THE Hα LINE PROFILE IN EARLY TYPE-BINARY SYSTEMS HD 47129 AND γ VELORUM*

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Abstract. A brief description of the variation of the Hα Line profile in γ Velorum and HD 47129 is given.

The radial velocity curves of binary systems which contain massive early-type components are generally distorted. Whereas the primary velocity curve is fairly well defined, the velocity of the secondary shows large and erratic fluctuations. Batten (1973) remarks "In some systems, such as Plaskett's star (HD 47129) and HD 190967, the secondary spectrum seems to arise at least partly from a nonstellar source. No matter how well it may be observed, it will be impossible to obtain accurate masses for these systems".

In spite of the complexities of these systems, where one has to propose phase-dependent mass loss and stellar wind (Hutchings, 1976) gas streams and expanding clouds of gases (Sahade, 1962) for an interpretation of the observed spectroscopic behaviour, we plan to observe such systems to see if we can unravel at least a part of the mystery that shrouds their spectroscopic behaviour. These observations are being obtained to separate the phase-dependent regular changes from those which are sporadic in nature. We hope that in the not so long a future, such periodic changes if any can be interpreted.

I present here our preliminary results on the behaviour of the Hα line in HD 47129. I have also included here the profile of the Hα line in γ_2 Velorum from a few selected plates. This Wolf–Rayet binary has been extensively observed by Dr Bappu and myself from λλ3700–6700 Å.

γ Velorum: These profiles indicate that there is not much of a change associated with phase. We find a sharp fairly stationary emission component superposed over a broad flat-topped profile. There seems to be a periodic change in the intensity of the violet and red wings. No strong changes are apparent as a function of phase where as in the blue region, the violet shifted He I 3888 Å line is very strong and sharp close to zero phase (Wolf–Rayet star behind) and strong but split near phase 0.25.

HD 47129: The profile of the Hα line determined from various spectra that were obtained (listed in Table I) with the one-meter telescope at Kavalur are shown in Figure 1. The phase was calculated from the time of periastron passage T_0 given by Abhyankar (1959). The general behaviour of the Hα line is similar to that described by Struve *et al.* (1958). However, two interesting points are to be noted.

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TABLE I

List of observations

Plate number	Date	Mid Exp UT	Plate	Dispersion Å mm^{-1}	Phase (period)
HD 47129					
δ 1365	Feb. 1, 1981	15^h11^m	O9802	45	0.98
1437	19, 1981	14 10	IIa–D + IT	22	0.23
1448	20, 1981	13 34	IIa–D + IT	22	0.30
1508	Mar. 3, 1981	18 40	IIa–D + IT	22	0.14
1696	Nov. 19, 1981	18 55	O9802	45	0.21
1704	20, 1981	18 31	O9802	45	0.28
1713	21, 1981	18 22	O9802	45	0.35
1721	22, 1981	18 39	O9802	45	0.42
1806	Feb. 2, 1982	15 10	IIa–D + IT	22	0.41
γ Vel					
δ 1301	Jan. 17, 1981	22 35	IIIa–F	22	0.99
1369	Feb. 1, 1981	19 32	IIIa–F	22	0.18
1389	5, 1981	15 57	IIIa–F	22	0.23
1399	7, 1981	19 38	IIIa–F	22	0.25
1469	22, 1981	15 20	IIIa–F	22	0.44
1497	26, 1981	19 16	IIIa–F	22	0.50
1530	Mar. 15, 1981	17 12	IIIa–F	22	0.71
1543	17, 1981	17 10	IIIa–F	22	0.73

IT = Image Tube (Varo).

The strength of the emission component seems to be associated with the radial velocity of the primary component. In plate δ 1721 (phase 0.42) when the primary has maximum velocity of approach, the violet component is stronger and in plate δ 1365 (phase 0.98) when the primary has large velocity of recession, the red component is stronger. At phase 0.23 (δ 1437) close to conjunction, the primary is behind the secondary and the violet emission component is almost absent. Unfortunately, we have not taken so far a spectra at the other conjunction. However, in the illustration of the Hα spectra of this star by Struve *et al.* (1957) we can notice that at the other conjunction, when the secondary is behind the primary, the red emission component is extremely weak. At phase 0.14, just before conjunction both emission feature show self reversal, with the violet absorption being much stronger.

It seems probable that the mass loss and stellar wind from the components is not spherically symmetric and that such phenomenon are stronger on the hemisphere away from the common centre of mass. Such a cometary tail of expanding material at each component due to radiation pressure may be responsible for the changes in the line spectrum due to changing geometry as the components revolve around their common centre of mass.

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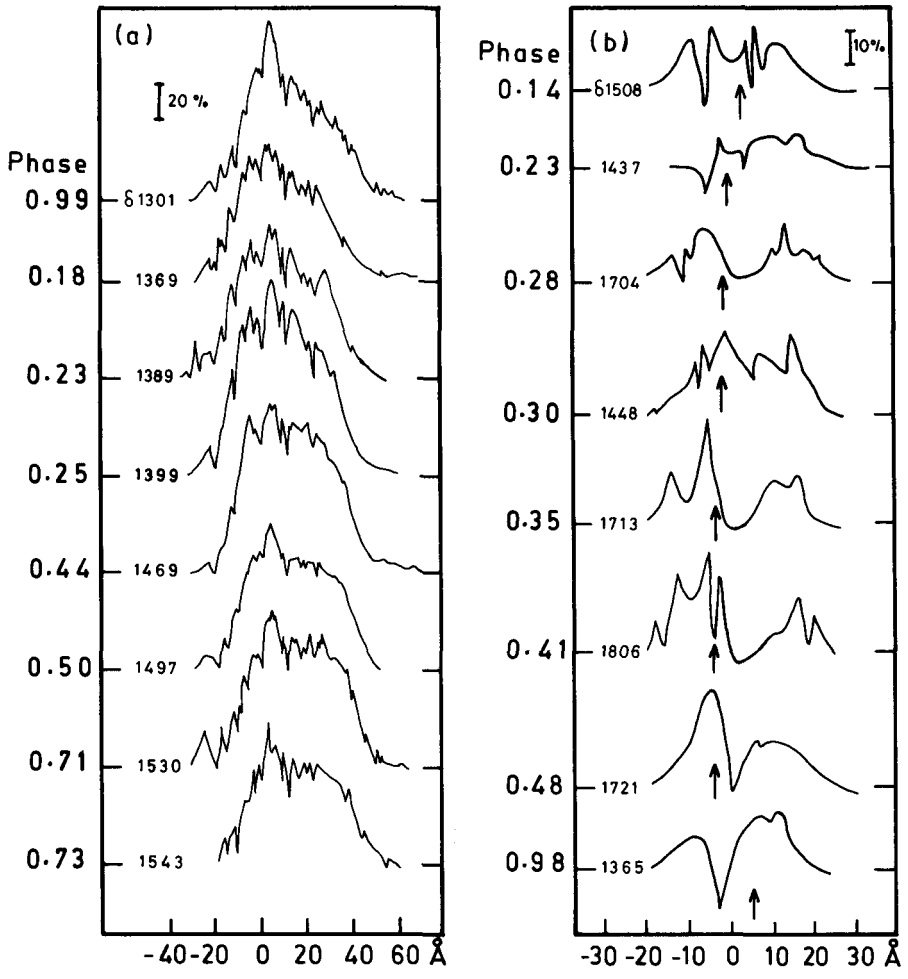

Fig. 1. The profile of Hα line in γ Velorum (a) and HD 47129 (b). Arrow indicated the expected position of Hα due to the primary component alone.

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