Combining Probes of Dark Energy in LSST

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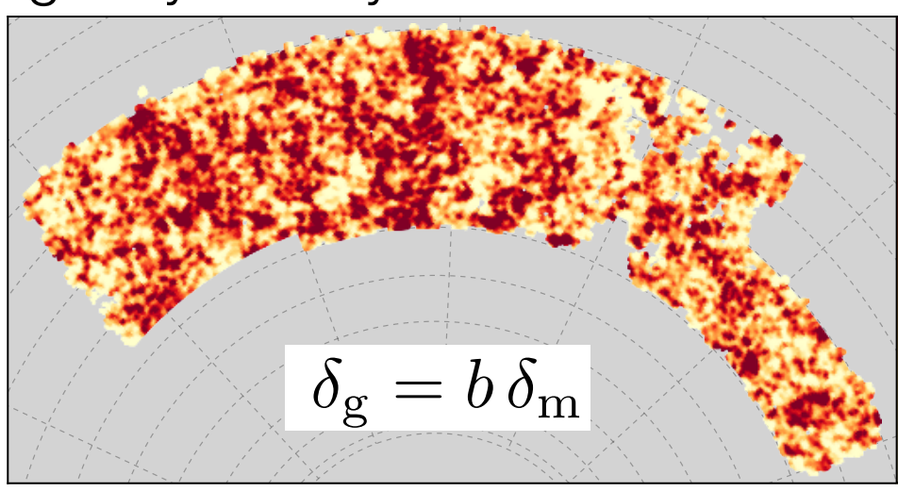
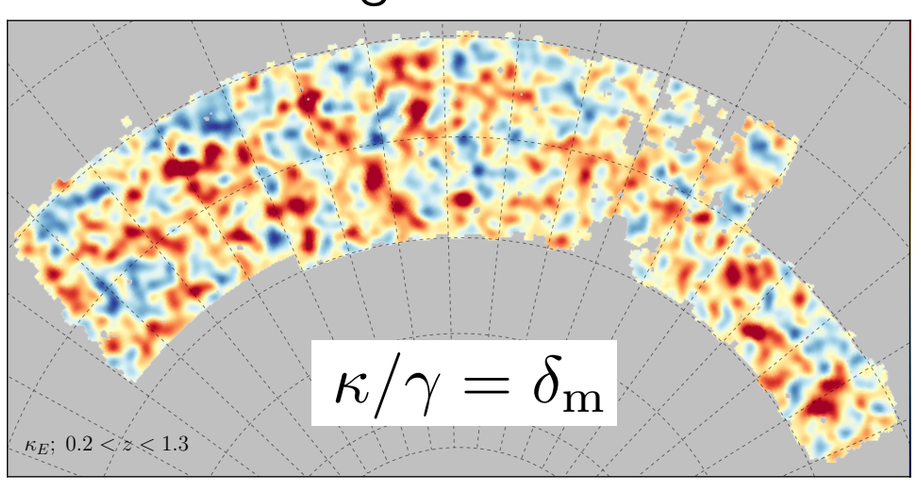
galaxy density

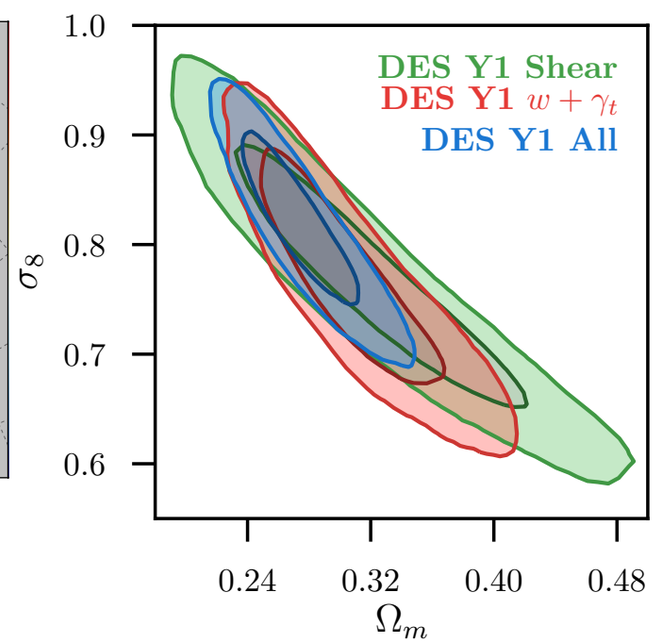


weak lensing



$\langle \delta_g | \delta_g \rangle = \xi_{\rm gg} \sim b^2 \sigma_8^2$ $\quad$ $\langle \delta_g | \gamma \rangle = \xi_{\rm mg} \sim b \sigma_8^2$ $\quad$ $\langle \gamma | \gamma \rangle = \xi_{\rm mm} \sim \sigma_8^2$

DES Year 1: Elvin-Poole+ 2017; Chang+ 2018; DES 2017



- **"3x2" analysis:** Combine galaxy density and weak lensing auto- and cross-correlations. Can also combine with clusters, SNe, strong lensing, RSD, CMB lensing, 21cm

- **Why combine?** More statistical power, different systematics and degeneracies, "self-calibration"

- **Requirements:** Modeling of observables and systematics, including nonlinear galaxy bias and intrinsic alignments (IA); software for predictions (`CCL`), joint covariance (`TJPCov`), and inference pipeline (`TJPCosmo`)

Learn more:

- Core Cosmology library: github.com/LSSTDESC/CCL
- Nonlinear IA modeling: arXiv:1708.09247
- Evaluation of nonlinear perturbation theory with `FAST-PT`: github.com/JoeMcEwen/FAST-PT