A Massive Star Odyssey, from Main Sequence to Supernova
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Integrated photometric and spectroscopic properties of massive stellar clusters in Wolf-Rayet galaxies

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Abstract. We report here the first results of an extensive optical/near-infrared imaging and spectroscopic study of massive stellar clusters in Wolf-Rayet (WR) galaxies using observations obtained from KPNO (USA), OAN (Mexico), the *HST* and the 2MASS data archive. We have collected spectra, *B*-imagery and 2MASS *JHK* imagery of approximately 60 prominent stellar clusters in 23 WR galaxies. One-third of the clusters have a WR stellar signature at He II λ4686. In this poster, we present the comparison of the derived ages and masses of clusters with WR stars (WRCs) against clusters not containing WR stars (nWRCs). The results show that the mean age of the WRCs distribution is 5.2 ± 1.8 Myr and 6.4 ± 2 Myr for the nWRCs. The mean ages of the two cluster groups are not statistically different. The WRCs masses appear to be more evenly distributed than the nWRC masses and one typically finds that the WRC mass in a particular galaxy is larger than the nWRC mass.

1. Introduction

Wolf-Rayet galaxies are starburst galaxies where broad He II λ4686 emission (associated with Wolf-Rayet stars) has been detected. Because of the presence of Wolf-Rayet stars, the starburst must have occurred in the last 2 - 6 Myr. Studying these galaxies allows us the perfect opportunity to study the initial properties of the starburst phenomena (age, mass, star formation rate). In this study, we compare the age and masses of clusters with and without Wolf-Rayet stars.

2. Observations, analysis and results

Twenty-two galaxies were observed over the past three years (1999-2001) using the telescopes at Kitt Peak National Observatory (KPNO) and San Pedro Mártir Observatorio Astronómico Nacional (OAN). Johnson *B*-imagery for cluster photometry was taken with the 0.9m telescope and T2KA CCD at KPNO during 1999; with the 2.1m telescope and T2KA CCD at KPNO during 1999; with the 1.5m telescope and SiTe CCD at OAN during 2001. Long-slit spectra covering the

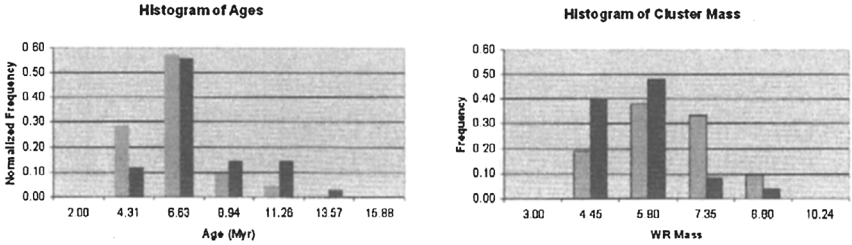

Figure 1. Histogram of the cluster ages (*left*) and mass (*right*) for Wolf-Rayet clusters (light grey) and non Wolf-Rayet clusters (dark grey). The frequency of all sets has been normalized with respect to their total object numbers, respectively.

wavelength range 3500 - 7 500 Å were taken with the GoldCam Spectrograph and Ford 3K×1K CCD on the 2.1m telescope at KPNO during 1999, and with the Boller and Chivens Spectrograph and Thompson 2K CCD on the 2.1m telescope at OAN during 2000 - 2001.

Ages were derived by comparing the measured and STARBURST99 (Leitherer *et al.* 1999) model Hα and Hβ equivalent widths (W_λ). Masses were found using the stellar continuum of the spectra and the M_B of the stellar clusters and comparing them to the STARBURST99 models. The results were subdivided into non-Wolf-Rayet ($\sim$40 nWRCS) and Wolf-Rayet clusters ($\sim$20 WRCs). Histograms of the ages and masses (see Figure 1) were produced for the nWRCs and WRCs using bins standard deviation of the results and sample size (Scott, private communication).

3. Conclusion

The mean age of the Wolf-Rayet clusters is 5.16 ± 1.79 Myr and 6.38 ± 2.14 Myr for the non Wolf-Rayet clusters. According to the F-test for comparing means, we cannot confirm that the means of the distributions are significantly different. However, the histogram distributions are significantly different in both age and mass. The cluster mass histogram of Figure 1 shows that WRCs are more evenly spread over the mass range than their nWRC counterparts. Comparisons of WRC and nWRC masses in an individual galaxy show the WRC mass being typically larger than the nWRC mass.

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References

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