New cataclysmic variable system discovered

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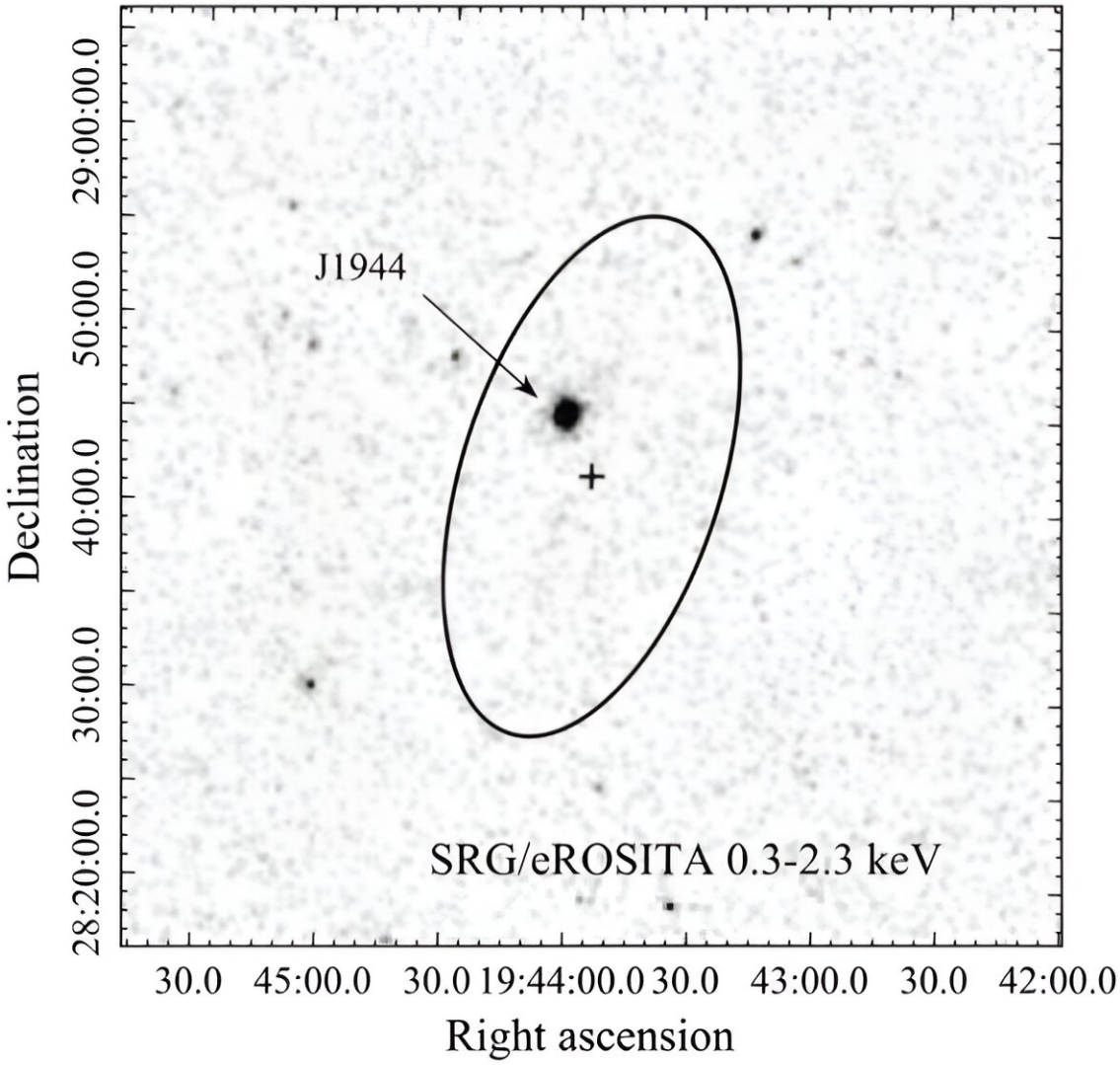

eROSITA image of the J1944 field in the 0.3 – 2.3 keV range. Credit: Kolbin et al., 2024.

Astronomers from the Special Astrophysical Observatory (SAO) in Russia and elsewhere report the discovery of a new cataclysmic variable system, designated SRGe J194401.8+284452, which is located some 1,350 light years away. The finding was detailed in a research paper published August 26 on the pre-print server *arXiv*.

Cataclysmic variables (CVs) are binary star systems consisting of a white dwarf primary that is accreting matter from a normal star companion. They irregularly increase in brightness by a large factor, then drop back down to a quiescent state.

These binaries have been found in many environments, such as the center of the Milky Way galaxy, the solar neighborhood, and within open and globular clusters. Polars are a subclass of cataclysmic variables distinguished from other CVs by the presence of a very strong magnetic field in their white dwarfs.

SRGe J194401.8+284452, or J1944 for short, was first identified in 2008 as an X-ray source. Further studies of this source have suggested that it may be a pulsar wind nebula (PWN). However, more recent observations have found that it is too faint to be a PWN. Therefore, its true nature remains undisclosed.

That is why a team of astronomers led by SAO's Alexander Kolbin decided to investigate J1944 by conducting multi-wavelength spectral and photometric observations of this source.

First of all, the observations found that J1944 experiences fast spontaneous transitions between the high and low brightness states in the optical and X-ray bands, remaining relatively stable between the transitions on scales of several months or years.

Moreover, the optical light curves of J1944 do not exhibit flare activity,

but show regular variations in the emission intensity with a period of about eight minutes. When it comes to the high state, the optical spectrum of J1944 appears to be almost completely dominated by the disk emission.

According to the authors of the paper, these findings indicate that J1944 is a CV consisting of an accreting white dwarf and a non-degenerate late-type star, which is a donor of accreting material.

"The presence of an eight-min period excludes the interpretation of the object as a binary system with a neutron star, expected to be a millisecond pulsar," the scientists concluded.

Based on the collected data, the astronomers found that J1944 is a tight binary accreting system with an orbital period of approximately 89 minutes. The mass of the white dwarf is estimated to be between 0.3 and 0.9 solar masses, while the mass of the donor star is expected to be below 0.08 solar masses.

All in all, the researchers concluded that J1944 is most likely an intermediate polar, with one of the shortest orbital periods among CVs of this subclass.

More information: A. I. Kolbin et al, New X-ray cataclysmic variable SRGe J194401.8+284452 in the field of the gamma-ray source 4FGL J1943.9+2841, *arXiv* (2024). DOI: 10.48550/arxiv.2408.14136