INFRARED SCANNING OF THE GALACTIC BULGE

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ABSTRACT

We find values of the interstellar absorption from J, H and K scans of a 6.8 x 200 arcmin strip of sky extending from the Sgr I field to the Galactic Centre. The visual absorption, excluding dark clouds, increases from 3 to 30 magnitudes in this region.

Three InSb detectors, mounted behind J, H and K (1.2, 1.6 and 2.2μ) filters in a single dewar, view the sky through 6 x 12 arcsec apertures at the Cassegrain focus of the 1.9m reflector at SAAO Sutherland. The DC output of the detectors is measured every 40 ms as the sky drifts past at the sidereal rate. Between scans the telescope is moved 8 arcsec in

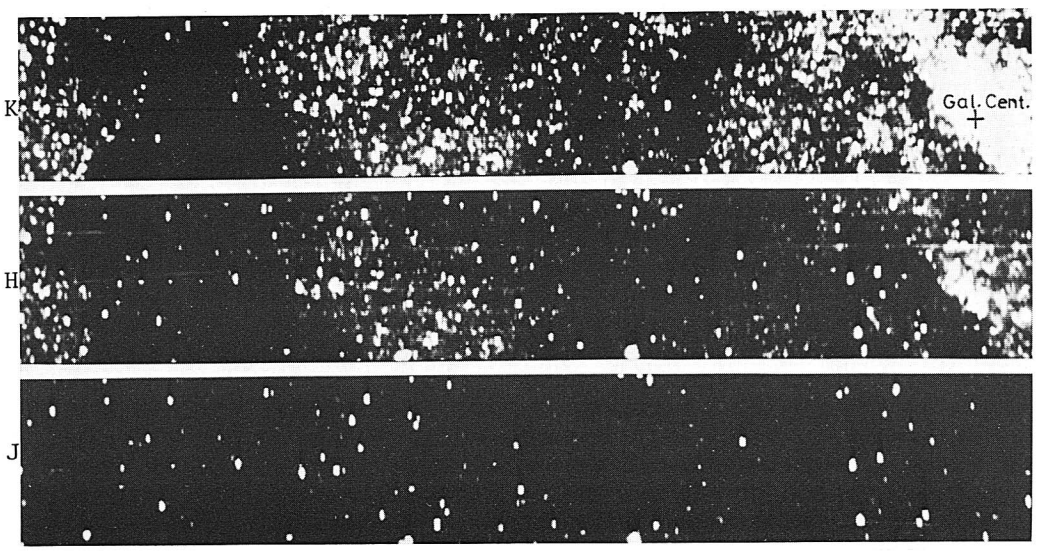

Fig. 1. A 6.8 x 44 arcmin area of sky at K, H and J. N is up, E to left.

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declination. JHK magnitudes are obtained by first removing background variations from all the scans to reduce them to a common zero and then integrating the flux along a short strip centered on each star. Stars are automatically found and centered on the K scans. The scans are also combined to produce monochromatic pictures of the sky, as shown in Fig.1.

Individual K against (H-K) diagrams, which show a well-defined giant branch, are constructed for consecutive 11 arcmin sections of the scan. The observed giant branch is then compared with the de-reddened 47 Tuc giant branch from Frogel et al. (1981) placed at the distance of the Galactic Centre (9.2 kpc, Glass and Feast (1982)). This allows us to deduce mean values of A_V for each field using the ratios $A_V : A_H : A_K = 1.0 : 0.141 : 0.088$. We empirically extend the 47 Tuc reference giant branch to K = 6.0 by using our photometry of Lloyd Evans' (1976) Sgr I long-period variables, de-reddened by $A_V = 2.01$ (Glass and Feast (1982)). Fig. 2 shows the resulting model values of A_V, for various de-reddened magnitude intervals, as a function of galactic latitude. We estimate that there is an uncertainty of $\pm$ 0.3 in A_V due to the as yet poorly defined colour transformation between our photometry and that of Frogel et al. The solid line in Fig. 2 is van Herk's (1965) galactic absorption law:

$$A_V = 0.14 \text{ Cosec } b \ (1 - \exp(-10\ r \text{ Sin } b)) \text{ with } r = 9.2 \text{ kpc.}$$

The scans show patches of very high obscuration, several of which can be seen in the K scan in Fig. 1 and which have $A_V > 40$. These dark clouds only appear on our scans out to about 1^o from the Galactic Centre, which corresponds to the angle subtended by the galactic disk (150 pc) at that distance. This may imply that the obscuring clouds occur in the disk mainly at the distance of the Galactic Centre.

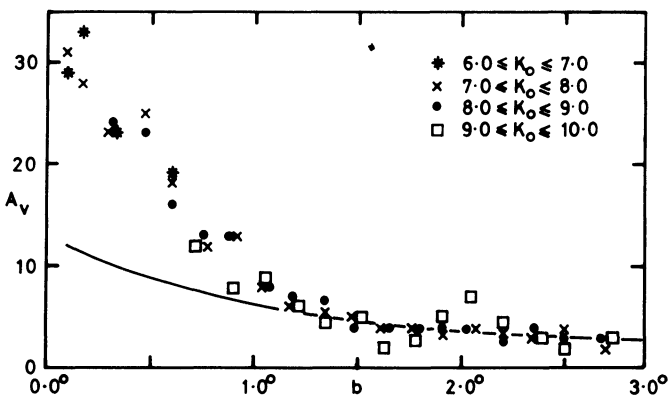

Fig. 2. A_V as a function of galactic latitude.

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