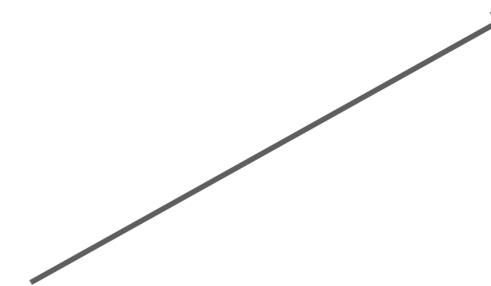


A joint analysis of KiDS-1000 and the tSZ effect

Tilman Tröster

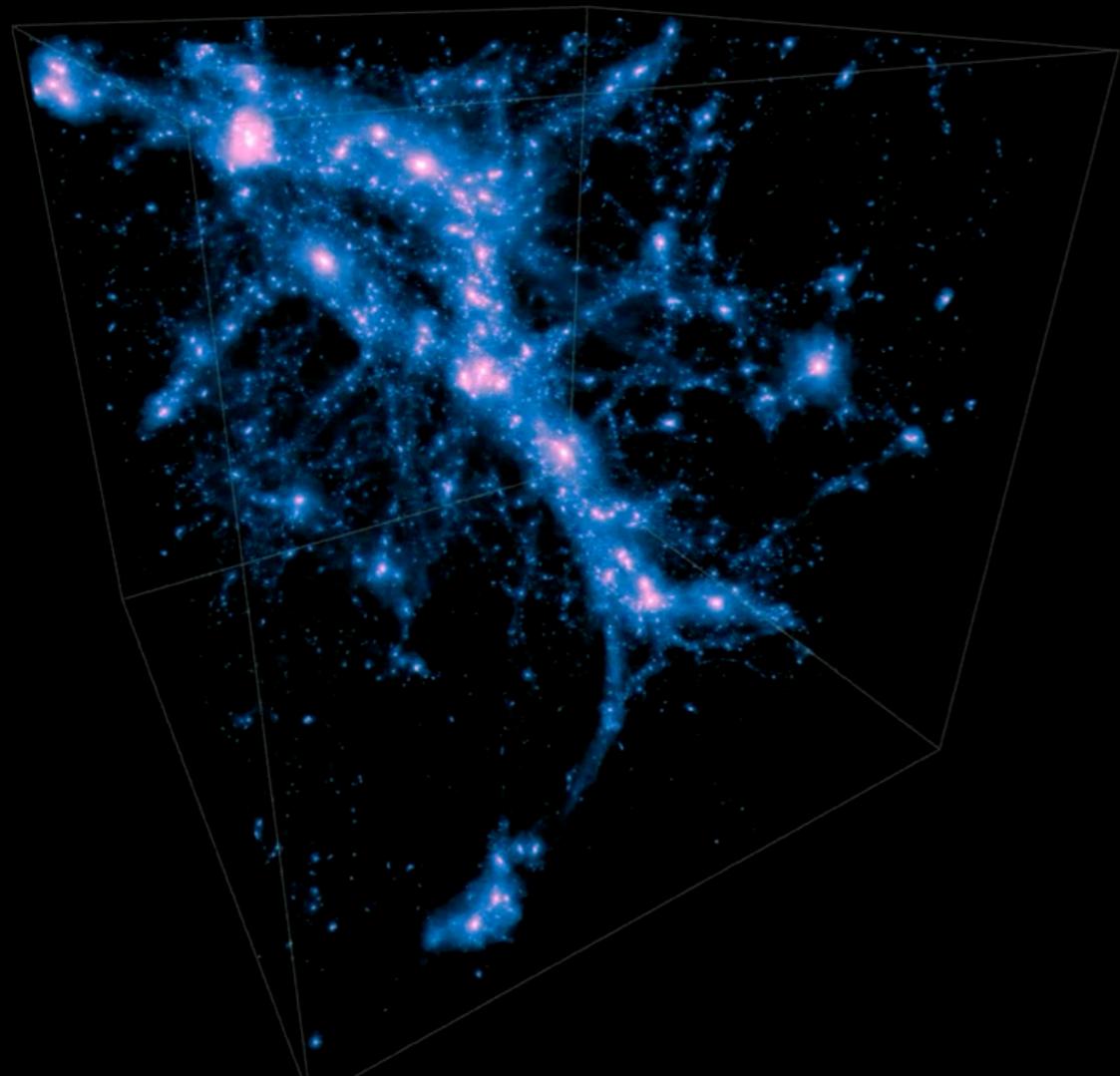
GCCL Seminar
2021/09/24

Gravitational lensing probes the matter distribution

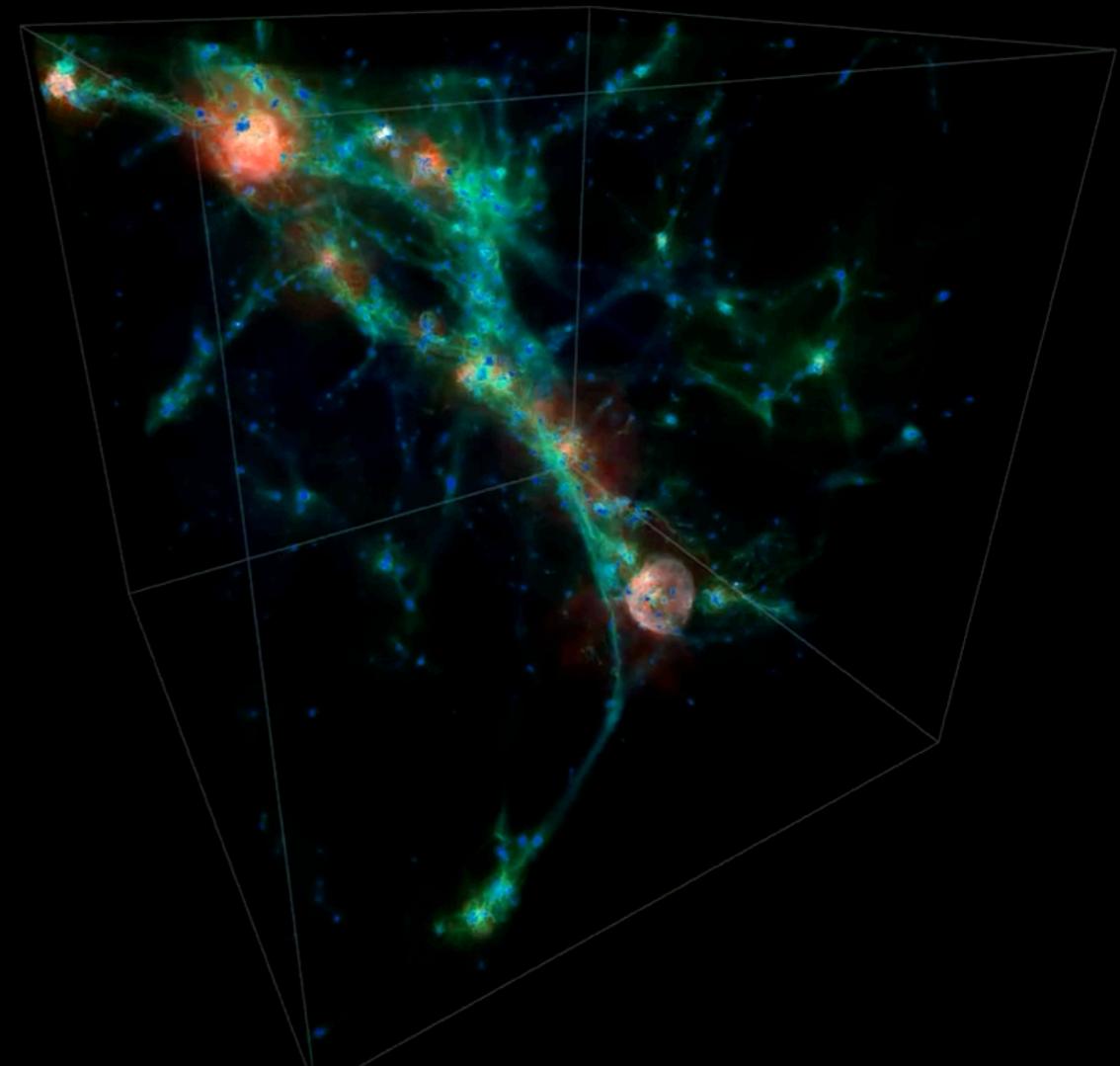


dark matter + baryons!

Dark Matter



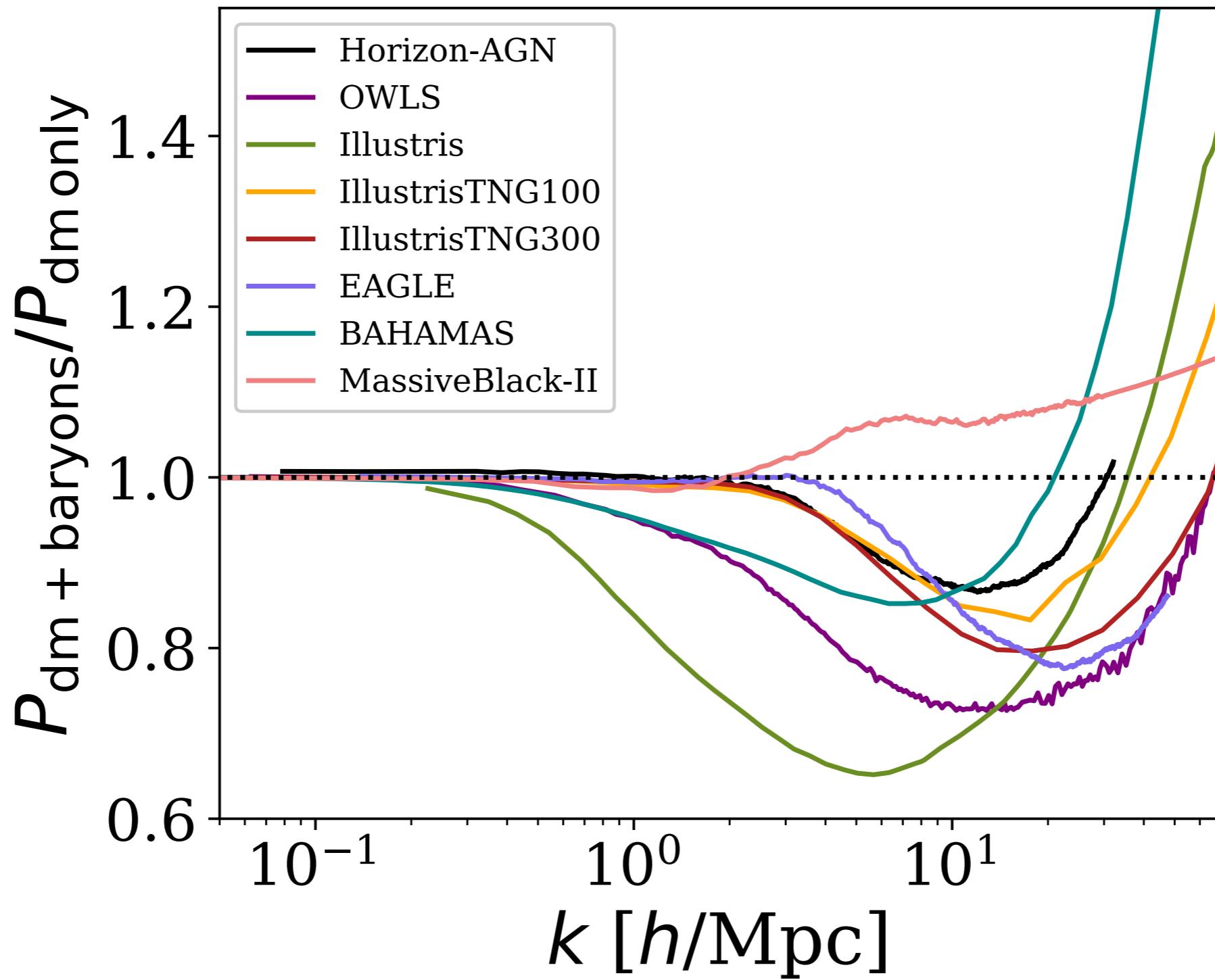
Gas Temperature

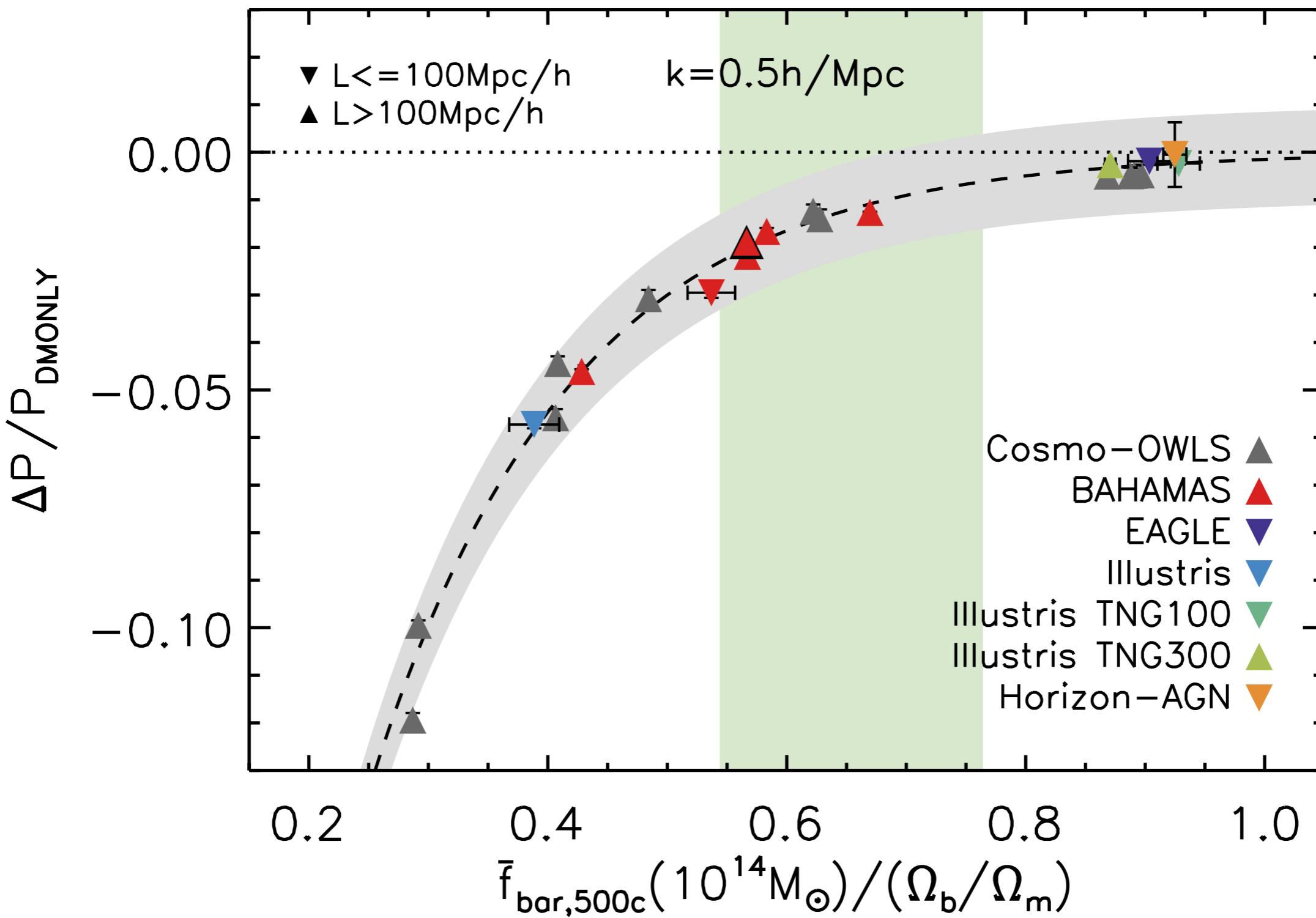


redshift : 1.66
Time since the Big Bang: 4.0 billion years

stellar mass : 24.5 billion solar masses

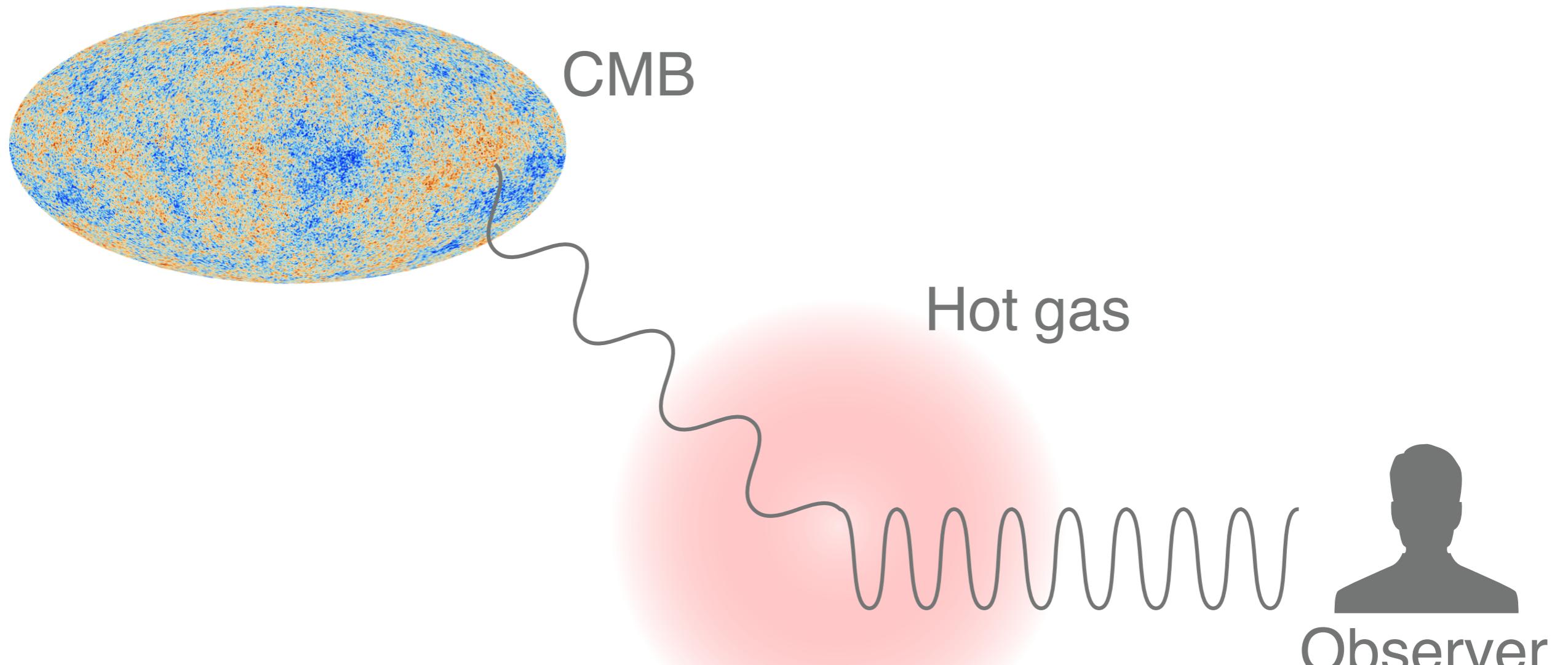
ILLUSTRIS

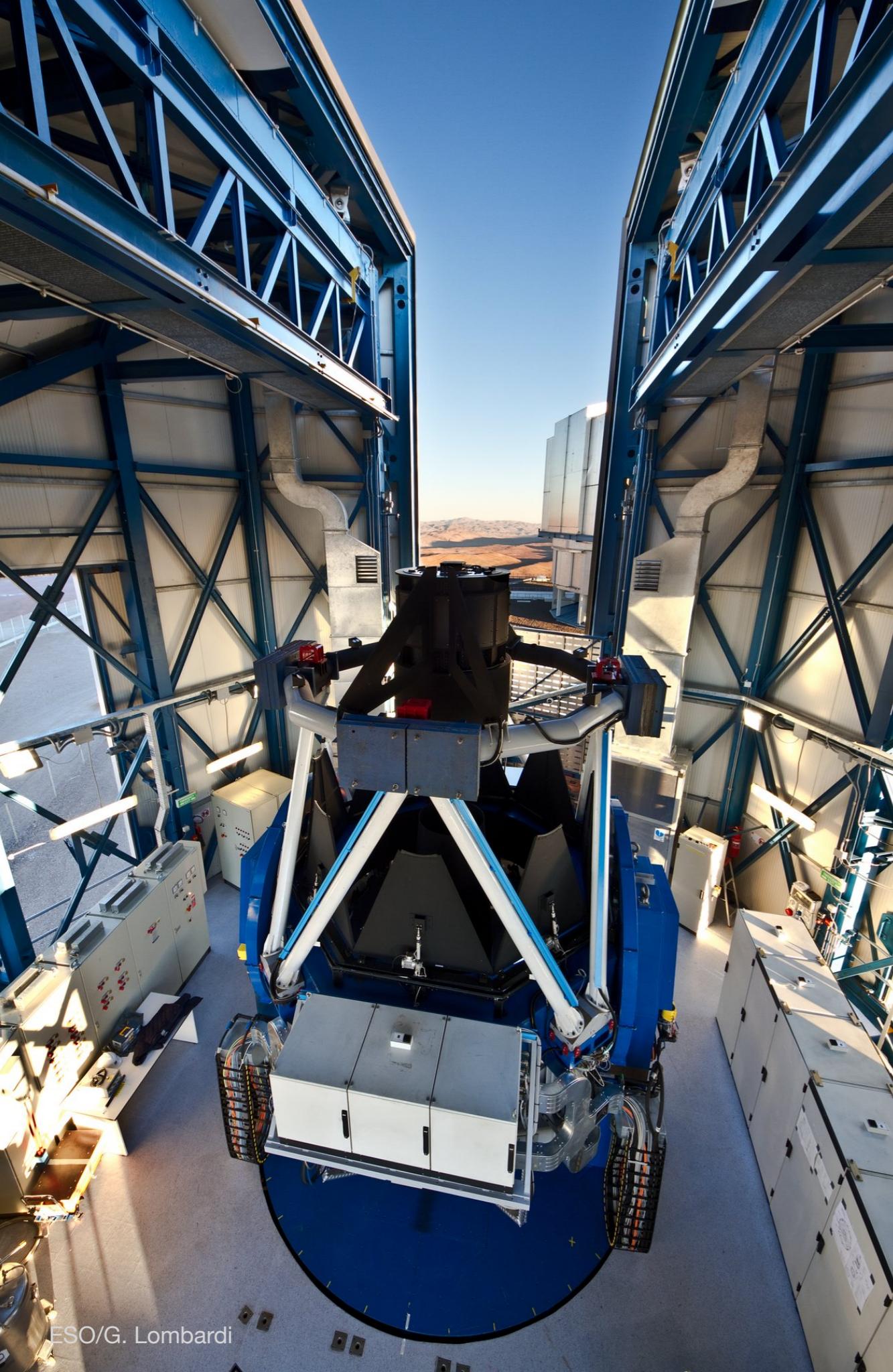




van Daalen+ 2020

Thermal Sunyaev-Zel'dovich (tSZ) effect



A photograph taken from inside a large telescope dome, looking out through the open door. The interior is filled with complex blue and white structural beams of the telescope's optical bench. In the center, a large black cylindrical instrument, likely a camera or spectrograph, is mounted on a mechanical arm. The floor is a polished metal surface. Through the open door at the end of the hall, a vast, arid landscape under a clear blue sky is visible.

KiDS

Optimised for weak lensing

- 1000 deg² analysed
- Full survey: 1350 deg²
- 21 million galaxies

Overlap with VIKING

- 9 photometric bands

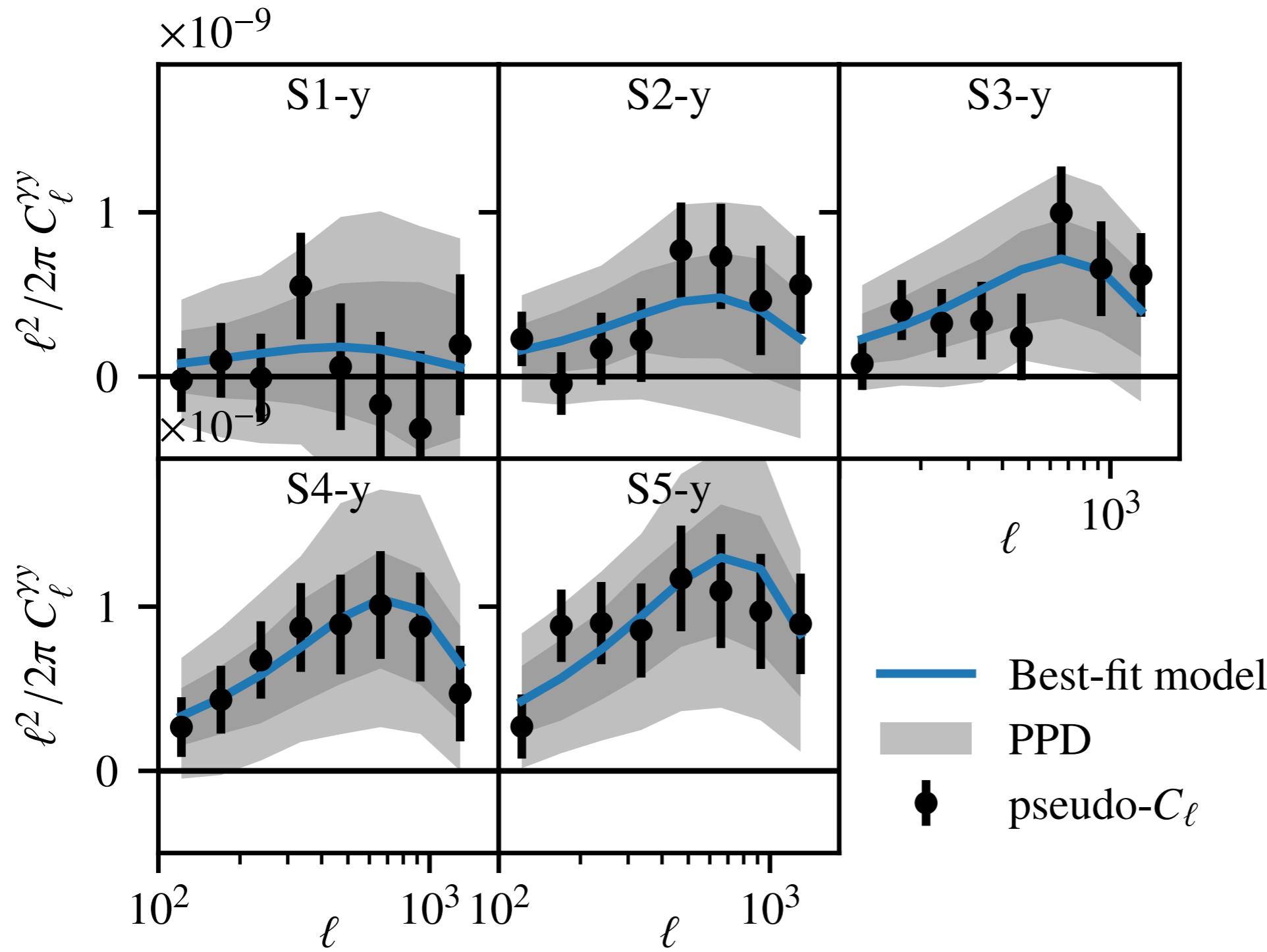
tSZ data

Planck

- Full-sky
- MILCA, NILC, custom CIB-subtracted maps
- Beam: $10'$

ACT

- Partial overlap with KiDS-N
- Combined ACT and Planck data, different components deprojected
- Beam: $1.6'$



Modelling

Power spectra for: dark matter

Many options

- Emulators
- HaloFit and derivatives

Power spectra for: all matter

Some options:

- HMCode
- PCA approaches

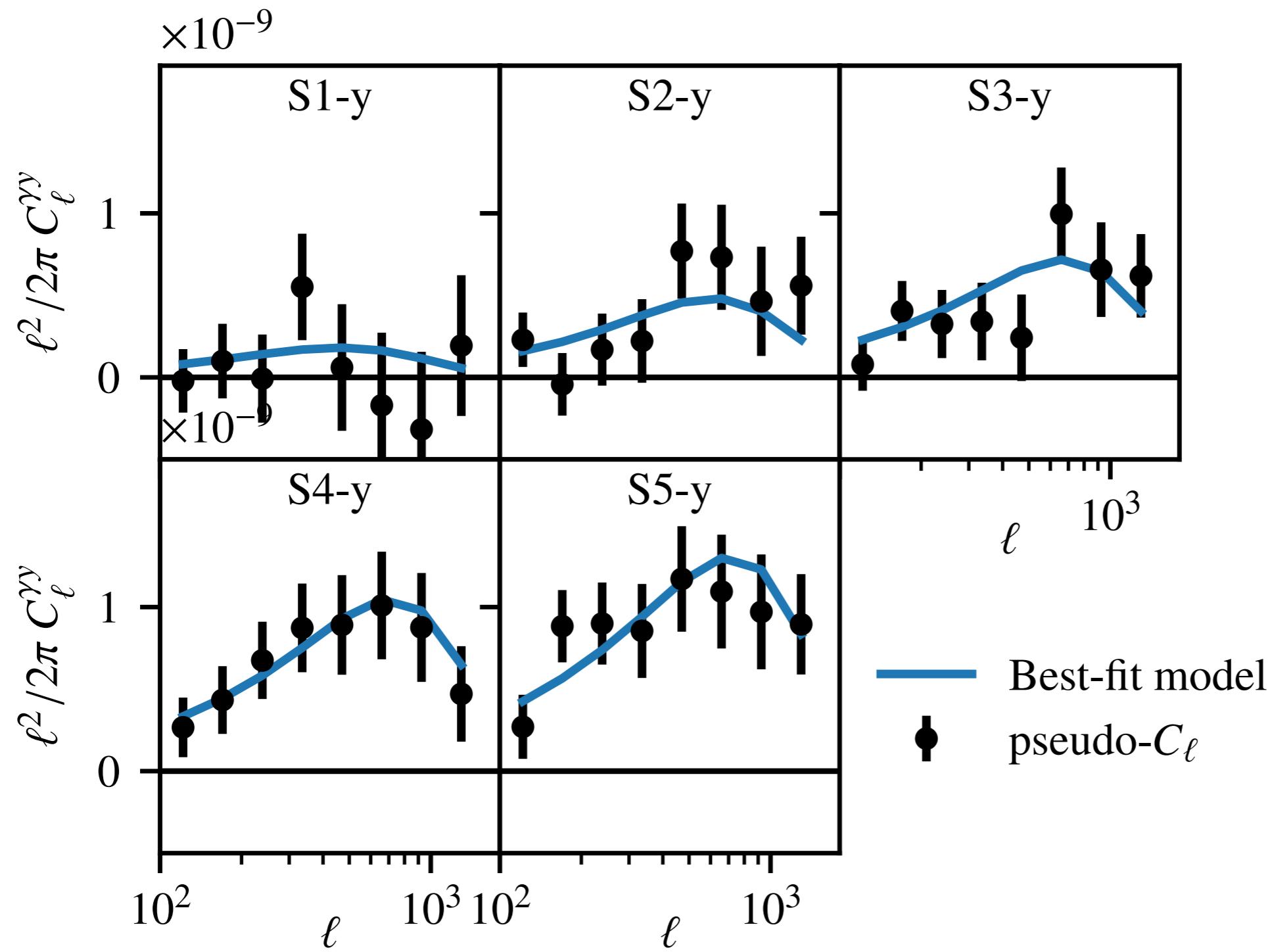
Power spectra for: matter \times pressure

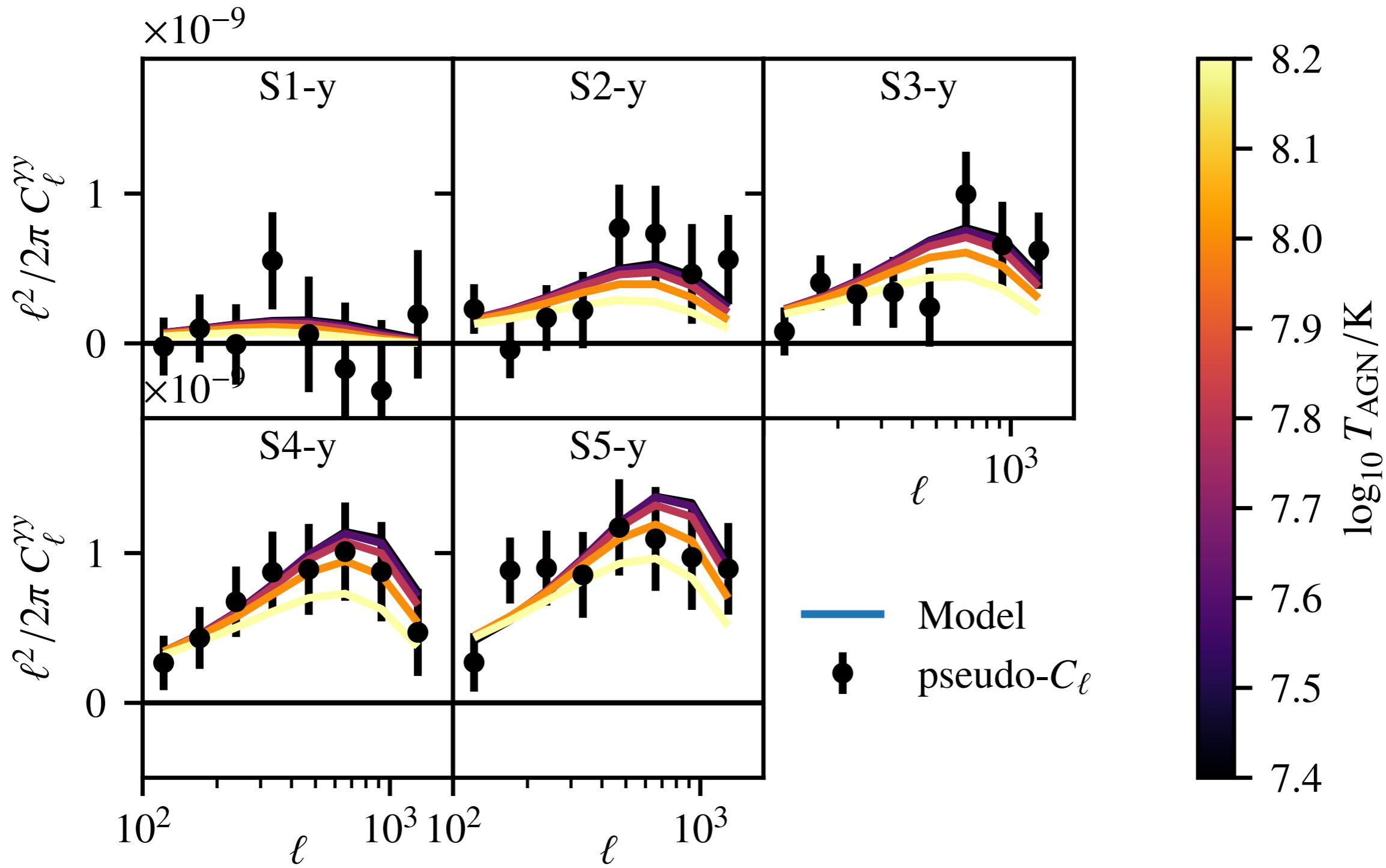
No good options:

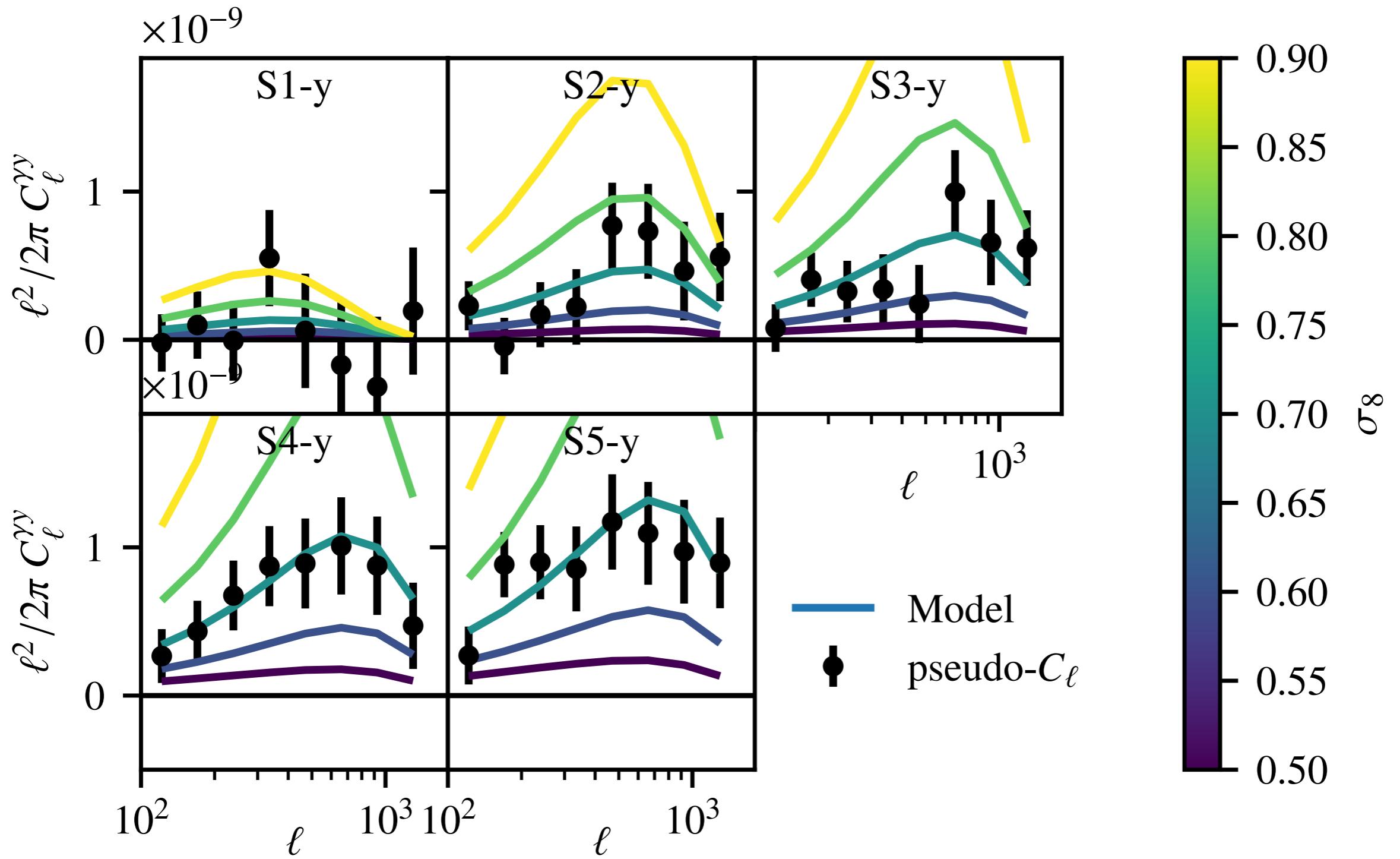
- Matter and pressure profiles are independent
- Only simple halo model implementations

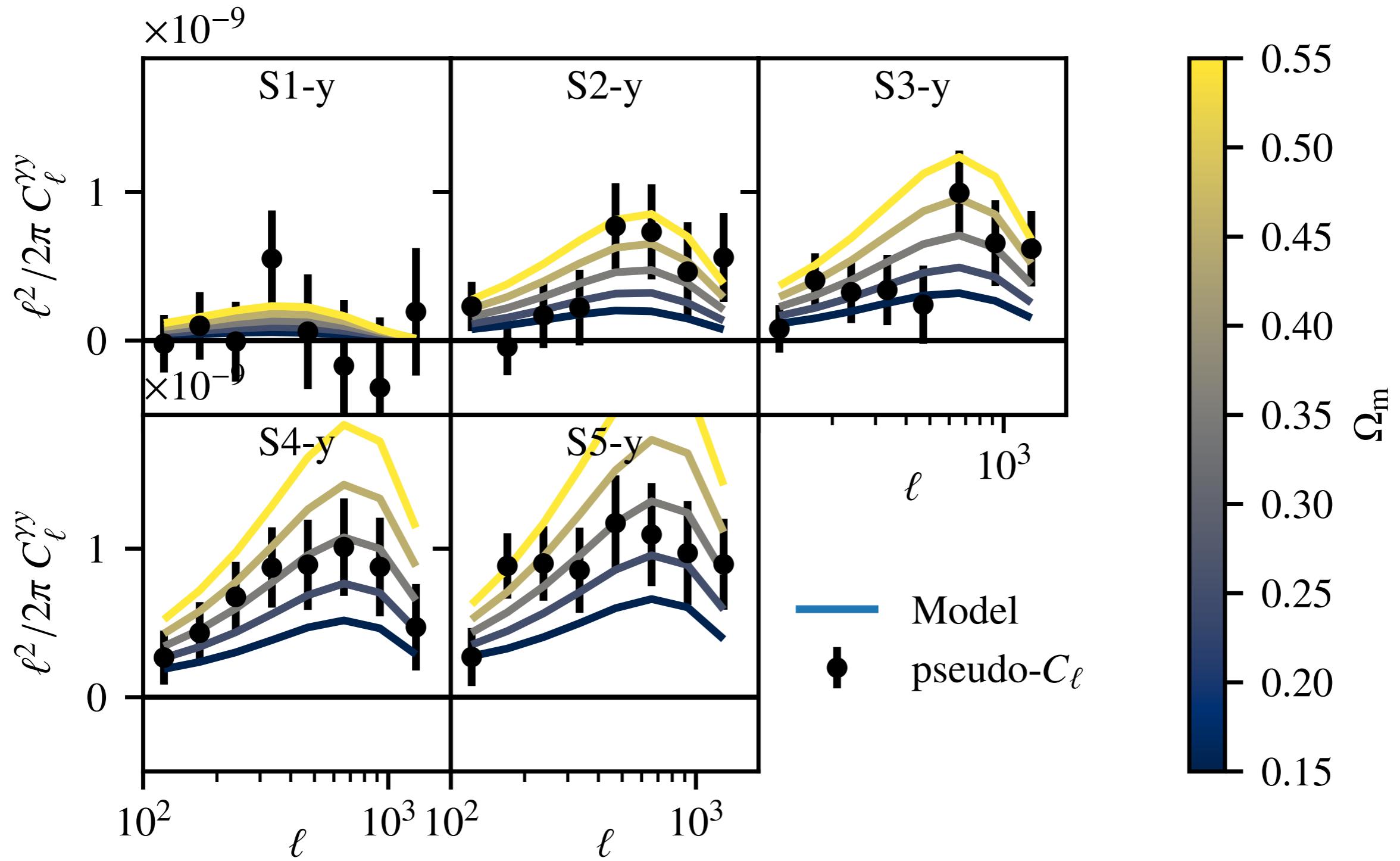
HMx

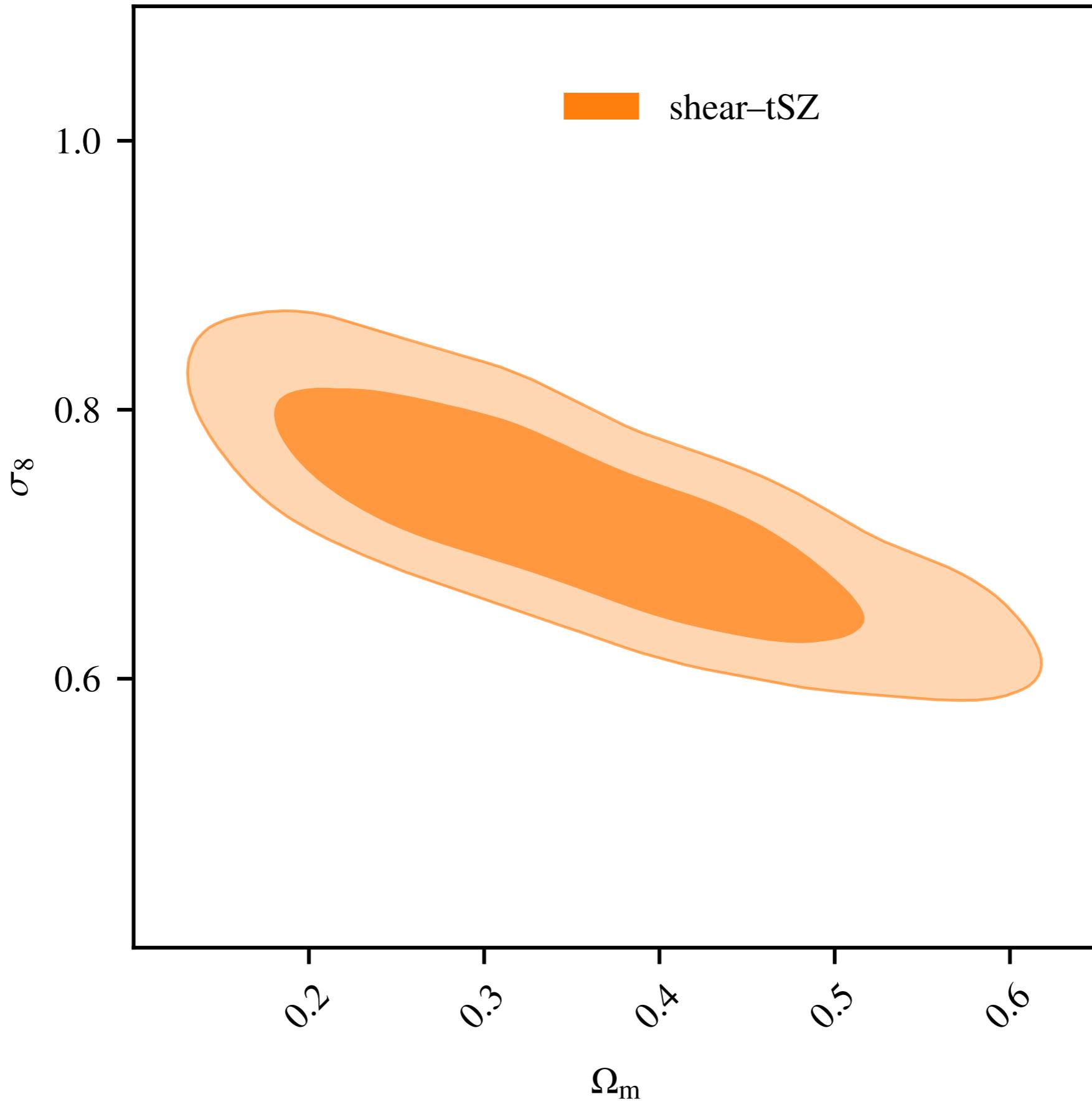
- Models dark matter, gas, stars components
- Calibrated on BAHAMAS hydrosims
- Reaction formalism for accurate power spectra
- Matter and pressure fields modelled consistently



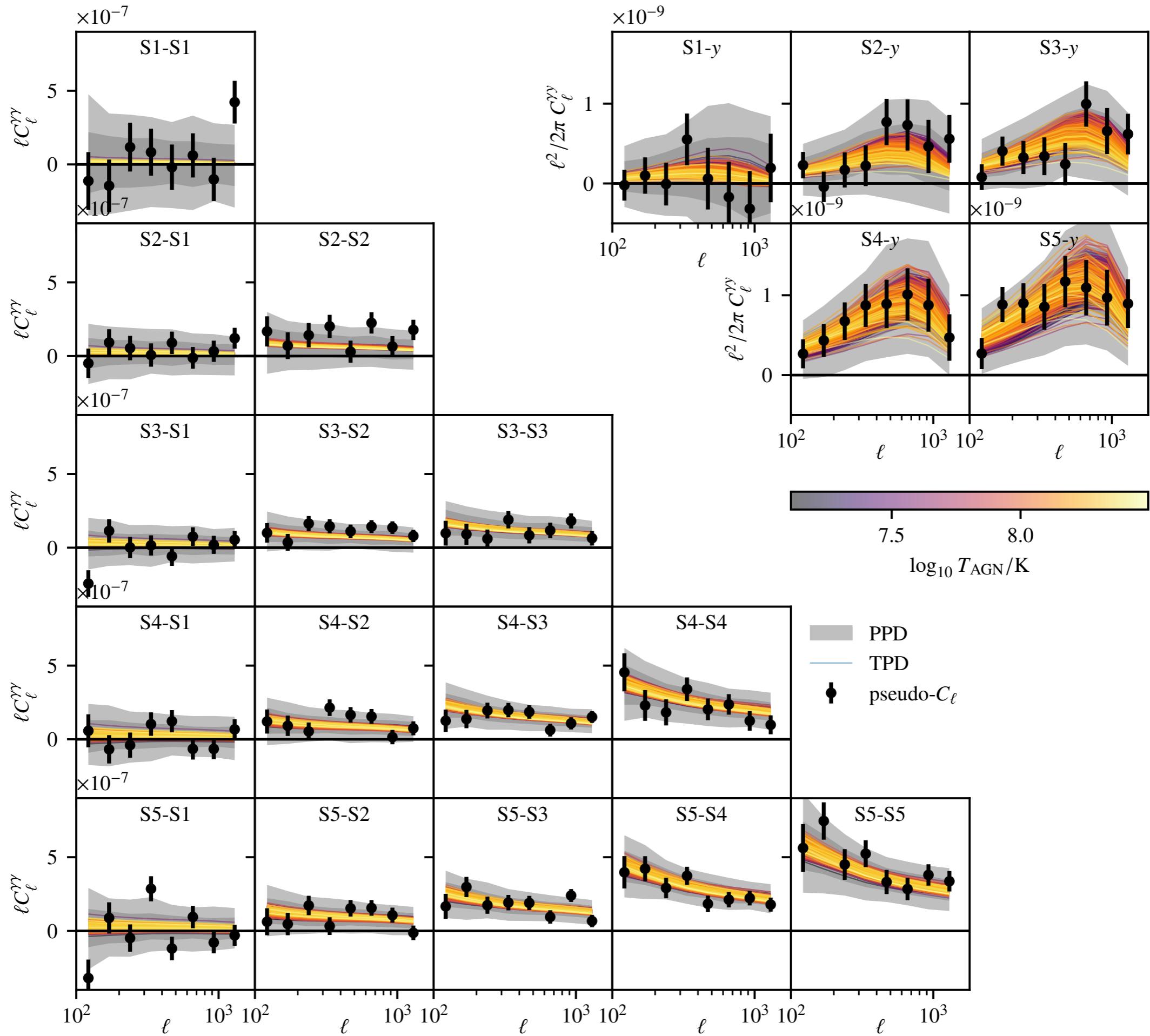


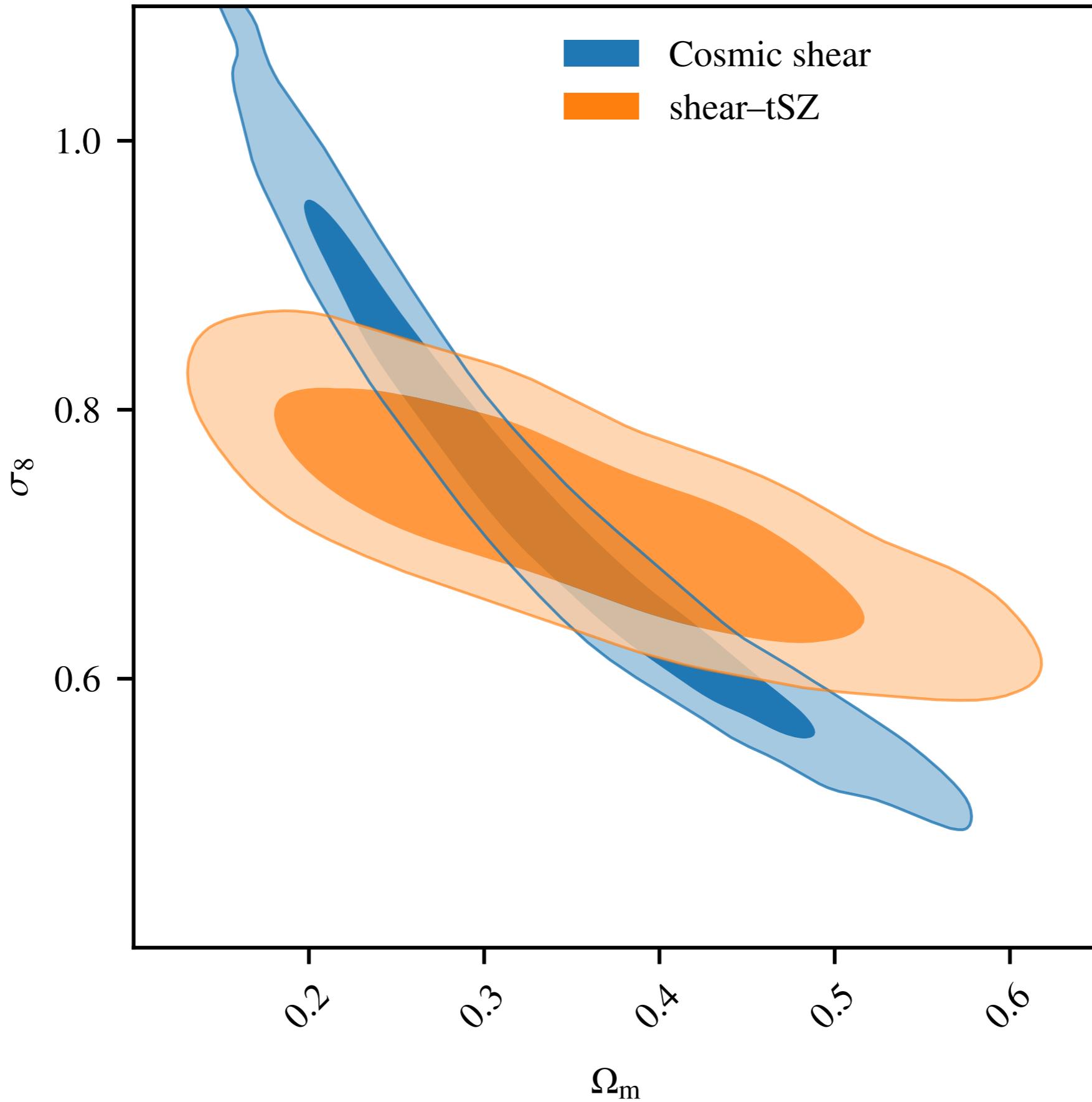


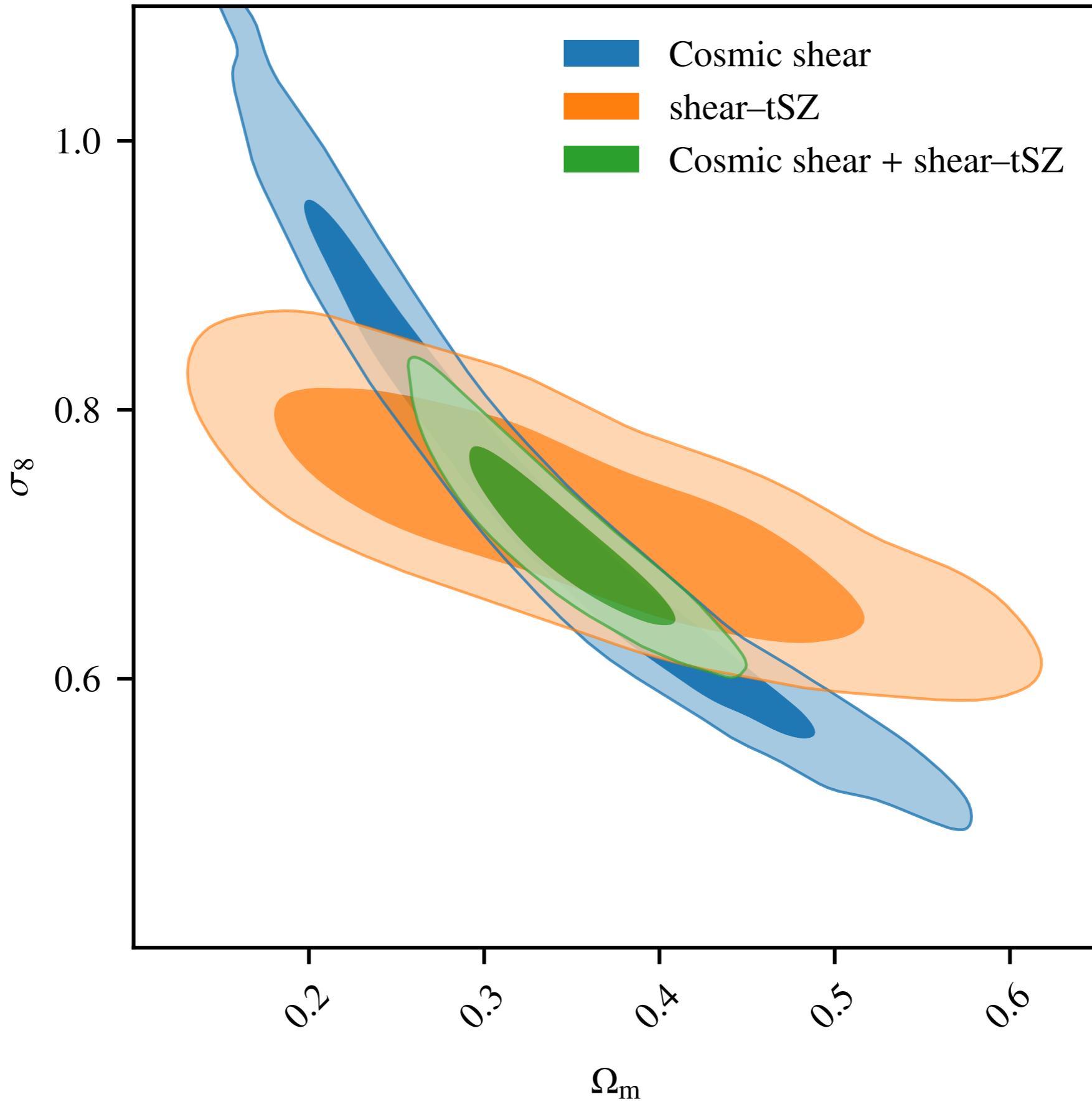


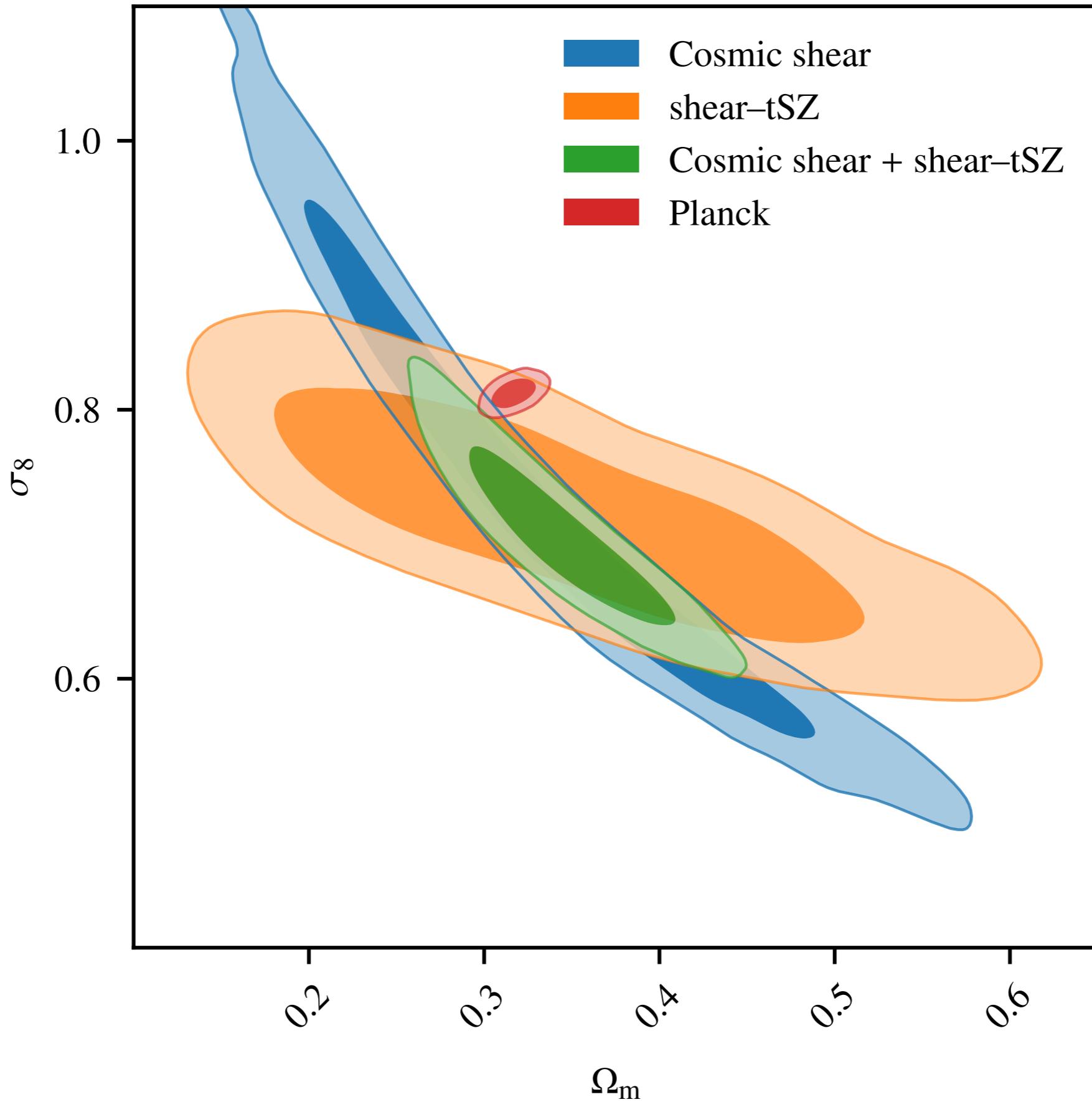


Joint analysis with cosmic shear

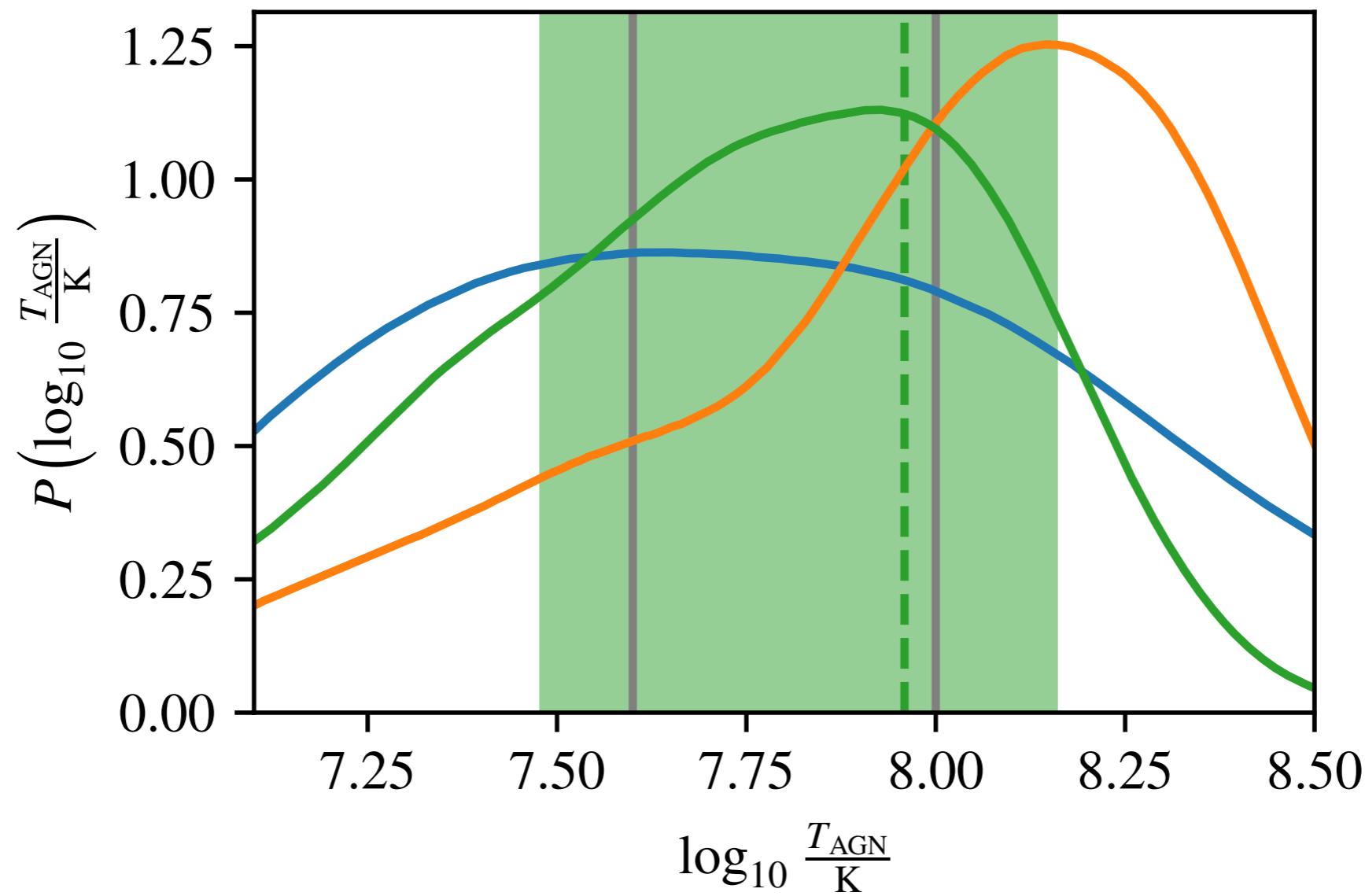








- Cosmic shear
- shear-tSZ
- Cosmic shear + shear-tSZ

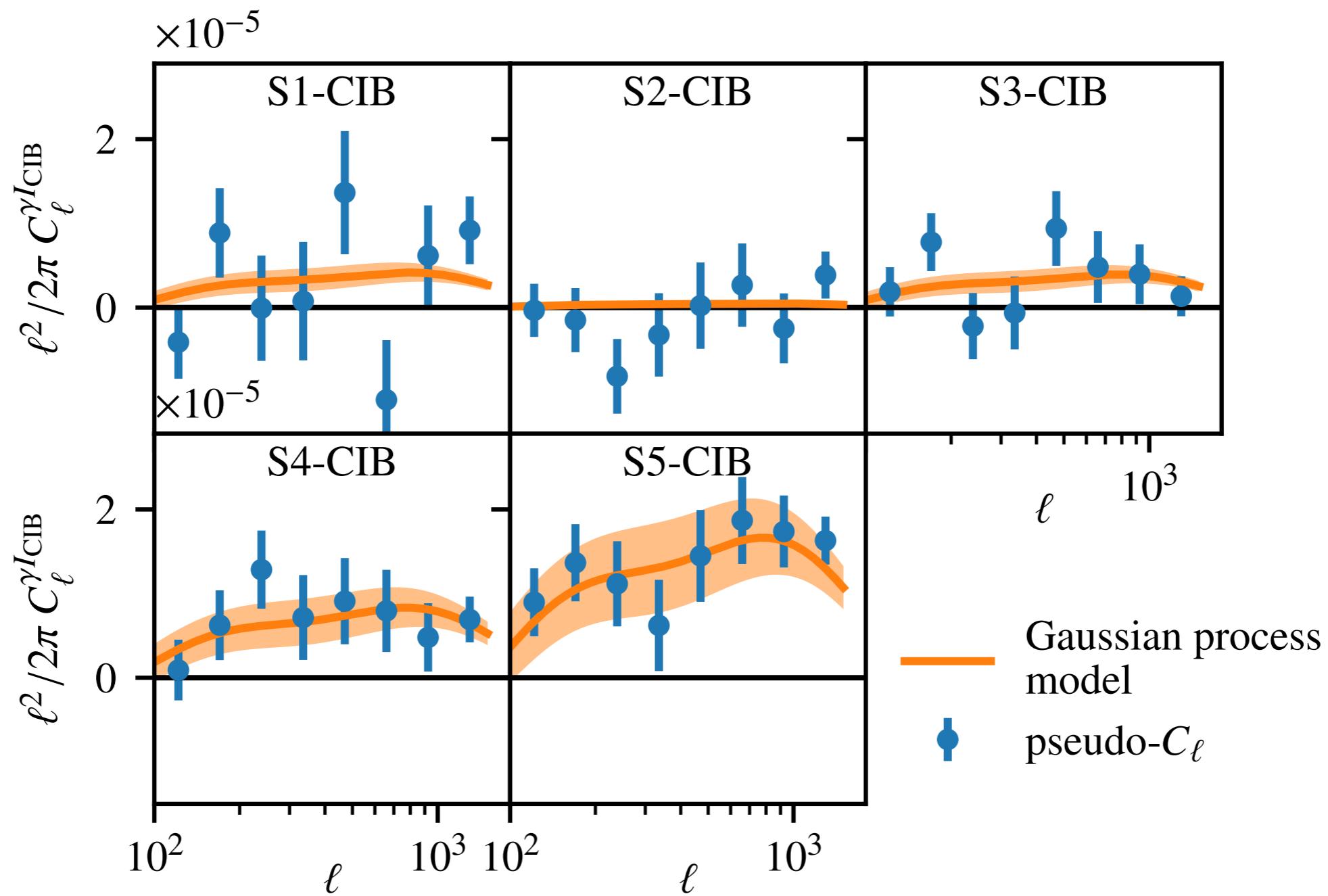


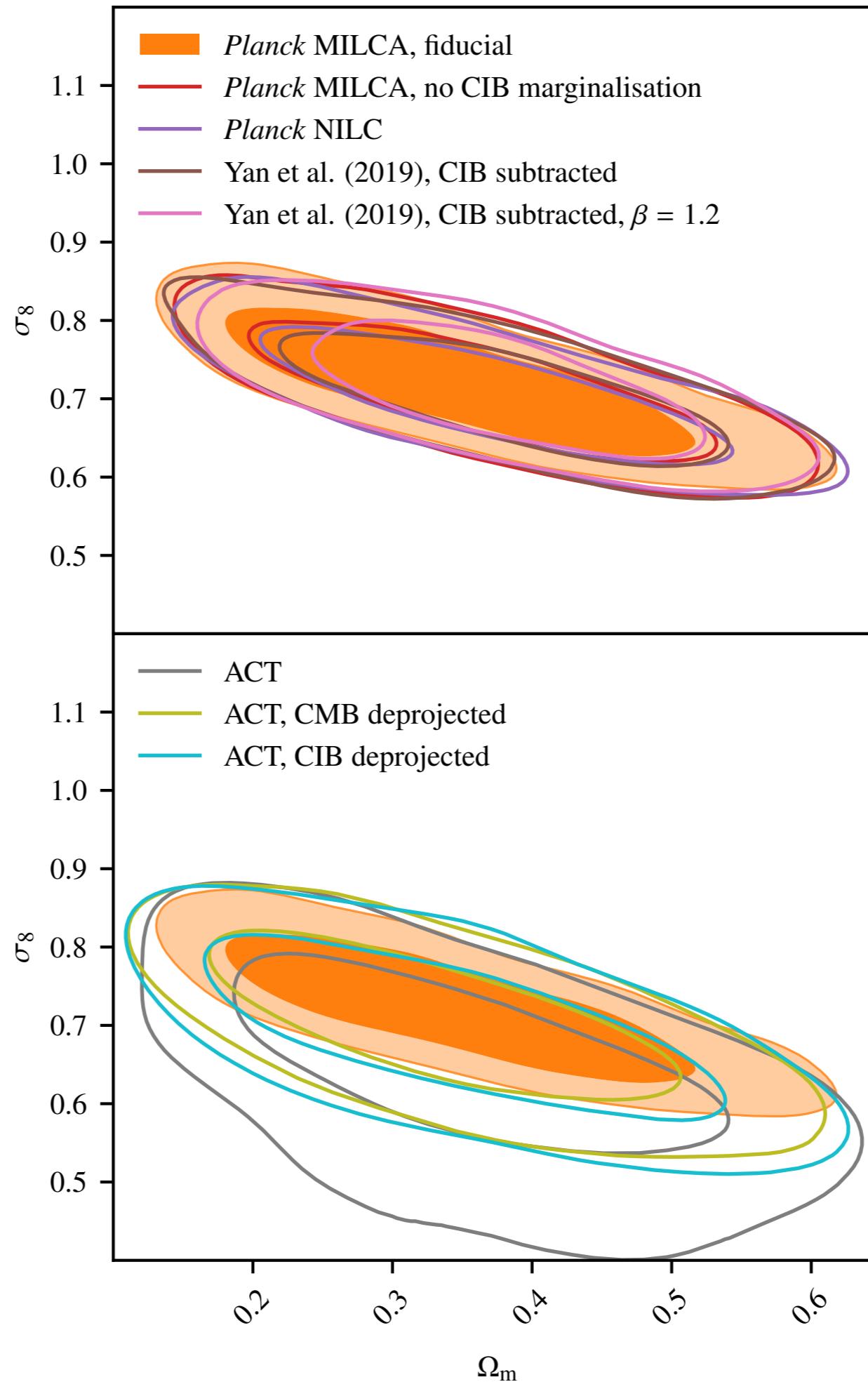
Systematics

Cosmic infrared background

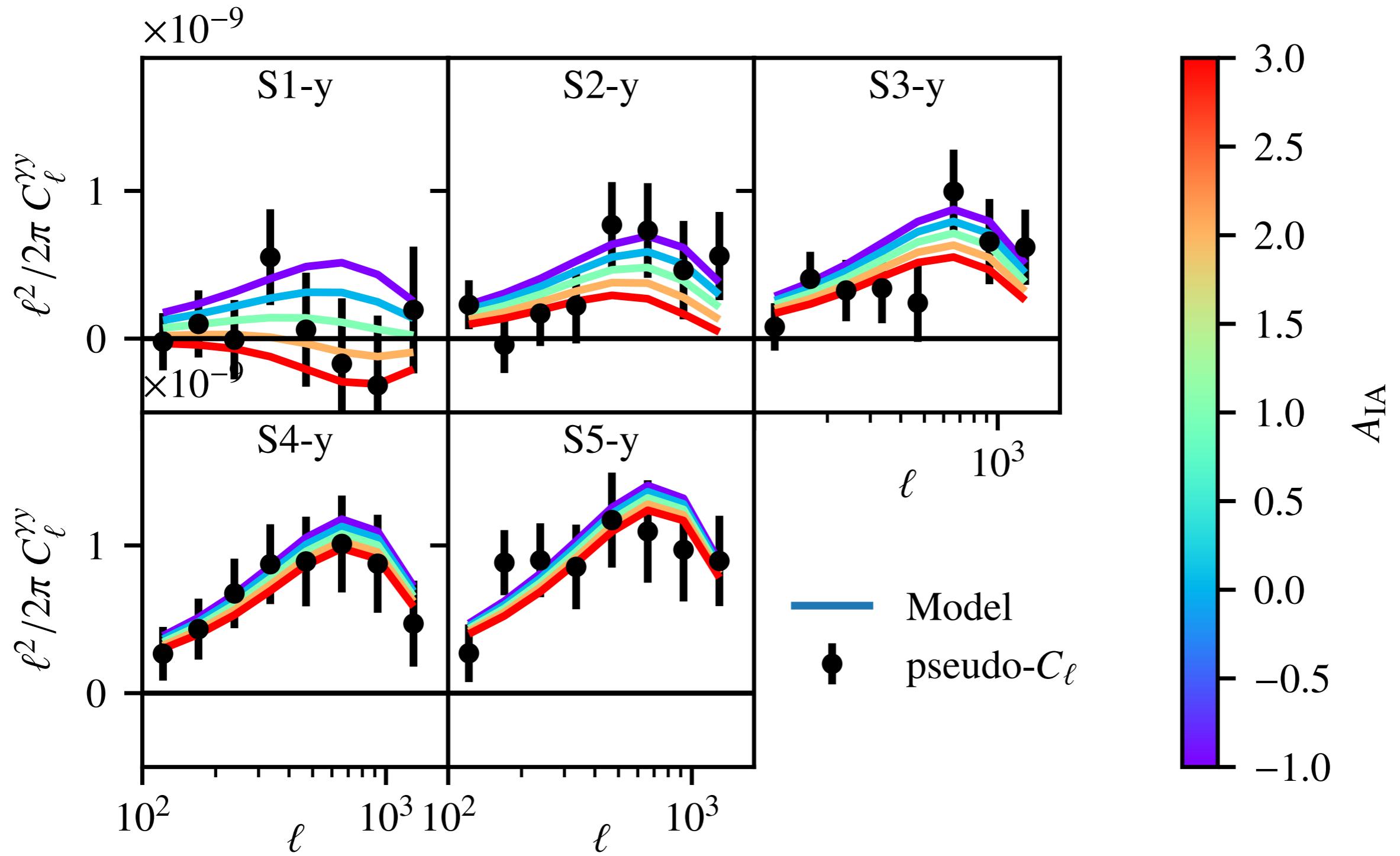
$$y_{\rm obs} = y_{\rm true} + \alpha_{\rm CIB} I_{\rm CIB}$$

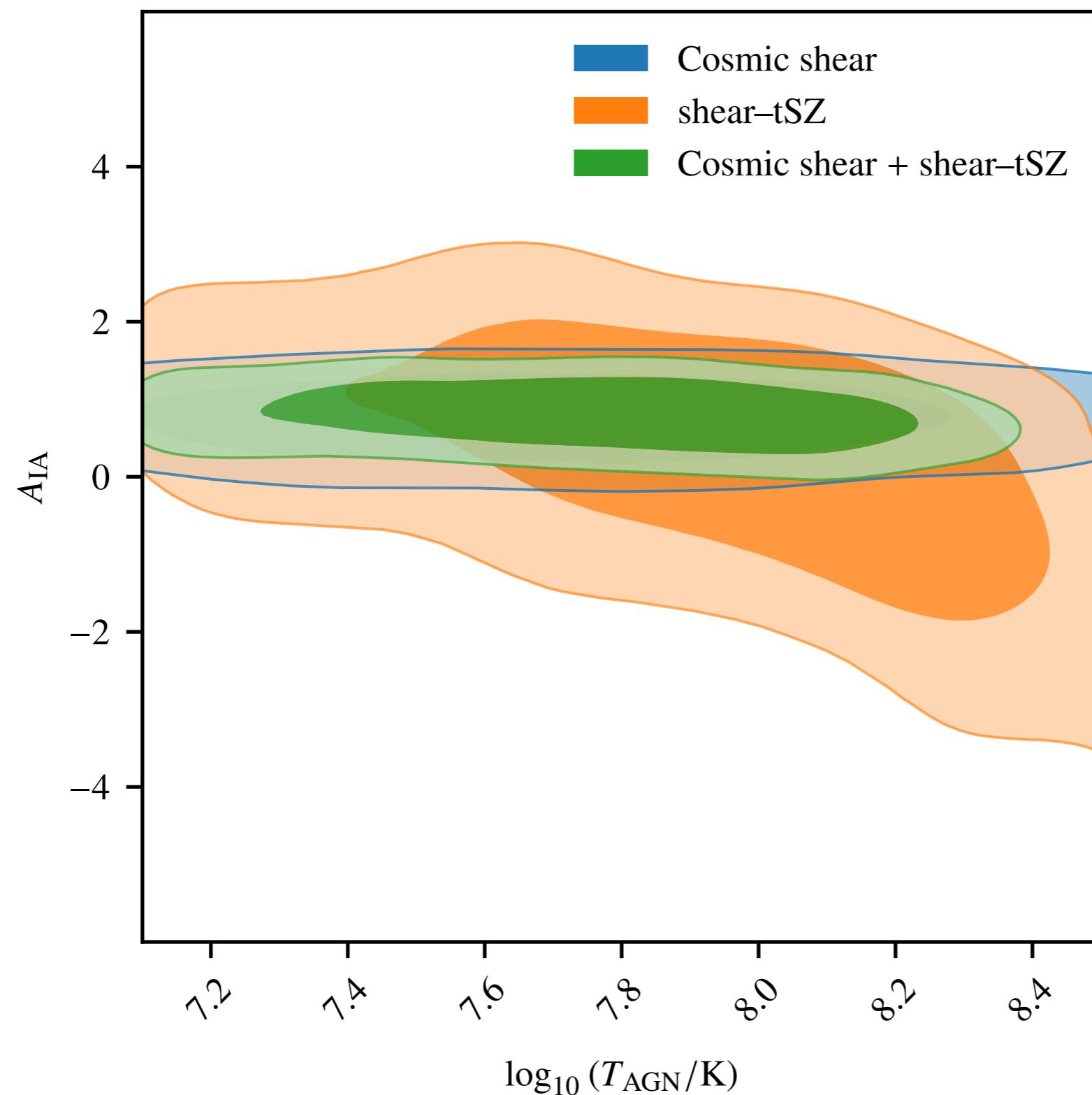
$$C_\ell^{\gamma y_{\rm obs}} = C_\ell^{\gamma y_{\rm true}} + \alpha_{\rm CIB} C_\ell^{\gamma I_{\rm CIB}}$$



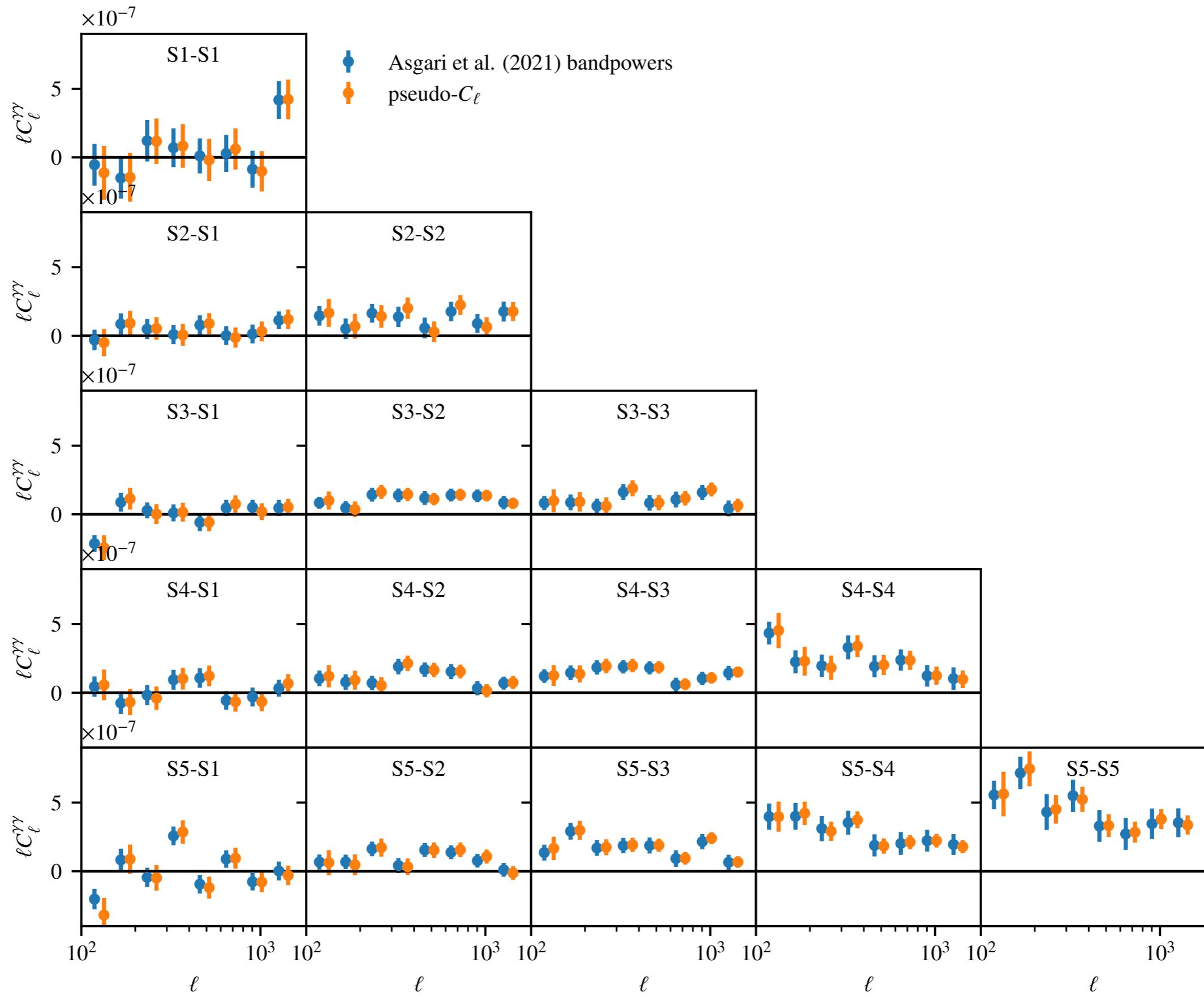


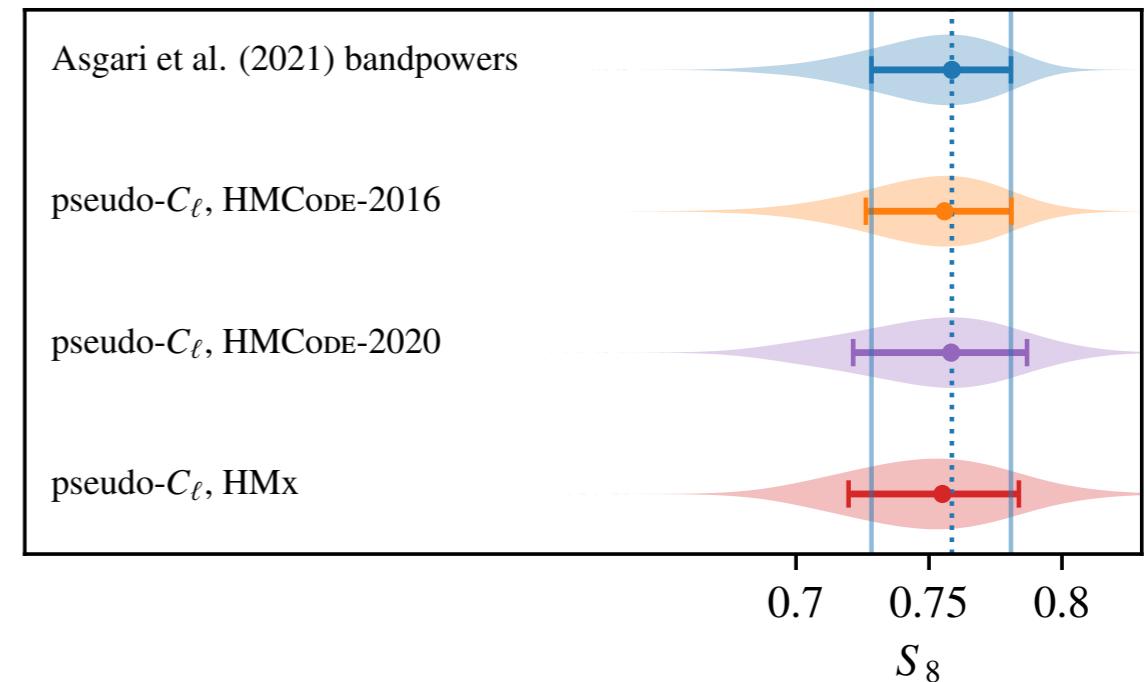
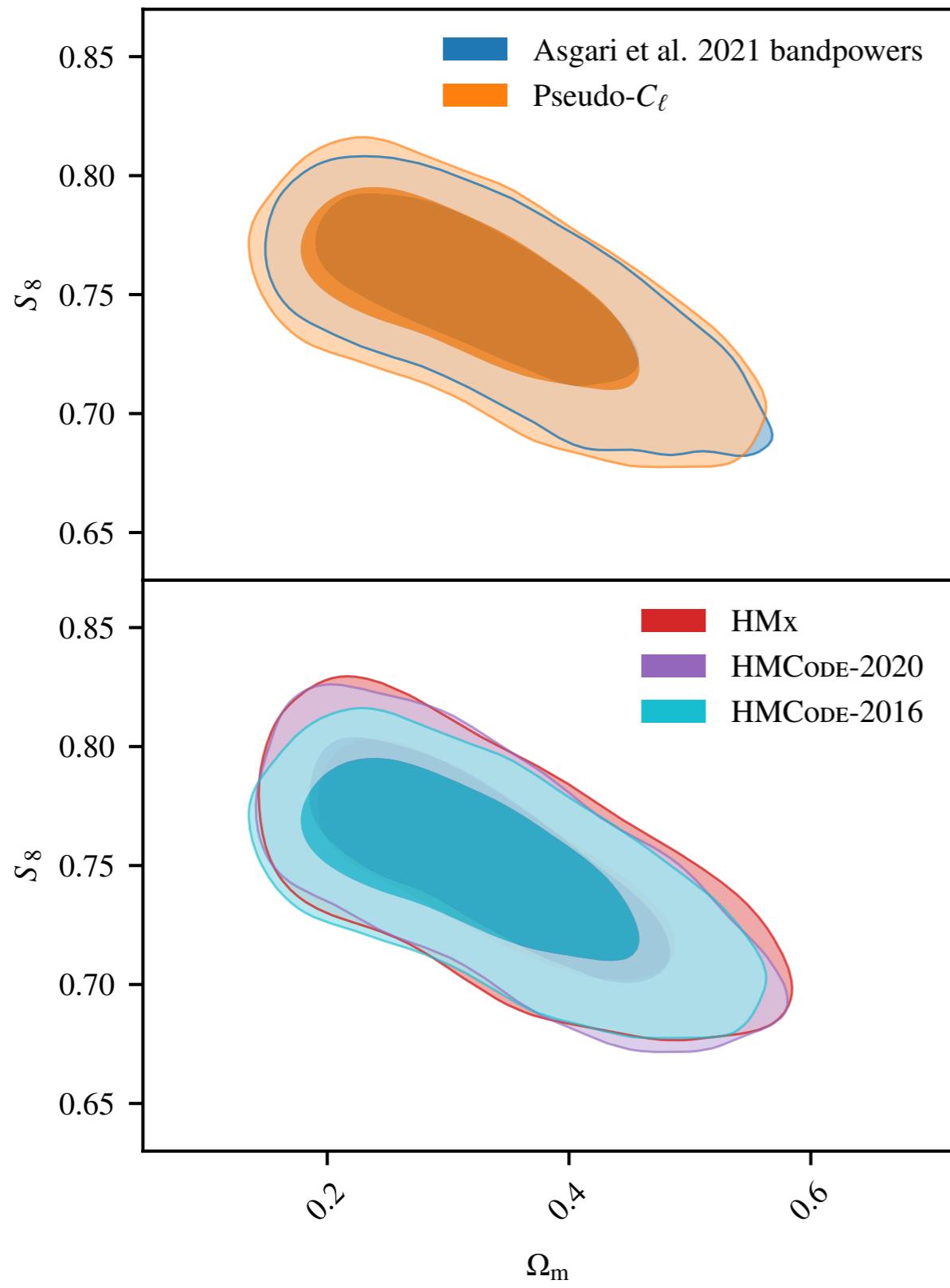
Baryon feedback – intrinsic alignment interaction

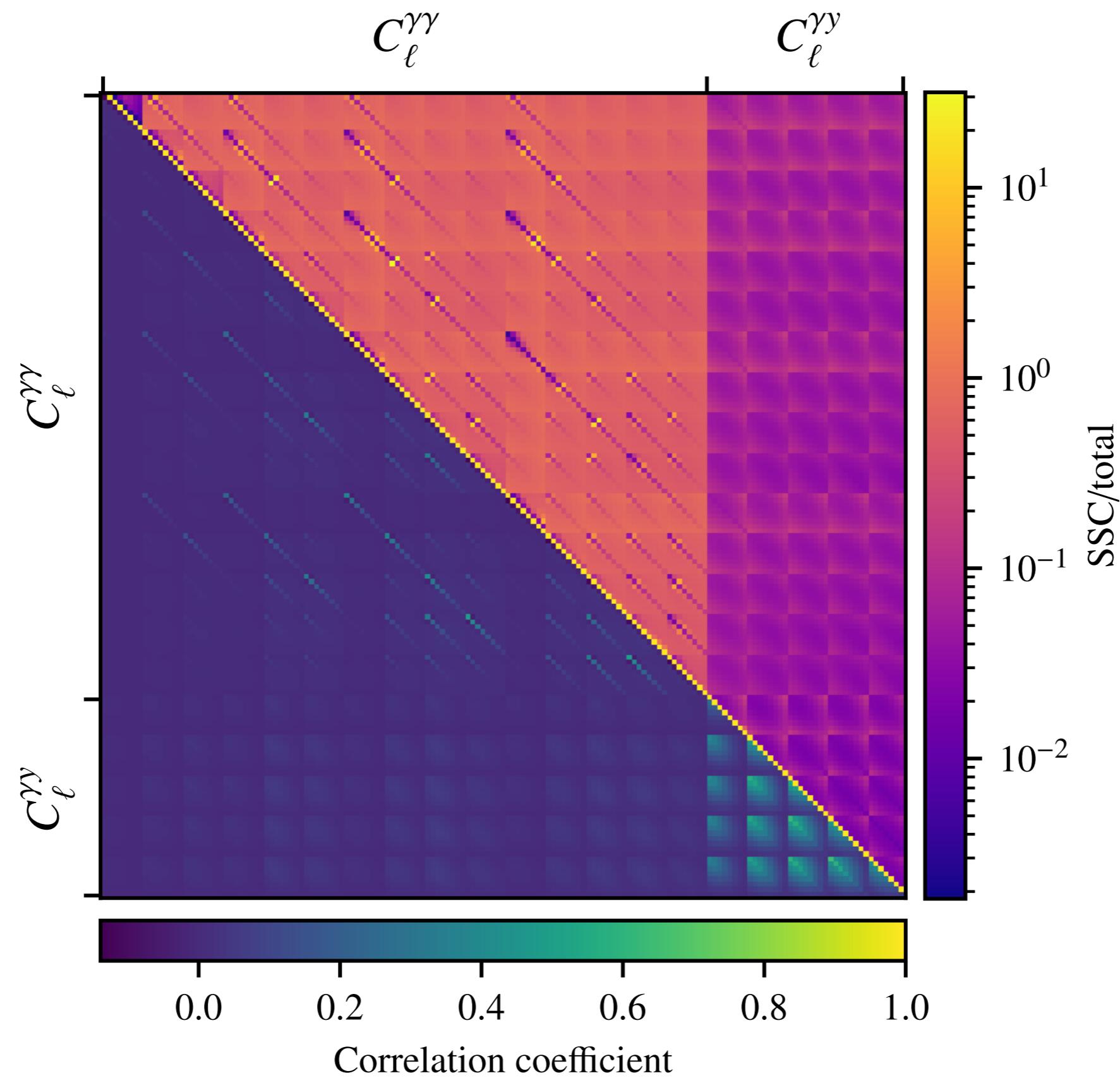




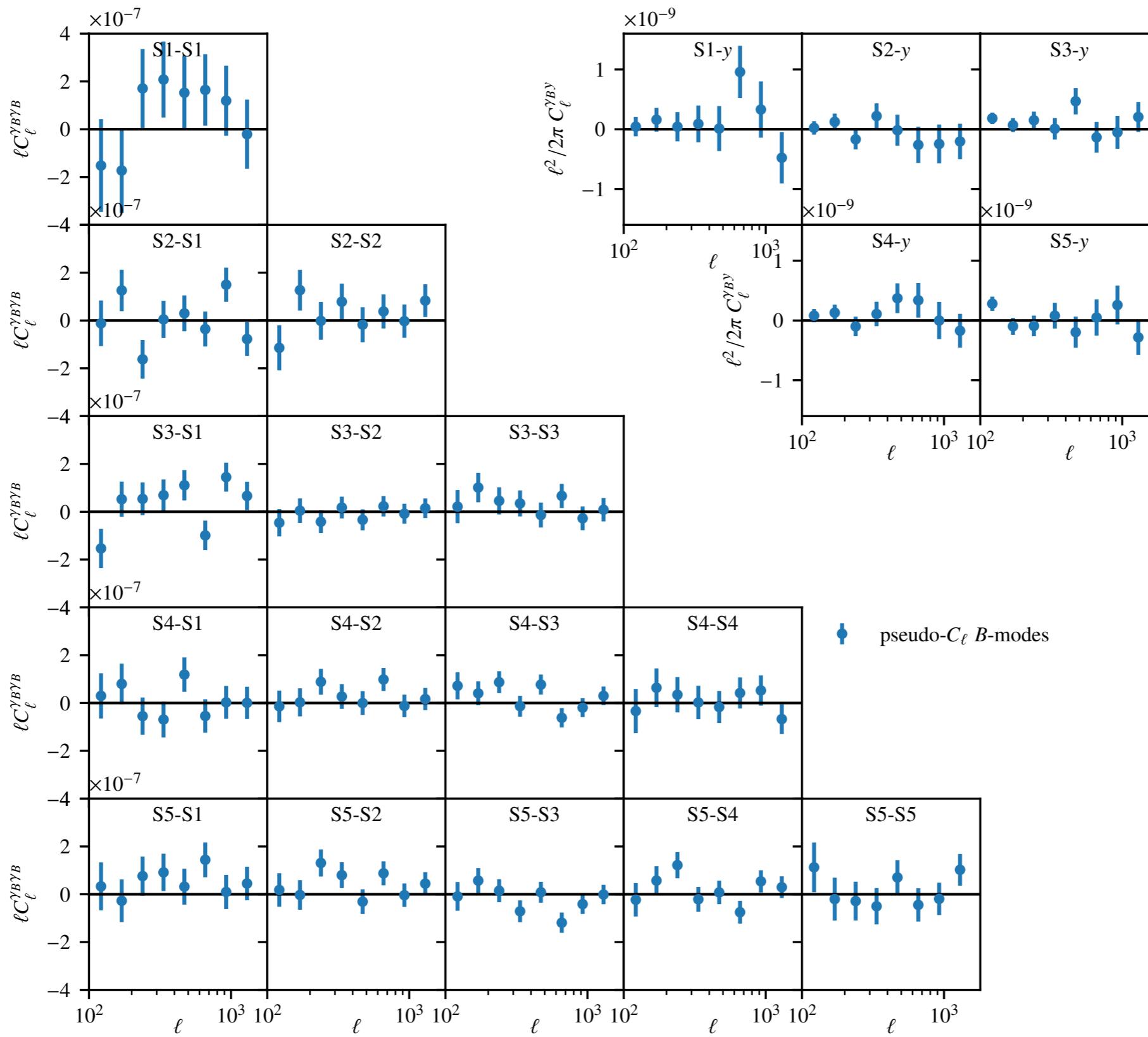
Extra slides

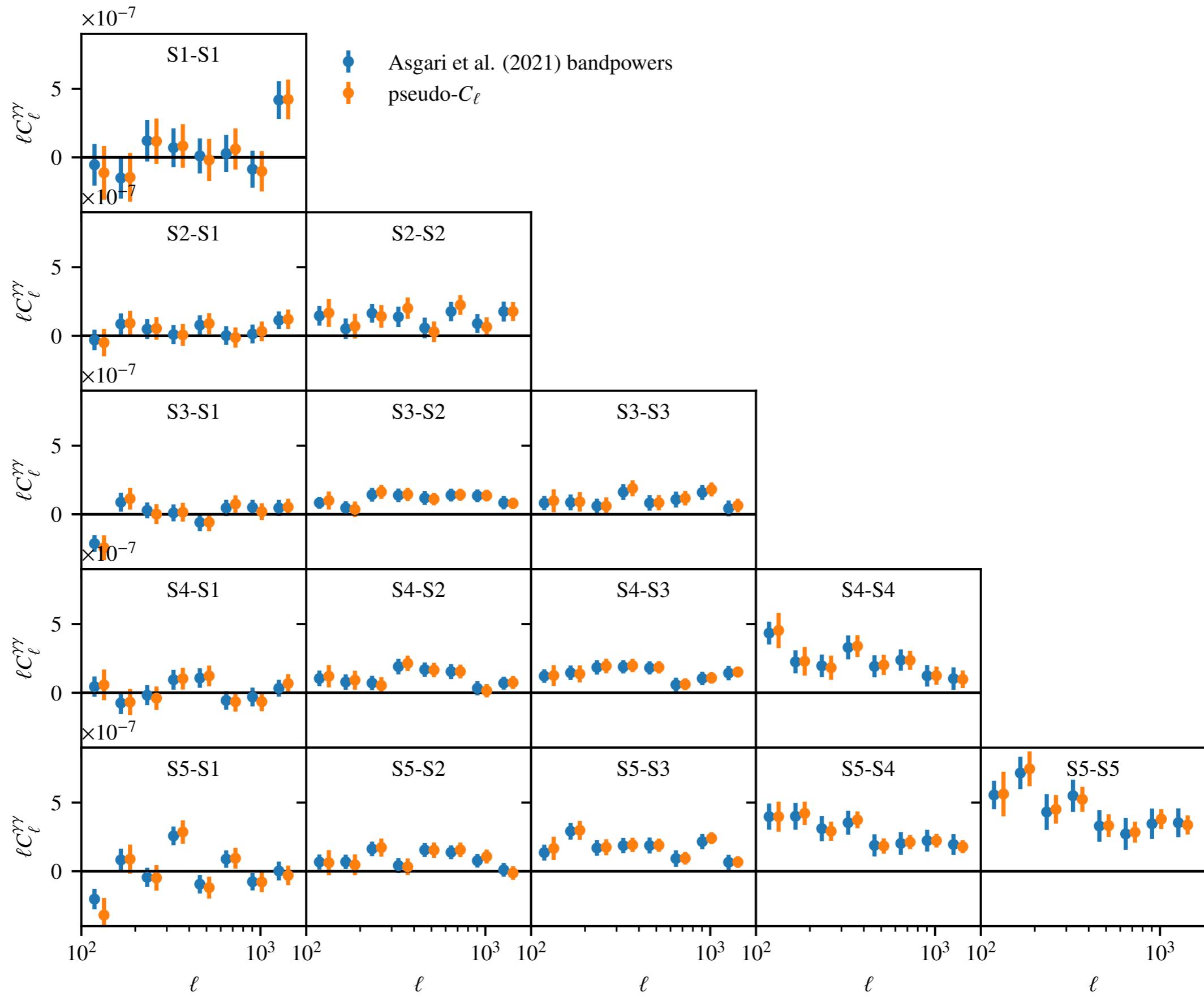


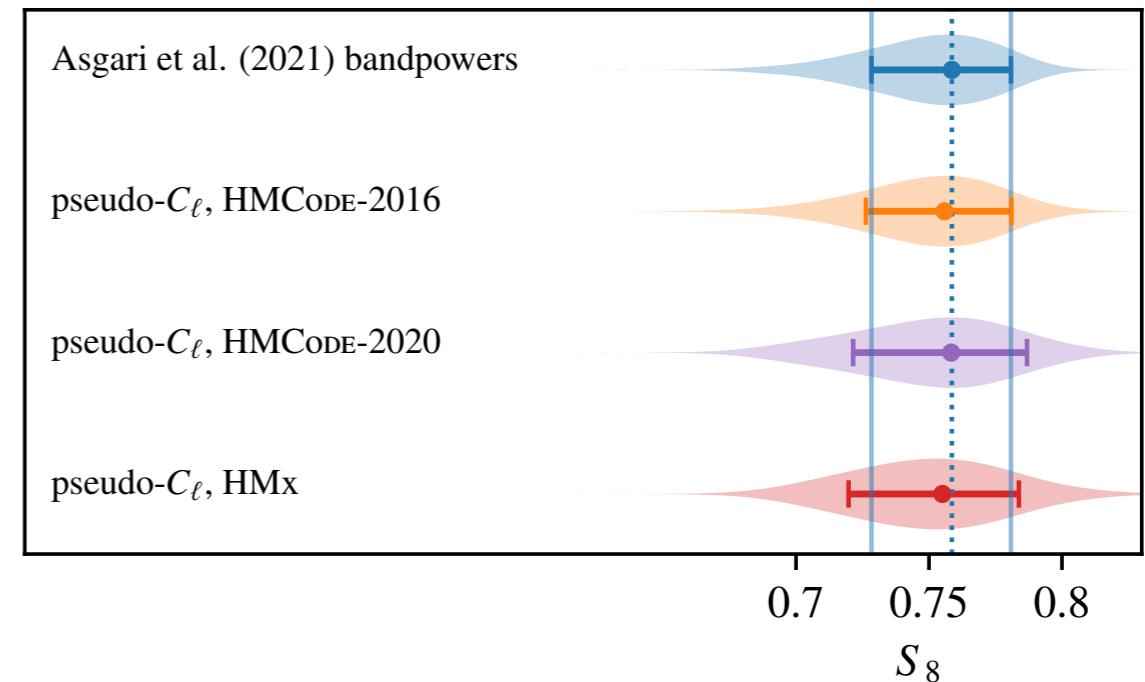
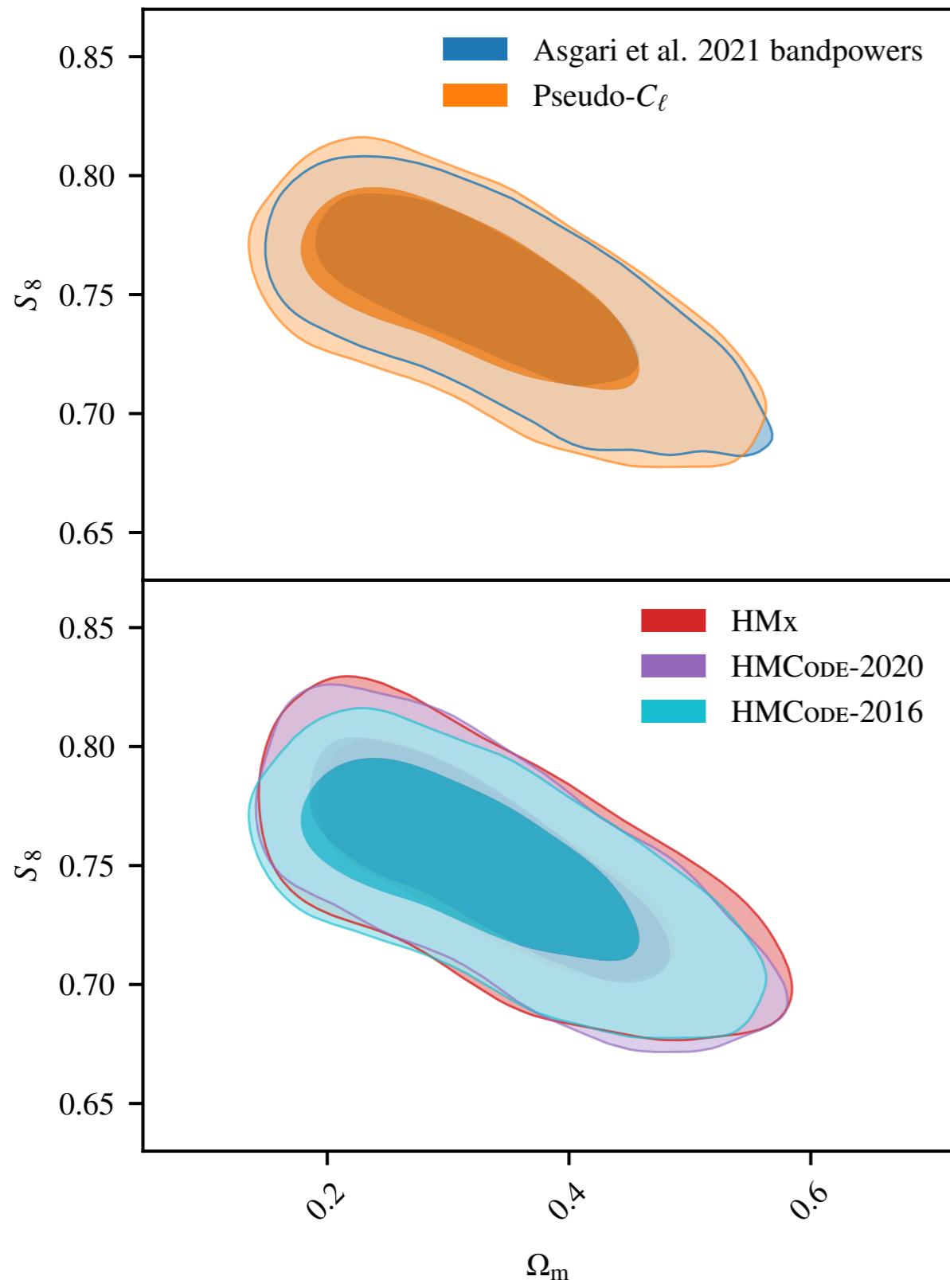




B-modes







Window functions

