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The connection between ultra-luminous X-ray sources and double compact objects

We explore the different formation channels of merging double compact objects (DCOs: BH-BH/BH-NS/NS-NS) that went through an ULX phase (X-ray sources with luminosity exceeding the Eddington luminosity of a 10 $M_{\odot}$ black hole). There are two major formation channels which can naturally explain the formation of DCO systems: isolated binary evolution and dynamical evolution inside dense clusters. It is not clear which channel is responsible for (majority/all) LIGO/Virgo sources. Finding connections between ULXs and DCOs can potentially point to the origin of merging DCOs as more and more ULX are being discovered.
We use the StarTrack population synthesis code to show how many of the observed ULXs may form merging DCOs in the framework of isolated binary evolution. We find that in the local universe as many as 50% of merging DCO progenitor binaries have evolved through an ULX phase. This shows that ULXs can be used to study the origin of LIGO/Virgo sources. We also find that $5\% - 40\%$ of the observed ULXs will form DCOs in the future.

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