Observations of the dark and luminous mass profiles of LRG environments

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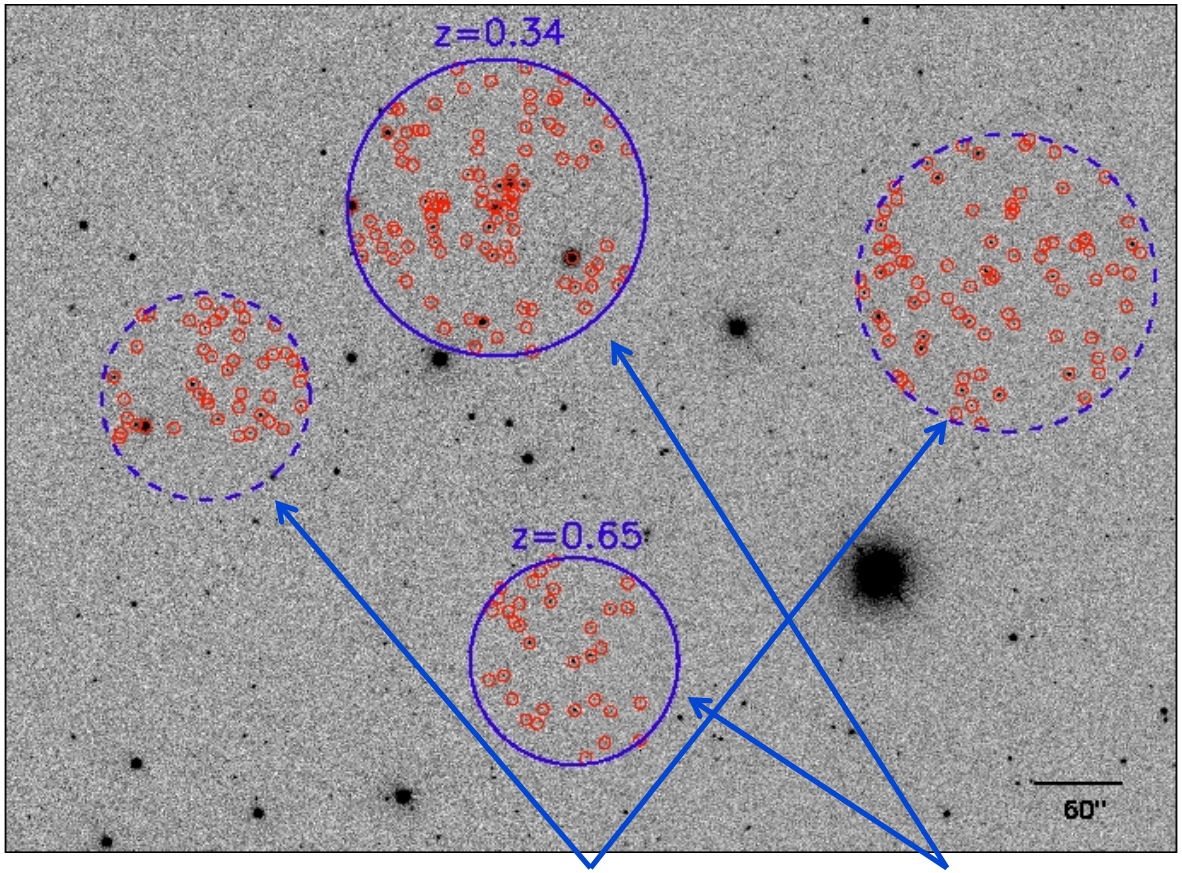
Statistical derivation of LRG properties

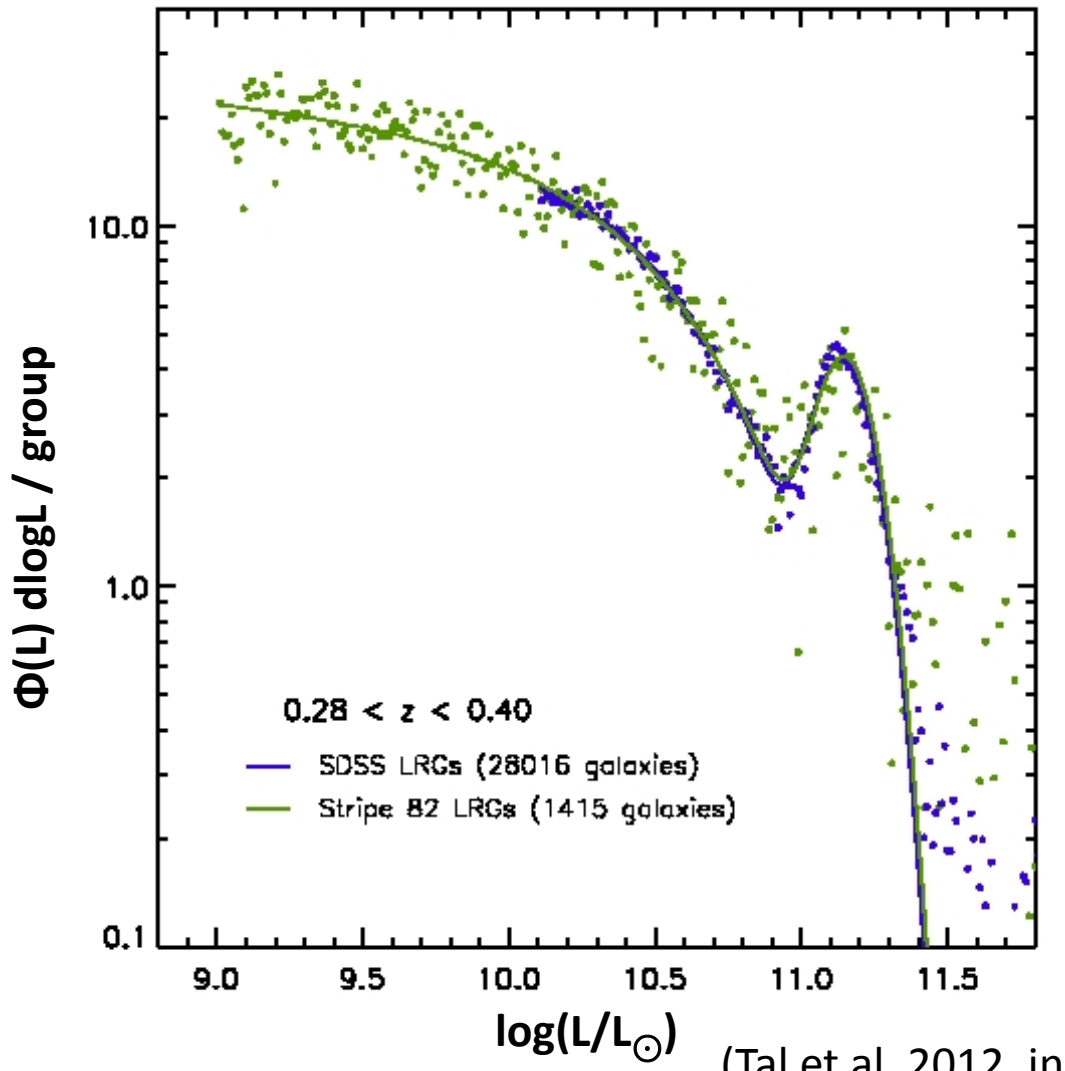
- Detect all objects in 500 kpc apertures around each LRG
- Low detection threshold
- Repeat in randomly selected positions within the same SDSS imaging fields



(Tal et al. 2012, in press)

Luminosity function of LRG satellites

- Using SDSS, BOSS, Stripe 82 data we constrained luminosity functions of satellite galaxies around LRGs at z=0.34, z=0.65

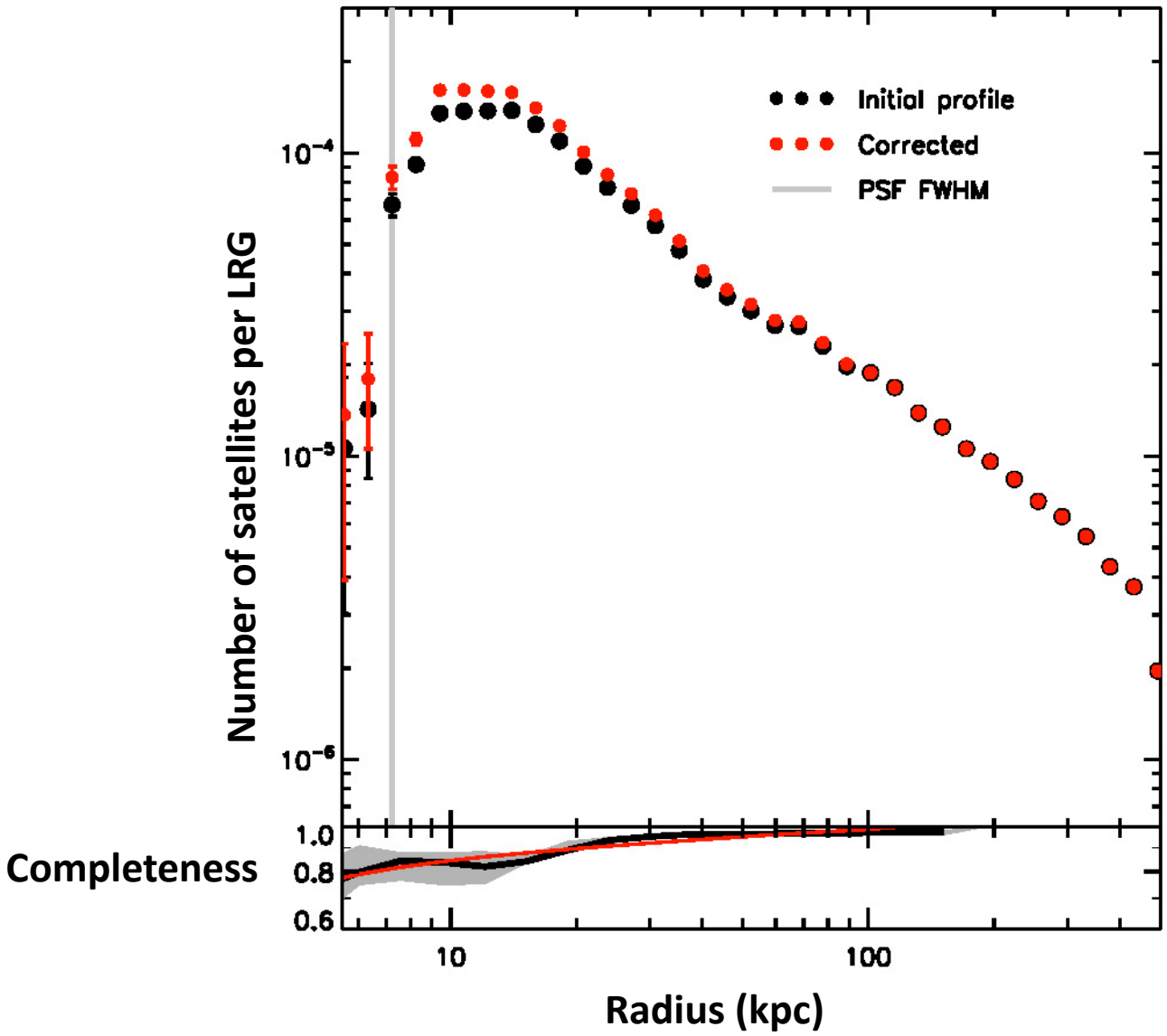


(Tal et al. 2012, in press)

Radial distribution of satellites

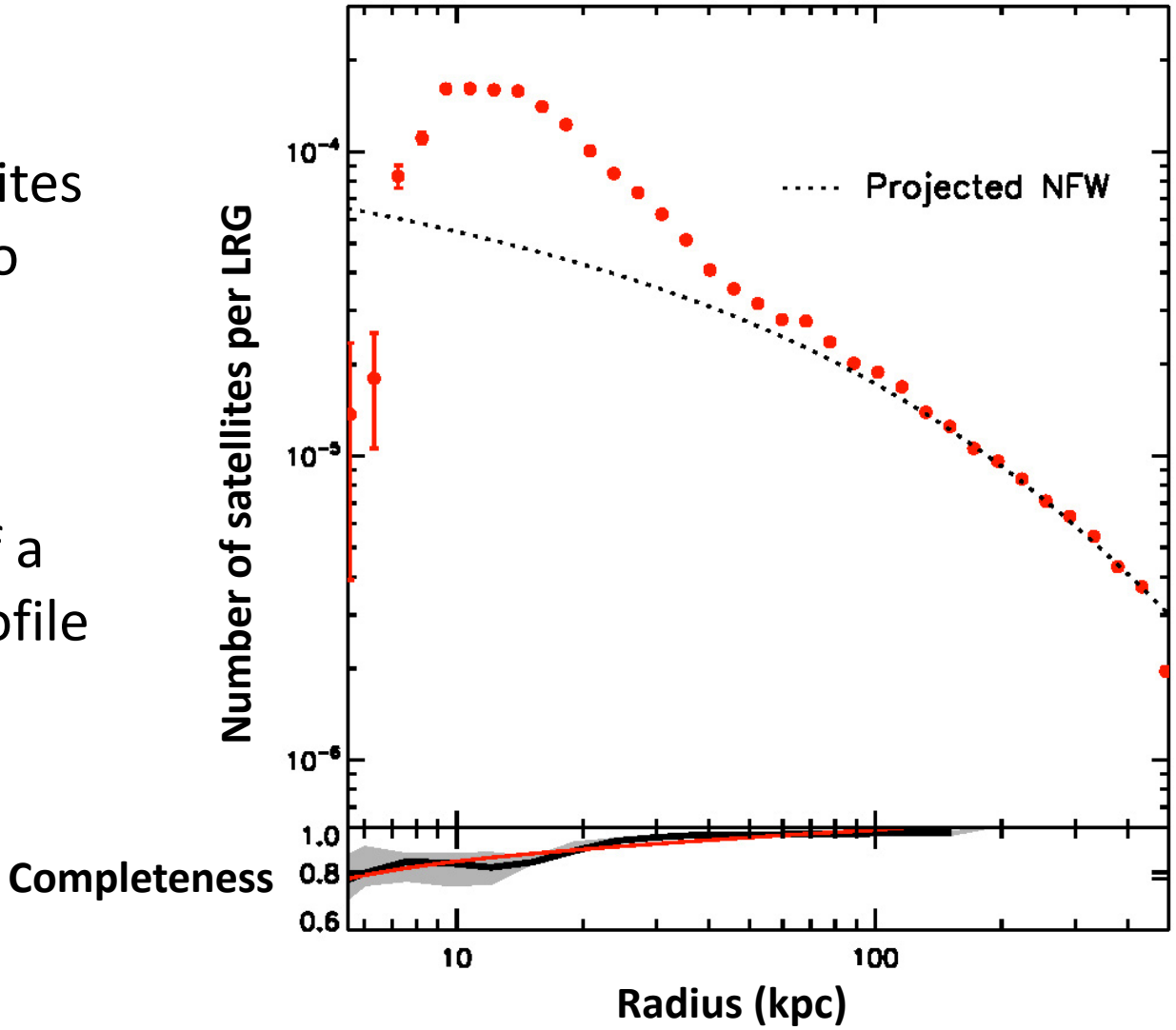
- Can similarly (statistically) extract other properties of LRG satellites
- Example – projected radial distribution
  - Subtract LRG model fit
  - Measure projected distance to all detected objects in LRG-centered apertures
  - Repeat in randomly positioned apertures
  - Subtract contribution of unassociated sources

Radial distribution of satellites

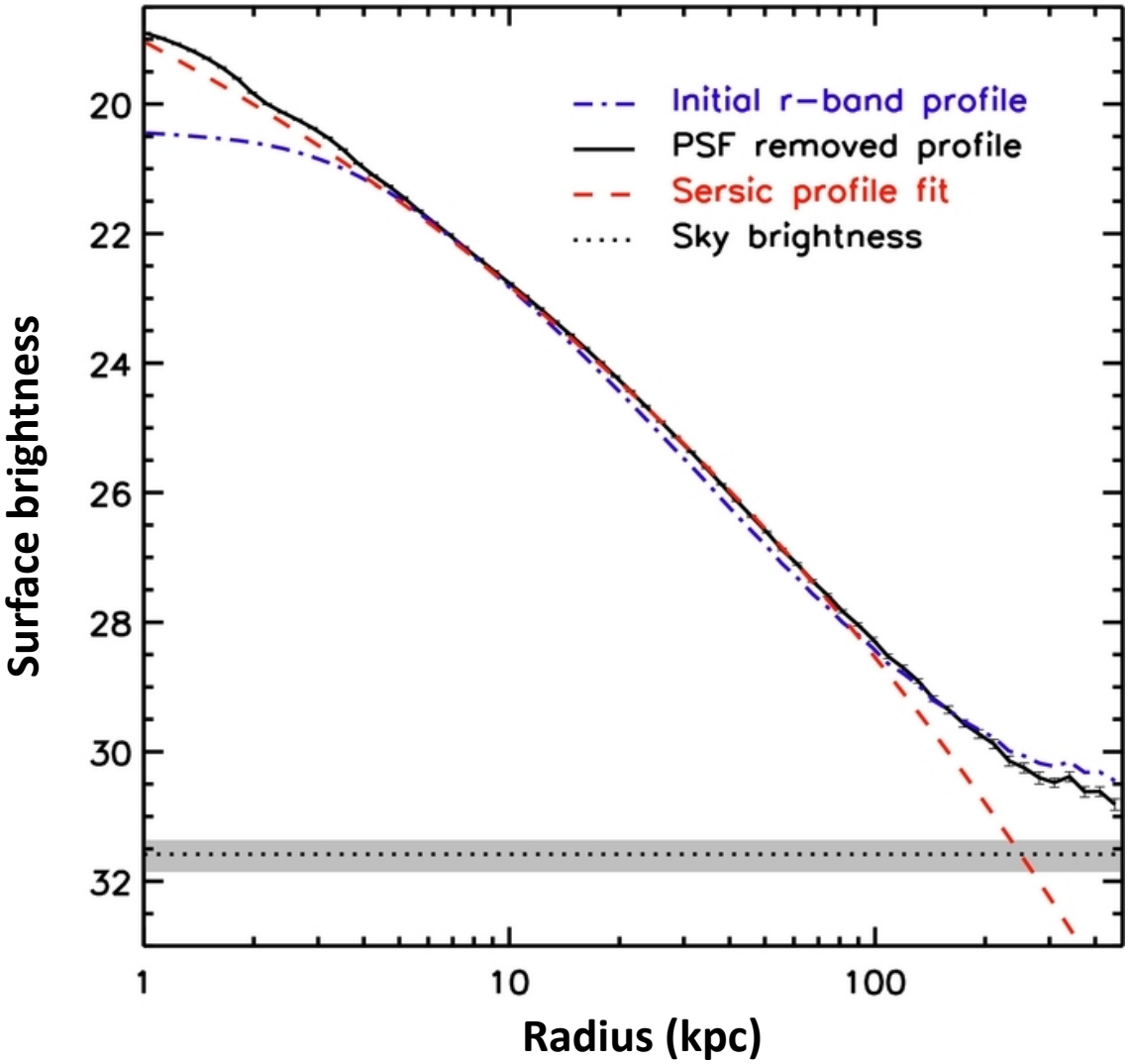


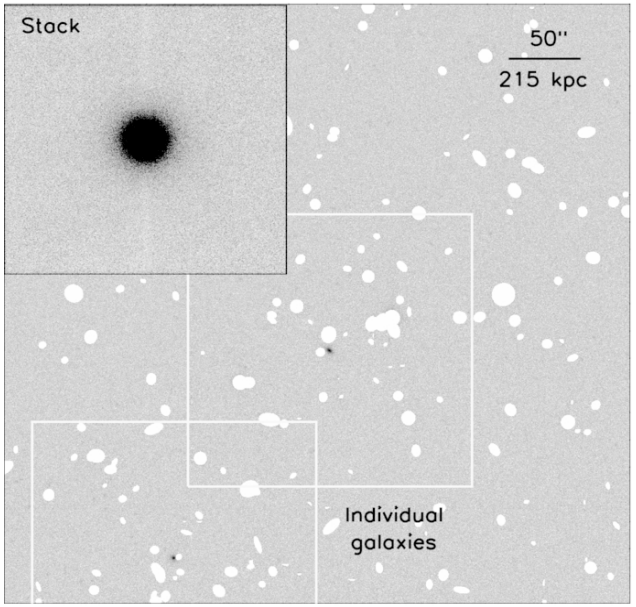
Satellite galaxies as tracers of mass

- Assume that satellites are test particles to trace gravitational potential
- Fit any variation of a projected NFW profile



Stellar light profile



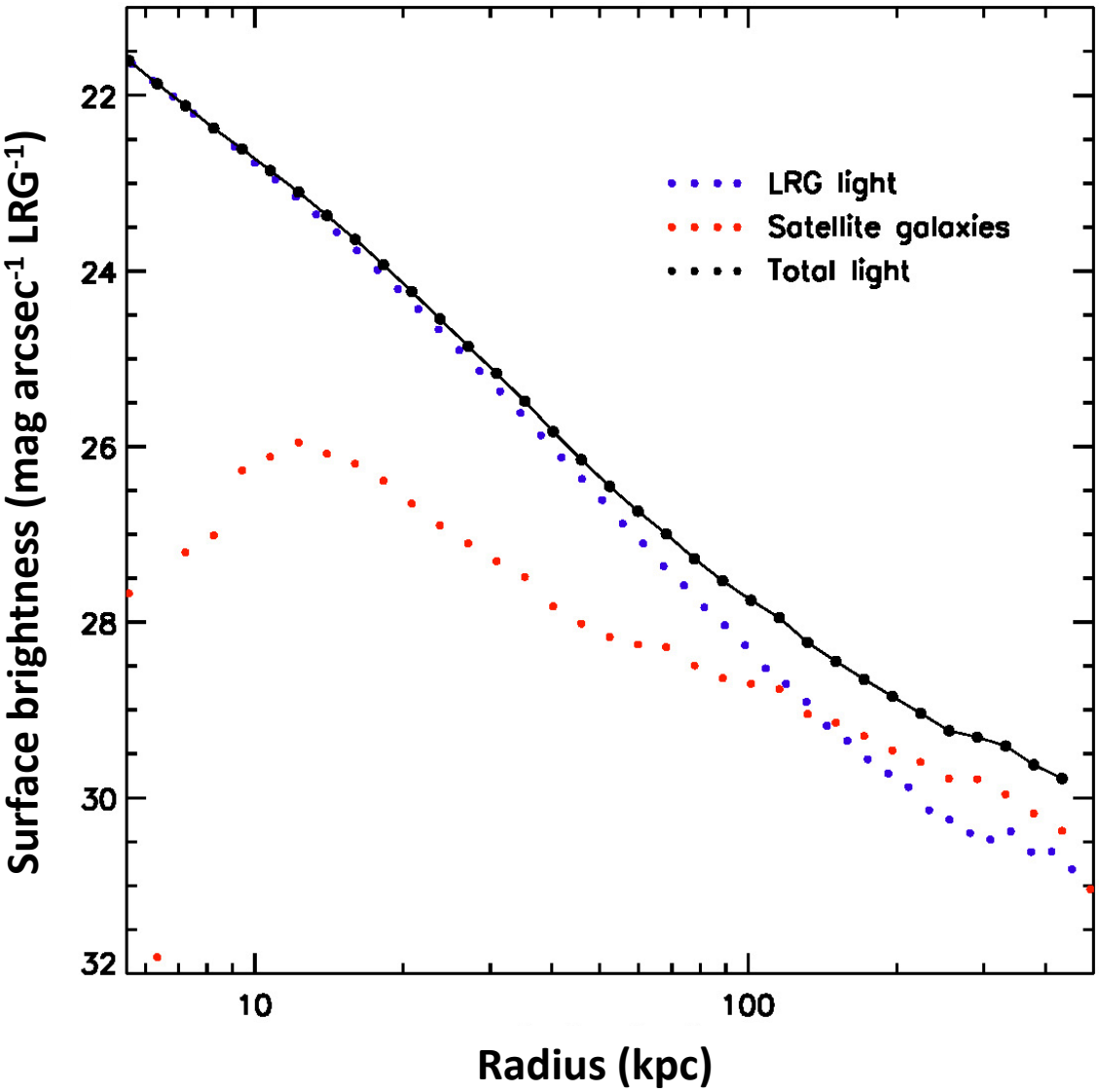


Taken from a stack of >40k LRG images at same redshift

(Tal & van Dokkum 2011)

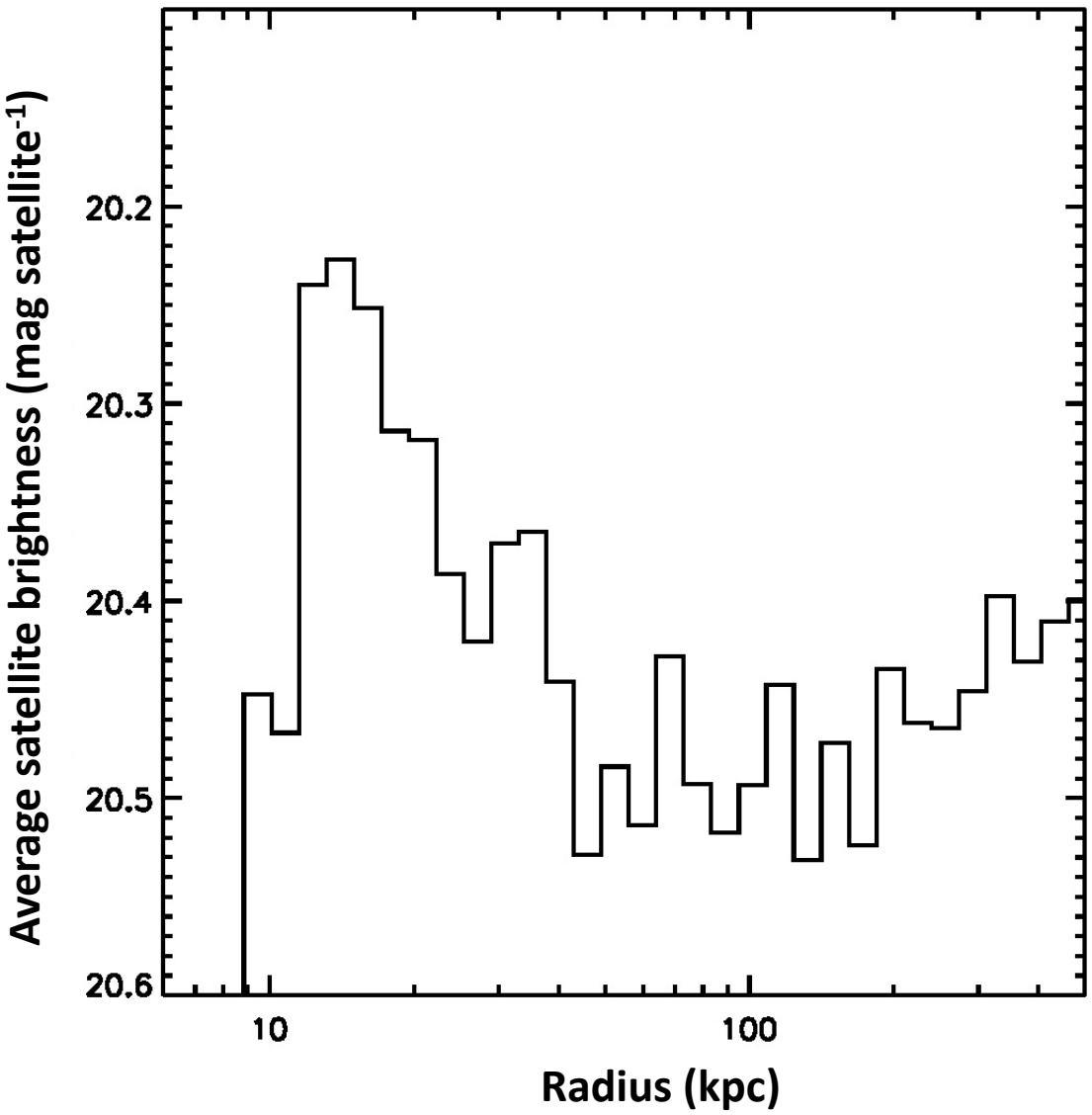
How much light is in the satellites?

- At r<80 kpc most of the light is in LRG stars (and profile well fitted by a single Sersic model)
- At r>100 kpc most of the light in the environment is in detected satellites

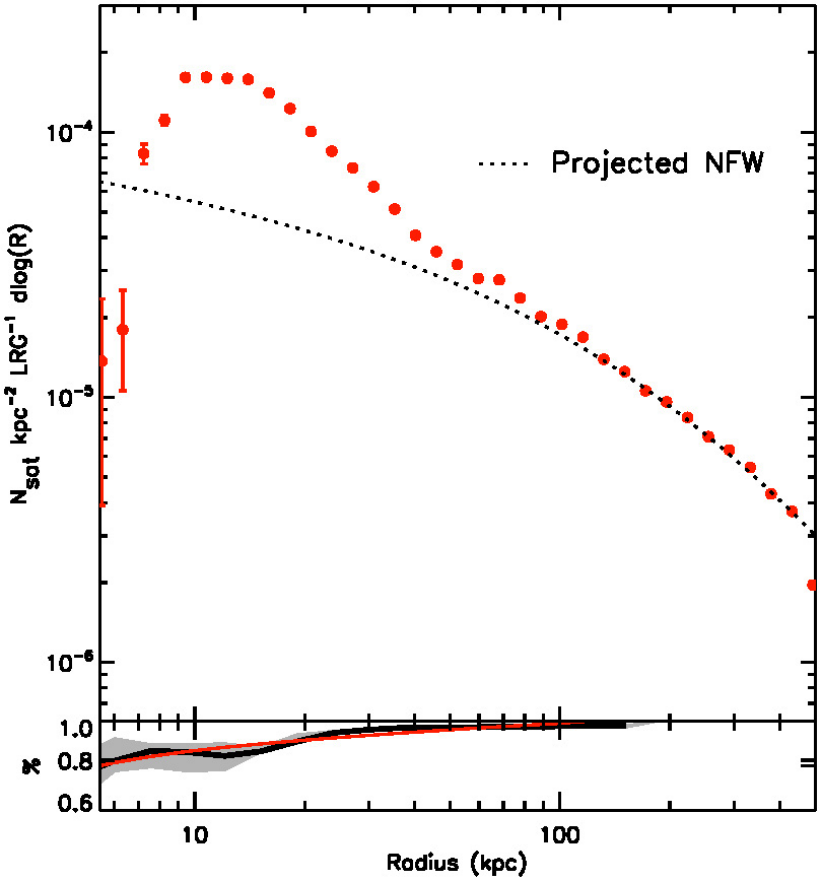


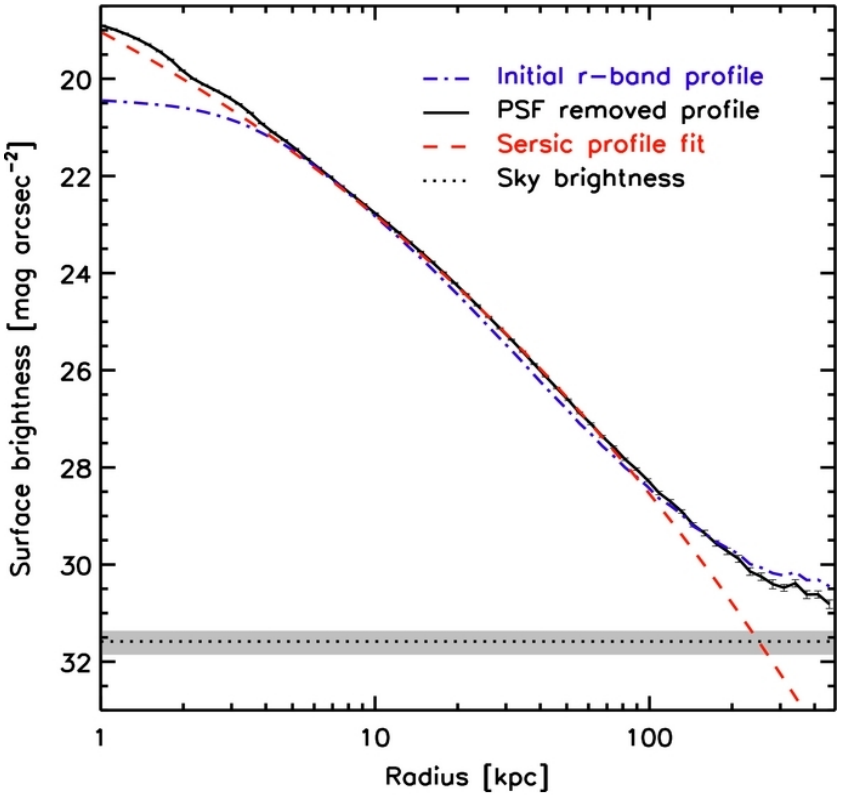
Mass segregation?

- More luminous (massive) satellites are found closer to the LRG (environment center of mass)
- Evidence for mass segregation (through dynamical friction) in galaxy groups



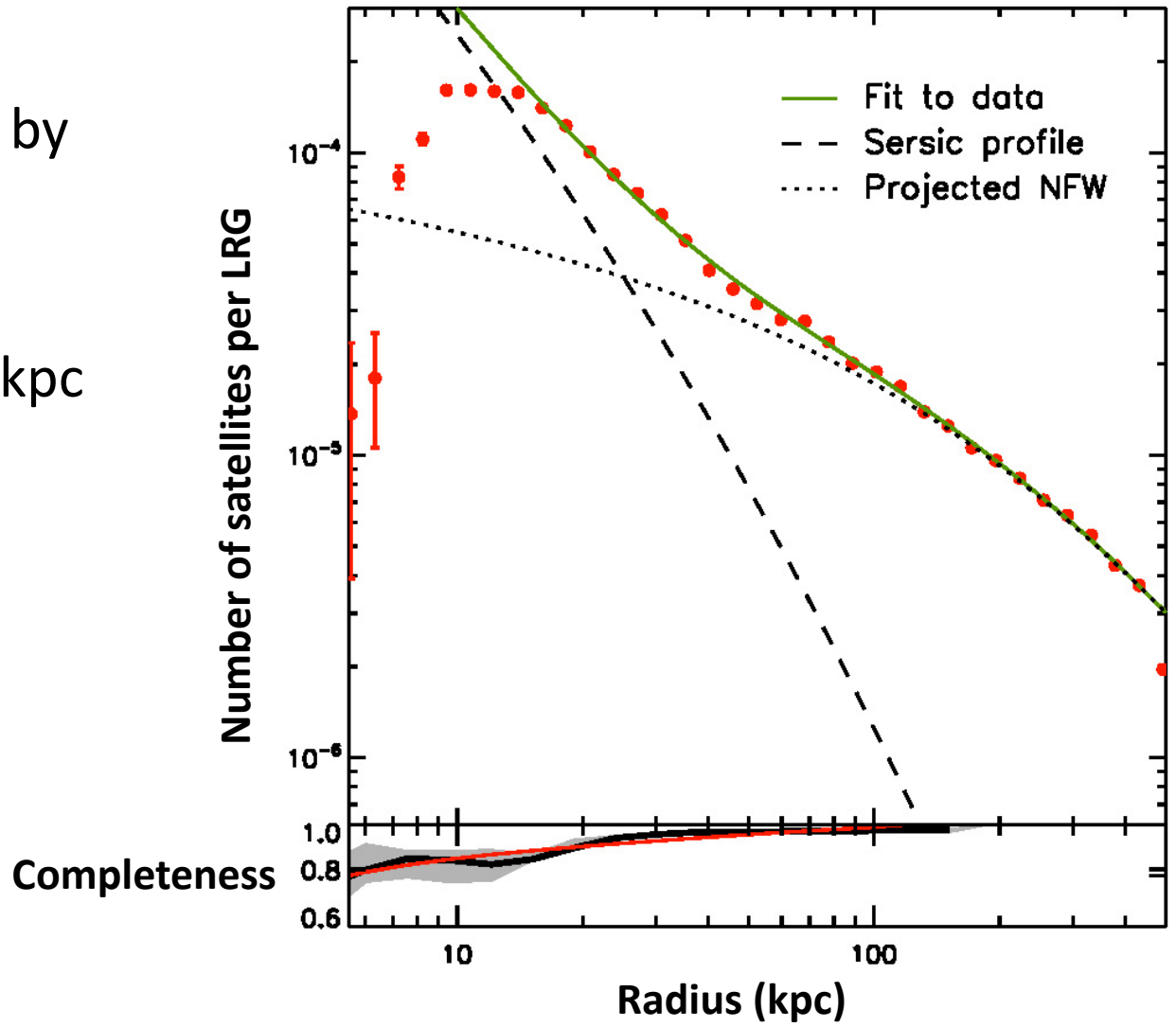
Luminous and dark mass profile





Overall gravitational profile

- Profile well fitted by NFW+Sersic
- Stars dominate potential at r<25 kpc
- DM dominates at large radii



Summary

- Statistical derivation of satellite galaxy properties
- Satellites as tracers of the gravitational potential
- Not well fitted by projected NFW at small radii
  - Better fitted with an additional stellar mass contribution