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Diving into the whirlpool –understanding accretion in High-Mass X-ray Binaries with Vela X-1

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The eclipsing high mass X-ray binary Vela X-1 consists of an accreting X-ray pulsar orbiting an early type supergiant with an orbital period of ~ 9 days. It was discovered as an X-ray source by the Uhuru satellite and it has been observed since then by every X-ray observatory. Due to its brightness and variability as well as the large observational archives, Vela X-1 is the Rosetta stone for studies of wind accretion onto neutron stars.

We discuss the X-ray observational properties of the system in conjunction with the supergiant properties to test recent accretion models in high mass X-ray binaries, ranging from detailed descriptions of the wind acceleration (e.g., Sander et al. 2018) to modelling of the structure of the flow of matter close to the neutron star (e.g., EL Mellah, Keppens & Sundqvist 2018). We report new results on the impact of the wind clumpiness on the X-ray time variability and how the revised downwards wind speed implies dramatic consequences for the accretion process such as the formation of a wind-captured disc beyond the neutron star magnetosphere. Such a structure remains to be observed but its indirect signatures through jets or the torques it applies on the neutron star could well be within our observational grasp.

Topic

Compact and diffuse sources in galaxies and in the Galactic Center

Affiliation

Instituto de Física de Cantabria (CSIC-UC)

Author: Dr MARTÍNEZ-NÚÑEZ, Silvia (Instituto de Física de Cantabria (CSIC-UC))

Co-authors: Dr KRETSCHMAR, Peter (ESA); Dr EL MELLAH, Ileyk (KU Leuven); Dr MANOUSAKIS, Antonis (Univ of Sharjah); Dr SANDER, Andreas (Armagh Observatory); Dr FÜRST, Felix (ESA); Dr GRINBERG, Victoria (Univ. Tübingen)

Presenter: Dr MARTÍNEZ-NÚÑEZ, Silvia (Instituto de Física de Cantabria (CSIC-UC))

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