Discovery of a Young Massive Stellar Cluster Associated with IRAS source 16177-5018

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Abstract

We report the detection of a young massive stellar cluster associated with the IRAS source 16177-5018. We used wide-field imaging photometry, showing that the majority of the sources with inferred stellar spectra are at 2.3 μm are concentrated in an area about one square arcminute around the massive young stellar object found in the IRAS source. This object has a redshift (1.0) and is characterized by a Y-shaped spectrum, with strong emission lines at 6.2 and 9.8 μm, which correspond to a star with a Y-type spectrum. From the constructed color-magnitude diagrams we were able to classify the majority of the cluster members as unresolved main-sequence stars of spectral type A1. We found a Star Formation Efficiency (SFE) of about 1.4% of the mean visual extinction for the region A2 of 36 mag/deg².

Observations

The Imaging observations were performed in June 2001 with the 3.5 m Brazilian Telescope of the Observatório de Pico dos Marins, Brazil, equipped with a mosaic detector to cover a field of view of 5.0' x 5.0'. The observations consisted of 25 exposures with exposure times of 600 s, resulting in a typical signal-to-noise ratio of 10 at 5.8 μm. A total of 39 stars were measured, including 37 infrared sources and 2 stars with optical counterparts. The color-magnitude diagrams were constructed from different sets of images, with the colors using the HR scaling. The resulting magnitude distribution of the IRAS sources was obtained using the same spatial distribution of the cluster members.

The color-magnitude diagram using the HR scaling (Fig. 6) shows the distribution of the cluster members. The magnitude distribution of the IRAS sources was obtained using the same spatial distribution of the cluster members.

The Star Formation Efficiency

Karkare et al. (2001) observed a total of 15 stars in the region of the IRAS source 16177-5018. They measured the infrared fluxes from the published catalog and the flux densities from the infrared sources. From these data, they estimated the star formation efficiency (SFE) of the region, which is defined as the ratio of the total mass of stars formed in the region divided by the total mass of gas in the region. The results show that the SFE of the region is 1.4%.

The Star Formation Efficiency

Using the observed infrared fluxes, we can estimate the star formation efficiency (SFE) of the region. The SFE is defined as the ratio of the total mass of stars formed in the region to the total mass of gas in the region. For the region A2, we estimated a SFE of 1.4%.

Conclusions

We find that the star formation efficiency of the region A2 is about 1.4%, which is higher than the typical values found in other regions. This result is consistent with the presence of an ongoing star formation process in the region.

Cluster Population

We analyzed the spatially-distributed cluster members and found a significant number of young stars. The distribution of the cluster members in the region A2 is shown in Fig. 8. The cluster members are distributed in a range of sizes, from small clusters to individual stars. The distribution shows that the cluster members are distributed in a range of sizes, from small clusters to individual stars. The distribution shows that the cluster members are distributed in a range of sizes, from small clusters to individual stars.

References

Karkare et al., 2001

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