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PHOTOMETRY OF STARS IN THE FIELD OF THE MIRA YZ DRACONIS

YZ Draconis (= IRC +70156 = IRAS 19243+7135 = GSC 4452–0864) is a Mira variable that has been relatively well studied at infrared and millimeter wavelengths. The star was found to be a water maser by Crocker and Hagen (1983), who also gave the first accurate position, which was measured by S. G. Kleinmann and R. R. Joyce. The visual light curve exhibits a cycle length near 348 days, with maxima around mag. 10. The spectrum has been classified by Vyssotsky (1946) as M8e.

There are three accurate positions in the literature for the star, which are summarized here for equinox 2000:

	RA (2000)	Dec (2000)	
YZ Draconis:	$19^h23^m45\overset{s}{.}3$	+71°41' 14"	(Crocker & Hagen 1983)
	19 23 45.5	+71 41 12	(IRAS)
	19 23 45.2	+71 41 14	(Guide Star Catalog)

At the request of Charles Scovil of the American Association of Variable Star Observers, I made photoelectric observations of several stars in the field to improve the magnitudes of a comparison sequence on a preliminary AAVSO chart for the variable.

I observed the stars using the Lowell 53cm photometric telescope on 8 October 1992, and 20 and 21 May 1993 UT. Strömgren y and b filters were used through either a 19- or 29-arcsec diaphragm. Each observation consisted of at least four 10s integrations on 'star' and two 10s integrations on 'sky', with greater numbers for stars fainter than about mag. 10. The range of colors found among randomly-selected field stars is usually well outside the limits of the primary four-color standards, which include no K-giant stars fainter than V = 5.0. Thus a set of secondary standards was adopted to enable the calibration of V magnitudes of red and reddened stars, which occur in abundance all over the sky. V magnitudes were taken mostly from the lists of Landolt (1983a, 1983b, 1992), supplemented by values from Menzies et al. (1991). Strömgren $b - y$ colors were taken from the primary four-color standards list of Perry, Olsen, and Crawford (1987), plus much-observed stars from lists by Olsen (1983, 1993), Anthony-Twarog, et al. (1991), and Stetson (1991) – in that order of preference. Some V magnitudes come from these sources as well. Several of the Landolt stars have $b - y$ values determined using the Lowell 53cm telescope. The data for each night were reduced separately using linear transformations. Atmospheric extinction was estimated on these nights from measurements taken on other nights near this time.

Because of the mix of standards, Table 1 shows both the adopted and observed mean V and $b - y$, and the number of observations 'n'. The stars are listed in RA order. The

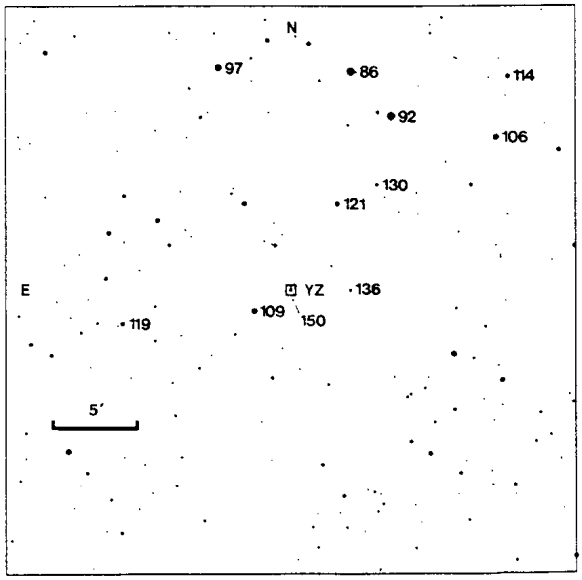

Figure 1. The field of YZ Draconis showing stars from the GSC.
V magnitudes are indicated to the nearest tenth with the decimal point omitted.

Table 1. Standard Star Observations.

Name	V (std)	$b-y$ (std)	V (obs)	$b-y$ (obs)	n
HD 143761	5.403	0.396	5.406	0.393	2
HD 149382	8.944	−0.146	8.955	−0.145	1
HD 153847	7.241	0.244	7.238	0.247	1
HD 160233	9.095	0.031	9.100	0.032	1
HD 160471	6.155	1.162	6.158	1.164	2
HD 161817	6.982	0.137	6.969	0.139	1
BD +04°3508	9.326	1.179	(9.359)	1.188	1
HD 162596	6.342	0.717	6.342	0.717	1
HD 172365	6.369	0.510	6.362	0.511	1
HD 172829	8.474	1.383	8.475	1.369	1
HD 182239	6.657	0.167	6.653	0.168	1
HD 184914	8.178	0.799	8.186	0.804	1
HD 184965	8.529	0.306	8.534	0.300	1
HD 186427	6.230	0.417	6.230	0.415	3
BD −00°4073	9.905	0.776	9.892	0.781	1
HD 199280	6.583	−0.030	6.583	−0.039	1
HD 209960	5.254	0.897	5.253	0.897	1
HD 218155	6.783	−0.004	6.779	−0.001	1
HD 222732	8.860	0.735	(8.835)	0.733	1

V data for two stars (in parentheses) were omitted from the transformations. The mean deviations of the observed averages from the assumed values in this group of data are: V $= -0.001 \pm 0.007$; $b - y = 0.000 \pm 0.005$.

Results for the stars near YZ Dra are shown in Table 2, listed in order of decreasing brightness. The stars are identified by HD, BD, or GSC number; positions come from either astrometric catalogues (for the brighter stars) or the GSC. Rough spectral types are available for a few brighter stars, obtained from the SIMBAD database. The stars fainter than mag. 12.0 were observed on two nights, and the standard deviations of the means are shown in the second line of each entry. The faintest star in the list, GSC 4452-1050, is well beyond the comfortable limits of Strömgren photometry with the 53cm telescope. Thus although the V magnitudes on the two nights are felicitously consistent, a more realistic estimate of the true uncertainty can be found under the $b - y$ color, whose error is in line with that expected from photon statistics.

Table 2. Photometry of Stars in the Field of YZ Dra.

Name	RA (2000)	Dec (2000)	V	$b - y$	n	spec
HD 183382	$19^h22^m59^s.0$	+71°54' 15"	8.575	0.193	1	A5
HD 183278	19 22 28.0	+71 51 34	9.185	0.237	1	F0
BD +71°0954	19 24 40.4	+71 54 27	9.676	0.164	1	
GSC 4452-0994	19 21 07.9	+71 50 15	10.648	0.689	1	
BD +71°0952	19 24 12.8	+71 39 59	10.874	0.255	1	A0
GSC 4452-0852	19 20 58.4	+71 53 52	11.357	0.246	1	
GSC 4452-1132	19 25 51.6	+71 39 12	11.866	0.386	1	
GSC 4452-1508	19 23 09.5	+71 46 21	12.135	0.912	2	
			.009	.010		
GSC 4452-1492	19 22 39.5	+71 47 30	13.030	0.547	2	
			.019	.013		
GSC 4452-1098	19 24 52.1	+71 41 12	13.622	0.599	2	
			.013	.024		
GSC 4452-1050	19 23 43.6	+71 40 39	15.017	0.841	2	
			.012	.158		

For the convenience of observers, a chart derived from the GSC is shown in Figure 1. The comparison stars are indicated by their V magnitudes rounded to the nearest tenth (decimal point omitted) in the style of visual variable-star charts.

The photometric data herein were reduced using a clever IDL routine written by Laura Woodney with help from Eliza Fulton and Hugo Spencer. Preparation of this report was facilitated by the use of SIMBAD, maintained by the Centre de Données astronomiques, Strasbourg, France.

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