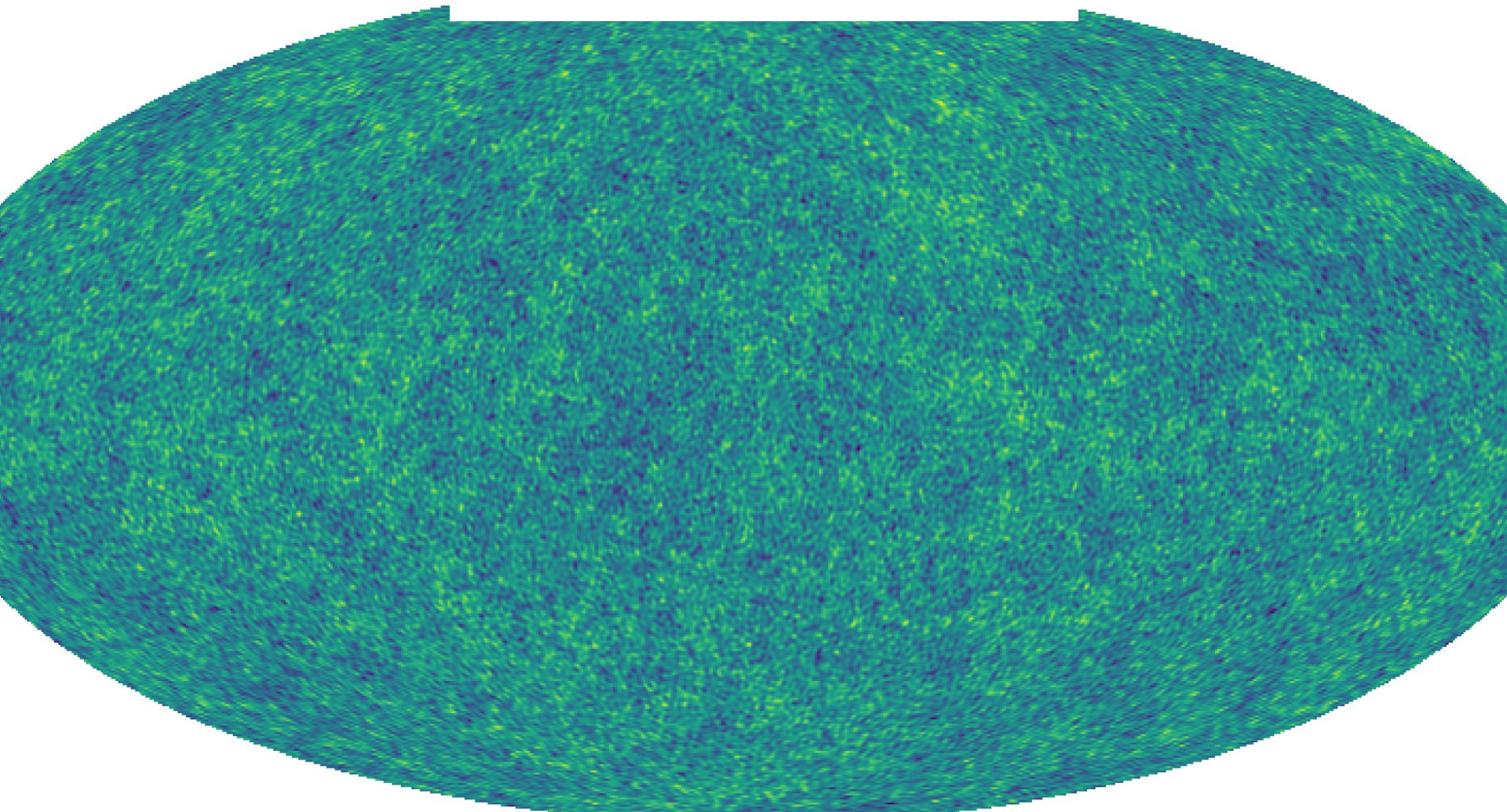


Cross-correlating the GW astrophysical background with galaxy clustering

Guadalupe Cañas-Herrera, **Omar Contigiani**, Valeri Vardanyan



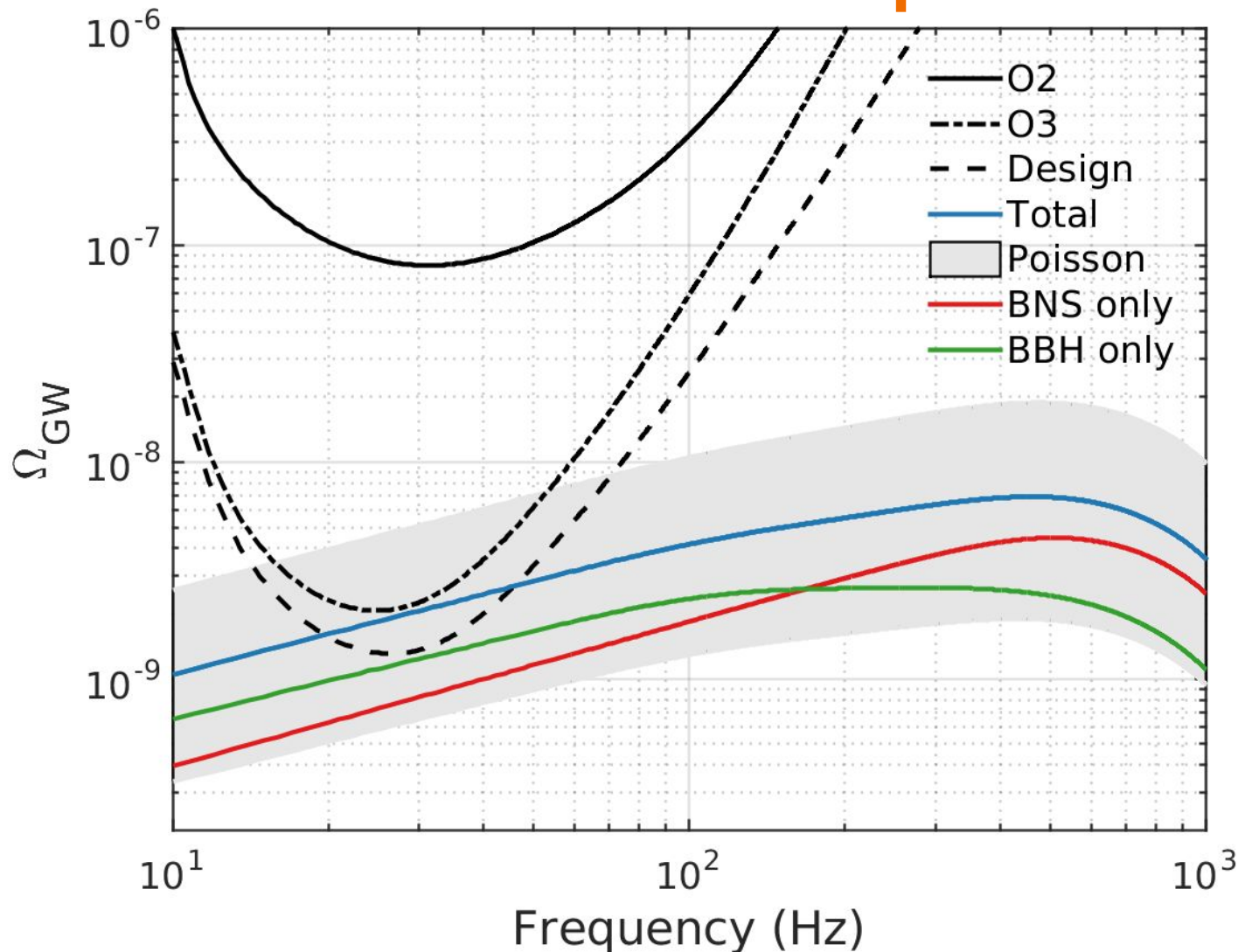
$$\Omega_{\text{GW}}(\nu_0, \hat{\mathbf{r}}) = \frac{\nu_0}{\rho_c} \frac{d\rho_{\text{GW}}(\nu_0, \hat{\mathbf{r}})}{d\nu_0 d^2\hat{\mathbf{r}}},$$



$$\Omega_{\text{GW}}(\hat{\mathbf{r}}) \equiv \int dr r^2 \mathcal{K}(r) n(\vec{\mathbf{r}}),$$

GW astrophysical background - hard to detect

LIGO & the monopole



GW astrophysical background - hard to model

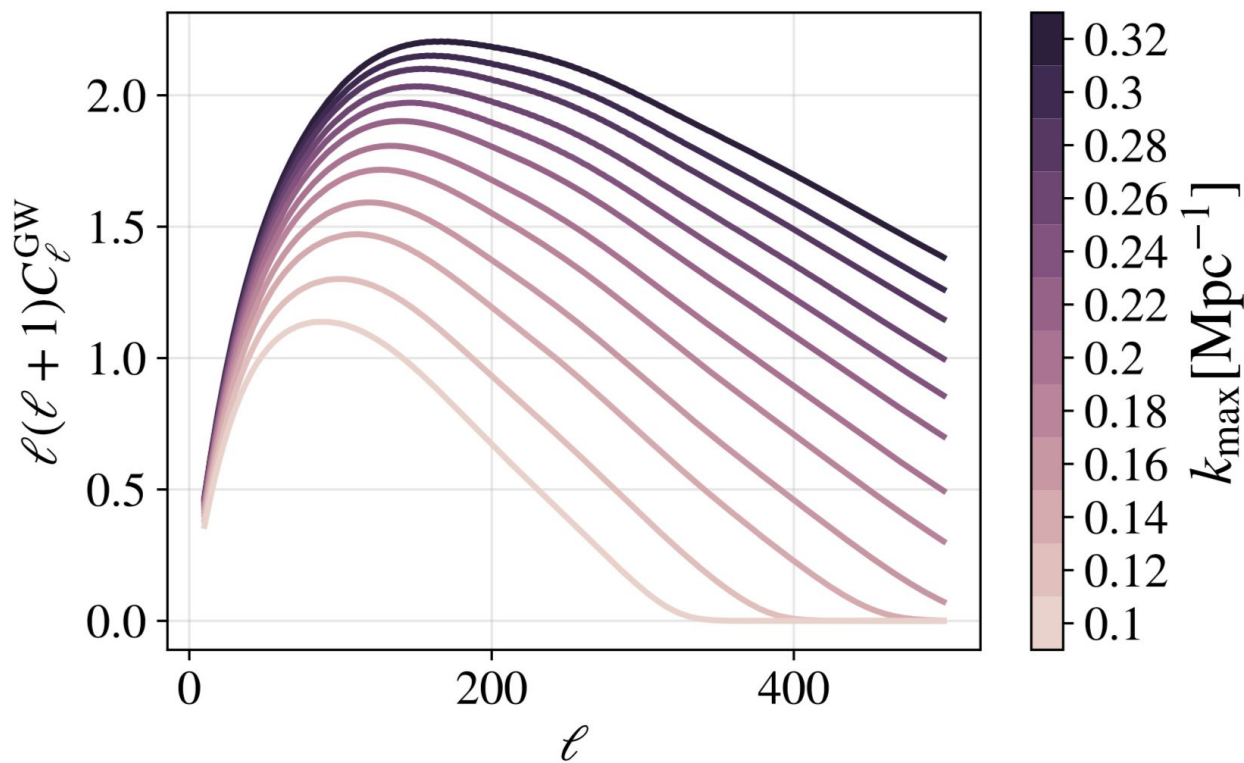
Depends on small and nearby structure

$$C_\ell \sim \int \frac{dr}{\ell^2} r \mathcal{K}^2(r) \mathcal{P}_g \left(k = \frac{\ell}{r}, z(r) \right)$$

GW astrophysical background - hard to model

Depends on small and nearby structure

$$C_\ell \sim \int \frac{dr}{\ell^2} r \mathcal{K}^2(r) \mathcal{P}_g \left(k = \frac{\ell}{r}, z(r) \right)$$

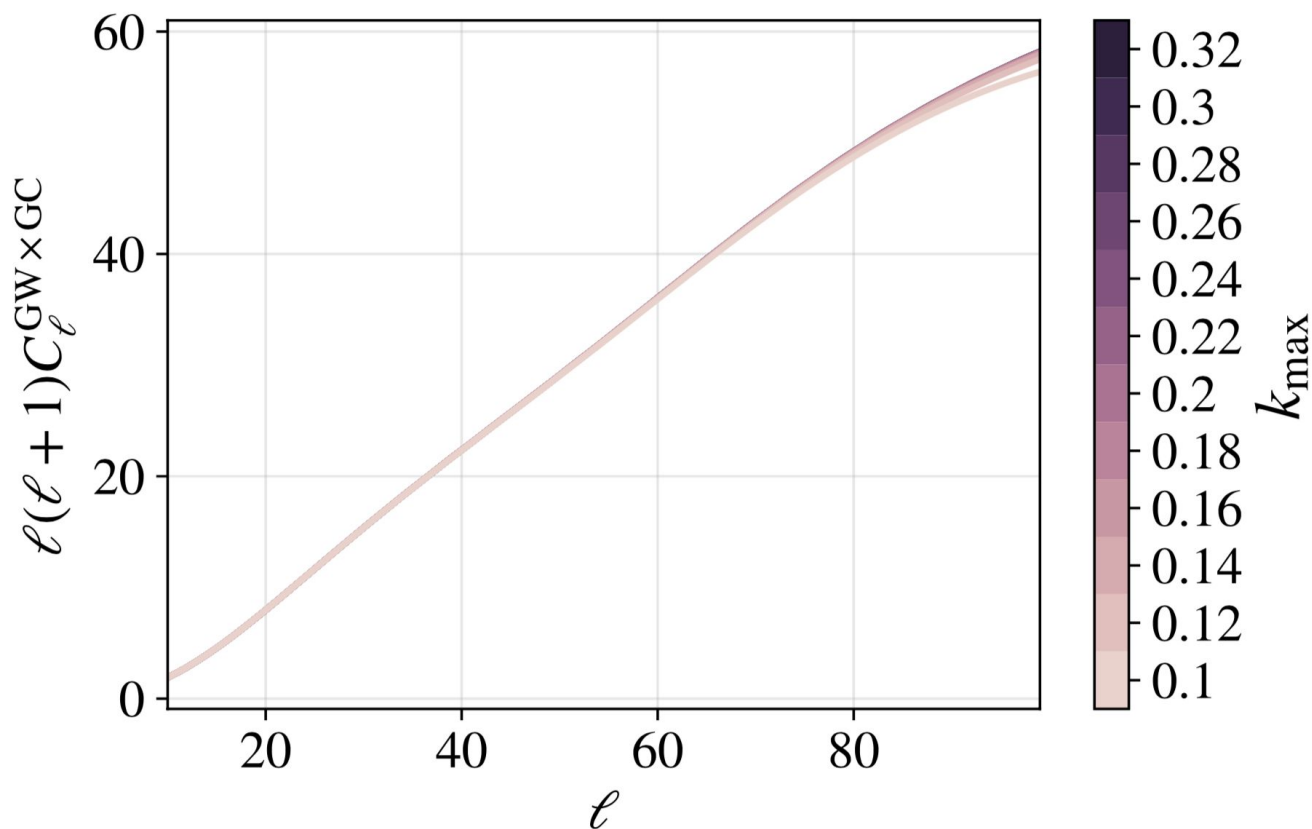


Cross-correlating GW background with galaxy catalogs

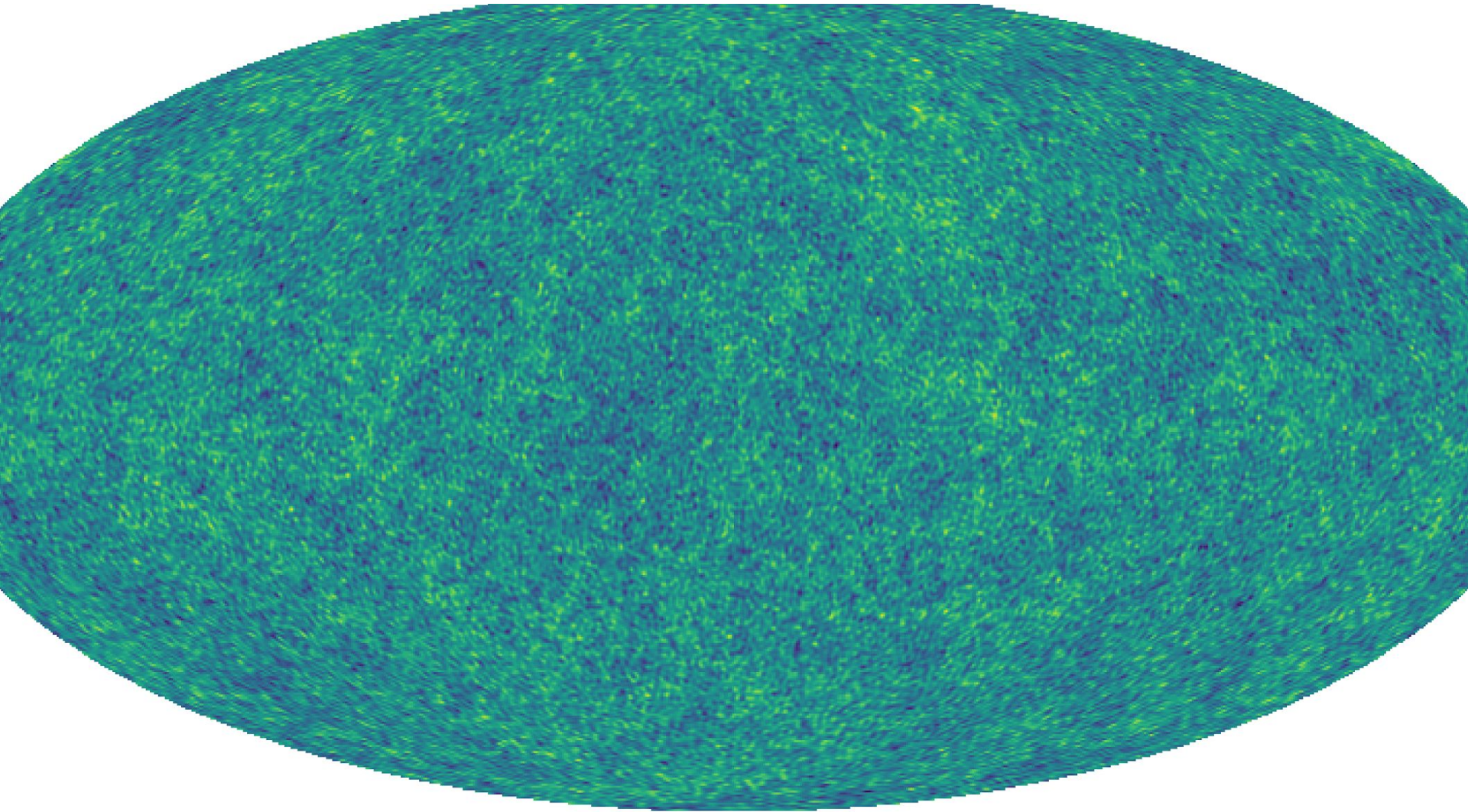
$$\Omega_{\text{GW}}(\hat{\mathbf{r}}) \equiv \int dr r^2 \mathcal{K}(r) n(\vec{\mathbf{r}}),$$

GW-GC cross-correlation - no noise, easy to model

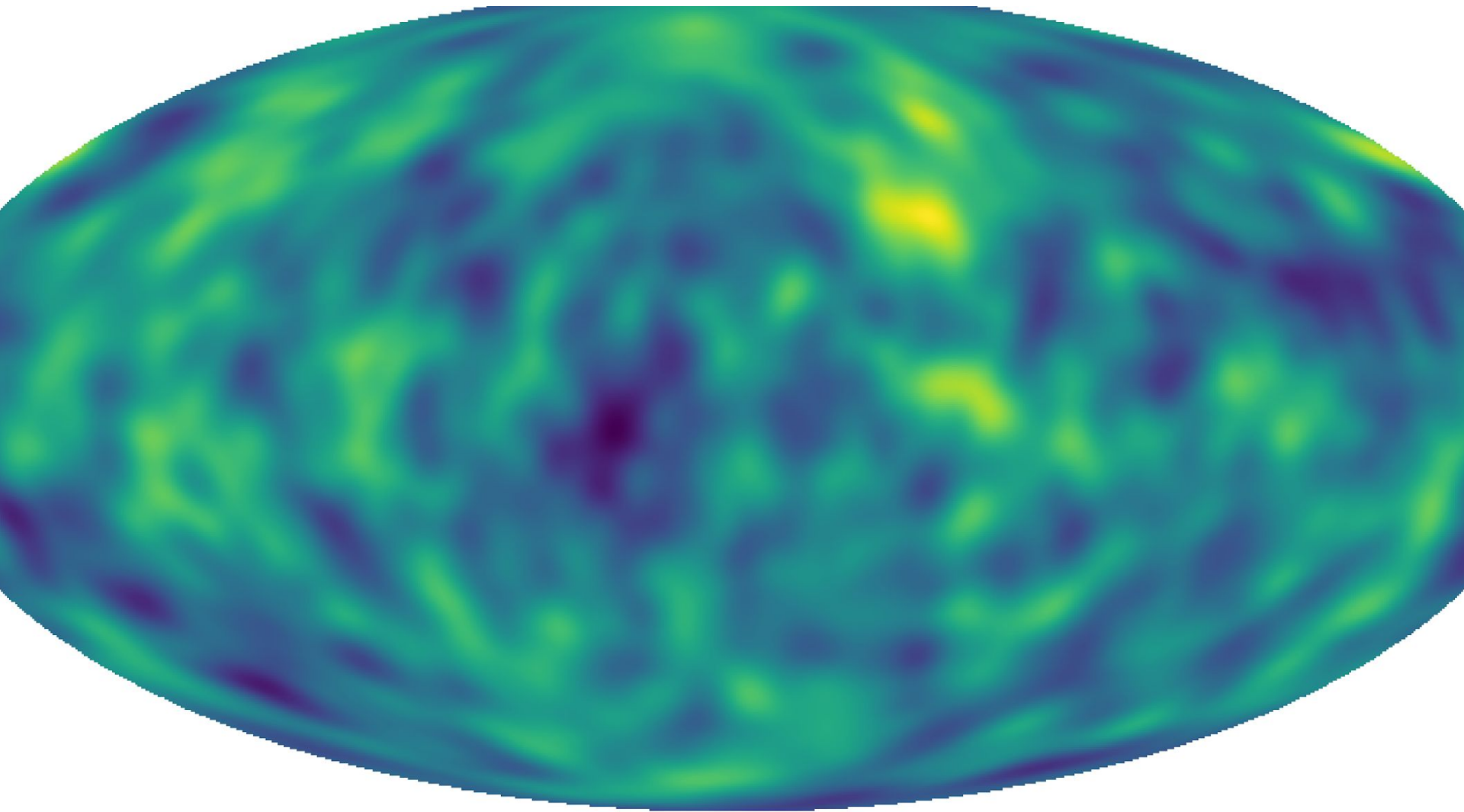
$$C_\ell \sim \int \frac{dr}{\ell^2} r \mathcal{K}(r) \mathcal{W}(r) \mathcal{P}_g \left(k = \frac{\ell}{r}, z(r) \right)$$



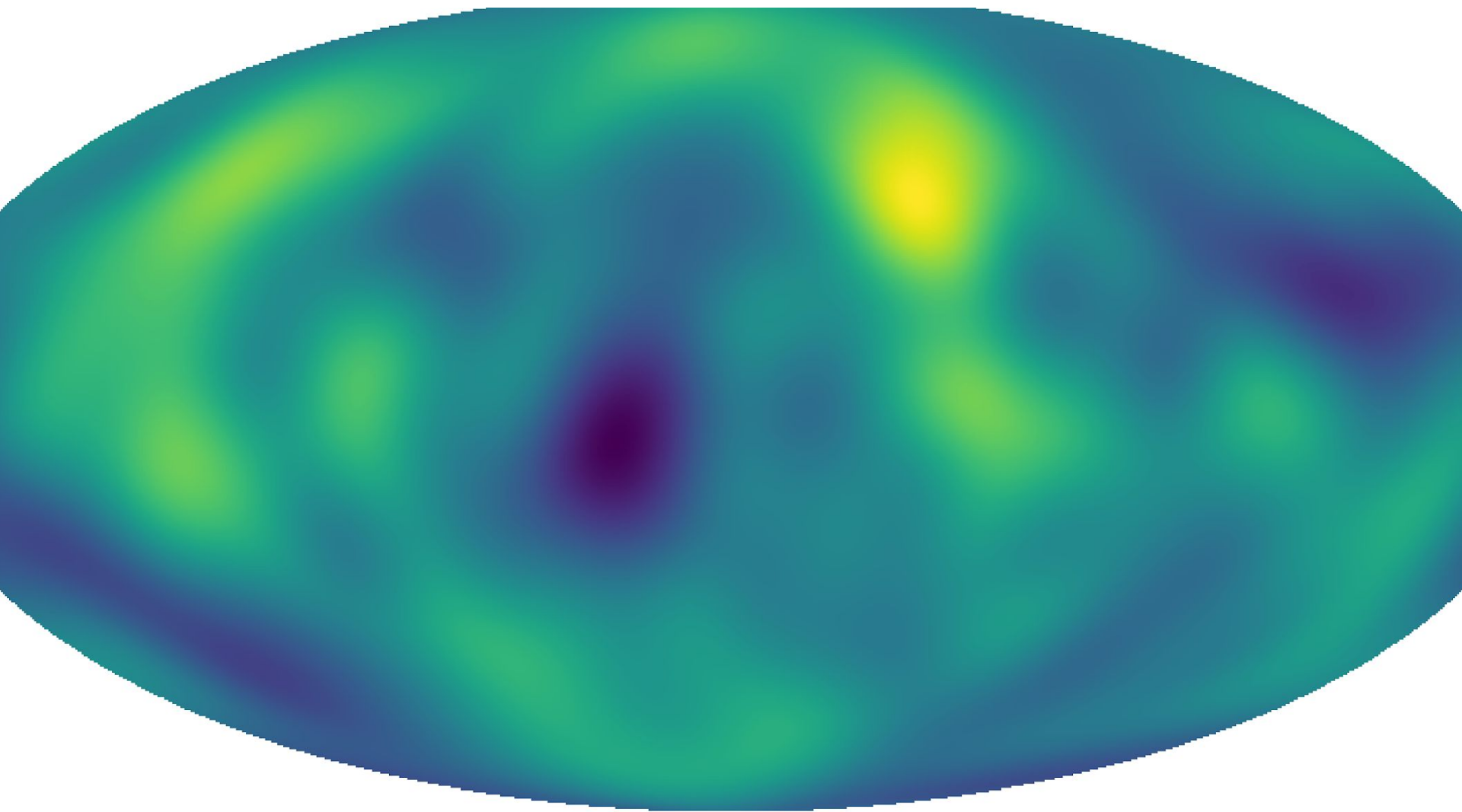
GW-GC cross-correlation - angular resolution



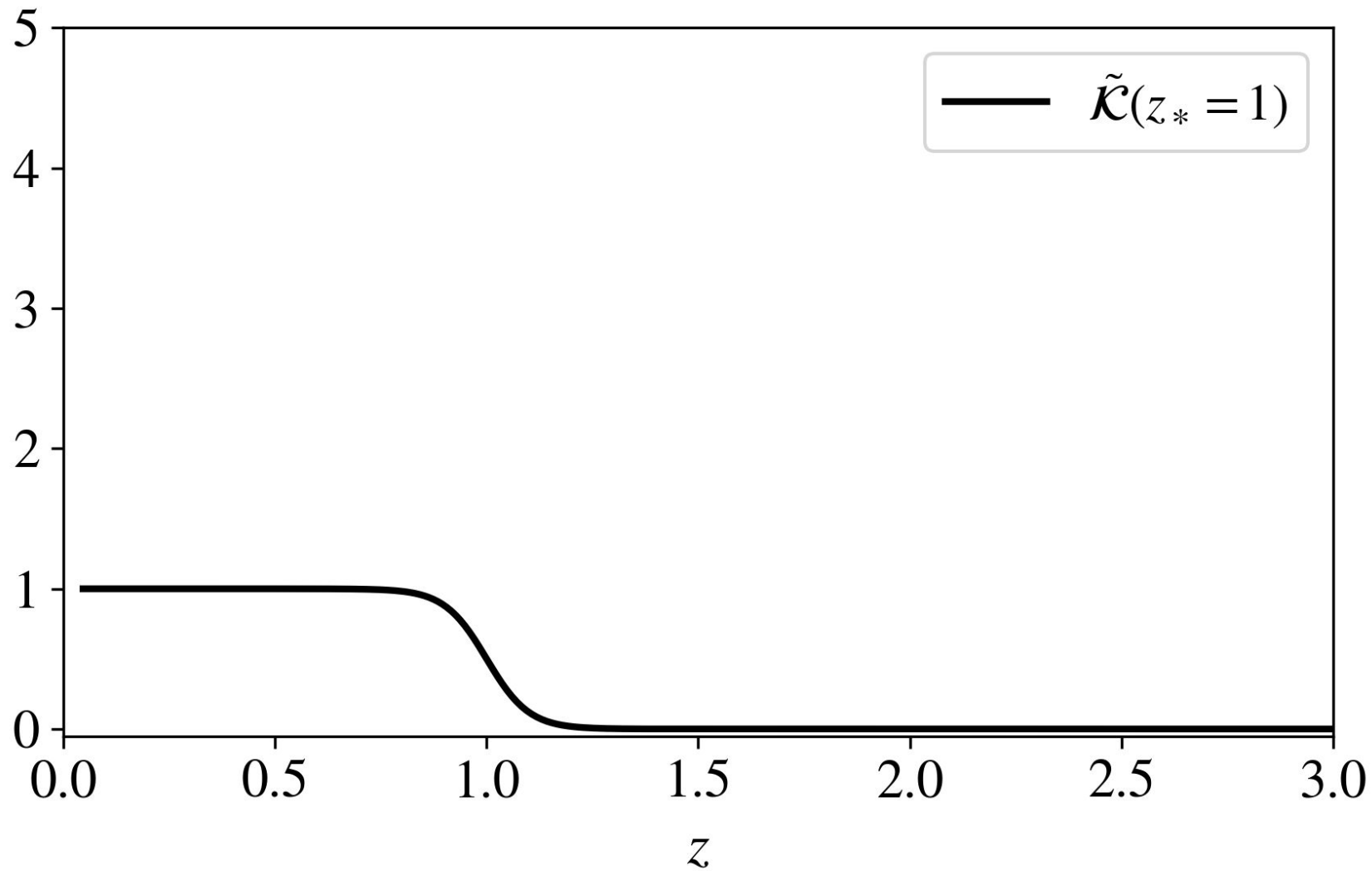
GW-GC cross-correlation - angular resolution



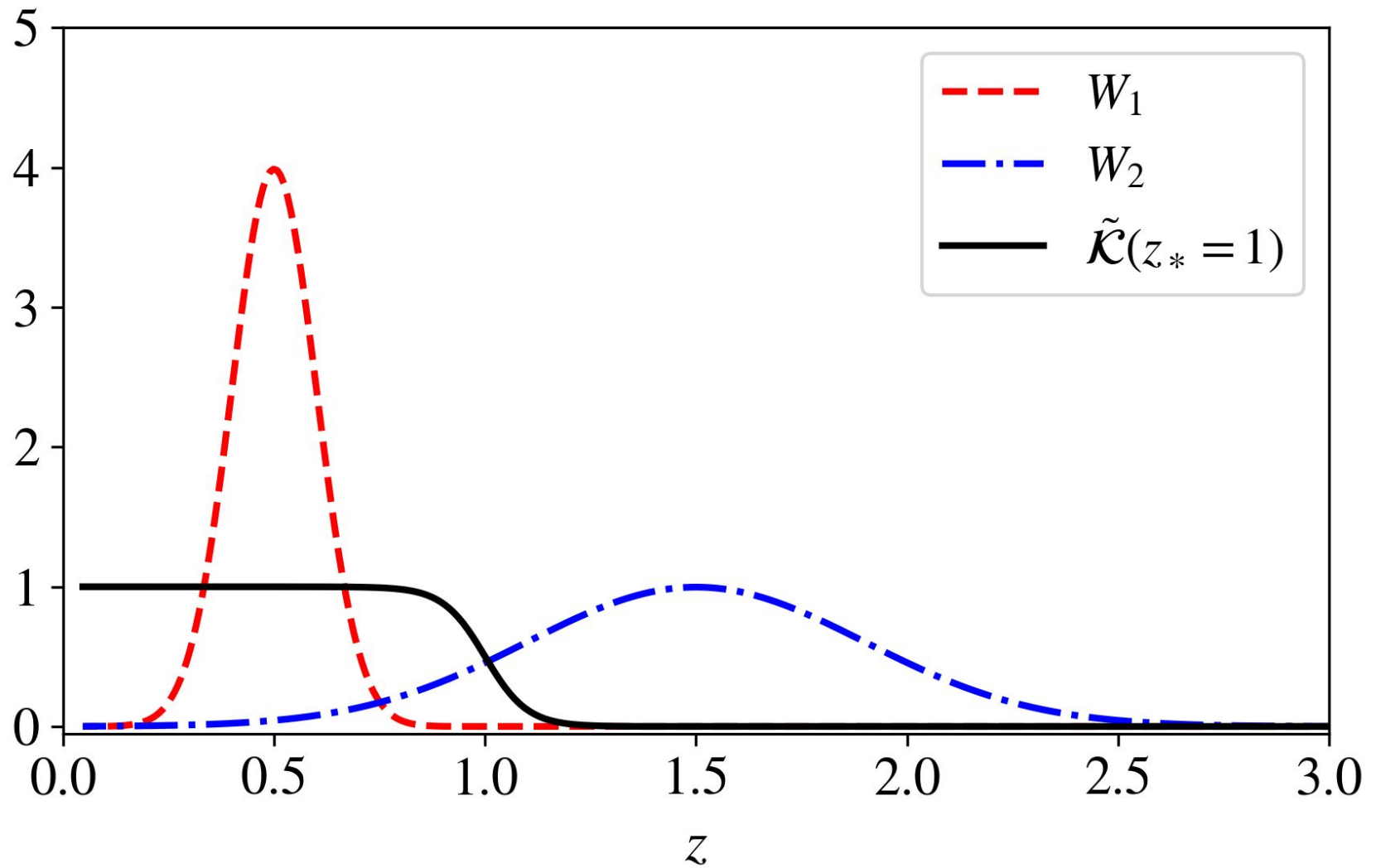
GW-GC cross-correlation - angular resolution



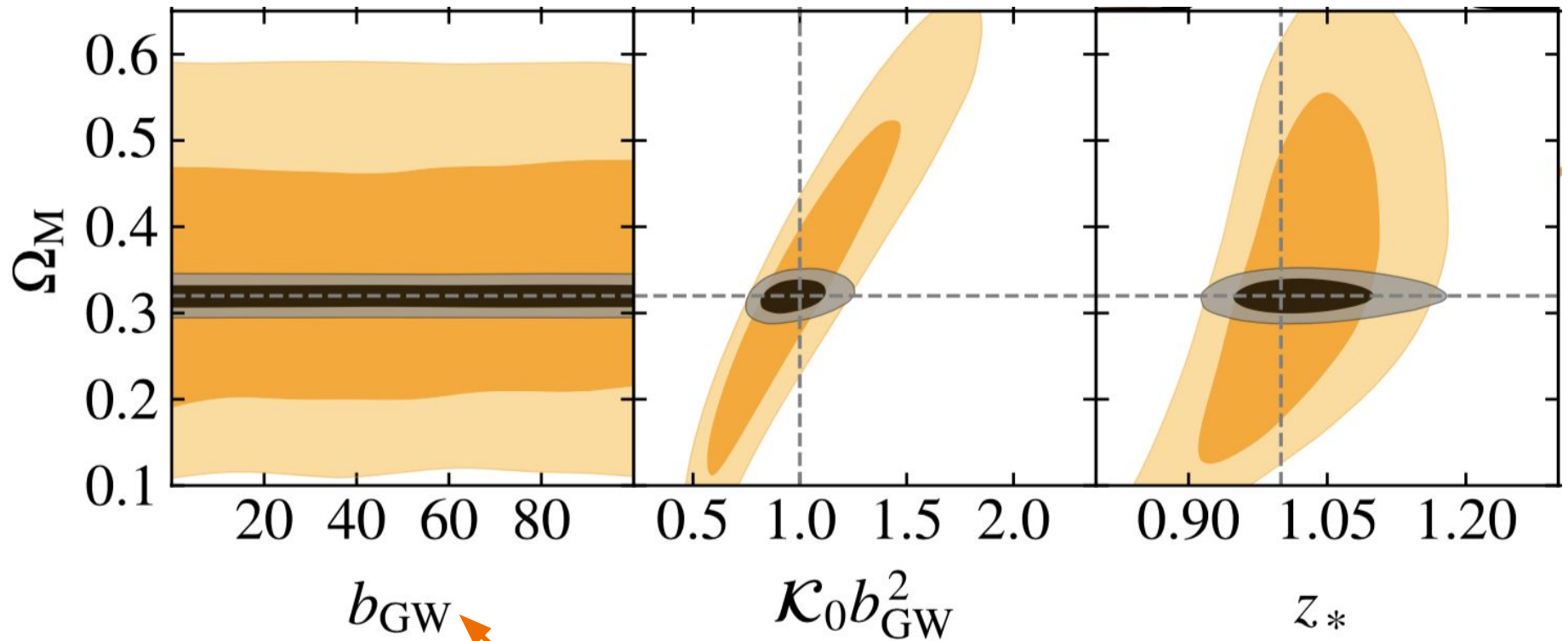
GW-GC cross-correlation - toy model setup



GW-GC cross-correlation - toy model setup

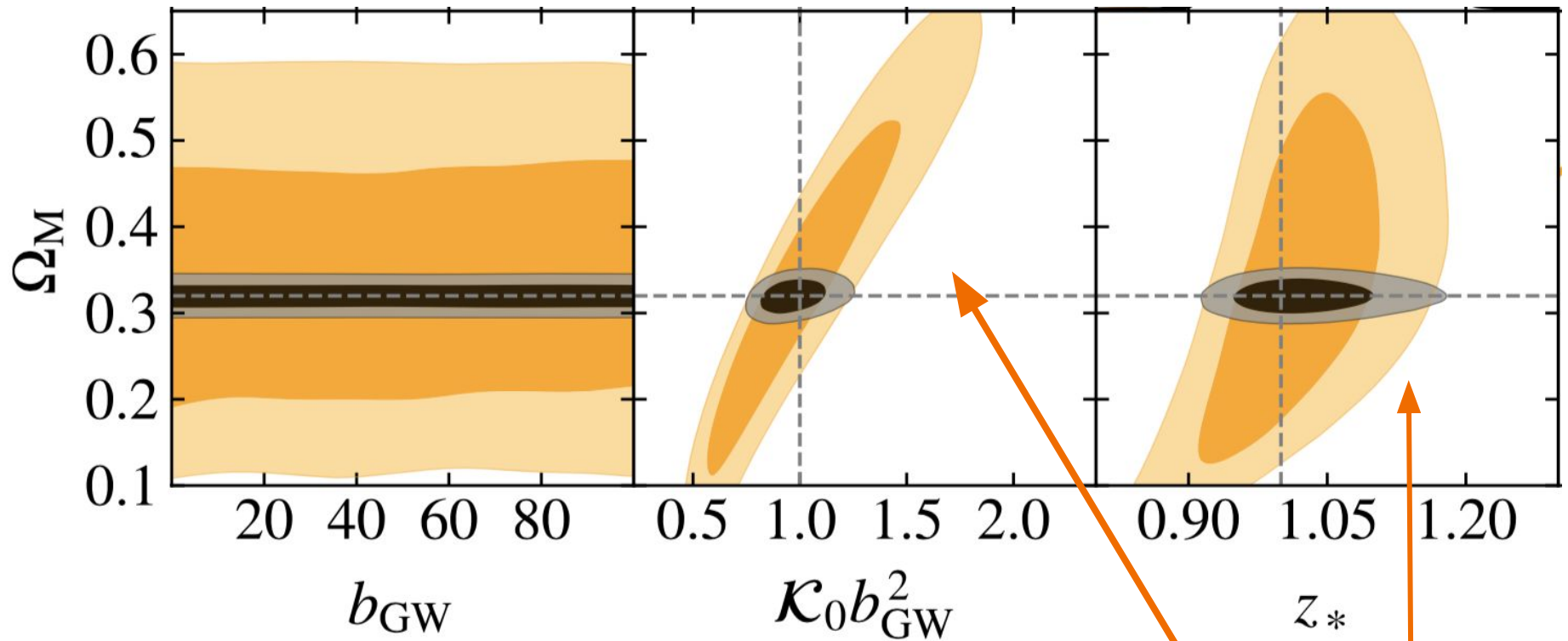


GW-GC cross-correlation - constraining the model



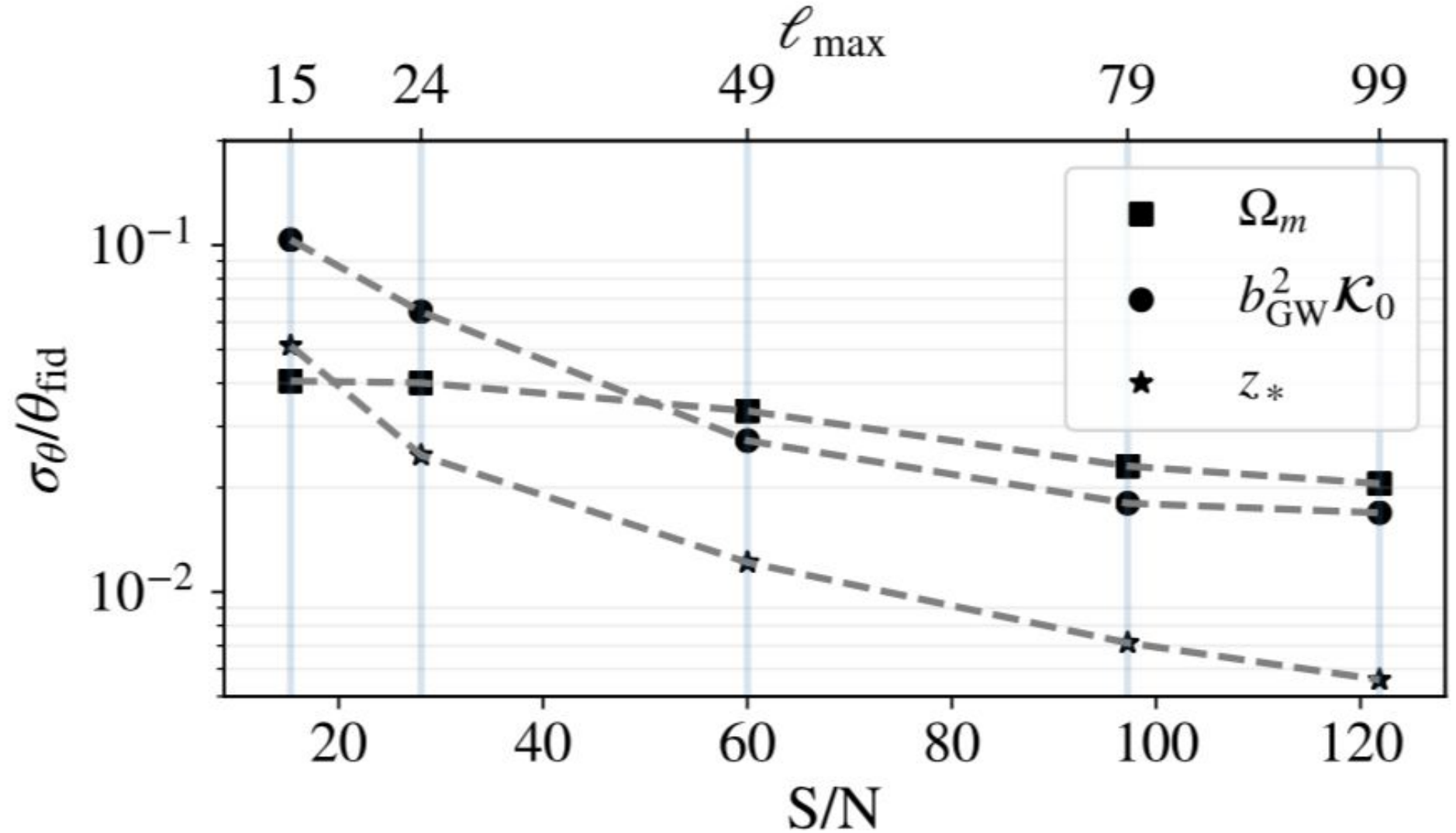
Galaxy bias, signal amplitude

GW-GC cross-correlation - constraining the model

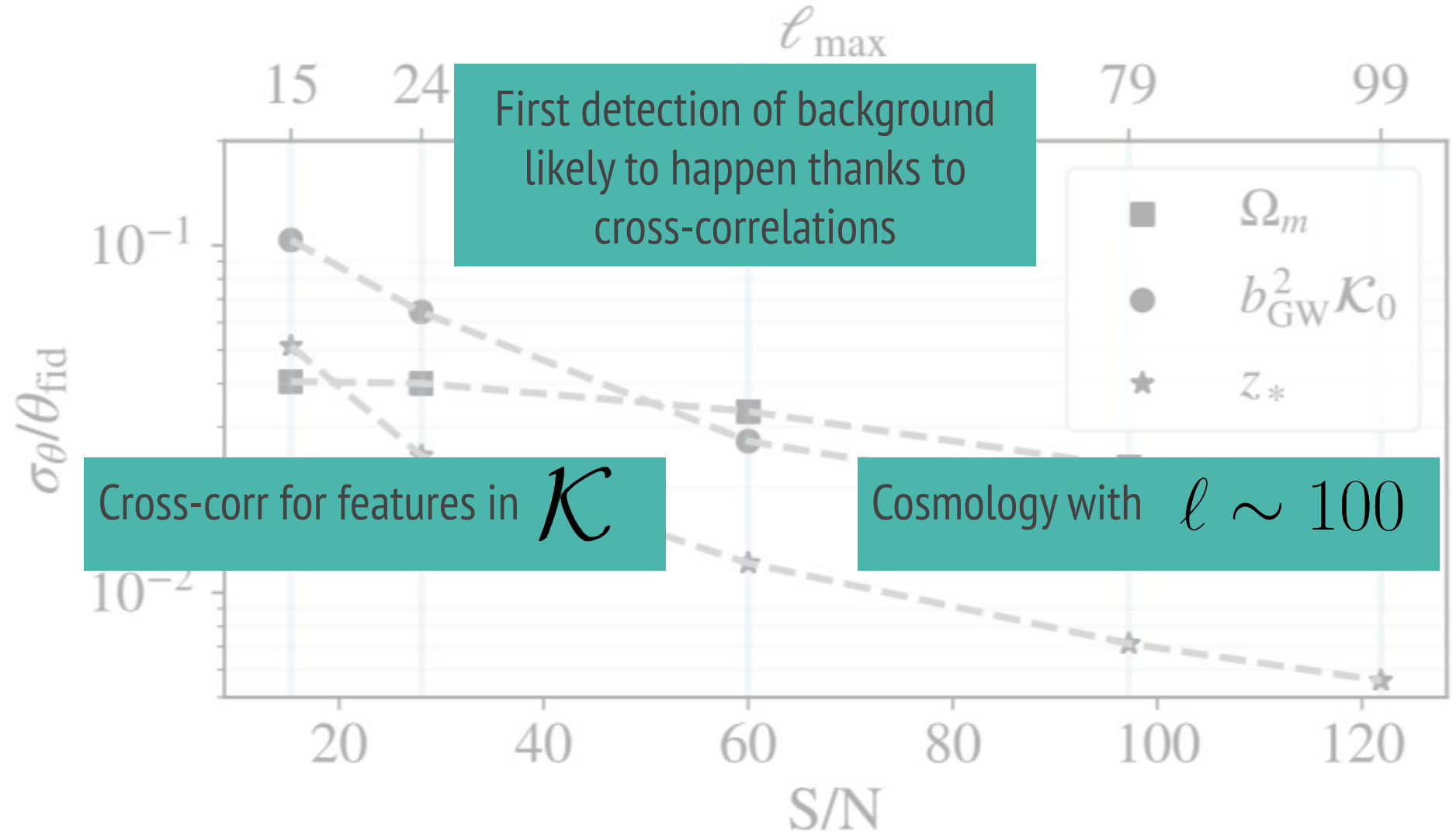


**Degenerate with cosmology,
Planck priors**

GW-GC cross-correlation - constraining the model

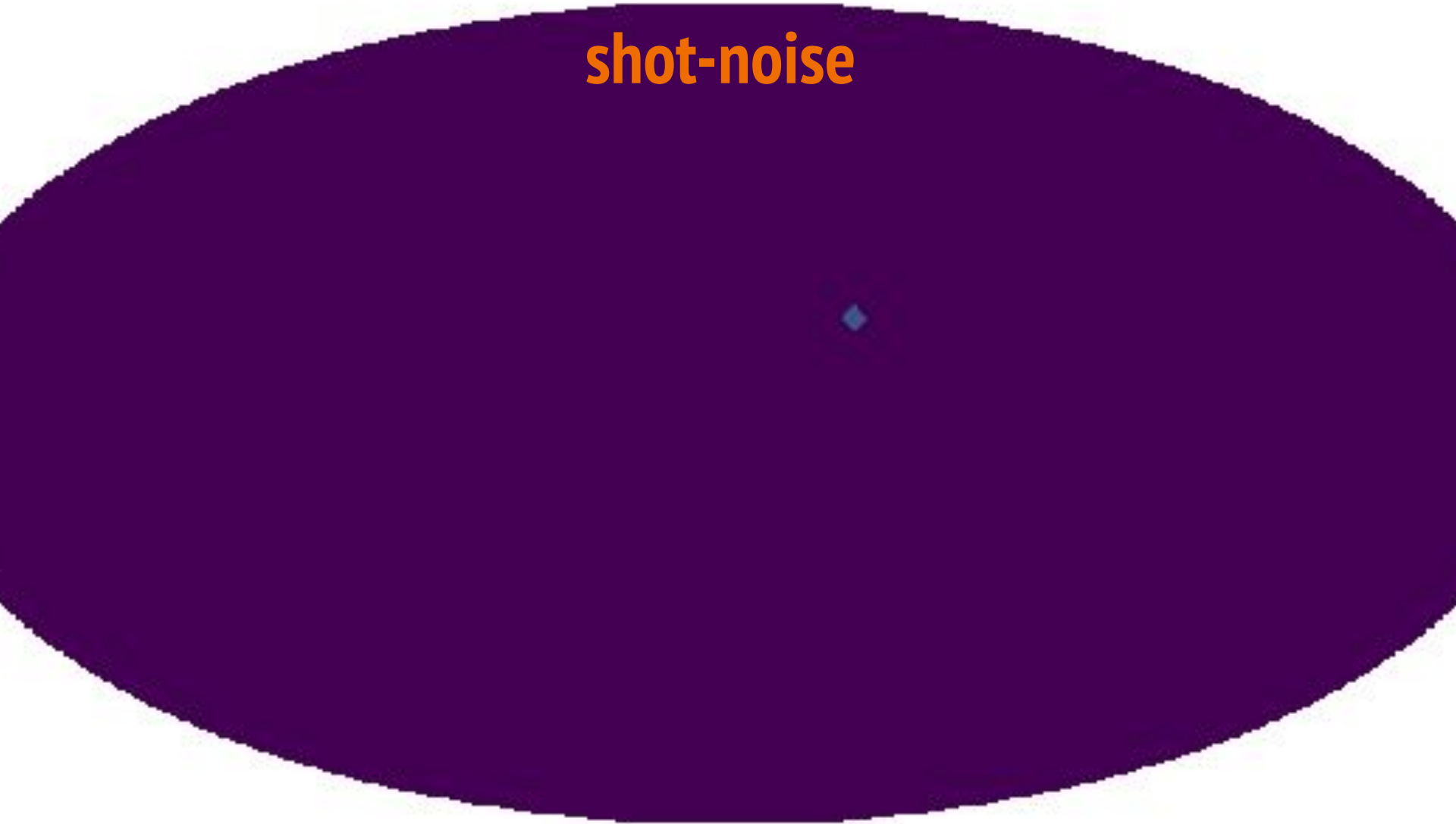


GW-GC cross-correlation - constraining the model

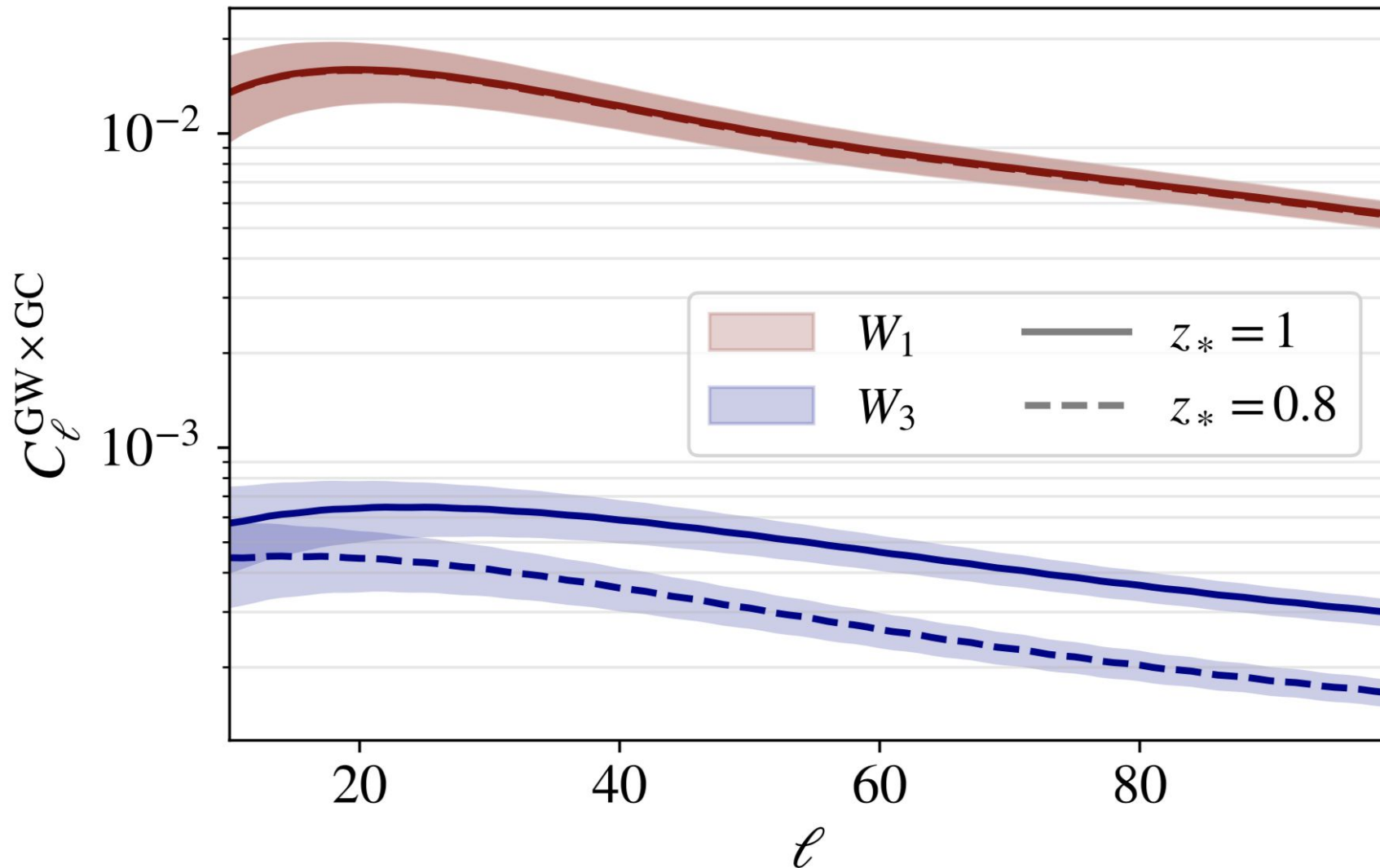


GW astrophysical background - hard to detect

shot-noise



GW-GC cross-correlation - playing with toy model



GW-GC cross-correlation - playing with toy model

