SOME NOTES ON MAYALL'S VARIABLES

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Margaret Mayall discovered 15 new variables (14 of Me type and 1 of N type) by examination of objective prism plates taken with the 10-inch Metcalf telescope in South Africa (Mayall, 1951). They were given the designations HV 11093 through HV 11108 (except HV 11106). A comparison of information on these objects in SIMBAD and GCVS revealed a number of deficiencies in these databases viz., incomplete cross-identifications (and, hence, incomplete data listings), dissimilar co-ordinates, only approximate co-ordinates for some sources, etc. Accordingly, this effort was undertaken to try and remove at least some deficiencies.

Searching for infrared counterparts is a natural step towards this goal and the 2MASS database is an obvious choice for doing this in case of red variables. These sources were extracted from the 2MASS database using the VizieR utility (Ochsenbein, Bauer & Marcout 2000). In cases where the SIMBAD and GCVS co-ordinates matched or were close enough, the corresponding 2MASS source was easily found. In other cases, a larger search radius was required. The co-ordinates listed in Table 2 are those from 2MASS. IRAS associations were determined by a SIMBAD query around the HV position and checking whether the HV positions fell within the IRAS position error ellipse. In this manner, we have got new *IRAS* identifications for HV 11096, 11098 and 11105.

The case of HV 11094 is very interesting. According to the GCVS, it is a 17th magnitude Mira variable identified with NSV 917 and the co-ordinates listed therein match those of IRAS 02443-3626. However, totally different values are given in SIMBAD, which probably identifies the 'red star' of Deemers & Lang (1986) with HV 11094. However, as noted by the above authors, it is extremely unlikely that Mayall's survey would have picked up such a faint star. Judging from the magnitudes of other stars listed by Mayall, it is likely that HV 11094 has a magnitude between 10 and 12. Indeed, a TYCHO star of magnitude 11 lies close to the GCVS position, and its 2MASS colours correspond to a G0III star. Therefore, we believe that this is the true identity of HV 11094. The near- and far-infrared colours of IRAS 02443-3626 indicate that it also is a late-type star. This is probably the faint Mira variable NSV 917. Co-ordinates and JHK_s magnitudes of all red stars in the field of HV 11094 are listed in Table 1.

Table 1. Red stars in the field of HV 11094.

| Source	RA (2000)	Dec	J	H	K_s	Comments
CD $-36°1043$	02 46 05.31	-36 14 55.15	9.450	9.237	9.167	BV 1486 = NSV 919
IRAS 02443-3626	02 46 21.09	-36 13 35.58	6.331	5.511	5.003	NSV 917 ?
HV 11094	02 46 22.14	-36 13 24.92	9.937	9.633	9.518	Tycho star
Red star	02 45 0.6	-36 16 10.97	15.967	15.256	14.987	

Table 2 gives the 2MASS positions, cross-identifications and remarks (as in SIMBAD) of Mayall's variables. Table 3 gives the B and V magnitudes from SIMBAD, JHK_s magnitudes from 2MASS and the far-infrared fluxes measured by $IRAS$, thus consolidating in one place all known photometric information on these variables.

Table 2. Positions and cross-identifications of Mayall's variables.

HV	RA (2000)	Dec	IRAS	Other	Remarks
11093	02 30 10.47	-65 06 12.5	02290-6519	SX Hor	M5e ; SR, pulsating
11094	02 46 22.14	-36 13 24.92			
11095	04 02 57.29	-79 50 42.9	04058-7958	WW Men	M5e ; SR, pulsating
11096	04 28 50.33	-54 30 08.0	04277-5436	ST Dor	Son 4838 ; M0e, variable
11097	06 10 51.79	-69 00 57.6	06112-6900	SV Dor	M1e; Mira variable
11098	06 17 23.66	-61 54 07.79	06169-6152	RZ Pic	Son 4864 ; M3e, variable
11099	07 04 04.67	-16 06 22.44	07018-1601	NSV 3361	N type Carbon star
11100	07 34 28.49	-59 56 43.99	07336-5949	NSV 3655	M2e, variable ; S star
11101	09 44 54.39	-67 56 49.27	09438-6742	NW Car	Me, SR, pulsating
11102	14 30 42.417	-63 05 29.54		TYC 9010-128-1	Me, variable
11103	14 53 06.92	-33 41 45.21	14500-3329	V799 Cen	Me, variable
11104	15 01 39.42	-39 45 35.78	14584-3933	V643 Cen	M3e, Mira variable
11105	18 03 28.85	-41 53 42.00	17599-4154	V473 CrA	CSV 7749 ; Me,Mira variable
11107	19 31 05.64	-50 23 46.46		HL Tel	Son 7680 ; M0e, SR pulsating
11108	20 33 10.51	-23 40 11.28	20302-2350	NSV 13131	M5e, variable

Table 3. Optical-NIR magnitudes and $IRAS$ fluxes (Jy) of Mayall's variables. The last column gives the $IRAS$ flux quality in the four bands ranging from 3 (good) to 1 (bad).

HV	B	V	J	H	K_s	F12	F25	F60	F100	Fqual
11093	12		4.574±0.210	3.542±0.198	3.190±0.260	4.95	1.91	0.40	1.00	3311
11094	11.8	11.1	9.937±0.021	9.633±0.026	9.518±0.021					
11095		9.69	2.960±0.248	1.989±0.214	1.573±0.254	13.9	4.81	1.27	1.19	3331
11096	12		6.485±0.023	5.685±0.034	5.323±0.023	0.734	0.226	0.40	1.00	3311
11097	11.7		6.146±0.016	5.288±0.024	4.814±0.023	1.86	0.834	0.40	1.00	3311
11098	11.5		5.335±0.019	4.599±0.034	4.032±0.024	4.71	2.69	0.359	1.00	3331
11099	13.5	10.7	6.075±0.026	4.901±0.023	4.318±0.029	2.09	0.528	0.40	1.82	3311
11100			6.164±0.019	5.221±0.029	4.584±0.017	3.52	1.50	0.40	3.28	3311
11101	13		6.500±0.027	5.569±0.042	4.933±0.024	5.09	2.13	0.393	1.00	3321
11102	11.8	10.7	8.181±0.027	7.598±0.042	7.363±0.021					
11103			5.829±0.018	4.989±0.033	4.526±0.016	2.91	1.52	0.40	1.00	3311
11104	12		6.444±0.023	5.679±0.029	5.180±0.020	1.38	0.772	0.40	1.08	3311
11105	12.2		7.267±0.021	6.453±0.029	5.971±0.020	0.693	0.336	0.40	10.4	3111
11107	13		8.198±0.019	7.443±0.026	7.040±0.018					
11108			4.601±0.274	3.551±0.258	3.198±0.296	6.03	2.31	0.65	1.00	3321
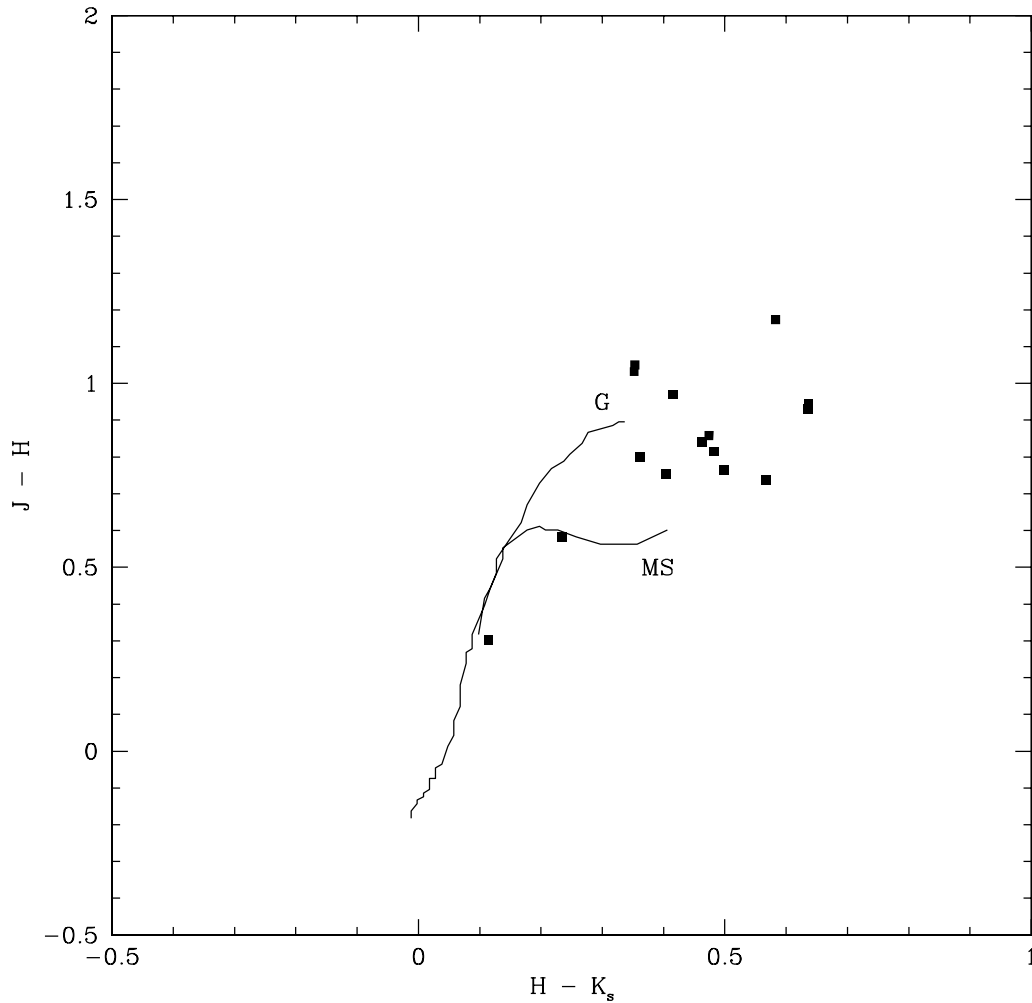
Figure 1. Near-Infrared two-colour diagram for Mayall's variables. Curves for the main sequence (MS) and giant (G) stars are also shown. It can be seen that the objects lie in the region occupied by late-type stars.

Figure 1 shows the near- infrared (2MASS) two-colour diagram for Mayall's variables. The colours of main sequence (MS) and giant (G) stars are from Cox (2000) and have been converted from Bessel & Brett (1988) to 2MASS system using the transformations given in Carpenter (2001). All objects in the sample except HV 11102 (whose $(J - H)$ colour seems to be bluish) have colours corresponding to late-type stars.

The IRAS two-colour diagram for Mayall's variables (and IRAS 02443-3626) is presented in Figure 2. Also shown are the blackbody curve (solid line) and the Mira-OH/IR star evolutionary curve (dotted) of van der Veen & Habing (1988). The regions populated by these objects are characteristic of variable stars with O-rich (II) or C-rich (VII) circumstellar shells or O-rich (VIb) and C-rich (VIa) stars having circumstellar dust.
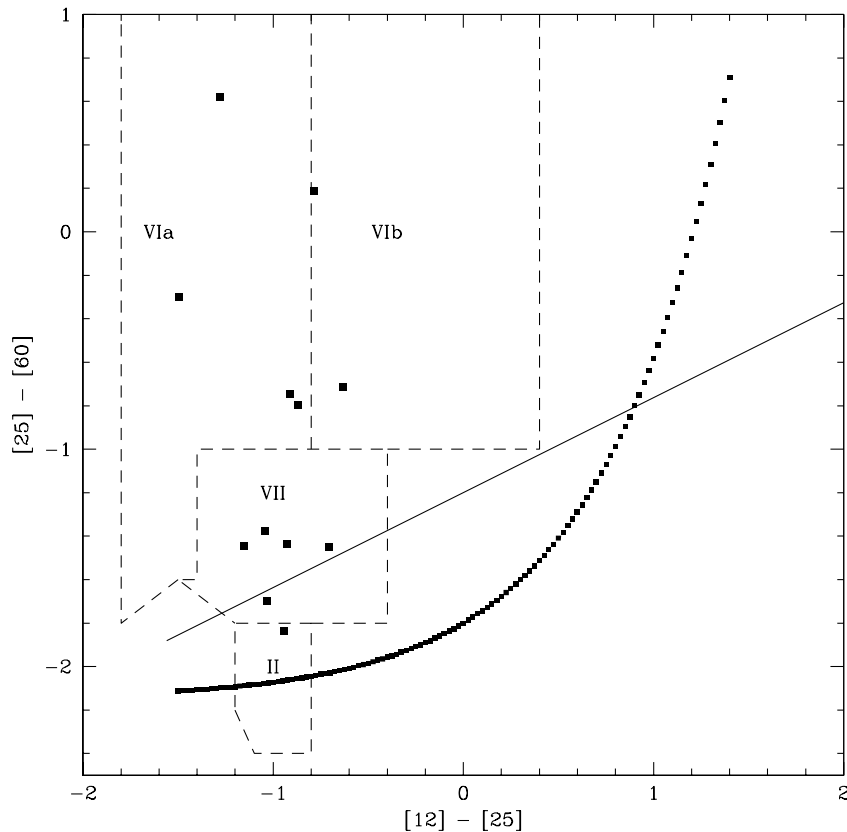
Figure 2. *IRAS* two-colour diagram for Mayall's variables (and IRAS 02443-3626). The dotted line is the Mira-OH/IR star evolutionary track of van der Veen & Habing (1988) and the solid line is that of a blackbody, starting with 10000 K at the bottom left and moving towards cooler temperatures. Again, it can be seen that Mayall's variables occupy the region populated by cool, late-type stars.

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ERRATUM FOR IBVS 5503

HV 11094 is specified by Mayall to lie 'south preceding CoD-36 1043'; in addition there is a finder chart that matches this description. This makes the identification with the red star there certain, despite its evident faintness in DSS images. Thus

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IRAS 02443-3626 = NSV 917 at: 2 46 21.09  -36 13 35.6 (J2000, 2MASS).
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In the same field, the star given by Kamath as CD-36 1043 is actually CD-36 1041 = CPD-36 282, which is correctly catalogued in SIMBAD. The true

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CD-36 1043 = TYC 7017-880-1 = NSV 919,
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about 20" northeast of IRAS 02443-3626, also correct in SIMBAD. The faint red star to the southwest (2 45 00.6 -36 16 11) seems to be unrelated to any of these; it is probably a distant M dwarf.

Kamath has also misidentified HV 11102, which is the relatively bright star and IRAS source IRAS 14265-6254. Again, Mayall provides a chart which makes the ID unambiguous:

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SV* HV 11102 = IRAS 14265-6254 = GSC 9010-4846 = NSV 6681:
       at: 14 30 28.06  -63 07 45.5 (J2000, 2MASS)
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Finally, there appears to be a -20" Dec typo for the coordinates of HV 11105. This should be given as: 18 03 28.86 -41 54 03.2 (J2000, UCAC2). There is no star at Kamath's position.

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