：	日期

最后四行是仪器全天工作天数的月平均日变化与相应的月均值的差。宇宙线强度图说明请参见每年第 1 期说明。

突然电离层扰动(D 层)表

Imp：	级别(最小为 1－级,最大为 3＋级。)
SPA：	相位突然异常
LF－SPA：	低频相位突然异常
VLF－SPA：	甚低频相位突然异常
LF－SFA：	低频场强突然异常

地磁活动指数 K 和 A_K 表

第一行：	以三小时为时段的 K 指数
Sum：	总和
A_K：	A_K 指数

磁暴表

Time of Magne－tic：	磁暴时间
Begining：	开始时间
Ending：	终止时间
h：	小时
m：	分钟
Type：	类型
Sudden Com. Amplitude	急始变幅
D′ HnT ZnT：	
Deg. of Acti.：	活动程度
Maximum Acti. on K-scale：	最大活动程度
3 hour Int.：	三小时时段
K Index：	K 指数
Maximum Range	最大幅度
D′ HnT ZnT：	

DAILY RELATIVE SUNSPOT NUMBERS AND SUNSPOT AREAS

AUGUST 1997

		Relative-Numbers			Sunspot Areas					
					Drawing			Photographic		
Day	Gro.	N.H.	S.H.	Sum	N.H.	S.H.	Sum	N.H.	S.H.	Sum
1	0	0	0	0	0	0	0			
2	1	8	0	8	9	0	9			
3	3	14	10	24	8	13	21			
4	2	8	10	18	6	32	38			
5	2	0	16	16	0	35	35			
6	3	18	17	35	54	35	89			
7	3	14	21	35	98	21	119			
8	3	12	20	32	95	51	146			
9	4	29	16	45	56	36	92			
10	2	8	18	26	7	33	40			
11	3	16	10	26	5	5	10			
12	4	25	13	38	134	11	145			
13	4	26	13	39	144	36	180			
14	4	25	10	35	124	17	141			
15	5	32	8	40	103	16	119			
16	4	31	0	31	88	0	88			
17	4	23	7	30	65	2	67			
18	3	25	0	25	77	0	77			
19	3	23	0	23	69	0	69			
20	1	7	0	7	66	0	66			
21	2	14	0	14	71	0	71			
22	1	8	0	8	62	0	62			
23	1	7	0	7	57	0	57			
24	0	0	0	0	0	0	0			
25	1	7	0	7	8	0	8			
26	4	18	14	32	130	7	137			
27	3	21	8	29	96	7	103			
28	3	38	0	38	95	0	95			
29	2	40	0	40	138	0	138			
30	3	49	0	49	159	0	159			
31	4	61	0	61	224	0	224			
Mean		19.6	6.8	26.4	72.5	11.5	84.0			

DAILY SUNSPOT OBSERVATIONS

AUGUST 1997

Day	Group	CMP Mo-Day	Lat	L	CMD	Type	r/R	Sd	Corre. Whole	Area Max	See.	Remarks
1.19	0											
2.03	74	8- 7.9	6	51	77E	AXX	0.97	4	9	9	0	PLAT
3.07	69	7-31.7	26	146	32W	AXX	0.59	4	3	3	0	
	74				63E	AXX	0.89	4	5	5	0	
	75	8- 6.3	-21	72	44E	BXI	0.77	17	13	10	0	
4.09	74				50E	AXX	0.76	8	6	3	0	
	75				29E	CRO	0.62	50	32	27	0	
5.09	75				16E	CRO	0.51	50	29	27	0	
	76	8- 9.8	-19	26	65E	AXX	0.93	4	6	6	0	
6.04	75				3E	HSX	0.45	42	24	24	0	
	76				52E	BXO	0.83	13	11	4	0	
	77	8- 3.3	20	112	37W	CRI	0.62	84	54	24	0	
7.06	75				10W	BXO	0.46	17	9	5	0	
	76				38E	BXI	0.69	17	12	3	0	
	77				50W	DAI	0.75	130	98	60	0	
8.12	75				24W	AXX	0.59	4	3	3	0	
	76				23E	CSI	0.56	80	48	25	0	
	77				64W	DSI	0.89	88	95	45	0	
9.60	76				10E	CSI	0.46	63	36	21	0	
	77				76W	CSI	0.95	25	42	21	0	
	78	8-11.6	21	2	33E	AXX	0.57	8	5	3	0	
	79	8-13.4	25	338	61E	BXO	0.87	8	9	4	0	
10.07	76				4W	CSI	0.44	59	33	19	0	
	79				49E	BXO	0.77	8	7	3	0	
11.06	76				18W	BXI	0.53	8	5	2	0	
	79				31E	BXO	0.56	8	5	3	0	
	80	8-17.7	14	281		HRX		13			0	PLAT
12.07	76				29W	BXI	0.62	17	11	3	0	

DAILY SUNSPOT OBSERVATIONS

AUGUST 1997

Day	Group	CMP Mo-Day	Lat	L	CMD	Type	r/R	Sd	Corre. Area Whole	Max	See.	Remarks
	79				18E	BXI	0.41	17	9	7	0	
	80				74E	HSX	0.95	46	77	77	0	
	81	8-17.8	26	279	77E	HRX	0.97	25	48	48	0	
13.13	76				42W	CRI	0.76	46	36	26	0	
	79				3E	CRO	0.32	55	29	27	0	
	80				59E	HSX	0.85	76	72	72	0	
	81				62E	HSX	0.87	42	43	43	0	
14.02	76				57W	BXO	0.87	17	17	9	0	
	79				10W	CRO	0.36	34	18	16	0	
	80				48E	HSX	0.74	84	62	59	0	
	81				50E	CRO	0.78	55	44	40	0	
15.13	76				71W	BXO	0.97	8	16	8	0	
	79				24W	AXX	0.48	13	7	5	0	
	80				33E	HSX	0.54	105	62	62	0	
	81				35E	CRO	0.62	46	30	27	0	
	82	8-19.3	28	260	57E	AXX	0.84	4	4	4	0	
16.03	79				35W	AXX	0.61	4	3	3	0	
	80				21E	HSX	0.37	118	63	63	0	
	81				23E	CRO	0.49	34	19	17	0	
	82				43E	AXX	0.72	4	3	3	0	
17.07	80				8E	HSX	0.18	114	58	58	0	
	81				10E	AXX	0.37	8	5	2	0	
	83	8-15.8	-3	306	17W	AXX	0.32	4	2	2	0	
	84	8-18.7	27	268	22E	AXX	0.51	4	2	2	0	
18.04	80				5W	HSX	0.15	135	68	68	0	
	81				3W	AXX	0.33	8	4	2	0	
	84				8E	BXI	0.37	8	5	2	0	
19.03	80				18W	HSX	0.32	118	62	62	0	
	81				15W	BXO	0.40	8	5	2	0	
	84				5W	AXX	0.36	4	2	2	0	
20.04	80				34W	HSX	0.52	114	66	66	0	
21.03	80				45W	HSX	0.70	97	68	68	0	

DAILY SUNSPOT OBSERVATIONS

AUGUST 1997

Day	Group	CMP Mo-Day	Lat	L	CMD	Type	r/R	Sd	Corre. Whole	Area Max	See.	Remarks
	84				32W	AXX	0.57	4	3	3	0	
22.06	80				59W	HSX	0.84	67	62	58	0	
23.06	80				73W	HSX	0.94	38	57	57	0	
24.20	0											
25.07	85	8-30.6	28	111	76E	AXX	0.97	4	8	8	0	
26.03	85				64E	DSO	0.90	114	128	71	0	
	86	8-23.8	-6	200	29W	AXX	0.53	4	2	2	0	
	87	8-24.4	7	192	21W	AXX	0.34	4	2	2	0	
	88	8-30.6	-23	111	60E	AXX	0.91	4	5	5	0	
27.19	85				49E	DSI	0.78	114	91	67	0	
	88				45E	AXX	0.79	8	7	3	0	
	89	8-29.9	16	120	37E	AXX	0.60	8	5	3	0	
28.09	85				37E	CSI	0.67	130	87	62	0	
	89				24E	AXX	0.41	8	5	2	0	
	90	8-30.5	21	112	33E	AXX	0.57	4	3	3	0	PLAT
29.22	85				22E	EAI	0.49	231	133	53	0	
	90				18E	AXX	0.37	8	5	2	0	
30.22	85				5E	EAI	0.34	265	141	116	0	
	90				4E	BXI	0.24	13	7	2	0	
	91	8-28.7	18	135	20W	BXI	0.38	21	11	7	0	
31.08	85				7W	EAI	0.36	362	194	158	0	
	90				8W	BXI	0.28	17	9	2	0	
	91				32W	BXI	0.54	13	7	2	0	
	92	9- 6.7	33	16	88E	AXX	0.99	4	14	14	0	

INTERVALS OF H-ALPHA FLARE PATROL OBSERVATION

AUGUST 1997

Day	From	To	From	To	From	To	From	To	From	To	From	To	From	To
1														
2														
3														
4														
5														
6	1030	1230												
7	15	130												
8	255	500												
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19	412	500												
20	112	230	325	406	1140	1247								
21	100	127	211	247										
22														
23														
24														
25														
26														
27	820	930												
28														
29	30	500												
30														

Combined reports from the observatories listed below:

URUM

OBSERVATION OF MAGNETIC AND VELOCITY FIELDS OF SOLAR ACTIVE REGIONS

AUGUST 1997 HUAIROU ST. BEIJING OBS.

Day	L0	Huairou Region	Lat	L	Data
2	128.5	0			
3	115.3	0			
4	102.1	49	-24	(72)	L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
5	88.9	49			D4 V4 S5 L5 D5 V5 T5 Q5 U5
6	75.7	49			S5 L5
7	62.4	49			S5 L5
		50	-17	25	S5 L5
8	49.2	49			S5 L5
		50			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		51	19	112	S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
11	9.5	50			L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		51			L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		52	24	333	L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
12	356.3	52			S5 L5
		53	24	276	S5 L5
		54	13	281	S5 L5
13	343.1	50			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		52			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		53			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
14	329.9	50			S4 S5 L5
		52			S4 S5 L5
		53			S4 S5 L5
		54			S4 S5 L5
17	290.2	52			S5 L5
		53			S5 L5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
18	277.0	52			S5 L5

OBSERVATION OF MAGNETIC AND VELOCITY FIELDS OF SOLAR ACTIVE REGIONS

AUGUST 1997 HUAIROU ST. BEIJING OBS.

Day	L0	Huairou Region	Lat	L	Data
		53			D4 V4 S5 L5 D5 V5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
19	263.8	52			S5 L5
		53			S5 L5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
21	237.4	53			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
22	224.1	53			S5 L5
		54			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
23	210.9	54			S5 L5
		53			S5 L5
24	197.7	53			S5 L5
27	158.1	55	13	(120)	S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		56	11	(120)	S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
28	144.9	55			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5
		56			S4 L4 D4 V4 S5 L5 D5 V5 T5 Q5 U5

NPL SPL: 2 3 4

SOLAR RADIO EMISSION FLUX

AUGUST 1997

Day	BEIJ 2840	PURP 2700	URUM 9375	YUNN 2840
1	73	82		
2	74	81		
3	76	81		
4	75	81		
5	75	83		
6	79	82		
7	78	82		
8	79	87		
9	78	86		
10	80	90		
11	83	91		
12	81	91		
13	84	95		
14	83	95		
15	80	89		
16	78	90		
17	79	91		
18	77	92		
19	77			
20	76	88		
21	76	89		
22	75	89		
23	76	89		
24	79	83		
25	79	89		
26	84	89		
27	84	94		
28	89	99		
29	93	104		
30	97	108		
31	94	106		
Mean	80.4	89.9		

SOLAR RADIO EMISSION OUTSTANDING OCCURRENCES

AUGUST 1997

Day	Freq	Sta	Type	Start (UT)	Time of Maximum (UT)	Duration (Min)	Flux Density Peak	Rel	Mean
15	2700	PURP	1 S	0138.6	0139.2	1.1	18.0		
26	2840	BEIJ	45 C	0053.0	0057.5	15.0	15.4	18.3	
26	2840	BEIJ	1 S	0533.0	0534.5	6.0	6.6	7.8	
29	2840	BEIJ	5 S	2330.0	2331.5	3.0	31.0	31.9	
29	2840	BEIJ	1 S	2340.0	2345.0	8.0	8.9	9.2	

INTERVALS OF SOLAR RADIO EMISSION PATROL OBSERVATION

AUGUST 1997

Day	BEIJ From To 2840	PURP From To 2700	URUM From To 9375	YUNN From To 2840
1	0355 0420	0022 0807		
	2233 2400			
2	0000 1011	0044 0620		
	2234 2400	0647 0807		
3	0000 0242	0035 0807		
	0451 1037			
	2259 2400			
4	0000 1036	0040 0807		
	2228 2400			
5	0000 1040	0043 0805		
	2227 2400			
6	0000 1049	0047 0808		
	2219 2400			
7	0000 1037	0043 0807		
	2253 2400			
8	0000 1018	0038 0805		
	2249 2400			
9	0000 1049	0049 0808		
	2235 2400			
10	0000 1039	0035 0808		
	2225 2400			
11	0000 0750	0042 0805		
	2216 2400			
12	0000 1043	0054 0805		
	2223 2400			
13	0000 1051	0033 0804		
	2221 2400			
14	0000 1027	0047 0802		
	2221 2400			
15	0000 1045	0038 0803		
	2253 2400			
16	0000 1033	0040 0800		
	2222 2400			
17	0000 1042	0501 0800		
	2216 2400			
18	0000 1028	0024 0807		
	2213 2400			
19	0000 0752			
	2304 2400			
20	0000 0940	0032 0800		

INTERVALS OF SOLAR RADIO EMISSION PATROL OBSERVATION

AUGUST 1997

Day	BEIJ From To 2840	PURP From To 2700	URUM From To 9375	YUNN From To 2840
	2310 2400			
21	0000 1026	0032 0800		
	2339 2400			
22	0000 1021	0026 0800		
	2215 2400			
23	0000 1012	0044 0800		
	2209 2400			
24	0000 1031	0046 0800		
	2310 2400			
25	0000 1035	0107 0800		
	2332 2400			
26	0000 1025	0029 0811		
	2212 2400			
27	0000 0800	0029 0807		
	0900 1004			
	2242 2400			
28	0000 1018	0027 0808		
	2227 2400			
29	0000 1031	0120 0810		
	2212 2400			
30	0000 0358	0027 0805		
	0617 1022			
	2220 2400			
31	0000 0119	0029 0807		
	0503 1018			

COSMIC RAY NEUTRON INTENSITY

Real Counts: 256 Times (Tabulated Counts Plus 1500)

AUG 1997 — U.T. Hours at End of Interval

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	N
1	411	415	410	411	408	402	401	407	403	407	409	411	409	411	415	408	404	411	415	412	415	416	423	430	411.0	24
2	424	428	426	413	417	413	412	418	406	407	405	402	404	406	415	408	403	423	406	414	421	417	414	421	413.5	24
3	419	416	414	411	413	402	410	408	412	411	410	407	406	414	410	414	425	423	431	422	423	422	427	432	415.9	24
4	431	429	421	420	414	419	417	422	410	419	417	413	414	412	411	405	405	401	403	399	397	411	413	416	413.3	24
5	417	421	413	408	408	409	408	405	399	409	402	399	403	395	403	398	393	398	401	405	404	411	412	406	405.3	24
6	407	407	410	407	408	412	406	402	398	396	395	398	402	408	402	398	404	401	410	398	409	409	411	409	404.5	24
7	408	404	397	397	397	407	402	408	399	403	397	403	402	402	400	404	407	404	405	403	404	406	406	404	402.9	24
8	410	406	408	402	412	409	407	404	414	407	407	409	413	407	406	405	418	407	416	420	419	424	418	425	411.4	24
9	423	420	424	424	420	415	414	412	411	408	411	412	414	410	413	411	410	416	412	409	417	416	417	411	414.6	24
10	420	418	415	421	423	419	414	411	417	406	398	400	407	408	403	410	421	416	420	418	423	418	423	423	414.7	24
11	415	419	422	418	417	419	414	418	404	408	411	405	407	409	411	412	408	415	412	416	411	413	412	411	412.8	24
12	415	424	406	414	410	403	404	402	399	399	397	398	397	397	409	405	410	407	406	398	409	403	413	423	406.2	24
13	418	418	404	408	414	413	409	413	408	405	402	407	397	393	400	401	407	407	412	406	422	421	415	408	408.7	24
14	411	422	417	406	408	411	411	417	414	403	409	402	400	400	398	398	412	409	417	414	409	408	414	408	409.1	24
15	411	404	412	408	414	412	403	405	407	410	402	405	411	405	408	405	415	411	418	411	411	417	417	415	409.9	24
16	412	417	414	403	412	422	420	411	415	417	417	417	416	413	411	416	419	409	410	417	421	427	427	427	416.3	24
17	419	418	428	421	413	421	410	411	411	416	424	425	424	435	431	441	432	429	419	433	427	425	428	431	423.8	24
18	429	436	425	420	427	425	422	418	427	414	416	423	417	426	418	417	422	430	435	423	417	417	421	416	422.5	24
19	426	421	420	419	419	420	417	404	404	410	405	406	406	407	408	403	407	405	406	408	416	418	413	415	411.8	24
20	412	416	405	406	411	411	406	417	417	418	421	416	415	418	411	419	415	416	425	425	427	421	429	431	417.0	24
21	429	425	422	422	417	421	423	413	418	414	418	420	419	418	420	423	423	422	422	429	423	426	424	420	421.3	24
22	425	422	418	419	408	418	414	415	410	418	410	409	417	413	412	425	417	427	416	426	423	416	413	415	416.9	24
23	423	417	416	414	407	422	418	418	412	415	414	409	404	404	407	415	414	410	414	417	412	400	404	412	412.4	24
24	408	411	419	413	415	410	406	405	401	417	404	414	405	413	411	404	403	402	406	398	395	409	405	410	407.7	24
25	413	410	405	404	414	409	402	404	408	402	391	396	405	397	406	402	405	395	401	396	407	400	401	407	403.3	24
26	405	402	412	416	410	402	406	403	406	402	400	399	404	398	404	411	405	402	410	409	404	411	414	411	406.1	24
27	422	409	399	406	406	421	406	410	408	402	403	396	405	402	403	404	410	408	406	410	408	409	413	413	407.5	24
28	407	422	417	412	417	409	406	414	417	408	414	412	417	410	415	412	417	420	422	424	413	424	431	417	415.7	24
29	413	417	403	410	411	407	410	413	412	410	418	420	407	423	426	427	423	412	424	411	414	409	412	416	414.5	24
30	404	412	406	405	404	415	420	417	418	413	413	424	415	422	417	422	420	417	418	416	417	410	408	414	414.5	24
31	409	408	402	414	404	410	408	404	402	408	412	409	413	406	404	406	404	413	410	409	410	414	411	419	408.7	24

MONTHLY MEAN=412.046

MONTHLY MEAN DAILY VARIATION FOR 31 COMPLETE DAYS DEVIATIONS FROM AVERAGE:412.046

(1-12) 3.95 4.53 1.18 -0.05 0.15 1.12 -1.53 -1.43 -2.79 -2.95 -3.92 -3.47

(13-24) -3.17 -2.95 -2.11 -1.43 0.15 -0.24 1.76 0.73 1.76 2.41 3.73 4.57

HARMONIC COMPONENTS (ORDER, COS, SIN, AMPLITUDE, MAX.-HR)

U.T.=(1 3.41 -0.66 3.47 23.28) (2 0.19 0.10 0.22 0.94) (3 0.60 -0.08 0.61 7.83) (4 0.50 0.03 0.50 0.05)

L.T.=(1 -1.14 3.28 3.47 7.28) (2 -0.01 -0.22 0.22 8.94) (3 0.60 -0.08 0.61 7.83) (4 -0.27 0.42 0.50 2.05)

COSMIC RAY MESON INTENSITY
VERTICAL COMPONENT
Real Counts: 128 Times (Tabulated Counts Plus 3000)

AUG 1997

U.T. Hours at End of Interval

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	N
1	49	43	90	97	68	68	67	60	40	54	57	39	47	62	61	44	48	33	56	55	52	62	61	60	57.2	24
2	71	72	70	68	78	70	71	49	72	62	61	61	69	64	75	75	76	63	72	62	71	87	75	70	69.3	24
3	78	79	77	66	66	59	70	70	57	62	60	57	72	55	69	66	62	66	84	65	63	62	66	75	66.9	24
4	67	79	67	88	82	45	55	65	52	52	54	37	41	28	35	33	38	36	34	27	36	55	35	63	50.2	24
5	42	58	65	43	43	62	45	37	47	43	44	39	33	34	33	39	32	24	34	30	36	52	46	55	42.3	24
6	53	58	58	63	50	56	37	44	40	31	26	30	41	43	39	23	44	29	38	39	43	34	42	32	41.4	24
7	29	40	40	36	33	44	24	33	28	35	23	29	38	27	24	39	41	14	36	33	45	43	28	39	33.4	24
8	32	42	43	47	33	48	44	35	28	30	22	28	33	36	26	33	30	34	43	26	49	34	38	44	35.8	24
9	45	30	42	31	38	36	46	31	19	23	16	27	27	25	22	25	23	39	30	21	35	33	34	37	30.6	24
10	34	28	41	27	27	23	25	25	24	26	34	26	26	25	18	18	29	35	35	42	35	44	34	44	30.2	24
11	39	27	32	35	46	37	37	30	29	26	22	21	15	13	24	16	26	44	22	39	20	27	30	28	28.5	24
12	46	33	33	22	31	24	25	33	21	25	24	27	19	33	19	10	17	39	31	28	36	37	24	34	28.0	24
13	47	32	34	36	26	19	37	25	42	21	19	19	9	32	27	37	28	30	35	31	34	45	34	40	30.8	24
14	32	35	25	23	35	40	38	37	28	24	18	15	22	23	38	30	29	32	17	40	35	19	35	33	29.3	24
15	32	39	28	38	34	29	24	38	21	32	32	24	28	36	17	31	24	14	26	25	39	39	49	48	31.1	24
16	29	41	26	34	46	37	41	31	25	27	12	31	17	22	30	29	29	22	43	36	39	31	27	33	30.8	24
17	35	44	51	40	44	49	36	26	18	30	36	35	35	33	39	23	44	26	23	28	38	32	28	54	35.3	24
18	54	56	50	57	34	40	36	37	44	35	15	21	24	18	32	34	25	36	43	22	28	23	33	29	34.4	24
19	40	43	36	32	25	25	39	10	22	24	12	16	23	14	9	25	17	19	28	17	16	20	22	15	22.9	24
20	25	37	23	27	22	22	17	17	28	23	17	18	18	12	8	29	26	28	23	25	28	23	30	25	23.0	24
21	28	34	23	20	26	14	22	14	10	15	34	20	28	14	35	22	33	24	13	29	13	38	35	41	24.4	24
22	28	14	30	39	42	43	33	35	34	35	27	27	33	40	29	32	24	35	44	27	44	36	38	37	33.6	24
23	35	35	35	53	39	31	22	35	37	36	31	39	26	19	38	31	18	41	32	20	33	17	29	36	32.0	24
24	29	42	41	31	17	22	33	31	38	29	22	28	22	15	24	20	13	37	39	15	21	19	26	33	27.0	24
25	33	25	41	39	35	27	23	28	27	30	26	35	33	26	34	29	26	47	29	29	41	33	44	42	32.6	24
26	37	19	40	20	34	25	42	17	23	19	36	22	18	36	18	14	7	19	20	30	16	17	22	19	23.8	24
27	25	23	26	33	30	18	40	35	32	19	22	31	16	9	27	24	30	23	28	25	45	36	39	45	28.4	24
28	39	42	41	42	22	34	32	21	20	26	26	26	19	31	23	17	29	20	29	47	32	49	36	33	30.7	24
29	29	31	25	18	33	17	17	18	18	20	10	18	28	29	18	17	3	14	27	13	32	15	21	21	20.5	24
30	24	12	7	13	19	13	20	21	13	18	9	3	10	-9	6	7	8	24	13	6	12	3	25	2	11.6	24
31	11	9	-3	8	-3	2	-1	13	9	-9	4	11	18	13	1	12	10	3	21	5	4	5	5	13	6.7	24

MONTHLY MEAN= 32.981

MONTHLY MEAN DAILY VARIATION FOR 31 COMPLETE DAYS DEVIATIONS FROM AVERAGE: 32.981

(1-12)	5.63	5.79	6.92	6.57	4.28	1.83	2.41	-0.69	-2.47	-3.21	-5.53	-5.24
(13-24)	-4.34	-5.30	-4.01	-4.47	-4.30	-2.34	0.83	-2.76	1.57	1.53	2.21	5.08

HARMONIC COMPONENTS (ORDER, COS, SIN, AMPLITUDE, MAX.-HR)

U.T.=(1 5.16 2.17 5.60 1.52) (2 -0.09 0.99 0.99 3.17) (3 -0.08 0.17 0.18 2.58) (4 0.10 0.31 0.33 1.20)

L.T.=(1 -4.46 3.38 5.60 9.52) (2 0.90 -0.42 0.99 11.17) (3 -0.08 0.17 0.18 2.58) (4 -0.32 -0.07 0.33 3.20)

COSMIC RAY MESON INTENSITY

Real Relative Intensity: 0.1% Times (Tabulated Value Plus 1000)

AUG 1997 — **U.T. Hours at End of Interval**

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	N
1	3	2	3	2	2	1	2	0	0	1	1	1	1	1	1	2	2	3	5	2	4	4	7	5	2.3	24
2	4	4	4	4	4	5	2	3	3	2	3	2	-1	2	3	3	1	2	6	4	4	3	4	6	3.2	24
3	5	7	5	5	1	3	5	1	3	0	3	3	4	3	4	5	3	6	4	5	4	4	6	5	3.9	24
4	6	6	7	3	3	3	3	2	2	2	-2	-1	0	1	0	0	1	-1	1	1	2	0	1	4	1.9	24
5	2	0	1	2	0	-1	1	2	-1	-1	-2	-2	-3	-1	-2	1	0	-4	-3	0	0	-1	1	1	-0.4	24
6	-1	0	1	-2	-3	-1	-3	-2	-3	0	-3	-1	-1	-4	-2	-3	-2	-3	-2	-5	-3	-4	-3	-2	-2.2	24
7	-2	-2	-2	-3	-3	-3	-4	-2	-5	-2	-4	-5	-3	-5	-2	-4	-2	-2	-4	-4	-2	-1	-2	-2	-2.9	24
8	-2	0	-2	-1	0	-1	0	-1	-2	0	-1	0	2	1	2	2	0	0	0	1	2	2	3	4	0.4	24
9	4	7	5	6	5	5	4	4	4	5	3	4	3	2	4	4	1	2	1	2	2	3	4	4	3.7	24
10	5	2	3	1	4	1	2	1	2	2	3	4	2	2	3	3	8	4	5	6	6	5	5	6	3.5	24
11	8	7	8	7	9	7	4	2	4	5	0	4	3	3	4	3	3	5	6	6	7	6	6	7	5.2	24
12	7	7	5	5	4	4	5	4	5	1	1	2	5	5	6	4	7	6	6	6	5	6	7	9	5.1	24
13	7	7	7	7	7	8	5	6	7	4	4	3	5	4	3	4	5	6	5	6	5	6	6	7	5.6	24
14	8	6	8	6	4	4	7	5	3	4	4	3	5	5	3	4	6	5	6	5	6	5	5	7	5.2	24
15	5	5	7	5	5	5	6	4	3	4	5	4	5	5	5	6	6	7	7	5	5	5	6	7	5.3	24
16	9	9	9	8	9	7	7	7	7	8	4	6	8	6	7	5	5	5	6	8	8	6	10	7	7.1	24
17	7	6	6	5	6	2	3	4	3	5	6	4	6	4	6	6	7	8	5	6	9	8	9	10	5.9	24
18	10	8	8	7	7	7	5	8	10	6	6	8	9	8	8	8	9	9	9	9	8	8	8	9	8.0	24
19	8	8	9	8	11	6	6	7	6	6	7	5	7	7	8	8	9	8	7	7	8	8	6	6	7.3	24
20	7	8	4	5	6	5	7	4	5	6	5	4	6	8	5	5	4	6	2	6	6	6	7	7	5.6	24
21	6	5	5	7	4	6	5	3	3	2	3	4	6	3	6	5	6	6	7	8	7	7	8	8	5.4	24
22	7	6	8	6	5	5	5	7	5	5	3	4	2	6	7	6	6	6	4	6	5	4	4	4	5.3	24
23	4	5	6	4	4	4	1	4	3	3	4	3	3	2	5	4	4	3	3	5	4	2	2	2	3.5	24
24	3	4	5	4	4	6	6	5	6	4	5	4	5	5	4	4	5	5	3	5	5	5	4	5	4.6	24
25	5	8	5	7	5	6	3	3	3	6	3	6	4	6	5	4	4	5	3	4	4	5	5	5	4.8	24
26	7	7	7	6	6	6	6	6	4	3	4	4	5	5	6	6	5	6	5	5	5	7	6	7	5.6	24
27	7	5	5	5	4	3	4	6	2	3	3	3	4	3	3	3	2	4	6	5	5	7	8	8	4.5	24
28	5	6	7	5	5	4	4	5	5	4	5	6	6	6	5	9	6	7	8	9	9	8	9	8	6.3	24
29	8	8	5	6	6	5	5	3	6	5	3	3	6	7	8	5	5	5	5	4	7	4	4	4	5.3	24
30	3	5	5	3	3	5	3	1	3	0	1	2	3	3	4	4	-1	3	2	1	4	-1	3	3	2.6	24
31	4	4	3	1	1	0	-1	1	1	1	1	0	4	1	4	3	2	2	4	5	4	4	6	7	2.6	24
																									MONTHLY MEAN=	4.000

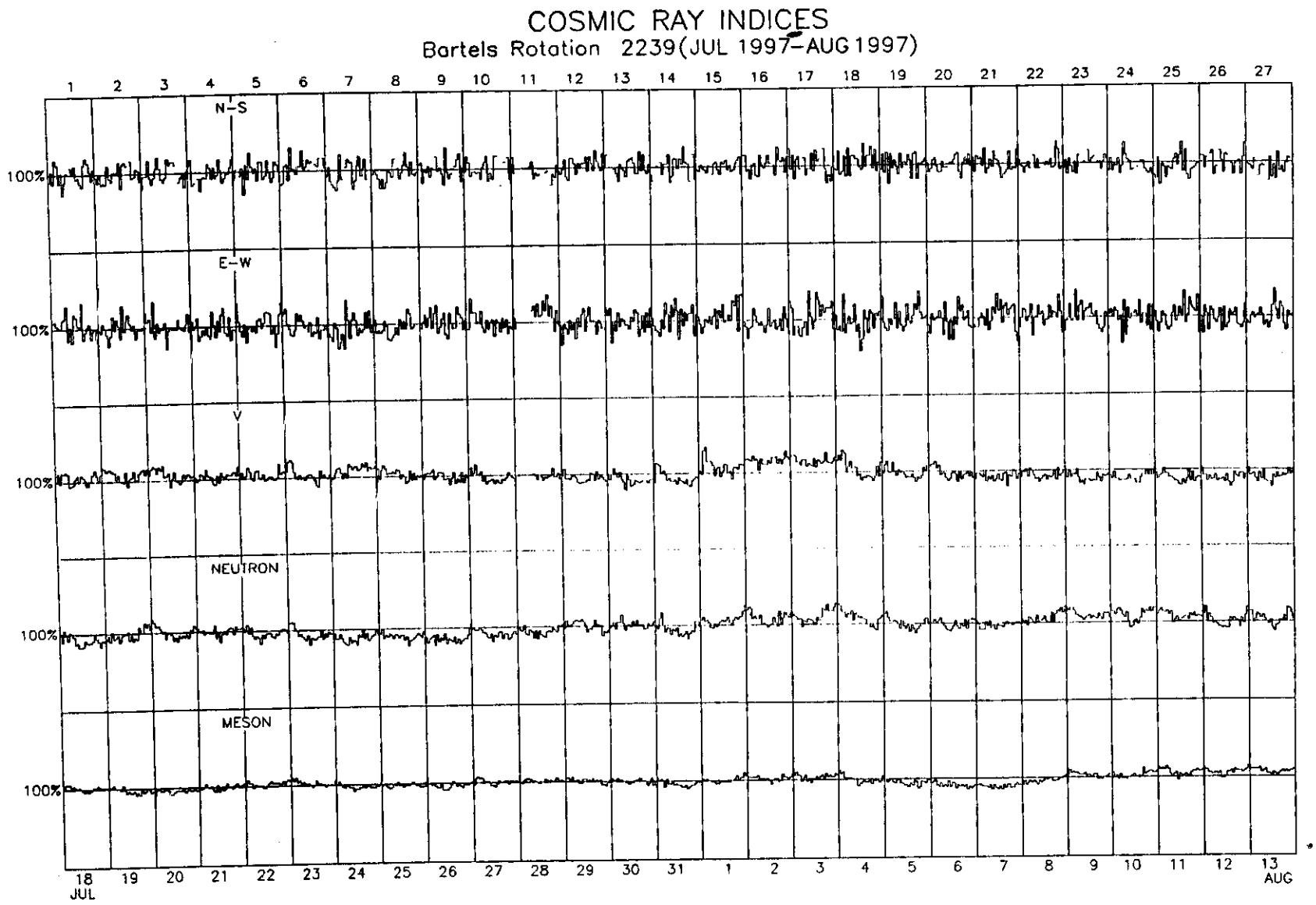
MONTHLY MEAN DAILY VARIATION FOR 31 COMPLETE DAYS DEVIATIONS FROM AVERAGE: 4.000

(1-12)	1.19	1.16	1.06	0.32	0.13	-0.23	-0.52	-0.68	-0.87	-0.97	-1.48	-1.19
(13-24)	-0.42	-0.65	-0.03	-0.16	-0.23	0.00	-0.06	0.29	0.68	0.23	1.00	1.42

HARMONIC COMPONENTS (ORDER, COS, SIN, AMPLITUDE, MAX.-HR)

U.T.=(1 0.98 -0.21 1.00 23.19) (2 0.18 0.27 0.32 1.85) (3 0.12 -0.05 0.13 7.48) (4 0.00 0.13 0.13 1.54)

L.T.=(1 -0.31 0.95 1.00 7.19) (2 0.14 -0.29 0.32 9.85) (3 0.12 -0.05 0.13 7.48) (4 -0.11 -0.07 0.13 3.54)


COSMIC RAY INDICES
Bartels Rotation 2239(JUL 1997–AUG 1997)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
N-S
100%
E-W
100%
V
100%
NEUTRON
100%
MESON
100%
18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13
JUL
AUG

SUDDEN IONOSPHERIC DISTURBANCES (D REGION)

AUGUST 1997

Day	Sta	Start (UT)	Max (UT)	End (UT)	Imp	SPA LF	SPA VLF	SFA LF
09	LINT	2345	2350	0100D	2-	- 3.9		+ 2.7
10	LINT	2350	0003	0140D	3	- 7.1		+ 5.4
14	LINT	0135	0146	0210U	1-	- 0.5		- 0.5
16	LINT	0122	0141	0215U	1-	- 0.3		- 0.6
26	LINT	0035	0047	0053D	1-	- 0.6		+ 0.9
26	LINT	0053	0059	0145	1+	- 2.5		- 1.3
29	LINT	0420	0435	0535	1+	- 2.6		- 2.8
29	LINT	2320	2348	0126D	3-	- 6.6		+11.0

GEOMAGNETIC ACTIVITY INDICES K AND A_K

AUGUST 1997

BGMO

Day	Three-Hourly Indices K								Sum	A_K
	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24		
1	1	2	2	1	2	1	2	1	12	5
2	1	1	2	1	0	1	2	0	8	3
3 D	0	2	3	4	5	5	4	2	25	22
4	3	3	3	4	1	2	3	2	21	13
5 Q	0	2	2	1	0	1	1	0	7	3
6 Q	1	1	1	0	1	1	0	0	5	2
7	1	1	2	2	3	3	2	3	17	9
8	1	3	1	1	2	2	1	1	12	6
9	1	1	3	1	3	2	2	2	15	8
10	2	2	3	2	1	2	3	2	17	9
11	1	3	2	4	2	1	1	1	15	9
12	1	1	2	1	1	1	2	3	12	6
13 D	2	2	3	3	3	3	2	3	21	12
14 D	3	4	4	3	1	2	1	1	19	13
15	2	1	1	2	2	2	1	0	11	5
16	2	2	2	2	1	1	0	0	10	4
17	2	1	2	3	3	5	3	2	21	15
18	0	1	2	2	3	3	2	1	14	7
19 Q	1	1	2	1	0	1	1	0	7	3
20	1	2	1	2	2	0	1	3	12	6
21	1	3	1	2	2	1	2	1	13	6
22	2	2	2	1	2	3	1	1	14	7
23 Q	0	1	1	0	2	1	2	1	8	3
24	2	2	1	3	2	1	2	1	14	7
25	2	2	2	1	0	0	[illegible]	0	8	3
26 Q	0	1	2	1	0	1	[illegible]	1	6	2
27	0	2	2	2	1	2	[illegible]	2	12	5
28 D	2	3	4	3	1	2	3	2	20	12
29 D	1	3	3	3	3	3	3	2	21	13
30	0	3	1	3	4	3	2	1	17	11
31	1	2	1	2	1	2	1	0	10	[illegible]
									S [illegible]	237
									[illegible]	7.6

MAGNETIC STORMS

AUGUST 1997

BGMO

Time of Magnetic						Sudden Com. Amplitude			Deg. of	Maximum Acti. on K-scale			Maximum Range		
Begining			Ending								3hour	k			
Day	h	m	Day	h	Type	D′	HnT	ZnT	Acti.	Day	Int.	Index	D′	HnT	ZnT

No observed

北京天文台沙河工作站 10.6 cm 波段日食射电观测*

王淑兰　姬慧荣　程丛玲　樊玉荣　劳得邦　徐德辉
(中国科学院北京天文台)

高正民
(北京师范大学)

杨　国
(南京大学天文系)

我们用北京天文台沙河工作站的 10.6 cm 波段太阳射电望远镜和 2.6~3.8 GHz 多波段动态频谱仪 (试观测) 对 1997 年 3 月 9 日所发生的日食作了射电观测，都取得了良好的观测结果。此文主要介绍 10.6 cm 的观测分析结果。

日食期间，天气晴朗，仪器工作正常。从初亏、食甚到复圆得到一条扣除各种因素影响的归一化太阳天线温度食变曲线，计算出太阳射电掩食半径 1.112 $R_\odot$，等效半径 1.107 $R_\odot$，食甚时的剩余流量比为 26%，同时认证了日面上射电局部源，并计算出它的角径、流量等参数。这次日食处于 22 周和 23 周两个峰年之间的低年期，是我们研究太阳的极好机会。

北京光学见食情况如下：

初亏： 233725 UT，食甚： 004134 UT，复圆： 015147 UT，最大食分： 0.85 。

10.6 cm 观测得到下列结果：

1. 我们得到的射电掩食半径和等效半径分别为 1.112 $R_\odot$和 1.107 $R_\odot$，同 1987 年 9 月 23 日在该波段上观测到的射电掩食半径和等效半径相比 (1.11 $R_\odot$和 1.10 $R_\odot$) 显然变大。

2. 观测到的射电食甚比光学食甚推迟 8 s， 1987 年 10.6 cm 提前 3 分 14 秒。

3. 获得食甚剩余流量 19.1 sfu，占日面总辐射的 26%，比 1987 年 10.6 cm 观测偏低。

4. 观测到黑子上空一个射电源，计算了它的角径、立体角、流量和亮温度，从这些计算结果来看也小于 1987 年的观测结果。

致谢：在准备本文过程中，北京天文台怀柔站提供的黑子掩露时间，张桂清提供的活动区位置，紫金山天文台何玉囡提供的日月位置，云南天文台李维宝提供的光球掩食和露放黑子图，李琼英提供的光球照片，在此表示诚挚的谢意。

参加观测的还有吕伍经、赵美娜同志。

* 收稿日期： 1997 年 10 月 5 日

RADIO OBSERVATION OF THE SOLAR ECLIPSE AT 10.6 cm WAVELENGTH

WANG Shu-lan JI Hui-rong CHENG Cong-ling FAN Yu-rong
LAO De-bang XU De-hui
(Beijing Astronomical observatory, Academia Science)
GAO Zheng-min
(Department of Astronomy, Beijing Normal University)
YANG Guo
(Department of Astronomy, Nanjing University)

Abstract

This paper introduces the results of the radio observation of the solar eclipse at 10.6 cm wavelength on March 9, 1997. The observation was made at Shahe station of Beijing Astronomical observatory (BAO). During the eclipse, it was a fine day and the instruments normally worked. The eclipsing curve was recorded from eclipse beginning, middle of the eclipse to fourth contact. We also obtained radio occultation radius of the sun at 10.6 cm wavelength was 1.112 $R_\odot$, equivalent one was 1.107 $R_\odot$, and the rate of the residual flux density of the totality of the eclipse was 26%. A local radio source corresponding to a optical active region was identified and the parameters of the source, such as angular diameter, flux density etc. were also calculated.

1. Introduction

We have observed the radio observation of the solar eclipse with the solar radio telescope at 10.6 cm wavelength and 2.6~3.8 GHz multi-frequencies spectrometer (under testing). We successfully obtained the complete eclipsing curve. Here, we mainly introduce the results of the observations at 10.6 cm wavelength.

The geographic coordinate of the solar radio telescope which is located at Shahe station is the north latitude 40°06′02″, east longitude 116° 19′46″ and 50 meters above sea level.

The circumstances of the optical eclipse at Beijing are:

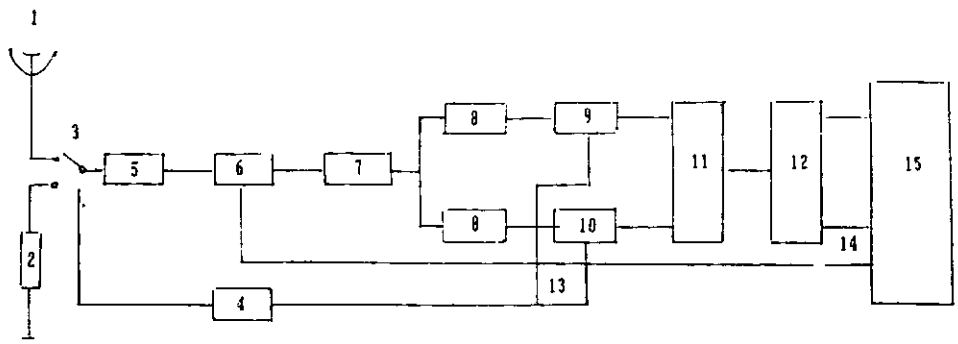
the time of eclipse beginning: 233725 UT; middle of the eclipse: 004134 UT; fourth contact: 015147 UT, the largest magnitude of the eclipse: 0.85.

2. The instrument of the observation

The recording models of the observation are: (1) the analogous record with time constant of one second. (2) the digital continuous sampling with the time constant of 200

Table 1. The radius of solar radio

	occultation time (UT)	radius
optics	233725	1.000
radio	232520	1.112
equivalent	232540	1.107



1 = Antenna 2 m aperture
2 = Noise tube
3 = Dicke switch
4 = Dicke oscillator
5 = Microwave hytrodyne
6 = Electrically controled attenuator
7 = If amplifier
8 = Video amplifier
9 = Integrator = 1 ms
10 = Integrator = 1 s
11 = Amplifier and multiplex
12 = Sample & hold circuit and AD converter
13 = Data bus
14 = Control bus
15 = Computer

Fig. 1 Block diagram of the radiometer-recorder system

ms is shown in Fig. 1. In this paper, we only analyse the data of the second one. The parameters of the observation instrument:

antenna aperture	2.5 m
working wavelength	10.6 cm
half power width of the main lobe	181′
sensitivity (τ=1s)	Δ Tmin=0.36 K
linear range	0.5~1× 10^4 K
the band width of the IF	10 MHz
stability of the receiver gain	1%

3. Analysing of observation

The purpose of the radio observation of solar eclipse makes enough use of the conditions of high space resolution which was provided during the eclipse to research the distribution of brightness temperature of solar disk and the physical parameters[1]. In order to obtain good data, we paid more attention to make testing and calibration for the instruments before the eclipse. Around the eclipse, we had also measured the radiation of the sky background emission where the sun passed during the eclipsing time. Then after a series of corrections, the eclipsing curve of the solar antenna temperature, which have removed the effects of factors of various kinds have been obtained (see Fig. 2).

The following is the calculated formula:

$$Ta(t) = L(t)[Ra_{\odot} - Rs] - Ts(t) - Tm(t)^{[2][3]}$$

L(t) is calibration constant, $Ra_{\odot}$ is the reading of the sky background. Ts, Tm are the radiation of the sky background and the antenna temperature of the moon, respectively. **L(t)** was obtained with the noise source. Ts was calculated by the observation data of the radiation of the sky background. Because Tm(t) is only 1% of the solar radiation at 10.6 cm wavelength, it was ignored. The zenith absorption coefficient of the atmosphere Γ_0 was obtained according to the theory formula [4]. Γ_0=0.0029. On the basis of paper [5], the slope curve of eclipsing was obtained (see Fig. 3).

4. The results of the eclipsing radio observations

(1). The radius of the radio sun

By eclipsing curve, we obtained the values of occultation radius of solar radio. On the basis of Sawanson's [6] definition, the ones of equivalent radius was also calculated (see Table 1).

(2). The middle of eclipse of solar radio

The radio middle of eclipse was at 004142 UT. It was 8^s later than the optical one. The residual flux density of the middle of eclipse was 26% of the total radiations of solar disk.

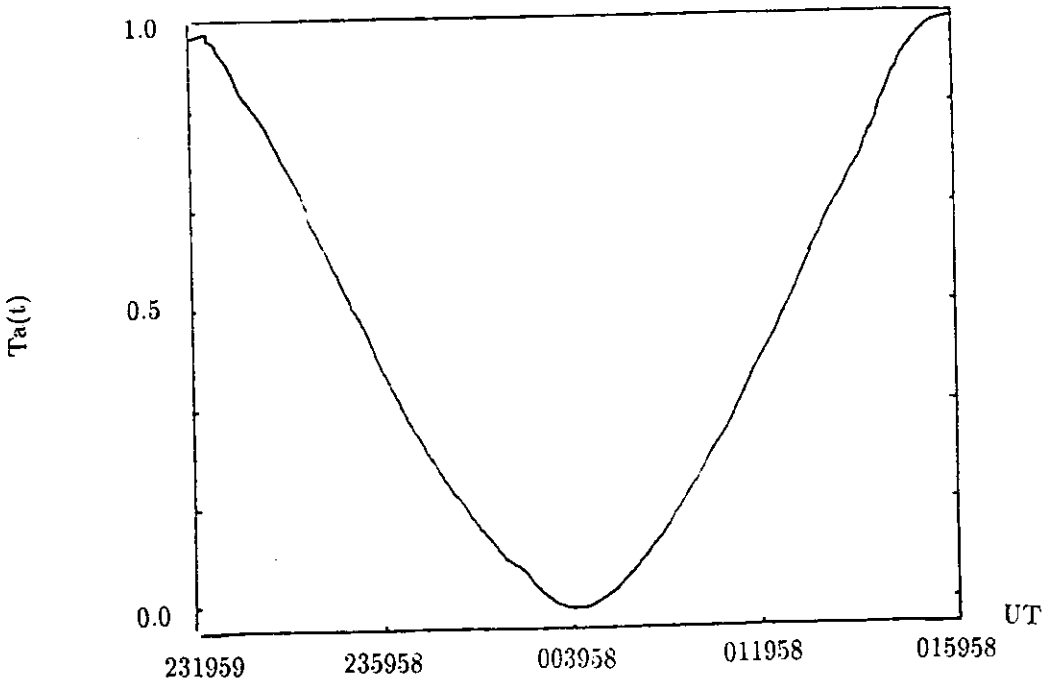


Fig. 2 The eclipsing curve of the antenna temperature of solar normalization Ta(t)

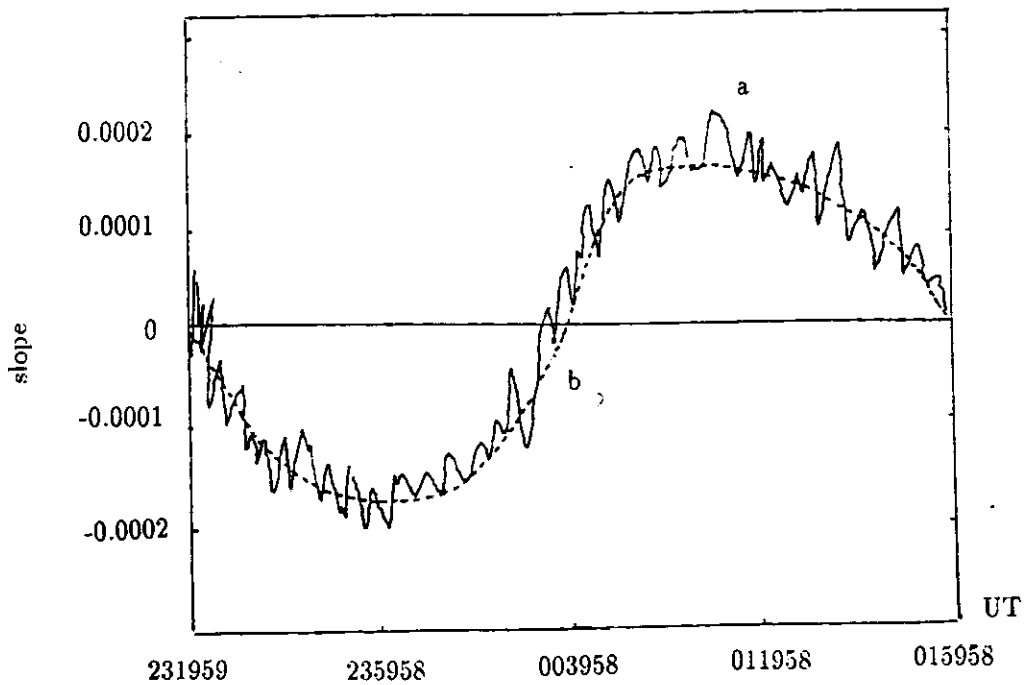


Fig. 3 a-the eclipsing slope curve of the antenna temperature
b-the eclipsing slope curve of the antenna temperature of the background of quiet the sun

(3). Identifying the local radio sources

By reasonable assumption of the distribution of radio solar disk, the eclipsing slope curve of the solar background emission was calculated (see Fig. 3b). Although the model is approximate, the error is tolerable. A radio local source was identified (see Table 2).

Table 2. The parameters of the radio local source

optical active objects SGD active region	the parameters of the local source angular diameter θ time range(″)	solid angle $\Delta\Omega$ 10^{-8}sr	flux density Δs (s.f.u.)	average brightness tem. Ts (10^5K)
8020	sunspot covering 20.6	1.2	1.06	2.2
	sunspot revealing 36.7	3.5	2.01	1.4

5. Conclusion

(1). We obtained the values of occultation radius of solar disk and the ones of equivalent radius were 1.112 $R_\odot$ and 1.107 $R_\odot$, respectively . They were larger compared with those of observation at the same wavelength on Sep. 23, 1987 (1.11 $R_\odot$ and 1.10 $R_\odot$).

(2). The time of the radio middle of eclipse at 10.6 cm was 8^s later than the optical one, while the value on Sep. 23, 1987 was earlier 3^m14^s.

(3). The residual flux density of the maximum phase of eclipse was 19.1 sfu, which occupies about 26% of the total flux. It was smaller than 1987's.

(4). The radio source above the sunspots was observed. The angular diameter, flux density and average brightness temperature have been calculated.

We thank the members of Huairou Station for providing covering and revealing times of the sunspots, we also thank Zhang Gui-qing, He Yu-nan, Li Wei-bao, Li Qiong-ying, for providing the data about solar optical observations during the eclipse.

Taking part in the observation of the eclipse still had Lu Wu-jing and Zhao Mei-na.

This work was supported by Chinese Academy of Sciences and National NSF of China.

References

[1] WANG Yong-quan et al., "Observations and Studies of China on Annular Solar Eclipse September 23, 1987", 1990

[2] FU Qi-Jun et al., "Observations and Yunnan of China on Total Eclipse on February 16, 1980"

[3] LIU Yan et al., " Observations and Studies of China on Annular Solar Eclipse", 1987. 9

[4] FU Qi-Jun "Method of radio astronomy" 1979. 10

[5] The group of the observation of the eclipse at Purple Mountain Observatory " Acta *Astronomica Sinica" 1974, P113*