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POLARIMETRIC OBSERVATIONS OF AW UMa

The variable AW UMa (BD +30°2163) was discovered by Paczynski (AJ 69,124,1964) in 1963 and was classified as an eclipsing variable of type W UMa.

The polarimetric observations of this close binary were carried out during 5 nights in March - May 1972. The same polarimeter was used as in Oshchepkov, IBVS 782, 1973 . The observational technique is described in Oshchepkov, Abast.Bull. 45,51, 1974 .

Our observational material is given in Table 1. The first column represents the heliocentric epochs of the observations, the polarization degrees and the position angles in equatorial frame of references are given in column two and three, respectively.

Table 1. Polarimetric Observations of AW UMa

2441000+	P%	θ°	2441000+	P%	θ°	2441000+	P%	θ°
392.4015	0.14	47	392.4833	0.18	175	393.2343	.18	97
.4043	.12	94	.4870	.08	168	.2368	.10	86
.4078	.14	108	.4897	.18	135	.2394	.12	115
.4113	.11	120	.4921	.16	161	.2427	.17	140
.4147	.18	123	.4951	.20	189	.2468	.24	154
.4175	.06	74	.4988	.26	189	.2505	.20	137
.4215	.05	168	.5024	.14	194	.2546	.31	152
.4251	.11	116	.5064	.16	169	.2582	.23	150
.4288	.02	118	.5099	.07	157	.2615	.43	157
.4323	.07	118	.5134	.10	149	.2655	.31	134
.4356	.13	123	.5166	.12	156	.2686	.17	131
.4395	.09	156	.5205	.13	146	.2718	.23	142
.4432	.16	122	.5238	.13	152	.2756	.25	150
.4467	.09	122	.5268	.18	131	.2794	.27	157
.4509	.06	154	.5307	.17	148	.2828	.33	150
.4548	.12	178	.5344	.16	155	.2868	.33	150
.4585	.18	142	.5384	.18	156	.3710	.38	143
.4627	.10	141	.5425	.14	134	.3752	.27	157
.4661	.14	130	.5460	.15	163	.3783	.33	141
.4689	.12	126	.5494	.17	185	.3813	.22	132
.4724	.14	133	.5536	.12	156	.3852	.29	126
.4759	.17	162	.5575	.09	152	.3891	.27	130
.4798	.20	162	393.2309	.29	160	.3931	.25	142

Table 1 (continued)

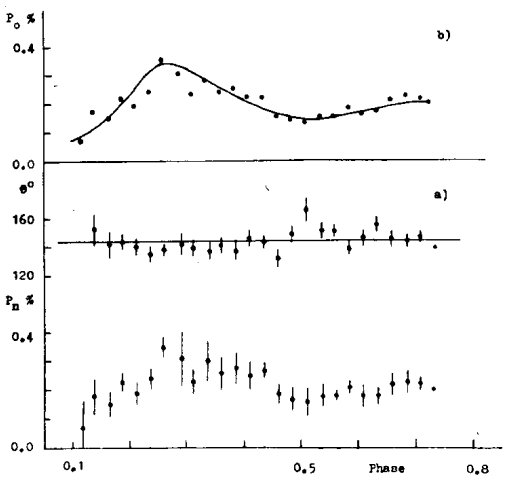
2441000+	P%	θ^{o}	2441000+	P%	θ^{o}	2441000+	P%	θ^{o}
393.3970	0.28	138	418.2830	0.12	107	443.3291	0.37	144
.4040	.25	150	.2850	.20	117	.3316	.38	133
.4079	.26	141	.2875	.24	126	.3348	.41	143
.4116	.21	147	.2902	.18	109	.3373	.25	135
.4154	.21	140	.2933	.15	90	.3395	.31	123
.4191	.21	148	.2959	.17	117	.3421	.45	129
.4224	.39	151	.2985	.29	125	.3453	.52	132
.4257	.31	154	.3012	.31	129	.3478	.54	143
.4295	.21	146	.3034	.16	141	.3500	.59	147
.4333	.20	152	443.2706	.09	71	.3525	.48	137
.4372	.23	137	.2734	.14	125	.3554	.49	130
.4409	.27	131	.2764	.18	137	.3585	.33	121
.4443	.28	139	.2800	.14	143	.3610	.35	126
.4480	.25	161	.2830	.30	135	.3636	.50	138
.4513	.18	133	.2850	.34	122	.3668	.45	137
.4545	.33	131	.2874	.28	123	.3699	.46	134
.4587	.31	148	.2905	.25	123	.3723	.31	119
.4627	.23	153	.2935	.21	121	.3748	.42	131
.4660	.28	151	.2959	.21	118	.3781	.40	145
.4693	.18	155	.2985	.22	137	.3813	.34	149
.4731	.21	140	.3015	.32	140	.3840	.41	151
.4771	.29	142	.3046	.40	137	.3868	.39	144
.4811	.20	142	.3071	.41	135	.3896	.38	143
.4845	.25	133	.3094	.39	138	.3921	.37	142
.4875	.27	150	.3123	.40	132	468.2832	.10	144
.4917	.25	147	.3149	.46	140	.2871	.26	135
.4954	.23	140	.3177	.42	145	.2897	.35	167
.4993	.18	153	.3202	.49	141	.2926	.31	166
.5023	.20	139	.3233	.65	143	.2951	.31	163
418.2798	.22	75	.3264	.49	145	.2986	.30	165
						.3016	.54	167

As the observational data are rather extensive, the values of the polarization parameters were averaged through the phases with a step $0^{p}.25$. The normal points obtained in this way are given in Table 2 together with the r.m.s. errors and with the number of observations for each normal point.

Table 2. Normal Points of AW UMa

Phase	P%	±	σ_p	θ^{o}	±	σ_θ	n	Phase	P%	±	σ_p	θ^{o}	±	σ_θ	n
0.117	0.07	±	0.09	128	±38		3	0.438	0.27	±	0.03	142	±	4	9
.138	.18		.06	152	9		3	.462	.19		.04	132		6	6
.166	.15		.05	142	9		5	.487	.17		.04	149		6	6
.189	.23		.04	144	5		11	.513	.16		.05	166		9	6
.213	.19		.04	140	6		14	.539	.18		.04	151		6	6
.237	.24		.04	135	4		10	.563	.18		.02	151		4	6
.260	.35		.04	138	3		6	.587	.21		.02	139		3	6
.291	.31		.09	142	9		6	.612	.18		.04	146		6	6
.313	.24		.05	139	5		7	.638	.18		.03	156		5	6
.338	.30		.07	137	5		7	.662	.22		.04	145		4	3
.362	.26		.06	141	7		7	.688	.23		.04	142		4	3
.387	.28		.06	137	6		7	.713	.22		.02	146		3	3
.413	.25		.05	146	6		7	.729	.20			139			1

The dependence of the observed polarization degree P_n and that of the position angle Θ on phase are shown in Figure 1a.



The variability of polarization indicates the presence of intrinsic polarization, even if an interstellar component may occur, although the high galactic latitude of the star ($b=+72^{o}$) makes any large amount of interstellar polarization very unlikely.

The change of the position angle is insignificant and within the limits of errors it can be considered as constant.

Figure 1b gives the dependence of the quantity of polarization $P_o = P_n(f) \cdot l(f)$ on phase, where $l(f)$ is the light loss computed from the observations carried out by Paczynski.

A peculiarity of this dependence is the maximum at phase $0^{p}.26$, qualitatively it resembles the polarization curve of YY Eri.

Kalish obtained the light curve for AW UMa and pointed out its peculiarity, that the maximum at phase $0^{p}.75$ is brighter than at phase $0^{p}.25$.

From spectral observations at phase $0^{p}.733$ Paczynski suggested that either the two stars are in touch with each other with a slight limb darkening or both of the stars have a common atmosphere, where the hydrogen lines are formed, as these lines are obviously not double in the spectrograms.

Taking into account the peculiarities of the light curve and spectral features mentioned above our polarimetric observations may be qualitatively explained either 1) by gaseous streams emerging from the component which is ahead in the primary minimum or 2) by the existence of a common atmosphere for both of the stars, but of irregular shape, more prolongated from the phase $0^{p}.25$.

Both spectral and photometric observations are necessary reveal as much as possible concerning the peculiarities of the system and the variability of the period.

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