ON THE EMPIRICAL REPRESENTATION OF THE OBSERVED DISTRIBUTION OF DOUBLE STARS UNDER AN ANGULAR SEPARATION LESS THAN 15″ ACCORDING TO d, m, Δm, β

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The empirical relation $\log_{10} N_m = A+B(\Delta m-1{\cdot}5)+C(\Delta m-1{\cdot}5)^2$ fairly represents the observed distribution of double stars.

INTRODUCTION

Innes (1907), Plummer (1908), Groot (1927), Kreiken (1928), Goyal (1962, 1964*a*, 1964*b*, 1965, 1967, and *in press*), Goyal and Mithal (1964) and Goyal and Varma (1966) have studied the observed distribution of doubles under an angular separation less than 15″ picked in a systematic survey of the Astrographic Catalogues. The results are summarized in their papers. In the present paper the cumulative counts of the observed distribution of doubles in different distance groups, viz. $0'' < d \leqslant 5''$, $5'' < d \leqslant 10''$ and $10'' < d \leqslant 15''$ in the Oxford, and the Hyderabad plus and minus zones according to the galactic latitude β lying in $0° < |\beta| \leqslant 20°$, $20° < |\beta| \leqslant 40°$ and $|\beta| > 40°$, have been represented by an empirical relation $\log_{10} N_m = A+B(\Delta m-1{\cdot}5)+C(\Delta m-1{\cdot}5)^2$. In the whole investigation the limits of Δm were $0^m{\cdot}0 \leqslant \Delta m \leqslant 2^m{\cdot}4$ and the mean value of m as $11^m{\cdot}0$. The number of stars in the catalogues is about 1,500,000. The values of the constants determined by the method of least squares are given in the Tables. The Tables are self-explanatory.

$0° < |\beta| \leqslant 20°$

Values of A

2·44448±0·06129	2·99216±0·11070	2·84873±0·03820
2·10814±0·14186	2·55578±0·15287	2·61736±0·10155
2·47638±0·08056	2·87869±0·04217	2·89037±0·06335

Values of B

+0·17243±0·01840	+0·20874±0·02038	+0·21161±0·01438
+0·23205±0·01761	+0·26381±0·01238	+0·26023±0·01499
+0·20420±0·00751	+0·25493±0·00751	+0·23443±0·00060

Values of C

−0·13608±0·01703	−0·46128±0·09512	−0·11344±0·00657
−0·19808±0·02044	−0·16242±0·08538	−0·13952±0·00918
−0·15865±0·00339	−0·28765±0·00975	−0·12000±0·00261

$20° < |\beta| \leqslant 40°$

Values of A

2·10040±0·05204	2·57220±0·13421	2·41589±0·10886
1·89928±0·06943	2·13739±0·12841	2·01058±0·10886
2·04300±0·01738	2·34037±0·00581	2·28048±0·02708

Values of B

+0·14694±0·02668	+0·07917±0·06706	+0·20332±0·02765
+0·17465±0·00994	+0·22663±0·02200	+0·27468±0·01545
+0·25174±0·03662	+0·26480±0·04505	+0·26934±0·01221

Values of C

−0·12507±0·01709	−0·13025±0·00731	−0·10963±0·00875
−0·11551±0·02286	−0·14899±0·00401	−0·14038±0·00982
−0·21950±0·03995	−0·14780±0·00329	−0·12236±0·00106

$|\beta| > 40°$

Values of A

1·80691±0·04117	1·93508±0·02255	1·87776±0·07001
1·48083±0·15578	1·62741±0·16328	1·98460±0·00548
1·92551±0·11461	2·13073±0·14073	2·11865±0·07548

Values of B

+0·19269±0·01619	+0·16953±0·01087	+0·37060±0·03927
+0·22265±0·00190	+0·15436±0·02003	+0·30291±0·01794
+0·24315±0·01428	+0·23867±0·03089	+0·24413±0·03730

Values of C

−0·15988±0·01758	+0·13018±0·01527	−0·12867±0·00892
−0·21894±0·01809	−0·07525±0·01791	−0·14763±0·00254
−0·18814±0·00051	−0·10927±0·00264	−0·15399±0·00638

The values of A will, of course, depend on the number of stars in each distance group for each galactic belt. The values of B and C are fairly constant. The explanation for the slight irregularities in the values of B and C lies in the irregularities of the diameter measurements on which the whole investigation rests. The errors are probable errors. If $K = (\Delta m - 1{\cdot}5)$, then the mean formulae appear to be

$$0° < |\beta| \leqslant 20°$$

0″ to 5″	$(2{\cdot}34300 \pm 0{\cdot}09457) + (0{\cdot}20289 \pm 0{\cdot}01227)K + (-0{\cdot}16427 \pm 0{\cdot}01361)K^2$
5″ to 10″	$(2{\cdot}80888 \pm 0{\cdot}10191) + (0{\cdot}24249 \pm 0{\cdot}01359)K + (-0{\cdot}30379 \pm 0{\cdot}06342)K^2$
10″ to 15″	$(2{\cdot}78549 \pm 0{\cdot}06770) + (0{\cdot}23542 \pm 0{\cdot}00999)K + (-0{\cdot}12432 \pm 0{\cdot}00612)K^2$

$$20° < |\beta| \leqslant 40°$$

0″ to 5″	$(2{\cdot}01423 \pm 0{\cdot}04628) + (0{\cdot}19111 \pm 0{\cdot}02441)K + (-0{\cdot}15336 \pm 0{\cdot}02663)K^2$
5″ to 10″	$(2{\cdot}34999 \pm 0{\cdot}08948) + (0{\cdot}19020 \pm 0{\cdot}04470)K + (-0{\cdot}14235 \pm 0{\cdot}00487)K^2$
10″ to 15″	$(2{\cdot}23565 \pm 0{\cdot}09063) + (0{\cdot}24910 \pm 0{\cdot}01843)K + (-0{\cdot}12412 \pm 0{\cdot}00654)K^2$

$$|\beta| > 40°$$

0″ to 5″	$(1{\cdot}73875 \pm 0{\cdot}10385) + (0{\cdot}21950 \pm 0{\cdot}01079)K + (-0{\cdot}18899 \pm 0{\cdot}01206)K^2$
5″ to 10″	$(1{\cdot}89774 \pm 0{\cdot}10885) + (0{\cdot}18752 \pm 0{\cdot}02060)K + (-0{\cdot}10490 \pm 0{\cdot}01194)K^2$
10″ to 15″	$(1{\cdot}99367 \pm 0{\cdot}05033) + (0{\cdot}30588 \pm 0{\cdot}03150)K + (-0{\cdot}14343 \pm 0{\cdot}00595)K^2$

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