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Massive Star Formation: Accreting from Companion

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Abstract. We report the possible accretion from companion in the massive star forming region (G350.69–0.49). This region seems to be a binary system composed of a diffuse object (possible nebulae or UC HII region) and a Massive Young Stellar Object (MYSO) seen in Spitzer IRAC image. The diffuse object and MYSO are connected by the shock-excited 4.5 μm emission, suggesting that the massive star may form through accreting material from the companion in this system.

Key words. Infrared: ISM—stars: formation—ISM: jets and outflows.

1. Introduction

The dynamics processes in Massive Star Formation Regions (MSFRs) are more complex than in the regions that form low mass stars (see Zinnecker & Yorke 2007). Among the complex dynamics in MSFRs, the role and physics of accretion are central to the understanding of the massive star formation. Yet they remain poorly understood: where has the accretion occurred, in an isolated core (monolithic collapse) or in a protocluster environment (competitive accretion)? Or can the protostar grow by accreting material from the surrounding companions within clusters?

2. Accretion scenario in G350.69–0.49

Recently, we identified a Massive Young Stellar Object (MYSO) candidate G350.69–0.49 that is associated with extended 4.5 μm emission from the Spitzer GLIMPSE-II survey. The strong, extended emission in 4.5 μm band is thought to be produced by shock-excited H_2 and CO molecules when material flow interacts with the ambient ISM (Cyganowski *et al.* 2008). Figure 1 shows Spitzer images of G350.69–0.49 at 3.6, 4.5, 5.8, 8.0, and 24 μm bands and 3-colour composite IRAC images. From this figure, it can be seen that the source shows very interesting structures which seem to be a binary system composed of a northeast diffuse red object (may be a nebulae or UC HII region) and a southwest compact object (a known MYSO since a 6.7 GHz class II methanol maser is associated with it). There is a significant extended 4.5 μm

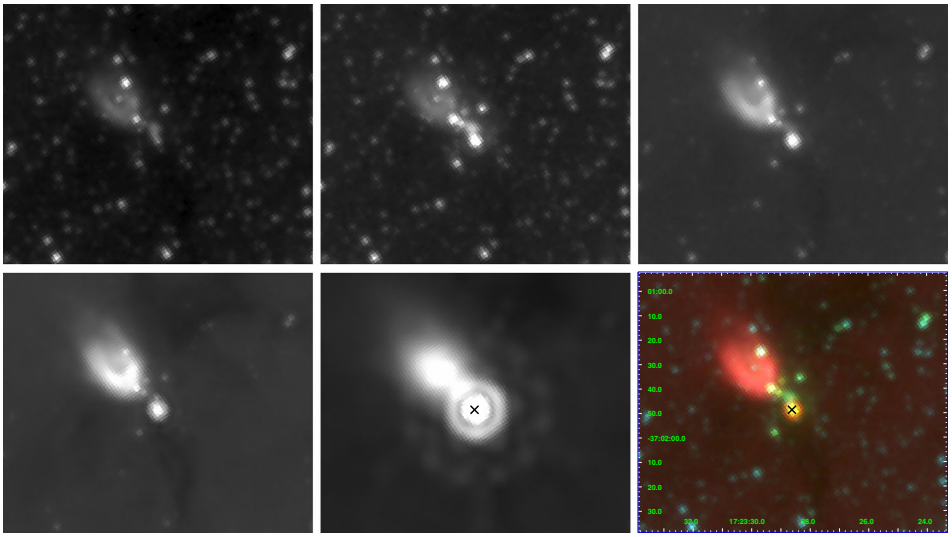

Figure 1. IRAC 3.6 μm (*upper left*), 4.5 μm (*upper middle*), 5.8 μm (*upper right*), 8.0 μm (*lower left*), and MIPS 24 μm (*lower middle*) images of G350.69–0.49. *Lower right*: three-colour IRAC image showing 8.0 μm (red), 4.5 μm (green), and 3.6 μm (blue). The position of 6.7 GHz class II methanol maser is marked by '$\times$'.

emission in the gap between the two objects, as well as significant collimated green spots along northwest–southeast direction approximately perpendicular to the binary system direction.

One possible scenario to explain this picture is the presence of accretion or material transferring process from the diffuse nebulae to the MYSO in the binary system. And a collimated jet/outflow could be expected to appear with an orientation perpendicular to the major axis direction of the binary system to release the angular momentum. This accretion scenario is similar to that of the X-ray binary microquasar, and suggests another possible accretion mode of massive star formation – the massive protostar disk accretes the material from the surrounding companions in the star forming clusters. However, such a picture also may be a projection effect of the two close objects along the line-of-sight. Further higher-resolution image observations with e.g., ALMA, are required to approve of this possible accretion mode.

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References

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