Press Release
Max-Planck-Institut für extraterrestrische Physik
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Turbulent Disk

Asymmetric accretion disk causes X-ray flux variations in bright supersoft nova

When a white dwarf accretes matter from his larger companion star and after reaching a critical mass ejects it in an explosion a nova occurs. Soft X-rays from classical novae are especially interesting for astronomers: They reveal ongoing residual hydrogen burning after the explosion and so give evidence that some of the accreted material is left on the white dwarf surface after the ejection. In this way the long-term evolution of the white dwarf in a binary system can be studied, for example to answer the question if the nova will later transform into a type Ia supernova, the most luminous supernova type.

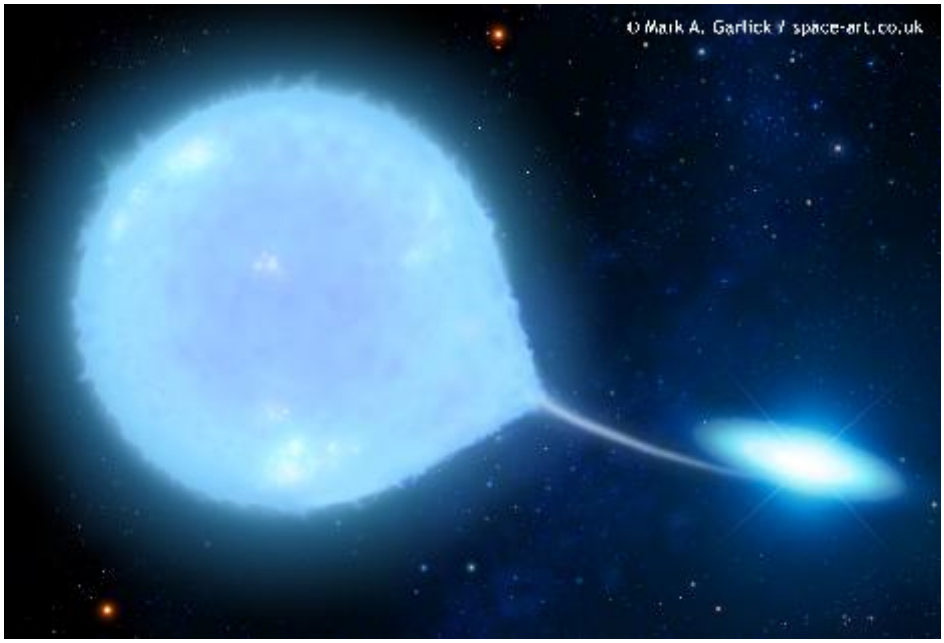

Illustration: Mark A. Garlick

The artistic view shows a cataclysmic variable, the kind of close binary systems that host classical novae

Gloria Sala and Jochen Greiner from the Max Planck Institute for extraterrestrial Physics and their colleagues Margarita Hernanz and Carlo Ferri from the Institut de Ciències de l'Espai (CSIC-IEEC) in Bellaterra, Spain, observed postoutburst nova V5116 Sgr, discovered on 2005 July 4, with the ESA X-ray observatory XMM-Newton and present the X-ray light curve and broadband spectrum in a recent paper (The Astrophysical Journal Letters, 2008 March 10). Although the X-ray light curve shows abrupt decreases and increases of the flux, the white dwarf atmosphere temperature is the same both in the low- and the high-flux periods. So Sala and her colleagues negate an intrinsic variation of the X-ray source itself as the origin of the flux changes.

Instead the flux variation can be explained by some partial coverage or eclipse. An eclipse from the companion star can be ruled out because of the curve shape: “A coverage by the secondary star would cause a short low-flux and a long high-flux period. But the light-curve of this nova has two peaks and an extended low-flux period between them”, Gloria Sala explained. So the only thing left in the system that could obscure the X-ray source is the accretion disk rotating around the white dwarf. “If the white dwarf had a magnetic field it would disrupt the disk and create strange shapes in the accretion stream”, said Sala. The consequence would be an asymmetric form of the accretion disk. Sala and her colleagues believe this to be the cause of the variations in the X-ray emission.

“We cannot say exactly from our data how the disk is, or if there really is a magnetic field, but we know that asymmetric disks exist in cataclysmic variables”, comments Sala. The scientists now want to verify their proposition in a longer observation period.

Original paper:

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ESA press release

http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=42482

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