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UBV AND SPECTROSCOPIC OBSERVATIONS OF PU VULPECULAE

We present observations which were obtained during the very remarkable brightening phase (especially in U) of PU Vul in October and November 1982 described by Purgathofer and Schnell (1983, hereinafter 'PS'). Table I lists the UBV-results which were obtained by one of us (H.M.M.) as Visiting Astronomer at the 1m Yale University telescope of the Observatorio Interamericano de Cerro Tololo (CTIO)+). A single channel photometer with a dry ice cooled S4 type photomultiplier was available in pulse counting mode with data output on a thermal printer.

Table I

UBV-observations of PU Vul minus BD 21<sup>0</sup>4165.

JD(2 0000+)	$\Delta V'$	e	$\Delta B'$	e	$\Delta U'$	e	n
5271.52	-0.759	1	-0.748	5	-0.400	4	2
5272.51	772	2	760	4	428	1	2
5273.51	795	5	780	3	456	7	2
5276.50	825	2	814	8	500	4	5
5277.51	828	2	827	3	540	6	4
5278.51	837	6	842	2	558	4	3
5279.51	828	3	842	5	538	5	3
5280.51	830	1	849	3	574	2	3
5281.51	-0.834	4	-0.860	6	-0.590	6	3

Notes: The columns headed by 'e' contain the values of the mean errors (in units of 0.001 mag) of the preceding values. 'n' is the number of integrations of 15 sec.

+ ) operated by the Association of Universities for Research in Astronomy (AURA), Inc. under contract with the National Science Foundation.

Due to the early right ascension the measurements were taken in dawn. Therefore, the sky readings were used to obtain a smooth curve from which the respective sky values during the star measurements were taken. The air masses of the photometric observations were always in the vicinity of 2.

The differences in Table I are given in the observer's system. Comparing our results with those of PS we notice good agreement in the zero-points of B and V. As our measurements exhibit a rather small scatter around a smooth curve, we conclude that the comparison star BD 21<sup>o</sup>4165 (which we have in common with PS) is constant (at least over the time interval spanned by our observations). Hence, the slight systematic variability of BD 21<sup>o</sup>4165 mentioned by PS must refer to longer time scales.

Significant difference appears in U: Our U-curve is somewhat steeper than that of PS, and our U of PU Vul is 0.1 mag fainter. This is consistent with a smaller effective wavelength of our U-filter.

Like PS we also lack an accurate transformation to the UBV-system. However, we may use spectral classification in order to estimate how close we match the UBV-system. Therefore, one of us (JH) has obtained spectrograms of PU Vul parallel to the photometric run (and one in June 1982), at the 1.5 m telescope of the Leopold Figl-Observatory of the Vienna University using a dispersion of 125Å/mm at the Boller & Chivens spectrograph and unbaked IIA-0 plates. The results are listed in Table II.

Table II

## Spectroscopic observations of PU Vul.

JD(2440000+)	height	n	spectral type
5157.55	500	1	F8-9 I
5273.34	350	1	F5 Ia
5274.25	500	2	F6 I
5275.26	500	3	F6 Ia

Notes: The spectrum height is given in microns, 'n' is the number of spectrograms.

During the brightening phase the H-beta line appears in weak, but definite emission with a P Cyg type blue-shifted absorption. This was not found on the first date of Table II.

Taking into account the usual calibrations of supergiants in the UBV system and the UBV results of PS we arrive at the following conclusions:

The reddening should be  $0.10 < E(B-V) < 0.15$ . Therefore the U-B values of PS during the time of the spectroscopic observations would point to luminosity class III. However, this is not compatible with our spectral types.

A consistent result would be reached by U-B values which are about 0.15 mag redder than those of PS. Our U-measurements which are 0.1 mag fainter than those of PS comply with this condition considering the errors and uncertainties involved.

Nevertheless, the atmospheric conditions of PU Vul are likely to be peculiar (which is indicated by the fact that the H and K lines of Ca yield a somewhat later spectral type than the other lines - in agreement with Yamashita et al. (1982)) and therefore our conclusions drawn from the comparison of spectroscopic and photometric observations are somehow straightforward and preliminary.

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