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**AAVSO PHOTOELECTRIC PHOTOMETRY OF RU Cam**

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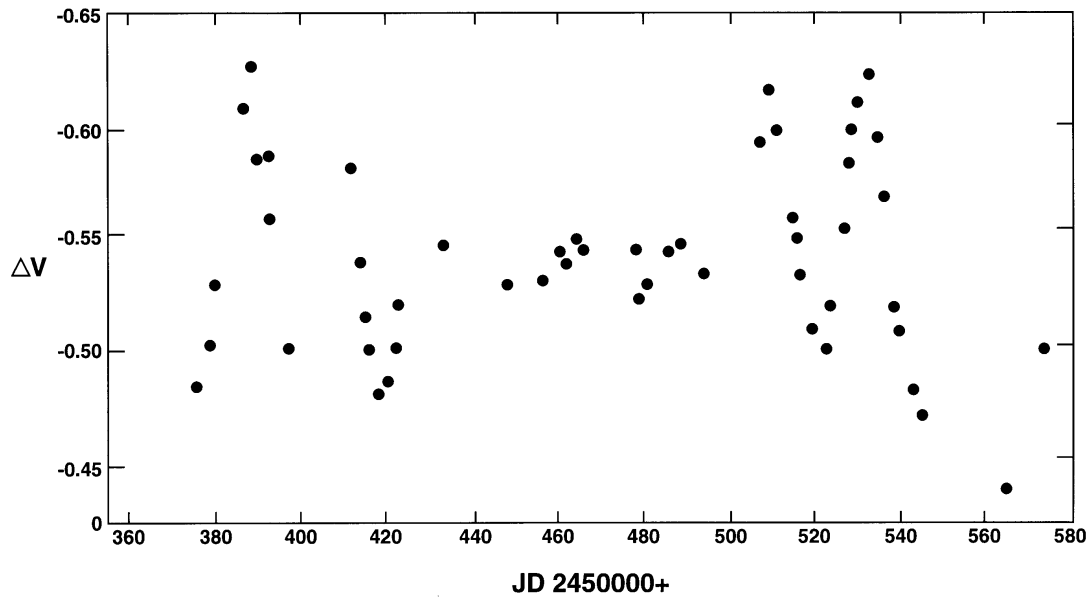
RU Cam (HD 56167) is a population II Cepheid which, in 1965-66, decreased its amplitude abruptly and drastically – from one magnitude to less than 0.1 (Demers & Fernie 1966). The amplitude fluctuated around 0.2 magnitude from 1966 to 1982; the cycle-length period varied between 17.4 and 26.6 days (Szeidl et al. 1992). Some UBV observations have been published by Berdnikov & Voziakova (1995); although they state that the amplitude of the light curve is 0.03 magnitude, their Figure 1 shows it to be about 0.2 magnitude. The *HIPPARCOS* satellite monitored RU Cam between 1989.85 and 1993.21; the star was classified as a periodic variable, with a period of 22.24 days (ESA 1997). The American Association of Variable Star Observers has monitored RU Cam photoelectrically from 1987 to 1997. The results are described here.

A total of 109 differential V observations were made between JD 2447066 and 2450709. The comparison stars were HD 56323 (F5) and HD 57201 (F8). The V magnitude of HD 56323 has been well established, by other observers, to be 9.05. Observations were corrected for differential extinction, and transformed to the V system using the catalog values of (B–V), and transformation coefficients determined for each observer from observations of blue-red pairs. The standard error of the check star observations was 0.012 to 0.03, depending on the observer.

The power spectrum of the observations was determined using the VSTAR software developed by the AAVSO ([www.aavso.org](http://www.aavso.org)) as part of its *Hands-On Astrophysics* education project.

The range of the observations was 8.34 to 8.68. The highest peak in the power spectrum of the 1987-1997 data was at a period of 22.20 days, in excellent agreement with the period derived from the *HIPPARCOS* photometry, and with the period (22.16 days) before 1966. The phase diagram for that data and period showed an amplitude of about 0.20 mag, with relatively little scatter.

The 1997-98 data (Figure 1) is rather different; it is more typical of a double-mode pulsator, in the sense that it appears to show systematic variations in amplitude. The data of Szeidl et al. (1992) occasionally show a similar appearance. The various forms of non-periodicity in RU Cam may arise from cycle-to-cycle changes in either the phase, the amplitude, or the shape of the light curve – or even from the presence of multiple periods.



**Figure 1.** The AAVSO photoelectric V light curve of the peculiar Population II Cepheid RU Cam in 1997-98, relative to HD 56323 ( $V=9.05$ )

Szeidl et al. (1992) suggested that the period of RU Cam fluctuates over a wide range. An alternative interpretation is that there are random, cycle-to-cycle fluctuations in period, as in the Mira and RV Tauri stars (Percy et al. 1997); this possibility was also alluded to by Szeidl et al. (1992). A cursory application of the Eddington & Plakidis (1929) method for identifying such changes supports this proposition. The exact period found over any limited range of time would then be affected by these random changes.

The low scatter in the phase curve from 1987 to 1997 shows that the pulsation is now relatively stable, so that the 1965 decrease in amplitude was an abrupt decrease from one discrete state to another, with no significant change in period; the more complex 1997-98 data remind us that this star is still not predictable, and is well worthy of study.

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