3-parameter SHAM model vs 2-parameter model

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24.08.2020

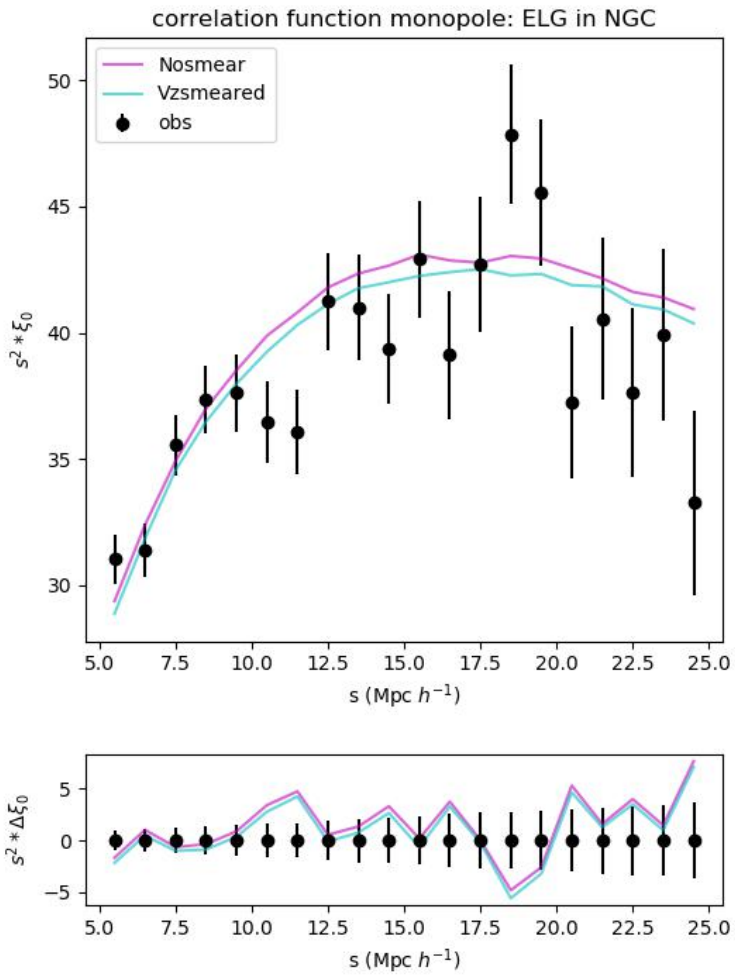
Comparison: Vpeak from the halo catalogue

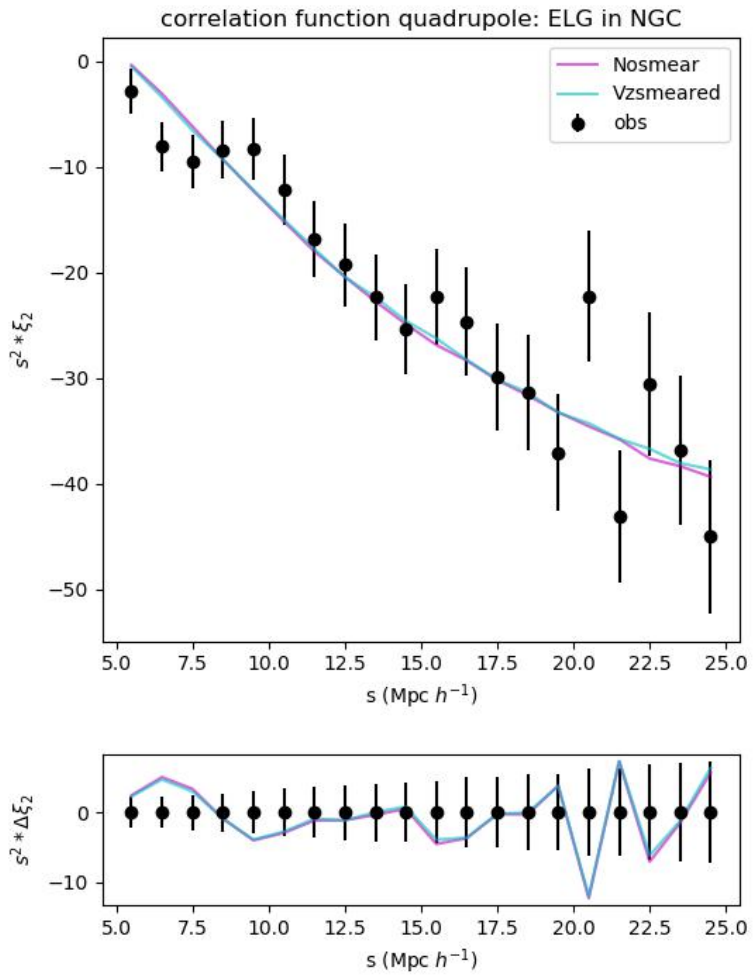
- No smearing (master thesis):
  - Vpeak scattering (**sigma**) and largest-end truncation (**Vcut**)
  - Select the N-th largest value
  - SHAM 2PCF calculation

- Vz smearing (3-parameter model):
  - Vpeak scattering (**sigma**) and largest-end truncation (**Vceil**)
  - Select the N-th largest value
  - **Gaussian smearing Vz (Vsmear) for the selected halos**
  - SHAM 2PCF calculation

ELG NGC 2PCF

σ	V_{ceil} (km/s)	V_{smear} (km/s)	χ^2	Reduced χ^2
$0.513^{+0.433}_{-0.081}$	268^{+124}_{-30}	-	52.296	1.376
$0.805^{+0.536}_{-0.163}$	345^{+151}_{-46}	5^{+29}_{-1}	54.870	1.482





ELG NGC Prob. Distri. Func.

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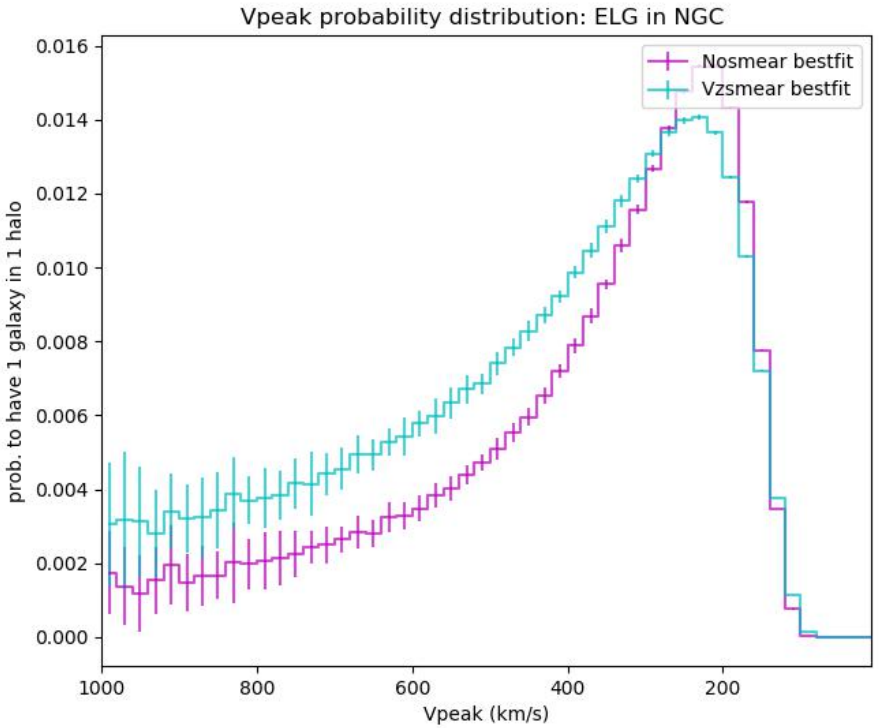

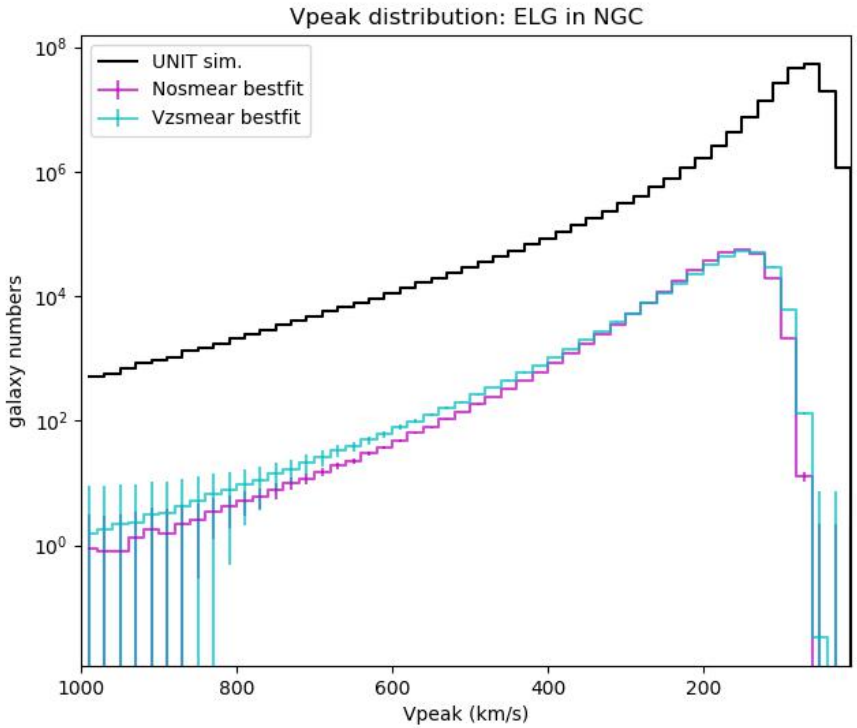

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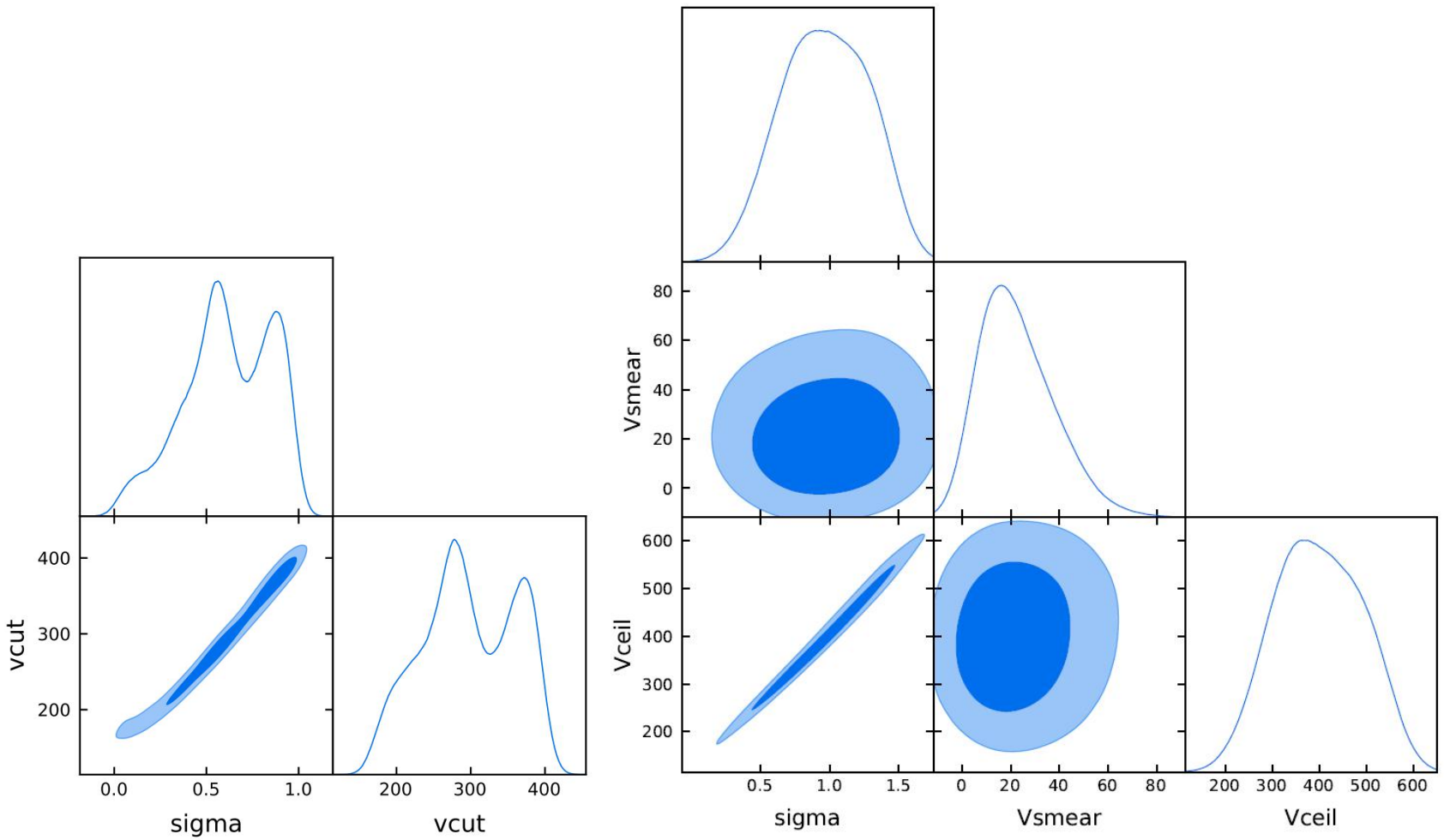

(Vcut ==Vceil)

ELG SGC 2PCF

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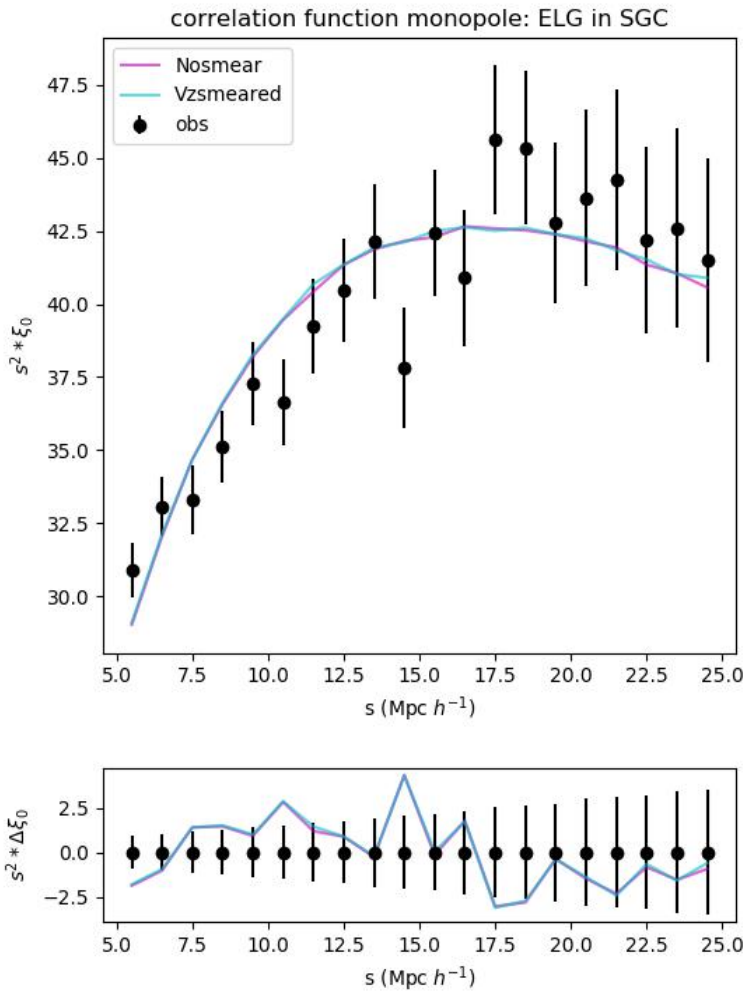
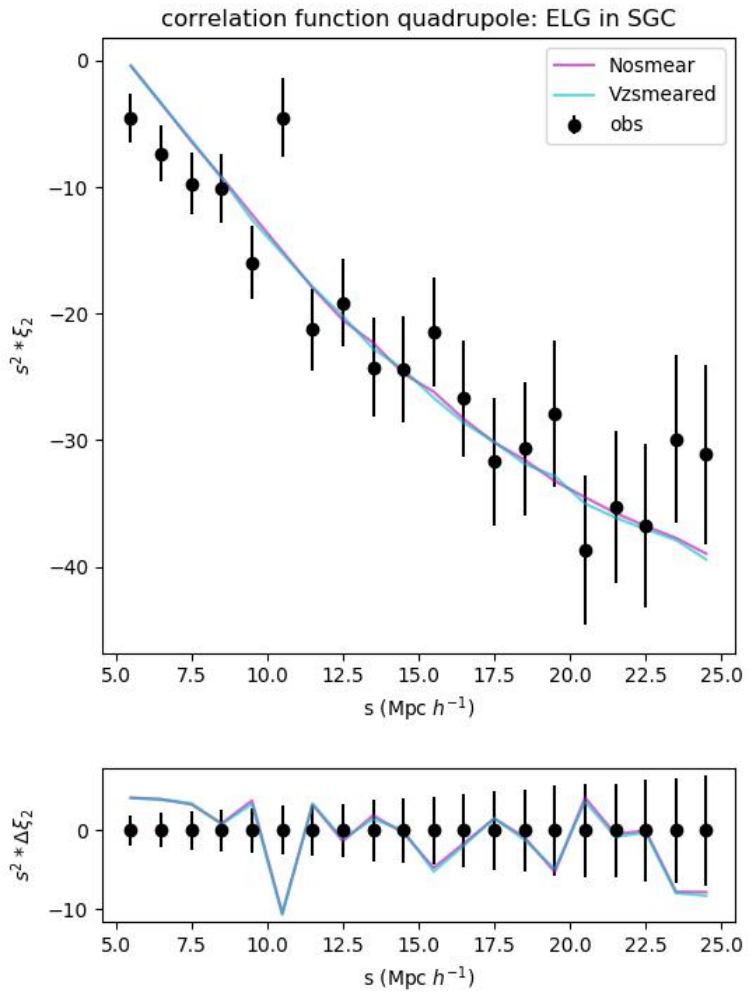
$0.790^{+0.200}_{-0.285}$	342^{+58}_{-61}	-	51.526	1.356
$0.925^{+0.422}_{-0.208}$	385^{+118}_{-73}	8^{+20}_{-6}	53.057	1.434





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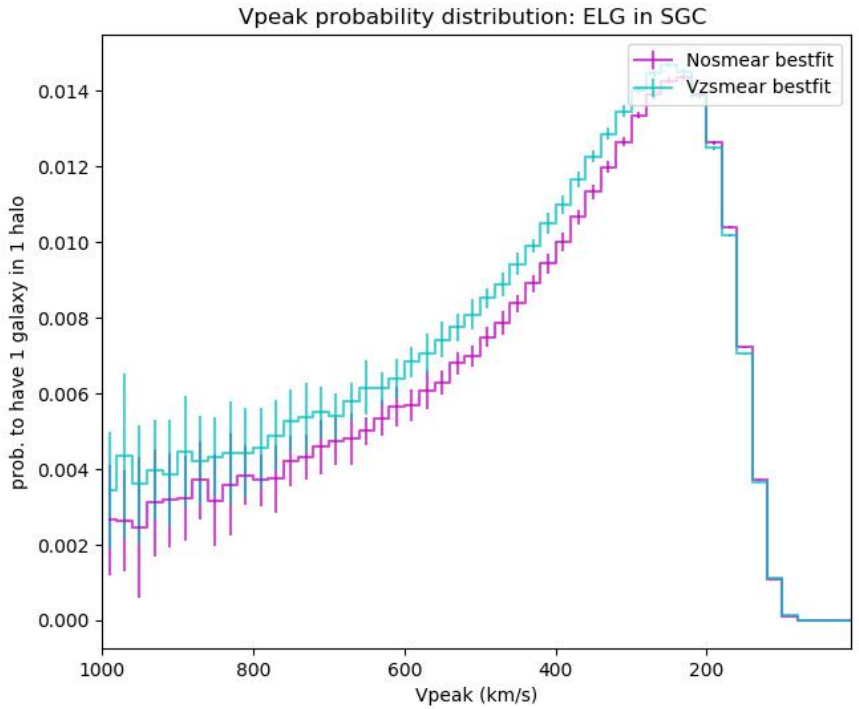

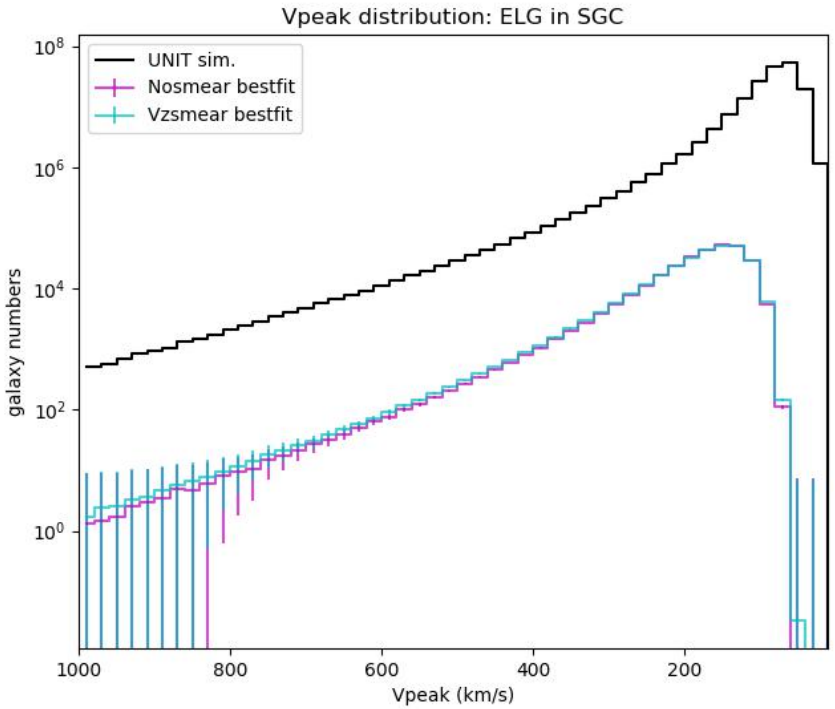

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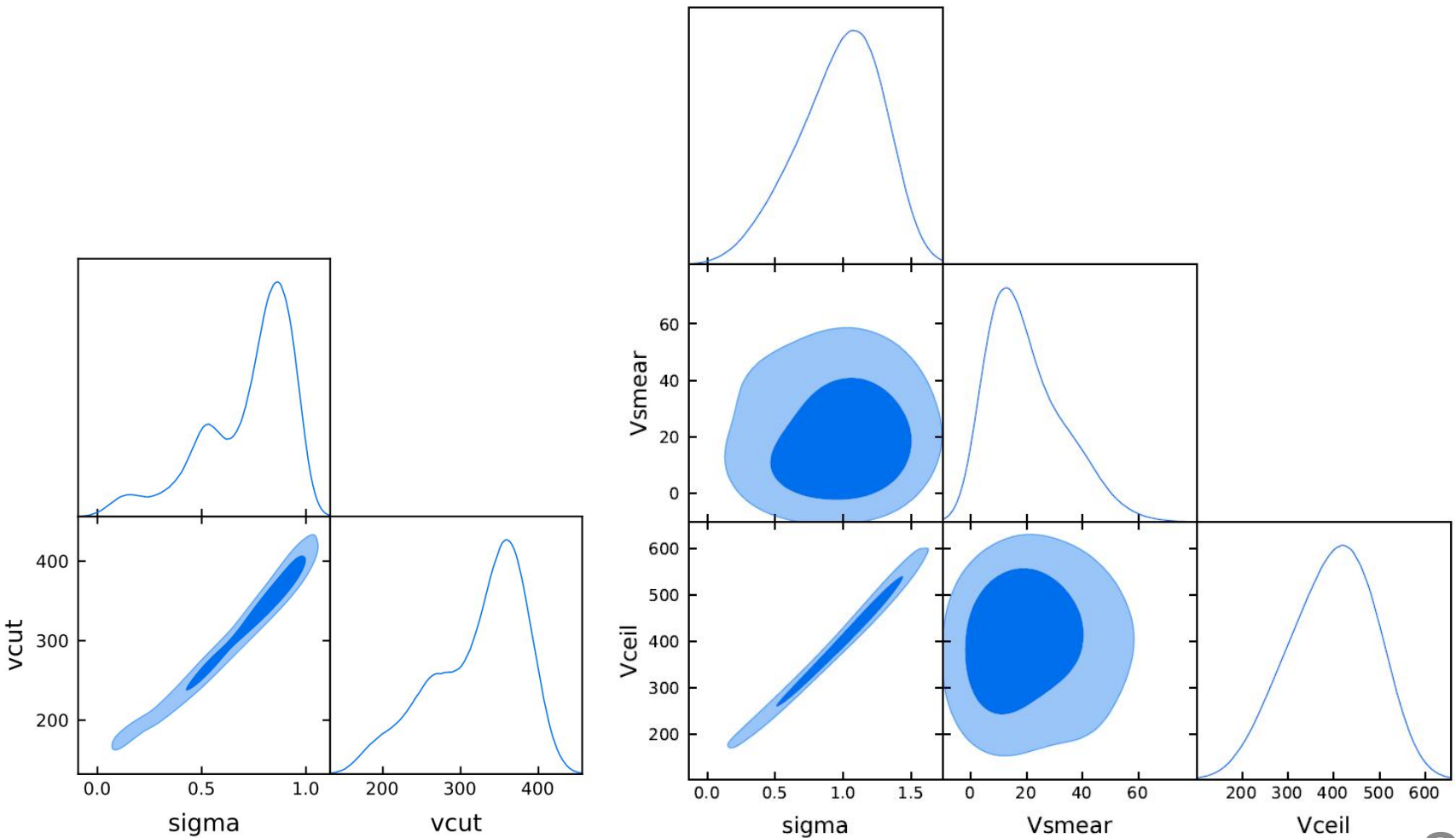
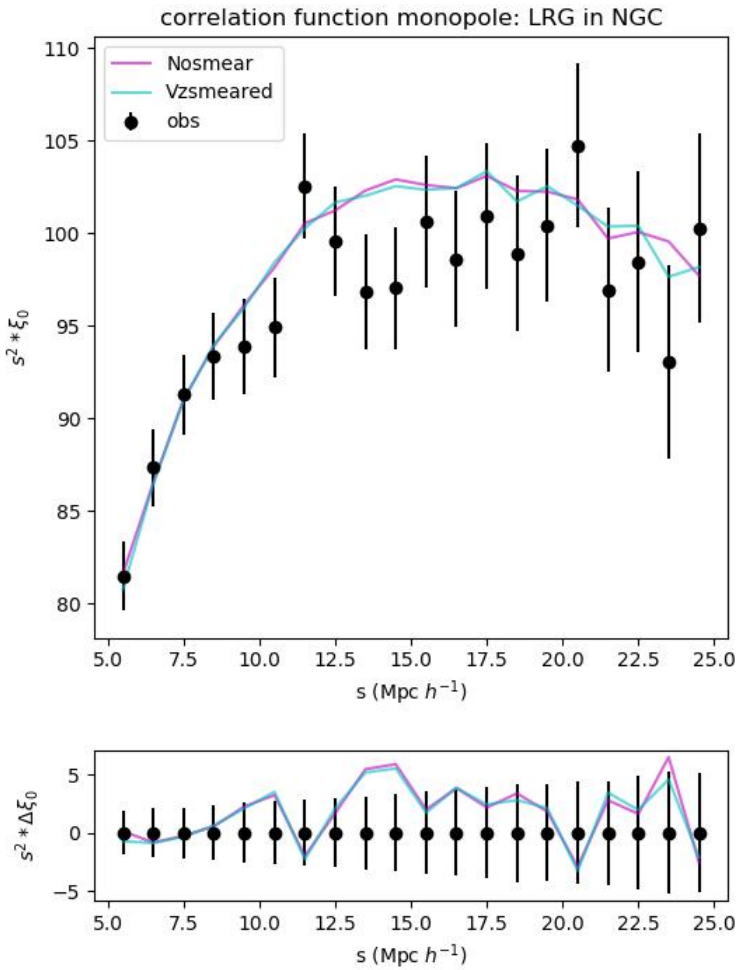
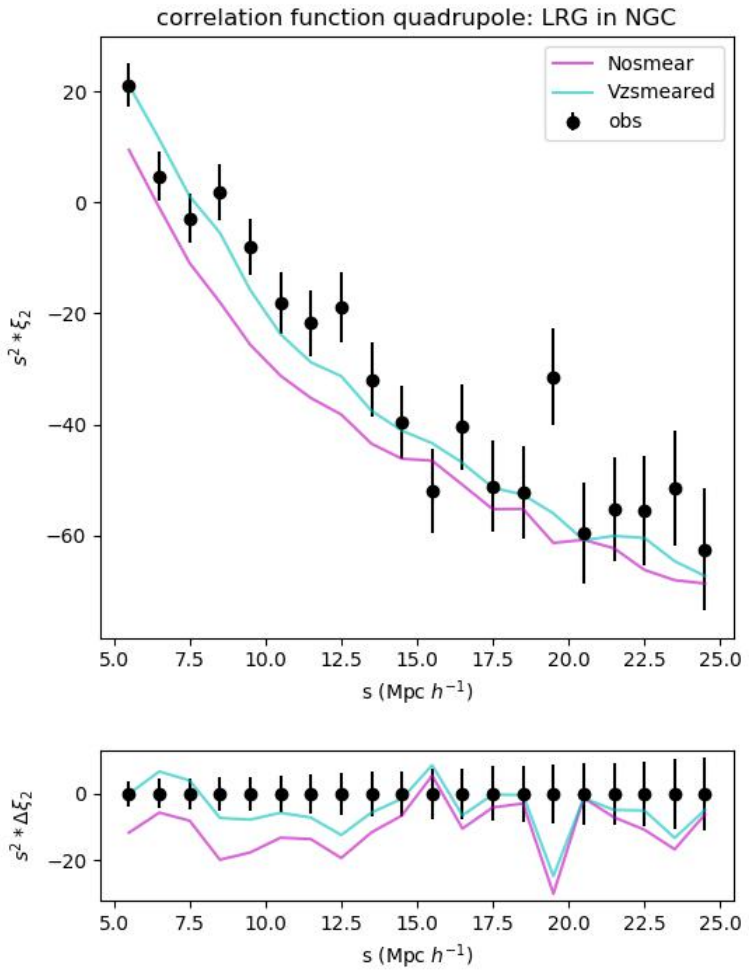


(Vcut ==Vceil)

LRG NGC 2PCF

σ	V_{ceil} (km/s)	V_{smear} (km/s)	χ^2	Reduced χ^2
$0.800^{+0.035}_{-0.056}$	1167^{+29}_{-63}	-	72.785	1.915
$1.178^{+0.127}_{-0.195}$	1627^{+144}_{-248}	106^{+8}_{-9}	34.514	0.933





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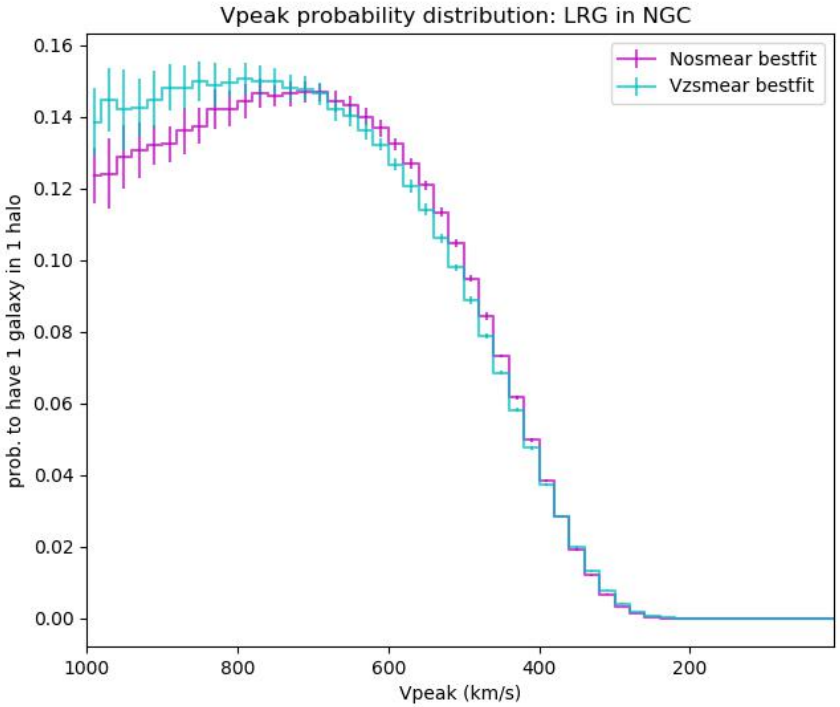

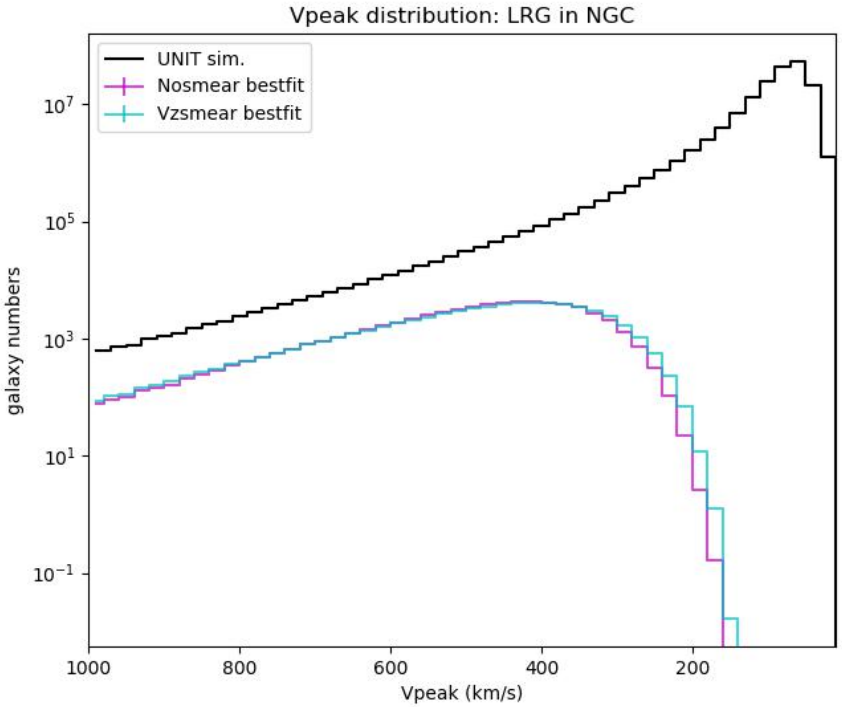

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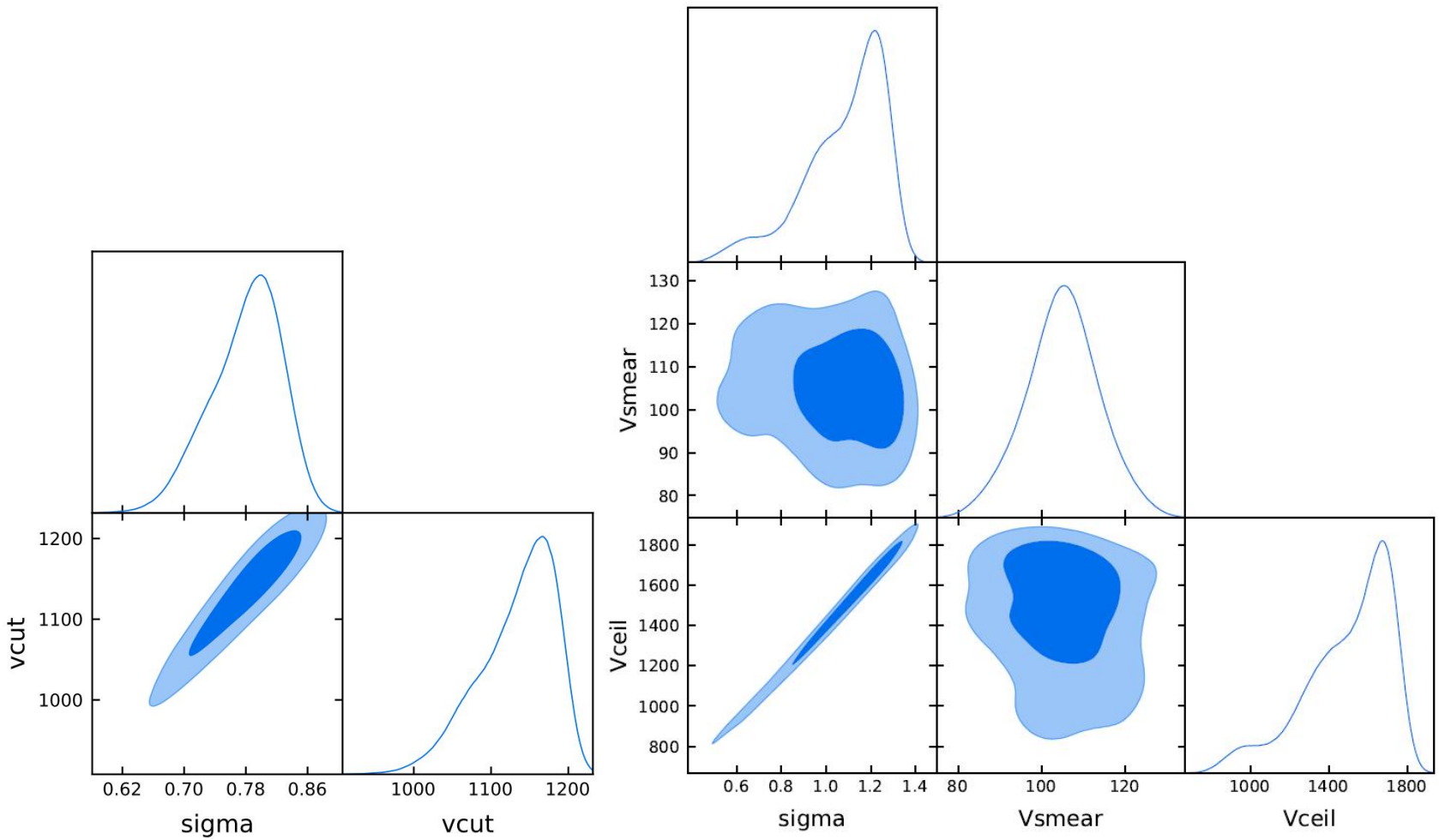
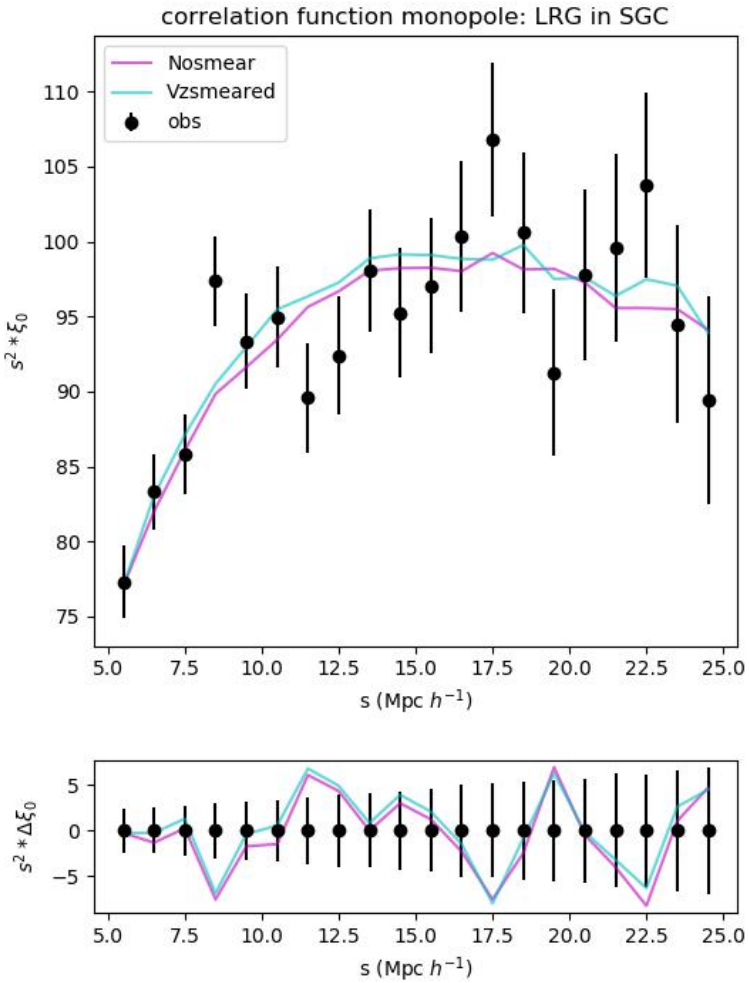
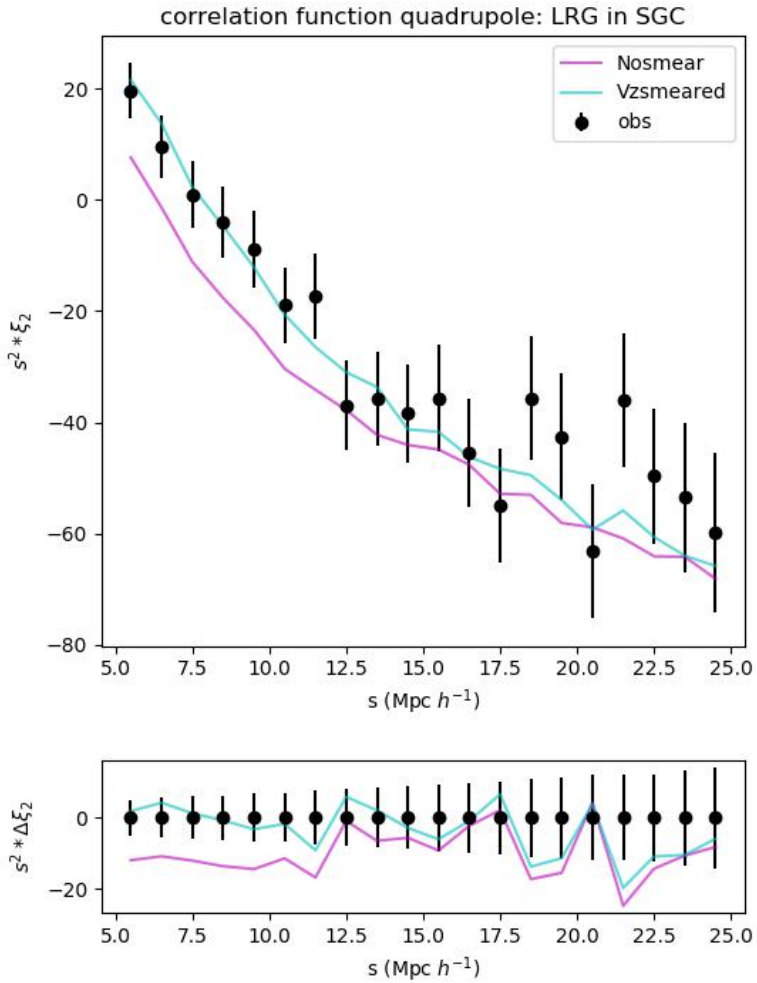


(Vcut ==Vceil)

LRG SGC 2PCF

σ	V_{ceil} (km/s)	V_{smear} (km/s)	χ^2	Reduced χ^2
$0.710^{+0.144}_{-0.029}$	994^{+167}_{-12}	-	54.593	1.437
$1.067^{+0.349}_{-0.230}$	1397^{+395}_{-282}	117^{+5}_{-15}	29.584	0.800





LRG SGC Prob. Distri. Func.

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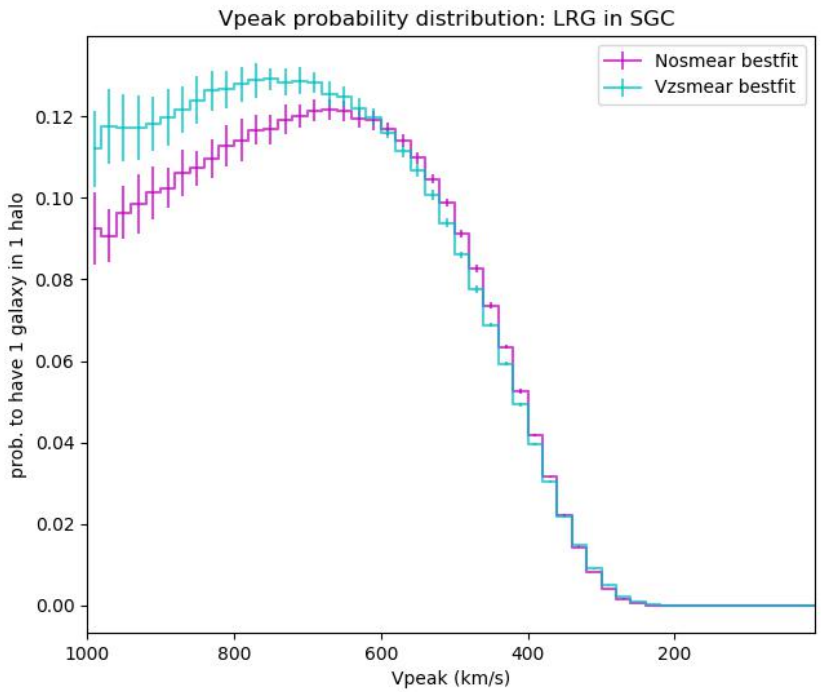

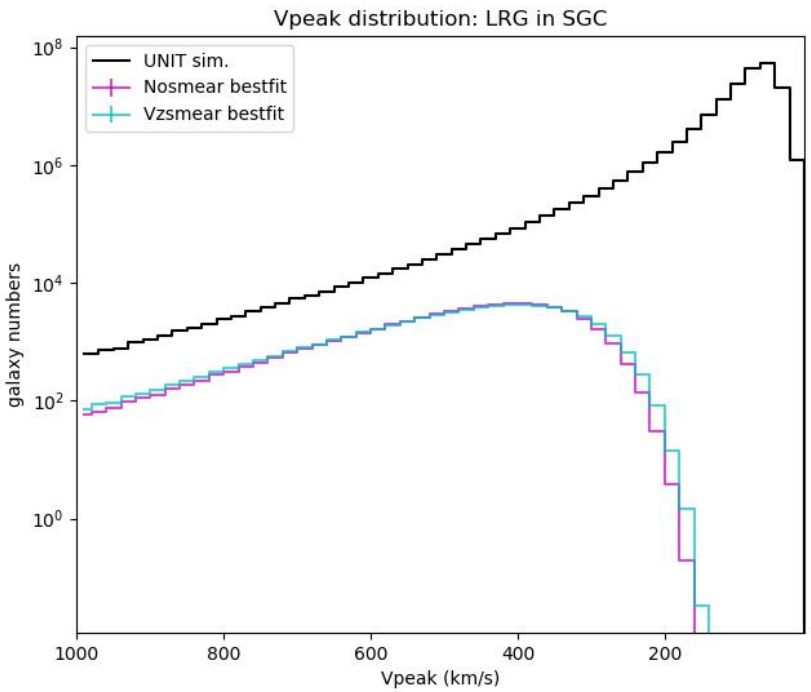

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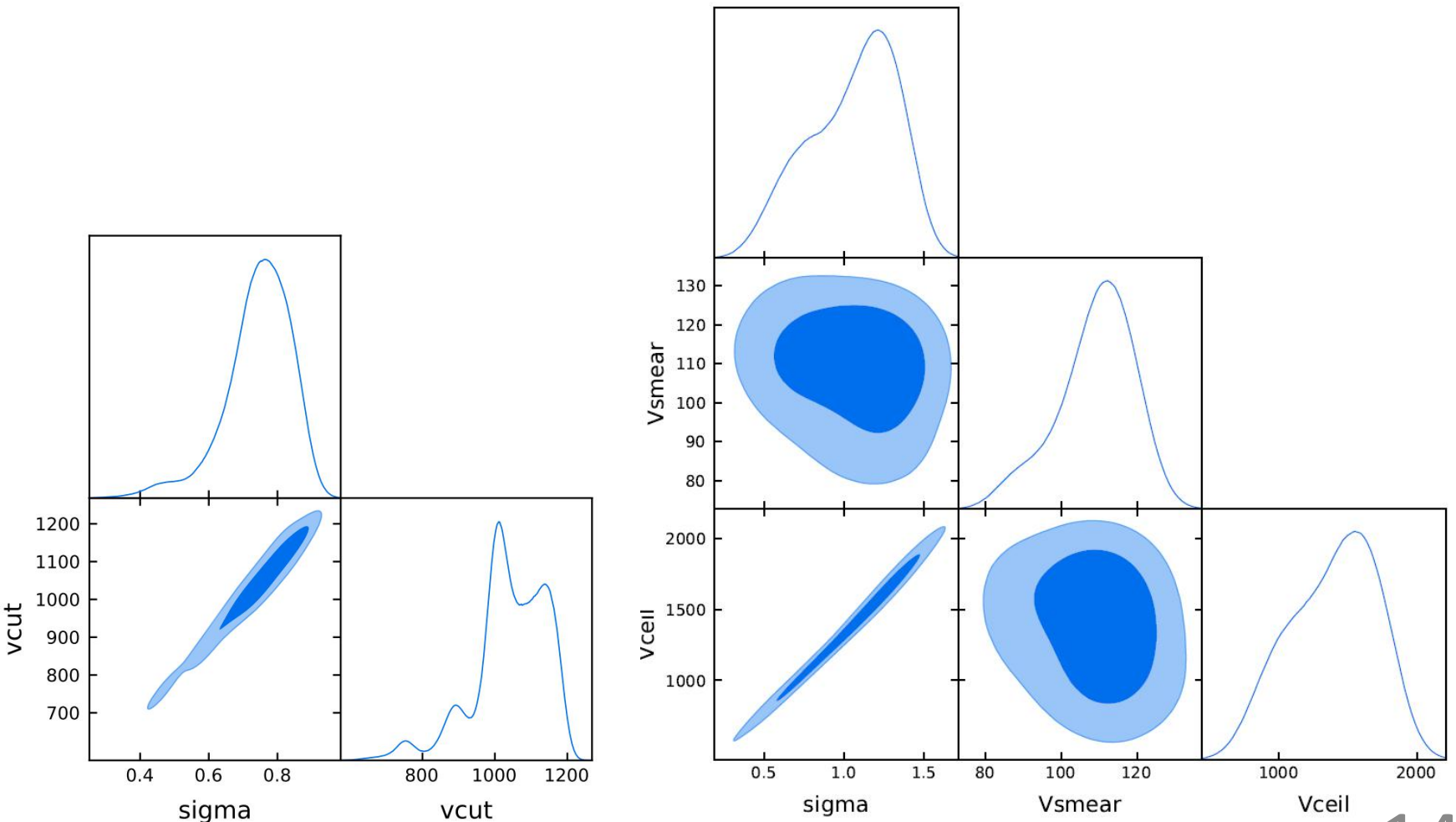

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Conclusions:

no smear	σ	V_{cut} (km/s)	V_{smear} (km/s)	χ^2	Reduced χ^2
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- ✓ Vz smearing works for SHAM **LRG**, improve the quadrupoles
- ✓ but has risk of **overfitting** according to the reduced χ^2 value

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? Vz smearing doesn't work for SHAM **ELG**, and even **gets worse**

✓ ? possible explanation: erroneously introduce the z uncertainty, because their real z uncertainty is very small

Outlooks:

- ✓ Reliable eBOSS LRG & ELG SHAM models
- ☐ Robust SHAM models
  - ✓ More averaged realisations: 60
  - ✓ Implement SHAM models with σ_{pec}
  - ☐ C-SHAM scripts (trying to have a functions outline)
  - ☐ SHAM LRG and ELG in the same redshift bins
- ☐ Multi-tracer SHAM
  - ☐ Generate multiple tracers simultaneously
  - ☐ Cross-Correlation Studies

Difficulties:

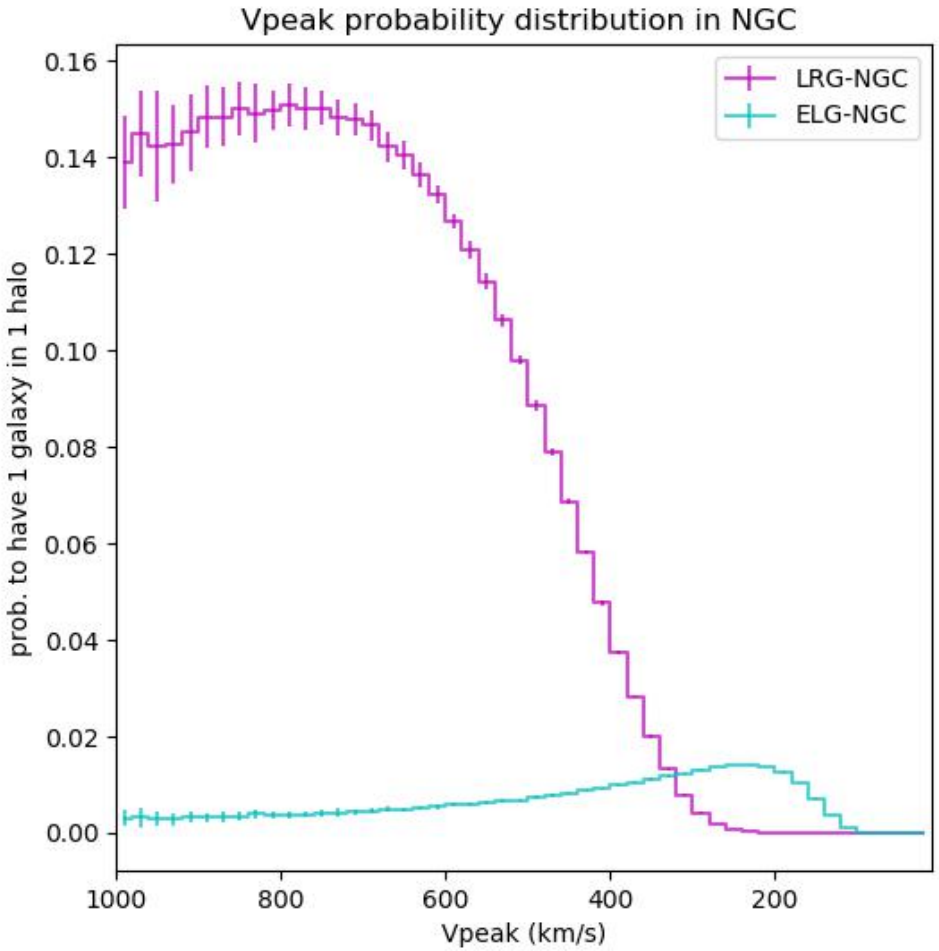
- Generate multiple tracers simultaneously
  - Single-tracer tests completed in **different redshift**
  - LRG and ELG has **different sigma** to scattering Vpeak
  - Vz smearing **only works for LRG**, but not ELG

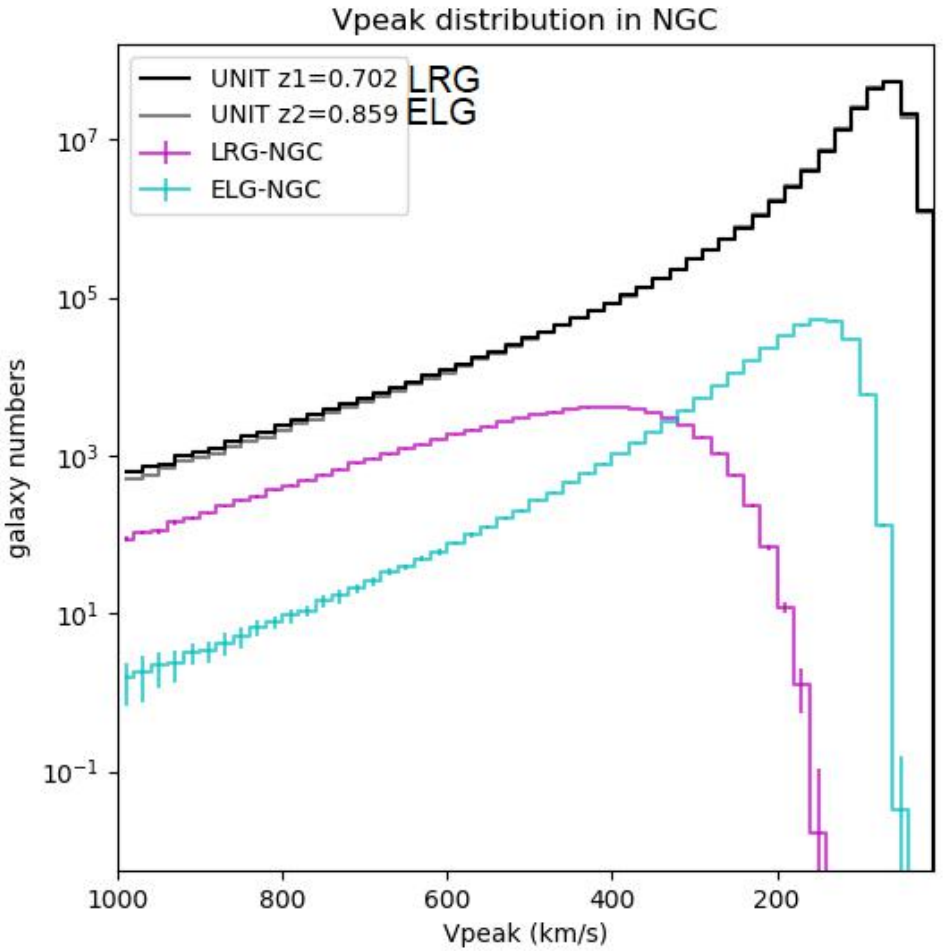
Prerequisite tests for multi-tracer SHAM:

- LRG and ELG **single-tracer tests in the same redshift bins:** is it **necessary?**

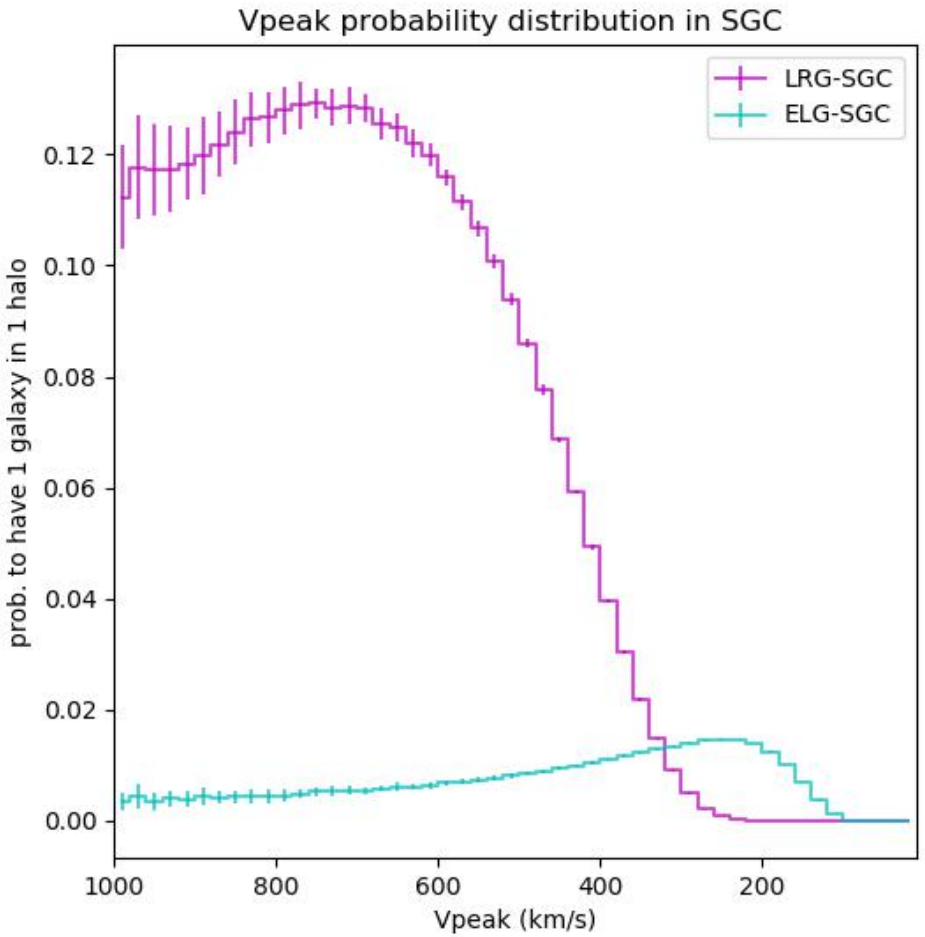
- The **simplest multi-tracer** implementation(5 parameters in total):
  - scattering & cut & select & vz smearing for SHAM LRG
  - remove LRG halos
  - scattering & cut & select for SHAM ELG from the remaining halos

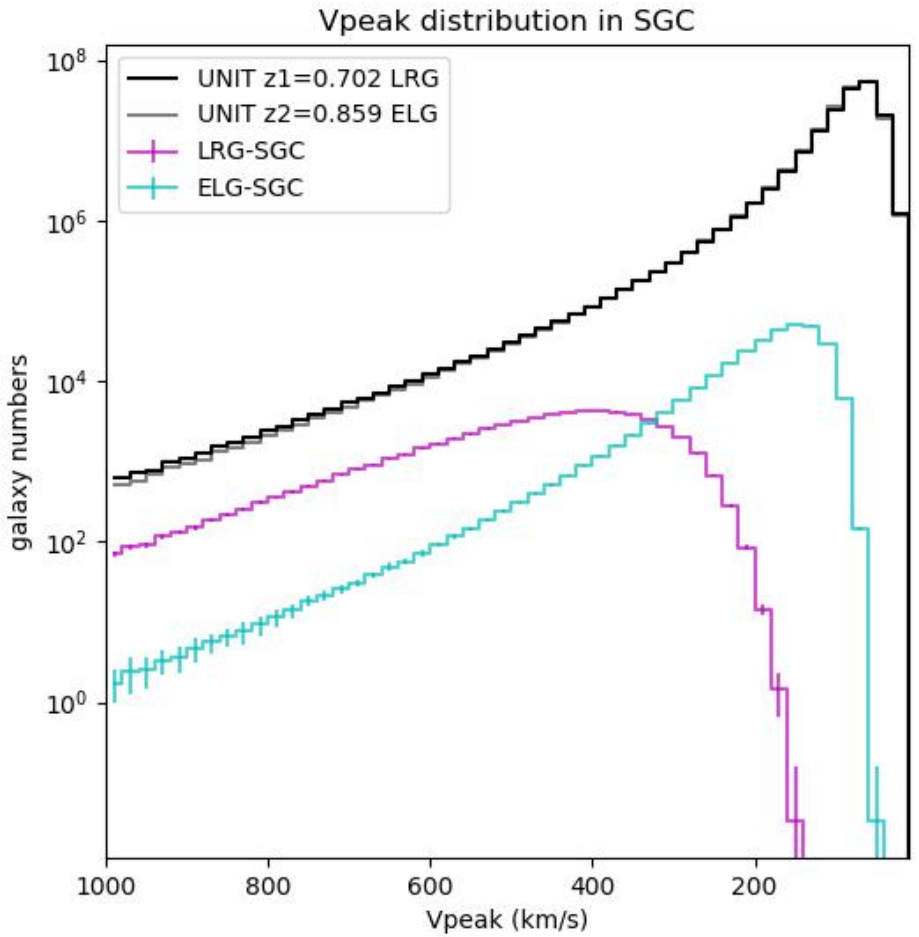
NGC Prob. Distri. Func.





SGC Prob. Distri. Func.





Prerequisite tests for multi-tracer SHAM:

- The **simplest multi-tracer** implementation:
  - LRG first or ELG first may need a physical explanation
  - Seen from the single-tracer probability distributions, LRG and ELG only occupies a small amount of halos, so the probability for two types of galaxy residing in one halo is small, i.e., we don't have to worry about the overlapped LRG and ELG probability distribution.

Thank you !