Long-term X-ray variability of the microquasar system LS 5039/RX J1826.2−1450

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We report on the results of the spectral and timing analysis of a BeppoSAX observation of the microquasar system. The source was found in a low-flux state with $F_X (1–10 \text{ keV}) = 4.7 \times 10^{-12} \text{ erg cm}^{-2} \text{ s}^{-1}$, which represents almost one order of magnitude lower than a previous RXTE observation 2.5 years before. The 0.1–10 keV spectrum is described by an absorbed power-law continuum with photon-number spectral index $\Gamma = 1.8 \pm 0.2$ and hydrogen column density of $N_H = 1.0^{+0.4}_{-0.3} \times 10^{22} \text{ cm}^{-2}$. According to the orbital parameters of the system the BeppoSAX observation covers the time of an X-ray eclipse should one occur. However, the 1.6–10 keV light curve does not show evidence for such an event, which allows us to give an upper limit to the inclination of the system. The low X-ray flux detected during this observation is interpreted as a decrease in the mass accretion rate onto the compact object due to a decrease in the mass-loss rate from the primary. stars: individual: LS 5039, RX J1826.2−1450, 3EG J1824−1514 – X-rays: stars – stars: variables: other – radio continuum: stars

Introduction

was first identified as a new massive X-ray binary by Motch et al. (motch97). Interest in this source has grown significantly because it has turned out to be a source of persistent radio-emitting relativistic jets, and because it is believed to be physically associated with the $\gamma$-ray source 3EG J1824−1514 (Paredes et al. paredes00, paredes02). The first radio detection was reported by Martí et al. (marti98) using the Very Large Array, but the discovery of radio jets was only possible when the source was observed at milliarcsecond scales with the Very Long Baseline Array (Paredes et al. paredes00). The radio emission is persistent, non-thermal and variable, but no strong radio outbursts or periodic variability have been detected (Ribó et al. ribo99, hereafter R99; Ribó ribo02t).

In the optical band appears as a bright $V=11.2$, O6.5V((f)) star showing little variability on timescales of months to years (Clark et al. clark01). Variations of $\sim 0.4$ mag have been reported in the infrared ($H$ and $K$ bands) but no obvious mechanisms for such variability have been proposed (Clark et al. clark01). Recent studies show that is a runaway system moving away from the Galactic plane with a total systemic velocity of $\sim 150 \text{ km s}^{-1}$ and a component perpendicular to the Galactic plane larger than 100 km s$^{-1}$ (Ribó et al. ribo02; McSwain & Gies mcswain02). The orbit of was first studied by McSwain et al. (mcswain01), who found that is a short-period, $P_{\text{orb}} = 4.117 \pm 0.011$ day and highly eccentric, $e = 0.41 \pm 0.05$, system. Spectroscopic observations carried out in July 2002 by Casares et al. (casares03) seem to confirm the orbital period of the system, but neither confirm nor reject the proposed eccentricity.

figure[htpb] !lc.eps []MECS background subtracted light curves of RX J1826.2−1450 in different energy ranges. Each point represents 60 minutes. Time zero corresponds to JD 2, 451, 825.75. The expected time of periastron ($P$) and in $10^4$ seconds. An estimate of the unabsorbed X-ray luminosity according to the model of Table specfit is also given in the right axis of the top panel. lc