Optimal {ϕ, delensed-E} bandpower estimation

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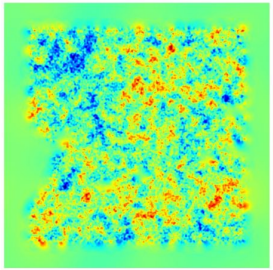
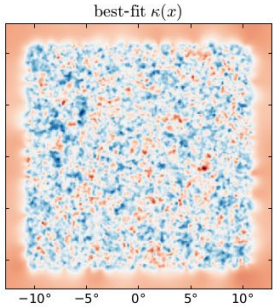
Can’t we just build bandpower estimates from existing reconstructions?

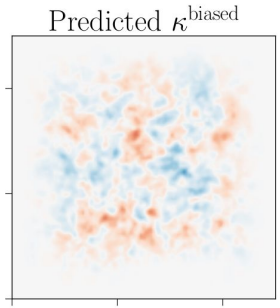
Carron&Lewis 2017
Marginal MAP



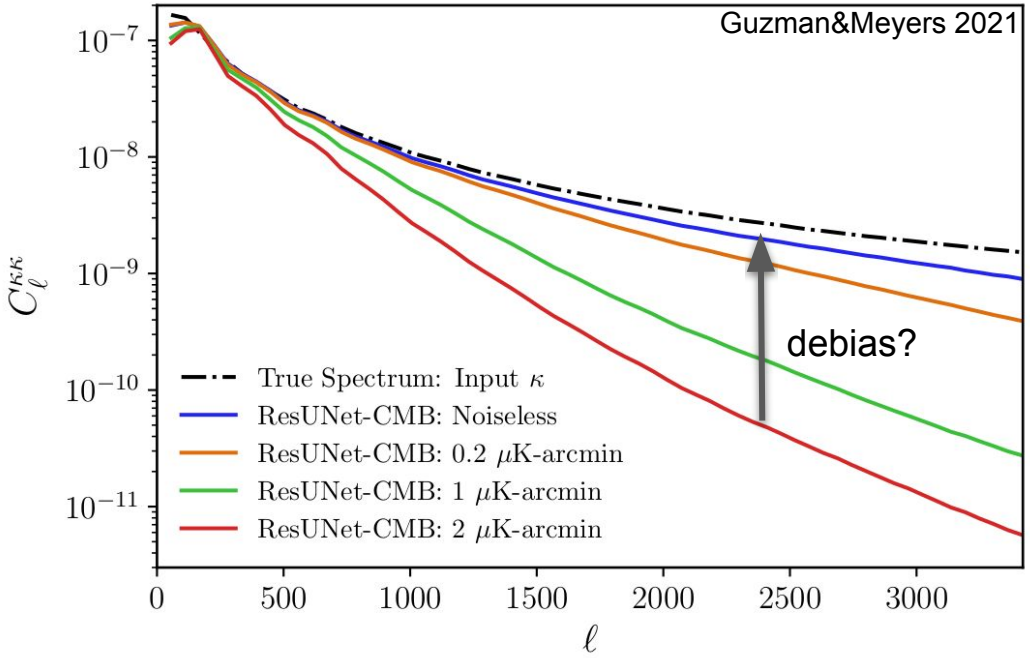
MM,Anderes,Wandelt 2017
Joint MAP



Caldeira++ 2018
Guzman&Meyers 2021
DeepCMB



Power spectrum of any of these maps is *biased*:

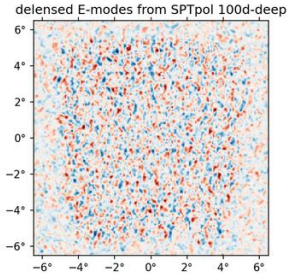


- Debiasing via sims only does so at a fiducial model
- Additive? Multiplicative? Both?
  - Wrong choice → loss in optimality

Generic and optimal “automatic” solutions

Monte-Carlo sampling:

$$\mathcal{P}(C_\ell \mid d) = \int \mathrm{d}f\, \mathrm{d}\phi\, \mathcal{P}(f, \phi, C_\ell \mid d)$$



Integrate via Monte-Carlo

Maximum-likelihood estimation (MLE):

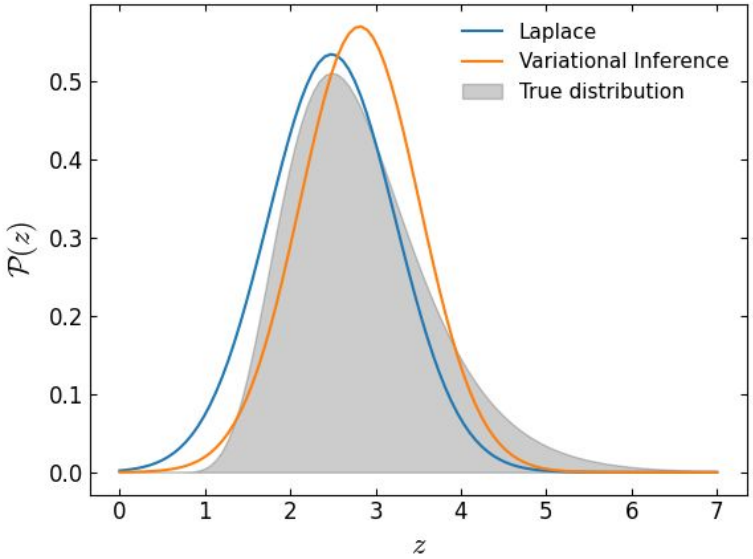
$$\frac{d}{dC_\ell}\mathcal{P}(C_\ell \mid d) = \int \mathrm{d}f\, \mathrm{d}\phi\, \frac{d}{dC_\ell}\mathcal{P}(f, \phi, C_\ell \mid d)$$

Iteratively maximize via gradients

Maximum posterior mass (MPM; this work)

Like MLE, but approximating the integrand as Gaussian

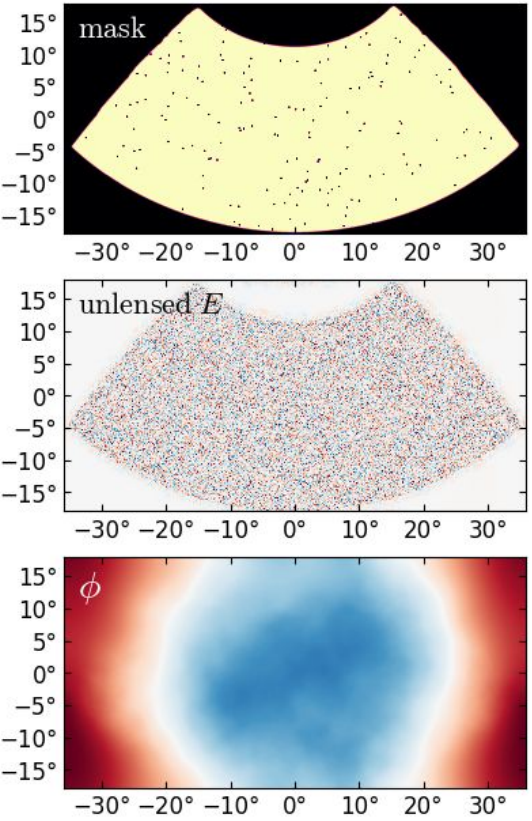
Toy example



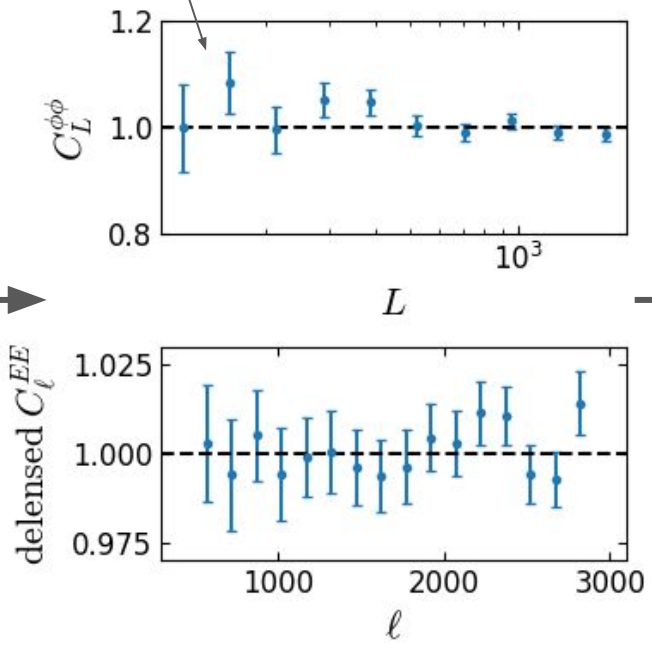
Maximum posterior mass (MPM) lensing estimation

Joint MAP

S4deep 95GHz noise (SPT-3G mask)

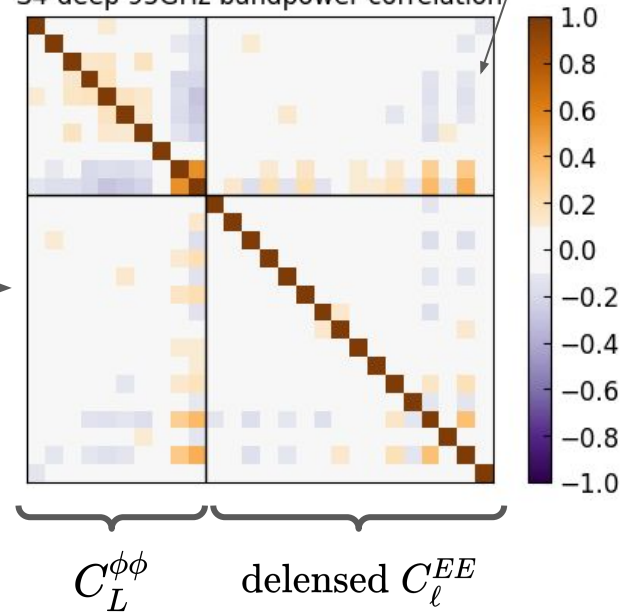


Mean-field



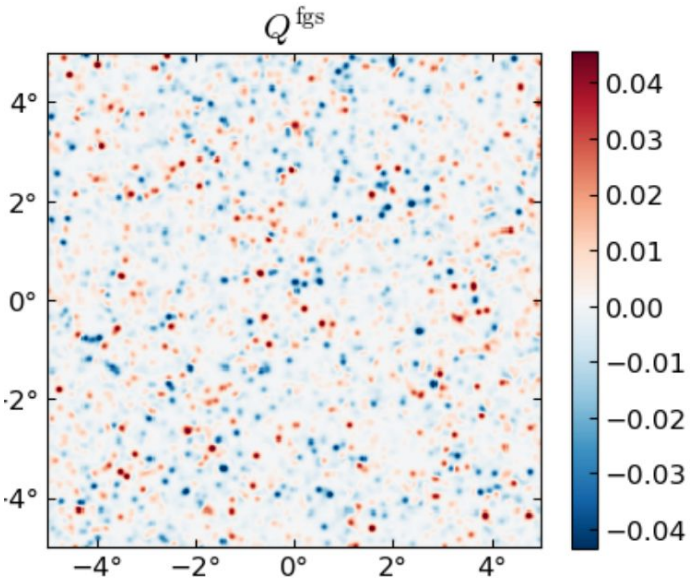
Never before looked at

Maybe seen by Green++?

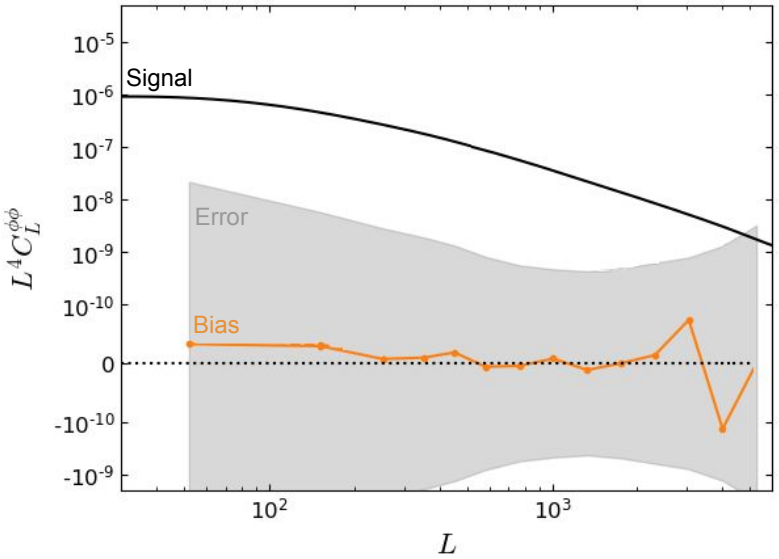


Works *great* for bias estimation from foregrounds or systematics.

Inject foregrounds into data
E.g: polarized radio point sources at 95GHz



Can demonstrate bias to optimal lensing reconstruction power spectrum is negligible given (attainable) masking



Schaan, MM, in prep

Wait for paper next week or https://github.com/marius311/CMBLensing.jl if you can’t wait.