The Wolf-Rayet stars in M31: I. Analysis of the late-type WN stars

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CONTEXT: Comprehensive studies of Wolf-Rayet stars were performed in the past for the Galactic and the LMC population. The results revealed significant differences, but also unexpected similarities between the WR populations of these different galaxies. Analyzing the WR stars in M31 will extend our understanding of these objects in different galactic environments.
AIMS: The present study aims at the late-type WN stars in M31. The stellar and wind parameters will tell about the formation of WR stars in other galaxies with different metallicity and star formation histories. The obtained parameters will provide constraints to the evolution of massive stars in the environment of M31.
METHODS: We used the latest version of the Potsdam Wolf-Rayet model atmosphere code to analyze the stars via fitting optical spectra and photometric data. To account for the relatively low temperatures of the late WN10 and WN11 subtypes, our WN models have been extended into this temperature regime.
RESULTS: Stellar and atmospheric parameters are derived for all known late-type WN stars in M31 with available spectra. All of these stars still have hydrogen in their outer envelopes, some of them up to 50% by mass. The stars are located on the cool side of the zero age main sequence in the Hertzsprung-Russell diagram, while their luminosities range from 10^5 to 10^6 Lsun. It is remarkable that no star exceeds 10^6 Lsun.
CONCLUSIONS: If formed via single-star evolution, the late-type WN stars in M31 stem from an initial mass range between 20 and 60 Msun. From the very late-type WN9-11 stars, only one star is located in the S Doradus instability strip. We do not find any late-type WN stars with the high luminosities known in the Milky Way.

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