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DISCOVERY OF SHORT-PERIODIC PULSATING COMPONENTS IN ALGOL-TYPE ECLIPSING BINARY SYSTEMS EF Her AND CT Her

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Observatory and telescope:
Sobaeksan Optical Astronomy Observatory in Korea, 61cm telescope for EF Her; Mt. Lemmon Optical Astronomy Observatory in USA, 1.0m telescope for CT Her

Detector:	2K CCD camera installed at each site

Filter(s):	Johnson B

Transformed to a standard system:	No

Availability of the data:
Upon request

Method of data reduction:
Standard CCD-frame reduction using the IRAF/DAOPHOT[1] package.

Remarks:
We have been performing a photometric survey to search for A-type pulsating components in eclipsing binary systems from September 2001 onwards at Sobaeksan Optical Astronomy Observatory (SOAO, Kim et al. 2003). Several observing targets were also monitored in March 2004 using a 1.0m telescope at Mt. Lemmon Optical Astronomy Observatory (LOAO), Arizona, USA; (Korea Astronomy Observatory has installed the telescope in September 2003). We report here a recent discovery of two new pulsating components in Algol-type semi-detached eclipsing binary systems EF Her and CT Her.

[1]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

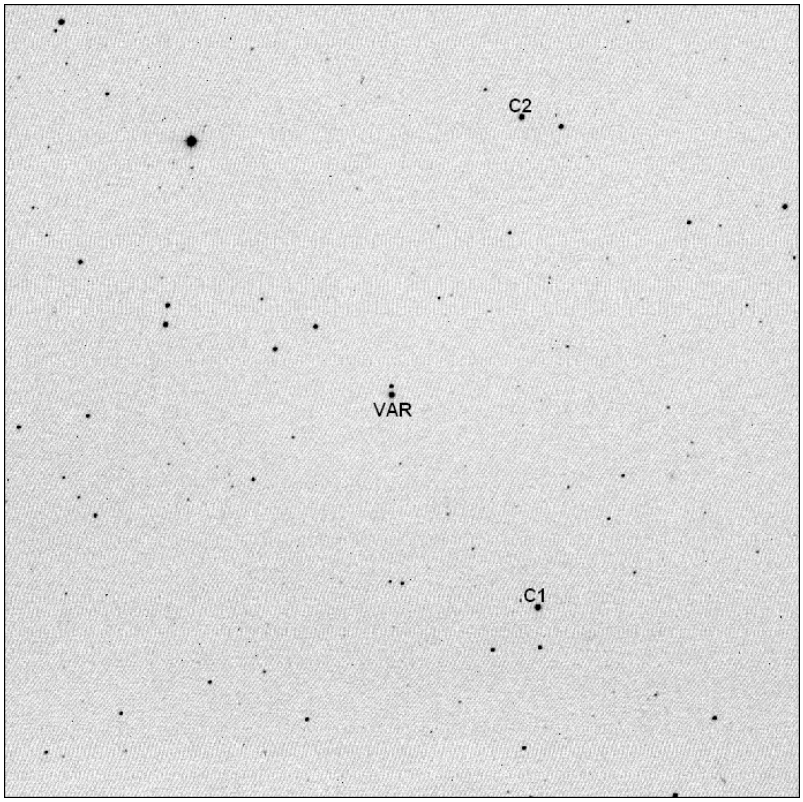

Figure 1. A B-band CCD image (20′.5×20′.5) near the eclipsing binary EF Her (VAR) obtained with the SOAO 61cm telescope and 2K CCD camera. The comparison (C1) and check stars (C2) are marked. North is up and east is to the left

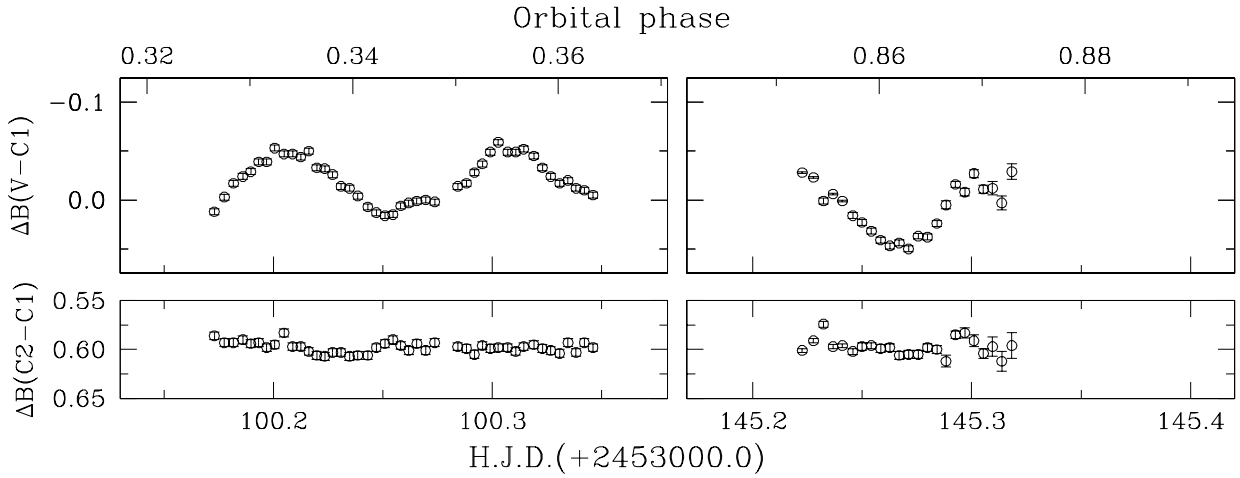

Figure 2. Differential magnitudes between the variable star EF Her and its comparison star, ΔB(V−C1). Observation data of the check star, ΔB(C2−C1), are also displayed at lower panel for comparison.

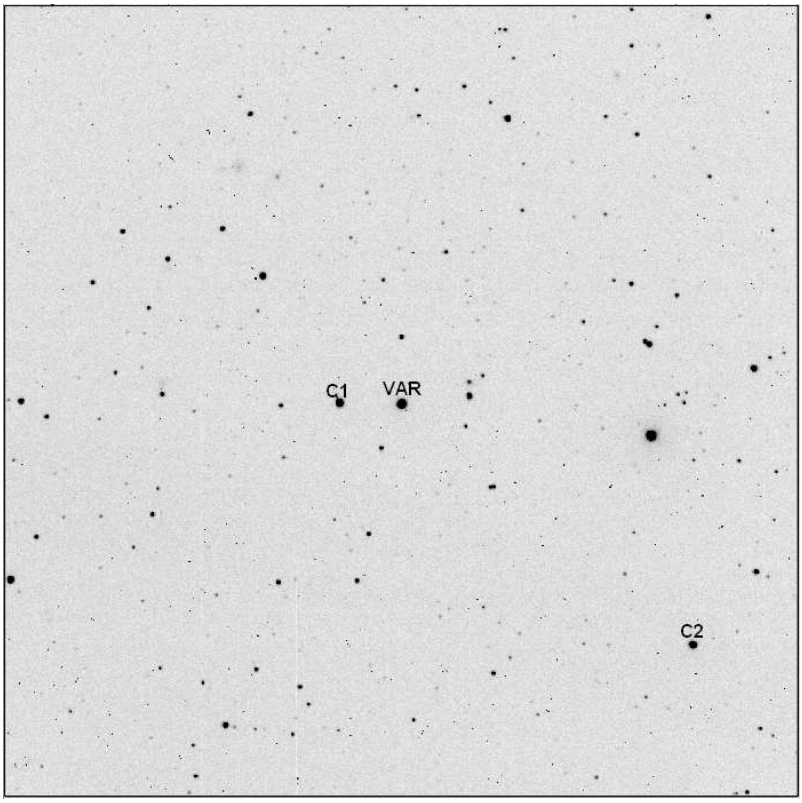

Figure 3. A B-band CCD image (22.′2×22.′2) near the eclipsing binary CT Her (VAR) obtained with the LOAO 1.0m telescope and 2K CCD camera. The comparison (C1) and check stars (C2) are marked. North is up and east is to the left

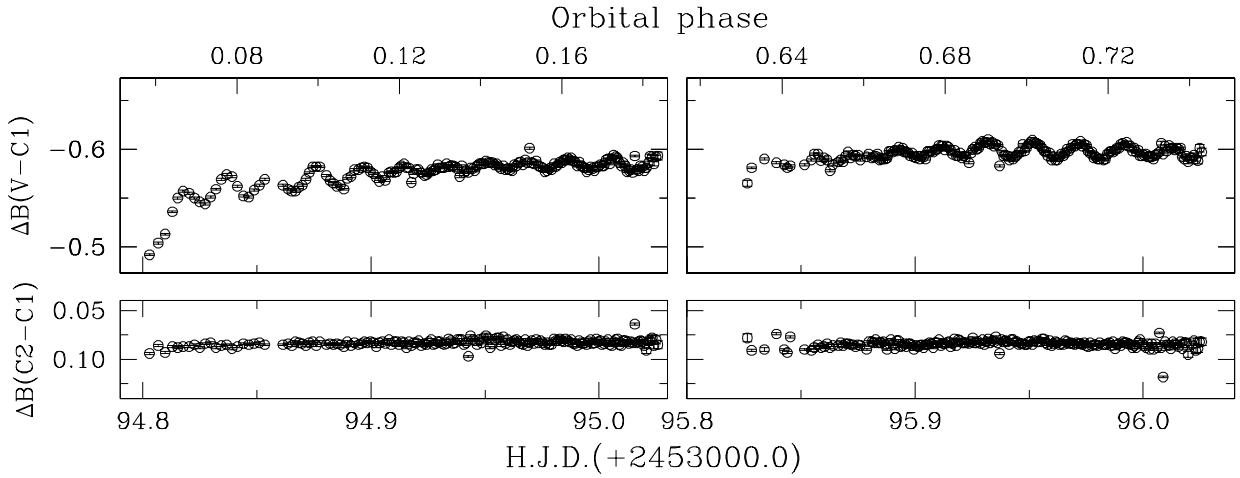

Figure 4. Differential magnitudes between the variable star CT Her and its comparison star, ΔB(V−C1). Observation data of the check star, ΔB(C2−C1), are also displayed at lower panel for comparison.

Table 1. Photometric parameters of observing stars from the Tycho-2 catalogue

ID	Name	RA (J2000)	DEC (J2000)	V_T	(B_T−V_T)
VAR	EF Her	$16^h55^m26^s.10$	$+17°17'47''.8$	$11^m.596$	$0^m.601$
C1	GSC 01525-01000	$16^h55^m10^s.75$	$+17°12'26''.0$	$11^m.189$	$1^m.093$
C2	GSC 01525-01242	$16^h55^m12^s.31$	$+17°24'46''.7$	$12^m.031$	$0^m.673$
VAR	CT Her	$16^h20^m26^s.57$	$+18°27'16''.9$	$11^m.347$	$0^m.203$
C1	GSC 01509-01140	$16^h20^m33^s.89$	$+18°27'18''.5$	$10^m.951$	$1^m.414$
C2	GSC 01509-01052	$16^h19^m52^s.30$	$+18°20'32''.9$	$11^m.405$	$0^m.779$

Remarks:

We applied simple aperture photometry to get instrumental magnitudes with an aperture radius of 10 pixels, that is, $6''.0$ for the SOAO 61cm telescope (EF Her) and $6''.4$ for the LOAO 1.0m telescope (CT Her). The seeing was between $2''.3$ and $3''.3$ during the observing runs in the two sites. Figures 1 and 3 display sample CCD images of EF Her and CT Her, respectively. There is a faint star near EF Her to the north, but it is about 13 arcsec from EF Her so our measurements were not affected by it. Comparison stars for each variable star did not show any peculiar light variation during our runs, examining with several check stars in the images. Differential magnitudes of EF Her and CT Her are shown in Figures 2 and 4, respectively. Orbital phases were calculated from the orbital period and epoch given in the GCVS catalogue (Kholopov et al. 1988).

We found short-period light variations of EF Her and CT Her, not originated from the eclipsing phenomena. The eclipsing binary EF Her, spectral type of A, has a primary component which shows δ Scuti-type pulsations with a period of about $2^h.5$ and an amplitude of about $0^m.06$. The primary component of CT Her shows also δ Scuti-type pulsations with a period of about $0^h.46$ and a maximum amplitude of about $0^m.03$. It also shows light curve modulation, suggesting multiple periods. CT Her is a very interesting object because its physical characteristics such as its semi-detached configuration, early A spectral type, very short-period of about 28 minutes and multi-periodicity, are very similar to the well-known oEA (oscillating EA) stars, RZ Cas (Rodríguez et al. 2004) and AS Eri (Mkrtichian et al. 2004). We suggest that EF Her and CT Her are new members of the recently formed group of mass-accreting pulsating components in Algol-type semi-detached eclipsing binary systems (oEA stars; Mkrtichian et al. 2004). Thus the number of oEA stars has increased to ten.

Acknowledgements:

This research made use of the SIMBAD database, operated at CDS, Strasbourg, France

Reference:

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