THE INTERPRETATION OF LIGHT CURVES λλ2460 : 35000Å OF THE ECLIPSING WOLF-RAYET BINARY V444 CYG

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ABSTRACT

The structure of the extended atmosphere and the physical characteristics of the WN5 star V444 Cyg have been determined from the analysis of light curves of this system in the range λλ2460 - 35000. The radius of the core of the WN5 star at $\tau = 1$ is $r_0 = 2.9R_\odot$; the temperature at the surface of the core is equal to 90000°K, the electron density at its surface is $0.9 \cdot 10^{13}$ cm^{-3}. The bolometric luminosity of the WN5 star $L_b = 2.10^{39}$ erg/s is close to the critical Eddington luminosity $2.6 \cdot 10^{39}$ erg/s. The electron temperature decreases monotonically with height through the extended atmosphere from the value $T_e = 80000^\circ$ - 90000°K at $r = 2.9R_\odot$ to the value $T_e = 20000^\circ$ - 30000°K at $r = 8R_\odot$. The outflow velocity at the surface of the core ($r_o = 2.9R_\odot, \tau = 1$) is $v_o = 400$ km/s; the outflow in the region $r \geq 12R_\odot$ becomes stationary with the constant velocity $v = 1000$ - 1200 km/s. The total interstellar absorption for the system V444 Cyg is $A_v = 2^m.66$. The results obtained confirm strictly the model of Wolf-Rayet phenomenon proposed by Beals (1944). Chromospheric-coronal effects in the extended atmosphere are absent until $r = 20R_\odot$. Characteristics of the WR star are consistent with the predictions of the evolution theory for massive close binary systems with mass exchange. The WR star is in a late evolutionary stage after the main sequence stage, being a helium remnant that has been formed as a result of the mass exchange.

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