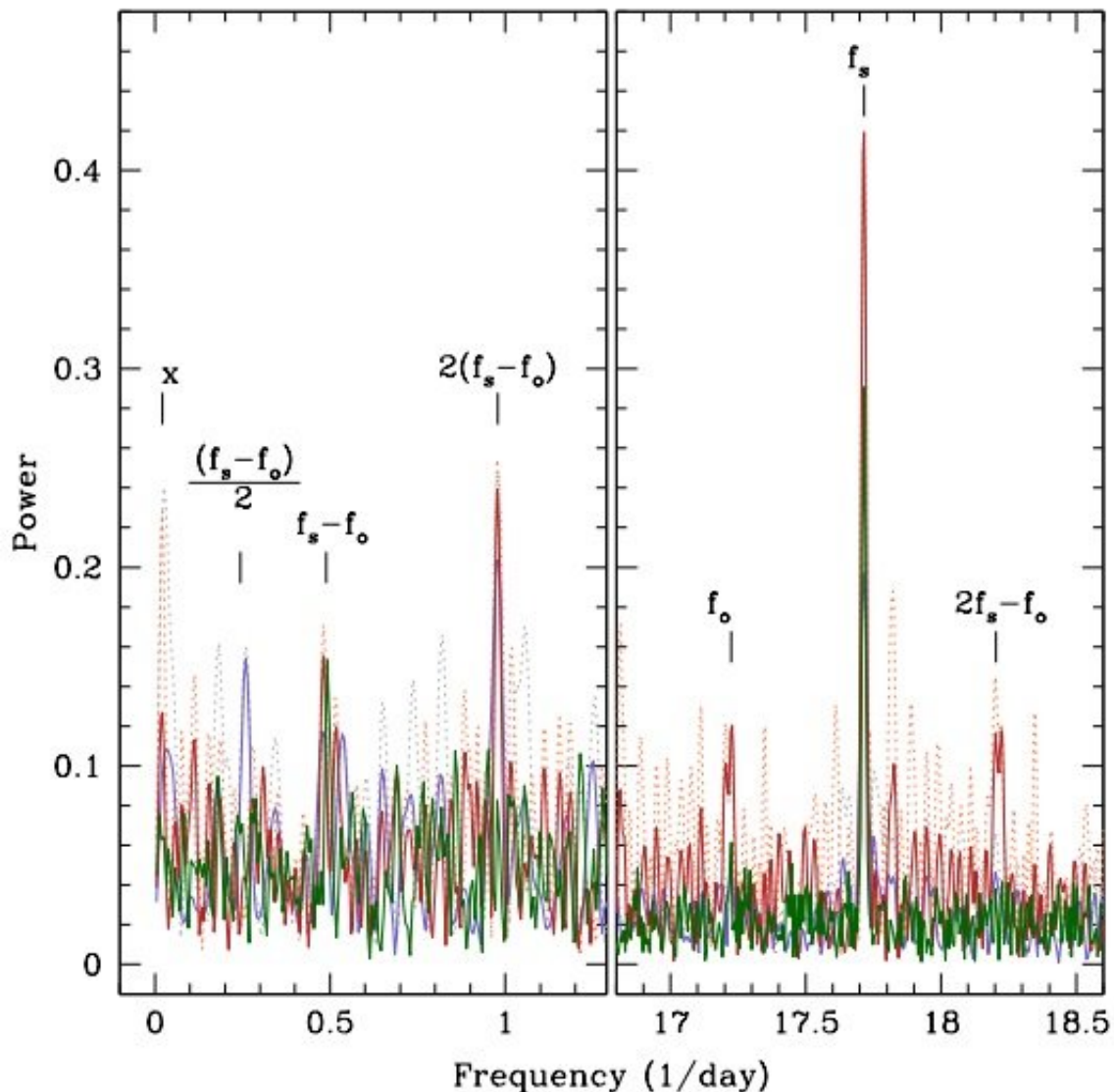


Astronomers identify new asynchronous short period polar

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Power spectra multiband photometry of IGR 1955+0044. The solid lines are powers after clean procedure is applied to powers presented as dotted lines. The bluish curves are for the V band, the red are for the I band, and the green are for

the WL light curves. Credit: Tovmassian et al., 2017.

(Phys.org)—An international team of astronomers led by Gagik H. Tovmassian of the National Autonomous University of Mexico (UNAM) has uncovered new details into the nature of a cataclysmic variable known as IGR J19552+0044. New observations reveal that this object is an asynchronous short period polar. The finding was presented October 5 in a paper published online on the arXiv pre-print server.

Cataclysmic variables (CVs) are binary star systems comprising of a white dwarf and a normal star companion. They irregularly increase in brightness by a large factor, then drop back down to a quiescent state. Polars are a subclass of cataclysmic variables, distinguished from other CVs by the presence of a very strong magnetic field in their [white dwarfs](#).

IGR J19552+0044 was detected in 2006 by the INTERnational Gamma-Ray Astrophysics Laboratory (INTEGRAL) space telescope. Subsequent observations of this highly variable X-ray source have shown that it is a magnetic cataclysmic variable. Now, Tovmassian's team has revealed the results of a new follow-up optical observational campaign, which helped the researchers to obtain further information about this variable object.

For their observations, the astronomers employed three telescopes at the National Astronomical Observatory (OAN) in Sierra San Pedro Mártir, Mexico, two Panchromatic Robotic Optical Monitoring and Polarimetry Telescopes (PROMPT) at Cerro Tololo Inter-American Observatory (CTIO) in Chile, and one telescope of South African Astronomical Observatory (SAAO) in South Africa. In the study, the authors also included data obtained by the MDM Observatory on Kitt Peak, Arizona as well as the results provided by the Center for Backyard

Astrophysics (CBA), a global network of telescopes observing CVs.

This comprehensive observational campaign spanning three years (from June 2011 to July 2014) allowed the team to classify the studied X-ray source correctly.

"We conducted follow-up optical observations to identify the sources and periods of variability precisely and to classify this X-ray source correctly," the paper reads.

According to the study, photometric and spectroscopic observations reveal that the white dwarf of IGR J19552+0044 has spin period and binary orbital period of 83.6 and 81.3 minutes, respectively. These discording results indicate that the studied CV is an asynchronous polar.

"The system is not an ordinary polar. The photometric period that we identify with the spin period of the magnetic white dwarf is 2.8 percent shorter than the spectroscopic period; we think the latter reflects the orbital period of the system. This is one of the extreme cases of asynchronism," the researchers wrote in the paper.

The study underlines that such rate of asynchronism is among the largest observed in a few similar objects. The scientists are also uncertain about the source of this deviation, however the growing number of found asynchronous polars suggests that such anomaly is not as rare as originally thought.

Besides detecting the asynchronism, the authors estimated the magnetic field strength of the white dwarf in this system. They reveal that this value is more likely about 16 MG and not higher than 20 MG.

More information: IGR J19552+0044: A new asynchronous short period polar: "Filling the gap between intermediate and ordinary polars",

arXiv:1710.02126 [astro-ph.SR] arxiv.org/abs/1710.02126

Abstract

Based on XMM—Newton X-ray observations IGR J19552+0044 appears to be either a pre-polar or an asynchronous polar. We conducted follow-up optical observations to identify the sources and periods of variability precisely and to classify this X-ray source correctly. Extensive multicolor photometric and medium- to high-resolution spectroscopy observations were performed and period search codes were applied to sort out the complex variability of the object. We found firm evidence of discording spectroscopic (81.29 ± 0.01 m) and photometric (83.599 ± 0.002 m) periods that we ascribe to the white dwarf (WD) spin period and binary orbital period, respectively. This confirms that IGR J19552+0044 is an asynchronous polar. Wavelength-dependent variability and its continuously changing shape point at a cyclotron emission from a magnetic WD with a relatively low magnetic field below 20 MG. The difference between the WD spin period and the binary orbital period proves that IGR J19552+0044 is a polar with the largest known degree of asynchronism (0.97 or 3%).

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