BLACK HOLES IN DENSE STAR CLUSTERS
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TITLE: Co-evolution of nuclear clusters, massive black holes, and their host galaxies

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How nuclear star clusters (NSCs) form and how they are related to the growth of massive black holes (MBHs) and their host galaxies is largely unknown. I will present the results of a new semi-analytical galaxy formation model that follows the evolution of dark matter halos along merger trees, as well as that of the baryonic components. This model allows us to study the evolution of NSCs in a cosmological context, by taking into account the growth of NSCs due to both dynamical friction driven migration of stellar clusters and star formation triggered by infalling gas, as well as dynamical heating from massive black-hole binaries and the negative feedback exerted by AGN activity and star formation. We find that in-situ star formation contributes a significant fraction (∼0.4) of the total mass of our model NSCs, casting doubts on former literature in which local processes are often ignored. Core-depletion due to gravitational slingshot of host galaxy stars by inspiralling MBHs has a negligible impact on the evolution of NSCs in low mass galaxies, while it leads to their full disruption in galaxies more massive than 10^11 Solar masses. In Galaxies of intermediate luminosity MBH mergers cause the partial dissolution of the clusters. Such partially eroded clusters appear at z∼0 significantly "underweight" relative to linear NSC-host spheroid scaling correlations. The presence of an under-massive NSC population causes a break in the NSC-host galaxy empirical correlations at high galaxy luminosities for which we find evidence in observational data. Several implications for NSC formation theories are finally noted.