Cataclysmic variable ES Ceti has an accretion disk, study suggests

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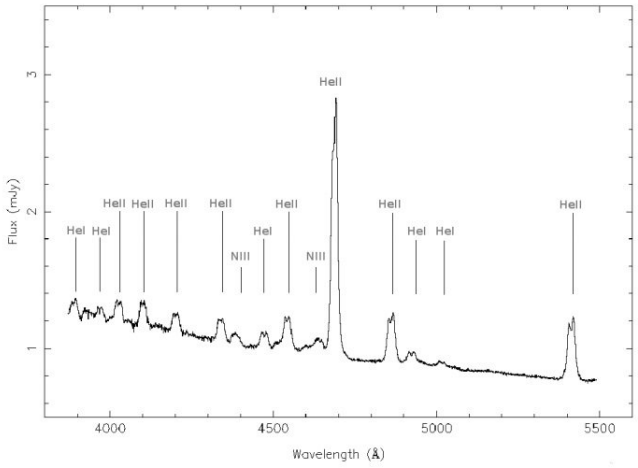

The mean spectrum of ES Ceti taken with Magellan on 27-28 Oct. 2002. All lines can be identified with He II, He I or N III. Image credit: B?kowska & Marsh, 2018.

Astronomers have conducted spectroscopic observations of the cataclysmic variable ES Ceti, which resulted in uncovering important insights about gas emission from this object. The new findings, presented in a paper published November 29 on the *arXiv* pre-print server, suggest the presence of an accretion disk in this system.

Cataclysmic variables (CVs) are binary star systems consisting 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. These binaries have been found in different environments such as the center of the Milky Way galaxy, the solar neighborhood, and within open and globular clusters.

AM CVn star (named after the star AM Canum Venaticorum), is a rare type of CV in which a white dwarf accretes hydrogen-poor matter from a compact companion star. In general, AM CVn stars are helium-rich binaries, not showing traces of hydrogen in their spectra, with orbital periods between five and 65 minutes.

ES Ceti is among AM CVn stars with shortest orbital periods (about 620 seconds). Karolina B?kowska of Nicolaus Copernicus Astronomical Center in Warsaw, Poland and Thomas R. Marsh of University of Warwick in Coventry, U.K., decided to performed spectroscopic observations of this system, hoping that it could improve our understanding of binary star formation process.

The duo used one of the 6.5-meter Magellan Telescopes Las Campanas Observatory in Chile to obtain more than 500 spectra of ES Ceti in late 2002, learning crucial insights about gas emission in the system.

"We present results of our spectroscopic campaign dedicated to the ultracompact binary ES Ceti. On the nights 2002 Oct. 27-28, 528 spectra were taken with the 6.5-meter telescope in Las Campanas Observatory in Chile," the researchers wrote in paper.

According to the study, the averaged spectrum of ES Ceti is dominated by ionized helium emission lines, but lines of neutral helium and nitrogen N III are also present. "The strong emission lines are among of the hallmarks of an accreting binaries," the paper reads.

By analyzing the spectra from Magellan Telescope, the researchers concluded that the accretion process in ES Ceti is via a disk. Hence, they excluded other explanations proposed by previous studies, like the direct-impact scenario.

The astronomers added that in ES Ceti hot gas produces a "disk-like" signature. They noted that this process is similar to the one observed in HM Cnc – an AM CVn star with the shortest known orbital period (324 seconds).

B?kowska and Marsh plan to conduct further studies of ES Ceti. Their aim is to create the equivalent Doppler maps based on the trailed spectra of the system.

"The method of Doppler tomography is a perfect tool which allows to track asymmetric structures in accretion disks and reveals details of the gas flow in a variety of systems," the researchers noted.

More information: K. Bakowska, T.R. Marsh. Spectroscopy of the cataclysmic variable ES Ceti. arXiv:1811.12151 [astro-ph.SR]. arxiv.org/abs/1811.12151

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