

The demographics of dynamically-formed binary black holes in star clusters.

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Abstract

Dynamical binaries are formed from unbound objects by multiple-body interactions in the centre of star clusters. These binaries release energy by shrinking their orbital radius via encounters with single objects, which prevents the core collapse of globular clusters. This process is one of most important pathways for the formation of black hole mergers and the production of gravitational waves.

If we take their formation rate, the maximum binding energy and its increase rate due to binary-single encounters, we should expect many binaries, increasing with lower cluster masses. Instead, in N-body simulations we find that there is only one dynamical binary at any given moment in a cluster. This discrepancy can be explained by binary-binary encounters, which are very effective at disrupting binaries. Such interactions may cause mergers with characteristic observables (i.e. orbital eccentricity) so neglecting them may have led us to wrongly predict the distribution of gravitational wave observables.

Improving our understanding of these observables will open up new probes for studying star clusters.

My poster is available at <https://zenodo.org/record/7046551#.Y29zzdLMKV4>