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Stars and Black Holes in Young Star Clusters: Friends or Foes?

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In dense star clusters close encounters between stars and stellar mass black holes can have a wide variety of outcomes ranging from disruption of stars to the formation of bound quiescent binary systems as those recently discovered thanks to Gaia. The former are transients addressed as “micro-Tidal Disruption Events” (TDEs). To date, micro-TDEs have not yet been observed but they are promising multi-messenger sources predicted to be detected by next gravitational waves (GW) observatories.

In this contribution, I will discuss micro-TDEs originated in young star clusters from a dynamical perspective. I have performed a suite of numerical high-precision direct N-body simulations of massive collisional young star clusters (YSCs) with the state-of-the-art code PeTar. PeTar is an N-body code which is coupled with up-to-date stellar population synthesis codes, which are fundamental to treat star and BH progenitors. I will present some preliminary results about the population of micro-TDEs originated in YSCs through hyperbolic-parabolic encounters between single stars and BHs and, furthermore black hole binaries (BBHs). Then I will compare the properties of quiescent BH-star binaries formed in YSCs to those of Gaia BH3, the first halo dormant BH-star binary discovered in the MW.

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