A Panoramic View of Magellanic Star Formation: From Optical to Infrared

We compare the Young Stellar Object Populations (YSOs) as revealed in observations of very young clusters, in the Magellanic Clouds over a variety of wavelength regimes. Infrared data from the SAGE (Surveying the Agents of a Galaxy's Evolution) Spitzer Legacy programs SAGE-LMC and SAGE-SMC are complemented by HST optical imaging.

NGC 602 in the SMC

NGC 602 is a small but active star forming cluster in the Wing of the SMC. The bright MS and pre-MS population are about 4 Myr in age (Carlin et al. 2007 ApJ 661, 199). Star formation continues in the cluster's periphery. We identified 25 YSOs, combining HST/ACS optical data with IRAC mid-IR and new SAGE-SMC MIPS/MCJc measurements. In the figure, bright solid lines show the best fits; faint solid lines show alternate fits; and dashed lines represent the naked photopgraphs.

Henize 206 in the LMC

Henize 206 is located South-West of 30 Doradus. Seven high probability YSOs have already been identified in the SAGE-LMC ISO overview papers (Whitney et al., 2008 AJ, 135, 193). We examine additional candidate YSOs that have been revealed by new IRAC mosaic photometry. The SED filter has classified 15 YSO candidates as Stage I, 4 as Stage II, and 4 as Stage III. There are 107 currently unclassified YSO candidates. Current fits use SAGE-LMC, SMAIS, and MCPS data.

N 11 in the LMC

N 11 is a well-known star-forming region in the north-west of the LMC. This was the primary example star forming region in Whitney et al. (2008), classifying several high probability, near YSOs in that paper. We now continue the work of identifying and classifying further YSOs in the region. Through examination of high-resolution optical and NIR images, we will be able to visually distinguish legitimate YSOs from the background galaxies and AGNs that cause confusion in both IR color-magnitude diagrams and SED fitting.

This Stage I source appears in a dusty finger. At least two optical sources fall within the NIR aperture. The SED peaks in the IR, dominated by an envelope. Red: optical fluxes as data points with error bars. Purple: optical fluxes as upper limits.

This Stage I or II source includes many optical sources, including some PMs, as well as optically bright ISM. We fit the optical fluxes as upper limits only. The dark orange dashed line shows a photoionizing SED. This source peeks in the F212 and has significant 24micron flux.

This Stage II source peaks in the NIR and is dominated by thick disk emission. It appears to be a pillar of fairly dark gas and very bright ISM. Red: optical fluxes (yellow) tells us this is a Stage III source with significant photopheretic SED. This source peaks in the F212 and has significant 24micron flux.

This Stage II source was also identified in the overview paper. It is located in a dusty finger in the west of the cluster. In the SED, peaks are obvious both in the near IR and at 70 micron. The visual source (purple) was for only 3 data points. We fit it (yellow).

This Stage II source is in a crowded area of filamentary structure in the south-west quadrant of the large image. In the (dusty) far IR, the original paper fit (purple) was for only 3 data points. We fit it (yellow).

This Stage II source is surrounded by a large number of circumstellar structures. In the overview paper, the SED falls below 25 micron. We fit the observed flux data in optical and IR with three bumps. The peaks are near 10, 25, and 35 micron.

This Stage II source is in a crowded area of filamentary structure in the south-west quadrant of the large image. In the (dusty) far IR, the original paper fit (purple) was for only 3 data points. We fit it (yellow).

This Stage II source is surrounded by a large number of circumstellar structures. In the overview paper, the SED falls below 25 micron. We fit the observed flux data in optical and IR with three bumps. The peaks are near 10, 25, and 35 micron.

Visual inspection shows clear 24 micron emission near the center Stage I source and strong [8.0] emission along the filaments. The SED peaks in the far IR, around 100 micron. Fainter lines are alternate fits and are also Stage I models.

This source lies just within the central cavity. It appears to be a single point source with an SED peaking in the mid-IR. It can be fit both to Stage I and Stage II YSO models. The most likely fits are shown, but there is no conclusive fit with only flux measurements.

Low 24 micron emission indicates that the source is more evolved than a Stage I source. Visual inspection shows that there are multiple sources within a small radius. The circle here is much larger than the IRAC aperture, but multiple sources may contribute at 24 micron.

This source is discussed in the SAGE YSO overview paper (Whitney et al., 2008). It is in the immediate vicinity of other two YSOs. The fit here includes Near IR fluxes from the 2MASS survey. The dip at [4.5] indicates likely PAH emission. Note that the circle is larger than the actual aperture used.