

STUDY OF OBSCURED FIELDS IN PA 793

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In our previous paper [1] we examined the determination of the total photographic absorption (Δm_{tot}) in the Great Rift (Cygnus) in the Palomar Atlas Sky Survey O 77. Bok's method [2] was applied. In the present paper Δm_{tot} is determined for the region of 2.54 sq. degr. (PA 793) by the same method.

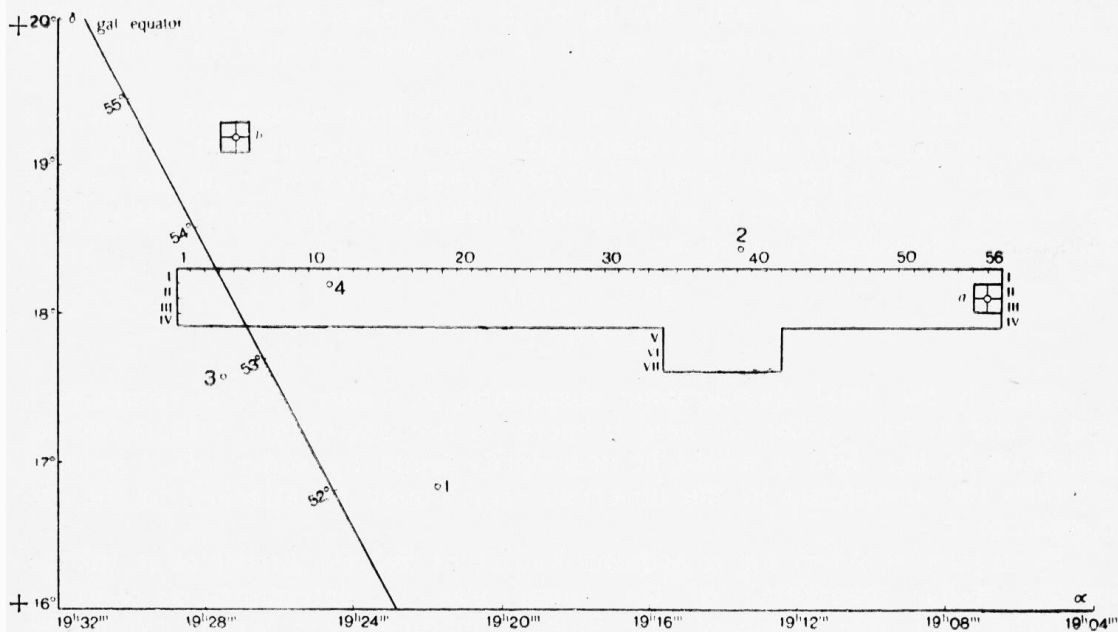


Fig. 1

I. For determination of Δm_{tot} we used the same plexiglass reseau [1] with the squares $6' \times 6'$ in size. The count of stars was carried out with the help of blink microscope for plates (Zeiss, magnificance $13\times$) also.

The field in which the absorption was measured is represented in Fig. 1, where the center of print O 793 is marked. The equatorial coordinates of the center are (by [3])

$$\alpha_{1950} = 19^{\text{h}} 16^{\text{m}} 13^{\text{s}},$$

$$\delta_{1950} = +18^{\circ} 10' 16''$$

and the galactic coordinates (the second system) are (by [4])

$$l^{\text{II}} = 52^{\circ}.21,$$

$$b^{\text{II}} = +2^{\circ}.50.$$

Table 1

Nr	GC	m	α_{1950}	δ_{1950}	l^{II}	b^{II}
1	26784	6 ^m .03	19 ^h 22 ^m 07 ^s	+16°50'20''	51°42'	+0°38'
2	26547	6.71	19 13 21	+18 25 38	52 06	+3 13
3	26939	7.16	19 28 11	+17 35 20	53 03	-0 17
4	26873	6.93	19 25 13	+18 11 37	53 15	+0 38

The reference stars in Fig. 1 are given in Table 1, where Nr, m , α and δ are after [5].

The examined region covers four almost complete lines of the reseau (respectively of the PA print), when a little extension was made (V—VIII lines), where there is localized a dark nebula. The center of PA 793 is located on line II, column 32. Actually, the reseau is given in Fig. 1. All counts have been made with the help of the cross-wire eyepiece, in the blink microscope. Each reseau square $6' \times 6'$ was divided in four equal parts with sides of $3'$.

The print O 793 is very poor of regions without absorption. This is a difficulty in the choice of the comparison field. It is found, that of the two fields a and b (the two are located on very great distances from the center) only a may be used, since b is obviously influenced by heavy absorption. The galactic coordinates of a are

$$b^{\text{II}} = 51^{\circ}.1,$$

$$l^{\text{II}} = +4^{\circ}.5.$$

Δm_{tot} is the total photographic absorption in respect of the comparison field a and in this sense in field a there is not absorption. Otherwise the absorption in the field a would be necessarily found by some other method and then the absorption in the observed region may be attached to the absorption of a .

By means of $N(m)$ for a and the Tables of Seares, Joyner et al. [6] the limiting stellar magnitude of the count may be determined as if for a , $\lg N(m) = 4.621$, we obtained the limiting photographic stellar magnitude $+20^{\text{m}}.2$.

The comparison field a has $b^{\text{II}} = +4^{\circ}.5$, and the Tables [6] are for a non-standard galactic pole, which has equatorial coordinates ($\alpha_{1875} = 12^{\text{h}}41^{\text{m}}20^{\text{s}}$ and $\delta_{1875} = +27^{\circ}21'$), and then we rightfully may reckon that in fact $b^{\text{II}} = +5^{\circ}$. With this value of a we tabulated

$$\Delta \lg N(m) = \lg N(m)_{\text{obs}} - \lg N(m)_{\text{stand}}$$

as function of the total photographic absorption Δm_{tot} by [6] (Table 2).

I	1,5	1,6	2,2	3,1	2,9	3,4	3,2	3,6	3,4	2,6	2,1	3,0	3,4	3,4	2,5	2,8	2,6	2,0	1,9	2,0	2,1	2,3	2,1	2,3	2,3	2,4	2,2	2,5	2,4	2,8	2,8	2,2	2,0	2,0	2,5	3,0	2,5	2,3	3,9	3,7	3,1	2,8	3,8	3,6	3,1	3,4	3,2	3,9	3,2	4,1	4,1	3,6	3,3									
I	1,4	1,4	2,0	2,2	3,2	2,6	3,3	3,5	3,1	2,8	2,5	3,1	3,5	3,7	2,5	2,8	2,6	2,0	2,0	2,8	2,7	2,1	2,3	1,9	2,4	2,6	3,4	2,2	2,4	3,0	2,1	2,1	2,0	2,2	2,1	2,8	2,8	3,1	3,4	2,9	3,3	3,4	2,8	4,1	3,2	3,8	3,6	3,1	3,6	2,9	4,2	3,3										
II	2,1	2,1	1,8	3,2	2,9	3,3	3,3	3,1	2,6	2,6	2,9	3,6	2,9	3,1	2,5	2,1	2,2	2,1	3,0	2,3	2,4	2,3	2,1	2,9	2,7	4,0	2,7	2,5	2,5	1,9	1,9	1,9	1,9	2,2	2,2	2,4	3,4	2,9	3,3	4,0	3,0	3,0	3,6	3,5	3,9	4,2	4,6	4,4	3,5	3,7	3,4	2,3										
III	2,2	2,3	1,9	2,0	2,8	2,6	2,3	2,7	3,2	2,5	3,1	3,0	2,9	3,2	2,8	2,7	2,7	2,4	2,4	2,6	2,6	2,6	1,7	2,6	2,9	4,2	2,5	2,0	2,5	1,7	1,5	1,7	2,3	1,9	2,4	2,8	3,0	3,0	2,5	2,9	3,3	3,2	3,6	3,5	3,9	4,6	3,9	3,2	3,9	3,3	3,2	3										
IV	3,0	2,7	2,4	2,7	2,5	2,9	3,7	4,8	3,3	3,4	3,4	3,3	2,9	3,9	3,3	3,7	2,8	3,3	3,6	2,8	2,5	2,5	3,1	2,9	2,6	2,6	4,6	2,4	2,2	1,7	2,4	2,7	2,4	2,3	2,2	2,3	2,2	2,2	4,2	2,7	2,5	3,0	2,4	3,3	4,8	3,6	4,2	3,2	3,3	3,7	3,7	3										
I	2,1	2,3	2,6	3,0	2,6	3,3	4,8	4,8	3,2	3,1	3,4	3,3	3,9	2,9	3,3	4,4	2,7	2,3	3,4	3,2	2,8	3,2	2,8	2,8	2,5	2,8	1,9	2,4	1,9	1,8	2,4	3,3	2,3	2,2	2,4	2,6	2,3	2,3	2,2	2,3	2,8	3,3	3,7	3,4	2,8	3,2	3,7	4,8	4,2	4,2	3,6	3,3	3,7	3,9	3							
I	4,6	4,7	4,8	3,0	1,7	1,0	1,5	6	2,2	3,7	4,1	4,4	3,0	2,1	4,7	5,1	4,5	5,4	5,9	3,7	5,0	4,8	4,1	4,4	5,0	4,7	4,8	4,5	6,0	5,3	4,9	4,6	5,4	4,7	7,0	5,5	5,6	5,3	2,3	4,5	3,6	4,5	4,9	3,2	2,0	2,4	1,8	2,9	1,9	1,4	3,3	2,4	3,2	2,8	3,1	4,2	7,7	5,4	4,6	6,6	4,9	3
I	5,5	1,4	5,9	4,7	3,2	2,3	1,8	4	3,1	3,3	3,9	5,0	2,9	2,7	3,4	4,1	3,8	3,6	4,1	5,8	4,8	4,9	3,8	4,5	6,2	4,8	5,2	5,6	6,5	5,0	4,4	6,8	4,7	6,0	5,3	5,5	5,1	5,5	5,1	3,0	4,1	3,5	4,9	4,2	2,6	2,0	1,6	8	1,5	1,5	3,2	3,1	4,3	4,2	4,7	5,1	5,2	6,4	4,8	5,6	3,8	4
II	6,2	6,0	5,6	5,6	4,7	3,8	2,6	8	3,1	5,5	6,7	2,8	3,7	3,9	3,4	5,2	5,5	5,2	4,3	6,0	5,5	5,3	6,4	6,9	6,5	7,1	7,0	8,2	8,9	7,5	7,1	9,0	7,5	8,8	6,9	6,9	6,5	4,7	5,0	2,7	3,6	5,0	3,8	8,9	3,1	3,1	1,4	1,3	1,3	2,1	3,9	3,7	4,0	4,2	5,4	6,6	8,2	5,4	6,2	5,7	6,6	3
III	6,6	6,5	6,1	7,4	4,8	3,6	2,9	2,6	3,5	5,5	5,6	3,4	4,8	6,0	3,7	3,3	4,7	5,7	4,3	4,3	6,1	7,6	7,1	6,7	9,1	8,1	8,2	7,9	7,4	7,0	8,5	8,2	9,2	8,9	7,0	5,7	6,7	4,6	5,3	4,2	4,9	5,7	4,6	4,9	3,5	1,6	4	1,0	1,7	3,3	3,8	3,0	3,2	3,7	5,0	6,5	6,2	6,4	4,5	3,4	4,5	3
IV	5,6	3,3	4,7	3,3	4,3	4,0	4,9	2,9	6	3,7	3,8	2,0	4,3	3,8	3,1	3,4	2,0	1,4	2,7	3,3	3,6	3,2	4,8	3,9	6,0	7,1	5,8	6,8	6,1	6,6	6,7	6,1	7,4	5,2	5,7	6,8	6,7	4,4	4,6	4,0	3,9	4,1	4,8	3,5	2,2	1,4	2,2	1,4	1,6	1,0	1,4	2,1	2,5	3,2	3,7	3,8	3,8	4,1	2,0	1,8	3,4	1
I	4,1	3,6	3,5	3,6	3,9	3,7	4,7	5,0	5	1,1	3,0	1,6	2,2	2,2	1,5	1,6	3,6	2,2	3,7	4,8	4,2	4,6	6,6	5,9	6,8	5,3	7,0	6,2	8,3	7,9	6,2	7,0	7,1	7,4	6,0	7,0	3,8	4,1	4,2	5,1	5,2	4,3	4,4	1,3	1,2	1,8	3,0	1,7	1,7	2,3	2,8	3,6	3,6	3,7	4,1	3,1	3,0	4,0	3,8	3,4	2	
II	3,3	3,6	3,0	2,5	3,7	2,4	2,5	1,6	9	7	1,0	1,1	1,6	2,8	1,5	1,8	2,4	1,5	2,2	3,3	3,6	5,2	3,8	5,1	6,0	4,6	4,0	6,9	5,1	6,8	5,2	6,9	5,7	6,2	5,5	5,4	5,4	4,9	5,6	5,0	4,1	3,8	3,5	2,4	2,4	3,2	3,4	2,1	2,2	2,9	5,0	3,0	3,9	2,7	2,1	3,9	3,3	4,3	3,9	3,8	3	
III	3,2	2,0	2,2	2,9	2,5	1,9	1,2	2	7	2	1,3	9	2,1	2,7	1,2	1,7	2,4	1,6	1,4	2,1	2,7	3,2	1,6	3,1	3,9	4,3	4,1	4,9	4,6	4,2	5,7	5,1	6,6	5,6	5,8	4,2	5,5	4,5	4,7	3,9	5,0	5,0	4,0	4,1	4,6	3,8	2,4	4,1	2,2	2,2	3,4	4,0	3,1	2,7	3,1	3,3	2,3	2,9	3,4	3,0	4,1	5

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 2.2 2.4 3.0 2.1 2.1 2.0 2.2 2.1 2.8 2.8 2.8 3.1 3.4 2.9 3.3 3.4 2.8 4.1 3.2 3.8 3.6 3.1 3.6 2.9 4.2 3.1 3.7 2.4 2.6 2.1 2.4 3.4 2.8 3.0 3.3 3.6 2.8 3.0 2.1 1.4 1.8 1.7 1.6 1.7 1.6 0.9 1.1 1.0 0.9 0.8 1
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 2.5 2.0 2.5 1.7 1.5 1.7 2.3 1.9 2.4 2.8 3.0 3.0 2.5 2.9 3.3 3.2 3.6 3.5 3.9 4.6 3.9 3.2 3.9 3.3 3.2 3.1 3.0 3.3 4.2 2.8 3.3 3.9 4.2 3.9 4.5 3.5 3.7 3.0 2.8 2.9 3.6 2.6 3.4 3.3 3.9 3.3 3.7 4.1 2.6 2.1 1
 2.7 2.8 2.2 2.9 2.3 1.9 1.8 2.0 2.1 2.4 3.2 2.9 3.4 2.9 2.9 2.6 3.0 4.4 3.5 4.8 4.2 4.2 3.8 4.4 3.4 4.2 3.8 3.9 3.0 4.3 3.4 4.4 5.5 3.6 3.4 5.2 3.6 3.8 4.4 3.4 3.9 4.8 3.9 5.2 6.0 4.2 ∞ 4.4 5.0 3.8 4
 2.6 2.5 2.5 2.4 2.5 2.2 2.5 2.2 1.7 1.7 2.2 2.7 2.8 2.9 3.4 3.3 4.4 3.9 3.0 3.7 3.6 5.2 4.2 3.8 3.0 3.8 3.7 3.4 3.2 3.7 3.0 3.0 2.9 3.8 3.4 3.7 3.7 4.8 4.8 4.4 4.0 4.2 3.8 5.2 4.8 4.2 4.4 3.8 4.8 4.4 4
 2.4 2.2 1.7 2.4 2.7 2.4 2.3 2.2 2.3 2.2 2.8 2.2 4.2 2.7 2.5 3.0 2.4 3.3 4.8 3.6 4.2 3.2 3.3 3.7 3.7 3.7 4.4 3.2 3.4 3.7 4.2 3.1 3.7 4.2 4.8 3.6 3.6 4.4 4.4 3.9 4.4 4.8 5.2 5.2 5.2 3.9 ∞ 5.2 3.7 3.9 4
 2.4 1.9 1.8 2.4 3.3 2.3 2.2 2.4 2.6 2.3 2.3 2.8 3.3 3.7 3.4 2.8 3.2 3.7 4.8 4.2 4.2 3.6 3.3 3.7 3.9 3.3 4.8 3.3 3.7 4.8 4.4 3.6 3.2 4.4 4.2 3.2 2.9 3.4 3.3 3.1 4.2 3.9 4.4 4.8 3.7 3.9 3.1 4.4 4.2 3.6 4

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 VI 1.9 2.3 3.1 3.3 2.8 2.9 3.7 3.9 3.6 4.2 3.9 4
 VII 2.0 2.2 2.2 2.0 1.9 2.1 1.7 2.7 3.1 3.6 2.5 2.6
 VIII 1.8 2.6 3.0 2.2 2.5 1.8 1.9 1.7 1.4 2.0 1.7 2.6 3.0 1.9

Fig. 2.

20 46 54 47 70 55 56 53 23 45 36 45 49 32 20 24 18 29 19 14 33 24 32 28 31 42 77 54 46 66 49 30 61 64 61 84 63 68 65 80 88 48 75 63 72 82 70 88 59 56 44 55 49 64 58 62 59 54 58 45
 63 47 60 53 55 51 55 51 30 41 35 49 42 26 20 16 8 15 15 32 31 43 42 47 51 52 64 48 56 38 49 49 42 60 69 50 82 85 68 74 73 73 70 75 43 60 62 57 53 57 59 77 72 58 63 48 67 65 71
 90 75 88 69 69 65 47 50 27 36 50 38 89 31 31 14 13 13 21 39 37 40 42 54 66 82 54 62 57 66 52 41 43 46 61 50 68 59 71 68 64 95 71 45 55 77 42 83 68 69 53 85 79 71 56 50 51 40 63
 82 92 89 70 57 67 46 53 42 49 57 46 49 35 16 4 10 17 33 38 30 32 37 50 65 62 64 45 34 45 30 54 68 57 54 54 55 56 44 48 52 50 62 36 57 59 56 71 55 76 55 75 66 74 80 69 66 63 56
 61 74 52 57 68 67 44 46 40 39 41 48 35 22 14 22 14 16 10 14 21 25 32 37 38 38 41 20 18 34 16 23 28 20 27 25 32 26 26 23 6 18 25 19 23 50 26 62 45 43 48 50 42 56 61 43 60 58 46
 62 70 71 74 60 70 38 41 42 51 52 43 44 13 12 18 30 17 17 23 28 36 36 37 41 31 30 40 38 34 28 32 40 16 11 18 12 17 13 13 8 6 12 16 31 38 17 48 59 47 44 46 42 77 67 50 40 47 37
 52 69 57 62 55 54 54 49 56 50 41 38 35 24 24 32 34 21 22 29 50 30 39 27 21 39 33 43 39 38 37 46 30 31 21 32 28 23 15 5 29 22 14 18 41 16 16 49 64 50 52 30 50 55 54 53 54 45 66
 51 66 56 58 42 55 45 47 39 50 50 40 41 46 38 24 41 22 22 34 40 31 27 31 33 23 29 34 30 41 51 46 40 51 38 51 44 44 33 38 17 38 38 24 27 10 13 56 55 39 34 57 58 68 60 53 44 54 71

30 53 64 45 32 51 14 30 37 38 29 13 37 61 57 59 52
 V 58 52 51 67 56 46 33 27 49 34 31 57 52 62 53 52
 VI 65 71 55 37 73 57 41 29 18 41 36 60 45 48 55 55
 68 61 73 70 60 75 65 58 37 36 53 55 55 57 52 57
 VII 55 60 48 56 60 52 51 57 44 34 28 67 56 66 50 44
 54 59 50 54 55 51 53 66 51 42 55 53 65 71 58 55

Fig. 3

0 2.5 3.3 2.5 2.0 2.0 1.4 1.3 1.5 1.5 1.9 1.7 1.1 1.1 1.5 1.6 1.2 1.8 1.7 2.0 2.7 2.2 2.2 1.7 1.5 1.3 1.3 1.4 2.0 2.0 2.1 2.3 2.5 2.4 1.4 0.8 1.1 0.8 0.5 0.6 0.2 0.6 0.7 0.7 0.5 0.5 0.8 0.3 0.4 0.3 0.4 0.1 0.3
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VII 2.0 2.2 2.6 1.8 1.9 1.7 1.4 2.0 1.7 2.6 3.0 2.0 1.3 1.9 1.9 2.3
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18 74 73 73 70 75 43 60 62 57 53 57 59 77 72 58 63 48 67 65 71 66 50 66 55 45 53 42 39 48 55 44 49 46 41 21 63 37 45 30 24 44 20
1 68 64 95 71 45 55 77 42 83 68 69 53 85 79 71 56 50 51 40 63 59 64 61 54 54 49 57 59 50 55 44 49 46 41 21 63 37 45 30 24 44 20
14 48 52 50 62 36 57 59 56 71 55 76 55 75 66 74 80 69 66 63 56 83 73 63 68 48 59 68 66 61 54 64 58 19 56 36 48 59 33 50 37 52 36
16 23 6 18 25 19 23 50 29 62 45 43 48 50 42 56 61 43 60 58 46 33 44 52 59 59 58 22 41 48 54 55 60 45 53 54 35 36 35 24 58 48 32
13 13 8 6 12 16 31 38 17 48 59 47 44 46 42 77 67 50 40 47 37 52 55 46 57 57 58 38 51 55 41 50 66 44 45 62 54 34 49 54 37 38 32
15 5 29 22 14 18 41 16 16 49 64 50 52 30 50 55 54 53 54 45 66 37 39 41 45 59 57 48 26 60 42 54 29 34 54 45 60 46 26 29 19 14 18
33 38 17 38 38 24 27 10 13 56 55 39 34 57 58 68 60 53 44 54 71 44 45 43 46 42 49 58 49 56 48 51 57 48 64 44 57 40 45 36 22 17 19
22 51 14 30 37 38 29 13 37 61 57 59 52
37 56 46 33 27 49 34 31 57 52 62 53 52
77 73 57 41 29 18 41 36 60 45 48 55 55
70 60 75 65 58 37 36 53 55 55 57 52 57
56 60 52 51 57 44 34 28 67 56 66 50 44
54 55 51 53 66 51 42 55 53 65 71 58 55

Table 2

Δm_{tot}	$\Delta \lg N(m)$	Δm_{tot}	$\Delta \lg N(m)$	Δm_{tot}	$\Delta \lg N(m)$	Δm_{tot}	$\Delta \lg N(m)$
0 ^m .0	0.000	1 ^m .4	-0.406	2 ^m .8	-0.848	4 ^m .1	-1.300
0.1	-0.032	1.5	-0.436	2.9	-0.881	4.2	-1.336
0.2	-0.064	1.6	-0.466	3.0	-0.915	4.3	-1.373
0.3	-0.092	1.7	-0.496	3.1	-0.948	4.4	-1.410
0.4	-0.119	1.8	-0.527	3.2	-0.982	4.5	-1.447
0.5	-0.147	1.9	-0.558	3.3	-1.017	4.6	-1.484
0.6	-0.174	2.0	-0.590	3.4	-1.052	4.7	-1.521
0.7	-0.202	2.1	-0.621	3.5	-1.086	4.8	-1.559
0.8	-0.231	2.2	-0.652	3.6	-1.121	4.9	-1.597
0.9	-0.260	2.3	-0.684	3.7	-1.156	5.0	-1.635
1.0	-0.288	2.4	-0.717	3.8	-1.192	5.1	-1.673
1.1	-0.317	2.5	-0.749	3.9	-1.228	5.2	-1.711
1.2	-0.346	2.6	-0.782	4.0	-1.264	5.3	-1.750
1.3	-0.376	2.7	-0.814				

The maximum absorption, which is practically limited by the square sizes ($3' \times 3'$) is $\Delta m_{\text{tot}} = 6^{\text{m}}.0$. The last value corresponds to the 1 star for area $1/400$ sq. degr. There is an exception in the squares of III and IV lines 37 column only, where $N(m) = 0$.

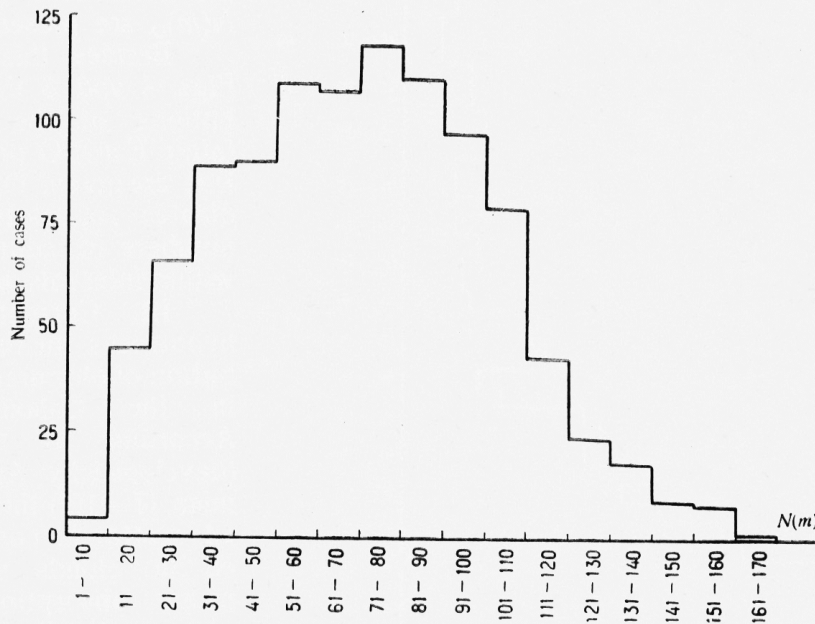


Fig. 4

One should correct the calculated values of Δm_{tot} (in the whole region) for the galactic latitude. This correction is not used because: 1. By [6] $\lg N(m)_{b=0^\circ} - \lg N(m) \approx 0.046 \div 0.050$, but by Table 2 for $\Delta m_{\text{tot}} = 0.1$ we have $\Delta \lg N(m) \approx 0.032 \div 0.040$, which values are not distinguished essentially. 2. On the other hand we are not sure that a is an unobscured field in fact. Thus we may conclude that within accuracy of about $0^{\text{m}}.1$ for Δm_{tot} there is no necessity of a correction.

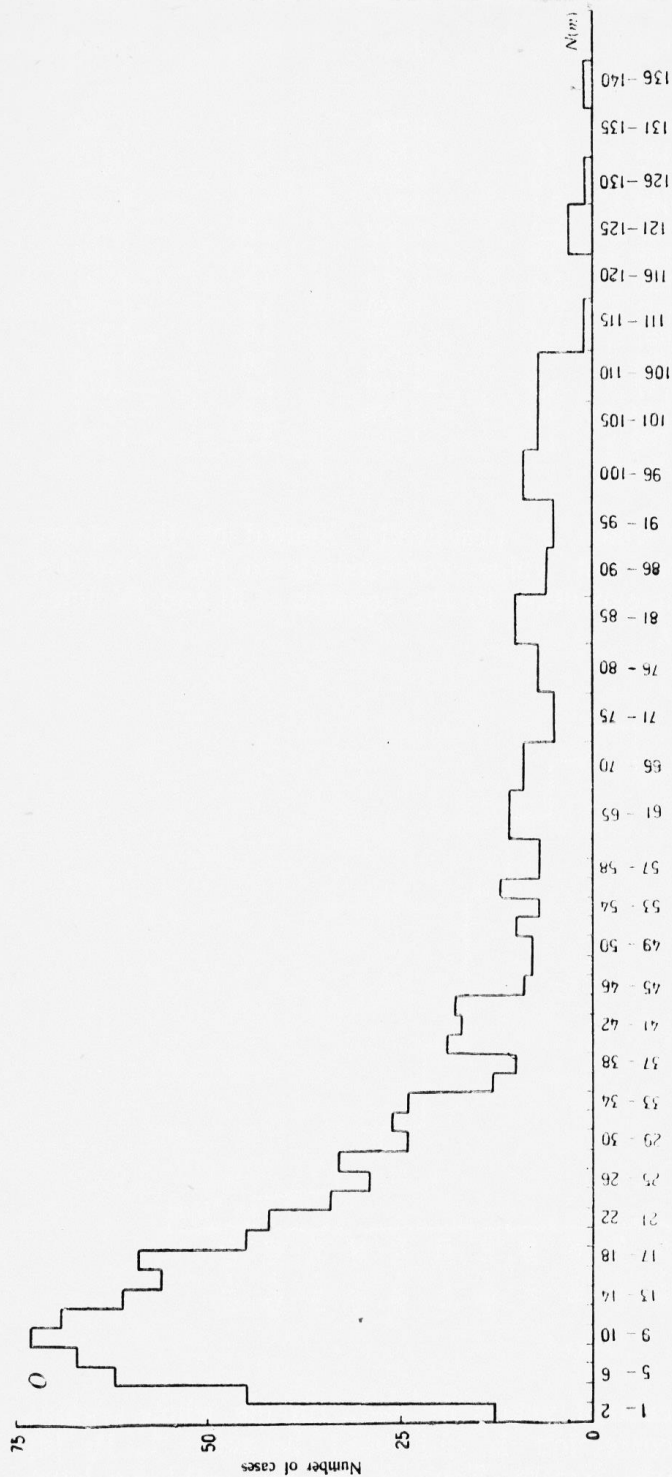


Fig. 5

The final results for Δm_{tot} are given in Fig. 2 (for PA O 793).

II. It is known, that Tables analogous to [6] for the red spectral region (E from PA) do not exist. That is why it is impossible to investigate the total red absorption of PA. Nevertheless, the corresponding value of $N(m)_E - N(m)_O$ for each square $3' \times 3'$ gives certain information for about the selective absorption. The values of $N(m)_E$ are obtained by the same method, for the identical region of E 793. In Fig. 3 the differences $N(m)_E - N(m)_O$ are presented.

Besides this on the Figs. 4 and 5 the distributions of the counts (after E and O print from PA) are given. On the ordinates are plotted the numbers of count cases within intervals by $N(m)$.

III. Currently two hypotheses for the distribution of obscured matter in the Galaxie exist. According to the first (developed by Ambartsumian [7—10]) the obscured matter is concentrated in clouds with the mean absorption and given distribution in space. According to the second hypothesis (Chandrasekhar and Münch [11—16]) the obscured matter has the continuous distribution, which per-

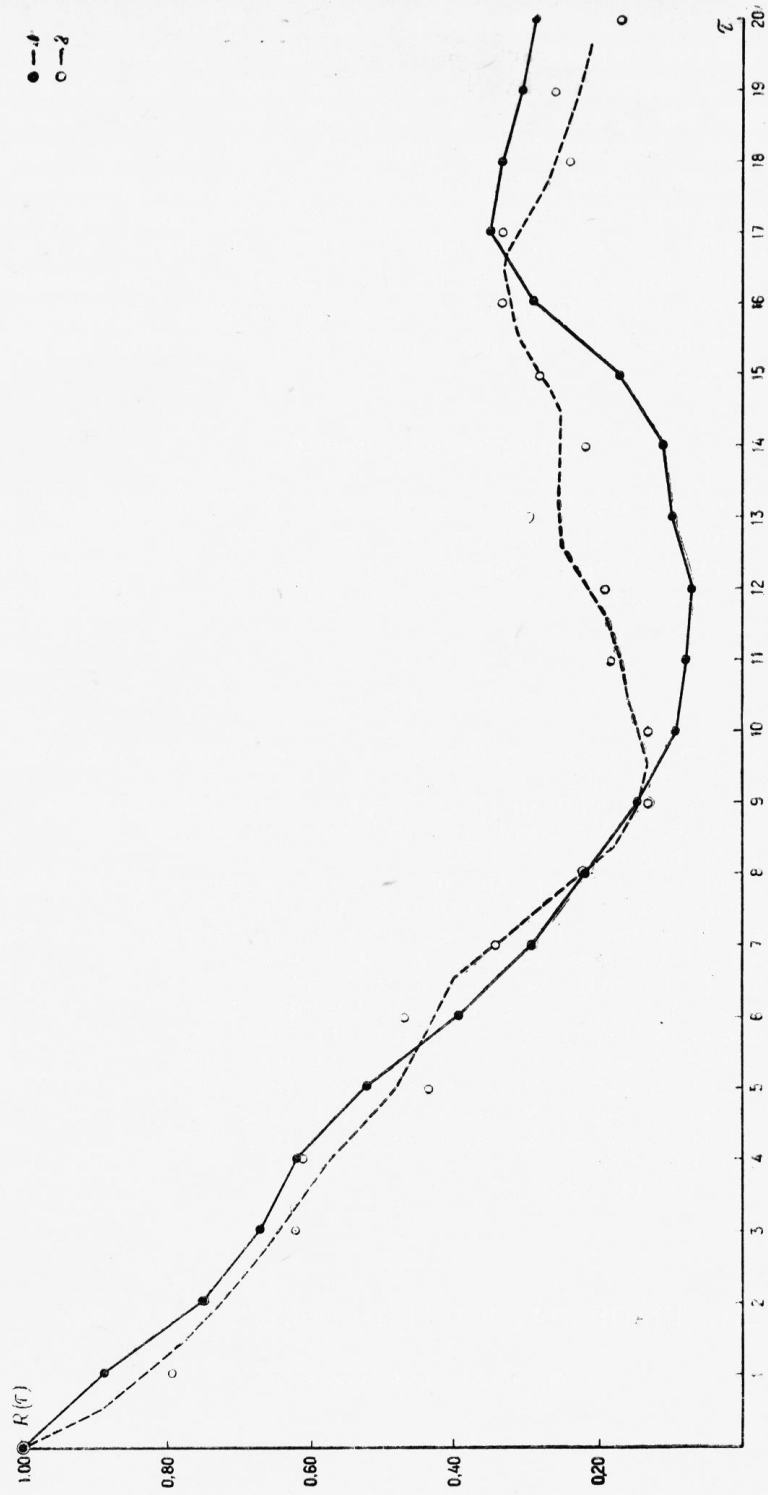


Fig. 6
 1 — O chart, I, smoothed; 2 — E chart, I, smoothed

mits the simple introducing of correlation functions. Actually, as it is shown by Paczyński [17], the two hypotheses can be unified. Paczyński develops a new hypothesis, which is supported by the count of stars in the prints O of PA.

Although for the prints E of PA do not exist statistic star Tables nevertheless autocorrelation functions from the star counts can be plotted. The counts $N(m)$ for the first lines of the two prints (in squares $6' \times 6'$) were used for deduction of autocorrelation functions $R(\tau)$, which are normalized to 1. $R(\tau)$ are given in Fig. 6. As it is shown in Fig. 6 the autocorrelation functions approach to the model of Chandrasekhar and Münch for the continual distribution of obscured matter. According to [17] one may think, the analogous picture should have place after the hypothesis of Ambartsumian also.

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ИЗСЛЕДВАНЕ НА ПОГЛЪЩАНЕТО ПО РА 793

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(Резюме)

По метода на Вок, изложен в [1], е получено пълното фотографическо поглъщане в област (фиг. 1) от РА О 793. Данните са приведени на фиг. 2.

За същата област по Е- и О-фотокопия са намерени разликите $\Delta N(m) = N_E(m) - N_O(m)$, представени на фиг. 3.