INVESTIGATION OF 947 DOUBLES IN THE PARIS ASTROGRAPHIC CATALOGUES +34° AND +35° WITH AN ANGULAR SEPARATION LESS THAN 15″

PART VI

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The present paper gives the results of the search and counts of 947 doubles with an angular separation less than 15 in different magnitudes for different values of Δm, the difference of magnitudes between the components. Using Kreiken's formula, the number of opticals O_k has been computed. The values of $T:O_k$ are in good agreement with the ones given by Goyal for other Astrographic Catalogues. The average galactic concentration, obtained by comparing the distributions in galactic latitudes $0° < |\beta| < 20°$ and $|\beta| > 40°$, is 11·947.

INTRODUCTION

The present paper is a continuation of the previous work (Goyal 1962, 1964*a*, 1964*b*, 1965) and (Goyal and Mithal 1964). We have searched the Paris Astrographic Catalogues for doubles with an angular separation $d \leqslant 15''$ and picked 947 pairs. The numbers of stars in the catalogues +34° and +35° are 78,157 and 80,506 respectively. The observed distributions in $0'' < d \leqslant 5''$, $5'' < d \leqslant 10''$ and $10'' < d \leqslant 15''$ in different intervals of Δm (the difference of magnitude between the components) have been tabulated in Tables I to VI. The last columns give the numbers of opticals computed according to Kreiken's formula (Kreiken 1928). In Table VII, the values of the ratio $T:O_k$ (observed to optical) are given. Further, these values of $T:O_k$ reveal that quite a large number of doubles with $0'' < d \leqslant 5''$ might turn out true binaries in $0'' < d \leqslant 5''$. The numbers in the last columns of Tables I to VI in the faint magnitudes for $5'' < d \leqslant 10''$ and $10'' < d \leqslant 15''$ are quite large, sometimes larger than the actual number of pairs picked up, which reveals that the catalogues are not complete in the fainter magnitudes. But irrespective of the magnitude, the number of opticals is quite small for $0'' < d \leqslant 5''$.

The distributions according to the galactic latitude lying between $0° < |\beta| \leqslant 20°$, $20° < |\beta| \leqslant 40°$, $|\beta| > 40°$ are given in Tables VIII to XVI. Approximate galactic latitude was seen from Ohlsson's Tables (Ohlsson 1932).

The average galactic concentration by comparing the total number of stars in $0° < |\beta| \leqslant 20°$ and $|\beta| > 40°$ was found to be 11·947. It is appreciably larger than the galactic concentration from all stars for these magnitudes in the zones +32° and +33° (Goyal 1961-62), +25° to +31° (Goyal, *in press*) and −17° to −21°, etc. (Goyal *et al.* 1963).

Observed distributions of stars in the catalogues +34° and +35° according to d, m, and Δm

TABLE I (+34°)

$0'' < d \leqslant 5''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	0	0	2	1	1	0	0	0	0	4	0·62
10·0	0	1	2	2	2	1	0	0	1	9	1·30
11·0	7	4	5	1	8	1	0	0	0	26	0·79
12·0	8	5	8	2	1	0	0	0	0	24	3·50
13·0	12	2	2							16	4·00
Total	27	12	19	6	12	2	0	0	1	79	10·21

TABLE II (+34°)

$5'' < d \leqslant 10''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	0	0	1	0	2	3	2	2	4	14	5·58
10·0	3	3	2	3	5	5	3	3	5	32	11·70
11·0	13	7	11	8	11	5	7	1	0	63	7·11
12·0	26	12	12	5						55	31·50
13·0	14	3	2							19	36·00
Total	56	25	28	16	18	13	12	6	9	183	91·89

TABLE III (+34°)

$10'' < d \leqslant 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	1	2	1	1	1	1	1	2	10	20	16·74
10·0	6	1	2	1	11	2	2	0	7	32	35·10
11·0	8	8	4	8	6	3	7	0	1	45	21·33
12·0	19	6	8	6	3	1				43	94·50
13·0	15	2								17	108·00
Total	49	19	15	16	21	7	10	2	18	157	275·67

* O_k are the number of opticals from Kreiken's formula (Kreiken 1928).

Further, we conclude that quite a large number of stars, with magnitudes less than 11·0 and differences of magnitudes between the components less

Observed distributions of stars in the catalogues +34° and +35° according to d, m, and Δm

TABLE IV (+35°)

$0'' < d \leqslant 5''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	0	1	0	0	0	1	0	0	0	2	0·17
10·0	4	1	0	3	1	0	1	0	0	10	0·74
11·0	11	3	10	2	0	3	0	0	0	29	0·94
12·0	13	5	4	1	1					24	3·29
13·0	8	1	1							10	4·10
Total	36	11	15	6	2	4	1	0	0	75	9·24

TABLE V (+35°)

$5'' < d \leqslant 10''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	3	0	2	2	3	2	2	5	9	28	1·53
10·0	7	3	8	3	7	4	5	5	7	49	6·66
11·0	21	8	14	7	6	6	9			71	0·46
12·0	24	9	18	9	4					64	29·61
13·0	12	4								16	36·90
Total	67	24	42	21	20	12	16	10	16	228	75·16

TABLE VI (+35°)

$10'' < d \leqslant 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T	O_k*
9·0	0	1	6	2	3	1	3	4	7	27	4·59
10·0	4	6	5	12	8	5	5	8	4	57	19·98
11·0	11	10	15	2	10	5	3	2		58	25·38
12·0	15	15	21	11	3	1				66	88·83
13·0	13	2	2							17	110·70
Total	43	34	49	27	24	12	11	14	11	225	249·48

* O_k are the number of opticals from Kreiken's formula (Kreiken 1928).

than 1·0, might turn out true binaries in $5'' < d \leqslant 10''$; as also those with Δm less than 0·6 for $10'' < d \leqslant 15''$ and almost all stars with $0'' < d \leqslant 5''$.

TABLE VII

Declination	Doubles	0″–5″	5″–10″	10″–15″
+34°	T	79	183	157
	O_k	10·21	91·89	275·67
	$T : O_k$	7·737	1·991	0·569
+35°	T	75	228	225
	O_k	9·24	83·16	249·48
	$T : O_k$	8·117	2·741	0·902

Observed distributions of stars in the catalogues +34° and +35° according to d, m, Δm, and β

TABLE VIII

(+34° and +35°)

$0° < |\beta| \leqslant 20°$; $0'' < d \leqslant 5''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	1	1	0	1	0	0	0	0	3
10·0	3	1	0	3	2	1	1	0	1	12
11·0	10	5	13	2	3	0	0	0	0	33
12·0	17	8	10	1	2					38
13·0	13	4	2							19
Total	43	19	26	6	8	1	1	0	1	105

TABLE IX

(+34° and +35°)

$20° < |\beta| \leqslant 40°$; $0'' < d \leqslant 5''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	0	0	0	0	1	0	0	0	1
10·0	1	0	2	2	1	0	0	0	0	6
11·0	7	1	2	1	4	3	0	0	0	18
12·0	4	2	1	2						9
13·0	5	0	1							6
Total	17	3	6	5	5	4	0	0	0	40

Observed distributions of stars in the catalogues +34° and +35° according to d, m, Δm, and β

TABLE X

(+34° and +35°)

$|\beta| > 40°$; $0'' < d \leqslant 5''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	0	1	1	0	0	0	0	0	2
10·0	0	1	0	0	0	0	0	0	0	1
11·0	1	1	0	0	1	1				4
12·0	0	0	1							1
13·0	1									1
Total	2	2	2	1	1	1	0	0	0	9

TABLE XI

(+34° and +35°)

$0° < |\beta| \leqslant 20°$; $5'' < d \leqslant 10''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	3	0	2	2	1	3	3	5	7	26
10·0	4	2	6	3	11	7	7	6	9	55
11·0	28	13	21	10	13	8	9	0	0	102
12·0	41	16	22	10	2	0	0	0	0	91
13·0	13	3	1							17
Total	89	34	52	25	27	18	19	11	16	291

TABLE XII

(+34° and +35°)

$20° < |\beta| \leqslant 40°$; $10'' < d \leqslant 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	0	1	0	2	1	0	1	6	11
10·0	5	4	3	2	0	1	0	0	1	16
11·0	2	2	4	5	4	1	5	1	0	24
12·0	5	5	7	4	2	0	0	0	0	23
13·0	10	3								13
Total	22	14	15	11	8	3	5	2	7	87

Observed distributions of stars in the catalogues +34° and +35° according to d, m, Δm, and β

TABLE XIII

(+34° and +35°)

$|\beta| > 40°$; $5'' < d \leqslant 10''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	0	1	0	2	1	1	1	0	6
10·0	1	0	0	1	1	1	1	2	2	9
11·0	3	0	1	0	0	2	2	0	0	8
12·0	4	0	1							5
13·0	3	1	1							5
Total	11	1	4	1	3	4	4	3	2	33

TABLE XIV

(+34° and +35°)

$0° < |\beta| \leqslant 20°$; $10'' < d \leqslant 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	1	0	3	2	3	2	3	1	13	28
10·0	7	5	5	12	16	6	6	8	7	72
11·0	14	14	15	7	12	6	7	0	1	76
12·0	26	17	25	15	3	2	0	0	0	88
13·0	18	2	1							21
Total	66	38	49	36	34	16	16	9	21	285

TABLE XV

(+34° and +35°)

$20° < |\beta| \leqslant 40°$; $10'' < d \leqslant 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	3	4	1	1	0	1	5	2	17
10·0	1	1	1	1	2	0	1	0	4	11
11·0	5	3	5	2	4	1	2	2	0	24
12·0	8	4	2	2	2					18
13·0	9	2	1							12
Total	23	13	13	6	9	1	4	7	6	82

Observed distributions of stars in the catalogues +34° and +35° according to d, m, Δm, and β

TABLE XVI

(+34° and +35°)

$|\beta| > 40°$; $10'' < d < 15''$

$\frac{\Delta m}{m}$	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	2·4 >	T
9·0	0	0	0	0	0	0	0	0	2	2
10·0	2	1	1	0	1	1	0	0	0	6
11·0	0	1	0	1	0	1	1	0	0	4
12·0	0	0	1	0	1	0	0	0	0	2
13·0	1									1
Total	3	2	2	1	2	2	1	0	2	15

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