



# Kodaikanal Observatory

Bulletin No. CLIX

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## INTRODUCTION

This Bulletin for the second half of 1959 contains apart from the usual summary of prominence and calcium flocculus observations, other additional data, specially collected for the I G C, in respect of surges and active prominence regions as well as information concerning the hours of late patrol and the times at which spectroheliograms were secured at this observatory

### PART I

#### SUMMARY OF PROMINENCE AND CALCIUM FLOCCULUS OBSERVATIONS FOR THE SECOND HALF OF 1959

The results of observations of prominences and calcium flocculi made at Kodaikanal Observatory during the second half of 1959 supplemented by data computed from photographs supplied by Mount Wilson and Meudon Observatories for those days on which Kodaikanal had imperfect or no observations are summarised in Part I of this Bulletin

*Calcium Prominences on the limb* —During the half-year under review, photographs of calcium prominences on the limb were obtained at Kodaikanal on 89 days which were counted as  $87\frac{1}{2}$  effective days after giving due weightage to the photographs according to their quality. Spectroheliograms were obtained for 77 days from the Mount Wilson Observatory and for 70 days from the Meudon Observatory. In all complete observations were available for  $170\frac{1}{2}$  effective days

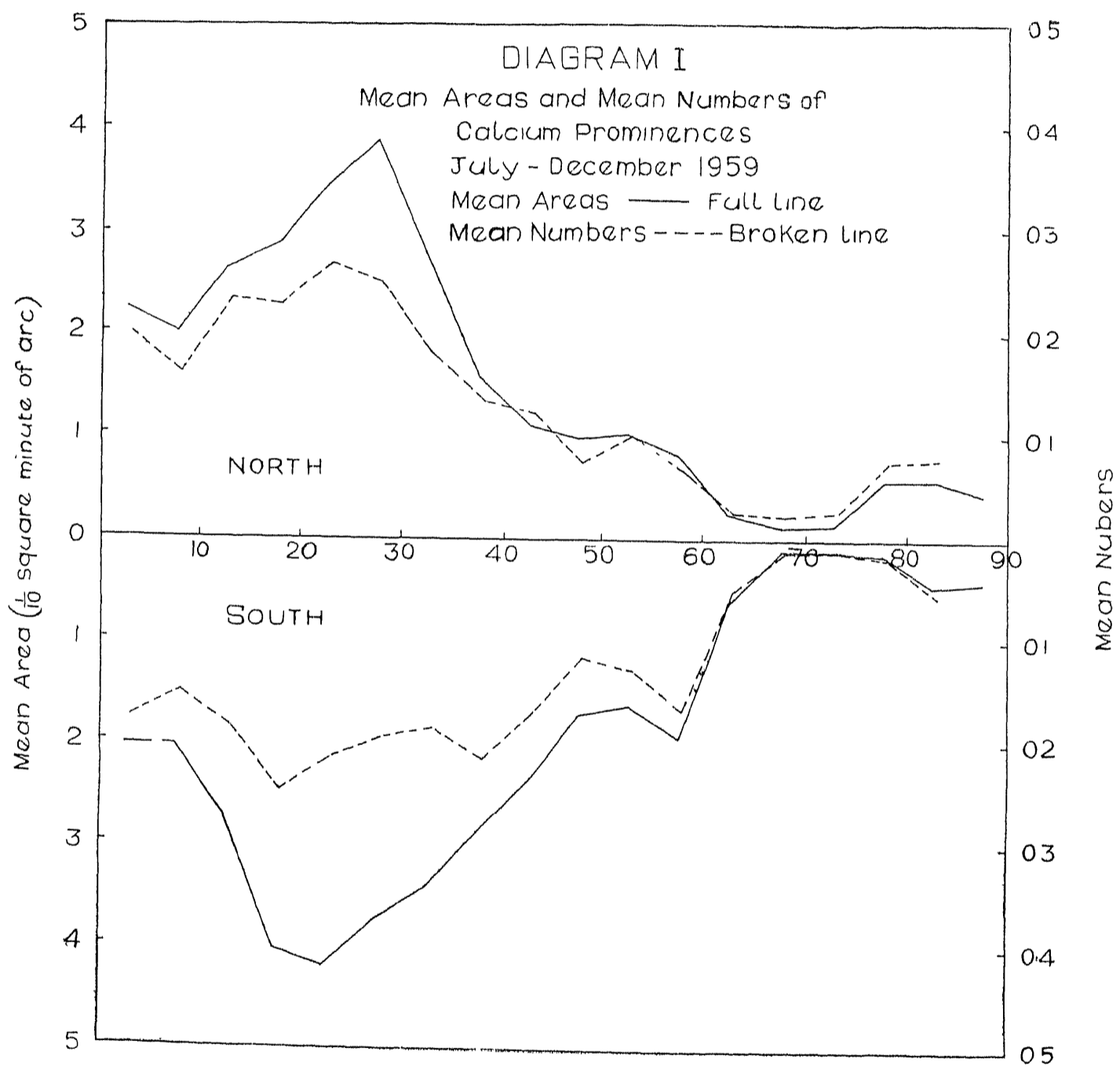
The mean daily areas (in square minutes of arc) and the mean daily numbers of prominences derived from all the above records are given below —

	Combined data	
	Mean daily areas (Sq minutes)	Mean daily numbers
North	2.71	1.33
South	3.47	4.62
	6.21	9.15

The above figures show that compared to the previous half-year there has been a slight increase in areas amounting to 10.4% whereas the numbers show a decrease of 13.3%

For comparison with data published in Bulletins prior to 1923, i.e. before the cooperation of the other observatories came into force, the following table gives the values based on Kodaikanal observations, alone.

	Kodaikanal data only	
	Mean daily areas (Sq minutes)	Mean daily numbers
North	1.74	3.35
South	2.13	3.37
TOTAL	3.87	6.72



The distribution of areas and numbers in five-degree ranges of latitude as obtained from the combined data is presented in diagram 1. The peaks of activity in the northern hemisphere is in the latitude belt  $25^{\circ}$ - $30^{\circ}$  and in the southern hemisphere in the region  $20^{\circ}$ - $25^{\circ}$ . There is evidence of polar activity indicated by secondary maxima in both the hemispheres in the region  $80^{\circ}$ - $85^{\circ}$ .

The monthly, quarterly and half-yearly areas, numbers, heights and extents of prominences derived from all the photographs are given in Table I.

TABLE I

1959 Months	No. of effective days	Area in sq. minutes	Number	Daily means		Mean height "	Mean extent "
				Area (sq. minutes)	Number		
1	2	3	4	5	6	7	8
July	30½	216.53	321	7.10	10.52	59.78	1.48
August	30½	169.23	339	5.53	10.81	51.50	3.87
September	28	159.80	295	5.71	10.53	51.70	3.72
October	26½	225.90	231	8.35	8.64	58.91	1.39
November	28	190.63	216	6.81	7.71	56.52	1.10
December	26½	95.86	166	3.58	6.21	51.02	3.83
3rd quarter	89	515.63	916	6.12	10.10	51.33	1.62
1st quarter	8½	512.33	613	6.28	7.52	55.48	1.11
2nd half-year	17½	1057.95	1559	6.30	8.96	51.91	4.07

The distribution of prominences about the sun's axis of rotation is as follows --

	1959 July	December	Percentage East
Area (sq. minutes)	520.83	337.10	49.3
Total number	761	798	48.8

#### Observations with the Hale Spectroheliograph

Details of Doppler displacements in prominences and dark markings observed with the H-alpha line are summarized below.

	North	South	East	West	Displacements			Total
					To red	To violet	Both ways	
1	2	3	4	5	6	7	8	9
Displacements in prominences	18	8	14	12		2	24	26
Displacements in dark markings	2	2	2	2			4	4

The following table gives details of solar flares observed during the period

TABLE II

Date 1959	Time in I S T			Coordinates		Inten- sity	Maximum width of H $\alpha$ line observed
	Be- g h m	Max h m	End h m	Mean latitude	Mean longitude from Central Meridian		
July 14	10 53*			15°N	05°E	3	
August 11	07 10	07 15	07 50	12°N	27°E	1	1.6
October 7	10 30†		10 40	30°N	55°E	Probably 2	2.2
December 4	11 15	11 25	11 50	07°N	36°W	2	1.9

\*Time when first photographed and not beginning of flare  
†First observation of flare and not beginning

*Sudden disappearances of Prominences and H-alpha darkmarkings*

Details of sudden disappearance of one darkmarking observed during the period are given in the following table

Nature of phenomenon	Date and time of phenomenon when last seen		Coordinates of phenomenon		Remarks
	Date	Time (I S T) h m	Mean Lati- tude	Mean Longi- tude	
Darkmarking	19-9-59	10 30	21°S	15°E	The darkmarking was not seen on the 20th

*Prominences projected on the disc as absorption markings*

During the period under review photographs of the sun's disc in H-alpha line were obtained at Kodaikanal on 102 days. Spectroheliograms were also received for 47 days from the Mount Wilson Observatory and for 61 days from the Meudon Observatory. On the whole records were available for 167½ effective days after giving due weightage to the quality of the photographs.

The mean daily areas in millionths of the sun's visible hemisphere (uncorrected for foreshortening) and the mean daily numbers of H-alpha darkmarkings as derived from the combined data are as follows —

	Combined data	
	Mean daily areas (mil- lionths of the sun's visible hemisphere)	Mean daily number
North	3422	20.3
South	2409	15.9
TOTAL	5891	36.2

On comparing with the previous half-year's values these figures show an increase in activity, the areas showing an increase of 28.6% and the numbers 22.3%. The figures based solely on Kodaikanal photographs are also given for purposes of comparison with similar data.

		Kodaikanal data only	
		Mean daily areas (mil- lionths of the sun's visible hemisphere)	Mean daily number
North		3038	17.4
South		2069	13.1
Total		5107	30.5

The distribution of the areas of the markings in five-degree ranges of latitude as obtained from the combined data is shown in diagram II. There is a well-marked peak of activity in both the hemispheres in the latitude belt 20°-25°.

The distribution of total areas and numbers of the dark markings east and west of the sun's axis is as follows:—

	Combined data		
	East	West	Percentage East
Total area (millionths of the sun's visible hemisphere)	182,359	510,808	18.6
Total Number	2971	3079	49.1

#### Calcium flocculus

During the half-year under review, calcium flocculus spectroheliograms were secured on 93 days at Kodaikanal. Calcium spectroheliograms for 78 days were received from the Mount Wilson observatory and for 70 days from the Meudon observatory. In all observations were available for 173½ effective days.

The mean daily areas (in millionths of the sun's visible hemisphere uncorrected for foreshortening) computed from the combined data are given below:

		Combined data
		Mean daily area (millionths of the sun's visible he- misphere)
North		18673
South		7510
Total		26213

Compared to the previous half-year's value there is no significant variation in areas. The distribution of flocculi east and west of the sun's axis of rotation is as follows:

	Combined data		
	East	West	Percentage East
Total area (millionths of the sun's visible hemisphere)	2,219,125	2,931,750	43.7

The western excess observed during the previous half-year is maintained.

Our thanks are due to the cooperating observatories for the photographs supplied by them.

Special I G C data are given in Tables IV to VI.

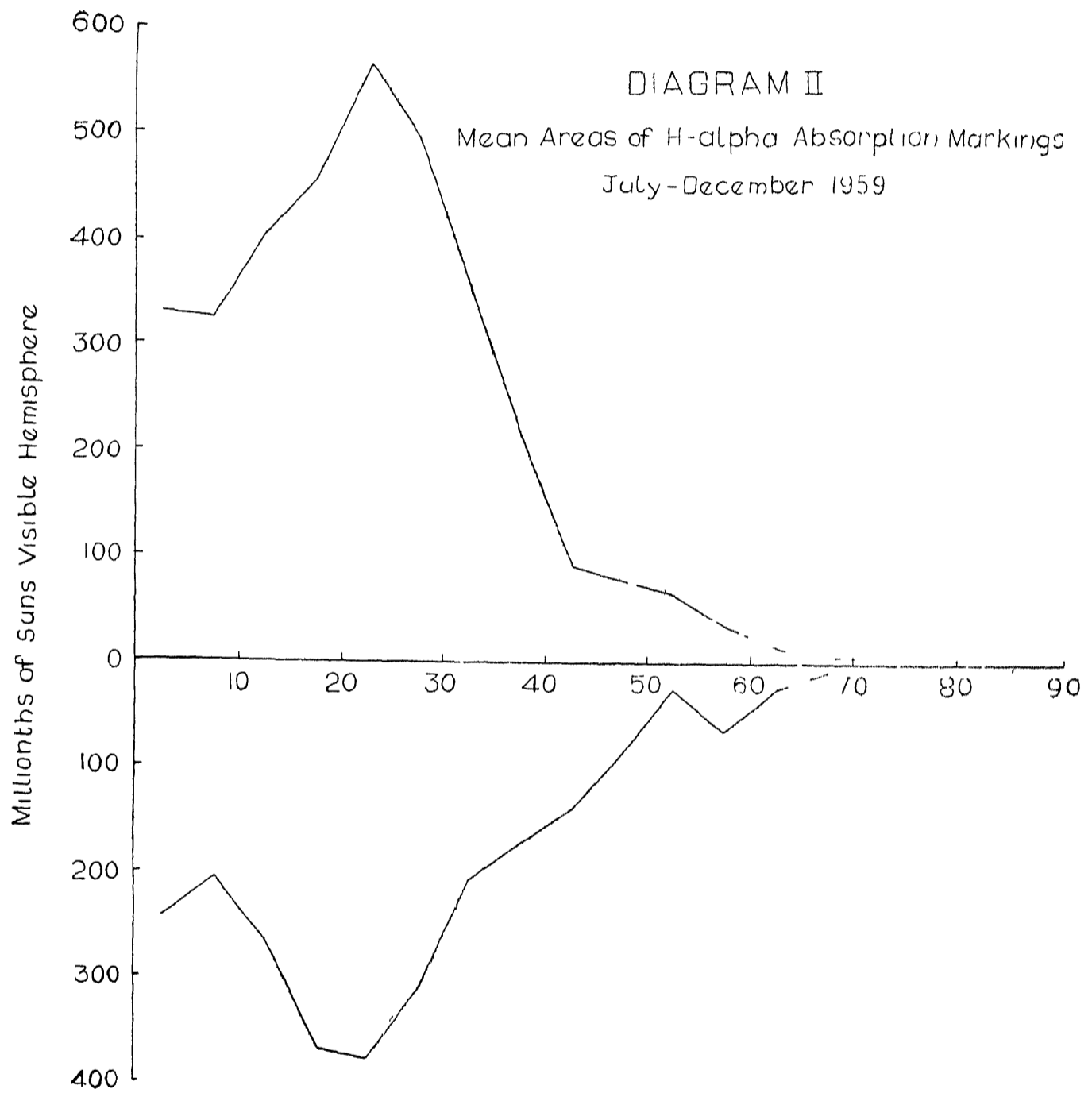


TABLE IV

*Surges, eruptive prominence and active prominence regions*

Date	Phenomenon	Importance	Position		Time ISI		Direction of outflow	Remarks
			Latitude	Longitude difference from Central meridian	Beginning	End		
			°	°	h m	h m		
1959 28th August	BSI	1	21 N	90 E	09 50	10 00	rn	V 1A to red and 1A <sup>o</sup> to violet
29th August	BSI	1	01 N	90 W	10 00	10 10	rs	V 1.2A <sup>o</sup> to red and 1.3A <sup>o</sup> to violet
9th October	APR	1	05 S	90 E	07 50			J
13th October	APR	1	10 S	90 E	07 50			J
14th October	BSI	2	10 N	90 E	07 30	08 00	rn	V 2.8A <sup>o</sup> to red and 1.6A <sup>o</sup> to violet at 0730 hrs
14th November	DSD	1	11 S	90 W	07 30			G Displaced to red and to violet at 08A at 0740 hrs
19th December	APR	1	10 N	90 E	09 55	10 00	r	

*\*Coded*

\*Code DSD Dark surge on disk  
 BSI Bright surge at limb  
 APR Active prominence region  
 BSD Bright surge on disk

TABLE V  
Flare Patrol Hours (Spectroheliographic)

Month and Date	Periods of watch (IST)	Month and date	Periods of watch (IST)
1959		1959	
July		August	
2	0830-0930 1030-1045	20	1130-1100, 1045-1100, 1110-1115
11	0930-1000, 1030-1100, 1130-1200	25	0330-0900, 0330-1000
14	0825-0900, 0930-1000, 0900-1000, 0930-945 1030-1100	27	0730-830, 0330-1000
15		28	
16		29	
21	1015-1100, 1130-1145	Sept 1	0800-1030
26	1430-1530	2	0830-1030, 0330-1030, 1030-1040
27	0845-0900	3	0330-0810, 0955-1045, 1420-1428
28	0745-0815, 0930-1050, 1115-1130	6	0800-1030, 0315-1000, 1330-1100, 1130-1200,
29	0730-0830, 0330-1000, 1030-1100, 1130-1200	7	0735-0830
30	0820-0840, 0930-1000	8	0730-0830,
31	0710-0830	9	0700-1000, 1030-1100,
August		10	0700-0830, 0930-1000, 1030-1100, 1130-1200
1	0830-0900, 1030-1100	14	0745-0830, 0915-1000, 1040-1100
2	0730-0830, 0930-1000, 1030-1100, 1130-1200	15	0735-0830, 0915-1000,
3	0900-1030, 1000-1100	16	0730-0830
5	0745-0815, 0835-0930, 1030-1100, 1130-1200	18	0735-1040, 1030-1045, 1115-1130, 1140-1150
6	0925-1010, 0930-1020, 1130-1200	19	0745-0810, 1135-1155,
7	0810-0815, 0930-1000, 1030-1040	20	0730-0755, 0815-0820,
8	0730-0830, 0930-1000	21	0730-0830
10	0930-1000	22	
11	0930-1015	23	0745-0830, 0925-1035, 0800-0830
12	1030-1100	24	
14	0730-0830, 0930-1000, 1050-1100, 1130-1150	26	0730-0830, 0930-1000, 1030-1045
15	0745-0800, 0930-0945, 0950-1000, 1130-1140	1	0815-0845, 0915-0930, 1015-1020
16	0730-0830, 0930-1000, 1030-1100, 1130-1200, 1420-1435	2	0820-0830, 1030-1100, 1130-1145
18	1000-1030		0730-0830



Month and Date	Periods of watch (IST)	Month and Date	Periods of watch (IST)
1959		1959	
October 3	0730-0830, 0930-1000, 1030-1045	November 20	0730-0830, 0930-1000, 1030-1100, 1130-1200, 1400-1430
6	0730-0830	22	0845-0850
7	0730-0830, 0930-1000, 1030-1035	23	0730-0830, 0930-1000, 1030-1100
8	0730-0810, 0825-0830, 0915-1000, 1030-1040	24	0850-0950, 1030-1100
10	0730-0810, 0815-0830, 0945-1030, 1045-1100	26	0910-0935, 1420-1430
12	0730-0830, 0930-0945, 1130-1200	27	1005-1025, 1030-1100, 1130-1200, 1405-1430
13	0730-0830, 0930-1000, 1030-1100, 1110-1115	December 3	0915-1000, 1030-1100, 1130-1200
14	0730-0830	4	0740-0800, 0825-0855, 0930-0950, 1030-1100, 1130-1200, 1400-1455, 1530-1600
15	0730-0830, 0930-0945, 1115-1145	5	0730-0830
16	1100-1430	6	0735-0810, 0818-0852, 0930-1015, 1030-1055, 1130-1200, 1400-1430, 1530-1600
17	0830-0840, 1050-1055, 1130-1200	7	0730-0800, 0830-0900, 0930-1000, 1030-1100, 1130-1200, 1400-1430, 1530-1600
18	1005-1100, 1115-1445	8	0711-1000, 1030-1100, 1130-1215
22	0820-0830	9	0740-0830, 0930-1000, 1030-1100, 1130-1200, 1410-1430
November 1	0800-0820, 1040-1100	11	0930-1015, 1030-1100, 1130-1200
3	0730-0830, 0930-1000, 1030-1100, 1130-1230	12	0745-0830, 0930-1000, 1030-1100, 1140-1150
7	0745-0830	13	0730-0830, 0930-1000, 1030-1200, 1400-1430, 1530-1600
10	0730-0820	14	0730-0830, 0930-1000, 1030-1100, 1130-1200, 1400-1430, 1530-1600
12	0730-0830, 1040-1100	15	0735-0830, 0930-1000, 1030-1100, 1130-1200, 1405-1430, 1530-1600
14	0730-0830	16	0730-0830, 1130-1200, 1400-1430, 1530-1600
15	0730-0830, 0930-1000, 1030-1100, 1130-1230		
16	0835-0900, 0930-1000, 1030-1100		
17	0740-0830, 0930-1000, 1030-1100		
18	0800-0830, 0930-1000, 1035-1100, 1130-1200, 1410-1430		
19	0730-0830, 0930-1000, 1030-1100, 1130-1200, 1400-1430		























































































































































































































































































































































































































































































































































































































































































































































