Search for the prompt X-ray emissions at the ignition of the Galactic classical novae

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Abstract

We try to detect the prompt X-ray emission at the ignition of the Galactic classical novae (CNe) by analyzing the archive data at the location of them, which were discovered during the regular observing stage of MAXI. Although no source has detected yet, we continue to explore the chance.

Key words: Classical novae (CNe), ignition, MAXI

1. Introduction

The Monitor of All-sky X-ray Image (MAXI) on board the International Space Station (ISS) scans all sky every 92 minutes, making a "movie of all sky". These data are stored as the archive, and we can search for phenomena back to the past. Classical novae (CNe) are explained as thermonuclear runaways on the surface of accreting white dwarfs. In the Galaxy, about 10 examples are detected a year. In analogous of the type-I X-ray bursts, which are thermonuclear runaways on the surface of neutron stars, the CNe possibly emit the prompt X-ray at their ignition. However, it has hardly been detected, because an observation equipment of X-ray rarely has pointed to the CNe at the moment of their explosion. As an unexpected gamma-ray emission of V407 Cyg detected by Fermi Gamma-ray Space Telescope this March (Abdo et al., 2010), and a prompt X-ray emission of RS Oph detected by Swift Burst Alert Telescope (BAT) several years ago (Bode et al. 2006), we can strongly expect unknown phenomena immediately after the explosions of CNe.

2. Analysis

We studied about 14 of CNe, which were detected from Aug.15, 2009 to Nov.19, 2010. Among of them, 6 examples of them have the known neighbouring X-ray sources, so it was difficult to extract their emissions. We searched for X-ray emission of other 8 examples, with the overall light curves (1.5 - 4 keV of GSC). The detection limit of GSC is 60 mCrab per a scan (every 92 minutes), 15 mCrab per a day integral, where we defined 1 Crab = 1.3 cnts $cm^{-2}s^{-1}$. Since the flares of CNe seem to emit soft X-ray mainly, we selected 1.5 - 4 keV, the most soft band of MAXI, as the search band. We also investigated the other bands, 4 - 10 keV, 10 - 20 keV, but cannot detect any significant X-ray emissions. Table 1 is a list of CNe during the regular observing stage of MAXI. Figures are the light curves of CNe in 1.5 - 4 keV with 1-orbit resolution. The each period is from the day, which is about a week before the last negative observation, to the day, which is about a week after the first detection of the optical emission. The dotted line means the detection limit of GSC of MAXI (1 orbit).

Table 1. List of CNe

Name	Discovery (UT)
V1723 Aql	2010 Sep. 11.485
V407 Cyg	2010 Mar. 10.797
V2674 Oph	2010 Feb. 18.845
V2673 Oph	2010 Jan. 15.857
V1722 Aql	2009 Dec. 14.40
KT Eri	2009 Nov. 25.536
V496 Sct	2009 Nov. 8.370
V5584 Sgr	2009 Oct. 26.440

3. Conclusion

We couldn't detect any prompt emissions from the 8 examples of CNe. However, more data of CNe have been observed by MAXI. We can expect that the prompt X-ray emission in future and we will keep this investigation.

References

Abdo et al. 2010, Sci., 329, 817
Bode et al. 2006, ApJ, 652, 629

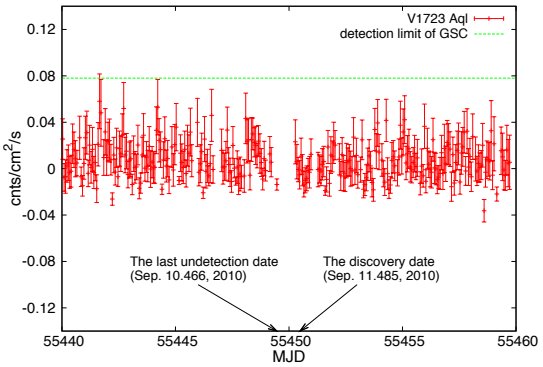

Fig. 1. V1723 Aql

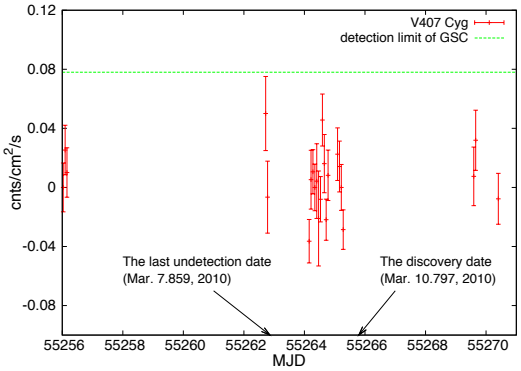

Fig. 2. V407 Cyg

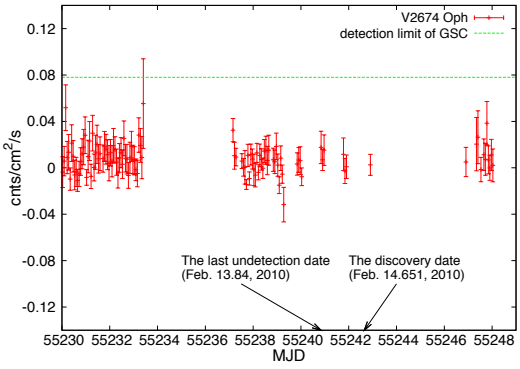

Fig. 3. V2674 Oph

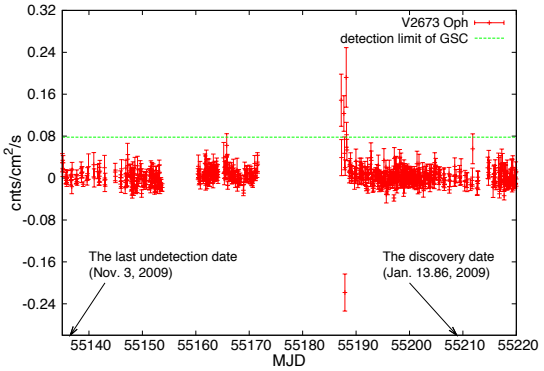

Fig. 4. V2673 Oph

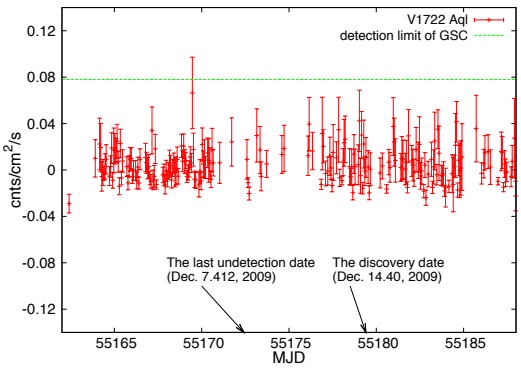

Fig. 5. V1722 Aql

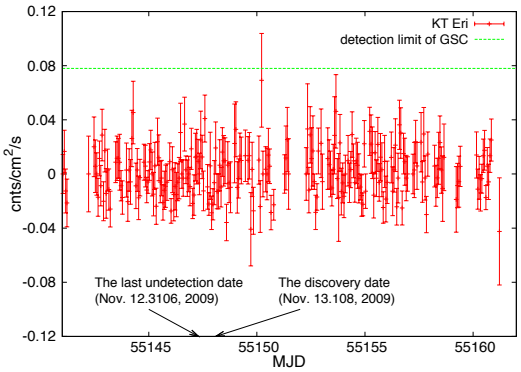

Fig. 6. KT Eri

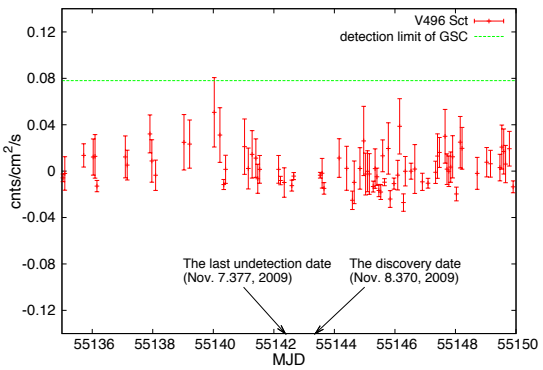

Fig. 7. V496 Sct

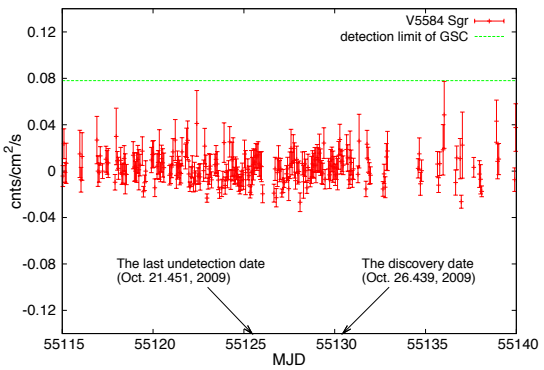

Fig. 8. V5584 Sgr