Nine HII Regions in the Large Magellanic Cloud: Young Stellar Objects, Star Formation Rates, and the ISM

We present a detailed examination of nine LMC star-forming regions with diverse environments, sizes, and morphologies. We identify 1068 Young Stellar Object (YSO) candidates (926 not previously known) and derive star-formation rates for each region via two distinct methods. We combine Spitzer infrared data from SAGE-LMC (Surveying the Agents of Galaxy Evolution; Meixner et al. 2006), optical photometry from the Magellanic Clouds Photometric Survey (MCP5; Ziurys et al. 1997), and near-infrared photometry from the Infrared Survey Facility (IRSF; Kato et al. 2007) to identify and characterize individual YSO candidates. From these, we derive bottoms-up star formation rates for each region, which we compare to top-down rates estimated from 70-micron flux. We compare the distribution of YSOs with that of warm and cold ISM components as revealed by Spitzer and Herschel (HERITAGE; PI: Meixner) imaging. Regions are LHA 120-N 11, N 44, N 51, N 105, N 113, N 120, N 144, N 160, and N 206.

We use the Spitzer infrared color-magnitude diagrams to select candidate YSOs, using photometry from SAGE. In each, we have a and b selection criteria. a criteria select regions right of the blue line, left of the rest of color-magnitude space with high contamination of YSOs but much from background galaxies or evolved stars. b selections should only be used in star forming regions where sources have a high probability of being genuine YSOs. We fit the fluxes for each source with a pre-computed grid of YSO models (Stassun et al. 2007) and require different goodness of fit according to how many selection criteria are met (see table). From the fluxs, we determine the evolutionary stages (the most embedded to the circumstellar disk remaining) and masses and other physical parameters. In all figures, red marks are Stage I, pink Stage II, yellow Stage II, green Stage II/III, cyan Stage III, and blue well-fit but of indefinite stage. Sources marked with * are from Whitney et al. (2008) and/or Gould & Chu (2009) and duplicated here. * are spectroscopically from Seale et al. (2009) or Woods et al. (2010). Large black squares are masers (Ellingsen et al. 2008).