STRUCTURE OF THE ENVELOPE OF EW LAC IN 1971-1984

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Kogure and Suzuki (1984)have noticed that EW Lac (HD217050, B2 III_{pe}) has revealed the long-term variation notably different before and after about 1976. Before 1976, the profiles of spectral lines were sufficiently symmetric and stable, suggesting a circular disk or ring for the structure of envelope. In contrast, since 1977, EW Lac entered a phase of anomalous V/R variation.

We have obtained about 180 coudé spectra in 16 years by 1985 with the 188 cm reflector at the Okayama Astrophysical Observatory. Most of them were measured using the PDS densitometer at the Kwasan Observatory, University of Kyoto for the radial velocities and line profiles. A part of results were reported by Suzuki and Kogure (1986).

In this paper we present a result of model fitting of anomalous V/R variation with the elliptical-ring model of Huang (1973). Figures 1a and b illustrate the heliocentric radial velocities of the central absorption component at its half-depth, and the V/R values for Hα, Hβ, and Hγ. It is evident that the V/R variation first appeared in Hγ and moved to Hβ and Hα. If we adopt the elliptical-ring model of Huang (1973) for each of Hα, Hβ, and Hγ, we can deduce the ring parameters as given in Table 1. The epoch of apocenter conjunction is determined from the log(V/R) curve at the crossing point from V/R > 1 to V/R < 1 in Figure 1b.

Table 1. Ring parameters of EW Lac in 1976-1984

		Hγ	Hβ	Hα
Eccentricity	e	0.143	0.129	0.114
Semi-major axis	a/R_*	8.3	9.8	11.2
Epoch of appocentric conjunction (JD2440000+)		4250	4460	4700

In Table 1 we can see that the asymmetry of envelope is higher in the inner Hγ-ring than in the outer Hα-ring, and the asymmetric structure propagated from inner to outer layer with a time scale of about 1.5 years. These elliptical rings seem to have completed their one revolution around

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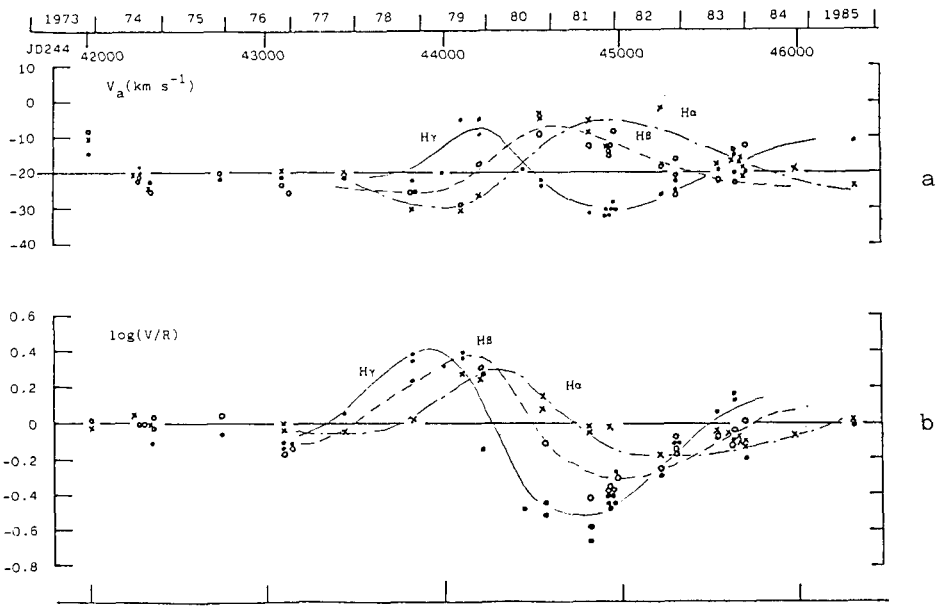

Figure 1. Asymmetric feature in 1977-1984.
(a) V_a(km s^{-1}): Heliocentric radial velocities of the center of the shell absorption component at its half-depth for Hγ(●), Hβ(o), and Hα(x).
(b) log(V/R): V/R variation for Hγ(●), Hβ(o), and Hα(x).

the star by 1984, but it is not certain whether the second revolution has started in 1985-86 or not. Dynamical processes to cause such asymmetric structure are also uncertain because EW Lac is the one among suspected single Be stars. Further studies are desirable.

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DISCUSSION FOLLOWING KOGURE

Houziaux:

What do you mean exactly by Hα and Hβ rings? Are these the region where the contribution function of formation of these lines is maximum?

Kogure:

The meaning of these rings is just what you have mentioned. We are considering a rotating elliptical disk in which the effective regions for the Hα, Hβ, and Hγ emission are distinguished.

Houziaux:

Where would be formed the Balmer discontinuity in your model? Would it have still higher eccentricity?

Kogure:

Though we have not observed the Balmer discontinuity, we can guess that the discontinuity should be formed in the inner region of high gas density where the shell absorption lines are formed. If so, the eccentricity of inner region would be higher than the region of the Hγ ring.

Granes:

In your opinion, what are the physical reasons for the eccentric structure?

Kogure:

First, the asymmetric structure has propagated from the inner to the outer region of the envelope. Second, the considerably blue-winged profiles of shell absorption lines, which appeared in 1979-1982, suggest the existence of outflow motion in the inner region. These facts imply that the cause of the eccentric structure can be attributed to some activities in the stellar photosphere, though the physical processes are not yet known.

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