# The 5th eBOSS-DESI France Joint Meeting

# Effect of galaxy reconstruction on voids

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Other Collaborators : Elena Sarpa, Carlo Schimd

# Voids as cosmological probes

- Voids in the Large Scale Structures have proven to be very multipurpose to constrain cosmology. Prime among the probed are the growth rate of structure and the Alcock-Paczynski test.

- The main source of systematic error in the latter is the redshift-space distortions.

Alcock-Paczynski test
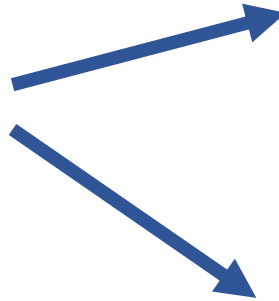
Could be erased by the RSDs
(*Nadathur et al 2019, arxiv:1904.01030)*

Is affected by the RSDs
only if we consider the smaller voids
(*Pisani et al 2016 , arxiv:1506.07982*)

# Voids in reconstructed DR12 Patchy mocks

- On-going project in collaboration with Elena Sarpa & Carlo Schimd (LAM) to test the effect of galaxy reconstruction on voids.

- DR12 Patchy mocks (North) reconstructed using the eFAM algorithm *(Sarpa et al 2019, MNRAS 484, 3818)\**

~ **590 000** galaxies

~ **2200** voids before reconstruction

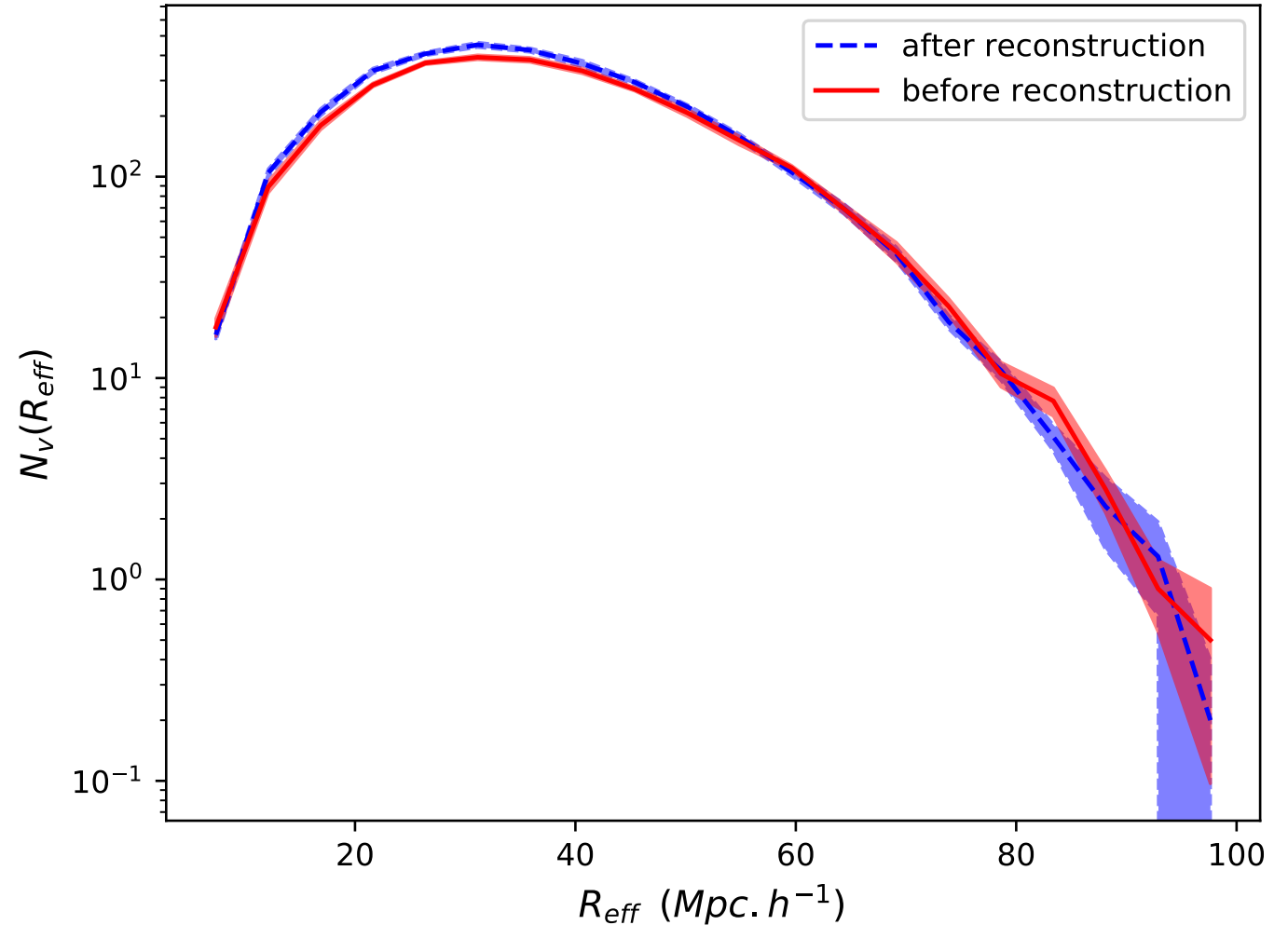~ **2400** voids  after reconstruction

10% increase in voids statistic

* arxiv: 1809.10738

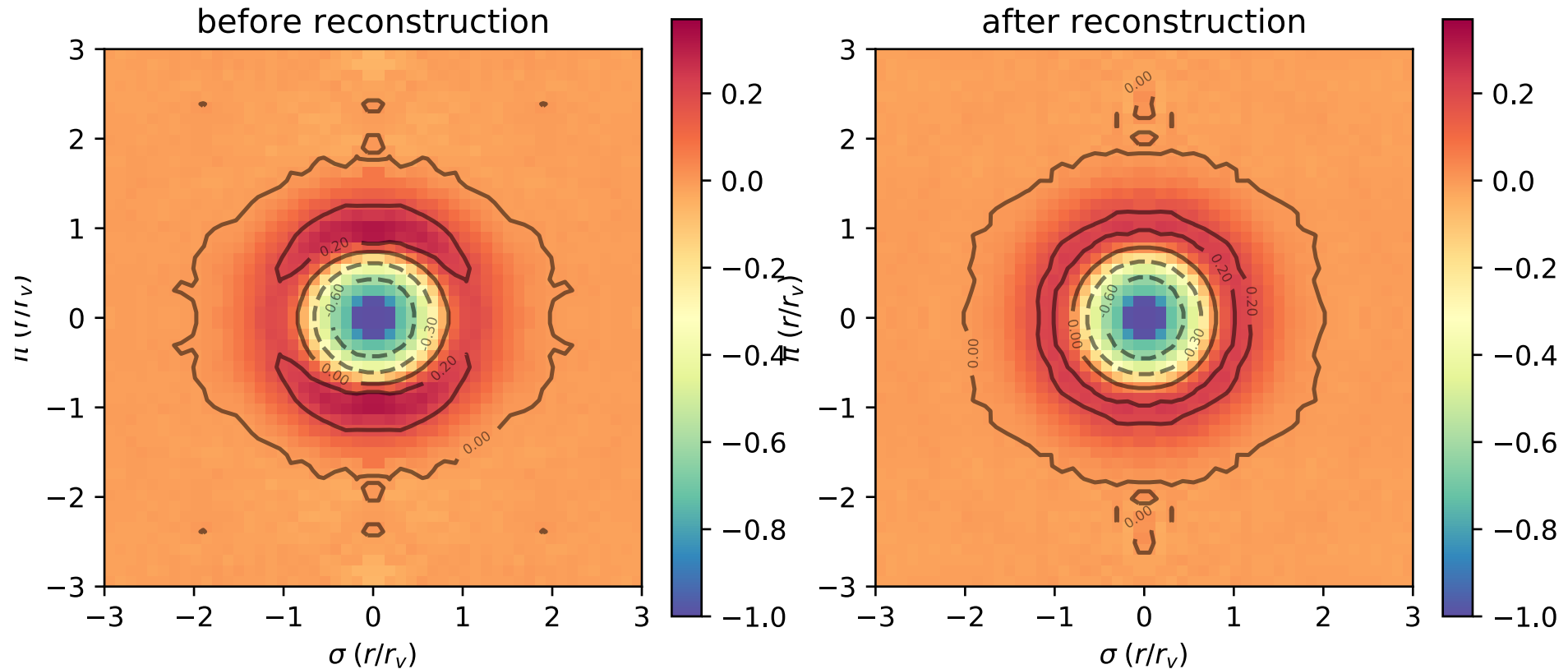# DR12 Patchy – Void abundance

For the same number of galaxies, there is an increase of smaller voids in the reconstructed catalog (15 to 60 Mpc.h-1)

This effect is expected as voids previously drowned by peculiar velocities emerge again.

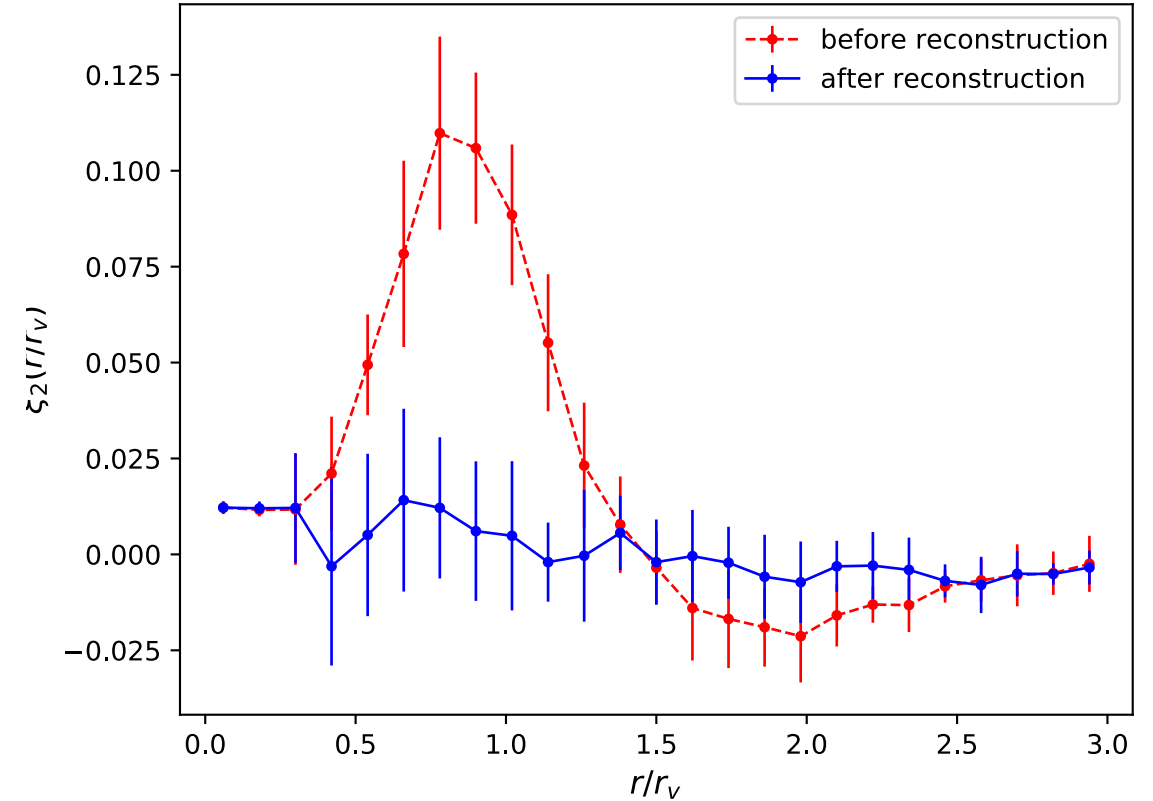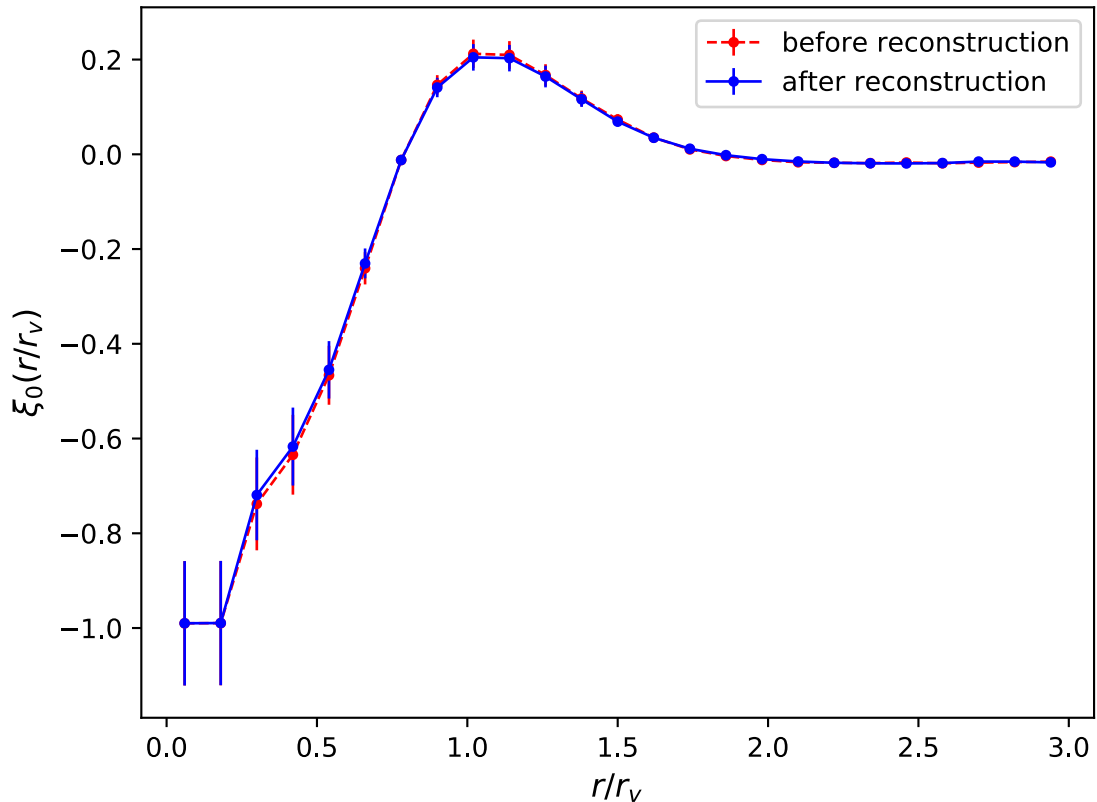# DR12 Patchy – Void-galaxy two point cross-correlation function



Before reconstruction :  Visible distortions along the LOS

After reconstruction : Density field is well distributed around the void center and approaches sphericity

# DR12 Patchy – Multipoles of the void-galaxy correlation function

Monopole , averaged
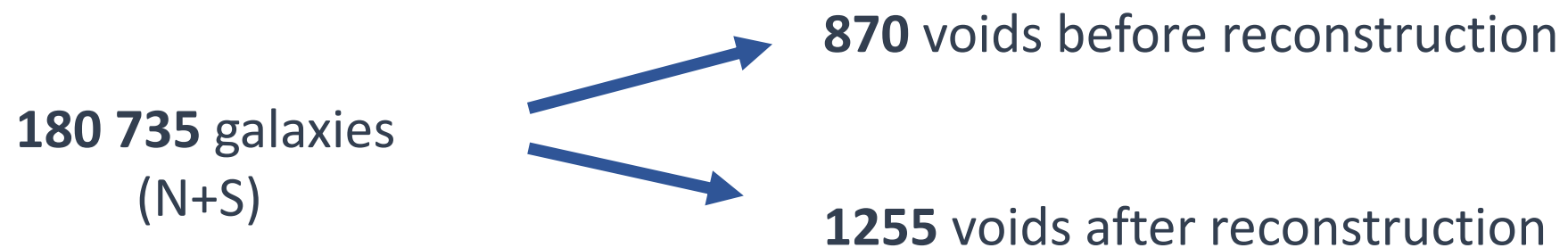density profile of the voids



Quadrupole.
The reconstructed quadrupole
is consistent with 0

# Voids in reconstructed eBOSS LRG v5

We've made use of the reconstructed eBOSS LRG v5 provided by the collaboration.
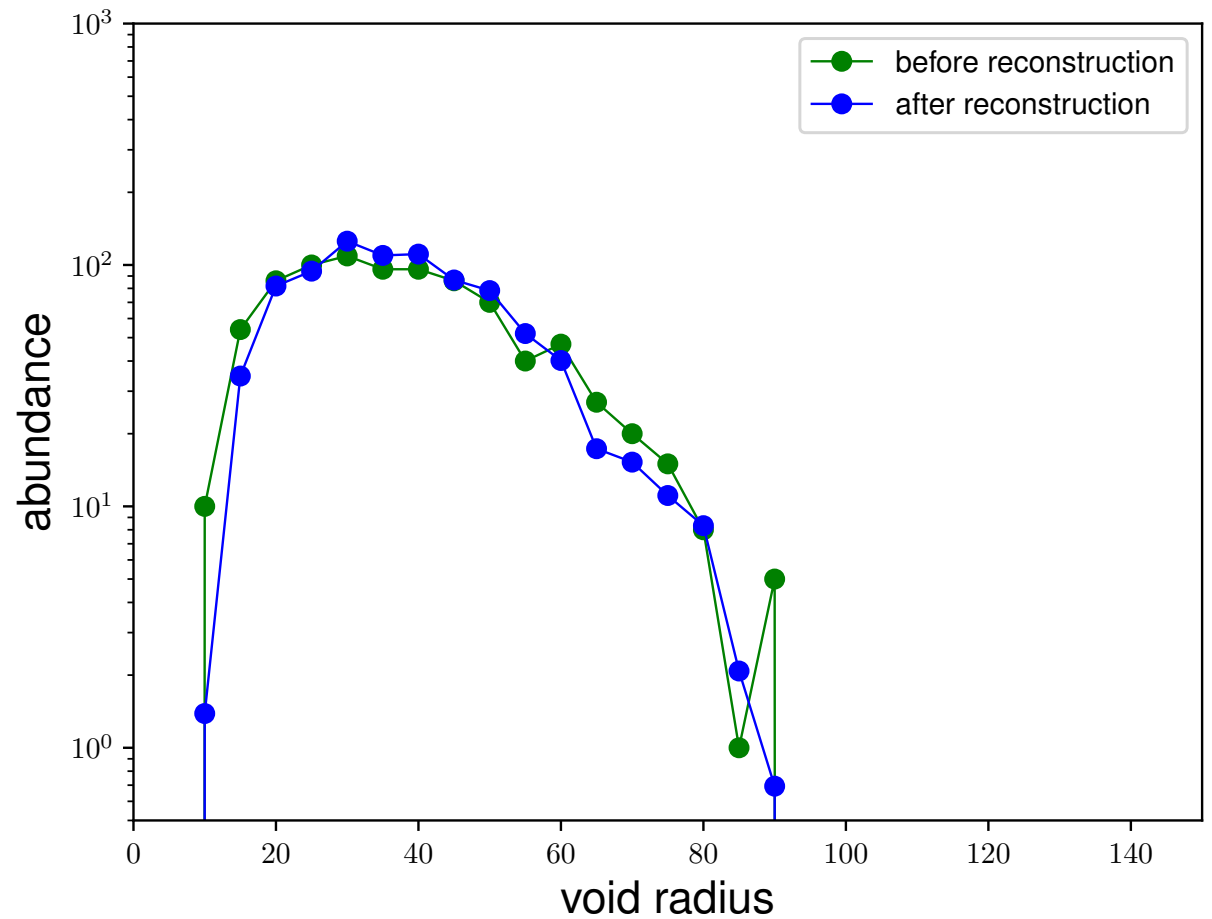
Using **only** the eBOSS LRGs , we have :

**180 735** galaxies
(N+S)

**870** voids before reconstruction

**1255** voids after reconstruction

30% increase in voids statistic

# LRG v5 – Void abundance

We can see a slight increase of voids around 40 Mpc.h$^{-1}$ in the post-reconstruction distribution.

But, this analysis needs to be applied on the reconstructed mock for certainty.
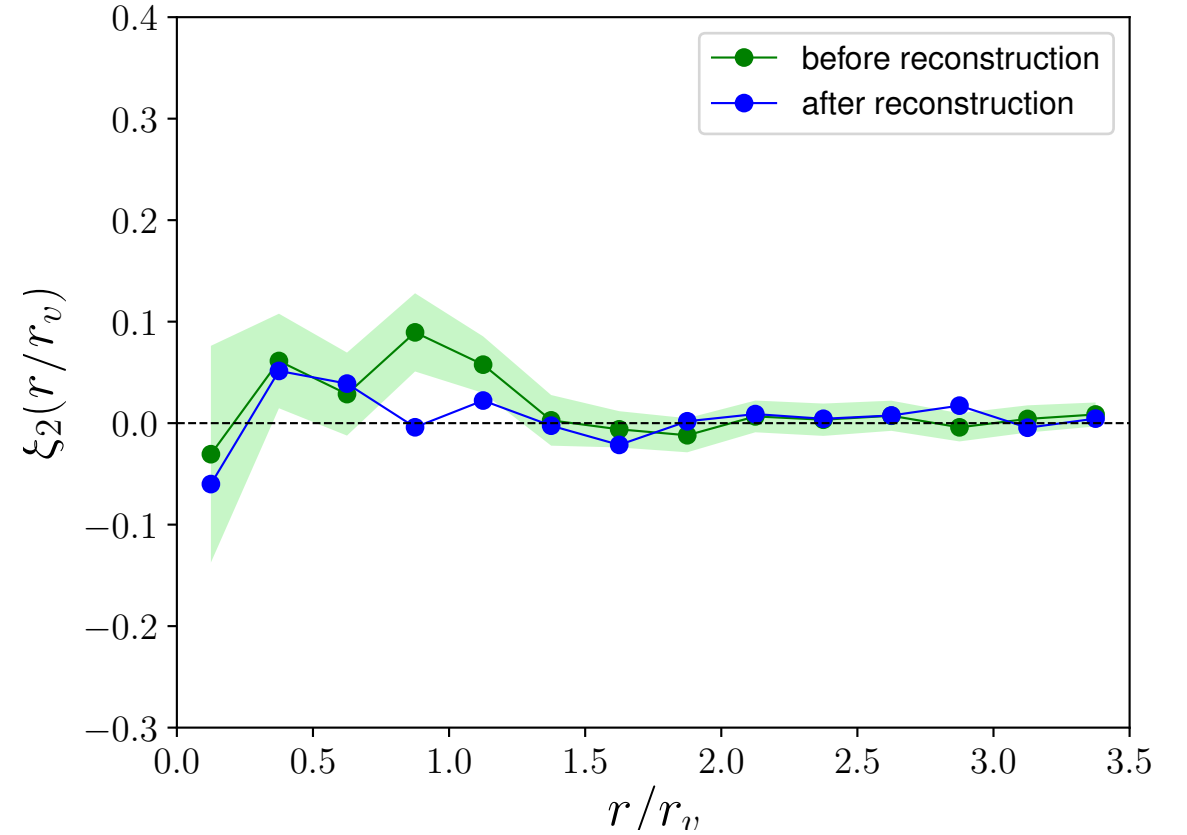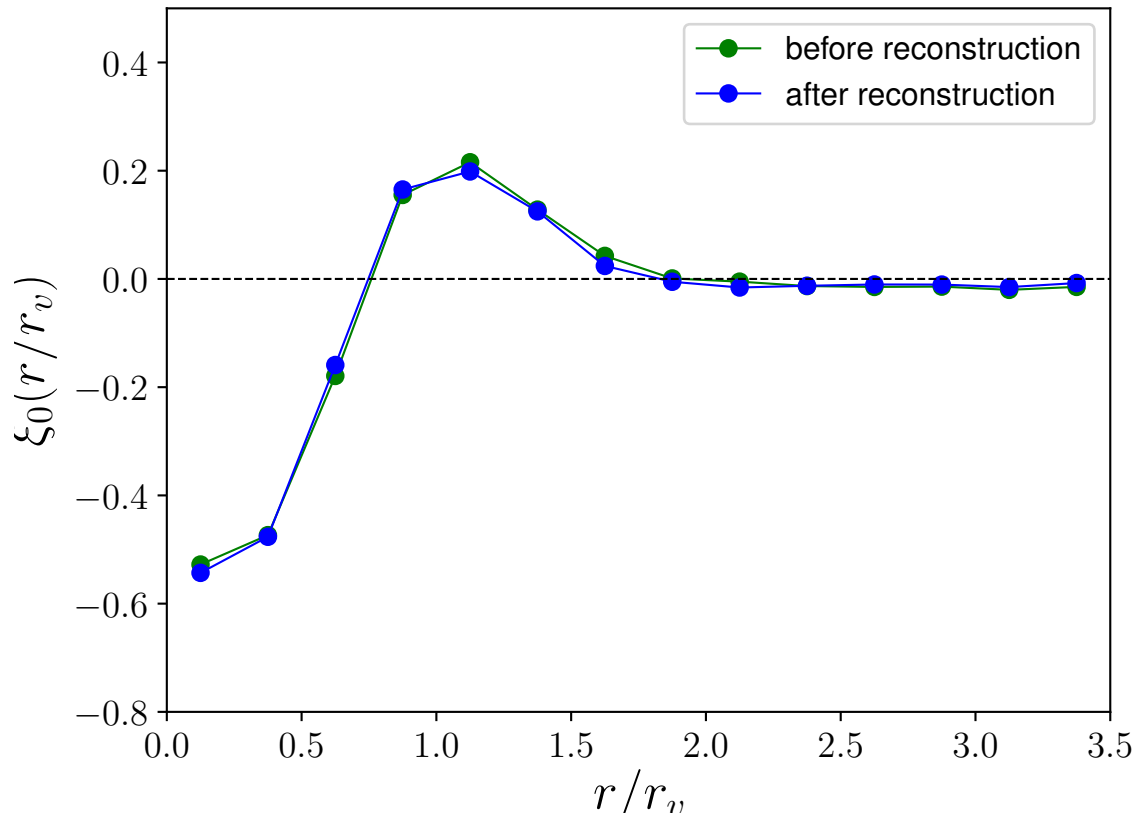


Courtesy of Marie-Claude Cousinou

# LRG v5 – Multipoles of the correlation function

## Monopole
### Averaged density profile of the voids

## Quadrupole
### The effect of reconstruction is not so obvious

# Conclusion

- On-going project to investigate the properties and behavior of voids extracted from reconstructed galaxy sample on DR12 data.

- In parallel, we investigate the voids and their properties in preparation for the final DR16 analysis for both reconstructed and unreconstructed sample.

- **PRELIMINARY results** shows that :
    - Null quadrupole of the correlation function but Monopole seems unaffected by the reconstruction
    - There is a systematical increased statistic in the number of voids after reconstruction (10% for Patchy DR12, 30% for LRGv5)
    - This increased statistic seems to correspond to small to mid sized void that were erased by the RSD's.

- The effects seem to be consistent independently of the reconstruction algorithm.
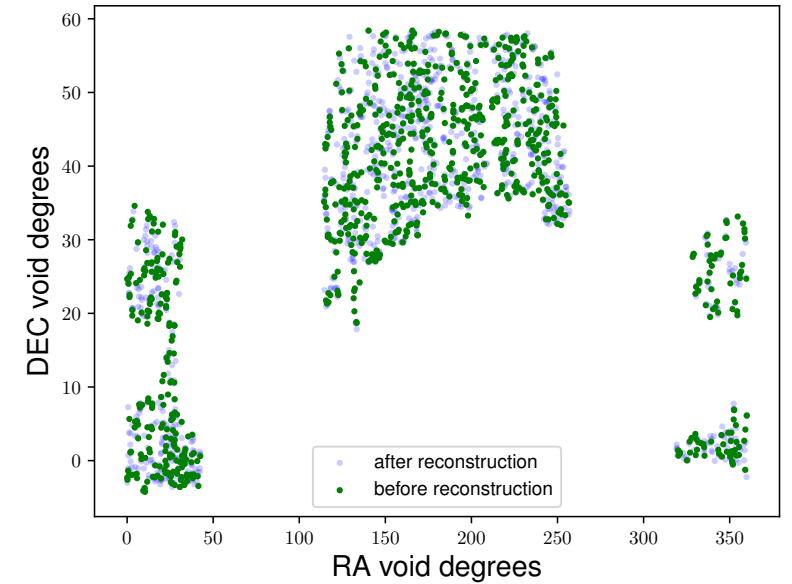
# LRG v5 – Void properties distributions
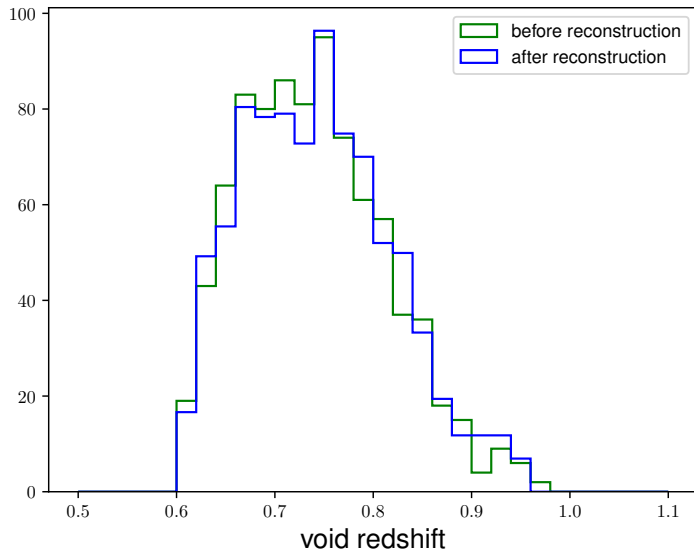


Redshift Distribution
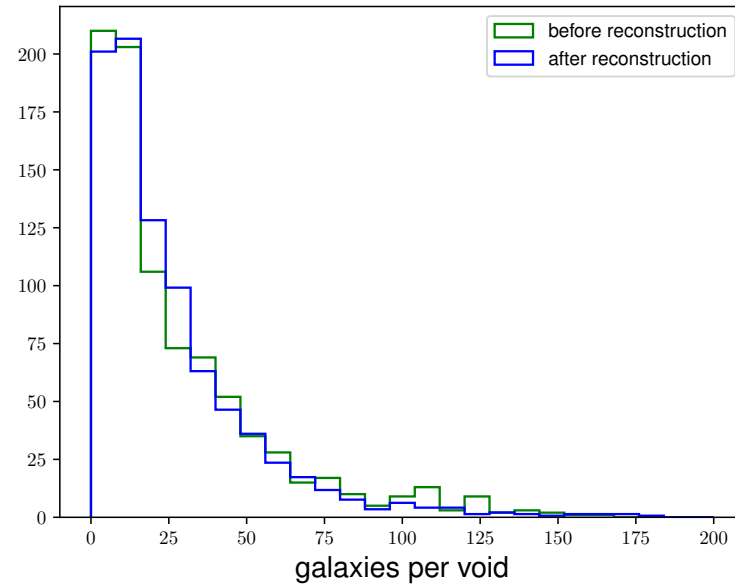
Number of galaxies per void

RA,DEC distribution