PHOTOMETRIC OBSERVATIONS OF RR LYRAE COVERING HALF A CENTURY

Abstract

4403 photographic observations obtained in the years 1943-1950, 2611 white light observations from the years 1950-1957, altogether 31794 *UBV* observations collected in the years 1958-1981 and 7135 observations made in the Strömgren uvby and Hβ wide/narrow band photometric system between 1990 and 1993 are published.

INTRODUCTION

Some sixty years ago Prof. L. Detre initiated the long term monitoring of RR Lyrae (HD 182989) at Konkoly Observatory resulting in the discovery of a four-year cycle in its 40-day Blazhko-period (Detre & Szeidl, 1973).

In order to solve the still enigmatic problem of the Blazhko effect we deem it important to publish all the observations of RR Lyr available to us. We present here photographic observations from the years 1943-1950, photoelectric observations in white light made in 1950-1957, photoelectric *UBV* observations obtained in 1958-1981 and Strömgren uvby and Hβ observations made from 1990 through 1993.

SUMMARY OF PHOTOMETRY OF RR LYRAE

i) Photographic observations

Photographic photometry was carried out at Konkoly Observatory, Budapest with the 16 cm astrograph using Eastman 40 plates with 30 s exposure time from 16 May 1943 (JD 2430861) through 21 June 1950 (JD 2433454). The comparison stars and their magnitudes used in measuring these plates are given in Detre's (1943) paper. During 96 nights about 8800 observations were obtained and by pairs averaged. Table 1 presents 4403 photographic observations. The time of observations are converted to HJD.

ii) Early photoelectric observations without filter (in white light)

The photoelectric photometry was commenced at Konkoly Observatory in 1950. At first the photometry was conducted with the observatory's 60 cm telescope without using any filter. In 1950-1953 an RCA 931A, from 1954 an RCA 1P21 multiplier tube was employed in the photometer. Although these observations are on an indefinite photometric system they well supplement Walraven's (1949) photoelectric observations. The observations published here were made between 12 July 1950 (JD 2433475) and 30 October 1957 (JD 2436142). The comparison star used was HD 183125. (The same one was used by Walraven, too.) In Table 2, 2611 white light observations obtained during 45 nights are given.

iii) *UBV* photometry

The *UBV* photoelectric observations were carried out using the 60 cm Newton telescope at Budapest from 26 July 1958 (JD 2436411) through 26 September 1981

(JD 2444874). Since RR Lyrae is fairly bright the mirror of the telescope usually had to be diaphragmed to 35–50 cm depending on the sky transparency. The mirror of the telescope was first aluminized in 1963. Before 1963 an RCA 1P21 multiplier was used with Schott filters UG1 in U, BG12+GG13 in B and GG11 in V; and thereafter an EMI 9052B tube with the same filter combination as in the previous years.

The comparison star used to the UBV observations was HD 183125 (A2). Tie-in observations made on several nights yielded for this star: $V = 7.999 \pm .007$, $B-V = +0.289 \pm .006$, $U - B = +0.077 \pm .015$. The constancy of the comparison star was checked against the star HD 182487 ($V = 7.009, B - V = +0.020, U - B = -0.119$, Preston et al., 1965).

The observations of the variable were reduced in the usual way. The UT times have been converted to HJD and the differential magnitudes have been corrected for atmospheric extinction. (These corrections were mostly negligible since the comparison is very close to the variable, only about half a degree away.) The observations have been transformed into the UBV system in the traditional way (see e.g. Hardie, 1962).

In Tables 3 and 4 we present 14977 differential V and 15331 differential B magnitudes collected on 446 nights. In Table 5, 1486 differential U magnitudes obtained on 38 nights are given. The differential magnitudes are given in the sense variable minus comparison.

iv) Strömgren and Hβ photometry

Differential photoelectric photometry of RR Lyr was conducted from 10 September 1990 through 22 June 1993 with the 0.8 m Automatic Photoelectric Telescopes (APT) at Fairborn Observatory, Mt. Hopkins, Arizona. These APTs are nearly identical and equipped with filter sets closely matched to the Strömgren uvby and H beta wide/narrow band photometric systems. The T5 APT was used for the observations made up to October 1991. Intensive photometry of RR Lyr was obtained during 1 May - 22 June UT 1993 using chiefly the T6 APT. The characteristics of the T6 APT (later acquired by the University of Vienna and renamed 'Wolfgang') is given by Strassmeier et al. (1997). The T5 APT is similar and has been operated by the Four College Consortium and is known as the FCC 0.8 m APT.

The comparison star was HD 182487 ($V = 7.01, B - V = +0.02$; A0 (V)) and HD 182694 (=HR 7382; $V = 5.84, B - V = +0.92$; G2 IIIa) served as the check star. The usual sky-comparison-variable/check-comparison-sky observing sequence was used and integration times of 10 s were used. Observations were obtained on 63 nights and given in the sense of differential magnitude, Δmag variable minus comparison star (V$-$C).

The observations were reduced in the usual way with UT times converted to HJD and the differential magnitudes corrected for atmospheric extinction. Because of the close angular proximity of the variable, comparison and check stars, the differential extinction corrections were always very small.

In Tables 6, 7, 8, 9, 10 and 11, 1199 Δy, 1196 Δb, 1176 Δv, 1166 Δu, 1199 Hβ narrow band and 1199 Hβ wide band observations are given, respectively.

ACKNOWLEDGEMENTS

We are grateful to the late director of the Konkoly Observatory, Prof. L. Detre who made the early photoelectric observations and significantly contributed to the UBV observations. Thanks are also due to Dr. I. Guman who made most of the photographic exposures and to our colleagues, Prof. B. Balázs, Dr. Katalin Barlai, Dr. G. Kovács, Mr. M. Lovas and Dr. L. Patkós who obtained some of the observations. Mr. J. Bartus helped us with the data handling. The research grant from OTKA No. T-015759 is also acknowledged.

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