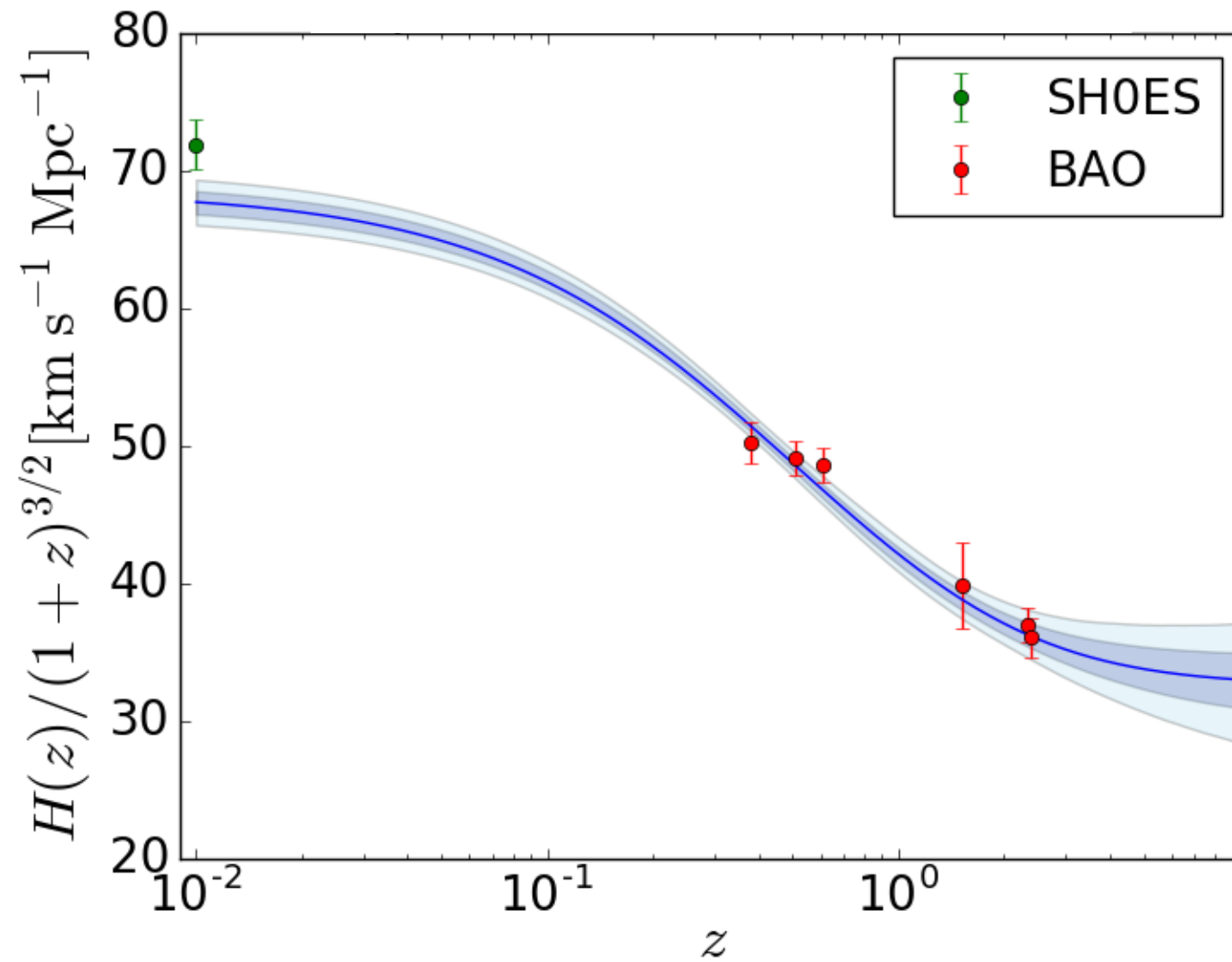


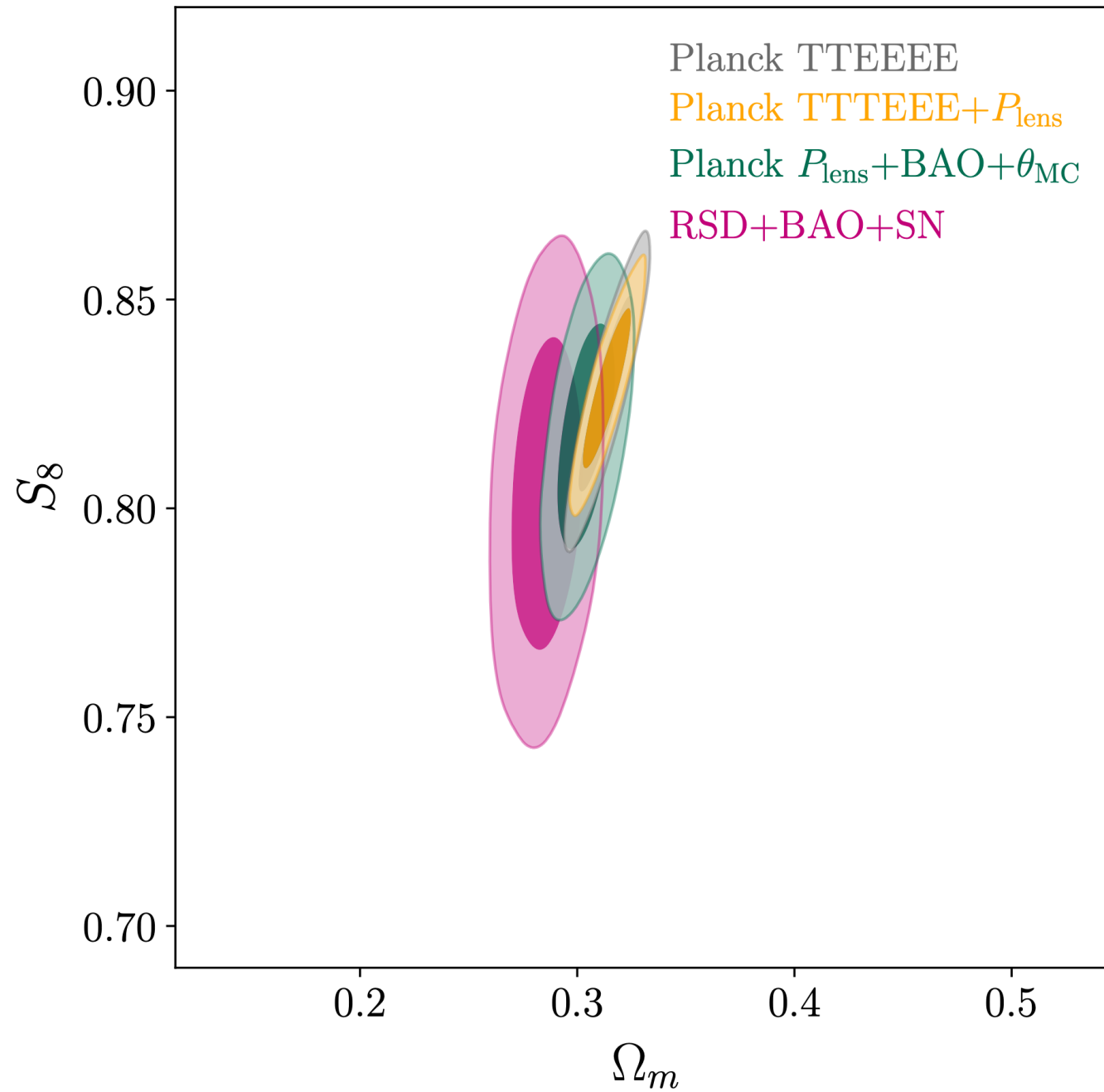
A Nonlinear Solution to the S_8 Tension?



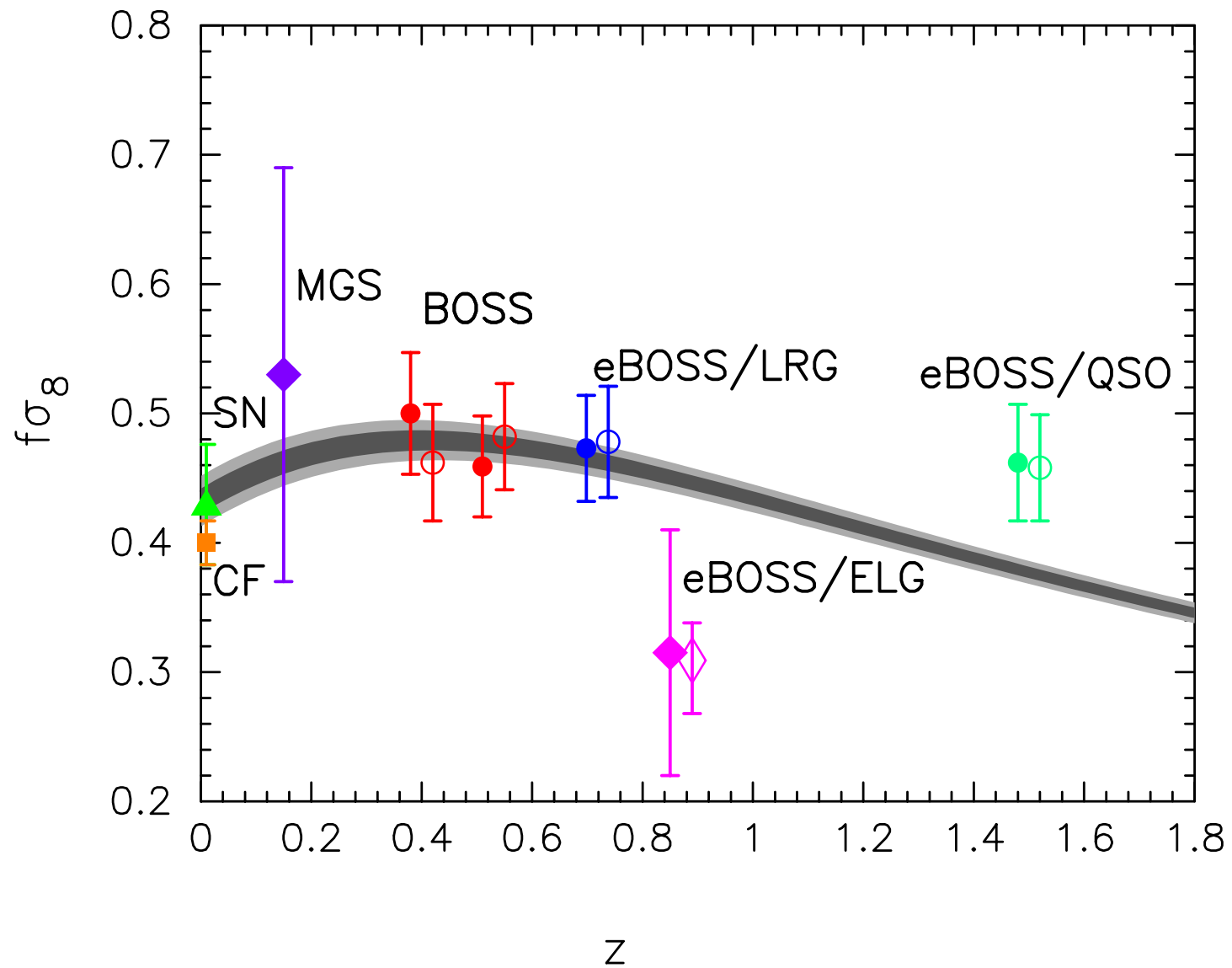
... or how I learned to stop worrying and love cosmic shear

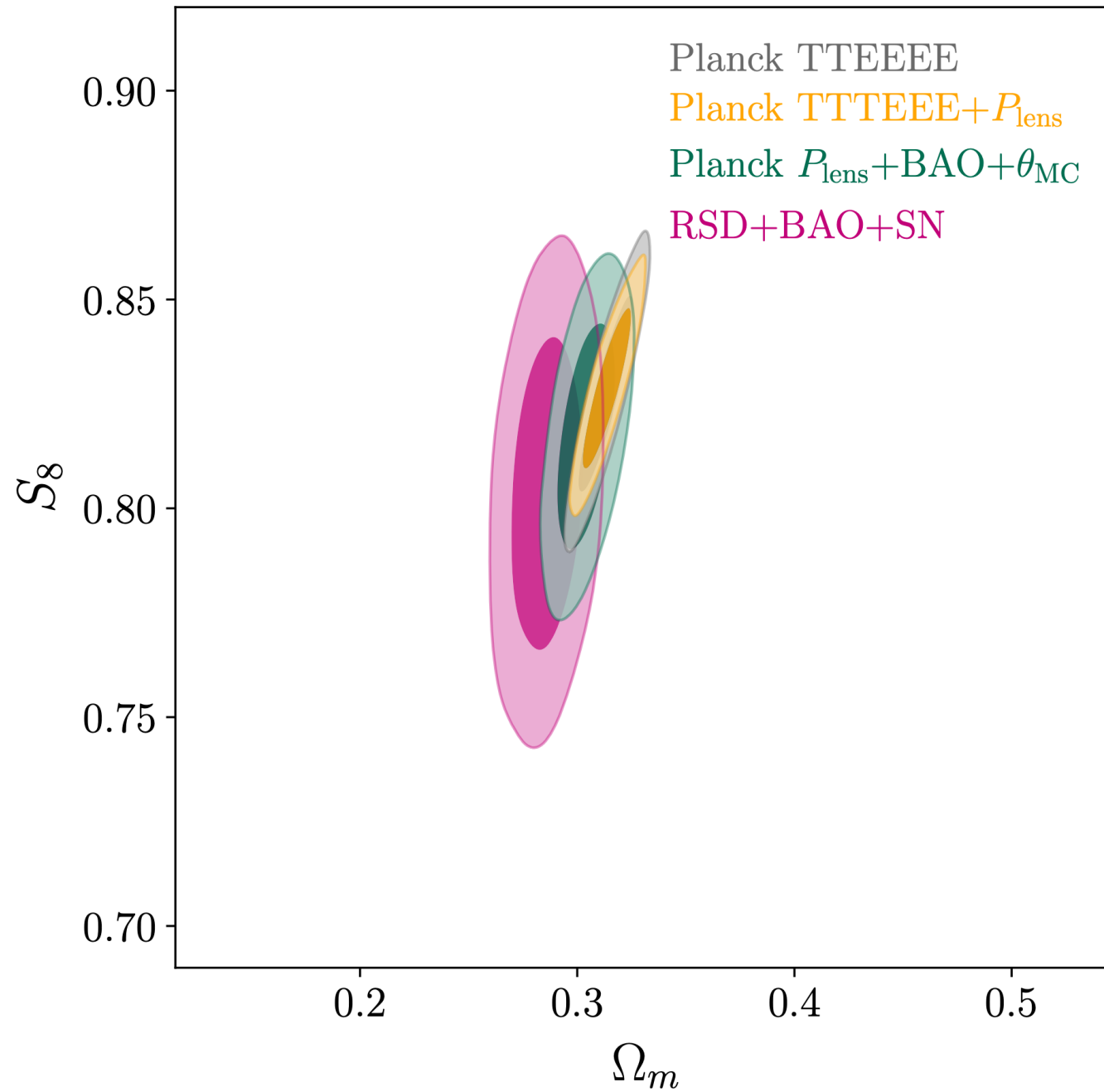
reconstruction of expansion history with Type Ia supernovae + BAO

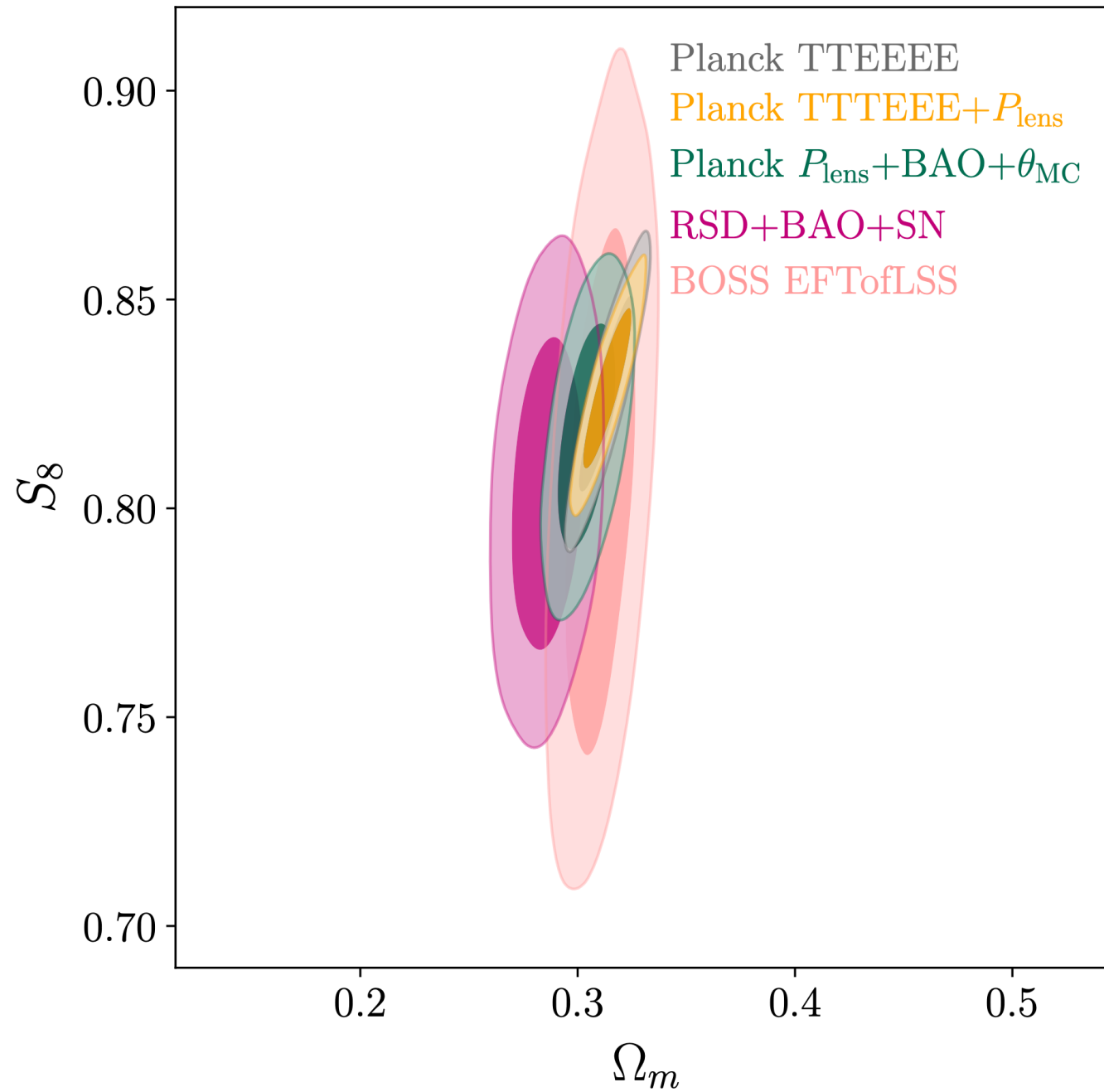


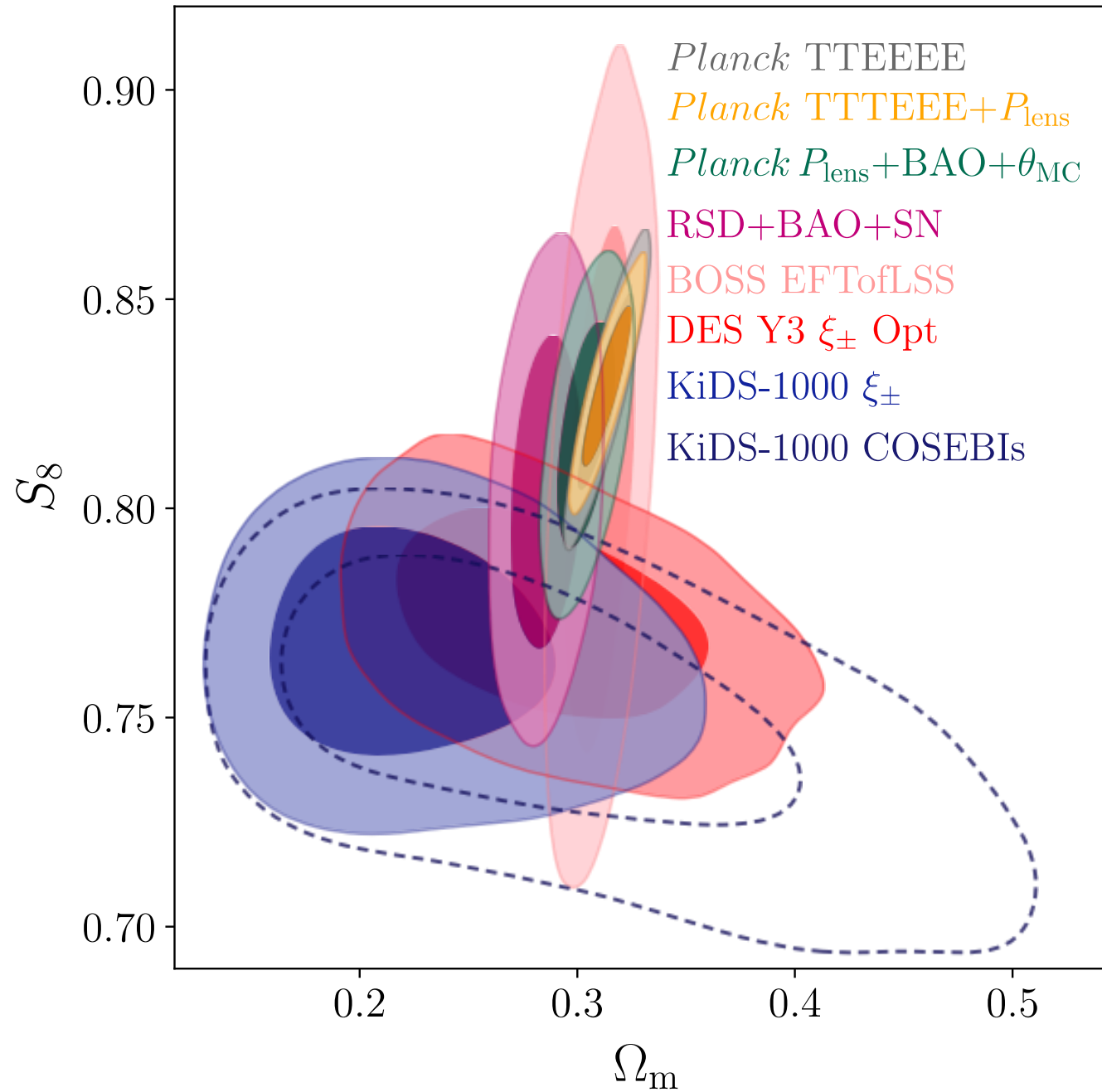


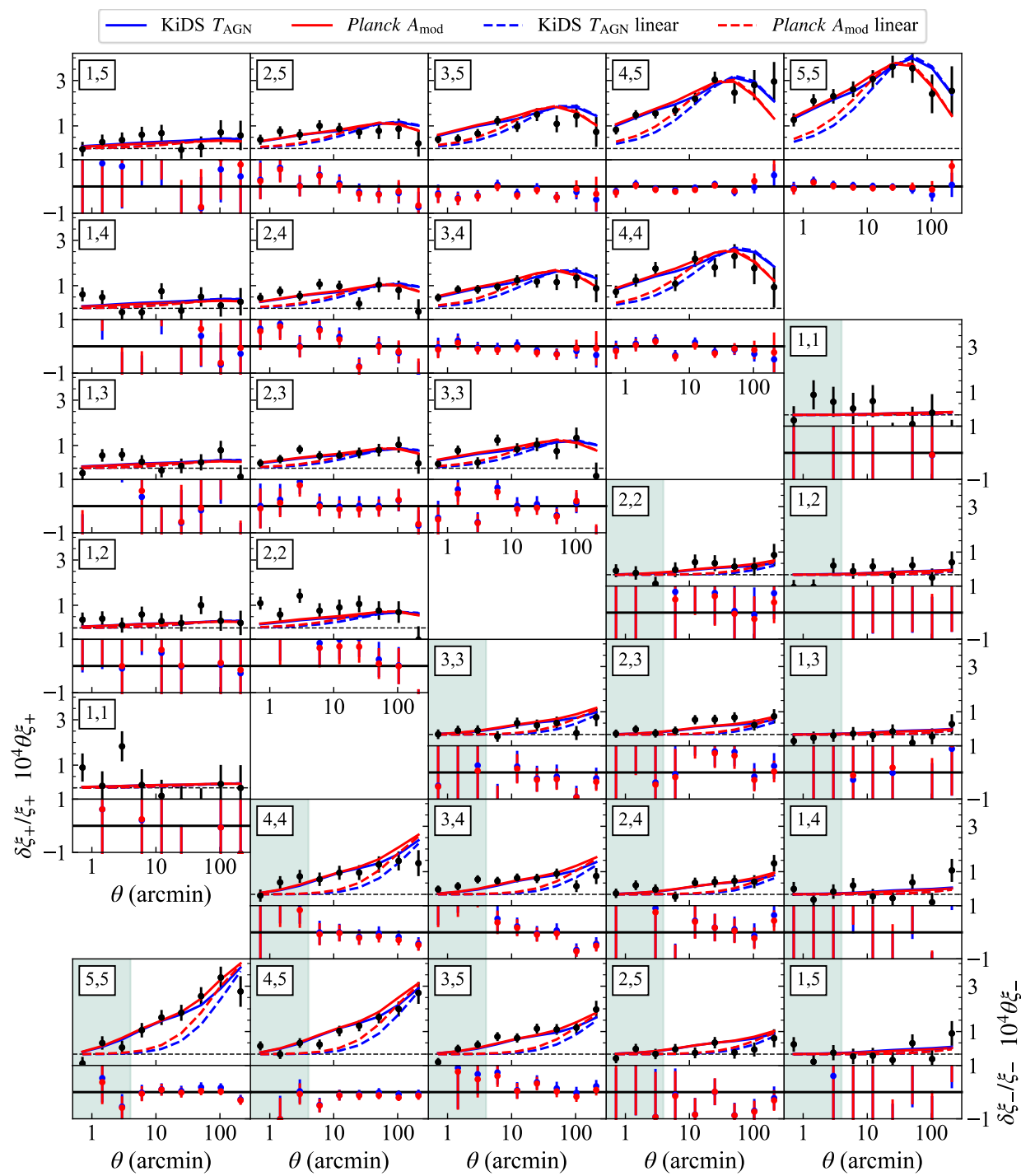
See also: d' Amico etal arXiv:2206.08327, Simon etal arXiv: 2208.0529



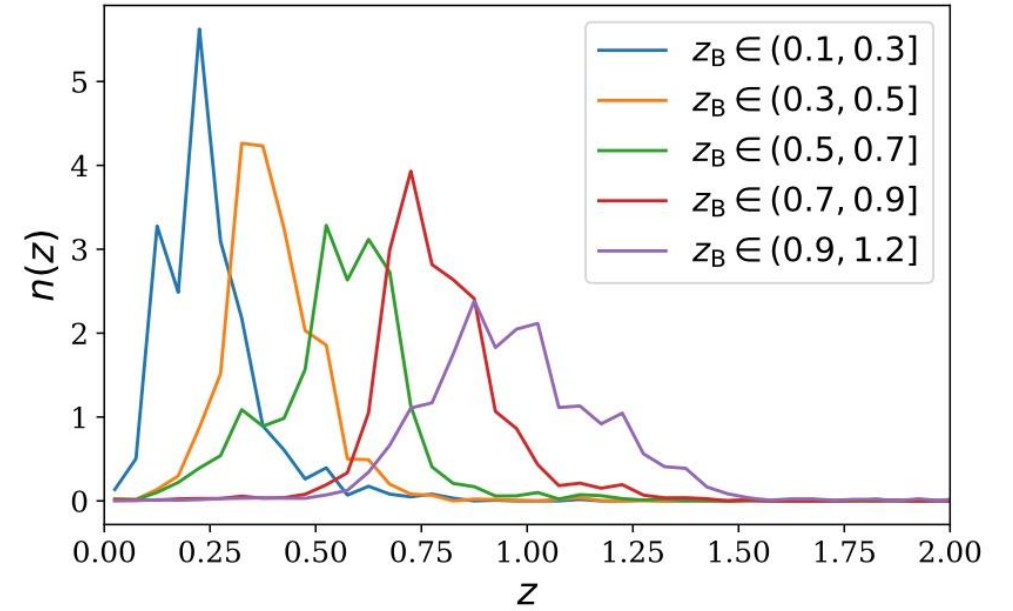


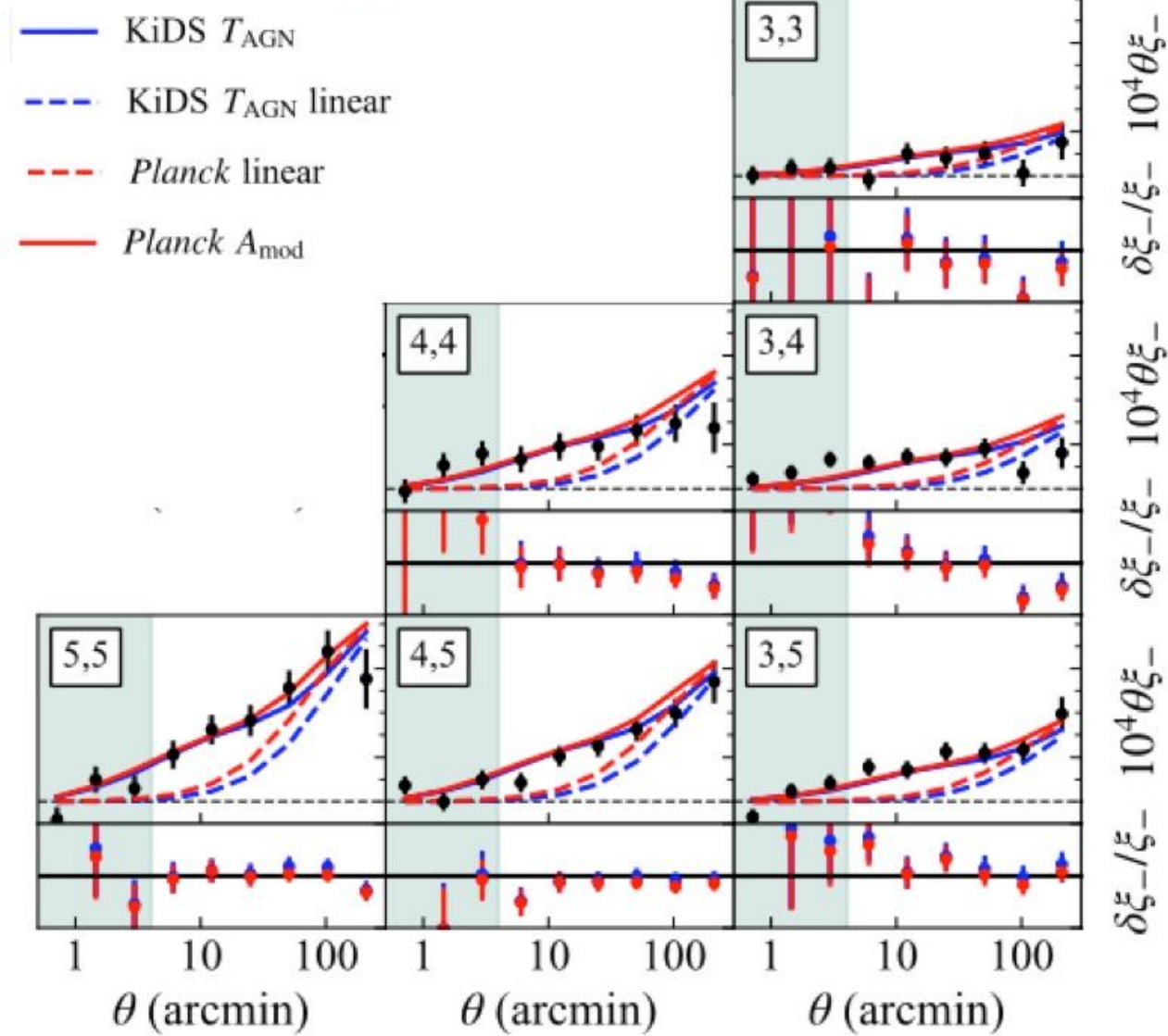
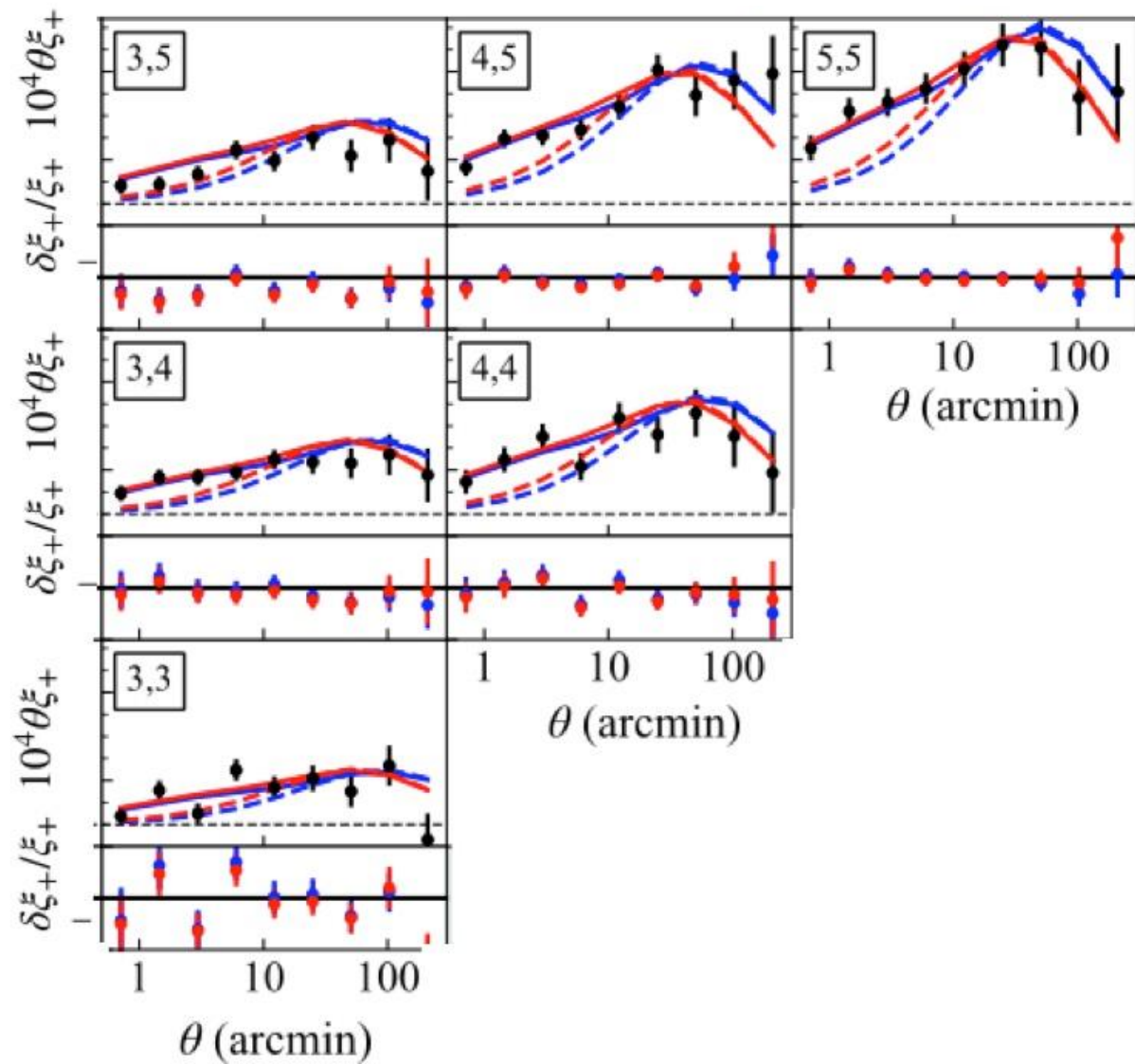






KiDS-1000 Cosmology
 Asgari et al 2021 A&A 645 104

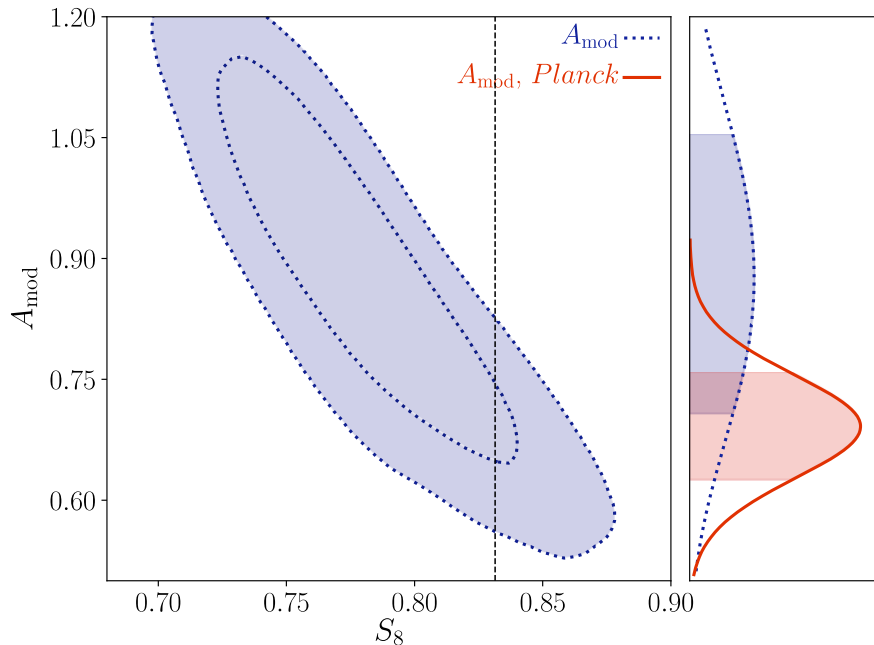




$$P_m(k, z) = P_m^L(k, z) + A_{\text{mod}} [P_m^{\text{NL}}(k, z) - P_m^L(k, z)],$$

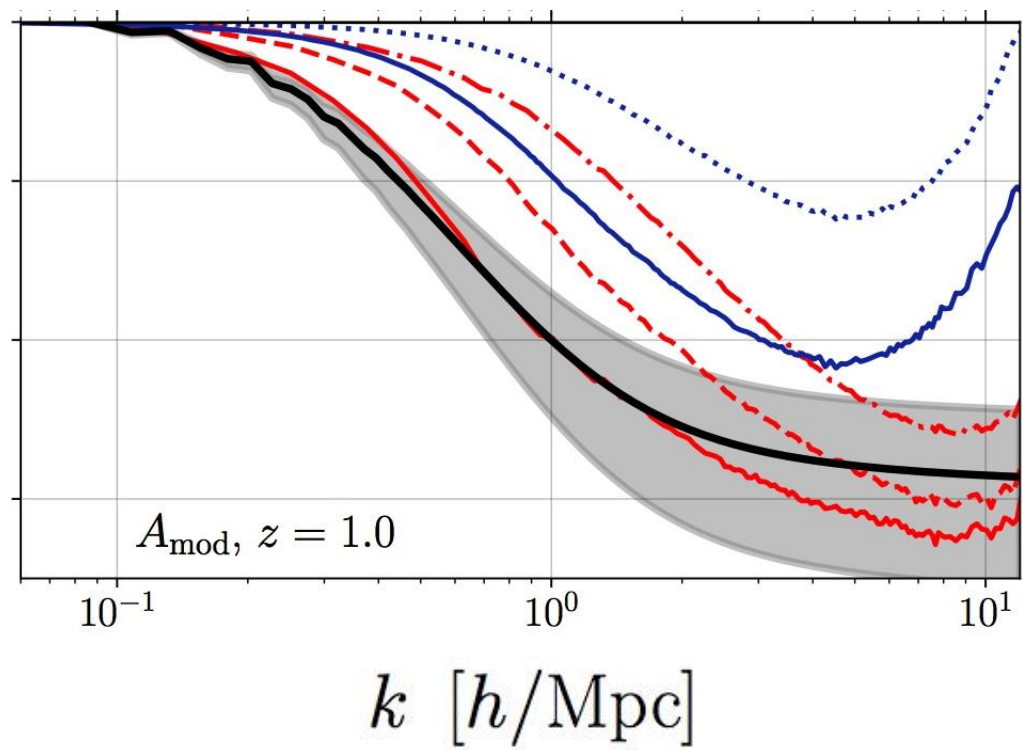
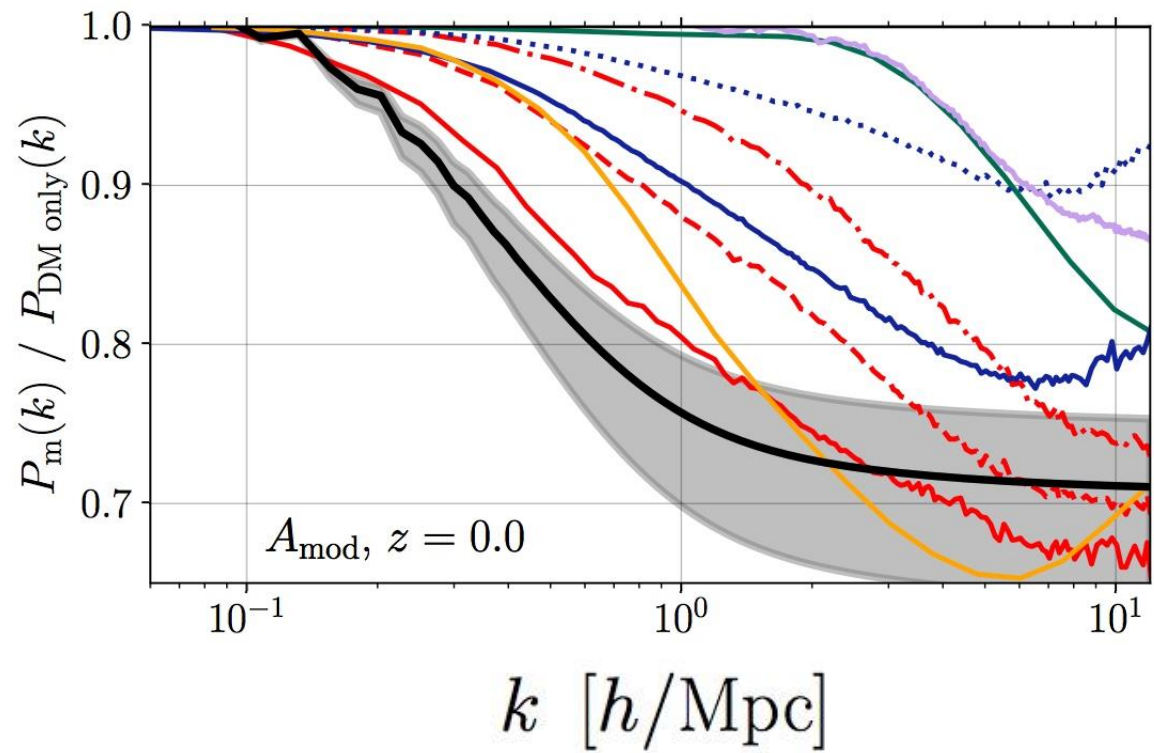
fixing to Planck cosmology

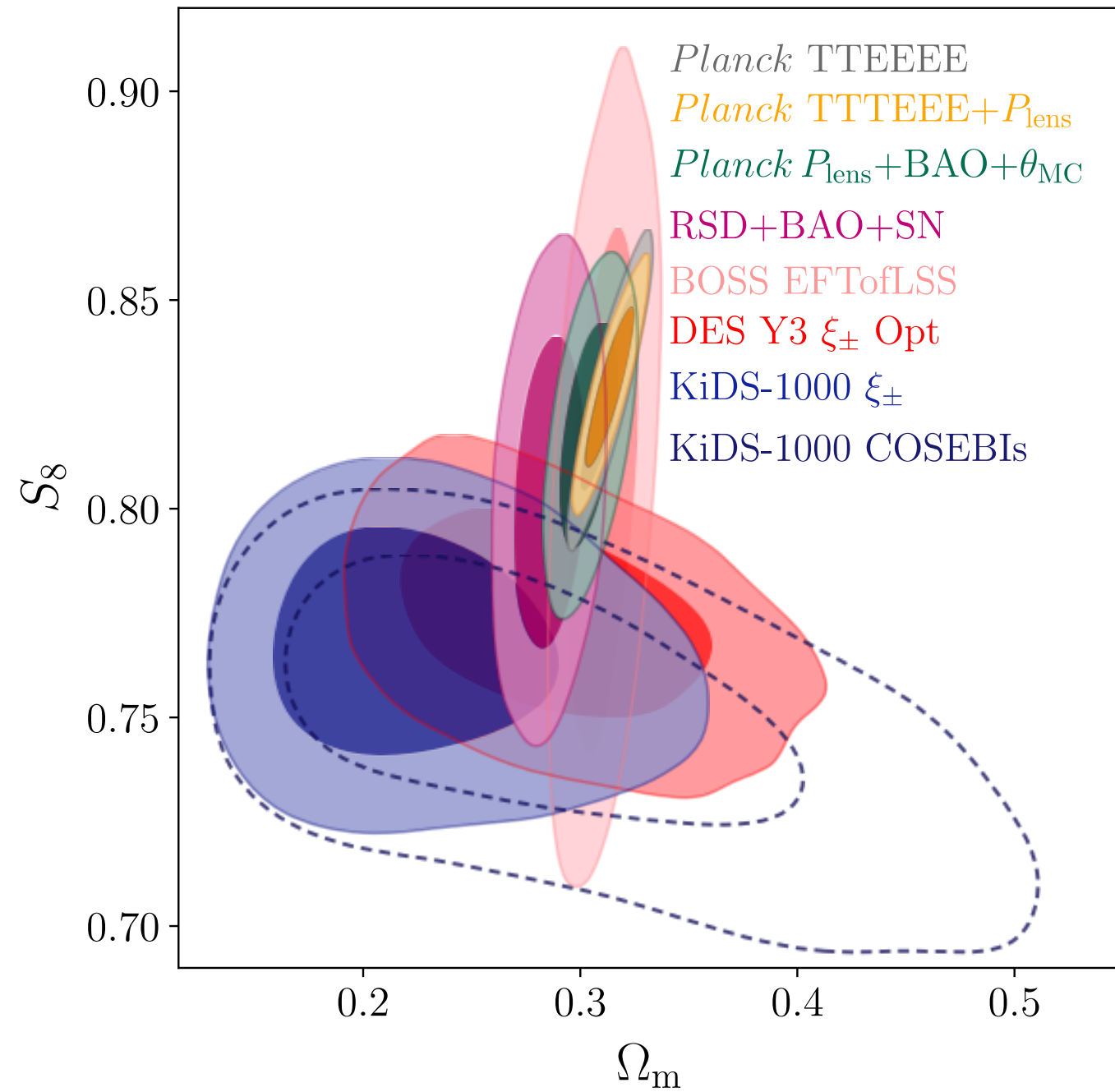
$$A_{\text{mod}} = 0.69 \pm 0.06,$$



Non-linear model & prior range	Cosmology	S_8	χ^2_{min}	N_σ	PTE
HMCODE2016	free	0.765 ± 0.018	260.1	1.92	0.030
HMCODE2020 no feedback	free	0.755 ± 0.016	261.5	1.95	0.025
*HMCODE2020 $\Theta_{\text{AGN}} = 7.3 - 8.3$	free	0.774 ± 0.021	260.2	1.89	0.029
HMCODE2020 $\Theta_{\text{AGN}} = 7.0 - 10.0$	free	0.785 ± 0.030	260.0	1.88	0.030
HMCODE2020 $\Theta_{\text{AGN}} = 7.0 - 10.0$	<i>Planck</i>	0.829	267.6	2.13	0.016
HMCODE2020 $A_{\text{mod}} = 0.5 - 1.2$	free	0.780 ± 0.035	260.3	1.89	0.029
HMCODE2020 $A_{\text{mod}} = 0.5 - 1.2$	<i>Planck</i>	0.829	265.5	2.04	0.021

See Alex's talk for more details and for fits to DES Y3

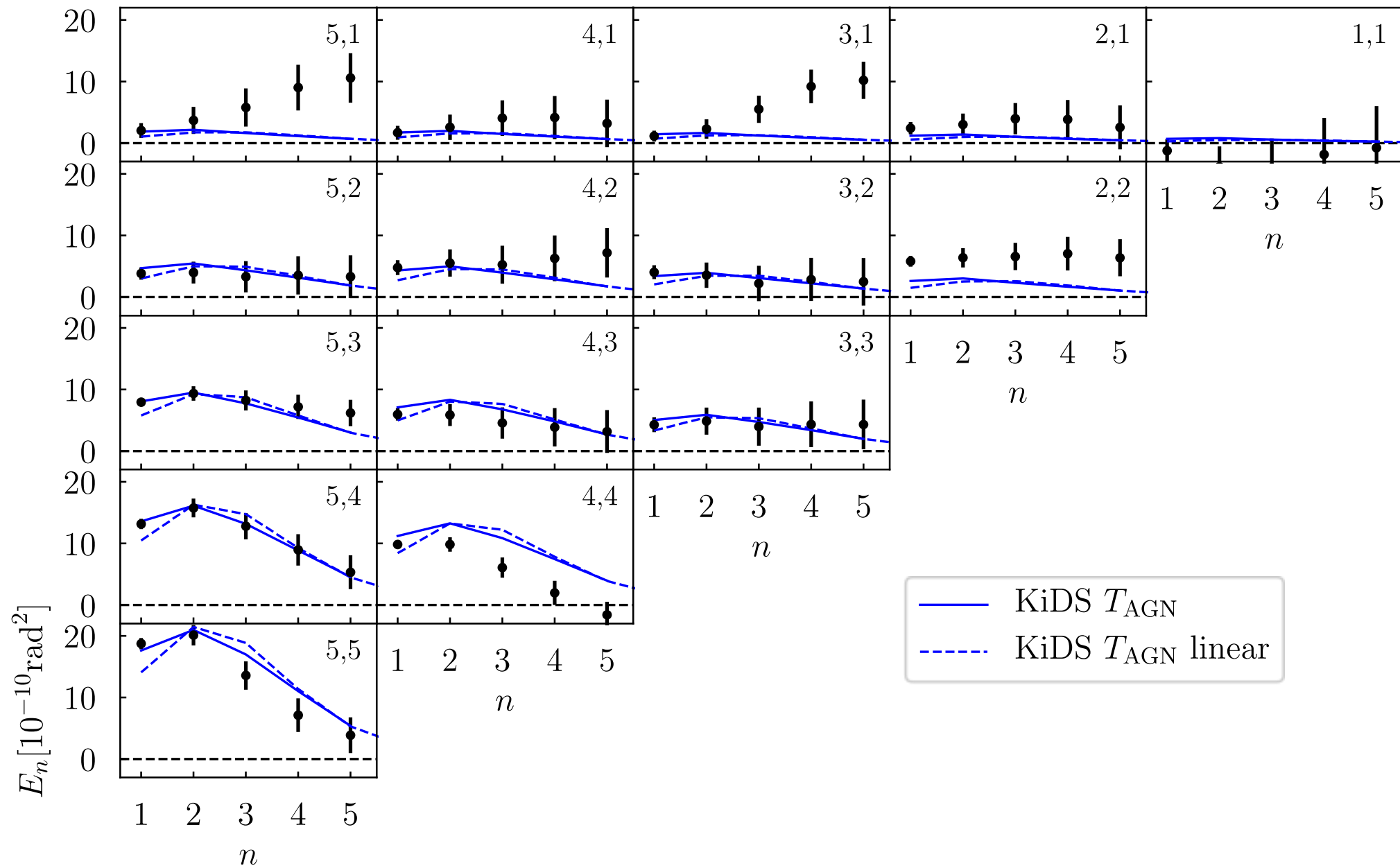


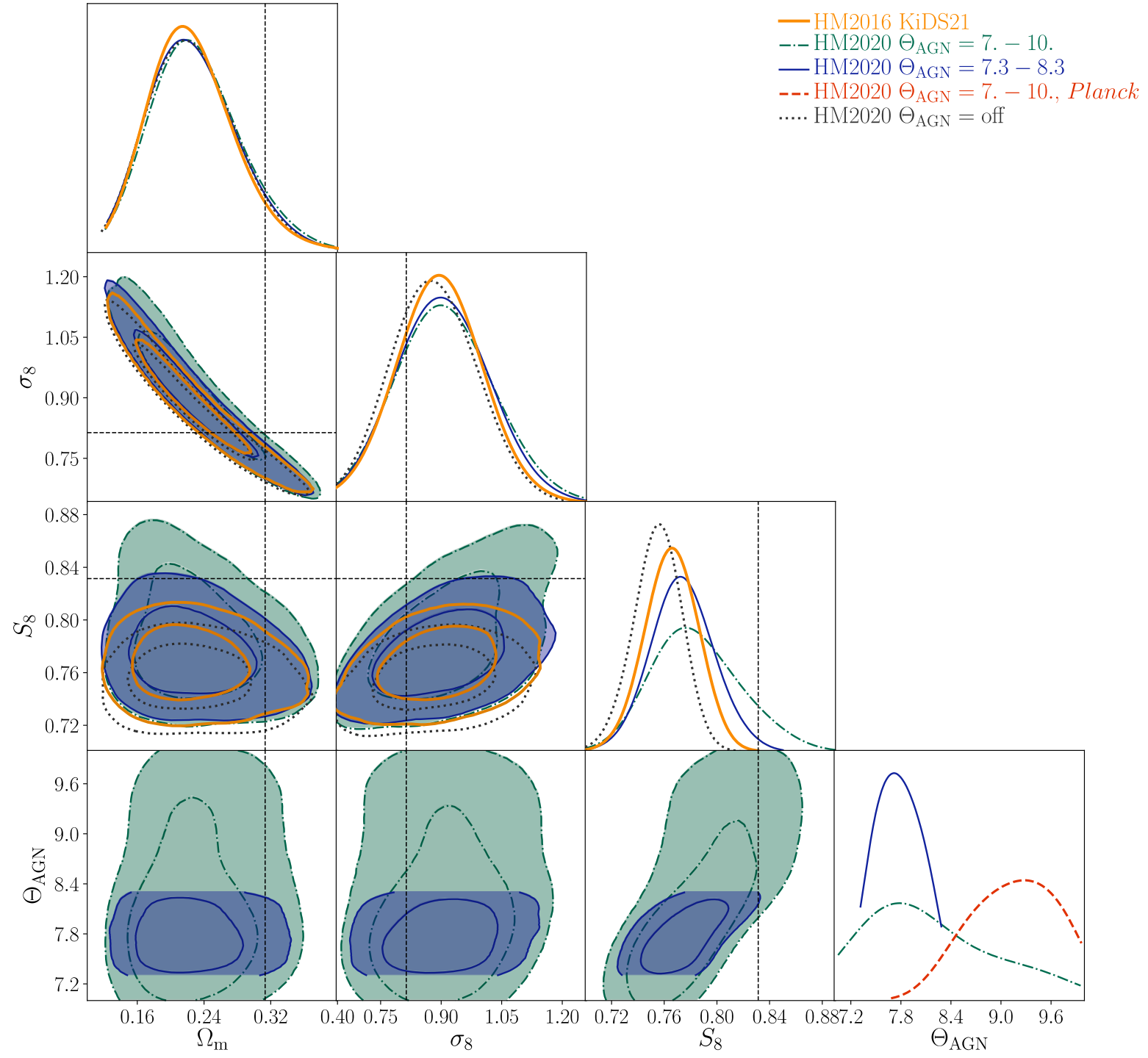


“A theory that fits all of the data will be wrong, as some of the data will be wrong”
(Francis Crick)

Conclusions

- ❑ Correction to spectrum on nonlinear scales may reconcile Planck cosmology with cosmic shear measurements.
- ❑ May be caused by baryonic feedback and/or properties of dark matter (e.g. axionic DM, interacting DM).
- ❑ Observations sensitive mainly to linear scales should agree with Planck cosmology (e.g. CMB lensing, RSD).
- ❑ Background expansion rate should agree with Planck cosmology
- ❑ Observations sensitive to non-linear scales should show amplitude deficit ($A_{\text{mod}} < 1$).
- ❑ Need additional constraints (e.g. tSZ, Tröster et al, 2022, A&A, 660, 27) to disentangle baryonic feedback from dark matter physics.





DESI LRGxPlanck CMB lensing White etal arXiv;2111.0989

