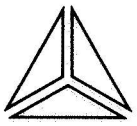

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PHOTOGRAPHIC MEASUREMENTS OF JOVIAN FEATURES

1960-1967

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ABSTRACT

Longitude measurements of Jovian features, primarily those in the southern hemisphere, from photographic plates taken between 1964 and 1967 are reported. During the apparition of 1965-66, several rapidly moving spots were observed on the south component of the South Equatorial Belt and the north edge of the South Temperate Belt, moving at the proper rate to suggest that they belonged to the well-known circulating current. In 1966-67, a dark spot on the north edge of the South Temperate Belt was observed whose drift in longitude, when taken as a function of time, was parabolic. The SEBs was very active: well over 100 spots were observed on this belt during the apparition. The SEBZ also was quite active.

A summary of photographic measurements of belt latitudes between 1960 and 1967 is included.

INTRODUCTION

This paper presents previously unpublished photographic measurements of Jovian features made at the New Mexico State University Observatory. Only the more interesting markings and currents will be discussed in the text; the rotation periods of other features will be presented in Tables I, III, and IV at the conclusion of this paper. The terminology used in this paper is basically the same as that used by Peek (1958). Exceptions include the use of STrZ for the South Tropical Zone and SEBZ for the zone dividing the two components of the South Equatorial Belt. Also, we use $^{n}/$ and $^{s}/$ to denote the north and south edges of an object.

Interested readers should refer to the following sources for more detailed discussions of selected Jovian features observed during the apparitions of 1965-66 and 1966-67:

Object	Apparition	Source
Red Spot	65-66; 66-67	Solberg 1968a; 1968b
Bright Spots, N. edge NEB	65-66	Solberg, 1968c
Vorticity of Red Spot	65-66,66-67	Reese & Smith, 1968

APPARITION OF 1965 - 66

South Temperate Belt. Several dark condensations on the north edge of the STB were observed to move with the velocity of the southern branch of the circulating current (Peek, 1958). Four of these objects persisted for at least a month (Fig. 1); one of them, spot A, traveled completely around the Red Spot and has been discussed in detail by Reese and Smith (1968).

South Equatorial Belt. Dark markings on the southern edge of the SEBs moved with the velocity of the northern branch of the circulating current. The first spot to be observed (Fig. 1) had a rotation period somewhat shorter than the other spots. About 12 December 1965, this spot suddenly moved southward to the middle of the STrZ (Table III) and actually reversed its longitudinal motion. As seen in Fig. 1, the spot reached a maximum longitude of 323°, which we shall call the "vertex." Letting the distance of the spot from the "vertex" equal r, we find that the acceleration of the spot varied approximately as 1/r between longitudes 230° and 320°. The maximum acceleration of the spot was approximately +0.1 deg/day^2 ($+1.6 \times 10^{-5}$ m/sec^2) referred to the direction of Jupiter's rotation, as the spot neared the vertex.

Spot B, on the other hand, showed no acceleration whatever as it neared the vertex. On January 24, 1966, when spot B reached conjunction with spot 1, spot 1 was apparently annihilated, while spot B became much darker.

The behavior of the SEBs spots near the Red Spot is discussed by Reese and Smith (1968).

APPARITION OF 1966 - 67

South Temperate Belt. During the apparition, two dark spots were observed on the north edge of the STB. One of these spots moved in a very unusual manner: its drift in longitude, when plotted as a function of time, is a parabola, within the uncertainty of the observations (Fig. 2). The motion of this spot is well shown in Fig. 3. We know of no other drift with so constant a deceleration ever being observed in Jupiter's atmosphere.

Here we define deceleration to be an acceleration in the direction opposite Jupiter's rotation.

A general least squares solution indicates that the parabola was normal to System II with its vertex at longitude 88°.6 on 8 March 1967. The equation of the parabola is:

$\lambda_2 = 88°.64 + 0°.02047T^2$,

where T = Julian Date - 2439557.57.

The deceleration of the spot was constant with a value of 6.6×10^{-6} m/sec^2, indicating that the spot was subject to a constant force in the direction opposing its motion. A constant force lasting for more than three months and extending almost 200° in longitude is remarkable, especially when one considers the amount of turbulence which seems to exist in the Jovian atmosphere.

Near the vertex, the STBn spot moved northward across the STrZ (Table V), much as the SEBs spot #1 of the previous apparition moved into the STrZ at its "vertex." It is interesting that the vertex of the STBn spot was very near the location of the proposed SEB source "A" (Chapman and Reese, 1968).

The other STB spot had a linear drift, with a discontinuity occurring at the end of April.

South Equatorial Belt. The SEBs was very active during 1966-67; more than 100 individual markings were observed on the south edge of the belt, and rotation periods were derived for 69 of the more long-enduring spots. (Fig. 4).

The behavior of the spots was unremarkable between approximately 100° and 350° -- their velocities were nearly constant and they were often observed to travel through 250° of longitude or more. Near the Red Spot, the number of long enduring spots decreased drastically (Fig. 5), although many transient spots were observed in the vicinity of the Red Spot.

The behavior of these transient spots, which were usually difficult to measure, is shown in a time-lapse motion picture prepared by T.C. Bruce, R.L. Fritz, and R.B. Minton. This motion picture, consisting of 26 photographs obtained during an interval of 33 days, shows the vicinity of the Red Spot between 4 January and 5 February 1967. As expected, the spots traveled down the SEBs and along the northern edge of the Red Spot Hollow. At the following end of the Hollow, the spots were apparently absorbed by a large, dark marking nearly stationary at longitude 45°. A few of the spots continued along the SEBs following the Red Spot, but gradually faded into the belt.

We do not know what became of these spots after they entered the Red Spot Hollow. Some of them were possibly disrupted near the following end of the Red Spot, causing a darkening of the Hollow. The material that was apparently absorbed by the stationary dark marking mentioned above may have continued along the SEBs, or it may have been obscured by bright clouds in the STrZ.

An interesting variation in the rotation rates of the spots is shown in Fig. 6. Spots 1-56 had a mean rotation period of $9^h57^m59^s.3$, while spots 57-69 had a mean period of $9^h57^m37^s.8$.

South Equatorial Belt Zone. During the last half of the apparition, a number of bright spots formed in the SEBZ near 85° (Fig. 2). They formed quite suddenly, as shown in Fig. 7. As they moved toward the Red Spot, their

lengths increased from a mean of 5°.6 between 60° and 90° to a mean of 10°.8 between 30° and 40°. The spots also became brighter as they neared the Red Spot. However, as they approached the longitude of the center of the Red Spot, the SEBZ spots faded to invisibility. (Fig. 8).

SUMMARY

Jupiter's southern hemisphere was very active throughout these two apparations, as the drift charts indicate. A possible correlation of activity near 85° is to be noted: at this longitude, the STBn spot had its vertex, the SEBZ spots formed, and the number of SEBs spots began to increase greatly. There would seem to be some significance in the unusual behavior of these spots near 85° during 1966-67.

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TABLE I

SOUTH TEMPERATE WHITE OVALS IN 1964 - 65
(N=Number of Plates Measured)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
BC	30 Jun - 22 Mar	151°.2 - 344°.7	32	-18°.85	$9^h55^m14^s.8$	$\pm 0^s.2$
DE	1 Jul - 6 Apr	272.8 - 106.5	26	-17.88	9 55 16.2	0.1
FA	27 Jun - 31 Mar	41.8 - 228.4	42	-18.78	9 55 14.9	0.1

Mean rotation period = $9^h55^m15^s.3$

Object	Mean Width	P.E.	Mean Length	P.E.	Mean Latitude	P.E.	Longitude (II) at opposition*
BC	6°.3	± 0°.3	15°.4	± 0°.2	-32°.9	± 0°.1	65°.8
DE	5.9	0.2	15.1	0.2	-32.8	0.1	192.4
FA	6.8	0.3	13.3	0.1	-33.0	0.1	314.8

*13 November 1964

TABLE II

ROTATION PERIODS OF SPOTS IN 1965 - 66

β'' = Zenographic Latitude

White Spot on South Edge of SSTB ($\beta'' = -49°.5$) (S.S.S. Temperate Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period
1	7 Oct-27 Dec	359° - 0°	10	+0°.37	$9^h55^m41^s.1$

White Spot on North Edge of SSTB ($\beta'' = -40°.9$) (S.S. Temperate Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period
1	25 Aug- 1 Mar	339° - 179°	11	-25°.53	$9^h55^m05^s.7$

STBn Dark Spots ($\beta'' = -25°.6$) (S. Branch of Circulating Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
1	7 Nov- 5 Dec	229° - 119°	4	-117°.86	$9^h53^m00^s$	
2	10 Nov- 5 Dec	228 - 130	3	-117°.60	9 53 01	
3	10 Nov- 5 Dec	241 - 141	6	-120.00	9 52 57	
A a	14 Nov- 9 Dec	234.5 - 138.4	8	-117.29	9 53 00.8	$\pm 0^s.7$
A b	9 Dec- 7 Jan	138.4 - 41.8	17	-101.98	9 53 21.6	1.3
A	14 Nov- 7 Jan	234.5 - 41.8		-107.06	9 53 14.6	

Mean rotation period = $9^h53^m3^s.8$

SEBs Dark Spots ($\beta'' = -21°.0$) (N. Branch of Circulating Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error	
1 a	23 Oct-24 Nov	217°.3 - 297°.4	6	+75°.03	$9^h57^m23^s.7$	$\pm 0^s.4$	
1 b	24 Nov-11 Dec	297.4 - 325.4	4	+48.83	9 56 47.6	1.5	
1 c	11 Dec-24 Jan	325.4 - 309.6	17	-11.07	9 55 25.5	0.9	Note[a]
2	4 Dec-30 Jan	156 - 353	6	+103.68	9 58 03.0		
B a	4 Dec- 7 Jan	141.4 - 256.4	4	+103.38	9 58 04.1	1.1	
B b	7 Jan-13 Feb	256.4 - 16.6	24	+96.53	9 57 53.3	0.9	
B c	13 Feb-17 Feb	16.6 - 35.2	4	+151.22	9 59 08.8	4.5	Note[b]
B d	17 Feb-20 Feb	35.2 - 43.6	5	+69.31	9 57 15.7	2.9	
B e	20 Feb-16 Mar	43.6 - 68.4	11	+31.97	9 56 24.5	1.2	
B f	16 Mar- 4 May	68.4 - 67.5	4	- 0.54	9 55 39.9	0.8	
4	4 Dec- 2 Jan	128 - 228	4	+103.45	9 58 03.0		

[a]Spot moved into middle of South Tropical Zone.
[b]Spot passed north of Red Spot.

TABLE II (CONTINUED)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error	
C a	12 Dec-29 Jan	134°.2 - 295°.2	9	+101°.56	$9^h58^m00^s.2$	$\pm 0^s.6$	
C b	29 Jan-20 Feb	295.2 - 17.7	11	+115.46	9 58 19.4	1.2	
C c	28 Feb-22 Mar	47.1 - 52.2	12	+6.92	9 55 50.1	2.0	
C d	22 Mar- 6 May	52.2 - 48.2	8	-2.70	9 55 36.9	1.0	
6	4 Mar-17 Mar	355 - 43	5	+110.77	9 58 13		
7 a	15 Feb-12 Mar	277 - 7	9	+108.00	9 58 09		
7 b	14 Mar-17 Mar	16 - 33	3	+169.99	9 59 35		Note[b]
8	10 Feb-19 Mar	228 - 2	10	+108.65	9 58 10		
9	19 Feb-12 Apr	143 - 334	8	+110.19	9 58 12		
10	8 Mar- 9 Apr	159 - 265	6	+ 99.38	9 57 57		
11	8 Mar-30 Mar	140 - 212	3	+ 98.18	9 57 56		
12	9 Mar- 6 Apr	76 - 173	4	+103.93	9 58 04		

Mean rotation period of rapidly retrograding spots = $9^h58^m8^s.5$

[a] Spot moved into middle of South Tropical Zone.
[b] Spot passed north of Red Spot.

TABLE III

LONGITUDE AND LATITUDE MEASUREMENTS OF SEB_s SPOT #1

1965-66

Date	System II Longitude	Zenographic Latitude
Oct 23.48	216°.9	
28.49	239.2	-21°.4
Nov 5.38	250.2	
10.30	262.4	
14.44	272.1	
17.38	279.8	
25.26	298.9	
29.41	305.2	
Dec 2.34	311.2	
6.43[a]	316.5	
Dec 12.27	323.1	-22.1
14.32	322.9	
17.23	323.0	
19.28	323.4	
20.15	323.5	
26.32	321.0	
28.39	320.0	
29.22	320.2	-22.8
Jan 2.34	319.4	
3.17	317.7	
5.23	317.1	-23.1
7.30	315.7	
10.21	312.7	
13.09	312.9	
15.15	311.0	
20.11	311.1	
24.25	310.5	

[a]Spot moves south into South Tropical Zone.

TABLE IV

ROTATION PERIODS OF SPOTS IN 1966-67

Dark Spot in STeZs (S.S. Temperate Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period
1	27 Jan- 1 Jun	160° - 55°	5	-25°.7	$9^h55^m06^s$

South Temperate White Ovals (S. Temperate Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
BC a	17 Aug-13 Jan	7°.9 - 266°.5	13	-20°.29	$9^h55^m12^s.9$	$\pm0^s.1$
BC b	13 Jan- 2 Jun	266.5 - 177.6	11	-19.16	9 55 14.4	0.1
BC	17 Aug- 2 Jun	7.9 - 177.6	(24)	-19.75	9 55 13.6	
DE a	6 Sep- 2 Mar	142.3 - 30.6	12	-18.97	9 55 14.7	0.2
DE b	2 Mar-29 May	30.6 - 323.7	5	-22.74	9 55 9.5	0.2
DE	6 Sep-29 May	142.3 - 323.7	(17)	-20.53	9 55 12.6	
FA a	14 Aug-14 Jan	247.6 - 161.3	14	-16.91	9 55 17.5	0.2
FA b	14 Jan-13 Jun	161.3 - 68.8	16	-18.52	9 55 15.3	0.2
FA	14 Aug-13 Jun	247.6 - 68.8	(30)	-17.70	9 55 16.4	

Object	Mean Width	P.E.	Mean Length	P.E.	Mean Latitude	P.E.	Longitude (II) at opposition
BC	6°.7	±0°.4	13°.6	±0°.2	-33°.1	±0°.2	262°.6
DE	6.3	0.3	14.5	0.3	-33.3	0.1	56.3
FA	6.8	0.1	12.3	0.2	-32.8	0.1	157.7

STBn Dark Spots (β'' = -25°.2) (S. Branch of Circulating Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
1	1 Dec-11 Mar	279°.9 - 88°.6	22	-102°.97*	$9^h53^m20^s.2$	$\pm0^s.6$
2 a	21 Mar-24 Apr	351.2 - 226.0	6	-110.12	9 53 10.5	0.3
2 b	2 May-23 May	207.4 - 154.2	4	- 75.95	9 53 57.0	1.2

Mean rotation period of 1 and 2a = $9^h53^m15^s.3$

*Variable, see text and Table V. The values given here are based on a least squares analysis for the interval between 1 and 20 December 1966, when the drift of the spot was essentially linear and typical of the southern branch of the circulating current.

TABLE IV (CONTINUED)
ROTATION PERIODS OF SPOTS IN 1966-67

SEBs Dark Spots (N. Branch of Circulating Current)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period
1	26 Aug- 2 Oct	244° - 0°	3	+ 94°.05	$9^h57^m49^s.8$
2	16 Aug- 4 Oct	193 - 358	5	101.02	9 57 59.4
3	17 Sep- 9 Oct	282 - 1	4	107.73	9 58 08.6
4	14 Sep-28 Oct	213 - 7	5	100.23	9 57 58.3
5	11 Sep- 7 Nov	185 - 24	11	104.74	9 58 04.5
6	16 Sep- 2 Nov	193 - 340	7	93.83	9 57 49.6
7	11 Sep- 6 Oct	169 - 249	4	96.00	9 57 52.5
8	6 Sep-22 Nov	130 - 24	12	98.96	9 57 56.6
9	1 Sep- 3 Oct	100 - 208	4	101.25	9 57 59.7
10	6 Sep-21 Nov	102 - 6	13	104.21	9 58 03.8
11	3 Oct- 2 Nov	184 - 284	4	100.00	9 57 58.0
12	3 Oct- 1 Dec	176 - 19	8	103.22	9 58 02.5
13	21 Sep-29 Nov	119 - 351	13	100.87	9 57 59.2
14	3 Oct-17 Nov	148 - 295	7	98.00	9 57 55.3
15	3 Oct- 8 Dec	128 - 350	12	100.91	9 57 59.3
16	8 Oct-18 Dec	132 - 0	13	96.34	9 57 53.0
17	25 Oct- 8 Dec	174 - 317	4	97.50	9 57 54.6
18	20 Oct-28 Nov	149 - 277	3	98.46	9 57 55.9
19	25 Oct-23 Dec	156 - 355	10	101.19	9 57 59.7
20	11 Nov-23 Dec	200 - 340	4	100.00	9 57 58.0
21	20 Oct-23 Dec	118 - 332	11	100.31	9 57 58.5
22	27 Oct- 2 Jan	133 - 354	5	98.95	9 57 56.6
23	16 Nov-23 Dec	190 - 310	8	97.30	9 57 54.3
24	27 Oct- 9 Jan	117 - 356	10	96.89	9 57 53.8
25	3 Nov-19 Jan	121 - 21	19	101.30	9 57 59.8
26	8 Nov-20 Jan	115 - 4	20	102.33	9 58 01.2
27 a	3 Nov-17 Dec	85 - 235	6	102.27	9 58 01.2
27 b	23 Dec-27 Jan	255 - 5	4	94.29	9 57 50.2
28	12 Nov-19 Jan	108 - 328	16	97.06	9 57 54.0
29	8 Nov-29 Jan	74 - 352	12	101.71	9 58 00.4
30	15 Nov-19 Jan	87 - 306	10	101.08	9 57 59.5
31 a	15 Nov-14 Dec	73 - 174	10	104.48	9 58 04.2
31 b	17 Dec-28 Jan	182 - 323	5	100.71	9 57 59.0
32	22 Nov-12 Feb	85 - 353	9	98.05	9 57 55.4
33	2 Dec- 4 Feb	105 - 318	12	99.84	9 57 57.8
34	2 Dec-28 Jan	85 - 284	9	104.74	9 58 04.5
35	17 Dec-22 Feb	124 - 3	11	107.01	9 58 07.7
36	12 Dec- 8 Mar	100 - 22	17	98.37	9 57 55.8
37 a	14 Dec-20 Jan	85 - 214	9	104.59	9 58 04.3
37 b	23 Jan- 8 Mar	224 - 4	12	95.45	9 57 51.8
38	29 Dec- 4 Feb	122 - 256	10	108.65	9 58 09.9
39	29 Dec-11 Mar	107 - 358	16	104.58	9 58 04.3
40	22 Feb-13 Mar	281 - 345	6	101.05	9 57 59.5

TABLE IV (CONTINUED)
ROTATION PERIODS OF SPOTS IN 1966-67

SEBs Dark Spots (continued)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period
41	29 Dec-15 Mar	88° - 349°	16	+103°.03	$9^h58^m02^s.2$
42	5 Jan-13 Mar	106 - 335	5	102.54	9 58 01.5
43	5 Jan-25 Mar	96 - 355	16	98.35	9 57 55.8
44	5 Jan-15 Mar	70 - 315	13	106.52	9 58 07.0
45	27 Jan-25 Mar	135 - 337	8	106.31	9 58 06.7
46	3 Feb- 1 Apr	149 - 356	11	108.95	9 58 10.3
47	7 Mar-27 Mar	252 - 320	5	102.00	9 58 00.8
48	15 Jan-27 Mar	65 - 309	13	103.10	9 58 02.3
49	12 Mar-16 Apr	242 - 345	6	88.28	9 57 41.9
50	29 Jan-27 Mar	95 - 282	12	98.42	9 57 55.9
51	27 Jan- 1 Apr	65 - 280	11	100.78	9 57 59.1
52	3 Feb-23 Apr	70 - 340	11	102.53	9 58 01.5
53	5 Feb- 5 May	65 - 5	8	101.12	9 57 59.6
54	22 Mar-23 Apr	206 - 315	5	102.19	9 58 01.0
55	2 Mar-23 Apr	124 - 306	6	105.00	9 58 04.9
56	9 Mar- 3 May	137 - 331	5	105.82	9 58 06.0
57	2 Mar-25 Apr	105 - 281	4	97.78	9 57 55.0
58	2 Mar- 1 Jun	90 - 23	7	96.59	9 57 53.3
59	2 Mar-12 May	75 - 293	5	92.11	9 57 47.2
60	9 Mar-17 May	83 - 298	8	93.48	9 57 49.1
61	9 Mar-12 May	72 - 258	8	87.19	9 57 40.3
62	5 Apr-24 May	140 - 273	5	81.43	9 57 32.4
63	31 Mar-14 May	112 - 235	7	83.86	9 57 35.8
64	20 Mar-31 May	71 - 266	7	81.25	9 57 32.2
65	10 Apr-24 Apr	119 - 157	3	81.42	9 57 32.4
66	17 Apr-31 May	134 - 249	3	78.41	9 57 28.3
67	24 Apr-16 May	128 - 185	3	77.73	9 57 27.4
68	11 May- 2 Jun	147 - 205	4	79.09	9 57 29.2
69	11 May- 2 Jun	132 - 190	3	79.09	9 57 29.2

Mean rotation period = $9^h57^m55^s.2$

White Spots in SEBZ ($\beta'' = -13°.7$)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
1	13 Feb-22 Feb	55°.4 - 40°.9	3	-48°.21	$9^h54^m34^s.8$	$\pm 3^s.0$
2	13 Feb-11 Mar	67.0 - 33.4	11	-38.77	9 54 47.6	1.9
3	22 Feb-15 Mar	67.0 - 38.9	12	-40.16	9 54 45.8	2.4
4	4 Mar-26 Mar	70.9 - 39.2	5	-43.21	9 54 41.6	1.7
5	11 Mar- 2 Apr	75.6 - 40.4	6	-48.99	9 54 35.1	1.3
6	26 Mar-16 Apr	62.1 - 37.2	3	-35.48	9 54 52.1	0.1
7	21 Mar-21 Apr	77.4 - 37.2	7	-38.91	9 54 47.4	0.9
8	25 Mar-26 Apr	80.0 - 35.4	5	-41.77	9 54 43.5	1.0

TABLE IV (CONTINUED)
ROTATION PERIODS OF SPOTS IN 1966-67

White Spots in SEBZ (continued)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
9	26 Mar-28 Apr	84°.4 - 38°.7	8	-41°.60	$9^h54^m43^s.8$	$\pm 1^s.0$
10	9 Apr-21 Apr	74.4 - 59.1	4	-38.31	9 54 48.3	2.4
11	16 Apr-13 May	74.1 - 34.4	8	-44.18	9 54 40.2	2.0
12	21 Apr-20 May	77.0 - 33.8	8	-44.69	9 54 39.6	0.8
13	8 May-27 May	69.5 - 43.5	3	-41.10	9 54 44.5	1.7

Mean rotation period = $9^h54^m43^s.4 \pm 0^s.5$

Following End Dark Column in SEBZ

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
1	13 Feb-13 May	77°.0 - 85°.3	10	+2°.78	$9^h55^m44^s.4$	$\pm 0^s.8$

NTBn Dark Spots ($\beta'' = +31°.4$) (N. Temperate Current A)

Object	Limiting Dates	Limiting Longitudes	N	$\Delta\lambda_2/30^d$	Rotation Period	Probable Error
1	13 Jan-11 Mar	307°.6 - 352°.8	5	+23°.79	$9^h56^m13^s.2$	$\pm 0^s.5$
2	31 Jan- 1 Jun	337.1 - 58.2	11	+20.12	9 56 08.2	0.2
3 a	31 Jan-27 Mar	350.9 - 34.6	11	+23.58	9 56 13.0	0.5
3 b	27 Mar- 1 Jun	34.6 - 75.7	6	+18.85	9 56 06.5	0.4
3	31 Jan- 1 Jun	350.9 - 75.7	(17)	+21.02	9 56 09.4	

Mean rotation period = $9^h56^m9^s.6 \pm 0^s.2$

TABLE V

STBn DECELERATING SPOT, 1966-67

(System II)

	OBSERVED LONGITUDE[a]	COMPUTED LONGITUDE	DEVIATION O-C[b]	LENGTH[c]	ZENOGRAPHIC LATITUDE[d]	WIDTH[e]	ROTATION PERIOD[f]
Dec 1.4	278°.07	279°.94	-1°.87	7°.1	---	---	$9^h52^m59^s.0$
8.4	253.58	253.24	0.34	6.3	-25°.2	2°.9	
10.4	246.47	245.98	0.49	5.3	---	---	9 53 13.9
17.4	223.70	221.86	1.84	5.8	-24.6	3.3	
20.3	212.57	212.45	0.12	7.2	---	---	9 53 30.5
29.4	186.20	185.17	1.03	6.7	---	---	
Jan 5.4	166.03	166.50	-0.47	6.6	-25.0	3.3	9 53 57.3
12.4	150.09	149.82	0.27	5.2	-24.3	3.8	
17.3	138.20	139.35	-1.15	5.4	-25.7	3.4	9 54 17.2
20.2	132.15	133.61	-1.46	---	-25.6	3.2	
22.3	129.26	129.67	-0.41	5.3	---	---	
27.3	120.79	121.02	-0.23	6.1	-25.7	2.7	
29.3	118.41	117.84	0.57	5.0	---	---	9 54 37.3
Feb 3.3	110.86	110.62	0.24	5.1	-24.5	2.8	
5.3	108.73	108.02	0.71	5.1	---	---	
12.3	99.95	100.20	-0.26	4.8	---	---	
13.2	99.63	99.34	0.28	4.6	-23.5	2.7	9 55 02.2
22.3	92.34	92.52	-0.18	5.6	---	---	
Mar 2.1	89.18	89.37	-0.19	3.1	-23.4	3.6	
9.1	88.68	88.66	0.02	---	-22.7	3.6	
11.2	89.14	88.84	0.30	---	---	---	9 55 45.9

[a]The average probable error of the observed longitude for one date is ±0°.26
[b]The deviation of a single observed longitude from the parabolic curve.
[c]The mean length is 5°.6
[d]The average probable error of the observed latitude for one date is ±0°.15
[e]The mean width is 3°.2
[f]The rotation periods are based on the equation of the parabola.

TABLE VI

MEAN ZENOGRAPHIC LATITUDES OF JOVIAN FEATURES

Object	1960	1961	1962	1963-64	1964-65	1965-66	1966-67	Mean
SSSTB	---	---	---	----	-56°.2	-58°.0	---	-57°.1
SSTB	-46°.3	-45°.0	-44°.3	-43°.1	-45.1	-45.1	-44°.5	-44.8
STeZB[a]	---	---	---	-38.5	-38.1	-38.4	-38.8	-38.4
s/STB	-34.5	-34.3	-33.1	-33.3	-33.6	-33.8	-32.9	-33.6
n/STB	-27.6	-26.9	-26.4	-25.4	-25.9	-25.8	-26.3	-26.3
s/SEBs	-20.7	-21.4	-21.6	-19.9	-20.3	-20.7	-21.7	-20.9
n/SEBn	- 5.8	- 0.5[c]	- 4.4	- 6.8	- 6.3	- 7.1	- 7.6	- 6.8
EB	---	---	---	---	---	---	+ 0.2	+ 0.2
s/NEB	+ 7.1	+ 8.0	+ 8.3	+ 8.6	+ 6.6	+ 7.2	+ 7.4	+ 7.6
n/NEB	+16.9	+19.8	+20.5	+19.5	+20.0	+19.1	+21.4	+19.5
s/NTB	---	---	---	---	+23.4	+23.8	+25.7	+24.3
n/NTB	---	---	---	---	+31.5	+31.4	+31.4	+31.5
NNTB	---	---	---	+37.0	+36.8	+37.3	+37.9	+37.1
NNNTB	---	---	---	+44.9	+45.9	+44.8	+44.9	+45.1
s/Red Spot	---	---	-29.2	-28.7	-28.1	-27.8	-26.7	-28.5[d]
Center Red Spot	---	---	-22.7	-22.5	-22.1	-22.3	-23.1	-22.4[d]
n/Red Spot	---	---	-16.2	-16.2	-16.1	-16.9	-19.5	-16.3[d]
s/WOS[b]	---	---	---	-36.0	-36.1	-36.3	-36.4	-36.1
Center WOS[b]	---	---	---	-32.6	-33.0	-33.4	-33.1	-33.0
n/WOS[b]	---	---	---	-29.3	-29.9	-30.4	-29.8	-29.9

[a] A thin dark belt in the middle of the South Temperate Zone.
[b] The mean of three white oval spots in the South Temperate Zone.
[c] This value applies to the north edge of a prominent dark belt in the normal latitude of the southern part of the Equatorial Zone.
[d] Mean does not include 1966-67 when the true outline of the Red Spot probably was concealed.

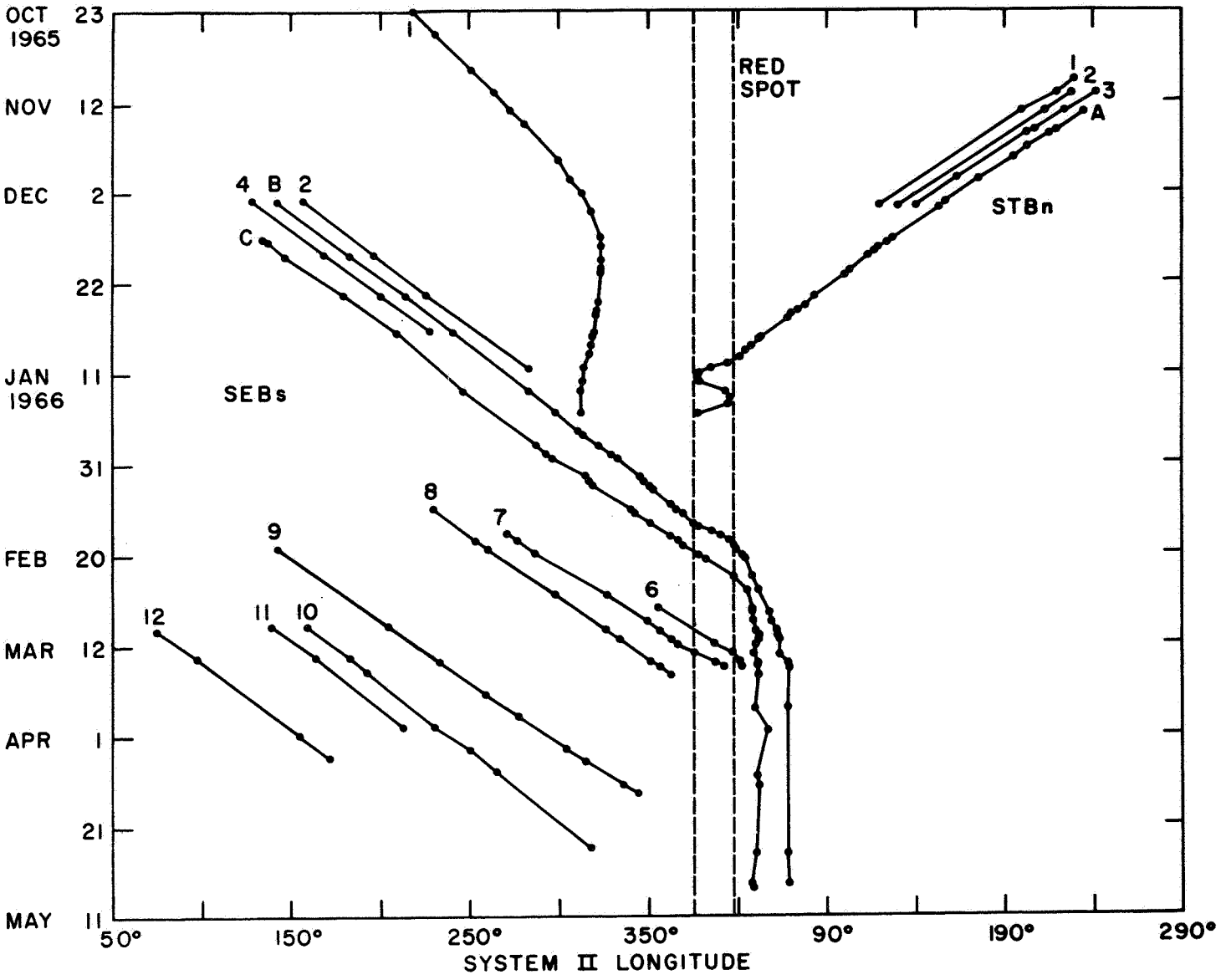

Fig. 1. Rapidly-moving spots in Jupiter's South Tropical Zone, 1965-66.

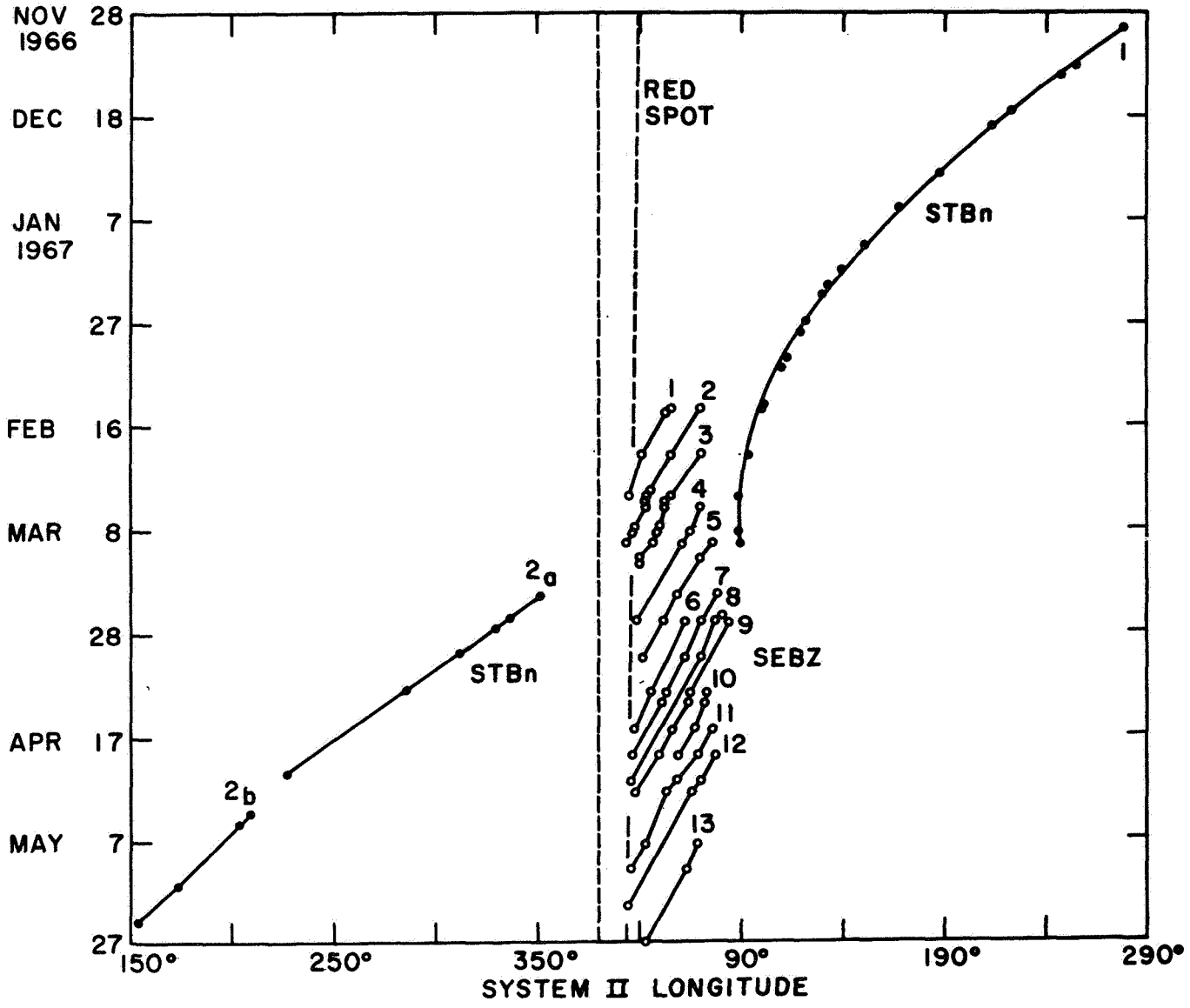

Fig. 2. Longitude chart of two dark spots on the north edge of the South Temperate Belt and a number of bright spots in the interior of the South Equatorial Belt, 1966-67.

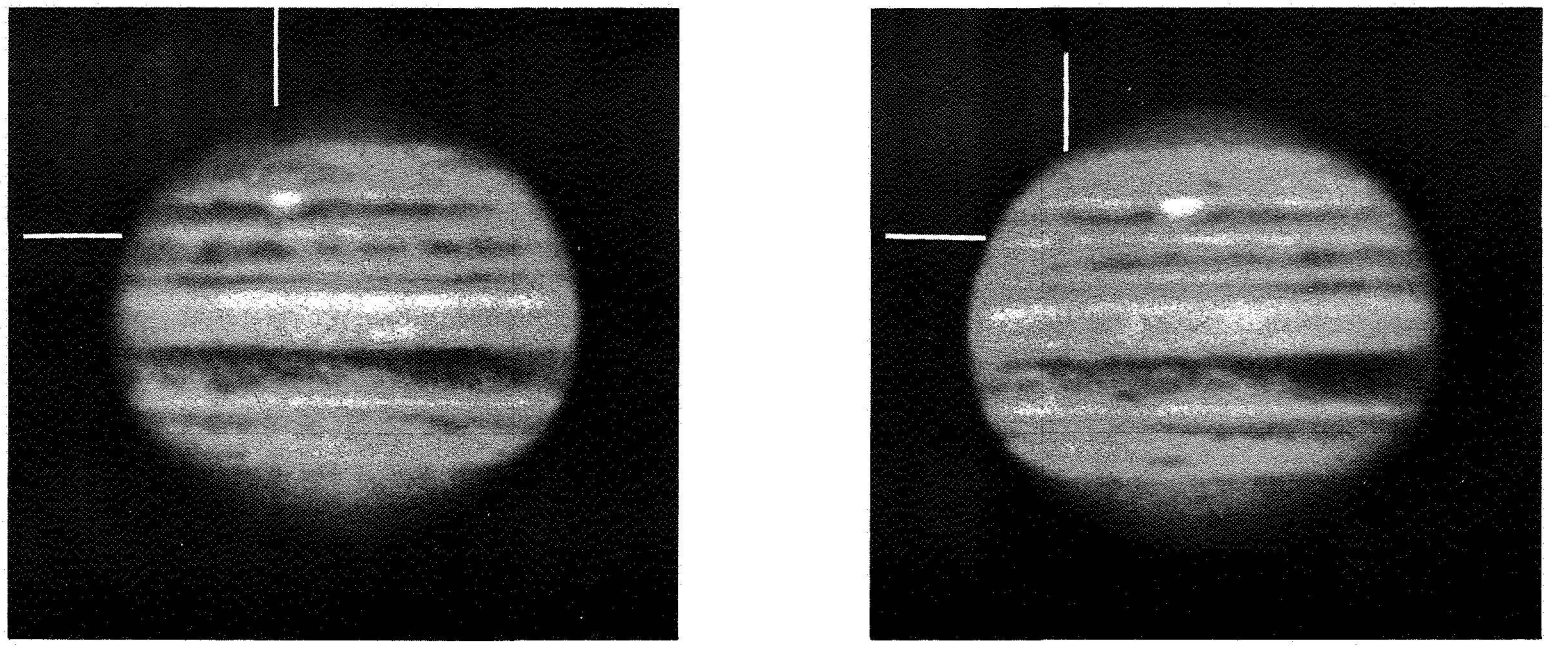

Fig. 3. Jupiter on 5 January 1967 (left), 0921 UT, W_2 180° and 27 January 1967 (right), 0650 UT, W_2 157°. Notice the motion of the STBn "decelerating" spot with respect to the white oval FA. Both photographs were taken in blue light with the 30-in. reflector.

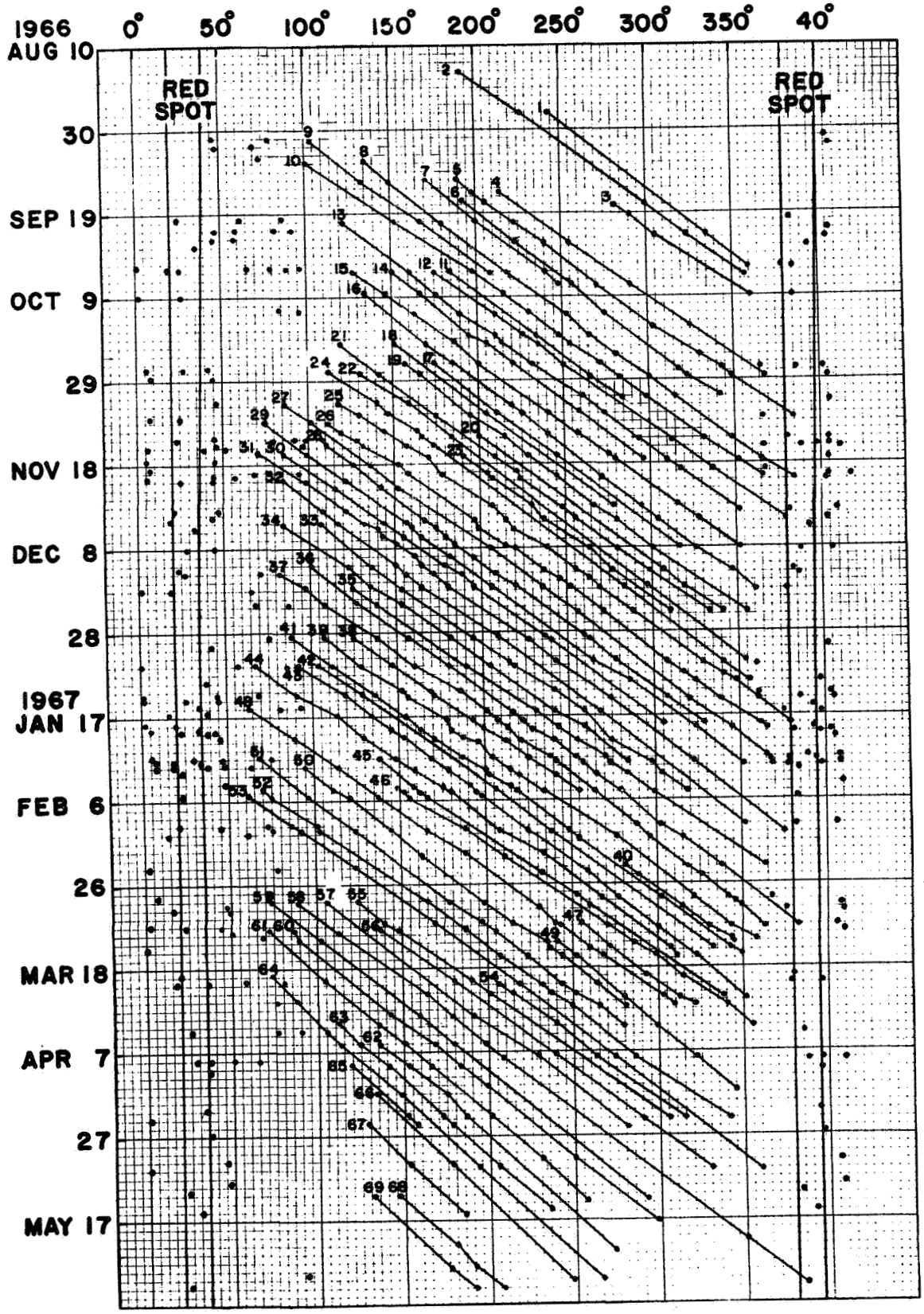

Fig. 4. Drift of dark spots on the south edge of the South Equatorial Belt in system II longitude.

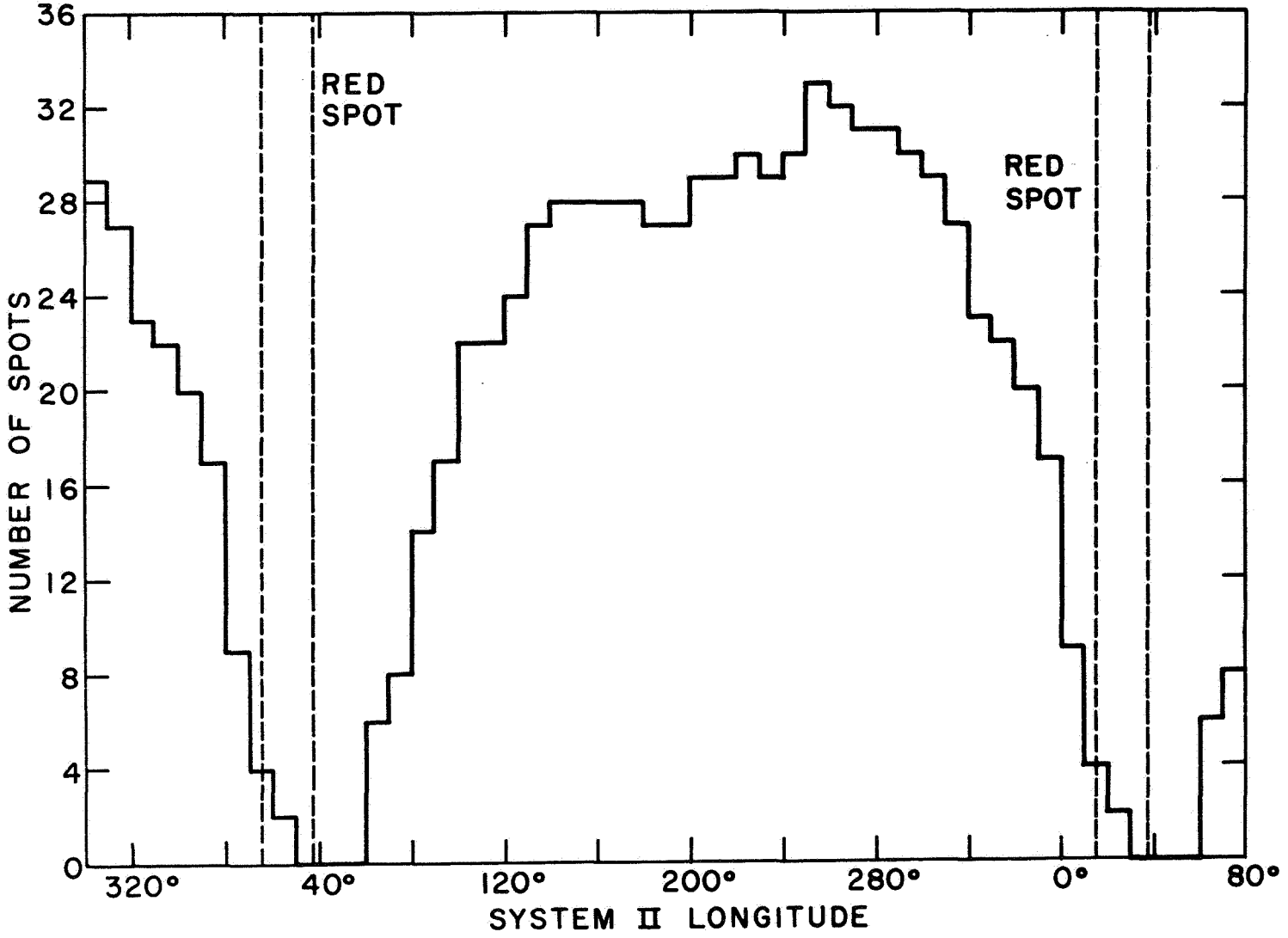

Fig. 5. A histogram showing the number of long-lived SEBs spots observed in 10° intervals of longitude, 20 November 1966 to 20 March 1967.

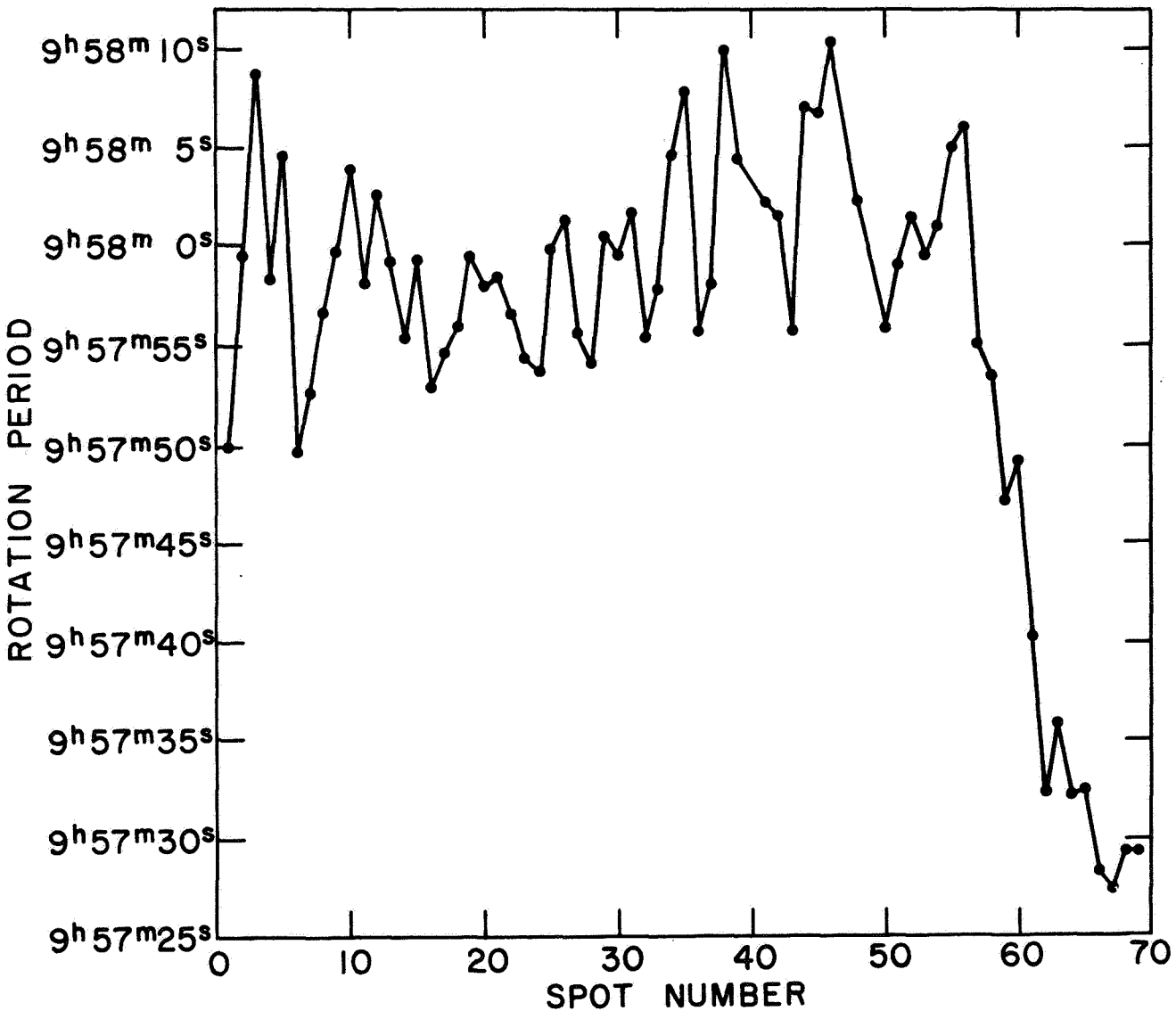

Fig. 6. Charts showing a notable decrease in the rotation period of SEBs spots observed late in the 1966-67 apparition.

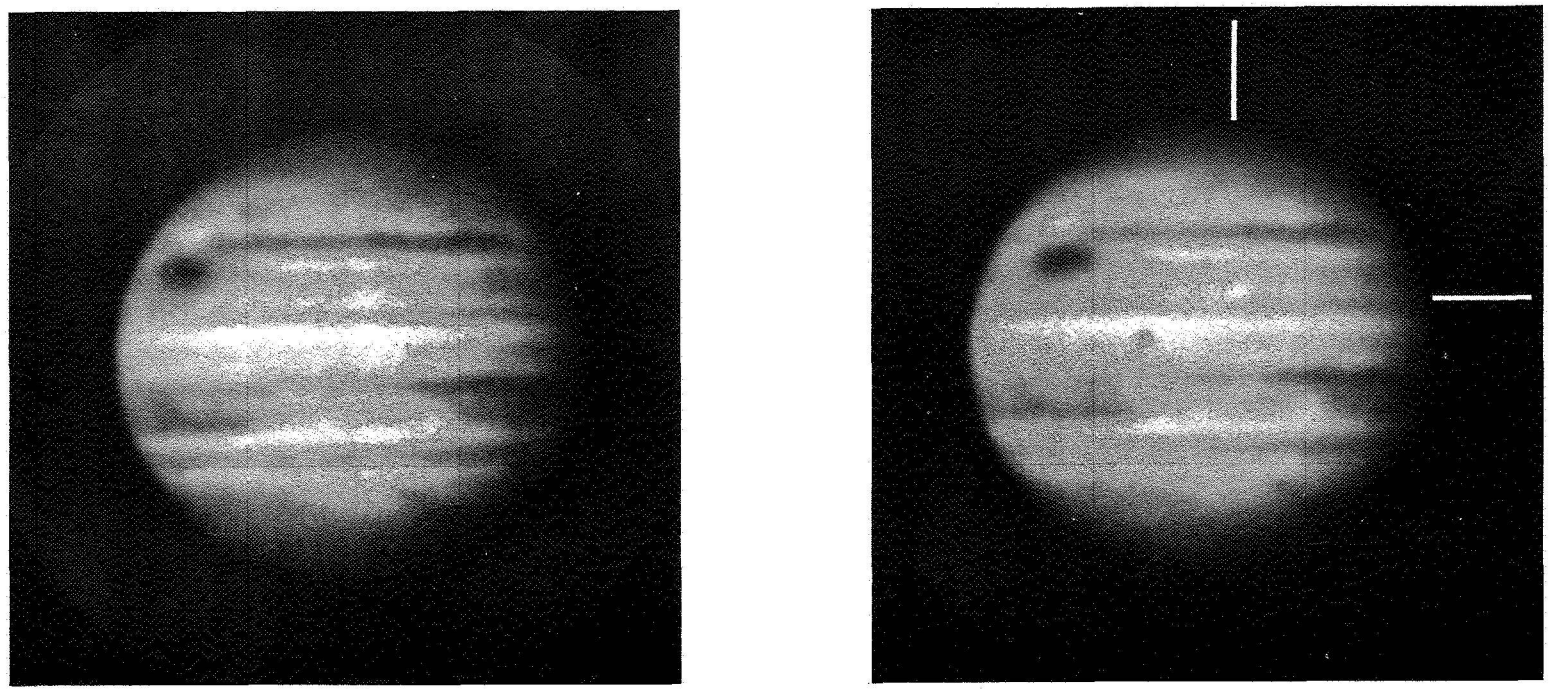

Fig. 7. Jupiter in blue light showing the rapid formation of a bright spot in the South Equatorial Belt between 9 March 1967 at 0322 UT (left) and 11 March 1967 at 0451 UT (right). 61-cm. reflector.

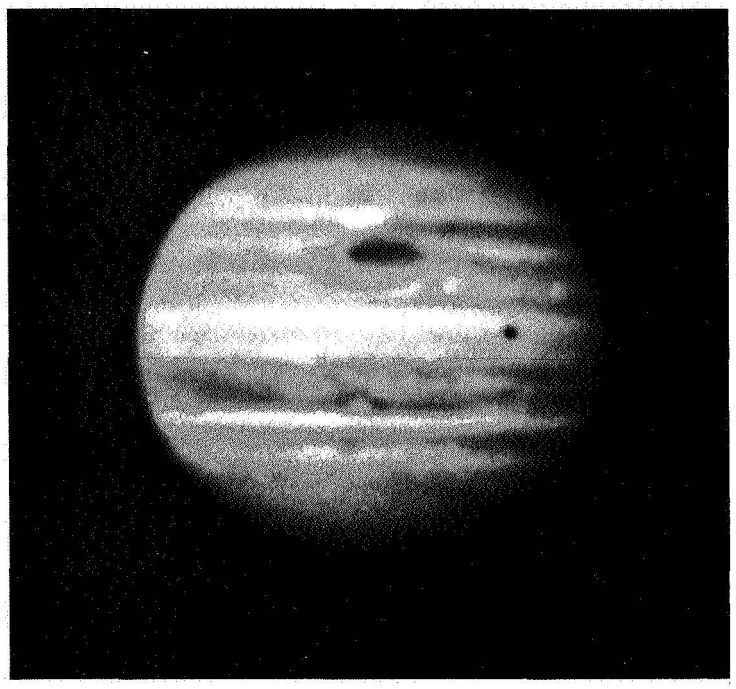

Fig. 8. Jupiter on 11 March 1967, 0345 UT, W_2 28°. Several of the features discussed in the paper are shown in this photograph. Several white spots are visible in the SEBZ: notice that none are visible preceding the Red Spot. The dark spot in the Equatorial Zone is the shadow of J II. This photograph was taken in blue light with the 61-cm. reflector.