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UBV AND SPECTRAL DATA ON RV PICTORIS

Photoelectric UBV observations of the eclipsing binary RV Pictoris were made with one of the 16-inch (40 cm) telescopes at the Cerro Tololo Interamerican Observatory (CTIO) on four nights in November and December, 1971, using HD 31507 (CPD $-52^{\circ}603$) as a comparison star; suitable standards were measured to correct for atmospheric extinction and express the results in the UBV system. The uncertainty of an individual observation is estimated to be $0^{m}.015$. The mean values obtained from 17 observations of HD 31507 are:

$$V = 8.048 \quad B-V = 0.000 \quad U-B = -0.019$$

The three light curves were used to determine the time of primary minimum, which combined with that given by Hoffmeister (1942) yielded the following ephemeris:

$$\text{Primary minimum} = \text{JD hel } 2441286.757 + 3^{d}.971780\ E$$

This is in good agreement with Knipe's determination (Knipe 1969). If the uncertainty in Hoffmeister's minimum is $0^{d}.01$, the uncertainty in the period is $0^{d}.000003$.

The results of the UBV observations are given in Table 1. The heliocentric time corresponds to the V observation, and the phases were calculated with the ephemeris given above.

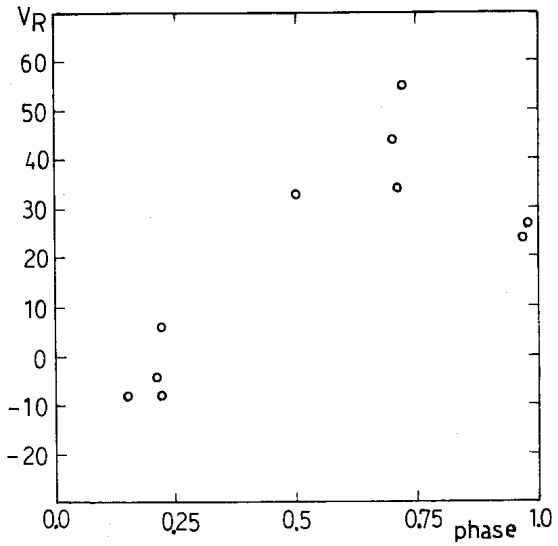
Ten spectrograms of RV Pic were obtained by Virpi Niemelä in November and December 1971 with the CTIO 36-inch (90 cm) and 60-inch (150 cm) telescopes, at dispersions of 125 and 80 Å mm^{-1}, respectively. Only the spectrum of the primary component is visible. The spectral type was determined by comparison with spectrograms of standard stars taken by O.H.Levato with the same equipment. The Balmer and metallic lines suggest a type A5 V, while the Ca II K line yields a slightly earlier type, A2 or A3; perhaps this is an indication of very mild metallicity, but a confirmation is desirable.

The radial velocities were measured at La Plata Observatory with a Grant comparator, and they are represented in Figure 1. The scatter is large, but a system velocity of 20 ± 10 km s^{-1} and a semiamplitude K of 25 ± 5 km s^{-1} are suggested.

TABLE 1

Photometric Observations of RV Pictoris

JD hel$_V$ 2441000+	phase$_V$	V	phase$_B$	B	phase$_U$	U
282.599	0.9531	9.953	0.9536	10.071	0.9539	10.179
.609	.9556	9.925	.9561	10.089	.9564	10.145
.617	.9576	10.006	.9579	10.139	.9581	10.198
.627	.9602	10.059	.9604	10.199	.9607	10.263
.702	.9790	10.872	.9793	11.240	.9796	11.363
.713	.9818	11.073	.9821	11.419	.9823	11.509
.722	.9841	11.244	.9842	11.631	.9846	11.766
.729	.9858	11.345	.9863	11.833	.9866	12.014
286.585	.9567	9.963	.9572	10.089	.9577	10.151
.595	.9592	10.038	.9593	10.147	.9595	10.270
.613	.9637	10.165	.9640	10.335	.9645	10.383
.621	.9658	10.254	.9660	10.437	.9665	10.478
.630	.9680	10.333	.9683	10.492	.9685	10.608
.647	.9723	10.508	.9726	10.734	.9728	10.787
.654	.9741	10.615	.9743	10.847	.9746	10.849
.661	.9758	10.713	.9761	10.963	.9763	11.035
.678	.9801	10.949	.9804	11.290	.9809	11.392
.687	.9824	11.143	.9826	11.486	.9829	11.581
.695	.9844	11.268	.9849	11.676	.9851	11.846
.704	.9867	11.457	.9869	11.864	.9872	12.081
.713	.9889	11.565	.9894	12.135	.9897	12.404
.727	.9924	11.777	.9927	12.406	.9930	12.694
.740	.9957	11.969	.9960	12.594	.9962	12.867
.749	.9980	12.005	.9985	12.804	.9987	13.028
.771	.0035	11.983	.0038	12.673	.0039	12.911
.784	.0068	11.804	.0073	12.424	.0074	12.657
.797	.0101	11.599	.0103	12.063	.0106	12.385
.810	.0133	11.393	.0136	11.759	.0141	11.845
287.713	.2407	9.650	.2412	9.763	.2415	9.815
.722	.2430	9.645	.2435	9.787	.2436	9.813
.733	.2457	9.644	.2460	9.784	.2462	9.807
288.590	.4615	9.690	.4618	9.794	.4620	9.815
.599	.4638	9.697	.4643	9.806	.4648	9.864
.618	.4686	9.689	.4691	9.804	.4698	9.837
.632	.4721	9.680	.4723	9.794	.4728	9.834
.643	.4749	9.691	.4751	9.792	.4754	9.828
.662	.4796	9.702	.4801	9.806	.4804	9.877
.673	.4824	9.711	.4827	9.790	.4832	9.821
.683	.4849	9.713	.4852	9.791	.4857	9.846
.695	.4879	9.710	.4882	9.802	.4889	9.832
.719	.4940	9.725	.4942	9.816	.4947	9.860
.731	.4970	9.743	.4971	9.805	.4975	9.859



RV Pictoris - Heliocentric Radial Velocities, km s^{-1}.

The scarcity of the observations does not permit a detailed analysis of the system; yet it is possible to make some rough calculations.

Knowledge of K and the period allows us to estimate the mass function, if we assume a circular orbit; we find $f(m) = 0.0064$. If we adopt $2.2 m_\odot$ for the mass of the primary and suppose that the inclination is 90°, we get a value of $0.35 m_\odot$ for the mass of the secondary.

The depths of the primary eclipse are $2^m.45$ in V, $3^m.07$ in B and $3^m.24$ in U (assuming constant brightness outside of eclipse). This imposes an upper limit to the depths of the secondary eclipse, even in the most favourable case of total eclipses and equal stellar radii the secondary eclipse cannot be deeper than $0^m.12$ in V, $0^m.07$ in B and $0^m.06$ in U. This is very near the observed values (in fact, Knipe (1969) gives $0^m.15$ in V for the secondary minimum); so we can safely conclude that both stars are approximately of the same size, and that the eclipses are almost total. It is thus very simple to obtain the difference in absolute visual magnitude between the components of the system as about $2^m.3$. Remembering the low mass of the secondary component, obtained on the assumption that the hotter star is on the main sequence, we see that we can place RV Pictoris in the selected

group of Algol systems that have a subgiant component which is overluminous by more than 5 magnitudes (see e.g. Plavec 1973).

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