SHOCKED MOLECULAR HYDROGEN FROM STAR FORMING REGIONS

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Near infrared (2 micron) emission lines from molecular hydrogen provide a powerful probe of the morphology and energetics of outflows associated with stellar birth. The H_2 emission regions trace the location of shock waves formed when the high velocity outflow from young stars encounters dense quiescent gas. Since H_2 is the dominant coolant of the hot post-shock molecular gas, the H_2 lines provide a measure of the fraction of the total mechanical luminosity radiated away from the cloud.

We report results obtained with the KPNO 2.1 m telescope as part of an on-going program of low spectral resolution, high sensitivity observations of H_2 lines from star forming regions. We have completed extensive mapping of the v = 1-0 S(1) line at 2.12 microns toward NGC 2071, NGC 1333 (HH-12), Cepheus A, and HH-2 with angular resolution 10-20 arcseconds. We discuss the structure and physical conditions of the emission regions.

NEAR-IR OBSERVATIONS OF THE SHARPLESS REGIONS S269, S271, S307 AND S311

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Using an InSb photometer/spectrophotometer attached to the 1-m ESO telescope (La Silla, Chile), we searched for the near-infrared emission from the Sharpless regions S269, S271, S307, and S311. These regions appear on the Palomar Sky Survey red plates, as bright visible nebulae, and have extended radio continuum emission.

The detected near-infrared sources are coincident in position with the 6-cm radio continuum peaks and with IRAS sources. Combining our J, H,K,L, photometry with IRAS flux densities, we have derived the bolometric luminosities of the sources.

The IR source in S269 has a luminosity between 1-100 μm of 1500 $L_\odot$, consistent with a B2-3 (ZAMS) star that could be the ionizing source of the H II region. An extended 2.2 μm emission with a near-IR flat

https://doi.org/10.1017/S0074180900095383 Published online by Cambridge University Press

spectrum has been observed in S307 and S311. This emission could be due to free-free in the H II region observed in the radio continuum. A detailed discussion of the sources including VLA radio data and IRAS observations will be presented.

NEW INFRARED OBSERVATIONS OF NGC 3603

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NGC 3603, one of the most massive H II regions in our galaxy, shows recent star forming activity (Frogel *et al.* 1977; Tapia 1981; Persi *et al.*, 1985). In this paper we report new near-infrared maps and photometric observations in the complex region surrounding Irs 9, Irs 2 and Irs 8. Most data were gathered at the 1.5-m telescope of CTIO, using an InSb photometer. Tables 1 and 2 synthesize the observations and the results of the photometry. While the low resolution K map (Figure 1) shows basically the previously reported features, the high resolution K and L maps (shown superimposed in Figure 2), show that Irs 9 is the brightest source in the field, clearly resolved from Irs 2 and Irs 8. The presence of a previously unreported source some 22"N and 5"W of Irs 2, should be further investigated. The spectral distributions derived from our measurements and from previous ones by Persi *et al.* (1985) strongly suggest that the 10 and 20 μm fluxes reported by Frogel *et al.* (1977) at the position of Irs 2, probably correspond to Irs 9. Under this assumption, Irs 9 is probably a highly reddened massive star (1 μm to 20 μm luminosity, $L_* = 2.2 \times 10^4$ $L_\odot$) while the luminosity of Irs 2 is less than 10^2 $L_\odot$. We therefore conclude that Irs 9 is a young massive star surrounded by a warm ($T_{dust} \sim 250$ K) dust envelope; Irs 2 seems to be the less obscured part of an associated H II region, as further corroborated by the Brγ emission and the free-free like spectrum and spectral distribution, as reported by Persi *et al.* (1985) and in this paper.

New observations of Irs 16, whose striking variability of at least six magnitudes in the K band was reported by Persi *et al.* (1985), show that at least one period has elapsed since its discovery by Tapia, in 1978 (Tapia, 1981). Figure 3 shows the peculiar behaviour of this late-type star.

https://doi.org/10.1017/S0074180900095383 Published online by Cambridge University Press