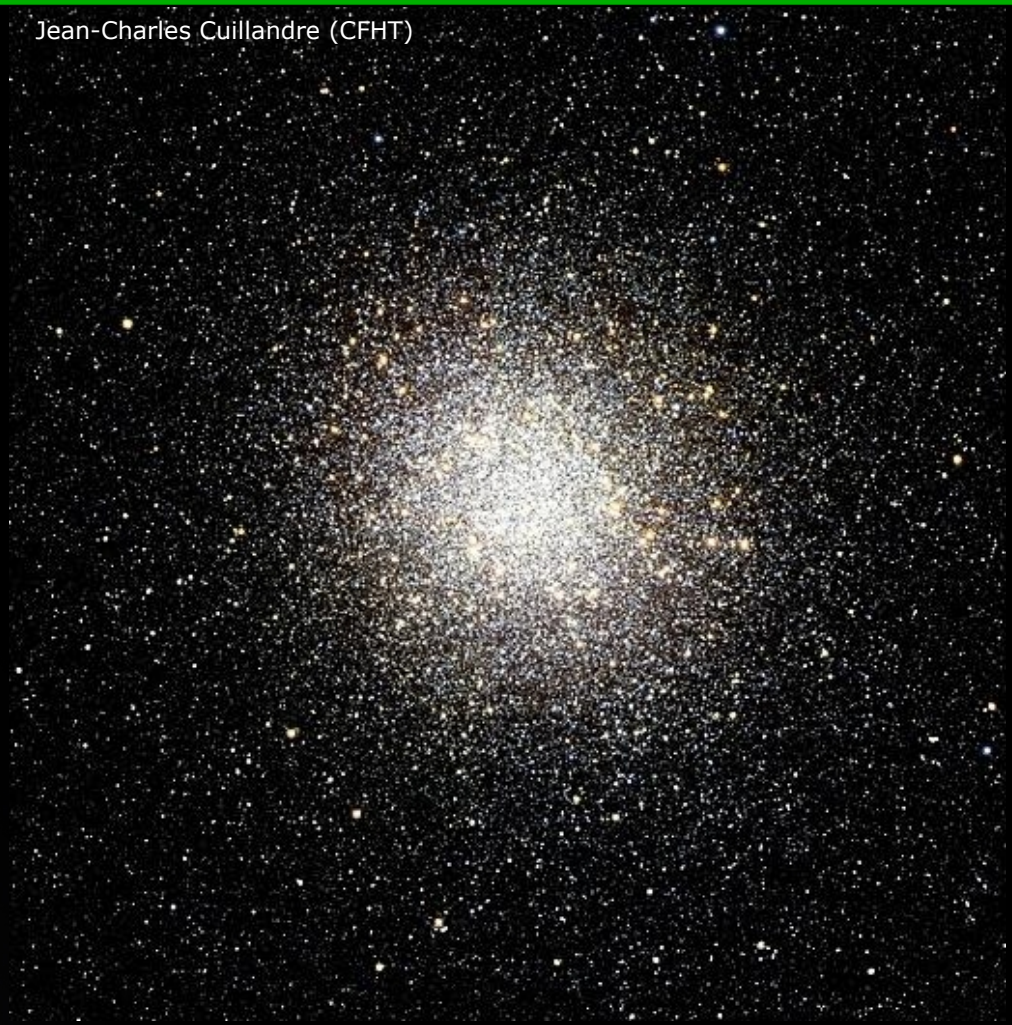
Velocity Dispersions of Galactic GCs: Testing Gravity?



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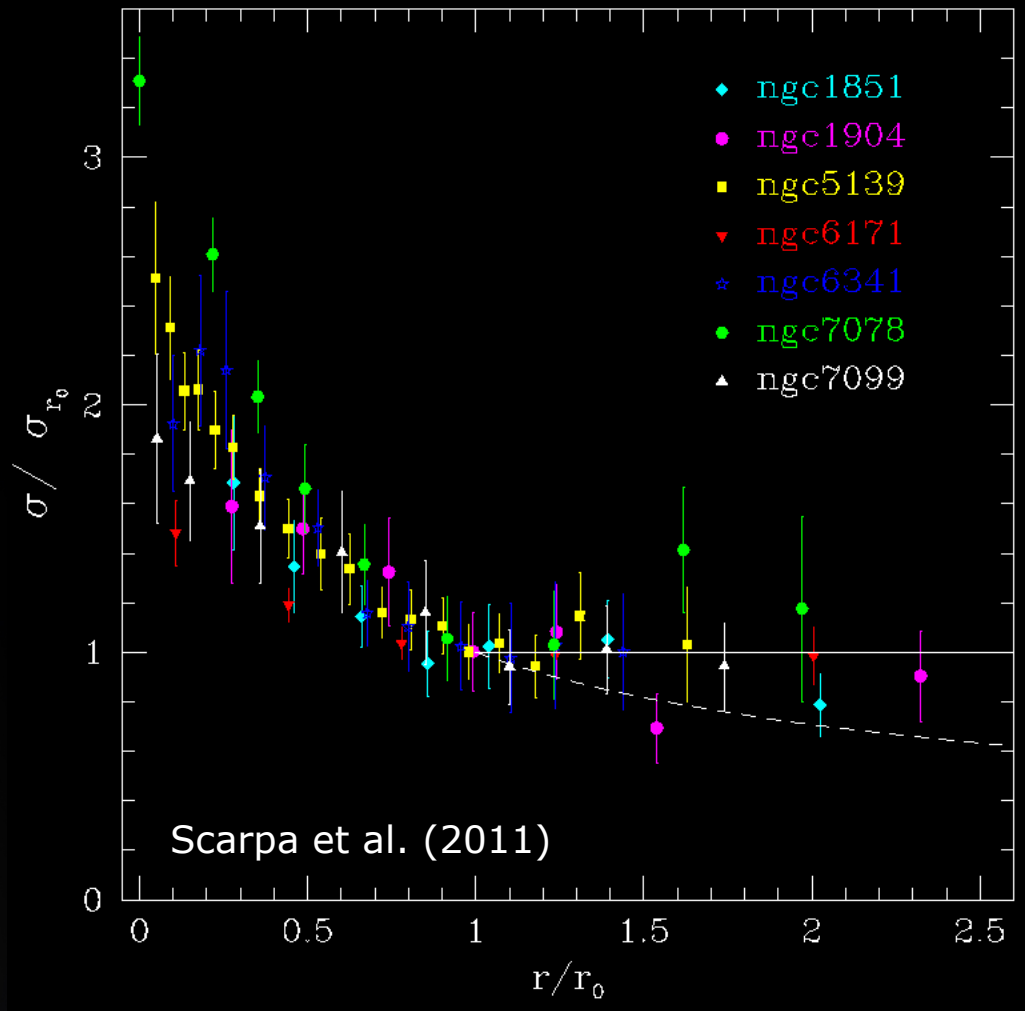
LASZLO KISS	Konkoly Observatory	ARNAUD SIEBERT	Strasbourg Observatory
GERAINT LEWIS	University of Sydney	TIM BEDDING	University of Sydney

Globular Clusters

- Pressure supported
- $10^{3(?)}$ – $10^{7(?)}$ M_{sun}
- Single stellar population(ish)
- Apparently contain little, or no, dark matter...
  - dynamical models (Phinney 1993)
  - *N*-body simulations (Moore 1996)
  - observations of GC tidal tails (Odenkirchen et al. 2001)
  - lack of microlensing events (Navarro, Frenk & White 1997; Ibata et al. 2002)
  - low M/L_V (Lane et al. 2009, 2010a,b – and many others)
  - etc

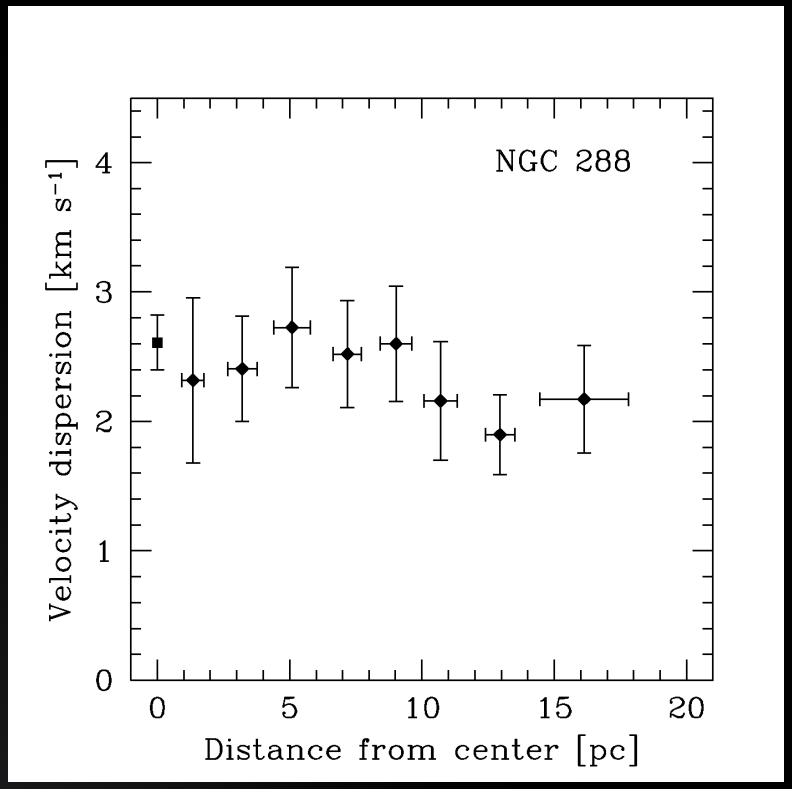
Globular Clusters



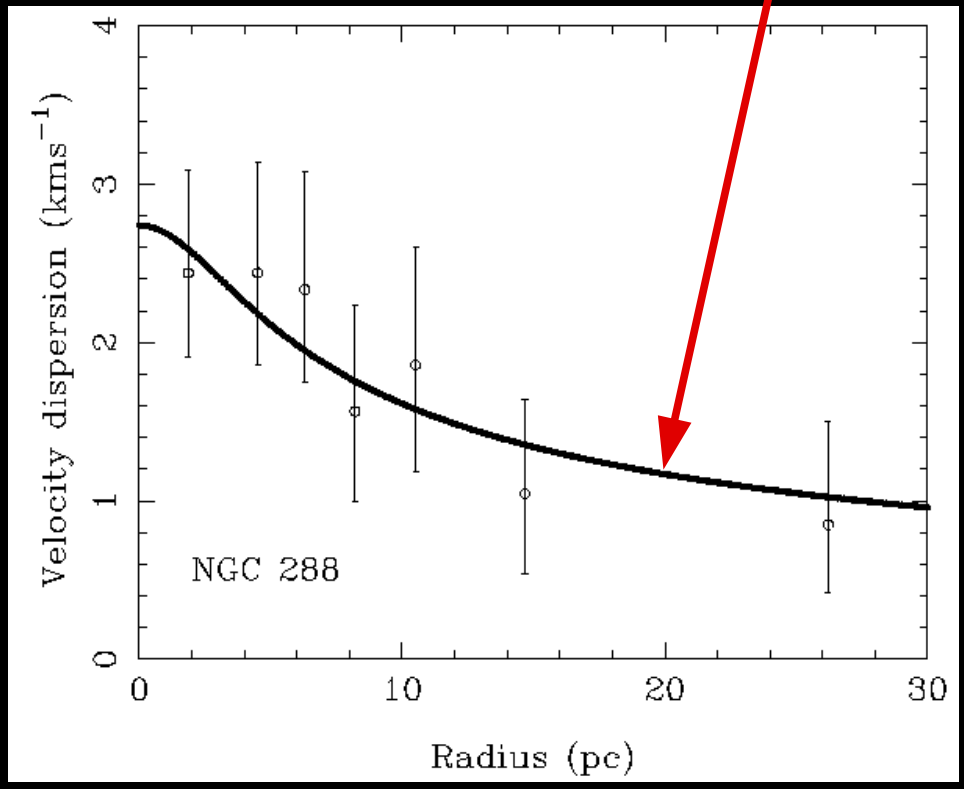
The AAOmega Survey

NGC 288

$$\sigma^2(R) = \frac{\sigma_0^2}{\sqrt{(1+R^2/r_s^2)}}$$



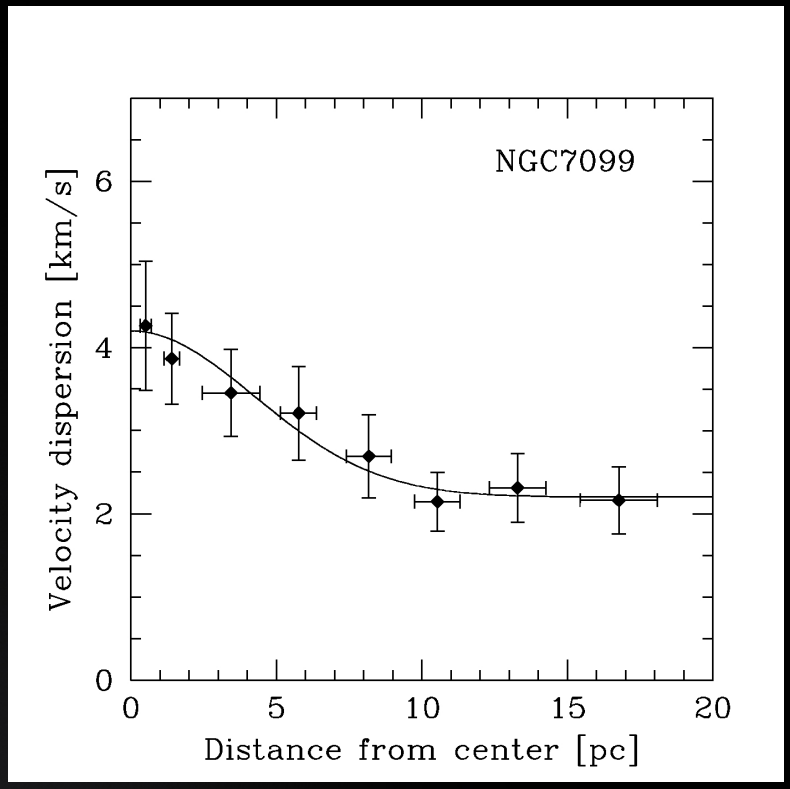
Scarpa et al. (2007)



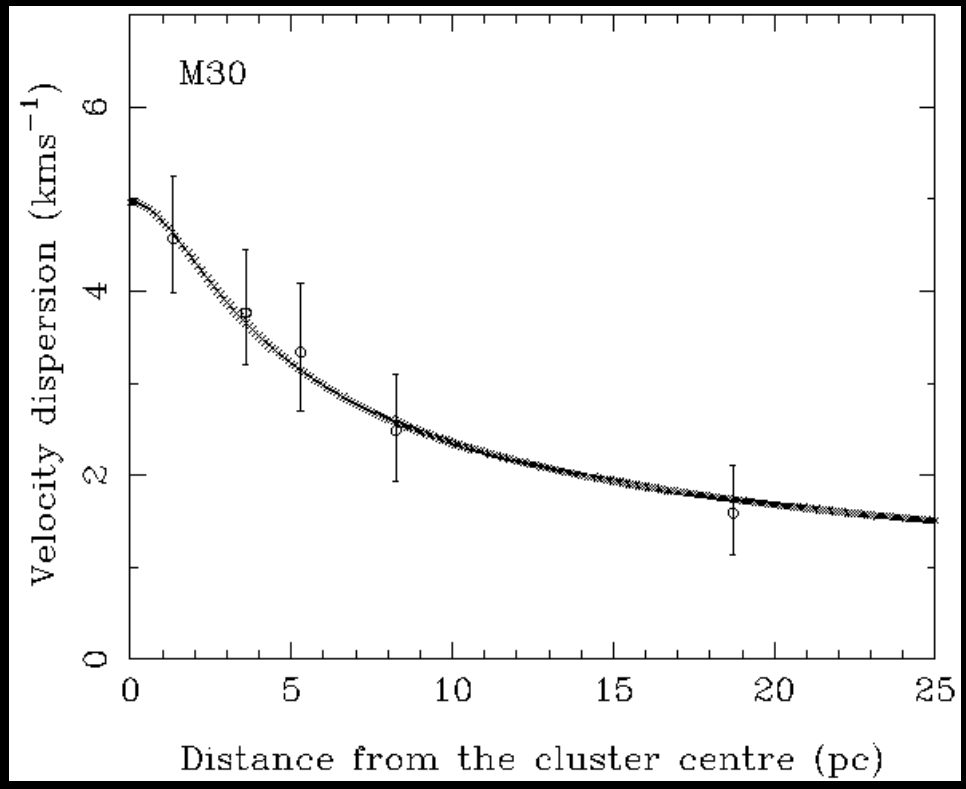
Lane et al. (2010b)

The AAOmega Survey

M30



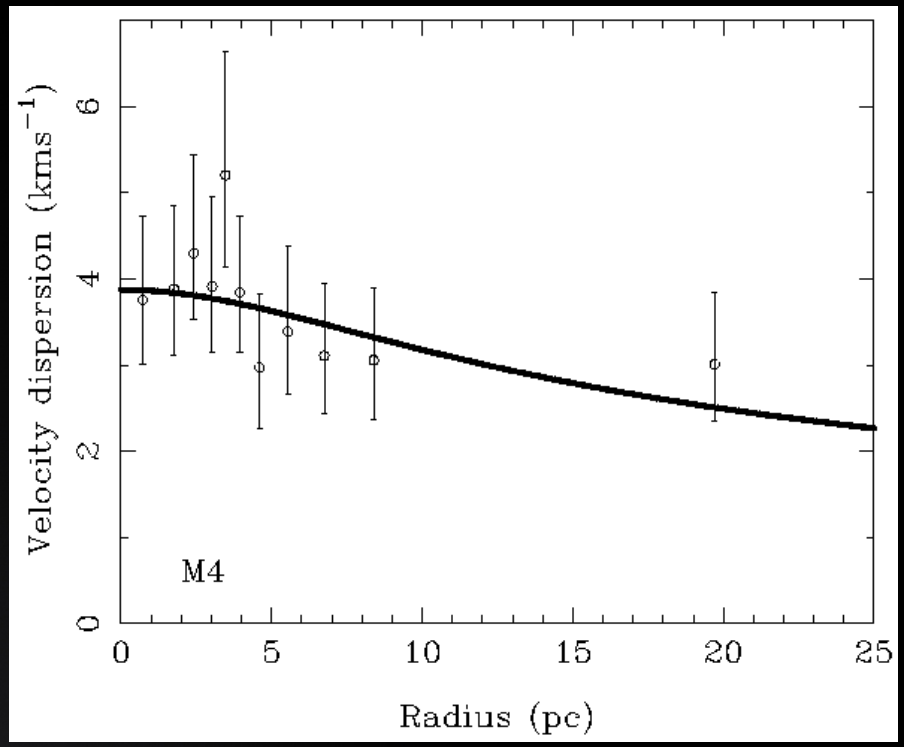
Scarpa et al. (2007)



Lane et al. (2009)

The AAOmega Survey

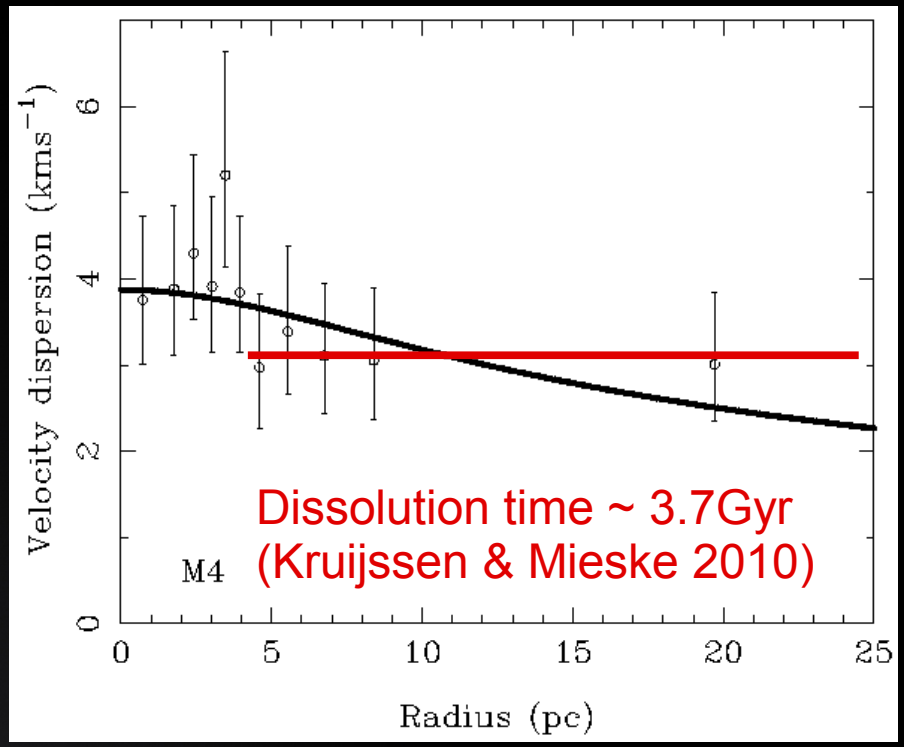
M4



Lane et al. (2010b)

The AAOmega Survey

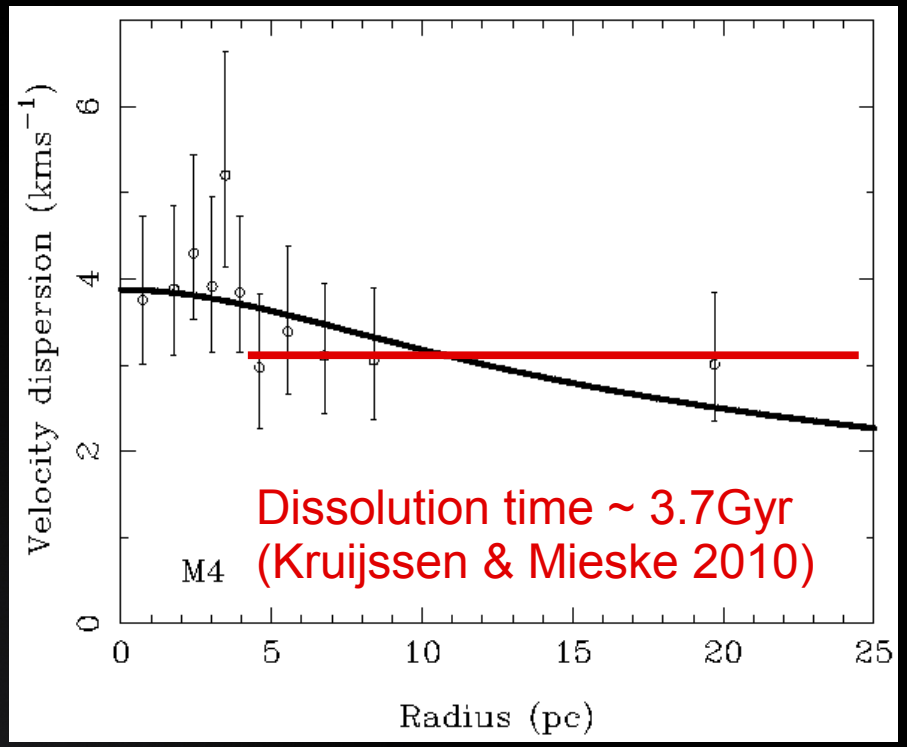
M4



Lane et al. (2010b)

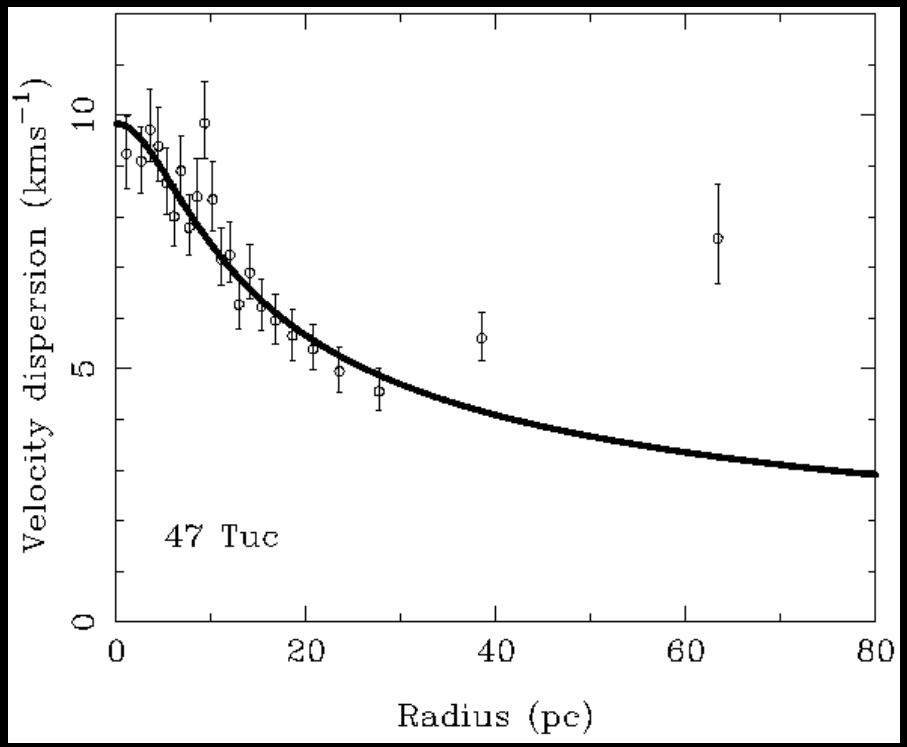
The AAOmega Survey

M4



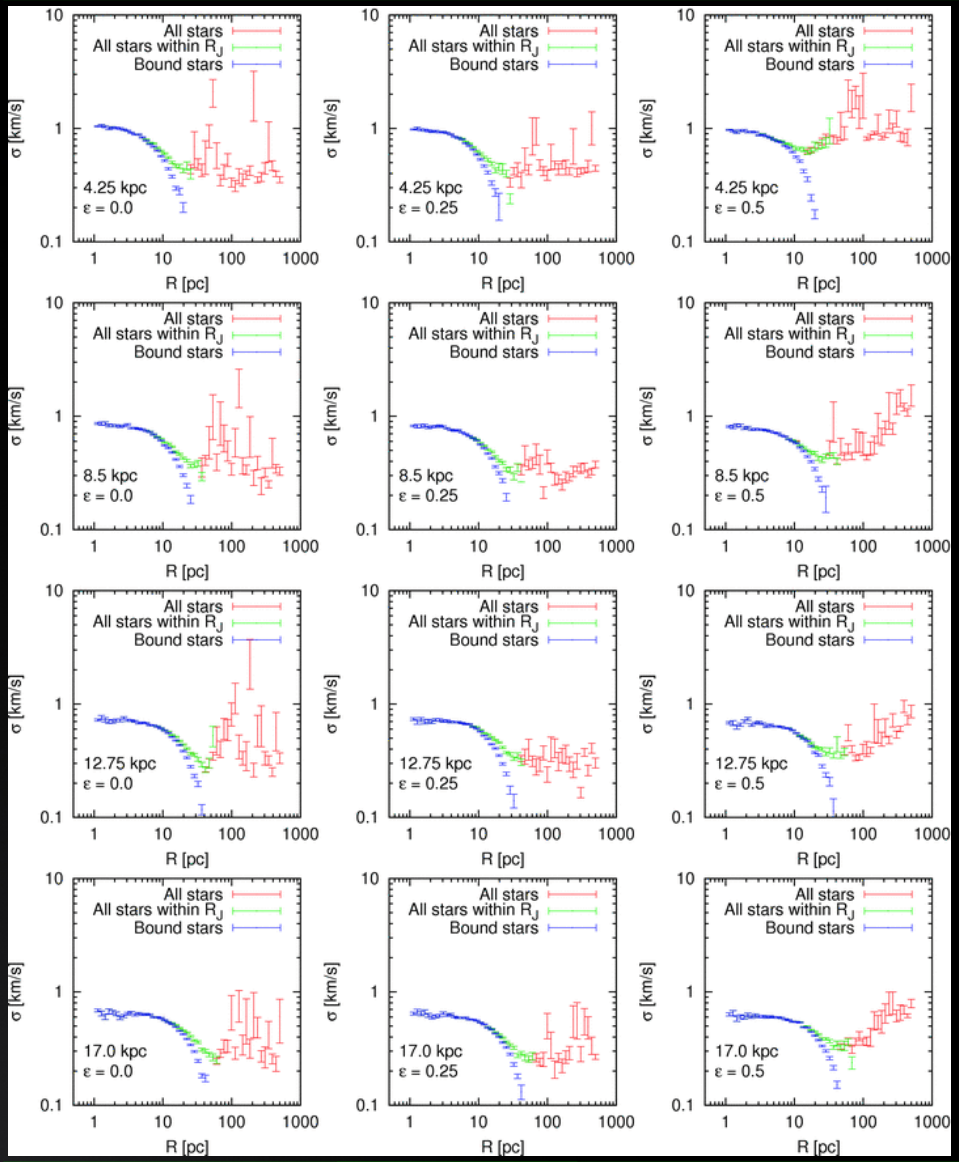
Lane et al. (2010b)

47 Tuc



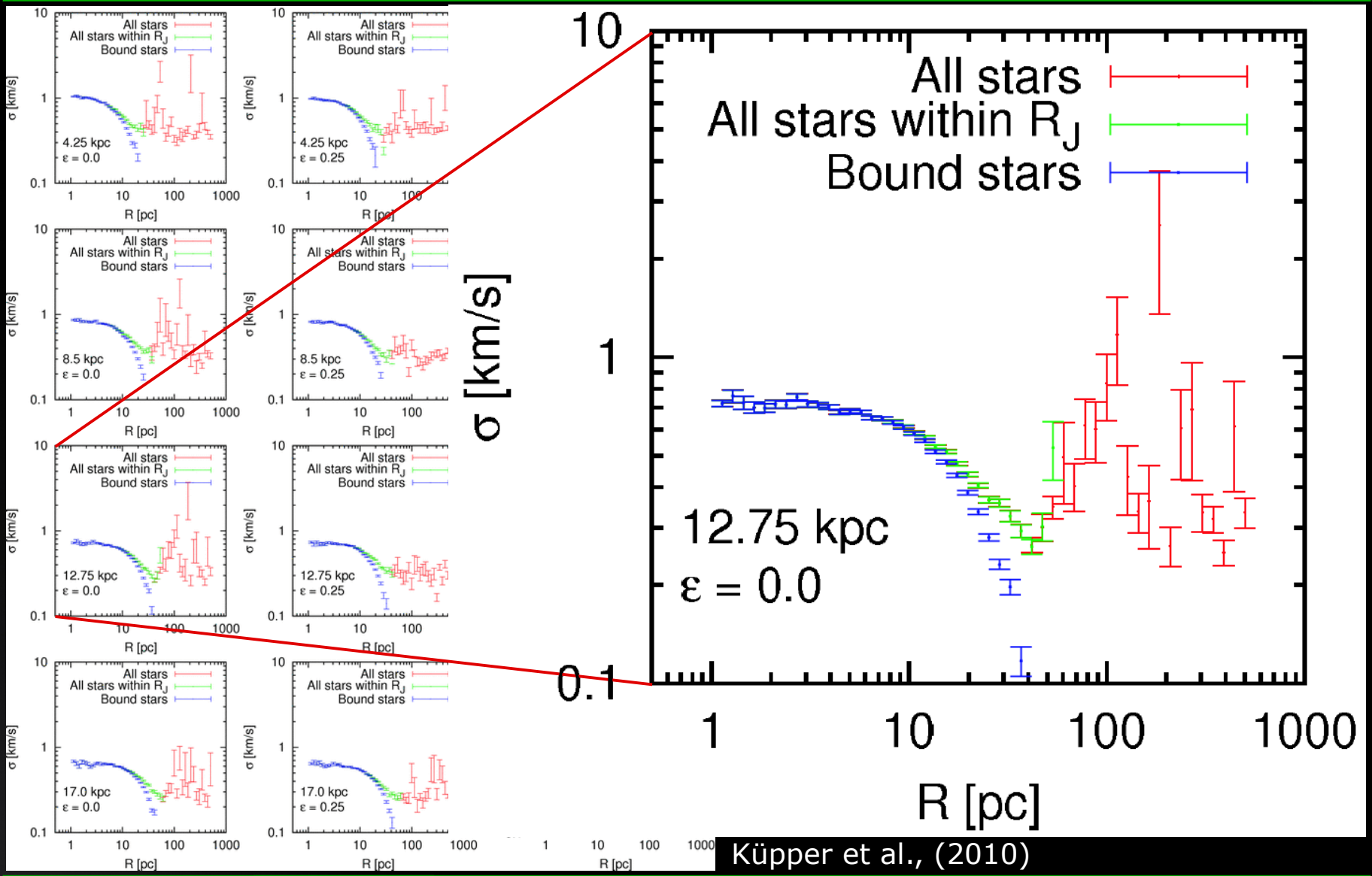
Lane et al. (2010a)

Projected Velocity Dispersions



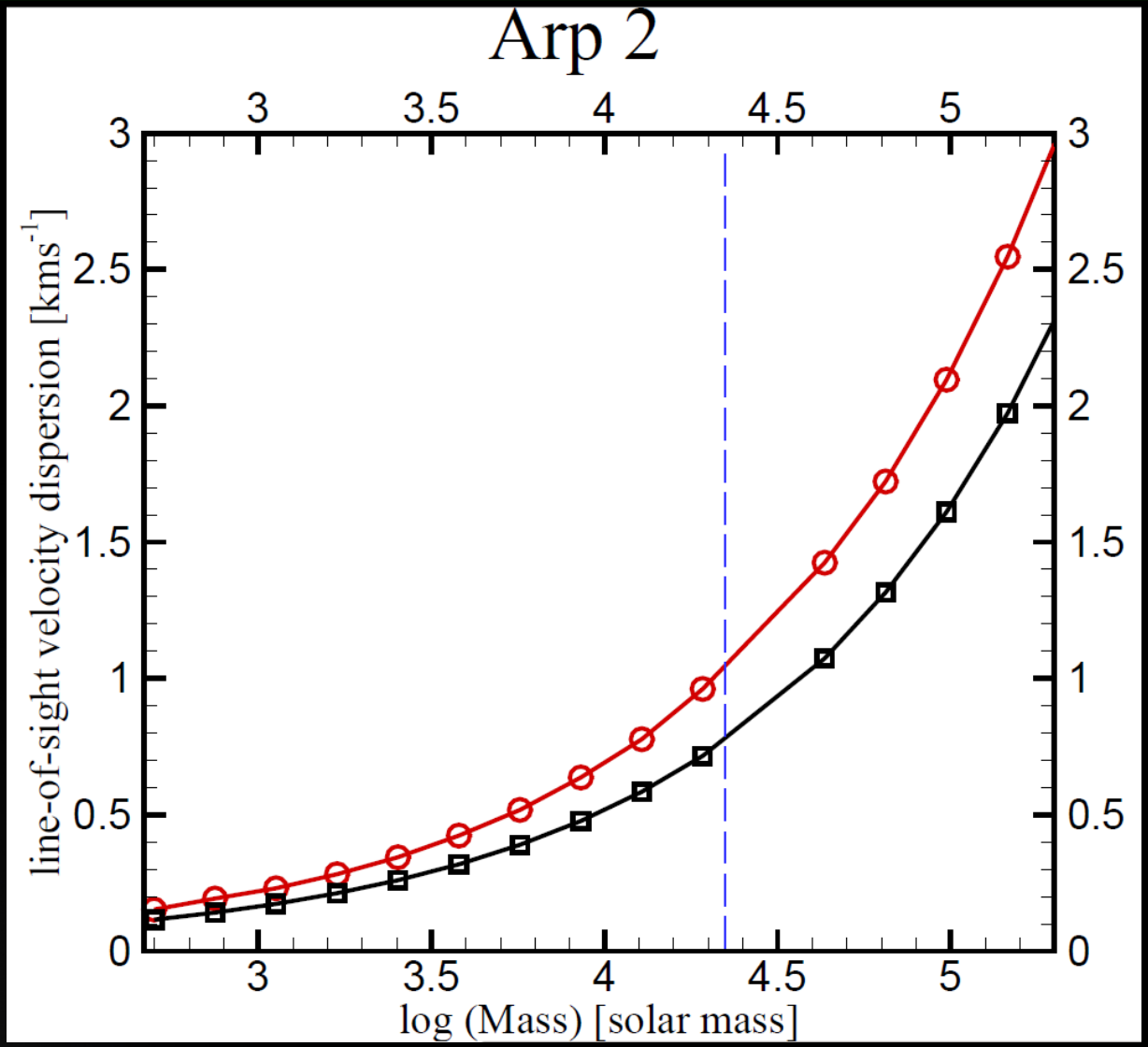
Küpper et al., (2010)

Projected Velocity Dispersions



Küpper et al., (2010)

Projected Velocity Dispersions



Haghi et al. (2011)

Projected Velocity Dispersions

M53 (DSS – 30' x 30'): Dist~18kpc

1465 spectra
180 members

Projected Velocity Dispersions

M53 (DSS – 30' x 30'): Dist~18kpc

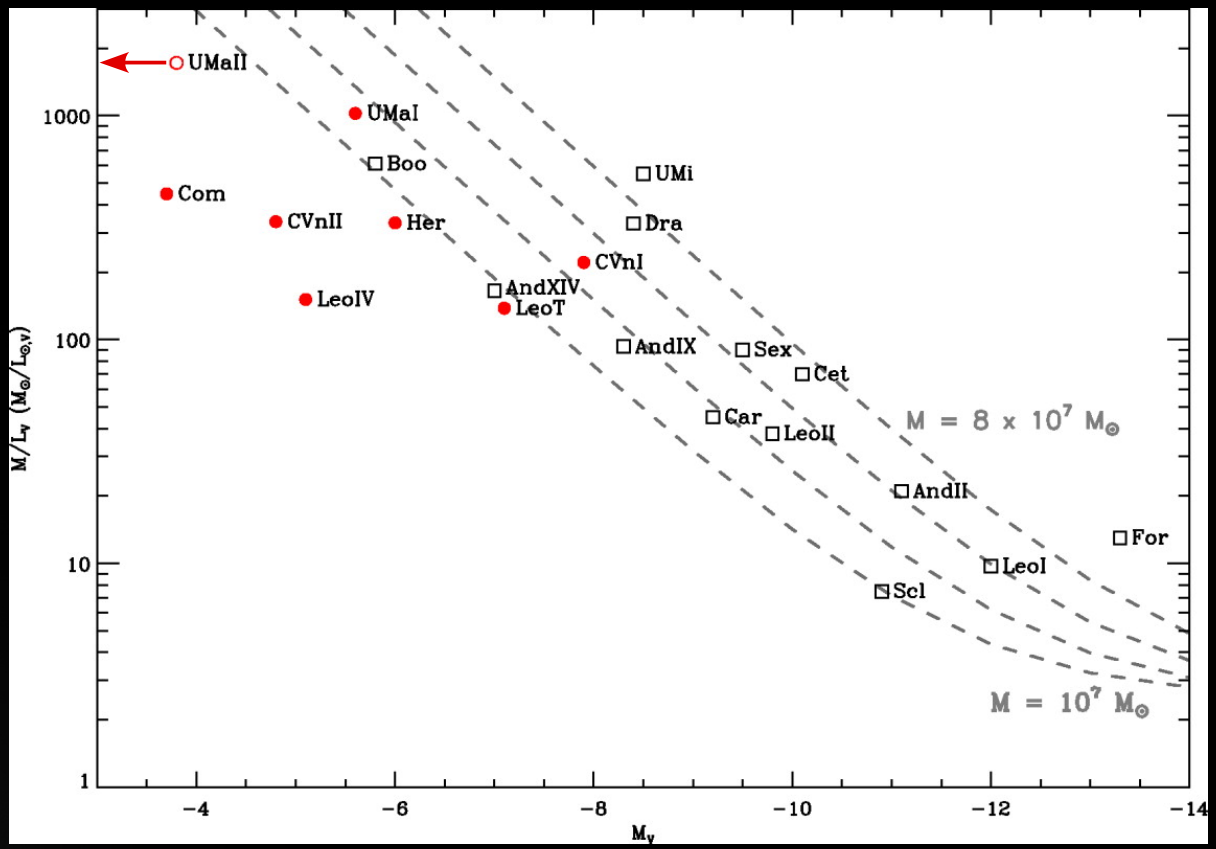
1465 spectra
180 members

Arp2 (DSS – 30' x 30'): Dist~30kpc

>10 000 spectra?
>150 members?

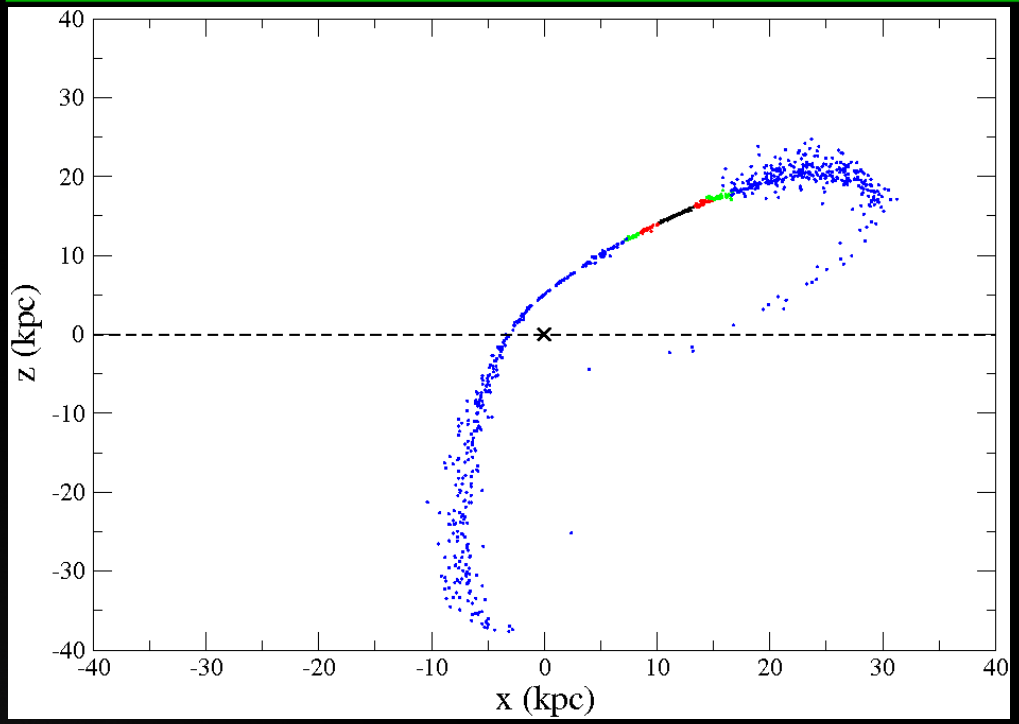
Projected Velocity Dispersions

M/L_V almost 2000!



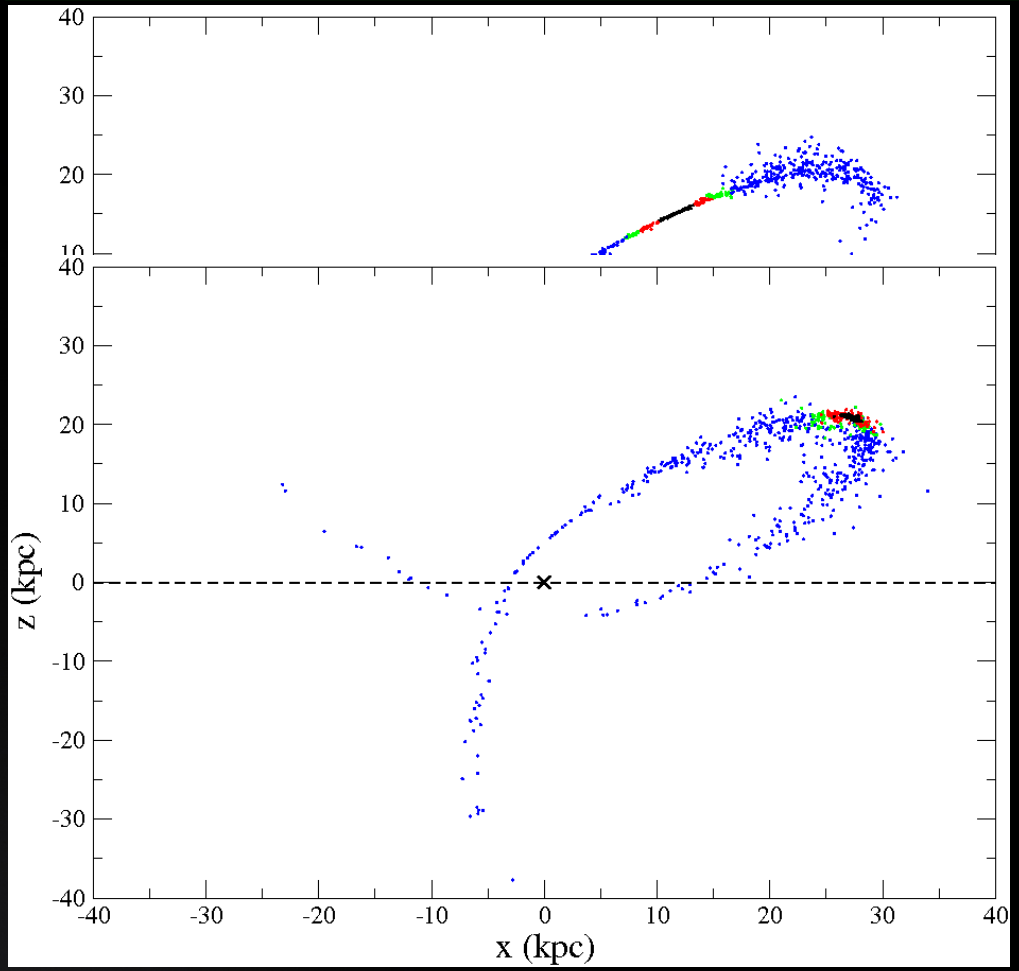
Simon & Geha (2007)

Projected Velocity Dispersions



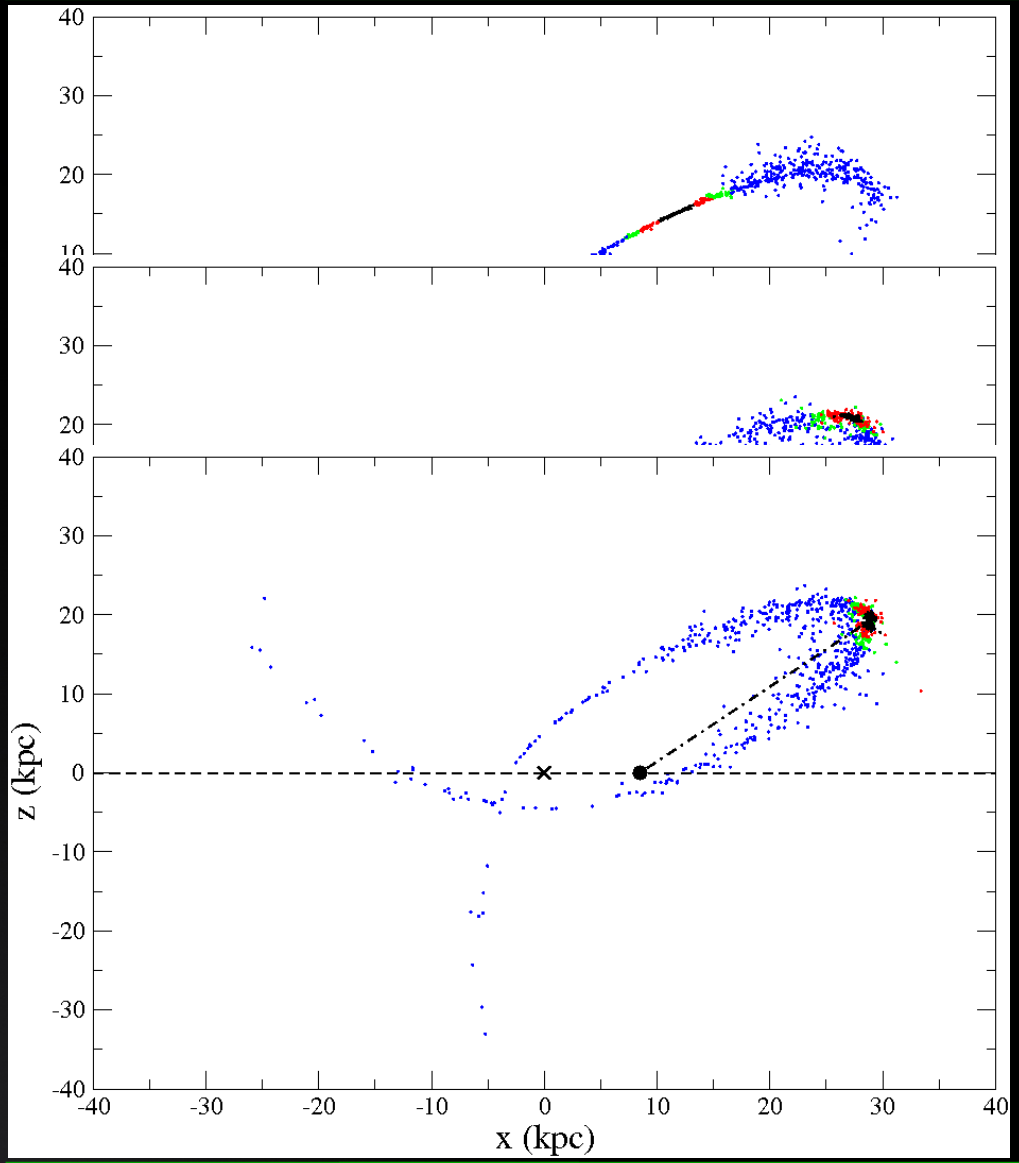
Smith et al. (submitted)

Projected Velocity Dispersions



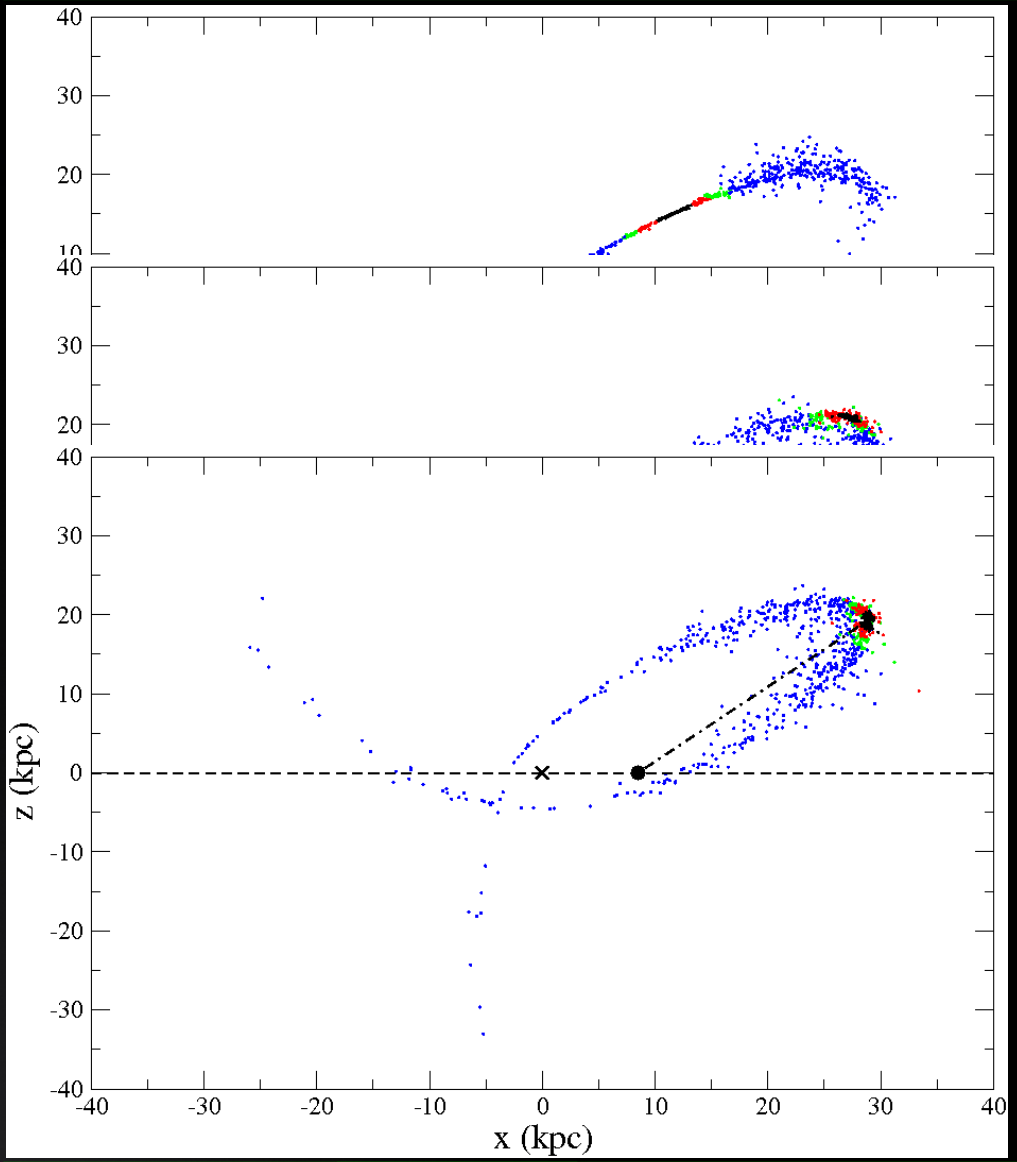
Smith et al. (submitted)

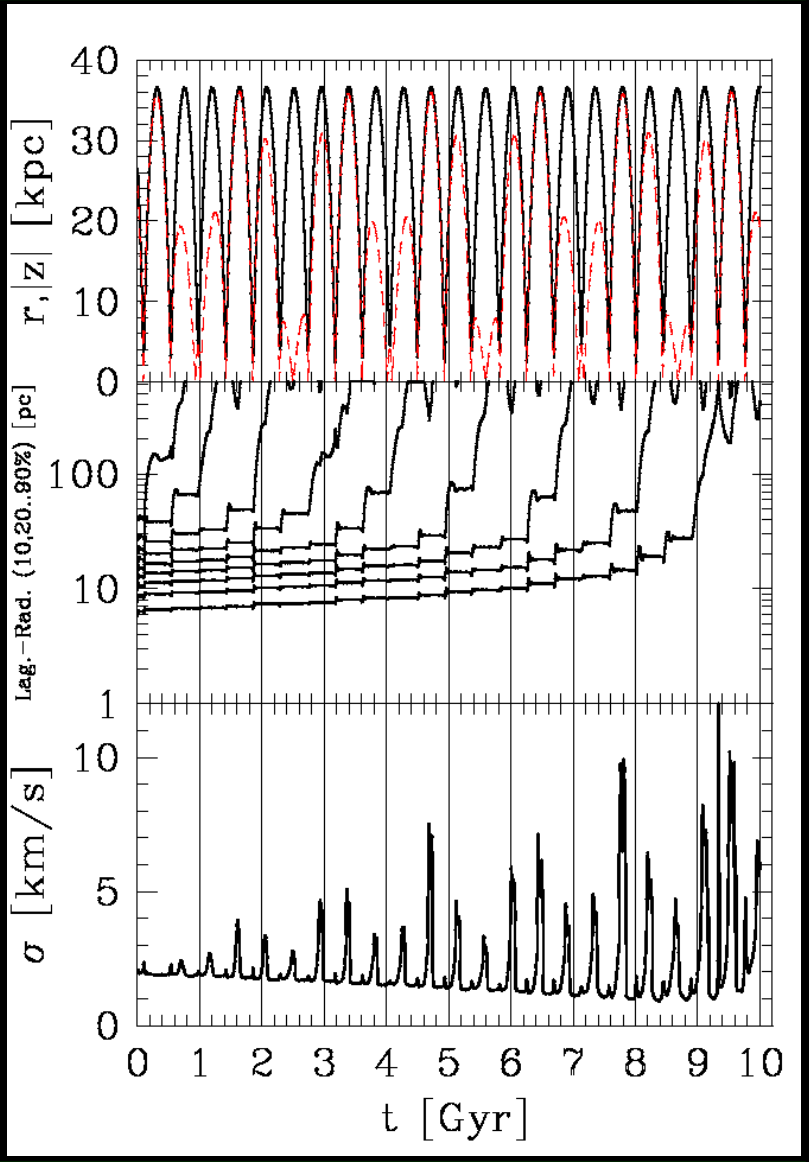
Projected Velocity Dispersions



Smith et al. (submitted)

Projected Velocity Dispersions

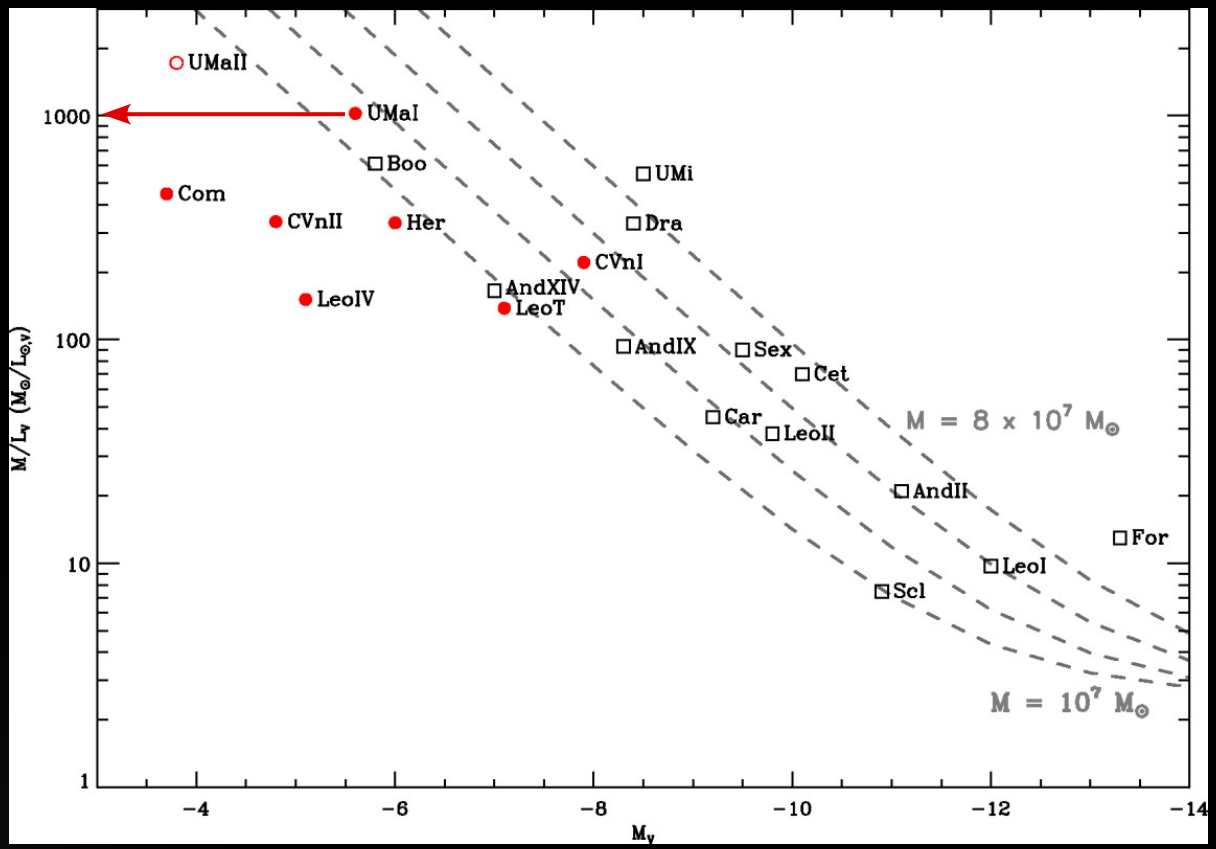




Smith et al. (submitted)

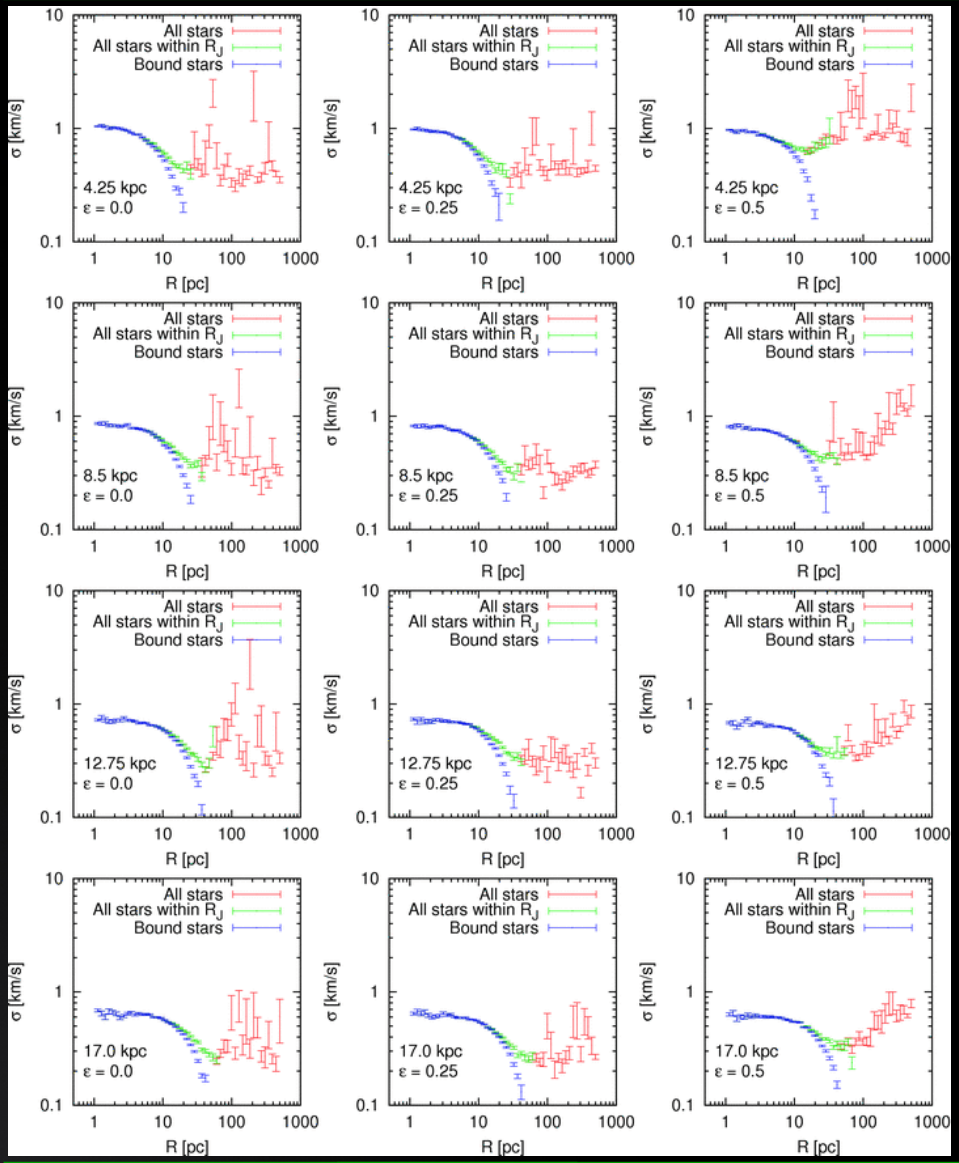
Projected Velocity Dispersions

$M/L_V \sim 1000$

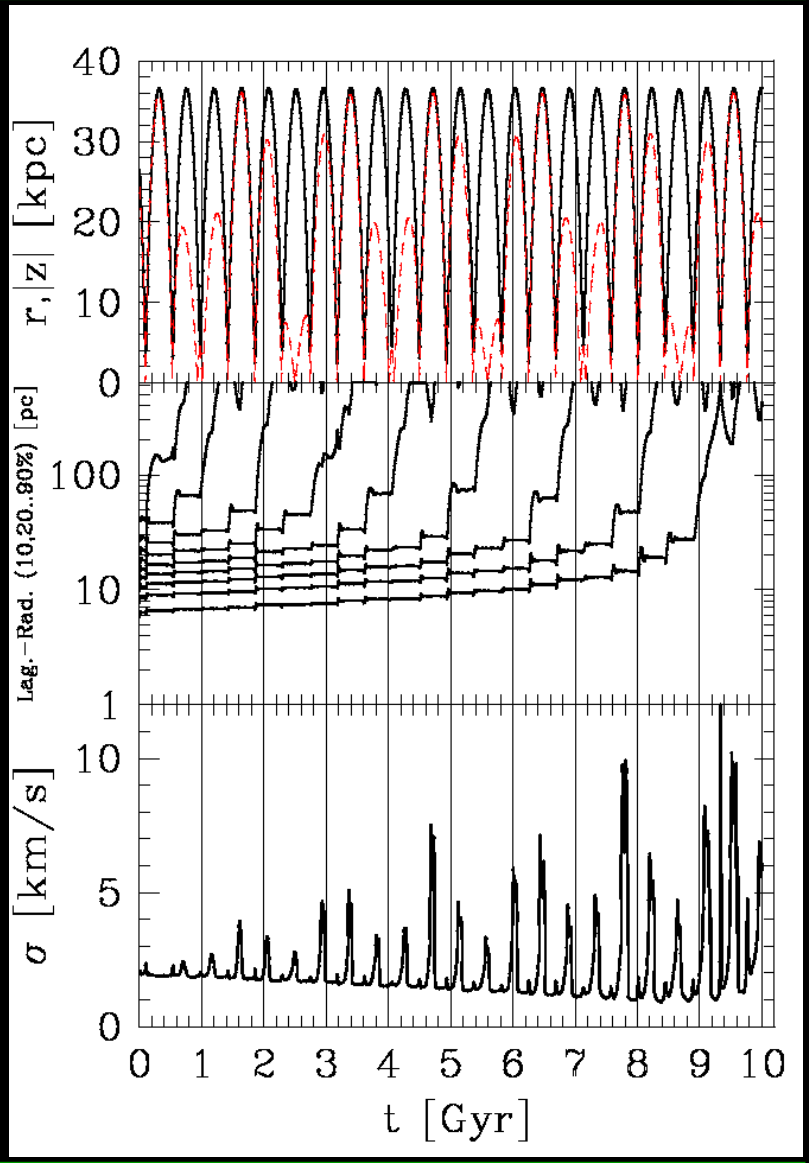


Simon & Geha (2007)

Projected Velocity Dispersions



Küpper et al., (2010)



Smith et al. (submitted)

Conclusions/Summary

A projected velocity dispersion profile is an interesting, but dangerous, animal which should be handled with care

Conclusions/Summary

A projected velocity dispersion profile is an interesting, but dangerous, animal which should be handled with care

- If our results and the Smith and Küpper simulations are correct, then:

- Except for the most distant globular clusters, the velocity dispersion profile tells us very little, if anything, about deviations from Newtonian gravity, and

- It gives us some information about the M/L of low-mass stellar systems, but we should not be surprised if our assumptions about these objects being in equilibrium are incorrect, and in this case the dynamical M/L will be inflated, especially at apogalacticon