

JHK IMAGING PHOTOMETRY OF TR 14, TR 15 AND TR 16

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RESUMEN

Se presentan resultados preliminares de un estudio que consiste en fotometría infrarroja en las bandas *JHK* a partir de imágenes NICMOS3 centradas en los cúmulos Tr 14, Tr 15 y Tr 16 en la Nebulosa de Carina. Una fracción pequeña de las fuentes detectadas muestran excesos infrarrojos en $2.2 \mu\text{m}$. Destacan algunas de ellas que forman cumulos embebidos con nebulosas de reflexión infrarrojas asociadas.

ABSTRACT

Preliminary results of a near-infrared photometric study in the *JHK* bands from NICMOS3 images centred in Tr 14, Tr 15 and Tr 16 are presented. A small fraction of the sources detected appear to have excess emission at $2.2 \mu\text{m}$, some of which are clustered and with associated infrared reflection nebulosities.

Key words: OPEN CLUSTERS AND ASSOCIATIONS — STARS: EVOLUTION — STARS: FORMATION

We observed in May and November 1993 the areas associated with the young open clusters Trumpler 14, Trumpler 15 and Trumpler 16 in the η Carinae Nebula in the near-infrared. Images in the *J*, *H* and *K'* bands were obtained using the NICMOS3 array camera (256×256) on the Swope 1-m and Du Pont 2.5-m telescopes of Las Campanas Observatory. The 1-m telescope images were sampled to 0.45 arcsec per pixel under an average seeing of 1.5 arcsec while those obtained with the 2.5-m telescope were sampled to 0.35 arcsec per pixel with an average seeing of 0.8 arcsec. Mosaics in the 1.2, 1.6 and $2.2 \mu\text{m}$ bands were constructed to include each of the three clusters. The final images covered areas of approximately 95, 15 and 115 square arcmin in the direction of Tr 16, Tr 15 and Tr 14 respectively. The latter includes a section of the Carina Western dark lane, including the radio of the H II region Carina I and its associated CO cloud.

More than 1100 sources were measured in the three IR bands and less than half of these have been identified with visible (Tapia et al. 1995) stars. Photometry was performed with the DAOPHOT IRAF package but because no adequate and unique point-spread functions could be fitted to isolated stars in all frames, aperture photometry was obtained. In crowded areas this could lead to larger errors. Confusion in the densest areas could also lead to higher uncertainties in the colour indices. Photometric calibration was done using previous aperture *JHK* photometry (Tapia et al. 1988) of isolated stars in the fields and zero points were checked against those obtained from isolated standard stars. The limiting magnitudes on the 1-m telescope (for Tr 14 and Tr 15) are 15.0 in *J*, 14.5 in *H*, and 14.0 in *K'* while on the 2.5-m telescope (for Tr 16) these are one magnitude fainter.

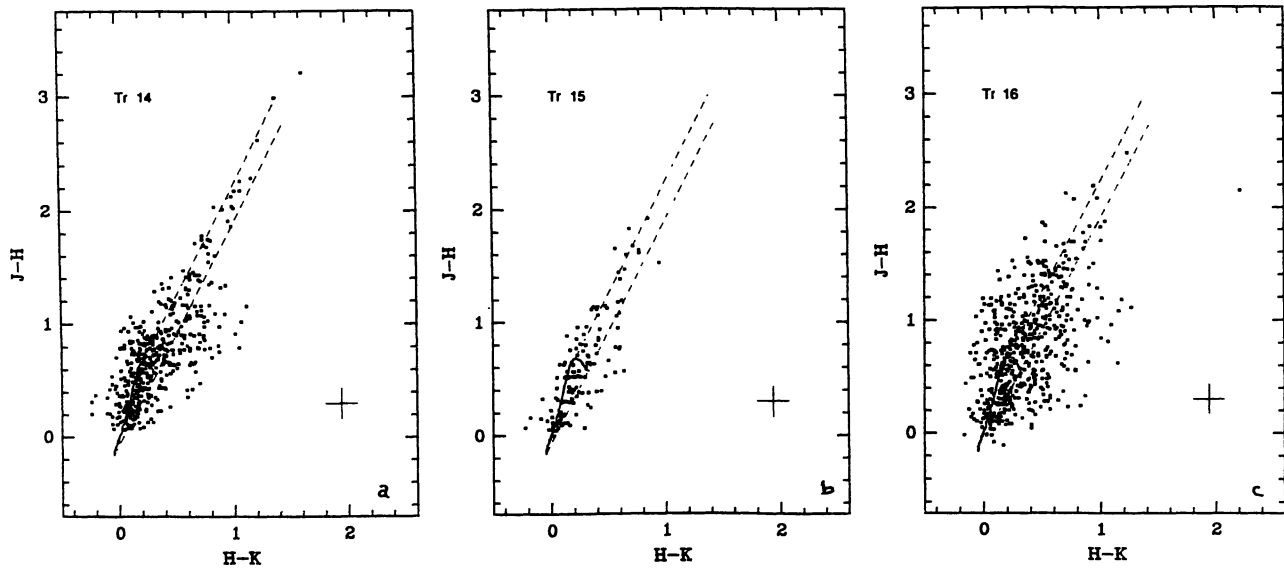


Fig. 1. $J - H$ vs. $H - K$ diagrams for the region containing Tr 14 (a), Tr 15 (b) and Tr 16 (c). The continuous line represents the main sequence and the broken lines the reddening vectors originating from the locus of OB-type stars (lower line) and KM-type stars (upper line). The large crosses at the lower right corners represent the typical observational errors.

The two-colour (Figure 1) and magnitude-colour diagrams indicate that most of the IR sources within the boundaries of the clusters which have visible stars associated are members of the clusters though, as expected, the fraction of optically faint ($V > 18$) late-type field stars is very large ($> 60\%$).

Surprisingly, only a small fraction of stars show large infrared excesses, and these may be the brightest members of the population of T Tauri stars in the region. Two faint IR sources stand out for being extended and very red. They appear like highly reddened small star clusters with an IR reflection nebulosity associated.

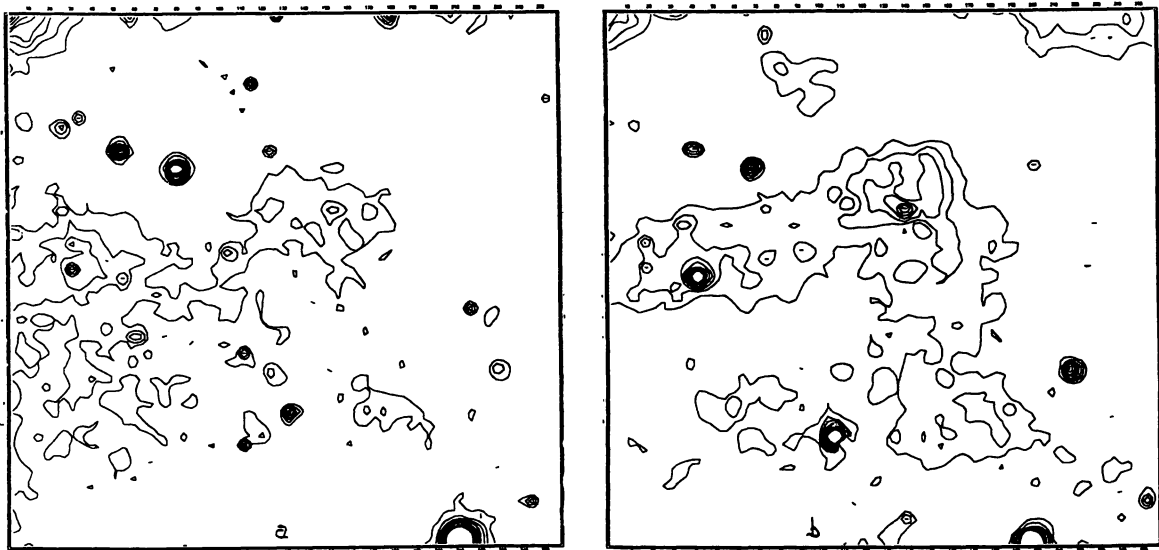


Fig. 2. Contour plots in the J (a) and K' (b) bands of the complex infrared source associated with the H II region Car I.

One of these (Figure 2) is very close to the radio H II region peak Car I, a CO emission peak and extended *IRAS* source (Cox 1995) located some 30 arcsec to the SW of Tr 14, implying that star formation is still active in this region. The details of this work will be published elsewhere.

REFERENCES

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