THE DISTRIBUTION OF STARS WITHIN 2° OF THE GALACTIC CENTRE REVEALED BY 1 TO 2μm IMAGES

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We have produced images at 1.2, 1.6, and 2.2μm of a 1° x2° region of the sky that includes the galactic centre using the drift scan techniques described by Catchpole et al. (1985) and Glass et al. (1987). These images were calibrated by observations of standard stars so that it is possible to make quantitative measurements of J, H and K magnitudes for individual stars. Colour magnitude diagrams have been constructed, using K against H-K, for the stars within elliptical annuli centred on the galactic centre, with major axes along the galactic plane and an axial ratio of 2.2. The distribution of stars within each colour magnitude diagram is compared with a composite giant branch, based on 47 Tuc as seen at a distance of 8.2 Kpc, but extended to higher luminosity by including photometry of long period variables in the Baade windows. The assumption of a unique giant branch for the galactic centre stars is empirically justified by the small scatter in the colour magnitude diagrams beyond about 1.5° from the galactic plane. Fig. 1a & b give examples of colour magnitude diagrams for 400" x 400" areas of sky far from and near to the galactic centre. The observed distribution of stars relative to the 47 Tuc giant branch allows us to measure both the foreground absorption and the number distribution of stars within a given range of dereddened apparent magnitude. The number of stars counted must be corrected for the effect of crowding which is estimated by generating simulated star fields and comparing the number of stars found using our reduction programmes, with the number used to simulate the fields.

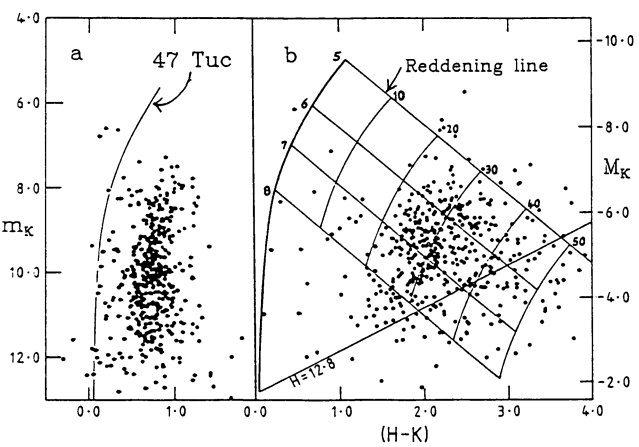

Fig. 1a & b. Colour magnitude diagrams for 2 areas of sky. Reddening lines marked in A_V

The curves without data points in Fig. 2

M. Morris (ed.), The Center of the Galaxy, 75–76.

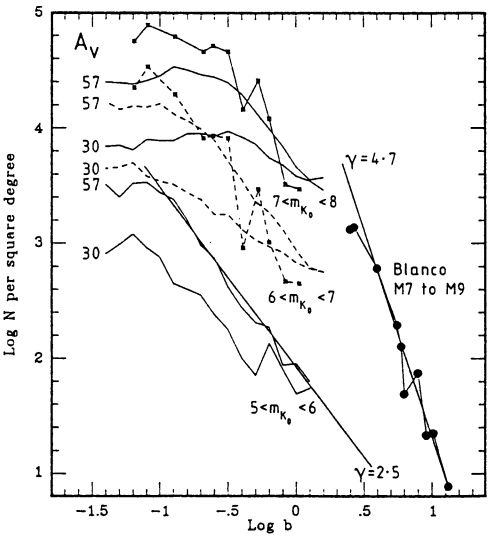

Fig. 2. Density of stars as a function of galactic latitudes for various magnitude ranges

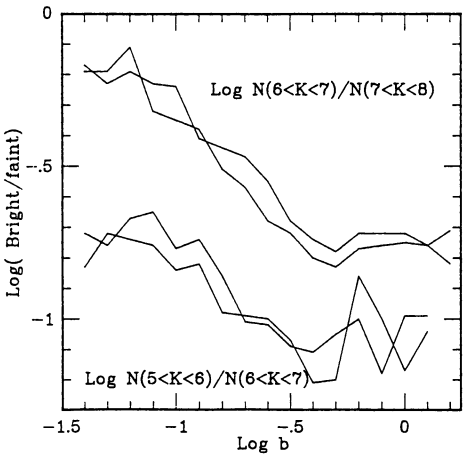

Fig. 3. Number ratio of stars

show the number of stars per square degree, within elliptical annuli, for three apparent magnitude ranges each summed to two visual absorption limits of A_V=30 and A_V=57. This procedure can be understood by referring to Fig. 1b and adding up the stars in adjacent boxes along the reddening line as far as the appropriate A_V limit. Counts made within selected 400" x 400" areas of sky that appear relatively transparent on the J images are shown by points. The turnover in the curves with decreasing galactic latitude is probably produced by the increase in extinction causing proportionally more of the stars to fall outside the absorption limits. For comparison the distribution of M7 to M9 stars from Blanco (1988) is also shown. Frogel and Whitford (1988) give mean values of K=7.39 and 6.89 respectively for these stars. The straight lines correspond to various density power laws of the form $\rho(r) \sim r^{-\gamma}$ where r is the radial distance from the galactic centre.

Fig. 3 shows the ratio of the number of stars within adjacent dereddened apparent magnitude ranges as a function of galactic latitude. The curves are drawn for counts made to limits of A_V=30 and A_V=57. The shape of the curves is independent of the absorption limit and indicates that the proportion of luminous stars increases towards the galactic centre.

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