Star Formation Activity in the Galactic HII Complex S255-S257

OJHA, D. K.[1], SAMAL, M. R.[2], PANDEY, A. K.[2], BHATT, B. C.[3], GHOSH, S. K.[1], SHARMA, S.[2]
TAMURA, M.[4], MOHAN, V.[5], ZINCHENKO, I.[6]

1: Tata Institute of Fundamental Research, India, 2: Aryabhatta Research Institute, India, 3: Indian Institute of Astrophysics, 4: NAOJ, 5: Inter-University Centre for Astronomy and Astrophysics, India, 6: Russian Academy of Sciences

We present results on the star formation activity of an optically obscured region containing an embedded cluster (S255-IR) and molecular gas between two evolved HII regions, S255 and S257. We have studied the complex using optical and near-infrared (NIR) imaging, optical spectroscopy, and radio continuum mapping at 15 GHz, along with Spitzer-IRAC results. We found that the main exciting sources of the evolved HII regions S255 and S257 and the compact HII regions associated with S255-IR are of O9.5–B3 V nature, consistent with previous observations. Our NIR observations reveal 109 likely young stellar object (YSO) candidates in an area of about 4.9 arcmin × 4.9 arcmin centered on S255-IR, which include 69 new YSO candidates (see Fig. 1). To see the global star formation, we constructed the V-I/V diagram for 51 optically identified IRAC YSOs in an area of about 13 arcmin × 13 armin centered on S255-IR. We suggest that these YSOs have an approximate age between 0.1 and 4 Myr, indicating a non-coeval star formation. Using spectral energy distribution models, we constrained physical properties and evolutionary status of 31 and 16 YSO candidates outside and inside the gas ridge, respectively. The models suggest that the sources associated with the gas ridge are younger (mean age about 1.2 Myr) than the sources outside the gas ridge (mean age about 2.5 Myr). The positions of the young sources inside the gas ridge at the interface of the HII regions S255 and S257 favor a site of induced star formation (Fig. 2) [1].

Reference

[1] Ojha, D. K., et al.: 2011, *ApJ*, **738**, 156.

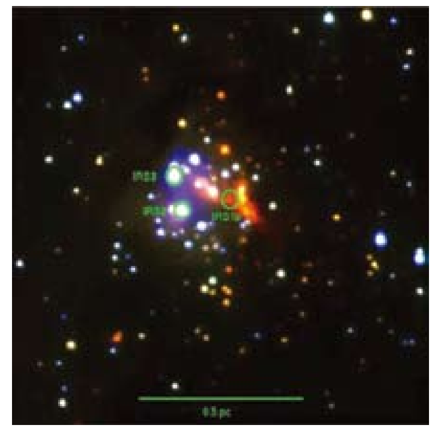

Figure 1: JHKs color-composite image of the S255-IR SFR (J, blue; H, green; and Ks, red). Only the central 1.5 arcmin × 1.5 arcmin is shown here. The ionizing sources of the compact and UC HII regions S255-2a, S255-2b, and S255-2c (marked with circles) are labeled IRS3, IRS2, and IRS1b, respectively. North is up and east is to the left.

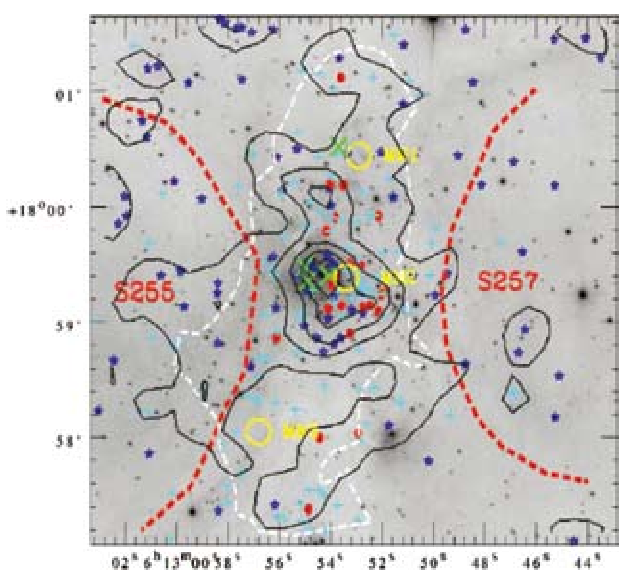

Figure 2: Spatial distributions of YSOs identified using the NIR CC diagram (asterisks), sources detected only in the H and Ks bands (filled circles), and sources detected only in the Ks band (plus symbols), overlaid on Ks-band image. The white dashed line shows the outer periphery of the dust continuum emission at 870 μm. The yellow circles are the positions of 1.2 mm continuum cores in the gas ridge. The red dashed lines are the demarcation of the outer boundaries of the S255 and S257. The large crosses represent the positions of the radio continuum sources. The YSO density contours are shown by black lines.