VOIDS

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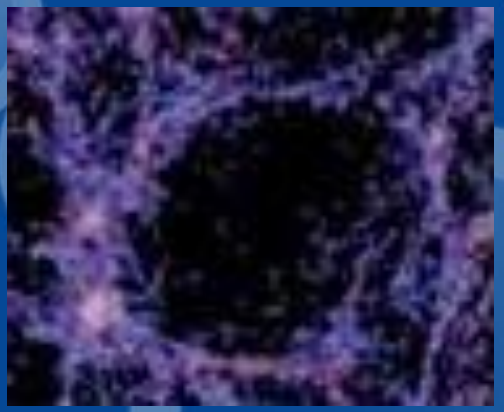
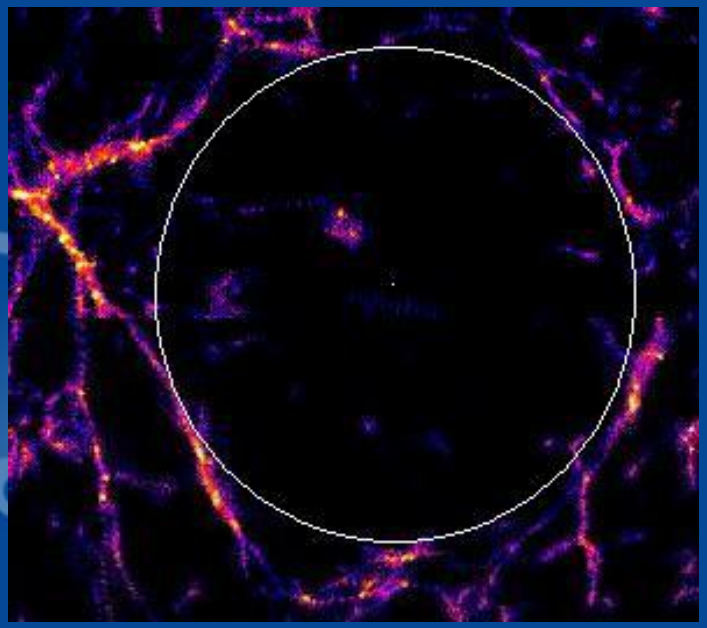
FOF meeting

11th april 2011

Voids:

large scale underdense regions



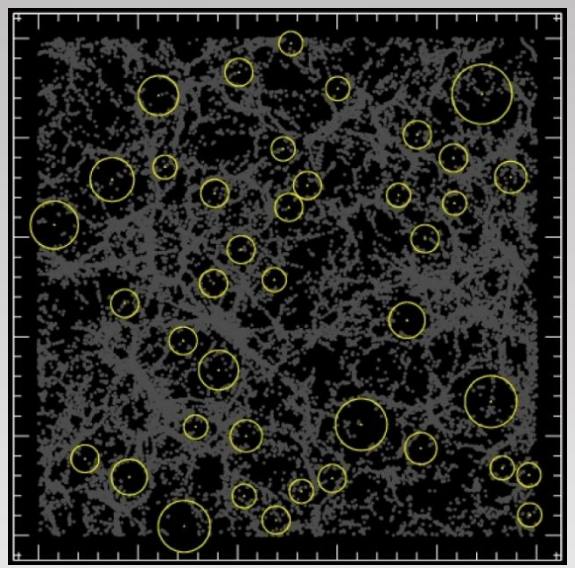


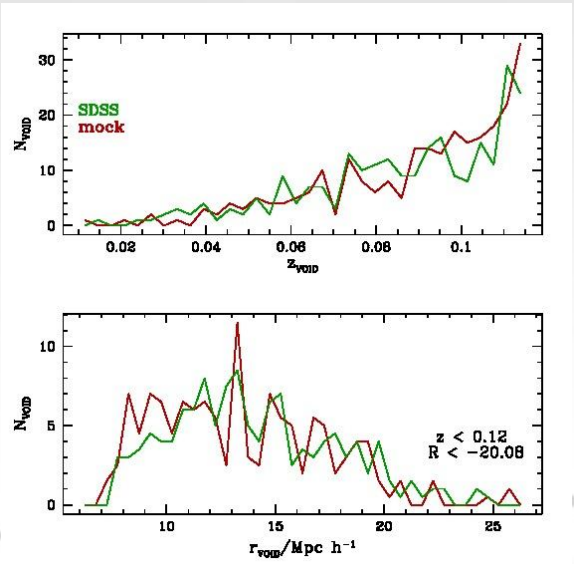
General characteristics

- Density contrast of voids: $\delta < -0.8$
- Extremely low density contrast at void centers
- Wall surrounding the voids
- Roughly spherical shapes
- Sizes of tens of Mpcs

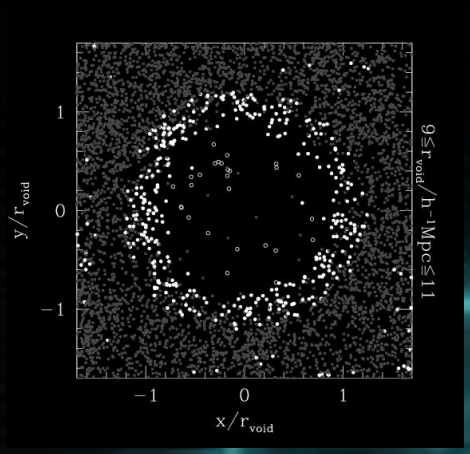
Void finding algorithm

- Select the largest underdense sphere ($\delta_{sphere} < \delta c = -0.9$).
- Eliminate overlapping spheres
- Galaxy surveys ↦ volume limited samples
  - SDSS
  - 2dFGRS

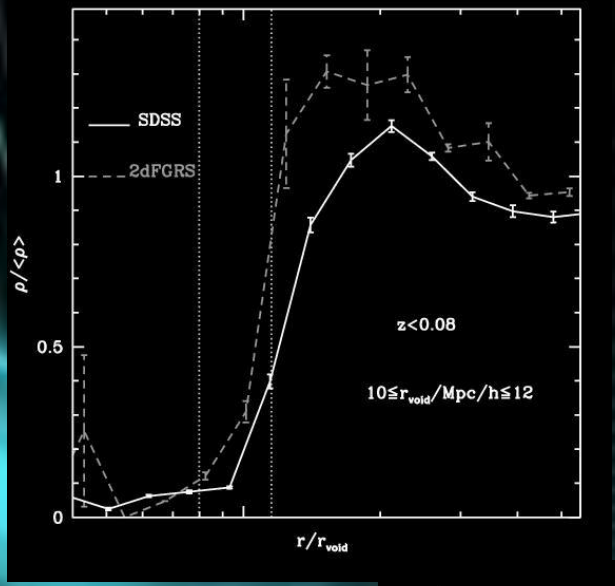




Properties of galaxies in voids and walls



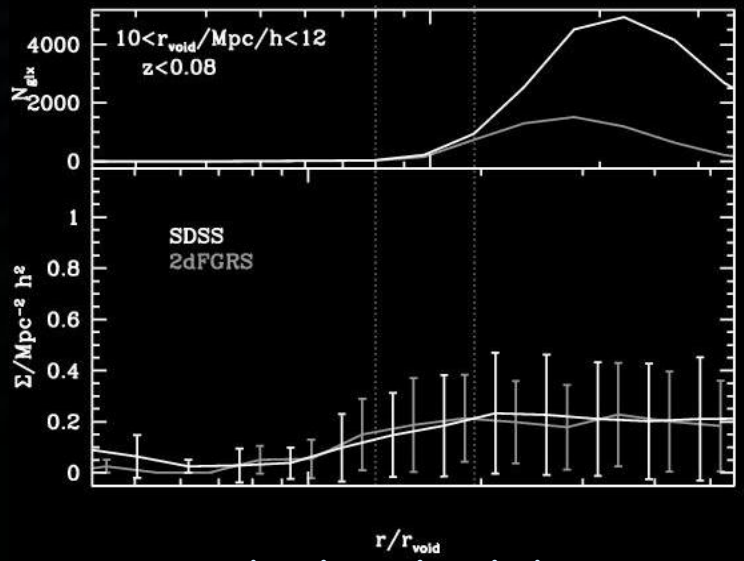
Wall ⇉ $0.8 < r/r_{void} < 1.15$



wall

↓

density increase



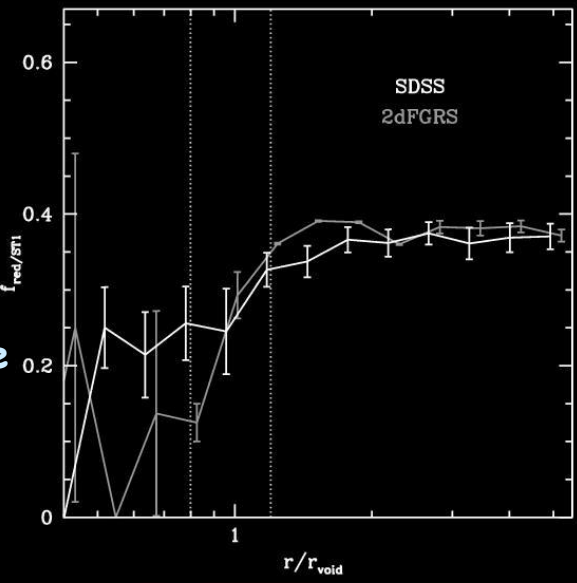
mean projected galaxy local density (d<2.5 Mpc/h, z < 1000 km/s)

- Fraction of SDSS red galaxies

  u-r>2.2

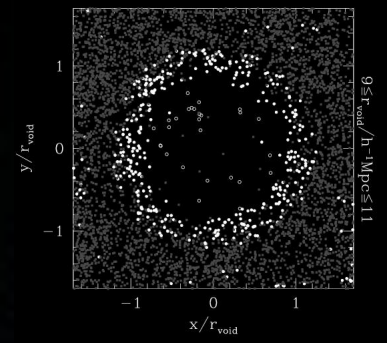
Fraction of 2dFGRS type 1 galaxies

η <-1.3



Ceccarelli, Padilla & Lambas, 2008

Wall vs field

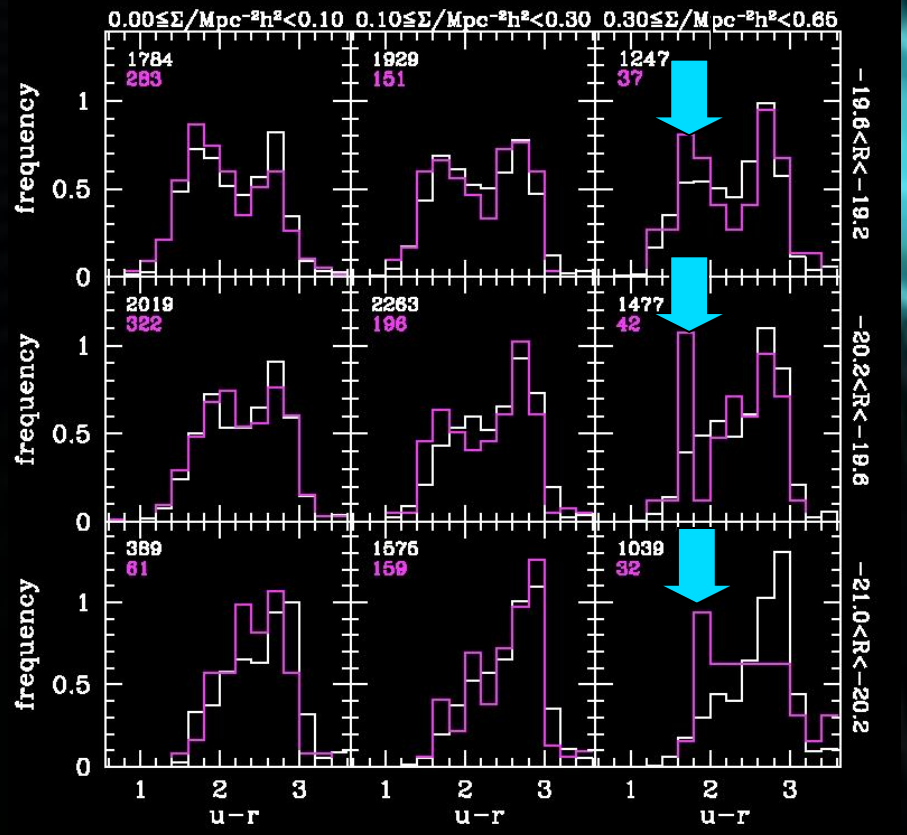


walls

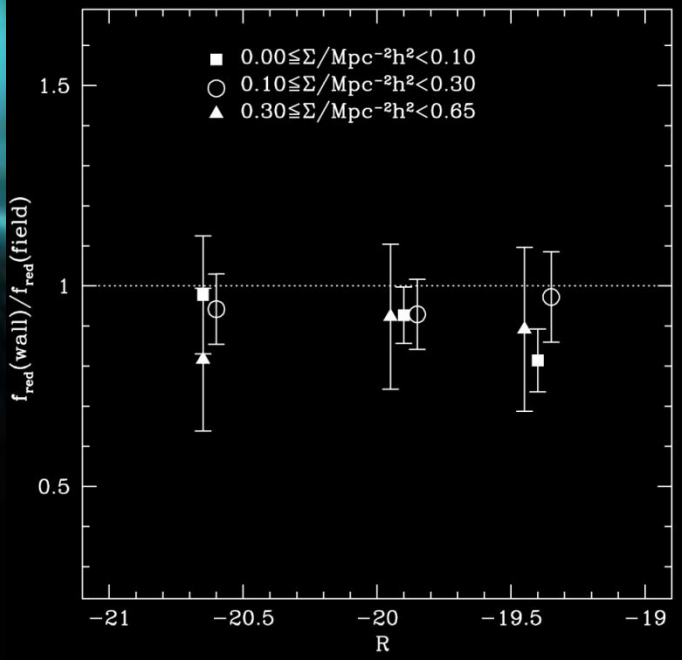
$0.8<r/r_{void}<1.15$

field

$1.8<r/r_{void}<3$



Red Galaxy Fraction as a Function of Luminosity and Local Density

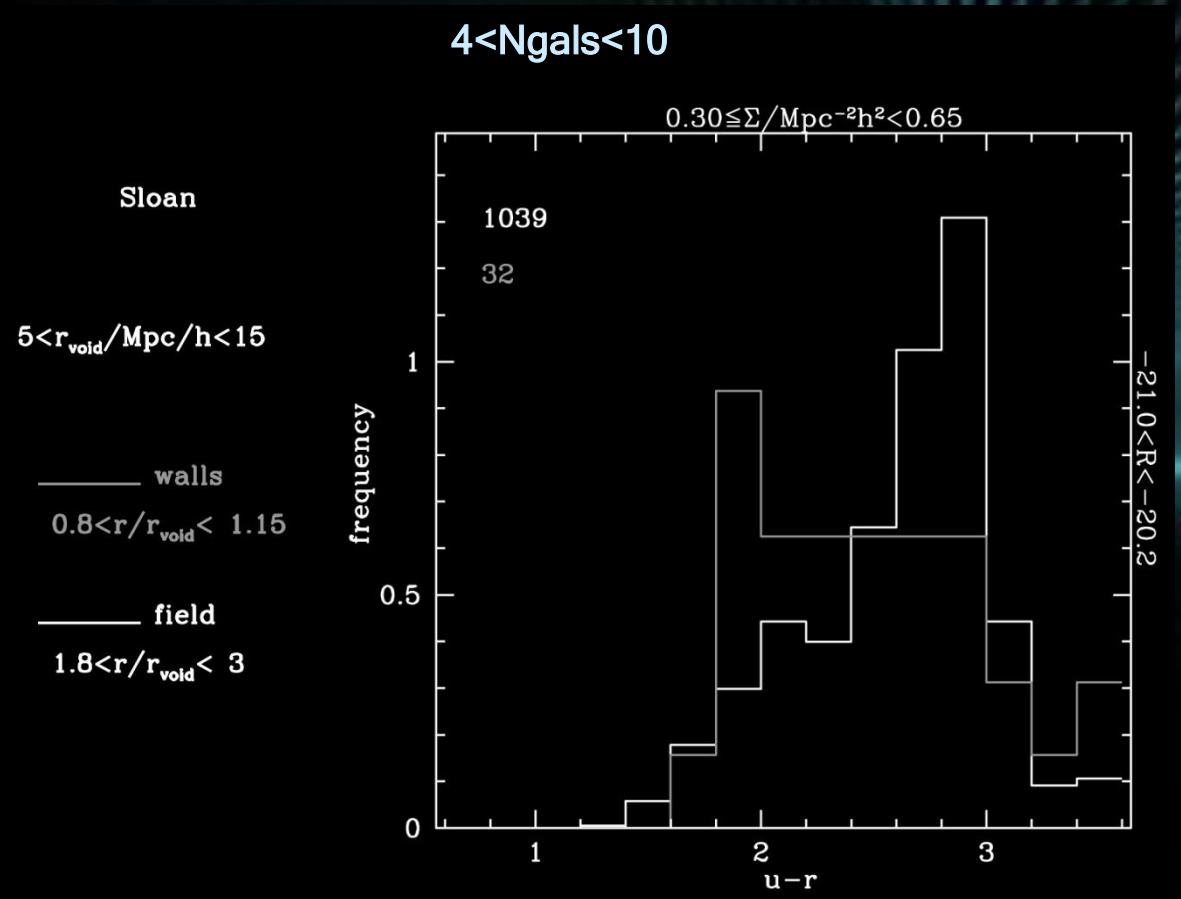


Fraction of gals with u-r>2.2

Ceccarelli, Padilla & Lambas. 2008.

Wall galaxies in groups

High luminosity galaxies in groups.



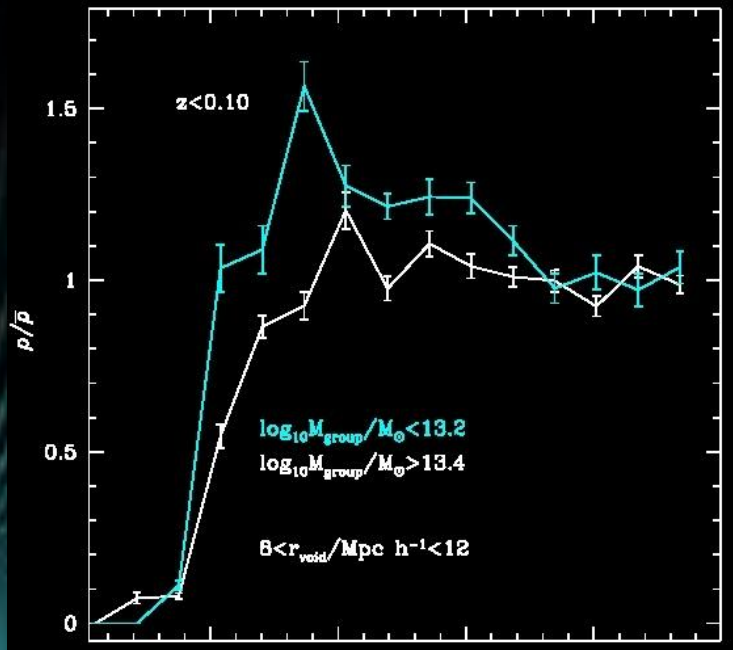
Comparison: wall-galaxies bluer than field galaxies

Ceccarelli, Padilla & Lambas. 2008.

Galaxy Groups and Voids

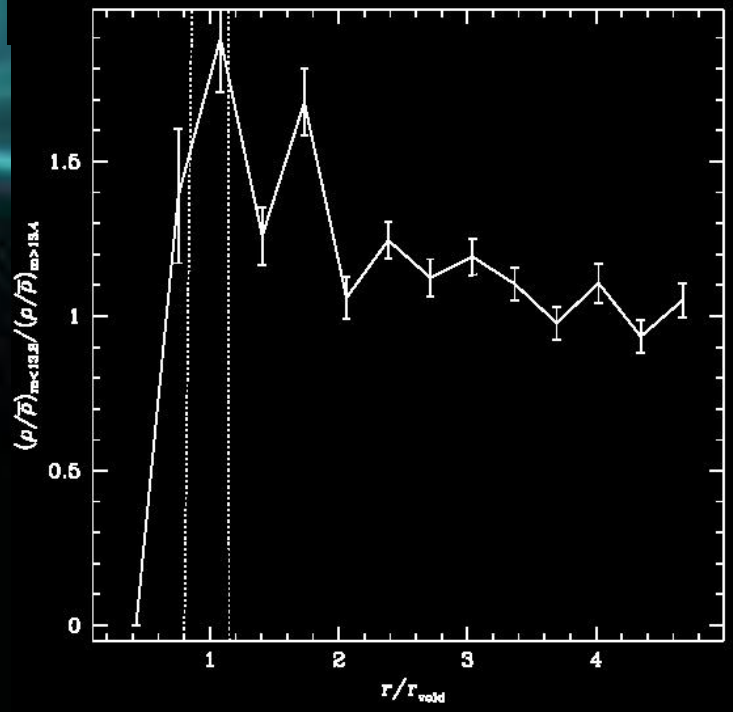
Relative density of SDSS groups as a function of distance to the void centre for different virial mass =

N_gru/<N_gru>



Low-mass groups → higher profile up to 2 r_void

Massive groups → approximately constant profile outside voids

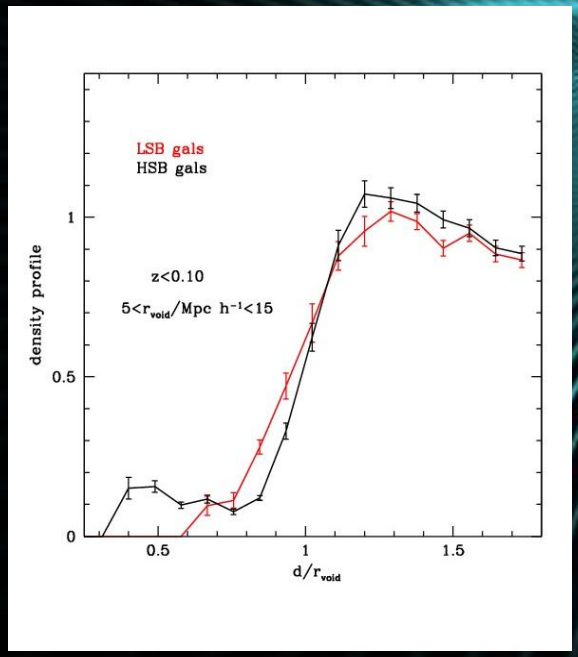


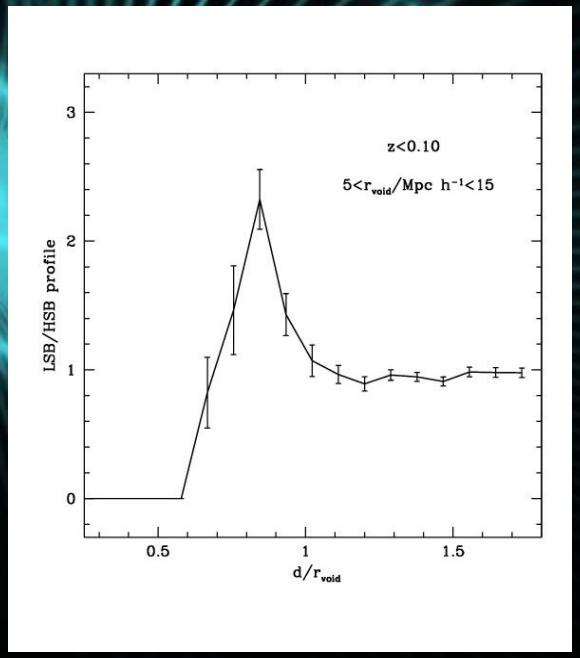
Groups in walls less massive than groups in field

Properties of galaxies in voids

Low Surface Brightness galaxies (LSB) are more isolated than the rest of the galaxies.

Distribution of LSB on the SDSS large scale voids

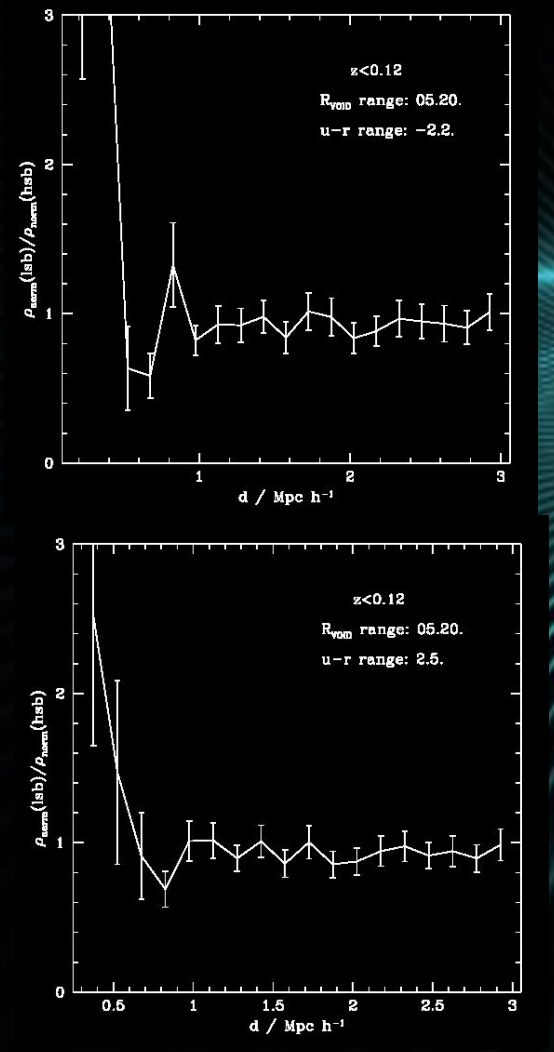




Galaz
Herrera
Padilla
Lambas
Ceccarelli
(work in progress)

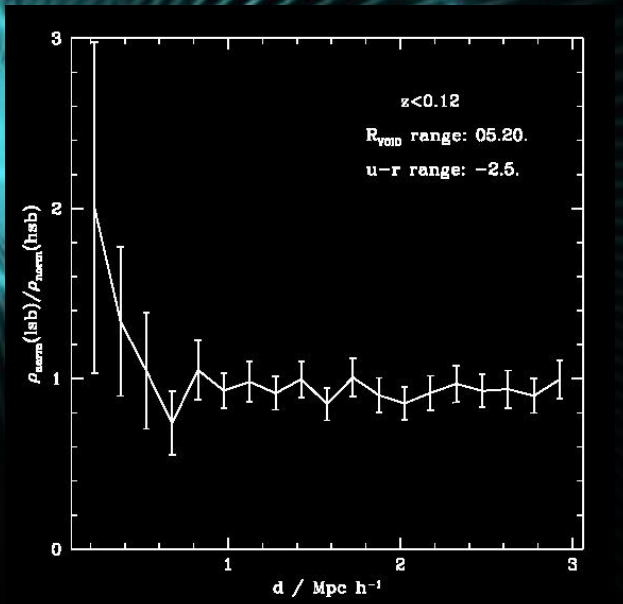
LSB galaxies tend to inhabit void walls, specially the regions just before the void radius.

Properties of galaxies in voids



Relative fraction of LSB and HSB galaxies in SDSS

Fraction of LSB galaxies are higher than HSB galaxies in voids

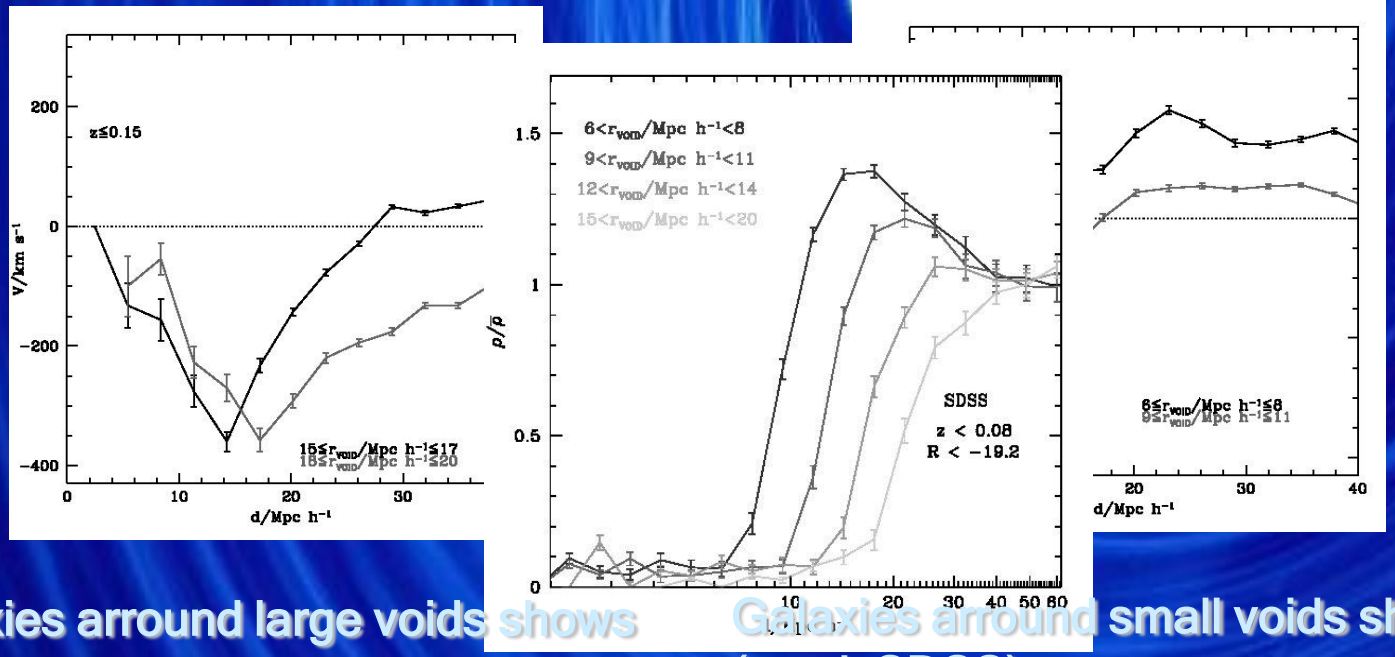


LSB galaxies tend to inhabit void and walls

Void Evolution

Numerical Simulations ⟶ two processes in void evolution

- Expansion
- Collapse



Galaxies arround large voids shows outflowing motions (mock SDSS)

Galaxies arround small voids show infall (mock SDSS)

- Lares, Paz, Ceccarelli, Padilla, Lambas. In preparation.

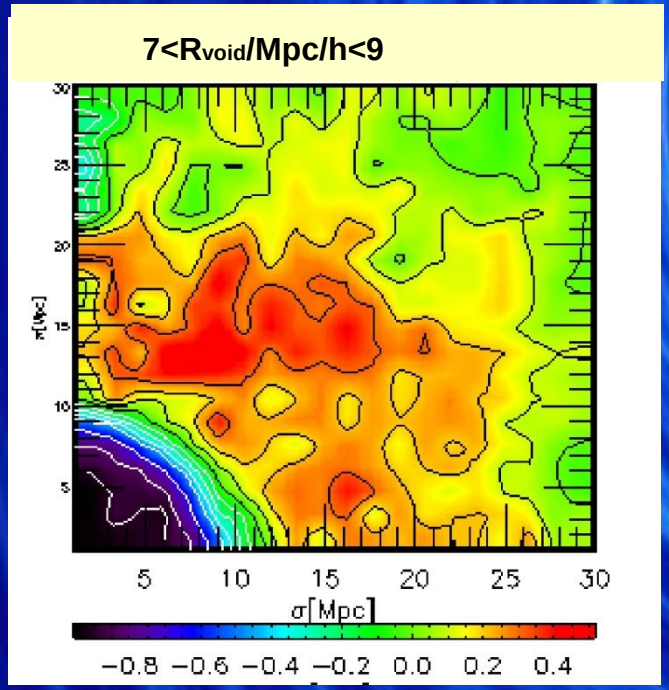
Redshit space distortions ↔ dynamical properties

Iso-contours of the void-galaxy cross-correlation function in the directions parallel and perpendicular to the line of sight (π and σ).

Compression → infall **Elongation→outflow**

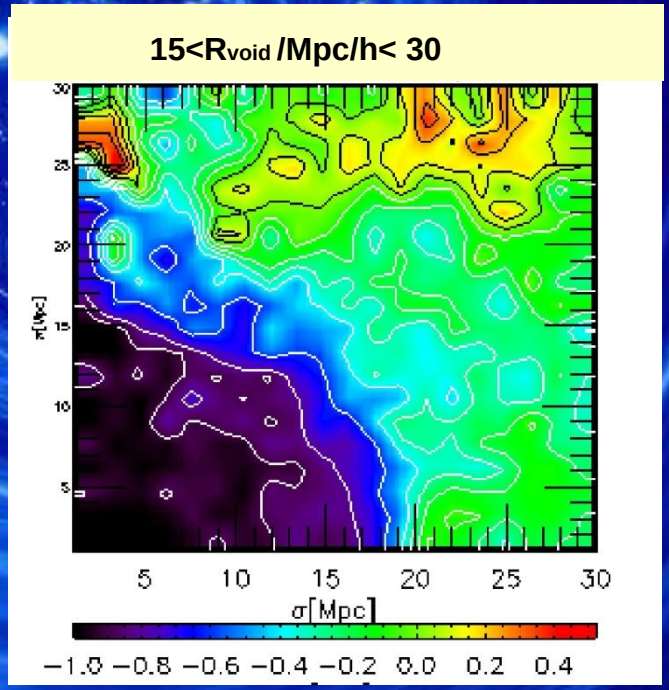
Results from SDSS

7<R_{void}/Mpc/h<9



Distortion pattern consistent with infall

15<R_{void} /Mpc/h< 30



Distortion pattern consistent with expansion

- Lares, Paz, Ceccarelli, Padilla, Lambas. In preparation.

Summary

- Galaxies residing in void walls are systematically bluer than field galaxies, at a given luminosity and local density range.
- Galaxies are subject to a large scale dependent star-formation activity besides the influence of local environment.
- LSB galaxies tend to populate voids and walls.
- Large voids show expansion whereas the outer regiones of small voids are collapsing
- It is also possible that the outflow of barionic particles, as part of the void expansion, inject material in walls causing star-formation activity in wall galaxies.