SubHalo Abundance Matching for eBOSS Galaxies

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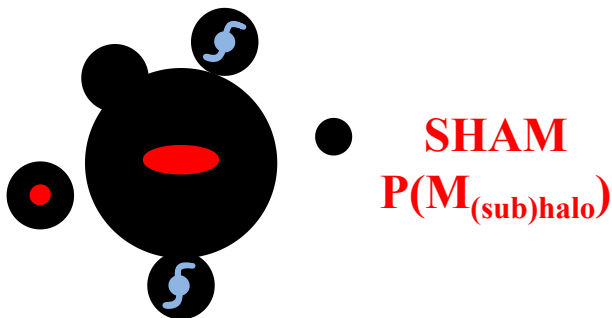➢ How do galaxies distribute in DM halos? (bias model)

SHAM
$P(M_{(sub)halo})$

Fig 1. The principle of the Subhalo Abundance Matching

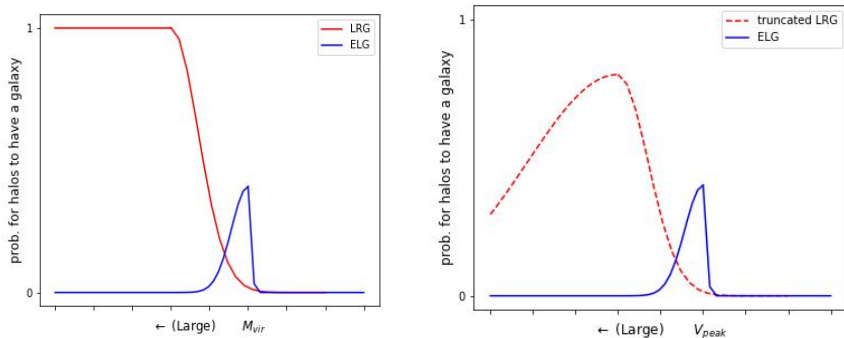➢ How do galaxies distribute in DM halos? **P(M$_{(sub)halo}$)**

Fig 2. The ideal galaxy probability distribution function (left) and the realistic eBOSS galaxy distribution function (right)

➢ How do galaxies distribute in DM halos?

✓ Select (sub)halos and assign galaxies inside

    ✓ Scattering & Cut of V_{peak};

    ✓ Galaxies in remaining halos with N_{th} largest $V_{peak,selection}$

➢ How do galaxies distribute in DM halos?

✓ Select (sub)halos and assign galaxies inside

    ✓ Scattering & Cut of V_{peak};

    ✓ Galaxies in remaining halos with N_{th} largest $V_{peak,selection}$

✓ Observed 2PCFs (Mohammad et al. (2020) to calibrate the real $P(M_{(sub)halo})$

Results: SHAM ELG in SGC

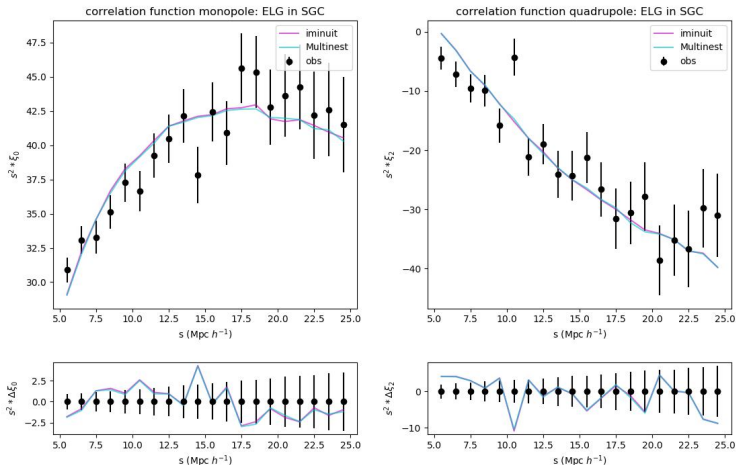| σ	V_cut (km/s)	χ²	Reduced χ²
$0.790^{+0.200}_{-0.285}$	342^{+58}_{-61}	51.526	1.356

Fig 3. The correlation functions of eBOSS SHAM ELGs in SGC

Results: SHAM ELG in SGC

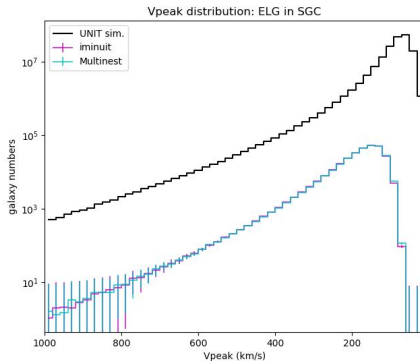| σ	V_{cut} (km/s)	χ^2	Reduced χ^2
$0.790^{+0.200}_{-0.285}$	342^{+58}_{-61}	51.526	1.356

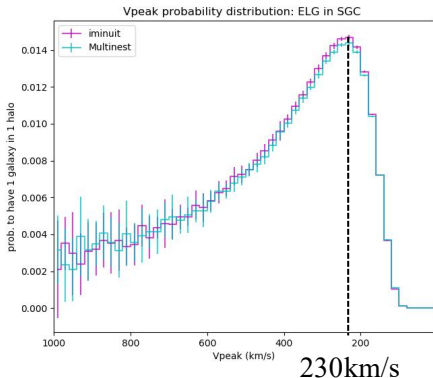Fig 4. The probability distribution function of eBOSS SHAM ELGs in SGC

Results: SHAM LRG in NGC

σ	V_{cut} (km/s)	χ^2	Reduced χ^2
$0.800^{+0.035}_{-0.056}$	1167^{+29}_{-63}	72.785	1.915

Fig 5. The correlation functions of eBOSS SHAM LRGs in NGC

σ	V_{cut} (km/s)	χ^2	Reduced χ^2
$0.800^{+0.035}_{-0.056}$	1167^{+29}_{-63}	72.785	1.915

700km/s
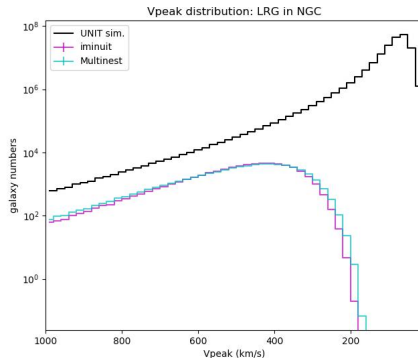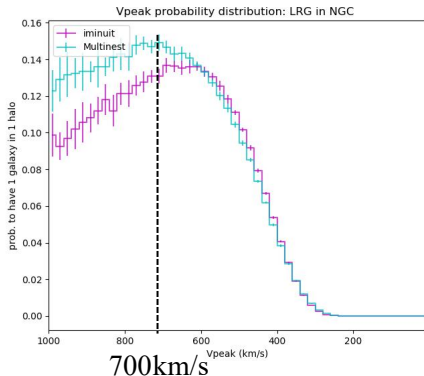
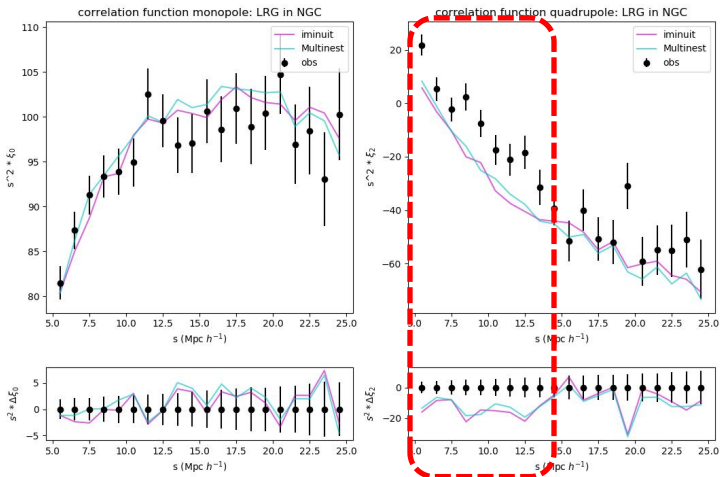Fig 6. The probability distribution function of eBOSS SHAM LRGs in NGC

Fig 5. The correlation functions of eBOSS SHAM LRGs in NGC

Improvement: LRG z uncertainty

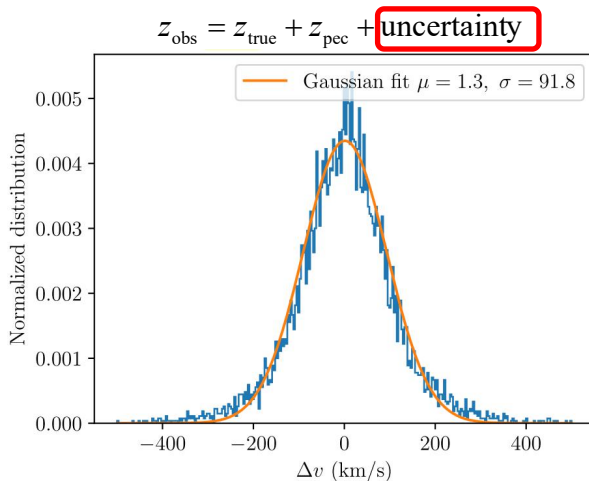$$z_{obs} = z_{true} + z_{pec} + \boxed{\text{uncertainty}}$$

Fig 7. The redshift uncertinty of eBOSS LRG pairs, Figure 2 of Ross et al. (2020)

$$\Delta v = c \Delta z (1 + z)$$

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Improvement: LRG z uncertainty

$$z_{obs} = z_{true} + z_{pec} + \boxed{\text{uncertainty}}$$

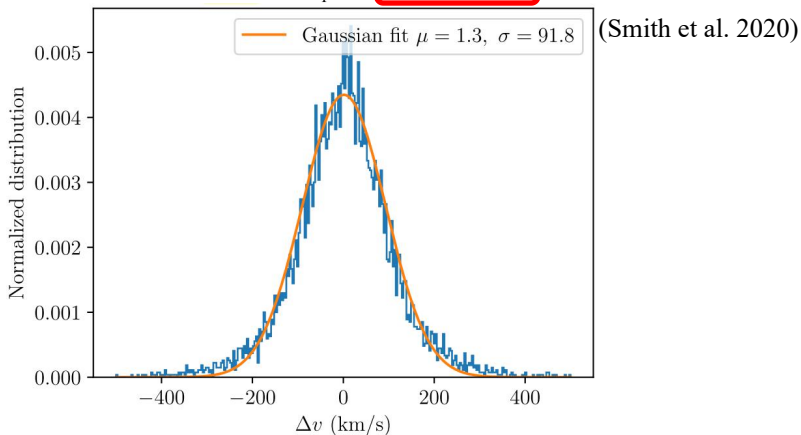$\Rightarrow v_{pec}$ Gaussian Smearing

(Smith et al. 2020)

Fig 7. The redshift uncertinty of eBOSS LRG pairs, Figure 2 of Ross et al. (2020)

$$\Delta v = c \Delta z (1 + z)$$

Improvement: LRG z uncertainty

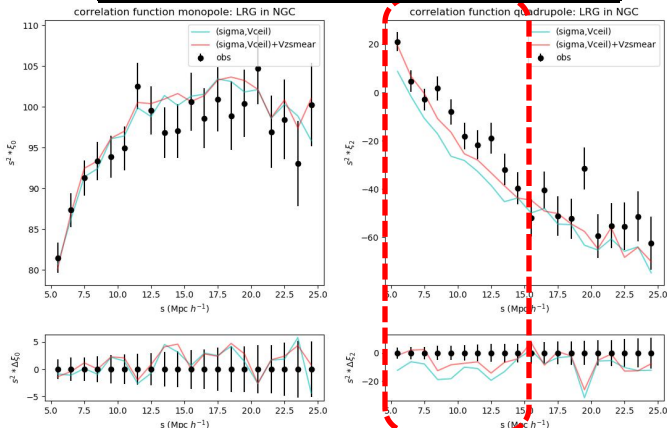| σ	V_{cut} (km/s)	χ^2	Reduced χ^2
$0.800^{+0.035}_{-0.056}$	1167^{+29}_{-63}	72.785	1.915
0.806	1170	33.910	0.916

Fig 8. The peculiar-velocity-smeared SHAM LRG in NGC

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Results: SHAM

✓ Reproduced the 2PCF of eBOSS galaxies with SHAM

✓ Improved the LRG SHAM by adding the redshift uncertainty

❑ Robust SHAM models

    ❑ Reduce the statistical fluctuations

    ❑ 3-parameter models

❑ Multi-tracer SHAM

    ❑ Cross-Correlation Studies

Thanks!