Galaxy evolution in clusters

Clusters of galaxies are important laboratories for the study of the physical processes that drive galaxy evolution. It is likely that the characteristics of the cluster environment (high galaxy density and the presence of a hot diffuse gas component) play a fundamental role in shaping the properties of cluster galaxies, which markedly differ from those of field galaxies. My main research lines in this field are:

1. the determination of the relative (spatial and velocity) distributions of different cluster galaxy populations and of their orbits within the cluster;
2. the study of the luminosity and stellar mass functions of different cluster galaxy populations as a function of the galaxy position in the cluster.

These analyses are based in particular on data from CLASH-VLT and on a multi-wavelength survey of a z~0.2 super-cluster observed from the far-UV to the far-IR.

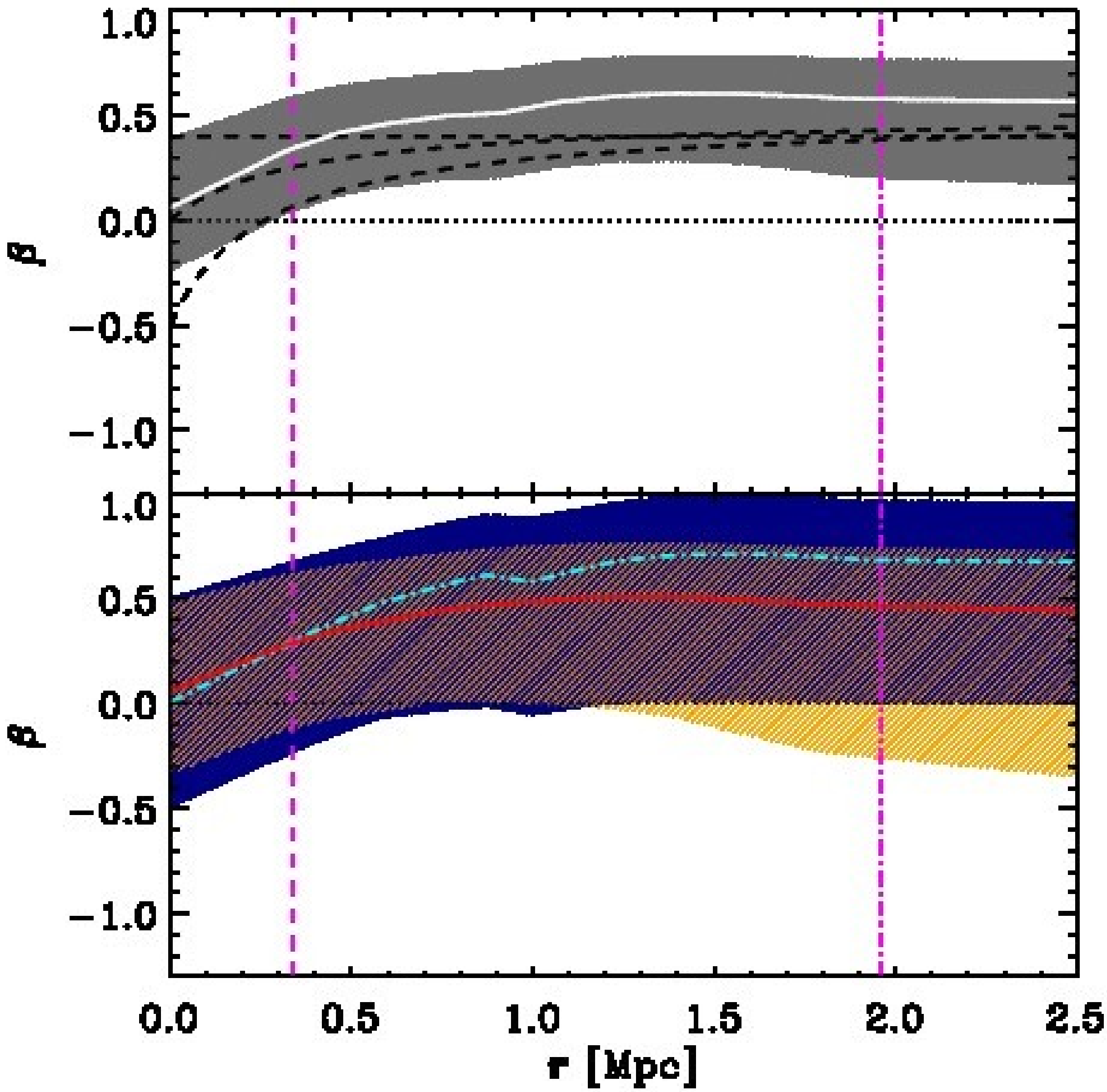

Fig.1: The velocity anisotropy profiles of a z=0.44 cluster of the CLASH-VLT data-set, for all cluster members (top panel, white line; grey shading indicates the 1-σ confidence region) and passive and star-forming cluster members separately (bottom panel, resp. red and cyan lines,;orange and blue shadings indicate the respective the 1-σ confidence regions). This is the result of applying the Jeans inversion (Solanes & Salvador-Solé 1990) to the data-set. The horizontal dotted line indicate β=0, isotropic orbits. The vertical dashed and dash-dotted lines indicate the positions of the scale radius of the mass density profile, r_{-2}, and of the virial radius, r_{200}, resp. As a consistency check, dashed curves in the top panel indicate the results obtained using MAMPOSSt [from Biviano et al. 2013, A&A, 558, A1].

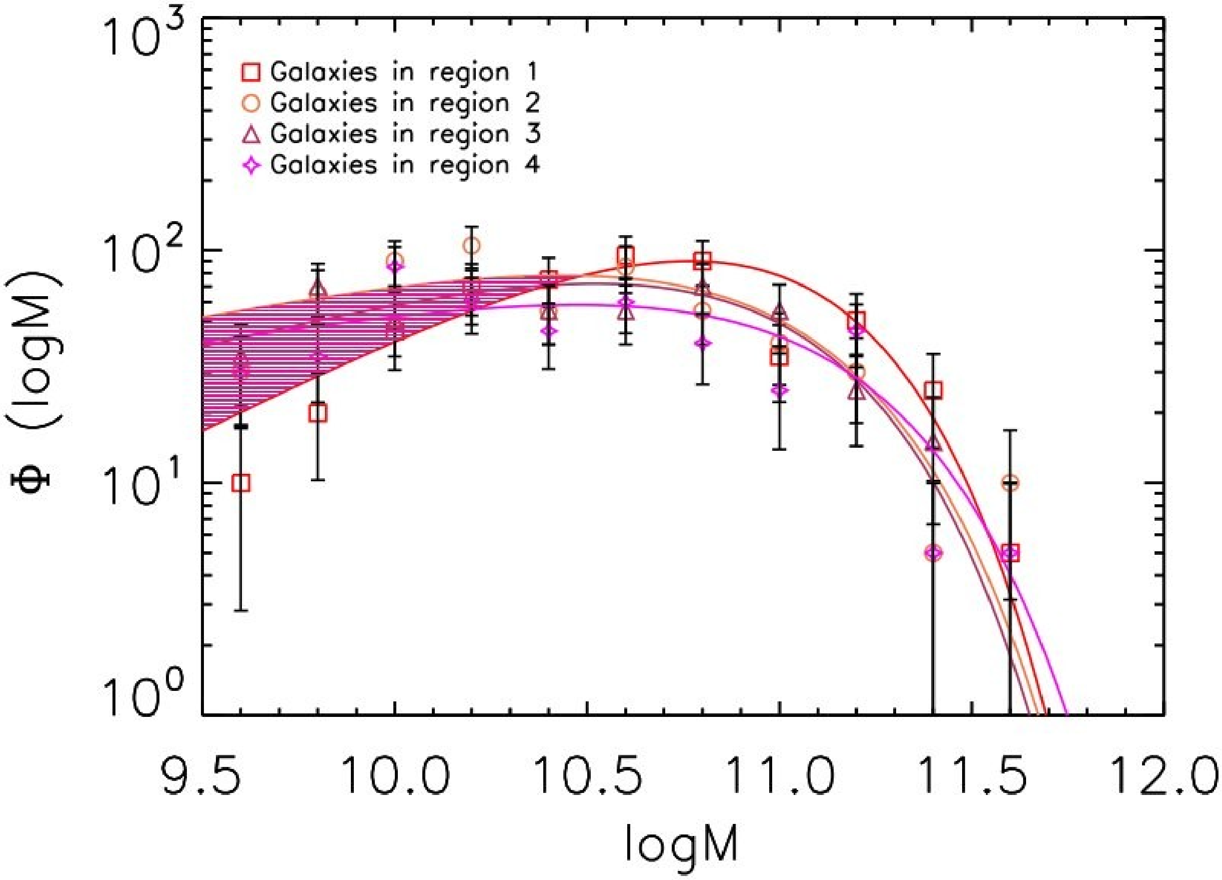

Fig.2: The stellar mass functions of passive galaxies in different regions of a z=0.44 cluster from the CLASH-VLT data-set (points with 1- σ error bars) and the best-fitting Schechter functions (lines). Regions 1 to 4 are at increasing distance from the cluster center. The shaded region indicates the difference between the inner mass function and that in the adjacent region, beyond the intersection point. This difference corresponds to a stellar mass deficit which is consistent with the stellar mass in the intra-cluster medium as estimated from the intra-cluster light [from Annunziatella, Biviano et al. 2014, in preparation]

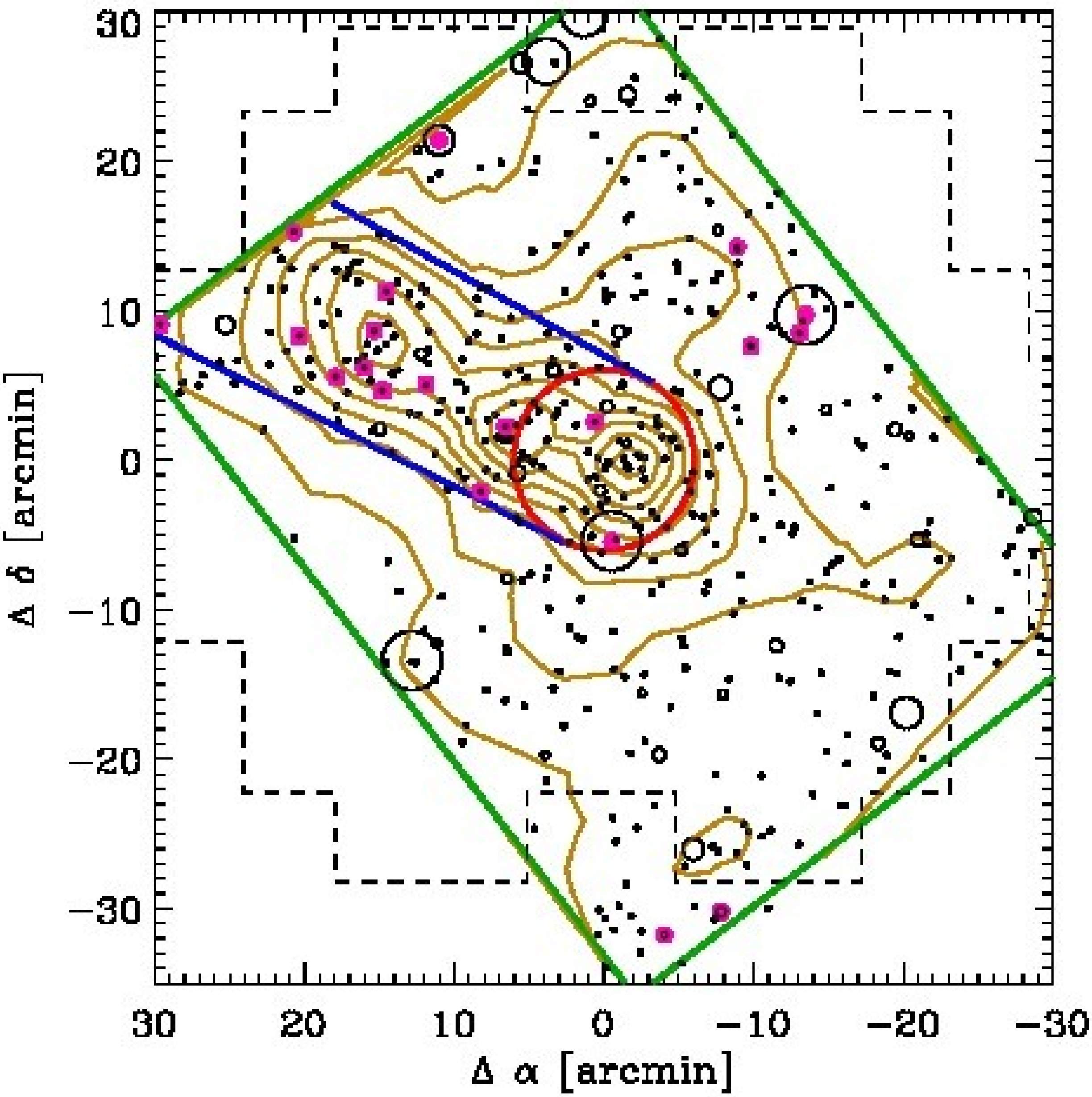

Fig.3: Number density contours (brown) of IR-emitting cluster members in a z=0.23 super-cluster. Points indicate the positions of the cluster members, and the size of the symbol is proportional to the galaxy specific star-formation rates. The pink symbols indicate the positions of the LIRGs (cluster members with IR luminosity $\geq 10^{11}$ $L_{\odot}$). The green lines delimit the region covered by Spitzer MIPS observations, while the dashed lines delimit the region covered by Palomar r-band observations. The red circle indicate the core region of the cluster ($\leq r_{500}$). The blue lines indicate the region of a large-scale filament. It can be seen that LIRGs tend to be located in this region. At the cluster redshift 1 arcmin corresponds to 222 kpc. [from Biviano et al. 2012, A&A, 523, A77]