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NEW uvbyβ PHOTOMETRY OF STARS OF "ASTROPHYSICAL INTEREST"

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This note reports the continuation of a project designed to acquire Strömgren–Crawford indices for stars of "astrophysical interest", mostly variable or candidate variable stars in the lower instability strip, for which this information was missing so far. The first part of the measurements was published by Handler (1995).

Since this program is being carried out during "leftover" observing time, progress is rather slow. Consequently, we consider it most useful to release the data for use of the community as soon as a reasonable amount has been collected, as opposed to waiting for the completion of the whole project (which could never happen).

The bulk of our observations (including *all uvby* measurements) was acquired with the 50-cm telescope at the South African Astronomical Observatory (SAAO) in July and November, 1999. A few additional Hβ measurements were taken with the McDonald Observatory 91-cm telescope in March 1996 and with the SAAO 75-cm telescope in October, 1999. We took care that also for fainter stars a sufficient number of counts ($\geq 100\,000$) was collected in each filter.

Transformations were calculated for each observing run separately by using a sufficient number of standard stars (10–30, depending on the observing run). A colour term was included in the equations. Care was taken that the standard stars spanned a larger range in color indices than the program stars did. Average zeropoints were applied for each observing run as well, with the exception of the November 1999 run which was spread out over several nights so that nightly zeropoint corrections for the V magnitude were found necessary; the transformation equation was recalculated thereafter. The rms residuals of a single standard star measurement were typically around 6 mmag for V and β, 3 mmag for $(b-y)$ and 12 mmag for m_1 and c_1, respectively. We are careful to note that these values may not always apply to the program stars, which are often fainter than the standards and which are mostly variable stars.

Our results are summarized in Table 1, where the program stars are ordered by increasing HD number. Objects without a HD identification can be found at the end of Table 1 in alphabetical order. We would now like to describe a few interesting findings from our results:

Table 1: $uvby\beta$ photometry of program stars

Star	V	$b-y$	m_1	c_1	β
HD 984					2.636
HD 4494	9.45	0.177	0.171	0.779	2.762
HD 12389					2.861
HD 12901					2.719
HD 13755					2.723
HD 14147					2.747
HD 14940					2.737
HD 16723					2.769
HD 17978	9.60	0.177	0.163	0.838	2.745
HD 21438					2.805
HD 22625	9.27	0.224	0.175	0.664	
HD 27093	7.45	0.126	0.164	1.021	2.801
HD 29870					2.712
HD 32195					2.625
HD 33957					2.879
HD 34025	7.85	0.261	0.155	0.608	2.688
HD 34409					2.727
HD 38643					2.768
HD 41448	7.62	0.189	0.184	0.693	2.747
HD 42304					2.749
HD 42503	7.46	0.130	0.139	1.057	2.779
HD 58453					2.742
HD 59594	7.33	0.126	0.167	0.832	2.803
HD 63176					2.727
HD 65526	6.98	0.188	0.151	0.662	2.734
HD 66829	9.22	0.242	0.152	0.559	2.713
HD 77347					2.766
HD 79766	8.87	0.148	0.172	0.814	2.800
HD 81421	6.97	0.173	0.169	0.754	2.751
HD 87271	7.10	0.151	0.094	0.939	2.775
HD 99267					2.724
HD 108100					2.705
HD 173173					2.673
HD 177120	6.74	0.157	0.118	1.091	2.813
HD 184190	9.76	0.232	0.113	0.693	
HD 187615	7.98	0.207	0.153	0.692	
HD 192871					2.741
HD 193084	7.61	−0.029	0.121	0.561	2.764
HD 199434	8.71	0.271	0.205	0.690	
HD 207651					2.834
HD 209295	7.29	0.139	0.185	0.840	2.821
HD 213669	7.40	0.155	0.113	0.835	2.758
HD 214291					2.627
HD 218225	8.71	0.235	0.182	0.649	2.705
HD 221866	7.44	0.151	0.207	0.766	2.791
HD 230990					2.781
HD 261331	9.73	0.136	0.187	0.992	2.784

Table 1 (continued)

Star	V	$b-y$	m_1	c_1	β
HD 261446	10.32	0.243	0.225	0.719	2.706
HD 290764	9.92	0.208	0.170	0.859	2.720
AI Hya					2.764
BD +21°1613	9.34	0.309	0.125	0.358	2.639
BD +21°1616	9.28	0.222	0.150	0.586	2.694
CD −41°15264	10.31	0.378	0.170	0.344	
GSC 4778-00324	10.26	0.202	0.168	0.894	2.797
V829 Aql	10.28	0.390	0.135	0.748	2.675

HD 42503, HD 87271, HD 213669: These are all suspected δ Scuti stars from HIPPARCOS photometry, but they also turned out to be quite metal-poor. It is suspected that they could be λ Bootis stars or even Pop. II objects.

HD 193084: This star was found to be a short-period variable by Paunzen (1997), who noted that its spectral classification (B8 V) makes it a very interesting object if it turned out not to be a binary. Our photometry corroborates this spectral classification. A detailed study of HD 193084 is recommended.

HD 209295: This is the hottest γ Doradus star known to date. Handler (1999a) did not consider it for his outline of the γ Doradus star domain in the HR diagram, since he was suspicious of the published $(b-y)$ (Twarog 1980). Our new measurement confirms this value, however. On the other hand, evidence for binarity of HD 209295 has recently been discovered (Balona 1999).

BD +21° 1613, BD +21° 1616: Handler (1999b) suspected that one of these stars is variable, but he was unable to determine which one. The Strömgren–Crawford indices of BD +21°1616 are typical for a γ Doradus star (Handler 1999a). We also note that BD +21°1613 seems quite metal-poor.

HD 261446: This is a pre-main sequence δ Scuti star (Breger 1972) in the open cluster NGC 2264. It has a rather high m_1 compared to the second δ Scuti star (HD 261331) in this cluster. Since the astrophysical interpretation of this result is not straightforward, we solicit an investigation of this star's spectrum.

V 829 Aql: This is one of only three radial triple-mode pulsators among δ Scuti stars (Handler, Pikall & Diethelm 1998). Our photometry puts the star somewhat outside the cool luminous border of the δ Scuti instability strip (Breger 1979); requiring $Q = 0.033$ for the longest period mode moves it even further out.

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