INFRARED STUDIES OF THE STELLAR POPULATION IN BAADE'S WINDOW

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An IR-scan of the Baade's Window ($l \simeq 0\overset{\circ}{.}0$, $b \simeq -4\overset{\circ}{.}0$) area (BW) has been obtained (Ruelas-Mayorga *et al.*, 1983). The Cumulative Counts Function (CCF) at 2.2 μm (No. of sources per sq. degree down to a given K magnitude) down to $K \simeq +13.5$ was formed by combining 1.9-m telescope scans with Anglo Australian Telescope (AAT) scans.

With the aid of a theoretical exponential-disk model (Jones *et al.*, 1981) and observations at $l = 20^{\circ}$, $b = -5^{\circ}$ and $l = 10^{\circ}$, $b = -5^{\circ}$, we decomposed the observed CCF into disk-CCF and bulge-CCF components. The bulge-CCF is steeper than the disk-CCF in the range $+5.0 < K < +11.0$, showing a relative depletion of high-mass stars with respect to the disk. The contribution of the bulge component towards BW is significant only at $K \simeq +9.5$ or fainter; the bright end of the CCF is dominated by the disk.

The bulge CCF has been compared with those of several globular clusters (47 Tuc, M3, M13, M92) and with that of the open cluster M67. The bright end of the globulars' CCFs have similar slopes to that of the bulge, suggesting that the stellar population of the bulge may be similar in age and metallicity to the globular clusters.

Figure 1 shows the observed CCF (solid dots are from JHK photometry of individual stars, triangles are from photometry derived from the 1.9-m scan, open squares are from photometry from the AAT scan). The theoretical CCF for an exponential disk towards BW (solid line) and the derived CCF for the bulge (open dots) are also illustrated.

Photometric studies of a bright-K subsample (135) of the 578 sources found in BW down to $K \simeq +11.0$ were made. Several sources with mild IR-excesses were found and later were confirmed spectroscopically as Mira variables. The majority of the sources lie along the reddening line at $E(J-K)=0.27$ from the solar-neighbourhood intrinsic giant sequence. The reddening agrees very well with the value $E(B-V)=0.45$ (van den Bergh 1971) obtained by optical techniques.

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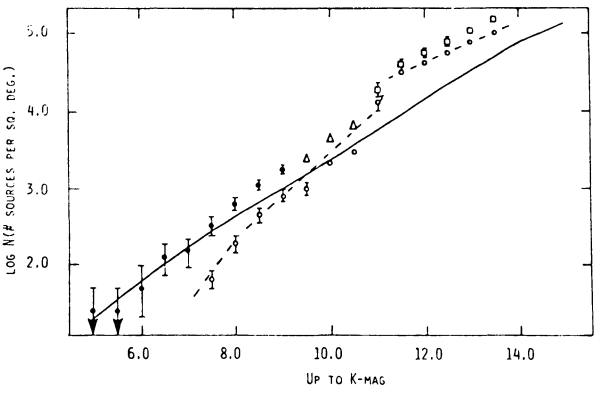

Figure 1. Cumulative Counts Function at 2.2 μm for Baade's Window. Full JHK photometry (solid dots), 1.9-m scan (triangles), AAT scan (squares). Theoretical CCF for and exponential disk towards BW (solid line). The bulge CCF (open circles).

Spectroscopic studies of 67 stars in our photometric sample were made with the Circular Variable Filter (CVF) facility at the AAT in the wavelength range $1.96<\lambda< 2.4$ μm. In this range the absorption bands of H_2O (shortward of 2.1 μm) and CO (longward of 2.3 μm) are commonly seen for stars of late spectral types.

In the interpretation of our photometric and spectroscopic observations it was convenient to divide the BW stars into 3 groups according to the strengths of their CO bands. It is shown that those stars with normal and strong CO bands may be consistently interpreted as disk stars. We suggest that the CO-weak stars may be true bulge members. The relative number of CO-weak objects to the total number of stars is consistent with the bulge and disk CCF data discussed earlier.

On the K vs. J-K diagram the sources in our photometric subsample lie above the giant-branch tips of 47 Tuc and M92. If the giant branches (GB) of these clusters were extrapolated to higher K brightnesses, a sizeable fraction of our sample would lie between them. This also suggests that its metallicity lies in the range between that of M92 and that of 47 Tuc. For those sources with redder J-K colours than the 47 Tuc GB and with magnitudes brighter than K = +8.5, an even higher value of metallicity is required. However, on the basis of the CCF results discussed above, these sources appear to be disk members, hence their high metal content should not be surprising.

REFERENCES

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