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RAPIDLY EVOLVING LIGHT CURVES OF LOW MASS X-RAY BINARIES

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A few Galactic Low Mass X-Ray Binaries (LMXBs) have shown drastically evolving X-ray and/or optical orbital light curves. In two short-period LMXBs, MS 1603+2600 (= UW CrB, P_{orb} = 111 min) and 4U 1916-053 (see e.g. Homer et al. 2001), the variations in the light curve morphology seem to be repeating in a periodic manner. We present first results of a photometric monitoring campaign of MS 1603+2600, showing evidence of a 5-day superorbital period in this yet unclassified source. The observations also unraveled optical flares, reminiscent of type I bursts, suggesting a neutron star primary.

MS 1603+2600, found by the Einstein satellite, has been a controversial source since the discovery of its optical counterpart (Morris et al. 1990). Several classification scenarios - including a Cataclysmic Variable, a LMXB dipper in the Galactic halo (Mukai et al. 2001) and a quiescent SXT (Hakala et al. 1998) - have been presented. Our photometric campaign with the Nordic Optical Telescope in 1999-2002 yielded several sets of high time resolution data, each with 4-8 consecutive nights. Particularly the longest run in Jun-Jul 2002 provides evidence of a cyclic 5-day variation in the light curve shapes, apparent by visual inspection and established by statistical analysis of the light curve shapes (Hakala et al. 2004, in prep.). As the overall optical flux remains constant during the 5-day period, variations in the mass transfer rate are not likely driving the long periodicity. We suggest that this superorbital variability may be induced by a precessing, possibly warped accretion disk (see e.g. Pringle 1996).

Presently we are developing a novel accretion disk modeling code, dedicated to reconstruct the disk geometry by inversion of light curves. An initial population with random disk shapes is created by varying the apex heights of irradiated triangles - providing the disk surface -, and a light curve is calculated for each candidate disk. Using genetic algorithms and regularisation the smoothest possible disk with the best match to the observed light curve is searched for. Tests using synthetic disks are in progress.

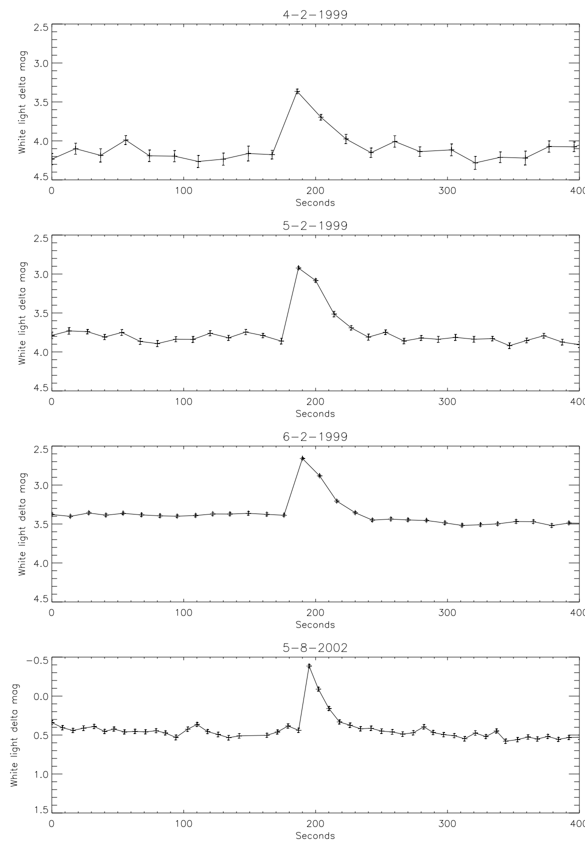

Fig. 1. Optical bursts in the light curves of UW CrB.

Finally, a handful of optical bursts were detected in our NOT data (a sample is presented in Fig. 1). Even though optical flares have been seen in quiescent SXTs, the profile, brightness and duration of the bursts in our data are more reminiscent of thermonuclear Type I bursts (see e.g. Matsuoka et al. 1984; Hynes et al., this volume). Hence, we conclude that the compact primary in UW CrB must be a neutron star.

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