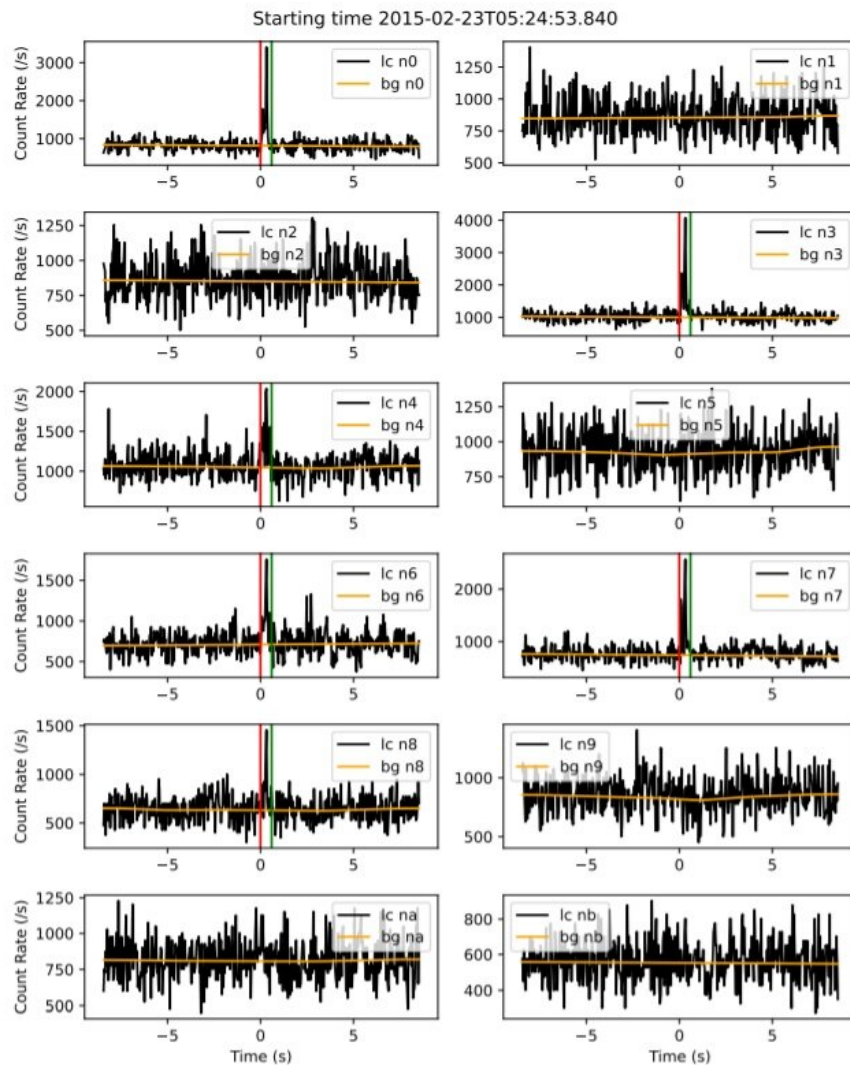


Chinese astronomers investigate X-ray bursts of SGR J1935+2154

July 19 2021, by Tomasz Nowakowski



SGR J1935+2154: Examples of short-duration bursts inspected in the study. Credit: Zou et al., 2021.

By analyzing the data from NASA's Fermi spacecraft, astronomers from the Hebei Normal University and Nanjing University in China, have investigated X-ray bursting activity of a soft gamma-ray repeater (SGR) known as SGR J1935+2154. Results of the study, published July 9 on arXiv.org, deliver more hints about the properties of X-ray bursts from this source.

SGRs are sources emitting large bursts of gamma-rays and X-rays at irregular intervals. They are known to be magnetars, isolated neutron stars with ultra-strong magnetic fields. SGRs emit X-rays in their quiescent state, and outbursts occur when the intense magnetic field shifts. Based on their brightness, the SGR bursts can be divided into three classes: short-duration bursts, giant flares, and intermediate bursts.

At a distance of about 30,000 [light years](#), SGR J1935+2154 is a soft gamma-ray repeater discovered in 2014 by NASA's Neil Gehrels Swift Observatory. To date, the source has experienced several periods (windows) of activity in 2014, 2015, 2016, 2019 and 2020. When it comes to April 2020, it was recognized as the most violent bursting month of this SGR so far.

Previous observations of SGR J1935+2154 suggested a periodic window behavior (PWB) for its bursting activity, which means that bursting phases always appear periodically, but there is no periodicity for specific bursts. In order to further investigate this hypothesis, a team of astronomers led by Jin-Hang Zou (Hebei Normal University/Nanjing University) has conducted a systematic search for X-ray bursts of this SGR using the data from the Gamma-ray Burst Monitor (GBM) onboard Fermi, hoping to identify its PWB.

"We performed a systematic search for X-ray bursts of the SGR J1935+2154 using the Fermi Gamma-ray Burst Monitor continuous data dated from Jan 2013 to July 2021," the researchers wrote in the paper.

By analyzing the Fermi data, Zou's team has identified eight bursting phases of SGR J1935+2154, consisting of a total of 255 individual bursts. Further analysis of this dataset using two independent methods allowed them to find that the bursts exhibit a period of approximately 237 days with an about 58.6 percent duty cycle.

These results are fully consistent with all the X-ray bursts of SGR J1935+2154 observed by multiple missions to date. Moreover, the findings suggest that the next active windows will occur June-November 2021 and February-July 2022. The first predicted window was confirmed by the current ongoing burst activities of SGR J1935+2154, which started on June 26, 2021.

Trying to explain the physical origin of the identified 237-day period of bursts, the astronomers assume that the most natural way to cause such a period may be the free precession of the magnetar.

"Given that there is no evidence showing SGR J1935+2154 are in a binary system, we focus on the explanations invoking the properties of the magnetar itself," the authors of the paper wrote in concluding remarks.

More information: Periodicity Search on X-ray Bursts of SGR J1935+2154 Using 8.5-year Fermi/GBM Data, arXiv:2107.03800 [astro-ph.HE] arxiv.org/abs/2107.03800

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