The interplay between galactic bar/bulges & nuclear stellar discs/clusters in Milky Way-like galaxy simulations

We explore the internal dynamics and formation scenarii of the central regions of galaxies, by ways of Milky Way-like galaxy simulations. Using the SWIFT hydro+N-Body simulation code, we model the growth and evolution of Nuclear Stellar Discs (NSDs)/Nuclear Stellar Clusters (NSCs) under different physical recipes: with and without an initial gaseous disk & with and without stellar feedback effects. We investigate the orbital families of stars found within those structures and how they relate to the ones in the bar/bulge regions. We find that the formation of a bar and its evolution leads to torques and hence to gas infall into the central regions where the cool gas forms a distinct young stellar population. Thus, we find that, in a scenario where most of the mass comes from bar-driven gas infall, the star formation history in these central regions can give insight into the bar formation time. The evolution of the bar as well as the formation of a boxy/peanut bulge lead to variations in the bar properties and locations of resonances, both impacting gas infall and star formation. We quantify the effect stellar feedback has on the star formation efficiency, as well as the imprinted chemistry in these regions and how it relates to the overall chemistry of the disc.