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EMBEDDED YOUNG STARS IN NORTHERN NGC 3372

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RESUMEN

Se presentan nuevas imágenes en el cercano infrarrojo obtenidas con PANIC montado en el telecopio Magallanes “Baade” del Observatorio Las Campanas. Estas fueron tomadas a través de filtros anchos JHK_s y de filtros angostos centrados en las líneas Brγ en 2.17 μm y H_2 en 2.12 μm. El estudio se complementó con imágenes del archivo del Satélite *Spitzer* con IRAC. Se presenta evidencia de la existencia de un cúmulo joven de radio $r = 23''$ embebido en Tr14-N4. Este contiene varias estrellas de baja y mediana masa y al menos una protoestrella de alta masa. Se presentan sus propiedades derivadas de la fotometría desde 1.2 hasta 11 μm. Se encuentran varios nudos de emisión compacta en la línea de H_2, lo que evidencia la existencia de al menos un flujo de masa, presumiblemente proveniente del núcleo del cúmulo. Se presentan también resultados recientes del monitoreo de dos jóvenes estrellas variables Car I-136 y 125, embebidas en la nube densa asociada con Car I.

ABSTRACT

Deep narrow-band (Brγ at 2.17 μm and H_2 at 2.12 μm) and broad-band (JHK_s) near-infrared images are presented of the young regions Tr14-N4 and Car I. The observations were made with PANIC, attached to the Baade 6.5 m Magellan Telescope at Las Campanas Observatory. These were supplemented by archive *Spitzer*/IRAC images. Evidence is given of an embedded young compact cluster ($r = 23''$) of medium-to-low mass stars in Tr14-N4 but that includes at least one high mass protostar. Its properties are derived from the 1.2 to 11 μm photometry. The presence of outflows is evinced by knotty H_2 emission near the edge of a cavity. We also presented updates of near-IR light-curves of Car I-136 and 125 embedded in the dark cloud associated with Car I.

Key Words: H II regions — ISM: jets and outflows — open clusters and associations: individual (NGC 3372) — stars: pre-main sequence

1. INTRODUCTION

Several sites of present star formation activity have been found throughout NGC 3372, the Carina nebula, in the last decade (see recent review by Smith & Brooks 2008). In the present paper, a description is given of the properties the young embedded population in the northern part of the nebula, in what appears to be the result of star formation triggered by the interaction of strong UV radiation and winds from hot stars in the clusters Trumpler 14 and 16 with the surrounding dense molecular clouds.

2. TR 14-N4

In Tr 14-N we found a new embedded cluster centred close to the apex of a low density dust pillar delineated by 8 μm PAH emission and thermal dust emission. The cluster has a diameter of $23''$ and is surrounded by dust that scatters the stellar light and emits thermally at longer wavelengths, being very bright in the mid and far-IR MSX and IRAS survey images. The cluster contains a large fraction of stars with L-band excess emission, confirming its youth. The brightest two extended sources at 2.2 μm, close to the cluster centre, are particularly interesting. Both are have mid-IR IRAC colours of Class I objects and at JHK, they display peculiar morphologies that suggest the presence of dense disks. Our images reveal a monopolar cavity towards the northwest with a series of bright H_2 emission knots close to its tip, some $24''$ from the brightest protostellar infrared source. Figure 1 shows our PANIC K-band image of the region.

3. THE DARK CLOUD ASSOCIATED WITH CAR I

In Car I we confirm the presence of molecular hydrogen emission knots, previously suggested to be associated with Hα, Hβ and [SII] emission (Tapia et al. 2006). The geometry of these features suggests the exciting young stellar object to be deeply embed-

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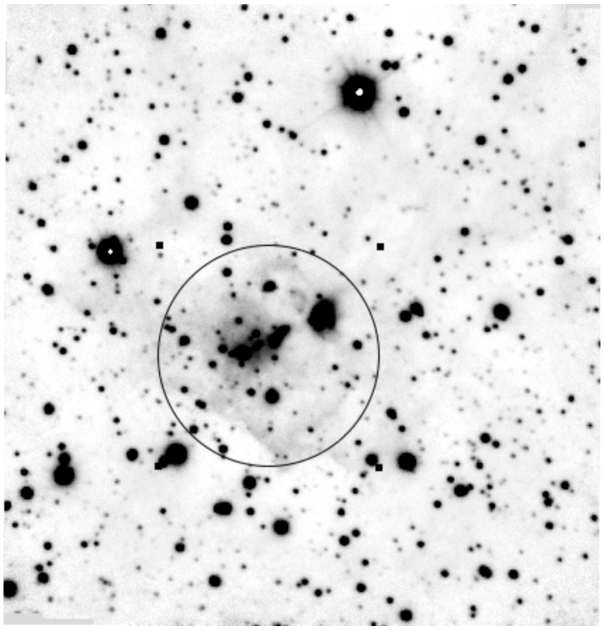

Fig. 1. K_s image of TR 14-N4 with the derived boundaries of the embedded cluster indicated by a circle. The centre of the field is at $\alpha = 10^{\mathrm{h}}\ 44^{\mathrm{m}}\ 31\overset{\mathrm{s}}{.}7$; $\delta = -59^\circ\ 33'\ 11''$ (J2000) and its size is $137'' \times 145''$. North is up, east is to the left.

ded in the dense cloud with the outflow directed close to the line of sight. We also update the near-infrared light curve (Figure 2) of the nearby embedded young objects #125 and #136, the latter known to have displayed K-band variations of more than four magnitudes (Tapia et al. 2003, 2006). It is evident that no clear variation pattern can yet be determined.

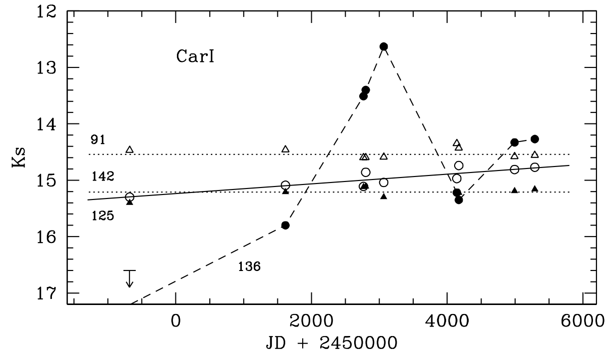

Fig. 2. Light curves in the K_s band, from 1993 November to 2010 April, of the young variable embedded stars (Tapia et al. 2006) Car I #136 (filled circles) and #125 (open circles). The photomeric data of the comparison (non-variable) stars #91 (open triangles) and #142 (filled triangles) in the same field are also plotted.

The results describing the details of this work are being submitted to MNRAS.

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