

Infrared imaging and spectroscopy of the (proto)cluster IRAS 18511+0146

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Abstract. IRAS 18511+0146 is a young protocluster with a luminosity of $\sim 10^4 L_{\odot}$ and located at a distance of 3.9 kpc. Here, we examine the dust and gas environment in the vicinity of the cluster members using infrared imaging and spectroscopy. Br- γ emission has been investigated using the near infrared spectra. Mid-infrared imaging with VISIR on ESO-VLT shows the presence of diffuse emission close to one of the cluster members which is rich in PAHs.

1. Observations

IRAS 18511+0146 is a likely forerunner of a Herbig Ae/Be type small star cluster with a luminosity of $\sim 10^4 L_{\odot}$ located at a distance of 3.9 kpc (Watt et al. 1999; Vig et al. 2007). As an extension to this study, we decided to investigate a few cluster members in detail using infrared spectroscopy and imaging. The near infrared spectroscopic observations of objects in the IRAS 18511+0146 region, shown as N1-N10 in Fig 1 (left), were carried out using the SOFI spectrometer of the ESO 3.6 m New Technology Telescope (NTT). The mid infrared imaging and spectroscopic observations of this region, shown in Fig 2 (left), were carried out using the VISIR imager and spectrograph mounted on the ESO-VLT Unit Telescope 3 (Melipal). Note that N1 in the near-infrared image corresponds to 18511-A in the mid-infrared image.

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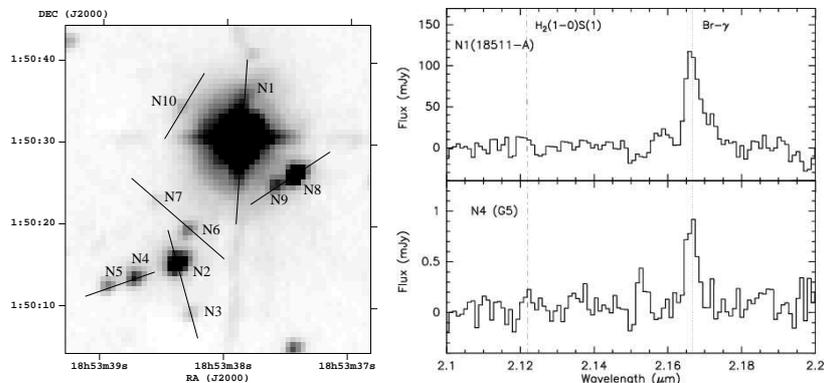


Figure 1. (Left) K_s band Palomar image of the region around IRAS 18511 with spectroscopy slit positions marked. (Right) Continuum subtracted spectra of N1 and N4 where the Brackett- γ line is detected.

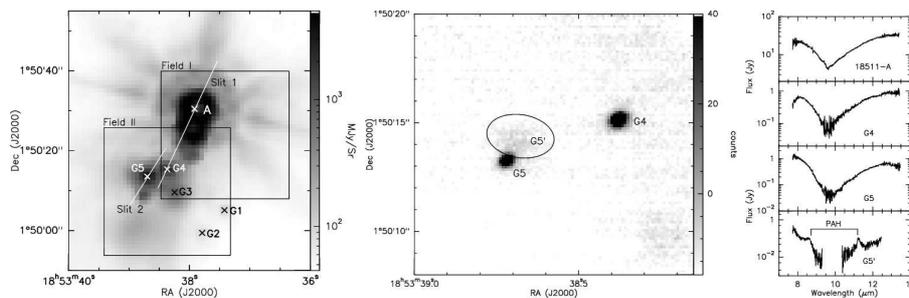


Figure 2. (Left) *Spitzer*-GLIMPSE 8 μm image of IRAS 18511 region with slit positions (white lines) and imaging fields (boxes) marked. (Middle) Mid infrared VLT-VISIR imaging of G4 and G5 through the filter PAH2. (Right) Mid infrared (8 – 13 μm) VLT-VISIR spectra of few sources in the IRAS 18511 region.

2. Results

All the near infrared K_s band spectra, other than N8 and N9, show rising SEDs with flux increasing with increase in wavelength. N10 shows CO absorption bands indicating cool photosphere (possibly a giant), likely to be a foreground object. The spectra are mostly featureless, characteristic of young stellar objects. Among the cluster members, two objects, 18511-A and N4 (G5), show weak Br- γ emission, which can be seen in Fig. 1 (right). It is to be noted that radio continuum emission is detected only towards G5. There is no evidence of detection of the ro-vibrational H_2 S(1-0) line at 2.12 μm in any of the spectra. The feature at ~ 2.15 μm in N4, Fig. 1 (right) is noise/artifact.

Mid-infrared imaging of this region shows that the sources, 18511-A, G4

and G5 are unresolved at all the wavelengths where they have been imaged. Further, diffuse emission towards the north-east ($\sim 0.''8$) of G5 is detected (we call this G5'). This emission (size $\sim 2'' \times 1''$) is particularly strong in the PAH filters; image in the PAH2 filter can be seen in Fig. 2 (middle). The mid infrared spectra of 18511-A, G4, G5 and G5' in the wavelength range 7.7 – 13.4 μm are shown in Fig. 2 (right). All the spectra show deep silicate absorption features. Of these spectra, only G5' shows emission in bands due to Polycyclic Aromatic Hydrocarbons (PAHs) at 8.6 μm and 11.2 μm .

References

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Watt S., & Mundy L. G., 1999, *ApJS*, 125, 143