WALRAVEN VBLUW PHOTOMETRY OF FIVE SUSPECTED VARIABLE STARS*

While observing pulsating variable stars with periods between one and
three days with the Walraven five channel photometer attached to the Dutch
91 cm telescope at the European Southern Observatory, La Silla, Chile, five
stars suspected of variability were observed occasionally in order to confirm
their variability. They were selected on the grounds of the spectral informa-
tion given in the "New Catalogue of Suspected Variable Stars" (Kholopov et.
al, 1982).

For a detailed analysis of the properties of the VBLUW system and its
instrumental implementations, we refer the reader to the article by Lub and
Pel (1977) and the references given therein. For the understanding of the
tables in this paper it is necessary to recall the fact, that in the Walraven
system all measurements are expressed in terms of log(intensity) units.

All the data presented in this paper were obtained differentially in
respect to nearby comparison stars whose intensities were tied into the
standard Walraven system by frequent and nightly observations of a number of
primary standards. The conventional transformation and extinction formulae
were applied. The integration times (most of the time in the order of a few
minutes) were chosen with the aim of attaining a 1% accuracy. A more detailed
description of the observing procedures and their internal errors will be
given in a subsequent paper on the observations of known pulsating variables.

Table 1 contains all the data on the five local standards used as compar-
ison stars. Nights of photometric quality were only used for the determina-
tion of these values. The columns give: (1) HD number, (2) Walraven data
with standard deviations, (3) number of observations and (4) V_J magnitude
as derived by the conversion formula given by Pel (1976) and NSV-number of
the corresponding variable. The standard deviations listed indicate non-
variability of the comparison stars at the 0.01 magnitude level.

Table I

VBLUW-data for the five local standards used

HD	V	V-B	B-U	U-W	B-L	n	V_J	
8188	-0.3212	0.2176	0.3138	0.1933	0.2142	4	7.64	
	± 48	12	32	45	45		(NSV 470)	
160069	-0.4483	0.0055	0.2356	0.0594	0.0730	11	7.99	
	± 49	15	16	57	39		(NSV 9246)	
177681	-1.0117	0.1204	0.3161	0.1210	0.1184	7	9.38	
	± 41	29	25	42	39		(NSV 11708)	
189270	-0.6963	0.2278	0.2899	0.1825	0.2048	11	8.57	
	± 67	33	35	62	47		(NSV 12665)	
213543	-0.7870	0.1672	0.3428	0.1788	0.1922	6	8.81	
	± 31	14	49	62	44		(NSV 14164)	

Notes on individual stars:

NSV 470 = BV 637 = HD 8093 (F0): The star was discovered by Strohmeier, Knigge and Ott (1965) as variable with an amplitude of 0.3 m_{pg}. Table II lists our data on this suspected variable. As in Table I, for the convenience

Table II

VBLUW-data for NSV 470 = BV 637 = HD 8093

JD_{hel}	V	V-B	B-U	U-W	B-L	V_J	$B-V_J$
2445541.817	-0.746	0.147	0.363	0.172	0.195	8.72	0.36
.855	-0.752	0.148	0.358	0.169	0.193	8.73	0.36
542.851	-0.757	0.147	0.361	0.162	0.188	8.74	0.36
.873	-0.758	0.146	0.361	0.163	0.192	8.75	0.36
544.871	-0.748	0.144	0.358	0.160	0.190	8.72	0.36
.906	-0.755	0.150	0.360	0.163	0.196	8.74	0.37
546.858	-0.754	0.146	0.361	0.167	0.198	8.74	0.36
551.820	-0.763	0.145	0.365	0.162	0.195	8.76	0.36

of the reader, the transformation into the Johnson BV system is provided, employing Pel's formula (1976) as well as Table 7 of Walraven, Tinbergen and Walraven (1964). A slight correction term due to the changes in the V-band sensitivity as determined by Lub and Pel (1977) has been added. Our observations do not confirm the variability with the given amplitude during ten nights of monitoring. Thus, the star is not a short-period Cepheid.

NSV 9246 = BV 547 = HD 159654 (F5 Ib): The variability of this star was first
noted by Strohmeier, Knigge and Ott (1964). They observed an amplitude of
0.6 m_{pg}. Our data, covering 58 nights and listed in Table III, confirm the

Table III

VBLUW-data for NSV 9246 = BV 547 = HD 159654

JD_{hel}	V	V-B	B-U	U-W	B-L	V_J	$B-V_J$
2445540.653	-0.099	0.306	0.549	0.328	0.286	7.07	0.74
.778	-0.108	0.299	0.525	0.283:	0.278	7.10	0.72
541.646	-	0.358	0.541	0.342	0.306	-	0.86
.759	-0.226	0.375	0.557	0.384	0.352	7.38	0.89
542.666	-0.231	0.367	0.543	0.355	0.335	7.39	0.88
544.784	-0.153	0.340	0.530	0.313	0.307	7.20	0.82
545.546	-0.236	0.378	0.543	0.356	0.346	7.40	0.90
546.537	-0.175	0.336	0.540	0.338	0.310	7.26	0.81
.742	-0.146	0.323	0.546	0.334	0.302	7.19	0.78
547.491	-0.114	0.312	0.555	0.337	0.293	7.11	0.76
.642	-0.123	0.315	0.554	0.340	0.299	7.13	0.76
.683	-0.134	0.319	0.562	0.345	0.306	7.16	0.77
548.502	-0.223	0.368	0.546	0.357	0.341	7.37	0.88
551.518	-0.174	0.349	0.549	0.348	0.321	7.25	0.84
564.533	-0.120	0.317	0.556	0.327	0.305	7.12	0.77
566.499	-0.209	0.355	0.543	0.348	0.328	7.34	0.85
582.495	-0.224	0.373	0.551	0.355	0.349	7.37	0.89
583.611	-	0.342	0.546	0.338	0.319	-	0.82
585.545	-0.208	0.358	0.560	0.353	0.336	7.34	0.86
593.504	-0.218	0.359	0.542	0.328:	0.328	7.36	0.86
596.506	-0.234	0.375	0.547	0.349	0.348	7.40	0.89
597.495	-0.144	0.320	0.545	0.339	0.300	7.18	0.77
598.528	-0.134	0.326	0.555	0.343	0.309	7.16	0.79

variability both in brightness and in colour, indicating Cepheid variation.
Our observation are sufficient to deduce preliminary elements using the
method of Stellingwerf (1978), namely:

$$JD(max) = 2445540.43 + 3.3825 * E$$
$$\pm.05 \quad \pm.015 \quad (me)$$

In Figure 1 the Walraven V, V-B and B-U light and colour curves are depicted,
phased according to these elements. These light curves show that NSV 9246 is
a small amplitude disc population Cepheid, therefore it pulsates in the first
harmonic mode.

NSV 11708 = SVS 994 = BD-05°4861 (F5): The first mentioning of a possible
variation of this star with an amplitude of one magnitude (photographic) and
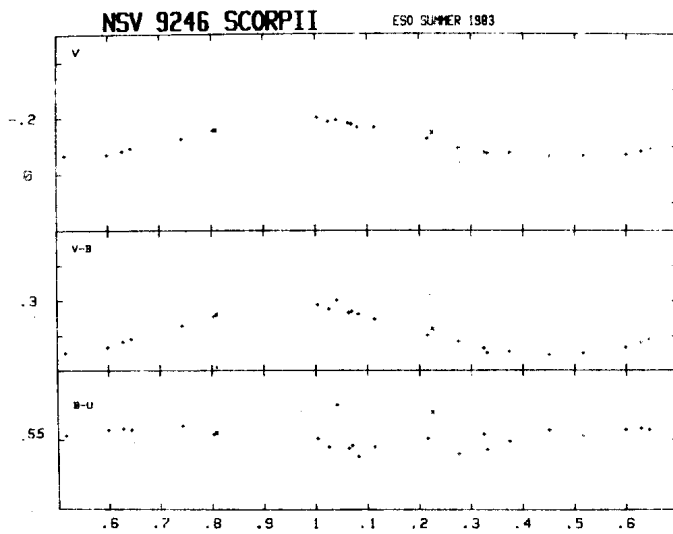
Figure 1

Light and colour curves of NSV 9246 in the Walraven system phased
according to the elements $JD_{hel} = 2445540.43 + 3.3825 * E$

a possible EA classification was provided by Soloviev (1945). Our data as
listed in Table IV might lend some support to this classification. A slight
decrease of the brightness ($\Delta V \sim 0.1m$) was observed on JD 2445541 during a
two and a half hour timespan. The period is probably rather long.

Table IV

VBLUW-data for NSV 11708 = SVS 994 = BD $-05^{O}4861$

JD_{hel}	V	V-B	B-U	U-W	B-L	V_J	$B-V_J$
2445540.701	-1.324	0.259	0.403	0.263	0.240	10.14	0.63
541.670	-1.330	0.263	0.407	0.269	0.235	10.16	0.64
.767	-1.362	0.252	0.423	0.288	0.248	10.24	0.62
542.740	-1.325:	0.265	0.413	-	0.235	10.14:	0.64
544.791	-1.336	0.258	0.414	0.250	0.245	10.17	0.63
546.725	-1.338	0.261	0.412	0.229	0.230	10.18	0.64
547.562	-1.331	0.254	0.421	0.238	0.236	10.16	0.62
551.686	-1.344	0.251	0.416	0.237	0.235	10.19	0.62

NSV 12665 = BV 1477 = HD 189306 (F2): The star was reported to be variable
with an amplitude of 0.3 m_{pg} by Strohmeier (1971). Our observations listed
in Table V indicate a slight variability by only a few hundredths of a
magnitude in V.

Table V

VBLUW-data for NSV 12665 = BV 1477 = HD 189306

JD_{hel}	V	V-B	B-U	U-W	B-L	V_J	$B-V_J$
2445540.771	-0.526	0.190	0.358	0.189	0.212	8.16	0.47
.854	-0.490:	0.187	0.362	0.202	0.212	8.07:	0.46
541.707	-0.524	0.187	0.351	0.190	0.211	8.15	0.46
.773	-0.530	0.194	0.350	0.196	0.213	8.17	0.48
.839	-0.540	0.199	0.369	0.220	0.228	8.19	0.49
542.746	-0.527	0.188	0.352	0.196	0.209	8.16	0.46
.864	-0.524	0.191	0.351	0.194	0.211	8.15	0.47
544.821	-0.524	0.190	0.348	0.200	0.212	8.15	0.47
546.749	-0.524	0.189	0.349	0.194	0.211	8.15	0.47
547.676	-0.523	0.189	0.350	0.194	0.208	8.15	0.47
551.808	-0.533	0.191	0.350	0.192	0.212	8.18	0.47

NSV 14164 = BV 793 = HD 212936 (F5): The last star in our sample was found
by Strohmeier, Fischer and Ott (1966) to be variable with an amplitude of
0.4 m_{pg}. The nine observations collected in Table VI show no variability
exceeding the internal errors of the measurements. If the star is variable
at all, it is probably an eclipsing binary.

Table VI

VBLUW-data for NSV 14164 = BV 793 = HD 212936

JD_{hel}	V	V-B	B-U	U-W	B-L	V_J	$B-V_J$
2445541.749	-1.066	0.176	0.350	0.183	0.206	9.51	0.44
.814	-1.070	0.170	0.342	0.178	0.208	9.52	0.42
.863	-1.064	0.169	0.350	0.175	0.207	9.51	0.42
542.753	-1.059	0.168	0.344	0.170	0.201	9.49	0.42
.869	-1.061	0.170	0.338	0.182	0.195	9.50	0.42
544.867	-1.060	0.165	0.334	0.164:	0.194	9.50	0.41
.912	-1.066	0.172	0.338	0.180	0.196	9.51	0.43
546.853	-1.070	0.173	0.346	0.188	0.208	9.52	0.43

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European Southern Observatory for the allotment of observing time on the
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