



X-RAY ASTRONOMY 2019

Current Challenges and New Frontiers in the Next Decade

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Diffuse X-ray emission around an ultraluminous X-ray pulsar

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Ultraluminous X-ray sources (ULXs) are extragalactic X-ray emitters located off-center of their host galaxy and with a luminosity in excess of a few 10^{39} erg/s, if emitted isotropically. The discovery of periodic modulation revealed that in some ULXs the accreting compact object is a neutron star (NS), indicating luminosities substantially above their Eddington limit. The most extreme object in this respect is NGC 5907 ULX-1 (ULX1), with a peak luminosity that exceeds by 500 times its Eddington limit. During a Chandra observation to probe a low state of ULX1, we detected diffuse X-ray emission at the position of ULX1. We interpret this extended structure as an expanding nebula powered by the wind of ULX1. Its diameter of ~ 200 pc, characteristic energy of ~ 2 keV, and luminosity of $\sim 5 \times 10^{38}$ erg/s imply a mechanical power of $\sim 2 \times 10^{41}$ erg/s and an age $\sim 6 \times 10^4$ yr. This proves that a genuinely super-Eddington regime can be sustained for time scales much longer than the spin-up time of the NS powering the system. Since the mechanical power from a single ULX nebula can rival the injection rate of cosmic rays of an entire galaxy, ULX nebulae could be important cosmic ray accelerators.

Topic

Compact and diffuse sources in galaxies and in the Galactic Center

Affiliation

INAF IASF-MI

Primary author: BELFIORE, Andrea (INAF - IASF Milano)

Co-authors: Dr ESPOSITO, Paolo (INAF-IASF Milano); PINTORE, Fabio (Istituto Nazionale di Astrofisica (INAF)); NOVARA, Giovanni (IUSS Pavia); Dr SALVATERRA, Ruben (INAF-IASF Milano); Dr DE LUCA, Andrea (INAF-IASF Milano); Dr TIENGO, Andrea (IUSS Pavia)

Presenter: BELFIORE, Andrea (INAF - IASF Milano)

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