

Super-sample covariance : Easy Euclid implementation

Based on

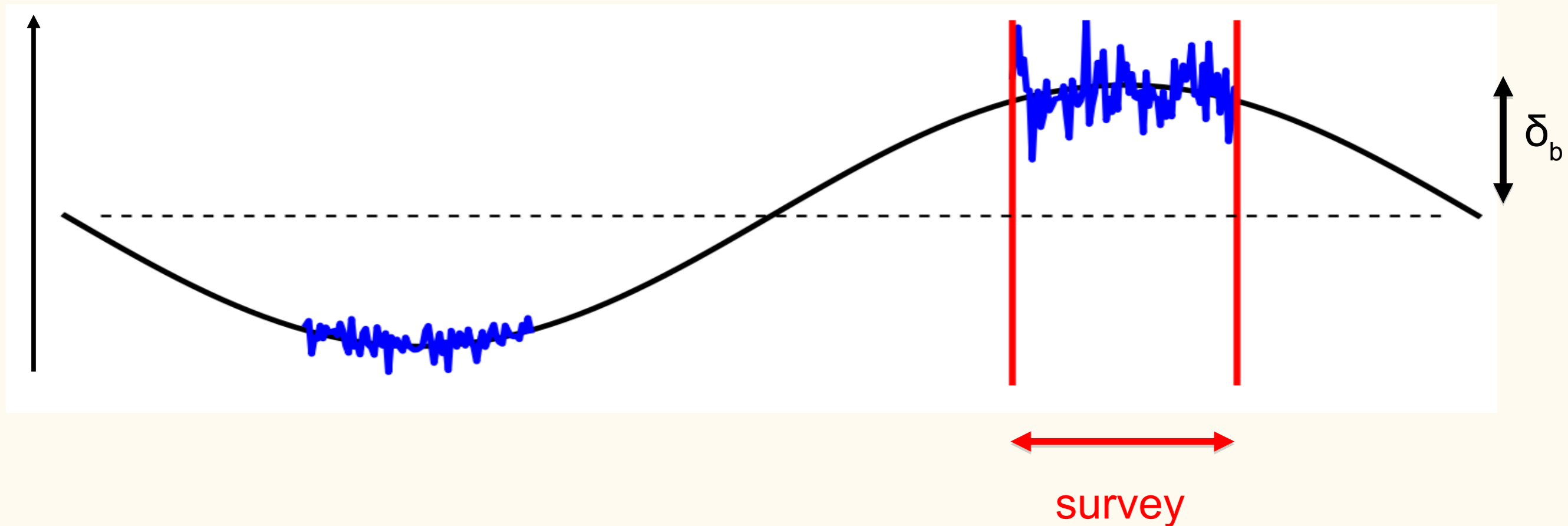
Lacasa & Grain 2019 – arXiv: 1809.05437

Lacasa 2019a - arXiv: 1909.00791

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Super-sample covariance (SSC)

Matter density



Why care ?

- Cluster counts: **doubles** error bar on Dark Energy
Hu & Kravtsov 2003
- Weak lensing: > doubles
+110% on w
Barreira+ 2018
- Photometric Galaxy Clustering: > doubles
+120-130% on w
Lacasa 2019a

Easy SSC

Approximation designed by [Lacasa & Grain 2019](#)

$$\text{Cov} (C_\ell(i_z), C_{\ell'}(j_z)) = R_\ell C_\ell(i_z) R_{\ell'} C_{\ell'}(j_z) S_{i_z, j_z}$$

Elements:

- C_ℓ : between any probes (GC, shear, clusters, iSW, CMB lensing...)
- R_ℓ : probe's response. Simple ansatz possible: $R=4$
- S_{ij} : amplitude of super-survey modes

Public code

<https://github.com/fabienlacasa/PySSC>

Python module with a notebook of examples and applications

Example use:

```
Import PySSC  
Sij = PySSC.Sij(z, windows, cosmo_params=params)
```

Kernel / window function
of the probe(s)

Optional: cosmo parameters
Default: Planck 2018

Running time for 10 bins : 5 seconds

Use in Euclid and outside

- Discussed for implementation in IST:nonlinear as input to IST:likelihood
- Already implemented in one code of IST:forecast
Vincenzo Cardone, Davide Sciotti
- Ongoing implementation in LSST
Rogerio Rosenfeld, Nelson Ferreira
- Current project
 - Generalisation to partial sky
 - Implementation in CosmosisMarie Aubert, Philippe Baratta, Adélie Gorce, Sylvain Gouyou Beauchamps and Isaac Tutusaus
→ Public release

For CMBXC

Impact for CMB secondaries (iSW, lensing)

- **Auto-spectra: negligible** probably
Reason: large volume
- **Cross-spectra: ???**
tomographic bins
trade-off with noise and scale cuts

We don't know but now easy to check

Do better than IST:forecast : no artificial scale cuts

Thanks for the attention

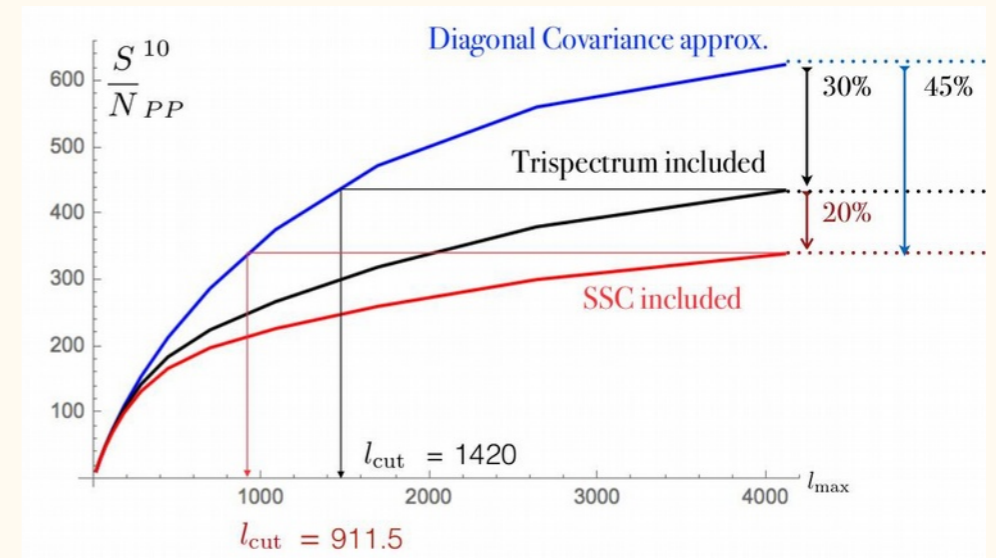
Additional slides

NL impact on weak lensing

- Impact on S/N (courtesy of M. Rizzato, IAP)

Equivalent to cutting data

$$l_{\max} = 5000 \rightarrow l_{\max} \sim 900$$



- Impact on param constraints : Barreira+ 2018

- Error bars increased by +30% to +110%

- DE heavily affected σ_8 and Ω_m too

