Clusters and groups of galaxies: internal structure and dynamics

Strong constraints on cosmological theories and on the nature of dark matter can be obtained from the study of cluster masses, mass distribution, and internal structure. My main research lines in this field are:

1. the determination of the cluster (total and baryonic) mass distribution, using galaxies as tracers of the cluster gravitational potential;
2. the characterization of the properties of the dark matter, using the comparison of different tracers of the cluster gravitational potential;
3. the analysis of the dynamical status of clusters, using the shapes of their pseudo phase-space density profiles.

These analyses are based in particular on data from WINGS, CLASH-VLT and GOGREEN.

I am also lead of a Euclid ESA mission Key Project, dealing with the determination of the characteristics of clusters of galaxies. Euclid is expected to lead to the detection of thousands of clusters at redshift z>1.

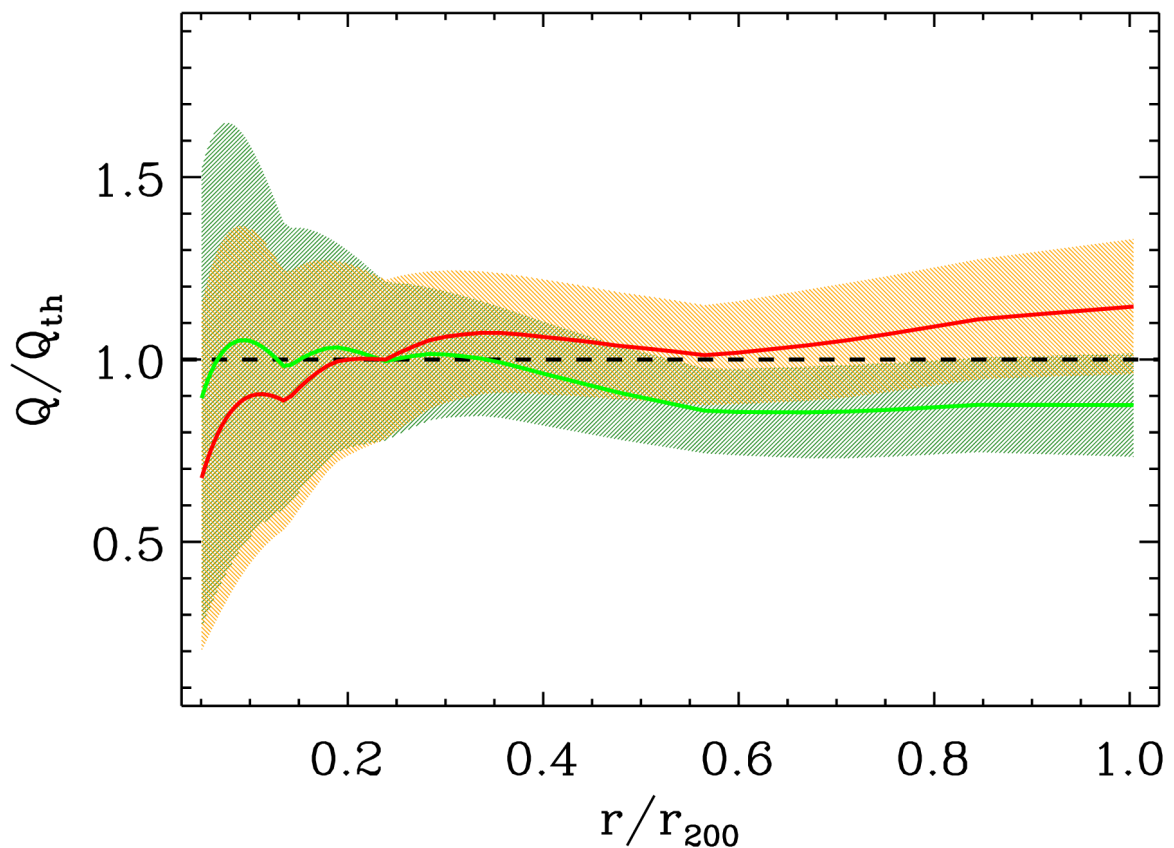Figure: The pseudo phase-space density profile Q(r) of an ensemble cluster at mean redshift 1.1 from the GOGREEN survey divided by the the theoretical $Q_{th}(r)$ of Dehnen & McLaughlin (2005, green) and Lapi & Cavaliere (2009, red). Dashed regions indicate 1-σ confidence level. rom Biviano et al. (2021).