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The nature of the unique precataclysmic variable V664 Cas with two-peaked balmer lines in its spectrum

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Abstract

We analyze photometric and spectroscopic observations of the close binary system V664 Gas. All the characteristics of its radiation are consistent with the star being a cataclysmic variable with powerful reflection effects. The orbital period is refined ($P = 0.5816475$ d) and the ephemerides of the system determined. The U, B, V, R light curves of V664 Gas display sinusoidal variations with similar amplitudes near $\Delta m = 1.1$ m. This suggests that a hot spot on the surface of the secondary always dominates the optical radiation of the system. The spectra contain emission lines, two-peaked hydrogen lines, and narrow lines of helium and heavy elements in high ionization states, whose intensities vary synchronously with the brightness. The H α $\lambda 4686$ Å line has broad absorption wings that form in the atmosphere of the O subdwarf. The mass function, $f(m) = 0.007M_{\odot}$, is the lowest among all precataclysmic variables: the mass of the secondary exceeds the mass of the primary by more than a factor of 1.6. A full set of fundamental parameters for V664 Gas is determined based on modeling of the spectra and light curves, taking into account reflection effects in the system. Most of the emission lines are formed under conditions of appreciable deviations from local thermodynamic equilibrium. The possibility of carrying out correct modeling of the Balmer-line profiles assuming the stellar radiation is absorbed in a planetary nebula is demonstrated. © 2004 MAIK "Nauka/Interperiodica".

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