Two new fast X-ray transients discovered in the galactic plane

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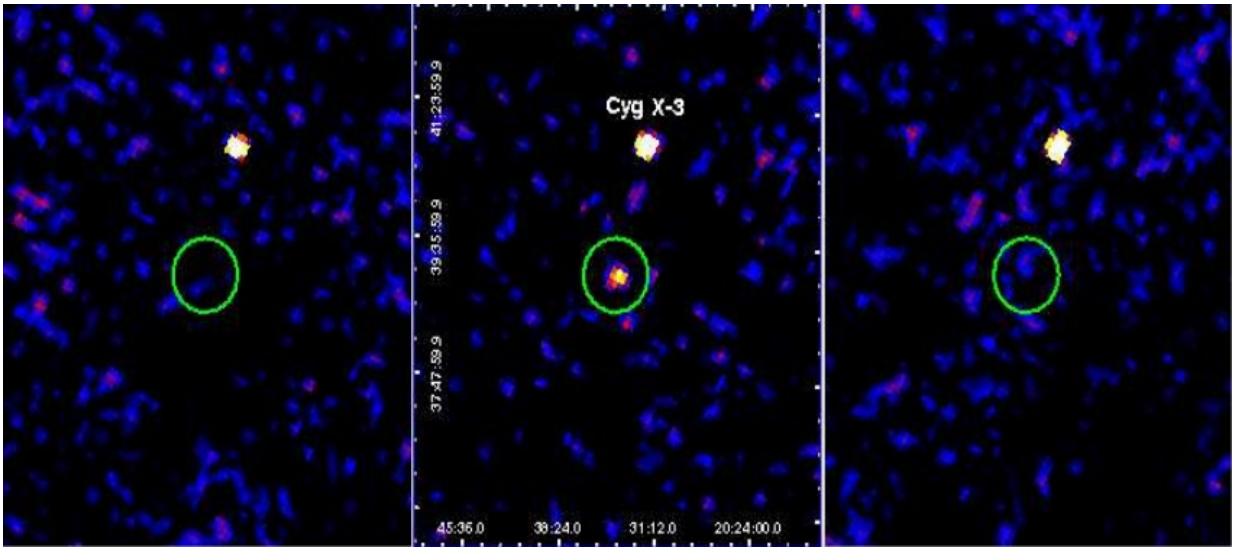

IBIS/ISGRI ScW image sequence (22–60 keV) from number 25 to 27 (revolution 1614) of the newly discovered transient source IGR J20344+3913 (encircled). Credit: Sguera et al., 2016.

(Phys.org)—Astronomers have identified two new X-ray sources in the galactic plane with short outbursts and very fast rise times, a category known as fast X-ray transients (FXTs). The newly detected FXTs were found in the archival data of ESA's INTErnational Gamma-Ray Astrophysics Laboratory (INTEGRAL) spacecraft. The findings are detailed in a paper published Aug. 29 on arXiv.org.

FXTs are very difficult to detect because they occur at unpredictable locations and times and their activity is very brief. INTEGRAL is one of the space observatories capable of detecting such elusive X-ray sources. Since 2002, the spacecraft, equipped in an X-ray detector, is constantly scanning the sky simultaneously in gamma rays, X-rays and visible light, searching for powerful explosions in the universe.

Now, a team of researchers led by Vito Sguera of the Institute of Space Astrophysics and Cosmic Physics of Bologna, Italy, has analyzed archival INTEGRAL data, looking for interesting FXTs in the galactic plane, still undetected by other X-ray telescopes.

"We report on the analysis of archival INTEGRAL data pertaining to observations of specific regions of the galactic plane with the aim of finding new FXTs. As result, we report on the discovery of two new such sources which have not been previously detected by any other X-ray telescope," the paper reads.

The newly found FXTs were designated IGR J03346+4414 and IGR J20344+3913. Both sources showcase a remarkable hard X-ray activity above 20 keV, in term of duration, peak-flux and dynamic range. The duration of IGR J03346+4414 is only 15 minutes and it exhibits a fast rise, lasting about three minutes, followed by a slower decay. IGR J20344+3913 lasted 33 minutes and its rise was much slower, as it took the source about 15 minutes to reach its peak activity.

"Both are characterized by short and bright outbursts as detected by INTEGRAL," the astronomers wrote in the paper.

Presenting the spectral and temporal characteristics of the two FXTs, the scientists also discuss the possible origin of these sources. According to the paper, the most plausible hypotheses that could explain the nature of the two newly detected violent X-ray events include stellar flares,

symbiotic X-ray binaries (SyXBs) and blazars behind the galactic plane.

Regardless of the nature of these FXTs, the researchers emphasized that their peculiar characteristics make them very interesting targets for astronomers. They also noted that the discovery could be the first step toward revealing a real panoply of X-ray transients.

"It seems plausible that other such sources wait to be discovered, further exploitations of the entire INTEGRAL data archive may yield additional discoveries of this kind of interesting X-ray transients," the team concluded.

Although a large population of undetected FXTs could be hidden in our galaxy, it will not be easy to discover and characterize new ones due to the very transitory nature and especially the very low duty cycle of such events. While INTEGRAL proved its efficiency as X-ray source hunter, it will continue its scientific mission only till the end of 2018, raising concerns that no tool could replace it in the near future in its search for FXTs.

More information: Discovery of two new Fast X-ray Transients with INTEGRAL: IGR J03346+4414 and IGR J20344+3913, arXiv:1608.08071 [astro-ph.HE] arxiv.org/abs/1608.08071

Abstract
We report on the discovery of two Fast X-ray Transients (FXTs) from analysis of archival INTEGRAL data. Both are characterized by a remarkable hard X-ray activity above 20 keV, in term of duration (about 15 and 30 minutes, respectively), peak-flux (about 10^-9 erg cm^-2 s^-1) and dynamic range (about 2400 and 1360, respectively). Swift/XRT follow-up observations failed to detect any quiescent or low level soft X-ray emission from either of the two FXTs, providing an upper limit of the order of a few times 10^-12 erg cm^-2 s^-1. The main

spectral and temporal IBIS/ISGRI characteristics are presented and discussed with the aim of infering possible hints on their nature.