# MULTICOLOUR CCD PHOTOMETRY OF FOUR RRab STARS

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The fourth set of CCD light curves of monoperiodic fundamental mode RR Lyrae stars based on the observations of the 60 cm automatic telescope of Konkoly Observatory, Svábhegy, Budapest is published. The equipment and data reduction procedure were the same as in Jurcsik et al. (2008).

Observations of RZ Cam, SW CVn, GI Gem and SU Leo are presented, which are the first complete, accurate, multicolour light curves of these variables. Photometric data of the stars were published previously by Bookmeyer et al. (1977), Schmidt, Chab & Reiswig (1995) and Sturch (1966). These data were, however, either too noisy or scanty to define accurate light curves. Based on the time coverage of the data we conclude that the light curves of the stars are stable, there is no light curve modulation apparent with amplitude larger than $0.02 − 0.03$ mag in the maximum brightness of any of the stars.

**Table 1.** Log of observations

| Star | Comparison | | | | Observation period | | No. of | |
|------|------------|--|--|--|--------------------|--|--------|--|
| | GSC 2.3.2 / BD | RA(2000) | DEC(2000) | $V$ * [mag] | JD 2400000 + | nights | $B/V/I_C$ data | |
| RZ Cam | N7T2000280 | 06 34 25.02 | +67 03 14.2 | 12.70 | $54510 − 54585$ | 17 | 457 / 460 / 445 | |
| SW CVn | BD +37°2310 | 12 41 23.02 | +37 01 00.3 | 9.99 | $54544 − 54602$ | 10 | 400 / 387 / 377 | |
| GI Gem | N8N9000652 | 07 04 59.14 | +13 27 03.3 | 12.81 | $54431 − 54523$ | 22 | 646 / 655 / 643 | |
| SU Leo | N6WV000233 | 09 53 37.66 | +08 01 20.0 | 12.83 | $54453 − 54576$ | 12 | 0 / 321 / 317 | |

\* $V$ magnitudes of the comparison stars are from GSC 2.3.2

The photometric data are available electronically from the IBVS website (`5846-t5.txt` − `5846-t19.txt`). The tables list the relative $BVI_C$ magnitude and relative $B−V$, $V−I_C$ colour time series with respect to the comparison stars. The brightnesses of the comparison stars remained constant during the observations. The *r.m.s.* scatter of their relative magnitudes measured to several check stars are about 0.006 and 0.012 mag. For comparison, the *r.m.s.* scatter of the Fourier fits to the $B, V, I_C$ light curves of RZ Cam, SW CVn, GI Gem, and SU Leo are 0.014/0.009/0.010, 0.013/0.011/0.013, 0.013/0.010/0.010, and −/0.010/0.009 mag, respectively.

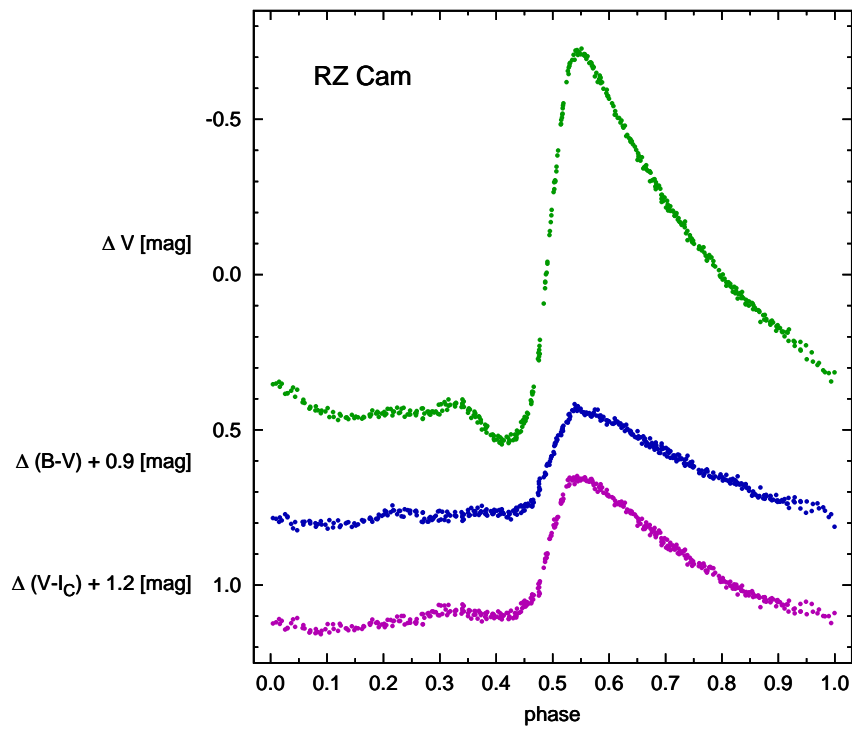The $V$ light curves and the colour curves of the three stars are plotted in Figs. $1 − 4$.

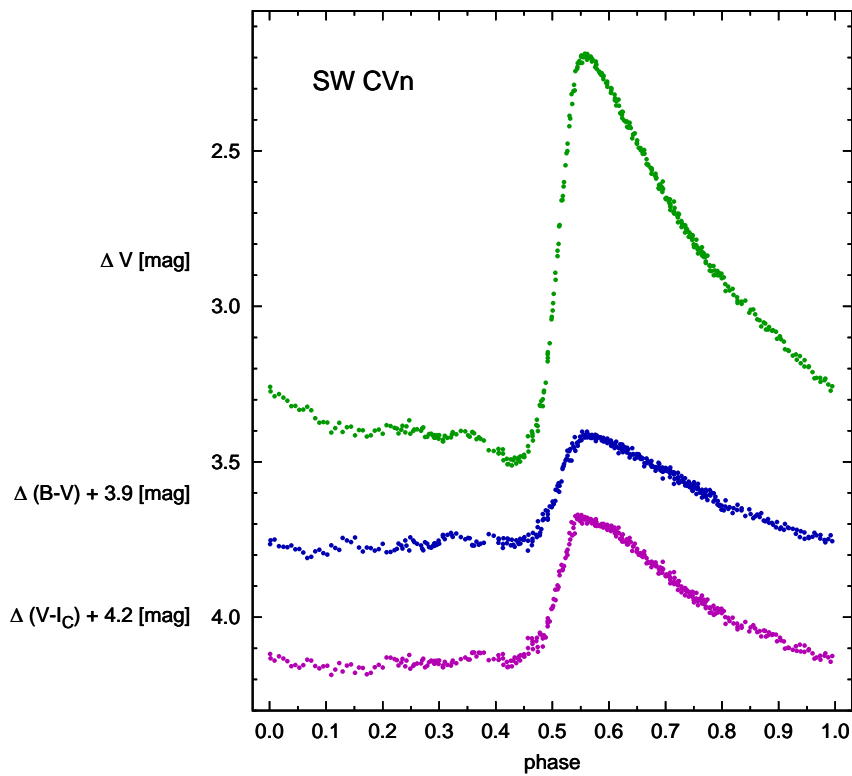**Figure 1.** Differential $V$, $B - V$ and $V - I_C$ light and colour curves of RZ Cam.
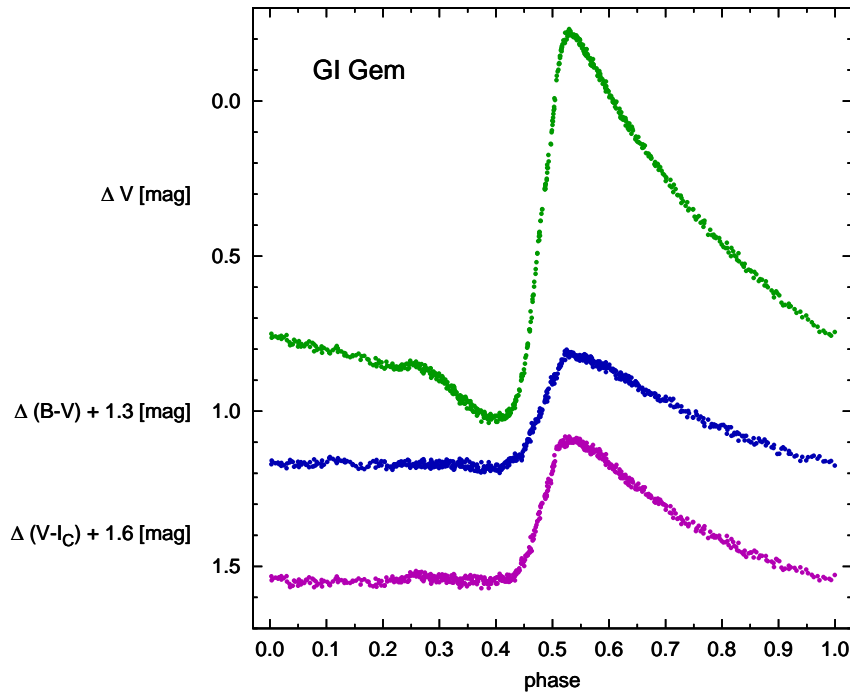


**Figure 2.** Differential $V$, $B - V$ and $V - I_C$ light and colour curves of SW CVn.

**Figure 3.** Differential $V$, $B - V$ and $V - I_C$ light and colour curves of GI Gem.

**Table 2.** Normal maximum timings of the $V$ light curves.

| Star | $T_{max}$ - 2400000 [HJD] | Star | $T_{max}$ - 2400000 [HJD] |
|---|---|---|---|
| RZ Cam | 54546.4615 | SW CVn | 54573.4340 |
| GI Gem | 54479.5847 | SU Leo | 54497.5215 |

**Table 3.** Fourier parameters of the $V$ light curves.

| Star | $P$ [d] | $A_1$ [mag] | $R_{21}$ | $R_{31}$ | $R_{41}$ | $R_{51}$ | $\phi_{21}$* [rad] | $\phi_{31}$* [rad] | $\phi_{41}$* [rad] | $\phi_{51}$* [rad] |
|---|---|---|---|---|---|---|---|---|---|---|
| RZ Cam | 0.4804514(8) | 0.444 | 0.453 | 0.351 | 0.229 | 0.167 | 2.251 | 4.751 | 1.118 | 3.736 |
| SW CVn | 0.441671(1) | 0.461 | 0.480 | 0.342 | 0.223 | 0.152 | 2.264 | 4.807 | 1.135 | 3.744 |
| GI Gem | 0.4332664(6) | 0.402 | 0.550 | 0.366 | 0.250 | 0.164 | 2.377 | 5.143 | 1.545 | 4.345 |
| SU Leo | 0.4722633(5) | 0.454 | 0.458 | 0.347 | 0.221 | 0.163 | 2.239 | 4.724 | 1.104 | 3.702 |

* Phase differences are given according to sine term decomposition.

Seasonal normal maximum timings and Fourier parameters of the $V$ light curves of RZ Cam, SW CVn, GI Gem, and SU Leo are listed in Table 2, and Table 3, respectively. Table 4 compares the photometric metallicities calculated from the $V$ light curves of the variables according to Eq. 3 of Jurcsik & Kovács (1996) to the results of spectroscopic metallicity measurements.

**Table 4.** Spectroscopic and photometric [Fe/H] values.

| Star | [Fe/H]$_\mathrm{phot}$ | [Fe/H]$_\mathrm{spect}$ [a] | ref. |
|------|------|------|------|
| RZ Cam | −1.24 | −0.77 | Layden (1994) |
| SW CVn | −0.95 | −1.26 | Layden (1994) |
|        |       | −1.65 | Suntzeff et al.(1994) |
| GI Gem | −0.46 | − | − |
| SU Leo | −1.23 | −1.15 | Layden (1994) |

a: Spectroscopic metallicities are transformed to the [Fe/H] scale used
   for the photometric metallicities according to Eq. 3 and Eq. 2 of
   Jurcsik (1995) and Jurcsik & Kovács (1996).
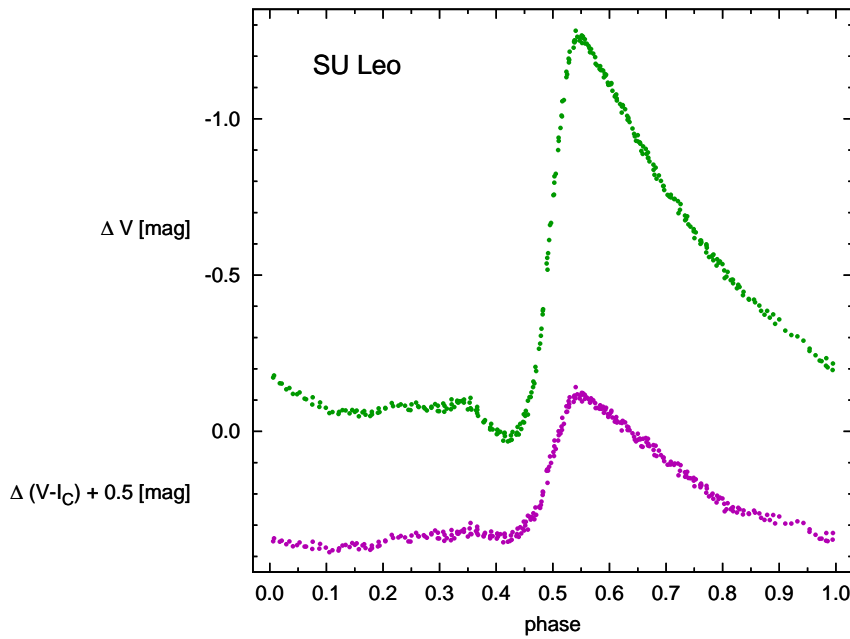


**Figure 4.** Differential $V$ and $V - I_\mathrm{C}$ light and colour curves of SU Leo.

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