

Magnitude Anomalies in the WDS

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Abstract: Visual magnitude entries in the WDS often differ from those in other catalogs by a magnitude or more. Using the 2MASS, PPMXL, Tycho, UCAC4, and URAT1 catalogs, we provide listings of the WDS entries that have no corresponding entries in the other catalogs that are within a magnitude (visual band) of the WDS primary stars' magnitude and are also within 10" of the WDS primary.

Those stars with two digit fractional magnitudes must be within 0.5mv of the catalog stars. WDS stars that are marked by the WDS as dubious, infrared, Johnson red band, have no primary visual magnitude, have no precise coordinates, are marked as uncertain, or are brighter than 6.0mv or fainter than 17.0mv are not included in this study.

The Little Tycho Observatory currently specializes in visual double star observations, and uses the WDS as its main catalog for choosing which pairs to examine on a given night. Over the years, it has become apparent that a few pairs were non-existent, but that many more were significantly fainter than their listings indicated.

The WDS[2] currently contains 137,225 entries. The USNO[1], which maintains the WDS, generally takes their data from previously published papers on double stars and enters these data into the WDS. Some of the magnitude estimates vary considerably from the actual brightness of the pair. The discoveries of Robert Jonckheere, for instance, are notorious for their estimates of stellar brightness that are often too bright by a magnitude or more. Progress has been made in this matter as some of the lists (W. Struve's STF list, for example) have been updated with accurate magnitudes, usually taken from Tycho[5] or APASS[8] data. These updated magnitudes are listed with two decimal fractions in the WDS, and are subject to a more stringent tolerance ($\pm 0.5mv$) that those stars without accurate magnitudes.

Five catalogs were used to check the WDS data. They were:

- 2MASS[3]
- PPMXL[4]
- Tycho[5]
- UCAC4[6]
- URAT1[7]

The catalogs were downloaded, and programs were written to convert each catalog to a standard format. A search was then made for each WDS star in all of the catalogs. A WDS entry was considered confirmed if an entry from any of the catalogs was within 10 arc seconds of the WDS position and that entry was within a magnitude (or half magnitude, in the case of two decimal entries) the primary magnitude listed in the WDS. The version of the WDS used for this study was dated 2016 June 23.

If the primary star of a pair failed the magnitude test, the combined magnitude of the pair was calculated and the test was again done. If the combined pair magnitude was within the the full or half magnitude range, the pair was considered confirmed.

Combined magnitudes are derived from the magnitude - luminosity relation [10]:

$$mc = -2.5 \log \left[10^{-0.4m_1} + 10^{-0.4m_2} \right]$$

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A star was also considered confirmed if the WDS notes about the pair had any of these caveats:

- The pair's identification is uncertain.
- K band infrared magnitude.
- Johnson red band magnitude.
- The pair is dubious.
- WDS primary stars that were fainter than 16.99mv.
- WDS primary stars that were brighter than 6.0mv.

There were 2604 WDS pairs found with no catalog star that was within 0.5 or 1 mv of the WDS primary star listing. Of these, 1019 pairs had a greater separation than 10", and 1585 were found that were closer than this. This separation is important, as close pairs can easily have magnitude errors in the survey catalogs used to verify the WDS pairs. This is because the catalogs themselves are generated by computer analysis of digital images that can easily be thrown off by the presence of a bright star within the "aperture" of the scanning software. 10" is the figure of merit where these effects become noticeable [9]. In other words, the closer the pair, the less certain the error.

These 2604 stars with anomalous magnitudes are listed on the author's web site:

<http://mainsequence.org/html/wds/magnitudeStudy/html/WdsMagnitudeAnomalies.html>.

Table 1 lists the 48 WDS pairs that have no corresponding catalog star (as of December 2016). Table 2 lists the 169 WDS pairs that have no corresponding catalog star within 4mv of the WDS primary.

The column explanation for Table 2 is as follows:

- WDS ID: The WDS designation of the pair.
- Discover: The Discoverer's designation of the pair.
- RA: The WDS precise J2000 right ascension of the star.
- Dec: The WDS precise J2000 declination of the star.
- mva-mvb: The WDS visual magnitudes of the primary and secondary stars.
- Rho: The separation of the pair, at the most recent epoch, in arc seconds.
- Theta: The position angle of the pair, at the most recent epoch, in degrees.
- dmv: The smallest difference in visual magnitude between the WDS listing and a catalog listing.

The column explanation for Table 1 is the same as Table 2, but lacking the dmv column.

Please note that many of the WDS pairs in these two appendices are currently undergoing a detailed review by the USNO. Their listing might be changed in subsequent versions of the WDS.

Acknowledgments

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References

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- [2] The Washington Double Star Catalog, Brian D. Mason, Gary L. Wycoff, William I. Hartkopf, Geoffrey G. Douglass, and Charles E. Worley, 2001
- [3] <http://irsa.ipac.caltech.edu/Missions/2mass.htm>
- [4] <http://irsa.ipac.caltech.edu/Missions/ppmx1.html>
- [5] <http://www.astro.ku.dk/~erik/Tycho-2/>
- [6] <http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/ucac>
- [7] <http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/urat>
- [8] <http://www.aavso.org/apass>
- [9] William Hartkopf, Astrometry Department, U.S. Naval Observatory, 3450 Massachusetts Ave, NW, Washington, DC 20392. Personal communication.
- [10] https://en.wikipedia.org/wiki/Apparent_magnitude#Magnitude_addition

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Table 1. 48 WDS Pairs That Have No Corresponding Catalog Star

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta
00334+1418	LDS9094	0:33:22.04	14:18:5.6	14.3-18.5	11.000	0.00
01344-0412	LDS5336	1:34:29	-4:13:18	11.9-14.7	344.000	352.00
02419+2909	LDS3415	2:41:55	29:9:0	16.7-18.0	173.000	231.00
03533+2540	LDS5446	3:53:26	25:39:48	10.6-17.9	14.000	225.00
03590+2315	LDS6123	3:59:2	23:14:42	15.4-15.5	21.000	135.00
04128+1404	LDS5519	4:12:49	14:4:12	15.4-19.0	10.000	330.00
04275+1323	LDS5580	4:27:32	13:22:48	12.2-14.3	21.000	283.00
04371+1848	LDS3599	4:37:6	18:47:30	15.4-16.8	2.000	175.00
04483+5729	LDS3618	4:48:26	57:29:36	16.8-18.2	155.000	353.00
04569+2019	LDS5630	4:56:58	20:19:54	15.1-16.4	155.000	262.00
04594+2215	LDS6153	4:59:24	22:14:48	14.5-19.0	2.590	124.10
05250+3645	FYM 375	5:25:1	36:45:6.7	13.8-13.8	9.800	230.80
05406+2632	ITF 45	5:40:36.87	26:32:32.3	13.5-14.5	3.981	62.80
06105+2307	POU1101	6:10:29	23:6:54	12.8-12.8	10.600	207.70
06177+2348	POU1196	6:17:42	23:48:12	14.0-14.4	7.900	188.70
06214+2203	L 58	6:20:8.35	22:2:5.5	11.4-11.9	1.220	120.50
06220+2339	POU1261	6:22:2	23:39:0	12.2-12.6	5.300	66.10
07015+2317	POU2282	7:1:29	23:17:0	13.2-13.6	6.000	293.70
07430+2410	POU2877	7:42:59	24:10:24	12.5-13.4	11.320	327.20
09164+3014	LDS3868	9:16:23	30:14:6	14.7-17.4	35.000	230.00
09259-1530	LDS3891	9:25:52	-15:30:24	14.2-17.0	327.970	279.00
09332-7433	KOH 84	9:33:9.7	-74:33:10	15.4-	0.222	231.40
09550+2738	FYM 230	9:54:57.01	27:38:6.59	11.4-12.9	36.000	280.00

Table 1 concludes on next page.

Magnitude Anomalies in the WDS*Table 1 (conclusion). 48 WDS Pairs That Have No Corresponding Catalog Star*

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta
10038+2246	POU3071	10:3:46	22:46:24	12.9-13.0	6.100	161.20
10386-7151	LDS6177	10:38:35	-71:51:18	14.1-14.6	4.000	340.00
11431+5546	LDS4137	11:42:59	55:45:6	13.5-17.5	6.000	244.00
13027+1521	LDS4309	13:2:36	15:20:54	15.2-17.5	163.000	237.00
13194-0939	LDS4344	13:19:17	-9:38:24	14.0-17.0	20.000	104.00
13289+2350	POU3141	13:28:49	23:49:48	12.6-13.6	13.700	90.00
13468-2759	LDS5793	13:46:54	-28:9:6	13.6-19.5	76.000	306.00
13484+5306	LDS5801	13:48:25	53:5:54	16.0-17.3	5.000	222.00
13485+0331	LDS3103	13:48:19	3:31:18	16.3-17.3	72.000	282.00
13507+0722	LDS3111	13:50:38	7:22:36	15.2-16.8	7.720	354.70
14086+2349	POU3157	14:8:36	23:48:48	11.2-13.0	8.200	16.70
15160+7111	LDS1815	15:16:2	71:11:6	13.3-15.8	10.000	49.00
15488-2842	LDS5846	15:48:50	-28:42:48	16.9-18.0	41.000	158.00
21117+2447	POU5236	21:11:43	24:46:12	12.2-13.5	6.000	91.10
21324+1054	LDS4894	21:32:28	10:52:48	16.2-18.7	6.950	7.00
22229-3341	LDS4961	22:22:58	-33:41:6	16.4-16.4	46.000	128.00
22300+0426	STF2912Ba, Bb	22:29:57	4:25:54	8.0-8.8	0.060	268.50
22391-2912	LDS5964	22:39:3	-29:12:18	13.0-16.0	120.000	260.00
22470+0325	FAR 21	22:46:57.3	3:24:42	16.46-19.82	2.400	58.00
22478-2510	LDS5977	22:47:36	-25:10:48	13.9-19.8	73.000	38.00
22575-2933	LDS5991	22:57:31	-29:33:48	15.0-16.8	28.000	315.00
23149-3047	LDS6017	23:15:2	-30:48:12	16.3-17.8	38.000	208.00
23194+2417	POU5798	23:19:26	24:16:24	11.8-11.8	19.100	90.20
23316-2549	LDS6036	23:31:36	-25:49:36	16.6-19.8	257.000	169.00

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Table 2. 169 WDS Pairs that have no Corresponding Catalog Star Within 4mv of the WDS Primary

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta	dmv
00200+3814	FYM 147DG	20:00.4	+38:13:38.6	15.4-15.4	3.2	279.7	7.6
00536+0510	OCC 917	53:33.0	+5:9:50	6.6-8.8	0.049	-1	4.85
01460+3254	J 3305	45:53.9	+32:54:18.09	11.3-13.0	3.659	158.7	18.9
02442+4914	STF 296BC	44:10.3	+49:13:54	10.-11.08	88.2	231.8	20.34
02557+3028	GII 2Ba, Bb	2:55:39	+30:28:3.19	13.4-13.8	0.454	155.1	4.08
02594+6034	MZA 14EF	59:22.1	+60:33:56.79	14.0-14.6	0.992	24.5	4.92
03423+3141	COU 691	42:15.9	+31:40:49.5	9.0-9.0	0.216	244.2	9.05
03447+3210	DCH 15	44:40.3	+32:9:32.59	12.8-13.7	0.13	186.6	17.59
03495-3504	LDS3537	49:32.1	-35:4:13.6	15.0-15.2	3	185	15.65
03541+3153	SLV 2BC	54:07.4	+31:52:49.8	9.16-11.24	32.23	309	7.89
03541+3153	SLV 2BD	54:07.4	+31:52:49.8	9.16-10.44	85.43	193	8.04
04290+1338	SIG 2	29:02.9	+13:37:58.7	13.2-13.7	0.294	131.6	17.33
04293-3124	SIG 4	29:18.4	-31:23:56.79	11.18-12.38	0.511	40.7	4.83
04352+5858	LDS3594	4:35:26	+58:57:6	14.1-14.6	2	80	16.43
05145-0812	BU 555BC	14:32.3	-8:12:5.89	7.5-7.6	0.124	29.8	6.49
05154+3241	STF 653BC	15:24.5	+32:41:25.29	10.9-7.33	22.65	209.9	2.28
05174+2424	POU 635	5:17:26	+24:23:54	12.9-13.5	16.3	227.4	17.59
05272+1758	STT 107BC	27:09.5	+17:57:49.89	10.1-11.8	7	57	20.1
05302-4705	RST 136BC	30:09.4	-47:4:38.4	11.7-12.7	0.778	84.6	5.8
05352-0522	GET 20FG	35:13.8	-5:22:6.89	14.40-.	2.2	-1	15.6
05352-0522	SMN 1Ha, Hb	35:13.9	-5:22:2.49	12.35-13.92	0.367	126	17.87
05352-0522	SMN 2Na, Nb	35:14.8	-5:22:29.29	12.40-12.40	0.301	145	18.35
05352-0523	GET 9DE	35:10.5	-5:22:45.69	14.76-.	1.8	-1	15.24
05352-0523	GET 25NO	35:14.7	-5:22:38.19	13.96-.	2.6	-1	16.04
05352-0524	PRS 11GH	35:12.2	-5:23:48.2	15.00-15.81	0.1	163	15.42
05352-0525	GET 16	35:13.1	-5:24:52.8	15.10-.	2.9	-1	14.9
05353-0522	GET 33HI	35:15.5	-5:22:48.49	16.06-.	2.3	-1	13.94
05353-0522	GET 44IM	35:16.9	-5:22:22.39	14.86-.	2	-1	15.14
05353-0522	GET 45NO	35:16.9	-5:22:35.49	14.60-.	2.6	-1	15.4
05353-0522	PRS 17Ua, Ub	35:17.6	-5:22:56.69	14.91-16.85	0.384	248.1	15.25
05353-0522	PRS 19Xa, Xb	35:18.6	-5:22:56.69	13.77-15.58	0.91	339	16.41
05353-0523	PTR 1Aa, Ab	35:15.8	-5:23:14.3	6.55-9.83	0.193	9.4	6.39
05353-0523	STF 748AB	35:15.8	-5:23:14.3	6.55-7.49	8.69	31.7	6.06
05353-0523	STF 748AC	35:15.8	-5:23:14.3	6.55-5.06	12.59	132.1	4.71
05353-0523	STF 748AD	35:15.8	-5:23:14.3	6.55-6.38	21.33	96.1	5.6
05353-0523	STF 748AE	35:15.8	-5:23:14.3	6.55-11.1	4.61	352.3	6.43
05353-0523	STF 748AH	35:15.8	-5:23:14.3	6.55-15.8	8.18	177.1	6.44
05353-0523	SMN 5Ba, Bb	35:16.1	-5:23:6.8	7.49-8.5	0.996	252.6	7.02
05353-0523	SMN 5Ba, Bc	35:16.1	-5:23:6.8	7.49-10.50	0.593	298.2	7.32
05353-0523	PTR 1Ba, Bd	35:16.1	-5:23:6.8	7.49-.	1.029	250.7	7.39
05353-0523	SMN 5Bb, Bc	35:16.1	-5:23:6.8	8.5-10.50	0.6	37	8.24

Table 2 continues on next page.

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Table 2 (continued). 169 WDS Pairs that have no Corresponding Catalog Star Within 4mv of the WDS Primary

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta	dmv
05353-0523	PTR 1Bb, Bd	35:16.1	-5:23:6.8	8.5-	0.117	219.7	8.4
05353-0523	STF 748BC	35:16.1	-5:23:6.8	7.49-5.06	16.65	163.7	4.84
05353-0523	STF 748BD	35:16.1	-5:23:6.8	7.49-6.38	19.24	120.6	5.94
05353-0523	STF 748BE	35:16.1	-5:23:6.8	7.49-11.1	6.05	240.5	7.35
05353-0523	STF 748BF	35:16.1	-5:23:6.8	7.49-11.5	20.49	153.4	7.36
05353-0523	KSS 1Da, Db	35:17.2	-5:23:16.6	6.38-	0.019	41	6.28
05353-0523	STF 748DE	35:17.2	-5:23:16.6	6.38-11.1	22.95	287	6.26
05353-0523	STF 748DF	35:17.2	-5:23:16.6	6.38-11.5	11.46	221.2	6.27
05353-0523	STF 748DG	35:17.2	-5:23:16.6	6.38-16.7	7.84	270.2	6.27
05353-0523	GET 37Ea, Eb	35:15.8	-5:23:9.8	11.1-	2.2	-1	8.9
05353-0523	STF 748HI	35:15.8	-5:23:22.5	15.8-16.3	1.547	270.1	4.73
05353-0523	GET 30JK	35:15.2	-5:22:54.29	14.26-	2.8	-1	15.74
05353-0523	GET 36LM	35:15.7	-5:23:22.5	14.5-	1.6	-1	5.5
05353-0523	GET 39Na, Nb	35:16.1	-5:23:7.1	7.96-	1	-1	7.86
05353-0523	PTR 2Qa, Qb	35:17.8	-5:23:15.5	9.69-13.0	0.303	178.3	9.53
05353-0523	GET 42RS	35:16.3	-5:23:16.5	11.4-	2.6	-1	5.25
05353-0523	GET 43TU	35:16.6	-5:23:16.1	11.4-	2	-1	5.25
05353-0524	PAD 2Da, Db	35:15.7	-5:23:47.8	14.-15.	0.49	-1	16.36
05353-0524	SMN 7Ea, Eb	35:15.9	-5:23:50.1	13.79-	0.52	39.2	16.21
05353-0524	GET 38FG	5:35:16	-5:23:52.9	12.50-	1	-1	17.5
05353-0524	PRS 24Ha, Hb	35:16.7	-5:24:4.5	13.77-15.58	0.13	339	16.41
05353-0524	SMN 6Ia, Ib	35:16.8	-5:23:26.7	12.97-13.44	0.396	34.6	6.28
05353-0524	GET 48JK	35:17.0	-5:23:37	14.9-12.9	3	155	17.25
05353-0524	SMN 8La, Lb	35:17.7	-5:23:41	12.6-	0.88	98.5	17.39
05353-0524	PRS 22Ta, Tb	35:20.4	-5:23:30.2	15.73-19.09	0.68	278.7	14.31
05353-0525	PAD 3Aa, Ab	35:15.9	-5:24:54.69	15.9-16.	0.52	-1	14.8
05353-0526	PAD 4Ca, Cb	35:17.7	-5:25:32.3	16.1-16.	0.24	-1	14.7
05353-0526	PAD 5Ea, Eb	35:18.0	-5:25:33.3	14.9-16.	0.3	-1	15.43
05354-0524	PRS 34AB	35:21.2	-5:23:45.2	16.26-20.38	1.09	232	13.76
05354-0524	GET 56CD	35:21.8	-5:23:53.8	13.27-	2.1	-1	16.73
05354-0524	PAD 8EF	35:22.1	-5:24:12.2	14.5-17.5	1.75	-1	15.56
05354-0524	GET 57GH	35:22.3	-5:24:14.3	13.82-	1.9	-1	16.18
05355-0524	GET 60	35:28.4	-5:25:3.4	15.36-	2.9	-1	14.64
05416-0153	BCK 3Ea, Eb	41:36.9	-1:52:33.29	11.6-12.2	0.42	200	5.54
05416-0154	BCK 1Ea, Eb	41:36.6	-1:53:54.49	10.6-11.1	0.18	40	19.93
05518-4434	BLR 1	51:46.0	-44:34:13	14.86-15.39	2.2	359.6	15.65
06221+2427	POU1262AB	6:22:06	+24:26:48	13.2-14.4	6.2	139.3	4.46
06221+2427	POU1263AC	6:22:06	+24:26:48	13.2-14.4	13.3	122.9	4.46
06234+2332	POU1285	6:23:21	+23:32:18	14.2-14.3	5.1	107.7	16.5
06323+5225	WOR 6	32:18.4	+52:24:50.2	10.4-10.5	0.77	159.8	8.6
06451-1643	AGC 1BC	45:08.9	-16:43:2	8.5-12.6	79.08	29.7	8.37
07178-2559	BRG 26Aa, Ab	7:17:47	-25:59:8.69	13.5-	0.1	311.6	4.72

Table 2 continues on next page.

Magnitude Anomalies in the WDS

Table 2 (continued). 169 WDS Pairs that have no Corresponding Catalog Star Within 4mv of the WDS Primary

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta	dmv
07179+2319	POU2648	7:17:59	+23:18:54	13.0-14.1	22.36	350.3	6.08
07274+0514	WDK 2	27:24.1	+5:14:5.19	10.03-. .	0.17	327	6.02
07412+0219	BAL1806	41:09.9	+2:19:54.29	12.3-13.2	12	247.6	6.68
07467+2001	RED 9	46:42.6	+20:0:32.2	12.23-12.83	0.351	214.3	18.26
09047+3441	ALI 122	04:41.2	+34:40:51.7	12.79-12.86	5.66	32	17.92
09086-2550	TOK 357BC	08:36.6	-25:50:20.19	11.8-19.3	0.102	268.6	4.96
09252+1602	FAR 8	25:13.5	+16:1:44.2	16.26-17.30	4.51	287	14.09
10522+4423	DUP 2	52:13.5	+44:22:55.89	14.99-15.50	0.055	97.2	15.53
11112-4106	JAO 5	11:14.8	-41:5:31.2	13.2-17.3	4.28	62.2	5.64
12302+3211	LDS4221	12:30:07	+32:10:0	16.6-16.9	93	102	14.01
12538-6022	CRU9008CD	53:48.9	-60:22:44.2	10.0-10.4	7.73	87.4	3.47
13062+2902	BU 1083BC	06:10.0	+29:1:40.79	11.7-12.0	0.416	252.2	4.55
13172-1230	GWP1964	17:12.1	-12:30:26.1	10.3-15.6	10.21	64.4	8.14
13529-1943	GWP2116	52:54.5	-19:43:22	11.5-14.9	500.4	147.9	5.98
14048-3200	LPR 2	04:49.5	-31:59:33	14.9-16.1	0.134	275.3	15.41
14125+1636	WSI 117	12:27.9	+16:35:42.39	16.3-16.6	0.882	47.1	3.67
14325+4911	HU 57BC	32:30.9	+49:11:2.6	12.62-11.77	1.21	135	2.92
14503+2355	POT 1BC	50:15.9	+23:54:41.79	13.9-14.2	0.1	316.9	7.34
15096-6843	DAM 20DG	09:36.6	-68:43:16.8	11.39-11.39	5.8	82	3.79
15186+2356	COU 307	18:34.8	+23:56:42.8	9.5-9.6	0.35	3.4	21.2
15200-4423	BUG 12	20:02.2	-44:22:41.9	13.55-14.70	1.174	152.9	16.77
15500-0355	RST4553BC	49:57.3	-3:55:11	12.5-13.0	1.49	304.8	4.82
15503-4524	DON 764BC	50:16.3	-45:24:9.39	11.6-11.9	0.34	328.5	4.83
15582-3005	BRT3026	58:10.5	-30:4:17.2	11.2-. .	3.61	107.9	4.12
16078-1750	LDS4632	16:07:45	-17:49:30	12.9-18.8	220	136	5.34
16264-2425	ALO 2CD	26:25.3	-24:24:45	13.2-16.9	7.76	273.1	16.83
16268-2428	BNY 1	26:48.5	-24:28:38.89	11.3-12.9	4.15	343.2	18.92
16268-2438	BNY 2	26:49.0	-24:38:25.1	10.0-11.7	3.57	291.1	8.24
16274-2430	ALO 8AB	27:22.0	-24:29:39.79	15.4-19.9	6	84	14.61
16274-2430	ALO 9CD	27:24.6	-24:29:35.4	14.7-15.0	8.47	313	15.91
17113-2725	CHN 26AC	11:17.3	-27:25:8.2	14.3-15.0	5.068	329.7	16.15
17296+2916	LDS4744	29:29.3	+29:16:9.29	16.9-18.0	15.93	162.2	13.43
17297-3143	PRO 165	29:42.4	-31:43:19	12.0-12.6	3.52	202.3	18.49
17408-3052	BSS 1	17:40:50	-30:52:4.29	10.0-15.9	0.41	206	20
17465+2743	AC 7BC	46:25.1	+27:43:1.39	10.2-10.7	0.75	289.2	20.33
17465+2743	ABT 14BC,D	46:25.1	+27:43:1.39	9.78-12.33	335.04	9.9	20.31
18138-2104	SLV 7BD	13:44.6	-21:3:35.4	10.48-9.96	40.92	331	20.56
18138-2104	SLV 7BE	13:44.6	-21:3:35.4	10.48-9.22	64.43	105.8	21.07
18146+0422	BAL2922	14:34.5	+4:21:56.39	11.6-12.1	53.81	84.3	6.73
18173+2832	LDS4782	17:18.2	+28:31:10.69	16.6-18.0	48.02	61.1	13.66
18178-1537	J 2205AB	17:49.1	-15:37:21.8	11.0-13.0	4.581	99.9	5.72
18178-1537	J 2205AC	17:49.1	-15:37:21.8	11.0-14.5	13.86	47.2	5.61

Table 2 concludes on next page.

Magnitude Anomalies in the WDS

Table 2 (conclusion). 169 WDS Pairs that have no Corresponding Catalog Star Within 4mv of the WDS Primary

WDS ID	Discover	RA	Dec	mva-mvb	Rho	Theta	dmv
18289+0515	LDS5237	18:28:52	+5:14:36	15.6-19.5	6	329	14.42
18342-3158	PRO 205	34:08.8	-31:57:15	11.91-12.2	3.57	178.8	18.7
18369+3846	STF3136BC	36:56.1	+38:45:44.8	9.5-11.0	83.7	310	20.74
18451-6358	BIL 1	45:07.1	-63:57:47.39	12.6-	1.2	170.2	4.97
19025+2432	POU3663	19:02:36	+24:31:42	12.7-13.3	2.6	176	17.79
19064-1154	RST4028Ba,Bb	19:06:25	-11:53:50	12.9-13.0	0.252	78.2	3.61
19121+0254	AST 1	12:13.5	+2:53:15.59	11.29-13.11	0.125	296.9	5.29
19302+3842	ADP 5	30:13.3	+38:41:49.79	15.0-15.8	2.35	18.6	15.42
19390+1528	J 774	38:58.4	+15:28:11	9.5-10.0	3.68	220.4	8.16
19407+2343	FYM 103CD	40:39.6	+23:43:4.69	11.4-14.8	31	94	4.7
19484+2518	POU4090	19:48:23	+25:17:54	14.6-14.7	14.18	213.7	4.87
19492+2316	POU4103	19:49:07	+23:16:0	14.3-14.7	8.8	142.4	16.27
19495+3843	ES 84BC	49:27.8	+38:42:26	11.1-13.2	20.29	67.4	19.04
19563+3505	BU 980CE	56:18.4	+35:5:0.6	10.5-11.5	8.31	264	6.12
20090+3258	SEI 916	09:00.4	+32:57:29.4	10.5-11.0	5.442	29.4	8.19
20097+3240	SEI 933	09:46.6	+32:39:59.59	11.0-11.0	4.482	334.8	7.55
20098+3130	SEI 932	09:47.6	+31:30:5.59	10.0-10.0	5.394	291	8.05
20181-1233	AGC 12BC	18:03.3	-12:32:48	11.2-11.5	1.2	245.4	6.9
20286+5924	ADP 6	28:34.0	+59:24:17.6	15.0-16.5	4.43	158.9	15.24
20322+1759	GWP2966	32:10.6	+17:58:50.29	10.7-12.2	121.03	74.7	19.54
20357+3901	SEI1185	35:42.6	+39:1:8.7	10.5-11.0	3.467	298.4	20.03
20358+4123	NML 1	35:48.1	+41:22:42.4	16.2-16.4	0.149	15.8	4.42
20380+3806	SEI1197	37:55.5	+38:5:20.1	11.0-11.0	14.728	173.5	19.75
20400+2350	POU4832	20:40:00	+23:50:24	11.8-13.9	16.47	26.6	5.19
20476+4347	CHN 28	47:37.5	+43:47:24.79	15.4-	5.01	56.9	4.09
20549+4451	LDS2466	54:52.0	+44:50:46.2	15.0-16.3	4.52	285.7	15.28
21009+4730	BU 1290CD	02:40.7	+45:53:5.2	14.0-15.0	2.9	90	5
21023+3931	WRD 4AG	02:30.0	+39:30:38.3	6.62-12.46	95	230	4.22
21179+3454	STT 433BC	17:54.3	+34:53:37.09	10.0-10.0	10.13	141.3	20.75
21203+4921	BU 839CB	20:17.5	+49:20:35.7	10.12-11.9	13.69	29.6	4.53
21214+3321	J 3136	21:01.8	+33:18:59.7	12.5-12.6	7.8	177.6	18.2
21231+6414	LDS4882	23:04.3	+64:14:25.3	15.9-21.0	11.38	162.4	14.1
21401+2426	POU5456	21:40:11	+24:26:18	12.2-12.3	3.7	263.5	18.5
21415+3817	SEI1532	41:28.7	+38:17:27.19	10.8-11.0	5.06	138.5	8.08
21491-6413	CVN 30	49:06.2	-64:12:55.9	15.5-	0.074	122	14.5
22200+4304	LOS 10BC	20:02.4	+43:6:2.69	16.0-17.2	1.08	138.8	3.99
22225+2922	AZC 119	22:28.8	+29:22:12.49	16.2-17.2	36.11	13.6	5.14
22234+4531	LOS 11BC	23:22.4	+45:30:42	14.5-15.3	2.65	198.8	4.73
22464+2336	POU5747	22:46:24	+23:35:48	12.8-13.0	15.2	339.2	17.85
22468+4420	HER 5BC	46:49.5	+44:20:21.1	12.4-12.9	1.214	255	18.13
23177+4901	KUI 116BF	17:44.8	+49:0:47	13.0-16.	6.36	184.7	7.91
23205+0002	LDS5254	23:20:30	+0:2:12	13.1-20.7	6	323	4.65
23526+2417	POU5868	23:52:34	+24:17:54	13.6-13.8	8.9	74.7	5.99