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Compact quiescent galaxies with adaptive optics

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Relic galaxies, low-redshift old compact massive galaxies, are thought to be local counterparts of red and quiescent compact massive galaxies at high-z (the so called "red nuggets"), that missed the channels of galaxy size growth and evolved undisturbed since their first mass assembly. Therefore, they represent the perfect laboratories to study the mass assembly in the early universe through the cosmic history. Thanks to wide-sky multi-band deep photometric surveys and low-resolution spectroscopic follow-ups, a large sample of photometrically selected and spectroscopically validated ultra-compact massive galaxies at z < 0.5, consisting of small (Re < 1.5 kpc) and massive (M_star > 8*10^10 M_solar) systems, has been collected (e.g. KiDS@VST; Tortora et al. 2018). Future instruments (as Euclid) will allow to increase this redshift baseline, discovering large samples of compact quiescent galaxies, progenitors of the local biggest galaxies or relics, up to redshift z = 1.5 and beyond. Due to the sub-arcsec and sub-PSF nature of such galaxies (since Re < 0.4 arcsec), adaptive optics technique is the only way to resolve them in both photometry and spectroscopy. I will discuss the possible use of the upcoming ERIS and MAVIS spectrographs, the perfect instruments for this kind of analysis. The spatial resolution reached by these instruments can first allow to derive very precise estimates of the structural parameters. Moreover, they provide a unique opportunity to study their stellar populations and constrain the IMF from the very central galaxy regions to the peripheries. In this way, we can constrain the physical scenario which led to the formation of such very peculiar objects, determining constraints on the accretion history of the most massive galaxies in the Universe till the present day.

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