

Dynamical and stellar population properties of early-type galaxies (ETGs) over the last 9 Gyr (Not funded)

Scientific objectives

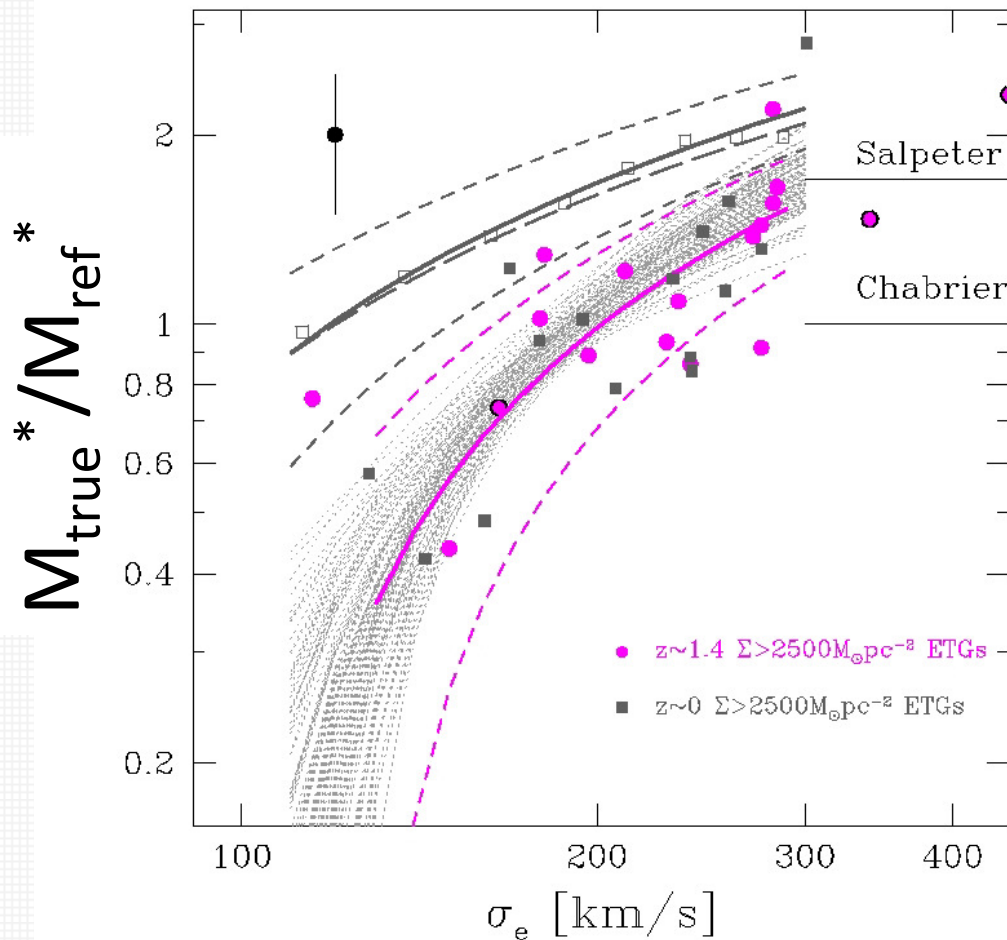
- **Determining the nature of the (Initial Mass Function) IMF- σ_v relation**
 - Does it depend on the physical parameters (stellar/total mass, density) of the galaxy or on chemical abundances?
 - Are dynamical constraints to the IMF consistent with those derived from stellar population properties?
- **Determining the nature of the radial variation of stellar population properties inside ETGs: IMF vs age/metallicity variation**

Background

- **What is the stellar IMF?**
 - It is the mass distribution of a stellar generation and gives the fraction of low- to high-mass stars in a burst of star formation.
 - It fixes the properties of a stellar population: Spectral Energy Distribution, stellar mass, M/L, chemical enrichment and how these properties change with time.
- **Is the IMF universal?** >2010 - studies point to a “non-universal” IMF in ETGs: higher velocity dispersion (σ_v) ETGs have a higher fraction of low-mass stars (bottom-heavier IMF) than the Milky-Way-like distribution → **IMF- σ_v relation**

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IMF- σ_v relation



Gargiulo et al. 2015, A&A 573

$$\sigma^2 \propto GM_{\text{true}}^* / R$$

$$M_{\text{ref}}^* = M^* (\text{IMF}_{\text{ref}})$$

$M_{\text{DM}} \approx \text{const}$ with σ_V (dynamical models of obs. vel. disp. profiles)

if $M_{\text{true}}^*/M_{\text{ref}}^* \neq \text{const}$

$\Rightarrow \text{IMF}_{\text{true}}$ changes with σ_V

- M_{true}/M^* changes with σ_v
- M_{true}/M^* changes with the stellar mass density of the galaxy
- M_{true}/M^* for dense ETGs does not change with redshift

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Tools: dedicated spectroscopic observations of nearby ($z=0$) and high- z ($z\sim 1.3$) ETGs

- **VLT/Xshooter observations of ETGs at $z\sim 0$** (PI La Barbera): very high S/N (~ 100) spectra to constrain the IMF shape through gravity-sensitive features (PI La Barbera)
- **LBT/MODS observations of ETGs at $z\sim 1.3$** (PI Saracco): high S/N spectra to study the IMF- σ_v relation for different ranges of masses and densities
- **HST observations of $z\sim 1.8$ ETGs** (Col Andreon, Trinchieri): low-res spectra of high- z ETGs to study the role of the environment.

PRIN Research Unites composition and participants

UdR Brera	UdR Napoli	Involved in the project
Stefano Andreon	Francesco La Barbera	Federica Ciocca (PhD)
Marcella Longhetti	Anna Pasquali	Adriana Gargiulo (post-doc)
Ilaria Lonoce (PhD)	Vincenzo Tortora (post-doc)	
Paolo Saracco		
Ginevra Trinchieri		