

The Evolution and Physical Parameters of WN3/O3s: a New Type of Wolf-Rayet Star

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As part of a search for Wolf-Rayet (WR) stars in the Magellanic Clouds, we have discovered a new type of WR star in the Large Magellanic Cloud (LMC). These stars have both strong emission lines, as well as H α and Balmer absorption lines and spectroscopically resemble a WN3 and O3V binary pair. However, they are visually too faint to be WN3+O3V binary systems. We have found nine of these WN3/O3s, making up \sim 6% of the population of LMC WRs. Using CMFGEN, we have successfully modeled their spectra as single stars and have compared the physical parameters with those of more typical LMC WNs. Their temperatures are around 100,000 K, a bit hotter than the majority of WN stars (by around 10,000 K) although a few hotter WNs are known. The abundances are what you would expect for CNO equilibrium. However, most anomalous are their mass-loss rates which are more like that of an O-type star than a WN star. While their evolutionary status is uncertain, their low mass-loss rates and wind velocities suggest that they are not products of homogeneous evolution. It is possible instead that these stars represent an intermediate stage between O stars and WNs. Since WN3/O3 stars are unknown in the Milky Way, we suspect that their formation depends upon metallicity, and we are investigating this further by a deep survey in M33, which possesses a metallicity gradient.

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Comments:

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