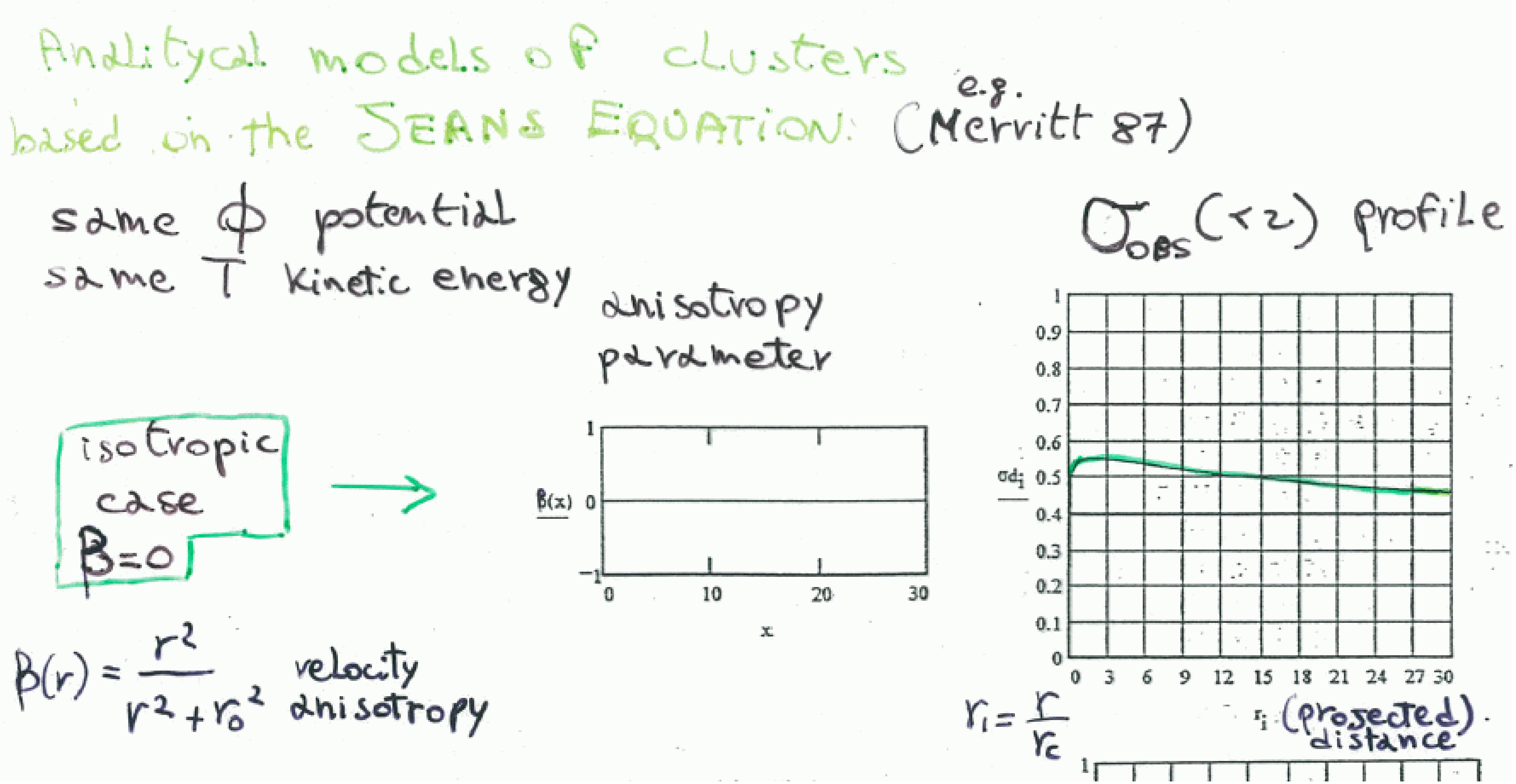
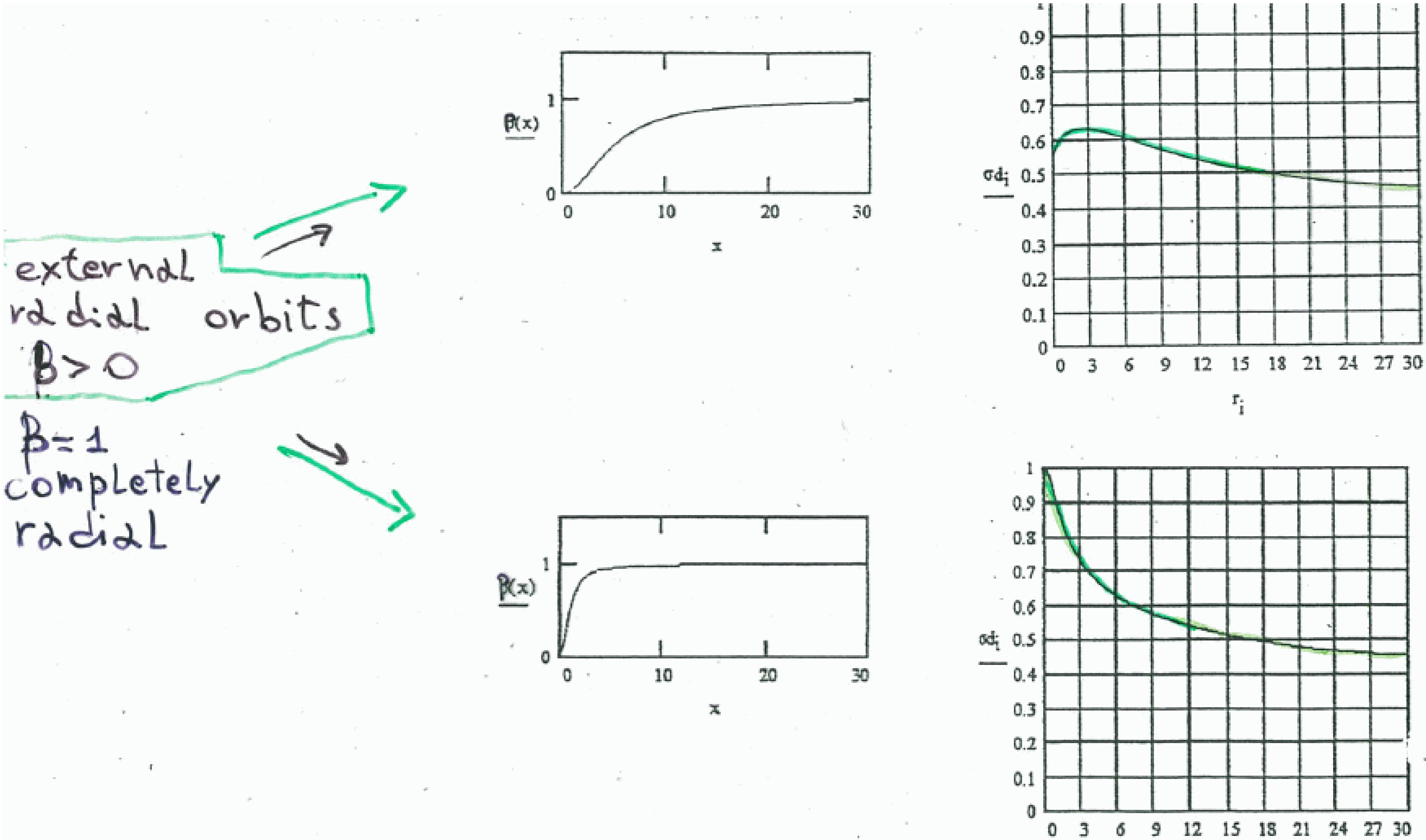
Velocity dispersion profiles
Galaxy orbits
Cluster mass estimate

Simple models made with software.





The only way to avoid the use of the unknown beta, it is to integrate in the whole cluster. The gllobal value of velocity dispersion does not depend of the velocity anisotropies. This is an advantage of the virial theorem with respect to the Jeans equation.

Velocity Dispersion Profiles and Velocity Anisotropies

MG et al. 98

Ensemble cluster built with gals of 160 nearby clusters⇒observational profile

Jeans eq.+ mass distribution+assumption for v-anisotropy⇒theoretical profile.

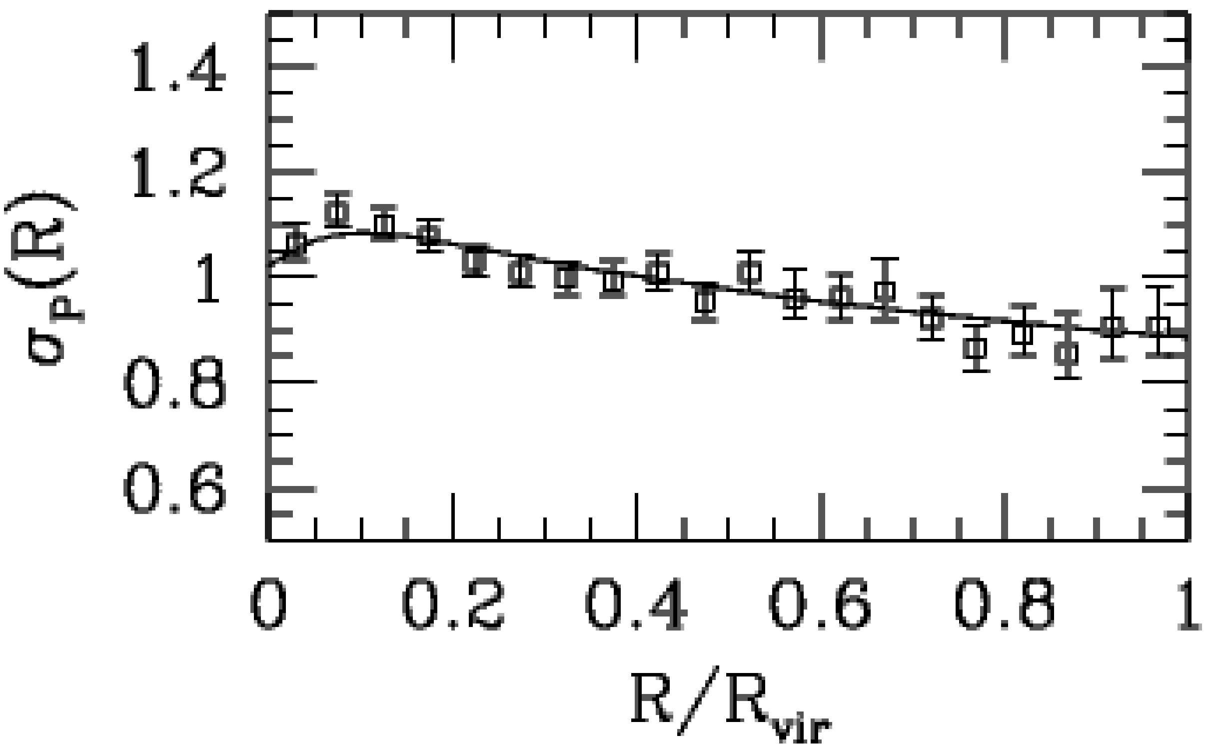
Mass-follows-light assumption

Velocity anisotropy parameter

$\beta(r)=1-\sigma_\tau(r)/\sigma_r(r)=0$:

χ^2 goodness of fit is 96%.

The "average" cluster has isotropic velocities!



⇒Mean surface term correction to virial mass about 20%.

Velocity Dispersion Profiles and Velocity Anisotropies

MG et al. 98

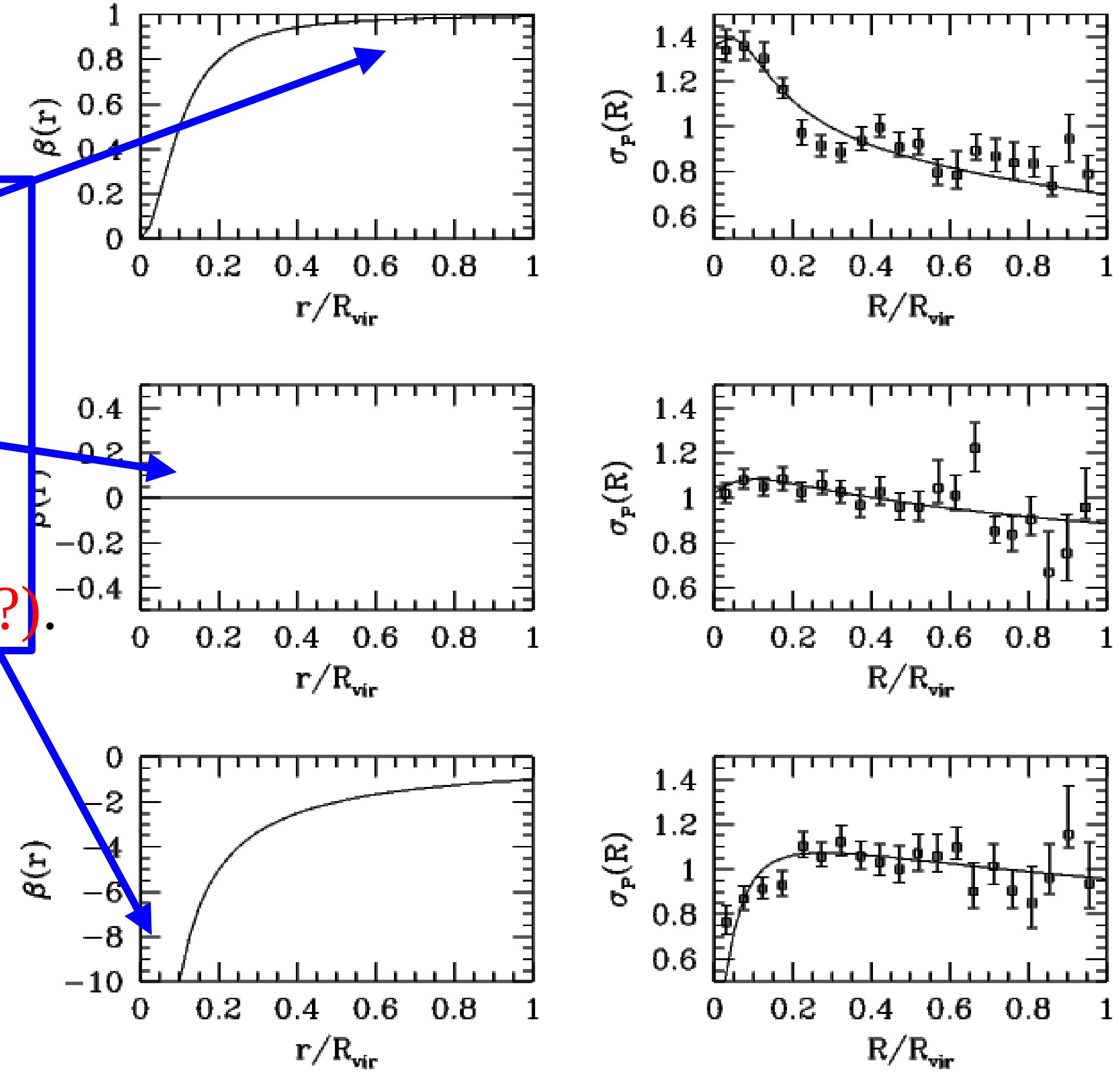
3 families of clusters (for $\neq\sigma_v$ in central regions/σ_{TOT})⇒3 ensemble clusters.

Jeans eq.+ mass distribution+assumption for anisotropy⇒theoretical profile

M∝L

$\beta(r)=1-\sigma_\tau(r)/\sigma_r(r)$

Radial orbits in external regions (infall of galaxies?);
isotropic orbits (violent relaxation?);
circular orbits in internal regions (secondary relaxation phenomena?).



⇒Surface term correction to virial mass about 18-40%.

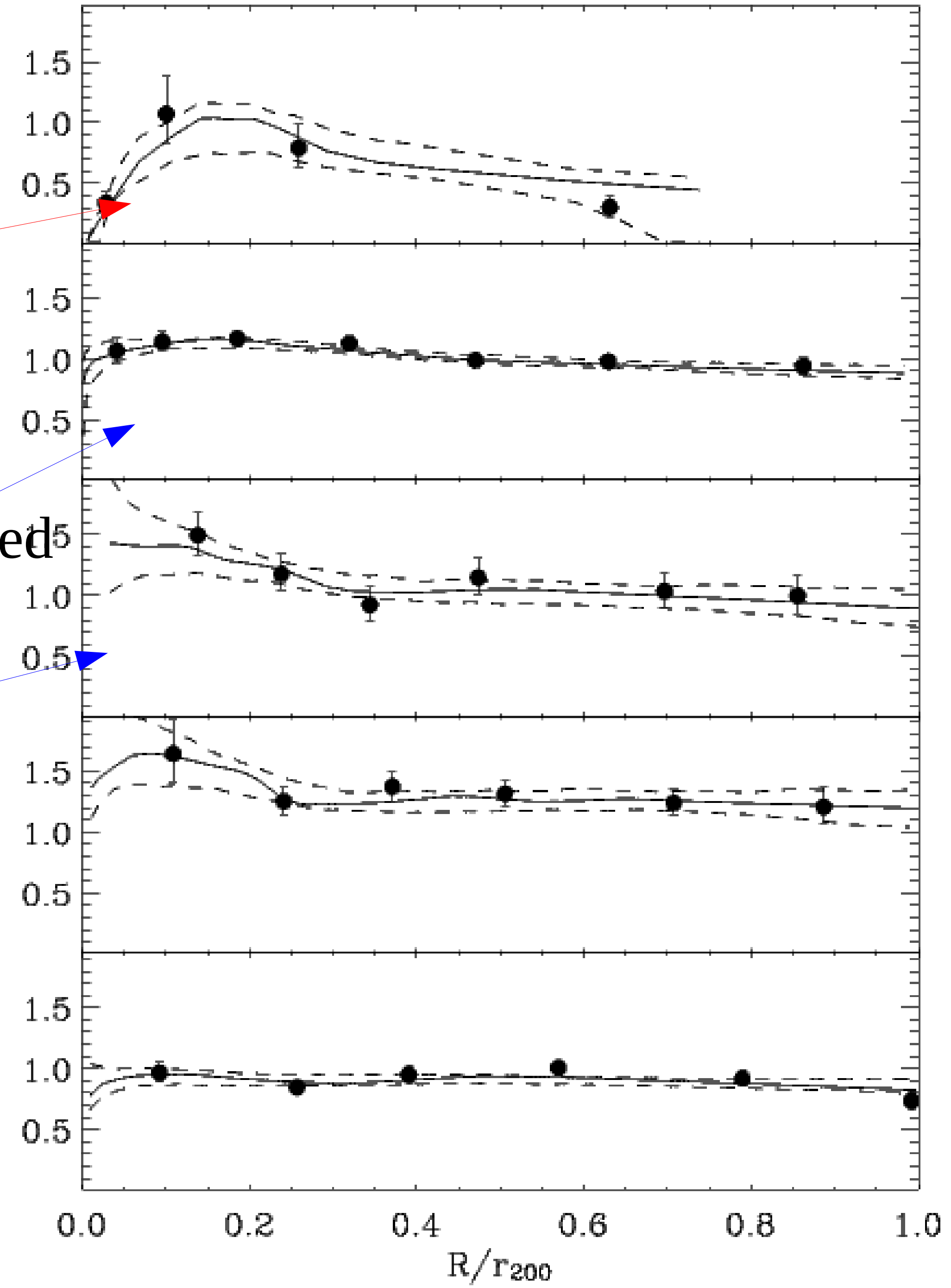
Clusters may be characterized by different anisotropies...
different stages of evolution?

Biviano & Katgert 2004

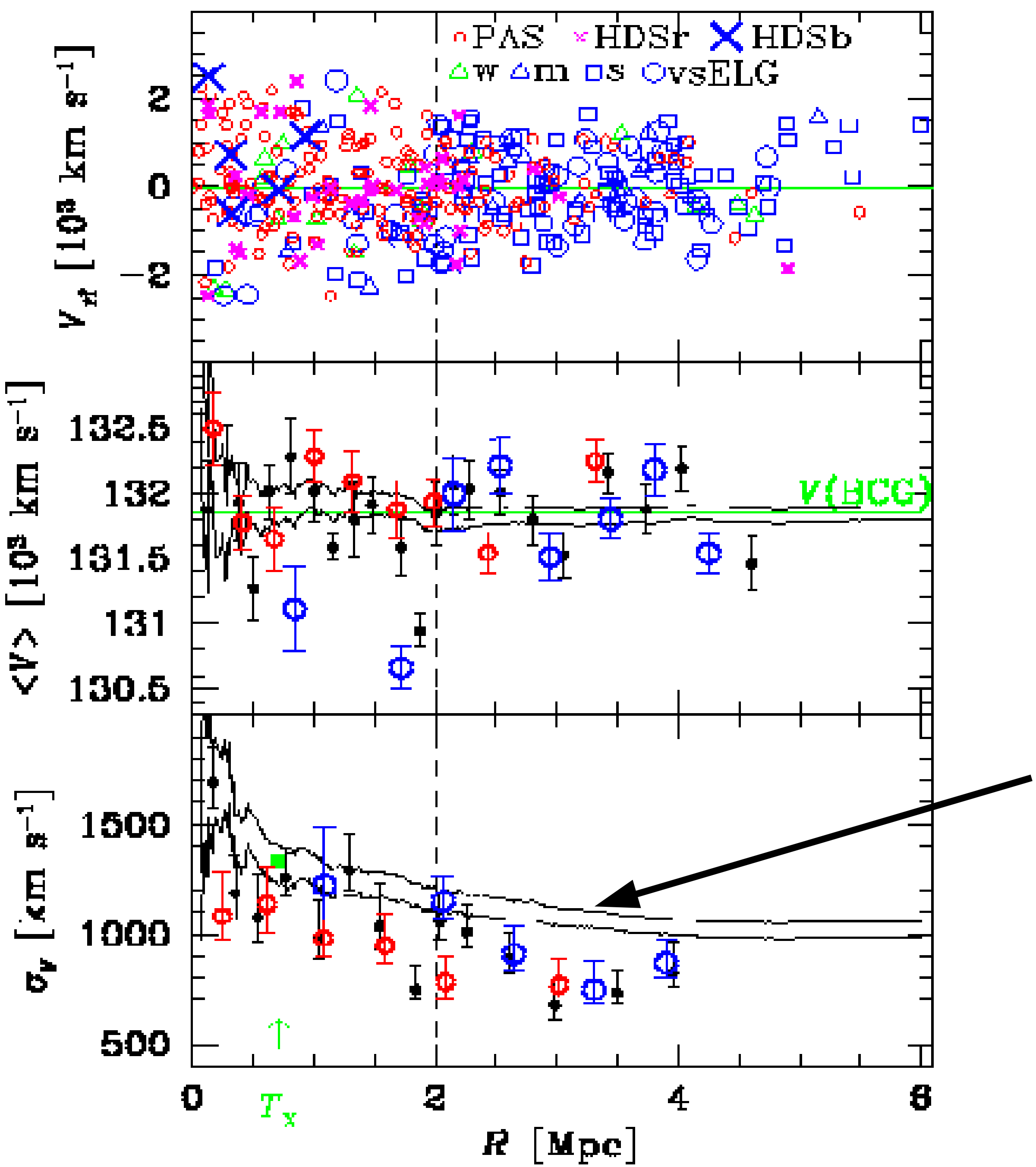
Projected
velocity dispersion profiles

E bright: cannot be explained
by no velocity anisotropy →
The Jeans equation cannot be applied
→ may be due that E-bright
Produced by mergers.

E-galaxies
Spi-early
Spi-late
-



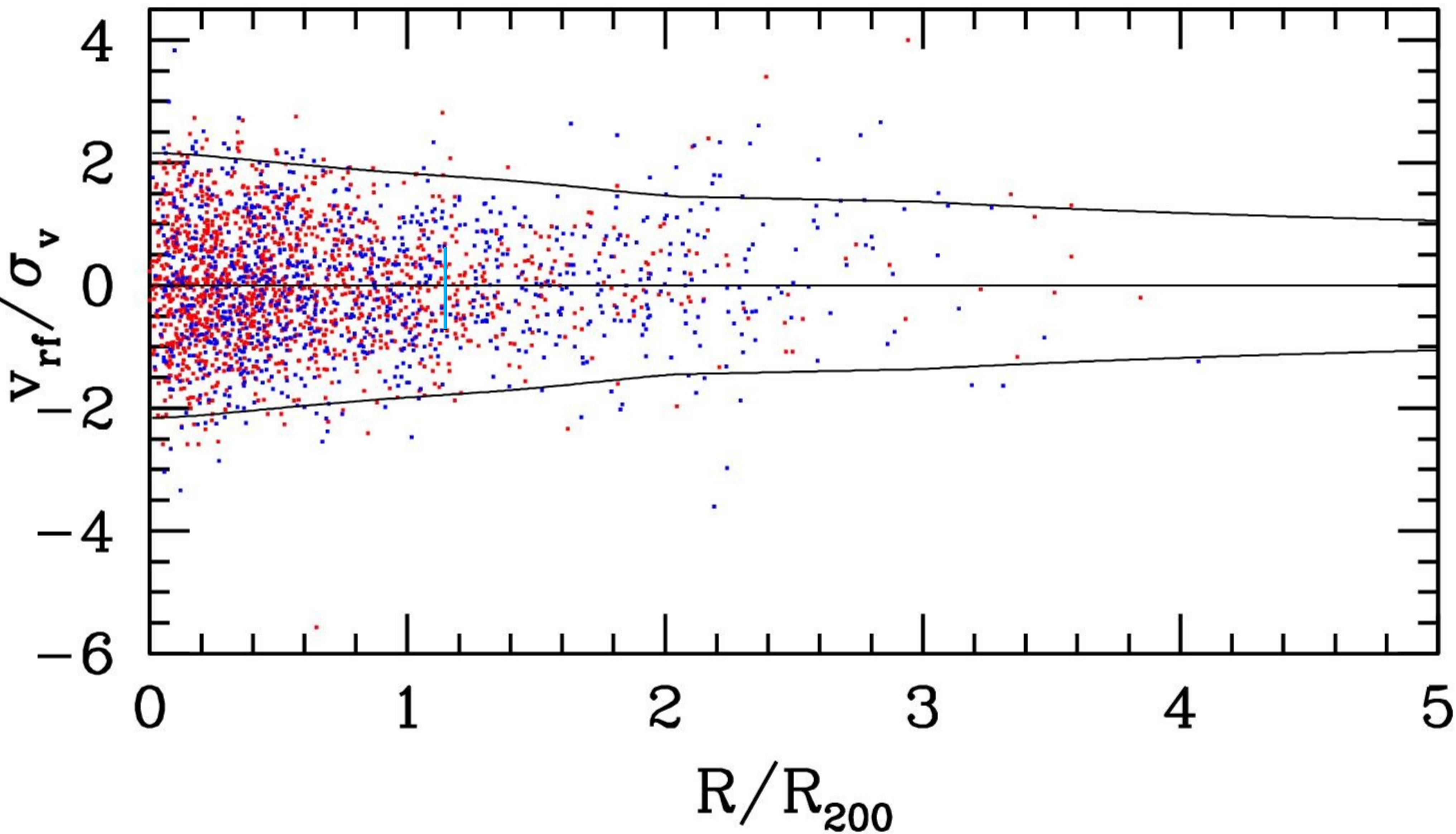
Spi populations have larger radial
Orbits than E-galaxies...
OK with recent infall of Spi



~500 gals per cluster
MACS1206 at z~0.4
CLASH-VLT data
Girardi et al. 2015

Passive and star forming galaxies have different velocity dispersion profiles (VDP).

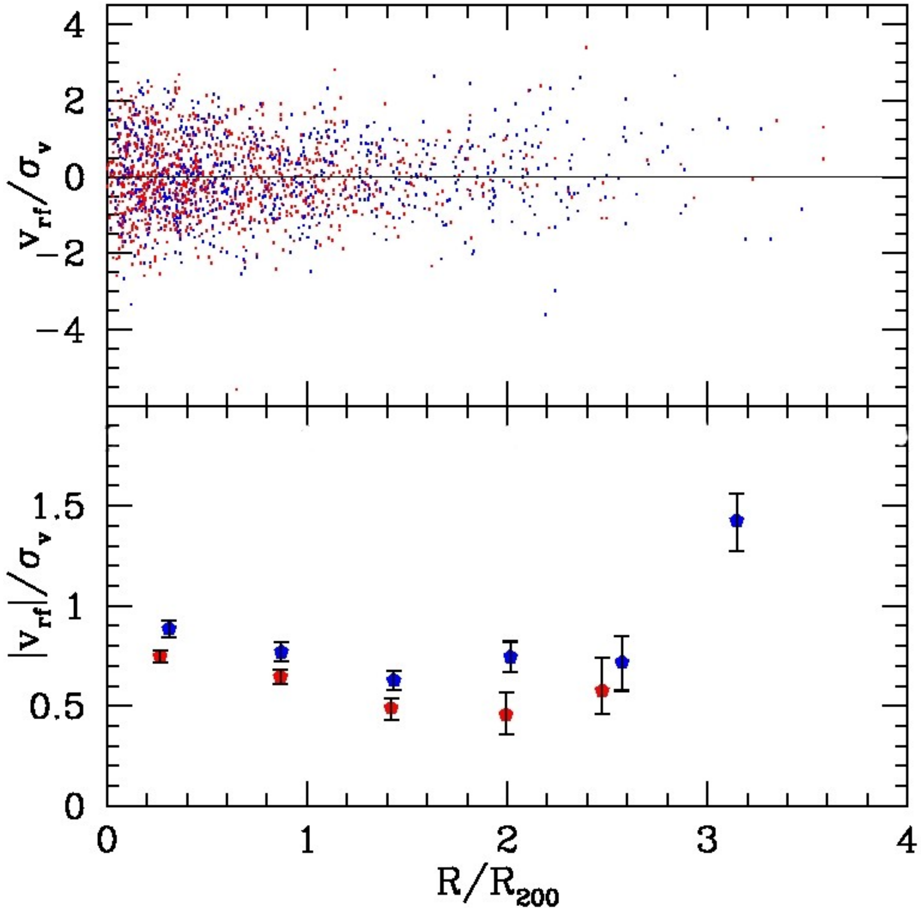
Barsanti's thesis (Barsanti et al. In prep.) ~50 clusters 0.8<z<1.4
NWF profile → Escape velocity curve to check
the member selection in the projected phase space.

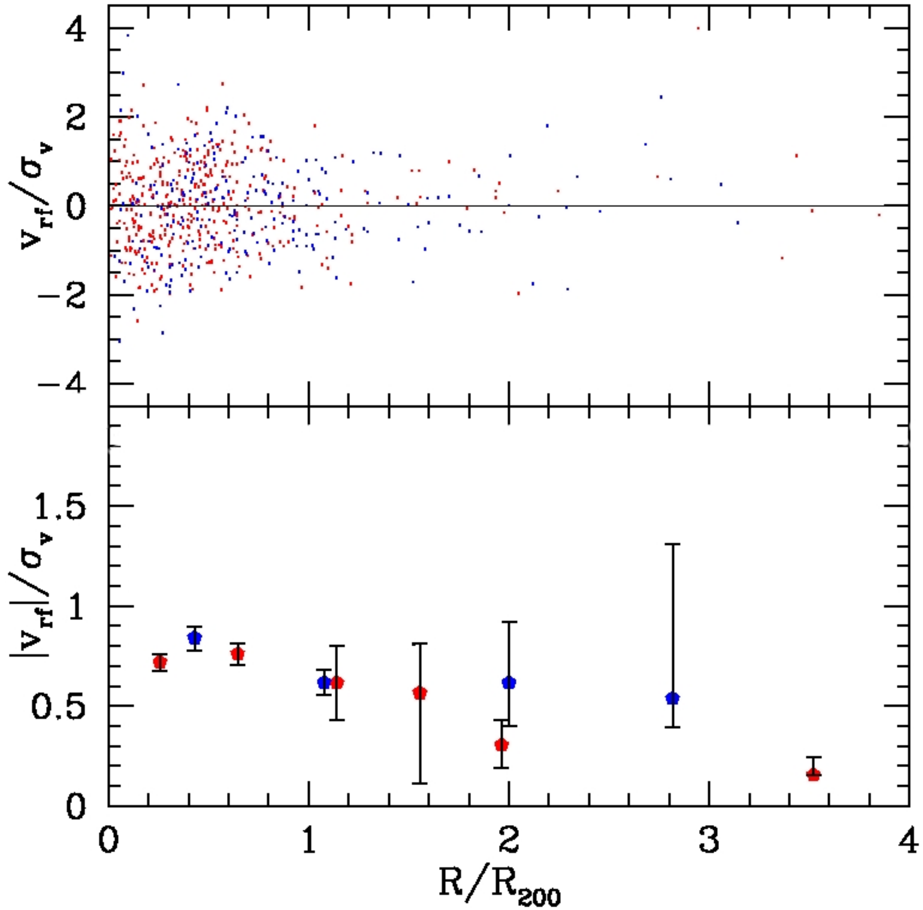


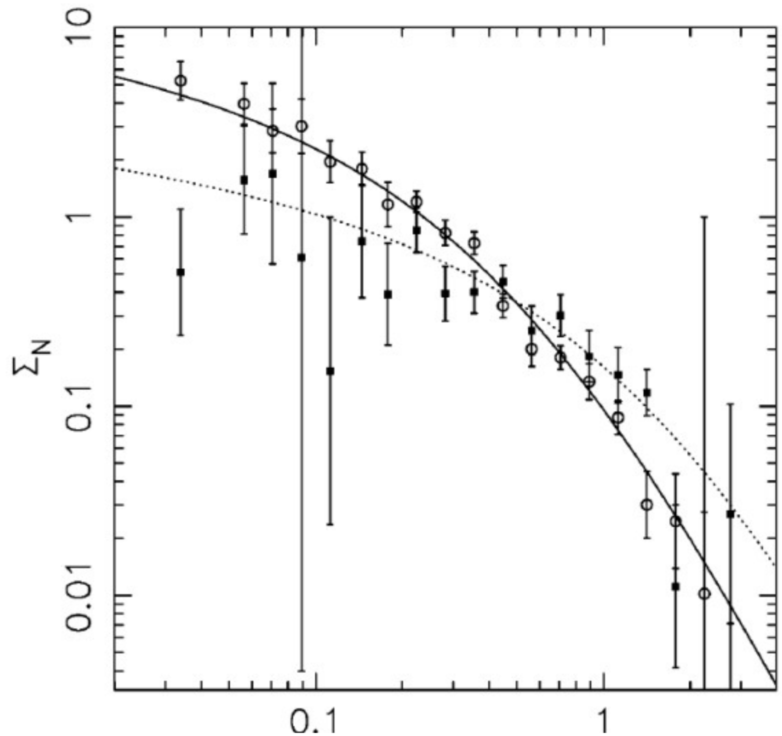
Velocity Dispersion Profiles (Barsanti's thesis)

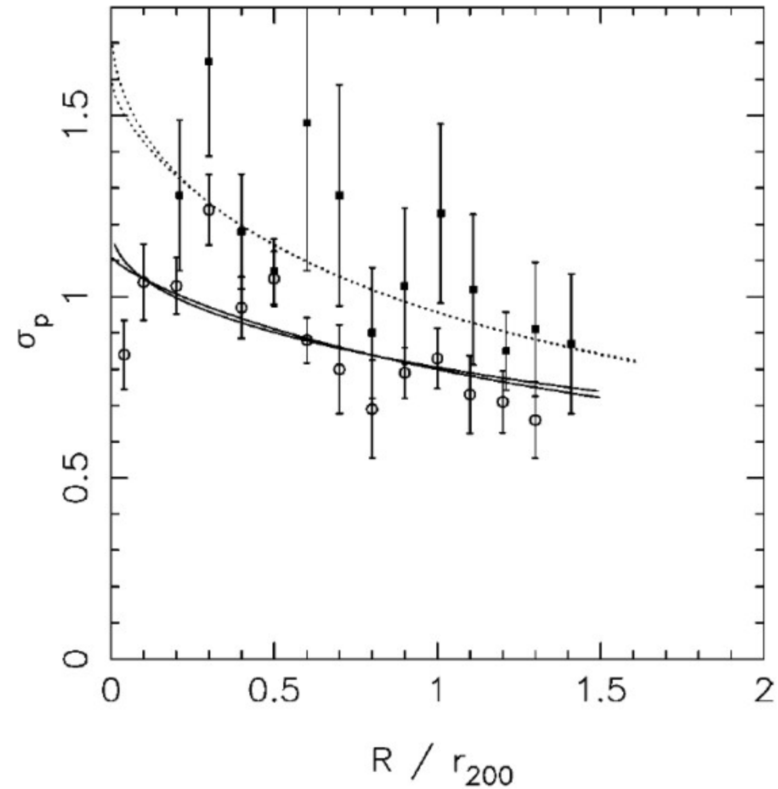
0.4<z<0.8
VDPs are different.

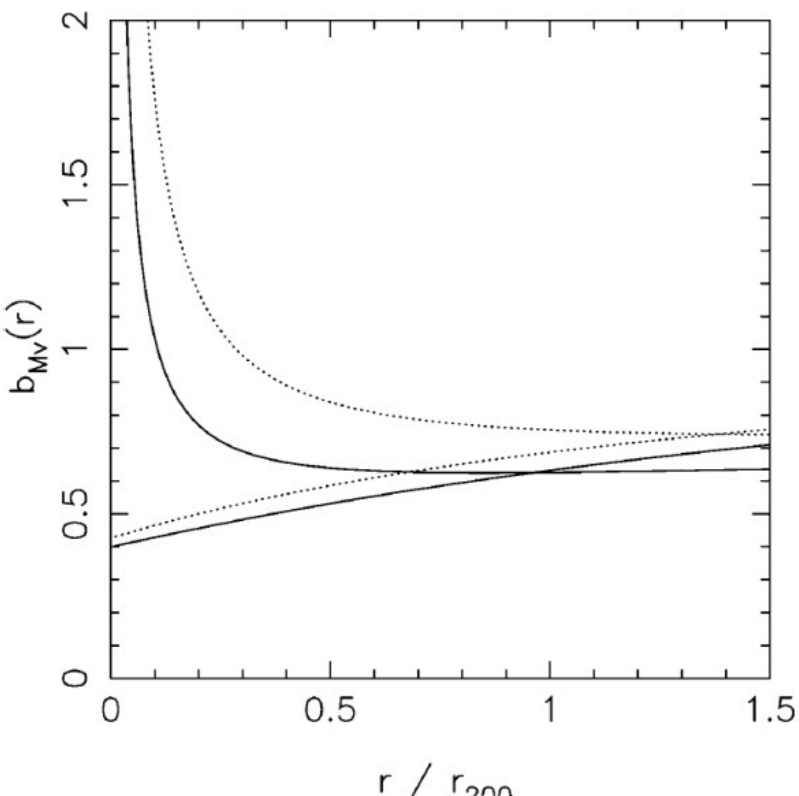
0.8<z<1.4
VDPs are not different!
Connected to evolution of
Galaxies & clusters.



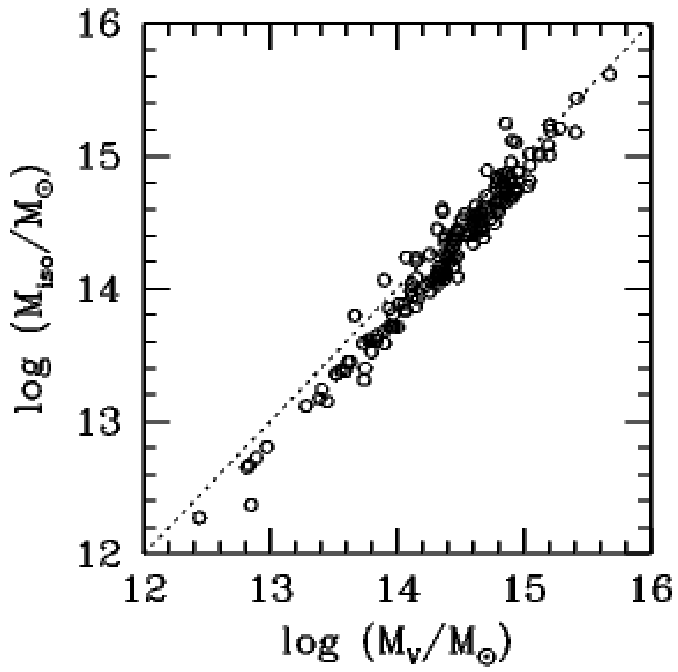


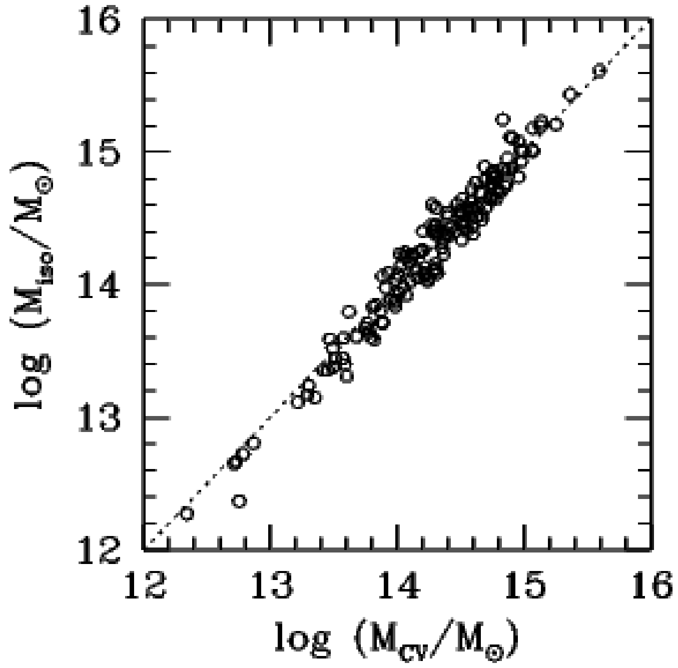






Carlberg et al. 1996 – CNOC clusters red and blue galaxies have different galaxy distribution and velocity dispersion profiles BUT they are both in dynamical equilibrium and can be used in the Jeans equation to give mass.
The difference between the mass from
The Jeans eq. and the virial mass
b=MJeans(r)/L(r)*<L>/Mvir <1.
is due to the surface pressure correction.





Miso=MJeans i.e. mass from the Jeans eq.
Mv=virial Mass, i.e. mass from the virial theorem.

The difference between Miso and Mc is due to the surface pressure correction, that is to the fact that clusters are not sampled out to infinity and at the observed external radius, the radial velocity dispersion is still >0.

Mvcorr virial Mass after the opportune correction.

Girardi et al. 1998