# Thermonuclear type-I X-ray bursts detected from MAXI J1807+132

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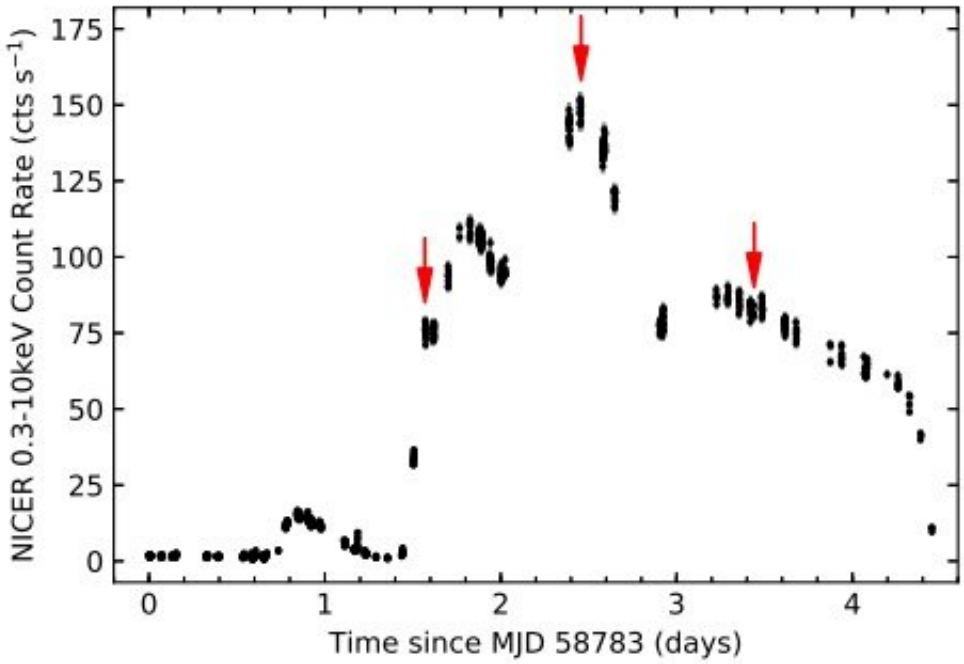


NICER long-term light curve of MAXI J1807+132 with 25 s time resolution in the 0.3–10 keV energy band. This section of the outburst contains the three thermonuclear X-ray bursts detected in October 2019. The X-ray burst data have been removed for clarity, and their onsets marked by arrows. Credit: Albayati et al., 2020.

An international team of astronomers has investigated an X-ray binary system known as MAXI J1807+132, using the NICER instrument aboard the International Space Station (ISS). They now report the detection of

three thermonuclear type-I X-ray bursts from this source. The finding is reported in a paper published November 20 on arXiv.org.

X-ray binaries consist of a normal star or a white dwarf transferring mass onto a compact neutron star or a black hole. Based on the mass of the companion star, astronomers divide them into low-mass X-ray binaries (LMXB) and high-mass X-ray binaries (HMXB).

LMXBs may exhibit transient outbursts during which an increase in X-ray luminosities is observed. Some of these outbursts are characterized as type I X-ray bursts—thermonuclear explosions taking place on the surface layers of neutron stars.

MAXI J1807+132 is an X-ray binary that was detected during its 2017 outburst by the Monitor of All-sky X-ray Image Gas Slit Camera (MAXI/GSC) on ISS. In September 2019, another bursting activity period of this source started. Follow-up observations of MAXI J1807+132 suggested that it is an LMXB with a neutron star (NS) as a primary object.

Now, a new study published by a team of researchers led by Arianna C. Albayati of the University of Southampton, U.K., confirms the NS LMXB scenario for MAXI J1807+132. Using the Neutron star Interior Composition Explorer (NICER), they observed the system between September 16 and November 29, 2019, and identified three thermonuclear type-I X-ray bursts.

"NICER observed MAXI J1807 between 16 September and 26 November 2019, generating a total of 47 observation IDs (ObsIDs). We searched all available data for X-ray bursts; here, we report on the five observations around the time of the detection of three X-ray bursts," the astronomers wrote in the paper.

The newly detected bursts were designated B1, B2 and B3. B2 took place approximately 21.3 hours after B1, while B3 occurred nearly 24 hours after B2. The hardness ratios of all the three bursts were observed to track similar profiles to the light curves, increasing through the burst rise and decreasing through the decay.

All three X-ray bursts have a rise time of about four seconds and exhibit long decay tails, lasting over one minute. The astronomers explained that such a slow rise and long decay suggests hydrogen-rich fuel at the moment of ignition, which is likely the result of accretion of a mixed hydrogen/helium fuel.

B1 is the brightest thermonuclear type I X-ray burst out of the three reported in the study. The observations found a pause in this burst, lasting approximately 1.6 seconds during the rise. Based on this finding and comparing it to results from other studies, the astronomers concluded that there is no link between the detection of double-peaked profiles and the detection of a pause during the rise.

**More information:** Discovery of Thermonuclear Type-I X-ray Bursts from the X-ray binary MAXI J1807+132, arXiv:2011.10448 [astro-ph.HE] arxiv.org/abs/2011.10448



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