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 neighboring X-ray sources, so it was difficult to extract their emissions. We searched for X-ray emission of other 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 cts 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Discovery (UT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1723 Aql</td>
<td>2010 Sep. 11.485</td>
</tr>
<tr>
<td>V407 Cyg</td>
<td>2010 Mar. 10.797</td>
</tr>
<tr>
<td>V2674 Oph</td>
<td>2010 Feb. 18.845</td>
</tr>
<tr>
<td>V2673 Oph</td>
<td>2010 Jan. 15.857</td>
</tr>
<tr>
<td>KT Eri</td>
<td>2009 Nov. 25.536</td>
</tr>
<tr>
<td>V496 Sct</td>
<td>2009 Nov. 8.370</td>
</tr>
</tbody>
</table>

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
The last undetection date (Sep. 10.466, 2010)
The discovery date (Sep. 11.485, 2010)

Fig. 1. V1723 Aql

The last undetection date (Mar. 7.859, 2010)
The discovery date (Mar. 10.797, 2010)

Fig. 2. V407 Cyg

The last undetection date (Feb. 13.84, 2010)
The discovery date (Feb. 14.651, 2010)

Fig. 3. V2674 Oph

The last undetection date (Nov. 3, 2009)
The discovery date (Jan. 13.86, 2009)

Fig. 4. V2673 Oph

The last undetection date (Nov. 12.3106, 2009)
The discovery date (Nov. 13.108, 2009)

Fig. 5. V1722 Aql

The last undetection date (Nov. 7.377, 2009)
The discovery date (Nov. 8.370, 2009)

Fig. 6. KT Eri

The last undetection date (Oct. 21.451, 2009)
The discovery date (Oct. 26.439, 2009)

Fig. 7. V496 Sct

The last undetection date (Nov. 4.370, 2009)
The discovery date (Nov. 6.370, 2009)

Fig. 8. V5584 Sgr