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Nuclear star clusters and the evolution of their host galaxy

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Abstract

Located at the center of galaxies and with small sizes of a few parsecs, nuclear star clusters (NSCs) can form via two different channels: star-cluster inspiral to the center and in-situ star formation. These scenarios are not mutually exclusive and several studies have shown that the dominant mechanism depends on galaxy mass and morphological type. In particular, more metal-poor NSCs are hosted by lower-mass galaxies ($< 10^9\,M_\odot$), probably as a result of globular-cluster inspiral. At higher galaxy masses, NSCs are on average more metal-rich, pointing to in-situ formation as the dominant mechanism. Nevertheless, this trend still needs to be investigated in spiral galaxies. Here I show the stellar-population analysis of NSCs in five massive spirals ($M > 10^9\,M_\odot$), using MUSE data from the PHANGS survey. Due to their small sizes, these NSCs are not spatially resolved and we extract their stellar populations from the light integrated in a point-spread-function (PSF) aperture. These NSCs have lower metallicities than previously analyzed NSCs in early-type galaxies of similar masses, supporting a different formation scenario in late types. Two out of five NSCs show ongoing nuclear star formation and very young ages, while some others are relatively old and with no signs of ionized gas. These NSCs are also metal poor, suggesting that in-situ formation can lead to metal-poor NSCs in star-forming spirals. For one of the galaxies, M 74, we disentangle the light of the NSC (modeled as the PSF) from the underlying galaxy, using the spectro-photometric decomposition code C2D. This method reaffirms that the NSC is very old and metal poor, much older and more metal poor than the host galaxy in the same (PSF-size) region. This reveals that this NSC formed at early times, and did not grow or get chemically enriched via later in-situ star formation, without being affected by the intense star formation in the host galaxy.

My poster in zenodo.org can be found here.