

SI plans in LSST DESC LSS

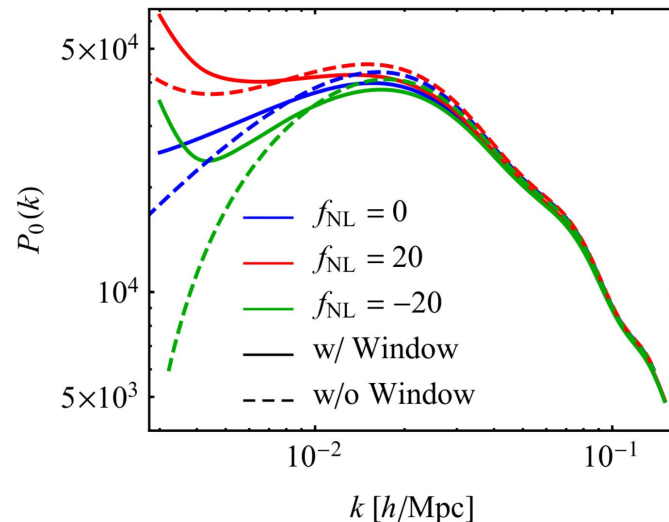
Science

Main observable: density contrast with respect to the mean: $\delta_g(\mathbf{x}) = \frac{n_g(\mathbf{x}) - \bar{n}_g(\mathbf{x})}{\bar{n}_g(\mathbf{x})}$

Need to estimate expected n_g accurately, accounting for systematic fluctuations (observing conditions, depth variations etc.)

Critical to achieve LSST science goals (faintest/highest-redshift galaxies, widest area)

Particularly critical for large-scale observables (e.g. primordial non-Gaussianity)



Typical treatment of systematics in LSS (after data cuts)

Create systematics template maps (data-driven, sherry-picked)

(Optional: decomposition or selection of templates, to avoid overfitting)

Then (non exhaustive list):

- **correct density maps or clustering estimates** using
 - cross-correlations
 - $n_g = f(\text{systematics})$ relations
 - object weights
- **or directly include in clustering estimator** via
 - mode (de)projection in power spectra
 - randoms in correlation functions

related by how contamination is modeled and removed

(e.g., mode projection = marginalization of linear contamination of density maps)

SI can deliver:

- improved template maps
- improved randoms for clustering estimators
- even better: a model for the transfer function of each galaxy sample
- redshift distribution estimates (incl. blending)
- improved sample selection (with minimal data cuts)
- pipeline improvements/characterization (blending, photo-z, etc)

Realistically, a combination of those (sample- & science-dependent)

Objectives of first DC2 DESC project (LSS+BL groups)

- Run (some) SI on DC2 simulations (images & LSS catalogs)
- Develop & compare SI-based systematics-mitigation methods (previous page)
- Determine SI needs*:
 - If/when coadd injections are sufficient
 - What area & range of observing conditions are needed
 - What populations to simulate, how realistically
- Develop methods to emulate SI if full footprint SI is not possible

**those questions could be answered generally, but DC2 could be a great testbed*

Complementary DC2 projects to be expected (e.g., photo-z)

Next steps: some DC2 runs, gather existing software

Long term: what galaxy populations + images would we like SI for?