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Asymptotic giant branch stars in the ISOGAL survey

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Abstract. We present and analyse the data of a field at l = 0°, b = +1° from the ISOGAL survey of selected areas of the inner Galactic bulge at 15 and 7 μm. In combination with IJK$_s$ data from the near-infrared southern sky survey DENIS, the ISOCAM data allow the first detailed study of infrared stellar populations in very obscured regions of the inner Galaxy. The K/J-K magnitude-color diagram for the sources detected in the ISOGAL field shows a remarkably well-defined tip of the bulge red giant sequence. A few stars clearly show an excess in the value of J-K with respect to the red giant sequence. Most of them are probably AGB stars with large mass-loss rates. The other color-color and magnitude-color diagrams are also discussed. About half of the source have observed K-[15] colors. Thus these data suggest that these are masslosing stars.

1. Introduction

ISOGAL is the first near+mid-infrared, high resolution imaging survey of the inner Galactic disk and bulge of the Milky Way. The survey covers~22 deg^2 in selected areas mostly within the central l =±30 deg of the Galactic plane, all complemented by 0.8-2.2 μm DENIS data. Combined with the near infrared (I,J,K) data of the DENIS survey, it is mainly aimed at the study of the cold stellar populations of the most obscured regions of the inner Galaxy and the corresponding Galactic structure. The field analysed here is at (l, b)=(0°,+1°), with a total area of 0.038 deg^2 (Omont et al. 1999). ISOGAL observed this field with the broad filters LW3 (12-18 μm) and LW2 (6-8.5 μm) with 6″ pixels in a (4x7) raster.

2. Stellar sources

A clear linear sequence of increasing [7]-[15] color for brighter 15 μm fluxes can be seen in the [15] us [7]-[15] magnitude-color diagram of ISOGAL sources (Omont et al. 1999). The interpretation is that we see here a sequence of increasing mass-loss of AGB stars. The DENIS K vs J-K diagram of the bulge field shows a well-defined red-giant sequence shifted by fairly

uniform extinction of A_v = 6 mag. Most of the extinction should thus be associated with interstellar matter outside of the bulge. Most of the source have K_o < 8.2 mag and are thus above the RGB limit (Tiede et al. 1996). The K_o range of stars also indicates that the spectral type is M5 or M6 and later (Frogel & Whitford 1987).

3. Conclusion

We conclude that most of the ISOGAL sources seen in the bulge are M type stars. The whole sequence in color-magnitude ([15] vs [7]-[15]) diagram is well coincident with the late M AGB sequence, from M6 to M9, just above the RGB tip.

We have started a spectroscopic program aimed at confirming the chemical nature derived from the photometric measurements and to observe peculiar sources in the ISOGAL survey. The spectra of a few ISOGAL sources from 3 ISOGAL fields were obtained with the OMR spectrograph (Vainu Bappu Observatory, Kavalur, India) attached to the 2.3 meter telescope during the period of March to May, 1998 (Ojha et al. 1999). Since most of the observed stars are surrounded by a thick dust shell, their optical counterparts are in most cases very faint and spectroscopic measurement can be done only in the red (~5500 - 8500 Ang). Only stars with m_I brighter than ~ 11 can be measured. The spectra of the sources confirm that most of them are K & M giants. The DENIS I-J and J-K colors of these sources suggest that these are mass-losing stars.

References

Frogel J.A., Whitford A.E., 1987, ApJ 320, 199.
Ojha D.K., Sivarani T., Parthasarathy M., et al. 1999 (in preparation).
Omont A., Ganesh S., Alard C., et al., 1999, A&A (in press).
Tiede G.P., Frogel J.A., terndrup D.M., 1996, AJ 110, 2788.