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ИЗВЕСТИЯ КРЫМСКОЙ АСТРОФИЗИЧЕСКОЙ ОБСЕРВАТОРИИ

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The high-resolution optical spectroscopy as a method of X-ray binary CYG X-1 investigation. The results of CYG X-1 monitoring during 2002-2004

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Abstract. The detailed spectral analysis is recognized as necessity to understand the physical nature of different phenomena in Cyg X-1. We discuss the possibilities to understand the way of the gas flow between the components by the high-resolution spectroscopy, the physical characteristics of the gas outflow from supergiant and in the regions of accretion structure, the origin of 147 day period, a significant correlation between the long-time optical and 2-10 keV X-ray variations (with the lagging of the last ones), and some other features of the system. The results of observations are carried out using of the echelle spectrometers of the 2-m telescope (Peak Terskol Observatory) and of 1.84-m telescope (BOAO, South Korea) are given. The obtained high-resolution spectra (R = 45000, 30000, 13000 and 100000) cover the whole or the main part of the optical spectral range at the same time. The spectra were obtained during the “soft” and “hard” states of Cyg~X-1. The different types of profile dependencies for some spectral lines from X-ray 2-12 keV flux value were researched by comparing this spectral material with X-ray RXTE/ASM data. X-ray flare of 13.06.2003 led to strong line profile variations in Hα and HeII λ4686Å emissions during several hours. We connect this behavior with variations of ionization structure of matter in the system Cyg X-1. The comparison of observed and non-LTE model calculated profiles for HeI and MgII goes to *logg* = 3.34 instead of 3.18 for Herrero et al (1995) and for overabundance of He and Mg: [He/H] = 0.43, [Mg/H] = 0.59. The sequence of line profile variation with the orbital phases is clearly observed. The Doppler image was reconstructed by using the improved method of Doppler tomography on the base of HeII λ4686Å profiles. The tomogramms show optical component to be 3-4 times more massive then X-ray one.