A changing boundary layer in a lower kHz quasi-periodic oscillation

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AGN galactic, rate and distribution of star formation, and geometry, content, and velocity of the outflow. To this end, we will present detailed analysis of the spatially-resolved radio and optical emission of two SDSS-IV MaNGA outflow galaxies.

234 — X-Ray Pulsars and Neutron Stars

234.01 — Future prospects for LIGO: The DNS merger rate revisited

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We present the Galactic merger rate for double neutron star (DNS) binaries using the observed sample of eight DNS systems merging within a Hubble time. This sample includes the recently discovered, highly relativistic DNS systems J1757$-$1854 and J1946+2052, and is approximately three times the sample size used in previous estimates of the Galactic merger rate by Kim et al. Using this sample, we calculate the vertical scale height for DNS systems in the Galaxy to be $z_0 = 0.4
pm 0.1$kpc. We calculate a Galactic DNS merger rate of $
mathcal{R}_{
rm MW} = 47^{+33}_{-16}$Myr^{-1} at the 90
% confidence level. The corresponding DNS merger detection rate for Advanced LIGO is $
mathcal{R}_{
rm LIGO} = 0.20^{+0.15}_{-0.07}
times
left(D_{
rm r}/100

rm Mpc
right)3
rm yr^{-1}$, where $D_{
rm r}$ is the range distance. We explore the effects of the underlying pulsar population properties on the merger rate and compare our merger detection rate with those estimated using different formation and evolutionary scenario of DNS systems. As we demonstrate, reconciling the rates are sensitive to assumptions about the DNS population, including its radio pulsar luminosity function. Future constraints from further gravitational wave DNS detections and pulsar surveys anticipated in the near future should permit tighter constraints on these assumptions.

234.02 — A changing boundary layer in a lower kHz quasi-periodic oscillation

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Kilohertz quasi-periodic oscillations (kHz QPOs) are the most rapid (quasi-)coherent kind of variability that have been detected in the light curves of accreting neutron star X-ray binaries. Previous spectral-timing work using the rms spectrum revealed that the lower kHz QPO emission is a Comptonized blackbody, consistent with that expected from the boundary layer between the accretion flow and neutron star surface. To better interpret the spectral variability, we present phase-resolved spectroscopy of a kHz QPO for the first time, using a method based on the energy-dependent cross-correlation function. We find that the Comptonized spectral shape changes as a function of QPO phase, and the variations of the spectral parameters must intrinsically lag one another. These spectral variations could be explained by radial oscillations in the boundary layer caused by unstable accretion onto the neutron star, which could be due to plasma instabilities, asteroseismic modes, or an opacity-radiation trade-off like in the variable star mechanism. These possibilities can be explored in greater detail with current and future X-ray missions such as AstroSat, NICER, eXTP, and STROBE-X.

234.03 — NICER observations of the Ultraluminous X-ray Pulsar NGC 300 ULX-1

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Recently, the ultraluminous X-ray source in the spiral galaxy NGC 300 was revealed to be an accretion-powered pulsar, with a spin period that is rapidly decreasing with time, from 31 seconds in 2016 December to 18.5 seconds at present. Since 2018 February 6, NICER has been monitoring this source, with intensive observations covering 2018 May through September. We will report on the spin evolution of this unique source, which includes the discovery of