COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2198

Konkoly Observatory
Budapest
1982 September 14
*HU ISSN 0374-0676*

# A NOTE ON TWO Be STARS*

## HD 30076

HD 30076 (= HR 1508 = 56 Eri) is known as a variable at least since Cousins (1963). It appears also in the Second Catalogue of Suspected Variable Stars (Kukarkin et al., 1965) under the number 6131. The spectral type given by Cousins was B5ne and the range of variation in V was 5.90 - 5.99. Later UBV observations by Feinstein (1968) pointed out variations of $0^m.12$ in V, $0^m.03$ in B-V and U-B (see Table III) in 35 months. However, HD 30076 is listed without indication of variability both by Crawford et al. (1971) and by Grønbech and Olsen (1976a).

We were unaware of this variability and HD 30076 was included in several occasions as a secondary reference or as a comparison star in our observing runs. uvby observations of this star have then been carried out at the ESO 1m telescope in September 1980 and August 1981, and at the Danish 50cm telescope at La Silla in January 1982. The 1m telescope was equipped with a standard one-channel photometer (Danks, 1981, Chap. II.C.1 and III.B.3) and the Danish 50cm telescope with a simultaneous four-channel photometer (Danks, 1981, Chap. II.H.1 and III.B.8). The integrations were repeated until reaching a satisfactory precision of the counts. For each run, the typical overall agreement of the observations with the international uvby standard system was for V, b-y, $m_1$, $c_1$ respectively less than $0^m.011$, $0^m.006$, $0^m.008$ and $0^m.009$. The results are presented in Tables I and II.

*Based on observations collected at the European Southern Observatory, La Silla, Chile

Table I

uvby observations of HD 30076 at the ESO 1m telescope (Sept. 1980 and Aug. 1981)

| $JD_{\odot}$ 2,440,000 + | V | b-y | $m_1$ | $c_1$ |
|---|---|---|---|---|
| 4487.8350 | 5.886 | -0.013 | 0.066 | 0.078 |
| 4835.8886 | 5.842 | -0.033 | 0.074 | 0.119 |
| 4839.8748 | 5.874 | -0.032 | 0.075 | 0.130 |
| 4841.8664 | 5.893 | -0.034 | 0.075 | 0.119 |

Table II

uvby observations of HD 30076 at the Danish 50cm telescope (Jan. 1982)

| $JD_{\odot}$ 2,440,000+ | V | b-y | $m_1$ | $c_1$ |
|---|---|---|---|---|
| 4972.6373 | 5.909 | -0.031 | 0.064 | 0.148 |
| 4973.6607 | 5.906 | -0.031 | 0.064 | 0.163 |
| 4974.6450 | 5.934 | -0.016 | 0.059 | 0.128 |
| 4975.6371 | 5.879 | -0.017 | 0.055 | 0.131 |
| 4978.5979 | 5.898 | -0.027 | 0.064 | 0.144 |
| 4979.6252 | 5.979 | -0.030 | 0.069 | 0.145 |
| 4980.5861 | 5.923 | -0.030 | 0.070 | 0.145 |
| 4981.5899 | 5.898 | -0.032 | 0.073 | 0.146 |
| 4982.6172 | 5.923 | -0.035 | 0.072 | 0.161 |
| 4983.6289 | 5.939 | -0.023 | 0.069 | 0.137 |
| 4984.6327 | 5.954 | -0.021 | 0.067 | 0.146 |
| 4985.6248 | 5.948 | -0.026 | 0.065 | 0.145 |

In Tables III and IV, we have gathered past observations of this star. The indices in the seven-colour (Geneva) system are the following (Rufener, 1981): $m_v$ = 5.890, U = 0.391, V = 1.065, $B_1$ = 0.797, $B_2$ = 1.585, $V_1$ = 1.758 and G = 2.261. The star was pointed out as a suspected variable in Rufener and Bartholdi (1982) with $\sigma_v$ = 0.035 and $\sigma$(colours) = 0.007. Feinstein (1968) found also R = 6.69 and R-I = -0.06 from two measurements in November 1965.

It is not easy to draw a light curve with all these data because the epochs are missing for most observations. But clearly, from our own observations and from the past data, variability appears to be present both on a short and long timescales with different amplitudes difficult to separate: daily fluctuations of a few hundreths of magnitude, while monthly or yearly effects are more important. The total variability seems to be fairly typical for a Be star and amounts to (from individual variations): $0^m.22$ in V, $0^m.07$ in b-y, $0^m.05$ in $m_1$, $0^m.15$ in $c_1$, $0^m.02$ in $\beta$, $0^m.06$ in U-B and in B-V.

Table III

UBV observations of HD 30076

| V | B-V | U-B | n | Ref. |
|---|---|---|---|---|
| 5.92 | -0.11 | -0.83 | | Mendoza (1958) |
| 5.90 | -0.11 | -0.81 | | Cousins (1963) |
| 5.90 | -0.13 | | | Lake (1963) |
| 5.91 | -0.09 | -0.77 | 4 | Feinstein (1968) (Jan. 1963) |
| 5.81 | -0.10 | -0.80 | 4 | " (Dec. 1964) |
| 5.79 | -0.07 | -0.77 | 4 | " (Nov. 1965) |
| 5.86 | -0.09 | -0.80 | 4 | Crawford et al. (1971) |
| 5.90 | -0.11 | -0.81 | | Nicolet (1978) |

Table IV

uvbyβ observations of HD 30076

| V | b-y | $m_1$ | $c_1$ | n | β | n | Ref. |
|---|---|---|---|---|---|---|---|
| 5.86 | 0.006 | 0.040 | 0.069 | 4 | 2.469 | 3 | Crawford et al. (1971) |
| 5.800 | 0.013 | | | | | | Grønbech (1974) ($JJ_\odot$ 42,000.79-83) |
| 5.765 | 0.023 | | | | | | " 1.74-80) |
| 5.794 | 0.024 | | | | | | " 2.67-82) |
| 5.780 | 0.017 | | | | | | " 3.75) |
| 5.760 | 0.023 | | | | | | " 4.67) |
| 5.762 | 0.015 | | | | | | " 5.76) |
| | | | | | 2.470 | 3 | Feinstein (1974) (observ. in 1970) |
| | | | | | 2.484 | 3 | " 1972) |
| | 0.006 | 0.040 | 0.069 | | 2.469 | | Hauck & Mermilliod (1975) |
| 5.836 ±0.009 | 0.034 ±0.002 | 0.021 ±0.009 | 0.015 ±0.005 | 2 | | | Grønbech & Olsen (1976a) |
| | | | | | 2.463 ±0.010 | 3 | Grønbech & Olsen (1976b) |
| 5.886 | -0.013 | 0.066 | 0.078 | 1 | | | Table I (1980) |
| 5.870 ±0.026 | -0.032 ±0.001 | 0.074 ±0.001 | 0.123 ±0.006 | 3 | | | Table I (1981) |
| 5.924 ±0.028 | -0.027 ±0.006 | 0.066 ±0.005 | 0.145 ±0.010 | 12 | | | Table II |

Table V

uvby observations of HD 172256

| $J.D._{\odot}$ 2,440,000+ | V | b-y | $m_1$ | $c_1$ |
|---|---|---|---|---|
| 4838.4851 | 8.667 | 0.120 | -0.013 | 0.159 |
| .5008 | 8.662 | 0.112 | 0.003 | 0.156 |
| .5276 | 8.658 | 0.112 | -0.005 | 0.167 |
| .5371 | 8.661 | 0.119 | -0.021 | 0.180 |
| .5585 | 8.667 | 0.111 | -0.007 | 0.180 |
| .5675 | 8.671 | 0.113 | -0.003 | 0.166 |
| .5837 | 8.686 | 0.117 | -0.013 | 0.166 |
| .5939 | 8.690 | 0.113 | -0.002 | 0.151 |
| .6179 | 8.734 | 0.107 | -0.011 | 0.149 |
| .6285 | 8.740 | 0.101 | 0.004 | 0.129 |
| .6455 | 8.743 | 0.110 | -0.008 | 0.124 |
| .6558 | 8.751 | 0.108 | -0.006 | 0.124 |
| .6733 | 8.742 | 0.106 | 0.001 | 0.111 |
| .6826 | 8.733 | 0.108 | -0.002 | 0.115 |
| 4839.4795 | 8.674 | 0.115 | -0.007 | 0.147 |
| .4903 | 8.673 | 0.109 | 0.005 | 0.140 |
| .5808 | 8.740 | 0.112 | 0.000 | 0.162 |
| .5955 | 8.740 | 0.121 | -0.011 | 0.168 |
| .6852 | 8.738 | 0.117 | -0.003 | 0.131 |
| .6971 | 8.729 | 0.124 | -0.021 | 0.146 |
| 4840.5550 | 8.750 | 0.119 | -0.007 | 0.173 |
| .5660 | 8.755 | 0.121 | -0.008 | 0.169 |
| 4841.5610 | 8.680 | 0.117 | -0.005 | 0.153 |
| .5726 | 8.678 | 0.122 | -0.018 | 0.161 |
| 4842.5432 | 8.693 | 0.119 | -0.011 | 0.144 |
| .5531 | 8.701 | 0.117 | -0.009 | 0.143 |
| 4843.6192 | 8.755 | 0.120 | -0.008 | 0.154 |
| .6291 | 8.761 | 0.121 | -0.006 | 0.156 |
| 4844.6194 | 8.704 | 0.114 | -0.006 | 0.154 |
| .6281 | 8.696 | 0.117 | -0.009 | 0.153 |
| overall average (n = 30) | $8.709\pm0.035$ | $0.115\pm0.005$ | $-0.008\pm0.006$ | $0.151\pm0.017$ |

Table V (cont.)

| | | | | |
|---|---|---|---|---|
| daily averages | | | | |
| 2,400,000+ | | | | |
| 4838 (n =14) | 8.700±0.037 | 0.111±0.005 | -0.006±0.007 | 0.148±0.024 |
| 4839 (n = 6) | 8.716±0.033 | 0.116±0.005 | -0.006±0.009 | 0.149±0.014 |
| 4840 (n = 2) | 8.752±0.003 | 0.120±0.002 | -0.008±0.001 | 0.171±0.003 |
| 4841 (n = 2) | 8.679±0.002 | 0.119±0.003 | -0.012±0.009 | 0.157±0.006 |
| 4842 (n = 2) | 8.697±0.005 | 0.118±0.002 | -0.010±0.001 | 0.143±0.001 |
| 4843 (n = 2) | 8.758±0.004 | 0.120±0.001 | -0.007±0.002 | 0.154±0.002 |
| 4844 (n = 2) | 8.700±0.005 | 0.116±0.002 | -0.007±0.003 | 0.153±0.001 |
| mean of the daily averages (n = 7) | | | | |
| | 8.715±0.030 | 0.117±0.003 | -0.008±0.002 | 0.154±0.009 |

HD 172256

HD 172256 (=SAO 187112) was found variable when used as a comparison in our observations of V348 Sgr (Heck et al., 1982), which is not too surprising since it is listed as a Be star under # 606 in Wackerling's catalogue (1970). Its radial velocity is +3.3 km $sec^{-1}$ (Wilson, 1953).

Our detailed observations are gathered in Table V. They were carried out in August 1981 at the ESO 1m telescope and the characteristics are the same as for HD 30076. The daily averages are also given in Table V. We have been unable to extract any periodicity out of the variations.

Here the amplitudes are relatively small, especially in b-y and $m_1$. It would be interesting to check the variability on a longer timescale.

A. HECK[1] AND J. MANFROID[2**]

[1]IUE Observatory, Astronomy Division, ESTEC, European Space Agency, Villafranca Satellite Tracking Station, Apartado 54065, Madrid, Spain

[2]Département d'Astrophysique de l'Université de Liege, avenue de Cointe 5, B-4200 Cointe-Ougrée, Belgium

**Chercheur Qualifié F.N.R.S.

References:

Cousins, A.W.J. 1963, Monthly Not. Astron. Soc. South Africa 22,58
Crawford, D.L., Barnes, J.V., Golson, J.C. 1971, Astron. J. 76, 1058
Danks, A.C. 1981, The ESO User's Manual, European Southern Observatory
Feinstein, A. 1968, Zeit. f. Astrophys. 68, 29
Feinstein, A. 1974, Monthly Not. Roy. Astron. Soc. 169, 171
Grønbech, B. 1974, IAU Comm. 27 Inf. Bull. Var. Stars 890
Grønbech, B., Olsen, E.H. 1976a, Astron. Astrophys. Suppl. 25, 213
Grønbech, B., Olsen, E.H. 1976b, Astron. Astrophys. Suppl. 27, 443
Hauck, B., Mermilliod, M. 1975, Astron. Astrophys. Suppl. 22, 235
Heck, A., Houziaux, L., Manfroid, J. 1982, IAU Comm, 27 Inf. Bull. Variable Stars 2184
Kukarkin, B.V., Kholopov, P.N., Efremov, Y.N., Kurochkin, N.E. 1965, Second Catalogue of Suspected Variable Stars, Moscow
Lake , R. 1963, Monthly Not. Astron. Soc. South Africa 22, 79
Mendoza, E.E.V. 1958, Astrophys. J. 128, 207
Nicolet, B. 1978, Astron. Astrophys. Suppl. 34, 1
Rufener, F. 1981, Astron. Astrophys. Suppl. 45, 207
Rufener, F., Bartholdi, P. 1982, Astron. Astrophys. Suppl. 48, 503
Wackerling, L.R. 1970, Mem. Roy. Astron. Soc. 73, 153
Wilson, R.E. 1953, General Catalogue of Stellar Radial Velocities, Carnegie Inst. Washington 601