The Lives and Death-Throes of Massive Stars
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Massive Stars in M31

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Abstract. Massive stars are intrinsically rare and therefore present a challenge to understand from a statistical perspective, especially within the Milky Way. We recently conducted follow-up observations to the Panchromatic Hubble Andromeda Treasury (PHAT) survey that were designed to detect more than 10,000 emission line stars, including WRs, by targeting regions in M31 previously known to host large numbers of young, massive clusters and very young stellar populations. Because of the existing PHAT data, we are able to derive an effective temperature, bolarimetric luminosity, and extinction for each of our detected stars. We report on preliminary results of the massive star population of our dataset and discuss how our results compare to previous studies of massive stars in M31.

Keywords. stars: emission-line, Be, stars: Wolf-Rayet

1. Emission Line Survey Basics

We carried out a deep, 2 epoch, Hα imaging survey to detect emission line stars in 6 regions of M31 known to host very young stellar populations and large numbers of young massive clusters from the Panchromatic Hubble Andromeda Treasury (PHAT) survey. By leveraging the PHAT dataset, we are able to determine properties such as age, T_{eff}, L_{bol}, and A_V for all our sources. Each of our six targeted regions was observed twice with either WFC3 or ACS. Therefore, each star in our emission line survey has 1 epoch of data from each of the 6 filters used for PHAT plus 2 epochs of Hα and F625W imagery. In total, we detected more than 2 million stars.

2. Preliminary Results and Future Work

We found the B stars in our sample by making cuts on $\log(T_{eff})$ between 4 and 4.5 and log(age) between 7.0 and 8.0. Approximately 6% of the sample is B stars and, of those, 2% are in previously identified clusters. We expect between 10% and 40% of the B star sample are Be stars, which we will determine by comparing the two epochs of data.

Ten previously discovered red supergiants and 12 previously discovered WRs were observed as part of our survey. We are currently trying to identify them in our sample and determine if they show variable Hα emission or absorption that might be indicative of a binary companion.