A Massive Star Odyssey, from Main Sequence to Supernova
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A spectroscopic survey of the WNL population in the LMC: very preliminary results

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Abstract. We present very preliminary results of a spectroscopic survey of all known 47 WNL stars in the LMC.

1. Introduction

The LMC is a perfect laboratory to study the effects of the metallicity Z on the evolution of massive stars: (*a*) reddening is small and almost uniform; (*b*) distances are well known; (*c*) Z is lower than in our Galaxy ($Z_{\rm LMC} = 0.3\, Z_{\rm MW}$) and quite uniform; and (*d*) the sample of WR stars is complete and large enough to obtain statistically significant results.

We are currently undertaking a large spectroscopic survey of all 47 known WNL stars in the LMC. In a first campaign, we have been awarded 49 nights at several 2m-class telescopes (CASLEO, MSO, SAAO, and CTIO) in order to obtain low-resolution (2.3 Å pix^{-1}) spectra of the 41 WNL stars accessible from the ground (for the seven remaining stars, *HST* is to be used). The goals of this study are:
(*i*) to determine the binary frequency among the WNL population of the LMC. Is binarity a major channel for WR formation in low-Z environments, following the scenarios of Vanbeveren, van Rensbergen & de Loore (1998)? Is there a dichotomy of the binary frequency among WN8,9 and WN6,7 stars, as has been

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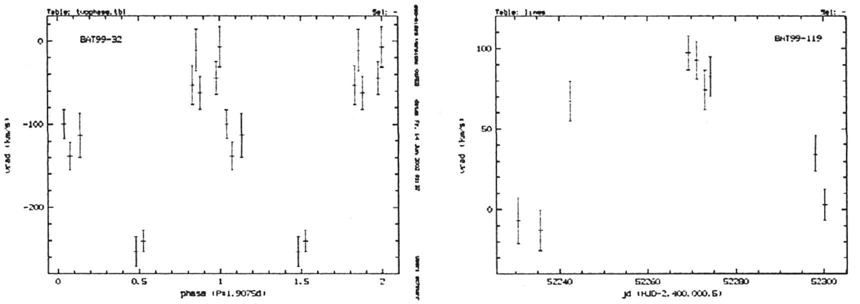

Figure 1. *Left:* BAT99-32 (WN6h) is a known binary with a period of 1.9075 d (M89). Graph shows our RVs plotted into corresponding phase. We can confirm the binary nature of this star. *Right:* BAT99-119 (WN6h) is a suspected binary with a tentative period of 25.17 d (M89). Our RVs confirm significant variability, although the period seems to be considerably longer, if this star is indeed a binary. More data are required.

reported by Moffat (1989, hereafter M89)?
(*ii*) to determine the masses of the WNL stars. Extremely luminous stars of the hydrogen-rich subgroup (denoted WNLh) are supposedly MS or early post-MS objects, thus still core hydrogen burning. They hence have the potential to be the most massive stars observable;
(*iii*) to study the wind-wind collision (WWC) effects in identified binaries. Modeling the excess emission due to WWC is a powerful tool to derive the orbital inclination angle, needed to obtain absolute masses (Lührs 1997; Hill, Moffat & St-Louis 2001); and
(*iv*) to study line profile variations in identified single stars in order to search for large-scale structures in the WR wind, like co-rotating interacting regions (CIR).

2. Results

Very preliminary results of radial velocity (RV) analyses for selected stars are given (see Figure 1). RVs were measured by cross-correlation of the He II λ4686 emission, using the best spectrum as template.

References

Hill, G., Moffat, A.F.J., St-Louis, N. 2001, MNRAS 318, 402

Lührs, S. 1997, PASP 109, 504

Moffat, A.F.J. 1989, ApJ 347, 127

Vanbeveren, D., van Rensbergen, W., de Loore, C. 1998, *The Brightest Binaries* (Dordrecht: Kluwer).

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