Mid-Infrared Imaging of Massive Young Stars

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Abstract

Formation of massive stars is a poorly understood process. Detailed observations of high-luminosity young stellar objects (YSOs), often embedded in dusty envelopes, could provide valuable clues to their origin. Imaging in the mid-infrared allows us to investigate the multiplicity of sources, characterize the immediate circumstellar material, and connect the overall structure of the YSO environment on both large and small scales. Here we present subarcsecond-resolution mid-infrared images of nine young stellar objects: AFGL 961, AFGL 2136, AFGL 4176, AFGL 7009S, G343.126, I17441, M8E-IR, S269-IRS2, and W33A. The observations were obtained in two runs using the Thermal Infra-red Multi-Mode Instrument (TIMMI2) on the European Southern Observatory's 3.6-meter telescope in La Silla, Chile. Each target, with the exception of AFGL 4176, has observations at both 11.9 microns and Q-band. M8E-IR was also observed at 8.9 and 9.8 microns, while AFGL 961 and S269-IRS2 were imaged at 4.6 microns as well. We present photometry and contour plots to show the infrared morphology of each target, several of which reveal multiple sources and/or diffuse nebulosity. For example, we find that M8E-IR has six separate sources clustered around the central point source. In addition to I17441’s central point source, there are three fainter sources as well as a large bow-shaped nebulosity. We detect four point sources toward AFGL 961 and extended diffuse mission associated with S269-IRS2. We discuss the relation between our mid-infrared images of these YSOs and previously available data on their near-infrared morphology, silicate features, and CO outflows.