

Discovery and confirmation of some double-lined spectroscopic binaries in the Sco-Cen Complex

Christian Nitschelm

*Astrophysics Research Group, University of Antwerp, Middelheimlaan 1,
2020 Antwerp, Belgium*

Abstract. This progress report fits in a large study of the binary population in the Sco-Cen Complex (Lower Centaurus Crux (LCC), Upper Centaurus Lupus (UCL) and Upper Scorpius (US)). With the identification of astrometric members of these associations based on the Hipparcos satellite data, statistics predict some 90, mostly fainter, spectroscopic binaries to await detection. A first-look analysis of two recent high-resolution spectroscopic runs on 53 stars reveals 5 SB2s (one doubtful), including two newly detected ones.

1. Introduction

Despite earlier efforts (Levato et al. 1987; Verschueren, David, & Brown 1996), the binary population of the Sco-Cen Complex is not well-known. Nitschelm (2003) describes an on-going project to extend the empirical knowledge to fainter members (de Zeeuw et al. 1999) and a broader range of orbital periods. High-dispersion echelle spectroscopy was obtained in 2003, June 10-17, at Sutherland Observatory (SAAO) with GIRAFFE (36 spectral orders with a resolution of 39 000 from 3770 Å to 5560 Å) and July 1-12 at Mt. John Observatory (Univ. of Canterbury, New Zealand) with HERCULES (34 spectral orders with a resolution of 35 000 from 3760 Å to 4560 Å).

At SAAO, 57 spectra of 13 “single” stars ($6.4 < V < 7.0$) and 2 known SB2s were obtained, at Mt. John 135 spectra of 9 “single” stars ($6.0 < V < 7.0$) and 29 suspected/known SBs ($2.0 < V < 6.5$) were collected. A signal-to-noise ratio of 200 at 4500 Å was aimed for.

In this report, I present the obvious SB2s of the sample. The double-lined character is visualised (Fig. 1) using the Mg II line near 4481 Å. In Fig. 1, all wavelengths are corrected for barycentric velocity.

2. Discovered or confirmed double-lined spectroscopic binaries

HD 90264 ($V = 4.97$, B8 V, member of LCC). It was termed SB2 by Pedersen & Thomsen (1977) and by Hubrig & Mathys (1996). For Dolk, Wahlgren, & Hubrig (2003), it is a SB1 with $v \sin i = 7$ km/s (and not 80 km/s as Hubrig & Mathys quote). The two spectra obtained with three days in-between clearly confirm the SB2 nature of this star, without ambiguity. The two components are very sharp-lined stars with similar spectral type and mass. The blue-shifted component in both spectra is the HgMn component.

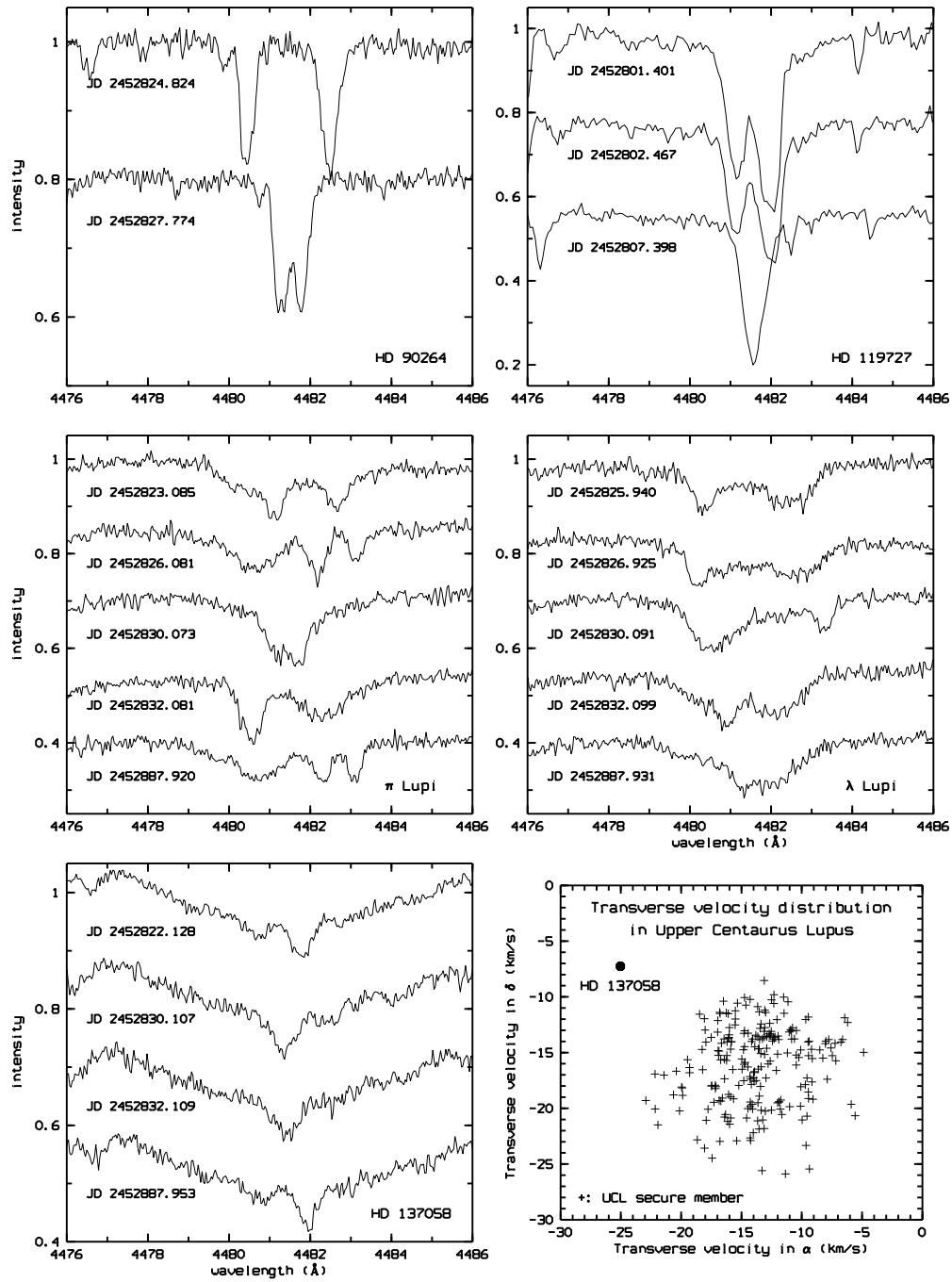


Figure 1. Composite Mg II line for confirmed SB2s and discrepancy in proper motion for k Lupi

HD 119727 ($V = 6.42$, A1 V, member of LCC). This is a *newly detected* SB2 with sharp-lined components and considerable changes of RVs in one week.

π Lupi = HD 133242 (HD 133242, $V = 4.57$, B5 V) + HD 133243 (HD 133243, $V = 4.65$, B5 IV, member of UCL). Visual binary with $P_{orb} = 517$ yr, semi-major axis $a = 1''.59$ (Nitschelm 2003). π Lupi was found to be a SB by Buscombe & Stoeckley (1975). The system consists at least of a SB2 + SB1, one component having broader lines than the others.

λ Lupi = HD 133955 ($V = 4.43 + 5.23$, B3 V, member of UCL). λ Lupi was identified as a RV variable by Buscombe & Morris (1960). One of the components of the visual binary ($P_{orb} = 72.36$ yr, $a = 0''.265$, Nitschelm 2003) is a slowly rotating SB2. The other visual component is probably fast rotating (underlying broad Mg II component). The SB2 period must be shorter than one week, the mass ratio roughly 0.7.

k Lupi = HD 137058 ($V = 4.70$, A0IVn): Fast rotator ($v \sin i = 268$ km/s, Brown & Verschueren 1997) and possibly an SB2, as suggested by a moving sharp component superposed on a very broad Mg II line. If so, then the very different line strength suggests a mass ratio far from unity. HD 137058 is not a secure member of UCL (Fig. 1).

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References

- Brown, A. G. A., & Verschueren, W. 1997, A&A, 319, 811
 Buscombe, W., & Morris, P. M. 1960, MNRAS, 121, 263
 Buscombe, W., & Stoeckley, T. R. 1975, A&AS, 37, 197
 de Zeeuw, P. T., Hoogerwerf, R., de Bruijne, J. H. J., Brown, A. G. A., & Blaauw, A. 1999, AJ, 117, 354
 Dolk, L., Wahlgren, G. M., & Hubrig, S. 2003, A&A, 402, 299
 Hubrig, S., & Mathys, G. 1996, 120, 457
 Levato, H., Malaroda, S., Morrell, N., & Solivella, G. 1987, ApJS, 64, 487
 Nitschelm, C. 2003, in Astrophysics and Space Science Library Vol. 299, Open Issues in Local Star Formation and Early Stellar Evolution, eds. J. Gregorio-Hetem and J. Lépine (Dordrecht: Kluwer Academic Publishers), in press
 Pedersen, H., & Thomsen, B. 1977, A&AS, 30, 11
 Verschueren, W., David M., & Brown, A. G. A. 1996, in ASP Conf. Ser. Vol. 90, The origins, evolution, and destinies of binary stars in clusters, eds. E. F. Milone and J.-C. Mermilliod, (San Francisco: ASP), 131