Bull. Spec. Astrophys. Obs., 1994, **38**, 169-170.
UDC 524.332-56

ON THE MAGNETIC VARIABILITY OF RR LYRAE
(SHORT COMMUNICATION)

YU.S.ROMANOV[1], S.N.UDOVICHENKO[1], M.S.FROLOV[2]
[1]Odessa State University, Astronomical Observatory, Odessa, Ukraine
[2]Institute of Astronomy, Moscow, Russia

ABSTRACT. *The results of measurements of RR Lyrae magnetic field, carried out at the 6 m telescope, are briefly presented. The field variability with the phase of the pulsation period (~0.5^d) and the Blazhko effect period (~41^d) has been found.*

Investigation of magnetic fields of pulsating variables is extremely important for understanding the nature of pulsations. First searches for magnetic field in the well known variable RR Lyr were made by Babcock (1958), however up to now the obtained results were umbiguous.

Spectral observations of RR Lyrae were carried out from 1978 to 1983 on the Main Stellar Spectrograph (MSS) of the 6 m telescope with the purpose of investigating the variation of the magnetic field strength. During these years several series of spectrograms were obtained for RR Lyrae with the Zeeman achromatic circular polarization analyzer for magnetic field measurements. The results of measurements in three seasons of observations, 1978, 1982 and 1983, have already been published (Romanov et al., 1987; 1988).

Further observations were carried out on October 10th-13th, 1984. To reduce the time of exposure the Kodak 103a-0 emulsion was hypersensitised by hydrogen, begun in 1982. The time resolution between the successive spectrograms ranges from 10 to 60 min, depending on the phase of the light curve and prevailing seeing. The spectra span a wavelength interval of 3900-5000 Å. The measurements of the fourth series of the Zeeman spectrograms indicate that the average value of the magnetic field strength, by the period of light variation, turns out to be about zero (varies from -400 to 400 Gs). The probable errors of measurements for each plate range from 100 to 500 Gs, depending on the number of lines measured and density of the spectrograms. Values of the Lande g-factor for the lines between 3900-4600 Å have been adop-

ted from Babcock (1967) and Romanyuk (1984).

The dependence of the RR Lyrae magnetic field strength variations on the basic pulsation period for the fourth series of spectrograms is presented in Fig. 1. The vertical bars indicate the probable error of measurements for the mean field strength on each plate.

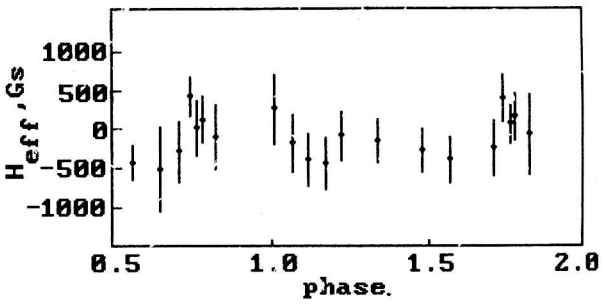

Fig.1. *The dependence of the magnetic field strength variations of RR Lyrae with the basic pulsation period for the fourth series of spectrograms.*

The obtained data allows us to compare our results of the magnetic field strength measurements made in 1984 with both those obtained in 1978-83 and with Babcock's (obtained in 1955-56).

The mean magnetic field strength values were estimated for all curves. Analysis of all the published observations shows that the probable period of magnetic field polarity variations is the Blazhko period. The phases of the basic pulsation period and the Blazhko period have been computed from the elements:

J.D. (max.hel.)=2442995.405^d-0.566867^d.E

J.D. (max.Blazhko)=2437551.316^d-40.885^d.E

The observations of 1984 were carried out at the Blazhko-effect phase ϕ=0.27. If one analyzes all the observations over the last 30 years, the average field strength turns out to vary with the 41^d period of the Blazhko effect.

Fig. 2 illustrates how the magnetic field of RR Lyr depends on the Blazhko effect phase.

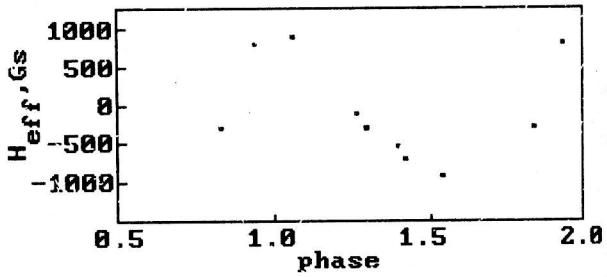

Fig.2. *The dependence of the magnetic field polarity with the Blazhko period.*

REFERENCES

Babcock H.W.: 1956, *Astrophys.J.Suppl.ser.* **3**, 141 (No.30).

Babcock H.W.: 1962, in: *Astronomical Techniques (Stars and Stellar Systems)*, Univ. Chicago Press; 1967, Chap.5, Mir, M. 100.

Romanov Yu.S., Udovichenko S.N., Frolov M.S.: 1987, *Sov. Astron. Lett.* 13(1), 69-74.

Romanov Yu.S., Udovichenko S.N., Frolov M.S.: 1988, *Magnetic stars.* Proc. of the 7th meeting "Physics and Evolution of Stars", L.: Nauka.

Romanyuk I.I.: 1984, *Astrofiz. Issled. (Izv. SAO)*, **18**, 37.

Received 1993 April 7