

FEBRUARY 1988 NUMBER 522 - Part I

# Solar-Geophysical Data prompt reports



Data for January 1988, December 1987, and Late Data  
Explanation of Data Reports Issued as Number 515 (Supplement) July 1987

S O L A R - G E O P H Y S I C A L   D A T A

NUMBER 522

(Issued in Two Parts)

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The entry "516A 38" under Jun 1987, for example, means that the sunspot drawings for Jun 1987 appear in SOLAR-GEOPHYSICAL DATA No. 516, Part I, and that they begin on page 38. "A" denotes Part I and "B", Part II. Blanks indicate data not yet received and dashes mark unavailable data.

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**ALERT PERIODS**  
INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

## Summary of the Geoalert Messages

JANUARY 1988

Julian Day	Date of Issue	Date of Observation	Wolf No.	10-cm Solar Flux	A-index	Location		Flares			Date of Forecast	Location		Region Forecast <sup>1</sup>	Geoalerts
						°Lat	°Long	Total	M	X		°Lat	°Long		
001	01	31	040	103	003	S33 E00		3	0	0	01	S33 E00	Q	Solquiet, Magquiet.	
						S33 W59		0	0	0		S33 W59	Q		
002	02	01	058	104	004	S34 W11		2	0	0	02	S34 W11	Q	Solquiet, Magquiet.	
						S35 W77		0	0	0		S35 W77	Q		
						S09 W11		0	0	0		S09 W11	Q		
						S17 E52		0	0	0		S17 E52	Q		
003	03	02	035	097	023	S34 W24		1	0	1	03	S34 W24	A	Solalert 03/XX, Magalert 03/XX.	
						S19 E39		0	0	0		S19 E39	Q		
			Presto: <sup>2</sup> Boulder Tenflare 110 flux units 02/2214 UT duration 40 minutes. Boulder Proton event began 02/2335 UT, 13 particles/cm <sup>2</sup> -s-sr at greater than 10 MeV. Sydney Soflare Culgoora 2B in progress start 2128 UT, maximum 2140 UT. Type II start 2143 UT, weak type IV at 2155 UT, Herringbone structure 6-22 MHz, shock velocities estimated 1400 km/sec, parallel ribbon flare, strong SWF, gradual commencement Sydney 02/0900 UT, followed by major storm.												
004	04	03	028	105	006	S32 W39		0	0	0	04	S32 W39	Q	Solnil, Magalert 04/XX.	
						S17 E26		0	0	0		S17 E26	Q		
			Presto: Kakioka Magstorm begins 03/0208 UT.												
005	05	04	037	102	008	S33 W53		0	0	0	05	S33 W53	E	Solquiet, Magalert 05/06.	
						S17 E12		0	0	0		S17 E12	Q		
						N19 W47		0	0	0		N19 W47	Q		
			Presto: Kakioka Magstorm begins 04/2011 UT. Sydney Sudden Commencement 04/2012 UT, approximately 50 gammas.												
006	06	05	040	103	014	S34 W65		0	0	0	06	S34 W65	Q	Solquiet, Magalert 06/06 Recurrence.	
						S19 E02		0	0	0		S19 E02	Q		
						N31 E65		0	0	0		N31 E65	Q		
007	07	06	045	105	026	S33 W80		0	0	0	07	S33 W80	Q	Solquiet, Magnil.	
						N30 E50		3	0	0		N30 E50	Q		
						S23 W03		1	0	0		S23 W03	Q		
			Presto: Kakioka Magstorm begins 06/04XX UT.												
008	08	07	066	106	012	S34 W91		0	0	0	08	S34 W91	Q	Solquiet, Magalert 08/08.	
						N30 E37		4	0	0		N30 E37	E		
						S23 W17		0	0	0		S23 W17	Q		
						S27 E53		4	0	0		S27 E53	Q		
009	09	08	073	109	019	N30 E24		1	0	0	09	N30 E24	E	Solquiet, Magnil.	
						S22 W29		0	0	0		S22 W29	Q		
						S24 E38		5	0	0		S24 E38	E		
010	10	09	082	111	004	N30 E09		7	0	0	10	N30 E09	E	Solquiet, Magquiet.	
						S22 W43		1	0	0		S22 W43	Q		
						S25 E25		7	0	0		S25 E25	E		
						S07 W03		0	0	0		S07 W03	Q		
						N23 W11		0	0	0		N23 W11	Q		
011	11	10	082	104	002	N30 W04		0	0	0	11	N30 W04	E	Solquiet, Magquiet.	
						S22 W57		0	0	0		S22 W57	Q		
						S25 E12		0	0	0		S25 E12	E		
						S08 W17		0	0	0		S08 W17	Q		
						N25 W28		0	0	0		N25 W28	E		

**ALERT PERIODS**  
INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

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JAN 1988

Summary of the Geoalert Messages

JANUARY 1988

Julian Day	Date of Issue	Date of Observation	Wolf No.	10-cm Solar Flux	A-index	Location		Flares			Date of Forecast	Location		Region Forecast <sup>1</sup>	Geoalerts
						°Lat	°Long	Total	M	X		°Lat	°Long		
012	12	11	079	108	011	N31 W17	2	0	0	12	N31 W17	E	Solquiet, Magquiet.		
						S21 W69	0	0	0		S21 W69	Q			
						S26 E01	0	0	0		S26 E01	E			
						N24 W37	1	0	0		N24 W37	E			
						S17 W41	0	0	0		S17 W41	Q			
013	13	12	079	114	023	N30 W31	2	0	0	13	N30 W31	E	Solquiet, Magquiet.		
						S26 W11	0	0	0		S26 W11	Q			
						N23 W51	3	0	0		N23 W51	E			
						S34 E64	0	0	0		S34 E64	Q			
						S24 W25	0	0	0		S24 W25	Q			
014	14	13	093	117	005	N29 W44	2	0	0	14	N29 W44	E	Solquiet, Magquiet.		
						S26 W22	2	0	0		S26 W22	Q			
						N22 W65	1	0	0		N22 W65	E			
						S34 E52	0	0	0		S34 E52	Q			
						S18 E74	4	0	0		S19 E74	E			
						N16 W65	1	0	0		N16 W65	E			
015	15	14	124	118	028	N30 W56	4	0	0	15	N30 W56	Q	Solquiet, Magalert Minor 15/16.		
						S27 W38	1	0	0		S27 W38	Q			
						N24 W76	1	0	0		N24 W76	E			
						S36 E38	5	2	0		S36 E38	E			
						S19 E63	6	0	0		S19 E63	E			
						N18 W79	2	0	0		N18 W79	E			
						N05 W19	0	0	0		N05 W19	Q			
016	16	15	124	122	043	N30 W70	0	0	0	16	N30 W70	Q	Solquiet, Magalert 15/16.		
						S27 W51	1	0	0		S27 W51	Q			
						N26 W87	0	0	0		N26 W87	E			
						S35 E26	14	0	0		S35 E26	E			
						S19 E51	5	0	0		S19 E51	Q			
						N17 W91	0	0	0		N17 W91	Q			
						N20 E17	0	0	0		N20 E17	Q			
Presto: <sup>2</sup> Boulder Strong magstorm in progress 15/0730 UT. Sudden Storm Commencement of 30 gammas at 13/2328 UT.															
017	17	16	091	127	004	N30 W86	2	0	0	17	N30 W86	Q	Solquiet, Magnil.		
						S28 W64	1	0	0		S28 W64	Q			
						S35 E14	3	0	0		S35 E14	E			
						S18 E37	7	0	0		S18 E37	E			
						N20 E03	0	0	0		N20 E03	Q			
018	18	17	084	120	004	S29 W76	0	0	0	18	S29 W76	Q	Solquiet, Magquiet.		
						S35 E02	1	0	0		S35 E02	E			
						S17 E24	1	0	0		S17 E24	E			
						N21 W11	0	0	0		N21 W11	Q			
019	19	18	064	115	007	S35 W10	0	0	0	19	S35 W10	Q	Solquiet, Magquiet.		
						S18 E12	1	0	0		S18 E12	E			
						S31 E35	2	0	0		S31 E35	Q			
020	20	19	066	118	010	S36 W23	0	0	0	20	S36 W23	Q	Solquiet, Magquiet.		
						S19 W01	4	0	0		S19 W01	E			
						S31 E23	0	0	0		S31 E23	E			

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**ALERT PERIODS**  
INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

## Summary of the Geoalert Messages

JANUARY 1988

Julian Day	Date of Issue	Date of Observation	Wolf No.	10-cm Solar Flux	A-index	Location		Flares			Date of Forecast	Location		Region Forecast <sup>1</sup>	Geoalerts
						°Lat	°Long	Total	M	X		°Lat	°Long		
021	21	20	078	116	007	S36 W38		1	0	0	21	S36 W38	Q	Solquiet, Magquiet.	
						S20 W13		4	0	0		S20 W13	E		
						S31 E10		1	0	0		S31 E10	E		
						S24 E06		0	0	0		S24 E06	Q		
022	22	21	075	115	006	S36 W46		1	0	0	22	S36 W46	Q	Solquiet, Magquiet.	
						S20 W26		1	0	0		S20 W26	E		
						S30 W03		1	0	0		S30 W03	E		
						S23 W08		0	0	0		S23 W08	Q		
023	23	22	059	108	003	S36 W59		0	0	0	23	S36 W59	Q	Solquiet, Magquiet.	
						S19 W39		0	0	0		S19 W39	Q		
						S30 W17		0	0	0		S30 W17	Q		
024	24	23	054	108	001	S35 W74		0	0	0	24	S35 W74	Q	Solquiet, Magquiet.	
						S19 W52		0	0	0		S19 W52	Q		
						S30 W31		0	0	0		S30 W31	Q		
025	25	24	043	106	002	S36 W85		5	0	0	25	S36 W85	E	Solquiet, Magquiet.	
						S19 W65		1	0	0		S19 W65	Q		
						S29 W45		0	0	0		S29 W45	Q		
026	26	25	040	098	004	S19 W81		2	0	0	26	S19 W81	Q	Solquiet, Magquiet.	
						S30 W59		0	0	0		S30 W59	Q		
						S30 E25		0	0	0		S30 E25	Q		
027	27	26	069	097	008	S23 W94		1	0	0	27	S23 W94	Q	Solquiet, Magquiet.	
						S30 W71		0	0	0		S30 W71	Q		
						S30 E13		0	0	0		S30 E13	Q		
						N21 W49		3	0	0		N21 W49	Q		
						S30 E38		1	0	0		S30 E38	Q		
028	28	27	060	105	011	S31 W85		0	0	0	28	S31 W85	Q	Solquiet, Magquiet.	
						S30 E00		0	0	0		S30 E00	Q		
						N20 W62		13	0	0		N20 W62	E		
						S33 E20		0	0	0		S33 E20	Q		
029	29	28	094	106	006	S29 W14		0	0	0	29	S29 W14	Q	Solquiet, Magquiet.	
						N21 W74		4	0	0		N21 W74	E		
						S27 E05		0	0	0		S27 E05	Q		
						S14 W51		0	0	0		S14 W51	Q		
						N18 E33		0	0	0		N18 E33	Q		
						N17 E76		0	0	0		N17 E76	Q		
030	30	29	080	102	003	S29 W29		0	0	0	30	S29 W29	Q	Solquiet, Magquiet.	
						N21 W86		3	0	0		N21 W86	E		
						S14 W66		0	0	0		S14 W66	Q		
						N17 E20		0	0	0		N17 E20	Q		
						N19 E65		0	0	0		N19 E65	Q		
						N19 E83		0	0	0		N19 E83	Q		

**ALERT PERIODS**  
INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

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**Summary of the Geoalert Messages                      JANUARY 1988**

Julian Day	Date of Issue	Date of Observation	Wolf No.	10-cm Solar Flux	A-index	Location		Flares			Date of Forecast	Location		Region Forecast <sup>1</sup>	Geoalerts
						°Lat	°Long	Total	M	X		°Lat	°Long		
031	31	30	074	103	000	S29	W45	1	0	0	31	S29	W45	Q	Solquiet, Magquiet.
						S13	W80	0	0	0		S13	W80	Q	
						N18	E05	0	0	0		N18	E05	Q	
						N18	E50	0	0	0		N18	E50	Q	
						N20	E66	0	0	0		N29	E66	Q	
					S25	W35	0	0	0		S25	W35	Q		
032	01	31	062	106	001	N18	W09	0	0	0	01	N18	W09	E	Solquiet, Magquiet.
						N18	E37	0	0	0		N18	E37	Q	
						N21	E54	1	0	0		N21	E54	E	
						S27	E51	0	0	0		S27	E51	Q	

<sup>1</sup>Q = quiet, E = eruptive, A = active, P = proton.  
<sup>2</sup>Presto message is a rapid report of a major event.



INTERNATIONAL RELATIVE SUNSPOT NUMBERS

Day	Final Feb 87	Mar	Apr	May	Jun	Prov Jul	Aug	Sep	Oct	Nov	Dec	Jan 88
01	0	13	14	39	15	0	45	33	34	56	17	47
02	0	23	12	40	11	0	47	38	26	57	16	31
03	0	15	10	27	0	0	39	37	37	57	18	25
04	0	16	13	23	0	0	33	38	58	46	12	26
05	0	24	28	24	10	13	31	39	48	47	15	32
06	0	23	47	27	0	0	32	44	48	27	19	40
07	0	24	56	34	0	9	38	56	39	31	34	58
08	0	22	64	25	0	12	45	67	55	43	39	57
09	0	14	69	23	0	13	39	64	50	42	37	59
10	7	11	77	25	0	11	47	59	51	30	34	68
11	0	9	80	26	11	0	56	58	63	28	17	75
12	0	0	80	23	21	0	48	44	53	22	13	71
13	0	0	79	22	14	0	47	25	74	15	20	81
14	8	10	77	13	10	0	49	18	92	23	26	97
15	7	11	78	39	11	11	49	21	101	19	42	90
16	0	11	60	50	12	17	55	14	101	33	40	83
17	0	22	41	68	14	12	46	25	91	46	39	72
18	0	21	36	54	24	17	43	32	86	48	43	68
19	0	12	29	65	13	23	45	35	82	51	28	73
20	0	12	12	46	22	33	51	38	79	49	26	78
21	7	15	19	41	29	67	48	32	61	51	14	84
22	7	17	26	38	38	87	34	23	50	70	24	66
23	0	19	25	40	37	102	39	26	33	89	17	47
24	0	19	35	38	38	92	35	25	22	71	10	44
25	7	16	25	37	38	88	35	11	29	42	28	40
26	9	12	21	37	41	85	34	10	40	50	22	44
27	8	11	11	35	33	77	24	19	70	27	29	54
28	8	12	14	21	41	60	23	22	79	20	28	67
29		13	20	17	25	60	11	26	78	20	30	59
30		15	30	15	14	62	10	26	85	20	42	56
31		15		12		73	20		78		43	57
Mean	2.4	14.7	39.6	33.0	17.4	33.0	38.6	33.5	61.1	40.9	26.5	59.6

The preliminary yearly mean sunspot number equaled 29.3 in 1987.

Algonquin Radio Observatory		OTTAWA 2800 MHz (10.7 cm) SOLAR FLUX										Adjusted to 1 AU	
Day	Feb 87	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec 87	Jan	
01	69.2	72.8	72.5	79.3	77.8	76.0	91.0	85.3*	84.2	99.1	87.6	100.1	
02	69.8	73.3	71.9	80.2	77.9	74.4	89.7	85.5	84.8	105.0	86.5	93.7	
03	70.0	71.6	72.4	82.8	76.4	73.7	87.1	87.5	85.6*	98.0	85.8	101.2	
04	68.3	73.3	74.0	84.4	77.3	73.2	84.0	89.6	89.2	101.1*	85.1	98.2	
05	67.5	73.7	77.6	86.1	76.1	73.4	81.6	93.5*	90.1	99.2	86.8	99.5	
06	67.7	75.6	89.4	87.9	75.8	73.3	85.2	95.6*	89.5	94.9	85.7	101.7	
07	69.1	75.5	94.4	88.1	76.0	74.1	89.5*	99.5*	90.9	94.4	85.3	102.1	
08	68.9	76.9	94.8	89.1	77.0	76.1	93.8	101.9	95.0	92.7	88.7	105.6	
09	69.2	73.6	100.5	87.3	76.8	76.3	94.8	100.9	92.7	90.3	91.2	100.6*	
10	69.3	71.4	100.0	89.5	78.1	76.3	94.0	97.8	101.1	89.2	90.1	100.9	
11	68.5	70.5	101.3	86.4	80.7	75.7	99.8*	95.4	100.8*	92.6	91.1	101.7*	
12	67.8	69.5	98.6	85.4	82.1	75.5	100.0	91.1	102.2	92.6	91.5*	107.5*	
13	68.0	69.6	99.3	87.4	82.3	75.1	101.8*	89.7	105.5	92.9	91.1	108.1*	
14	68.3	71.1	97.7	91.2	80.6	76.6	102.4	86.8	113.3*	92.3	91.5	113.7	
15	69.3	70.5	97.8	93.6	80.4	78.8	101.3	85.0	117.8I	93.7	92.0*	112.4*	
16	68.4	71.0	95.3*	98.2	81.3	80.9	102.7	83.5	111.1	95.0	93.4*	121.8*	
17	68.1	71.2	97.3	96.7	81.8	81.5	101.2	84.0	106.0	96.8	92.2	116.4	
18	69.8	72.5	94.0	98.5	82.9	82.5	100.4	82.4	106.5	100.0	90.2	110.9	
19	69.5	71.5	91.7	100.1	82.4	85.1	99.0	82.7	100.4	106.6	88.4	114.2	
20	69.6	73.8	85.6	99.8	81.1	93.8	101.2	84.9	95.6	112.2	86.9	112.7	
21	70.7	74.2	78.3	99.9	82.6	95.6	96.6	83.0	89.3	115.3	90.7	111.6	
22	70.4	73.8	76.5	101.0	87.1	102.6*	94.4*	81.3	88.2	117.8	88.1	104.5	
23	70.5	75.5	76.5	94.9	87.5	115.6	91.8	80.4	87.0	115.1	88.2	104.7	
24	72.1	75.9	78.6	98.5	89.1	115.0	89.6	80.3	87.1	109.4	89.9	102.2	
25	73.5	75.7	75.8	96.8	86.3	114.9	89.9	77.9	92.3	104.9	96.2*	94.9	
26	73.9	75.6	74.3	92.3	84.3	109.8*	87.3	76.4	96.9	101.3	96.8*	93.5	
27	74.0	75.4	74.8	87.5	78.9	105.4	85.1	80.2	105.9	94.9	101.4	101.6	
28	72.7*	75.0	74.3	85.1	79.2	102.5	81.3	82.3	106.2	92.3	102.5	103.0	
29		75.3	73.6E	79.3	76.6	97.3	79.9	83.5	102.7	90.7	101.4	99.1	
30		74.6	76.8	77.9	75.9H	94.0	78.5	81.9	104.2	89.1	99.2	100.1	
31		71.9G		77.3		91.9	83.2		97.8		99.7	103.1	
Mean	69.8	73.3	85.5	89.8	80.4	87.0	92.2	87.0	97.4	99.0	91.5	104.6	

\* = corrected for burst in progress; E = corrected for snow on antenna; G = corrected for ice on antenna; H = measured at Penticton; I = 1700 UT calibration taken at 1915 UT. The yearly mean 2800 MHz flux equaled 85.3 in 1987.

DAILY SOLAR INDICES

9  
Jan 88

January 1988

Day	Julian Day	Bartels Cycle Day	Sunspot Numbers		Obs Flux Ottawa (2800)	Solar Flux Adjusted to 1 Astronomical Unit								
			Int	Amer		SGMR (15400)	SGMR (8800)	SGMR (4995)	Ottawa (2800)	SGMR (2695)	SGMR (1415)	SGMR (610)	SGMR (410)	SGMR (245)
01	1	25	47	43	103.5	517	276	132	100.1	94	83	50	38	14
02	2	26	31	29	96.9	517	260	126	93.7	83	87	50	51	9
03	3	27	25	21	104.7	520	271	133	101.2	99	84	50	--	10
04	4	1	26	23	101.6	498	275	122	98.2	90	73	47	35	9
05	5	2	32	24	102.9	531	279	134	99.5	92	74	53	25	10
06	6	3	40	44	105.2	525	270	132	101.7	95	75	52	32	11
07	7	4	58	57	105.6	531	285	135	102.1	100	83	54	68	12
08	8	5	57	59	109.2	517	268	135	105.6	96	80	53	54	11
09	9	6	59	64	104.0*	522	280	136	100.6*	94	81	51	46	11
10	10	7	68	69	104.3	508	283	132	100.9	92	80	48	15	14
11	11	8	75	67	105.2*	521	264	134	101.7*	90	81	53	54	11
12	12	9	71	62	111.1*	530	285	145	107.5*	104	84	55	--	12
13	13	10	81	82	111.7*	520	279	144	108.1*	97	85	52	35	13
14	14	11	97	87	117.5	535	337	147	113.7	105	84	57	30	19
15	15	12	90	97	116.2*	526	298	151	112.4*	109	88	54	31	19
16	16	13	83	76	125.9*	534	274	152	121.8*	111	91	53	28	17
17	17	14	72	67	120.3	528	262	142	116.4	100	88	53	29	12
18	18	15	68	59	114.6	434	261	140	110.9	101	88	50	29	13
19	19	16	73	73	118.0	524	289	144	114.2	99	79	53	29	14
20	20	17	78	65	116.4	493	278	141	112.7	104	84	52	28	11
21	21	18	84	73	115.2	527	262	139	111.6	104	82	--	--	--
22	22	19	66	63	107.9	527	284	134	104.5	95	80	51	27	14
23	23	20	47	46	108.1	523	274	132	104.7	98	78	50	28	12
24	24	21	44	40	105.5	531	260	132	102.2	92	55	48	26	13
25	25	22	40	39	97.9	501	251	127	94.9	86	72	42	26	12
26	26	23	44	39	96.5	514	273	132	93.5	90	72	46	25	11
27	27	24	54	55	104.8	533	267	132	101.6	92	74	49	27	12
28	28	25	67	70	106.2	530	266	137	103.0	92	77	51	33	24
29	29	26	59	51	102.2	533	291	134	99.1	92	76	51	29	23
30	30	27	56	55	103.2	523	263	131	100.1	95	76	49	29	16
31	31	1	57	49	106.2	527	278	136	103.1	93	78	47	29	19
Mean			59.6	56.4	108.0	519	275	136	104.6	96	79	50	33	13

All sunspot numbers shown above are preliminary values.

The observed and the adjusted Ottawa fluxes tabulated here are the "Series C" daily values reported by the Algonquin Radio Observatory, Ottawa, Ontario, Canada. Numbers in parentheses in the column headings denote frequencies in MHz. Qualifiers after an entry have the following meaning:

\* = corrected for burst in progress

Equipment problems produced any gaps shown above in the Air Weather Service's Sagamore Hill (SGMR) observations.

OBSERVED AND PREDICTED SOLAR ACTIVITY INDICES

JANUARY 1988

Date	RELATIVE SUNSPOT NUMBERS						2800 MHz RADIO FLUX Adjusted to 1 AU (S <sub>a</sub> )	
	International (R <sub>i</sub> )		American (R <sub>a</sub> )		Derived (R <sub>s</sub> )		Monthly Mean	Smoothed
	Monthly Mean	Smoothed	Monthly Mean	Smoothed	Monthly Mean	Smoothed		
Mar 84	83.5	53	83.0	51	68.5	55	120.8	108
Apr	69.7	50	66.5	48	78.1	52	129.7	105
May	76.4	48	72.1	45	79.6	49	131.1	103
Jun	46.1	46	45.2	44	49.8	48	103.5	102
Jul	37.4	44	36.2	42	37.6	39	92.2	99
Aug	25.5	40	24.5	38	30.7	41	85.8	95
Sep	15.7	34	13.6	32	23.2	35	78.9	90
Oct	12.0	29	9.8	27	16.9	31	73.1	86
Nov	22.8	25	19.4	23	18.6	26	74.6	72
Dec	18.7	22	17.0	20	17.4	23	73.5	79
Jan 85	16.5	20	14.5	19	15.9	21	72.1	77
Feb	15.9	20	16.3	18	15.7	20	71.9	76
Mar	17.2	19	11.8	16	16.3	19	72.5	75
Apr	16.2	18	17.1	17	19.8	19	75.7	75
May	27.5	18	24.0	17	26.6	19	82.0	75
Jun	24.2	18	22.2	16	22.8	19	78.5	75
Jul	30.7	17	30.8	16	25.8	19	81.3	75
Aug	11.1	17	10.7	15	17.2	19	73.3	75
Sep	3.9	17	3.4	16	13.8	20	70.2	76
Oct	18.6	17	16.5	16	18.1	20	74.2	76
Nov	16.2	17	16.4	15	16.4	19	72.6	75
Dec	17.3	15	10.1	14	16.2	19	72.4	75
Jan 86	2.5	14	2.3	12	14.6	18	70.9	74
Feb	23.2	13	23.8	11	26.0	17	81.5	74
Mar	15.1	13	12.5	11	20.3	17	76.2	73
Apr	18.5	14	13.8	12	19.6	18	75.6	74
May	13.7	14	11.6	12	18.1	18	74.2	74
Jun	1.1	14	0.8	11	13.3	18	69.7	74
Jul	18.1	14	17.7	11	16.3	18	72.5	74
Aug	7.4	13	7.6	11	13.7	17	70.1	73
Sep	3.8	12	3.5	10	13.0	17	69.4	73
Oct	35.4	13	19.8	11	27.0	17	82.4	73
Nov	15.2	15	14.7	13	19.5	18	75.5	74
Dec	6.8	16	5.1	14	14.0	19	70.4	75
Jan 87	10.4	18*	9.4	16	13.8	20	70.2	76
Feb	2.4	20*	3.0	18	13.4	22	69.8	78
Mar	14.7	22*	13.3	20	17.2	24	73.3	80
Apr	39.6	24*	39.4	23	30.3	25	85.5	81
May	33.0	26*	30.7	26	35.0	27	89.8	83
Jun	17.4	28*	18.0	28	24.8	29	80.4	84
Jul	33.0*	31*	34.3	31	32.0	32	87.0	87
Aug	38.6*	<u>34(2)*</u>	39.0	<u>34</u>	37.6	<u>35</u>	92.2	--
Sep	33.5*	<u>38(4)*</u>	34.0	<u>38</u>	32.0	<u>39</u>	87.0	--
Oct	61.1*	<u>43(7)*</u>	55.8	<u>43</u>	43.2	<u>44</u>	97.4	--
Nov	40.9*	<u>50(10)*</u>	42.5	<u>49</u>	44.9	<u>51</u>	99.0	--
Dec	26.5*	<u>57(12)*</u>	26.7	<u>56</u>	36.8	<u>58</u>	91.5	--
Jan 88	59.6*	<u>63(15)*</u>	56.4*	<u>62</u>	51.0	<u>64</u>	104.6	--
Feb	----	<u>67(20)*</u>	----	<u>67</u>	----	<u>69</u>	----	--
Mar	----	<u>71(24)*</u>	----	<u>71</u>	----	<u>73</u>	----	--
Apr	----	<u>76(28)*</u>	----	<u>75</u>	----	<u>77</u>	----	--
May	----	<u>80(32)*</u>	----	<u>79</u>	----	<u>82</u>	----	--
Jun	----	<u>85(35)*</u>	----	<u>84</u>	----	<u>86</u>	----	--
Jul	----	<u>92(39)*</u>	----	<u>91</u>	----	<u>93</u>	----	--

\*An asterisk marks either a preliminary value or one based in part on preliminary observations.

Underlined entries indicate predicted values and parentheses enclose the absolute value of the 90% confidence limits. The two columns headed "Derived" represent a sunspot number computed from a linear regression equation between the 2800 MHz solar flux (adjusted to 1 astronomical unit) and the Zurich sunspot number.

## SMOOTHED (OBSERVED AND PREDICTED) SUNSPOT NUMBERS: CYCLES 21 AND 22

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	164	163	161	159	156	155	153	150	150	150	148	143
1981	140	142	143	143	143	142	140	141	143	142	139	138
1982	137	133	129	124	120	117	115	109	101	96	95	95
1983	93	90	86	82	77	71	66	66	68	68	67	64
1984	60	56	53	50	48	47	44	40	34	29	25	22
1985	21	20	19	18	18	18	17	17	17	17	17	15
1986	14	13	13	14	14	14	14	13	12*	13	15	16
1987	18	20	22	24	27	28	31	34 ( 2)	38 ( 4)	43 ( 7)	50 (10)	57 (12)
1988	63 (15)	67 (20)	71 (24)	76 (28)	80 (32)	85 (35)	92 (39)	99 (44)	105 (47)	110 (52)	114 (56)	116 (59)
1989	118 (60)	124 (59)	133 (60)	143 (62)	151 (63)	157 (65)	162 (66)	167 (67)	173 (72)	178 (74)	181 (75)	181 (77)
1990	180 (79)	178 (81)	173 (81)	164 (79)	155 (74)	149 (69)	144 (66)	140 (66)	132 (62)	124 (56)	115 (49)	110 (43)

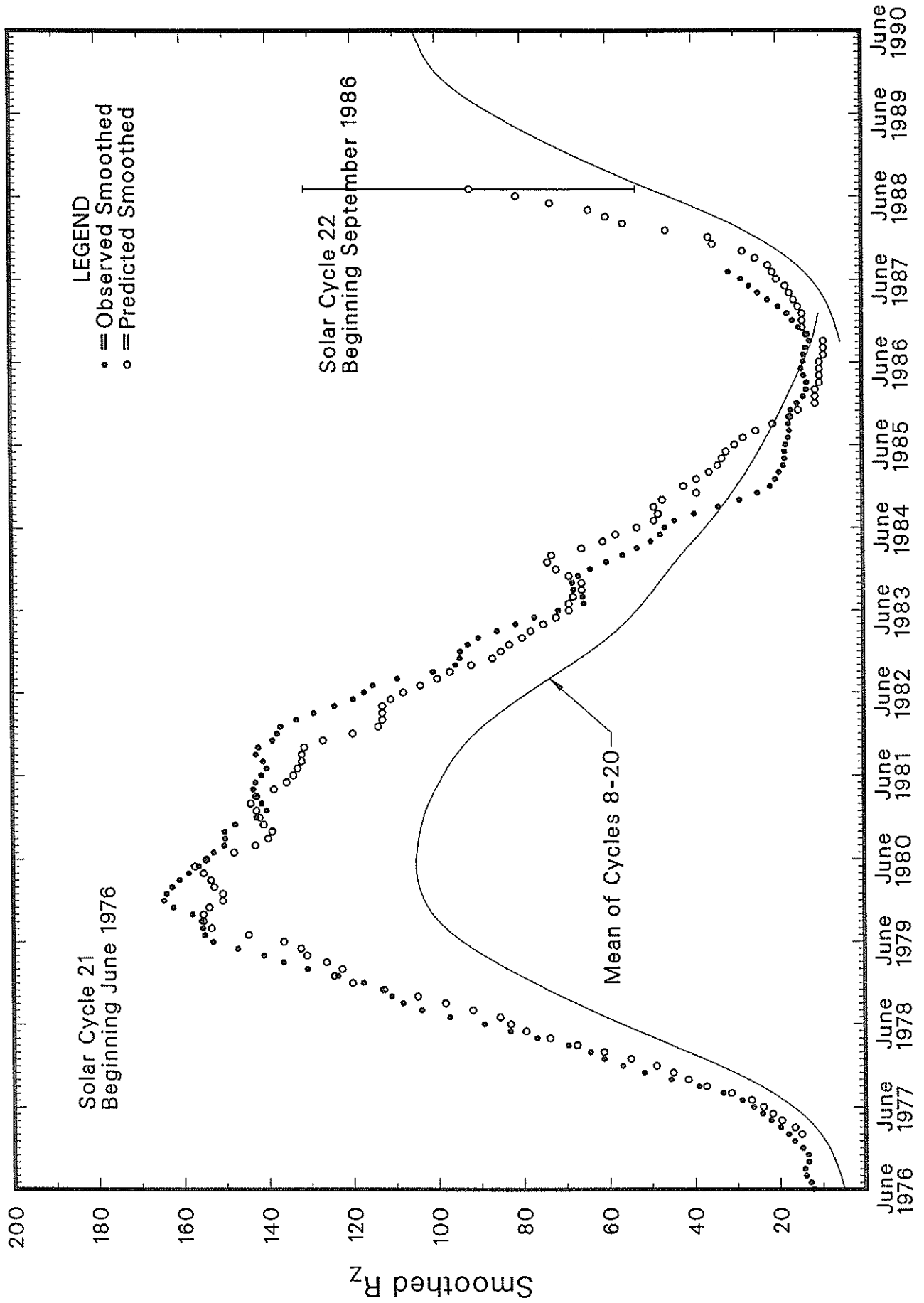
\*September 1986 marks the onset of Sunspot Cycle 22.

For the end of Solar Cycle 21, and the beginning of Cycle 22, the table gives observed smoothed sunspot numbers up to the one calculated from the most recently measured monthly mean. These smoothed observed values are based on final, unsmoothed monthly means through June 1987 and on provisional numbers thereafter.

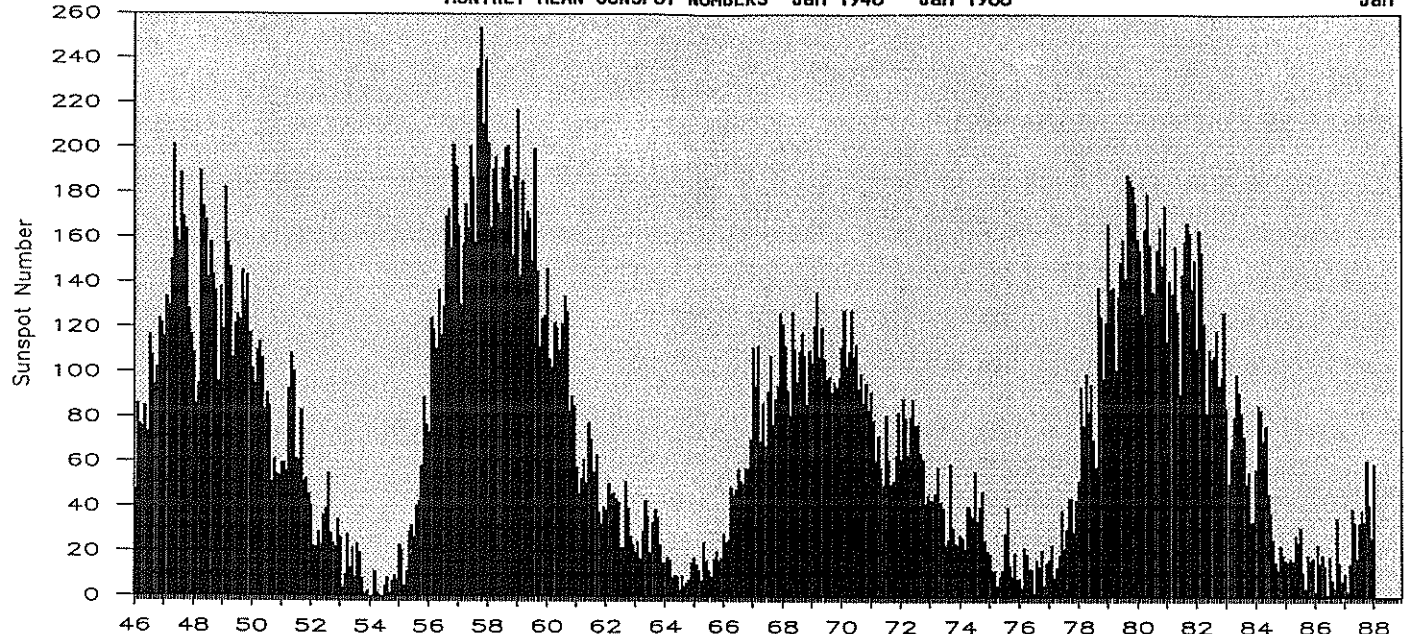
Table entries, with numbers in parentheses below them, denote predictions by the McNish-Lincoln method. (See page 9 in the July 1987 supplement to *Solar-Geophysical Data*.) Adding the number in parentheses to the predicted value generates the upper limit of the 90% confidence interval; subtracting the number from the predicted value generates the lower limit. Consider, for example, the July 1988 prediction. There exists a 90% chance that in July 1988 the actual smoothed sunspot number will fall somewhere between 53 and 131.

THE MCNISH-LINCOLN PREDICTION METHOD GENERATES USEFUL ESTIMATES OF SMOOTHED, MONTHLY MEAN SUNSPOT NUMBERS FOR NO MORE THAN 12 MONTHS AHEAD. Beyond a year the predictions regress rapidly toward the mean of all 14 cycles used in the computation. Moreover, the method is very sensitive to the date defined as the beginning of the current sunspot cycle, that is, to the date of the most recent sunspot minimum. The new-cycle predictions tabulated above are based on the minimum value of 12.3 that occurred in September 1986.

# OBSERVED AND ONE-YEAR-AHEAD PREDICTED SUNSPOT NUMBERS



MONTHLY MEAN SUNSPOT NUMBERS Jan 1946 - Jan 1988



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1946	47.6	86.2	76.6	75.7	84.9	73.5	116.2	107.2	94.4	102.3	123.8	121.7	92.6
1947	115.7	133.4	129.8	149.8	201.3	163.9	157.9	188.8	169.4	163.6	128.0	116.5	151.6 M
1948	108.5	86.1	94.8	189.7	174.0	167.8	142.2	157.9	143.3	136.3	95.8	138.0	136.3
1949	119.1	182.3	157.5	147.0	106.2	121.7	125.8	123.8	145.3	131.6	143.5	117.6	134.7
1950	101.6	94.8	109.7	113.4	106.2	83.6	91.0	85.2	51.3	61.4	54.8	54.1	83.9
1951	59.9	59.9	55.9	92.9	108.5	100.6	61.5	61.0	83.1	51.6	52.4	45.8	69.4
1952	40.7	22.7	22.0	29.1	23.4	36.4	39.3	54.9	28.2	23.8	22.1	34.3	31.5
1953	26.5	3.9	10.0	27.8	12.5	21.8	8.6	23.5	19.3	8.2	1.6	2.5	13.9
1954	0.2	0.5	10.9	1.8	0.8	0.2	4.8	8.4	1.5	7.0	9.2	7.6	4.4 m
1955	23.1	20.8	4.9	11.3	28.9	31.7	26.7	40.7	42.7	58.5	89.2	76.9	38.0
1956	73.6	124.0	118.4	110.7	136.6	116.6	129.1	169.6	173.2	155.3	201.3	192.1	141.7
1957	165.0	130.2	157.4	175.2	164.6	200.7	187.2	158.0	235.8	253.8	210.9	239.4	190.2 M
1958	202.5	164.9	190.7	196.0	175.3	171.5	191.4	200.2	201.2	181.5	152.3	187.6	184.8
1959	217.4	143.1	185.7	163.3	172.0	168.7	149.6	199.6	145.2	111.4	124.0	125.0	159.0
1960	146.3	106.0	102.2	122.0	119.6	110.2	121.7	134.1	127.2	82.8	89.6	85.6	112.3
1961	57.9	46.1	53.0	61.4	51.0	77.4	70.2	55.8	63.6	37.7	32.6	39.9	53.9
1962	38.7	50.3	45.6	46.4	43.7	42.0	21.8	21.8	51.3	39.5	26.9	23.2	37.6
1963	19.8	24.4	17.1	29.3	43.0	35.9	19.6	33.2	38.8	35.3	23.4	14.9	27.9
1964	15.3	17.7	16.5	8.6	9.5	9.1	3.1	9.3	4.7	6.1	7.4	15.1	10.2 m
1965	17.5	14.2	11.7	6.8	24.1	15.9	11.9	8.9	16.8	20.1	15.8	17.0	15.1
1966	28.2	24.4	25.3	48.7	45.3	47.7	56.7	51.2	50.2	57.2	57.2	70.4	47.0
1967	110.9	93.6	111.8	69.5	86.5	67.3	91.5	107.2	76.8	88.2	94.3	126.4	93.8
1968	121.8	111.9	92.2	81.2	127.2	110.3	96.1	109.3	117.2	107.7	86.0	109.8	105.9 M
1969	104.4	120.5	135.8	106.8	120.0	106.0	96.8	98.0	91.3	95.7	93.5	97.9	105.5
1970	111.5	127.8	102.9	109.5	127.5	106.8	112.5	93.0	99.5	86.6	95.2	83.5	104.5
1971	91.3	79.0	60.7	71.8	57.5	49.8	81.0	61.4	50.2	51.7	63.2	82.2	66.6
1972	61.5	88.4	80.1	63.2	80.5	88.0	76.5	76.8	64.0	61.3	41.6	45.3	68.9
1973	43.4	42.9	46.0	57.7	42.4	39.5	23.1	25.6	59.3	30.7	23.9	23.3	38.0
1974	27.6	26.0	21.3	40.3	39.5	36.0	55.8	33.6	40.2	47.1	25.0	20.5	34.5
1975	18.9	11.5	11.5	5.1	9.0	11.4	28.2	39.7	13.9	9.1	19.4	7.8	15.5
1976	8.1	4.3	21.9	18.8	12.4	12.2	1.9	16.4	13.5	20.6	5.2	15.3	12.6 m
1977	16.4	23.1	8.7	12.9	18.6	38.5	21.4	30.1	44.0	43.8	29.1	43.2	27.5
1978	51.9	93.6	76.5	99.7	82.7	95.1	70.4	58.1	138.2	125.1	97.9	122.7	92.5
1979	166.6	137.5	138.0	101.5	134.4	149.5	159.4	142.2	188.4	186.2	183.3	176.3	155.4 M
1980	159.6	155.0	126.2	164.1	179.9	157.3	136.3	135.4	155.0	164.7	147.9	174.4	154.6
1981	114.0	141.3	135.5	156.4	127.5	90.9	143.8	158.7	167.3	162.4	137.5	150.1	140.4
1982	111.2	163.6	153.8	122.0	82.2	110.4	106.1	107.6	118.8	94.7	98.1	127.0	115.9
1983	84.3	51.0	66.5	80.7	99.2	91.1	82.2	71.8	50.3	55.8	33.3	33.4	66.6
1984	57.0	85.4	83.5	69.7	76.4	46.1	37.4	25.5	15.7	12.0	22.8	18.7	45.9
1985	16.5	15.9	17.2	16.2	27.5	24.2	30.7	11.1	3.9	18.6	16.2	17.3	17.9
1986	2.5	23.2	15.1	18.5	13.7	1.1	18.1	7.4	3.8	35.4	15.2	6.8	13.4 m
1987	10.4	2.4	14.7	39.6	33.0	17.4	33.0*	38.6*	33.5*	61.1*	40.9*	26.5*	29.3*
1988	59.6*												59.6*

\*Preliminary For the yearly means, each "M" marks a sunspot cycle maximum and each "m" a minimum.

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Day	Dur (Min)	Imp Opt	Xray	See	Obs Type	Time (UT)	Area Measurement		Remarks
																	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)	
0001	LEAR	01	0456	0458	0505	S36	E07	4912	01	1.8	9	SF		3	C		17		F
0002	LEAR	01	0558	0604	0616	S35	E06	4912	01	1.7	18	SF		3	C		20		F
0003		02	2111*	2135	2432	S35	W18	4912	01	1.4	201	3N X 1.4					692		UZ
	HOLL	02	2111	2135	2352D	S34	W18	4912	01	1.4	161D	3B X 1.4	3	C			785		ZU
	PALE	02	2131E	2143U	2409	S35	W18	4912	01	1.4	158D	3B X 1.4	2	C			995		ZU
	LEAR	02	2257	2301U	2455	S37	W17	4912	01	1.6	118	2F	3	C			295		ZU
0004	YUNN	03	0320E	0339U	0452D	S36	W24	4912	01	1.2	92D	SF			P	0339	80	1.1	
0005	HOLL	04	2148	2150	2157	N32	E78	4919	01	11.1	9	SF		3	C		32		
0006	PALE	06	0023	0023	0034	N29	E65	4919	01	11.1	11	SF		3	C		35		
0007		06	09096	09201	0940	N31	E57	4919	01	10.9	31	SF C 1.7					44		3F
	SVTO	06	0909	0920	0941	N32	E61	4919	01	11.2	32	SF C 1.7			C		46		3F
	LEAR	06	0915	0921	0939	N30	E53	4919	01	10.5	24	SF C 1.7	3	C			43		
0008	HOLL	06	1732	1740	1744D	N29	E42	4919	01	10.0	12D	SF		2	C		31		
0009		06	2009	2012	2053	N29	E48	4919	01	10.6	44	SF					46		
	PALE	06	2009	2012	2035	N29	E48	4919	01	10.6	26	SF		3	C		39		
	HOLL	06	2009E	2012U	2111	N29	E47	4919	01	10.5	62D	SF		3	C		52		
0010	HOLL	06	2146	2146	2150	S23	W01	4920	01	6.8	4	SF		3	C		12		
0011	PALE	07	0127	0131	0153	N34	E53	4919	01	11.3	26	SF		3	C		27		F
0012	LEAR	07	0430	0430	0437	N32	E56	4919	01	11.6	7	SF		3	C		15		
0013	RAMY	07	1255	1304	1313	S26	E59	4921	01	12.1	18	SF		3	C		12		
0014		07	1717*	17382	1746	N30	E42	4919	01	11.0	29	SF C 2.9					31		HZ
	RAMY	07	1717	1738	1750	N33	E42	4919	01	11.0	33	SF C 2.9	3	C			41		H
	HOLL	07	1732	1740	1744D	N29	E42	4919	01	11.0	12D	SF C 2.9	2	C			31		
	PALE	07	1734	1740U	1742	N28	E41	4919	01	10.9	8	SF C 2.9	1	C			21		HZ
0015	RAMY	07	1747	1749	1755	S24	E53	4921	01	11.8	8	SF C 1.1	3	C			21		
0016	RAMY	07	2050	2107	2133D	S23	E58	4921	01	12.3	43D	SF		3	C		35		
0017	PALE	07	2204	2206	2209	S24	E50	4921	01	11.8	5	SF		3	C		13		
0018	PALE	07	2233	2240	2258	N29	E39	4919	01	11.0	25	SF C 1.7	3	C			23		F
0019	PALE	07	2304	2308	2313	S25	E50	4921	01	11.8	9	SN		3	C		18		
0020	PALE	07	2320	2321	2324	N31	E38	4919	01	11.0	4	SF		3	C		12		
0021	PALE	08	0020E	0023	0035	S23	E48	4921	01	11.7	15D	SF C 1.9	3	C			25		
0022	LEAR	08	0150	0150	0158	N33	E36	4919	01	10.9	8	SF		3	C		14		F
0023		08	0159	0204	0219	S24	E48	4921	01	11.8	20	SN C 2.3					46		
	PALE	08	0159	0204	0215	S24	E49	4921	01	11.9	16	SN C 2.3	3	C			38		
	LEAR	08	0159	0204	0223	S24	E48	4921	01	11.8	24	SF C 2.3	3	C			54		
0024	YUNN	08	0323	0327	0345	S24	E47	4921	01	11.8	22	SF					16	.3	
0025	MITK	08	0422	0427	0440	N34	E37	4919	01	11.1	18	SN			C	0427			E
0026		08	0618	0620	0644	S25	E47	4921	01	11.9	26	SN C 2.6					109	2.0	EU
	MITK	08	0618	0620	0634	S25	E48	4921	01	12.0	16	1F C 2.6		C	0620		170	2.6	
	LEAR	08	0618	0620	0655	S25	E46	4921	01	11.8	37	SF C 2.6	3	C			60		UE
	YUNN	08	0619E	0626U	0646D	S24	E47	4921	01	11.9	27D	SB C 2.6		P	0626		96	1.5	
0027	KAND	08	0959	1000	1002	S24	E43	4921	01	11.7	3	SF			P	1000	62	.9	DH
0028	KAND	08	1200	1200	1205	S25	E45	4921	01	12.0	5	SN			P	1200	42	.7	E

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Day	Dur (Min)	Imp Opt	Xray	See	Obs Type	Time (UT)	Area Measurement		Remarks	
																	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)		
0029	RAMY	08	1406	1409	1421	S25	E42	4921	01	11.8	15	SF	C	1.4	3	C		32		F
0030		08	1730	1735	1748	S25	E41	4821	01	11.9	18	SF	C	1.7				35		F
	PALE	08	1725E	1730U	1747	S25	E40	4821	01	11.8	22D	SN	C	1.7	2	C		19		F
	RAMY	08	1728E	1733U	1750	S25	E41	4921	01	11.9	22D	SF	C	1.7	3	C		36		F
	HOLL	08	1730	1735	1749D	S24	E41	4921	01	11.9	19D	SF	C	1.7	4	C		49		F
0031		09	02211	02266	0245	S24	E33	4921	01	11.6	24	1N	C	6.5				195	3.1	UZ
	LEAR	09	0221	0226	0244	S24	E33	4921	01	11.6	23	1N	C	6.5	3	C		108		ZU
	YUNN	09	0221	0232	0247	S24	E32	4921	01	11.6	26	1B	C	6.5		C		177	2.3	
	MITK	09	0222	0227	0243	S24	E33	4921	01	11.6	21	1N				C	0227	300	3.9	
0032		09	0625	06272	0639	N32	E24	4919	01	11.2	14	SF						85	2.0	EU
	LEAR	09	0625	0627	0633	N34	E25	4919	01	11.2	8	SF			3	C		23		U
	PEKG	09	0628E	0629	0645	N30	E23	4919	01	11.1	17D	SF				P	0629	147	2.0	E
0033	LEAR	09	0844	0844	0852	N34	E24	4919	01	11.3	8	SF			3	C		16		
0034	LEAR	09	0933	0936	0940	S25	E32	4921	01	11.9	7	SF	C	1.6	3	C		20		
0035	RAMY	09	1144	1145	1200	S22	W42	4920	01	6.3	16	SF			3	C		16		FH
0036	RAMY	09	1319	1323	1343	N35	E22	4919	01	11.3	24	SF			3	C		23		
0037	RAMY	09	1431	1435	1453	S26	E34	4921	01	12.2	22	SF			3	C		23		H
0038	RAMY	09	1503	1505	1514	S22	W04	4921	01	9.3	11	SN			2	C		36		H
0039		09	1525	1533	1557	S24	E26	4921	01	11.6	32	1N	C	6.7				140		EFH
	RAMY	09	1524E	1533	1602	S23	E26	4921	01	11.6	38D	1N	C	6.7	3	C		187		EH
	HOLL	09	1525	1533	1552	S24	E25	4921	01	11.6	27	SN	C	6.7	3	C		94		FE
0040	RAMY	09	1655	1659	1711	N32	E19	4919	01	11.2	16	SF			3	C		18		H
0041	RAMY	09	1941	1944	1951	N32	E18	4919	01	11.2	10	SF			3	C		11		
0042		09	1952*	20112	2057	N32	E17	4919	01	11.2	65	SF	C	1.4				49		F
	HOLL	09	1952	2013	2056	N32	E16	4919	01	11.1	64	SF	C	1.4	3	C		60		
	RAMY	09	2002	2011	2049	N32	E17	4919	01	11.2	47	SF	C	1.4	3	C		39		F
	PALE	09	2002	2012	2107	N32	E17	4919	01	11.2	65	SF	C	1.4	3	C		47		
0043	HOLL	09	2032	2033	2038	S23	E22	4921	01	11.5	6	SF			3	C		11		
0044		09	21006	21017	2112	S24	E22	4921	01	11.6	12	SF						20		
	RAMY	09	2100	2101	2109	S23	E21	4921	01	11.5	9	SF			3	C		25		
	PALE	09	2106	2108	2114	S25	E23	4921	01	11.7	8	SF			3	C		14		
0045		09	21298	21383	2154	S24	E22	4921	01	11.6	25	SF						38		F
	PALE	09	2129	2141	2157	S25	E23	4921	01	11.7	28	SF			3	C		59		F
	HOLL	09	2137	2138	2150	S24	E21	4921	01	11.5	13	SF			3	C		18		
0046		09	23178	2332*	2458	N32	E14	4919	01	11.1	101	1N	C	3.7				119		EFU
	PALE	09	2317	2355	2505	N33	E15	4919	01	11.2	108	1N	C	3.7	3	C		158		UF
	HOLL	09	2325	2332	2332D	N31	E14	4919	01	11.1	7D	SF			3	C		69		F
	LEAR	09	2325	2402	2503	N32	E16	4919	01	11.2	98	1F	C	3.7	3	C		130		UF
	MITK	09	2351E		2445	N32	E12	4919	01	10.9	54D	SN				C	2351			E
0047	PALE	11	1940E	1946U	2028	N25	W37	4923	01	8.9	48D	SF	C	1.5	3	C		53		FH
0048	LEAR	11	2227	2308	2319	N31	W13	4919	01	10.9	52	SF	C	4.0	3	C		49		EU
0049	YUNN	12	0244	0250	0340D	S34	E75	4925	01	18.1	56D	1N				P		16		
0050	LEAR	12	0459	0501	0504	N22	W41	4923	01	9.0	5	SF			3	C		12		
0051	RAMY	12	1311	1314	1322	N29	W24	4919	01	10.7	11	SF			3	C		15		
0052	RAMY	12	1324	1327	1333	N26	W44	4923	01	9.1	9	SF	C	1.0	4	C		51		E



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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Dur Day	Imp (Min)	Opt	Xray	Obs See	Type	Time (UT)	Area Measurement		Remarks	
																	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)		
0053		12	1621	1626	1705D	N24	W46	4923	01	9.1	44D	SF						32		
	RAMY	12	1621	1626	1701D	N22	W48	4923	01	9.0	40D	SF		3	C			35		
	HOLL	12	1652E	1653U	1705D	N27	W45	4923	01	9.2	13D	SF		3	C			29		
0054	RAMY	12	1703	1706	1716	N29	W27	4919	01	10.6	13	SF		3	C			16		
0055	RAMY	12	1703	1705	1716	S34	E70	4925	01	18.3	13	SF		3	C			18		
0056	LEAR	13	0639	0645	0652	N21	W58	4923	01	8.8	13	SF	C 2.7	3	C			30		
0057	LEAR	13	0719	0725	0742	N31	W31	4919	01	10.8	23	SF	C 2.9	3	C			76		F
0058	RAMY	13	1151E	1154U	1211	S19	E80	4927	01	19.6	20D	2B	C 8.3	3	C					
0059	RAMY	13	1253	1314	1333	S18	E81	4927	01	19.7	40	SF		3	C					
0060	RAMY	13	1340	1344	1354	S18	E78	4927	01	19.5	14	SF		3	C					
0061	RAMY	13	1344	1352	1357	N16	W56	4928	01	9.3	13	SF		3	C			15		
0062		13	1559	1607	1634	N31	W34	4919	01	11.0	35	SF	C 4.5					42		FHU
	HOLL	13	1559	1607	1639	N32	W32	4919	01	11.1	40	SF	C 4.5	4	C			65		UF
	RAMY	13	1616E	1618U	1630	N30	W36	4919	01	10.8	14D	SF	C 4.5	2	C			20		H
0063	HOLL	13	1752	1752	1757	S27	W19	4921	01	12.3	5	SF	C 1.2	3	C			23		
0064	HOLL	13	1809	1816	1824	S17	E87	4927	01	20.4	15	SF		3	C			14		
0065	LEAR	14	0051	0051	0055	N31	W37	4919	01	11.1	4	SF		3	C			15		
0066	LEAR	14	0138	0146	0154	S19	E69	4927	01	19.3	16	SF		3	C			22		
0067		14	0149I	0154	0210	N16	W63	4928	01	9.3	21	SF						16		
	LEAR	14	0149	0154	0209	N16	W64	4928	01	9.2	20	SF		3	C			14		
	PALE	14	0150	0154	0212	N16	W62	4928	01	9.4	22	SF		3	C			19		
0068	LEAR	14	0427	0427	0433	N17	W66	4928	01	9.2	6	SF	C 1.1	3	C			18		
0069		14	06292	0634I	0656	N32	W41	4919	01	11.0	27	1F	C 2.0					153	4.4	EF
	MITK	14	0629	0635	0702	N33	W41	4919	01	11.0	33	1F	C 2.0		C	0635		250	4.4	E
	LEAR	14	0631	0634	0649	N32	W41	4919	01	11.0	18	SF	C 2.0	3	C			56		F
0070	LEAR	14	0741	0742	0750	N17	W66	4928	01	9.3	9	SF	C 5.6	3	C			29		
0071	LEAR	14	0741	0743	0750	N20	W72	4923	01	8.8	9	SF	C 5.6	3	C			20		
0072	LEAR	14	0847	0849	0859	S38	E52	4925	01	18.6	12	SN	C 2.9	3	C			59		F
0073	LEAR	14	0905	0919	0945	S38	E51	4925	01	18.5	40	1N	M 1.3	3	C			125		FU
0074		14	1458	1502	1534	S38	E53	4925	01	18.9	36	1B	M 2.3					186		FH
	HOLL	14	1458	1502	1534	S37	E48	4925	01	18.5	36	1B	M 2.3	3	C			249		F
	RAMY	14	1508E	1508U	1517D	S39	E58	4925	01	19.3	9D	1B	M 2.3	1	C			123		FH
0075	HOLL	14	1644	1648	1653	S19	E66	4927	01	19.7	9	SF		3	C			19		
0076	HOLL	14	1701	1701	1706	S38	E50	4925	01	18.7	5	SF		3	C			13		
0077		14	18353	1838	1850	S20	E66	4927	01	19.8	15	SF						28		
	HOLL	14	1835	1838	1855	S19	E65	4927	01	19.7	20	SF		3	C			34		
	PALE	14	1838	1838	1844	S20	E67	4927	01	19.9	6	SF		3	C			21		
0078	HOLL	14	1849	1850	1857	S26	W32	4921	01	12.3	8	SF		3	C			16		
0079		14	19325	1939	1946	S18	E63	4927	01	19.6	14	SF						30		
	HOLL	14	1932	1939	1952	S18	E66	4927	01	19.8	20	SF		3	C			40		
	PALE	14	1937	1939	1941	S19	E60	4927	01	19.4	4	SF		3	C			20		
0080	PALE	14	2143	2144	2200	S19	E63	4927	01	19.7	17	SF		3	C			55		

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Dur Day	Imp (Min)	Opt	Xray	See	Obs Type	Time (UT)	Area Measurement		Remarks
																	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)	
0081	HOLL	14	2148	2157	2209	N33	W48	4919	01	11.1	21	SF			3	C		17	
0082	PALE	14	2214	2215	2222	S17	E65	4927	01	19.9	8	SF			3	C		11	
0083	PALE	14	2331	2332	2346	S40	E47	4925	01	18.8	15	SF			3	C		20	
0084		14	23374	23413	2352	N31	W50	4919	01	11.0	15	SF						44	F
	HOLL	14	2337	2341	2352	N31	W49	4919	01	11.1	15	SF			3	C		52	
	LEAR	14	2341	2344	2353	N31	W52	4919	01	10.9	12	SF			3	C		35	F
0085		15	00051	00101	0040	S39	E43	4925	01	18.5	35	SF	C 3.3					68	EF
	LEAR	15	0005	0010	0031	S39	E44	4925	01	18.6	26	SF	C 3.3	3	C			48	F
	MITK	15	0005	0010	0049	S38	E43	4925	01	18.5	44	SF	C 3.3		C	0010			E
	PALE	15	0006	0011	0042D	S39	E43	4925	01	18.5	36D	SF	C 3.3	3	C			89	F
0086	LEAR	15	0659	0700	0725	S37	E38	4925	01	18.3	26	SF	C 1.1	3	C			45	
0087	LEAR	15	0800	0807	0812	S37	E37	4925	01	18.3	12	SF			3	C		18	
0088	RAMY	15	1151	1206	1234	S38	E38	4925	01	18.6	43	SF	C 1.1	3	C			47	H
0089	RAMY	15	1402	1407	1427	S18	E55	4927	01	19.8	25	SF	C 1.1	3	C			52	H
0090		15	1444*	15091	1518	S37	E36	4925	01	18.5	34	SF						42	FH
	HOLL	15	1444	1509	1521	S37	E37	4925	01	18.6	37	SF			3	C		69	FH
	RAMY	15	1508	1510	1514	S37	E35	4925	01	18.4	6	SF			3	C		16	
0091	RAMY	15	1501	1506	1517	S18	E55	4927	01	19.8	16	SF			3	C		38	
0092		15	16201	1622	1628	S34	E30	4925	01	18.1	8	SF	C 1.2					24	F
	HOLL	15	1620	1622	1629	S34	E31	4925	01	18.1	9	SF	C 1.2	3	C			22	F
	RAMY	15	1621	1622	1628	S34	E29	4925	01	18.0	7	SF	C 1.2	3	C			27	
0093		15	17021	17211	1742	S38	E35	4925	01	18.5	40	SF	C 2.1					38	F
	HOLL	15	1702	1721	1738	S38	E36	4925	01	18.6	36	SF	C 2.1	3	C			42	
	RAMY	15	1703	1722	1745	S38	E34	4925	01	18.4	42	SF	C 2.1	3	C			34	F
0094		15	17121	17135	1723	S18	E54	4927	01	19.8	11	SF	C 2.2					12	F
	HOLL	15	1712	1718	1722	S17	E54	4927	01	19.8	10	SF	C 2.2	3	C			11	F
	RAMY	15	1713	1713	1724	S18	E54	4927	01	19.8	11	SF	C 2.2	3	C			13	
0095		15	17544	17591	1811	S19	E52	4927	01	19.7	17	SF						36	F
	RAMY	15	1754	1759	1817	S18	E53	4927	01	19.8	23	SF			3	C		42	
	HOLL	15	1755	1800	1812	S19	E53	4927	01	19.8	17	SF			3	C		46	F
	PALE	15	1758	1800U	1804	S19	E49	4927	01	19.5	6	SF			3	C		20	
0096	HOLL	15	1829	1832	1849	S18	E57	4927	01	20.1	20	SF			3	C		14	
0097		15	1848	1850	1856	S32	E30	4925	01	18.1	8	SN	C 1.8					36	
	RAMY	15	1848E	1849U	1858	S30	E32	4925	01	18.3	10D	SN	C 1.8	3	C			43	
	HOLL	15	1848	1850	1854	S34	E29	4925	01	18.1	6	SF	C 1.8	3	C			29	
0098		15	1937	1939	1941	S37	E33	4925	01	18.5	4	SF						16	
	PALE	15	1937	1939	1941	S38	E33	4925	01	18.5	4	SF			3	C		16	
	HOLL	15	1937	1939	1941	S36	E33	4925	01	18.5	4	SF			3	C		17	
0099		15	19561	1957	2000	S37	E33	4925	01	18.5	4	SF						12	
	PALE	15	1956	1957	2000	S38	E33	4925	01	18.5	4	SF			3	C		11	
	HOLL	15	1957	1957	2000	S36	E33	4925	01	18.5	3	SF			3	C		13	
0100		15	2049*	2054*	2126	S38	E32	4925	01	18.4	37	SF						30	F
	PALE	15	2049	2054	2122	S38	E32	4925	01	18.4	33	SF			3	C		41	F
	HOLL	15	2124	2126	2129	S38	E32	4925	01	18.5	5	SF			3	C		19	
0101	HOLL	15	2053	2054	2115	S40	E46	4925B	01	19.6	22	SF			3	C		30	F
0102	HOLL	15	2149	2151	2154	S38	E34	4925	01	18.6	5	SF			3	C		12	
0103	PALE	15	2349	2350	2406	S37	E32	4925	01	18.6	17	SF			3	C		13	

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	NOAA/USAF			CMP Mo	Dur (Min)	Imp Opt	Xray	Obs See	Type	Time (UT)	Area Measurement		Remarks
						Lat	CMD	Region								Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)	
0104	LEAR	16	0804	0810	0832	S18	E44	4927	01	19.7	28	SF	3	C		34		
0105	LEAR	16	0930	0934	0942	S18	E43	4927	01	19.7	12	SF	3	C		22		
0106		16	12352	12433	1258	S18	E44	4927	01	19.9	23	SF				22		3
	RAMY	16	1235	1246	1303	S17	E45	4927	01	19.9	28	SF	3	C		26		
	SVTO	16	1237	1243	1253	S18	E43	4927	01	19.8	16	SF		C		18		3
0107	RAMY	16	1324	1330	1406	S19	E43	4927	01	19.8	42	SF	3	C		19		
0108	RAMY	16	1342	1343	1402	N33	W64	4919	01	11.5	20	SF	3	C		18		H
0109	RAMY	16	1616	1618	1620	N32	W73	4919	01	10.9	4	SF	3	C		18		
0110	RAMY	16	1631	1632	1650	S18	E42	4927	01	19.9	19	SF	3	C		12		
0111	RAMY	16	1710	1713	1723	S37	E24	4925	01	18.6	13	SF	3	C		11		
0112	RAMY	16	1734	1734	1750	S31	W63	4921	01	11.8	16	SF	3	C		10		H
0113	RAMY	16	1746	1748	1813	S18	E40	4927	01	19.8	27	SF C 1.7	3	C		27		F
0114	RAMY	16	1831	1831	1841	S18	E39	4927	01	19.7	10	SF	3	C		16		
0115	RAMY	16	2105	2109	2115	S41	E28	4925	01	19.2	10	SF C 1.0	3	C		23		F
0116	RAMY	16	2145	2146	2152	S38	E17	4925	01	18.3	7	SF	3	C		11		
0117	SVTO	17	0904	0906	0910	S19	E33	4927	01	19.9	6	SF		C		15		3F
0118	RAMY	17	1855E	1859U	1902D	S37	E86		01	24.7	7D	SF	2	C				
0119		18	00293	00311	0043	S18	E23	4927	01	19.8	14	SN C 1.4				30		E
	MITK	18	0029	0031	0046	S18	E25	4927	01	19.9	17	SN C 1.4		C	0031			E
	LEAR	18	0032	0032	0040	S19	E21	4927	01	19.6	8	SF C 1.4	3	C		30		E
0120	LEAR	18	0823	0823	0829	S31	E48	4931	01	22.1	6	SF	3	C		21		
0121	KAND	18	1147	1147	1151	S30	E49	4931	01	22.3	4	SF		P	1147	42	.7	D
0122	RAMY	18	1859	1920	1938	S32	E38	4931	01	21.8	39	SF	3	C		19		
0123	KAND	19	1055	1100	1101D	S32	E33	4931	01	22.1	6D	SF		P	1100	21	.3	D
0124	RAMY	19	1643	1645	1656	S20	W02	4927	01	19.5	13	SF	3	C		26		
0125	RAMY	19	1819	1822	1829	S21	E08	4927	01	20.4	10	SF	3	C		13		F
0126		19	19562	19581	2004	S22	E06	4927	01	20.3	8	SF				14		
	RAMY	19	1956	1959	2004	S22	E07	4927	01	20.4	8	SF	3	C		18		
	PALE	19	1958	1958	2004	S21	E06	4927	01	20.3	6	SF	3	C		10		
0127		19	20321	20391	2107	S19	E00	4927	01	19.8	35	1F C 1.1				101		
	RAMY	19	2032	2040	2107	S19	E00	4927	01	19.8	35	1F C 1.1	3	C		104		
	PALE	19	2033	2039	2051D	S19	E00	4927	01	19.8	18D	SF C 1.1	3	C		98		
0128	LEAR	20	0102	0102	0105	S19	W01	4927	01	20.0	3	SF	3	C		11		
0129		20	0149	01502	0159	S30	E22	4931	01	21.8	10	SF				26		EF
	PALE	20	0149	0150	0201	S31	E23	4931	01	21.9	12	SF	3	C		34		F
	LEAR	20	0149	0152	0157	S28	E21	4931	01	21.7	8	SF	3	C		18		E
0130	YUNN	20	0321	0324	0329	S30	E20	4931	01	21.7	8	SN		C		96	1.2	
0131	LEAR	20	0521	0522	0530	S19	W04	4927	01	19.9	9	SF	3	C		12		E
0132	YUNN	20	0722	0735	0744	S29	E19	4931	01	21.8	22	SF		C		32	.4	
0133	HOLL	20	1841	2009	2010	S20	W14	4927	01	19.7	89	SF	3	C		11		

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Dur Day	Dur (Min)	Imp Opt	Xray	See	Obs Type	Area Measurement			Remarks
																Time (UT)	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)	
0134	PALE	20	1917	1921	1936	S19	W12	4927	01	19.9	19	SN	C	1.2	4	C	55		FU
0135		20	20071	20083	2030	S36	W32	4925	01	18.3	23	SF					25		F
	HOLL	20	2007	2008	2028	S35	W33	4925	01	18.2	21	SF			3	C	25		
	PALE	20	2008	2011	2032	S36	W32	4925	01	18.3	24	SF			3	C	25		F
0136		20	2210	2215	2241	S20	W16	4927	01	19.7	31	SF	C	1.2			29		F
	HOLL	20	2210	2215	2241	S20	W19	4927	01	19.5	31	SF	C	1.2	3	C	30		
	PALE	20	2215E	2216U	2219D	S20	W13	4927	01	19.9	40	SF	C	1.2	3	C	28		F
0137	LEAR	21	0459	0500	0507	S34	W33	4925	01	18.6	8	SF			3	C	23		
0138	HOLL	21	1550	1551	1556	N21	W57	4930	01	17.3	6	SF			3	C	19		
0139		21	1939	1940	1943	S30	W04	4931	01	21.5	4	SF					22		
	PALE	21	1939	1940	1943	S29	W06	4931	01	21.3	4	SF			3	C	15		
	HOLL	21	1939	1940	1943	S31	W02	4931	01	21.7	4	SF			3	C	29		
0140	HOLL	21	1943	1944	1948	S19	W25	4927	01	19.9	5	SF			3	C	11		
0141	PALE	24	0035	0036	0045	S34	W71	4925	01	18.4	10	1N	C	1.7	3	C	115		F
0142	PALE	24	0234	0235	0241	S35	W71	4925	01	18.4	7	SF			3	C	41		
0143		24	18134	18203	1837	S35	W89	4925	01	17.6	24	1N	C	1.2			170		
	HOLL	24	1813	1819U	1836	S36	W90	4925	01	17.5	23	1N	C	1.2	3	C	181		
	RAMY	24	1813	1820	1836	S36	W88	4925	01	17.7	23	1B	C	1.2	3	C			
	PALE	24	1817	1823	1839	S32	W90	4925	01	17.6	22	1F	C	1.2	3	C	160		
0144	HOLL	24	1902	1902	1913	S21	W62	4927	01	20.0	11	SF			3	C	10		
0145		24	20064	20082	2015	S35	W87	4925	01	17.9	9	SN	C	1.0			38		
	HOLL	24	2006	2008	2015	S36	W90	4925	01	17.6	9	SN	C	1.0	3	C	41		
	PALE	24	2010	2010	2015D	S34	W84	4925	01	18.1	5D	SF	C	1.0	3	C	35		
0146	PALE	24	2112	2113	2116	S35	E67	4935	01	30.2	4	SF			3	C	19		
0147	LEAR	25	0442	0445	0447	S20	W71	4927	01	19.8	5	SF			3	C	13		
0148		25	1721	17213	1738	S20	W74	4927	01	20.1	17	SF					15		
	RAMY	25	1721	1721	1734	S20	W74	4927	01	20.1	13	SF			3	C	15		
	HOLL	25	1721	1724	1741	S21	W74	4927	01	20.0	20	SF			3	C	15		
0149	LEAR	26	0234	0234	0238	S34	E49	4935	01	30.0	4	SF			3	C	15		F
0150	YUNN	26	0824E	0828U	0835D	N18	W42	4934	01	23.1	11D	SB			P	0828	32	.5	
0151	SVTO	26	1100	1103	1113D	S21	W90	4927	01	19.5	13D	1F	C	5.9		C	148		2
0152	HOLL	26	2149E	2154U	2204	N19	W48	4934	01	23.2	15D	SF			3	C	16		
0153		26	2246*	23111	2322	N18	W48	4934	01	23.3	36	SF					39		
	HOLL	26	2246	2312	2317	N18	W49	4934	01	23.2	31	SF			3	C	59		
	LEAR	26	2311	2311	2326	N19	W47	4934	01	23.4	15	SF			3	C	19		
0154	HOLL	26	2330	2336	2356	N19	W51	4934	01	23.1	26	SF			3	C	28		
0155	LEAR	27	0101	0103	0108	N19	W48	4934	01	23.4	7	SF			3	C	21		
0156		27	0203*	0205*	0232	N19	W50	4934	01	23.3	29	SF					25	.6	
	LEAR	27	0203	0205	0216	N19	W50	4934	01	23.3	13	SF			3	C	17		
	YUNN	27	0209	0219U	0235D	N20	W51	4934	01	23.2	26D	SN			P	0219	32	.6	
	LEAR	27	0221	0227	0248	N19	W50	4934	01	23.3	27	SF			3	C	25		
0157	LEAR	27	0252	0305	0308	N19	W49	4934	01	23.4	16	SF			3	C	32		
0158	LEAR	27	0702	0706	0736	N19	W52	4934	01	23.3	34	SF	C	1.5	3	C	37		F
0159	YUNN	27	0800	0809	0845	S29	E07	4933	01	27.9	45	SN				C	48	.5	

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Grp #	Sta	Day	Start (UT)	Max (UT)	End (UT)	Lat	CMD	NOAA/ USAF Region	CMP Mo	Dur Day	Imp (Min)	Xray	Obs See	Type	Area Measurement			Remarks		
															Time (UT)	Apparent (10 <sup>-6</sup> Disk)	Corr (Sq Deg)			
0160	LEAR	27	0959	0959	1009	N19	W53	4934	01	23.4	10	SF	C	1.2	2	C	25			
0161	SVTO	27	1320	1359	1417D	N19	W59	4934	01	23.0	57D	SF	C	2.4		C	66		2	
0162	PALE	27	1725E	1725U	1732	N19	W59	4934	01	23.2	7D	SF			1	C	23			
0163	PALE	27	1907	1918	1930	N20	W59	4934	01	23.3	23	SN			2	C	34			
0164		27	2014I	2023A	2104	N20	W60	4934	01	23.2	50	1B	C	3.6			118		EF	
	HOLL	27	2014	2027	2113	N18	W59	4934	01	23.3	59	1N	C	3.6	3	C	137		FE	
	PALE	27	2015	2023	2055	N21	W60	4934	01	23.2	40	SB	C	3.6	3	C	99		FE	
0165	HOLL	27	2115	2232	2242	N20	W60	4934	01	23.3	87	SF			3	C	37		F	
0166		27	2245*	2305	2316	N20	W62	4934	01	23.2	31	1N	C	4.3			70		EF	
	HOLL	27	2245	2305	2328D	N19	W62	4934	01	23.2	43D	1N	C	4.3	3	C	102		F	
	PALE	27	2304	2305	2316	N20	W61	4934	01	23.3	12	SN	C	4.3	3	C	38		FE	
0167	LEAR	27	2356	2358	2413	N19	W61	4934	01	23.3	17	SF	C	1.9	3	C	22			
0168		28	02325	0237I	0251	N20	W62	4934	01	23.4	19	SF	C	1.7			16			
	LEAR	28	0232	0238	0249	N19	W62	4934	01	23.4	17	SF	C	1.7	3	C	20			
	PALE	28	0237	0237	0253	N20	W63	4934	01	23.3	16	SF	C	1.7	3	C	12			
0169		28	0547*	0606I	0618	N19	W65	4934	01	23.3	31	1N	C	6.6			83			
	MITK	28	0547	0607	0617	N19	W66	4934	01	23.2	30	1N	C	6.6		C	0607	100		
	LEAR	28	0606	0606	0620	N19	W64	4934	01	23.4	14	SN	C	6.6	3	C	66			
0170		28	0847	0847	0905	N18	W65	4934	01	23.4	18	1N	C	9.6			102		3	
	LEAR	28	0847	0847	0905	N18	W65	4934	01	23.4	18	1N	C	9.6	3	C	133			
	SVTO	28	0848E	0848U	0900D	N19	W65	4934	01	23.4	12D	SF	C	9.6		C	70		3	
0171	RAMY	28	1814	1823	1924	N19	W74	4934	01	23.1	70	SF			2	C	44		F	
0172		29	0256*	0304*	0322	N19	W75	4934	01	23.4	26	SF					38			
	LEAR	29	0256	0304	0313	N19	W75	4934	01	23.4	17	SF			3	C	23			
	LEAR	29	0314	0316	0332	N19	W75	4934	01	23.4	18	SF			3	C	53			
0173		29	0337	0344	0347	N20	W76	4934	01	23.3	10	SN					19			
	LEAR	29	0337	0344	0347	N19	W75	4934	01	23.4	10	SF			3	C	22			
	YUNN	29	0341E	0342U	0345D	N21	W78	4934	01	23.2	4D	SN				P	0342	16		
0174	PEKG	30	0045E	0058	0114	N19	W90	4934	01	23.2	29D	SF				C	0058	63		A
0175	LEAR	30	0411	0418	0436	N17	E18	4937	01	31.5	25	SF			3	C	24			
0176	RAMY	30	1456	1457	1506	S31	W34	4933	01	27.9	10	SF			3	C	11			
0177	LEAR	31	1001	1002	1004	N19	E60	4939	02	5.0	3	SF	C	1.2	3	C	13		F	

"Remarks"

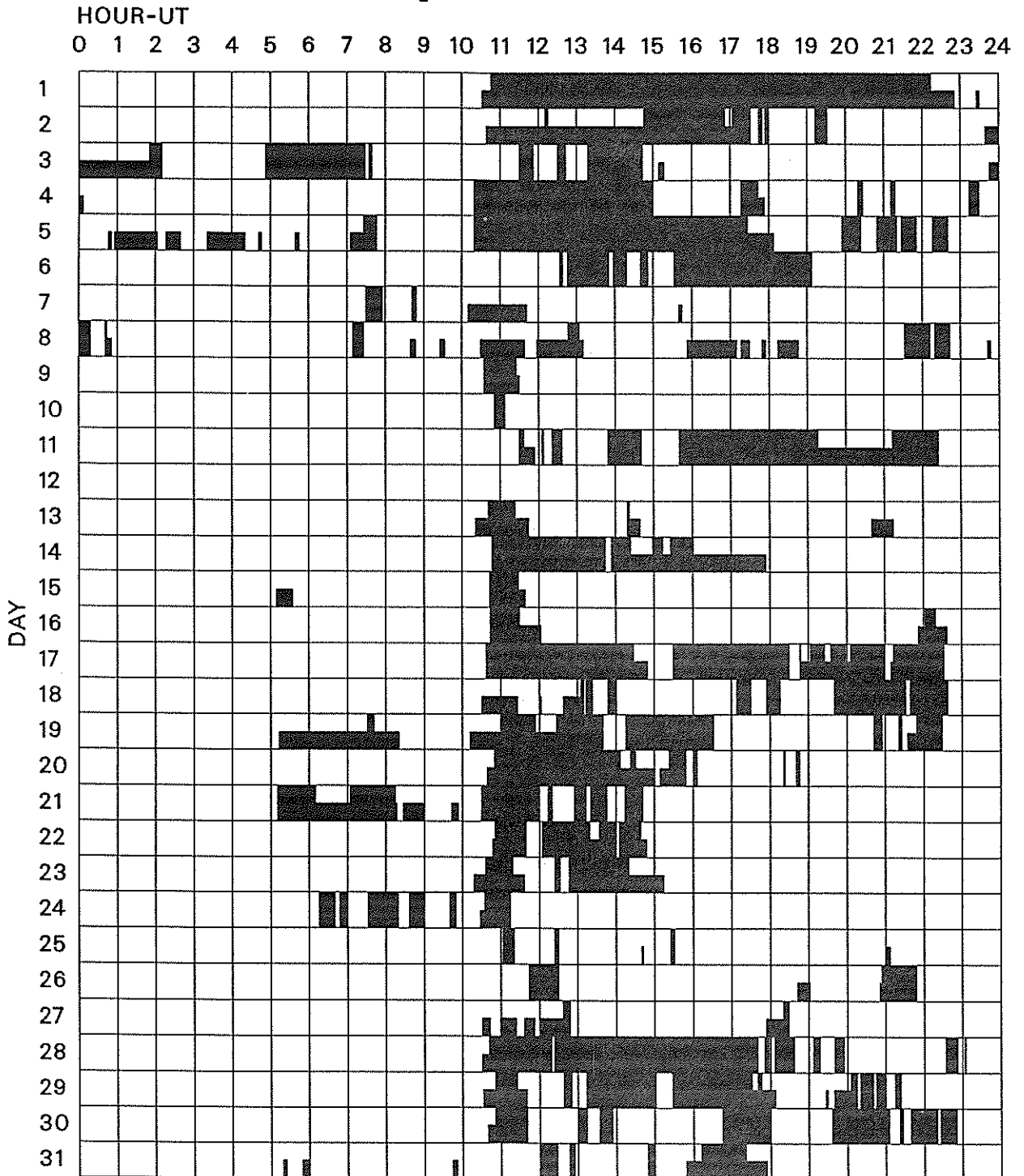
A = Eruptive prominence whose base is less than 90 degrees from central meridian.  
 B = Probably the end of a more important flare.  
 C = Invisible 10 minutes before.  
 D = Brilliant point.  
 E = Two or more brilliant points.  
 F = Several eruptive centers.  
 G = No visible spots in the neighborhood.  
 H = Flare accompanied by high-speed dark filament.  
 I = Active region very extended.  
 J = Distinct variations of plage intensity before or after the flare.  
 K = Several intensity maxima.  
 L = Existing filaments show signs of sudden activity.  
 M = White-light flare.  
 N = Continuous spectrum shows effects of polarization.

O = Observations have been made in the H and K lines of Ca II.  
 P = Flare shows Helium D3 in emission.  
 Q = Flare shows Balmer continuum in emission.  
 R = Marked asymmetry in H-alpha line suggests ejection of high-velocity material.  
 S = Brightness follows disappearance of filament in same position.  
 T = Region active all day.  
 U = Two bright branches, parallel or converging.  
 V = Occurrence of an explosive phase; important, expansion within roughly 1 minute that often includes a significant intensity increase.  
 W = Great increase in area after time of maximum intensity.  
 X = Unusually wide H-alpha line.  
 Y = System of loop-type prominences.  
 Z = Major sunspot umbra covered by flare.

# INTERVALS OF NO FLARE PATROL OBSERVATION FOR PRECEDING SOLAR FLARE TABLE

21  
Jan 88

## JANUARY 1988



Times of no flare patrol, shown here as shaded areas, combine reports from the observatories listed below. Portions of a panel completely shaded mark dates and times of no patrol of any kind, that is, of neither visual nor cinematographic; portions of a panel with only the bottom half shaded mark times of strictly visual patrol.

Holloman  
Istanbul

Kandilli  
Learmonth

Mitaka  
Palehua

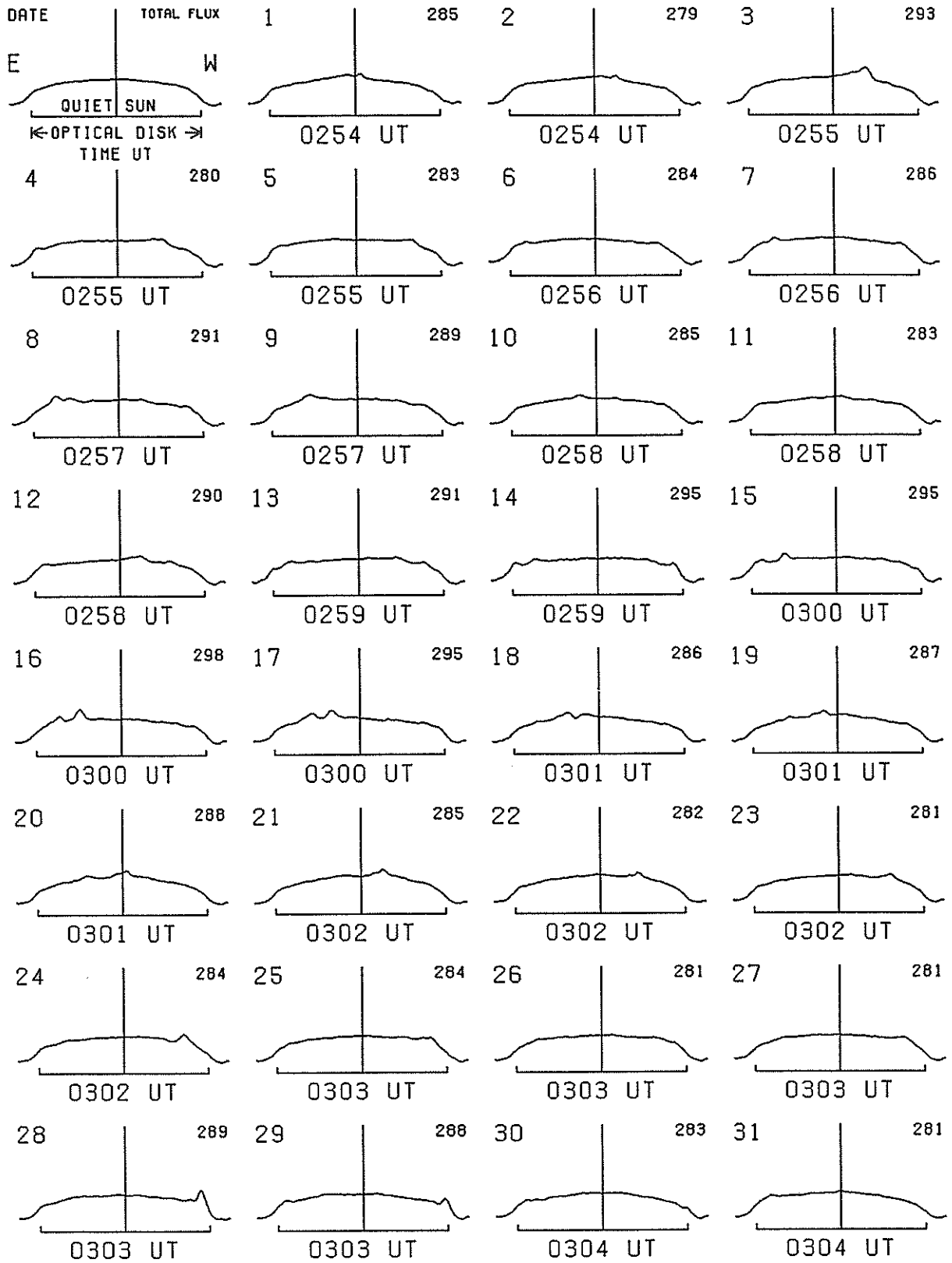
Peking  
Ramey

San Vito  
Yunnan

# EAST-WEST SOLAR SCANS JANUARY 1988

TOYOKAWA, JAPAN

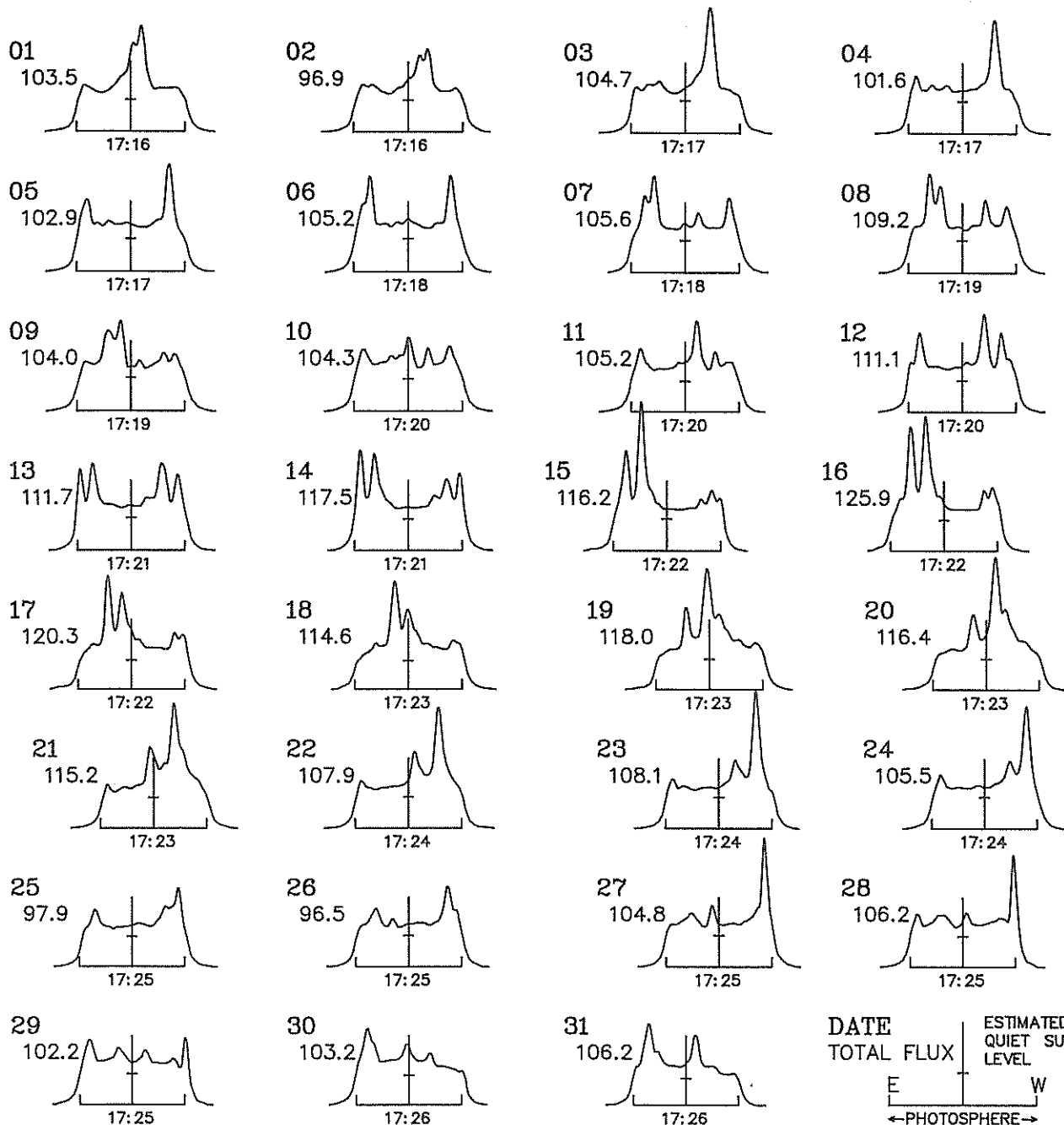
3 CM  
FAN BEAM WITH 1.1 MINUTES OF ARC



EAST - WEST SOLAR SCANS  
JANUARY 1988

ALGONQUIN RADIO OBSERVATORY  
CANADA

10.7 cm  
Fan Beam with 1.5 minutes of arc  
E - W Resolution





24  
Jan 88

EAST - WEST SOLAR SCANS

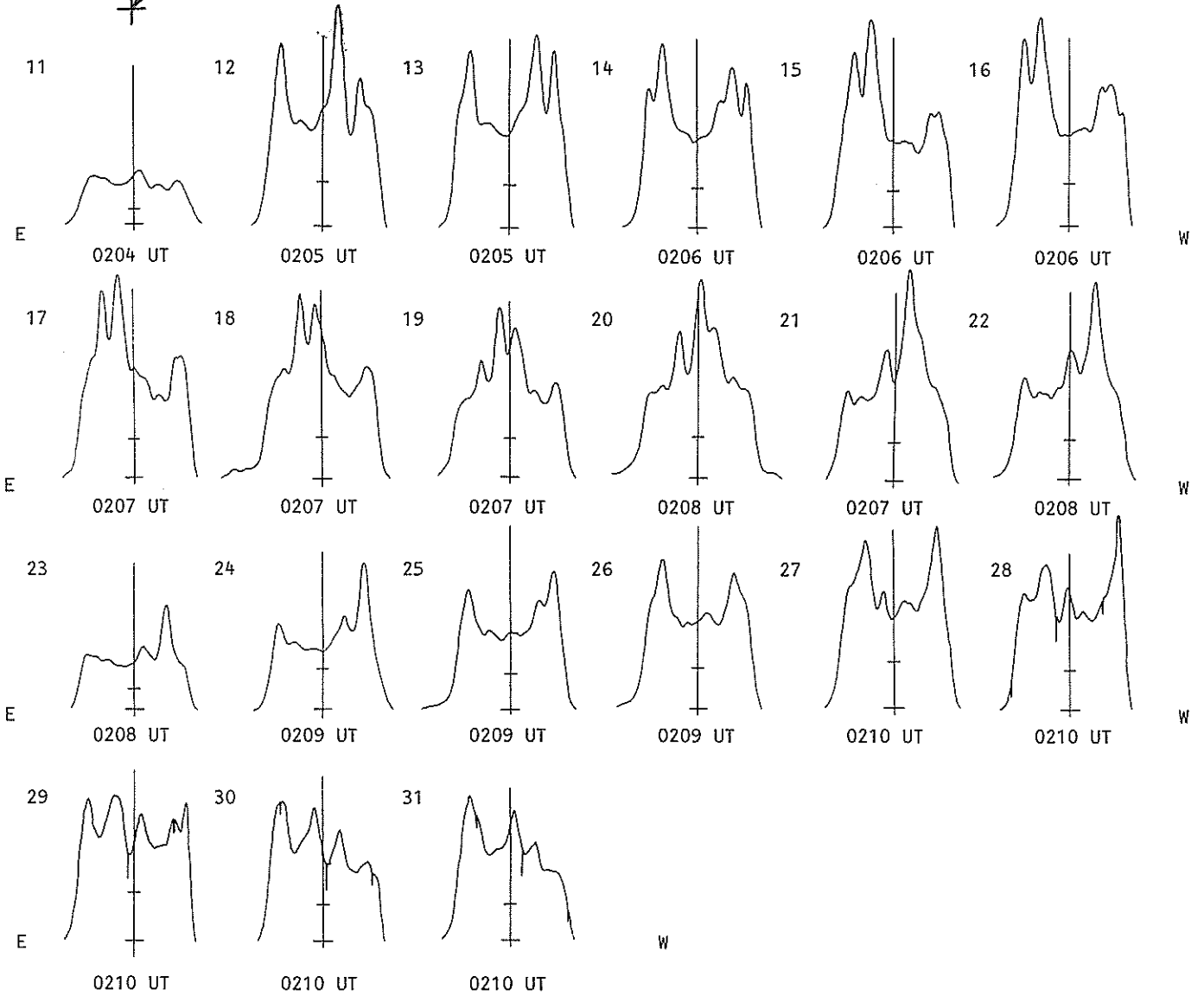
Fleurs, Australia

JANUARY 1988

21 cm  
Fan-Beam with 2 minutes of arc  
E-W Resolution

Estimated Quiet Sun Level  
Cold Sky Level

NO DATA JANUARY 1-10, 1988

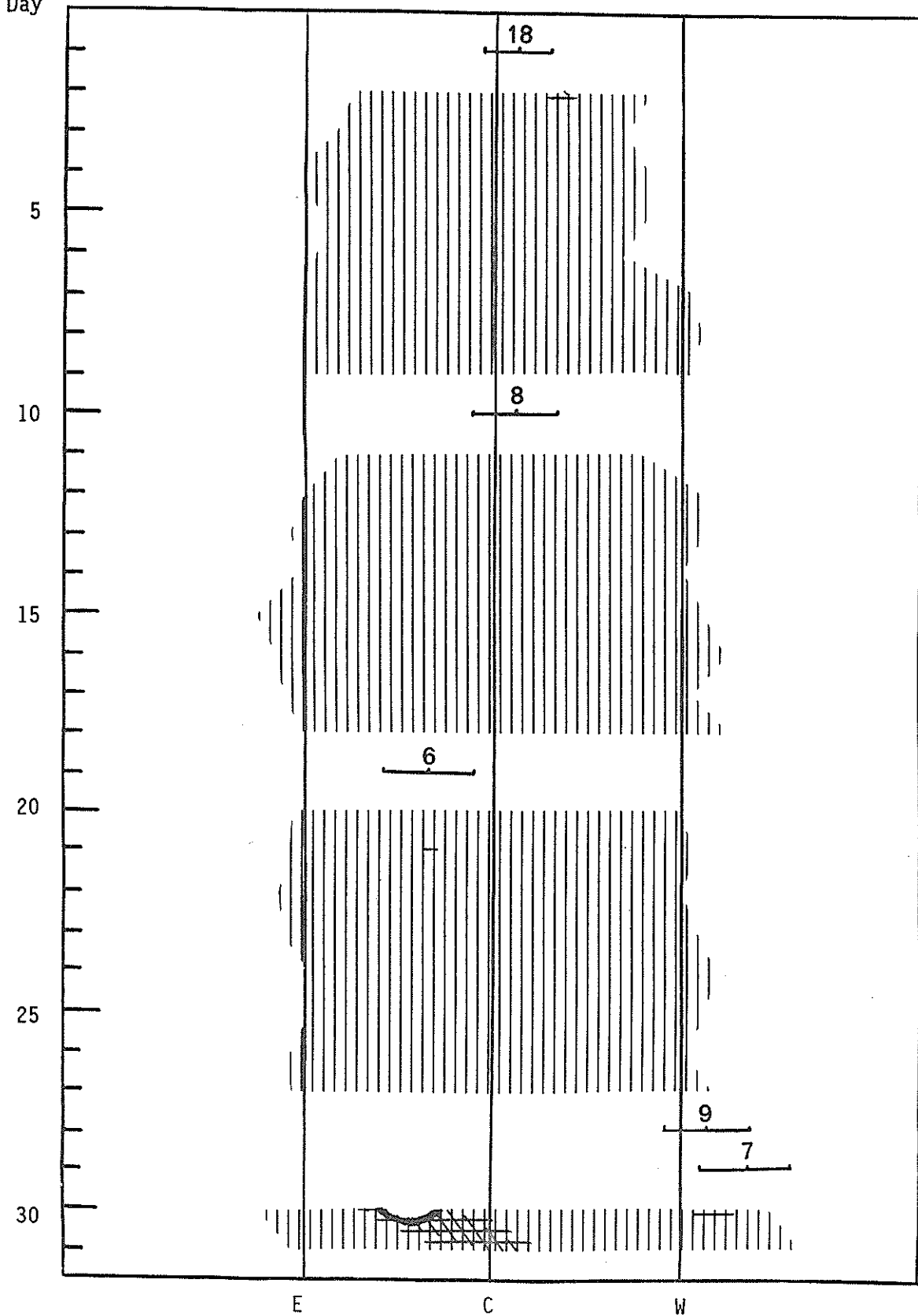


SOLAR INTERFEROMETRIC OBSERVATIONS  
JANUARY 1988

25  
Jan 88

Nancay  
Day

164 MHz



SOLAR RADIO EMISSION  
SELECTED FIXED FREQUENCY EVENTS

JANUARY 1988

Day	Freq Sta	Type	Start (UT)	Time of Maximum (UT)	Duration (Min)	Flux Density Peak (10 <sup>-22</sup> W/m <sup>2</sup> Hz)	Flux Density Mean (10 <sup>-22</sup> W/m <sup>2</sup> Hz)	Int	Remarks
02	2695 LEAR	20 GRF	2223.0	2237.0	97.0	110.0			QL=5 ST=1 TYP=2
07	2695 SGMR	48 C	1733.0	1734.0	3.0	95.0			QL=5 ST=3 TYP=8
	2695 PALE	8 S	1734.0	1735.0	1.0	85.0			QL=5 ST=2 TYP=5
09	2800 OTTA	22 GRF	1410.0	1600.0	300.0	8.7			
11	2800 OTTA	22 GRF	1400.0	1428.0	280.0	8.5			
	2800 OTTA	22 GRF	1905.0	1937.0	120.0	7.3			
	2695 LEAR	4 S/F	2218.0	2218.0	97.0	12.0			QL=1 ST=2 TYP=3
12	2800 OTTA	20 GRF	1505.0	1830.0	360.0	2.3			
13	2800 OTTA	28 PRE	1505.0	1515.0	55.0	2.3			
	2800 OTTA	22 GRF	1600.0	1610.0	280.0	10.5			
14	2695 SVTO	8 S	0741.0	0742.0	2.0	10.0			QL=5 ST=2 TYP=3
	8800 LEAR	8 S	0742.0	0742.0	1.0	19.0			QL=5 ST=2 TYP=3
	8800 SVTO	8 S	0742.0	0742.0	1.0	26.0			QL=5 ST=2 TYP=3
	8800 LEAR	8 S	0848.0	0848.0	1.0	89.0			QL=5 ST=2 TYP=5
	2695 SVTO	8 S	0848.0	0848.0	2.0	30.0			QL=5 ST=2 TYP=3
	2695 LEAR	8 S	0848.0	0848.0	1.0	28.0			QL=1 ST=2 TYP=3
	8800 SVTO	8 S	0848.0	0848.0	1.0	68.0			QL=5 ST=2 TYP=5
	8800 SVTO	8 S	1336.0	1336.0	1.0	30.0			QL=5 ST=2 TYP=3
	2695 SVTO	8 S	1459.0	1500.0	2.0	57.0			QL=5 ST=2 TYP=5
	2695 SGMR	8 S	1500.0	1500.0	1.0	78.0			QL=5 ST=2 TYP=5
	8800 SGMR	8 S	1500.0	1500.0	1.0	130.0			QL=5 ST=2 TYP=5
15	8800 PALE	8 S	0009.0	0010.0	2.0	36.0			QL=1 ST=3 TYP=3
	8800 LEAR	8 S	0009.0	0010.0	2.0	44.0			QL=5 ST=2 TYP=3
	2800 OTTA	22 GRF	1400.0	1730.0	420.0	7.0			
	2800 OTTA	1 S	1644.2	1644.7	2.0	10.0	4.0		
	2800 OTTA	1 S	1841.3	1841.7	.9	7.0	3.5		
	2800 OTTA	1 S	1842.2	1842.3	1.2	25.0	7.5		
	2800 OTTA	1 S	1848.0	1848.3	2.0	6.2	3.0		
16	2800 OTTA	22 GRF	1612.0	1627.0	180.0	2.8			
17	8800 LEAR	8 S	0055.0	0056.0	1.0	19.0			QL=5 ST=2 TYP=3
19	2800 OTTA	28 PRE	2020.0	2030.0	14.0	- 1.0			
	2800 OTTA	3 S	2037.0	2040.0	7.0	20.0	14.0		
	2800 OTTA	30 PBI	2044.0	2044.0	48.0	4.4			
21	2800 OTTA	20 GRF	1525.0	1610.0	180.0	4.2			

Reports are received routinely from the following observatories:

LEAR = Learmonth

OTTA = Ottawa

PALE = Palehua

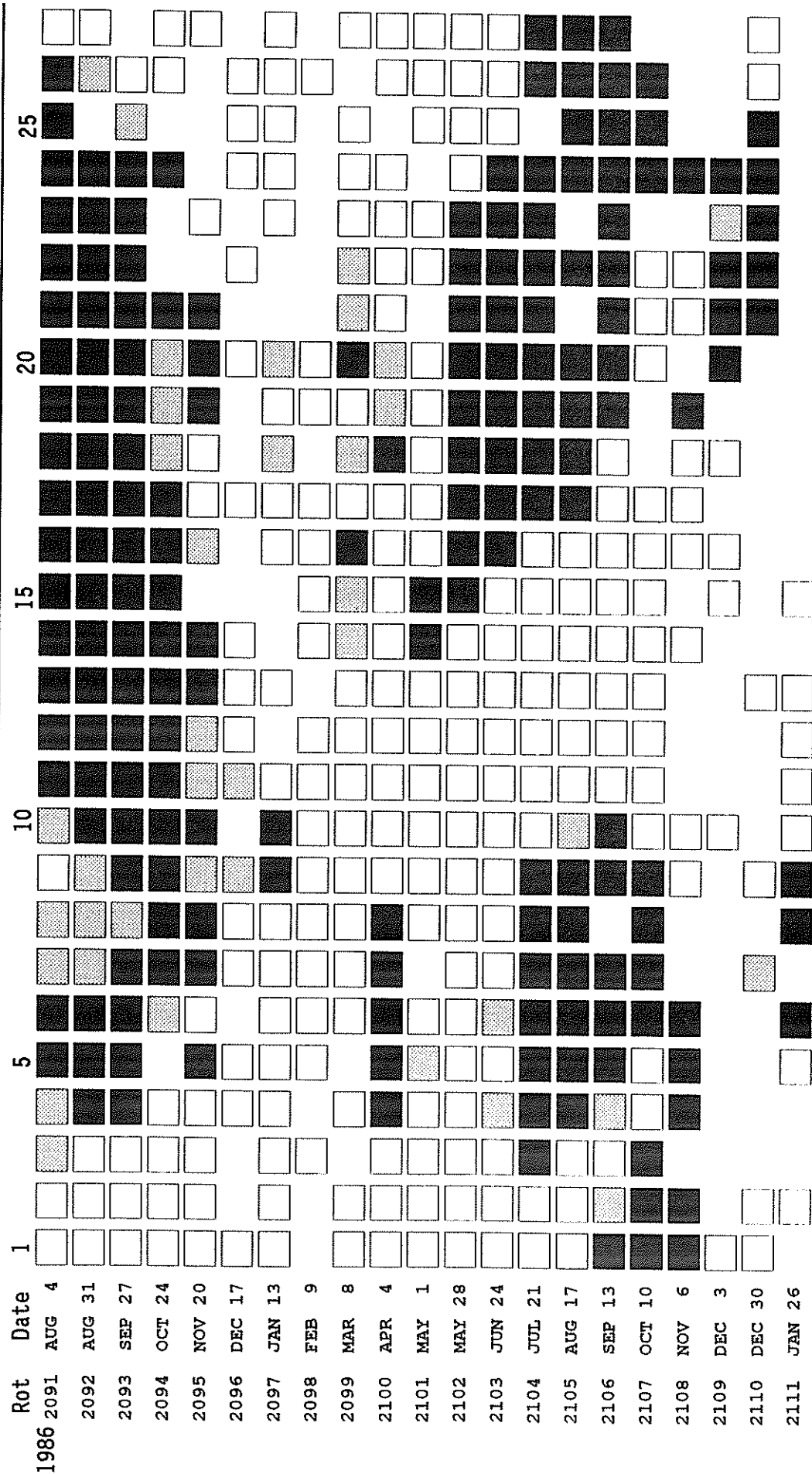
SGMR = Sagamore Hill  
SVTO = San Vito

Explanation of Type Code:

1 Simple 1	7 Minor +	24 Rise	30 Post Burst Increase A	43 Onset of Noise Storm
2 Simple 1F	8 Spike	25 Rise A	31 Post Burst Decrease	44 Noise Storm in Progress
3 Simple 2	20 Simple 3	26 Fall	33 Absorption	45 Complex
4 Simple 2F	21 Simple 3A	27 Rise and Fall	40 Fluctuation	46 Complex F
5 Simple	22 Simple 3F	28 Precursor	41 Group of Bursts	47 Great Burst
6 Minor	23 Simple 3AF	29 Post Burst Increase	42 Series of Bursts	48 Major
1A Simple 1A	4A Simple 2AF	24PF Post Rise F	27F Rise and Fall F	
3A Simple 2A	40 Rise Only	16A Fall A	27AF Rise and Fall AF	
21A Simple 3A GRF	40F Rise Only F	260 Fall Only	31A Post Burst Decrease A	
2A Simple 1AF	4P Post Rise	26F Fall F	32A Absorption A	

RSTN Site Information: Beginning in April 1986, the RSTN sites LEAR, PALE, SGMR, and SVTO fixed frequency solar radio data are periodically adjusted to several world standard stations. These world standard stations include: Kislovodsk, USSR 15,500 MHz; Ottawa, Canada 2800 MHz; Hiraiso, Japan 500 and 200 MHz; and Toyokawa, Japan 9400, 3750, 2000 and 1000 MHz.

STANFORD MEAN SOLAR MAGNETIC FIELD



Mean Solar Magnetic Field Polarity:  = field > 2 microT;  = -2 microT ≤ field ≤ 2 microT;  = field < -2 microT; No box = no data available

Observations are taken at 2000 UT. Rotation numbers given are the Bartels series, but the dates are not; these dates mark times of occurrence of phenomena on the Sun that affect the Earth during the given Bartels Rotation.

STANFORD MEAN SOLAR MAGNETIC FIELD (MICROTESLA)

Day	1987											1988
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	1	.	10	14	2	11	39	12	-3	.	.	.
2	.	.	.	17	3	20	43	-3	-4	-20	.	.
3	.	.	8	11	12	26	27	-16	-3	-19	2	.
4	9	.	13	5	23	33	14	-19	-17	-24	.	.
5	10	.	10	0	27	33	4	-31	-28	.	.	0
6	14	9	2	3	24	32	-10	.	-35	-10	.	.
7	16	.	-5	.	29	17	-16	-49	-28	-12	.	20
8	15	14	-14	6	38	2	-29	.	-24	.	.	.
9	.	15	-13	6	31	-10	-37	-50	-20	-28	.	.
10	.	.	-12	5	8	-13	-38	-39	-16	-28	.	.
11	10	10	-5	20	-8	-19	-36	-24	-6	-20	.	29
12	.	.	5	17	-17	-29	-43	-18	-3	.	19	.
13	14	10	18	5	-19	-24	-32	-10	6	.	.	.
14	8	23	30	-6	-21	-22	.	-1	7	4	.	.
15	7	18	30	-4	-21	-18	-19	4	-11	5	.	.
16	15	22	25	2	-16	-15	-7	-1	-9	.	.	.
17	13	22	19	4	-12	-9	2	-5	-10	.	22	.
18	11	17	13	3	-16	4	6	-5	-6	.	30	.
19	12	13	6	4	-6	9	3	-8	5	18	.	-12
20	11	7	2	7	9	11	-13	.	6	.	20	-22
21	.	-1	-3	.	13	7	-15	-10	9	21	.	-35
22	2	1	-2	19	12	11	-18	-5	12	30	-10	-28
23	2	-3	1	21	7	-5	-22	7	23	3	-17	-15
24	5	2	2	.	7	-12	-25	14	25	-10	-18	4
25	4	0	6	3	11	-11	-18	19	21	.	-1	15
26	.	3	8	8	6	-10	-2	21	23	4	-3	.
27	4	-3	10	8	-1	-10	12	22	.	4	.	23
28	6	-2	.	12	4	-5	26	20	.	.	.	.
29	.	-1	12	17	-1	-10	33	15	15	-5	.	.
30	.	7	12	16	5	6	22	5	2	.	24	3
31	.	12	.	4	.	27	16	.	4	.	24	-15

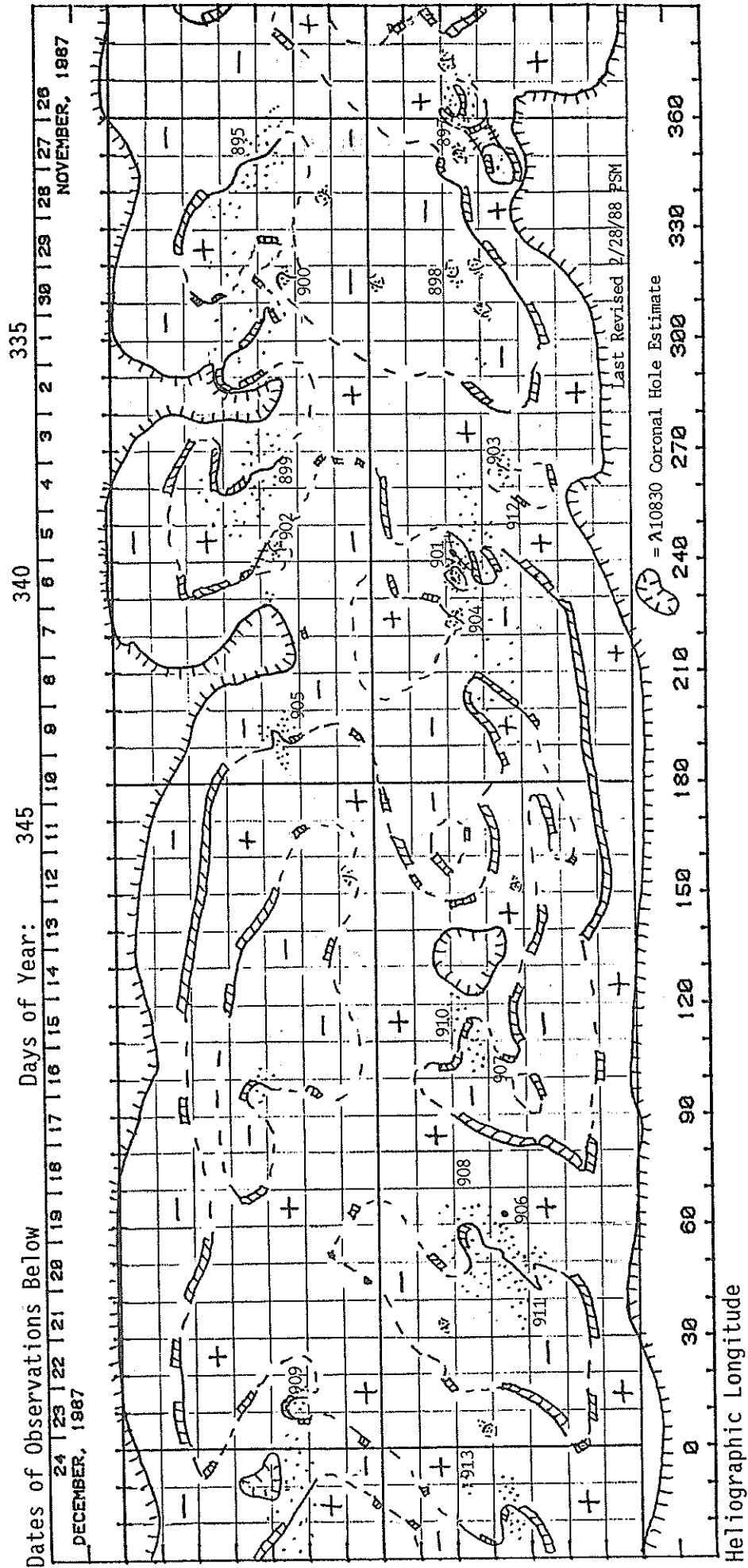
Dot symbol indicates no data available for the day.

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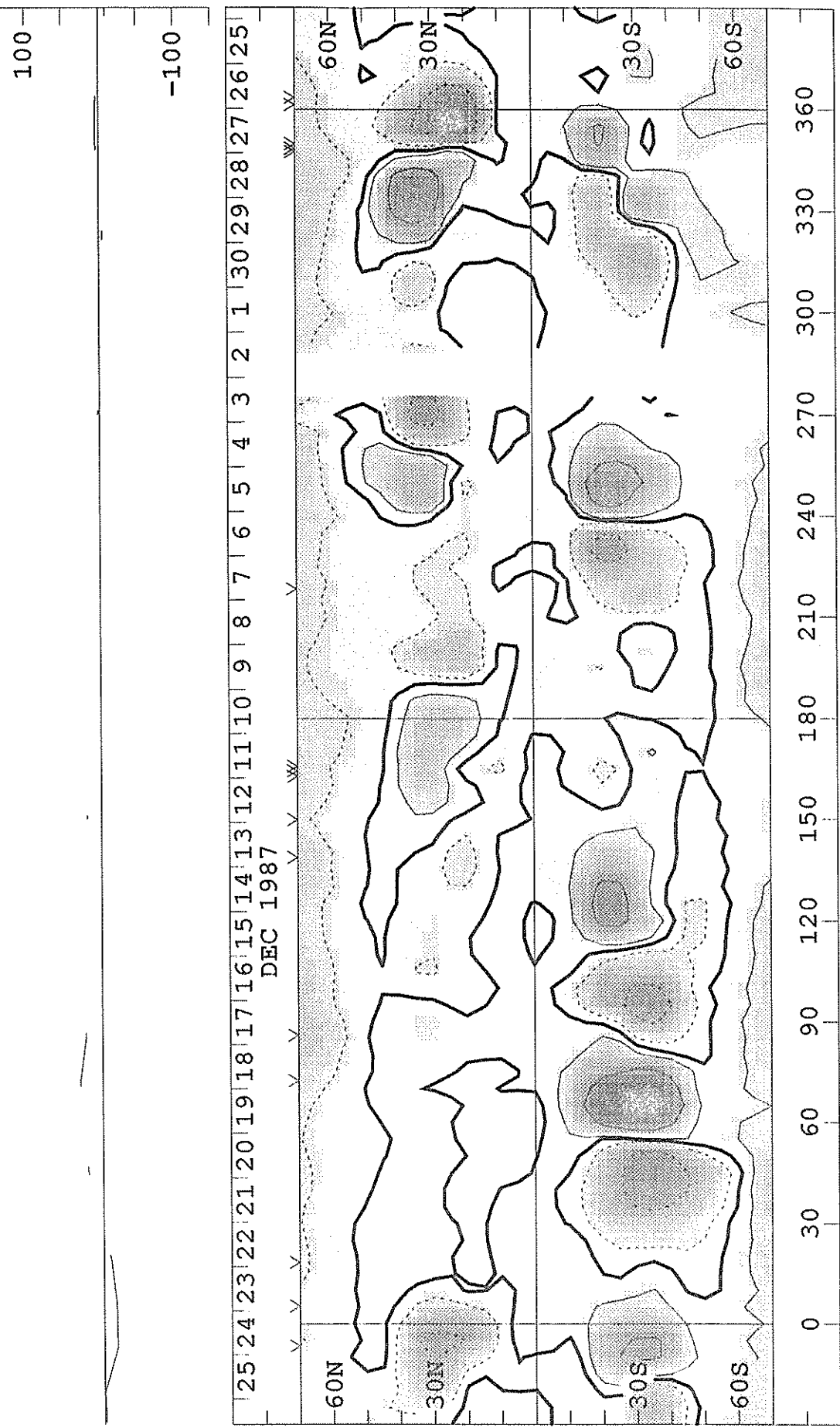
PRELIMINARY H - ALPHA SOLAR SYNOPTIC CHART  
CARRINGTON ROTATION NUMBER 1796  
(26 November to 24 December 1987)



S O L A R M A G N E T I C F I E L D S Y N O P T I C C H A R T  
CARRINGTON ROTATION NUMBER 1796  
(26 November to 24 December 1987)

Stanford Solar Observatory

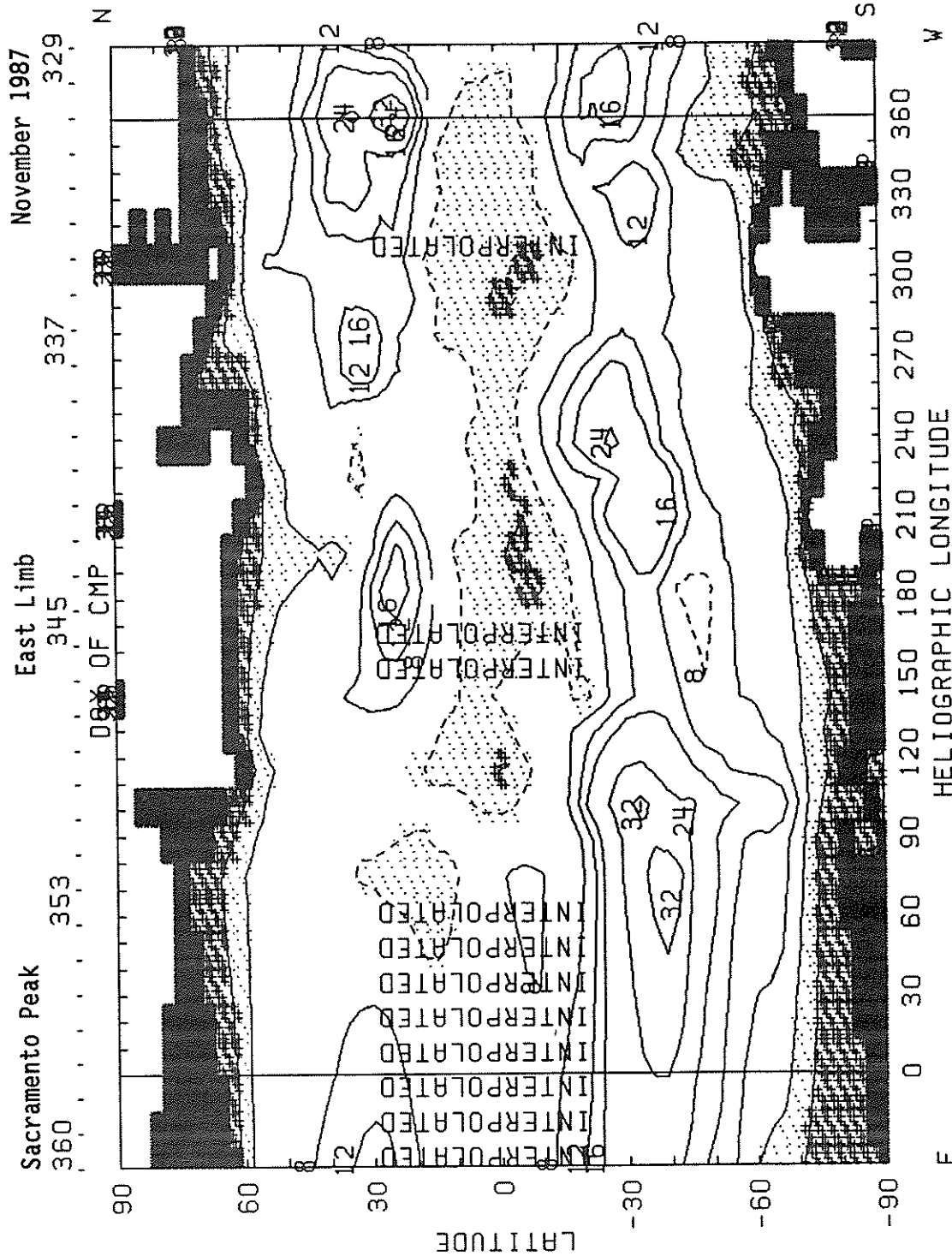
0, ±100, 500, 1000, 2000 microTesla



Heliographic Longitude

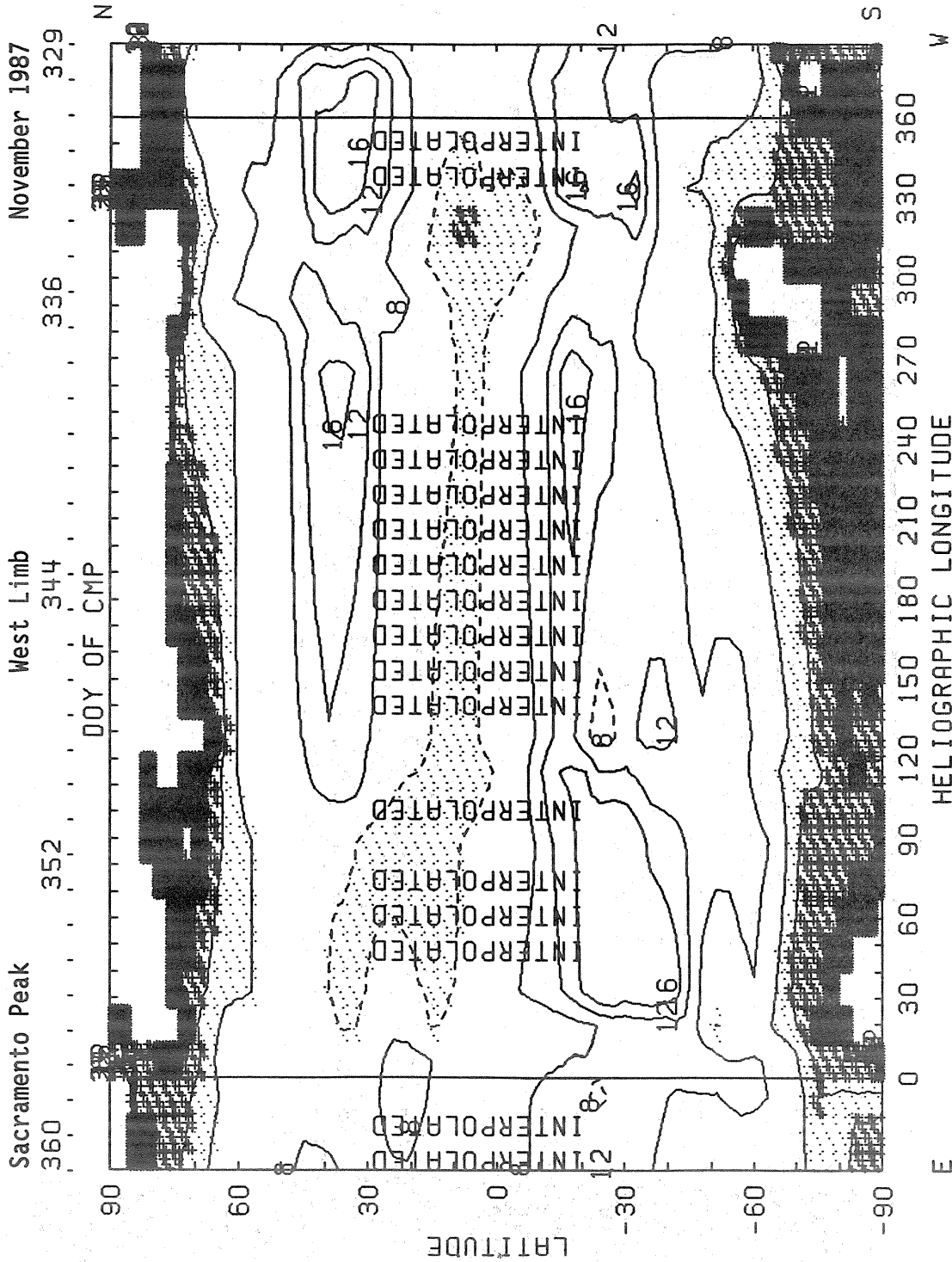


**CORONAL GREEN LINE SYNOPSIS MAP**  
 CARRINGTON ROTATION NUMBER 1796  
 (26 November to 24 December 1987)



**1987 E LIMB CONTOURS: .5, 1, 2, 4, 8, 12, 16, 24, 32 MILLIONTHS OF I<sub>o</sub>**  
**CORONAL HOLES ARE SHOWN AS WHITE SURROUNDED BY BLACK**

**CORONAL GREEN LINE SYNOPTIC MAP**  
 CARRINGTON ROTATION NUMBER 1796  
 (26 November to 24 December 1987)

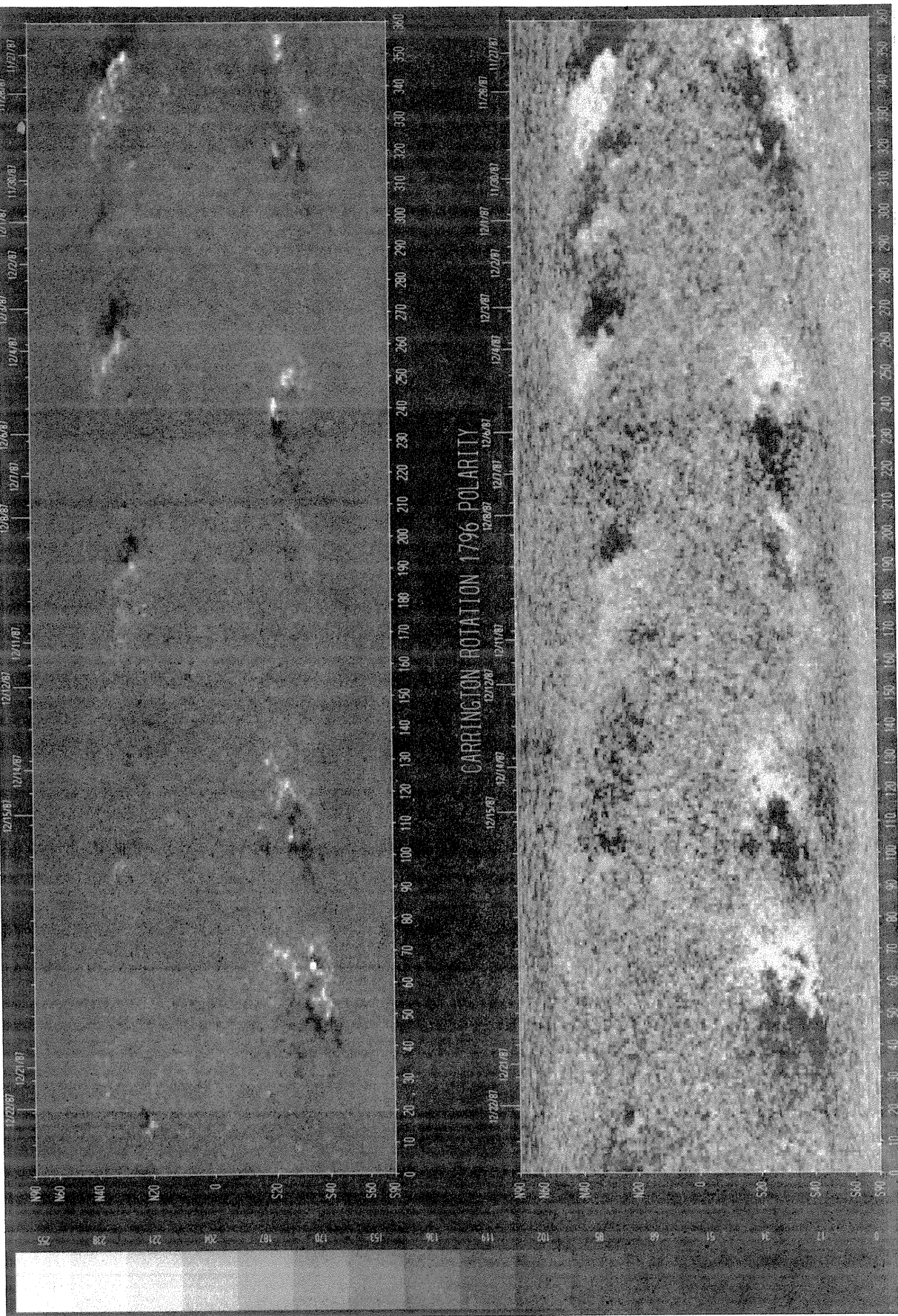


E  
 1987 W LIMB CONTOURS: .5, 1.2, 4.8, 12.16, 24.32 MILLIONTHS OF I<sub>o</sub>  
 CORONAL HOLES ARE SHOWN AS WHITE SURROUNDED BY BLACK  
 W

S O L A R M A G N E T I C F I E L D S Y N O P T I C C H A R T  
CARRINGTON ROTATION NUMBER 1796  
(26 November to 24 December 1987)

Dates of Observation

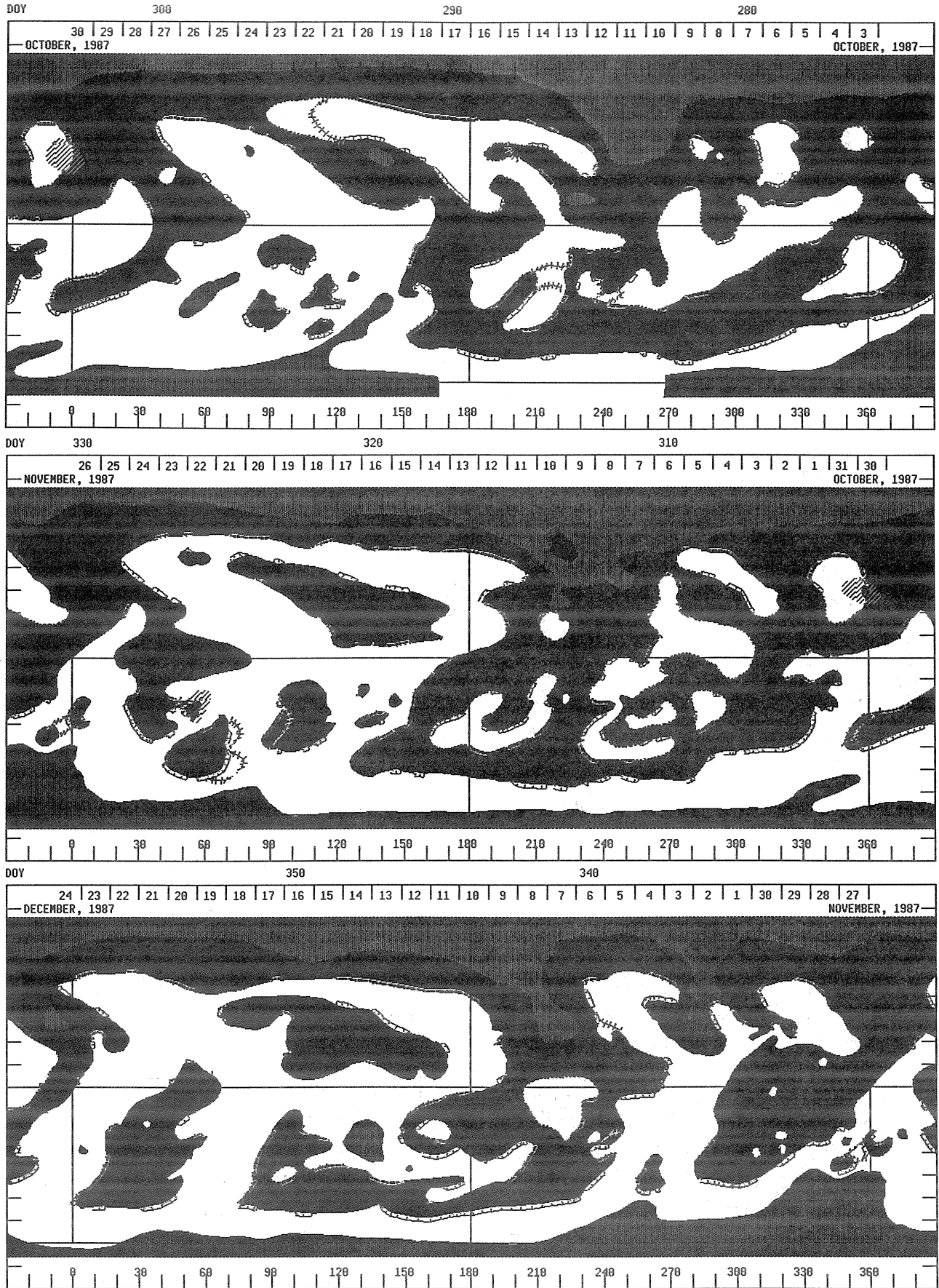
Kitt Peak National Observatory



# SHADED H-ALPHA SOLAR SYNOPTIC CHARTS

Carrington Rot. 1794-1796

3 Oct to 24 Dec 1987

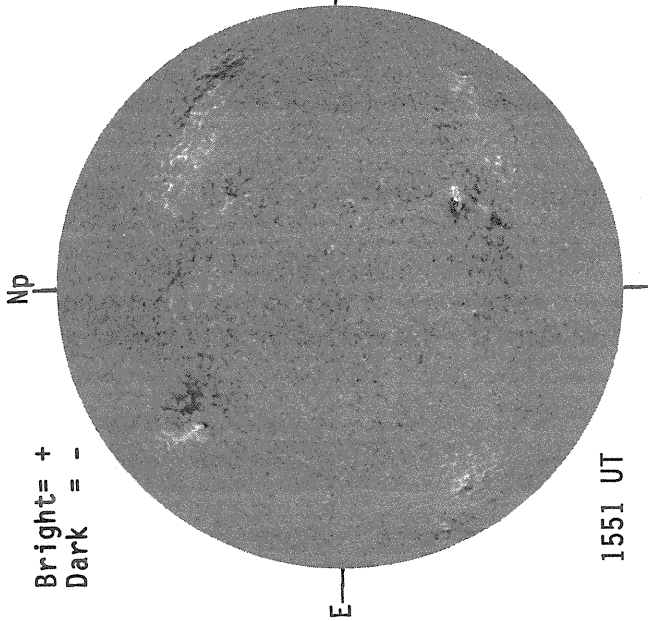


☐ = Positive Polarity    ■ = Negative Polarity    ▣ = 10830 Coronal Hole Estimate    ▨ = X-Ray Flares > M1

Heliographic Longitude

KITT PEAK MAGNETOGRAM

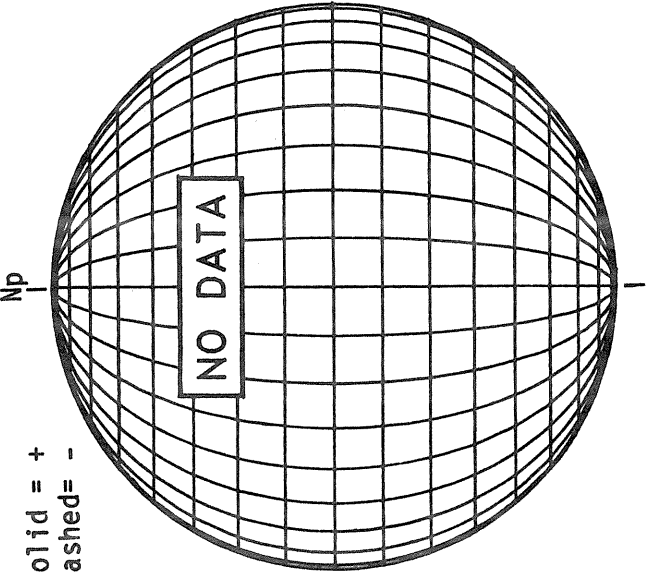
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Dark = -



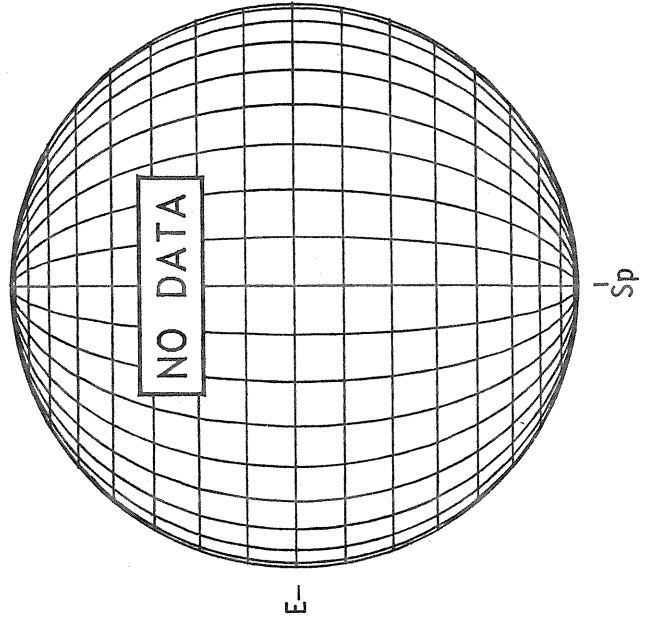
1551 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

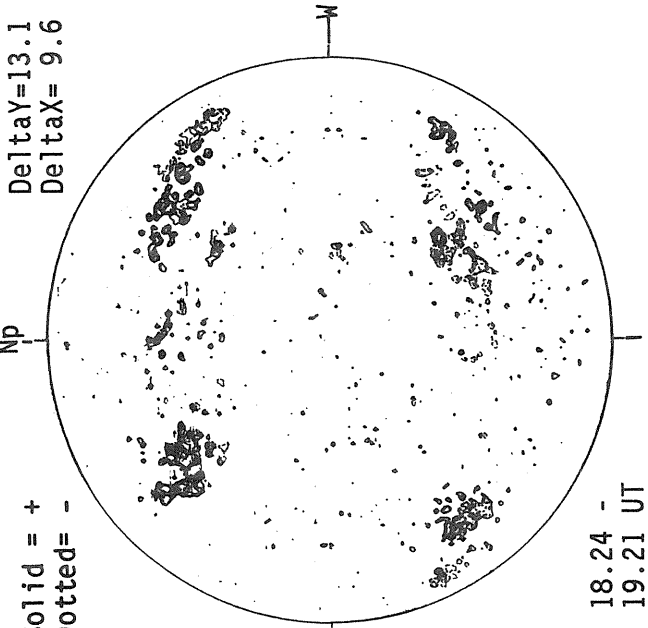


BOULDER H-ALPHA



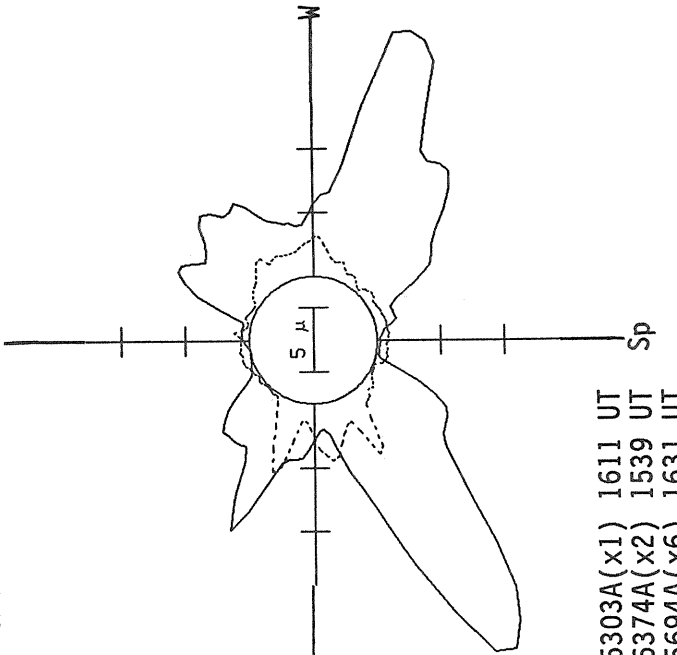
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Np  
Delta Y = 13.1  
Delta X = 9.6



18.24 -  
19.21 UT

SACRAMENTO PEAK CORONA (1.15 Radii)



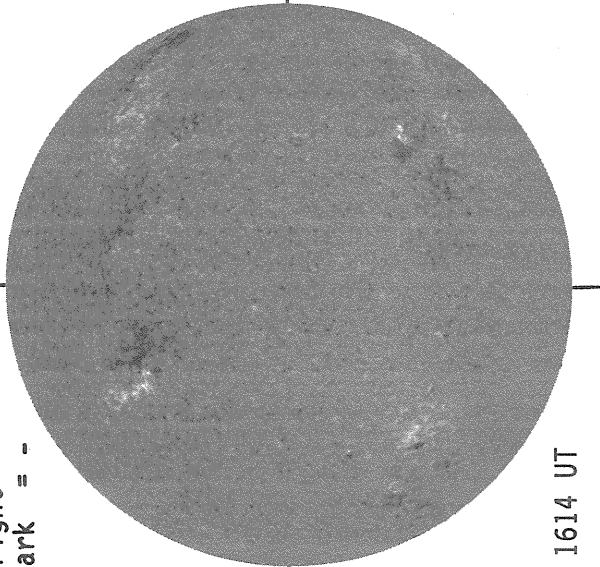
— 5303A(x1) 1611 UT  
.... 6374A(x2) 1539 UT  
xxxx 5694A(x6) 1631 UT  
NO 5694A ACTIVITY TODAY

1530 UT BOUL Prom Sp  
1535 UT BOUL Prom Sp

KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -

Np

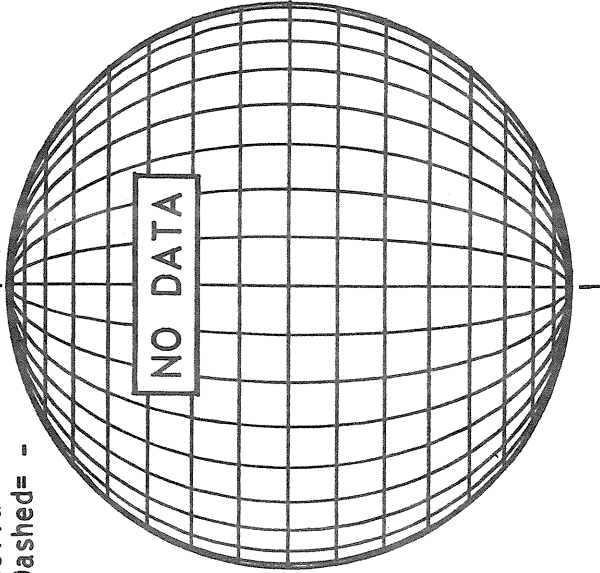


1614 UT

STANFORD MAGNETOGRAM

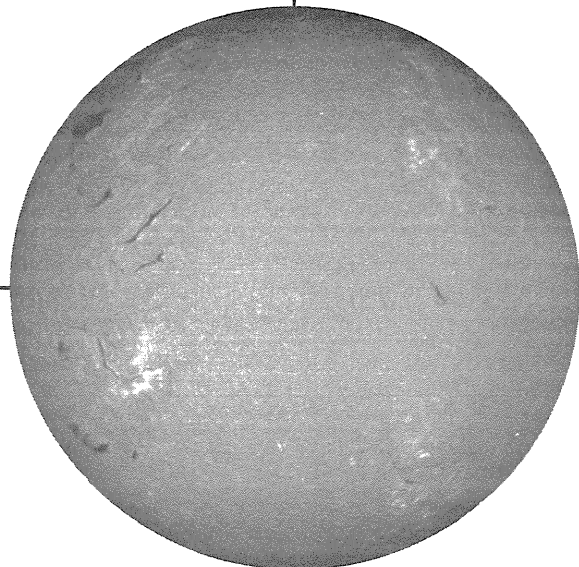
Solid = +  
Dashed = -

Np



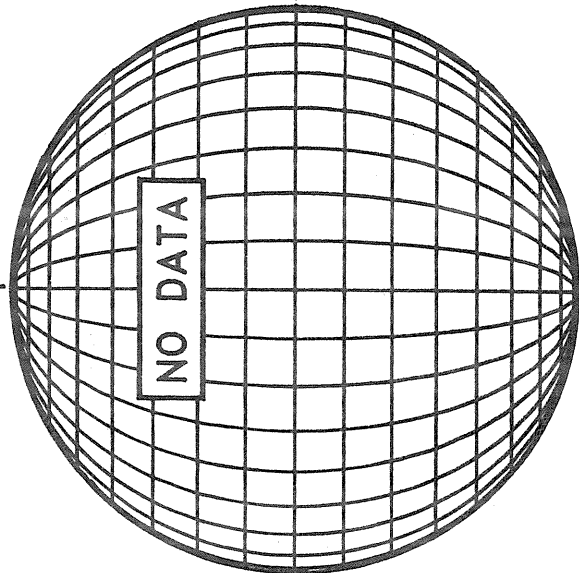
SACRAMENTO PEAK H-ALPHA

1613 UT



Sp

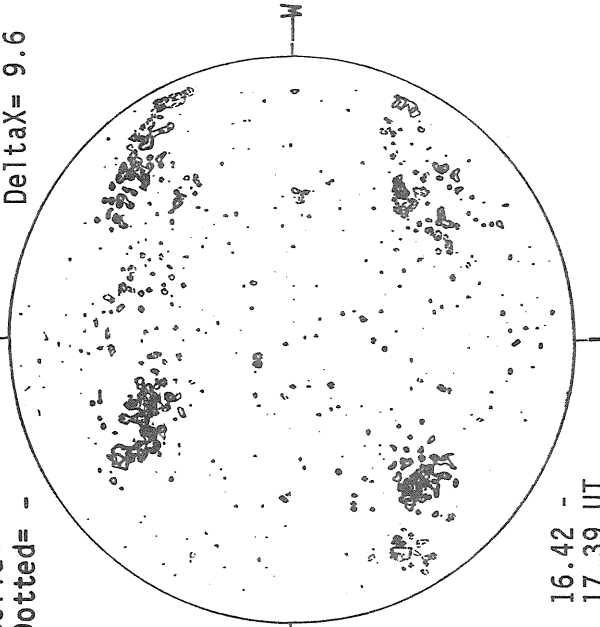
BOULDER SUNSPOTS



Sp

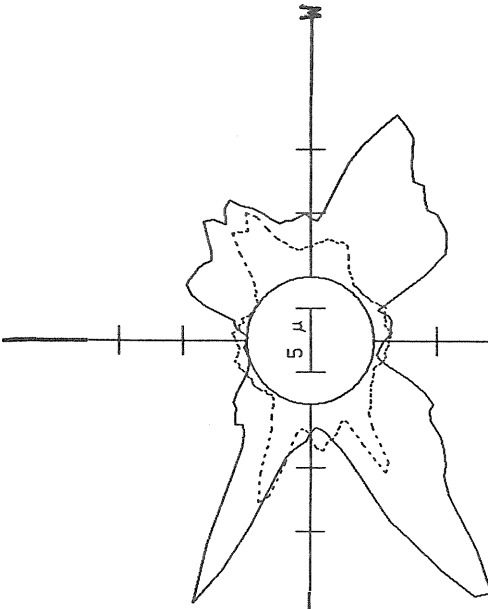
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Np  
Delta Y = 13.1  
Delta X = 9.6



16.42 -  
17.39 UT

SACRAMENTO PEAK CORONA (1.15 Radii)

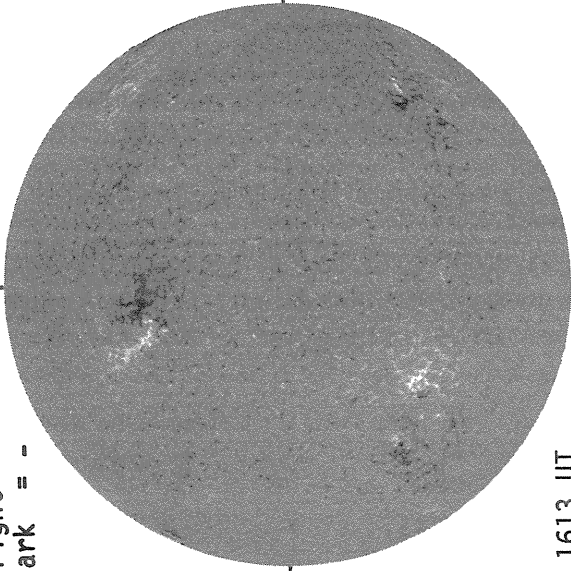


— 5303A(x1) 1517 UT  
 .... 6374A(x2) 1455 UT Sp  
 xxxx 5694A(x6) 1541 UT  
 NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -

Np

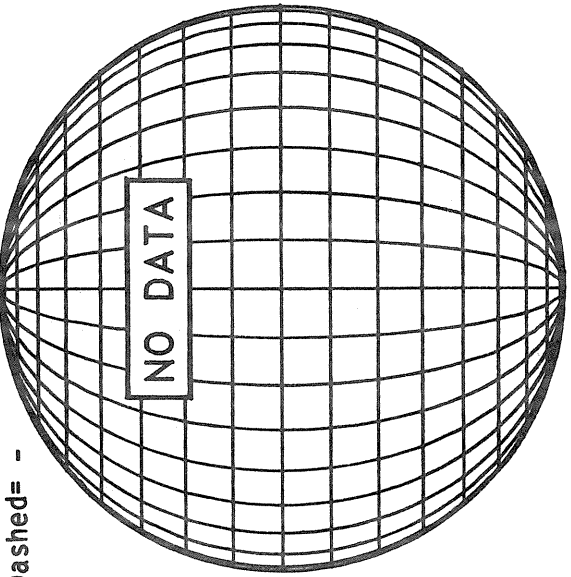


1613 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

Np



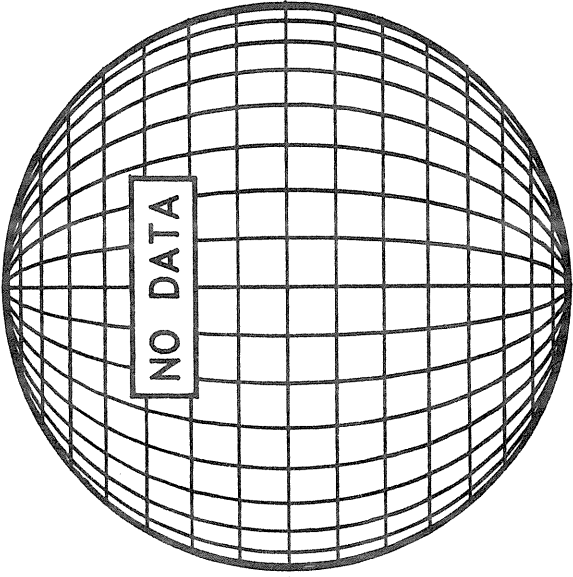
NO DATA

SACRAMENTO PEAK H-ALPHA



1530 UT

BOULDER SUNSPOTS

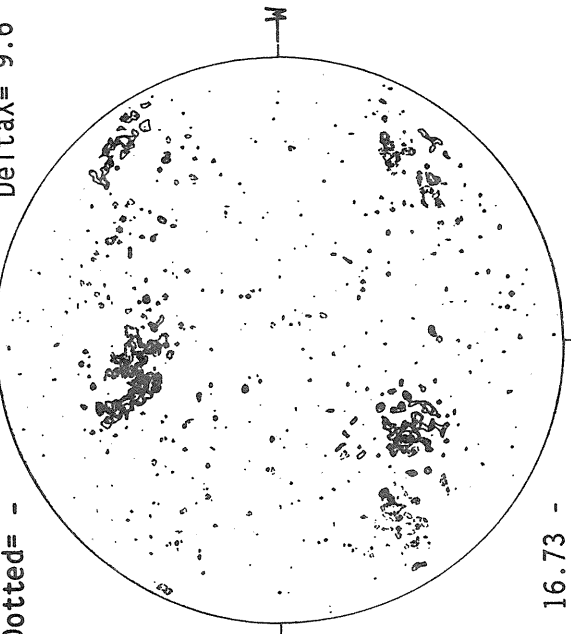


NO DATA

MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

Np

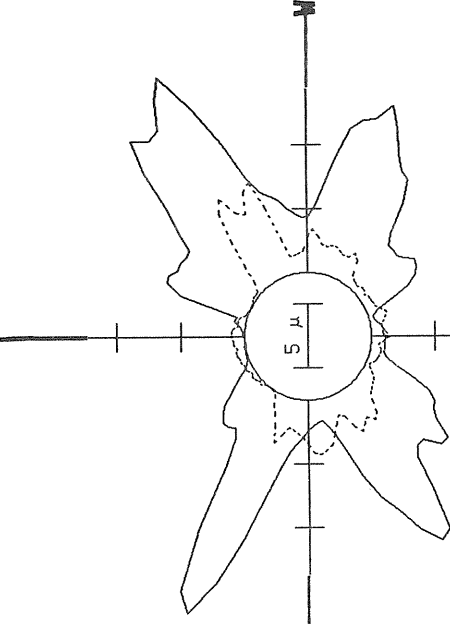


16.73 -  
17.70 UT

Delta Y = 13.1  
Delta X = 9.6

N

SACRAMENTO PEAK CORONA (1.15 Radii)



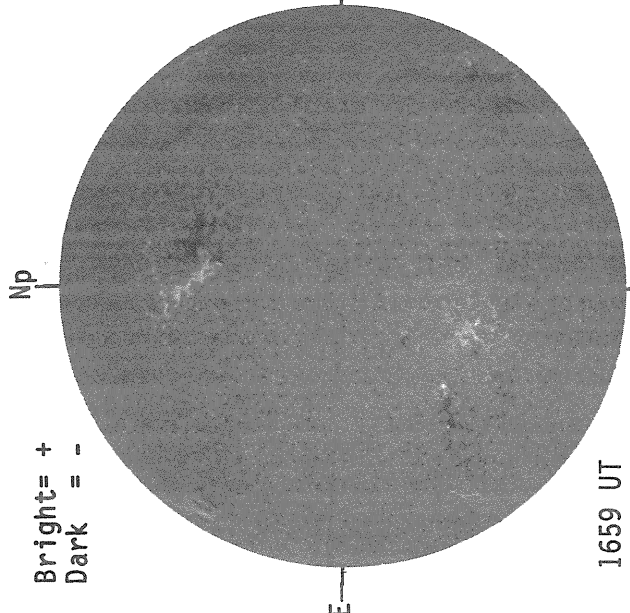
N

— 5303A (x1) 1549 UT  
... 6374A (x2) 1504 UT  
xxxx 5694A (x6) 1524 UT

Sp

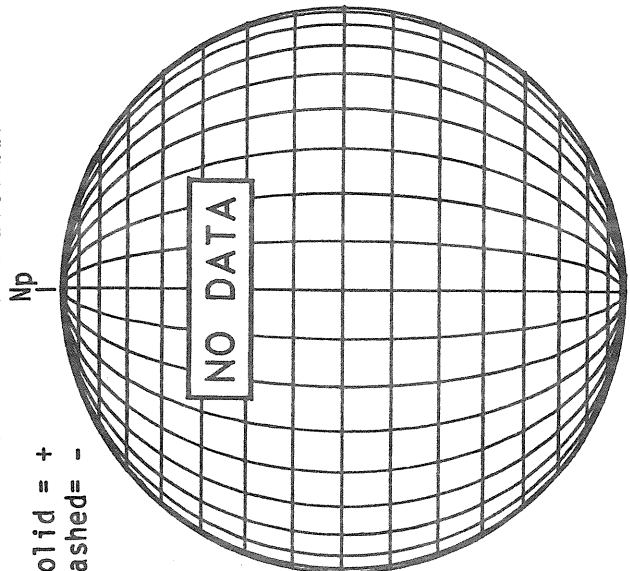
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



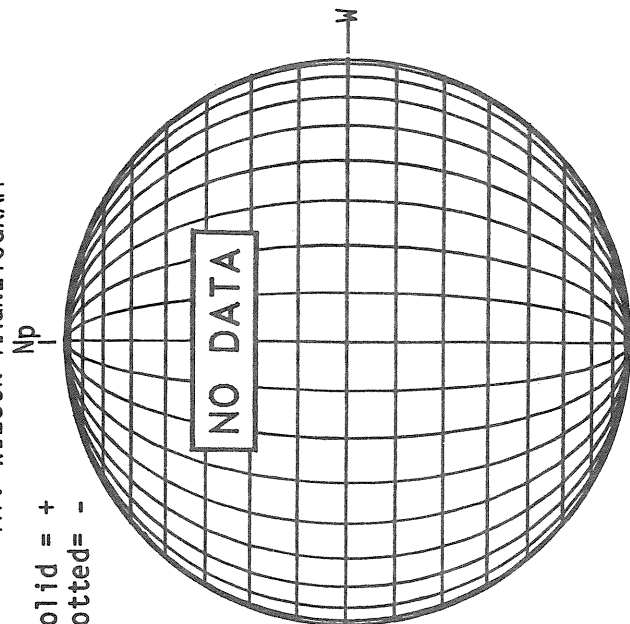
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

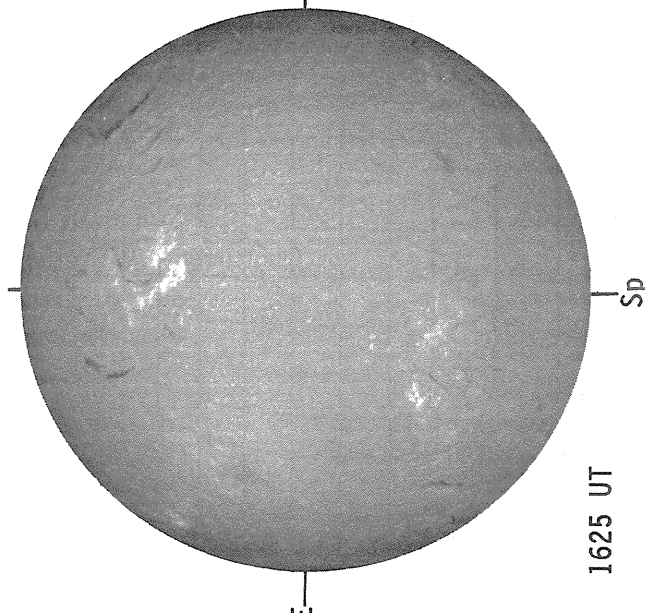


MT. WILSON MAGNETOGRAM

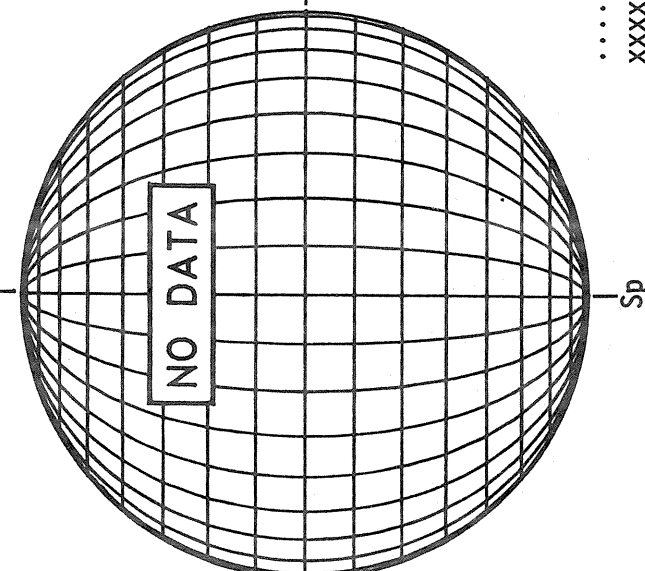
Solid = +  
Dotted = -



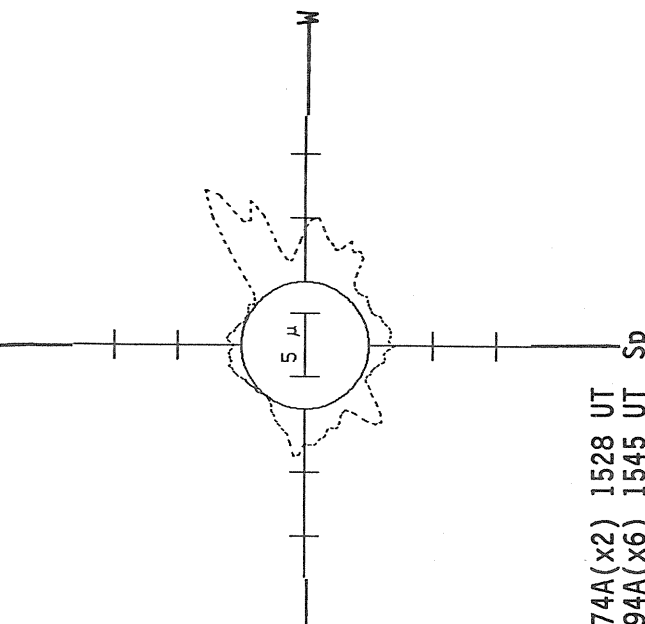
SACRAMENTO PEAK H-ALPHA



BOULDER SUNSPOTS



SACRAMENTO PEAK CORONA (1.15 Radii)

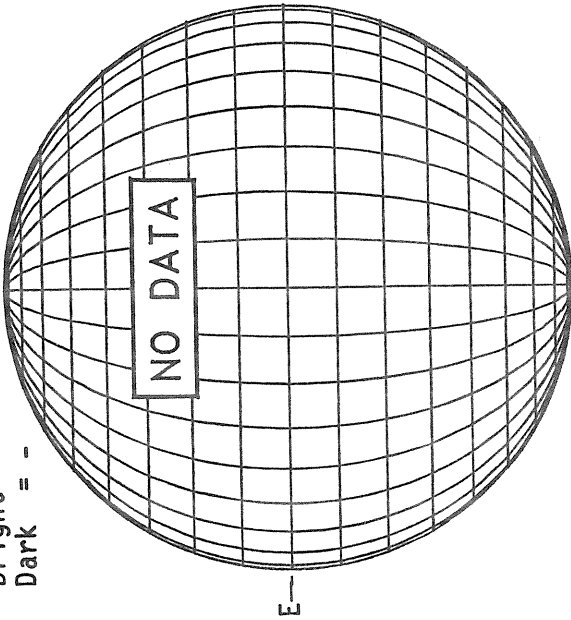


..... 6374A(x2) 1528 UT  
xxxxx 5694A(x6) 1545 UT  
NO 5694A ACTIVITY TODAY



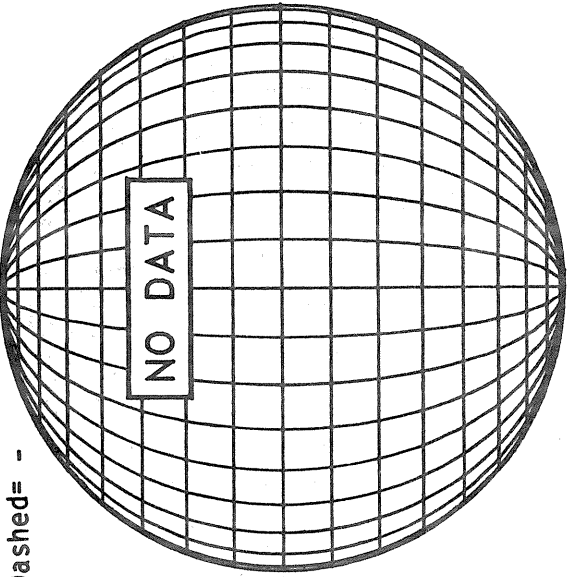
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



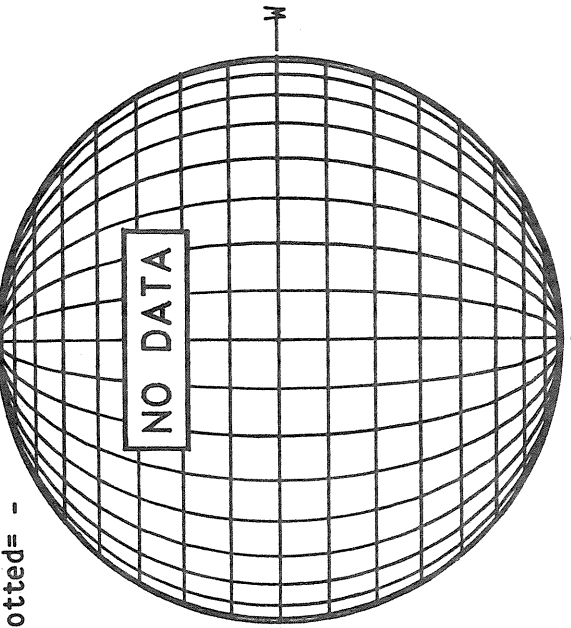
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

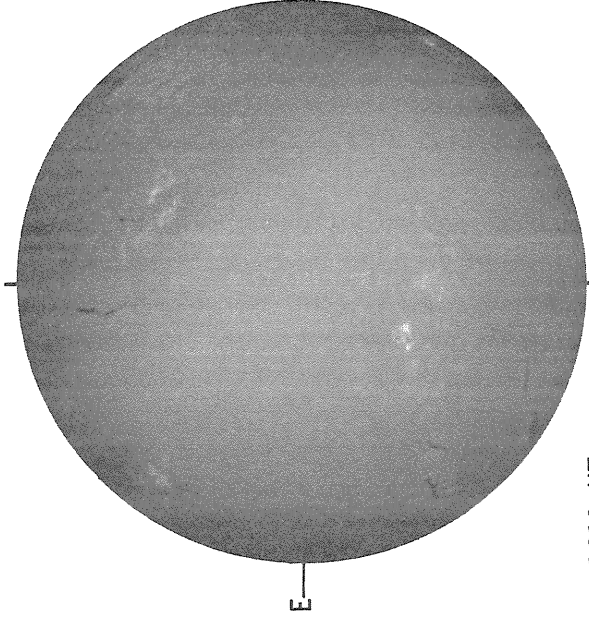


MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

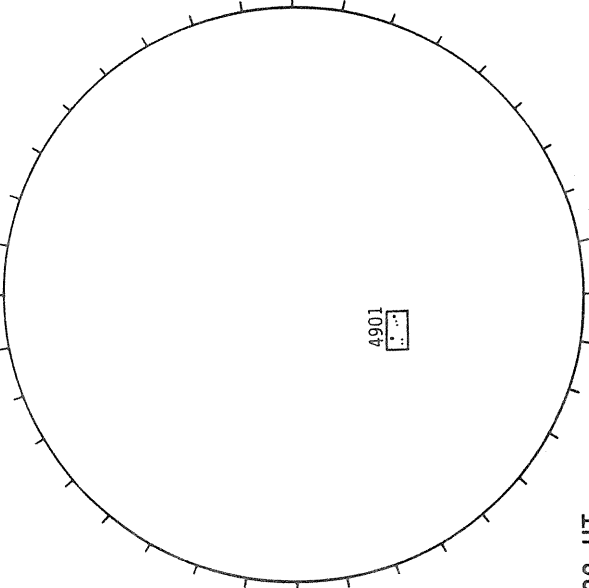


SACRAMENTO PEAK H-ALPHA



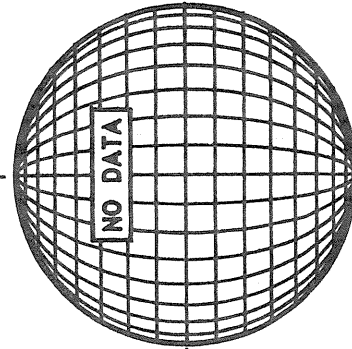
1613 UT

BOULDER SUNSPOTS



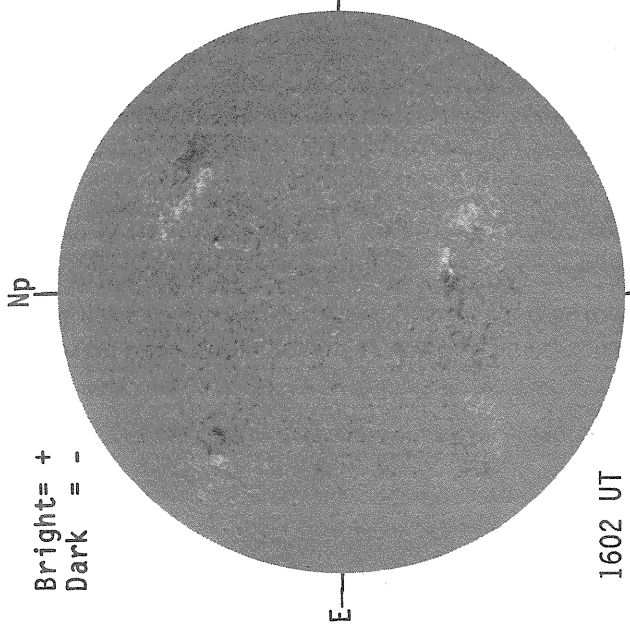
1522 UT

SACRAMENTO PEAK CORONA (1.15 Radii)



KITT PEAK MAGNETOGRAM

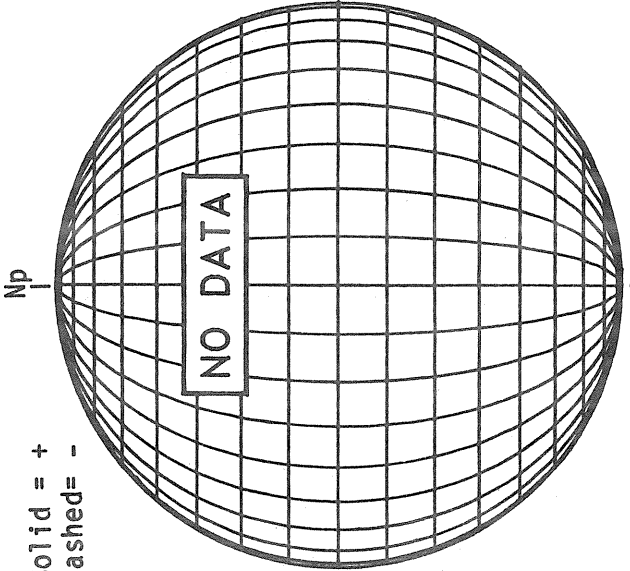
Bright = +  
Dark = -



1602 UT

STANFORD MAGNETOGRAM

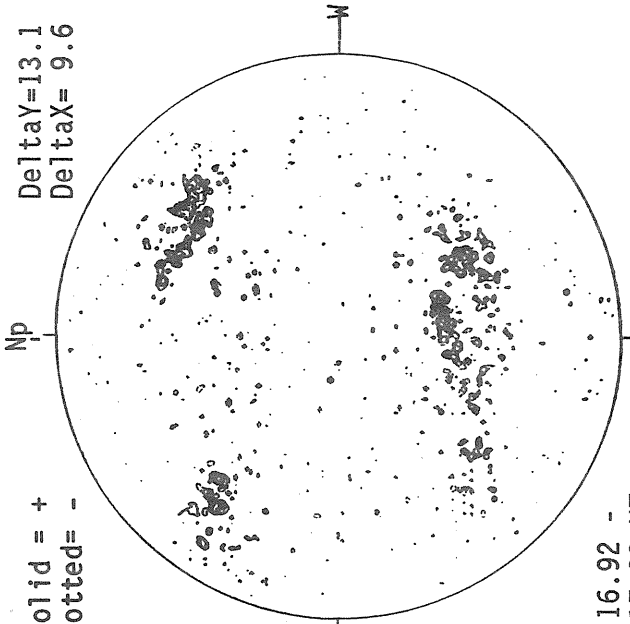
Solid = +  
Dashed = -



NO DATA

MT. WILSON MAGNETOGRAM

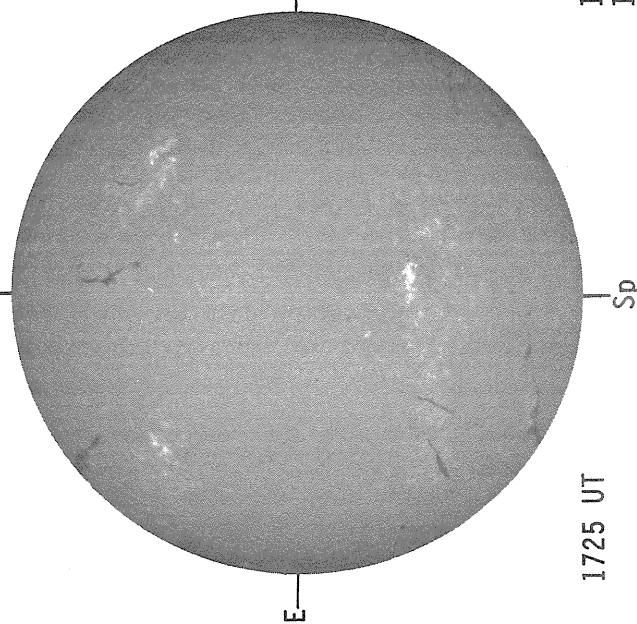
Solid = +  
Dotted = -



16.92 -  
17.88 UT

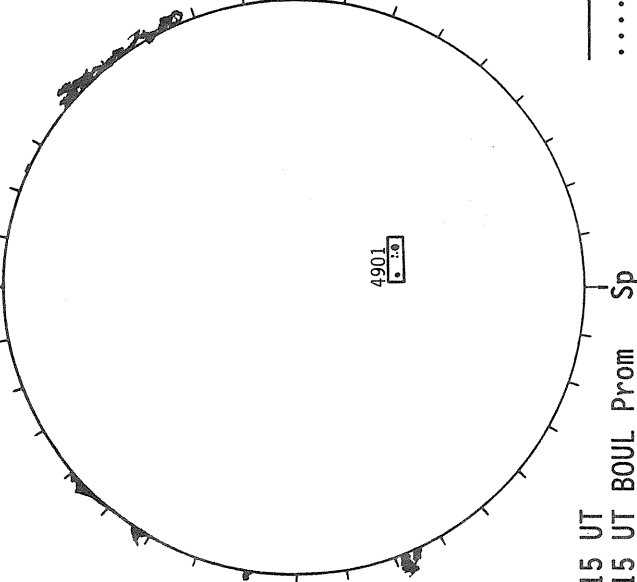
Delta Y = 13.1  
Delta X = 9.6

SACRAMENTO PEAK H-ALPHA



1725 UT

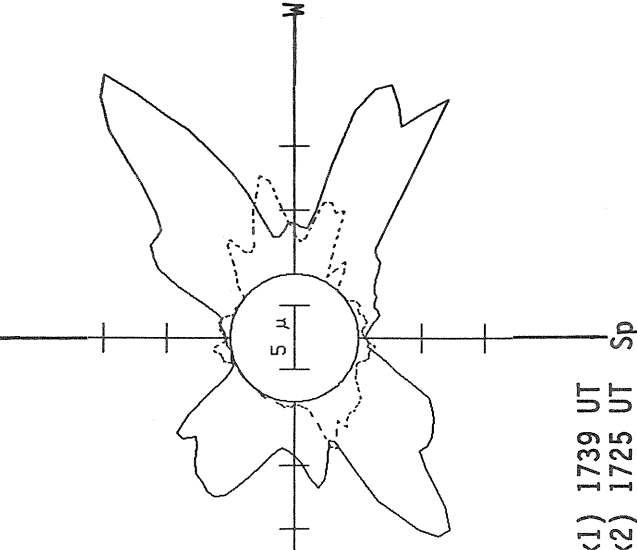
BOULDER SUNSPOTS



4901

1515 UT  
1615 UT

SACRAMENTO PEAK CORONA (1.15 Radii)

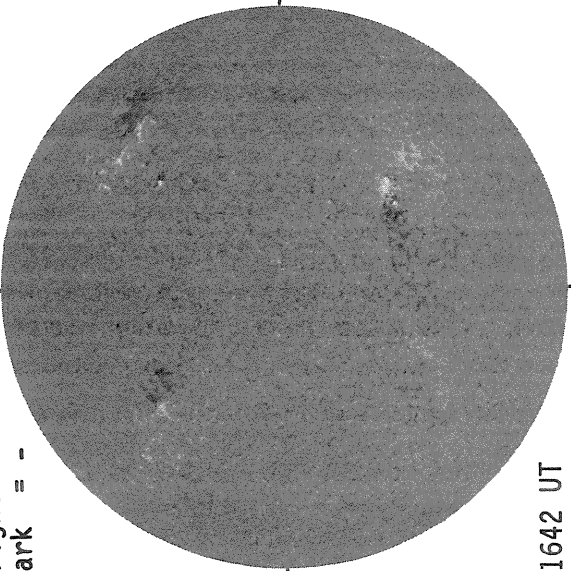


5 μ

— 5303A(x1) 1739 UT  
 .... 6374A(x2) 1725 UT  
 xxxxx 5694A(x6) 1704 UT  
 NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -



1642 UT

STANFORD MAGNETOGRAM

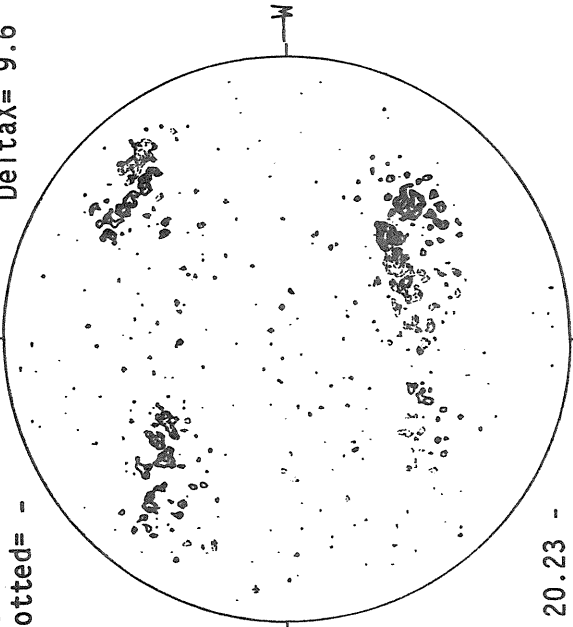
Solid = +  
Dashed = -



1813 UT

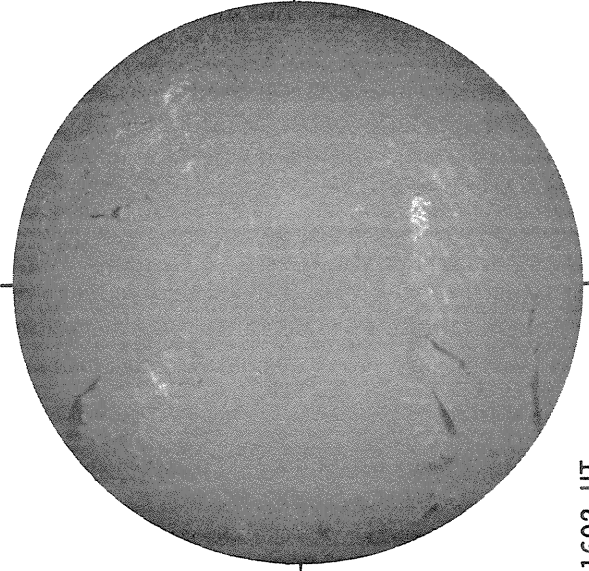
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Np  
Delta Y = 13.1  
Delta X = 9.6



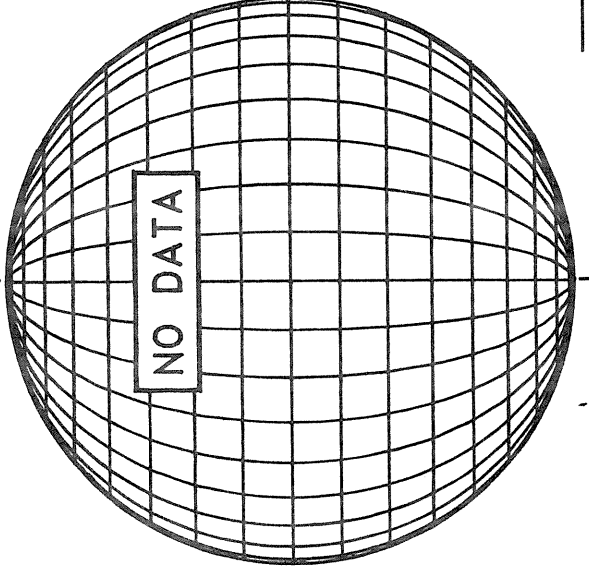
20.23 -  
21.20 UT

SACRAMENTO PEAK H-ALPHA



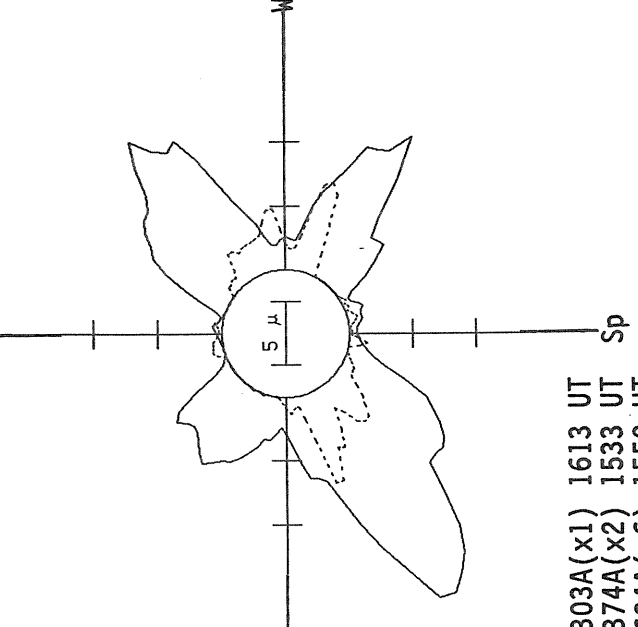
1602 UT

BOULDER SUNSPOTS



NO DATA

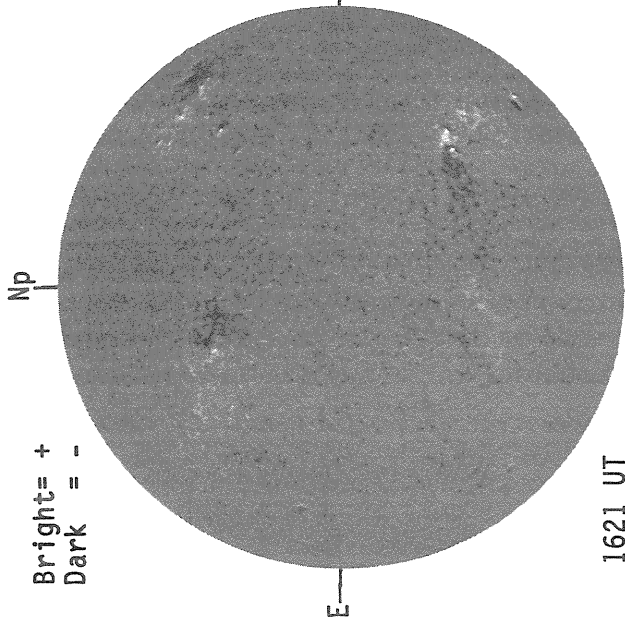
SACRAMENTO PEAK CORONA (1.15 Radii)



— 5303A(X1) 1613 UT  
... 6374A(X2) 1533 UT  
xxxx 5694A(X6) 1552 UT  
NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

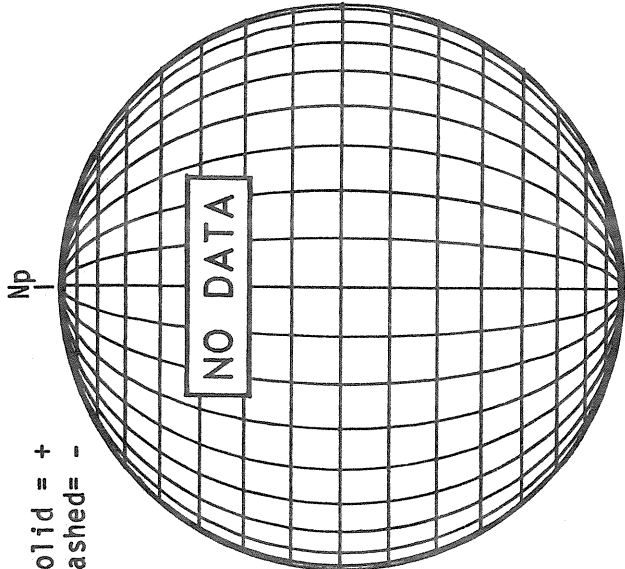
Bright= +  
Dark = -



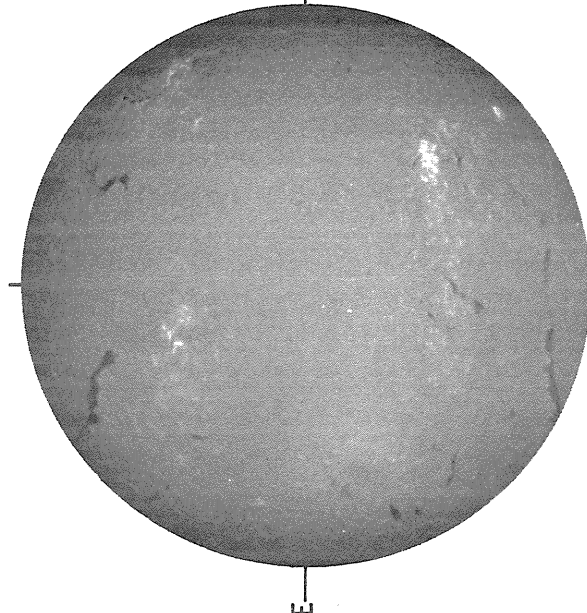
1621 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



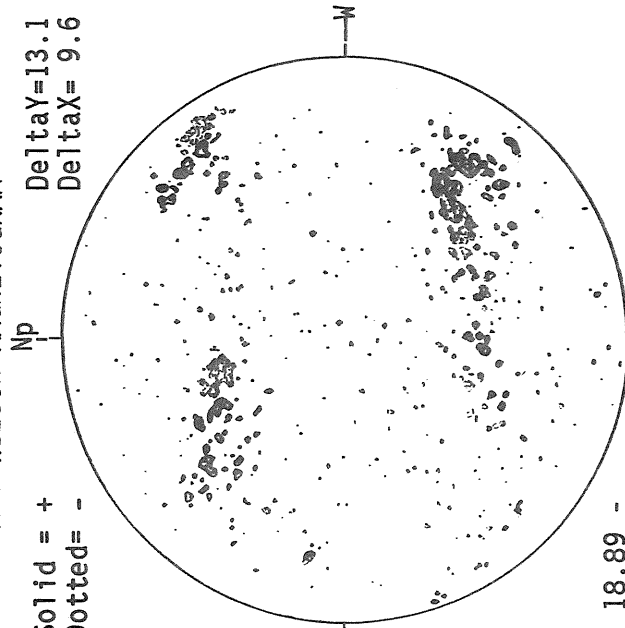
SACRAMENTO PEAK H-ALPHA



1632 UT

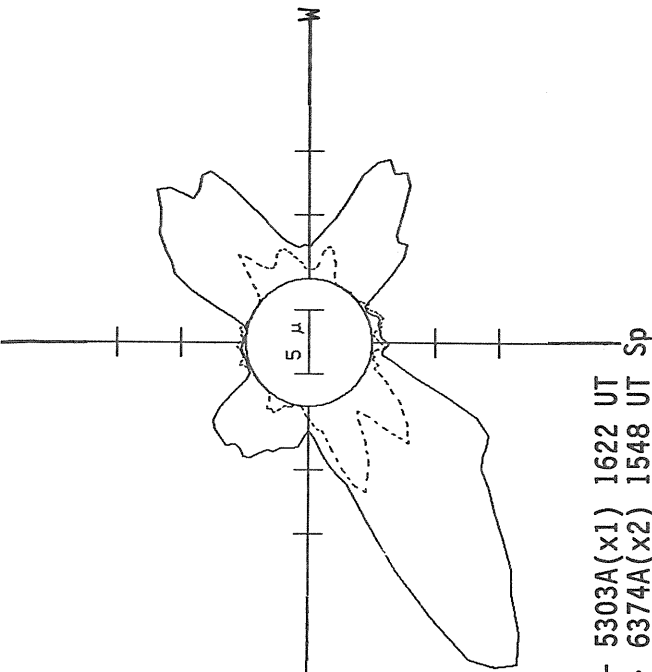
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6



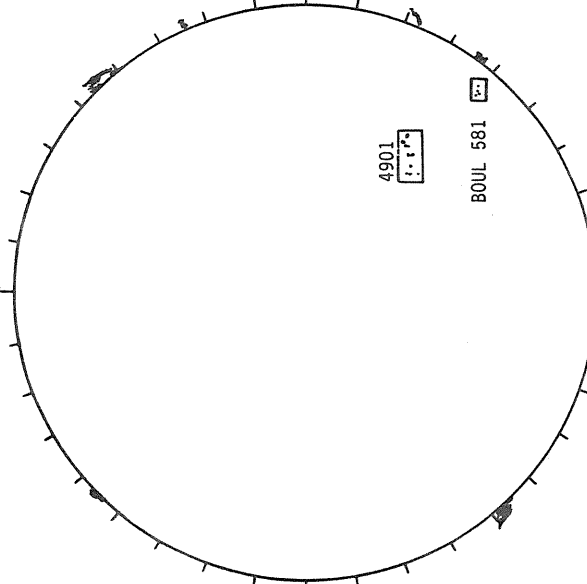
18.89 -  
19.87 UT

SACRAMENTO PEAK CORONA (1.15 Radii)



— 5303A(x1) 1622 UT  
.... 6374A(x2) 1548 UT  
xxxx 5694A(x6) 1607 UT  
NO 5694A ACTIVITY TODAY

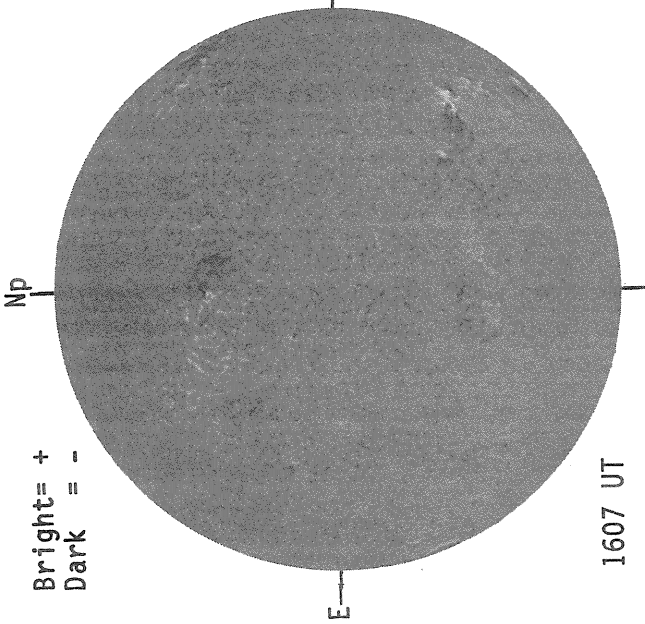
BOULDER SUNSPOTS



1452 UT  
1603 UT BOUL Prom Sp

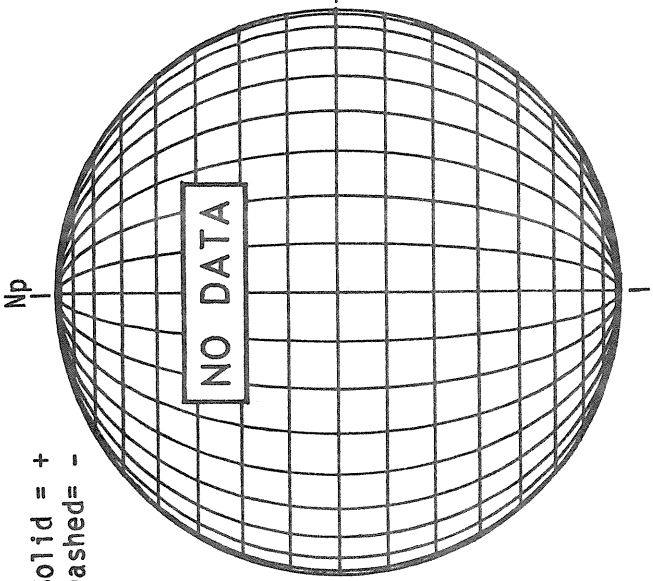
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



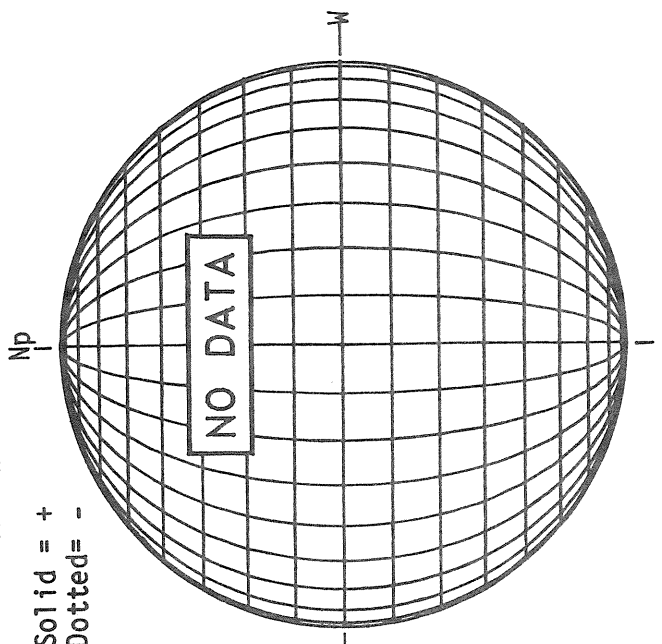
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

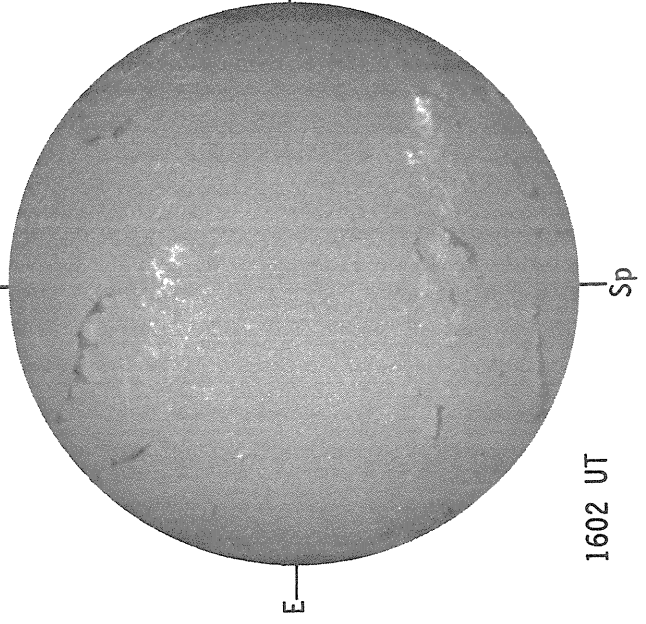


MT. WILSON MAGNETOGRAM

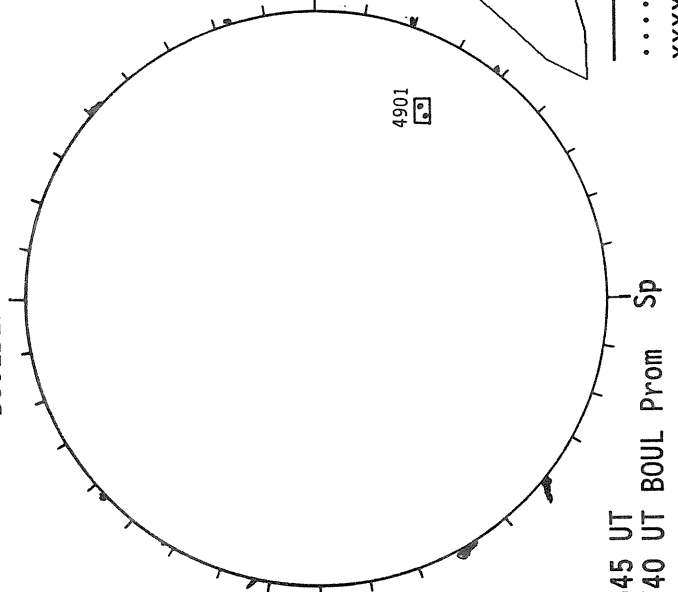
Solid = +  
Dotted = -



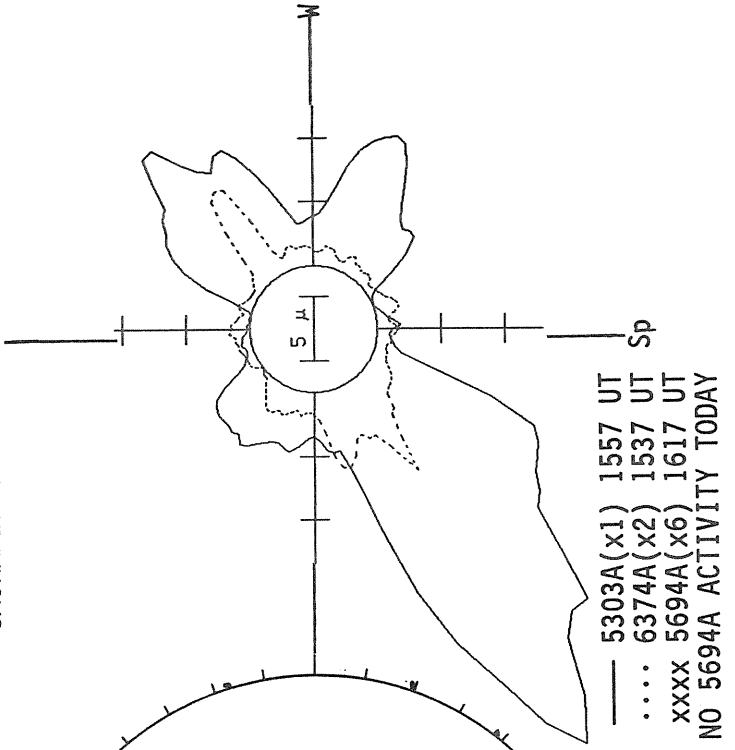
SACRAMENTO PEAK H-ALPHA



BOULDER SUNSPOTS



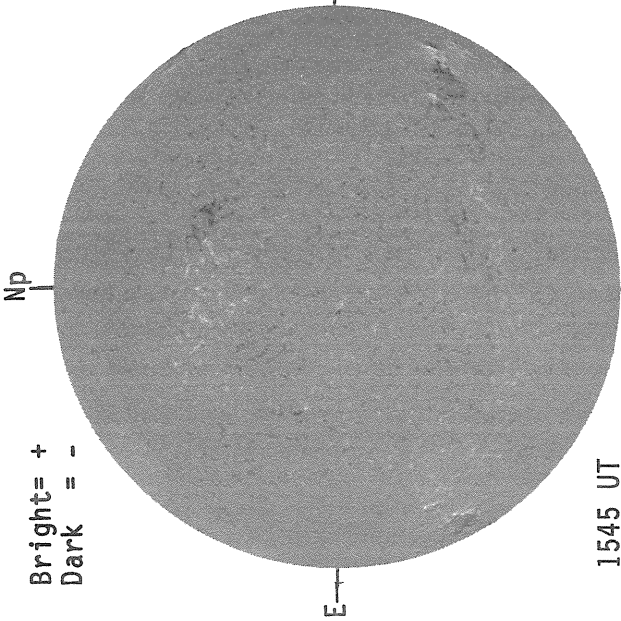
SACRAMENTO PEAK CORONA (1.15 Radii)



5303A(x1) 1557 UT  
6374A(x2) 1537 UT  
5694A(x6) 1617 UT  
NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

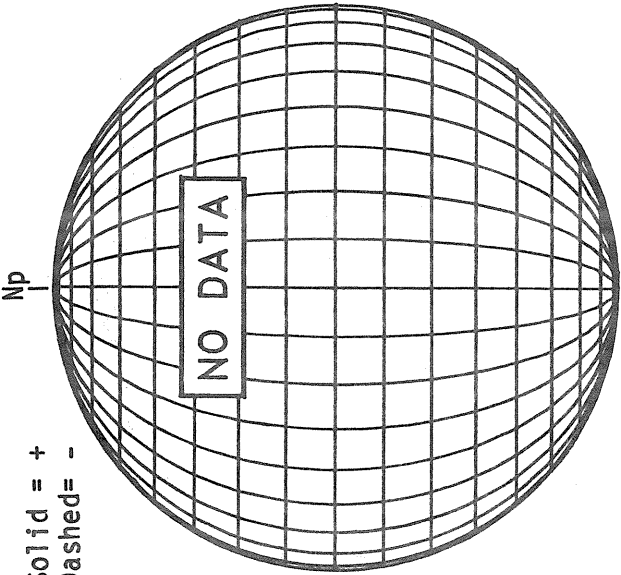
Bright = +  
Dark = -



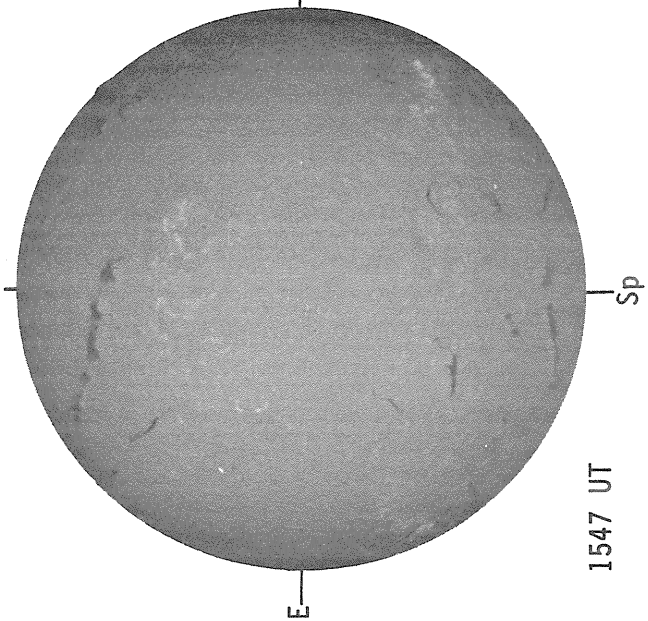
1545 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

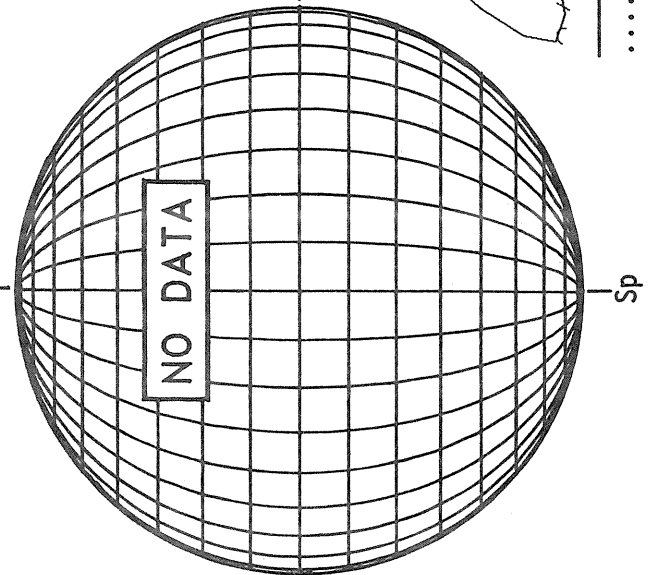


SACRAMENTO PEAK H-ALPHA



1547 UT

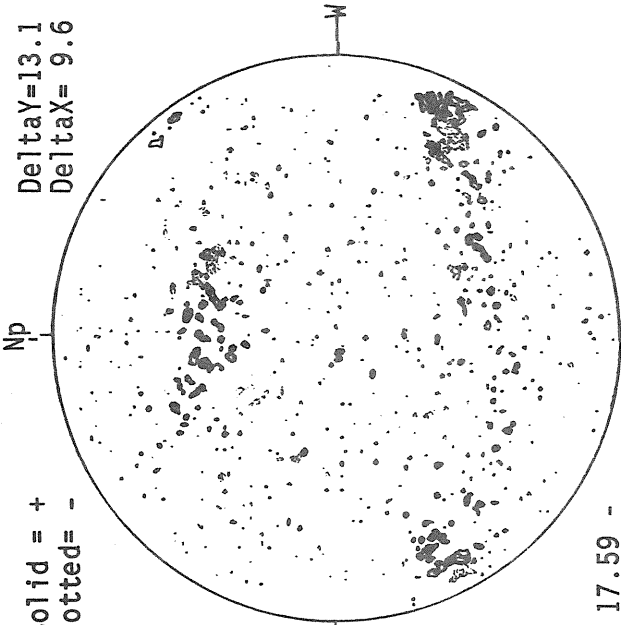
BOULDER SUNSPOTS



Sp

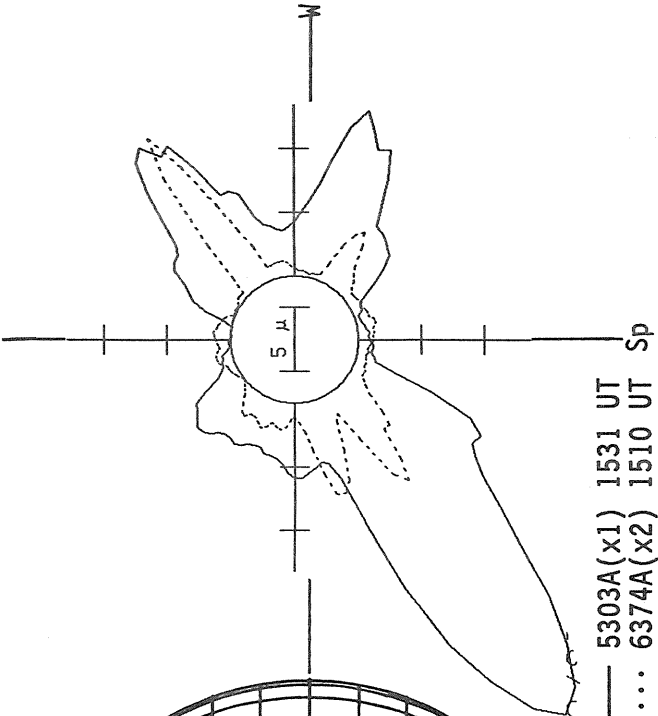
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6



17.59 -  
18.59 UT

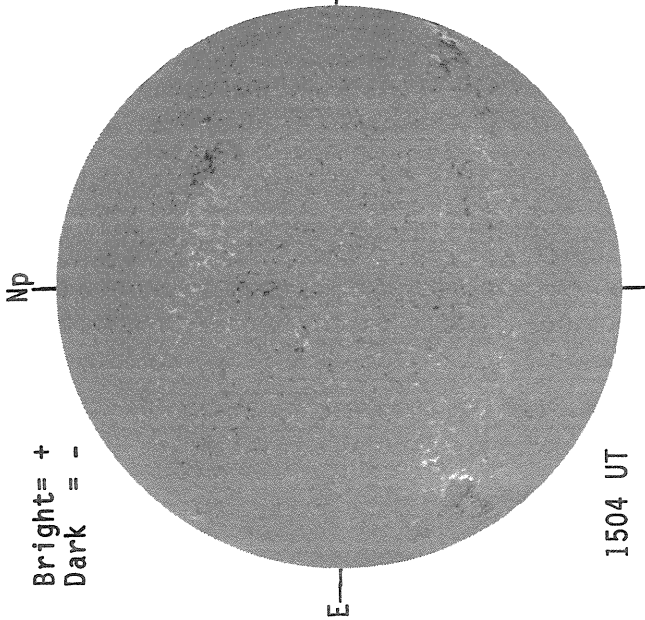
SACRAMENTO PEAK CORONA (1.15 Radii)



— 5303A(x1) 1531 UT  
 .... 6374A(x2) 1510 UT  
 xxxxx 5694A(x6) 1551 UT  
 NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

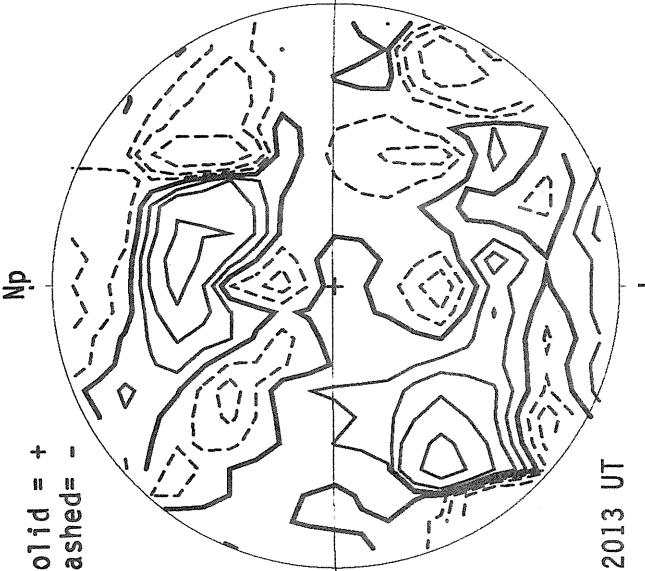
Bright= +  
Dark = -



1504 UT

STANFORD MAGNETOGRAM

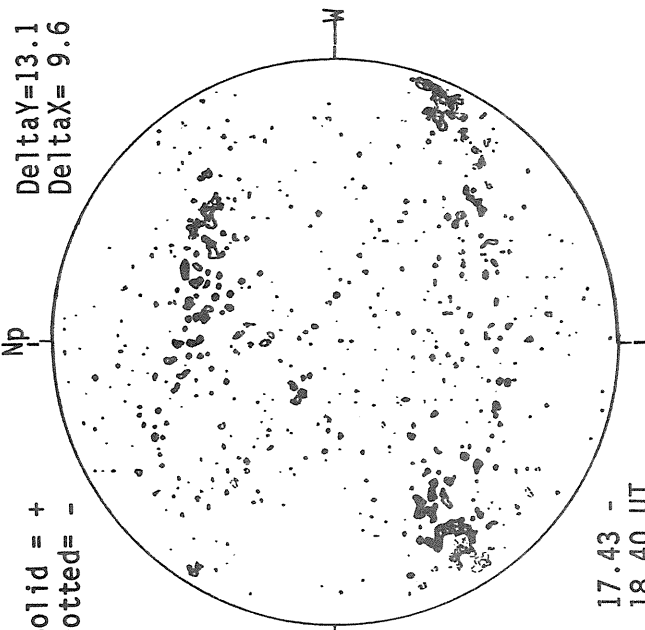
Solid = +  
Dashed = -



2013 UT

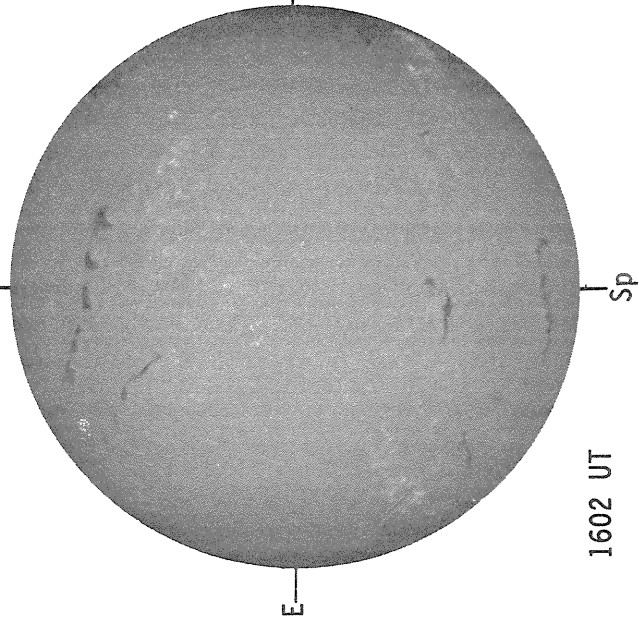
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6



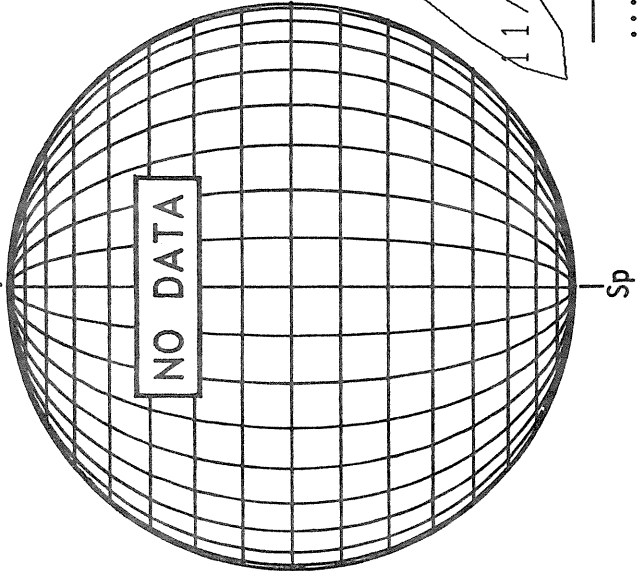
17.43 -  
18.40 UT

SACRAMENTO PEAK H-ALPHA

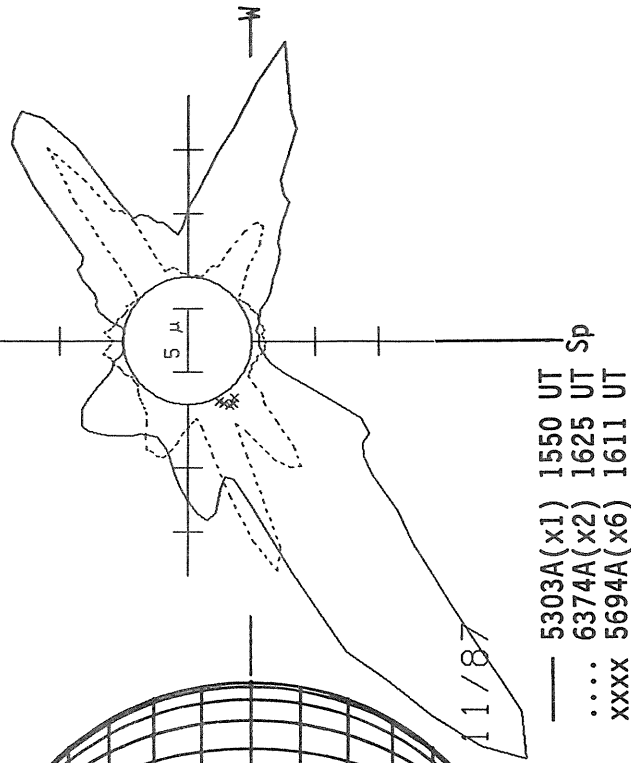


1602 UT

BOULDER SUNSPOTS



SACRAMENTO PEAK CORONA (1.15 Radii)

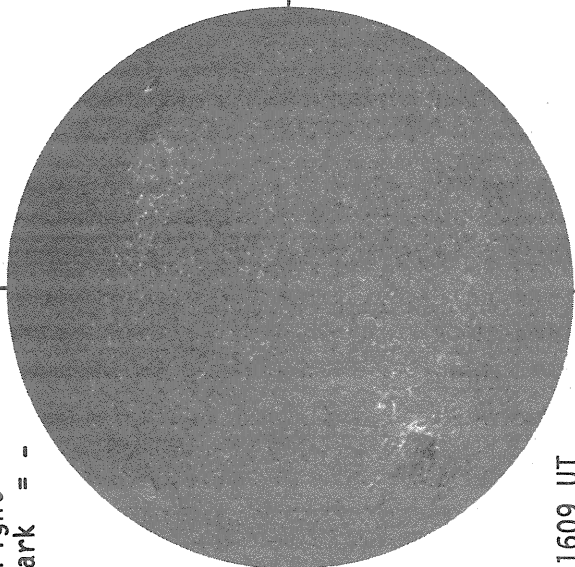


— 5303A(x1) 1550 UT  
..... 6374A(x2) 1625 UT Sp  
xxxx 5694A(x6) 1611 UT

KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -

Np

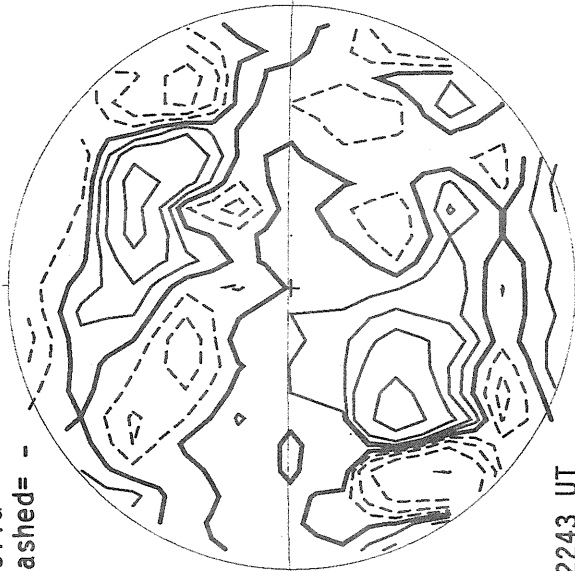


1609 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

Np



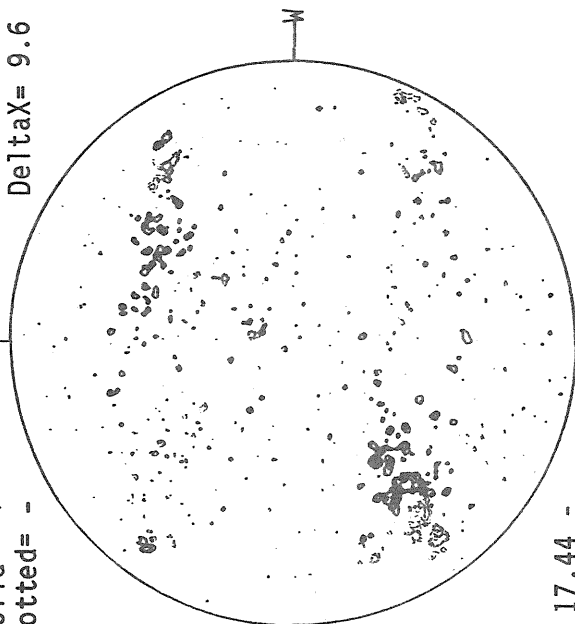
2243 UT

MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

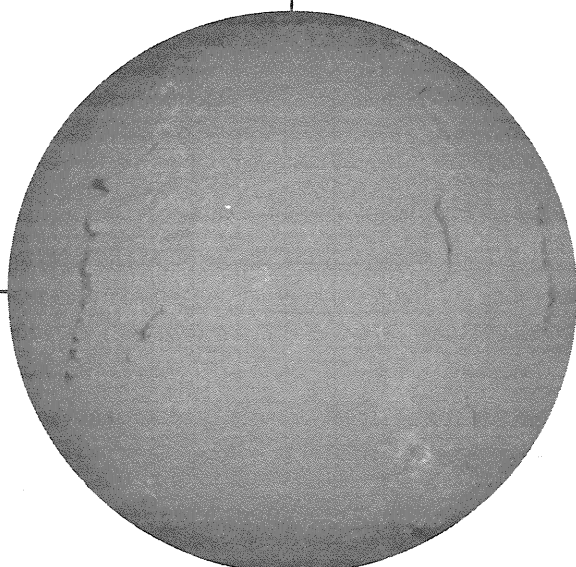
Np

DeltaY=13.1  
DeltaX= 9.6



17.44 -  
18.41 UT

SACRAMENTO PEAK H-ALPHA



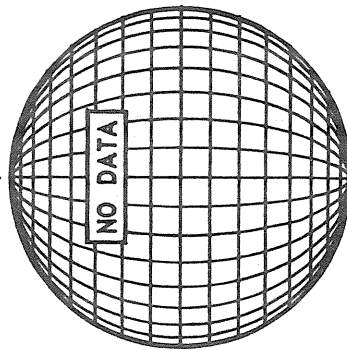
1613 UT

BOULDER SUNSPOTS

NO VISIBLE SPOTS

1515 UT  
1538 UT BOUL Prom Sp

SACRAMENTO PEAK CORONA (1.15 Radii)



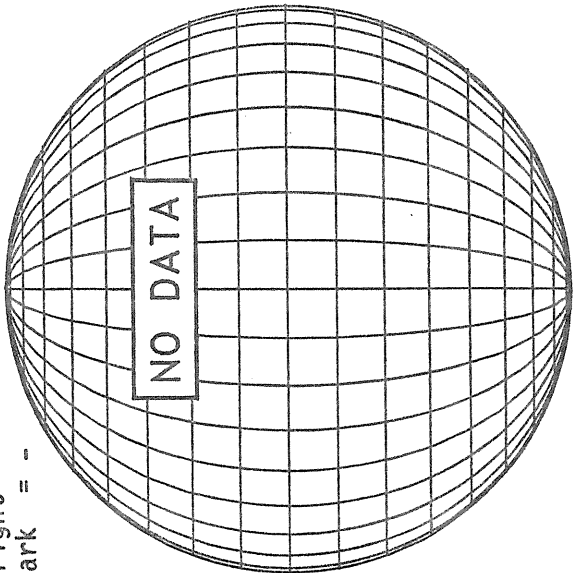
Sp



KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -

Np



E-

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

Np

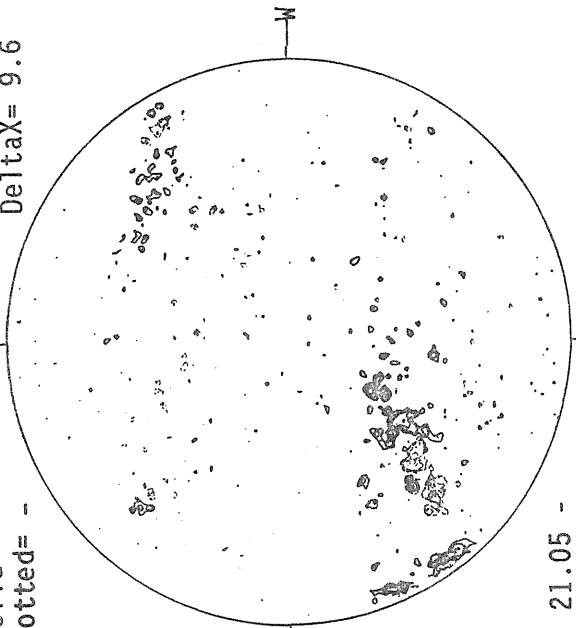


1907 UT

MT. WILSON MAGNETOGRAM

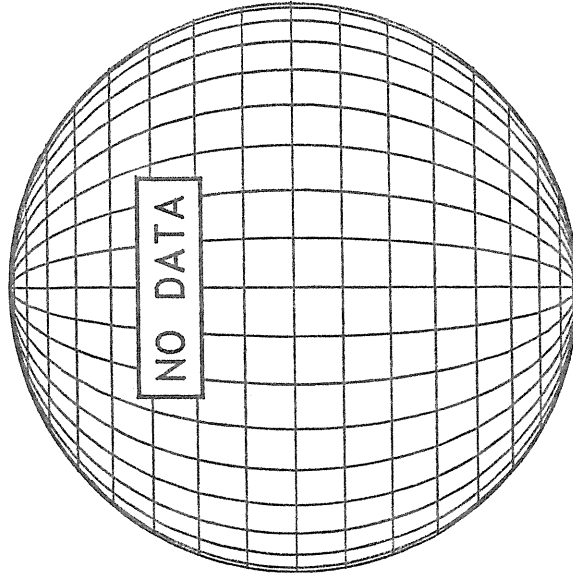
Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6

Np



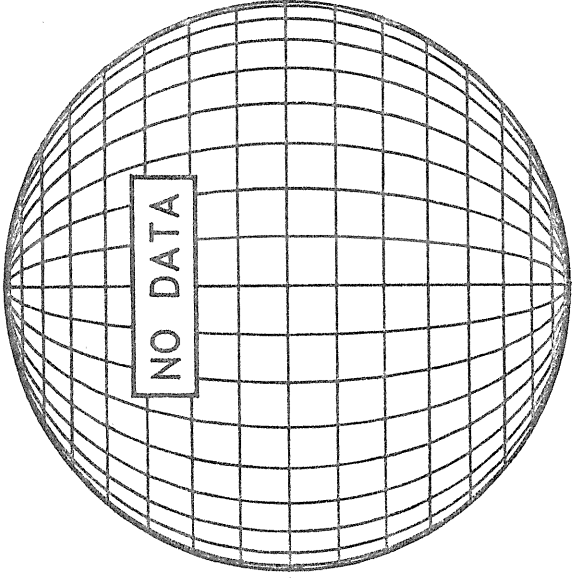
21.05 -  
22.03 UT

SACRAMENTO PEAK H-ALPHA



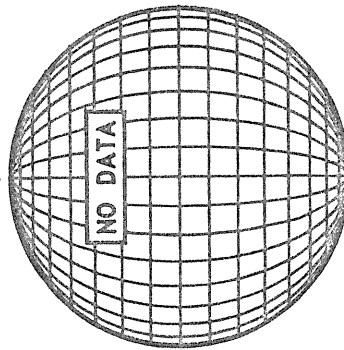
E-

BOULDER SUNSPOTS



Sp

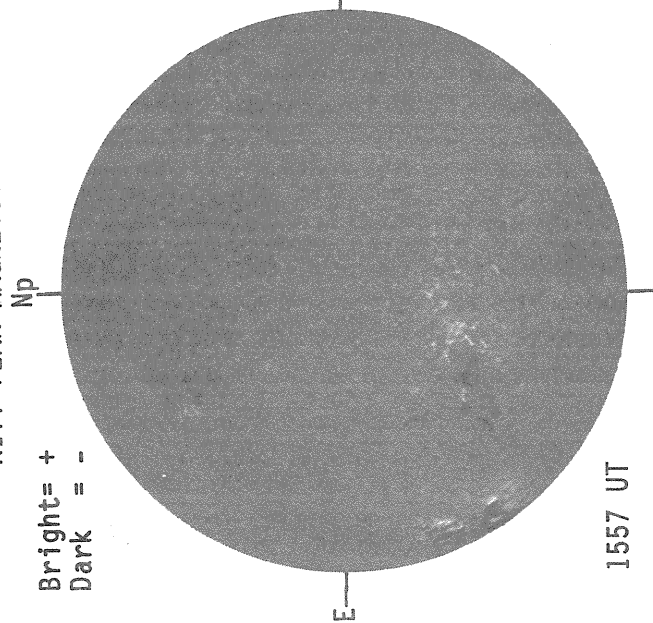
SACRAMENTO PEAK CORONA (1.15 Radii)



Sp

KITT PEAK MAGNETOGRAM

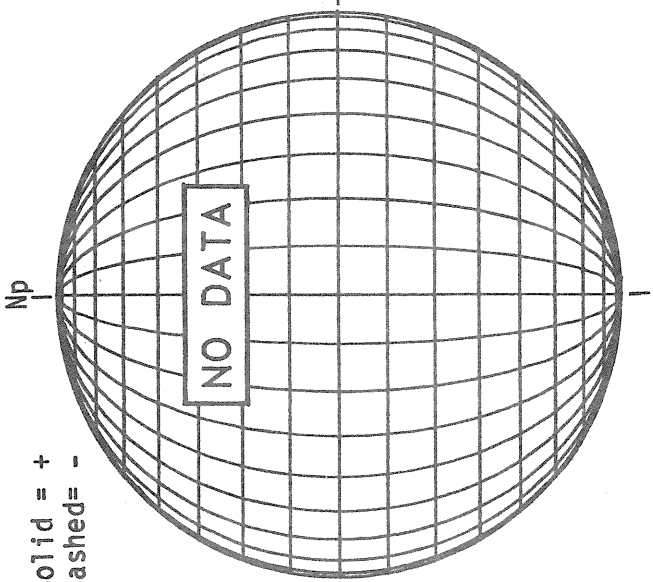
Bright = +  
Dark = -



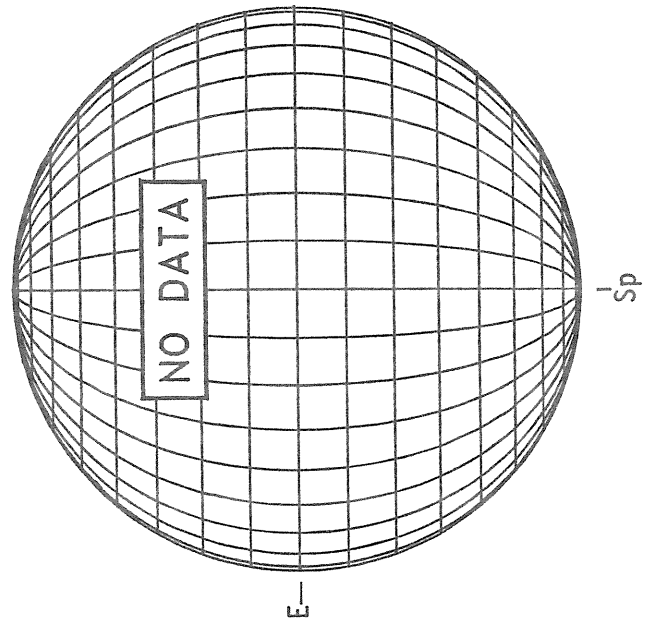
1557 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

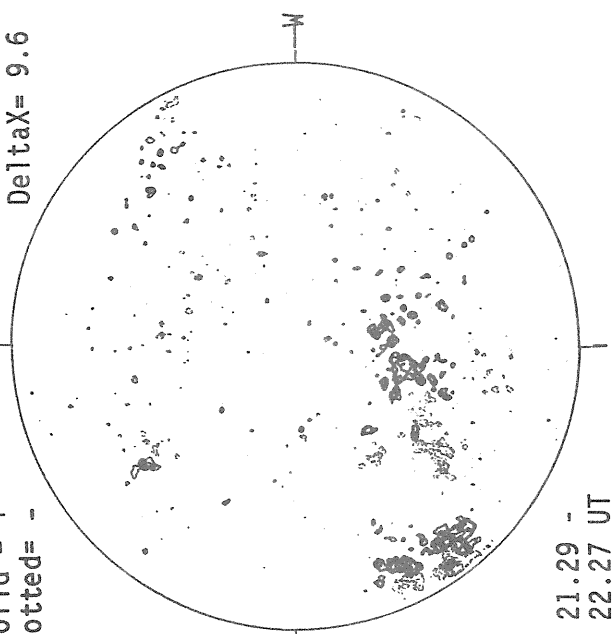


SACRAMENTO PEAK H-ALPHA



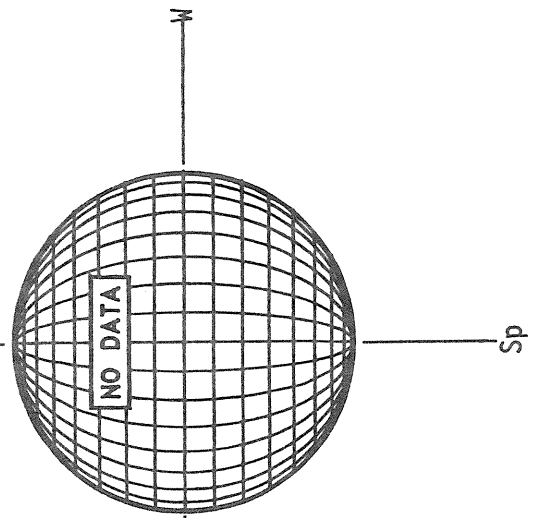
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6



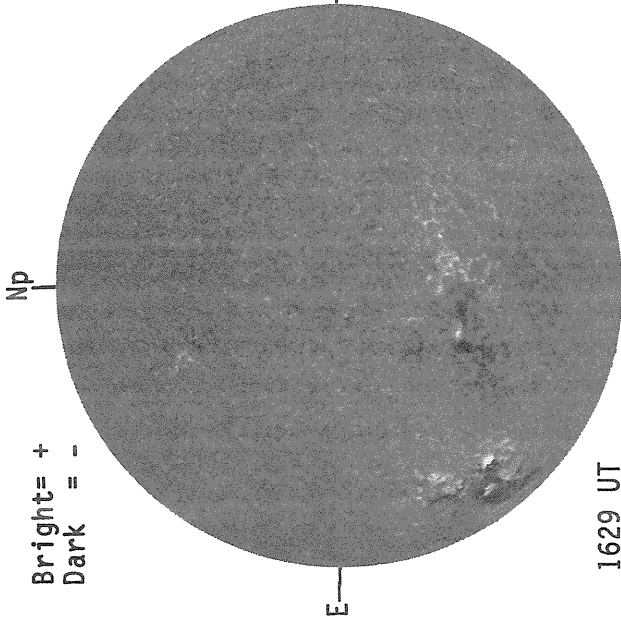
21.29 -  
22.27 UT

SACRAMENTO PEAK CORONA (1.15 Radii)



KITT PEAK MAGNETOGRAM

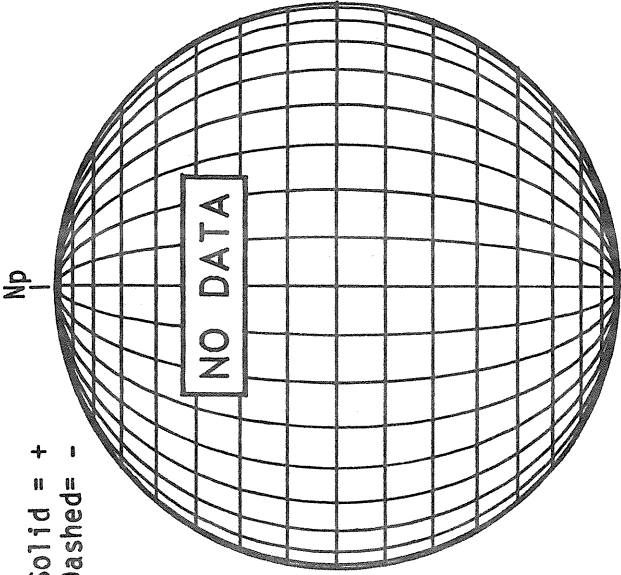
Bright= +  
Dark = -



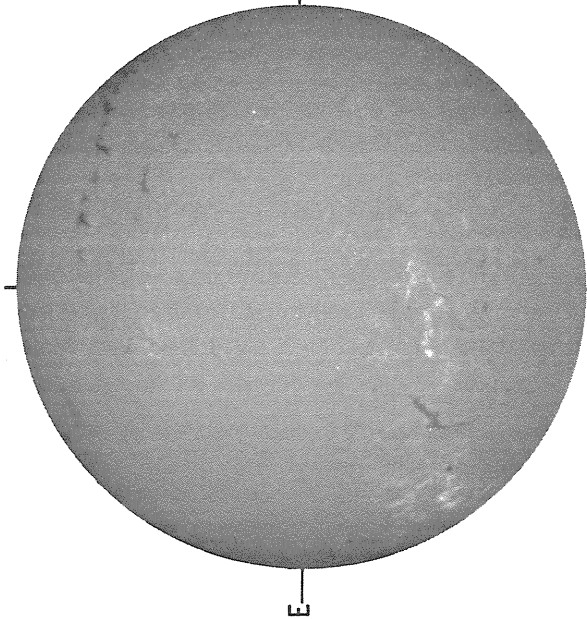
1629 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

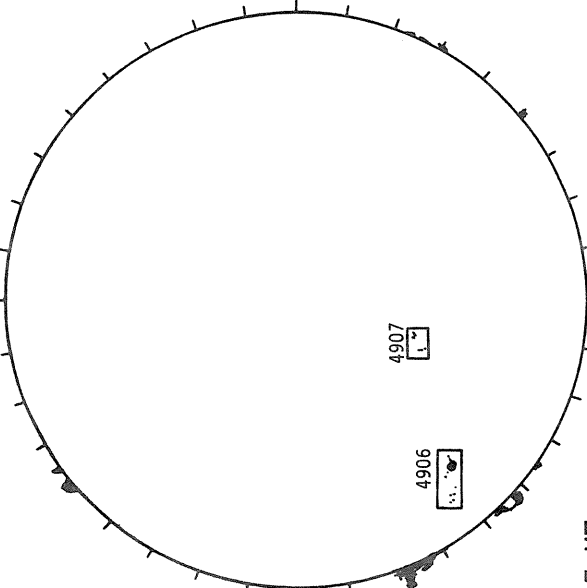


SACRAMENTO PEAK H-ALPHA



1559 UT

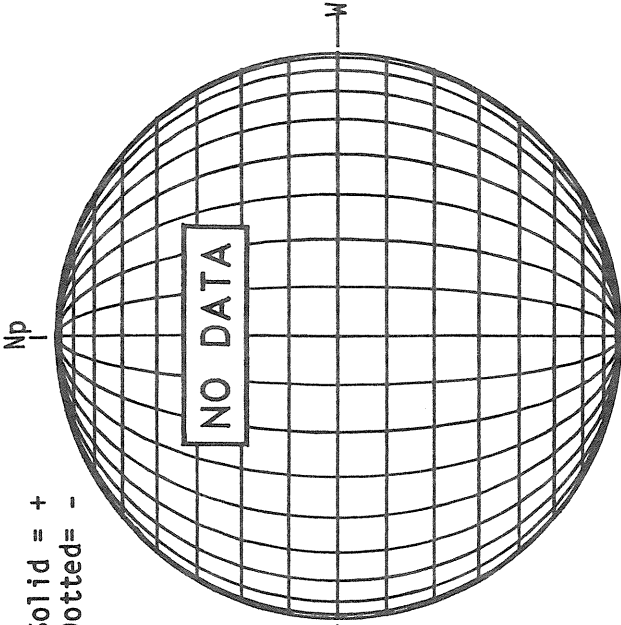
BOULDER SUNSPOTS



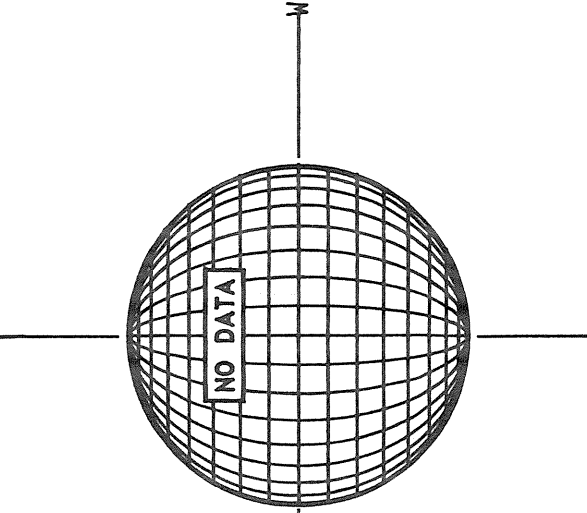
1947 UT  
1947 UT BOUL Prom Sp

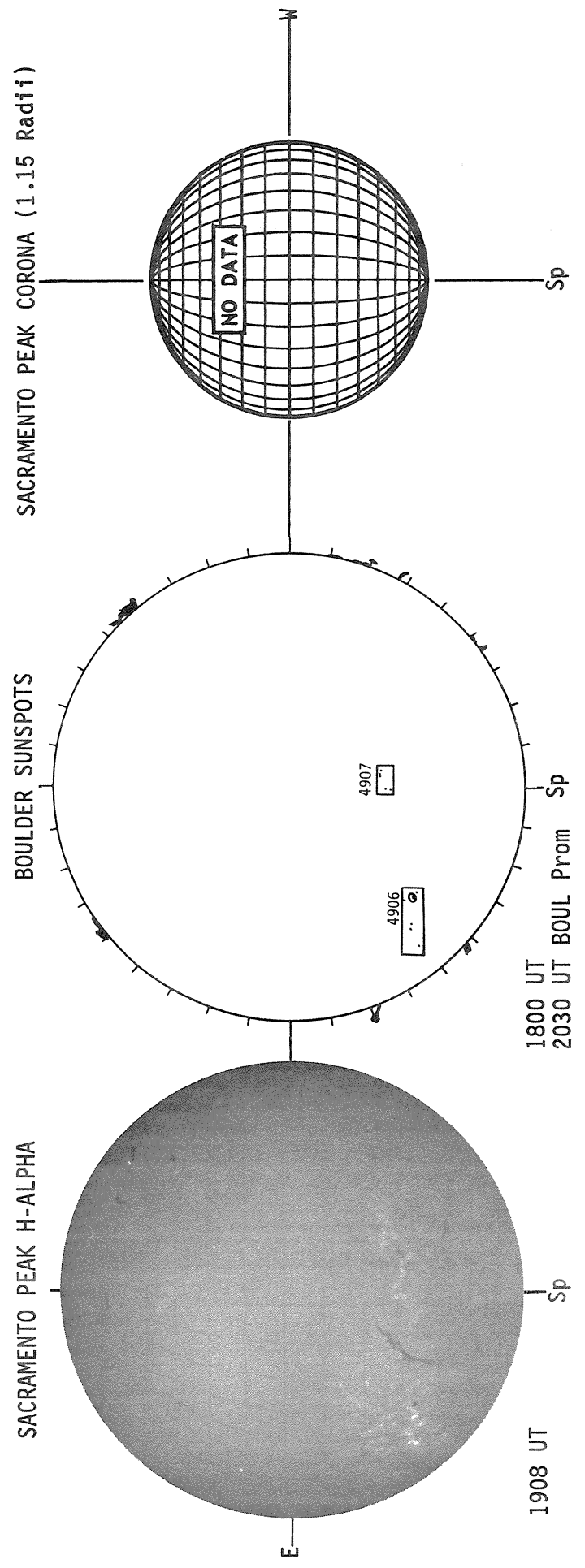
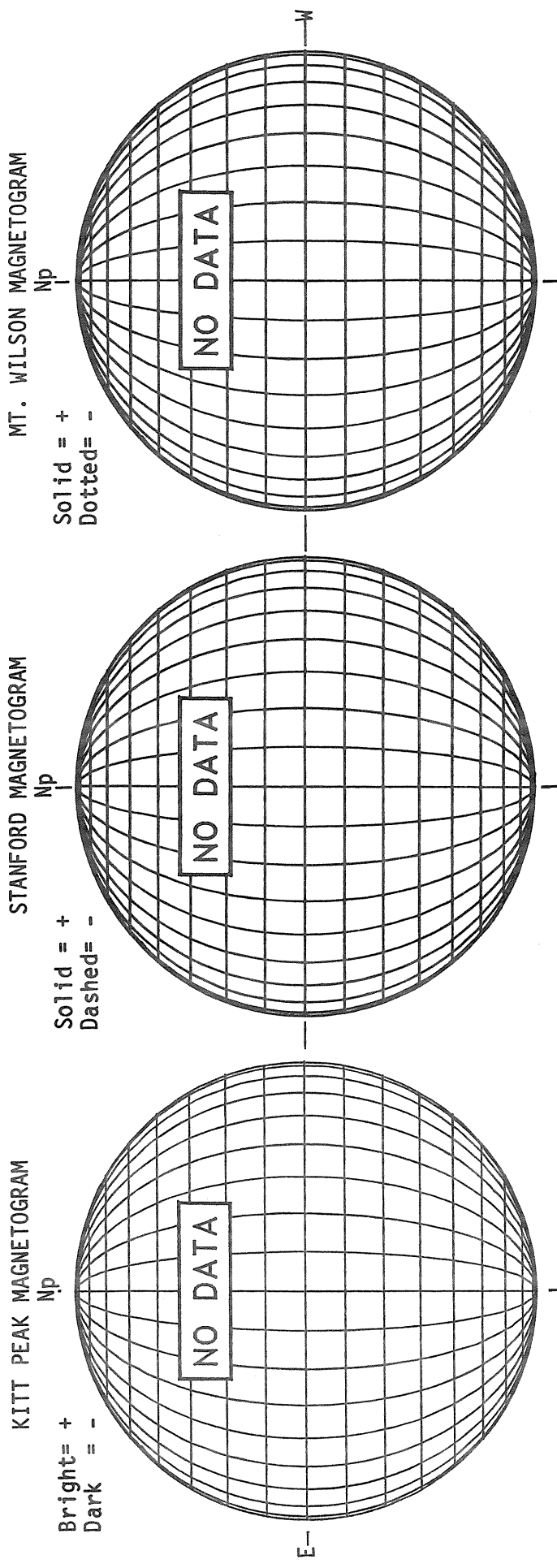
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -



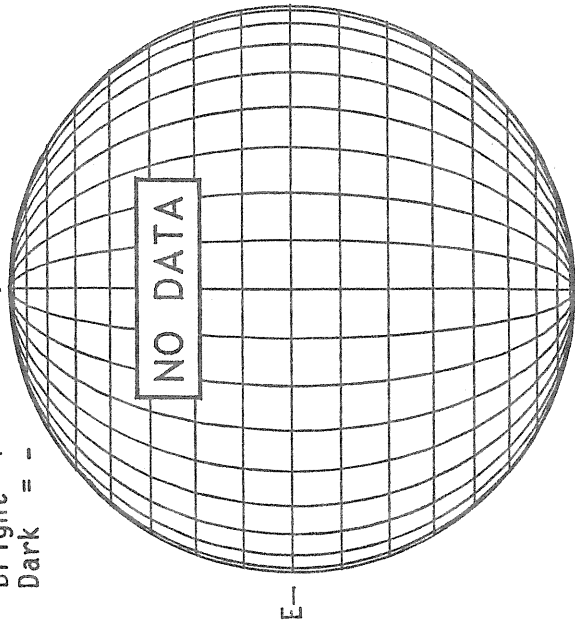
SACRAMENTO PEAK CORONA (1.15 Radii)





KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



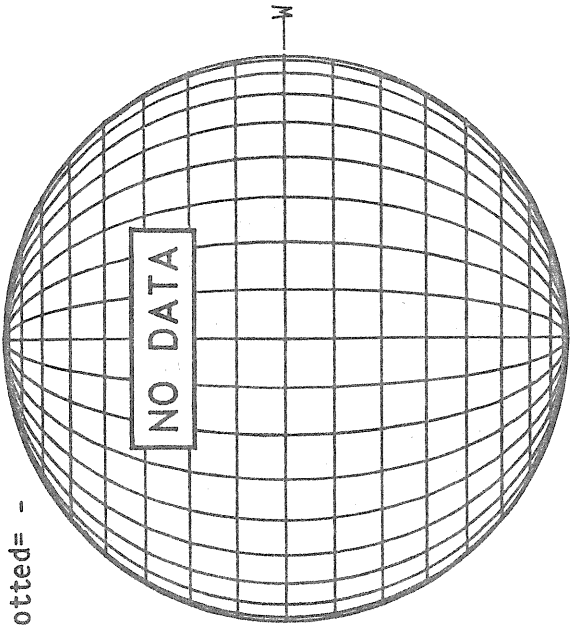
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

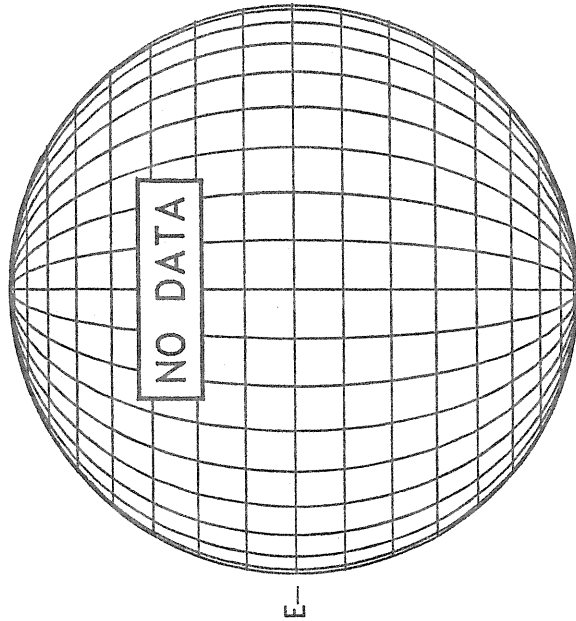


MT. WILSON MAGNETOGRAM

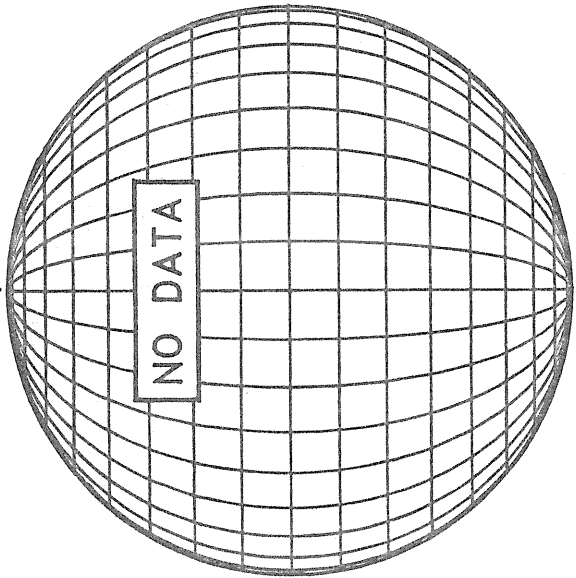
Solid = +  
Dotted = -



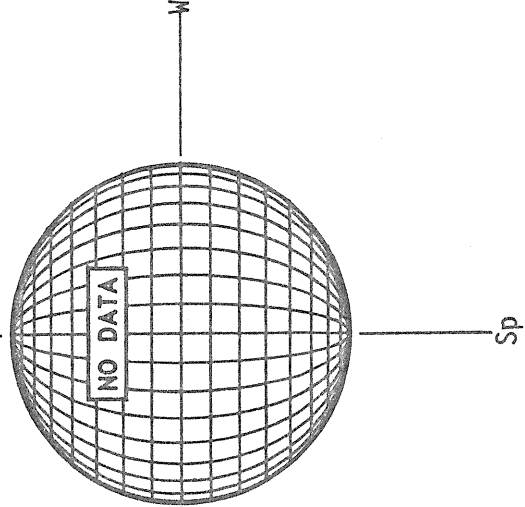
SACRAMENTO PEAK H-ALPHA



BOULDER SUNSPOTS

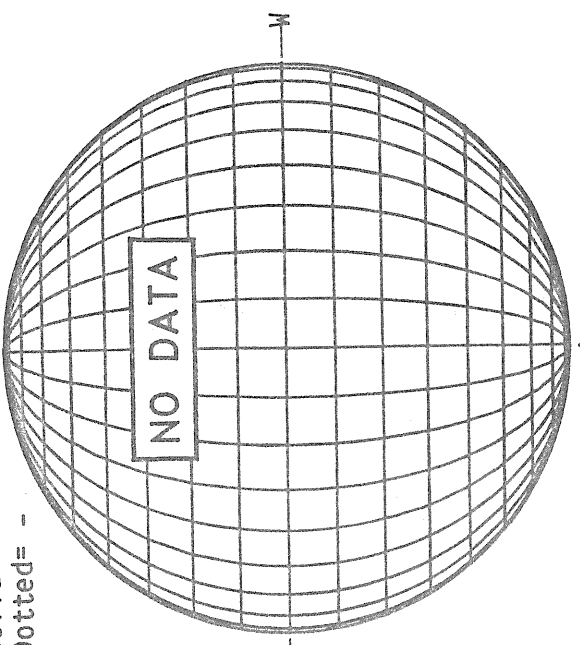


SACRAMENTO PEAK CORONA (1.15 Radii)



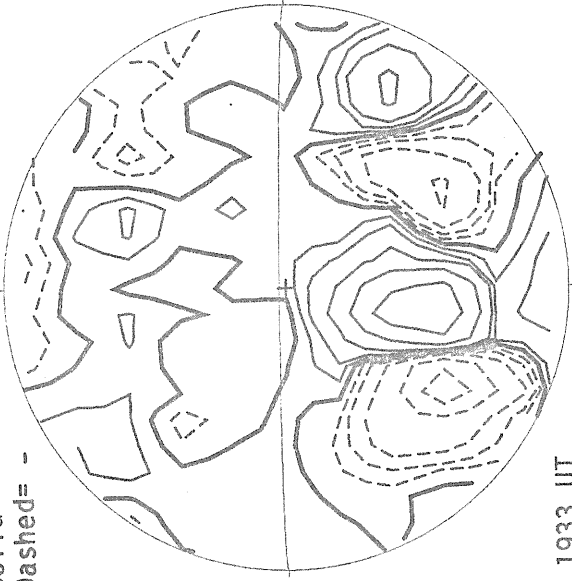
MT. WILSON MAGNETOGRAM

Np  
Solid = +  
Dotted = -

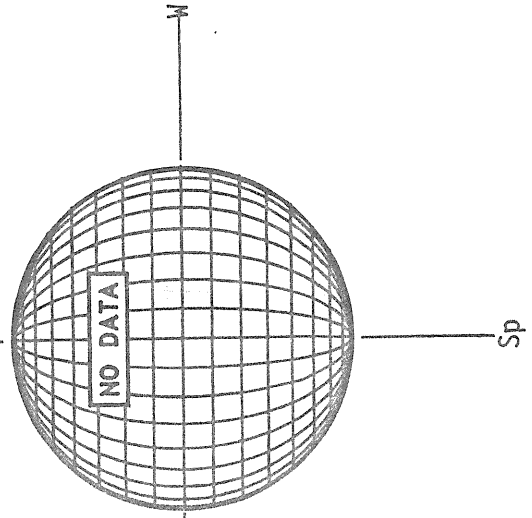


STANFORD MAGNETOGRAM

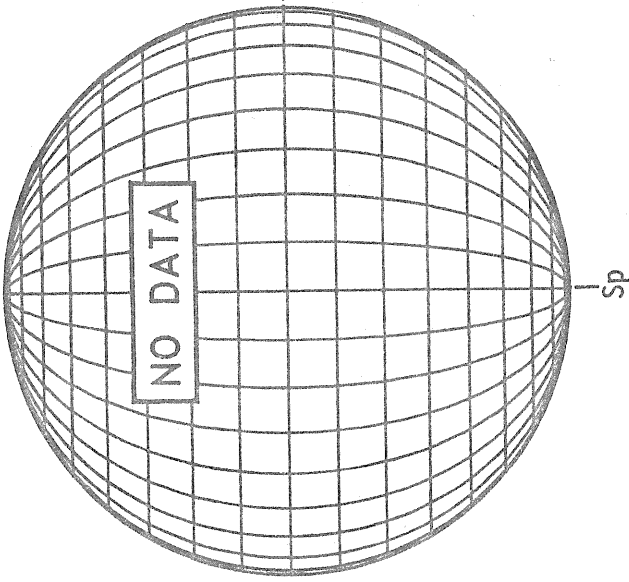
Np  
Solid = +  
Dashed = -



SACRAMENTO PEAK CORONA (1.15 Radii)

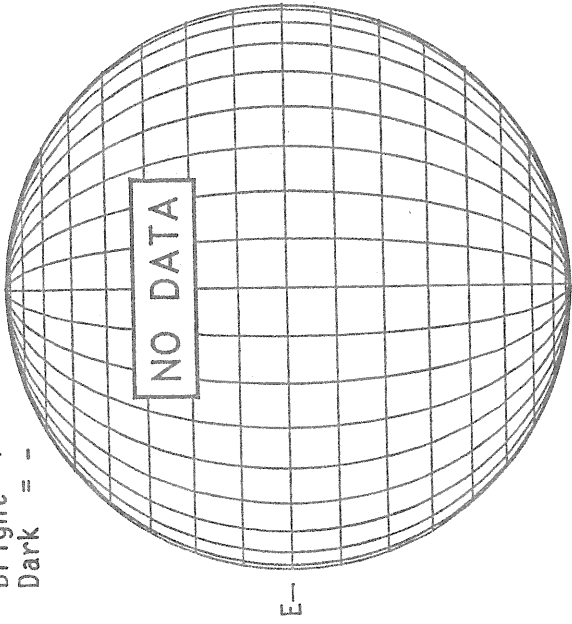


BOULDER SUNSPOTS

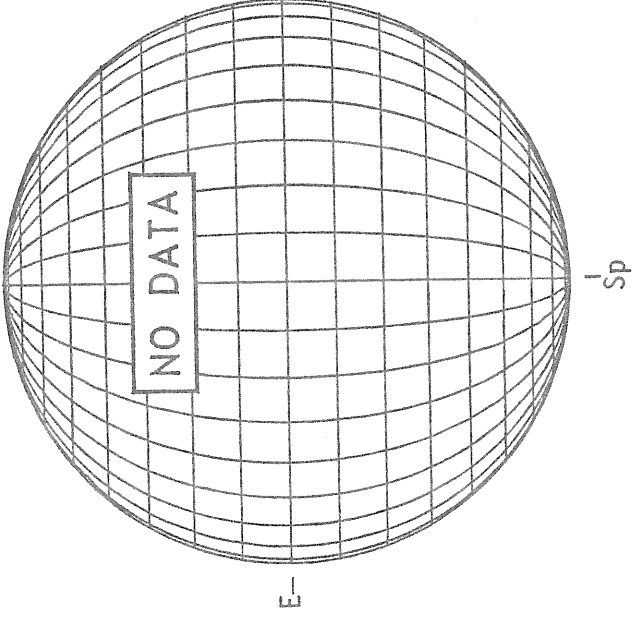


KITT PEAK MAGNETOGRAM

Np  
Bright = +  
Dark = -

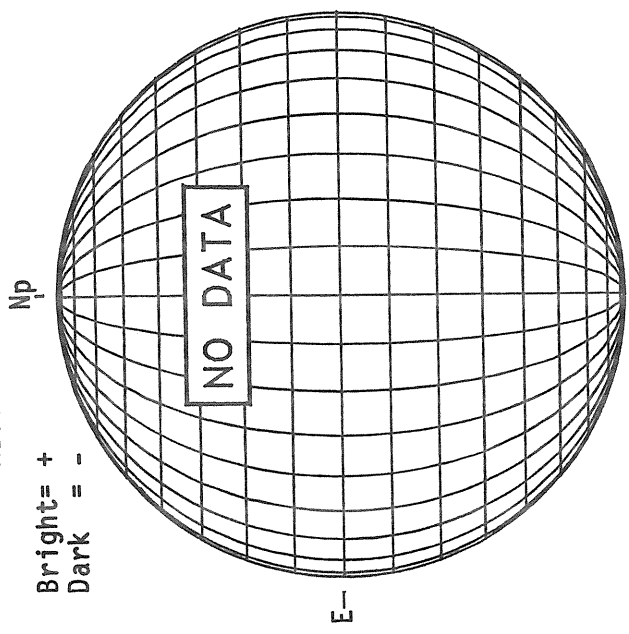


SACRAMENTO PEAK H-ALPHA



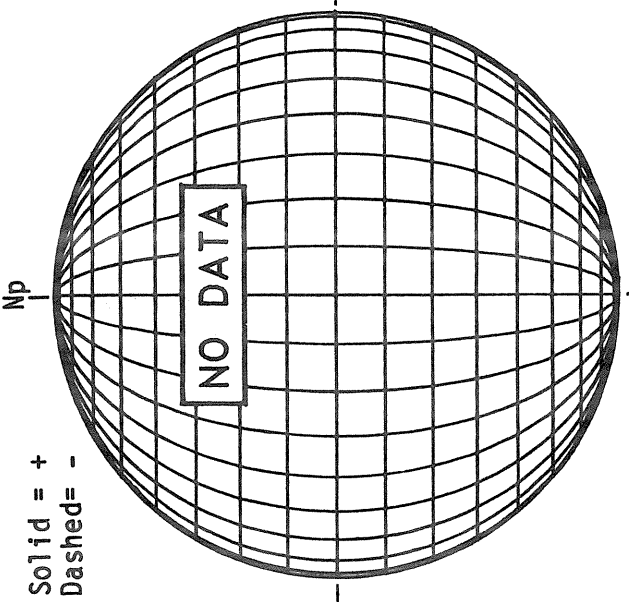
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



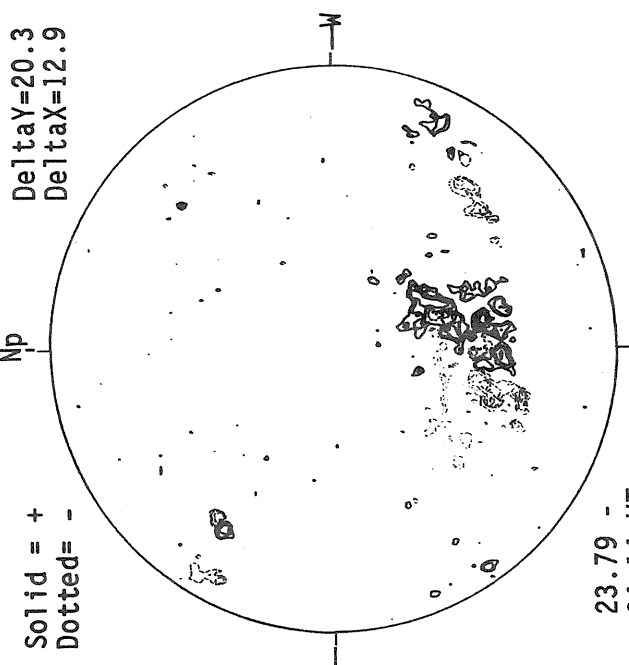
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



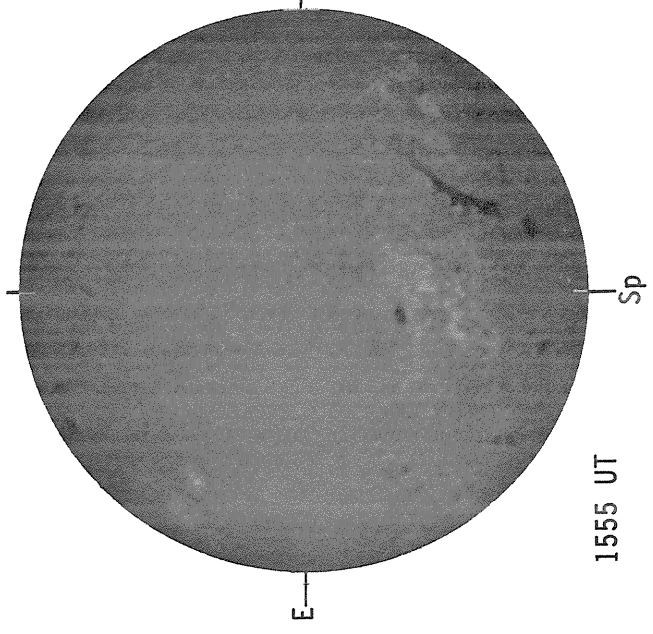
MT. WILSON MAGNETOGRAM

Delta Y = 20.3  
Delta X = 12.9



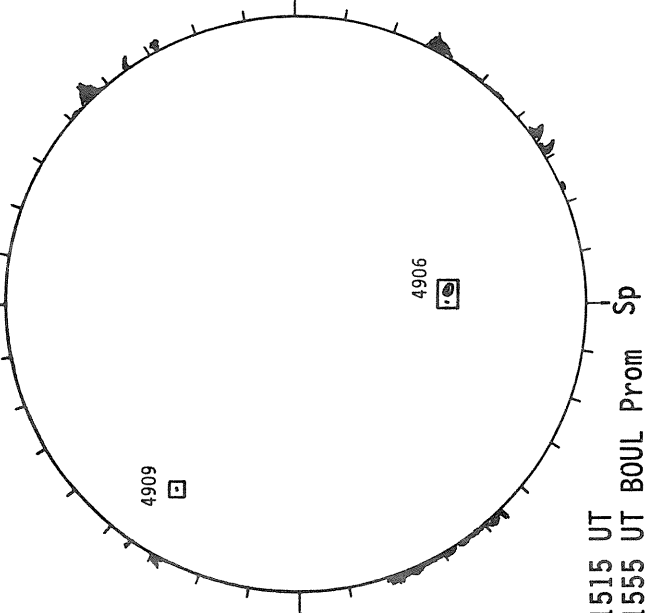
23.79 -  
24.14 UT

BOULDER H-ALPHA



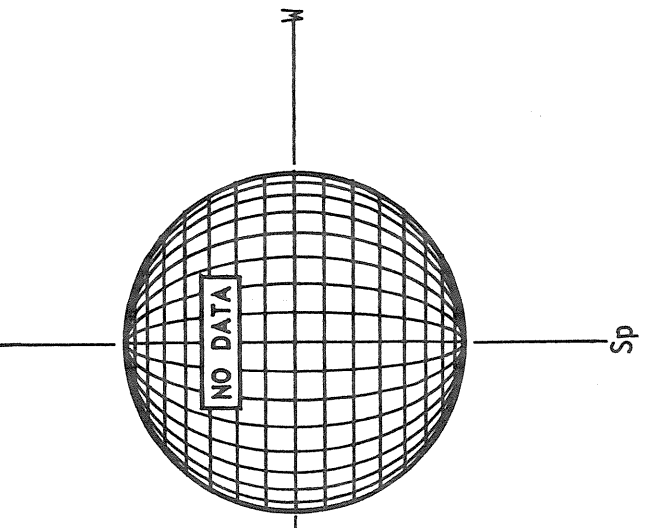
1555 UT

BOULDER SUNSPOTS



1515 UT  
1555 UT BOUL Prom

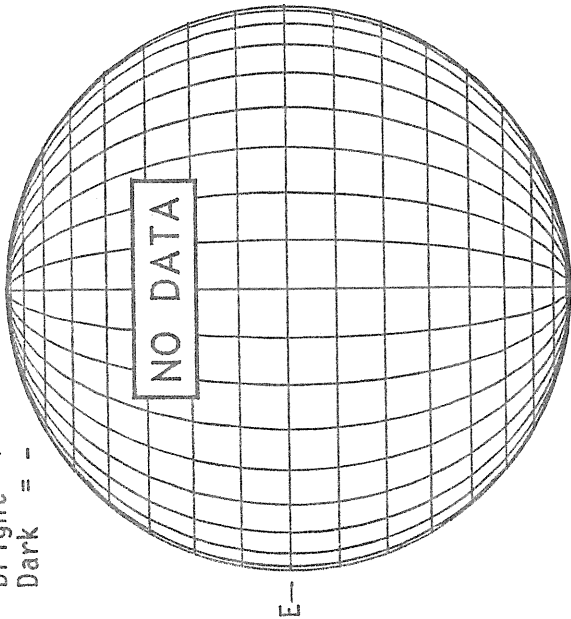
SACRAMENTO PEAK CORONA (1.15 Radii)



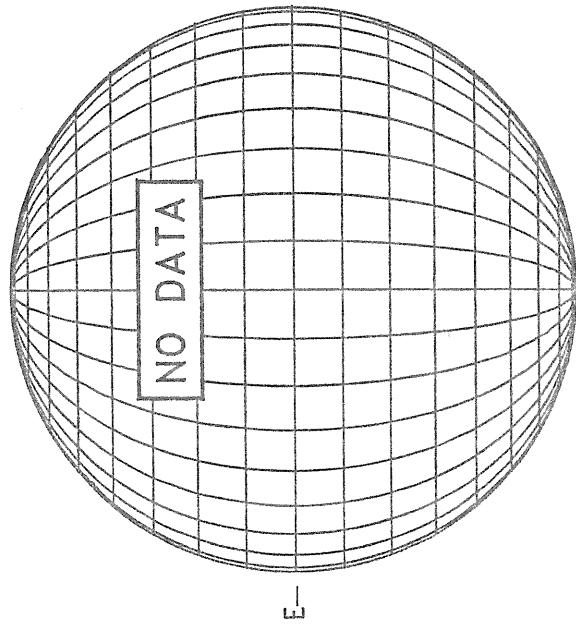
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -

Np



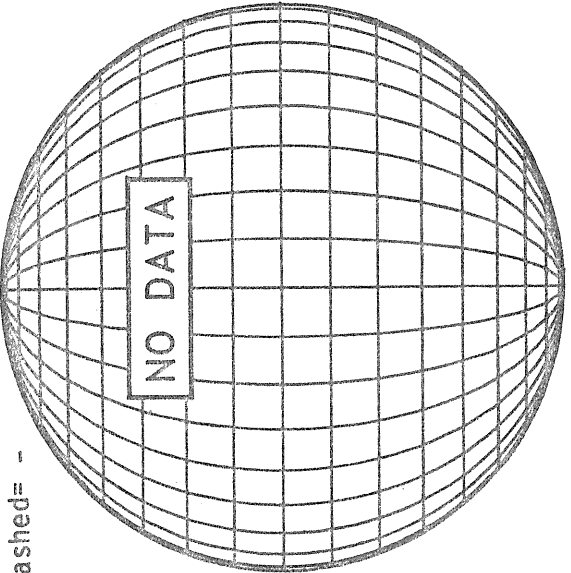
SACRAMENTO PEAK H-ALPHA



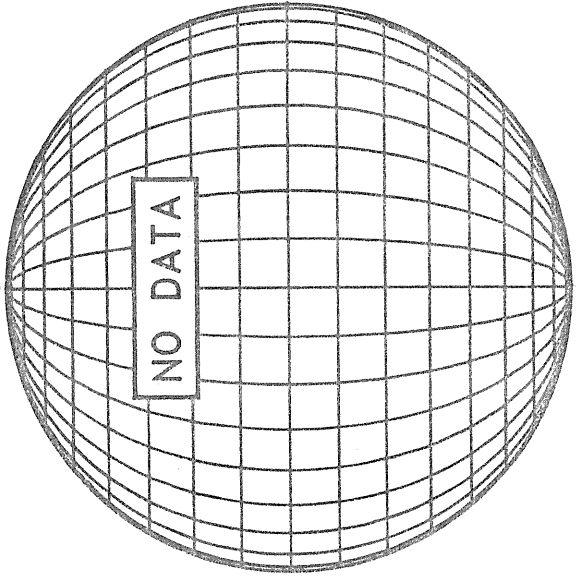
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

Np



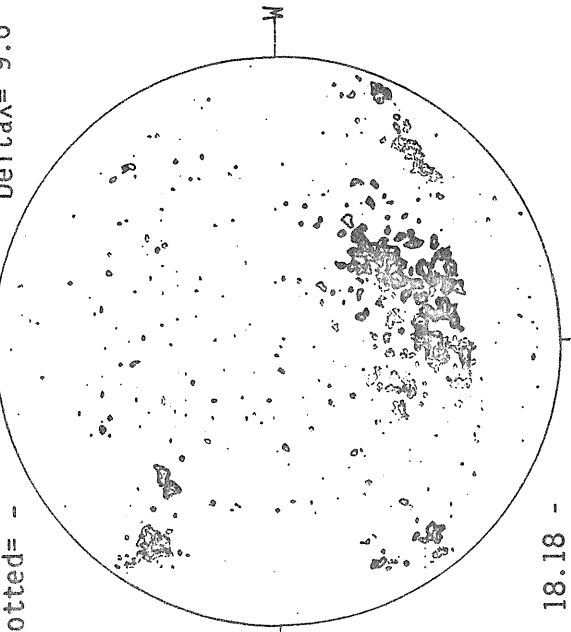
BOULDER SUNSPOTS



MT. WILSON MAGNETOGRAM

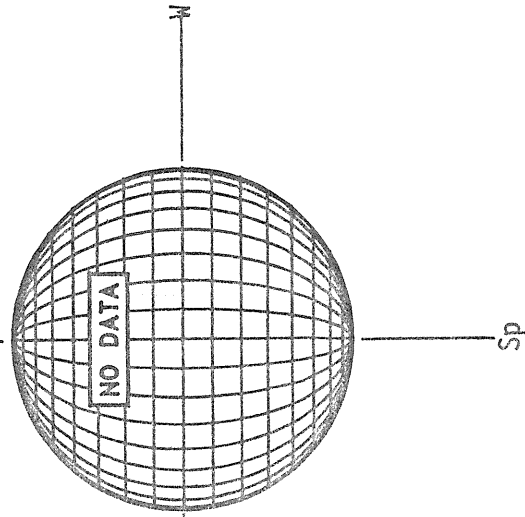
Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6

Np



18.18 -  
19.16 UT

SACRAMENTO PEAK CORONA (1.15 Radii)

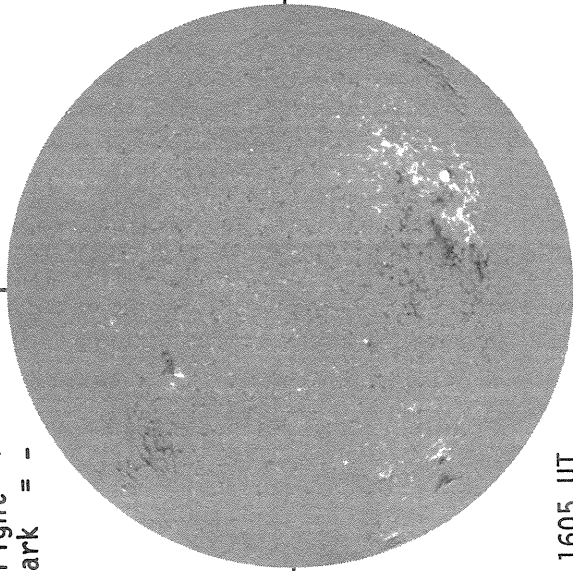




KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -

Np

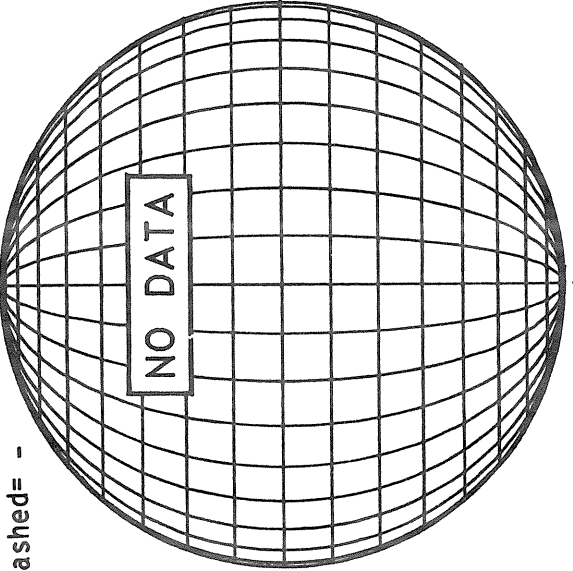


1605 UT

STANFORD MAGNETOGRAM

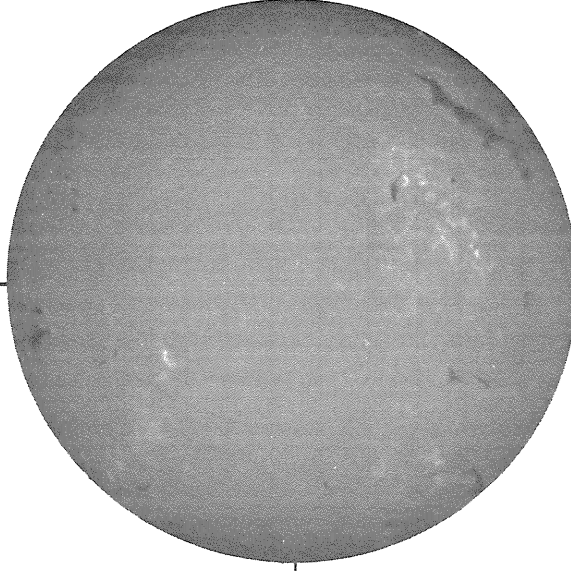
Solid = +  
Dashed = -

Np



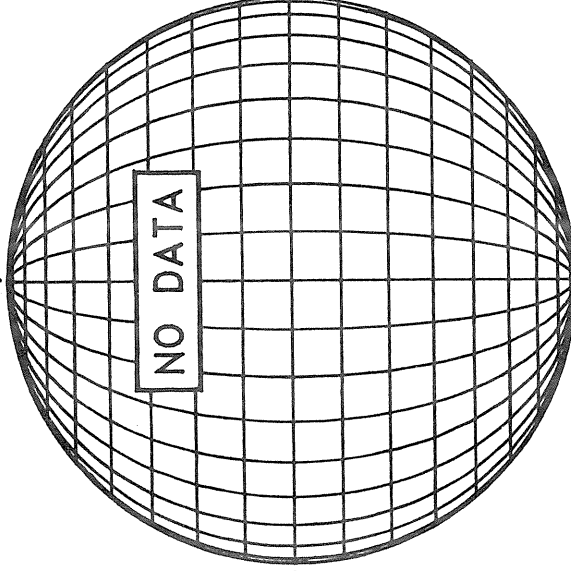
SACRAMENTO PEAK H-ALPHA

1739 UT



BOULDER SUNSPOTS

Sp

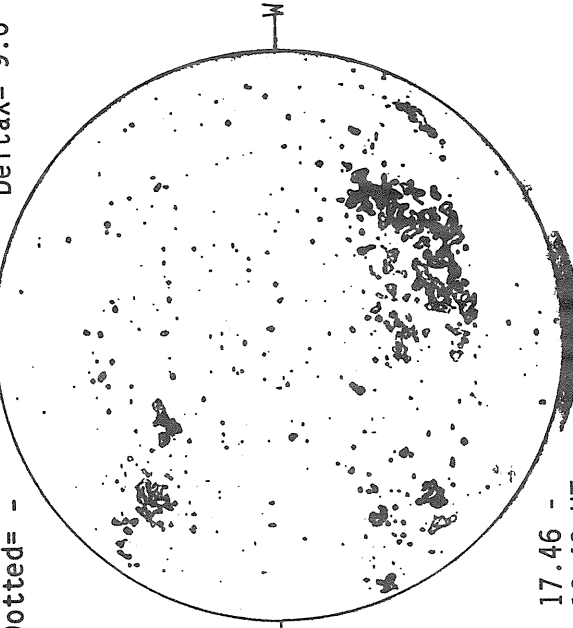


MT. WILSON MAGNETOGRAM

Delta Y = 13.1  
Delta X = 9.6

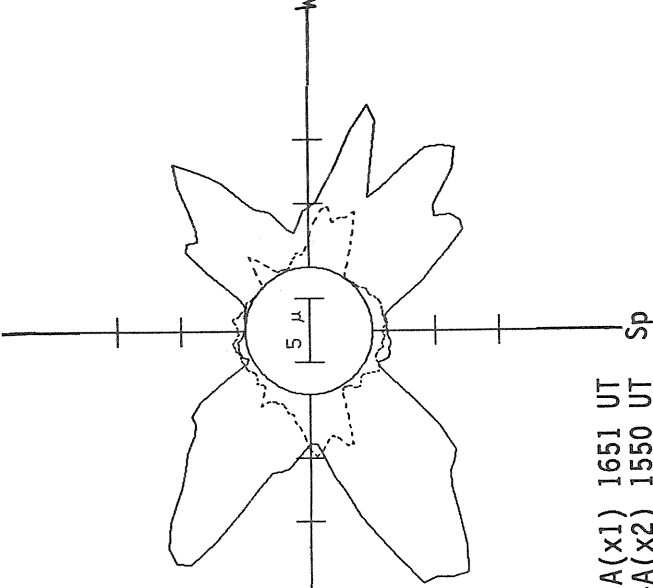
Np

Solid = +  
Dotted = -



17.46 -  
18.43 UT

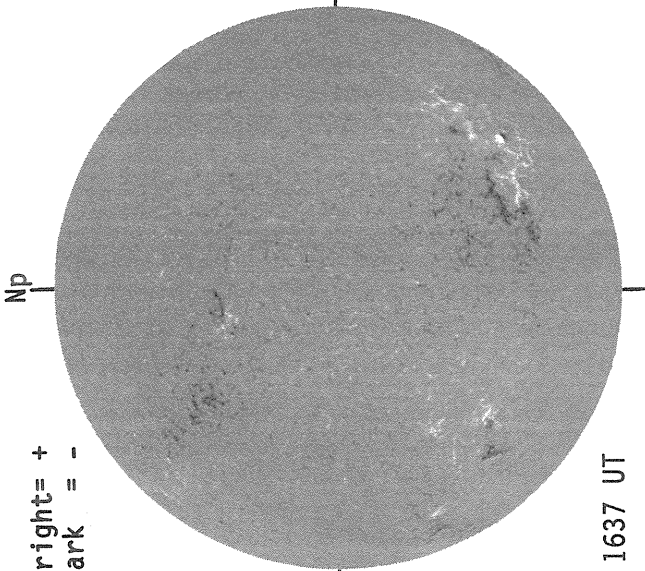
SACRAMENTO PEAK CORONA (1.15 Radii)



— 5303A(x1) 1651 UT  
..... 6374A(x2) 1550 UT  
xxxxx 5694A(x6) 1627 UT  
NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -



1637 UT

STANFORD MAGNETOGRAM

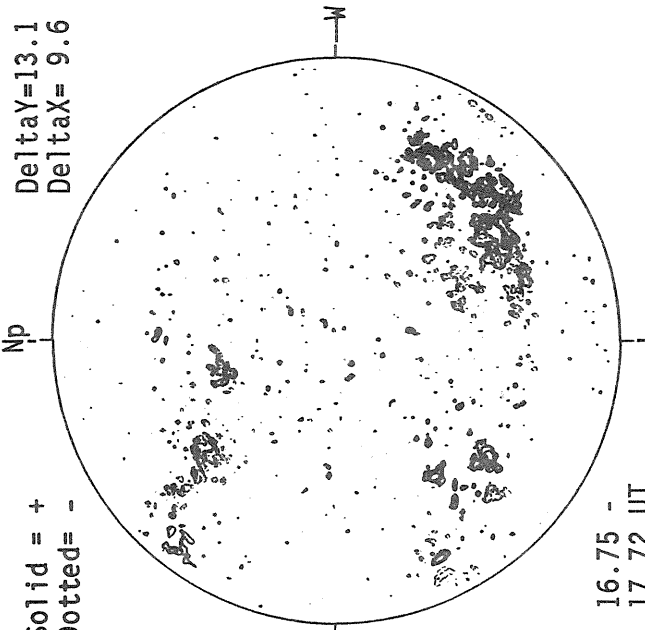
Solid = +  
Dashed = -



2148 UT

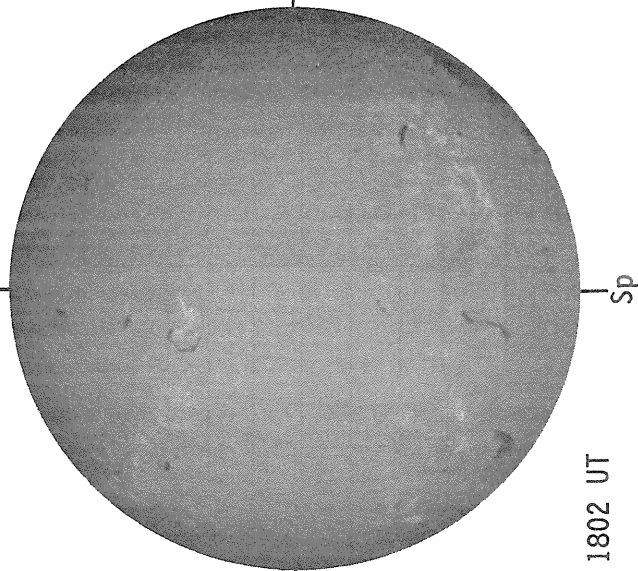
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.1  
Delta X = 9.6



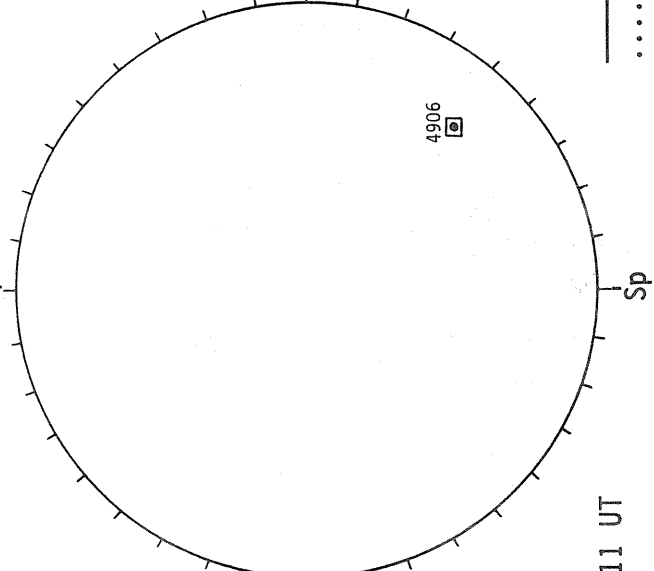
16.75 -  
17.72 UT

SACRAMENTO PEAK H-ALPHA



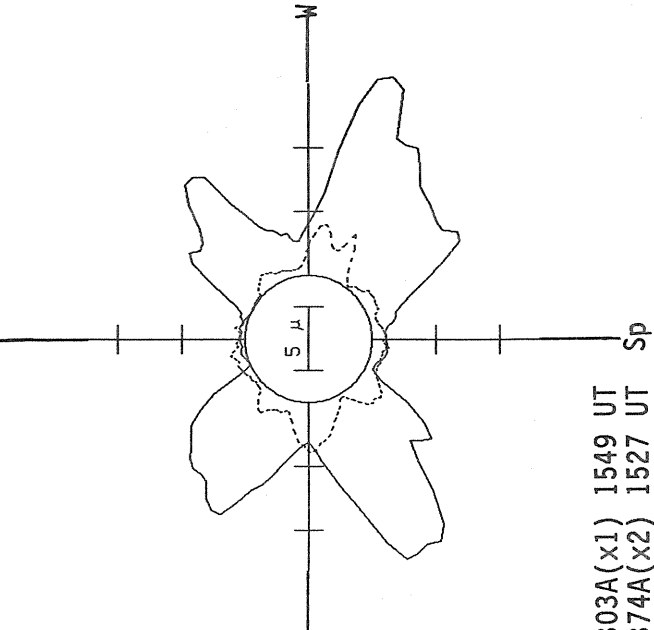
1802 UT

BOULDER SUNSPOTS



1511 UT

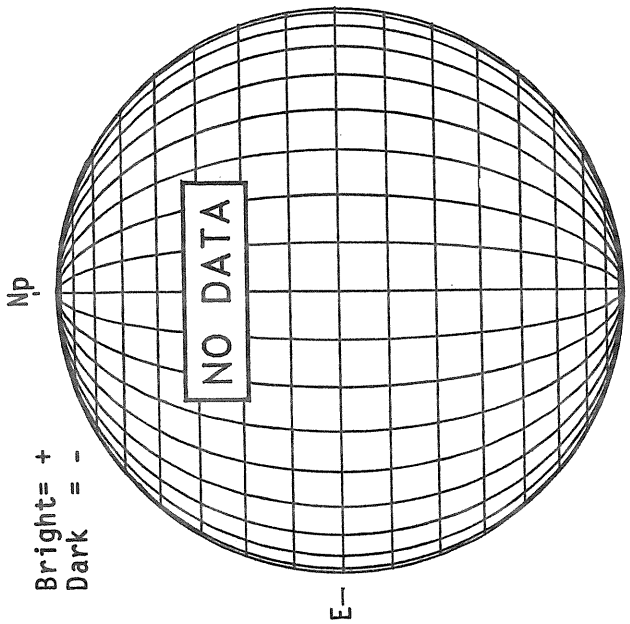
SACRAMENTO PEAK CORONA (1.15 Radii)



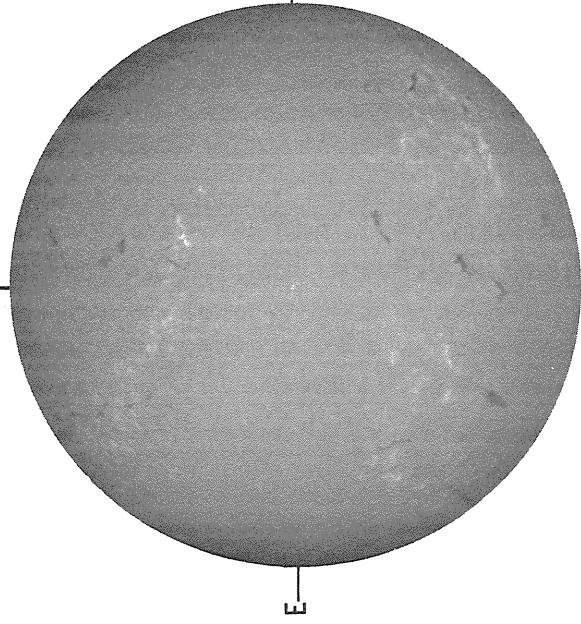
— 5303A(x1) 1549 UT  
... 6374A(x2) 1527 UT  
xxxx 5694A(x6) 1628 UT  
NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



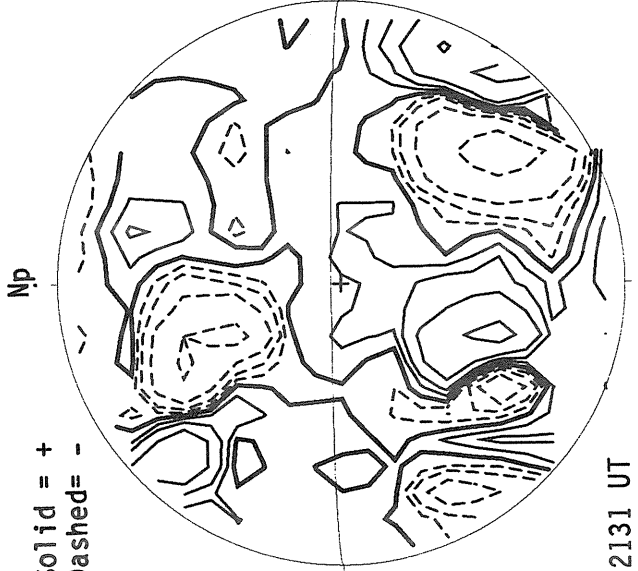
SACRAMENTO PEAK H-ALPHA



2123 UT

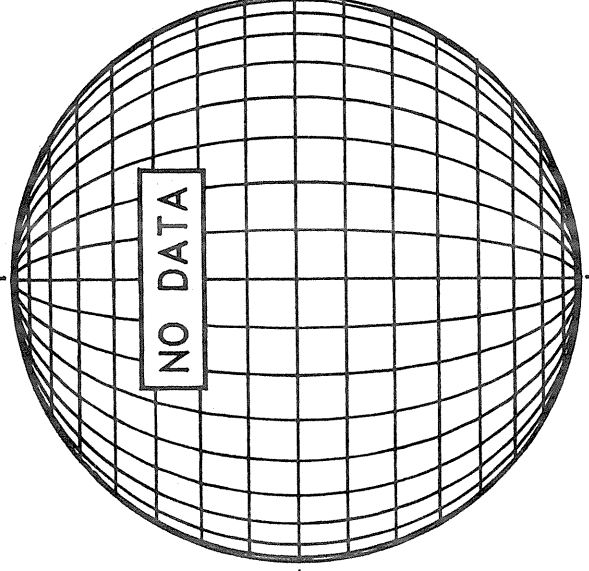
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



2131 UT

BOULDER SUNSPOTS

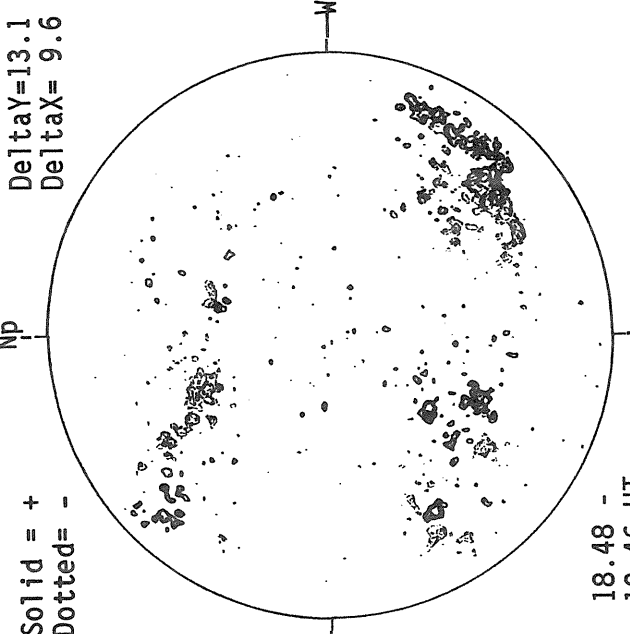


Sp

MT. WILSON MAGNETOGRAM

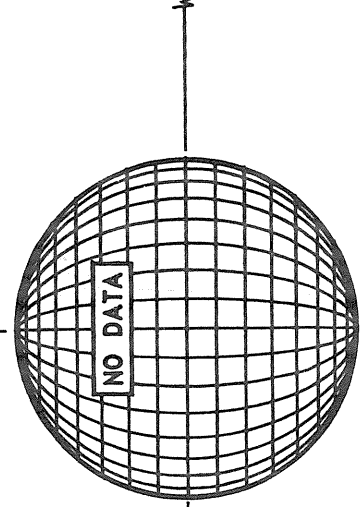
Delta Y = 13.1  
Delta X = 9.6

Solid = +  
Dotted = -



18.48 -  
19.46 UT

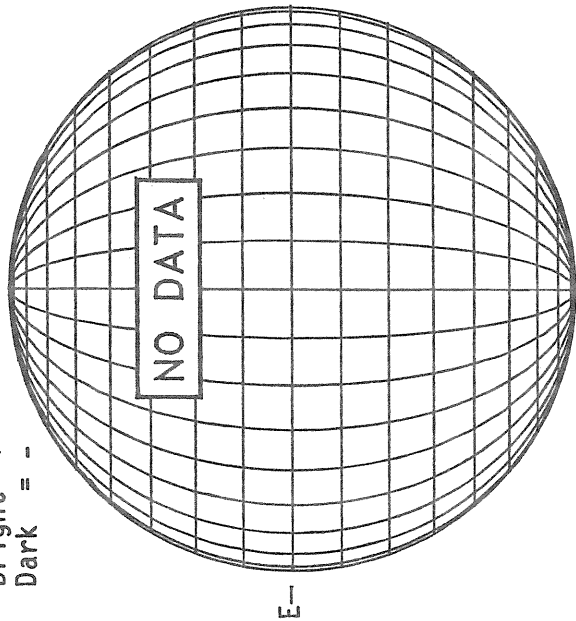
SACRAMENTO PEAK CORONA (1.15 Radii)



Sp

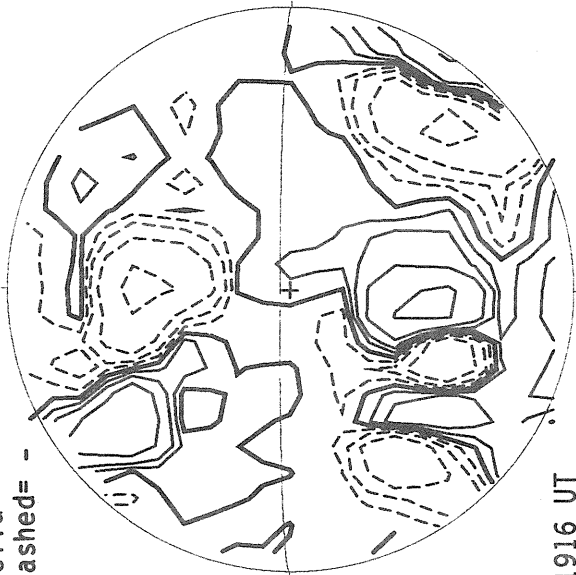
KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -



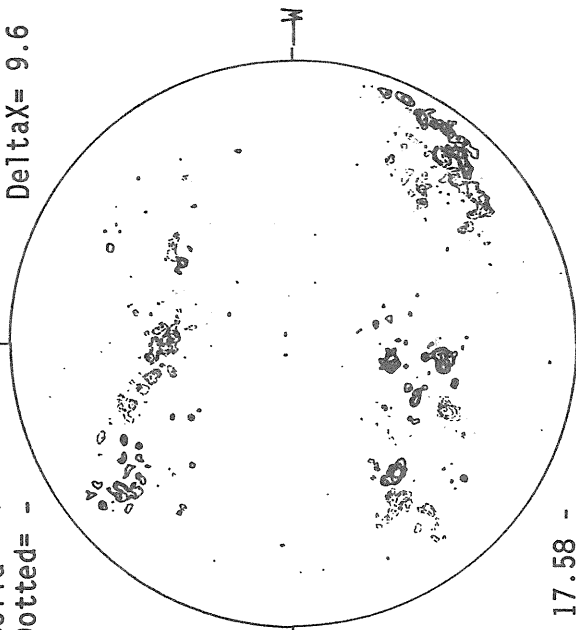
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



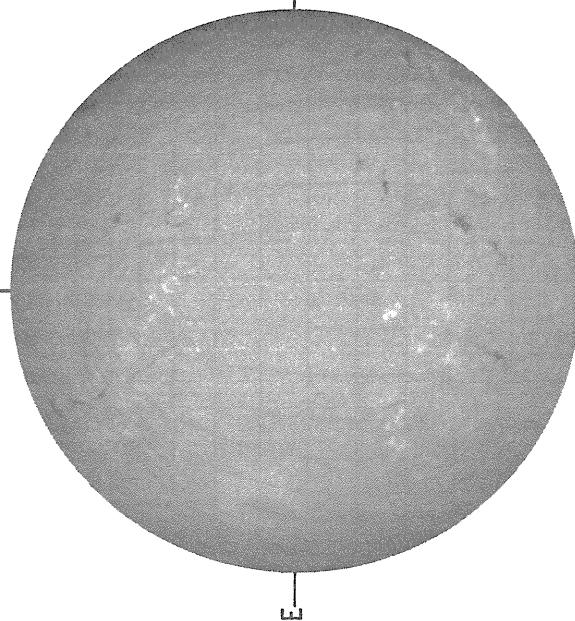
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 13.0  
Delta X = 9.6



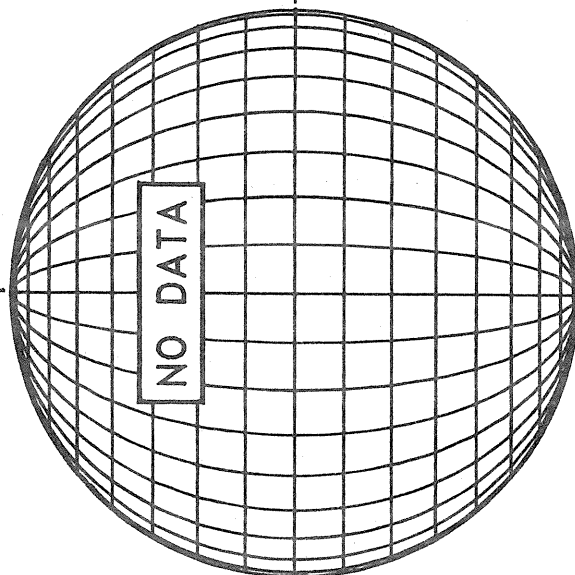
17.58 -  
18.58 UT

SACRAMENTO PEAK H-ALPHA

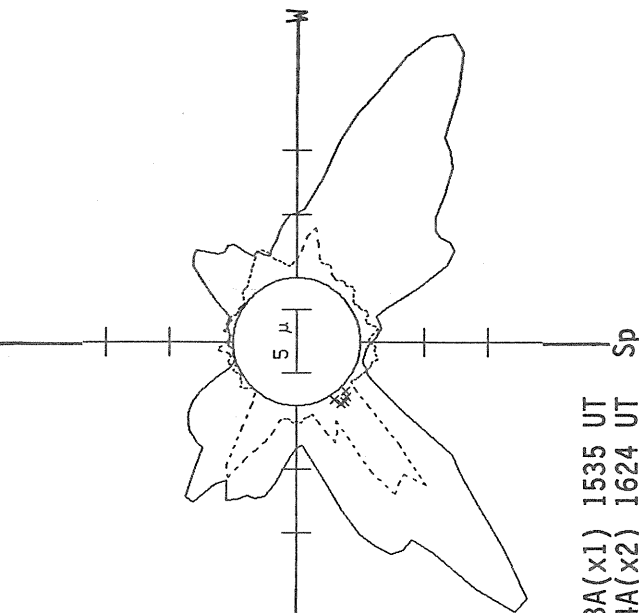


1920 UT

BOULDER SUNSPOTS



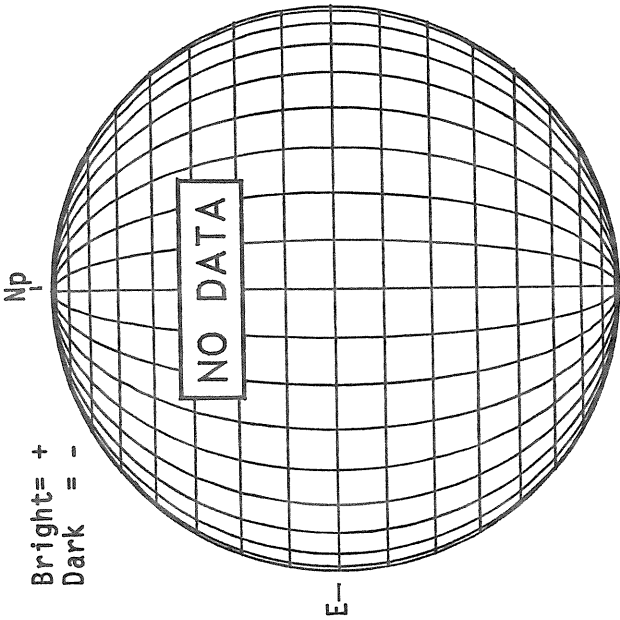
SACRAMENTO PEAK CORONA (1.15 Radii)



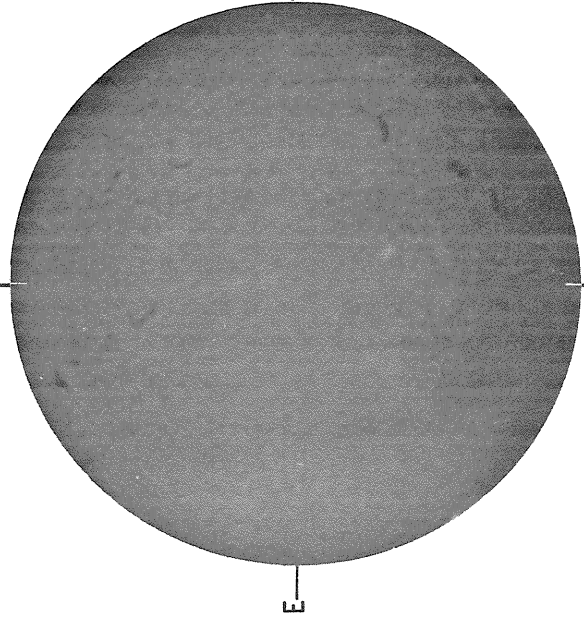
— 5303A(x1) 1535 UT  
... 6374A(x2) 1624 UT  
xxxx 5694A(x6) 1610 UT

KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



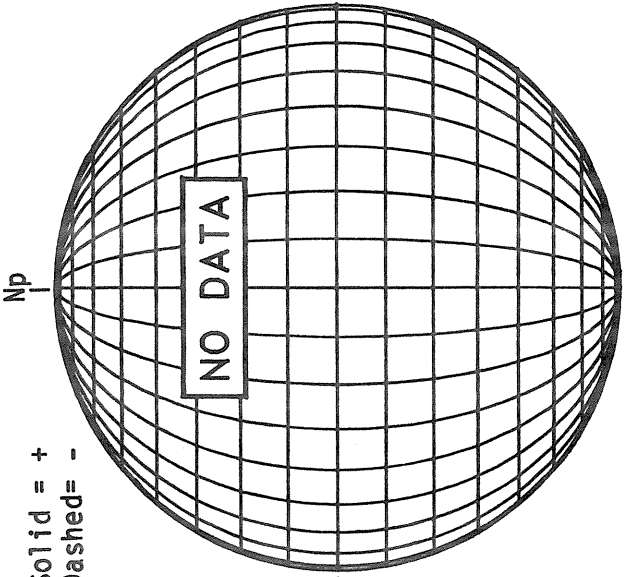
BOULDER H-ALPHA



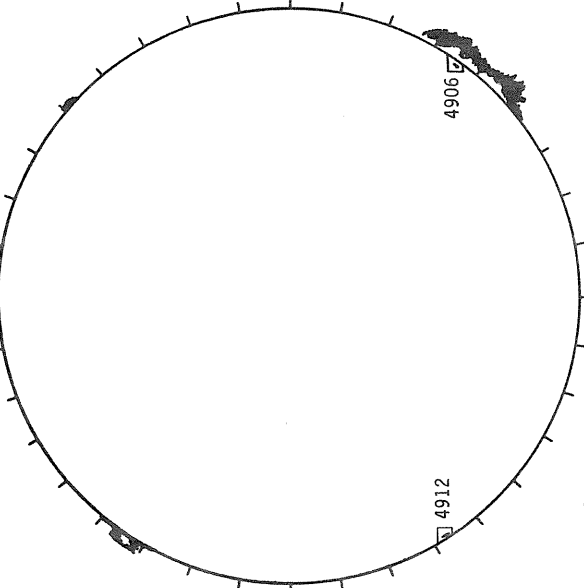
1603 UT

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



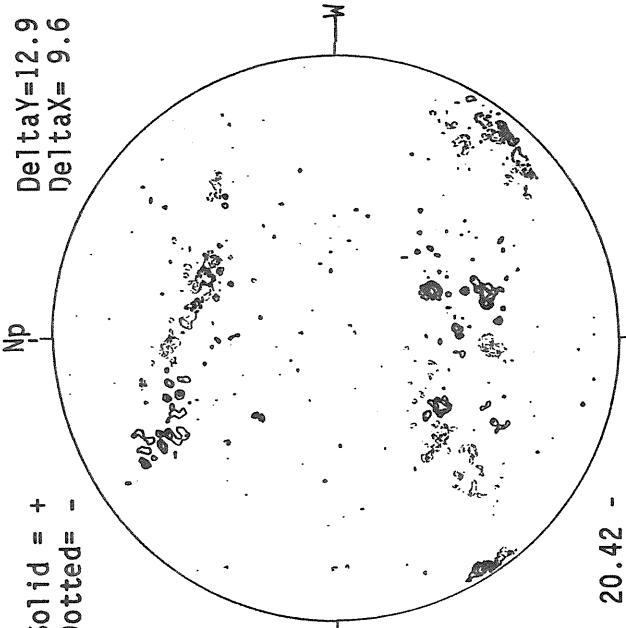
BOULDER SUNSPOTS



1515 UT  
1603 UT BOUL Prom

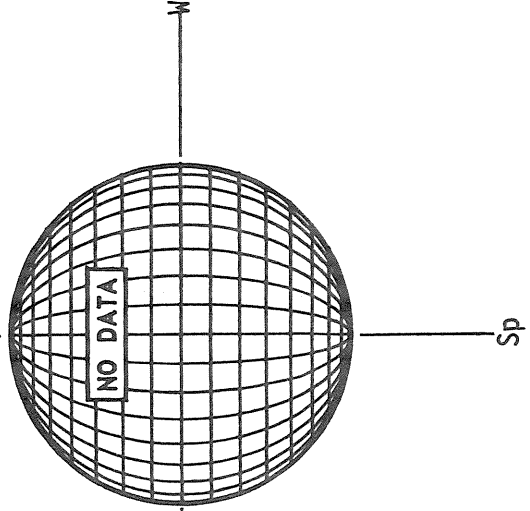
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -  
Delta Y = 12.9  
Delta X = 9.6

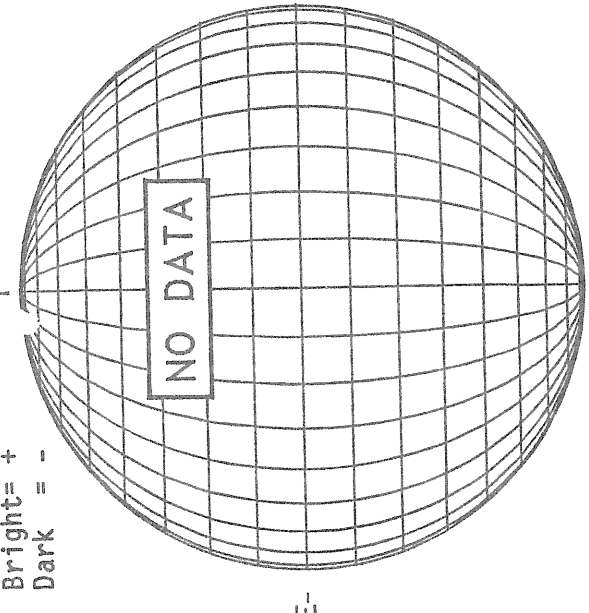


20.42 -  
21.40 UT

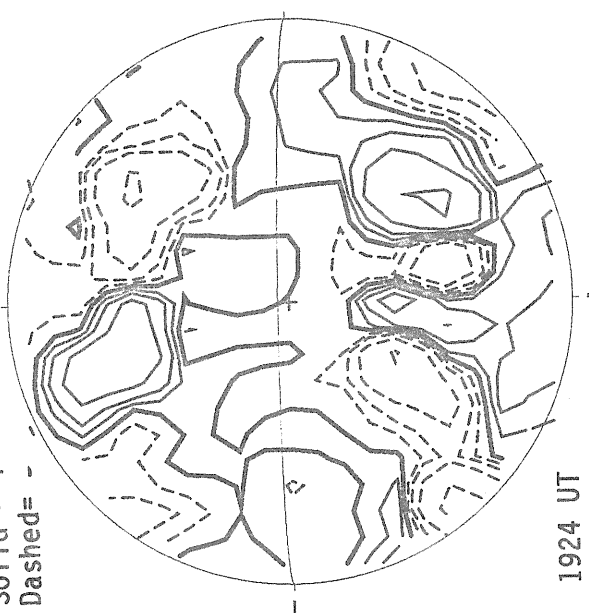
SACRAMENTO PEAK CORONA (1.15 Radii)



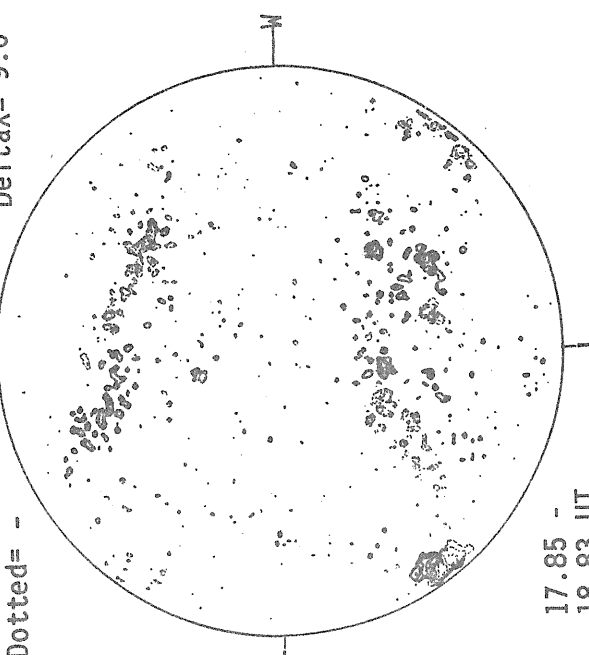
KITT PEAK MAGNETOGRAM  
Bright = +  
Dark = -



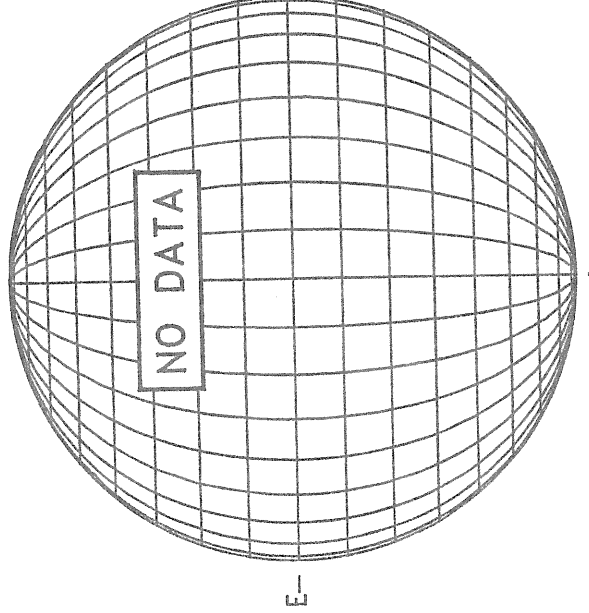
STANFORD MAGNETOGRAM  
Solid = +  
Dashed = -



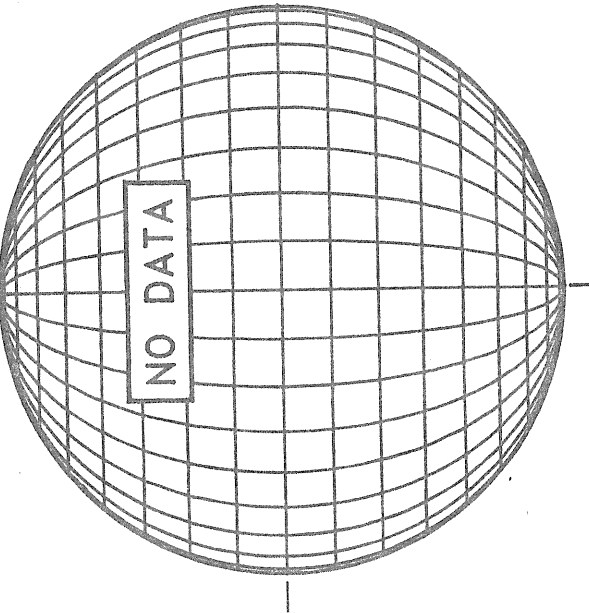
MT. WILSON MAGNETOGRAM  
Delta Y = 12.9  
Delta X = 9.6  
Solid = +  
Dotted = -



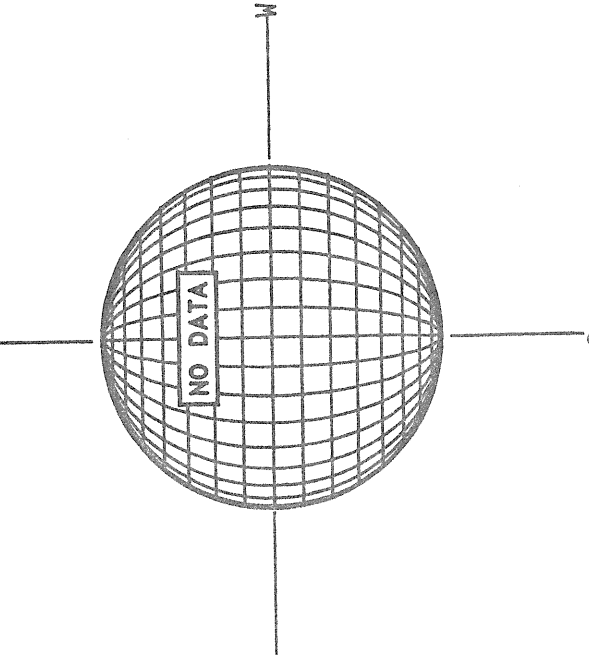
SACRAMENTO PEAK H-ALPHA



BOULDER SUNSPOTS



SACRAMENTO PEAK CORONA (1.15 Radii)

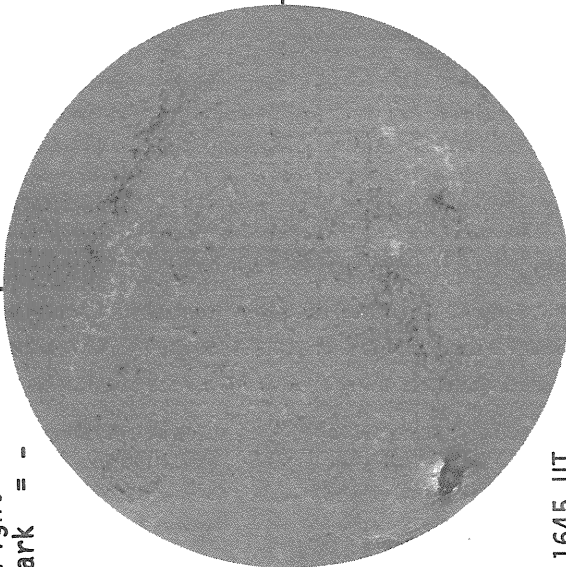


17.85 -  
18.83 UT

KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -

Np



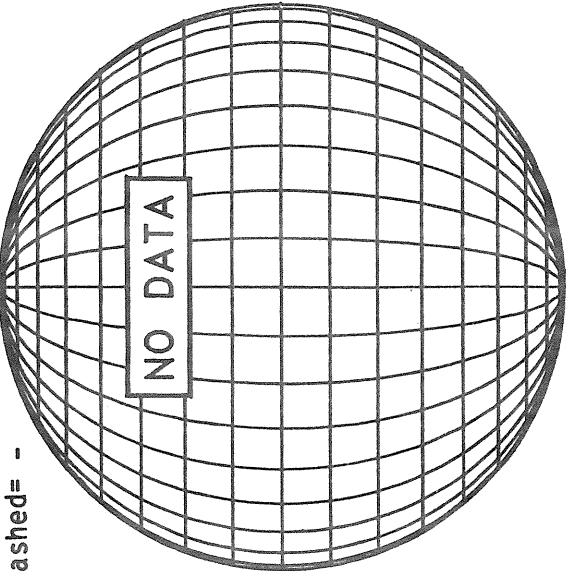
1645 UT

E

STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

Np



SACRAMENTO PEAK H-ALPHA

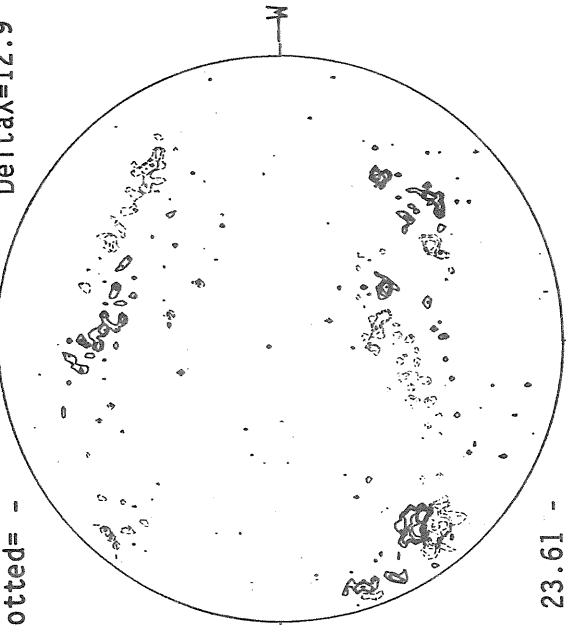
2117 UT

E

MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

Np

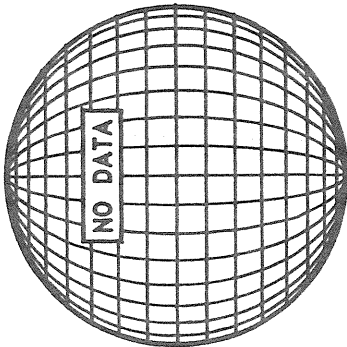


23.61 -  
23.96 UT

W

SACRAMENTO PEAK CORONA (1.15 Radii)

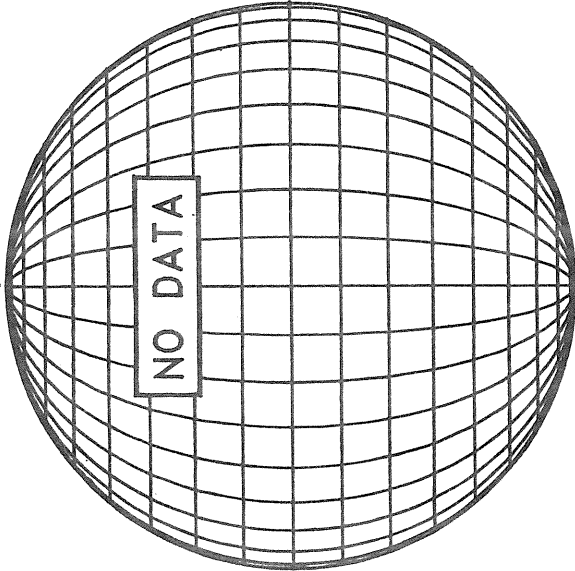
NO DATA



Sp

BOULDER SUNSPOTS

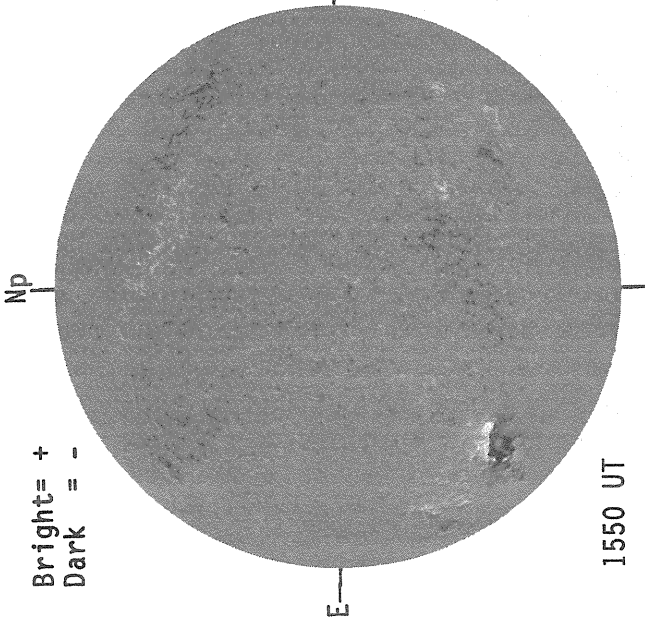
NO DATA



Sp

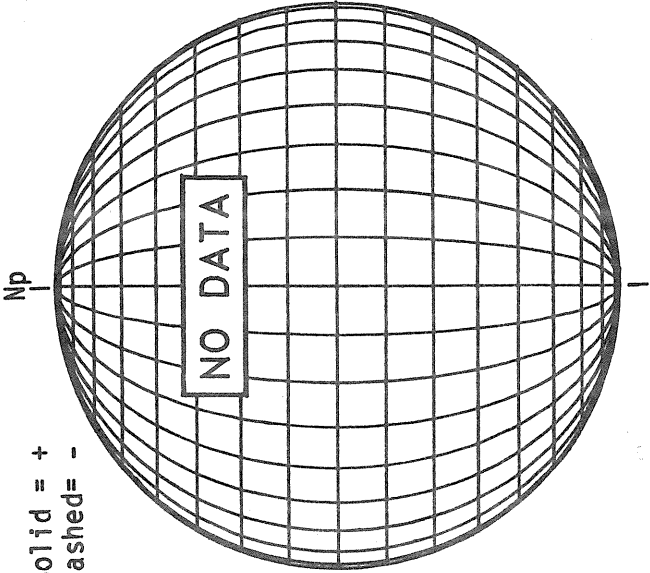
KITT PEAK MAGNETOGRAM

Bright = +  
Dark = -



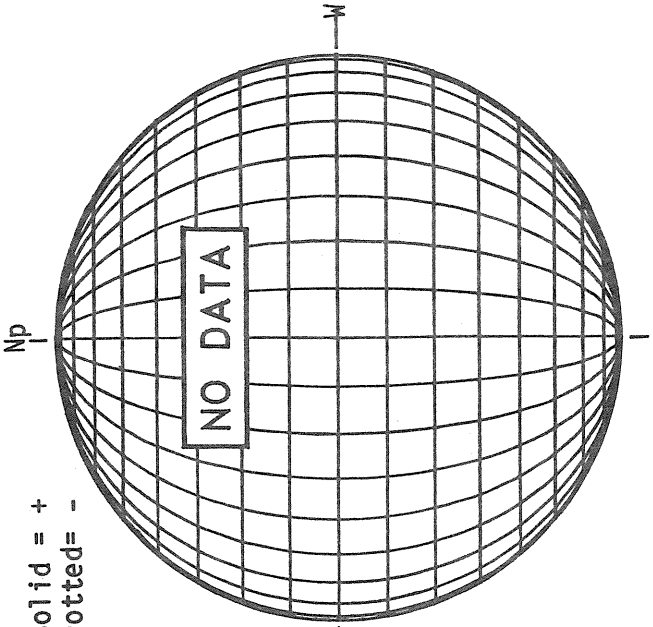
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -



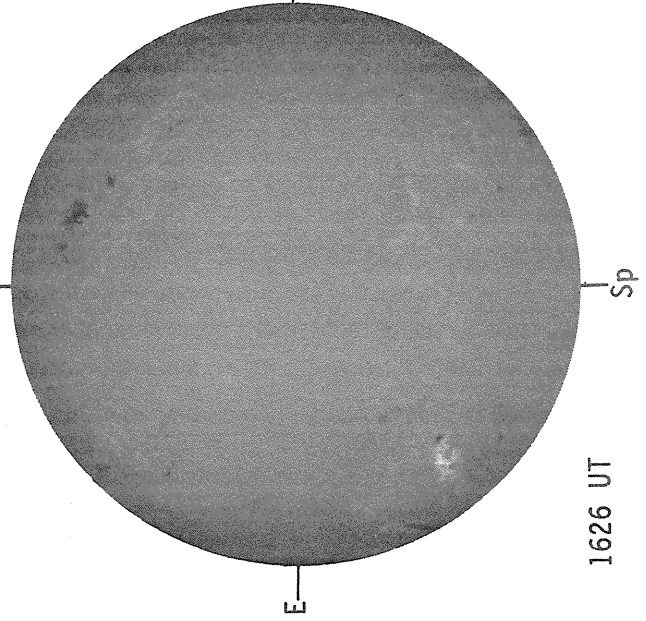
MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

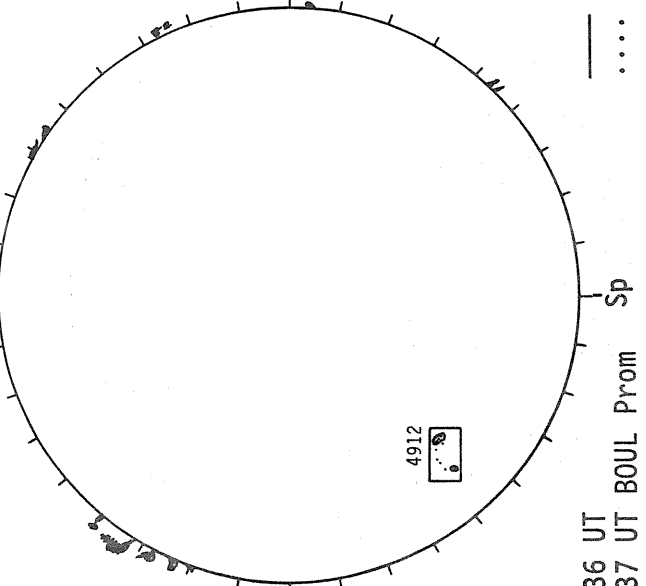


SACRAMENTO PEAK H-ALPHA

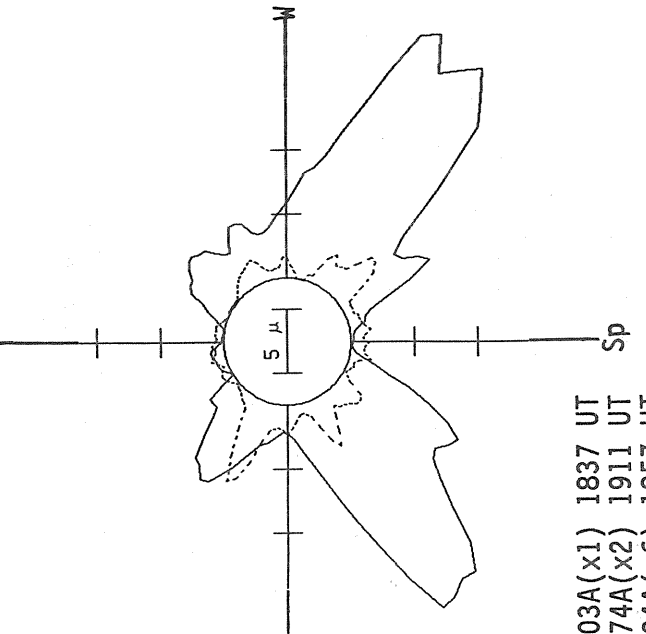
1550 UT



BOULDER SUNSPOTS



SACRAMENTO PEAK CORONA (1.15 Radii)



— 5303A(x1) 1837 UT  
 .... 6374A(x2) 1911 UT  
 xxxx 5694A(x6) 1857 UT  
 NO 5694A ACTIVITY TODAY

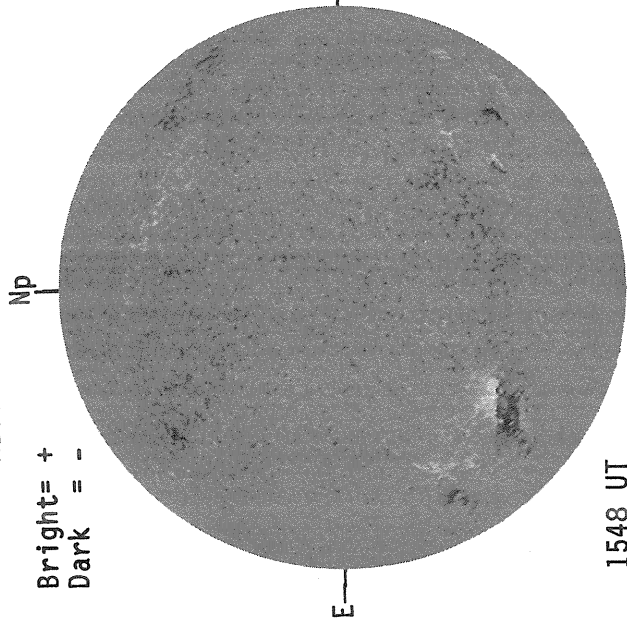
1536 UT  
 1637 UT BOUL Prom

1626 UT



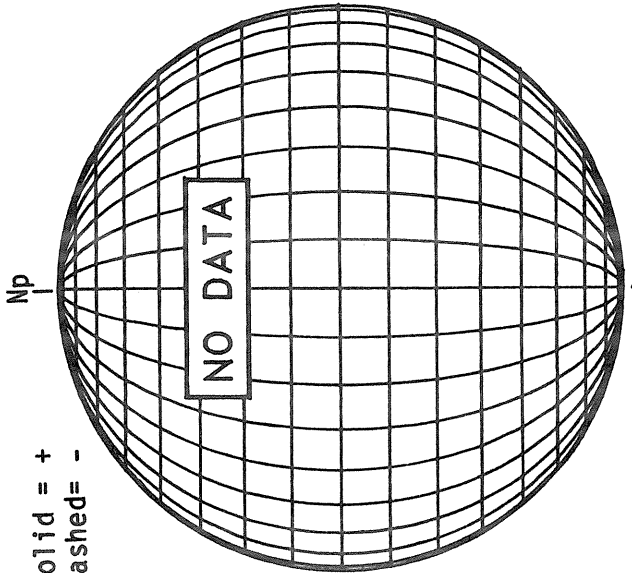
KITT PEAK MAGNETOGRAM

Bright= +  
Dark = -



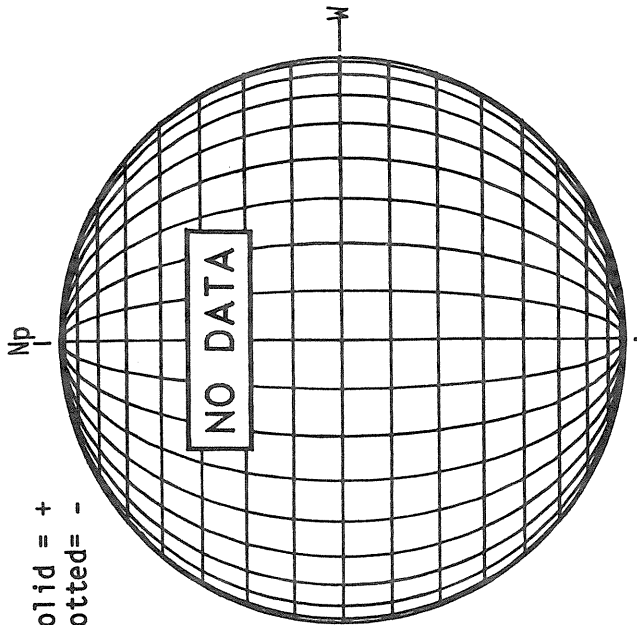
STANFORD MAGNETOGRAM

Solid = +  
Dashed = -

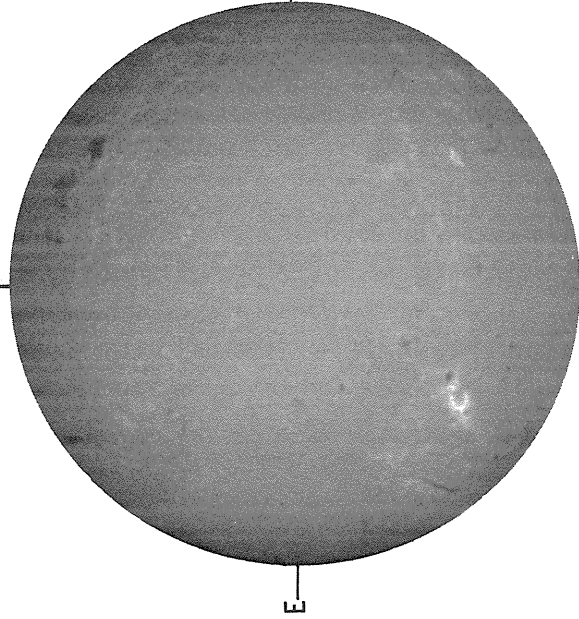


MT. WILSON MAGNETOGRAM

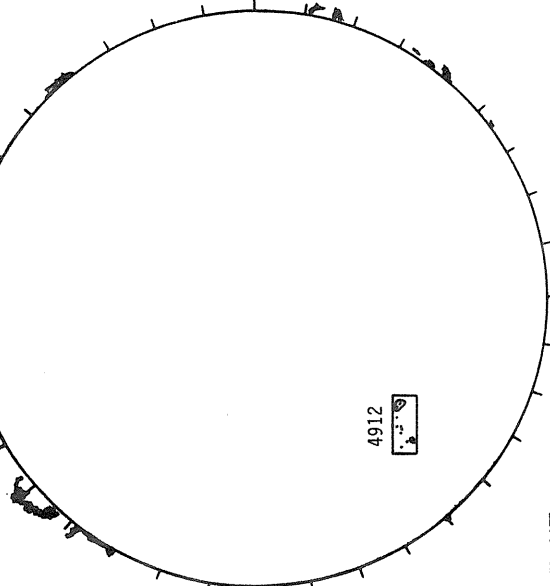
Solid = +  
Dotted = -



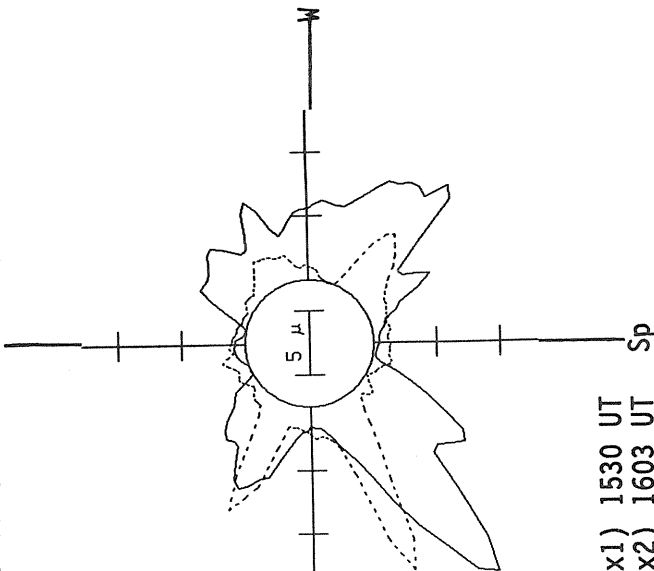
SACRAMENTO PEAK H-ALPHA



BOULDER SUNSPOTS



SACRAMENTO PEAK CORONA (1.15 Radii)



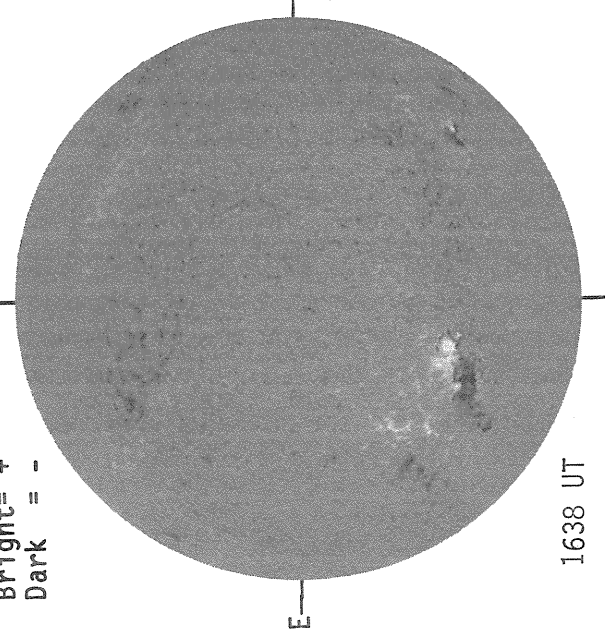
— 5303A(x1) 1530 UT  
 .... 6374A(x2) 1603 UT  
 xxxxx 5694A(x6) 1550 UT  
 NO 5694A ACTIVITY TODAY

1507 UT  
 1552 UT BOUL Prom

1658 UT

KITT PEAK MAGNETOGRAM

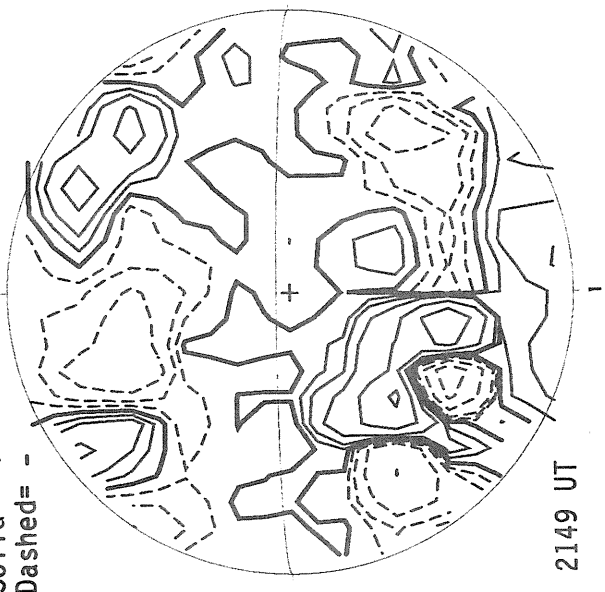
Bright = +  
Dark = -



1638 UT

STANFORD MAGNETOGRAM

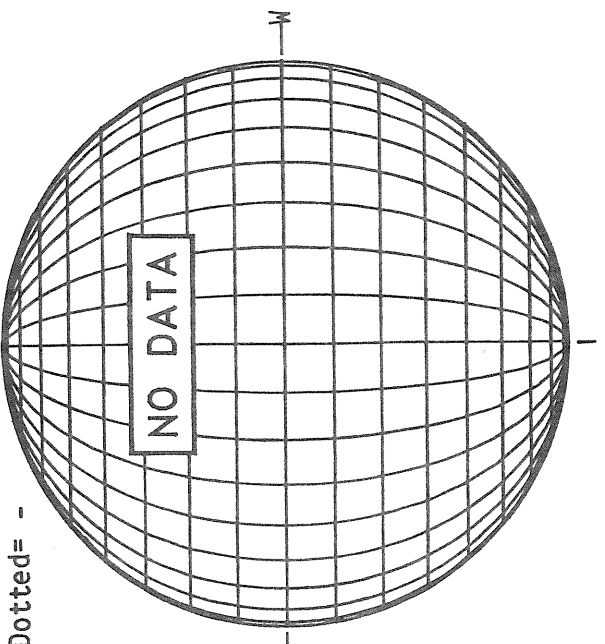
Solid = +  
Dashed = -



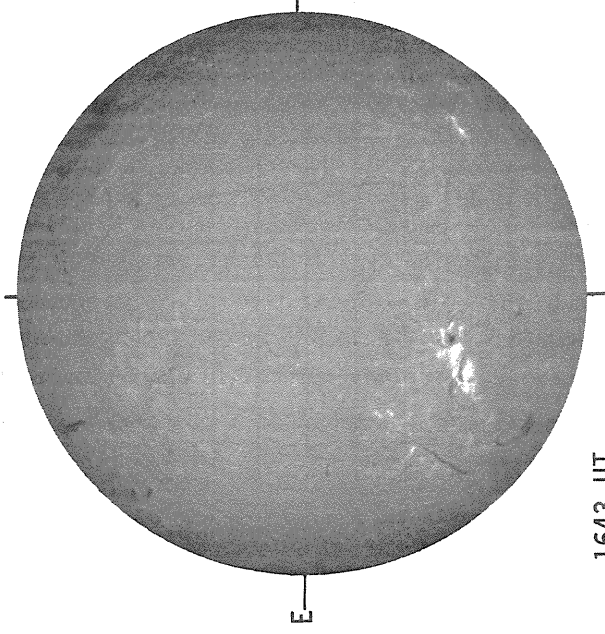
2149 UT

MT. WILSON MAGNETOGRAM

Solid = +  
Dotted = -

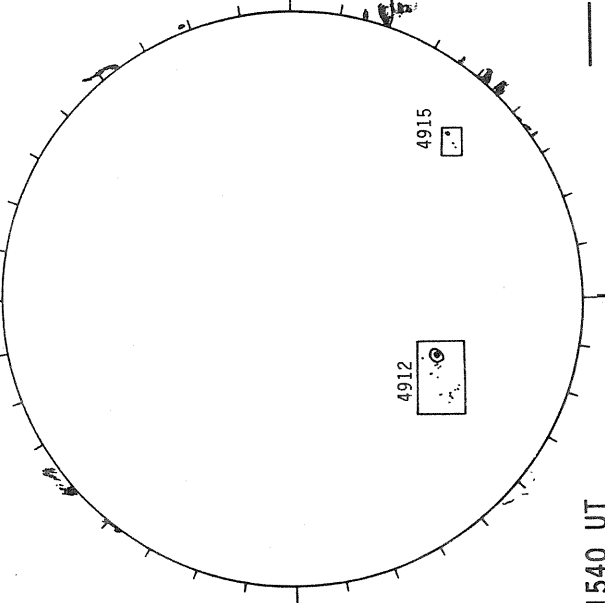


SACRAMENTO PEAK H-ALPHA



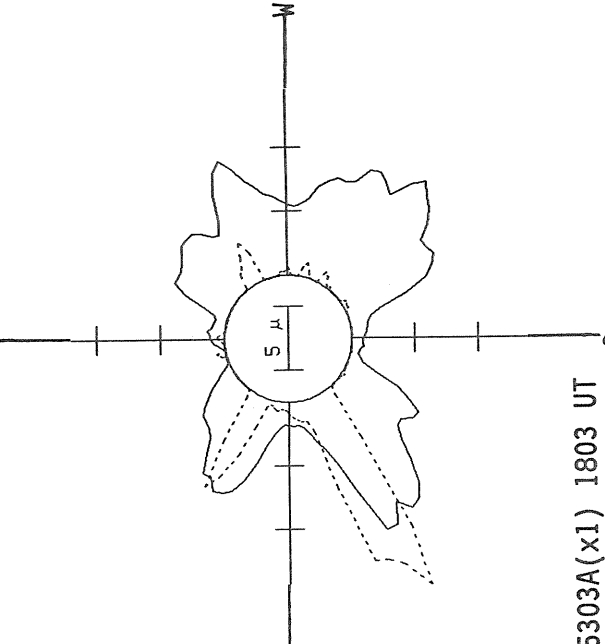
1643 UT

BOULDER SUNSPOTS



1540 UT  
1555 UT BOUL Prom Sp

SACRAMENTO PEAK CORONA (1.15 Radii)

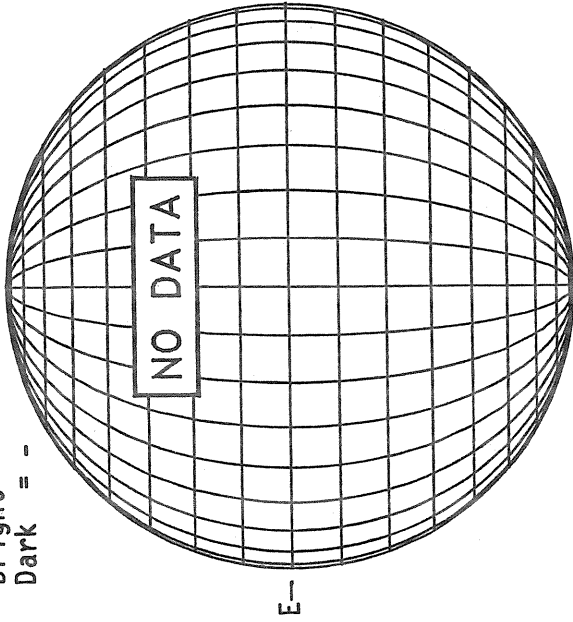


— 5303A(x1) 1803 UT  
... 6374A(x2) 1839 UT  
xxxx 5694A(x6) 1825 UT  
NO 5694A ACTIVITY TODAY

KITT PEAK MAGNETOGRAM

Np

Bright = +  
Dark = -

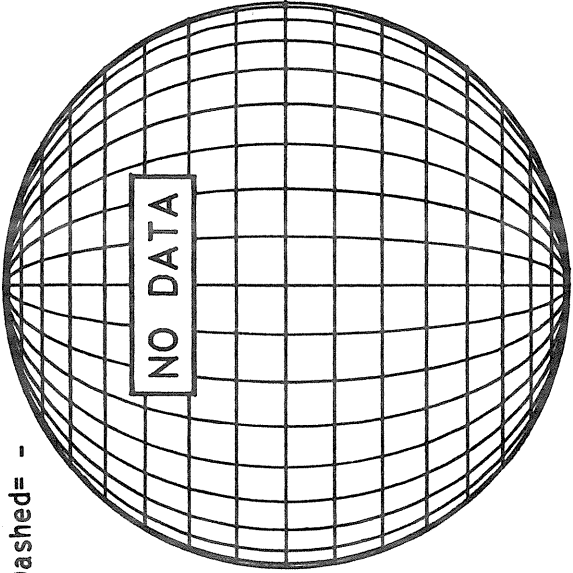


E

STANFORD MAGNETOGRAM

Np

Solid = +  
Dashed = -

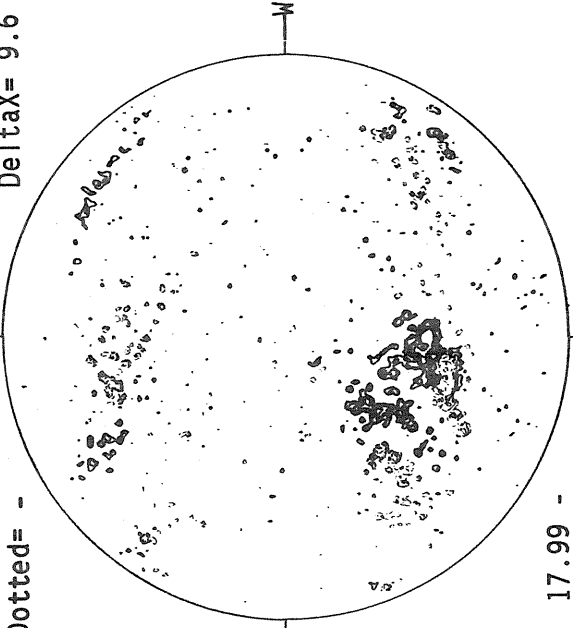


MT. WILSON MAGNETOGRAM

Np

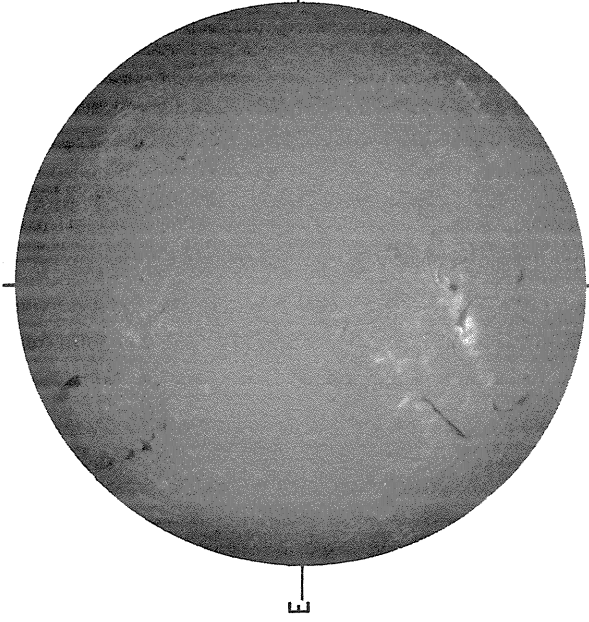
Solid = +  
Dotted = -

Delta Y = 13.0  
Delta X = 9.6



17.99 -  
18.96 UT

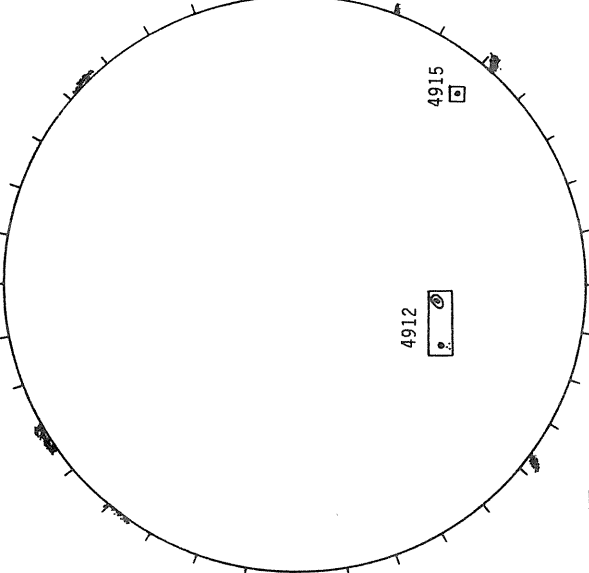
SACRAMENTO PEAK H-ALPHA



E

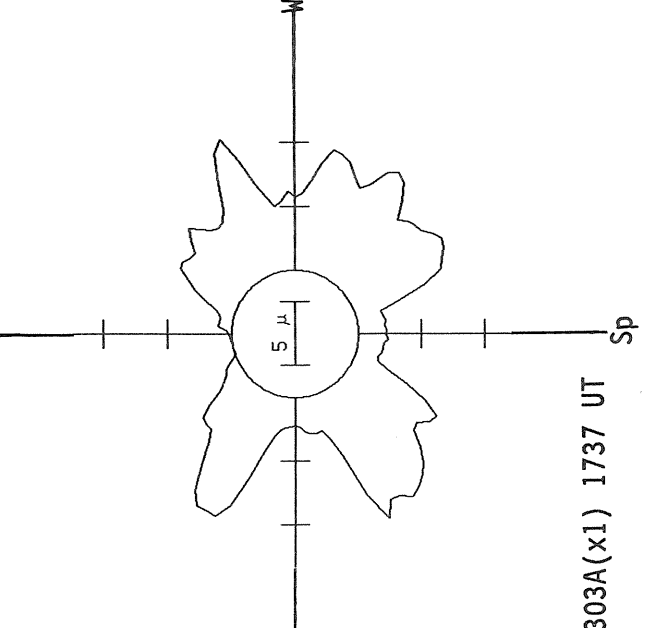
1602 UT

BOULDER SUNSPOTS



1640 UT  
1700 UT BOUL Prom

SACRAMENTO PEAK CORONA (1.15 Radii)



5303A(x1) 1737 UT

Sp

SUNSPOT GROUPS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

DECEMBER 1987

NOAA/ USAF Group	Mt Wilson Group	Sta	Observation Time (UT)	Lat	CMD	CMP Mo	Day	Max H	Mag Class	Spot Class	Corrected Area (10 <sup>-6</sup> Hemi)	Spot Count	Long. Extent (Deg)	Qual
4898B		SVTO	12 02 1055	N08	E09	12	3.1		A	AX		1	1	3
	24480A	MWIL	11 27 1530	S33	E74	12	3.5	4	(AF)					
4898C	24485	MWIL	12 02 1530	S23	E18	12	4.0	2	(AP)					
4903		BOUL	12 08 1452	S36	W60	12	3.8		A	AX	20	2	2	1
4903		HOLL	12 08 1645	S33	W57	12	4.2		B	BXO	10	3	5	3
4903	24490	MWIL	12 08 1800	S36	W60	12	3.9	4	(AP)					
4903		PALE	12 08 1948	S35	W61	12	3.9		B	CSO	30	3	7	3
4903		LEAR	12 09 0002	S35	W61	12	4.1		B	CSO	110	5	7	3
4903		CULG	12 09 0445	S34	W68	12	3.8		B	CRO	40	3	4	3
4903		RAMY	12 09 1452	S34	W68	12	4.2		B	CSO	30	2	2	1
4903		HOLL	12 09 1530	S33	W69	12	4.2		B	CAO	60	3	6	3
4903		PALE	12 09 1759	S35	W75	12	3.7		B	CSO	30	3	5	3
4903		LEAR	12 10 0223	S32	W77	12	4.0		B	CSO	60	2	6	3
4899		LEAR	11 29 0029	N27	E66	12	4.2		A	AX	10	1	1	3
4899		SVTO	11 29 0935	N28	E65	12	4.5		B	BXO		2	3	3
4899		RAMY	11 29 1340	N30	E64	12	4.6		B	BXO	10	3	3	3
4899		HOLL	11 29 1600	N27	E66	12	4.8		A	AX		1		2
4899		RAMY	12 01 1347	N31	E37	12	4.5		A	AX	10	1	1	4
4899		HOLL	12 03 1509	N27	E12	12	4.6		A	AX	10	2	2	3
4899	24487	MWIL	12 03 1515	N26	E10	12	4.4	3	(B)					
4899		PALE	12 03 1918	N27	E09	12	4.5		B	BXO	10	3	3	2
4899		LEAR	12 04 0012	N27	E06	12	4.5		B	BXO	10	3	3	3
4899A		PALE	12 02 1901	S12	E36	12	5.5		A	AX		1		3
4899A		LEAR	12 03 0000	S12	E32	12	5.4		A	AX	10	1	1	3
4899B		HOLL	12 01 1610	S28	E52	12	5.7		A	AX		1	1	3
4899B		PALE	12 02 1901	S27	E36	12	5.6		A	AX		1		3
4899B		LEAR	12 03 0000	S27	E33	12	5.6		A	AX	10	1	1	3
4902		LEAR	12 07 0003	N26	W15	12	5.8		A	AX	10	1	1	3
4902		CULG	12 07 0440	N24	W21	12	5.6		A	AX	20	2	1	3
4902		SVTO	12 07 1025	N26	W18	12	6.0		B	BXO	10	3	2	3
4902		RAMY	12 07 1325	N26	W23	12	5.8		B	BXO	20	4	3	4
4902		HOLL	12 07 1550	N27	W22	12	5.9		B	BXO	20	4	3	3
4902	24489	MWIL	12 07 1645	N26	W24	12	5.8	4	(B)					
4902		PALE	12 07 1834	N26	W26	12	5.7		B	BXO	10	4	4	3
4902		LEAR	12 08 0002	N28	W27	12	5.9		B	BXO	10	4	3	3
4902		CULG	12 08 0445	N25	W32	12	5.7		B	BXO	20	2	2	2
4902		HOLL	12 08 1645	N27	W36	12	5.9		B	BXO	10	3	3	3
4901		PALE	12 03 1918	S22	E37	12	6.6		A	AX		1		2
4901		LEAR	12 04 0012	S23	E33	12	6.5		B	BXO	10	5	3	3
4901		SVTO	12 04 0835	S23	E27	12	6.4		B	BXO	10	3	3	3
4901		HOLL	12 04 1530	S24	E22	12	6.3		B	BXO	10	2	4	3
4901		PALE	12 04 1759	S23	E23	12	6.5		B	BXO	20	4	6	3
4901		LEAR	12 05 0010	S23	E18	12	6.4		B	BXO	20	8	6	3
4901		CULG	12 05 0500	S22	E14	12	6.3		B	BXO	30	4	6	2
4901		RAMY	12 05 1320	S22	E11	12	6.4		B	CRO	30	5	7	4
4901		BOUL	12 05 1522	S21	E07	12	6.2		B	BXO	20	6	6	2
4901		HOLL	12 05 1554	S22	E08	12	6.3		B	BXO	30	12	6	2
4901		PALE	12 05 1745	S23	E08	12	6.3		B	CRO	80	12	8	2
4901		LEAR	12 06 0002	S22	E04	12	6.3		B	CRO	50	12	7	3
4901		CULG	12 06 0445	S22	E01	12	6.3		B	DSI	80	8	9	3
4901		RAMY	12 06 1407	S22	W05	12	6.2		B	DAO	60	12	7	4
4901		BOUL	12 06 1515	S21	W05	12	6.2		B	DAO	80	5	8	1
4901	24488	MWIL	12 06 1515	S22	W05	12	6.2	4	(B)					
4901		HOLL	12 06 1558	S21	W07	12	6.1		B	DAO	70	11	6	3
4901		PALE	12 06 1938	S22	W08	12	6.2		B	DSO	60	11	8	2
4901		LEAR	12 07 0003	S22	W11	12	6.1		B	DSO	110	17	9	3
4901		CULG	12 07 0440	S22	W11	12	6.3		B	DSO	90	7	9	3
4901		SVTO	12 07 1025	S22	W14	12	6.3		B	DSO	40	13	7	3
4901		RAMY	12 07 1325	S22	W17	12	6.2		B	CSI	70	14	9	4
4901		HOLL	12 07 1550	S20	W20	12	6.1		B	DSO	70	15	9	3
4901	24488	MWIL	12 07 1645	S22	W19	12	6.2	4	(B)					

SUNSPOT GROUPS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

DECEMBER 1987

NOAA/ USAF Group	Mt Wilson Group	Sta	Observation Time			Lat	CMD	CMP Mo	Day	Max H	Mag Class	Spot Class	Corrected Area (10 <sup>-6</sup> Hemi)	Spot Count	Long. Extent (Deg)	Qual
			Mo	Day	(UT)											
4901		PALE	12	07	1834	S22	W21	12	6.1		B	DSO	60	11	9	3
4901		LEAR	12	08	0002	S21	W25	12	6.1		B	DSO	130	22	9	3
4901		CULG	12	08	0445	S22	W27	12	6.1		B	DSI	100	9	8	2
4901		BOUL	12	08	1452	S21	W30	12	6.3		B	BXO	60	10	10	1
4901		HOLL	12	08	1645	S19	W33	12	6.2		B	DAO	110	15	10	3
4901	24488	MWIL	12	08	1800	S22	W33	12	6.2	4	(B)					
4901		PALE	12	08	1948	S22	W35	12	6.1		B	DSO	60	16	9	3
4901		LEAR	12	09	0002	S21	W37	12	6.2		B	DSO	180	16	10	3
4901		CULG	12	09	0445	S21	W42	12	6.0		B	DAO	80	7	7	3
4901		RAMY	12	09	1452	S20	W47	12	6.0		B	DAO	70	6	9	1
4901		HOLL	12	09	1530	S18	W46	12	6.1		B	DAO	70	10	8	3
4901		BOUL	12	09	1645	S23	W46	12	6.1		B	BXO	90	2	5	1
4901		PALE	12	09	1759	S22	W47	12	6.1		B	DSO	60	12	9	3
4901		LEAR	12	10	0223	S19	W54	12	6.0		B	DSO	120	7	10	3
4901		RAMY	12	10	1357	S20	W60	12	6.0		B	CSO	70	7	8	2
4901	24488	MWIL	12	10	1545	S20	W61	12	6.0	5	(BP)					
4901		HOLL	12	10	1635	S17	W62	12	6.0		B	CSO	60	6	6	3
4901		PALE	12	10	1850	S21	W63	12	5.9		B	CSO	70	10	8	3
4901		LEAR	12	11	0010	S21	W64	12	6.1		B	CSO	30	6	12	4
4901	24488	MWIL	12	11	1545	S20	W72	12	6.1	4	(B)					
4901		HOLL	12	11	1615	S17	W73	12	6.1		B	BXO	60	8	9	3
4901		PALE	12	11	1855	S22	W77	12	5.9		B	BXO	10	5	9	3
4901		LEAR	12	12	0000	S21	W74	12	6.3		B	BXO	30	4	12	3
4904		CULG	12	09	0445	S19	W26	12	7.2		A	AX	10	1		3
4904		RAMY	12	09	1452	S18	W28	12	7.5		B	BXO	10	3	2	1
4904		HOLL	12	09	1530	S18	W31	12	7.3		B	BXO	10	5	3	3
4904		PALE	12	09	1759	S21	W32	12	7.3		B	BXO	10	5	3	3
4904		LEAR	12	10	0223	S19	W38	12	7.2		B	BXO	10	4	5	3
4904		RAMY	12	10	1357	S19	W44	12	7.2		B	BXO	10	4	4	2
4904	24491	MWIL	12	10	1545	S20	W44	12	7.3	4	(B)					
4904		HOLL	12	10	1635	S18	W46	12	7.2		B	BXO	20	2	3	3
4904		PALE	12	10	1850	S21	W46	12	7.2		B	BXO	3	3	3	3
4904		LEAR	12	11	0010	S21	W47	12	7.4		A	AX	10	1	1	4
4904		LEAR	12	12	0000	S21	W66	12	6.9		A	AX	10	1	1	3
4905		PALE	12	11	1855	N27	W44	12	8.3		A	AX		1		3
4905		RAMY	12	12	1410	N26	W52	12	8.5		B	BXO	20	4	3	3
4905		HOLL	12	12	1540	N27	W51	12	8.7		B	BXO	10	2	2	2
4905		LEAR	12	13	0000	N28	W61	12	8.2		B	BX	20	2	5	2
4905A		LEAR	12	08	0002	N26	E19	12	9.5		A	AX	10	1	1	3
4905B		PALE	12	10	1850	N35	E18	12	12.2		A	AX		1		3
4905C		LEAR	12	07	0003	N06	E74	12	12.5		B	BXO	10	2	4	3
4905C		LEAR	12	08	0002	N06	E58	12	12.3		A	AX	10	1	1	3
4910		RAMY	12	19	1700	S22	W58	12	15.2		A	AX	10	1	1	2
4910		HOLL	12	19	1805	S18	W61	12	15.1		A	AX	10	1	1	3
4910		LEAR	12	20	0002	S21	W63	12	15.2		B	BX	10	2	3	3
4910		SVTO	12	20	1104	S22	W74	12	14.8		A	AX	10	1	1	3
4910		RAMY	12	20	1420	S22	W72	12	15.1		A	AX	10	1	1	3
4910	24496	MWIL	12	20	1545	S21	W75	12	14.9	2	(AP)					
4910		HOLL	12	20	1900	S18	W72	12	15.3		A	AX	10	1	1	2
4910		HOLL	12	21	1726	S18	W89	12	14.9		A	AX	20	1	1	3
4910A		LEAR	12	18	0034	S17	W30	12	15.7		B	HS	20	1	1	2
4910A		LEAR	12	19	0036	S17	W40	12	16.0		B	BSO	20	2	2	2
4910A		CULG	12	19	0415	S17	W39	12	16.2		B	BXO	20	2	3	2
4907		RAMY	12	13	1330	S25	E38	12	16.5		B	BXO	20	3	3	4
4907		RAMY	12	14	1345	S27	E18	12	16.0		B	BXO	10	2	3	4
4907		HOLL	12	14	2011	S26	E21	12	16.5		B	BXO	10	5	4	2
4907		LEAR	12	15	0002	S23	E20	12	16.5		B	BX	10	5	3	3
4907		CULG	12	15	0440	S25	E18	12	16.6		B	BXO	10	3	3	2
4907		SVTO	12	15	1215	S26	E15	12	16.7		B	BXO	10	7	5	3
4907		BOUL	12	15	1947	S26	E09	12	16.5		B	BXO	10	6	5	2
4907		LEAR	12	16	0003	S24	E07	12	16.5		B	CSO	30	6	5	3

SUNSPOT GROUPS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

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Dec 87

DECEMBER 1987

NOAA/ USAF Group	Mt Wilson Group	Sta	Observation		Lat	CMD	CMP		Max H	Mag Class	Spot Class	Corrected Area (10 <sup>-6</sup> Hemi)	Spot Count	Long. Extent (Deg)	Qual
			Mo	Day			Mo	Day							
4907		CULG	12	16	0435	S26	E04	12	16.5	B	BX0	30	3	6	2
4907		SVTO	12	16	1114	S26	E02	12	16.6	B	CRO	20	6	4	2
4907		RAMY	12	16	1335	S26	E01	12	16.6	B	CRO	30	12	7	4
4907		BOUL	12	16	1800	S26	W03	12	16.5	B	BX0	60	6	5	3
4907		LEAR	12	17	0028	S27	W05	12	16.6	B	CRO	20	6	6	3
4907		CULG	12	17	0440	S26	W09	12	16.5	B	BX0	20	3	6	3
4907		RAMY	12	17	1419	S26	W14	12	16.5	B	BX0	30	13	7	3
4907		HOLL	12	17	1620	S26	W17	12	16.3	B	BX0	20	4	8	3
4907		CULG	12	18	0500	S27	W29	12	15.9	B	BX0	20	2	2	1
4907		SVTO	12	18	0850	S25	W29	12	16.1	A	AX		1		3
4907		RAMY	12	18	1350	S26	W32	12	16.1	A	AX	10	1	1	4
4907		HOLL	12	18	1935	S23	W36	12	16.0	A	AX	10	1	1	2
4907		LEAR	12	20	0002	S26	W45	12	16.5	B	BX	10	2	2	3
4906		RAMY	12	12	1410	S32	E85	12	19.3	A	HA	60	1	8	3
4906		HOLL	12	12	1540	S36	E84	12	19.4	A	HA	60	1	6	2
4906		LEAR	12	13	0000	S33	E78	12	19.2	A	HS	180	1	2	2
4906		CULG	12	13	0325	S29	E79	12	19.3	A	HS	150	1	2	2
4906		RAMY	12	13	1330	S33	E79	12	19.8	B	CHO	280	3	10	4
4906	24492	MWIL	12	13	2230	S33	E69	12	19.4	3	(AP)				
4906		CULG	12	14	0520	S32	E67	12	19.5	A	HS	80	1	1	1
4906		LEAR	12	14	0842	S33	E66	12	19.6	B	ESO	310	6	12	3
4906		RAMY	12	14	1345	S34	E65	12	19.7	B	EHO	240	4	12	4
4906	24492	MWIL	12	14	1945	S34	E57	12	19.4	5	(AP)				
4906		HOLL	12	14	2011	S34	E60	12	19.6	B	ESO	200	5	11	2
4906		LEAR	12	15	0002	S32	E59	12	19.7	B	ESO	370	4	13	3
4906		CULG	12	15	0440	S32	E54	12	19.5	B	CS0	110	2	9	2
4906		SVTO	12	15	1215	S33	E55	12	19.9	B	FHO	190	9	16	3
4906		BOUL	12	15	1947	S33	E50	12	19.8	B	ESO	140	10	15	2
4906		LEAR	12	16	0003	S34	E47	12	19.7	B	FS0	250	13	17	3
4906		CULG	12	16	0435	S31	E45	12	19.7	B	EHO	180	5	12	2
4906		SVTO	12	16	1114	S32	E43	12	19.9	B	CS0	200	13	20	2
4906		RAMY	12	16	1335	S33	E46	12	20.2	B	FHO	270	22	23	4
4906		BOUL	12	16	1800	S32	E37	12	19.7	B	CS0	300	6	21	3
4906		LEAR	12	17	0028	S32	E38	12	20.0	B	FS0	260	11	20	3
4906		CULG	12	17	0440	S32	E34	12	19.9	B	CS0	170	5	12	3
4906		SVTO	12	17	0726	S30	E28	12	19.5	B	ESO	150	6	13	2
4906		RAMY	12	17	1419	S33	E30	12	20.0	B	CS0	200	11	21	3
4906		HOLL	12	17	1620	S34	E28	12	19.9	B	CS0	170	10	22	3
4906		LEAR	12	18	0034	S33	E19	12	19.5	B	DS0	120	4	10	2
4906		CULG	12	18	0500	S32	E17	12	19.5	B	CS0	130	5	11	1
4906		SVTO	12	18	0850	S34	E16	12	19.6	B	CS0	170	7	11	3
4906		RAMY	12	18	1350	S33	E18	12	20.0	B	CS0	180	8	20	4
4906		HOLL	12	18	1935	S33	E12	12	19.8	B	CS0	140	6	18	2
4906		LEAR	12	19	0036	S33	E06	12	19.5	B	CS0	100	4	4	2
4906		CULG	12	19	0415	S33	E01	12	19.2	B	CS0	130	2	4	2
4906		BOUL	12	19	1515	S33	W03	12	19.4	B	CS0	180	3	5	1
4906		RAMY	12	19	1700	S33	W05	12	19.3	B	CS0	120	2	4	2
4906		HOLL	12	19	1805	S31	W08	12	19.1	B	CS0	90	4	4	3
4906	24492	MWIL	12	19	2300	S33	W08	12	19.3	4	(AP)				
4906		LEAR	12	20	0002	S31	W09	12	19.3	A	HS	180	1	3	3
4906		CULG	12	20	0510	S32	W12	12	19.3	A	HS	90	1	3	2
4906		SVTO	12	20	1104	S34	W14	12	19.3	A	HH	120	1	3	3
4906		RAMY	12	20	1420	S33	W16	12	19.3	A	HS	90	1	2	3
4906	24492	MWIL	12	20	1545	S33	W16	12	19.4	5	(AP)				
4906		HOLL	12	20	1900	S34	W21	12	19.1	A	HS	100	1	2	2
4906		LEAR	12	21	0001	S31	W20	12	19.4	A	HS	130	1	2	2
4906		CULG	12	21	0400	S32	W25	12	19.2	A	HS	90	1	4	1
4906		SVTO	12	21	0957	S34	W26	12	19.3	A	HH	110	1	3	2
4906		RAMY	12	21	1243	S33	W28	12	19.3	A	HS	70	1	2	3
4906	24492	MWIL	12	21	1600	S34	W28	12	19.4	5	(AP)				
4906		HOLL	12	21	1726	S31	W32	12	19.2	A	HS	100	1	2	3
4906		LEAR	12	22	0028	S31	W32	12	19.5	A	HS	80	1	2	3
4906		CULG	12	22	0430	S32	W37	12	19.2	A	HS	40	1	1	2
4906		SVTO	12	22	0742	S33	W38	12	19.3	A	HS	110	1	2	3
4906		BOUL	12	22	1511	S33	W42	12	19.3	A	HA	60	2	2	2
4906		RAMY	12	22	1535	S33	W42	12	19.3	B	HS	130	1	2	3
4906	24492	MWIL	12	22	1600	S34	W42	12	19.3	5	(AP)				
4906		HOLL	12	22	1620	S32	W41	12	19.4	A	HA	120	1	3	3

SUNSPOT GROUPS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

DECEMBER 1987

NOAA/ USAF Group	Mt Wilson Group	Sta	Observation			CMP Mo Day	Max H	Mag Class	Spot Class	Corrected Area		Spot Count	Long. Extent (Deg)	Qual
			Mo	Day	Time (UT)					Lat	CMD			
4906		LEAR	12	23	0015	S31 W44	12 19.5	A	HS	60	1	2	3	
4906		CULG	12	23	0440	S33 W50	12 19.2	A	HS	40	1	1	1	
4906		SVTO	12	23	0933	S33 W51	12 19.3	A	HS	110	1	2	3	
4906	24492	MWIL	12	23	1600	S34 W55	12 19.3	5	(AP)					
4906		RAMY	12	23	1645	S34 W53	12 19.5	A	HS	100	1	2	3	
4906		HOLL	12	23	1733	S32 W56	12 19.3	A	HS	110	1	2	4	
4906		LEAR	12	24	0007	S34 W58	12 19.4	A	HS	100	1	2	3	
4906		CULG	12	24	0440	S33 W61	12 19.3	A	HS	30	1	1	2	
4906		SVTO	12	24	1105	S34 W66	12 19.2	A	HS	150	1	2	3	
4906		RAMY	12	24	1240	S34 W64	12 19.4	A	HS	130	1	2	3	
4906		HOLL	12	24	1540	S32 W68	12 19.3	A	HS	100	1	2	3	
4906	24492	MWIL	12	24	1600	S34 W66	12 19.4	4	(AP)					
4906		PALE	12	24	1834	S34 W70	12 19.2	A	HS	60	1	2	3	
4906		LEAR	12	25	0005	S33 W69	12 19.5	A	HS	180	1	2	3	
4906		CULG	12	25	0440	S33 W74	12 19.3	A	HS	30	1	1	3	
4906		SVTO	12	25	0810	S34 W75	12 19.4	A	HS	60	1	2	3	
4906		RAMY	12	25	1350	S34 W78	12 19.3	A	HS	120	1	2	3	
4906		BOUL	12	25	1515	S35 W81	12 19.1	A	HA	60	1	1	1	
4906	24492	MWIL	12	25	1700	S33 W78	12 19.5	4	AP					
4906		PALE	12	25	1907	S34 W83	12 19.2	A	HS	60	1	2	2	
4906		LEAR	12	26	0004	S33 W82	12 19.5	A	HA	120	1	2	3	
4908		LEAR	12	14	0842	S26 E68	12 19.6	A	AX	10	1	1	3	
4908		RAMY	12	14	1345	S26 E66	12 19.7	A	AX	10	2	2	4	
4908	24493	MWIL	12	14	1945	S26 E62	12 19.6	3	(AP)					
4908		HOLL	12	14	2011	S26 E61	12 19.6	A	AX	10	1	1	2	
4908		LEAR	12	15	0002	S23 E60	12 19.6	B	BX	20	2	7	3	
4908		CULG	12	15	0440	S25 E57	12 19.6	A	AX		1		2	
4908		LEAR	12	16	0003	S23 E42	12 19.2	B	BX	10	2	6	3	
4908		HOLL	12	20	1900	S22 W17	12 19.5	A	AX		1		2	
4908A	24494	MWIL	12	14	1945	S34 E68	12 20.2	3	(AP)					
4911		SVTO	12	22	0742	S39 W21	12 20.6	B	CRO	20	4	3	3	
4911		RAMY	12	22	1535	S39 W26	12 20.5	B	BXO	10	4	3	3	
4911	24497	MWIL	12	22	1600	S40 W25	12 20.6	4	(B)					
4911		HOLL	12	22	1620	S37 W28	12 20.4	B	BXO	20	4	4	3	
4911		LEAR	12	23	0015	S36 W27	12 20.8	B	BXO	10	4	4	3	
4911		SVTO	12	23	0933	S38 W35	12 20.6	B	CRO	20	3	5	3	
4911		RAMY	12	23	1645	S38 W38	12 20.6	A	AX		1	1	3	
4911		HOLL	12	23	1733	S37 W42	12 20.3	A	AX	10	1	1	4	
4911		RAMY	12	24	1240	S39 W47	12 20.7	A	AX	10	1	1	3	
4909		RAMY	12	17	1419	N23 E73	12 23.2	A	AX	10	1	1	3	
4909		HOLL	12	17	1620	N19 E74	12 23.3	B	BXO	30	2	7	3	
4909		LEAR	12	18	0034	N17 E69	12 23.3	B	HS	50	1	1	2	
4909		CULG	12	18	0500	N20 E69	12 23.5	B	BXO	30	2	4	1	
4909		SVTO	12	18	0850	N21 E63	12 23.2	B	BXO	40	4	4	3	
4909		RAMY	12	18	1350	N22 E61	12 23.3	B	CRO	30	2	4	4	
4909		HOLL	12	18	1935	N19 E57	12 23.2	B	CSO	40	3	7	2	
4909		LEAR	12	19	0036	N19 E49	12 22.8	B	CSO	30	4	3	2	
4909		CULG	12	19	0415	N20 E53	12 23.2	B	BXO	40	2	4	2	
4909		BOUL	12	19	1515	N24 E44	12 23.0	A	AX	10	2	1	1	
4909		RAMY	12	19	1700	N23 E45	12 23.2	A	HS	20	1	1	2	
4909		HOLL	12	19	1805	N19 E45	12 23.2	A	AX	20	3	1	3	
4909	24495	MWIL	12	19	2300	N23 E40	12 23.0	3	(AP)					
4909		LEAR	12	20	0002	N23 E42	12 23.2	B	BX	10	2	3	3	
4909		RAMY	12	20	1420	N23 E33	12 23.1	A	AX		1	1	3	
4913		SVTO	12	25	0810	S21 W03	12 25.1	4	B BXO	10	6	3	3	
4913	24498	MWIL	12	25	1700	S22 W08	12 25.1		X					
4913		PALE	12	25	1907	S21 W09	12 25.1	B	BXO	10	2	2	2	
4913		LEAR	12	26	0004	S16 W11	12 25.2	B	BXO	10	2	3	3	
4913A		RAMY	12	26	1405	S36 W07	12 26.0	A	AX		1	1	3	
4913B		LEAR	12	26	0004	N17 E16	12 27.2	B	BXO	10	3	1	3	
4913B		CULG	12	26	0440	N13 E11	12 27.0	B	BXO	10	2	2	2	
4913B		RAMY	12	26	1405	N15 E07	12 27.1	A	AX		1	1	3	

SUNSPOT GROUPS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

DECEMBER 1987

NOAA/ USAF Group	Mt Wilson Group	Sta	Observation			Lat	CMD	CMP Mo Day	Max H	Mag Class	Spot Class	Corrected		Spot Count	Long. Extent (Deg)	Qual
			Mo	Day	Time (UT)							Area (10 <sup>-6</sup>	Hemi)			
4915		RAMY	12	29	1350	S36	W31	12	27.1	B	BXO	70	6	5	3	
4915		HOLL	12	29	1655	S33	W33	12	27.1	B	BXO	20	5	5	3	
4915		PALE	12	29	1808	S33	W31	12	27.3	B	BXO	30	7	5	4	
4915		LEAR	12	30	0025	S35	W35	12	27.2	B	CRO	20	9	7	3	
4915		CULG	12	30	0340	S34	W38	12	27.1	B	BXO	30	3	4	2	
4915		SVTO	12	30	0800	S36	W39	12	27.2	B	CSO	50	4	5	3	
4915		RAMY	12	30	1530	S37	W43	12	27.2	B	CRO	50	5	5	4	
4915		BOUL	12	30	1540	S36	W43	12	27.2	B	BXO	50	3	3	2	
4915	24500	MWIL	12	30	1800	S36	W44	12	27.2	3	(B)					
4915		HOLL	12	30	1815	S32	W45	12	27.2		B	CAO	40	4	7	2
4915		LEAR	12	31	0010	S31	W43	12	27.6		B	CRO	50	5	6	3
4915		CULG	12	31	0405	S34	W51	12	27.1		B	CRO	50	2	5	3
4915		RAMY	12	31	1420	S33	W53	12	27.4		B	CRO	20	3	7	2
4915	24500	MWIL	12	31	1630	S35	W57	12	27.1	4	(BP)					
4915		BOUL	12	31	1640	S34	W57	12	27.1		A	AX	40	1	2	1
4915		HOLL	12	31	1747	S34	W55	12	27.3		B	CSO	20	2	8	4
4915		PALE	12	31	2150	S35	W65	12	26.7		A	HS	50	1	2	1
4915		LEAR	01	01	0006	S35	W64	12	27.0		A	HS	20	1	1	3
4915		CULG	01	01	0440	S33	W67	12	27.0		A	AX	30	1	1	3
4915		RAMY	01	01	1457	S36	W71	12	27.0		A	AX	10	1	1	2
4915		BOUL	01	01	1522	S35	W73	12	26.9		A	AX	10	1	1	1
4915	24500	MWIL	01	01	1630	S34	W72	12	27.0	3	(AP)					
4915		LEAR	01	02	0030	S35	W79	12	26.8		A	AX	30	1	1	3

Stations reporting:

BOUL = Boulder  
CULG = Culgoora

HOLL = Holloman  
LEAR = Learmonth

MWIL = Mt. Wilson  
PALE = Palehua

RAMY = Ramey  
SVTO = San Vito



S U D D E N I O N O S P H E R I C D I S T U R B A N C E S

DECEMBER 1987

Day	Start (UT)	Max (UT)	End (UT)	Imp	Wide-spread Index	Number of Station Reports by Type					Known Flare	X-ray Class	NOAA/SESC Region
						SWF	SEA	SPA	LF-SPA	SES			
01	1536	1548	1551	1	1	1						No flare reported	
05	1827	1832	1846	1	1	1						No flare reported	
06	0242	0251	0319	1-	3			1	1			0239 UT	4901
06	0551	0600	0656	1+	3			1	1			0550 UT C3.7	4901
08	1602	1606	1608	1-	1	1						No flare reported	
09	0111	0116	0145	1-	1			1				0106 UT C1.1	4901
09	0242	0246	0303	1-	1			1				0236 UT C1.0	
10	0107	0109	0117	1-	1			1				No flare reported	
10	1405	1408	1416	1-	3					3		1402 UT C1.5	
10	1521	1534	1630	2	3					3		1519 UT C1.1	
11	0017	0053	0117	1-	1			1				0016 UT C1.3	
11	2314	2320	2335	1-	1			1				No flare reported	
11	2339	2358	0044	1-	1			1				No flare reported	
12	0057	0108	0136	1-	1			1				No flare reported	
12	0148	0230	0337	1-	3			1	1			No flare reported	
12	0559	0608	0720	1-	1			1				0557 UT C1.3	
12	1402	1418	1429	1	1	1						No flare reported	
12	1633	1638	1746	2	3					3		No flare reported	
12	2251	2259	2341	1-	1			1				No flare reported	
13	0345	0358	0456	1-	3			1	1			0337 UT C1.8	
13	0630	0635	0745	1-	1			1				0625 UT C1.6	
14	0422	0429	0551	2+	3	1		1	1			0420 UT C1.8	4908
14	1625	1640	1645	2	1			1		1		No flare reported	
14	2116	2123	2143	1-	1			1				2114 UT C1.8	4908
15	2131	2146	2213	1-	1			1				*	
15	2207	2211	2226	1	1	1						*	
17	0753	0803	0813	1-	1			1				0746 UT C1.2	
20	0611	0616	0712	1-	1			1				No flare reported	
22	0722	0740	0803	1	1			1				0719 UT C1.2	
24	0438	0454	0611	1-	1			1				0438 UT C1.3	
24	2348	2354	0043	1-	1			1				2345 UT C2.1	
25	0106	0107	0119D	1-	1			1				No flare reported	
25	0217	0222	0235	1-	1			1				No flare reported	
25	0345	0356	0417	1-	1			1				No flare reported	
26	0157	0223	0311	1	1			1				0152 UT C4.6	
26	0457	0507	0547	1-	1			1				0454 UT C1.1	
26	1758	1802	1835	2	5					7		1804EUT M1.8	4912
26	2010	2035	2200	1	1			1		1		2019EUT	4912

S U D D E N I O N O S P H E R I C D I S T U R B A N C E S

DECEMBER 1987

Day	Start (UT)	Max (UT)	End (UT)	Imp	Wide-spread Index	Number of Station Reports by Type					Known Flare	X-ray Class	NOAA/SESC Region
						SWF	SEA	SPA	LF-SPA	SES			
27	0715E	0724	0823	2+	1			1			0714 UT	C5.5	4912
27	0825	0827	0853	1-	1			1			0822 UT	C1.9	
27	1015	1020	1030D	1-	3	1		1	1		1011 UT	C2.5	
27	1027	1048	1120	2	3	2		1	1	1	1027 UT	C9.1	
27	1759	1802	1815	1	3			1		5	1756 UT	C3.1	4912
27	2130	2148	2243	1-	1			1			2129 UT	C4.4	4912
27	2302	2305	2327	1-	1			1			2302 UT	C1.1	4912
28	0148	0154	0220	1-	1			1			0148 UT	C1.3	4912
28	0415	0421	0517	1-	1			1			0416 UT	C1.8	4912
28	0607	0619	0747	3	1			1			0605 UT	C7.3	4912
29	0708	0716	0808	1-	1			1			0708 UT		4912
29	2320	2336	0017	1-	1			1			2321 UT	C1.7	4912
30	0046	0052	0116	1-	1			1			No flare reported		
30	0142	0158	0346	1	1			1			0142 UT	C4.1	4912

\*No flare patrol.

O B S E R V A T O R I E S R E P O R T I N G F O R D E C E M B E R \*

Amherst, New Hampshire, USA	SES	Kuhlungsborn, German Dem Rep	SEA, SPA
Ayrshire, Scotland	SES	Latrobe, Pennsylvania	SES
Darmstadt, German Fed Rep	SWF	Lintong, People's Rep of China	SPA
Farsta, Sweden	SES	Louisville, Kentucky, USA	SES
Hiraiso, Japan	SWF	Maui, Hawaii, USA	SWF
Houston, Texas, USA	SES	Sao Paulo, Brazil	SES, SPA
Huancayo, Peru	SWF	Somersworth, New Hampshire, USA	SES
Inubo, Japan	SPA	Tavares, Florida, USA	SES
Juliusruh, German Dem Rep	SWF	Tucson, Arizona, USA	SES
Kandilli, Turkey	SEA	Valley Cottage, New York, USA	SES

\*Observations are not necessarily continuous.

S I D S b y N O A A / S E S C R E G I O N S

DECEMBER 1987

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	25	26	27	28	29	30	31
Region No.																															
4901						2				1																					
4908														2																	
4912																											2	4	3	2	1
X-ray						1			2	2	1	1	2	2			1					1		2		3	7	3	1		
No Flare		1		1			1		1	2	5		1							1				3						1	
No Flare Patrol																2															
No Data																															
Event Totals		1		1	2		1	2	3	3	6	2	3	2		1				1		1		2	3	4	7	3	2	2	

SOLAR RADIO EMISSION--SPECTRAL OBSERVATIONS

DECEMBER 1987

Day	Observation		Sta	Decimetric Band			Metric Band			Dekametric Band			Spectral Type
	Start (UT)	End (UT)		Start (UT)	End (UT)	Int (1-3)	Start (UT)	End (UT)	Int (1-3)	Start (UT)	End (UT)	Int (1-3)	
01	0000	0719	CULG				0630.5	0632.0	1				IIIG
			CULG				0631.0	0632.0	1				III
			LEAR				0631.0	0631.0	2				III
	0736	1505	WEIS										
	2019	2400	CULG										
02	0000	0720	CULG										
	0737	0811	WEIS										
	0820	0937	WEIS							1931.0	1932.0	1	III
			PALE										
	2021	2400	CULG										
03	0000	0722	CULG										
	2022	2400	CULG										
04	0000	0722	CULG										
	2022	2400	CULG										
05	0000	0722	CULG										
	2022	2400	CULG										
06	0000	0722	CULG										
	2023	2400	CULG										
07	0000	0723	CULG										
	2023	2400	CULG										
08	0000	0723	CULG										
	2024	2400	CULG										
09			LEAR				0251.0	0252.0	2				III
	0000	0724	CULG				0252.0	0253.0	1				IIIB
	0745	1502	WEIS										
	2024	2400	CULG										
10	0000	0724	CULG										
	0747	1355	WEIS										
	1408	1503	WEIS										
	2024	2400	CULG										
11	0000	0724	CULG										
	0748	1502	WEIS										
	2024	2400	CULG										
12	0000	0725	CULG				0008.0	0008.0	1	0008.0	0008.5	1	IIIB
			LEAR				0107.0	0107.0	2				III
			LEAR				0237.0	0237.0	1				III
			CULG				0238.0	0238.0	1				III
			CULG				0238.5	0238.5	1				IIIB,RS
	0752	1503	WEIS				1144.2	1144.6	2				IIIG
			WEIS				1348.6	1348.7	1				IIIB
	2025	2400	CULG				2112.0	2112.0	1				IIIB
13			LEAR				0306.0	0307.0	2				III
	0000	0725	CULG				0306.5	0307.5	2				IIIG
			CULG				0626.0	0626.0	1				III
			LEAR				0626.0	0626.0	1				III
			LEAR				0742.0	0742.0	1				III
	0750	1503	WEIS				1307.2	1307.3					IIIB
	2025	2400	CULG				2037.5	2218.0	1				IIIN,B
			CULG				2038.0	2218.0	1				S
14	0000	0725	CULG				0004.5	0005.0	2	0004.5	0005.0	2	IIIB
			LEAR				0019.0	0023.0	3				III
			CULG				0021.5	0022.0	2	0021.5	0022.0	2	IIIB
			LEAR				0412.0	0444.0	3				S
			CULG							0513.0	0515.0	2	III
			CULG				0513.5	0515.0	2				III,V,G
			CULG				0521.0	0527.0	3				III
			CULG				0521.5	0526.5	3	0521.5	0526.5	3	III,V,G





SOLAR RADIO EMISSION--SPECTRAL OBSERVATIONS

77  
Dec 87

DECEMBER 1987

Day	Observation		Sta	Decimetric Band			Metric Band			Dekametric Band			Spectral Type			
	Start (UT)	End (UT)		Start (UT)	End (UT)	Int (1-3)	Start (UT)	End (UT)	Int (1-3)	Start (UT)	End (UT)	Int (1-3)				
28	0000	0734	CULG				0000.0	0734.0	1	0000.0	0734.0	1	IIIS			
			LEAR				0012.0	1051.0	1				CONT			
				PALE				0015.0	0032.0	1			S			
				LEAR				0150.0	0205.0	2			S			
				LEAR				0150.0	0159.0	1			III			
				LEAR				0225.0	0225.0	2			III			
				LEAR				0247.0	0247.0	2			III			
				LEAR				0518.0	0537.0	2			S			
				LEAR				0606.0	0722.0	2			S			
		0758	1509	WEIS				0807.0	1506.0	2				IIIN,DP,RS		
	WEIS						1019.4	1020.2	2				DP			
				PALE				1837.0	1837.0	1				III		
				PALE				1853.0	1926.0	1				S		
				PALE				1951.0	1951.0	1				III		
				PALE				2001.0	2002.0	1				III		
		2034	2400	CULG				2034.0	2400.0	2	2034.0	2400.0	2	IIIS		
						PALE				2034.0	2035.0	1				III
						PALE				2103.0	2109.0	1				III
						PALE				2123.0	2124.0	1				III
						PALE				2138.0	2138.0	1				III
					PALE				2234.0	2235.0	1				III	
					LEAR				2235.0	2235.0	1				III	
					PALE				2302.0	2302.0	2				III	
					LEAR				2305.0	2305.0	1				III	
					PALE				2325.0	2326.0	1				III	
					LEAR				2326.0	2326.0	2				III	
					LEAR				2342.0	2342.0	2				III	
					LEAR				2343.0	1052.0	2				CONT	
			LEAR				2359.0	0022.0	2				S			
29	0000	0734	CULG				0000.0	0734.0	2	0000.0	0734.0	2	IIIS			
			PALE				0019.0	0022.0	1				III			
			PALE				0032.0	0032.0	1				III			
			PALE				0043.0	0146.0	2				CONT			
			CULG				0310.0	0734.0	1				I			
		0758	1337	WEIS				0850.0	1337.0	3				IIIN,DP,RS		
	PALE						1923.0	1932.0	1				III			
		2034	2400	PALE				2004.0	2113.0	1				CONT		
	CULG						2034.0	2400.0	1	2034.0	2400.0	1	IIIS			
				LEAR				2324.0	1021.0	1				CONT		
	30	0000	0734	CULG				0000.0	0734.0	1	0000.0	0734.0	1	IIIS		
				LEAR				0206.0	0210.0	3				III		
				PALE				0206.0	0210.0	1				III		
LEAR							0829.0	0830.0	3				III			
				SVTO				0830.0	0830.0	2				III		
		1035	1511	WEIS				1039.0	1511.0	2				IIIN,DP,RS		
CULG							2034.0	2400.0	1	2034.0	2400.0	1	IIIS			
				PALE				2050.0	2054.0	1				III		
31	0000	0734	CULG				0000.0	0734.0	1	0000.0	0734.0	1	IIIS			
			LEAR				0030.0	0930.0	1				CONT			
			LEAR				0204.0	0205.0	2				III			
			PALE				0204.0	0205.0	1				III			
		0758	1512	WEIS				1024.0	1329.0	1				IIIN		
	WEIS						1331.8	1333.9	3				IIIGG,B,RS			
				PALE				1905.0	1913.0	1				III		
		2034	2400	CULG				2034.0	2400.0	1	2034.0	2400.0	1	IIIS		
	LEAR						2317.0	1053.0	1				CONT			

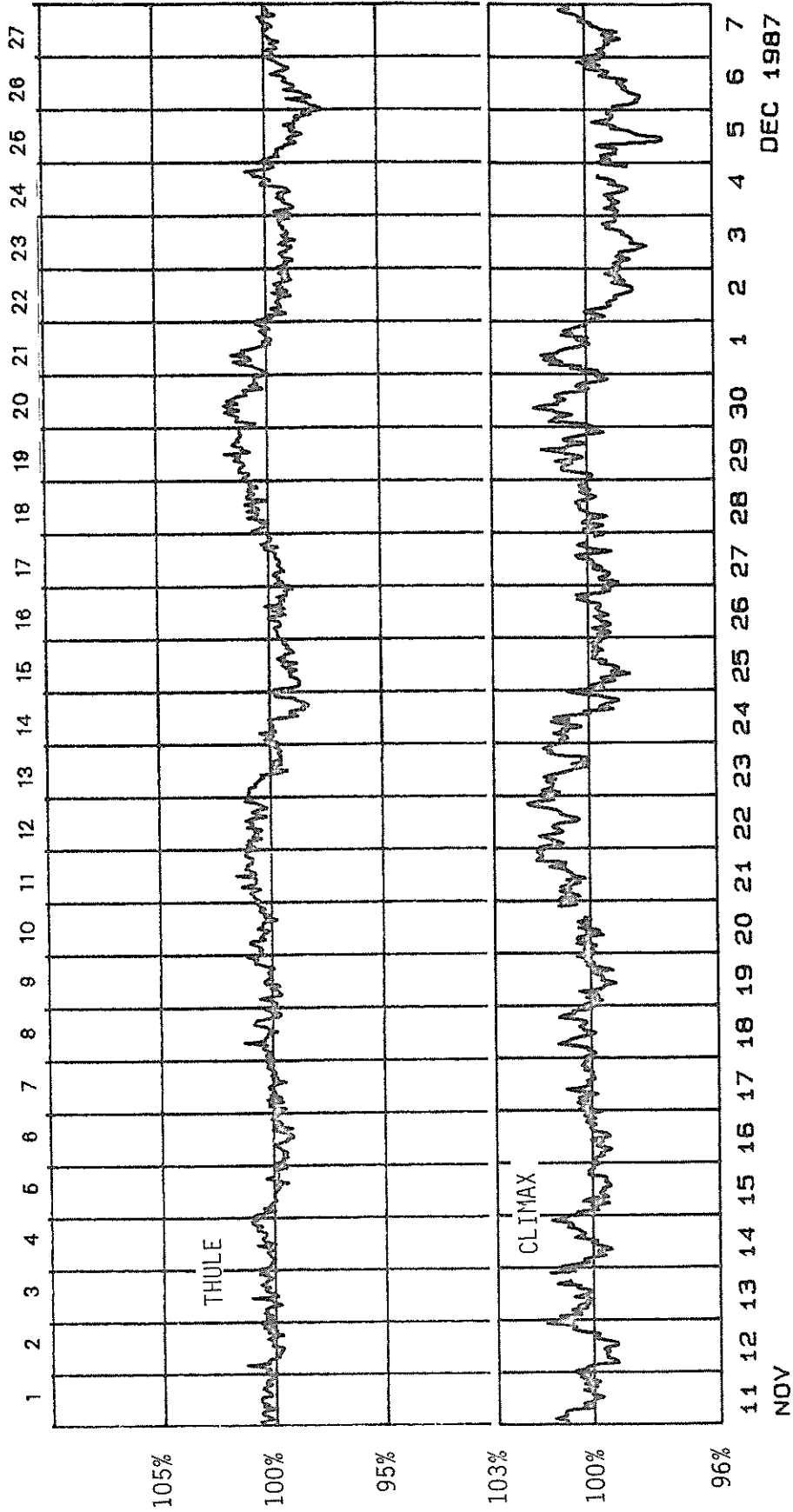
The symbols used under the column heading SPECTRAL TYPE have the following definitions:

- B = Single burst
- G = Small group (< 10) of bursts
- GG = Large group (> 10) of bursts
- C = Underlying continuum (particularly with Type I)
- S = Storm in the sense of intermittent but apparently connected activity
- N = Intermittent activity in this period
- U = U-shaped burst of Type III

- RS = Reverse slope burst
- DP = Drifting pairs
- DC = Drifting chains
- H = Herringbone
- W = Weak
- P = Pulsations
- CONT = Continuum
- UNCLF = Unclassified activity

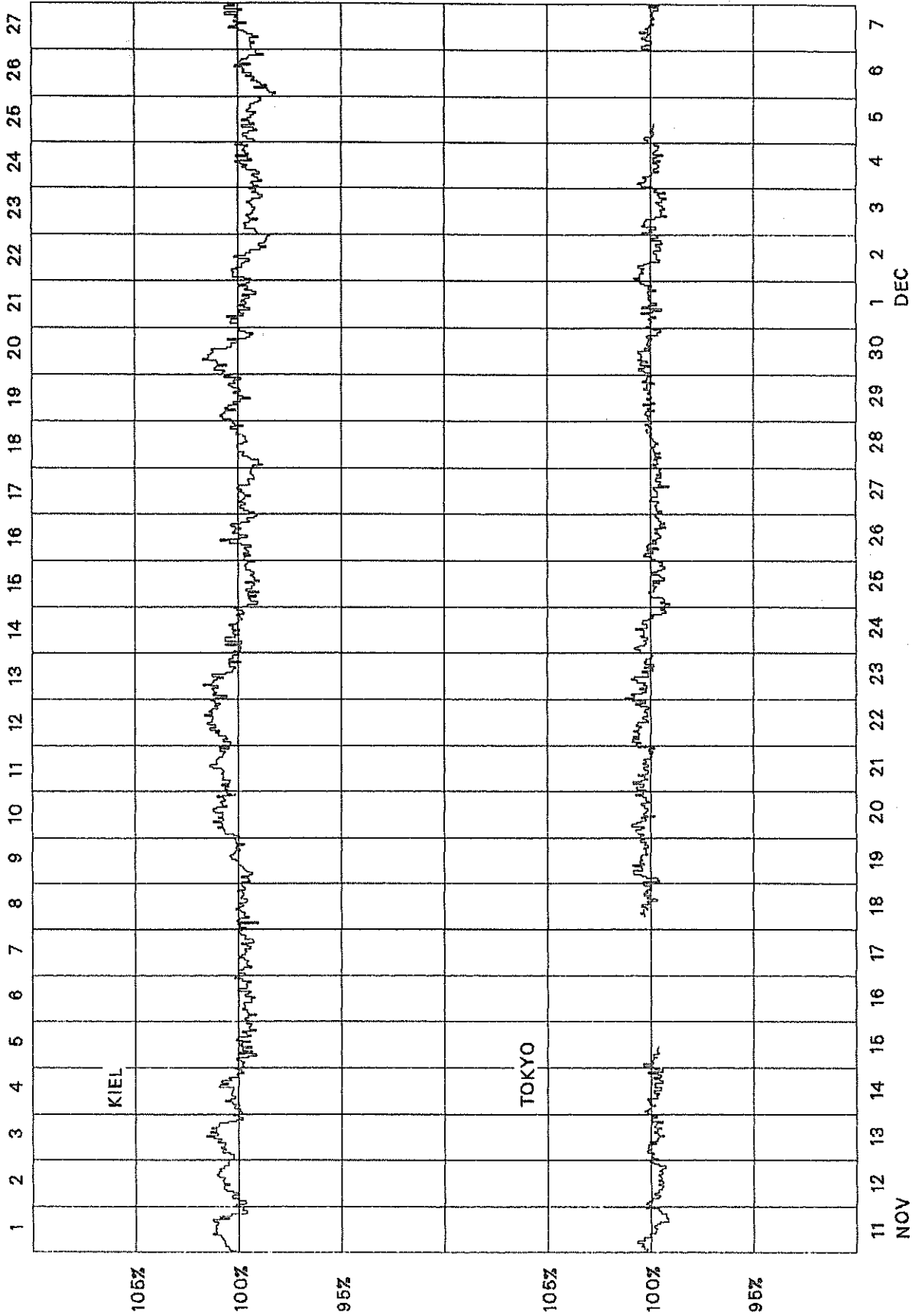
# COSMIC RAY INDICES (Neutron Monitor)

Bartels Rotation 2108 (November-December 1987)



# COSMIC RAY INDICES (Neutron Monitor)

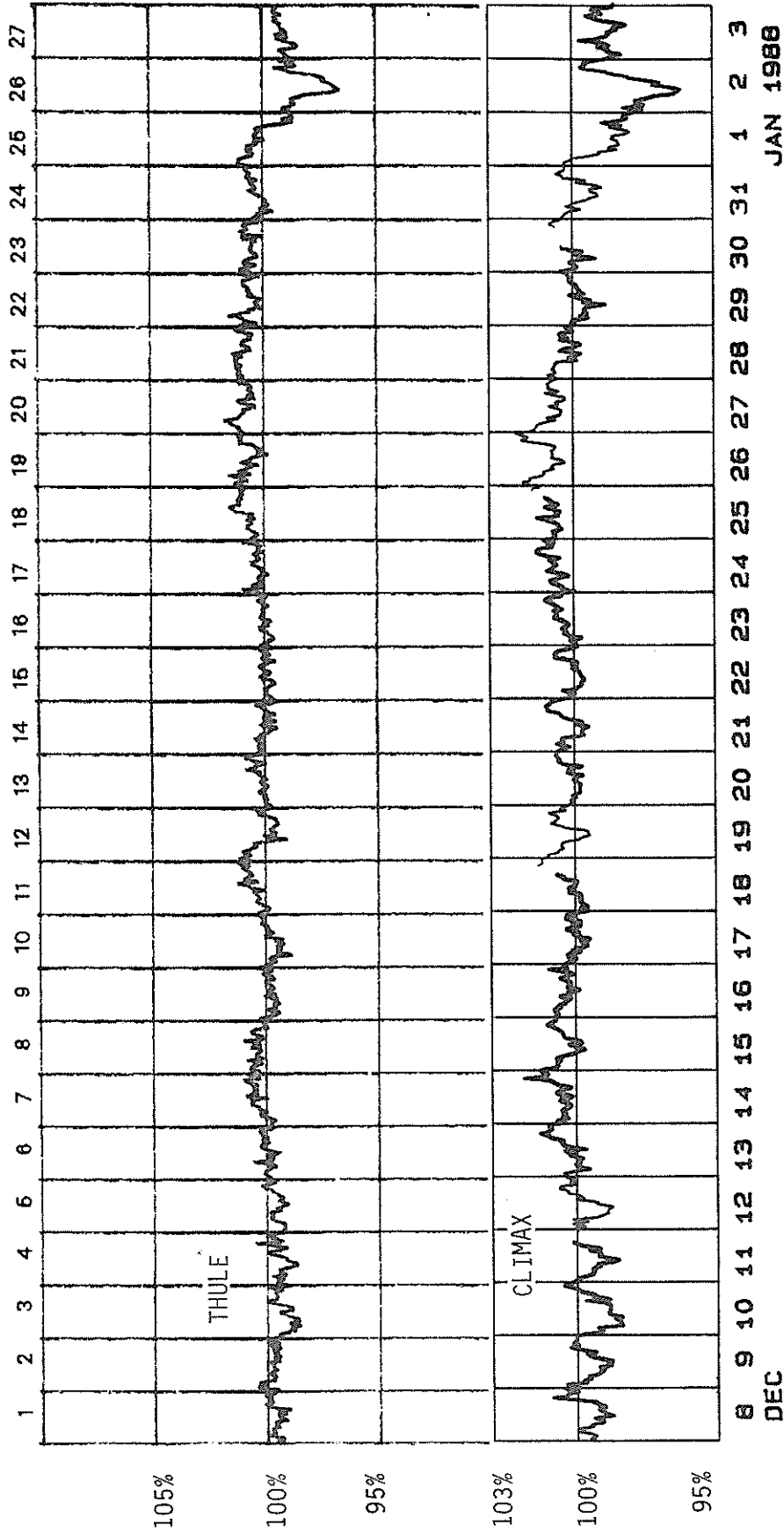
Bartels Rotation 2108 (November 1987-December 1987)





# COSMIC RAY INDICES (Neutron Monitor)

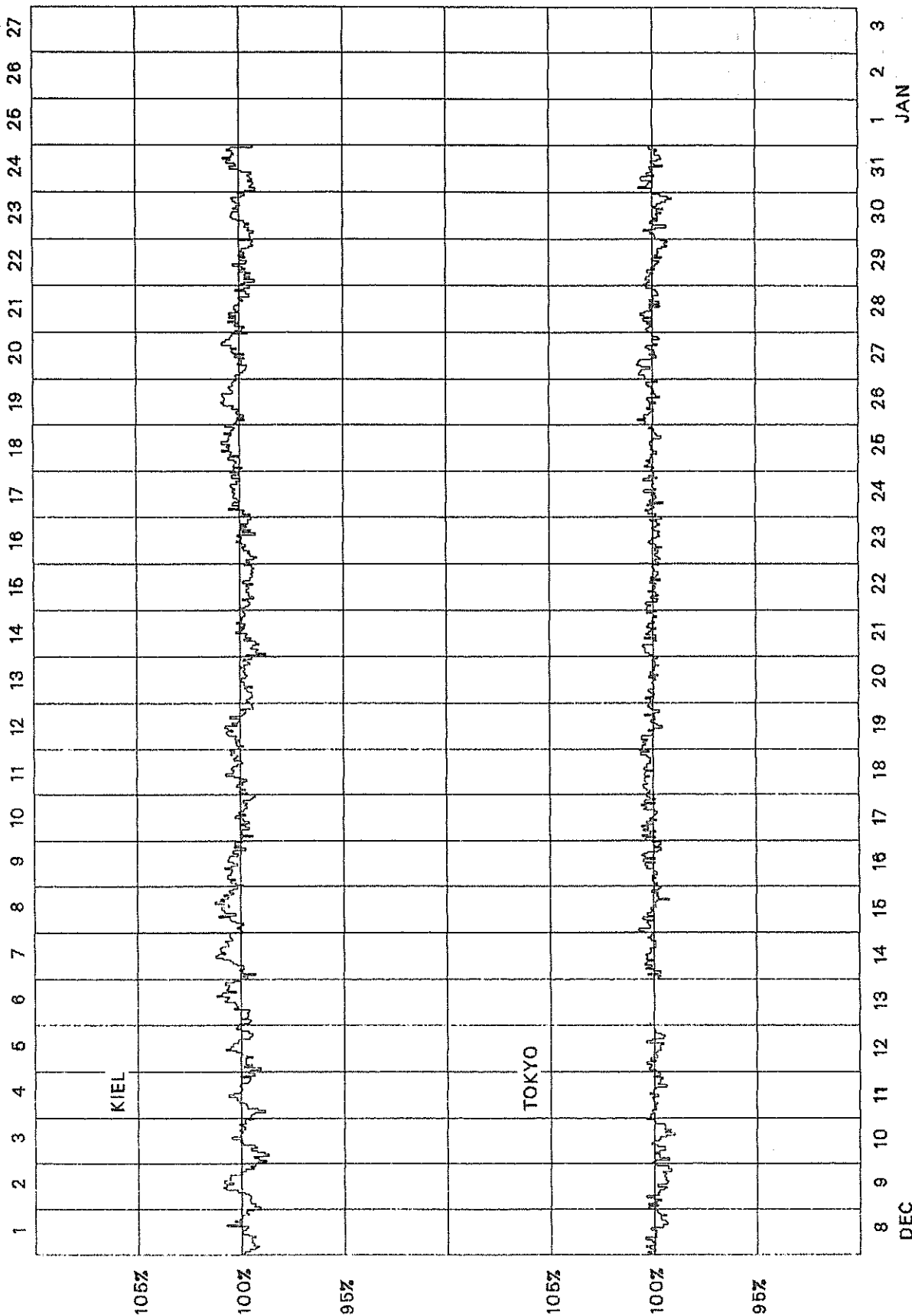
Bartel's Rotation 2109 (December 1987-January 1988)



# COSMIC RAY INDICES

(Neutron Monitor)

Bartels Rotation 2109 (December 1987-January 1988)



C O S M I C R A Y I N D I C E S  
(Neutron Monitor)

DECEMBER 1987

Day	THULE Average (cts/h)/100	ALERT Average (cts/h)/100	DEEP RIVER Average (cts/h)/300	KIEL Average (cts/h)/100	CLIMAX Average (cts/h)/100	PREDIGTSTUHL Average (cts/h)/100	TOKYO Average (cts/h)/256	HUANCAYO Average (cts/h)/100
01	4379			6105.5	4036.1		3625.5	
02	4331			6085.3	3983.2		3623.8	
03	4320			6075.1	3969.7		3614.3	
04	4340			6087.5	3981.0		3619.5	
05	4308			6079.4	3975.2		3624.0	
06	4309			6071.1	3977.9		---	
07	4350			6107.3	4006.2		3625.5	
08	4370			6128.5	4023.6		3625.1	
09	4376			6141.0	4023.8		3616.6	
10	4353			6120.0	4007.7		3617.4	
11	4362			6131.0	4019.3		3625.4	
12	4367			6137.1	4030.4		3625.3	
13	4385			6158.9	4055.4		3635.0	
14	4403			6170.1	4065.0		3632.2	
15	4404			6174.2	4059.0		3630.1	
16	4378			6164.0	4056.0		3629.7	
17	4375			6130.1	4039.8		3634.8	
18	4410			6152.5	4048.9		3639.7	
19	4391			6149.4	4055.8		3633.0	
20	4396			6124.2	4044.8		3628.5	
21	4387			6122.5	4053.1		3632.6	
22	4382			6117.6	4042.0		3626.7	
23	4386			6124.7	4057.8		3622.2	
24	4401			6153.9	4069.7		3628.8	
25	4423			6169.9	4072.8		3629.0	
26	4420			6164.7	4084.6		3632.7	
27	4426			6151.9	4071.7		3635.3	
28	4429			6145.0	4052.5		3631.7	
29	4415			6126.2	4031.1		3623.1	
30	4412			6138.7	4045.0(30)		3619.0	
31	4400			6138.6	4033.8		3629.5	
Mean	4380			6130.5	4034.6		3627.2	

For less than 24-hour coverage, parentheses enclose the number of hours for which data are available.  
For Climax and Huancayo, parentheses enclose the number of section hours whenever the sum of both sections falls below 40 hours.

G E O M A G N E T I C   A C T I V I T Y   I N D I C E S

December 1987

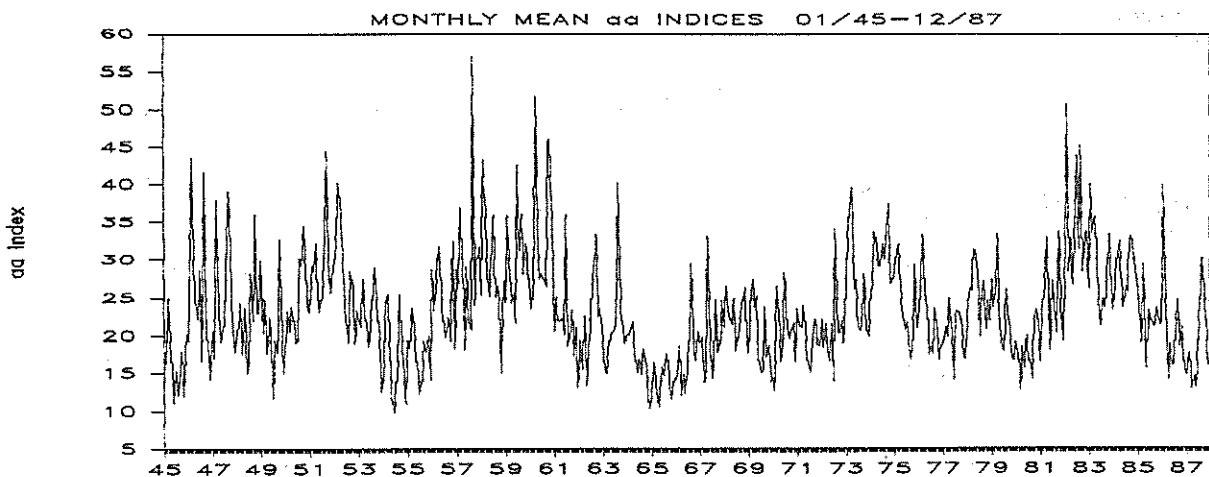
Kp Three-Hourly Indices										Km Three-Hourly Indices								aa Provisional						
Day	1	2	3	4	5	6	7	8	Sum	Ap	Cp	1	2	3	4	5	6	7	8	Am	N	S	M	
1	1+	2-	1-	2-	1	1+	1+	1-	10-	5	0.2	2-	1+	1+	2-	1+	1+	2	1+	10	7	10	9	8 CC
2	Q7	2	1+	1-	0+	1	2-	1	1-	9-	4	0.1	2+	1+	1+	0+	2-	2	1+	10	9	10	9	10 CK
3		3-	4-	3-	2	2-	4-	2-	2+	20+	12	0.7	2+	3	2+	2	4-	2	3-	23	26	24	22	28
4		2-	1	1	0+	1	2+	3	4+	15-	10	0.5	2-	1	1	1-	1+	2+	3-	17	20	13	8	25
5	D4*	4	4-	4+	3+	2	3-	3	1+	24+	17	0.9	3+	3	4	3+	3-	3-	3+	32	34	35	46	24
6		1	3-	2-	1	2	2+	2+	3	16	8	0.4	1-	2-	1+	1	2	3-	2	13	17	10	8	19
7	Q10	2	1+	1+	1-	1+	1	1+	0+	9+	4	0.2	1+	1	1	1-	1+	1+	1	7	10	6	8	8 CC
8	Q2	0+	0	0	0+	0+	0	0+	1-	2	1	0.0	0+	0	0	0+	0+	0	0+	2	4	2	2	4 CC
9		1-	0+	0+	1-	0+	0+	3-	4-	9	6	0.3	1-	0	0	1	1-	1-	3	13	12	13	4	21 KK
10	D2	3-	3-	3	3+	4	5+	5+	4+	31-	28	1.2	3	2+	3-	3	4	5-	5	45	48	39	24	63
11		4+	3	1+	2-	2+	3+	3	3+	22+	15	0.8	4+	3-	1	2-	3-	3-	3	26	28	23	24	27
12		3	3+	2+	2+	2+	2	1+	1-	17+	9	0.5	3-	3-	2	3-	3-	2-	1+	16	15	19	24	10
13	Q5	1-	0	1+	1-	1-	2-	1+	1+	8-	4	0.1	1-	0+	1	1-	1	1+	1	6	8	5	5	8 CC
14	Q6	1	1	1+	1-	1-	1-	1+	2-	8+	4	0.1	1	1	1	1	1+	1-	1+	8	9	7	6	10 CC
15		0	0+	1	1	2-	4+	4-	3	15	11	0.6	0+	0	1	1+	2	4-	4-	20	17	16	4	28
16	D1	5-	6-	5+	4	5-	5-	3	4+	36+	39	1.4	4	4+	4	4	4	4	3	52	57	42	52	47
17	D5*	3	4	2-	3	3+	3	3	3+	24+	16	0.9	2+	3	1+	3	4-	3-	3	26	30	23	20	33
18		3+	3+	2+	2-	1+	1	0+	1+	15-	8	0.5	2+	2+	2	2-	1+	1-	1	11	16	7	16	7 C
19		1-	2	2	2+	2+	2	3-	1+	15	7	0.4	0+	1	1+	3-	2	2	3-	13	16	12	12	16 C
20		0+	2-	1+	1+	2	1+	2-	0	10-	4	0.2	1-	1+	1	1+	2+	2-	1+	9	8	11	7	13 CC
21		1-	3	1+	2	2+	2+	3	3+	18	10	0.6	1	2+	1+	2+	3-	2+	3	20	24	11	13	23
22	D3	4	4	4-	3-	3+	3-	4	4+	29-	22	1.1	4-	3	3-	3-	3+	3-	4-	32	48	20	25	43
23		3	4-	2+	2+	2+	2	1+	0+	17+	10	0.5	2+	3-	2	2	2+	2	1+	16	19	14	21	12
24		1	2+	2-	2	2-	2-	1+	2	14-	6	0.3	1	2-	2	2	2-	2-	1+	12	14	13	13	14 CC
25		1+	2+	2-	2-	2-	1+	1	3-	14-	7	0.3	1+	2-	2-	2	2	1+	1+	12	13	13	12	14 CC
26	Q9	1+	2	1-	2-	1	1	1	1-	9+	4	0.2	1+	1+	0+	1+	1+	1+	1	7	9	8	10	7 CC
27	Q1	0+	0	0	0+	0	0+	1-	0+	2	1	0.0	1-	0	0	0	0	0+	0+	1	4	2	3	3 CC
28	Q4	0	0	0+	1-	1-	0+	2-	1	5-	2	0.0	0	0	0+	0+	1-	0	1+	4	8	3	3	8 CC
29		2	2	2+	1+	0+	0+	0+	1-	9+	5	0.2	1+	2-	2+	1+	0+	0	1-	8	10	10	14	6 CC
30	Q3	1-	0+	1	1+	0+	0+	1-	0	5-	3	0.0	1	0+	1	1+	1	0+	0+	5	6	6	8	4 CC
31	Q8	0+	1-	1+	1+	2-	1	2-	1+	9+	4	0.2	1-	0+	1-	2-	2-	1+	2	8	9	9	7	11 CC
Mean										9	0.43								15.6	18.0	14.1		16.0	

Day	Kn Three-Hourly Indices								An	Ks Three-Hourly Indices								As	Sa	Prov			IMF
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8			Ri	Ra	Rs	
1	2-	1	1	2-	1	1+	2	1	9	2-	2	1+	2	2-	1	2+	2-	12	87.6	17	17	33	
2	2-	1+	1	0+	2-	2	1+	1	9	3-	1+	1+	0+	2	2	1+	1	11	86.5	16	14	31	
3	2+	3	2+	2	2-	4-	2	3-	23	2+	3	3-	2	2+	4-	2	2+	22	85.8	18	21	31	
4	2-	1	1	1-	1+	2+	3-	4+	18	2-	1+	1	1	1	2+	3-	4	17	85.1	12	14	30	
5	4-	3+	4-	3	3-	3-	3	2-	31	3	3	4	4-	3-	3-	3+	2-	33	86.8	15	21	32	
6	1-	2-	2-	1	2	3-	2	2+	13	1-	1+	1+	1+	2+	3-	2	3-	14	85.7	19	26	31	
7	1+	1	1-	1-	2-	2-	1	0+	7	1+	1+	1	0+	1	1	1	0	6	85.3	34	31	30	
8	0+	0	0	0	1-	0	1-	0+	2	1-	0	0	0+	0+	0	0	0+	2	88.7	39	35	34	
9	1-	0+	0	1-	1-	0+	3	3+	11	1-	0+	0	1+	0+	1-	3	4+	15	91.2	37	37	36	
10	3-	2	2	3	4	5-	5+	4-	47	3	3-	3	3+	4-	4+	5-	3+	44	90.1	34	32	35	
11	4	3-	1	1+	3-	3-	3-	2+	22	5-	3-	1	2	3-	3-	3-	3-	29	91.1	17	21	36	
12	2+	3-	2	3-	3-	2-	1+	1-	16	3-	3-	2	3	3-	1+	1+	0+	18	91.5#	13	11	37	
13	1-	0+	1+	1-	1	2-	1-	1	6	0+	0+	1	1-	1	1+	1	0+	5	91.1	20	19	36	
14	1	1	1	1	1+	1	1	2-	7	1	1+	1+	1-	2-	1-	2-	2-	8	91.5	26	26	37	
15	0	0	1	1	2	4	4-	3	21	1-	0	1+	1+	2	3+	3+	3+	19	92.0#	42	34	37	
16	4+	4+	5-	4	5-	4+	3	4-	59	4	4	4-	4	4-	4	3	3	46	93.4#	40	35	39	
17	3-	3+	1+	3	4-	3-	3	3	28	2+	3-	2-	3	4-	3-	2	3-	23	92.2	39	33	38	
18	3-	3-	2+	2	1+	1	0+	1	13	2	2	1+	1+	1	0+	1	1-	8	90.2	43	38	35	
19	0+	1+	1+	3-	2	2-	3	1+	14	0+	0+	1	3-	2	2	2	1+	12	88.4	28	33	33	
20	0+	1+	1	2	3-	2-	1+	0+	10	1-	1	1	1-	2+	1+	1+	0+	8	86.9	26	27	32	
21	1-	2+	1+	2+	3-	2	3+	3	20	1+	3-	1+	2+	2+	3-	3-	3-	19	90.7	14	15	36	
22	3+	3+	3	3	3+	3-	4	4	38	4-	3-	2	3-	3	3-	3	3	27	88.1	24	16	33	
23	3-	3	2+	2+	3-	2+	1+	0+	18	2	3-	2	2-	2+	2-	1+	0+	13	88.2	17	20	33	
24	1-	2-	2	2	2-	2	1+	2	12	1	1+	2-	2-	1+	2-	1+	2+	11	89.9	10	15	35	
25	1+	2	2-	2+	2	1+	1	2+	13	1+	1+	2-	2-	2	1+	1+	2-	11	96.2#	28	31	42	
26	1+	2-	0+	2-	1+	1	1-	1-	7	1+	1	0+	1	1	1+	1+	0+	7	96.8#	22	33	43	
27	1-	0	0	0+	0	0+	1-	0	2	1-	0	0	0	0	0	0	0	1	101.4	29	26	48	
28	0	0	0+	0+	1	0	2-	1	4	0	0+	0+	0	0+	0+	1	1+	4	102.5	28	32	49	
29	1+	2	2	1	0+	0+	0+	1	7	1	2-	2+	1+	0+	0	1-	1+	8	101.4	30	36	48	
30	1-	0+	1-	1+	1-	0+	0+	0+	4	1	0+	1+	1+	1+	0+	0+	0+	5	99.2	42	39	45	
31	0+	1-	1	1+	1+	1	2-	2-	8	1-	0+	0+	2-	2-	1+	2+	1	9	99.7	43	40	46	
Mean									16.1									15.1	91.5	26.5	26.7	36.8	

DAILY AVERAGE INDICES Ap

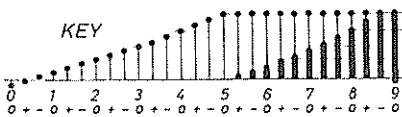
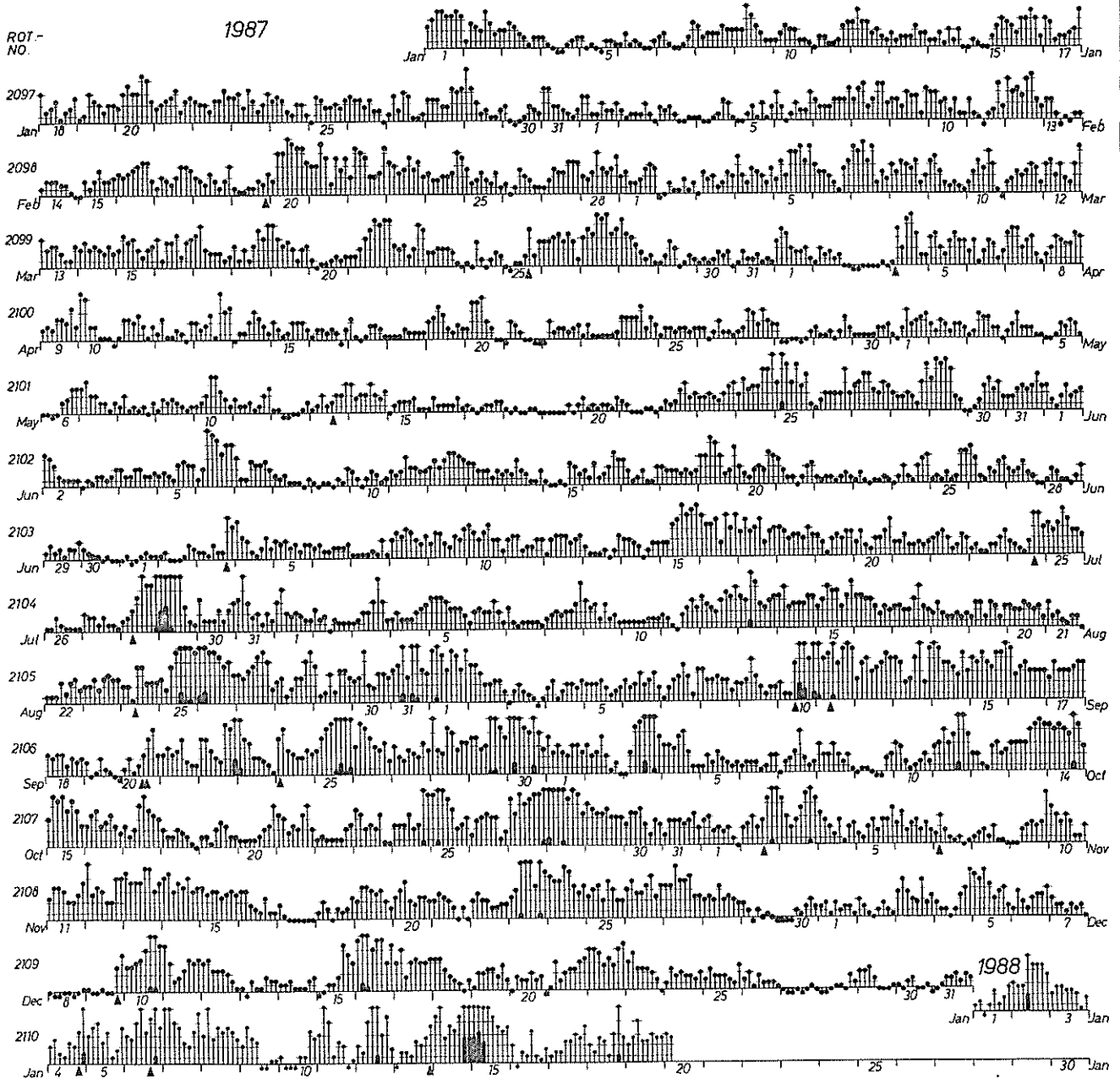
DAY	1987 - DEC 1987											
	JAN	FEB	MAR	JAN APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	18	7	9	10	7	8	2	10	34	13	7	5
2	10	4	3	4	6	8	3	5	12	9	23	4
3	6	4	6	2	6	4	9	12	4	36	27	12
4	3	4	10	16	5	6	8	7	6	14	9	10
5	3	4	21	12	4	7	6	13	6	6	10	17
6	3	7	10	7	5	25	5	8	9	5	9	8
7	5	9	21	13	8	9	4	4	11	8	5	4
8	7	14	12	11	4	4	10	10	10	8	4	1
9	10	11	9	8	4	3	9	8	10	3	10	6
10	6	8	11	10	10	4	11	4	38	7	11	28
11	5	7	8	7	6	7	7	7	40	28	14	15
12	10	18	14	5	2	13	7	16	22	8	20	9
13	6	4	8	12	6	6	4	23	23	24	27	4
14	5	5	8	6	9	6	5	16	26	31	22	4
15	5	6	10	6	4	4	24	19	29	26	14	11
16	12	12	12	4	4	8	20	12	19	13	8	39
17	10	9	10	5	4	6	14	11	17	18	3	16
18	8	7	12	4	2	6	10	6	7	5	5	8
19	7	5	11	8	2	17	8	9	3	6	12	7
20	18	29	4	12	4	8	9	8	11	8	10	4
21	10	19	18	3	3	6	6	5	10	13	6	10
22	10	18	15	4	7	4	8	7	29	5	7	22
23	11	14	6	4	8	3	6	10	17	11	35	10
24	7	12	5	9	20	7	12	11	14	19	24	6
25	7	7	6	4	25	7	17	39	46	28	12	7
26	7	6	13	4	9	9	4	40	20	11	17	4
27	7	12	26	9	14	5	5	21	11	35	20	1
28	11	13	12	2	10	4	26	15	22	44	9	2
29	10		5	4	21	5	52	12	30	19	3	5
30	4		4	4	9	3	9	14	43	13	3	3
31	8		4		11		14	34		11		4
MEAN	8	10	10	7	8	7	11	14	19	16	13	9



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1945	16.1	16.4	25.0	19.1	15.4	11.1	15.3	12.1	15.6	17.9	12.0	20.2	16.3
1946	19.2	30.2	43.5	25.0	24.1	22.3	28.6	16.7	41.7	19.6	19.3	14.3	25.4
1947	20.6	17.1	37.9	23.3	19.1	21.1	21.4	32.9	39.1	31.3	20.7	17.9	25.2
1948	20.8	21.0	24.2	17.7	23.7	15.0	16.2	28.3	22.0	36.1	23.1	23.0	22.6
1949	29.8	20.4	24.7	17.6	22.4	17.9	11.8	19.2	17.8	32.7	24.6	15.1	21.2
1950	19.5	23.2	20.6	23.8	21.7	19.0	19.5	30.2	29.3	34.5	28.0	24.0	24.4
1951	23.1	29.2	28.5	32.1	25.5	23.2	25.2	29.7	44.4	30.3	25.7	28.2	28.8
1952	28.5	34.3	40.1	38.0	33.1	23.8	20.7	19.0	28.5	26.4	18.9	23.4	27.9
1953	22.3	21.2	27.4	22.7	21.4	18.4	22.5	26.1	29.0	22.4	20.2	12.6	22.2
1954	13.9	24.5	25.5	20.6	12.0	9.7	13.1	16.5	25.4	21.1	14.5	10.9	17.3
1955	19.3	18.2	23.6	21.1	16.7	15.1	12.3	14.3	19.1	17.8	19.9	14.1	17.6
1956	28.7	23.3	27.6	31.7	29.3	23.5	19.8	20.7	22.4	19.3	32.3	18.2	24.7
1957	28.7	26.8	36.7	28.8	18.1	29.1	21.7	20.7	57.0	24.0	29.5	31.7	29.4
1958	25.5	43.2	36.1	27.6	25.2	29.7	36.0	25.1	26.5	24.7	15.0	27.2	28.5
1959	24.3	35.9	29.9	24.2	25.7	21.6	42.5	31.2	36.1	28.2	32.1	30.8	30.2
1960	25.2	23.5	27.6	51.5	31.6	27.6	28.1	27.2	26.4	45.6	45.9	34.5	32.9
1961	20.6	25.1	22.0	21.8	22.3	20.1	36.0	18.5	20.7	23.3	17.3	21.1	22.4
1962	13.2	19.2	15.5	22.6	13.4	18.1	21.0	26.2	29.8	33.3	22.5	23.5	21.5
1963	19.3	15.3	14.9	18.2	20.4	20.5	20.8	22.5	40.2	23.5	20.7	18.9	21.3
1964	20.1	20.1	21.0	21.7	17.5	15.1	16.9	14.8	18.2	16.9	13.8	10.3	17.2
1965	11.8	16.3	14.3	12.6	10.5	15.7	14.7	16.8	17.5	13.1	11.7	13.8	14.1
1966	14.2	14.8	18.6	12.0	14.8	12.5	17.1	20.0	29.4	17.5	16.8	20.5	17.3
1967	18.9	19.8	13.8	15.5	33.1	18.6	14.4	17.5	24.7	17.8	18.9	24.5	19.8
1968	21.1	26.5	23.3	22.2	21.4	24.9	18.0	20.1	22.0	24.8	26.2	20.3	22.6
1969	17.8	25.8	27.3	23.6	25.2	16.7	15.0	15.3	23.8	17.2	18.7	13.8	20.0
1970	14.4	12.7	26.4	23.1	16.6	18.3	28.4	21.0	19.7	20.6	21.6	16.5	19.9
1971	23.5	21.2	21.1	23.9	21.1	17.0	15.2	17.1	21.4	22.2	18.8	18.6	20.1
1972	21.9	18.3	21.5	18.1	16.6	21.5	14.0	34.2	20.4	20.4	21.8	18.9	20.6
1973	26.1	32.7	36.9	39.6	26.1	27.3	20.9	20.6	22.8	28.2	20.7	19.9	26.8
1974	25.8	26.4	33.7	32.9	29.2	29.2	32.0	30.2	33.7	37.3	26.8	27.5	30.4
1975	27.6	31.1	32.0	24.3	22.7	20.7	21.7	18.1	16.9	20.2	29.3	21.1	23.8
1976	23.3	28.5	33.4	25.4	23.7	17.5	18.4	17.7	23.7	20.4	16.9	18.6	22.3
1977	18.7	21.0	19.9	24.9	20.1	14.2	22.9	23.2	23.0	20.9	17.3	17.0	20.3
1978	24.6	26.2	25.9	31.3	31.2	28.3	19.9	25.6	27.0	20.8	24.6	22.0	25.6
1979	27.3	23.7	26.9	33.5	21.0	18.3	17.9	26.0	22.0	19.3	17.1	16.8	22.5
1980	19.0	17.3	12.7	18.4	15.6	20.0	17.0	15.9	14.2	21.9	23.3	21.7	18.1
1981	16.5	23.1	26.6	32.8	26.9	18.0	27.2	24.0	20.4	33.7	24.1	19.3	24.4
1982	24.2	50.6	28.5	32.9	26.7	32.1	43.9	31.4	45.1	28.5	33.0	33.8	34.2
1983	26.2	40.0	33.6	35.7	31.6	24.9	21.3	24.9	23.7	28.3	33.5	26.0	29.1
1984	23.5	26.7	30.7	32.5	27.2	23.7	26.4	25.8	32.6	33.1	31.0	29.0	28.5
1985	25.7	24.1	19.0	29.5	15.6	19.9	23.4	22.0	21.2	22.2	23.7	21.4	22.3
1986	22.4	40.0	21.1	14.3	18.8	15.9	16.3	22.3	24.7	18.6	21.2	15.3	20.9
1987	14.8	16.6	17.6	12.9	14.7	13.2	19.3	24.3	30.3	25.8	22.4	16.0	19.0

DAYS IN SOLAR ROTATION INTERVAL

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



▲ = sudden commencement

PLANETARY MAGNETIC  
THREE - HOUR - RANGE INDICES

Kp 1987

(preliminary indices to 1988 January 20)

PRINCIPAL MAGNETIC STORMS

87  
Dec 87

DECEMBER 1987

Sta	Geomag Lat	Commencement			SC Amplitudes			Maximum 3-Hour K Index Day(3-Hour Periods)	Ranges			End Hour Day (UT)	
		Day	Time (UT)	Type	D (Min)	H (Gamma)	Z (Gamma)		D (Min)	H (Gamma)	Z (Gamma)		
HYB	07.6N	04	1100	..	..	..	04(8) 05(3,4)	4	5	62	8	05 23	
ETT	00.6S	04	1200	..	..	..		-	6	136	39	05 23	
COL	64.6N	09	1941	SC*	- 13	50	..	10(6)	7	105	1300	590	11 04
FRD	49.6N	09	1941	SC	1.0	13.9	- 3.8	10(6,7) 11(1)	5	22	107	32	11 06
HON	21.1N	09	1940	SC	0.6	4.9	2.7		5	--	--	--	-- --
JAI	17.3N	09	1339	SC	- 0.8	18	- 5		-	4	79	19	11 24
KRC	16.4N	09	1945	SC	- 1.4	25	12	10(4,5,6)	5	5	90	32	13 --
SHL	14.7N	09	1339	SC	- 0.5	17	3		-	3	85	15	11 24
UJJ	13.5N	09	1339	SC	--	--	--		-	--	--	--	11 24
ABC	09.5N	09	1339	SC	- 0.7	19	- 7	10(6)	5	4	88	35	11 24
HYB	07.6N	09	1941	SC	- 0.3*	20	- 1	10(6)	5	3	99	26	11 22
ETT	00.6S	09	1941	SC	- 0.5	16	14		-	6	149	44	11 22
TRD	01.1S	09	1339	SC	- 0.3	18	23		-	4	154	72	11 24
HER	33.7S	09	1941	SC	3	18	7	10(7)	5	28	90	109	11 03
GNA	43.2S	09	1942	SC*	3.0*	22	17 *	09(8)	5	18	110	90	11 07
SIT	60.0N	15	15--	..	..	..	..	16(3)	7	130	--	450	17 04
FRD	49.6N	15	15--	..	..	..	..	16(3)	6	29	93	32	17 05
JAI	17.3N	15	1200	..	..	..	..		-	5	90	22	18 24
KRC	16.4N	15	0600	..	..	..	..	16(2,3,5,6)	5	6	93	50	18 20
SHL	14.7N	15	1200	..	..	..	..		-	5	84	11	18 24
UJJ	13.5N	15	1200	..	..	..	..		-	5	89	25	18 24
ABC	09.5N	15	1200	..	..	..	..	16(5,6)	5	4	94	41	18 24
HYB	07.6N	15	0700	..	..	..	..	16(5,6)	5	4	125	17	17 02
ETT	00.6S	15	0700	..	..	..	..		-	4	143	46	17 24
TRD	01.1S	15	1200	..	..	..	..		-	6	109	68	18 24
GNA	43.2S	15	12--	..	..	..	..	16(1,5)	5	16	100	90	17 18
COL	64.6N	16	01--	..	..	..	..	16(3)	7	206	1290	690	17 05

Stations Reporting:

ABC = ALIBAG  
CNB = CANBERRA  
COL = COLLEGE  
ETT = ETAIYAPURAM

FRD = FREDERICKSBURG  
GNA = GNANGARA  
HER = HERMANUS  
HON = HONOLULU

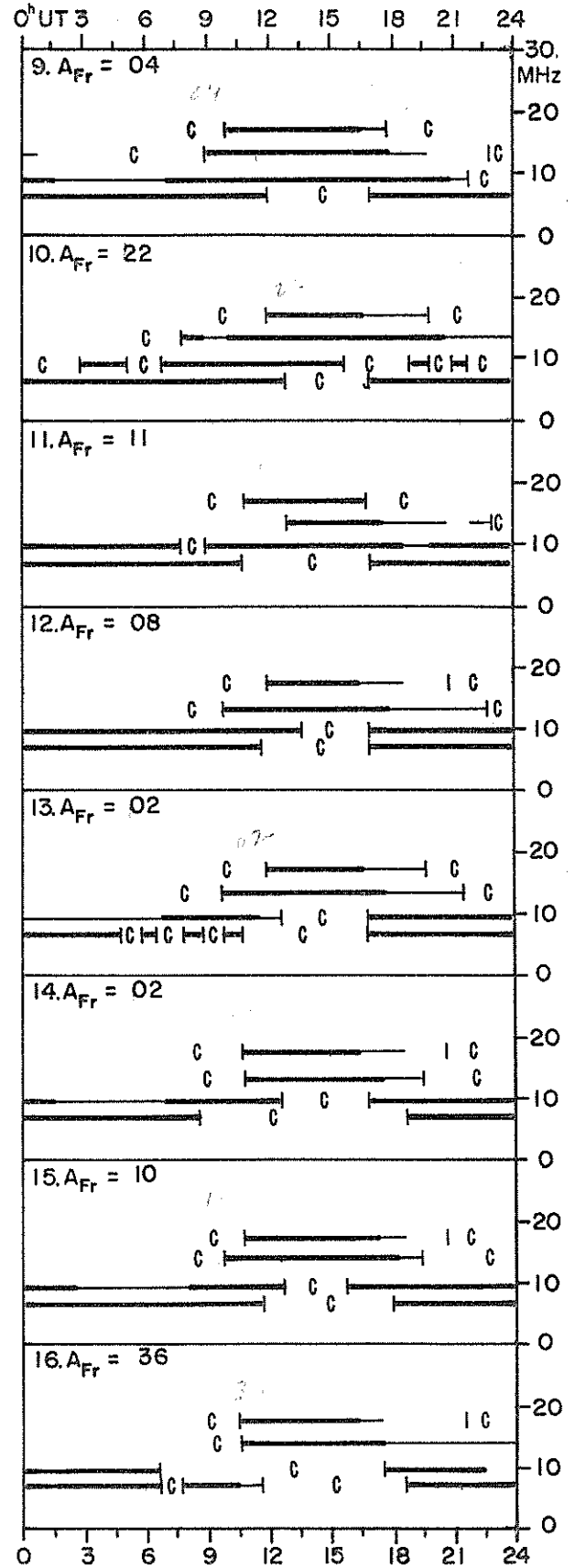
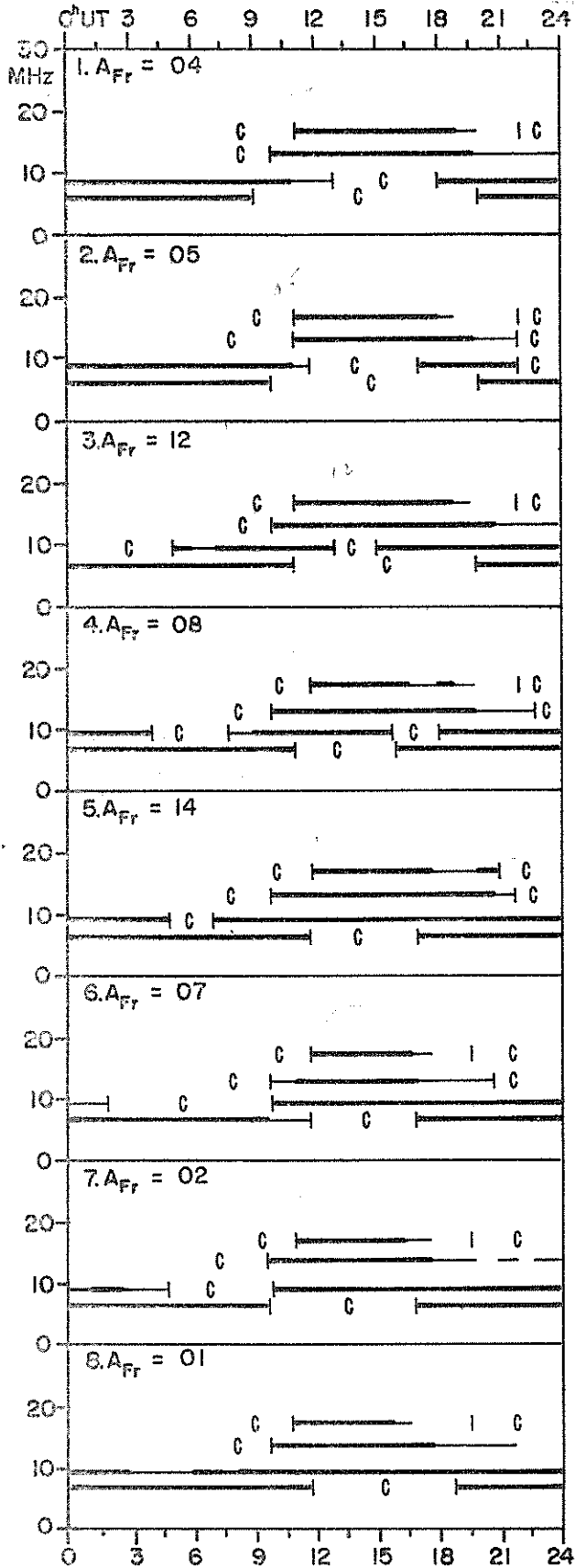
HYB = HYDERABAD  
JAI = JAIPUR  
KRC = KARACHI  
SHL = SHILLONG

SIT = SITKA  
TRD = TRIVANDRUM  
UJJ = UJJAIN



TRANSMISSION FREQUENCY RANGES--NORTH ATLANTIC PATH

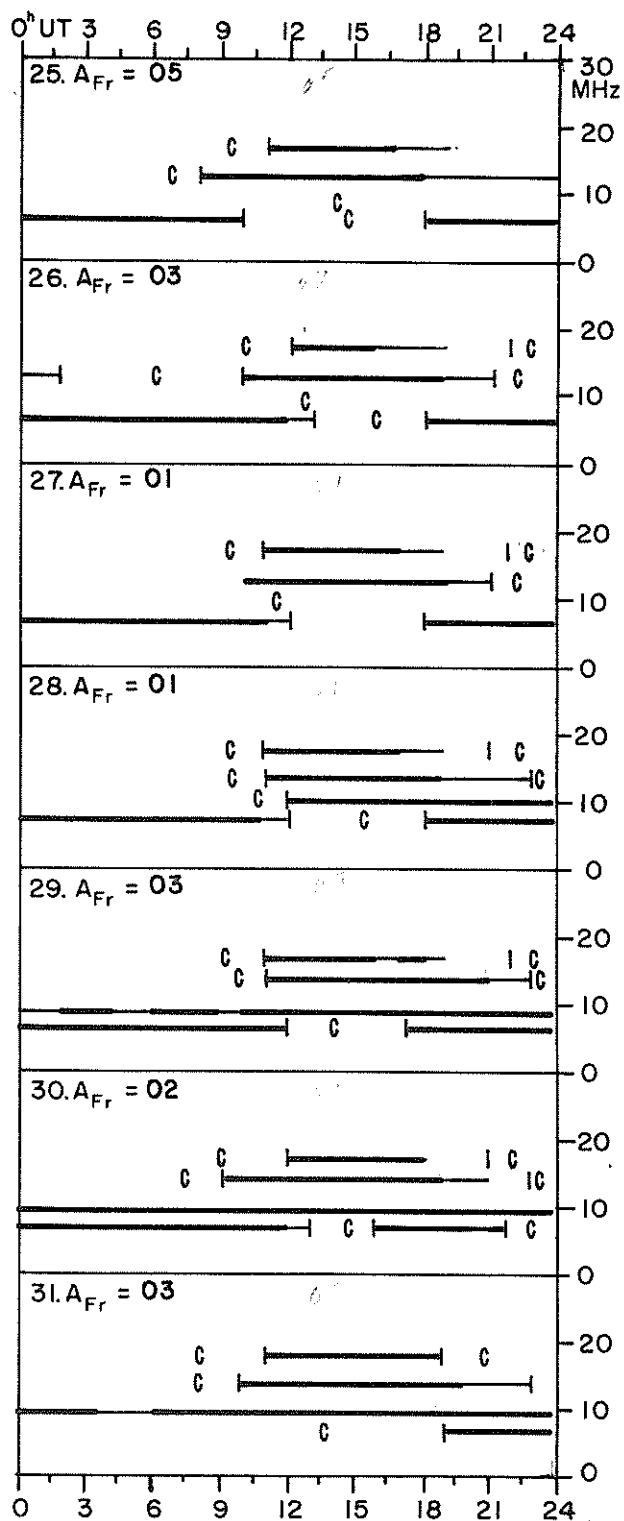
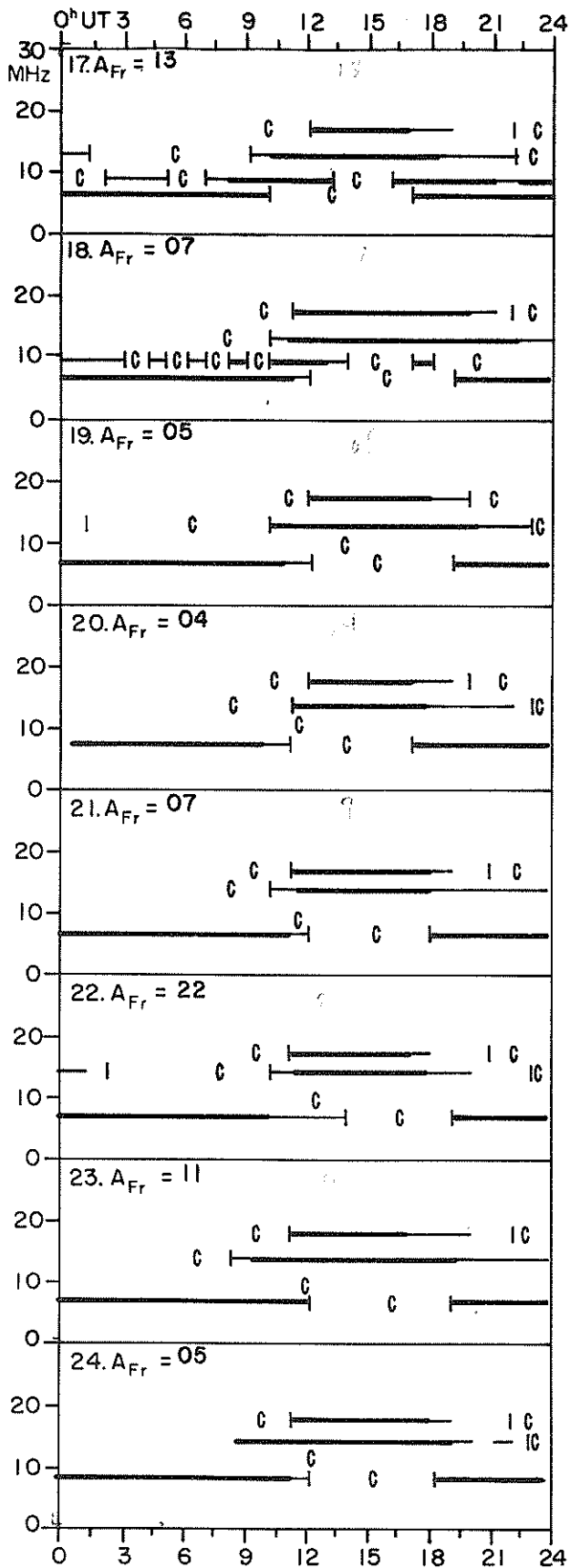
DECEMBER 1987



TRANSMISSION FREQUENCY RANGES--NORTH ATLANTIC PATH

89  
Dec 87

DECEMBER 1987



Field strengths from four frequencies, 6.4, 8.6, 13.0, and 17.0 MHz, observed on a Norddeich-New York circuit are represented above. Heavy solid lines represent field strengths  $\geq$  -12 dB above  $1 \mu\text{V}/\text{m}$  (transmitter power reduced to 1 kW). Observed field strengths between -12 dB and -40 dB above  $1 \mu\text{V}/\text{m}$  are represented by the fine line.

**RADIO PROPAGATION INDICES**  
DECEMBER 1987

Day	For Circuits from Norddeich to:					
	Bracknell	Rome	Teheran	New York	Tokyo	Canberra
1.	5.3	5.9	5.4	5.1	5.4	6.4
2.	5.6	5.4	3.9	4.1	7.2	5.3
3.	6.4	6.5	6.9	5.9	6.4	6.4
4.	6.9	6.2	3.8	6.5	8.3	5.6
5.	6.6	5.9	4.9	6.0	7.4	4.6
6.	6.0	5.5	3.7	4.7	5.8	5.0
7.	5.8	4.8	3.7	5.2	6.5	4.6
8.	5.8	4.9	3.5	5.6	7.0	4.8
9.	6.0	6.0	5.3	6.2	8.4	5.1
10.	7.7	6.5	5.8	7.2	7.3	7.5
11.	5.6	6.4	6.9	5.6	8.0	6.8
12.	4.9	5.8	6.5	4.6	8.4	5.9
13.	5.2	5.9	5.6	3.9	8.0	5.6
14.	5.8	5.3	5.0	4.1	8.1	5.5
15.	6.6	5.8	7.0	5.7	7.9	6.7
16.	4.3	5.2	4.2	4.4	7.9	6.0
17.	4.8	5.4	5.0	4.1	7.1	6.4
18.	6.8	6.3	5.9	5.7	7.0	6.8
19.	6.4	6.2	6.1	5.8	7.4	7.0
20.	6.1	6.2	6.0	4.8	6.1	6.6
21.	6.9	6.0	7.0	6.2	7.3	7.6
22.	5.3	5.8	5.5	4.1	8.3	5.6
23.	4.7	5.2	3.4	4.9	7.7	6.0
24.	5.2	5.9	6.5	5.2	7.3	6.6
25.	6.1	5.5	7.6	6.8	8.0	6.8
26.	5.8	5.6	3.4	6.7	8.0	6.6
27.	5.2	4.6	3.4	6.1	7.3	5.9
28.	5.9	4.8	4.3	6.7	5.9	5.7
29.	5.8	4.9	4.5	7.1	6.3	6.3
30.	6.1	4.9	7.8	6.9	7.2	6.3
31.	7.0	6.1	5.8	8.1	7.8	7.8
MEAN:	5.9	5.7	5.3	5.6	7.3	6.1

**CALCULATION OF QUALITY INDICES (Q):**

From all 24 hourly field strength values and from all frequencies of the same circuit a median field strength value is calculated (FD). This daily value is compared with the average value (FA) of the preceding 27 days (1 sun rotation).

$$Q = 6.0 + 20 \log (FD/FA)/3.0$$

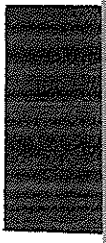
The quality indices vary from 0.1 to 9.9 where 6.0 is normal. Conditions are "normal" (index = 6.0), if they respond to the average of the preceding 27 days.

**SCALE FOR QUALITY INDICES:**

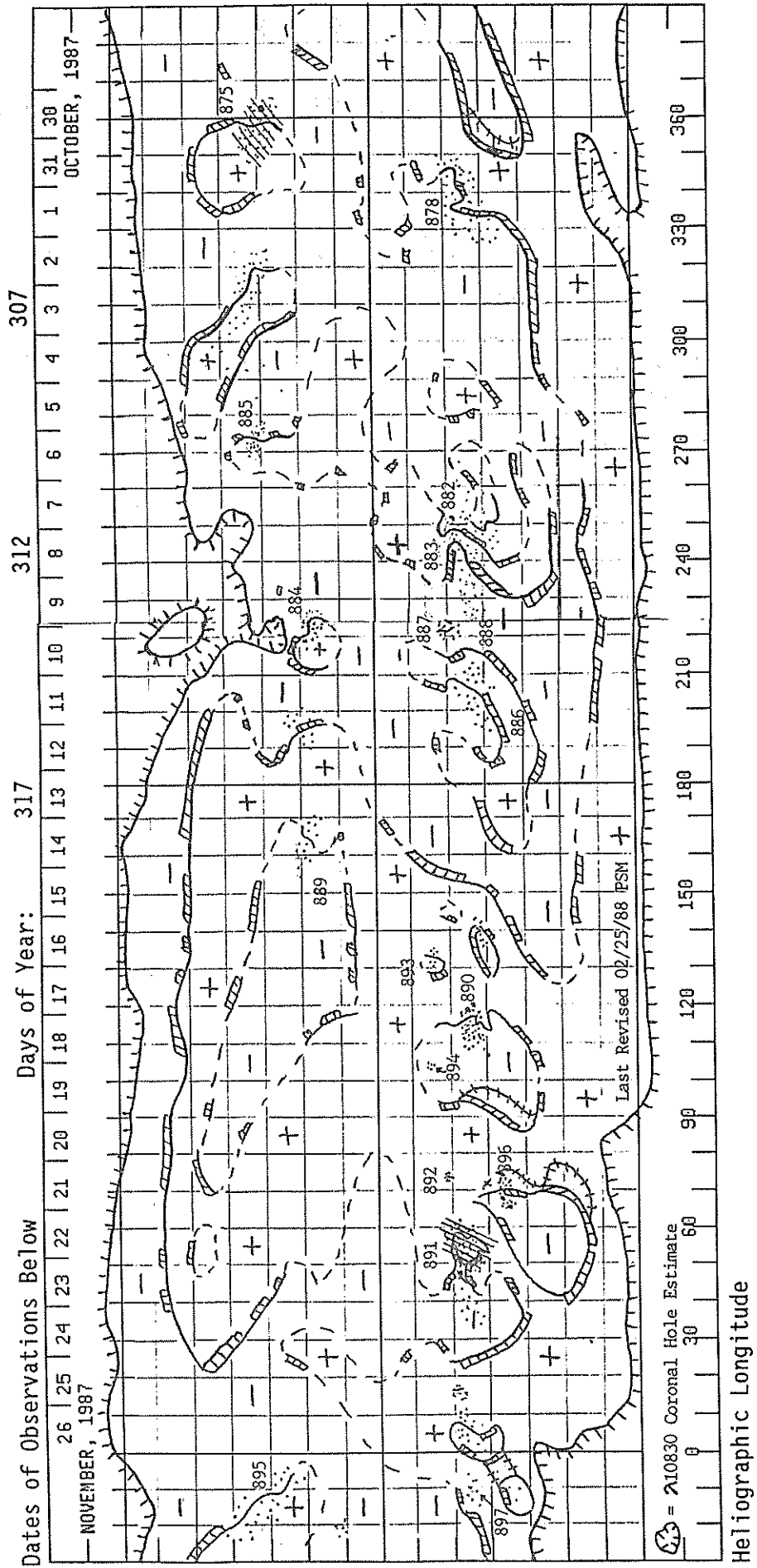
- 0.1 - 1.0 = very poor
- 1.1 - 3.0 = poor
- 3.1 - 5.0 = fair
- 5.1 - 7.0 = normal
- 7.1 - 9.0 = good
- 9.1 - 9.9 = very good

C O N T E N T S

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	Daily Plage Summaries		
	Daily Maps June 1987 . . . . .		97-101



PRELIMINARY H - ALPHA SOLAR SYNOPSIS CHART  
CARRINGTON ROTATION NUMBER 1795  
(30 October to 26 November 1987)



CALCIUM PLAGE REGIONS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

MAY 1987

Calcium Plage Region	Sta	Observation Time		Lat	CMD	CMP		Intensity	Corrected Area (10-6 Hemi)	NOAA/USAF #1	Sunspot #2	Groups #3
		Mo	Day			Mo	Day					
19961	BIGB	04	27	1340	N26	E47	05	1.2	1.0	0080	4803A	
19961	BIGB	04	28	1342	N26	E34	05	1.2	2.0	0114	4803A	
19963	BIGB	04	28	1342	N06	E77	05	4.3	1.9	1048	4805	
19963	BIGB	04	29	1409	N06	E64	05	4.4	2.5	0835	4805	
19963	BIGB	04	30	1318	N06	E54	05	4.6	2.1	0869	4805	
19963	BIGB	05	02	2244	N06	E22	05	4.6	2.3	0744	4805	
19963	BIGB	05	04	1951	N05	W03	05	4.6	2.2	0791	4805	
19963	BIGB	05	05	1738	N05	W15	05	4.6	1.6	0682	4805	
19963	BIGB	05	08	1625	N05	W54	05	4.6	1.6	0484	4805	
19963	BIGB	05	09	1548	N05	W67	05	4.6	1.2	0462	4805	
19968	BIGB	04	30	1318	S28	E80	05	6.8	1.5	1522	4804	
19968	BIGB	05	02	2244	S25	E48	05	6.7	1.4	1560	4804	
19968	BIGB	05	04	1951	S25	E24	05	6.7	1.6	1598	4804	
19968	BIGB	05	05	1738	S25	E12	05	6.7	1.5	1565	4804	
19968	BIGB	05	08	1625	S25	W21	05	7.0	2.0	1597	4804	
19968	BIGB	05	09	1548	S25	W34	05	7.0	1.5	1397	4804	
19974	BIGB	05	13	1532	S57	W39	05	10.2	1.5	0190	4807A	
19974	BIGB	05	14	1622	S57	W52	05	10.1	1.5	0200	4807A	
19971	BIGB	05	04	1951	S33	E75	05	10.8	2.6	2000	4806	
19971	BIGB	05	05	1738	S33	E69	05	11.2	2.8	2691	4806	
19971	BIGB	05	08	1625	S33	E30	05	11.1	1.8	1319	4806	
19971	BIGB	05	09	1548	S33	E13	05	10.7	3.6	2564	4806	
19971	BIGB	05	13	1532	S33	W40	05	10.5	3.0	2343	4806	
19971	BIGB	05	14	1622	S33	W54	05	10.4	3.0	2279	4806	
19970	BIGB	05	04	1951	S11	E75	05	10.5	1.1	1501	4807	
19970	BIGB	05	05	1738	S10	E68	05	10.8	1.1	1663	4807	
19970	BIGB	05	08	1625	S10	E29	05	10.9	2.2	2159	4807	
19970	BIGB	05	09	1548	S10	E16	05	10.9	2.2	2026	4807	
19970	BIGB	05	13	1532	S10	W37	05	10.9	1.6	1779	4807	
19970	BIGB	05	14	1622	S10	W50	05	10.9	1.4	1648	4807	
19975	BIGB	05	13	1532	N28	W30	05	11.3	1.7	0143	4809	
19975	BIGB	05	14	1622	N28	W43	05	11.3	1.2	0158	4809	
19972	BIGB	05	05	1738	S35	E78	05	12.0	1.5	1320	4806	
19972	BIGB	05	08	1625	S35	E45	05	12.3	3.4	2469	4806	
19972	BIGB	05	09	1548	S35	E32	05	12.2	1.8	1088	4806	
19972	BIGB	05	13	1532	S35	W09	05	12.9	1.6	1203	4806	
19972	BIGB	05	14	1622	S35	W23	05	12.8	1.9	1391	4806	
19972	BIGB	05	17	1717	S35	W65	05	12.5	2.0	1127	4806	
19972	BIGB	05	18	1723	S35	W72	05	13.0	2.0	0734	4806	
19983	BIGB	05	19	1657	S25	W81	05	13.4	1.3	0151		
19976	BIGB	05	13	1532	S21	E03	05	13.9	1.9	0205		
19976	BIGB	05	14	1622	S21	W11	05	13.8	1.5	0106		
19981	BIGB	05	17	1717	S23	W47	05	14.1	3.5	0554	4808	
19981	BIGB	05	18	1723	S23	W61	05	14.0	2.8	0494	4808	
19981	BIGB	05	19	1657	S23	W76	05	13.8	2.3	0382	4808	
19977	BIGB	05	13	1532	N30	E22	05	15.4	1.0	0231		
19977	BIGB	05	14	1622	N30	E08	05	15.3	1.1	0197		
19977	BIGB	05	17	1717	N30	W32	05	15.2	.8	0088		
19978	BIGB	05	13	1532	N30	E62	05	18.5	.8	0370		
19978	BIGB	05	14	1622	N30	E49	05	18.5	1.1	0372		
19978	BIGB	05	17	1717	N30	E09	05	18.4	1.1	0323		
19978	BIGB	05	18	1723	N30	W04	05	18.4	.9	0386		
19984	BIGB	05	23	1740	S43	W40	05	20.4	2.1	0144		
19979	BIGB	05	14	1622	S23	E80	05	20.8	2.8	1345	4810	
19979	BIGB	05	17	1717	S23	E42	05	20.9	3.3	1449	4810	
19979	BIGB	05	18	1723	S23	E28	05	20.9	3.0	1645	4810	
19979	BIGB	05	19	1657	S23	E15	05	20.9	2.9	1493	4810	

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Late  
May 87

CALCIUM PLAGE REGIONS  
(ORDERED BY CENTRAL MERIDIAN PASSAGE DATE)

MAY 1987

Calcium Plage Region	Sta	Observation Time		Lat CMD	CMP		Intensity	Corrected Area (10-6 Hemi)	NOAA/USAF Sunspot Groups			
		Mo	Day (UT)		Mo	Day			#1	#2	#3	
19979	BIGB	05	20	2250	S23 W01	05	20.9	3.3	1425	4810		
19979	BIGB	05	21	1859	S23 W12	05	20.9	2.8	1359	4810		
19979	BIGB	05	23	1740	S23 W38	05	20.8	3.1	1326	4810		
19979	BIGB	05	24	1611	S23 W51	05	20.7	2.9	1210	4810		
19979	BIGB	05	25	1710	S23 W65	05	20.7	2.7	1164	4810		
19979	BIGB	05	26	1744	S23 W76	05	20.9	2.3	0988	4810		
19979	BIGB	05	27	1727	S23 W83	05	21.3	1.4	0588	4810		
19980	BIGB	05	17	1717	N33 E58	05	22.3	3.6	3910	4811		
19980	BIGB	05	18	1723	N33 E45	05	22.3	4.2	4153	4811		
19980	BIGB	05	19	1657	N33 E32	05	22.2	4.0	4045	4811		
19980	BIGB	05	20	2250	N33 E15	05	22.1	3.9	5288	4811		
19980	BIGB	05	21	1859	N33 E04	05	22.1	4.3	5579	4811		
19980	BIGB	05	23	1740	N33 W21	05	22.1	4.1	4805	4811		
19980	BIGB	05	24	1611	N33 W34	05	22.0	3.6	4684	4811		
19980	BIGB	05	25	1710	N33 W48	05	21.9	3.5	4325	4811		
19980	BIGB	05	26	1744	N33 W62	05	21.8	3.8	4401	4811		
19980	BIGB	05	27	1727	N33 W71	05	22.1	3.5	4556	4811		
19982	BIGB	05	18	1723	N07 E79	05	24.6	1.5	0402	4811A		
19982	BIGB	05	19	1657	N07 E68	05	24.8	1.7	0371	4811A		
19982	BIGB	05	20	2250	N07 E53	05	24.9	1.4	0307	4811A		
19982	BIGB	05	21	1859	N07 E42	05	24.9	1.1	0437	4811A		
19982	BIGB	05	23	1740	N07 E16	05	24.9	1.8	0557	4811A		
19982	BIGB	05	24	1611	N07 E04	05	25.0	1.5	0726	4811A		
19982	BIGB	05	25	1710	N07 W10	05	25.0	1.8	0649	4811A		
19982	BIGB	05	26	1744	N07 W23	05	25.0	1.9	0558	4811A		
19982	BIGB	05	27	1727	N07 W37	05	24.9	1.1	0441	4811A		
19982	BIGB	05	28	1801	N07 W50	05	25.0	1.2	0444	4811A		
19982	BIGB	05	29	2355	N07 W67	05	25.0	.9	0467	4811A		
19985	BIGB	05	25	1710	N23 E35	05	28.4	1.9	0152	4812		
19985	BIGB	05	26	1744	N23 E21	05	28.3	2.3	0391	4812		
19985	BIGB	05	27	1727	N23 E08	05	28.3	3.0	0978	4812		
19985	BIGB	05	28	1801	N23 W05	05	28.4	3.2	1014	4812		
19985	BIGB	05	29	2355	N23 W22	05	28.3	2.7	1041	4812		
19985	BIGB	05	30	1759	N23 W29	05	28.5	2.4	1005	4812		
19985	BIGB	05	31	2351	N23 W46	05	28.4	2.5	0864	4812		
19985	BIGB	06	01	1644	N23 W56	05	28.5	2.5	0752	4812		
19985	BIGB	06	02	1533	N23 W70	05	28.3	1.7	0775	4812		
19985	BIGB	06	03	1509	N23 W79	05	28.6	1.3	0574	4812		

BIG BEAR SOLAR OBSERVATORY  
ACTIVE REGION SUMMARY

95  
Late  
May 87

MAY 1987

Region Number	Return Of Region	Rotation Age	First Seen This Rotation	Duration This Rotation
19969	New	1	870504	1 days
19961	New	1	870427	2
19963	New	1	870428	12
19968	19936	2	870430	>10
19971	19937	2	870504	10
19974	New	1	870513	>2
19970	19940	2	870504	>10
19975	New	1	870513	2
19972	19938	2	870505	13
19983	New	1	870519	1
19976	New	1	870513	>2
19981	New	1	870517	3
19977	19941 and 19942	3&2	870513	>5
19978	19957	2	870513	>6
19984	New	1	870523	1
19979	New	1	870514	14
19980	New (in location of 19952)	1	870517	>11
19982	19956	4	870518	12
19985	New	1	870525	10

1. No NSO or BBSO Calcium Data on May 1, 3, 6, 7, 10, 12, 15, 16 and 22.
2. No KPNO Magnetograms on May 20, 22, 25 and 26.
3. Contiguous Plages: 19971/19972.
4. Plageless days: None



96  
Late  
May 87

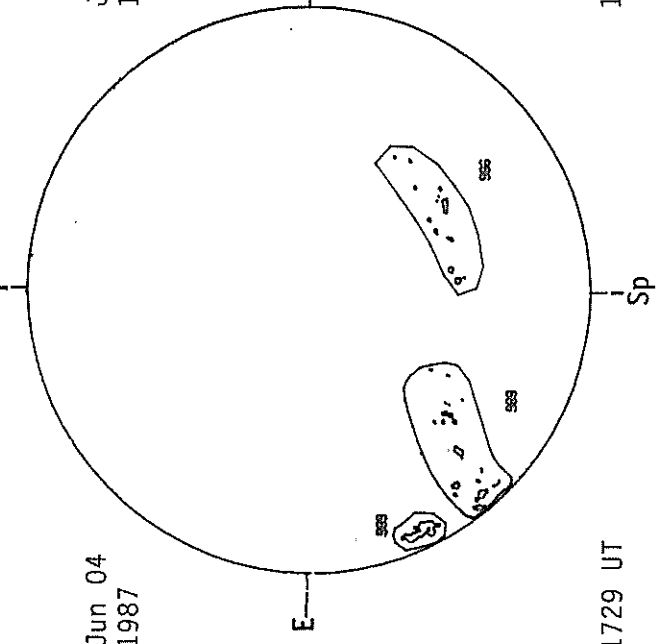
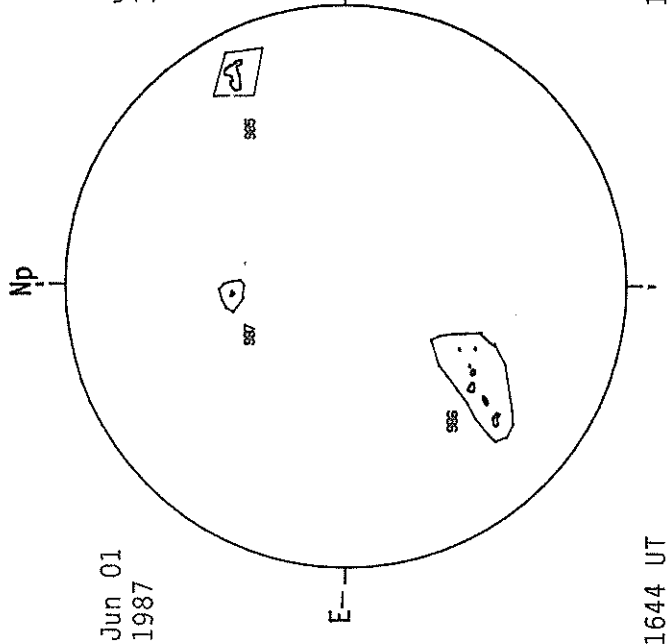
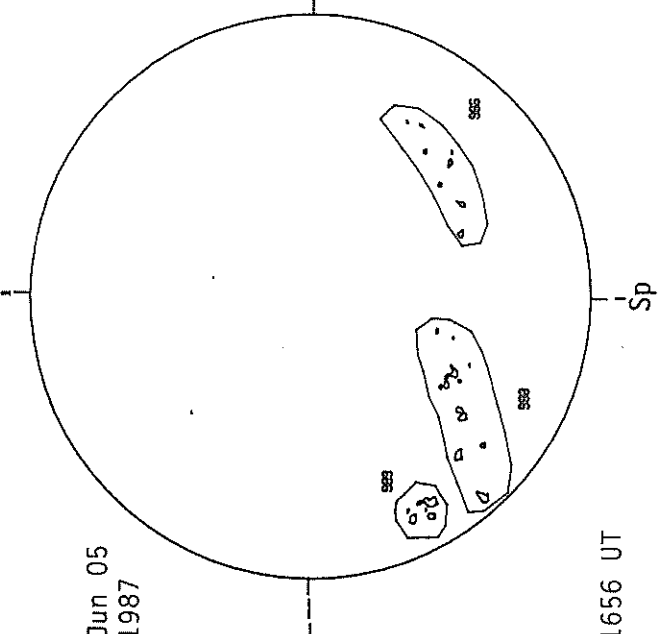
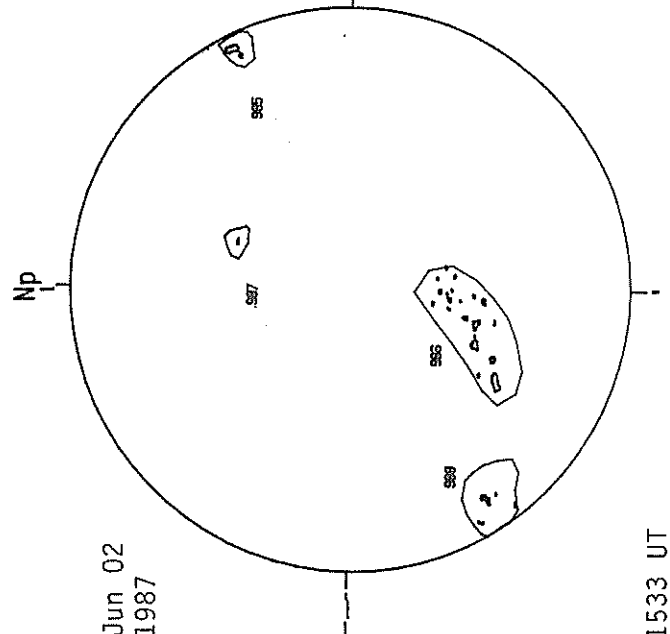
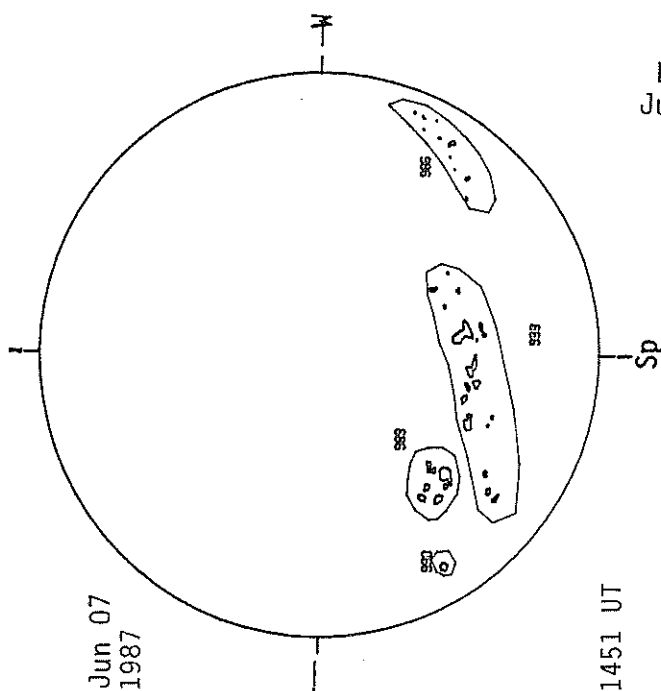
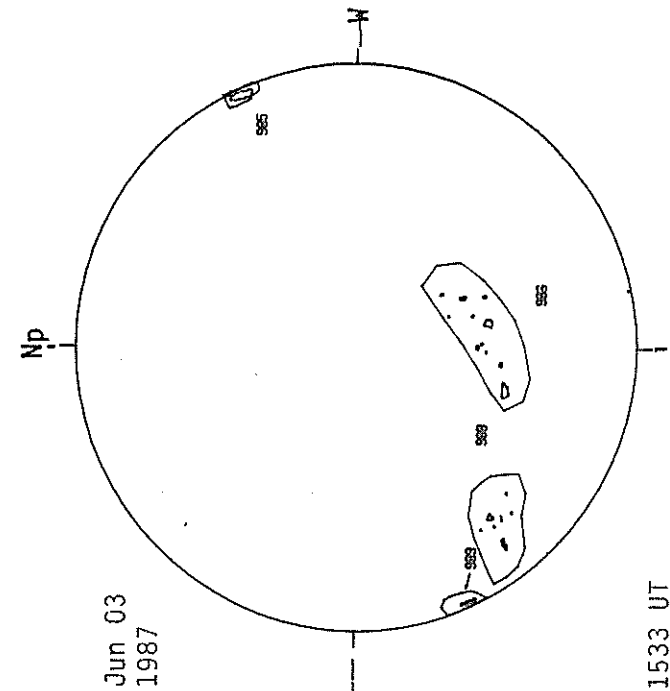
DAILY PLAGE SUMMARIES

MAY 1987

Day	Sta	Plage Index	Plage Count	Smallest Plage (Millionths)	Largest Plage of Solar Hemisphere)	Total Area	Smallest Intensity	Largest Intensity
01	No Observations This DAY							
02	BIGB	6.3	4	744	1560	4957	1.4	3.5
03	No Observations This DAY							
04	BIGB	5.9	6	201	2000	7421	.9	3.4
05	BIGB	6.1	5	682	2691	7921	1.1	2.8
06	No Observations This DAY							
07	No Observations This DAY							
08	BIGB	13.7	5	484	2469	8028	1.6	3.4
09	BIGB	14.9	5	462	2564	7537	1.2	3.6
10	No Observations This DAY							
11	No Observations This DAY							
12	No Observations This DAY							
13	BIGB	9.2	8	143	2343	6464	.8	3.0
14	BIGB	7.9	9	106	2279	7696	1.1	3.0
15	No Observations This DAY							
16	No Observations This DAY							
17	BIGB	11.5	6	88	3910	7451	.8	3.6
18	BIGB	15.5	6	386	4153	7814	.9	4.2
19	BIGB	15.7	5	151	4045	6442	1.3	4.0
20	BIGB	21.3	3	307	5288	7020	1.4	3.9
21	BIGB	23.9	3	437	5579	7375	1.1	4.3
22	No Observations This DAY							
23	BIGB	19.5	4	144	4805	6832	1.8	4.1
24	BIGB	14.7	3	726	4684	6620	1.5	3.6
25	BIGB	10.8	4	152	4325	6290	1.8	3.5
26	BIGB	8.4	4	391	4401	6338	1.9	3.8
27	BIGB	7.1	4	441	4556	6563	1.1	3.5
28	BIGB	3.3	2	444	1014	1458	1.2	3.2
29	BIGB	2.8	3	467	1041	2186	.9	2.7
30	BIGB	2.2	2	610	1005	1615	.8	2.4
31	BIGB	1.9	3	112	864	1616	1.0	2.5

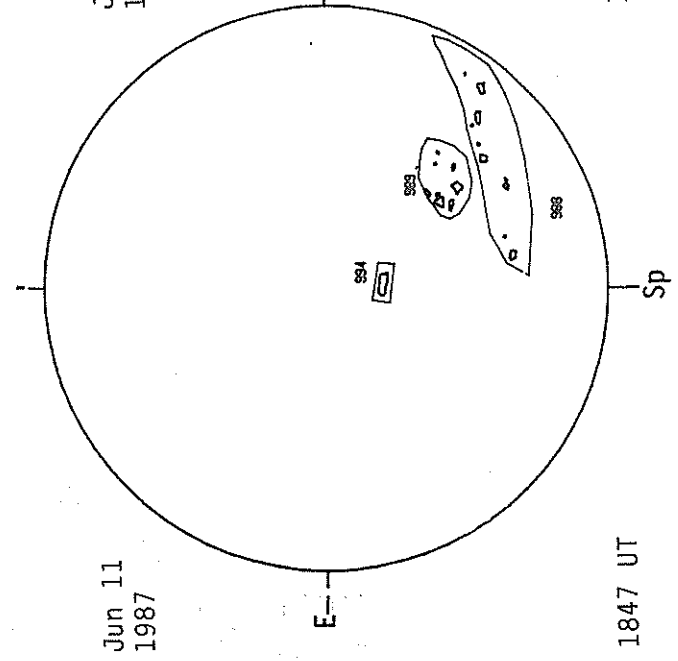
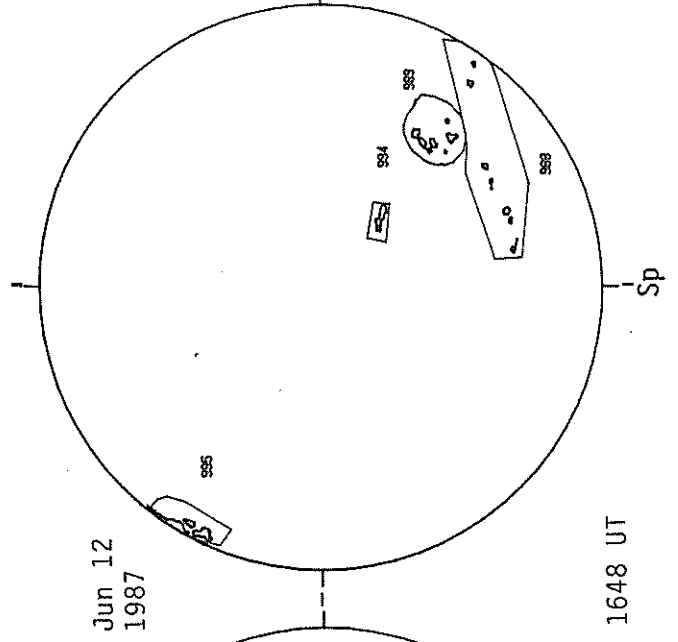
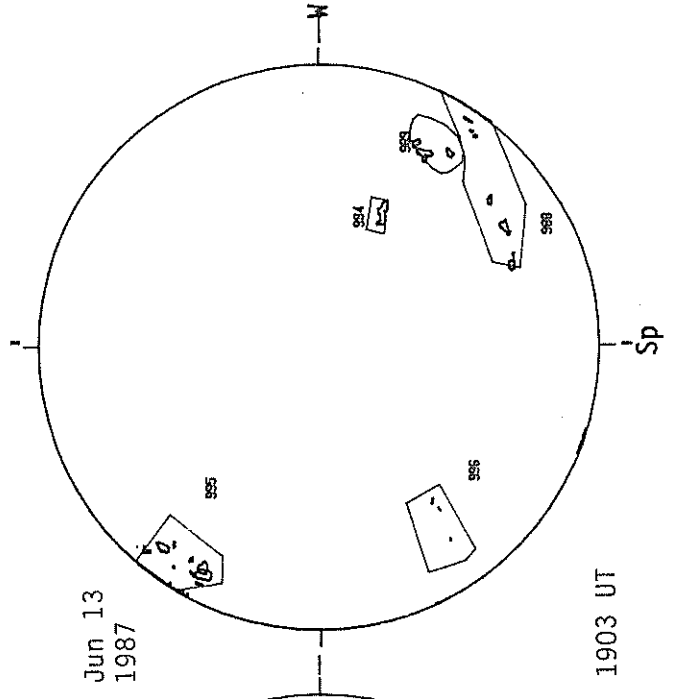
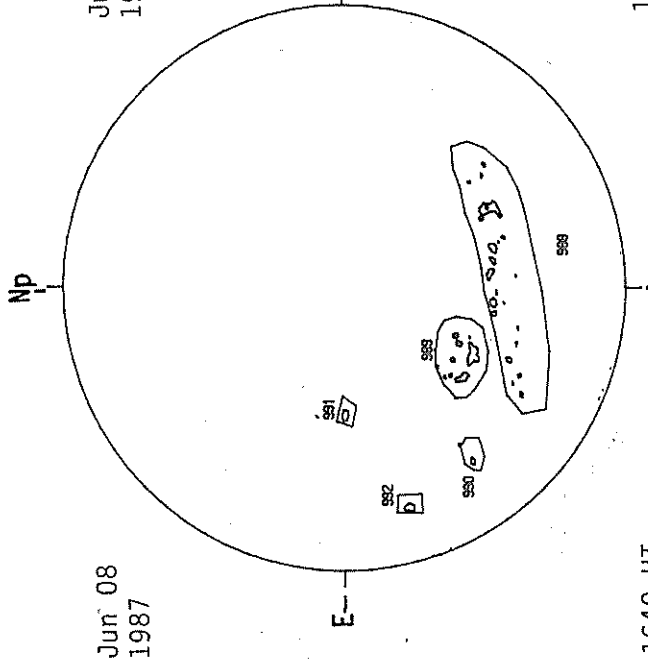
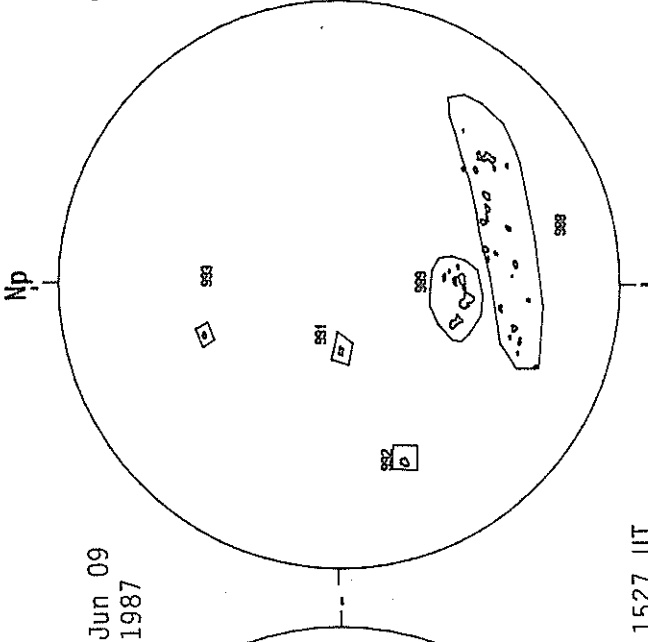
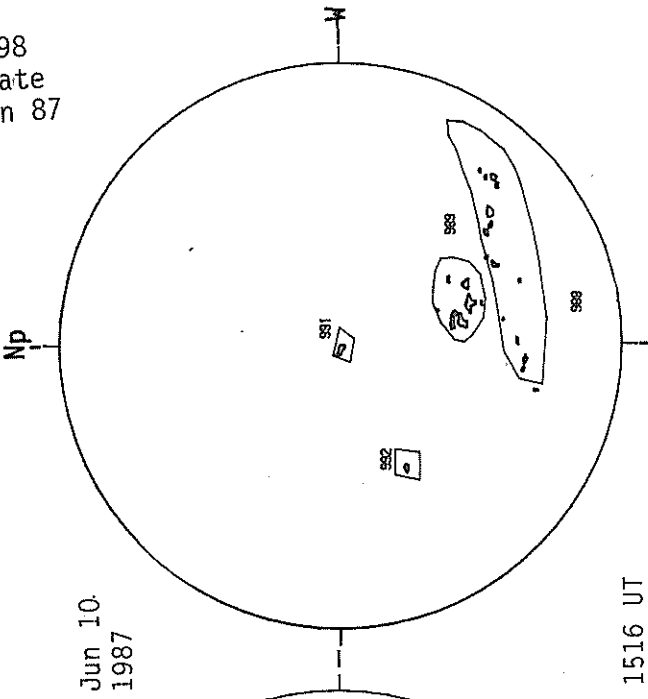
BIG BEAR SOLAR CALCIUM PLAGE REGIONS

97  
Late  
Jun 87

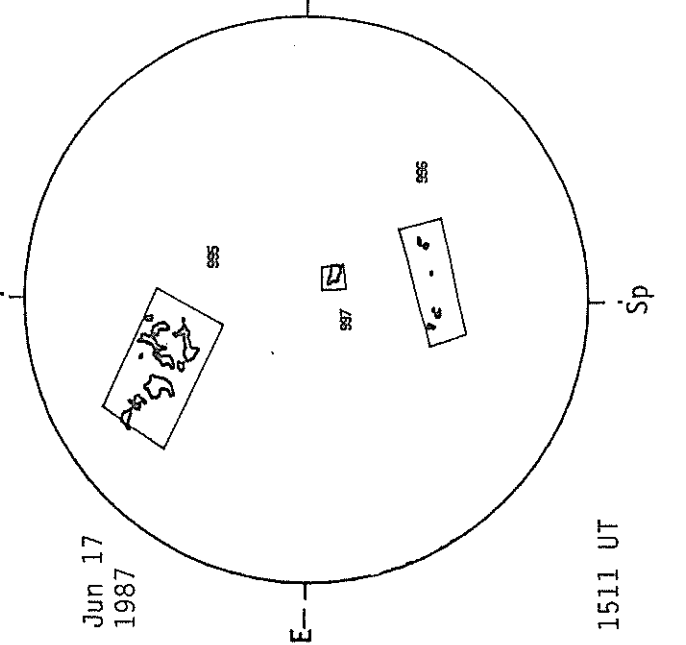
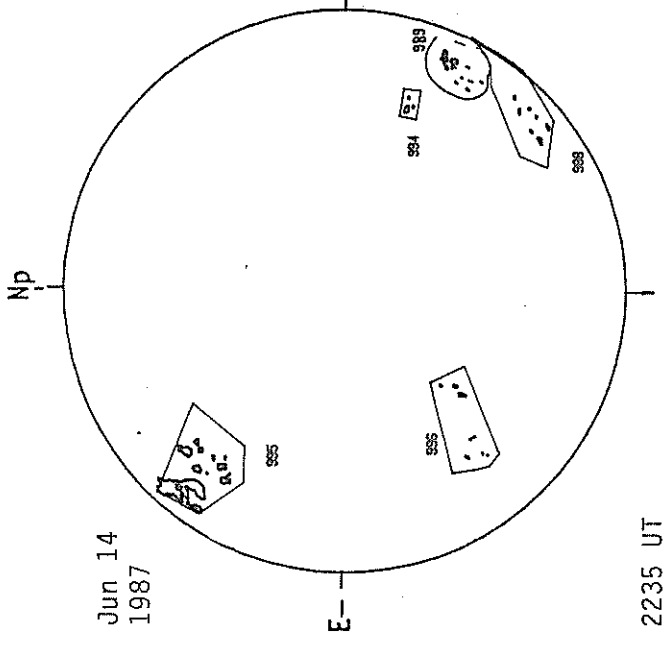
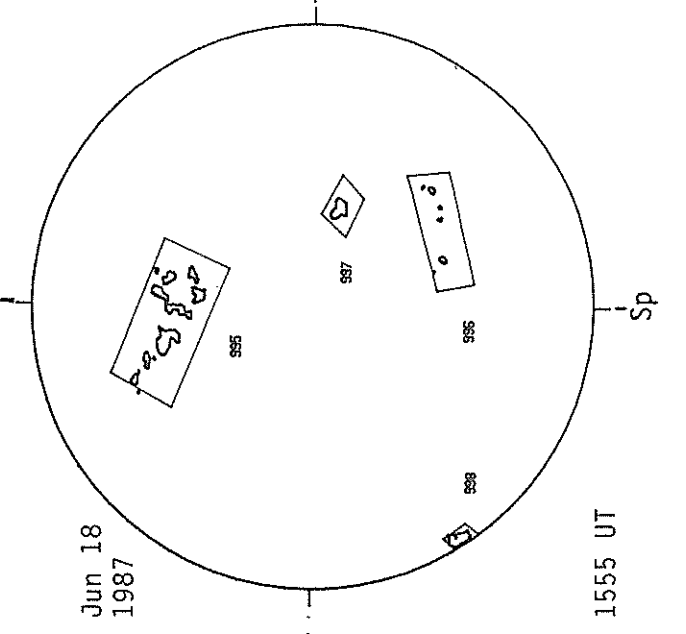
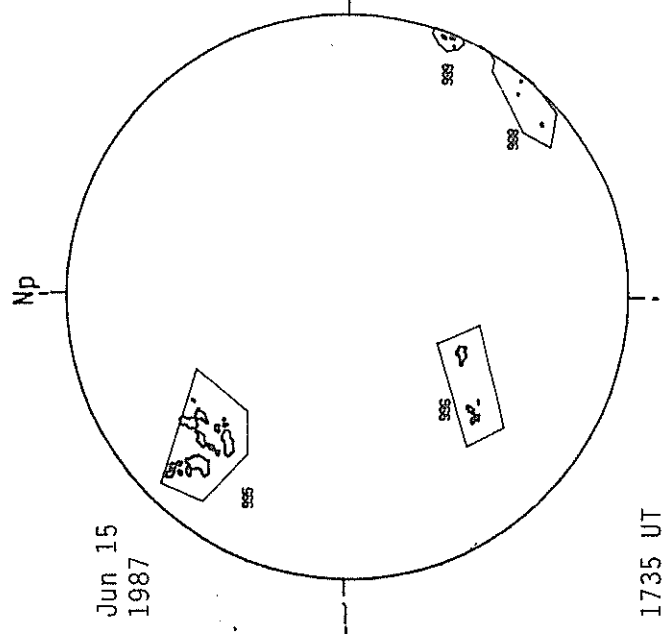
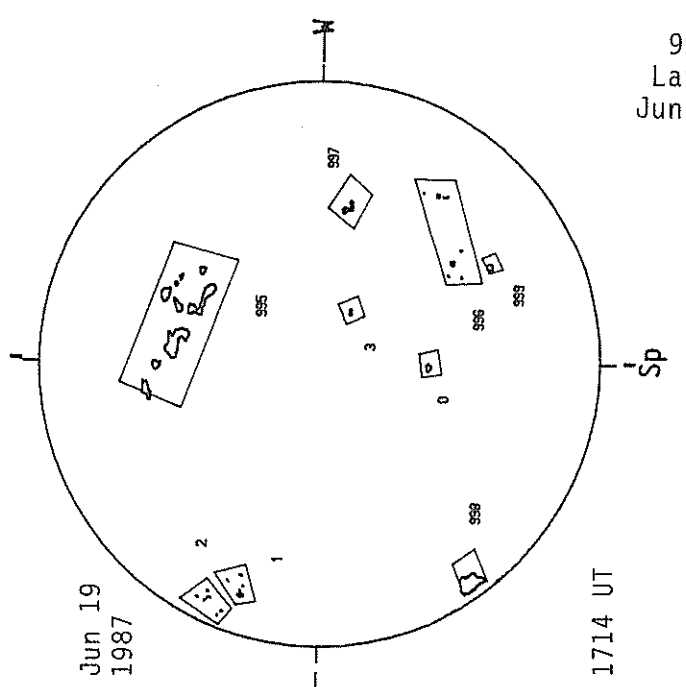
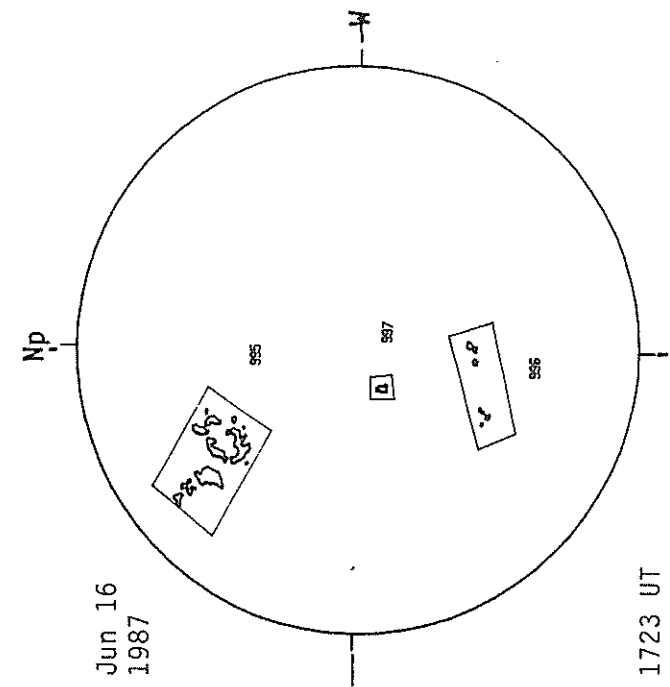


98  
Late  
Jun 87

BIG BEAR SOLAR CALCIUM PLAGE REGIONS

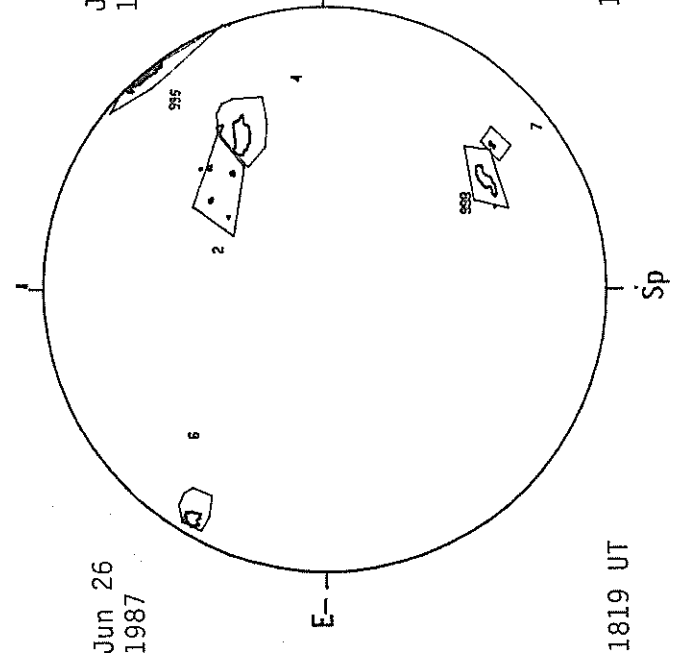
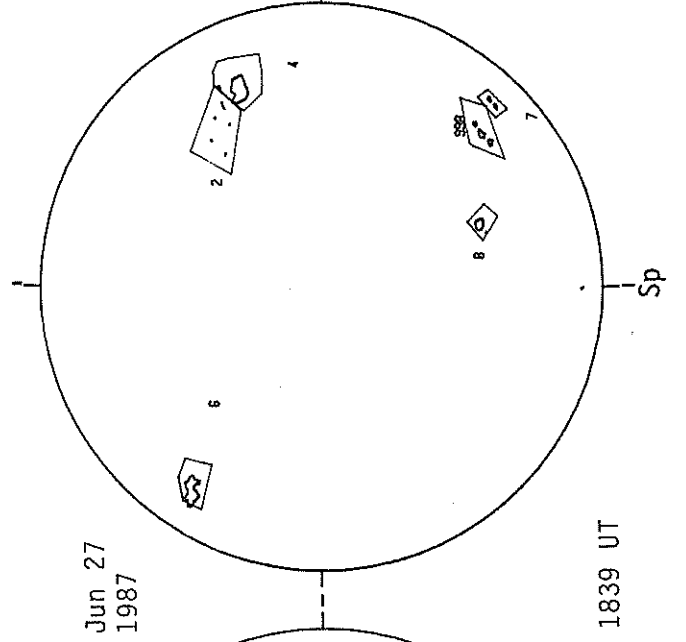
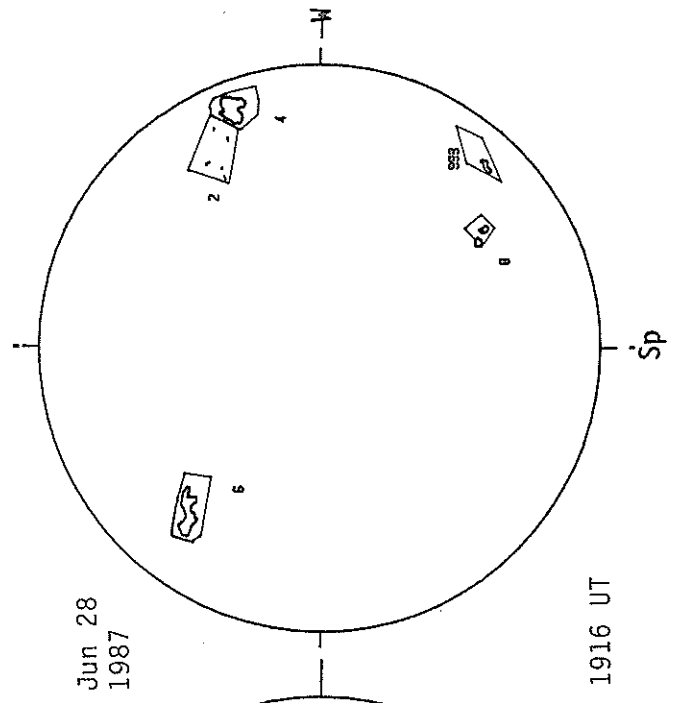
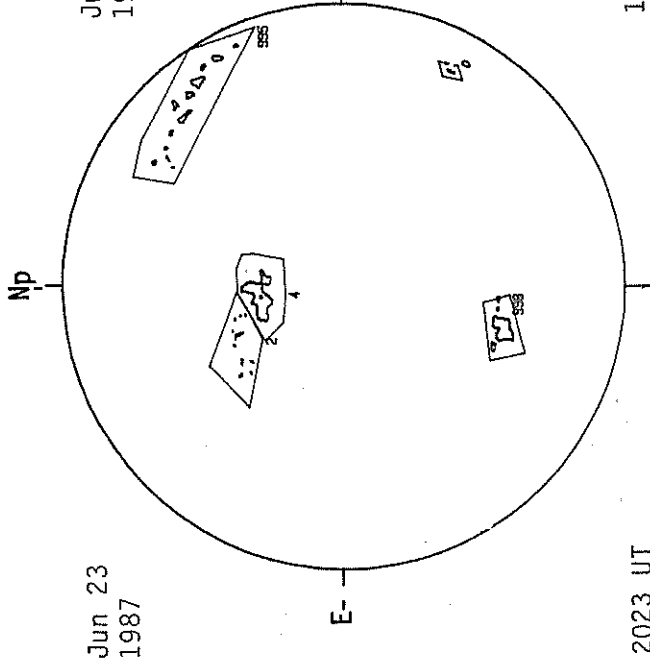
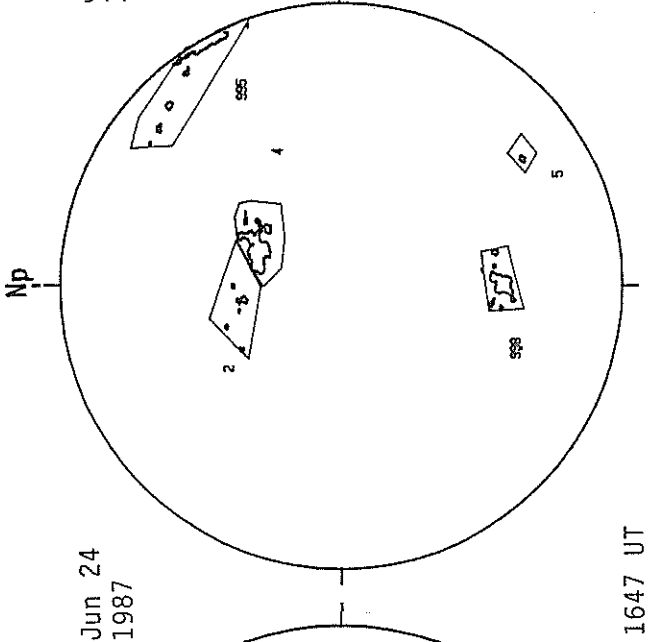
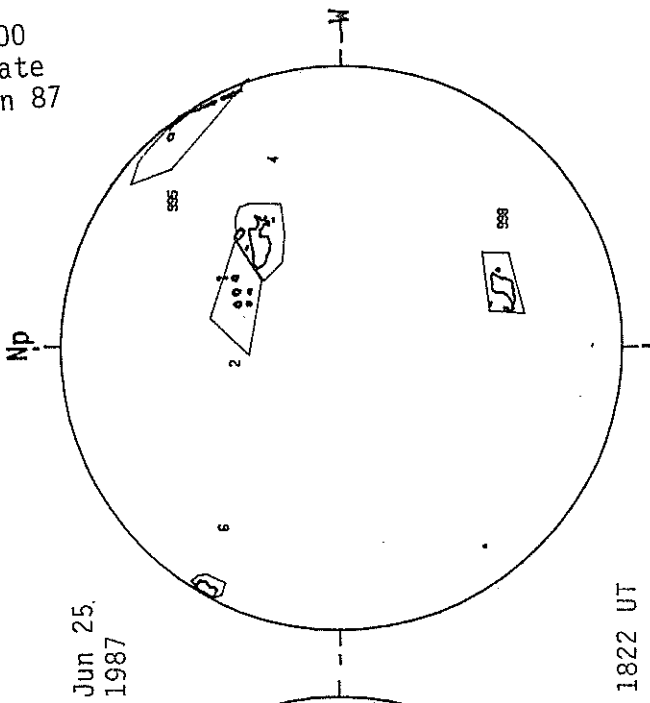


BIG BEAR SOLAR CALCIUM PLAGE REGIONS

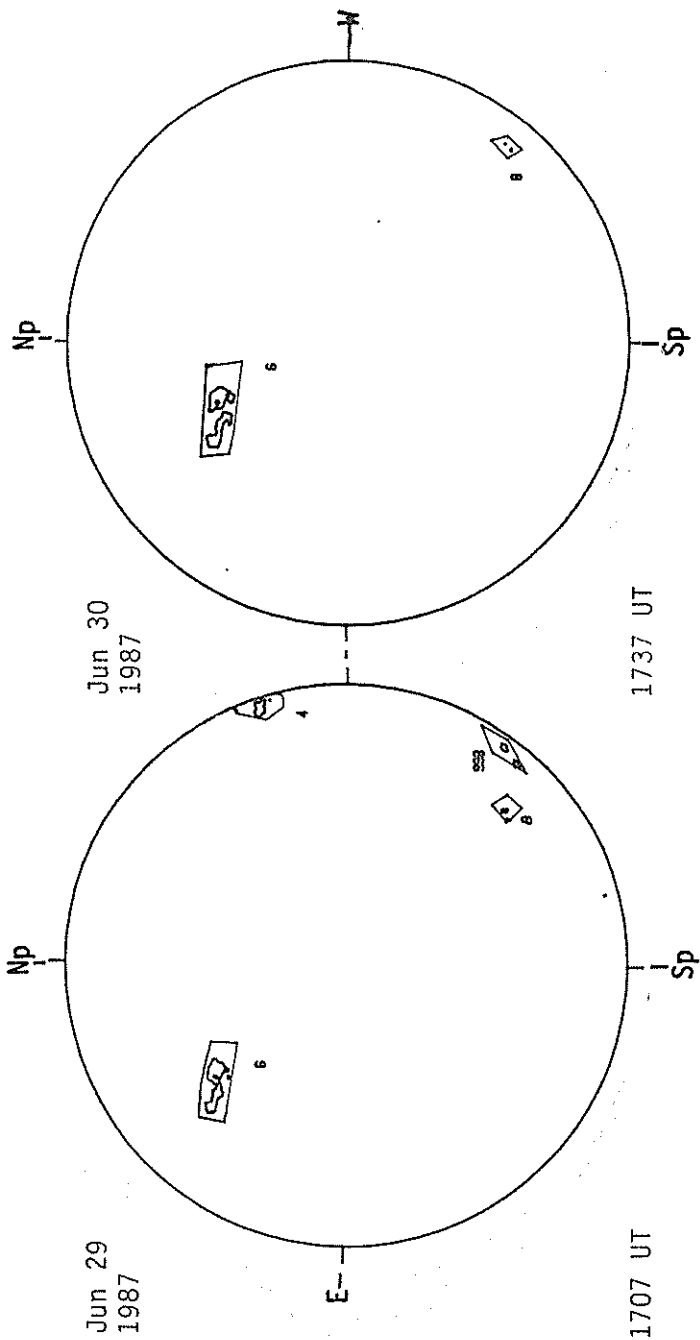


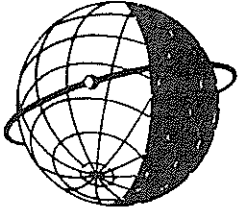
100  
Late  
Jun 87

BIG BEAR SOLAR CALCIUM PLAGE REGIONS

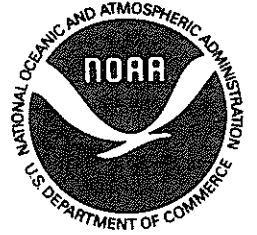


BIG BEAR SOLAR CALCIUM PLAGE REGIONS





**WORLD DATA CENTER A**  
**FOR**  
**SOLAR-TERRESTRIAL PHYSICS**



The ICSU Panel on WDCs has recommended that it would be appropriate courtesy to acknowledge in publications that data were obtained from the originating station or investigator through the intermediary of the WDCs. The following statement is suggested:

"Data used in this study were provided by WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder Colorado 80303, USA."