ON THE VARIABILITY OF THE NEBULAR SPECTRUM OF RY SCT

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Due to the presence of forbidden lines [N II], [O III], [Fe III] in the spectrum of RY Sct as well as emission nebular components of lines H I and He I great attention has been paid to this eclipsing binary system for a long time. It is found that line intensities are variable with the phase and the lines themselves split. Therefore, the investigation of equivalent widths of the lines above mentioned is of considerable interest.

The investigation has been carried out from high-dispersion spectrograms obtained with spectrographs of 1.5 m telescope ESO (June, 1981) and 6 m telescope SAO, Academy of Sciences of the USSR (August, 1981). The data on spectrograms are summarized in Table 1. In identifying the spectrum of RY Sct week nebular lines are found to add the list of work Swings and Struve (1940). The measured characteristics of the weak lines averaged and reduced to the maximum light are given in Table 2. The continuum variation with the orbital phase is taken into account by means of a mean V-light curve of RY Sct (Ciatti et al., 1980; Zakirov, 1985):

	Max	MinI	MinII
V	$9^m.07$	$9^m.64$	$9^m.53$
B-V	1.04	1.05	1.04
U-B	-0.11	-0.08	-0.11
V-R	1.15	1.16	1.16

The investigation of line characteristics with the orbital phase is made for the most intensive nebular lines. The data for some of them reduced to the system W_λ (ESO) are summarized in Table 3. Here W_λ are equivalent widths of the emission lines, phases of light are calculated by formula :

$$\text{MinI} = 2443342.42 + 11^d.12471 \times E$$

(Ciatti et al., 1980).

Table 1

No	J.D.	Phase	λ [nm]	D	Telescope
1	2444775.7554	0.842	360 - 510	1.2	1.5m, ESO
2	2444776.7002	0.927	360 - 510	1.2	1.5m, ESO
3	2444777.6460	0.012	360 - 510	1.2	1.5m, ESO
4	2444777.8150	0.028	360 - 510	1.2	1.5m, ESO
5	2444778.5818	0.097	360 - 510	1.2	1.5m, ESO
6	2444778.6926	0.107	360 - 510	1.2	1.5m, ESO
7	2444778.8231	0.118	360 - 510	1.2	1.5m, ESO
8	2444779.6252	0.190	360 - 510	1.2	1.5m, ESO
9	2444779.7585	0.202	360 - 510	1.2	1.5m, ESO
10	2444779.8542	0.211	360 - 510	1.2	1.5m, ESO
11	2444780.5950	0.278	360 - 510	1.2	1.5m, ESO
12	2444780.7252	0.289	360 - 510	1.2	1.5m, ESO
13	2444829.2743	0.653	360 - 680	2.8	6m, SAO
14	2444829.3243	0.658	654 - 659	2.8	6m, SAO
15	2444830.3000	0.746	360 - 680	2.8	6m, SAO
16	2444834.2965	0.105	360 - 680	2.8	6m, SAO
17	2444835.3000	0.195	360 - 680	2.8	6m, SAO
18	2444835.3368	0.198	654 - 659	2.8	6m, SAO
19	2444836.3167	0.286	360 - 680	2.8	6m, SAO
20	2444836.3472	0.289	654 - 659	2.8	6m, SAO
21	2444837.2875	0.374	360 - 680	2.8	6m, SAO
22	2444837.3146	0.376	654 - 659	2.8	6m, SAO
23	2444828.2882	0.563	360 - 680	2.8	6m, SAO

Table 2

THE AVERAGED EQUIVALENT WIDTHS OF NEBULAR LINES OF RY Sct

λ [nm]	W_λ [nm]	λ [nm]	W_λ [nm]	λ [nm]	W_λ [nm]	λ [nm]	W_λ [nm]
H I		4713	0.010	[N II]		4640	0.004
3970	0.015	4921	0.013	5755	0.070	4658	0.085
4101	0.029	5015	0.026	6548*	0.207	4658*	0.076
4340	0.058	5047	0.006	6584*	0.371	4667	0.007
4861	0.185	5875*	0.260	[S II]		4701	0.046
4861*	0.121	[O II]		6313*	0.032	4701*	0.043
6563*	0.275	3727	0.004:	6713*	0.015	4733	0.020
He I		[O III]		[Fe III]		4755	0.017
3819	0.008	4959	0.010	4046	0.003:	4768	0.016
3888	0.060	5007	0.051	4071	0.003:	4778	0.009
4026	0.018	[C III]		4080	0.003:	4881	0.015
4471	0.045	3675	0.004:	4607	0.009	5011	0.020

Note: * - the determinations of W_λ - nebular lines from spectrograms taken by 6m telescope.

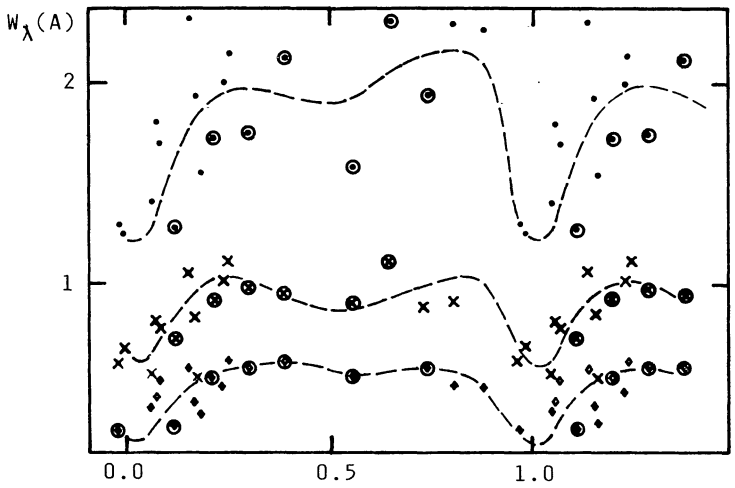

Fig. 1. The variation of W_λ of lines H_β, [FeIII] λ4658 and [FeIII] λ4701 (from the top to the bottom) with the phase. W_λ obtained from observations at 6m telescope reduced to the ESO-system are designated with circles.

Table 3

THE VARIATION OF EQUIVALENT WIDTHS OF SOME LINES WITH THE PHASE

Phase	k	W_λ [nm]		
		H_β	[FeIII] λ4658A	[FeIII] λ4701A
ESO				
0.097	0.68	0.140	0.054	0.038
0.107	0.73	0.197	0.080	0.042
0.118	0.77	0.170	0.077	0.052
0.190	0.91	0.233	0.105	0.058
0.202	0.94	0.182	0.083	0.040
0.211	0.95	0.155	0.053	0.036
0.278	1.00	0.200	0.101	0.048
0.289	1.00	0.215	0.110	0.062
0.842	0.98	0.230	0.108	0.048
0.927	0.88	0.227	0.121	0.049
0.012	0.60	0.130	0.060	0.027
0.028	0.60	0.126	0.068	-
SAO				
0.105	0.85	0.085	0.059	0.024
0.195	0.98	0.115	0.076	0.044
0.286	1.00	0.116	0.081	0.049
0.374	0.91	0.142	0.078	0.050
0.565	0.75	0.106	0.075	0.045
0.653	0.95	0.155	0.092	-
0.746	1.00	0.129	0.073	0.049

Note: k is the coefficient by which the observed W_λ are multiplied to exclude the continuum variation with the phase.

The character of variations of the equivalent widths of the lines with the phase is illustrated in Fig. 1. The depedencies obtained are similar to the RY Sct light curve but with a considerable scattering of the data at secondary minimum. We can assume that the radiation of a circumstellar nebula is associated with the emission source being eclipsed. Complicated contours of the emissions in H_α and H_β lines result in a low precision of W_λ (H_α, H_β)-determination and a considerable scattering of values in the diagrams.

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