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The binary population in the Sco-Cen Complex

The present state of knowledge and preparation of future research ⋆

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Abstract. In the framework of the Symposium "Open Issues in Local Star Formation and Early Stellar Evolution", held at Ouro Preto, Brazil, on April 05-10, 2003, we present the main results of the extensive study of the binary population in the Sco-Cen Complex, composed by three nearby southern OB associations: Lower Centaurus Crux, Upper Centaurus Lupus and Upper Scorpius. Our main purpose is to do a statistical study using Hipparcos data for the wider binaries and high-resolution spectroscopy for the closer ones. We aim at the research of all kinds of multiple objects, including visual binaries, spectroscopic binaries and eclipsing binaries, bright and faint, main sequence as well as pre-main sequence. This poster is giving the present state of duplicity knowledge in the Sco-Cen Complex, using all available sources, mainly the Simbad database, the Hipparcos astrometric results and the literature.

1. The Sco-Cen Complex

The Sco-Cen Complex, also named Sco OB2 in the literature, is composed of three nearby southern OB associations, Lower Centaurus Crux (LCC), Upper Centaurus Lupus (UCL) and Upper Scorpius (US), first identified by Blaauw (1964). During the pre-Hipparcos era, many of the bright members of the Sco-Cen Complex were observed frequently, whereas the fainter objects were largely ignored.

Using Hipparcos data (Perryman 1997) and two selection methods (see Hoogerwerf & Aguilar 1999 and de Bruijne 1999), de Zeeuw et al. (1999) made a thorough study of the membership of the three OB associations LCC, UCL and US. For the whole Sco-Cen Complex, they found a total of 521 secure members: 120 in US, 221 in UCL and 180 in LCC. The mean distances of the three associations were found to be 145 ± 2 pc for US, 140 ± 2 pc for UCL and 118 ± 2 pc for LCC. No systematic studies of the duplicity were made, except two partial ones (Levato et al. 1987, Verschueren et al. 1996).

2. The Sco-Cen Main Catalogue (SCMC)

We compiled a list of 668 objects which will be screened for multiplicity. In this list, 525 objects are secure members, according to de Zeeuw et al. (1999), while 143 are possible members, according to pre-Hipparcos studies (de Geus 1988, Brown 1996), not selected by de Zeeuw *et al.* who preferred to publish a selection based solely on the Hipparcos data, rather than use additional information of very inhomogeneous quality. They admit that this is at the expense of some members, especially in the case of binarity.

Among the 143 doubtful members, there are some tens which exhibit a large discrepancy in their transverse velocity which undoubtedly would exclude them from membership if they were single stars. Yet we have chosen to retain them in our binary search programme because their transverse-velocity discrepancy could be caused by orbital motion. Obviously, for every new binary found among those, the membership will have to be reassessed.

Fig. 1 shows the distribution of the selected stars on the sky. Fig. 2 shows the HR diagram of the secure and possible members, whereas Fig. 3 is correlated with the transverse velocity of the same objects.

3. The Sco-Cen Double and Multiple Systems Catalogue (SCDMSC)

For studying the multiplicity in the Sco-Cen Complex, we created a specific catalogue for all known or suspected double or multiple systems, using the Hipparcos DMSA (see Perryman 1997,pages 167-199), the Simbad database, the CCDM Catalogue,

⋆ Partly based on data from Hipparcos astrometry satellite and from the Simbad database

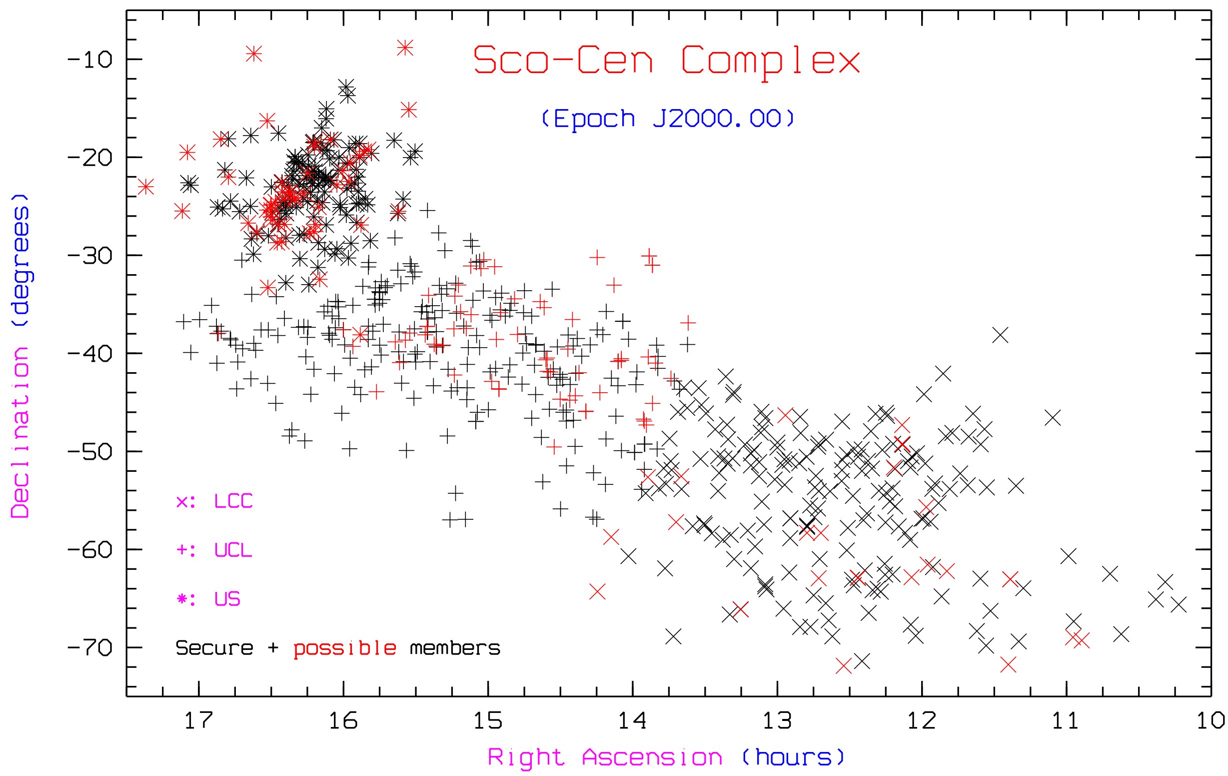

Fig. 1. The 668 secure and possible members of the Sco-Cen Complex

the WDS Catalogue, the Fourth CHARA Catalog, the SB8 Catalogue and a thorough investigation through the literature for each system.

The duplicity turns out to be known far better for the bright objects (V ≤ 6.5) than for the fainter ones. This is especially clear when we compare the distributions in magnitude of the total population of the Sco-Cen Complex and the physical binary one (see Fig. 4).

With 668 secure or possible members of the Sco-Cen Complex and 55 physical binaries known among the 188 bright objects (V ≤ 6.5), we can expect the discovery of, at least, 120 yet unknown binaries, either visual, spectroscopic (SB1 and SB2) or eclipsing, as well as ellipsoidal stars, during a systematic survey, only 19 fainter systems being already known (V > 6.5), up-to-date.

4. Evaluation of the SCDMSC

We present tables wherein the available information on binaries is evaluated with the purpose to guide observers (resulting in a 'quality' entry), including those participating in our project, in defining observing programmes.

Concerning visual binaries, René Mante (private communication) has reviewed most orbits including the latest observations. However, for cases which are too doubtful, only the orbital period estimate is given and no further parameters (Table 1).

The quality of the data on close binaries is still being evaluated, but Table 2 gives an early attempt ordering them from systems with excellent orbits to systems with doubtful or unknown periods. Although they all are expected to be spectroscopic binaries, some have only been identified by photometric means.

On the other hand, a list of suspected spectroscopic binaries from the literature or from earlier spectroscopic observations made with the Echelec spectrograph (Verschueren et al. 1997) is given in Table 3, with some comments. High resolution spectroscopy of those targets would be very welcome...

Furthermore, the Hipparcos astrometry was used to select possible binaries with periods in the range of months to few years among stars treated by Hipparcos as single objects. The basic idea used by Dimitri Pourbaix (private communication) is that if the star is single, no orbit (strictly speaking...) will significantly reduce the chi-square with respect to the single star solution

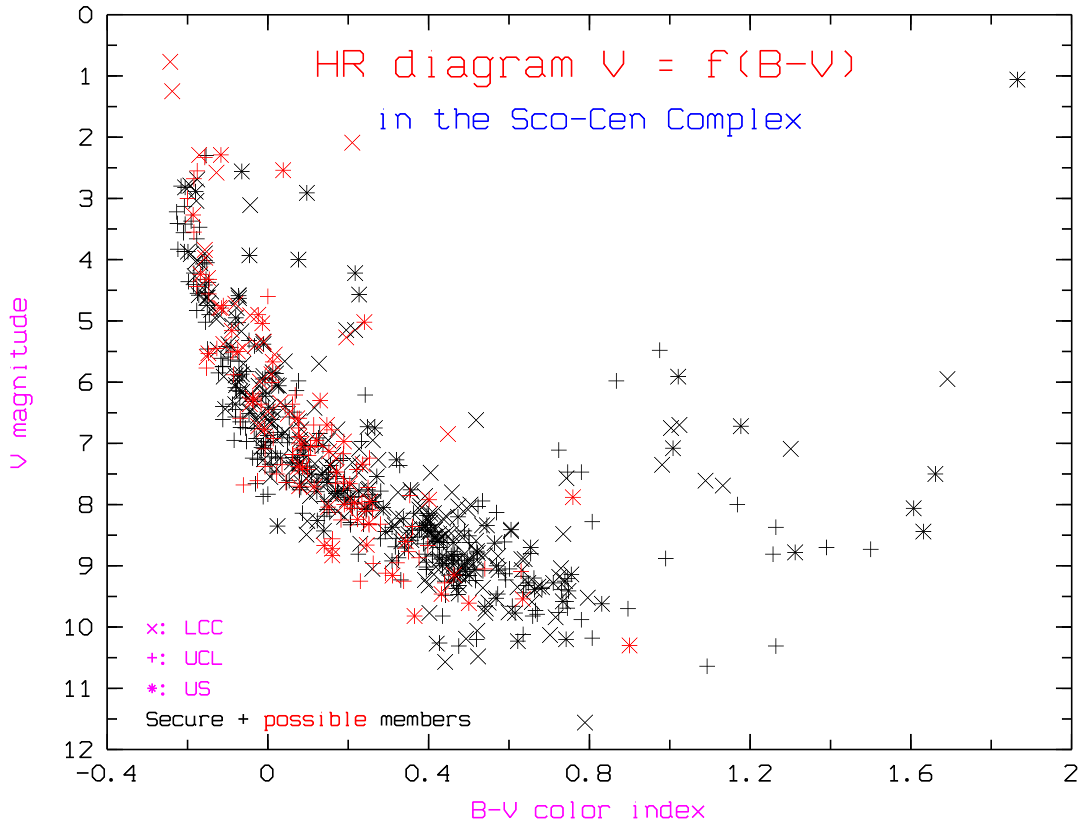

Fig. 2. Hertzsprung-Russell diagram for the Sco-Cen Complex members

(neither will it fulfill some additional statistical criteria which we will not elaborate here). By testing many orbits, the probability of binarity is evaluated. A list of resulting candidate binaries is given in Table 4.

5. Use of the SCDMSC

Besides a statistical programme on the search of fainter binaries, which will be started by me at SAAO in June, 2003, some systems of special interest are studied in detail. These systems are selected either because they are interesting from the viewpoint of precise fundamental parameters (SB2s, many slowly rotating, see Fig. 5) or/and to resolve orbital period ambiguities (see poster Hensberge et al. on η Musca). Studies of SB2s will use the spectral disentangling technique (Hadrava 1995) and provide the spectra of each component in its own intrinsic continuum.

The SCDMSC is a first step in a long-term study.

6. Conclusion

The study of the duplicity in the Sco-Cen Complex is far from complete. Many observations are still needed for allowing a realistic statistical study of the binary parameters, especially on faint members. This is seen from the strong discrepancy of the magnitude histograms of the Sco-Cen Complex population, of the already known close binaries and of the suspected spectroscopic binaries.

This is the main reason why we propose to do a systematic spectroscopic survey of all secure or possible members of the three associations (i.e. 668 targets), in order to confirm or to correct periods and orbital parameters of already known spectroscopic binaries and to detect as many as possible yet unknown spectroscopic binaries in the Sco-Cen Complex. Once a reasonable complete census of the multiplicity has been obtained, most of the resulting objects will have to be monitored individually to derive their orbits, mass ratio and other fondamental parameters.

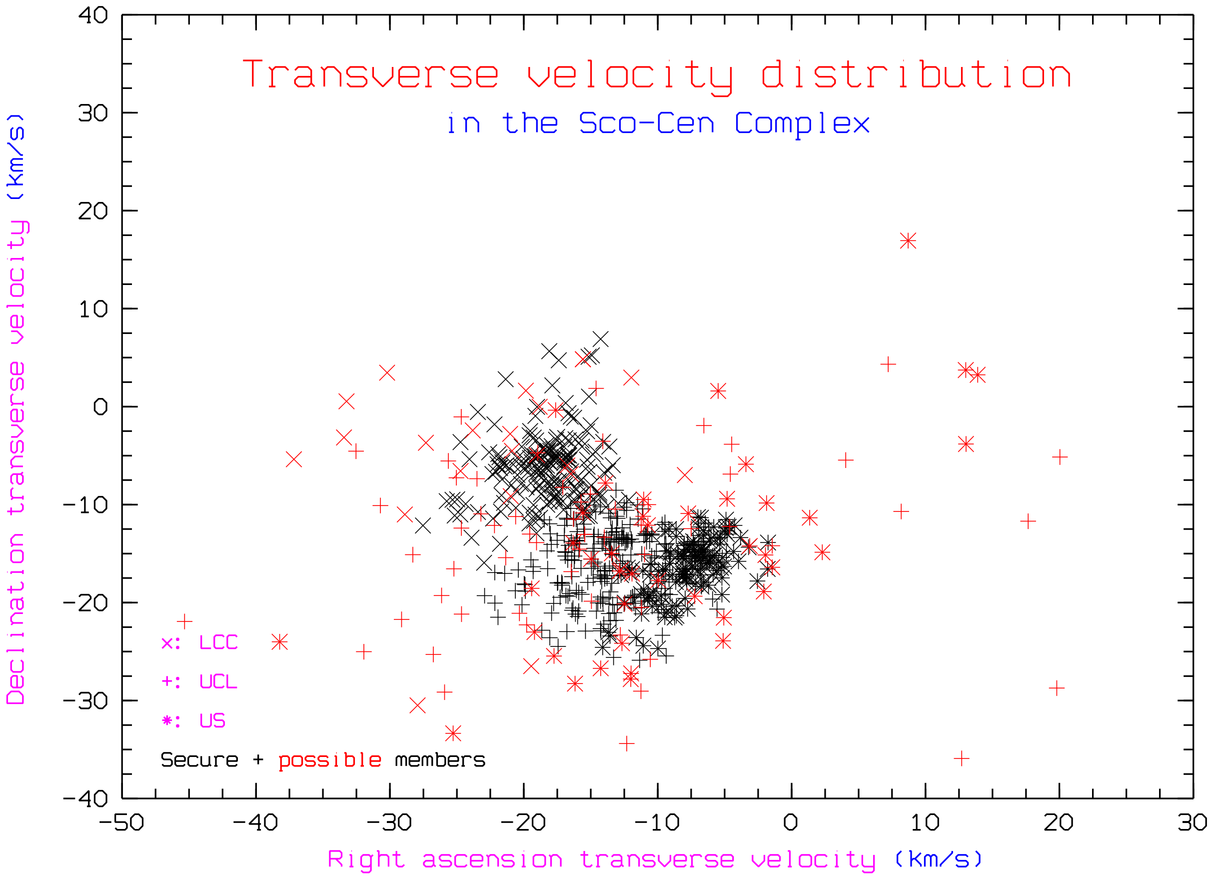

Fig. 3. Transverse velocity distribution for the Sco-Cen Complex members

Concerning the visual binaries, it is obvious that new astrometric observations are needed, for the improvement of orbits and of the knowledge of the masses of the components. So, we are asking to the astronomical community to continue this long term effort, for our common benefit [1]...

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[1] A list of very interesting targets in the Sco-Cen Complex is available upon request from nitschel@ruca.ua.ac.be

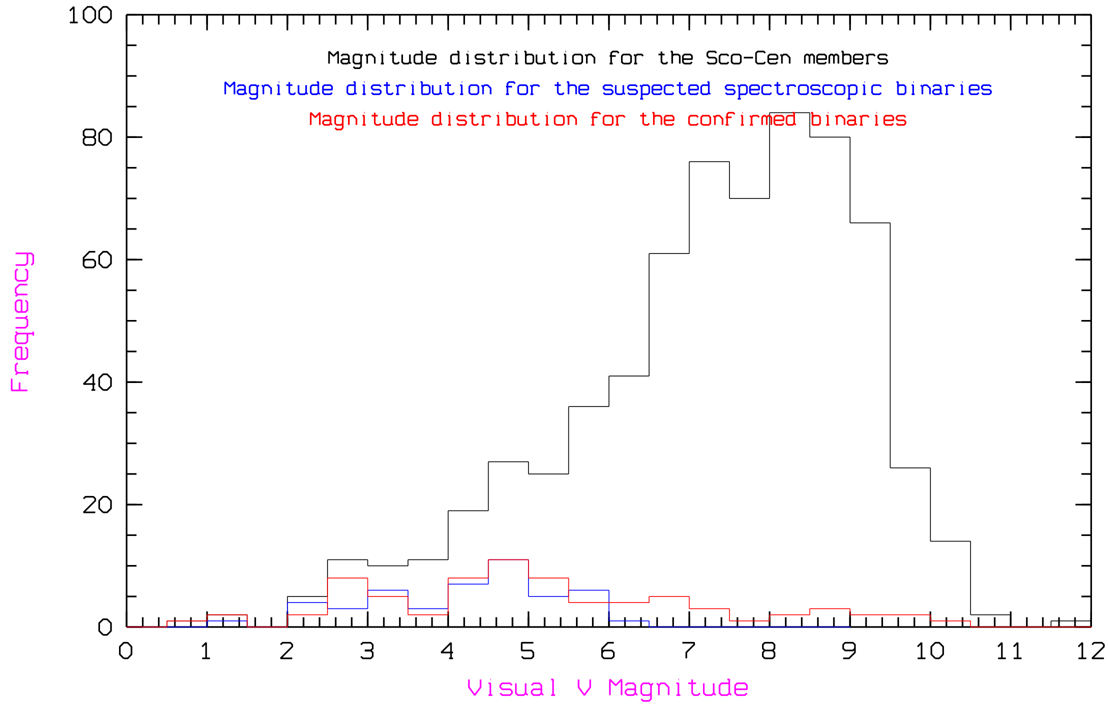

Fig. 4. Comparison of the magnitude distribution for all Sco-Cen Complex members with the one of the confirmed physical binaries and the one of the suspected spectroscopic binaries: a quasi complete lack of binarity knowledge for the fainter members

Miroshnichenko, A. S., Fabregat, J., Bjorkman, K. S., et al. 2001, A&A, 377, 485
Molenberghs, G., Aerts, C., & de Cat, P. 1999, A&AS, 135, 383
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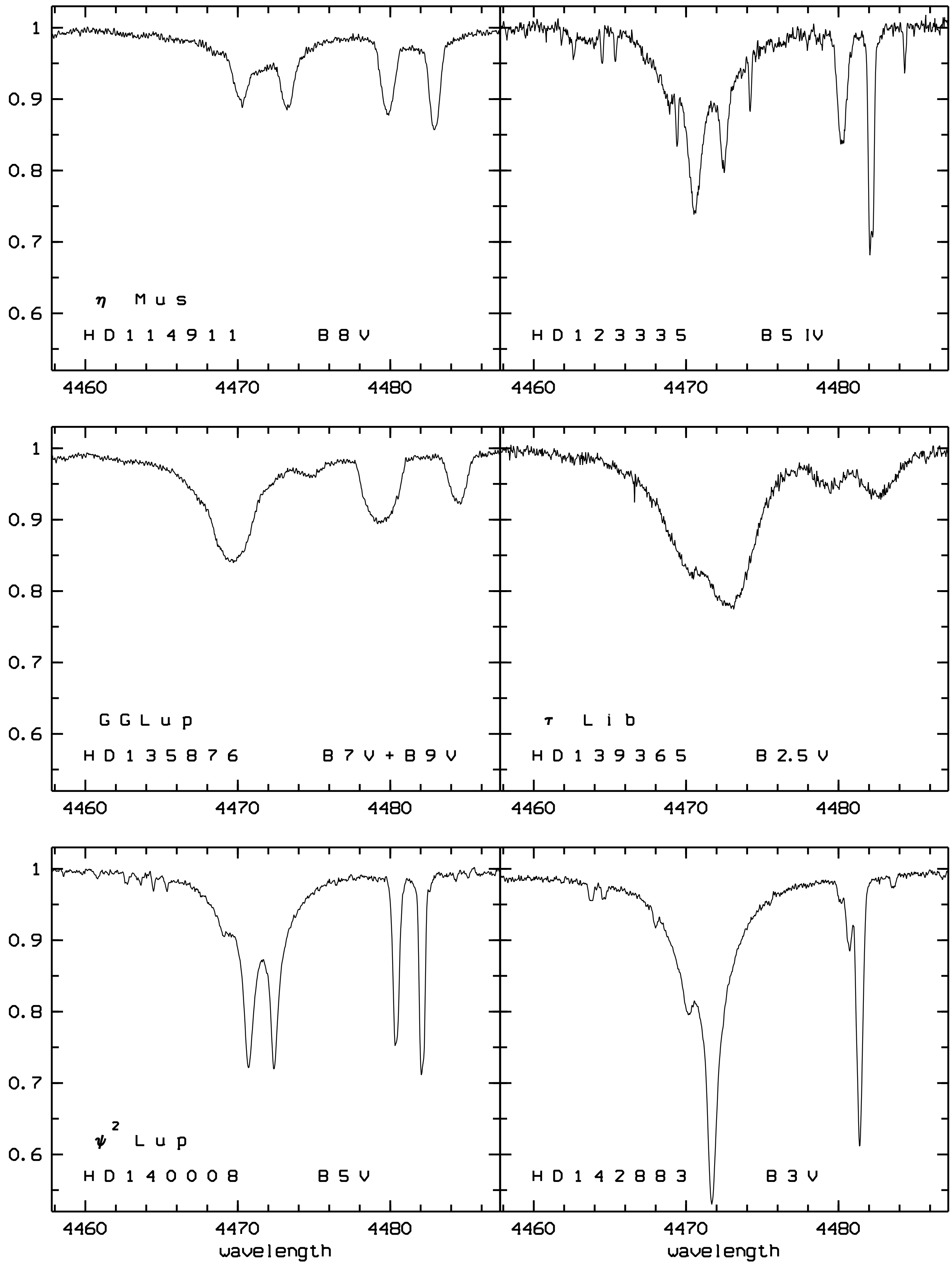

Fig. 5. Region of the He I 4471.5 Å and Mg II 4481.2 Å lines (4458 Å to 4487 Å range) of spectra recently taken (February 2003) with FEROS (2.2-m Telescope, ESO la Silla Observatory) of six confirmed double-lined spectroscopic binaries

Table 1. Visual binaries in the Sco-Cen Complex.

CNS	*CCDM/WDS*	*Zone*	*Mp*[a]	1	*Mag*$_1$	2[b]	*Mag*$_2$	*Q*[c]	*Period*	*Epoch*	*a*	*e*	*i*	*ω*	*Ω*	*Source*[d]
			%		*mag*		*mag*		*yr*		*arcsec*		*o*	*o*	*o*	
0100143275[e]	16003−2237*AB*	*US*		*A*	2.39	*B*	4.62	*G*	10.58	2000.693	0.1070	0.940	38.0	359.0	175.0	*Lit.*[q]
0100098718[f]	11210−5429*AB*	*LCC*	95	*A*	4.08	*B*	5.57	*G*	38.67	1936.228	0.2962	0.780	65.3	220.2	116.0	*R.M.*
0100144218[g]	16054−1948*CE*	*US*		*C*	4.92	*E*	7.43	*G*	36.97	2011.529	0.1283	0.050	45.8	317.1	13.8	*R.M.*
0100133955	15088−4517*AB*	*UCL*	54	*A*	4.43	*B*	5.23	*G*	72.36	1925.710	0.2634	0.598	74.3	299.6	25.5	*R.M.*
0100138690	15351−4110*AB*	*UCL*	78	*A*	3.40	*B*	3.51	*G*	395.01	1865.127	0.9512	0.150	99.4	10.3	88.2	*R.M.*
0100112361[h]	12567−4741*AB*	*LCC*		*A*	6.52	*B*	9.86	*F*	257.13	1924.070	0.7306	0.878	47.3	292.9	122.9	*R.M.*
0100147165[i]	16212−2536*AC*	*US*	98	*A*	3.06	*C*	5.24	*F*	154.09	1965.793	0.5140	0.494	138.4	298.2	125.0	*R.M.*
0100114772	13134−5042*AB*	*LCC*	85	*A*	6.56	*B*	6.78	*F*	99.42	1981.378	0.3232	0.612	137.1	87.9	23.1	*R.M.*
0100136504	15227−4441*AB*	*UCL*	88	*A*	3.56	*B*	5.04	*F*	225.43	2024.726	0.7251	0.495	112.1	26.1	104.7	*R.M.*
0100144217[j]	16054−1948*AB*	*US*	57	*A*	2.90	*B*	10.60	*F*	299.27	1828.878	0.6207	0.048	66.7	234.4	101.3	*R.M.*
0100110879	12463−6806*AB*	*LCC*	97	*A*	3.51	*B*	4.01	*F*	305.39	1871.895	1.7307	0.652	67.3	88.1	155.2	*R.M.*
0100114529	13123−5955*AB*	*LCC*	64	*A*	5.30	*B*	6.00	*F*	27.94	1939.537	0.1762	0.757	51.5	227.1	76.6	*R.M.*
0100110698	12446−5717*AB*	*LCC*	88	*A*	6.99	*B*	8.18	*M*	121.88	2063.637	0.2952	0.591	109.1	109.7	68.1	*R.M.*
0100130807	14516−4335*AB*	*UCL*	92	*A*	4.84	*B*	5.27	*M*	20.69	1999.604	0.1515	0.131	69.9	110.9	111.8	*R.M.*
0100133022	15035−4035*AB*	*UCL*	90	*A*	9.53	*B*	9.85	*M*	113.51	1909.557	0.2800	0.433	61.3	112.4	24.7	*R.M.*
0100133242[k]	15051−4703*A*	*UCL*	88	*A*	4.57	*B*	4.65	*M*	516.81	2116.070	1.5871	0.516	107.6	107.1	57.3	*R.M.*
0100147888	16255−2327*DE*	*US*	96	*D*	7.04	*E*	8.65	*M*	312.12	2046.952	0.6604	0.345	122.7	182.7	26.9	*R.M.*
0100148478[l]	16294−2626*AB*	*US*	100	*A*	0.96	*B*	5.37	*M*	1308.1	1387.880	2.6239	0.388	83.1	45.4	90.0	*R.M.*
0100145502[m]	16120−1928*AB*	*US*	88	*A*	4.36	*B*	5.39	*M*	4067.6	1851.708	5.2795	0.963	90.9	270.0	4.0	*R.M.*
0100106725	12165−5009*AB*	*LCC*	99	*A*	10.20	*B*	10.26	*P*	201.86							*R.M.*[r]
0100138138[n]	15313−3349*AB*	*UCL*	77	*A*	7.07	*B*	7.90	*P*	87.99							*R.M.*[r]
0100138138[n]	15313−3349*AC*	*UCL*	77	*A*	7.07	*C*	9.18	*P*	1156.0							*R.M.*[r]
0100140817	15471−3531*AB*	*UCL*	85	*A*	7.02	*B*	8.91	*P*	276.12							*R.M.*[r]
0100116087	13226−6059*AB*	*LCC*	98	*A*	5.40	*B*	5.40	*P*	110.98							*R.M.*[r]
0100143677	16038−4356*AB*	*UCL*	92	*A*	10.44	*B*	10.78	*P*	170.46							*R.M.*[r]
0100137059	15253−3845*BC*	*UCL*		*B*	8.70	*C*	9.60	*P*	1096.8							*R.M.*[r]
0100147628	16245−3734*AB*	*UCL*	81	*A*	6.10	*B*	6.20	*P*	99.83							*R.M.*[r]
0100140475	15451−3506*AB*	*UCL*	99	*A*	8.40	*B*	8.70	*P*	71.63							*R.M.*[r]
0100099104[o]	11234−6457*A*	*LCC*		*A*	5.36	*B*	6.68	*P*	1842.0							*R.M.*[r]
−003310685[p]	15452−3418*AB*	*UCL*	99	*A*	10.31	*B*	13.11	*P*	8500(?)							*R.M.*

[a] Membership probability from de Zeeuw et al. (1999) (secure members)
[b] Close binaries with a small magnitude difference could present an ambiguity in the component identifi cation
[c] Orbit quality: G: Good; F: Fair; M: Mean; P: Poor
[d] Source: Lit.: Literature; R.M.: Calculus from René Mante (private communication, 2002-2003)
[e] HD 143275 = δ Sco
[f] HD 98718 = π Cen
[g] HD 144218 = β^2 Sco: Not accepted as a secure member by de Zeeuw et al. (1999) very probably because of its high value error on the Hipparcos parallax (e_{plx} = 12.99 mas)
[h] HD 112361: Rejected by de Zeeuw et al. (1999), possibly because of its orbital motion
[i] HD 147165 = σ Sco
[j] HD 144217 = β^1 Sco
[k] Th B component is HD 133243
[l] HD 148478 = α Sco = Antares
[m] HD 145502 = ν Sco AB
[n] HD 138138 is a physical triple system
[o] Th B component is HD 99103
[p] HT Lup: Period value very doubtful (around 8500 years) and no orbital elements
[q] Literature: Miroshnichenko et al. (2001)
[r] Period value quite doubtful and orbital elements very incertain (lack of observations or too long period)

Table 2. Confirmed close binaries (spectroscopic, eclipsing, ellipsoidal) in the Sco-Cen Complex.

CNS	*Name*	*Zone*	*Mp*[a]	*Plx*	*V*	*Sp.Type*	*Q*[b]	*Period*	*Epoch*	*a sini*	*e*	*i*	ω	*Duplicity*
			%	*mas*	*mag*	*MK*		*days*	*yr*	10^6 *km*		*o*	*o*	
0100111123[c]	β *Cru*	*LCC*		9.25	1.25	*B0.5III*	*E*	1828.0	1995.440	136.136	0.380	16.0	293.0	SB
0100121263[d]	ζ *Cen*	*UCL*		8.48	2.55	*B2.5IV*	*E*	8.0240	1940.461	10.600	0.500	61.3	290.0	SB2
0100135876	*GG Lup*	*UCL*	100	6.34	5.59	*B7V + B9V*	*E*	1.849693	1985.194	8.268	0.150	86.8	86.2	EB + SB2
0100140008	4ψ^2 *Lup*	*UCL*	100	8.24	4.75	*B5V*	*E*	12.26	1963.609	10.470	0.192	50.7	82.8	SB2
0100143018	6π *Sco*	*US*	97	7.10	2.89	*B1V + B2V*	*E*	1.57008	1991.250	2.580	0.150	48.8	25.0	EB + SB2
0100143275[e]	7δ *Sco*	*US*		8.12	2.29	*B0.2IV*	*E*	3813.82	2000.693		0.940	38.0	359.0	SB1
0100144217	8β^1 *Sco*	*US*	57	6.15	2.56	*B0.5V*	*E*	6.8282	1909.531	11.300	0.290	60.5	17.4	SB2
0100151890	μ^1 *Sco*	*UCL*		3.97	3.00	*B1.5IV + B*	*E*	1.44626	1978.000	3.680	0.037	30.0	151.4	EB + SB2
0100104841[d]	θ^2 *Cru*	*LCC*		4.33	4.72	*B2IV*	*G*	3.4280	1912.551	2.420	0.000		0.0	SB1
0100108248	α^1 *Cru*	*LCC*		10.17	0.77	*B0.5IV*	*G*	75.7794	1907.179	38.600	0.460		21.0	SB1
0100113791	ξ^2 *Cen*	*LCC*	95	7.92	4.27	*B1.5V*	*G*	7.6497	1908.370	3.820	0.350		308.6	SB1
0100120307	ν *Cen*	*UCL*	93	6.87	3.41	*B2IV*	*G*	2.6249	1991.250	0.744	0.000		0.0	ELL + SB1
0100120710	3 *CenB*	*UCL*		10.96	6.01	*B8V*	*G*	17.4280	1977.417	3.980	0.210		15.0	SB1
0100120955	4 *CenA*	*UCL*		4.87	4.75	*B4IV*	*G*	6.9301	1910.412	1.940	0.250		152.0	SB1
0100134687	*e Lup*	*UCL*	100	7.18	4.83	*B3IV*	*G*	0.9014	1954.704	0.273	0.030		0.0	SB1
0100136504	ε *Lup*	*UCL*	88	6.47	3.37	*B2IV – V*	*G*	4.5598	1966.669	3.400	0.260		330.0	SB2
0100137432	*HR* 5736	*UCL*	98	7.79	5.46	*B5V*	*G*	3.8275	1964.137	0.642	0.250		22.0	SB1
0100139160	*HR* 5801	*US*	98	5.43	6.19	*B9IV*	*G*	5.2766	1974.368	2.530	0.330		86.0	SB
0100139365	40τ *Lib*	*UCL*	99	7.33	3.66	*B2.5V*	*G*	3.2907	1966.400	3.260	0.280		114.0	SB2
0100142165	*HR* 5906	*US*	99	7.87	5.38	*B5V*	*G*	1.9235	1955.280	0.812	0.360		309.0	SB1
0100142315	*HD* 142315	*US*	79	6.52	6.86	*B9V*	*G*	1.2640	1962.298	0.386	0.610		330.0	SB1
0100142669	5ρ *Sco*	*US*	93	7.97	3.87	*B2IV/V*	*G*	4.0033	1974.357	0.869	0.270		231.0	SB1
0100145482	13 *Sco*	*US*	95	6.97	4.58	*B2V*	*G*	5.7805	1977.423	2.460	0.190		115.0	SB2
0100145502	14ν *Sco*	*US*	88	7.47	4.00	*B2IV*	*G*	5.5521	1974.376	2.010	0.110		267.0	SB1
0100145519	*HD* 145519	*US*			8.00	*B9V*	*G*	3.3606	1961.673	1.150	0.330		6.0	SB1
0100147165[f]	20σ *Sco*	*US*	98	4.44	2.91	*B1III*	*G*	34.23	1954.416	14.900	0.360		308.0	SB2
0100148184	7χ *Oph*	*US*	61	6.67	4.22	*B2Vne*	*G*	138.8	1973.469	25.700	0.440		325.0	SB1
−003110727[g]	4 *CenB*	*UCL*			8.36	*Am*	*P*	4.839	1976.377	1.127	0.050		51.0	SB
0100138690[h]	γ *Lup*	*UCL*	78	5.75	2.80	*B2IV*	*P*	2.8081	1991.250	1.090	0.100		97.0	ELL + SB
0100142096[i]	45λ *Lib*	*US*		9.15	5.04	*B3V*	*P*	14.4829	1955.175	5.470	0.270		217.0	ELL + SB2
0100142883[j]	*HR* 5934	*US*	98	7.16	5.84	*B3V*	*P*	10.0535	1974.361	7.210	0.580		340.0	SB2
0100108250	25α^3 *Cru*	*LCC*			4.79	*B4IV*	*A*	1.2250						SB1
0100114529	*V*831 *Cen*	*LCC*	64	9.42	4.58	*B8V*	*A*	0.64252						ELL (SB2?)
0100114911[k]	η *Mus*	*LCC*	71	8.04	4.79	*B8V*	*A*	2.396321						EB + SB2
0100115823	*V*964 *Cen*	*LCC*	92	8.24	5.47	*B6V*	*A*	1.54259						EB (SB?)
0100116650	*V*966 *Cen*	*LCC*	91	9.59	9.76	*K0/2V : +(G)*	*A*	1.08875						EB
0100127381	σ *Lup*	*UCL*		5.68	4.44	*B2III*	*A*	3.0186						ELL
0100134518[l]	*HP Lup*	*UCL*		6.54	9.25	*A8V*	*A*	1.154553						EB + SB
0100149711	*V*1003 *Sco*	*UCL*	97	4.75	5.83	*B2.5IV*	*A*	1.5942						ELL
0100110020	*FH Mus*	*LCC*	90	9.23	6.26	*B8V*	*B*	0.58						ELL
0100145718	*V*718 *Sco*	*US*	75	7.66	8.83	*A8III/IV*	*B*	2.0						EB
0100100546[m]	*KR Mus*	*LCC*	99	9.67	6.69	*B9Vne*	*N*							EB?
0100120709	*V*983 *Cen*	*UCL*		10.96	4.32	*B5*	*N*							EB
0100123335	*V*883 *Cen*	*LCC*		3.05	6.34	*B5IV*	*N*							EB + SB2
0100144844	*HR* 6003	*US*	87	7.65	5.86	*B9V*	*N*							SB2
0100147628	*NSV* 20610	*UCL*	81	6.97	5.42	*B8V*	*N*							ELL (SB1?)

[a] Membership probability from de Zeeuw et al. (1999) (secure members)
[b] Orbit quality: E: Excellent; G: Good; P: Poor; A: Good period, but no orbit; B: Poor period and no orbit; N: No period
[c] HD 111123 = β Cru: orbit coming from Aerts et al. (1998) and Molenberghs et al. (1999)
[d] Rejected by de Zeeuw et al. (1999), possibly because of its orbital motion
[e] δ Sco: orbit coming from Bedding (1993) and Miroshnichenko et al. (2001) (P = 10.58 yr = 3813.82 days; a = 0.1070 arcsec)
[f] HD 147165: Variable star of β Cep type, with a photometric period of 0.24683 days
[g] CD -31 10727: Probable error in SB8 period value coming from Levato et al. (1987)
[h] HD 138690: Ellipsoidal star. Discrepancy between spectroscopic (2.8081 days) and photometric (2.8511 days) periods
[i] HD 142096: Ellipsoidal star. Discrepancy between spectroscopic (14.4829 days, which is probably wrong for an ellipsoidal star)) and photometric (1.0720 or 0.5360 days) periods (see Levato et al. 1987 and Jerzykiewicz 1993). To be reobserved spectroscopically
[j] HD 142883: Variable star of β Cep type. The period and the orbital elements coming from the SB8 Catalogue are very doubtful
[k] HD 114911 = η Mus: Our recent observations show that [contrary to what is stated in the literature] the spectroscopic period equals the photometric one (2.396321 days)
[l] HD 134518: Eclipsing binary. Period (1.154553 days) coming from Przybylski (1981). Russo (1983) is giving a value of 77.2^o for the inclination
[m] HD 100546: Herbig Be star, suggested to be an eclipsing binary

Table 3. Suspected spectroscopic binaries in the Sco-Cen Complex.

CNS	Name	Zone	Mp[a]	Plx	V	SpType	Susp.[b]
			%	mas	mag	MK	
0100090264	HR 4089	LCC	77	7.59	4.97	B8V	Lit.
0100095122[c]	HD 95122	LCC		3.92	6.48	B7V	Ech.
0100099264[c]	HR 4406	LCC		3.69	5.55	B2IV – V	Ech.
0100102776[c]	j Cen	LCC		7.10	4.30	B3Vne	Ech.
0100103884	HR 4573	LCC		5.45	5.59	B3V	Lit.*
0100104878	HR 4604	LCC	94	9.61	5.34	A0IV	Lit.
0100105382[d]	V863 Cen	LCC	83	8.68	4.46	B2IIIne	Ech.
0100105435[e]	δ Cen	LCC		8.25	2.58	B2IVne	Ech.
0100105937	ρ Cen	LCC		9.53	3.97	B3V	Ech.
0100108249[f]	α^2 Cru	LCC			2.09	B1V	E. + L.
0100108483	σ Cen	LCC	78	7.36	3.91	B3V	Ech.
0100109026[c]	γ Mus	LCC		10.07	3.84	B5V	Ech.
0100109668[g]	α Mus	LCC	89	10.67	2.69	B2IV – V	Ech.
0100110335[c,e]	CH Cru (39 Cru)	LCC		3.15	4.91	B6IVe	Lit.
0100110432[c,e]	BZ Cru	LCC		3.32	5.27	B2pe	Lit.
0100110879	β Mus	LCC	97	10.48	3.04	B2.5V	Ech.
0100110956	HR 4848	LCC	76	8.24	4.62	B3V	Ech.
0100112078[g]	λ Cru	LCC	85	9.06	4.62	B4Vne	Ech.
0100114529[h]	V831 Cen	LCC	64	9.42	4.58	B8V	E. + L.
0100115823[i]	V964 Cen	LCC	92	8.24	5.47	B6V	Lit.
0100118716[c,g]	ε Cen	LCC		8.68	2.29	B1III	Ech.
0100120324[e]	μ Cen	UCL	90	6.19	3.47	B2IV – Vnpe	E. + L.
0100126341[g]	τ^1 Lup	UCL		3.15	4.56	B2IV	Ech.
0100127972[e]	η Cen	UCL		10.57	2.33	B1.5Vne + A	E. + L.
0100129056[g]	α Lup	UCL	73	5.95	2.30	B1.5III	E. + L.
0100130807	o Lup	UCL	92	8.00	4.32	B5IV	Lit.
0100132058[c]	β Lup	UCL		6.23	2.68	B2III	Lit.*
0100132200	κ Cen	UCL	89	6.05	3.13	B2IV	Lit.*
0100133242[j]	π Lup	UCL	88	6.56	4.37	B5V	Lit.
0100133937	HR 5625	UCL	99	7.34	5.85	B7V	Lit.
0100133955[j]	λ Lup	UCL	54	8.02	4.07	B3V	E. + L.
0100136298[g]	δ Lup	UCL	97	6.39	3.22	B1.5IV	Ech.
0100136664	ϕ^2 Lup	UCL	100	5.38	4.54	B4V	Ech.
0100137058	k Lup	UCL		8.72	4.60	A0V	E. + L.
0100138485	35ζ^4 Lib	US		4.24	5.53	B2Vnn	Lit.
0100138764	IU Lib	US		9.30	5.16	B6IV	Lit.
0100138769[d]	KT Lup (d Lup)	UCL	84	7.51	4.55	B3IVp	Lit.*
0100142378	47 Lib	US	95	5.23	5.95	B2/B3V	Lit.
0100142983[e]	FX Lib (48 Lib)	US	68	6.36	4.95	B8Ia/Iab	Lit.
0100143118	η Lup	UCL	95	6.61	3.42	B2.5IV	Ech.
0100144294[k,l]	θ Lup	UCL	73	7.94	4.22	B2.5Vn	Ech.
0100144987[c]	HR 6007	US		7.53	5.50	B8V	Lit.
0100147628[h]	HR 6100	UCL	81	6.97	5.42	B8V	E. + L.
0100147933	5ρ Oph	US	43	8.27	4.57	B2V	Ech.
0100148478	21α Sco	US	100	5.40	1.06	M1Ib + B2.5V	Lit.
0100148703	N Sco	US		4.37	4.24	B2III – IV	E. + L.
0100157056[g]	42θ Oph	US		5.79	3.27	B2IV	Lit.*

[a] Membership probability from de Zeeuw et al. (1999) (secure members)
[b] SB suspicion: Ech. = Echelec observations (see Verschueren et al. 1997); Lit. = literature; Lit.* = unconfirmed by Echelec; E.+L. = both
[c] Rejected by de Zeeuw et al. (1999), possibly because of its orbital motion
[d] Be star
[e] Variable star of γ Cas type
[f] HD 108249 = α^2 Cru: Possible period of 56 days (literature)
[g] Variable star of β Cep type
[h] Ellipsoidal star
[i] HD 115823 = V964 Cen: Eclisping binary of β Lyr type
[j] HD 133242 and HD 133955: Very strong SB suspicion (see the poster of Jilinski, E., Cunha, K. & de la Reza, R., this symposium)
[k] HD 144294 = HIP 78918 = θ Lup: Hipparcos DSMA-O orbital solution, with a period of 1031.9 ± 90.8 days
[l] Unresolved by speckle interferometry observations (Mason et al. 1999)

Table 4. Sco-Cen Complex candidate binaries selected from statistical test on Hipparcos data.

CNS	*HIP*	*Zone*	*Mp*[a]	*Plx*	*V*	*SpType*	*Prob.*[b]
			%	*mas*	*mag*	*MK*	%
0100149711	81472	*UCL*	97	4.75	5.83	*B2.5IV*	89
0100102814	57710	*LCC*	100	8.41	8.20	*A3V*	85
0100104897	58899	*LCC*	96	8.74	8.41	*F3V*	73
0100116038	65219	*LCC*	96	7.77	7.09	*A3/A4III/IV*	70
0100104509	58680	*LCC*	74	5.27	9.05	*A4IV/V*	52
0100124961	69845	*UCL*	96	4.23	7.87	*B9V*	48
0100148118	80565	*US*		3.98	9.46	*A5IV*	47
0100105070	58996	*LCC*	99	9.78	8.89	*G1V*	43
0100110506	62058	*LCC*	94	7.88	5.99	*B7.5V*	42
0100125718[c]	70241	*UCL*		3.37	9.25	*A4V*	40
0100131120	72800	*UCL*	93	8.49	5.02	*B7II/III*	39
0100146331	79771	*US*	98	6.86	8.37	*B9V*	37
0100116087	65271	*LCC*	98	9.20	4.52	*B3V*	35
0100131518	73035	*UCL*		4.43	9.12	*A8/A9V*	33
0100123800	69327	*UCL*	96	7.39	8.54	*F0IV*	27
0100128345	71536	*UCL*	76	10.51	4.05	*B5V*	27
0100145560	79516	*UCL*	100	7.90	8.91	*F5V*	27
0100103703	58220	*LCC*	93	9.52	8.48	*F3V*	29
0100112091	63005	*LCC*	100	9.03	5.08	*B5Vne*	26
0100123798	69302	*UCL*	75	6.78	8.55	*A8/A9IV*	26
0100136246	75077	*UCL*	100	6.97	7.18	*A1V*	26
0100146069	79643	*US*	87	5.61	9.53	*F2V*	25
0100098363	55188	*LCC*	90	7.71	7.86	*A2V*	24
0100108857	61049	*LCC*	99	9.99	8.59	*F7V*	24
0100107821	60459	*LCC*	89	10.21	7.41	*A3V*	23
0100108904	61087	*LCC*	94	10.84	8.00	*F6V*	23
0100109197	61265	*LCC*	97	6.84	7.61	*A2V*	21
0100113902	64053	*LCC*	64	10.06	5.70	*B8V*	21
0100124469	69605	*UCL*	99	5.01	8.69	*A9V*	21
0100128893	71767	*UCL*	86	5.18	9.02	*F3V*	19
0100116402	65423	*LCC*	88	10.28	9.59	*(G3w)F7*	18
0100141774[c]	77677	*US*		4.93	7.70	*B9V*	18
0100135454	74752	*UCL*	98	7.29	6.76	*B9V*	17
0100113901	64044	*LCC*	88	9.41	8.83	*F5V*	14
0100118697	66651	*LCC*	73	8.50	7.34	*B9.5V*	15
0100120411	67522	*UCL*	100	7.94	9.79	*G1V*	15
0100126194	70483	*UCL*		9.25	6.70	*A1V*	15
0100138485	76126	*US*		4.24	5.53	*B2Vnn*	15
0100100786	56543	*LCC*	99	7.31	8.11	*A5V*	14
0100141327	77523	*UCL*	90	5.00	7.47	*B9V*	14
0100100841	56561	*LCC*	53	7.96	3.11	*B9II :*	13
0100106048	59505	*LCC*	95	9.21	8.60	*A9V*	13
0100120709	67669	*UCL*		10.96	4.32	*B5*	13
0100138285	76098	*UCL*		4.38	7.50	*A0V*	13
0100107920	60513	*LCC*	76	7.95	8.52	*F3V*	12
0100127971	71353	*UCL*		9.10	5.88	*B6V*	12
0100139486	76633	*US*	67	5.17	7.64	*B9V*	12
0100104231	58528	*LCC*	100	11.17	8.54	*F5V*	10
0100119511	67068	*LCC*	88	10.98	8.45	*F3V*	9

[a] Membership probability from de Zeeuw et al. (1999) (secure members)
[b] Hipparcos duplicity probability, according to a calculation made by D. Pourbaix (see Pourbaix (2002))
[c] Rejected by de Zeeuw et al. (1999), possibly because of its orbital motion