GROWTH OF THE LINE-PROFILE VARIATION REGION DURING BE EPISODES

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Abstract. We have found that the range in wavelength of the line-profile variations (*lpv*) in the Be star λ Eridani increases by some 20% during its emission phases. This growth is associated with a possible increase in the equatorial velocity of the star during emission. We discuss the significance of this in connection with other features of the *lpv* and our earlier discovery of a weak correlation between the amplitude of the *lpv* and Be outbursts in ζ Ophiuchi.

1. Introduction

In an attempt to examine features of *lpv* and their relation to the mass loss phenomena, we have monitored two Be stars, λ Eri and ζ Oph in particular, at Okayama Astrophysical Observatory in Japan since 1987. Dominion Astrophysical Observatory and other sites have joined the project since 1992 as part of an international campaign. In this paper, we discuss the features of the observed *lpv* especially in the context of mass loss episodes.

2. LPV during emission and quiescence

We have found that the *lpv* region of λ Eri is systematically extended during emission by $\sim$ 100 kms^{-1} (380 kms^{-1} $\Longrightarrow$ 480 kms^{-1} at the extreme edge of the profiles). The *lpv* during emission: 1) are well confined within 480 kms^{-1} of the line center; 2) appear similarly at both extreme wings; 3) have amplitudes comparable to those in the main profile; 4) are seen repeatedly at every emission epoch observed; and 5) in a least one case, have a period comparable to that of the *lpv* in the main profile (see Kambe et al. 1993b for details).

An increase of the *lpv* amplitude, which was detected in ζ Oph (Kambe et al 1993a), is not significant in λ Eri, which is consistent with earlier studies (Smith 1989, Bolton and Stefl 1990). However, this may be partly due to large variations of double peak emissions in the star. An accumulation of data and a monitoring of non-emission lines are necessary to examine such a slight change of *lpv* amplitudes.

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3. Discussion

The growth of the *lpv* region in λ Eri seems to suggest that the extension is connected with stellar rotation and we propose the existence of a rotationally accelerated equatorial region, in which *lpv* can propagate, during emission phases of the star (Kambe et al 1993b). If the acceleration occurs during emission, it could be connected with mass loss episodes. One of the possible mechanism of such a rotational acceleration is a redistribution of angular momentum by nonradial pulsations at the stellar surface.

However, our study of HeI λ 6678 alone can provide limited information about the proposed accelerated region and the related *lpv*. It is impossible to examine if the region has a property of a stellar photosphere and/or an inner disk. Multi-line spectroscopic observations are necessary for a detailed examination. A possible change of amplitudes of *lpv* should also be monitored in the context of an acceleration mechanism by nonradial pulsations (Ando 1991).

The confirmation of an existence of multiple modes, the specification of an origin of photometric variations could be other important aspects for examing a relation between short-term and long-term variations in Be stars and also for future asteroseismology (g-modes and/or r-modes). International campaigns have been completed and more are planned for the near future by our group (Hirata 1993) and others. We hope they will produce fruitful results soon.

References

Ando H., 1991, in Rapid Variability of OB-stars: Nature and Diagnostic Value, ESO Conference and Workshop Proceedings No. 36, ed.D. Baade (ESO-WS91), p. 303

Bolton C.T., Stefl S., 1990, in Angular Momentum and Mass Loss for Hot Stars, eds. L.A. Wilson and R. Stalio (Kluwer Academic Publishers, The Netherlands), p.191

Hirata R., 1993, Be Star Newsletter, No 26

Kambe E., Ando H., Hirata R., 1993a, AA, 273, 435

Kambe E., Ando H., Hirata R., Walker G.A.H., Kennelly, E. J., Matthews, J. M.,1993b, PASP, in press

Smith M.A., Peters G.J., Grady C.A., 1991, ApJ, 367, 302

Walker G.A.H., 1991, in ESO-WS91, p.27