Accretion Phenomena and Related Outflows, IAU Colloquium 163
ASP Conference Series, Vol. 121, 1997
D.T. Wickramasinghe, L. Ferrario, and G.V. Bicknell, eds.

Optical Low States of the Supersoft X-Ray Source RX J0513.9-6951

K. Reinsch, A. van Teeseling, K. Beuermann

Universitäts-Sternwarte, Geismarlandstr. 11, Göttingen, Germany

T.M.C. Abbott

CFHT Hawaii

The transient luminous soft X-ray source RX J0513.9–6951 (Schaeidt et al., 1993, A&A 270, L9) is a high-mass-transfer binary system (Cowley et al., 1993, ApJ 418, L63; Pakull et al., 1993, A&A 278, L39) with a probable orbital period of 0.76 days (Crampton et al., 1996, ApJ 456, 320). Here, we summarize the results of a quasi-simultaneous optical and X-ray monitoring (see Fig. 1). The sudden decrease of the optical flux, the accompanying reddening, and the turn-on in the soft X-ray band can be quantitatively described by variations in the irradiation of the accretion disk by the hot central star (Reinsch et al., 1996, A&A 309, L11). In this simple model, we consider a white dwarf with nuclear burning of accreted matter (van den Heuvel et al., 1992, A&A 262, 97), surrounded by a flat standard disk. In the optical high state, accretion at near-Eddington rate occurs and the white dwarf photospheric radius must be considerably expanded causing an enhanced illumination of the disk and the secondary. In the optical low state, the photosphere shrinks in response to a temporarily slightly reduced mass-transfer rate. At the same time, the effective temperature increases, and the soft X-ray flux becomes detectable with ROSAT. This model does not depend on the particular cause for the drop in the accretion rate and can describe the optical/ X-ray variability with the total luminosity changing by less than 20 %.

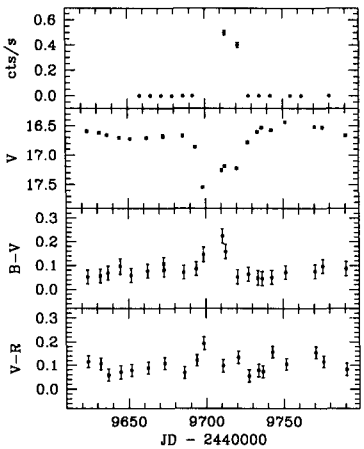

Figure 1. X-ray and optical light curves of RX J0513 obtained between October 1994 and March 1995. From top to bottom: ROSAT HRI soft X-ray flux (Schaeidt et al., 1996, Lecture Notes in Physics 472, 159), V, $B-V$, and $V-R$ CCD photometry obtained with the ESO Dutch 0.9 m telescope. During our monitoring campaign, RX J0513 went through an optical low-state, lasting ~ 40 days. The optical flux decreased by $\Delta V \sim 1$ mag, accompanied by a reddening of the spectrum, $\Delta(B-V) \sim 0.1$–0.2 mag and $\Delta(V-R) \sim 0.1$ mag. At the same time, an outburst of the soft X-ray flux was detected.