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AN ATLAS OF LIGHT AND COLOUR CURVES OF FIELD RR LYRAE STARS*

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An Atlas is presented of light and colour curves in the Walraven *VBLUW* photometric system for 90 field RR Lyrae and short-period variables. The observational programme and the reduction procedure are briefly described. Tables are presented containing the colours at mean and minimum light.

Key words: RR Lyrae stars – variable stars – photometry

1. INTRODUCTION

This paper presents the results of an extensive programme of photoelectric photometry of RR Lyrae and short-period variable stars. The measurements were obtained by several Leiden observers during the years 1966 to 1976 with Walraven's simultaneous five-channel photometer attached to the 90 cm Light Collector at the Leiden Southern Station near Hartebeespoortdam, South Africa.

The initiative for this project was taken by Dr. G. van Herk. In his work on the proper motions of RR Lyrae stars (van Herk 1965) he found that, especially in the Southern Hemisphere, the lack of good photometric data, in particular $(B-V)$ and light amplitude, as well as population criteria made a meaningful subdivision of his material very difficult. Therefore he asked the Leiden photometrists to extend the already available measurements of only a few RR Lyrae stars in the Walraven *VBLUW* system (Ponsen and Oosterhoff 1966; Oosterhoff and Walraven 1966) to more variables.

The first *VBLUW* observations were very fragmentary and unevenly distributed in phase as compared with the present data and are not presented here. However, they proved to be sufficiently interesting to continue the programme. As a first result Van Herk found that a correlation exists between the strength of the bumps that "type a" RR Lyrae lightcurves exhibit near minimum light, and Preston's ΔS parameter, which is an indicator of metal-line strength. He presented this result at the IAU in Brighton, 1970 (van Herk 1971).

As it was judged very important to be able to derive from the lightcurve alone a reddening-free population criterion, a major survey of *VBLUW* photometry of about 100 field RR Lyrae stars was started. Its aim was to obtain a continuous coverage of each lightcurve, including the bumps near minimum light. This new programme required a very considerable observing effort, which task has rested largely upon the shoulders of Dr. A.M. van Genderen, resident astronomer at the Leiden Southern Station.

In the beginning of 1973, after the retirement of Dr. van Herk in 1972, the author took over the project. In the meantime it had become evident, however, that the *VBLUW* data on RR Lyrae stars show, apart from their original purpose (*i.e.* the study of the secondary maxima as a population criterion), many other interesting aspects. The present observations (complete lightcurves in five simultaneous channels) and the properties of the *VBLUW* photometric system (a good separation of abundance, temperature and gravity effects for A, F and G stars) are well suited for a detailed study of the variation of effective temperature and gravity over the whole pulsation cycle for a large number of RR Lyrae and related variables. Up till now such a study has been done for only a few RR Lyrae stars (Oke and Bonsack 1960, Oke *et al.* 1962, Oke 1966, van Albada and de Boer 1975).

The last two authors also discuss the possibility of deriving the physical properties of the equilibrium state of a variable star from photometry over the whole cycle. This provides an important test of the theoretical pulsation models.

* Based on observations mainly by Dr. A.M. van Genderen.

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During the last decade our knowledge of the colours of RR Lyrae stars has much improved due to the large surveys of Fitch *et al.* (1966), Sturch (1966) and Clube *et al.* (1969), who used *UBV* photometry, as well as Epstein (1969, 1973) and Jones (1973), who used Strömgren photometry or a modification thereof. Most of these data, however, are either not very well suited for a study of the pulsation behaviour of RR Lyrae stars (*UBV* photometry) or cover only particular phases of the light variation.

With the *VBLUW* photometer, J.W. Pel has recently observed a large number of Cepheids in the Southern Milky Way (Pel 1976a and 1976b). In many ways this study of cepheids and the present RR Lyrae programme are supplementary especially with respect to the determination of the physical parameters that characterize the stellar photosphere. Several aspects of the *VBLUW* photometry which are of importance to both studies were therefore discussed in a common paper (Lub and Pel 1977). That paper includes a calibration of the *VBLUW* photometry in terms of physical parameters for intermediate type stars, using the grid of model atmospheres by Kurucz (1975). This calibration will be the basis for the interpretation of the RR Lyrae material.

Section 2 of the present paper first describes the observing programme; section 3 discusses the observing procedure; section 4 summarizes the reduction and section 5 contains details on the atlas of lightcurves, a description of the tables and a list of remarks on individual variables. Following papers will deal with the derivation of line-blanketing, interstellar reddening and physical parameters for RR Lyrae stars. We shall study the physical behaviour of RR Lyrae stars over their pulsation cycle, as well as the form of their lightcurves and compare this with the large number of theoretical pulsation computations now available (*e.g.* Christy 1966, Stellingwerf 1974). A separate article is planned to present and discuss extensive measurements of several short period (RRs) variables.

For the construction of the instrument and the general properties of the *VBLUW* photometric system we refer to Walraven and Walraven (1960), Rijf *et al.* (1969) and Lub and Pel (1977). One remark is in order here: in *VBLUW* photometry it is usual to express all quantities in units of $^{10}\log$ (intensity) rather than in magnitudes.

2. THE PROGRAMME

The initial observing list, which was selected by Dr. G. van Herk and A.A. Schoenmaker, consisted of RR Lyrae stars South of declination $+15°$ and with visual magnitudes at minimum light brighter than $V_J \sim 12^{m}.5$. Here V_J is the visual magnitude on the *UBV* photometric system. Care was taken to choose the stars in such a way that a good coverage of the (period – ΔS) plane was obtained. No attempt was made to be "complete" in any respect.

The author has added a few bright variables to the programme after 1973, because these would allow a higher accuracy to be obtained in the ultraviolet channels. At the beginning of 1973 the state of the programme was reviewed and several fainter stars were deleted from the list. This left a total of 90 variables. The distribution of the variables in the (period – ΔS) plane is not affected by this choice.

The final measurements presented in this paper were done in summer 1974, but during 1975 and 1976 several interesting stars were reobserved or newly added to the programme. These additional data will be published separately.

Periods and epochs for the variables were taken first from the Second Edition of the General Catalogue of Variable Stars (Kukarkin *et al.* 1958) and later from the third edition and its supplements (Kukarkin *et al.* 1969, 1970, 1972, 1974, hereinafter referred to as the GCVS). Identification charts for the majority of the variables were found in the Odessa atlas of identification charts (Tsesevich and Kazanasmas 1963). Each variable was observed relative to a nearby reference star, which during the initial stages of the project usually was taken to be the comparison star indicated on the Odessa chart. As the latter star was often not very well suited with respect to bringhtness or spectral type, we soon decided to use only stars of spectral type A or F within 30′ from the variable, chosen from the Henry Draper catalogue.

In 1973 a programme of bright stars of spectral types A, F and G was observed by Dr. A.M. van Genderen, along with the variable star programme. A discussion of these measurements and their application to the calibration of the *VBLUW* photometric system has already been given by Lub and Pel (1977). Similar programmes were carried out during the following observing seasons, but are as yet unreduced.

3. THE OBSERVATIONS

Long continuous runs of observations were made in order to cover the lightcurves in as few nights as possible. Ideally a lightcurve should be completed in one observing run, because of the possibility of variations in the form and the amplitude of the lightcurve, the so-called Blazhko effect. In practice this was feasible only for the variables with the shorter periods.

The observations were much facilitated by the use of time-tables prepared by Mr. A.A. Schoenmaker. For all variables and every night these give phases and air masses for each hour of South African Standard Time. In this way it proves easy to fill in gaps in the lightcurves caused by bad weather conditions or an unfavourable period.

No fixed observing sequence was used; instead, the way in which the measurements were alternated between variable, reference star and sky was adjusted to their relative brightness and to the quality of the night. The basic integration time of the photometer was fixed at 30 seconds; longer integrations were made by repeating the measurements. Typically the RR Lyrae measurements were made with two integrations *i.e.* 1 minute, but in the case of fainter variables or stars with long periods more integrations were made for a single measurement.

Before accepting a reference star a check was made for optical companions. Normally a 23″ diaphragm was used for the observations, so in general it is expected also that the light of the variable star is not contaminated by optical companions. (For a few typical cases see the discussion by Jones (1973)).

At Hartebeespoortdam the sky conditions have been slowly deteriorating during the last decade, mainly due to smog from the nearby cities. However, it appeared that by rapidly alternating between variable and reference star it was possible to continue observing on many "non-photometric" nights. Exceptionally clear nights were selected to observe the reference stars together with the standard stars and so tie them to the *VBLUW* standard system.

The observers who took part in observing the programme are: A.M. van Genderen in 1966, W. Wamsteker in 1968, J.W. Pel in 1970, during 1971 to 1974 again A.M. van Genderen, and in the spring of 1974 C.J. van Houten and W. van Vliet. Additional observations in 1975 and 1976 were made by A.M. van Genderen, F. van Leeuwen and W. Bijleveld.

4. REDUCTION

Considering the fact that we had to process more than a hundred thousand integrations, each in five channels, the whole reduction had to be done by computer–it should be remarked here that these data are the equivalent of 200 or more observing nights of eight hours. Initially this was done by Mr. A.A. Schoenmaker, during the later stages Mr. J. Schafgans provided much assistance. Mrs. M. Wisse took part in the tedious task of finding all punching errors in the raw data. The various reduction procedures are well described by Pel (1976a) and need not be fully repeated here. In the following only a few details are given.

4.1. The Variables

The variables are reduced differentially with respect to the reference stars. In the computer programmes the amount of smoothing applied to the sky background and the reference star could be prescribed such that the effects of variations in either this background or the sensitivity of the instrument would be as small as possible. To account for the difference in airmass between the variable and the reference star a mean extinction coefficient is used. This might only in some very extreme cases–airmass differences greater than 0.010–cause an error larger than 0.001 in ^{10}log (intensity) in the derived colours. The table below gives the equivalent wavelengths of the photometric passbands as well as the standard extinction coefficients κ_s (in units of ^{10}log (intensity)) that were used.

	V	*B*	*L*	*U*	*W*
λ_{eff} (Å)	5470	4325	3840	3630	3260
κ_s	0.102	0.173	0.240	0.286	0.459

Finally Heliocentric Julian days and phases are calculated for the measurements and the data are plotted. Using these plots it is possible to study the quality of the observations and decide from the internal accuracy of the data which data points have to be deleted (see section 5.2.). In no case was any smoothing applied to the variable star data. Also it was possible in this way to find improvements of the light elements (see the following section).

4.2. The Reference Stars

The reference stars were brought unto the standard *VBLUW* photometric system using the extinction and instrumental zeropoints obtained from the standard stars by the relation:

$$I = i + a + \kappa(m-1)$$

where i is the measured ^{10}log (intensity), I the corresponding value on the standard system, a the correction for instrumental sensitivity, κ the extinction coefficient and m the airmass through which the star has been observed. No colour terms are necessary in this determination, as discussed by Pel (1976b) and Lub and Pel (1977).

5. PRESENTATION OF THE DATA

It was already indicated in section 4 that the amount of data collected is quite formidable. Therefore we had to decide upon the best way in which to present the measurements: extensive tables have distinct disadvantages as compared with a graphical representation, especially in the case of lightcurves. The data are presented in the form of an atlas with accompanying tables that give certain mean quantities characterizing the light and colour curves of each variable. The complete data will be made available on magnetic tape.

5.1. The Atlas

Figures 1,1 to 1,45 show the light and colour curves. Two variables are presented per figure. For each variable are given the lightcurves in *V* and *B*, as well as the colour curves *V–B, B–U, B–L* and in several cases *U–W*. The *B* lightcurve is displayed because it shows the secondary maxima most clearly.

The variables are ordered by type: short-period (RRs), RRc and RRab respectively. Within each type the variables are ordered by increasing period.

For the fainter variables the signal in the *W* channel is so weak that it is not worthwile to publish the *(U–W)* curve. As a quality criterion the rms scatter in the *(U–W)* curve around minimum light is used: whenever this scatter exceeds 10% (or 0.040 in ^{10}log (intensity) units) the $(U-W)$ curve is not displayed. A further discussion of the accuracy of the measurements will be found in part 5.2 of this section.

In most cases it was judged to be sufficient to derive only a new maximum epoch from our measurements. New light elements were determined only if the GCVS period is manifestly in error; in that case the new light elements are given in part 5.3. of this section: Remarks on Individual Variables. Usually our own measurements were sufficient for the determination of a new period by making use of the information that is contained in the slopes of the separate but continuous pieces that make up each lightcurve (this was done for RZ Cet, U Pic, CG Lib, V494 Sco and AO Tuc). Such new periods are expected to be accurate to one part in 10^5 or 10^6 (when rising branches are fitted).

New heliocentric epochs were determined from the B lightcurves as follows. For stars of type c, *i.e.* with symmetric lightcurves, we took the epoch of the point halfway between median light on the rising and descending part of the lightcurves. In the case of variables with asymmetric lightcurves, *i.e.* mainly stars of the ab-type, epochs of maximum were used. This was done in the following way: mean tangents were drawn along the rising and falling part of the lightcurve. The bisectrix of the angle between these two lines was constructed, and the phase of maximum light was taken as the intersection of this bisectrix and the level of maximum light. Epochs derived in this way are accurate to within 0.002.

5.2. The Tables

Information on the variables and their reference stars can be found in tables 1 and 2 respectively. Sturch (1966) has shown the usefulness of observations made over the phase interval 0.50–0.80 (minimum light) for the determination of metal line blanketing in RRab type stars. Mean colours for the variable stars at minimum light are therefore given in table 3 (for other types these minimum light colours have been determined at phase 0.50). Also given in tables 2 and 3 are accuracies of the colours which they contain. The stars have been ordered by right ascension in all tables (for the epoch 1900.0).

The accuracy of the colours given in these three tables must now be further discussed, as this is the foundation upon which much of the further work will be built. For the reference stars the accuracy was derived from the number of nights on which they were observed together with the standard stars and the standard deviation from the measurements, whereas for the variables we determined the accuracy by considering the colours near minimum light, where all light and colour curves change very slowly, if at all. Here it was possible to derive this accuracy from the standard deviation of a single observation for several groups of 8 observed points. By going back again to the original observations, we checked that the scatter within a group is mainly due to observational scatter. The accuracy of the minimum light colours is therefore given in table 3 as the standard deviation of a single observation divided by the square root of the number of points contributing to the average colours at minimum light.

Average colours over the whole lightcurve are more accurate by a factor of two or more. The average colours in table 1 have been obtained by a simple integration of the light and colour curves in $^{10}\log$ (intensity) units over the period.

Also contained in table 1 is Preston's ΔS parameter for each variable as calculated by van Herk and Schoenmaker from the general literature on that subject (van Herk 1971) or else taken from the GCVS.

For the calculation of the visual brightness of the reference stars on the UBV system, V_J, given in table 2 the formula given by Pel (1976a) was used, i.e.: $V_J = 6^m.874 - 2.5\,\{V + 0.065(V-B)\}$.

5.3. Remarks on Individual Variables

In this subsection information is given on those variables for which new lightelements have been obtained or which show peculiarities in their lightcurves. As in the tables the stars are ordered by right ascension.

SS For: The behaviour of the reference star has been carefully checked and it has to be concluded that the variations near minimum light are real. In September 1975 further observations were obtained near minimum light, but these are as yet unreduced.

RZ Cet: New lightelements were derived by fitting the 1968 and 1973 measurements together; the lightcurve contains all points. The new elements are: max = Hel.J.D. 2442014.369 + 0.5106077 × E.

U Pic: New lightelements were derived from our measurements and the GCVS epoch: max = Hel.J.D. 2441666.449 + 0.4403710 × E.

RY Col: This RR Lyrae star shows strong Blazhko effect. The new epoch is only valid for the one maximum observed.

HH Pup: The peculiar shoulder on the descending part of the lightcurve is present in observations on two consecutive nights. However the *UBV* lightcurve by Warren (1966) does not show it and also its form is much more characteristic of low ΔS, high amplitude RR Lyrae stars.

WY Ant: New lightelements were derived from our data and the GCVS epoch: max = Hel.J.D. 2440645.303 + 0.57433095 × *E*.

SS Leo: New lightelements were obtained from the present data and additional measurements by Pel (in 1970): max = Hel.J.D. 2441781.406 + 0.6263432 × *E*.

AP Ser: The lightcurve shown here was observed by van Genderen in 1973. Observations by van Genderen in 1966 show a lightcurve much more characteristic of a c-type variable. In order to study the lightcurve variations additional measurements were made in 1975 (as yet unreduced).

TV Lib: The present observations were obtained by van Genderen in 1973. Van Genderen in 1966 and Pel in 1970 also observed this variable. From all *VBLUW* data at hand the following new lightelements are found: max = Hel.J.D. 2441809.396 + 0.2696242 × *E*.

FW Lup: This variable was in Pel's survey of Cepheids (Pel 1976a); he found however, that it is an RR Lyrae star. The present observations were obtained by van Houten in 1974. The lightelements given here are derived from all available *VBLUW* data: max = Hel.J.D. 2442171.377 + 0.4841712 × *E*.

AR Ser: Due to the very strong Blazhko effect the epoch given is valid only for the one maximum observed. In order to derive a better lightcurve and study the amplitude variations further observations were made in 1975 (as yet unreduced).

CG Lib: Schoenmaker found from an analysis of the *VBLUW* data that only a period of 0.3067 satisfied the observations instead of 0.443050 as given by Clube *et al.* (1969). This is in accordance with the period of 0.3068674 derived by Cacciari (1975) from the observations of Clube *et al.* With this period the lightcurve is a characteristic c-type lightcurve.

UV Oct: The epoch given for this variable with Blazhko effect is a mean maximum epoch from two maxima at differing amplitude, and is useful solely for plotting the data points.

V494Sco: New lightelements were derived from our epoch and the GCVS epoch: max = Hel.J.D. 2441126.388 + 0.4273326 × *E*. With these new lightelements all parts of the lightcurve fit very well together. However our *B* amplitude, $1^{m}.27$, is much lower than the value of $1^{m}.66$ by Kinman (1961); also its colours are very similar to those of RV Cap, so it is very probable that V494 Sco also shows the Blazhko effect.

V703Sco: Extensive *VBLUW* observations by Ponsen have been discussed by Oosterhoff (1966). This star shows very strong modulations of the lightcurve and unfortunately our measurements were done at very low amplitude. Therefore no new maximum epoch was derived.

S Ara: New lightelements were derived from our measurements and the old GCVS epoch: max = Hel.J.D. 2441152.417 + 0.451883 × *E*.

V 675 Sgr: New lightelements were derived from our measurements and the old GCVS epoch: max = Hel.J.D. 2441180.370 + 0.6422895 × *E*.

V 455 Oph: New lightelements derived from our measurements and the old GCVS epoch: max = Hel.J.D. 2441833.389 + 0.4539182 × *E*.

V 440 Sgr: From all available *VBLUW* data (complete lightcurves have been measured both in 1968 and 1971) new lightelements were derived: max = Hel.J.D. 2441509.445 + 0.47747883 × *E*. The lightcurve contains all available data points.

DN Pav: Using two complete lightcurves from 1968 and 1971–1972, new lightelements were derived: max = Hel.J.D. 2441183.397 + 0.46844376 × *E*.

The lightcurve contains all available points; for the L band, the minimum observed in 1972 was not used in forming the averages.

V 341 Aql: From all available *VBLUW* data (complete lightcurves from 1971 and 1968) new lightelements were derived: max = Hel.J.D. $2441196.251 + 0.57802054 \times E$. The lightcurve contains all data points.

DX Del: A few measurements near minimum light fit poorly, possibly due to real variations.

RV Cap: A mean maximum epoch from two maxima at differing amplitude was determined, useful only for plotting the lightcurve.

YZ Cap: The present lightcurve was obtained by van Genderen in 1973; he has observed also a complete lightcurve in 1966. New lightelements were derived from all available *VBLUW* data:
max = Hel.J.D. $2441872.444 + 0.27345698 \times E$.

SX Aqr: New lightelements were derived using also a maximum observed by van Genderen in 1966: max = Hel.J.D. $2441868.445 + 0.53571386 \times E$.

RT Gru: As for other stars which show the Blazhko effect, a mean maximum epoch was derived, useful only for plotting the data points.

SX Phe: No new epoch was derived. Extensive *VBLUW* observations by Wamsteker in 1968 will be presented and discussed separately.

AO Tuc: New lightelements were derived using the present observations and those of Ponsen (Ponsen and Oosterhoff, 1966): max = Hel.J.D. $2441948.542 + 0.3332332 \times E$.

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Table 3 Minimum light colours of the RR Lyrae stars.

STAR	V–B		B–U		U–W		B–L		N
RY PSC	.167	1	.355	3	.206	17	.175	2	48
W TUC	.162	1	.378	3	.210	8	.161	2	63
AM TUC	.128	2	.375	3	.152	13	.153	2	32
RR CET	.169	1	.367	1	.187	4	.171	1	42
SV SCL	.108	1	.401	3	.197	11	.159	2	24
SS FOR	.157	1	.369	1	.186	3	.164	1	54
RZ CET	.164	1	.366	3	.202	9	.170	2	54
BB HYI	.113	2	.424	5	.189	30	.168	3	28
BY ERI	.110	2	.401	4	.179	16	.165	3	28
X ARI	.223	1	.378	1	.211	4	.166	1	63
SV ERI	.183	1	.379	2	.189	5	.163	1	16
U PIC	.180	1	.392	2	.220	8	.200	2	56
U LEP	.166	1	.367	4	.181	20	.157	2	15
RY COL	.171	1	.385	2	.208	6	.193	2	32
IU CAR	.210	1	.365	4	.203	18	.172	3	40
HH PUP	.210	2	.405	4	.233	17	.203	3	35
BB PUP	.208	2	.434	4	.223	16	.214	3	40
VZ CNC	.152	1	.392	1	.163	3	.207	1	15
T SEX	.123	1	.432	2	.178	6	.173	2	16
AF VEL	.209	2	.394	4	.165	11	.179	3	42
TV LEO	.175	2	.368	3	.197	15	.157	3	58
WY ANT	.173	1	.361	1	.227	4	.169	2	28
W CRT	.181	1	.413	3	.239	10	.206	2	32
SS LEO	.166	1	.366	2	.159	6	.161	1	56
ST LEO	.173	1	.387	2	.221	7	.180	1	120
X CRT	.173	1	.352	2	.189	6	.161	2	48
UU VIR	.172	1	.386	1	.207	5	.186	1	35
SV HYA	.174	1	.378	1	.205	5	.170	1	56
AV VIR	.182	1	.372	2	.187	10	.181	1	42
AU VIR	.116	1	.411	3	.171	14	.163	2	24
RV OCT	.219	1	.386	2	.233	12	.175	1	63
FY HYA	.167	2	.364	4	.174	14	.142	3	90
V499 CEN	.182	1	.384	2	.189	6	.168	1	56
UY BOO	.168	1	.331	2	.198	6	.149	2	56
XX VIR	.183	2	.373	4	.236	18	.161	3	48
TY APS	.215	2	.418	4	.237	17	.183	3	40
AP SER	.120	2	.395	5	.179	18	.161	3	16
TV LIB	.178	2	.408	6	.205	28	.211	5	16
FW LUP	.216	1	.418	1	.234	8	.229	1	56
VY SER	.185	1	.359	1	.208	4	.164	1	48
AR SER	.172	1	.374	2	.200	17	.164	1	36
CG LIB	.188	3	.391	6	.185	18	.170	4	24
VY LIB	.235	2	.408	4	.248	20	.202	3	49
AN SER	.210	1	.437	2	.214	9	.251	1	49
AT SER	.164	1	.356	3	.213	9	.155	2	54
AV SER	.231	2	.412	3	.209	3	.188	2	40
UV OCT	.199	1	.373	1	.189	4	.173	1	64
V445 OPH	.299	1	.456	3	.336	11	.274	2	40
VX HER	.182	1	.384	3	.229	13	.171	2	42
RW TRA	.230	2	.433	8	.197	35	.248	4	21
V452 OPH	.241	1	.411	4	.260	25	.190	3	35
V487 SCO	.247	2	.481	5	.246	20	.213	3	24
ST OPH	.248	2	.441	6	.179	25	.203	3	36
V494 SCO	.216	1	.432	3	.210	10	.207	2	48
V703 SCO	.145	1	.409	1	.178	3	.200	1	16
TY PAV	.203	2	.353	4	.235	15	.158	3	40
V690 SCO	.215	2	.398	4	.208	15	.211	3	36
S ARA	.195	1	.390	2	.209	8	.179	1	45
V567 OPH	.247	2	.488	5	.157	16	.252	3	16
V675 SGR	.189	1	.362	1	.196	4	.158	1	56
V455 OPH	.204	2	.396	4	.193	25	.186	3	40
V413 CRA	.206	1	.384	2	.223	6	.180	1	40
MT TEL	.109	1	.402	2	.180	7	.145	1	64
V440 SGR	.200	1	.396	1	.208	4	.183	1	54
DN PAV	.174	1	.374	4	.198	16	.168	3	99
V341 AQL	.179	1	.386	1	.202	4	.181	1	180
AA AQL	.183	2	.422	4	.195	14	.202	3	48
DX DEL	.209	1	.433	1	.194	5	.242	1	64
RV CAP	.166	2	.396	3	.190	9	.172	2	38
V IND	.179	1	.366	2	.193	8	.172	2	42
CP AQR	.183	1	.403	3	.245	18	.201	2	40
SW AQR	.175	1	.383	3	.216	10	.172	2	48
Z MIC	.218	2	.399	4	.265	11	.191	2	36
YZ CAP	.135	2	.444	4	.160	14	.172	3	25
SX AQR	.171	1	.356	3	.195	16	.156	2	42
RT GRU	.154	2	.370	5	.190	20	.160	3	80
TZ AQR	.188	2	.368	5	.241	14	.180	3	40
DH PEG	.139	1	.456	1	.185	3	.183	1	32
CY AQR	.132	2	.370	4	.205	8	.186	4	16
RW GRU	.157	2	.349	4	.195	18	.157	3	32
BH PEG	.211	1	.383	3	.221	10	.181	2	64
BO AQR	.180	2	.372	3	.210	17	.162	2	40
YY TUC	.164	1	.359	3	.179	14	.153	2	42
DN AQR	.172	1	.361	2	.199	5	.163	1	72
RV PHE	.172	1	.358	3	.236	12	.167	2	40
BR AQR	.175	1	.396	3	.243	11	.199	2	56
SX PHE	.100	1	.363	2	.147	2	.170	1	8
BS AQR	.145	1	.405	2	.177	4	.214	1	32
UU CET	.178	1	.361	3	.156	14	.169	2	54
AO TUC	.109	1	.399	4	.182	16	.157	2	16

Each colour is followed by its accuracy in units of 0.001 in ^{10}log (intensity). The number of measured points contributing to the average is found in the column marked N. For a discussion see section 5.2. in the text.

Table 1 General information on the RR Lyrae variables

NO	STAR	TYPE	PERIOD	EPOCH	l	b	ΔS	V_{max}	A_V	<V>	<V-B>	<B-U>	<U-W>	<B-L>	R
1	RY PSC	ab	0.5297291	41538.476	100.66	-62.89	7	-2.020	0.332	-2.229	.137	.393	.204	.166	
4	W TUC	ab	0.6422299	41242.414	301.66	-53.72	7	-1.587	0.453	-1.867	.130	.396	.210	.156	1
6	AM TUC	c	0.405689	41960.387	299.06	-49.00	4	-1.833	0.179	-1.917	.107	.410	.165	.152	
7	RR CET	ab	0.5530253	41942.471	143.53	-59.90	5	-0.924	0.385	-1.166	.141	.395	.183	.164	
8	SV SCL	c	0.37760	41918.555	230.16	-77.89	7	-1.725	0.207	-1.725	.079	.433	.181	.155	
9	SS FOR	ab	0.4954320	41964.552	216.44	-73.00	8	-0.994	0.555	-1.360	.118	.404	.186	.155	
12	RZ CET	ab	0.5106077	42014.369	178.21	-60.35	4	-1.750	0.387	-2.003	.131	.405	.206	.164	
11	BB HYI	c	0.287131	41993.430	293.59	-41.62	7	-1.969	0.201	-2.079	.085	.443	.180	.170	
13	BY ERI	c	0.31134900	41633.419	262.48	-58.81	4	-2.115	0.205	-2.214	.092	.433	.188	.165	
15	X ARI	ab	0.6511336	41300.299	169.08	-39.85	10	-0.842	0.402	-1.098	.193	.412	.213	.159	
16	SV ERI	ab	0.713759	42063.360	194.26	-53.49	7	-1.080	0.270	-1.255	.158	.406	.195	.162	1
20	U PIC	ab	0.440371	41666.449	257.68	-39.61	3	-1.525	0.504	-1.811	.139	.421	.212	.185	1
22	U LEP	ab	0.5814738	41712.289	221.11	-34.78	8	-1.240	0.445	-1.530	.133	.397	.189	.149	1
23	RY COL	ab	0.4788571	41694.367	246.46	-35.05	3	-1.468	0.284	-1.650	.145	.414	.211	.185	2
24	IU CAR	ab	0.737108	41695.359	269.59	-22.96	9	-1.810	0.384	-2.057	.180	.402	.199	.162	
25	HH PUP	ab	0.3907463	41361.296	258.24	-14.74	1	-1.433	0.567	-1.833	.174	.445	.234	.190	
26	BB PUP	ab	0.480544	41362.472	241.29	+10.26	3	-1.890	0.415	-2.146	.175	.449	.217	.197	
28	VZ CNC	s	0.1783645	41698.362	216.50	+28.73	0	-0.149	0.264	-0.319	.122	.412	.156	.201	2
30	T SEX	c	0.3246980	41384.300	235.63	+40.60	3	-1.198	0.181	-1.281	.098	.463	.179	.172	
112	WY ANT	ab	0.57433095	40645.303	266.92	+22.08	6	-1.387	0.372	-1.621	.145	.390	.211	.162	
31	AF VEL	ab	0.5273984	41432.267	284.16	+08.60	7	-1.603	0.379	-1.856	.175	.421	.179	.169	
32	TV LEO	ab	0.6728430	41424.348	262.98	+49.06	10	-1.815	0.490	-2.126	.138	.404	.205	.149	
33	W CRT	ab	0.4120134	41451.387	275.99	+40.46	2	-1.568	0.540	-1.913	.141	.444	.206	.191	
34	SS LEO	ab	0.6263432	41781.406	265.29	+57.06	8	-1.407	0.459	-1.697	.133	.397	.183	.154	
113	ST LEO	ab	0.4779843	40648.498	353.42	+66.15	7	-1.546	0.530	-1.890	.132	.424	.220	.171	
36	X CRT	ab	0.7328332	41798.339	278.86	+49.49	10	-1.715	0.254	-1.857	.149	.375	.190	.158	
37	UU VIR	ab	0.4756063	41797.461	280.72	+60.53	2	-1.216	0.472	-1.506	.132	.420	.197	.174	1
38	SV HYA	ab	0.4785439	41102.346	297.07	+36.59	6	-1.147	0.514	-1.498	.134	.421	.197	.163	
39	AV VIR	ab	0.6569080	41470.283	324.99	+70.84	6	-1.814	0.314	-2.004	.155	.394	.202	.172	
40	AU VIR	c	0.3432302	41795.332	317.44	+54.96	6	-1.802	0.199	-1.909	.086	.442	.176	.161	
41	RV OCT	ab	0.5711300	41070.286	304.37	-21.67	10	-1.376	0.465	-1.674	.185	.418	.217	.168	
42	FY HYA	ab	0.6366510	41089.311	318.77	+31.38	7	-2.014	0.440	-2.310	.138	.397	.199	.136	
43	V499 CEN	ab	0.5212100	41126.248	315.09	+18.13	6	-1.395	0.495	-1.727	.147	.419	.194	.165	
44	UY BOO	ab	0.6508446	41420.466	354.25	+68.62	10	-1.361	0.476	-1.670	.135	.375	.196	.143	
45	XX VIR	ab	1.3482051	41459.329	337.79	+50.73	9	-1.888	0.492	-2.196	.147	.404	.224	.152	
46	TY APS	ab	0.5016935	41488.235	312.12	-10.57	3	-1.771	0.425	-2.043	.186	.436	.223	.179	
47	AP SER	c	0.2541180	41811.360	012.88	+52.33	8	-1.611	0.199	-1.684	.092	.434	.171	.162	2
48	TV LIB	ab	0.2696242	41809.396	353.15	+39.68	2	-1.745	0.525	-2.080	.140	.440	.205	.190	1
104	FW LUP	ab	0.4841712	42171.377	331.33	+13.47		-0.794	0.161	-0.883	.192	.421	.212	.220	
50	VY SER	ab	0.7140931	41443.309	006.16	+44.10	9	-1.153	0.292	-1.322	.160	.381	.201	.157	
51	AR SER	ab	0.5751090	41509.266	007.88	+44.27	8	-1.826	0.360	-2.084	.149	.386	.188	.161	2
52	CG LIB	c	0.3068674	41153.324	344.20	+25.13	1	-1.746	0.230	-1.857	.161	.430	.174	.175	
53	VY LIB	ab	0.53393770	41144.370	353.86	+28.84	6	-1.707	0.422	-1.965	.204	.441	.223	.195	
54	AN SER	ab	0.52207070	41460.424	023.82	+45.24	0	-1.418	0.427	-1.665	.166	.453	.209	.226	
55	AT SER	ab	0.74656820	41798.579	018.05	+42.46	9	-1.655	0.376	-1.871	.135	.385	.208	.148	
56	AV SER	ab	0.4875571	41508.361	011.30	+36.81	6	-1.583	0.460	-1.888	.194	.441	.203	.184	
57	UV OCT	ab	0.5426250	41079.547	308.40	-23.54	9	-0.753	0.517	-1.098	.164	.408	.191	.163	2
								-0.935	0.335						
58	V445 OPH	ab	0.3970228	41181.264	007.90	+28.46	2	-1.464	0.358	-1.686	.251	.468	.323	.257	
60	VX HER	ab	0.4553728	41446.593	035.22	+39.09	5	-1.210	0.540	-1.572	.142	.422	.220	.159	
61	RW TRA	ab	0.3740351	41489.292	324.20	-14.77	1	-1.622	0.312	-1.808	.195	.444	.233	.225	
62	V452 OPH	ab	0.5571623	41825.359	032.53	+25.73	5	-1.919	0.403	-2.185	.210	.444	.216	.186	
63	V487 SCO	c	0.3291385	41456.569	354.19	-00.99	1	-1.712	0.199	-1.812	.221	.517	.195	.212	
64	ST OPH	ab	0.4503564	41853.359	022.84	+16.65	6	-1.806	0.545	-2.161	.210	.467	.219	.191	
65	V494 SCO	ab	0.4273326	41126.388	357.24	-00.48	2	-1.564	0.401	-1.826	.179	.471	.203	.198	
66	V703 SCO	s	0.1152179	39279.530	356.56	-01.26	1			-0.405	.145	.409	.178	.200	2
67	TY PAV	ab	0.7104425	41532.333	330.55	-17.10	10	-2.096	0.361	-2.310	.176	.384	.221	.151	
68	V690 SCO	ab	0.4922558	41797.592	351.19	-08.00	4	-1.572	0.456	-1.854	.179	.439	.205	.196	
69	S ARA	ab	0.4518830	41152.417	343.38	-12.44	3	-1.240	0.537	-1.599	.158	.426	.210	.170	
70	V567 OPH	s	0.1300729	41134.467	027.80	+12.29	0	-1.843	0.140	-1.783	.238	.507	.190	.248	
71	V675 SGR	ab	0.6422895	41180.370	358.25	-07.82	11	-1.173	0.392	-1.418	.162	.390	.195	.154	
72	V455 OPH	ab	0.4539182	41833.389	040.04	+13.55	5	-1.976	0.337	-2.200	.170	.434	.214	.175	
73	V413 CRA	ab	0.5893240	41500.369	358.10	-15.56	6	-1.347	0.285	-1.513	.178	.404	.220	.173	
102	MT TEL	c	0.316899	42206.350	350.25	-21.12		-0.737	0.229	-0.858	.087	.435	.174	.152	
75	V440 SGR	ab	0.47747883	41509.445	015.31	-19.19	7	-1.091	0.506	-1.430	.161	.431	.204	.175	
76	DN PAV	ab	0.46844376	41183.397	332.82	-30.80	8	-1.915	0.510	-2.280	.137	.409	.213	.148	
77	V341 AQL	ab	0.57802054	41196.251	045.62	-22.03	3	-1.311	0.515	-1.634	.142	.422	.200	.171	
78	AA AQL	ab	0.3617869	41127.440	043.08	-24.98	0	-1.663	0.534	-2.021	.143	.437	.195	.185	
111	DX DEL	ab	0.4726239	39367.340	058.46	-18.84	0	-1.086	0.299	-1.260	.176	.445	.178	.223	
79	RV CAP	ab	0.4477502	41209.270	033.12	-35.53	6	-1.487	0.371	-1.719	.128	.434	.194	.166	1,2
116	V IND	ab	0.4795910	40118.393	355.34	-43.11	8	-0.912	0.535	-1.264	.135	.403	.180	.167	1
80	CP AQR	ab	0.4634070	41511.498	048.73	-31.33	3	-1.672	0.522	-2.004	.143	.432	.199	.185	
81	SW AQR	ab	0.4593029	41208.347	051.31	-31.47	8	-1.416	0.524	-1.776	.137	.422	.224	.164	
82	Z MIC	ab	0.5869340	41597.376	015.69	-43.16	4	-1.780	0.261	-1.929	.194	.416	.261	.182	1
83	YZ CAP	c	0.27345698	41872.444	035.37	-39.50	0	-1.681	0.209	-1.788	.109	.472	.171	.174	
84	SX AQR	ab	0.5357139	41868.445	057.89	-34.00	9	-1.690	0.461	-1.994	.128	.402	.190	.154	1
85	RT GRU	ab	0.512208	41151.555	352.66	-50.00	7	-2.093	0.445	-2.412	.129	.401	.185	.160	1,2
								-2.223	0.315						
86	TZ AQR	ab	0.5711943	41568.399	053.24	-44.32	5	-1.930	0.340	-2.133	.160	.393	.202	.170	
87	DH PEG	c	0.255510	41134.546	069.13	-39.24	1	-0.984	0.202	-1.087	.113	.487	.179	.183	
88	CY AQR	ab	0.06103840	41126.596	069.22	-46.92	2	-1.433	0.301	-1.630	.111	.400	.186	.186	
89	RW GRU	ab	0.550273	41215.512	351.09	-58.99	7	-1.951	0.444	-2.248	.120	.386	.190	.151	1
90	BH PEG	ab	0.6410009	41236.391	085.60	-38.36	6	-1.292	0.278	-1.450	.183	.405	.190	.175	2
								-1.306	0.264						
91	BO AQR	ab	0.6940186	41621.252	055.38	-58.82	6	-1.984	0.444	-2.151	.148	.408	.197	.156	
92	YY TUC	ab	0.6350210	41894.497	325.32	-52.20	8	-1.782	0.489	-2.085	.129	.394	.168	.153	
93	DN AQR	ab	0.6337525	41148.509	035.73	-69.05	8	-1.578	0.318	-1.763	.147	.388	.196	.161	
94	RV PHE	ab	0.5964182	41915.525	336.03	-63.99	8	-1.888	0.283	-2.052	.147	.374	.200	.162	1
95	BR AQR	ab	0.4818785	41150.534	075.45	-65.24	3	-1.569	0.466	-1.858	.139	.425	.205	.189	
96	SX PHE	s	0.0549645	34200.039	341.42	-70.36	10			-0.183	.085	.378	.138	.177	2
97	BS AQR	s	0.1978228	41617.301	081.99	-65.90	0	-0.926	0.186	-1.028	.121	.423	.172	.208	
98	UU CET	ab	0.606081	41208.576	073.22	-75.08	4	-1.939	0.281	-2.098	.159	.380	.180	.161	
99	AO TUC	c	0.3332332	41948.542	313.85	-56.62	5	-1.619	0.198	-1.715	.081	.446	.179	.164	1

The variables are arranged by right ascension. Column 1: the identification number of each variable in the datafile. Periods are given in days column, the first two digits (24) of the heliocentric Julian day numbers for the maximum epochs are not printed column. Next are given galactic coordinates, Preston's ΔS parameter, the *VBLUW* brightness at maximum light and the amplitude of the V lightcurve.

For the derivation of the average luminosity in V and the average colours see the text (section 5.2.). The symbols in the column (R) have the following meaning: 1: Incomplete lightcurve; 2: Variable lightcurve or Blazhko effect. Additional remarks on the variables can be found in section 5.3. *All photometric quantities are given in* ^{10}log *(intensity) units.*

Table 2 The reference stars

VARIABLE	HD	α_{1900}	δ_{1900}	SP	V_J	YEAR	V	V−B	B−U	U−W	B−L	N
RY Psc	746	00 06.7	−02 20	F8	9.41	71,72	−1.029 4	.224 1	.314 4	.165 8	.248 3	3
W Tuc	5648	00 53.0	−63 49	A2	9.01	71,72	−0.861 5	.089 1	.409 5	.143 1	.197 4	3
AM Tuc	8298	01 17.1	−68 36	F2	8.71	73	−0.744 3	.157 2	.333 2	.149 4	.207 1	2
RR Cet	9387	01 27.2	+01 04	A3	8.11	73	−0.502 2	.091 1	.415 2	.119 5	.212 2	3
SV Scl		01 42.0	−30 06		10.14	73	−1.324 2	.246 2	.312 5	.190 7	.258 4	3
SS For	13168	02 03.6	−28 03	A5	7.24	73	−0.154 1	.097 1	.414 1	.137 1	.205 1	2
RZ Cet		02 23.9	−08 48		9.86	68,73	−1.203 2	.143 1	.361 1	.150 3	.206 1	8
		02 22.9	−08 47		9.80	68	−1.184 2	.209 1	.299 1	.166 4	.209 2	6
BB Hyi	16530	02 33.9	−74 27	A2	7.49	73	−0.248 2	.056 2	.459 3	.129 1	.198 2	1
BY Eri	17936	02 47.8	−48 23	F5	9.41	71	−1.028 2	.174 2	.319 2	.165 3	.224 1	3
X Ari	19504	03 03.0	+10 25	F5	7.29	71,72	−0.175 2	.165 1	.334 2	.157 4	.195 2	3
SV Eri	19825	03 06.2	−11 29	A3	8.63	73,74	−0.711 2	.122 2	.355 3	.133 5	.189 2	1
U Pic	31050	04 45.1	−51 00	F8	9.86	72	−1.203 1	.166 1	.328 2	.167 1	.194 2	2
U Lep	31415	04 50.6	−21 20	A0	9.13	72,73	−0.909 1	.101 1	.435 1	.146 3	.212 3	1
RY Col		05 12.3	−41 44		10.83	73	−1.598 2	.234 2	.336 3	.202 9	.263 3	2
IU Car	51210	06 51.3	−59 13	A2	6.41	73	0.183 2	.063 1	.440 1	.133 1	.195 1	3
HH Pup		07 18.4	−46 25		10.47	72	−1.450 10	.226 1	.333 2	.195 6	.243 4	3
BB Pup		08 19.7	−19 27		10.77	72	−1.563 3	.060 3	.454 2	.120 7	.204 2	3
VZ Cnc	73316	08 32.7	+09 56	A0	6.53	73	0.139 2	−.007 1	.400 1	.072 1	.149 4	2
T Sex	85517	09 47.2	+02 46	F2	9.39	72	−1.019 2	.216 2	.362 2	.184 6	.254 3	3
WY Ant		10 11.7	−29 20		10.09	70	−1.300 2	.233 2	.335 3	.197 3	.263 2	3
AF Vel		10 49.4	−49 19		11.53	72	−1.870 1	.150 1	.373 4	.124 10	.180 4	4
TV Leo	97143	11 05.8	−05 28	F2	9.68	72	−1.134 1	.174 1	.322 1	.143 2	.214 2	3
W Crt	99423	11 21.3	−17 33	F5	8.32	72	−0.589 2	.168 1	.315 1	.144 2	.206 2	3
SS Leo	100269	11 27.2	+00 09	F8	8.08	73	−0.495 1	.206 1	.301 1	.157 3	.229 1	3
		11 29.0	+00 41		11.10	70	−1.704 7	.254 7	.351 5	.193 6	.305 7	3
ST Leo		11 32.9	+11 08		9.85	70	−1.202 4	.210 2	.322 3	.180 4	.236 3	2
X Crt	102574	11 43.3	−09 45	G0	6.26	73	0.232 5	.228 2	.360 1	.185 1	.282 1	5
UU Vir	105390	12 03.0	+00 11	F5	9.27	73	−0.971 3	.169 2	.311 4	.145 5	.199 2	3
SV Hya	108631	12 23.6	−25 28	F8	9.76	71	−1.167 2	.217 1	.326 2	.173 6	.234 2	6
AV Vir	115994	13 15.7	+09 28	K5	8.97	72	−0.865 1	.421 1	.543 2	.252 10	.481 1	6
AU Vir	116639	13 19.8	−06 38	G5	9.53	73	−1.081 2	.293 1	.388 2	.197 2	.354 2	4
	116638	13 19.8	−06 34	K2	9.29	66	−0.996 3	.449 2	.597 2	.341 10	.520 2	4
RV Oct	117709	13 26.9	−83 57	G	9.48	71	−1.045 3	.168 2	.315 2	.135 7	.186 2	4
FY Hya		13 48.4	−29 02		11.34	71	−1.800 2	.251 2	.332 2	.180 7	.239 3	5
	120567	13 45.7	−28 39	A2	9.93	73	−1.228 1	.089 2	.444 3	.106 9	.197 1	2
V499 Cen	121538	13 49.8	−42 42	A2	8.12	71	−0.501 1	.052 1	.463 1	.142 1	.180 1	3
UY Boo		13 53.7	+13 37		9.81	72	−1.190 2	.261 1	.355 2	.190 10	.309 2	4
XX Vir	124915	14 11.2	−06 09	A3	6.44	72	0.166 2	.109 1	.393 1	.134 2	.200 1	4
TY Aps	129885	14 39.9	−70 55	A0	9.57	72	−1.082 2	.053 1	.479 1	.122 5	.162 1	3
AP Ser		15 09.8	+10 41	G5	9.31	66,73	−0.983 2	.157 1	.308 2	.143 4	.185 1	3
TV Lib	136010	15 13.2	−08 02	K0	7.49	73	−0.282 1	.535 1	.729 2	.383 7	.615 2	3
		15 13.1	−08 01		10.96	66,70	−1.650 2	.249 1	.344 2	.226 7	.280 2	4
FW Lup	136334	15 15.0	−40 24	A2	6.19	74	0.027 1	.027 1	.441 1	.102 2	.179 1	2
VY Ser	137898	15 23.6	+02 12	A5	5.16	72	0.682 1	.089 2	.414 1	.132 1	.205 1	5
AR Ser	138644	15 28.2	+03 40	K0	7.37	72	−0.229 2	.472 3	.644 1	.325 4	.559 2	2
		15 28.7	+03 05		11.33	68	−1.802 3	.285 2	.367 3	.185 10	.315 2	4
		15 28.4	+03 20		10.82	68	−1.590 5	.191 3	.341 4	.138 20	.218 2	3
CG Lib		15 29.3	−23 57		12.28	71	−2.170 4	.296 3	.326 5	.172 15	.262 4	4
		15 29.5	−23 57		12.10	71	−2.109 4	.410 5	.556 10	.213 15	.548 10	3
VY Lib	141130	15 42.3	−15 29	A3	9.76	71	−1.167 2	.171 1	.455 4	.165 7	.250 4	3
AN Ser	142267	15 48.5	+13 31	G0	6.10	72	0.294 1	.243 2	.295 1	.171 1	.245 1	3
AT Ser	142500	15 49.8	+08 52	A2	6.28	73	0.232 1	.057 1	.436 1	.134 1	.193 1	3
AV Ser	144172	15 59.4	+00 56	F8	6.79	72	0.020 2	.186 1	.301 1	.150 2	.190 1	2
UV Oct		15 59.4	−83 45		10.82	71	−1.584 4	.148 2	.404 4	.146 14	.206 3	6
V445 Oph		16 18.8	−06 10		11.38	71	−1.822 2	.313 3	.345 4	.295 15	.278 2	4
VX Her		16 26.1	+18 33		10.70	72	−1.548 3	.235 2	.333 3	.203 30	.250 3	4
RW TrA	153056	16 52.0	−66 16	A2	9.21	72	−0.942 1	.126 1	.457 1	.159 4	.206 2	3
V452 Oph		17 12.7	+11 20		9.60	73	−1.109 2	.259 2	.346 3	.167 5	.282 2	4
V487 Sco		17 27.9	−34 29		10.65	72	−1.515 6	.109 4	.385 3	.105 20	.137 1	3
ST Oph	159370	17 29.3	−01 04	F0	9.60	73	−1.102 1	.206 1	.392 2	.187 10	.202 1	2
V494 Sco		17 34.8	−31 24		10.40	71	−1.423 3	.181 3	.475 2	.170 5	.242 2	4
V703 Sco	160409	17 34.6	−32 13	A0	9.20	72	−0.939 3	.143 2	.451 1	.177 6	.216 1	2
TY Pav		17 39.5	−62 38		10.64	72	−1.511 1	.052 2	.446 2	.140 15	.152 2	2
V690 Sco	163579	17 51.7	−40 35	A2	8.49	72,73	−0.654 2	.093 2	.454 1	.144 6	.216 2	2
S Ara	163542	17 51.5	−49 28	A0	10.23	71	−1.344 1	.040 1	.454 1	.114 4	.170 1	3
V567 Oph		17 53.7	+01 02		10.65	71	−1.520 1	.136 1	.522 2	.136 10	.217 2	2
V675 Sgr		18 06.9	−34 18		9.38	71	−1.015 2	.195 1	.347 1	.164 5	.208 1	2
V455 Oph		18 12.2	+12 22		10.02	73	−1.273 1	.198 1	.332 1	.166 5	.207 2	3
V413 CrA	173356	18 39.7	−37 49	A2	10.04	72	−1.268 2	.023 1	.407 2	.104 10	.146 2	3
MT Tel	176725	18 56.5	−46 42	A0	7.61	74	−0.294 2	−.007 1	.387 1	.117 2	.108 1	1
V440 Sgr	183574	19 25.1	−24 18	F2	8.20	72	−0.543 2	.174 1	.345 1	.162 1	.204 1	4
	183604	19 25.2	−23 50	A0	9.39	68	−1.010 3	.032 1	.437 4	.099 4	.190 1	3
	183524	19 24.9	−24 10	G5	7.60	68	−0.320 5	.467 1	.610 4	.337 5	.549 2	3
DN Pav	187394	19 44.6	−63 49	F0	7.57	68,72	−0.286 1	.103 1	.406 1	.139 1	.221 1	6
	186811	19 41.5	−64 12	G5	8.04	68	−0.494 4	.447 1	.581 1	.320 4	.516 1	3
V341 Aql		20 27.3	+00 13		11.02	68,72	−1.672 1	.181 1	.335 3	.145 9	.210 2	8
		20 27.2	+00 17		9.09	68	−0.915 1	.450 1	.585 1	.321 4	.523 1	5
AA Aql	196546	20 33.0	−03 08	B9	8.51	71	−0.654 2	−.008 1	.386 1	.101 2	.108 1	3
DX Del		20 42.9	+12 03		9.88	66	−1.229 3	.435 1	.553 3	.299 14	.495 3	5
		20 42.7	+12 09		11.27	66	−1.768 5	.170 2	.352 4	.213 20	.208 4	5
RV Cap	200182	20 56.8	−15 49	A0	10.19	71	−1.328 1	.039 1	.450 2	.106 4	.198 1	2
V Ind	201303	21 03.5	−45 17	K0	8.93	68	−0.868 3	.696 2	.937 7	.537 15	.751 4	5
	201696	21 06.1	−45 29	K2	7.50	68	−0.658 1	.524 1	.719 3	.337 10	.629 4	5
CP Aqr	201688	21 06.1	−02 00	A0	9.44	72	−1.016 2	−.002 1	.385 2	.074 3	.149 2	2
SW Aqr		21 09.6	−00 18		10.67	71	−1.530 1	.207 2	.318 5	.190 3	.218 1	2
Z Mic	202439	21 10.7	−30 43	G0	9.59	72,73	−1.102 2	.247 2	.330 3	.198 5	.272 1	3
YZ Cap	202803	21 13.2	−15 53	G0	10.02	73	−1.274 1	.221 1	.313 2	.152 5	.236 2	2
		21 14.0	−15 27		11.72	66	−1.958 3	.318 2	.430 6	.227 7	.384 4	2
		21 14.5	−15 36		11.89	66	−2.022 4	.243 2	.331 3	.236 5	.238 9	2
SX Aqr	205401	21 29.9	+02 42	G0	9.33	73	−0.993 2	.176 1	.332 1	.143 3	.214 1	4
		21 30.9	+02 49		11.61	66	−1.910 5	.249 3	.329 5	.220 10	.241 4	4
		21 31.0	+02 52		11.54	66	−1.894 2	.400 3	.523 7	.350 25	.473 6	4
RT Gru	207512	21 44.3	−46 14	K0	8.58	71	−0.703 1	.353 1	.446 1	.241 1	.392 1	3
TZ Aqr		21 56.7	−06 03		10.43	72	−1.435 1	.213 2	.312 1	.155 4	.225 2	3
DH Peg	211229	22 10.6	+06 08	B9	8.47	71	−0.635 1	.018 1	.355 2	.085 4	.113 1	4
CY Aqr		22 33.3	+01 06		10.77	71	−1.568 2	.202 1	.329 2	.208 10	.214 3	3
	214315	22 32.2	+01 25	K5	8.12	68	−0.528 1	.463 2	.639 1	.336 2	.570 3	2
	214670	22 34.7	+00 31	A2	8.56	68	−0.685 2	.141 2	.407 3	.171 2	.210 5	2
RW Gru		22 35.1	−44 48		10.57	71	−1.492 1	.243 1	.371 3	.188 10	.295 2	3
BH Peg		22 48.5	+15 12		8.63	71	−0.715 3	.228 1	.327 1	.135 3	.251 2	4
BO Aqr		22 48.7	−13 01		10.58	72	−1.496 1	.186 1	.298 1	.143 5	.194 1	5
YY Tuc	219107	08.2	−58 39	F2	9.52	73	−1.071 1	.185 1	.314 1	.149 5	.217 1	5
DN Aqr	219836	23 13.8	−24 0	G0	9.32	71	−0.997 2	.269 1	.337 2	.174 5	.290 1	3
RV Phe	220710	23 20.8	−47 29	G0	10.42	73	−1.431 2	.210 1	.309 2	.151 10	.222 2	4
BR Aqr	222113	23 33.8	−10 16	F8	9.62	71	−1.115 2	.269 1	.367 3	.164 6	.310 2	3
SX Phe	223379	23 43.9	−42 28	G0	8.95	72	−0.845 1	.237 1	.316 3	.190 2	.262 3	3
		23 42.0	−40 37		10.93	68	−1.638 3	.245 2	.333 3	.179 15	.261 2	10
	223011	23 40.7	−40 45	A2	6.66	68	0.214 2	.079 1	.417 1	.133 2	.207 1	5
BS Aqr	223049	23 41.1	−09 13	G5	9.43	72	−1.042 1	.285 1	.394 6	.196 30	.354 5	2
UU Cet	225132	23 58.6	−17 54	A0	4.55	71	0.931 1	−.011 1	.377 1	.081 2	.106 1	2
AO Tuc	225023	23 59.2	−59 53	B9	7.55	72,73	−0.678 1	.013 1	.429 1	.102 3	.175 1	

In several cases a variable has had more than one reference star (*e.g.* in different years). In the first column is indicated the variable star to which the reference star belongs; if available, its HD number is given in column 2. Coordinates are for the epoch 1900.0. The following three columns contain the HD spectral type, the brightness on the Johnson *UBV* system *(V_J)*, and the years in which observations of the variable were made. The next ten columns contain the *VBLUW* brightness and colours, each followed by their accuracy which is in units of 0.001 in $^{10}\log$(intensity). The last column (N) contains the number of nights in which the star was tied to the standard system.

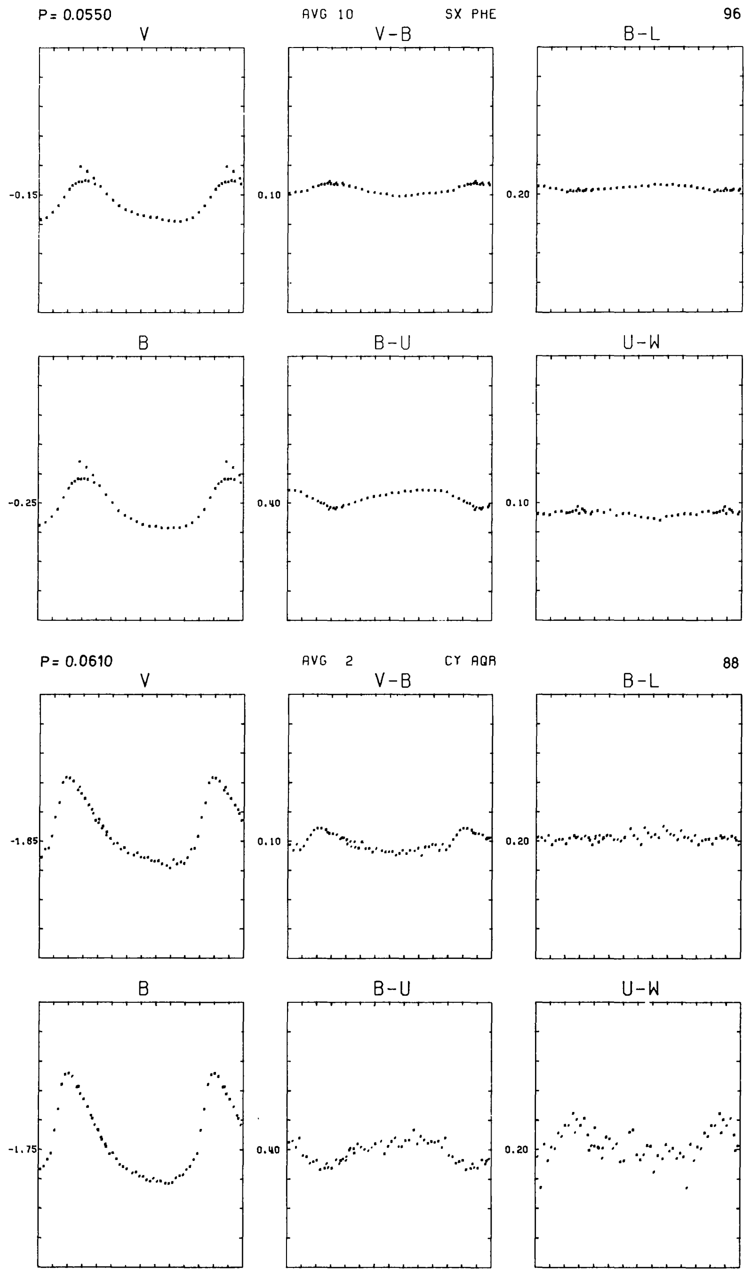


Figure 1

Figures 1 to 45. Light and colour curves in *V, B, (V−B), (B−U), (B−L)* and in several cases *(U−W)* for the variables. Two stars are shown per page.

Above the light and colour curves for each variable are given: the period in four decimals, a code for the observer, ΔS, the name of the variable and the identification number in the data file.

The abscissa is the phase, from 0.8 to 0.2 including one complete cycle. The ordinate is brightness or colour on the standard *VBLUW* system in units of $^{10}\log$ (intensity); brightness or blueness increasing upwards. The subdivisions along abscissa and ordinate are set at intervals of 0.10. For the brightness and the colours the average value is indicated to the left of each graph.

The observer codes are: AVG for van Genderen, P70 for Pel (1970), H74 for van Houten (1974), W68 for Wamsteker (1968).

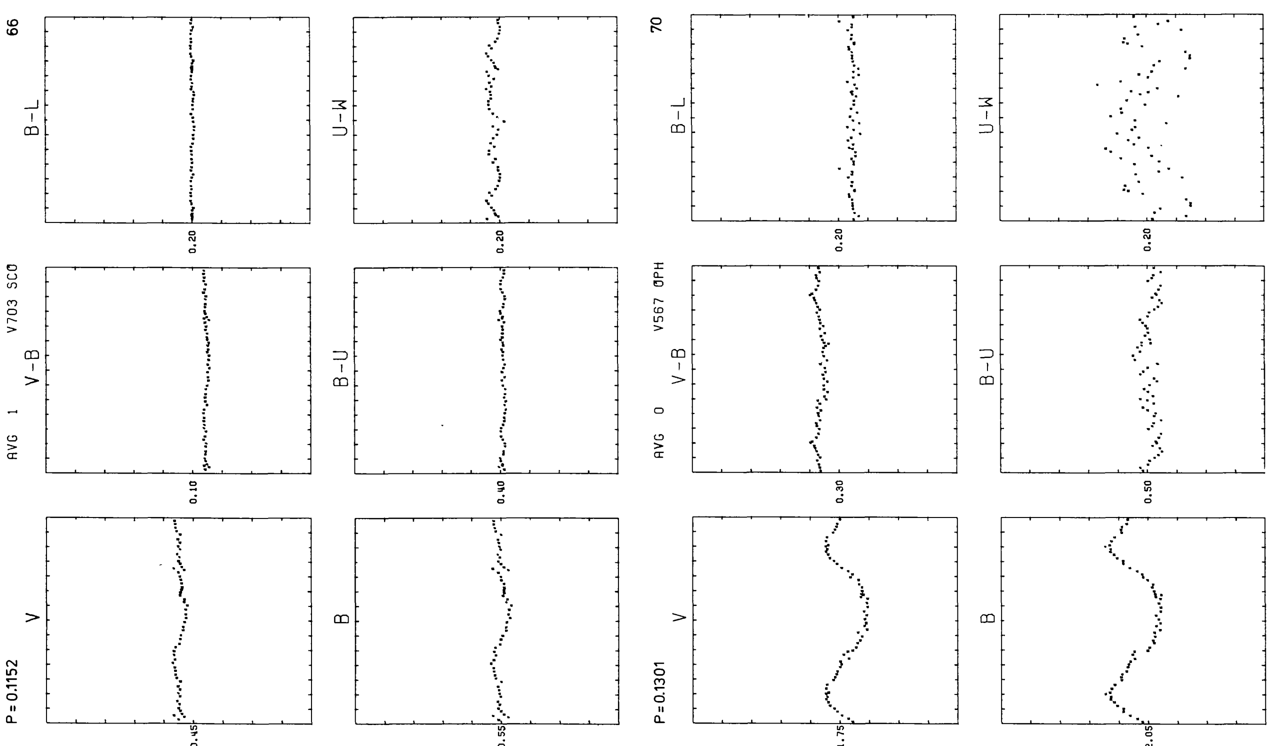


Figure 2

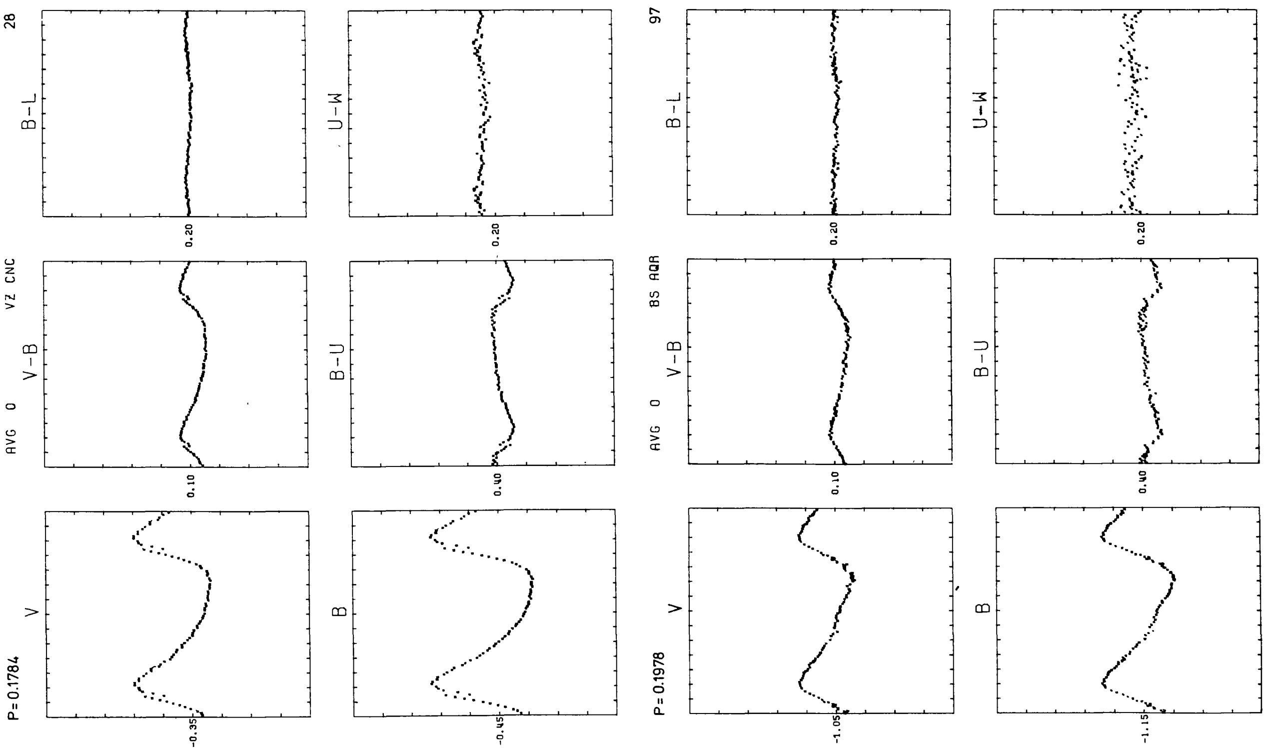


Figure 3

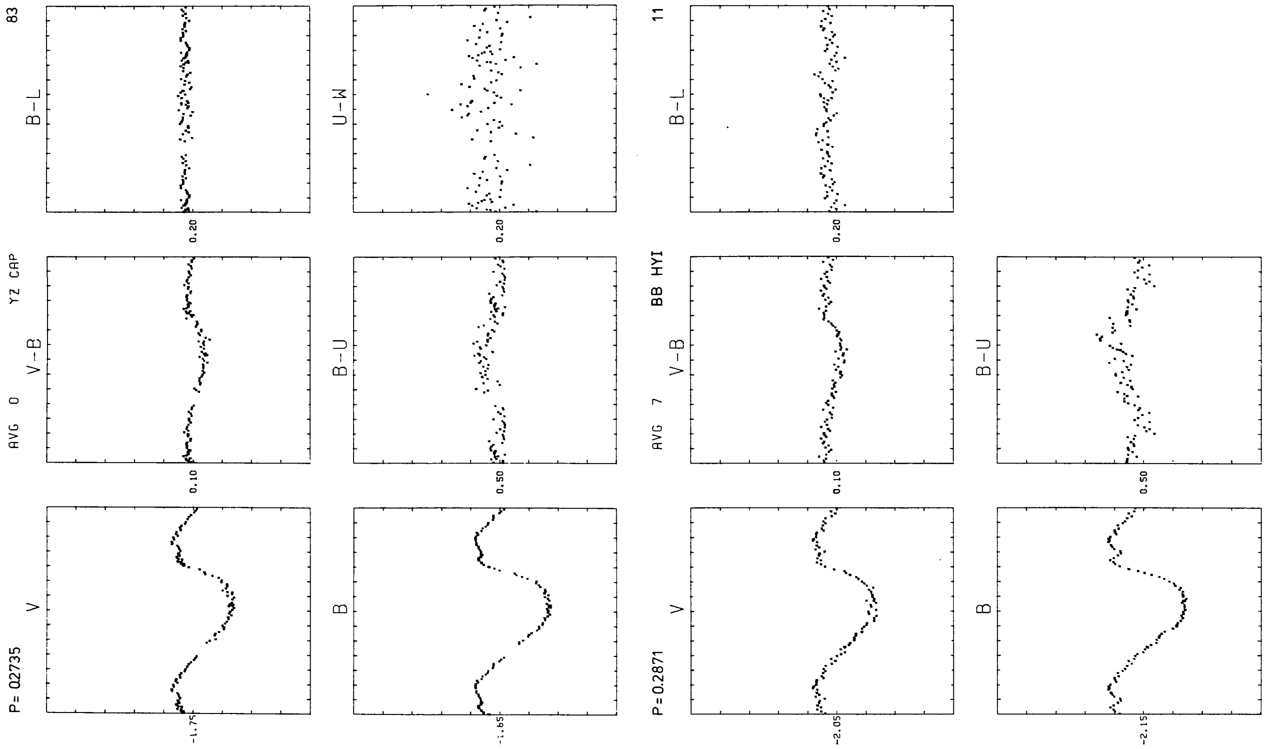


Figure 5

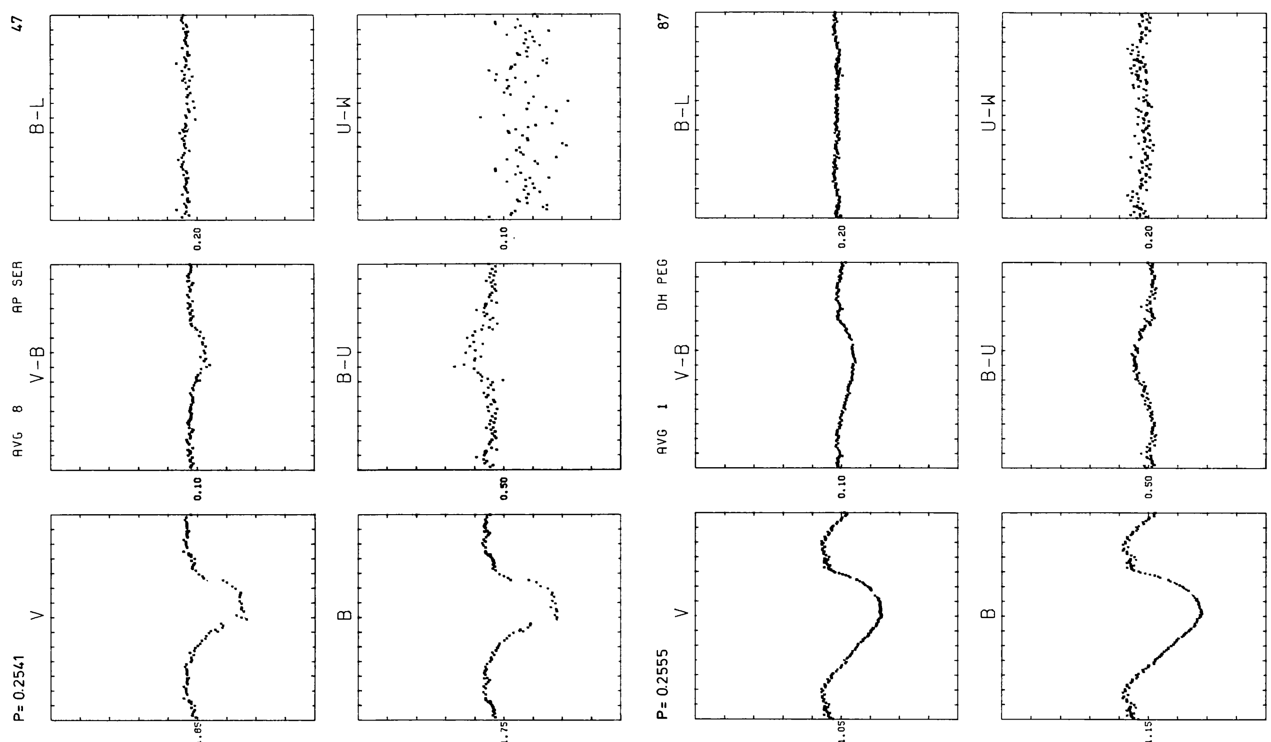


Figure 4

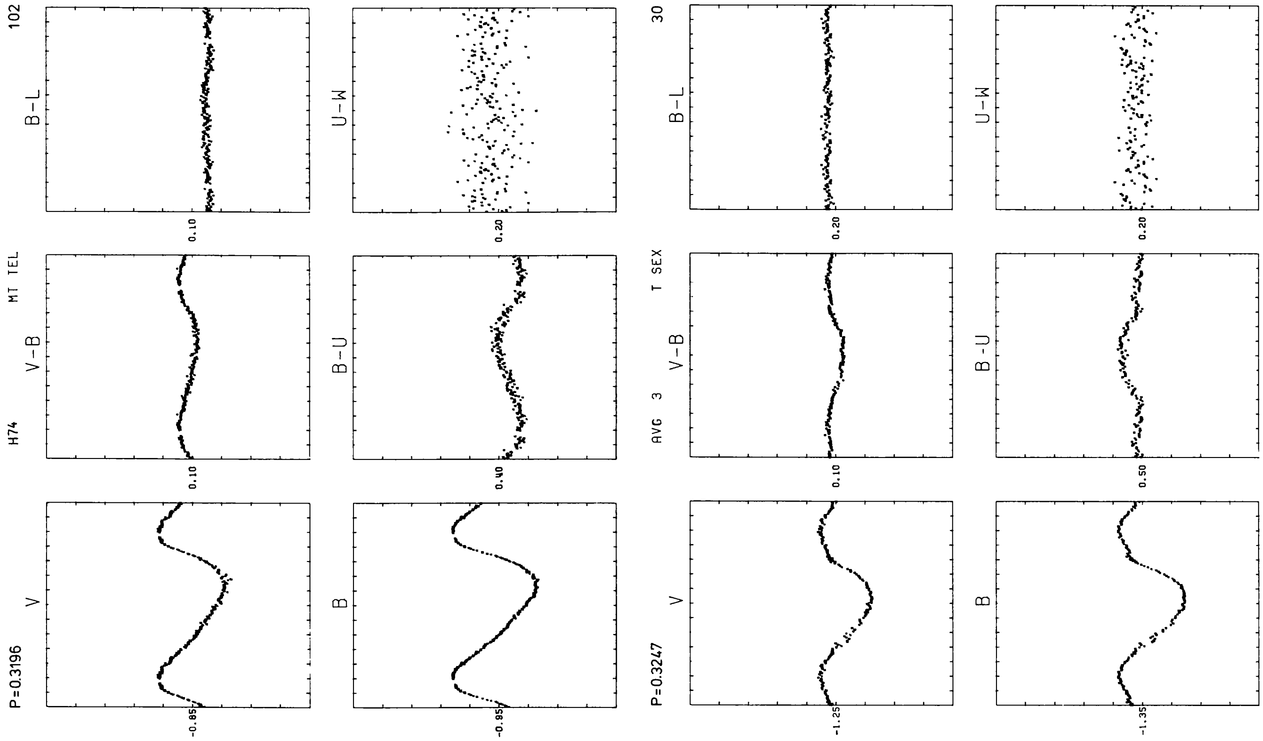


Figure 7

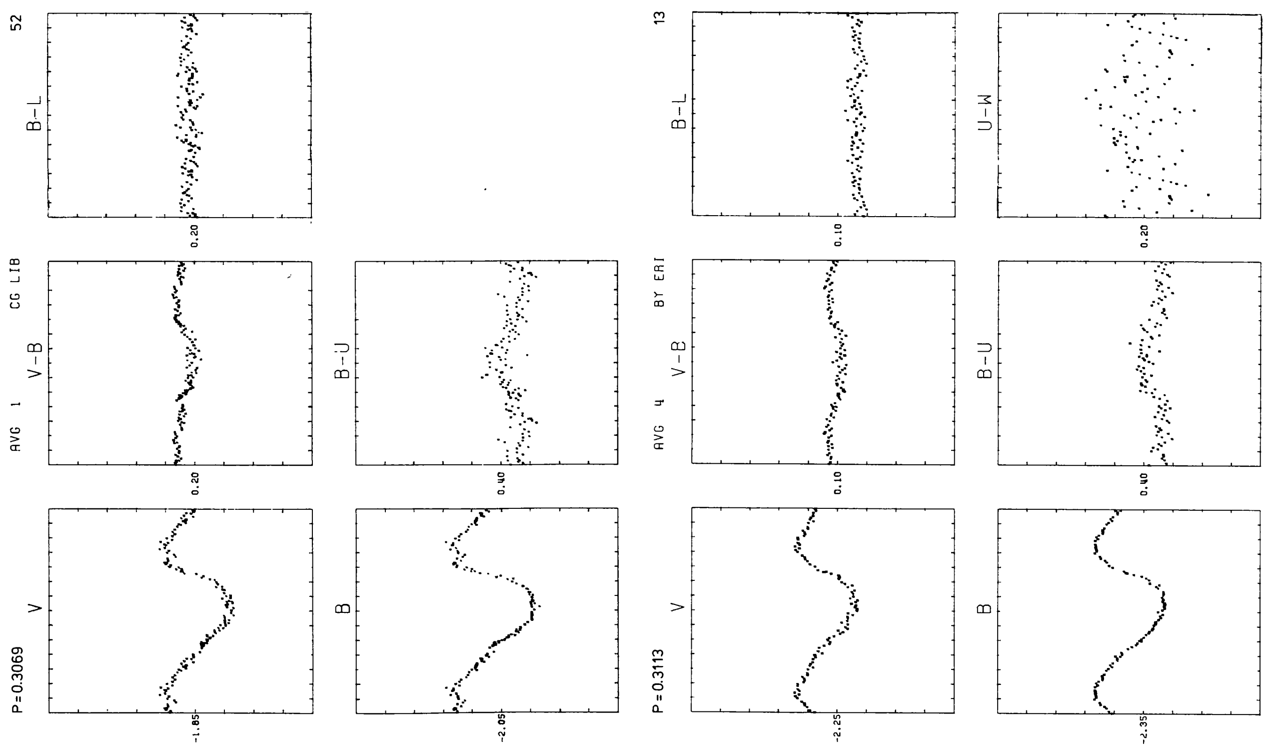


Figure 6

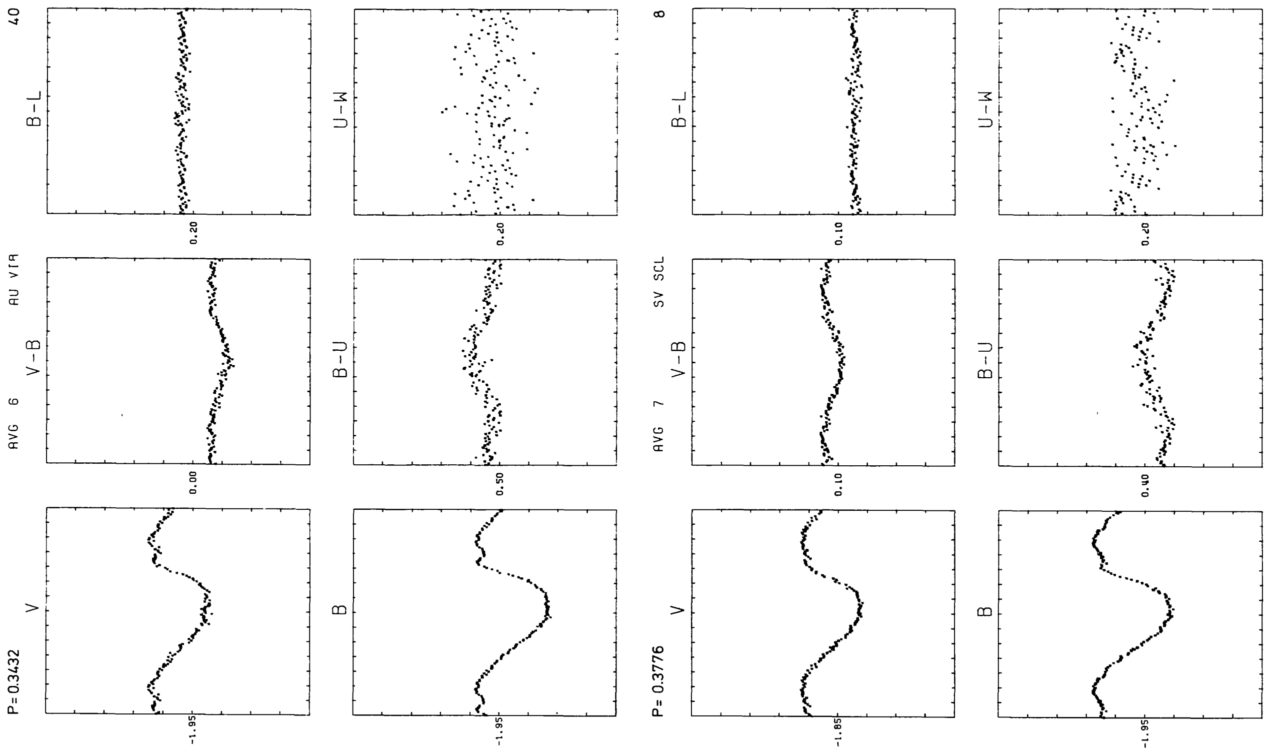


Figure 9

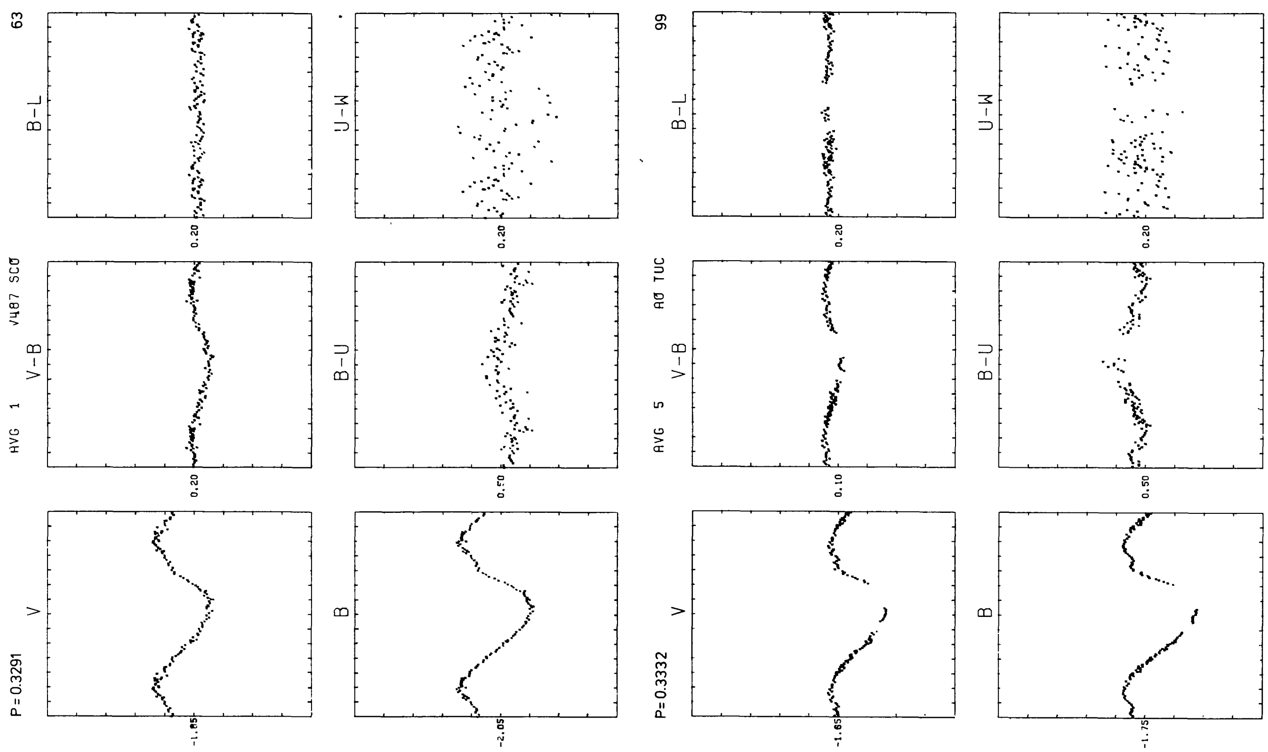


Figure 8

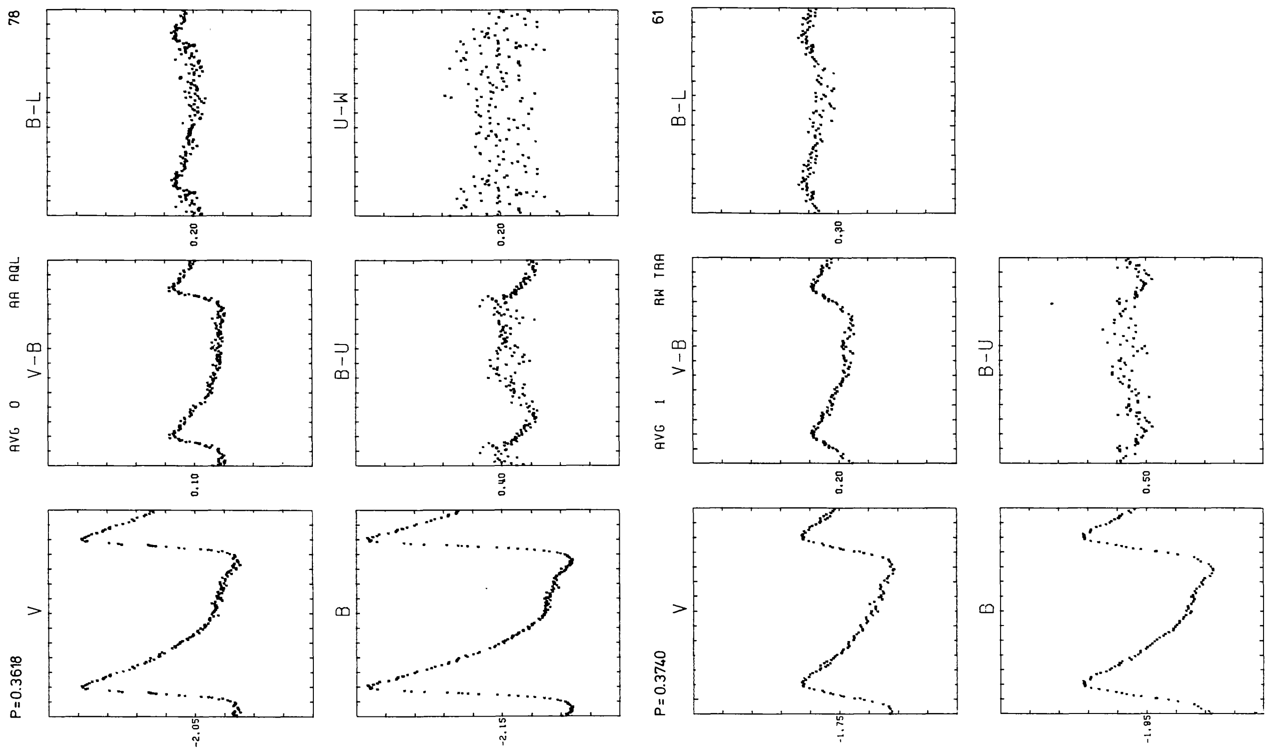


Figure 11

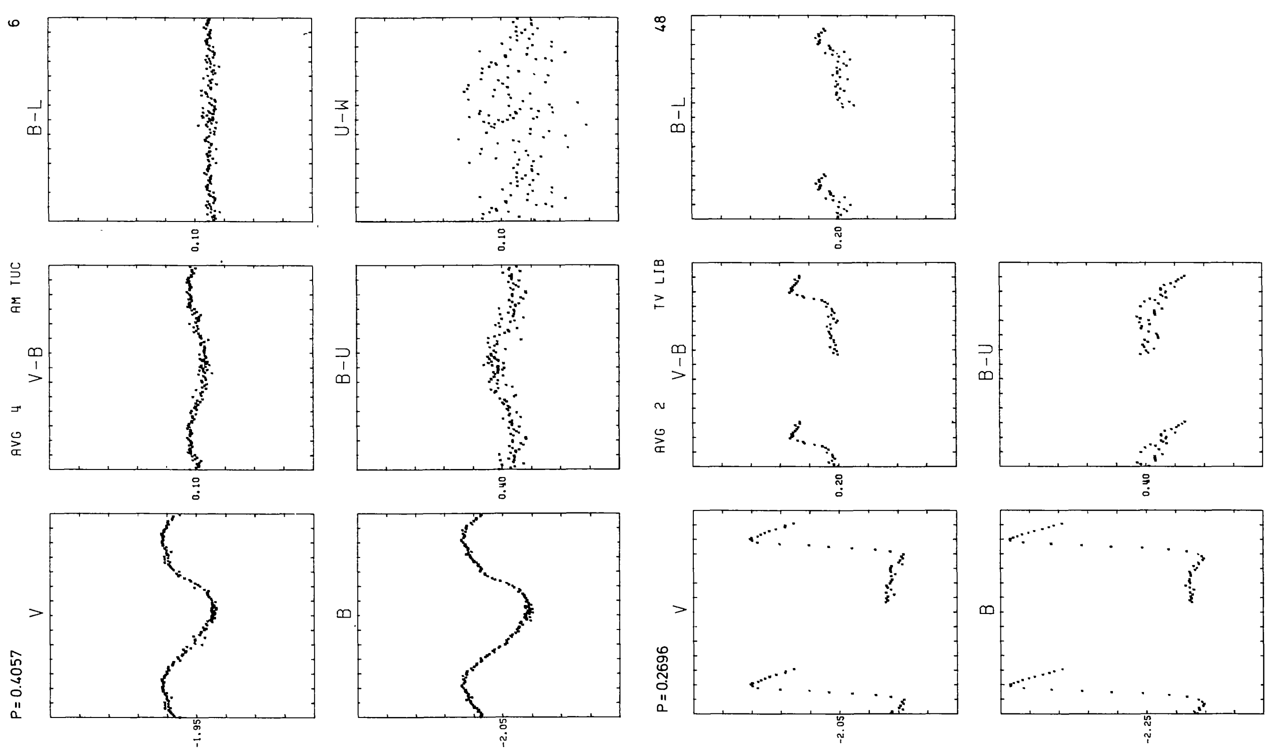


Figure 10

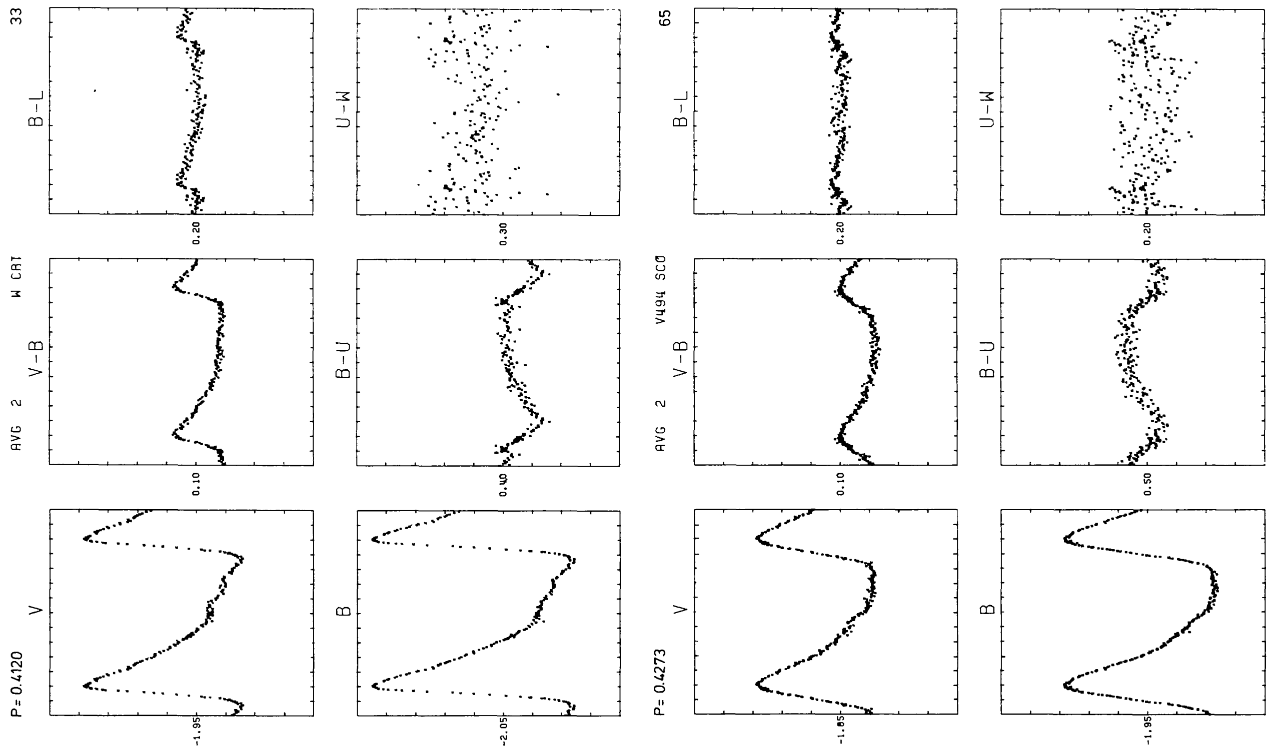


Figure 13

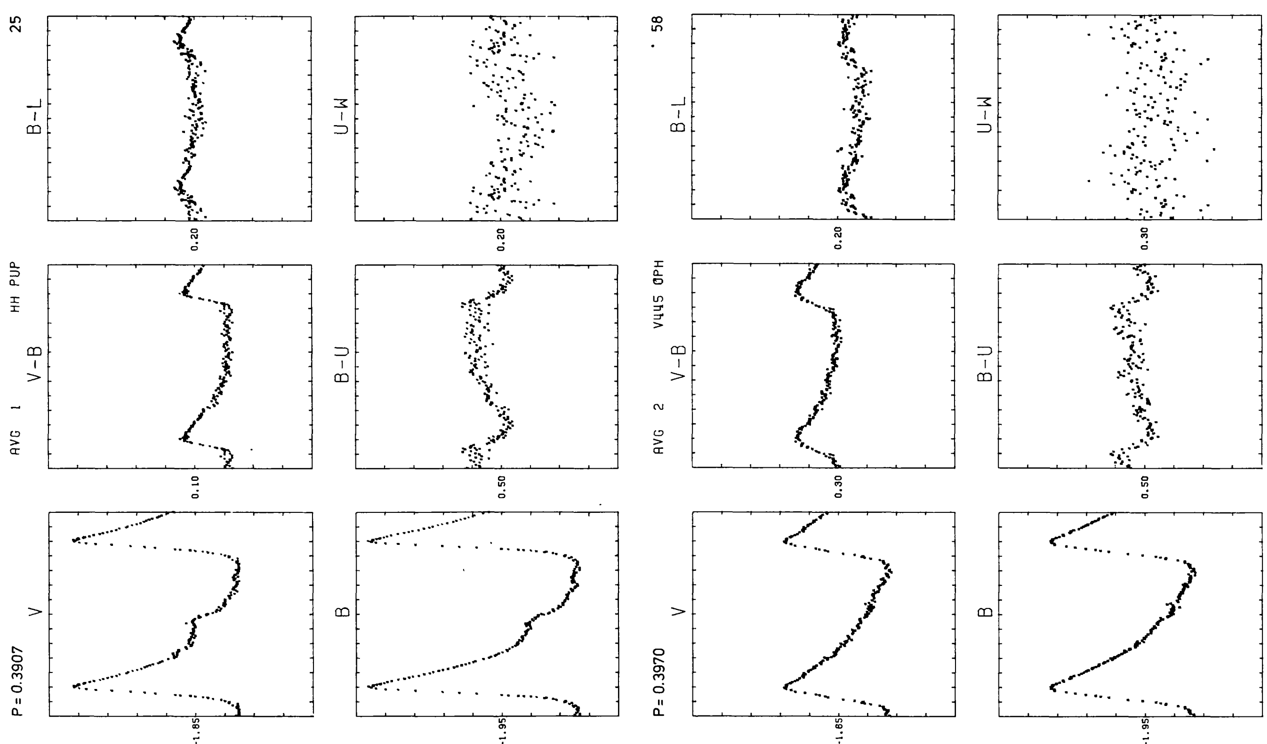


Figure 12

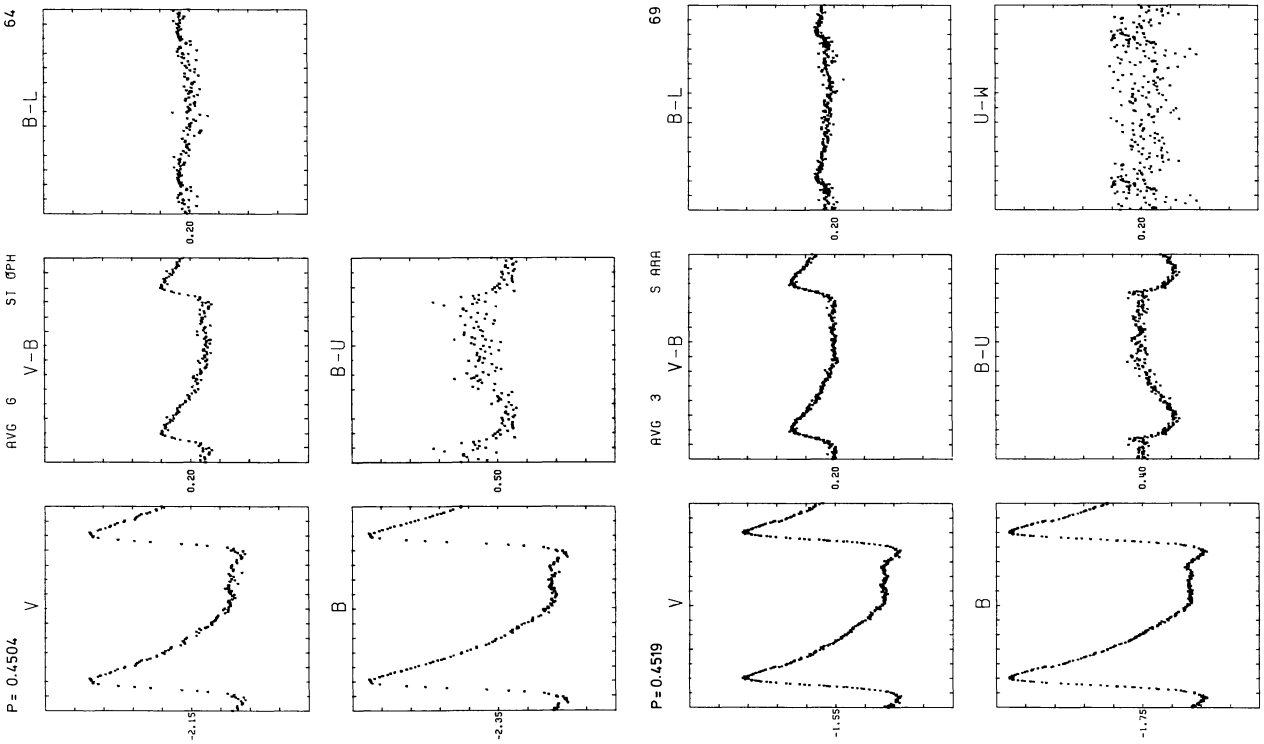


Figure 15

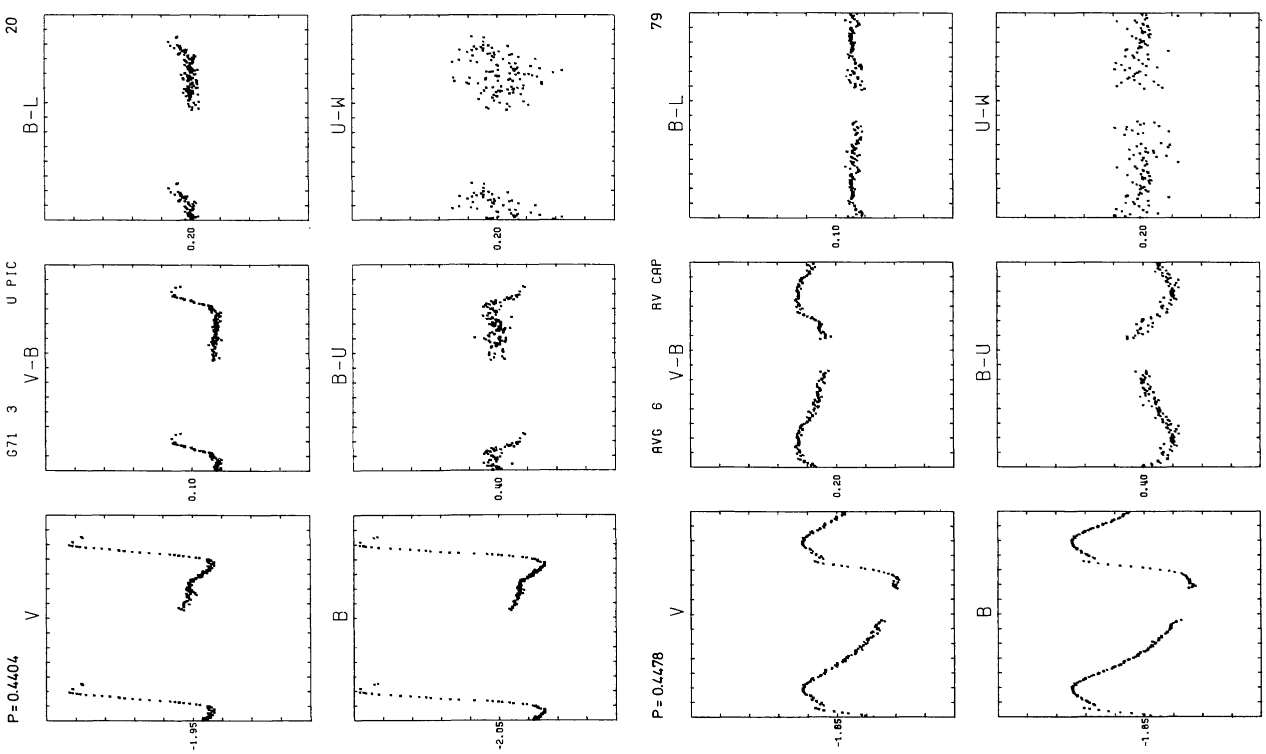


Figure 14

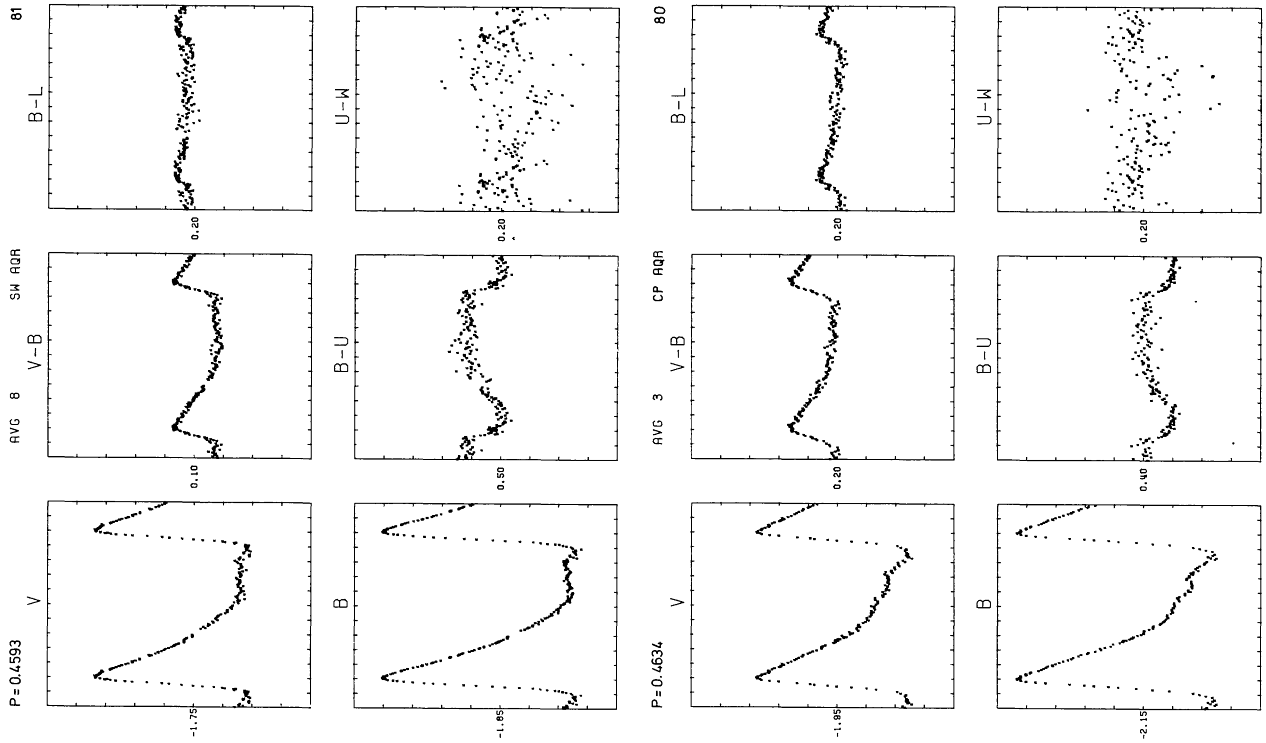


Figure 17

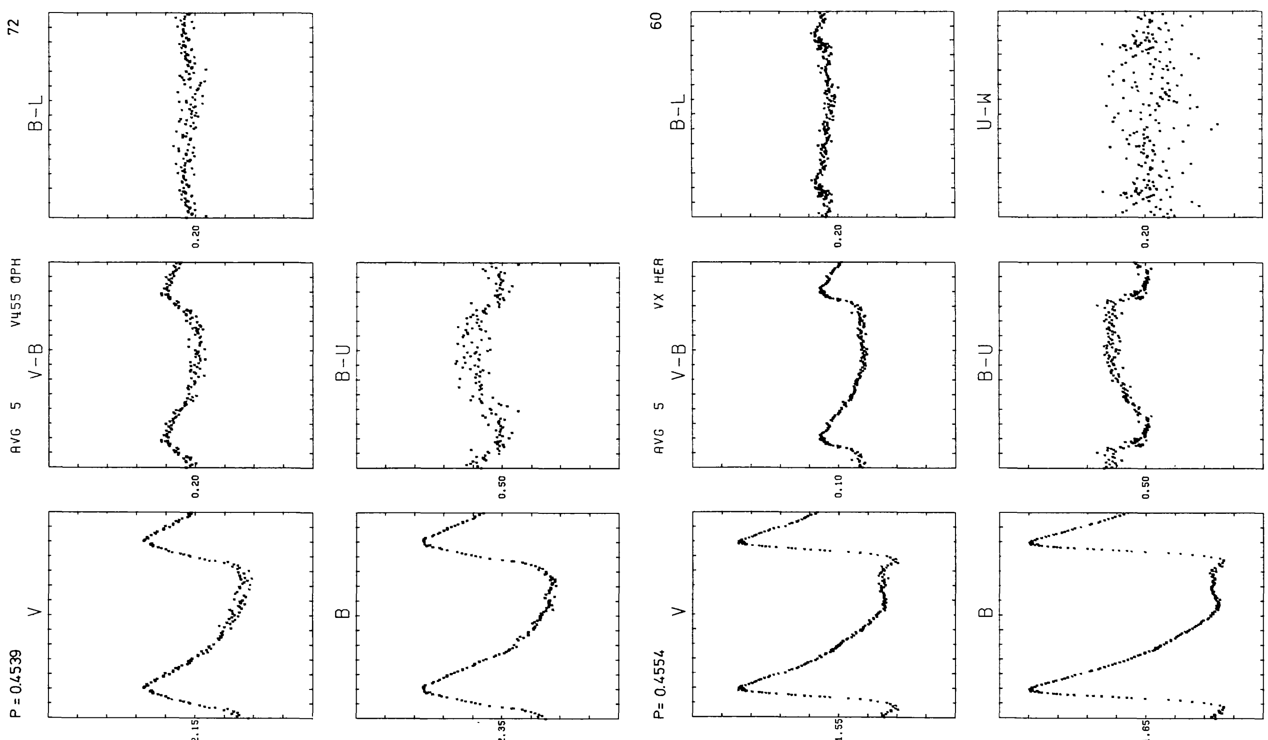


Figure 16

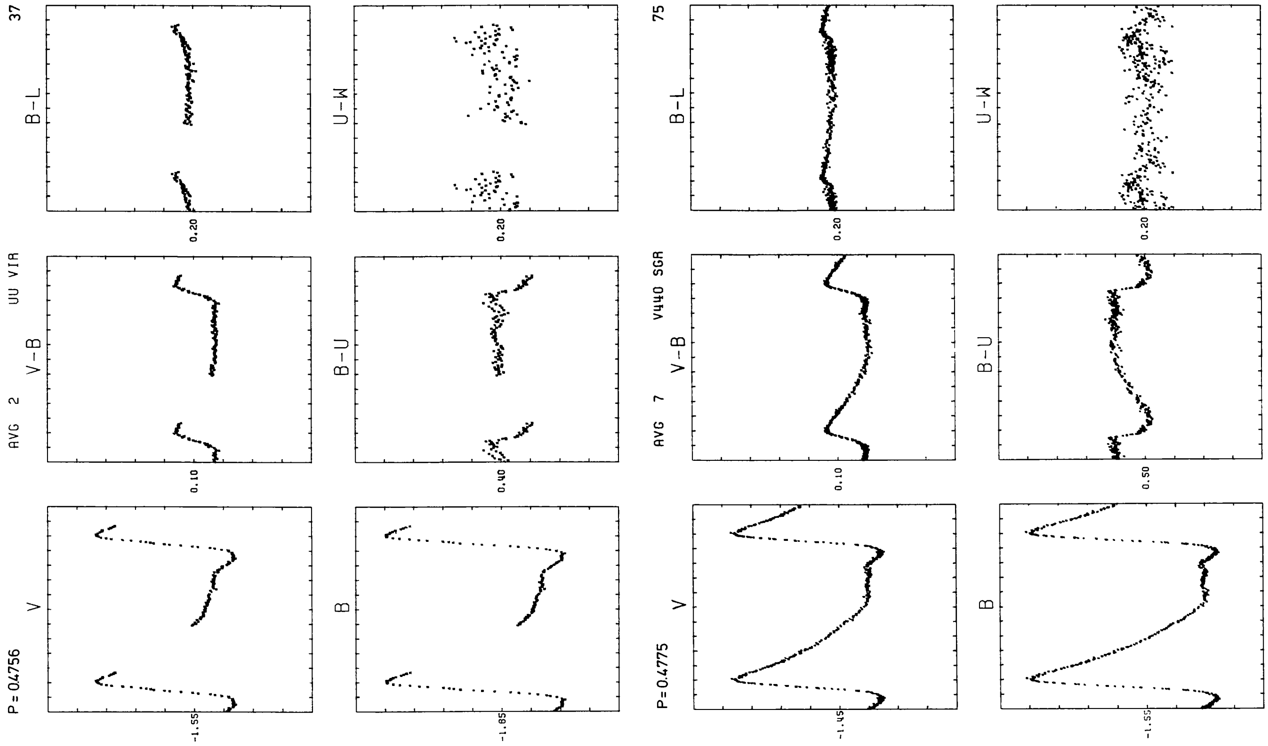


Figure 19

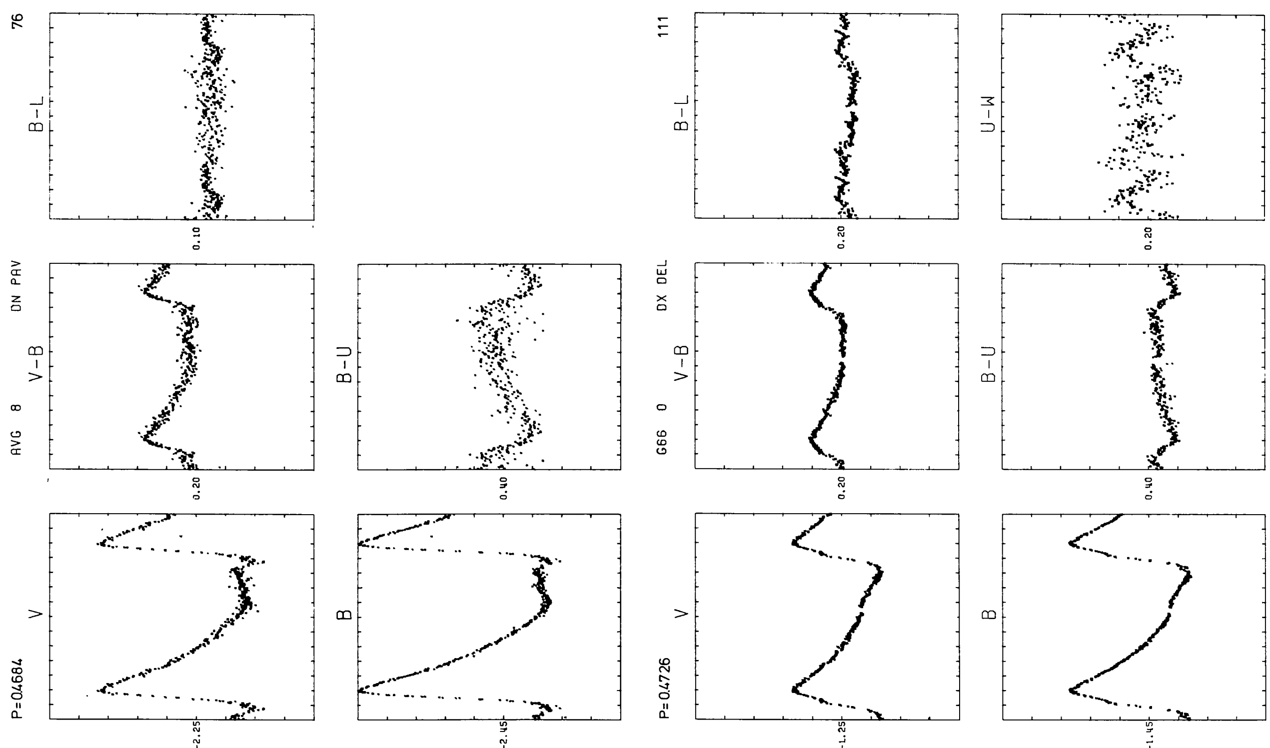


Figure 18

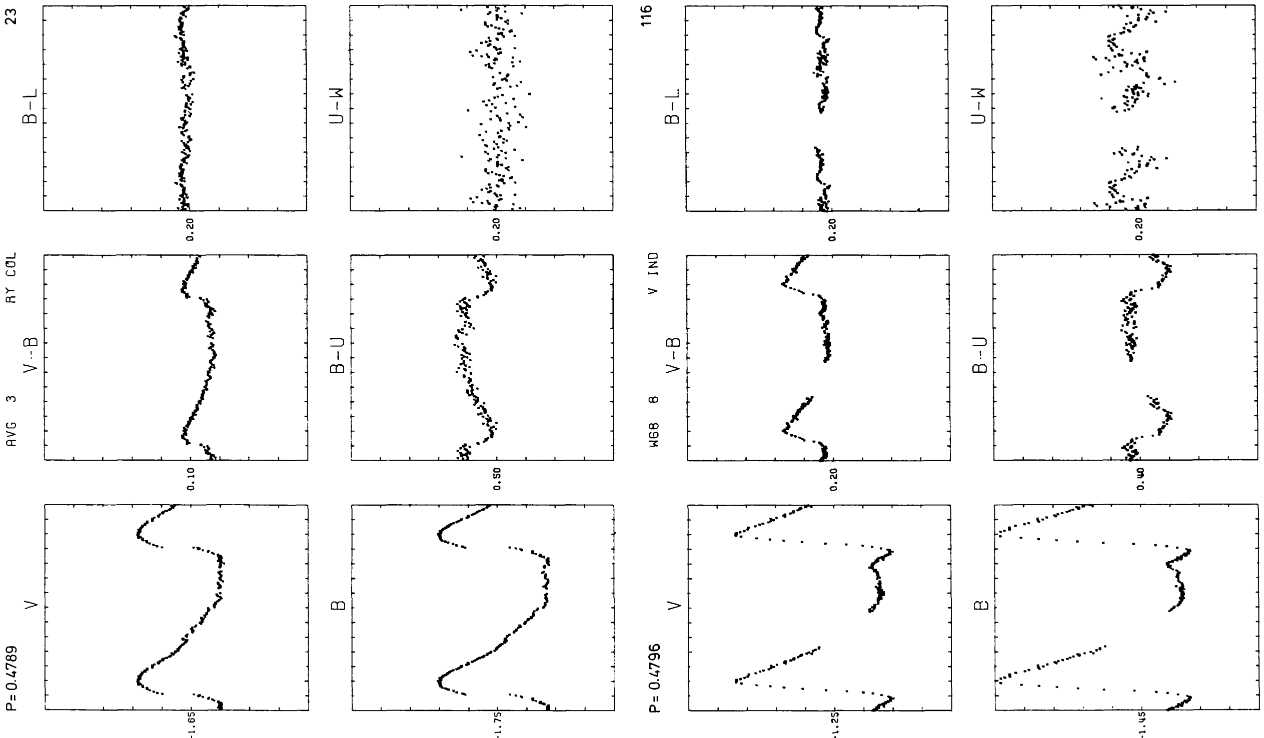


Figure 21

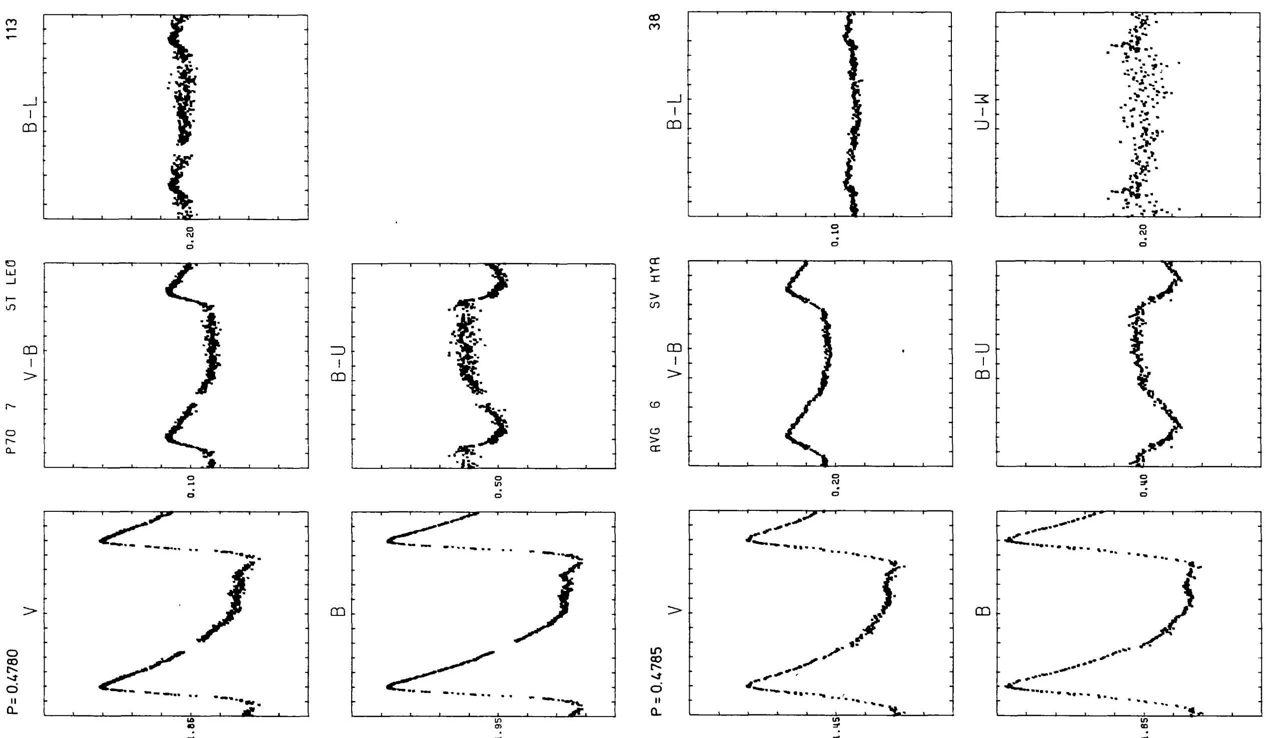


Figure 20

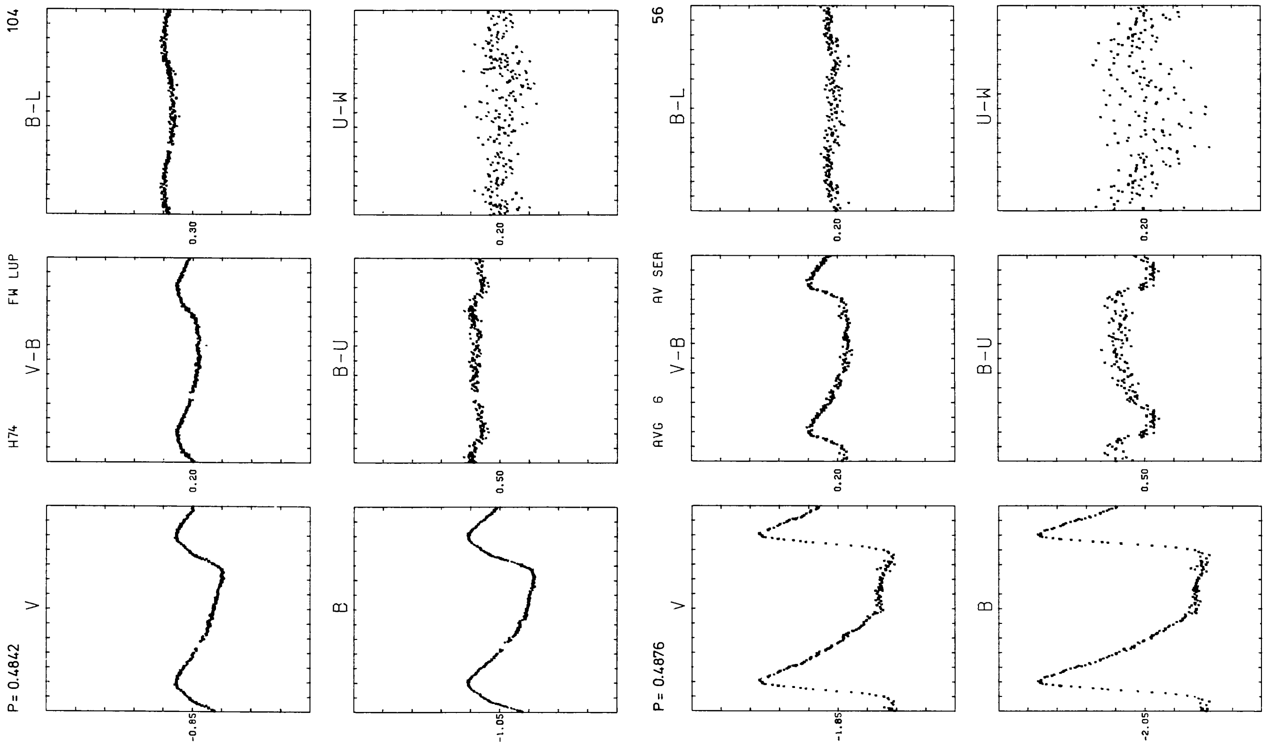


Figure 23

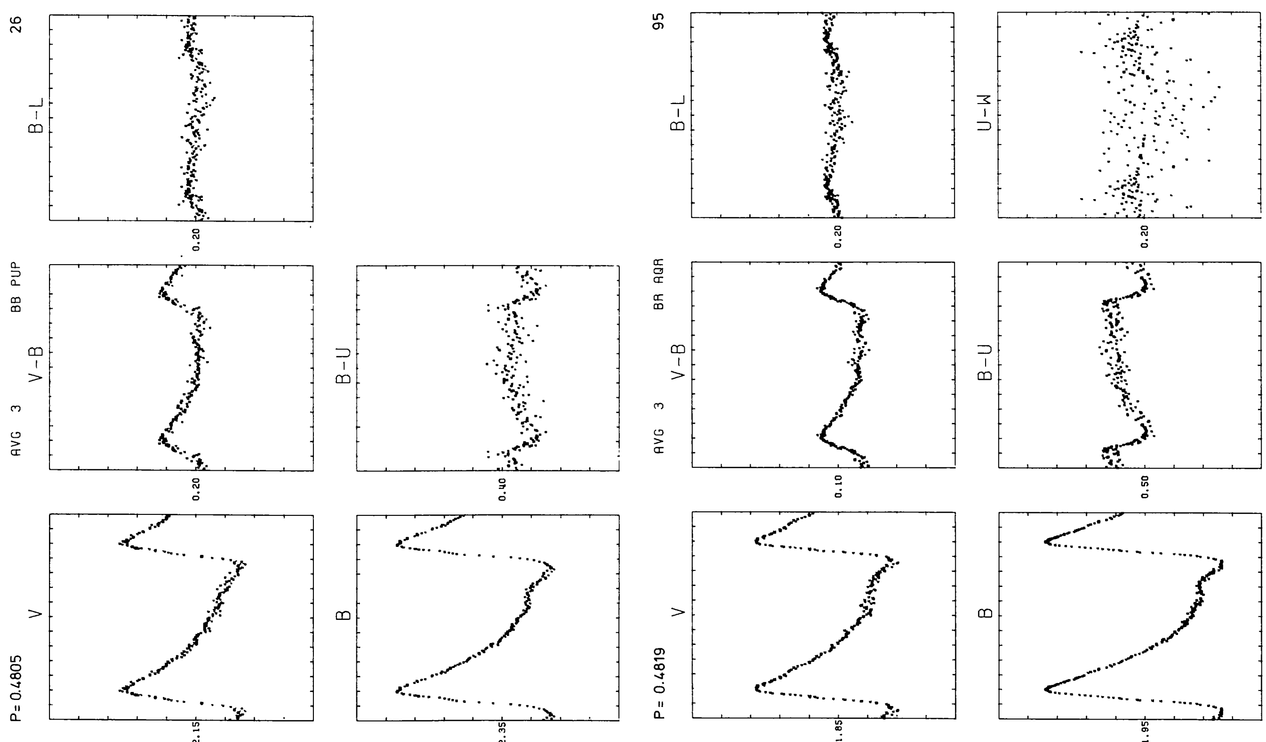


Figure 22

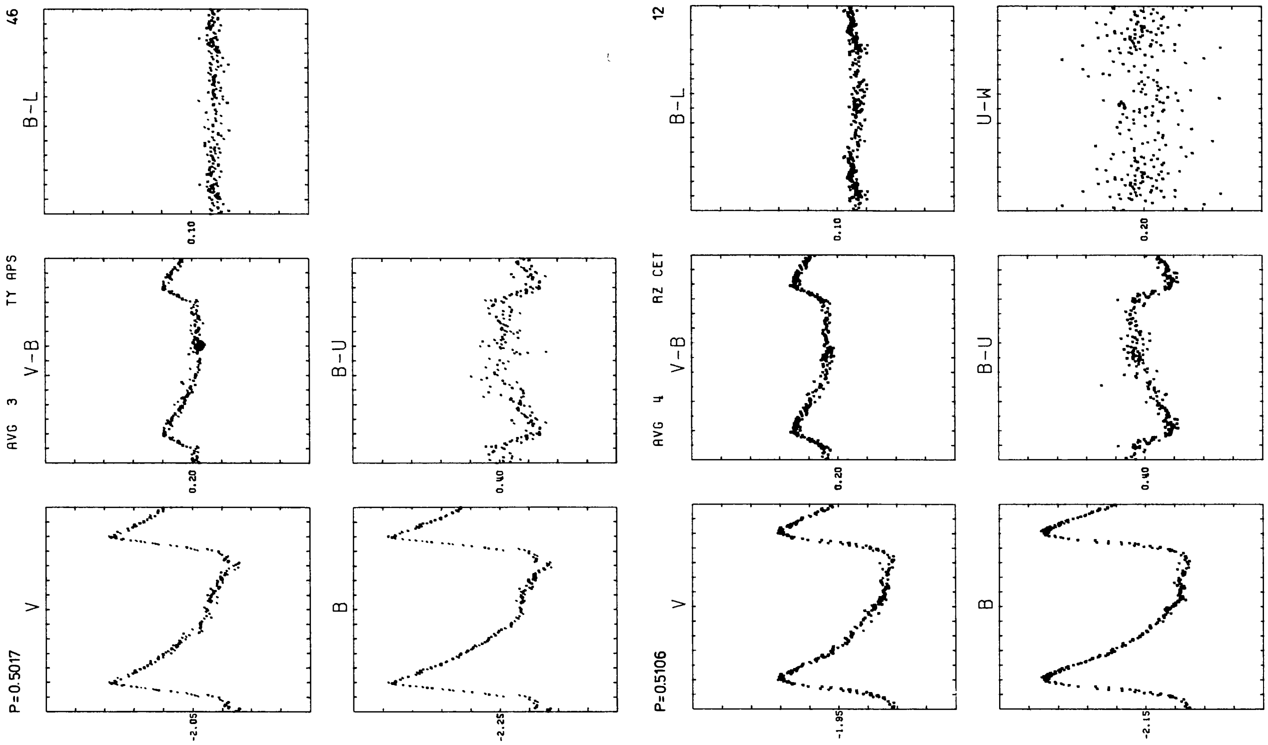


Figure 25

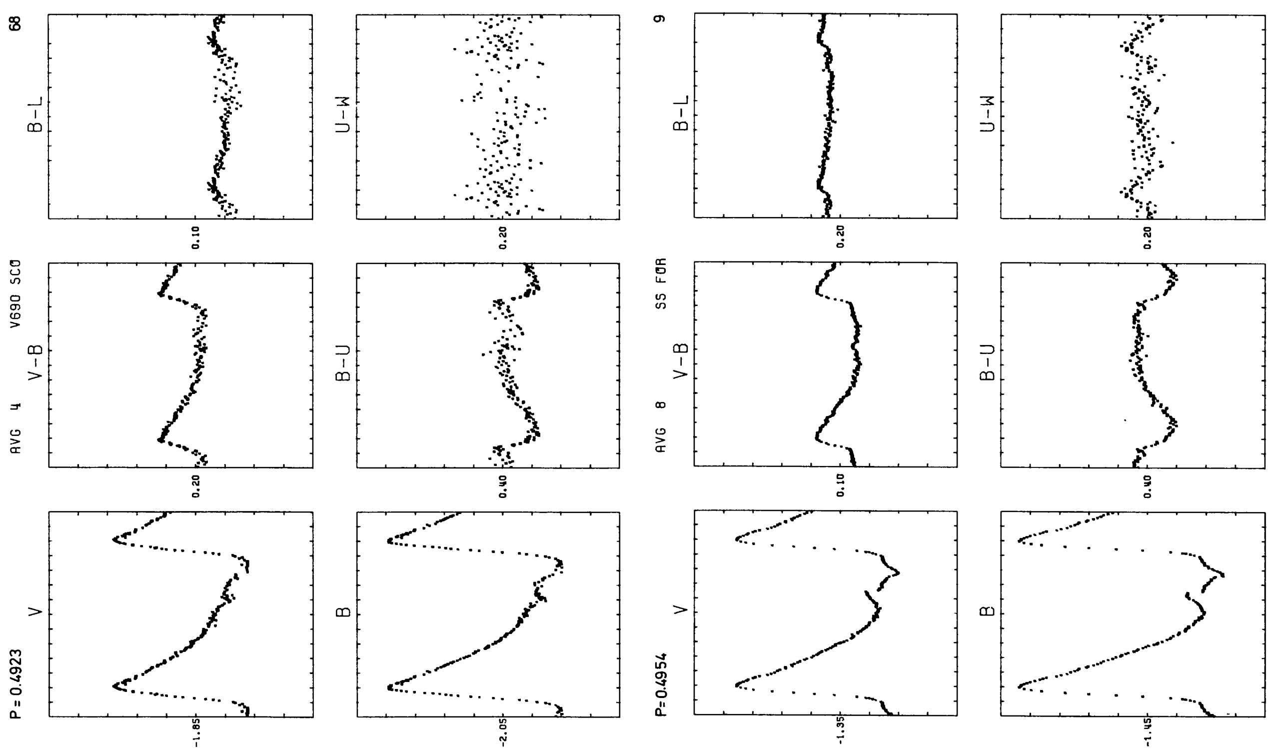


Figure 24

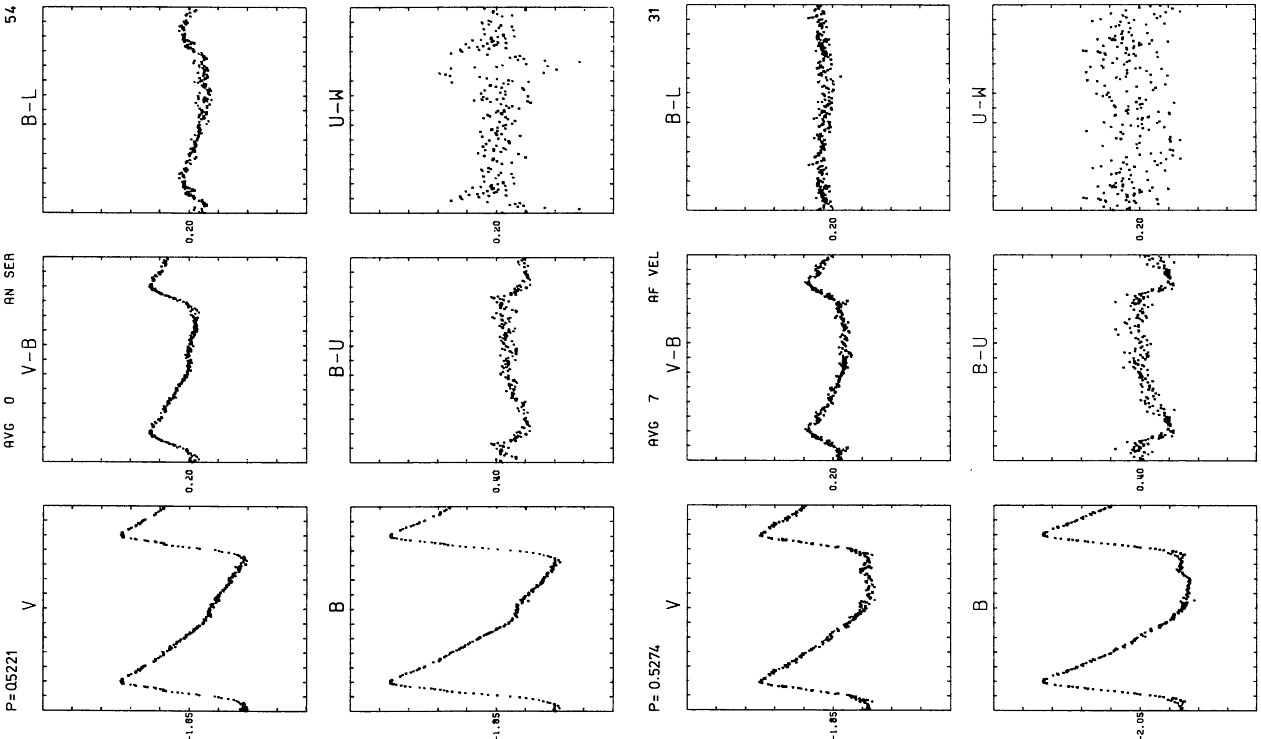


Figure 27

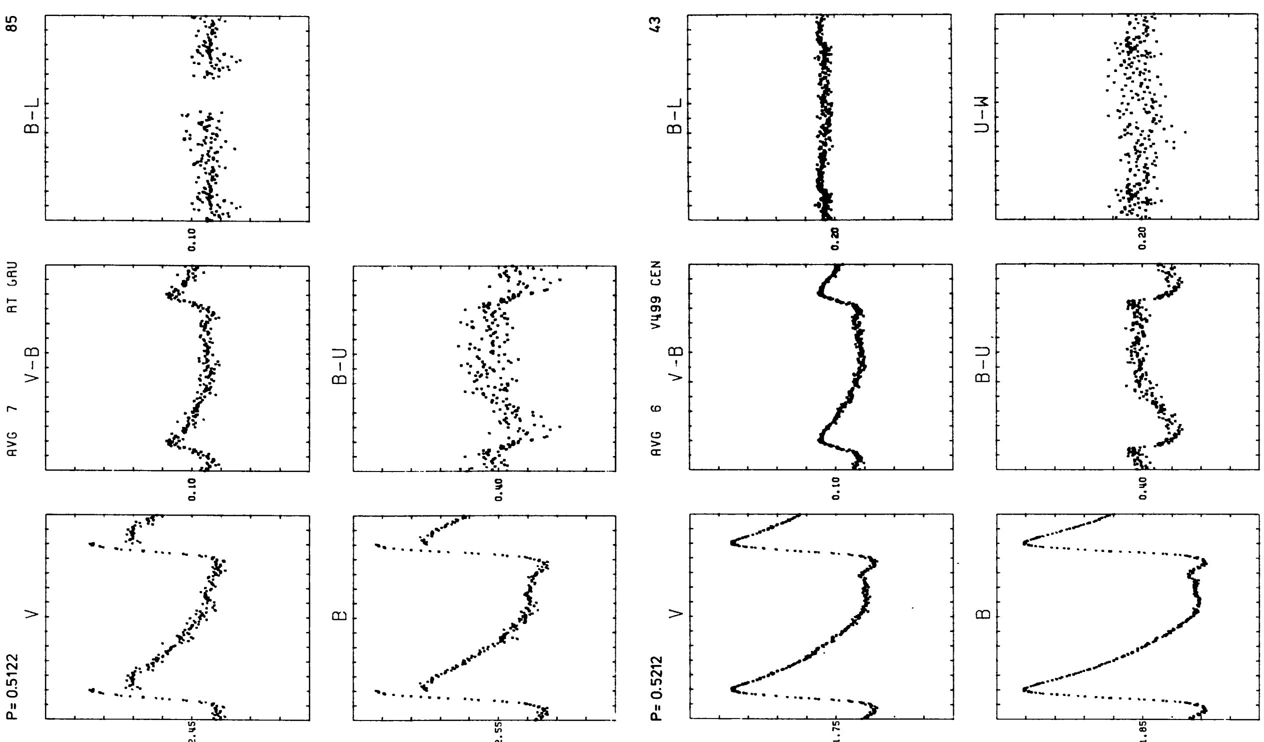


Figure 26

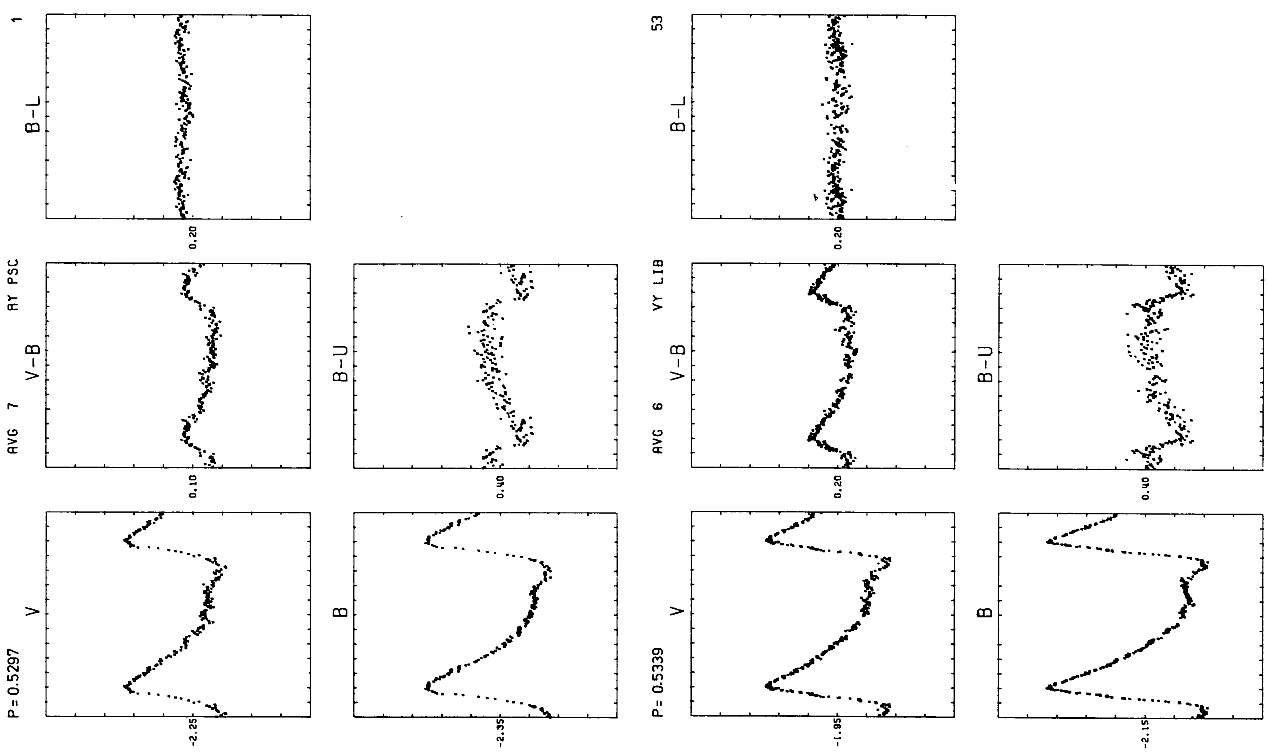
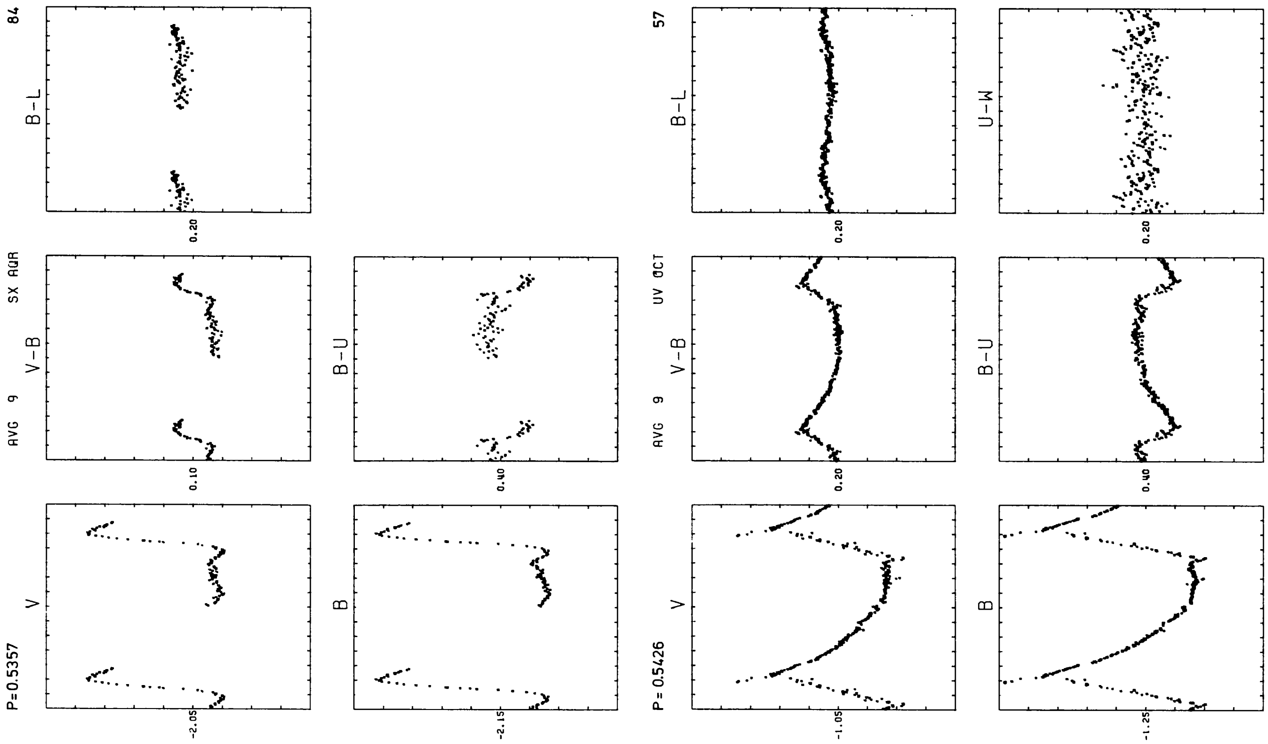


Figure 28



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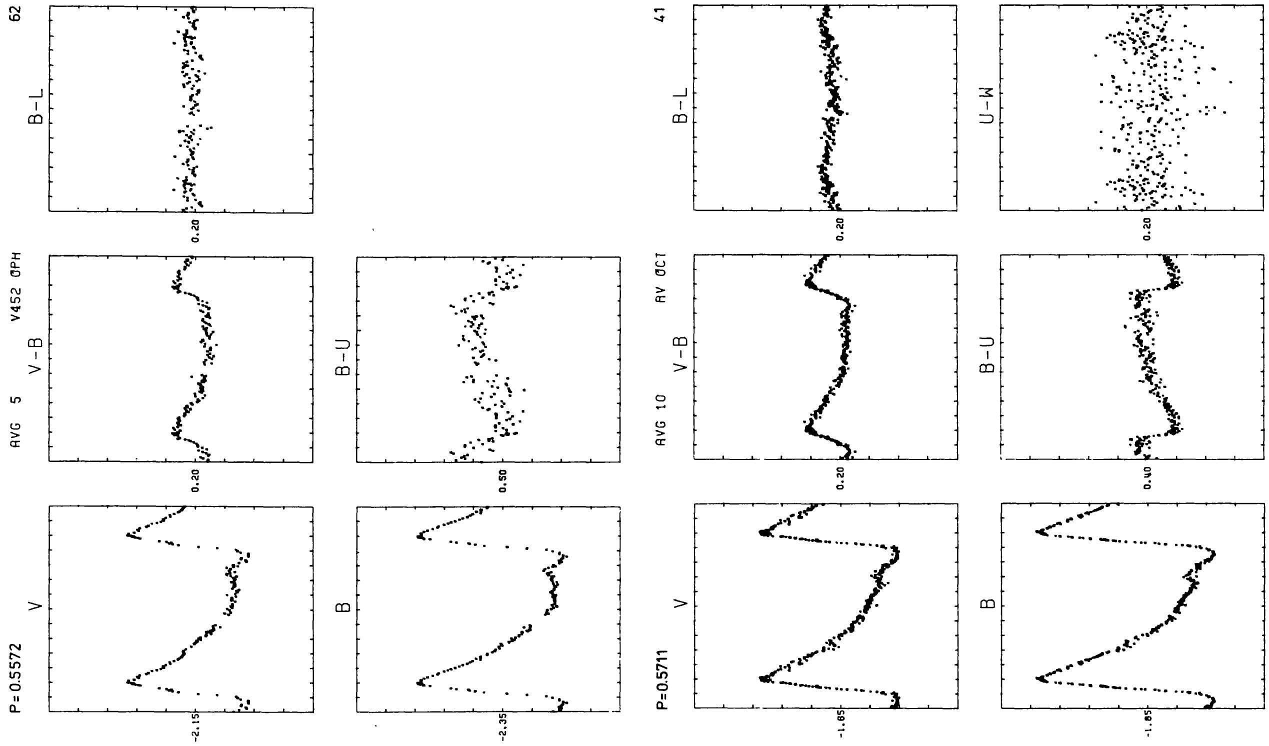


Figure 31

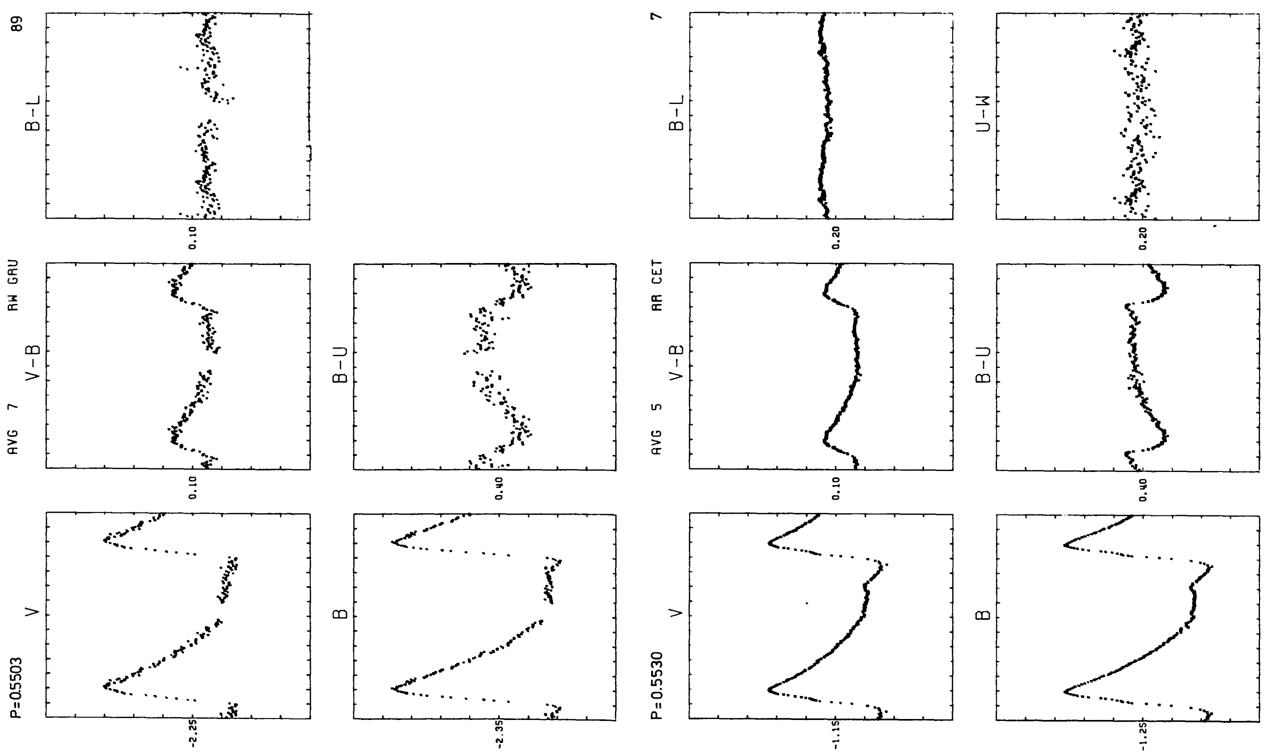


Figure 30

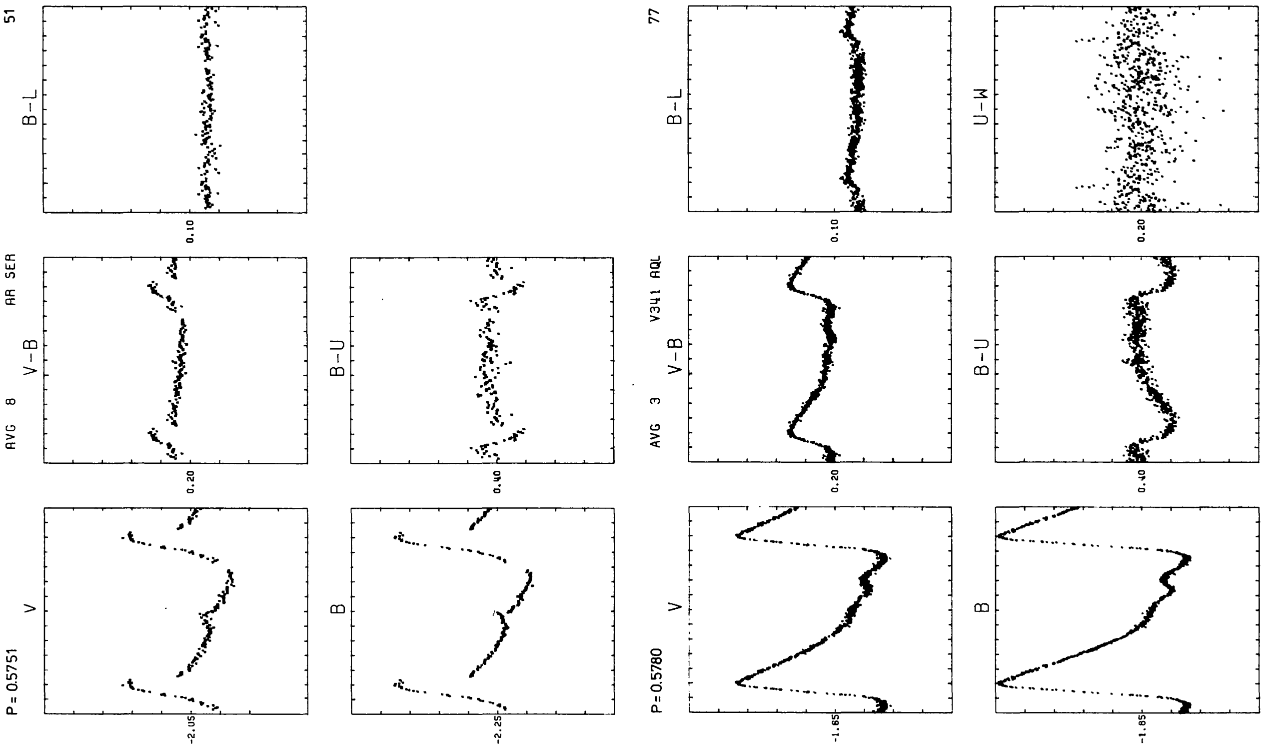
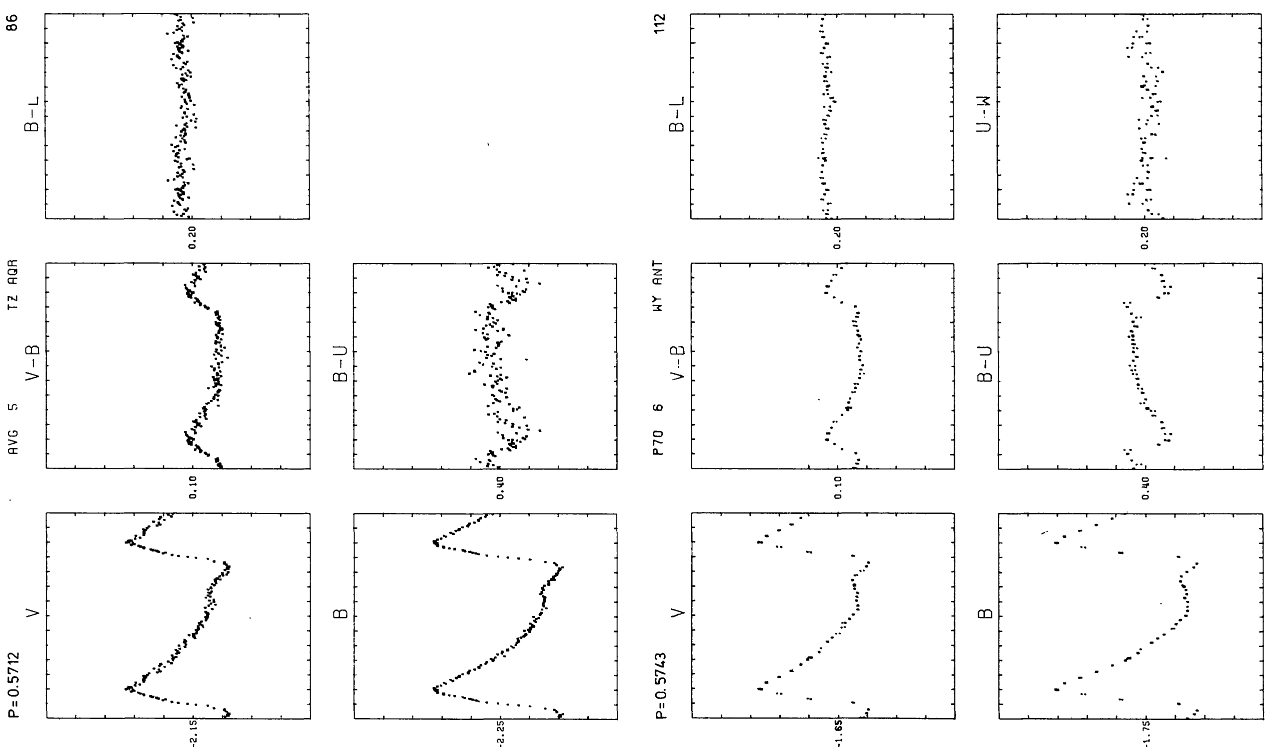


Figure 33



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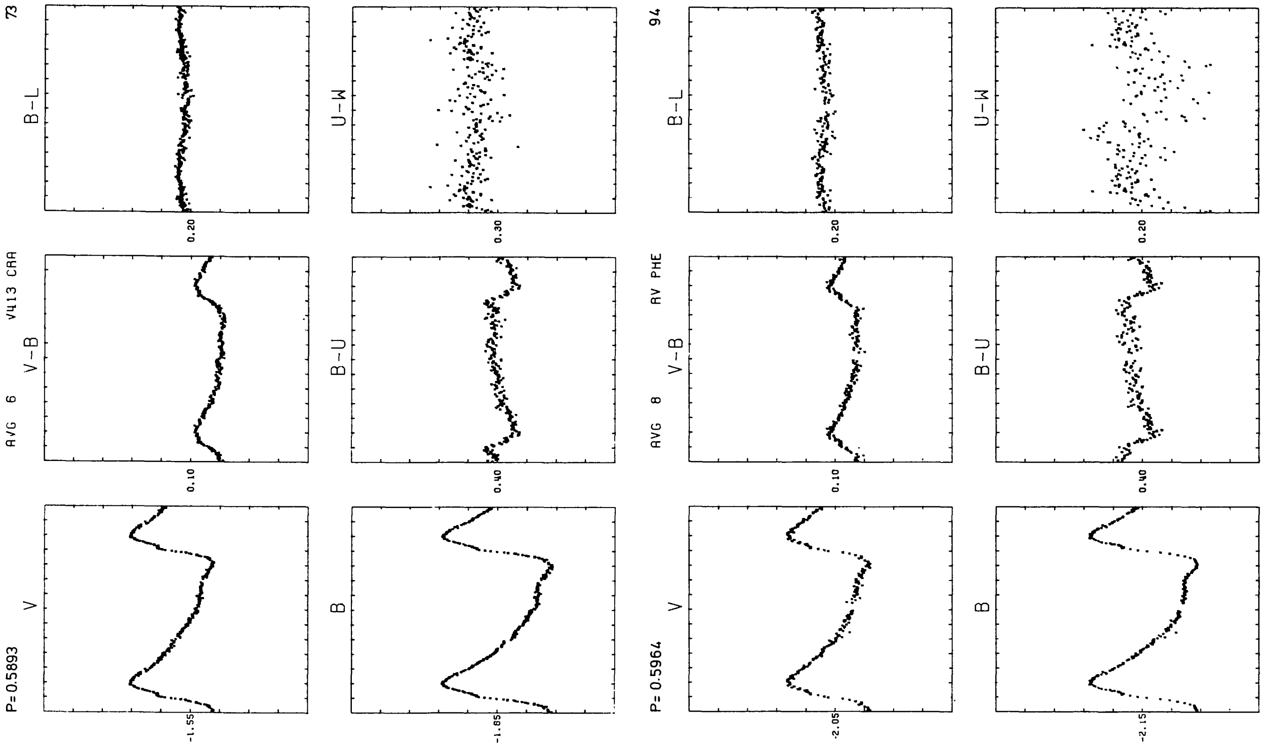
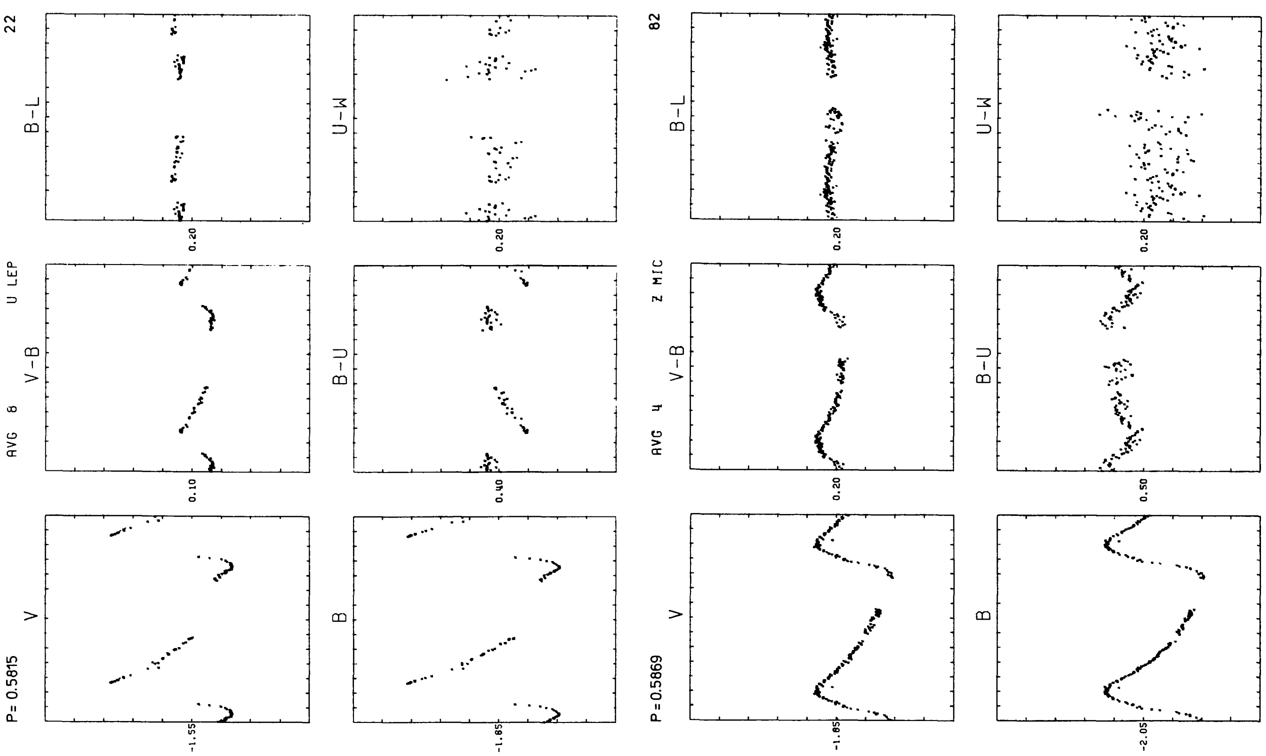


Figure 35



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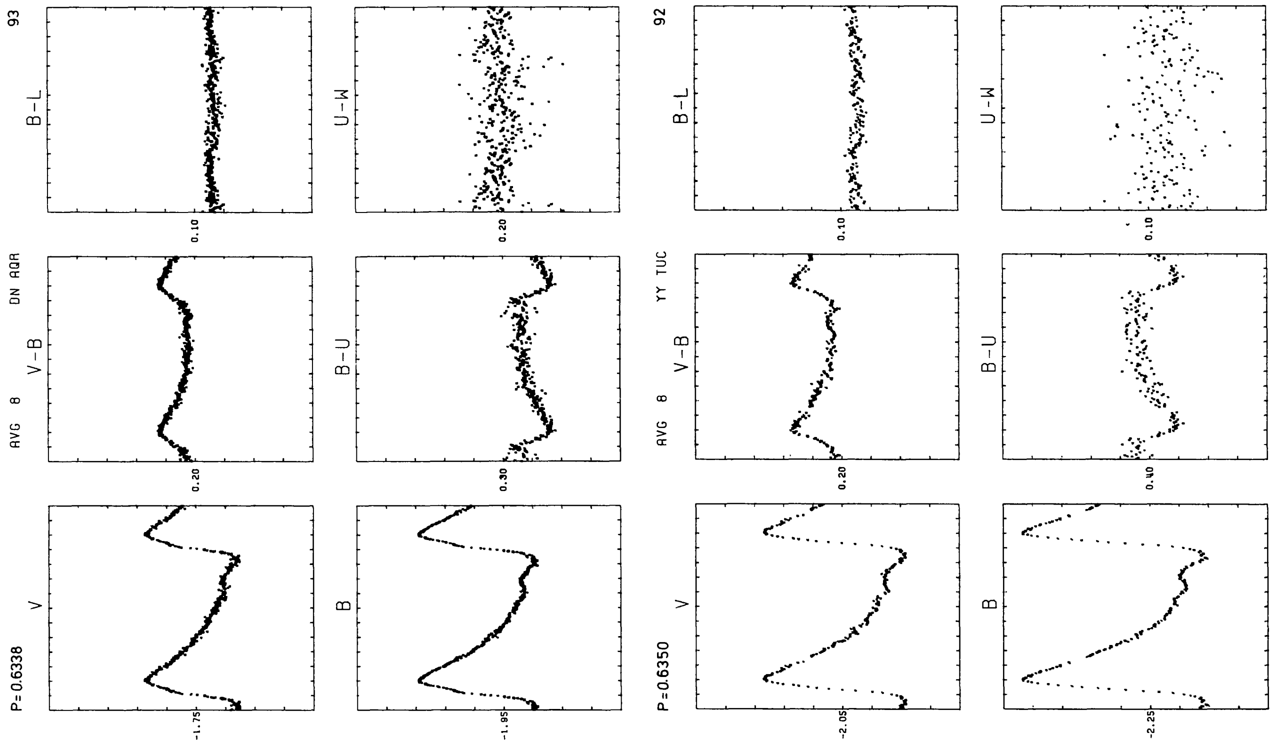

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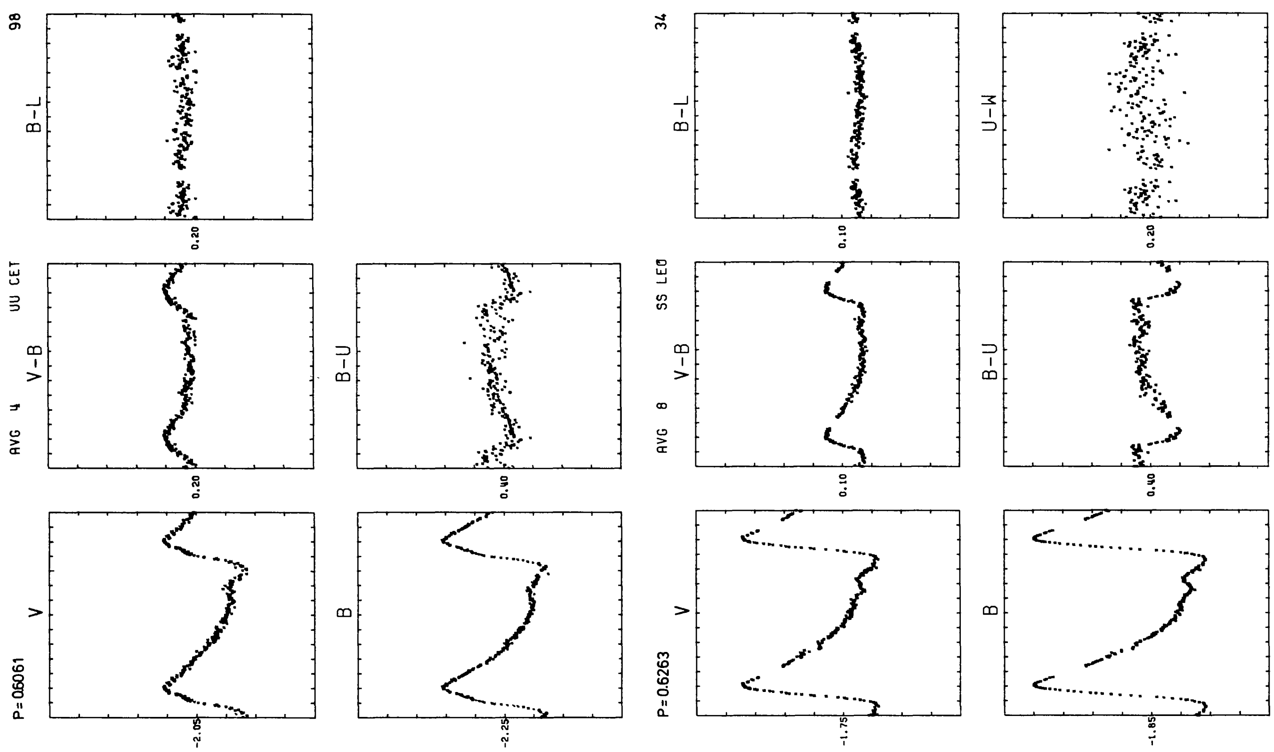

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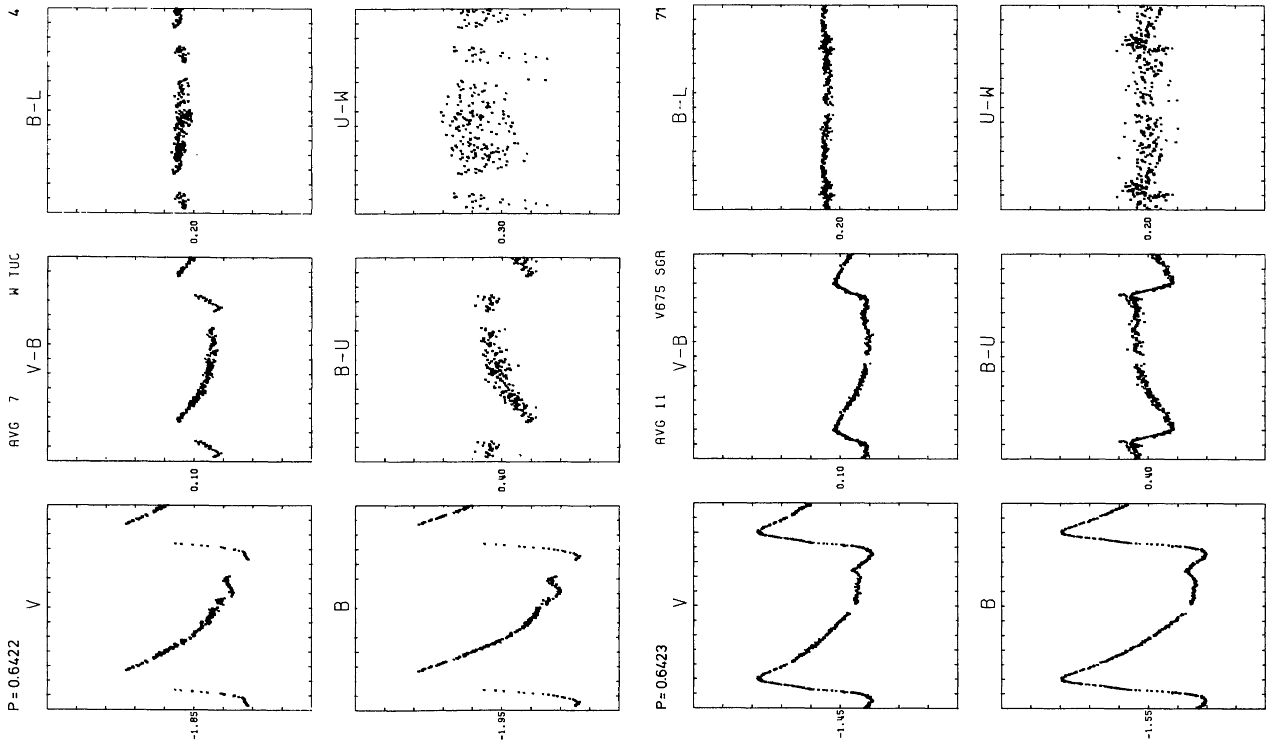

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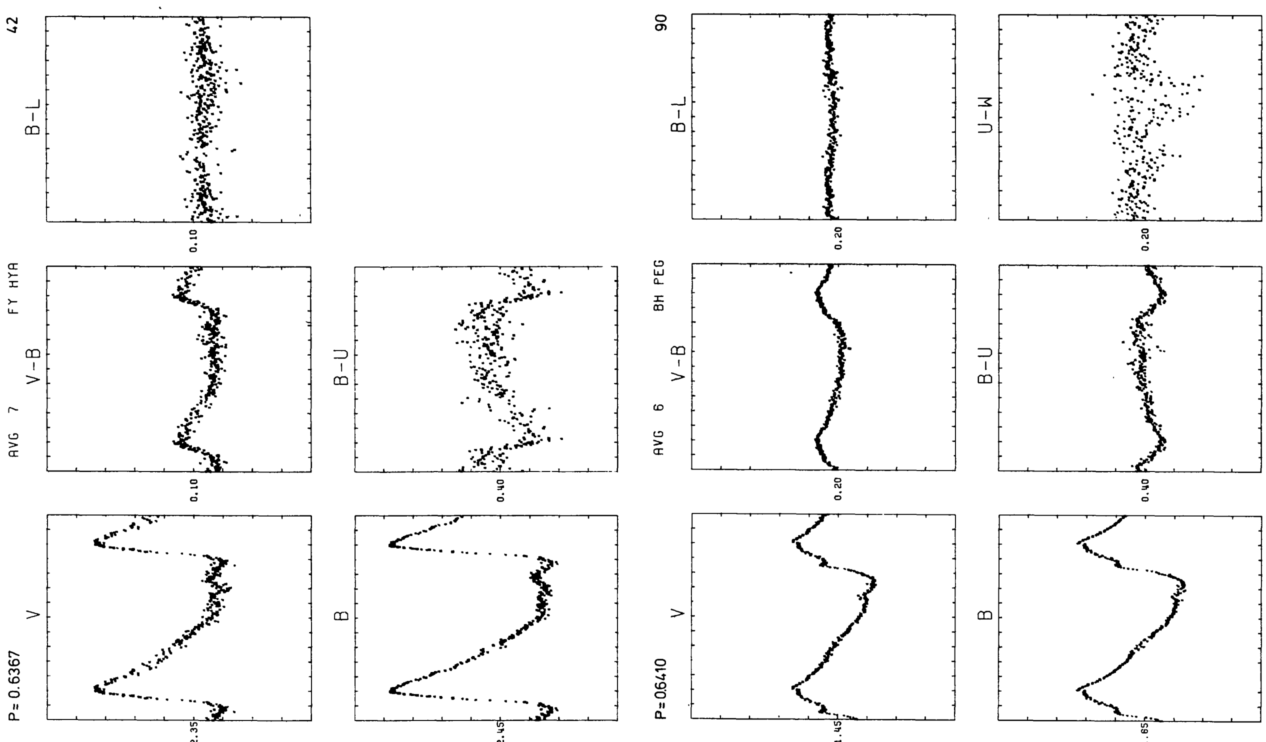


Figure 38

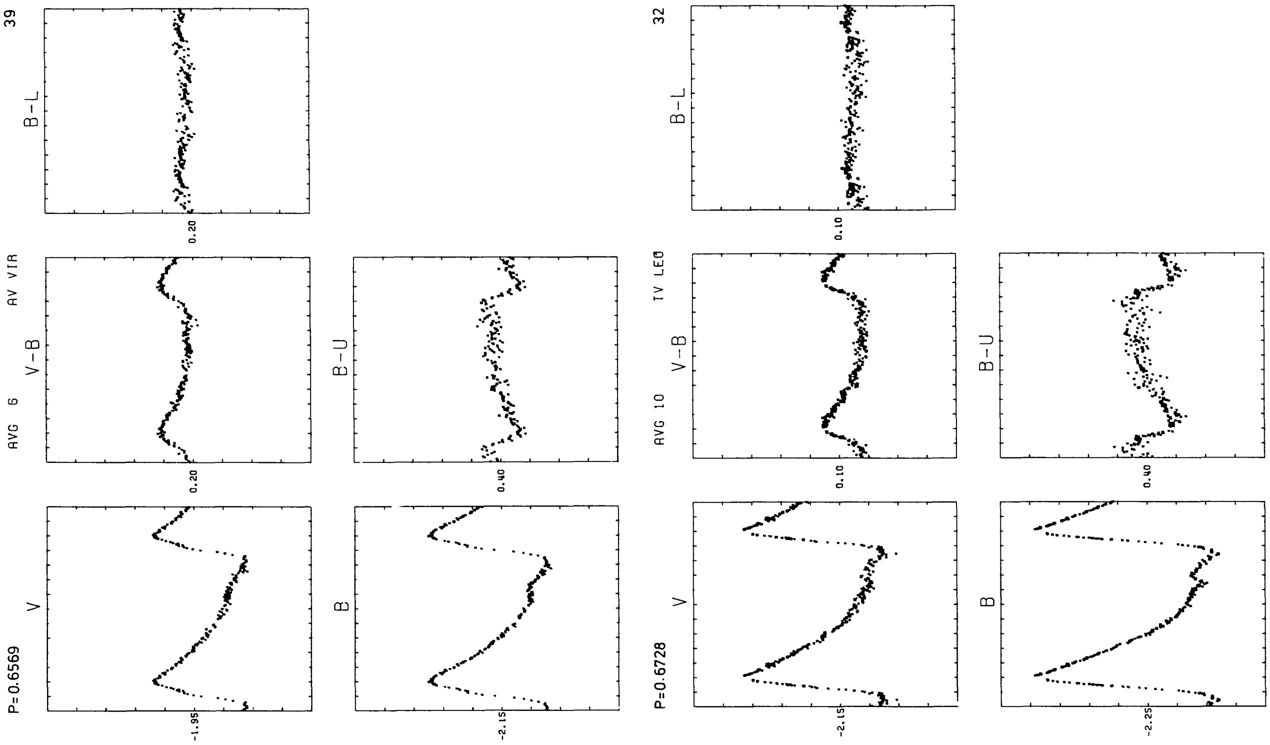


Figure 41

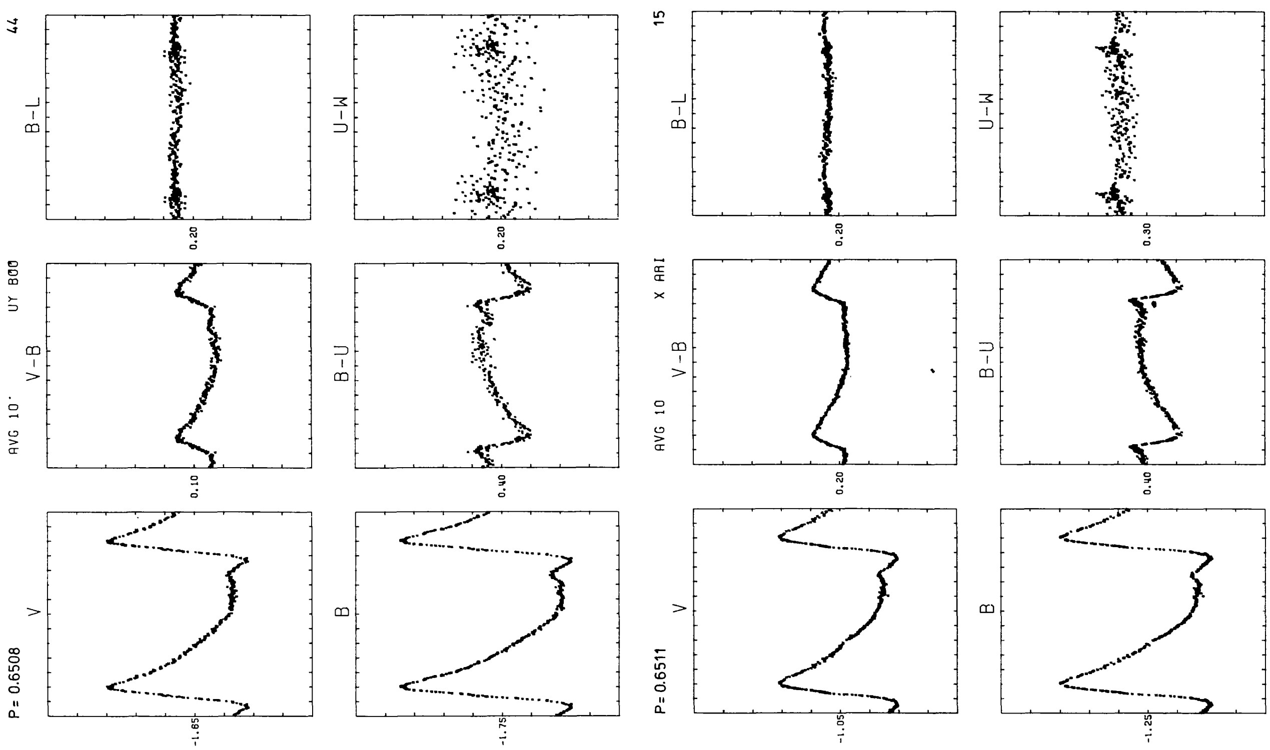
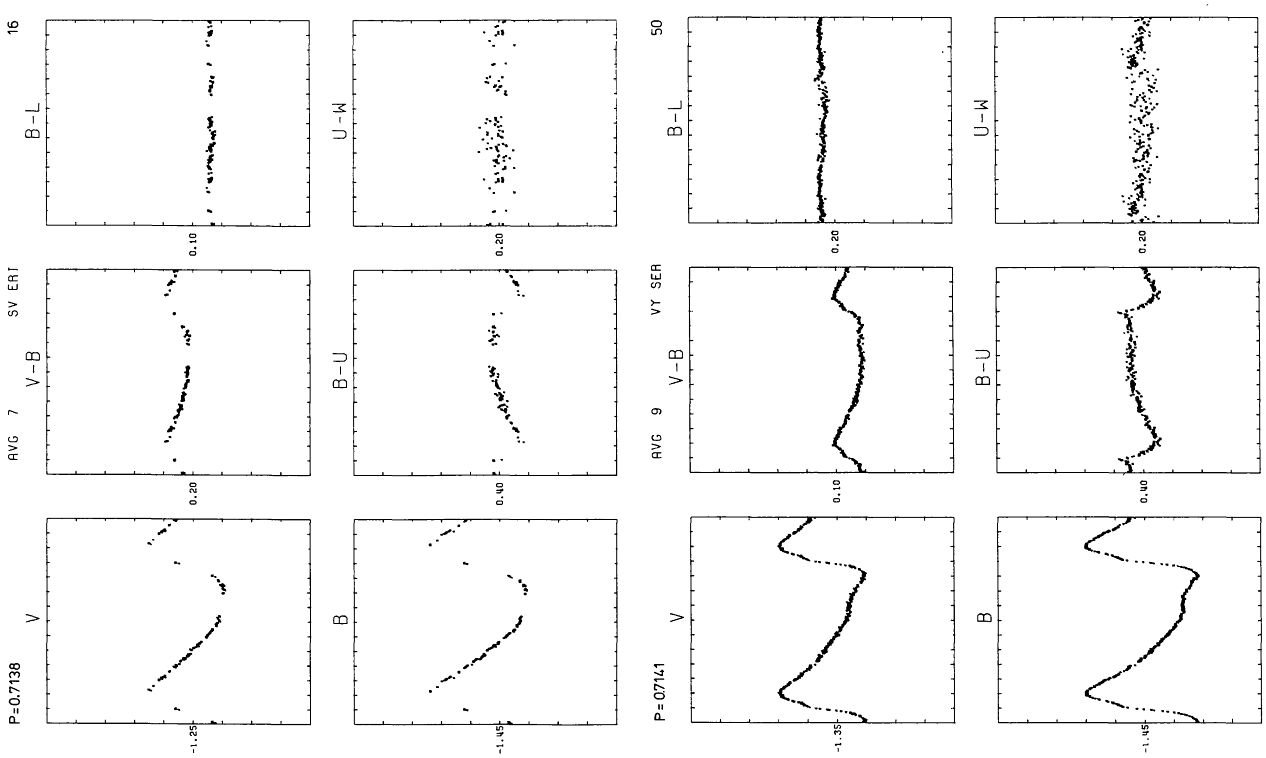


Figure 40



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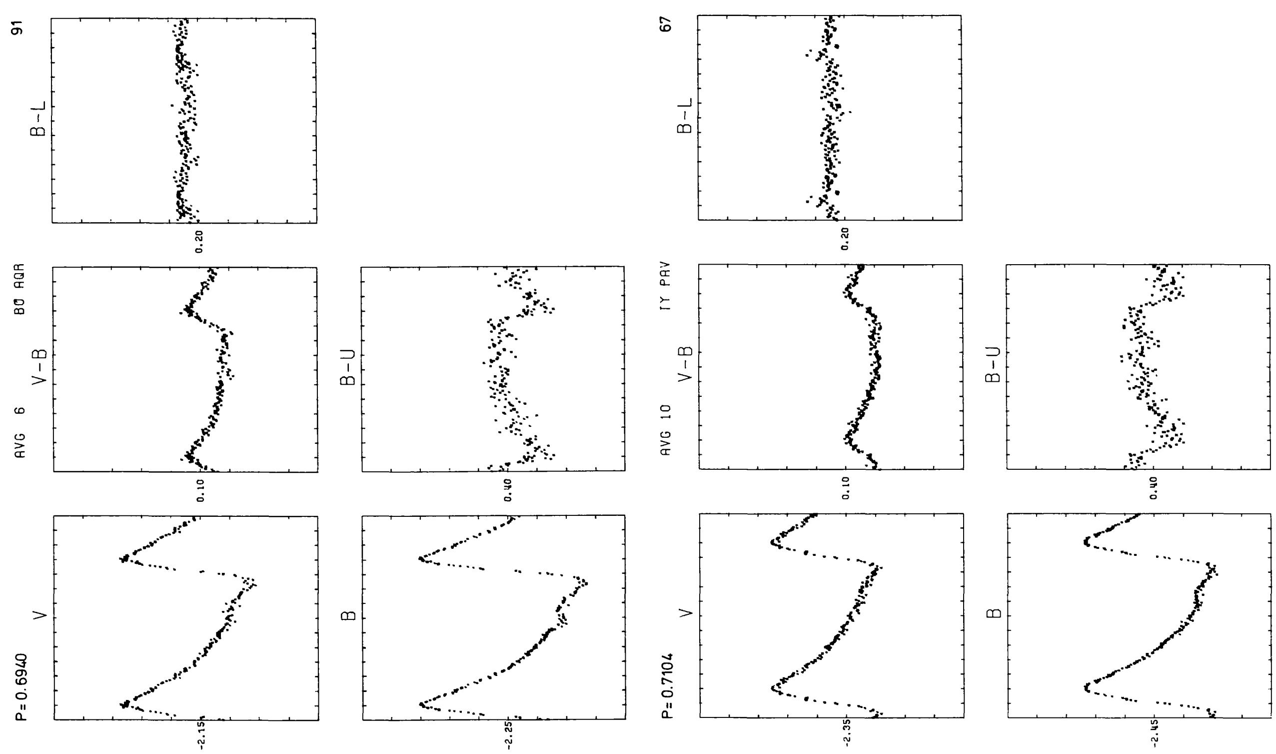
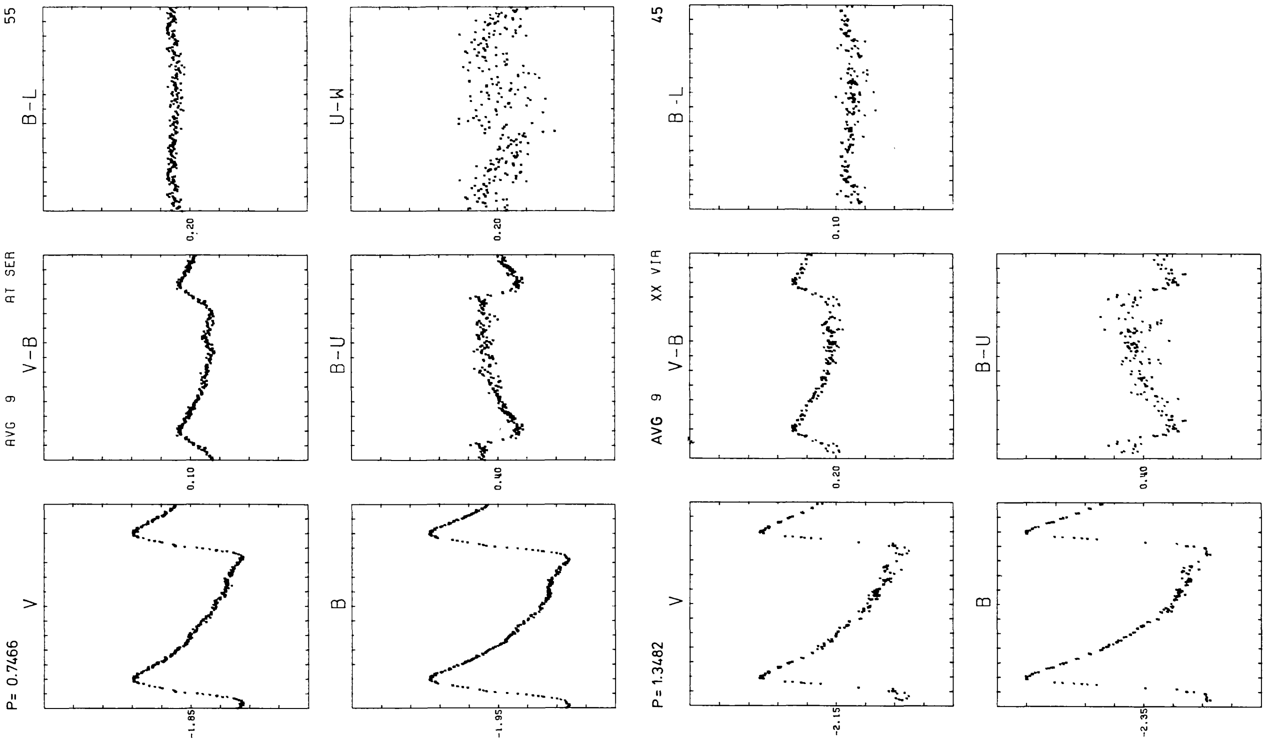


Figure 42



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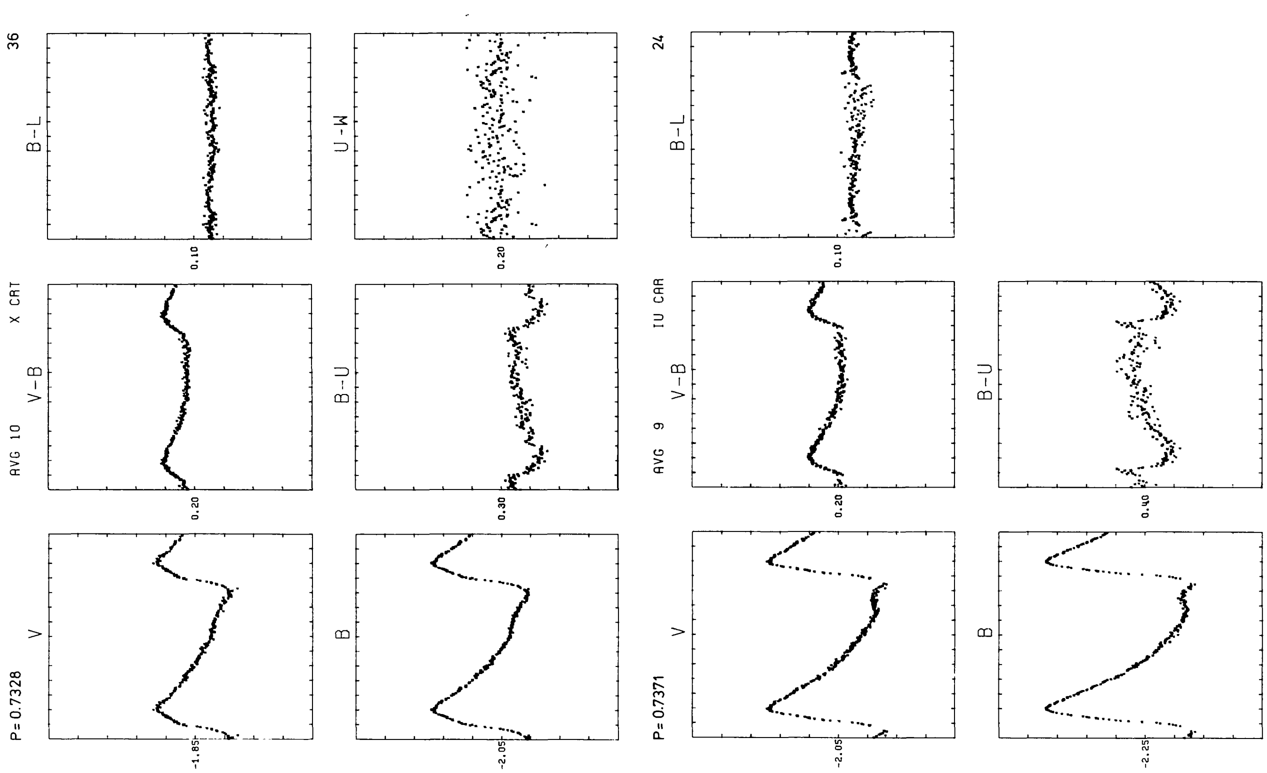

Figure 44

NOTE ADDED IN PROOF

It has been found that in table 1, for DN PAV, $<B\text{–}L>$ should be .155 instead of .148.