Contribution ID: **80** Type: **not specified**

On the origin of pulsating ultraluminous X-ray pulsars

Thursday, 16 June 2022 11:45 (15 minutes)

Ultraluminous X-ray sources (ULXs) are off-nucleus objects whose apparent X-ray luminosity exceeds 10^39 erg/s, the Eddington limit of a typical stellar mass black hole (~10 Msun). Recent studies revealed that some of them are accreting neutron stars (NSs), called pulsating ULXs (PULXs), the luminosity of which is usually more than ~ 2-3 orders of magnitude higher than most Galactic and nearby accreting X-ray pulsars. It has been suggested that the NSs in PULXs have very high surface magnetic fields, higher than that of the regular accreting NSs (~ 10^12 G), or even comparable to that of magnetars (~ 10^14 G), in order to explain their extremely high luminosity. Some other models of PULXs include strongly collimated radiation such that the intrinsic luminosity is much lower than that directly inferred from the observed X-ray flux. Here, we report the detection of pulsed X-ray emission from 1 keV to above 130 keV from the PULX RX J0209.6−7427 in the SMC using insight-HXMT data, which is the highest energy emission detected from any PULXs. We demonstrate that its main pulsed X-ray emission is not strongly collimated, the same conclusion can also be extended reliably to other ultraluminous accreting X-ray pulsars. We find that, RX J0209.6-7427, together with the other two similar Galactic and nearby PULXs, Swift J0243.6+6124 and SMC X-3, they have experienced large luminosity changes from well below their Eddington limit to super-Eddington and their maximum luminosity fills the luminosity gap between Galactic pulsars and extragalactic PULXs. We also find that all these pulsars share the same range of inferred surface magnetic fields (~10^12-13 G). Our results suggest that all these sources belong to the same class of accreting pulsars, and the high luminosity of extragalactic PULXs only samples the very rare bright accreting X-ray pulsars in those galaxies.

Presenter: 侯贤 (云南天文台)

Session Classification: Session II