FREQUENCY ANALISYS OF RADIAL VELOCITIES VARIATIONS OF XZ CYG

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ABSTRACT. The observation of RR Lyr type star XZ Cyg were carried out at 50" telescope of Crimean Astrophysical observatory and covered the time interval of JD 2441483 - 2441579. For radial velocities measuring were used H, CaII and other metals line of low dispersion spectrograms. The frequency analysis was carried out using computer code FOUR-1 (Andronov I.L., Odessa Astron. Publ., 1994, 7, 49). Radial velocities variations are sufficiently fitted by sinusoid. The variations of radial velocities with the phase of curve lights and of Blazko effect was investigated.

Key words: Stars: RR Lyr-type; Stars: individual: XZ Cyg.

1. Introduction

The spectral observations of the variable star of RR Lyra type-stars XZ Cyg were carried out at 50" telescope of the Crimean Astrophysical observatory with the new to inves-tigate of the changes of radial velocities v_r. The spectrograms XZ Cyg were obtained in the minimum of its brilliancy with the maximal possible resolution of the lines were converted into radial velocities v_r considering the corrections of the orbital motion and axial rotations of the Earth. The radial velocities were mainly determined with the help of lines of absorption H_γ, H_δ, H_8 and H_9.

In certain cases the radial velocities were determined with the help of H_β orthother hydrogen lines till H_{14} homeliness in the region of the ascending bronch of the curve of brightness certain lines of absorption bifurcate. Due to the phenomenon two radial velocities were determined with the aid of the bifurcated lines.

The phases of the basic period ϕ and of the period of the Blazhko effect ψ were calculated the elements Kynchev (1974):

JD Max hel =2440445.789 + 0.466497 E

JD Max A =2441571.50 + 57.52 N

In the atmospheres of stars of this type occur stormy, rapid processes, which are accompanied by impact ware and by the appearance of the excessive radiation. May be that's why calcium atoms which are easily ionized can be in the higher grade of ionization, and their lines of absorption's can be located beyond the visible of the spectrum. It night be the reason for the weakening of the intensity of lines of absorption K CaII in comparison with stationary stars. Though the neasuring of the H and K lines CaII was difficult, we radial velocities v_r for ψ phases of the Blazko effect. In certain spectrograms we managed to measure separate lines of iron, magnesium, and titanium and their v_r.

The radial velocities XZ Cyg were determined with the help of the spectra with prolonged exposition without taking into account the influence of the changes of brilliance and velocity.

Using the multi-frequency changes of the parameters of the stars, which was worked out at the Odessa Astronomical Observatory by Andronov I. L.

$x_t = C_1 + C_2 \sin\omega t + C_3 \cos\omega t$, where $f_1(t_k) = 1$, $f_2 = \sin(\omega t_k)$, $f_3 = \cos(\omega t_k)$.

Here $\omega = 2\pi f$, where f is trial frequency.

The changes of the radial velocities may be represented by trigonometric polynomial of the first degree

$v(\varphi) = C_1 + C_2 \cos 2\pi(\varphi - C_3)$,

C_1 - is the mean value of the radial velocity i.e. γ - velocity.

C_2 - the semi-amplitude of the radius variations of the layer of formation of spectral lines H, H and K Ca II and Me.

C_3 - the phases ϕ_{max} of maximum (the approximation after iterating).

The results obtained are represented in table 1.

The table also represents the number of lines n, which were included in the determination of the mean radial velocity.

σ_γ - error estimate of γ - velocity and σ_r - error estimate of r and σ_φ - error estimate of φ.

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References

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Table 1: Radial velocities of XZ Cyg

Elements	n	γ km/s	σ_γ	R	σ_R	φ_{max}	σ_φ
ψ = 0.135 -0.275							
H	11	-157.52	16.8	58.15	11.5	0.87	0.072
CaII	8	-130.73	14.2	31.66	25.1	0.76	0.073
ψ = 0.465 - 0.570							
H	18	-175.25	6.7	31.93	9.2	0.99	0.061
CaII	13	-159.08	10.28	17.60	9.26	0.870	0.183
Me	6	-185.71	78.01	94.24	105.65	0.073	0.089
ψ = 0.570 - 0.670							
H	18	-172.88	5.95	39.45	11.14	0.044	0.038
CaII	8	-131.73	21.00	49.02	51.09	0.601	0.076
ψ = 0.990 - 0.130							
H	21	-169.18	5.50	61.39	10.54	0.065	0.026
CaII	17	-156.26	5.77	37.58	8.05	0.965	0.047
Me	9	-139.85	13.71	55.53	49.25	0.169	0.083