INTERSTELLAR ABSORPTION IN SOME DIRECTIONS

M.P.Yasinskaya, A.V.Dragunova

Astronomical Observatory, Odessa National University
T.G.Shevchenko Park, Odessa 65014, Ukraine
astro@paco.odessa.ua

ABSTRACT. Interstellar absorption has been researched towards Kapteyn Areas KA-64, KA-65, KA-86, KA-87, KA-88, KA-98 by the method of a colour excess. The star magnitudes V and colour indexes (B-V) of stars were received by the employees of Odessa Astronomical Observatory Yasinskaya etc. (Odessa Astron. Publ., 2000, v.13, p.4). The stars of all spectral classes had been used for determination of quantity of interstellar absorption. The received curves of absorption have allowed to estimate the density of an absorption substance in explored directions. The results are presented in a graphical view. The random error of determination of complete visual absorption for KA-64, KA-86, KA-88 is $\pm 0^m.10$, for KA-65 is equal to $\pm 0^m.09$, for KA-87, KA-98 - $\pm 0^m.11$. The random error of determination of distance for all areas is 110 pc on the first kiloparsec. At the distance of 2 kpc the random error increases up to 220 pc.

Key words: Galaxy, interstellar absorption, Kapteyn Aries.

The classical method of a colour excess of stars was used to study the allocation of interstellar absorbing substance in the Galaxy. This method allows - simply and reliably - to determine quantity of complete interstellar absorption on all distance up to the star using the data of a photometry in two photometric systems (in our case it is systems B and V). The catalogues of stars magnitudes and colour indexes are initial materials for examinations by this method. The catalogue of B- and V- magnitudes of 4437 stars from Kapteyn Areas 64, 65, 86, 87, 88, 98 (Yasinskaya et al. (2000)) has been used in this work. The photographic material for researched Kapteyn Areas was obtained by M.S.Kazanasmas, L.A.Zavershneva and L.Ph.Tomak with the help of unaberrational Schmidt camera of Abastumany Astrophysical Observatory in 1981 - 1988. The filter Schott GG11 with the film A -600 (V- magnitudes) and filter Schott GG13 with the film A-500 (B-magnitudes) were used for reception of the Johnson-Morgan B-,V-magnitudes. The photometric processing of the received photographic material was made using micro-photometer. Three films were used to make measurements for every star. The mistake of a field of the Schmidt camera was not taken into account, because it does not exceed $0^m.01$ at distance $2^o20'$ from the centre of a photosnapshot, where the photometry of stars was carried out. The standard technique was applied for calculations of stellar magnitudes. The random errors of B- and V- magnitudes are less than $\pm 0^m.04$. The area of each Kapteyn square makes 15,9 square degrees. The equatorial coordinates of areas at the epoch 2000.0, Galactic coordinates l, b, and also the quantity of stars N, which were examined in each area, are indicated in the Table 1. The interstellar absorption was explored by the method of colour excess according to main relation: $A_V = RE_{B-V}$. A_V - complete visual absorption, E_{B-V} - colour excess, which is determined by the difference E_{B-V}=(B-V)-$(B-V)_0$, where (B-V) - observed colour index of a star, $(B-V)_0$ - normal colour index, which have not been burdened by interstellar absorption. Coefficient R, that translates a colour excess in complete visual absorption, was considered as a stationary value 3.0. The normal colour indexes of stars were taken from Fitzgerald's publication (1970). The dependence of complete visual absorption A_V from distance r in parsecs was calculated by the formula: lg r=0.2(V+5-M_V-A_V). The values of absolute magnitudes of stars M_V by Straizys et al.(1982) were used for evaluation of photometric parallaxes of stars (r). The spectral classes and classes of a brightness of stars for Kapteyn Areas were received by Bartaya R.A. (Abastumani astrophysical Observatory, private communication), and also were taken from the literature. The stars of all spectral classes were used for determination of quantity of interstellar absorption. The root mean squared errors of determination of absorption σ_{A_V} and the distance σ_r for one star are $\pm 0^m.23 \div \pm 0^m.38$, and $\pm$2pc $\div$ $\pm$970pc. Received relationships of absorption A_V from distance r at the chosen directions are shown in Figure 1. The calculations have shown, that the random errors of determination of complete visual absorption for KA-64, KA-86, KA-88 are $\pm 0^m.10$; for KA-65 there are equal to $\pm 0^m.09$, for KA-87, KA-98 - $\pm 0^m.11$. The random error of determination of distance for all areas is 110 pc on the first kiloparsec.

Apart 2 kpc the random error is incremented up to

Table 1: Equatorial and Galactic coordinates of the Kapteyn Areas

Name of Kapteyn Area	α	δ	l	b	N, quantity of stars
KA-64	$20^h\ 02^m.0$	$+30^o16'.1$	$67^o.1$	$+0^o.1$	475
KA-65	$21^h\ 02^m.6$	$+30^o32'.8$	$75^o.3$	$-10^o.8$	425
KA-86	$18^h\ 15^m.0$	$+15^o00'.0$	$42^o.6$	$+14^o.6$	396
KA-87	$19^h\ 15^m.0$	$+15^o11'.0$	$48^o.9$	$+2^o.0$	345
KA-88	$20^h\ 14^m.0$	$+15^o26'.0$	$56^o.5$	$-10^o.7$	440
KA-98	$06^h\ 52^m.0$	$-\ 0^o15'.0$	$213^o.1$	$+0^o.3$	345

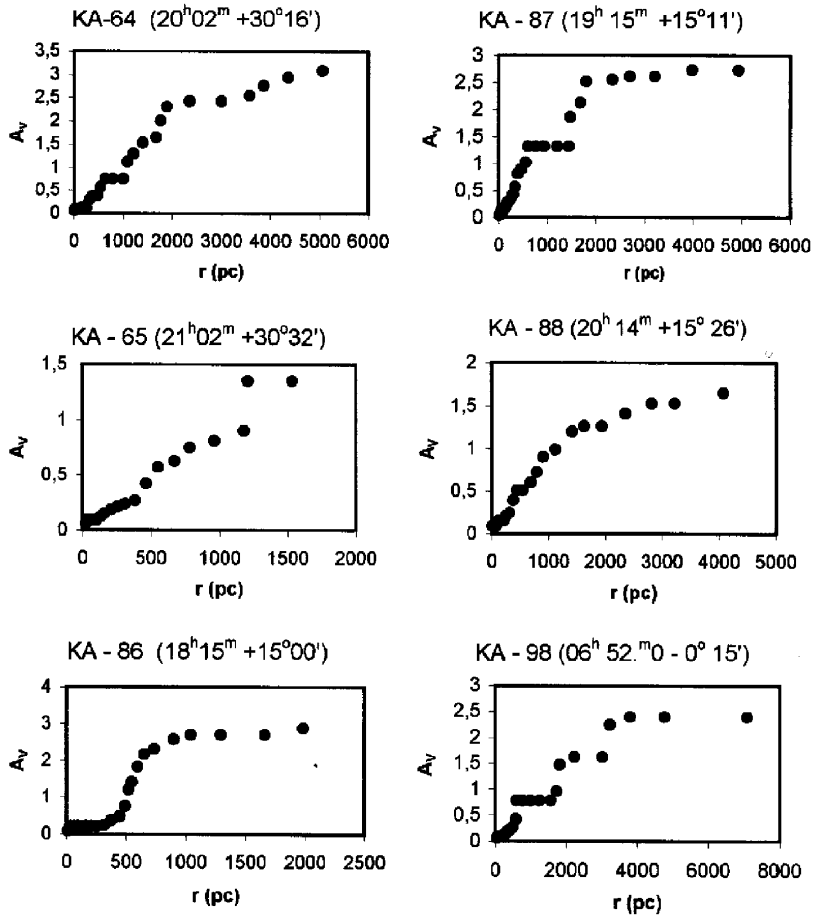

Figure 1: The mean absorption relationships at the chosen directions.

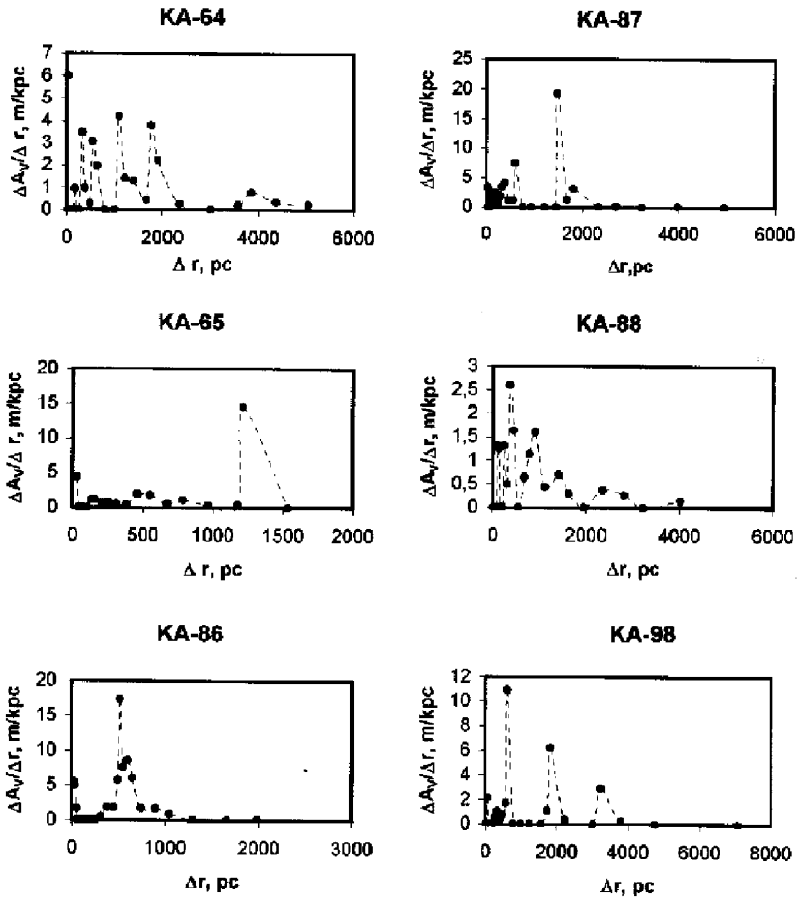

Figure 2: Distribution of the interstellar absorption matter.

220 pc. The obtained curves of absorption allow to estimate the density of an absorbing substance in explored directions. The results are presented in Figure 2, where Δ_{A_V}/Δ_r is the density of an absorbing substance on 1 kpc, Δ_r - the distance interval. The analysis of received results permits to make the following deductions. In a direction KA-64, KA-65, KA-86, KA-88 apart 300 pc from the Sun the absorption misses. In a direction KA-87 the absorption becomes noticeable from distance 200 pc, and in a direction KA-98 the absorption is not observed almost up to 500 pc. It is impossible to consider the dust clouds, which appear on this distance, to be real because of the major errors in quantities of complete visual absorption and distances. The absorbing matter is distributed very nonuniformly, and forms the clouds. The ground mass of the dust concentrates in the galactic plane. So, in directions of KA-64 (b = $+0^o.07$), KA-87 (b = $+2^o.0$), KA-98 (b = $+0^o.3$) the dust clouds are observed on distances, twice bigger, than in directions KA-65 (b = $-10^o.8$), KA-86 (b = $+14^o.6$), KA-88 (b = $-10^o.7$).

The dense clouds of absorption substance are observed at the distances, which exceed the half-thickness of dust layer, equal 100 pc, mean for the Galaxy. So, in direction of KA-65 apart 1200 pc from the Sun the dust cloud with density 14.52 m/kpc is situated under a galactic plane apart 225 pc. And in a direction of KA-86 apart 500 pc from the Sun the dense cloud is observed apart 130 pc above a galactic plane. Increase of absorption discontinues in all explored directions, if the beam of sight goes out in space between spiral sleeves.

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