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Advances with NICER on neutron stars, accreting black holes, and optical transients in nearby galaxies

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The Neutron Star Interior Composition Explorer (NICER) began science operations from the International Space Station in 2017 July, conducting observations in X-rays (0.4-12 keV) with sub-microsecond time resolution. Accomplishments to date are briefly reviewed for several types of sources. Pulse profiles for rotation-powered millisecond pulsars are modeled to constrain the equation of state of the neutron stars, achieving the primary objective of the Mission. Spectral-timing analyses of accreting black holes address technical questions regarding the disk:corona connection, and the measurements suggest a contraction of the corona as the source evolves from the intermediate to the hard X-ray state. Less anticipated is the wealth of information coming from observations of optical transients in nearby galaxies: tidal disruption events, change-look Active Galactic Nuclei, extreme supernovae, and quasi-periodic eruption sources. The characterizations of these transient subtypes is in the midst of a fundamental overhaul.

Abstract field

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