The ALHAMBRA Survey: Evolution of Galaxy Clustering Segregation

ALHAMBRA SURVEY

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We select the galaxies satisfying:

-$I < 24$ (F814W Hubble filter).

-Four redshift bins: $[0.35, 0.6]$, $[0.6, 0.8]$, $[0.8, 1.0]$, $[1.0, 1.25]$

-Star-galaxy separation

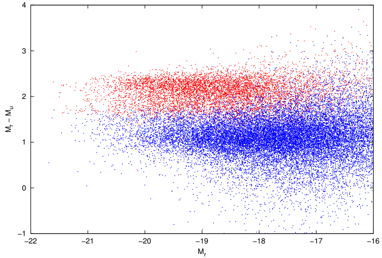
The final catalogue used contains a total of 174.633 galaxies. Which represents a global density of $\bar{n} = 15.63 \cdot 10^{-3} h^3 Mpc^{-3}$.

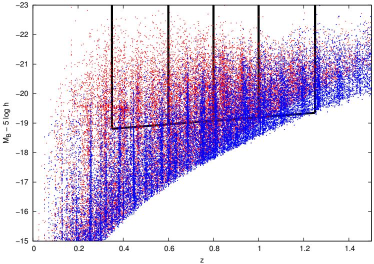
Sample selection

-Luminosity threshold: $M_B(z) - 5 \log h < -18.6 - 0.6z$

-Spectral segregation using BPZ spectral template:

Early and Late-type galaxies



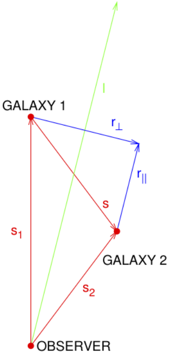


The projected correlation function is a variation of the two points correlation function $\xi(r)$ devised by Davis & Peebles (1983) to deal with the redshift-space effects present in spectroscopic samples and it can be used as well to optimize the study of photometric populations. It can be computed as

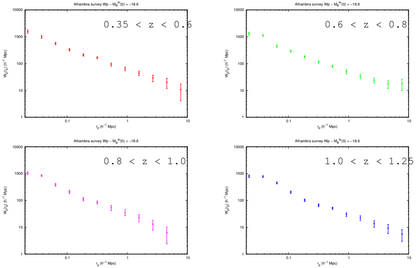
$$\xi(r_\perp, r_{||}) = 1 + \left(\frac{N_R}{N_D}\right)^2 \frac{DD(r_\perp, r_{||})}{RR(r_\perp, r_{||})} - 2\frac{N_R}{N_D}\frac{DR(r_\perp, r_{||})}{RR(r_\perp, r_{||})}$$

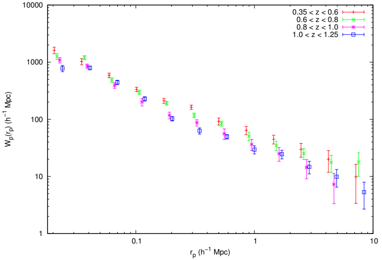
where N_D is the number of galaxies and N_R is the number of random points ($N_R = 20N_D$) used in the calculations. The functions DD, RR and DR are the number of pair between galaxies, random points or crossed pairs at a distance given by vectors r_p and π as indicated by the figure. Now we can integrate to obtain

$$w_p(r_\perp) = 2\int_0^{\pi_{max}} \xi(r_\perp, r_{||}) dr_{||}$$

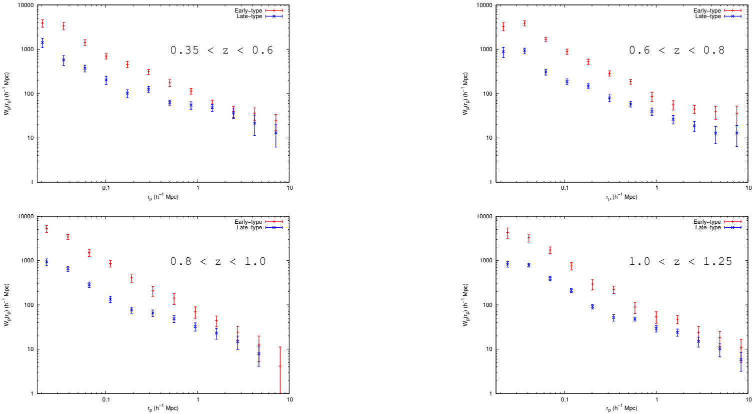


Evolution of galaxy clustering $0.02h^{-1}$ Mpc $< r_p < 10h^{-1}$ Mpc.





We can see how at high redshift the W_p function shows a break point around $r_p \sim 0.2h^{-1}$ Mpc. For shorter distances the curve presents a higher slope, creating two different branches, the One-halo and the Two-halo term. Then, the slope γ decreases monotonically until redshift $z = 0.5$ when both branches match into the usual power law (A cosmic coincidence: the Power-Law galaxy correlation function, Watson, Berlind & Zentner (2011)).

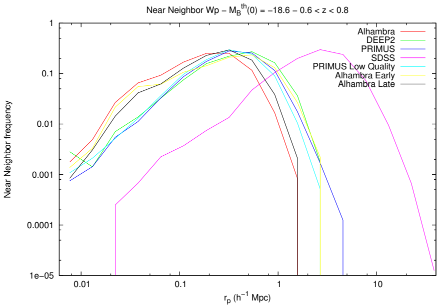


Evolution of galaxy clustering for segregated populations. As it is known, Early-type galaxies have a strong clustering, but we can clearly see as well the effect of the one-halo term and the two-halo term in the Late-type galaxies, probably due to their tendency to cluster in lower mass halos with smaller virial radii (Seljak 2000).

The projected correlation function $W_p(r_p)$

Telescopes... and microscopes!

ALHAMBRA allows us to extend our work over distance ranges never studied before. Due to its high galaxy number density, the number of galaxy pairs at distances below $0.1h^{-1}$ Mpc is high enough to show us the shape of the projected correlation function in the intracluster medium. The near-neighbor distribution shows a higher density of objects at shorter distances for the ALHAMBRA survey compared with other surveys.



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