COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1575
Konkoly Observatory
Budapest
1979 March 26

ASYMMETRIC PROFILES OF EW LAC

As reported by Hadrava et al. (1978) and Harmanec et al. (1979), the Be and shell star EW Lac (HD 217050, B2IIIpe) has exhibited a strong change in its spectrum and colors in 1978, after a long stable shell phase. We here present our results of spectroscopic observations which were made on November 14, 15, and 19, 1978 with the coudé spectrograph attached to the 188-cm reflector at the Okayama Astrophysical Observatory. The list of our observations is as follows:

Plate number	Julian day	Dispersion (Å/mm)	Exposure time (minute)	Spectral region (Å)
C4-5464	2443827.00	10.2	49	3500-4300
C4-5465	2443827.03	10.1	29	3800-4600
C4-5466	2443827.06	10.2	36	3500-4300
C4-5467	2443827.13	10.1	166	3800-4600
C4-5471	2443827.99	9.9	54	4300-5050
C4-5488	2443831.97	20.1	128	5200-6800

The strong asymmetry and the strengthening of the shell lines were noticed on the whole. Figure 1 shows the Hβ-, Hγ-, and Hδ-line profiles normalized to the adjacent continuum, together with the CaII K and FeII λ4233 lines. The abscissa is the heliocentric radial velocity in km/sec. It is evident that the shell-absorption profiles are very steep in their shortward sides, while distinctly winged in the longward sides. The deepest points are located at the shortward edge of the absorption cores. The violet emission components are stronger than the red ones (V/R > 1).

The shell absorption profiles for some Balmer lines on the spectrogram C4-5466 are shown in figure 2, where the point-to-point normalization with

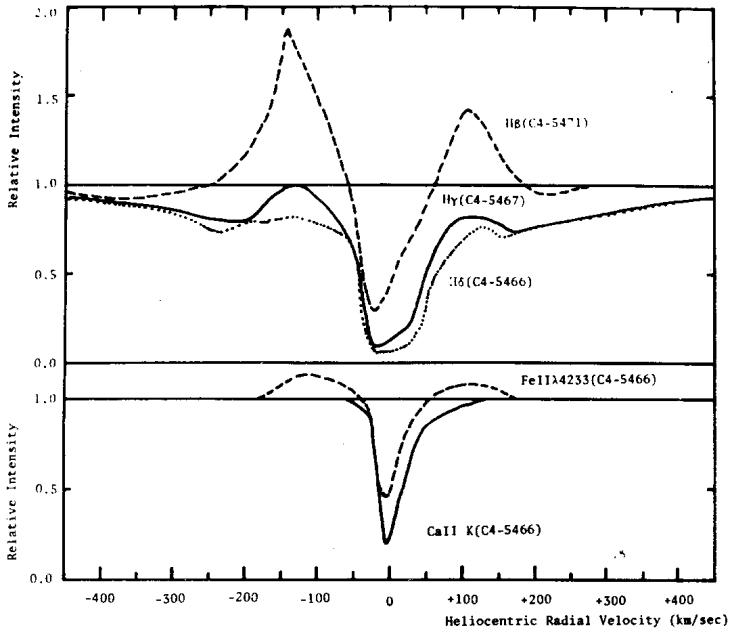

Figure 1

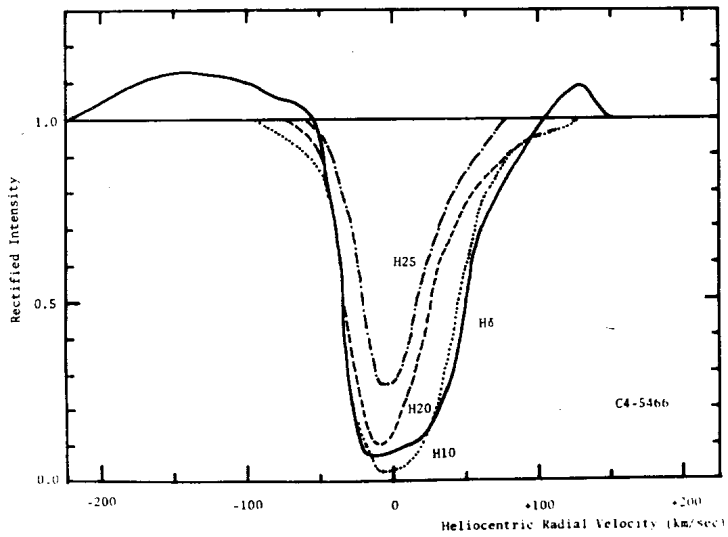

Figure 2.

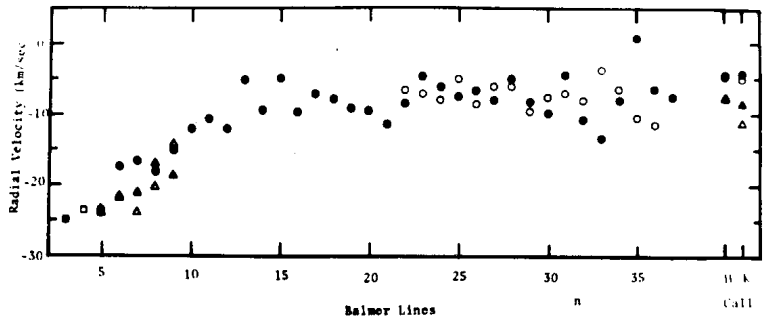

Figure 3

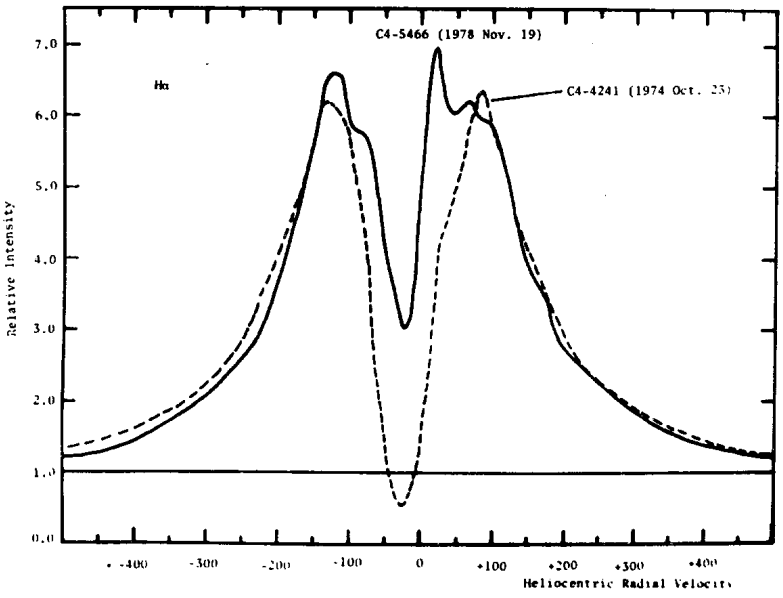

Figure 4

respect to the photospheric line profile has been made up to H17. The steep shortward wing coincides with each other in the lower members, while the longward wing weakens rapidly as the principal quantum number increases. These behaviors could be attributed to the difference in the optical depth $\tau_\alpha(v)$ of the envelope in the Hα line and the fractional area $\beta(v)$ of the photospheric disk which is screened by the envelope, where v is the line-of-sight velocity (Kogure et al. 1978). That is, the profiles of shortward wings in the lower members correspond to large $\tau_\alpha(v)$, and thus represent $\beta(v)$, while those of longward wings correspond to smaller values of $\tau_\alpha(v)$ with large $\beta(v)$, in each zone of the corresponding line-of-sight velocity. In the higher members like the H25 line, the optical thickness of the envelope becomes smaller even in the shortward wing.

The heliocentric radial velocities of the deepest points in the profiles of the Balmer shell lines and the CaII H and K lines are plotted in figure 3. The symbols in figure 3 are as follows: C4-5464 (o), C4-5465 (▲), C4-5466 (●), C4-5467 (Δ), C4-5471 (□), and C4-5488 (■). The progression phenomenon is clearly seen in between the Hα and H15 lines in the sense that the higher members have larger velocities. The higher members than H15 show rather constant velocity of about -7 km/sec. The mean radial velocity of the metallic lines was about -5 km/sec, slightly larger than those of the higher Balmer lines. These results are in good agreement with Hadrava et al. (1978) in December 5.869, 1978.

The profile of the Hα line in November 19, 1978 is puzzling (figure 4). For comparison, the Hα-line profile in October 23, 1974 (JD 2442344.14, Vr = -19.7 km/sec) is also shown in figure 4 (broken line). While the emission wing was similar in these two epochs, the central part was considerably filled by the emission, and the central dip was the reverse type of the

other shell lines in November 19, 1978. We note that the NaI D lines on the same plate (C4-5488) with the Hα line had the similar type profile to the CaII K line in figure 1. Because of the strong emission intensity, the profile of the Hα line reflects essentially the emission profile and may also be influenced by the re-absorption process in the outer part.

It is hard to judge at present whether this active phenomenon is a transient one as observed in Pleione or indicates the beginning of the long-term cyclic variation as in 48 Lib and ζ Tau. Further spectroscopic observations and the photoelectric monitoring are highly desirable.

Finally we wish to acknowledge M. Nakagiri for his kind help in the use of the Grant-type comparator at the Tokyo Astronomical Observatory.

RYUKO HIRATA and TOMOKAZU KOGURE
Department of Astronomy
University of Kyoto
Kyoto, 606, Japan

References:

Hadrava, P., Harmanec, P., Koubský, P., Krpata, J., Ždárský, F. 1978, IAU Circular No. 3317.

Harmanec, P., Horn, J., Koubský, P., Ždárský, F., Kříž, and Pavlovski, K. 1979, IBVS No. 1555.

Kogure, T., Hirata, R., and Asada, Y. 1978, Publ. Astron. Soc. Japan, 30, 385.