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N. Kochiashvili<sup>a</sup>; R. Natsvlshvili<sup>a</sup>; H. Bakis<sup>b</sup>; M. Tanriver<sup>c</sup>

<sup>a</sup> Georgian National Astrophysical Observatory, Abastumani, Georgia

<sup>b</sup> Çanakkale Onsekiz Mart University, Çanakkale, Turkey

<sup>c</sup> Ankara University Observatory, Science Faculty, Beşevler, Ankara, Turkey

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## Investigation of EM Cep

N. KOCHIASHVILI\*†, R. NATSVLISHVILI†, H. BAKIS‡ and M. TANRIVER§

†Georgian National Astrophysical Observatory, 0301 Abastumani, Georgia

‡Çanakkale Onsekiz Mart University, Çanakkale, Turkey

§Ankara University Observatory, Science Faculty, 06100 Beşevler, Ankara, Turkey

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The *UBVR* photoelectric observations of the variable star EM Cep were made at the Abastumani Astrophysical Observatory, Georgia. On 15–16 November 1991 an unusual flare of this star was revealed. On 17–18 July 2003, flare activity of EM Cep was detected by Turkish astronomers. A suggestion as to the  $\lambda$  Eri-type variability of the star is made.

*Keywords:* Variables; Close binaries;  $\lambda$  Eri-type variability; EM Cep

### 1. Introduction

We observed EM Cep electrophotometrically at the Abastumani Astrophysical Observatory (AbAO) during 1990–1999 in *UBVR* passbands and in *UBV* bands at the Çanakkale University Observatory (ÇUO) and Tubitak National Observatory (TNO) during 2001–2005. Variability of EM Cep (BD + 61° 2216) was discovered by Lynds [1, 2] in 1959, when he observed early B giants. EM Cep is a component of Cep OB2 association, which belongs to the Galaxy cluster of NGC 7160 and it is a brighter component of the visual binary ADS 15454.

EM Cep was considered as a close binary system. Electrophotometric and spectral data of the star have been obtained by numerous researchers [1–9]. Many of these determined its period and epochs of minima but only Romanian researchers tried to obtain orbital elements [10]. The period of the system is  $P = 0.806187$  days. The magnitude of its visible luminosity varies from 7.02 to 7.17. The spectrum of only one component is visible on spectrograms (BI IV + ?). Light curves of the system vary from cycle to cycle and their form and brightness also vary [5]. The depths of the minima are almost the same and the heights of the maxima are different [6, 7, 9]. A flare was observed in the *B* and *V* bands [3].

Light curve analysis by classical methods and also by recent methods of synthesis is difficult because of the above peculiarities. High-resolution spectral material has not been obtained to date. From the analysis of the H $\alpha$  emission line's contour [7] it is possible to conclude that EM Cep has a gaseous envelope.

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\*Corresponding author. Email: dianoz@yahoo.com

## 2. The flares

*UBVR* photometry of EM Cep was made at AbAO with a 48 cm telescope using a one-channel photometer. The photometric system is close to the standard system of Johnson. BD + 62°1994 (HD 208218) was considered as a comparison star and BD + 61°2217 as a check star. Figures 1 and 2 represent light curves of EM Cep in the *R* and *U* bands respectively. On the night of 15–16 November 1991 we observed a flare in the *R* band (figure 1 [11, 12]). In the *V* band the brightness is increased only slightly; in the *B* band the brightness is ‘normal’ and corresponds to the brightness for this phase. As in the *U* band, here all points are located under the light curve (figure 2). So we observed a decrease in brightness in the *U* band while we had a flare in the *R* band. Observations were carried out simultaneously in all bands.

ÇUO and TNO observations were obtained with the SSP5-A photometer attached to a 40 cm telescope during the observing runs in 2001 and 2003 and the observing runs in 2004 and 2005 respectively [13, 14]. Observations were made in a Johnson *UBV* system. As comparison star, HD 208218 was observed. The flare event was observed during observations on Julian date (JD) 2 452 838.4166 by Turkish researchers. The maximum increase during the flare was seen in the *U* band but not in the *R* band, as observed by Kochiashvili [11, 12].

## 3. EM Cep as a possible $\lambda$ Eri variable

EM Cep has rather unstable light curves. They sometimes vary even from period to period, *i.e.* the star undergoes fast changes in brightness. This makes it possible to suggest that the star may be  $\lambda$  Eri variable.  $\lambda$  Eri is a  $\beta$  Cep variable. It has a period of 16 h 50 min.  $\lambda$  Eri-type stars often show irregular variations (flickering [15]). The mean light level changes from season to season.  $\lambda$  Eri-type Be stars often undergo a sudden increase in brightness.

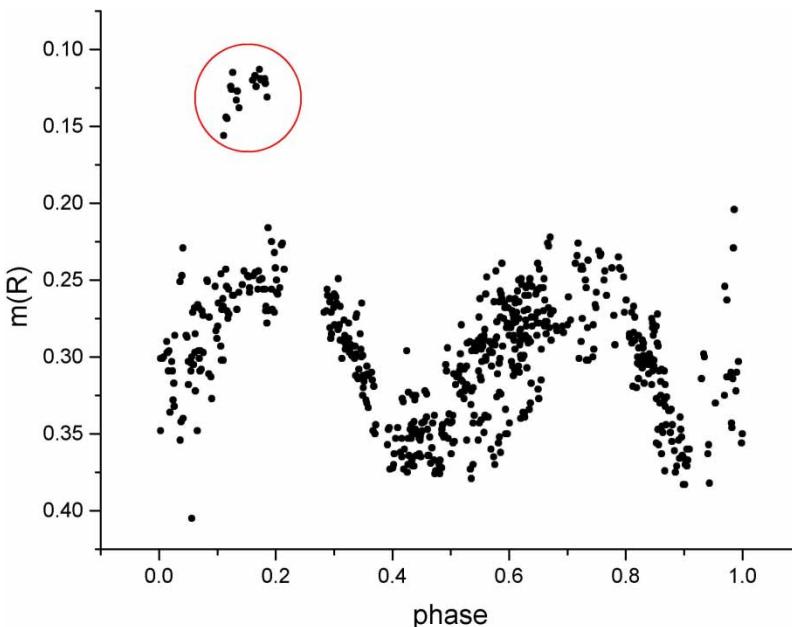


Figure 1. Light curve of EM Cep in the *R* band.

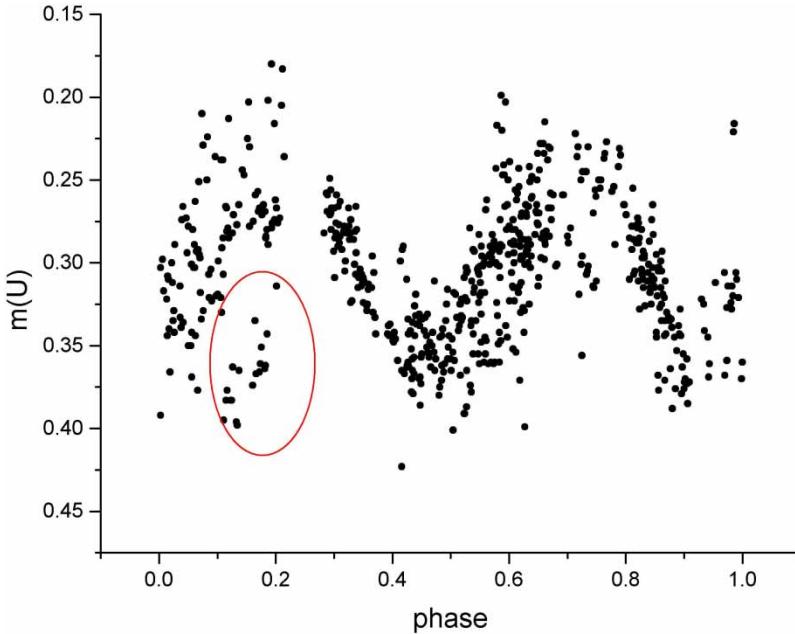


Figure 2. Light curve of EM Cep in the  $U$  band.

We are planning to analyse all observational data obtained for the star in order to reveal the true nature of its non-stability phenomenon. We decided also to try to solve the problem of EM Cep light curve variations in the near future.

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