

Fast sims

June 3, 2019

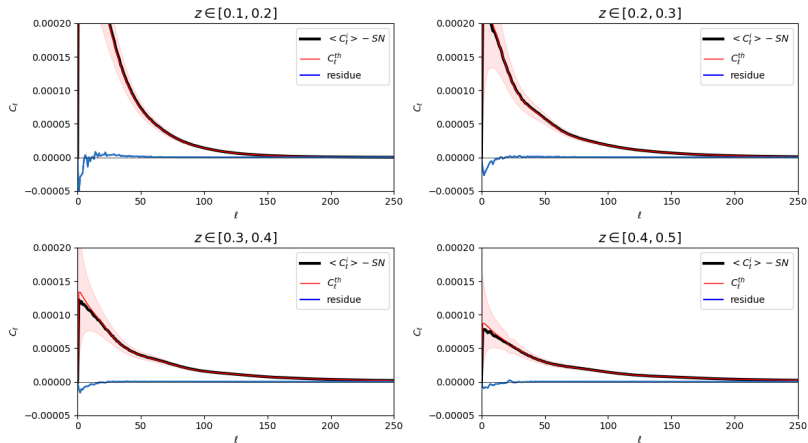


Fast simulations

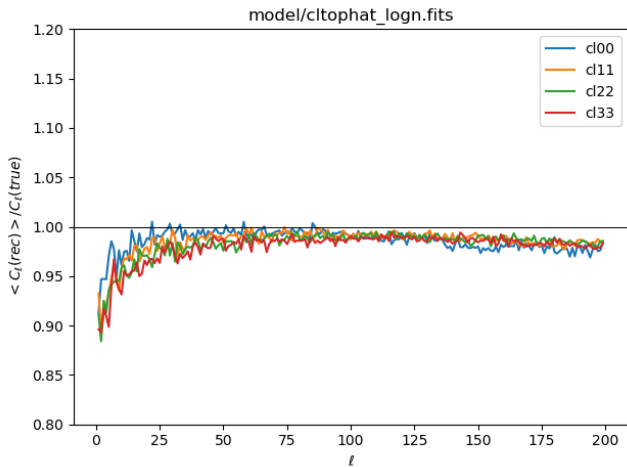
- Gaussian (+clipping...) multithreaded @cc
- LogNormal : CoLoRe
 - OMP+MPI : OMP@cc \rightarrow many sims (but limited in z) / OMP+MPI@NERSC \rightarrow large sims (LSST10Y in 30s).
 - includes RSD, WL...
 - be carefull: $P^{LN}(k) \neq P^{CLASS}(k) \rightarrow$ cosmo inference complicated : use `camgal` not `AngPow`
- a better one soon to come (Baratta, Bel, Ealet,SP):
LogNormal PDF + $P^{CLASS}(k)$



Testing CoLoRe



Testing CoLoRe



Analyzing (large) sims

CoLoRe write FITS files → Spark analysis with SparkFITS
(@NERSC or UPSud, soon CC)

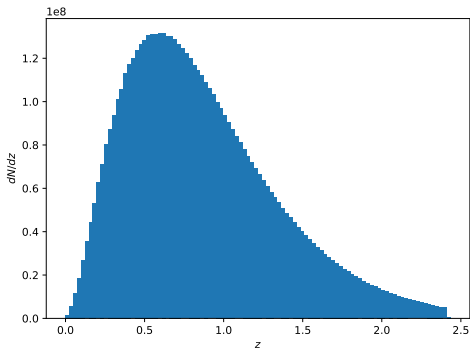
- *simple* (built-in) parallelization without MPI
- automatic pipeline optimization
- cache (60GB/node @NERSC) → interactive analysis
- scalable
- best performances on the market (industry)

demonstration on LSST10Y ($6 \cdot 10^9$ galaxies)



selection function

gaussian smearing ($\sigma_z = 0.03(1 + z)$):

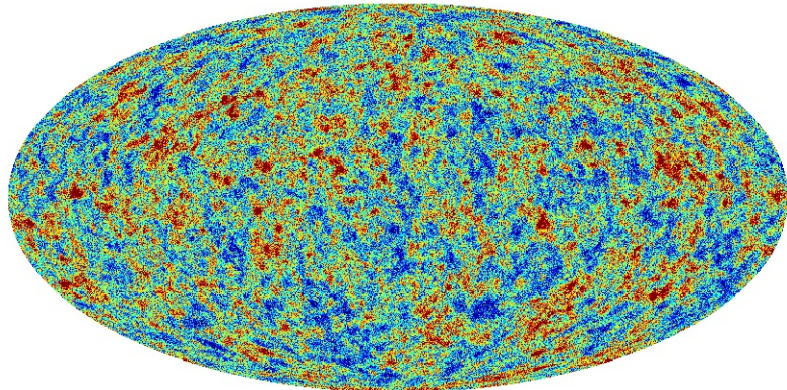


10s!



Tomography

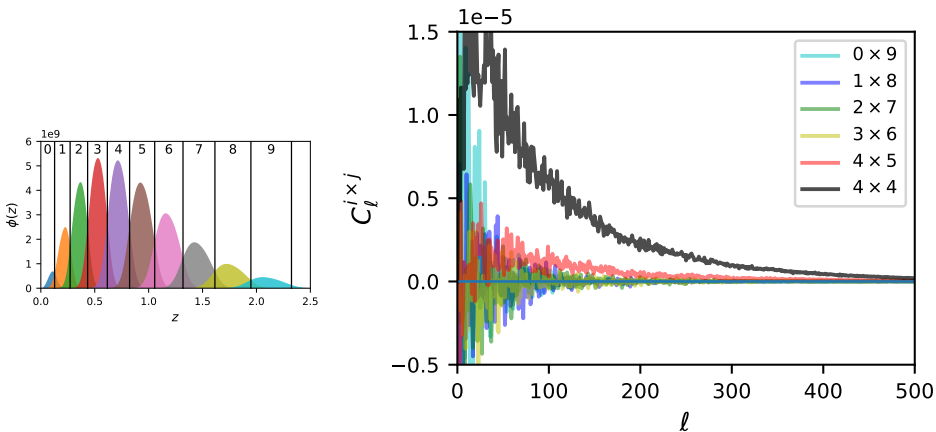
$z \in [0.0, 0.1]$



$\simeq 30s/\text{shell}$ (ang2pix)



Power spectra



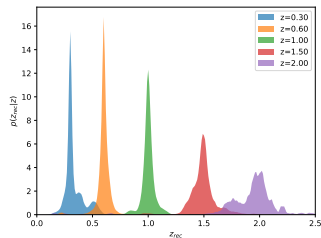
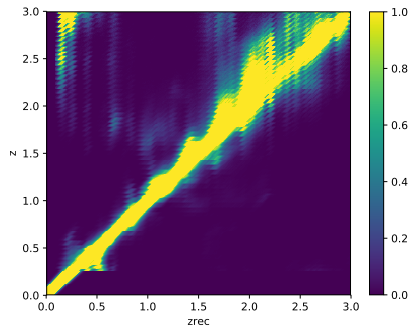
<https://arxiv.org/abs/1807.03078>



Including realistic PZ

from Cecile et al work

based on template-fitting (first no quality cut):



Generation

standard MC technique:

$$u \sim U(0, 1) \rightarrow F^{-1}(u) \sim f$$

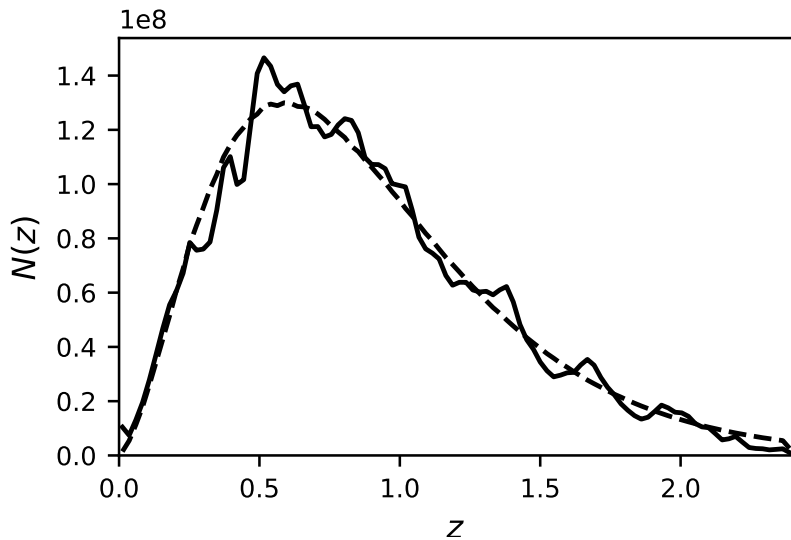
where F is the cumulative function of f .

→ Pre-compute the $F^{-1}(u, z)$ table for each $f(z_{rec}|z)$ (finely binned)

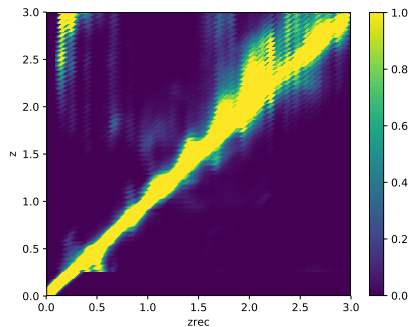
- 1 shoot a column of randoms u (in **Spark**)
- 2 for each z value read from $F^{-1}(u, z)$
 - extremely fast
 - checked on Gaussian case.



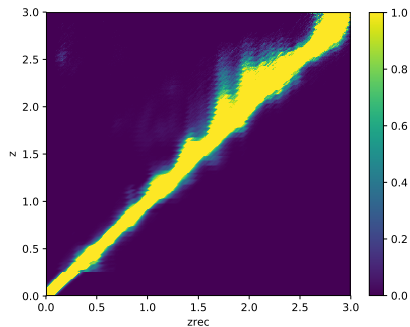
Result



Quality cut



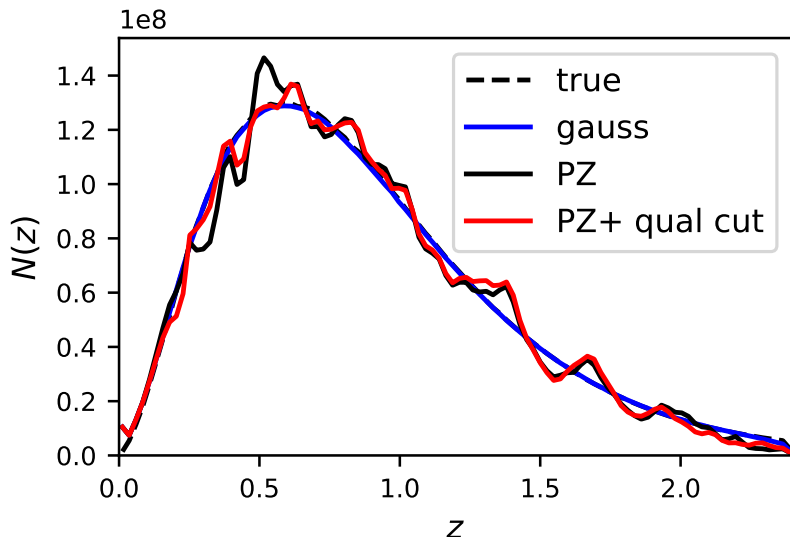
without



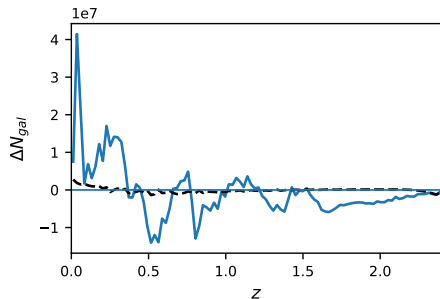
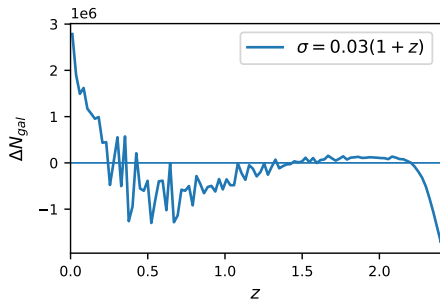
with



Result



A strong effect



key point is robustness

(Joanna+Jean-Eric)

