

The Massive Star Population in M101. I. The Identification and Spatial Distribution of the Visually Luminous Stars

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An increasing number of non-terminal giant eruptions are being observed by modern supernova and transient surveys. But very little is known about the origin of these giant eruptions and their progenitors, many of which are presumably very massive, evolved stars. Motivated by the small number of progenitors positively associated with these giant eruptions, we have begun a survey of the evolved massive star populations in nearby galaxies. The nearby, nearly face on, giant spiral M101 is an excellent laboratory for studying a large population of very massive stars. In this paper, we present BVI photometry obtained from archival HST/ACS WFC images of M101. We have produced a catalog of luminous stars with photometric errors $<10\%$ for $V < 24.5$ and 50% completeness down to $V \sim 26.5$ even in regions of high stellar crowding. Using color and luminosity criteria we have identified candidate luminous OB type stars and blue supergiants, yellow supergiants, and red supergiants for future observation. We examine their spatial distributions across the face of M101 and find that the ratio of blue to red supergiants decreases by two orders of magnitude over the radial extent of M101 corresponding to 0.5 dex in metallicity. We discuss the resolved stellar content in the giant star forming complexes NGC 5458, 5453, 5461, 5451, 5462, and 5449 and discuss their color-magnitude diagrams in conjunction with the spatial distribution of the stars to determine their spatio-temporal formation histories.

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