

Astrometric Observations of Wide Southern Double Stars – II

Christina Bauer^A, Graeme L. White^A, David L. Blank^{A,C}, Alex Hons^A,
and Paul A. Jones^B

^A Centre for Astronomy, James Cook University, Townsville QLD 4811, Australia

^B School of Physics, University of New South Wales, Sydney NSW 2052, Australia

^C Corresponding author. Email: david.blank@jcu.edu.au

Received 2007 July 20, accepted 2007 September 5

Abstract: Astrometric CCD observations have been made of wide (~ 3 to 60 arcsec) southern double stars selected from the Washington Double Star catalogue (WDS). Southern double stars have not been well studied in the past; typically they had not been measured since about 1930, and $\sim 50\%$ of them have been observed only once before our observations. Of the pairs measured $\sim 80\%$ show no evidence of motion since the last observation. This is Paper II in which we present the observations of 290 WDS stars in the approximate RA range $17^{\text{h}} 13^{\text{m}}$ to $07^{\text{h}} 30^{\text{m}}$ and in the declination range -70° to -60° . We suggest 412 companions for these 290 stars and list 29 (10%) pairs that have shown significant motion.

Keywords: Stars: double, multiple, binary

1 Introduction

Double star observations have historically been important in astronomy as the mass of stars is best determined through the astrometry of dynamic binary star systems and the accurate determinations of stellar masses have been used in calibrating the mass–luminosity relationship. The work presented here, however, grew out of our interest in spacecraft astrometry, where double stars had the potential to confuse guidance sensors that work on interferometric principals (see Blackmore et al. 1990; White et al. 1991; Argue et al. 1992; Dommangen 1992). The study of binary stars has a host of other uses, such as probing the conditions of star formation, probing stellar evolution and chemical composition (by identifying pairs of similar age and make up) and others (Chanamé & Gould 2004). Since accurate observations of double stars give important constraints in stellar modelling, additional data can only help improve the models.

Recent compilations of double star observations in Lampens and Strigachev (2001) and Oblak et al. (1999) have focused on double stars with intermediate (1–10 arcsec) separations. This paper concentrates on far southern stars with separations greater than ~ 3 arcsec.

This paper contains observations of 290 stellar systems lying chiefly between Declination -60° to -70° and between Right Ascension $17^{\text{h}} 13^{\text{m}}$ to $07^{\text{h}} 30^{\text{m}}$ (J2000). This is $\sim 60\%$ of the neglected zone between -70° and -60° . Pairs were selected from the WDS (Washington Double Star Catalog; <http://ad.usno.navy.mil/wds/>) with catalogued separations of ~ 3 arcsec or more to ensure that they could be resolved and accurately measured. There are a small number just outside of this zone as selection was made based

on B1950 coordinates. In addition, the region of the Large Magellanic Cloud ($04^{\text{h}} 40^{\text{m}}$ to $06^{\text{h}} 00^{\text{m}}$ and south of Declination -65°) was excluded to avoid the considerable confusion due to background stars. The limiting magnitude of the primary component was 13.0, this being the limiting magnitude of the 0.15 m finder telescope. We summarise below the details concerning the observations and data precision since a fuller account is available in Bauer, White & Hons (1994; hereafter referred to as Paper I). We also discuss our methodology for determining which double stars are likely to be physically associated.

2 Observations and Data Precision

Observations were made during three periods, 6–10 October 1992, 4–25 November 1992 and 8–12 December 1993, with the last session being primarily concerned with calibration. The mean epoch of the observations is 1992.9. We used an SBIG ST6 CCD camera mounted on the $f/18$ focus of the 24 inch (0.6 m) telescope of Mount Stromlo and Siding Spring Observatory (MSSSO) at Siding Spring Observatory (SSO), Australia. Images were obtained of each star through uncalibrated Cousins R and I filters. The stars were sufficiently bright that exposure times could be kept short, typically 180 s or less.

Raw relative positions and differential magnitudes were determined using the software supplied with the camera (CCDOPS) which does a least-squares fit to the images after subtraction of the sky background. Observations were not made with precise photometry as the principal objective, and indeed were often made on nights that were not photometric. The quoted precision of the magnitude differences represents well the precision of the data.

Post calibration was undertaken relative to five reference astrometric pairs (Geffert, Sinachopoulos & Guilbert 1992) to obtain both the image scale and the camera orientation. In addition, the well studied pair α Cen and ‘fixed’ pairs, β PAus and h3670 Ret (Norton’s 2000), were also observed to check the consistency of the observations from night-to-night.

The plate scale determined from these observations was found to be 18.13 ± 0.02 arcsec per mm, 0.9641 ± 0.0009 relative to the nominal value for the $f/18$ focus of the 0.6 m telescope. The orientation of the camera was determined with an accuracy of $0^\circ.04$. There is little evidence for changes in these calibration parameters either throughout the individual nights or from night to night, however, any change in the image scale between observing runs was calibrated out. All measured position angles (PAs) were corrected for the position of the pole at equinox J2000; corrections are typically less than $0^\circ.08$. The rms uncertainties in the separation (ρ) and PA are respectively $\Delta\rho = 0'.16$ and $\Delta\text{PA} = 7^\circ.8/\rho$ (ρ in arcsec).

3 Probability of Physical Association/ Chance Alignment

In Paper I we concluded that ~ 18 percent of the stars listed in this region of the WDS show significant movement since their last measurement which, for the most part, was around 1920 (they ranged from 1850 to 1980 with a median at 1920; the majority (44%) were made in the period 1910–19; see figure 1a of Paper I).

For the remainder the measured ρ and PA are in good agreement with the corresponding values in the WDS indicating that there has been no significant relative motion between the presented observations and the last prior recorded observation. The comparison between the catalogued WDS figures and our measurements can be found in figures 4 and 5 of Paper I.

We report here an additional 122 stars seen in proximity to WDS primaries. These are fainter stars that appeared in the image, and it remains to be determined whether they are previously undetected faint companions of a multiple system or merely background stars (these are called optical doubles). All of these additional companion stars are (a) closer than 60 arcsec, (b) less than 7.0 magnitudes fainter than the primary in the R and I bands, and are (c) no fainter than ($V + \Delta R =$ or $V + \Delta I =$) magnitude 17.0.

In the absence of observable orbital motion or proper motion measurements, the question of whether any two stars are physically related becomes a matter of the probability determined from the magnitudes of the stars, the separation between them and the density of background stars.

It is easily show that the probability of a secondary star of magnitude m being a chance positional alignment with a previously known star is:

$$\text{Probability} = 2.4 \times 10^{-7} N \rho^2 \quad (1)$$

where N is the number of stars (per square degree) brighter than magnitude m , and ρ is the separation in arcsec.

Note that N depends on the magnitude of the secondary star and the galactic latitude. These values are interpolated from the data in Cox (2000).

In the Notes column of Table 1 we indicate the probability of chance alignment of all stars in Table 1 as a percentage; the column is blank for 274 stars (66%) as the probability is less than 1%.

Table 1 is the observation of 290 southern wide double stars selected from the WDS. Multiple line entries are for multiple companions of the same WDS pair. We propose 412 stars as companions for these, hoping to define new multiple systems. The table consists of 12 columns. Columns 1, 2 and 3 list the WDS Nomenclature, J2000 Right Ascension and Declination. Columns 4 and 5 give the separation ρ measured from the images taken respectively through the R and I filters with the average given in column 6. For the 290 WDS primaries and their WDS designated secondaries, the median separation is 11 arcsec (average 16.3 arcsec). Similarly, columns 7, 8 and 9 are the PA for equinox and epoch J2000 measured in R, I and their average.

The V magnitude of the primary star listed in column 10 is taken from the WDS. Columns 11 and 12 contain the difference in magnitude between the primary and the secondary star measured respectively in R and I. The median value for the 290 WDS primaries and their WDS catalogued secondaries (the pair as listed in the WDS) is 1.6 magnitude in both wavebands (the secondary is typically 1.6 magnitude fainter than the primary). The precision of these data is represented by the significant figures in this column. Negative values apply to stars of very close magnitudes where the original discoverer designated the dimmer star as the primary, or where one of the stars has varied in brightness.

The notes are in column 13. The numerical value is the percentage probability of chance alignment of a background star. No numerical value indicated that the percentage probability is less than 1% (see above). M (‘moved’) designates the 29 secondary stars have moved more than 10 arcsec relative to the primary of the period between the first available observation and ours (Table 2).

4 Stars that Have Moved

In Paper I we concentrated on comparison of separation and position angle with the last recorded observations recorded in an earlier version of the WDS Catalogue. This was done to establish the reliability of our dataset. Most of the measurements there were made around 1920 and we reported that $\sim 18\%$ of the stars had moved.

For this paper we have compared our positions with the earliest recorded position in the new format WDS Catalog. These observations were made earlier still, starting in the 1820s. This gives a longer time-line of up to 180 years (typically 120 years), but at the cost of possibly poorer data at the earlier epoch. The majority (45%) of the early observations were made in a rush of activity in the 1830s or between 1890 and 1930 (47%).

Table 1. Wide double stars in the declination range -70° to -60° and RA range $17^h 13^m$ to $07^h 30^m$

WDS nomenclature	Position			J2000			Separation			Position angle			mag		Δ mag		Notes
	h	m	s	°	'	"	R ["]	I ["]	Ave. ["]	R [°]	I [°]	Ave. [°]	V		Δ R	Δ I	
00006-6641GLI	00	00	38.13	-66	40	59.5	3.77	4.16	3.96	274.27	273.52	273.90	7.69		1.55	1.56	
00015-6203B	00	01	29.2	-62	02	45		2.71	2.71	204.48	204.48	204.48	9.5			2.11	
00013-7012GLI	00	01	17.42	-70	11	11.5	28.28	28.28	28.28	118.29	118.27	118.28	10.35		0.53	0.53	2
00021-6817I	00	02	08.72	-68	16	50.6	4.16	3.93	4.04	123.79	119.65	121.72	9.71		3.12	2.96	
00063-6414I	00	06	16.841	-64	14	25.7	46.99	47.31	47.15	58.39	58.70	58.55			1.17	1.05	34
00076-6038I	00	07	34.74	-60	38	30.7	5.78	5.78	5.78	136.24	136.23	136.24	8.03		6.03	6.56	
00102-6719HJ	00	10	13.4	-67	19	17	5.50	5.22	5.36	28.09	29.97	29.03	8.51		2.29	2.28	
00163-6128HJ	00	16	13.25	-61	27	50.3	14.35	14.36	14.35	102.74	102.69	102.72	9.6		2.50	2.30	
00160-6754HJ	00	16	01.95	-67	53	57.9	15.82	15.84	15.83	12.30	12.28	12.29	10.90		0.3	0.6	
00174-6635DON	00	17	24.5	-66	34	02	10.12	9.98	10.05	335.67	337.08	336.38	8.49		3.2	2.68	
00209-6507RST	00	20	55.3	-65	06	49	5.72	5.51	5.61	20.32	17.60	18.96	8.2		3.1	2.7	
00237-6742VOU	00	23	41	-67	42	50	4.01	4.26	4.14	318.90	324.86	321.88	8.5		3.9	3.8	
00268-6743HJ	00	26	48.9	-67	43	17	5.01	5.16	5.09	111.33	114.42	112.88	9.3		0.0	0.0	6
00282-6447HJ	00	28	14.1	-64	47	17	39.43	39.13	38.78	160.15	159.89	160.02			5.0	3.8	
00282-6555HJ	00	28	14.4	-65	54	43	20.37	20.73	20.55	357.97	358.11	358.04	8.1		5.55	5.46	IM
00300-6023JSP	00	30	06	-60	22		15.16	15.16	15.16	342.39	342.54	342.47	10.5		2.08	1.91	
00312-6418MLO	00	31	10.51	-64	17	30	49.20	49.22	49.21	282.58	282.52	282.55			5.59	5.02	64
00319-6057JSP	00	31	51.5	-60	56	42	3.28	3.29	3.28	68.21	68.31	68.26	8.43		1.41	1.23	M
00315-6257LCL	00	31	32.5	-62	57	29	28.35	28.62	28.49	310.90	311.35	311.13	11.7		0.24	0.23	
00327-6302B	00	32	43.7	-63	01	53	41.74	41.42	41.58	274.45	274.57	274.51	10.46		3.43	3.05	7
00335-6109HJ	00	33	32.50	-61	08	50.1	7.65	7.64	7.64	316.52	316.11	316.32			0.48	0.57	
00391-6249HJ	00	39	06.4	-62	48	55	AC	AC	AC	302.18	302.19	302.19	9.3		3.1	2.8	
00394-6844GLI	00	39	25.88	-68	44	17.6	27.21	27.27	27.23	348.89	348.56	348.73	4.28		0.0	0.10	
00485-6506HJ	00	48	30.85	-65	05	47.4	27.05	27.34	27.20	348.53	349.07	348.80	5.8		0.1	0.11	M
00520-6520HJ	00	51	59.5	-65	20	07	7.41	7.43	7.42	352.53	352.93	352.73	7.76		3.70	3.49	
00517-6520HJ	00	51	39.1	-65	20	26	25.83	25.80	25.81	227.99	228.11	228.05	9.66		3.06	3.34	1
00530-6105GLI	00	53	00.71	-61	04	37.2	4.81	4.82	4.82	249.09	248.95	249.02	9.66		0.7	0.6	
00523-6523DAW	00	52	27.0	-65	22	58	5.33	5.32	5.43	139.86	143.18	141.52	9.92		0.9	1.0	
00524-6930DUN	00	52	24.52	-69	30	13.6	33.94	33.96	33.95	231.32	230.91	231.12	9.4		4.75	4.93	4M
00523-7037B	00	52	20.5	-70	37	21	12.88	12.69	12.78	337.82	336.14	336.98	10.1		0.90	2.58	
00547-6528HJ	00	54	40.19	-65	27	36.4	5.66	6.01	5.83	71.53	72.50	72.02	8.41		0.5	1.0	
00548-6727GLI	00	54	46.36	-67	26	41.2	5.84	5.83	5.84	91.75	91.97	91.86	11.2		0.6	0.6	
00584-6605DON	00	57	56.8	-66	05	51.7	20.16	20.54	20.35	79.92	81.00	80.46	6.70		0.68	0.60	
01033-6006HJ	01	03	18.0	-60	05	50	4.66	4.66	4.66	254.80	255.09	254.95	9.7		2.0	2.2	
01058-5959R	01	05	46.00	-59	59	25.7	16.58	16.06	16.32	214.37	212.56	213.47	8.01		1.67	1.63	
							19.35	19.21	19.28	92.93	95.79	94.36	9.49		0.38	0.28	
							6.13	6.07	6.10	138.90	133.97	136.44	10.8		1.14	1.28	
							38.96	37.73	38.35	99.99	97.50	98.74			5.48	4.39	37
							3.23	3.52	3.37	129.14	124.05	126.60	7.58		0.03	0.11	
							22.59	22.66	22.62	194.27	194.68	194.48	9.91		0.7	0.7	

16M

01158-6853HJ	3423	01	15	45.50	-68	52	34.5	AB	5.16	4.97	5.06	329.25	324.47	326.86	5.00	2.82	2.19
01171-6624HJ	3426	01	17	03.76	-66	23	52.3		2.65	2.33	2.49	329.95	325.97	327.96	6.41	1.52	1.30
01282-6100LDS	49	01	28	02.3	-61	00	14		71.67	72.17	71.92	113.35	113.49	113.42	12.8	1.2	0.9
01341-6114JSP	22	01	34	04.6	-61	14	04		4.47	5.38	4.93	308.55	306.57	307.56	8.3	4.19	4.38
01355-6045JSP	858	01	35	32.4	-60	45	07		6.72	7.13	6.92	338.83	339.82	339.33	9.8	2.1	1.8
01349-6909GLI	12	01	34	51.18	-69	09	17.4		24.00	24.02	24.01	125.16	125.15	125.16	9.83	0.9	0.8
01351-6932VOU	17	01	36	47.3	-69	32	28		13.73	13.39	13.56	281.54	282.07	281.81	10.5	1.4	1.5
01404-6714COO	9	01	40	24.00	-67	13	56.0		4.78	4.48	4.63	49.79	47.87	48.83	8.80	1.5	1.4
01412-6741LDS	56	01	41	01.7	-67	40	37		45.79	45.77	45.78	47.90	47.94	47.92	3.8	3.7	2
01455-6035JSP	9001	01	45	30.4	-60	35	01		33.81	33.82	33.82	218.79	218.79	218.74	8.0	3.75	3.34
01583-6513LDS	64	01	58	18.7	-65	13	05		6.09	6.41	6.25	232.70	234.51	233.61	9.5	3.1	2.5
01599-6131ALD	21	01	59	52.70	-61	30		54.6	52.77	51.94	52.35	92.86	92.43	92.65	5.5	5.7	22
02005-6246HJ	3479	02	00	29.96	-62	45	44.8		25.07	25.09	25.08	268.28	269.10	268.69	11.7	1.9	1.3
02046-6508HJ	3482	02	04	35.5	-65	08	12		3.23	3.60	3.41	316.71	321.31	319.01	11.79	0.2	0.2
02051-6048LPO	3	02	05	04.60	-60	48	15.8		32.30	34.83	33.57	272.27	271.26	271.77	7.73	2.51	2.52
02101-6421HJ	3486	02	10	08.2	-64	21	18		59.17	58.55	58.86	219.36	219.44	219.40	7.5	5.3	5.0
02113-6302HJ	3487	02	11	16.7	-63	01	40		6.47	6.41	6.44	187.91	184.50	186.21	10.34	0.2	0.2
02109-6342B	1432	02	10	51.1	-63	41	41		84.17	84.16	84.16	250.12	250.10	250.11	7.49	4.8	4.6
02124-6139HJ	3488	02	12	26.37	-61	39	04.7		20.62	20.52	20.57	213.92	207.81	210.87	9.33	2.5	2.3
02119-6249R	13	02	11	55.2	-62	34	36.4		5.70	5.53	5.62	213.92	207.81	213.92	10.0	3.2	3.2
02120-6546HJ	3490	02	12	01.9	-65	46	27		5.31	5.13	5.22	146.23	141.31	143.77	8.67	0.6	0.6
02119-7057HJ	3489	02	11	55.2	-70	57	03		35.29	35.30	35.29	83.14	83.14	83.14	10.69	0.48	0.68
02119-7057DAW	184	02	11	51.2	-70	57	14		30.52	30.47	30.49	342.08	342.40	342.24	3.9	4.4	5
02124-7023R	15	02	12	24.15	-70	09	18.1		23.59	23.53	23.56	206.78	206.89	206.84	8.3	5.0	5.2
02177-6244B	668	02	17	39.2	-62	44	21		20.20	20.19	20.19	239.60	239.72	239.66	7.10	5.1	5.1
02171-6812HJ	3496	02	17	06.4	-68	11	34		9.57	10.01	9.79	267.04	269.75	268.40	11.5	0.3	0.36
02205-6003R	16	02	20	23.5	-60	02	36		14.01	14.24	14.12	140.35	139.09	139.72	10.60	0.6	0.6
02207-6002HJ	3499	02	20	43.38	-60	01	34.9		9.47	9.12	9.29	193.25	190.07	191.66	8.2	5.0	4.8
02207-6533BRT	1962	02	20	42.9	-65	32	11		24.17	24.48	24.32	306.34	311.29	308.82	9.5	2.6	2.4
02258-6312HJ	3501	02	25	46.3	-63	11	38		18.40	18.20	18.30	144.34	143.97	144.17	10.7	0.03	0.07
02280-6903DON	34	02	28	00.7	-69	03	00		8.24	7.88	8.07	62.40	61.15	61.78	10.13	0.8	0.8
02304-6351HJ	3507	02	30	23.1	-63	50	51		4.26	4.70	4.48	334.31	336.33	335.32	11.4	0.41	0.4
02335-6912HJ	3517	02	33	29.40	-69	11	56.9		23.02	22.97	22.99	337.50	337.49	337.50	9.0	2.2	1.8
02363-6329B	1435	02	36	18.32	-63	28	43.6		5.35	5.69	5.52	334.06	335.61	334.84	9.1	3.4	3.2
02401-6121LDS	77	02	40	03.2	-61	21	15		35.99	36.04	36.01	312.13	313.01	312.57	2.0	1.9	1.9
02455-6342HDO	306	02	45	27.5	-63	42	36		21.52	21.62	21.57	108.67	109.37	109.02	9.5	4.3	4.6
02452-6700GLI	18	02	45	12.49	-67	00	08.4		16.07	16.28	16.18	239.57	239.93	239.75	9.20	3.4	3.6
02469-6009HJ	3534	02	46	52.0	-60	08	58		2.83	2.25	2.54	309.85	308.51	309.18	10.59	0.4	0.3
02500-6212HJ	3538	02	49	59.5	-62	12	22		46.31	45.70	46.00	46.09	46.21	46.15	5.3	5.0	37
									27.00	27.17	27.09	299.27	299.72	299.50	10.6	4.02	2.97
									19.58	19.72	19.65	78.51	78.83	78.67	5.7	7.18	7.08
									4.70	4.69	4.69	197.77	197.83	197.80	9.95	0.0	0.1
									20.74	20.80	20.77	215.53	215.44	215.49	8.8	2.3	2.3
									14.83	14.14	14.49	296.70	298.06	297.38	9.5	2.5	2.3

(Continued)

Table 1. (Continued)

WDS nomenclature	Position			J2000			Separation			Position angle			mag V	Δmag		Notes
	h	m	s	°	'	''	R ["]	I ["]	Ave. ["]	R [°]	I [°]	Ave. [°]		ΔR	ΔI	
02521-6054HJ	02	52	06.3	-60	54	11	7.90	7.75	7.82	9.58	9.82	9.70	10.5	0.88	0.86	
02504-6759BRT	02	50	21.4	-67	59	17	3.45	3.55	3.50	358.20	10.10	4.15	13.0	0.48	0.57	
							19.04	18.97	19.01	189.60	188.51	188.56		2.93	2.90	
02536-6420HJ	02	53	35.16	-64	20	21.9	56.59	56.63	56.61	276.49	276.48	276.49	3.96	3.81	150	
02544-6300I	02	54	23.08	-63	00	21.0	12.75	12.75	12.75	141.13	141.15	141.14	9.63	0.6	0.5	
02555-6908HJ	02	55	28.23	-69	08	19.3	4.43	4.50	4.46	2.75	7.75	5.25	8.62	1.7	1.9	
02570-6302RST	02	57	01.2	-63	02	06	4.70	5.25	4.97	153.96		153.96	10.34			M
03034-7029HJ	03	03	21.37	-70	28	37.2	15.70	15.65	15.67	144.32	143.33	143.83	7.5	4.82	4.76	
03084-7033HLN	03	08	34.85	-70	34	34.8	8.05	8.05	8.05	65.65	65.76	65.71	8.53	3.4	3.6	
03101-6355HJ	03	10	03.2	-63	54	49	43.28	43.32	43.30	40.88	40.89	40.88	6.67	0.3	0.4	
03121-6420HJ	03	12	05.84	-64	19	57.4	34.62	34.30	34.46	331.34	331.52	331.43	9.25	0.7	0.6	
03137-6550HJ	03	13	41.85	-65	49	48.3	13.47	13.23	13.35	37.46	38.59	37.03	8.53	2.8	2.7	M
03152-6427DUN	03	15	11.0	-64	26	37	19.02	19.07	19.05	104.86	104.78	104.82	6.68	2.27	2.25	
03177-6305I	03	17	40.93	-63	04	38.1		3.86	3.86		357.25	357.25		8.30	1.8	
03154-7015HLN	03	15	24	-70	15		8.93	8.95	8.94	335.24	335.19	335.22		2.2	2.1	
03294-6256HJ	03	29	22.68	-62	56	15.1	54.44	54.38	54.41	127.54	126.51	127.03	4.75	5.42	4.53	
03335-6742LDS	03	33	34.4	-67	41	47	11.37	11.42	11.39	350.60	348.67	349.64	12.5	0.3	0.2	
							16.91	16.56	16.74	40.63	41.81	41.23	6.4	6.2		
03351-6750NZO	03	35	04.27	-67	49	58.5	4.98	4.62	4.80	63.75	61.84	62.79	10.16	0.27	0.26	
03393-6721BRT	03	39	12.08	-67	19	50.2	3.60	3.60	3.60	32.00	31.83	31.91	12.15	0.04	0.05	
03402-6631LDS	03	40	54.94	-66	31	22.7	5.91	6.06	5.99	151.65	148.36	150.01	12.6	1.2	0.91	
03461-6405HJ	03	46	08.41	-64	04	42.2	22.08	18.90	20.49	24.42	25.15	24.78	8.59	1.4	1.6	
03480-7048HJ	03	47	58.10	-70	48	03.9	16.78	16.87	16.82	336.43	335.49	335.96	10.26	1.0	1.2	
03525-6230HJ	03	52	29.7	-62	29	52	9.85	9.85	9.85	311.06	311.06	311.06	10.9	0.4	0.2	
03531-6238HJ	03	53	05.8	-62	38	24	4.11	3.81	3.96	123.29	126.70	125.00	9.5	1.4	1.5	
							26.44	25.49	25.96	110.99	110.74	110.87		4.7	4.6	3
04025-6121LDS	04	02	27.0	-61	21	25	28.34	28.35	28.35	239.16	239.24	239.20	6.73	4.46	3.56	
04066-6019R	04	06	34.36	-60	18	52.9	57.01	57.26	57.13	152.86	153.00	152.93	9.68	0.4	0.4	
04078-6903HJ	04	07	45.50	-69	03	08.6	7.02	7.02	7.02	233.12	233.10	233.11	9.93	0.6	0.6	
04096-6023R	04	09	38.22	-60	23	18.2	50.23	50.18	50.21	71.31	71.61	71.46	9.91	1.2	1.3	1
04148-6212HJ	04	14	48.5	-62	11	31	12.22	12.50	12.36	217.47	218.79	218.13	5.5	5.09	5.11	M
04158-6613GLI	04	15	48.06	-66	13	05.6	40.74	40.79	40.77	35.63	35.62	35.63	8.86	1.1	0.4	M
04177-6315RMK	04	17	40.27	-63	15	19.7	3.35	4.37	3.86	3.08	2.55	2.82	6.04	1.51	1.48	
04198-6622LDS	04	19	56.9	-66	20	49	31.57	31.70	31.64	152.50	152.7	152.60	11.6	1.5	1.3	1
							42.03	41.74	41.88	110.62	111.4	111.01		4.3	4.5	31
04242-6411HJ	04	24	13.0	-64	11	21	16.85	16.88	16.87	63.16	63.15	63.15	9.15	1.4	1.4	
04239-6644HJ	04	23	55.9	-66	44	14	18.77	18.89	18.83	127.77	128.95	128.36	7.00	5.6	5.5	M
04243-6616HJ	04	24	33.42	-66	16	35.9	11.91	11.88	11.89	338.08	338.50	338.29	10.5	0.93	1.16	
04252-6405HJ	04	25	09.15	-64	04	48.3	49.43	49.55	49.49	114.69	114.81	114.75	7.97	0.54	0.64	M
04278-6231B	04	27	46.0	-62	31	16	9.24	9.56	9.39	122.69	125.20	123.95	5.75	6.04	5.65	
04269-6530HJ	04	26	51.83	-65	29	35.2	74.47	74.24	74.35	164.71	164.44	164.58	10.31	4.31	4.12	31M

04269-6718HJ	3661	04	26	54.3	-67	17	00		12.46	12.75	12.60	347.53	351.34	349.44	10.4	2.5	2.7	
04284-6543HJ	3662	04	28	21.2	-65	42	43	AB	13.47	13.48	13.47	108.51	108.52	108.52	8.31	1.4	1.4	M
								AC	47.68	47.68	47.68	194.31	194.29	14.30		4.9	4.8	4
								AD	22.42	22.75	22.58	39.20	38.49	38.85		5.2	4.7	1
04301-6607HJ	3666	04	30	05.5	-66	06	45		13.35	13.70	13.53	204.75	204.01	204.38	9.8	1.7	1.9	
									17.53	17.83	17.68	313.56	312.62	312.59		5.4	5.6	3
									33.42	33.43	33.43	23.78	23.78	23.78		4.7	4.8	6
04336-6249HJ	3670	04	33	33.95	-62	49	25.2		31.77	31.74	31.75	99.82	100.02	99.92	5.90	3.61	3.66	
04336-6734HJ	3676	04	33	34.57	-67	32	48.4		14.36	14.28	14.32	185.29	183.75	184.52	10.1	0.9	0.9	
									44.36	43.76	44.06	40.40	40.39	40.40		3.6	4.2	5
04347-6440B	2575	04	34	39.6	-64	39	58		26.25	26.08	26.17	14.35	14.55	14.45	9.3	5.01	4.98	3
04377-6607HJ	3682	04	37	39.3	-66	07	12		45.62	45.25	45.43	207.28	208.10	207.69	6.38	6.34	6.34	30
									17.96	17.95	17.96	264.95	265.03	264.99	9.6	3.17	3.09	
04375-6742HJ	3684	04	37	30.9	-67	42	28		45.78	45.63	45.70	273.00	272.57	272.79	6.04	6.04	5.41	29
									5.91	5.87	5.89	4.89	1.23	3.06	9.4	2.4	2.2	
04395-6601DON	76	04	39	30.5	-66	01	05		28.48	28.46	28.47	93.01	92.02	92.51		5.4	5.2	5
									7.33	7.58	7.45	220.10	222.00	221.05	8.37	0.09	0.12	
04417-6113HJ	3686	04	41	45.23	-61	13	03.8		10.07	9.90	9.98	304.66	303.16	303.91	10.0	1.53	1.65	
04493-6153HJ	3703	04	49	24.4	-61	53	02		35.24	35.17	35.20	35.05	35.93	35.49		5.27	5.37	12
									4.00	4.01	4.01	188.88	188.78	188.83	8.8	1.7	2.4	
04589-6106JSP	64	04	58	54.9	-61	06	25		40.94	40.94	40.94	176.79	176.83	176.81	9.18	0.51	0.25	M
05024-6454GLI	32	05	02	23.09	-64	54	17.6		59.07	59.11	59.09	54.49	55.05	54.77		6.59	6.44	55
									6.97	6.96	6.97	306.33	306.32	306.33	9.29	2.68	2.40	
05065-6051JSP	67	05	06	27.32	-60	51	13.6		54.33	54.71	54.52	332.56	332.76	332.66		0.91	0.4	
									3.14	3.15	3.15	37.43	37.35	37.39	10.2	0.63	0.64	
05081-6212B	2095	05	08	06.7	-62	12	06		33.42	33.43	33.43	287.60	287.61	287.61		2.54	1.84	1
									47.54	47.68	47.61	239.42	240.16	239.79		5.23	4.59	26
05156-6139JSP	9002	05	15	38.0	-61	39	23		5.26	5.28	5.27	210.63	210.70	210.67	9.4	2.8	3.4	
05180-6041I	737	05	18	01.6	-60	41	23		7.98	8.15	8.07	28.09	24.39	26.24	10.5	0.53	0.37	
05182-6157HJ	3755	05	18	10.4	-61	57	03		21.40	21.49	21.45	273.65	274.62	274.14	8.3	4.81	5.09	1
05256-6005HJ	3764	05	25	38.65	-60	06	32.2		11.53	11.78	11.66	276.42	276.20	276.31	11.2	2.08	2.04	
05303-6356HDO	192	05	30	15.9	-63	55	40		8.68	8.39	8.53	70.89	80.32	75.61	6.19	3.14	4.07	
									48.99	48.30	48.64	332.41	333.08	332.75		6.53	6.19	2
05491-6108HJ	3810	05	49	03.70	-61	08	07.7		23.96	23.95	23.95	175.11	175.75	175.43	9.79	2.40	2.66	
05582-6245HJ	3829	05	58	14.5	-62	45	18		22.64	22.66	22.65	355.26	356.18	355.72	8.9	4.69	4.93	1
									46.05	45.63	45.84	248.54	248.42	248.48		5.98	6.12	15
06013-7001B	2597	06	01	19.3	-70	00	47		6.74	7.12	6.93	288.29	287.37	287.83	8.5	4.75	4.39	
06064-6304RST	175	06	06	26.2	-63	03	39		4.12	4.12	4.12	50.73	50.73	50.73		9.2	2.7	
06053-6500HJ	3838	06	05	25.2	-64	59	55		10.52	10.51	10.51	308.20	308.16	308.18	11.0	-0.2	-0.2	
									11.01	11.70	11.36	208.90	206.29	257.60		3.9	3.9	1
06052-6551MLO	20	06	05	09.6	-65	50	52	A-BC	10.19	10.20	10.20	206.58	206.52	206.55	9.1	1.8	1.7	
06081-6330LDS	155	06	08	01.3	-63	29	59		12.23	12.23	12.23	177.13	177.10	177.12	12.6	0.6	0.6	

(Continued)

Table 1. (Continued)

WDS nomenclature	Position			J2000			Separation			Position angle			mag V	Δ mag		Notes
	h	m	s	°	'	"	R ["]	I ["]	Ave. ["]	R [°]	I [°]	Ave. [°]		Δ R	Δ I	
06078-6941HJ	06	07	50.6	-69	41	09	20.59	21.58	21.08	320.98	321.61	321.30		3.6	3.4	10
							43.47	42.66	43.07	148.45	147.81	148.13		4.0	4.2	62
							13.42	13.43	13.43	93.40	93.18	93.29	9.0	3.9	4.1	
							34.09	34.30	34.20	136.57	136.07	136.32		3.0	3.3	1
06115-6020HJ	06	11	27.42	-60	19	57.1	11.58	11.56	11.57	328.60	328.66	328.63	8.72	0.8	0.7	
06122-6532DUN	06	12	11.24	-65	31	52.2	20.71	20.71	20.71	119.74	119.74	119.74	6.86	1.38	1.35	
06173-6139HJ	06	17	19.1	-61	38	31	15.05	15.03	15.04	84.96	84.95	84.95	9.4	2.9	2.8	
06174-6550MLO	06	17	30	-65	48		4.48	4.47	4.48	166.27	166.24	166.26	11.15	-0.1	-0.1	
							40.61	40.99	40.80	64.98	64.79	64.89		2.27	2.46	4
							51.12	50.85	50.98	325.61	325.77	325.69		2.82	4.00	11
06225-6013JSP	06	22	30.9	-60	13	07	15.91	16.14	16.02	49.08	50.00	49.54	6.52	4.93	4.5	
							38.03	38.04	38.04	184.00	184.01	184.01		5.69	5.9	1
06212-6735HJ	06	21	14.52	-67	34	59.2	7.86	7.68	7.77	292.60	289.58	291.09	9.40	2.0	2.0	
							7.16	7.52	7.34	259.06	263.23	261.15		4.6	4.6	
							43.34	43.44	43.39	343.13	342.61	342.87		6.5	6.2	34
							29.62	29.24	29.43	294.57	294.96	294.77		6.9	6.6	22
06300-7037HJ	06	29	59.93	-70	37	15.6	14.82	14.76	14.79	236.78	235.52	236.15	10.55	0.10	0.07	M
							25.43	25.22	25.33	296.97	297.46	297.22		5.63	5.73	15
							5.02	5.02	5.02	81.49	81.52	81.51	10.83	0.2	0.1	
06327-6617HJ	06	32	41.66	-66	16	15.4	13.66	13.55	13.60	285.06	284.21	284.64	7.3	6.12	6.16	
06346-6130JSP	06	34	33.7	-61	29	46	3.88	4.45	4.16	56.42	54.06	55.24	9.6	1.4	1.3	
06347-6452B	06	34	39.2	-64	52	08	4.43	4.87	4.65	171.89	172.42	172.16	9.1	1.6	1.5	
06357-7006HJ	06	35	44.2	-70	05	49	13.46	13.70	13.58	348.01	347.16	347.59	10.08	1.91	1.88	
06393-6248HJ	06	39	15.7	-62	47	35	33.35	33.53	33.44	225.70	225.95	225.83		0.97	0.97	
							45.04	45.30	45.17	348.99	349.16	349.08		5.02	4.92	34
							56.22	56.22	56.22	265.41	265.41	265.41		4.3	4.3	27
							10.76	10.76	10.76	74.78	74.78	74.78		4.3	4.3	1
							25.24	25.24	25.24	127.26	127.26	127.26		4.3	4.3	6
06387-6342RST	06	38	38.5	-63	41	47	4.00	4.37	4.18	28.01	25.14	26.58	10.3	3.14	3.20	
							54.11	54.11	54.11	71.29	71.29	71.29		2.30	2.12	3
							57.75	57.74	57.74	104.78	104.79	104.79		3.58	3.53	10
06396-6427B	06	39	36.5	-64	27	12	9.00	8.82	8.91	109.17	106.94	108.06	9.5	3.4	3.5	
							41.91	41.62	41.76	162.64	162.02	162.33		5.8	5.7	18
							47.55	46.96	47.26	136.61	136.71	136.66	8.10	4.2	4.6	5
06421-6431I	06	42	07.35	-64	31	26.1	5.79	5.46	5.62	236.46	234.38	235.42		2.9	2.6	
							59.73	60.11	59.92	83.76	83.77	83.77		2.1	1.5	
							27.28	27.28	27.28	218.13	218.12	218.13	8.6	1.9	1.2	
06424-6545HJ	06	42	24.3	-65	44	33	30.83	30.85	30.84	204.48	206.08	205.28		6.5	5.6	8
							5.01	5.03	5.02	261.35	261.35	261.32	10.0	1.6	1.6	
06455-7048B	06	45	30.8	-70	48	30	26.28	25.68	25.98	332.80	333.05	332.93		5.0	4.8	5
							55.72	56.17	55.95	141.87	141.26	141.57	9.9	3.9	3.8	9
06493-6722MLO	06	49	22.5	-67	21	51	8.05	8.05	8.05	288.70	288.69	288.70		0.91	0.82	

06569-6211LDS	174	06	56	51.9	-62	10	02	51.90	51.95	51.92	322.31	322.35	322.33		4.37	4.35	11
								42.10	41.87	41.99	172.64	173.02	172.83	12.2	1.68	1.34	5
								27.23	27.30	27.26	191.20	191.03	191.12		3.48	3.35	11
06556-6557HJ	3915	06	55	33.6	-65	56	57	19.65	18.93	19.29	81.11	81.26	81.19	8.8	4.72	4.67	17
								19.57	19.57	19.57	269.69	268.52	269.11		3.2	2.93	28
06564-6829HJ	3918	06	56	21.2	-68	28	52	50.11	49.85	49.98	237.78	237.43	237.61	11.0	6.6	5.44	28
								12.18	12.16	12.17	328.59	328.57	328.58		1.01	0.98	27
07003-6052HJ	3922	07	00	16.7	-60	51	46	59.52	59.20	59.36	217.40	217.18	217.29	7.74	3.98	4.19	27
								17.31	16.76	17.03	236.76	238.69	237.73		3.65	3.27	5
07005-6052HJ	3924	07	00	29.3	-60	51	44	55.16	55.81	55.48	95.11	94.10	94.60		5.47	4.90	6
07031-6355RST	231	07	03	03.3	-63	55	29	53.63	52.98	53.31	45.27	45.36	45.31	9.7	5.87	5.20	6
								16.06	16.05	16.06	358.49	358.48	358.48	10.1	1.45	1.44	
								4.00	4.00	4.00	28.11	27.82	27.96		0.99	1.00	2
07029-6801MLO	23	07	02	56.0	-68	00	51	42.31	42.34	42.33	211.88	211.89	211.89		2.56	2.62	2
								20.23	20.92	20.57	253.17	254.86	254.02	9.0	4.02	3.99	2
								5.43	5.24	5.33	54.72	58.16	56.44		2.35	2.56	
07086-6041HJ	3937	07	08	35.71	-60	40	55.0	35.58	35.52	35.55	228.78	227.85	228.32		6.77	6.57	20
								57.81	57.76	57.78	166.26	166.25	166.26	10.09	6.22	6.38	32
								5.73	5.52	5.62	37.16	33.93	35.54		0.47	0.72	
07091-6035I	184	07	09	07.3	-60	34	31	52.05	51.97	52.01	217.48	218.12	217.80		3.84	3.74	8
07102-6301HJ	3944	07	10	09.8	-63	01	04	16.73	16.49	16.61	342.44	345.33	343.89	8.5	5.04	5.23	1
								13.74	13.76	13.75	267.26	267.27	267.27	9.5	1.84	1.77	
								53.60	53.63	53.62	272.78	272.76	272.77	9.49	1.62	1.41	7
07087-7030DUN	42	07	08	44.86	-70	29	56.1	30.89	30.91	30.90	263.40	264.31	263.86		5.36	5.35	
07156-6311R	72	07	15	38.42	-63	10	47.4	14.13	13.88	14.01	298.30	298.96	298.63	3.86	2.17	2.44	
07157-6612HJ	3955	07	15	44.8	-66	11	49	24.99	25.02	25.00	318.45	318.49	318.47	8.94	2.48	3.11	
								28.07	28.35	28.21	33.36	33.01	33.18	9.98	1.18	1.14	
								43.44	43.41	43.43	106.79	106.81	106.80		4.21	4.12	7
07245-6232HJ	3972	07	24	28.8	-62	32	01	44.98	45.98	45.48	325.20	325.35	325.28		5.18	4.85	19
								17.06	15.93	16.49	84.00	83.57	83.79	9.6	3.50	3.40	
07262-6854HJ	3976	07	26	10.9	-68	54	18	20.86	20.41	20.64	47.92	47.13	48.03	10.31	1.02	1.04	
07289-6835MLO	24	07	28	54.9	-68	34	51	6.75	6.30	6.52	134.15	136.35	135.25	9.27	1.09	1.23	
17133-6712DUN	214	17	13	17.88	-67	11	47.7	11.17	11.37	11.27	332.94	331.20	332.07	8.9	2.28	2.26	
								9.55	10.51	10.03	344.55	345.63	345.09	8.5	3.21	3.33	M
17145-6750MLO	75	17	14	30.43	-67	50	15.7	37.12	36.74	36.93	12.90	12.89	12.89	5.99	3.32	3.64	2
17163-6749DON	827	17	16	19.8	-67	49	39	54.33	54.34	54.33	168.91	169.07	168.99		6.03	5.98	
17357-6257HJ	4956	17	35	40.76	-62	57	12.9	7.34	7.61	7.47	313.76	311.79	312.78	9.26	2.5	2.3	
								4.40	4.24	4.32	24.68	20.07	22.38	10.1	1.5	1.5	4
								50.00	50.47	50.23	256.64	256.19	256.42		3.2	3.1	
								4.99	5.34	5.17	109.69	108.38	109.04	10.29	0.1	0.1	
17404-6553MLO	76	17	40	21.3	-65	52	43	35.01	35.26	35.13	192.02	190.58	191.30		5.7	5.4	24
								32.61	33.63	33.12	164.28	164.01	164.15		5.2	5.2	14
								4.86	5.08	4.97	56.37	52.98	54.68	10.9	0.1	0.1	
								57.07	57.09	57.08	137.36	137.31	137.34		2.6	2.1	7

(Continued)

Table 1. (Continued)

WDS nomenclature	Position			J2000			Separation			Position angle			mag V	Δ mag		Notes
	h	m	s	°	'	"	R ["]	I ["]	Ave. ["]	R [°]	I [°]	Ave. [°]		Δ R	Δ I	
18111-6624HJ	5008	18	11	07.9	-66	24	00	38.85	39.12	38.99	138.31	137.89	138.10	3.5	3.5	7
18133-6513NZO	89	18	13	16.85	-65	12	51.6	14.28	13.87	14.08	240.98	241.31	241.15	3.24	3.48	1
18148-6649HJ	5019	18	14	50.2	-66	48	54	10.46	10.29	10.37	162.70	160.25	161.48	6.0	6.0	23
18152-6649I	627	18	15	09.7	-66	48	57	5.25	5.59	5.42	102.59	101.68	102.14	0.1	0.16	
19096-6314RST	5604	19	09	36.5	-63	14	04	54.67	54.89	54.78	148.10	147.76	147.93	4.7	4.1	
19142-7037B	2874	19	14	10.7	-70	36	55	37.83	38.12	37.98	333.80	333.72	333.76	3.6	2.8	
19177-6559B	966	19	17	40.8	-65	58		3.18	3.21	3.20	217.55	217.33	217.44	1.9	1.8	10
19197-6741MLO	84	19	19	31.9	-67	40	50	45.33	45.37	45.35	165.7	165.69	165.70	5.5	5.2	
19216-6925BRT	2014	19	21	33.6	-69	24	32	5.51	5.48	5.48	9.85	5.83	7.84	1.64	1.54	
19223-6117HJ	5102	19	22	20.25	-61	16	32.0	9.10	9.09	9.10	201.17	201.09	201.13	2.10	1.90	
19254-6718MLO	85	19	25	26.0	-67	18	02.8	4.02	4.02	4.02	164.99	165.10	165.05	2.69	2.72	
19298-6718HJ	5109	19	29	45.4	-67	18		21.93	22.54	22.24	23.45	26.76	25.10	6.09	6.09	5
19302-6652MLO	86	19	30	10.9	-66	51	34	5.12	5.23	5.17	102.83	98.01	100.42	0.0	-0.1	
19355-6906DON	960	19	35	28.04	-69	05	41.7	49.40	49.60	49.50	175.26	175.89	175.58	4.65	4.38	17M
19351-7039HJ	5118	19	35	07.2	-70	39	41	14.10	14.09	14.09	341.76	342.65	342.21	1.27	1.53	
19360-6624HJ	5123	19	36	00.30	-66	24	29.4	31.40	31.12	31.26	326.67	328.92	327.80	6.69	6.32	59
19369-6949FIN	272	19	36	54.65	-69	49	00.6	3.53	3.65	3.59	190.83	196.87	193.85	0.04	0.02	
19402-6903MLO	87	19	40	10.0	-69	02	11	27.68	27.77	27.72	140.97	141.42	141.20	1.74	1.85	
19399-6641DAW	224	19	39	52.2	-66	41	08	37.31	37.19	37.25	13.13	13.26	13.19	2.10	2.28	
19440-6618HJ	5132	19	43	59.97	-66	17	51.1	7.63	7.34	7.48	51.38	49.74	50.56	2.38	2.69	
19491-6149HJ	5141	19	49	07.2	-61	48	53	8.43	8.49	8.46	5.68	8.10	6.89	0.39	0.40	1
19512-6435MLO	88	19	51	12.8	-64	34	46	12.54	12.31	12.43	236.32	238.30	237.31	3.98	4.02	15
19597-6102HJ	5155	19	59	39.50	-61	01	37.8	35.08	35.47	35.28	36.77	36.26	36.52	4.46	3.85	
20026-6541I	1409	20	02	36	-65	41		29.15	29.4	29.27	176.91	177.17	177.04	0.55	0.93	
20040-6541I	1411	20	04	04.7	-65	35	57	6.53	4.88	5.70	31.84	33.64	32.74	2.44	2.11	2
20079-7049HJ	5162	20	07	56.08	-70	48	54.2	52.54	52.75	52.64	326.82	326.45	326.64	3.06	5.60	15
20088-6001I	1120	20	08	50.30	-60	01	15.3	45.46	46.38	45.92	342.50	342.81	342.66	5.60	5.75	
20118-6337HJ	5167	20	11	50.6	-63	37	01	4.16	2.55	3.36	266.78	277.66	272.22	0.43	0.01	
20138-6728DON	981	20	13	49.02	-67	27	30.3	19.95	19.88	19.91	241.88	239.26	240.57	5.31	4.66	5
20146-6426HJ	5171	20	14	34.9	-64	25	46	10.92	10.4	10.66	163.79	162.75	163.27	3.77	3.71	M
								17.25	18.34	17.79	316.41	319.87	318.14	0.0	-0.1	
								17.25	18.34	17.79	281.64	279.18	280.41	1.5	1.1	
								5.95	6.35	6.12	290.97	289.78	290.38	2.03	3.97	
								5.95	5.95	5.95	69.89	69.89	69.89	1.43	1.54	
								7.10	7.04	7.07	29.95	35.04	32.49	1.12	1.13	
								2.97	3.36	3.16	168.71	169.64	169.18	1.11	1.16	
								18.24	17.78	18.01	301.77	304.38	303.08	2.76	2.74	

20191-7052HJ	5176	20	18	51.4	-70	51	27	AC	33.49	33.62	33.56	333.29	334.48	333.89		2.96	3.04	
									54.54	53.25	53.89	215.14	216.27	215.71		6.26	5.91	5
									6.17	6.63	6.40	121.51	122.31	121.91	11.7	0.2	0.3	
									33.60	33.52	33.47	184.62	184.04	184.33		4.4	4.3	24
									13.29	13.83	13.56	160.30	159.47	159.89		4.5	4.7	4
20218-6420IDS	708	20	21	48.3	-64	19	11		22.17	22.22	22.20	209.75	210.01	209.88	12.9	0.62	0.56	1
									44.63	44.81	44.72	280.96	280.06	280.51		2.09	1.75	8
20286-6225HJ	5196	20	28	34.1	-62	26	22		56.62	56.59	56.61	267.25	267.01	267.13	9.5	5.48	5.55	25M
20303-6904HJ	5194	20	30	17.44	-69	04	09.2		4.17	4.21	4.19	258.95	254.92	256.94	7.12	3.37	3.10	
20289-6228HJ	5197	20	28	54.5	-62	27	34		25.10	25.10	25.10	82.64	82.70	82.67	8.4	1.5	1.5	M
									32.62	32.77	32.69	267.25	267.01	267.13		4.3	4.4	2
20309-6648MLO	89	20	30	52.75	-66	48	42.2		5.51	5.15	5.33	139.58	136.51	138.05	10.19	0.1	0.0	M
20330-6822HJ	5200	20	32	57.33	-68	22	19.4		12.35	12.53	12.44	136.40	135.15	135.78	7.53	2.39	2.11	
20398-6430HJ	5217	20	39	48.48	-64	29	35.0		7.66	7.66	7.66	231.72	231.70	231.71	10.10	0.9	0.9	
20412-6242R	323	20	41	11.31	-62	41	46.2		2.94	2.94	2.94	321.44	321.36	321.40	9.54	0.59	0.64	
									8.82	8.48	8.65	259.96	256.82	258.39		4.53	4.44	
20432-6730IDS	718	20	43	12.6	-67	29	44		29.18	29.20	29.19	308.91	309.27	309.09	11.9	1.3	1.1	1
20449-6904BRT	2017	20	44	53.7	-69	03	28		4.43	4.37	4.40	187.36	182.79	185.08	12.0	0.3	0.4	
20496-6427DAW	229	20	49	30	-64	27			7.70	7.38	7.54	136.36	134.30	135.33	11.0	1.8	2.0	
									50.19	50.17	50.18	304.78	304.73	304.76		4.4	4.7	29
									51.29	50.98	51.14	161.31	160.74	161.03		2.5	2.6	5
20515-6543HJ	5221	20	51	27.88	-65	42	42.6		9.53	10.16	9.84	44.95	44.44	44.69	10.14	0.6	0.7	M
20587-7025HJ	5231	20	58	40.1	-70	25	19	A-BC	5.95	6.32	6.14	111.16	109.68	110.42	7.91	0.24	0.21	
20594-6558MLO	91	20	59	22.9	-65	58	30		17.15	17.02	17.08	242.81	242.56	242.69	10.5	1.05	0.34	M
21059-6844DON	998	21	05	57.8	-68	45	05		4.20	3.71	3.96	153.94	156.63	155.29	10.8	0.72	0.67	
									59.97	59.84	59.90	253.66	254.04	253.85		4.57	4.41	40
21081-6702HJ	5240	21	08	08.5	-67	02	16		12.06	12.08	12.07	203.58	203.61	203.60	9.7	2.4	2.4	
21153-6341HJ	5250	21	15	20.18	-63	41	15.9		9.26	10.08	9.67	306.13	302.53	304.33	8.56	1.41	1.24	
21190-6013R	328	21	18	58.50	-60	12	46.7		19.82	19.88	19.85	149.33	149.44	149.39	10.14	0.3	0.4	M
									31.47	31.24	31.35	139.45	140.01	139.23		5.1	4.8	10
									48.85	49.23	49.04	269.16	269.14	269.15		5.7	5.6	41
21200-6018HJ	5256	21	20	00.95	-60	17	32.8		19.64	19.67	19.65	150.08	150.22	150.15	9.13	0.34	0.26	
									49.14	49.39	49.27	269.10	268.74	268.92		5.70	5.42	16
									31.37	31.16	31.27	140.94	141.27	141.11		4.69	4.27	3
21214-6655HJ	5255	21	21	24.49	-66	54	57.4		26.44	26.56	26.50	109.89	109.74	109.82	9.08	1.34	0.99	
21263-6806MLO	93	21	26	15.66	-68	06	00.6		4.73	4.76	4.75	132.53	132.29	132.41	8.92	2.6	2.2	
21297-6016R	332	21	29	41.7	-60	15	00		13.40	13.38	13.39	332.87	332.78	332.83	10.5	0.77	0.68	
21304-6012HJ	5270	21	30	25.0	-60	12	25		27.41	27.69	27.55	47.59	47.35	47.47	7.6	4.71	4.85	1
21335-6144B	531	21	33	28.18	-61	43	56.6		3.20	3.48	3.34	331.91	322.33	327.12	9.21	3.13	3.09	
									50.83	50.82	50.82	60.02	59.51	59.76		6.26	6.15	
21408-6733HJ	5281	21	40	51.2	-67	32	57	AB	45.74	46.01	45.87	37.28	37.01	37.15	9.6	3.52	3.73	3
									7.04	6.76	6.90	35.63	35.63	35.63	12.4	0.07	0.09	
21444-6013HJ	5294	21	44	21.69	-60	13	00.4	BC	8.55	8.63	8.59	191.42	193.20	192.31	10.52	-0.2	-0.1	
									28.43	28.56	28.49	161.56	160.99	161.28		3.50	4.48	3

(Continued)

Table 1. (Continued)

WDS nomenclature	Position			J2000			Separation			Position angle			mag V	Δ mag		Notes
	h	m	s	°	'	"	R ["]	I ["]	Ave. ["]	R [°]	I [°]	Ave. [°]		ΔR	ΔI	
21476-6254RST	21	47	38.8	-62	54	24	40.69	40.86	40.78	123.91	124.30	124.11		3.62	5.06	6
21500-6319RST	21	49	59.5	-63	18	47	5.09	4.86	4.98	122.14	117.95	120.05	9.1	3.2	3.0	
21549-6535MLO	21	54	56.0	-65	34	31	16.46	16.48	16.47	284.20	284.24	284.20	9.1	2.7	2.6	
22040-6955LDS	22	04	05.8	-69	55	30	14.20	14.27	14.24	258.05	258.05	258.05	10.3	2.27	2.27	1
22130-6159HU	22	13	00.00	-61	58	52.9	2.30	2.30	2.30	292.00	291.11	291.56	9.31	1.1	1.0	
22131-6112CPO	22	13	03.29	-61	12	05.9	5.39	5.05	5.22	190.47	191.50	190.99	9.95	0.11	0.11	7
22188-6819HDO	22	18	49.7	-68	18	47	28.28	27.88	28.08	280.09	280.25	280.17		5.17	5.00	
22195-6048HJ	22	19	30.28	-60	47	33.5	25.78	25.92	25.85	53.61	52.88	53.24	7.1	4.53	4.61	
22231-6509HJ	22	23	04.90	-65	09	02.3	22.70	22.83	22.76	203.79	204.40	204.10	8.39	0.61	0.79	
22237-6513LDS	22	23	51.0	-65	12	09	25.63	25.43	25.53	128.52	128.92	128.72	9.82	0.7	0.5	
22243-6508HJ	22	24	15.9	-65	07	32	70.17	70.27	70.22	238.46	238.34	238.40	11.8	-0.1	0.09	2
22254-6556MLO	22	25	26.9	-65	55	41	48.57	48.84	48.71	174.97	174.90	174.94		3.21	3.27	19
22262-6157HJ	22	26	08.91	-61	57	06.8	36.76	36.91	36.83	61.78	61.67	61.72		3.32	3.50	12
22271-6203HJ	22	26	54.14	-62	03	14.1	9.42	9.42	9.42	294.56	294.66	294.61	10.8	1.4	1.6	
22278-6325NZO	22	27	50.4	-63	25	28	24.69	25.09	24.89	262.24	262.38	262.31		4.6	4.3	7
22273-6458HJ	22	27	19.8	-64	57	59	7.25	7.10	7.17	48.66	47.49	48.07	10.1	2.14	1.97	
22318-6124HJ	22	31	46.95	-61	24	25.5	19.76	19.76	19.76	347.56	348.10	347.83	11.08	0.30	0.39	
22333-6049MLO	22	33	20.58	-60	49	01.7	14.92	15.00	14.96	252.55	251.75	252.15	10.79	1.93	2.72	
22340-6009RST	22	34	01.6	-60	08	37	6.54	6.52	6.53	233.67	233.73	233.70	10.8	0.75	0.77	
22354-6605HJ	22	35	28.6	-66	04	58	34.75	34.51	34.63	230.53	232.16	231.35		5.19	4.99	23
22437-6439R	22	43	40.47	-64	38	53.4	7.13	6.82	6.97	280.05	281.21	280.63	4.49	3.90	3.63	
22446-6357HDO	22	44	33.9	-63	57	14	6.02	6.02	6.02	127.54	127.73	127.64	11.14	-0.3	-0.3	
22447-6007HJ	22	44	40.32	-60	07	01.0	4.43	4.20	4.31	121.32	124.50	122.91	8.78	1.22	1.18	
22476-6534HJ	22	47	35.66	-65	33	36.9	66.14	66.16	66.15	55.66	55.66	55.66	8.1	5.44	5.60	9
22477-6221HU	22	47	39.1	-62	21	28	7.54	7.59	7.56	262.38	259.88	261.13	10.4	0.75	0.81	
22583-6111HJ	22	58	19.43	-61	10	31.6	51.69	52.07	51.88	85.35	85.80	85.58		2.65	2.94	4
22593-6022B	22	59	19.0	-60	21	56	10.74	11.04	10.89	246.99	249.18	248.09	8.81	1.09	1.07	
23023-6418DUN	23	02	16.03	-64	17	52.7	43.42	44.05	43.74	293.73	293.32	293.53	7.1	7.0	6.2	7
23052-6727HJ	23	05	09.40	-67	26	51.7	31.34	31.50	31.42	91.06	91.05	91.06	8.02	2.39	2.56	
23054-6316B	23	05	23.69	-63	15	48.2	84.09	84.26	84.18	43.47	43.49	43.48	6.62	4.85	4.88	2
23062-6803MLO	23	06	10.19	-68	02	34.2	10.76	10.42	10.59	113.98	115.13	114.56	9.4	3.75	3.76	
23138-6009NZO	23	13	47.9	-60	09	04	18.34	18.15	18.25	145.38	146.19	145.79	10.12	1.02	1.03	
23150-6334LDS	23	15	01.1	-63	34	25	38.71	38.23	38.47	13.15	12.83	12.99		3.59	3.58	4
22593-6022B	22	59	19.0	-60	21	56	AC	AC	AC	AC	AC	AC	10.15	0.51	0.41	
23023-6418DUN	23	02	16.03	-64	17	52.7	47.09	47.14	47.12	91.65	91.92	91.79	7.68	2.10	1.69	
23052-6727HJ	23	05	09.40	-67	26	51.7	12.97	12.31	12.64	93.69	95.93	94.81	9.65	1.59	1.55	
23054-6316B	23	05	23.69	-63	15	48.2	3.49	3.50	3.50	300.35	300.37	300.36	9.33	2.37	2.24	
23062-6803MLO	23	06	10.19	-68	02	34.2	4.88	5.04	4.96	151.24	147.66	149.45	10.59	0.23	0.22	
23138-6009NZO	23	13	47.9	-60	09	04	11.60	11.47	11.54	176.52	176.52	176.53	10.2	1.55	1.57	
23150-6334LDS	23	15	01.1	-63	34	25	24.71	25.00	24.85	248.33	248.58	248.46	11.2	3.4	2.7	3

23157-6710HJ	5389	23	15	41.91	-67	10	19.9	8.12	8.51	8.32	248.93	249.58	249.26	8.35	3.23	3.38	
23173-6655LDS	807	23	17	20.79	-66	55	09.5	70.20	70.25	70.23	196.74	196.75	196.75	8.82	0.25	0.18	
23180-6100DUN	247	23	18	00.80	-61	00	13.2	50.01	49.82	49.91	292.92	293.06	292.99	6.87	1.94	2.36	
23233-6352HU	1647	23	23	18.2	-63	51	53	7.69	7.92	7.80	51.52	49.48	50.50	9.58	2.23	2.02	
								AB									2
								AC									5
23310-6905HJ	5402	23	31	02.85	-69	04	36.3	36.62	36.76	36.69	197.57	197.92	197.75	7.17	1.82	1.62	
23339-6141NZO	108	23	33	53.8	-61	41	20	3.37	3.37	3.37	206.61	206.59	206.60	10.2	0.6	1.0	
23352-6441HJ	5403	23	35	13.00	-64	41	20.8	35.85	35.83	35.84	43.20	43.16	43.18	7.16	2.92	2.80	
23365-6405HJ	5407	23	36	28.9	-64	05	13.8	9.77	9.48	9.62	14.71	10.34	12.53	9.71	1.11	1.18	
23366-6219RST	1171	23	36	35.1	-62	18	48	3.88	3.48	3.68	350.87	356.21	353.54	10.4	1.0	0.93	
23394-6159RST	3330	23	39	26.1	-61	59	04	3.19	3.20	3.20	136.66	136.90	136.78	10.2	1.5	1.5	
23397-6912R	348	23	39	39.49	-69	11	44.9	4.45	4.93	4.69	345.25	349.54	347.40	8.55	0.85	0.74	
23433-7049HJ	5415	23	43	17.0	-70	49	05	39.68	39.64	39.66	132.09	132.15	132.12	7.5	3.86	3.94	
23476-6031COO	261	23	47	33.42	-60	31	08.9	5.24	5.78	5.51	96.08	99.44	97.76	8.97	2.50	2.18	
23492-6046I	697	23	49	10.44	-60	45	46.9	7.97	7.68	7.83	122.25	124.32	123.29	8.68	3.0	2.9	
23503-6107HJ	5425	23	50	20.00	-61	06	18.9	13.57	13.59	13.58	276.84	276.81	276.83	10.98	0.50	0.49	67
								58.95	58.50	58.73	57.83	57.92	57.87	5.02	4.71	4.71	
23506-6950FIN	293	23	50	36.1	-69	49	56	4.19	3.89	4.04	239.01	236.32	237.67	9.4	2.1	2.1	
23537-6557HJ	5428	23	53	39.9	-65	56	50	12.19	12.27	12.23	113.81	111.13	112.47	6.7	4.36	3.51	
23553-6922HJ	5449	23	55	18.78	-69	19	45.6	8.26	8.25	8.23	354.12	354.08	354.10	11.96	0.7	0.6	
								37.28	37.30	37.29	173.70	173.73	173.72	4.8	4.3	54	
23553-7059LDS	827	23	55	20.00	-70	58	10.7	72.62	72.63	72.62	11.20	11.20	11.20	12.9	0.27	0.74	8
23563-7052HJ	5434	23	56	19.39	-70	52	07.6	20.07	20.43	20.25	53.03	53.45	53.24	9.57	2.6	2.5	
23582-6956LPO	68	23	58	10.2	-69	55	54	3.88	3.64	3.76	71.80	64.00	67.90	9.6	1.4	1.4	
								35.97	36.02	35.99	19.43	19.39	19.41	4.9	4.9	4.9	6
23589-6105HJ	5436	23	58	52.4	-61	04	33	33.96	33.98	33.97	252.48	252.06	252.27	9.6	3.68	3.82	2

Table 2. Movement of double stars

WDS nomenclature	First observation		This work		Movement		
	Date	PA [°]	ρ ["]	PA [°]	ρ ["]	Δ PA [°]	$\Delta\rho$ ["]
00006-6641GLI	1851	270	2.3	273.90	3.96	4	1.7
00015-6203B	1927	207	2.8	204.48	2.71	-3	-0.1
00013-7012GLI	1851	123	31	118.28	28.28	-5	-3
00021-6817I	1907	85	1	121.72	4.04	37	3
00063-6414I	1907	135	4	136.24	5.78	1	2
00076-6038I	1907	40	4	29.03	5.36	-11	1
00102-6719HJ	1836	115	20	102.72	14.35	-12	-6
00163-6128HJ	1834	13	12	12.29	15.83	-1	4
00160-6754HJ	1836	304	15	336.38	10.05	33	-5
00174-6635DON	1928	20	5.3	18.96	5.61	-1	0.3
00209-6507RST	1934	328	3.4	321.88	4.14	-6	0.7
00237-6742VOU	1917	135	2	112.88	5.09	-22	3
00268-6743HJ	1836	395	25	358.00	20.55	-37	-4
00282-6447HJ	1835	345	12	342.47	15.16	-3	3
00282-6555HJ	1834	54	38	68.20	49.21	14	11
00300-6023JSP	1928	243	3.4	240.39	3.28	-3	-0.1
00312-6418MLO	1893	281	3.8	274.51	3.75	-6	-0.1
00319-6057JSP	1928	303	7.3	302.19	7.64	-1	0.3
00315-6257LCL	1826	354	25	348.73	27.23	5	2
00327-6302B	1925	353	0.1	348.80	27.20	4	27.1
00335-6109HJ	1836	353	9.5	352.73	7.42	0	-2.1
00391-6249HJ	1835	223	20	228.05	25.81	5	6
00394-6844GLI	1851	227	4.1	249.02	4.82	22	0.7
00485-6506HJ	1835	141	3.5	141.52	5.43	1	1.9
00520-6520HJ	1835	222	21.5	231.12	33.95	9	12.4
00517-6520HJ	1835	336	13.5	336.98	12.78	1	-0.7
00530-6105GLI	1851	52	6.7	72.02	5.83	2	-0.9
00523-6523DAW	1892	95	6.3	91.86	5.84	3	-0.5
00524-6930DUN	1834	77	22.5	80.46	20.35	3	-2.1
00523-7037B	1894	262	4.1	254.95	4.66	-7	0.6
00547-6528HJ	1836	212	20	213.47	16.32	1	-4
00548-6727GLI	1851	75	23	94.36	19.28	19	-4
00584-6605DON	1928	152	4.5	136.44	6.10	-16	1.6
01033-6006HJ	1836	128	4.7	126.60	3.37	-1	-1.3
01058-5959R	1870	192	23.1	194.48	22.62	2	-0.5
01158-6853HJ	1834	372	2	326.86	5.06	45	3
01171-6624HJ	1834	342	2	327.96	2.49	-14	0
01282-6100LDS	1920	135	73	113.42	71.92	-22	-1.1
01341-6114JSP	1928	307	5.1	307.56	4.93	1	-0.2
01355-6045JSP	1928	340	7	339.33	6.92	-1	0
01349-6909GLI	1851	129	26.8	125.16	24.01	-4	-2.8
01368-6932VOU	1909	285	9	281.81	13.56	-3	5

01404-6714COO	9	1894	55	3.9	48.83	4.63	-6	0.7	1
01412-6741LDS	56	1920	225	22	218.74	33.82	-6	12	12
01455-6035JSP	9001	1928	235	6.5	233.61	6.25	-1	-0.2	0
01583-6513LDS	64	1920	315	26	268.69	25.08	-46	-1	20
01599-6131ALD	21	1921	315	3.4	319.01	3.41	4	0.0	0
02005-6246HJ	3479	1835	272	30	271.77	33.57	0	4	4
02046-6508HJ	3482	1835	203	30	219.40	58.86	16	29	31
02051-6048LPO	3	1918	184	6.3	186.21	6.44	2	0.1	0
02101-6421HJ	3486	1835	220	30	250.11	84.16	30	54	60
02113-6302HJ	3487	1835	345	12	210.87	20.57	-134	9	30
02109-6342B	1432	1925	206	5.1	213.92	5.62	8	0.5	1
02124-6139HJ	3488	1834	138	3	143.77	5.22	6	2	2
02119-6249R	13	1870	83	37.4	83.14	35.29	0	-2.1	2
02120-6546HJ	3490	1834	198	18	206.84	23.56	9	6	6
02119-7057HJ	3489	1834	243	20	239.66	20.19	-3	0	1
02119-7057DAW	184	1916	271	8	268.40	9.79	-3	2	2
02124-7023R	15	1870	137	11.6	139.72	14.12	3	2.5	3
02177-6244B	668	1927	205	11.4	191.66	9.29	-13	-2.1	3
02171-6812HJ	3496	1834	322	12.5	308.82	24.32	-13	11.8	12
02205-6003R	16	1873	140	14	144.17	18.30	4	4	4
02207-6002HJ	3499	1834	64	4	61.78	8.07	-2	4	4
02207-6533BRT	1962	1892	336	5	335.32	4.48	-1	-1	0
02258-6312HJ	3501	1834	335	20	337.50	22.99	2	3	3
02280-6903DON	34	1929	278	3.7	334.84	5.52	57	1.8	5
02304-6351HJ	3507	1835	116	12	109.02	21.57	-7	10	10
02335-6912HJ	3517	1834	236	15	239.75	16.18	4	1	2
02363-6329B	1435	1929	308	2.8	309.18	2.54	1	-0.3	0
02401-6121LDS	77	1920	315	26	299.50	27.09	-15	1	7
02455-6342HDO	306	1895	70	20	78.67	19.65	9	0	3
02452-6700GLI	18	1852	161	4.4	197.80	4.69	37	0.3	3
02469-6009HJ	3534	1836	213	25	215.49	20.77	2	-4	4
02500-6212HJ	3538	1837	297	13	297.38	14.49	0	1	2
02521-6054HJ	3540	1836	5	7	9.70	7.82	5	1	1
02504-6759BRT	1963	1892	11	3.3	4.15	3.50	-7	0.2	0
02536-6420HJ	3542	1837	143	12	141.14	12.75	-2	1	1
02544-6300I	148	1896	5	4	5.25	4.46	0	0	0
02555-6908HJ	3547	1834	116	10	153.96	19.05	38	9	13
02570-6302RST	56	1929	143	5.5	143.83	4.97	1	-0.5	0
03034-7029HJ	3552	1834	5	12	0.86	15.67	6	4	4
03084-7033HLN	19	1892	63	8.4	65.71	8.05	3	-0.3	0
03101-6355HJ	3559	1837	38	40	40.88	43.30	3	3	4
03121-6420HJ	3562	1836	329	48.4	331.43	34.46	2	-13.9	14
03137-6550HJ	3566	1834	41	12	37.03	13.35	-4	1	2
03152-6427DUN	12	1826	98	14	104.82	19.05	7	5	5

(Continued)

Table 2. (Continued)

WDS nomenclature	First observation			This work			Movement		
	Date	PA [°]	ρ ["]	PA [°]	ρ ["]	Δ PA [°]	$\Delta\rho$ ["]	Δ ["]	
03177-6305I	1896	355	3	357.25	3.86	2	1	1	
03154-7015HLN	1977	337	9.4	335.22	8.94	-2	-0.5	1	
03294-6256HJ	1837	122	60	127.03	54.41	5	-6	7	
03335-6742LDS	1892	347	11.7	349.64	11.39	3	-0.3	1	
03351-6750NZO	1893	54	5.4	62.79	4.80	9	-0.6	1	
03393-6721BRT	1892	22	3.7	31.91	3.60	10	-0.1	1	
03402-6631LDS	1920	135	7	150.01	5.99	15	-1	2	
03461-6405HJ	1837	12	18	24.78	20.49	13	2	5	
03480-7048HJ	1834	333	15	335.96	16.82	3	2	2	
03525-6230HJ	1835	309	4	311.06	9.85	2	6	6	
03531-6238HJ	1835	185	2.3	125.00	3.96	-60	1.7	3	
04025-6121LDS	1920	225	29	239.20	28.35	14	-1	7	
04066-6019R	1920	153	58.1	152.93	57.13	0	-1.5	1	
04078-6903HJ	1834	224	4	233.11	7.02	9	3	3	
04096-6023R	1920	70	46.7	71.46	50.21	1	3.5	4	
04148-6212HJ	1835	286	8	218.13	12.36	-68	4	12	
04158-6613GLI	1851	26	56.1	35.63	40.77	10	-15.3	17	
04177-6315RMK	1835	6	6.4	2.82	3.86	-3	-2.5	3	
04198-6622LDS	1920	135	32	152.60	31.64	18	0	10	
04242-6411HJ	1836	60	15	63.15	16.87	3	2	2	
04239-6644HJ	1834	95	15	128.36	18.83	33	4	10	
04243-6616HJ	1835	337	10	338.29	11.89	1	2	2	
04252-6405HJ	1837	158	15	114.75	49.49	-43	34	40	
04278-6231B	1927	125	10.2	123.95	9.39	-1	-0.8	1	
04269-6530HJ	1834	252	18	164.58	74.35	-87	56	76	
04269-6718HJ	1835	368	8	349.44	12.60	-17	5	6	
04284-6543HJ	1836	46	25	108.52	13.47	63	-12	22	
04301-6607HJ	1836	206	12.5	204.38	13.53	-2	1.0	1	
04336-6249HJ	1836	95	32	99.92	31.75	5	0	3	
04336-6734HJ	1837	185	9	184.52	14.32	0	5	5	
04347-6440B	1965	229	9.1	228.37	10.02	-1	0.9	1	
04377-6607HJ	1837	15	25	14.45	26.17	-1	1	1	
04375-6742HJ	1837	295	13.5	264.99	17.96	-30	4.5	9	
04395-6601DON	1928	3	5.3	3.06	5.89	0	0.6	1	
04417-6113HJ	1935	216	7	221.05	7.45	5	0	1	
04493-6153HJ	1834	300	5	303.91	9.98	4	5	5	
04589-6106JSP	1930	188	4.4	188.83	4.01	1	-0.4	0	
05024-6454GLI	1852	192	39.5	176.81	40.94	-15	1.4	11	
05065-6051JSP	1930	306	6.8	306.33	6.97	0	0.2	0	
05081-6212B	1923	42	3.1	37.39	3.15	-5	0.0	0	
05156-6139JSP	1930	210	5.4	210.67	5.27	1	-0.1	0	
05180-6041I	1912	24	7.2	26.24	8.07	2	0.9	1	

05182-6157HJ	3755	1836	286	20	274.14	21.45	-12	1	4
05256-6005HJ	3764	1835	271	4.5	276.31	11.66	5	7.2	7
05303-6356HDO	192	1896	75	7	75.61	8.53	1	2	1
05491-6108HJ	3810	1836	170	30	175.43	23.95	5	-6	7
05582-6245HJ	3829	1834	354	15	355.72	22.65	2	8	8
06013-7001B	2597	1932	337	9	287.83	6.93	-49	-2	7
06064-6304RST	175	1930	55	4.3	50.73	4.12	-4	-0.2	0
06053-6500HJ	3838	1835	306	4	308.18	10.51	2	7	6
06052-6551MLO	20	1893	204	10.9	206.55	10.20	3	-0.7	1
06081-6330LDS	155	1920	180	12	177.12	12.23	-3	0	1
06078-6941HJ	3844	1835	91	8	93.29	13.43	2	5	5
06115-6020HJ	3843	1836	323	15	328.63	11.57	6	-3	4
06122-6532DUN	26	1834	113	23	119.74	20.71	7	-2	3
06173-6139HJ	3851	1836	81	15	84.95	15.04	4	0	1
06174-6550MLO	21	1892	167	4.3	166.26	4.48	-1	0.2	0
06225-6013JSP	101	1930	51	16	49.54	16.02	-2	0	0
06212-6735HJ	3862	1834	277	12	291.09	7.77	14	-4	5
06300-7037HJ	3879	1835	278	15	236.15	14.79	-42	0	11
06327-6617HJ	3880	1835	82	2	81.51	5.02	0	3	3
06346-6130JSP	871	1930	293	13.3	284.64	13.60	-8	0.3	2
06347-6452B	2119	1893	53	4.6	55.24	4.16	2	-0.4	1
06357-7006HJ	3885	1836	174	4	172.16	4.65	-2	1	1
06393-6248HJ	3886	1834	341	12	347.59	13.58	7	2	2
06387-6342RST	211	1930	25	3.7	26.58	4.18	2	0.5	1
06396-6427B	2607	1892	107	9.7	108.06	8.91	1	-0.8	1
06421-6431I	284	1898	270	4	235.42	5.62	-35	2	3
06424-6545HJ	3894	1834	213	20	218.13	27.28	5	7	8
06455-7048B	2608	1893	261	4.7	261.32	5.02	0	0.3	0
06493-6722MLO	22	1893	289	7.7	288.70	8.05	0	0.3	0
06569-6211LDS	174	1920	180	43	172.83	41.99	-7	-1	5
06556-6557HJ	3915	1837	267	20	269.11	19.57	2	0	1
06564-6829HJ	3918	1836	319	6	328.58	12.17	10	6	6
07003-6052HJ	3922	1836	235	15	237.73	17.03	3	2	2
07005-6052HJ	3924	1836	356	19	358.48	16.06	2	-3	3
07031-6355RST	231	1930	26	3.8	27.96	4.00	2	0.2	0
07029-6801MLO	23	1892	54	5.4	56.44	5.33	2	-0.1	0
07086-6041HJ	3937	1836	29	2	35.54	5.62	7	4	4
07091-6035I	184	1900	340	24.5	343.89	16.61	4	-7.9	8
07102-6301HJ	3944	1837	284	20	267.27	13.75	-17	-6	8
07087-7030DUN	42	1826	302	15.7	298.63	14.01	-3	-1.7	2
07156-6311R	72	1881	317	26.9	318.47	25.00	1	-1.9	2
07157-6612HJ	3955	1837	28	25	33.18	28.21	5	3	4
07245-6232HJ	3972	1917	90	18.3	83.79	16.49	-6	-1.8	3
07262-6854HJ	3976	1835	131	7	135.25	6.52	4	0	1

(Continued)

Table 2. (Continued)

WDS nomenclature	First observation		This work		Movement		
	Date	PA [°]	ρ ["]	PA [°]	ρ ["]	Δ PA [°]	$\Delta\rho$ ["]
07289-6835MLO	24	1915	10.3	345.09	10.03	-1	-0.3
17133-6712DUN	214	1826	22	12.89	36.93	-315	15
17145-6750MLO	75	1892	7	312.78	7.47	7	0
17163-6749DON	827	1929	3	22.38	4.32	-2	1
17357-6257HJ	4956	1835	2.2	109.04	5.17	-58	2.9
17404-6553MLO	76	1909	4.2	54.68	4.97	-2	0.8
18111-6624HJ	5008	1836	13.5	241.15	14.08	3	0.6
18133-6513NZO	89	1905	2	102.14	5.42	-18	3
18148-6649HJ	5019	1835	45	333.76	37.98	1	-7
18152-6649I	627	1909	3	217.44	3.20	-8	0
19096-6314RST	5604	1929	5.2	7.84	5.48	-0	0.3
19142-7037B	2874	1892	4.8	201.13	9.10	-24	4.3
19177-6559B	966	1927	4.1	165.05	4.02	-2	-0.1
19197-6741MLO	84	1892	4.5	100.42	5.17	-34	0.7
19216-6925BRT	2014	1895	4.3	175.58	49.50	-64	45.2
19223-6117HJ	5102	1836	10	342.21	14.09	7	4
19254-6718MLO	85	1892	3.6	193.85	3.59	2	0.0
19298-6718HJ	5109	1835	20	141.20	27.72	1	8
19302-6652MLO	86	1918	4.8	50.56	7.48	1	2.7
19355-6906DON	960	1828	3.6	23.73	2.98	-3	-0.6
19351-7039HJ	5118	1835	3	6.89	8.46	-2	5
19360-6624HJ	5123	1835	20	177.04	29.27	-6	9
19369-6949FIN	272	1929	5.8	32.74	5.70	-9	-0.1
19402-6903MLO	87	1895	4.2	272.22	3.36	-3	-0.8
19399-6641DAW	224	1916	19.7	240.57	19.91	-1	0.2
19440-6618HJ	5132	1835	21.5	308.29	21.63	-4	0.1
19491-6149HJ	5141	1836	15	341.57	13.98	0	-1
19512-6435MLO	88	1892	5.7	226.56	4.87	19	-0.8
19597-6102HJ	5155	1835	3.5	191.13	4.30	-2	0.8
20026-6541I	1409	1895	7	318.10	10.66	147	4
20040-6541I	1411	1895	16.8	280.41	17.79	-3	1.0
20079-7049HJ	5162	1835	8.3	290.38	6.12	-2	-2.2
20088-6001I	1120	1916	5.4	69.89	5.95	-1	0.6
20118-6337HJ	5167	1836	8	32.49	7.07	-2	-1
20138-6728DON	981	1928	2.9	169.18	3.16	2	0.3
20146-6426HJ	5171	1836	12	303.08	18.01	-2	6
20191-7052HJ	5176	1835	1.3	121.91	6.40	-25	5.1
20218-6420LDS	708	1920	22	209.88	22.20	-16	0
20286-6225HJ	5196	1836	18	267.10	56.61	-16	39
20303-6904HJ	5194	1835	3	256.94	4.19	8	1
20289-6228HJ	5197	1836	30	82.67	25.10	-129	-5
20309-6648MLO	89	1892	5	318.05	5.33	178	0.3

20330-6822HJ	5200	1835	138	15.3	135.78	12.44	-2	-2.9	3
20398-6430HJ	5217	1835	232	7.6	231.71	7.66	0	0.1	0
20412-6242R	323	1880	313	2.7	321.40	2.94	8	0.2	0
20432-6730LDS	718	1920	315	29	309.00	29.19	-6	0	3
20449-6904BRT	2017	1894	190	4.2	185.08	4.40	5	0.2	0
20496-6427DAW	229	1916	135	7.6	135.33	7.54	0	-0.1	0
20515-6543HJ	5221	1835	124	12	44.69	9.84	-79	-2	14
20587-7025HJ	5231	1835	112	10	110.42	6.14	-2	-4	4
20594-6558MLO	91	1915	250	30	242.69	17.08	-7	-13	13
21059-6844DON	998	1892	153	3.8	155.29	3.96	2	0.2	0
21081-6702HJ	5240	1835	206	11.5	203.60	12.07	-2	0.6	1
21153-6341HJ	5250	1836	304	16.4	304.33	9.67	0	-6.7	7
21190-6013R	328	1870	296	20.5	149.39	19.85	-147	-0.6	39
21200-6018HJ	5256	1835	153	25	150.15	19.65	-3	-5	6
21214-6655HJ	5255	1835	108	34.3	109.82	26.50	2	-7.8	8
21263-6806MLO	93	1915	129	4.6	132.41	4.75	3	0.1	0
21297-6016R	332	1880	334	14.4	332.83	13.39	-1	-1.0	1
21304-6012HJ	5270	1835	56	18	47.47	27.55	-9	10	10
21335-6144B	531	1927	329	3.3	327.12	3.34	-2	0.0	0
21408-6733HJ	5281	1835	37	30	37.15	45.87	0	16	16
21444-6013HJ	5294	1835	193	4	192.31	8.59	1	5	5
21476-6254RST	1107	1929	123	4.9	120.05	4.98	-3	0.1	0
21500-6319RST	9009	1929	346	6	284.20	6.02	-62	0	6
21549-6535MLO	10	1892	223	11.8	258.05	16.47	35	4.7	10
22040-6955LDS	769	1920	135	13	136.15	14.24	1	1	1
22130-6159HU	1636	1914	293	2.7	291.56	2.30	-1	-0.4	0
22131-6112CPO	91	1901	195	5.3	190.99	5.22	-4	-0.1	0
22188-6819HDO	297	1897	85	18	53.25	25.85	-32	8	14
22195-6048HJ	5323	1834	204	20	204.10	22.76	0	3	3
22231-6509HJ	5327	1835	128	30	128.72	25.53	1	-4	4
22237-6513LDS	783	1920	315	77	238.40	70.22	-77	-7	91
22243-6508HJ	5328	1835	296	5	294.61	9.42	-1	4	4
22254-6556MLO	95	1900	50	6	48.07	7.17	-2	1	1
22262-6157HJ	5331	1834	370	12	347.83	19.76	22	8	10
22271-6203HJ	5333	1834	237	18	252.15	14.96	15	-3	5
22278-6325NZO	103	1905	235	4	233.70	6.53	-1	3	3
22273-6458HJ	5334	1835	283	8	280.63	6.97	-3	-1	1
22318-6124HJ	5340	1834	122	2	127.64	6.02	6	4	4
22333-6049MLO	7	1891	124	2	122.91	4.31	-1	2	2
22340-6009RST	5169	1943	69	1.4	55.66	66.15	-13	64.7	65
22354-6605HJ	5342	1835	253	8.7	261.13	7.56	8	-1.1	2
22437-6439R	339	1873	249	11.1	248.09	10.89	-1	-0.2	0
22446-6357HDO	300	1897	290	20	293.53	43.74	4	24	24
22447-6007HJ	5358	1834	90	30	91.06	31.42	1	1	2

(Continued)

Table 2. (Continued)

WDS nomenclature	First observation		This work		Movement	
	Date	PA [°]	ρ ["]	PA [°]	ρ ["]	Δ ["]
22476-6534HJ	1892	41	78.5	43.48	84.18	2
22477-6221HU	1927	108	12.5	114.56	10.59	7
22583-6111HJ	1836	137	15	145.79	18.25	9
22593-6022B	1921	47	17.4	14.86	17.17	-32
23023-6418DUN	1836	100	48.9	91.79	47.12	-8
23052-6727HJ	1836	92	9	94.81	12.64	3
23054-6316B	1927	297	3.2	300.36	3.50	0.3
23062-6803MLO	1892	151	4.7	149.45	4.96	0.3
23138-6009NZO	1905	180	3	176.53	11.54	9
23150-6334LDS	1920	225	24	248.46	24.85	23
23157-6710HJ	1836	250	8.5	249.26	8.32	-1
23173-6655LDS	1894	197	70.6	196.75	70.23	0
23180-6100DUN	1926	278	30	292.99	49.91	15
23233-6352HU	1914	51	8.5	50.50	7.80	0
23310-6905HJ	1835	200	35	197.75	36.69	2
23339-6141NZO	1927	206	3.5	206.60	3.37	-2
23352-6441HJ	1836	48	42.5	43.18	35.84	1
23365-6405HJ	1834	25	7	12.53	9.62	-5
23366-6219RST	1930	352	3.5	353.54	3.68	-12
23394-6159RST	1935	139	3	136.78	3.20	2
23397-6912R	1870	350	4.2	347.40	4.69	-2
23433-7049HJ	1835	117	40	132.12	39.66	-3
23476-6031COO	1900	101	5.9	97.76	5.51	15
23492-6046I	1907	130	5	123.29	7.83	-3
23503-6107HJ	1836	275	10	276.83	13.58	-7
23506-6950FIN	1935	236	3.9	237.67	4.04	2
23537-6557HJ	1836	116	12	112.47	12.23	0.1
23553-6922HJ	1834	350	4	354.10	8.23	-4
23553-7059LDS	1920	315	170	11.20	72.62	4
23563-7052HJ	1835	48	12	53.24	20.25	-304
23582-6956LPO	1919	71	3.8	67.90	3.76	5
23589-6105HJ	1836	275	20	252.27	33.97	-3
						-23
						14
						17

In Table 2 we present the WDS Catalog Nomenclature name of the double star, the date of the first observation as listed in the new format WDS Catalog, and the PA and ρ recorded for that date. We then give the average PA and ρ observed by us (epoch ~ 1992.9). The three ‘Movement’ columns are (Δ PA) the difference in PA (ours – first), ($\Delta\rho$) the difference in ρ (ours – first) and (Δ) the movement in the period since first WDS observation; here measured as the linear distance between the first and our positions.

There are 29 secondaries (10%) listed that have moved more than 10 arcsec over the period. Of the remainder, the distribution of movement shows that 49% percent show movement of less than 1.0 arcsec and $\sim 30\%$ show more than 5 arcsec of motion. Given that the component of measurement uncertainty from our observations alone is ~ 0.8 arcsec for a pair of separation of 10 arcsec (reducing to 0.3 arcsec at $\rho = 30$ arcsec), and that the uncertainty in the earlier observations is not known but presumed to be of the same order, it is reasonable to report that the majority of pairs listed have not moved over the period.

Acknowledgements

The authors thank the Research School of Astronomy and Astrophysics of the Australian National University for the

use of their 0.6 m telescope and the generous donation of the R and I filters, and the University of New South Wales for their accommodation at Siding Spring Observatory. Much of this work was undertaken in the former Centre for Astronomy at the University of Western Sydney, Nepean.

References

- Argue, N., et al., 1992, MNRAS, 259, 563
- Bauer, C., White, G. L. & Hons, A. H., 1994, PASA, 11, 201
- Blackmore, D. R., et al., 1990, SPIE, 1237, 231
- Chanamé, J. & Gould, A., 2004, ApJ, 601, 289
- Cox, A. N., 2000, Allen’s Astrophysical Quantities, 4th edn (Berlin: Springer)
- Dommanget, J., 1985, in The European Astrometry Satellite HIP-PARCOS – Scientific Aspects of the Input Catalogue Preparation, Eds. Guyenne, T. D. & Hunt, J. J., STIN, p. 153
- Geffert, M., Sinachopoulos, D. & Guilbert, J., 1992, in Complementary Approaches to Double and Multiple Star Research, IAU Colloquium 135, ASP Conference Series Vol. 32, Eds. McAlister, H. A. & Hartkopf, W. I. (ASP: San Francisco), 137
- Lampens, P. & Strigachev, A., 2001, A&A, 368, 572. doi:10.1051/0004-6361:20010024
- Norton’s Star Atlas and Reference Handbook 2000, Ed. Ridpath, I. (Benjamin Cummings)
- Oblak, E., et al., 1999, A&A, 346, 523
- White, G. L., et al., 1991, MNRAS, 248, 411