THE DARK ENERGY SURVEY

GALAXY CLUSTERING AND SYSTEMATICS WITH THE DARK ENERGY SURVEY Y3 DATA

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of the DES Collaboration….

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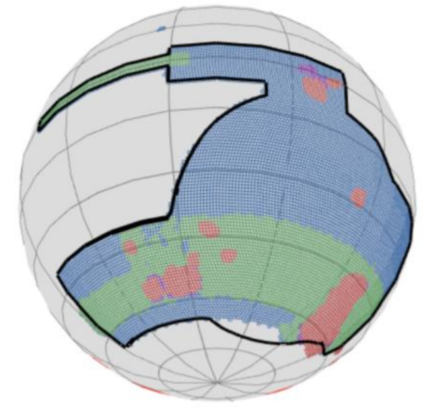
INTRODUCTION

- The Dark Energy Survey is a 6-year photometric survey placed in Cerro Tololo (Chile) that covers around 5000 deg2 of the southern sky up to magnitude i = 23.7 or redshifts of about 1.2. Its main goal is to unveil the nature of the DARK ENERGY
- One of the main probes for the Large-Scale Structure (LSS) is the GALAXY CLUSTERING, described by the two-point correlation function. Its combination with galaxy lensing provides tight constraints on cosmological parameters
- The main sources of SYSTEMATIC ERROR for galaxy clustering are photometric redshift errors, observing conditions and astrophysical sources of contamination
- To obtain reliable cosmological information it is necessary to perform a systematics mitigation and to validate the impact of these corrections

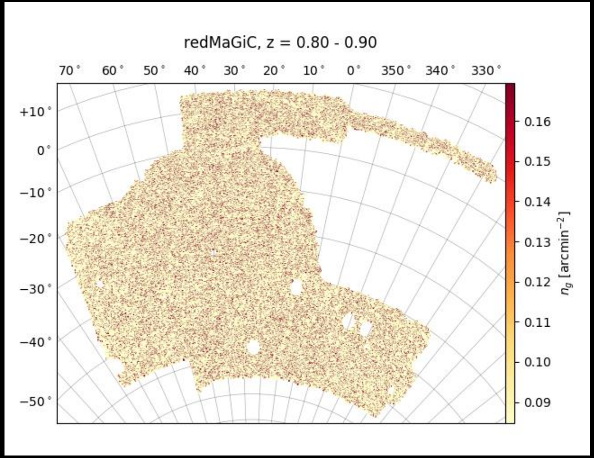


A.Drlica-Wagner, I.S.-N. et al. 2017

Victor Blanco Telescope, 4m,
Cerro Tololo, Chile

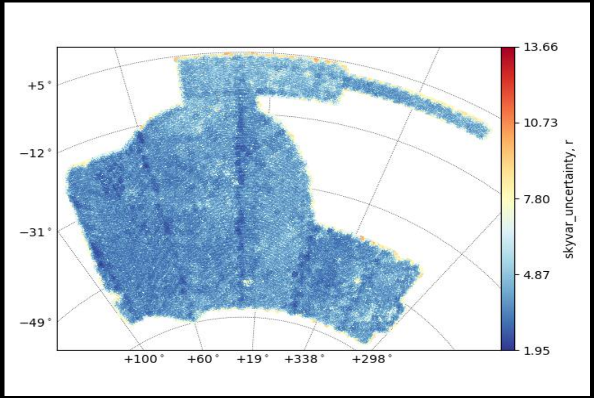
SAMPLES

- REDMAGIC: Luminous Red Galaxies (LRGs) selected by the redMaGiC algorithm (E. Rozo, et al., arXiv:150705460). HIGH QUALITY photo-z's. Redshift range = 0.15 – 0.90
- MAGLIM: magnitude limited sample. Optimized selection of lens galaxies. INCREASED DENSITY with reliable photo-z. Redshift range z = 0.20 – 1.05
- BAO SAMPLE: red galaxy sample. Optimized to detect the BARYONIC ACOUSTIC SCALE. Balance between density and photo-z precission. Redshift range z = 0.60 – 1.10
- MOCK CATALOGS: log-normal mock realizations. 1000 mocks for each galaxy sample. We use them to identify the main contaminants and for validation tests



SURVEY PROPERTY MAPS

- SURVEY PROPERTY (SP) MAPS: healpix maps that track the spatial variations of a statistic concerning the IMAGING CONDITIONS of the survey
- We also consider a galactic extinction and a stellar density map
- Many of these SP maps are correlated, so we reduce their number using correlation matrices. We go from 102 maps to 34 representative SP maps



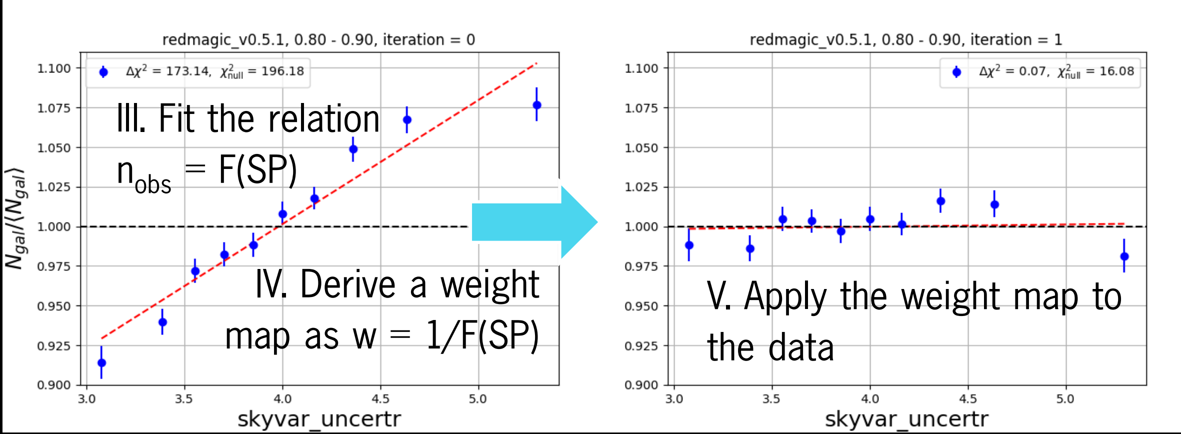
SYSTEMATICS MITIGATION

I. Fix a significance THRESHOLD for the contamination

II. Identify the MOST SIGNIFICANT SP map

VI. Re-evaluate the significance of the SP maps and repeat iteratively until convergence is achieved

VII. FINAL WEIGHT MAP = product of individual weight maps



ROBUSTNESS OF THE WEIGHTS

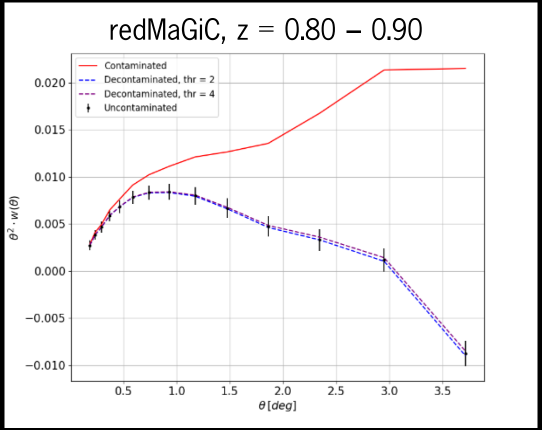
In order to ensure that our correction dies not induce BIASES neither on w(θ) nor on its covariance, we perform validation tests:

- ESTIMATOR BIAS: do weights introduce a bias when combined with w(θ) estimator?
- FALSE CORRECTION BIAS: do we correct for some SP maps just by chance?
- RESIDUAL SYSTEMATIC BIAS: do we leave some contamination uncorrected?
- IMPACT ON COVARIANCE: do weights impact the covariance of w(θ)?

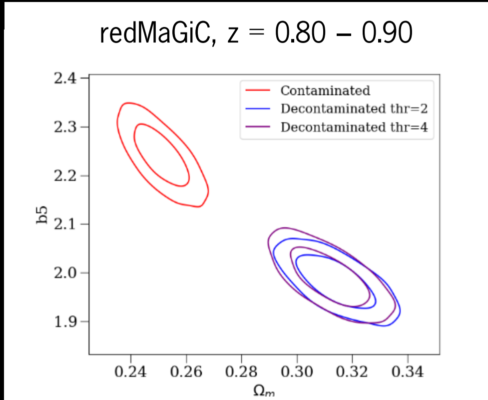
RESULTS AND PROSPECTS

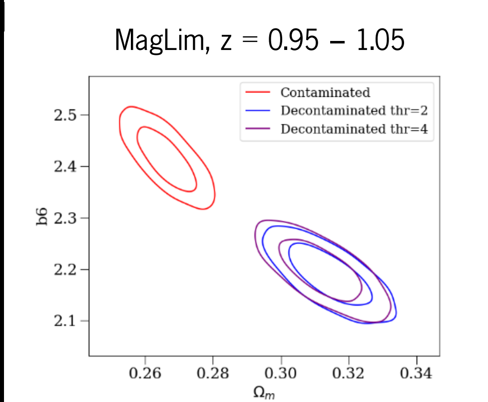
- We determine that a strict significance threshold is the best option to correct our data completely. Our validation tests demonstrate that any bias imparted on w(θ) or on its covariance by the weights is NEGLIGIBLE compared to our statistical error
- We study a generalization of the metric taking into account the clustering of the SP maps
- IN SUMMARY, we have validated the weights, the methodology and the metric itself, showing that our results are ROBUST and that the systematic uncertainty is smaller than the statistical error
- Covering larger areas reduces the statistical uncertainty, so the characterization and MITIGATION OF SYSTEMATIC ERRORS are becoming an increasingly important task for DES and for the coming surveys

Results from log-normal mocks



Results from log-normal mocks





감사합니다!

Thank you!