COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5641

Konkoly Observatory
Budapest
4 August 2005

HU ISSN 0374 – 0676

REVISION OF THE LIST OF GALACTIC FIELD RRab STARS WITH KNOWN BLAZHKO PERIODS

SÓDOR, Á.; JURCSIK, J.

Konkoly Observatory, H-1525 Budapest, P.O.Box 67, Hungary, e-mail: sodor@konkoly.hu

The first comprehensive list of galactic field RR Lyrae stars showing Blazhko effect was published by Szeidl (1988). Most of these RR Lyrae stars were identified as Blazhko variables on the grounds of visual or photographic observations and some of the investigations utilized only $O-C$ data. The compilation of Blazhko stars was modified and complemented with recent, well established data by Smith (1995) and Jurcsik et al. (2005b).

In Jurcsik et al. (2005a) it has been found that RR Gem, listed with a 37 d Blazhko period in Szeidl (1988) based on photographic observations of Detre (1970), is actually a very small modulation amplitude Blazhko star with a modulation period of 7.2 d. Some doubts may also arise about results which were based on e.g., exclusively visual data. These facts led us to decide to check the validity of the Blazhko status and period of the stars included in Szeidl's list.

Utilizing all the available data of the stars (the original datasets that the announcement of the Blazhko status was based on, recent photometric data e.g., ROTSE[1] (Wozniak et al., 2004), ASAS[2] (Pojmanski, 2002), and the GEOS light maxima database[3]) and using powerful computer-aided analysing technique we have found 9 variables of which the Blazhko periods are definitely wrong, and even their Blazhko status can be questioned.

The accuracy of the data sets a limit to our conclusions. Keeping also in mind that small amplitude modulation might be quite frequent (RR Gem: Jurcsik et al., 2005a; SS Cnc: Jurcsik et al., 2005c) we cannot decide for sure whether these stars show modulation characteristics or not. To reach definite conclusion about their modulation properties more accurate and extended photometric observations were needed. Without this, the aim of our investigation could be only to check whether the available data consistently show the modulation period appearing in the literature.

The Blazhko period of the following stars do not fit all the available data, consequently without further observations their modulation behaviour has to be taken with suspect.

MW Lyrae

No observations of this star can be found in the ROTSE database, only two (photographic and visual) observation sets of MW Lyr are available. The modulation was found by Mandel (1970) based on his visual observations. In these data the variability of

[1] http://skydot.lanl.gov/nsvs/nsvs.php
[2] http://archive.princeton.edu/~asas/
[3] http://webast.ast.obs-mip.fr/people/leborgne/dbRR/

maximum light shows the 33.3 d periodicity, indeed, although the light curve has a very strange shape even for a Blazhko star (see fig. 5 in Mandel, 1970). Earlier photographic observations were taken by Gessner (1966). These 7 light maxima cover epochs of different phases of the 33.3 d modulation without showing any significant scatter at maximum light contradicting Mandel's result.

DM Cyg

Light curve modulation was found by Lysova & Firmanyuk (1980) based on their visual observations of 29 light maxima. They found a periodic oscillation in the times of light maxima with a period of 26.01 d and with an amplitude of about 0.006 d. Fourier analysis of their data shows this periodicity, nevertheless the resultant 0.006 d amplitude ($\sim$ 10 min) if compared to the accuracy of visual observations hints some suspect about the result. The ROTSE data show the light curve to be stable within the uncertainty, without any appearance of modulation frequency peaks in the Fourier spectrum in the vicinity of the pulsation frequency. There are 206 times of maxima of DM Cyg in the GEOS $O-C$ database which primarily show a steady period increase. After the removal of this long term trend and Fourier analysing either the entire dataset or its shorter segments, no convincing evidence of a 26.01 d periodicity in the $O-C$ data was found.

TU Com

The modulation and its period were determined from the photographic measurements of Ureche (1965). Though the photometric data show modulation in the brightness and phase of maxima, the Fourier analysis of the light curve does not support the published $\sim$ 75 d modulation period. No unambiguous modulation period from these data can be determined, indicating that maybe observational error mimics modulation. Schmidt & Seth (1996) show a bit scarce folded light curve of TU Com without any sign of modulation. The ROTSE data do not show modulation, but due to the faintness of the star these data show quite large scatter.

SW Boo

Blazhko modulation was found by Taylor (1977) based on the unpublished visual observations of Baldwin (AAVSO). An anomalously large amplitude modulation (pulsation amplitude varied between 0.7 mag and 2.6 mag) with 13 d periodicity was determined. The ROTSE data unambiguously confute this result, showing no modulation at all. CCD observations of Husar (2004) also contradict the large amplitude modulation of SW Boo.

V434 Her

There are 35 published times of maxima of this variable (Hoffmeister, 1960) among them 19 are from visual and 16 are from photographic observations. Based on this data Rozhavski (1964) found this variable to be phase modulated with a period of 26.06 d and an amplitude of about 0.06 d. Fourier analysis does not show any significant periodicity in the original $O-C$ data given by Hoffmeister. The same is true if the visual and pg data are treated separately. ROTSE data have large uncertainties.

SW Psc

Phase modulation with 34.5 d periodicity and 0.013 d amplitude was found by Ureche (1971) on the basis of 15 photographic observations of light maxima from two seasons. Fourier analysis of these data shows the mentioned periodicity. Earlier $O-C$ data are scarce and show no significant periodicity but random noise. The ROTSE light curve indicates no modulation with this periodicity.

V788 Oph and *V829 Oph*

These variables were observed by Mandel (1969) visually and photographically, but only visual data were published. These data indicate some modulation, but the Fourier spectra of the light curves do not support the Blazhko periods given by Mandel (115 d for V788 Oph and 165 d for V829 Oph). The observed light maxima are too few in number for determining the modulation period unambiguously. Due to their faintness, the ROTSE data of these stars indicate neither evidence nor refutation of the modulation, because of the large uncertainties.

AD UMa

Hoffmeister (1958) found variability in the magnitude of light maxima with about $35-40$ d period and 0.25 mag amplitude from visual observations. The original photometric data are not available. Only two folded light curves are given (see Fig. 2 and Fig. 3 in Hoffmeister, 1958) corresponding to the brighter and fainter maxima. Taking into account the uncertainties of the visual observations and the faintness of AD UMa (15 mag at light maximum), the 0.25 mag modulation found by Hoffmeister is suspicious to arise from observational errors. No ROTSE data are available.

WY Dra

It was found to be modulated by Chis et al. (1975). They reported a significant variation in the shape of the light curve and in the height of maxima of about 0.6 mag with 24.3 d periodicity. Reanalysing their $O-C$ and maximum magnitude data, no evidence of this periodicity emerges. The ROTSE data show no variation in the maximum light within its uncertainty, which is by far less than 0.6 mag.

Acknowledgements: We would like to thank Béla Szeidl for the useful suggestions and valuable comments. The financial support of OTKA grants T-043504 and T-048961 id acknowledged. This research has made use of the SIMBAD database, operated at CDS-Strasbourg, France.

References:

Chis, D., Chis, G. and Mihoc, I., 1975, *IBVS*, 960
Detre, L., 1970, *Transactions of the IAU XIV A, Rep Astron.*, **259**
Gessner H., 1966, *VSS*, **7**, 61, (H2)
Hoffmeister, C., 1958, *AN*, **284**, 165
Hoffmeister, C., 1960, *VSS*, **4**, 315, (H5)
Husar, D., 2004, *BAV Rundbrief*, **53**, 1
Jurcsik, J., Sódor, Á., Váradi, M. et al., 2005a, *A&A*, **430**, 1049
Jurcsik, J., Szeidl, B., Nagy, A. and Sódor, Á., 2005b, *Acta Astronomica*, in press
Jurcsik, J. et al., 2005c in preparation
Lysova L.E., Firmanyuk B.N., 1980, *ATsir*, **1122**, 3
Mandel, O. E., 1969, *Peremennye Zvezdy*, **16**, 628
Mandel, O. E., 1970, *Peremennye Zvezdy*, **17**, 335
Pojmanski, G., 2002, *AcA*, **52**, 397
Rozhavski, P. G., 1964, *Peremennye Zvezdy*, **15**, 208
Schmidt, E. G. and Seth, A., 1996, *AJ*, **112**, 2769
Smith, H. A., 1995, *RR Lyrae Stars* (Cambridge University Press)
Szeidl, B., 1988, in *Multimode Stellar Pulsation*, eds. G. Kovács, L. Szabados and B. Szeidl (Kultúra, Budapest), p. 45

Taylor, P. O., 1977, *JAAVSO*, **6**, 56
Ureche, V., 1965, *Babes-Bolyai Stud. fasc.*, **1**, 73
Ureche, V., 1971, *IBVS*, 532
Wozniak, P. R. et al., 2004, *AJ*, **127**, 2436